Universal Armament Interface (UAI)

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Overview

- **Objective:**
  - To discuss the role of UAI in USAF weapons integration efforts, continuing dialog on the future of UAI for NATO members

- **Outline**
  - UAI: a brief history
  - Capabilities Overview
  - Technical Scope: How does UAI work?
  - Interface Management: Current & Planned
  - USAF Implementation
  - Opportunities for International Participation
  - Summary

UAI: A BRIEF HISTORY

UAI: A Brief History

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UAI is a US DOD and NATO initiative to develop *standardized* functional interfaces in aircraft, weapons and mission planning to support integration of future weapons independent of aircraft OFP cycles

UAI: A Brief History

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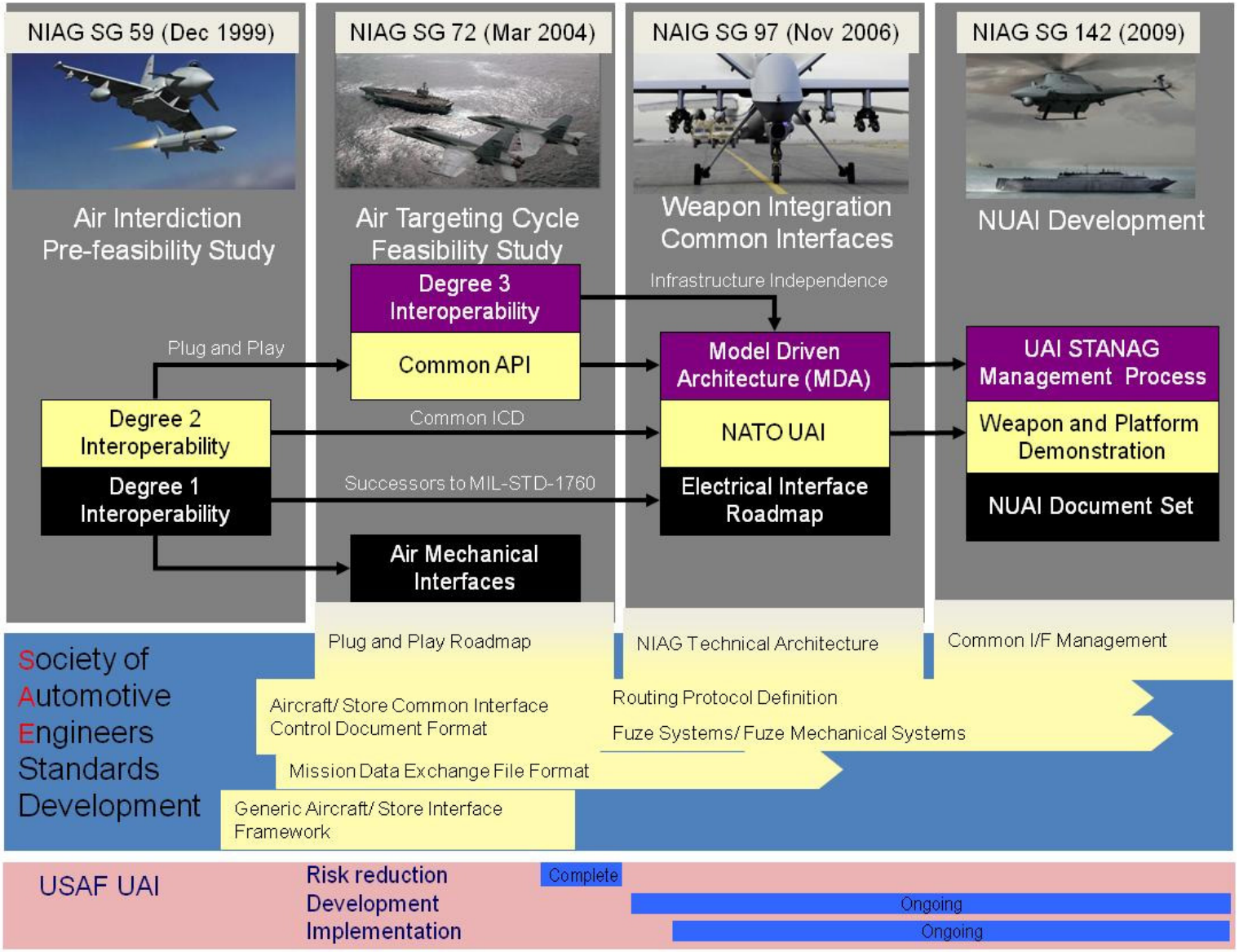

CAPABILITIES OVERVIEW

Capabilities Overview

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- **The "Capability Gap" in today's context**
  - **"Less than a month into the Libyan conflict, NATO is running short of precision bombs, highlighting the limitations … countries in sustaining even a relatively small military action over an extended period of time, according to senior NATO and U.S. officials."**
    - **Washington Post, Friday, April 15, 2011**
  - **Universal integration capability did not previously exist**
    - **Non-standard software interfaces drive integration schedules**

Is it possible to increase the "rate" of integration?

