Modeling and Simulation (M&S) Phase Two Next Generation M&S Architecture

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DD J7 Synchronization & Integration

JOSE Environment Development

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Purpose

- Information brief to describe the Next Generation Modeling and Simulation Architecture

Challenges with Current M&S Approach

- Federation becoming increasingly large and unmanageable
- Costs increasing to upgrade existing and new federate additions
- Resource-intensive integration of new federates and support
- Tightly-coupled simulations
- Bridges and gateways often required to integrate new and emerging technologies
- Many redundancies and inconsistencies in data representation

Next-Generation M&S Capability

- Rapidly utilize real-world source data
  - Cloud-based Rapid Data Generation (RDG) and distribution capability
  - Support operational COA development
  - Support Concept Development with Training
- Make simulations smarter / more capable
  - Navigate terrain / interpret physical environment and effects
  - Attempt to apply orders more effectively
  - Allow faster than real-time simulation without intervention
  - Dynamic Intelligent Control Agent (scalable in cloud)
  - Reduce role-player dependency
- Abstract User Interfaces to lower the barrier to use
  - Invoke only services needed by user
  - On demand access to scenario repositories
  - Users interact with common terms and symbols (Military & Civilian systems)
  - Interact with C2 systems

Fundamental Precepts

- Open Architecture Principles
- Yearly deliveries through JLVC increments with the ability to roll back to a previous year's increment
- Composable simulations
- Central Management
- Synergy and Efficiencies Gained By Aligning Current Efforts
  - Service Oriented Architecture (SOA) Prototype (JCW Joint Simulations)
  - KORCOM project
  - Rapid Data Generation (RDG) project
  - NATO Training Federation (NTF) Objectives (MSG-105)

Overarching Business Principles & Relationships

- JCW in collaboration with the Service stakeholders define the architecture and standards associated with the single constructive architecture

- JCW in collaboration with the Service and COCOM stakeholders lead the Serviced Oriented Architecture governance body

- JCW within resources constraints incentivizes the Services to modify their flagship simulation to adopt federation provide services

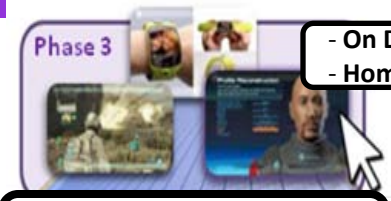
The Future of M&S -- Service Oriented Architecture (SOA)

Design to support Joint Training and Experimentation for the Joint and Coalition Warfighter

Seamless Integration
Automatic code generation based on metadata

Phase 3: FY16 – 17 JLVC 10
COMPOSABLE JOINT ENVIRONMENT FRAMEWORK

- SERVICE BASED M&S ARCHITECTURE
- INTELLEGENT SERVICES
- COMPOSABLE SIMS / MODELS
- SIMULTANEOUS, MULTIPLE ON-DEMAND CAP
- IMMERSIVE TRAINING
- ADAPTIVE LEARNING

