



Data

=>Information

=>Wealth

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Introduction

Think about how the advanced network infrastructure will function and what this means in terms of wealth for

- The globe
- The countries
- The enterprise

Premises

- **The new “ global information economy * ” is real (in spite of the dot-com issue)**
- **The ENTERPRISE is a management object focused on increasing wealth**

And

- **If you cannot measure it you cannot manage it**

* SEE “The Lexus and the Olive Tree” –by T. L. Friedman

Measure it (IT?)

- Global size in meters
- Population size & distribution
- Components of global wealth
- Data organized is information
- Data sizes
- Network sizes (rates)

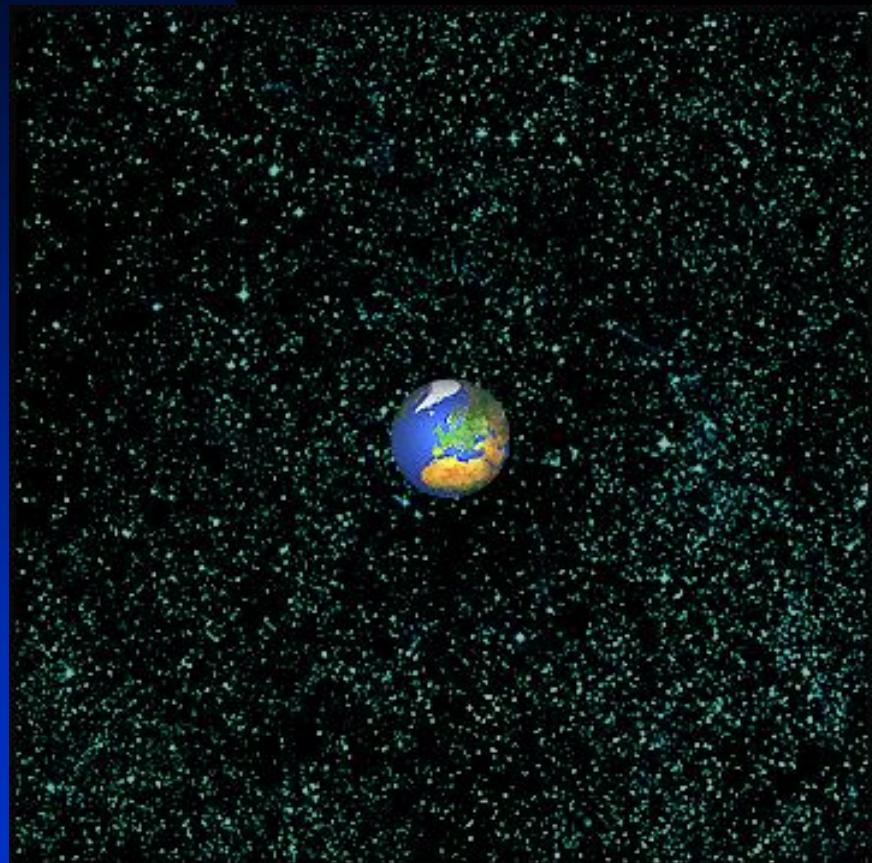
Look at Some Measurements of Space, People and Economies

- Measurements can prevent us from seeing the meaning behind the numbers
- Let us look at numbers and extract some meaning

