The Internet's Impact on Government Programs and Services

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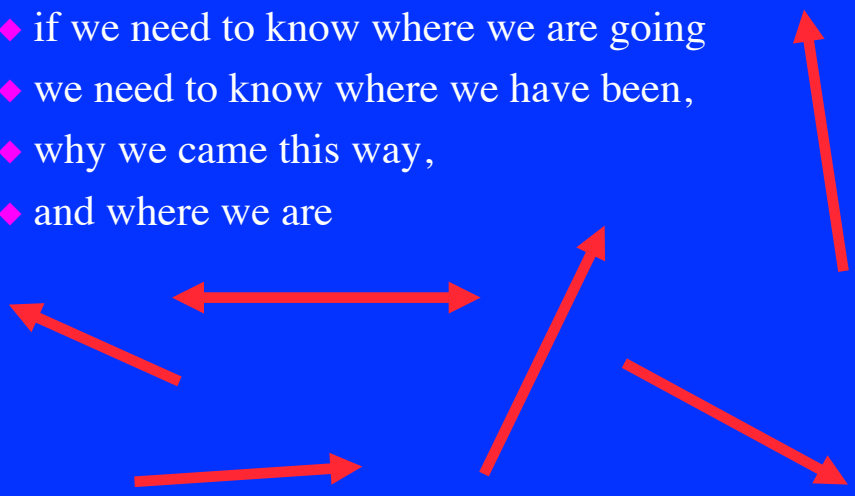
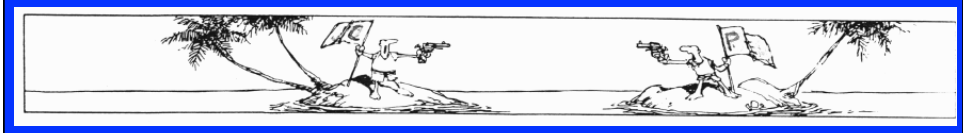
Vectors / History

- if we need to know where we are going
- we need to know where we have been,
- why we came this way,
- and where we are



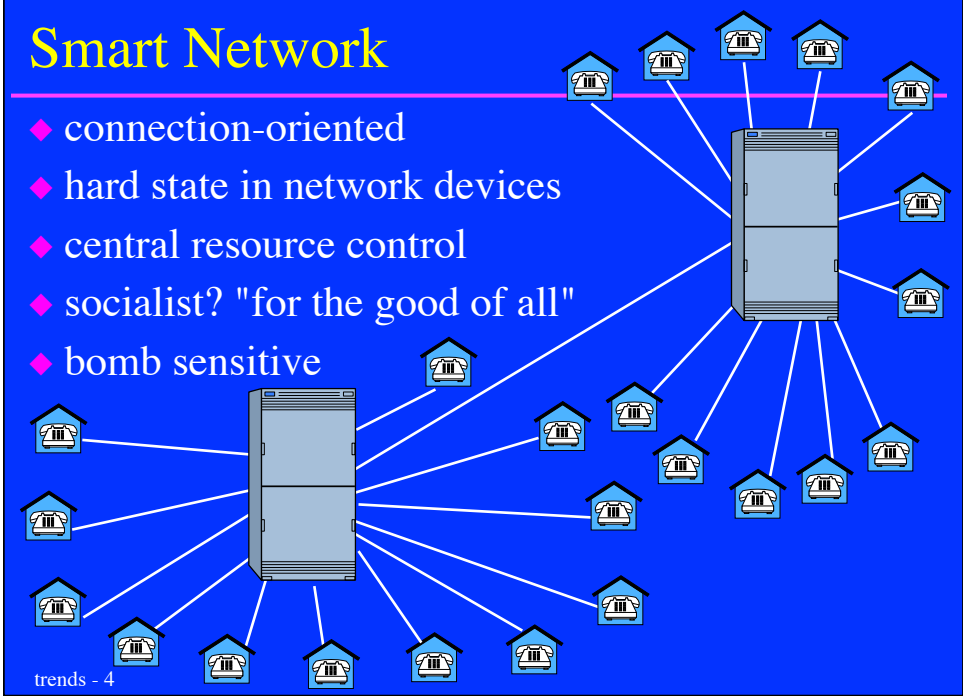
In the Beginning

- in the beginning (and now)
- there was (is) philosophy
  - or is that religion?
- smart network vs. smart edges
- centralized vs. distributed



