Implementing the Global Information Grid (GIG)

A Foundation For 2010 Net Centric Warfare (NCW)

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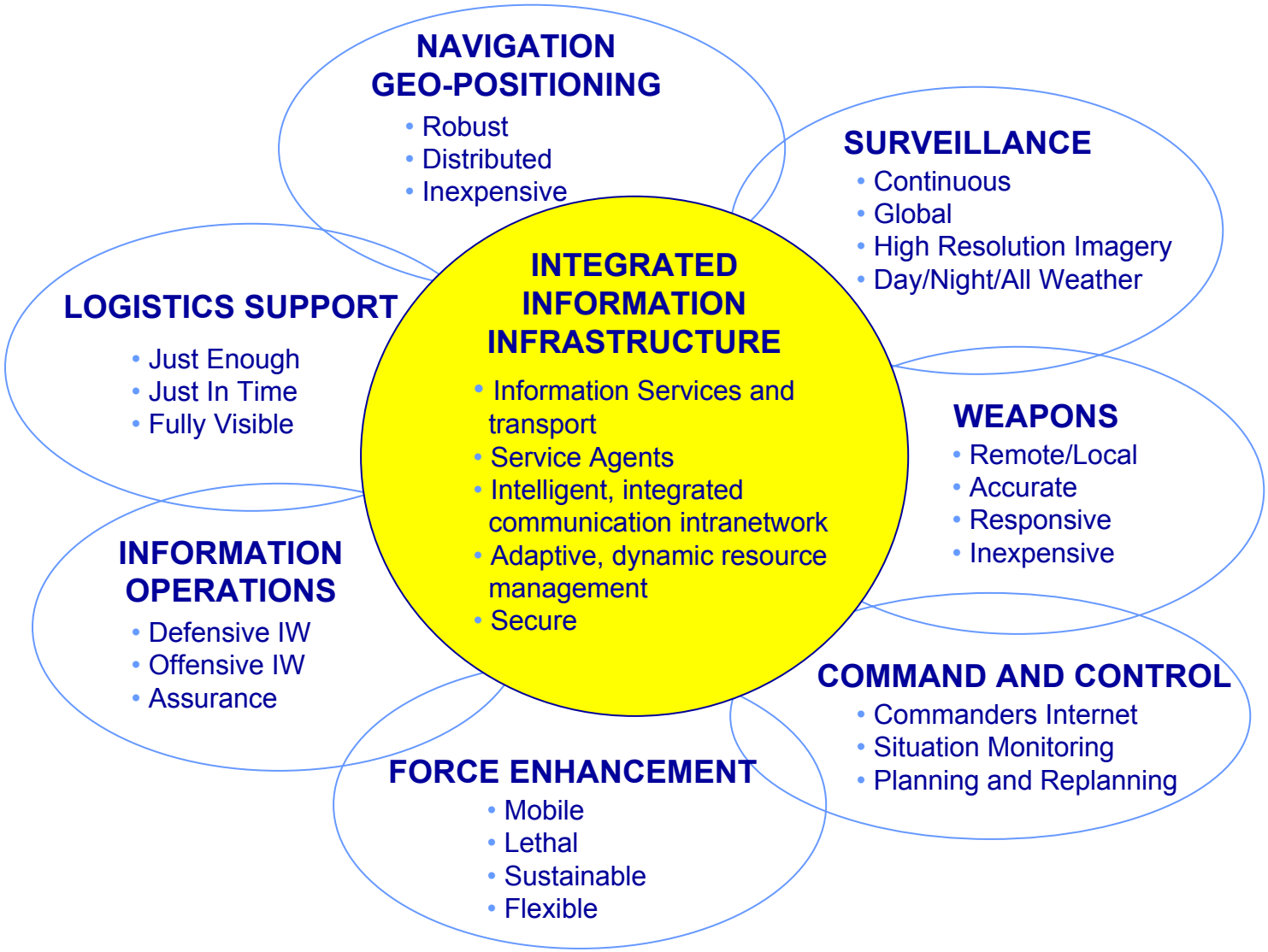
Global Information Grid (GIG)



GIG: Description & Operational Implications

- **Description**
  - **An integrated, scaleable, fully distributed processing and transport environment, commercial-technology based, that:**
    - **Moves information from any source to any destination**
    - **Provides tailored information through intelligent pull**
    - **Is dynamic, adaptive, self reconfiguring, robust and secure**
    - **Integrates legacy C4ISR systems**
    - **Permits full exploitation of sensor, weapon & platform capabilities**
      - **Joint cooperative component**
      - **Sensor to sensor for cueing**
- **Implications**
  - **Permits geographic separation and functional integration of command, targeting, weapons delivery, and support functions**
  - **Provides single, integrated infrastructure for all military information needs: C4ISR, fire control, logistics**
  - **Supports: split base, force projection, information reach back**
  - **Provides Joint Forces with common situational understanding, common operating picture, and information necessary for rapid decision making**

GIG: Warfighting Advantage

- **Dominant Maneuver**
  - **Digitized forces demonstrate capability to fight over a much larger area with fewer forces than non-digitized forces (USA Division Capstone Exercise - Phase I, Apr 2001)**
- **Precision Engagement - Counter Anti Access**
  - **Networked combined force requires 62% less time to restore mine free shipping in Strait of Hormuz (FBE Foxtrot, Dec 1999)**
- **Precision Engagement - Counter SOF (CSOF)**
  - **Decision cycle reduced by half - shooter effectiveness increased**
  - **10 fold reduction in SOF penetrators by water (FBE Delta, Oct 1998)**
- **Full Dimensional Protection - Counter Air**
  - **USAF found F-15Cs, working with data links (shared awareness), increased kill ratio by over 100% -- 2.6:1 for both Day & Night Ops (JTIDS Operational Special Project - Mid 1990's)**

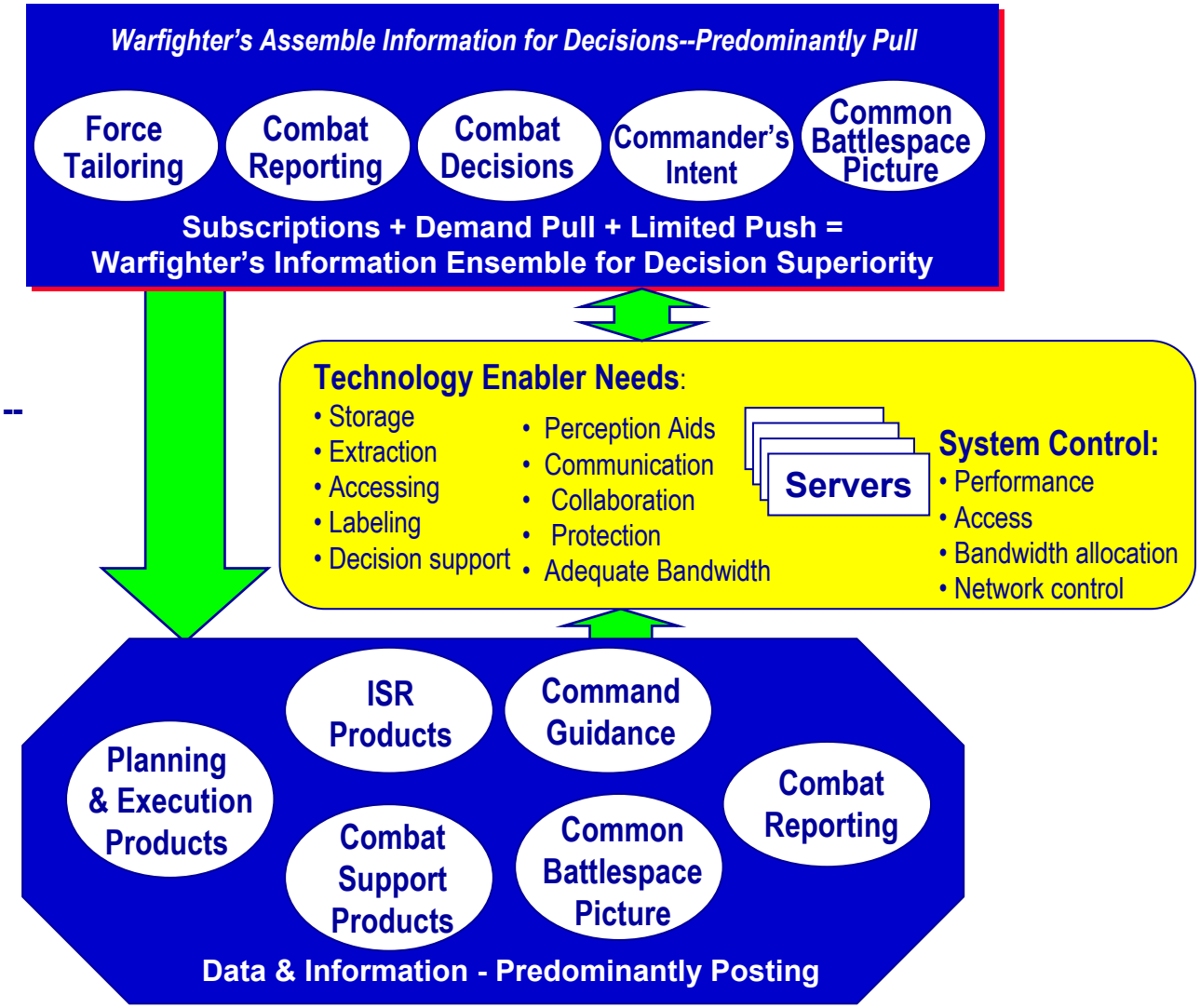
Source: Office of Force Transformation

Battlespace Information: High Level Operational Architecture For Information Input

