

*Information Age*

# ***Network Centric Operations***

*Globalization II*

*Globalization III*

***The Power of Information Age Concepts and Technologies***

*Industrial Age*

***Col Gary Agron  
Col Chuck Pattillo  
Office of Force Transformation  
[www.offt.osd.mil](http://www.offt.osd.mil)***



# Bottom Line Up Front



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## Transformation

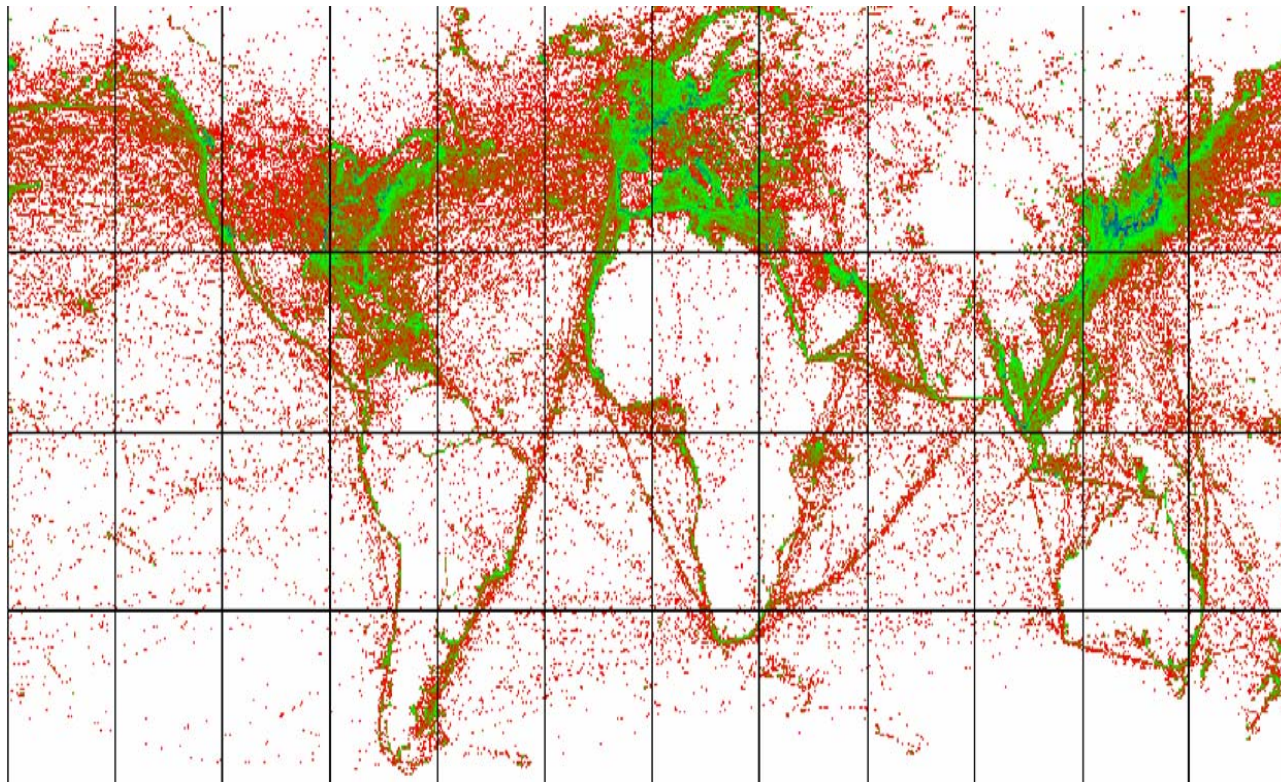
- A process for continuous change
- Network Centric Warfare (NCW)
  - An Emerging Military Response to the Information Age
- NCW Implementation and Case Studies
  - Involves all lines of development
  - Maturing capabilities demonstrated during OEF/OIF



# Global Trends

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**Globalization II** → **Globalization III**



