

FPCUG Notes for June 2019

Editor: Frank Fota (fotafm@gmail.com)

SCHEDULE OF EVENTS (7:00 PM - Falmouth Firehouse, Butler Road):

-- Tues, Jun 4: **Technology Workshop (Josh Cockey)**

-- Tues, Jun 11: **Board of Directors (BoD) Meeting (Patty Davis, Presiding)**

-- **Thu, Jun 13: General Meeting.** APCUG Region 2 Advisor, Gabe Goldberg will present, "What's a Router and Why Do I Want One?" Gabe says, the electronic box connecting your ISP and home network is almost certainly a router (providing Ethernet ports and Wi-Fi access), or perhaps it's a router with added capabilities (e.g., a modem converting ISP connectivity to Ethernet). You're not alone if you haven't given it much thought as it likely "just works", year after year. But routers are complex devices: in fact, they're computers running operating systems and applications! Therefore, informed decisions about selection and configuration are needed along with occasional updates or replacement to fix problems, improve performance, and (especially) close security exposures. This presentation will answer the questions posed above and help you understand and exploit router features. The public is invited and refreshments will be served.



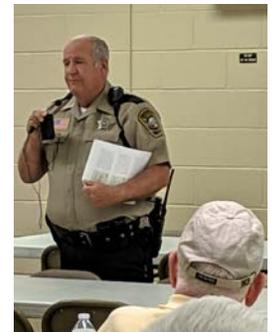
-- **Tues, Jun 18: Windows 10 Workshop (Ed Alexander)**

-- **Thu, Jun 20: Experimac Workshop** 1865-106 Carl D. Silver Parkway

-- **Thu, Jun 27: Windows All Workshop (Jim Hopkins)**

MAY GENERAL MEETING RECAP

Deputy Jim Hamilton, Stafford County Sheriff's Office discussed the tactics and techniques used to commit internet/email fraud, specifically, fraud targeting senior citizens. Deputy Hamilton surprisingly revealed that the perpetrators of these crimes are most often relatives. The presentation was informative and well attended by FPCUG members.



ANNUAL MEMBER'S APPRECIATION DINNER

The appreciation dinner for FPCUG members will be at the [Red Lobster](#), Sunday, July 28 at 3 pm.

LAST REMINDER – FPCUG MEMBERSHIP DUES ARE OVERDUE

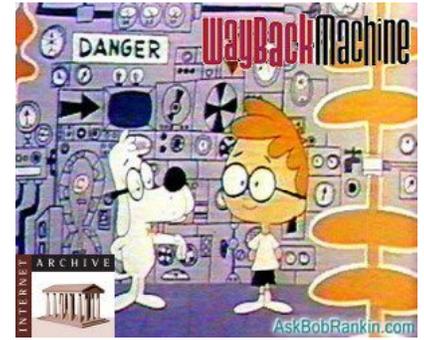
Please remember to renew your membership. Annual membership is for the period April 1 through March 31, 2020. If you haven't already done so, please provide Rick Neil a check for \$25 made out to the "FPCUG." Checks can also be mailed to: FPCUG, P.O. Box 276, Fredericksburg, VA 22404.

THE DEPARTMENT OF DEFENSE (DOD) SOFTWARE BLACKLIST

DOD Acquisition and Sustainment Undersecretary Ellen Lord told reporters during a May 10 briefing at the Pentagon that the DOD is expected to publish a list of software companies that are not trusted. The DOD cannot simply share the list, but is working with Congress to "...get authorities to be able to share our restricted vendors list." Writing for Federal Computer Week (FCW), Lauren C. Williams says, "The 2019 Defense spending bill banned services and equipment from five companies: Huawei, ZTE, Hytera Communications Corp., Hangzhou Hikvision Digital Technology Co., and Dahua Technology Co., as well as any of their subsidiaries or affiliates."

