[Michael McKibben, Leader Technologies. (Feb. 19, 1996). Small firm helps AT&T cure program headache; New software spruces up Email text [AT&T AccessPlus 3.0]. *Columbus Business First, The Columbus Dispatch.*]

also attached:
[Elizabeth Feinler, John Vittal. (Jul. 01, 2022). Email Innovation Timeline. Computer History Museum.]

New software spruces up E-mail text

TECHNOLOGY TODAY

RON LIETZKE

Columbus-based Planning Works Inc. has helped develop a product that gives electronic mail the power of a word-processing system.

Available next month from AT&T, AccessPlus is for those who live by E-mail — mobile business professionals and "virtual employees" who routinely work away from a central office.

Planning Works, 6663 Huntley Rd., specializes in developing software within short time frames for clients.

With AccessPlus, a writer has a choice of fonts and font sizes and can justify, underline, indent and spell-check text. Users also can put text in boldface or italics and form bullets. There also are message sorting and tagging features.

"This is industrial-strength messaging," said David Hughart, AT&T vice president in charge of the project. "These E-mail documents are good enough to be printed for presentations and handouts."

AccessPlus will be distributed through direct sales at a cost of $69. There will be volume discounts, and the software will be bundled with software packages, Hughart said.

The product is designed to take advantage of 32-bit operating systems and will run on Windows 95 and Windows NT, as well as on 16-bit operating systems, such as Windows 3.1 and Windows for Workgroups 3.11.

Planning Works collaborated with AT&T Bell Laboratories to develop the programming code for AccessPlus, said Michael McKibben, Planning Works chief executive.

"This is the most advanced E-mail interface on the market," McKibben said. "AT&T will be looking for business customers with a high volume of E-mail use."

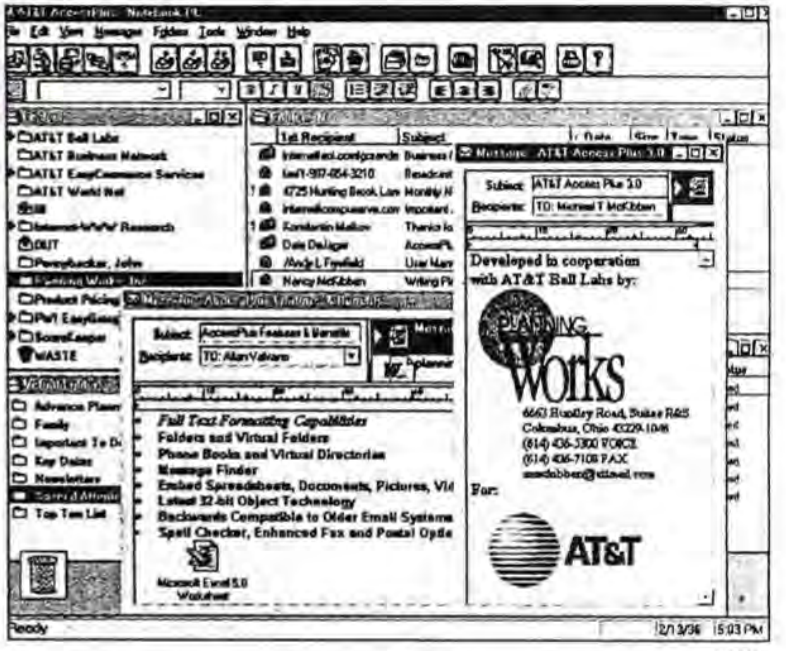
AT&T picked Planning Works for the project because the company is good at developing end-user applications, Hughart said.

AT&T often hires specialized companies to produce that kind of software so AT&T software developers can concentrate on large telecommunications and computer-network projects.

Founded eight years ago by McKibben, Planning Works is a virtual organization with many of its professionals working in various parts of the country. The company has 14 full-time employees.

Much of their work centers on Internet integration, E-mail, group collaboration and the needs of the virtual office.

According to the Electronic Messaging Association, more than 90 million people in the United States will use electronic messaging to communicate by 2000. Word-based electronic messaging is a $12.6 billion business, according to the association.



AT&T

AccessPlus gives E-mail users a variety of text choices.

Ron Lietzke is a business reporter for The Dispatch.

Small firm helps AT&T cure program headache

By JOHN W. FREES

Just as in the Aesop's fable in which Androcles earned the friendship of a lion when he pulled a thorn from its paws, so has a small Columbus software company earned the friendship — and business — of AT&T.

AT&T, that telecommunications giant with armies of programmers at its disposal, turned to tiny Production Works Inc. of Columbus to help it with a thorny problem: rewrite its popular but out-of-date EasyAccess e-mail program.

Mike McKibben, Production Works president, said his 8-year-old company took AT&T's old DOS program and rewrote it for the 32-bit Windows 95 environment, adding additional features that makes it more attractive to business users.

Why did AT&T hire PWI — with all of 12 employees — for such an important job when it had research powerhouse Bell Labs at its disposal?

McKibben said it's not unusual for big companies to turn to small software designers for certain projects, despite Bell Labs' talent.

"Their core competency was not in these messaging systems," he said, "it was more in mainframes.

AT&T recognized it needed a company more suited to the Windows environment, McKibben noted. And smaller companies can generally turn around projects of that type much faster than large corporations can do it in-house, he added. PWI received the assignment in June and had it ready in time for AT&T's fall launch of the new program.

PWI was not unknown to AT&T before this project, said Bob Jones, vice president for new business development for AT&T EasyCommerce Services.

"PWI and I have had a business relationship for several years," he said. "We recognized that they were becoming a rather competent software development boutique."

McKibben says he was helped in the project by Konstantin Malkov, his Russian-born vice president who holds two Ph.D.s from Moscow State University and was the youngest person to be named a full professor there.

The project is expected to support the growing demand for "intranets" — networks that link business computers to each other as well as to the Internet.

Business e-mail via the Internet is expected to grow significantly by the year 2000. According to the Electronic Messaging Association, more than 90 million people will use e-mail to communicate by the turn of the century. As a result, electronic messaging is expected to grow from a $13.5 billion business in 1994 to a $62 billion business.

AT&T is well-positioned to grab a share of that market, thanks to PWI, Jones said.

"The capabilities they gave us in this package far outstrips anything in the industry," Jones said.

Among the features that will help AT&T sell the program to businesses are the support of so-called "rich text," which allows businesses to "drag and drop" a wide variety of applications being sent by e-mail. This goes far beyond the ability to send a text document.

For example, Jones said, someone could send a PowerPoint presentation, including slides, via e-mail. The receiving business could pull it from the Internet ready for use.

The program also offers unlimited file folders that can store any number of messages and "virtual folders" that allow message sorting and retrieval based on criteria defined by the user.

This gives AT&T a huge advantage in the growing e-mail environment, Jones said.

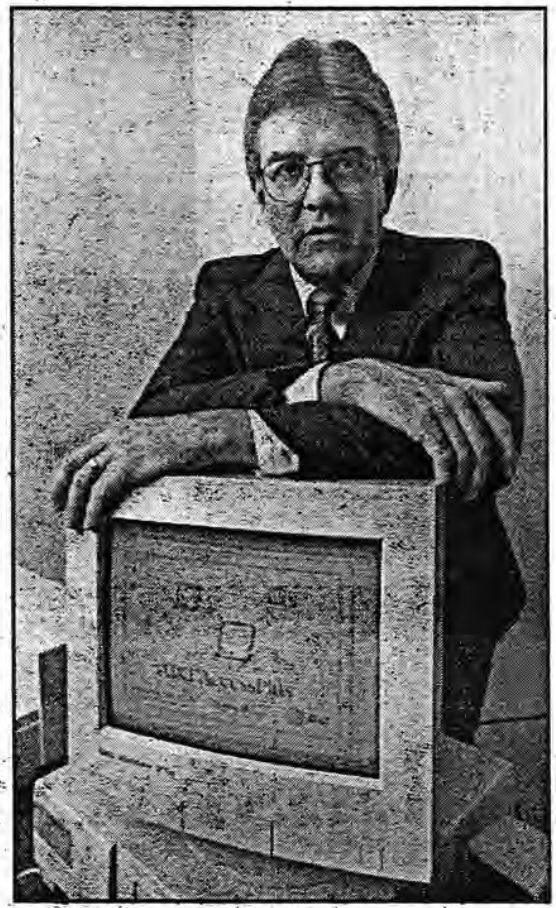
"PWI has become a rather important member of our team," he said.

"This project was an outsourcing agreement structured to leverage two party's strengths and be mutually rewarding," McKibben said.

McKibben said the AT&T alliance has elevated PWI's profile and revenues — although he wouldn't talk specifics. He said he expects revenues to double yearly for the immediate future. He also said PWI is looking at an initial public offering, perhaps as early as this year. At a minimum, he expects to add more employees to keep up with business generated by the AT&T arrangement.

Jones says there will be future projects for PWI at AT&T.

"As we expand our initiatives across the industry called electronic commerce, we'll be working closely with this firm to enable us to do this quickly," he said.



JACQUI KRAWIETZ

Mike McKibben, president of Production Works Inc., says his company's profile has been elevated by working on a project for AT&T.

Columbus Business First

Planning Works' latest effort is with Gillette Co.

By VICKI OLIVER
Daily Reporter Staff Writer

The Gillette Co. has joined forces with Planning Works International Inc. to develop an application of its pen-based computing software.

The Columbus firm, which recently announced an agreement to exchange services with AT&T, will modify its mobile computing tools for a group of Gillette senior executives.

Boston-based Gillette, the personal products and services company, will use a modification of Planning Works' Scorekeeper mobile information system.

"I will confirm that we are talking and working with Planning Works," said Stephen Brayton, spokesman for The Gillette Co.

Gillette's sales representatives have been using pen-based computers to track their accounts since last July, according to an article in Sales & Marketing Management magazine.

Gillette executives to pull up electronic mail messages on a mobile computer, add additional notes to them and then send them on to another location," said Mike McKibben, president of Planning Works International Inc.

Planning Works is developing the software for a new IBM pen-based computer, the NNN-C, he said.

"The application of the technology we are supplying to Gillette has universal potential," McKibben said. "We place the value of the technology as a whole at a minimum of $10 million to $15 million over the next three years."

Planning Works' Scorekeeper system utilizes audio, video and on-screen notes that allow executives to track their businesses.

The software gives portable computers the ability to print brochures, provide monthly sales results, analyze balance sheets, play CD ROM videos and record sound all on the same screen. McKibben

Q&A

Interviewed by NANCY BYRON

Buddying up with the big guys

Tips from a veteran alliance builder

Editor's Note: Mike McKibben, president and CEO of Columbus-based software company Planning Works Inc., explains the advantages of building business alliances with larger companies.

Q You have alliances with some rather big names: AT&T, Gillette, IBM, Apple. What prompted you to seek such allies to build your business?

A Opportunity was the driving force. Large companies need companies like us as much as we need them. In the case of AT&T and IBM, obviously they have a lot of maturity and infrastructure and ability to communicate to a wide audience which a small business never has. What we, as a small business, can offer is speed, rapid turnaround, the ability to produce products that can get to market quickly. The whole outsourcing movement has proven this sort of relationship works.

Q How do you go about forging such alliances?

A It's a pretty classic story. You meet [illegible] have to persist through all the gatekeepers that exist in a large company—and who don't necessarily want outside help.

You really need a fairly key employee in the large company to be your cheerleader and champion when things [illegible]

out and finding the funding, and building the whole thing yourself. Or you can focus on a core competency (like software development) and then find alliance partners who are already doing the other pieces. Their competencies were gained over time and with a lot of expense. Why should we go through all that when we can cut a good deal with them?

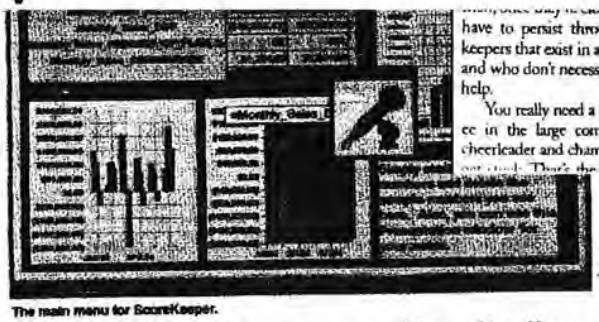
Q What's in it for the other company?

A Our cost of R&D is much smaller than theirs. We can take an identical group of people and develop a product more quickly and cheaply than a large company can. And in the software market, time to market is a real critical issue.

Q What are the pitfalls of alliance building?

A One difficulty is the culture difference between a large and small company. The personnel in large companies have different expectations on their use of time. They tend to have more regular hours, and their sense of urgency is usually not as high. That often creates difficulties when you've got to get something out quickly. In a small company, you kind of do what it takes to get a product out on time. You might work extra hours and not think anything of it. In a large company, where that hasn't been their mode of operation, that can create a lot of frustration.

Q What advice would you give other entrepreneurs looking to [illegible]



The main menu for ScoreKeeper.

Software maker expanding its line of mobile management systems

"With our system, an executive can grab [illegible], jump on a plane, hand-write notes and then send them back to the office to process," he said. "We relieve them of their paperwork burden in much the same way workers were liberated from the sweatshops of the Industrial Revolution."

The system, in development for three years, offers businesses a computer screen of [illegible] where," McKibben said.

The ScoreKeeper product represents a different direction Planning Works is taking for its mobile computing applications. The company was developing a clipboard-type cellular telephone and computing system for an investor last year who later decided to take the project in a different direction, McKibben

11. Supplemental Information

AccessPlus Rewritten By Popular Demand

BY COLLINS YEARWOOD

AT&T ACCESSPLUS, THE e-mail software that is as ubiquitous [illegible] generally improve productivity. The program was effective and reliable, yet there was still room for improvement.

"Customers also wanted a friendlier program that allowed multiple open message windows, better message-search capabilities and advanced word-processing features. This kind of functionality is what the completely rewritten AccessPlus 3.0 strives to deliver."

The new edition is compatible not only with Windows 3.1 but with Windows '95, Windows NT 3.51, and Windows for Workgroups 3.11, and can communicate with earlier versions of AccessPlus.

From the AT&T "tone" that greets you when the program boots up to the array of icons that accomplish various tasks at the click of a mouse, the program is impressive. Users can sort and display messages several different ways, including by sender, subject matter or recipient. They also can be placed in a "virtual" folder based on the user's own criteria. In addition, messages can be visually "tagged" to reflect a particular urgency or if the message is an

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AT&T AccessPlus 3.0

The smart way to manage mail

AT&T

AT&T AccessPlus 3.0: T

New capabilities and enhanced features make it faster, f

We've enhanced the software from top to bottom, to offer you an interface that makes it easier to find the information you want, and use it more efficiently than ever before.

SCREEN VIEW:

The ease of use and friendliness become clear just as soon as you start up the software. You have a new view of your desktop that helps you look at your mail differently. You get to decide just what's important to you: you can customize your screen by deciding if you want to see the toolbars, and deciding which AccessPlus Windows you want to see when you start the application.

TOOLBAR:

Commonly used functions can now be easily initiated by a single click of the toolbar "button" at the top of your screen. For example, to attach a document to your message, you just click on the paper clip on the toolbar.

FOLDERS:

AccessPlus 3.0 supports an unlimited number of folders for organizing your messages, and there's no limit to the number of messages that can be stored in each folder. Folder displays are resizable depending on your preferences. And folders can be nested inside other folders, providing heirarchical organization of your messages.

A new folder enhancement, called **Virtual Folders**, gives you a new view of what's in existing folders and allows you to separate out and sort messages from "real" folders, based on certain criteria such as Subject, **Tag**, or Text from the message body, and more. **Virtual Folders** can save you time in locating information you want to retrieve, by allowing you to specify the parameters for selection.

SMART MESSAGE MANAGEMENT:

Sorting messages is now faster and easier: there are a number of new ways to locate and organize information. You can sort by attributes — like Recipient, Date, Size, Subject, Type, Address and more.

he smart way to organize

riendlier and more functional, for improved productivity.

You can even "tag" a message (like an electronic sticky note), to highlight selected messages and give them special labels that say "action required" or "follow-up," or any other tag you choose.

A "drag" and "drop" feature lets you easily highlight and move either single or multiple messages, or even a whole folder, and drop them into another folder.

MESSAGE CREATION AND EDITING:

When creating a message you can choose from different fonts, colors and styles, including bolds, italics, etc. A built-in, integrated spell checker makes it easier and faster to check for spelling errors. And AccessPlus now supports Object Linking and Embedding (OLE) attachments.

You can cut, copy and paste both inside your current message window, and between messages, keeping multiple message windows open at the same time. Plus you can click on a file and drag it to your current message as an attachment.

DIRECTORY:

The AccessPlus Directory allows you to store information that makes it easier to organize and keep track of the people with whom you exchange messages; it includes names, e-mail addresses, fax numbers and delivery options. This handy tool simplifies your correspondence with business partners, saving you the time and trouble of looking up and carefully copying fax numbers and e-mail addresses — which can often be lengthy when you need to deliver messages to another network.

We've upgraded this tool with advanced innovations, giving it smart addressing features that make it easier than ever to conduct your business using electronic messaging.

You can now create a "Virtual Directory," which allows you to sort the information in your Directory based on specific criteria you select, and then address messages to those selected parties. A feature called "Autopopulation" even makes it possible for you to automatically add names and addresses to your Directory as you reply to mail from new correspondents.

And the Directory is easier than ever to access from the Create Message screen, the toolbar, or as a separate capability available from within other applications.

and manage your mail.

AccessPlus supports a variety of advanced applications to increase your mobility, and improve the efficiency of your communications.

FAX SENDER/FAX VIEWER:
Lets you create, send and receive secure faxes right from your PC or laptop all via AT&T Enhanced FAX — without the need of a fax machine. So you can receive important faxes virtually anytime, anywhere, improving the efficiency of today's mobile workers. You can choose to display a fax in actual size, or scale down the size, and you can even forward a received fax message.

PREVIEW MAIL:

Lets you scan through your messages in remote folders on the AT&T Mail network, and choose which messages you wish to receive. This feature allows you to manage your time more efficiently, by allowing you to browse through all your new mail and choose to download only those messages which require your immediate attention.

Depend on world-class customer support

AccessPlus 3.0 is backed by AT&T's experience, reliability and reputation for top quality service. You can access support through easy-to-read graphical help files built right into the program, or through the full documentation which accompanies the software. Or you can call on us 24 hours a day, 7 days a week for live technical support.

System Requirements

- IBM PC - 386 compatible or greater.
- Windows 95, Windows 3.1, Windows for Workgroups 3.11, Windows NT 3.5.1.
- Modem speeds of up to 14,400 (9600 Baud minimum Modem required for use of FAX SENDER)
- At least 8 megabytes RAM recommended.

For more information
about AccessPlus 3.0,
call 1 800 242-6005, Dept. 5300.
Outside the U.S., call 214-778-5024.
In Canada call 1 800 567-4671.
E-mail to telemark@attmail.com
Or you can reach us on the Internet at
http://www.att.com/easylink

FAST, MOBILE AND VERSATILE SOFTWARE THAT OFFERS SMART SOLUTIONS FOR YOUR BUSINESS:

- *Marketing departments can quickly relay confidential promotions and new advertising campaigns to internal staff, utilizing rich text formatting (RTF).*
- *Sales managers can easily sort important messages that require immediate action using* ***virtual folders****, and forward the messages to appropriate sales reps.*
- *Sales people can prepare presentations in a rich graphic format and fax them directly from their PC for head quarters' approval.*
- *Support staff can use the Virtual Directory feature to organize specific people on a project and forward all pertinent memos and information.*

And now a great thing just got better, with enhancements that make the software even more powerful and flexible:

- ***New Capabilities*** — *message management is more efficient with expanded folder searching, sorting and filtering,* ***"virtual folders"****, nested folders,* ***message "tags"****, the ability to view multiple messages,...and more.*

- ***Enhanced Features*** — *we've added advanced innovations to the Directory to make it faster and easier to address your messages, we've included rich text formatting so you can choose fonts, use color, bolds and italics, and now you can even check your spelling.*

- ***Easier Than Ever to Use*** — *the software has been totally updated to be a truly Windows-compatible interface, including toolbars to speed up commonly used functions and support for standard Windows conventions, such as drag and drop.*

CALL 1 800 242-6005, DEPT. 5300.

Outside the U.S., call 214-778-5024.

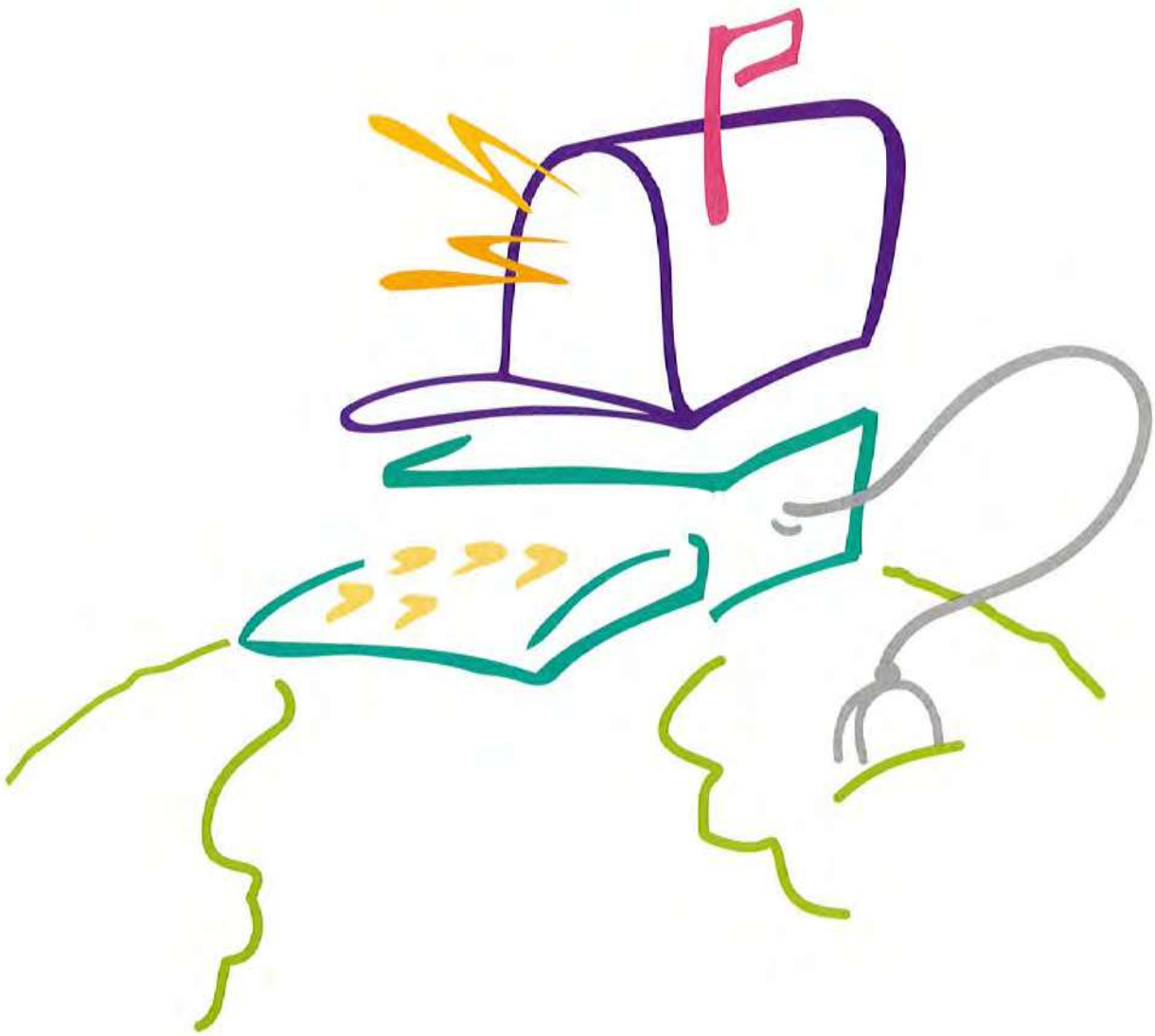
In Canada call 1 800 567-4671.

E-mail to telemark@attmail.com

Or you can reach us on the Internet at

http://www.att.com/easylink

AT&T Mail



Turning Communications Into a Competitive Advantage

AT&T

What value does AT&T offer you...

We bring you...

... bundled solutions which bring our products and services together in comprehensive packages to solve your business needs.

These bundled offers can include products by our partners as well as independent software vendors and a Professional Services group to consult and assist in mail enabling your mission critical business applications...

Your Competitive Advantage

Business competition has never been tougher. Operating margins are at razor-thin levels. Process re-engineering has squeezed every extra hour from production and delivery. Often the only difference between winning and losing business is how well you serve your customers.

AT&T can help your company turn communications into a competitive advantage by giving you and your customers a better, faster way of exchanging information. The AT&T EasyLink Services family of products and services offers you a total messaging solution... from its reliable AT&T Mail message transport service for your Electronic Commerce (EC) needs to Professional Services to help design your mission critical applications. And AT&T offers the added value of dedicated messaging specialists who can help you solve your messaging requirements with Mail-Enabled Application (MEA) solutions.

Enhance Enterprise Productivity with AT&T Mail

Businesses today are focusing on enterprise productivity — using information technology to help people work together more efficiently. LANs and client/server systems can enhance communications within your enterprise and AT&T Mail can enhance communications with people outside the enterprise.

AT&T Mail is a worldwide public messaging service that supports electronic mail messaging, electronic data interchange (EDI), fax, telex and multimedia messaging, and Information Services. AT&T Mail eliminates the obstacles of geography, time and technology, so you can seamlessly exchange information and data with virtually anyone, anywhere, at any time — clients, business partners and employees on the move.

With AT&T Mail, price updates can be sent out any time, day or night — even after business hours. People can exchange messages and data files even when their schedules don't coincide. Information updates or daily newsletters can be instantly available to employees or clients. Sales data, invoices and purchase orders can be entered into customer and vendor information systems without re-keying, speeding payment and reducing delivery time.

AT&T Mail offers connectivity with over 30 million private and public electronic mail subscribers worldwide. Fax, telex, mobile devices and U.S. postal messaging options give you access to branch offices, customers, trading partners and business partners, worldwide, with speed, accuracy and security. AT&T Mail even lets you keep in touch with mobile workers via notebook computers, organizers and personal communicators.

Cut Costs by Automating Mission Critical Applications

You can achieve dramatic gains in productivity by mail-enabling your business-critical communications with AT&T. The technology used can be any of a variety of electronic commerce technologies; including FAX, Email, electronic forms, or EDI. The most important thing is that you are eliminating the creation and physical delivery of a paper document, and replacing this process with an electronic alternative that speeds cycle time, reduces errors related to re-keying data, and provides better record keeping of transactions with customers and business partners. Your customers will be delighted with your new level of service quality and at the same time, you will be cutting costs. It's a win-win situation.

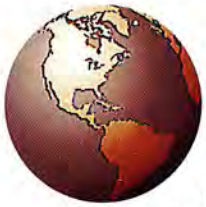
Connectivity Options to Meet Your Systems — and Your Business — Needs

Your company probably has multiple information systems, from PCs and terminals to minicomputers and mainframes. And you may already have electronic mail systems in place. Your business demands that these systems can communicate and AT&T can help you reach that goal.

Worldwide Connectivity via X.400

AT&T Mail is an X.400 based network, the international standard for communications between separate mail systems. You might use private X.400 gateways within your company to enable electronic mail communication between your existing LAN and host-based mail systems. However, you can use AT&T Mail as a backbone network — bridging your private enterprise network to other departments within your company, to vendors or partners, worldwide.

Globally, AT&T Mail maintains X.400 interconnect agreements with over 50 public mail systems. If you are interested in bridging your private enterprise network to the outside world via X.400, our expert staff can assist you in the process.



AT&T and its many business alliances, can help your company extend the reach of these systems. We support your mobile devices, stand alone PCs and Local Area Networks, as well as the most popular midrange systems, including DEC, IBM and HP. Our solutions often require minimal investment, make optimal use of existing hardware and Email systems, provide customization options, and adhere to international standards for worldwide connectivity.

Interface Software

AT&T makes it easy for you to connect your existing systems to the AT&T Mail network. We offer a variety of software options — compatible with common operating environments — to connect your local environment with AT&T Mail. Most of these options extend your communications without the need to displace existing systems or train users on new software.

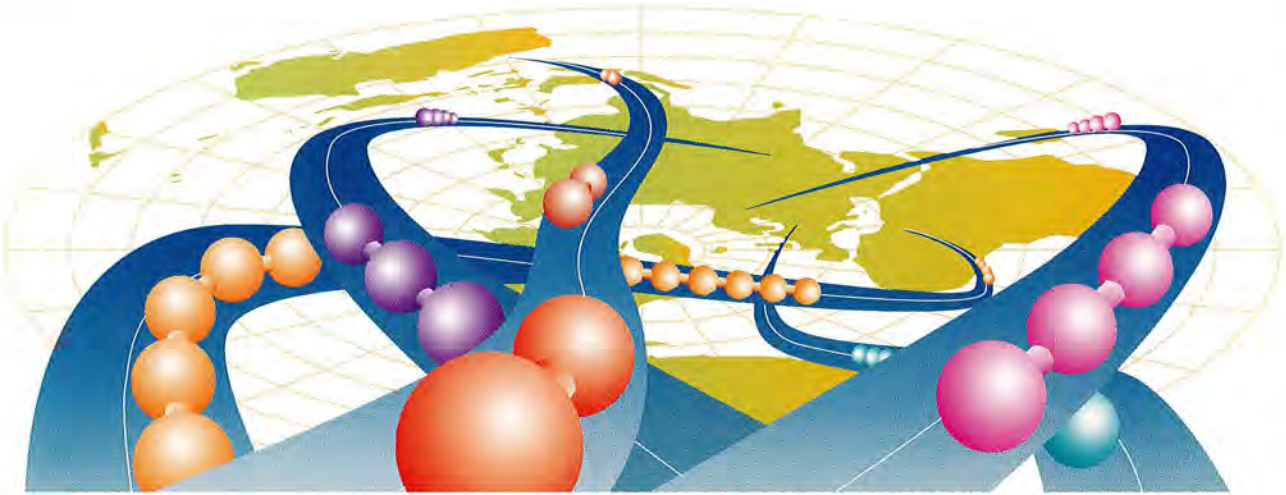
We have solutions for your personal computers, whether you need to connect from a DOS, Microsoft Windows, or Macintosh PC. We also have PC Software available in select foreign languages.

And we provide connectivity for personal communicators or organizers via software that connects to our service.

If your environment consists of LAN implementations, AT&T can provide solutions for over 90% of today's LAN electronic mail users. We can also provide interface solutions for companies running messaging applications on midrange or mainframe systems, such as IBM or DEC.

Companies can often gain a competitive advantage by message-enabling some mission-critical applications — so that sales and purchase data can be exchanged with customer and vendor systems electronically. We can provide you with the tools to make these applications communicate with our network via proprietary or industry standard Application Programming Interfaces (API's), and can provide further customization to meet your specific needs.

AT&T supports worldwide connectivity via the Internet Information Superhighway, for exchange of electronic mail and binary documents via DNS, SMTP, TCP/IP and X.400.



AT&T Mail Delivery Options

Clients and business partners have a need to conduct EC, which extend beyond simple text messages. Some may want to exchange electronic text and binary documents, while others may prefer their information via fax or mail. You may need to create messages in a variety of formats — memos, business letters, freeform notes, or messages consisting of attachments of multiple spreadsheets and word processing documents. You might even want to add personalized logos and signatures to your fax or paper messages. In order to stay competitive, you may conduct EC by MEA's, electronic forms, or EDI.

The AT&T Mail network supports all these formats and more, plus messaging capabilities that allow communications to reach world-wide across the Internet. Access to the Internet is fast becoming a business requirement.

With AT&T Mail you can send and receive messages to and from the Internet. You can also take advantage of our other Internet service offerings such as:

- Domain Name Service (DNS)
- Simple Mail Transfer Protocol (SMTP)
- X.400 over TCP/IP (Transmission Control Protocol/Internet Protocol)
- Multipurpose Internet Messaging Extension (MIME)

ACCESS OPTIONS

HandHeld

Laptop

PCs

Local Area Networks

Mini Computers

Host Computers

With AT&T, your company connects easily with electronic commerce technologies including FAX, Email, electronic forms and EDI, replacing paper documents with fast, accurate communications that cut costs and improve service to your customers.

AT&T EasyLink Services

DELIVERY OPTIONS

Voice

Radio Pager

Wireless

Hard Copy

Remote Printer

Fax

Telex

Electronic Mailbox

AT&T Mail allows you to send messages to multiple recipients and delivery options simultaneously. You can also create distribution lists made up of any combination of addresses (both Email and fax addresses, for example).

The following delivery options are available upon message creation:

Electronic Delivery
You can send a message to another AT&T Mail subscriber, X.400 users, Internet users, users of private Email systems, users of other value-added messaging networks and LAN Email users.

MailFAX
Text mail messages can be sent to any Group 3 Fax machine.

Mobile Devices
AT&T Mail can deliver electronic mail messages to a variety of mobile devices, such as laptops, Skytel pagers, and personal communicators.

TELEX
A message can be delivered by AT&T mail to virtually any telex terminal in the world.

MailPRINT
A mail message can be routed directly to a receive-only printer (U.S. only).

U.S. Postal service
A paper message can be sent via the postal service to any U.S. recipient (U.S. only).

Overnight Delivery
Time sensitive paper messages can be delivered via a courier service (U.S. only).

Rapid, secure, password-protected communication begins with an easy-to-use menu that gives users access to the full resources of AT&T Mail.

System Reliability, Integrity and Security

With information fast becoming a company's most valuable asset, the content of your messages must be secure from unauthorized access. And in a twenty-four hour a day economy, your messages must get to the intended systems or recipients quickly if they are to have value.

AT&T maintains high standards for network security and performance. We take the worry out of messaging by providing you with the reliability, security, and tracking mechanisms that your business demands.

Security

AT&T Mail provides multiple safeguards against unauthorized network access, including user IDs and passwords. If you require additional access security, you may use your private profile option to select and identify a second password.

We have designed precautions beyond the log-in process. Users are precluded from accessing services beyond those to which they subscribe. A structured menu process masks the actual network destination addresses and locations, preserving data confidentiality and network configuration information. Administration of this menu follows secure procedures that require strict authentication of authorized identities.

The patented, unified AT&T network architecture builds on X.400 protocols for seamless interchange of Email and information, with built-in future upgradability to voice and video services.

Availability, Redundancy

To assure that mission-critical messages and information arrive in a timely manner at their intended destinations, AT&T utilizes various techniques to measure and improve the availability and reliability of our service. Reliability and redundancy are built into our Network architecture to keep traffic flowing. Our nodes are distributed and we have redundant processors and mirrored storage for total data reliability. With AT&T your message will reach your intended destination in a timely, accurate manner.

Audit Trail

Our customers sometime have the need to track a particular message. At the customer request, AT&T can trace a message through the network by a unique message identification number assigned when it is submitted.

Unique, Patented Messaging Architecture

The AT&T EasyLink Services family of products include AT&T Mail, EDI, Enhanced Fax and Information Services — all built upon a patented, unified messaging architecture called the MTA, or Message Transfer Architecture. The MTA is a functional superset of International Telecommunications Union (ITU) Message Handling System (MHS) X.400 standard, the globally-recognized standard for messaging movement and management.

The MTA ensures the exchange of messages and other forms of information among all current and future AT&T EasyLink Services messaging products and services. Our network is designed to handle multiple media and messaging services. As technology evolves, the portfolio of services offered under our messaging umbrella will broaden; you'll be able to add future AT&T messaging options as they become available, without disrupting your existing messaging infrastructure.

Our unique architecture enables you to have a unified mailbox for fax, EDI, and Email services and to establish a single session for all your Email and information services needs. Our "common envelope" technology lets you send and receive faxes containing multiple media — text, data and graphic fax images — in one step. And in the future, you'll be able to send and receive voice and video messages as easily as you can now send text, data and graphics.

Our network has additional features that make it easy to manage your company's use of AT&T Mail. You can request notification of message delivery, message tracking reports, departmental billing and flexible status reports on all message types. We provide you with the necessary tools to maximize your investment in our service.

Customize Your AT&T Mail Service

AT&T allows you to personalize the mail service environment to meet your specific business requirements. You can configure your mail profile, set logos and signatures, and determine how you would like to receive your billing reports. You even have the option of setting up your users within a closed user group.

Custom Profile

You can configure a network mailbox to your preferences in page widths and lengths, time zones, mail forwarding instructions, passwords, extended answering services and more. You can even register up to three separate logos and signatures for use on the AT&T Mail network.

Billing Options

AT&T gives you the flexibility to receive your bill in the manner of your choice. By assigning billing codes to messages going out to the network, for instance, you can charge usage to a specific department, project or individual. The system also supports customized billing for multinational corporations, payable in many local currencies.

Closed User Group

You can set up a virtual private network for your company by requesting a closed user group implementation. Creating a closed user group makes it appear to your users that they have private messaging services on the AT&T Mail Network and enables you to optimize the permissions and access available to your users.

- **On-line Capabilities**

While connected to the AT&T Mail network you can create, read, and reply to your messages. Messages can also be created and stored off-line without connecting to the service.

- **On-Line Directory**

AT&T Mail maintains a directory of registered AT&T Mail users and gateway accounts, making it easy to locate listed subscribers (those not members of a closed user group) by a simple directory search. You can search by ID name, last name, full name, phonetic name, organization name, the name of the system or gateway account, or even X.400 addresses.

If you choose to belong to a closed user group, then users will only have the capability to make directory lookups of members within that group.

- **Help**

Our on-line help option gives users a simple explanation of each feature available in AT&T Mail, along with a description of usage and proper syntax. You can create group specific HELP files for general help, specific commands, or specific topic. Users can also send electronic messages to our help desk or receive prompt, personalized service by calling our toll-free Customer Service Center (CSC).

Regardless of the industry you're in, from trade and transportation to manufacturing, healthcare and insurance to finance, AT&T is there to offer you a wide range of solutions for your industry.

With AT&T's family of products and services, conducting business electronically is fast, easy, timely, and accurate.

OTHER AT&T MAIL FEATURES

• Service Menu
Register with AT&T Mail as a Service Menu user and your AT&T Mail Service Menu becomes a source for rapid access to a wealth of key business information. From your AT&T Mail Service Menu, you can quickly reach a vast array of databases, information services and interactive research services.

If you need to provide your users with access to specific information which you control, you can work with our Professional Services Group to create your own options for the menu, such as private access to a corporate database or corporate-wide directory, and on-line storage of your messages on the AT&T network.

With AT&T Mail you can customize your mission critical application to enable you to conduct business "electronically" with your partners, vendors, and customers. We provide end-to-end electronic commerce solutions for all your business needs.

With our industry applications your business will benefit by improved productivity, cost efficiencies and faster turnaround time, resulting in improved satisfaction for you and your customers.

• Information Sharing Capabilities
Twenty-four hour access to important information can help you stay one step ahead of the competition. AT&T Mail provides you with a variety of options, including bulletin boards and shared folders, for distributing information to key recipients.

• Large Scale Broadcast
You can send one message to multiple people by creating and storing address lists on the AT&T Mail network. These distribution lists — which can be any combination of addresses supported by our network — enable you to send one message to many predetermined locations with a single address line. You can easily modify these distribution lists and share them with other users.

• Shared Folder
You can create AT&T Mail Shared Folders for storing standard text, binary or forms files on the network. Clients, business partners and employees can then access the contents of the folder at their convenience.

Interested users can also "subscribe" to the shared folders you create; subscribers automatically receive information placed in the shared folder the next time they go on-line.

• AT&T Mail Catalog
With the auto-response feature of the AT&T Mail network, you can easily provide a way for users to receive information by typing a key word in the "Subject" line of an Email message. You store the information — such as a catalog of product information, answers to users' frequently-asked questions, or up-to-the-minute pricing data — in a folder on the AT&T Mail network. Auto-response automatically matches the "subject" of the incoming request message to the "Subject" in the folder and sends the appropriate reply.

The AT&T Mail Catalog also allows you to keep track of the Email IDs that have requested information from the catalog, as well as the type of information they requested.

• FYI Bulletin Board
You can also create traditional bulletin boards via AT&T Mail. Access to the bulletin board is through an on-line interactive process in which topic choices are made through the use of layered menus. These bulletin boards may be of public or private (reserving access only for your company). You have full control of the types of information that you want to distribute, as well as the frequency of updates.

AT&T EasyLink Services reach the entire world, allowing multinational corporations to transact business in multiple languages, with support for billing in many international currencies.

Let AT&T Mail Give You a Competitive Advantage

Today, using communications in creative ways can often make the difference between winning and losing a customer. Let AT&T Mail from AT&T EasyLink Services give you the advantage you need to succeed.

Professional Services

AT&T offers expert assistance from AT&T Professional Services for the optimization and customization of your electronic messaging capabilities.

AT&T Professional Services provides general consulting support for the message-enabling of your applications, and for the implementation of your local messaging network, including virtual private networks for closed user groups. Technology consulting is available in areas such as synchronous access, and various global protocol and support issues.

