

Office of Force Transformation



Sense and Respond Logistics: Co-evolution of an Adaptive Capability

CAPT Linda Lewandowski
Project Lead

6 August 2003

Agenda

- Future Warfighting Trends
- Essence of “S&R Concept”
- The S&R Project
- Co-evolution: Moving from Concept to Capability

Transforming Defense

...The new American Way of War

The New Rules

- Fight first for information superiority
- Speed of command
- Access to information-shared awareness
- Dispersed forces-noncontiguous operations
- Demassification
- Elimination of process lines
(eg. organize, deploy, employ, sustain, ops, intel, logistics)
- Elimination of structural lines
(eg. Joint ops at the small unit level)
- Dynamic self-synchronization
- Alter initial conditions
- Develop high rates of change
- Compression of levels of war

NETWORK CENTRIC WARFARE

HIGH RATES OF
CHANGE

CLOSELY COUPLED
EVENTS

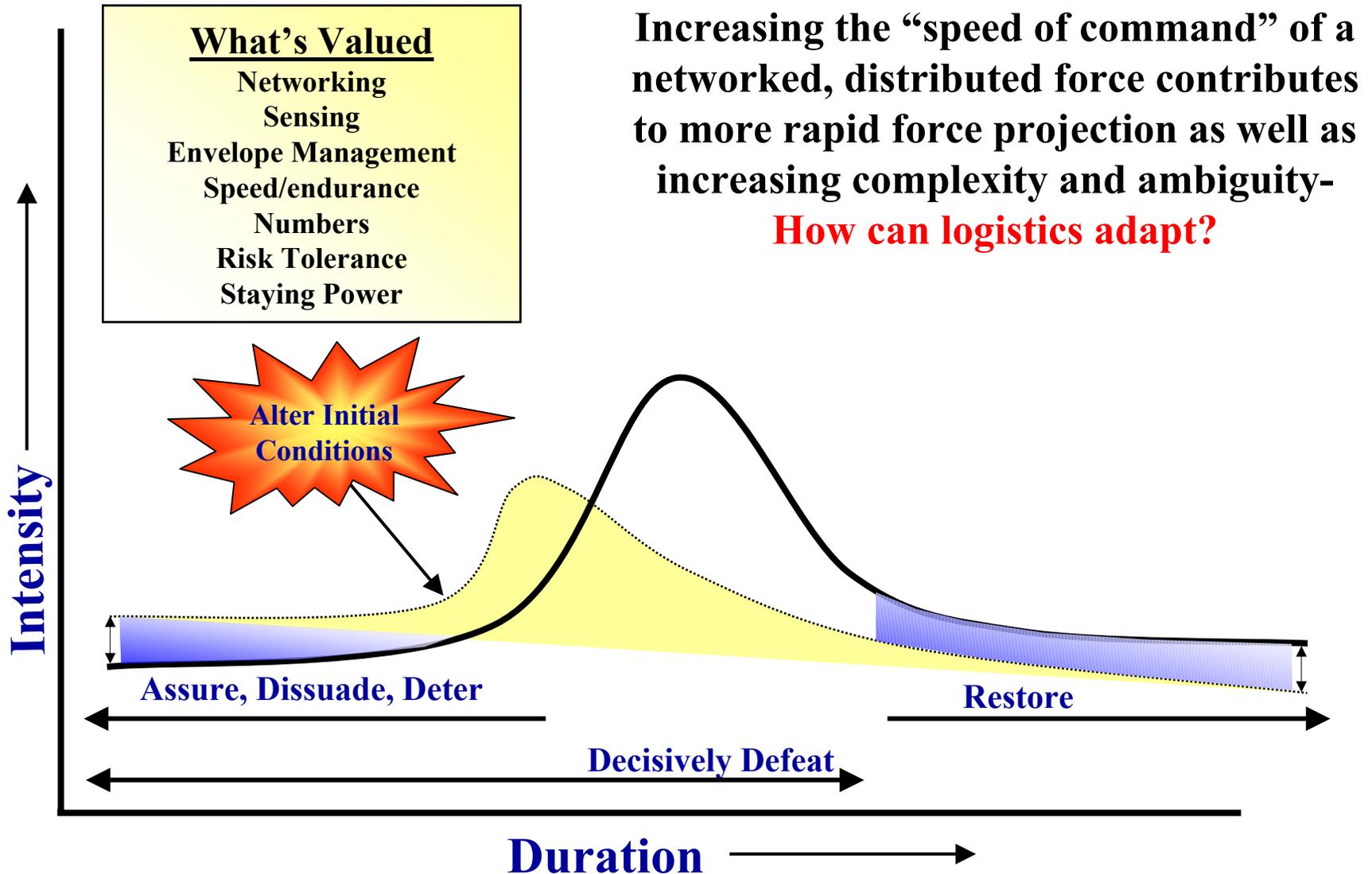
LOCK IN/OUT

SPEED OF COMMAND

SELF-
SYNCHRONIZATION

Transforming Defense

...deter forward ...or defeat with modest reinforcement



Implications for Logistics

Phased deployment of monolithic units via fixed infrastructure and traditional sustainment mechanisms are not responsive enough for NCW

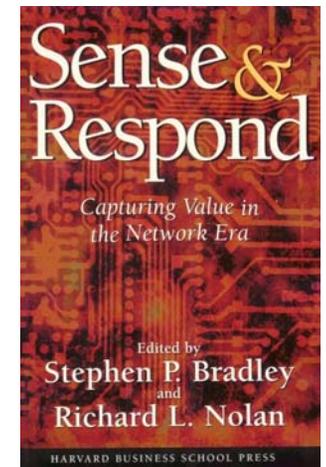
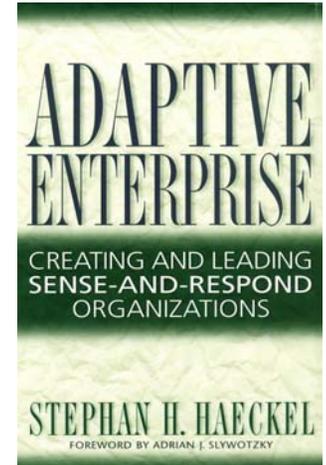
- Joint capability packages, configured on-the-fly
- Maneuver directly on objectives from operational and strategic distances w/o fixed ISBs or RSOI (force-to-objective maneuver—FTOM)
- Organize/Deploy/Employ/Sustain a single, continuous process
