



# ***CERDEC GRA Initiatives***

***TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.***

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## GRA Origins

## GRA Technical Overview

## GRA Initiatives

- GRA CRADA
- GRA Consortia
- GRA SharePoint Site
- GRA MILCOM Publications
- GRA Live Demos
- GRA Multivendor-Vendor Terminal
- GRA ISR-NET Concept

# JTRS High-Band High-Throughput (HBHT) AoA

## JTRS AoA Study

MILSATCOM Above 2GHz Tiger Team January 2006

Institute for Defense Analyses

The Johns Hopkins University/Applied Physics Laboratory

Determine how the HBHT capability can be provided to the warfighter in a timely, operationally effective, and cost efficient manner in accordance with the ASD(NII) policy

### HBHT Alternatives:

- Alternative 1: Status quo baseline (used for comparison only)
- Alternative 2: Implement HBHT in current JTRS Clusters
- Alternative 3: Create new HBHT terminal/radio family
- Alternative 4: Create new MILSATCOM and new LOS HBHT terminal/radio families
- Alternative 5: Develop reusable HBHT core hardware modules (components, not complete terminals)

*AoA Study Team recommended an alternative in which core modules are developed and employed in HBHT terminals/radios (AoA Alternative 5)*

**BUT HOW?**

1. Common Data Link (CDL)
2. Warfighter Information Network Tactical (WIN-T)
3. SHF SATCOM and Gapfiller
4. EHF SATCOM
5. Global Broadcasting System (GBS)
6. Data Distribution System (DDS) – Cooperative Engagement Capability
7. Network Data Link (NDL)
8. Soldier Radio Waveform (SRW)
9. Mobile Satellite Service (MSS)

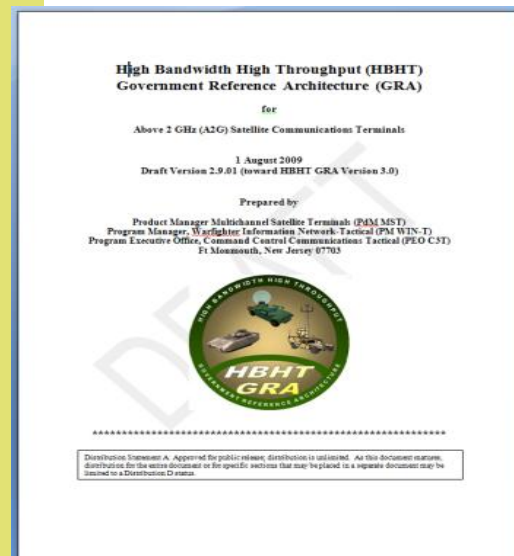


*Numerous terminal/radios associated with each of the waveforms*

- **GRA Definition:** *The **GRA** is a **Standard** Above 2 GHz Military Communication Modular Open Systems Architecture based on **MDA** (Model Driven Architecture) constructs*

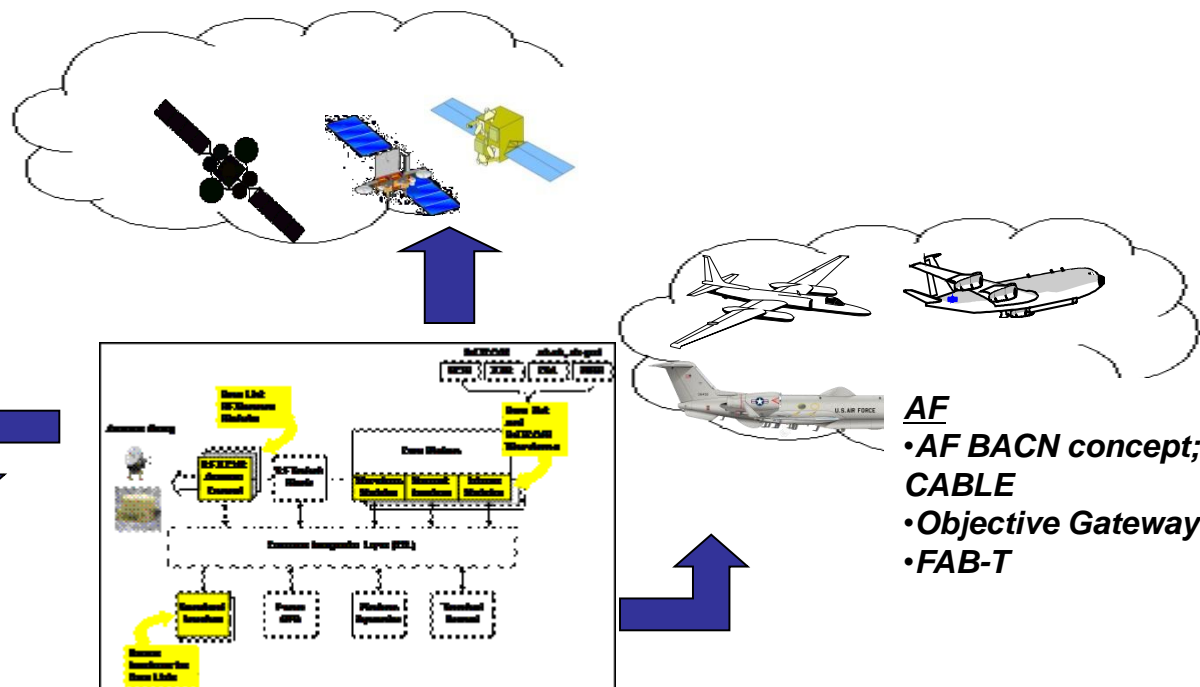
### • GRA Objectives:

- **Establish** a Functional Decomposition **Standard** pattern for terminals defining Common Integration Layer (CIL)
- Develop a **common** system level architecture that decouples H/W and S/W module dependencies to enable reuse
- **Decouple** H/W & S/W dependencies in order to break the monolithic paradigm in current A2G terminal programs
- **Maximize** opportunities for **competition** and cost reductions across all life cycle phases
- **Collaborative development** between Gov't & Industry
- **Protect** industry's rights to their **intellectual property**
- **Enable** integration of new capabilities through **tech refresh** or new program increment without significant terminal redesign
- **Objective** is to supporting **Plug and Play** system integration of COTS and third party module development efforts



