

The Cloud—For Non-Meteorologists

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Learn-30

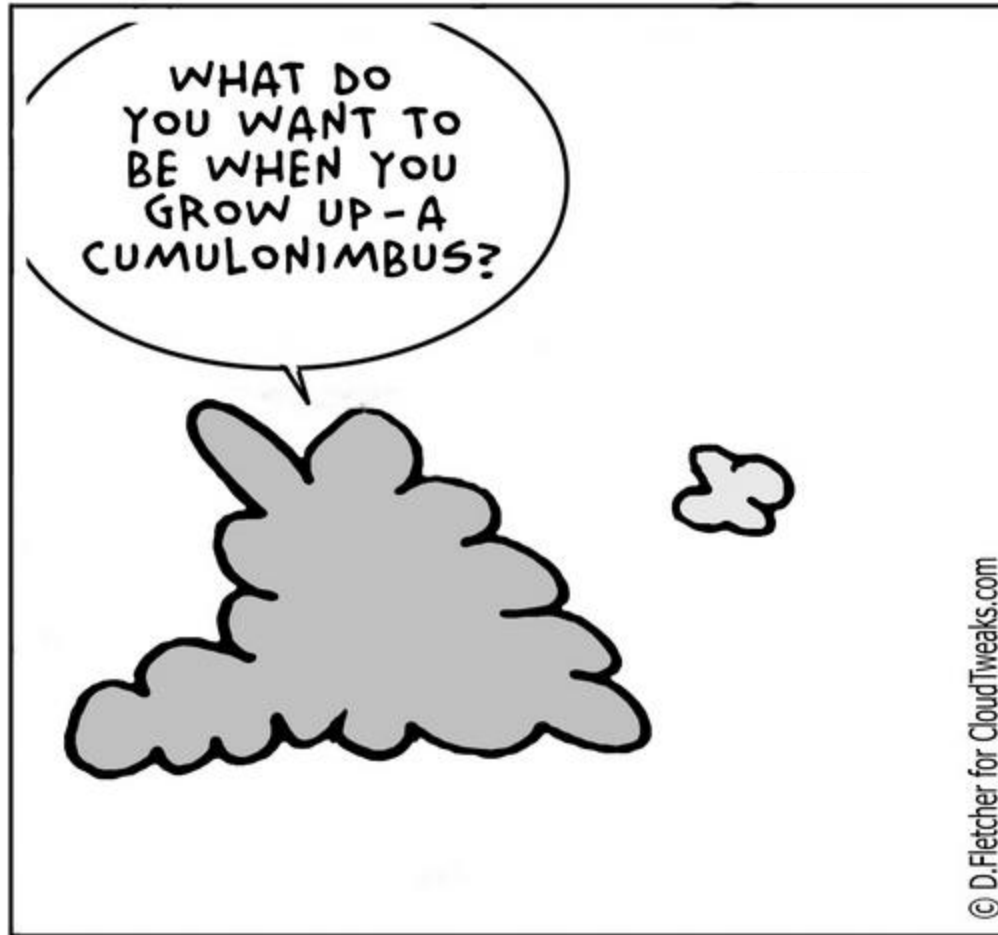
PATACS/OPCUG

March 15, 2014

Cloud [klaúd] vb. to make obscure, to confuse



“The Cloud”—an unfortunate label



**“The Cloud” = $f(\text{data storage}) + f(\text{telecommunications})$
+ $f(\text{software})$**

Cloud software...



Overview

- PCs and local storage
 - ✓ Floppy disks
 - ✓ Hard drives
 - ✓ CDs/DVDs
 - ✓ Thumb drives
 - ✓ Solid state drives (SSDs)