Highly experienced professionals are available to project manage application management, site management, and contingency planning. Professional Service also provides specification development and architecture customization services, as well as user training tailored to your specification, your business needs, your native language.

AT&T Service and Support

The AT&T Customer Support Center is staffed by messaging specialists who have the resources to answer your technical, administrative or billing questions.

Local in-country technical and sales support are provided throughout North America, South America, Europe and the Far East.

AT&T Mail. The powerful messaging and expert support you want. Virtually Anytime. Anywhere.

To see how AT&T Mail can benefit your business, please contact your AT&T representative, an authorized AT&T dealer or call toll-free to

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or outside the US call 214 778-5024

for more information

on AT&T Mail —

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anywhere, anyplace

communications tool.

AT&T EasyCommerce Services[sm]

Electronic Commerce – for improved productivity and profit

AT&T

AT&T EasyCommerce Services℠: a family of services t

USING ELECTRONIC COMMERCE, TODAY YOU CAN

— Take customer orders using EDI, to automatically start the shipment process and update inventory reports through links to your legacy systems...for faster, more efficient order processing and inventory control.

— Store documentation in a central repository for printing on demand by your business partners and employees, reducing the costs and time for distribution.

— Reach your customers on the Internet by establishing a home page on the World Wide Web, for new ways of developing your business.

— Send updated price lists to all your sales people by broadcasting one e-mail message that's delivered to appropriate fax, e-mail and postal addresses, for easier internal communications.

— Collaborate with a team of experts within your industry to create a recommendation for specific changes to a document, for faster turnaround times.

— Let your distributors view and order from an electronic catalog, streamlining the sales process and improving customer service.

The demands of conducting business continue to get tougher. To remain competitive and successful, companies must explore alternative ways to accomplish everyday internal functions and find new ways of building business relationships.

Electronic Commerce backed by a world-class network and support system

In its simplest definition, Electronic Commerce is the use of computers to electronically communicate from one business to another business, as well as from business to consumers – for faster, more efficient communication with customers, your mobile sales force, your vendors, your branches and anyone else you deal with in business.

AT&T EasyCommerce Services offers advanced electronic solutions that simplify everyday business functions. And you know you can count on AT&T for quality, experience and reliability, along with a full system of support including consulting expertise and technical assistance.

We offer a wide array of services to meet your Electronic Commerce needs, including:

AT&T Imaging Network Services puts our vast network capabilities to work, making it possible for your business to store and distribute documents electronically, and then print on demand at multiple sites around the world – reducing the need for large print runs, and expensive distribution and storage.

AT&T Network Notes℠ provides a global gateway for Lotus Notes, taking the award-winning capabilities of the software and allowing collaboration on documents between business partners, customers and remote/mobile employees anywhere across the globe.

AT&T Easy World Wide Web Services℠ offers a fast, easy way to establish your presence on the global Internet, providing an end-to-end solution with minimum investment of time, trouble and money.

at can address your specific business challenges.

AT&T EasyLink Services is a leader in advanced electronic solutions, with a network that offers ease of use, flexibility, compatibility and connectivity to virtually all electronic mail systems everywhere:

E-Mail – our global service is designed to support mission-critical applications for business customers. We offer a rich set of messaging capabilities and tools to build mail-enabled applications, while also delivering broad connectivity and support for standards.

EDI – our network service allows the interorganizational exchange of business transactions in a secure and reliable environment. We offer all the key elements for EDI implementation including the network, systems design and implementation support.

FAX – AT&T offers a broad base of enhanced fax services and delivery options to meet the needs of most store-and-forward fax applications including broadcast, FAX catalog, PC-to-FAX and FAX-to-FAX.

TELEX – we are a leading provider of this important means of communication which continues to be used for international commerce and in certain key industries.

PUT THE BENEFITS OF ELECTRONIC COMMERCE TO WORK FOR YOUR BUSINESS

- *Improved business relationships*
- *Reduced time to market*
- *Extended reach*
- *Improved customer satisfaction*
- *Enhanced collaboration*
- *Improved productivity*

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Like the original Executive ScanCard® System, which is used by executives in more than 450 of the *Fortune 500* companies, and by individuals in all walks of life, new *ScanCard™* for Windows software helps you work more efficiently and effectively. With your computer as a project control center, you can keep more projects moving smoothly, concurrently, than you ever thought possible . . . without missed deadlines or costly last minute rushes.

SAME PROVEN PRINCIPLE. On your computer screen, new *ScanCard™* for Windows looks just like the original, manual ScanCard® system. And you operate it the same way . . . recording important data and reminder notes on a separate "card" for each project. Then you file the cards into "pockets" that let you scan the visible titles periodically to see what is due next on each one . . . from whom . . . and when.

Information is typed onto electronic *ScanCard™* project "cards," which are then filed into "pockets" in department or project "folders" in the computer.

DEADLINE WARNINGS. Daily and weekly follow-ups can be done in only minutes . . . keeping you on top of every project. Deadlines can also be recorded on each card, and a warning flasher will alert you to each one as many days in advance as you want. So nothing is ever overlooked.

SPECIALTY "CARD" FORMAT. In addition to the standard project "cards" which appear on the screen, a variety of other formats are provided for special needs such as sales call records, cost estimating, travel itineraries and expenses, "to do" lists, phone messages, phone numbers and addresses, and more. Additionally, you can design formats to fit your own specific business or personal needs, and print out any or all of the cards on your printer.

NEW FEATURES. New *ScanCard™* for Windows also lets you import other applications to a project card, like charts, spreadsheets, graphs and four-color photographs — even multi-media video, voice and music!

A FILE MANAGER, TOO! *ScanCard™* for Windows can function as a file manager which allows you to directly access your various program applications — with file names in plain English! Once applications are linked to *ScanCard™* you can avoid having to remember 8-character DOS file names!

EVEN NEW "PEN-BASED" COMPUTERS. New *ScanCard™* for Windows can be used with any traditional PC running Windows 3.1 or higher.* Or with the new pen-based computers running Window for Pen Computing which lets you write notations right on the cards with the electronic pen.

ScanCard™ for Windows also works beautifully on new pen-based computers. It will record your handwriting, too!

*Available for Macintosh Computers after September 1, 1994.

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UPS 2nd Day Air® delivery available. Call for rates. *Orders outside the U.S. call for rates.

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☐ American Express ☐ Company purchase order (otherwise enclosed)

Card # Exp. Date
Signature
Name Title
Address Company
City/State/Zip
Business Phone # ( )

Figure: Airline Magazine Ad (Continental) for The Executive ScanCard System which sold very well in this media. Planning Works built this product under a licensing agreement with The Executive Gallery. The next iteration of this product will be SmartFolders.

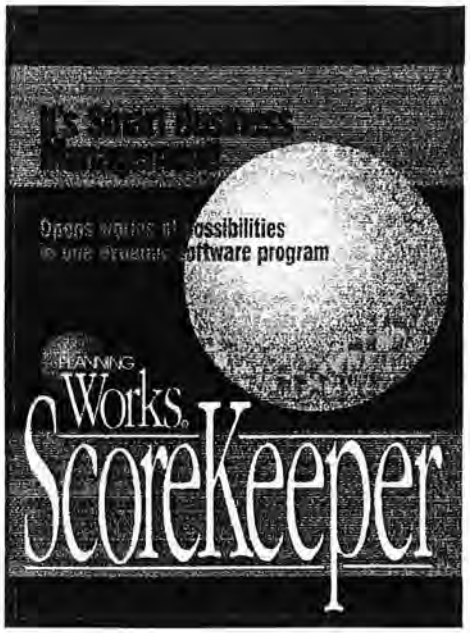

Figure: Much ScoreKeeper code was licensed to AT&T. ScoreKeeper code and EIS (executive information system) approach will be used in future vertical market enhancements of SmartFolders.

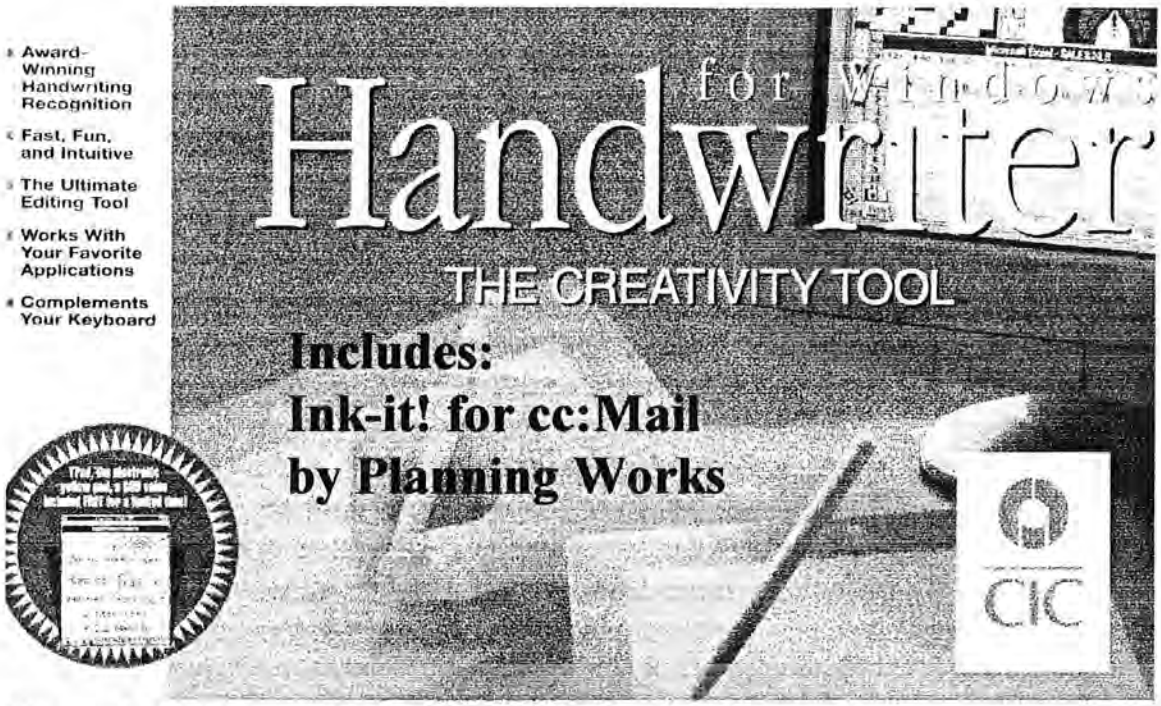

Figure: Ink-it! for cc:Mail was first built for The Gillette Company by Planning Works. PWI licensed the code to CIC which is now bundled in this digitizer. Much Ink-it! code was used in AT&T AccessPlus 3.0. PWI's Ink-it! Viewer will be bundled in the next release of Lotus cc:Mail. Inking features will be included in all future versions of Planning Message Desk in order to accomodate eventual forms functionality.

Email Innovation Timeline

Elizabeth Feinler and John Vittal

7/1/2022

The authors and the Computer History Museum are grateful to Vint Cerf for funding the digitization of relevant email historical materials. This includes selected records from the SRI ARC/NIC Collection (x3578.2006) and selected materials from John Vittal's collection at the Computer History Museum.

Seminal Events

Email Bibliographic Timeline

About This Timeline

This timeline reflects the history of computer-mediated human communications (any human communication that occurs through the use of two or more electronic devices), the events that led up to the development of electronic mail (email), and its commercialization. It is intended for use by researchers and academics interested in the technical evolution of email from its beginning through email as we know it at the time this was written (2022).

Today, email consists of messages that are transmitted and received by digital computers through a network. An email system enables computer users to send text, graphics, audio, programs, animated images, and video to other users. Facsimile, the sending of images by electronic means, is a variant of email, though not necessarily computer-mediated. Email is different from an electronic bulletin board, which is a computerized system that supports the public exchange of messages or files. Most bulletin boards are dedicated to a special interest, which may be an extremely narrow topic. Chat, texting, and instant messaging are variants of email, but differ in that they are all forms of text- or image-based communication in which two or more persons participate in a single personal conversation over their computers or mobile devices. These variants can be more ephemeral than standard email.

Computer users began communicating with each other and forming user communities soon after they were linked through time-sharing systems in the 1960s. Back then they variously had real time chat, person-to-person email, and public discussion groups, but were confined to a single computer or site.

That changed with the advent of computer networks. Networked email enabled people distributed around the world to work collaboratively to solve problems. In the Completion Report[1] for the ARPANET in 1978, the authors state "There is little doubt that the techniques of network mail developed in connection with the ARPANET program are going to sweep the country and drastically change the techniques used for intercommunication in the public and private sectors." This continued with the advent of the Internet.[2] As Dave Clark of MIT pointed out in 1988, "Little did we know when we were developing email that we were actually creating a new paradigm for communication."[3]

Networked systems and the World Wide Web (WWW) have since added many other capabilities, from publishing to social media to virtual worlds. Yet the earliest forms of electronic communication still thrive and remain the foundation of online communities.

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[1] F. Heart, A. McKenzie, J. McQuillian, and D. Walden. "Completion Report," Bolt Beranek & Newman, Cambridge, MA, BBN Rept. 4799, Jan. 4, 1978. https://www.computerhistory.org/collections/catalog/102638096 and http://walden-family.com/bbn/arpanet-completion-report.pdf

[2] An 'internet' is a widely accepted technical term for a collection of disparate physical networks connected together with a particular type of packet switch, called 'routers'. The 'Internet' is the massive internet to which most people of the world now have access.

[3] Personal communication between John Vittal and Dave Clark about June, 1988.

We use acronyms liberally throughout this document. At the end of the document, we provide definitions of some critical terms and a list of acronyms with their meaning as used herein.

We would like to also note that although we perhaps imply that a milestone happens based on the published record, it is often the case that the record is basically after-the-fact documentation of then-existing mechanisms that had been proposed and implemented, sometimes well before the published record, and had often been discussed and negotiated using email. Often, the source of the idea or mechanism and the discussion about it have been lost.

Unintentionally we may have missed some significant achievements. Indeed, one reason this has taken so long to produce is because we keep discovering mistakes and new information about what came first, or what inspired a particular event. If a significant milestone has been overlooked, or we're wrong about what we state as a "first," we apologize.

Finally, the URLs in this document were confirmed to work on Feb. 24, 2022. If they no longer work, and aren't available at the Internet Archive, we apologize.

Additional Historic Sources of Information

There are many additional sources of archival information on email and its creation. A short inventory is below. The Computer History Museum (CHM) in Mountain View, CA, holds the original email bibliography that Elizabeth Feinler produced for the U.S. Navy in 1979, https://www.computerhistory.org/collections/catalog/102785623. (Reprints of all items from this bibliography are available from the Computer History Museum.)

The Museum also holds Stanford Research Institute (SRI) Augmentation Research Center (ARC) / Network Information Center (NIC) archival records. A brief description and finding aid is available at https://www.computerhistory.org/collections/catalog/102706170. Additionally, a "History and Background of SRI ARC and NIC" authored by Elizabeth Feinler is available at https://www.computerhistory.org/collections/catalog/500001010.

Other related Computer History Museum collections include:

- Cerf, Vint (Vinton) oral history, Acquisition X4308.2008, catalog number 102658186. https://www.computerhistory.org/collections/catalog/102658186
- Engelbart's Augmentation Research Center programmers oral history panel, Acquisition X5674.2010, catalog number 102702010.
- Feinler, Elizabeth oral history, Acquisition X5378.2009, catalog number 102702199. https://www.computerhistory.org/collections/catalog/102702199
- Vittal, John oral history, Acquisition X8188.2017, Catalog number 102738251. https://www.computerhistory.org/collections/catalog/102738251
- Kahn, Bob (Robert) oral history, Acquisition X3699.2007, catalog number 102657973. https://www.computerhistory.org/collections/catalog/102657973

- Metcalfe, Bob (Robert M.) oral history, Acquisition X3819.2007, catalog number 102657995. https://www.computerhistory.org/collections/catalog/102657995
- Taylor, Bob (Robert W.) oral History, Acquisition X5059.2009, catalog number 102702015. https://www.computerhistory.org/collections/catalog/102702015

Additional archival sources of information outside the Computer History Museum include:

- Doug Engelbart Institute http://dougengelbart.org/library/engelbart-archives.html
- Douglas C. Engelbart Papers. M0638. Dept. of Special Collections, Stanford University Libraries, Stanford, CA. https://searchworks.stanford.edu/view/4083506
- Internet Engineering Task Force (IETF), online archives of Arpanet and Internet RFCs (Requests for Comments). http://datatracker.ietf.org/doc/search/
- The Kleinrock Internet History Center, which is part of the Kleinrock Center for Internet Studies at UCLA. http://digital2.library.ucla.edu/internethistory/

Introduction

Email is a simple program to use. It is based on an interoffice memo format of "to," "from," and "subject." It is therefore amazing that email and its derivatives have changed the way the world communicates.

Few people today remember that business executives of the past had secretaries. These secretaries were predominately women, and they were trained in the shorthand language and the proper formats for business correspondence. An executive would dictate to the secretary who would take the dictation in shorthand, then interpret the dictation, and type it on paper on a typewriter with one or two carbon copies. The correspondence would then be reviewed by the executive, sealed in a typed envelope, and delivered by inter-office correspondence mechanisms, or stamped and delivered by postal mail. Mistakes were corrected by retyping, or more recently using white-out fluid and typing over the mistake, which was both messy and tedious. Copies were filed by hand. There were rules for addresses, headers, salutations, and signatures. The process was formal, rigid, and time consuming.

Military correspondence was equally complex in that one branch of the military did not communicate randomly with someone in another branch of the military. Rather messages would go up through channels for approval in one branch before being delivered over to another branch then down through channels to the intended recipient. Similar restrictions often were practiced between organizations within a branch.

When users were exposed to electronic mail, or e-mail and then email as it soon was called, they were delighted that it was so easy to learn and was delivered so fast. At first email was a convenient tool for users on a single computer to correspond with each other. As networks developed, email became a tool for users to correspond using like computers on the same network. Then as protocols were developed and the Internet evolved, virtually every network user with an email program on their computer could correspond with any other user with an email program. Not only could email users on one network or in one country correspond with each other, but eventually users on dissimilar networks in different countries were sending messages across the world and these messages were delivered in minutes not days or weeks. Email was definitely the first "***killer app***." It was easy, fast, cheap, and bypassed the formality of letter writing.

Because electronic mail changed the way the world communicated for most people, the authors thought it imperative that the history of how it evolved should be documented. This referenced timeline is an effort to do just that.

I. Setting the Stage (through 1962)

Where did email come from? We trace email's beginnings to the mid-1800s with the ability to communicate over wires, either using code (*e.g.,* Morse Code) or by sending images.

1843 to 1880

First image sent over a wire

The first technology to send an image over a wire was developed by Alexander Bain. Frederick Bakewell later improved upon this, creating the facility that is similar to today's fax. Subsequently, in 1844 Paul Gottlieb Nipkow patented the Nipkow Disk, in 1860 Giovanni Caselli developed the Pantelegraph, and other developments followed. This implies that images were being transmitted before text.

- "Mr. Bain's electric printing telegraph." *The Mechanics' Magazine, Museum, Register, Journal and Gazette*, pp. 268-70, Apr. 13, 1844.
- "The history of Fax (from 1843 to present day)," FaxAuthority, Seneca Labs., Calgary, Alberta, CAN, Mar. 5, 2020. https://faxauthority.com/fax-history/ Archived from the original on Aug. 12, 2001.
- Caselli, G. *II. Pantelegrafo de Caselli: In'invenzione sfortunata.* https://web.archive.org/web/20210818202933/http://www.itisgalileiroma.it/shed/shed0/shed0/caselli.htm
- Murray, J. *A Story of the Telegraph*, Project Gutenberg, eBook no. 5068, 1905. http://www.gutenberg.org/ebooks/50864 Archived from the original on Nov. 27, 2018.
- Smith, E. "Pushing Photos Through Wires," Tedium, Nov. 19, 2021. https://tedium.co/2021/11/19/newspaper-wire-service-photo-transmission-history/ Archived from the original on Dec. 8, 2021.

1844

First "electronic" mail service developed

By 1838, Samuel Morse and Alfred Vail created what became known as "Morse code." In 1843, Morse obtained $30,000 in funding from Congress to build an experimental line between Baltimore and Washington. The line was completed in 1844, superintended by Ezra Cornell, and, on May 24th, Cornell sent the first message,

"`What hath God wrought!`"

- Panko, R. "Electronic mail overview II," SRI., Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Mabee, C. "Samuel F. B. Morse," IN: Encyclopedia Britannica https://www.britannica.com/biography/Samuel-F-B-Morse Archived from the original on Jan. 6, 2022.
- Timmons, G. "Samuel F. B. Morse biography (1791–1872)," Biography, updated Sep, 11, 2019. http://www.biography.com/people/samuel-morse Archived from the original on Oct. 20, 2021.

- McEwen, N. *A Tribute to Morse Telegraphy and Resource for Wire and Wireless Telegraph Key Collectors and Historians,* The Telegraph Office, updated Sep. 11, 2004. https://web.archive.org/web/20210101200432/https://www.telegraph-office.com/

1856

Western Union Telegraph Company established

In 1851 the New York and Mississippi Valley Printing Telegraph Company was organized, and Ezra Cornell created the New York & Western Union Telegraph Company. In 1856 they merged, creating the Western Union Telegraph Company.

- "Western Union." In U.S. History. http://www.u-s-history.com/pages/h1801.html Archived from the original on Jan. 27, 2022.

1903, June 4

Radio telegraph/wireless encryption recognized as necessary

Guglielmo Marconi was about to send a message to Prof. John Fleming, a colleague who was 300 miles away giving a lecture. Marconi claimed his system was secure. However, Nevil Maskelyne caused the printer in the lecture hall to print out

"`There was a young man from Italy, who diddled the public quite prettily`,"

proving Marconi's system had been hacked. This initiated the development of wireless encryption.

- Baguley, R. "Origin of wireless security: The Marconi radio hack of 1903," Hackaday, Mar. 2, 2017. http://hackaday.com/2017/03/02/great-hacks-of-history-the-marconi-radio-hack-1903/ Archived from the original on Dec. 14, 2021.

1908

Printing telegraph developed

Charles Krum, at the Morkrum Company, developed a printing telegraph system. The first working model was made in 1908. This and Edward Kleinschmidt's teleprinter were precursors to the fax machine.

- "The teletype story," Teletype Corp., Chicago. IL, 1958. http://www.samhallas.co.uk/repository/telegraph/teletype_story.pdf Archived from the original on Jun. 24, 2021.

1914

Teleprinter invented

Edward Kleinschmidt invented the teleprinter, a device for transmitting telegraph messages as they are keyed, and for printing messages received. Ultimately, Kleinschmidt's company was merged with Morkrum Company and was renamed Teletype Corporation.

- Kleinschmidt, E. *Printing Telegraphy-A New Era Begins*. eBooks, 1967. http://www.gutenberg.org/ebooks/53481 Archived from the original on Aug. 1, 2020.

- https://www.kleinschmidt.com/ks/company/
  Archived from the original on Aug. 3, 2020.
- *Newsfront Data Communications*, pp. 16-26, Sep. 1977.
- Kleinschmidt, E. "Telegraph Printer," US Patent 1,448,750, Mar. 20, 1923.
  https://pdfpiw.uspto.gov/.piw?Docid=01448750
  Archived from the original on Nov. 30, 2021.

1914

Amateur Radio National Traffic System started

Started in 1914 by Hiram Percy Maxim as the American Radio Relay League (ARRL), the National Traffic System (NTS) was officially established in 1949. The NTS is a network of amateur radio operators who relay messages throughout the US and Canada. Amateur Radio "message traffic" used a lot of the mechanisms that later appeared in computer networks. A message is transmitted through a geographical hierarchy of separate "servers" (radio operators) to route it to its destination. There are well-defined protocols used between stations as they transfer messages in often noisy conditions.

- "Ham Radio History." *ARRL, The National Association for Amateur Radio.*
  http://www.arrl.org/ham-radio-history
  Archived from the original on Dec. 6, 2021.
- Hulett, A. "National Traffic System and Radiogram Format." ARRL North Texas. https://www.k8amh.com/wp-content/uploads/2021/01/National-Traffic-System-and-Radiograms.pdf Archived from the original on Feb. 1, 2022.
- "National Traffic System," Wikipedia, edited Apr. 14, 2020.
  https://en.wikipedia.org/wiki/National_Traffic_System
  Archived from the original on Dec. 6, 2021.

1924, May

Fax machine developed

"A new process of transmitting pictures by electricity" is developed by American Telephone and Telegraph Co. (AT&T). On May 19, 1924, 15 photographs were sent over telephone wires from Cleveland to New York City. Thus, the fax machine was born.

- "The Evolution of the Fax Machine," etherFax, Nov. 7, 2016.
  https://www.etherfax.net/the-evolution-of-the-fax-machine/
  Archived from the original on Apr. 14, 2021.
- "Pictures by Wire Sent with Success for the First Time," *The New York Times*, p. 1, May 20, 1924. https://www.nytimes.com/1924/05/20/archives/pictures-by-wire-sent-with-success-for-the-first-time-telephone.html
  Archived from the original on Dec. 8, 2021.
- *The Montreal Gazette*, p. 10, col. 3, May 20, 1924.

1920s

Teletypewriter switched communication service created

Telex modified rotary telephone switches to carry DC telegraph signals (rather than telephone audio), thus providing a switched service for teletypewriters.

- Kimberlin, D. F. *Telex and TWX history*, 1986. http://www.baudot.net/docs/kimberlin--telex-twx-history.pdf Archived from the original on Nov. 7, 2021.

1930

AT&T buys Teletype Corporation

The Teletype Corporation was purchased by American Telephone and Telegraph Company (AT&T) and it became a subsidiary of Western Electric Co.

- *Newsfront Data Communications*, pp. 16-26, Sep. 1977.
- *The Teletype Story*. Teletype Corporation. 1958. http://www.samhallas.co.uk/repository/telegraph/teletype_story.pdf Archived from the original on Jun. 24, 2021.

1940, September 11

First remote access to a computer

George Stibitz developed the Complex Number Calculator at Bell Laboratories from February 1938 through early 1940. In September 1940, he arranged to have the computer connected by telephone lines from Bell Laboratories in New York to Dartmouth College in Hanover, NH so that it could be demonstrated at a meeting of the American Mathematical Society.

- "George Stibitz Distant Computer Work," History Computer: The History of Computing. http://history-computer.com/Internet/Dreamers/Stibitz.html Archived from the original on Jan. 3, 2020.

1940/1941

First wireless phone developed

SIGSALY was the first digitally scrambled, wireless phone. It was developed by Bell Laboratories in 1940-42 and built by Western Electric in 1942-1943. It enabled confidential talks between various parties. For example, it was used by British Prime Minister Winston Churchill and President Franklin D. Roosevelt for discussions during WWII. Twelve were built, one of which was installed on a ship that Douglas MacArthur used during his South Pacific campaigns.

- *The Start of the Digital Revolution: SIGSALY. Secure Digital Voice Communications in World War II*, Center for Cryptologic History, Natl. Security Agency, Fort George G. Meade, MD, 20755-6886, ATTN: N63. https://www.nsa.gov/Portals/70/documents/about/cryptologic-heritage/historical-figures-publications/publications/wwii/sigsaly.pdf Archived from the original on Sept. 18, 2021.
- "SIGSALY, Ciphony 1, Digital voice encryption with OTP," Crypto Museum, The Netherlands. Updated Sept. 17, 2020. https://www.cryptomuseum.com/crypto/usa/sigsaly/index.htm. Archived from the original on Jan. 8, 2022.

- Poundstone, W. *Fortune's Formula: The Untold Story of the Scientific Betting System That Beat the Casinos and Wall Street*, pp. 24-5, Hill and Wang, New York, N.Y, ©2005. ISBN 978-0-8090-4637-9. https://delanceyplace.com/view-search-results.php?3681 Archived from the original on Feb. 1, 2022.

1950

Pagers introduced

Wireless, one-way message service was created.

- Ennis, C. "Pocket radio pages doctor night and day." *Popular Science*, pp. 104-105, Jan. 1951. Available in Docktor, M. "Happy 67th Birthday Pager (aren't you dead yet?)" TigerConnect, Sept. 20, 2017. https://www.tigertext.com/blog/happy-67th-birthday-pager-arent-you-dead-yet/ Archived from the original on Feb. 1, 2022.

1952

Telex used for coordination

American Airlines linked its offices in New York City via telex to coordinate seat reservations on its planes using its "Magnetronic Reservisor" system.

- Kilker, J. "Social and technical interoperability, the construction of users, and 'arrested closure': A case study of networked electronic mail development." IN: *Iterations, An Interdisciplinary Journal of Software History,* The Charles Babbage Institute for the History of Information Technology, Minneapolis. MN, 13 Sep. 2002. https://web.archive.org/web/20210105011354/http://www.cbi.umn.edu/iterations/kilker.html
- Ammann, C. "Airline automation: A major step," *Computers and Automation*, vol. 6, no. 8, pp. 10-14, Aug. 1957.
- Campbell-Kelly, M. *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry*, Cambridge, MA, MIT Press, 2003. ISBN 0-262-03303-8.

1958

Switched networking used for government communications

The AUTOmatic DIgital Network system (AUTODIN), originally called ComLogNet, was designed and developed by Western Union, Radio Corporation of America (RCA), and International Business Machines (IBM) for the U.S. Air Force. It was originally intended to improve the speed and reliability of logistics traffic between Air Force bases, logistics centers, and contractors. While the first site became operational in 1962, deployment did not start until 1966.

- Hall, J. "AUTODIN (Automatic Digital Network)," Oct. 14, 2005. http://jproc.ca/crypto/autodin.html. Archived from the original on May 7, 2021.

1960, March

Augmenting human communication with computers

J.C.R. Licklider publishes his seminal paper, "Man-computer symbiosis," describing a complementary relationship between people and computers. Included were concepts of timesharing, graphical interfaces, and natural language communication. However, email was not included in this discussion. This was followed in 1963 by his discussion in a memo on the "Intergalactic Computer Network," outlining part of his strategy for the development of a network of computers.

- Licklider, J.C.R. "Man-computer symbiosis," *IRE Transactions on Human Factors in Electronics*, vol. 1, no.1, pp. 4-11, Mar. 1960. http://groups.csail.mit.edu/medg/people/psz/Licklider.html Archived from the original on Jan. 13, 2022.
- Licklider, J.C.R. "Memorandum For Members and Affiliates of the Intergalactic Computer Network." Washington, D.C., Apr. 23, 1963. https://www.kurzweilai.net/memorandum-for-members-and-affiliates-of-the-intergalactic-computer-network Archived from the original on Dec. 18, 2021.
- Taylor, R., ed. *In Memoriam: J.C.R. Licklider 1915-1990*, Digital Systems Res. Center, Palo Alto, CA, Reports 61. Aug. 7, 1990. https://web.archive.org/web/20201213191534/https://web.stanford.edu/dept/SUL/library/extra4/sloan/mousesite/Secondary/Licklider.pdf
- Waldrop, M. M. *The Dream Machine: J.C.R. Licklider and the Revolution That Made Personal Computing*. Viking Adult, 2001. ISBN 978-0-670-89976-0.

1960

Miniaturization starts

John Mitchell at Motorola developed the first transistorized pager.

- "John Francis Mitchell," Engineering: Across Disciplines, Across the World. The Greatest Engineers of All Time. https://sites.google.com/site/infamousfiveee/john-francis-mitchell Archived from the original on Oct. 24, 2020.
- "John Francis Mitchell," Wikipedia, edited Dec. 27, 2020. https://en.wikipedia.org/wiki/John_Francis_Mitchell Archived from the original on Nov. 13, 2021.

1961, November

Time-sharing begins

The Compatible Time-Sharing System (CTSS), the first operational general-purpose time-sharing operating system, was demonstrated at the Massachusetts Institute of Technology (MIT). CTSS ran on a single IBM 7094 computer.

- McCarthy, J. "Reminiscences on the history of time-sharing," Stanford AI., Stanford, CA, 1983. Updated Sep. 9, 1996. http://www-formal.stanford.edu/jmc/history/timesharing/timesharing.html Archived from the original on Dec. 5, 2021.

- Corbató, F. J., et al. *The Compatible Time-Sharing System: A Programmer's Guide*, Cambridge, MA, MIT Press, 1963. ISBN 978-0-262-03008-3. http://bitsavers.trailing-edge.com/pdf/mit/ctss/CTSS_ProgrammersGuide.pdf Archived from the original on May 24, 2017.
- Walden, D. and Van Vleck, T., eds., *The Compatible Time-Sharing System (1961-1973) Fiftieth Anniversary Commemorative Overview*, IEEE Computer Soc., Jun. 2011. https://history.computer.org/pubs/2011-06-ctss.pdf Archived from the original on Jan. 20, 2022.
- Walden, D. and Nickerson, R., eds. "Networked E-mail," Chap. 19, pp 493-500. IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., Washington, D.C., 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.

1962

First commercial computer modem appears

AT&T introduced the Bell 103, the first civilian commercial computer modem, rather than just for the military. It was an asynchronous 300 bits per second (bps) full-duplex modem that used frequency-shift keying (FSK) modulation on dial-up phone lines. It was the successor to the Bell 101 dataset, introduced in 1958, which could transmit at approximately 150 bps for use by SAGE missile radar warning system.

- "Bell 103," Techopedia, updated May 28, 2012. https://www.techopedia.com/definition/513/bell-103 Archived from the original on Apr. 14, 2021.
- Oxford, T. "Getting connected: a history of modems," Techradar pro, Dec. 26, 2009. https://www.techradar.com/news/internet/getting-connected-a-history-of-modems-657479 Archived from the original on May 24, 2021.
- Noll, A. M. "Bell Telephone Labs, Inc. List of Significant Innovations & Discoveries (1925-1983)," Eng. and Technol. History Wiki, Bell Labs, May 2012. https://ethw.org/Bell_Telephone_Laboratories,_Inc._List_of_Significant_Innovations_&_Discoveries_(1925-1983) Archived from the original on Nov. 28, 2020.

II. Computer-Specific Email and the Advent of Networking (1963-1971)

The advent of time-sharing computers made communicating with others easier. You could easily carry on a conversation, leave a message, or whatever. Neither you nor those with whom you wished to communicate needed to be "on line" at the same time. However, you did have to have accounts on the same computer. All that changed in August 1971 when Ray Tomlinson sent the first email over the ARPANET.

1963, March 12

IBM introduces the IBM 1050 Data Communications System

The IBM 1050 Data Communication System was ultimately used as a computer terminal (using an IBM Selectric typewriter mechanism) to send and receive data from a computer. Communication was serial and half-duplex at 75 or 150 bits per second. It needed a modem such as the Bell 103 or the IBM Line Adapter to connect it to a communication line. This was used, for example, on CTSS at MIT, and later also for the Louisville and National Railroad which was based in Louisville, KY.

- "The IBM 1050 communications system," Computer Museum, Univ. of Amsterdam, The Netherlands. (Catalog no. 05.03) https://ub.fnwi.uva.nl/computermuseum/ibm1050.html Archived from the original on Oct. 4, 2021.
- "History of the IBM Selectric Typewriter." IBM Archives. https://www.ibm.com/ibm/history/ibm100/us/en/icons/selectric/ Archived from the original on Jan. 21, 2022.
- Commercial for IBM's Selectric Typewriter 1960's. https://www.youtube.com/watch?v=vNUEUth7qjc Archived from the original on Oct. 14, 2021.
- "Working for the Railroad," IBM Archives (excerpted from *IBM News*, p. 3, Jun. 24, 1966.) https://www-03.ibm.com/ibm/history/exhibits/valueone/valueone_railroad.html Archived from the original on Mar. 30, 2021.
- "DPD Chronology," IBM Archives. https://www.ibm.com/ibm/history/exhibits/dpd50/dpd50_chronology.html Archived from the original on

1963, April 23

IBM Introduces the Internal Teleprocessing System

For communication throughout their offices and plants, IBM designed and implemented a teleprocessing system for sending messages via computer on IBM's network of leased lines.

- "The Big Switch: A Story of Improved Message Control," IBM, 1963. Computer History Archives Project. https://www.youtube.com/watch?v=irPw9oyAju8 Archived from the original on Sept. 5, 2021.

1963

Teletype Model 33 introduced

Though it was announced in 1962, at about the same time as the introduction of the IBM 1050 Data Communication System, the Teletype Corporation introduced the Teletype Model 33, which came in several configurations. The Model 33 was one of the first commercial products to use ASCII encoding of characters, and was upper-case only. It was based on the prior Model TT-242, and was followed by the Model 35 and Model 38. The Model 38 was capable of supporting upper- and lower-case characters, and some special characters.

- "Teletype Machines," Columbia University Computing History, Columbia University. http://www.columbia.edu/cu/computinghistory/teletype/index.html Archived from the original on Dec. 25, 2021.
- House, D.R. "A Synopsis of Teletype Corporation History," North America Data Communications Museum (NADCOMM), San Diego, 2001. http://www.baudot.net/docs/house--teletype-corp-synopsis.pdf Archived from the original on Mar. 19, 2021.

1963

First computer-based chat service created

System Development Corporation (SDC), a spinoff of the Rand Corporation, developed a time-sharing system, called TSS (no relationship to IBM's TSS), on IBM's prototype Q-32 (AN/FSQ-32) computer. One of its commands, `DIAL`, let a user communicate with other users or operators on-line. It was reportedly used primarily to send short "instant messages" back and forth with the operator.

- Hemmendinger, D. "Messaging in the early SDC Time-Sharing System," *IEEE Annals of the History of Computing*, vol. 36, no. 1, pp. 52-57, Jan.-Mar. 2014. https://web.archive.org/web/20210428183747/http:/athena.union.edu/~hemmendd/History/messaging.pdf
- Van Vleck, T. Excerpts from the *Compatible Time-Sharing System (CTSS) Manual.* http://www.multicians.org/thvv/mail-history.html (archived from the original on Jan. 22, 2022) and http://www.multicians.org/thvv/mail-details.html (archived from the original on Jul. 5, 2021).

1964

Packet switching proposed

Paul Baran of Rand Corporation proposed packet switching communications as a more survivable digitized voice military command and control communications technique.

- Baran, P. "On Distributed Communications: I. Introduction to Distributed Communications Networks," The Rand Corp., Santa Monica CA, Memo. RM-3420-PR, Aug. 1964. https://www.rand.org/pubs/research_memoranda/RM3420.html Archived from the original on Jan. 24, 2022.

- Baran, P. "Some perspectives on networks - past, present, and future," pp. 459-464, IN: *Information Processing* 77, IFIP, North Holland Publishing Co., Amsterdam, Netherlands, 1977. https://users.cs.duke.edu/~chase/cps49/baran-net-perspectives-ifip.pdf Archived from the original on Apr. 15, 2021.

1964

First example of linking users and sharing desktops

The Scientific Data Systems (SDS) 940 computer could "link" users so that their input devices could act as though they were the single device. This was done through the `LINK` command.

- Hemmendinger, D. "Messaging in the early SDC Time-Sharing System," *IEEE Annals of the History of Computing*, vol. 36, no. 1, pp. 52-57, Jan.-Mar. 2014. https://web.archive.org/web/20210428183747/http:/athena.union.edu/~hemmendd/History/messaging.pdf

1965, Spring

Instant messaging continues

Tom Van Vleck and Noel Morris at MIT wrote a command "`. SAVED`" (dot saved) for CTSS that provided users a way to do "instant messaging."

- Van Vleck, T. "The History of Electronic Mail*,"* MIT Computation Center, MIT, Cambridge, MA, (c) 2001-2013. http://www.multicians.org/thvv/mail-history.html (archived from the original on Jan. 22, 2022) and http://www.multicians.org/thvv/mail-details.html (archived from the original on July 5, 2021).
- Van Vleck, T. "Documentation and source for early electronic mail and messaging," MIT Computation Center, MIT, Cambridge, MA, posted Mar. 8, 2008. http://www.multicians.org/thvv/mail-details.html . Archived from the original on July 5, 2021.

1965, August 6

First computer-based email program created

Tom Van Vleck and Noel Morris at MIT created the first email program when they implemented the CTSS `MAIL` "command" in the summer of 1965. The facility was proposed by Pat Crisman, Glenda Schroeder, and Louis Pouzin. CTSS ran on a single IBM 7094 computer. `MAIL` was announced in the MIT Computation Center CTSS Bulletin 88 on August 6, 1965. A user created a file (limited to 2,592 characters) and then used the `MAIL` command to send it to another user. The recipient would be notified, at login, if his mailbox was not empty, and could view (type out) the mailbox contents with the `PRINT` command. Van Vleck and Morris also implemented a rudimentary chat (text messaging) mechanism allowing a user to enter a line of up to 120 characters that was then printed on the receiver's terminal when the user session resumed.