- Non-contiguous battlespace, no secure rear areas

Hierarchical, stovepiped logistics chains can not support distributed, adaptive operations

The S&R Concept

What is “Sense and Respond”?

- The S&R business analog is an adaptive managerial framework originally developed by IBM
 - **Key ideas:**
 - Assume demand is ultimately unpredictable, so success depends on speed of pattern recognition and speed of response
 - The best supply chain is no longer one that is highly optimized, but one that is highly flexible
 - Organizes business units and subunits into “modular capabilities” that negotiate with one another over commitments
 - Networks “self-synchronize” via a common environment and set of shared objectives; typically business financial and customer satisfaction measures
 - Depends on sophisticated IT support to enable data sharing, “knowing earlier,” commitment tracking, and role reconfiguration
 - **Business literature and practice reflect application of network centric theory and principles**
- OFT is exploring the utility of S&R concepts to transform Defense Logistics



Approaches to Logistics

Mass-Based



- More is better
- Mountains of stuff measured in days of supply
- Uses massive inventory to hedge against uncertainty in demand and supply
- Mass begets mass and slows everything down

Prime Metric: Days of supply

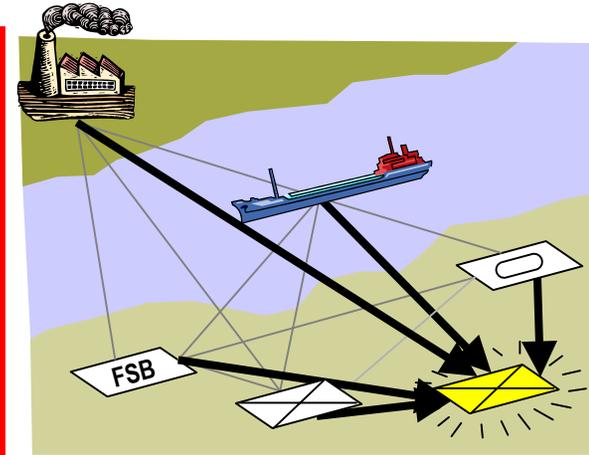
Just-in-Time



- On-time is better
- Inventory is reduced to a minimum and kept moving
- Uses precise demand prediction and static optimization to purge uncertainty
- Works great, except when it doesn't

