



Track To Target

Coalescing Multiple ISR Feeds Optimizes The Employment of Kinetic and Non-Kinetic Weapons, Desired Effects and Platforms

Marc Boswell, CISSP

Red Hat

maboswel@redhat.com, 804-363-2468



Agenda

Scenario: The Challenge with Pacing Adversary ISR Stovepipe
Capture

Propagation of Multispectral Waveforms In Multiple Domains
Disaggregated
Compromises Mean Time in F2T2EA Decision Process

Review of Modern, Domain Centric ISR Lines of Effort
Title 10
Title 50

Fusion of Federal and Civilian Service Delivery Points

JOPPA Planning Cycle
Integrated ISR as Center of Gravity
Definition of Desired Global Integration

DoD Cloud mapped to JWCC and Outsourced Cloud Service
Issues of COOP, PACE, and Federation
Migration Questions
Federation Questions
Edge Node Capability

The Operational Impact of a Hybrid Cloud Strategy

Discussion and Conclusion



C2 of ISR Capability Gap



21.95N, 123.32W
Bearing 320
04/1930Z

Adversary DDG



C2 of ISR Capability Gap



22.55N, 125.32W
Bearing 311
04/1955Z

Adversary DDG



C2 of ISR Capability Gap



20.15N, 118.32W
Bearing 327
04/1919Z

Adversary DDG



C2 of ISR Capability Gap



21.02N, 121.12W
Bearing 323
04/1923Z

Adversary DDG



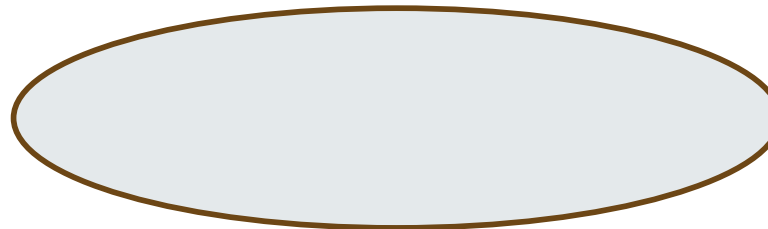
Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



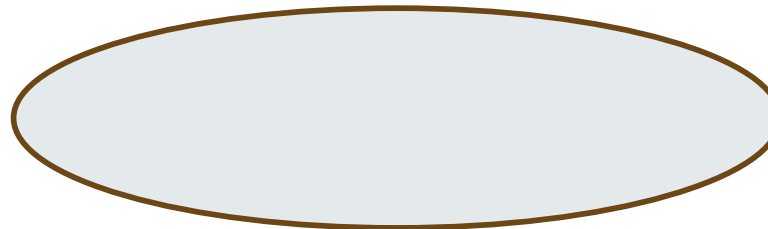
21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



DTG Difference: 36 Minutes



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



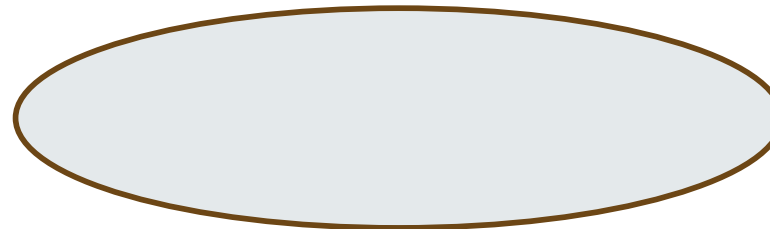
21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z

DTG Difference: 36 Minutes
Latitude/Longitude Similarity



Four Fixes, Four Tracks, But Four Targets?



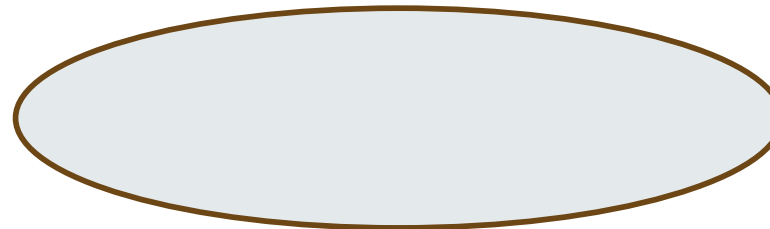
21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



DTG Difference: 36 Minutes
Latitude/Longitude Similarity
16 Degree Difference in Bearing



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



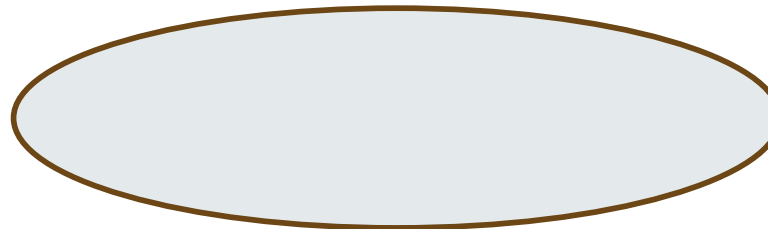
21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z

DTG Difference: 36 Minutes
Latitude/Longitude Similarity
16 Degree Difference in Bearing
At 20KTs, Delta in Distance
Traveled is Roughly 12NM



Four Fixes, Four Tracks, But Four Targets?



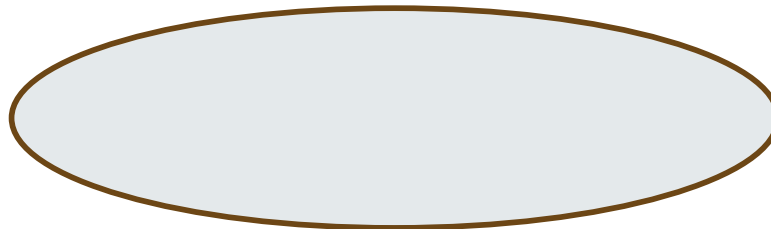
21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



Consider Scale: Whether 1 or 4 Objects,
How will JFC Coalesce hundreds of tracks
to ascertain and authenticate targets in a
scaled, speed fight?



DTG Difference: 36 Minutes
Latitude/Longitude Similarity
16 Degree Difference in Bearing
At 20KTs, Delta in Distance
Traveled is Roughly 12NM



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Where Does Data Live?

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Where Does Data Live?
2. Orchestration: Track To Target

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Where Does Data Live?
2. Orchestration: Track To Target
3. Fusion of ISR Feeds Source of Truth

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Where Does Data Live?
2. Orchestration: Track To Target
3. Fusion of ISR Feeds Source of Truth
4. Positive Control, Weapons & Platforms

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



1. Where Does Data Live?
2. Orchestration: Track To Target
3. Fusion of ISR Feeds Source of Truth
4. Positive Control, Weapons & Platforms
5. COCOM JFC Assurance



20.15N, 118.32W
Bearing 327
04/1919Z



Four Fixes, Four Tracks, But Four Targets?



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



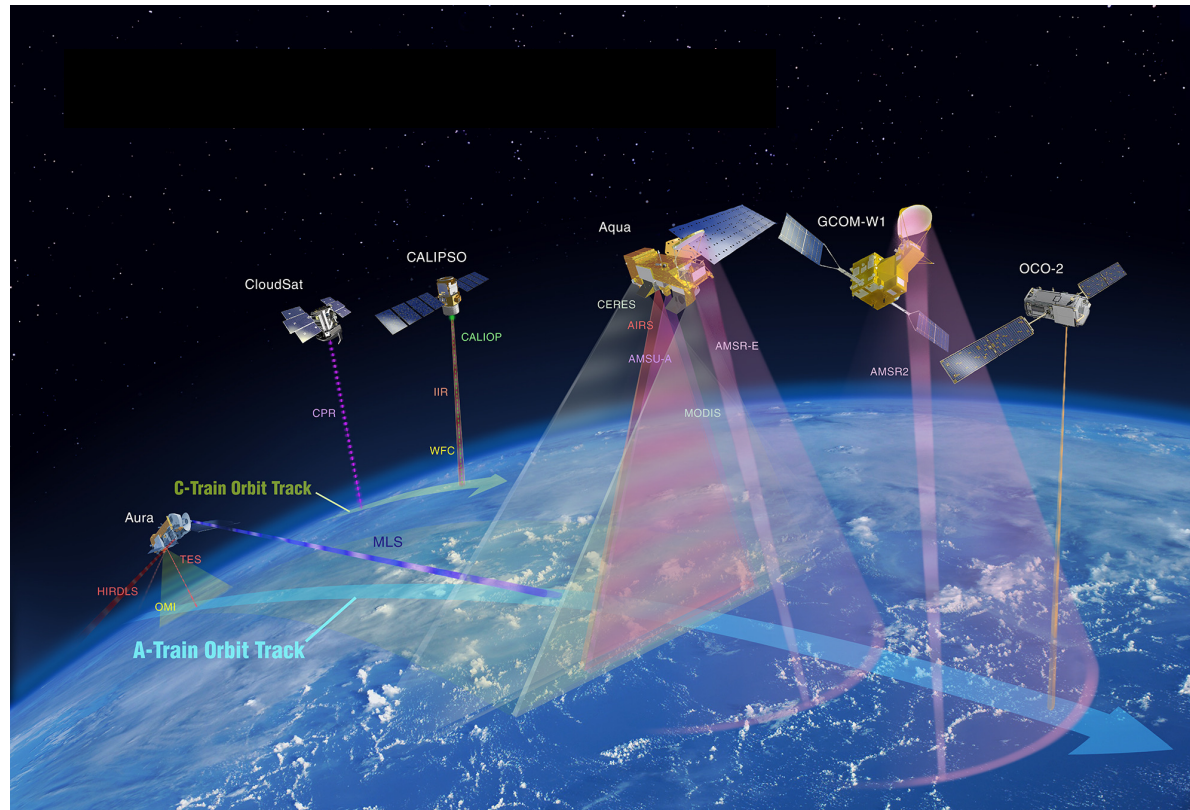
1. Where Does Data Live?
2. Orchestration: Track To Target
3. Fusion of ISR Feeds Source of Truth
4. Positive Control, Weapons & Platforms
5. COCOM JFC Assurance
6. Right Platform, Target and Weapon