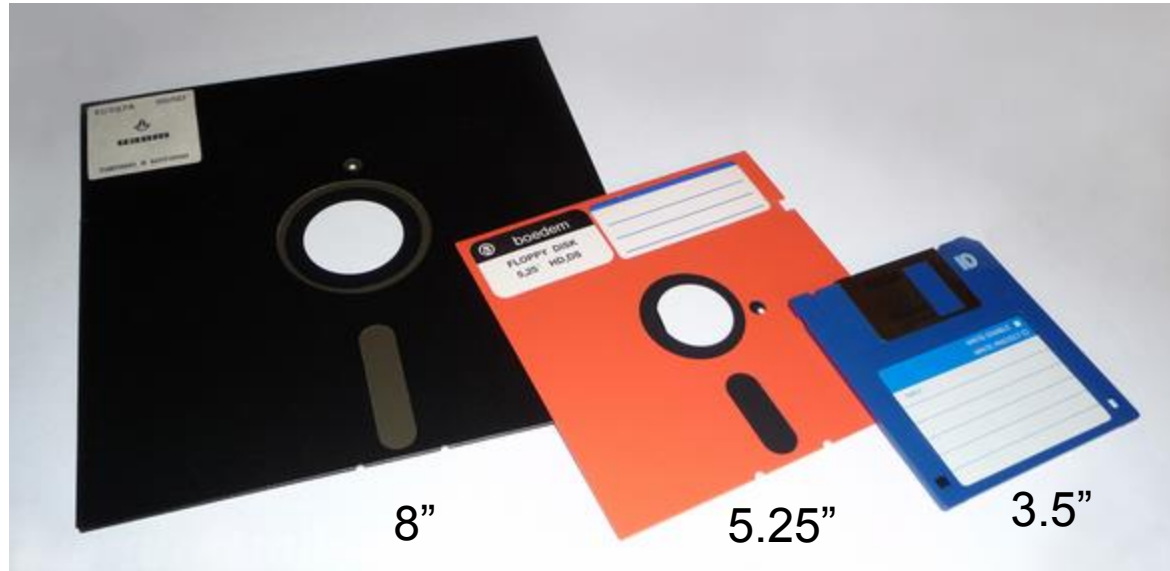
Overview (cont.)

- PCs and local storage (cont.)
 - ✓ **Network Attached Storage**
 - ✓ Local servers
- A brief history of telecommunications
 - ✓ The Internet (a network of networks)
 - ✓ STN (network for scientific information)

Overview (cont.)

- “The Cloud” **Finally!**
- Providers of “Cloud” storage
- Server farms, where your stuff lives
- Advantages of “The Cloud”
- Disadvantages of “The Cloud”