Prime Metric: Flow Time

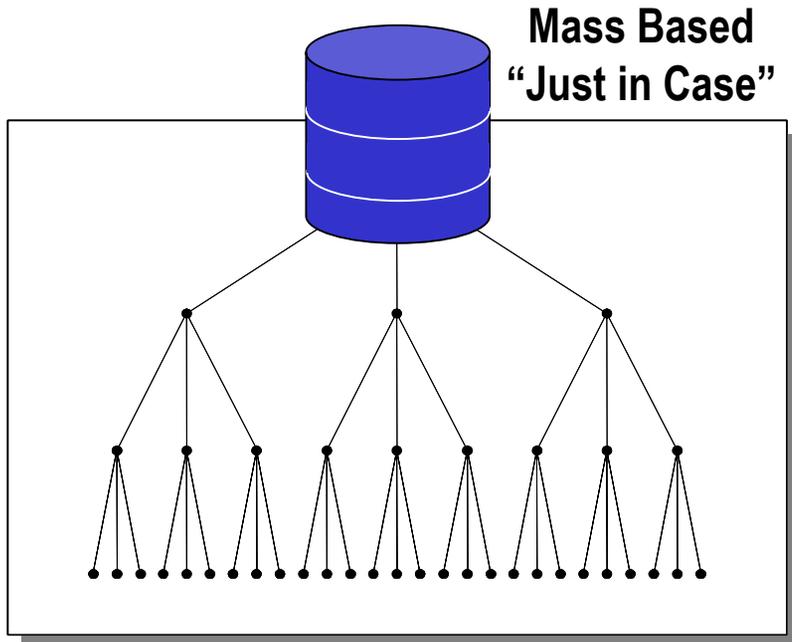
Sense and Respond



- Agile is better
- Inventory is dynamically positioned throughout
- Uses transportation flexibility and robust IT to handle uncertainty
- Initial S&R models look promising
- Supports adaptive ops

Prime Metric: Spd/qual of effects

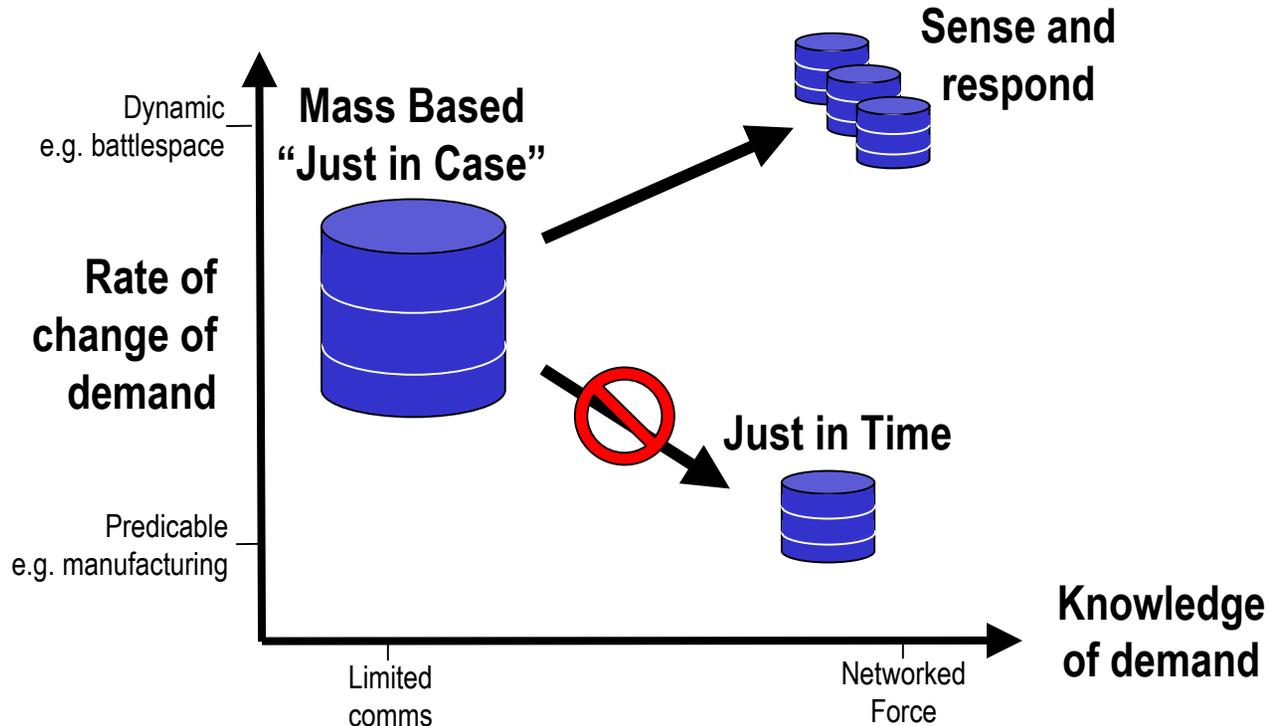
The Problem: Logistics in a World of Network Centric Operations