Count in Powers of ten –

$10^0, 10^1, 10^2\dots$

8=>7

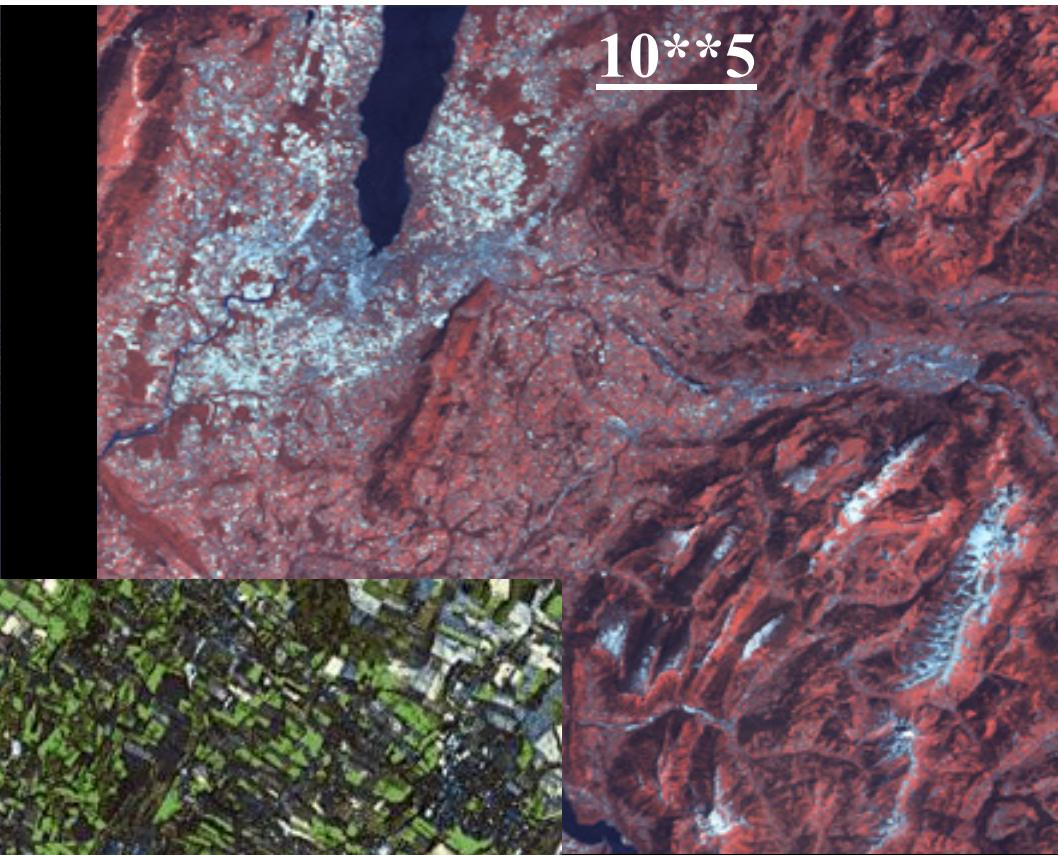