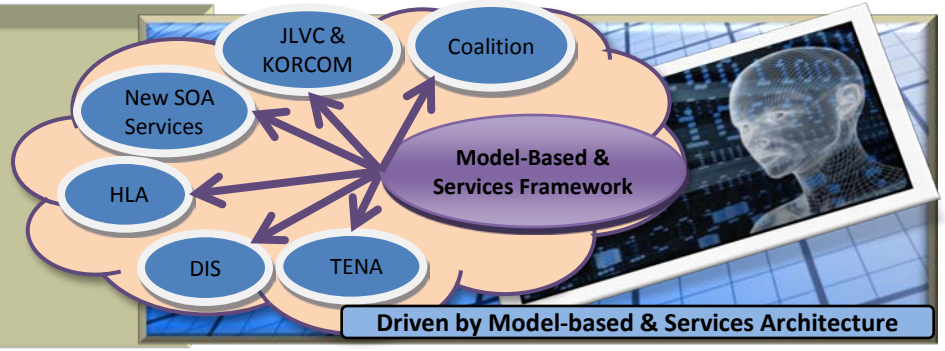


Intelligent Services - distributed data, logic and architecture

Maximize Composability & Reusability

Phase 2: FY14 – 15 JLVC 8 & 9
COMPOSABLE SOA

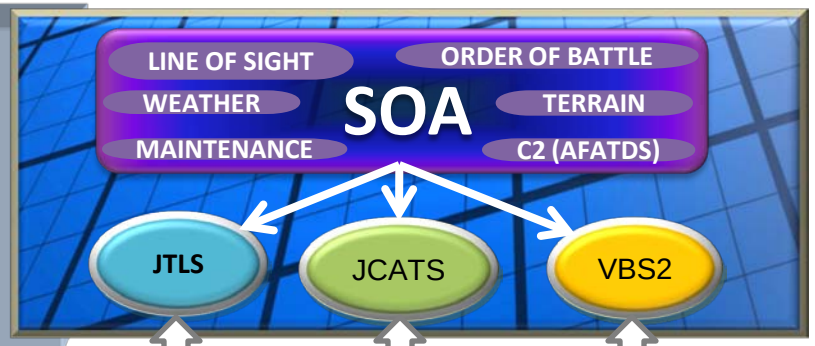
- ESTABLISH SOA GOVERNANCE
- RAPID DATA GEN (RDG)
- COMPOSABLE SIMS & MODELS
- DEVELOP SOA SERVICES
- WEB ONTOLOGY
- DISTRIBUTION METHODS
- ANALYZE AND REFINE SOA



Design/ Prototype

Phase 1 : FY12 – 13 JLVC 6 & 7
HYBRID SOA ARCHITECTURE

- HLA IEEE 1516-2010 (RTI SELECTION)
- NEW MODULAR FED OBJ MODEL (FOM)
- SOA XML/WEB SERVICES
- INITIATE SOA GOVERANCE
- INITIAL DECOOUPLING OF DATA / APPS
- DEVELOP SOA SERVICES
- TEST & EVALUATE



Joint Theater Level Simulation | Joint Conflict and Tactical Simulation | Virtual Battlespace 2 Gaming / Virtual