Warfighters' Business -- Creating the Warfighter's Information Ensemble

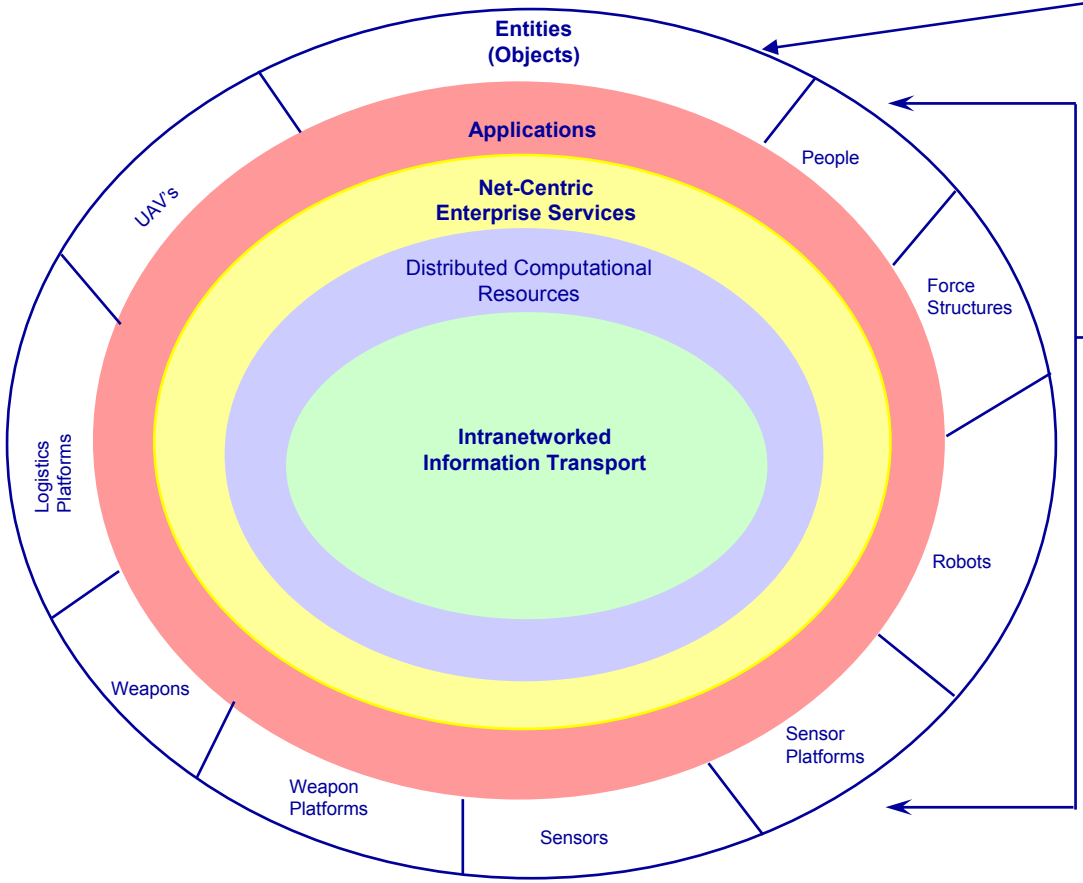
Information Systems Business -- The Global Information Grid (GIG)

Everybody's Business -- Creating Information, Filtering, and Posting it to the Global Information Grid



Task, Post, Process & Use

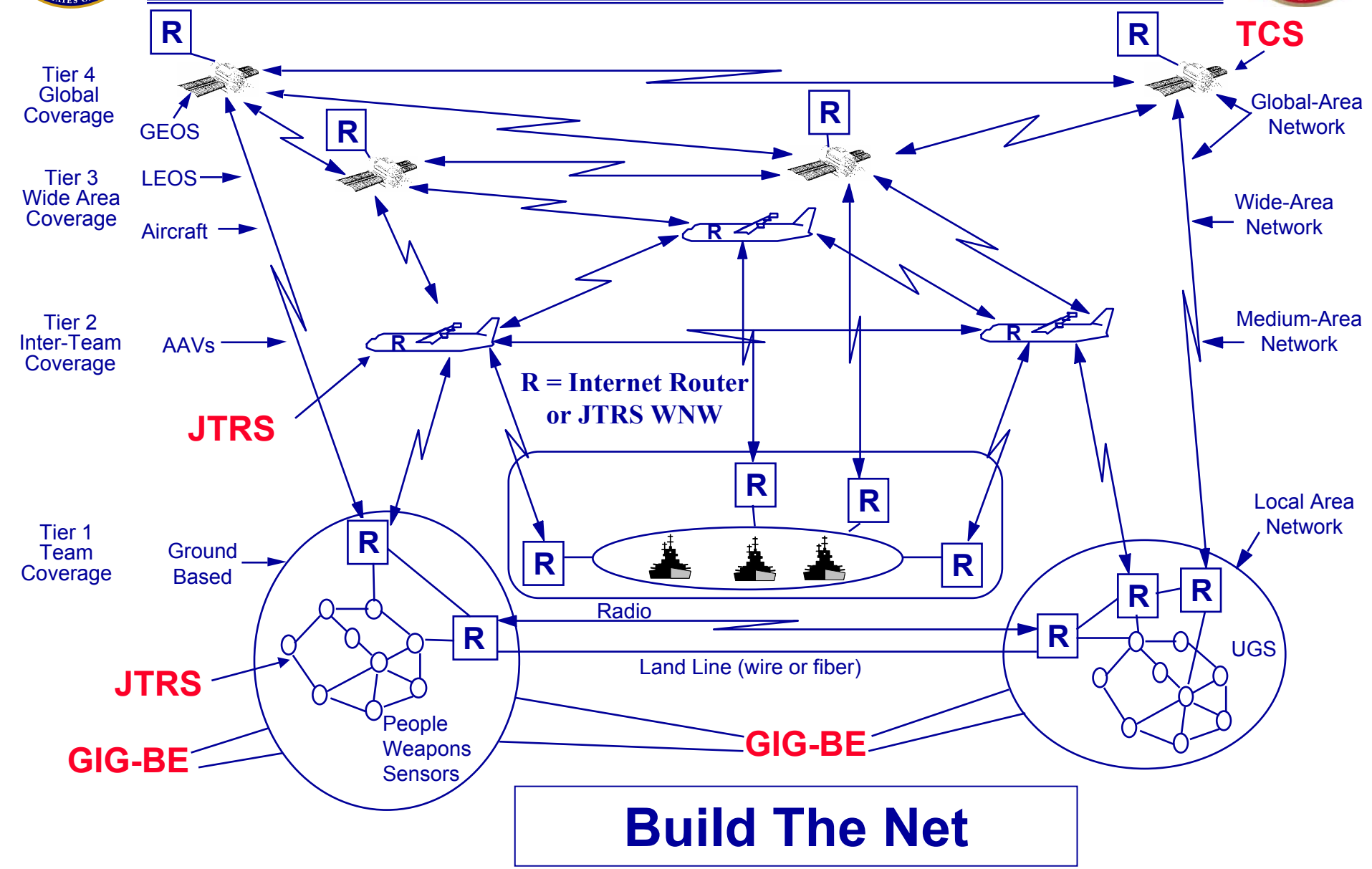
GIG: A Conceptual View



- Entities
  - Sources and users of information
  - Diversity of information needs
    - Type, quantity, timeliness
    - Change as a function of mission & situation
- Information infrastructure (II) functional decomposition
  - Layer concept. Each layer:
    - Provides services to layer above
    - Receives services from layers below
    - Dynamically adapts to meet information needs of entities
    - Tightly coupled to each other to permit adaptation as an integrated system

