Achieving a Defense Intranet through the use of Commercial Technology
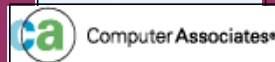
Archie Clemins
Admiral, U.S. Navy (Retired)

Events Are Changing the Strategic Paradigm

- ✦ **Security Challenges of the 21st Century – Battlefield Landscape has Changed**
- ✦ **Pace and Proliferation of Technology**
- ✦ **Compelling Need to Respond More Rapidly & Decisively Across the Full Spectrum of Military Operations**
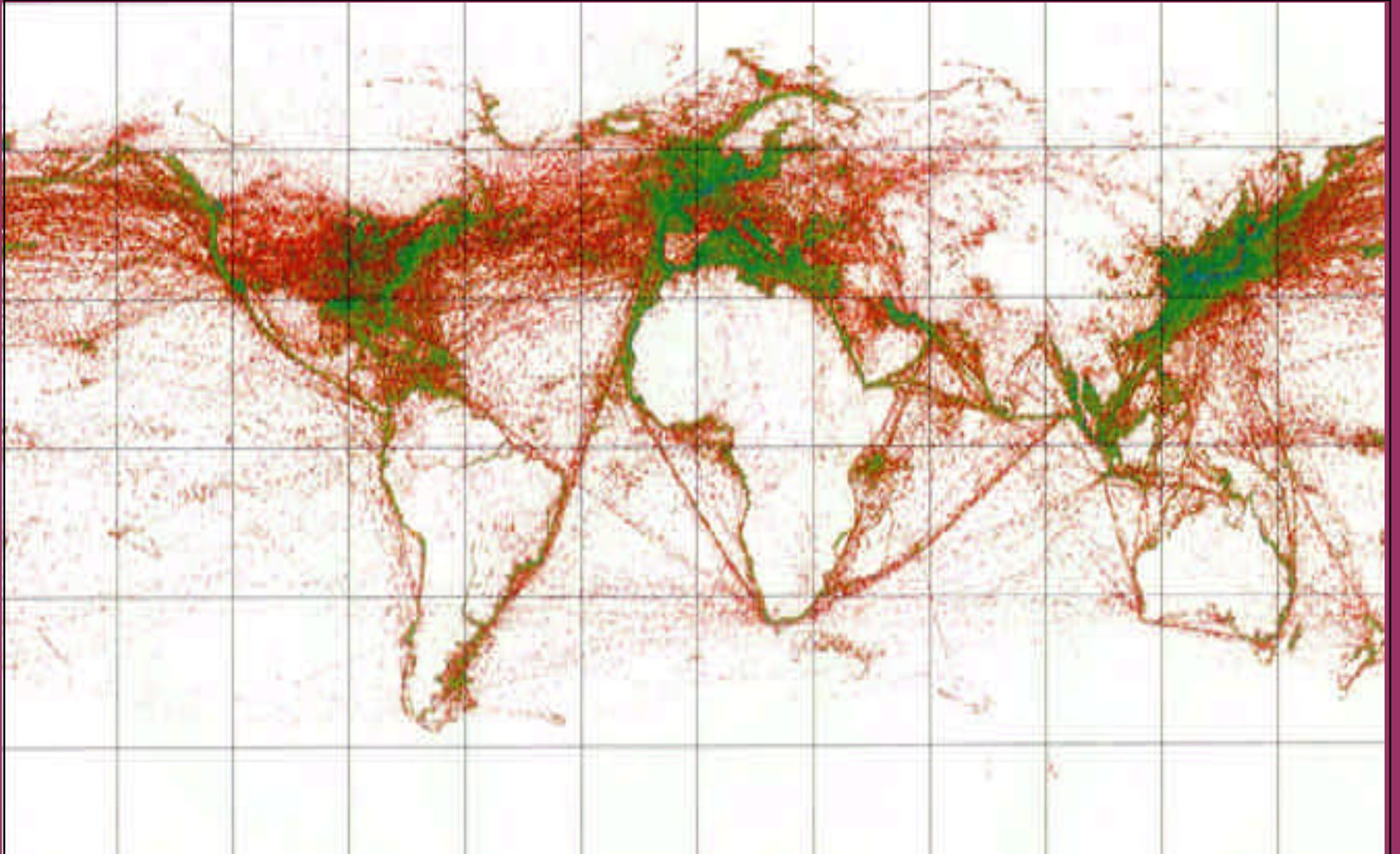
Migrating Commercial Technology to the Government

Windows … Ethernet …

TCP IP … Desktop …

Laptops … Exchange …

Routers … Switches …

Security … Virus Detection

Electronic Activity

A Sea Change

" **The most important transformation that we're facing is** the transformation from the Industrial to the Information Age. To the extent we do that well, all of our other efforts in transformation will prosper. **To the extent that we don't, all of those efforts will be for naught.** "
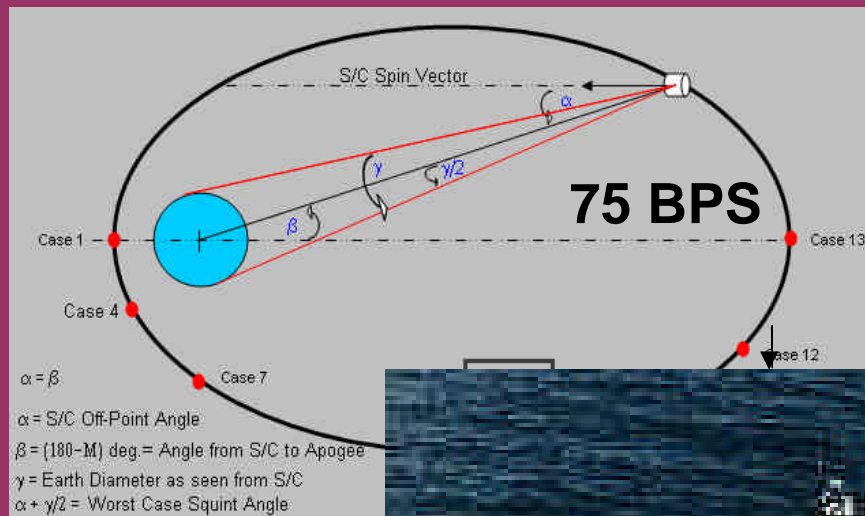
VADM. ARTHUR CEBROWSKI, USN [RET.]
Director, Office of Force Transformation, OSD
31 Jan 02 Remarks at National Defense University.

75 BPS

S/C Spin Vector

Case 1
Case 4
Case 7
Case 13
Case 12

$\alpha = \beta$

α = S/C Off-Point Angle
$\beta = (180-M)$ deg.= Angle from S/C to Apogee
γ = Earth Diameter as seen from S/C
$\alpha + \gamma/2$ = Worst Case Squint Angle

Intelligence

4 Messages
of 25 Words
in 90 Days

INFORMATION MANAGEMENT

The Power of Information
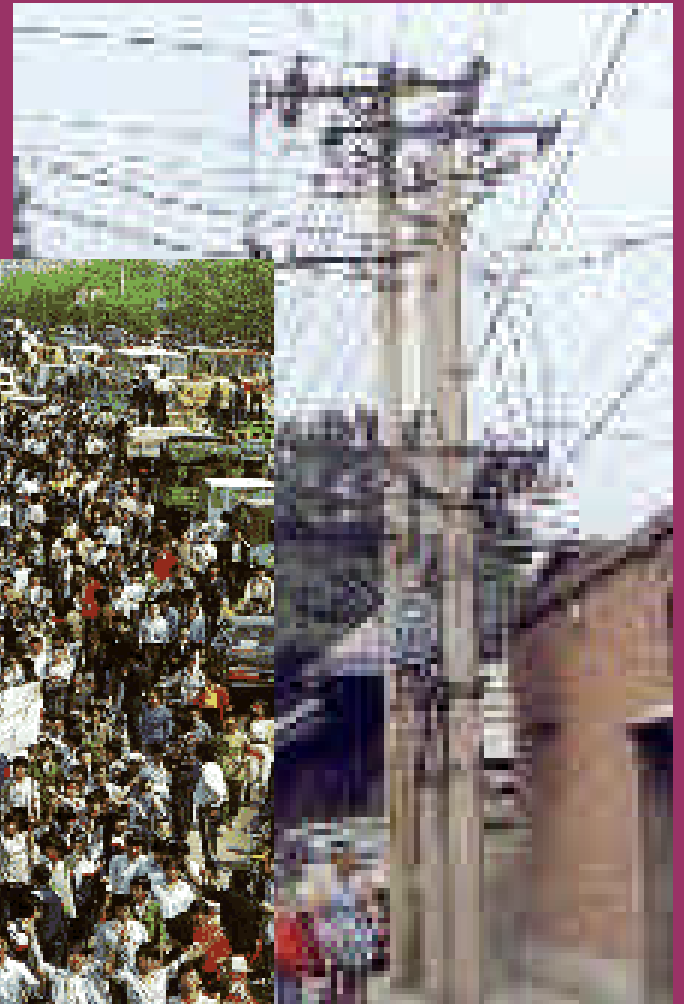
CAMBODIA

LAOS

Cambodian Information Center
Homepage

Poipet

Angkor

Siem Reap

Battambang

Vietnamese
Floating Village

Tonlé Sap

Stung
Treng

Mekong River

Chuor Phn.
(Cardamo...