20.15N, 118.32W
Bearing 327
04/1919Z



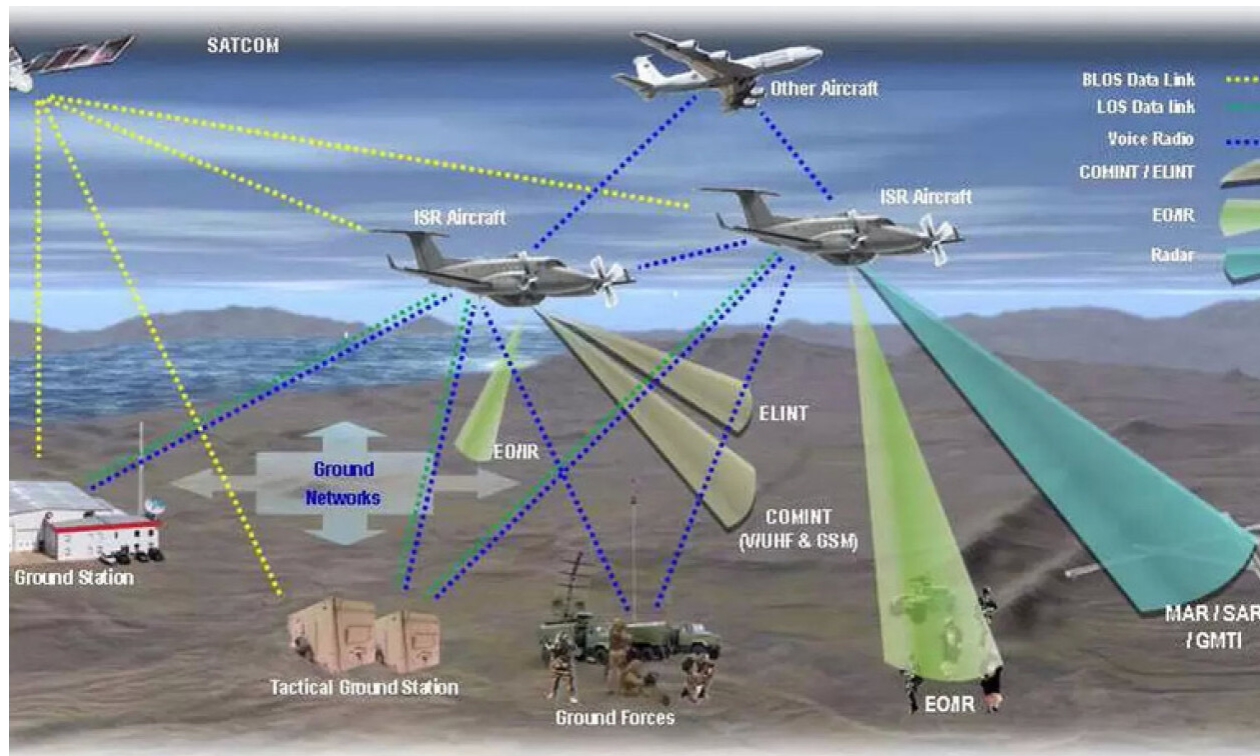
Multispectral Waveform Capture



NASA Archive Rendering



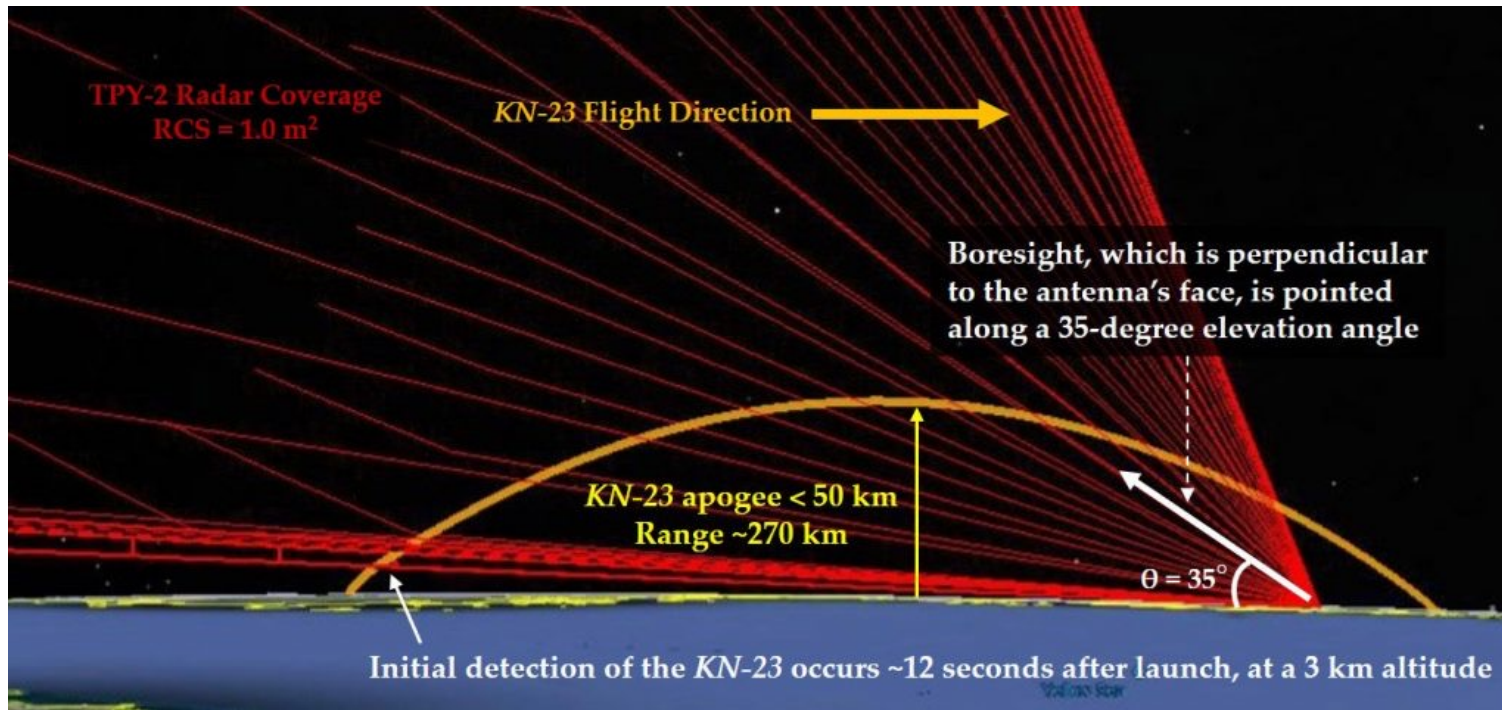
Multispectral Waveform Capture



Source: Raytheon UK



Multispectral Waveform Capture



Source: 38 North, 20 Oct 2020, Author Michael Ellman



Domain-Centric ISR Lines Of Effort



\$24 Billion FY 2022 Military
Intelligence Program Budget



Multiple SIGINT data environments, Title 10 and Title 50
Source, Congressional Record



Domain-Centric ISR Lines Of Effort



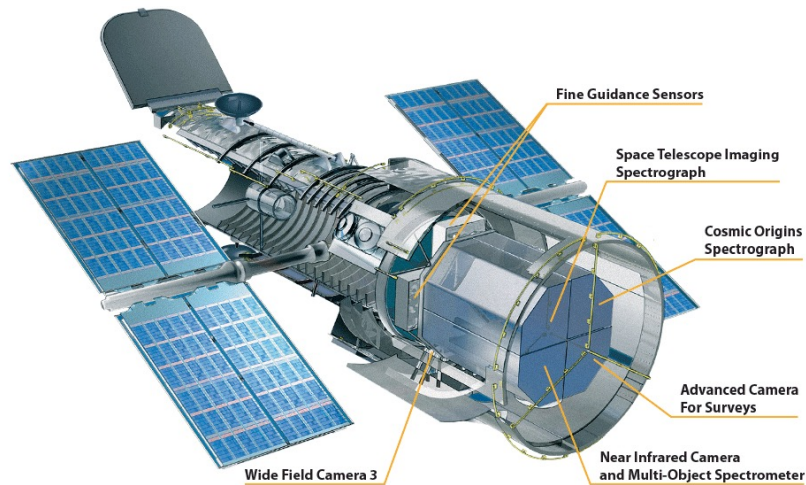
\$40 Billion FY 2022 National Intelligence Program Budget Allocation (estimated, from \$63B total non-DoD IC Budget)



Multiple SIGINT data environments, Title 10 and Title 50
Source: Congressional Record



Transformation Of ISR Via Open Standards



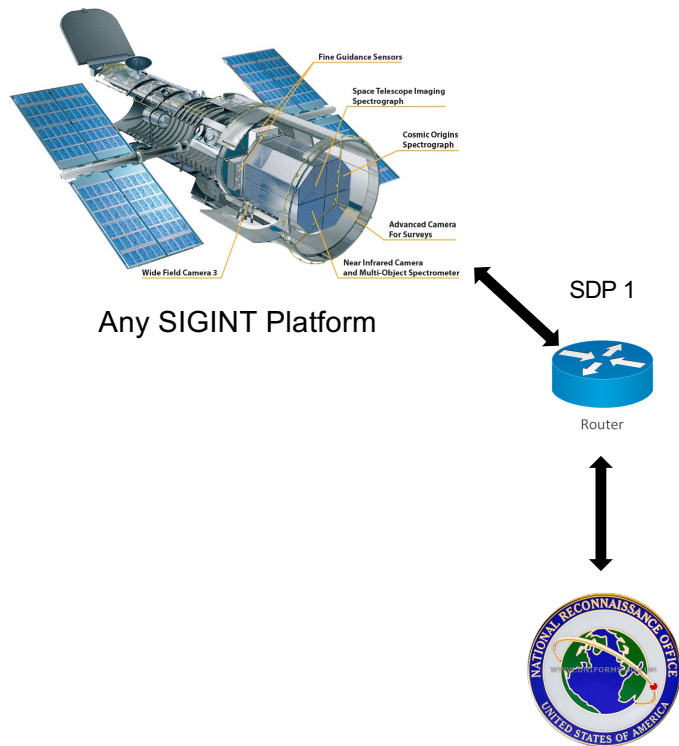
First Telemetry Capture Satellite Program

Telemetry Transport Proprietary Until 1999
IBM Invents Message Queue Telemetry Transport (MQTT)
and Publishes To Public Domain