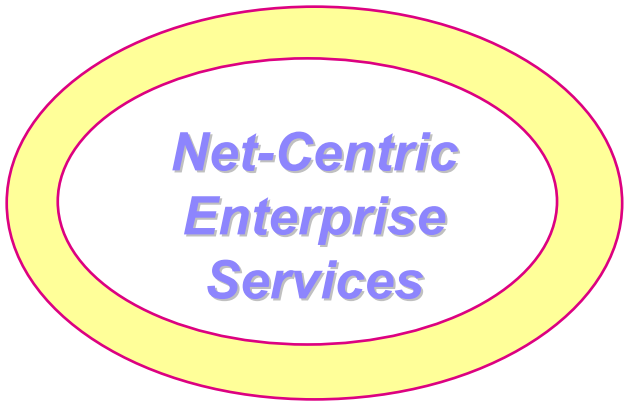
Power to the Edge

GIG: Transport Layer



Build The Net

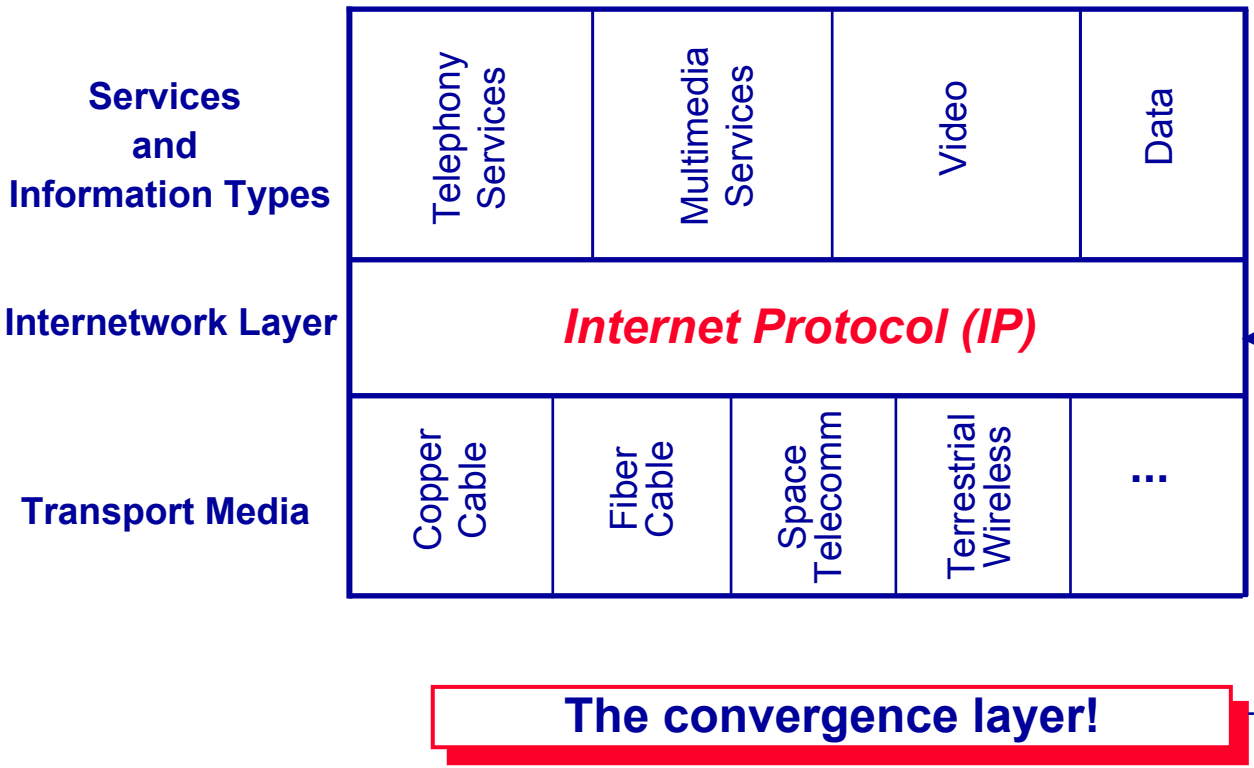
GIG:Net-Centric Enterprise Services



- **Enterprise Systems Management (ESM)** – end-to-end GIG performance monitoring, CM, and problem detection
- **Messaging** – Ability to exchange information among GIG users or applications
- **Discovery** – Processes to find information content or services
- **Mediation** – software to help broker, translate, aggregate, fuse or integrate data/metadata
- **Collaboration** – Allows users to work together and jointly use selected capabilities on the network.
- **User Assistant** – Automated help capabilities
- **Information Assurance –** Capabilities that provide confidentiality, integrity, availability, identification and authentication, authorization, accountability, and assurance for information, users, applications, and networks
- **Storage** – Physical and virtual places to host data on the network
- **Application** – Infrastructure to host and organize distributed on-line processing capabilities.

Build The Net

GIG: IP Based



- *World-wide* acceptance and *use*
- *Packet-switched* Internet transport
- Provides *common-user,* integrated services framework
- Provides *standardized interface* between Application and Transport Services
- Used over many network-level protocols (Ethernet, ATM, WAP…)

Facilitate Interoperability

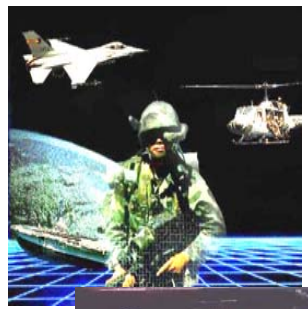
GIG: Security

- End-to-End information assurance (IA) architecture
  - Being developed by NSA, TC/GIG IA office established
  - User to user data security, “Black” transport layer
  - TRANSEC to protect against link-level attack
  - IA technical working group established
- Content-based information security
  - Security tags part of metadata, dynamic sharing of secured information
  - Greater flexibility with Allied/Coalition partners
- Access control provided by Public Key Infrastructure (PKI)
  - Extended to support dynamic communities of interest
  - Strong authentication of users and controlled access to resources
- Global Network Defense (GND)
  - -- Robust enterprise sensor grid for outer perimeter and internal enclaves
  - -- Move from Static to Agile Defense-in-Depth approach with sophisticated C2 and vulnerability management
- Aggressive training and certification

Protect the Net

GIG: DoD Investments

The Global Information Grid Development Strategy



- GIG Bandwidth Expansion (GIG-BE)
- Transformational Communication Satellite (TCS)
- Joint Tactical Radio System (JTRS)
- Net-Centric Enterprise Services (NCES)
- Horizontal Fusion (HF)
- Distributed Common Ground Station (DCGS)
- Global Command and Control System (GCCS)
- Crypto Transformation Program

A Subset Of Several Key Initiatives

GIG: GIG Bandwidth Expansion

Part of the Global Information Grid

- **GIG Bandwidth Expansion (GIG-BE)-- provides ubiquitous, secure, robust optical IP foundation network**
- *Transformational SATCOM (TCS)*
- *Joint Tactical Radio System (JTRS)*
- *Net-Centric Enterprise Services (NCES)*
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
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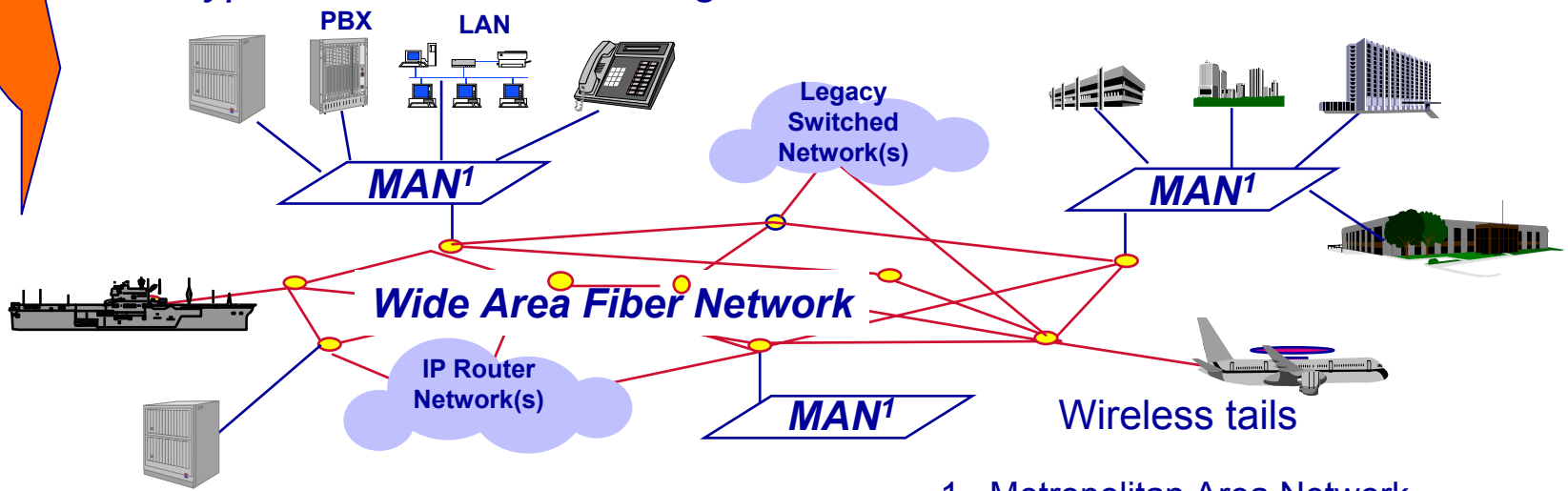


1. Metropolitan Area Network

GIG: GIG Bandwidth Expansion

Optical IP terrestrial backbone with a ubiquitous presence. Mitigates constraints in terrestrial bandwidth.

