

Module 2

Network-Enabled Capability

Network Enabled Command and Control
Short Course

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October 2009

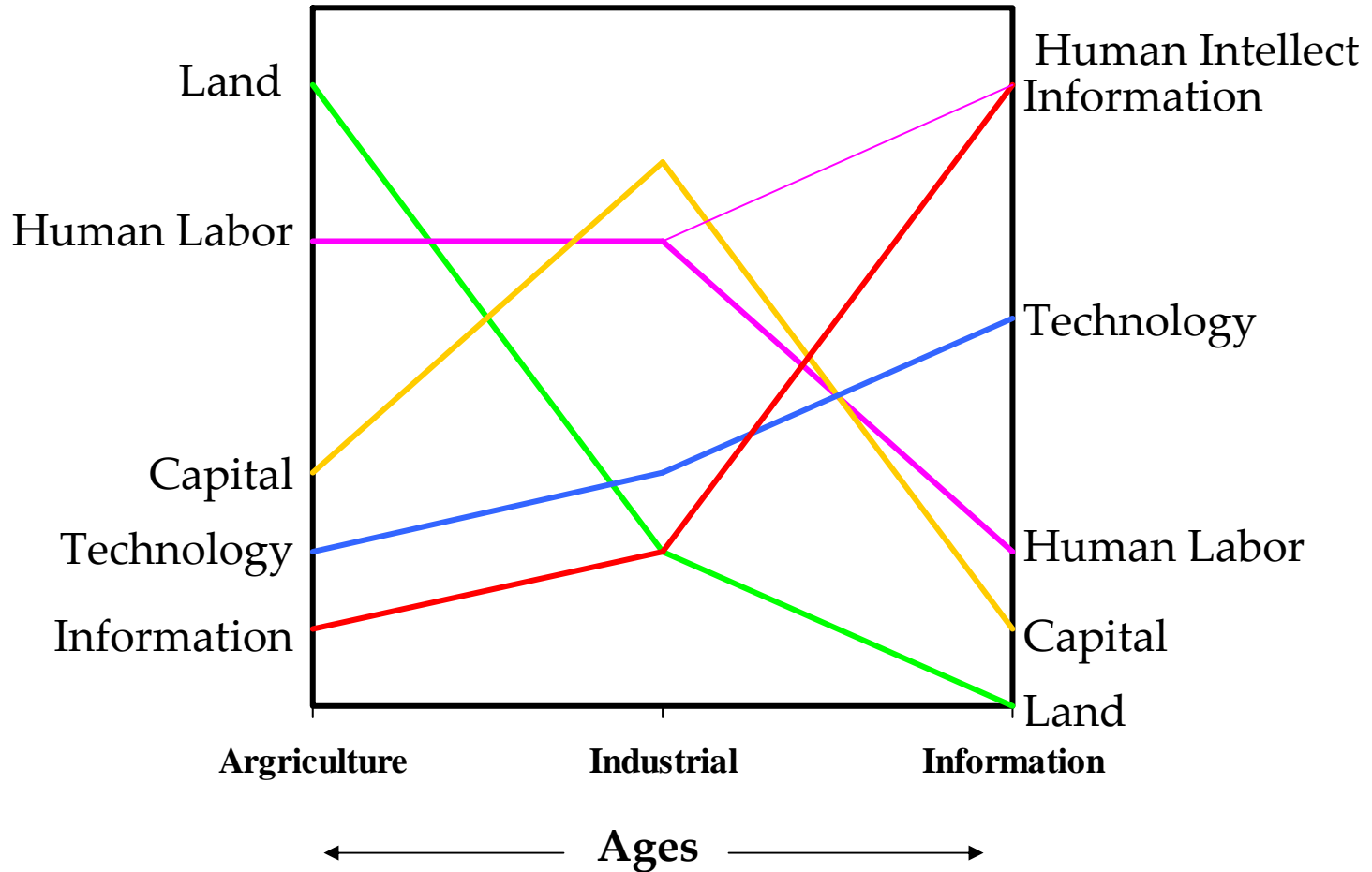
Questions Addressed

- How have Information Age concepts and technologies changed the way we think about military operations and the practice of C²?
- Where did NCW come from?
- Why the different terms
 - Network Centric Warfare (NCW)?
 - Network Centric Operations (NCO)?
 - Network Enabled Capability (NEC)?
- What are the basic tenets?
- What is Network-Enabled C2 (NEC²)?
- How does it differ from traditional military C²?
- What is meant by “Power to the Edge” and how it is related to NEC²?

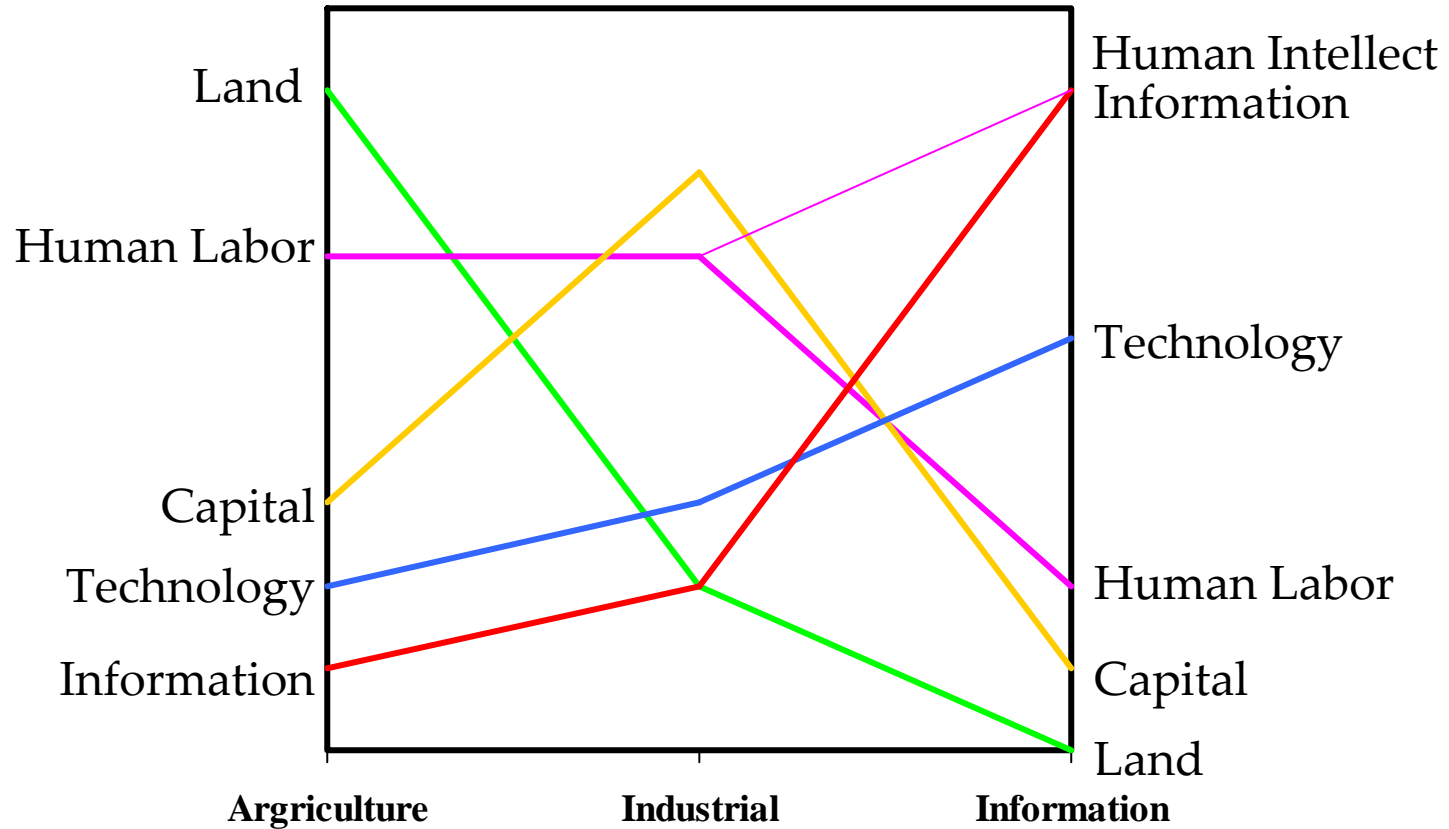
Agenda

- Sources of Power
- Pre-NCW Primordial Soup
- NCW Basics
- Evolution of Terminology
- Myths
- Tenets, the Value Chain, and the Magic
- Maturity Model
- C² Approach Space
- Power to the Edge
- Summary

Sources of Power



Sources of Power



Transformation is about adaptation to changes in the sources of power.

