



Defense Information Systems Agency

A Combat Support Agency

Converging MILSATCOM with the GIG

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- DISA Roles and Responsibilities for the GIG and SATCOM
- Overarching Guidance and MILSATCOM Drivers
- 2012 (Now-Term) Wideband SATCOM Vision
- Now Term Engineering Efforts
- 2016 (Near-Term) Wideband SATCOM Vision
- 2020 (Far-Term) Wideband SATCOM Vision



DISA SATCOM Roles

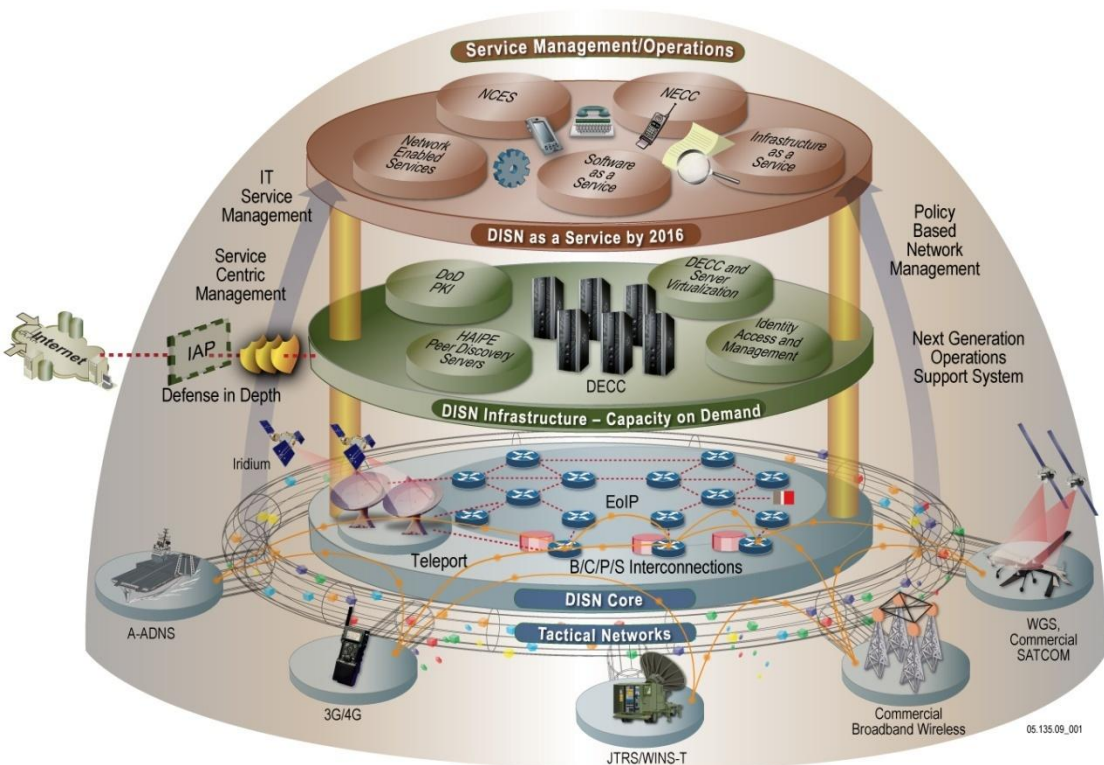
- GIG End to End Systems Engineer
- DISN Engineer / Provider
- DoD Systems Engineer for SATCOM
- Teleport Program Manager
- Commercial SATCOM Program Manager
- Joint IP Modem Program Manager
- Global Broadcast System Engineer
- Commercial SATCOM System Expert
- Gateway Consolidated SATCOM System Expert
- DSCS SATCOM System Expert



GIG Top Level Technical Guidance

- GIG Technical Guidance
- GIG Convergence Master Plan
- DISN Technical Evolution Plan
- GIG / SATCOM Integration Roadmap

DISA GIG Strategy



- The GIG provides Warfighters with increased information sharing capabilities over a robust and secure communications infrastructure
- Key enabler for this vision is the migration from legacy stove-piped communications to network-centric (IP-based) communications
- As the primary service provider of the GIG, DISA will interconnect heterogeneous (e.g., fixed, mobile) DoD assets across a “common core”

Goal: Provide the Warfighter with ubiquitous GIG connectivity through high capacity terrestrial and SATCOM links

Current MILSATCOM Drivers

- **Current MILSATCOM deployment to the Warfighter is rigid**
 - “Nailed-up” circuit allocations to users based on telephony standards
 - Results in an inefficient utilization of the limited RF spectrum
- **Capacity of current MILSATCOM systems do not meet the Warfighter's bandwidth requirements**
 - Workaround to this constraint is to augment MILSATCOM with commercial SATCOM
- **Demand is high and growing – we can meet these needs by leveraging existing assets, programs, and technologies (e.g. WGS, Commercial SATCOM)**
 - Based on POM 10 and 11, there will be no space program new-starts available until 2018 at the earliest
- **Wideband IP SATCOM can satisfy many of these near term bandwidth requirements more efficiently**

*Transformation is achievable with the assets, programs,
and technologies available today*

- Interconnect SATCOM and Data Gateways with partial Mesh and diverse broadband communication paths
- Improve IA posture at SATCOM Gateways to include HBSS
- Transition to WGS and maximize leverage of WGS capabilities
- Make investment in NetOps development to take advantage of new IP SATCOM infrastructure
- Complete JIPM and begin fielding
- Prototype MUOS-Legacy functions at SATCOM Gateways
- Improve offerings of Managed Services of Commercial SATCOM
- Converge deployed terminals into a standards-based family

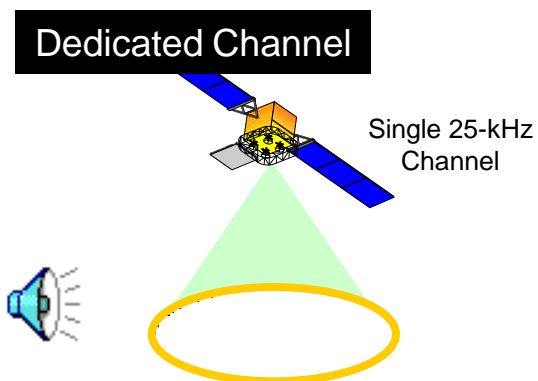


Integrated Waveform – Now Term Efficiency

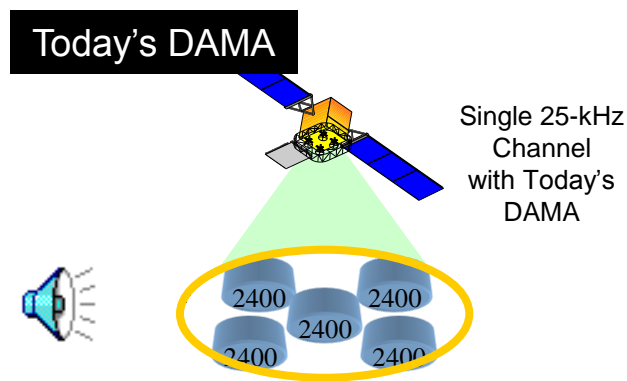
- **The Integrated Waveform project improves the use of available UHF bandwidth by increasing efficiencies over a two phase implementation by:**
 - **Upgrading deployed software programmable radios**
 - **Improving channel control efficiency by simplifying the number and types of orderwire messages**
- **IW is primarily a software upgrade to existing DAMA (Demand Assigned Multiple Access) UHF SATCOM radios that will enable a minimum 100% increase in throughput capacity via an already oversubscribed and aging UFO constellation.**
 - **As part of the DISA IW development effort, Viasat Corporation is under contract to develop the Channel Control (CC) terminal software and select Network Terminal (NT) software for this project.**
- **IW is being developed and fielded in two phases.**
 - **The phase one initial capability is scheduled to provide pre-assigned UHF SATCOM services in early CY2010.**
 - **The phase two final capability is scheduled to provide both the phase one capability, plus on demand ad-hoc services by mid CY2011.**