GRA 3.0

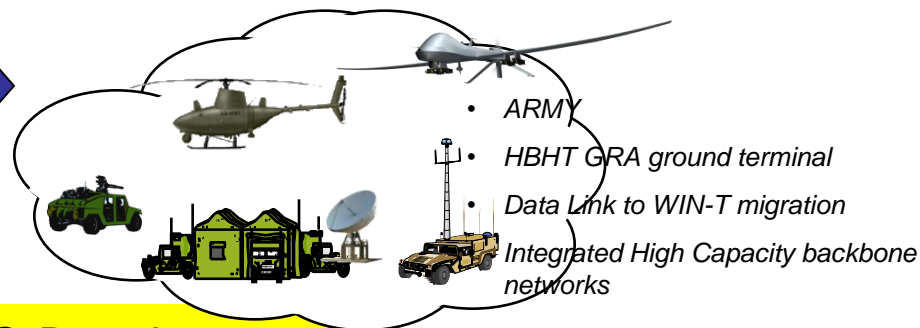
- Use of Open GRA standards in multiple programs (within a service or across services)
- Allow companies to offer modules outside their traditional markets & customer base
- Companies that are typically Army suppliers can effectively compete on Navy Programs)
- Larger volumes (across multiple programs) translate to lower production costs



## GRA Airborne Networking Terminal

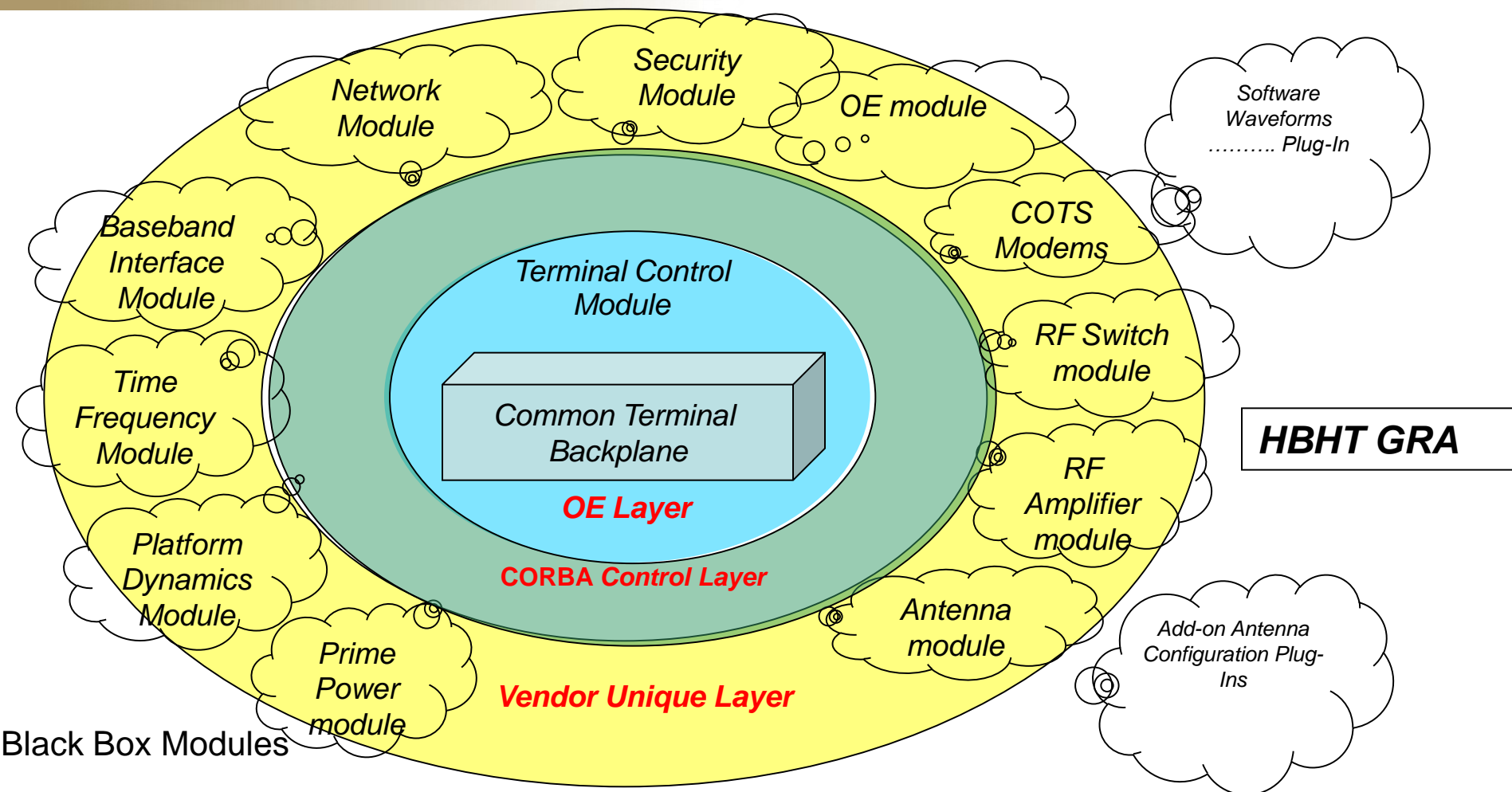
**NAVY**

- **Navy Automated Digital Network System (ADNS)**
- **MILES**

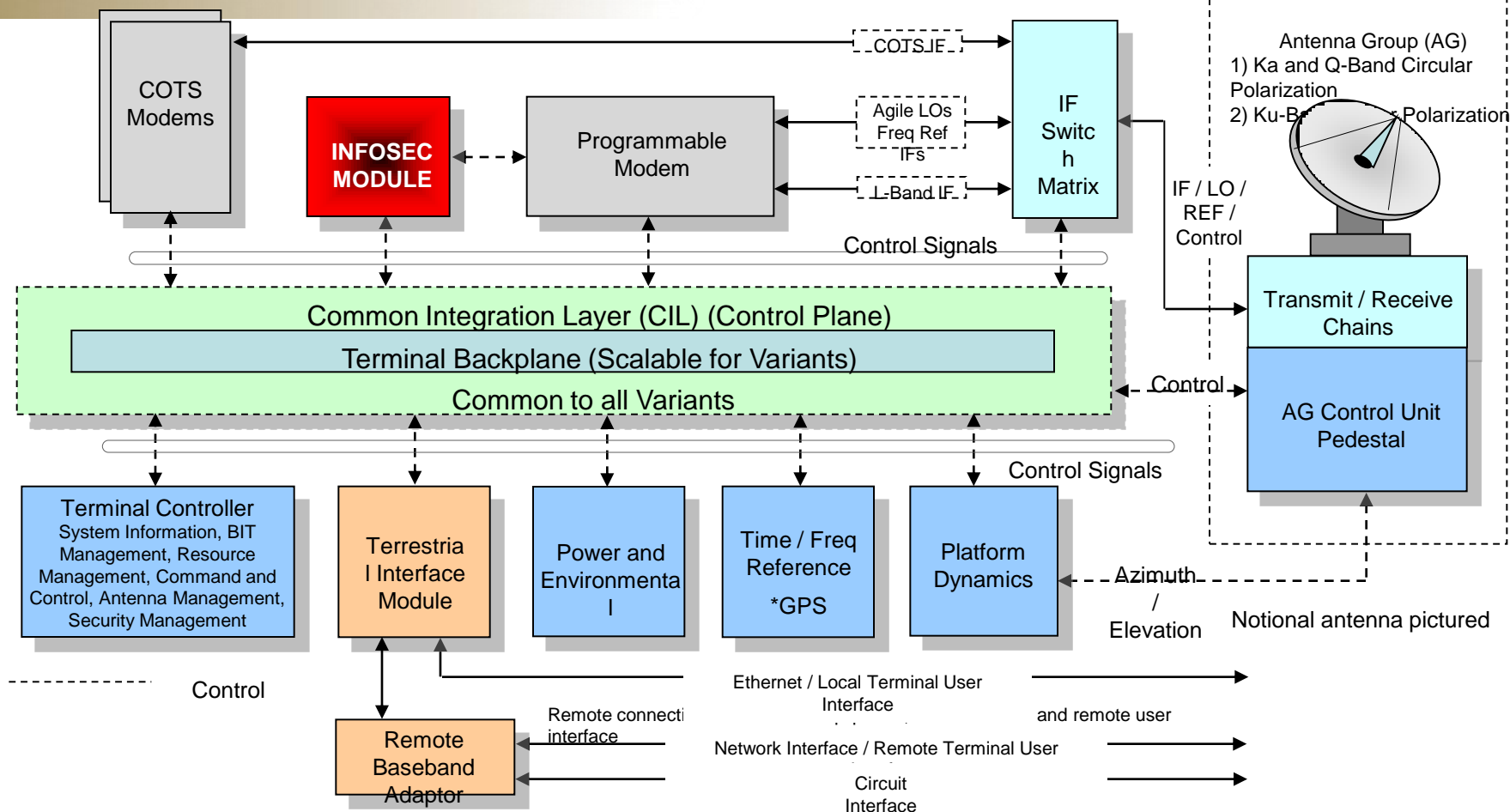


