

Integrated Space Command and Control (ISC2)



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3-5 March 1999**

Outline

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- **NORAD USSPACECOM Warfighter Support System (N/UWSS) Initiative**
- **Architecture initiatives**
- **Impact of evolving standards**
- **Defining and managing architectures**

N/UWSS Scope

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N/UWSS: Future BM/C2 Functions and Systems for NORAD/USSPACECOM Mission Areas

N/UWSS Mission Scope

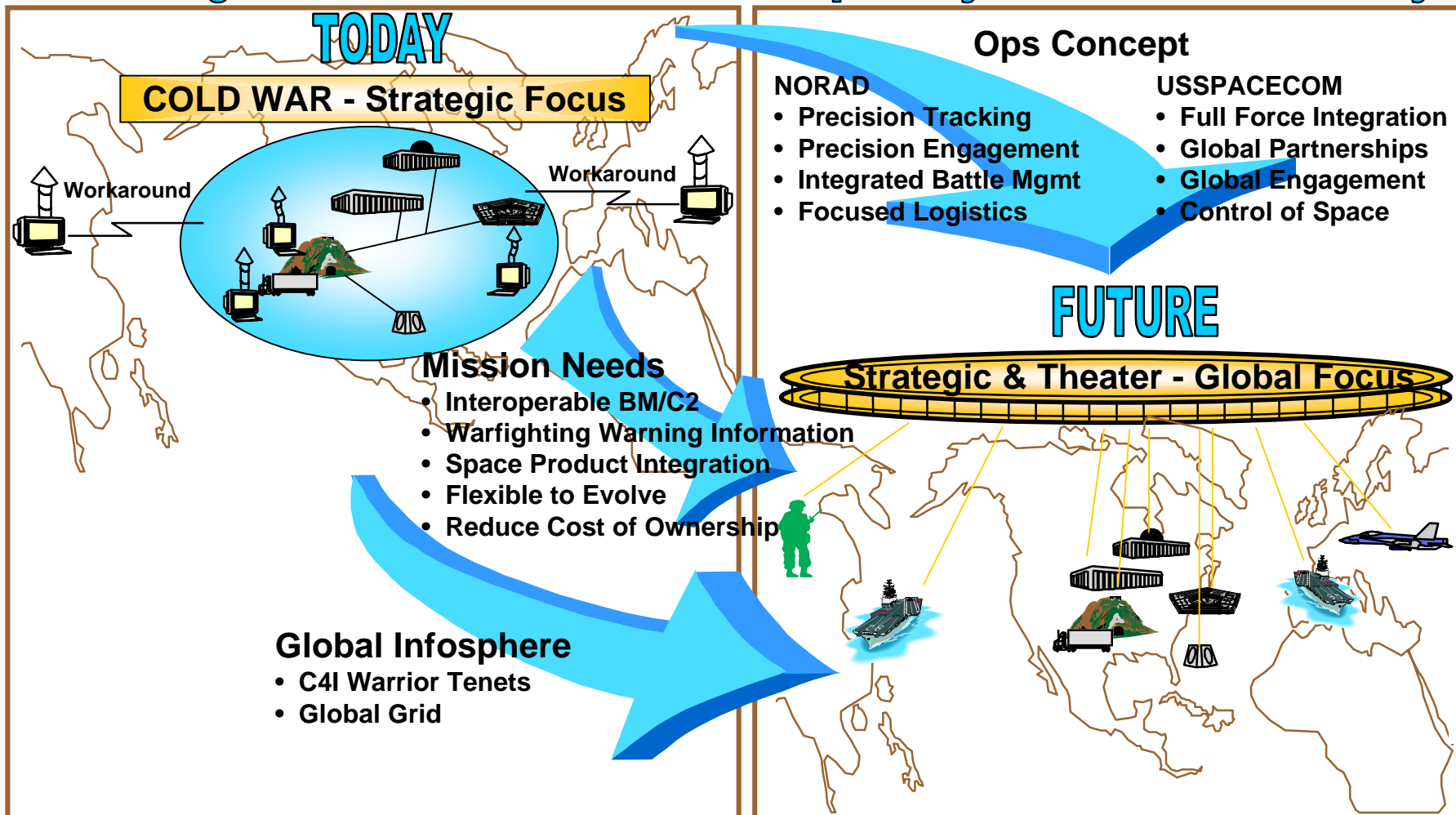
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- **Command and Control for**
 - **Strategic Missile Warning**
 - **Air Defense and Warning**
 - **National Missile Defense**
 - **Space Control**
 - **Space Support**
 - **Space Force Enhancement**
 - **Space Force Application**
 - **Information Operations**

N/UWSS Thrust

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Evolving NORAD/USSPACECOM C2 Capability into the 21st Century