Source: NRO, NASA and IBM



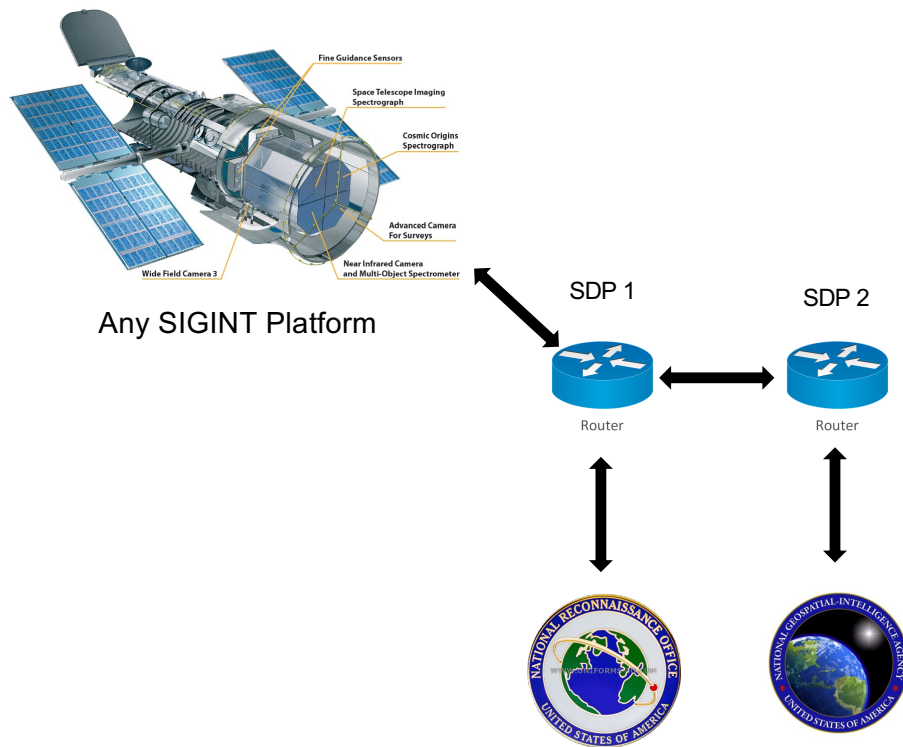
Encapsulation Is A Transport Multiplier



Source: NRO



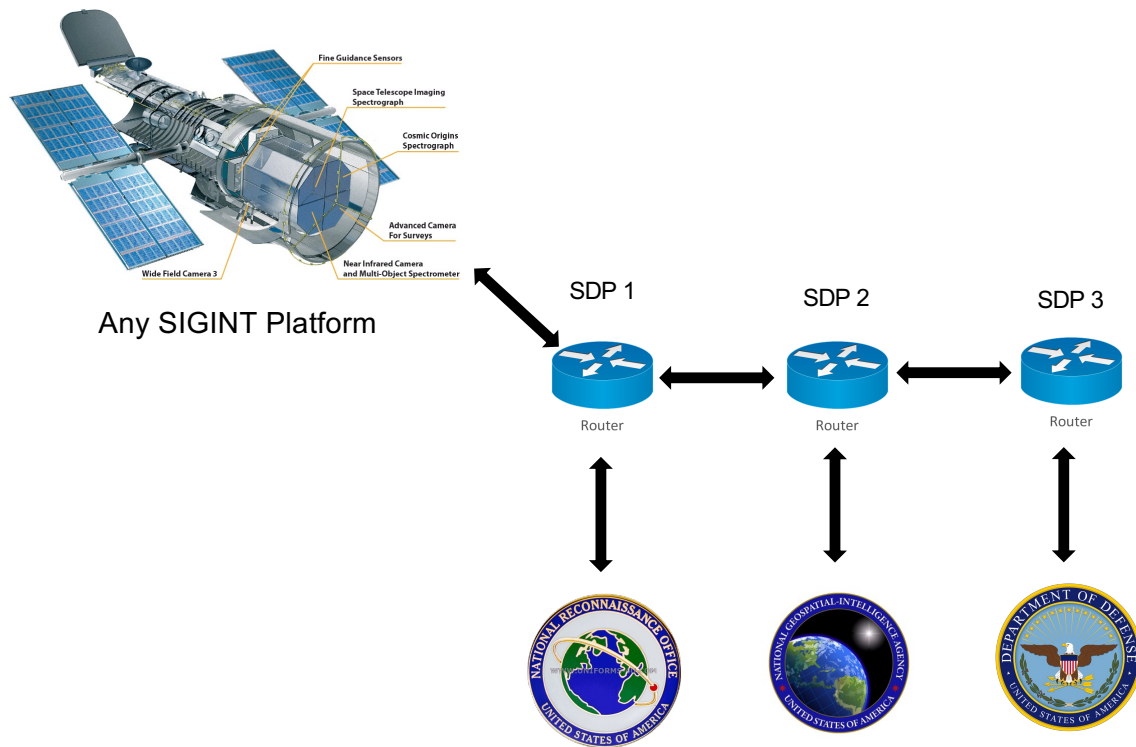
Encapsulation Is A Transport Multiplier



Source: NRO and NGA



Encapsulation Is A Transport Multiplier

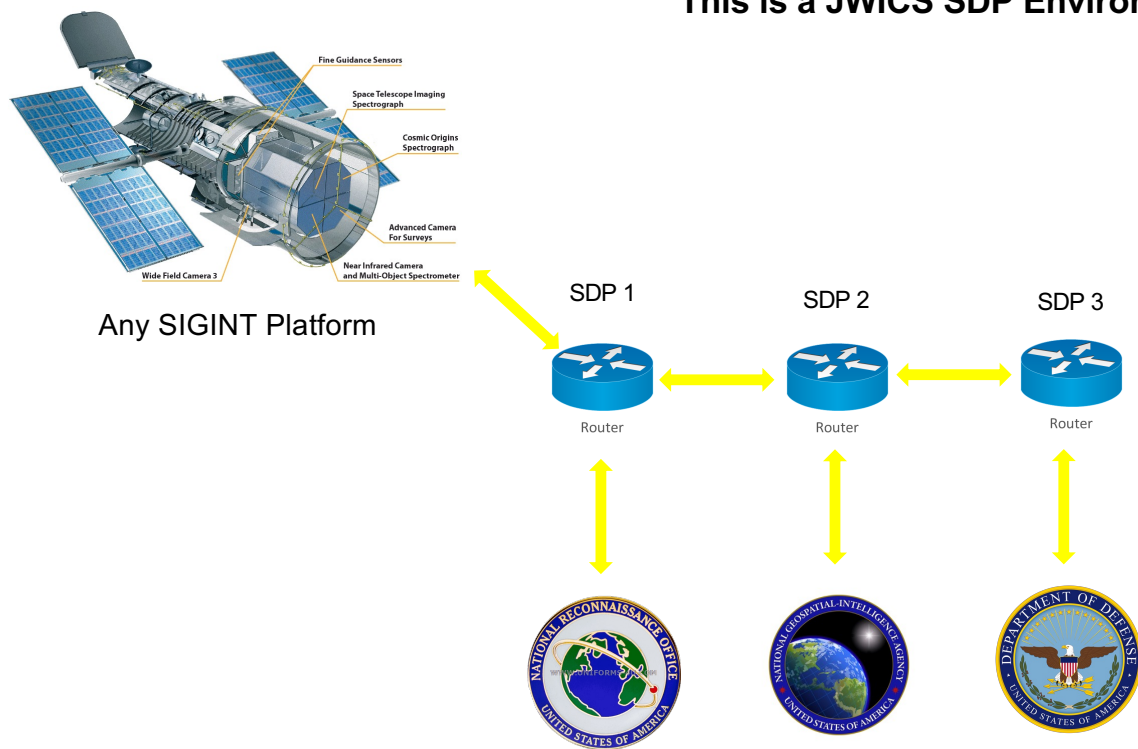


Source: NRO and Inmarsat



Encapsulation Is A Transport Multiplier

This is a JWICS SDP Environment

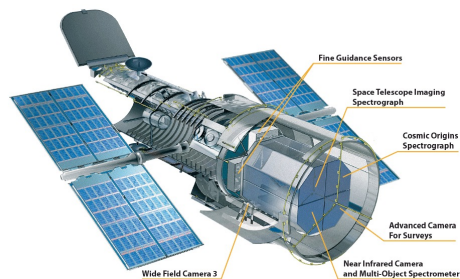


Source: NRO, NGA and DoD

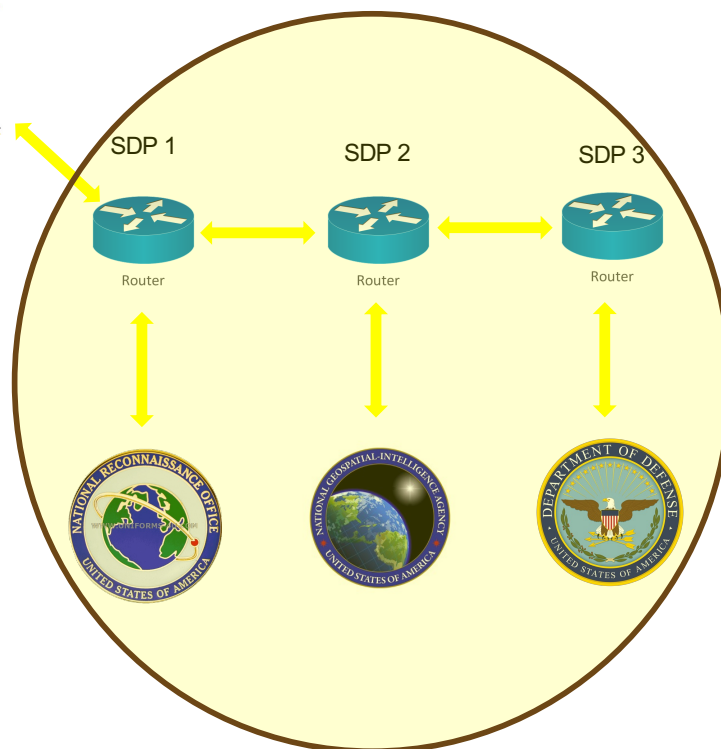


Encapsulation Is A Transport Multiplier

This is a JWICS SDP Environment



Any SIGINT Platform

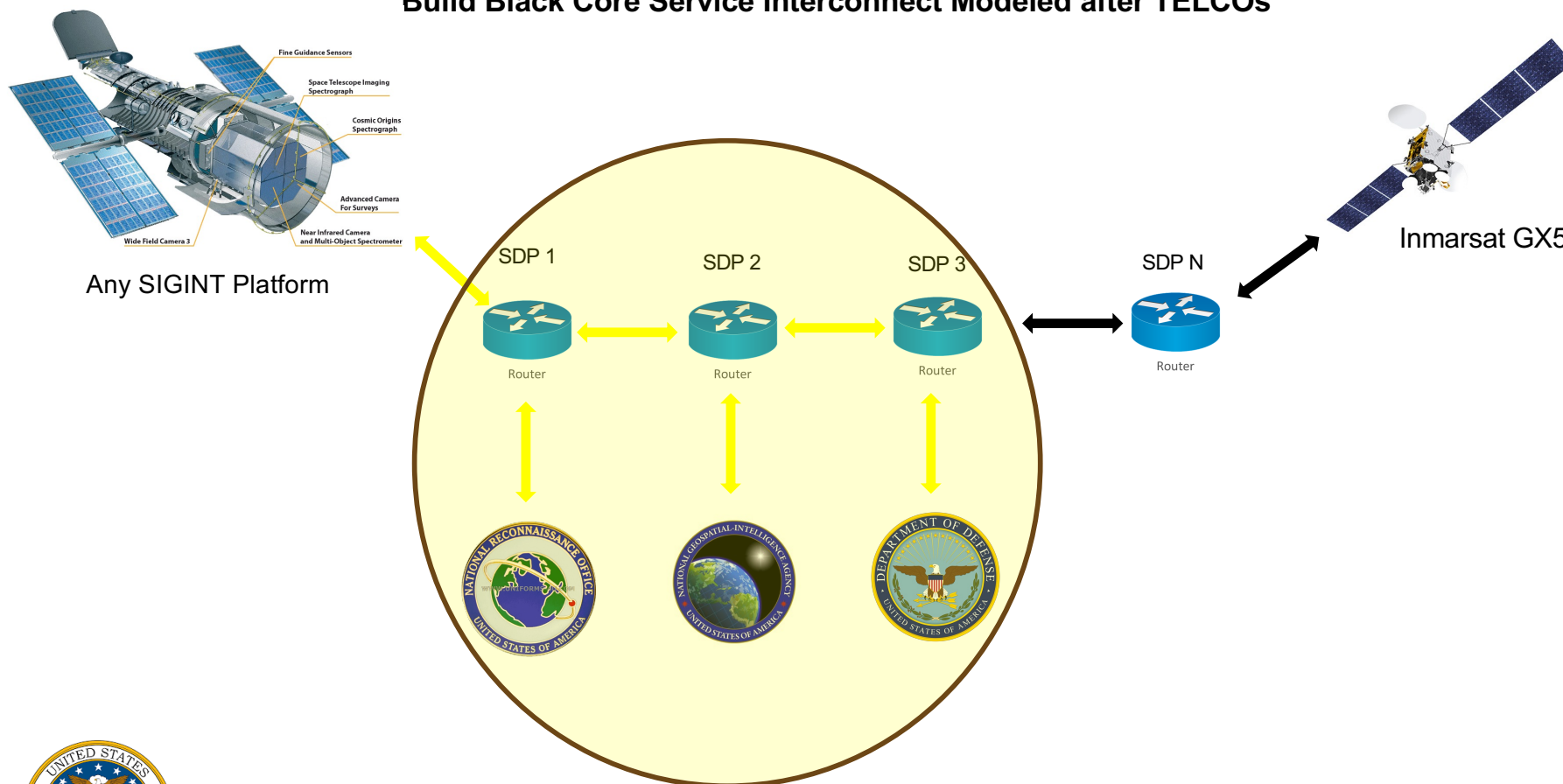


Source: NRO, NGA and DoD



Encapsulation Is A Transport Multiplier

Build Black Core Service Interconnect Modeled after TELCOs

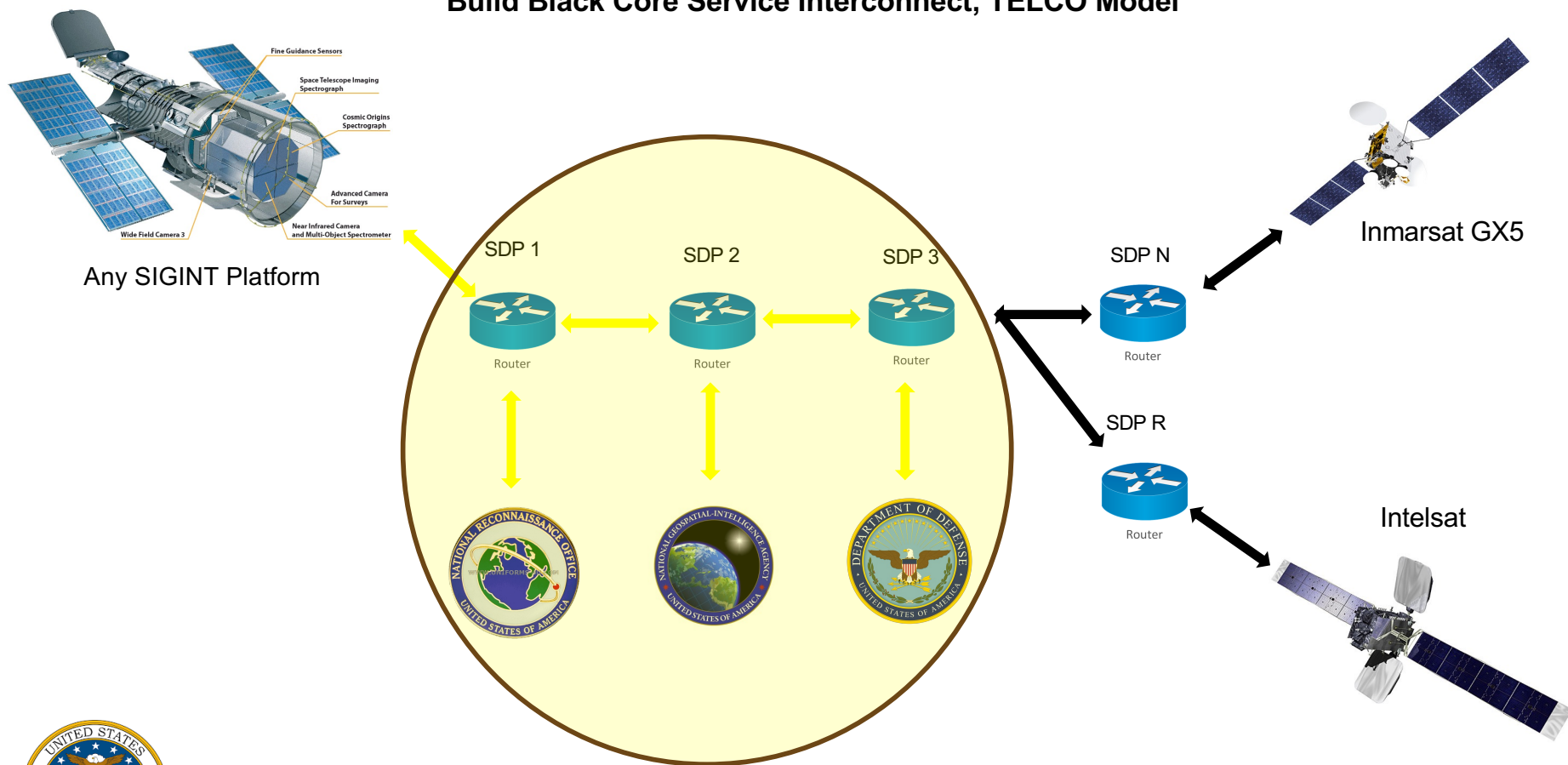


Source: NRO, NGA, DoD, Inmarsat



Encapsulation Is A Transport Multiplier

Build Black Core Service Interconnect, TELCO Model



Source: NRO, NSA, DoD, Inmarsat, Intelsat



Building Redundancy and Resiliency At The Tactical Edge



Source: Air Combat Command



Building Redundancy and Resiliency At The Tactical Edge



Quad Band SATCOM Antenna Can Receive Military and Civilian Waveforms



Building Redundancy and Resiliency At The Tactical Edge



Quad Band SATCOM Antenna Can Receive Military and Civilian Waveforms
One Transponder From One Carrier Is A Single Point Of Failure (or Attack)



Building Redundancy and Resiliency At The Tactical Edge

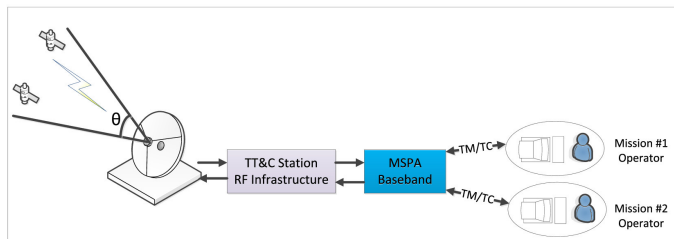


Quad Band SATCOM Antenna Can Receive Military and Civilian Waveforms
One Transponder From One Carrier Is A Single Point Of Failure (or Attack)
Consider Development And Use Of Carrier Neutral Software Defined Transponder



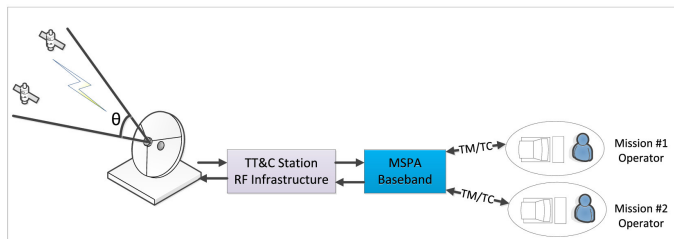
Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