The Case for Moving Beyond Traditional C²

- Traditional Approaches
 - Limit our ability to “connect the dots” and understand the situation
 - Constrain the way information is disseminated
 - Limit our ability to respond quickly and effectively
 - utilize a sequential decision process
 - constrain the allocation of responsibility
 - create seams
 - Are optimized for selected concepts and circumstances
 - stove-piped
 - As a result they lack agility

Origins of Network Centric Warfare?

NCW is an approach to operations that embraces Information Age concepts and is enabled by Information Age technologies

What would we change if we had total situation awareness?

C2 as a force multiplier

C4I for the Warrior

Disruptive Innovation

Spawning of Processing in Real Time Systems

Co-evolution of Mission Capability Packages

Common Operational Picture

Virtual Organizations

Sensor to Shooter

Cooperative Engagement Capability

Primordial Soup of NCW

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C4I for... tive Innovation... Spawn:

Pre-NCW Focus: Improve quality of information to make better decisions

Co-evolution of Mission Capability Packages

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Primordial Soup of NCW

What is Network Centric Warfare?

- NCW = an Information Age Transformation
- A new way of thinking about
 - how we accomplish our missions
 - how we organize and interrelate to one another
 - how we acquire and field the systems that support us
- NCW is not all about technology or a collection of systems; rather NCW is enabled by an increasingly capable infostructure
- NCW can be successfully practiced at various levels of maturity under difference circumstances

Impact of the Information Age Technologies

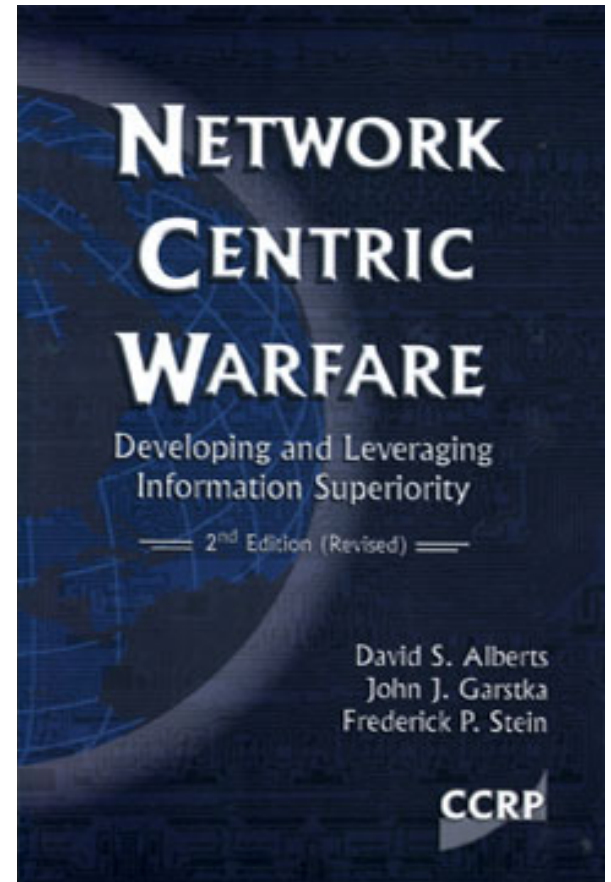
- Information Age technologies
 - extend our ability to observe and understand the significance of our observations
 - increase our access to information, enable sharing and collaboration, and make it possible to adopt different approaches to command and control
- Advances in information-related technologies make more capability more affordable to us and our adversaries
- Those who learn how best to leverage the Information Age will develop a competitive advantage

NCW

(published 1999)

“This publication will assist the joint warfighting community in taking the necessary steps to pursue the change associated with the ongoing revolution in military affairs.

The emerging evidence for network-centric warfare as the intellectual basis for Joint Vision 2010.” CJCS



Evolution of Terminology (NCW → NCO)

- NCW → NCO
 - The “W” in NCW was deliberate; it was meant to emphasize the point that NCW was not about information technology and communications networks but rather about warfare
 - The change to Network Centric Operations (NCO) was intended to counter the view that network-centric concepts and capabilities were only applicable to high-end combat; rather that it was applicable to the full mission spectrum including non-kinetic missions

Evolution of Terminology

(network v. net)

- The term “network” in NCW originally referred to networking, what is called social networking today (see Myth 2)
- The term “network” in NCW was simply shortened by some to “net” with no change of meaning implied
- The term “net” to pre-information age communicators refers to instantiations of radio networks
- Some thought that the term “network” was perceived as meaning communications or information networks and that “net” was a more inclusive term
- A lot of confusion! “A rose is a rose”

Evolution of Terminology

(network-centric v. network-enabled)

- The term “network-centric” was chosen as a direct counter to the existing “platform-centric” mindset
- The network-centric proposition was that, for a given investment, one could generate more value by “networking the force” than by adding platforms
- Thus, it was networking (of entities) that is central to military operations, not the individual platforms
- Many misunderstood the term network-centric and focused on the technology as an end unto itself
- The adoption of the term “network enabled” was an attempt to make sure that the emphasis remained on the operations that were enabled, not on the information network

Myths*

1. NEC provides all the answers
2. NEC is all about the Network (as in communications-information systems)
3. NEC will change the nature of war (as in stand-off, automated)
4. NEC applies only to large-scale conflict with a peer competitor
5. NEC makes us more vulnerable to asymmetric attacks
6. We are well on the road to NEC
7. The commercial world has shown us the way, all we need to do is follow
8. NEC gives us the power to dominate our adversaries
9. NEC will not survive first contact with the real fog, friction, and complexity of war
10. NEC is an attempt to automate war that can only fail
11. NEC will result in our chasing our tails rather than responding to battle-space events.

* originally NCW Myths – see NCW pages 5-11)

NEC*

- NEC is about human and organizational behavior
- NEC is based on adopting a new way of thinking, network-centric thinking, and applying it to operations
- NEC focuses on the power that can be generated from the effective linking or networking of the enterprise
- NEC is characterized by the ability of geographically dispersed forces (consisting of entities) to:
 - understand intent
 - share information widely
 - collaborate as required
 - achieve a high level of shared awareness
 - exploit shared awareness via self-synchronization