N/UWSS Content

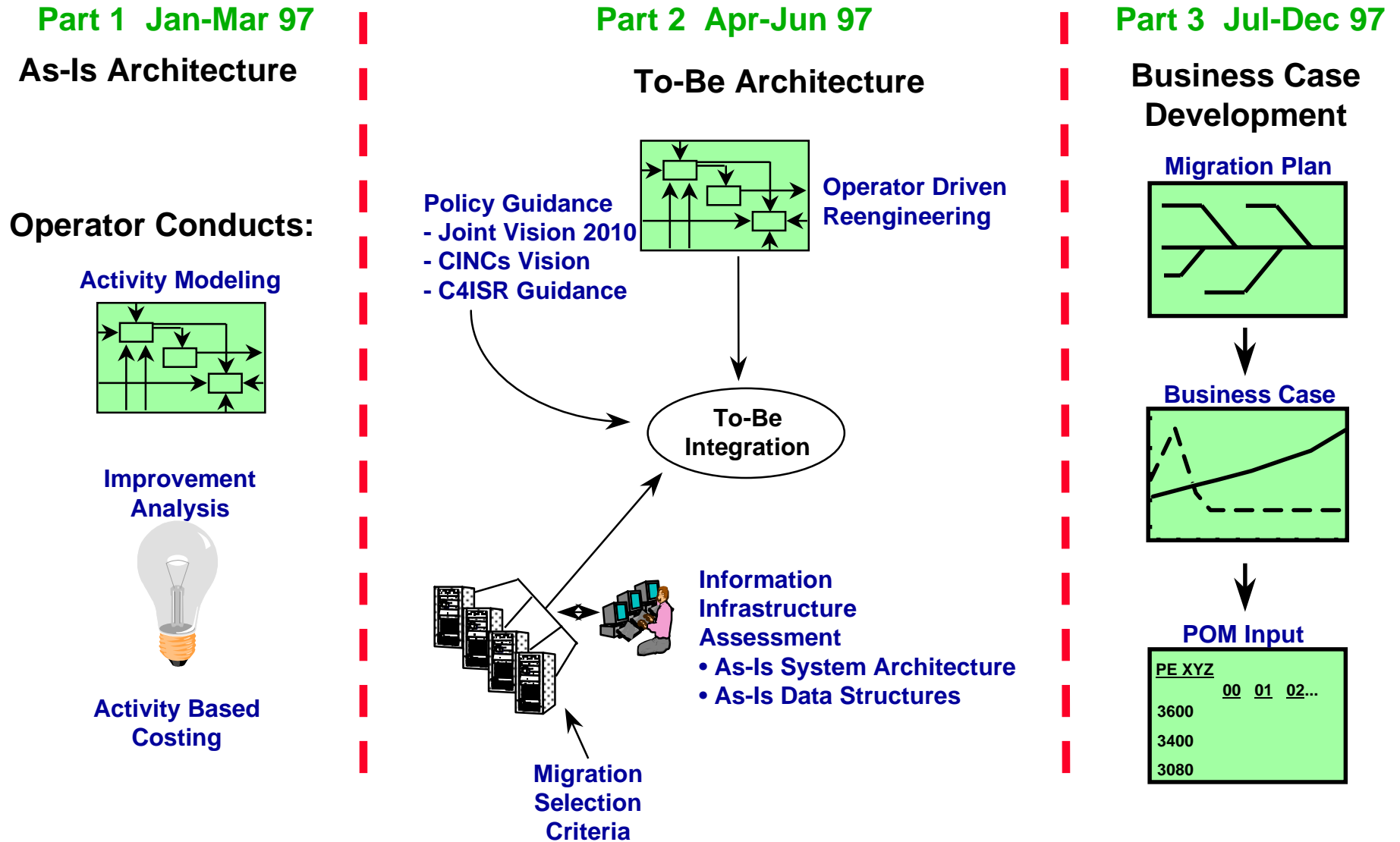
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- **Strategic Warning & North American Defense**
 - **Migrate existing warning & NORAD C2 systems**
 - Enable global information availability/interoperability
 - Align with joint C2 doctrine
 - Address sustainment problems
 - Evolve to DII COE/GCCS based infrastructure
 - NORAD/USSPACECOM COP
 - **Integrate expanding mission responsibilities**
 - Global Space Battle Management C2
 - Single Focal Point for Space
 - Global Space Partners Integration
 - Incorporate National Missile Defense C2
 - Information Operations
- **Theater support & integration**
 - **Add new space C2 capabilities**
 - Integrate emerging capabilities to effective ops tools
 - Leverage off-the-shelf capabilities**
 - Add new C2 decision support**
 - Improve collaborative (vertical & horizontal) planning**
 - Align with Joint Doctrine**
 - Enable theater space information integration

N/UWSS Process

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The Path to N/UWSS Business Case and POM Input



Architecture Initiatives

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- **N/UWSS Operational Architecture Development**
 - Approach
 - Products
 - Architecture evaluation
- **Space Battle Manager Core System (SBMCS)**
- **Migration of Space Architecture**
- **Shared Early Warning**

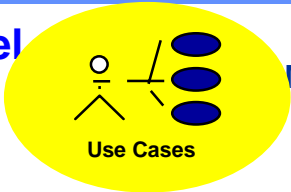
Architecture Approach

Path 1: Top-down
To Be Requirements
(Vision)