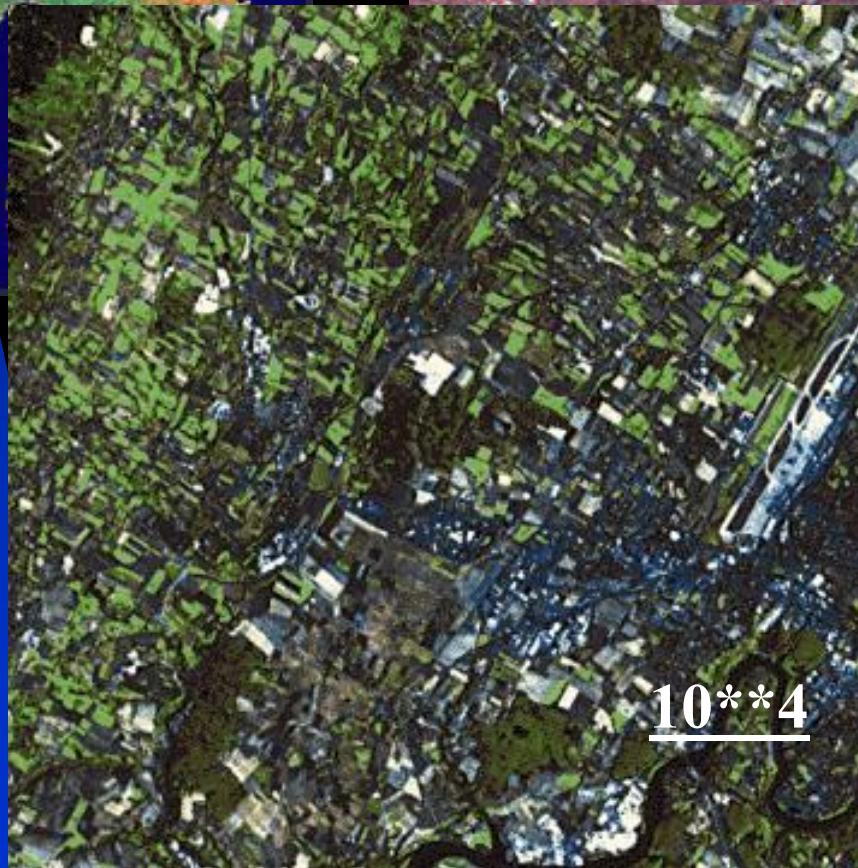
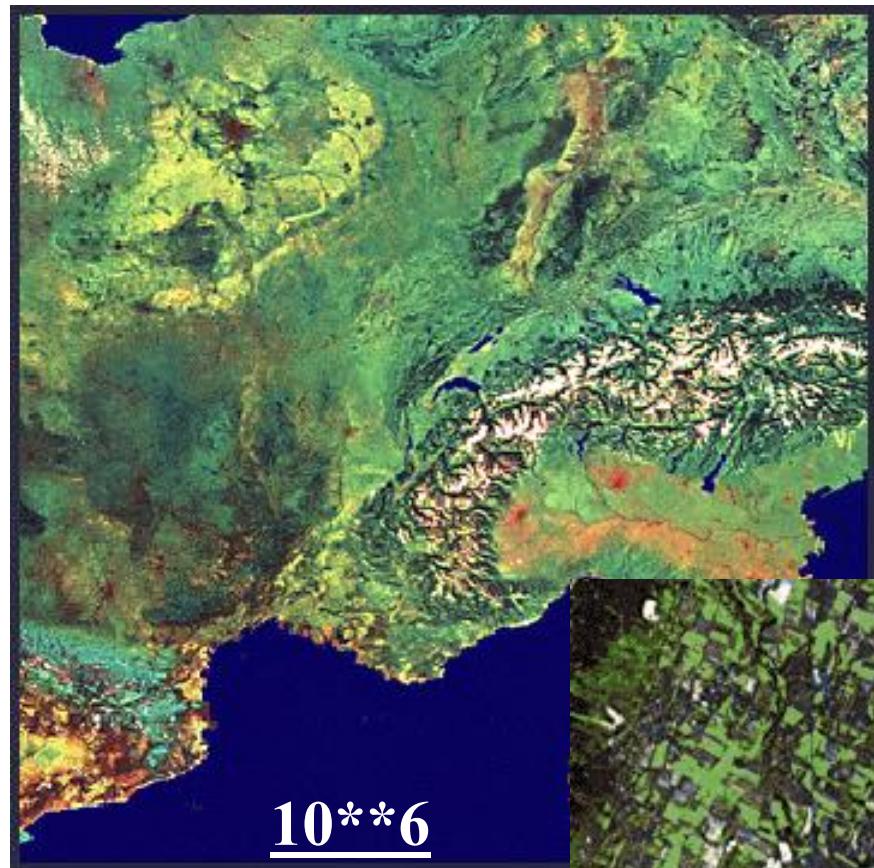