* Adapted from NCW p.88

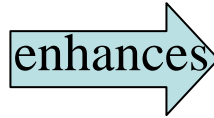
Tenets

A robustly networked force



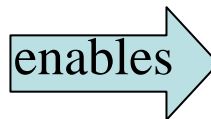
Information Sharing

*Information Sharing
and
Collaboration*



*Quality of Information
and
Shared Situational Awareness*

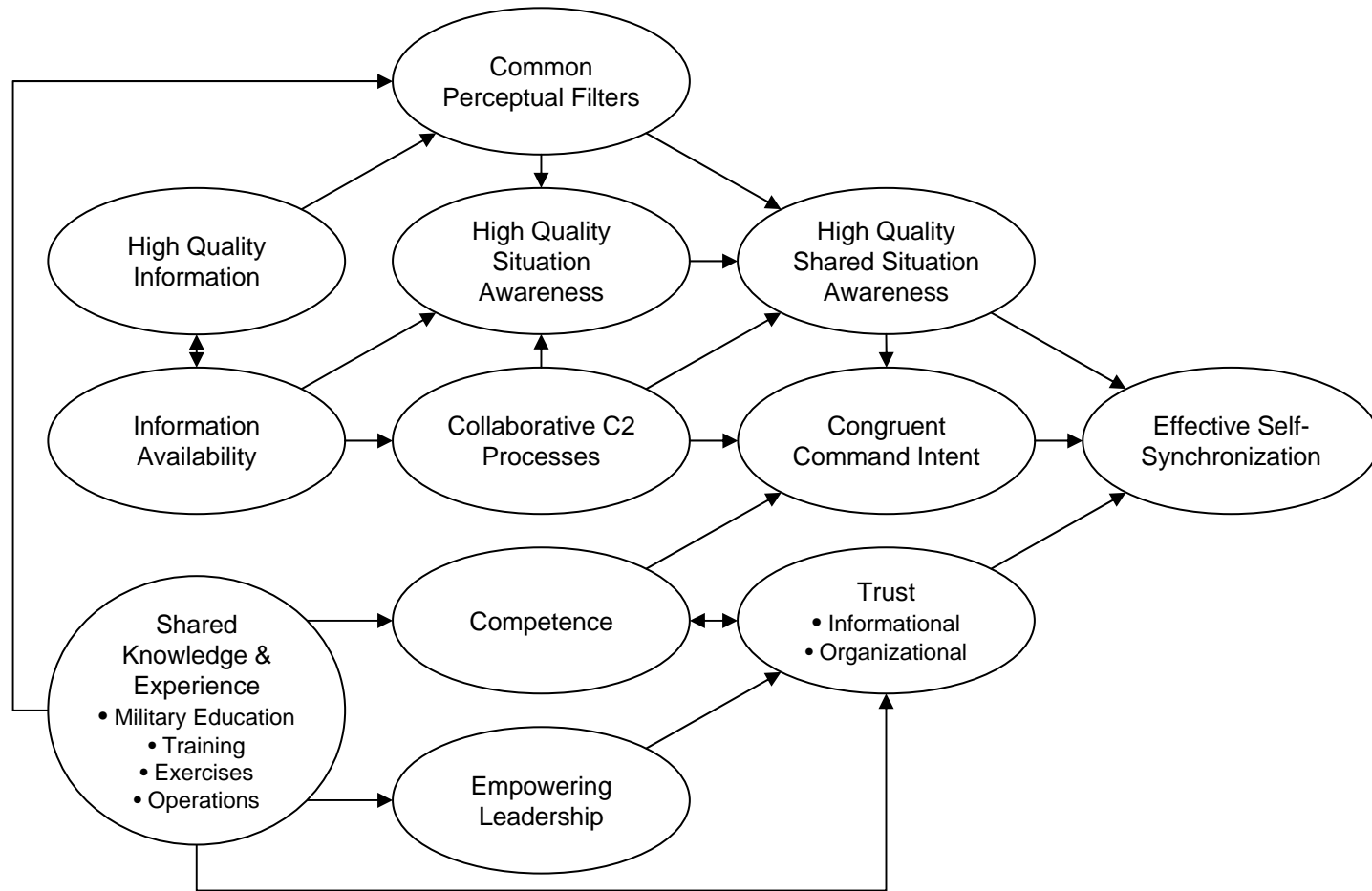
Shared situational awareness



*Collaboration
and
Self-synchronization*

These, in turn, dramatically increase *mission effectiveness*.

Conditions for Self-Synchronization



Traditional Military C² Assumptions

- Someone is recognized as “in charge”
- A single chain of command exists
- Patterns of interaction are defined by doctrine
- Information distribution follows the chain of command

NCW and C²

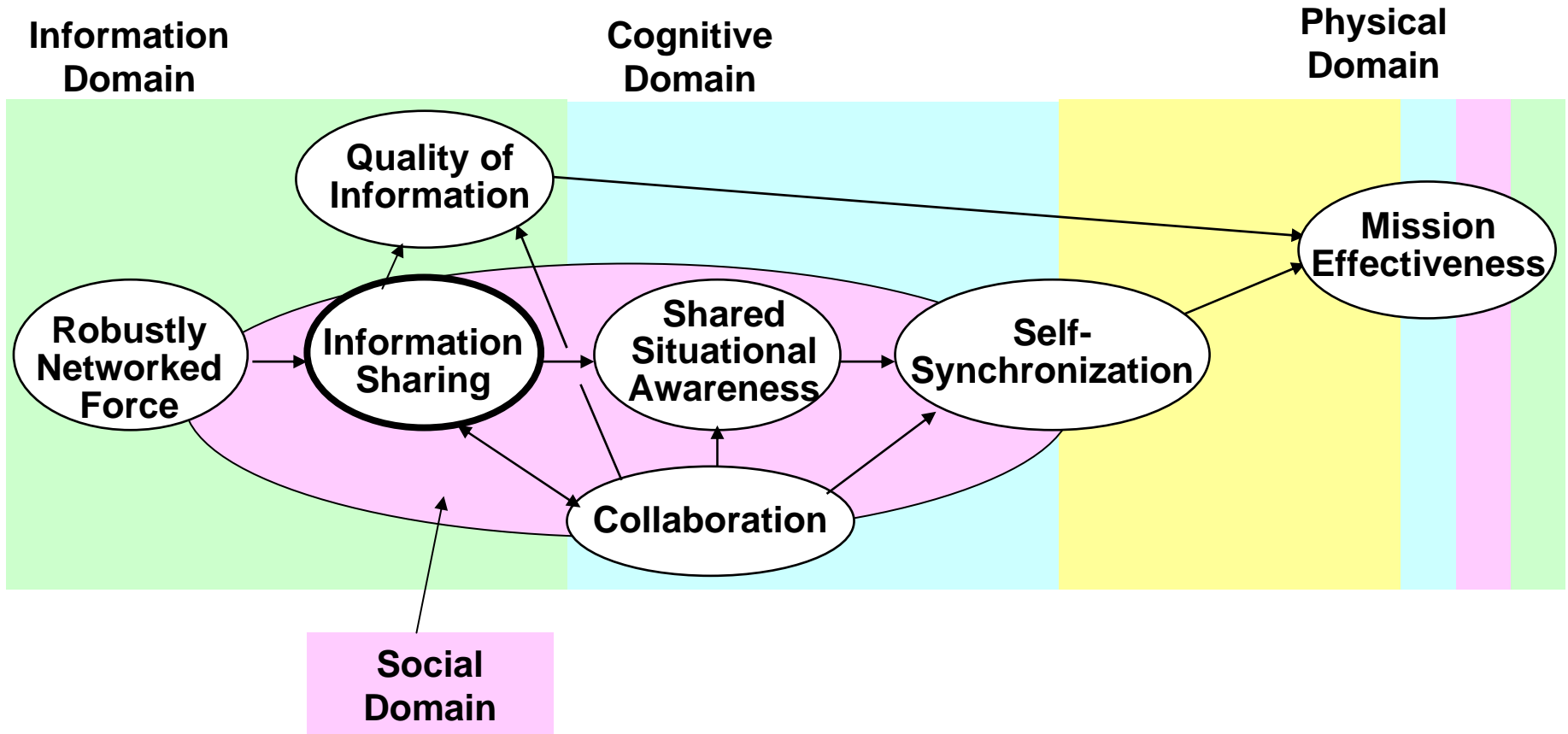
NCO

Is NCW an existential threat to traditional C²?