- Van Vleck, T. "The History of Electronic Mail*,"* MIT Computation Center, MIT, Cambridge, MA, (c) 2001-2013. http://www.multicians.org/thvv/mail-history.html (archived from the original on Jan. 22, 2022) and http://www.multicians.org/thvv/mail-details.html (archived from the original on July 5, 2021).
- Crisman, P. A., Schroeder, G., and Pouzin, L. "Proposed Minimum System documentation*,"* MIT, Cambridge, MA, Programming Staff Note 39, est. date Dec. 1964 or Jan. 1965. http://multicians.org/thvv/psn-39.pdf Archived from the original on Jan. 14, 2022.
- Crisman, P. A., ed. Section AH.9.05, IN: *The Compatible Time-Sharing System: A Programmer's Guide, 2nd ed.,* Cambridge, MA, The MIT Press, 1965. https://archive.org/details/ctss-programmers-guide-2e/page/n1/mode/2up
- Morris, E. "Did my brother invent E-Mail with Tom Van Vleck?" Op-ed in 5 parts in the New York Times, June 19-23, 2011. https://opinionator.blogs.nytimes.com/tag/tom-van-vleck/ Archived from the original on Jan. 29, 2022.
- Van Vleck, T. "Electronic mail and text messaging in CTSS, 1965-1973," *IEEE Annals of the History of Computing*, vol. 34, no. 1, pp. 4-6, Jan.-Mar. 2012. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6161671 Archived from the original on May 9, 2021.
- "MIT Computer Center CTSS Bulletin 88," Multics History Project, MIT, Computer Center, Cambridge, MA, Aug. 6, 1965. https://multicians.org/thvv/cb-88.pdf. Archived from the original on Apr. 4, 2021.
- Walden, D. and Van Vleck, T., eds., *The Compatible Time-Sharing System (1961-1973) Fiftieth Anniversary Commemorative Overview*, IEEE Computer Soc., Jun. 2011. https://history.computer.org/pubs/2011-06-ctss.pdf Archived from the original on Jan. 20, 2022.

1965

IBM enters time-sharing

QUICKTRAN was a computer programming language, similar to Fortran. In addition, it was IBM's first entry into time-sharing. Vint Cerf was the systems engineer in Los Angeles for QUICKTRAN from 1965 to 1967.

- "FORTRAN-like, interactive with debugging facilities." https://web.archive.org/web/20060908020903/http://hopl.murdoch.edu.au/showlanguage.prx?exp=461&language=QUIKTRAN
- Cerf, V. Personal communication. Oct. 28, 2021.

1965

Transport of files between machines enabled

As part of the development of CTSS, the ability to request that a file be transferred (carried) via magnetic tape from one CTSS system to another was implemented.

- Crisman, P., ed. *A Compatible Time-Sharing System: A Programmer's Guide*, MIT Press, Cambridge, MA. 1965. Section AE.1. https://archive.org/details/ctss-programmers-guide-2e/page/n1/mode/2up

1966, June

Railroad uses computers to communicate

The Louisville and National Railroad, based in Louisville, KY, used the IBM 1050 to communicate train contents (*e.g.,* list of freight cars) from one railroad yard to another. It consisted of a single IBM 1448 transmission control unit connected to an IBM 1460 data processing system via remote terminals.

- "Working for the Railroad," IBM Archives, excerpted from IBM News, p. 3, Jun. 24, 1966. https://www-03.ibm.com/ibm/history/exhibits/valueone/valueone_railroad.html Archived from the original on Mar. 30, 2021.

1967, early

Chat services continue

A chat system was added to the SDS 940 running the Berkeley Time-sharing System (BTSS) from the University of California at Berkeley (UCBerkeley) that let users communicate with the operator. In June 1967, SDS acquired the Tymshare operating system, a highly modified version of BTSS, that included a rudimentary email mechanism that had been developed by Verne van Vlear. It enabled one to `SEND TO` a login name a note, `MAIL` to type everything in your inbox, and `CANCEL MAIL` to unsend a note, if it had not yet been delivered. Tom Watson posted a message to the newsgroup `alt.folklore.computers` indicating that around this time the SDS 940 (at Tymshare) also had email.

- "tymshare :: SDS 940 :: Tymshare manuals binder," Apr. 1967, Internet Archive. https://archive.org/details/bitsavers_tymshareSDBinderApr67_9203955
- "SDS 940 time-sharing system technical manual," SDS, Santa Monica, CA, Rept. SDS 90 11 16A, Nov. 1967. http://www.mirrorservice.org/sites/www.bitsavers.org/pdf/sds/9xx/940/901116A_940_TimesharingTechMan_Nov67.pdf Archived from the original on Jul. 26, 2017.
- Watson, T. Post on `alt.folklore.computers`, Sep. 3, 1997. https://groups.google.com/forum/#!searchin/alt.folklore.computers/watson$20sds$20940/alt.folklore.computers/5FG_0ffi7No/V3xG81IJm1sJ Archived from the original on Feb. 24, 2022.

1967, October

Email is offered as one rationale for the ARPANET

The initial plan for the ARPANET, written in 1967, gave several reasons for establishing a computer network. They were: load sharing, message service (electronic mail), data sharing, program sharing, and enabling remote logins.

- Roberts, L. "The ARPANET and computer networks." IN: *A History of Personal Workstations*, A. Goldberg, ed., New York, NY, ACM Press, Jun. 26, 1986. https://dl.acm.org/doi/pdf/10.1145/12178.12182

1968, April

The Computer as a Communication Device

J.C.R Licklider at MIT and Bob Taylor at ARPA publish the paper "The Computer as a Communication Device." This important paper laid out a vision of how computers could be used to facilitate human interaction. The paper explains concepts including Message Processing and On-line Interactive Communities as ways in which computers will support and enhance human activities of many kinds.

- Licklider, J.C.R. and Taylor, R. **"**The Computer as a Communication Device," *Science and Technology*, April, 1968. Republished on KurzweilAI.net Nov. 9, 2001. https://www.kurzweilai.net/the-computer-as-a-communication-device Archived from the original on Jan. 20, 2022.

1968, June 26

Carterfone decision handed down

The Federal Communications Commission (FCC) Carterfone decision allowed third-party terminal equipment to be connected directly to the telephone network as well as through acoustic couplers (13 F.C.C.2d 420). This enabled the development of a customer premise equipment industry. Prior to this decision, one could not use an acoustic coupler unless it was supplied or explicitly authorized by the carrier (telephone company).

- Pelkey, J. **"**Carterfone, ATT and the FCC 1948-1967," Chap. 1, IN: *Entrepreneurial Capitalism and Innovation: A History of Computer Communications 1968-1988,* 2007. http://www.historyofcomputercommunications.info/Book/1/1.2CarterfoneATT_FCC48-67.html. Archived from the original on May 11, 2021.
- Johnson, N. "Carterfone: My story," Santa Clara High Technology Law Journal, vol. 25, no. 3, pp. 677-700, 2009. http://digitalcommons.law.scu.edu/cgi/viewcontent.cgi?article=1485&context=chtlj. Archived from the original on Aug. 8, 2020.
- Johnson, M. "Carterfone, 13 F.C.C.2d 420, 13 Rad. Reg. 2d (P & F) 597, 77 Pub. Util. Rep. 3d 417 (1968)", Federal Communications Commission, Jun 26, 1968. https://web.archive.org/web/20201124034532/https:/myweb.uiowa.edu/johnson/FCCOps/1968/13F2-420.html

1968, July 29

ARPA issues Request for Quotation for a computer network

Thomas Sheblik, Deputy Director for Procurement, Defense Supply Service, Department of the Army (as the contracting agent for ARPA), sent a letter (with accompaniments) inviting recipients to submit a proposal for the development of Interface Message Processors (IMPs) for the ARPA computer network. The selected contractor was to construct and install IMPs and associated interfaces at Stanford Research Institute (SRI),

University of California at Los Angeles (UCLA), University of California at Santa Barbara (UCSB), and the University of Utah.

- Sheblik, T. Request for Quotation and attachments, July 29, 1968. https://web.archive.org/web/20191219161921/http://www.walden-family.com/bbn/arpanet-rfq.pdf

1968, July

MAILGRAM service proposed

Earl D. Hilburn, Executive Director of Western Union Telegraph Co., proposed the concept for MAILGRAM, an electronic message, cheaper than a telegram, sent to post offices and delivered as hard copy to a recipient's physical mailbox as next day mail.

- Williams, R. L. "MAILGRAM - an electronic mail service," pp.15/5-6. IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

1968

NLS (oN-Line System) adds teleconferencing

Douglas Engelbart and his group at Stanford Research Institute, Augmentation Research Center (SRI-ARC) developed a shared-screen remote-host interactive teleconferencing system within the NLS program.

- Engelbart, D. and English, W. "A research center for augmenting human intellect," pp. 395-410, IN: *AFIPS Conf. Proc.*, vol. 33, Fall Joint Computer Conf., San Francisco, CA, Dec. 1968. https://dougengelbart.org/content/view/140/000/ (AUGMENT,3954,) Archived from the original on Dec. 13, 2021.

1969, May

MAILGRAM trial begins

The MAILGRAM trial begins between U.S. post offices and Western Union.

- Williams, R. L. "MAILGRAM – an electronic mail service," pp.15/5-6. IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

1969, Early

Contract to develop the ARPANET awarded

Based on a plan developed by Larry Roberts, in early 1969 ARPA awarded the contract (through their agent) to develop the Interface Message Processor (IMP) for the ARPANET to Bolt Beranek and Newman, Inc. (BBN). The contract authorized the connection of four nodes at UCLA, SRI-ARC, UCSB, and University of Utah using 50kb/s lines leased from AT&T. It seems as though the contract was awarded in January, but the funds for the formal start came in early April.

- Hafner, K. and Lyon, M. *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Roberts, L. "The Evolution of Packet Switching," Proceedings of the IEEE, Vol 66, No. 11, pp. 1307-13, Nov. 1978. https://web.archive.org/web/20181231092936/http://www.ismlab.usf.edu/dcom/Ch10_Roberts_EvolutionPacketSwitching_IEEE_1978.pdf

- Abbate, J. *Inventing the Internet*. Cambridge, MA, MIT Press, 1999. ISBN 978-0262511155.
- "The ARPANET: Forerunner of Today's Internet," Raytheon BBN Technologies, Cambridge, MA. https://www.raytheon.com/sites/default/files/rtnwcm/groups/gallery/documents/digitalasset/rtn_224614.pdf. Archived from the original on May 23, 2019.
- "Persistent Innovation: The history of BBN technologies," Raytheon BBN Technologies, Cambridge, MA. https://www.raytheon.com/sites/default/files/rtnwcm/groups/gallery/documents/digitalasset/rtn_221418.pdf. Archived from the original on June 10, 2019.

1969, Summer

Multics adds email

Multics `mail` is written by Tom Van Vleck at MIT. The first Multiplexed Information and Computing Service (Multics) `mail` command "was a direct re-implementation of CTSS MAIL." Original Multics mail lacked privacy, authentication, and security, since it simply opened the user's mailbox as a "shared memory segment" (public-access file) and added the message to the bottom. This meant that a user's mailbox had to be "writeable" by every other user.

- Van Vleck, T. "The History of Electronic Mail*,"* MIT Computation Center, MIT, Cambridge, MA, (c) 2001-2013. http://www.multicians.org/thvv/mail-history.html (archived from the original on Jan. 22, 2022) and http://www.multicians.org/thvv/mail-details.html (archived from the original on July 5, 2021).

1969, August 30

First ARPANET IMP delivered

BBN delivered and installed the first IMP (Interface Message Processor) to Len Kleinrock's group at UCLA. This is the beginning of the ARPANET. The UCLA team responsible for connecting the IMP to their SDS Sigma 7 computer and thereby creating the first ARPANET node included graduate students Vinton Cerf, Steve Crocker, Bill Naylor, Jon Postel, and Mike Wingfield. They helped BBN's Bob Kahn and Dave Walden with host testing.

- Hafner, K. and Lyon, M. *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN: 0-684-81201-0.
- Abbate, J. *Inventing the Internet*. Cambridge, MA, MIT Press, 1999. ISBN 978-0262511155.
- "ARPANET – The First Internet." https://www.livinginternet.com/internet/i/ii_arpanet.htm Archived from the original on Sept. 19, 2021.
- "Persistent Innovation: The history of BBN technologies," Raytheon BBN Technologies, Cambridge, MA. https://www.raytheon.com/sites/default/files/rtnwcm/groups/gallery/documents/digitalasset/rtn_221418.pdf. Archived from the original on June 10, 2019.

1969, December

ARPANET research network starts operation

The initial contract to develop the ARPANET (Dept. of Defense (DoD) packet-switched research network) using packet-switched technology was "completed." ARPA had authorized the connection of four nodes at UCLA, SRI-ARC, UCSB, and University of Utah using 50kb/s lines leased from AT&T. Those four nodes were operational in December, 1969, completing the initial contract for the ARPANET.

- Kleinrock, L. "An early history of the internet," IEEE Communication Mag., pp. 26-36, Aug. 2010. https://www.lk.cs.ucla.edu/data/files/Kleinrock/An%20Early%20History%20Of%20The%20Internet.pdf. Archived from the original on May 5, 2921.

1970, January

MAILGRAM mail service initiated

MAILGRAM service was offered jointly by Western Union and United States Postal Service (USPS) to Western Union Telex and InfoCom customers in 12 cities. (InfoCom was a private network type teleprinter service by which subscribers' terminals accessed each other through a Western Union computer system.)

- Williams, R. L. "MAILGRAM - an electronic mail service," pp.15/5-6. IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

1970, November

Bulk mailing added to MAILGRAM

MAILGRAM offered bulk mailing capabilities using address and message information provided on magnetic tape.

- Williams, R. L. "MAILGRAM – an electronic mail service," pp.15/5-6. IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

1970

USPS initiates their first study of electronic mail

Starting in 1970, the USPS commissioned several studies on new technologies. The first, done by General Dynamics, was a "Study of Electronic Mail." This was followed in 1973 by a study at Philco-Ford on the performance and cost of converting graphics and letter mail to digital forms, and one by A.D. Little on the technologies that would offer the greatest promise as building blocks. A fourth, in 1974 by the U.S. Dept. of Commerce, was a "Study of Satellite Frequency requirements for the U.S. Postal Service Electronic Mail System."

- U.S. Postal Service Support Panel of the Committee on Telecommunications, and the Assembly of Engineering of the National Research Council. "Electronic Message Systems for the U.S. Postal Service: A Report," Natl. Acad. of Sciences, NTIS PB 262-892, 1976.
- "Conversion subsystems for the electronic mail handling program: Final report." Philco-Ford Corp., Willow Grove, PA, May 1973.

1970

NLS Mail adds attachments

Doug Engelbart's NLS system at SRI-ARC added a mail capability with attachments. Users could mail any file or part of a file or create a new message from within NLS and send it to remote NLS users across the ARPANET. NLS users could send other NLS users email containing hyperlinks (roughly the equivalent of uniform resource locators – URLs – or online expandable references).

- Engelbart, D. C. "Collaboration Support Provisions in Augment," Tymshare Corp., Cupertino, CA, OAD 2221, p. 6, Oct. 25, 1983. https://dougengelbart.org/content/view/147/ Archived from the original on Oct. 16, 2021.

1971, February

MAILGRAM messages accepted by telephone

Telephone acceptance of MAILGRAM messages was inaugurated.

- Williams, R. L. "MAILGRAM - an electronic mail service," pp.15/5-6. IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976

1971, Spring-Summer

First network computer worm created

Bob Thomas at BBN created the first network "worm" called `Creeper`, which creates copies of itself on multiple TENEX computers, displaying the message

"`I'M THE CREEPER : CATCH ME IF YOU CAN`"

In response, Ray Tomlinson created `Reaper` to track down Creepers and destroy them. TENEX was a paging time-sharing operating system developed at BBN that went live on June 15, 1970 on Digital Equipment Corporation (DEC) PDP-10 computers.

- "The first computer virus of Bob Thomas (Complete History)," IN: *History computer*, *The History of Computing*, Education Pro on Genesis Framework. https://history-computer.com/the-first-computer-virus-of-bob-thomas/ Archived from the original on Feb. 1, 2022.
- Cunningham, J.S. "Interview with Ray Tomlinson on Creeper/Reaper," OS News, Apr. 6, 2016. https://www.osnews.com/story/29157/interview-with-ray-tomlinson-on-creeperreaper/. Archived from the original on Dec. 22, 2020.
- Kopriva, J. "50 years of malware? Not really. 50 years of computer worms? That's a different story…" IN: InfoSec Handlers Diary Blog, March 16, 2021. https://isc.sans.edu/diary/rss/27208. Archived from the original on Apr. 23, 2021.
- "Core War: Creeper and Reaper." https://corewar.co.uk/creeper.htm Archived from the original on Sept. 13, 2021.

1971, July-August

Mail Box Protocol proposed for the ARPANET

A Mail Box Protocol for the ARPANET was proposed by Dick Watson at SRI-ARC. He then proposed version 2 of his ARPANET Mail Box protocol suggesting that the Mail Box protocol be a subset of File Transfer Protocol (FTP), and published both versions as Request for Comments (RFCs).

- Watson, R. "A Mail Box Protocol," SRI-ARC., Menlo Park, CA, RFC 196, Jul. 20, 1971. https://www.rfc-editor.org/info/rfc196
  Archived from the original on Jan. 19, 2022.
- Watson, R. "A Mail Box Protocol, Version-2," SRI-ARC, Menlo Park, CA, RFC 221, Aug. 25, 1971. https://www.rfc-editor.org/info/rfc221
  Archived from the original on Apr. 20, 2021.

1971

Memo-styled email created

Ray Tomlinson at BBN wrote the `SNDMSG` application to enable TENEX users to send and receive simple memo-like messages (consisting of header lines for "To," "Subject," "From," "Date," and "cc") and `READMAIL` to allow recipients to read their messages. This version of `READMAIL` had no search or retrieve capabilities. `SNDMSG` was the first to use "memo" format, including the fields "Subject:," "To:," and "cc:."

- "Ray Tomlinson" (oral history), BBN, Cambridge, MA, n.d.
  https://web.archive.org/web/20210815191652/http:/openmap.bbn.com/~tomlinso/ray/firstemailframe.html
- "The First E-mail Message of Ray Tomlinson," IN: *History computer***,** *The History of Computing***,** Education Pro on Genesis Framework.
  https://history-computer.com/the-first-e-mail-message-of-ray-tomlinson/
  Archived from the original on Feb. 1, 2022.
- "Present state of Tenex," Tenex Newsletter, BBN, Cambridge, MA, Jul. 16, 1970.
  http://tenex.opost.com/tenexnews.txt.
  Archived from the original on Sept. 13, 2019.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008.
  https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4.
  https://www.computerhistory.org/collections/catalog/102706168
  Archived from the original on Feb. 1, 2022.

1971, Fall

Networked email demonstrated

Ray Tomlinson at BBN modified the TENEX `SNDMSG` application to transmit messages using `CPYNET` ("copynet," a TENEX-based file transfer capability), enabling mail to be sent from one TENEX system to another over the ARPANET, with the message then being appended to the end of the recipient's mailbox. At the same time, he introduced the @ sign followed by a destination address (*e.g.*, recipient@host-name) to indicate the ARPANET host to which the mail was to be delivered.

- "The First Network Email sent by Ray Tomlinson," The Centre for Computing History, Cambridge, UK, 1971. http://www.computinghistory.org.uk/det/6116/first-e-mail-sent-by-ray-tomlinson/ Archived from the original on Nov. 18, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1971, November 3

Email comes to Unix

A rudimentary "`mail`" command was added to the Unix operating system at Bell Labs by Dennis Ritchie and Ken Thompson to "send mail to another user." It was effectively a clone of the Van Vleck implementation on Multics, and worked by appending new mail to a file named "`mailbox`" in the destination user's home directory, or by typing out the contents of that file depending on the arguments to the command.

- *Unix Programmer's Manual*, The "`man`" page, Nov. 3, 1971. https://www.bell-labs.com/usr/dmr/www/1stEdman.html Archived from the original on Jan. 5, 2022. The page for "`mail`" is also available at https://minnie.tuhs.org/cgi-bin/utree.pl?file=V1/man/man1/mail.1. Archived from the original on July 14, 2021.

1971, November

Standards begin to emerge

The ARPANET File Transfer Committee revised the Mail Box protocol (RFC 221) to accept only American Standard Code for Information Interchange (ASCII) strings of text as a standard, along with other minor changes

- Bhushan, A. K., *et al*. "Revision of the Mail Box Protocol," RFC 278, Nov. 17, 1971. https://www.rfc-editor.org/info/rfc278 Archived from the original on May 6, 2021.
- Watson, R. "A Mail Box Protocol, Version-2," SRI-ARC, Menlo Park, CA, RFC 221, Aug. 25, 1971. https://www.rfc-editor.org/info/rfc221 Archived from the original on Apr. 20, 2021.

1971, December

Baran predicts the email market

Paul Baran predicted the emergence of a household mail service that would enable transmission of written text corresponding to "first class mail" as well as a service for mass mail and direct advertising mail. He estimated potential revenue for such services to be $707 million by 1989.

- Baran, P. "Potential market demand for two-way information services to the home 1970-90," IFF, Menlo Park, CA, Rept. R-26, Dec. 1971. https://scholar.google.com/scholar?hl=en&as_sdt=0,5&q=Paul+Baran+potential++market&btnG= . Archived from the original on Feb. 1, 2022.

1971

First spam email sent

The first non-network spam was sent in 1971 by an MIT system administrator of CTSS "to all people on CTSS" that began

"`There is no way to peace. Peace is the way.`"

- Templeton, B. "Reflections on the 25th Anniversary of Spam." http://www.templetons.com/brad/spam/spam25.html Archived from the original on Oct. 11, 2021.

1971

First text-oriented teleconferencing system developed

The FORUM teleconferencing system was developed by Olaf Helmer, Roy Amara, Hubert Lipinski, Richard Miller and Jacques Vallee at the Institute for the Future (IFF). It was funded by DARPA and National Science Foundation (NSF). A new system called PLANET, the "next level of conferencing," was started in mid-1974 by the same group at IFF.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Vallee, J., Lipinski, H. M. and Miller, R. H. "Group Communication Through Computers: Design and Use of the FORUM System," IFF Report R-32, Institute for the Future, Menlo Park, CA, July, 1974. https://files.eric.ed.gov/fulltext/ED110012.pdf Archived from the original on July 9, 2021.
- Vallee, J. *The Heart of the Internet: An Insider's View of the Origin and Promise of the On-Line Revolution*, Charlottsville, VA, Hampton Roads Pub. Co., Jul. 1, 2003. ISBN: 978-1571743695. https://books.google.com/books?id=EH46qowjvasC&printsec=frontcover#v=onepage&q&f=false. Archived from the original on Feb. 24, 2022.
- "PLANET-2 User Manual," IFF, Menlo Park, CA, May 1976.
- Vallee, J., Johansen, R., Lipinski, H. and Wilson, T. "Pragmatics and dynamics of computer conferencing: A Summary of Findings from the FORUM Project," IFF, Menlo Park, CA, Paper P-42. IN: *The Third Intl. Conf. on Computer Communication*, 1976.

1971

Multi-Computer Chat developed

The first multi-computer chat system, Emergency Management Information Systems And Reference Index (EMISARI), was designed by Murray Turoff while working in the U.S. Office of Emergency Preparedness. One of its first uses was to coordinate policy information for U.S. President Nixon's wage and price control program to fight high inflation. Functionality included real-time voting, data collection assignment and reporting, and discussion threads for individual database elements.

- Turoff, M. "The design of a policy Delphi," *Technological Forecasting and Social Change,* vol. 2, no. 2, pp. 149-171, 1970.

- Turoff, M. " 'Party-Line' and 'Discussion' computerized conference systems." Office of Emergency Preparedness, Washington, DC, No. OEP-ISP-109, 1972. https://apps.dtic.mil/sti/citations/AD0744349.
  Archived from the original on Oct. 31, 2020.
- Renner R.L., Bechtold R.M., Clark C.W., et al. "EMISARI: A Management Information System Designed to Aid and Involve People," IN: Tou, J.T., ed., *Information Systems*, Springer, Boston, MA, 1974. https://link.springer.com/chapter/10.1007/978-1-4684-2694-6_13 (archived from the original on June 17, 2018) and http://archives.njit.edu/vhlib/cccc-materials/njit-cccc-tm-230/njit-cccc-tm-230.pdf
  (archived from the original on Sept. 26, 2015).
- "First chat program of Murray Turoff," History of Computers and Computing, Education Pro on Genesis Framework, WordPress. https://history-computer.com/first-chat-program-of-murray-turoff/
  Archived from the original on Oct. 28, 2021.

1971

RAND Video Graphics System enables sharing of resources

RAND offered its Video Graphics System (VGS) message handler to provide inter-process communications control and message switching across the ARPANET.

- Uncapher, K. W. "The Rand Video Graphics System - An approach to a general user-computer graphic communication system," The Rand Corp, Santa Monica, CA, R-753-ARPA, Apr. 1971. https://www.rand.org/pubs/reports/R0753.html
  Archived from the original on Jan. 29, 2022.
- Carlstedt, J. "A message exchange for computer programs and terminals," Rand Corp., Santa Monica, CA, R-0694-ARPA, Jan. 1, 1972. https://www.rand.org/pubs/reports/R0694.html
  Archived from the original on Jan. 15, 2020.

1971

Multi-party teleconferencing invented

Murray Turoff at the New Jersey Institute of Technology developed Party Line and other variants of social teleconferencing.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Turoff, M. " 'Party-Line' and 'Discussion' computerized conference systems." Office of Emergency Preparedness, Washington, DC, No. OEP-ISP-109, 1972. https://apps.dtic.mil/sti/citations/AD0744349.
  Archived from the original on Oct. 31, 2020.
- "First chat program of Murray Turoff," History of Computers and Computing, Education Pro on Genesis Framework, WordPress. https://history-computer.com/first-chat-program-of-murray-turoff/
  Archived from the original on Oct. 28, 2021.

1971

APL Mail developed

The APL*Plus message processing system (Mailbox) was designed and implemented by Lawrence Breed and Francis Bates at Scientific Timesharing Corporation (STSC), with send, receive, and edit features, as well as private mail group and group distribution capabilities, for STSC users and their customers and clients. Shortly after, the Canadian company I. P. Sharp Associates offered a commercial email service called "666 BOX" also built in APL. 666 BOX was also used at STSC.

- Hui, R. (ed.), "APL Quotations and Anecdotes." https://www.jsoftware.com/papers/APLQA.htm Archived from the original on May 8, 2021.
- Dyer, D. "The Use of APL in the Management of a Time Sharing Company," IN: *APL '74: Proceedings of the sixth international conference on APL*, Association for Computing Machinery, New York, NY, pp. 148-150, Jan. 1974. https://doi.org/10.1145/800269.810806
- *APL*Plus message processing system user's guide*, Scientific Time Sharing Corp., Bethesda, MD. p. 1, Feb. 1975.

III. Growth of Network-Based Email (1972-mid 1975)

The advent of computer networks enables people in the next building, across town, or on the other side of the world to communicate cheaply and easily. Email becomes the first "killer app," and the term "electronic mail" enters the mainstream vocabulary.

1972, Early

Network mail capability becomes widely distributed

BBN distributed a version of its TENEX operating system that included Ray Tomlinson's `SNDMSG` and `READMAIL` with network mail capabilities, and with the @ as the user-name/host-name divider in the address. At first it worked only among TENEX systems on the ARPANET, but later in 1972 other operating systems began to include similar capabilities.

- Tomlinson, R. "The First Network Email," Raytheon BBN Technologies, Nov. 2, 2011. www.raytheon.com/sites/default/files/news/rtnwcm/groups/public/documents/content/rtn12_tomlinson_email.pdf Archived from the original on Jan. 21, 2022.
- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

- Hafner, K. and Lyon, M. *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Hafner, K. "E-Mail, 30 Years Later: Billions Served Daily," *New York Times*, Dec. 6, 2001. http://www.nytimes.com/2001/12/06/technology/billions-served-daily-and-counting.html. Archived from the original on May 6, 2021.
- "Email creator, Ray Tomlinson, inducted into Internet Hall of Fame; Tomlinson, honored in first class of inductees, fundamentally changed global communication and secured the '@' symbol's place in history as a digital icon," Raytheon Co., Waltham, MA, 2012. https://raytheon.mediaroom.com/index.php?s=43&item=2085. Archived from the original on Jan. 21, 2022.

1972, Early

Multics adds network-based email

Mike Padlipsky, Ken Pogran, and others at MIT implemented `net_mail` for sending and receiving ARPANET mail on MIT-Multics using the same user "mailbox" as the Multics internal `mail` command. Since the @ sign was the text-editing "line kill" character on Multics (in text editing and command line editing), the Multics `net_mail` command used "`-at`" as a command modifier instead.

- Van Vleck, T. "The History of Electronic Mail," MIT Computation Center, MIT, Cambridge, MA, (c) 2001-2013. http://www.multicians.org/thvv/mail-history.html (archived from the original on Jan. 22, 2022) and http://www.multicians.org/thvv/mail-details.html (archived from the original on July 5, 2021).
- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1972, July

Selective email-reading created

Larry Roberts, Director of the Information Process Techniques Office (IPTO) at DARPA, wrote `RD`, an email-reading program that enabled users to sort, save, and reorder messages online. This was done at the request of Stephen Lukasik, the Director of DARPA. It was coded in Text Editor and Corrector (`TECO`) macros and added improved functionality not included in BBN's `READMAIL`. Roberts' implementation was very slow in moving to the next message, so Steve Crocker, who was also at DARPA, modified the program to make moving from one message to the next much faster. Roberts used email to manage his contractors with near daily requests and instructions. Lukasik would ask Roberts a question, Roberts would send messages and have answers overnight. Lukasik quickly insisted the other office directors use email so he could use email to manage his interactions with them.

- Panko, R. "Electronic mail overview II," SRI., Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Roberts, E. "The Origins of E-mail," Stanford Univ., Stanford, CA, updated Sep. 17, 1999. https://cs.stanford.edu/people/eroberts/courses/soco/projects/1999-00/internet/email.html. Archived from the original on Oct. 30, 2020.
- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. Talking Headers, *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Hafner, K. "E-Mail, 30 Years Later: Billions Served Daily," *New York Times*, Dec. 6, 2001. http://www.nytimes.com/2001/12/06/technology/billions-served-daily-and-counting.html. Archived from the original on May 6, 2021.
- Murphy, D. "The Beginnings of TECO," *IEEE Annals of the History of Computing*, vol. 31, no. 4. pp. 110-115, Oct.-Dec. 2009. https://opost.com/tenex/anhc-31-4-anec.pdf Archived from the original on Nov. 19, 2021.
- Kozlowska, H. "Email's first real user was also the first person to compulsively check his inbox," *Quartz*, Jun. 30, 2018. https://qz.com/1318453/emails-first-real-user-was-also-the-first-person-to-compulsively-check-his-inbox/. Archived from the original on Aug. 12, 2018.
- Crocker, S. Personal email communication, Feb. 14, 2017.
- Personal email from Stephen Lukasik to Steve Crocker, Jan. 26, 2019.
- Personal emails from Steve Crocker, Alex McKenzie, and Dave Walden, Aug. 1-2, 2019.

1972, August

ARPANET email transfer mechanism specified

`MAIL` and `MLFL` ("mail file") commands were added to the ARPANET File Transfer Protocol. In this version, a separate copy of the email message was sent to each recipient.

- Bhushan, A. K. "Comments on the File Transfer Protocol," MIT-MAC, Cambridge, MA., RFC 385, Aug. 18, 1972. https://www.rfc-editor.org/info/rfc385. Archived from the original on May 8, 2021.

1972, Summer

Linking users; sharing desktops

The `RSEXEC` program from BBN enabled TENEX users to "link" to other users, so that each linked user could see what the others are typing or doing. The program was later implemented on other operating systems.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Thomas, R. H. "A Resource Sharing Executive for the Arpanet," p. 155, IN: *AFIPS '73 Proc. of the June 4-8, 1973, Natl. Computer Conf. and Exposition, June 4-8. 1973*, New York, NY, ACM, 1973. https://dl.acm.org/citation.cfm?id=1499636 and https://apps.dtic.mil/sti/pdfs/AD0758162.pdf (archived from the original on Feb. 2, 2002).
- Thomas, R. H. and Clements, B. "FTP Server-Server Interaction," BBN, Cambridge, MA, RFC 438, Jan. 15, 1973. https://www.rfc-editor.org/info/rfc438 Archived from the original on May 9, 2021.

1972, September

Consolidation of Telecommunications Centers on Oahu

An effort was initiated to consolidate the 96 military telecommunications centers on Oahu into 24. The Military Message Experiment (MME) that was funded in July 1975 was part of this effort.

- "CINCPAC Plan for Consolidation of Telecommunications Centers Oahu (COTCO)", PACOM Coordination, Sept. 1972.
- Ellis, T., Gallenson, L, Heafner, J., and Melvin, J. "A Plan for Consolidation and Automation of Military Telecommunications on Oahu," USC-ISI, Marina del Rey, CA, ISI RR-73-12, May 1973. https://apps.dtic.mil/sti/pdfs/AD0769110.pdf Archived from the original on Feb. 2, 2022.

1972, around September

Email goes commercial

Scientific Time Sharing Corporation (STSC) in Bethesda, MD offered its electronic mail system called MAILBOX to their users.

- Bennington, H. D. "Electronic mail," pp, 887-948, IN: Manassah, J. T. *Innovations in Telecommunications, Part B*, New York, NY, Academic Press, 1982. ISBN 978-0124674028.

1972, October 24-26

Public demonstration of the ARPANET

Originally suggested by Larry Roberts, Bob Kahn organizes and runs the International Conference on Computer Communications (ICCC) which was held October 24-26 in Washington, D.C. It was the first major international computer conference with a broad interdisciplinary flavor. It included "Participating Demonstrations of a Multi-Purpose Network Linking Dissimilar Computers and Terminals." It was humans communicating with a distant computer as well as "software communicating with other software."

- Pelkey, J. *Entrepreneurial Capitalism and Innovation: A History of Computer Communications 1968-1988*. "Arpanet: 1969-1972. The Beginnings of Computer Networks." The History of Computer Communications. https://historyofcomputercommunications.info/section/6.8/early-surprises-1969-1970/. Archived from the original on Nov. 20, 2021.
- Announcement for the International Conference on Computer Communications, Washington, D.C., October 24-26, 1972. IN: Lasar, M. "Arpanet's coming out party: when the Internet first took center stage", ArsTechnica, Oct. 18, 2011. https://arstechnica.com/tech-policy/2011/10/arpanets-coming-out-party-when-the-internet-first-took-center-stage/. Archived from the original on Jan. 21, 2022.
- "Program for the International Conference on Computer Communication." IN: *The Papers of Clay T. Whitehead*, Box 42, https://d3so5znv45ku4h.cloudfront.net/Box+042/013_Speech-International+Conference+on+Computer+Communications,+Washington,+DC,+October+24,+1972.pdf. Archived from the original on May 9, 2021.
- Metcalfe, R. "Scenarios for using the Arpanet at the International Conference on Computer Communications," Washington, D.C., October 24-26, 1972. Collections, Computer History Museum, Sunnyvale, CA. https://archive.computerhistory.org/resources/access/text/2019/07/102784024-05-001-acc.pdf.
- Target, S. "The Real Novelty of the ARPANET," IN: Two-Bit History, Computing Through the Ages, Feb. 7, 2021. https://twobithistory.org/2021/02/07/arpanet.html Archived from the original on Aug. 31, 2021.

1972

MIT starts implementing Licklider's vision

The Dynamic Modeling Group at MIT designs and initiates the implementation of a "new, integrated mail service that brings all the desirable mail and announcement features ... into one consistent framework, and ... incorporates features of descriptor-based dissemination and retrieval schemes and of teleconferencing systems." Messages are handled as data structures, and stored in a database which facilitates managing message exchanges as persistent and "living" data structures Several components are brought

online – a Composer, Reader, Communications Daemon, and Information Retrieval System – which operate cooperatively as a first step toward the "Oliver" smart digital assistant functionality. This is the start of the MSGDMS system.

- Fredkin, E. Project MAC Progress Report X, July 1972 – June 1973. MIT, December, 1973. https://www.multicians.org/AD771428.pdf Archived from the original on July 4, 2021.
- Fredkin, E. Project MAC Progress Report XI. MIT, December, 1974. https://apps.dtic.mil/dtic/tr/fulltext/u2/a004966.pdf Archived from the original on July 1, 2021.
- Licklider, J.C.R. and Taylor, R. "The Computer as a Communication Device," *Science and Technology*, April, 1968. Republished on KurzweilAI.net Nov. 9, 2001. https://www.kurzweilai.net/the-computer-as-a-communication-device Archived from the original on Jan. 20, 2022.

1972

MAILGRAM service expands

Western Union's MAILGRAM service was extended to all Teletypewriter Exchange Service (TWX) subscribers.

- Williams, R. L. "MAILGRAM - an electronic mail service," pp.15/5-6, IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

late 1972-early 1973

Mail handling software improves

Barry Wessler, first at DARPA and then at Telenet Communications Corporation (a 1972 offshoot of BBN that provided the first commercial packet-switched network and eventually produced the Telemail email system), wrote the "New RD" (`NRD`) program. It was written in Stanford Artificial Intelligence Language (SAIL), an Algol-based programming language, and was intended to be a significant improvement to `RD`, adding still more mail-handling features. `NRD` never became operational and was never distributed outside of DARPA.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- "Telenet." IN: *Industry: GTE -> Genuity*. Cybertelecom Federal Internet Law & Policy, An Educational Project, updated Aug. 17, 2016. http://www.cybertelecom.org/industry/genuity.htm Archived from the original on June 12, 2021.

1973, February 23

Uniformity in mail systems discussed

The ARPANET Network Working Group (NWG) held a network mail system meeting at SRI on Feb. 23, 1973. Several extensions to existing mail systems on the ARPANET

were discussed so that all ARPANET systems would use uniform user and site identifications, utilize FTP to originate and distribute mail, allow users to record the dialog, and allow Terminal Interface Processor (TIP) users to handle mail.

- Kudlick, M. "Meeting Announcement to Discuss a Network Mail System," SRI-NIC, Menlo Park, CA, RFC 453, Feb. 7, 1973. https://www.rfc-editor.org/info/rfc453 Archived from the original on Apr. 13, 2021.
- Kudlick, M. "Network Mail Meeting Summary," SRI-NIC, Menlo Park, CA, RFC 469, Mar. 8, 1973. https://www.rfc-editor.org/info/rfc469 Archived from the original on May 6, 2021.
- Bhushan, A. K. "FTP and Network Mail System," MIT-DMCG, Cambridge, MA, RFC 475, Mar. 6, 1973. https://www.rfc-editor.org/info/rfc475 Archived from the original on May 6, 2021.
- White, J. "Use of FTP by the NIC Journal," SRI-ARC, Menlo Park, CA, RFC 479, Mar. 8, 1973. https://www.rfc-editor.org/info/rfc479 Archived from the original on May 17, 2021.
- Kilker, J. "Social and technical interoperability, the construction of users, and 'arrested closure': A case study of networked electronic mail development." IN: *Iterations, An Interdisciplinary Journal of Software History,* The Charles Babbage Institute for the History of Information Technology, Minneapolis. MN, 13 Sep. 2002. https://web.archive.org/web/20210105011354/http://www.cbi.umn.edu/iterations/kilker.html

1973, February

Expanded repertoire of email-related FTP commands proposed

Bob Bressler and Bob Thomas, BBN, proposed `ReadMailFile` and `ReadMail` as new FTP commands to be symmetrical with the `MLFL` and `MAIL` commands used in sending email.

- Bressler, R. and Thomas, R. "Mail Retrieval via FTP," BBN, Cambridge, MA, RFC 458, Feb. 28, 1973. https://www.rfc-editor.org/info/rfc458 Archived from the original on May 9, 2021.

1973, March

First computer-based calendar application appears

Ted Strollo of BBN wrote TENEX `Calendar`, the first calendar system. He expanded it over time, and ultimately rewrote it in the Smalltalk language when he moved to Xerox Palo Alto Research Center (PARC).

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Source code for Tenex Calendar provided by Ted Strollo.

1973, June-July

Formal mail protocol proposed

Jim White at SRI-ARC proposed a mail protocol for the ARPANET in RFC 524. It drew a response from Dave Crocker and Jon Postel, both then at UCLA Network Measurements Center (UCLA-NMC), in RFC 539.

- White, J. E. "A Proposed Mail Protocol," SRI-ARC, Menlo Park, CA., RFC 524, Jun. 13, 1973. https://www.rfc-editor.org/info/rfc524 Archived from the original on May 6, 2021.
- Crocker, D. and Postel, J. "Thoughts on the Mail Protocol Proposed in RFC 524," UCLA-NMC, Los Angeles, CA, RFC 539, Jul. 30, 1973. https://www.rfc-editor.org/info/rfc539 Archived from the original on May 9, 2021.

1973, August

Community Memory starts

Community Memory was the first public computerized bulletin board system (BBS), a kind of information flea market. One could put notices into the Community Memory and look through the memory for notices of interest. It was established in 1973 in Berkeley using an SDS 940 time-sharing system in San Francisco connected via a 110 baud link to a teletype at Leopold Records, enabling users to enter and retrieve messages.