Capabilities Overview (cont)

- **Two aircraft deploy to same forward base, each with similar structural/avionics configurations, both are UAI compliant**
  - **Nation A objectives (acft with SDB CDS): SEAD**
  - **Nation B objectives (acft with BRIMSTONE CDS): mechanized**

Capabilities Overview (cont)

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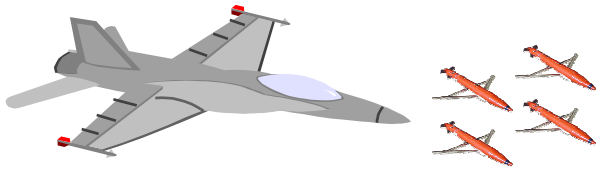
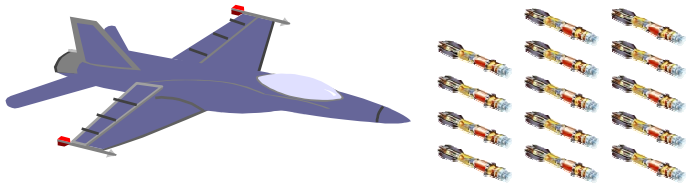
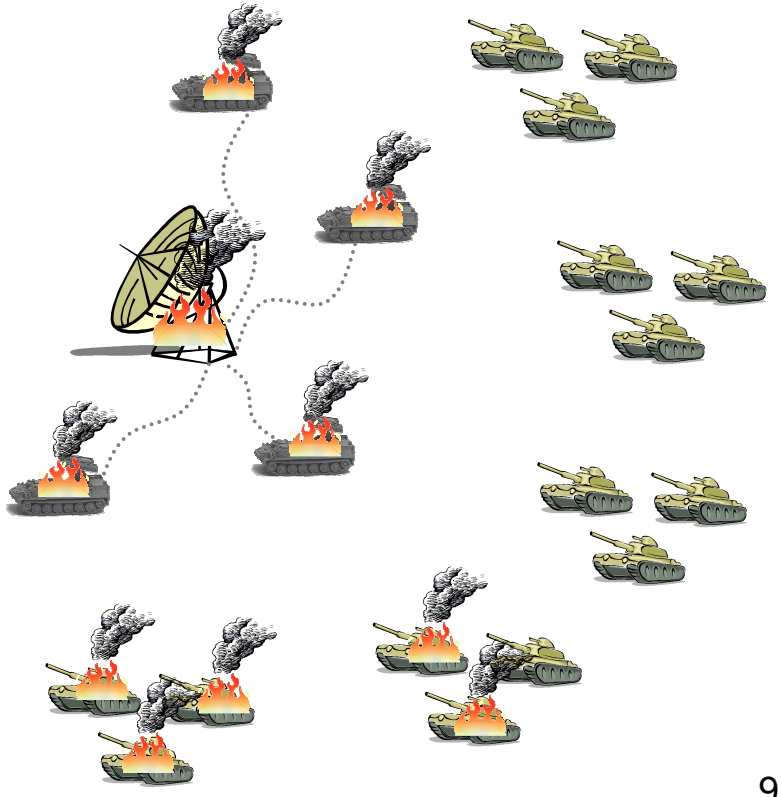
- **After several missions…**
  - **Nation A acft have completed objectives, now out of munitions**
  - **Nation B acft have surplus munitions, partial target set remains**
  - **How can Nation A rapidly integrate BRIMSTONE to help address remaining target set?**







Capabilities Overview (cont)

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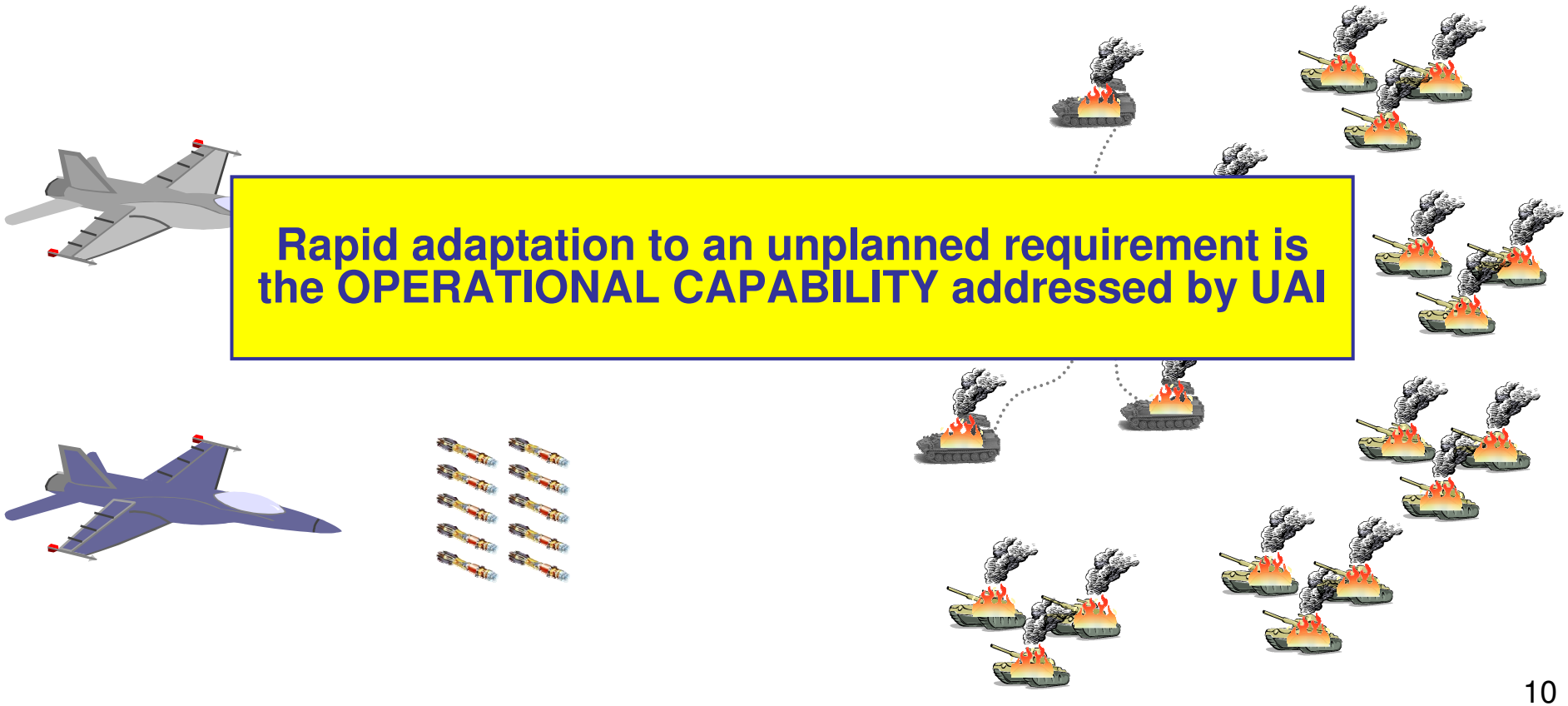
- **If Nation B provides existing BRIMSTONE CDS or creates limited functionality CDS…**
  - **Nation A aircraft have rapid capability upgrade**
  - **Both aircraft can now address remaining target set together**