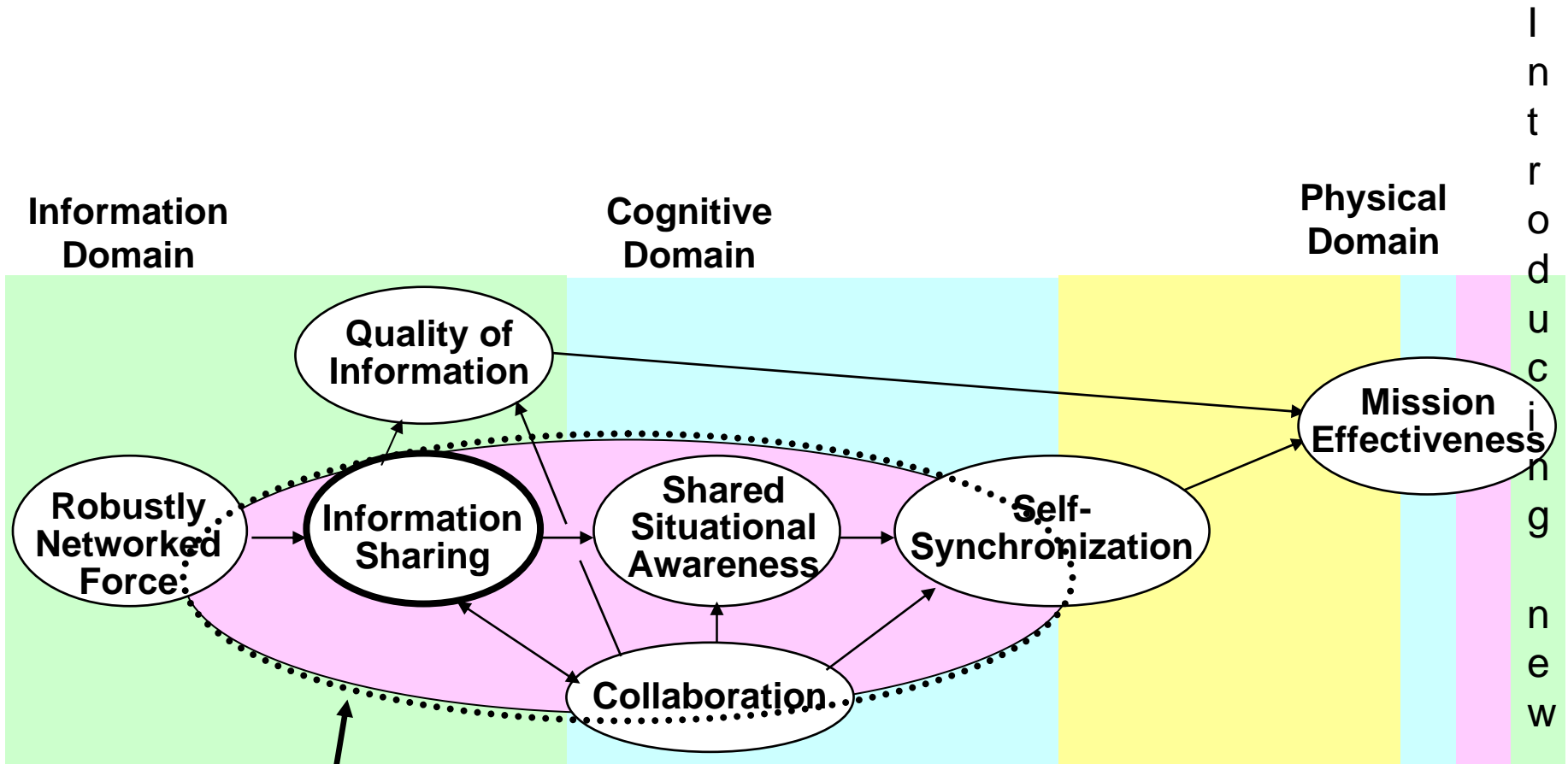
NEC

Network-Enabled Value Chain

involves multiple domains



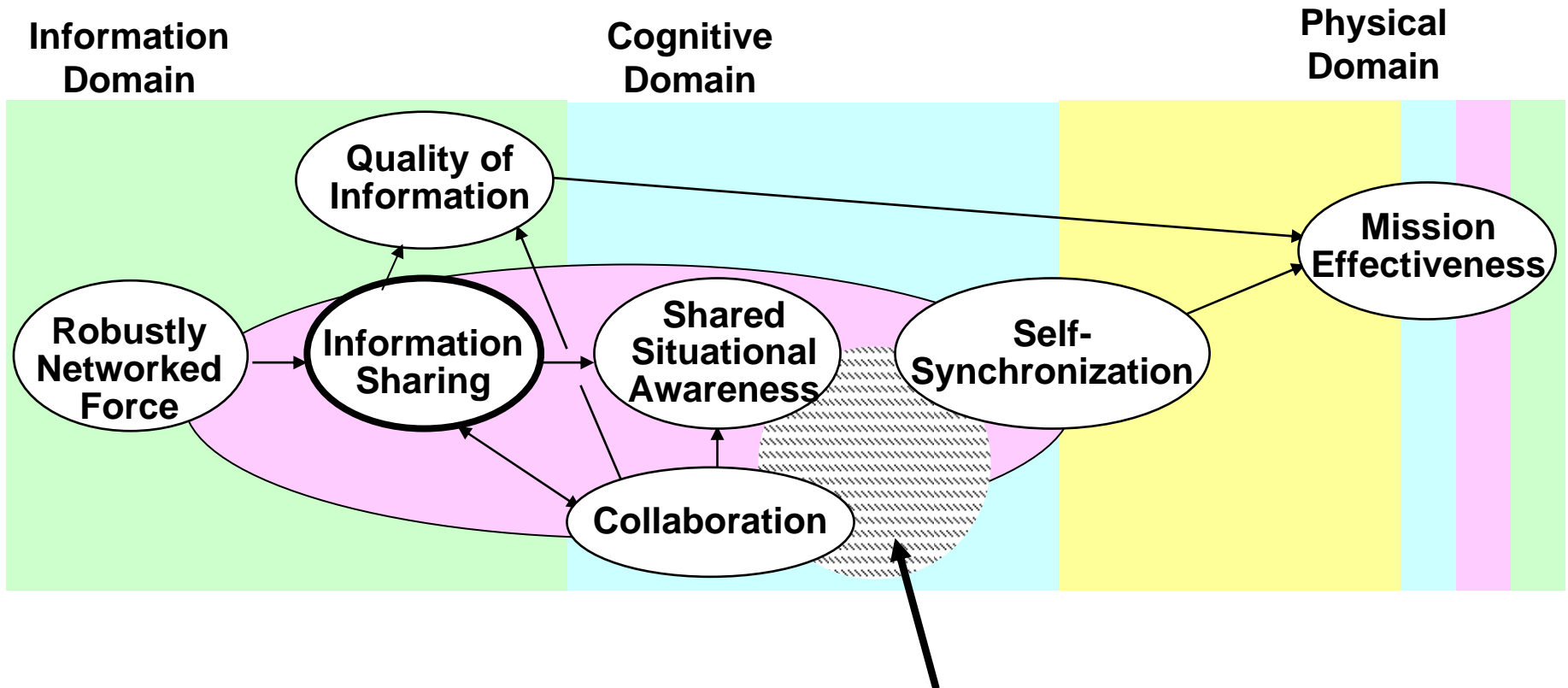
Co-evolution



New & Co-evolved

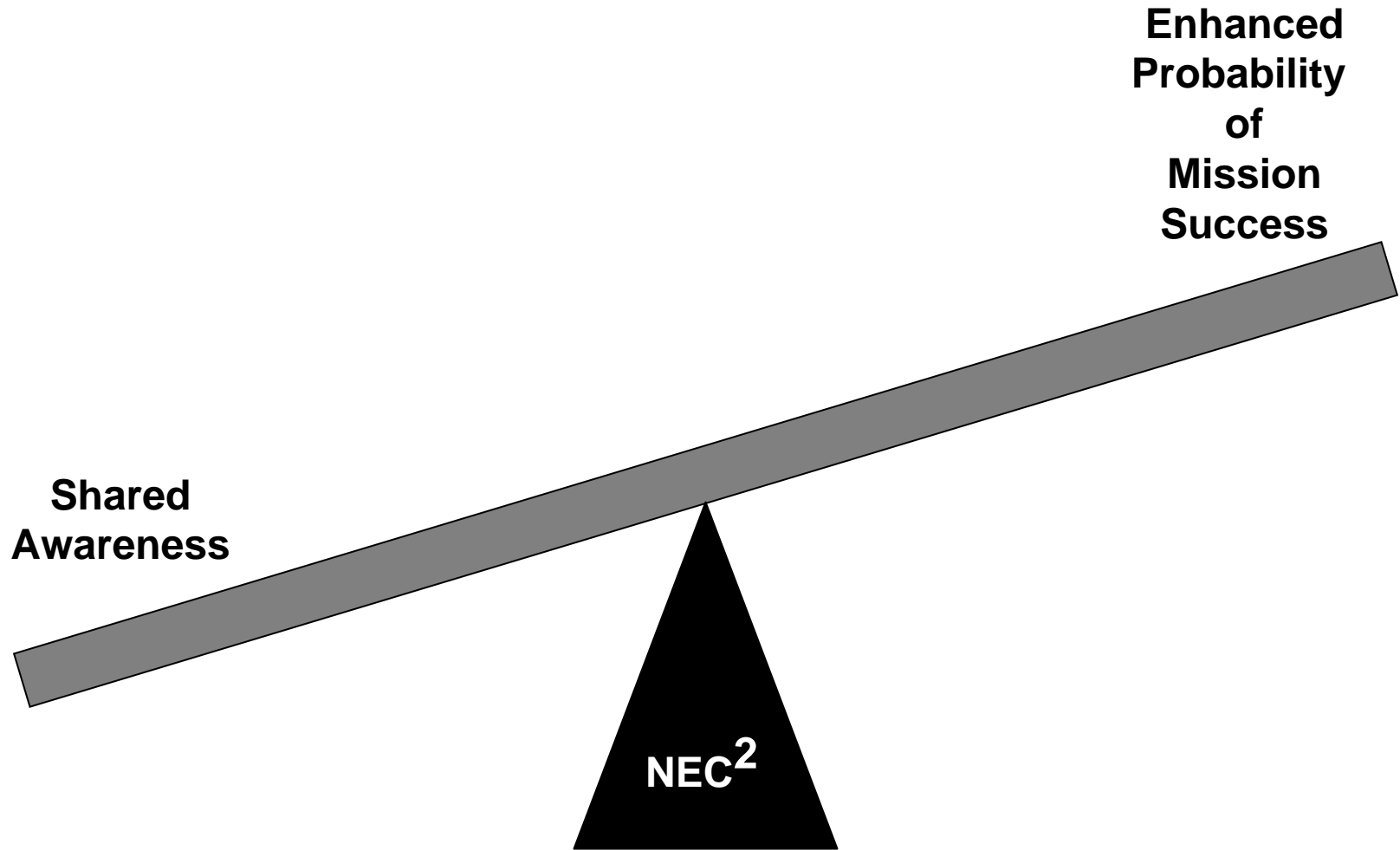
- concepts of operations
