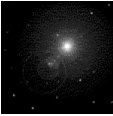
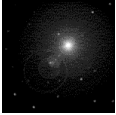


CS 6/75995 Internet-based	Kent State University Department of Computer Science <u>LECTURE-1</u>
Applications & Systems Design, 2001	

<p><i>Today's Topic</i></p>  <p>Unit background and administrivia</p> <p>Internet-based Applications & Systems</p>	 <p>INTERNET BASED SYSTEMS DESIGN</p>
	<p>LECT-1, S-2 IAD2001F, javed@kent.edu Javed I. Khan@2000</p>

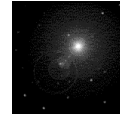
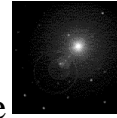
General Course Information

This course will not teach you how to write HTML or Java code.

Nor will make you a Web Master!

In this course you will learn:

- Current limitations and standing open problems
 - Multimedia over internet
 - Performance scalability
 - Web security
 - Advanced applications protocols



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- **Javed I. Khan**

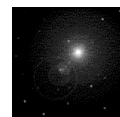
Email: javed@kent.edu

Office Hours: 3:00-4:00pm Tuesday

Phone: 672-9038

- TA
to be announced.

- Web Page:
<http://www.mcs.kent.edu/~javed/class-IAD01F/>

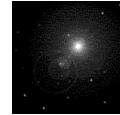


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Reference Books

- **Text Books:**
- WebBook, <http://mcs.kent.edu/~javed/class-IAD01F/>
- Collection of Papers in Class Digital Library.
- Douglas E. Comer, & D. L. Stevens, Internetworking with TCP/IP Volume-III: Client-Server programming and Applications, Prentice Hall, ISBN-0-13-032071-4, 2001.
-
- **Other relevant books:**
- Fluckiger, Understanding Networked Multimedia Applications and Technology, Prentice Hall, ISBN 0-13-190992-4, 1995.
- Computer Networks & Internet, Comer, D. E., Prentice Hall, ISBN 0-13-239070-1
- Web Server Technology, Nancy Yeager & McGarth, Morgan Kaufmann, 1996, ISBN 1-55860-376-X

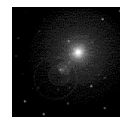


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Course Format

- **Research Paper Reading & Class Presentation**
 - We will study 15-20 selected papers on the four theme topics.
 - “Building high performance Internet”
 - “Hypermedia”
 - “Mobile Convergence”
 - “Internet Security: threats, and countermeasures”
 - Each student will be assigned 2-3 papers.
 - Estimated time required 3x10=20 hours.
- **Term Paper**
 - One survey paper on a special internet topic.
 - Estimated time required 20 hours.
- **Project**
 - One exploratory project/experiment.
 - C/C++/Java language can be used.
 - Estimated time requirement 30 hours.

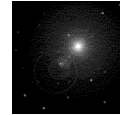


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What is Expected Out of You?

- About 10 hours per week
- Learning by doing
- Questions and exercises
- Reading the papers and materials
- Taking active part in paper discussions
- Read/Listen Think Do **Ask**

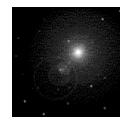


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Grading

Type	Number	Weight
Research Paper Review and Presentation	2-3	20%
Area Coverage Exams	4	20%
Take Home Assignments on Papers	4-5	20%
Research Survey Paper	1	20%
Selected Exploratory Project	1	20%



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What is the Internet?

9

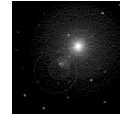
A World Wide Network of
Millions of Computers



**INTERNETED
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Internet = Network of Computer Networks



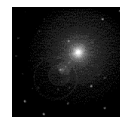
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The Internet is a global network of networks enabling computers of all kinds to directly and transparently communicate and share services throughout much of the world. Because the Internet is an enormously valuable, enabling capability for so many people and organizations, it also constitutes a shared global resource of information, knowledge, and means of collaboration, and cooperation among countless diverse communities.

*-Internet Society
June 1998*



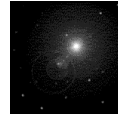
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The Internet is more important in what it enables than what it is; more phenomenon than fact. Yes, the Internet is networks, software, computers and other technologies; but more so, it is a catalyst of change, a new mass medium, a culture, a mind warp, new things never before imagined.

