United States Joint Forces Command
Joint Warfighting Center

JNTC
Rapid Distributed Database Development (RD3) Initiative

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RD3 Overview & Integrating IPT

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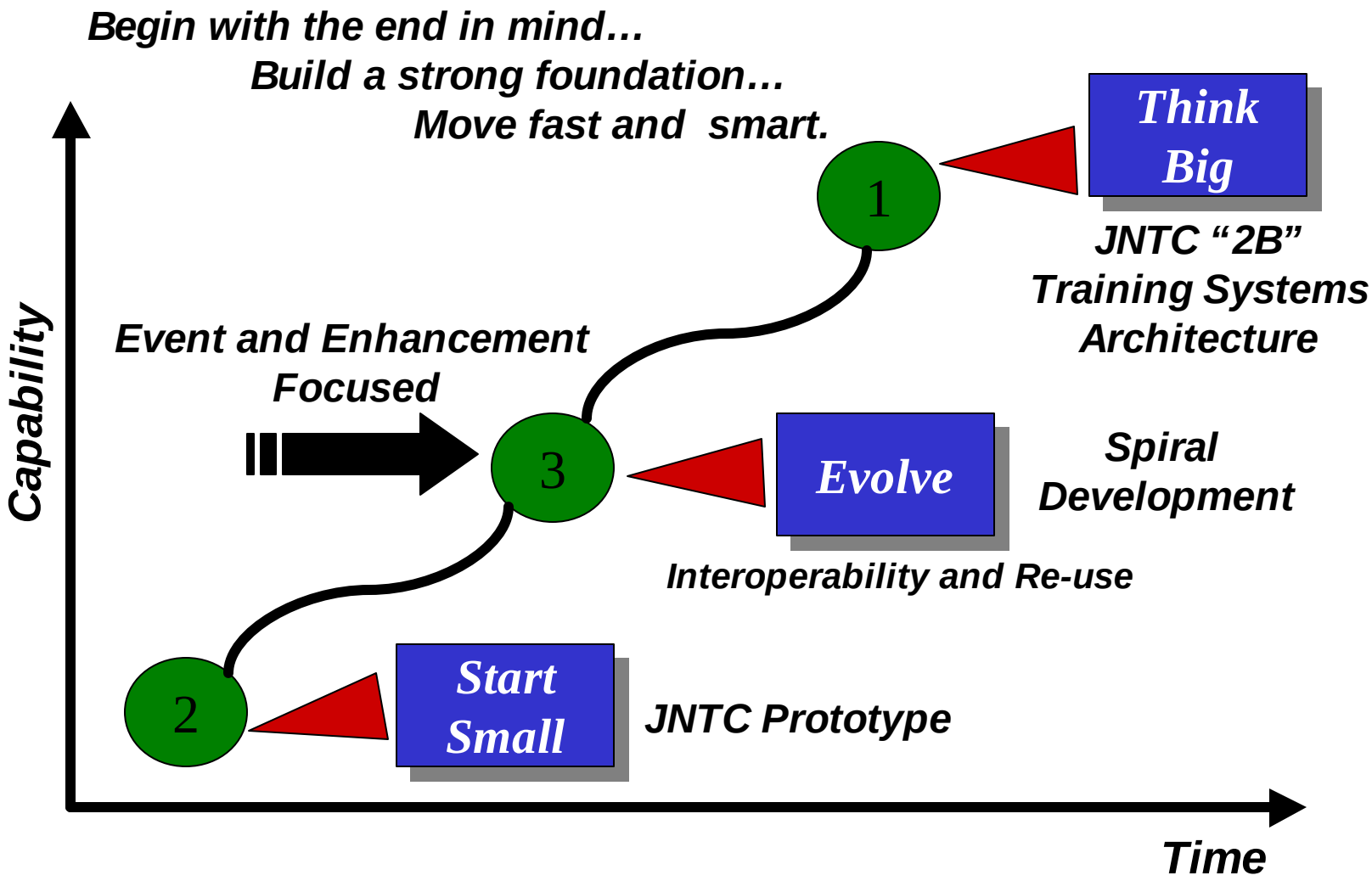
Think Big, Start Small, Evolve



Rapid Distributed Database Development (RD3) Initiative - Statement of Objectives

- The definition, design, development, and support of an integrated system for identifying, collecting, manipulating, ingesting, storing, and retrieving ***geospatial/environmental*** (physical, natural, forces, order of battle, target, C4I, visual, etc.) ***data*** in a usable form to support Joint requirements for ***planning, training, mission rehearsal, and experimentation.***

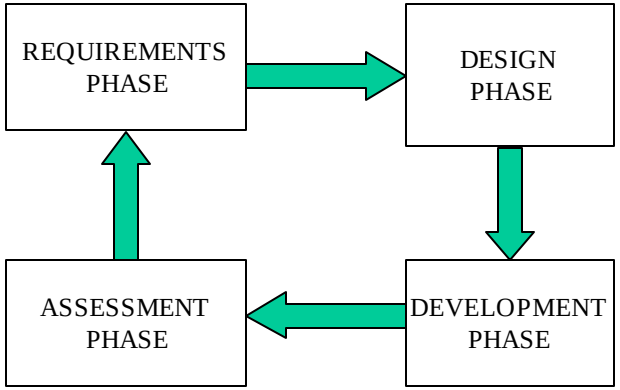
- Provide the capability to rapidly generate simulation event scenario and ***mission relevant*** databases in support of the ***Joint National Training Capability.***

Requirement Background

- Current training and experimentation event production process is complex and labor intensive
- There is a well established requirement for rapid, simulation training event production (e.g. $\leq$ 96 hours)
- Obstacles to meeting requirement are primarily funding, policy and organizational issues, not state of technology
- Joint Forces Command has key role and requirement:
  - To provide rapid production capability for Joint training simulation needs
  - To provide rapid distributed database production capability to meet Joint Training Requirements, Joint National Training Capability, and Distributed Continuous Experimentation Environment requirements
  - To provide rapid LVC federation database capability
    - To enhance Joint Exercise support
    - Compatible with C4I databases

Approach

- Identify stakeholders, users, sponsors, and technical knowledge base (leverage existing initiatives)
- Use integrated product and process improvement methodology and JCIDS process
- Establish Mission Data Preparation (MDP) & RD3 performance standards & requirements
- Detail concept and define potential solution sets
  - Open architecture
  - Interoperable
  - Non-proprietary (Gov't owned & maintained)
  - Standardization
  - Policy/advocate through EXCIMS
- Develop, Build, & Integrate Tools
- Execute & Assess
  - Spiral development



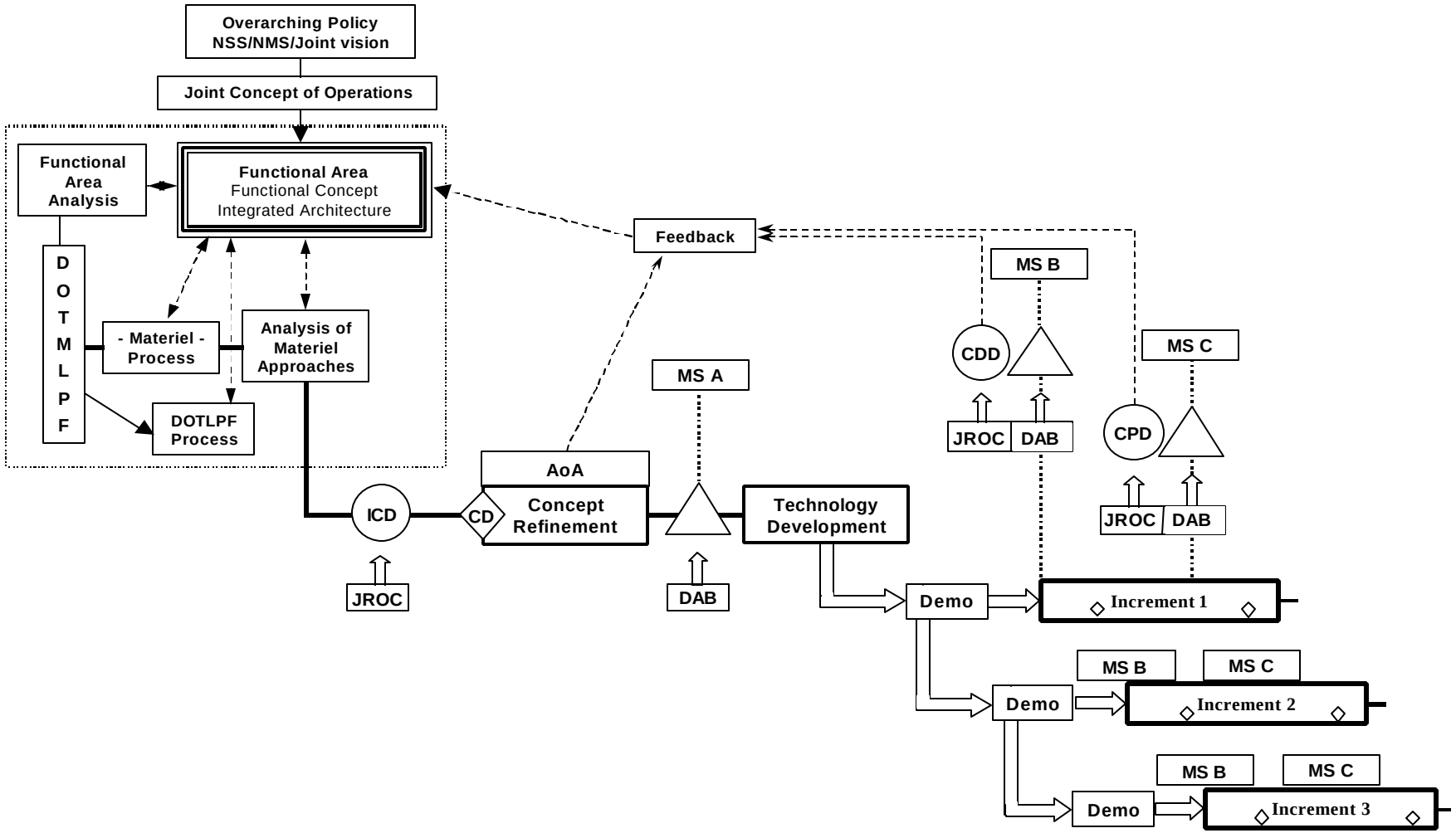
Rapid Distributed Database Development (RD3) Expectations & Way Ahead

- Leadership buy-in on RD3 process and strategy.
  - Coordination with the appropriate government agencies to establish a single POC for interface to RD3 Team.
  - Lead for each WIPT.
- Continue discussion on IPT leadership, membership, objectives and products (update of IPT overview doc).
- Identification of membership for WIPT's.
- Schedule WIPT meeting(s).