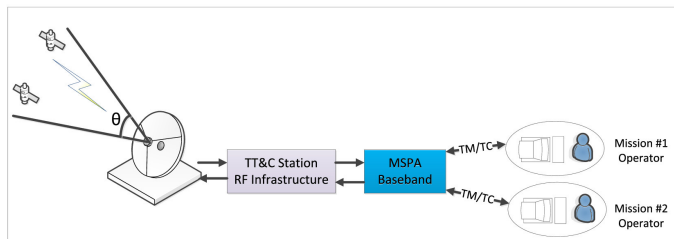


Multiple Spacecraft Per Aperture SD Transport



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

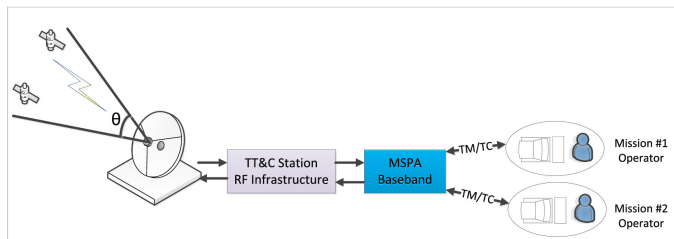


Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

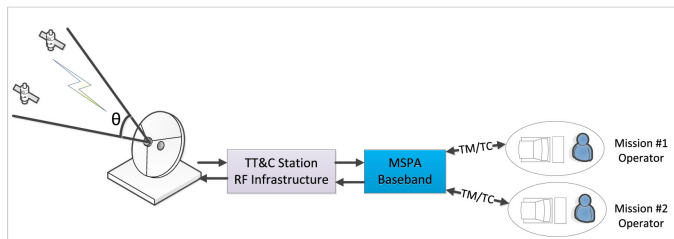


Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

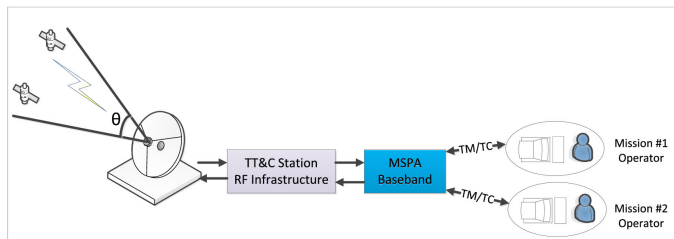


Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema
Per Transponder CODEC



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

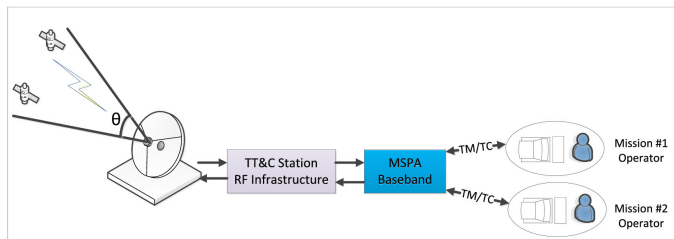


Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema
Per Transponder CODEC
Per Transponder Crypto (maybe)



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations



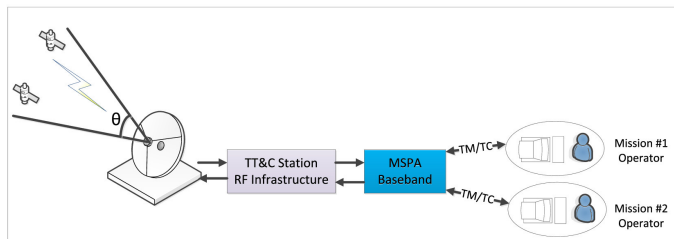
Open Source Provisioning

Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema
Per Transponder CODEC
Per Transponder Crypto (maybe)



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations



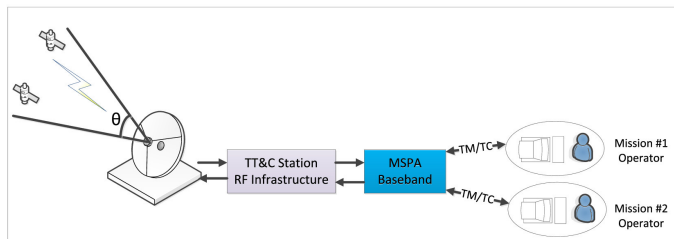
Open Source Provisioning
Predeveloped Playbooks

Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema
Per Transponder CODEC
Per Transponder Crypto (maybe)



Automate Provisioning At Tactical Edge

Feasibility of using a software-defined baseband for multiple space per aperture (MSPA) ground operations

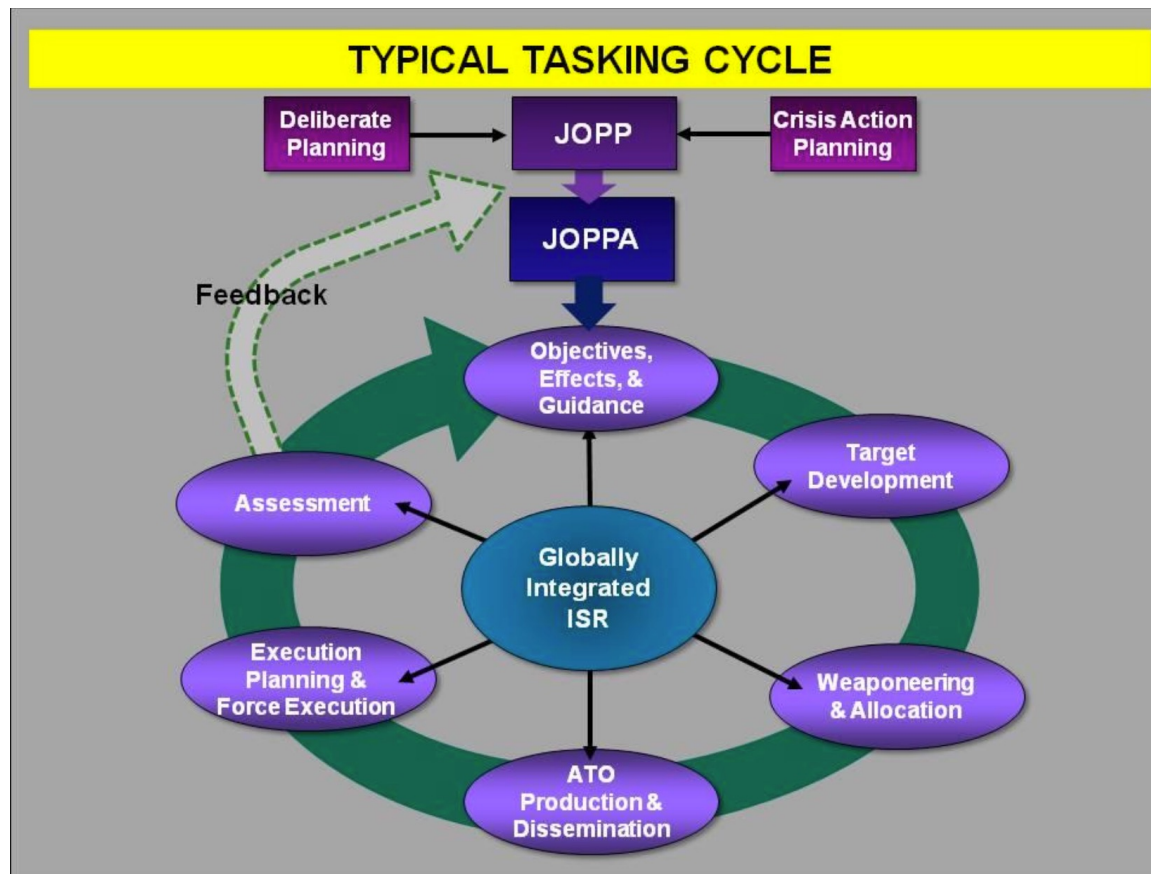


Open Source Provisioning
Predeveloped Playbooks
Based upon ACE Scenarios
“Click to Connect”

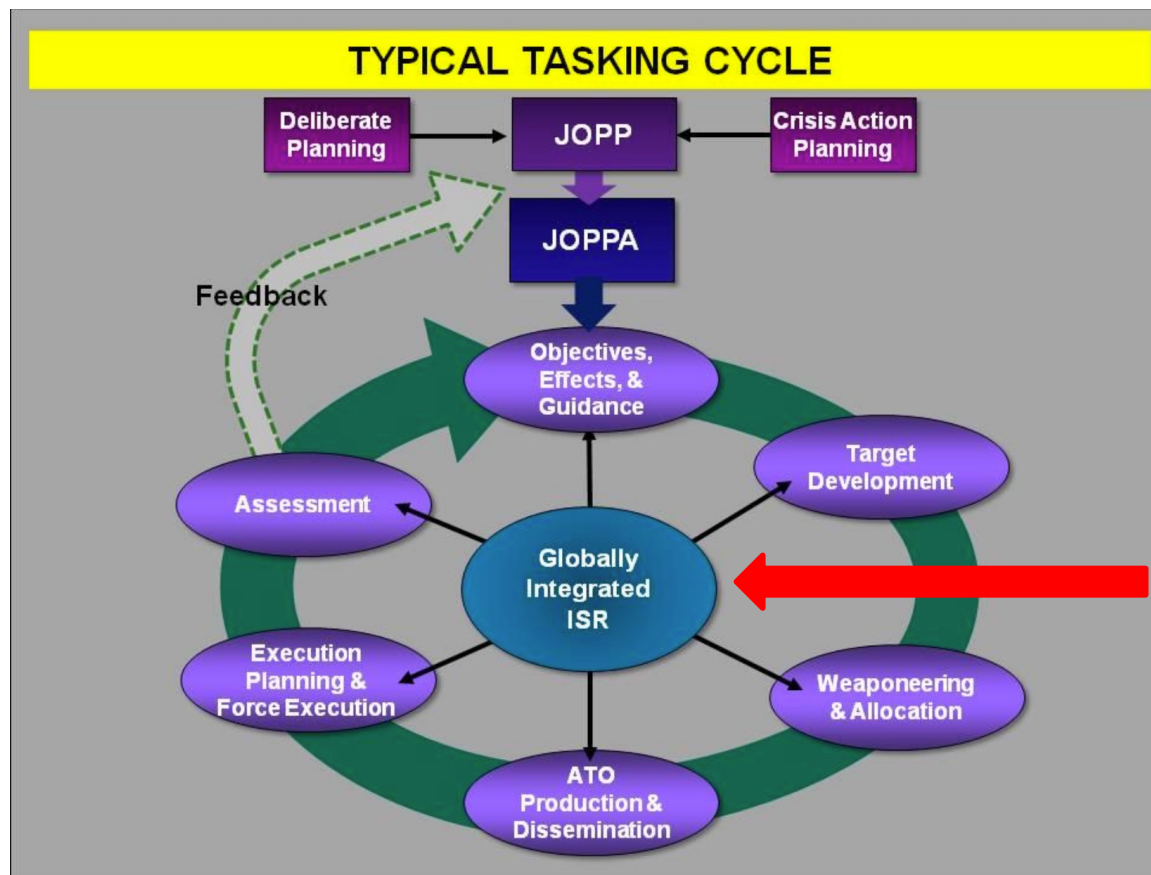
Multiple Spacecraft Per Aperture SD Transport
Multiple Baseband Links Require Automation:
Per Transponder IP Schema
Per Transponder CODEC
Per Transponder Crypto (maybe)