*-J. Neil Weintraut
Wall Street Technologist*

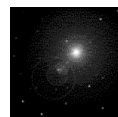


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Structure of Internet

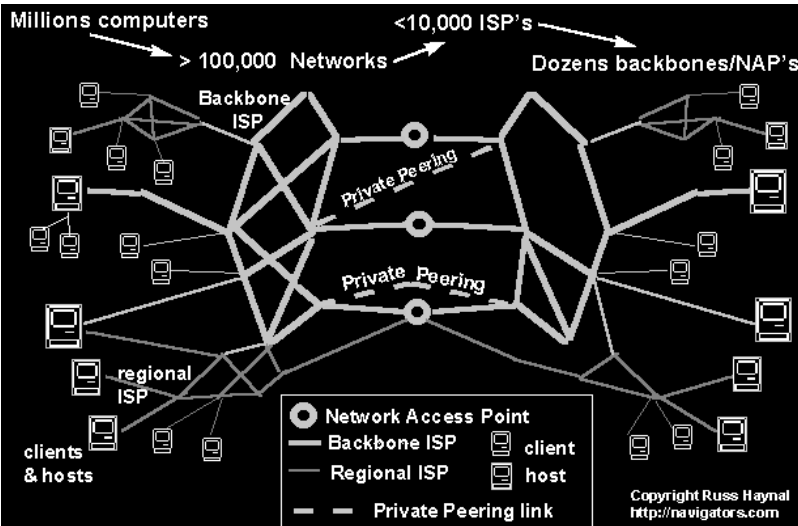
[Click Here](#)



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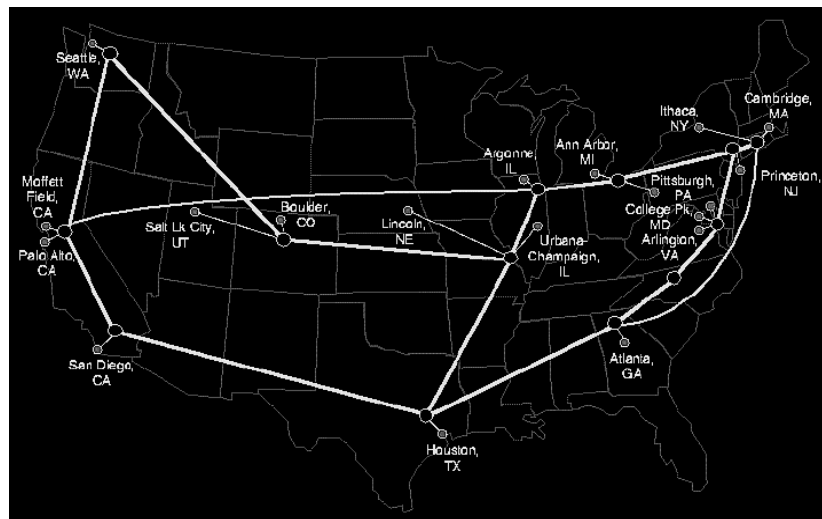
Physical Network