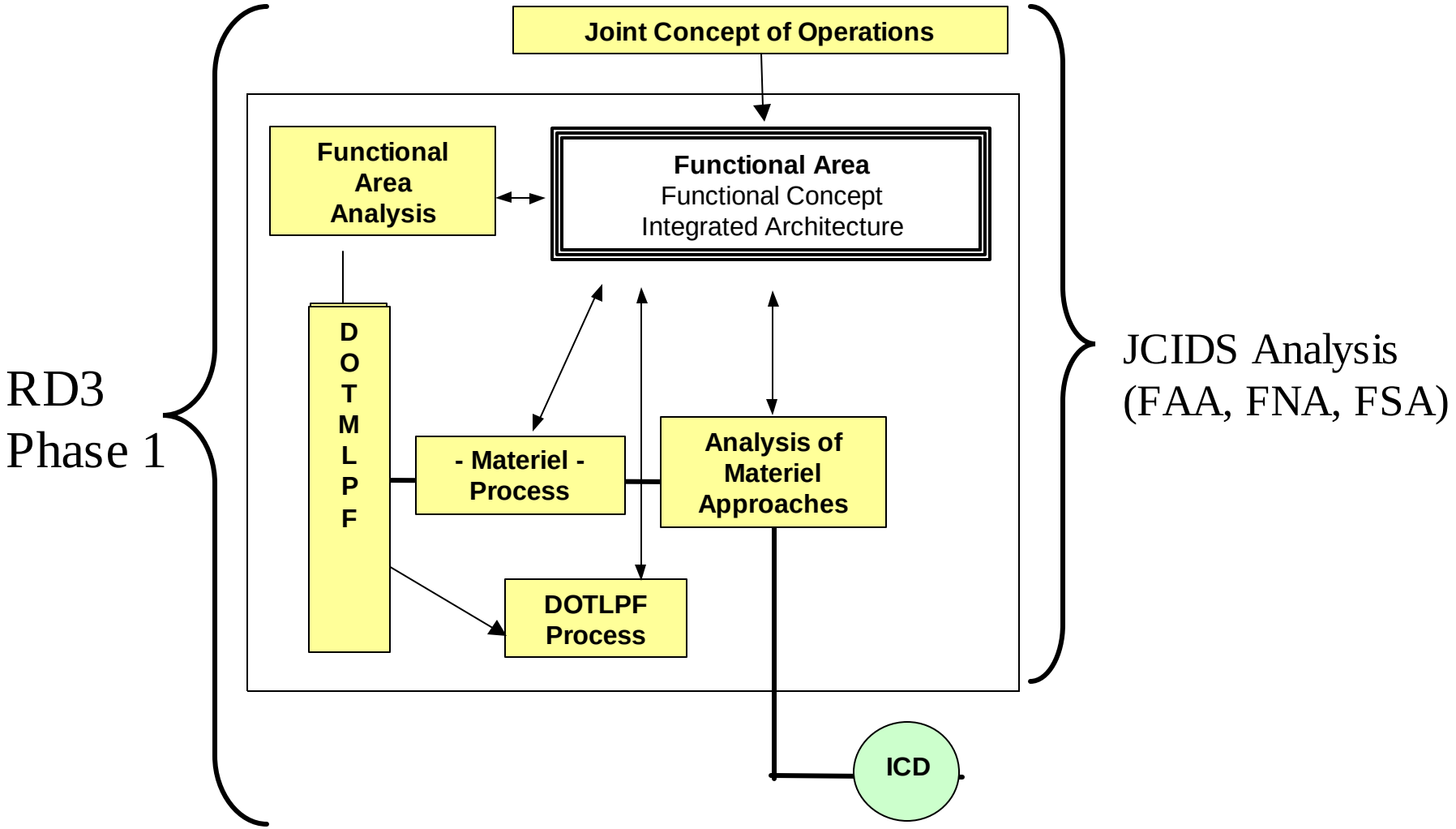
Rapid Distributed Database Development (RD3) Expectations & Way Ahead (cont'd)

- Work technical, policy and organizational issues simultaneously.
- Develop Functional Area Analysis (FAA)
- Develop Functional Needs Analysis (FNA)
- Collect data and develop Functional Solution Analysis (FSA).
- Develop Initial Capabilities Document (ICD).
- Develop RD3 process to authenticate data and establish architecture to tap authoritative distributive database(s).

Requirements and Acquisition Process Depiction per DoD Instruction 5000.2



JCIDS Analysis Process for the RD3 Phase 1 Effort

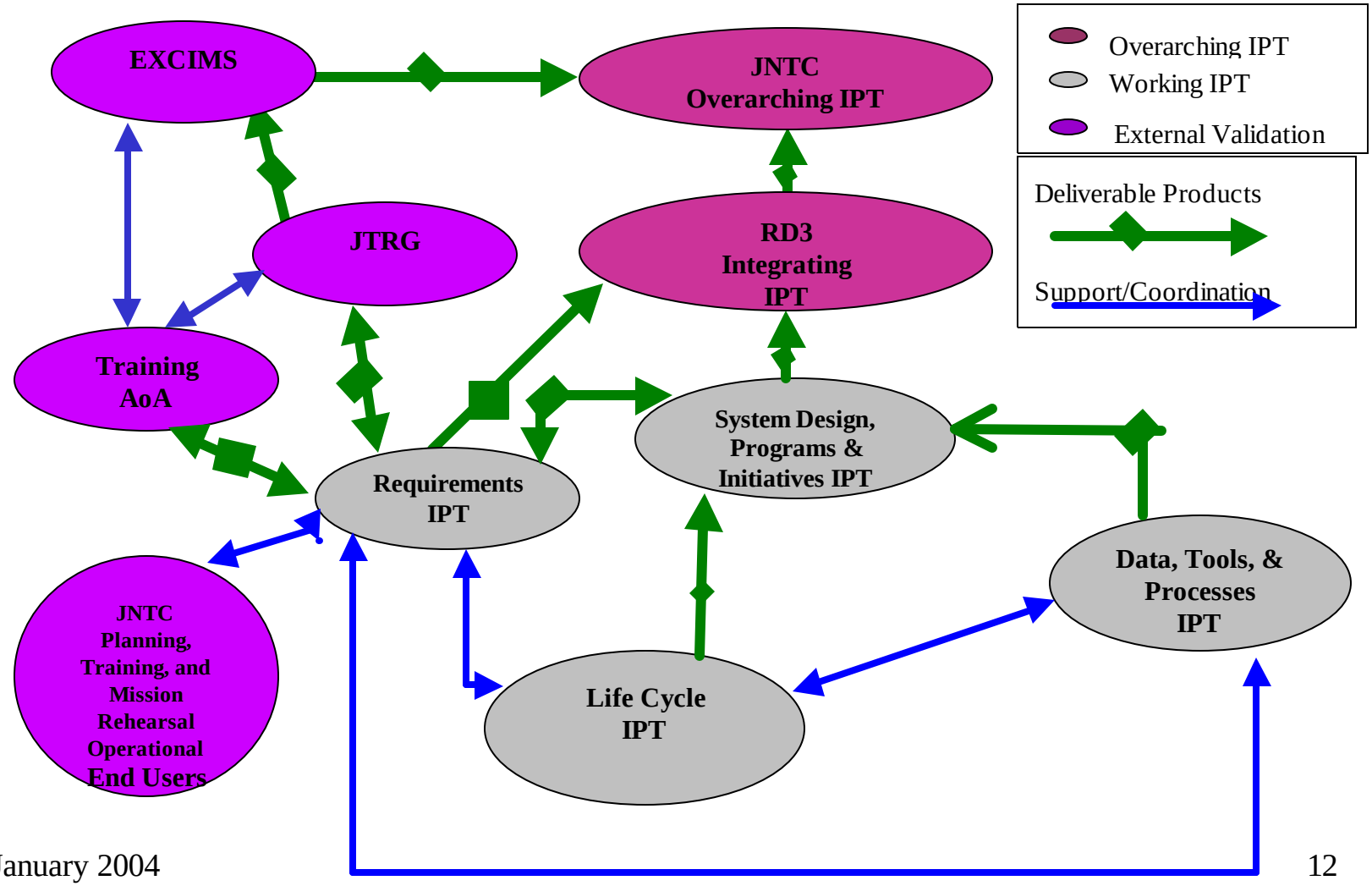


Rapid Distributed Database Development (RD3) Integrated Product Team (IPT) Structure

- **Overarching -** responsible for overall project guidance, communication, coordination and recommendations to JFCOM/OSD, and will be the IPT approval authority for IPT products.
- **Integrating -** responsible for the overall project, communication, coordination and recommendations to go forward to JNTC.
- **Working IPT's:**
  - **Requirements -** responsible for Functional, Operational, and Support Requirements and the development of the RD3 lexicon, FAA & ICD.
  - **Data, tools and processes -** responsible for surveying and documenting available data, tools, and processes to establish standards, and distribution/archiving approaches that may be utilized to support the RD3 concept. Develops FNA
  - **System design, programs and initiatives -** responsible for RD3 prototype architecture development strategy and alternative design solution sets. Develops FSA.
  - **Life Cycle –** responsible for RD3 concept and architecture logistics tail. Supports efforts of all other IPT's.

