



**Program Executive Office  
Command, Control, Communications,  
Computers and Intelligence (PEO C4I)**

**The Rapid Integration and Test Environment -  
A Process for Achieving Software Test Acceptance**

**12 May 2010  
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**PEO C4I**





# Agenda

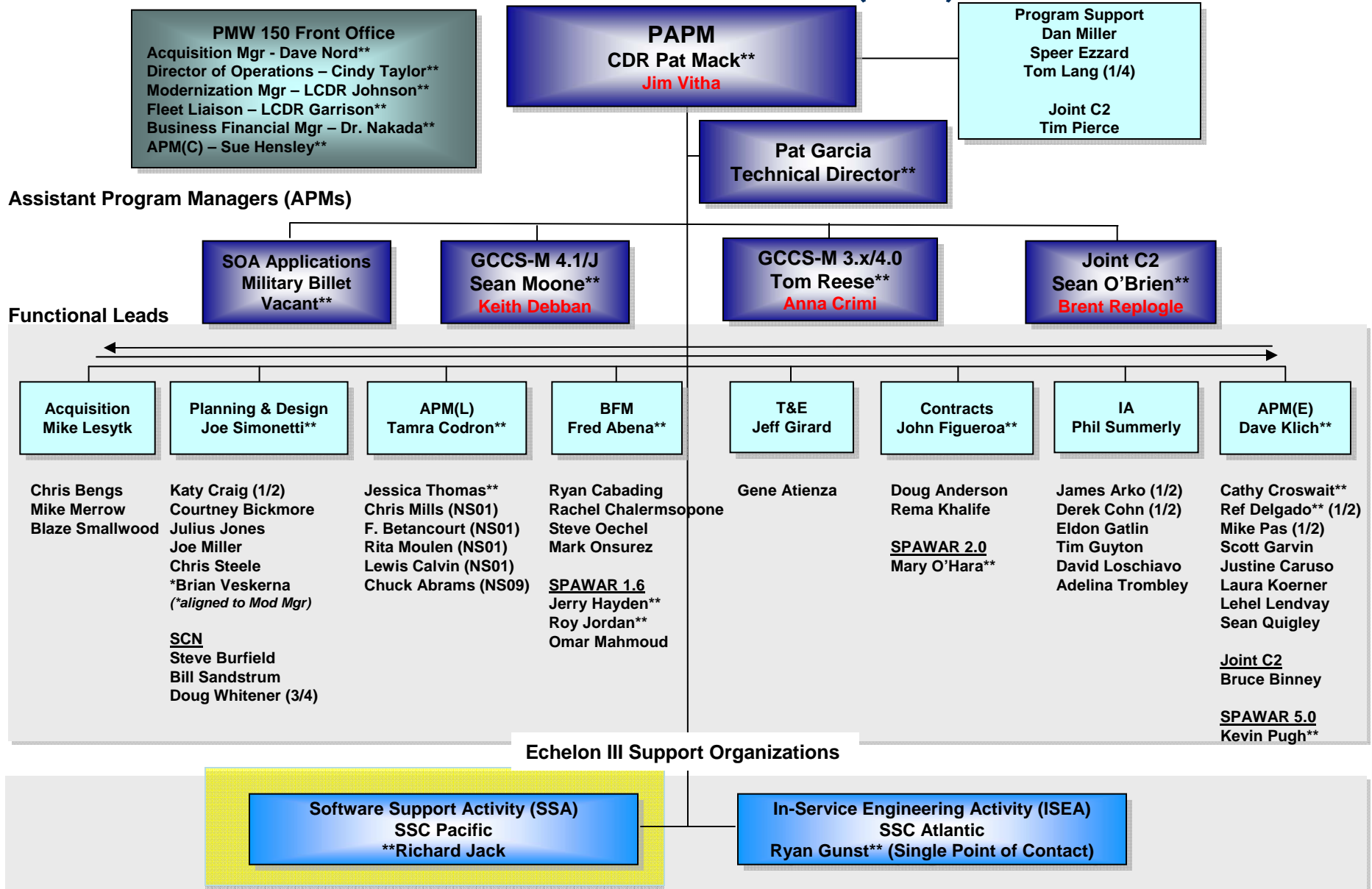
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- ▼ Organizational Overview
- ▼ Navy C2 Software Development Issues
- ▼ Rapid Integration and Test Environment (RITE)
- ▼ Operational Implementation
- ▼ Closing Statements