$$10^{**8} = 100,000,000 \text{ m}$$

ICEIS 2001



$$10^{**7} = 10,000 \text{ km}$$



6,5,4

ICEIS 2001



3,2,1

ICEIS 2001

POPULATION SIZE

According to the International Programs Center, U.S. Bureau of the Census, the total population of the World, projected to 7/1/01 at 5:18:35 GMT (7/1/01 at 1:18:35 AM EDT) is

$$\underline{6,157,447,141} = 6.2 \times 10^9$$

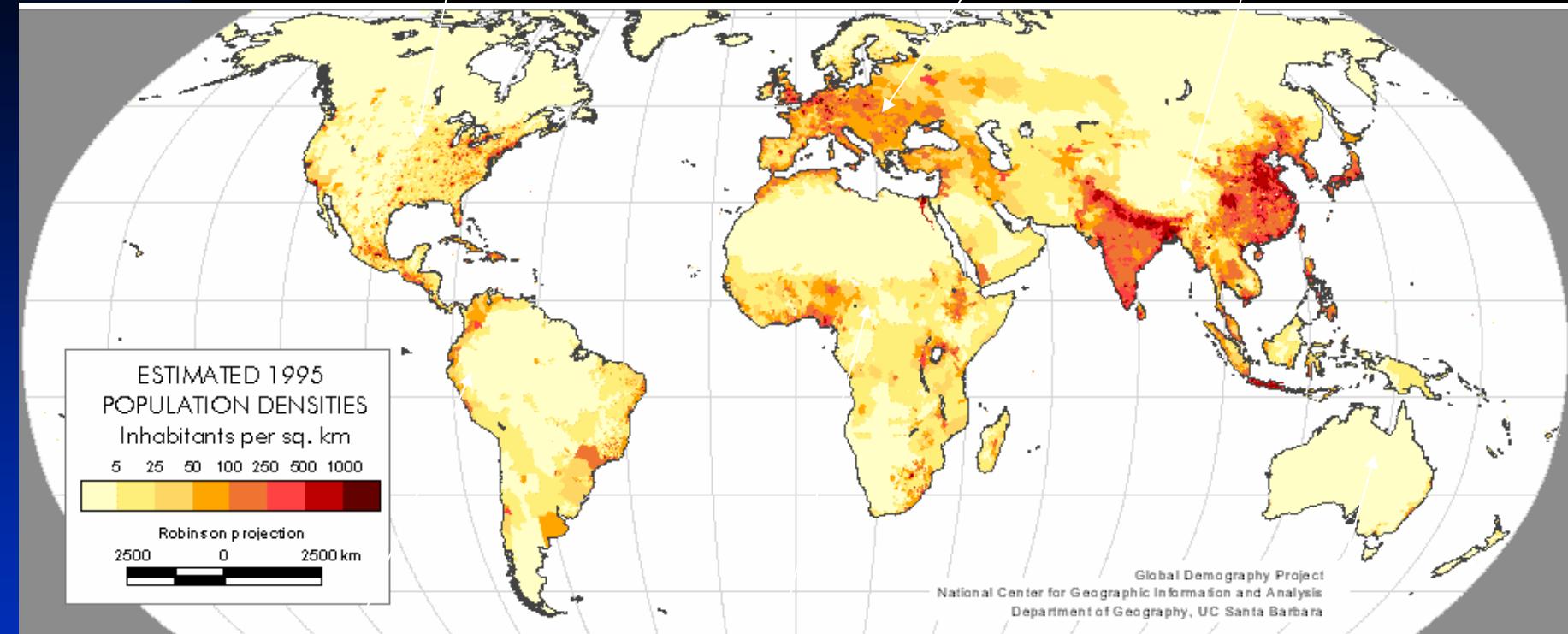
<http://www.census.gov/cgi-bin/ipc/popclockw>

US & Canada = 310M(5%)

Population
Distribution

Asia = 3.68B (61%)

Europe = 729M (12%)



Latin America &
Caribbean = 519M(9%)

Africa = 784M(13%)

Oceania = 30M (0.1%)

If the Global Population Was a Village of 100 People

- 57 Asians, 21 Europeans, 14 western hemisphere, 8 Africans
- 52 female, 48 male
- 70 non-white, 30 white
- 70 non-Christian, 30 Christian
- 89 heterosexual, 11 homosexual
- 6 people would possess 59% of the entire world's wealth
- 80 live in substandard housing
- 70 would be unable to read
- 50 would suffer from malnutrition
- 1 near death; 1 near birth
- 1 college education
- 1 would own a computer

Wealth Of Nations Triangle Index

Updated semiannually since its introduction in march 1996, the world times wealth of nations triangle index is a 63-variable measure of the

- ★ **Economic factors**
- ★ **Social factors**
- ★ **Information-exchange factors**

Environments of 40 emerging economies. (Weighted sums on a triangle.)