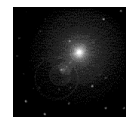
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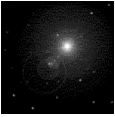
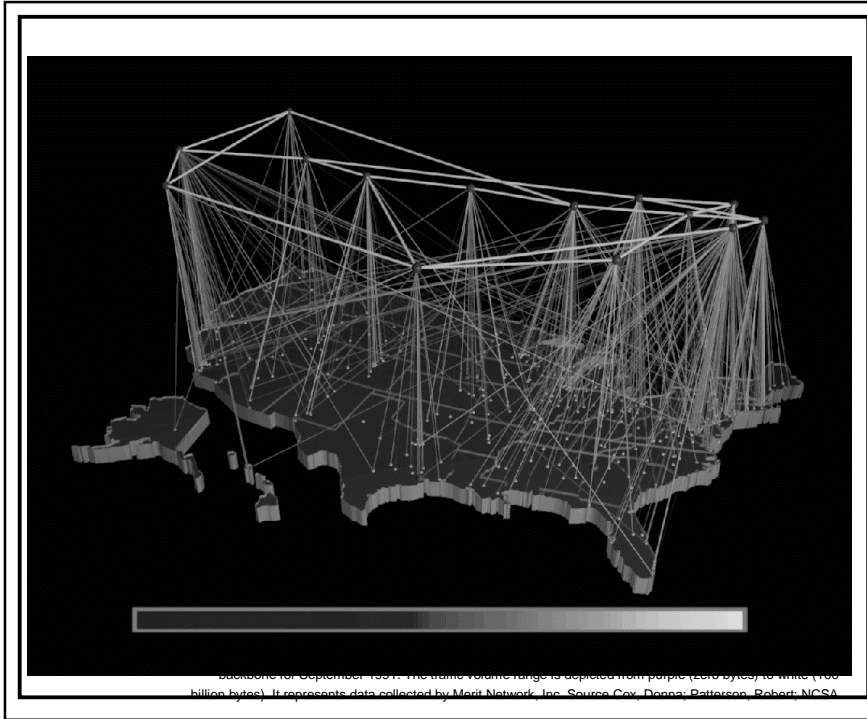
The Wide Area Network that formed the backbone of the Internet before 1992. Funding came from NSF, IBM, MCI, and MERIT



INTERNET
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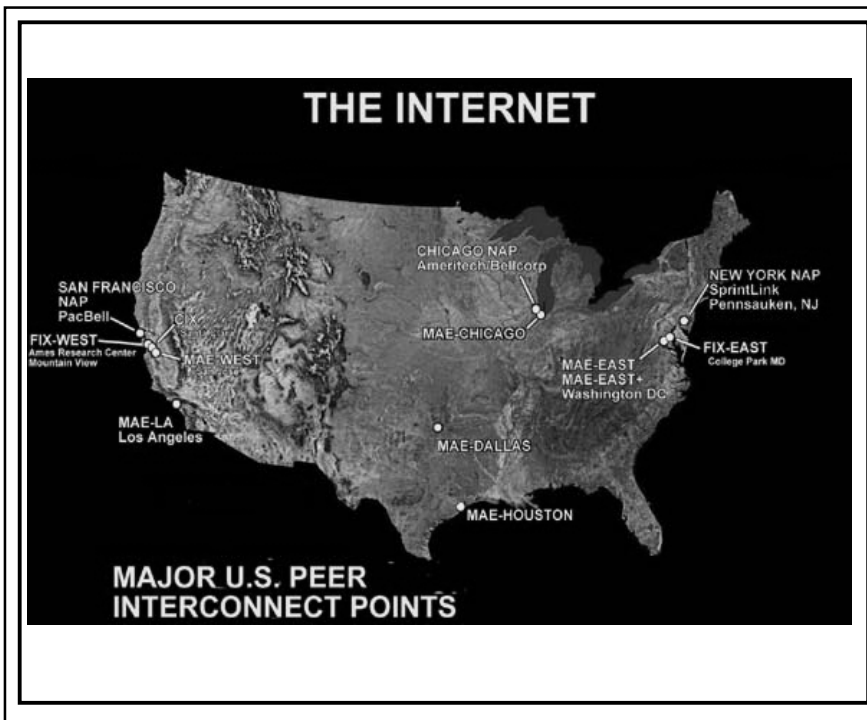
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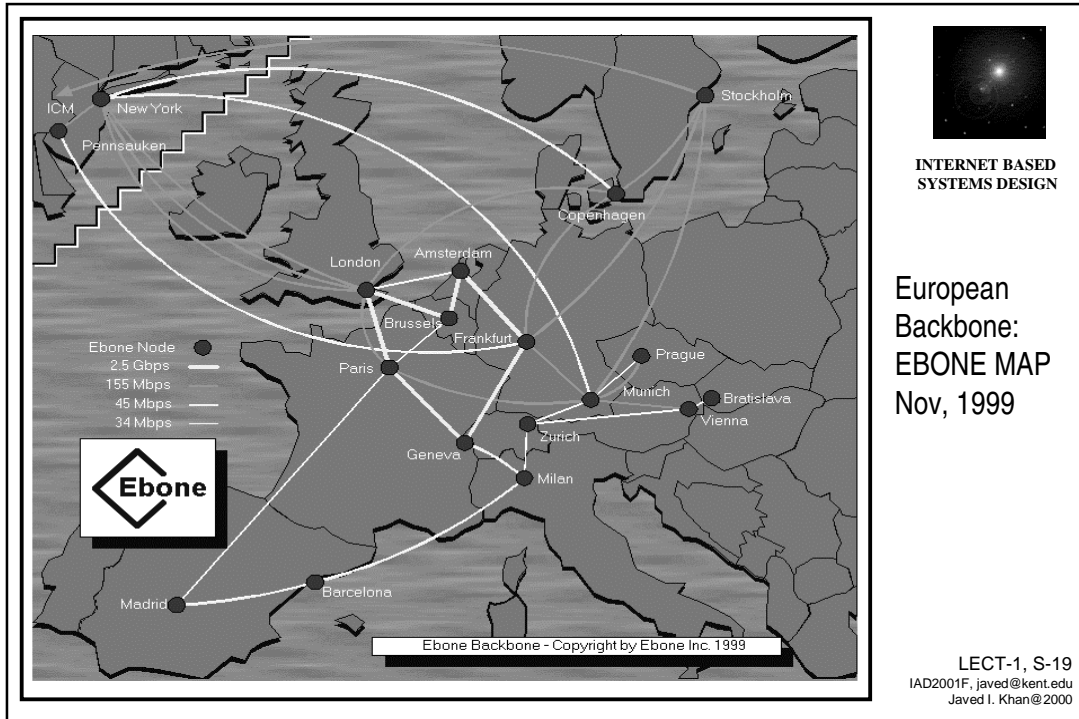
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**INTERNET BASED
SYSTEMS DESIGN**