Floppy Disks



Sneaker Net



Hard Disk Drives



CDs and DVDs



Thumb Drives

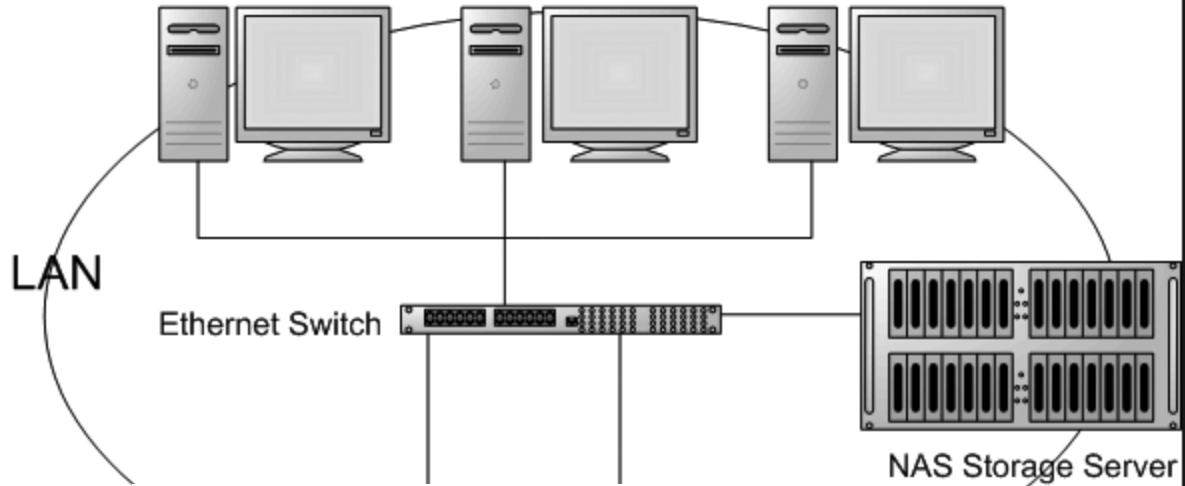


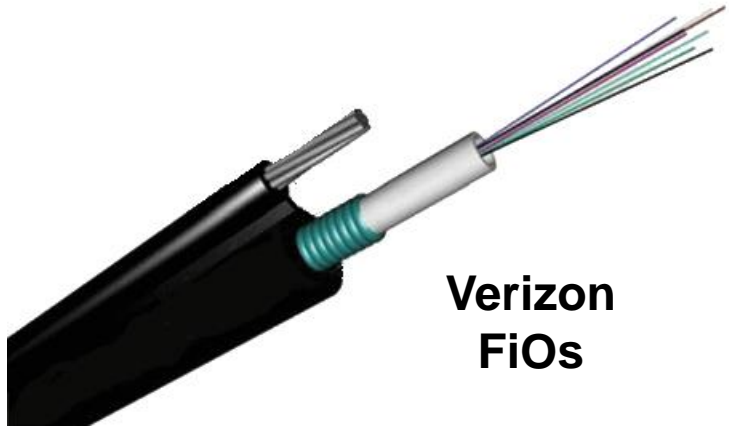
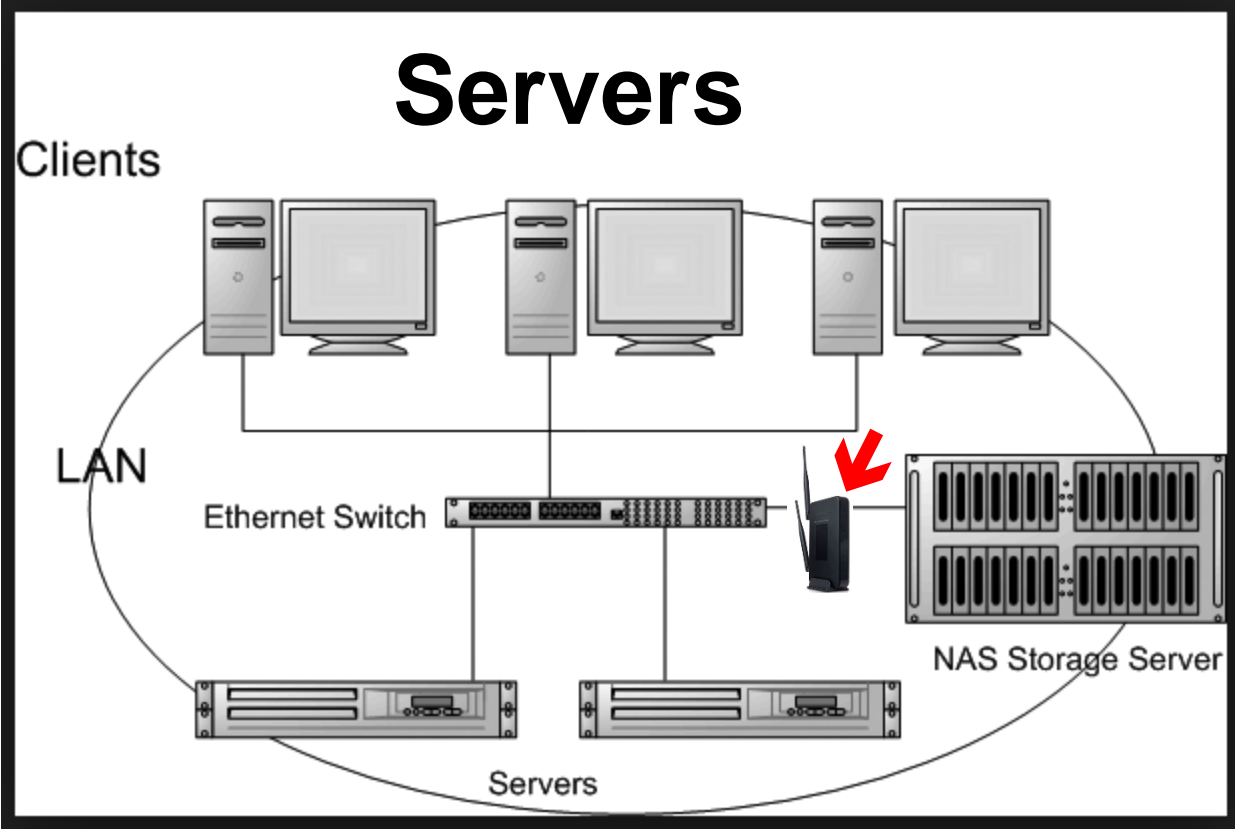
Solid State Drives