Rapid Distributed Database Development (RD3) IPT Structure (cont'd)

Specification Process for Customer Requirements



JCIDS Analysis Timeline and IPT Responsibility

RD3 Product Timeline/Flow (Phase 1)

Products	IPT Responsibility
FAA – Task Definition	**Primary – R-IPT** Support – DTP-IPT, SDPI-IPT
FNA – Gap Analysis, Capability Overlap Identification, Required Solution Timeline	**Primary – DTP-IPT** Support – R-IPT, SDPI-IPT
FSA – Identify solutions to fulfill identified capability gaps	**Primary – SDPI-IPT** Support – R-IPT, DTP -IPT
ICD	**Primary – R-IPT** Support – DTP-IPT, SDPI-IPT
VV	**Primary – LC-IPT**

Overarching IPT (O-IPT) Objectives

- Coordination with JFCOM, OSD, and EXCIMS
- Keep the chain of command informed
- Maintain OSD training transformation vision
- Approve RD3 Initial Capabilities Document (ICD)
- Approve RD3 process, methodology and development strategy
- Approve the RD3 detailed concept, architecture, prototype system design and POA&M
- Provide guidance and oversight
- Provide integrated project assessment

Integrating IPT (I-IPT)
Objectives

- Coordination with overarching IPT
- Perform coordination and integration of the working IPTs
- Maintain overall RD3 focus for IPTs
- Develop project plan and milestones
- Finalize and publish RD3 FAA, FNA, FSA & ICD
- Finalize and publish RD3 data, tools, processes, methodology and development strategy
- Finalize and publish the RD3 detailed concept, architecture, prototype system design and POA&M

Integrating IPT (I-IPT) Products

- Approve WIPT membership, structure and IPT overview document.
- RD3 Initiative plan and milestones for FY04 – FY09 (Initial Phase 1 – Feb 04, Revisions – Quarterly)
- Final RD3 Initial Capabilities Document (ICD) (Phase 1 Draft – Sept 04, Rev 1 – Nov 04)
- RD3 system architecture and prototype design strategy (Draft – Oct 04, Final – Dec 04)
- Final RD3 system architecture and prototype recommendation (Dec 04, Rev 1 – Feb 05)

Rapid Distributed Database Development (RD3) Working IPTs

- Requirements IPT (R-IPT) – *Bill Robinson*
- Data, Tools, and Processes IPT (DTP-IPT) – *Pamela Woodard*
- System Design, Programs, and Initiatives IPT (SDPI-IPT) – *Warren Bizub*
- Life Cycle IPT (LC-IPT) – *Dr. Dave Dryer*

RD3 Requirements Integrated Product Team (R-IPT)

Mr. Charles W. “Bill” Robinson

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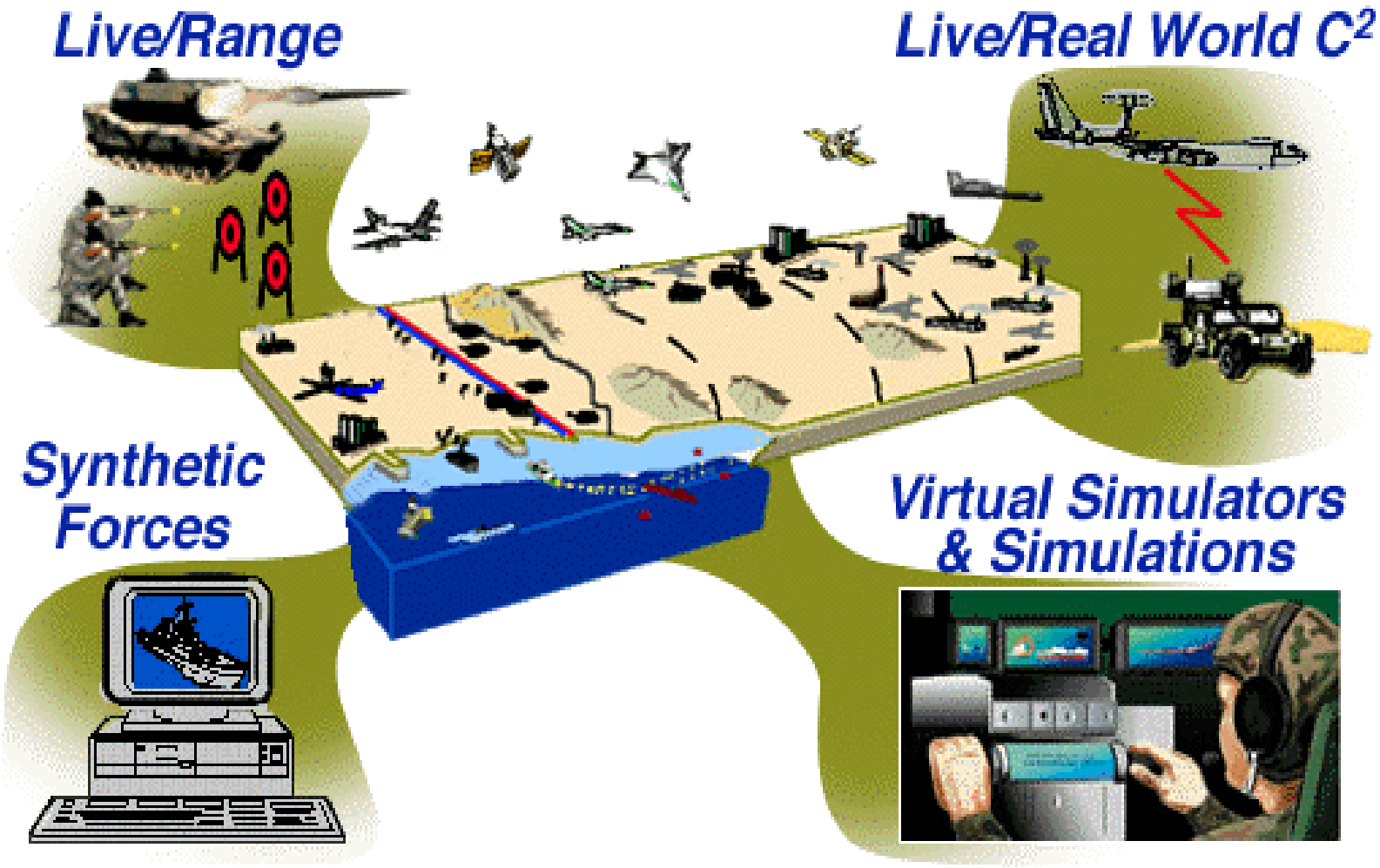
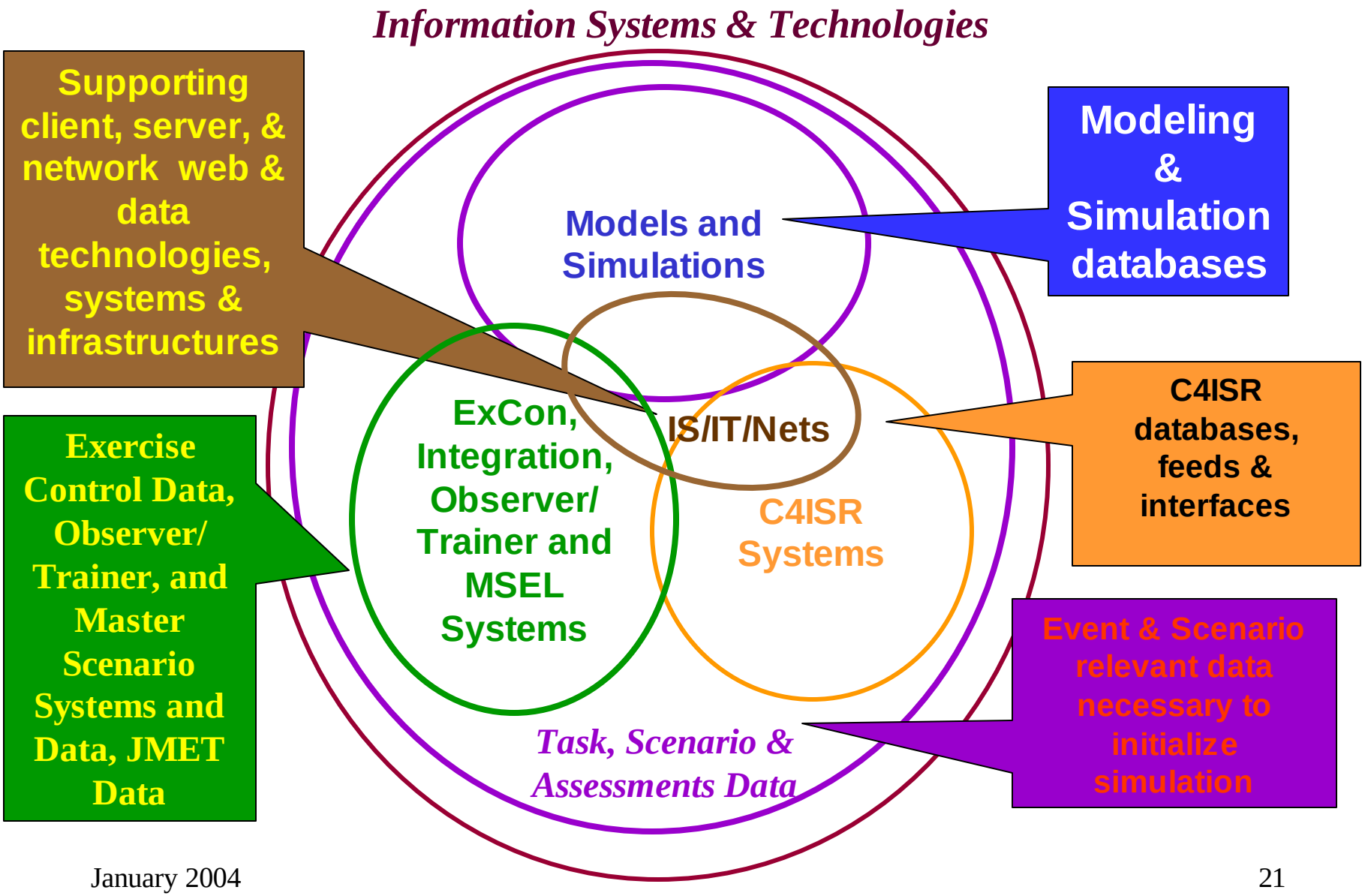
Strategic Goal

Provide the capability to generate simulation event scenario and ***mission relevant*** databases for initializing ***federations of live, virtual and constructive*** models and C4 systems in support of the ***Joint National Training Capability***, the Joint Experimentation Capability, and the needs of the Combatant Commanders, their Components, and their subordinate Joint Force Commanders