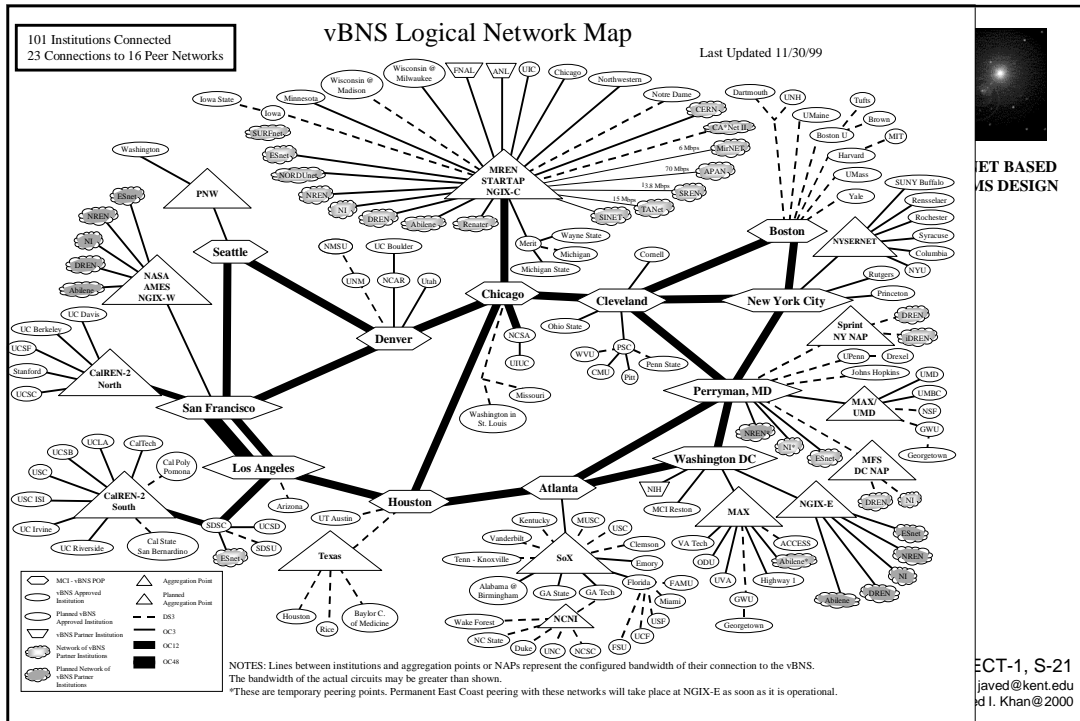
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Next Generation Internet....

