The Mother of All Demos

Dedicated to the memory of Douglas Engelbart and Bill English

Dealing lightning with both hands

On December 9th, 1968 at the Fall Joint Computer Conference in San Francisco, Douglas Engelbart and Bill English, with the help of Stewart Brand, Bill Paxton, Jeff Rulifson, Don Andrews, Charles Irby, Martin Hardy, Ed Vanderand, and many others put on a demo that was later nicknamed "The Mother of All Demos". This 90 minute demo showed a future of human computer interfaces that had never before been seen. Doug sat in front of 2,500 people at San Francisco's Civic Auditorium with a custom computer keyboard, display, and one of the first computer mouse devices. He wore a headset with a microphone and was able to communicate (via audio and video) with his colleagues back at the Augmentation Research Conference in the Stanford Research Institute. His face and display were projected on a large screen in front of the audience. For the next hour he and his colleagues demonstrated tasks on the computer that are considered mundane by today's standards but at the time were unthinkable. He demonstrated a computing future where the balance shifted from users adapting themselves to work with the computer to computers adapting themselves to work with users. It showed compelling evidence that human intellect could be augmented by such a setup. Folks who attended the demo said that Doug was "dealing lightning with both hands", and gave him and his team a standing ovation. While many of the computing innovations were not directly realized from this demo it spread the seeds of this vision across the computing industry, resulting in the Xerox PARC project, the rise of personal computers, and the use of the mouse as a pointing device in the early 1980s.

Which makes it the perfect target for rogue time travelers to disrupt. After all; no demo goes according to plan.

Who is trying to sabotage this demo?

There are many reasons why someone from the future might want to disrupt this demo.

The demo was influential much in the same way that The Velvet Underground and Nico in 1967 were influential ("Everyone who bought one of those 30,000 copies started a band" – Brian Eno). Without this demo the likelihood of interactive computing gaining traction becomes much more reduced. Innovations like the computer mouse and the "cursor" (their term for the mouse pointer) would not exist. Other research groups like Xerox PARC wouldn't have been started (and wouldn't have been staffed with former members from Doug's

group). The trajectory of personal and interactive computing would have been vastly different without this demo.

Perhaps the rogue time travelers want a future like this. Perhaps they want the centralized computing of the 1960s to last well into the turn of the century. Maybe the idea for time travel itself would be buried without some enterprising researcher typing notes into their word processor for others to share. Remove the demo and you remove your adversaries. Sure you might remove yourself from this equation, but maybe that's a win-win situation.

There's also the potential for saboteurs to use those from the timeline to help them disrupt the demo. The could use the resistance from contemporary computing professionals to the notion of interactive computing. Computing time was expensive, and dedicating some of that expensive resource for interactive use was considered absurd and wasteful. Rogue time-travelers could rile up folks who believed that Doug's vision of interactivity was misusing computing resources and dry up the funding.

It could also be something as simple as a bet between time travelers to see if they could disrupt this demo. There was a large amount of redundant equipment used for the demo so it makes an inviting target for those who want to poke at a historic event to find out just how reliable it was. Time tourists could find a lot of technology here to disrupt in the hopes that nobody notices. Perhaps time travel agents have been sent to clean up the mess left behind when these fools accidentally find out how far is too far.

If there was a list of soft targets for time travelers to disrupt computing history this would be near the top of that list.

How could they sabotage this demo?

The on-Line Systems project was an expensive and complex system to demonstrate. There were several organizations responsible for the funding of the project. If there was a sense that this project was somehow misusing those funds, or if the group was unable to produce anything of consequence then the funding would dry up. There was also a push during the conservative Nixon years to cut a lot of government waste. If Nixon was elected during his first bid for the presidency then perhaps his budget-tightening would happen sooner. And if conservative lawmakers were clued in on the money being spent for an interactive computer system they might withhold funding or demand the scope of the project be changed.

The demo itself was complex and expensive. Since it's a demonstration there are bound to be last-minute fixes and other assorted issues during the demo. Much of the technology used for the demo is custom-built, expensive, and fragile. It wouldn't take much to cut a phone line, cause one of the 1200 baud modems to fail, or ensure the giant displays in front of the audience malfunctioned during

the demonstration. It also wouldn't take much to have folks working on the project lose faith in the overall vision. Folks like Stewart Brand could decide to pass on helping Doug's project, which would not only have deprived the demo of its main camera operator but also removed some badly needed presentation advice and the phrase "personal computer".