- organization (roles, relationships)
- processes

The Magic of NEC

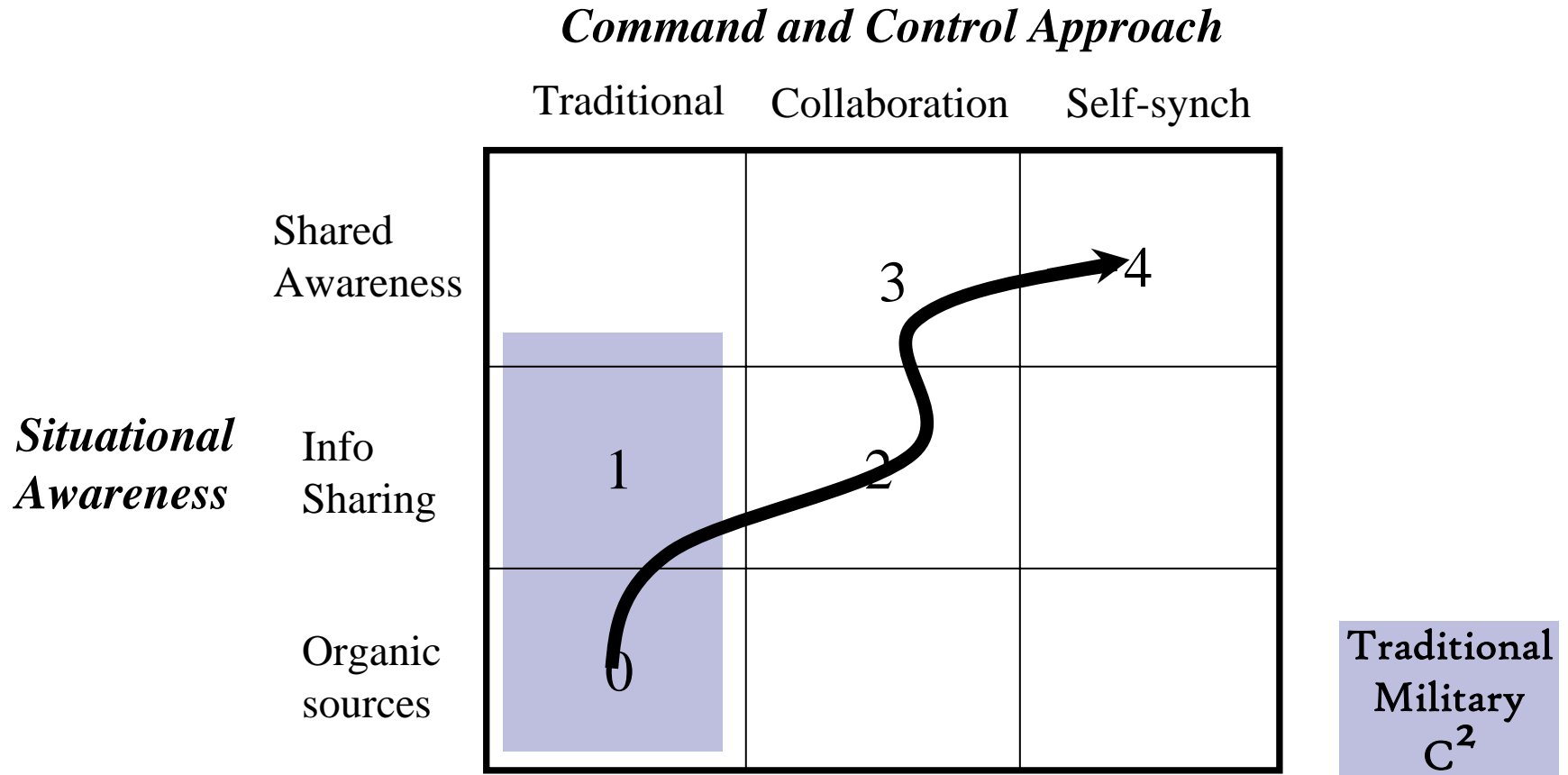


This is where the magic of NEC happens

The Lever and the Fulcrum



NCW Migration Model (Co-evolution of DOTMLP-F)