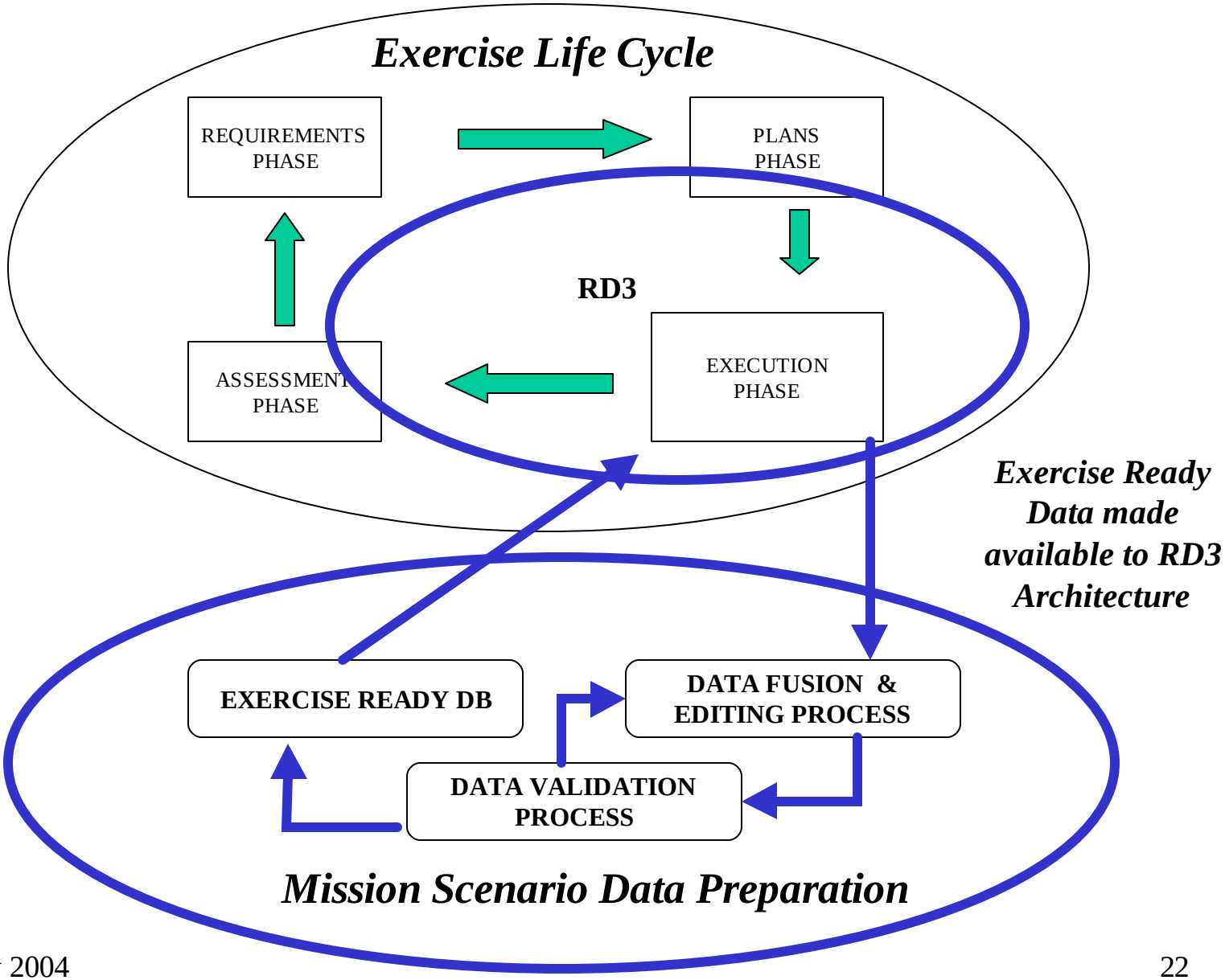
Simulation model and C4ISR databases for live, virtual and constructive federated-simulation events



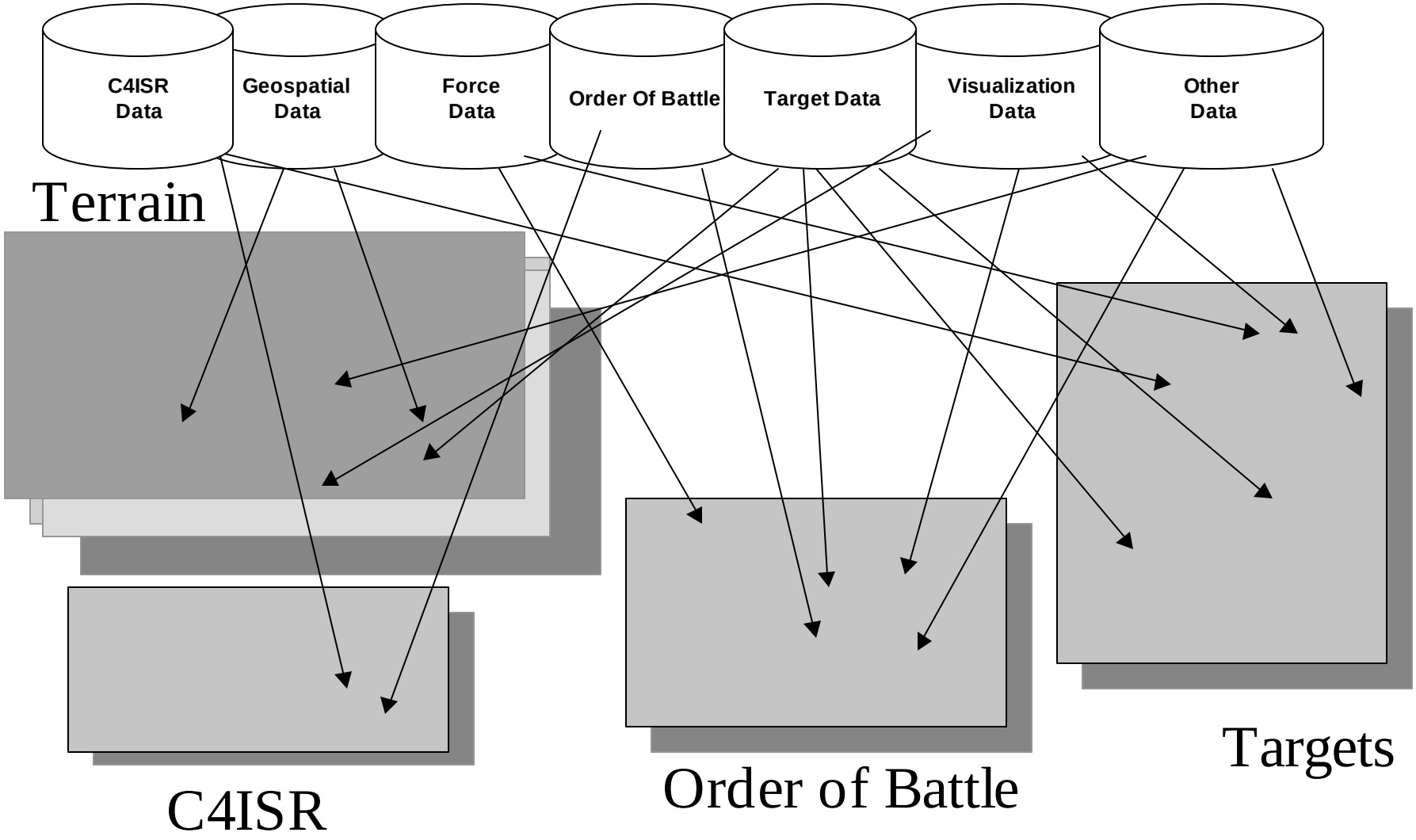
Objective Output: Execution Ready Data for Integrated Joint and Interagency Modeling, Simulation and C4ISR