**Industrial Age** → **Information Age**



# Global Trend # 1

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## Globalization II

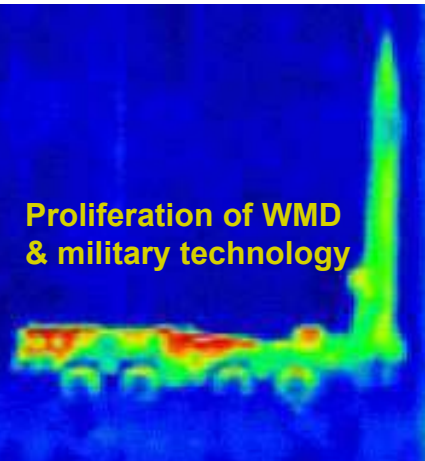


## Globalization III

- **Beliefs in Conflict: Political Ideology**
- Static, bipolar “market”
- Bulk of population in 3<sup>rd</sup> World
- Limits on security “exports”
- Ordering principle = Great Power War; yet none since 1945

- **Beliefs in Conflict: Religion/culture**
- Also bifurcated, but very fluid
- 4 Billion in Core, 2 Billion in Gap
- “Unlimited” global demand for security exports
- Warfare now simultaneous across system, state and individual levels

Proliferation of WMD  
& military technology



- *New Rules*
- *New Institutions*
- *New Security Environment*
- *Disconnectedness*  *Danger*





# Global Trend # 2

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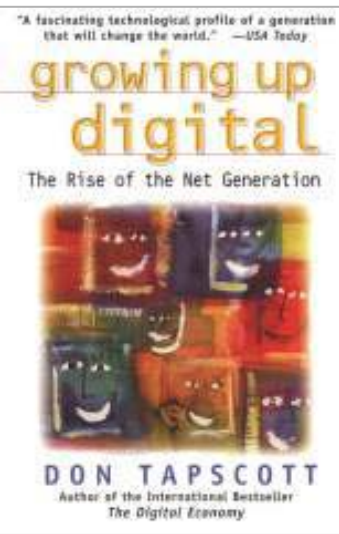
## Industrial Age

- Success = Scale + Scope
- Top Down - Centralized
- Vertical Integration
- Information Hoarding
- Local Awareness
- Arms Length Relationships
- Make and Sell
- Inwardly Focused

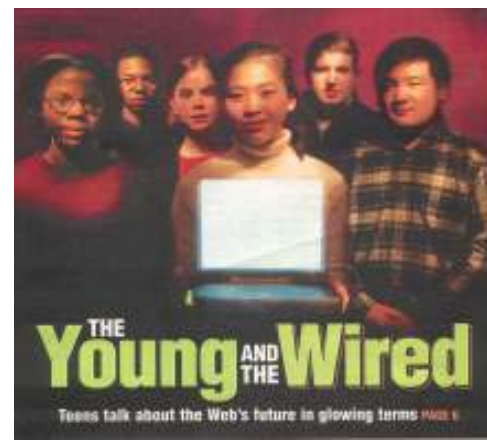


## Information Age

- Success = Adaptability + Agility
- Empowering the “Edges”
- Virtual Integration
- Information Sharing
- Increased Transparency
- Collaboration & Synchronization
- Sense and Respond
- Externally Oriented
- Accelerated Innovation & Experimentation