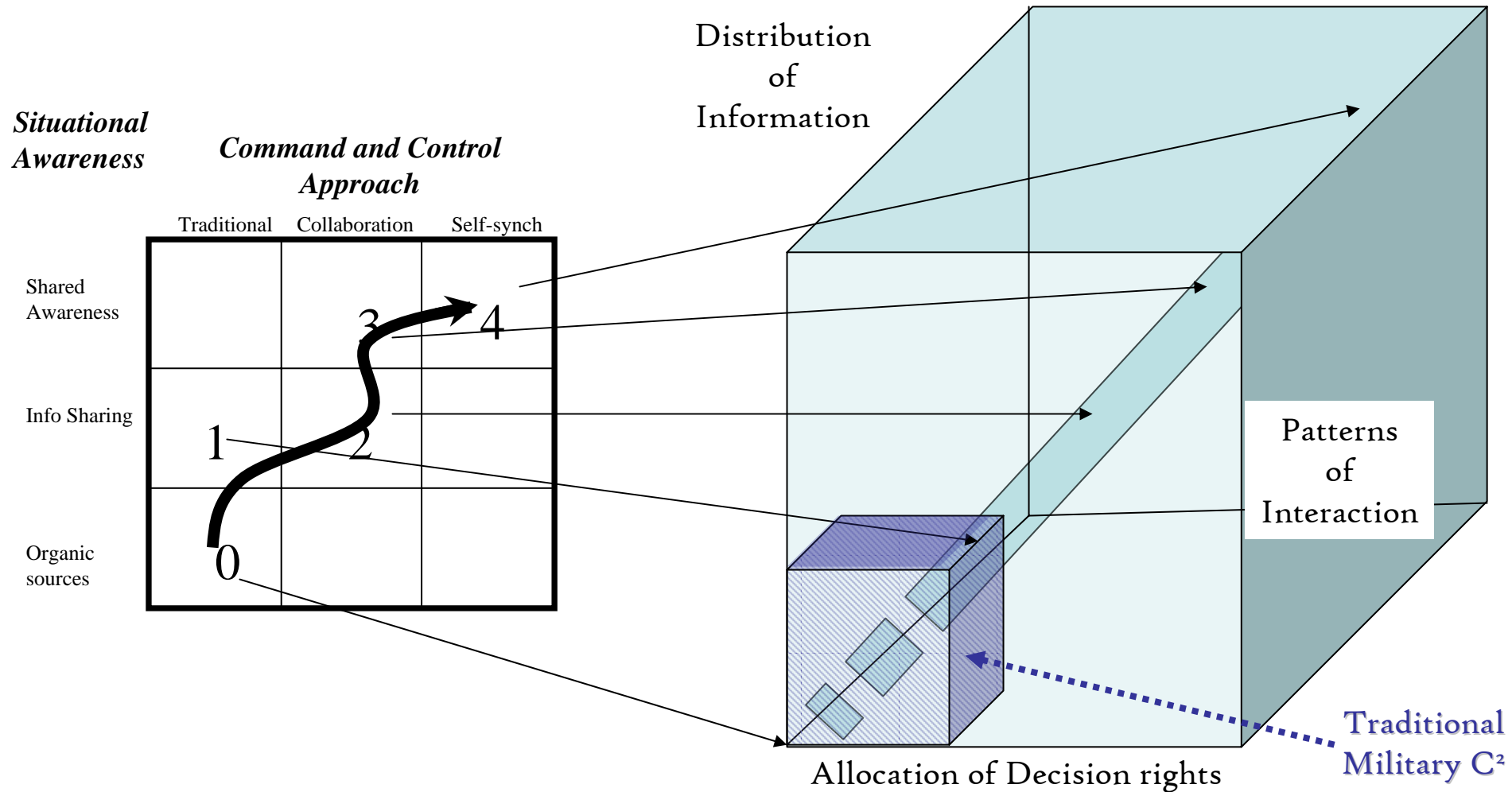


* First appeared as a “maturity” model in *Understanding Information Age Warfare* p.241, CCRP 2001

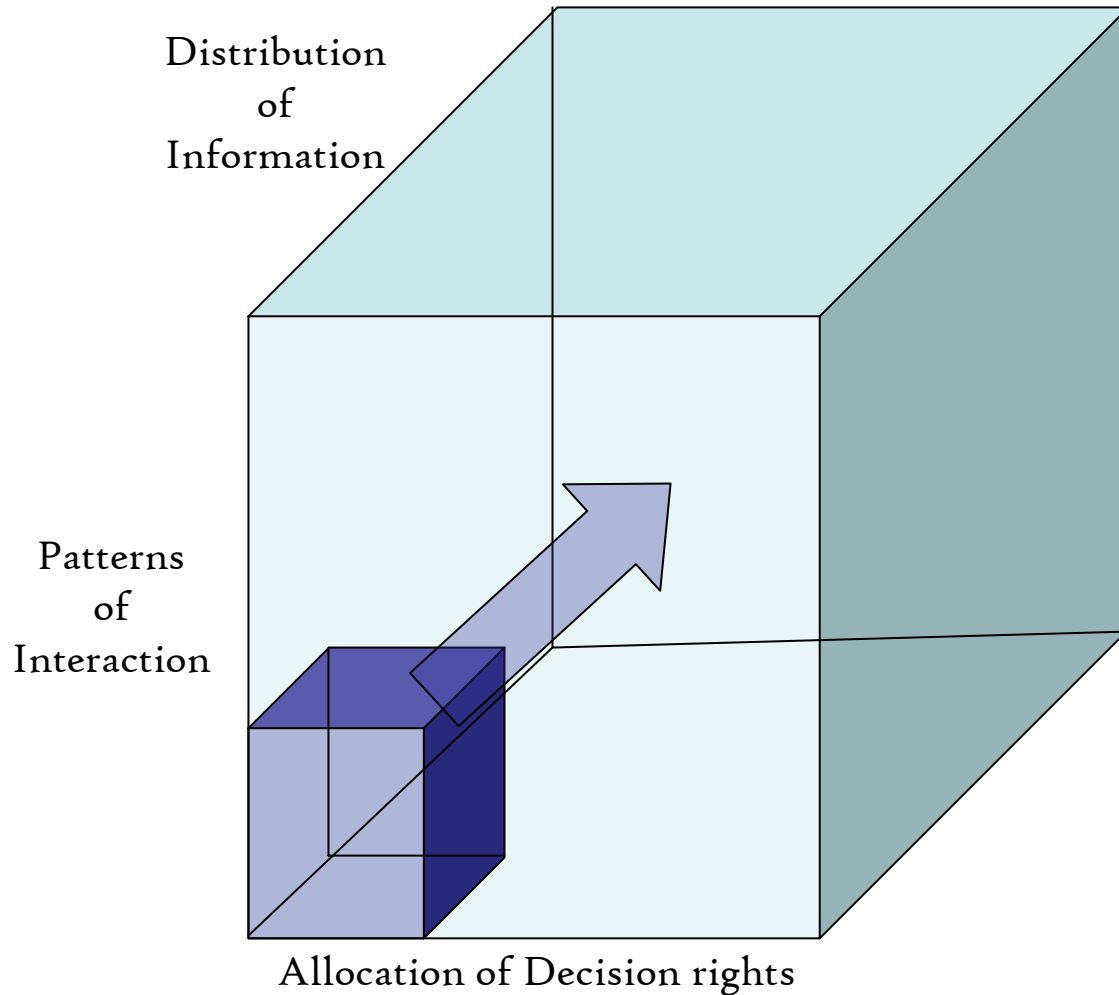
Network Enabled C² (NEC²)

- Information flows must be freed from the chain of command
- Patterns of Interaction must be less constrained
- Roles and responsibilities need to change appropriately
- One Size Does Not Fit All