[Http://www.worldpaper.Com/WNIndex/idxintr.Html](http://www.worldpaper.Com/WNIndex/idxintr.Html)

ECONOMIC ENVIRONMENT Variables

<u>NATIONAL ECONOMY</u>	<u>INTERNATIONALIZATION OF THE ECONOMY</u>	<u>BUSINESS ENVIRONMENT</u>
<ul style="list-style-type: none">① GDP growth rate① Real GDP per capita (in PPP\$)① Annual inflation rate① Gross domestic savings rate① Government deficit/surplus (% of GNP)① Current account balance① External debt/GDP① Debt service/exports■ Foreign reserves(excl.gold)/imports	<ul style="list-style-type: none">① International trade (% of GDP)① Convertible currency?① Foreign direct investment① Portfolio investmentMarket capitalization	<ul style="list-style-type: none">① Economic Freedom Index① Corruptions Perception Index① Real exchange rate① Money velocity GDP/M2① Interest rate spread (overLIBOR)① Consumer price parityState owned enterprises (as %of GDP)

SOCIAL ENVIRONMENT

Variables

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INFORMATION EXCHANGE Variables

<u>INFORMATION APTITUDE</u>	<u>INFORMATION INFRASTRUCTURE</u>	<u>INFORMATION DISTRIBUTION</u>
Newspaper readership (per 1000 inhabitants)	<u>PCs(residential) in use (per 1000 inhabitants)</u>	Radio ownership (per 1000 inhabitants)
Literacy rate	Number of independent daily newspapers published	Television ownership (per 1000 inhabitants)
Students completing the tertiary level of education	<u>Cable TV available?</u>	Telephone mainlines (per 1000 inhabitants)
College students studying abroad (%)	<u>Satellite television coverage?</u>	Telephone ownership (per 1000 inhabitants)
English as primary language for business?	<u>Telephone quality</u>	Faxes in use (per 1000 inhabitants)
	<u>Average price of telephone call</u>	<u>Cellular telephones in use (per 1000 inhabitants)</u>
		Government IT expenditure (% of GDP)
		Press Freedom Index
		Books published annually (per 100,000 inhabitants)
		<u>Number of internet hosts</u>

Top 10 Internet Penetrated Countries...

<u>Country</u>	<u># Hosts</u>	<u># Users(x 10³)</u>
USA	80569.0	181748.
Japan	6404.0	47541.4
Germany	4183.5	36256.1
UK	4298.8	48443.1
Canada	5874.90	26745.8
Australia	1880.39	11601.8
Finland	1016.5	3219.67
Netherlands	1942.9	11676.9
Sweden	1607.39	6834.6
France	1633.9	11739.7

Measurement – caution!

- The globe and people are concrete objects so *meaning* is easier
- Information and communication are less concrete--The numbers we use to describe them can have *less meaning*

Data Sizes

Bytes(8 bits) =B

- 0.1 bytes: A binary decision
- 1 byte: A single character
- 10 bytes: A single word
- 100 bytes: one sentence

KB (1000 bytes)

- 1 Kilobyte: A very short story
- 2 Kilobytes: A Typewritten page
- 10 Kilobytes: An encyclopedic page
- 50 Kilobytes: A compressed document image page
- 100 Kilobytes: A low-resolution photograph

MB (1 000 000 bytes)

- 1 Megabyte: A small novel OR A 3.5 inch floppy disk
- 2 Megabytes: A high resolution photograph
- 5 Megabytes: The complete works of Shakespeare OR 30 seconds of TV-quality video
- 10 Megabytes: A minute of high-fidelity sound OR A digital chest X-ray
- 20 Megabytes: A box of floppy disks
- 50 Megabytes: A digital mammogram
- 100 Megabytes: 1 meter of shelved books OR A two-volume encyclopedic book
- 200 Megabytes: A reel of 9-track tape
- 500 Megabytes: A CD-ROM OR an old hard disk of a PC

DATA SIZES –cont.