## GRA Brings MOSA to Joint A2G Development





- **GRA Concept : GRA Intellectual Property Layers**
- **Vendor Unique Layer:** Contains Vendor IP GRA layers provide utilities and infrastructure
- **Government Owned Layers:** Control Plane SCA 2.2.2, Data Plane & OE Interface



- *GRA Dual Gigabit Ethernet Back Plane*
- *Separate "Control" and "Data" Planes*
- *Functional Decomposition*

## PIM Structure Diagram

for each Device, Service,  
Application, Adapter  
Module

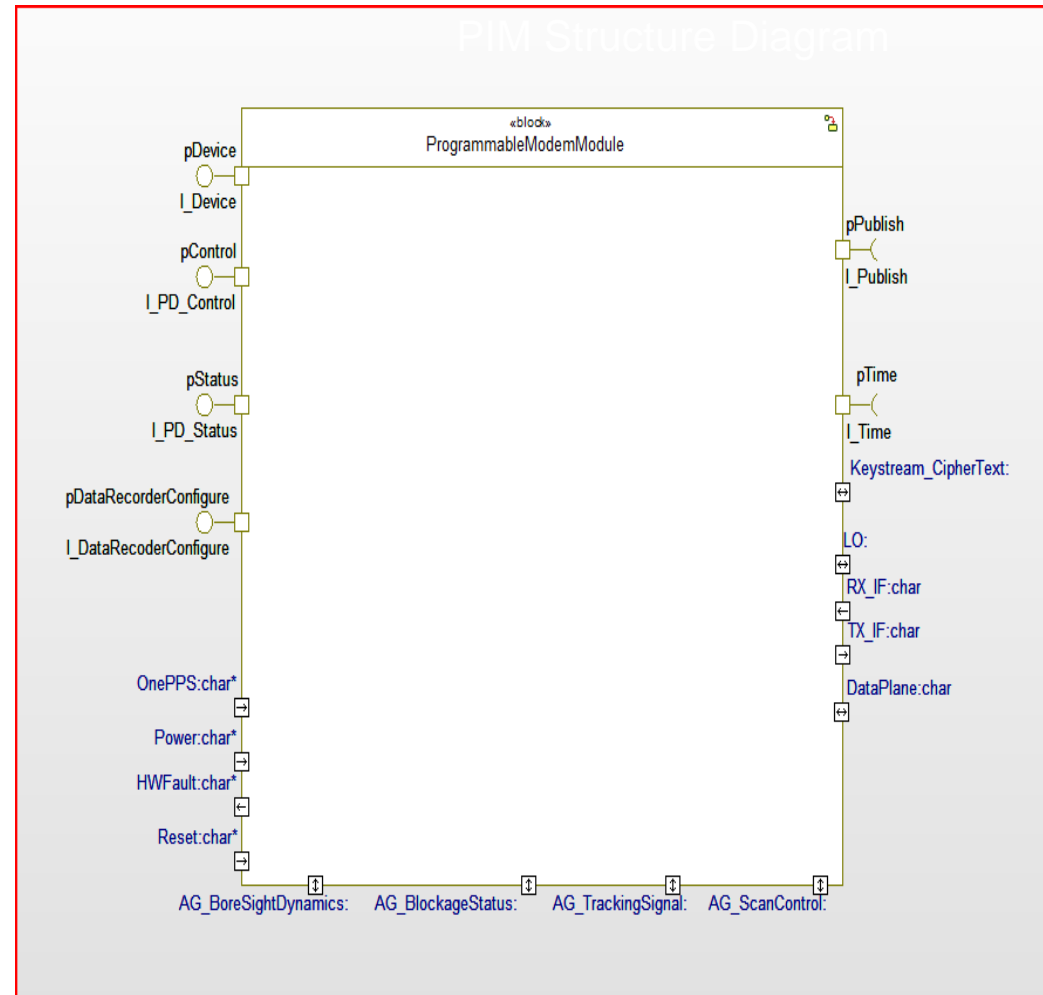
PIM defines Provides and  
Requires (I/O)