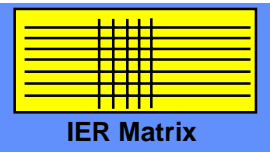
Activity Model

Operational Architecture

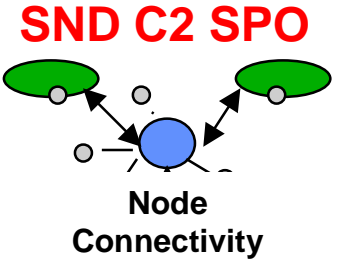


Use Cases

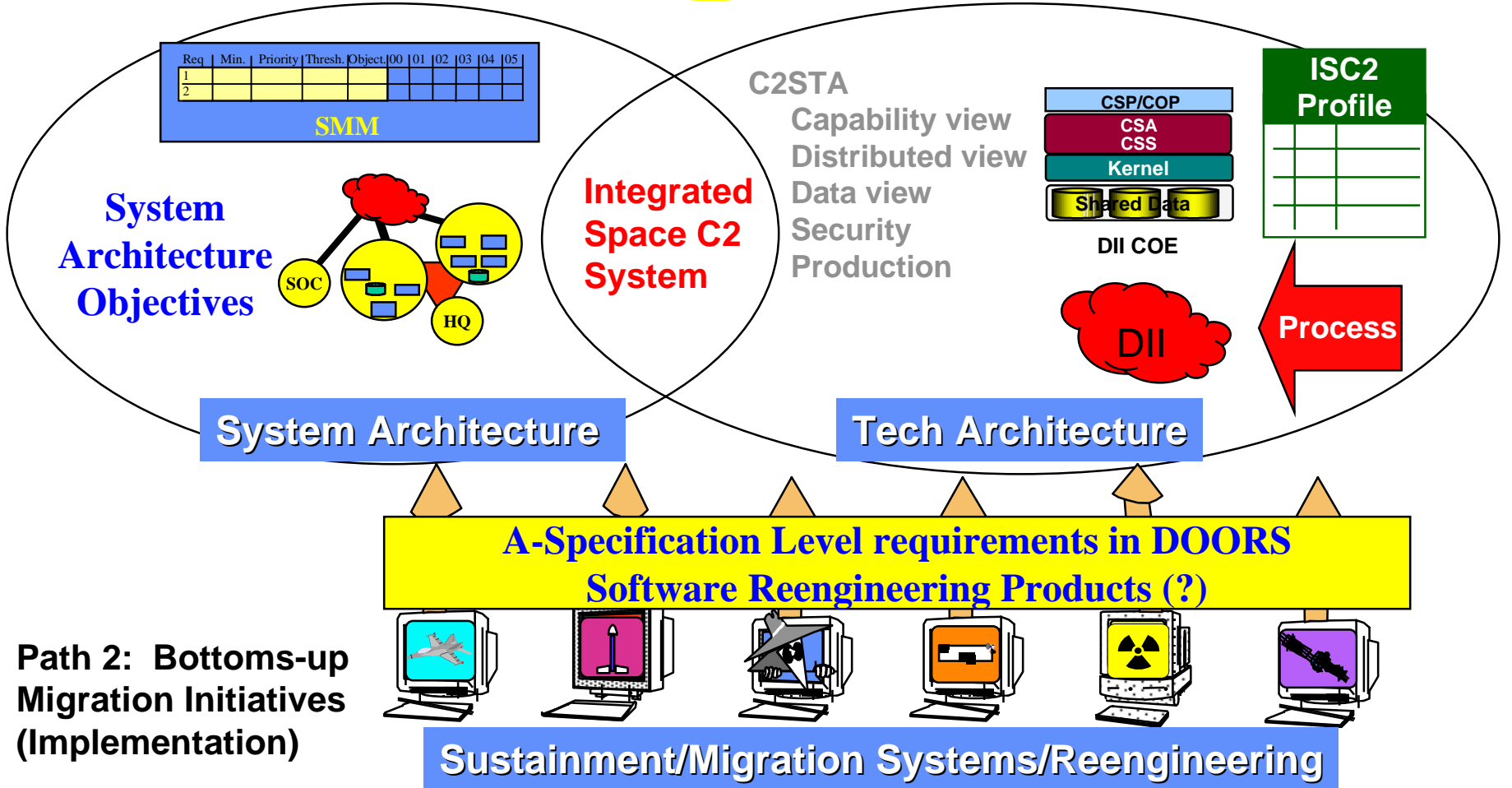
New Missions



IER Matrix



Node Connectivity