INTERNET ARCHIVE

Have you ever clicked on a website link or tried to open a favorite URL (i.e., a Uniform Resource Locator) only to find the page has been moved or removed? All hope of finding the content you desire is not lost. The web page may be available from the [Internet Archive](#). The Archive was founded by computer engineer and digital librarian, Brewster Kahle. The Archive is one of the largest libraries in the world. Mr. Kahle created the Internet's first publishing system called Wide Area Information Server (WAIS). WAIS was sold to AOL in 1995. In 1996, Mr. Kahle co-founded Alexa Internet; a program designed to catalog the Web. Mr. Kahle sold it to Amazon.com in 1999. Writing for [askbobrankin.com](#), Bob Rankin says, "The front-end to this massive library is the Wayback Machine (which fans of Dr. Peabody and Sherman will recognize). It allows journalists, researchers, and the nostalgically curious to search for older versions of Web pages, even if the pages no longer exist on the Web." Bob says that web page URLs can also be submitted for archiving. This essentially makes the web page permanent. A browser extension is available for Chrome and an add-on for Firefox that automatically searches the Internet Archive when you reach "page not found" URLs. Another means for finding lost internet content is Google's cache. According to [Google](#), "Google takes a snapshot of each web page as a backup in case the current page isn't available. These pages then become part of Google's cache. If you click a link that says 'Cached,' you'll see the version of the site that Google stored." To get a cached link:



- **On your computer, do a Google search for the page you want to find.**
- **Click the green down arrow to the right of the site's URL.**
- **Click Cached.**
- **When you're on the cached page, click the current page link to get back to the live page.**

SLOW INTERNET – COULD BE A Wi-Fi INTRUDER

Gabe Goldberg plans to discuss router security at the June 13th General Meeting. If you have neighbors within 300-feet of your home (i.e., the maximum outdoor range of modern Wi-Fi routers), they could be "borrowing" your Wi-Fi and limiting your bandwidth (i.e., reducing speed). Your neighbor's use of your broadband may prove harmless: he saves on his bills and potentially adds to yours. Access, however, could provide an intruder a means to commit credit card or bank fraud. In either case, you could lose money and/or your identity (i.e., identity theft). Writing for Techrival (spelled [techrival.com](#)), Mehul Boricha says, "Whenever you buy a WiFi router, it comes with its own username and password for accessing the admin panel by default. The problem with using the default id and passwords is that many of the online sites like this that provide databases for default id and passwords for each router model which makes it relatively easy for someone to peak [sic] into your network and access the admin panel by using these values." In addition to changing the default Admin Login User ID and Password, Mr. Boricha advises:

1. **Replace your Network's default SSID Name**
2. **Use Ethernet to Access Admin Panel**
3. **Enable Network Encryption using WPA2 and AES**
4. **Disable WPS**
5. **Enable Firewall on your Router**
6. **Enable MAC addresses Filter**
7. **Limit the WiFi Range**
8. **Update your Router's Firmware**

FOUR NEW VULNERABILITIES AFFECT INTEL CPUs MADE SINCE 2011

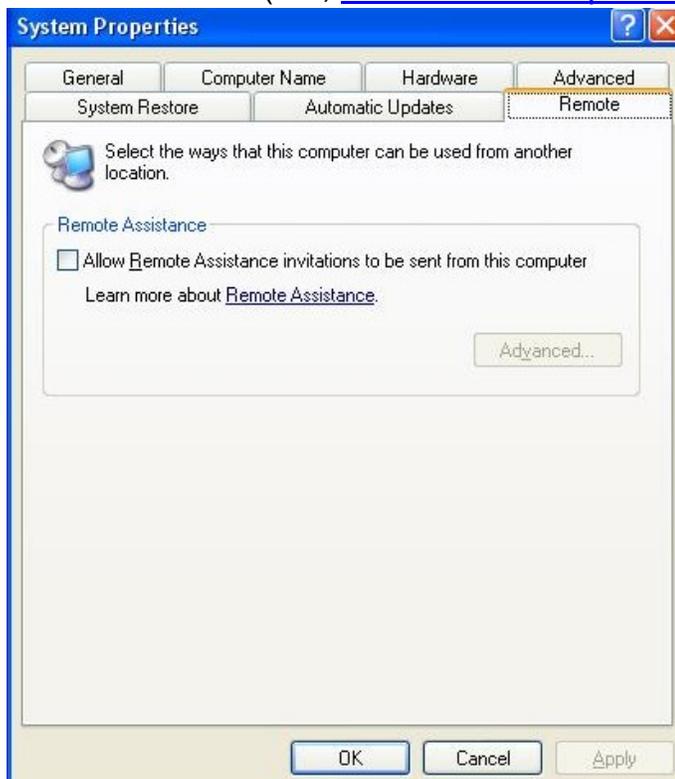
Four new vulnerabilities have been identified in Intel processors:

1. **ZombieLoad** – could let intruders steal information from applications and cloud-based systems
2. **Rogue In-Flight Data Load** – could manipulate chips' memories to expose sensitive information
3. **Fallout** – could be exploited to steal data or compromise operating systems, and
4. **Store-to-leave-forwarding** – could also be exploited to steal data or compromise operating systems

Like the Spectre and Meltdown flaws, the new security holes could be used to compromise CPUs using speculative execution. Speculative execution predicts the data that you will next request and loads or prepares to load it when requested. This speculation makes modern computer processors operate faster. San Francisco bureau chief of [MIT Technology Review](#) Martin Giles says, "There's no evidence (yet) that the latest set of vulnerabilities have been exploited by hackers, but they could be used to pilfer all kinds of sensitive data." Since replacing the affected processors is not a practical option, the best fix is to apply software patches as they are developed by Intel and others. Intel says it discovered these flaws a year ago and customers are angry finding out that their recently purchased systems were more vulnerable than they at first thought. The decision to release these new vulnerabilities was delayed, however, to allow patches to be developed before a means to exploit the vulnerabilities.

SERIOUS WINDOWS FLAW "BLUEKEEP"

Researchers at McAfee and ESET warn that exploitation of the "BlueKeep" vulnerability could spread like the *WannaCry* and *NotPetya* worms (2017). McAfee researchers were able to exploit the vulnerability (Indexed as "CVE-2-19-0708") and remotely execute code on a vulnerable (i.e., [Remote Desktop Protocol](#) or RPC enabled), computer without any



user interaction. RPC is not enabled by default in Windows XP. That may not be the case if you have ever asked for remote (i.e., online) support or for Windows Vista. According to Security Evangelist Ondrej Kubovič at [ESET](#), "The BlueKeep vulnerability was found in Remote Desktop Services (also known as Terminal Services). If successfully exploited in the future, it could enable access to the targeted computer via a backdoor with no credentials or user interaction needed." Mr. Kubovič adds, "Users of Windows 7, Windows Server 2008 R2, and Windows Server 2008 with automatic updates enabled are protected." Windows 8 and Windows 10 are not affected by the vulnerability. Given the probability and severity of this vulnerability, Microsoft categorized "BlueKeep" CVE-2-19-0708 as, "...a critical remote code execution vulnerability." Patches for no longer supported operating systems (i.e., Windows XP, Windows Vista, and Windows Server 2003) are available [here](#).

SpaceX's STARLINK (SATELLITE INTERNET) JUST GOT INTERESTING

SpaceX's "Starlink" is one of many companies that intend to offer global broadband internet service to disparate areas of the earth using an array of satellites in Low Earth Orbit (LEO). Competitors include Airbus/OneWeb, LeoSat Enterprises, and Canada's Telesat. SpaceX plans to place approximately 12,000 satellites in LEO and claims that the array will provide nearly instantaneous world-wide internet access when completed. A SpaceX Falcon 9 rocket launched from Cape Canaveral, Florida on Thursday, May 23, 2019, carrying 60 Starlink satellites (pictured at right). Each satellite weighs about 500 pounds. This was SpaceX's heaviest payload to date. You can watch a video of the launch [here](#).