Network Attached Storage

Clients



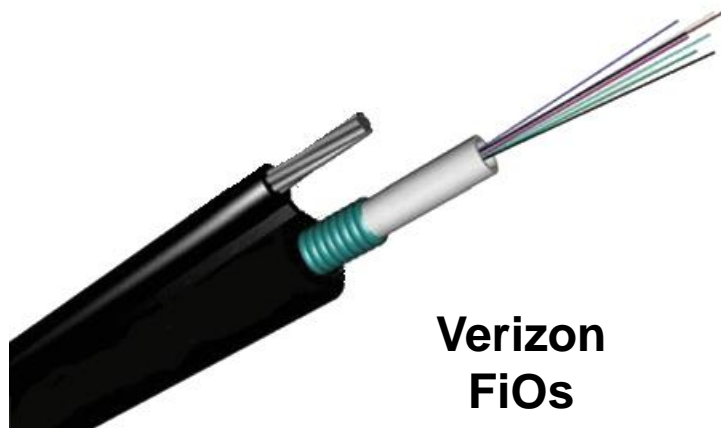


**Verizon
FiOs**

“My Cloud” from Western Digital

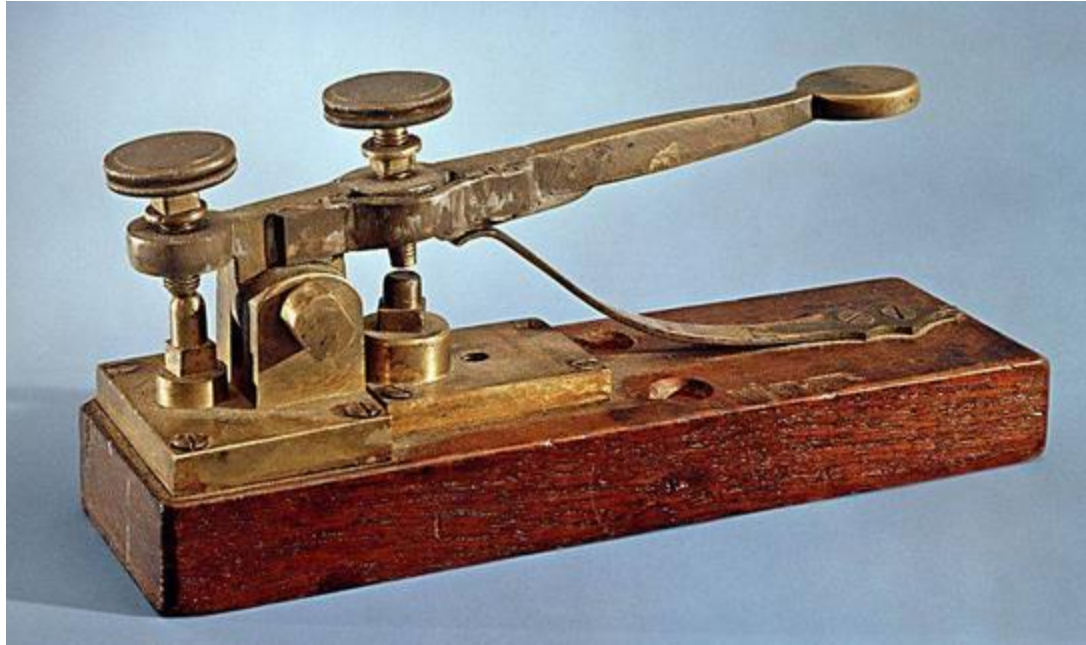


- 2TB—\$150, 3TB—\$180 & 4TB—\$250
- PC and/or Mac
- Automated backup
- Internet accessible
- File sharing
- Apps for iOS & Android



**Verizon
FiOs**

What was the first digital communication system?



