The Internet -- past, present, and future

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Disclaimers and Warning
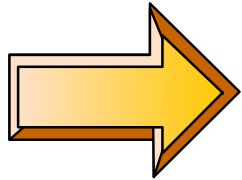
- **The year 2000**
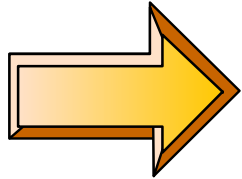 - Is at least 20 Web years from now
- **If I could predict the future accurately....**
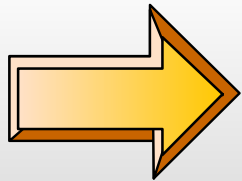 - I'd be in a somewhat different tax bracket
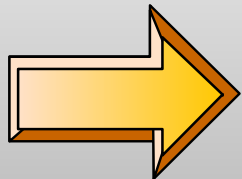
Agenda

A brief history of the Internet

The Internet today

Where do we go from here?

The Internet of the future

A brief history of the Internet

- Originally intended for use as a distributed, survivable command and control network for the US Military in the event of nuclear war
- It has found other uses

A brief history of the Internet

1969-1979

- ARPAnet starts operation in 1969
- Electronic mail is the first "killer app"
- Many networks exist but do not interoperate
- Unix (or other large system) knowledge is required to use the network

A brief history of the Internet

1980's

- TCP/IP protocol cutover (1983)
- ARPAnet splits into MILNET and ARPAnet
- NSFnet backbone run by IBM, MCI, Merit
  - ▲ Commercialization of the 'Net is feared
- Netnews is the "killer app"
- Unix (or other large system) knowledge is required to use the network

A brief history of the Internet

Early 1990's

- Commercial Internet Exchange (CIX) formed
- Improved access and search programs spring up
  - ▲ Archie (McGill University)
  - ▲ Gopher (University of Minnesota)
  - ▲ World Wide Web (CERN)
- Gopher is the "killer app"

A brief history of the Internet

1993

- Mosaic released (NCSA)
  - Graphical Web browser
  - Point-and-click surfing
  - The price is right: free
- Internet starts appearing in the popular press
- Mosaic is the "killer app"

A brief history of the Internet

1994

- Netscape Communications is formed and ships its first browser
- IBM includes a Web browser in every copy of OS/2 Warp
- Internet columns pop up everywhere

A brief history of the Internet

Early 1995

- NSFnet disappears
- The "big three" online services embrace the Internet
- Newspapers and magazines publish on the Internet
- Movie ads and underwear packages include URLs

A brief history of the Internet

Late 1995

- Netscape Communications goes public at $28
- Domain name registration conflicts go to court
- Domain name registration is no longer free
- The US Senate attempts to regulate Internet content

The Internet today

- has changed from a network of computers to a network of humans
- has changed from an academic curiosity to a daily part of the lives of millions
- but not all of those millions actually use it, though!

Why has the Web become so popular?

- It makes it easy to tell a story
  - ▲ Organizational, personal, or commercial
  - ▲ Words, pictures, sounds, and movies can all be included
- It greatly increases the velocity of ideas
  - ▲ Information, published in one place on the Web, can be accessed by people all over the world
  - ▲ "Pages of pointers" provide aggregation of information from many sources into one page

Where do we go from here?

- Social Issues
- Technical Issues
- Solutions in Search of Problems

Social Issues

Pornography and Offensive Material

- Yes, it exists
- No, it is not ubiquitous
- What's being done about it?
  - Platform for Internet Content Selection (PICS)
  - Initiative of the World Wide Web Consortium
  - Create a structure to label and select Web content
    - By originator
    - By third-party
    - Using many rating scales and dimensions

Copyright and Payments

- Information on the Web is easily copied
  - In fact, the only way to display information is to copy it to your computer
  - Once it's on your computer, how can the owner control your use of it?
- Payment mechanisms exist
  - But they are too expensive for small transactions
  - Or they require pre-existing relationships between buyer and seller

Copyright and Payments

- Approaches to the copyright problem
  - Digital Watermarking
  - Cryptolopes
- Approaches to the payment problem
  - Subscription-based services
  - Digital Cash
  - Micropayment systems

International Boundaries

- Basically, they don't exist on the Internet
- Data on a machine in one country is accessible from any other country
- The user may not even know where the information is stored
- Enforcing local standards is impossible
  - Cryptography
  - "Unacceptable" content

Technical Issues

Limited Interactivity

- Some pages take a long time to display
  - Not everyone is connected via a LAN
  - Improvements are coming
    - ISDN (available now in many areas)
    - Cable Modems (next 18 months)
    - Satellite Downlinks
  - But many users will always be connected via normal phone lines and modems
  - Designers need to be sensitive to their users

Limited Interactivity

- Web pages just sit there waiting for you
  - Nothing happens until you click
  - Can't tell where you'll go if you click a graphic
- This is an area of active development -- some examples:
  - Java -- download and run programs via the Web
  - Shockwave -- multimedia in your browser
  - clientside mapping -- shows where you'll go on a click

No Community

- On the Web, no one can see you surf
- Some attempts have been made to build interaction onto the Web
    - Ubique's "Virtual Places"
    - various "avatar" systems
    - Web chat areas
- Nothing is compelling yet

Solutions in search of problems

- Virtual Reality Modelling Language (VRML)
  - Allows 3-D "worlds" you navigate locally
  - Still rather lo-res for decent performance
  - Useful in limited situations
- Background Music on Web Pages
- The <blink> tag

Disclaimers and Warning *(continued)*

- Clarke's Laws
  - When a distinguished but elderly scientist states...that something is impossible, he is very probably wrong
  - The only way of discovering the limits of the possible is to venture a little way past them into the impossible
  - Any sufficiently advanced technology is indistinguishable from magic

The Internet of the future

- Will be a mass medium, like television or movies
- In fact, it may be indistinguishable from television
  - Delivered via cable or satellite
  - Viewed on a big screen with high fidelity sound
  - Mostly professionally-produced content for commercial purposes
- Unlike television, people can produce their own content and make it easily available to a global audience

The Internet of the future *(continued)*

- Transactional privacy is assured via encryption and digital signatures, even across international boundaries
- Micropayment systems allow content providers to sell information for a very small fee per transaction, but with a very large number of transactions

The Internet of the future *(continued)*

- Business transactions are routinely accomplished over the Net
  - Both business-to-business and consumer
  - Multiple payment methods:
    - Credit Card
    - Direct Debit
    - Digital Cash
    - Purchase Order

The Internet of the future *(continued)*

- There is a thriving industry of 'Net guides and reviews -- almost any discipline, hobby, or interest group has a guide
- Creators of interesting and successful Web pages are celebrities
  - Of course, they're profiled on the Web itself!