TECHNICAL SCOPE
How Does UAI Work?

Interfaces Addressed By UAI

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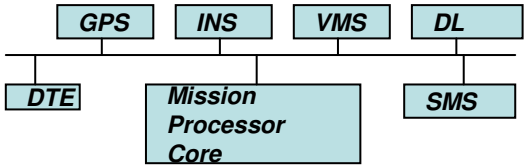
Platform/Store (P/S)

Unique Avionic Systems



Unique Implementations Of MIL-STD-1760

Common Weapon Logical Interfaces

Mission Planning (MP)

Common Mission Planning Systems

Common UPC Interface

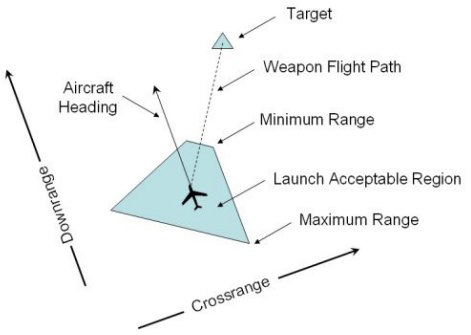
Unique Aircraft Data Files

Common mission data file formats

Launch Acceptability Region (LAR)

Unique Weapon Systems

Common Data Requirements and LAR Algorithms



How a Configuration Data Set Works

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Tailoring Instructions

Use
- Message 1
- Message 2
- Message 5
- Message 7

Set Variables

X=5
T=30
B is yes
.
.
.

Sequencing and Timing

Message 1
Wait 30 ms
Message 2
Wait 20 ms
Message 5 at 30 Hz.
.