Autonomous Intelligent Services

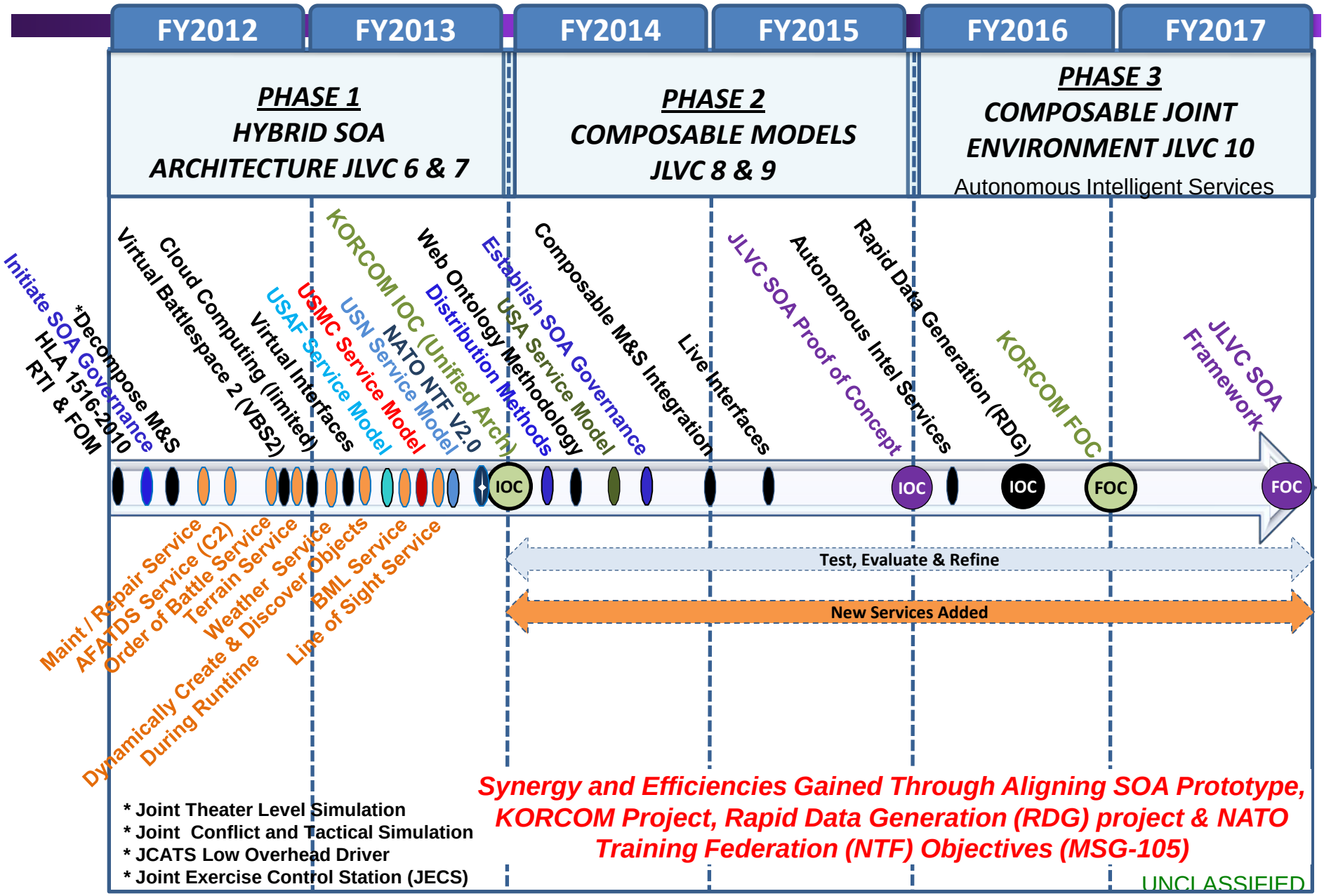
JLVC ENVIRONMENT

EDUCATION AND TRAINING

Tightly-Coupled Architecture

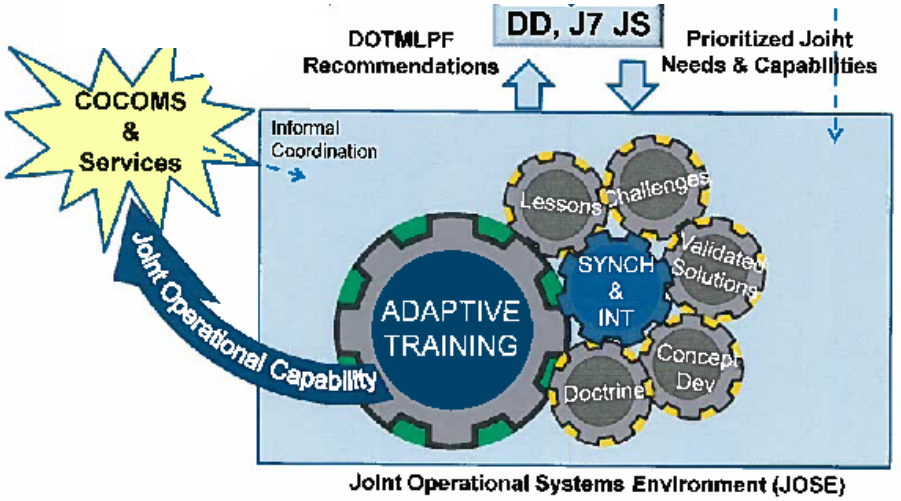
CURRENT STATE: TIGHTLY COUPLED RTI; COMPLEX; EXPENSIVE INTEGRATION & EXECUTION

M&S Future – Service Oriented Architecture (SOA) Implementation



Joint Staff
Joint & Coalition Warfighting
M&S - Future

- Integrated training and experimentation
- Open Architecture
- Service oriented architecture
- Full Interagency & Coalition integration
- Learn from results of simulation
- Seamless multi-level training
- Rapid scenario generation
- Cost effective business model
- Routinely accessible from anywhere



JLVC 5.0 USMC integrated

JTEN in the National Capitol Region

Persistent Coalition training network

Simulation for Course of Action Development

On Demand Multi-Level Training (Integrated Gaming)

2011 2012 2013 2014 2015 2016 2018 2020

Joint Training Enterprise Network Ver 2.-0

Simulation as Services

Coalition M&S Information Sharing

KORCOM IOC (Unified Arch)