# PEO C4I Command and Control Systems Program Office (PMW 150)

## Maritime Command and Control (MC2) Division



\*\* = Govt/Mil Personnel



# Navy GCCS-M Force Structure

As of 19 MAR 2010



### CONUS Sites (20 qty)

- USJFCOM
- COMUSNAVSO / C4F
- COMNAVSPECWARGRU2
- COMNAVSPECWARGRU4
- COMEXSTRIKGRU2
- COMSOCJFCOM
- COMNAVFACENCOM
- NOLSC
- CBC
- COMEXSTRIKGRU3
- NFELC
- COMFIRSTNCD
- CNO
- Alt Navy CMD Center
- USFF
- COMTHIRDFLT
- COMSECONDFLT
- COMNAVSPECWARCOM-West
- COMSUBFOR
- COMSUBRON-11

### OCONUS Sites (14 qty)

- USFJ
- USPACOM
- COMNAVFORJAPAN
- COMEXSTRIKGRU7
- CTF-72
- CTF-73 / COMLOG WESTPAC
- PA-RSC
- COMPACFLT
- COMUSNAVCENT/C5F
- COMUSNAVEUR / COMSUBGRU 8
- CTF74 / COMSUBGRU 7
- COMSUBPAC
- CTF-34
- COMSUBGRU 8 Rep

### Training Sites (8 qty)

- SWOSCOLCOM
- CSCS U Dam Neck
- CID LS Dam Neck
- NMITC
- FLEASWTRACEN
- CID LS San Diego
- FITCPAC
- NSAWC Fallon

## 68 Submarines

 50 SSNs

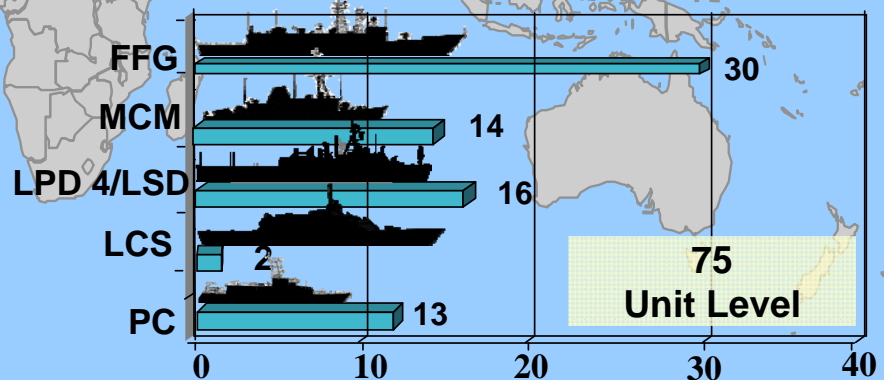
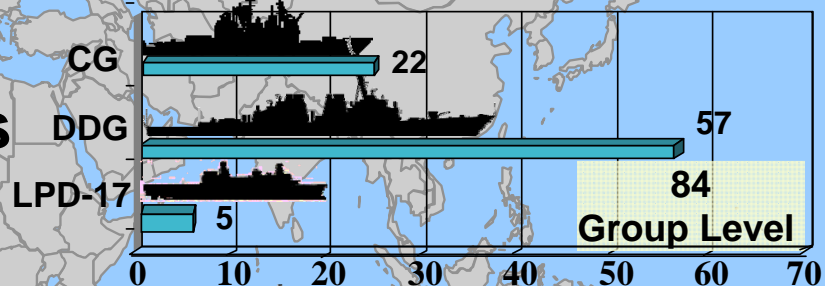
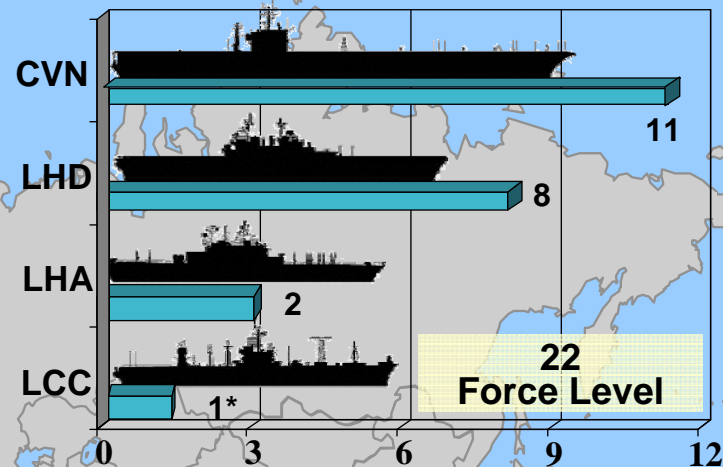
 14 SSBNs