Trat

Kompon
Cham

Phnom
Penh
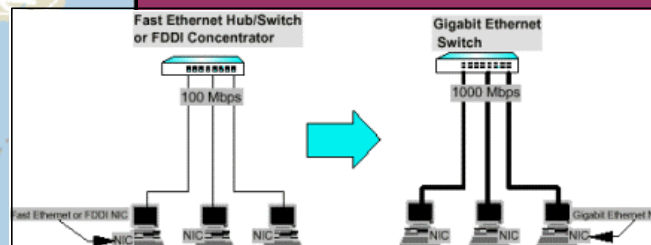
Chau Doc

Mekong
Delta

Kep

SOUTH KOREA

Korea has one of the world's highest Internet penetration rates. Nearly half of the population in Korea is on-line. There are nearly 80 Internet Service Providers (ISPs) in Korea, and more than 511,000 "kr" domains. Korea is home to 88 of the top 1,000 most frequently visited Web sites in the world.

Change in Connectivity in Korea (1995 to 1999)
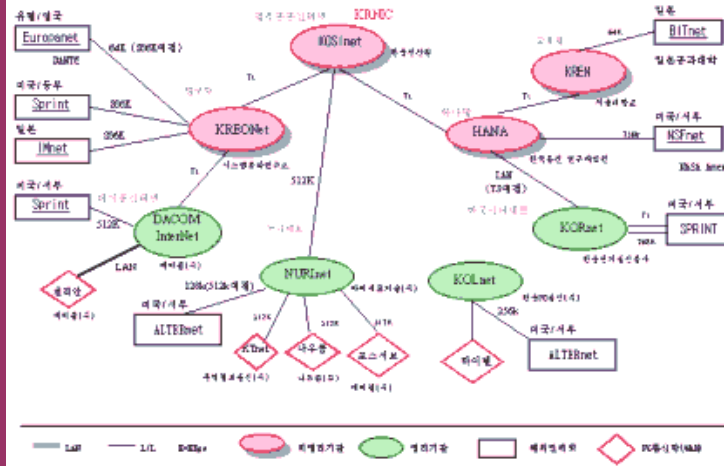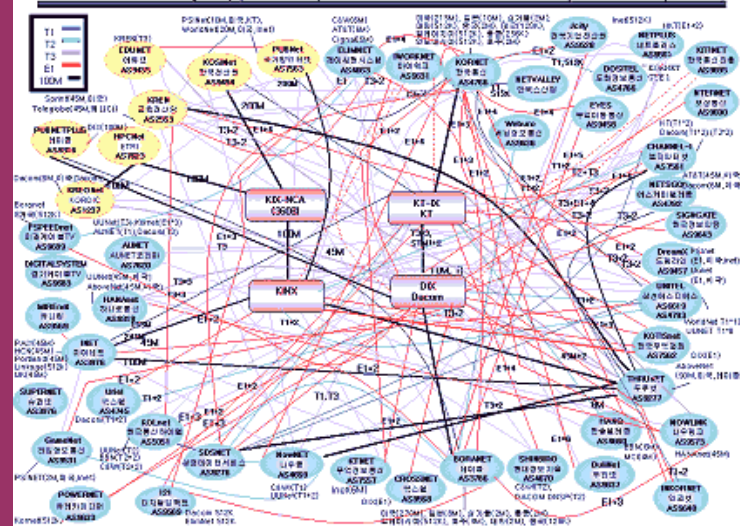
In Technology you are either *Improving* or *Declining*

Other countries can invest LESS to surpass your capabilities

"Don't Look Back"
(Someone may be gaining on you)

The Power of the Network

Going After Saddam
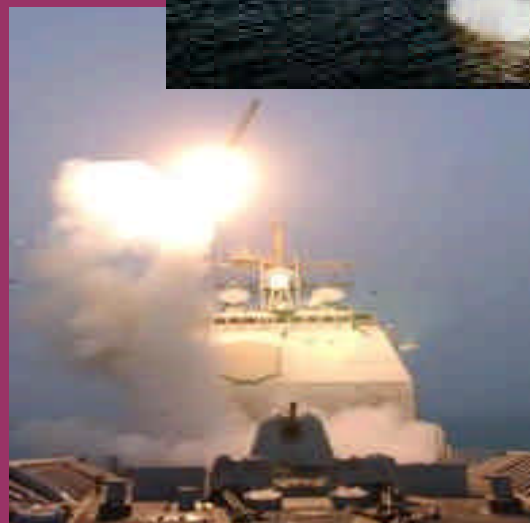
File   Edit   View   Format   Room   Member   Favorites   Window   Help

#C6F_Internal

<TOL_ETC> abe de tol rgr have not received r01 or r02 via ehf tty
<SJN_NAV> does anyone know if these LSP's are coming down via
another circuit? or am I stuck with EHF NET 217 TTY
<CTF69_CWO> sir req u read my last.....k/gtr

<Prv_Radio> Have R01 and R02 from SSIXS 36, and G01 from 217, plus
assorted partials.
<CTF69_CWO> all med subs.....r01 and r02 loaded in ssixs msbw
sids....k/gtr
<SJN_ETC> CTF_69CWO, rgr
<TOL_OOD> CTF 69CWO rgr.
<Prv_Radio> How many LSPs are we supposed to be getting now?

#C6F_TLAM_FRU_TECH_SUP

<KYW_FTLPO> all green with exception status ok on fddi board is
cycling between green and red
<FTSCLANTP> KYW, rgr, can you call up the term window on any
other machine?
<KYW_FTLPO> negative

<KYW_FTLPO> gfcp term window will come up. only thing in it is
nhosts=3
<FTSCLANTP> KYW, hitting the ENTER button should bring up the
window, verify the cursor is in
 the window
<KYW_FTLPO> already tried that.

<FTSCLANTP> KYW, go to the GFCP and power it down, reset the
flash cards, and power up and check status.
<KYW_FTLPO> flash cards referring to cpu cards?
<KYW_FTLPO> rgr

File   Edit   View   Format   Room   Member   Favorites   Window   Help

#C6F_I&W_COORD   #C6F_Internal

<PRV_FTOW> ALL, PRV current thru L78/P50.
<PIT_STRK> KYW: I have a news file for you, stby for file xfer.
<KYW_OOD> stndg by
<NNS_Strik> PITT: req same.
<CHY_FTC> PITT: can i get in on that?

<BRI-THAWK> DINO_FCC: copy my whisper?
<DINO_FCC> BRI, rgr, standing by

#C6F_Targeting

<DINO_real> All FRUs continue with maint with the
exception of BRI and TOL...BRI/TOL report current
status....we will still keep alert shooters on short tether
to meet any tasking.
<TOL_OOD> DINO: rg brk currently aligning missles
tubes 1,2,3,4
<DINO_FC1> TOL: Up and ready
<TOL_OOD> DINO: aligning missiles tubes 1,2,3,4

<AA_STK1> BRI: ALIGN 1 3-C PLACE MISSILE IN
RELOAD POOL.
<BRI-THAWK> AA: rgr Align 1 3-C Place in reload
pool
<TOL_OOD> Dino: line A: 0317.
<TOL_OOD> DINO: Line A:0317 R01
<BOI_OOD> Dino: line A R01: 0318.

<TOL_OOD> DINO: Line B: aff
<TOL_OOD> DINO: Line B: aff ownship all others in
progress Line C: no Line E: 0322 P14S/P13N Line F:
0340
<TOL_OOD> DINO: revised Line B: aff all
<CUTLASS> anyone have it, that can turn it around

Crafting the Road Ahead
Operation Iraqi Freedom
Lessons Learned

- Two top priorities
  - Increase capacity
  - Converge Data, Voice, Video into IP
  - Solve Allied Interoperability

- Chat, not voice, was premier collaboration tool!!!!
- Chat is rapidly replacing Plain old Telephone System (POTS) and tactical SATCOM
- STE-STU secure telephone did not work well for mobile users or at sea
- CENTRIX and Joint Data networks were leveraged heavily
- Networks are now tactical, not just informational !!!!!!
- INMARSAT had to be timeshared
- Need ship-to-ship data connectivity to the small decks as well as mobile users

NMCI & Tactical Networks Interface

Base Area Network

Metropolitan Area Network

Wide Area Network

Long Haul
(DISN, with Commercial as necessary)

