



JTCW and System Engineering

John Kays

Army Product Director JTCW

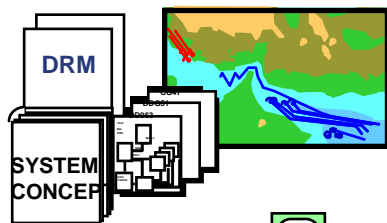
PdM MCS, PM GCC2



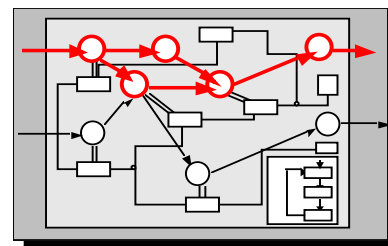
NPS SEP

Analysis

3. Conceptual Development/ Operations Analysis



4. System Engineering & Spiral Design (Iterative)



Engineering

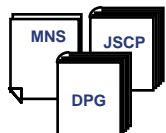
5. Physical & Info System (HW/SW) Design

This process must also be rationalized with and respond to the JCIDS, PPBS and Acquisition processes.

2. System Requirements Assessment/ Derivation



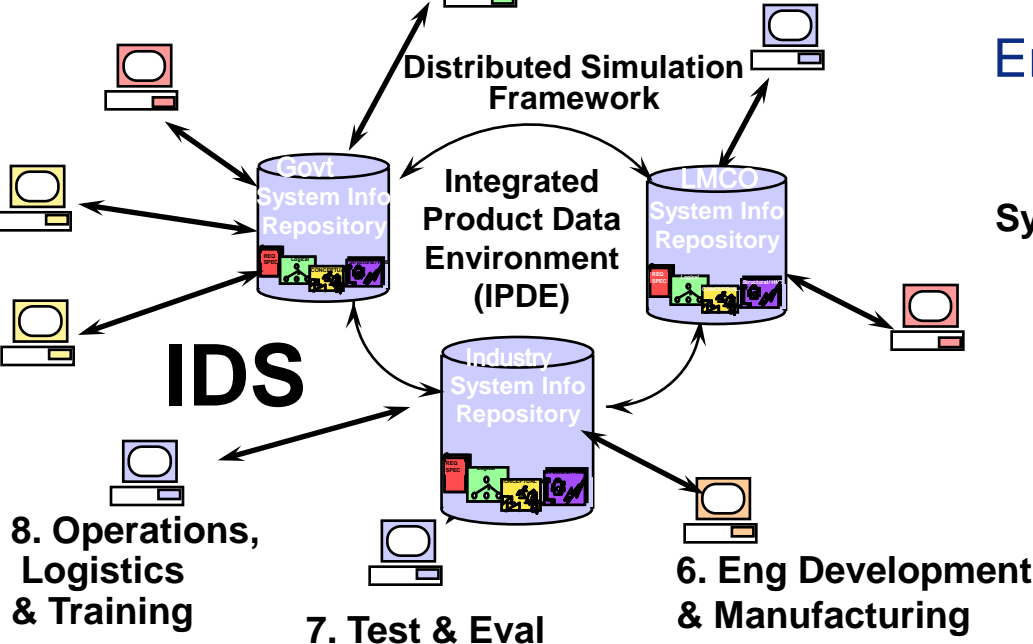
1. Identify Need & Capabilities



9. Cost, Schedule & Program Mgmt



Acquisition, Management





Purpose

- Provide my personal experience of applying the Systems Engineering Process in the Department Of Defense's Acquisition Policy by concentrating on problem definition and requirements analysis.



Agenda



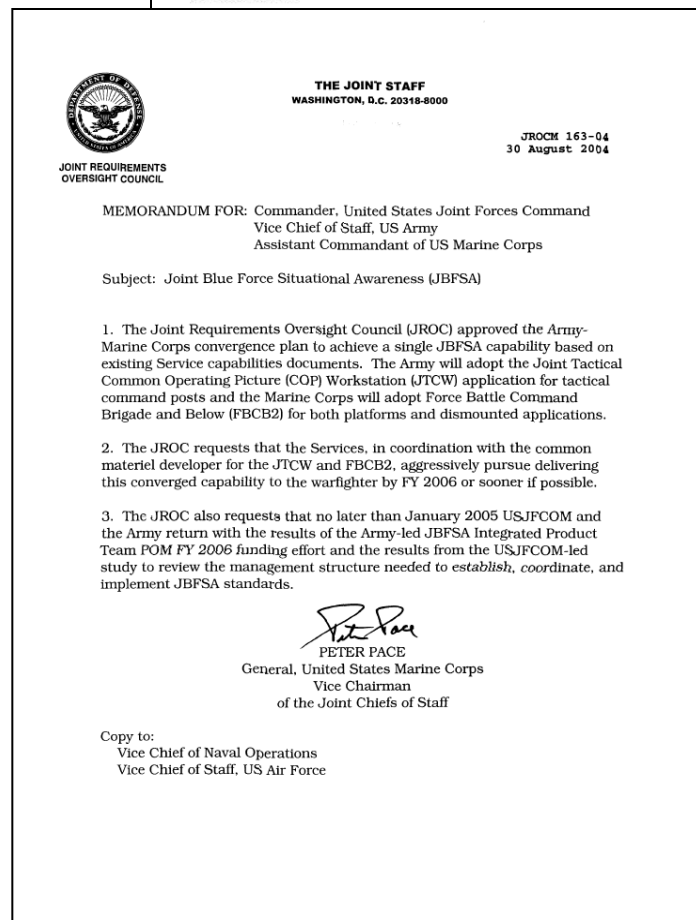
- Background
- Current Process
- Using the SEP
- Recurring problems and Issues



Army/Marine Corps JROCM 161-03 Path



- **13 Aug 03** - JROCM 161-03 issued
 - USMC and Army converge to a single BFT capability:
 - Focus on ground forces for near term.
 - Facilitate interoperability with Air Force, Navy and Coalition by putting Army, Marines and select SOF on one baseline.
 - **Not just BFT – C2 and SA.**
- **28 Jan 04** - Battalion and Above (BAA) convergence methodology approved by 3-Star AMCB.
- **12 Mar 04** - USJFCOM has lead for 161-03 Security and URN Issues resolution, at request of Council of Colonels.
- **30 Apr 04** – Brigade and Below (BAB) convergence methodology approved by 3-Star AMCB.
- **14 Jun 04** – Joint Capabilities Board endorses/approves USA/USMC BFT Convergence Initiative.
- **30 Aug 04** – JROC approves USA/USMC Convergence Strategy – JROCM 163-04.
- **01 Dec 04** – AMCB approves USA/USMC PLI security policy and DOTMLPF impact recommendations.
- **27 Jan 05** – 2-Star AMCB requests revised BAA/BAB program plans