- **Diverse physical access to the network, the near term effort secure, robust**
- **CONUS & OCONUS**
- **Key to integrated net-centric transformation**

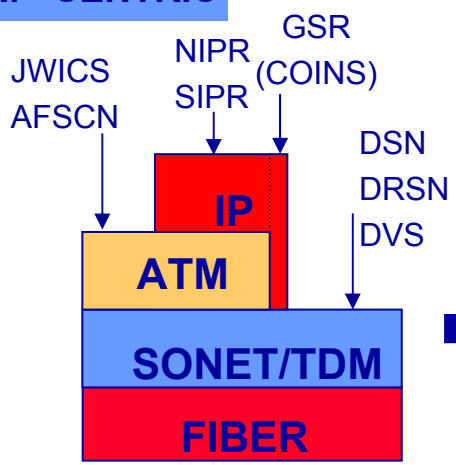
Investment $800+M

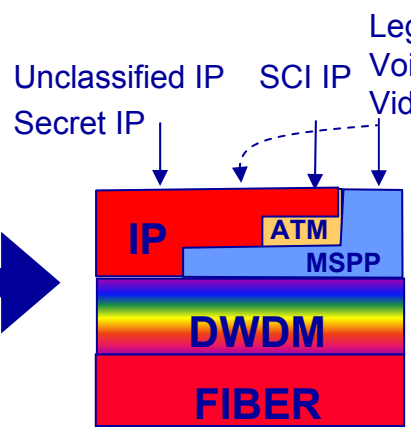
FY03: $500+M
- **Requests for Proposals**
- **Contract awards**
- **Site surveys**
- **Installations begin**

FY04: $300M
- **Complete al installations**
- **Provide minimum 100 Mbps per site per service**

Today:

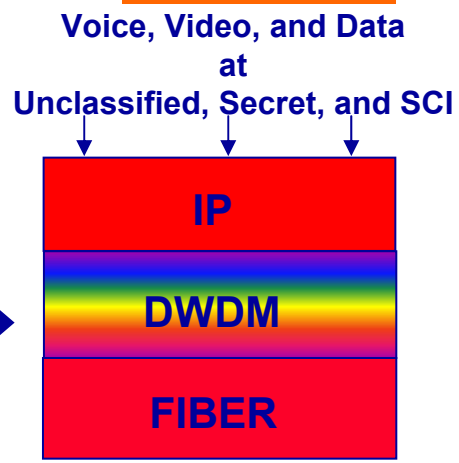
TDM - CENTRIC





Tomorrow:

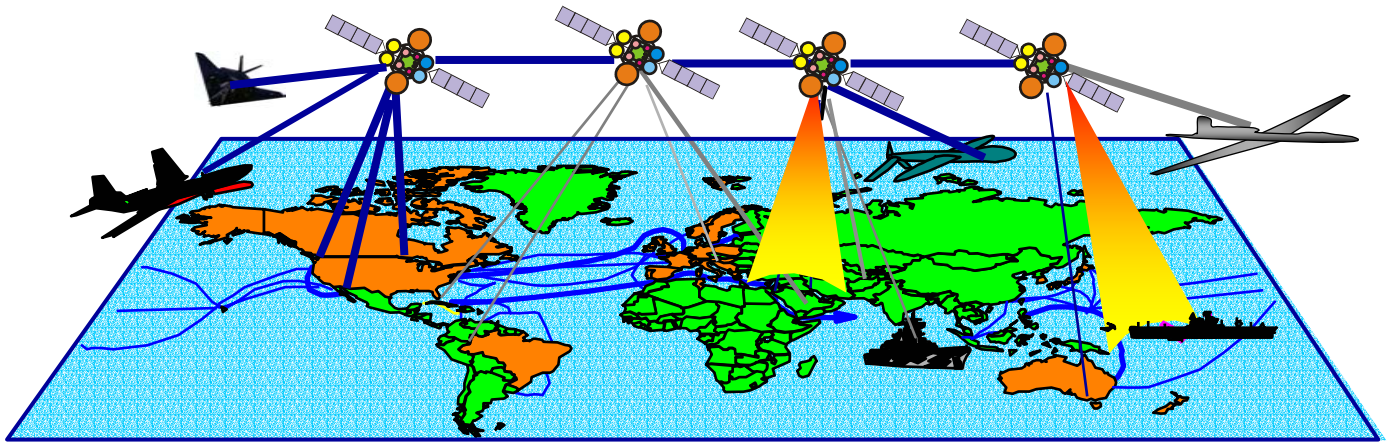
IP - CENTRIC



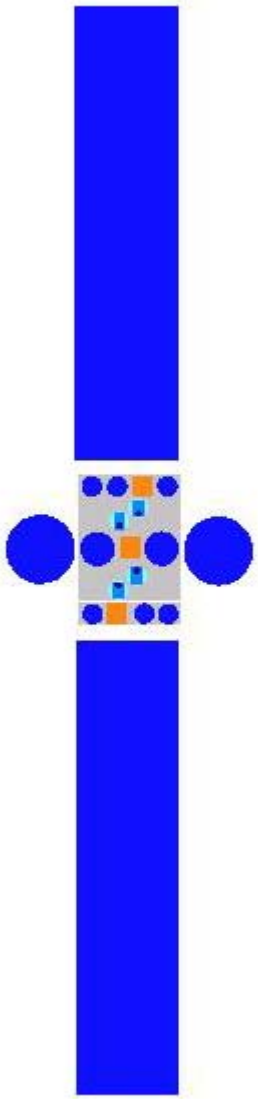
GIG: Transformational Satellite Communications

Part of the Global Information Grid

- GIG Bandwidth Expansion (GIG-BE)
- ***Transformational SATCOM (TCS) -- integrates mobile/tactical users and global intelligence services via IP -- optical comm links and EHF, Ka and X-band up/down links***
- *Joint Tactical Radio System (JTRS)*
- *Net-Centric Enterprise Services (NCES)*
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
- *Crypto Transformation Program*



GIG: Transformational Satellite Communications



Notional TSAT Capabilities:

EHF Comm (44Ghz up/20 Ghz down):

- 0.8 to 3.1 Gbps "raw capacity" per TSAT – does not include IP gain, link margin management, etc (AEHF 0.2 to 0.3 Gbps)
- Space-based IP router – bandwidth on demand
- "XDR+" waveform
- 40 active processed input channels
- 17 active output channels
- 2 80" EHF 19 element Nuller Antennas
- 1 40" EHF MBA
- 6 24" GDAs
- 1 10-beam Rx Phased Array
- 2 Single Beam Tx Phased Array

Ka-band Payload (30Ghz up/20Ghz down)

X-band Payload (8 Ghz up/7 Ghz down)

Optical Communications (5 laser heads)

DoD Resources:

FY03: PB – Approved by Congress

- $120M fro FY03 - analysis of alternatives and technology risk reduction
- FY04-07: Initial increment of TSAT investment
  - Approix $500M "seed money" to enable transition of Service terminals to TSAT architecture
  - Funded Lasercomm terminal for Global Hawk AISR link to TSAT

FY04: $450M, Phase B TSAT funding

- System Definition & Risk Reduction
- Continue technology risk reduction

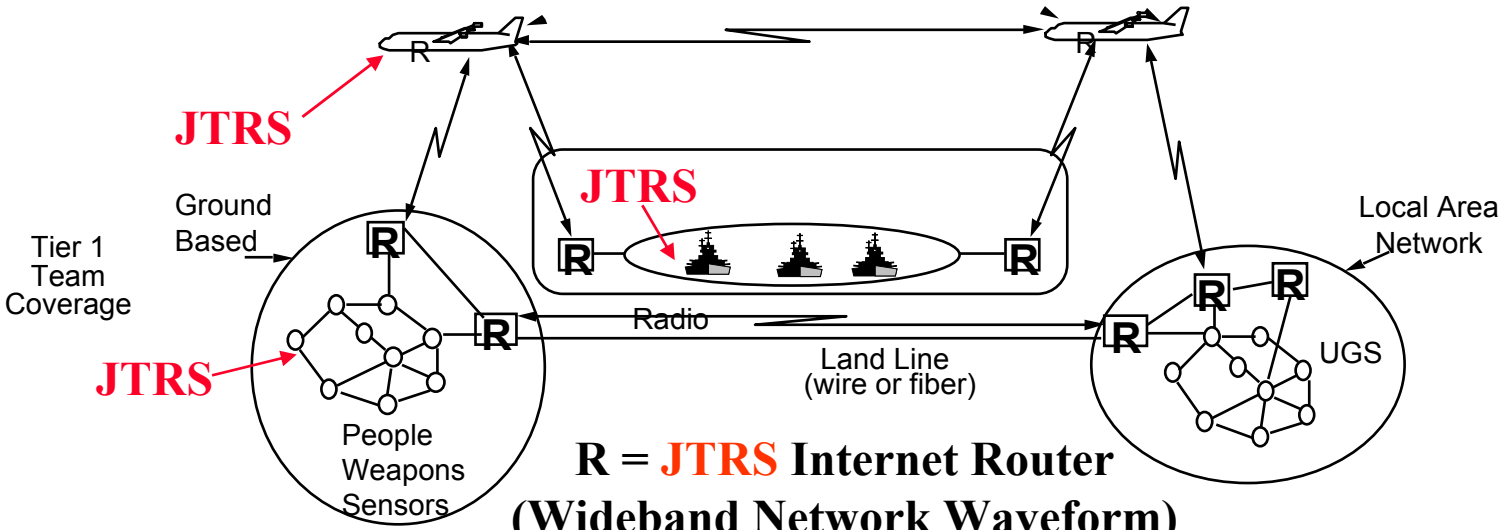
FY04-09: $8.9B,TSAT fully funded for late 2009 first launch – to meet 2010 AEHF FOC