NMCI/IT-21 Interface

LAN

BASE

CLINIC

LAN

NAVAL AMPHIBIOUS BASE

MC AIR STATION

DoD TELEPORT

TRNG CEN

HQ

BASE

NOC

IMA FISC

TRAINING CENTER

USN/USMC LOGISTIC BASE

NCTAMS

NMCI to the pier

Network Operations Center

Deployed/ Mobile Units
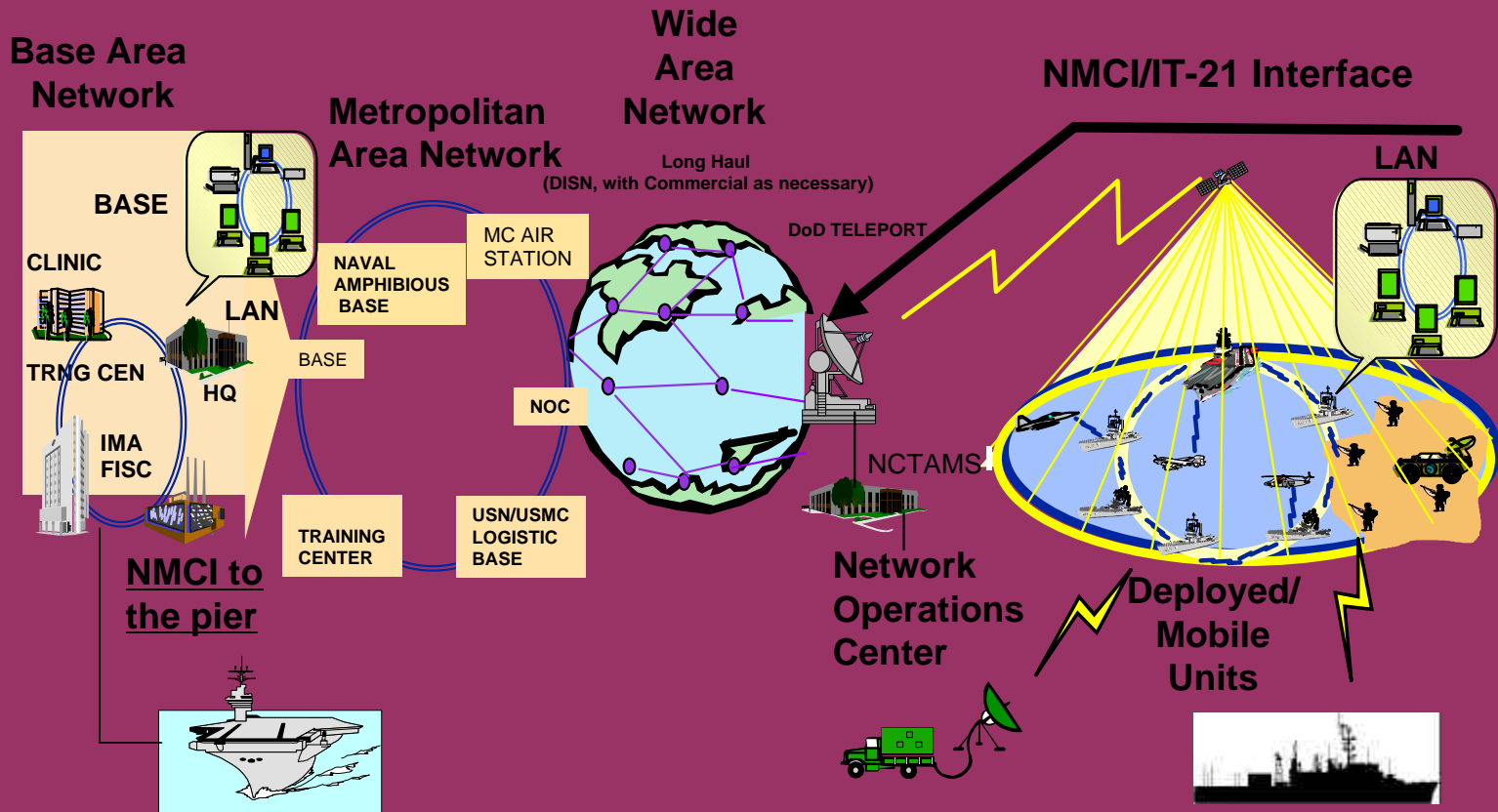
End-to-End Connectivity

Services Included in Seat

- **Security Services (firewalls, intrusion detection, encryption)**
- **CAC/PKI Implementation**
- **Wide Area Network Access (DISN, Commercial WAN, Internet)**
- **Infrastructure**
- **Joint and Industry Network Interoperability**
- **Enterprise Functions (Help Desk/Tech Support)**
- **Network Management Services**

- **Desktop Hardware**
- **Desktop Software (standard software suite)**
- **Organizational Messaging**
- **Training**
- **Directory Services**
- **E-mail**
- **Domain Name Service**
- **Local Area Networks**
- **Base Area Networks**
- **System Management Services**

Standard set of services provided for interoperability and security

Market Share

NMCI NAVY MARINE CORPS INTRANET

The contracting for MNCI is REVOLUTIONARY in concept and scale.

Seats Managed (K)

Legend: 2002, 2004

Categories: GM, Xerox, Bell South, Weyerhauser, EDS, GSA, ODIN, IT21, MCEN, NMCI
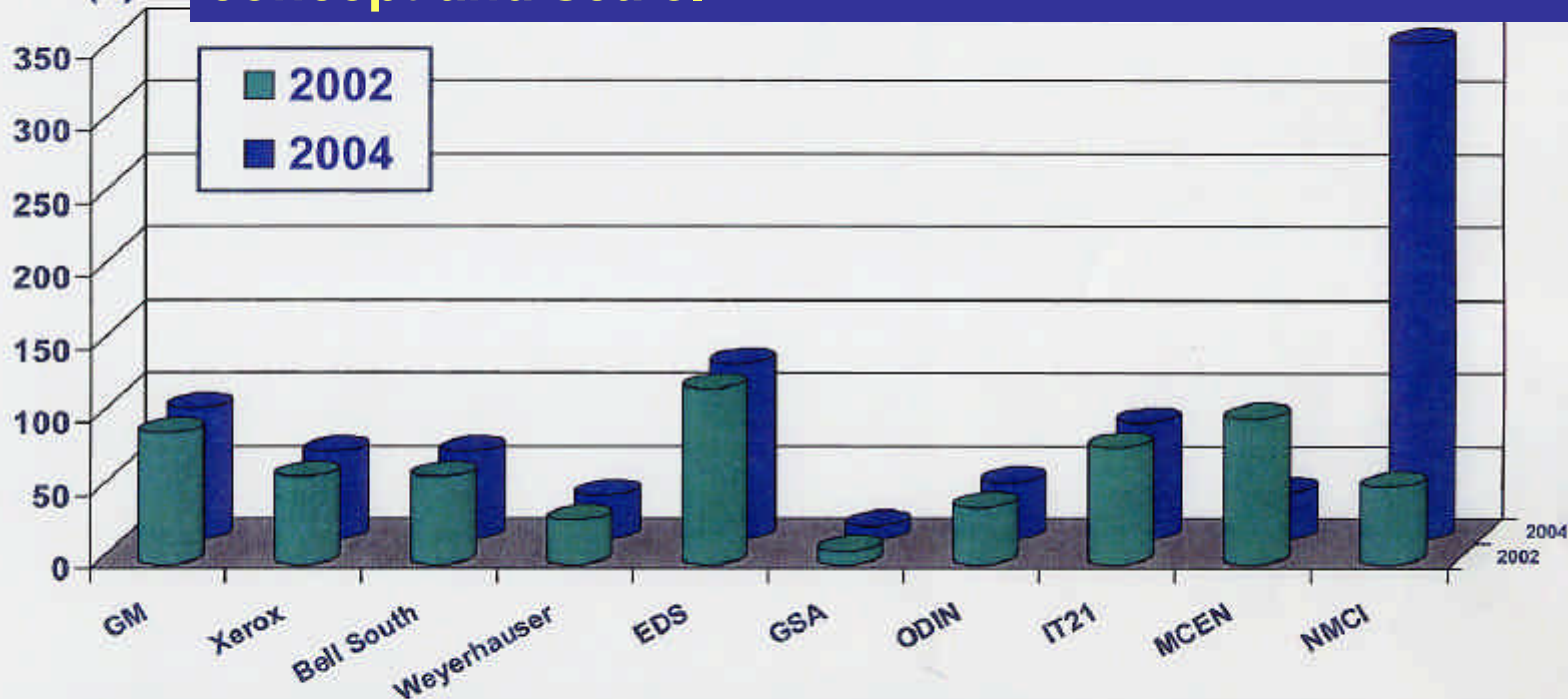
According to the Gartner Group, NMCI will eventually comprise 4% of the total U.S. managed seat market

4

2003 - MNCI Contract

Refresh rate is every 3 years or 3 months after new software release.

Integrator

EDS

Network Solutions

MAN/LAN

WAN

Security

Software

Desktops and Servers

WORLDCOM

CISCO

DELL

MICROSOFT

SYMANTEC

40% small business
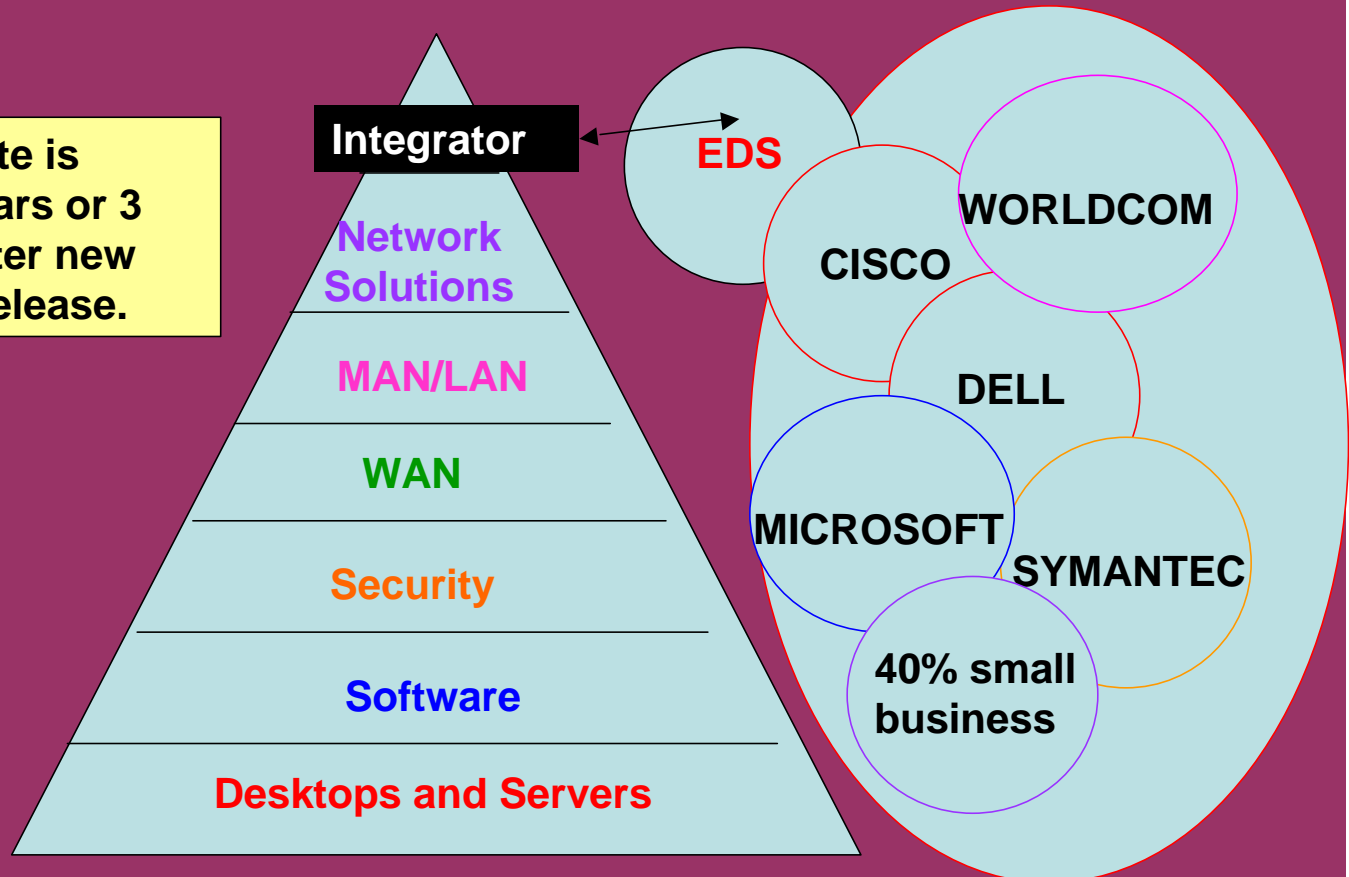
The Navy owns SEATS - NOT hardware or software