Concerns have already been expressed about the planned array on two fronts: the number of satellites added to those already in LEO (i.e., space junk), and the impact on both traditional astronomy (visible observation) and radio astronomy. With regard to space junk, SpaceX state that Starlink satellites have a limited lifespan and will reenter the earth's atmosphere after a short five-years of service. Ninety-five percent of the satellite's components are designed to burn up during reentry. According to [Wikipedia](#), "SpaceX filed documents in late 2017 with the US FCC to clarify their space debris mitigation plan. The company will 'implement an operations plan for the orderly de-orbit of satellites nearing the end of their useful lives (roughly five to seven years) at a rate far faster than is required under international standards. [Satellites] will de-orbit by propulsively moving to a disposal orbit from which they will reenter the Earth's atmosphere within approximately one year after completion of their mission.' In March 2018, the FCC issued SpaceX approval with some conditions. SpaceX would need to obtain a separate approval from the [ITU](#). The FCC supported a NASA request to ask SpaceX to achieve an even higher level of de-orbiting reliability than the standard that NASA had previously used for itself: reliably deorbiting 90% of the satellites after their missions are complete." The initial train of sixty satellites will separate but each is clearly



SpaceX Starlink satellite train with flaring

visible in the night sky in a video captured [here](#). Given the number of satellites planned by SpaceX for Starlink and the thousands of satellites intended to be launched by competitors, could there eventually be more visible satellites than stars? Elon Musk is quoted on Twitter saying, "If we need to tweak sat orientation to minimize solar reflection during critical astronomical experiments, that's easily

done." Elon Musk also suggests via [Twitter](#) that the reflectivity of future Starlink satellites could be reduced. He is waiting, however, for the Starlink satellites to move into higher orbits as intended to determine whether such a change is needed. It appears that Elon Musk has thought about the potential for the Starlink network to interfere with radio astronomy observations. He is quoted on [Twitter](#) saying, "We avoid use of certain lower Ku frequencies specifically for radio astronomy."

LUCI BY MPOWERD

*By George Harding, Treasurer, Tucson Computer Society, AZ, Tucson Computer Society
March 2019 / www.aztcs.org*

Luci is a light powered by the sun. It has a solar cell on top that accumulates charge sufficient to power the light.

When you first get the Luci unit, it needs to be inflated. It's pretty much flat and although the solar cell will still charge, the light does not have any space to shine. Inflation is mouth-powered. You blow up the unit until it is a cylinder.

Then you can set the unit on a window sill or outside to charge. It doesn't take long. There is a recessed button on the top which turns the light on. There are three levels: normal, bright and flash.



There is enough light to brighten a small room or allow you to read a book. It lasts for 24 hours or so, depending on the illumination level chosen.

The original goal for developing Luci, according to its founders, is:

With Luci, we were aiming for something much bigger than convenience. We want to empower the three billion people around the world who still live without reliable access to electricity. So we made a light that's

clean and safe – pretty much the opposite of the toxic and expensive kerosene lamps so many depend on – because life doesn't stop after the sun goes down.

MPOWERD has several Luci models, varying by the range of colors that can be displayed and length of battery life. They are all modestly priced, easy to use and very helpful when you don't have electricity available. Some versions are not only charged by sunlight, but also alternatively by using a cable.

The company has a program of giving Luci units to those for whom electricity is unavailable. You donate \$10, which sends a Luci unit to Africa or other similar location.

I received two Luci units for review. The first is the original Luci, which only has white light, but works to illuminate your room for reading or doing homework. The second is a more complex unit with external charging capability and multiple colors available. Both do the job of giving you light when you need it and don't have it.

Luci by MPOWERD www.mpowerd.com

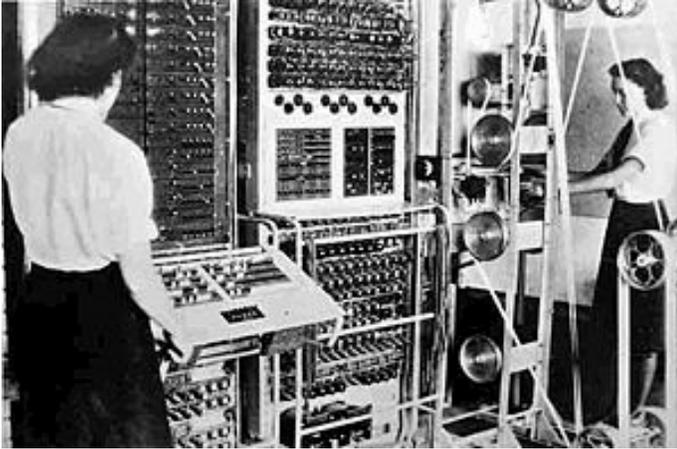
Prices vary by unit from \$15 to \$65

NOTE... the FPCUG does not endorse products or services of any kind 😊.