LAR Data

CDS

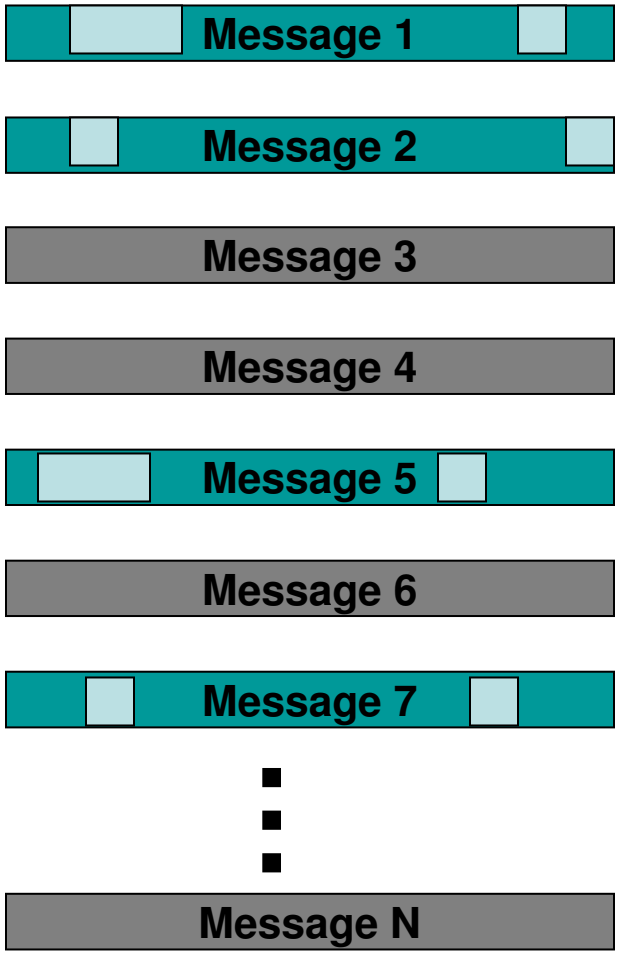
Message 1

Wait 30 ms

Message 2

Wait 20 ms

Message 5 at 30 Hz



Full UAI PSICD Message Set

UAI Mission Planning Interface

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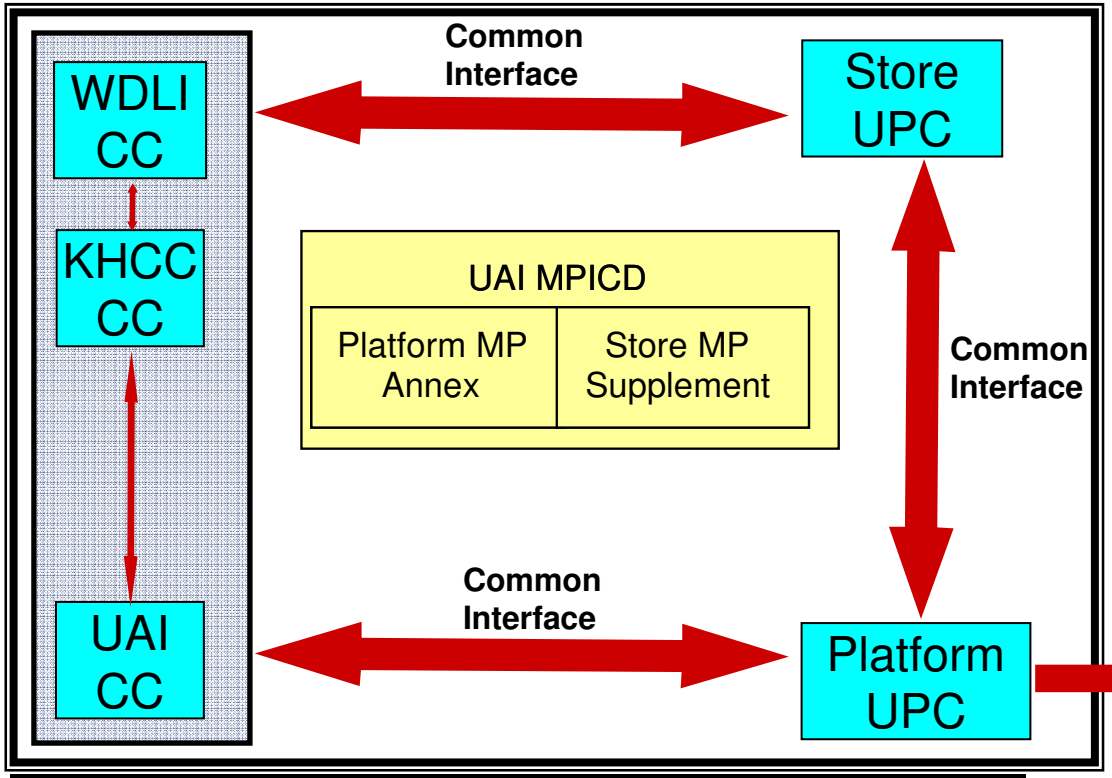
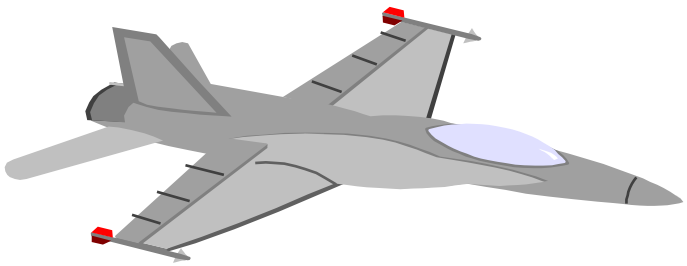


UAI adopted MIL-STD-3014 for use of MiDEF files

DTD



Software Component

Interface Control Document

System Interface

WDLI – Wpn Data Link Initialization
CC – Common Component
KH – Key Handler
UPC – Unique Planning Component

UAI LAR Standardization

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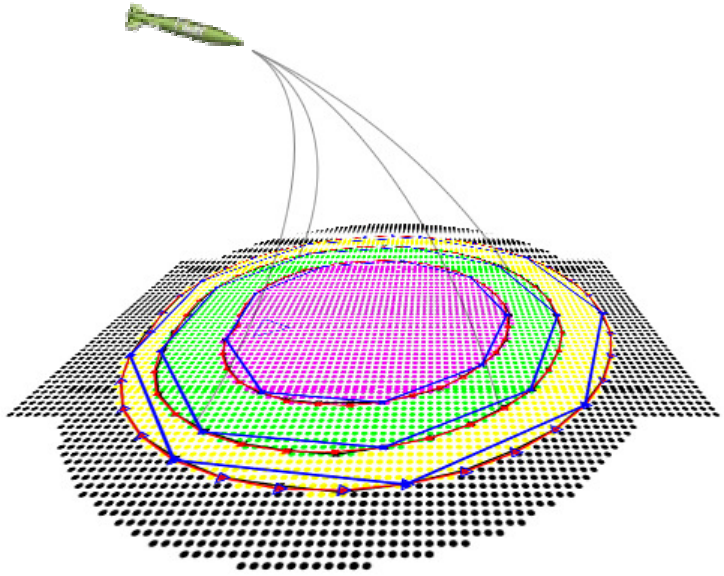
- **Problem:**
  - Calculate the region where a platform can release a guided weapon and hit a given target within specified impact constraints



- **UAI efforts standardized the LAR process**
  - Based on common truth data sets instead of independent n-DOF analysis
  - Developed common process and software toolset
  - Adopted standard algorithms
  - Added configuration controls to the LAR process

- **Results**
  - Platform LARs can be updated via mission data only
  - No OFP update will be required for the addition of a new weapon