for each module type

Defines Protocol for each  
port

PIM written in UML

PIM derived from CIM







# CERDEC GRA Initiatives



communications



**Rockwell  
Collins**

**Raytheon**



**NORTHROP GRUMMAN**

**GENERAL DYNAMICS**  
C4 Systems

**LOCKHEED MARTIN**



**ITT**



**•The GRA Consortium**

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Company Name	Task Description	CERDEC Signed	Company Signed	Completion Date
Space Coast	Develop Multi-Band Transceiver Test Bed	Sept 16 2011	Sept 16 2011	May 9, 2011
PrismTech	Demonstrating a GRA-compliant platform/waveform model and implementation within Spectra CX	Sept 16 2011	Sept 16 2011	May 9, 2011
DataSoft	SDR Forum	Sept 16 2011	Sept 16 2011	May 9, 2011
Radio Technologies	Software Defined Radio	Sept 16 2011	Sept 16 2011	May 9, 2011
ITT	IR&D SDR	Sept 16 2011	Sept 16 2011	May 9, 2011
OIS	SDR Forum	<b><i>GRA CRADA is unique Legal Framework that provides legally binding definition of Intellectual Property Ownership.</i></b> <b><i>US Gov. OWNS Full Data Rights (not merely Government Purpose Rights) to all GRA software and documentation. Industry owns all intellectual property developed in GRA Compliant modules.</i></b>		
CTC - Canada	SDR Forum			
Indiana Purdue Fort Wayne Univ	SDR Forum			
L3 Corp	GRA Developer			

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Public Interest

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www.firstfr.com

- *All GRA Members can Contribute (Upload and Download) to the following Collaboration libraries:*

- 1) *Shared Documents*

*GRA User Guide, GRA 3.0 Standard*

- 2) *MILCOM Archive*

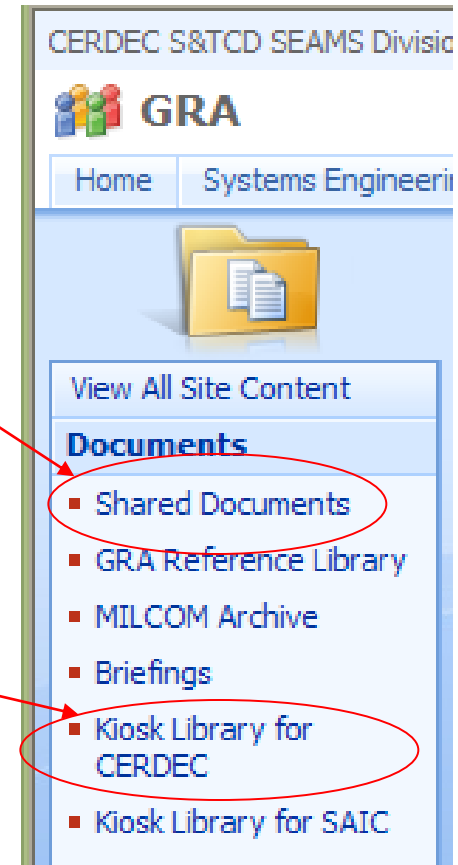
*for past MILCOM papers*

- 3) *Briefings*

*for background PowerPoint briefings of general interest.*

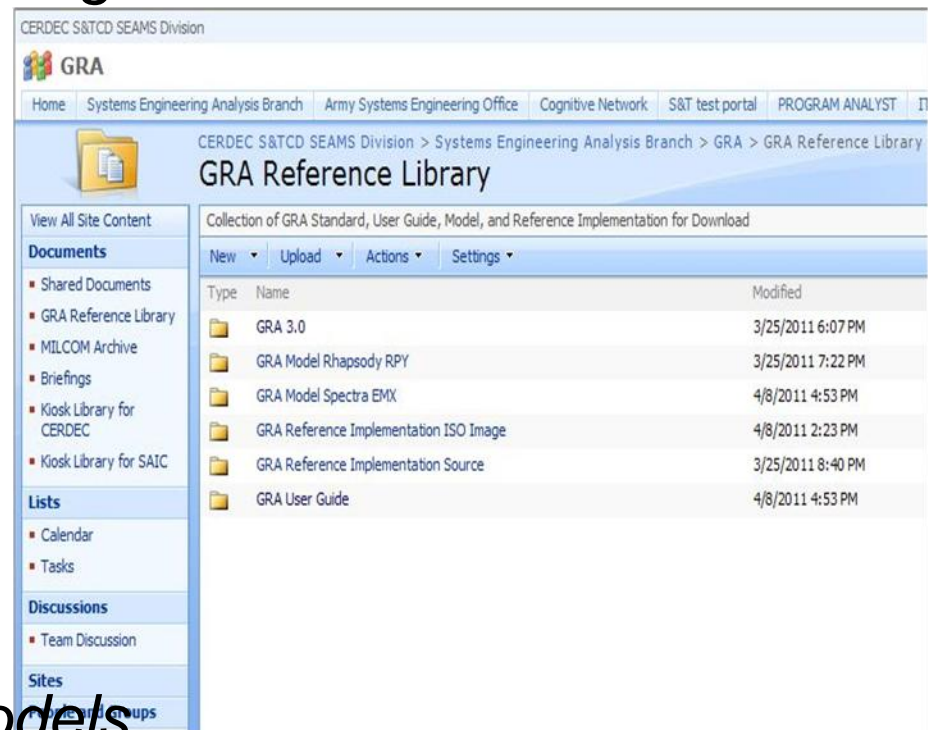
- *Kiosk Libraries are set up for Private Document Libraries for each CRADA partner*