- *New Rules*
- *New Behaviors*
- *New Competencies*
- *New Relationships*



accenture

**Chinese to Become #1 Web Language by 2007**

{ Now it gets interesting. }



# Global Trends:

*...New Competitive Landscape*

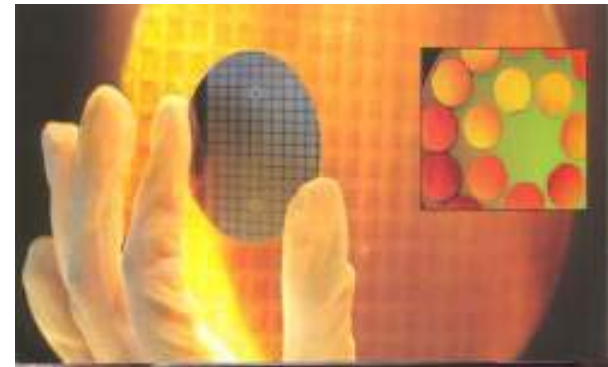


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## *Information Age*

- **New Technological Context**

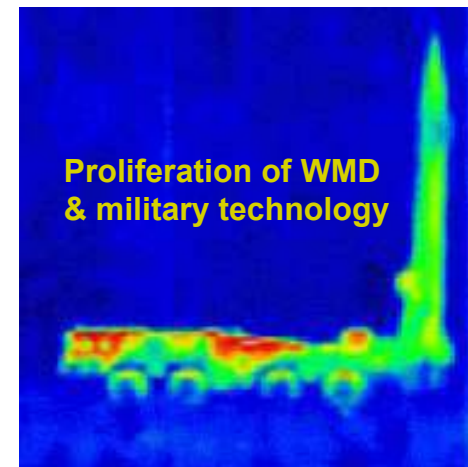
- Access to highly capable, low-cost IT
- Falling barriers to competitive entry -- sea, space, cyberspace



## *Globalization III*

- **Broadened Threat Context**

- Era of uncertainty with rapidly evolving threats
- State/non-state, nodal/non-nodal
- Asymmetric / conventional
- Unrestricted – deterring the un-deterable





# Global Trends:

*...Create a New Strategic Context*



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## *Information Age*

- *New Strategic Context:*

- *Information Age principles & phenomena changing character of competition*
- *Era of globalization – a changed international landscape*
- *New relationship between operations abroad and homeland security*

*Globalization III*

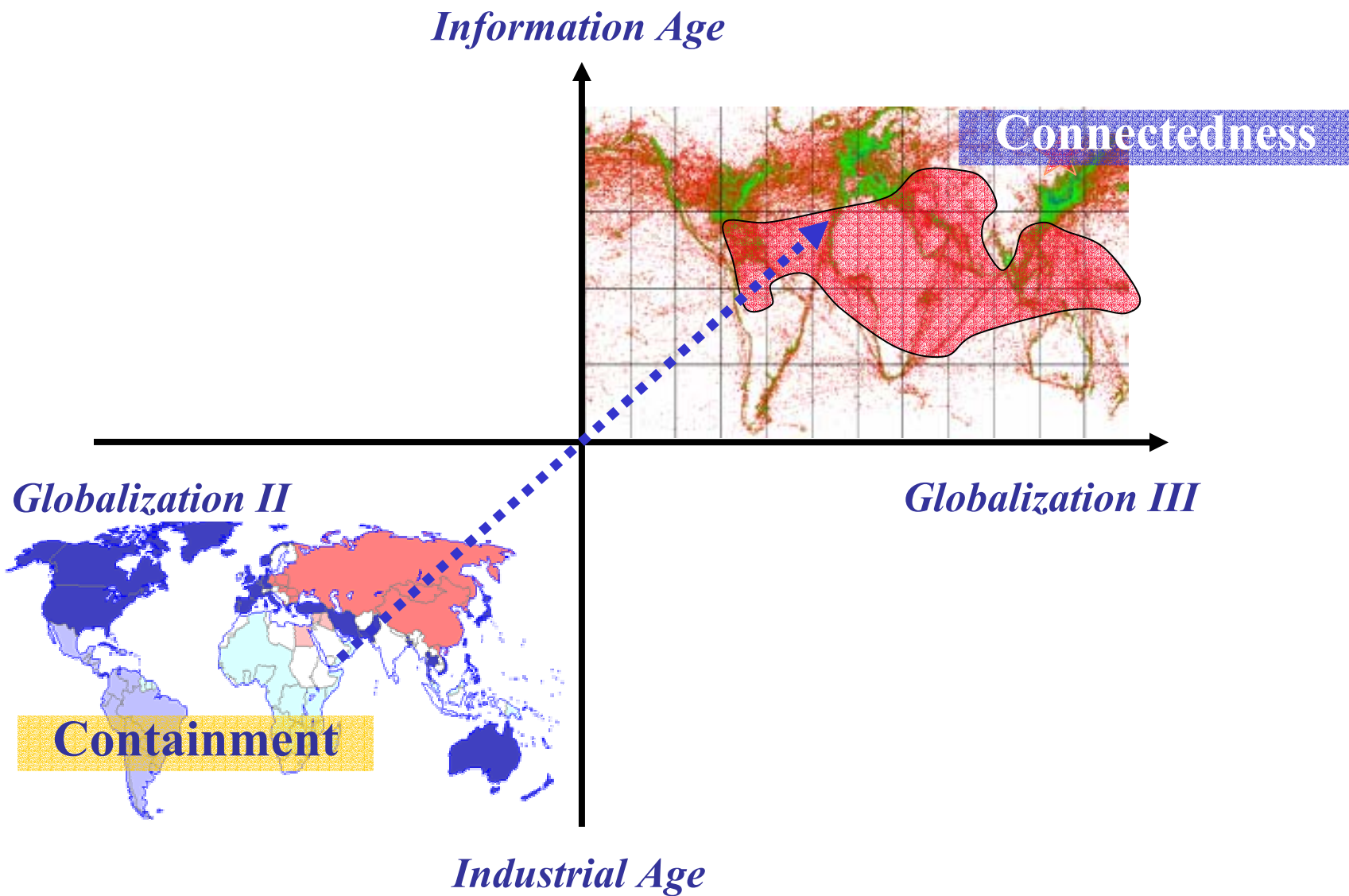
*To the degree we do not transform,  
we are strategically a fixed-target and therefore at risk*