- Doub. B. "Community memory: Precedents in social media and movements," CHM Blog, Computer History Museum, Mountain View, CA, Feb. 23, 2016. https://computerhistory.org/blog/community-memory-precedents-in-social-media-and-movements/. Archived from the original on Nov. 4, 2021.
- "Remembering Leopold Records." Pt. 1. IN: *The Amoeba Connection*, posted by Billy Jam on the Amoeba Blog, Sep. 4, 2008.
- Colstad, K., and Lipman, E. "Community memory: A public information network," ACM *SIGCAS Computers and Society,* vol. 6, no. 4, pp. 6-7, Dec. 1975.
- Felsenstein, L. "Community Memory - A 'Soft' Computer System," IN: *Proc. First West Coast Computer Faire*, San Francisco, CA, Apr. 15-17, 1977, pp 142-143. https://usermanual.wiki/Document/ProceedingsoftheFirstWestCoastComputerFaire1977.4207648070/help. Archived from the original on Mar. 1, 2021.
- "Efrem Lipkin." http://www.transaction.net/people/efremlipkin.html Archived from the original on Nov. 4, 2021.

1973, Summer

Email messages linked into a "conversation"

`Notes` for the Programmed Logic for Automatic Teaching Operations (PLATO) system (effectively email between PLATO users) was released (`Personal Notes` was released in August, 1974). PLATO was the first generalized computer-assisted instruction system. Originally intended for bug reporting, `Notes` was very structured and did not interface to other systems. `Notes` is notable for linking together an original note and its responses, effectively forming a "conversation."

- Woolley, D. "PLATO: The Emergence of Online Community," 1994. http://thinkofit.com/plato/dwplato.htm Archived from the original on Feb. 9, 2010.
- "PLATO Notes screenshot," Computer History Museum, Mountain View, CA, Object ID 500004894, 1975. http://www.computerhistory.org/revolution/the-web/20/377/2154 Archived from the original on Jan. 3, 2020.
- Jones, S. "PLATO." *Encyclopedia Britannica*, https://www.britannica.com/topic/PLATO-education-system. Archived from the original on Nov. 17, 2021.
- Dear, B. "PLATO History: Remembering the Future." http://www.platohistory.org/about/. Archived from the original on Nov. 2, 2021.

1973, September 5

ARPANET mail headers specified

Since, at this time, each system's mail headers were a little different (or, in some cases, nonexistent), the intent of RFC 561was to make explicit the "specification of such header information as author, title, and date" in an attempt to achieve uniformity across email systems, reducing the need to understand what each site was sending and therefore reducing the need for specialized parsers (per source host) of the email by those systems. This was not originally intended to be a standard, but rather everyone "agreeing on network mail headers." This work became a *de facto* standard.

- Bhushan, A., Pogran, K., Tomlinson, R., and White, J. "Standardizing Network Mail Headers," MIT, Cambridge, MA, RFC 561, Sep. 5, 1973. https://www.rfc-editor.org/info/rfc561 Archived from the original on Mar. 8, 2021.

1973, October

Priorities for email proposed

In RFC 577, Dave Crocker of UCLA-NMC proposed adding the concept of "priority" to the ARPANET mail protocol, and suggested degrees of urgency for mail delivery.

- Crocker, D. "Mail Priority," UCLA-NMC, Los Angeles, CA, RFC 577, Oct. 18, 1973. https://www.rfc-editor.org/info/rfc577 Archived from the original on May 15, 2021.

1973, November

ANSI proposes a format for email headers

American National Standards Institute (ANSI) circulates its X3 draft proposal "Message heading formats for information interchange using the ASCII for data communications system control" for review and comment.

- Amer. Natl. Standards Inst., "Draft proposed message heading formats for information interchange using ASCII for data communications system control," BSR X3.57 (revised), prepared by Task Group X3S33/125, X3 Project 47, pp. 17+, Nov. 1974.

1973

First worldwide corporate email system created

Comsys, the Hewlett Packard (HP) internal worldwide messaging system, was created by Rich Nielsen, Hank Taylor, and Bob Puette. It ran on HP 3000 computers.

- Minck, J. "Inside HP: A narrative history of Hewlett-Packard from 1939-1990." https://www.scribd.com/document/65390438/HP-Early-Days Archived from the original on Feb. 2, 2022.
- "Fast as a speeding electron … The Penny Post Rides Again." *Measure*, pp. 11-13, Hewlett-Packard, April, 1974. This article implies that the date is 1973, or perhaps 1972. http://www.hp.com/hpinfo/abouthp/histnfacts/publications/measure/pdf/1974_04.pdf. Archived from the original on July 3, 2016.

1973

Email gains in popularity

By 1973, well over 50% of the traffic on the ARPANET was email (some say it was more like 75%).

- Tomlinson, R. "Networked email as an early "Killer App," CHM Timeline, Computer History Museum, Mountain View, CA, 1971. http://www.computerhistory.org/timeline/1971/#169ebbe2ad45559efbc6eb3572069731. Archived from the original on Jan. 5, 2022.
- Roberts, E. "The Origins of E-mail," Stanford Univ., Stanford, CA, updated Sep. 17, 1999. https://cs.stanford.edu/people/eroberts/courses/soco/projects/1999-00/internet/email.html. Archived from the original on Oct. 30, 2020.

1973

ARPANET bulletin boards are born

Richard Kahler at Stanford University Medical EXperimental computer resource for Artificial Intelligence in Medicine (SUMEX-AIM) wrote `BBD`, a bulletin board program, in SAIL, running under TENEX and connected to the ARPANET.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.

1974, January

First email directory published

The SRI Network Information Center (SRI-NIC) published an ARPANET Directory that contained the names, host affiliation, and email address for most ARPANET users. It was the first ARPANET-wide network email address directory.

- *ARPANET Directory*, SRI-NIC, Menlo Park, CA, Jan. 1974. https://archive.computerhistory.org/resources/access/text/2021/11/102805038-05-01-acc.pdf

1974, early-to-mid

DARPA Message Services Committee formed

A new "Message Services Committee" was established by DARPA program manager Steve Walker. The committee was charged with thinking about email issues, and some of its members wanted to focus on the larger issue of computer-supported cooperative work. However, its focus ended up being on user agents and email headers.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1974, early

From `NRD` to `WRD`

`WRD` was written by Martin Yonke and John Vittal, both at University of Southern California's Information Sciences Institute (USC-ISI). Yonke had obtained a copy of Barry Wessler's `NRD` in 1973 from Steve Crocker. Vittal joined ISI in January 1974, and with Yonke, modified `NRD`, first into `WRD` which was never released. Yonke later modified `WRD` into `BananaRD` and Vittal modified `WRD` into `MSG`. All were written in SAIL.

- Panko, R. "Electronic mail overview II." SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- Vittal, J. "MSG - A simple message system," IN: R. P. Uhlig, ed., *Computer Message Systems*, North Holland Pub. Co., New York, NY, 1981. ISBN 0-444-85253-6.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1974, May

First client/server-based teleconferencing system introduced

Announced with the publication of Case Western Reserve University student Jim Calvin's bachelor's thesis, the development of `tctalk/telser` was started in late 1973. Earlier examples of teleconferencing systems were hosted (*i.e.,* you had to dial or Telnet into the service yourself) rather than have a program interact with the service. As described on MSGGroup (founded on June 7, 1975), it was a "distributed network teleconferencing facility oriented to networks." Calvin supported the system for a while after he moved to BBN. (Telnet was the protocol, defined starting with RFC 15, that allowed a "bi-directional interactive text-oriented communication facility using a virtual terminal connection.")

- Calvin, J. *The Design and Implementation of an Interactive Teleconferencing Environment*, Bachelor of Sci. thesis, Case Western Reserve Univ., Cleveland, OH, May 10, 1974.

- Farber, D. "TCTALK," MSGGroup email no. 1, MSGGroup Archives, Jun. 7, 1975. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/ Archived from the original on May 27, 2021.
- Jernigan, M. E. "ARPANET technology report, tctalk/telser teleconference program (written by James O. Calvin)." Rept. No. ACC-35, A Consultant Co., Santa Barbara, CA, Nov. 30, 1975.
- Carr, S. "Network Subsystem for Time Sharing Hosts," University of Utah, Salt Lake City, UT, RFC 15, Sept. 25, 1969. https://www.rfc-editor.org/info/rfc15 Archived from the original on May 17, 2021.
- "Telnet," Wikipedia, edited Feb. 17, 2022. https://en.wikipedia.org/wiki/Telnet Archived from the original on Feb. 27, 2022.

1974, mid

First "integrated" email system developed

Martin Yonke at USC-ISI wrote `BananaRD`, the first program to integrate reading and sending email together with a user-friendly help system in the same application. `BananaRD` invoked `SNDMSG` as a subprocess for mail creation.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Vittal, J. "MSG - A simple message system," IN: R. P. Uhlig, ed., *Computer Message Systems*, North Holland Pub. Co., New York, NY, 1981. ISBN 0-444-85253-6.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.

1974, mid

`MSG`: the first modern email application introduced, includes Reply and Forward

John Vittal at USC-ISI wrote `MSG` for TENEX. `MSG` (on TENEX and later on Unix) became the most popular email program on the ARPANET until about 1984, being widely disseminated and used by thousands of people (more than 50% of the users of the ARPANET). It was still in use on Unix machines as late as 1989. `MSG` was first written for TENEX, but its functionality was widely copied and expanded in `read_mail` on Multics at MIT, `MS` at the Rand Corporation, `MM`, and other similar programs on other platforms. `MSG` was notable for being the first to include automatically addressed answering and forwarding features along with filtering messages, multiple mailboxes, a configurable user interface, and a user-friendly help system, among others. It had a more concise user interface than `BananaRD`. Vittal developed `MSG` and released it in

"private" beta in 1974. The private release went viral in the research community, because friends gave it to friends who gave it to friends, etc. The announced "public" release came in the first third of 1975. Programmers writing other systems on the ARPANET and Internet copied elements of `MSG`'s functionality (e.g., the ability to selectively type out or delete individual messages, not to mention the semantics of `answer` (reply) and `forward`). Like `BananaRD`, `MSG` invoked `SNDMSG` for email creation. Indeed, "… today's email programs are not fundamentally different from Vittal's pioneering design" (Donath, p. 2). "Vittal's program was so groundbreaking that he has sometimes been hailed as the true inventor of email" (Milne, p. 30).

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Vittal, J. "MSG - A simple message system," IN: R. P. Uhlig, ed., *Computer Message Systems*, North Holland Pub. Co., New York, NY, 1981. ISBN 0-444-85253-6.
- MSGGroup archives: http://mercury.lcs.mit.edu/~jnc/tech/msggroup/ Archived from the original on May 27, 2021.
- Roberts, E. "The Origins of E-mail," Stanford Univ., Stanford, CA, updated Sep. 17, 1999. https://cs.stanford.edu/people/eroberts/courses/soco/projects/1999-00/internet/email.html. Archived from the original on Oct. 30, 2020.
- Beranek, L. "Who Really Invented the Internet?" Sound and Vibration, January 2007. http://www.sandv.com/downloads/0701bera1.pdf. Archived from the original on Aug. 8, 2007.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.
- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. "E-Mail, 30 Years Later: Billions Served Daily," *New York Times*, Dec. 6, 2001. http://www.nytimes.com/2001/12/06/technology/billions-served-daily-and-counting.html. Archived from the original on May 6, 2021.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Crocker, D. "Email History." https://www.livinginternet.com/internet/e/ei.htm Archived from the original on Apr. 20, 2021.

- Vittal, J. "MSG Manual." USC Information Sciences Institute, Oct. 1, 1975. IN: Untitled document containing the manual from Artificial Intelligence Lab., Stanford Univ., Stanford, CA, 1976. A later version from April 18, 1977 is available in https://exhibits.stanford.edu/feigenbaum/catalog/jw795bg1033 Archived from the original on Feb. 2, 2022.
- Beranek, L. "Roots of the Internet: A Personal History." Massachusetts Historical Review, vol. 2, Massachusetts Historical Society, Boston, MA, 2000. https://www.jstor.org/stable/25081152 . Archived from the original on May 11, 2021.
- Donath, J. "Visualizing Email Archives," draft, MIT Media Lab, Cambridge, MA, Feb. 4, 2004. https://smg.media.mit.edu/papers/Donath/EmailArchives.draft.pdf Archived from the original on Jan. 10, 2022.
- Milne, E. *Email and the Everyday: Stories of Disclosure, Trust, and Digital Labor*. MIT Press, Cambridge, MA, Feb. 9, 2021. ISBN 978-0262045636

1974, mid

Client-server system for collaboration developed

Dave Lebling and Greg Thompson at MIT developed a client-server system for user collaboration, using a PDP-10 server and multiple Imlac workstations as clients. Users could interact, and exchange comments with others in conversational behavior. Many people remember this as an implementation of the "Maze War" game, which became quite popular across the ARPANET.

- Fredkin, E. Project MAC Progress Report XI. MIT, December, 1974, pp. 71-72. https://apps.dtic.mil/dtic/tr/fulltext/u2/a004966.pdf Archived from the original on July 1, 2021.
- Lebling, D. "Dave Lebling's Story of Maze at MIT," IN: Stories from the Maze War 30 Year Retrospective, Digibarn Computer Museum, https://www.digibarn.com/history/04-VCF7-MazeWar/stories/lebling.html Archived from the original on Jan. 7, 2022.

1974, July

Electronic signatures can be authenticated

Bob Thomas at BBN presented a general approach to the problem of authenticating electronic signatures

- Thomas, R. "On the Problem of Signature Authentication for Network Mail," BBN, Cambridge, MA, RFC 644, Jul. 22, 1974. https://www.rfc-editor.org/info/rfc644. Archived from the original on May 9, 2021.

1974, November 27

Unix MBOX file format developed

The MBOX file format for holding collections of email messages was defined and first implemented in the Fifth Edition Unix.

- "MBOX Email Format," Sustainability of Digital Formats: Planning for Library of Congress Collections, Library of Congress, Washington, DC, updated: Sep. 23, 2019. https://www.loc.gov/preservation/digital/formats/fdd/fdd000383.shtml Archived from the original on Mar. 23, 2021.
- Source code for the "`mail`" command in V5 Unix is available at https://minnie.tuhs.org/cgi-bin/utree.pl?file=V5/usr/source/s2/mail.c Archived from the original on July 18, 2021.

1974, November

ANSI publishes a draft message format standard

The ANSI draft standard for message heading formats, that used ASCII for data communication control, was released for public comment. This was a revision of its X3 533/125 standard.

- "Draft proposed American National Standard message heading formats for information interchange using the ASCII for data communication system control," ANSI Data Communications Formats Tech. Committee X3, Data Communications, X3 533/125, rev. Nov. 1974, X3 Proj. 47, CBEMA/Secretary X3, Washington, D.C.

1974, Fall

The U.S. Army gets email

The U.S. Army Materiel and Readiness Command (DARCOM) began experiments using SRI's NLS/Augment for email communications among key DARCOM individuals.

- Uhlig, R. P. "Human factors in computer message systems," *Datamation*, pp. 120-26, May 1977.

1974, December

MAILGRAM goes international

Western Union extended its MAILGRAM service to Canada.

- Williams, R. L. "MAILGRAM - an electronic mail service," pp.15/5-6, IN: *Proc. Joint Conf. on Communications*, Philadelphia, PA, 1976.

1974, December

Getting the word out about email

Steve Lukasik, Director of DARPA, presented a paper on the organizational and social impacts of a personal message service.

- Lukasik, S. *Proc. of the Natl. Telecommunications Conf.*, IEEE Communications Soc., San Diego, CA, Dec. 1974.

1974

MSG gets competition

`HG`, a simple message reading program, was written by James Calvin at BBN. `HG` was based on the program `R` that he wrote in 1973-4 as a student at Case Western Reserve University. Like `MSG`, `HG` (for Mercury) used `SNDMSG` to send email. By 1977, and perhaps as early as 1975, it had commands forward, reply, send, save, since, status,

subject, to, cc, from, subject, undelete, delete, write, as well as commands for filtering the inbox. It used status bits for message attributes such as seen (read), deleted, perpetual (undeletable), always-show.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- Calvin, J. "HG, A Simple Mail Reading Program Manual," BBN, Cambridge, MA, 1974-1975.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.

1974

BBN starts work on MAILSYS

`MAILSYS` (also called `XMAIL`), forerunner to `Hermes`, was written by Ted Myer, *et al*., at BBN. `MAILSYS` combined mail reading and mail composition functions. It was intended to be very general compared to its competition. It stored messages as a repository, and had a template facility to allow users to specify how the message fields should be displayed.

- Mooers, C. D. "Mailsys message system: Manual for users (draft*)," BBN*, Cambridge, MA, Jun. 1975.
- Panko, R. "Electronic mail overview II." SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Deutsch, D, and Dodds, D. "Hermes system overview," BBN, Cambridge, MA, Rept. 4115, May 1979.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.

1974

Teleconferencing improves and goes international

The Planet teleconferencing system, an updated version of Forum, was offered commercially on Tymnet. In the mid-1970s Forum was installed at the Stockholm University Computing Center, QZ, in Sweden, and Torgny Tholerus modified the program to use Swedish-language commands.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.
- "Teleconferencing Guide," Information Gatekeepers, Inc., Brookline, MA, pp. 56-57, 1976. https://books.google.com/books?id=EhtUvCLGJtoC&printsec=frontcover&source=gbs_ge_summary_r&cad=0 - v=onepage&q&f=false Archived from the original on Feb. 2, 2022.

- Palme, J. "History of the KOM Computer Conferencing System," originally May, 1990, latest revision Feb. 7, 2015. https://people.dsv.su.se/~jpalme/s1/history-of-KOM.html Archived from the original on Jan. 20, 2022.

1975, Spring

DARCOM use of email expands

NLS/Augment email use was extended to data processing managers at 20 more DARCOM sites.

- Uhlig, R. P. "Human factors in computer message systems," *Datamation*, pp. 120-26, May 1977.

1975, April 30

First de facto standard of memo-oriented format for email published

Implementations of email functionality exposed the complexity of such communications, especially when automatic processing was involved. RFC 561 was updated to RFC 680 by Ted Myer and Austin Henderson at BBN. The number of headers used in ARPANET email had increased in practice since RFC 561 was published, to include `to, cc` ("carbon copy"), `bcc` ("blind cc"), `sender`, and `message-id`. The `"message-id"` field uniquely identified each message as it was created, and facilitated the detection of situations such as "routing loops" as various sites processed and forwarded email and interacted with each other. RFC 680 was a clear step forward, even though it was never officially issued as a standard. This work also became a *de facto* standard.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Myer, T. and Henderson, A. "Message Transmission Protocol," BBN, Cambridge, MA, RFC 680, Apr. 30, 1975. https://www.rfc-editor.org/info/rfc680 Archived from the original on May 6, 2021.

1975, May

Database-based email developed

MSGDMS is developed by Mike Broos at MIT-DMS on Tenex, a reimplementation of the version originally developed for the Incompatible Time Sharing (ITS) operating system. It had an inverted index system for fast retrieval of old messages and stored archived messages on CCA's terabit Datacomputer.

- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.
- Haverty, J. "MIT-DMS Communication System Overview," Programming Technol. Div., MIT, Cambridge, MA, Document SYS.16.00, May 15, 1975. https://github.com/larsbrinkhoff/its-archives/blob/master/dmcg/MIT-DMS SYS.16.00.pdf (archived from the original on Feb. 2, 2022) which is part of https://github.com/PDP-10/its/issues/748 (archived from the original on Oct. 2, 2020).

- Dertouzos, M. L. Progress Report XIII, January - December 1975. Laboratory for Computer Science, MIT. https://apps.dtic.mil/dtic/tr/fulltext/u2/a061246.pdf Archived from the original on Feb. 2, 2002.

1975, June 7

DARPA's MSGGroup working group formed

Steve Walker at DARPA established the ARPANET MSGGroup working group in mid-1975. He sought to "establish a group of people concerned with message processing." Its goal was to develop a sense of "what is mandatory, what is nice and what is not desirable in message services." MSGGroup was not an actual committee but rather an email discussion and distribution list. Dave Farber maintained the original list of members, but shortly after its start Einar Stefferud became the MSGGroup moderator. It provided, among other things, a sounding board for many proposals from a myriad of people.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Walker, S. "Message Group Status," MSGGroup email no. 2, *MSGGroup Archive*, June 7, 1975. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup0001-0100.txt Archived from the original on Oct. 1, 2020.
- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.

1975, June 30

"Electronic mail" term used for the first time

The term "electronic mail" apparently was first used by the popular press in an article in Business Week in 1975. Up until this point, an email message was generally referred to as an "electronic message" or "network mail" both technically and in the popular media. It was also used in an Associated Press article by Jeffrey Mills that was forwarded to the MSGGroup list on January 5, 1976.

- See "electronic mail" IN: *Oxford English Dictionary*.
- Goodfellow, G. "ARPAnet mail the coming thing?" MSGGroup email no. 248, *MSGGroup Archives*, Jan. 5, 1976. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup0201-0300.txt Archived from the original on Oct. 1, 2020.

IV. Email Spreads Like Wildfire (mid 1975-1977)

Email started to go viral in 1974 with the advent of MSG. By 1975, all platforms on the ARPANET had email, and it was poised to skyrocket. However, the rules of this new game needed to be established while at the same time preserving the systems that had already been created.

1975, July

Rich email protocol proposed

Two camps emerged from extensive online discussions. The first camp focused on rapid implementation of a basic protocol set that would permit "electronic mail" to be sent and received by any computer, much as Telnet and FTP had done for remote terminal access and file transfer. This included the people interested in email viewing by humans directly. The second camp sought a richer protocol that would support long-term interactions and chains of messages, as well as messages exchanged between computer programs. A proposal from the second camp was submitted to the Message Services Committee as a first step to such a system. This second camp sought to have email produced and consumed by computer programs, which would use the information as metadata for subsequent storage and processing, including presentation to humans.

- Dertouzos, M. L. Progress Report XIII, January - December 1975. Laboratory for Computer Science, MIT. https://apps.dtic.mil/dtic/tr/fulltext/u2/a061246.pdf Archived from the original on Feb. 2, 2022.

1975 July

Military Message Experiment begins

DARPA funded the Sigma Project at USC-ISI, under Rob Stotz, to evaluate requirements and to develop a secure, interactive electronic messaging system. The project was based on a Memorandum of Agreement (MOA) between DARPA, the Naval Telecommunications Command (NAVTELCOM), the Naval Electronic Systems Command (NAVELEXSYSCOM), and the Commander in Chief Pacific (CINCPAC) for the conduct of a Military Message Experiment (MME). The specific objective of the MME was to determine the utility of an interactive message service in a major military headquarters, in this case at CINCPAC on Oahu. It included the capability to read and create/release formal military messages and internal memos at all levels of security classification. The program expanded to include the development of email programs at BBN and MIT's Dynamic Modeling Group that could run on the HP 2645A terminal running a USC-ISI operating system. The MME later involved BBN (Mailsys/Hermes) and a database-oriented messaging system developed at MIT (COMSYS/MSGDMS). Both BBN (Mailsys/Hermes) and ISI (Sigma) were funded under the MME program, while MIT (COMSYS/MSGDMS) was not.

- "Military Message Processing Design," ISI Information Automation Project, USC-ISI, Marina del Rey, CA., Jan. 10, 1975. (Internal project documentation, now out of print.)
- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.

- Tugender, R., and Oestreicher, D. R., "Basic functional capabilities for a Military Message Processing Service," USC-ISI, Marina del Rey, CA, ISI RR-74-23, May 1975. https://apps.dtic.mil/sti/citations/ADA011166
  Archived from the original on Feb. 24, 2021.
- Stotz, R., et al. "SIGMA - An interactive message service for the Military Message Experiment," IN: *Proc. of the Natl. Computer Conf.*, Amer. Fed. of Info. Processing Socs. (AFIPS), Jun. 1979.
  https://ieeexplore.ieee.org/document/8817135
  Archived from the original on Feb. 2, 2022.
- "The design of a message system for CINCPAC," Programming Technol. Div. of the Lab. for Computer Sci., MIT, Cambridge. MA, May 24, 1976. (An internal design document.)
- Henderson, D.A., and Myer, T.H. "Issues in message technology," pp. 6-1 to 6-9, IN: *Proc. of the Fifth Data Communications Symposium*, Sept. 27-29, 1977.
- Vezza, A. and Haverty, J. "Preliminary design of Technical Communique Facility," MIT, Cambridge, MA, May 15, 1973.
- Wilson, S. H., Goodwin, N. C., Bersoff, E. H., and Thomas, N. M., III. "Military Message Experiment, Volume I. Executive Summary." 1982. Also available via the Naval Res. Lab., Washington, DC, Final rept., NRL-MR-4454-v1, Mar. 24, 1982. (AD-A112789) https://apps.dtic.mil/sti/citations/ADA112789
  Archived from the original on Feb. 2, 2022.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4.
  https://www.computerhistory.org/collections/catalog/102706168
  Archived from the original on Feb. 1, 2022.

1975, September

Networking via satellite

DARPA launched an experimental Satellite Network (SATNET), linking satellite earth stations in Etam, West Virginia, Goonhilly Downs, England, and Tanum, Sweden in a 64 Kbit/s data communications network via the Intelsat satellite IV-A, using a single channel in a multi-access arrangement. SATNET combined packet-switching architecture with an earth station satellite information message protocol, SIMP.

- "Newsfront," *Data Communications*, pp. 16-26, 1977.
- "The history of the Internet 1976-1987," History of Computing project, updated Mar. 19, 2001.
  https://web.archive.org/web/20200103084830/https://www.thocp.net/reference/internet/internet2.htm
- "Internet history of 1970s," Computer History Museum, Mountain View, CA, c. 2021. http://www.computerhistory.org/internethistory/1970s/
  Archived from the original on Jan. 21, 2022.

- Ryan, J. "The essence of the 'Net: a history of the protocols that hold the network together," ArsTechnica, updated Mar. 8, 2011. https://arstechnica.com/tech-policy/2011/03/the-essence-of-the-net/2/ Archived from the original on Oct. 12, 2016.

1975, November

Need to handle junk mail recognized

In RFC 706, Jon Postel, SRI-ARC, made suggestions for handling junk mail.

- Postel, J. "On the Junk Mail Problem," SRI-ARC, Menlo Park, CA, RFC 706, Nov. 1975. https://www.rfc-editor.org/info/rfc706 Archived from the original on May 15, 2021.

1975, December 4-5

Moving towards standardization of message services continues

The fourth meeting of DARPA's Message Services Committee was held at USC-ISI on 4-5 December 1975. The committee formed several subcommittees for further work, including developing message header standards, exploring inter-entity communication issues, and developing a proposal for an intersite message protocol and server. MIT was asked to extract and package the specifications of its internal "messaging" protocols and formats and publish them for the community. Also discussed were message system user interface issues, primitive functions together with the preferred commands to invoke those functions, and a minimum set of functions that should be in all mail systems on the network.

- Ellis, T. "Summary of Dec. 4-5, 1975 Message Services Committee meeting," USC-ISI, Dec. 12, 1975. An email sent to the attendees of the Dec. 4-5 meeting summarizing the action item results.
- Ellis, T. "Message Functions," USC-ISI, Dec. 12, 1975. MSGGroup email no. 228, *MSGGroup Archives*, Dec. 16, 1975. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup0201-0300.txt Archived from the original on Oct. 1, 2020.
  An email sent to the attendees of the Dec. 4-5 meeting noting the list of primitive functions.

1975, December 18

Committee on Computer-Aided Human Communication formed

The Committee on Computer-Aided Human Communication (CAHCOM) was established by DARPA's Steve Walker, consisting of Dave Farber (University of Delaware, Chair), John Seely-Brown (BBN), John Vittal (USC-ISI) and Ken Pogran (MIT). Among other things, it was charged with the development of a standard for the format of ARPANET mail headers, which culminated in RFCs 724 and 733.

- Panko, R. "Electronic mail overview II." SRI, Menlo Park, CA, NIC 40270, 54 pp., May 11, 1977.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Pogran, K. T., Vittal, J. J., Crocker, D. H., and Henderson, A. "Proposed Official Standard for the Format of ARPA Network Messages." RFC 724, 38 pp., May 12, 1977. https://www.rfc-editor.org/info/rfc724
  Archived from the original on May 6, 2021.
- Crocker, D. H., Vittal, J. J., Pogran, K. T., and Henderson, D. A. "Standard for the Format of ARPA Network Text Messages," RFC 733, 38 pp., Nov. 21, 1977. https://www.rfc-editor.org/info/rfc733
  Archived from the original on Nov. 13, 2021.

1975, December

Rich email protocol revised

Based on feedback from the July 1975 proposal, a revised protocol was submitted to the Message Services Committee. At the request of the committee, general-purpose components of that system were broken out and presented separately in RFC713. Implementation work at ARPANET sites was focused on deploying a "simple" protocol, limited to the basic functionality of sending electronic mail, in order to get that service in place quickly.

- Haverty, J. (untitled). RFC 713, April, 1976. https://www.rfc-editor.org/info/rfc713.
  Archived from the original on Sept. 10, 2021.
- Dertouzos, M. L. Progress Report XIII, January - December 1975. Laboratory for Computer Science, MIT. https://apps.dtic.mil/dtic/tr/fulltext/u2/a061246.pdf
  Archived from the original on Feb. 2, 2022.

1975

Datapost competes with MAILGRAM

Datapost was added to the TDX system by Telecomputing Corporation of America's Chairman, William F. von Meister, to compete with MAILGRAM. Von Meister later sold TDX to Cable and Wireless North America in 1977. Datapost was an unregulated mail service that received messages electronically in its Chicago office, printed them on a MAILGRAM-like form and envelope, and sent them via USPS Express Mail for a fee of 75 cents.

- *Data Communications*, p. 16, Jul. 1979.

1975

Datacomputer repository, the Message Archiving & Retrieval Service, becomes available

The Computer Corporation of America (CCA), under contract to DARPA, developed the Datacomputer, providing a service starting in 1973. The Datacomputer was equipped with a massive (for the time) amount of storage dedicated to the database management needs of a network of computers that had comparatively limited storage capacity. In 1975, email could be archived by sending it to the Datacomputer Message Archiving and

Retrieval Service (MARS) repository. It was also possible to retrieve messages on the basis of words in the subject-field of the filed messages (*e.g.*, SUBJECT: FIPS), or on the basis of words in the message body (*e.g.*, TEXT: proposed standard).

- Marill, T. and Stern, D. "The datacomputer - A network data utility," pp. 389-95, IN: *Proc. of the Natl. Computer Conf.*, 1975. https://www.computer.org/csdl/proceedings-article/afips/1975/50830389/12OmNzYNNeX
- "Arpanet DBMS uses Decsystem-10, mass memory," *Computerworld*, Vol. 11, No. 19, May 9, 1977, p. 30. Available at https://www.google.com/search?tbm=bks&q=computerworld
- Sattley, J. "MARS - A Message Archiving & Retrieval Service," CCA, Cambridge, MA, RFC 744, Jan. 8, 1978. https://www.rfc-editor.org/info/rfc744 Archived from the original on May 6, 2021.
- Header-People archive mentions the facility several times. http://mercury.lcs.mit.edu/~jnc/tech/header/mins05.txt Archived from the original on Oct. 1, 2020.
- Abbate, J. *Inventing the Internet*. Cambridge, MA, MIT Press, 1999. ISBN 978-0262511155.

1975

MS is added to Unix

`MS`, an ARPANET email capability for the Unix operating system, was developed at the Rand Corporation to provide email on a par with that which was already available on TENEX, such as `MSG`. Dave Farber of the University of California at Irvine (UC Irvine) consulted on the project. Rand's Dave Crocker designed `MS`, and Steve Tepper and Bill Crosby did the programming. `MS` supported multiple user interfaces, from the basic Unix `mail` command to an `MSG` emulation.

- Crocker, D. "Framework and functions of the MS message system," Rand Corp., Santa Monica, CA, Rept. R-2134, Dec. 1977. https://www.rand.org/pubs/reports/R2134.html Archived from the original on Jan. 15, 2020.
- Crocker, D. "Email History," https://www.livinginternet.com/internet/e/ei.htm Archived from the original on Apr. 20, 2021.

1975

Hermes development starts

BBN began Project Hermes, sponsored by DARPA, and started development of the `Mailsys`/`Hermes` mail system to run under TENEX. It started as `MAILSYS` in 1974. `Hermes` was initially intended to be part of the MME. By 1979 `Hermes` was available as a commercial BBN email product. Early contributors included Ted Myer, Austin Henderson, Doug Dodds, Jerry Burchfiel, and Charlotte Mooers, and were later joined by John Vittal (in 1976), Debbie Deutsch, Ron Brachman, and Jim Miller.

- Henderson, D.A., and Myer, T.H. "Issues in message technology," pp. 6-1 to 6-9, IN: *Proc. of the Fifth Data Communications Symposium*, Sep. 27-29, 1977.

- "Mailsys documentation," BBN, Cambridge, MA, Feb. 12, 1976.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.

1976, March 26

Email across a network is first used by a head of state

A link between the British Royal Signals and Radar Establishment at Malvern, UK, and University College London (UCL), which was on the ARPANET, was established around January of 1976. It was arranged that Queen Elizabeth would inaugurate the link by logging into an account at USC-ISI in Los Angeles and sending a welcome email. This occurred on March 26, 1976.

- Kirstein, P. "The early days of the Arpanet," *IEEE Annals of the History of Computing*, vol. 31, issue 3, p. 67, Jul.-Sep. 2009. This is a sidebar in the article "Magnavox and Intel: An Odyssey," pp. 64-66. https://www.computer.org/csdl/magazine/an/2009/03/man2009030064/13rRUB7a1hF
- "Coral 66, text of message to be transmitted by Her Majesty the Queen," (copy of the email as received.) https://twitter.com/royalfamily/status/525572319339876352?lang=en Archived from the original on Feb. 2, 2022.
- Metz, C. "How the Queen of England Beat Everyone to the Internet," Wired, Dec. 25, 2012. https://www.wired.com/2012/12/queen-and-the-internet/ Archived from the original on Jan 21, 2022.

1976, early

CCA releases Telecommunication Data Access Message Service

CCA released the Telecommunication Data Access (TDA) Message Service for the exchange of messages among the users of their service. While the original aim was to be better than `SNDMSG/READMAIL`, it included facilities for filing and replying to individual messages, and used a single-character command mechanism similar to that of `MSG`.

- Marill, T. "TDA Message System," p. 143, IN: *Proc. of the Berkeley Workshop on Distributed Data Management and Computer Networks*, Tech. Info. Dept., Lawrence Berkeley Lab., Univ. of Calif., Berkeley, CA, LBL-5315, UC-32, TID-4500-R64, May 25-26, 1976.
- Campbell, E. J., Kannel, M., and Saffran, K. "Feasibility Study of Networks: Progress report for period July 15. 1976 – Dec. 14, 1976," Lab. for Nuclear Science, MIT, Cambridge, MA, pp. 6-14, Oct. 15, 1976.

https://www.osti.gov/biblio/7233486/.
Archived from the original on Feb. 2, 2022.

1976, May

European Information Network comes online

The European Information Network (EIN), a packet-switched research network, enabling letters and telegrams to be sent among its signatories, went online. EIN provided service between Germany, France, Italy, Norway, Netherlands, Portugal, Yugoslavia, Sweden, Switzerland, UK, and the European Atomic Energy Community and was jointly funded by these countries and organizations.

- "European Information Network (EIN) centres: A brief report," Rept. EIN/76/001, 20 pp, 1976. See Also https://en.wikipedia.org/wiki/Packet_switching - EIN
  Archived from the original on Jan. 27, 2022.

1976, June

Public-key cryptography proposed

Whitfield Diffie and Martin Hellman of Stanford University proposed public key cryptography to provide security on a multiuser computer communication system.

- Diffie, W. and Hellman, M. E. "Multiuser cryptographic techniques," vol. 45, pp 109-112, IN: AFIPS *Natl. Computer Conf. Proc.*, Jun. 7-10, 1976.

1976, August

Specification syntax proposed for network mail addresses

In RFC 720, Dave Crocker proposed an address specification syntax for network mail.

- Crocker, D. "Address Specification Syntax for Network Mail," USC-ISI, Marina del Rey, CA, RFC 720, Aug. 1976. https://www.rfc-editor.org/info/rfc720
  Archived from the original on May 9, 2021.

1976, Fall

Email first used during a U.S. presidential campaign

The Jimmy Carter and Walter Mondale presidential campaign used the commercial STSC MAILBOX service to coordinate their campaign schedules. MAILBOX ran on a single Amdahl 470 system with dial-up and/or hardwired access intended for within-company access.

- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, vol. 10, no. 9, pp. 34-42, Sep. 1978.
- *Computer Decisions*, Jan. 1977.
- Panko, R. "CB Computer Mail?" IN: *Proc. First West Coast Computer Faire*, San Francisco, CA, Apr. 15-17, 1977, pp 139-141.
  https://usermanual.wiki/Document/ProceedingsoftheFirstWestCoastComputerFaire1977.4207648070/help. Archived from the original on Mar. 1, 2021.

1976, September

Teleconferencing improvements explored

A teleconference on teleconferencing was held by USC-ISI to develop a taxonomy of computer conferencing as well as ideas for improving teleconferencing communications. Students and researchers attending it used `NCONFER`, a modified version of `Forum5`.

- Bretz, R., *et al*. "A Teleconference on Teleconferencing," USC-ISI, Marina del Rey, CA, Working Paper ISI/WP-4, Sep. 1976. http://www.computerhistory.org/collections/catalog/102775099. Archived from the original on Jan. 16, 2021.

1976, November

Effectiveness of email outlined for the US Army

James Carlisle of Network Management Associates presented findings on the effectiveness of the use of electronic mail to the U.S. Army's Directorate of Management Information Systems (DARCOM-DMIS). His work, along with that of Einar Stefferud and Ronald Uhlig, was instrumental in the adoption of electronic mail by the U.S. Army. Carlisle evaluated users of `SNDMSG`, `MSG`, `HERMES` and NLS mail programs.

- Carlisle, J. H. *Benefits and problems in the use of computer message systems by management: Summary of results from an in-depth study of management information systems,* U.S. Army Development and Readiness Command, Network Management Associates, Inc., Los Angeles, CA, 38 pp., Nov. 1976.

1976, November

"Header-People" discussion list formed

Ken Harrenstien of MIT started the Header-People mailing list. The group was unofficial and un-moderated (meaning it had no MSGGroup-like human filter). Harrenstien recruited at least one representative from every kind of system on the ARPANET. The Header-People list discussion was contentious (and voluminous) but mainly worthwhile for the participants.

- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Header-People mailing list. http://mercury.lcs.mit.edu/~jnc/tech/header/ Archived from the original on May 1, 2021.

1976, November 8

First attachments for ARPANET email added

Jack Haverty, who was in the Dynamic Modeling Group (DMG) at MIT, announced the addition of "Enclosures" to COMSYS/MSGDMS to the Header-People mailing list. (Other contributors were Dave Lebling and Mike Broos.) This facility had been inherent in the DMG's mail system since approximately 1973. "Enclosures" enabled large or non-

textual content to be included in a message outside of the message body itself. It is notable that this was the first example of email attachments. The main text message would be delivered by COMSYS, and the recipient would retrieve the enclosure later. However, messages sent to users outside of the COMSYS world sent the enclosure as part of the message body.

- "The design of a message system for CINCPAC," Programming Technol. Div., MIT-LCS, Cambridge, MA, Internal Design Document, May 24, 1976.
- Vezza, A. and Broos, M. "An electronic message system: Where does it fit?," pp. 89-97, IN: *Proc. of the IEEE Symposium on Trends and Applications 1976: Computer Networks*, Nov. 17, 1976.
- Haverty, J. "Huge Messages," Header-People archive, Nov. 8, 1976. http://mercury.lcs.mit.edu/~jnc/tech/header/mins02.txt Archived from the original on Aug. 9, 2016.
- Vezza, A. and Haverty, J. "Preliminary design of Technical Communique Facility," MIT, Cambridge, MA, undated, but it updates "Preliminary design of network mail facility," May 15, 1973.

1976, November 12

Email and bulletin boards linked

Richard Kahler at SUMEX-AIM modified `MSG` to assist in transferring messages to `BBD` bulletin boards.

- Kahler, R. "MSG – version of 11/12/76," Nov. 12, 1976. IN: Untitled document containing email from Artificial Intelligence Lab., Stanford Univ., Stanford, CA, 1976. Previously available at: https://stacks.stanford.edu/file/druid:sg278vc2246/sg278vc2246.pdf
- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.

1976, November 13

First stand-alone commercial email system offered

CCA offers the COMET mail system for $40,000. It ran on a PDP-11 over Telenet and Tymnet.

- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.

1976

Mail Manager (MM) developed

The original version of Mail Manager (`MM`), also known colloquially as Mail Munger, was written by Michael McMahon at SRI to run under Tenex. Stuart Cracraft and Mark Crispin also participated in the early development of `MM`. `MM` had a similar user interface

to MSG, but was speedier than other mail systems. The user interface was later changed to be more like the Tenex and Tops-20 command interface, and then further developed to run on other systems. In addition to email, MM could also read bulletin boards.

- "About MM," IN: *Columbia MM Manual,* Columbia Univ., New York, NY. http://www.kermitproject.org/mm/mmmanual/8.about.mm.html Archived from the original on Oct. 27, 2020.
- da Cruz, F. "History," IN: *Using the MM email client in the Modern World*, The Kermit Project, New York, NY, Updated Feb. 19, 2016. http://www.kermitproject.org/mm/#history Archived from the original on Nov. 24, 2021.