JLVC SOA Proof of Concept

On-Demand Simulation

Dynamic JELC

Joint-Service SOA Governance

KORCOM FOC

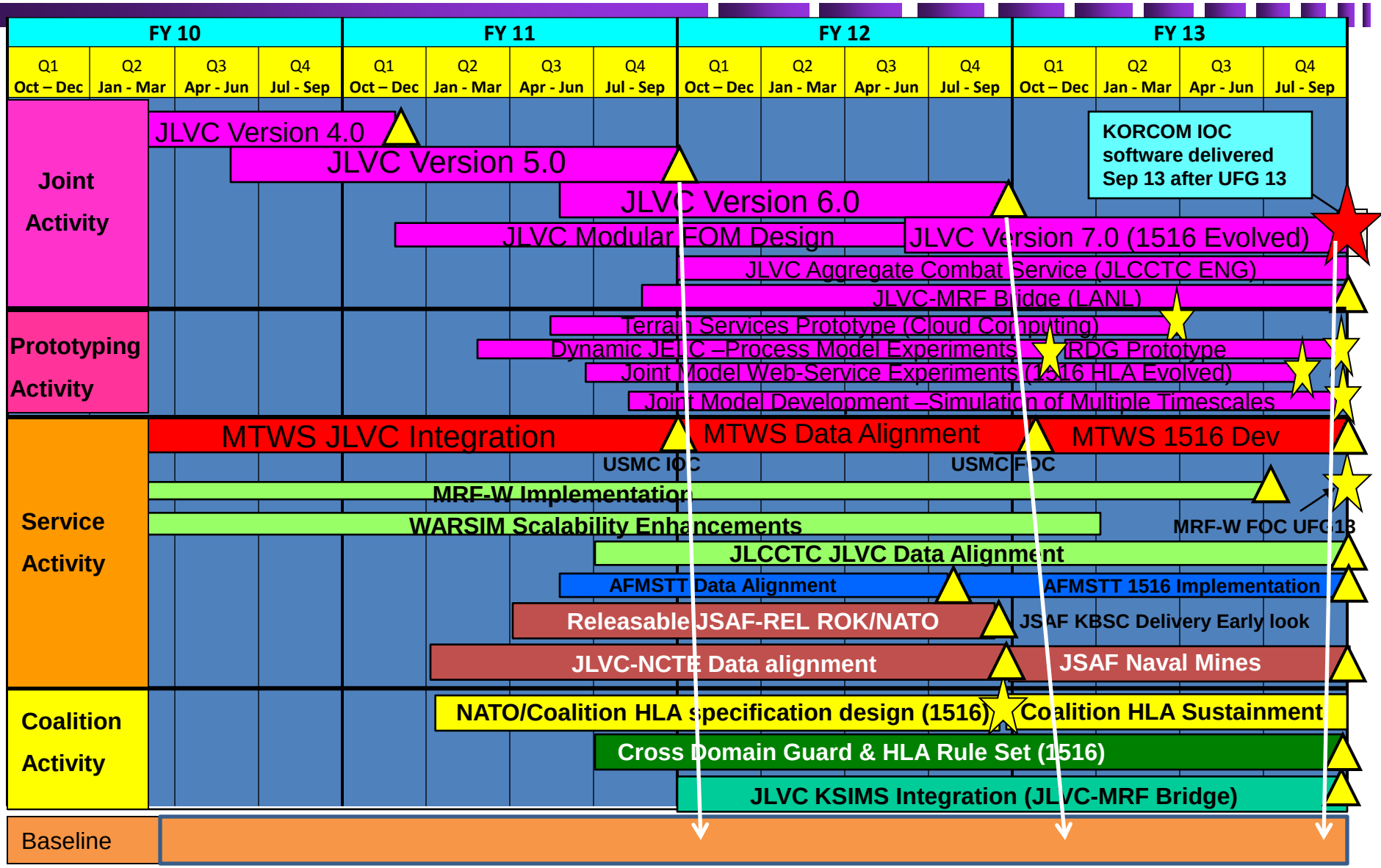
Rapid Scenario Gen Services (Automated)

Wireless Simulation Distribution

Questions?