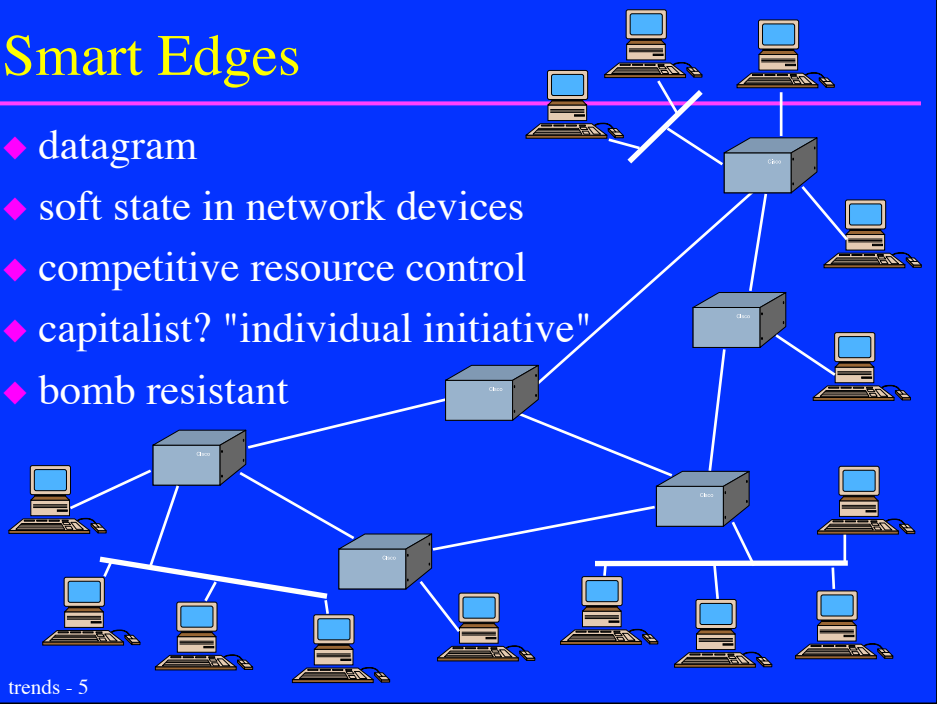
Smart Network

- connection-oriented
- hard state in network devices
- central resource control
- socialist? "for the good of all"
- bomb sensitive

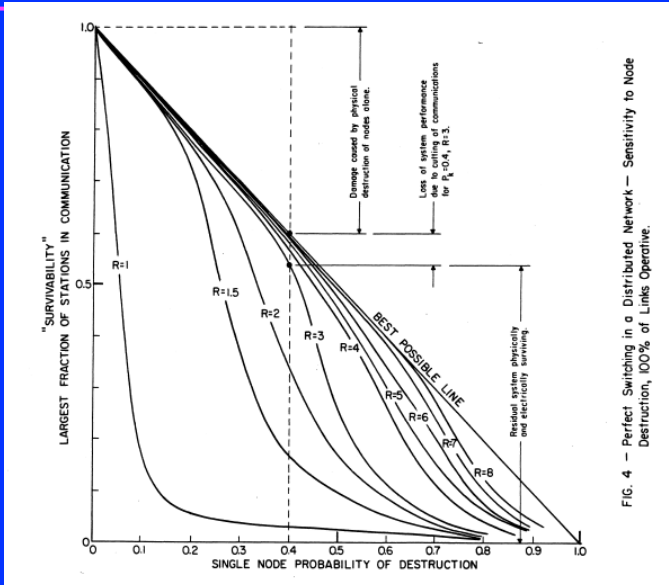


Smart Edges

- datagram
- soft state in network devices
- competitive resource control
- capitalist? "individual initiative"
- bomb resistant