EVENTS IN COMPUTER HISTORY

(paraphrase and additions to the [Iceni Technology Blog](http://www.iceni.com/technology-blog) by Iceni Technology Contributor Rebecca Coe and historical data from the websites <http://www.computerhope.com/history/>, <http://www.computerhistory.org>, and <http://www.historyorb.com/>)

-- Jun 1 --



The Colossus Mark 2 computer was introduced on June 1, 1944. An improved version of the world's first electronic digital computer (i.e., the Colossus Mark 1), the Colossus computers were used by British codebreakers during World War II to decrypt encoded messages from the German High Command. Ten Colossus computers were used by the end of the war.

-- Jun 1 --

The Intel 8088 processor was introduced (1979).

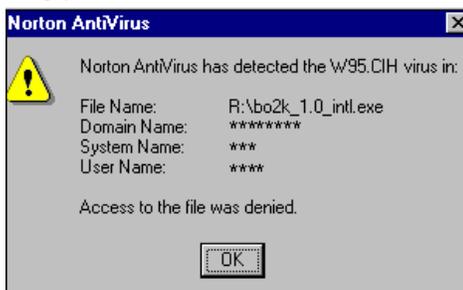


-- Jun 1 --

Maxis, the company that created the SimCity video game, went public (1995). The SimCity simulator programs were built on Maxis co-founder Will Wright's childhood interest in model ships and airplanes. The series included SimEarth, SimAnt, and SimLife. With partner Jeff Braun, a company was founded that allowed people to create virtual cities and protect them from various disasters.

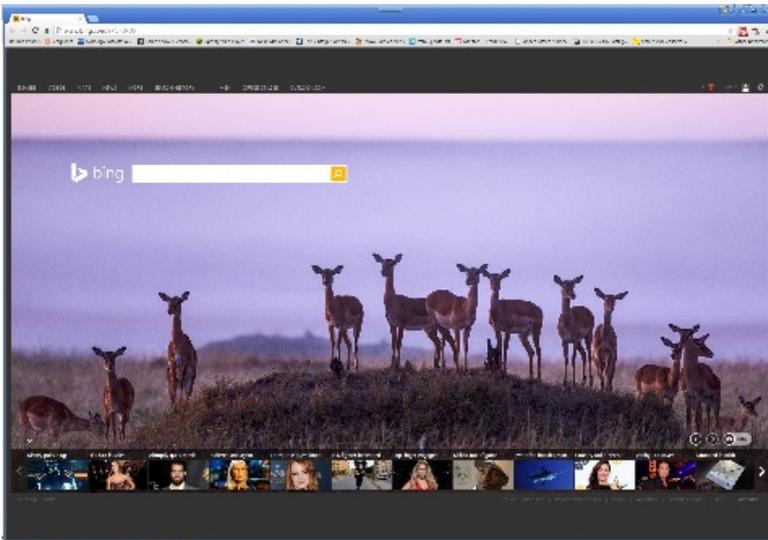


-- Jun 2 --



The CIH computer virus, also known as Chernobyl or Spacefiller, was discovered in Taiwan (1998). The virus infected 60 million computers, overwriting critical information on system drives, and in some cases destroying the system BIOS. The virus was created by Chen Ing-hau, a student at Tatung University in Taiwan. The damages caused by the virus were estimated at \$1 billion.

-- Jun 3 --



Bing was created by Microsoft on Jun 3, 2009, as a competitor to rival Google. Microsoft changed the look and feel of a standard search engine by adding dynamic and high resolutions pictures of places and wildlife, making the Bing homepage a very pretty search engine visually to look at. Microsoft and Yahoo! partnered to use Bing as the default search engine for Yahoo Search.

-- Jun 3 --

Napster filed for a Chapter 11 bankruptcy (2003).



-- Jun 4 --



US and Japanese officials agreed on a pact governing the countries' microprocessor trade (1991). The pact resulted from intense competition between American and Japanese chipmakers and called for sales of foreign semiconductors to reach 20 percent in the Japanese market within a year.

President Reagan imposed sanctions on Japan in 1986 because they failed to increase the US share of the Japanese semiconductor market.