The scope of the demo could also be changed to make it a smaller, less costly demonstration. The ARC was very open to letting visitors in to look at their technology, but they didn't seek out large groups of audiences. They would have contented themselves with these smaller demos Without Bob Taylor's prodding to do something bigger. The scale and audacity of the "mother of all demo" really set it apart as an event. It added gravity and authenticity to what was being demonstrated. Without the large-scale demonstration there wouldn't have been the same impact. Perhaps all a saboteur needs to do is tell the members of the ARC to keep it small and don't spend a lot of money for a flashy demo.

SIDEBAR: ARC at the center of the culture of the 1960s and the Vietnam War

One of the reasons for folks deciding to go work for Doug Engelbart's lab is because of the Vietnam War and the draft. One way to avoid the draft was to get a "critical industries deferment". Since Doug's lab was Pentagon-funded it qualified for such deferments. Many folks on the project were against the Vietnam war so highlighting that the project was funded with ARPA and NASA money could cause folks that are against the military industrial complex to leave the project before the demo. The lab was a mixture of these two cultures: the conservatism of the management of SRI, and the radicalism of the students and employees of ARC. Paying the political sides against each other and placing Englebart in the middle might cause more friction in the lab. There was already friction between the techies that just wanted to work on interesting problems and those who were more interested in augmenting their consciousness, either with computers or other means. The 1970s saw more fragmentation in the lab when Doug's ideas seemed outmoded and outdated. The 1970s also saw a lot of ARPA funded research being militarized, so finding non-ARPA-funded opportunities became more appealing. Should ARPA decide to militarize their research projects in the mid 1960s it could remove many key members from Doug's team.

The effects of destroying or delaying the demo

The NLS system was widely forgotten in the 1970s, but its effects were felt throughout the computing industry. The NLS system was one of the early nodes connected to the ARPAnet, and the early versions of hypertext, graphical displays, and collaborative editing were burned into the memory of many that

worked on later systems in the 1970s. Destroying this demo or disrupting the institutions that helped support the Augment Research Center (ARC) could have devastating effects on the computing industry. Targeting the engineers working on the demo could cause the to leave the industry altogether, depriving us of folks who were instrumental for creating Xerox Palo Alto Research Center (PARC) and the machines that were built or influenced by that project. The ARC was not only a space for computing research but also research into using the technology to enhance the human mind and conciousness. Without the call for technologists to think of computers as information processing machines we might be stuck with computers being solely used as large calculating machines.

The idea, Augment Research Center (ARC), and the oN-Line System (NLS)

The seeds for the Augment Research center were planted in 1946 at a small hut in the Philippines during Doug Engelbart's Navy tour. He read an article by Vannevar Bush entitled "As We May Think" which greatly inspired him. He read about mankind's technological advances that often backfired or were used for nefarious purposes. In Fred Turner's book "From Counterculture to Cyberculture" he describes Doug's reaction to the article:

"[T]he American military had developed technologies with which it might destroy the world. In its wake, scientists and technologists had begun to fan out around the globe, seeking to use their knowledge to eradicate disease and increase food production, often in an effort to win the cold war loyalties of Third World nations. Engelbart had read about these efforts and saw that they often backfired. Rapid food production led to the depletion of the soil; the eradication of insects led to ecological imbalances."

The actual Augment Research Center was created by Doug Engelbart in the early 1960s as part of a research paper entitled "Augmenting Human Intellect: A Conceptual Framework". It was his dream to use computers to help people to better themselves. It also was created with the idea of "bootstrapping", where the tools for the lab were created by all of the members of the team; carefully refined and fed back into the system. Over time this lab created a complex and full-featured computing environment that ushered in a way of thinking about computers that, while not fully realized by today's technology, still remains a goal of many computer researchers and technologists.