AF Transformation Vision

Secretary James G. Roche   General John P. Jumper

It is the right time to leverage technology to transform the USAF's fundamental processes to a more effective and efficient information-centric environment to support the Air Force task forces and maintain our ability to provide Global Vigilance, Reach and Power

Air Force Transformation

"A process by which the military achieves and maintains asymmetric advantage through changes in operational concepts, organizational structure, and/or technologies that significantly improve warfighting capabilities or ability to meet the demands of a changing security environment"

AF Transformation Flight Plan

"Create an acquisition policy environment that fosters efficiency, flexibility, creativity, and innovation"

Deputy Defense Secretary Paul Wolfowitz on interim acquisition guidance

Wireless Layer--- Battalion to Company

The start of Future Combat System (FCS)
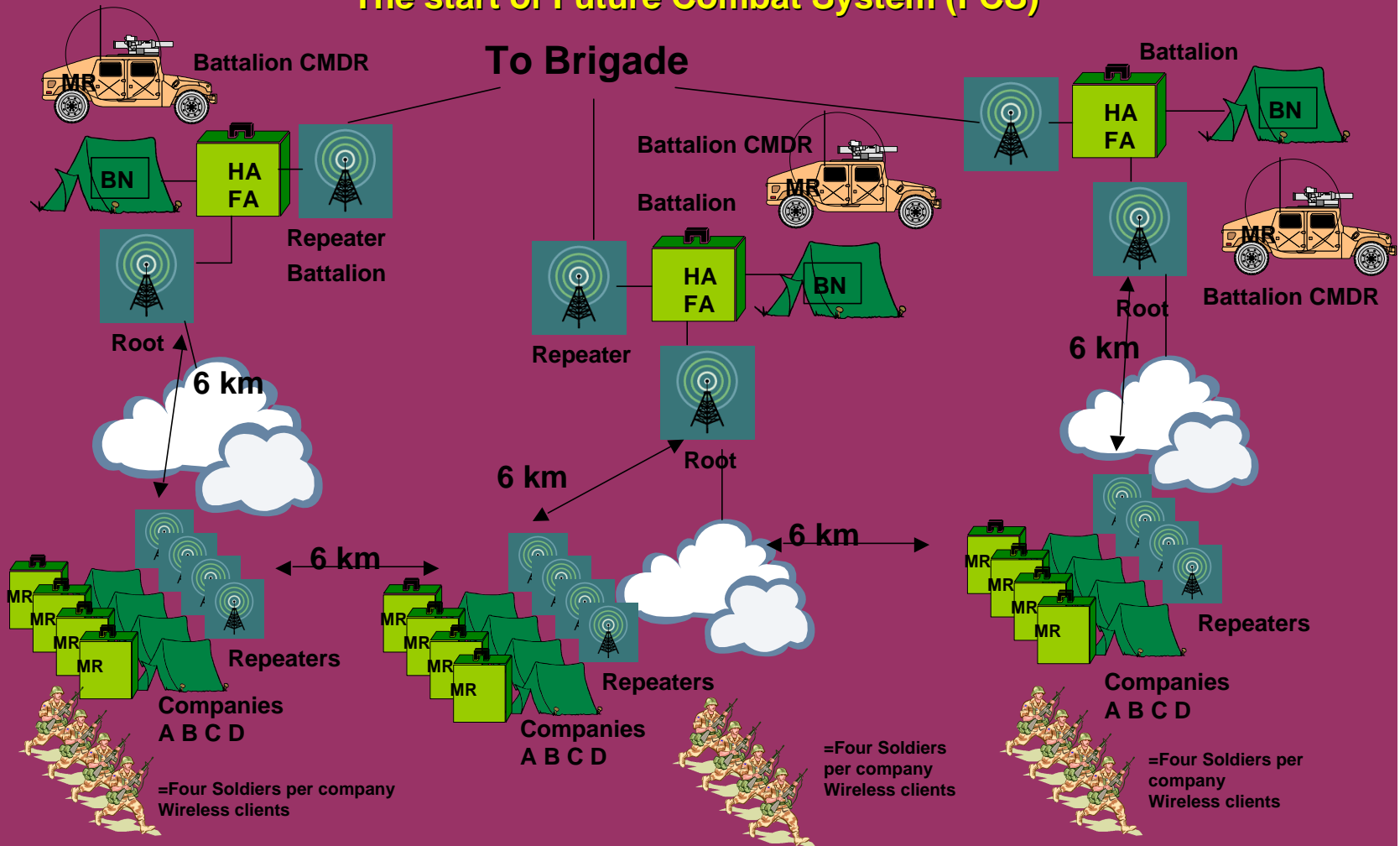
Networking the Warfighter
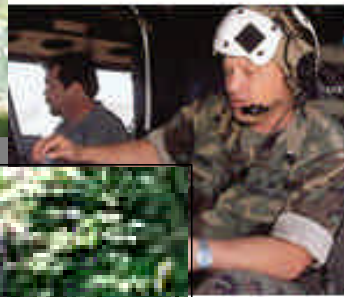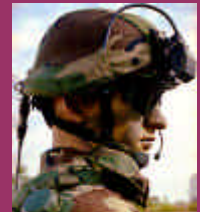
Combined Enterprise Regional Information Exchange System (CENTRIXS)
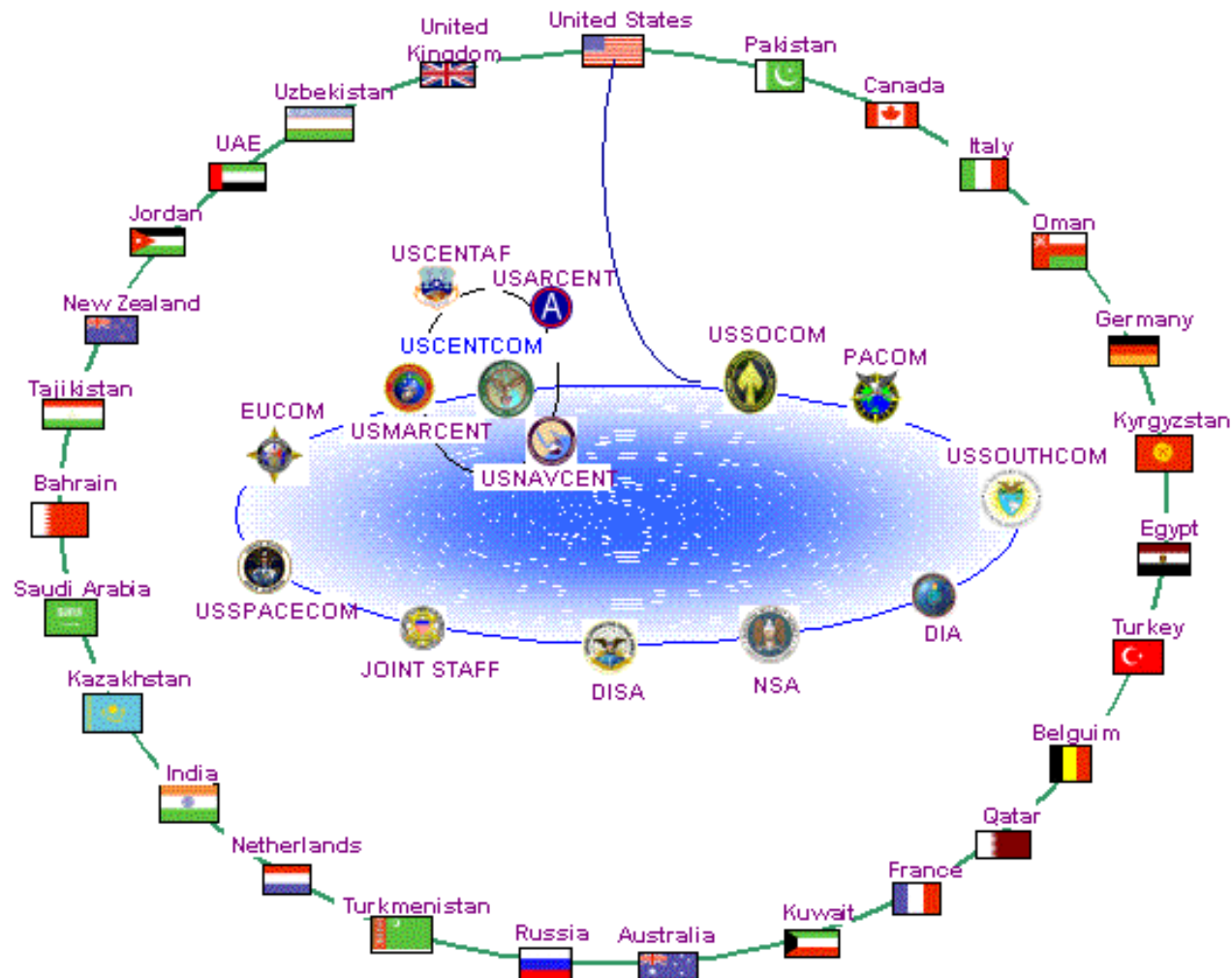
Electronic information sharing across joint commands with multinational partners... for combined global operations region-to-region