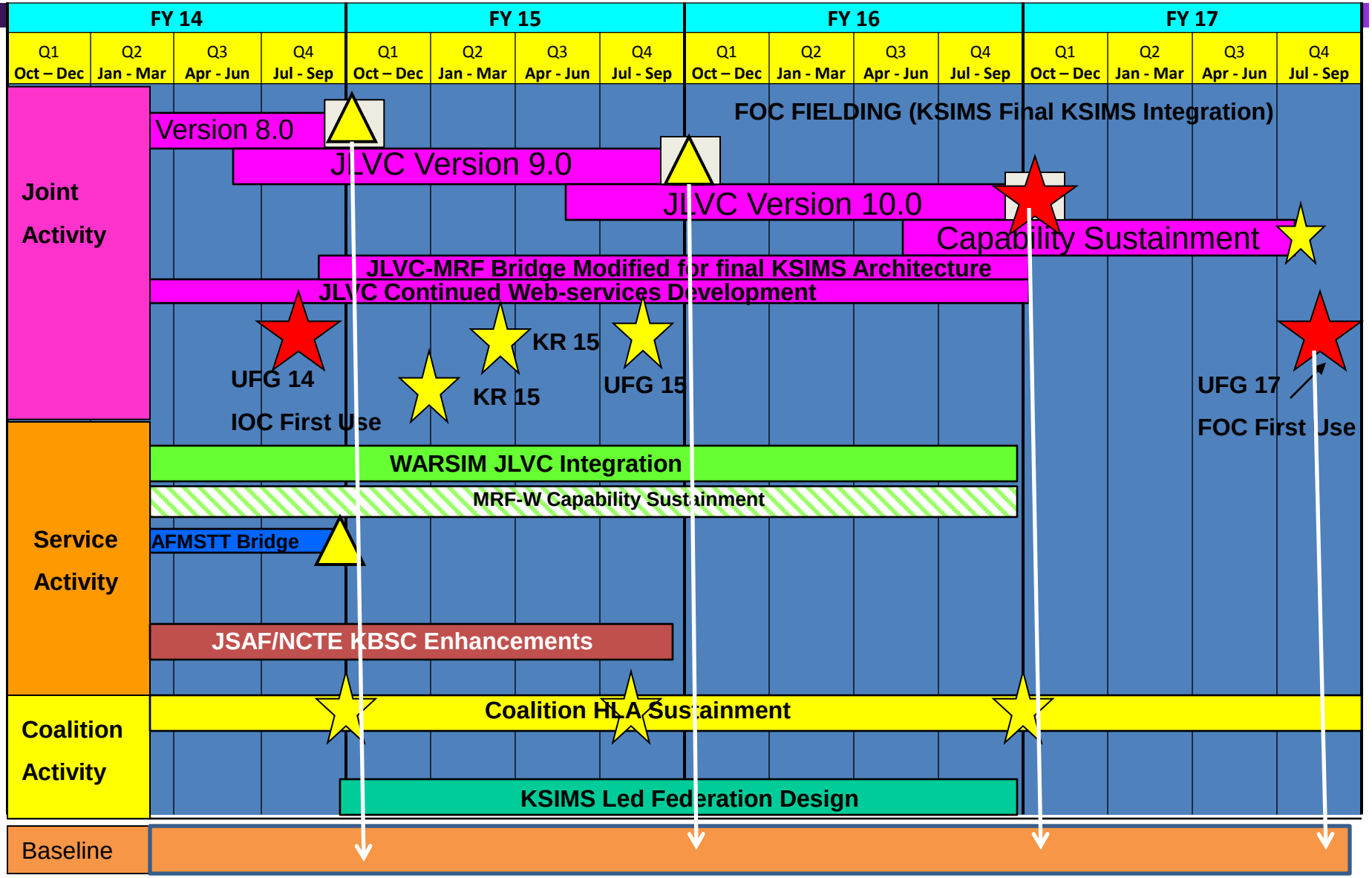
BACKUP

JLVC Project Timeline (IOC)



Key — Release/Delivery — Milestone — Decision Point — NET/Fielding

JLVC Project Timeline (FOC)