1977, Early

Army use of email expands

DARCOM expanded its use of email to over 200 individuals in several time zones using both SRI and BBN email services across the ARPANET. The experiment changed the way the DARCOM communicated among its many sites.

- Uhlig, R. P. "Human factors in computer message systems," *Datamation*, pp. 120-26, May 1977.

1977, March

Sigma chosen for the MME

After an evaluation of the three candidate systems by representatives from the US Navy, DARPA, MITRE Corp, CTEC, Inc., and CINCPAC staff, ISI's Sigma was chosen as the winning system for the experiment.

- Wilson, S. H., et al. "Military Message Experiment, Volume I. Executive Summary." 1982. Also available via the Naval Res. Lab., Washington, DC, Final rept., NRL-MR-4454-v1, Mar. 24, 1982. (AD-A112789) https://apps.dtic.mil/sti/citations/ADA112789 Archived from the original on Feb. 2, 2022.

1977, April

Shared information services proposed for PC users

A time-shared service of "bulletin boards, yellow pages, and mailboxes" (addresses) for Personal Computer (PC) users was proposed by Mike Wilbur of the SRI Artificial Intelligence Laboratory (SRI-AI).

- Wilbur, M. "A Network of Community Information Exchanges Issues and Problems," IN: *Proc. First West Coast Computer Faire*, San Francisco, CA, Apr. 15-17, 1977, pp. 149-155. https://usermanual.wiki/Document/ProceedingsoftheFirstWestCoastComputerFaire1977.4207648070/help. Archived from the original on Mar. 1, 2021.

1977, April

Hobbyist email network created

At the First Computer Faire, in San Francisco, Dave Caulkins presented a design for a hobbyist computer network to deliver email from one personal computer to another.

- Caulkins, D. "Design Considerations for A Hobbyist Computer Network," IN: *Proc. First West Coast Computer Faire*, San Francisco, CA, Apr. 15-17, 1977, pp. 144-148. https://usermanual.wiki/Document/ProceedingsoftheFirstWestCoastComputerFaire1977.4207648070/help. Archived from the original on Mar. 1, 2021.

1977, April

SITA network used extensively by airlines

As of April 1977, Société Internationale de Télécommunications Aéronautiques (SITA), the private-line network for airlines, had handled a quarter billion messages of data, orders, invoices, and person-to-person correspondence. At the time, these were essentially Telex messages.

- SITA History. IN: About SITA. https://web.archive.org/web/20120819091302/http://www.sita.aero/about-sita/what-we-do/sita-history
- Panko, R. "Electronic mail overview II," SRI, Menlo Park, CA, NIC 40270, 54 pp, May 11, 1977.

1977, May and November

ARPANET email message format standards developed

A "Standard for the format of ARPA network text messages" was published as RFC 733 (21 Nov. 77). Dave Crocker (RAND), John Vittal (BBN), Ken Pogran (MIT), and Austin Henderson (BBN), proposed mail header standard revisions to RFCs 561 and 680 in RFC 724 (12 May 77). This was followed by publication of RFC 733 by the same authors, which was self-described as THE "Standard for the Format of ARPA Network Text Messages." In an unusual move for the ARPANET community, the authors had the temerity to declare it an "official standard" (with the blessing of DARPA). It stuck, and indeed became the first official standard for the ARPANET/Internet. It is important to note that compatibility with existing usage was one of the highest priorities of the authors. Changing the format completely, for example to something akin to eXtensible Markup Language (XML), was not seriously considered, though it was discussed. In 1982, RFC 822 changed relatively minor aspects of 733 to adapt the standard for Internet (*vs.* ARPANET) standards and usage as described by Craig Partridge.

- Pogran, K. T., Vittal, J. J., Crocker, D. H., and Henderson, A. "Proposed Official Standard for the Format of ARPA Network Messages." RFC 724, 38 pp., May 12, 1977. https://www.rfc-editor.org/info/rfc724 Archived from the original on May 6, 2021.
- Crocker, D. H., Vittal, J. J., Pogran, K. T., and Henderson, D. A. "Standard for the Format of ARPA Network Text Messages," RFC 733, 38 pp., Nov. 21, 1977. https://www.rfc-editor.org/info/rfc733 Archived from the original on Nov. 13, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1977, June

Hermes modified to run on a commercial operating system

BBN modified its `Hermes` mail system to run on both the Tops-20 operating system as well as TENEX. `Hermes` functionality remained the same, but was modified to run on DEC's new Tops-20 OS platform, which was basically a commercial version of BBN's TENEX.

- "Hermes message system. Introduction," BBN, Cambridge, MA, May 1976.
- Henderson, D.A., and Myer, T.H. "Issues in message technology," pp. 6-1 to 6-9, IN: *Proc. of the Fifth Data Communications Symposium*, Sept. 27-29, 1977.

1977, July

Commercial time-shared store-and-forward email becomes available

Tymnet, Inc. (a subsidiary of Tymshare) introduces OnTyme to Tymnet users. OnTyme is a commercial store-and-forward mail system, which is both an email program and an advanced form of message switching.

- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, no. 9, vol. 10, pp 34-42, Sep. 1978.
- Field, R. B. "Advanced message system," *Telecommunications*, vol. 11, no. 10, 55+, Oct. 1977.

1977, July

Internetworking via satellite demonstrated

The international internetworking demonstration, led by SRI in the San Francisco Bay Area, and directed by Vint Cerf and Bob Kahn, linked SATNET with the ARPANET and the Packet Radio network.

- "The history of the Internet 1976-1987," History of Computing project, updated Mar. 19, 2001. https://web.archive.org/web/20200103084830/https://www.thocp.net/reference/internet/internet2.htm
- "Internet history of 1970s," Computer History Museum, Mountain View, CA, c. 2021. http://www.computerhistory.org/internethistory/1970s/ Archived from the original on Jan. 21, 2022.

1977, Fall

Active message processing

John Vittal at BBN developed a system for "active message processing," allowing programs to be sent and executed remotely via email. This enabled a user to send a program across the ARPANET via email and execute that program on the recipient's system. It also included sending messages (perhaps a reply) onward from the recipient's system, perhaps without the recipient even knowing about it. This active message processing is a subset of what ultimately became known as "Enabled Mail."

- Vittal, J. "Active message processing: Messages as messengers," IN: Uhlig, R. P., ed., *Computer Message Systems*, North Holland Publishing Co., New York, NY, 1981. ISBN 0-444-85253-6.

- Rose, M. and Borenstein, N. "A Model for Enabled Mail (EM)," working draft, May 6, 1993. http://ftp.funet.fi/pub/unix/mail/metamail/st/em-model.txt Archived from the original on Feb. 17, 2007.
- Borenstein, N. "Email With A Mind of Its Own: The Safe-Tcl Language for Enabled Mail," IFIP WG 6.5 Conference, Barcelona, May, 1994, North Holland, Amsterdam, 1994. http://guppylake.com/~nsb/pubs/safe-tcl.pdf Archived from the original on Dec. 15, 2020.
- See also the entries below for KnowBots created (March, 1988), General Magic develops Telescript (1990), and OMG (Exchanging messages via remote procedure calls) (Nov, 1991).

1977, October

DEC develops email for internal use

Digital Equipment Corporation (DEC) began several efforts to develop internal email systems. One was for the corporation as a whole; the other, called EMS, was for the Computer Information Systems (CIS) department and its LDP (Laboratory Data Products) product line. The CIS system was ahead of the corporate effort, and integrated a number of features, including "Calendar Keeper" and "Memo Handler." By March 1978 the system had grown to include "Document Handler" and "Graphics Handler," covering much of what is included in modern, enhanced message-based service today. Notably, it had a very early version of attachments as discrete sub-components of a message. It was intended to mimic the paper-based inter-office memo system in place at the time, and even differentiated between internal and external communications. In January 1978 DEC proposed an interface to enable sending international TWX messages, and by August 1978 they had implemented an interface to their customer database (for sales orders). However, "`Reply`" appears not to have been included until October 1978. By November 1978, DEC was under pressure from customers to offer EMS as a product. It ultimately became the seed for the DECMAIL product.

- Digital Equipment Corp. "1970s DEC email correspondence about the DEC email system, 1977-1981," catalog no. 102776088, Computer History Museum, Mountain View, CA. http://www.computerhistory.org/collections/catalog/102776088 Archived from the original on Feb. 2, 2022.

1977, December

First email-centric publication appears

EMMS (known, at various times, as EMMS, Electronic Mail and Message Systems, Electronic Mail and Micro Systems, Electronic Mail and Messaging Systems) began publishing. It was a twice-monthly newsletter covering technology, user, product, and legislative trends in graphic, record, and microcomputer communications.

- "EMMS; Electronic Mail and Message Systems; Electronic Mail and Micro Systems; Electronic Mail and Messaging Systems," Computer History Museum, Mountain View, CA, catalog no. 102661013 http://www.computerhistory.org/collections/catalog/102661013 Archived from the original on Apr. 11, 2021.

1977, December 30

WHOIS starts

Ken Harrenstein (now at SRI-NIC) publishes RFC 742 on the Name/Finger protocol. It provided a "…status report on either the system at the moment or a particular person…" This marks the start of the WHOIS (name service) protocol, published in 1982.

- Bruen, Garth O. "1970s: OK, now that we have an Internet, how do we keep track of everyone?" Section 1.5, pp. 27-36, IN: *WHOIS Running the Internet: Protocol, Policy, and Privacy*, Hoboken, NJ, John Wiley & Sons, Oct.5, 2015. ISBN 978-1-118-67955-5.
- Harrenstein, K. "Name/Finger," SRI-NIC, RFC 742, 7 pp, Dec. 30, 1977. https://www.rfc-editor.org/info/rfc742 Archived from the original on Oct. 26, 2021.
- Harrenstein, K. and White, V. "Nickname/Whois," SRI-NIC, RFC 812, Mar. 1, 1982. https://www.rfc-editor.org/info/rfc812 Archived from the original on Oct. 27, 2021.

1977

MAILBOX becomes a resale common carrier

In 1977 the FCC approved the MAILBOX message processing system as a resale Common Carrier.

- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, vol. 10, no. 9, pp 34-42, Sep. 1978.
- *Computer Decisions*, vol. 9, no. 1, Jan. 1977.

1977

USPS initiates E-COM email system

The Postal Service, recognizing the threat of email to First Class mail, initiated a service called Electronic Computer-Originated Mail (E-COM). Again, email was transmitted to a post office where it was printed and mailed to the recipient. The Postal Regulatory Commission (PRC) and the Federal Communications Commission (FCC) had overlapping notions of jurisdiction. PRC is like the FCC in that it oversees mail-related issues whereas the FCC oversees the carriers and related telecommunication issues. Both the PRC and FCC opposed E-COM.

- *Implications of Electronic Mail and Message Systems for the U.S. Postal Service,* No. PB83-265017 (NTIS), Aug. 1982. https://govinfo.library.unt.edu/ota/Ota_4/DATA/1982/8214.PDF Archived from the original on July 14, 2019.
- Ellis, D. *Internet (Online book)*. Sept. 3, 2012. https://web.archive.org/web/20130129200916/http:/www.davidellis.ca/wp-content/uploads/2012/11/Internet-book.pdf
- Kahn, R. Private communication, Sep. 10, 2018.

V. Email Goes Commercial (1978-1979)

By the end of 1977, the utility of, and need for, email had been firmly established. Usage appeared to be growing exponentially. With that explosion, commercialization was inevitable.

1977-1978

Unix MS program rebuilt

The UNIX `MS` program was rebuilt by Bruce Borden at RAND to take better advantage of the Unix system environment, breaking the commands out into individual programs that run in individual Unix shells. `MS` aggregated messages into folders comprising a clear-text file, with a parallel index file. It implemented a functional module that supported multiple user interfaces, including emulation of John Vittal's `MSG` on TENEX, as well as the email command that came with Unix. Unfortunately, `MS'` folder index file implementation was far too general and the system was painfully slow. This prompted the follow-on work to develop `MH` in 1979.

- Crocker, D. "Impact of email work at The Rand Corporation in the mid-1970s." Brandenburg InternetWorking, Sunnyvale, CA, Aug. 28, 2008. Revised Mar. 9, 2014.
  https://bbiw.net/articles/rand-email-2014.pdf
  Archived from the original on Dec. 21, 2016.
- Crocker, D. "Email History," https://www.livinginternet.com/internet/e/ei.htm
  Archived from the original on Apr. 20, 2021.
- Payne, S. "MH: Electronic Mail on Text Processors 1, 2, and 3," Rand Corp., Santa Monica, CA, 1985. https://www.rand.org/pubs/notes/N2247.html.
  Archived from the original on Nov. 26, 2020. Also available in print form.
- Borden, B., Gaines, R.S. and Shapiro, N. "The MH Message Handling System: User's Manual," Rand Corp., Santa Monica, CA, Rept. R-2367-AF, Nov. 1979.
  http://www.rand.org/pubs/reports/R2367.html
  Archived from the original on May 12, 2011.
- Anderson, R. H., Shapiro, N., Bikson, T. K. and Kantar, P. "The Design of the MH Mail System," Rand Corp., Santa Monica. CA, 1989.
  http://www.rand.org/pubs/notes/N3017.html
  Archived from the original on Oct. 20, 2021.
- Peek, J. "History of MH." IN: J. Peek, *MH and nmh: Email for Users and Programmers*. May, 2006.
  https://rand-mh.sourceforge.io/book/overall/hiofmh.html
  Archived from the original on Feb. 2, 2022.

1978, January - February

Public community bulletin board established

The Computerized Hobbyist Bulletin Board System (CBBS) was developed by Ward Christiansen and Randy Suess. CBBS used a single phone number and computer

equipment through which all messages passed. Users with modems dialed in to retrieve messages. It officially went online on Feb. 16, 1978.

- Christiansen, W. and Suess, R. "Hobbyist computerized bulletin board," *Byte Magazine*, pp. 150-156, Nov. 1978. https://archive.org/details/byte-magazine-1978-11 Archived from the original on Oct. 14, 2021.
- Metz, C. "Randy Suess, Computer Bulletin Board Inventor, Dies at 74," New York Times, Dec. 20, 2019. https://www.nytimes.com/2019/12/20/technology/randy-suess-dead.html Archived from the original on Dec. 25, 2021.

1978, Early

First controllable worm appears

A computer worm was developed by John Shoch and Jon Hupp at Xerox PARC that searched out other computers, copied itself, then self-destructed after a programmed interval. A Worm program could reach out and alert a human (*e.g.*, via telephone or email).

- Shoch, J. and Hupp, J. "The 'Worm' programs–Early Experience with a Distributed Computation," *Communication of the ACM*, vol. 25, no. 3, pp. 172–180, Mar. 1982. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.137.9511&rep=rep1&type=pdf. Archived from the original on Feb. 2, 2022.
- "John Shoch," Wikipedia, edited Feb. 7, 2021. https://en.wikipedia.org/wiki/John_Shoch Archived from the original on Jan. 26, 2022.

1978, Early

DEC licenses CCA's COMET for internal use

DEC purchased a license for CCA's COMET mail system to use as its own corporate internal electronic mail system.

- Leavitt, D. "Two Software Houses Back Use of Electronic Messaging," *Computerworld*, vol. 12, no. 11, pp 1 and 8, Mar. 13, 1978.
- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, vol. 10, no. 9, pp 34-42, Sep. 1978.

1978, Early

COM conferencing in Sweden becomes operational

Led by Jacob Palme and Torgny Tholerus, the COM (also named KOM) system was developed in Sweden, starting in 1976, with the first version operating in 1977, and became operational in early 1978. It was a text-based BBS, and the service became known as QZKOM. It was the first social network in Sweden. Enhancements became available in follow-on versions, *e.g.*, Porta-COM and SuperCom.

- Palme, J. "History of the KOM Computer Conferencing System," originally May, 1990, latest revision Feb. 7, 2015.

https://people.dsv.su.se/~jpalme/s1/history-of-KOM.html
Archived from the original on Jan. 20, 2022.

- Rittsel, P. "The anarchist tied the researchers together," IDG.se, Sep. 18, 2010. https://www.idg.se/2.10186/1.29485/anarkisten-knot-ihop-forskarna Archived from the original on Mar. 25, 2020.
- "1978 Torgny Tholerus - the anarchist who created the 70's Facebook," Internetstiftelsen, Stockholm, SE. https://www.internetmuseum.se/tidslinjen/torgny-tholerus/ Archived from the original on Nov. 16, 2021.
- Quaterman, J. S. *The Matrix: Computer Networks and Conferencing Systems Worldwide*, Digital Press, 1990. ISBN 1-55558-033-5.
- Lotsson, A. "Pioneer who guessed wrong," ComputerSweden, Mar. 30, 2009. https://computersweden.idg.se/2.2683/1.221192/pionjar-som-gissade-fel Archived from the original on Oct. 3, 2017.

1978, Early

Large companies now using email for internal communications

Citibank, Bank of America, Cook Industries, and other large companies began using word processors with electronic mail capabilities for internal corporate communications.

- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, vol. 10, no. 9, pp 34-42, Sep. 1978.

1978, February

Office systems include email capabilities

Dave Farber and Steve Caine at Rand designed a CRT-based personal modular office system (MOS) with a mouse pointing device using commercial off-the-shelf hardware and estimated to cost $7,000. MOS included a messaging system.

- Farber, D. "Design for a modular office system - an introduction," Email from D. Farber to J. Gilbert and R. Uhlig, Aug. 19, 1977.

1978, March 9

CCA's COMET service goes live

CCA offered COMET to its users as a commercial electronic mail service. COMET ran on a DEC PDP-11 computer and could be accessed by any CRT or hardcopy ASCII terminal. It was announced as a minicomputer-based electronic mail system for intra-company use.

- "CCA Press release," CCA, Cambridge, MA, Mar. 9, 1978.

1978, May 3

First commercial junk (spam) email appears on the ARPANET

Gary Thuerk at DEC sent the first commercial network spam (mass e-mailing) message on the ARPANET. The message trumpeted two open houses to show off new models of the DECSYSTEM-20 computer. In 2007, Thuerk admitted that he "was pushing the envelope" and "thought of it as e-marketing."

- Templeton, B. "Reaction to the DEC Spam of 1978," Brad Templeton's Home Page, n.d. https://www.templetons.com/brad/spamreact.html
  Archived from the original on Dec. 20, 2021.
- Templeton, B. "Reflections on the 25th Anniversary of Spam," Brad Templeton's Home Page, n.d.
  http://www.templetons.com/brad/spam/spam25.html
  Archived from the original on Nov. 23, 2021.
- Smith, G. "Unsung innovators: Gary Thuerk, the father of spam." *Computerworld*, Dec. 3, 2007.
  https://www.computerworld.com/article/2539767/unsung-innovators--gary-thuerk--the-father-of-spam.html
  Archived from the original on Aug. 3, 2021.
- Smith, E. "The Chinese Robocall Blues," Tedium, May 15, 2018.
  https://tedium.co/2018/05/15/spam-robocalls-history-comparison/
  Archived from the original on Sept. 29, 2021.

1978, May

Store-and-forward faxes introduced

Ricoh introduced Rapicom 650, a facsimile message switching system enabling true store and forward facsimile switching that communicated in bisync, High-level Data Link Control (HDLC), or Synchronous Data Link Control (SDLC) protocols.

- Anderson, H. "What is electronic mail - and where does it fit into the office?" *Telecommunications*, vol. 12, no. 11, pp. 31-54, Nov. 1978.

1978, July

AT&T gets into packet switching

AT&T petitioned the FCC for authorization to offer its Advanced Communication System (ACS) packet-switched data communication service to be provided over both digital and analog transmission facilities.

- *Communications News*, vol. 15, no. 12, p. 79, Dec. 1978.

1978, August 14

ASCII replacement of Baudot for systems for the deaf proposed

Senator Charles Percy recommended that Baudot (international teleprinter code) be replaced by ASCII for a government-sponsored telecommunications system for the deaf.

- "Contemplated legislation to provide telecommunications for the deaf," Comptroller General of the U.S., Rept. LCD 78-118, 70 pp., Aug. 14, 1978.
  https://www.gao.gov/products/lcd-78-118
  Archived from the original on Jan. 21, 2021.

1978, August 18

Dial-up phone lines used to distribute email among Unix systems

The UUCP network (named for the Unix-to-Unix CoPy program) came into being. It used dial-up telephone links to enable the distribution of files, and soon to follow, email.

- Nowitz, D. and Lesk, M. "A Dial-Up Network of UNIX Systems," IN: *Unix Seventh Ed. Manual, Vol. 2*, Bell Labs., Murray Hills, NJ., Aug. 18, 1978. https://wolfram.schneider.org/bsd/7thEdManVol2/ Archived from the original on Oct. 28, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1978, September

International email standards effort proposed

The proposed International Federation for Information Processing (IFIP) Technical Committee (TC) 6.5 on International Computer Messaging Services held its first meeting in Kyoto, Japan, with Ron Uhlig chairing.

- "Meeting minutes of new proposed IFIP TC 6.5," Rept. IFIP WG 6.5 N1, 4pp, Kyoto, JP., Sep. 28, 1978.

1978, October 2

National Software Works includes email

Bob Thomas presented ideas for providing ARPANET-compatible mail service within the National Software Works (NSW) project funded by DARPA. NSW was a project to link a set of geographically distributed and diverse hosts with an operating system that appears as a single entity to a user.

- Thomas, R. "Providing Mail Services for NSW Users," NSW Working Note 24, Natl. Software Works Project, DARPA, Washington, DC, Oct. 2, 1978.
- Millstein, R. "The National Software Works: A distributed processing system," pp. 44-52, IN: *ACM '77 Proc. of the 1977 Annual Conf.*, Seattle, WA, Oct. 16-19, 1977.

1978, October

MH Unix message system debuts

While many email systems, such as `MSG`, implemented their various commands within a single application, Rand's `MH` differed in that it implemented each email command as a separate program, accessed in the usual way through the Unix shell, or command line. `MH` stored each message as a separate file under UNIX and utilized the tree-structured UNIX file system to organize groups of messages into folders. It ran on DEC PDP-11s and VAXes.

- Borden, B., Gaines, R.S. and Shapiro, N. "The MH Message Handling System: User's Manual," Rand Corp., Santa Monica, CA, Rept. R-2367-AF, Nov. 1979. http://www.rand.org/pubs/reports/R2367.html Archived from the original on May 12, 2011.

1978, November

Satellite-based email starts

USPS contracted with COMSAT for a one-year field test of high- and low-speed facsimile and optical character recognition (OCR) overseas transmission among 101 countries in Europe, Asia, and South America. The system transmitted from an earth station in Etam, WV to the Intelsat IV-A satellite.

- Anderson, H. "What is electronic mail - and where does it fit into the office?" *Telecommunications.*, vol. 12, no. 11, pp. 31-54, Nov. 1978.

1978, November

Who controls the FAX machine market?

It was reported that Xerox controlled more than 50% of the FAX machine market, with Rapicom, Panafax, 3M, Graphics Sciences, Qwip, etc. offering competition.

- Anderson, H. "What is electronic mail - and where does it fit into the office?" *Telecommunications.*, vol. 12, no. 11, pp. 31-54, Nov. 1978.

1978, Fall

Email flows between the ARPANET and other networks

Dave Crocker, now at the University of Delaware (UDel), developed MMDF, a Unix-based, channel-independent Multi-purpose Memo Distribution Facility. MMDF ran on a DEC PDP 11/70 that relayed email between ARPANET sites and sites accessible over dial-up telephone lines. Ed Szurkowski, also at UDel, developed the adaptive, link-level protocol for use over dial-up lines. Steve Kille, of the Department of Computer Science at UCL, enhanced MMDF to support some U.K. conventions, and later adapted the software to support the ISO/CCITT OSI X.400 email standard, naming the software PP. MMDF was later re-coded at the University of Pennsylvania to became Pascal MDF (PMDF), and was commercialized through Innosoft, a company founded by Ned Freed, and colleagues.

- Kille, S. E. *Implementing X. 400 and X. 500: The PP and QUIPU Systems*, Artech House, Boston MA, 1991. ISBN 0890065640. https://www.computerhistory.org/collections/catalog/102676803
- Kille, S. and Onions, J. *The PP Manual*, UCL, London, UK, December, 1991.
- Crocker, D. and Szurkowski, E. S. "Components of a channel-independent memo transmission system," IFIP W.G. 6.5, 10 pp, Feb. 10, 1978.
- Crocker, D., Szurkowski, E. and Farber, D. "An internetwork memo distribution capability," IN: *Sixth Data Comm. Symposium*, Nov. 27-29, 1979, pp. 18-25, Asilomar, Pacific Grove, CA, 1979.
- Crocker, D. "Email History," https://www.livinginternet.com/internet/e/ei.htm Archived from the original on Apr. 20, 2021.
- Kille, S. "The interconnection of multiple internetwork mail systems using different addressing strategies," UCL, London, UK, Apr. 1982. Also IN: *Proc. Symposium Computer Based Message Systems*, 1982.
- "MMDF Frequently Asked Questions List (FAQ)," Irvine Compiler Corporation - Irvine, CA, Nov. 5, 1998.

https://cdn.preterhuman.net/texts/other/random_usenet_faqs/mail/mmdf-faq/part1
Archived from the original on Nov. 10, 2016.

1978

Faxing can make money

A FAXgram (faxed telegram) cost $2.23 plus a monthly service charge of $1.00

- Barns, B. "Electronic messaging can make cents," *Computer Decisions*, no. 9, vol. 10, pp. 34-42, Sep. 1978.

1978

A program called "EMAIL" is developed and copyrighted

Shiva Ayyadurai wrote a computer program called `EMAIL` while he was a volunteer at the University of Medicine and Dentistry of New Jersey. It emulated a paper-based interoffice mail system then in use at the medical school. While most, if not all, of the features of his system were available in one form or another in other systems at the time, this was the first system called "EMAIL" and thus may be the first usage of the term. However, Ayyadurai's use of the term differs somewhat from today's common colloquial use of the term "email" as a short form of "electronic mail" (see Tom Haigh's article for an explanation of how they differ). Ayyadurai copyrighted his "EMAIL" program in 1982.

- "Email Credit." https://www.livinginternet.com/internet/e/ei_inv.htm
  Archived from the original on Apr. 16, 2021.
- Nanos, Janelle. "Return to Sender," *Boston*, May 30, 2012.
  https://www.bostonmagazine.com/2012/05/30/shiva-ayyaduri-email-us-postal-service/
  Archived from the original on Jan. 6, 2022.
- Haigh, T. "Did V.A. Shiva Ayyadurai Invent Email?" SIGCIS, Aug. 4, 2015.
  https://www.sigcis.org/Ayyadurai. Archived from the original on Jan. 13, 2022.
- Masnick, M. "Laying Out All The Evidence: Shiva Ayyadurai Did Not Invent Email." *techdirt*, May 22, 2019.
  https://www.techdirt.com/articles/20190518/23370542236/laying-out-all-evidence-shiva-ayyadurai-did-not-invent-email.shtml
  Archived from the original on Jan. 27, 2022.
- See "email" IN: *Oxford English Dictionary*.

1978-1979

First user authentication and graphical user interface for email developed

Xerox PARC began work on Laurel, an email system on the Xerox Alto workstation. The system used Grapevine, another Xerox PARC development, for distribution and user authentication. This authentication capability was folded into the Grapevine distributed computing effort (whose primary test application was the Grapevine mail service). Thus, when using Grapevine, one might receive an email marked from `"name@parc [not authenticated]"` or from `"name@parc [authenticated by SomeAuthority]"`. The recipient could decide how to filter incoming messages, based on the authentication. The design also included solutions to issues such as how to

get your email when your specific email server is down. It was built on a fully distributed computing system with multiple servers, and its interface pioneered the multi-pane graphical user interface that is popular today. This was the first distributed/replicated email system and the first to run on small "PC-like" servers with "PC-like" user machines.

- Levin, R. and Schroeder, M. D. "Transport of Electronic Messages Through a Network," Xerox PARC, Palo Alto, CA, Rept. CSL-79-4, Apr. 1979. https://www.eserviceinfo.com/downloadsm/78660/xerox_CSL-79-4 Transport of Electronic Messages Through a Network.html
  Archived from the original on Feb. 2, 2022.
- For an image of the screen interface, see http://xeroxalto.computerhistory.org/image/1980_02C-2400dpi-019.jpg
  Archived from the original on Oct. 26, 2021.
- Birrell, A., *et al*., "Grapevine: An exercise in distributed computing," IN: *Proc. of the Eighth ACM Symposium on Operating Systems Principles (SOSP)*, Pacific Grove, CA, Dec. 1981.
- Lampson, B. "Personal Distributed Computing: The Alto and Ethernet Software," IN: *Proc. of the ACM Conf. on The History of Personal Workstations*, 1986. https://www.academia.edu/41012987/Personal_distributed_computing_the_Alto_and_Ethernet_software?email_work_card=title
  Archived from the original on Feb. 2, 2022.
- Needham, R. and Schroeder, M. "Using encryption for authentication in large networks of computers," *Communications of the ACM*, vol 21, no. 12, pp. 993-99, Dec. 1978.
- Brotz, D. "Laurel Manual," Xerox PARC, Palo Alto, CA, Rept. CSL-81-6, May 1981. Also available in the *Alto User's Handbook*, Sept. 1979. http://xeroxalto.computerhistory.org/Indigo/DMS/Laurel/6/Manual/.Laurel6.press!1.pdf (archived from the original on Aug. 13, 2019) and http://bitsavers.informatik.uni-stuttgart.de/pdf/xerox/alto/Alto_Users_Handbook_Sep79.pdf (archived from the original on Nov. 27, 2021).
- A Xerox commercial showing Laurel that first aired on May 14, 1979. https://www.youtube.com/watch?v=M0zgj2p7Ww4
  Archived from the original on Jan. 26, 2022.
- Johnson, J, *et al*. "The Xerox Star: A retrospective," *Computer*, vol. 22, no. 9, p. 11-29, Sep.1989. (DOI:10.1109/2.35211) https://ieeexplore.ieee.org/document/35211.
  Archived from the original on Dec. 19, 2021.

1979, January 10

Need for email beyond text identified

An ARPANET Message Services meeting held at BBN considered problems and issues with network mail, including new "things" like multimedia, fax, and internetworking. It was attended by many ARPANET site representatives and ARPANET NWG members. A list of existing ARPANET email systems was also compiled at the meeting.

- "Message services meeting minutes," BBN, Cambridge, MA, Jan. 10, 1979.
- Farber, D. J. "First preliminary list of Arpanet mail systems," Message Service meeting, BBN, Cambridge, MA, Jan. 10, 1979.
- Postel, J. "Summary of computer mail services meeting held at BBN on 10 January 1979," USC-ISI, Marina del Rey, CA, RFC 808, Mar. 1, 1982. https://www.rfc-editor.org/info/rfc808 Archived from the original on Jan. 24, 2022.

1979, February

Military Message Experiment goes live

An enhanced version of Sigma was installed in October 1978, and after training and shakedown, MME users began full experimental use of the system in February 1979. The experiment was concluded only seven months later, in September 1979.

- Wilson, S. H., Goodwin, N. C., Bersoff, E. H., and Thomas, N. M., III. "Military Message Experiment, Volume I. Executive Summary." 1982. Also available via the Naval Res. Lab., Washington, DC, Final rept., NRL-MR-4454-v1, Mar. 24, 1982. (AD-A112789) https://apps.dtic.mil/sti/citations/ADA112789 Archived from the original on Feb. 2, 2022.
- Stotz, R., et al. "SIGMA - An interactive message service for the Military Message Experiment," IN: *Proc. Of the Natl. Computer Conf.*, Amer. Fed. Of Info. Processing Systems (AFIPS), Jun. 1979.

1979, February

Prediction for satellite-based email

Ivan Bekey of NASA/Aerospace Corporation predicted that the advent of large communication satellites would enable cheap, widespread telecommunications, including the spread of electronic mail.

- Bekey, I. "Big comsats for big jobs at low user cost," *Astronautics and Aeronautics*, vol. 17, no. 2, pp. 42-56, Feb. 1979.

1979, February

First European email protocol specified

Derek Barber at the UK's National Physical Laboratory (NPL) proposed and implemented a mail protocol for EIN.

- Barber, D. L. A. and Laws, J. "A basic mail scheme for EIN," Intl. Networking Working Group (INWG), Note no. 192, 17pp, Feb. 1979.

1979, February

First email offering for home users

Digital Broadcasting System began offering Compucom, a time-sharing system for home users that included electronic mail.

- "Home time-sharing net coming," *Data Channels*, vol. 6, no. 1, Jan. 1979.

1979, Early

First client-server architecture for delivering email developed

Eric Allman, at University of California at Berkeley (UCBerkeley), wrote `Delivermail`. It was the first message transport agent to transfer email messages from one computer to another, using a client-server architecture. This included the ability for automatic replies or automatic forward of an email. `Delivermail` was first shipped with Berkeley Software Distribution (BSD) 4.0 in November 1980. In the early 1980s, with the advent of the Internet, Allman wrote `Sendmail`, which was first shipped with BSD 4.1c in early 1983 (the first BSD to include TCP/IP).

- Costales, B., Assman, C., Jansen, G. and Shapiro, G.N. *Sendmail (4th edition)*. Boston, MA, O'Reilly Media, Nov. 5, 2007. ISBN-13: 978-0596510299
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1979, March

Internet Message Protocol proposed

Jon Postel at USC-ISI presented RFC 753 for comments. It "…describes an internetwork message system. The system is designed to transmit messages between message processing modules…" This document was updated in August, 1980 to RFC 759.

- Postel, J. "Internet Message Protocol," USC-ISI, Marina del Rey, CA, RFC 753, Mar. 1979. https://www.rfc-editor.org/info/rfc753 Archived from the original on May 6, 2021.
- Postel, J. "Internet Message Protocol," USC-ISI, Marina del Rey, CA, RFC 759, Aug. 1980. https://www.rfc-editor.org/info/rfc759 Archived from the original on May 18, 2021.

1979, March

Email for PCs developed

Douglas Gage and members of the Personal Computer NETwork (PCNET) Committee developed `PAN`, a distributed electronic mail program for personal computers. Paul Baran, head of the PCNET working group, also announced that the group's main effort would be to expand adaptation of `PAN` to a wide range of personal computers, so that any `PAN` could communicate with any other `PAN` regardless of hardware involved.

- Baran, P. "PAN - A tiny electronic mail system," MSGGroup email no.1187, MSGGroup Archives, May 26, 1979. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup1101-1200.txt Archived from the original on Oct. 1, 2020.

1979, March

International protocol for email over X.25 networks proposed

The Telemail protocol was proposed at the 1980 Hanover Fair, Germany. It was constructed from the X.29 protocol for control of transmission of text between host computers linked by an X.25 packet-switched network.

- "Telemail protocol proposal," Darmstadt, DEU, Telenet, 5 pp, Mar. 12, 1979.

1979, March

IFIP working group 6.5 meets

A meeting of the IFIP working group 6.5 on international computer message services was held in Montreal, with Ron Uhlig chairing, prior to its formal approved by the IFIP General Assembly in September, 1979.

- Uhlig, R. P., ed. *Computer Message Systems*, New York, NY, North Holland Publishing Co., 1981. ISBN 0-444-85253-6.
- Stefferud, E. "Report of the March 1979 Montreal Workshop, IFIP Working Group 6.5," IFIP, Montreal, Canada, Sep. 30, 1979.
  See also MSGGroup email no. 1520, MSGGroup Archives, Apr. 25, 1980.
  http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup.1520.txt
  Archived from the original on Oct. 1, 2020.
- Schicker, P. "IFIP WG6.5 Workshop on International Computer Message Systems," IN: Naffah, N, *Office Information Systems*, pp. 47-57. New York, NY, North Holland Publishing Co., Elsevier Science Ltd., 1982.
  https://af.booksc.eu/book/3002476/e23ff7
  Archived from the original on Feb. 2, 2022.

1979, April

Basic Four combines its office system with email

A Basic Four Corporation system combining data processing, electronic mail, and word processing was highlighted at the 7th Annual Interface Data Communications Conference. It ran IBM 2780 and 3780 bisync protocols on its own processors with proprietary software.

- Beeler, J. "Among debuts at show [Interface '79]: Network facility has DP, WP, electronic mail," *Computerworld*, vol. 13, no. 16, Apr. 16, 1979.

1979, April

How should email systems be described?

Jacques Vallee and Rich Miller were awarded an NSF grant to develop a common set of standards and definitions to enable users and designers to describe precisely the behavior of word processing systems, electronic mail networks, and teleconferencing systems.

- Miller, R. and Vallee, J. "Towards a formal representation of EMS," *Telecommunications Policy*, pp. 79-95, Jun. 1980.
  https://www.sciencedirect.com/science/article/abs/pii/0308596180900026
  Archived from the original on June 12, 2020.

1979, April 18

Telecomputing Corporation of America brings UPI wire services to the home

United Press International (UPI) and Telecomputing Corporation of America (TCA) offered UPI wire service news to home computers via dial-up to a local telephone number.

- "Wire service to send world news into home computers," *Peninsula Times Tribune*, Weds., Apr. 18, 1979.

1979, May 27

Dialnet announced

Mark Crispin announced Dialnet, a service to provide ARPANET-like services via switched telephone circuits, including transferring files and email. This work had started earlier, being first publicly described in April 1977.

- Crispin, M. "A Universal Host Table," AI Lab., Stanford Univ., Stanford CA, RFC 752, Jan. 2, 1979. https://www.rfc-editor.org/info/rfc752 Archived from the original on May 6, 2021.
- Crispin, M. "Dialnet status," MSGGroup email no. 1188, MSGGroup archives, May 27, 1979. http://mercury.lcs.mit.edu/~jnc/tech/msggroup/msggroup1101-1200.txt Archived from the original on Oct. 1, 2020.
- McCarthy, J. and Earnest, L. "Dialnet and Home Computers," *Proc. First West Coast Computer Faire*, San Francisco, Apr. 1977, pp. 137-138. https://usermanual.wiki/Document/ProceedingsoftheFirstWestCoastComputerFaire1977.4207648070/help. Archived from the original on Mar. 1, 2021.

1979, May

CSNET starts

Larry Landweber at Univ. of Wisconsin held a planning meeting for what would become the Computer Science Network (CSNET). He prepared the proposal on behalf of a consortium of universities. Ultimately, in 1980, the National Science Foundation (NSF) awarded a $5 million contract to launch the network.

- Denning, P. J., Hearn, A. and Kern, C. W. "History and overview of CSNET," IN: *SIGCOMM '83 Symposium on Communication Architectures & Protocols*. Assoc. Computing Machinery (ACM), Apr. 1983. ISBN 0-89791-089-3. https://www.researchgate.net/publication/2918985_History_And_Overview_Of_Csnet. Archived from the original on Feb. 2, 2022.
- "From modest beginnings," NSF Archives, NSF, Washington. DC. https://web.archive.org/web/20170202232829/https://www.nsf.gov/about/history/nsf0050/internet/modest.htm

1979, June

TCA offers "The Source" for email and news

Telecomputing Corporation of America (TCA) began offering "The Source," a time-sharing system for the public that included electronic mail as well as many news feeds and features such as: dining out, home entertainment, personal finance, sports, travel, voicegram, weather, and many more. It also included MailCall and Chatting. Its services were offered via the Tymnet and Telenet networks.

- "Turn-on, tune-in and discover The Source," *Electronic Mail and Message Systems*, vol. 3, no. 13, Jul. 2, 1979
- "Electronic mail is here," *Interface Age*, pp. 86-87+, Jan. 1980.

- *EMMS*, vol. 3, no. 13, pp. 1-7, Jul. 2, 1979. https://www.computerhistory.org/collections/catalog/102661013 (but, vol. 3 is missing from the collection).

1979, June

NLS adds automatically distributed email

SRI designed a system to automatically mail NLS journal items to the master NLS Journal and then automatically update all remote systems supporting the NLS journal. The SRI Journal served as the master journal that updated all the others. Consequently, any NLS user could "send" a document to the NLS Journal via email and all sites supporting the NLS Journal would be automatically updated.

- Andrews, D. I. "NLS MSG system delivery mechanism," SRI-ARC, Menlo Park, CA, 3 pp., Jun. 26, 1979.

1979, June

NLS Mail syntax defined

SRI defined the syntax of its NLS MAIL system.

- Andrews, D. I. "Introduction: Syntax of the [NLS] MAIL subsystem commands as proposed by Syntax Committee," SRI-ARC, Menlo Park, CA, 16 pp, Jun. 26, 1979.

1979, June

NLS mail becomes unified

SRI ARC specified a single mail subsystem for NLS/Augment that can be used for sending, reading and manipulating both journal and sequential email. This replaces `SNDMSG` and `MESSAGE` for Augment (the commercial version of NLS).

- Andrews, D. I. "NLS MSG overall design," SRI-ARC, Menlo Park, CA, 15 pp, Jun. 26, 1979.

1979, June

Critiques of NLS Mail

SRI ARC members Jon Postel and Raphi Rom critiqued the integrated single NLS MAIL subsystem specification for sending, reading and manipulating both NLS journal and sequential email.

- Postel, J. B. and Rom, R. "Review of MAIL design," SRI-ARC, Menlo Park, CA, Journal No. 47646, 6 pp., Jun. 1979.