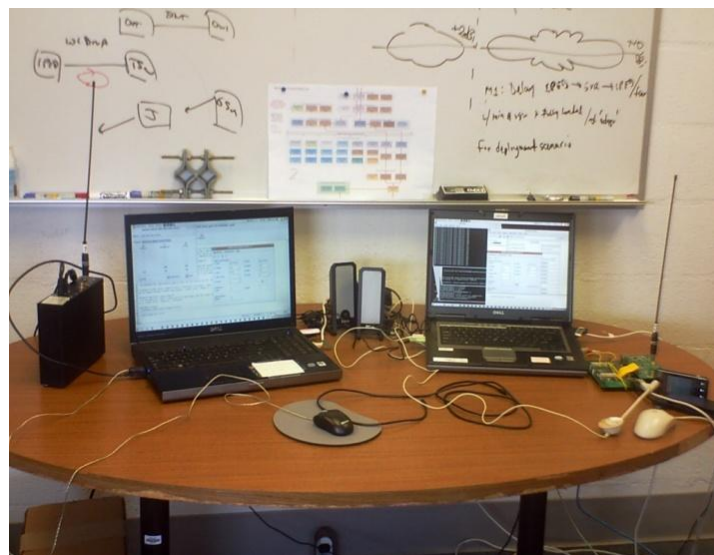
- *Each Team leader has Full Control over content, membership, and permission*



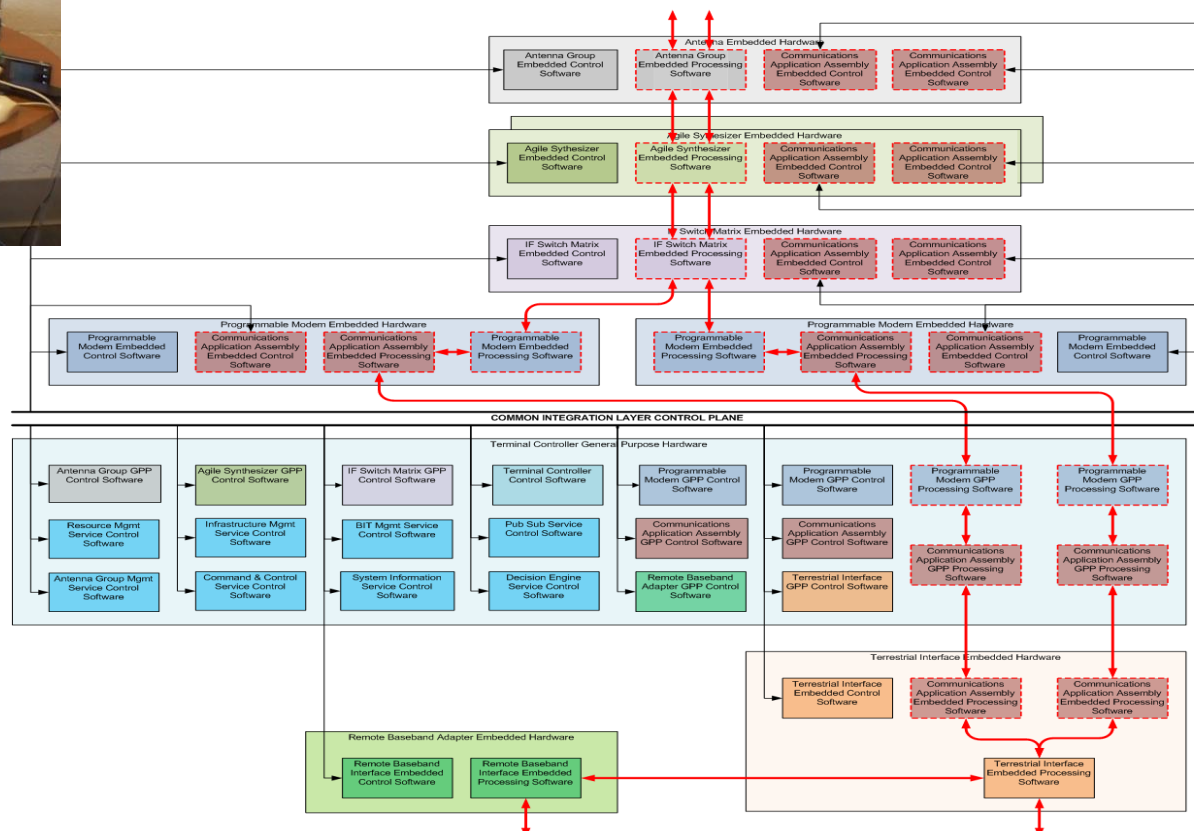


- *Purpose: to encourage collaboration and reuse of GRA framework, components, interfaces.*
- *Authentication thru AKO after signed GRA CRADA*
- *Landing Page*
- *Document Libraries*
  - *GRA Reference Library*
  - *Shared Documents*
  - *Restricted Kiosks*
  - *Rhapsody GRA UML Models*



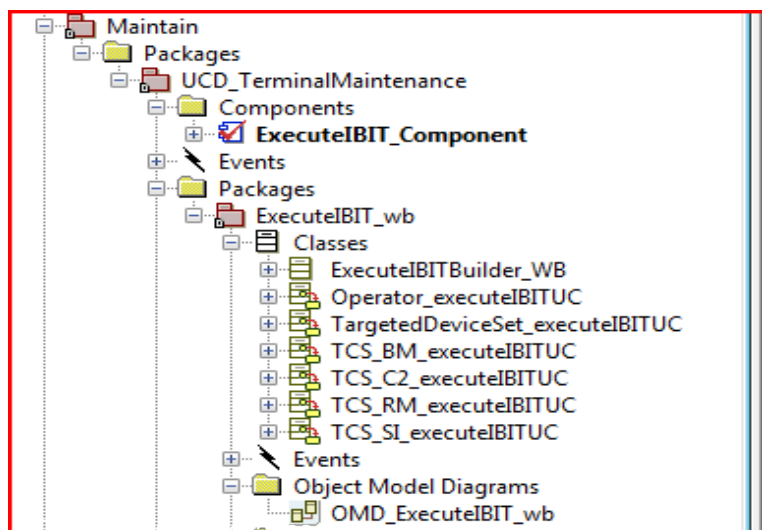


*GRA Cognitive PIM ISO download is fully functioning GRA PIM Implementation that can be downloaded from GRA Sharepoint and lab tested by GRA CRADA Partners. Demonstrates the GRA Modular Software Interfaces in a functioning Radio Demonstration*