Background of IW - Technical Gains

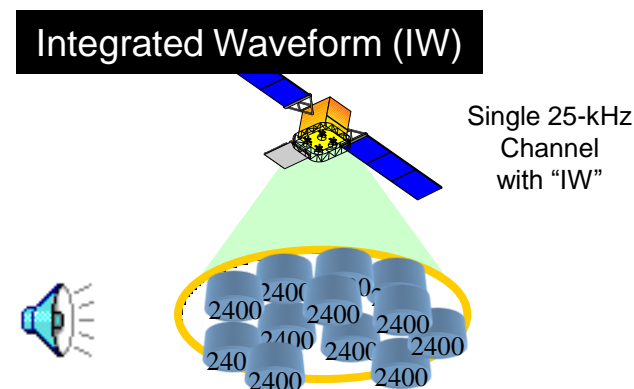
- **IW Operational Improvements**
 - Significant increase in available accesses over DAMA
 - Nearly 3X increase possible over DAMA
 - Full capability provides potential for 80-100% additional increase
 - Simplified terminal operation
 - Operational flexibility - move users between channels without disruption
 - More reliable Link Acquisition (3dB improvement)
 - Improved voice quality (MELP encoding)



A 25kHz channel typically supports one non-DAMA network



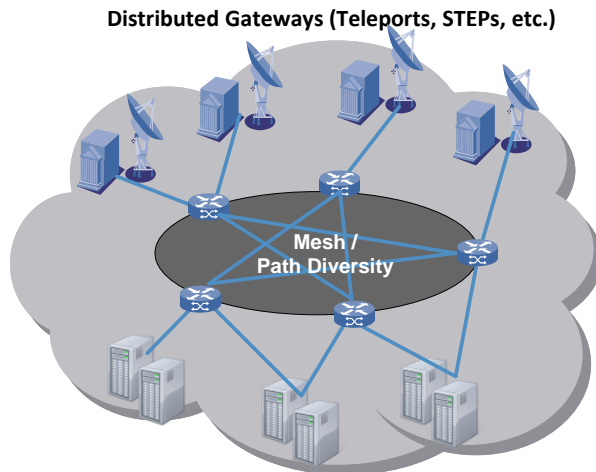
A 25-kHz DAMA Channel supports MAX 5 simultaneous 2.4k Voice networks



A 25-kHz IW Channel supports max of 14 simultaneous 2.4k Voice networks

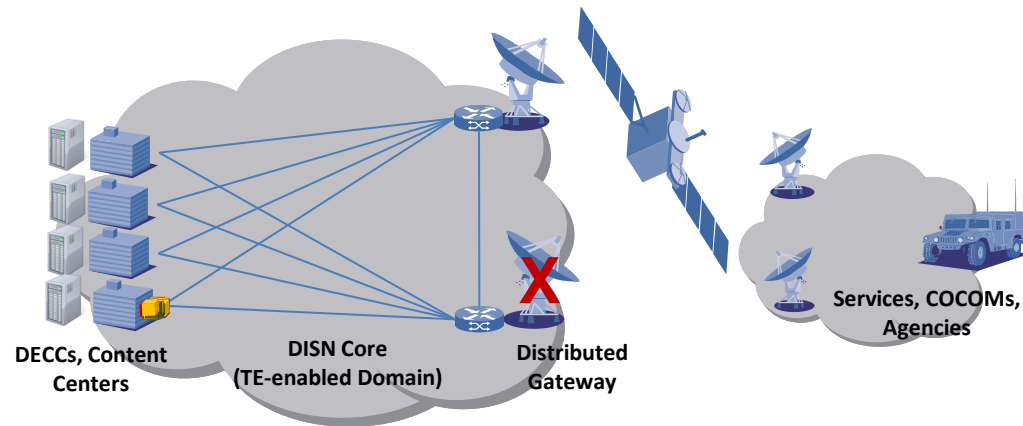
DAMA – Demand-Assigned, Multiple Access
MELP – Mixed Excitation Linear Prediction

Distributed Gateway and Mesh Connectivity – Now Term Resilience



Sources: Data Enabled Content Centers, Web, PB, Imagery, Video

- ① Connectivity to DISN
- ② Redundancy Capabilities
- ③ Load Balancing Capabilities