1979, June

Store-and-forward faxes offered

Compression Labs. Inc., Cupertino, CA, offered a store-and-forward facsimile message switch with inter-machine and teletypewriter compatibility.

- "Store and forward facsimile switch to speed machines," *Data Communications*, vol. 8, no. 8, p. 9, Aug. 1979.

1979, July

It's a GEM

Telenet offers GEM, which links standard ASCII terminals and a number of public-message delivery systems such as Telex/TWX, MAILGRAM, and international TELEX. GEM was created by Joshua Graham based on the Dartmouth Time-sharing Services system licensed and marketed by CTSS (which is unrelated to MIT's Compatible Time-Sharing System).

- "Applications-oriented mail system opens on Telenet," *Data Communications*, pp. 18-22, Jul. 1979.

1979, August

USPS seeks to compete against commercial email offerings

The US Post office (USPS) continues its interest in email, and President Carter sanctioned it to compete against commercial electronic mail services, with some resistance from Congress. The USPS decided to use MAILGRAM for that purpose. To do that they needed to have the Domestic Mail Classification Guide updated and also get overall approval from the Postal Regulatory Commission (PRC). The USPS proposal was opposed by the FCC. Ultimately, the PRC declined to approve the USPS proposal, and USPS never again proposed an email system.

- "Carter blesses USPS's electronic mail bid," *Data Communications*, vol. 8, no. 8, p. 13, Aug. 1979.
- Kahn, R. Private communication, Sep. 10, 2018.

1979, August

Goodbye to outdated messaging technology

The Pentagon dismantled its pneumatic tube messaging apparatus.

- *Bull. Amer. Soc Info. Sci.*, vol 5, no. 6, p. 9, Aug. 1979.

1979, September

MME ends

MME concluded successfully in September 1979. Among other results, it was found that many users preferred reviewing messages on paper, and preferred manual over automatic coordination (distribution of messages). Another conclusion was that an automated message handling system such as the one developed for the MME is a more complex system than originally thought.

- Wilson, S. H., Goodwin, N. C., Bersoff, E. H., and Thomas, N. M., III. "Military Message Experiment, Volume I. Executive Summary." 1982. Also available via the Naval Res. Lab., Washington, DC, Final rept., NRL-MR-4454-v1, Mar. 24, 1982. (AD-A112789) https://apps.dtic.mil/sti/citations/ADA112789 Archived from the original on Feb. 2, 2022.

1979, September

Xerox XTEN network approved by FCC

The FCC allows Xerox's XTEN (1.5 Mbit/s bandwidth) network to be used for electronic messaging services (EMS).

- "Newsletter," *Data Communications*, vol. 8, no. 9, p. 15, Sep. 1979.

1979, September 15

sf-lovers mailing list starts

`sf-lovers`, a mailing list to discuss science fiction literature, was initiated. The first message was by Larry Stewart from Xerox PARC concerning the books "The Demon Breed" and "A Tale of Two Clocks." `sf-lovers` was the first "hobbyist" or social mailing list. This was followed by many others, including `human-nets`, `network-hackers`, `wine-tasters`, and `security-digest` (`Zardoz`).

- "Mailing List History," https://www.livinginternet.com/internet/l/li.htm Archived from the original on Jan. 18, 2021.
- "Files for SFLoversDigestArchive," Internet Archive, San Francisco, CA, uploaded Nov. 25, 2012. https://archive.org/download/SFLoversDigestArchive

1979, September 24

CompuServe enters the email game

CompuServe was the first service to offer electronic mail capabilities commercially to personal computer users.

- "About CompuServe," https://webcenters.netscape.compuserve.com/home/about.jsp Archived from the original on Apr. 13, 2021.
- Tweney, D. "Sept. 24, 1979: First Online Service for Consumers Debuts," Wired, Sep. 24, 2009. http://www.wired.com/2009/09/0924compuserve-launches/ Archived from the original on Jan. 31, 2022.
- "CompuServe Interactive Services, Inc. history," *Intl. Directory of Company Histories*, vol. 27. St. James Press, 1999. ISBN 978-1558623866.
- "CompuServe," Wikipedia, updated Jan. 24, 2021. https://en.wikipedia.org/wiki/CompuServe Archived from the original on Jan. 27, 2021.

1979, November 30

SRI publishes a "Computer Message Services Bibliography"

This bibliography covered the many aspects of email handling at the time, based on the published literature. Originally created for the U.S. Navy, in 2014 it became the seed document for the creation of this Timeline.

- Feinler, E., Pickens, J., and Sjoberg, A. "Computer Message Services Bibliography." SRI International, NIC-Biblio-791130, Nov. 30, 1979. https://www.computerhistory.org/collections/catalog/102785623. Archived from the original on Feb. 15, 2022. (Reprints of all items from the Computer Message Services Bibliography are available from the Computer History Museum.)

1979, November

ACS America offers PRIMACS

ACS America offered the PRIMACS-1 editing and email system, interfacing with its own central processing units (CPUs) and other processing systems on the ACS Telex message-switching system, for $15,000.

- *Info. Sys. News*, p. 37, Nov. 12, 1979.

1979, November

Videotex protocols specified

Gregor Bochmann identified functions in videotext (video-based interactive content) systems for which standardized communication protocols would be needed.

- Bochmann, G.V. and Gecsel, J. "Towards videotext standards," Dept. d'informatique et de recherché operationnelle, Univ. Montreal, Montreal, CAN, Pub. 350, 9 pp., Nov. 1979.

1979, late

Flexible fax transmission introduced

International Telephone and Telegraph's Domestic Transmission System (ITT-DTS) offered FAXPAK, enabling users to communicate among a variety of previously incompatible fax machines

- "ITT inaugurates FAXPAK," *Business Communications Review*, pp. 29-31, Nov-Dec. 1979.
- *Infosystems*, vol. 27, no. 5, p. 28, May 1980.
- "[FAXPAK]," *Telecommunications,* pp. 39-42, Mar. 1980.

1979

Prestel videotex service launched

The U.K. Post Office launched commercial Prestel ("press telephone"), an interactive videotex system. The Germans and the Dutch also used the system. The Prestel Information Service made 146,000 pages of facts available to users via telephone or specially adapted TV screens. It had 90,000 subscribers in the U.K. by the time British Telecom sold it in 1994.

- "Prestel: The technology," British Telecom–Post Office Telecommunications, Aug. 1980, pp. 1-17, Jun. 1979.
- *Bull. Amer. Soc. Info. Sci*., vol. 5, no. 6, p. 9, Aug. 1979.
- "Prestel," Wikipedia, updated Nov. 14, 2021. https://en.wikipedia.org/wiki/Prestel. Archived from the original on Jan. 6, 2022.

1979

Wang introduces Mailway

Wang Laboratories released `Mailway`, an advanced electronic mail system that enabled users to transmit email and documents from a Wang workstation terminal to remote locations.

- *Infosystems*, vol. 27, no. 5, p. 28, May 1980. https://archive.org/details/sim_infosystems_1980-05_27_5/page/28/mode/2up

1979

Newsgroups effort starts

USENET, a collection of newsgroups (a forum for the discussion of particular topics) to which users can post messages, was created by Tom Truscott and Jim Ellis at Duke University and Steve Bellovin at University of North Carolina. It went live in 1980, originally using the UUCP network. "netnews" is a general term for the entire news medium.

- Emerson, S. "Usenet: A bulletin board for UNIX users." *BYTE Magazine*, vol. 8, no. 10, pp. 219-236, Oct. 1983. https://archive.org/details/byte-magazine-1983-10/page/n219/mode/2up
- Hauben, M. and Hauben, R. *Netizens: On the History and Impact of Usenet and the Internet*, New York, NY, Wiley & Sons, May 11, 1997. ISBN 978-0818677069. http://www.columbia.edu/~hauben/project_book.html Archived from the original on Apr. 16, 2021.

VI. Email and the Internet (1980-1985)

As the ARPANET expands, and as the Internet is born and enables inter-network connectivity, email similarly expands and becomes a truly global phenomenon.

1980, Early

Field trial of videotext begins in Canada

Telidon, a videotext system developed by the Canadian Communications Research Centre starting in the late 1970s, launched a one-year field trial in early 1980 encompassing technological tests as well as exploration of educational applications and other possibilities.

- "Canada testing videotext system," *Electronic News*, vol. 4, p. 4, Feb. 18, 1980.
- "Canada's Telidon: Two-way TV is Here," https://web.archive.org/web/20210226071850/http:/www.ieee.ca/millennium/telidon/telidon_twoway.html
- "Internet: Telidon, the two-way television," Archives, CBC/Radio-Canada http://www.cbc.ca/player/play/1631529223 Archived from the original on Apr. 23, 2017.

1980, January

Dial-up directory of bulletin-board services proposed

Frank Derfler proposed a directory of computer bulletin board services that could be accessed via dial-up using an RS232 ASCII port, modem and telephone.

- Derfler, Jr., F. J. "Dial-up directory," *Kilobaud Microcomputing*, pp. 80-3, Apr. 1980. https://archive.org/details/kilobaudmagazine-1980-04/page/n79/mode/2up?view=theater

1980, January

Postal services deliver faxes

INTELPOST was offered by the USPS and other postal authorities. The INTELPOST service sent a faxed document via a data network to other post offices where it was turned back into paper and delivered to the intended recipient. The initial service included Canada and the United Kingdom, with Argentina, Belgium, France, Germany, Iran, Netherlands, and Switzerland joining in. Ultimately, about 50 countries participated. The service was no longer offered as of Sept. 11, 1997, but because of international agreements, it remained available until Mar. 18, 2004.

- "Postal Technology**,** Technological progress in postal transport," Britannica, London, UK. https://www.britannica.com/topic/postal-system/Postal-technology Archived from the original on Nov. 9, 2019.
- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.
- "INTELPOST…..What the heck is that?" http://stampsjoann.net/intelpost/intelpost.html Archived from the original on Aug. 24, 2021.
- Tomlinson, R. "Oral history*,"* Computer History Museum, Mountain View. CA, ref. no. X5409.2009, 16 pp., 2009. https://archive.computerhistory.org/resources/access/text/2016/03/102702118-05-01-acc.pdf

1980, April

International email standards specification begins

John Vittal, Debbie Deutsch, and Jan Walker at BBN started work on a message format standard for the National Bureau of Standards (NBS) intended as a Federal Information Processing Standard. This format was used in the X.400 international email standard, developed by Vittal, Deutsch, and Jim White (at Xerox), among others. It ultimately became the CCITT (now ITU-T) X.409 standard. The syntax proposed there evolved into part of Abstract Syntax Notation number One (ASN.1) (now ISO/IEC 8824-1/ITU X.680).

- Deutsch, D. "Design of a message format standard," IN: *Computer Message Systems*, R. P. Uhlig, ed., New York, NY. North Holland Publishing Co., 1981. ISBN 0-444-85253-6.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- "The X.400 standards," International Organization for Standardization (ISO), Geneva, CH. A pointer to the ISO documents is available at http://www.alvestrand.no/x400/standards.html (archived from the original on Mar. 22, 2016).

1980, April

GTE launches nationwide email service

General Telephone & Electronics Corporation (GTE) launched a commercial, nationwide electronic mail service to data terminals and word processors compatible with the Telenet network. GTE had acquired Telenet, Inc. in 1979.

- *Infosystems*, vol. 27, no. 5, p. 28, May 1980.

1980, May

Wang's MailWay downscales

Wang Laboratories, Inc. released entry level and intermediate versions of its MailWay electronic mail system plus MailWay Distribution Controller to provide central management of electronic mail functions to users not requiring data processing capabilities.

- "Wang unveils software for electronic mail," *Datamation*, p. 78, May 19, 1980. Available at the Computer History Museum, Mountain View. CA, Lot 3682.2007.

1980, June 1

Tymshare upgrades OnTyme email system

Dubbed OnTyme-II, Tymshare upgraded their existing email system, providing an ASCII-to-fax feature, enabling ASCII computer terminals to intercommunicate with fax terminals.

- "Tymshare upgrades electronic mail," *InfoWorld*, vol. 2, no 8, p. 9, May 26, 1980. https://books.google.com/books?id=Yz4EAAAAMBAJ Archived from the original on Feb. 2, 2022.

1980, June

Binary data is encoded for transmission via email

Mary Ann Horton at UCBerkeley developed `uuencode` (Unix-to-Unix encoding), a mechanism in UNIX to encode binary data (*e.g.*, an executable program) as text for transmission in email systems, such as those using UUCP.

- See the original man page of `uuencode`, available at http://www.tuhs.org/cgi-bin/utree.pl?file=4BSD/usr/man/cat1/uuencode.1c Archived from the original on Dec. 21, 2021.

- Horton, M. A. "Email attachments," Mary Ann's personal website. https://maryannhorton.com/mary-ann-horton/a-career-in-computing/email-attachments/. Archived from the original on Aug. 8, 2020.

1980, August

Transitioning email from the ARPANET to the Internet

DARPA's Vint Cerf published the Network Control Program (NCP) to Transmission Control Protocol (TCP) mail service transition plan from the ARPANET to the Internet. NCP provided the middle layers of the protocol stack for ARPANET host computers. The University of Delaware was then funded by DARPA to provide the email relay service.

- Cerf, V. "NCP/TCP mail service transition plan," Personal correspondence forwarded by Dawson@usc-isi to postel@usc-isi, *et al*., 13 pp., Aug. 1, 1980.

1980, September

Internet Mail Transfer Protocol proposed

Suzanne Sluizer and Jon Postel at USC-ISI published the first draft of the proposed Mail Transfer protocol (MTP) using Transmission Control Protocol/Internet Protocol (TCP/IP) as its underlying protocols.

- Sluizer, S. and Postel, J. "Mail transfer protocol," USC-ISI, Marina del Rey, CA, RFC 772, Sep. 1980. https://www.rfc-editor.org/info/rfc772 Archived from the original on May 18, 2021.

1980, September

CCITT begins work on X.400

The Consultative Committee for International Telephony and Telegraphy (CCITT) appointed Ian Cunningham of Bell Northern Research to chair its message handling system (MHS) working group whose work led to the adoption of the X.400 protocol in 1984.

- *Electronic Mail and X.400: A tutorial*, Electronic Mail Assoc., Washington, D.C., 5 pp., Sept. 1987.

1980, October

Formal specification of Internet mail proposed

Gregor Bochmann and John Pickens proposed a service specification consistent with the Draft DARPA Internet Message Protocol as well as a formalized specification of this protocol.

- Bochmann, G. V. and Pickens, J. "A methodology for the specification of a message transport system," SRI, Menlo Park, CA, Oct. 1980. Also published IN: *Proc. International Symposium on Computer Message Systems (IFIP TC-6),* New York, NY, North Holland Publishing Co., pp. 221-32, 1981, as well as IN: *Computer Message Systems*, R. P. Uhlig, ed., New York, NY. North Holland Publishing Co., 1981. ISBN 0-444-85253-6.
- Postel, J. "Internet Message Protocol," USC-ISI, Marina del Rey, CA, RFC 753, Mar. 1979. https://www.rfc-editor.org/info/rfc753 Archived from the original on May 6, 2021.

- Postel, J. "Internet Message Protocol," USC-ISI, Marina del Rey, CA, RFC 759, Aug. 1980. https://www.rfc-editor.org/info/rfc759 Archived from the original on May 18, 2021.

1980

First multiplatform email system developed

BBN Information Management Corporation developed InfoMail, a commercial email product offered on various operating systems, among them UNIX, Digital's VAX\VMS, IBM's MVS, and IBM CICS. It was popular among users of the U.S. Defense Data Network (DDN).

- Walden, D. and Nickerson, R., eds. "Networked e-mail," Chap 19, pp. 493-500 IN: *A Culture of Innovation: Insider Accounts of Computing and Life at BBN*. Waterside Pub., E. Sandwich, MA, 2011. ISBN 978-0-9789737-0-4. https://www.computerhistory.org/collections/catalog/102706168 Archived from the original on Feb. 1, 2022.
- McQuillan, J. and Walden, D. "Designing electronic mail systems that people will use," *SIGOA Newsletter*, vol. 1, no. 2, May 1980.

1981, January

CSNET enables universities without ARPANET access to connect via Telenet

The National Science Foundation (NSF) initiated the Computer Science Network (CSNET), making use of the Telenet commercial packet switching service. The purpose of CSNET was to extend networking benefits to academic Computer Science departments who were otherwise not able to connect to the ARPANET. One of the primary CSNET components was an email relaying service. The proposal was initiated in late 1979, with the project ultimately being approved in January 1981. Contracts for CSNET were let to Univ. of Wisconsin, Purdue Univ., Univ. of Delaware, and the Rand Corp. in late spring, 1981.

- Denning, P. J., Hearn, A. and Kern, C. W. "History and overview of CSNET," IN: *SIGCOMM '83 Symposium on Communication Architectures & Protocols*. Assoc. Computing Machinery (ACM), Apr. 1983. ISBN 0-89791-089-3. https://www.researchgate.net/publication/2918985_History_And_Overview_Of_Csnet. Archived from the original on Feb. 2, 2022.
- "From modest beginnings," NSF Archives, NSF, Washington. DC. https://web.archive.org/web/20170202232829/https://www.nsf.gov/about/history/nsf0050/internet/modest.htm
- "CSNET," Wikipeda, edited Jul. 11, 2020. https://en.wikipedia.org/wiki/CSNET Archived from the original on Aug. 28, 2021.

1981, April

International email model proposed

IFIP working group 6.5 on Electronic Mail proposed a model for an international computer-based message system.

- Schicker, P. "The IFIP model of an international computer-based message system," IN: *Intl. Workshop on Office Automation Syst.*, Saint Maximin, FR. Oct 13-15, 1981.
- Schicker, P. "Service definitions in a computer-based mail environment," IN: *International Symposium on Computer Message Systems*, Ottawa, CAN, Apr. 6-8, 1981. ISBN 0-444-85253-6.

1981, May

France Telecom introduces Minitel

Minitel was introduced as part of France's nationalized telecommunications service. Its principal services were electronic mail, phone directory, chat, and dating service. France Telecom began work on Minitel in 1978 and started a trial with 1500 customers in May 1981. It eventually became available in Paris in December, 1983. While the most popular service was the electronic phone directory, the most lucrative service ended up being Minitel Rose ("pink messages"), a sex-oriented chat line. Minitel was retired nearly 30 years later, on June 30, 2012.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.
- Schoefield, H. "Minitel: The rise and fall of the France-wide web," *BBC News Magazine* (Paris), Jun. 27, 2012. http://www.bbc.com/news/magazine-18610692 Archived from the original on Jan. 27, 2022.

1981, Spring

BITNET provides competition for CSNET and UUCP

The BITNET ("Because It's There" or "Because It's Time") network was established under the leadership of Ira Fuchs at CUNY and Greydon Freeman at Yale. They decided that IBM's Remote Spooling Communications Subsystem (RSCS) made communications practical between their institutions, using leased lines. BITNET was a store-and-forward network, and as with CSNET and UUCP, email was a major application.

- "A brief history of BITNET," http://bit.net/ Archived from the original on Dec. 26, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1981, June

NLS/Augment Mail interfaces to other mail systems

Tymshare designed a "foreign" (*i.e.*, "other") mail interface to the NLS/Augment mail system.

- "Foreign mail interface*,"* Augment Tech. Memo., Tymshare Corp., Cupertino, CA, 14 pp., Jun. 15, 1981.
- "The Augment Mail Users' Guide, Second Edition*,"* Office Automation Div., Tymshare Corp., Cupertino. CA., Augment 103481, Nov. 1983.

1981, September

MSG begins to be supplanted as the most widely-used email program

`MM` was adopted as the Stanford email program for use on their DECSYSTEM-20s.

- "Introduction to MM: Electronic mail facility for the context DECSYSTEM-20 at Stanford University," Stanford Univ., Stanford, CA, Sep 1981.

1981, October

NLS/Augment introduces an email directory

Tymshare introduced a "new ident system" that included group identification as well as individual identification and email addresses, i.e., an email "phone book" for Augment.

- "New ident system," Augment Tech. Memo., Tymshare Corp., Cupertino, CA, Oct. 6, 1981.
- "New ident system," Augment Tech. Memo., Tymshare Corp., Cupertino, CA, May 12, 1982.

1981, November

National Bureau of Standards issues a Message Transfer Protocol for comment

The National Bureau of Standards (NBS) issued a draft document for public comment describing features for a Message Transfer Protocol (MTP), which was prepared under contract by BBN.

- "Features of a Message Transfer Protocol," Draft Rept. No. ICST/CBOS-82-1, NBS, Gaithersburg, MD, 43 pp., Nov. 1981.

1981

BinHex file encoding gets its start

Tim Mann wrote a program in Microsoft Basic, `BINHEX/BAS`, implementing the same encoding format that Lance Micklus used in ST80-III for the TRS-80 computer to convert files from binary to hexadecimal and back.

- Mann, T. "Prehistory of BinHex," Tim Mann's TRS-80 Pages. http://www.tim-mann.org/binhex.html Archived from the original on Dec. 30, 2021.

1981

GILT message standard is developed

The Get Interconnection between Local Text systems (GILT) message standard, enabling message transfer between independent computer-based message systems, was developed within the framework of the International Organization for Standardization open systems reference model (ISO OSI).

- "GILT message structure standard, Internal working paper," GI:T/MES/FOA/005
- Sztajnkrycer, F, and Karmouch, A. "A proposal for interconnecting heterogeneous CBMS's in the GILT project," IN: Naffah, N., ed., *Office Information Systems*, Amsterdam, NL, North Holland Publishers, pp. 317-37, 1982.

- Santo, H. "Gilt Interconnection of Existing Message Systems," IN: Schindler, S. and Spaniol, O., eds., *Kommunikation in Verteilten Systemen — Anwendungen und Betrieb*. Informatik-Fachberichte, vol. 60, 19–21, Jan. 1983, Springer Publishing, Berlin, Heidelberg, Chap. 10, pp. 383-93, 1983. ISBN: 978-3-642-68829-4. http://link.springer.com/chapter/10.1007/978-3-642-68829-4_19 Archived from the original on June 4, 2018.

1982, January

Multimedia email appears

By now there were Internet multimedia projects in development at seven institutions, sparked by the advent of desktop computers with high-resolution graphics. One of them, Diamond (from BBN, led by Bob Thomas and Harry Forsdick, with contributions by Ray Tomlinson), had multimedia email, but the development of multimedia capabilities was perhaps premature, as these projects did not initially address the issue of packaging binary content into regular email.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1982, March

WHOIS server identifies host names

An enhanced WHOIS server to identify people, computers, and host names on the ARPANET was launched by the SRI-NIC.

- Harrenstien, K. and White, V. "NICNAME/WHOIS," SRI -NIC, Menlo Park, CA, RFC 812, Mar. 1, 1982. https://www.rfc-editor.org/info/rfc812 Archived from the original on Oct. 27, 2021.

1982, August 13

ARPANET email message format standard RFC 733 is replaced by the Internet standard, RFC 822

The DARPA-sponsored standard for the format of DARPA Internet text messages (RFC 822) is published by Dave Crocker. RFC 822 included a description of the syntax of domain names. It updated RFC 733 to serve the needs of the Internet, but the fundamentals specified in RFC 733 remained.

- Crocker, D. "Standard for the format of ARPA internet text messages," UDel, Newark, DE, RFC 822, Aug. 13, 1982. https://www.rfc-editor.org/info/rfc822 Archived from the original on Dec. 1, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1982, August

Simple Mail Transfer Protocol (SMTP) specification published

Jon Postel published the DARPA-sponsored Simple Mail Transfer Protocol (SMTP), used for email transmission, the development of which began in 1980. Previously, it had been thought that Internet mail would be entirely multimedia, and that wholesale replacement of ARPANET mail mechanisms would be needed. This also specified what to do if the mail could not be delivered. It was not until 1992 that a complete specification for multimedia mail was published, and 1996 that the formal specification for Delivery Status Notifications was specified. With the exception of the DNS-based "MX" routing system described in RFCs 973 and 974, and clarifications in RFC 1123, SMTP itself was not updated until 1993.

- Postel, J. "Simple Mail Transfer Protocol," USC-ISI, Marina del Rey, CA, RFC 821, Aug. 1982. https://www.rfc-editor.org/info/rfc821 Archived from the original on Dec. 2, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Borenstein, N. and Freed, N. "MIME (Multipurpose Internet Mail Extensions)," RFC 1341, June 1992. https://www.rfc-editor.org/info/rfc1341 Archived from the original on Aug. 11, 2021.
- Moore, K. "SMTP Service Extension for Delivery Status Notifications," Univ. Tennessee, Knoxville, TN, RFC 1891, Jan. 1996. https://www.rfc-editor.org/info/rfc1891 Archived from the original on Apr. 12, 2021.
- Mockapetris, P. "Domain System Changes and Observations," ISI, Marina del Rey, CA, RFC 973, Jan. 1986. https://www.rfc-editor.org/info/rfc973. Archived from the original on Aug. 13, 2021.
- Partridge, C. "Mail Routing and the Domain System," BBN Laboratories, Inc., Cambridge, MA, RFC 974, Jan. 1986. https://www.rfc-editor.org/info/rfc974. Archived from the original on July 3, 2021.
- Braden, R., ed. "Requirements for Internet Hosts – Application and Support," RFC 1123, Oct. 1989. https://www.rfc-editor.org/info/rfc1123. Archived from the original on Dec. 1, 2021.

1982, Late

Unix Message Handling System, MH, becomes the email application of choice

Marshall Rose at UC Irvine and others upgraded and continued to maintain `MH` the original of which was developed by B. Borden, R. S. Gaines, and N. Shapiro at Rand. It became the standard email application for the Unix systems on the Internet. `MH UCI` ran under the UNIX operating system on DEC PDP-11s and VAXes.

- Borden, B., Gaines, R.S. and Shapiro, N. "The MH Message Handling System: User's Manual," Rand Corp., Santa Monica, CA, Rept. R-2367-AF, Nov. 1979. http://www.rand.org/pubs/reports/R2367.html Archived from the original on May 12, 2011.

- Anderson, R. H., Shapiro, N., Bikson, T. K. and Kantar, P. "The Design of the MH Mail System," Rand Corp., Santa Monica. CA, 1989. http://www.rand.org/pubs/notes/N3017.html Archived from the original on Oct. 20, 2021.
- Crocker, D. "Email History," https://www.livinginternet.com/internet/e/ei.htm Archived from the original on Apr. 20, 2021.
- "The Rand MH message handling system: User's manual," UCI version, UC Irvine, Irvine, CA, Jan. 22, 1984. The 1995 version is available at https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.38.900&rep=rep1&type=pdf. Archived from the original on Feb. 3, 2022.

1983, January 1

The U.S. government networks transition to TCP/IP, and a true internet is born

After a lengthy transition period of running both protocols in parallel, the switchover from the ARPANET NCP protocol to the internet TCP/IP protocols happened on January 1, 1983, and is commonly referred to as "flag day." It was the culmination of a multi-year planning effort. Because some sites were late in implementing the new protocols, both sets of protocols continued to run in parallel for a while. This began an era of new mail protocols, like SMTP, similar to those in use today.

- Leiner, B. M., et al. *A Brief History of the Internet*, Internet Soc., Reston, VA, 1997. https://www.internetsociety.org/internet/history-internet/brief-history-internet/. Archived from the original on Jan. 27, 2022.

1983, April

First US industry organization focused on email started

The Electronic Mail Association (EMA) was launched in Arlington, VA. EMA was a membership organization devoted to promoting email, voicemail, fax, Electronic Data Interchange (EDI) and other messaging technologies. (In 2001, the EMA was folded into The Open Group.)

- "Electronic Mail Association formed," *Electronic Mail & Message Systems*, vol. 7, no. 9, p. 10, May 2, 1983.
- *Computer Desktop Encyclopedia*, ©1981-2012 by The Computer Language Corp., Inc., New York, NY, McGraw-Hill.

1983, April

Teleconference held on automating the office

Dean Meyer & Associates, Ridgefield, CT, conducted an early teleconference on office automation techniques.

- "Items of interest," *Electronic Mail & Message Systems*, vol. 7, no. 9, p. 14, May 2, 1983.

1983, September

Augment Mail user documentation published

Tymshare released Augment Mail Quick Reference documentation. Augment was the commercial version of SRI's NLS.

- "Augment mail quick reference," Tymnet, Cupertino, CA, Journal no. 103464, Sept. 1983.
- "The Augment mail user's guide, 2nd ed.," Tymnet. Cupertino, CA, Nov. 1983.

1983, September 23

MCI Mail launched

MCI Mail included remote printing at locations around the US, and a Telex number for each user. It offered gateways to faxing and telex. It eventually became the first commercial email system to use the Internet, gatewayed through a purpose-built Multi-channel Memo Distribution Facility (MMDF).

- Manes, S. *The Complete MCI Mail Handbook*, New York, NY, Bantam Books. 1988. ISBN 978-0-553-34587-2.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Hafner, K. and Lyon, M. "E-mail," Chap. 7, IN: *Where Wizards Stay Up Late*, 1st ed., Simon & Schuster, New York, NY, 1996. ISBN 0-684-81201-0.
- Hafner, K. and Lyon, M. "Talking Headers," *The Washington Post Magazine*, pp. 9-28, Aug. 4, 1996. https://www.washingtonpost.com/archive/lifestyle/magazine/1996/08/04/talking-headers/41be42fa-d4ff-4c7b-9490-3ab441644886/ Archived from the original on Apr. 19, 2021.
- Hafner, K. "E-Mail, 30 Years Later: Billions Served Daily," *New York Times*, Dec. 6, 2001. http://www.nytimes.com/2001/12/06/technology/billions-served-daily-and-counting.html. Archived from the original on May 6, 2021.

1983, October

BBN releases a revised Unix mail system

BBN described their Unix mail system in the second revision of its BBN Unix mail system tutorial.

- "BBN O/S mail system tutorial, 2nd rev," BBN Communications Corp., Cambridge, MA, Rept. No. 0300008, Oct. 1983.

1983, November

First international email standard submitted for approval

The final draft of this version of X.402, ISO Recommendations on Message Handling Systems, was submitted for approval. The final adoption of the standard didn't occur until 1984.

- White, J., chair. "X.402, ISO recommendations on Message Handling Systems, final draft," Brighton, UK., Nov. 22, 1983. (White was from SRI-ARC, Menlo Park, CA.)

1983, November

Domain Name System (DNS) specified

Paul Mockapetris at USC-ISI published two RFCs that were to become the Domain Name System. DNS became a fundamental building block for the Internet, allowing user-friendly names to be associated with Internet sites' numeric IP addresses. Email addresses evolved with the creation of DNS, and added to email's scalability.

- Mockapetris, P. "Domain Names – Concepts and Facilities," USC-ISI, RFC 822, Nov. 1983. https://www.rfc-editor.org/info/rfc882 Archived from the original on Dec. 3, 2021.
- Mockapetris, P. "Domain Names – Implementation and Specification," USC-ISI, RFC 823, Nov. 1983. https://www.rfc-editor.org/info/rfc883 Archived from the original on Jan. 29, 2022.
- Mockapetris, P. "The domain system." IN: *Proceedings of IFIP/WG6.5 Conference on Computer Message Services*, Nottingham University, Nottingham, UK, 1984, pp. 59-70.
- "Domain Name System," Wikipedia, edited Nov. 16, 2021. https://en.wikipedia.org/wiki/Domain_Name_System Archived from the original on Feb. 2, 2022.
- Robachevsky A. "Happy 30th Birthday, DNS!" Internet Society, 26 Nov. 2013. https://www.internetsociety.org/blog/2013/11/happy-30th-birthday-dns/ Archived from the original on Jan. 9, 2022.
- National Research Council. *Signposts in Cyberspace: The Domain Name System and Internet Navigation*. Washington, DC: The National Academies Press, 2005. https://www.nap.edu/catalog/11258/signposts-in-cyberspace-the-domain-name-system-and-internet-navigation
- Shoch, J. "A note on Inter-Network Naming, Addressing, and Routing," Xerox PARC, Internet Experiment Note #19, Jan. 1978. https://www.rfc-editor.org/ien/ien19.txt. Archived from the original on Sept. 10, 2021. Also, as Shoch, J. "Inter-network naming, addressing, and routing." IN: *Proceedings of IEEE Computer Conference, COMPCON* (Washington, D.C., Fall). IEEE, New York, 1978, pp. 72-79.
- Frey, D. and Adams, R. *!%@:: A Directory of Electronic Mail Addressing and Networks*, O'Reilly and Associates, Sebastapol, CA, Aug. 1989. ISBN 978-1565920460.

1983, late

Email gateways and bridges appear

An approach was developed to achieve mail connectivity among incompatible mail systems that do not necessarily share common conventions or protocols.

- Cohen, D. and Postel, J. "Gateways, Bridges and Tunnels in Computer Mail," IN: *Local Networks: Distributed Office and Factory Systems*, Proc. of Localnet '83,

New York, NY., 1983 and Local Networks: Strategy and Systems, Proc. of Localnet '83, London, UK, 1983. Also reprinted as *ISI Technical Report ISI/RS-83-117*, USC-ISI, Marina del Rey, CA, Jan. 1984.
ftp://ftp.isi.edu/isi-pubs/rs-83-117.pdf
Archived from the original on July 5, 2017.

1983

Mail delivered over commercial Ethernet

3Com Corp began offering its EtherSeries line of products enabling computer systems, including IBM PCs, DEC VAX-11s, and others to communicate with each other over an Ethernet local area network, and to exchange electronic mail (EtherMail).

- *EMMS*, vol. 7, no. 9, p. 16, May 2, 1983.

1984, February 13

First commercial on-line service with a graphical user interface offered

Prodigy service commenced, offering email as one of its services. Prodigy, accessed via dial-up telephone, was the first commercial service to offer a graphical user interface. Prodigy was founded as a joint venture between CBS, IBM, and Sears. (It was the first product to offer users dial-up service to the World Wide Web in 1994.)

- Banks, M. "Prodigy: The pre-Internet online service that didn't live up to its name," TechRepublic, Dec. 18, 2008.
  https://www.techrepublic.com/article/prodigy-the-pre-internet-online-service-that-didnt-live-up-to-its-name/
  Archived from the original on Jan. 30, 2022.
- McCullough, B. "Compuserve, Prodigy, AOL and the early online services," Internet History Podcast, chap. 3, part 1, Apr. 3, 2014.
  http://www.internethistorypodcast.com/2014/04/chapter-3-part-1-compuserve-prodigy-aol-and-the-early-online-services/
  Archived from the original on Oct. 5, 2021.
- McCullough, B. *How the Internet Happened: From Netscape to the iPhone*, Liveright Publishing Corp., New York, NY, Oct 23, 2018.
  ISBN 978-1-63149-307-2.
- "Prodigy (Online Service)," Wikipedia, edited Dec. 16, 2020.
  https://en.wikipedia.org/wiki/Prodigy_%28online_service%29
  Archived from the original on Jan. 24, 2022.

1984, June

BinHex published for the Macintosh

William Davis ported `BinHex`, written in Microsoft Basic, to the Macintosh, publishing it on the Info-Mac mailing list by Joe Heller. Later that year, it was reimplemented by Yves Lempereur in assembler code to mitigate performance issues. `BinHex` was commonly used to send binary files, including programs, as email attachments.

- Mann, T. "Prehistory of BinHex," Tim Mann's TRS-80 Pages.
  http://www.tim-mann.org/binhex.html
  Archived from the original on Dec. 30, 2021.

- Lewis, P. N. "BinHex 4.0 definition," Aug. 1991. http://files.stairways.com/other/binhex-40-specs-info.txt Archived from the original on Dec. 30, 2019.

1984, August

Internet email interfaced to MCI Mail

USC-ISI introduced MCIMailer to forward email messages between Internet mail and commercial MCI mail.

- DeSchon, A. L. "MCI Mail/ARPA Mail Forwarding," USC-ISI, Marina del Rey, CA, ISI/RR-84-141, Aug. 1984. ftp://ftp.isi.edu/isi-pubs/rr-84-141.pdf Archived from the original on July 5, 2017.

1984, October

X.400 international email standard adopted

The CCITT X.400 email standard, largely based on the IFIP work started in 1979, was adopted at the CCITT Plenary meeting in Malaga-Torremolinos, Spain. It includes X.401, X.408, X.409, X.410, X.411, X.420, and X.430.

- Heist, H.D. *Electronic Mail and X.400: A tutorial*. Electronic Mail Assoc., Washington, D.C., Sep. 1987.
- CCITT Recommendations X.400 - X.430, "Data Communication Networks: Message Handling Systems", CCITT Red Book, Vol. VIII - Fasc. VIII.7, Malaga-Torremolinos, 1984.
- Kille, S. "Mapping Between X.400 and RFC 822," University College London, RFC 987, June, 1986. https://www.rfc-editor.org/info/rfc987 Archived from the original on Oct. 28, 2021.

1984, October

Mail is fetched from a mailbox server

POP, the Post Office Protocol, was published to enable personal computers to access mail stored in a mailbox on a server. POP coexisted with established Internet mail programs, used IP, and was not hardware- or OS-specific. Similarly, mail was sent from a workstation to the mailbox server using the Simple Mail Transfer Protocol (SMTP).

- Chase, D., *et al*. "Post office protocol – POP," USC-ISI, Marina del Rey, CA, Oct. 1984.
- Reynolds, J. "Post Office Protocol," USC-ISI, Marina del Rey, CA, RFC 918, Oct. 1984. https://www.rfc-editor.org/info/rfc918 Archived from the original on May 6, 2021.
- Butler, M., *et al*. "Post office protocol – Version 2," USC-ISI, Marina del Rey, CA, RFC 937, Feb. 1988. https://www.rfc-editor.org/info/rfc937 Archived from the original on Oct. 7, 2021.
- Postel, J. "Simple Mail Transfer Protocol," USC-ISI, Marina del Rey, CA, RFC 821, Aug. 1982. https://www.rfc-editor.org/info/rfc821 Archived from the original on Oct. 21, 2021.

1984, November

FedEx adopts email

Federal Express (FedEx) started Zapmail, a program to electronically transmit documents for customers between FedEx offices. The service lasted just two years, until November 1986.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.
- Smith, F. "How I delivered the goods," *Fortune Small Business*, Oct. 2002. https://web.archive.org/web/20070709195409/http://fedex.com/us/about/news/ontherecord/speaker/fredsmith.pdf

1984, December

Development of Lotus Notes begins

Ray Ozzie started Iris Associates Inc., under contract to and funded by Lotus Development Company, to develop the first version of Lotus Notes. It was modeled after Plato Notes, but included many more powerful features, including on-line discussion, email, phone books, and document databases.

- "The history of Notes and Domino," IBM Corp., Armonk, NY, Nov. 14, 2007. https://dokumen.tips/documents/the-history-of-notes-and-domino-notes-and-domino-began-in-the-work-of-ray-ozzie.html Archived from the original on Feb 3, 2022.

1984

First software developed to automatically manage email lists

In 1984, under the leadership of Ira Fuchs, Daniel Oberst and Ricky Hernandez, software was developed to allow mailing lists to be implemented on IBM VM mainframes. Developed for BITNET, the software was known as the BITNIC (BITNET NIC) Listserv.

- "Early History of LISTSERV," L-Soft International, Inc. Bethesda, MD, 1996. http://www.lsoft.com/products/listserv-history.asp Archived from the original on Sept. 6, 2021.

1985, February

Mobile phone text messaging proposed

Short Message Service (SMS) was proposed, with the first document describing the service distributed in June 1985. SMS became the text messaging component of most mobile telephony systems, together with telephone service and internet access.

- *GSM Document 19/85*
- "SMS: The 'Who created SMS' debate," *IN: History of GSM: Birth of the Mobile Revolution,* GSM Doc. 28/85r2, 2021. http://www.gsmhistory.com/sms/. Archived from the original on Jan. 26, 2022.

1985, July

Artificial Intelligence filters for email introduced

The MIT Sloan School of Management developed the Information Lens, an intelligent system to help people share and filter information communicated by computer-based

messaging systems. For example, emails could be distributed automatically based on their content. This was the first use of Artificial Intelligence (AI) in an email system.

- Malone, T.W., Grant, K.R., and Turbank, F.A. "The Information Lens: An Intelligent System for Information Sharing in Organizations," Center for Info. Syst. Res., Sloan School of Management, MIT, Cambridge, MA, CISR WP No. 133, Sloan WP No. 1749-86, and 90s WP No. 86-016, Jan. 1986. https://archive.org/details/informationlensi00malo

1985, September

Mail forwarded across mail system boundaries

Annette DeSchon of USC-ISI describes Intermail, an experimental mail forwarding system that enabled users to send electronic mail across mail system boundaries, such as with MCI Mail and Telemail.

- DeSchon, A. L. "INTERMAIL, an Experimental Mail Forwarding System," USC-ISI, Marina del Rey, CA, RR-85-158, 14 pp., Sept. 1985. https://apps.dtic.mil/docs/citations/ADA160193 Archived from the original on Feb 3, 2022. Also IN: Uhlig, R., ed. *Proc. of the IFIP TC 6 International Symposium on Computer Message Systems - 85*, Amsterdam, NE, North Holland Publishers, 425 pp., c1985. This Symposium was held in Washington, D.C., Sept. 5-7, 1985 with participants from 19 countries.
- Westine, A., *et al*. "Intermail and Commercial Mail Relay Services," USC-ISI, Marina del Rey, CA, RFC 1168, July 1990. https://www.rfc-editor.org/info/rfc1168 Archived from the original on Mar. 8, 2021.