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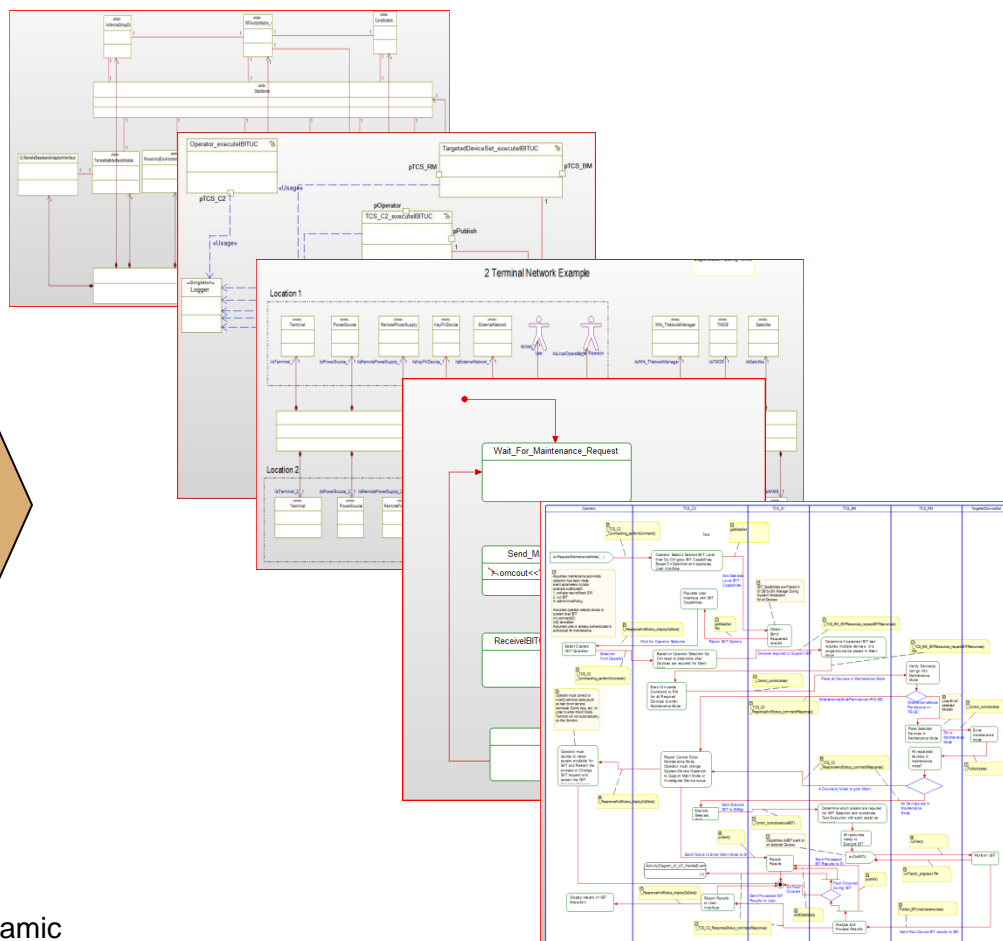




- Contains:
    - Use Case
    - System Architecture Design Package
    - Object model diagram
    - Activity Diagram
    - Statechart
    - Sequence Diagram
    - Ports and Flows
  - SysML Language Model can be compiled Run, tested
  - Provides a detailed, graphically documented and dynamic Model of all SubSystem Functionalities
- Critical for Software Reuse and Portability

### Example CIM module model contents

#### – GRA CIM Maintain /Execute IBIT



**MILCOM PROVIDES  
FORUM For  
CERDEC - INDUSTRY  
Collaboration  
30 Papers Published  
GRA dedicated MILCOM  
Sessions  
GRA Hardware Demo Booth  
2010/2011**



*Published MILCOM 2007*

ALL DIGITAL RF SATCOM TRANSCEIVER PROVIDES THE MODULAR  
OPEN SYSTEMS ARCHITECTURE REQUIRED TO MEET HC3 GRA  
Wes Littlefield, Dr. Oleg Mukhanov, Dick Hitt (Hypres), Thomas Rittenbach  
CERDEC STCD

*Published MILCOM 2007*

High Capacity Communications Capability (HC3)  
Government Reference Architecture (GRA):  
Alternatives for Third Party A2G Waveform Porting  
Thomas Rittenbach CERDEC, Kuan Collins SAIC/HC3

*Published MILCOM 2008*

AN EXCURSION TO DEFINE THE BOUNDARIES OF THE GOVERNMENT  
REFERENCE ARCHITECTURE  
Dr. Carl Dietrich Virginia Tech  
Mindy Gavitt SED, U.S Army CERDEC  
Hiroshi Satake Science Applications International Corporation  
Sagor Hoque S&TCD, U.S Army CERDEC  
Tom Rittenbach S&TCD, U.S Army CERDEC

*Published MILCOM 2008*

SOFTWARE DEVELOPMENT OF SATCOM TERMINALS  
Piya Bhaskar, Jianxin Zhao, Lockheed Martin  
Tom Rittenbach CIV USA AMC Fort Monmouth, NJ  
Published MILCOM 2008

High Bandwidth High Throughput (HBHT) Government Reference Architecture  
(GRA) Open Source Management and Compliance  
Thomas Rittenbach CERDEC

*Published MILCOM 2008*

APPLICATION OF THE GRA TO DATA LINKS  
Tom Rittenbach CERDEC  
Dan Hampel Booz Allen Hamilton

*Published MILCOM 2009*

DODAF ANALYSIS OF THE HIGH BANDWIDTH HIGH THROUGHPUT  
GOVERNMENT REFERENCE ARCHITECTURE MODEL DRIVEN  
DEVELOPMENT  
Rick Paroline BAH  
Tom Rittenbach CERDEC  
Mike Monteleone CERDEC