# Transformation

*...Meeting the Challenges of the New Competitive Landscape*

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# Network Centric Warfare

...*Information Age Transformation*



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Translates an **Information Advantage** into a decisive **Warfighting Advantage**

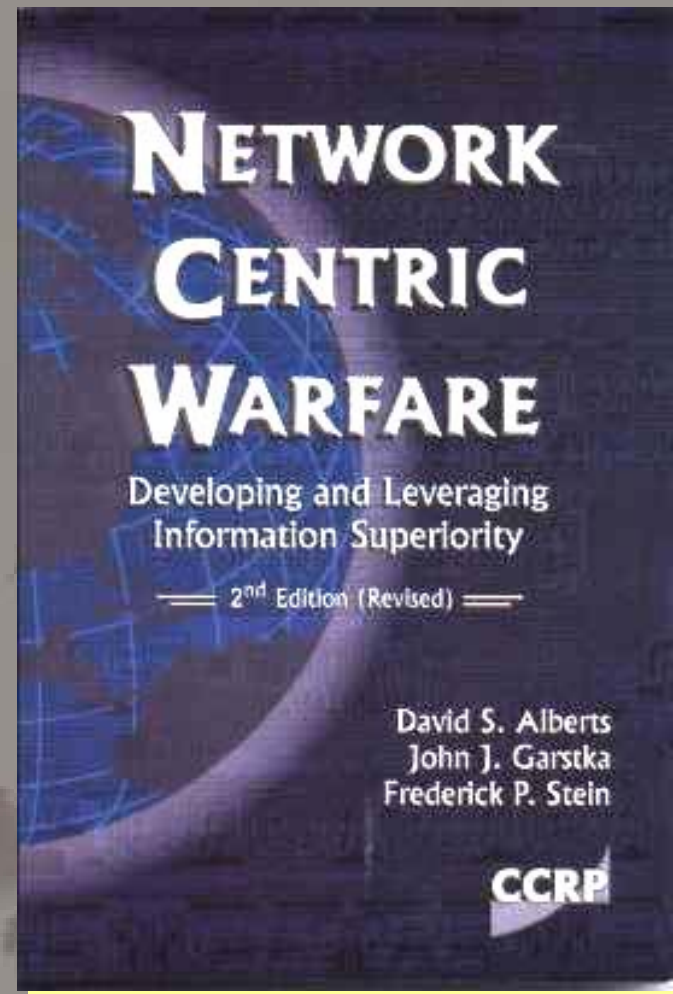
**Information Advantage** - enabled by the robust networking of **well informed** geographically dispersed forces