1985, October

DIALMAIL offered by Dialog Information Systems

Dialog Information Systems, an online bibliographic search service, offered DIALMAIL electronic mail to its users.

- *DIALMAIL Basics*, Dialog Info. Services, Inc., Palo Alto, CA, Oct. 1985.

1985, November

Mail gateway standards specified

Marshall Rose, Dale Horton, and Steve Kille discussed standards for gateways between ARPANET-Internet mail, ARPANET-MHS mail, and CCITT X.400-MHS mail at the IFIP 6.5 North American Subgroup Gateway Project working group meeting held at SRI, Menlo Park, CA., Nov. 13-14, 1985. This was ultimately standardized by RFC 987 in 1986.

- Stefferud, E. "ARPA-Internet gateway standards workshop report," pp.403-4. IN: Uhlig, R, ed. *Computer message systems - 85*, Amsterdam, NE, North Holland Pub. Co., 1985. ISBN 0-444-85253-6.
- Kille, S. "Mapping between X.400 and RFC 822," University College London, London, UK, RFC 987, June 1986. https://www.rfc-editor.org/info/rfc987 Archived from the original on Oct. 28, 2021.

VII. Email and the Internet grow dramatically (1986-2021)

The expansion continues. Not even the advent of social networking and texting can dampen the increasing acceptance of email.

1986, January

First international commercial email interconnection established

The first international commercial email interconnection was initiated between GTE Telenet's Telemail and Telecom Canada's Envoy 100.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.

1986, January

Using MX resource records to route email

It became obvious in 1985 that the domain name system needed to be extended to allow for accurate routing of email. After much deliberation, the culmination of the effort was the creation of Mail Exchanger (MX) records which provided a significant operational simplification for mail routing.

- Partridge, C. "Mail Routing and the Domain System," BBN, Cambridge, MA, RFC 974, Jan. 1986. https://www.rfc-editor.org/info/rfc974 Archived from the original on Dec. 3, 2021.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1986, January

Domain names provide a standard for email compatibility

At a meeting at SRI, the various representatives of the Internet, UUCP, Bitnet, CSNET, and others met to resolve email compatibility across the various systems and networks. They agreed upon using domain name syntax for systems on other networks that did not, themselves, have DNS entries.

- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR

1986, February

MCI Mail interconnects with CompuServe

MCI Mail provided a gateway to CompuServe to enable the first domestic interconnection of commercial public email services.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.

1986, February

Network news transfer protocol published

The Network News Transfer Protocol (NNTP) "specifies a protocol for the distribution, inquiry, retrieval, and posting of news articles using a reliable stream-based transmission of news."

- Kantor, B. and Lapsley, P. "Network News Transfer Protocol," RFC 977, February 1986. https://www.rfc-editor.org/info/rfc977 Archived from the original on Oct. 27, 2021.

1986, April

X.400 receives preliminary commercial approval

The Corporation for Open Systems (COS), composed of major computer and telecommunications companies in the United States, met with similar organizations from Canada and Europe to approve preliminary design standards for electronic mail based on the CCITT X.400 standard.

- "Computer makers working to deliver electronic mail," *San Jose Mercury News*, p. 10D, Monday, Feb. 10, 1986.

1986, May

Andrew Message System developed at CMU

Nathaniel Borenstein, Craig Everhart, Larry Raper and Jonathan Rosenberg introduced the campus-wide Unix-based Andrew Message System to provide a "multi-media interface to mail, mailing lists, and bulletin boards." It was part of the Andrew Project, developed jointly by IBM and Carnegie Mellon University (CMU) starting in 1982 to run on PCs using the Kermit file transfer program and the Versatile Commodore Emulator (VICE) file system.

- Perkins, D. D. "The Andrew message system," Presentation at the PC Lan Mail Conf., Stanford Univ, Stanford, CA, May 1986. (Available at the Computer History Museum, Mountain View, CA.)
- Rosenberg, J., Everhart, C., and Borenstein, N. "An Overview of the Andrew Message System," pp. 99-108, IN: *SIGCOMM '87 Proc. of the ACM Workshop on Frontiers in Computer Communications Technology*, Stowe, VT, 11-13 Aug. 1987. https://www.andrew.cmu.edu/user/rjs3/ams.pdf. Archived from the original on Jan. 4, 2022.
- "The Andrew Project: History (an overview)," CMU, Pittsburgh, PA, 2007. https://web.archive.org/web/20120717075926/http://www.cmu.edu/corporate/news/2007/features/andrew/history_overview.shtml
- "The Andrew Messages System" CMU, Pittsburgh, PA., 1994? http://www.cs.cmu.edu/afs/cs.cmu.edu/Web/People/AUIS/ams.html Archived from the original on Feb. 15, 2017.

1986, May

Email moves to PCs

The personal computer (PC) local area network (LAN) mail conference was held at Stanford University to examine PC mail protocols. It was attended by Bob Metcalfe, Bob Bressler, Alan Kessler, Bob Purvy, and Bob Stephens, among others.

- Notes and slides, Stanford Univ., Stanford, CA, May 15-16, 1986. (Available at the Computer History Museum, Mountain View, CA.)

1986, May

Distributed email on PCs developed

Dave Clark and Mark Lambert at the MIT Laboratory for Computer Science (MIT-LCS) published RFC 984 on the design of *PCMAIL: A Distributed Mail System for Personal Computers*. Today's IMAP4 is, to some extent, IMAP2+PCMAIL+MIME.

- Clark, D. and Lambert, M. "PCMAIL: A distributed mail system for personal computers," MIT-LCS, RFC 984, May 1986. https://www.rfc-editor.org/info/rfc984. Archived from the original on May 18, 2021.
- Crispin, M. "Internet Message Access Protocol – Version 4," Univ. of Washington, RFC 1730, Dec. 1994. https://www.rfc-editor.org/info/rfc1730. Archived from the original on Oct. 20, 2021.

1986, Summer

First automated email list distribution software developed

Eric Thomas was a student in Paris when BITNIC LISTSERV was developed, and saw the problems with it, especially automatically handling requests that had to be handled manually. Thomas developed a "Revised LISTSERV" server that, among other things, automated "add me to this list" requests. Development continued with the work being transferred to L-Soft for its commercialization in May 1993.

- "Revised LISTSERV," IN: *Early History of LISTSERV,* L-Soft international, Inc., Bethesda, MD, 1996. http://www.lsoft.com/products/listserv-history.asp Archived from the original on Sept. 6, 2021.

1986, September

Tymshare offers X.400 mail

X.Ontyme by Tymshare offered X.400 mail that provided "unattended send and receive functions" to customers.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.

1986, September

Enhanced electronic document exchange introduced

NSF launched EXPRESS to improve the ability of researchers to exchange documents containing text, images, and graphics.

- *EXPRESS Project, Solicitation for research groups*, NSF, Washington, D.C., Jun. 1986.

1986

Elm email client released

Elm (ELectronic Mail), a text-based email client for Unix, was is first released in 1986, probably in November. It was developed by Dave Tayler, then at Hewlett Packard. Elm is notable for having the ability to automatically filter and sort email, and is probably the first to enable those actions.

- Pemberton, B. (Coordinator). *The Elm Users Guide (The Elm Mail System, Version 2.4)*, University of Virginia, Charlottesville, VA. Oct. 1, 1992. http://www.instinct.org/elm/doc/Users.txt Archived from the original on Mar. 2, 2017.
- Taylor, D. "autoreplying to mail with 'filter'." https://groups.google.com/g/comp.mail.elm/c/Bk6j7qbMg2Y/m/jFSytJky-b0J Archived from the original on Feb. 3, 2022.
- "Elm (email client)," Wikipedia, edited Sept. 12, 2021. https://en.wikipedia.org/wiki/Elm_(email_client) Archived from the original on Jan. 5, 2022.
- Hicks, A., et al. *Slackware Linux Essentials*, "Chapter 13 Basic Network Commands," http://www.slackbook.org/html/basic-network-commands-email.html Archived from the original on Feb. 14, 2020.
- Elm – Electronic Mail for UNIX, Update Jan. 6, 2000. http://www.instinct.org/elm/. Archived from the original on Jan 21, 2022.

1986

NSFNet initiates operations

NSF's supercomputing program was launched in 1984. In 1985, four supercomputing centers were established with NSF support. Part of the initiative was the creation of an internet called NSFNet, which became operational in 1986 and was connected to the Internet. This led eventually to the commercialization of the Internet.

- "The Launch of NSFNET," NSF, Washington, D.C. https://web.archive.org/web/20170202190224/https://www.nsf.gov/about/history/nsf0050/internet/launch.htm

1986

Military email moves to PCs

The DDN NIC at SRI developed Simple Access to Mail (SAM), a mail management software package that enabled military network users to download/upload email from a host computer and manage it on a PC.

- "PC SAM, simple access to e-mail user's guide," SRI-NIC, Menlo Park, CA., Sep. 1986.

1986

European email industry association founded

The European Electronic Mail Association (EEMA) was founded, with an inaugural meeting held Mar. 24, 1987 in Paris, sponsored by the French PTT.

- *Electronic Mail Association Newsletter*, vol. 2, no. 2, p. 2, Jul. 1987.

1987, January

Email usage continues to increase

It was estimated that there are 975,000 users of various commercial email systems.

- Bairstow, J. "The electronic mailbox: As close as your PC," *High Technology*, pp. 16-22, Jan. 1987.

1987, February

Privacy Enhanced Mail provides secure exchange of email

Privacy Enhanced Mail (PEM), a set of message authentication and encryption procedures, was developed by the IAB Privacy Task Force chaired by Steve Kent at BBN. PEM was described in a series of Internet RFCs (*e.g.*, RFC 989). This work was then standardized in a series of RFCs (1421, 1422, 1423, 1424) in February 1993. The standard was never widely adopted, and was ultimately supplanted by the Pretty Good Privacy (PGP) protocol and Secure/Multipurpose Internet Mail Extensions (S/MIME). End-to-end security software for email is still not widely used.

- Linn, J. "Privacy Enhancement for Internet Electronic Mail: Part I: Message Encipherment and Authentication Procedures," RFC 989, Feb. 1987. https://www.rfc-editor.org/info/rfc989 Archived from the original on May 8, 2021.
- Zimmerman, P. *PGP: Source Code and Internals*. MIT Press (MA), June 9, 1995. ISBN 978-0262240390.
- Gurski, M. "Privacy-Enhanced Mail (PEM)," Oct. 24, 1995. https://www.csee.umbc.edu/~woodcock/cmsc482/proj1/pem.html Archived from the original on Feb. 24, 2021.
- Housely, R. "Cryptographic Message Syntax," RFC 2630, June 1999. https://www.rfc-editor.org/info/rfc2630 Archived from the original on Jan. 21, 2022.
- Atkins, D., Stallings, W., and Zimmermann, P. "PGP Message Exchange Formats," RFC 1991, Aug. 1996. https://www.rfc-editor.org/info/rfc1991 Archived from the original on Oct. 20, 2021.

1987, April

Vendors demonstrate international X.400 interconnectivity

Fourteen vendors from 8 countries demonstrated interconnectivity of their electronic mail systems using X.400 at the Hannover Messe trade fair in Germany.

- Wilk, E. S. "X.400 key to international e-mail implementation," *Info. Week*, Jun. 1, 1987.

1987, July

Email provided for the deaf

DEAFNET communication services for hearing-impaired children at 12 schools was funded as a collaboration by the U.S. Dept. of Education, the National Institute of Handicapped Research, and GTE. This continued the work on DEAFNET that Ken Harrenstein, Earl Craighill and David Fylstra at SRI began in 1982, as well as the Visicom effort in Great Britain, a joint project between British Telecom and GTE Telenet.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.
- Kloss, J. "SRI Promotes Computer Networks for the Deaf," SRI Journal, Vol. 3, No. 1, Feb. 1983. IN: Deafnet," http://www.smecc.org/deafnet.htm Archived from the original on Mar. 2, 2021.
- Who is DCI.DEAFNET? "DCI.DEAFNET is a Nationwide Electronic Mail System for the Deaf." Deaf Communications Institute, Framingham, MA. https://www.smecc.org/deafnet/Scan%20deafnet%20who%20is%20dci%20deafnet%20201-208.pdf. Archived from the original on Jan 3, 2020.

1987, July

MCI Mail offers bulletin board service

MCI Mail offered bulletin board service, providing "multiple distribution of email messages" to users for $25/month.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.

1987, July

New DIALCOM service offers "Priority" email

DIALCOM launched a new service called COMMUNICATE! that offered "Priority One email service reaching 17 countries."

- Tucker, S.A. "Electronic mail connections," *Online,* pp. 55-62, Jul. 1987.

1987, September 3-4

Graphical document exchange explored

A workshop was held at CMU to investigate methodologies for exchanging scientific documents other than plain text (that is, including equations, line drawings, scanned images, etc.).

- *Workshop on scientific document interchange*, CMU, Pittsburgh, PA, Sep. 3-4, 1987.

1987, September 20-25

Phishing first described and discussed

While the origin of the term phishing is commonly attributed to America On-Line (AOL), Jerry Felix and Chris Hauck presented a paper at the INTEREX conference in which they discussed a method for a third party to imitate a trusted service, thereby enticing people to provide information that was otherwise "private." Email became the most convenient and prominent vector for phishing attacks.

- Felix, J. and Hauck, C. "System Security: A Hacker's Perspective." IN: *1987 INTEREX HP Business Users Conf. Proc.*, Las Vegas, NV, Sept. 20-25, 1987.
- "Phishing History – The Earliest Phishing Scams," Bright Hub, Aug. 13, 2010. https://www.brighthub.com/internet/security-privacy/articles/82116/ Archived from the original on Jan. 20, 2022.
- "What is Phishing?," Confluence, Mountain View, CA, Apr. 11, 2011. https://wikispaces.psu.edu/pages/viewpage.action?pageId=75829031 Archived from the original on Feb. 3, 2022.

1987, October

DASnet exchanges messages among dissimilar email systems

DASnet (D. A. Systems, Campbell, CA) designed a system that maintained accounts on 18 different email systems and automatically exchanged messages among them.

- Bairstow, J. "E-mail services broaden links to corporate, Telex networks." *PC Week, Connectivity Buyers Guide*, C/46-C/47, Oct. 20, 1987.

1987

Email language translation service offered

GlobalLink offers translation service for short (1-5 page) email documents from/to English, French, German, Spanish, Italian, and Portuguese.

- Tucker, S.A. "Electronic mail connections," *Online*, pp. 55-62, Jul. 1987.

1987

Seven systems dominate the commercial email market

Seven email services dominated the publicly-available electronic mail market in 1987: AT&T Mail, GEISCO Quik-Comm, GTE Telenet Telemail, ITT Dialcom, McDonnell Douglas On-Tyme, MCI Mail, and Western Union Easy Link.

- *1987 Inc. Office Guide*

1987

Email combined with netnews

After earlier GNU Emacs extensions to allow email handling, `GNUS` was created by Masanobu Umeda at Fujitsu Laboratories. Originally a netnews reader, it later enabled the reading and composing of both news and mail. (netnews is a generalized newsgroup mechanism, where users or organizations post messages called articles or posts in one or more categories.) `GNUS` ran within GNU (GNU's Not Unix) Emacs, and was written in the Lisp programming language. The GNU Project is sponsored by the Free Software Foundation.

- "The Gnus Newsreader." https://www.gnu.org/software/emacs/manual/html_node/gnus/ Archived from the original on Aug. 25, 2021.
- "Gnus Network User Services." https://www.gnus.org/ Archived from the original on Jan. 30, 2022.
- "What is GNU?" https://www.gnu.org/ Archived from the original on Feb. 2, 2022.

- "Free Software Foundation." https://www.fsf.org/
  Archived from the original on Feb. 1, 2022.

1988, March

Knowbots created

Corporation for National Research Initiatives (CNRI) developed the notion of active, mobile (moveable) software components which they called Knowbots (Knowledge-Based Object Technology). A Knowbot is an active program capable of operating in its native software environment that performs services for its users. Although a general capability, Knowbots originally were intended to be part of a Digital Library System.

- Kahn, R. and Cerf, V. "Knowbots and their applications," pp. 34-42, IN: *The Digital Library Project, Vol. 1: The World of Knowbots*, *An Open Architecture for a Digital Library System and a Plan for its Development*, unpublished draft, Corp. for Natl. Res. Initiatives, Reston, VA, Mar. 1988.
  https://www.cnri.reston.va.us/kahn-cerf-88.pdf.
  Archived from the original on Jan. 20, 2022.
- See also the entries above for Active message processing (Fall, 1977), and below for General Magic develops Telescript (1990), and OMG (Exchanging messages via remote procedure calls) (Nov. 1991).

1988, April

Commercial mass emailing offered

Business Corporation of America, Fairfax, VA, offered the Zipnet commercial electronic mass mailing service and software. While originally intended for legitimate marketing purposes, many consider mass emailing mechanisms the primary source of spam email today.

- Advertising flyer, Apr. 20, 1988.

1988, April

New version of X.400 standard released

Continuing the evolution of email standards, X.400 version 5.5 was released. It was a complete rewrite of the 1984 standard. By this time, earlier collaboration and liaisons with ISO TC 97 and, later, after it was formed, with ISO/IEC JTC 1, had evolved into a joint development agreement with work and approvals involving committees, working groups, and final review in both bodies. The ITU (CCITT) X.400 Recommendations and the ISO/IEC International Standards (with ISO/IEC 10021 at their core), contain substantially identical text and were published at about the same time.

- *F.400/X.400: Message handling system and service overview*. International Telecommunications Union, Nov. 25, 1988.
  https://www.itu.int/rec/T-REC-F.400-198811-S
  Archived from the original on Feb. 3, 2022.
- Alvestrand, H. "Index to X.400 Web pages." Mod. Oct. 3, 1995.
  https://www.alvestrand.no/x400/index.html.
  Archived from the original on May 13, 2021.

1988, July

IMAP published

Mark Crispin published Internet Message Access Protocol (IMAP), another way to access mail on a server. IMAP can be considered a superset of POP, though very different in intent. POP was entirely about downloading messages, while first-generation IMAP was a kiosk-oriented remote access and use protocol, with the original intent of enabling a "workstation or similar small machine to access electronic mail from a mailbox server."

- Crispin, M. "Interactive Mail Access Protocol, Version 2." Stanford Univ., Stanford, CA, RFC 1064, Jul. 1988. https://www.rfc-editor.org/info/rfc1064 Archived from the original on Dec. 1, 2021.
- Butler, M., *et al*. "Post office protocol – Version 2," USC-ISI, Marina del Rey, CA, RFC 937, Feb. 1988. https://www.rfc-editor.org/info/rfc937 Archived from the original on Oct. 7, 2021.

1988, August

Internet Relay Chat developed

Based on earlier developments, Jarkko Oikarinen, a Finnish college student at the time, developed Internet Relay Chat (IRC), a protocol that facilitates text communication using a client/server model. An IRC Client communicates with chat servers to transfer messages to other clients. While mainly designed for group communication, it also facilitated private, one-on-one messages and file sharing. It was the first inter-platform chat mechanism.

- Oikarinen, J. and Reed, D. "Internet Relay Chat Protocol," Oulu. FI, RFC 1459, May 1993. https://www.rfc-editor.org/info/rfc1459 Archived from the original on Apr. 15, 2021.

1988, September

First Internet trade show opens

Dan Lynch, in cooperation with the Internet Architecture Board (IAB), started a workshop in August 1986 called "Advanced Computing Environments" to teach corporations about the technology behind the Internet. In September 1988, Lynch organized the first Interop trade show to demonstrate equipment from multiple vendors communicating interoperably using TCP/IP. It also provided a marketplace for the government (and others) to buy commercial off-the-shelf (COTS) internet-compatible products. This was the start of the commercialization effort to transition the Internet from government-funded research to the private sector.

- Leiner, B., et al. "Commercialization of the technology," IN: *Brief History of the Internet,* Internet Soc., Reston, VA, 1997. https://www.internetsociety.org/internet/history-internet/brief-history-internet/ Archived from the original on Jan. 27, 2022.
- Savage, M. "Greatest Moments in Interop History," Network Computing, Informa PLC, London, UK, Mar. 19, 2014. https://www.networkcomputing.com/networking/greatest-moments-interop-history. Archived from the original on Jan. 25, 2021.

1988

Eudora email client debuts

Steve Dorner, at University of Illinois, started the development of the Eudora email client. Announced July 3, 1990 in a USENET posting, Eudora was later acquired by Qualcomm in 1992. Until development stopped in 2006, Eudora was the most popular email client on the Internet. Eudora was highly customizable, had fine-grained filtering, sorting within a mailbox, allowed "redirect" of a message in addition to forwarding, and offered capabilities that, for the most part, were unmatched by other contemporary email clients. Originally, Eudora used POP to access mail servers, but when IMAP started getting traction, an effort was made to extend Eudora to include it.

- Dorner, S. "Re: PopMail+GatorBox+MacTCP," subject of an email sent to the mac/Eudora mailing list, Jul 3, 1990. https://groups.google.com/g/comp.archives/c/NgbQu78ODXY/m/foLFQMK0vOMJ. Archived from the original on Feb. 3, 2022.
- "Eudora (email client)," Wikipedia, edited May 28, 2021. https://en.wikipedia.org/wiki/Eudora_(email_client) Archived from the original on Jan. 3, 2022.
- "The history of Eudora," Facebook, Nov. 7, 2017. https://www.facebook.com/The-History-of-Eudora-1589678564387125/ Archived from the original on Feb. 3, 2022.
- Gedney, C. *Eudora*, University of Illinois, Mar. 20, 1991. The manual for version 1.2 of Eudora.
- Gedney, C., Dorner, S., Sadil, K., and Durbin, R. *Eudora by Qualcomm*, QUALCOMM Inc., Aug. 1993. The manual for version 2.0 of Eudora, Sept. 1993.

1988

National Research and Education Network formed

A national research and education network (NREN) started, with the purpose of supporting the needs of the research and education communities within a state or country. Each NREN is a specialized internet service provider.

- Kleinrock, L. "Toward a National Research Network," National Academies Press, Washington, DC, 1988. https://vdoc.pub/download/toward-a-national-research-network-7rnm7ad3kn10. Archived from the original on Mar. 1, 2022.

1989, February

First email link made to the USSR

San Francisco/Moscow Teleport Inc. established a commercial dedicated electronic mail link with the Institute for Automated Systems of the Soviet Union.

- Berniker, M. D. "How to write your comrade - electronically," *San Jose Mercury News*, p. 4D, Feb. 26, 1989.

1989, March

World Wide Web proposed

Tim Berners-Lee presented a proposal to the management at Conseil Européen pour la Recherche Nucléaire (CERN) for a system that eventually became known as the World Wide Web (WWW or the Web). The first browser and website went live on December 30, 1990.

- "History of the Web", World Wide Web Foundation, https://webfoundation.org/about/vision/history-of-the-web/. Archived from the original on May 1, 2021.
- "World Wide Web," Wikipedia, edited Apr. 21, 2021. https://en.wikipedia.org/wiki/World_Wide_Web Archived from the original on Apr. 30, 2021.

1989, July

Email usage continues to grow unabated

It was estimated there are 15 million email users shortly before the U.S. government-sponsored Internet went commercial.

- "X-400: Breaking vendor boundaries for enterprise-wide e-mail," *Data Communications*, p. 47, Jul. 1989.

1989, mid

CompuServe and MCI Mail connect to the Internet

CompuServe and MCI Mail connected their email services to the Internet mid-year, with CompuServe's service beginning on July 14, 1989.

- "Mail Access to CompuServe," Posting by Karl Kleinpaste who posted simultaneously to Usenet group `comp.mail.misc`, and info-nets@think.com. July 14, 1989. https://groups.google.com/g/comp.mail.misc/c/uP16AJShjvQ/m/ix8_EmcdpicJ Archived from the original on Feb. 3, 2022.
- Yvonne, L. "Compuserve, MCI Mail introduces gateways to internet network," *InfoWorld*, vol. 11, no. 39, p. 32, Sep. 25, 1989.
- Cerf, V. Private communication. Oct. 28, 2021.
- "The First Gateways Between Private E-Mail Carriers and the Internet, Compuserve and MCI, are Established." Jerry Norman's HistoryofInformation.com, 1989. https://historyofinformation.com/detail.php?id=1020 Archived from the original on Feb. 3, 2022.

1989, October

Requirements for Internet host software, including email, are defined

Bob Braden at USC-ISI defined and discussed the requirements for Internet host software in RFC1123. Section 5 discussed RFC 822-based email and the interaction of email clients with SMTP, with major contributions by Craig Partridge and John Klensin.

- Braden, R., ed. "Requirements for Internet Hosts - Application and Support," USC-ISI, Marina del Rey, CA, RFC 1123, Oct. 1989. https://www.rfc-editor.org/info/rfc1123. Archived from the original on Dec. 1, 2021.

1989, October

AOL: "Welcome! You've got mail."

AOL, which can be traced back to 1985 and earlier, became a commercial service in October 1989, and its users heard "Welcome! You've got mail." for the first time.

- Clabaugh, J. "AOL marks 25th anniversary." Washington Business Journal, May 24, 2010. https://www.bizjournals.com/washington/stories/2010/05/24/daily9.html Archived from the original on June 30, 2018.
- "America Online AOL dial up sounds with 'Welcome, You've Got Mail' and more!," YouTube, Feb. 17, 2014. https://www.youtube.com/watch?v=x5L37RrODtA Archived from the original on Nov. 21, 2020.

1989, November

"The World" is the first commercial service provider to provide a direct connection to the Internet

STD, Inc. (doing business as Software Tool and Die) was incorporated on March 21, 1989 by Barry Shein. Their service, The World, provided access to the Internet for their dial-up users, as well as software services, such as email.

- "History of the World - Our version," @TheWorld, edited Jul. 31, 2010. https://theworld.com/world/about/history/our_version Archived from the original on Jan. 25, 2022.

1990, February

Email directory service group meets

Western Union convened a meeting to develop email directories based on the X.500 protocol. Representatives of AT&T, Sprint International, GE Information Services, MCI Communications Corp., Pacific Bell, IBM Information Network and others participated.

- Booker, E. "Email directories: One step at a time." *Computerworld*, vol. 24, no. 8, pp. 57-60, Feb. 19, 1990. https://books.google.com/books?id=pkvc05wLmkAC Archived from the original on Feb. 3, 2022.

1990

General Magic develops Telescript

Started at Apple in 1989, and later spun out, General Magic developed Telescript, a programming language and interpreter that enabled programs on one machine to be transmitted to and executed on another. General Magic's aim was to develop a pocket communicator (what today we would think of as a smartphone) with email, address book, calendar, phone, etc. They succeeded in accomplishing much of their goal and announced their first product in February 1993.

- Levy, S. "Bill and Andy's Excellent Adventure II," *Wired*, Apr. 1, 1994. https://www.wired.com/1994/04/general-magic/ Archived from the original on Jan. 12, 2022.
- Charles, A. "Black hat, white rabbit," *New Scientist*, Apr. 16, 1994. https://www.newscientist.com/article/mg14219217-300-black-hat-white-rabbit/ Archived from the original on Dec. 5, 2020.
- Braswell, S. "The magical Apple spin-off that almost invented the iPhone … in 1993," Jun. 26, 2017. https://www.ozy.com/true-and-stories/the-magical-apple-spinoff-that-almost-invented-the-iphone-in-1993/40708/ Archived from the original on Oct. 4, 2021.
- White, J. "Telescript technology: Mobile agents," General Magic, Mountain View, CA, White Paper, 1996. http://www.datarover.com/Telescript/Whitepapers/wp4/whitepaper-4.html Archived from the original on June 24, 2021.
- Kerruish, S, Key, J., et al. "General Magic." Spotlight Productions, 2018. See https://www.imdb.com/title/tt6849786/?ref_=ttfc_fc_tt (archived from the original on Feb. 3, 2022) for additional information about this documentary.
- See also the entries above/below for Active message processing (Fall, 1977), Knowbots created (Mar. 1988), and OMG (Exchanging messages via remote procedure calls) (Nov. 1991).

1991, June 6

PGP adds encryption to email

Philip Zimmerman created Pretty Good Privacy (PGP), an encryption mechanism used for signing, encrypting and decrypting email, among other things. It was publicly released on June 6, 1991.

- Zimmerman, P. "Why I wrote PGP," IN: *PGP User's Guide,* 1991. https://www.philzimmermann.com/EN/essays/WhyIWrotePGP.html Archived from the original on Feb. 1, 2022.
- Zimmerman, P. "PGP Marks 30th Anniversary," June 6, 2021. https://philzimmermann.com/EN/essays/PGP_30th/ Archived from the original on Jan. 2, 2022.

1991, November

Exchanging messages via remote procedure calls

The Object Management Group (OMG) vendor consortium released software that enabled object-oriented applications to exchange messages or invoke procedures on other machines via remote procedure calls (RPC).

- "OMG unveils key tool for distributed applications," *Network World*, vol. 8, no. 44, p. 6+, Nov. 4, 1991.
- See also the entries above for Active message processing (Fall, 1977), Knowbots created (Mar. 1988), and General Magic develops Telescript (1990).

1991, December 9

Commercial use of the Internet permitted

The High-Performance Computing Act of 1991, introduced in the U.S. Senate by Sen. Albert (Al) Gore, became law. It allowed for phasing out federal support for non-government Internet backbones, and encouraged commercial entities to set up their own backbones. The backbone operators created the Central Internet Exchange to interconnect their backbones and directly exchange traffic. The Internet then started carrying commercial traffic, which enabled Internet Service Providers (ISPs) to finally offer email and other services to the public.

- "Internet History::NSFNET." https://www.cybertelecom.org/notes/nsfnet.htm. Archived from the original on Jan. 21, 2022. Derived from: Werbach, K. *Digital Tornado: The Internet and Telecommunications Policy*, FCC, Washington, DC, Office of Plans and Policy, Working Paper No. 29, p. 13, Mar. 1997. https://www.fcc.gov/reports-research/working-papers/digital-tornado-internet-and-telecommunications-policy. Archived from the original on Jan. 19, 2022.
- *S.272 – High-Performance Computing Act of 1991*, Bill introduced by Sen. Albert Gore, U.S, Senate, Commerce, Sci., and Transportation Committee, Jan. 24, 1991. https://www.congress.gov/bill/102nd-congress/senate-bill/272 Archived from the original on Aug. 21, 2021.
- Internet History 1962 to 1992, Computer History Museum, Mountain View, CA. https://www.computerhistory.org/internethistory/1990s/ Archived from the original on Jan. 21, 2022.

1992, June

MIME specified. What's in the body of email?

An Internet Engineering Task Force (IETF) working group chaired by Nathaniel Borenstein and Ned Freed developed Multipurpose Internet Mail Extensions (MIME) to describe the structure of mail message bodies. MIME drew a lot of inspiration from the Andrew Messaging System, a collaboration between IBM and CMU, which had gone into use at CMU around 1986. Originally started largely to do non-ASCII and multiple language email, it grew to include multimedia, and eventually HTML-based email.

- RFCs 1341, 1343, 1344, and subsequent modifications and extensions, now specified by RFCs 2045, 2045, 2047, 4288, 4289, 2049. These are available at https://www.rfc-editor.org/. See also: "MIME," Wikipedia, edited Jan. 15, 2022. https://en.wikipedia.org/wiki/MIME Archived from the original on Feb. 1, 2022.
- Partridge, C. "The Technical Development of Internet Email," *IEEE Annals of the History of Computing*, vol. 30, no. 2, pp. 3-29, Apr.-Jun. 2008. https://www.computer.org/csdl/magazine/an/2008/02/man2008020003/13rRUx0xPuR
- Smith, E. "New Emails, Old Tech," Tedium, Jun. 25, 2019. https://tedium.co/2019/06/25/html-email-limitations-design/ Archived from the original on Jan. 11, 2022.

1992, November 24

First email sent to Antarctica

A real-time video link using data networking was established that enabled email and other traffic to reach Antarctica's McMurdo Station.

- Leon, M. "Establishing a real-time video link to Antarctica," *IEEE Network*, Vol. 9, Issue 2, pp. 8-15, Mar.-Apr. 1995.
- Kaspar, P. "Communications system installed at South Pole," *Info. Systems Newsletter*, NASA Sci. Internet, Mountain View, CA, pp. 19-20, May 1994.

1992, December 3

First SMS message sent

Short Message Service (SMS), proposed in 1985, became operational, enabling mobile phone users to send each other short text messages.

- "Hppy bthdy txt!," BBC News, World ed., Tues., Dec. 3, 2002. http://news.bbc.co.uk/2/hi/uk_news/2538083.stm Archived from the original on May 17, 2021.

1993, February

SMTP extended to support optional features, types of mail, and other capabilities

RFCs 1425, 1426 and 1427 were published, providing SMTP with mechanisms by which servers could announce extended features for which they had support and clients could then indicate which features they were using and optionally supply parameters to them. These mechanisms provided the foundation for subsequent important development of, for example, delivery service notifications, 8-bit character transport without requiring encoding into an ASCII-compatible form, negotiation of maximum message sizes between server and client (so that messages that are too large need not be transmitted to find that out), encrypted transmission of messages, and use of email addresses containing non-ASCII characters. Other extensions followed that were eventually incorporated into the SMTP specification. The extensions are noted in registries maintained by the Internet Assigned Numbers Authority (IANA).

- Klensin, J. et al. "SMTP Service Extensions," RFC 1425, Feb. 1993. https://www.rfc-editor.org/info/rfc1425. Archived from the original on Oct. 21, 2021.
- Klensin, J. et al. "SMTP Service Extension for 8bit-MIMEtransport," RFC 1426, Feb. 1993. https://www.rfc-editor.org/info/rfc1426 Archived from the original on May 15, 2021.
- Klensin, J., Freed, N., and Moore, K. "SMTP Service Extension for Message Size Declaration," RFC 1427, Feb. 1993. https://www.rfc-editor.org/info/rfc1427 Archived from the original on Apr. 16, 2021.
- Hoffman, P. "SMTP Service Extension for Secure SMTP over TLS," RFC 2487, Jan. 1999. https://www.rfc-editor.org/info/rfc2487 Archived from the original on Oct. 28, 2021.

- "Mail Parameters," Internet Assigned Number Authority registry of SMTP Service Extensions. https://www.iana.org/assignments/mail-parameters/mail-parameters.xhtml. Archived from the original on Jan. 30, 2022.

1994, early

Internet connectivity established between the National Aeronautics and Space Administration (NASA) and Russia

The Russian Institute for Space Research (IKI) in Moscow became an operational NASA Science Internet hub providing Internet connectivity between NASA scientists and their Russian colleagues. The effort began in January 1993.

- Kaspar, P. "Connection to Russia opened," *Information Systems Newsletter*, NASA Sci. Internet, Mountain View, CA, pp. 18-19, May 1994.

1994, March 9

First web-based email system demonstrated

Phillip Hallam-Baker of the CERN Programming Techniques Group (PTG) announced the alpha testing of the PTG MAIL-DAEMON server. The Mail Server Daemon enabled a user to access mail on a remote host via the World Wide Web. This was a demo and was never released.

- Hallam-Baker, P. The original announcement "Announcing alpha test of PTG MAIL-DAEMON server" is archived on https://groups.google.com/g/comp.archives/c/vpWqUAmg8xU Archived from the original on Feb. 3, 2022.

1994, October 20

Whitehouse.gov launched

President Bill Clinton and Vice President Al Gore opened a new web page for the White House in the United States. It included personal email addresses for the President, Vice President, and their spouses.

- "Frequently Asked Questions." https://clintonwhitehouse4.archives.gov/textonly/WH/html/faq.html Archived from the original on Mar. 19, 2021.

1994, November

Web-based social networking starts with the founding of Geocities

While computer-mediated communication had been available in many forms on the ARPANET and Internet (*e.g.*, bulletin board services and usenet), social networking on the Web began as generalized online communities. There are many examples, but perhaps Geocities, founded in November 1994 by David Bohnett and John Rezner, is the earliest. Many others followed, including Friendster, Myspace, LinkedIn and Facebook (in 2004). Many eventually enabled users to communicate (*e.g.*, Facebook Messenger and LinkedIn Messaging) with interfaces to email.

- Edwards, B. "Remembering GeoCities, the 1990s Precursor to Social Media." How-To Geek, Oct. 3, 2020. https://www.howtogeek.com/692445/remembering-geocities-the-1990s-precursor-to-social-media/ Archived from the original on Jan. 18, 2022.
- "Social networking service," Wikipedia, edited Jan. 23, 2021. https://en.wikipedia.org/wiki/Social_networking_service Archived from the original on Feb. 1, 2022.
- "Facebook Messenger," Wikipedia, edited Jan. 13, 2021. https://en.wikipedia.org/wiki/Facebook_Messenger Archived from the original on Feb. 1, 2022.
- "LinkedIn Messaging - Overview," LinkedIn, Corp., Mountain View, CA, Jul. 4, 2018. https://www.linkedin.com/help/linkedin/answer/61106/linkedin-messaging-overview?lang=en. Archived from the original on July 18, 2021.

1994

First dial-up access to the World Wide Web

Prodigy was the first dial-up service to provide access to the World Wide Web for its subscribers. It also offered web page hosting to its members.

- Farquhar, D. "What happened to Prodigy Internet," The Silicon Underground, https://dfarq.homeip.net/what-happened-to-prodigy-internet/. Archived from the original on May 11, 2021.
- "Prodigy (Online Service)," Wikipedia, edited Dec. 16, 2020. https://en.wikipedia.org/wiki/Prodigy_%28online_service%29 Archived from the original on Jan. 24, 2022.

1995, September 26

First commercial webmail offered

cc:Mail, a web-based email program, was introduced in 1994 by Bill Fisher at Lotus; it became a commercial product in the Fall of 1995. While only cc:Mail users could access their mail via the Web in this way, Hotmail and RocketMail followed it quickly in 1996.

- Timmins, A. "Lotus readies cc:Mail-Web hooks," *Network World*, vol. 12, no. 36, pp. 1 and 55, Sep. 4, 1995. https://books.google.com/books?id=lA8EAAAAMBAJ&pg=PA1#v=onepage&q&f=false.
- Davis, J. "cc:Mail users will get E-mail through the Web," *Infoworld*, vol. 17, no. 40, p. 12, Oct. 2, 1995. https://books.google.com/books?id=XDoEAAAAMBAJ&pg=PA12#v=onepage&q&f=false.

1995

Automatic email filtering and sorting developed to help with information overload

Jonathan Helfman at AT&T Bell Laboratories and Charles Lee Isbell at MIT developed Ishmail, a program that sorted email messages into mailboxes, and ordered mailboxes by a combination of user-specified priorities and alarms. It was intended to help users manage massive amounts of email; those that are suffering from "information overload."

However, sorting messages within a mailbox had been available in Eudora since at least March 1991 and filtering since Sept. 1993, and in elm since about 1987.

- Helfman, J. and Isbell, C. "Ishmail: Immediate Identification of Important Information," AT&T Bell Laboratories, 1995. https://www.researchgate.net/publication/2356798_Ishmail_Immediate_Identification_of_Important_Information. Archived from the original on Feb. 3, 2022.
- Isbell, C., Amento, B., Bell, G., and Helfman, J. *Ishmail: Managing Massive Amounts of Mail*, 1996. https://www.academia.edu/19856490/Ishmail_Managing_massive_amounts_of_mail. Archived from the original on Feb. 3, 2022.
- Gedney, C. *Eudora*, University of Illinois, Mar. 20, 1991. The manual for version 1.2 of Eudora.
- Gedney, C., Dorner, S., Sadil, K., and Durbin, R. *Eudora by Qualcomm*, QUALCOMM Inc., Aug. 1993. The manual for version 2.0 of Eudora, Sept. 1993.
- Taylor, D. "autoreplying to mail with 'filter'." https://groups.google.com/g/comp.mail.elm/c/Bk6j7qbMg2Y/m/jFSytJky-b0J Archived from the original on Feb. 3, 2022.

1996, January

Delivery and reading confirmation specified

The SMTP specification was extended to include facilities for more extensive Delivery Status Notifications and Message Disposition Notifications than was provided in RFC 821.

- Moore, K. "SMTP Service Extension for Delivery Status Notifications," Univ. Tennessee, Knoxville, TN, RFC 1891, Jan. 1996. https://www.rfc-editor.org/info/rfc1891. Archived from the original on Oct. 26, 2021.
- Vaudreuil, G. "Enhanced Mail System Status Codes," Octel Network Services, RFC 1893, Jan. 1996. https://www.rfc-editor.org/info/rfc1893 Archived from the original on Oct. 28, 2021.
- Moore, K., and Vaudreuil, G. "An Extensible Message Format for Delivery Status Notifications," Univ. Tennessee and Octel Network Services, RFC 1894, Jan. 1996. https://www.rfc-editor.org/info/rfc1894 Archived from the original on Mar. 9, 2021.