UAI Integration Process

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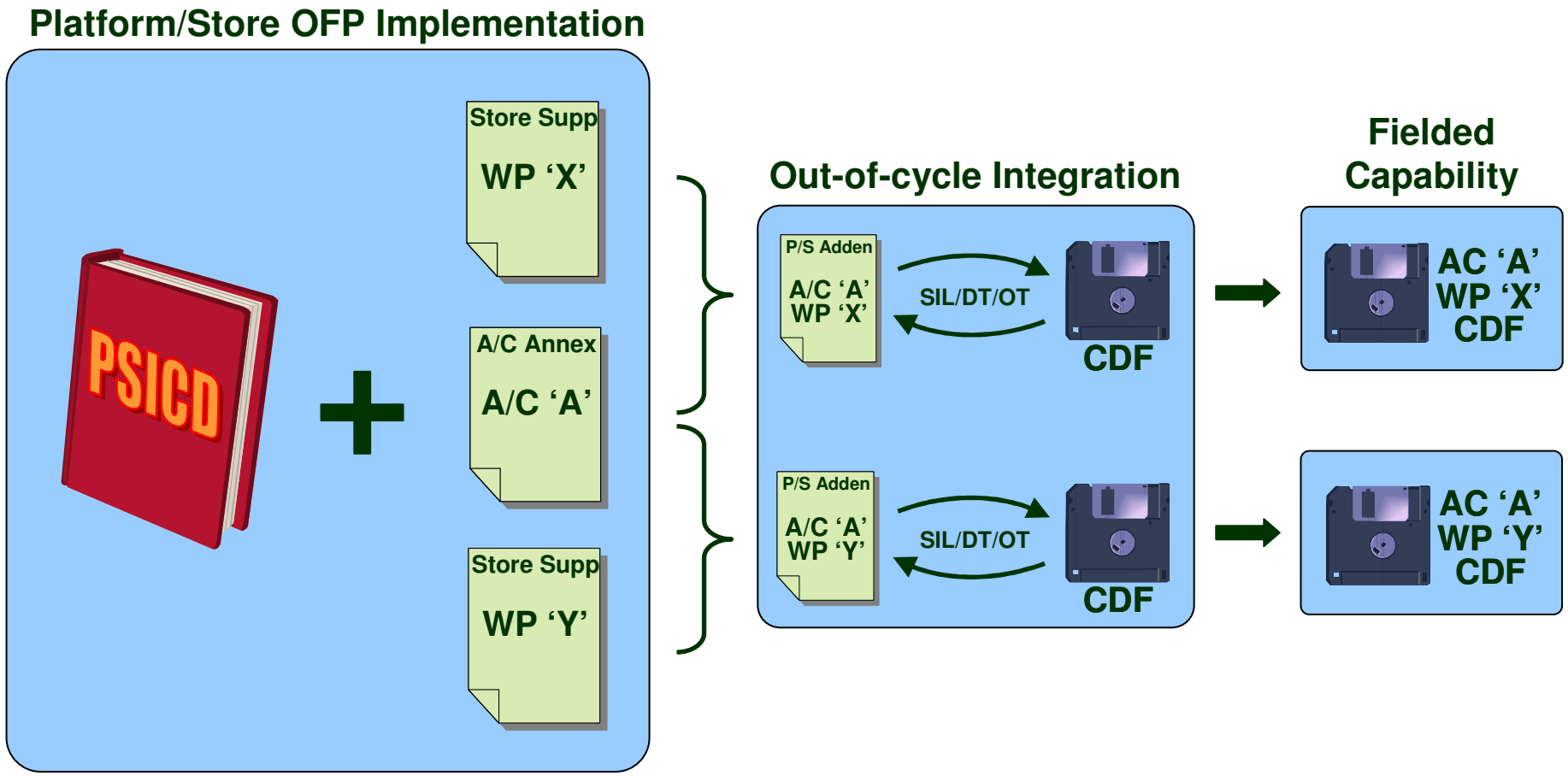