- 4 TSATs + long lead for 5th TSAT
- Network Operations Center and Space Operations Center

GIG: Joint Tactical Radio System

Part of the Global Information Grid

- GIG Bandwidth Expansion (GIG-BE)
- *Transformational SATCOM (TCS)*
- ***Joint Tactical Radio System (JTRS) – provides IP-based, self-managed, beyond line-of-sight ,mobile data and voice communications services***
- *Net-Centric Enterprise Services (NCES)*
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
- *Crypto Transformation Program*



GIG: Joint Tactical Radio System

Cluster 1 - Vehicular & Army Rotary Wing

- Contract–Awarded 24 June 2002 to Boeing –
- If all options exercised total contract award (SDD & LRIP options) will be approx $1.3B

Cluster 2 – Handheld/Dismounted

- SOCOM awarded ECP to THALES
  - Make PRC-148 MBITR JTRS SCA compliant
  - Development of programmable COMSEC
- Phase 2 will be competitive contract -- take H/H to 2Ghz and incorporate additional Waveforms

Cluster 3 – Maritime & Fixed Station

- Acquisition development progressing
- RFP out Jun 03, MS B 4QFY03, LRIP-1 1QFY07

Cluster 4 – Airborne

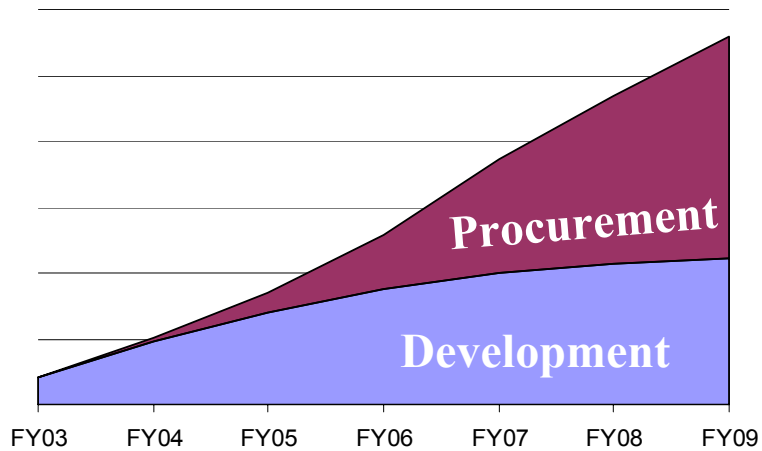
- Multi-functional Information Distribution System (MIDS) terminals migrating to JTRS SCA
- Develops JTRS radio family for 65+ platforms
  - Cost effectively meet users needs
  - Features to support net-centric operations

FY03: $200+M

- Cluster 1
- JTRS SCA-compliant Handheld

FY04-09: $5.75B

- Handheld/Manpack
- MIDS to JTRS SCA
- Cluster 3 Maritime
- Cluster 4 Airborne

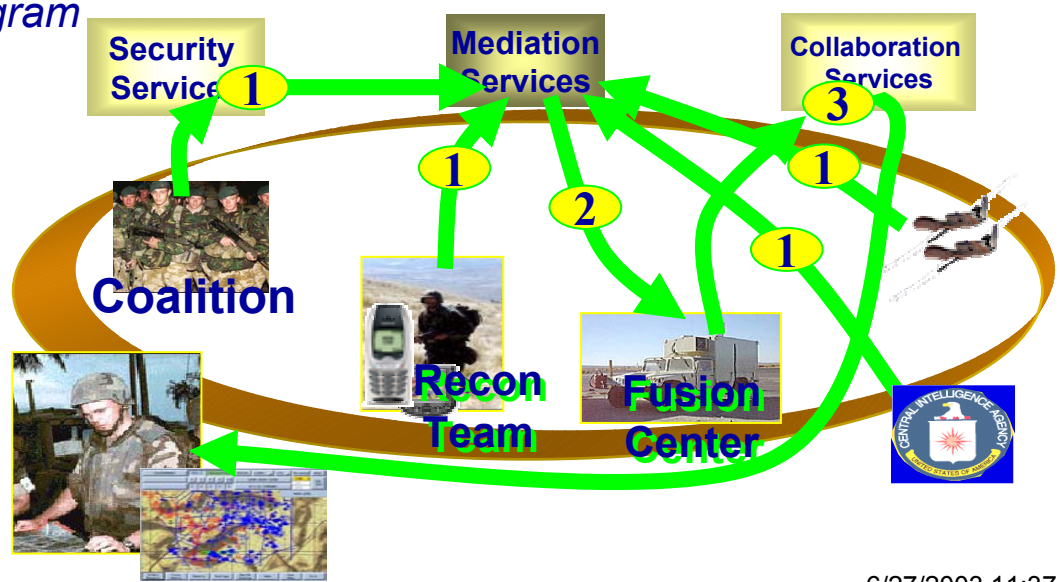


GIG:Net-Centric Enterprise Services

Part of the Global Information Grid

- GIG Bandwidth Expansion (GIG-BE)-- provides ubiquitous, secure, robust optical IP foundation network
- *Transformational SATCOM (TCS)*
- *Joint Tactical Radio System (JTRS)*
- ***Net-Centric Enterprise Services (NCES) -- provide a common set of information capabilities for the GIG that provides for timely, secure, ubiquitous edge user access to decision quality information.***
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
- *Crypto Transformation Program*

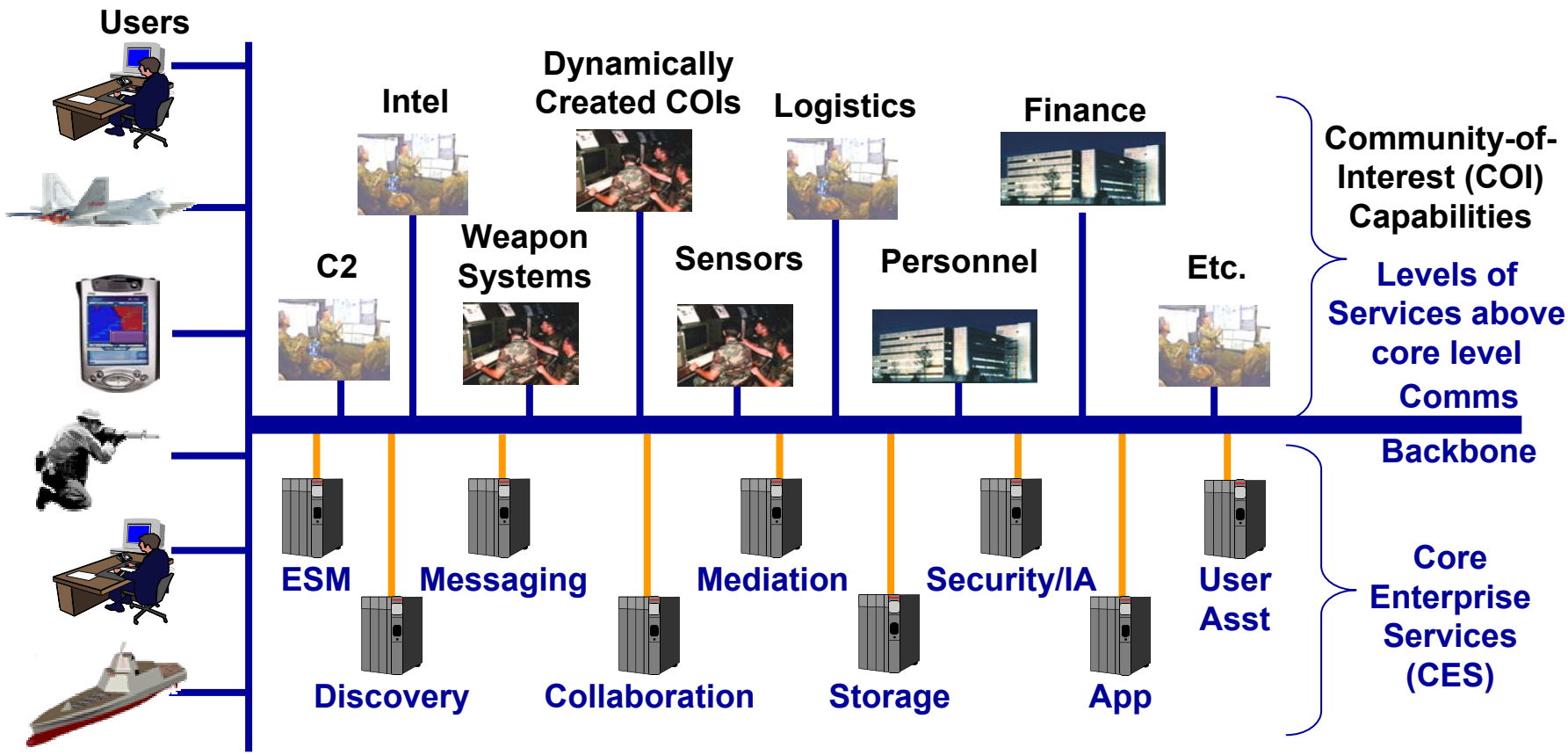
1. Report
2. Deliver Transformed Data
3. Share Estimate