CENTRIXS In The Arab Gulf Region

First Operational Experience Kabul

Netherlands' Project TITAAN

A LEAP OF FAITH

Choosing change accepts risks . . . .

Choosing not to change accepts irrelevancy

CEO RECOMMENTDATIONS
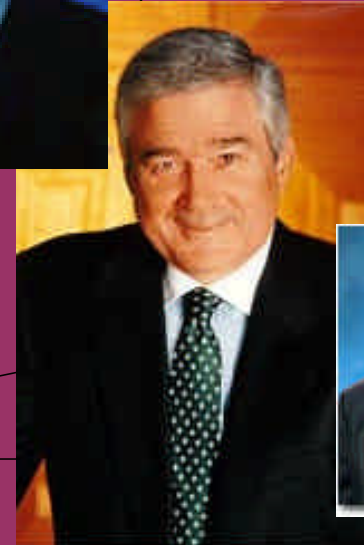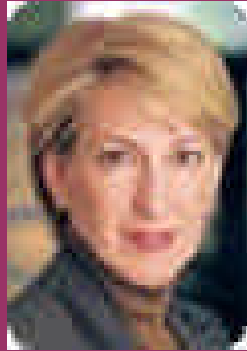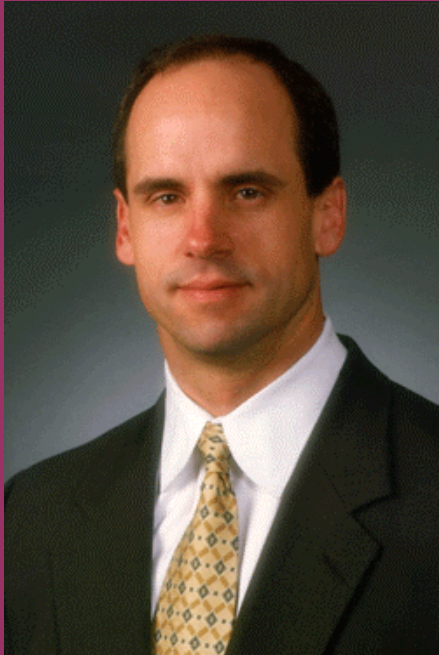
Build a secure Enterprise Intranet

LARRY TISCH'S HUGE TRADING LOSSES

BusinessWeek

HOW JACK WELCH RUNS GE

A Close-up Look at America's #1 Manager
SPECIAL REPORT

SEA POWER 21

Sea Shield

Sea Strike

50
40
30
20
10

Income
Expenses

$88 B Expenses

100 B Income ???
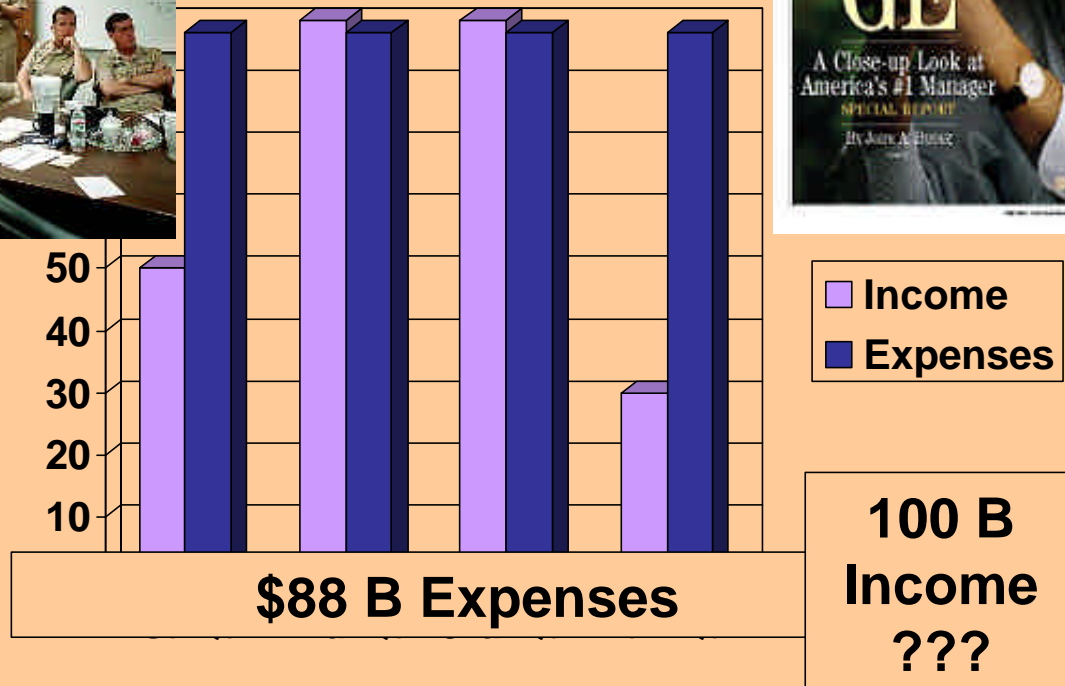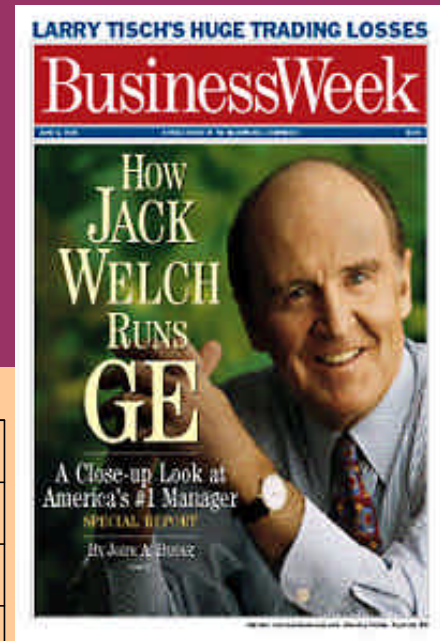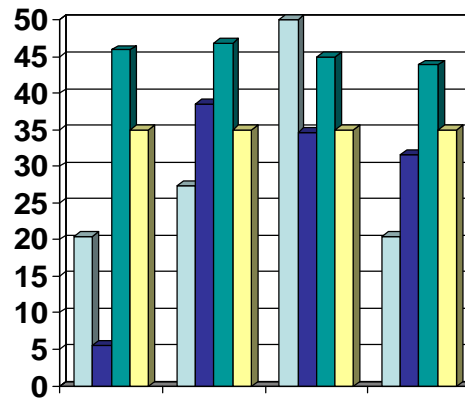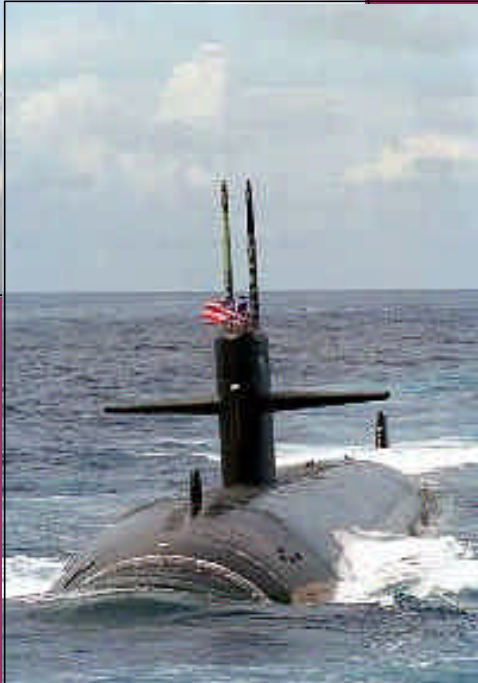
Always 10% SHORT
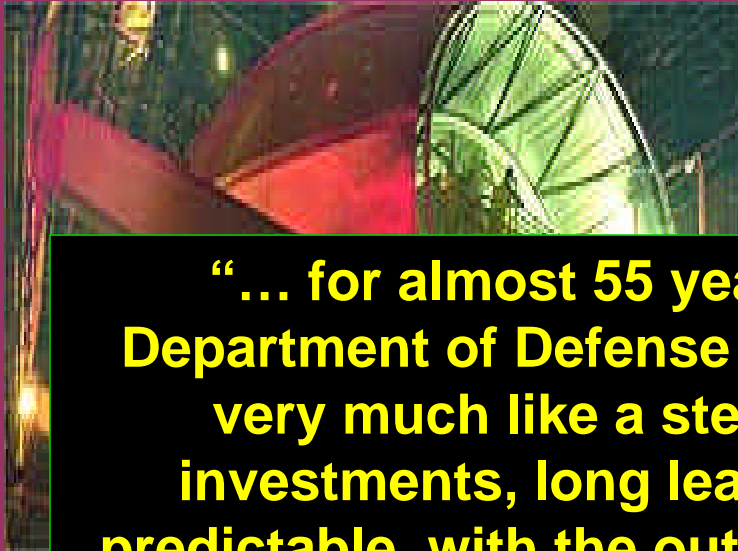
"… for almost 55 years the U. S. Department of Defense has functioned very much like a steel mill: high investments, long lead times, very predictable, with the output five years in the future."