Characterized by:

- Information sharing
- Shared situational awareness
- Knowledge of commander's intent

**Warfighting Advantage** - exploits behavioral change and new doctrine to enable:

- Self-synchronization
- Speed of command
- Increased combat power



*Exploits Order of Magnitude Improvement in Information Sharing*



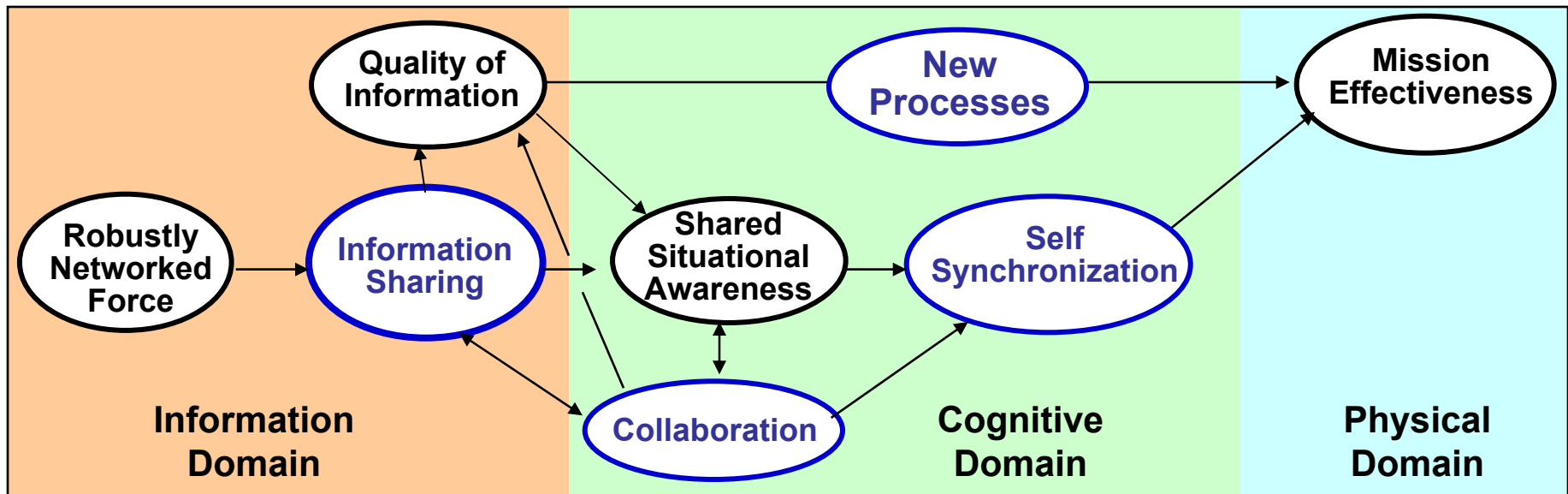
# Tenets of Network Centric Warfare

*...The New Value Chain*



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- A robustly networked force improves information sharing
- Information sharing and collaboration enhances the quality of information and shared situational awareness
- Shared situational awareness enables collaboration and self synchronization, and enhances sustainability and speed of command
- These in turn dramatically increase mission effectiveness