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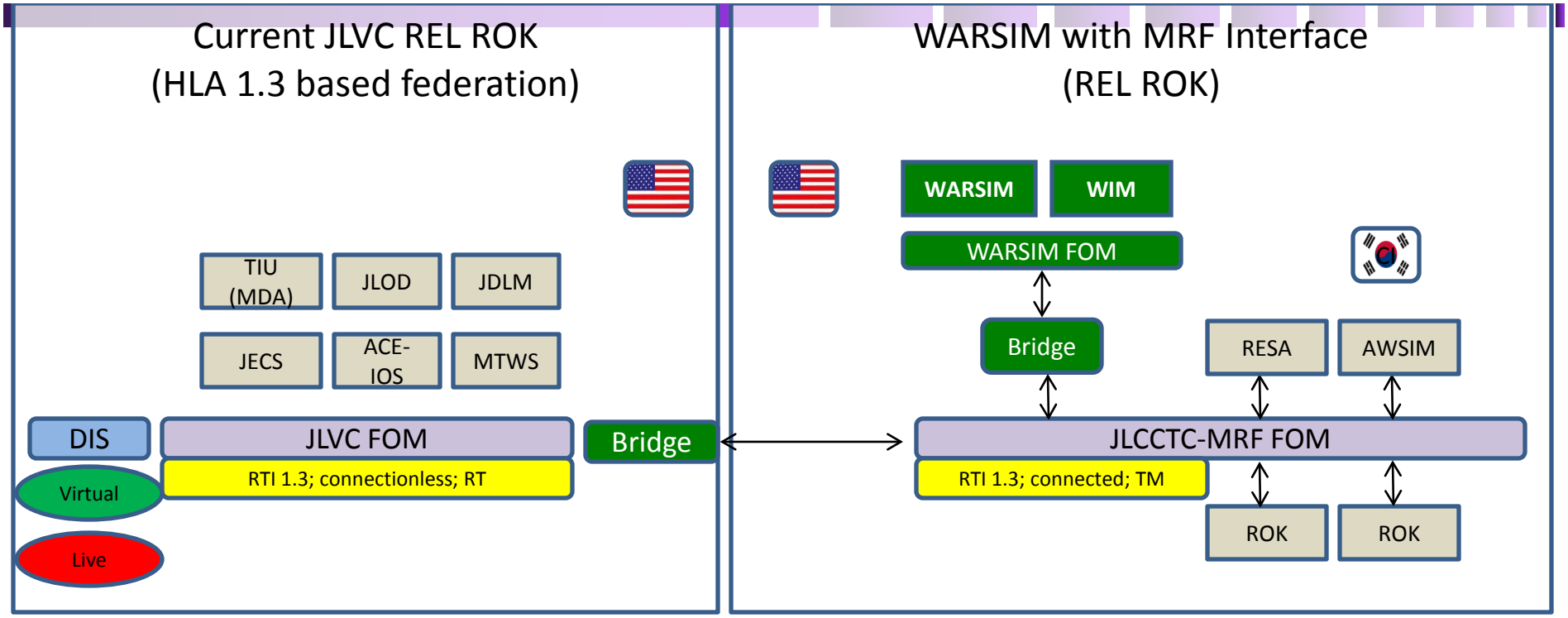
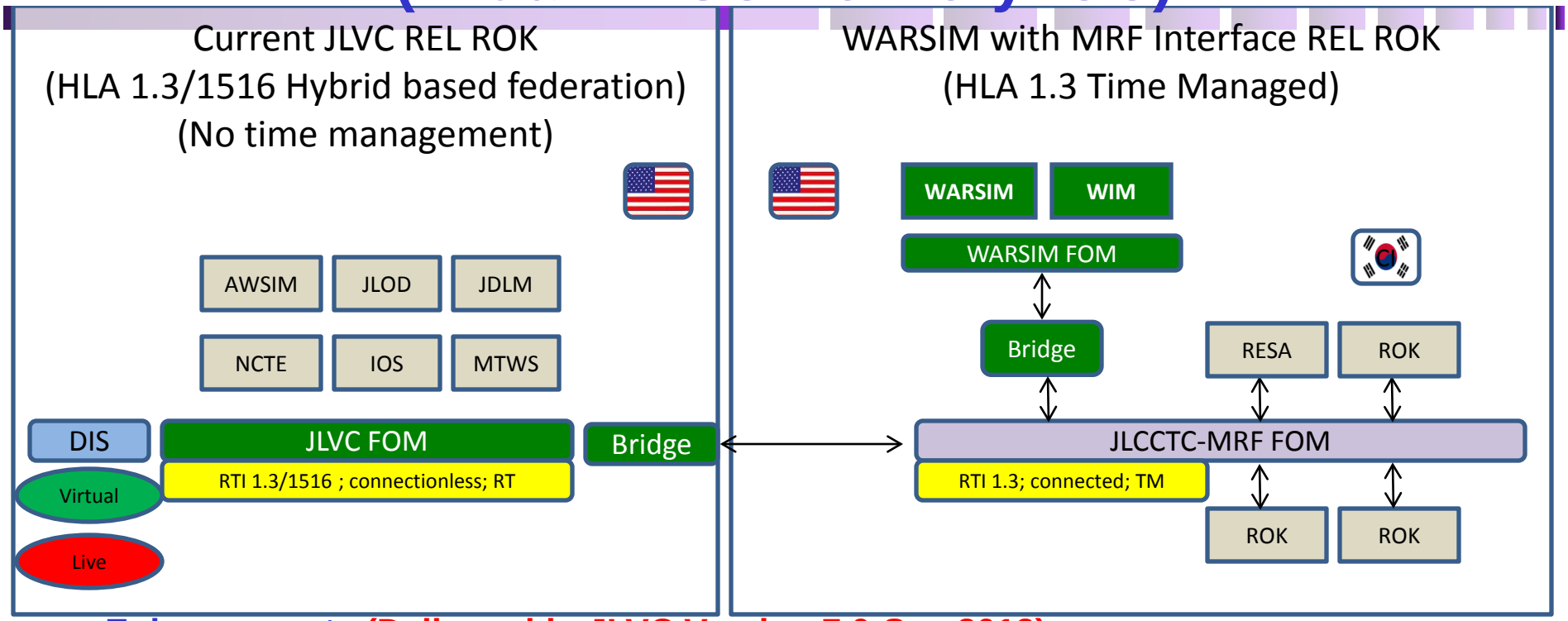
KORCOM JLVC MRF-Bridge Architecture (FY12)