-- Jun 6 --

The Los Angeles Times reported that Father Leonard Boyle was working to put the Vatican's library on the World Wide Web -- "bringing the computer to the Middle Ages and the Vatican library to the world." This merger of religion and technology in Vatican City was partially funded by IBM. Boyle digitized the library's catalog and placed manuscripts and paintings on the website. Today, thousands of manuscripts and incunabula have been digitized and are publicly available via the Vatican Library website. A number of other offerings are available, which include images and descriptions of the Vatican's extensive numismatic collection that dates back to Roman times.



-- Jun 8 --

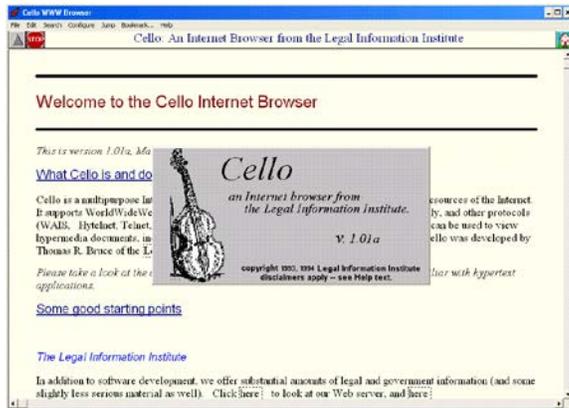
The Intel 8086 was introduced (1976).



-- Jun 8 --

The PHP (Hypertext Pre-processor) computer language was introduced on June 8, 1995. PHP is a server-side scripting language designed for web development but also as a general-purpose programming language. As of January 2013, PHP was installed on more than 240 million websites and 2.1 million web servers ([read more](#)).

-- Jun 8 --



The Cello internet browser was released (1993). Developed by Thomas Bruce for use by lawyers who could not access legal information (hypertext) on the internet, Cello was the first Web browser for Windows and the first free Winsock browser. (Note: A "Winsock" is an adaptation for Windows of the Berkeley UNIX sockets interface.). Cello development stopped in 1994.

-- Jun 8 --

The US House of Representatives voted down the Net Neutrality Amendment on June 8, 2006. The amendment would have formalized Net Neutrality policies, a move lobbied for and favored by a number of Silicon Valley tech companies. The vote was split closely down partisan lines, with most dissenting votes coming from the Republican side of the House, while the majority of Democrats were in favor of it. Net Neutrality, which calls for an open Internet with no favoritism granted towards certain users, providers, or types of streaming services and data, has been an ongoing debate, especially in the US. The Federal Communications Commission (FCC), following the reclassification of Broadband as a "public utility," voted 3-2 for the Net Neutrality Policy (February 26, 2015). Congress did not have a vote on the matter.



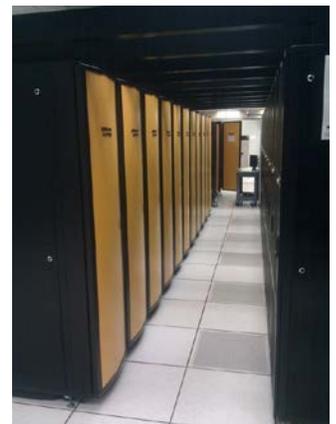
-- Jun 8 --



The Safari (Apple Inc.) web browser was released for Windows (2007). Safari was discontinued on May 9, 2012, when Microsoft redesigned the look and feel of Internet Explorer. In 2011, Safari held over 60% of mobile web browsing traffic.

-- Jun 9 --

The Pittsburgh Supercomputer Center opened to support the precursor to the modern Internet, the National Science Foundation's NSFNET, which linked five supercomputer centers at Princeton University, Pittsburgh, the University of California at San Diego, the University of Illinois at Urbana-Champaign, and Cornell University in Ithaca, New York (1986). Soon, several regional networks developed. Eventually, the government reassigned pieces of the ARPANET to the NSFNET. The NSF allowed commercial use of the Internet in 1991, and in 1995, it decommissioned the backbone, leaving the Internet a self-supporting industry.