JOPPA Planning Cycle



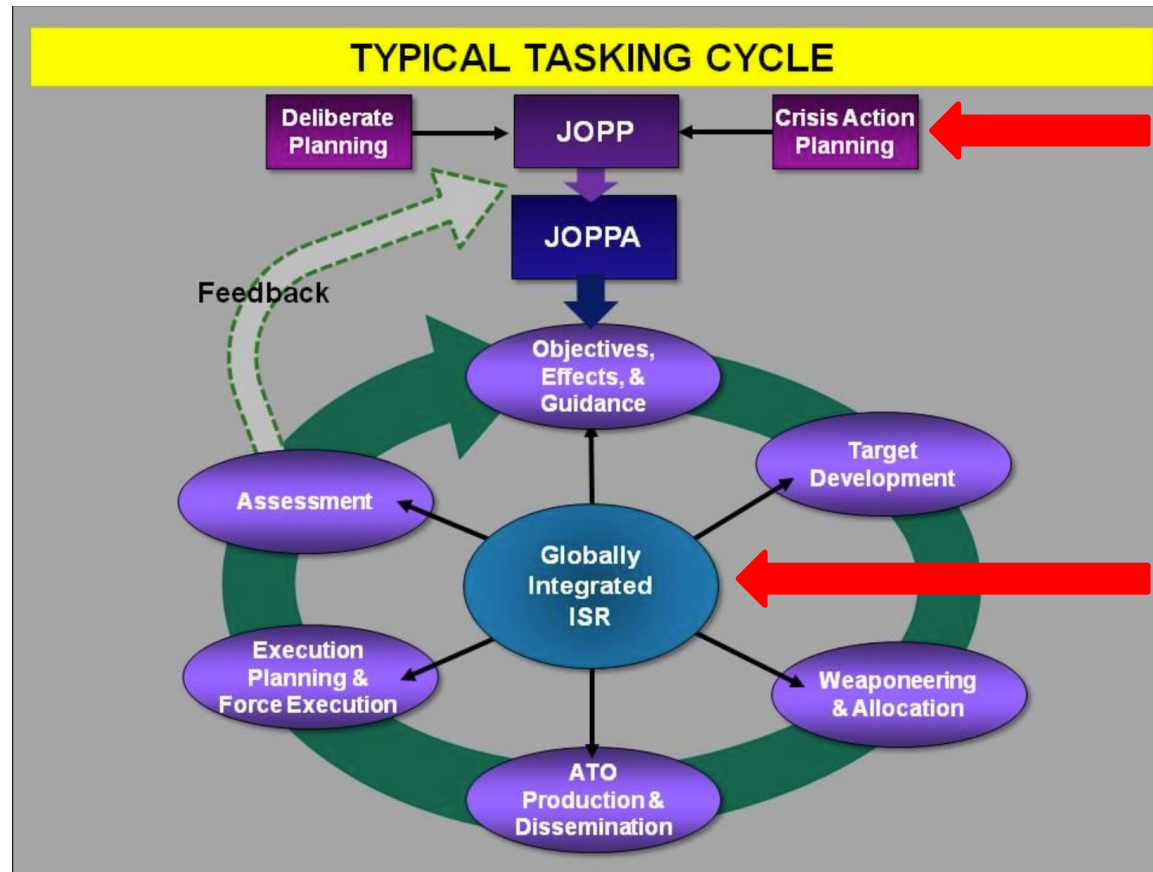
JOPPA Planning Cycle



Notional:
Doesn't Exist
Today But
Desired End
State



JOPPA Planning Cycle



Dynamic Targeting:
Command Entry
Point

Notional:
Doesn't Exist
Today But
Desired End
State



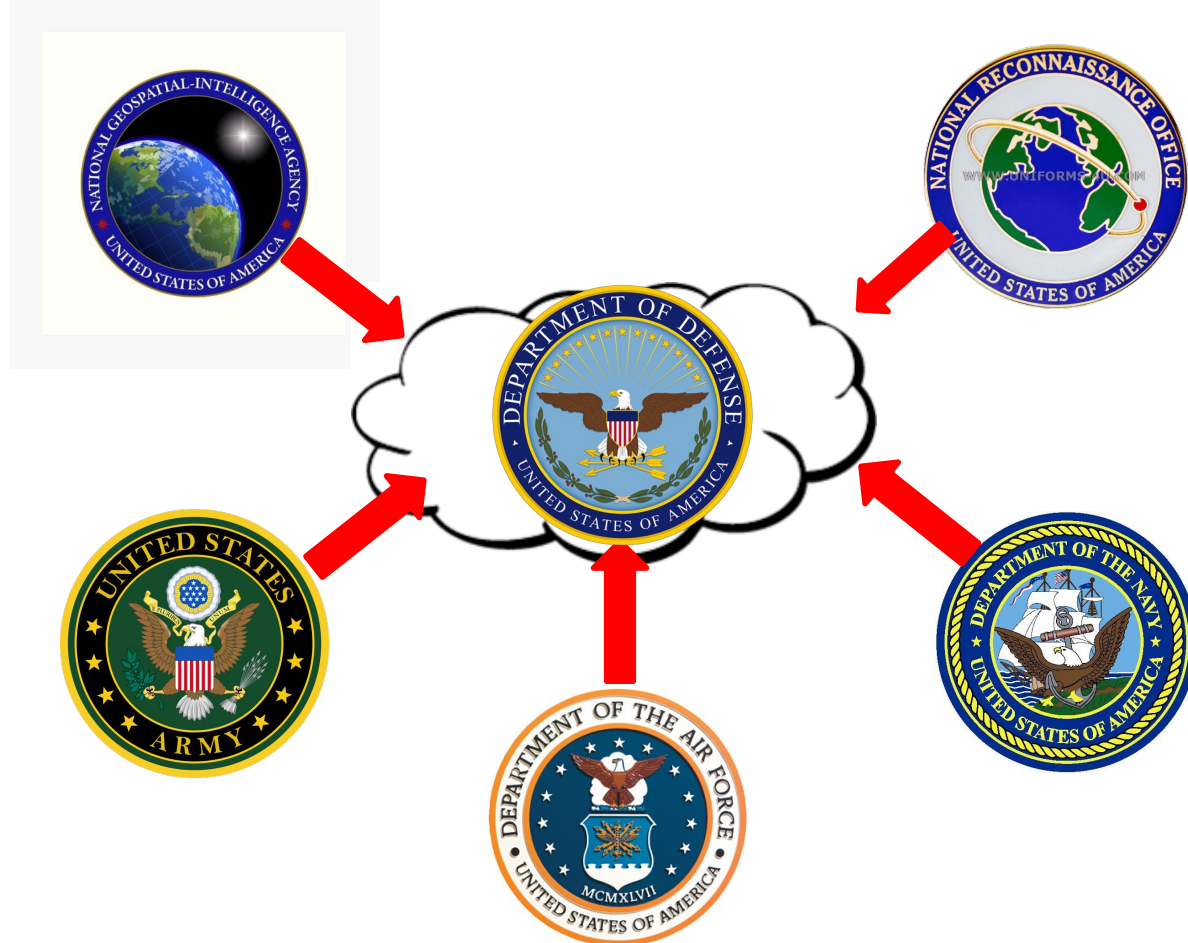
JOPPA Planning Cycle

Globally Integrated ISR At the Nexus of Deliberate and Dynamic Mission

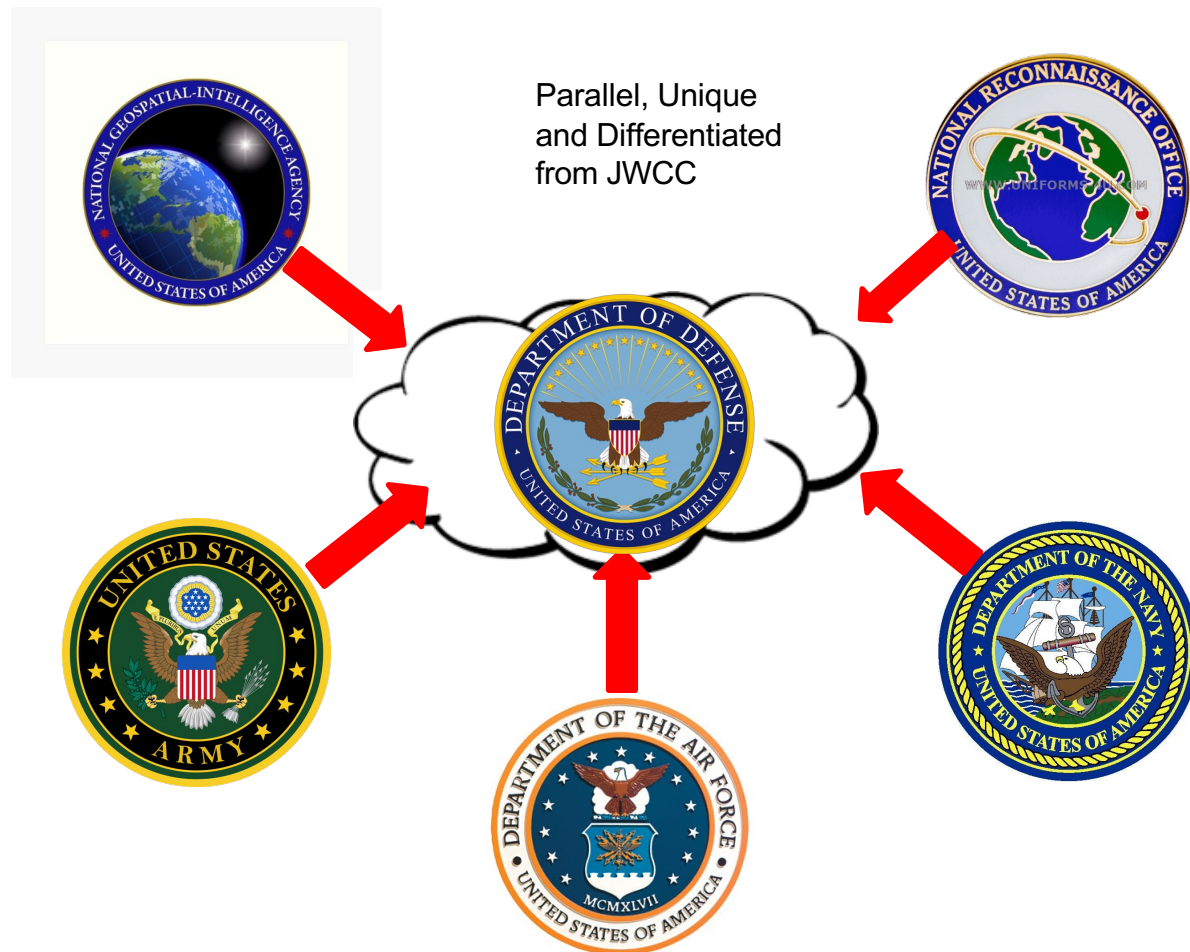


JOPPA Planning Cycle

Globally Integrated ISR At the Nexus of Deliberate and Dynamic Mission



DoD ISR Cloud Of Federated Data



COOP and PACE of ISR Data



1. Outsourced clouds: Single Points of Failure?
2. Outsourced clouds: Add'l attack surface?
3. Outsourced clouds: One ring to rule them all?



COOP and PACE of ISR Data



1. Outsourced clouds: Single Points of Failure?
 2. Outsourced clouds: Add'l attack surface?
 3. Outsourced clouds: One ring to rule them all?
-
1. Migration: Migrate to DoD Cloud First?
 2. Migration: Interoperable between hyperscalers?
 3. Migration: Cost of exfiltration of data, to share or otherwise?



COOP and PACE of ISR Data



1. Outsourced clouds: Single Points of Failure?
 2. Outsourced clouds: Add'l attack surface?
 3. Outsourced clouds: One ring to rule them all?
-
1. Migration: Migrate to DoD Cloud First?
 2. Migration: Interoperable between hyperscalers?
 3. Migration: Cost of exfiltration of data, to share or otherwise?
-
1. Federation: Provision for Coalition Access?
 2. Federation: How do you fire a cloud provider?
 3. Federation: Are new cloud capes options limited?



COOP and PACE of ISR Data

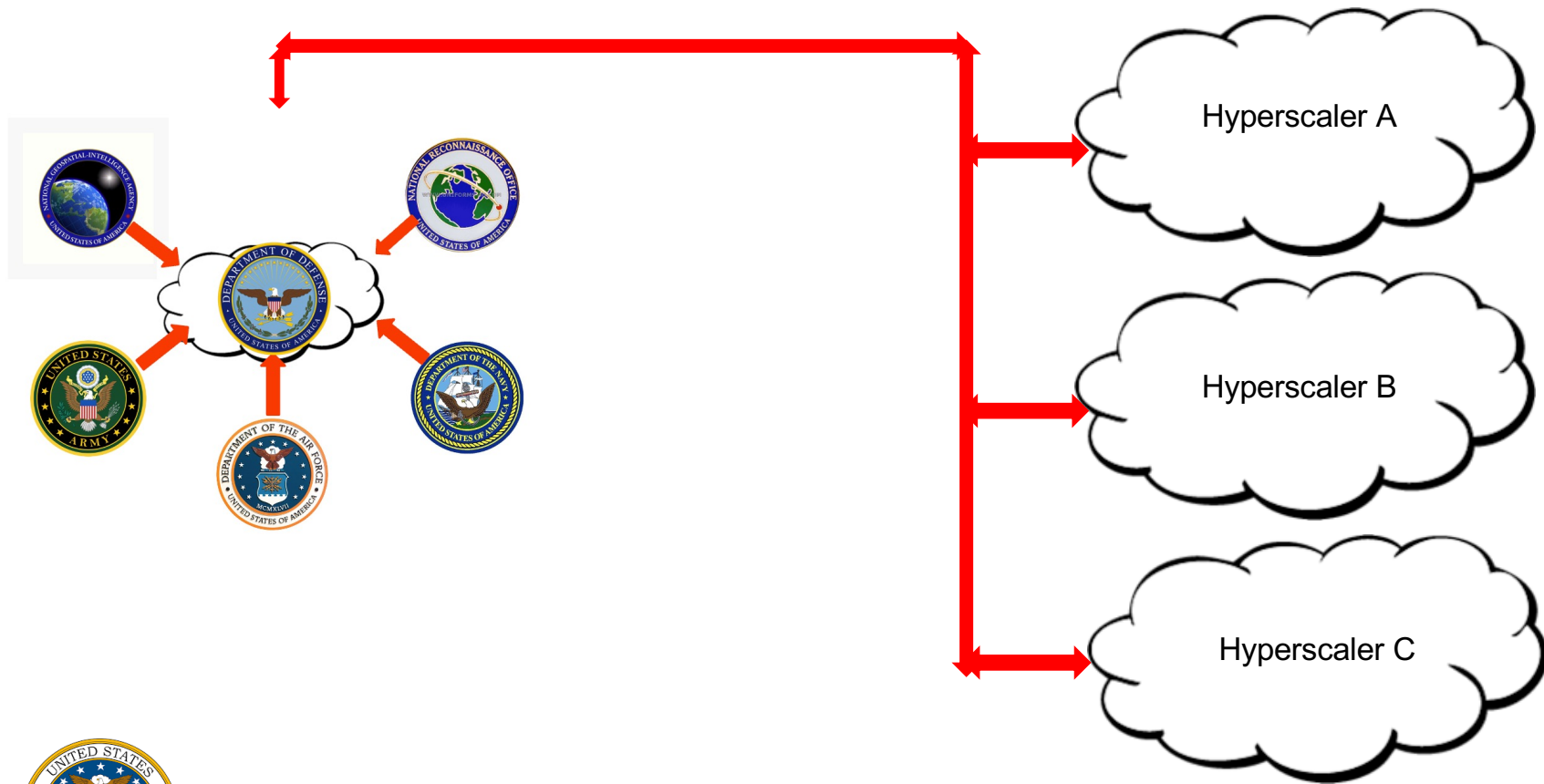


1. Outsourced clouds: Single Points of Failure?
 2. Outsourced clouds: Add'l attack surface?
 3. Outsourced clouds: One ring to rule them all?
-
1. Migration: Migrate to DoD Cloud First?
 2. Migration: Interoperable between hyperscalers?
 3. Migration: Cost of exfiltration of data, to share or otherwise?
-
1. Federation: Provision for Coalition Access?
 2. Federation: How do you fire a cloud provider?
 3. Federation: Are new cloud capes options limited?
-
1. Edge node: Interoperable with other providers?
 2. Edge node: Is the box proprietary?