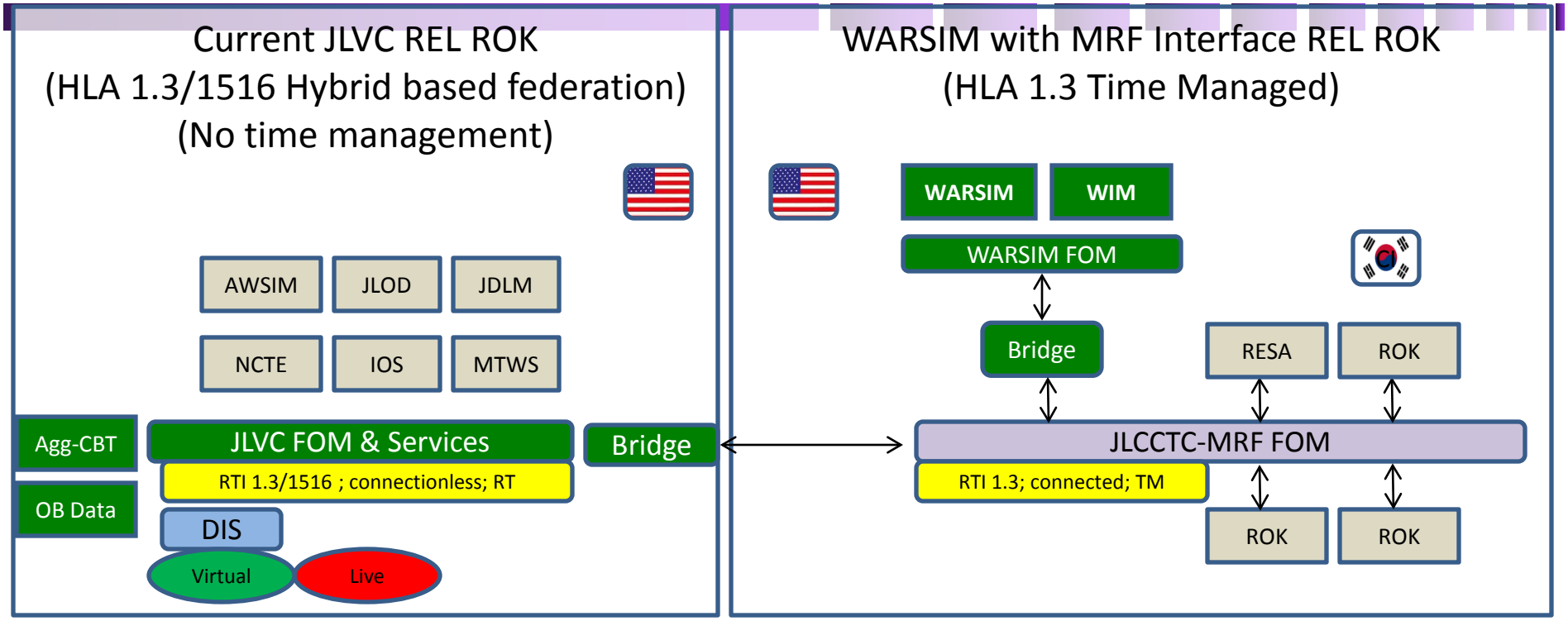
- **Enhancements (JLVC Version 6.0-Not delivered to KORCOM)**
  - WARSIM/WIM XML Ingestion/FED ID to MRF
  - JLCCTC JLVC Data Alignment and Configuration Management
  - WIM Integration with JLVC –Classified/Standalone
  - Consistent Logistics Play (Convoys,Supply,Med)
  - Consistent Fixed Targeting Play
  - ROK/NATO Releasable JSAF
  - NCTE & AFMSTT Data Alignment with JLVC and Configuration Management
  - JLVC design modular 1516 HLA Evolved Architecture
  - Joint Models, JBUS, and GIAC 1516 Evolved Experiment

KORCOM JLVC MRF-Bridge Architecture (FY13) (Initial KBSC Delivery IOC)



- **Enhancements (Delivered in JLVC Version 7.0-Sep 2013)**
  - Configuration Management of WARSIM/WIM/ONESAF Data
  - Implement scenario XML Ingestion for KSIMS products
  - Production JLVC-MRF Bridge and Federation Agreements
  - AFMSTT connect to MRF using JLVC Bridge solution IOC
  - JLVC design modular 1516 Architecture implemented
  - Cross Domain Guard and HLA Rule Set implemented
  - JSAF Mine Enhancements
  - MTWS & AFMSTT Implement 1516 HLA Evolved