-- Jun 10 --



Apple Computer Inc. shipped the first Apple II computer (1977). The original model cost \$1,298 and came with 4KB of RAM (upgradeable to 48KB), and had sound and color graphics. The BASIC programming language was built in, which made programming easy. Apple II's sold well in schools and, with the arrival of the VisiCalc spreadsheet program, in the small business market.

-- Jun 11 --

Texas Instruments, Inc. introduced Speak & Spell (1978), a talking learning aid for ages 7 and up. Its debut marked the first electronic duplication of the human vocal tract on a single chip of silicon. Speak & Spell utilized linear predictive coding to formulate a mathematical model of the human voice and predict a speech sample based on previous input. It transformed digital information processed through a filter into synthetic speech. It could store over 100 seconds of linguistic sounds.



-- Jun 11 --

COMPAQ

Compaq Computer paid \$9 billion for Digital Equipment Corporation in the largest high-tech acquisition to date (1998).

digital

-- Jun 12 --

3Com Corp. and US Robotics Corp. completed their merger on Jun 12, 1997. This was the largest business deal to date in the networking industry. US Robotics developed remote access networks and modems. 3Com concentrated on network interface cards and network systems.

-- Jun 12 --

Analog signal (i.e., broadcast) was terminated across the United States and HDTV was officially adopted (2009)

-- Jun 14 --

The US Census Bureau dedicated its first UNIVAC computer on June 14, 1956 -- and experienced its first programming error. Once the bugs were fixed, the UNIVAC I became the first commercial computer to attract widespread public attention. Remington Rand eventually sold 46 machines at more than \$1 million each.



-- Jun 15 --



The Adobe Acrobat/Reader was released for Apple Macintosh PCs (1993). It was later released for Windows 3.1 and DOS. Originally, the Acrobat Reader was only available as a \$50 extra with the purchase of a new computer.

-- Jun 16 --



Charles Ranlett Flint founded the precursor of IBM, Control-Tabulating-Recording Company (1911). IBM became one of the world's largest manufacturers of computer hardware and software, offering infrastructure, hosting and consulting services in a vast range of areas from mainframe computers to nanotechnology.



-- Jun 17 --

A Philips factory in Germany created the world's first compact disc (1982).

-- Jun 19 --

AMD released the Duron processor (2000).



-- Jun 20 --



The National Bureau of Standards dedicated the SEAC (Standards Eastern Automatic Computer) in Washington on June 20, 1950, as a laboratory for testing components and systems for setting computer standards. The SEAC was the first computer to use all-diode logic, a technology more reliable than vacuum tubes and was the first stored-program computer in the United States. Magnetic tape in the external storage units stored programming information, coded subroutines, numerical data, and output.

-- Jun 20 --



China's supercomputer Sunway TaihuLight becomes the world's fastest computer at 93 petaflops (2016).

The title was held for approximately 2 years (i.e., until the US Department of Energy and IBM unveiled the Summit supercomputer in 2018).

-- Jun 21 --

The Manchester Small-Scale Experimental Machine (nicknamed "Baby") became the world's first stored-program computer (1948). It was created at the Victoria University of Manchester by Frederic C. Williams, Tom Kilburn, and Geoff Tootill. The SSEM was built as a testbed for the Williams tube, an early form of computer memory. It was capable of only a 32-bit word length and a memory of 32 words.



-- Jun 21 --



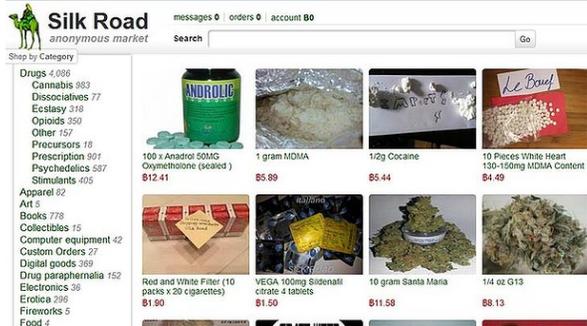
IBM retired its last "STRETCH" mainframe (7000 series), the company's first transistorized computers (1981). The 7030 "STRETCH" was the best in its class; significantly faster and more dependable than vacuum tube machines. Seven of the computers, featuring 64-bit word architecture and other innovations, were sold to national laboratories and other scientific users. L. R. Johnson first used the term "architecture" in describing the STRETCH.