Questions
request you
in cil

se have
653,
ne, J-8,

USMC lead for BAA/USA lead for BAB



The Simple JROCM Equation



- **Defined “the What”**

- JRCOM defined the end state – The Army and Marine Corps will achieve convergence by developing and using one, joint C2 system in order to share common C2 SA

- **Defined “the How”**

- Army

- Migrate from current C2 tactical system – MCS to JTCW and follow USMC’s lead by loading sw onto USMC’s baseline
- Lead platform effort and develop a joint system that satisfies both Army and USMC requirements

- USMC

- Migrate from current platform SA system – DACT to JCR and follow Army’s lead
- Lead C2 tactical system effort and help Army integrate sw onto current C2PC baseline



JTCW



- JTCW software serves as a common C2 foundation for Army and Marine Corps...now and in the future
 - Used in Combat Posts (stationary and mounted) from Battalion to Corps
 - Common system to exchange and manage situational awareness and C2 information and functions
 - “Injectors” are added to span functional areas through specific suites of capability
 - Integrates with FBCB2 for continuous C2 from platform to JFC
- Used extensively throughout services (USN, USAF, Homeland Defense, Coast Guard)



Joint Tactical COP Workstation Defined



Joint Tactical COP Workstation

Army Injectors

Ground Planning (CAPES),
Engineering (Joint Eng. App),
Coalition Interoperability (MIP)

USMC/Joint Injectors

Intel (Intel Office), Logistics
(CLC2S), Fires (EMT, WEEMC,
TSA), NBC (JWARN),
Amphibious Planning (EDSS)

Core C2PC 7.0

Tracks, Overlays, Routes, Alerts,
Air Picture (Links), Terrain
Analysis, CJMTK, Comms

COTS Apps

Windows XP

Target Hardware

- **JTCW = C2PC 7.0 + USMC/ Joint 3rd Party Injectors + Army Injectors + COTS Applications + Windows XP + Hardware**
- **Scope:**
 - **Marine Corps – JTCW is a multiple Battlefield Functional Area (BFA) workstation, covering the areas of Maneuver, Intelligence, Fires, and Logistics**
 - **Army – JTCW effort is focused on GCCS-A Client and MCS requirements.**
 - **Separately, Army PM FATDS (Fires) is adopting the use of C2PC with the Effects Management Tool (EMT) (AFATDS Client)**
 - **All JTCW activities must support both perspectives**



Provides executive level oversight of the overall JROCM ensuring

AMCB
3 STAR GOSC
1-2 Star GOSG
COC

Provides joint program management oversight for the JTCW

JTCW EXE IPT
PM GCC2
PM BC

JCCB
USA, USMC, USN
USCG, DISA, SOCOM
COCOMs

Multi service control board to review requirements for priority & implementation to C2PC software. JT

Reviews & determines new requirements for the JTCW

ORWG
TSM JTCW
TSM FBCB2
MCTSSA

Monitors and guides system and technical activities of the sub-IPTS and injector developers

SE-IPT
PM GC2, PM BFT
PdM MCS, PdM GCCS-A

Review new req'ts for tech feasibility for a given build and recommend to JCCB for implementation to core

Design & Development

Integration

Interfaces

Mapping

Training & ILS

Testing

Injectors

*Sub-IPT composition is made of USMC and USA SMEs for their appropriate area. From an Army perspective this will also include SMEs from various BFAs.

Injectors that are monitored by JTCW report to the SE-IPT to ensure they are meeting capabilities and schedule relative to the JTCW capabilities deliver schedule.