Chain
Too brittle, simple pattern, simple control, scaled
‘business end’ most poorly connected, hard to reconfigure or change flow

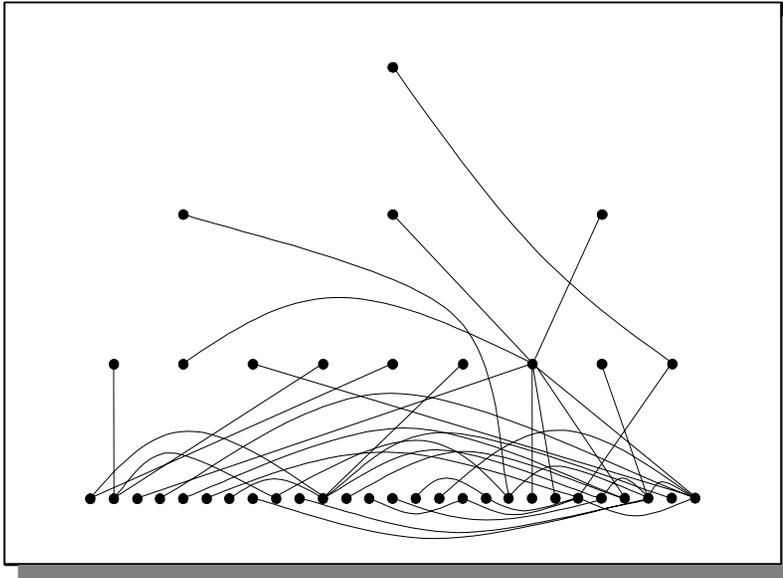
- Classic logistics is not agile enough for distributed adaptive operations
 - Has no ability to reconfigure the logistics network relationships, inventory, or distribution strategy
 - Entails long buildup times, longer resupply cycles, and large inventories
 - Operates best with “massing of forces” combat doctrine
- Classic logistics involves an unstable combination of push and pull signals
 - Supply pull signals beyond the first level are inventory fills
 - Rear suppliers don’t see combat unit demand and can be whipsawed
- Classic logistics is vulnerable
 - Results in asset concentration in stockpiles towards rear (targets)
 - Relies on a linear battlefield and secure log area
 - Exhibits predictable network structure
- Classic logistics is inefficient
 - Combat units can only draw on the supply in their chain, not (typically) the total battlefield stocks or stocks of other services

S&R Vision: Reduce Logistics Bulk AND Support Demand Dynamics



- **S&R exploits advanced comms and IT capabilities, scale-free distribution network design, and transportation flexibility to**
 - Dynamically *evolve* the logistics network structure with the operation
 - Make more *efficient* use of battlefield stocks by increasing supply options
 - Increase operational *agility* by delaying logistics commit time
 - Support *distributed, adaptive* operations
- **S&R is NCW for logistics**

Sense and Respond Logistics Concept



Network

**Very robust, complex pattern,
complex control, scale free**

**'business end' best connected,
natural to reconfigure or change flow**

- Supply network is dynamic
 - **Supply doctrine anticipates reconfigurable supply nets**
 - **Emphasizes transportation flexibility over large inventories**
- Negotiation-based relationships
 - **All entities use commander's intent and detailed situation awareness to negotiate and synchronize**
 - **Roles and commitments of entities are dynamically defined within a specific context**
 - **All entities are described in terms of current capabilities, not as static forces**
- Networks are difficult to analyze and attack
 - **More robust to node failure**
 - **Adapts to real-time demand driven by unit signals**
- Supports distributed, adaptive operations
 - **Network adaptivity allows logistics decisions to be made later**
 - **Emphasis on information and transportation allows a greater degree of operational flexibility**
 - **No pause**