 4 SSGNs

### 10 Allied/Coalition Partners



- GCCS-M systems installed; does not account for SCN Hulls
- Sites in purple have Navy installed GCCS-J systems
- Sites in blue have Navy installed GCCS-M/GCCS-J systems
- Sites in black have Navy installed GCCS-M systems
- \* LCC19 has GCCS-J 4.1.0.4 GENSER, GCCS-M 4.0.1.2 SCIC





# Software Development Issues



## ▼ Poor Government – Industry Relationship

- Insufficient non-functional Requirements Definition and Product Design
- Inadequate quantitative performance measures
- Poor software and data rights management
  - Developer controlled source code
  - Government got “black box” binaries only, no insight into internals

## ▼ Institutional Knowledge Lock

- Contractor controlled source code (and software knowledge), therefore competitive environment favored incumbent
- Contracts essentially became ‘sole source’ – reduced competition and eroded Government Corp knowledge
- Government had limited ability to set development cost, schedule, or performance targets

## ▼ High Sustainment Cost

- Above issues resulted in poor quality software released to operational forces
- Performance issues caused high maintenance costs to sustain fielded systems



# PMW-150 'Leap of Faith'



There is an upfront cost to doing business a different way AND savings not realized until later in the program life cycle...

- ▼ Can reduce total ownership cost (TOC) by implementing new development and testing processes
  - Improve software quality which reduces sustainment/maintenance costs
- ▼ BUT...new Navy C2 Programs of Record (PORs) require additional RDT&E funding NOW to transition to SOA/Open Architecture and implement corrections
- ▼ AND... still need to maintain current Navy C2 installations until end-of-life
  - Maintenance costs of existing systems expected to increase as systems age





# The RITE Vision



RITE addresses issues and facilitates development and distribution of Navy C2 systems:

- ▼ Check –software development
- ▼ Stabilize – the current build
- ▼ Influence – the final product delivery

## RITE PILLARS



### Contracts

- Govt responsible for non-functional 'requirements definition
- "Govt Purpose Rights" or "unlimited Rights" for s/w (include source code)
- Drives CDRLs/ DID/CPARS deliverables
- Aligns Developers and Testers



### Processes

- Puts increased effort into early stages of PLC
- Integrates "early" and "frequent" testing into Development stage
- Requires regular engineering drops of software
- Institutionalize source code analysis
- Automates and focuses testing
- Standardizes tools and test cases for Developers and Testers



### Infrastructure

- Centralized Repository– enhances project communication and collaboration
- Create Framework for:
  - Software Distribution/Apps Store
  - Documentation Library
  - Development
  - Software Testing tools and data
- Centralized software Configuration Management