- A network always “one step ahead”
 - HPCC in 1993
 - vBNS lunched in 1995.

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SYSTEMS DESIGN

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vBNS Features

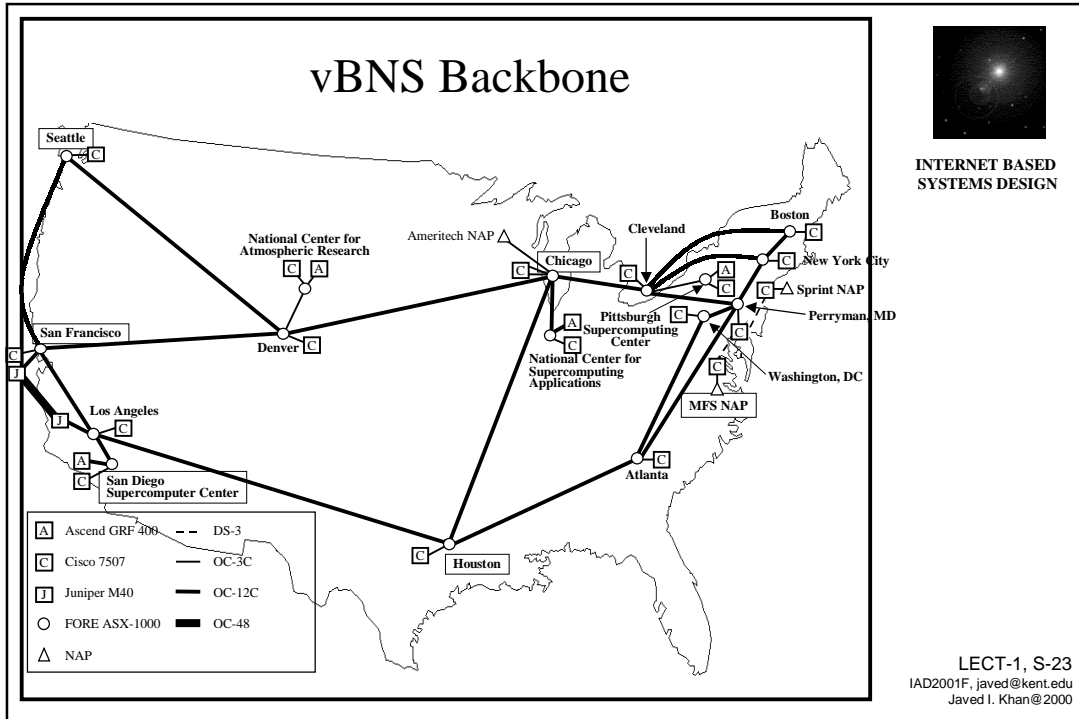
- Low latency (average coast to coast less than 100 ms)
- High throughput (over 490 Mbps of payload)
- Stable (99.95% or greater service availability)
- Uncongested (average utilization less than 50%)
- 622 Mbps 14,000+ route mile backbone network

- Today, the vBNS connects:
 - five supercomputing centers
 - about 100 universities
 - peers about 11 other Networks.



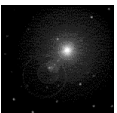
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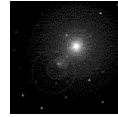
Next Generation Internet (cont..)

- A network always “one step ahead”
 - HPCC in 1993
 - vBNS lunched in 1995.
 - Internet-2 Abilene
 - vBNS+ (Sept 1999)



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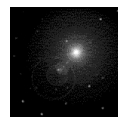
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Demonstration Route Tracing

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INTERNET
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Applications & Services

The real story of the Internet excitement is however is the new genre of systems and applications developed on it.

The Internet offer access to data, graphics, sound, software, text, and people through a variety of services and tools for communication and data exchange:

- Remote login (telnet)
- File transfer (ftp)
- Electronic mail (e-mail)
- News (USENET or network news)
- Hypertext (WWW)
- Platform independent computing (Java)
- E-commerce, Digital Library, Online Banking
- Virtual University, Tele-medicine

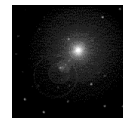
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Why Study Internet Systems?