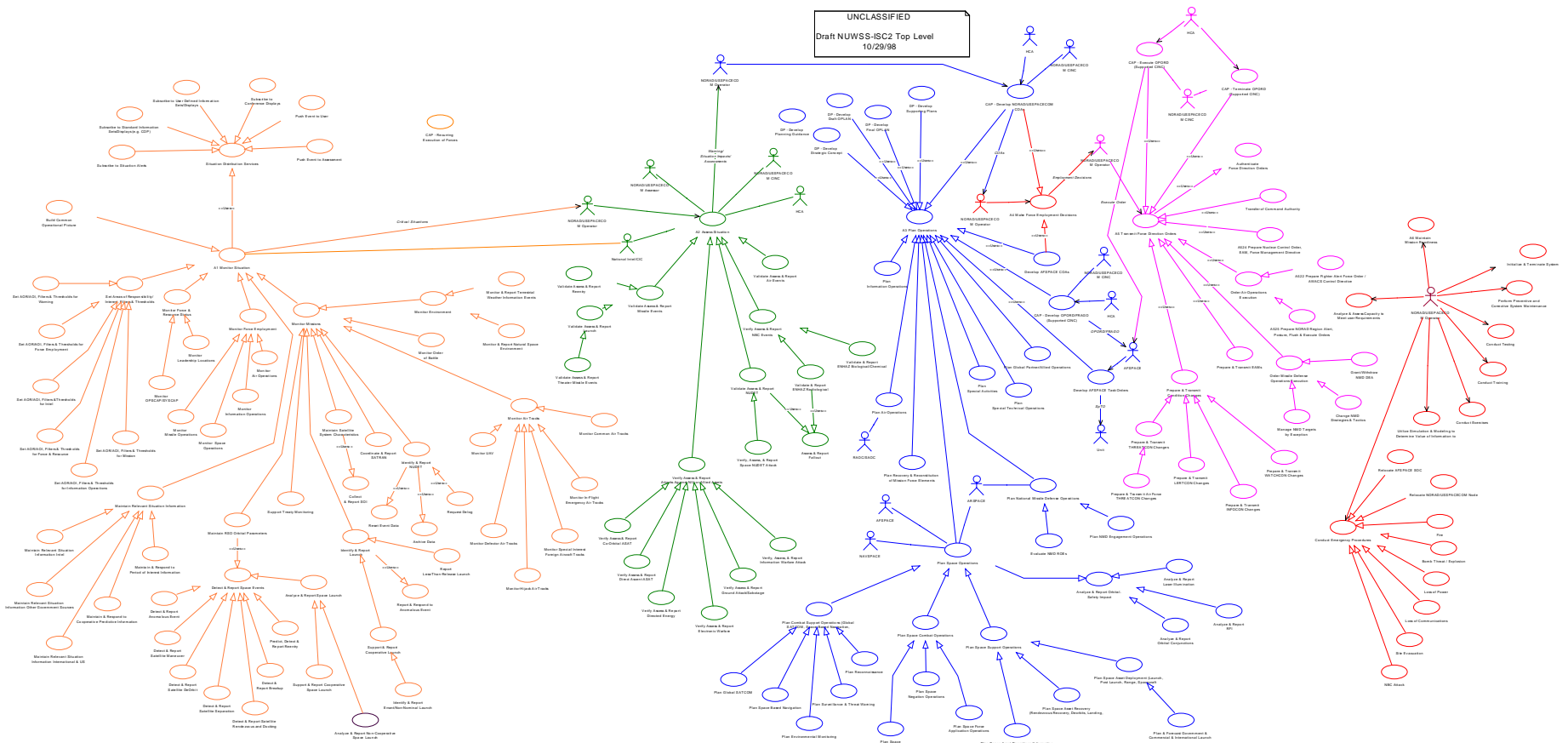


Path 2: Bottoms-up
Migration Initiatives
(Implementation)

Top Level Use Case Model

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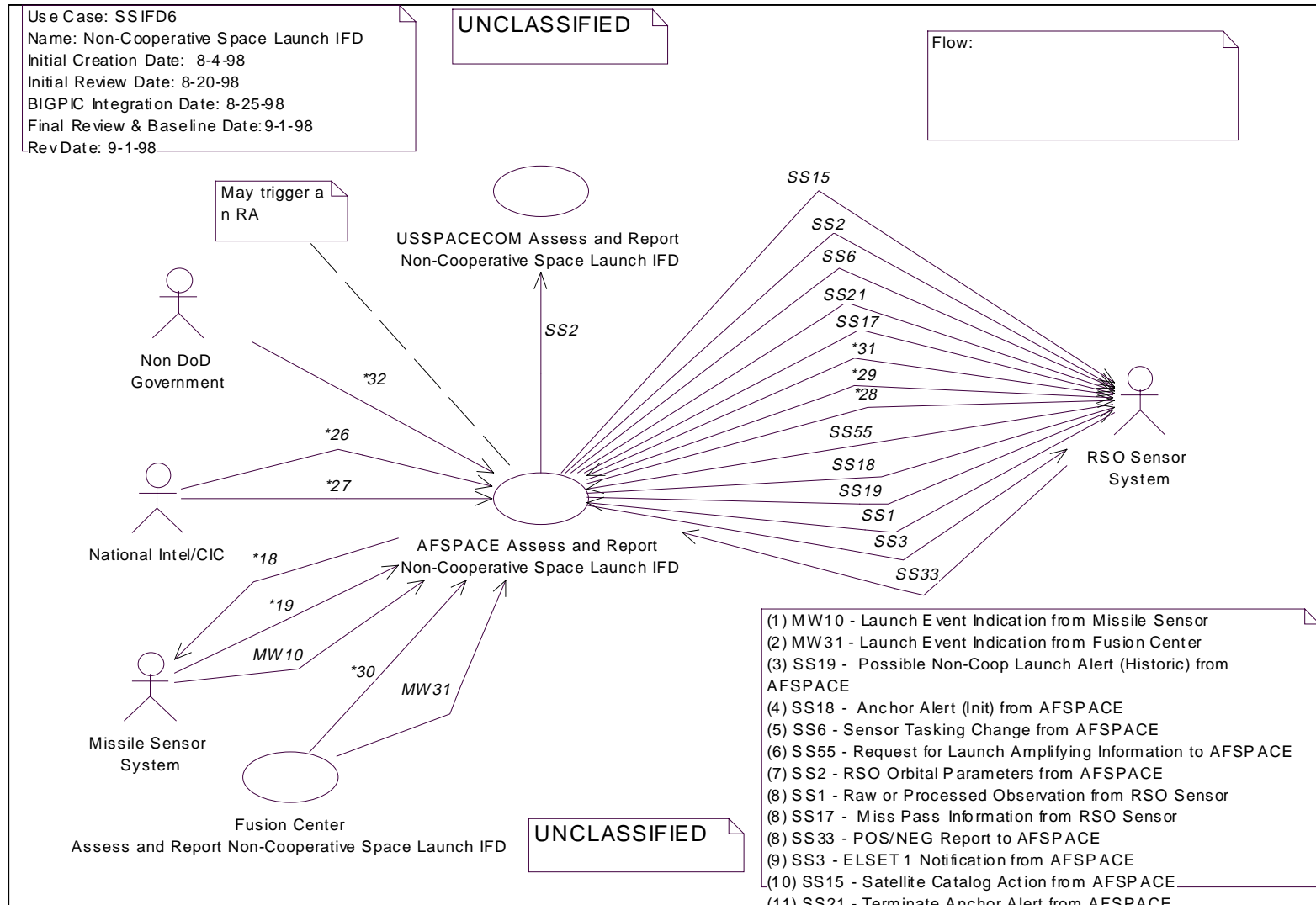
Use Case Model