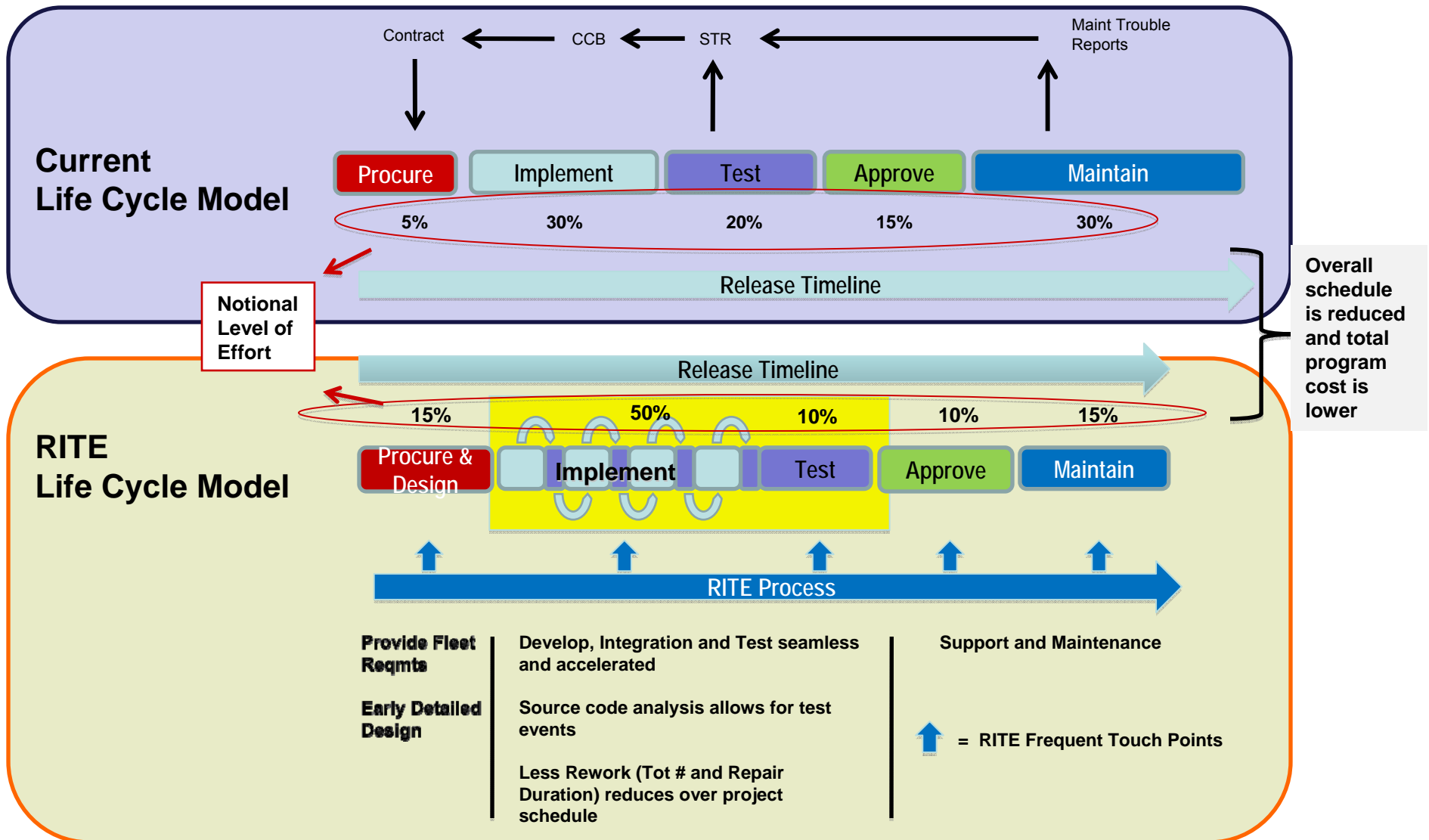


### Organization

- Establish Governance Plan based upon community process
- Expanded Proj Mgr Perf Metrics
- Different Personnel Qualls and Certs
- Software focused vs. operationally focused