SIDEBAR: Engelbart's Guiding Philosophy

Engelbart's career was inspired in December 1950 when he was engaged to be married and realized he had no career goals other than "a steady job, getting married and living happily ever after". Over several months he reasoned that:

1. he would focus his career on making the world a better place
2. any serious effort to make the world better would require some kind of organized effort that harnessed the collective human intellect of all people to contribute to effective solutions.
3. if you could dramatically improve how we do that, you'd be boosting every effort on the planet to solve important problems – the sooner the better
4. computers could be the vehicle for dramatically improving this capability.

The technology

The NLS system was based on a Scientific Data Systems SDS 940 computer with 96MB of disk storage using the Berkeley Timesharing System. The system was able to support 16 workstations. The terminals were a complex system that relayed keyboard and mouse input over an input bus to the timesharing system, which then output the results to one of two display controllers and display generators. The image was displayed on a 5" Cathode Ray Tube Monitor inside of a special enclosure. This display was then picked up with a professional video camera which then displayed the image via a closed-circuit signal back to the workspace of the user.

The computer was prone to crash, so the engineers created a way to recover quickly from a crash. While the demo was happening the machine crashed and recovered so quickly that only one frame of the 24fps film caught the crash before the machine recovered. (Unfortunately modern compression techniques have erased this artifact from any online copies of the film).

Each workstation had a special tray which contained a chorded keyboard, keyboard, and mouse. The tray was created by Herman Miller research company in Zeeland Michigan. It was separate from the display and looked like an ergonomic hospital table, with wheels underneath that allowed it to be positioned wherever was most comfortable for the user. Some users in the lab turned their workstations into "Yoga Stations", positioning themselves on the floor so they could assume a meditative pose while using the machine.

The mouse was made by Bill English. It was machined in a shop and made of wood. Underneath it were two wheels at 90 degree angles from each other. This represented the X/Y axis of the device. Several buttons sat atop the device. The mouse used in the demo was one of several devices made of plastic.

The demo itself used a complicated mixture of digital and analog technology. Two modems were used for transmitting the audio and keyboard / mouse controls from SRI to the auditorium. The video was transmitted using microwave dishes with repeaters inbetween. Back at SRI the production team worked to send back what was displayed on the screen and maintain the computer system. Very little of the actual machine was at the San Francisco Auditorium. Agents that are looking to protect the machine itself will need to be at the ARC center, where most of the group was handling the behind-the-scenes of the demo.

Familiar, but different

One thing the agents will need to remember is that nobody outside of the SRI lab has ever seen a mouse or the environment that Doug will demonstrate. The characters will be briefed on this prior to the mission, but anyone from the late 20th and early 21st century will instinctively pick up the mouse to try to use it. This could be played off as "wow, this is so intuitive" to Doug, but the way Doug's mouse buttons work is completely different from how mice evolved after the 1970s and 80s. Stranger still is the five-key chord keyboard to that Doug used with his left hand. This was used for entering letters into the computer, as well as other commands. Worse, the system was not simple at all and contemporary folks like John McCarthy (inventor of LISP) found the system needlessly complex. Also the level of collaboration that these machines have has never been replicated since, and certainly not at the operating system level of NLS. Agents will be instructed to let folks in the lab teach them how to use the technology and to set their expectations about the system. However it is possible for agents to arouse suspicion and possess too much domain knowledge if the agents aren't careful.

Sidebar

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Scotty:
Computer! Computer?

(McCoy points to the Macintosh mouse. Scotty looks relieved. He picks it up
and moves it closer to his mouth.)

Scotty:
Hello, computer.

Dr. Nichols:
Just use the keyboard.

Scotty:
Keyboard. How quaint.
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Events Leading up to the demo

In 1967 the Augmentation Research Center was running into budget issues. Doug was traveling the country with a 16mm film demonstration that, while impressive, wasn't gaining the traction needed to get people really excited about the technology. Bob Taylor was curious what progress was being made at the Augmentation Research Center. Engelbart was insecure about this meeting, thinking that he and his group would be providing comic relief for the new director, and their budget would be slashed. On the contrary - the film intrigued

Bob Taylor. He commented: "The trouble with you, Doug, is that you don't think big enough". He and Doug created proposals to purchase the expensive SDS-940 computer and bootstrap the lab.

