Modeling & Simulation for Enterprise Test and Evaluation

Shala Malone
Combat Systems Performance Manager
PEO IWS 7D
202-781-2133
Shala.Malone@navy.mil

Rich Reading
Cutlass Systems Engineering LLC
301-129-1203
reading@cutlass-se.com

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Operational Context: Ship Self Defense

Radars: SPS-49, SPS-48, SPQ-9B, MFR...

Ship Defense MOE
Probability of Raid Annihilation (P_{RA})

*is the ability of a particular stand-alone ship **as a system** to detect, control, engage, and defeat a specified raid of threats within a specified level of probability in an operational environment*

CIWS/SEARAM sensor

ES, IRST

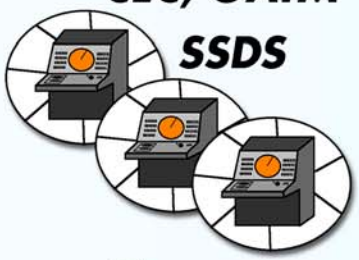
SLQ-32, advanced ES

DEW

NATO Seasparrow, ESSM

Onboard EA

CEC, OATM



SSDS

Open Architecture

TSCE

MK 214 Chaff

Multi-threat raid

- Subsonic, supersonic, high diver
- Hi-G maneuvers
- Multi-mode seekers

NULKA

MK 216 Chaff

CIWS gun

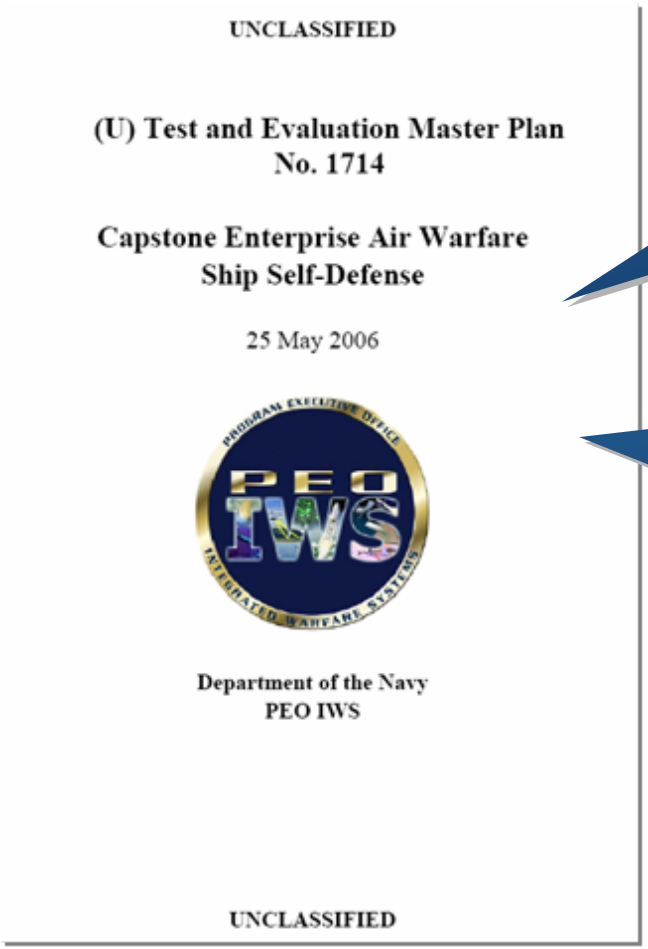
RAM

Signature control

Battle Timeline ≈ 30 seconds

Battle Space ≈ 0-12 nmi

Enterprise Test & Evaluation Master Plan



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(U) Test and Evaluation Master Plan
No. 1714

Capstone Enterprise Air Warfare
Ship Self-Defense

25 May 2006

Department of the Navy
PEO IWS

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The purpose of the Capstone Enterprise Air Warfare Ship Self Defense (AW SSD) Enterprise Test and Evaluation Master Plan (TEMP) is to consolidate all AW SSD at-sea testing and P_{RA} Testbed testing

The AW SSD T&E Enterprise Strategy is founded on a two-tiered process to assess AW SSD warfare systems performance:

1) Validate models with live testing
   - Operational Ship testing
   - Self Defense Test Ship (SDTS) testing
2) Assess performance with models