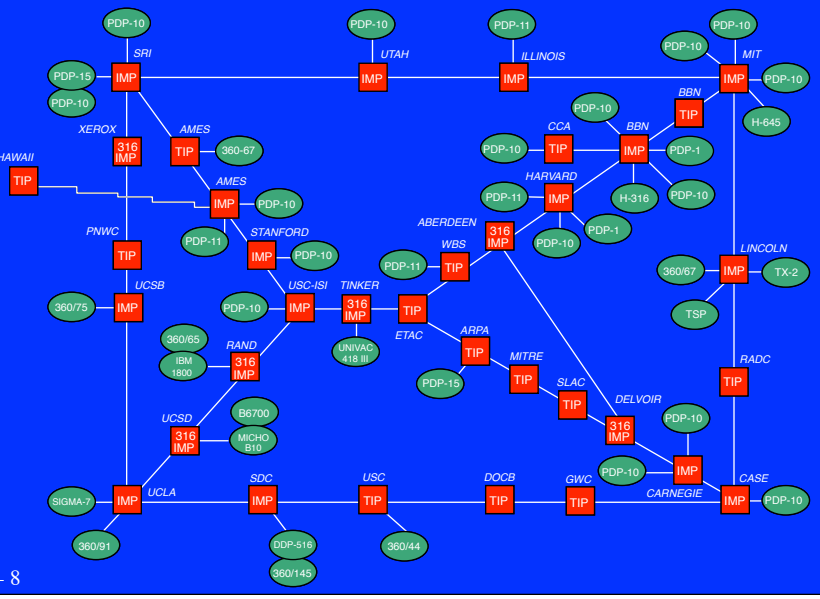
Survivability - Baran, 1964



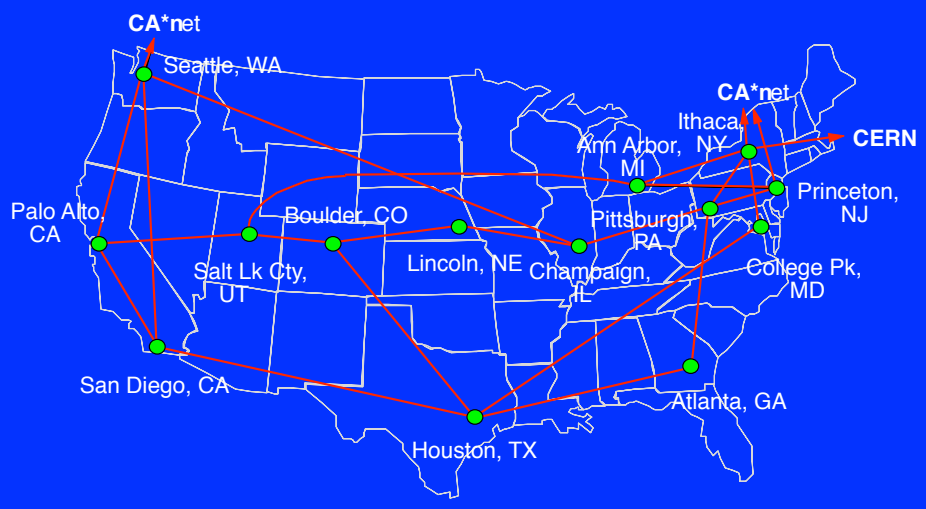
Creating the Internet

- government involvement critical
- provided "proof of concept" networks
- when traditional networking world (read AT&T) said it was not needed
- federal government funded a series of networks
- lead to today's Internet
- but US government a ver very small part of the picture today