"We have to be some sort of quick, agile, responsive start-up company that can move fast and be quick in decisions and technology and applications."

Transformation

- **Transformation requires changing the structure of our military forces, our military culture and doctrine, and streamlining our war fighting functions.**

- **Transformation is not simply about new technology. It is also about new ways of _thinking_ and new ways of _fighting_...**

Kristin Krohn Devold, Norwegian Minister of Defense
SACLANT Open Road '03

RELATIVE ADVANTAGES

One additional Ship = 1/300th

One additional Airplane = 1/4000th

One additional NETWORK Node ~ N^2
Metcalf's Law

PURPOSE OF TRANSFORMATION

Time from ID to Bomb on Target

- WWII – Months
- Vietnam – Weeks
- Desert Storm – Days
- OEF/Afghanistan – Hours
- OIF/Iraq – Double Digit Minutes
- Next war – Minutes or Seconds

RETURN ON INVESTMENT

Tactical:
Timely and Accurate Information

Overwhelming Force:
Ratio reduced from 3 to 1 down to 1-300!

CHANGING THE LIVES OF
Sailors, Soldiers & Airmen

Platform BW Requirements

CV / CVN	AGF / LCC	LHA / LHD	LSD / LPD	CG	CG/DDG	DD/SSN	FFG
Precision Engagement	CJTF JFACC	OMFTS		AADC	TMD		

= 1,280 Kbps ◄ - - - - - - - - - - - - - - - - **Cable Speed (without neighbors!)**

+768 Kbps	**Primary Imagery**

= 512 Kbps ◄ - - - - - - - - - - - - - - - - **DSL Download Speed**

+384 Kbps	**Collaborative Planning**	AADC
	Siprnet-64Kbps Voice -128 Kbps	
	Niprnet-64Kbps VTC - 128Kbps	12 units
Tele-Medicine - Radiography/Diagnostics		

DSL Upload Speed

+64 Kbps	**Common Tactical Picture** (GEO SATCOM)	**IT-21 CORE CAPABILITY 128Kbps**
	JTIDS, Link 16	

+64 Kbps	**Tactical Data Network** (GEO SATCOM)
	COMMON OPERATIONAL PICTURE NSFS, IBS
	RECORD MSG / EMAIL TELEMEDICINE (E-mail / Image Capture)

+2.4 Kbps	**CMD VOICE NET** (5Khz UHF/EHF LDR)

Satellite Communications Frequency Usage

Commercial SATCOM Services

orbcomm
137-138 | 148-150

"regular" cellular (Land Mobile Radio)
800 | 900

Inmarsat, iridium, globalstar, ellipso
1.53-1.55 | 1.61-1.65

Ico, ellipso, globalstar
1.98-2.1 | 2.4-2.5

INTELSAT
3.9 | 6.3

INTELSAT, GE
12 | 14

TELEDESIC, SPACEWAY, ASTROLINK, CELESTRI, SKYBRIDGE, iridium (inter-satellite & gateway links)
17.5

17.3 | 20.2

TELEDESIC, SPACEWAY, ASTROLINK, CELESTRI, CYBERSTAR, SKYBRIDGE, iridium (inter-satellite & gateway links)
27.5 | 30

Com'l. VHF
Com'l UHF
Com'l L
Com'l S
Com'l C
Com'l Ku
Com'l K
Com'l Ka

300 MHz
3 GHz
30 GHz

All letter band designations shown (for example, "X-band") conform to definitions in IEEEE Standard 521-1984

VHF | UHF | SHF | EHF

1GHz | 2GHz | 4GHz | 8GHz | 12GHz | 18GHz | 27GHz | 40GHz | 75GHz

L | S | C | X | Ku | K | Ka | V | W

135-170 MHz
400-600MHz
1.5-2.0 GHz
5 - 7 GHz
12 - 18 GHz
27 - 30 GHz
40 - 45 GHz

110 GHz

7.26-7.38 GHz
SBRD

7.91-8.02 GHz
SBRD

DSCS
7.25-7.75 GHz

DSCS
7.9-8.4 GHz

ACTS
19.2-20.2 GHz

Milstar & GBS
20.2-21.2 GHz

GBS
30-31 GHz

ACTS
29-30 GHz

MILSTAR
43-45 GHz

Military Air/Ground Radios
138-144 MHz

AF / FLT SATCOM UFO
225-400 MHz

Global Positioning System (GPS)
L2: 1.22760 GHz
L1: 1.57542 GHz

Space-Ground Link System (SGLS)
1.761-1.842 GHz downlink
2.200-2.290 GHz uplink

UHF SATCOM users are subject to interference from terrestrial UHF users, who have higher international regulatory priority.

SGLS frequencies are at risk from international & US commercial encroachment.

Heavy orbital/terrestrial congestion requires much coordination with terrestrial microwave link users.

Advanced Communications Technology Satellite (ACTS)

Government / Military SATCOM Services

↑ = Used as Uplinking Band
↓ = Used as Downlinking Band

= 'At-Risk' bands currently sought for commercial satellite use, with potential for U.S. or international spectrum reallocation

Connexion is Off the Ground

- Launched on May 17, 2004
- 8 airlines, >160 aircraft committed
- Two routes
  - Munich to Los Angeles
  - Munich to Tokyo Narita
- High speed internet intranet access

Commercial Airlines

Plan - Long Term

90º maximum scan angle with 5º Angle of Attack margin. Coverage is notional.

North Pacific Q2-05

North Pacific Q2-05

N. America – Europe Corridor

Europe – Asia Corridor/Japan

C. America

South Pacific Q1-06

South Atlantic & America

Africa

Indian Ocean

Central Pacific Q1-06

SW Pacific Q2-05

South Pacific Q1-06

Latitude

75º
60º
45º
30º
15º
0º
-15º
-30º
-45º

☐ On-line
☐ Committed
☐ Future

- Final service coverage contingent upon:
  - Commercial airline service rollout and definitization
  - Satellite transponder availability, coverage, and performance
  - Regulatory approvals

ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000
May 2, 2002

COMMAND, CONTROL,
COMMUNICATIONS, AND
INTELLIGENCE

MEMORANDUM FOR DIRECTOR, COMMAND, CONTROL, COMMUNICATIONS AND
COMPUTERS (J-6)
SECRETARY, JOINT REQUIREMENTS OVERSIGHT COUNCIL

SUBJECT: Transformational Communications Study (TCS)

Thank you for your memorandum dated April 10, 2002. I appreciate your support in transforming DoD's communications infrastructure to eliminate bandwidth as a constraint using laser communications technology.
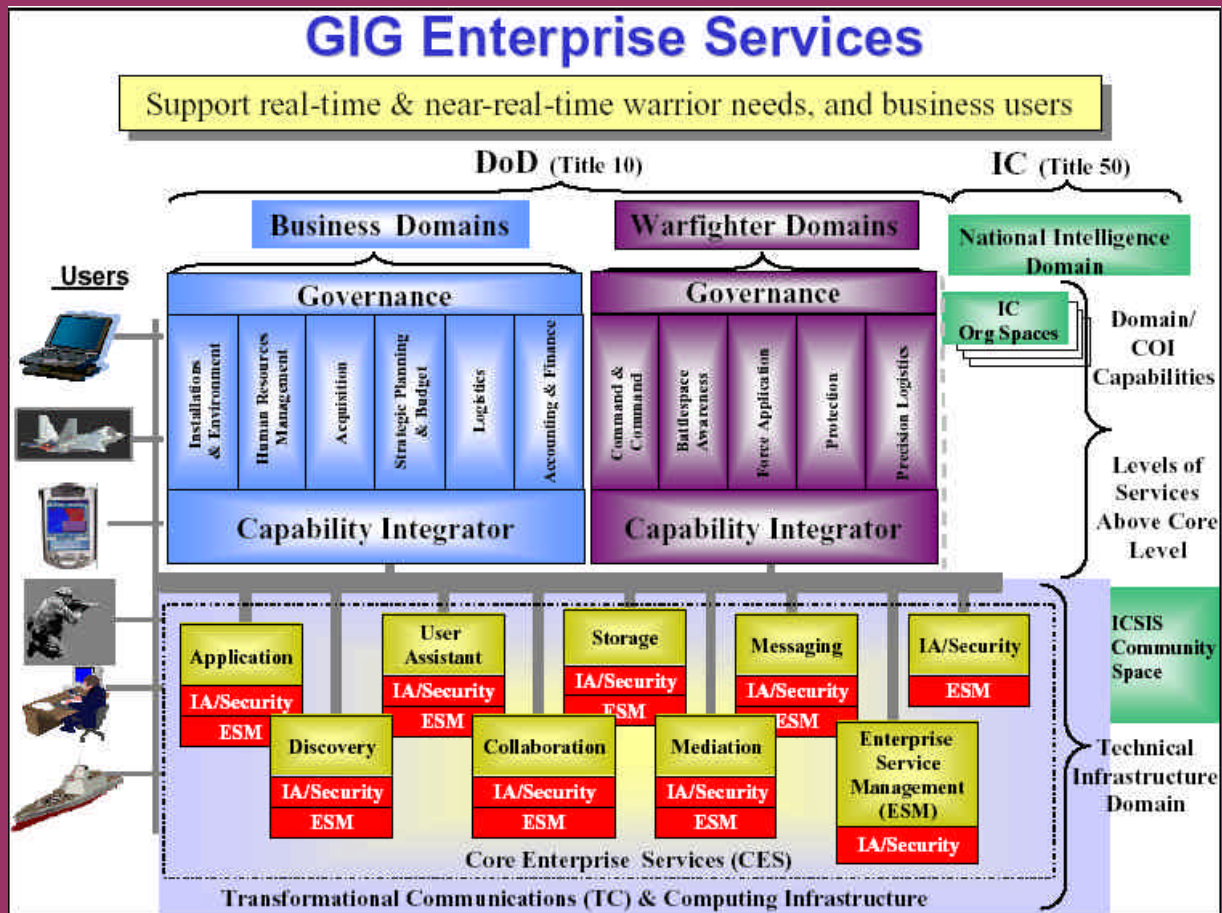
I look forward to working with you to address your concerns, and I remain confident that