S&R Hypotheses

1- Greater logistics agility (and hence greater operational agility)

- An S&R supply network can support the combat units with the same degree of quality, while allowing closer logistics commitment points
 - Measure by equipment readiness of combat units at the time they are needed (S- and R- level from GSORTS); secondarily by higher percentage of deliveries at or before RDD
 - An S&R supply network can respond better to stock outs and unanticipated needs
- An S&R supply network can therefore increase the operational options available to the commander
 - Measure by commitment window; that is, by comparing dates for the last possible order to get there by the RDD, or ability to do doctrine-supported asset repurposing (use of truck for POW transport) under the stresses of extended USMC operations, use of joint/coalition assets, and other OPLAN changes

2- Greater logistics network survivability

- An S&R supply network can withstand a greater range of node, communications, and security failures
 - Measure by set of vignette-directed perturbations such as infrastructure and unit failure

3- Better support for the full range of military operations

- An S&R supply network can support across ROMO (Peacekeeping, Foreign Consequence Mgmt, NEO, etc.) with a higher degree of effectiveness
- An S&R supply network can support current forces and evolving task-specific force packages with a greater degree of agility and responsiveness

4- Supports distributed, adaptive joint operations

When compared with current logistics doctrine, S&R logistics will enable commanders to better create and exploit operational advantage

S&R Project Overall Goals

- Catalyze transformation of joint logistics capability throughout DoD
- Develop a formal concept for S&R Logistics in the context of Joint Adaptive Operations
- Identify and document measures to evaluate potentially transformational logistics concepts
 - **Go beyond standard logistics flow measures to measures of survivability, agility, coherence, and speed/quality of effects**
- Incorporate a S&R logistics module into an LOE that allows DoD to gather operational data and evaluate the Sense and Respond concept; inform system design
 - **Create a prototype information system that supports logistics adaptation to changes in the operational environment**
 - **Use SEA VIKING LOE to capture learning and prepare second S&R spiral**

S&R Project Approach

- Conducted primarily as an [exploration into the behavioral aspects of networks](#) and how they impact operational, organizational, process, and technology designs
- Three networked teams operating synergistically to achieve the desired outcome: user group, technical group, concept/experimentation group
- Teams have access to industry and academia advisors
- Operational context set by Joint Operations from the Sea Base
- Exploit full range of experimentation opportunities
- Employ co-evolutionary process to guide development activities