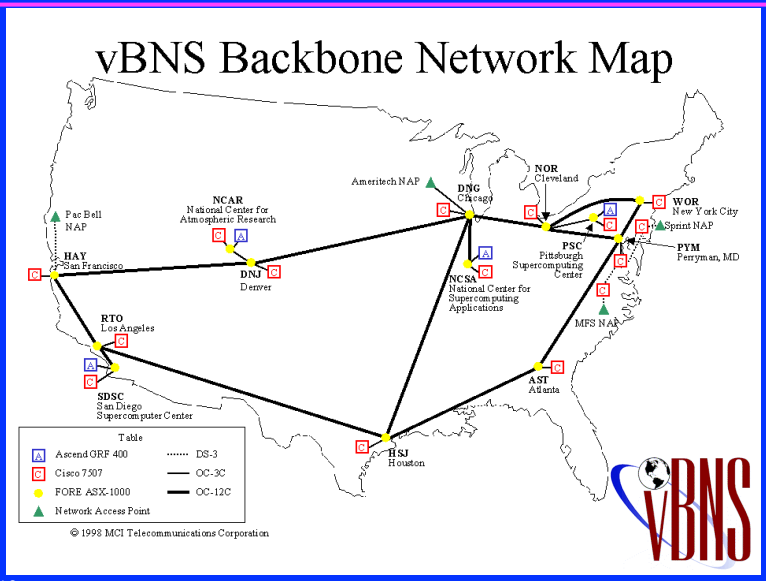
ARPANET - 1973



NSFnet - 1990



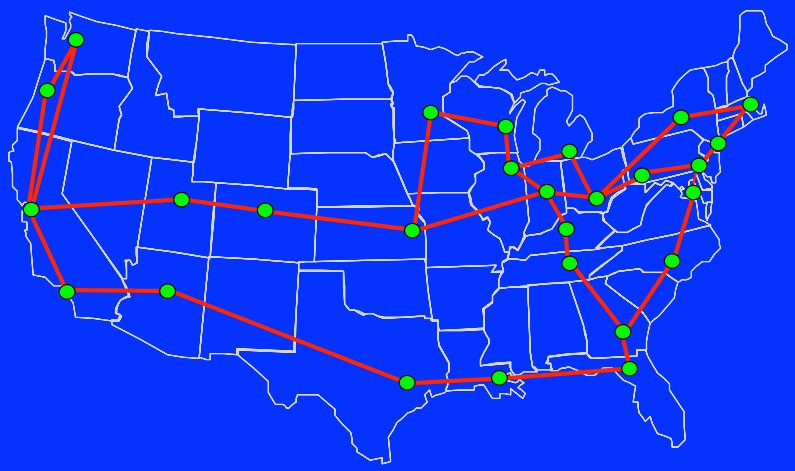
vBNS - Today's Research Network



Future Work

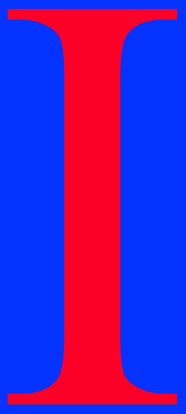
- non-government - Internet 2 & Project Abilene
  - prototype next generation Internet applications
  - 140 member institutions
- commercial - Qwest, Level 3, UUNET, etc
  - next generation transport - including Quality of Service
- government - Next Generation Internet (NGI)
  - 3-prong effort
    - next generation Internet middleware
    - next generation infrastructure
    - prototype next generation applications

Project Abilene



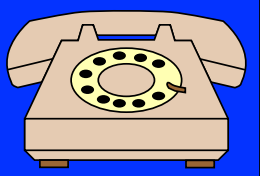
What is the Internet?

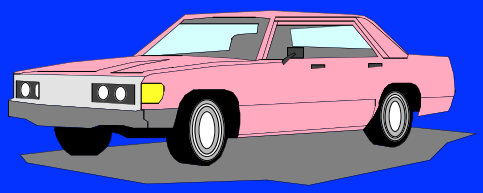
- separately identifiable data network
  distinction changing
- hype topic
- Wall Street crack
- security worry
- reliability worry
- content worry
- TCP/IP



Clue Check

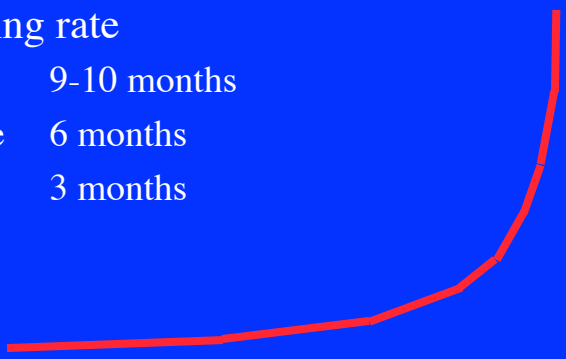
- if you are asking "what is the application"
  you have already lost
- many looking for "the killer app"
- what was killer app for telephone
- what was killer app for auto?
- if you must have one: connectivity