Test Events DT/OT-ET15 thru ET19 are formal P_{RA} Testbed events

Includes DDG 1000, LHA 6, LCS and CVN 21 ship classes

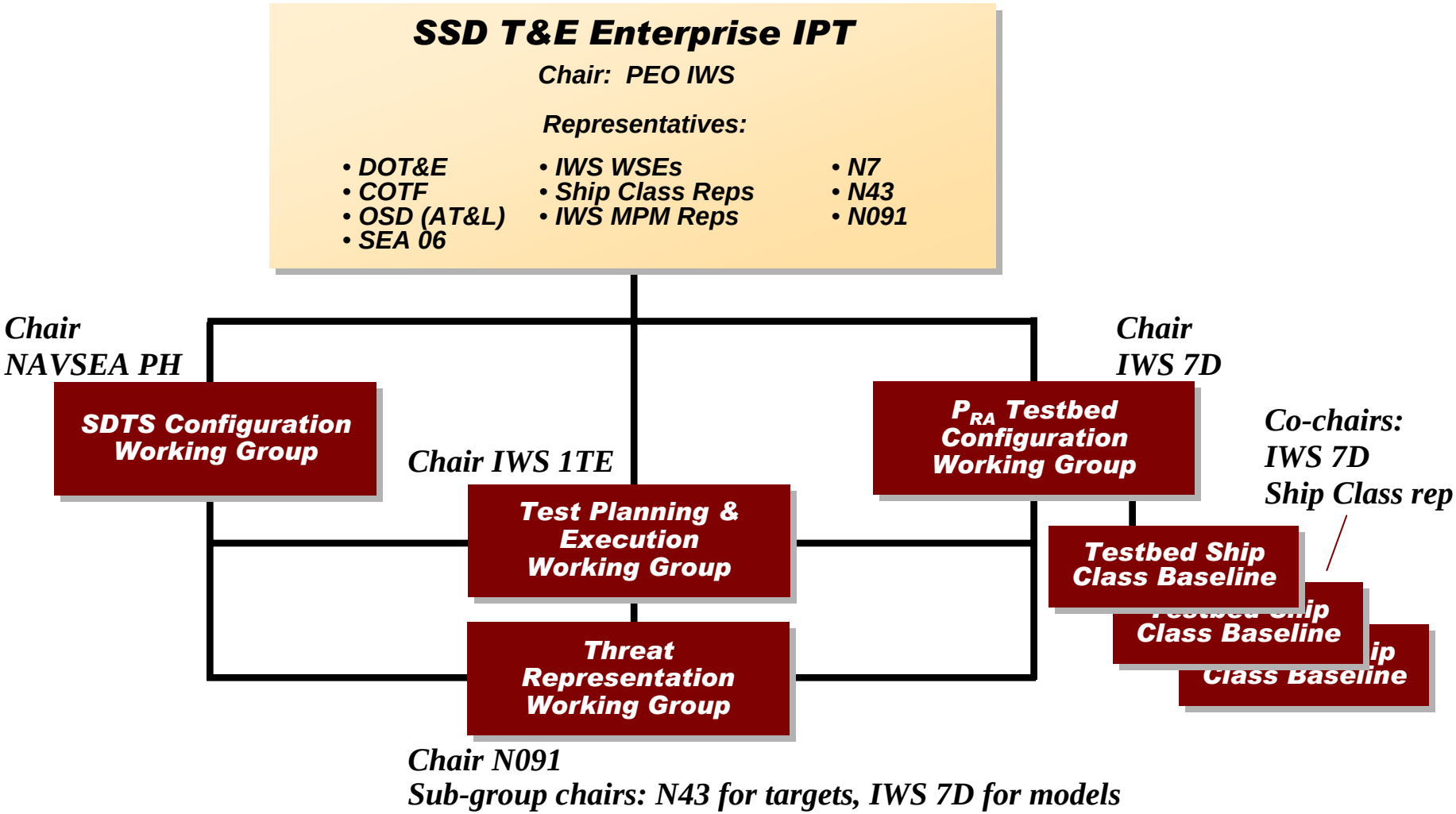
Enterprise P_{RA} Testbed System Engineering – Drivers for Centralized IWS Leadership

- **Systems performance for P_{RA} assessment spans different technical communities and multiple managing program offices**
- **P_{RA} will be assessed using a federation of interoperable simulations; it will not (cannot) be tested empirically**
  - Complex, multi-spectral, integrated HK/EW problem space
- **Many specific parameters, assumptions, and limitations are negotiated between the testing and acquisition communities**
- **The testing community is intent on consistent P_{RA} assessment across ship classes and warfare system configurations**
  - Different hulls, different configurations…same threat models, same virtual range conditions

Enterprise Test Planning & Execution

- **Non-traditional factors**
  - M&S events as formal test events
    - "Virtual Range" requirement
  - Expectation for formal, planned data flow from empirical testing to model validation
- **Organization and planning are combat-system-centric vice platform-centric**
  - Single Enterprise Test Team
  - Centralized management and resourcing of P_{RA} Testbed
  - Multiple ship classes provide testing data supporting P_{RA} Testbed component development and validation