N/UWSS NCD Example

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Assess & Report Non-Cooperative Space Launch



Operational Architecture Modeling Issues

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- **Many options for the modeling approach**
 - start with subsystems
 - start by extending from the top C2 functions
 - break out by mission domains
- **Key considerations**
 - must be understandable to mission users
 - must lend itself to further modeling to support system architecture and code generation

N/UWSS IER Example

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Operational Architecture Repository - [IERCoreDataTbl]

IER FORM IER Classification Level: **Unclassified**

Filter: [] Modified Since Reading Room: [No] Built By Dacom

IN146 Launch Assessment (Preliminary) from NORAD/USSPACEC

IER Purpose	Supports the CINC's Space Operations and Warning missions by providing timely assessments of space and missile launch events.	Producing Node(s)	NORAD/USSPACECOM
IER Content	Includes event time, location, type, azimuth or inclination, vehicle type, and preliminary mission and/or payload type. May also include orbital elements.		
IER Timeliness		Consuming Node(s)	AFSPACE
IER Timeliness Description	Immediate		COMBATANT COMMAND
IER Reliability	99.9%		HCA
IER Size	one page		NATIONAL_INTEL/CIC
IER Frequency	Approximately 10 per month (peacetime); multiple events per day (crisis/war).		NAVSPACE/ARSPACE
IER Potential Change	Increase anticipated through the year 2010.		NON_DOD_GOVERNMENT
IER Min Security Classification	Secret	IER Max Security Classification	Secret
IER Media Comments	Voice, electrical message, chatter		NORAD/USSPACECOM
IER Comment			
Link To Other IER's	Yes	Nature of Link	Contributing factor for IN144,150,148,154
Survivability Rqmt	Yes	Interoperability Rqmt	
IER Status:		IER Classification Comment:	

Close Find Associated NCDs Add Node [Left Arrow] [Right Arrow]

Start Exploring - Final FEA - Jun... Inbox - Microsoft Outlook Microsoft PowerPoint - [N... Operational Architect... 9:04 AM

ISC2 Architecture Evaluation

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- **Generate a framework for ongoing quantitative/qualitative analysis**
 - Evaluate proposals
 - Proposed system architectures
 - Architecture strategy with demonstration
 - Migration strategy and plan
 - Continue architecture evaluation throughout life cycle
- **Determine how well the proposed architecture supports specified quality attributes (requirements)**
- **Illuminate points in the architecture where:**
 - sensitivity to various attributes exists
 - quality attribute tradeoffs occur

Architecture Evaluation (concluded)