The operational capability lies in the CDF/S

INTERFACE MANAGEMENT
Current and Planned

Interface Management

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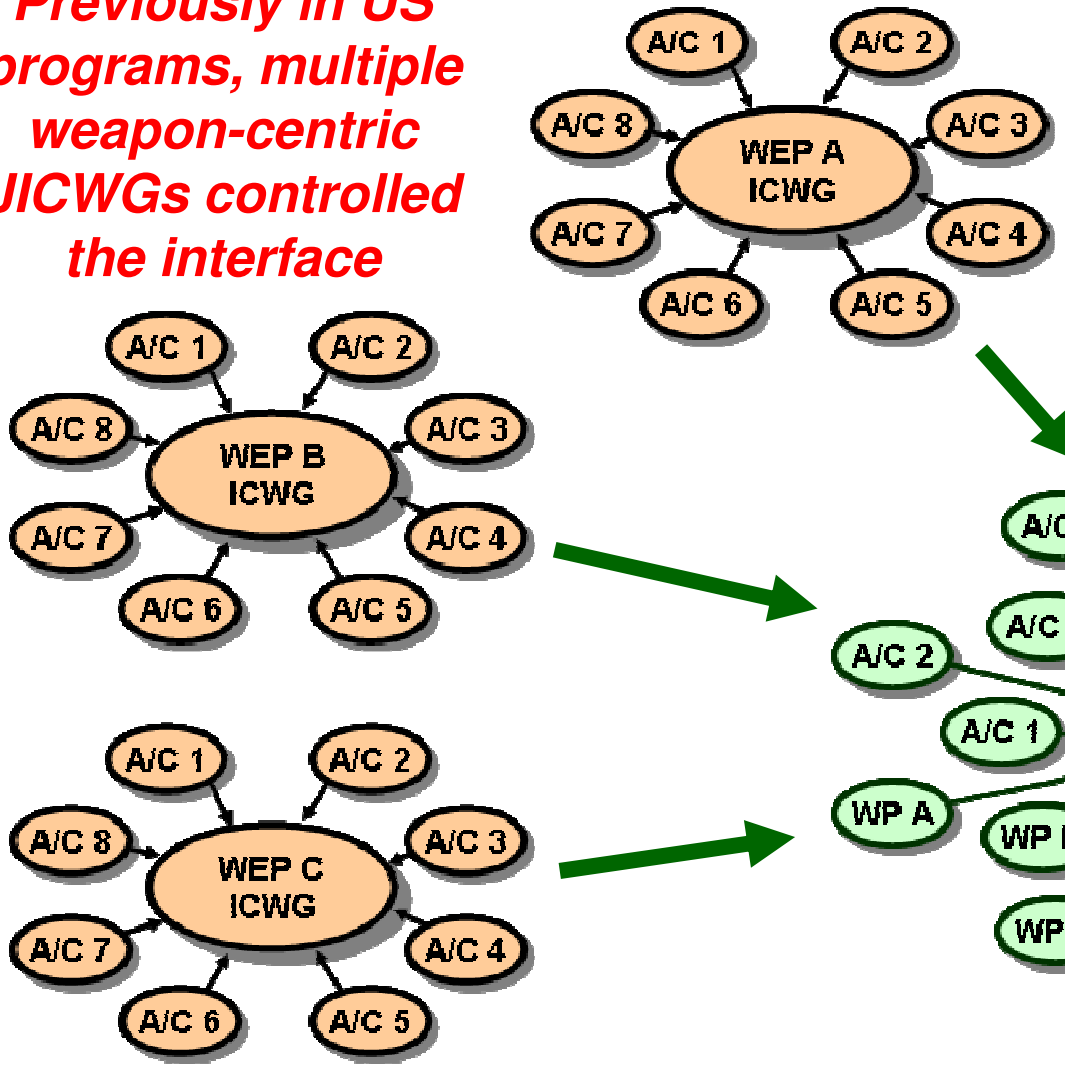
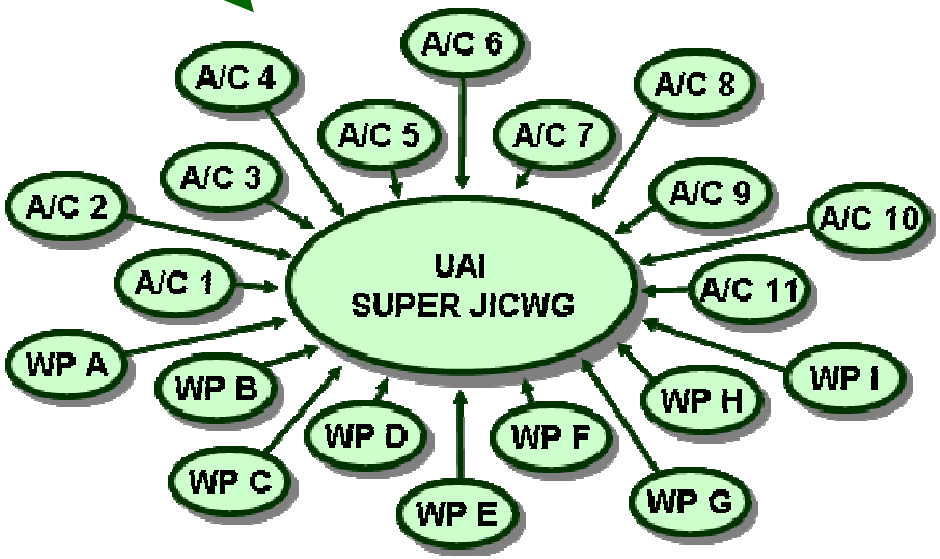
Previously in US programs, multiple weapon-centric JICWGs controlled the interface



UAI brings functional interfaces to a common single SJICWG



Interface Management (cont)

- **UAI is currently a USAF Program of Record**
  - **Since Jan 2005, the UAI Program has contracted with Boeing, Lockheed Martin, Northrop Grumman, and Raytheon for development and management of UAI**

- **Efforts also underway to expand UAI as a NATO STANAG (ie NUAI)**
  - **Specialist Team chartered in 2007 to coordinate efforts**
  - **SAE Int'l published AS6030 as framework for i/f mgt**
  - **NATO Industrial Advisory Group has executed multiple studies addressing the technical applicability of UAI to NATO**
  - **Other programmatic discussions still underway**

USAF IMPLEMENTATION

UAI Implementation Status

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- **Programs currently implementing/testing UAI compliant OFPs:**
  - **F-15E Suite 6**
  - **JDAM (all versions)**
  - **JASSM**
  - **F-16 M6/M6+**
  - **BRU-61**
  - **SDB 1**
  - **SDB 2**
- **Programs in planning for UAI Implementation**
  - **MQ-1C**
  - **F-35**
  - **B-2**
  - **B-1**
  - **B-52**

Successes

- F-15 has accomplished 30+ JDAM releases using UAI
- JASSM successfully completed UAI Certification testing
- F-15 was able to integrate LJDAM in days with only a CDS change
- F-16 is SIL and flight testing with M6+
- BRU-61 and SDB 1 successfully completed UAI Certification testing

First UAI/LJDAM Release accomplished in Jan 09

OPPORTUNITIES FOR INTERNATIONAL PARTICIPATION

International Opportunities

- **Although UAI is export controlled, cooperative efforts are already underway**
  - **NATO UAI Development: NATO Air Capability Group 2 (NUAI STANAG development)**
  - **OUSD Coalition Warfare Program: Turkey/USAF**
    - **Combined with SAF/IA Intl Cooperation R&D program**

- **Other potential venues**
  - **NAFAG**
  - **NATO Industrial Advisory Group**
  - **OUSD (US) Coalition Warfare Program**
  - **SAF/IA (USAF)**
  - **NATO ACT Concept Dev & Experimentation WG**

Cooperative Projects Start With an Concept

SUMMARY

Summary

- **The gap: integrating the next weapon faster than the last**
  - **How does this capability prioritize with other s/w candidates?**
- **UAI enables capabilities via config files, not lines of code**
- **Initial USAF pathfinders already fielded with UAI**
  - **Add'l programs in planning/demonstration/testing stages**
- **NATO/International efforts progressing well**
  - **Additional partnership opportunities exist**
- **Questions?**