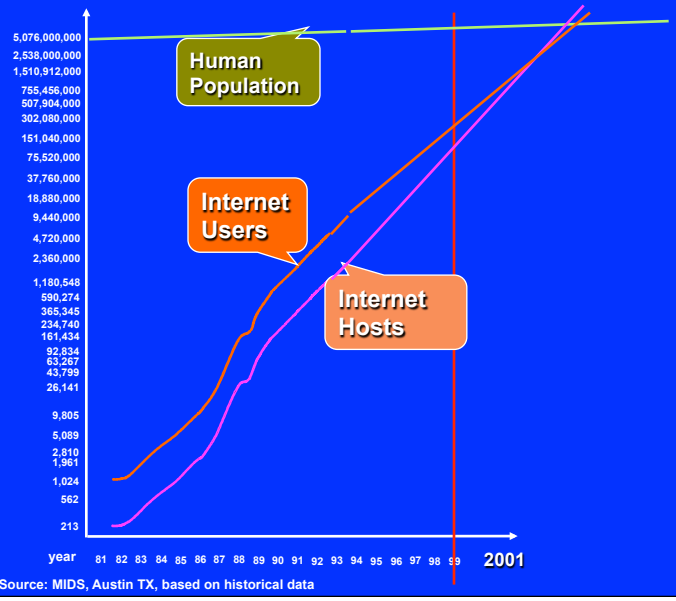


History

- ramp approaching vertical
- doubling rate
  - hosts 9-10 months
  - people 6 months
  - traffic 3 months



Future?



Source: MIDS, Austin TX, based on historical data

People vs. Silicon

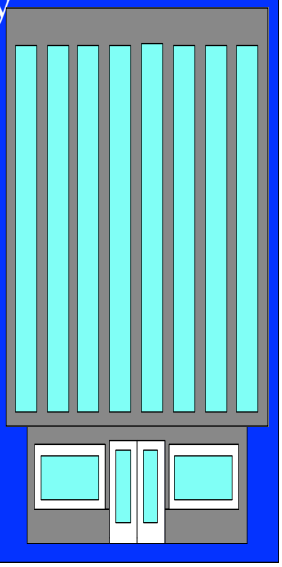
- why the Internet is not like the phone system
- phone system is scaled up as people do
  - mostly
- Internet will scale up as computers multiply
  - power controls
  - toaster net

silicon cockroaches

- phone net growth rate will reduce as services move to web

Apparent Scale

- on the ‘Net no one knows your puny’
- low cost of entry
- how can you tell if legit?
  - how can you tell if mail-order is legit?
- empower small company
- large company can lose big



What's Next?

- computers
- protocols
- applications
- structure
- security

Computers

- smaller
- cheaper
- faster
- more complicated == more support
- regulate types?
- incoming students know more about computers than senior faculty

Protocols

email, ftp
telnet, www

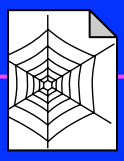
- pretenders have failed
  X.25, OSI, SNA/APPN, IPX, ATM
- "common bearer service" important
- most common protocol in 2010?
  will be called IP
- convergence
  everything over IP

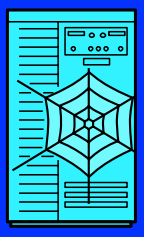
IP

Ethernet
token ring
FDDI, ATM

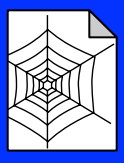
IP

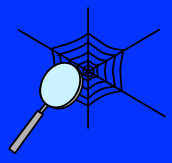
Applications

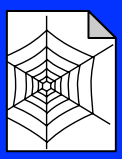


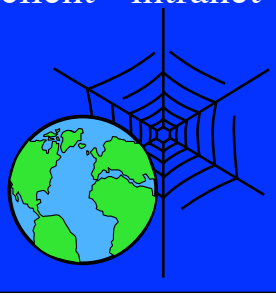


- the web filled an unseen hole
  what other holes are there?
- lowered Internet entry requirements
  mom can surf
  dad can be a vendor
- now web is all too-ubiquitous client - intranet
  the world is not all nails



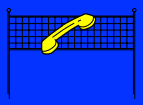






Applications

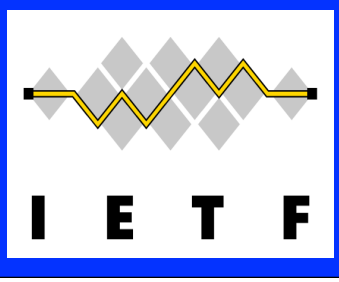
- only know a few of the apps of 2005
  - email
  - www
  - ftp
  - remote access
  - "buy" button



- but will these be in the top 10?