JTCW



JC2



ABCS

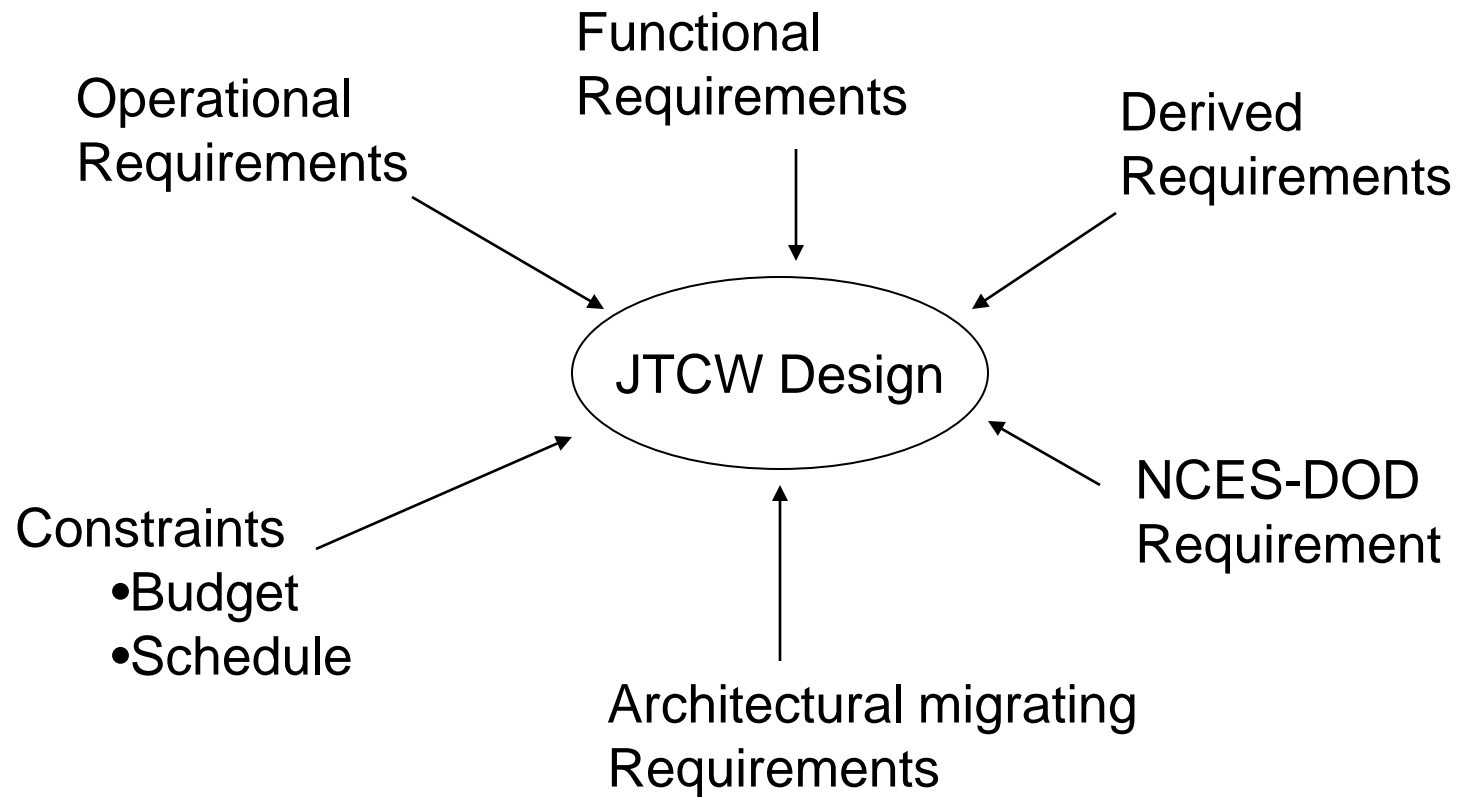


Old Requirements Analysis

- No joint requirements database
- No link btwn requirements database and testing database – how do measure success?



Old Requirements Nightmare





Old Fix



- C2PC Joint Configuration Control Board (JCCB) was only forum in which to vet joint requirements. No JTCW CCB.
- Everything went into service-unique Requirements Database, no prioritization, categories, etc.



Problems in the Old SEP

- Define the Problem
 - JTCW was formed for political reasons, not operational, or technical
 - MOA binding Marine Corps and Army is not followed by the Army
 - Marines are schedule driven, the Army is performance driven
 - JTCW builds upon 2 existing DOD PORs – doesn't follow Acquisition Process
 - Uses outdated requirements
 - Continuous Requirements Creep



Old Systems Engineering and Design



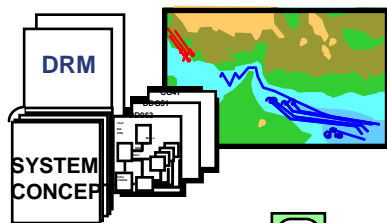
- No software architecture
 - Individual injectors were developing towards an unknown interface



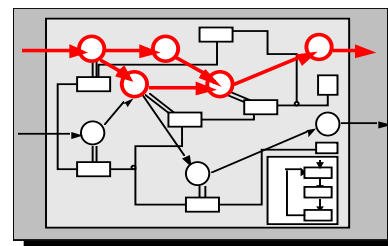
New Fix

Analysis

3. Conceptual Development/ Operations Analysis



4. System Engineering & Spiral Design (Iterative)



Engineering

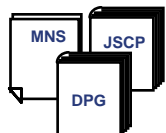
5. Physical & Info System (HW/SW) Design

This process must also be rationalized with and respond to the JCIDS, PPBS and Acquisition processes.

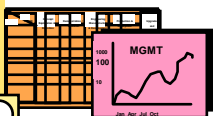
2. System Requirements Assessment/ Derivation