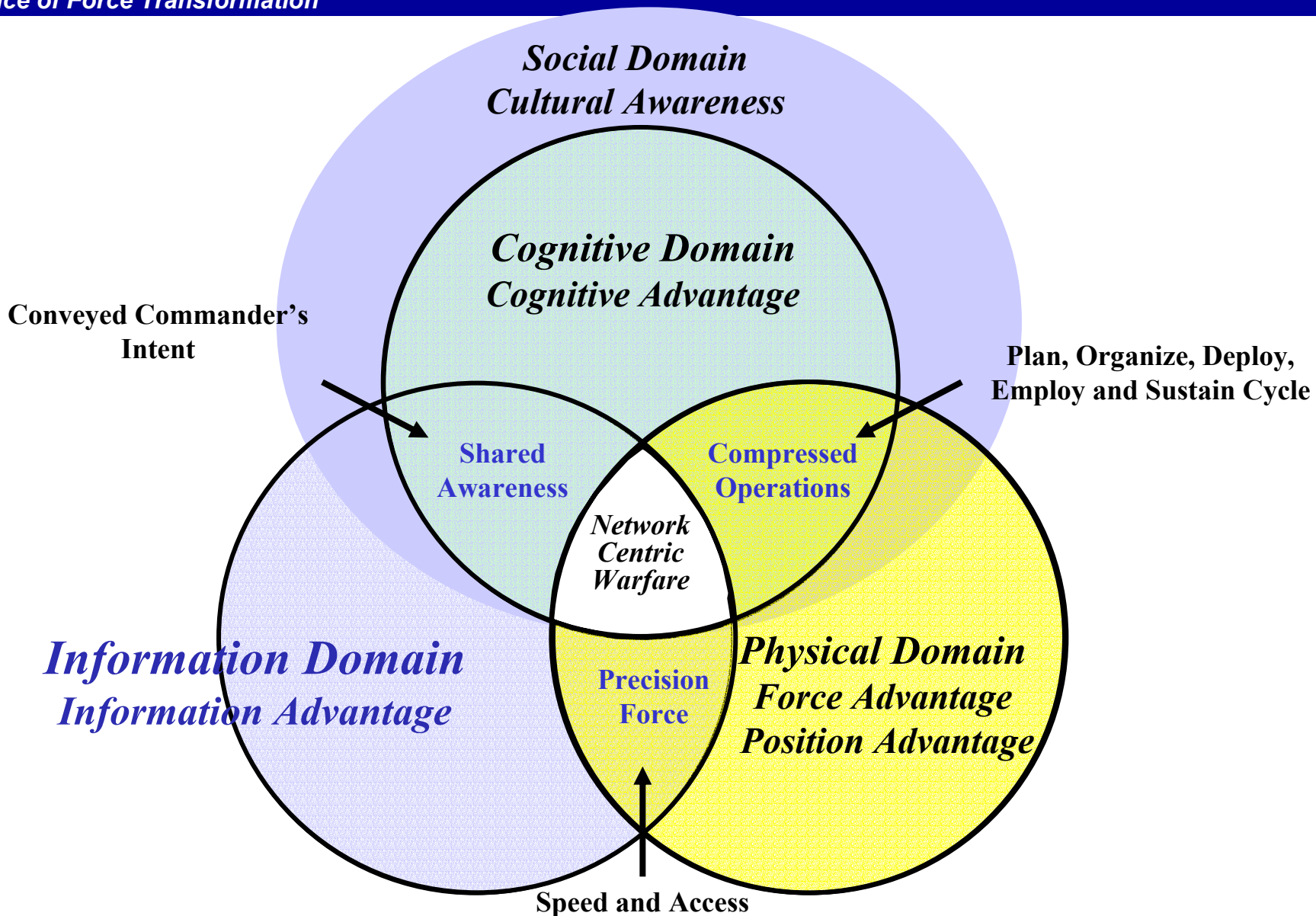


# Information-Age Warfare

*...Domains of Conflict*



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# Information Advantage: Meeting Information Needs



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**Individual/  
Node**

**Unit/  
Flight**

**Force**

Info On:

**Blue  
Force**

Where am I?  
Where are my buddies?  
What is CDR's Intent?

Where is the Flight?  
What is its Disposition?  
What is CDR's Intent?

Where is the Force?  
What is its Disposition?  
What is CDR's Intent?

**Neutrals /  
Non  
Combatants**

Where are the Airliners?

Where are the Airliners?

Is there commercial Air traffic in the area?

**Red  
Force**

Where is the Adversary?

Where is the Adversary?

Where is the Adversary?  
What is the Adversary doing now?

	Where am I? Where are my buddies? What is CDR's Intent?	Where is the Flight? What is its Disposition? What is CDR's Intent?	Where is the Force? What is its Disposition? What is CDR's Intent?
Neutrals / Non Combatants	Where are the Airliners?	Where are the Airliners?	Is there commercial Air traffic in the area?
Red Force	Where is the Adversary?	Where is the Adversary?	Where is the Adversary? What is the Adversary doing now?