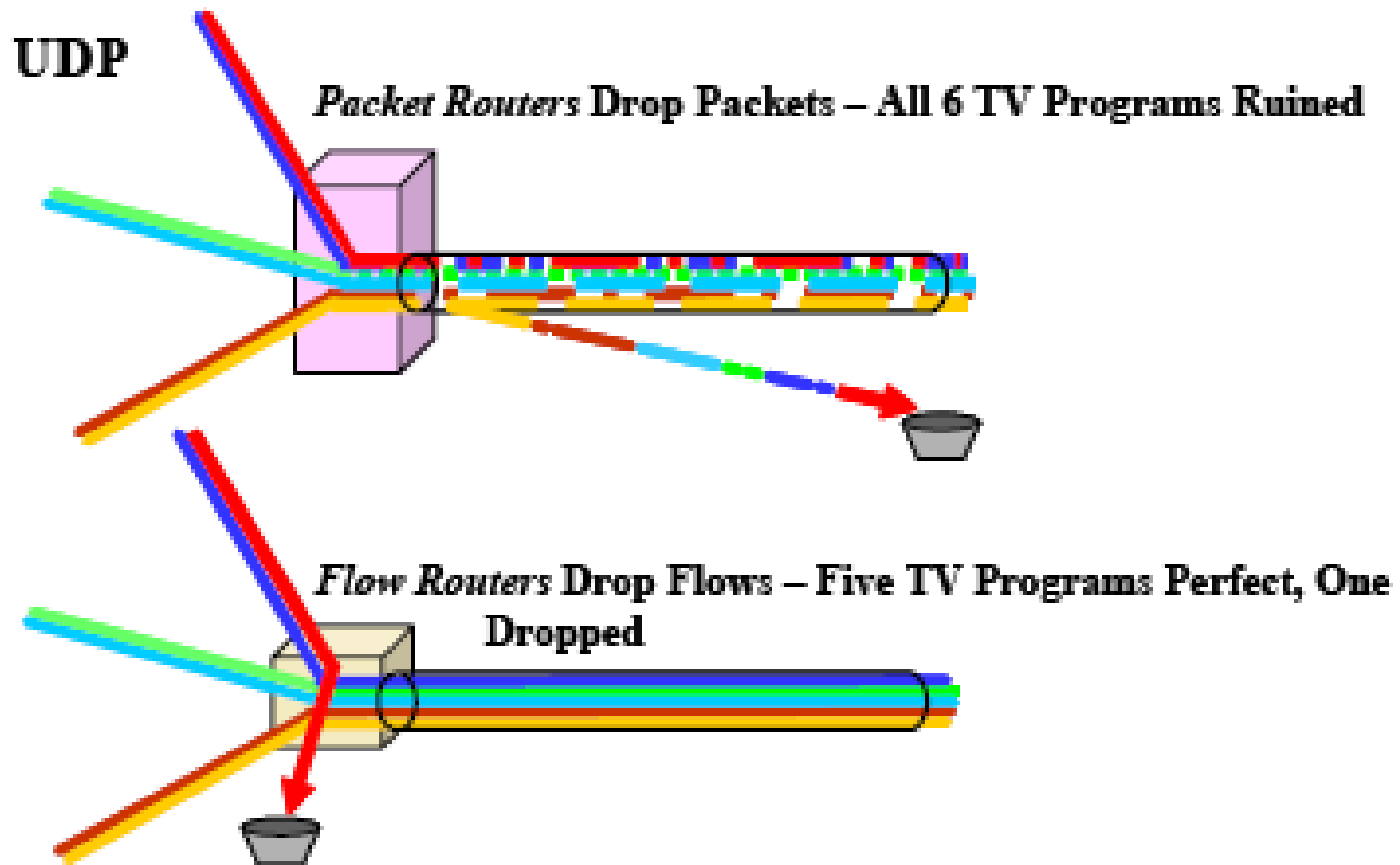
- **Distributed gateway enables users to access DISN resources through a homogenous construct**
- **Benefits of full mesh / path diversity include:**
 - Increased network availability/robustness during fault/failure events
 - Inbound/Outbound Load distribution of traffic, and traffic engineering (TE) opportunities

Mesh connectivity between Distributed Gateways offers path diversity to user networks, and therefore increases the availability of DISN Resources

Flow Routing – Efficient Load Balancing

- Normal routers handle every packet independently
- Flow routers set up a “flow” based on the source/destination and address/port and the protocol. Once the flow is established, the flow router’s ports work with each other.
Reducing power and complexity
- Flow routers were not feasible to make six years ago because of memory costs ... they are feasible now
- Using commodity processors and cheaper memory, network processors, and FPGAs they are lighter (9x), smaller (12x), use less power (5x) and cost less (3.5x) than conventional routers

Flow Routers Drop Lowest Priority FLOWS (not random packet discard)



Example of DSL that has the capacity for 5 TV programs, but 6 are requested

Flow Routing – Efficient Load Balancing

Current Approaches:

1. Separate pipes for separate services: Only way to ensure high quality for video and voice

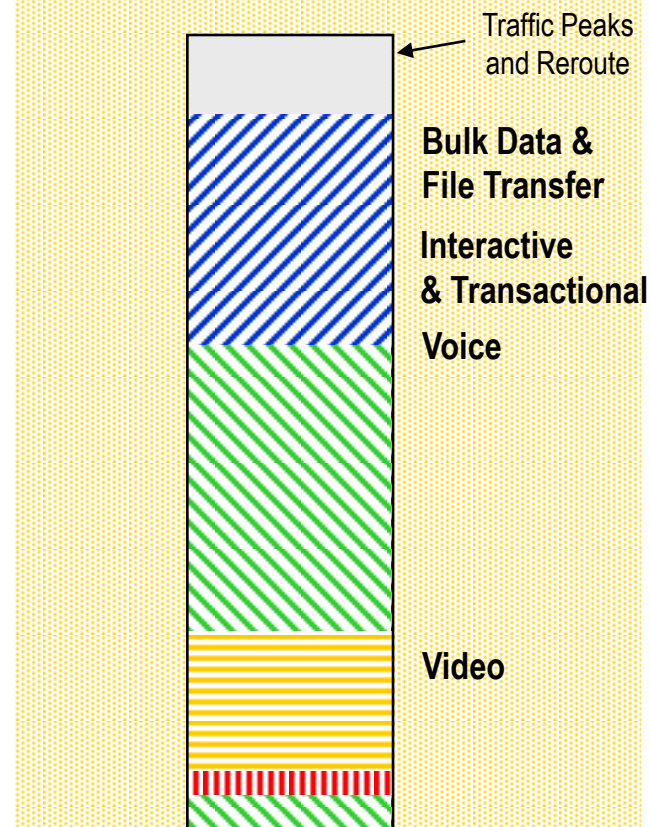


2. All services on a single over-provisioned, costly, highly under-utilized network

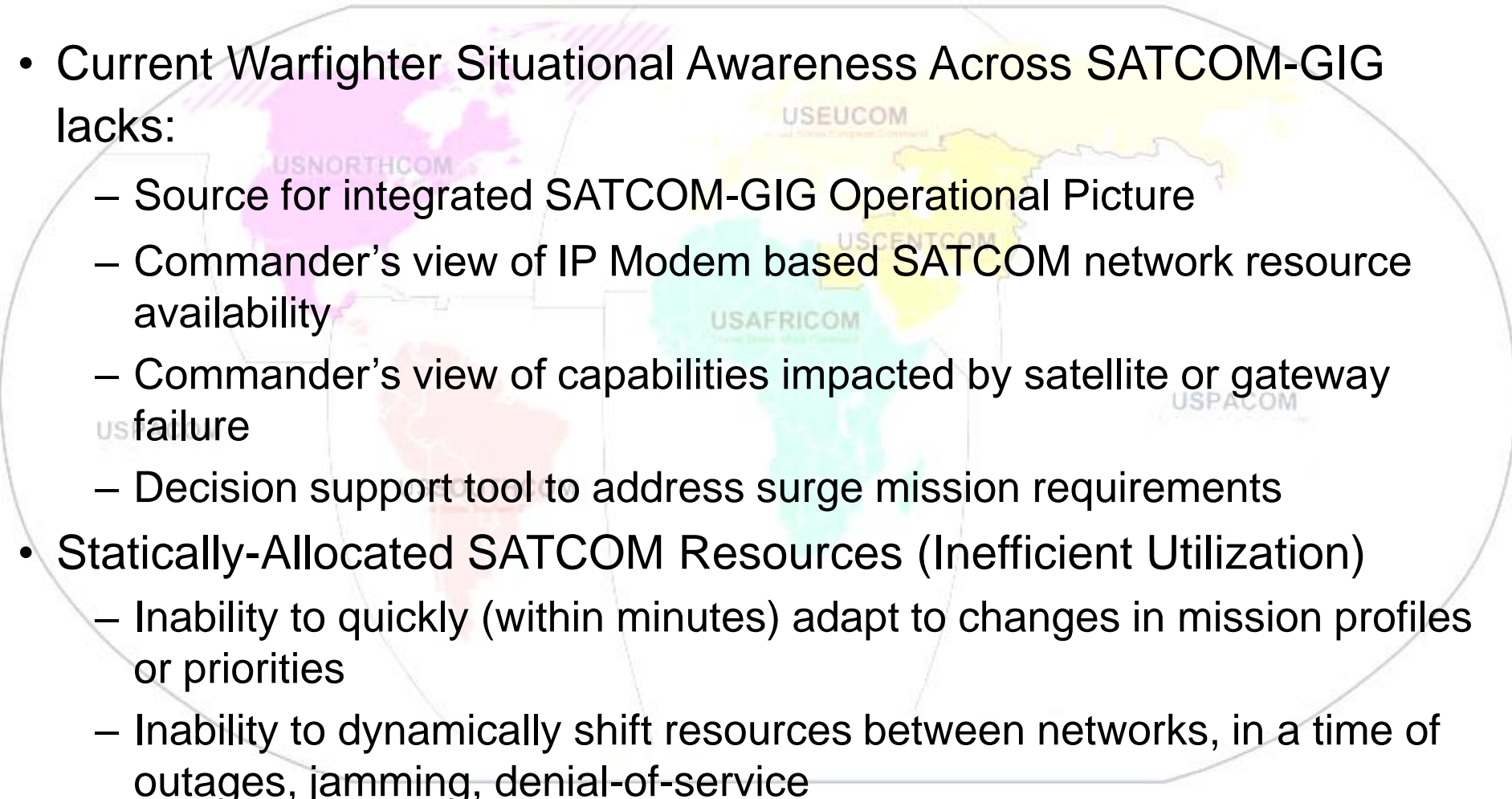


Flow Routing:

All services efficiently groomed over converged broadband “*virtual network(s)*”



Integrated SATCOM-GIG Operations & Management (ISOM)

- 
- Current Warfighter Situational Awareness Across SATCOM-GIG lacks:
 - Source for integrated SATCOM-GIG Operational Picture
 - Commander's view of IP Modem based SATCOM network resource availability
 - Commander's view of capabilities impacted by satellite or gateway failure
 - Decision support tool to address surge mission requirements
 - Statically-Allocated SATCOM Resources (Inefficient Utilization)
 - Inability to quickly (within minutes) adapt to changes in mission profiles or priorities
 - Inability to dynamically shift resources between networks, in a time of outages, jamming, denial-of-service

Critical Gaps in Situational Awareness & Resource Optimization



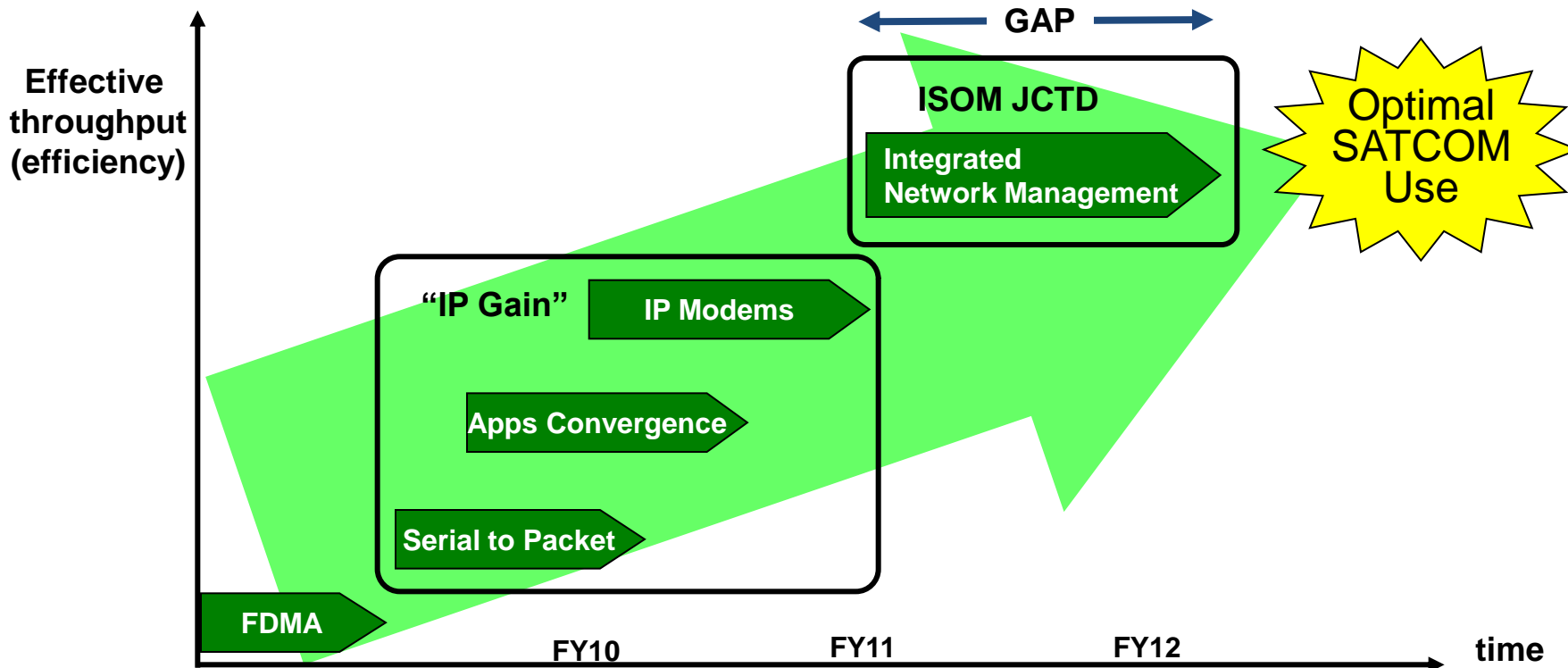
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Desired Capabilities

- **Integrated real-time Situational Awareness (SA)**
 - **Dynamic graphical representation of SATCOM networks**
 - **Access to real-time and historical data**
 - **Ability to depict associated mission impacts due to disruption or OPTEMPO changes**
 - **CDR STRATCOM has real-time insight into operations driven changes to global SATCOM allocation**
- **Dynamically reallocate resources**
 - **Warfighting Commanders have the ability to manage assigned SATCOM resources (e.g. bandwidth, channels) based on mission needs just like any other resource**
 - **Network capable of mitigating outages, jamming, and denial-of-service**
 - **Provides JTF-GNO and Combatant Commanders a global resource management tool to ensure effective and efficient resource utilization**

**Highly effective customer response to
Warfighter needs**

Achieving Wideband SATCOM Efficiency



- DoD SATCOM moving toward IP-based architecture
 - Past improvements in SATCOM efficiency provide much greater capacity
 - But IP only gets you so far because to a large degree SATCOM capacity is still “nailed-up”