Gigabyte (1 000 000 000 bytes)

- 1 Gigabyte: A pickup truck filled with paper OR A symphony in high-fidelity sound OR A movie at TV quality
- 2 Gigabytes: 20 meters of shelved books OR A stack of 9-track tapes
- 20 Gigabytes: A good collection of the works of Beethoven OR A VHS tape used for digital data
- 50 Gigabytes: A floor of books OR Hundreds of 9-track tapes
- 100 Gigabytes: A floor of academic journals OR A large ID-1 digital tape

Terabyte (1 000 000 000 000 bytes)

- 1 Terabyte: All the X-ray films in a large technological hospital OR 50000 trees made into paper and printed OR Daily rate of EOS data (1998)
- 2 Terabytes: An academic research library
- 10 Terabytes: The printed collection of the US Library of Congress
- 50 Terabytes: The contents of a large Mass Storage System

Petabyte (1 000 000 000 000 000 bytes)

- 1 Petabyte: 3 years of EOS data (2001)
- 2 Petabytes: All US academic research libraries
- 20 Petabytes: Production of hard-disk drives in 1995
- 200 Petabytes: All printed material

Exabyte (1 000 000 000 000 000 000 bytes)

- 5 Exabytes: All words ever spoken by human beings.

Some Network Numbers

- Pots*=56kbs
- DS0 = 64kbs
- ISDN(L) =128kbs
- T1(ds1)= 1.544mbps
- T3(ds3)=45mbps
- Oc3=155mbps
- Oc12=622mbps
- Oc24=1,244mbps
- Oc48=2,488mbps
- Oc192=10,000mbps
=10gbps

* Plain Old Telephone Service

The OLD Information Network and in Action

(Producing New Wealth With Client/server)

H.Miller inc, Zeeland MI, (founded 1923)

Old way

- Customer orders chair,file,desk
 - Faxes sent to suppliers
 - Built in 3 plants at 3 times
 - Distribution center gathers 3 items
 - Customer gets receives the order
-

New way

- Online order for 3 items
- Order transmitted to plants and supplies synchronized
- 3 items built in synch
- No storage of 3 items –one delivery
- Customer tracking available during entire process

NOW a *New Network is Emerging*

- NOT multiple connected computers
- Connected DEVICES delivering web services to each other
- Change rate? -30 years the internet, 5 years the WEB –
5 years for a NEW net? (DRIVING FUNCTION is market force of 6 billion customers for cell phones, movies, etc.)

New Net Technology

- Old technology = electronics
10mbps
- New technology = photonics
 - ★ Optical – 1gbps
 - ★ Wireless

Also -- dramatic Protocol changes

TDM, WDM(2-4), DWDM(16),MPLS

- Network Capacity increasing dramatically (32 lambdas/fiber, 100Ghz-10Ghz separation)
- Theoretically, the capacity of glass fiber is almost limitless: since 32 wavelengths represent less than 1 % of an optic fiber's capacity,
- Global net is already optical, many metro areas are quickly becoming optical
- Device (computer) level optical soon

SEE ---- “Next Generation Internet: Creating Advanced Networks and Services” --- by Joel Mambretti ; Andrew Schmidt

Grid Computing Concept

Enable communities (“virtual organizations”) to share geographically distributed resources as they pursue common goals—in the absence of central control, omniscience, trust relationships –*Ian foster*

SEE – “The Grid : Blueprint for a New Computing Infrastructure “ by Foster & Kesselman

*ALSO – Distributed Terabyte Program - NSF
<http://www.interact.nsf.gov/cise/descriptions.nsf/pd/DTF/>*

CONTENT and MPLS

- GOOGLE now searches
1,346,966,000 web pages
- NAPSTER = ??
- VIDEO = ??

As MPLS replaces SONET) =>Audio,
video, text go to Streaming on protocol
independent lambdas
(End to End circuit returns and maybe
A “Lambda” to each person at Birth?)



WILL THE NETWORK BE THERE?