1. Identify Need & Capabilities



9. Cost, Schedule & Program Mgmt



Acquisition, Management

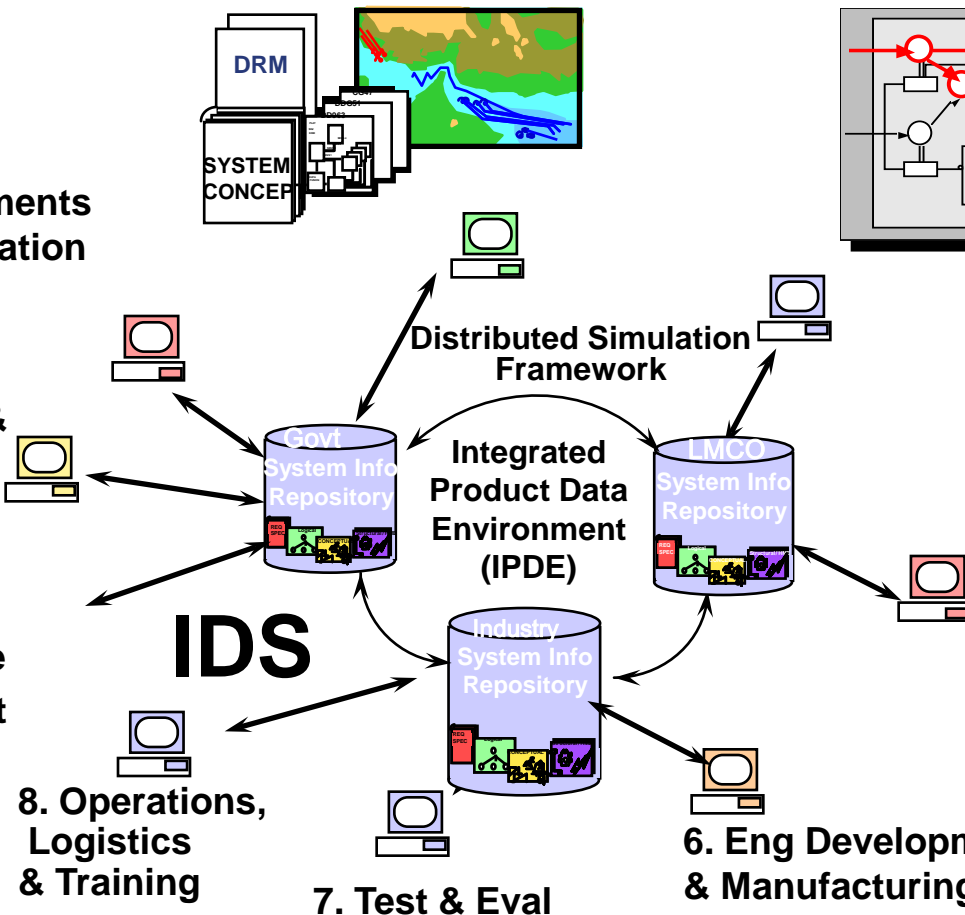
8. Operations, Logistics & Training



7. Test & Eval

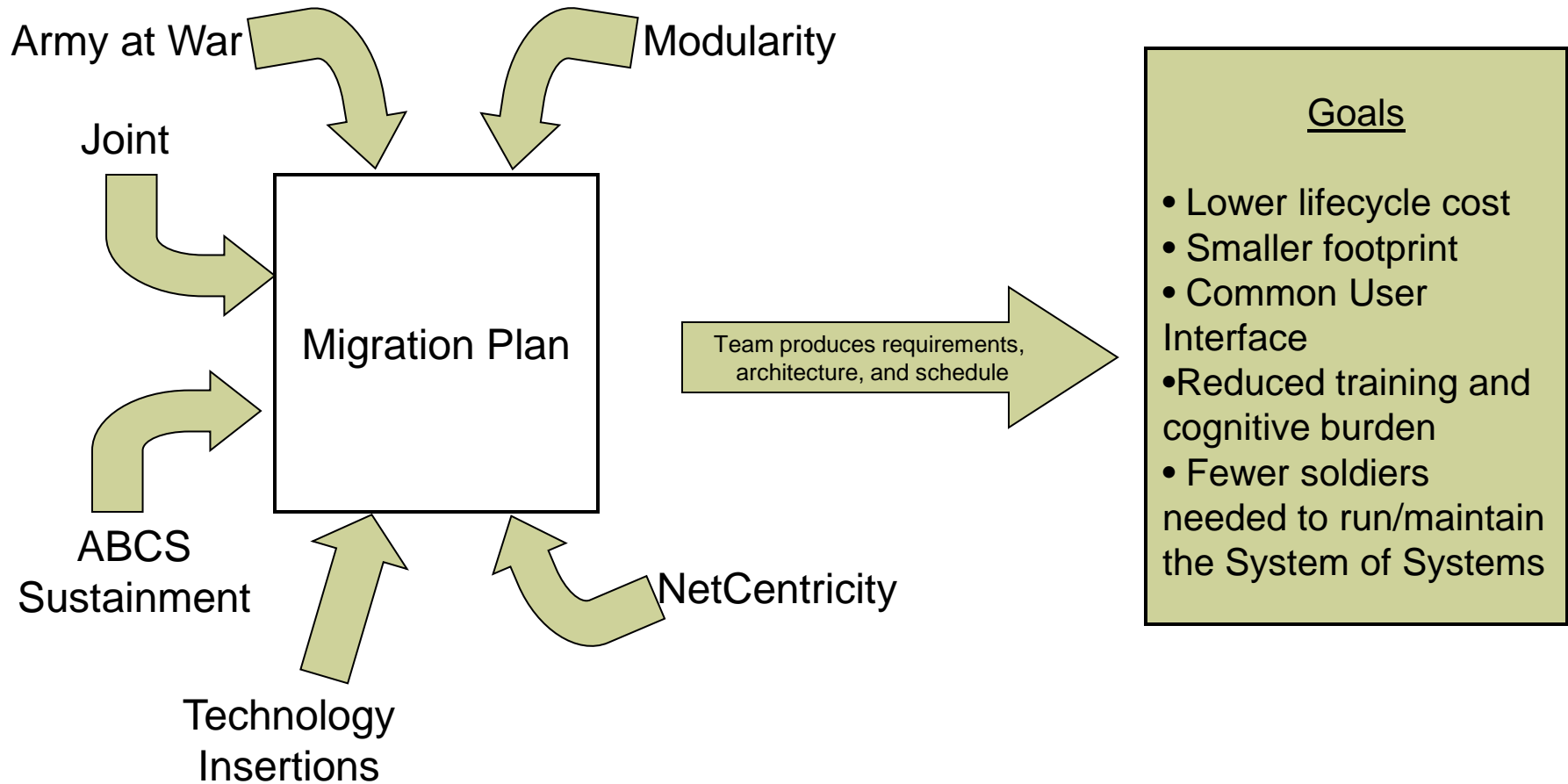


6. Eng Development & Manufacturing





Army Migration Plan Key Drivers and Goals





Problem Definition Round 2

- Re-defined the problem
 - New technologies and DOD requirements toward a net centric and service-oriented architecture would not allow JTCW in its present sense to be fruitful
 - Will obtain the JROCM “what,” but will execute differently than the JROCM defined “how”
 - Will converge on the Gateway to obtain and provide a Blue Force Tracking picture, but will not converge on a workstation



Requirements Analysis

- Process of translating customer needs into a system functional and performance requirements.
 - Why do we need the system?
 - Vital to justify development and its ability to satisfy those requirements via testing
- 9 Tasks
 1. Customer Expectations
 2. Constraints
 3. Operational Scenarios
 4. MOEs
 5. Interfaces
 6. Life Cycle Process
 7. Functional Reqs
 8. Design Characteristics
 9. Humans Systems Integration



Requirements Definitions

- Operational – Very high-level and are described as statements of fact or assumptions that define the expectations of the system in terms of mission, environment, constraints, and MOE
- Functional – Sub set of operations requirements that define the task, action or activity that must be able accomplished in order for the system's mission to be successful
- Design – Specify the “build to,” “code to,” and “buy to” requirements for product development
- Derived – More granulated requirement that defines the usability-needs of the system



Requirements Analysis Input

- Constraints/Controls
 - Organizational policies and procedures
 - Technical Architecture guidance
 - Utilization environments
- Enablers
- Documentation
 - ICD, CDD, MOEs