*Published MILCOM 2009*

HBHT GRA Validation  
Tom Rittenbach CERDEC  
Kuan H. Collins SAIC  
Frank Waldman

*Published MILCOM 2009*

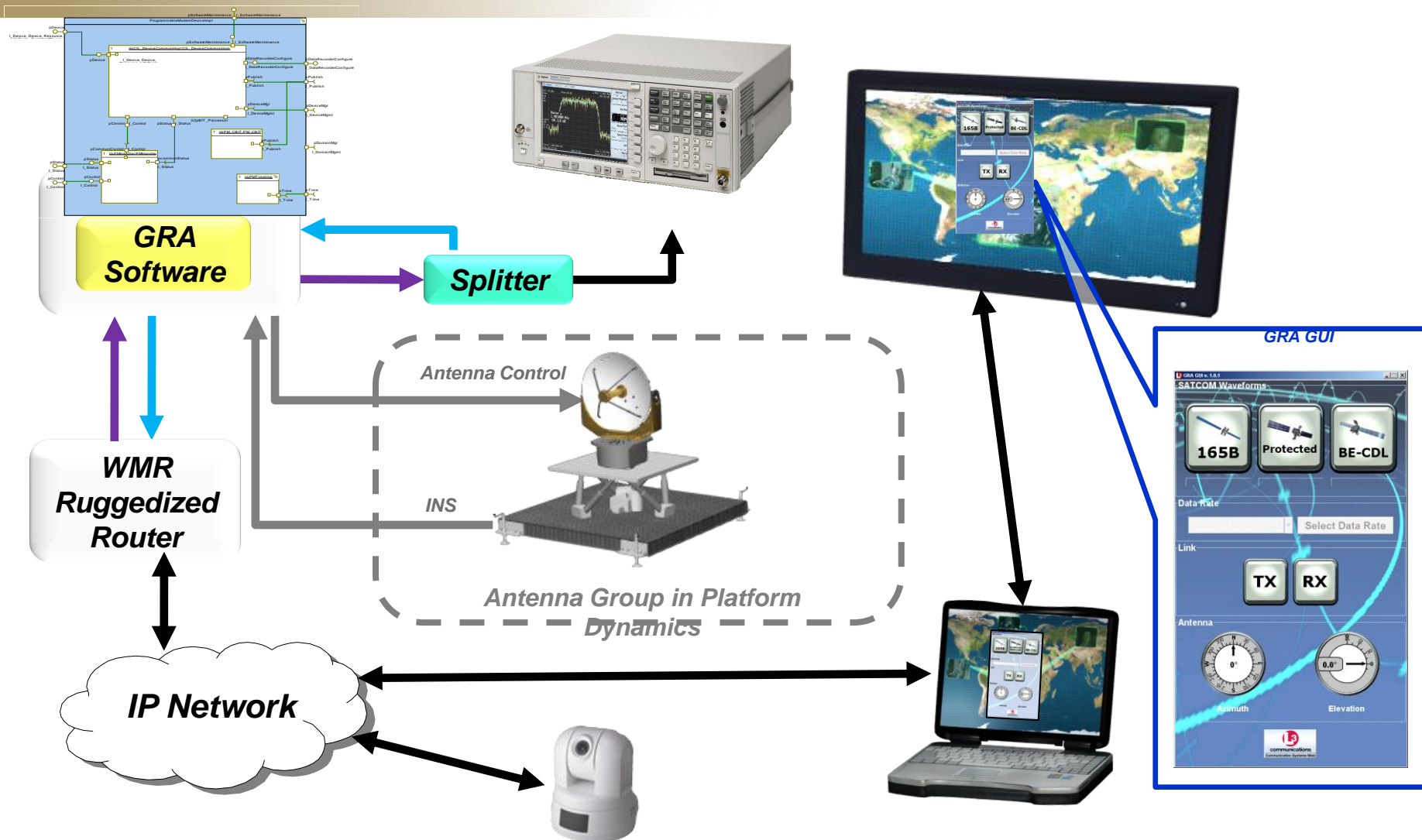
OSSIE-based GRA Testbed  
Eric Redding Harris  
Tom Rittenbach CERDEC,  
Hiroshi Satake SAIC  
Dr. Carl Dietrich Virginia Tech