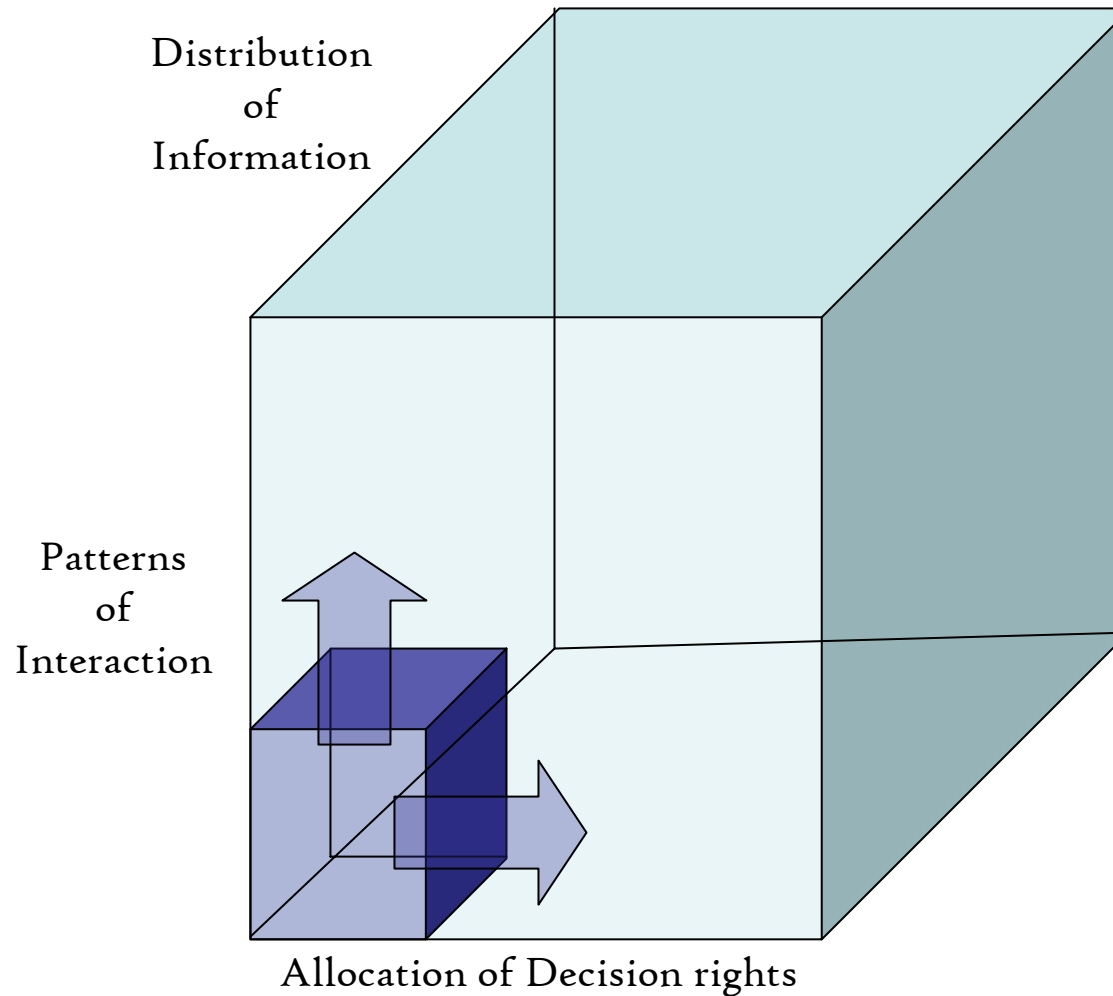
NCW Migration and the C² Approach Space



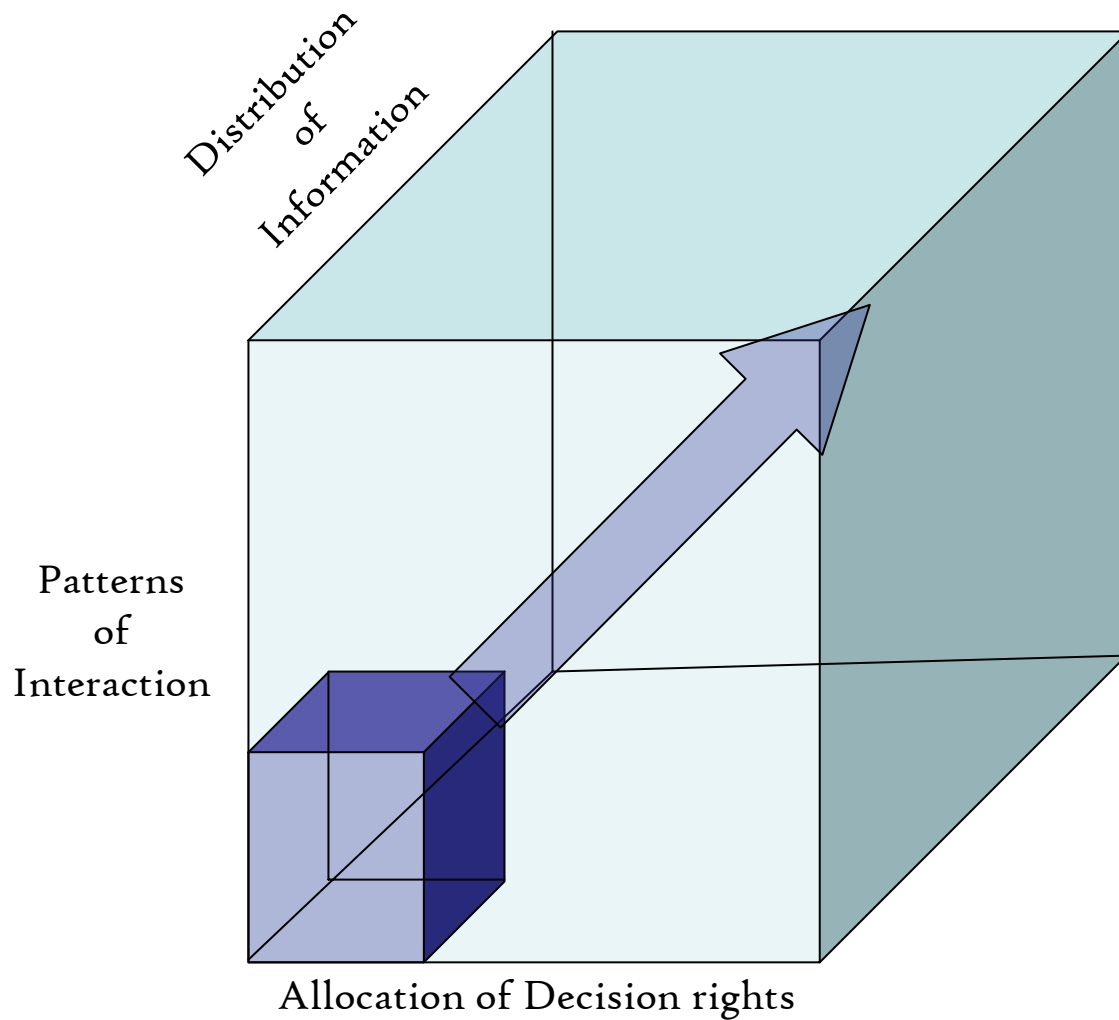
Freeing Information from the Chain of Command



Command Intent v. Commander's Intent



More Mature Network Enabled C²



Necessary C²-related Changes

- Access to information to ensure that those who need it can get it
- Authority and processes that are consistent with who knows what and when they know it
- Doctrine and tactics to exploit information advantage
- Systems requirements to provide needed capabilities
- CIO Policies to enable and encourage wide-spread sharing of information and collaboration

Power to the Edge

- Power is about the ability to accomplish something in a timely manner overcoming resistance
- The Edge is where the action is; where the organization or system meets the real world

Power to the Edge is about providing more means and opportunities to the entities that get things done

NCW, Co-evolution, and Power to the Edge

- The NCW Tenets are a set of linked “value chain” hypotheses
- Co-evolution refers to the adaptation of, in this case, approaches to command and control, organization, processes, doctrine, education, and training to appropriately leverage advances in technology and changes in information quality and distribution
- Power to the Edge articulates the policy, organizational, and command and control approaches that can make the promise a reality

Δing Roles and Responsibilities

- Everyone will need to think and act differently including commanders
- Decision Rights will be allocated differently
- Patterns of interaction will be different
- The way information is distributed will be different and thus who will know what will change

Traditional v Networked Enabled C2

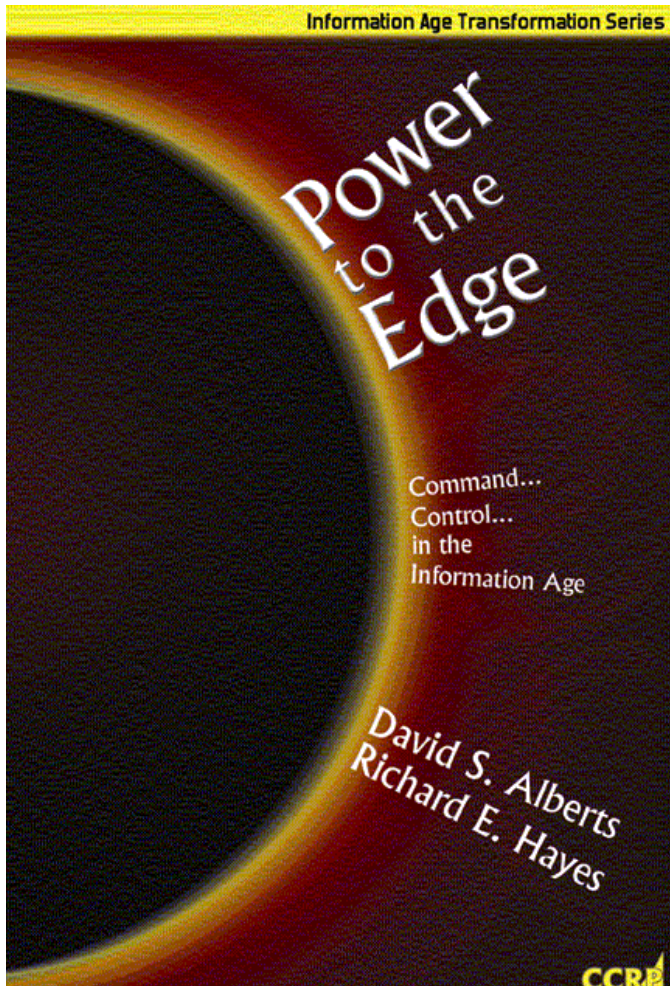
Traditional Command and Control

- Commander-Centric;
Centralized Power
- Commander recognizes what needs to be done
- Commander decides on course of action
- Commander sees to it that appropriate action is taken
(control)
- Organizations and processes are prescribed by doctrine