Differentiated Services

- is the Internet a one trick pony?
  - only ‘best-effort’ service
  - QoS to ISP means ‘ I will accept your packets”
- the Internet needs multiple “products”
  - better reliability for better money
- IETF (standards group) working on QoS technology
  - coming to your network soon



IP

- one of IP's strengths is that it can run over anything
  - barbed wire at 2,400 bps to glass at 2.4Gb
  - including wireless
- the world is not homogeneous
  - in any aspect, clearly not in networking
- IP can hide some of the differences

$$\frac{\text{IP}}{\text{anything}}$$

IP -- necessary and sufficient

Security

- today the security of the core of the net is quite good
- the edges are a problem
  - shared networks
- **very** good technology exists
- export control of encryption a problem
- complexity is a problem
- secure web very good
- but who can look at a student's email?
  - and if its encrypted?

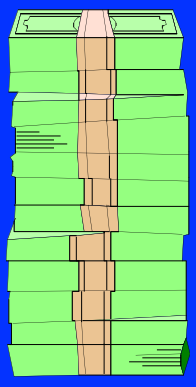
Will the Technology Structure Hold?

- traffic (both bits & routing info) are stressing current environment
- don't know what the glass will tie to
  - WDM & DWDM
- fog in the way of predicting
  - technology - who predicted the web?
  - regulations - son of CDA
  - prices - ISDN model

$ $ $ $ $ $

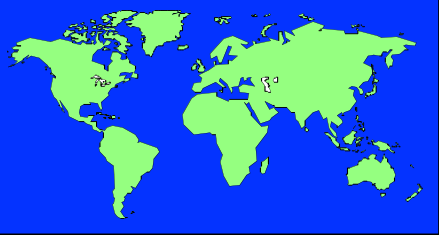
Money Funnies

- how do you regulate Internet money?
- how do you track Internet money?
- what is taxing jurisdiction?
- what is regulatory jurisdiction?
- anonymous cash
  - only disclose if spent twice



Will the Social Structure Hold?

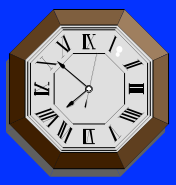
- the Internet is aggressively non-national
  - the 1st amendment is a local ordinance
- threat to "order"
  - as information sometimes is
- governments feel they must "protect" citizens
- Internet routes around censorship
- what authority does the FCC have?



Dumb Network

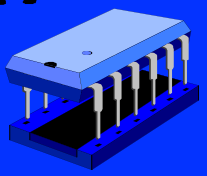
- smarts at edges not in network
  - i.e. in the PCs and servers not the network switches
  - reverse of telephone network
- means that it is easy to experiment
  - only end-systems need to be upgraded - e.g. web
- telephone net requires switch upgrade for new features
  - need to wait until the telco thinks it is worth it
- “the power of the Internet is chaos”

Businesses and the Internet



- shift in basic commerce interaction
  - to real-time over the ‘Net
- “just in time” ordering
- electronic ordering based on menus & history
- pure electronic billing & funds exchange
- but note no central management of application deployment
  - end users will deploy whatever applications they want to
  - this also means businesses do not need “approval” for their own applications

Equipment Control



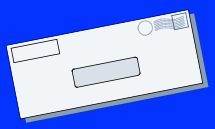
- the Internet (or actually IP) is getting into everything
  - “toaster net”
- “embed the ‘Net” - consortium
  - Internet on a chip
  - IP software in most significant equipment
    - pumps to ovens
    - monitor & control
- cheaper than individual connections to equipment
  - “every electrical device”

Visibility to Customer

- customers will expect to obtain all information they need via the 'Net
  - next week's menu
- may need to be part of a larger picture
  - e.g. Harvard "portal pages"
  - integrate data from many sources into unified view

Customer Input

- customers will expect to do all interactions over the 'Net
  - pay bills, report problems, order catering, etc
  - work out details of events (timing, services to be offered)
  - menu requests?
- report on quality of services
- note - reports can be anonymous



Government Information

- Internet as an information conduit is a strategic direction in Taiwan
- getting to be prevalent in US
  - SEC's Edgar
  - DOE Human Radiation Experiments & Comprehensive Epidemiologic Data Resource,
  - Government Printing Office (70 databases, 10M/mo acc)
  - draft congressional legislation (THOMAS)
  - White House web page (once blocked by net-Nanny)
  - more about Monica than you ever wanted to know
    (note that congress tried to make this illegal)

Government Information, contd.