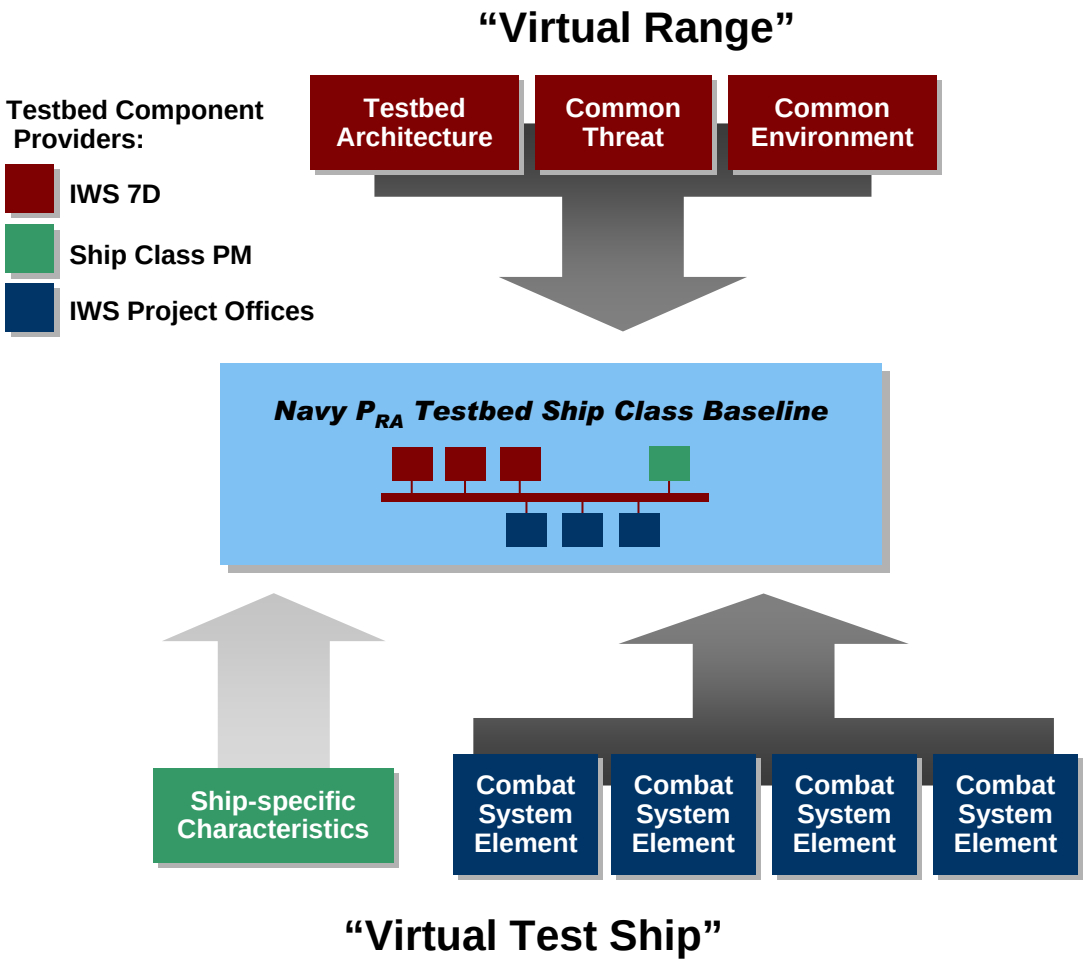
Navy Ship Self Defense
T&E Enterprise IPT Structure



Enterprise P_{RA} Testbed System Engineering

- **Engineering one Enterprise Testbed, which is instantiated in several unique configuration baselines**
  - Formally accredited Baselines are correlated to Enterprise test events and ship class OPEVALs
  - Element Project Offices are vendors to Enterprise not individual ship classes
- **One master set of requirements for the Testbed**
  - Fed by both Enterprise SE and Baseline IPTs
  - Allocated and adjudicated according to Enterprise deliveries
- **A single Enterprise delivery may provide capability to more than one Testbed Baseline**
  - A single set of SE artifacts is maintained at the Enterprise level
- **Testbed-based Enterprise test events will be treated as empirical events**
  - E.g., test readiness reviews, test objectives

Enterprise P_{RA} Testbed Components



"Virtual Range" (Infrastructure)

- Testbed Architecture: network interface layer, interface standards, functional allocation standards
- Common Threat Models: seeker, airframe/autopilot, signatures, vulnerability
- Common Environment Models: tailored authoritative databases, runtime environment data services