1837 Samuel Morse

1837 Cooke and Wheatstone

Before the Internet (1970s—1990s)

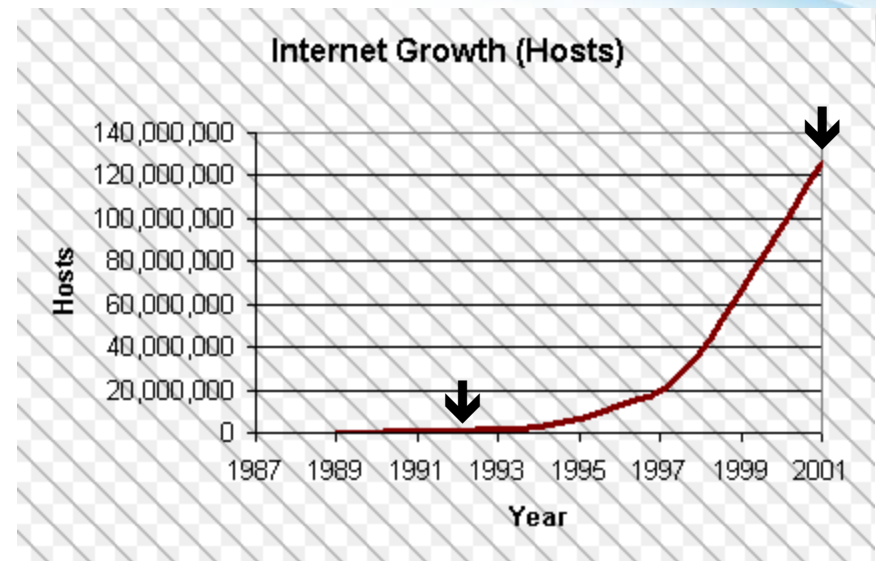
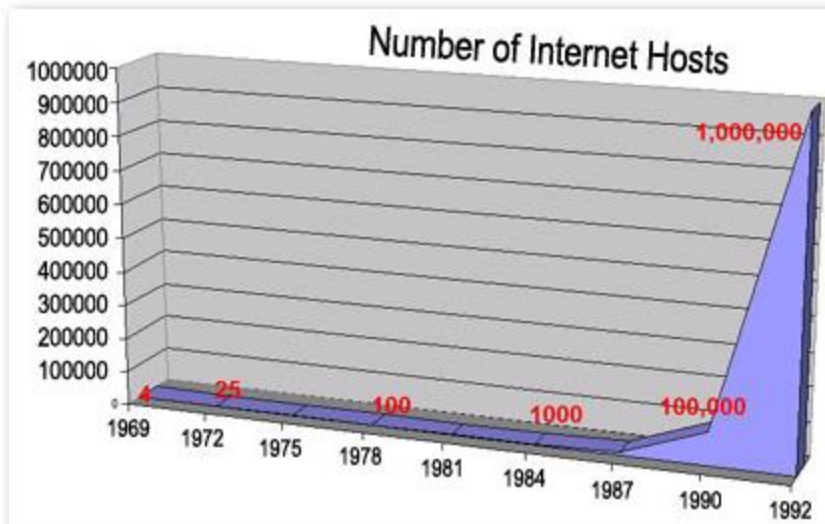
- 0.3 Kb/sec
- 1.2 Kb/sec
- 2.4 Kb/sec
- 9.6 Kb/sec
- 14.4 Kb/sec
- 28.8 Kb/sec
- 33.6 Kb/sec




The Internet

- 1960s ARPAnet (**A**dvanced **R**esearch **P**rojects **A**gency **n**etwork)—a web of computers
- 1986 NSFnet backbone linking five super computing centers (Princeton, UC San Diego, Univ of Illinois, Cornell and Univ of Pittsburgh)
- 1989-early 1990s commercial ISPs start up
- 1991 NREN (**N**ational **R**esearch and **E**ducation **N**etwork) and World Wide Web appeared