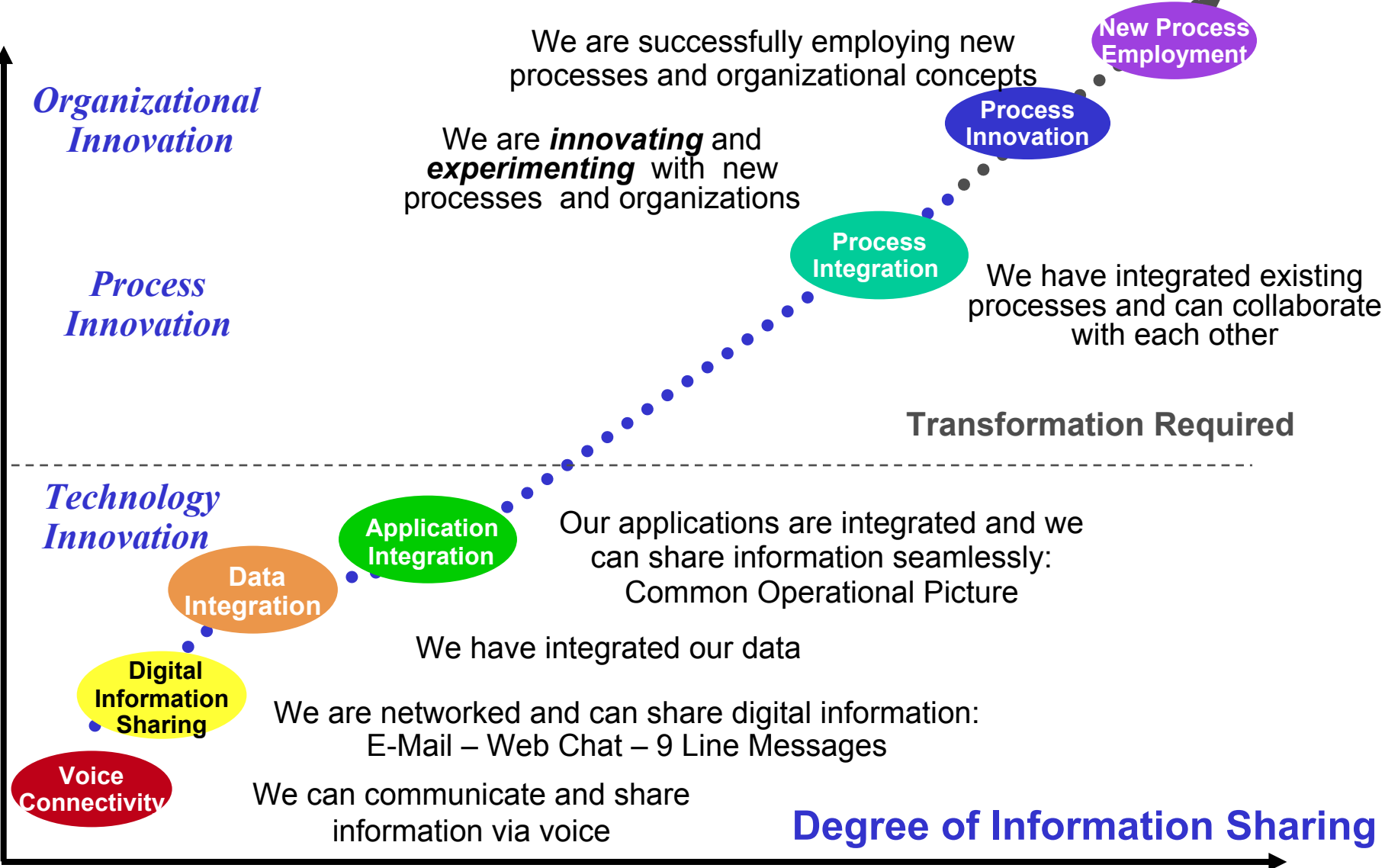
# Network Centric Warfare



...Implementing Network Enabled Capabilities –  
Trajectory of Innovation and Experimentation