Co-Evolution and Spiral Development

Concepts

Process

Technology

Organization

Co-Evolution and Spiral Development

Concepts

Process

Technology

Organization

Logistics
Elements

Network
Centric
Log System
Capability

Assessment
& Feedback

JUL

Analysis

Simulation

Demonstrations

Wargames

Real World Ops

Future

Incremental Capability Releases

FLOW

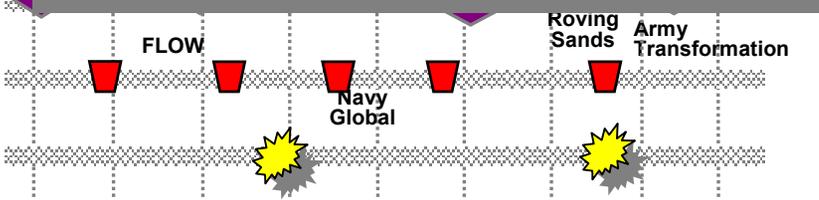
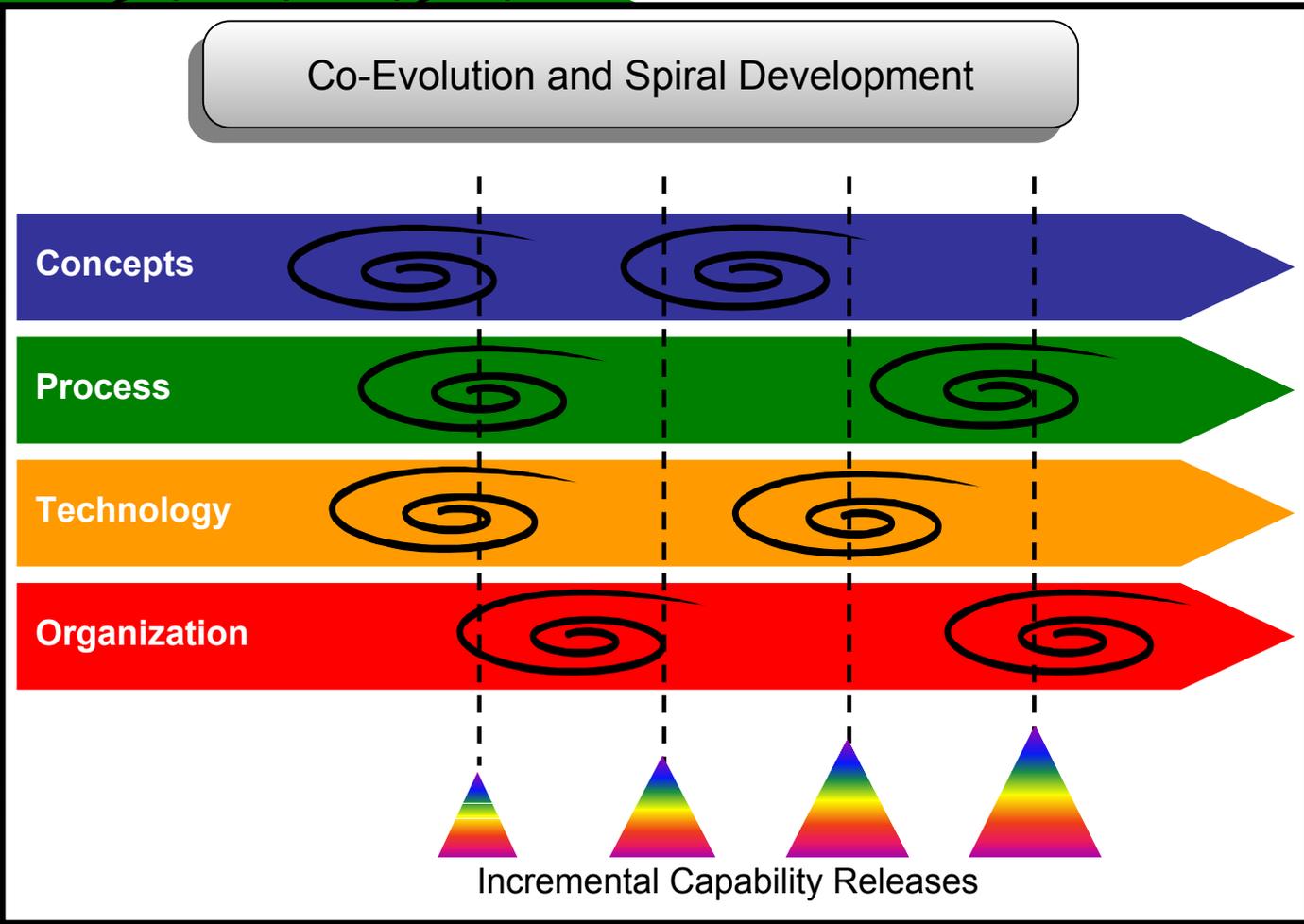
Navy
Global