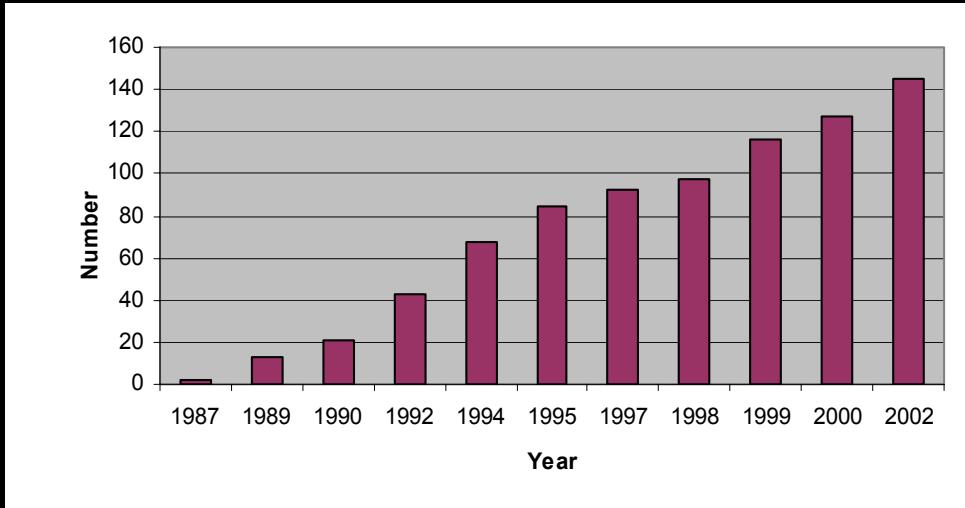
- SECURITY? REGULATIONS?
- PHYSICAL CONNECTIONS?
- PROTOCOL CHANGES?
- BANDWIDTH?

Submarine Fiber Optic Cable (“SFOC”) Industry

Global Broadband Solutions (GBS), LLC

Investment

- Installed and announced systems
 - 1991: \$4.2-billion
 - 1993: \$8.5-billion
 - YE 2000: \$41-billion
 - Thru 2003: >\$65-billion
- Additional facilities: ~\$7-billion



Technology

- Current Systems:
 - 4 to 8 fiber pairs per sheath
 - 2.5 to 10 Gbps per wavelength
 - 16 to 64 wavelengths per fiber pair
- Soon to be deployed for commercial SFOCs:
 - 40 Gbps per wavelength
 - 128 wavelengths per fiber pair