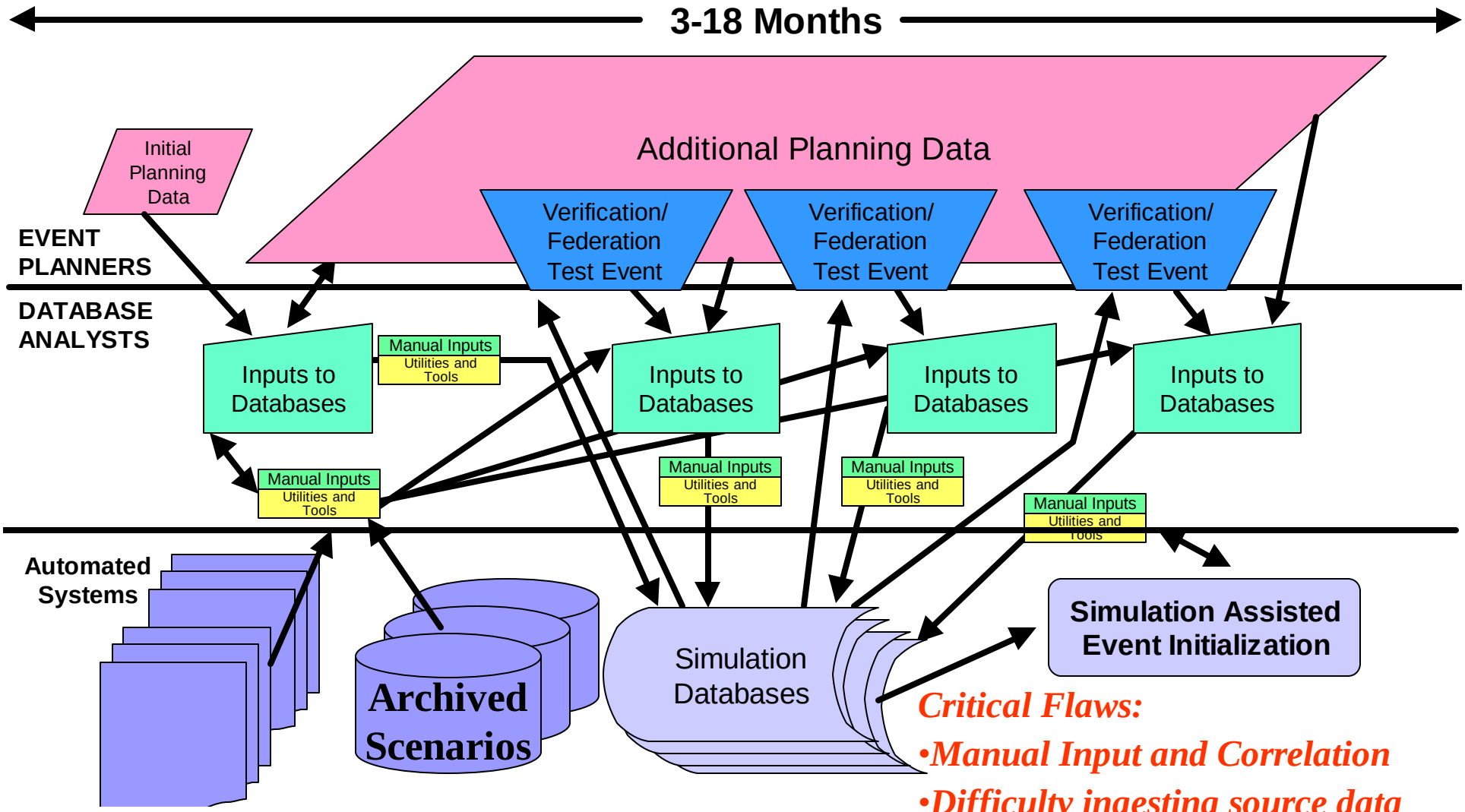
DATA FEED INTO JOINT EVENT LIFE CYCLE



Authoritative Data Populated in RD3 Repository Databases



Current Joint Event Live Cycle Driven Database Production Process

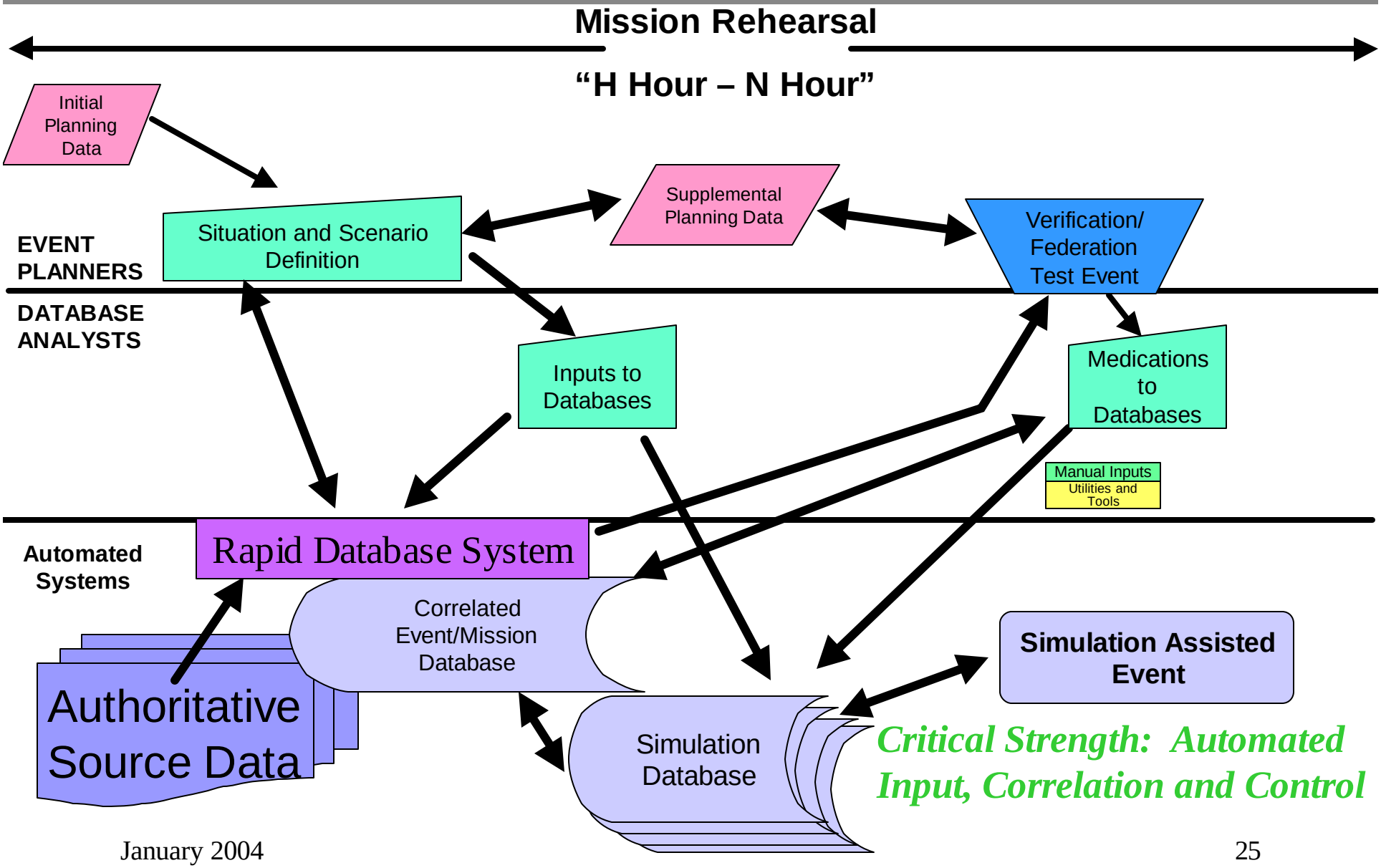


Critical Flaws:

- *Manual Input and Correlation*
- *Difficulty ingesting source data*

Multiple, Competing "Authoritative" Data Sources

Objective Database Production Process



Critical Strength: Automated Input, Correlation and Control

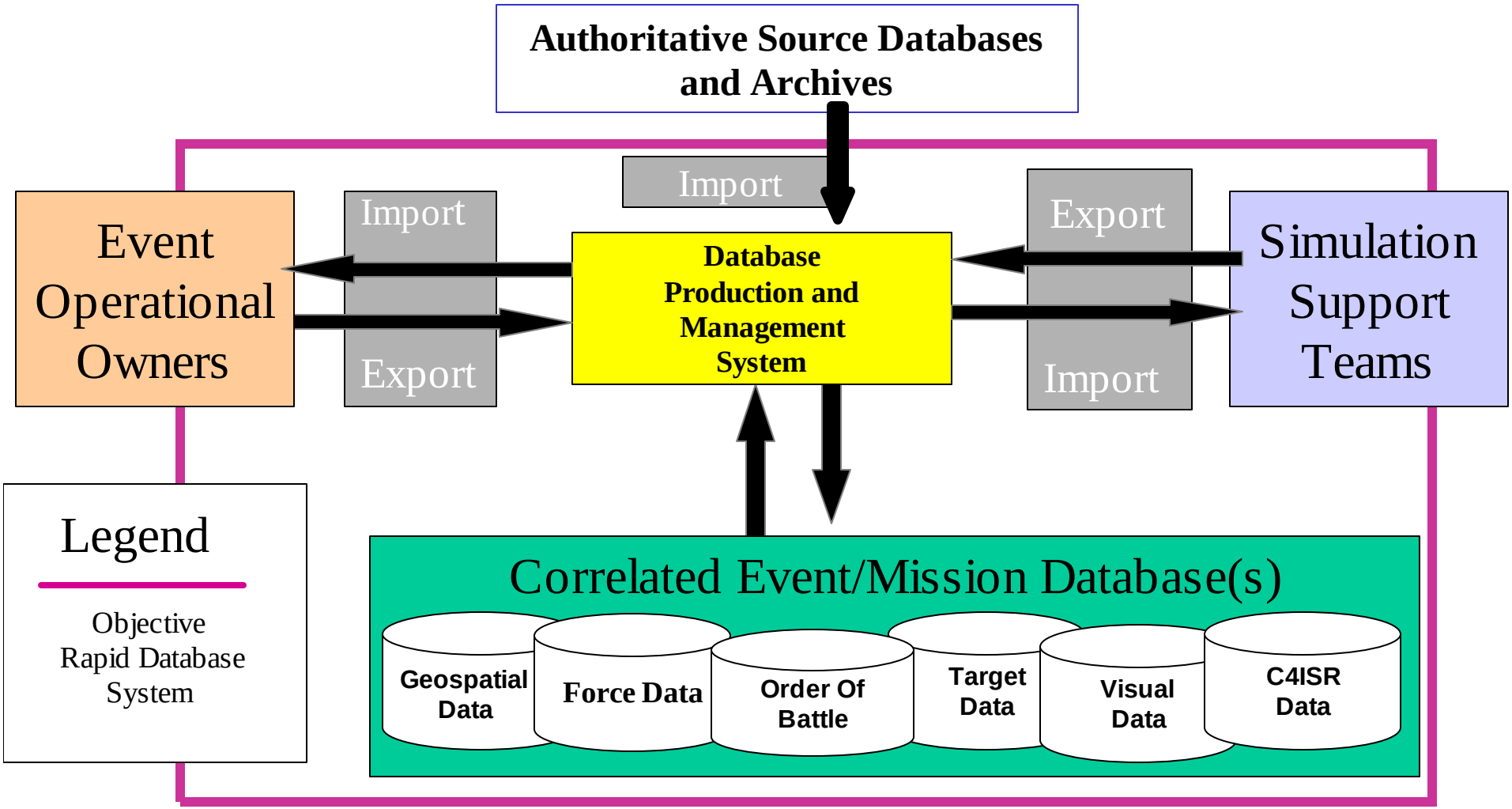
Concept

- Description – A web-enabled system and architecture to support the preparation of ***simulation model and C4ISR databases for live, virtual and constructive federated-simulation events***
- Purpose – Reduce the overall level of effort and time required to generate simulation, ***near - initialization ready, normalized model and C4ISR databases within mission planning, decision and preparation time-cycles to support use of federations of Live, Virtual and Constructive simulations for Joint training, planning, mission rehearsal***
- Benefit – Reduced cycle time and increased correlation will enhance the ability of joint simulation users to meet their ***mission driven planning, training, experimentation and rehearsal requirements***

Key Performance Areas

- **Operational**
  - Support collaboration between operators, intelligence and simulation system database developers and users
  - Reduce database development cycle time to meet planning and rehearsal needs
  - Provide proper implementation support to enable use
  - Provide near constant availability
  - Initial, validated content
- **Functional**
  - Provide interoperable, usable, relevant and reliable content with normalized and maintained simulation data structures
  - Reduce resources required to generate databases
  - Collaborative capabilities to allow data sharing across functional boundaries
- **Technical**
  - Establish a rapid distributed database development (RD3) system architecture which will allow a distributed set of users to develop and refine a simulation federation database
  - Establish a comprehensive archive
  - Full web enabled
  - Provides distributed storage area network capabilities

Objective Rapid Distributed Database Development System



High Level Requirements
Enterprise Sources

- **Executive Committee for Simulation (EXCSIM)**
- **Joint National Training Capability**
- **Training Capabilities Analysis of Alternatives**
- **Joint Simulation User Communities**
- **Modeling and Simulation Working Group**
- **Joint Training Requirements Group [for Simulation]**
- **Joint Training Policy and Doctrine**
- **Joint Simulation System Requirements**