# Life Cycle Comparison





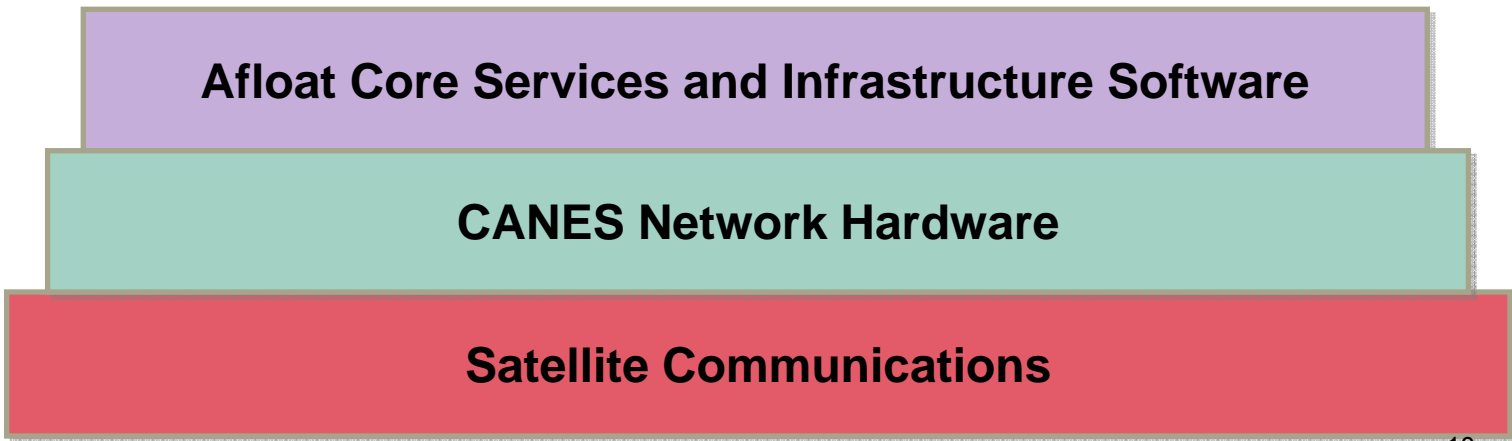
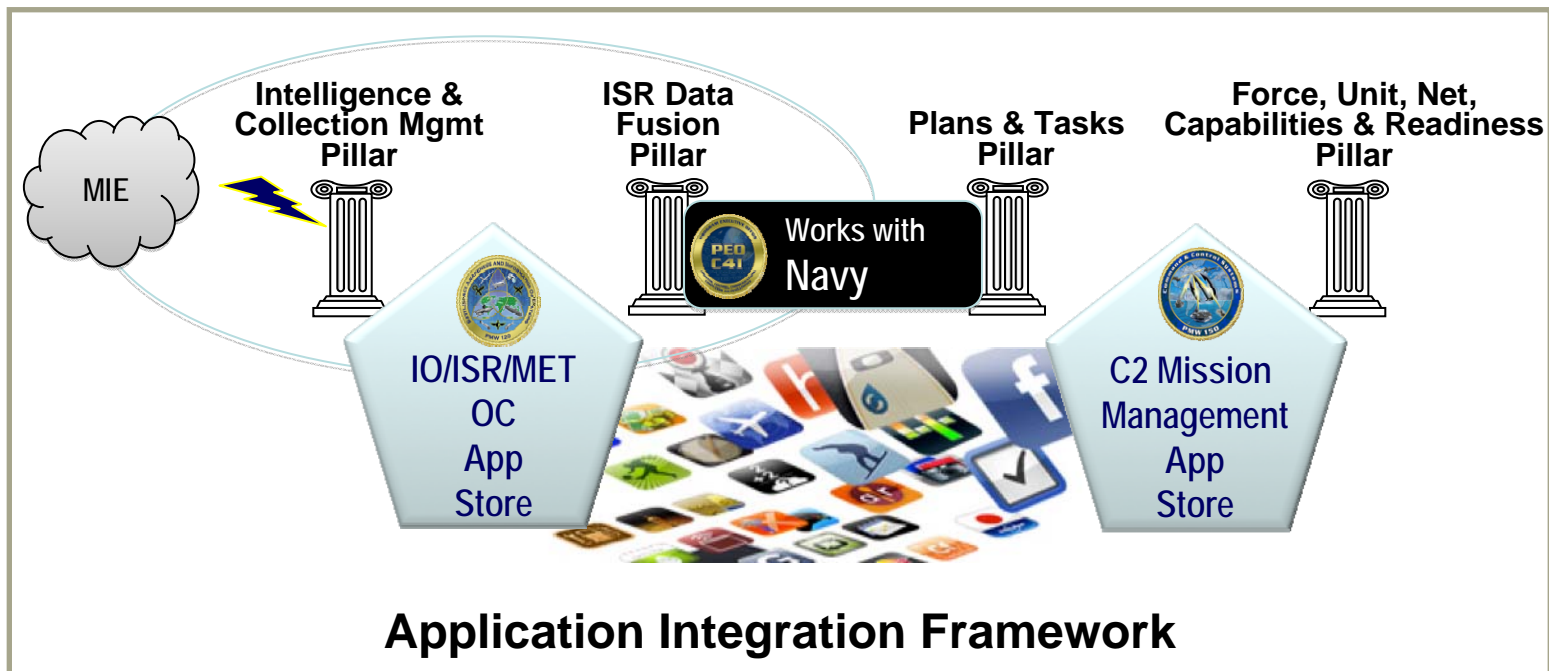