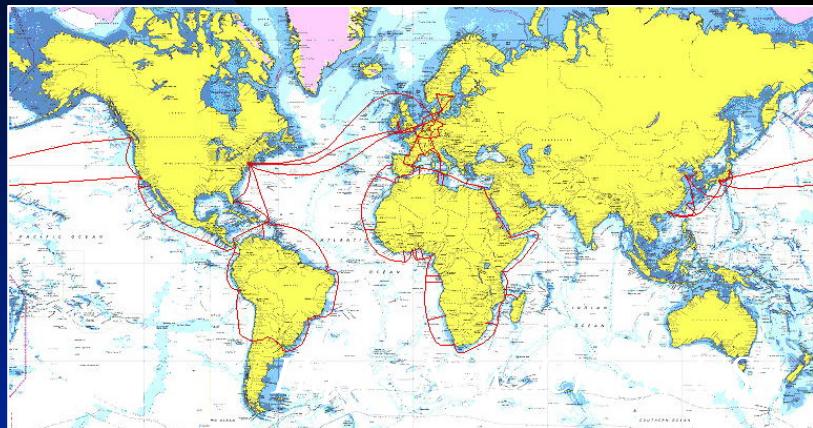
ICEIS 2001

Industry Status

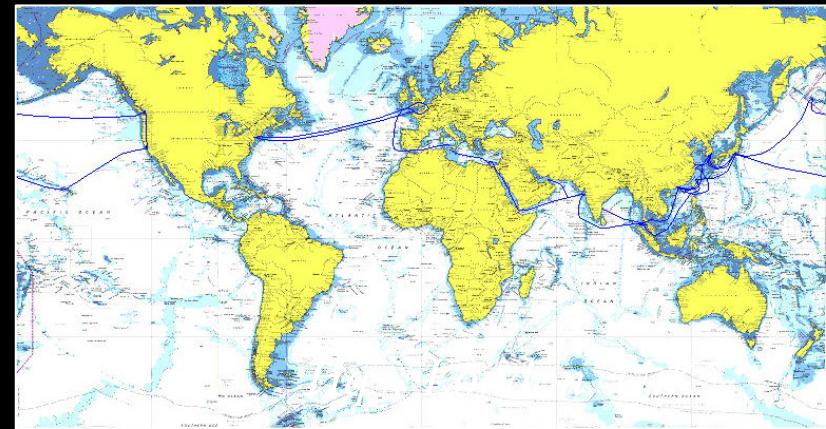
- Fast Growing (but slowing down):
 - Major expansion of Transatlantic cables occurred in 1998-99
 - Major expansion of Transpacific cables – in 2001-03
 - Major Expansion around Africa in 2002-04
 - Middle East lags in capacity growth
- Private investment financing growth
- New systems are terabit, self-healing rings
- Potential for rapid expansion of commercial ~~20~~ and for Global Contingency operations

Global SFOC Systems Evaluated

Global Crossing HQ:NJ



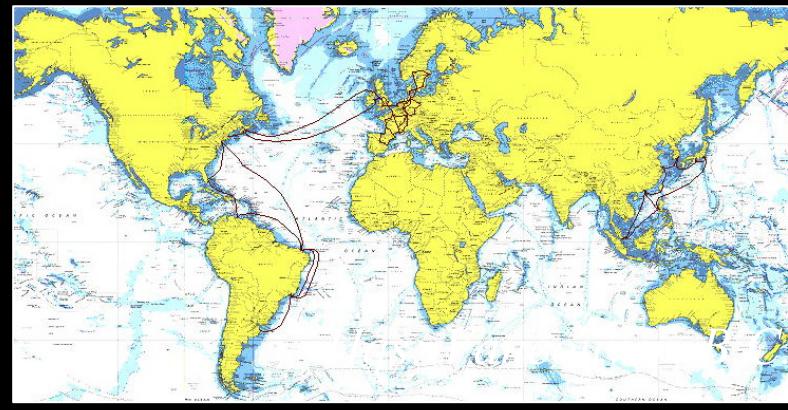
FLAG Telecom HQ:London



Tycom Global HQ:NJ



360Networks HQ:Vancouver



What This All Means

- The network is a wealth generator for enterprise systems
- Connectivity within your enterprise and to the globe will be a factor in determining enterprise wealth
- Think service connection between devices – globally- for your enterprise
- Measure the amount of information and device connectivity in your enterprise network as variables in the wealth of your enterprise

Conclusion

The network is undergoing
rapid change –

- We need faster, broader thinking about the enterprise information systems
 - NOT client/server, NOT computer/computer, BUT rather service/service
- *Enterprise systems must be placed in a global s-s framework* –

10^6

*The INFORMATION REVOLUTION rate of
change is at the speed of light (not the
industrial revolution mechanical speed of
sound)*

[C = 299,792,458 m/s s = 331 m/s] => ... 10^6

**P. S. Is this a real vision????
Or all nonsense & hype ????**

see CISCO & MICROSOFT PLANS at

microsoft.com/technet/treeview/default.asp?url=/TechNet/itsolutions/ecommerce/ciscomef.asp



Thank You !

Other URLs of Interest

- Physical sizes
 - ◆ <Http://cern.Web.cern.Ch/CERN/microcosm/p10/english/>
- Data sizes
 - ◆ <Http://www.cacr.Caltech.edu/~roy/dataquan/>
- Global wealth
 - ◆ <Http://www.worldpaper.Com/WNIndex/idxintr.Html>
- Global population
 - ◆ <Http://www.Un.Org/Depts/unsd/>
- Global networks
 - ◆ <Http://www.netsizer.Com/daily/TopCountry.Htm>
- The Grid
 - ◆ <Http://www.gridforum.Org/>
- Optical technology
 - ◆ Http://www.iec.Org/tutorials/opt_net/