Stakeholders & Users

- Combatant Commands and Components
  - Regional Combatant Commands and Components
  - Deploying JTFs and Joint Forces
  - SOCOM
- Joint National Training Capability Users
  - Joint Training Community of Interest
  - Service Joint Interoperability Trainers
  - Joint Force Trainers
- Service Users
  - Training Commands
  - Centers and Schools
- Joint Experimentation Community
  - Distributed Continuous Experimentation Environment

Stakeholders & Users (cont'd)

- Joint Simulation Community of Interest
  - Major Simulation Centers
  - Joint Simulation System Stakeholders
  - Joint Training Requirements Group
- Users of Joint Forces Command managed simulations and federations
  - JIDPS Users
  - Alliances and coalitions
  - Interagency and intergovernmental trainers and planners
  - Acquisition and analysis organizations
  - Other service users
- Intelligence and Targeting Community
  - Joint Warfare Analysis Center
  - JIDPS Users

User & SME Sub-IPTs

- Training, Planning and Mission Rehearsal Operational End Users
  - **Mission rehearsal support teams**
    - SOCOM, AFSOC, USASOC, USAREUR, ARCENT, USMC
- Live, Virtual and Constructive Simulation Operational End Users
  - **Federated training event simulation support teams**
    - JNTC & JWFC, USASOC, DMOC, USAREUR, SOCOM, JOUST, USA NSC DBST & ACTF
  - **Distributed training event simulation support teams**
    - JNTC & JWFC, DMOC, USA NSC CCTT & AATT
- **Current Rapid Database Generation project teams**
    - May be iterative with Data, Tools & Processes

Rapid Distributed Database Development (RD3) Working IPTs

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- System Design, Programs, and Initiatives IPT (SDPI-IPT) – *Warren Bizub*
- Life Cycle IPT (LC-IPT) – *Dr. Dave Dryer*

RD3 Data, Tools, and Processed Integrated Product Team (DTP-IPT)

Pamela Woodard

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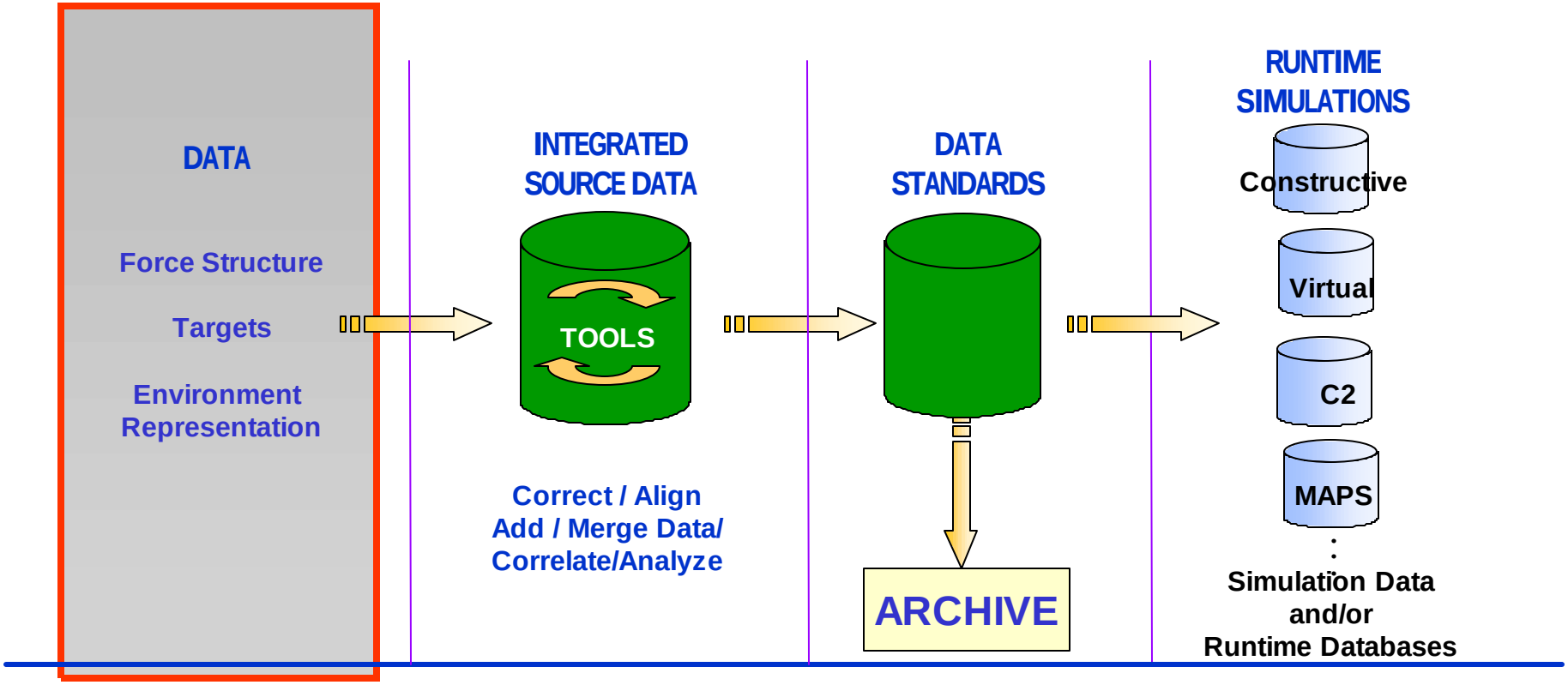
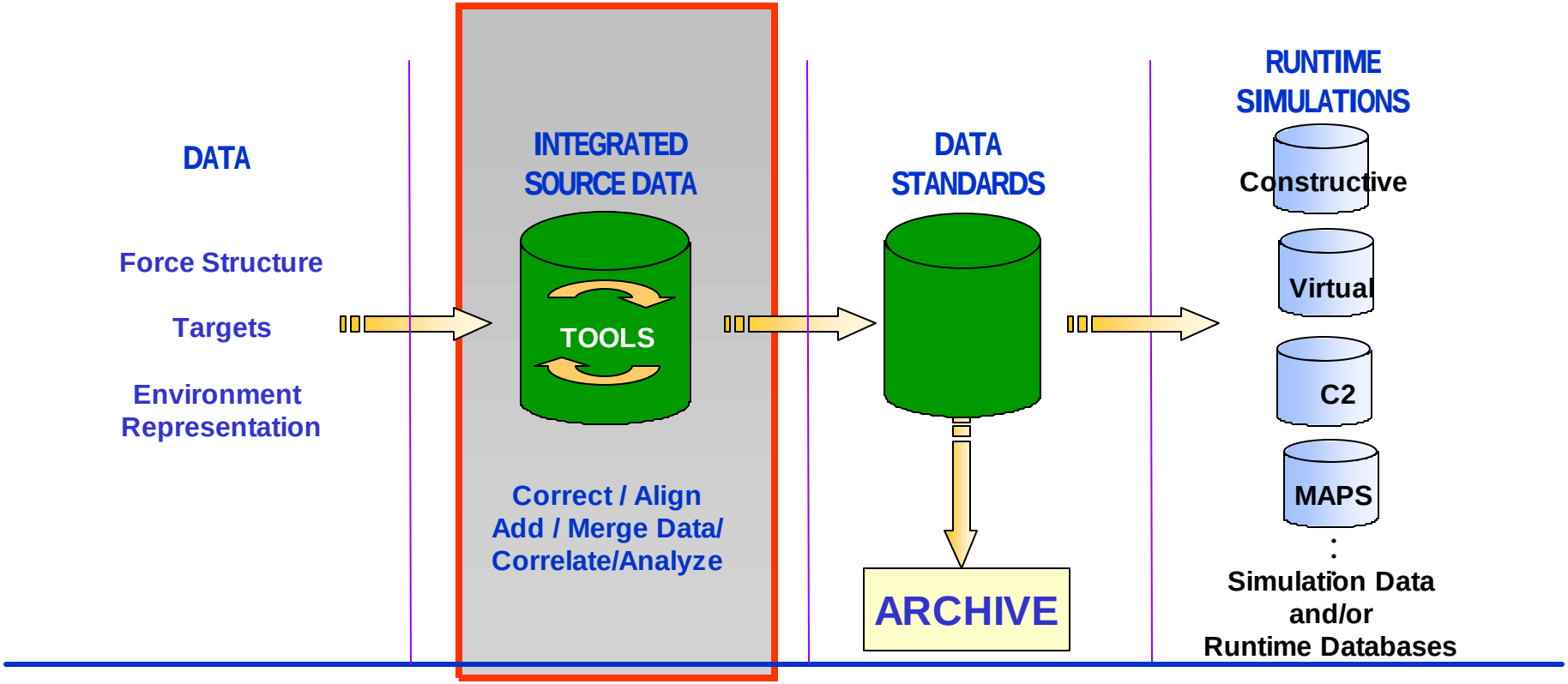
Data, Tools and Processes IPT (DTP-IPT) Focus Areas

- The primary focus areas for the IPT are:
  - Data
    - Force Structure
    - Targets
    - Environment Representation
  - Tools (data collection and analysis)
  - Data Standards
  - Data Archiving
  - Data Distribution