1996, April

Email overload recognized

The term "email overload" is used by Steve Whittaker and Candy Sidner of Lotus Development Corp. "…to describe the use of email for functions that it wasn't designed for." It has come to be used to describe (as Milos Vacek states) "…when users are hardly capable of managing all of their incoming messages and consequently their regular work."

- Whittaker, S. and Sidner, C. "Email Overload: Exploring Personal Information Management of Email." IN: *Proceedings of CHI '96*, Vancouver, British

Columbia, Canada. 13–18. pp. 276-283.
https://www.researchgate.net/publication/221519353_Email_Overload_Exploring_Personal_Information_Management_of_Email
Archived from the original on Feb. 3, 2022.

- Vacek, M. "Email Overload: Causes, Consequences and the Future." IN: *International Journal of Computer Theory and Engineering*. Vol. 6, pp. 170-176. Jan. 2014.
https://www.researchgate.net/publication/269757650_Email_Overload_Causes_Consequences_and_the_Future. Archived from the original on Feb. 3, 2022.
- The SaneBox Gang. "Email Overload: Research and Statistics." The SaneBox blog. Posted Feb. 18, 2016.
https://blog.sanebox.com/2016/02/18/email-overload-research-statistics-sanebox/
Archived from the original on Feb. 1, 2022.
- Helfman, J. and Isbell, C. "Ishmail: Immediate Identification of Important Information," AT&T Bell Laboratories, 1995.
https://www.researchgate.net/publication/2356798_Ishmail_Immediate_Identification_of_Important_Information. Archived from the original on Feb. 3, 2022.
- Dredze, M. *Intelligent email: Aiding users with AI*. Ph.D. Dissertation, University of Pennsylvania, Philadelphia, PA. Jan. 1, 2009.
https://www.academia.edu/2809744/Intelligent_email_Aiding_users_with_AI
Archived from the original on Feb. 3, 2022.

1996, August

First mobile device with email and browsing

The Nokia 9000 Communicator, one of the earliest smartphones, is introduced to the market. It was the first such device to offer email and web browsing in a single device.

- Smith, E. *The Other Windows*, Tedium, Jun. 20, 2019.
https://tedium.co/2019/06/20/geoworks-geos-history/
Archived from the original on Jan. 5, 2022.

1996, August

Juno offers free email service

Founded in May, 1996 by Charles Ardai, Brian Marsh, and Clifford Tse, Juno initiated a free email service in August, 1996. Juno offered a dial-up application, supported by advertising, that was somewhere between AOL and the free net model that was failing at the time in the marketplace. Juno's email service limited messages to 35kB and did not allow attachments.

- "Juno Online Services, Inc. - Company Profile, Information, Business Description, History, Background Information on Juno Online Services, Inc.," Juno Online Services. Inc., New York, NY., © 2021 Advameg, Inc.
http://www.referenceforbusiness.com/history2/21/Juno-Online-Services-Inc.html
Archived from the original on Sept. 21, 2015.
- Smith, E. "Nothing But Net (And Ads)," Tedium, Aug. 7, 2018.
https://tedium.co/2018/08/07/juno-netzero-free-dialup-internet-history/
Archived from the original on Sept. 29, 2021.

- Juno website: https://www.juno.com/. Archived from the original on Dec. 31, 2021.

1996

Growth of email continues

It was reported that there were 16 million email users at the end of 1995.

- "Internet Growth Statistics," World 2021 Stats, Apr. 19, 2021. http://www.internetworldstats.com/emarketing.htm Archived from the original on Apr. 29, 2021.

1996

The Telecommunications Act of 1996 overhauls regulation of telecommunications in the United States for the first time since 1934

The Telecommunications Act of 1996 greatly revised the Communications Act of 1934 to include many new forms of communication. This was the first major overhaul of U.S. telecommunications law in over 60 years.

- *Telecommunications Act of 1996*, FCC, Washington, D.C., 1996. https://www.fcc.gov/general/telecommunications-act-1996 Archived from the original on Jan. 19, 2022.

1997, July 11

Pictures are sent by cell phone

Phillipe Kahn inaugurated transmission of photos by cell phone, sending a picture of his newborn daughter to over 2,000 people across the world.

- "The Big Picture," *Wired*, Oct. 1, 2000. https://www.wired.com/2000/10/kahn/ Archived from the original on Sept. 13, 2021.
- Maney, K. "Baby's arrival inspires birth of cellphone camera - and societal evolution," *USA Today*, Jan. 23, 2007. https://usatoday30.usatoday.com/tech/columnist/kevinmaney/2007-01-23-kahn-cellphone-camera_x.htm. Archived from the original on Jan. 21, 2022.

1998, December 18

Email popularized by Hollywood

The movie "You've Got Mail" was released on December 18, 1998. It's a romantic comedy, and much of the communication between the leads in the movie was done using AOL's email, further popularizing email as a mainstream communication method.

- *You've Got Mail (the movie),* 1998. https://www.imdb.com/title/tt0128853/ Archived from the original on Dec. 31, 2021.
- King, S. "'You've Got Mail': Good News for Warner," IN: Weekend Box Office, Los Angeles Times, Dec. 22, 1998. https://web.archive.org/web/20210226225343/https://www.latimes.com/archives/la-xpm-1998-dec-22-ca-56365-story.html
- Fahri, P. "AOL gets its message out in 'Mail'," Washington Post, Dec. 17, 1998. https://www.washingtonpost.com/wp-srv/style/movies/features/aolinmail.htm Archived from the original on Jan. 21, 2022.

1998, December

Message Submission Servers specified

The needs of mail servers that work directly with users and mail user agents (MUA) are different from those of SMTP servers in the middle of the network. The former is re-specified as Message Submission Servers. This necessitated the creation of the terms message submission agent (MSA) and mail transfer agent (MTA), as well as mail user agent.

- Gellens, R., and Klensin, J. "Message Submission," RFC 2476, Dec. 1998. https://www.rfc-editor.org/info/rfc2476.
  Archived from the original on May 18, 2021.

1998

PDAs include an email client for the first time

Symbian released an operating system for Personal Digital Assistants (PDAs) and, later, mobile phones, that included an email client.

- "Symbian," Wikipedia, edited Mar. 30, 2021
  https://en.wikipedia.org/wiki/Symbian.
  Archived from the original on Jan. 29, 2022.
- Lomas, N. "A Look Back On Symbian On The Eve Of Its Demise," TechCrunch, Jun. 13, 2013. https://techcrunch.com/2013/06/13/rip-symbian/
  Archived from the original on Jan. 3, 2021.

1999, January 19

First PDA to include email released

Research in Motion released the BlackBerry 850 "email pager" on January 19, 1999. It was the first popular handheld device to integrate email.

- "BlackBerry," Wikipedia, edited Apr. 16, 2021.
  https://en.wikipedia.org/wiki/BlackBerry.
  Archived from the original on Jan. 30, 2022.
- "A history of BlackBerry in nine iconic handsets (and one 'meh' tablet): Photos," ZDnet, Jan. 23, 2013. http://www.zdnet.com/pictures/a-history-of-blackberry-in-nine-iconic-handsets-and-one-meh-tablet-photos/
  Archived from the original on Jan. 8, 2022.

1999, June

S/MIME published

RFC 2630 which became Secure/Multipurpose Internet Mail Extensions (S/MIME) was published. S/MIME documented a Cryptographic Message Syntax that could be used to digitally sign, digest, authenticate, or encrypt arbitrary messages. The actual S/MIME standard for public-key encryption and signing of MIME data was later documented in RFCs 3369, 3370, 3850 and 3851 published in August 2002.

- Housley, R. "Cryptographic Message Syntax," Spyrus, Herndon, VA, RFC 2630, Jun. 1999. https://www.rfc-editor.org/info/rfc2630
  Archived from the original on Jan. 21, 2022.

1999, September 1

Email-only appliance released

The Cidco MailStation was released in 1999. It was a standalone portable email appliance that had to be connected to a phone line. It was directed toward individuals wanted email but who did not want a computer or PDA. Originally sold by Amazon, it was also marketed by Earthlink as the Mivo 100. Earthlink terminated support of the Mivo devices prior to November, 2010.

- "PC-Free Email," PC Magazine, vol. 18, no. 15, p. 64, Sep. 1, 1999. https://books.google.com/books?id=cr7PRid0y5UC&pg=PA64 - v=onepage&q&f=false
- Smith, E. "The Email Appliance," Tedium, Jan. 21, 2020. https://tedium.co/2020/01/21/cidco-mailstation-history/ Archived from the original on Sept. 28, 2021.
- "Mailstation FAQ," Earthlink Support Center, EarthLink, Inc., Atlanta, GA, © 2011. https://web.archive.org/web/20110707020410/http://support.earthlink.net/articles/email/mailstation-faq-noimages.php

2000, April

Windows Mobile gets email

The Pocket PC was launched, running Microsoft Windows CE. In 2003, the mobile version of CE was renamed Windows Mobile. It came bundled with a variety of software, including a mobile version of Microsoft Outlook.

- "A Brief History of Pocket PC and Windows Mobile." IN: "The History of Pocket PC and Windows Mobile Platforms. With Promo coupon codes," Jan. 4, 2021. https://pocketpcmag.com/. Archived from the original on Jan. 30, 2022.
- "Pocket PC," Wikipedia, edited Jan. 23, 2021. https://en.wikipedia.org/wiki/Pocket_PC Archived from the original on Jan. 21, 2022.

2001, January

Email filtering standardization specified

The standardization of a language "that can be used to create filters for electronic mail" is started with the publication of RFC 3028.

- Showalter, T. "Sieve: A Mail Filtering Language," Mirapoint Inc., RFC 3028, Jan. 2001. https://www.rfc-editor.org/info/rfc3028 Archived from the original on Mar. 8, 2021.

2001, January 11

First email trade association succumbs

After 18 years, the Electronic Mail Association (EMA), which was devoted to promoting messaging technologies, was folded into The Open Group.

- "Electronic Messaging Association (EMA) Forum." The Open Group. 11 Jan. 2001. http://archive.opengroup.org/public/member/q101/ema_outline.htm Archived from the original on Oct. 25, 2016.
- "EMA." *The Free Dictionary*. https://encyclopedia2.thefreedictionary.com/Electronic+Mail+Association Archived from the original on Sept. 20, 2020.

2003, March

Domain names extended to allow the use of characters outside the ASCII repertoire

Because modern email addresses often utilize people's names, there was considerable interest in allowing addresses to reflect domain names that were not normally written in simple Latin-script characters. This started the work to encode non-ASCII characters in addresses.

- Falstrom, P., Hoffman, P., and Costello, A. "Internationalizing Domain Names in Applications (IDNA)," RFC 3490, March 2003. https://www.rfc-editor.org/info/rfc3490. Archived from the original on Oct. 26, 2021.
- Hoffman, P. and Blanchet, M. "Nameprep: A Stringprep Profile for Internationalized Domain Names (IDN)," RFC 3491, March 2003. https://www.rfc-editor.org/info/rfc3491 Archived from the original on Oct. 26, 2021.

2001, April

SMTP and the Internet Message Format continue to evolve

John Klensin, then of AT&T Laboratories, updated and clarified SMTP in RFC 2821. This RFC obsoleted RFCS 821, 974, and 1869 and updated the mail transport aspects of RFC 1123. It folded in the SMTP extension mechanism of RFC 821, but did not change the domain name system requirements called out in RFCs 974 and 1035. Similarly, Pete Resnick of Qualcomm, Inc. updated the Internet Message Format standard in RFC 2822, which obsoleted RFC 822, "updating it to reflect current practice and incorporating incremental changes that were specified in other RFCs."

- Klensin, J. "Simple Mail Transfer Protocol," AT&T Labs., RFC 2821, Apr. 2001. https://www.rfc-editor.org/info/rfc2821 Archived from the original on Jan. 19, 2022.
- Resnick, P. "Internet Message Format," Qualcomm, Inc., San Diego, CA, RFC 2822, Apr. 2001. https://www.rfc-editor.org/info/rfc2822 Archived from the original on Jan. 27, 2022.

2003, August

Skype created

Skype was created in Luxembourg by Janus Friis of Denmark and Niklas Zennström of Sweden. Skype is a peer-to-peer instant messaging and video conferencing application that uses the Internet as its transmission medium. Calls to landline or mobile phones were also possible, but emergency phone calls (*e.g.*, to 911 in the U.S.) were not. eBay acquired Skype in 2005, and then Microsoft acquired Skype in 2011.

- "About Skype." © Microsoft, 2021. https://web.archive.org/web/20220127052303/https:/www.skype.com/en/about/
- "Skype Technologies," Wikipedia, edited Jan. 7, 2021. https://en.wikipedia.org/wiki/Skype_Technologies Archived from the original on Jan. 25, 2022.
- "Skype," Wikipedia, edited Jan. 16, 2021. https://en.wikipedia.org/wiki/Skype. Archived from the original on Jan. 21, 2022.

2004, April 1

Gmail introduced with large storage capacity

Developed by Paul Buchheit, Google initially introduced Gmail as beta software, providing 1GB of storage to each user at no cost. At the time, that was orders of magnitude more than other service providers. Gmail became enormously popular because of its permanent archive of all email as well as the amount of storage provided.

- McCracken, H. "How Gmail Happened: The Inside Story of Its Launch 10 Years Ago," Time, Time USA, Apr. 1, 2014. http://time.com/43263/gmail-10th-anniversary/ Archived from the original on Jan. 17, 2022.

2004, June

First attempt to authenticate Internet mail senders initiated

In an attempt to stop email spoofing, several efforts were made to facilitate email authentication. The first was DomainKeys, currently referred to as DomainKeys Identified Mail (DKIM): "Domain-Based Email Authentication Using Public Keys Advertised in the Domain Name System (DNS)." It was published in 2007 as RFC 4870, although the work started in 2004, and has been updated several times since then. Subsequent efforts included Sender ID (starting with RFC 4406 in April 2006), Sender Policy Framework (SPF, starting with RFC 4408 also in April 2006), and "Domain-Based Message Authentication, Reporting, and Conformance (DMARC)" (RFC 7489 in March 2015).

- Delany, M. "Domain-Based Email Authentication Using Public Keys. Advertised in the DNS (DomainKeys)," Yahoo, Inc., Sunnyvale, CA., RFC 4870, May 2007. https://www.rfc-editor.org/info/rfc4870. Archived from the original on Dec. 14, 2021.
- Lyon, J. and Wong, M. "Sender ID: Authenticating E-Mail," Microsoft Corp., Redmond, WA, RFC 4406, Apr. 2006. https://www.rfc-editor.org/info/rfc4406 Archived from the original on Jan. 20, 2022.
- Wong, M. and Schlitt, W. "Sender Policy Framework (SPF) for Authorizing Use of Domains in E-mail, Version 1," Singapore and Lincoln, NE, RFC 4408, Apr. 2006. https://www.rfc-editor.org/info/rfc4408 Archived from the original on Jan. 20, 2022.
- Kucherawy, M. and Zwicky, E., eds. "Domain-based Message Authentication, Reporting, and Conformance (DMARC)," Yahoo, Inc., Sunnyvale, CA, RFC 7489, Mar. 2015. https://www.rfc-editor.org/info/rfc7489 Archived from the original on Jan. 19, 2022.

- "Email spoofing," Wikipedia, edited Oct. 31, 2021. https://en.wikipedia.org/wiki/Email_spoofing Archived from the original on Jan. 24, 2022.

2006, July

Twitter launched

Twitter is an online microblogging, news, and social networking service where users post and interact with short messages called "tweets." Tweets were originally restricted to 140 characters in the manner of cell phone SMS messages. Twitter was created in March, 2006, and launched that July. It started as the podcasting platform Odeo founded by Evan Williams and Noah Glass in 2005.

- Myer, J. "History of Twitter: Jack Dorsey and The Social Media Giant," TheStreet, Jan. 2, 2020. https://www.thestreet.com/technology/history-of-twitter-facts-what-s-happening-in-2019-14995056. Archived from the original on Feb. 2, 2021.
- Carlson, N. "The Real History of Twitter," Business Insider, Apr. 13, 2011. https://www.businessinsider.com/how-twitter-was-founded-2011-4 Archived from the original on Jan. 20, 2022.
- The Editors of Encyclopedia Britannica. "Twitter: microblogging service," Britannica, updated Oct. 22, 2020. https://www.britannica.com/topic/Twitter Archived from the original on Jan. 24, 2022.

2006, October 11

Qualcomm announces that future versions of Eudora will be based on Mozilla Thunderbird

Qualcomm and the Mozilla Foundation announced that future versions of Eudora would be based on the Mozilla Thunderbird platform and would be open source. Dubbed "Penelope," this new version was an extension of Thunderbird with the Eudora user interface that many of Eudora's users had grown to know and love.

- "QUALCOMM launches project in collaboration with Mozilla Foundation to develop open source version of Eudora email program," press release, Mozilla Press Center, Oct. 11, 2006. https://blog.mozilla.org/press/2006/10/qualcomm-launches-project-in-collaboration-with-mozilla-foundation-to-develop-open-source-version-of-eudora-email-program/. Archived from the original on June 12, 2021.
- "Qualcomm Launches Project in Collaboration with Mozilla Foundation to Develop Open Source Version of Eudora Email Program," press release, Qualcomm, San Diego, CA., Oct. 11, 2006. https://www.qualcomm.com/news/releases/2006/10/11/qualcomm-launches-project-collaboration-mozilla-foundation-develop-open Archived from the original on Apr. 11, 2021.

2007, June 29

Apple introduces the iPhone which includes email

Steve Jobs announced the iPhone on January 9, 2007 during his keynote at the MacWorld conference in San Francisco. Apple started selling the iPhone on June 29, 2007. It was

the first true smartphone, and included Internet email and SMS texting applications, web browsing, and music player.

- Steve Jobs iPhone 2007 Presentation. https://www.youtube.com/watch?v=vN4U5FqrOdQ Archived from the original on Jan. 29, 2022.
- Miles, S. "Apple iPhone history: Look how much the iPhone has changed." Pocket-lint, Oct. 21, 2020. https://www.pocket-lint.com/phones/news/apple/135231-the-apple-iphone-is-10-years-old-look-how-much-the-iphone-has-changed Archived from the original on Jan. 31, 2022.

2008, April

Facebook Chat is released

Facebook's messaging facility was released to the public as Facebook Chat is April 2008, after a one-month trial. It was subsequently revamped in 2010 and released as a standalone application (Messenger) under iOS and Android.

- Arrington, M. "Facebook to Launch Instant Messaging Service," *TechCrunch*, Mar. 14, 2008. https://techcrunch.com/2008/03/14/facebook-to-launch-instant-messaging-service/. Archived from the original on Jan. 12, 2022.
- Stenovec, T. "The Real Reason Facebook Is Forcing You To Download Messenger," *HuffPost*, Aug. 13, 2014. https://www.huffpost.com/entry/facebook-messenger_n_5674703 Archived from the original on Nov. 4, 2021.

2008, September

Internationalization of email continues

To continue the work started in March, 2003 with RFC 3490, an attempt was made to allow "…capabilities to transmit non-ASCII content…" by permitting the use of Unicode encoded in UTF-8 rather than ASCII. Development of this very important experimental work continued and was ultimately standardized in February 2012, which included changes to SMTP.

- Abel, Y., ed. "Internationalized Email Headers," RFC 5335, Sept. 2008. https://www.rfc-editor.org/info/rfc5335 Archived from the original on Sept. 12, 2021.
- Yao, J., and Mao, W., eds. "SMTP Extension for Internationalized Email Addresses," RFC 5336, Sept. 2008. https://www.rfc-editor.org/info/rfc5336 Archived from the original on Mar. 8, 2021.
- Newman, C., and Melnikov, A., eds. "Internationalized Delivery Status and Disposition Notifications," RFC 5337, Sept. 2008. https://www.rfc-editor.org/info/rfc5337 Archived from the original on Oct. 26, 2021.

2008, October

SMTP and the Internet Message Format once again updated and clarified

Evolution of the standards continued. John Klensin updated and clarified SMTP in RFC 5321, updating RFC 2821. "This specification also contains information that is important to its use as a 'mail submission' protocol for 'split-UA' (User Agent) mail reading systems and mobile environments." Similarly, Pete Resnick of Qualcomm, Inc. updated the Internet Message Format standard in RFC 5322, updating RFC 2822 "…to reflect current practice and incorporating incremental changes that were specified in other RFCs."

- Klensin, J. "Simple Mail Transfer Protocol," RFC 5321, Oct. 2008. https://www.rfc-editor.org/info/rfc5321 Archived from the original on Jan. 19, 2022.
- Resnick, P. "Internet Message Format," Qualcomm, Inc., San Diego, CA, RFC 5322, Oct. 2008. https://www.rfc-editor.org/info/rfc5322 Archived from the original on Jan. 25, 2022.

2008, December 31

There are 1.3 billion email users worldwide

It was reported that there were over 1.3 billion email users worldwide, sending over 200 billion email messages per day. Of that, 70% of all emails are estimated to be spam.

- "Internet Growth Statistics." Internet World Stats. https://www.internetworldstats.com/emarketing.htm Archived from the original on Jan 21, 2022.

2010, September 13

Eudora OSE released to the public

After several years of development, the first public version of the combination of Eudora and Thunderbird was released. Replacing Penelope and dubbed Eudora OSE (Open Source Edition), it was based on Mozilla Thunderbird 3.0.4.

- "Penelope extensions," Mozilla wiki, edited Jan. 2, 2019 https://wiki.mozilla.org/Penelope_Extensions Archived from the original on May 26, 2021.

2012, February

Standards specified for internationalized email

Because modern email addresses often incorporate people's names, there had been considerable interest in allowing addresses to reflect personal names not normally written in simple Latin-script characters. The impetus for this work built on efforts to encode non-ASCII characters in domain names with original specifications published in 2003 and a significant revision followed in 2010. Unsurprisingly, the interest was greatest in areas that used scripts very different from Latin-based script. Following earlier, experimental, versions published in September 2008, standards were published in February 2012 to extend SMTP to allow these characters in addresses and to modify the email header specifications and delivery status notifications to allow for these new address formats.

- Klensin, J. and Ko, Y. "Overview and Framework for Internationalized Email," RFC 6530, Feb. 2012. https://www.rfc-editor.org/info/rfc6530
  Archived from the original on Oct. 20, 2021.
- Yao, J., and Mao, W. "SMTP Extension for Internationalized Email," RFC 6531, Feb. 2012. https://www.rfc-editor.org/info/rfc6531
  Archived from the original on Oct. 23, 2021.
- Yang, A., Steele, S., and Freed, N. "Internationalized Email Headers," RFC 6532, Feb. 2012. https://www.rfc-editor.org/info/rfc6532
  Archived from the original on Oct. 20, 2021.
- Newman, C. and Melnikov, A. "Internationalized Delivery Status and Disposition Notifications," RFC 6533, Feb. 2012.
  https://www.rfc-editor.org/info/rfc6533.
  Archived from the original on Nov. 20, 2021.

2011, July

Snapchat introduces short-lived messages

Snapchat, originally called Picaboo, was launched, providing a messaging and multimedia application for mobile phones. Its goal was to have messages available for only a short time before they became inaccessible. Snapchat was initially launched for Apple iOS devices only.

- O'Connell, B. "History of SnapChat: Timeline and Facts," TheStreet, Feb. 28, 2020. https://www.thestreet.com/technology/history-of-snapchat
  Archived from the original on Nov. 12, 2021.
- "Snapchat," Wikipedia, edited Dec, 22, 2020.
  https://en.wikipedia.org/wiki/Snapchat.
  Archived from the original on Feb. 3, 2022.

2013

ProtonMail secure email service initiated

ProtonMail was founded in Geneva, Switzerland in 2013 by Andy Yen, formerly of CERN. It provides an email service employing end-to-end encryption. Secure email is now commercially viable and easy to use and has been popularized in the press. It has over 50 million users.

- "ProtonMail: Secure Email," Proton Technologies AG, Geneva, Switzerland, ©2021. https://protonmail.com/. Archived from the original on Feb. 3, 2022.
- Cox, J., "ProtonMail, the Easy-to-Use Encrypted Email Service, Opens Up to the Public," Vice, Mar. 17, 2016.
  https://www.vice.com/en/article/8q8xbg/protonmail-the-easy-to-use-encrypted-email-service-opens-up-to-the-public
  Archived from the original on Jan. 11, 2021.
- Sisco, J. "How ProtonMail Is Fighting Big Tech," The Information, Apr. 13, 2021.
  https://www.theinformation.com/articles/how-protonmail-is-fighting-big-tech
  Archived from the original on Aug. 17, 2021.

- Rubenking, N.J., "ProtonMail Review." Updated July 12, 2021. https://www.pcmag.com/reviews/protonmail Archived from the original on Jan. 28, 2022.
- Silva, D. *The Cellist*. New York: HarperCollins, 2021, p. 81. ISBN: 978-0-06-283486-7

2015, December 31

Number of email users grows to over 2.5 billion

It was reported that there were over 2.5 billion email users worldwide.

- "Email statistics report, 2015-2019," The Radicati Group, Inc., Palo Alto, CA, ©Mar. 2015. http://www.radicati.com/wp/wp-content/uploads/2015/02/Email-Statistics-Report-2015-2019-Executive-Summary.pdf. Archived from the original on Jan. 21, 2022.

2018, May 22

Eudora source code released

The Computer History Museum announced the public release and long-term preservation of the Eudora source code after an extended negotiation with Qualcomm. These are the sources for the final Qualcomm release of Eudora on October 11, 2006 (versions 6.2.4 for the Macintosh, and 7.1.0.9 for Windows).

- "Computer History Museum Makes the Eudora Email Client Source Code Available to the Public," Computer History Museum, Mountain View, CA, May 22, 2018. https://globenewswire.com/news-release/2018/05/22/1510151/0/en/Computer-History-Museum-Makes-the-Eudora-Email-Client-Source-Code-Available-to-the-Public.html Archived from the original on Aug. 30, 2021.
- Shustek, L. "The Eudora Email Client Source Code," CHM Blog, Computer History Museum, Mountain View, CA, May 22, 2018. https://computerhistory.org/blog/the-eudora-email-client-source-code/. Archived from the original on June 1, 2021.

2020, June 15

Hey email service introduced

Basecamp, a project management and team communication software company, announces a new email service called Hey. They call it "consent-based email, where you're in control." It's a new way to manage email, utilizing a different workflow.

- "Hey: How it works. We didn't reinvent the wheel, only email," Basecamp, LLC, ©2021. https://hey.com/how-it-works/. Archived from the original on Jan. 15, 2022.
- Newton, C. "Hey is a wildly opinionated new email service from the makers of Basecamp," The Verge, Vox Media, LLC, posted Jun. 15, 2020. https://www.theverge.com/2020/6/15/21286466/hey-email-basecamp-price-availability-platforms-launch. Archived from the original on Oct. 10, 2021.

2021, January 25

The number of email users grows to over 4 billion

Even though other methods of interpersonal communications are growing, it was reported that there were over 4.03 billion email users worldwide in 2020, and the expectation is that the number will grow to 4.48 billion users by 2024.

- Tankovska, H. "Number of e-mail users worldwide 2017-2024." Statista, Feb. 2021. https://www.statista.com/statistics/255080/number-of-e-mail-users-worldwide/ Archived from the original on Jan. 31, 2022.
- The Radicati Group, "Email Statistics Report, 2020-2024," March 2, 2020. https://www.radicati.com/?p=16510. Archived from the original on Apr. 14, 2021.

ACKNOWLEDGEMENTS

This document was started in May 2014 by Elizabeth Feinler based on a bibliography she had done for the Navy in November, 1979. She asked John Vittal to join the effort in April 2016. Since then, the work has expanded considerably, and the authors have received numerous and significant contributions from many people, including John Klensin, Vint Cerf, Steve Crocker, Jack Haverty, Ken Pogran, John Shoch, Bob Kahn, Barry Wessler, Roy Levin, Mike Schroeder, Ron Newman, Dave Crocker, Ted Strollo, Ron Uhlig, Dan Lynch, Tom Van Vleck, and Dave Walden. We are also indebted to the people and resources at the Computer History Museum, especially Paula Jabloner and Marc Weber. The authors are extremely appreciative to everybody who reviewed and contributed to this document.

DEFINITIONS

Electronic: Relating to electronics or electricity. Using, or involving the storage or transmission of, information by electronic means; carried out or performed using electronic devices or computers.

Mail: the postal matter consigned under public authority from one person or post office to another

Postal system: the institution, almost invariably under the control of a governmental or quasi-governmental agency, that makes it possible for any person to send a letter, packet, parcel, or other article of mail, to any addressee, in the same country or abroad, in the expectation that it will be conveyed according to certain established standards of regularity, speed, and security.

Electronic Mail: Messages transmitted and received by digital computers through a network. An electronic mail system enables computer users on a network to send text, graphics, sounds, animated images, or other media in electronic form, to other users. Facsimile, the sending of images by electronic means, is a variant of email. There are two primary subsystems involved in the creation, transmission, and delivery of electronic mail: a message handling system (MHS) which is responsible for moving messages from sending users to receiving users, and is built on servers called message transfer agents (MTA), and user agents (UA) which work on behalf of the user to create, deliver (with the help of the MHS), receive, and manage electronic mail messages.

Email: Electronic mail

Electronic Bulletin Board: Computerized system used to exchange public messages or files. Most are dedicated to a special interest, which may be an extremely narrow topic. Any participant may "post" his or her own message so that they appear on the site for all to read. Bulletin boards create "conversations" between interested participants, who may download or print out messages they desire to keep or pass on to others. Alternative names include Bulletin Board System or Bulletin Board Service.

Mailing List: A list of electronic-mail addresses, or an alias for such a list, that allows the same message to be sent to each address; the addresses on such a list collectively; (also) the people served by these addresses. "Distribution list" is an alternative term.

Teleconference: A meeting or conference at which people in different locations participate by means of telecommunications technology, such as telephones or videoconferencing equipment or software.

Teleconferencing: the action of holding or participating in a teleconference; the use of teleconferences.

Chat: Form of real-time text-based communication in which two persons participate in a single conversation over their computers or mobile devices.

Text Messaging: also known as **texting**, is the act of composing and sending electronic notes between two or more users of mobile phones, tablets, desktops/laptops, or other devices. Text messages may be sent over a cellular network or may also be sent via an Internet connection. The term originally referred to messages sent using the cellular telephone network Short Message Service (SMS). It has grown beyond alphanumeric text to include multimedia messages (known as MMS) containing digital images, videos, and sound content, as well as ideograms.

Spam: Unsolicited commercial electronic messages, generally via a mass e-mailing. Although email is the most common means of transmitting spam, blogs, social networking sites, newsgroups, and cellular telephones are also targeted. Also referred to as **Junk Mail**.

Spoofing: Spoofing is the forging of information in an email header so that the email appears to have originated from someone or somewhere other than the actual source, typically to make it look like it came from somewhere or someone legitimate. Often used hand-in-hand with phishing and spam.

Phishing: The term derives from the concept of fishing for sensitive information (sending out bait and seeing who strikes); many "phish" using email. Here, a third party imitates a trusted person or service, thereby enticing recipients to provide information that was "private".

GLOSSARY OF ACRONYMS

ACS	Advanced Communication System, AT&Ts packet-switched data communication service
AI	Artificial intelligence
ANSI	American National Standards Institute
AOL	America OnLine
ARPA	Advanced Research Projects Agency of the Department of Defense. Early name for DARPA
ARPANET	The Department of Defense packet-switched research network, forerunner of the Internet
ARRL	American Radio Relay League
ASN-1	Abstract Syntax Notation One
ASCII	American Standard Code for Information Interchange
AT&T	American Telephone and Telegraph Co.
AUGMENT	Tymshare's knowledge worker augmentation system, formerly NLS
AUTODIN	Automatic Digital Network system (originally called ComLogNet)
BAUDOT	International teleprinter code
BBN	Bolt Beranek and Newman, Inc.
BITNET	Because It's There Network; becoming Because It's Time Network
BSD	Berkeley Software Distribution
BTSS	Berkeley Time Sharing System
CAHCOM	Committee on Computers and Human Communication
CBBS	Computerized Hobbyist Bulletin Board System
CBEMA	Computer and Business Equipment Manufacturers Association
CCA	Computer Corporation of America
CCITT	Consultative Committee for International Telephony and Telegraphy
CERN	Conseil Européen pour la Recherche Nucléaire (the European Organization for Nuclear Research)
CHM	Computer History Museum
CINCPAC	Commander-in-Chief, Pacific
CIS	Computer Information System
CMU	Carnegie-Mellon University
CNRI	Corporation for National Research Initiatives
ComLogNet	(See AUTODIN)
COS	Corporation for Open Systems
COTS	Commercial-off-the-shelf
CR	Carriage return
CRT	Cathode-ray tube, as in a computer monitor, terminal, or television set.
CSNET	Computer Science Network
CTSS	Compatible Time-Sharing System
CUNY	City University of New York
DARCOM	U.S. Army Materiel and Readiness Command
DARCOM-DMIS	U.S. Army Material and Readiness Command, Directorate of Management Information Systems

DARPA	Defense Advanced Research Projects Agency
DARPA-IPTO	Defense Advanced Research Projects Agency, Information Processing Techniques Office
DEC	Digital Equipment Corporation
DDN	Defense Data Network
DKIM	DomainKeys Identified Mail
DNS	Domain Name System
DoD	U.S. Department of Defense
EEMA	European Electronic Mail Association
EDI	Electronic Data Interchange
EIN	European Information Network
EMA	Electronic Mail Association
EMACS	Editor MACroS for the TECO editor. An extensible display editor
EMMS	Electronic Mail and Messaging Systems
EMS	Electronic Messaging Service
FAX	Facsimile copy
FCC	Federal Communications Commission
FedEx	Federal Express
FSK	Frequency Shift Keying
FTP	File Transfer Protocol
GILT	Get Interconnection of Local Text systems
GNU	GNU's Not Unix
GTE	General Telephone & Electronics Corporation
HDLC	High-level Data Link Control protocol
HP	Hewlett Packard Company
HTML	Hypertext Markup Language
IAB	Internet Architecture Board (until the early 1990s, Internet Activities Board)
IANA	Internet Assigned Numbers Authority
IBM	International Business Machines Corporation
ICCC	International Conference on Computer Communications
IETF	Internet Engineering Task Force, the premier Internet standards body
IFF	Institute for the Future
IFIP	International Federation for Information Processing
IKI	Russian Institute for Space Research
IMAP	Internet Message Access Protocol
IMP	Interface Message Processor
INTEROP	First Internet Trade Show
IP	Internet Protocol
IRC	Internet Relay Chat
ISO	International Organization for Standardization
ISP	Internet Service Provider
ITS	Incompatible Timesharing System
ITT-DTS	International Telephone & Telegraph, Inc., Domestic Transmission System

ITU-T	International Telecommunication Union – Telecommunication
KnowBot	Knowledge-Based Object Technology
LAN	Local Area Network
LF	Line Feed or New Line; also, NL
MARS	Message Archiving and Retrieval System
MH	Mail Handler, Rand UNIX-based mail program
MHS	Message Handling System
MIME	Multipurpose Internet Mail Extensions
MIT	Massachusetts Institute of Technology
MIT-DMS	Massachusetts Institute of Technology, Project MAC – Dynamic Modeling System
MIT-LCS	Massachusetts Institute of Technology, Laboratory for Computer Science
MIT-MULTICS	Massachusetts Institute of Technology, Project MAC – MULTICS Group
MIT-ITS	Massachusetts Institute of Technology Incompatible Time-Sharing System
MLFL	File Transfer Protocol Mail File command
MMDF	Multichannel Memorandum Distribution Facility
MME	Military Message Experiment
MOA	Memo of Agreement
MOS	Modular Office System
MSA	Mail Submission Agent
MTA	Message Transfer Agent
MTP	Mail (Message) Transfer Protocol
MUA	Mail User Agent
MX	Mail Exchanger
NASA	National Aeronautics and Space Administration
NAVELEXSYSCOM	Navel Electronic Systems Command
NAVTELCOM	Naval Telecommunications Command
NBS	National Bureau of Standards
NCP	Network Control Program, ARPANET predecessor to TCP, provided the middle layers of the protocol stack
NIC	Network Information Center, founded to coordinate the operation of the network. Initially run by SRI. See also SRI-NIC
NLS	oN Line System
NNTP	Network News Transfer Protocol
NPL	National Physics Laboratory
NREN	National Research and Education Network
NSF	National Science Foundation
NSW	National Software Works
NTS	National Traffic System
NWG	ARPANET Network Working Group
OCR	Optical Character Recognition
OMG	Object Management Group
OS	Operating System
OSI	Open Systems Interconnection
PC	Personal Computer

PCMAIL	Personal Computer mail system
PDA	Personal Digital Assistant
PEM	Privacy Enhanced Mail
PGP	Pretty Good Privacy protocol
PLATO	Programmed Logic for Automatic Teaching Operations, the first generalized computer-assisted instruction system
POP	Post Office Protocol
POTS	Plain Old (or Ordinary) Telephone Service
PRC	Postal Regulatory Commission
Prestel	Press Telephone, an interactive videotext system
PTG	Programming Techniques Group
RAND	The RAND Corporation
RCA	Radio Corporation of America
RSCS	Remote Spooling Communications Subsystem
RFC	Request for Comments. ARPANET/Internet technical document
RPC	Remote Procedure Call
SAIL	Stanford Artificial Intelligence Laboratory. Also, the Stanford AI Language, an extended version of Algol 60 for the DEC PDP-10 computer.
SATNET	Satellite Network
SDC	System Development Corporation
SDLC	Synchronous Data Link Control protocol
SDS	Scientific Data Systems
SIMP	Satellite Information Message Protocol
SITA	International airline computerized reservation and message system
S/MIME	Secure/Multipurpose Internet Mail Extensions
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SRI	SRI International (formerly Stanford Research Institute)
SRI-ARC	Stanford Research Institute, Augmentation Research Center
SRI-AI	Stanford Research Institute, Artificial Intelligence Center
SRI-NIC	ARPANET/DDN Network Information Center (managed by SRI from Menlo Park, CA)
STSC	Scientific Timesharing Corporation
SUMEX-AIM	Stanford University Medical EXperimental computer for Artificial Intelligence in Medicine
TAC	Terminal Access Controller, enabled telephone dial-up access to a host on the ARPANET/DDN
TCA	Telecomputing Corporation of America
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TDA	Telecommunication Data Access message service
TDX	Text and Data Exchange
TECO	Text Editor and Corrector (originally, Tape Editor and Corrector)
TIP	Terminal Interface Processor. See TAC

TENEX	TEN-EXtended, a paging time-sharing operating system developed at BBN that ran on Digital Equipment Corporation PDP-10 computers
TWX	Teletypewriter Exchange Service
UA	User Agent
UCBerkeley	University of California at Berkeley
UC Irvine	University of California at Irvine
UCL	University College London
UCLA	University of California at Los Angeles
UCLA-NMC	University of California at Los Angeles, Network Measurement Center
UCSB	University of California at Santa Barbara
UDel	University of Delaware
UPI	United Press International
USC-ISI	University of Southern California, Information Sciences Institute
USPS	United States Postal Service
UUCP	Unix-to-Unix copy
uuencode	Unix-to-Unix encoding
VICE	Versatile Commodore Emulator
VGS	Video Graphics System
WHOIS	Network directory and name server
WWW	World-Wide Web
X.400	International Standards Organization mail protocol
Xerox PARC	Xerox Palo Alto Research Center
XML	Extensible markup language

About the authors

Elizabeth "Jake" Feinler

Elizabeth "Jake" Feinler pioneered and managed first the ARPANET, and then the Defense Data Network (DDN), network information centers (NIC) under contract to the Department of Defense (DoD). Both of these early networks were the forerunners of today's Internet.

Her group developed the first Internet "yellow-" and "white-page" servers as well as the first query-based network host name and address (WHOIS) server. Her group managed the Host Naming Registry for the Internet from 1970 until 1990. As part of this effort, she and her group developed the top-level domain-naming scheme of .com, .edu, .gov, .mil, .org, and .net, which are still in use today. She has long been a proponent of saving the history of the Internet, and after retirement, donated a large collection of NIC and Internet archives to the Computer History Museum in Mountain View, CA.

She has been appointed Delegate at Large to the White House Conference on Libraries and Information Centers; has been a member of ACM, ASIS, IEEE, and was a founding member of the Internet Engineering Task Force. In 2000, she was inducted into the SRI Alumni Hall of Fame, and in 2012 she was inducted into the Internet Hall of Fame. In addition, she has been inducted into the WITI and CTA Halls of Fame, and in 2013 received the Internet Society's Jon Postal Service Award.

John Vittal

John Vittal has been involved with the Internet and its predecessors since their inception. He has an outstanding track record in developing and bringing to market leading-edge technologies, including secure electronic commerce, multi-media services and communications. He is best known as having created the first modern, integrated email program, MSG, the initial "killer application" on the net, and developing the email standards still mostly in use today.

Prior to his retirement, his primary business and research goals generally involved ways of making computers more useful to, and usable by, people. He is a technologist who managed a wide range of research and development groups, an entrepreneur who served on many boards, and has been an advisor to a wide range of startup companies on both business and technical issues. He has had numerous publications, and has been an invited speaker at many national and international conferences. He has been a member of Internet Society, IETF, ACM, IEEE, and American Association of Artificial Intelligence.