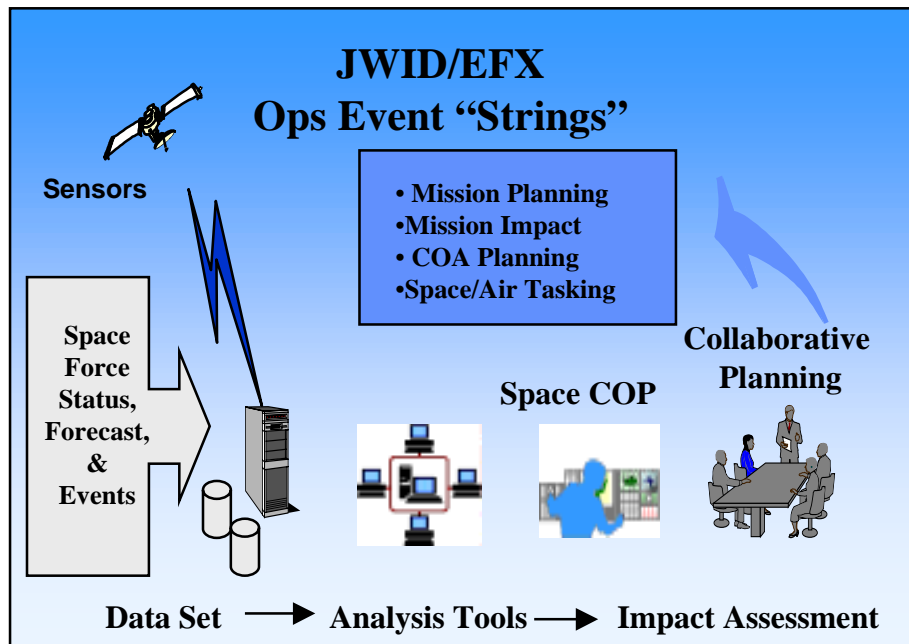
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Attributes Table

Architecture Attribute Category	Architecture Attribute	Rationale for Consideration	Architecture Artifact Used in Evaluation	Evaluation Method	Architecture Trades-off
Interoperability					
	Transparent access to space data (e.g., develop, manage and use a standard Data Access Interface with standard syntax for accessing data and metadata)	Automated access to space data for emerging space applications and for virtual command center concept. Allows Joint and Coalition interoperability			Security: May introduce security challenges (e.g., classified by aggregation)
	Transparent access to missile data	Allows Joint and Coalition interoperability			

Space Battle Management Core Systems (SBMCS)

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SBMCS Objectives:

- Provide space force status
 - Space surveillance (location) feed to Common Operational Picture
 - 2D-3D Satellite orbit visualization
 - Satellite system status (OPSCAP)
- Provide space event impact assessment to Joint Warfighter
 - GPS Navigational Accuracy
 - Solar environment Forecasts/Events
- Support collaborative planning for COA determination
- Produce Space Tasking Orders

Overview:

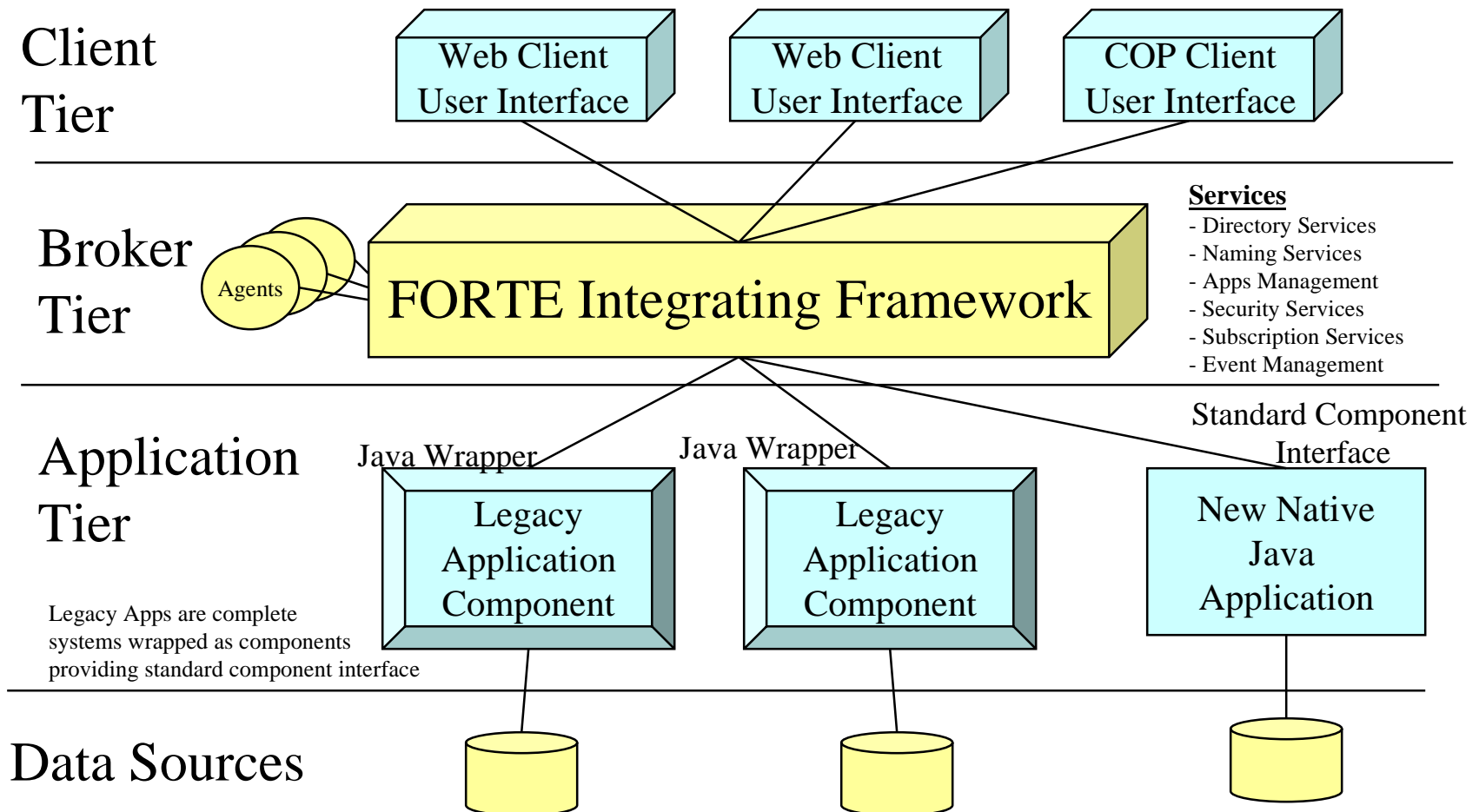
- Demo initial capability in JWID 99/EFX 99
- Transition current 14th AF SBM to future SBMCS
- Pathfinder for N/UWSS SBM requirements and architecture
- Capability to transition to ISC2 contract