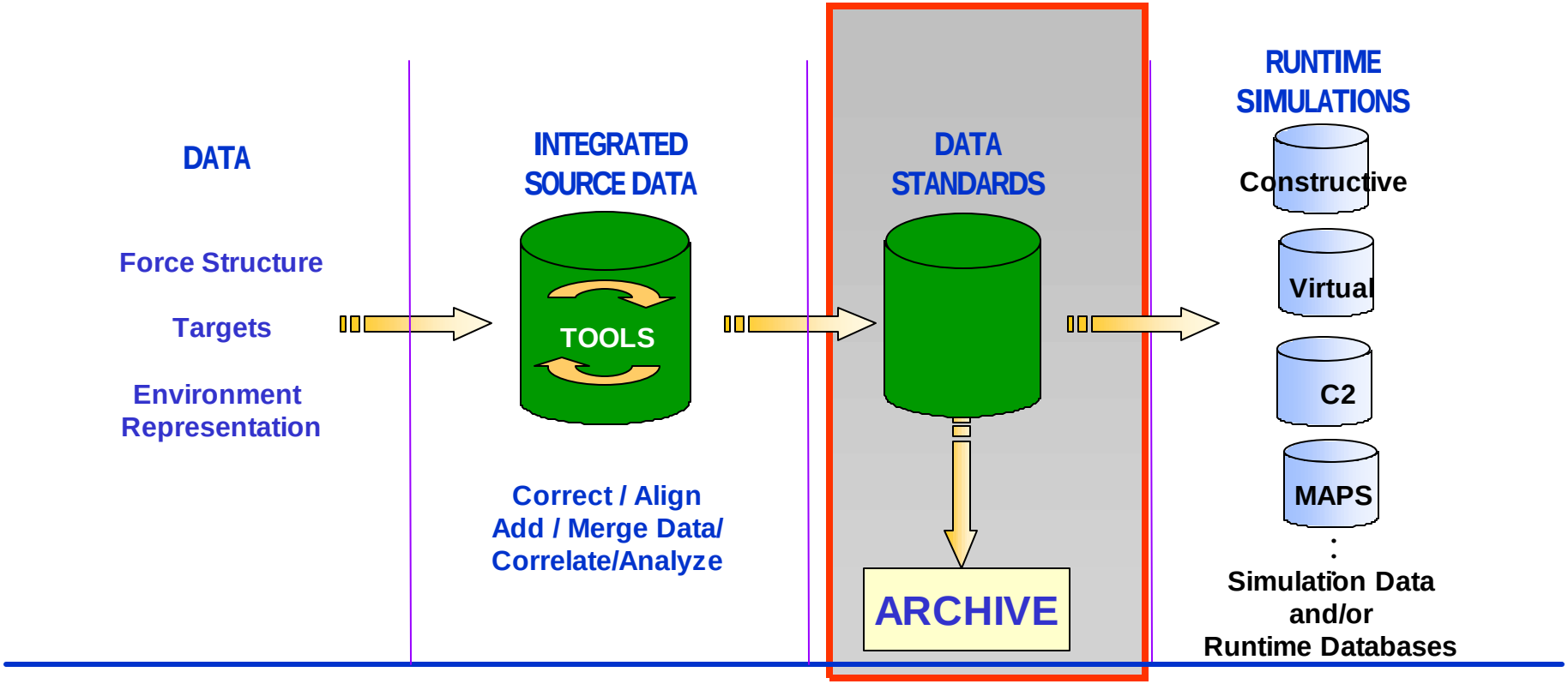
Data, Tools and Processes IPT (DTP-IPT)
Data



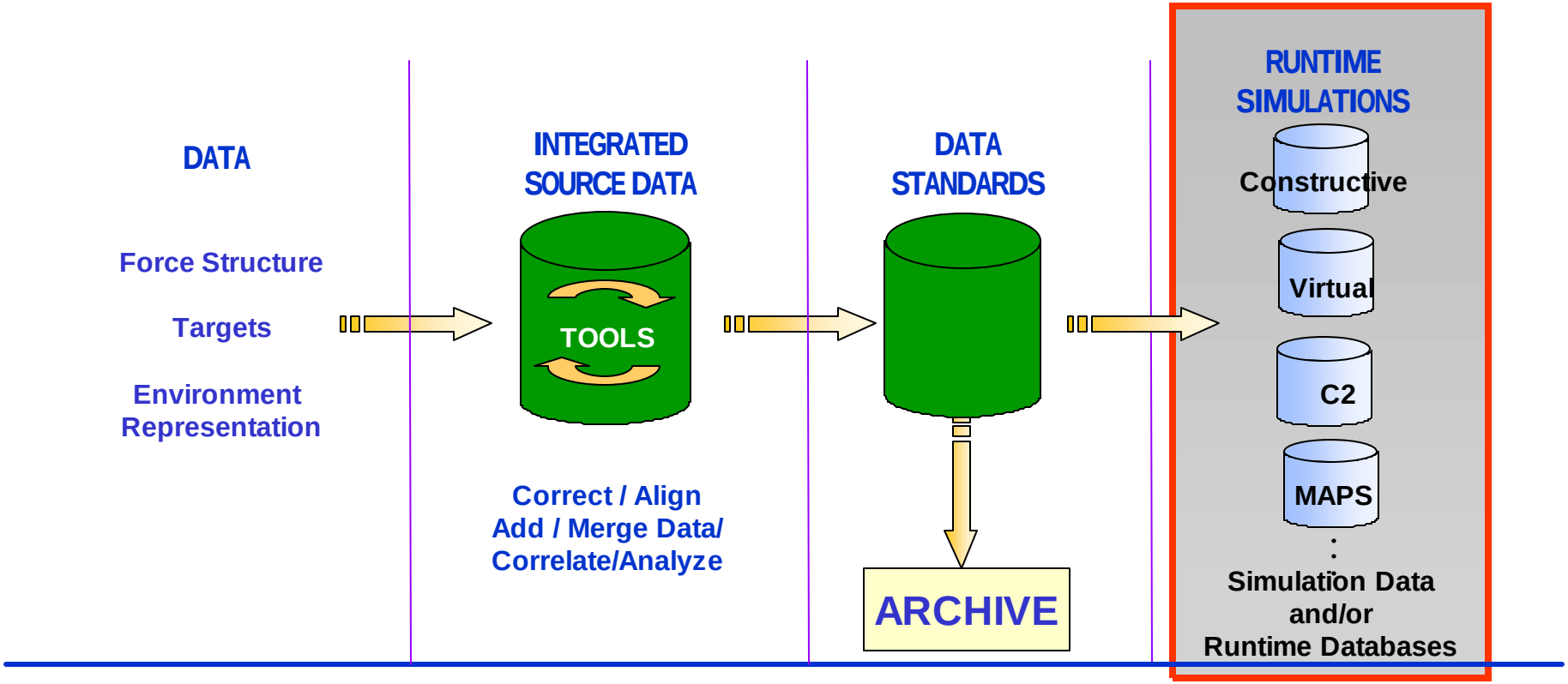
Data, Tools and Processes IPT (DTP-IPT) Tools



Data, Tools and Processes IPT (DTP-IPT)
Standards - Archiving



Data, Tools and Processes IPT (DTP-IPT) Distribution



Data, Tools and Processes IPT (DTP-IPT) Objectives

- Assess and document the following: (input to the R-IPT)
  - Data sources, Data and related standards
  - Tools techniques and L-V-C interoperable products
  - Data generation, collection, and transformation processes
  - Distribution and archiving processes
- Identify shortfalls in current state-of-the-art and state-of-the practice data, tools and processes
- Define tool infrastructure requirements
- Define the current processes and associated tools for converting authoritative source data into simulation data and runtime databases to support training applications / simulations
- Establish “fit for use” evaluation criteria

Data, Tools and Processes IPT (DTP-IPT) Objectives

- Define strategies for including legacy systems and databases
- Identify referent data to support prototype verification and validation
- Assess current standards for force structure, target, and terrain data and identify limitations and shortfalls
- Assess current archiving processes for force structure, target, and terrain data and identify limitations and shortfalls
- Assess current distribution processes for force structure, target, and terrain data and identify limitations and shortfalls
- Identify data needs to support the prototype development

Data, Tools and Processes IPT (DTP-IPT) Products: Phase 1

- Detailed list of "authoritative" data sources, available data, and related data standards
- Detailed list of available effects algorithms
- Defined data generation tools
- Defined data collection tools
- Defined data transformation tools
- Defined distribution & archiving approaches
- Defined data repository methodology
- Produce a Functional Needs Analysis (FNA)

Data, Tools and Processes IPT (DTP-IPT) Products: Phase 2

- Recommendations for modification to existing or development of new data generation, collection, and transformation tools / method
- Recommendations for modifications to existing or development of new tools / methods.
  - "Fit for use" evaluation criteria
- Recommendations for modification and development of data standards, distribution & archiving approaches
- Strategies for including legacy systems and databases

Data, Tools and Processes IPT (DTP-IPT) Products: Phase 3

- Identify initial authoritative sources for prototype verification and validation
- Identify referent data sets for prototype verification and validation

Data, Tools and Processes IPT (DTP-IPT) Products: Phase 4

- Selective participation in spiral design process to monitor compliance with RD3 required capabilities
- No specific products currently identified

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- Data, Tools, and Processes IPT (DTP-IPT) – *Pamela Woodard*
- System Design, Programs, and Initiatives IPT (SDPI-IPT) – *Warren Bizub*
- Life Cycle IPT (LC-IPT) – *Dr. Dave Dryer*

System Design, Programs, and Initiatives IPT (SDPI-IPT) Objectives

- Identify Government and Commercial Activities that RD3 can leverage or reuse
- Address the requirements for new or existing database development efforts to support integration with solution sets in support of development of the RD3 concept
- Support the R-IPT and DTP-IPT
- Develop the overall system design concept, prototype architecture, and potential solutions based on inputs from R and DTP IPTs (FSA)
- Identify alternative solutions for the prototype design
- Assess the cost vs. performance vs. system requirements
- Develop and update the overall project schedule

System Design, Programs, and Initiatives IPT (SDPI-IPT) Products

- An overview and assessment of the existing Government and Commercial programs and activities that can be reused or leveraged in the development of the RD3 architecture
- Recommendations on the modifications to current efforts to tailor to the RD3 concept
- Functional Solution Analysis (FSA)
- Define prototype scope and alternative design solutions
- Apply cost/performance/requirements data to the proposed design alternatives and provide recommendation to the I-IPT
- Project Schedule and Risk Mitigation plan

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RD3 Life Cycle Integrated Product Team (LC-IPT)

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Life Cycle (LC-IPT) Organizational Guidelines

- Major organizations should have a lead representative responsible for area input and appropriate IPT attendance.
- Incorporate use of collaborative engineering environment to maximize collaboration
  - Main work during distributed, informal (but structured) IPT/cross IPT interactions
  - IPT meetings kept to a relatively small (~fifteen member) group focused on selected areas of the LC problem space and synthesis of individual work.