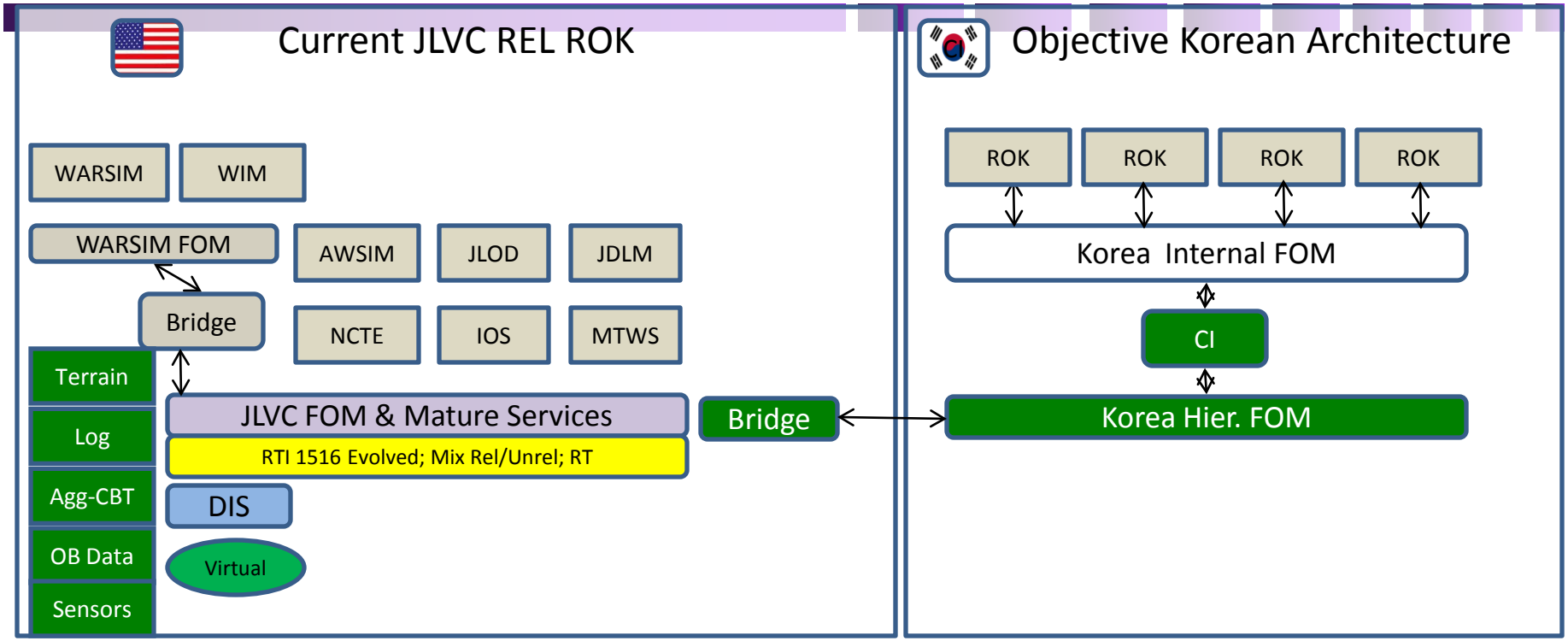
KORCOM JLVC MRF-Bridge Architecture (FY14)



- **Enhancements (Delivered in JLVC Version 8.0) – Reduced R&D Funding**
  - WARSIM-JLVC Bridge Development (3 year effort)
  - JDLM and remaining HLA Constructive federates implement 1516 Evolved
  - KSIMS data alignment
  - Design for new KSIMS Architecture & Federation Agreements
  - AFMSTT connect to MRF using JLVC Bridge solution FOC
  - Production Aggregate Combat Service
  - Enhanced AAR Collection
  - JSAF KBSC Requested User Enhancements
  - Prototype Sensor Services

Changes

KORCOM FOC Architecture (FY16)



- **Enhancements (Delivered in JLVC Version 10.0)**
  - Implement Korean Hierarchical Federation
  - Modified JLVC Bridge to support Korean Hier FOM
  - KBSC Requested Mods
  - Enhanced Interoperability with Korean Models
  - WARSIM-JLVC Bridge
  - *MRF-W Option for Time Managed Policies*

HLA 1516 Evolved Terms of Reference

- Dynamic Link Compatibility – That means federates can switch which RTI they use without recompiling/relinking their application.

- Modular FOMs – Modular FOMs allow federation developers to break up their object model into useful parts (called FOM Modules). Then each federate only needs to know about the FOM Modules it uses.

- Update Rate Reduction – Allows federates to tell the RTI they can only handle data updates below a certain rate. This allows update rate constrained federates to participate in busy federations without bogging down.

- Better Fault Tolerance – HLA now has a mechanism for notifying Federates when another Federate becomes disconnected from the network. It means when something goes wrong, everyone will understand what went wrong quickly.

- WEB Services API (WSDL) - The HLA Standard now defines a Web Service Description Language (WSDL) "binding". This is similar to the C++, or Java bindings, but for the Web.
  - Based on the WSDL code, it is possible to generate code in different programming languages. It is transparent to a federation whether a specific federate uses the C++, Java or WSDL API.
  - Major benefits of the WSDL API include the support for numerous newer and older languages as well as the ease of deployment across wide area networks.
  - The major long term benefit of the WSDL API is that it promotes and supports the concept of simulations as readily available services provided within and between enterprises.