Integrated Network Control optimizes Warfighter use of limited SATCOM resources

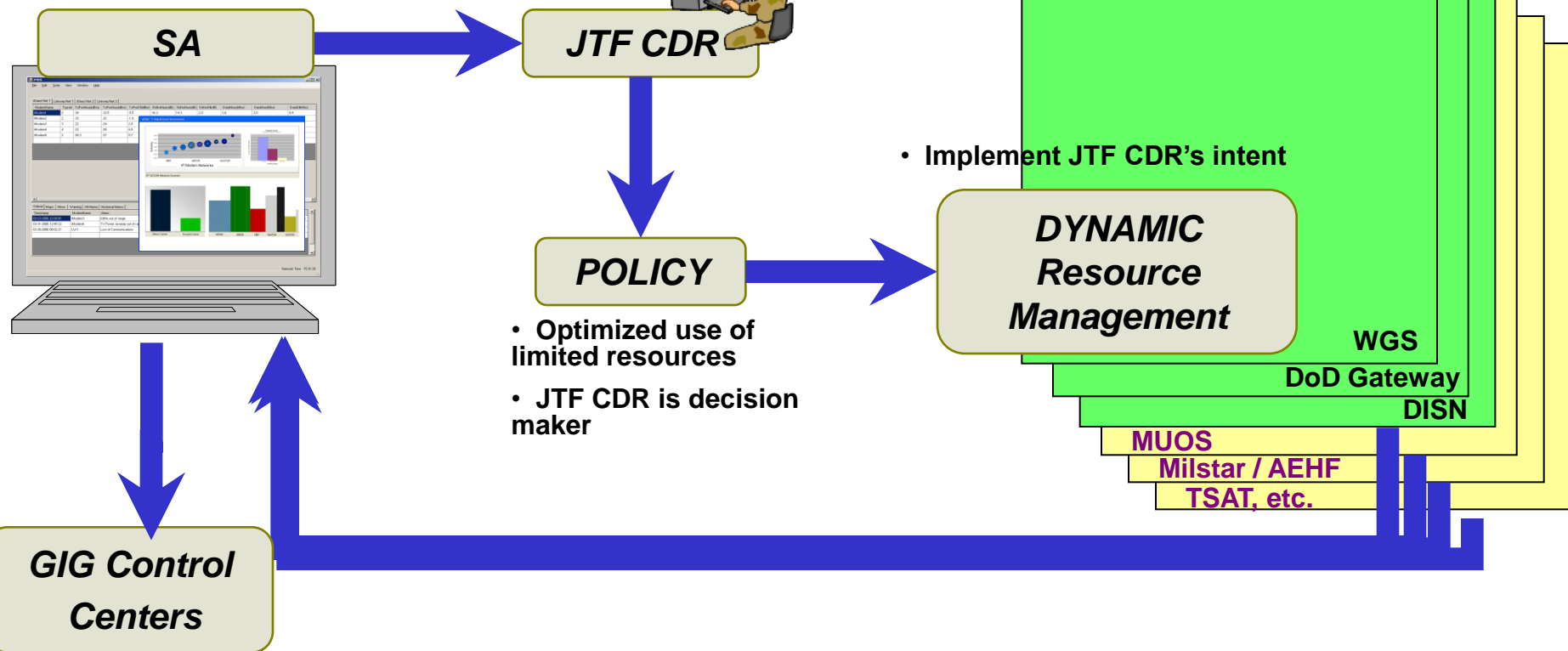
Operational Flow Diagram

- Create Situational Awareness (SA) view of SATCOM resources
- Enable JTF CDR to use SA knowledge to effectively utilize resources

- Reallocates SATCOM resources to accomplish the mission
- Manages fenced resources to win the fight

Communication Systems

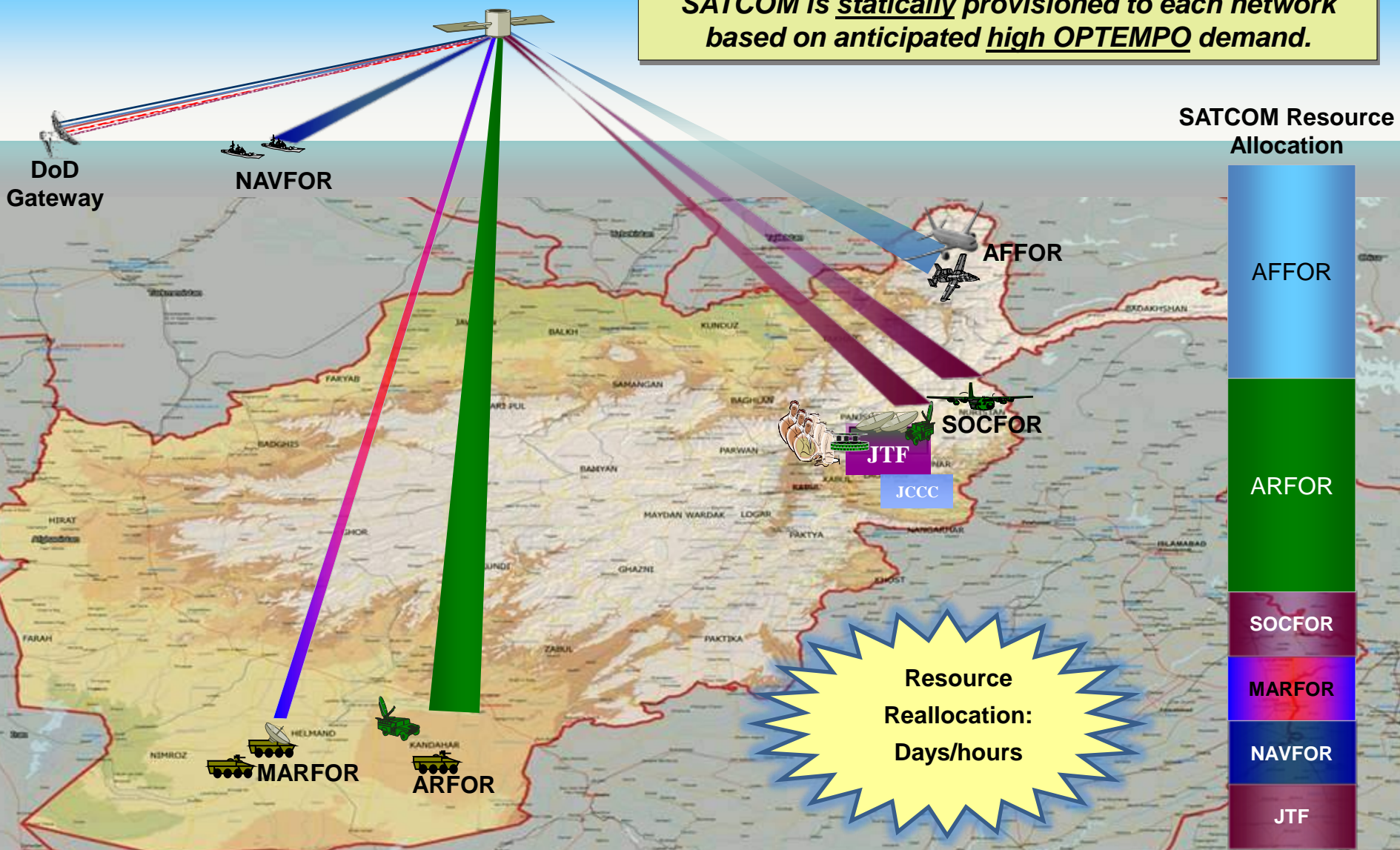
- Implement JTF CDR's intent



JTF CDR's intent best achieved through flexibility to optimize resource allocations based on situation