GIG: Net-Centric Enterprise Services

FY03:
- Leverage Horizontal Fusion
- New start request to Congress
- Below-threshold reprogramming
- Milestone A Activities

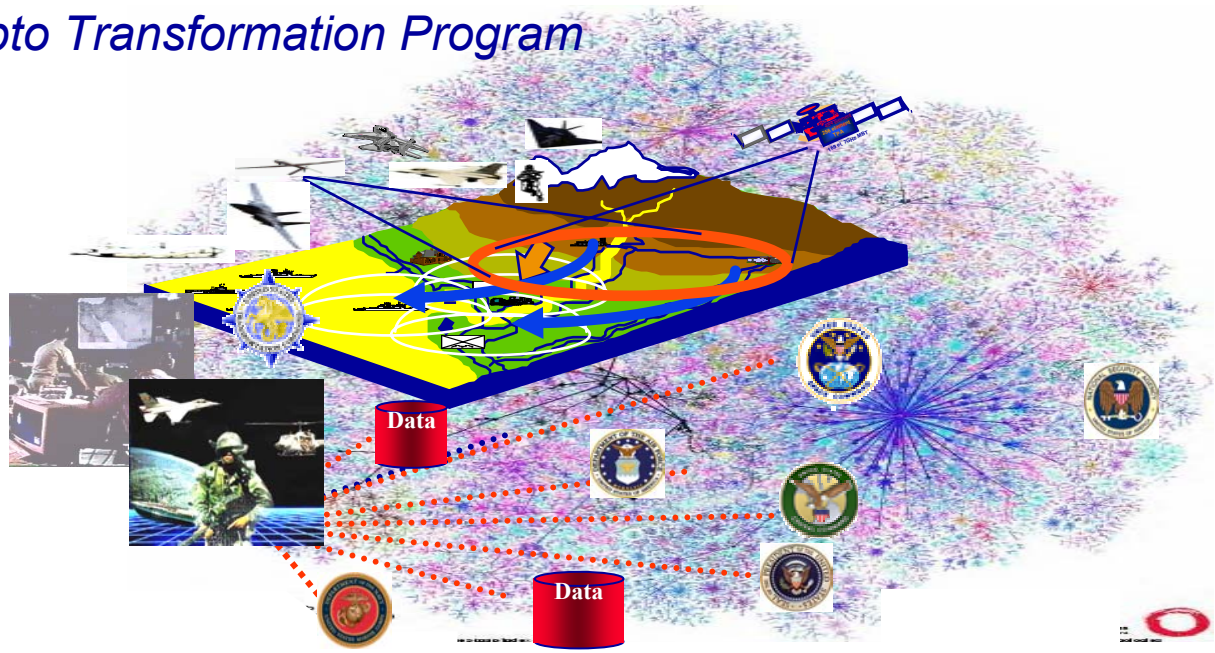
FY04-09: $380M
- Milestone B, 2nd QTR FY04



GIG: Horizontal Fusion

Part of the Global Information Grid

- GIG Bandwidth Expansion (GIG-BE)
- *Transformational SATCOM (TCS)*
- *Joint Tactical Radio System (JTRS)*
- *Net-Centric Enterprise Services (NCES)*
- ***Horizontal Fusion (HF) -- provides IP-based means/tools to enable the smart pull and fusion of data by users***
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
- *Crypto Transformation Program*



GIG: Horizontal Fusion

R&D Portfolio-Selectively Resourced
DoD CIO innovation effort

Ensures investments are matched to DoD-wide mission goals and objectives

Supports end-to-end trace of organizational missions to supporting IT infrastructures

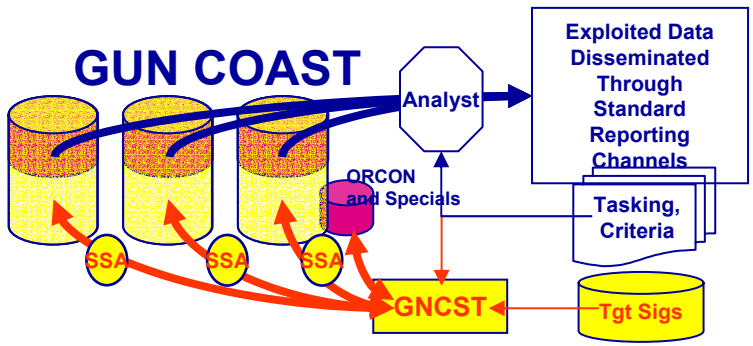
Delivers automated tools to assist in;

- Developing architectures depicting
  - -Capabilities
  - -Warfighting business practices
- Identifying the means & methods
  - -Enable smart pull & integration of data by users throughout the net-centric environment

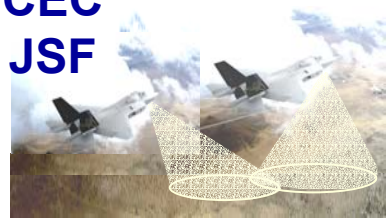
FY03: $75+ M

Start up fueled by the warfighters' increased awareness of the knowledge-oriented nature of the defense mission and operations.

FY04-09: $1.22B



CEC
JSF



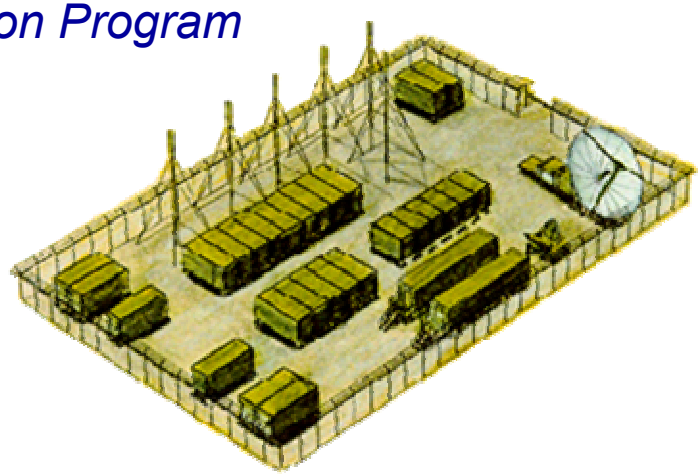
Falcon

EdgeWarrior

GIG: Distributed Common Ground Station

Part of the Global Information Grid

- GIG Bandwidth Expansion (GIG-BE)
- T*ransformational SATCOM (TCS)*
- *Joint Tactical Radio System (JTRS)*
- *Net-Centric Enterprise Services (NCES)*
- *Horizontal Fusion (HF)*
- ***Distributed Common Ground Station (DCGS) --*** **A family of systems at the JTF and below that enables joint/coalition forces to securely manage ISR resources and access, process, post and use multi-INT/multi-ISR information and intelligence in a collaborative IP-based environment .**
- *Global Command and Control System (GCCS)*
- *Crypto Transformation Program*



GIG: Distributed Common Ground Station

- A modular and scaleable multi-INT/multi-ISR net-centric architecture employing joint common components tailored to the unit, mission and situation
- Increases joint interoperability and enables joint distributed collaborative ISR operations. . . reduces forward footprint
- Capable of simultaneous tasking, processing, posting, and using National, Tactical, and Commercial data and products derived from multi-INT/multi-ISR sources
- Mission area spans land, air, and naval warfare surveillance and reconnaissance

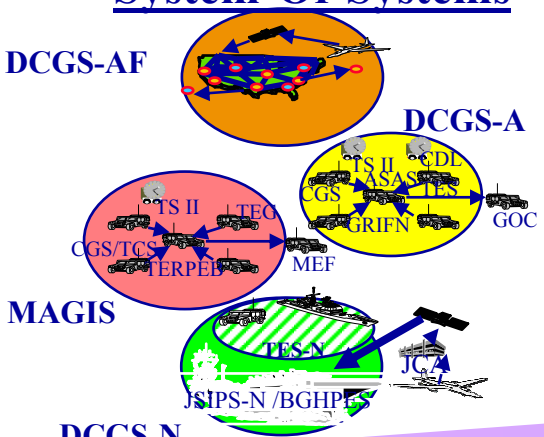
FY03: $513.2M

- Sustains current OEF/War on Terrorism operations
- DCGS-A Spiral 1 – Home Station Operations
- Tactical Exploitation Group upgrades.
- NFN Integration