-- Jun 21 --

The Norwegian software company, Opera Software ASA was founded (1995). Opera Software is best known for its web browsers. Opera is also involved in promoting Web standards through participation in the World Wide Web Consortium. The Opera family of web browsers has over 300 million users worldwide.



-- Jun 23 --



The FBI shut down the Silk Road, a website used to facilitate the sale of illegal drugs (2013).

-- Jun 24 --

The Apple touchscreen smartphone (i.e., the 4th generation iPhone 4), was introduced (2010). At 9.3 mm, the iPhone 4 was 24% thinner than the iPhone 3. It weighed in at 4.8 oz and claimed to have 20-25% better battery life than the iPhone 3. The iPhone's Retina Display featured 326 pixels per inch (four times as many as the iPhone 3GS). The iPhone 4 had both front and back cameras and video calling app called "FaceTime."



-- Jun 25 --

Microsoft® was incorporated on June 25, 1981. Founded 6-years earlier by Bill Gates and Paul Allen, Microsoft (MS) grew out of the friends' development of BASIC for the MITS Altair home computer kit. Later successes with the Windows OS and MS Office products led Microsoft to dominate the PC software industry.

-- Jun 25 --

Microsoft released the Windows 98 operating system to the world on June 25, 1998. Windows 98 was the second major operating system release after Windows 95. The operating system lasted less than 2 years before it was replaced by Windows ME in 2000.



-- Jun 26 --



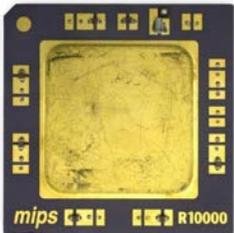
The US Supreme Court ruled the Communications Decency Act unconstitutional on a 7-2 vote (1997). The act, passed by both houses of Congress, sought to control internet content in an effort to keep pornography from minors. In an opinion written by Justice John Paul Stevens, the Supreme Court ruled the act a violation of free speech as guaranteed by the US Constitution.

-- Jun 29 --

Apple introduced the iPhone in the United States (2007).



-- Jun 29 --



Silicon Graphics Inc. (SGI) and MIPS Computer Systems merged in a stock swap valued at \$333 million (1992). SGI pioneered a number of techniques in widespread use in 1992 but financial difficulties lead to industry speculation about the future of the computer graphics software and hardware company. MIPS, founded by Stanford University Engineering School Dean John Hennessy, developed high-speed computer chips making use of reduced instruction set computing (RISC) technology, which improved speed by simplifying the transmission of information within a computer. On April 1, 2009, SGI filed for bankruptcy and was acquired by Rackable Systems a few weeks later.

-- Jun 30 --

First Draft of a Report
on the EDVAC

by

John von Neumann

Contract No. W-670-ORD-4926

Between the

United States Army Ordnance Department

and the

University of Pennsylvania

Moore School of Electrical Engineering
University of Pennsylvania

June 30, 1945

This is an exact copy of the original typescript draft as obtained from the University of Pennsylvania Moore School Library except that a large number of typographical errors have been corrected and the forward references that von Neumann had not filled in are provided where possible. Missing references, mainly to unwritten Sections after 15.0, are indicated by empty {}. All added material, mainly forward references, is enclosed in {}. The text and figures have been reset using TeX in order to improve readability. However, the original manuscript layout has been adhered to very closely. For a more "modern" interpretation of the von Neumann design see M. D. Godfrey and D. F. Hendry, "The Computer as von Neumann Planned It," *IEEE Annals of the History of Computing*, vol. 15 no. 1, 1993.

Michael D. Godfrey, Information Systems Laboratory, Electrical Engineering Department
Stanford University, Stanford, California, November 1992

"First Draft of a Report on the EDVAC" was published. Brian Randell notes, "It is generally accepted that the first documented discussion ... of the advantages of using just one large internal memory, in which instructions as well as data could be held, was the draft report on EDVAC written by Von Neumann." In 1944, he was appointed a consultant to the EDVAC project. The draft report contains a description of the planned machine and the reasons for various design decisions.

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