Life Cycle (LC-IPT) Membership

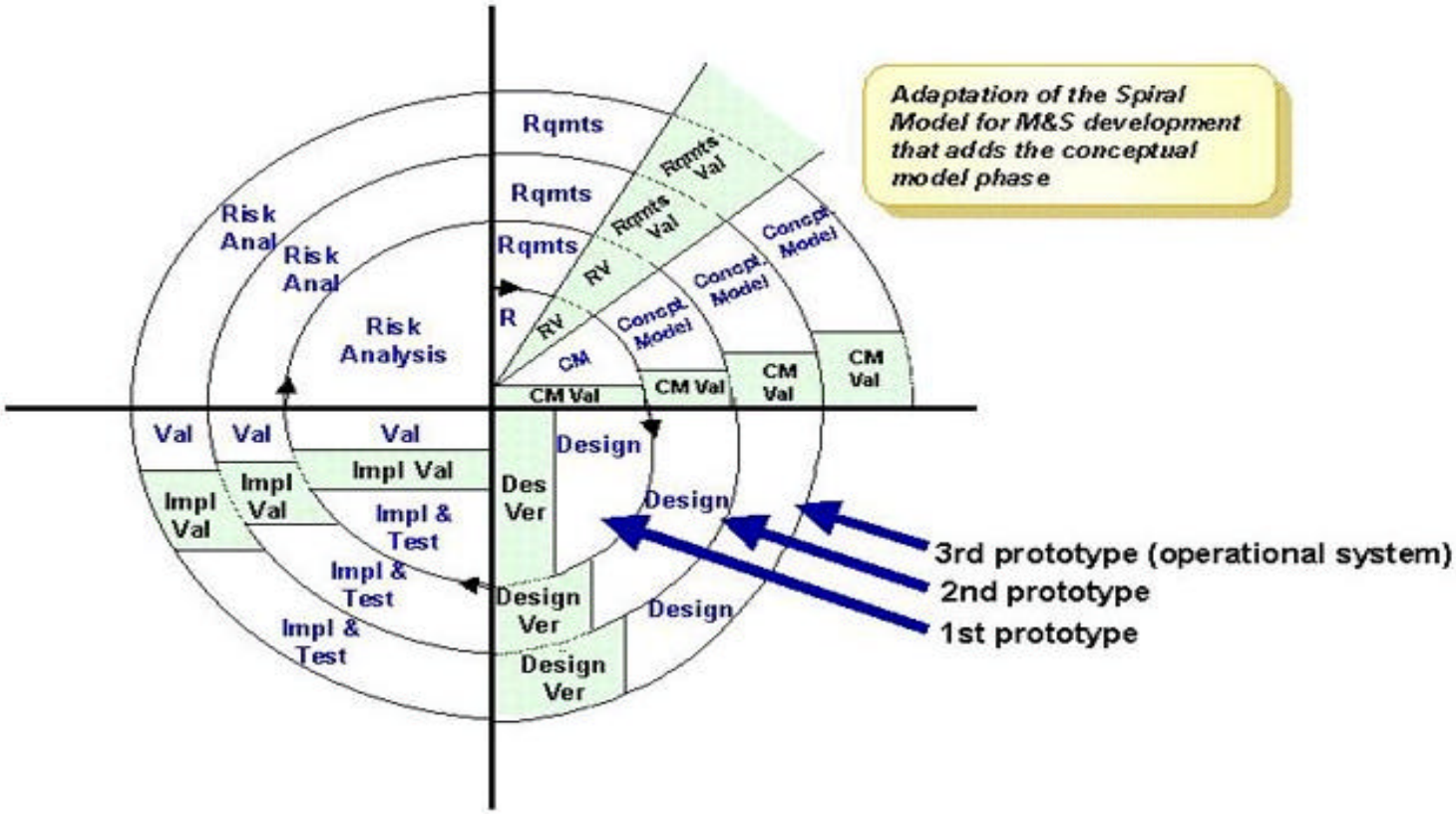
Initial List:

- DMSO
- DOT&E
- TENA
- Unified Combatant Commands
- Services
- Other stakeholders provide members for LC IPT as appropriate for RD3 life cycle and V&V activities

Life Cycle (LC-IPT) Objectives - 1

- RD3 deliverable *system* verification and validation (V&V)
  - Develop validation methodology for RD3 prototype and final systems
  - RD3 requirements input and support
    - Review and verify RD3 operational requirements
    - Derivation of metrics supporting V&V process
    - Development of requirements and metrics related to RD3 V&V, security, and life cycle
  - Conceptual model validation
  - Design & implementation verification
  - Embedded lifecycle validation (forcing function) during RD3 lifecycle milestones – event based
  - Not to be confused with RD3 Data Validation Process
    - RD3 capability
    - Part of RD3 operational view (business practice)

Life Cycle (LC-IPT)
Validation Relationship to Spiral Development



Spiral Process Paradigm

Life Cycle (LC-IPT)
RD3 Metrics

- Reflect
  - Operational, functional, technical performance
  - Life-cycle “ilities”
  - Affordability
- Categories
  - Technical Performance Measurements (TPMs)
  - Measures of Performance (MOPs)
  - Measures of Effectiveness (MOEs)

Life Cycle (LC-IPT)
Critical Validation Metric Areas

- Operational performance
- Cost
- “ilities”
  - Maturity
  - Data quality/Realism
  - Interoperability
  - Deployability
  - Usability
  - Availability
  - Reliability and Maintainability
  - Supportability
  - Extendibility

Life Cycle (LC-IPT)
Example Supportability Metric Areas

- Application maintenance level of effort and complexity
- Database maintenance level of effort and complexity
- Preplanned extension level of effort and complexity
- Server architecture requirements and constraints
- Client architecture requirements and constraints
- Wide Area Network and Bandwidth requirements and constraints
- Ease of use and customer support requirements

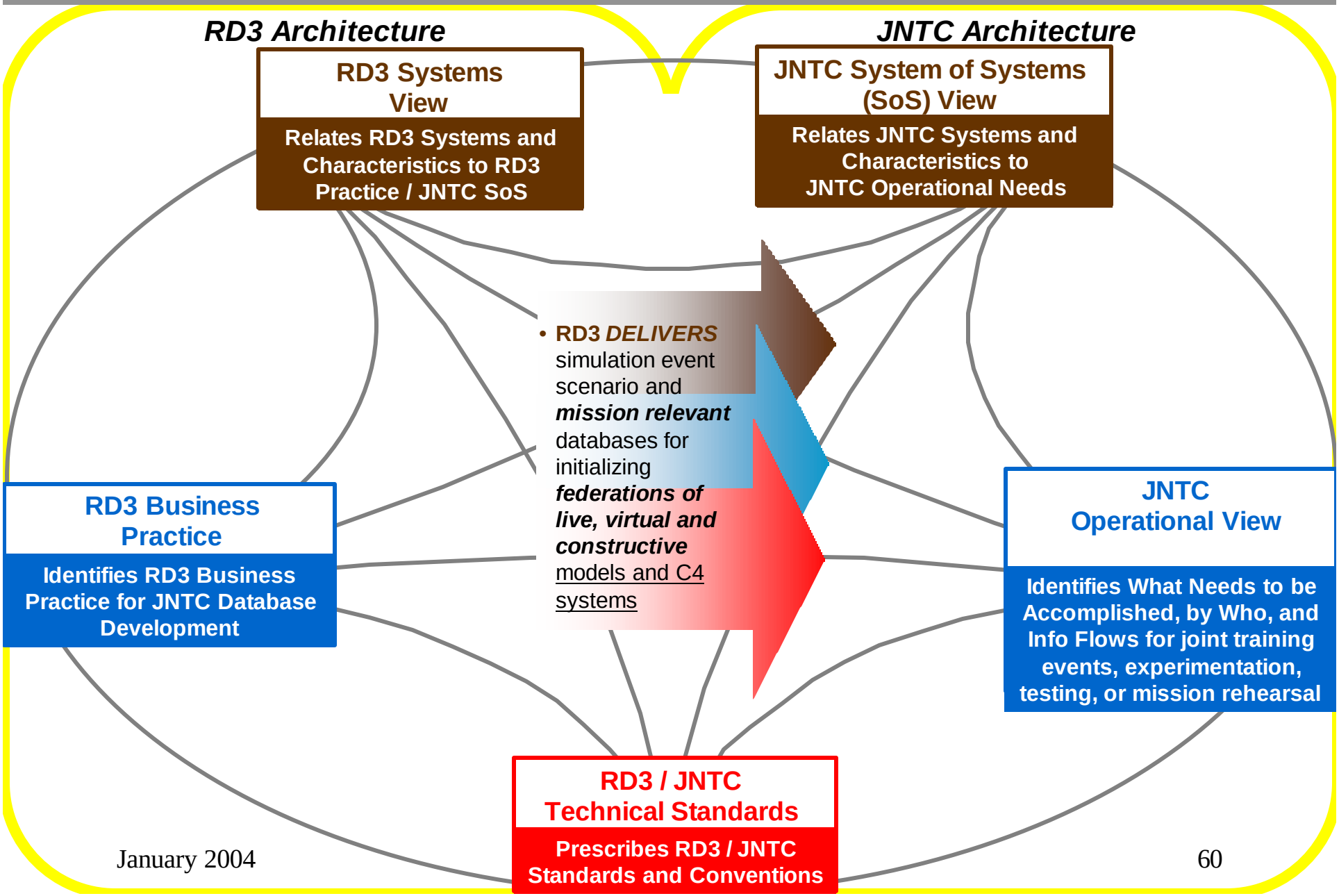
Life Cycle (LC-IPT) Objectives - 2

- RD3 systems engineering life cycle ***process*** validation
  - Develop process assessment/validation methodology for RD3 engineering process
  - Identify throughput issues and concerns with the RD3 development processes
  - RD3 collaborative engineering environment process and enabler recommendations/ feedback

Life Cycle (LC-IPT)
Critical RD3 Development Process Areas

- Model Driven System Design Approach and Tools
  - DODAF/CADM - based architecture framework
  - Focus on integrated enterprise delivery, interoperability and convergence of evolving systems
- Collaborative Engineering Environment
  - Data-centric interactions
    - Shared knowledge repository (JDLS, Groove)
    - Shared tools (Rational Suite, CORE)
    - RD3 workflow (JCIDS/system of systems engineering)
    - Application sharing
    - Configuration management
  - People-centric interactions
    - Synchronous/asynchronous
    - Audio, video, messaging (IWS, DCTS)

Some thoughts on RD3 Architecture Framework



Life Cycle (LC-IPT) Objectives - 3

- Identify security/classification issues related to the implementation of the RD3 concept
- Identify cost issues related to the development of the RD3 prototype
- Identify support/logistics issues for the RD3 system
- Address infrastructure supportability
- Address data rights

Life Cycle (LC-IPT) Initial Products: Phase 1 (thru 3Q 2004)

- RD3 operational rqmts review and lifecycle rqmts decomposition
- Recommendations on the RD3 concept and architecture related to lifecycle and security (contribution to ICD and System Arch. Revs)
- Defined approach for validation of the RD3 prototype and processes provided to the Integrating IPT (contribution to Prototype Design Strategy Revs)
- Initial RD3 V&V metrics derived from requirements
- IPT charter, agenda, and minutes