27

Trends

- Software Industry is the biggest and fastest growing industry in the world with an expansion rate approaching 15% annually.
- In 1996, Intranets became the fastest growing commercial application on Internet.
- At one point of this gold rush, Netscape was valued at 6.7 billion, before it earned a single dime. There will be many more surprises and tears and joys.



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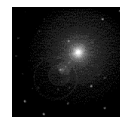
Internet in the Sky

29

Satellites

- At present, there are at least 111 plans for multimedia satellite systems involving 528 geo-stationary satellites, 874 low earth orbit satellites and 161 middle earth orbit satellites. The plans come from some 69 existing or new venture satellite operators. Most have not revealed the expected capital costs of their projects. However, those that have, involve capital expenditure of at least US\$ 99.5 billion.

– Telecomm Magazine

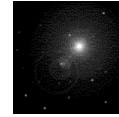
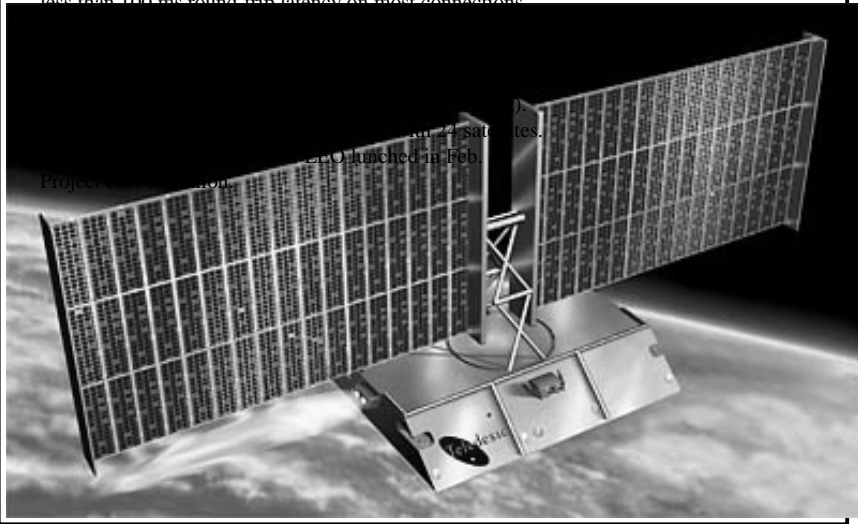


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Teledesic Systems

64 Mbps/2 Mbps or 64Mbps/64 Mbps data links.
 1400 km up
 less than 100 ms round trip latency on most connections

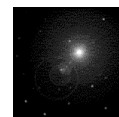
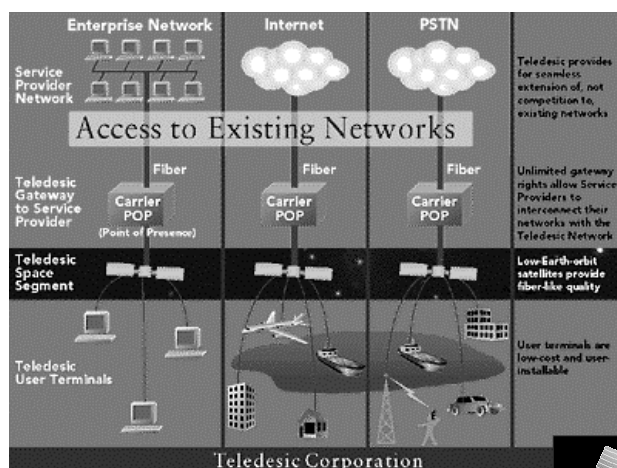


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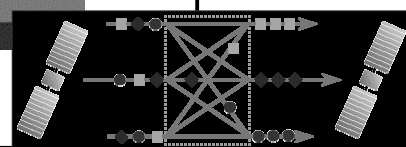
- [Visual1](#)
- [Visual2](#)

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Teledesic Connection Model

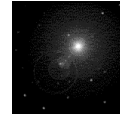


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Wiring of the World!