Over the next next few months Doug and his team worked feverishly to create a large-scale demo. Stewart Brand was instrumental in this, providing his expertise in presenting the Trips Festival (a mind-altering "multimedia show"). Brand was also recognized for his experience putting together "The Whole Earth Catalog", and lent an air of counter-cultural credence to the presentation.

The demo was never rehearsed in its entirety. It was performed in bits and pieces. This gave it the improvisational quality that is evident in the films.

Saboteurs could disrupt the events leading up to the demo by replacing Bob Taylor with someone less likely to think big. Removing Stewart Brand would also cause the demo to lose some of its qualities of improvisation and scale.

The night of the demo

Few have ever seen a spectacle like the demo. At the time most demos were three or so folks coming into a lab and giving a short demonstration of what they've been working on. This was more like a rock concert with 2,500 people in attendance. A large screen sat in front of the audience with two projectors the size of a Volkswagen Bus projecting on the screen.

The demo itself was a feat of improvisation. Small bits of it were rehearsed, but the demo in its entirety wasn't performed until that day. Doug Engelbart seemed very relaxed during most of the demo. When he was asked to stall a bit because something wasn't working he played it off in a calm and humorous way.

Things broke during the demo. Machines weren't as responsive, software didn't perform as it should, and a phone company operator interfered with the call from the auditorium to Menlo Park. There may have been other issues that were smoothed over by Doug's casual performance.

The demo was so well received that the audience gave Doug and his team a standing ovation. Folks commented on Doug's performance as "dealing lightning with both hands".

Redundancy

One of the reasons the demo was so successful was because of the redundancy they put in place for the demo. One way that saboteurs could disrupt the demo would be to have the funding for the demo cut so the redundancy is not an option. They cold also ensure that one of the projects wouldn't be available, so the demo can only use one of the projectors. They could also ensure that the equipment fails during the initial test runs, so that the demo is either scaled back or the team takes on the additional risk of not having a backup.

SIDEBAR: Using the demo in play

There are several recordings of the demo online (see "resources" below). The (moderator) could show the demo during play while the characters try to prevent some of the sabotage from happening. The demo itself has some interruptions in it which could be used to indicate areas where the saboteurs are trying to ruin the demo. This could add the feeling of urgency for the players to act quickly to prevent other events from occurring.

Remember, It's only a demo

The "Mother of All Demos" was an impressive feat of technology but the immediate effects were minimal. The seeds of this demo would flow through other companies and projects before taking root in the broader computing consciousness. Agents trying to determine any lasting effects will need to travel to the mid-1970s and 1980s to witness the best evidence of its impact. This will be disheartening for Doug Engelbart and many of the folks working with him. Ideological differences between Doug's vision of a centralized time-sharing system and other folks desires for more personalized computers will fracture the organization. Folks like Bill English, Jeff Rulifson, and Bill Duvall will move from the Augmentation Research Center on to other companies like Xerox's Palo Alto Research Center (PARC). Other attendees of the demo, such as Alan Kay, will also join PARC, where they will create two machines: the Xerox Alto and the Xerox Star. Both of these machines would also face commercial stagnation brought on by the Xerox's inability to understand and market them, but these machines influenced computers like the Apple Lisa and the Apple Macintosh. Those machines also influenced machines like the Atari ST and Commodore Amiga, and environments such as Digital Research's GEM and Microsoft Windows.

Agents may do too good of a job with giving Douglas Engelbart his wishes. Doug's vision of the future of computing requires timesharing systems and networking. This runs counter to the actual personal computing revolution, where cheap non-networked hardware became common in the 1970s. Doug's vision was never fully realized until the widespread use of the ARPAnet, which he mentions in the demo. ARPAnet was later christened The Internet, which didn't become ubiquitous until many years later. Catering to Doug's wishes may hasten the rise of centralized computing, which would prevent the innovations that occurred during the 1970s and 1980s. Platforms like the World Wide Web may never have been invented, nor the eventual "dot com" boom and bust of the 1990s. Keeping Doug's vision of personal computing without his implementation details will be key to preserving our present timeline.