Network-enabled Command and Control

- Network-Centric;
Edge Power
- Commander selects approach to C2
- Commanders establishes and conveys intent
- Commanders seeks to establish conditions that will foster success
(emergence)
- Organizations and processes adapt as a function of C2 approach

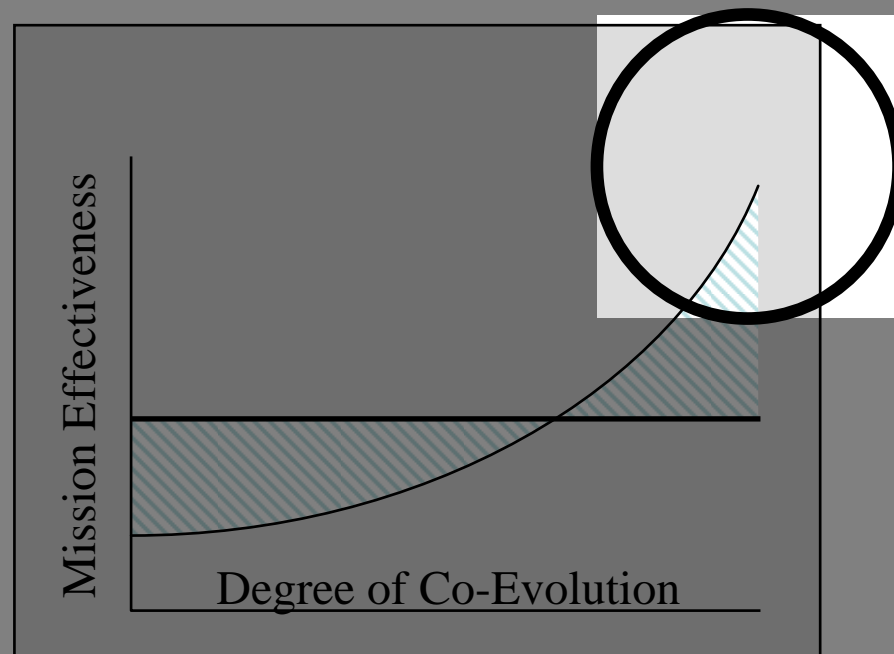
Power to the Edge: more than 'networking'



- **Internet Protocol**
packet switched not circuit switched network
- **Secure Communications**
end to end encryption, hardened against denial of service
- **Only Handle Information Once**
data posted by authoritative sources
- **Post in Parallel**
producers make their data available as soon as it is created
- **Smart Pull**
users can pull data directly form the Network
- **Data-Centric**
data separate for applications, which to talk to each other by posting data
- **Application Diversity**
users can operate multiple applications using the same data
- **Assured Sharing**
trusted accessibility to network resources
- **Quality of Service**
Data timeliness, completeness and integrity

Need for Co-evolution

- Co-Evolution is Essential
 - Isolated Changes May Have Dysfunctional Results
 - Coordinated Changes Have Synergistic Results



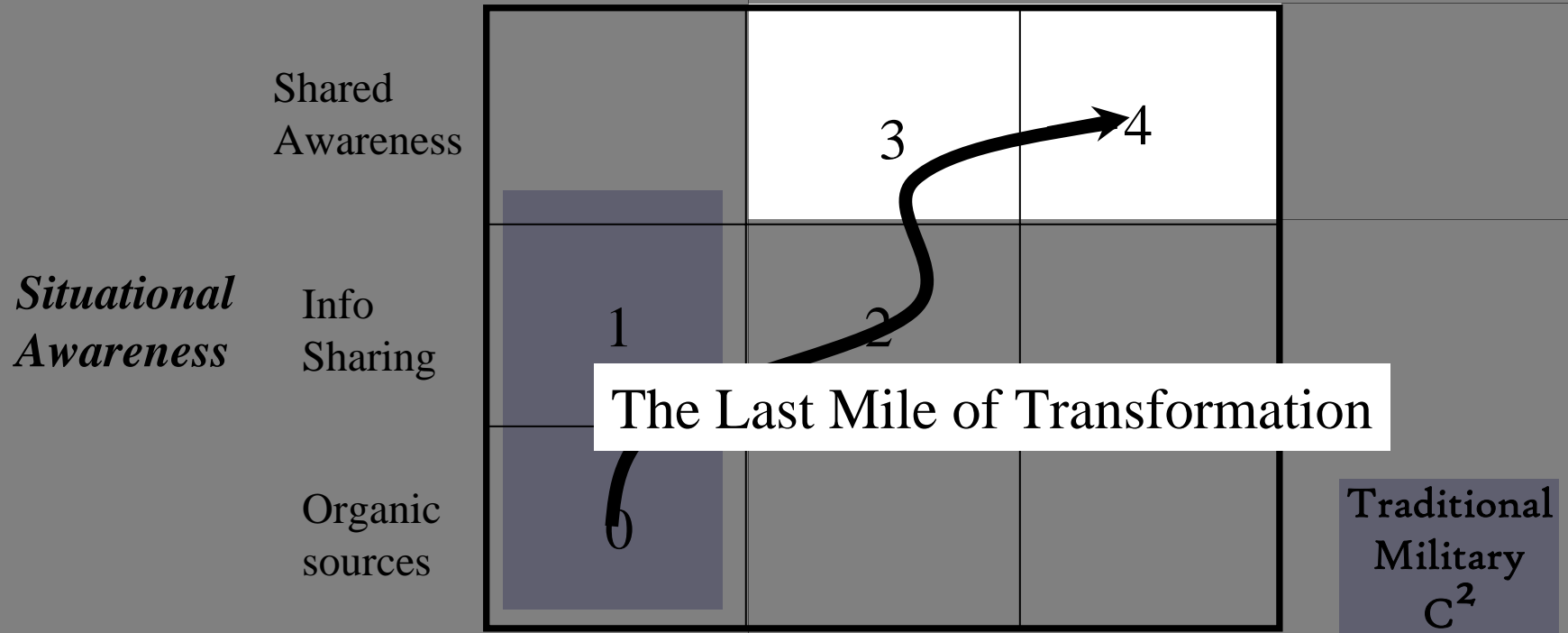
the “last mile”
Where the big
payoff is

NCW Migration Model

(Co-evolution of DOTMLP-F)

Command and Control Approach

Traditional Collaboration Self-synch



* First appeared as a “maturity” model in *Understanding Information Age Warfare* p.241, CCRP 2001

Critical Path Challenges

- Understanding and establishing trust and confidence in a network centric environment and in partners
- Getting smart in a “pull” environment
- Training and Experimentation – new mindset, new skills
- Developing Shared Awareness
- Collaborative processes
- ‘Command’ - Leadership “re-invented” for NEC²
- ‘Control’ – creating conditions for emergent behaviors

and Others ?

NEC Implications for Investment Priorities

- “Perfecting” existing platforms are yielding diminishing returns on investments
 - Consequence of maturity
 - Exacerbated by changing mission requirements
- Networking and Co-evolution are the most promising sources of increasing returns
- Investments in Information Assurance and Counter Cyber are increasingly important

IA and IO Priorities

- To support key NEC tenets, facilitate for us and deny for them the following
 - Secure widespread sharing of information
 - Secure collaborative environments
 - Identification of inconsistent, outdated, incorrect information and misinformation
 - Establishment of trust
- To support a competitive advantage in the information, cognitive and social domains
 - Attack their information position
 - Attack their awareness, shared awareness and understanding

Summary

- NEC is more about networking people than networks
- NEC is about enable people – Power to the Edge
- NEC is the military's adaptation to the Information Age
- NEC involves the redefinition of command and control
- A new C^2 vocabulary and a new set of criteria are needed
- The success of future coalition operations will depend upon the compatibility of approaches to command and control
- NEC applications will be developed, matured over time