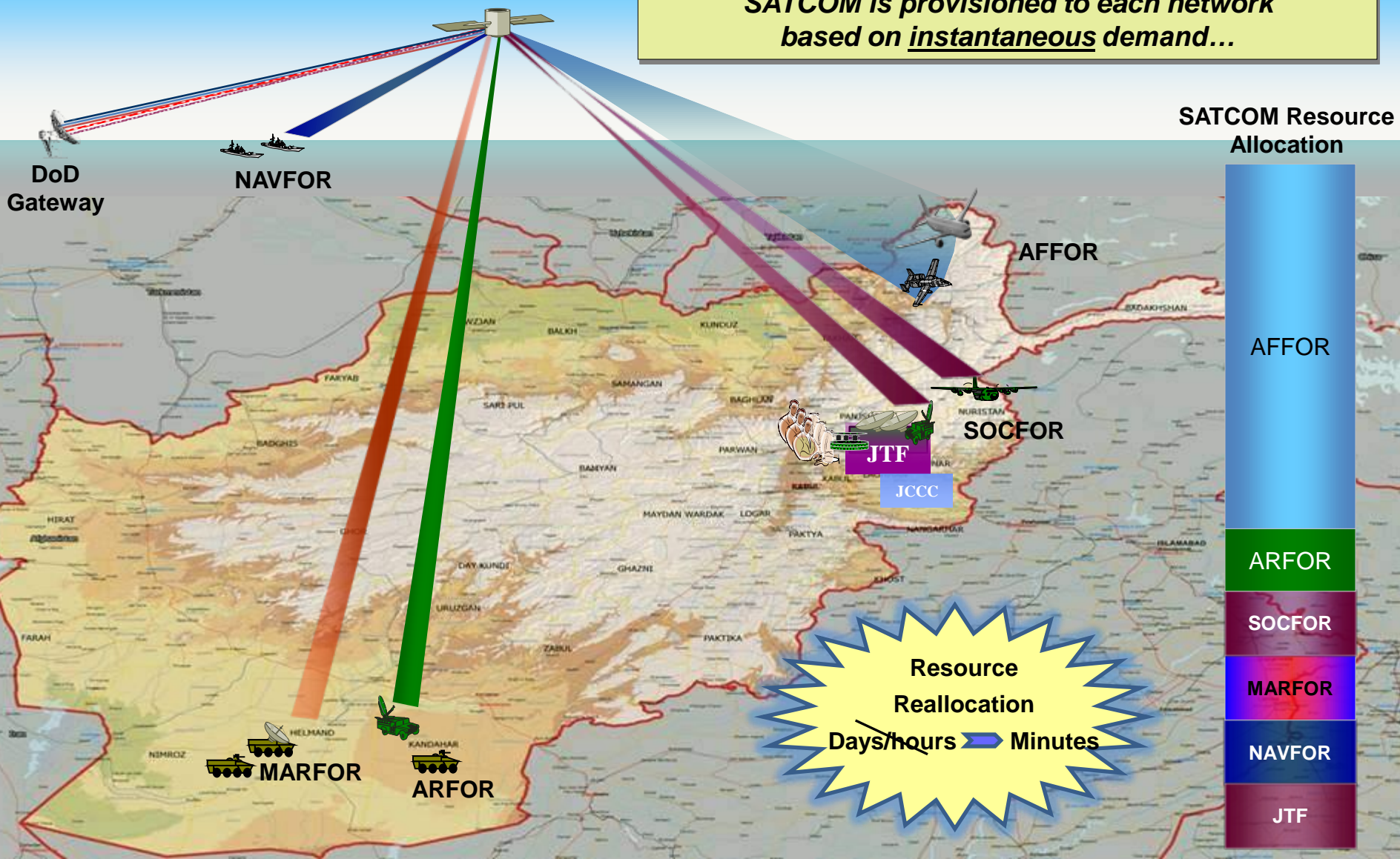
Today's Static SATCOM Resource Management OV-1 (without ISOM)

SATCOM is statically provisioned to each network based on anticipated high OPTEMPO demand.



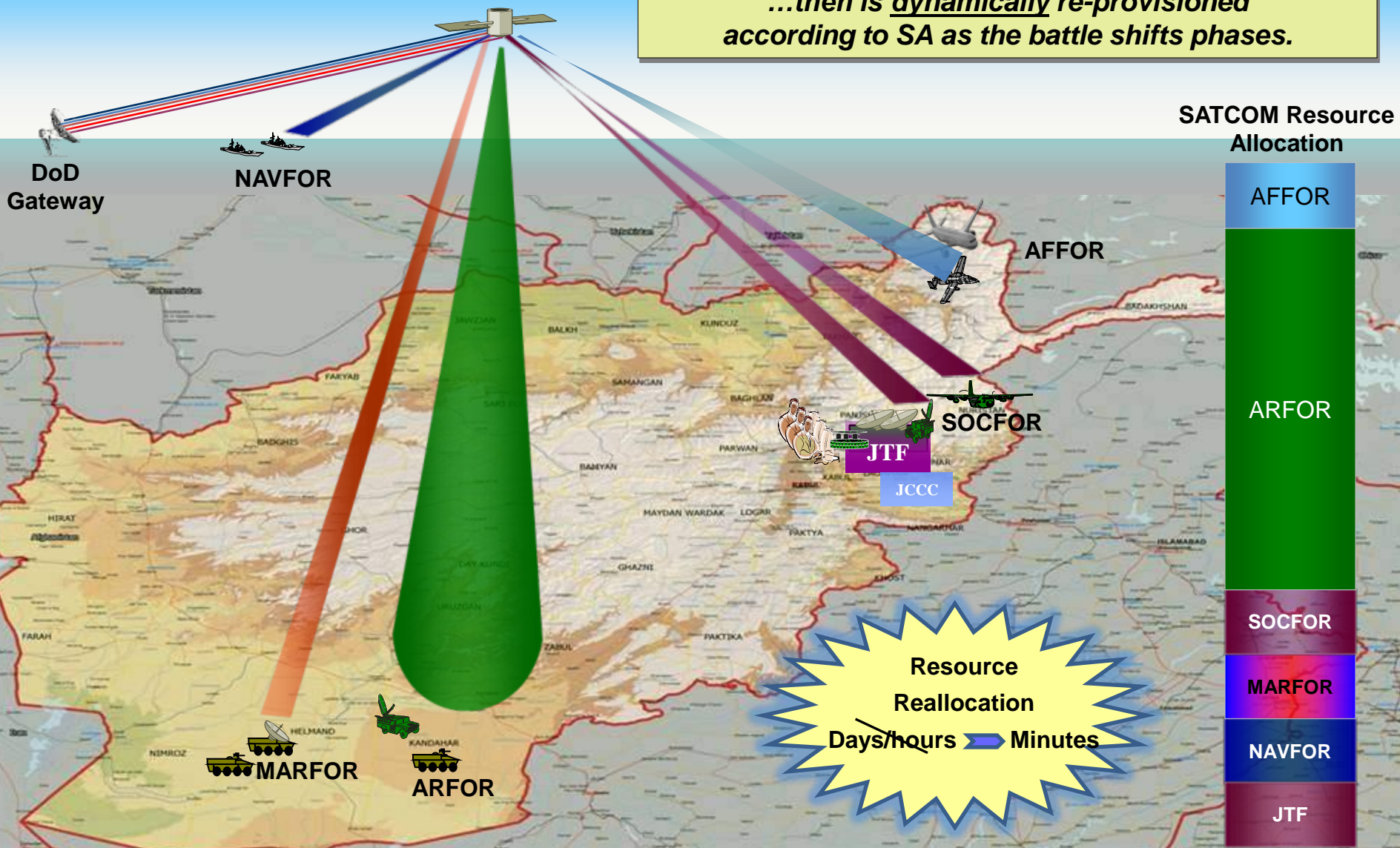
ISOM Resource Management OV-1 (Aerial Campaign)

SATCOM is provisioned to each network based on instantaneous demand...