*Published MILCOM 2010*

3 Papers

Published MILCOM 2011, 2 Papers

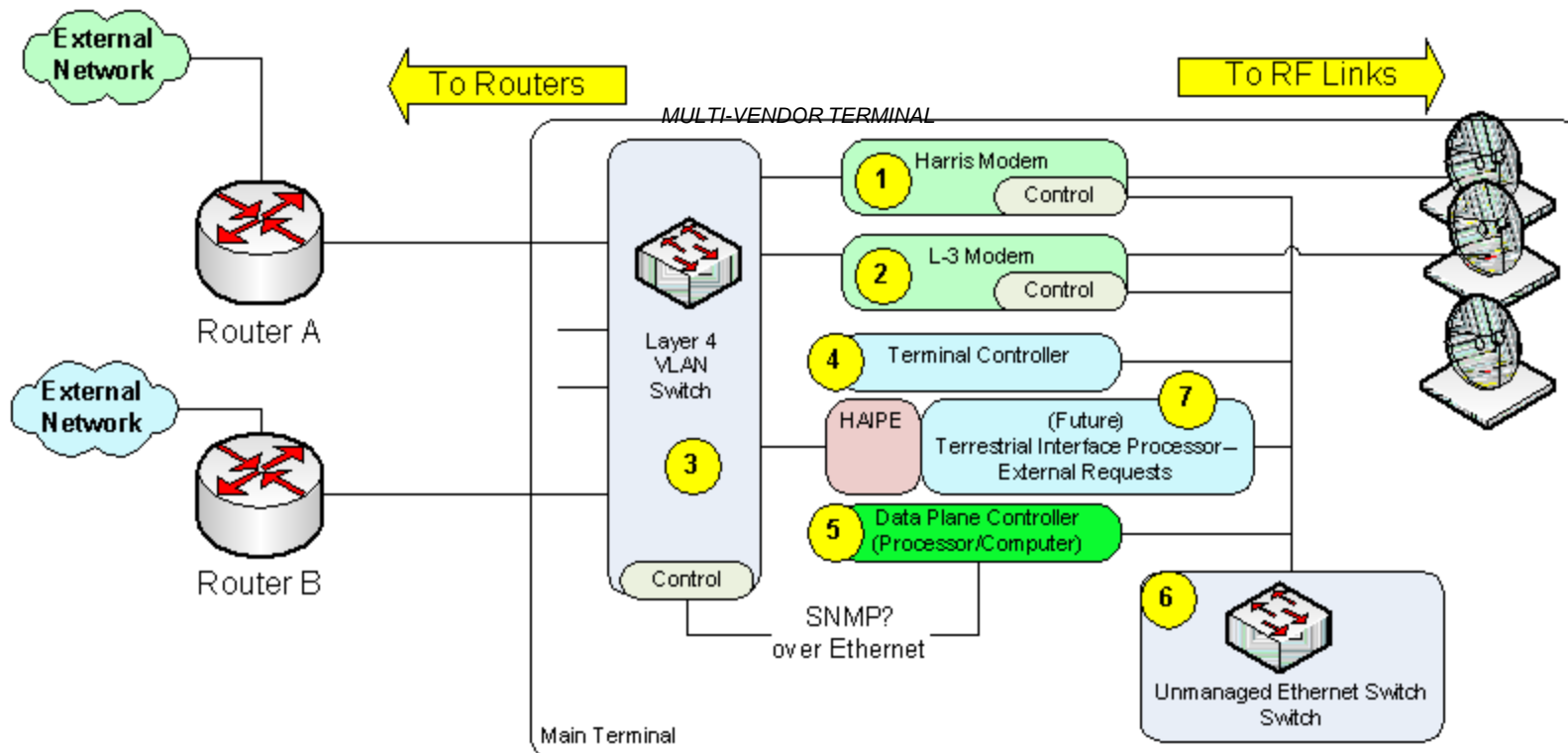
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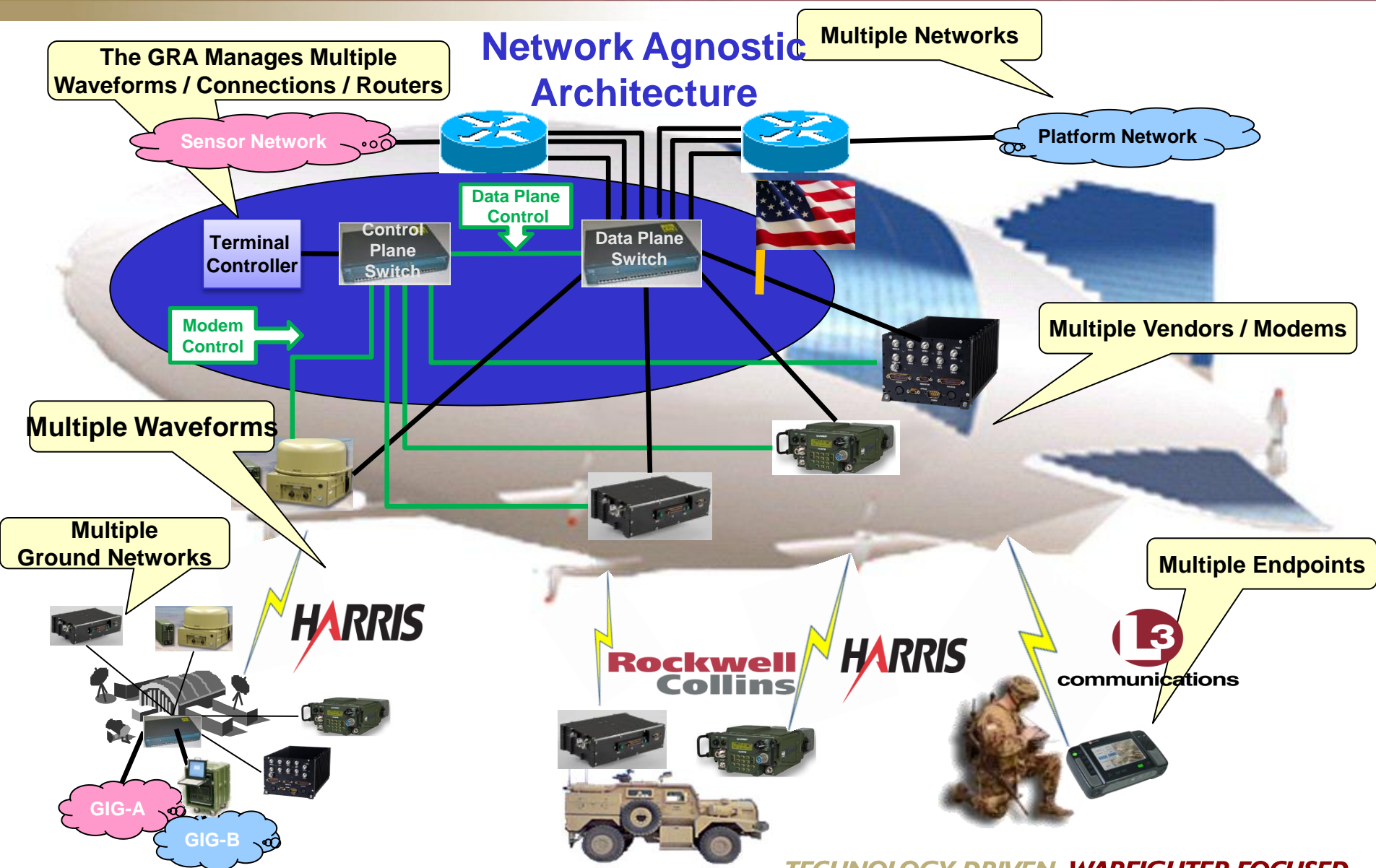
### GRA 2012 MILCOM Demo (STCD Net Mining Funded)

### MULTI-VENDOR TERMINAL

- DATAPLANE DEMO DIRECTLY APPLICABLE TO ISRNET
  - RF/Modems from *Rockwell, Harris, L-3* under Vendor Independent GRA Control of VLAN Traffic Switch
  - REFERENCE DRAFT MILCOM 2011 PAPER







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Questions?