After the demo

Much of the technology and concepts from the demo, while formative, was still considered by many to be the domain of freaks and cranks. In 1969 the pendulum of government spending moved toward belt-tightening. Many departments found their budgets slashed. Bob Taylor left ARPA in 1969 amid ARPA's funding changes. Gone were the lavish ARPA grants for research, and the management of SRI started making more demands for results from Engelbart's group. SRI management didn't understand this radical group of freewheeling, jeans-wearing programmers and engineers. As the money dried up the environment became less conducive to the ideals that brought this group together. Bob Taylor from ARPA headed to Xerox to lead the Computer Systems Laboratory at the Palo Alto Research Center (PARC). From there he hired Bill English, Jeff Rulifson, and Bill Duvall. Doug Englebart faded into relative obscurity, where an entire generation of programmers grew up not knowing about his amazing future but only feeling the aftershocks of his vision for the future of computing.

Much of what the

Determining how the timeline changed

One of the ways to determine if the timeline has changed is the type and frequency of computers that are in use. After the 1940s computers became part of life for many businesses. The 1970s saw an explosion of hobbyist computers, leading up to the golden age of personal computing in the 1980s. Subtle changes in history may change what computers achieve more or less market share than our current timeline. This might explain how some time travelers like John Titor can show up looking for an obscure computer like the IBM 5100 using the APL language. Agents with investigative abilities in Computer History will be able to detect these anomalies through magazines like Byte, Dr. Dobbs, and other popular computing magazines.

Some of the technologies that might be adopted instead of the computer mouse are the joystick, light pen, primitive touch screens, or other devices that mimic the mouse. The menu interfaces of the 1970s and 1980s may have gained more prominence, leading to keyboards with an array of function keys near the top (An IBM Model F keyboard with 122 keys) or multiple modifier keys (a Symbolics LM-2 "Space Cadet" keyboard).

Players with knowledge of History (especially Computer History) will be able to determine if something has changed. Archivists that have scanned copies of magazines like Byte Magazine, Doctor Dobbs, or other period computer magazines can compare them against the issues on the newsstands (or determine if they exist at all). Others with period knowledge might notice that certain computers look very different from what they remember, or that certain computers that should exist don't exist any longer. Examples include a classroom in 1982 full of

IBM 3270 terminals instead of Apple][computers, the absence of Commodore or Atari home computers in the late 1970s and 1980s, or Radio Shack only selling some modest VideoTex terminals instead of the plethora of TRS-80 computers.

Key people and organizations

Organizations

ARPA (Advanced Research Projects Agency)

- Advanced Research Projects Agency, formed in 1958 by Dwight D. Eisenhower to form and execute research and development projects to expand the frontiers of technology and science
- Formed as a direct reaction to Sputnik launching, which struck fear into the USA government that they would be left behind
- Endowed to do "high-risk", "high-gain", "far-out" research.
- Responsible for the ARPANet, which later became the Internet.

Stanford Research Institute (SRI)

- Research center for Stanford
- Used for research projects, including LCD displays, optical discs, and the Augment System.
- Was later seen as part of the "military industrial complex" during the Vietnam War, which became a liability for Stanford's enrollment. Was spun off into SRI International in 1970.

Augmentation Research Center (The Lab)

- Started by Doug Engelbart in 1962
- Utilized the principles of "Bootstrapping", where everything in the lab was created by the group and used by the group
- Responsible for creating the oN-Line System (NLS).
- Was the second node for the ARPAnet project.

People

J.C.R. Licklider

- Set the direction for the ARPA Information Processing Techniques Office for the Advanced Research Projects Agency (ARPA)

- Considered the "Johnny Appleseed" of computing technology funding.
- Believed deeply in interactive computing
- Was responsible for ensuring there was enough money for many of the projects that ARPA and NASA was funding
- Funded other groups like John McCarthy (LISP programming language) and Marvin Minsky

Bob Taylor

Before the demo:

- Became the Director of the Information Processing Techniques Office for the Advanced Research Projects Agency (ARPA) after Licklider
- Intrigued by the vision of using computers to "augment the human intellect".
- Got Engelbart funding via a NASA contract, which granted Engelbart a significant amount of funding.
- Convinced Doug to do the demo despite the outlandish costs to do so. Funded using ARPA money.
- Overall manager of most of the work done in computer science (about half of the people publishing in the Association of Computing Machinery in 1968 were receiving ARPA funding).
- Seeded the audience for the demo

After the demo:

- Left ARPA after Nixon was elected, and the resultant belt-tightening and clashes with upper management at ARPA.
- Went to Xerox to become the leader of the Computer Systems Laboratory at the Palo Alto Research Center (PARC)
- Hired many Augment Research Center (ARC) folks, including Bill English, Jeff Rulifson, and Bill Duvall

Douglas (Doug) Engelbart

Doug is a charismatic leader of the Augment Research Center (ARC) and the oN-Line System (NLS). He is a visionary person, able to impart his vision of computing to the rest of his group.