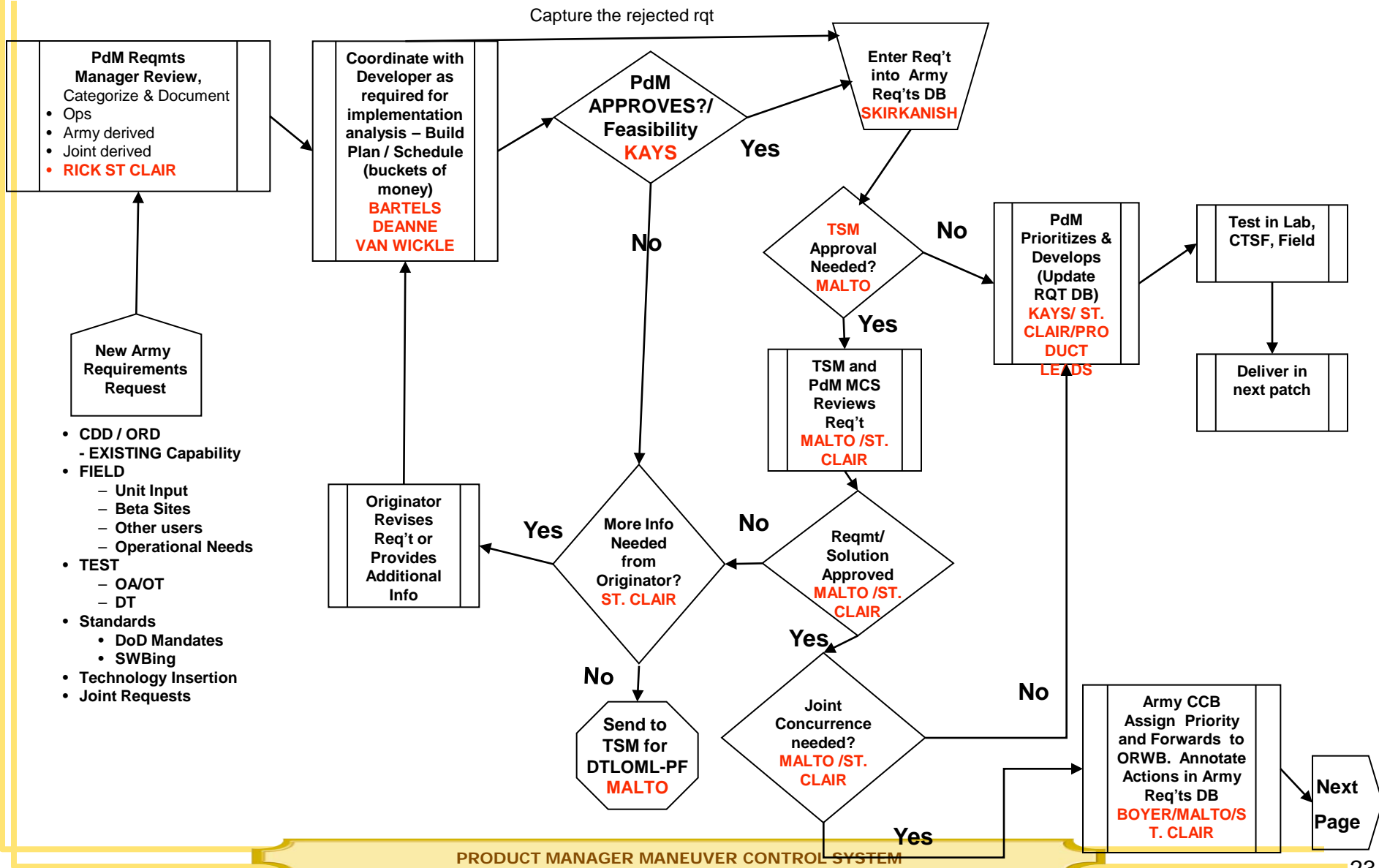


Requirements Analysis Outputs



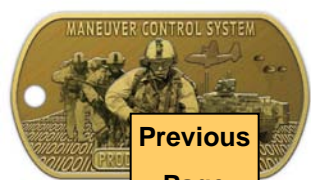
- Operational Concept Document
 - Operational Need Definition
 - System operational analysis
 - Operational scenarios
 - Conditional events
- Requirements Database
 - Operational, Functional, Design, and Derived requirements listed, prioritized, assigned, and categorized
 - Budget, schedule and status maintained
 - MOE/MOPs via testing threads have been developed

JTCW Requirements Process



- CDD / ORD
- EXISTING Capability
- FIELD
 - Unit Input
 - Beta Sites
 - Other users
 - Operational Needs
- TEST
 - OA/OT
 - DT
- Standards
 - DoD Mandates
 - SWBing
- Technology Insertion
- Joint Requests

JTCW Requirements Process



Previous Page

Operational requirements reviewed, prioritized, organized (Joint, Army, USMC), and approved by the ORWG shall be submitted to the C2PC JCCB as Joint requirements.

Per JROCM 161-03 BAA MOA.

The ORWG shall focus on enhanced future joint interoperability from an operational perspective.

Technical Review Board Meets to Review All Screened New Req'ts Coordinates with ORWG for Joint Reqs Process
BOYER/MALTO/ST. CLAIR

PdM Prioritizes & Develops
KAYS/ ST. CLAIR

Army Prioritizes & Develops and Builds with JTCW Target Build
KAYS/ ST. CLAIR

Test in Lab, CTSF, Field

Deliver in next patch

ORWG Approved Joint Reqmt?
BOYER/MALTO/ST. CLAIR

ORWG Assigns Priority and Forwards to JCCB. Annotate Actions in Army and Joint Req'ts DB
BOYER/MALTO/ST. CLAIR

Assign Priority and Release to JCCB. Annotate Actions in Req'ts DB
BOYER/MALTO/ST. CLAIR

Request ROM (Cost/Schedule) from Developers
BOYER/MALTO/ST. CLAIR

C2PC JCCB Approved?
BOYER

JTCW CCB
KAYS/BOYER

Maintain as Approved Req't in Req'ts DB
BOYER

C2PC JCCB Assigns Priority and Developer and Annotates Req'ts DB
BOYER

Funding Available?
BOYER

JTCW CCB or 3rd Party Injector

Injector Developer Schedules and Builds ICW with C2PC Target Build

Core SW?
BOYER

Schedule for Target Build



Conclusion

- SEP is necessary and applicable
- Problem definition and Requirements Analysis are the paramount for SE to work for you



Questions?