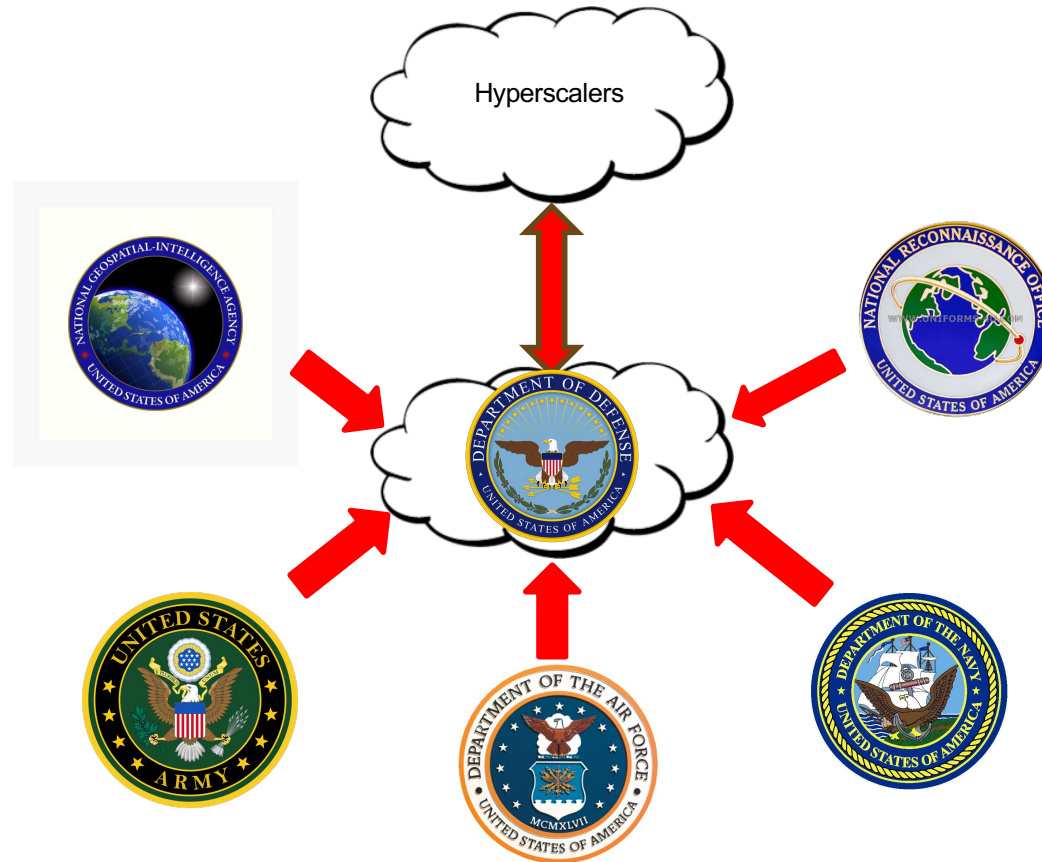
Of Course This Is Controversial



COOP and PACE of ISR Data

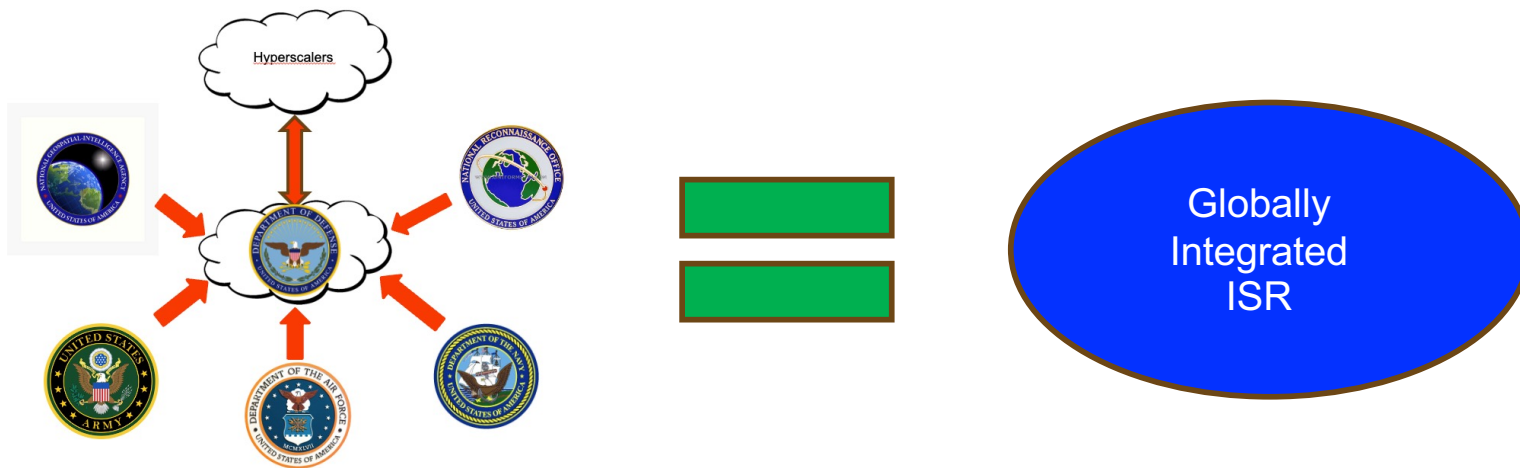


Hybrid Cloud Enhances COOP

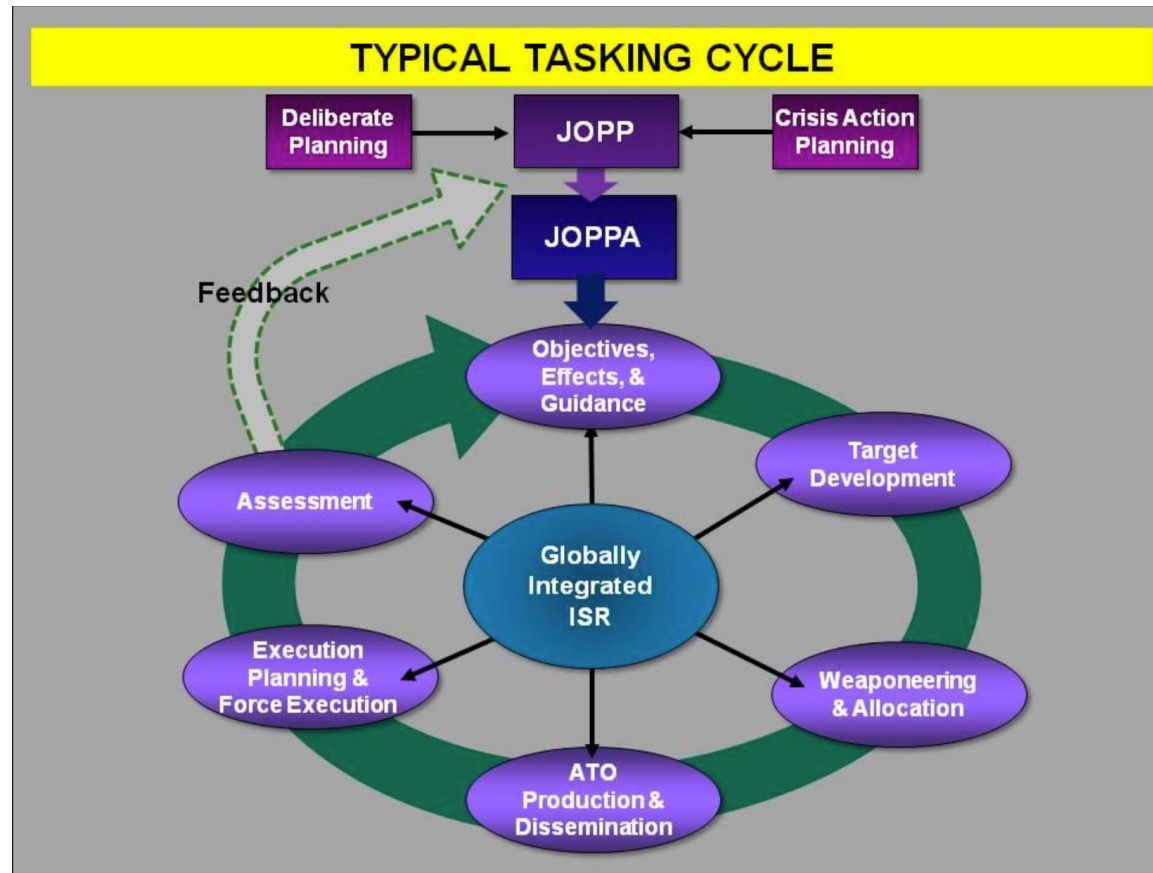


JOPPA Planning Cycle

Hybrid Cloud Environment Maps to Globally Integrated ISR

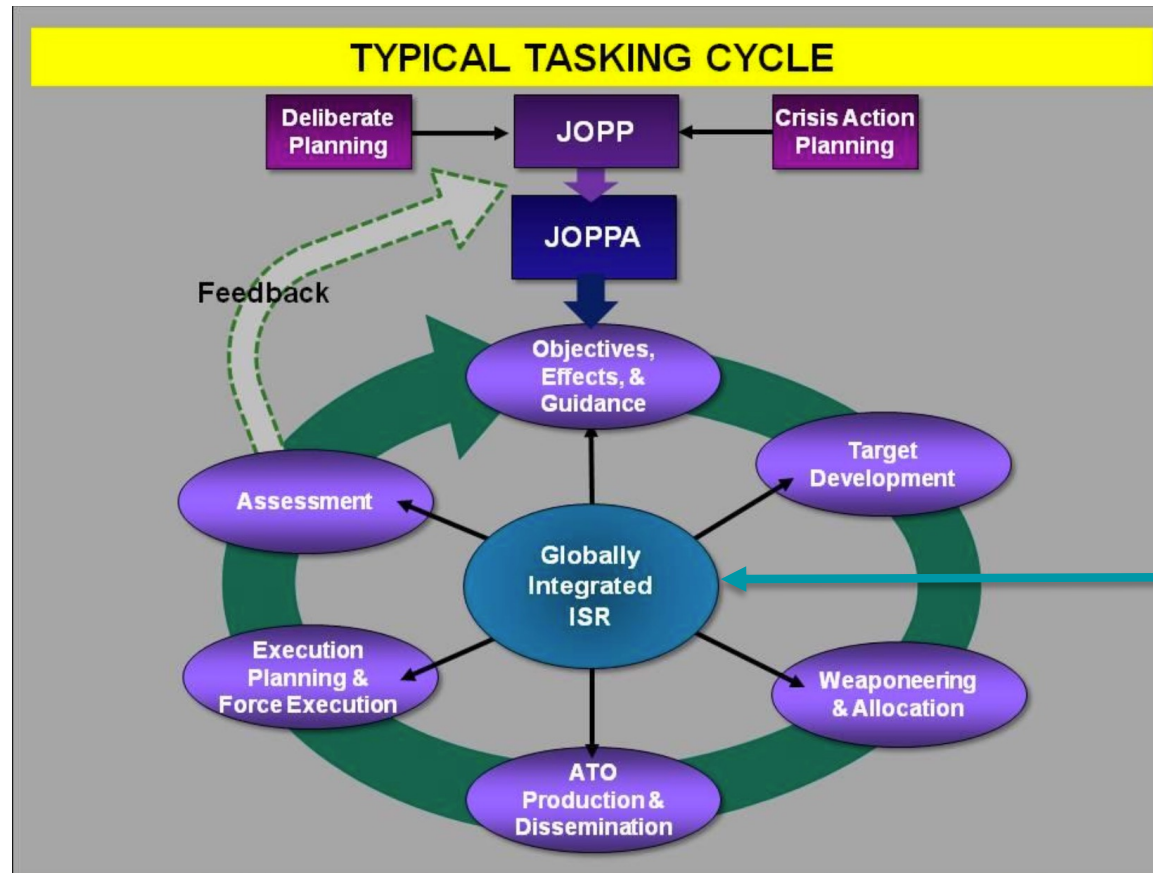


Hybrid Cloud Enhances JOPPA Planning Cycle



Hybrid Cloud Enhances JOPPA Planning Cycle

Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)