Roving
Sands
Army
Transformation

Process

Experimentation

Co-Evolutionary



Co-Evolution and Spiral Development

Concepts

Process

Technology

Planned and Event-Driven Experimentation and Operational Evaluation

Logistics
Elements

Network
Centric
Log System
Capability

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Analysis

Simulation

Demonstrations

Wargames

Real World Ops

Experimentation

ACTDs

Millennium
Challenge

CJTFFEX

Sea
Viking

FLOW

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Experimentation

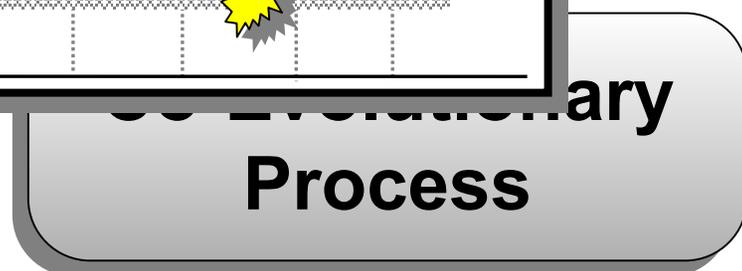
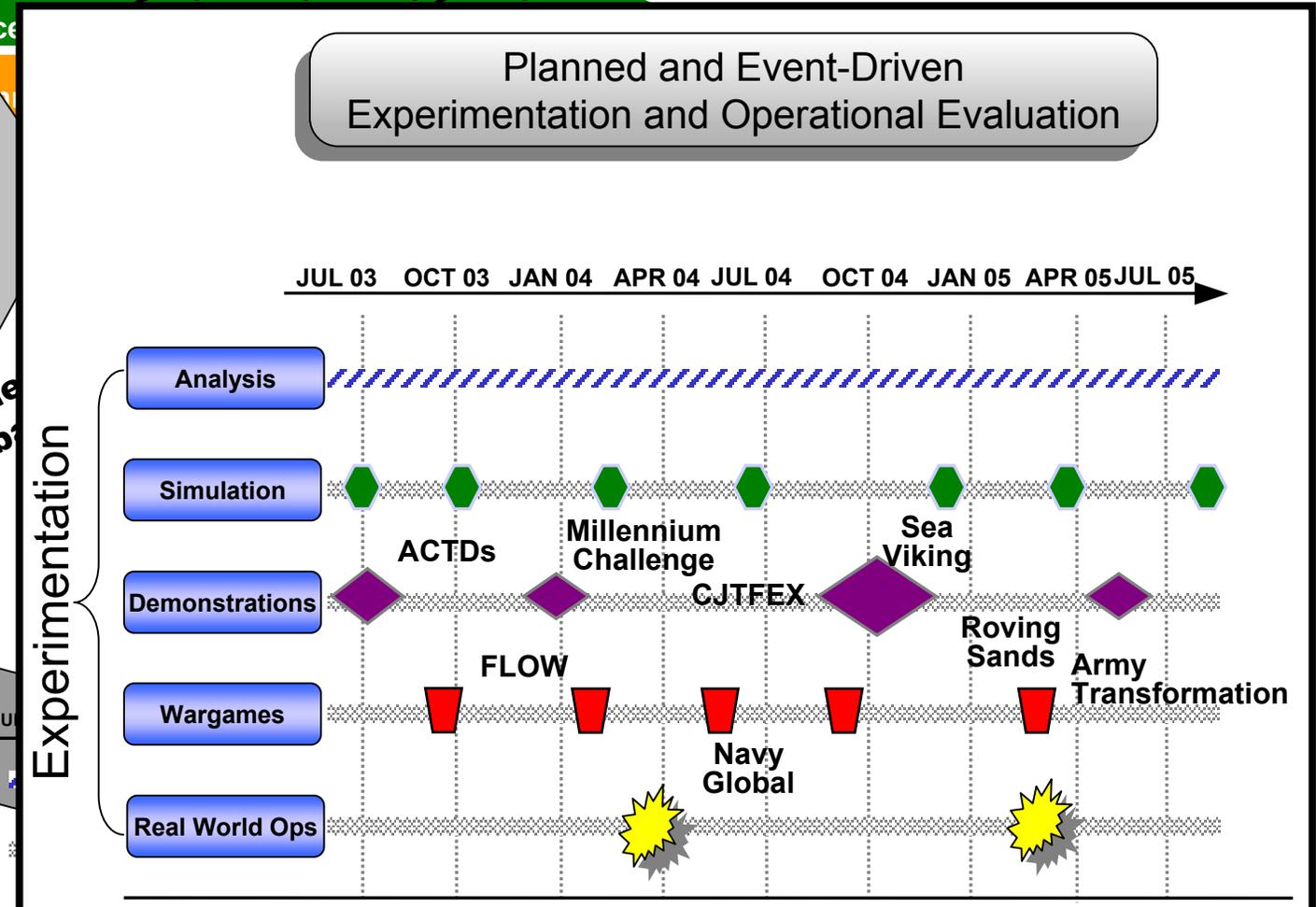
FLOW