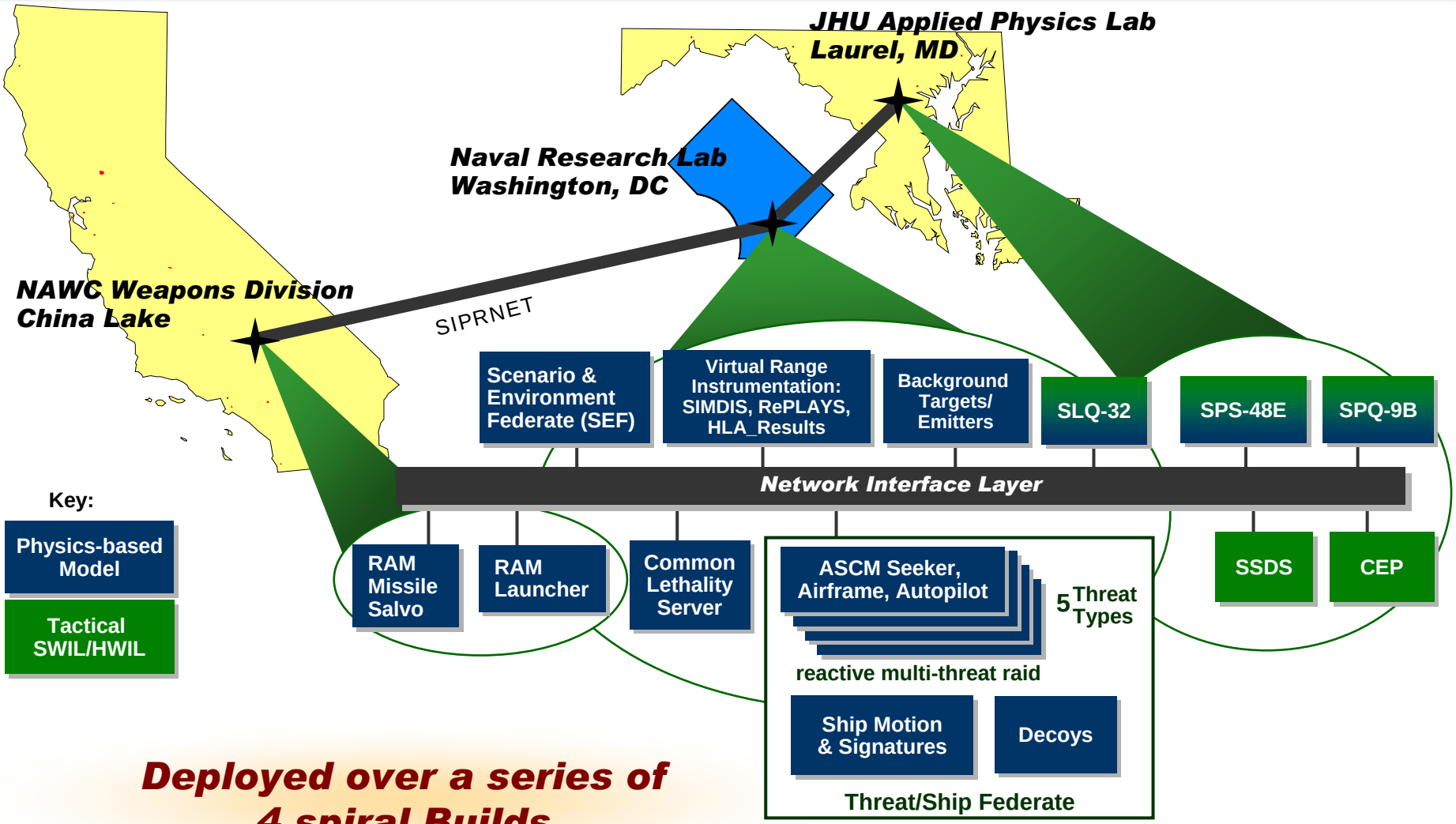
"Virtual Test Ship"(specific to ship class)

- **Ship Characteristics**
  - Signature, motion, launcher placements, etc.
- **Combat System Representation**
  - Authoritative, "T&E quality" models of combat system elements

Current Simulation Framework Characteristics

- **HLA federation implementation**
  - All system representations execute simultaneously for each ship defense engagement
- **Geographically distributed**
- **Constructive simulation, conservative time management**
- **System representations are a mix of digital models and tactical software**
  - Most representations are a hybrid of tactical SWIL and digital model
  - Most tactical SW re-hosted to general purpose computers