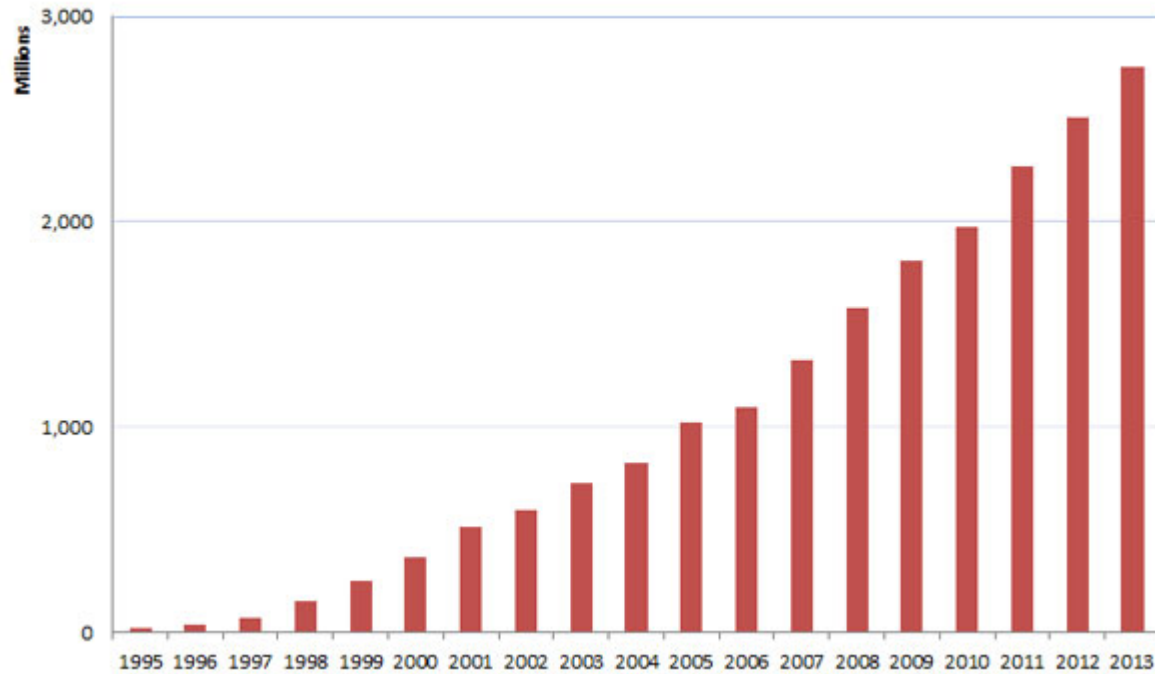
The Internet (cont.)



- Things connected to the Internet (see ):
 - 8-10 billion (2012)
 - ~15 billion (2015)
 - ~40 billion (2020)

The Internet (cont.)

Internet users worldwide

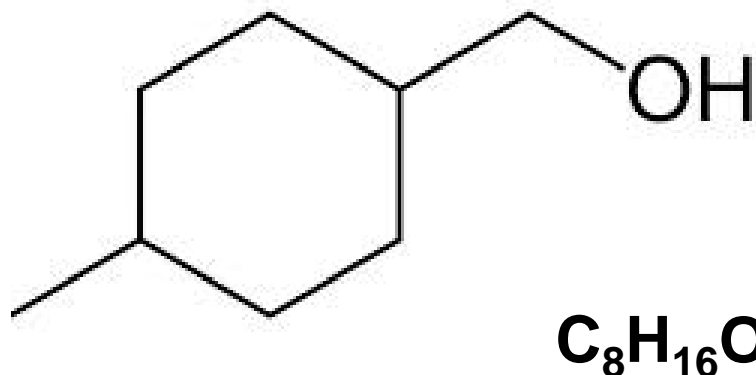


STN—Scientific Technical Information Network

- 1965 Chemical Abstracts Service created chemical information databases
- 1983 ACS partnered with FIZ Karlsruhe to form an international scientific network
 - Databases in Karlsruhe, Germany and Columbus, Ohio
 - Connected by leased T1 lines
- 1988 STN Express deployed on the desktop

FIZ = Fachinformationszentrum “Trade Information Central”

Do you know what this is?