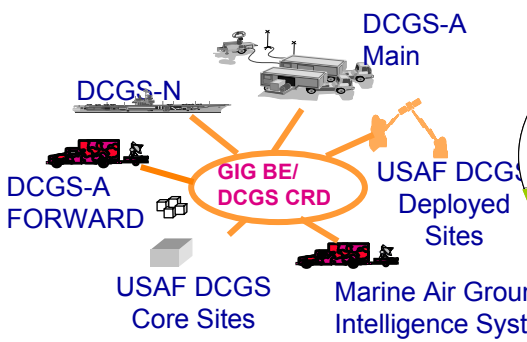
FY04-09: $6.573B

- Connect to GIG BE
- Objective DCGS-A development and fielding
- AF DCGS block 20 & 30 spiral development
- DCGS-N development and fielding (integrates JSIP-N, TES-N, CDL-N, SSE, BGPHES, GCCS-M)

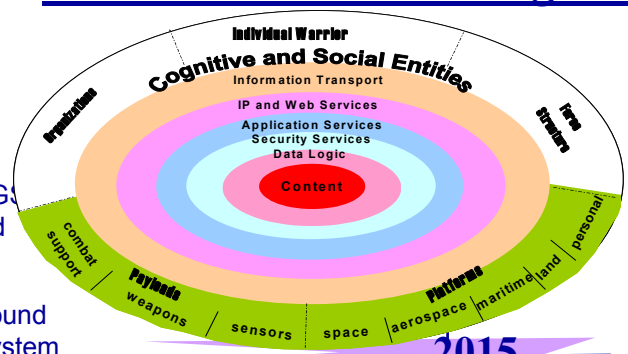
System-Of-Systems



Net-Centric Infancy



C4ISR Net-Centric Integration



2000 — 2003/4 — 2007 — 2010 — 2015

"As Is" Architecture — **CONOPS Transition** — **"To Be" Architecture**

GIG: Global Command and Control

Part of the Global Information Grid

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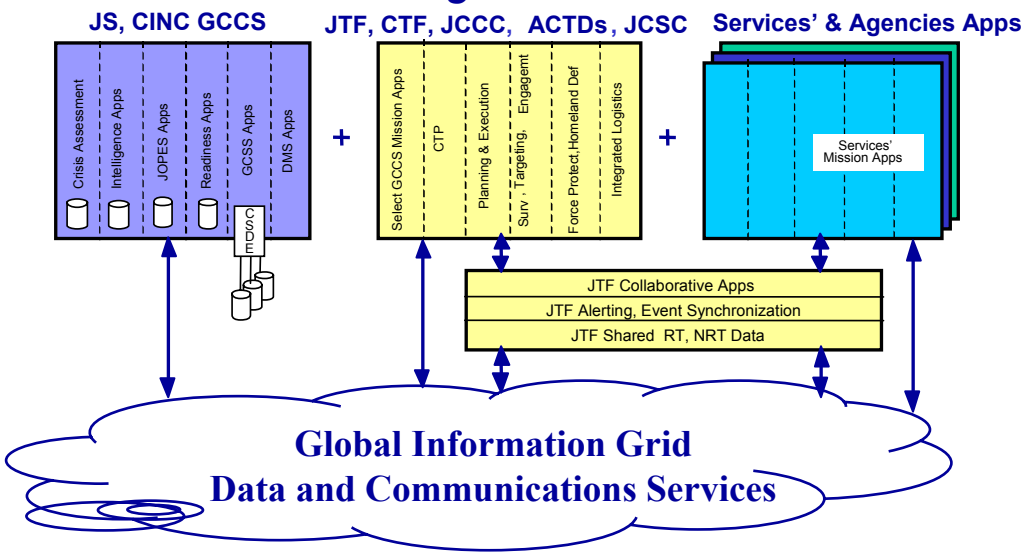
- *Transformational SATCOM (TCS)*
- *Joint Tactical Radio System (JTRS)*
- *Net-Centric Enterprise Services (NCES)*
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- ***Global Command and Control System (GCCS) -- provides IP-based, C2 applications to permit Joint Task Force Commander to effectively prosecute operations in any AOR***
- *Crypto Transformation Program*



GIG: Global Command and Control

Transformation - GCCS to Joint Command and Control (JC2) through block increments

JCC provides a single architecture for Joint C2 applications

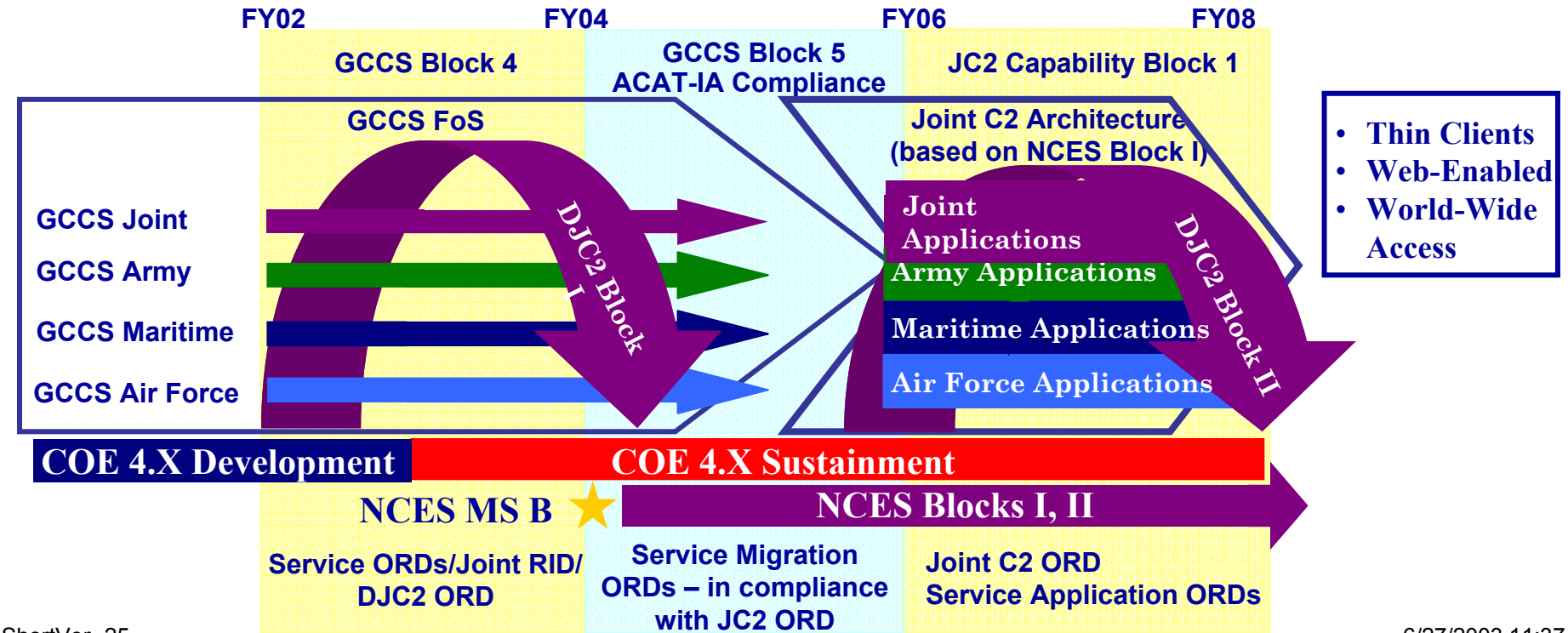
Block 1 Fielding - FY06 thru FY 07

JC2 ORD in Stage II (GO/FO) review

FY03: PB - $23M

FY04-09: $305M Budget submission:

- Initiates transformation of GCCS to a JC2 capability that operates in a Net0Centric environment
- Improves situational awareness & intelligence applications



GIG: Crypto Transformation

Part of the Global Information Grid

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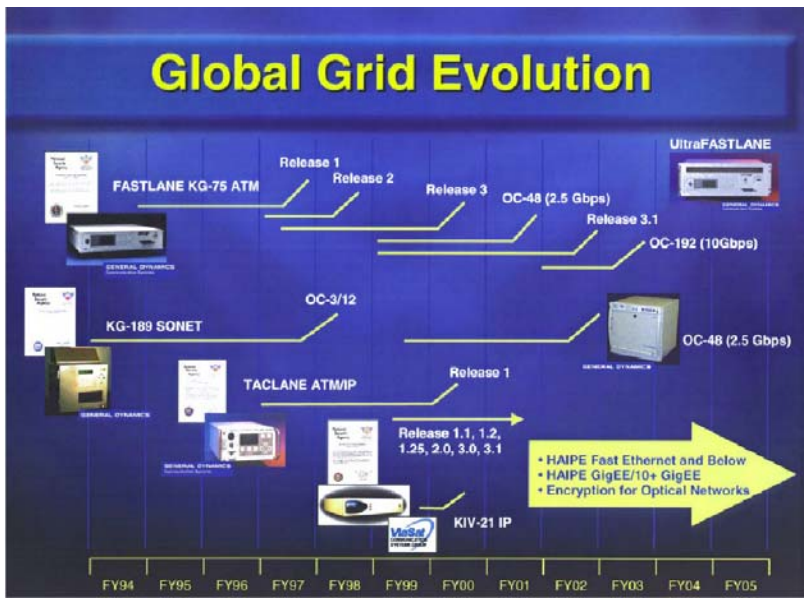
- *Horizontal Fusion (HF)*
- *Distributed Common Ground Station (DCGS)*
- *Global Command and Control System (GCCS)*
- ***Crypto Transformation Program – provide IA for the GIG***