# RITE Benefits

- ▼ **Provides Program Office planning and decision support**
  - Provides current and accurate data for program knowledge at any time throughout product life cycle
  - How many defects exist, what STRs to fix and when, where do I spend maint dollars, how's my A/o and why?
- ▼ **Supports the ability to use competitive awarded approach and support multi-contractor effort**
  - Validated code base is available for competitive contracts
  - Lower risk to performer switching (TOC effects) because of reduced proprietary data
- ▼ **Cost effective way to do QA**
  - Use tools to balance or reduce staffing requirements
- ▼ **Increases efficiencies and resource utilization**
  - May not need multiple DT's in the future
- ▼ **Ability to resolve long standing persistent bugs**
  - Facilitates "joint" teams to solve BIG problems
  - Leverages open source paradigm approach: allows more talented eyes on the problem



# iPhone™ Analogy for C2 Software Production





# C2 Mission Management App Store (Reconfigurable Navy C2 Distribution Scenario)



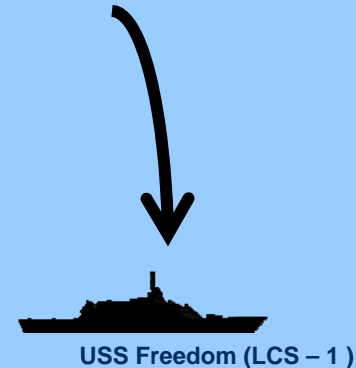
## C2 Mission Management Applications Store

- C2 SW component catalog
- Incremental engineering drops (developer builds)
- Automated Test Tools
- FAQs, Guidance, Mil-STDs
- Requirements, Best Practices, and Lesson's Learned
- Codes Sample



## Operational Commander

- Assigns new Tactical Mission (e.g. Civil-Military; Counter-drug; humanitarian relief, etc) to LCS-1
- Designates additional Navy C2 components needed to conduct new operations and to inter-operate with other tactical forces
- Provides 'authorization code' to download needed C2 Apps



## Navy C2 Software Support Activity (SSC Pac)

- Maintains Apps Store and Active Fleet configuration Management
- Interfaces with OPCON to identify specific "components" (app/version/release) for assigned unit
- Conducts interoperability and compatibility testing prior to releasing new components, if necessary
- Assigns 'Authorization Code' for selected Components
- Releases new components for designated unit

## Operational Unit

- Upon new assignment notification and Mission Package Update authorization – logs into Apps Store
- Using authorization code is able to access Apps Catalog that pertains to specific unit
- Downloads new Mission Package components
- Runs automated acceptance test and installs into GCCS-M



# Closing Statements



- ▼ Government – Industry Partnership was not working as well as it could have
- ▼ Delivering quality product, on time and within budget has been an ongoing challenge
- ▼ Issues (and poor results) drove changes initiated under RITE
- ▼ Still much to do
  - Institutionalize ALL processes
  - Continue integration of automated testing into development stage
  - Expand functionality and use of Apps Store and Central Repository
  - Metrics, Metrics, Metrics !!!!