- Internet is a cheap and fast way to distribute very large amounts of data
- tax forms - $10 if face-to-face, $0.01 over Internet
- overnight "publication" of Independent Council's report
  - the 'Net survived just fine
- same-day Supreme Court Opinions on-line

Government Information, contd.

- significant issue with government information with access restricted by government/private deals
- some agencies contract with private companies to handle public information - to generate revenue

  e.g. labor and business stats, criminal justice database, National Cancer Institute reports, etc
- free public access restricted or eliminated

GIS

- I'm no GIS expert
- real pretty pictures

  (and a lot of them)
- GIS systems easy way to create lots of data

  performance issue on download

  software compatibility issue
- many GIS talks at conference - one note

GIS Access to Harvard Library

- Harvard library experimenting with gis-like input to catalog search engine
- use GUI to indicate where on a global map you are interested (and maybe a point in time)
- catalogue returns entries relevant to that location

  maps (obviously), books on geology (almost as obviously), novels which take place there, biographies of people who lived there, pictures of location, books by people who lived there, etc
- YAUI - (yet another user interface)

Fundamental Issues

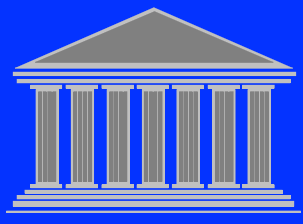
- on campus & global
- who says who makes the rules?

  all kinds of rules

  rule makers are problem-specific
- who pays for what?

  e.g., universal access

  browsers in libraries

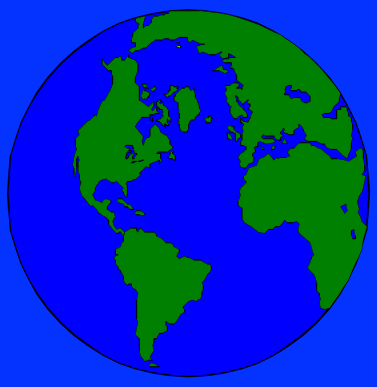


Impact on Society

- not the end of the nation state
  - but can change balance of power between government & citizen
- content, content, content
  - the dirty pictures are not the "real" problem
    - but an easy target - "protect the kids"
  - do not want to confuse citizens
- a "parent revolution"?

Complication

- remember the Internet is international

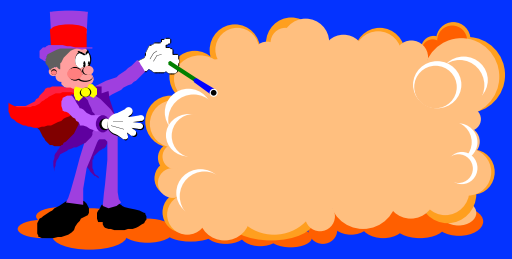


Futures

- it will be called IP
- it will be called the Internet
- convergence will have an impact
- it will always be "about to collapse"
- it will have differentiated services
- commerce will be normal
- continuous content control attempts
- continuous government attempts to "help"
  "too important" to left alone

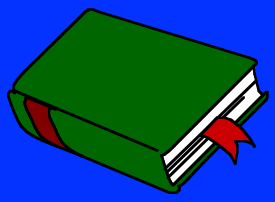
Where Are We?

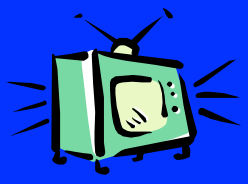
- not at end, end of beginning? or just starting?
- standing in '64 - today would be magic
- what will 2020 look like?
  hint - magic



Dreams

- can strengthen communities as well as threaten
- can empower individual entrepreneurs
  Nova Scotia books & Maine puppets
- broadcast TV vs. Internet



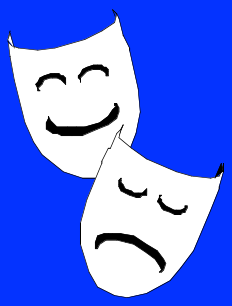


Worries

- can empower individual demagogues
- can enable big brother
- can destroy privacy
- can create information have-nots
- can exacerbate rich/poor split
- on the Net no one knows you are a nut
- on the Net no one knows you are a twit
  until you speak (too much)

Threat vs. Promise

- this data network can be both a threat & a promise
  - just like the auto
  - just like the telephone
- it will succeed at being both



we will see it together

Thank you