RED HAT
OPENSIFT
Container Platform

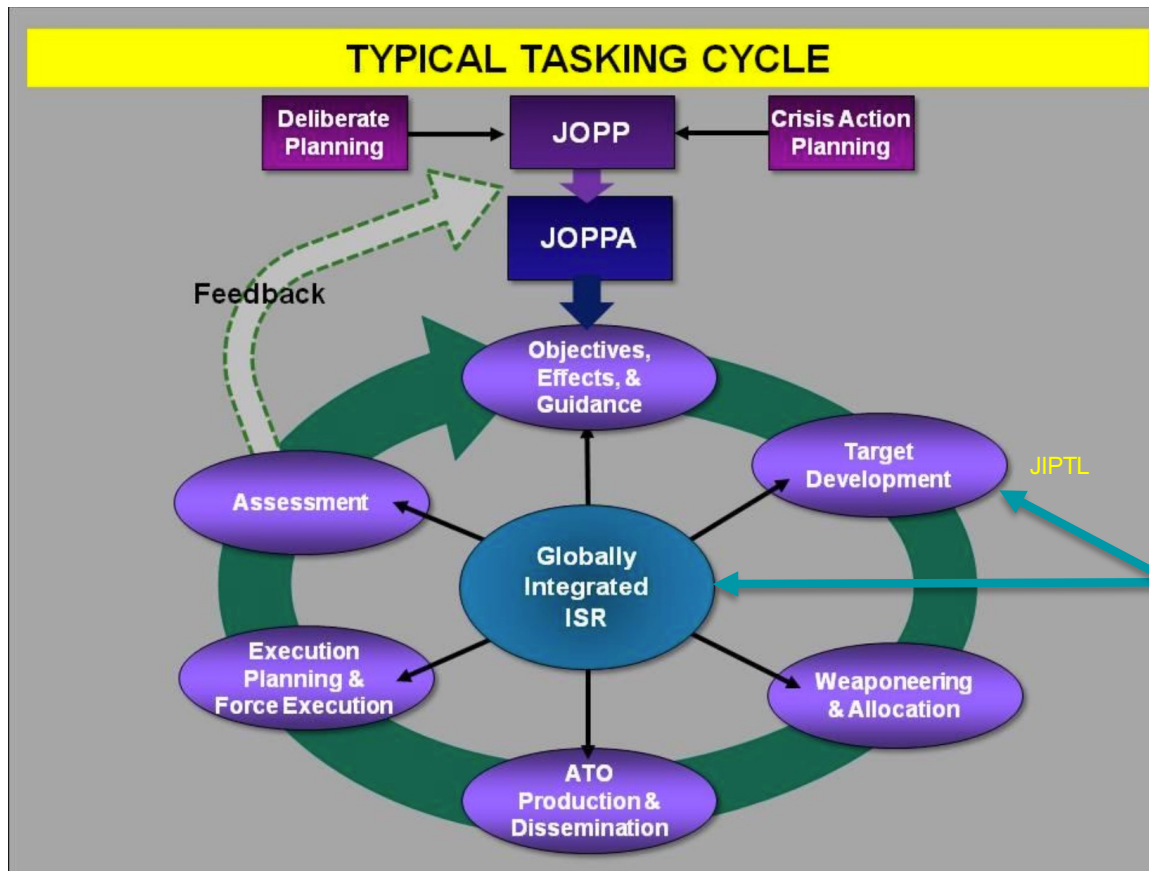
Red Hat



Hybrid Cloud Enhances JOPPA Planning Cycle

Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD



RED HAT
OPENSIFT
Container Platform

Red Hat

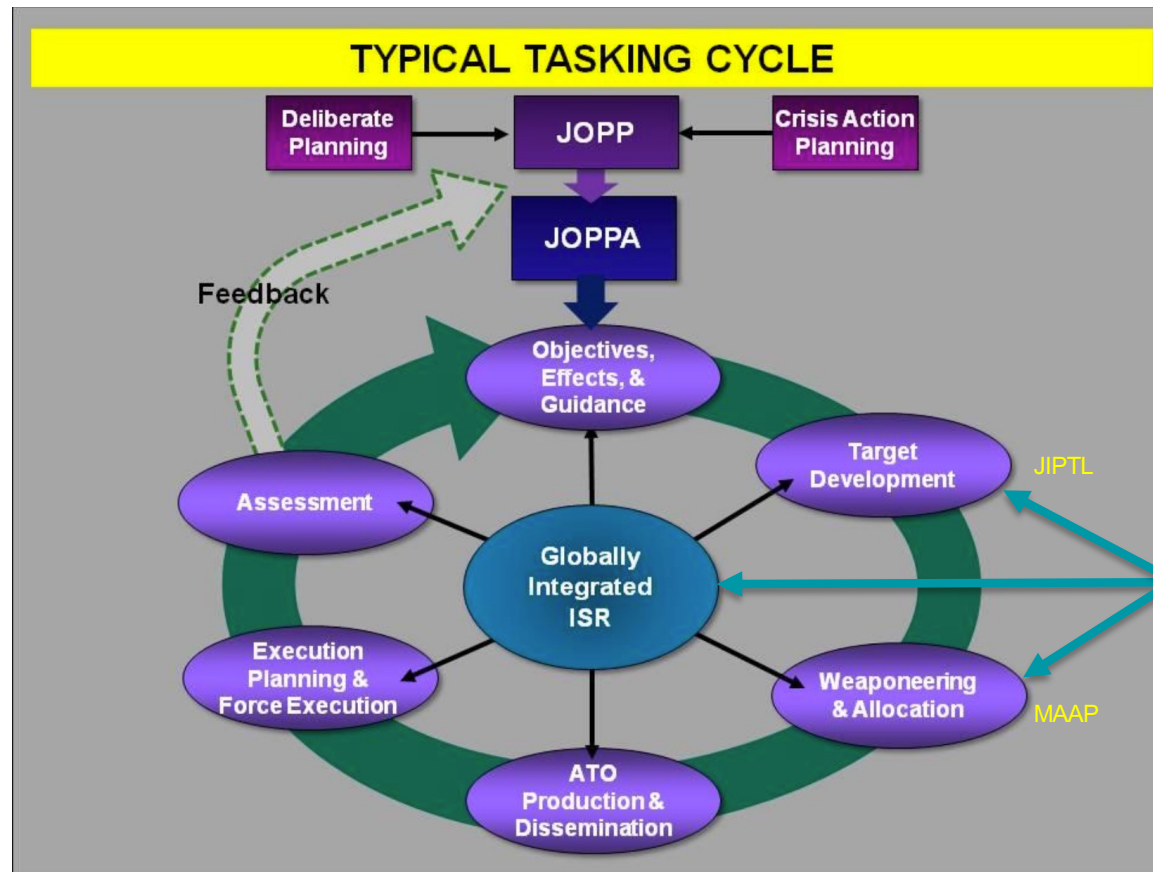


Hybrid Cloud Enhances JOPPA Planning Cycle

Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability



RED HAT
OPENSIFT
Container Platform

Red Hat



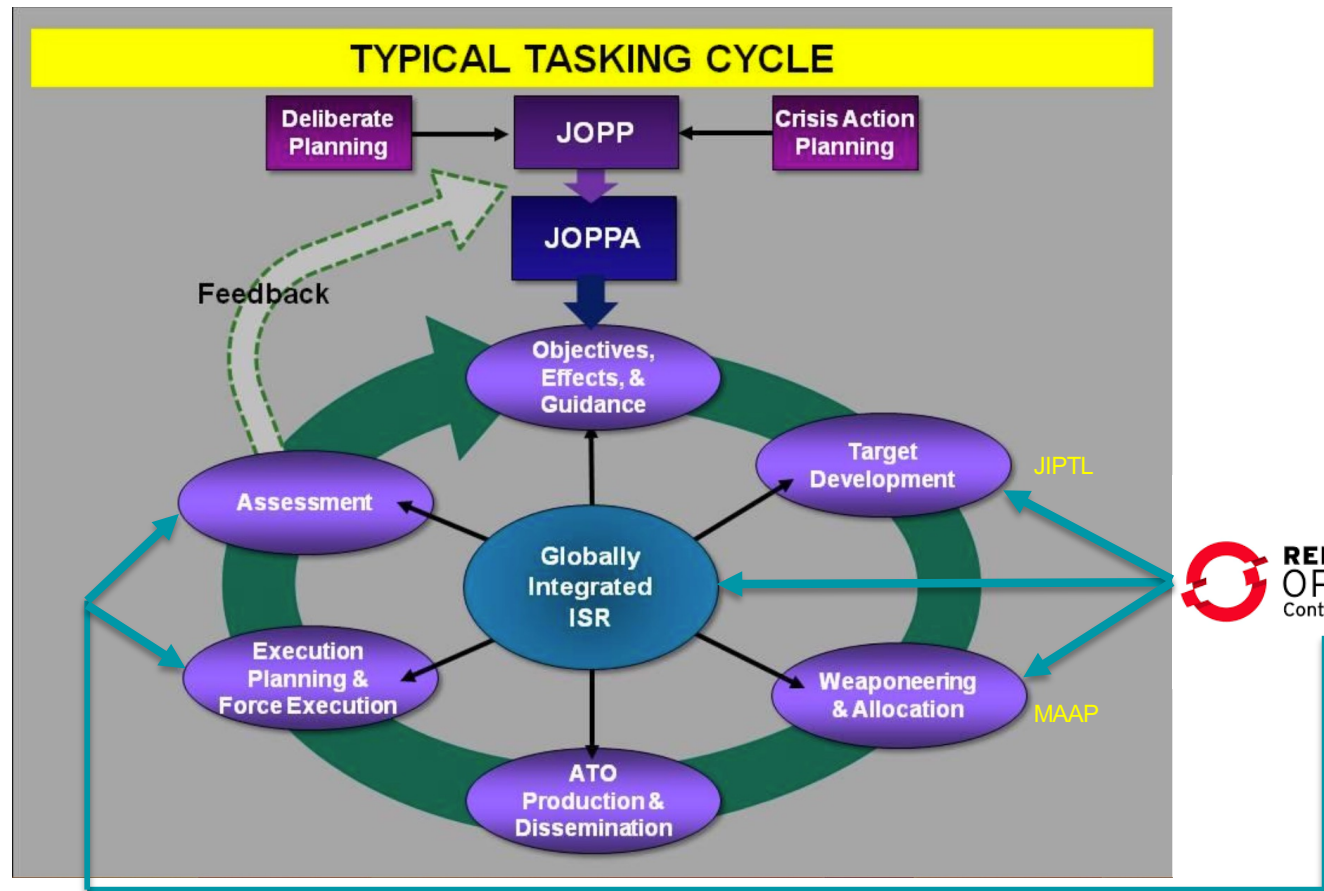
Hybrid Cloud Enhances JOPPA Planning Cycle

Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability

Captures Dynamic Updates During Execution and Assessment



RED HAT
OPENSIFT
Container Platform

Red Hat



Hybrid Cloud Enhances JOPPA Planning Cycle

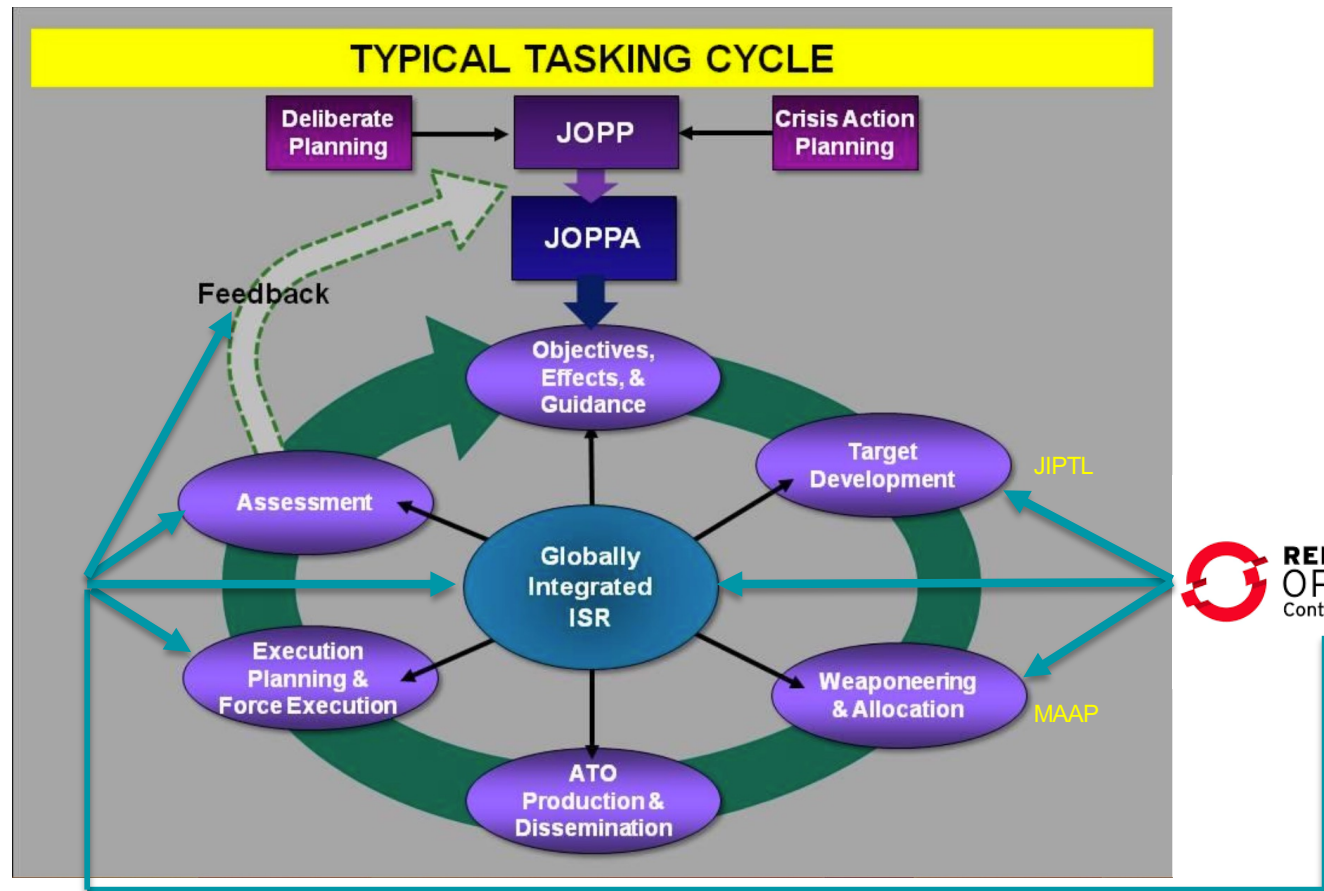
Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability