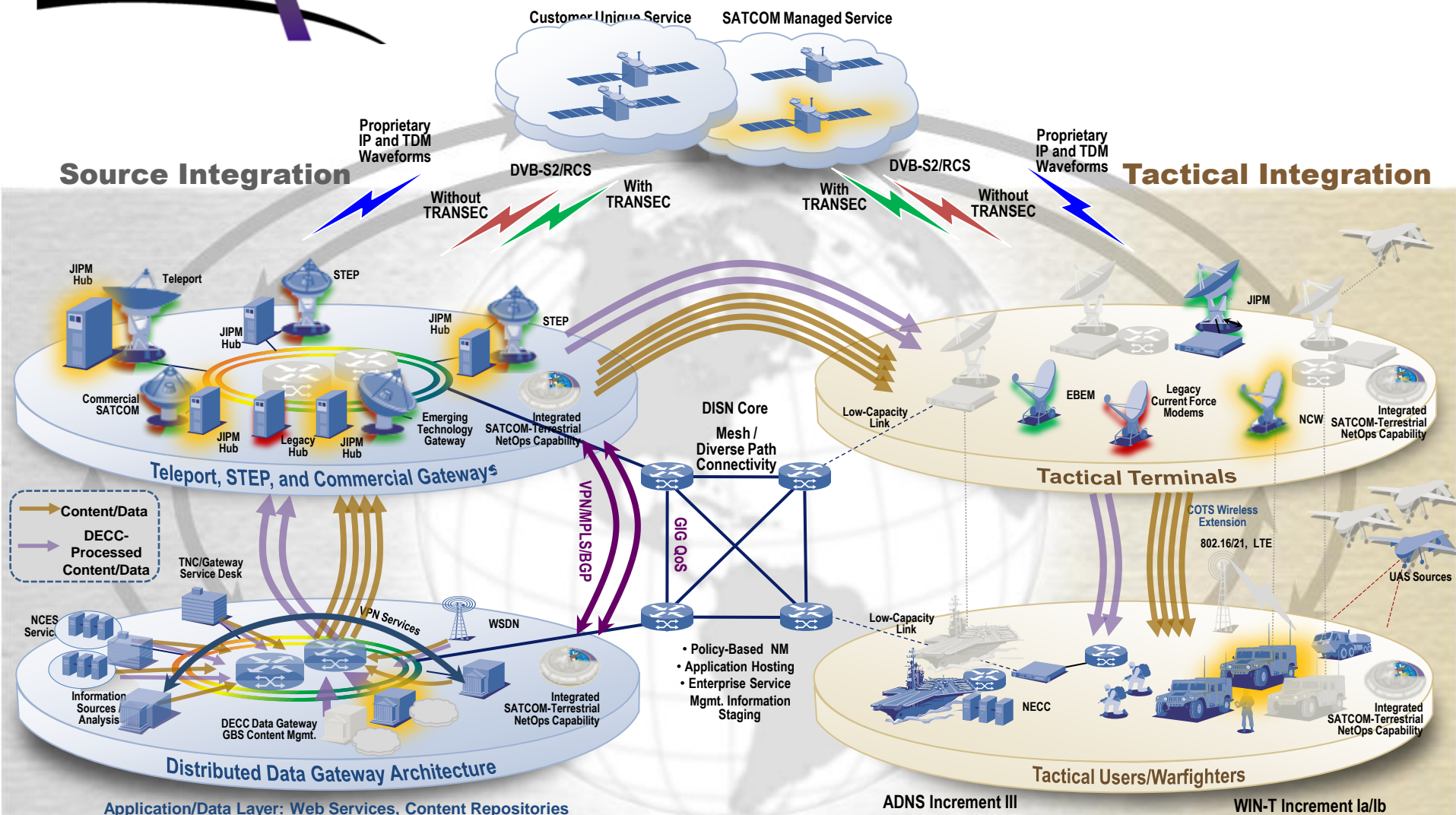
ISOM Resource Management OV-1 (Ground Assault)

...then is dynamically re-provisioned according to SA as the battle shifts phases.





2012 Wideband SATCOM Architecture



JIPMv1

Increased presence of JIPMv1 across Teleports, STEPs, and Commercial Gateways

Wideband SATCOM

Increased capacity helps in offload users from legacy systems/COMSATCOM to MILSATCOM