Back Ups

COA 2: PASS/NRTS and Injectors – Threshold



Legend:

- Army Development
- Marine Development
- Unchanged
- Web Service
- COTS/GOTS

External Services

External services need to be accessible to the client/gateway, but can be hosted on any machine

Discovery Agency

- Security, Authentication, Authorization
- DNS
- Mail Server
- Active Dir

JTCW Client

- TMFDB (Eng) Database
- Eng Server
- Web Server
- WebLogic
- Eng App Server

PASS

JTCW Gateway

- EZ Pass Server
- C2R Server & Planner
- NRTS Data Providers
- NRTS Server (Core)
- MIP
- C2IEDM (Oracle)
- C2PC Gateway Server
- 3.x and 4.x tracks
- Address Book
- Overlays
- Omnitracks

Gateway includes Client (one per CP)

MIP Gateway (2 LAN cards)

Position Reports & Overlays thru NRTS to PASS, GW

JTCW Client

Messaging Services (Core)

- C2PC Communications API
- Message Router
- CMP
- Address Book API
- Address Book

Mapping (Core)

- 3D JBV
- C/JMTK
- Map Engine
- ATLAS
- APIs

Injectors

- Trackplot
- Overlays
- TBMCS
- EMT
- DSTB
- Routes
- Plan
- NBC
- Joint Eng
- WEEMC
- Link-16
- MOE

NRT Client

- Data Handler

Contains decision logic for routing PASS data to the appropriate injector and visa versa.

Windows
MS Office
Internet Exp

Data Stores (Oracle)

Alerts Server

C2PC Notifier

Coalition LAN

Plan Data

XML

To C2R



JTCW Client Functional Block Description



Trackplot Injector	Displays Common Operational/Tactical Picture (CTP/COP) tracks – units, platforms, ELINT, missile, facilities, etc. Attribute filtering, to include "staleness" of tracks
Overlays Injector	Displays overlays - collection of Mil-Std 2525B objects, text, images, embedded documents, and primitive graphics. Can convert between GCCS 3.x and 4.x, C2PC, VMF, and FalconView graphics
Routes Injector	Display routes that can be used for steer-to functionality (mobile C2). Convert routes to VMF.
SA Injector	Display data feeds from NRTS (PASS, FBCB2, AMDWS, AFATDS), C2 Msgs (e.g. NBC-1), and VMF PosReps and Entity Data msgs.
NRT Client/Data Handler	Takes NRT Server data, and sends it to the appropriate Injector (graphics go to Overlays Injector, unit/platforms go to SA Injector, etc.)
DSTB Injector	Conducts terrain analysis – go/no go terrain, mobility corridors, weapon range fans



JTCW Client Functional Block Description



MOE Injector	Execution Management – oversees information quality and does alerting – units going in or out of an area, crossing an LOD on time, etc.
AODB Injector	Dynamic and graphical view of air mission data from TBMCS
LDMS Injector	Allows direct connection to a Link 16 network to view the real-time air picture, and pass selected group tracks to aircraft
EMT Injector	AFATDS Client. Conduct fire missions, monitor mission and firing unit status, show range fans and exchange track and battlefield geometries between GCCS and AFATDS
WEEMC Injector	ADOCS mission managers
Target SA Injector	Provide a web service, mines and displays target data from a variety of systems, and manages target data
FPSM Injector	Fire Plan Sketch Manager – generates and aggregates fire plan sketches. Shows direct fire weapon coverages, dead space, etc.



JTCW Client Functional Block Description



Explorer Map Injector	Puts an integrated web browser capability into C2PC, and link web data/pages (such as from TACWEB) to a specific map view.
Logistics Injector	Ties to Marine Corps Common Logistics C2 System (CLC2S) – mines log data from various log systems, to include TC-AIMS II.
MarineLink Injector	Search and selection of maps, overlays, routes, imagery, etc. from hard drives and web sources.
Joint Eng. App Injector	Combat engineer functionality put into web services. An evolution of MCS-Engineer.
TBMD Injector	Ties into GCCS alerts of missile threats, with graphical display and audio/visual alerts. Can send or receive alerts automatically using VMF Threat Warning
AMDWS Injector	Receive PASS or direct AMDWS information on air tracks, sensor/weapon coverage areas, etc.
Alerts Server	Provides a mechanism for a user or a program to set up and view different kinds of alerts, both audio and visual.



JTCW Client Functional Block Description



Oracle RDBMS	Provides a common database engine for the various separate databases being used by various injectors.
ATLAS	ATLAS provide for a common application framework and tactical graphics rendering on various map views
CJMTK	CJMTK provides map rendering of all NIMA data, querying of map data, and the ability to add mapping functions through “extensions”
3-D Viewer	Based on CJMTK. Will display 3-D terrain with CADRG and drapping, track position, and overlay objects
CIIL	Allows the use of ICSF/GCCS applications on C2PC, such as viewing UAV video via JIVE
XIL	Allows the use of XIS applications on C2PC – GCCS and GCCS-A tools.
UCP Configuration	GCCS FoS required function for servers to communicate.
CST Configuration	GCCS FoS required function for servers to filter and distribute information.



JTCW Client Functional Block Description



Intel Shop-O Injector	Provides ability to view and interact with national intelligence data from MIDB. USMC, Air Force and Navy Intel analyst tool
SPEED Injector	Provides for comm planning, line of sight terrain analysis, and links predictive comm link status with current or planed unit locations
Planning Injector	Based on CAPES, provides mission rehearsal, collaboration, future UTO, and current to planned mission comparison
Message Router	Message viewing, composition, logging, and alerting. Message summary can be seen in the main display by precedence. Individual VMF message can be pre-set for precedence, addressee, ack requirement, etc.
CMP	COE Message Processor. Used to validate VMF and USMTF messages, as well as generate VMF messages for which there is not a specific GUI.
Address Book	Contains unit, billet and platform information needed for communications, generating tracks, and show current UTO. Synchronizes via Gateway



JTCW Client Functional Block Description



JIVE	View Predator and other streaming video, and displays UAV coverage area on the map. Uses CIIL
EDSS	Amphibious operations planning tool. Uses CIIL
GPS Service	Allows the generation of your “own track” that can be displayed. Updates location and transmits it to pre-set groups
Set Time Service	Used to set system time based on GPS feed
CoT/M2MT	Gives an interface to 50+ systems that use its XML schema to pass blue PLI, target, and other types of information
JWARN Injector	The JWARN injector will provide the capability to display NBC related graphics on JTCW maps, use the JTCW Track Plot Injector units database to determine NBC hazards to Units, and utilize the JTCW messaging system to transmit NBC related reports.