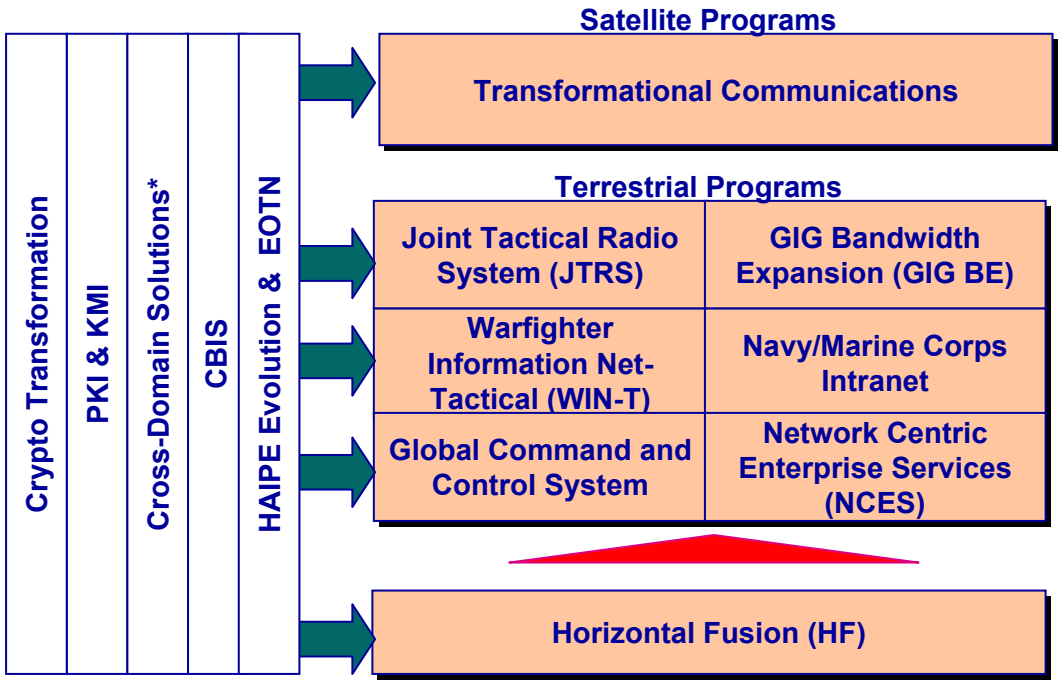
GIG: Crypto Transformation

- Black IP Fabric
- Strong identification, authentication and authorization
- Information marked & labeled based on content
- Labels bound to the information
- Metadata cross domain guards

FY03: PB $977M

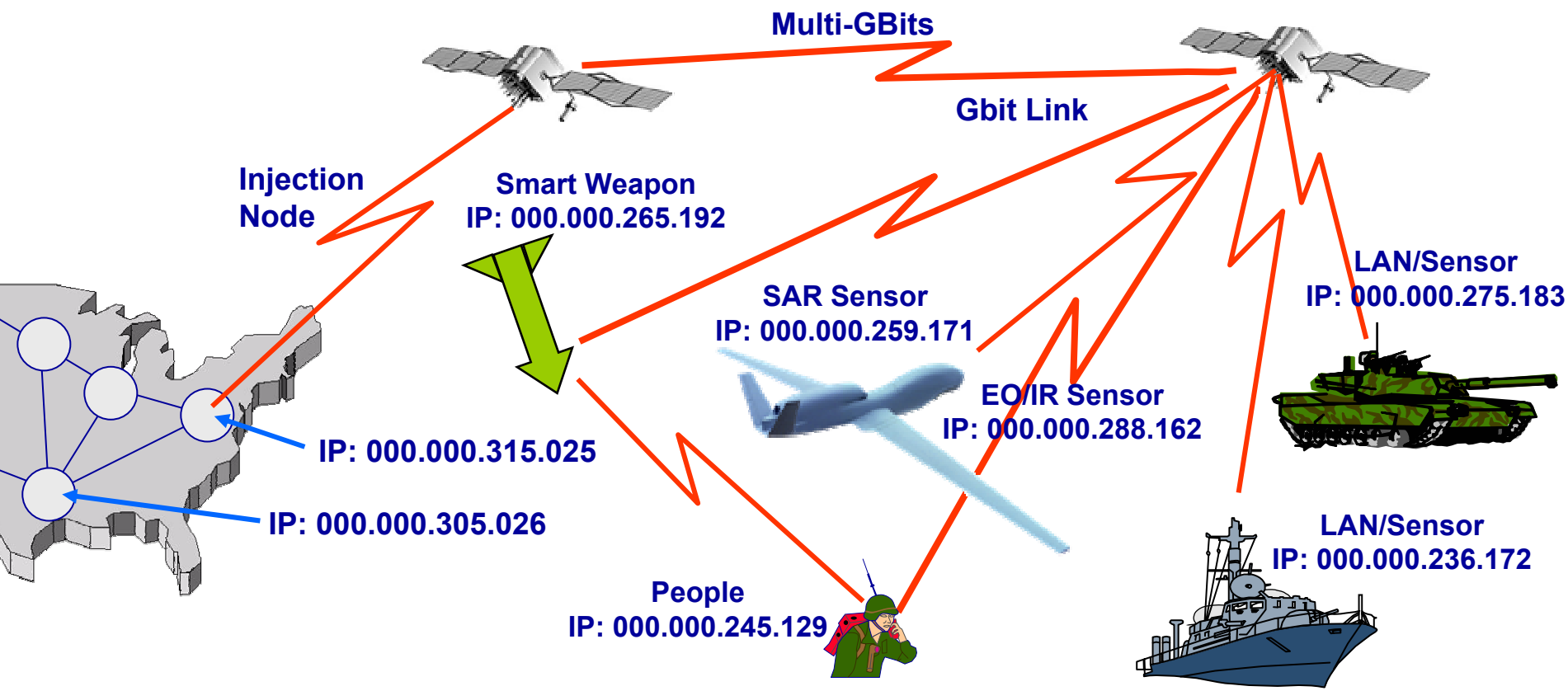
FY04-09: $6.152B Budget submission

- High Assurance IP Encryptors
- PKI development / deployment
- Security Management Infrastructure



GIG: Integrating The Entities

Transformational Communications Systems



Each Platform And Each Sensor, An Entity Of The GIG, Integrated With Warfighters and Their Applications

Helping the GIG Come Together

OSD Oversight For Critical Cross-Organization Programs

- Maintain the architectural vision and monitor the implementation of the resulting system(s)
- Ensure approved standards, protocols, and processes implemented and tested across programs
  - Joint Technical Architecture
  - Global Information Grid Architecture
- Provide end-to-end system-engineering oversight
  - Each program will have its own system engineering activities
  - Programs will work with OSD to ensure standards and protocols are implemented from end-to-end
- Provide end-to-end GIG test-bed

OSD will provide end-to-end, system-of-systems perspective to ensure net-centric capability is achieved

GIG: Summary

Description & Rationale

- An integrated, scaleable, fully distributed processing and transport environment that:
  - Moves information and command orders from any source to any destination
  - Provides tailored information automatically as required, through intelligent software agents
  - Is dynamic, adaptive, self reconfiguring, robust and secure
  - Combines appropriate legacy C^4ISR systems and modern information technology (IT)
- Permits full exploitation of sensor, weapon, platform & processing capabilities
  - Sensor to shooter/commander, cooperative engagements
  - Sensor to sensor for self tasking / cueing

Force Characteristics Implications

- Permits geographic separation and functional integration of command, targeting, weapons delivery, and support functions
- Provides single, integrated infrastructure for all military information needs: C2 ISR, fire control, logistics…
- Supports: split base, force projection, information reachback, small-unit combat, force protection...
- Joint forces with common situational understanding, common operating picture, and informed/rapid decision making
- Enhanced operational flexibility for commanders at all levels
- Reduced logistics footprint in immediate combat area

Enablers

- Explosive growth of commercial IT
  - Wideband satellite and fiber networks
  - High-capacity terminals, switches, intelligent software
  - Commercial security architectures and technology
- Commercial Internetwork technology
  - Open protocols and standards
  - Automatic information push and pull
- Joint Technical Architecture
- Investments by DoD to keep abreast of commercial technologies, to subsidize adoption of commercial systems to meet military needs, and to develop military-unique capabilities

Major Uncertainties

- Degree of OSD/JCS/Service commitment to:
  - Overcoming stovepipes and IT legacy burden
  - Developing and implementing policy to exploit COTS IT
  - Understanding, evaluating, and employing commercial IT
  - Developing and gaining acceptance of DoD and Service Technical Architecture to achieve IT interoperability
- Sustained DoD R&D investments that address military-unique IT requirements, including:
  - Automated, adaptive, internetworks; intelligent software agents
  - Continuing DARPA involvement in data and communication networking technologies
- Technology to provide security for “nomadic” agent-based software