Technology Initiatives:

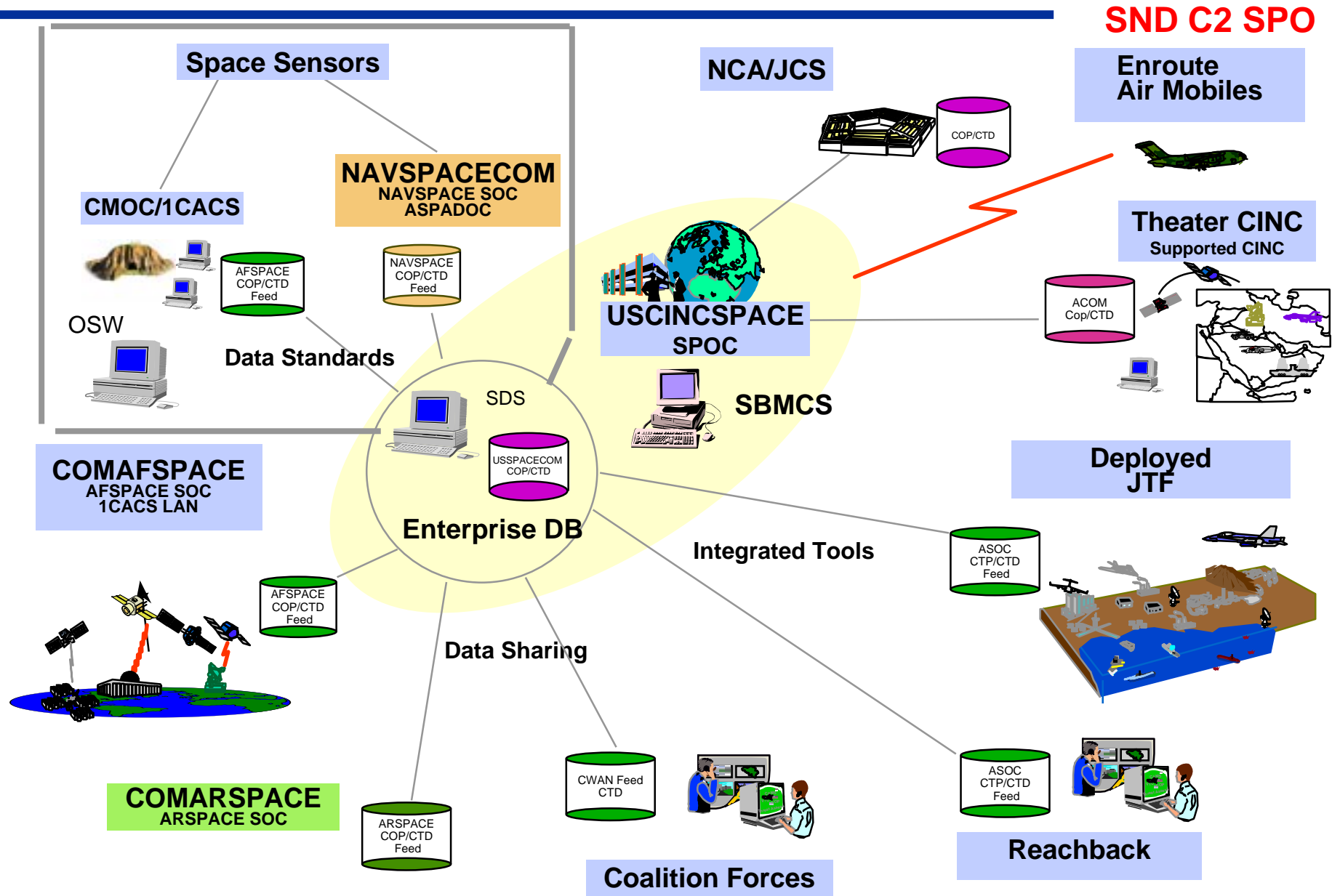
- 3-tier architecture
- Subscription-based brokering
- Agent-based information push
- Collaborative planning environment
- JTA & DII COE compliance migration
- Spiral development & demonstration