# Points of Contact



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# BACKUP





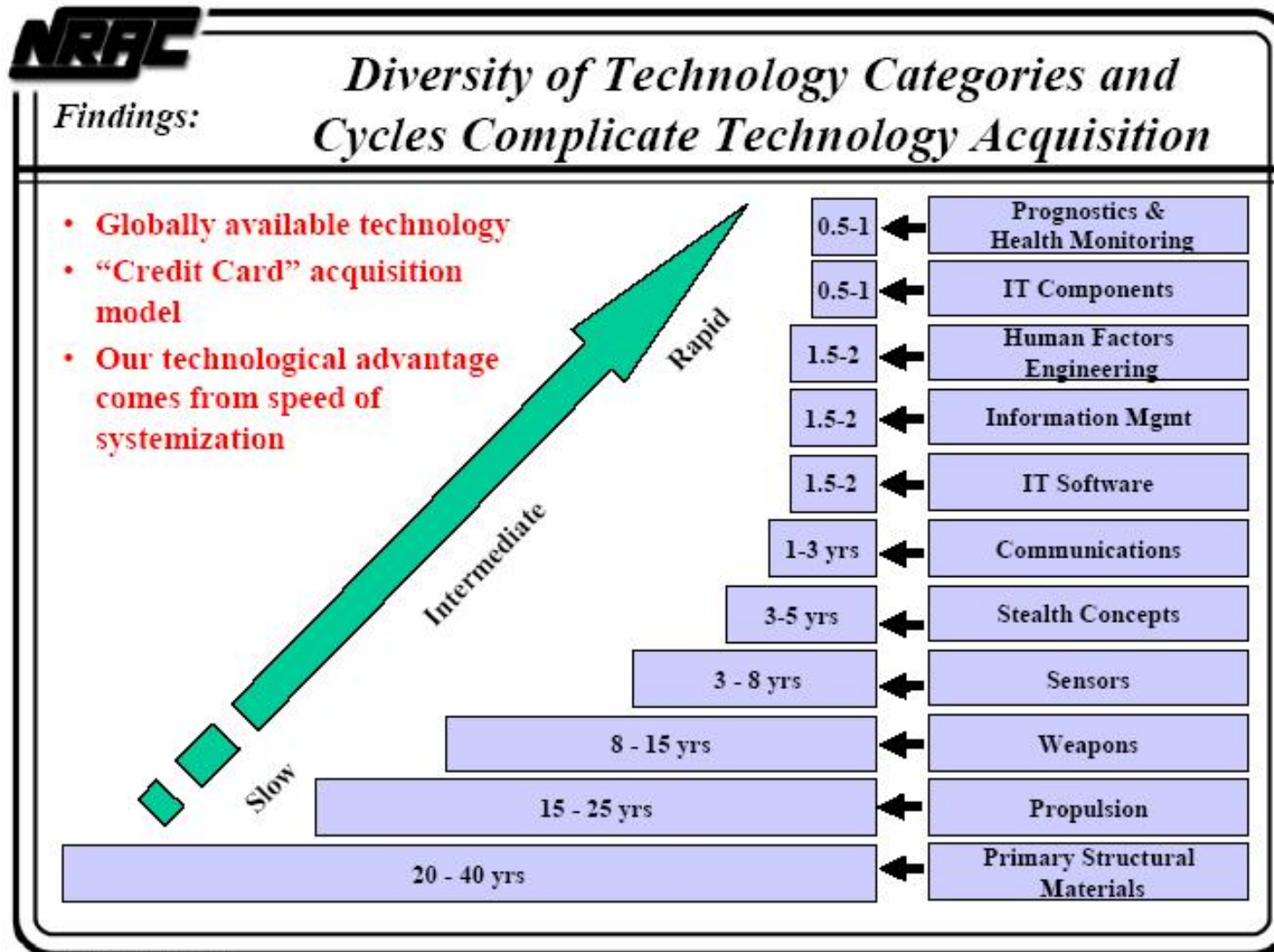
# Navy C2 Modular Component Approach Comparison Example



		
<p>Modular (component) approach</p>	<ul style="list-style-type: none"> <li>• Allows new capability to be added or modernized over it's lifecycle without incurring large lifecycle costs or effecting other parts of the system.</li> <li>• Operational Units can reconfigure C2 suite to meet new mission assignments</li> </ul>	<p>I don't have to buy a new phone to add/remove a feature. I can download apps to increase my capability. It's a phone right now but next week it's a Garmin GPS for my trip</p>
<p>Open Architecture</p>	<ul style="list-style-type: none"> <li>• Components built for Multi-platforms</li> <li>• Components are created and available for download</li> <li>• Ultimately may foster more independently funded development (lower component investment cost)</li> </ul>	<p>iPhone SDK allows anybody to develop applications. Applications are available for use via download center.</p>
<p>Open standards</p>	<ul style="list-style-type: none"> <li>• Uses open standards</li> <li>• Makes all interfaces, standards, and platform specifications available to the community</li> </ul>	<p>iPhone has and publishes standards and interfaces</p>



# Technology Acquisition Cycles



Naval Research Advisory Committee

NRAC Technology Acquisition Reform study March 2004