MCHM

(4-methylcyclohexyl)methanol


1-(hydroxymethyl)-4-methylcyclohexane

4-methylcyclohexyl-1-carbinol

Hexhydro-*p*-tolyl-carbinol

CAS Registry Number: 34885-03-5

MCHM Contaminates Elk River

- January 9, 2014—10,000 gallons of crude MCHM leaked into Elk River near Charleston, West Virginia
- 300,000 people advised not to drink water or use for bathing
- For more information see *Scientific American* at  and *Chemical & Engineering News* **92** (7), Feb 17, 2014, pp. 10-15

Toxic Industrial Chemicals

TICs listed by hazard index

High	Medium	Low
Ammonia (CAS# 7664-41-7)	Acetone cyanohydrin (CAS# 75-86-5)	Allyl isothiocyanate (CAS# 57-06-7)
Arsine (CAS# 7784-42-1)	Acrolein (CAS# 107-02-8)	Arsenic trichloride (CAS# 7784-34-1)
Boron trichloride (CAS#10294-34-5)	Acrylonitrile (CAS# 107-13-1)	Bromine (CAS# 7726-95-6)
Boron trifluoride (CAS#7637-07-2)	Allyl alcohol (CAS# 107-18-6)	Bromine chloride (CAS# 13863-41-7)
Carbon disulfide (CAS# 75-15-0)	Allylamine (CAS# 107-11-9)	Bromine pentafluoride (CAS# 7789-30-2)
Chlorine (CAS# 7782-50-5)	Allyl chlorocarbonate (CAS# 2937-50-0)	Bromine trifluoride (CAS# 7787-71-5)
Diborane (CAS# 19287-45-7)	Boron tribromide (CAS# 10294-33-4)	Carbonyl fluoride (CAS# 353-50-4)
Ethylene oxide (CAS# 75-21-8)	Carbon monoxide (CAS# 630-08-0)	Chlorine pentafluoride (CAS# 13637-63-3)
Fluorine (CAS# 7782-41-4)	Carbonyl sulfide (CAS# 463-58-1)	Chlorine trifluoride (CAS# 7790-91-2)
Formaldehyde (CAS# 50-00-0)	Chloroacetone (CAS# 78-95-5)	Chloroacetaldehyde (CAS# 107-20-0)
Hydrogen bromide (CAS# 10035-10-6)	Chloroacetonitrile (CAS# 7790-94-5)	Chloroacetyl chloride (CAS# 79-04-9)
Hydrogen chloride (CAS# 7647-01-0)	Chlorosulfonic acid (CAS# 7790-94-5)	Crotonaldehyde (CAS# 123-73-9)
Hydrogen cyanide (CAS#74-90-8)	Diketene (CAS# 674-82-8)	Cyanogen chloride (CAS# 506-77-4)
Hydrogen fluoride (CAS# 7664-39-3)	1,2-Dimethylhydrazine (CAS# 540-73-8)	Dimethyl sulfate (CAS# 77-78-1)
Hydrogen sulfide (CAS# 7783-0604)	Ethylene dibromide (CAS# 106-93-4)	Diphenylmethane-4,4'-diisocyanate (CAS# 101-68-8)
Nitric acid, fuming (CAS# 7697-37-2)	Hydrogen selenide (CAS# 7783-07-5)	Ethyl chloroformate (CAS# 541-41-3)
Phosgene (CAS# 75-44-5)	Methanesulfonyl chloride (CAS# 124-63-0)	Ethyl chlorothioformate (CAS# 2941-64-2)
Phosphorus trichloride (CAS# 7719-12-2)	Methyl bromide (CAS# 74-83-9)	Ethyl phosphonothioic dichloride (CAS# 993-43-1)
Sulfur dioxide (CAS# 7446-09-5)	Methyl chloroformate (CAS# 79-22-1)	Ethyl phosphonic dichloride (CAS# 1066-50-8)
Sulfuric acid (CAS# 7664-93-9)	Methyl chlorosilane (CAS# 993-00-0)	Ethyleneimine (CAS# 151-56-4)
Tungsten hexafluoride (CAS# 7783-82-6)	Methyl hydrazine (CAS# 60-34-4)	Hexachlorocyclopentadiene (CAS# 77-47-4)

From U.S. Occupational Safety & Health Administration; See 

How many CAS Registry Numbers are there (see )? 84,522,220 as of Mar 15, 2014

“The Cloud”

- What makes “The Cloud” possible?
 - ✓ Inexpensive, fast, high capacity world-wide telecommunications (i.e., today’s Internet)
 - ✓ Inexpensive data storage (i.e., server farms)
 - ✓ Software to send and retrieve data between your PC/Mac/Linux/smartphone and a server
 - ✓ **That’s it...**