Secretary Rumsfeld, General Myers, and General Pace have all testified before Congress …. The asymmetrical nature of much of our communications needs lends itself to an internet protocol (IP)-based packet switched approach that dominates our operations today.

Our goal must be to guide the TCS to develop an affordable wideband SATCOM system concept that includes both laser and Radio Frequency (RF) communications. This transformational concept enables an architecture that will support evolution to an even more capable system as new technologies emerge. Our approach to the Wideband/Lasercomm system is an evolutionary acquisition approach that will allow us to field a very capable Block I system with first launch in 2009 with even more capability in subsequent blocks.

US Transformational Communications End-State

GIG-Enterprise Services

GIG Enterprise Services

Support real-time & near-real-time warrior needs, and business users

DoD (Title 10)

IC (Title 50)

Business Domains

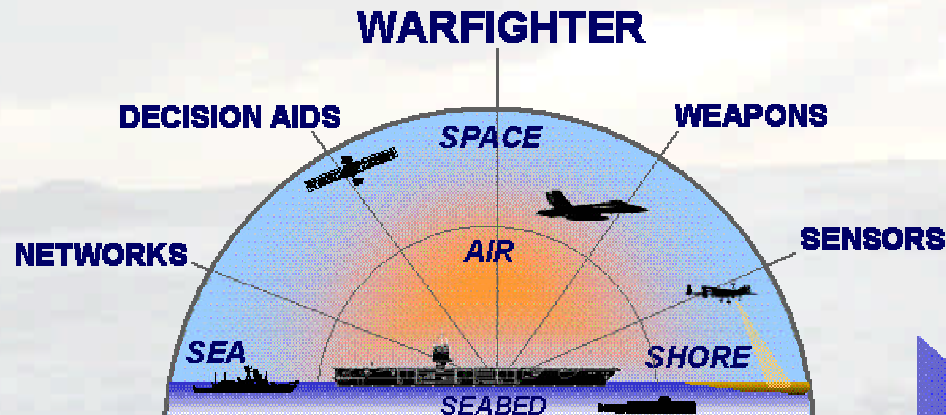**Warfighter Domains**

National Intelligence Domain

Users

Governance

Governance

IC Org Spaces

Domain/ COI Capabilities

- Installations & Environment
- Human Resources Management
- Acquisition
- Strategic Planning & Budget
- Logistics
- Accounting & Finance

- Command & Command
- Battlespace Awareness
- Force Application
- Protection
- Precision Logistics

Levels of Services Above Core Level

Capability Integrator

Capability Integrator

ICSIS Community Space

Application — IA/Security — ESM

User Assistant — IA/Security — ESM

Storage — IA/Security — ESM

Messaging — IA/Security — ESM

IA/Security — ESM

Discovery — IA/Security — ESM

Collaboration — IA/Security — ESM

Mediation — IA/Security — ESM

Enterprise Service Management (ESM) — IA/Security

Technical Infrastructure Domain

Core Enterprise Services (CES)

Transformational Communications (TC) & Computing Infrastructure

Vision— Introduction

Interoperability and systems integration are crucial to achieving maritime information superiority.
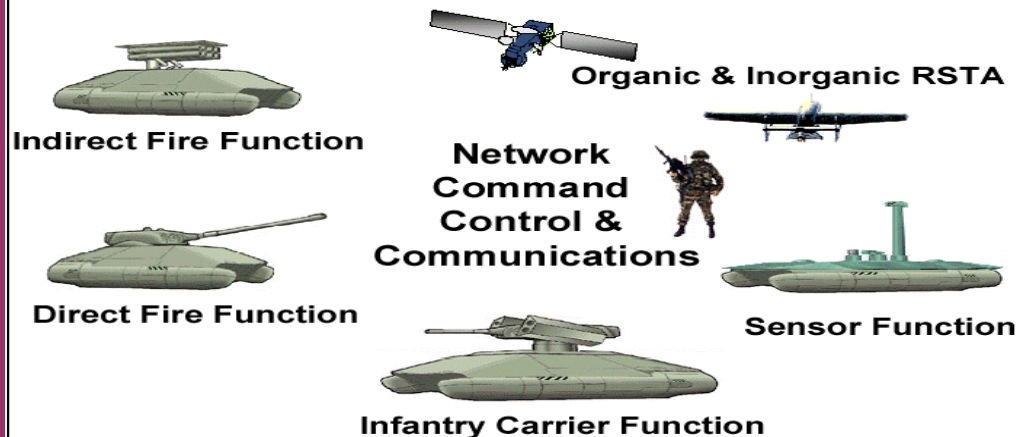
**Future Combat Systems
Enabling the Objective Force**

Organic & Inorganic RSTA

Indirect Fire Function

Network
Command
Control &
Communications

Direct Fire Function

Sensor Function

Infantry Carrier Function

■ **16-20T Manned Ground Platforms**

Resupply

SUAV Carrier

NLOS

Reconnaissance
and surveillance

APC, C2, CV, RV

BLOS/LOS

Mortar

NetFires

■ **Unmanned Air Platforms**

SUAV

Organic Air
Vehicle OAV

TUAV

■ **Combat Robots**

Armed reconnaissance

■ **Soldier Robots**

Tracked   Legged

Mule

IP Centric is a requirement to become Net Centric

Layer 6/7: Applications

Logistics   Personnel   Finance   Office Automation   Training

Layer 5: Session

Telnet   FTP   X Windows   SMTP   SNMP   NFS   DNS   TFTP   NTP

BGP   RIP

Layer 4: Transport

IGP   EGP   TCP   UDP   IGMP   ICMP

Layer 3: Network

IP
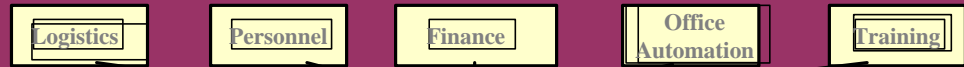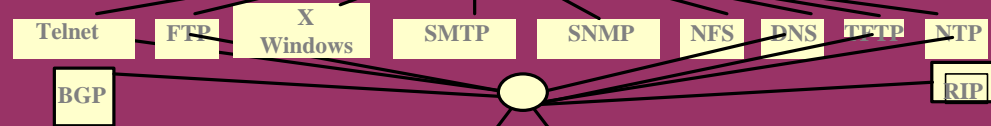
Layer 2 & 1: Data Link & Physical

Ethernet   802.3   802.4   802.5   802.6 SMDS   X.25   Frame Relay   SLIP

IPX   ATM   Arcnet   Appletalk   PPP
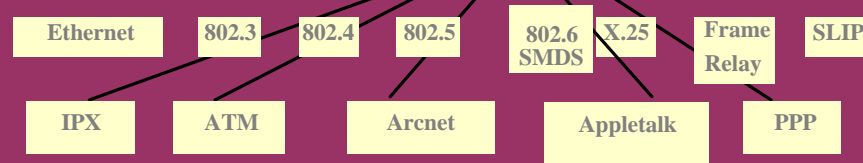
How Do IP Communications Drive Productivity?