Captures Dynamic Updates During Execution and Assessment

Shares Assessment Data Back To ISR Function And To Assess Success Of Commander's Intent for ATO



Hybrid Cloud Enhances JOPPA Planning Cycle

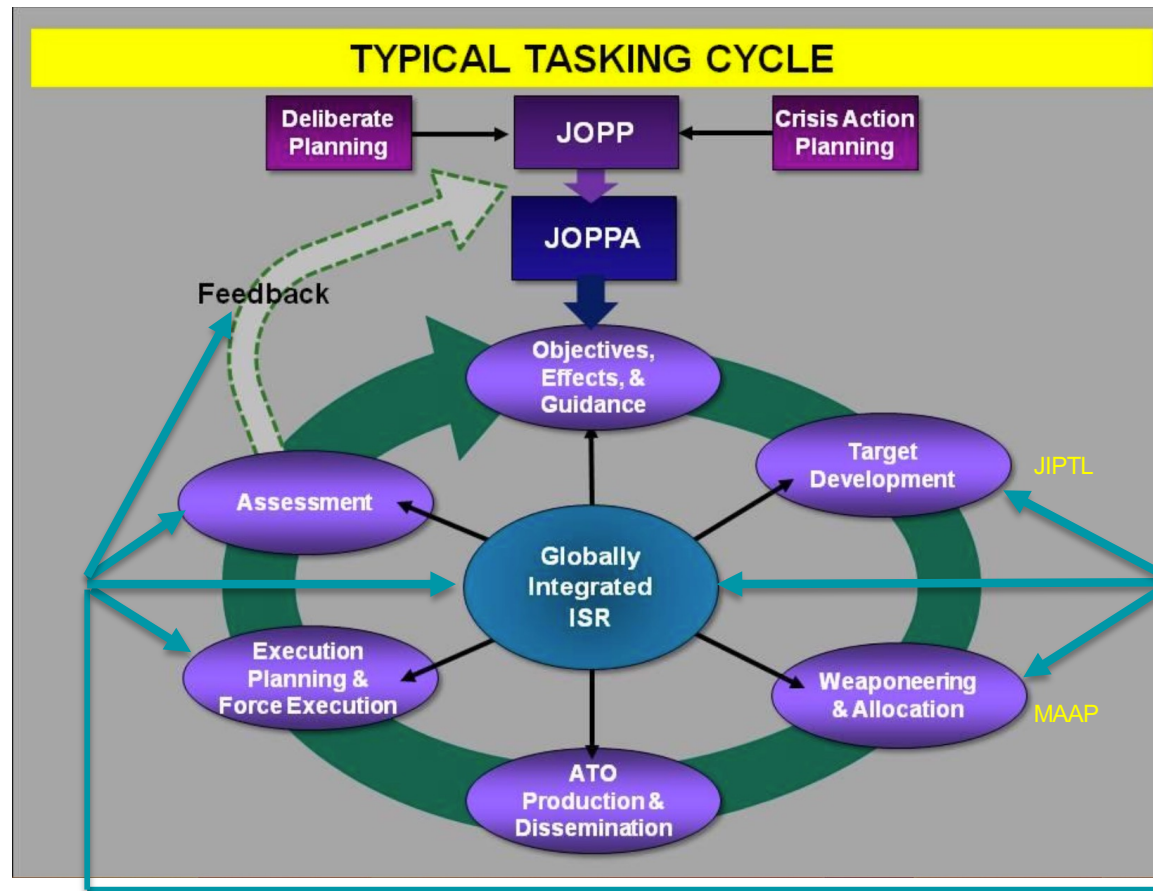
Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability

Captures Dynamic Updates During Execution and Assessment

Shares Assessment Data Back To ISR Function And To Assess Success Of Commander's Intent for ATO



Platform Facilitates Global Joint and Coalition Fight With Mission Partners Via Multicloud Integration



RED HAT
OPENSIFT
Container Platform

Red Hat



Deliberate Targeting Cycle Move To Dynamic

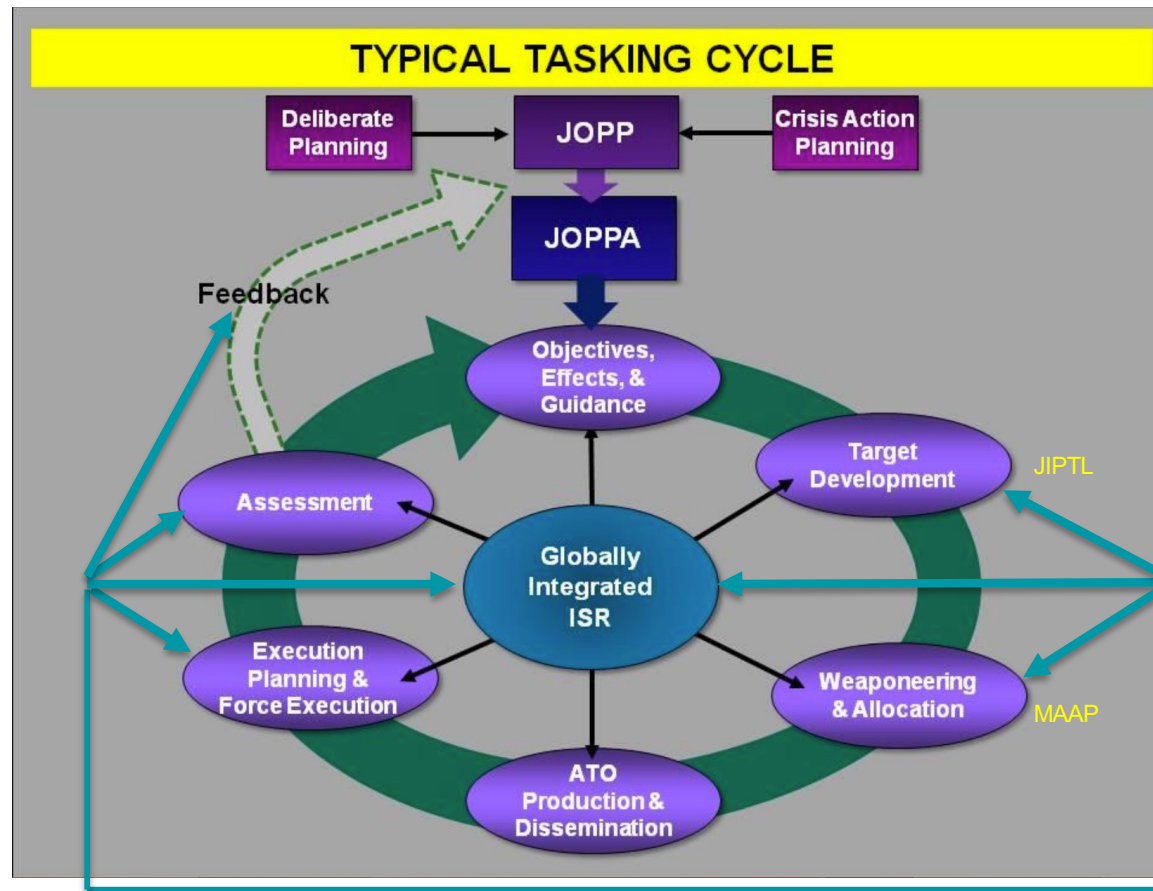
Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability

Captures Dynamic Updates During Execution and Assessment

Shares Assessment Data Back To ISR Function And To Assess Success Of Commander's Intent for ATO



Platform Facilitates Global Joint and Coalition Fight With Mission Partners Via Multicloud Integration



RED HAT
OPENS SHIFT
Container Platform

Red Hat



Move From Deliberate To Dynamic Targeting

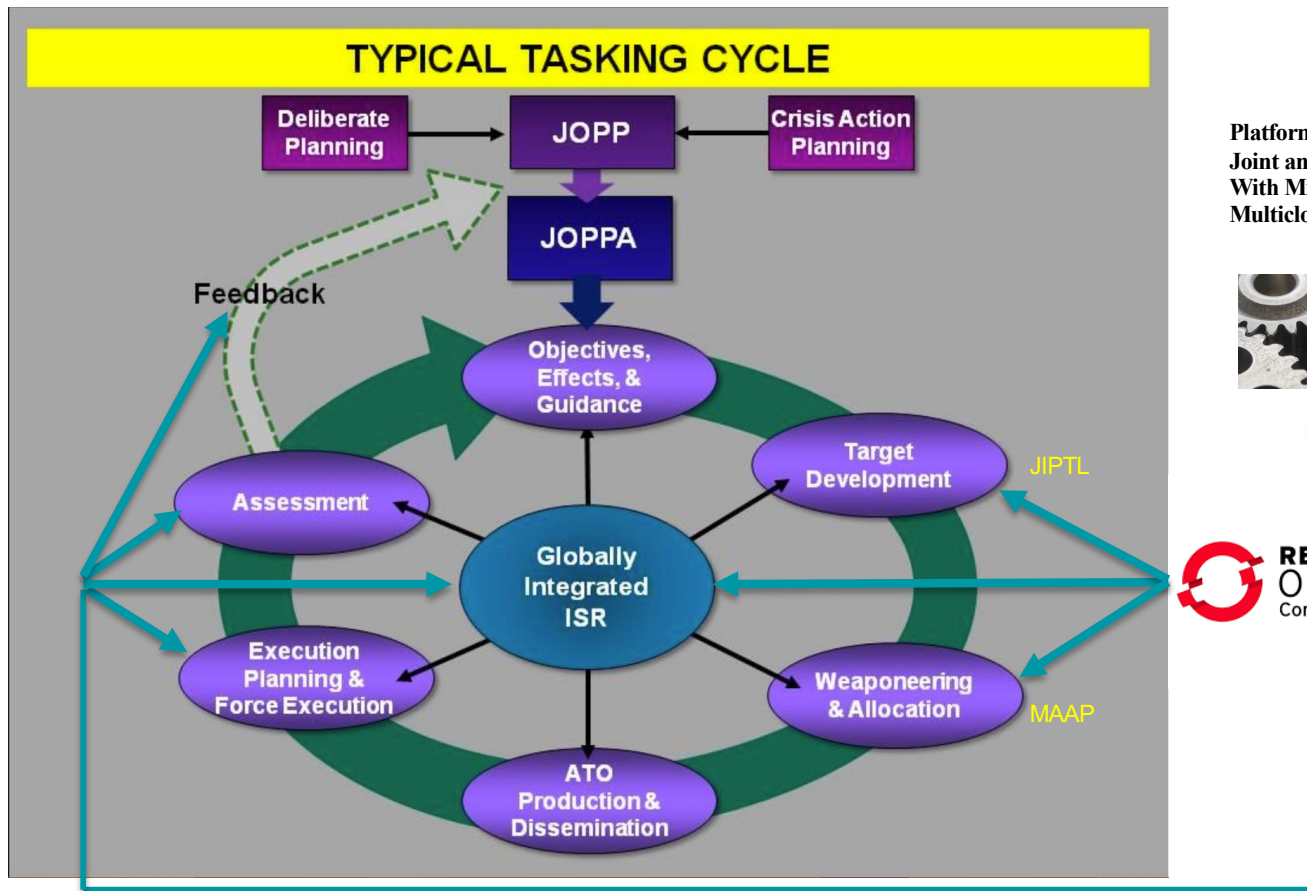
Orchestrates legacy and new applications across disparate clouds (DCGS/NGA/NRO/Other)

Feeds Target Processes from curated ISR Data inside the AOC via ISRD

Facilitates Enhanced Data Dynamically during Major Air Attack Planning, either fused with ISR for AI/ML or as a stand alone capability

Captures Dynamic Updates During Execution and Assessment

Shares Assessment Data Back To ISR Function And To Assess Success Of Commander's Intent for ATO



Platform Facilitates Global Joint and Coalition Fight With Mission Partners Via Multicloud Integration



RED HAT
OPENS SHIFT
Container Platform



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target
2. Sensor Informs Shooter

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target
2. Sensor Informs Shooter
3. Right Platform

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target
2. Sensor Informs Shooter
3. Right Platform
4. Right Weapon

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target
2. Sensor Informs Shooter
3. Right Platform
4. Right Weapon
5. Husbandry of Blue Force Options

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



One ISR Source of Truth Maximizes Scarce Resources



21.95N, 123.32W
Bearing 320
04/1930Z



21.02N, 121.12W
Bearing 323
04/1923Z



1. Distill Every Track to Target
2. Sensor Informs Shooter
3. Right Platform
4. Right Weapon
5. Husbandry of Blue Force Options
6. For Time and Decision Dominance

22.55N, 125.32W
Bearing 311
04/1955Z



20.15N, 118.32W
Bearing 327
04/1919Z



Summary



The creation of a common DoD ISR domain is essential to accelerating the mean time to sense, make sense and act, with greater data fidelity. This data domain gains resilience by leveraging private and public cloud environments holistically. Dynamic Targeting is enhanced by ubiquitous access to ISR Data, access hardened by a hybrid cloud approach.

A common ISR domain should not be limited to DoD and Title 50 transport domains. Consider building Black Core pass through with optional SCIFs at commercial satellite service delivery points.



Questions and Discussion



Thank You!