JTCW Gateway Functional Block Description



EZ-PASS	This provides a secondary PASS server capability in case the AIS Server fails. Also to be used in the USMC to get PASS data from Army AIS servers for interoperability
NRTS PASS Provider FBCB2 Provider AMDWS Provider NRTS Provider	Provides the core interface capability to ABCS systems via PASS and other mechanisms. PASS Provider gets PASS topics FBCB2 Provider receives and translates SA data AMDWS Provider translates AMDWS data NRTS Provider can be used to communicate between NRTS's
C2PC Gateway Track Plug-ins Address Book Plug-in Overlay Plug-in Misc. Plug-ins	Data distribution function that uses data subscription, data synchronization, correlation and persistent storage. Manages and distributes tracks from GCCS 3.x and 4.x, C2PC address book data, and overlay files. Omnitracks and SOCOM sensor data is also supported.
Web Server (IIS)	Provide webpages to users (TACWEB function)



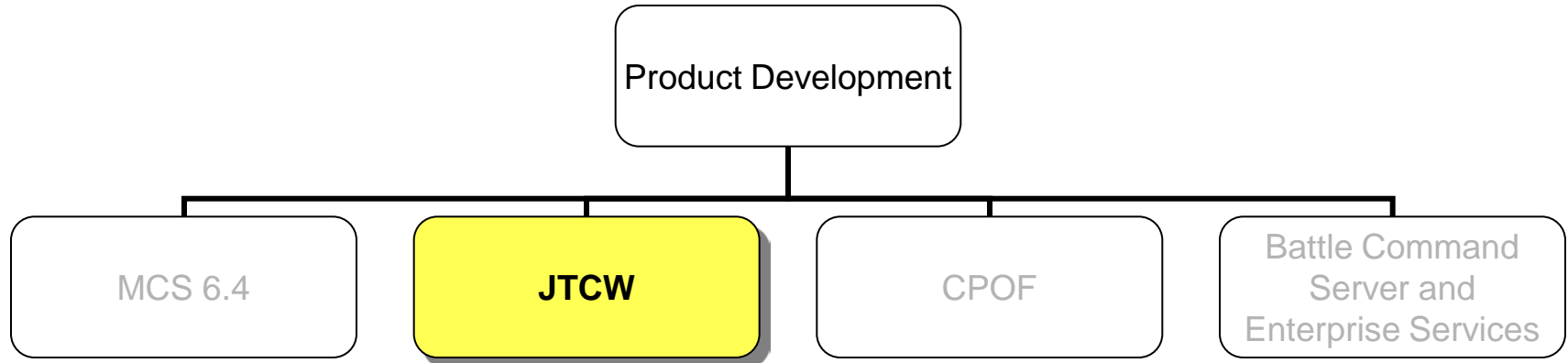
JTCW Gateway Functional Block Description



Web App Server	Provides web-services functionality, such as WebCOP (view track, overlay, etc.) data via the web, as well as functional applets for WEEMC (ADOCS functionality)
ArcSME	Provide map data via the web on a browser. Part of Joint WebCOP
Oracle RDBMS	Persistently store data from the C2PC gateway, CJMTK map information, etc.
MIP Injector	Provides Coalition interoperability and interface to the C2IEDM.



JTCW Critical Tasks

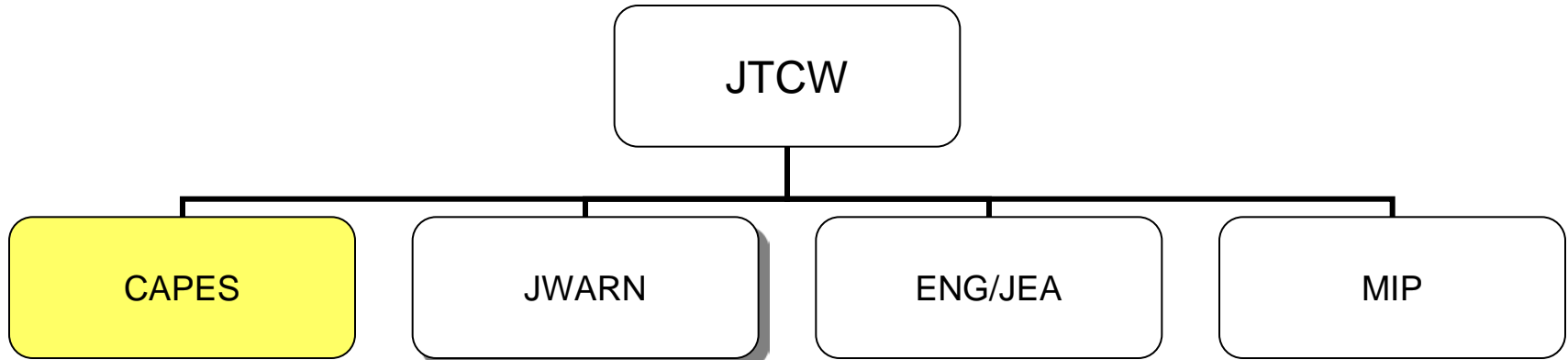


- JTCW Development Tasks

- Deliver JTCW solution NLT SEP 05 for joint integration and test
- Deploy JTCW a Software Block II solution for the ground tactical domain
- Manage the migration of MCS Eng, CAPES, MIP (+ cross domain solution), to the JTCW baseline
- Manage the migration of key foundation capability (PASS, NRTS, etc) as elements of the C2PC 7.0 foundation
- Ensure the JTCW baseline maintains interoperability with ABCS