P_{RA} Testbed Deployment LPD 17 Baseline



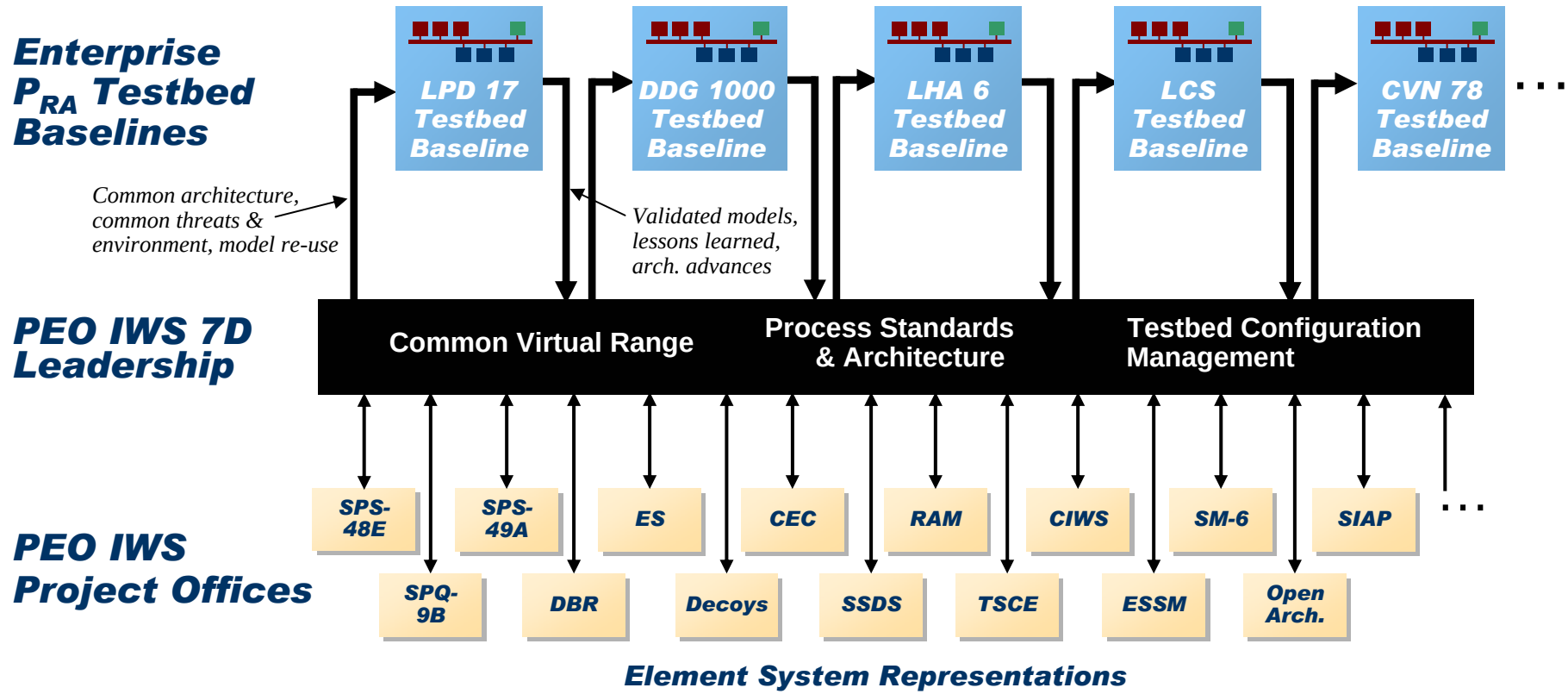
Deployed over a series of 4 spiral Builds

Enterprise P_{RA} Testbed Status

- **P_{RA} Testbed Configuration Working Group Established Under Ship Self Defense T&E Enterprise**
  - Chaired by IWS 7D, Shala Malone
  - Testbed baseline IPTs established for current Enterprise ship classes: LHA 6, DDG 1000, CVN 21, and LCS
- **LPD 17 Testbed Development Underway in Support of Ship Class OT&E**
  - 4th spiral integration underway
  - LPD 17 assessment 'runs for score' commence 1QFY08; completion planned for CY08

Enterprise P_{RA} Testbed Evolution

Consistent Testbed development across ship classes and CS configurations



Significant cost avoidance through re-use of models, virtual range, & architecture

Challenges Ahead

- **Feedback of knowledge and capabilities to early phase acquisition systems engineering**
- **Improved mechanisms for injecting data needs into planning of empirical tests**
- **Relationship of P_{RA} Testbed simulations to other M&S supporting system development and T&E**
- **M&S capabilities development to support Family-of-Systems development**

Questions?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