Roving
Sands

Army
Transformation

Navy
Global

Process



Co-Evolution and Spiral Development

Concepts

Process

Technology

Rapid, Incremental Sense & Respond Logistics
Operational Capability Enhancements

Logistics
Systems

Network
Centric
Log System
Capability

Network
Centric
Log System
Capability

Assessment
& Feedback

Logistics Capability

S&R
Vision /
Concept

Capability Increments

Future

Present

Future

Experimentation

Analysis

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Wargames

Real World Ops

FLOW

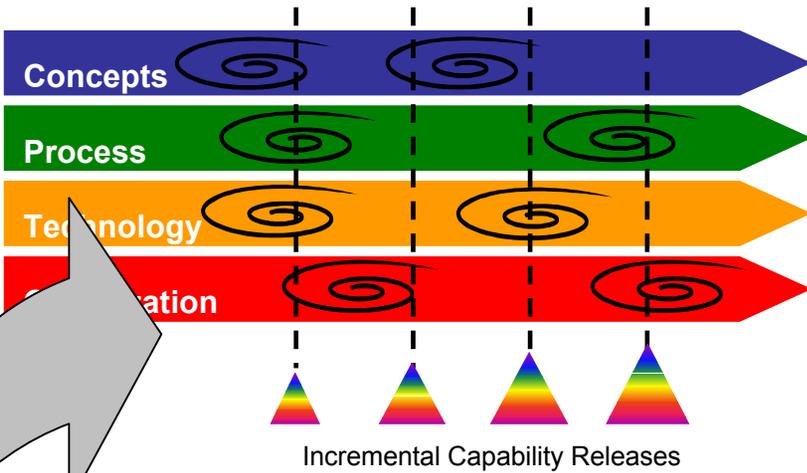
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Process

Co-Evolutionary

Co-Evolution and Spiral Development

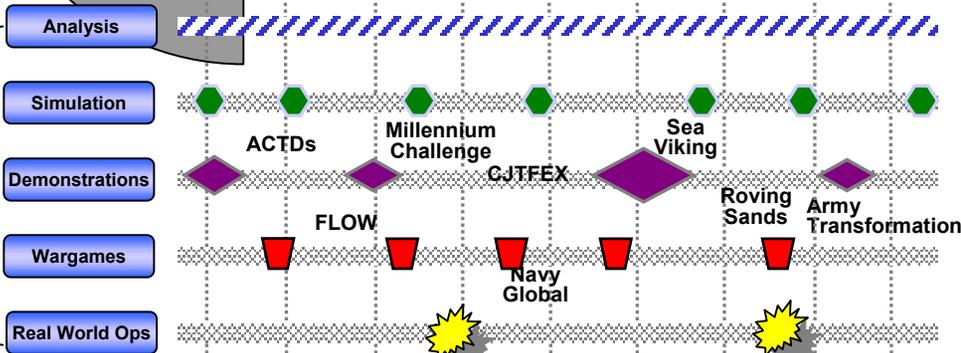


Assessment & Feedback

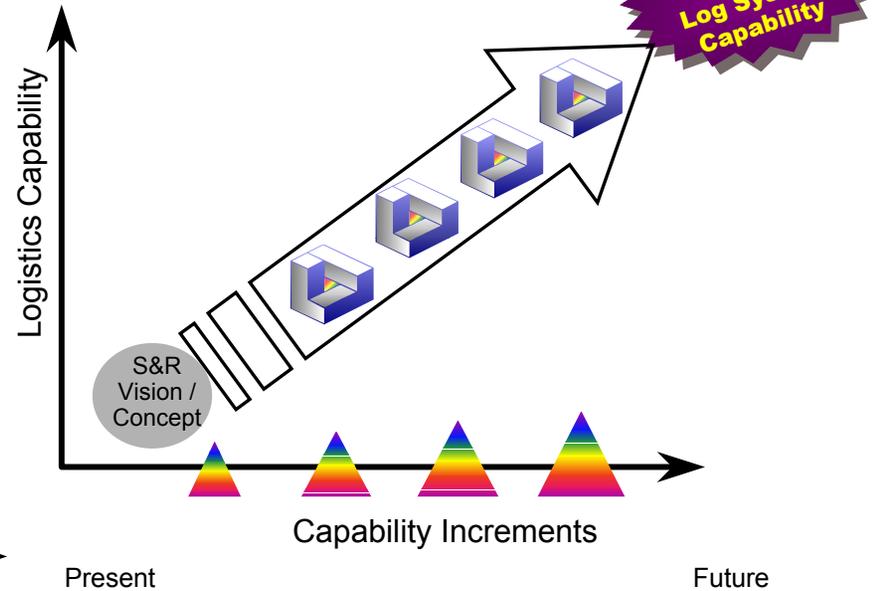
Planned and Event-Driven Experimentation and Operational Evaluation

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Experimentation



Rapid, Incremental Sense & Respond Logistics Operational Capability Enhancements



Co-Evolutionary Process