JTCW Injector Critical Tasks

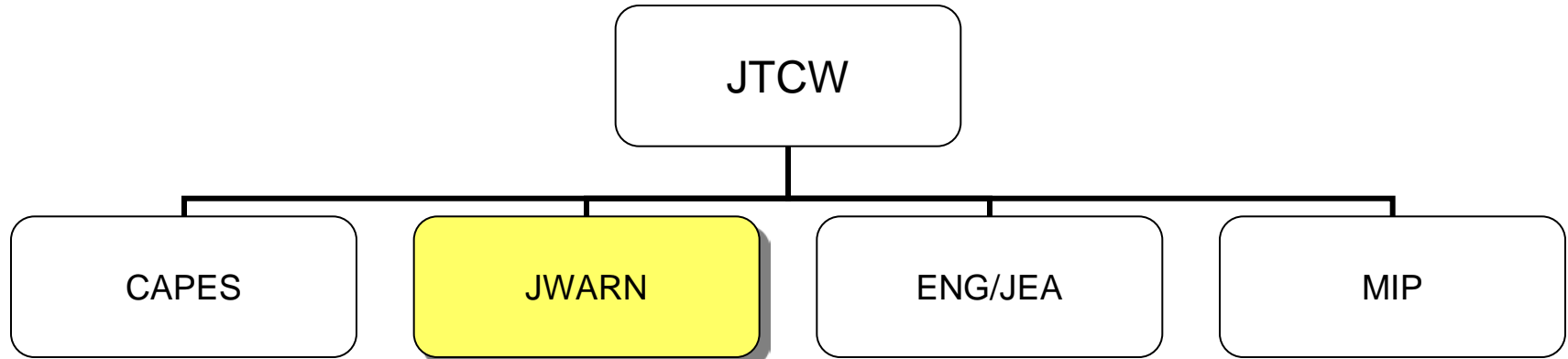


- CAPES

- Develop and enhance the JTCW mission planning and rehearsal tool for all echelons (from company up to corps), meeting GE requirements, while effectively integrating as a core injector for SW version 6.2.
- Maintain interoperability amongst ABCS 6.4 systems.
- Fulfill all necessary time, documentation, and performance criteria as a core injector.



JTCW Injector Critical Tasks

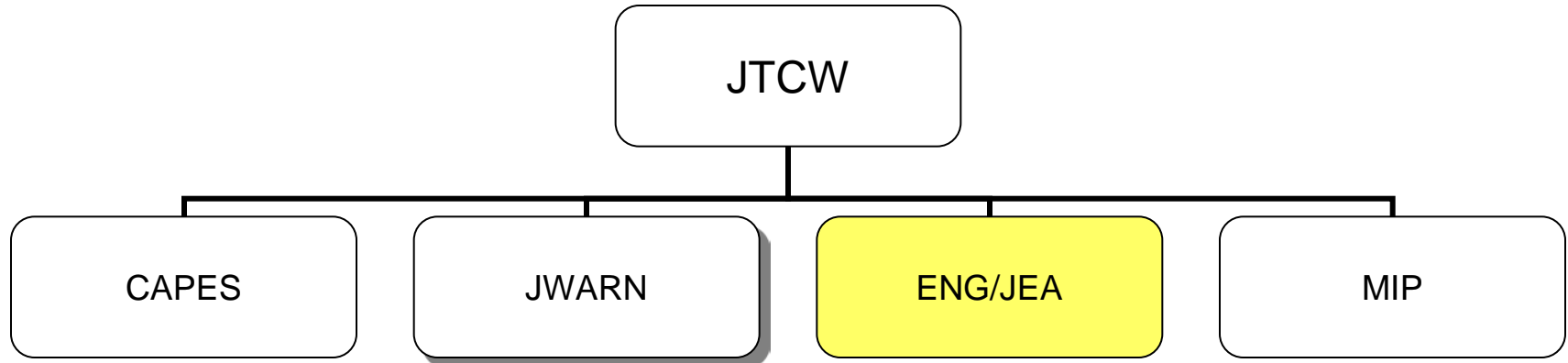


- JWARN

- Develop the NBC software tool to meet GE requirements, while effectively integrating as a third party injector for SW version 7.0.
- Establish a development plan, schedule, and MOE to monitor success.



JTCW Injector Critical Tasks

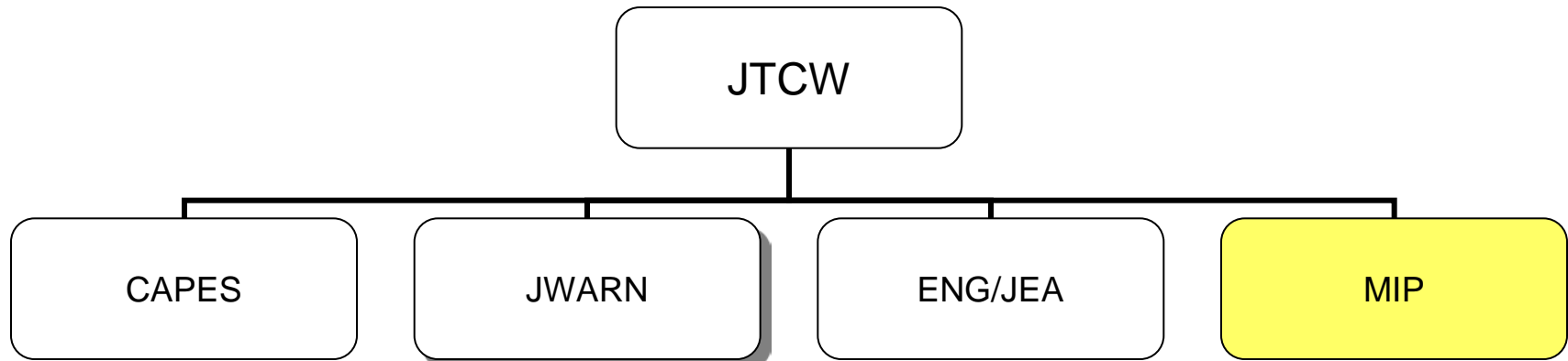


- **ENG/JEA**

- Develop the ENG/JEA software tool to meet GE requirements while effectively integrating as a third party injector for SW version 6.2.
- Establish a development plan, schedule, and MOE to monitor success.



JTCW Injector Critical Tasks



- MIP

- Develop and enhance coalition data exchange tool, meeting GE requirements, while effectively integrating as a third party injector for SW version 6.2.
- Maintain interoperability amongst ABCS 6.4 systems.
- Fulfill all necessary time, documentation, and performance criteria as a third party injector.