SBMCS Software Architecture Framework

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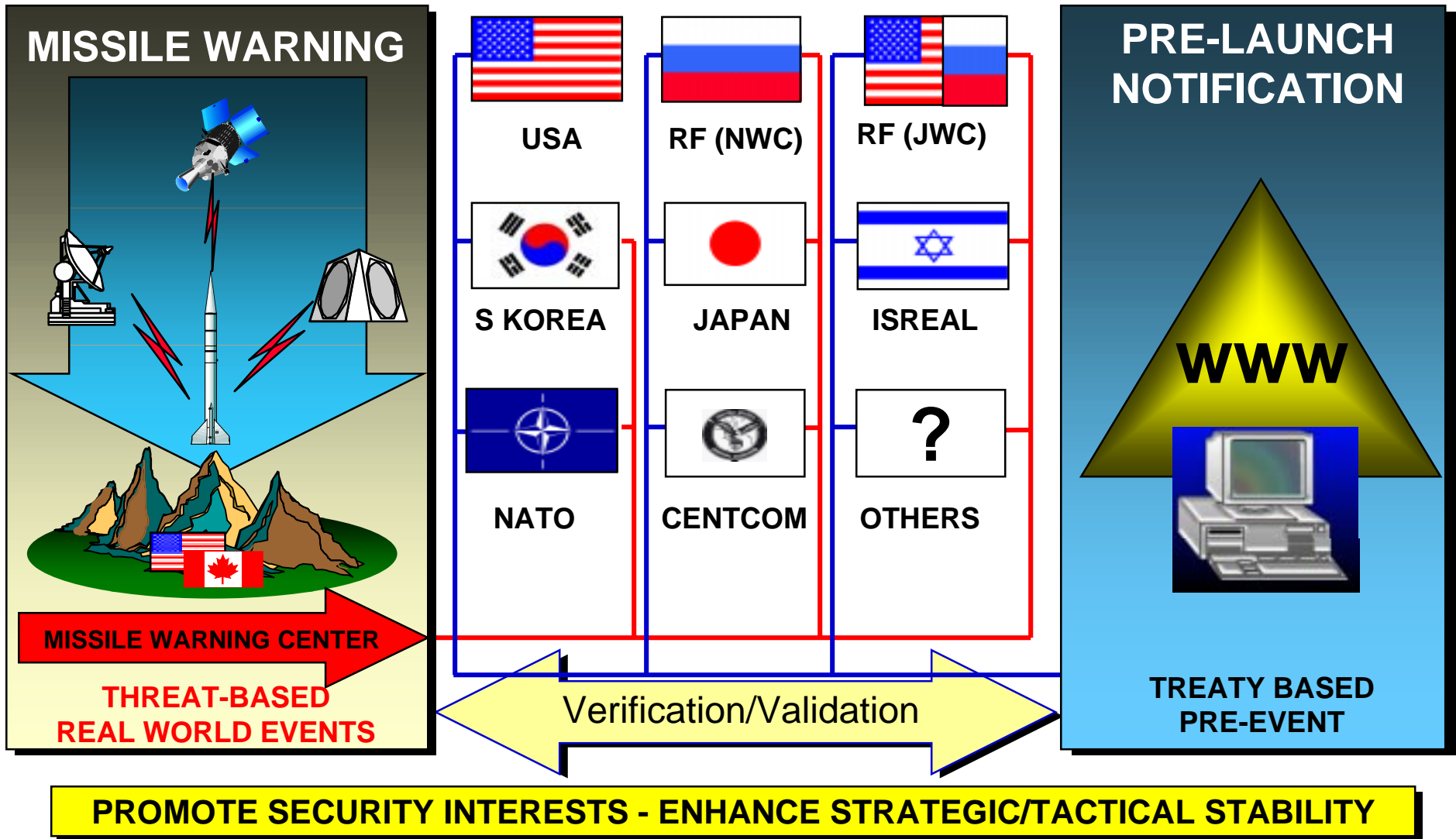


Migration of Space Architecture



Shared Early Warning Elements

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Impact of evolving standards

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- **UML**
 - Needed to sell concept of Use Cases
 - Waiting for XML support for exchange among tools
- **CORBA**
 - Real Time, Fault tolerance, load balancing, security
 - Component model
 - Asynchronous messaging
- **JTA**
 - Phase out legacy standards (message sets, link protocols)
 - Additions (emerging standards)
 - QoS (RSVP, diffserv, 802.1p)
 - Astro standards
 - Policy-based infrastructure
 - Space C2 subdomain annex?
 - USSPACECOM/J6N Joint Interoperability Portfolio (JIP)

Defining and managing architectures

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- **Government to provide**
 - **Target Ops Arch (2005-2010)**
 - **Initial Tech Arch**
- **Proposals to provide**
 - **System Architecture**
- **Post Contract Award**
 - **Contractor to maintain and evolve Sys and Tech Arch**
 - **Subject to Govt approval**
 - **Expect to form an Architecture IPT to consider outside influences (AC2ISRC, GNIE, ...)**

For further information

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