	IT Staff	End User
Faster moves, adds and changes	X	
Decreased reliance on external vendor services	X	
End users can complete more tasks without assistance	X	
Less time spent managing spares for multiple brands	X	
Less time checking voicemail because calls follow user		X
Improved telecommuter productivity		X
Ubiquitous access to PBX features for mobile workers		X
Access to PBX features at remote sites		X

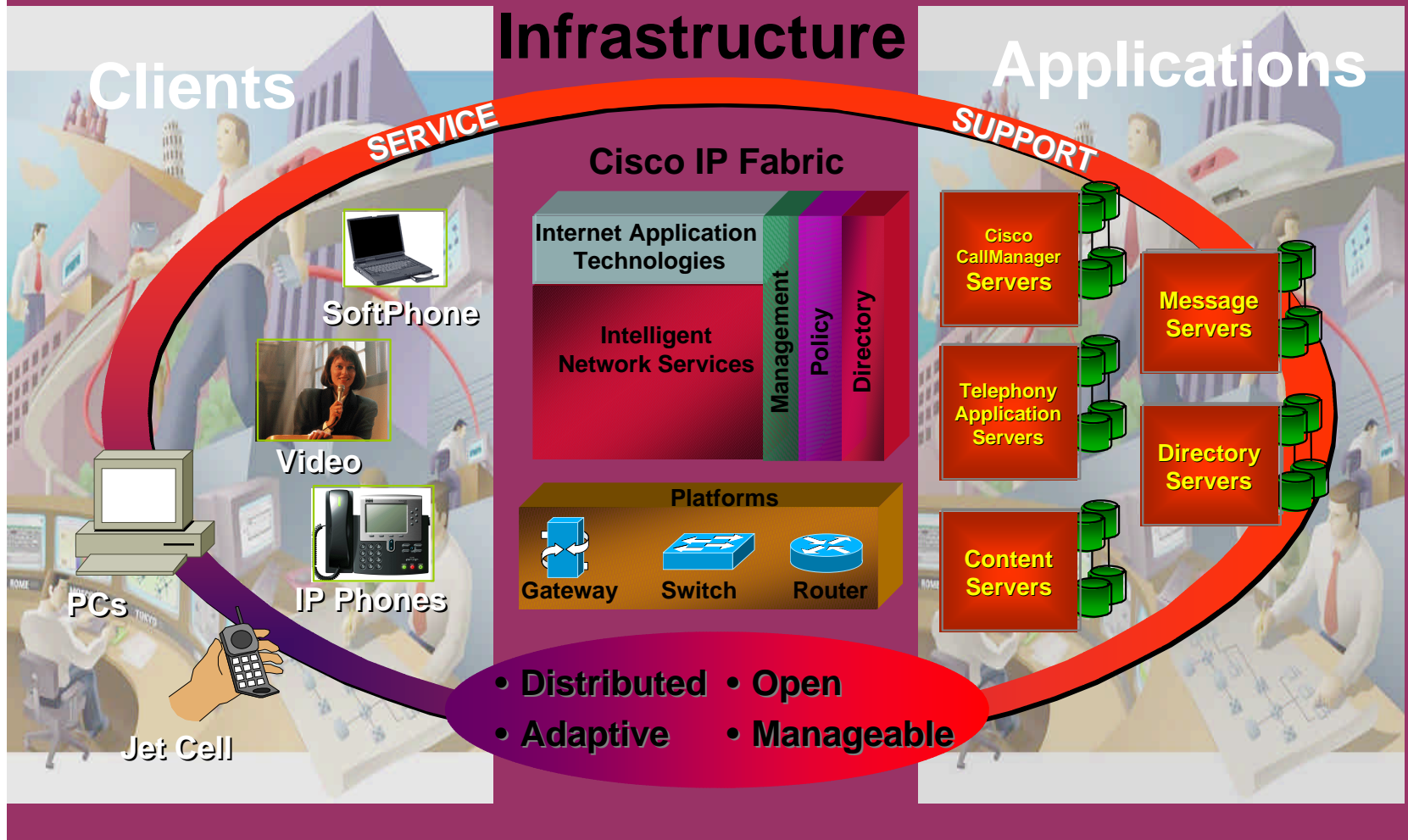Source: Sage Research, September 2002

Over Half of US Businesses Using IP Telephony

Percentage of US Enterprises Using IP Telephony

The "First Chasm" to Conduct Initial Trials of IP Telephony Has Essentially Been Crossed

67%

54%

40%

16%

The "Second Chasm" Between Initial Implementation and Committed Migration

20%

8%

3%

Early Market

The Chasm

Bowling Alley

The Tornado

Main Street

Produc Maturit

2000   2001   2002   2003   2004

80%
60%
40%
20%
0%

■ At Least 1 Site
■ More than 5 sites
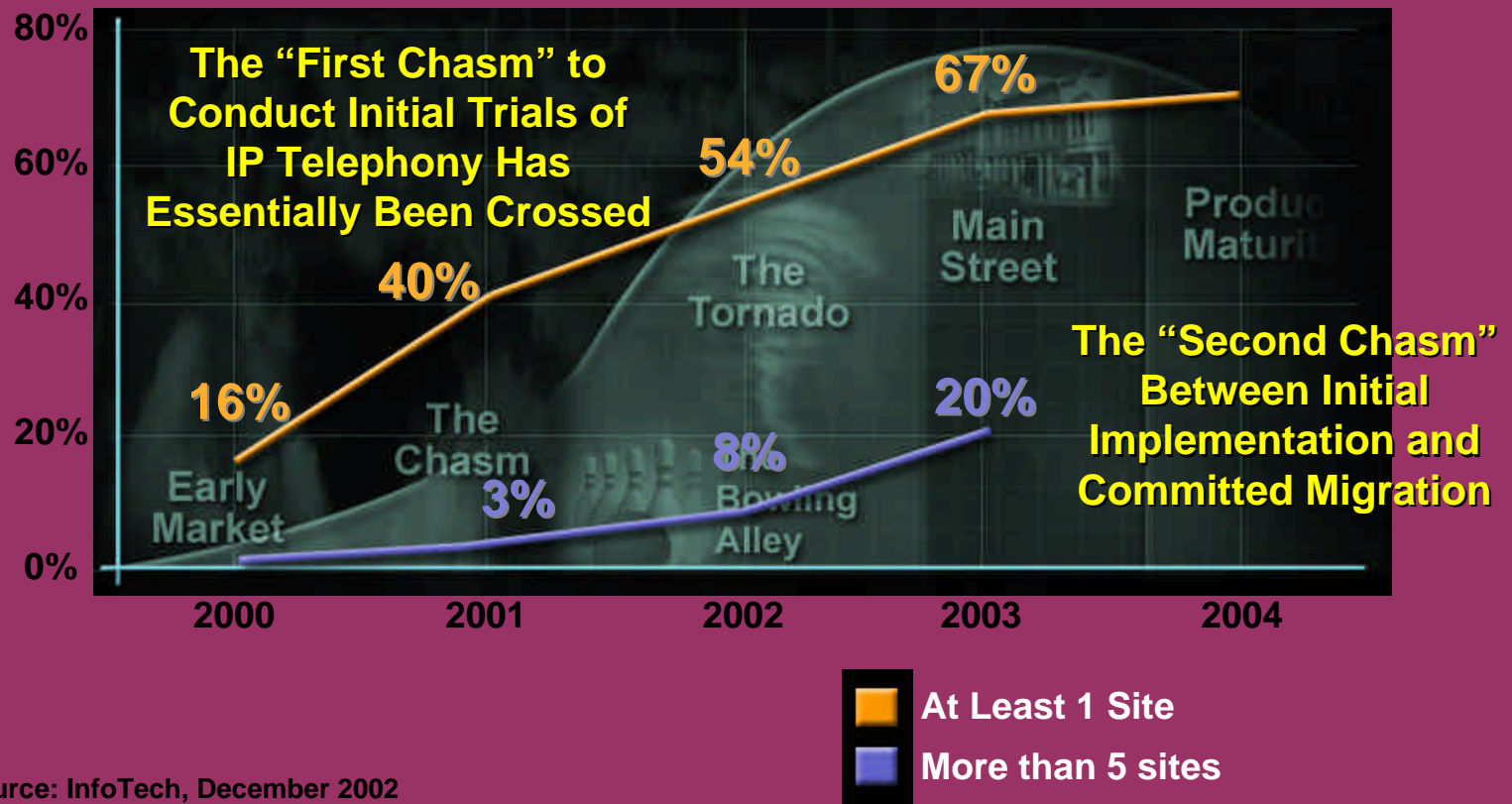
Cisco AVVID—
An End-to-End Architecture

Infrastructure

Clients

Applications

SERVICE

SUPPORT

Cisco IP Fabric

Internet Application Technologies		Management	Policy	Directory
Intelligent Network Services				

Platforms

Gateway   Switch   Router

SoftPhone

Video

IP Phones

PCs

Jet Cell

Cisco CallManager **Servers**

Telephony Application Servers

Content Servers

Message Servers

Directory Servers

- **Distributed**   • **Open**
- **Adaptive**   • **Manageable**

Challenges

- Multi-Level Security
- Information Assurance
- IP Quality of Service
- IP for Mobile Users
- Explore large scale integration approach

Intellectual Inflexibility

Cultural Issues	49 percent
Procurement Processes	40 percent
Government Coordination	36 percent
Budget	20 percent
Skills	20 percent
Legislative Issues	11 percent
Technical Issues	9 percent

Based on interviews with 45 technology suppliers in the United Kingdom. Multiple responses accepted.

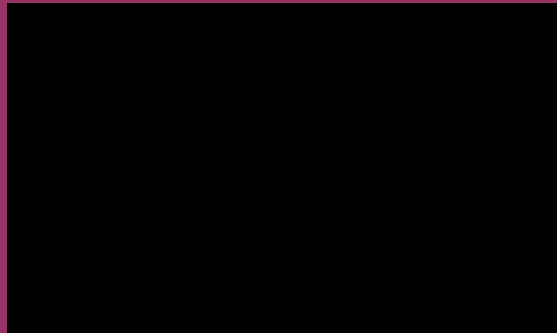Source: Forrester Research Inc.

US DOD expects industry to help it achieve net-centricity

".... We ultimately believe that most, if not all, of the significant advances that we need to have in our pocket will come out of commercial networking or commercial computing applications.

The old way of doing interoperability by connecting individual data links between entities will not scale to the level we need to make network-centric operations work. Proliferating all these links would simply bankrupt you and create an absolutely impossible engineering problem.

Industry __must__ be a 'key enabler' in achieving a network centric capability.

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Honda