Summary

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BACKUPS

Acronyms

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- ACT – [NATO] Allied Command Transformation
- API – Application Programming Interface
- BRU – Bomb Rack Unit
- CC – Common Component
- CCP – Compliance Certification Plan
- CDF/S – Configuration Data File / Set
- CSCI – Computer Software Configuration Item
- DL – Data Link
- DOF – Degree of Freedom
- DTD – Data Transfer Device
- DTE – Data Transfer Equipment
- GPS – Global Positioning System
- ICWG/JICWG – Interface Control Working Group / Joint ICWG
- I/F – Interface
- INS – Inertial Navigation System
- JASSM – Joint Air-Surface Standoff Missile
- JDAM/LJDAM – Joint Direct Attack Munition / Laser JDAM
- JMPS – Joint Mission Planning System
- KH – Key Handler
- LAR – Launch Acceptability Region
- MDA – Model Driven Architecture
- MiDEF – Mission Data Exchange Format
- MP CT – Mission Planning Certification Tool
- M/P – Mission Planning
- MPE – Mission Planning Environment
- MPICD – Mission Planning Interface Control Document
- NAFAG – NATO Air Forces Armaments Group
- NATO – North Atlantic Treaty Organization
- NIAG – NATO Industrial Advisory Group
- NUAI – NATO UAI
- OFP – Operational Flight Program
- OUSD – Office of the Undersecretary of Defense (US)
- PGMPS – Precision Guided Munitions Planning System
- P/S – Platform Store
- PSICD – Platform-Store Interface Control Document
- SAE – Society of Automotive Engineers International
- SAF/IA – Undersecretary of the Air Force, International Affairs (USAF)
- SDB – Small Diameter Bomb
- SEAD – Suppression of Enemy Air Defenses
- SIL – Systems Integration Lab
- SG – [NIAG] Subgroup
- SMS – Stores Management System
- STANAG – Standardization Agreement
- UAI – Universal Armament Interface
- UPC – Unique Planning Component
- UPS – Universal Platform Simulator
- USAF – United States Air Force
- USS – Universal Store Simulator
- UUT – Unit Under Test
- WDLI – Weapon Data Link Initialization

CERTIFICATION AIDS

UPS Configurations

- The UPS CSCI consists of three parts - the UPS Host Application, a set of baseline test scripts, and a Variable Management Tool
- There are three main test setups.
  1. Mission Store as UUT (Example: JDAM or JASSM)
  2. Type 1 Carriage System as UUT
  3. Type 2 Carriage System as UUT (Example: BRU-61 or BRU-61/SDB)
- Developed / Delivered Baseline Test Case Script Files
  1. Mission Store
  2. Type 1 Carriage System
  3. Type 2 Carriage System
  4. Functional Scripts

USS Cert Tool Overview

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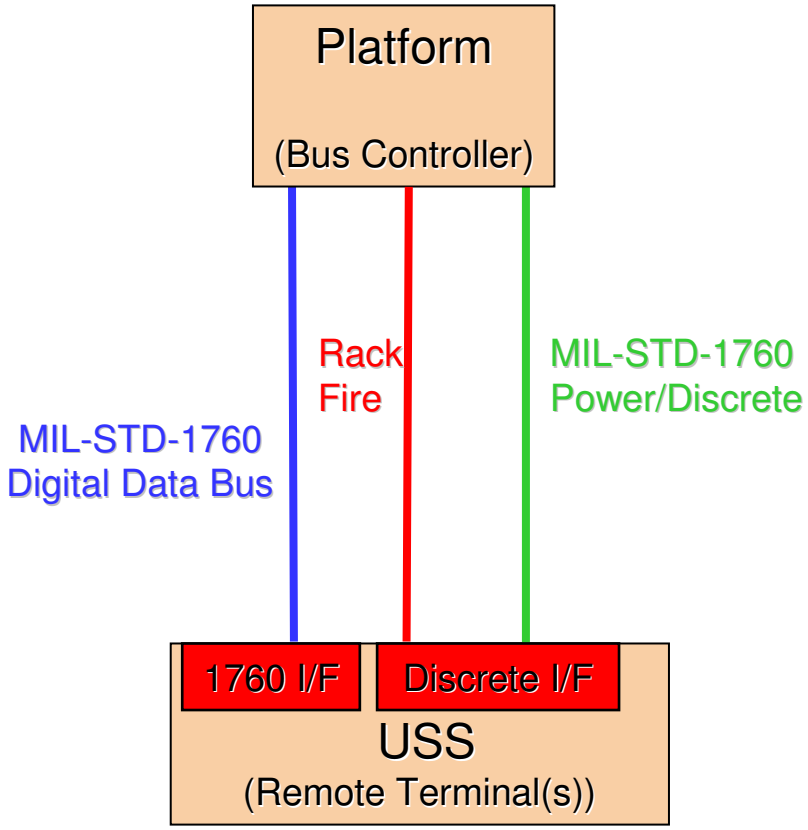
- The USS is used in a Platform Systems Integration laboratory (SIL)
- The USS can:
  - Simulate a Single UAI Mission Store
  - Simulate a Type I UAI Carriage System with up to 8 Mission Stores
  - Simulate a Type II UAI Carriage System with up to 8 Mission Stores
  - Be configured to emulate store capabilities to support UAI Compliance Certification Plan (CCP) Test Cases
  - Execute in Windows XP
  - Behave as a "borderline acceptable" UAI store by providing configurable response timing allowing testing at the edge of acceptable limits



The USS is an extremely versatile test tool designed to fully validate a UAI Platform interface

CT Status

- Final Versions of the UPS and USS that support the R02 version of the PS ICD plus some ICNs have been delivered.
- Final version of the MP CT that support the R03 version of the MP ICD plus some ICNs has been delivered.
- Updates to the UPS, USS and MP CT are scheduled to maintain concurrence with the UAI Configuration Versions.
  - Updates are planned for approximately once a year or when needed for a specific program capability