Key Events leading up to the demo:

- 1946 in a small hut in the Philippines while in the Navy: Reads Vannevar Bush's article "As We May Think" which greatly inspired him.

- December 1950: Doug Engelbart is engaged to marry Ballard Fish. He realizes he has no career goals other than "a steady job, getting married and living happily ever after". He spends the 1950s as a graduate student and as a professor before realizing that he wouldn't fulfill his vision there.
- 1957: Takes a position at the Stanford Research Institute. Works with Hewitt Crane on magnetic devices and miniaturization electronics.
- 1962: Publishes report introducing his concept for his vision and proposed research agenda entitled "Augmenting Human Intellect: A Conceptual Framework". This leads to funding from ARPA. He builds his Augmentation Research Center (ARC) and creates the "bootstrapping principles" to accelerate the rate of innovation in the lab.
- 1962-1967: Creates the oN-Line System (NLS) with Bill English and the rest of the team, which developed innovations like the bitmapped screen, mouse, hypertext, collaborative tools, and rudimentary Graphical User Interfaces (GUI). This was during a period where computer access was not available for individuals, and most processing was done non-interactively (batch processing).
- 1967: Applies for the patent for the computer mouse, a wooden structure with two wheels (X and Y axis). The patent is granted in 1970.
- Releases 16mm demo film reels which get released to many different labs. Alan Kay watches one of these reels.
- 1968: The demo takes place.

During the demo:

- Main presenter of the demo.

After the demo:

- Continued to make presentations to folks about the ARC up until around 1975
- Created the Bootstrapping Institute with his daughter in 1988 to do management seminars.
- Fades into relative obscurity compared with his noteriety.

William "Bill" English

Role: Lead engineer and co-designer of the computer mouse

Key events leading up to and after the demo:

- 1960s: Joins Stanford Research Institute and works with Hewitt Crane to build the first all-magnetic arithmetic units.

- 1963: Collaborates with Douglas Engelbart to build the prototype computer mouse and is the first user of the mouse.
- 1964: First person to join the Augmentation Research Center.
- 1968: Is instrumental in putting together the demo, including hooking up the demo computer at the auditorium to the host computer at SRI 30km away. He also figures out how to get audio and video between the locations.
- 1971: Joins Xerox PARC and perfects the ball mouse.

Johns Frederick (Jeff) Rulifson

Role: Lead programmer for the project

Before the Demo:

- 1966: Joins Stanford Research Institute (SRI) working on a form of software called "timesharing".
- Lead the software team for oN-Line System (NLS) and developed the command language for the NLS.
- Created the first display-based on the CDC 3100 and the first online editor.
- Wrote the program and demonstration files for the first public demonstration of the computer mouse
- Chief programmer for the first use of hypertext.
- Was the SRI's representative to the "network working group" in 1968 which led to the first connection on the ARPANET (later referred to as The Internet).
- Developed the idea of Decode-Encode Language (DEL) which was designed to allow remote use of NLS over ARPANET. The idea was for small "programs" to be downloaded to enhance user interaction. While it was never used for the NLS system it was later realized with the idea of Java "applets" in the 1990s.
- Involved with the development of the AI programming language QA4 which was used for the Shakey robot.

During the demo:

- Demonstrated the program structure and the Content Analyzer / MOL, along with with the compiler compiler.

After the demo:

- Joins Xerox PARC in 1973
- Collaborates in creating local networks
- Responsible for creating the concept of the desktop icon.