Providers of “Cloud” Storage

Service	Clients & Apps	Max File Size	Free Storage	Price/Year	Reference
BitCasa	PC, Mac, iOS, Android	4 GB	10 GB	\$99 unlimited	
Box	PC, Mac, iOS, Android, Blackberry	250 MB or 1 GB	5 GB	\$40 for 20 GB	
Dropbox	PC, Mac, iOS, Linux, Android, BlackBerry	300 MB	2 GB	\$100 for 50 GB	
Google Drive	PC, Mac, iOS, Android	10 GB	15 GB	\$30 for 25 GB \$60 for 100 GB	
iCloud (Apple)	PC, Mac, iOS	250 MB	5 GB	\$120 for 25 GB	
MediaFire	PC, Mac, Linux, iOS Android	200 MB	10-50 GB	\$50 for 100 GB	
SkyDrive (Microsoft)	PC, Mac, iOS, Windows Phone, Android	2 GB	7 GB	\$50 for 100 GB	
Spideroak	PC, Mac, Linux, iOS, Android	No limit	2 GB	\$100 for 100 GB	
SugarSync	PC, Mac, iOS, Android, Windows Phone, Kindle Fire, BlackBerry	No limit	5 GB	\$60 for 30 GB	
Ubuntu One	PC, Mac, Linux	5 TB	5 GB	\$30 for 20 GB	

SkyDrive is now OneDrive

My Personal Use of the Cloud

- Google Drive
 - ✓ Limited use
 - ✓ Anything sensitive is encrypted before depositing
 - ✓ Anything sensitive is stored encrypted on *home computers*
- iCloud
 - ✓ To sync Contacts and Calendar between Outlook/PC, iPad, iPhone and MacBook
 - ✓ Weekly manual backup of iCloud data to MacBook

Good Luck!!



**Don't be dissuaded by FUD
(Fear, Uncertainty and Doubt)**

Server Farms

- Thousands of servers in one “barn”
- Where, generally...
 - ✓ Cheap and reliable electricity
 - ✓ Cool climate
 - ✓ Good security
 - ✓ Good access to the Internet
 - ✓ Cheap land
 - ✓ Low taxes

Quincy, Washington

QUINCY DATA CENTERS



Microsoft's Server Farm



See  for a very good video on Microsoft's Cloud

Where is Quincy, Washington?



Quincy is 120 miles southeast of Seattle, near the Columbia River

The Other Washington

- **AiNet:** Beltsville & Laurel MD
- **ByteGrid:** Silver Spring MD
- **CenturyLink:** (6 local sites)
- **CoreSite:** Reston, VA
- **CyrusOne:** Loudoun, VA
- **Data Center Knowledge:** Stirling, VA
- **Equinix:** Ashburn, VA

Locations of Cloud Server Farms

- **Large cities:** Washington, New York, Chicago, Los Angeles, San Francisco, London, Hong Kong, Berlin, Amsterdam, etc.
- IBM—40 centers linked by private fiber optic network: U.S., Canada, Mexico, South America, Australia, England, Japan, India, China, etc.
- Sweden, Norway, and Finland

Advantages of “The Cloud”

- Off-site storage
- Sync data across devices
- Can be used for backup
- Inexpensive (free) for small amounts of data
- Cloud services professionally managed
 - ✓ High availability
 - ✓ Rigorous backup procedures

Disadvantages of “The Cloud”

- High cost for >5-20 GB
- “Slow” transmission speed
- Security (how paranoid are you?)
 - ✓ Risk of provider being hacked
 - ✓ Risk of data being intercepted in transmission
- Dependence on the Internet
- Provider can “disappear”

Speaking of security...











Backup Strategies...

- That's a different Learn-30



More Resources & References

- History of Cloud computing 
- History of the Internet  
- Cloud storage issues, *The Huffington Post* 
- The beginners guide to the Cloud 
- Five myths about the Cloud 
- The Cloud as disruptive technology 
- The Cloud a waste of money 

Thanks for your attention!

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**He isn't taking any calls right now.
He's backing up his brain to "The Cloud"**