Near Term 2012-2016



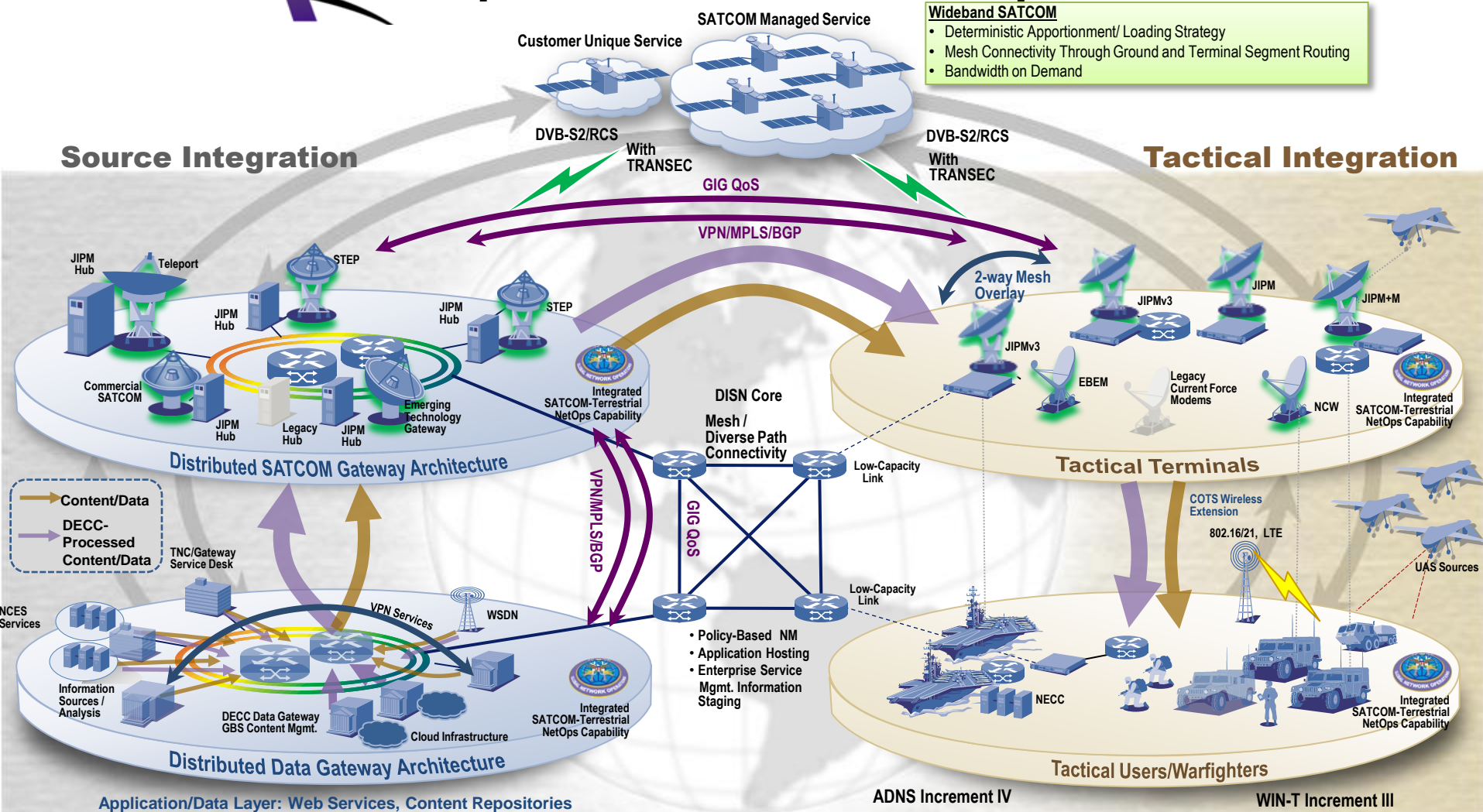
2016 Vision for Wideband SATCOM: Ubiquitous, Efficient, Enterprise Solutions

Wideband SATCOM

- Deterministic Apportionment/ Loading Strategy
- Mesh Connectivity Through Ground and Terminal Segment Routing
- Bandwidth on Demand

Source Integration

Tactical Integration



Distributed Gateway

JIPM V3/4 at Teleport & STEP sites connected via VPN Mesh provides network diversity

Deterministic Apportionment

Managed WGS & Commercial bandwidth allocations to meet on-demand Warfighter requirements

NetOps

Policy-based network mgmt & situational awareness to meet cyber requirements



Far Term 2016-2020



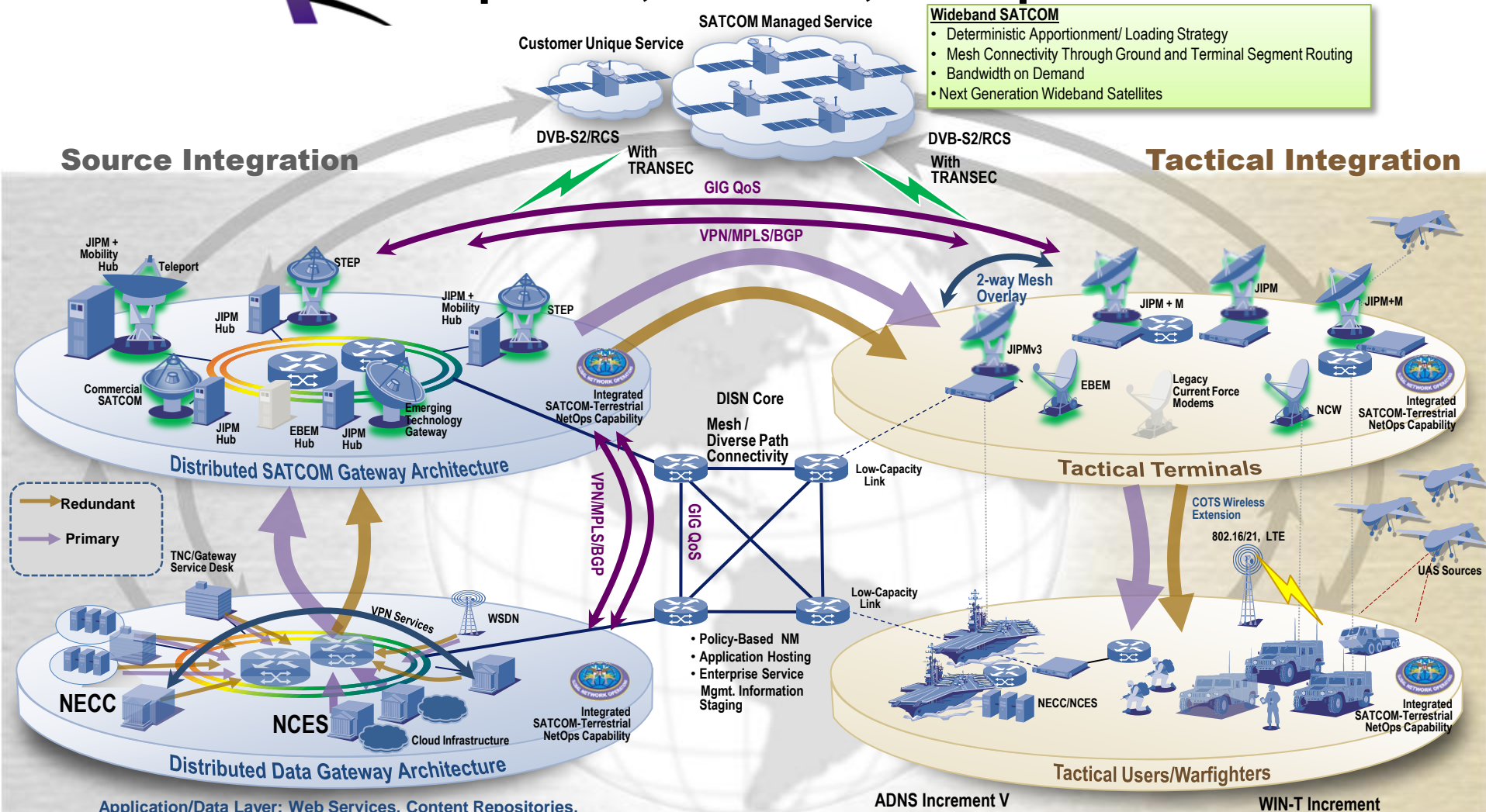
2020 Vision for Wideband SATCOM: Ubiquitous, Efficient, Enterprise Solutions

Wideband SATCOM

- Deterministic Apportionment/ Loading Strategy
- Mesh Connectivity Through Ground and Terminal Segment Routing
- Bandwidth on Demand
- Next Generation Wideband Satellites

Source Integration

Tactical Integration



Distributed Gateway

Full convergence of IP operations with Terrestrial Services. Automated Flow routing.

SATCOM Services

Convergence of Narrowband, Wideband, Protected, and Commercial offerings into a dynamic and flexible resource

NetOps

Policy-based network mgmt & situational awareness to meet cyber requirements



Questions?



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BACKUP