Stewart Brand

Role: Main camera operator and consultant for the demo

Before the demo:

- Was one of the 153 members of the (then legal) LSD experiments in 1962.
- Saw the video game "Spacewar" in 1962. Watching the participants enthralled with the game reminded him of the out-of-body experience in a whole other world.
- Was responsible for NASA taking the photograph of he "whole earth" after an LSD trip on the roof of his house after realizing that people would realize the "Earth's an island, surrounded by a lot of inhospitable space. And it's so graphic, this little blue, white, green and brown jewel-like icon amongst a quite featureless black vacuum."
- Advised Doug Engelbart and the rest of the team for the presentation
- Founder of the Whole Earth Catalog

During the demo:

- Principal Photographer / camera operator for the demo (back at ARC at SRI).

After the demo:

- Co-founder of The Well, one of the first online communities, among many other accomplishments

Bill Paxton

- Software Engineer at Augment

During the demo:

- Was on the video call with Doug and helped demonstrate the collaboration of the NLS system

Other Members of Augment Research Center

- Charles Irby (Software Engineer)
- Don Andrews (Software Engineer) (Demonstrated the mouse during the demo)

Audience Members and other major figures after the demo

Alan Kay

- Watched the demo on a 16mm film reel as a student. Was able to get ARPA money to come to the demo.
- Was quite impressed with the demo.
- Disagreed with Doug about centralizing the computers. Felt that computers should be more networked and independent than monolithic.
- Went on to work at Xerox PARC, and was fundamental with their research with Smalltalk, networking, an graphical displays.

Bill Duvall

- Joined Augment Research Center (ARC) in 1969 after the demo
- Became interested how computers could be used for communicating and presenting information
- Later became one of two people on the first iteration of ARPANet (the Internet) while at ARC
- Helped connect the ARC and the NLS to the ARPANet, becoming the second node on the network
- Was hired at Xerox PARC by Bob Taylor where he continued working on networking

Other Resources

Wikipedia

- The Mother of All Demos: https://en.wikipedia.org/wiki/The_Mother_of_All_Demos
- Doug Engelbart: https://en.wikipedia.org/wiki/Douglas_Engelbart
- William "Bill" English: https://en.wikipedia.org/wiki/Bill_English_(computer_engineer)
- Johns Frederick (Jeff) Rulifson: https://en.wikipedia.org/wiki/Jeff_Rulifson
- Alan Kay: https://en.wikipedia.org/wiki/Alan_Kay
- Stewart Brand: https://en.wikipedia.org/wiki/Stewart_Brand
- J.C.R. Licklider https://en.wikipedia.org/wiki/J.C.R._Licklider
- John McCarthy https://en.wikipedia.org/wiki/John_McCarthy_(computer_scientist)
- NLS Computer System: https://en.wikipedia.org/wiki/NLS_%28computer_system%29

- Andries van Dam https://en.wikipedia.org/wiki/Andries_van_Dam
- Bill Paxton https://en.wikipedia.org/wiki/Bill_Paxton_(computer_scientist)
- Charles Irby https://en.wikipedia.org/wiki/Charles_Irby

Articles

- https://www.pcworld.com/article/2043647/douglas-engelbart-inventor-of-the-computer-mouse-has-died.html
- https://computerhistory.org/blog/net-50-did-engelbart-s-mother-of-all-demos-launch-the-connected-world/

Books

- Fisher, Adam: "Valley of Genius: The Uncensored History of Silicon Valley (As Told by the Hackers, Founders, and Freaks Who Made It Boom)" (2018) (excerpt)
- Markoff, John: What the Dormouse Said (2003)
- Turner, Fred: "From Counterculture to Cyberculture" (2006)
- Rehingold, Howard: Tools for Thought: "The History and Future of Mind-Expanding Technology"

In-game resources

- Byte Magazine Archive.org: (https://archive.org/details/byte-magazine)
- Doctor Dobb's Magazine Archive.org: https://archive.org/details/dr_dobbs_journal

Photos

- https://tribute2doug.wordpress.com/photo-album/
- https://www.dougengelbart.org/content/view/374/464/
- https://www.dougengelbart.org/content/view/224/217/

Videos

- https://archive.org/details/motherofalldemos_reel1
- https://archive.org/details/motherofalldemos_reel2
- https://archive.org/details/motherofalldemos_reel3
- https://archive.org/details/dougengelbartarchives

Additional Resources

- The Demo at 50: ([Youtube Playlist](#))