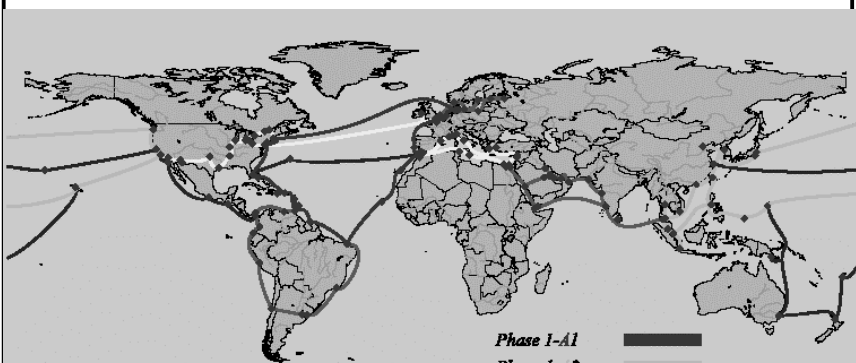
- A mega construction project FLAG (fiber-optic link around the glob) laid down in 1997 September, the longest man made structure ever built, stretches 16,400 miles from England to Japan via Mediterranean sea, Indian and the Pacific oceans.
- A yet bigger undersea cable (23,600 miles) SeaMeWe3, linking Europe with Asia, will be operational by 2012.



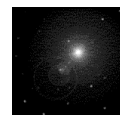
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Global Fiber-Optic Backbone



:Length: 25,000 km to eventually 40,000 km
Coverage: 6 continents, 75 countries,
96 landing points, 90% of telcomm market.
10 US landing sites (OR, SF, Boston, HI, FL, Guam, Midway)
Capacity: 2.56 terabits/s
Each cable has 8 pair of fibers each with 32 light wavelengths
STM-64 (10Gb/s) channel.
Supported protocols: ATM, SDH, PDH, IP (routing from 2001)

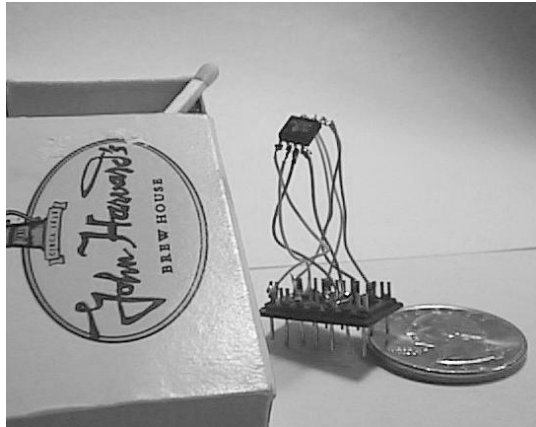


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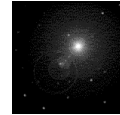
[•More](#)

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Digital Convergence



- 115K bps HTTP1.1 server, with 25kbyte TCP/IP stack.
- Courtesy: U. Mass News Office 1999
- Checkout links: <http://www-ccs.cs.umass.edu/~shri/iPic.html>



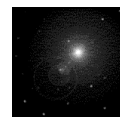
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Finally..

- Meganet will gradually transform itself from a **network of networks** into a **system of systems**. Each system or subnetwork will link groups with shared personal and professional interest in a vastly expanded version of the current Internetwork.
- How fast? The propellant will be technology, economy and politics.



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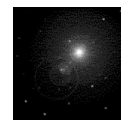
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Research Frontier

37

- **Real Time Applications:**
 - Instrument control/interaction over the Internet
- **Hypermedia/ Multimedia Applications:**
 - Audio-video delivery
- **Security over Shared Network:**
 - secured cache/ secured VM/ secured virtual net
- **Performance Scalability**
 - HTML/HTTP1.1 are severely limited.
 - Cache, Content networking
 - Virtual Machine. Build your own special purpose VM
- **Information Search**
 - Multimedia content-based retrieval
- **Mobile Internetworking**

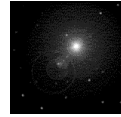


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Reminder....

- “javed@kent.edu”.
- Immediately, need to send email to the above with subject-field set to “IAD01F” to obtain further instruction.



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Next Class

Map of Cyberspace
Who Manages Internet?