Certification Tools

- UAI has two Cert Tools:
  - Mission Planning Cert Tool
    - Software module within Precision Guided Munitions Planning System (PGMPS)
    - Tests UAI mission planning implementation / compliance
    - Developed by Northrop-Grumman
  - System Integration Lab (SIL) Cert Tool
    - Test asset used by platforms and weapons in the SIL to test UAI implementation and compliance
    - Hardware developed by Lockheed-Martin
    - Universal Platform Simulator (UPS) software developed by Boeing
      - Emulates generic UAI platform to the weapon
    - Universal Store Simulator (USS) software developed by Raytheon
      - Emulates generic UAI store or weapon to the platform

Certification Tools (cont)

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UAI SIL Impact

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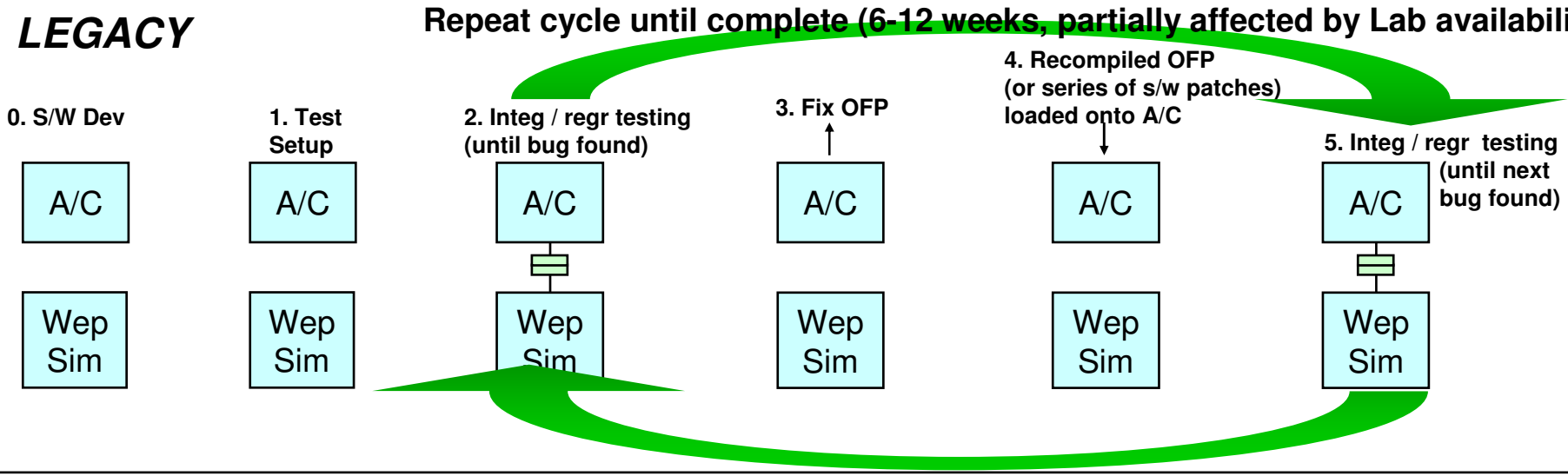
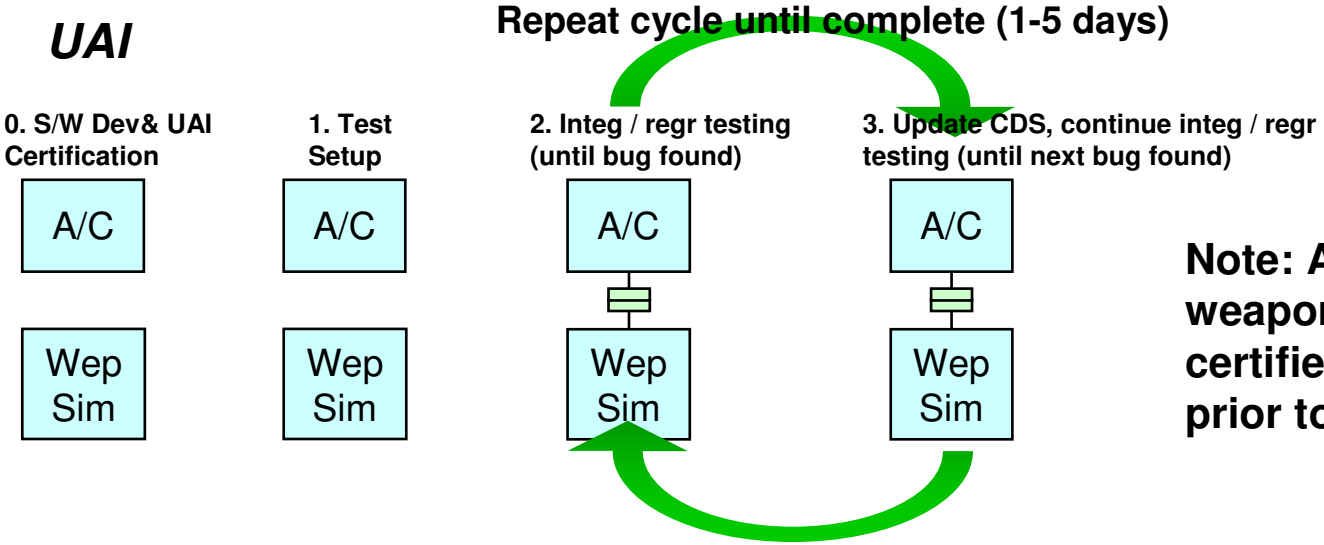
LEGACY



UAI



Note: Assumes A/C and weapon have already been certified as UAI compliant prior to SIL tests