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Warfighting Benefit of Information Sharing



Transformation Required

Degree of Information Sharing



# Implementing NCW

*...A Perspective on Strategy*



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- Get the Theory Right
- Apply the Theory Enterprise Wide
- Accelerate Networking of the Joint Force
- Accelerate Deployment of Network-Centric Systems, Concepts, and Capabilities
- Address Challenges of Allied & Coalition NCO
- Experiment with Network-Centric Concepts and Capabilities
- Develop Mature TTP for NCO
  - Service/Combined/Joint/Allied and Coalition

*Focus Areas for Current OFT Initiatives*





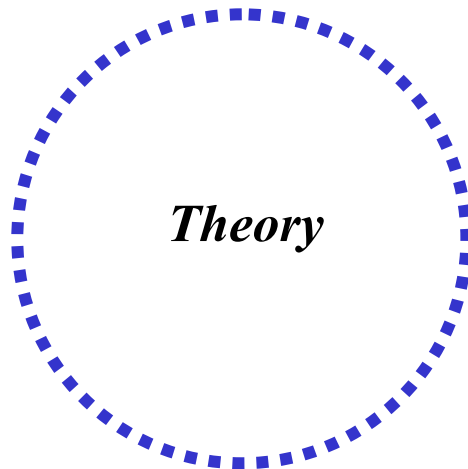
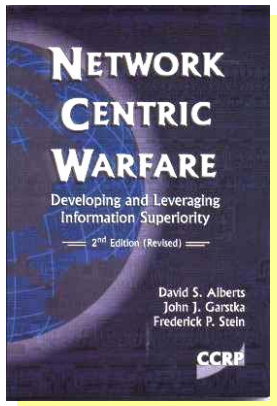
# Getting the Theory Right

*...Role of NCO Case Studies*

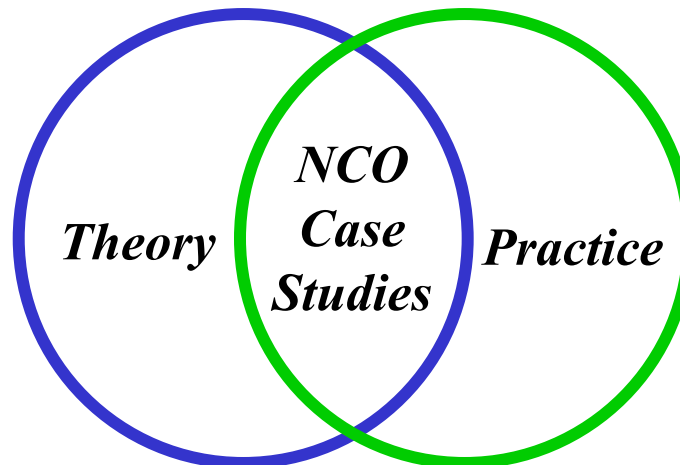


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1999



2004





# Getting the Theory Right

## ...NCO Case Studies



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- Completed:
  - Air-to-Air (Phase I)
  - C2 for Networked Forces: Commander Task Force-50 in OEF
- Ongoing:
  - Air-to-Ground (OEF/OIF)
  - Ground Maneuver - Stryker
  - Special Operations Forces (OEF/OIF)
  - Coalition NCO in OIF (UK Ground Forces)
  - Peace Keeping/Peace Support (NATO/Dutch/German)
- Recently Initiated
  - Ground Maneuver: V Corps and 3<sup>rd</sup> ID in OIF
  - Networked Air-Ground Ops: OIF Western Iraq
  - Application of NCO to Stability and Restoration Operations
- Exploratory Phase:
  - Application of NCO Concepts during the SARS Crisis in Asia
  - Network Based Defense: A Strategic Perspective on NCO







# Transforming Defense



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## *“Networked Forces Outfight Non-Networked Forces”*

*“...it allowed us to make decisions and execute those decisions faster than any opponent.”*

*Lt. Gen. David D. McKiernan  
Combined Forces Land Component  
Commander, OIF*

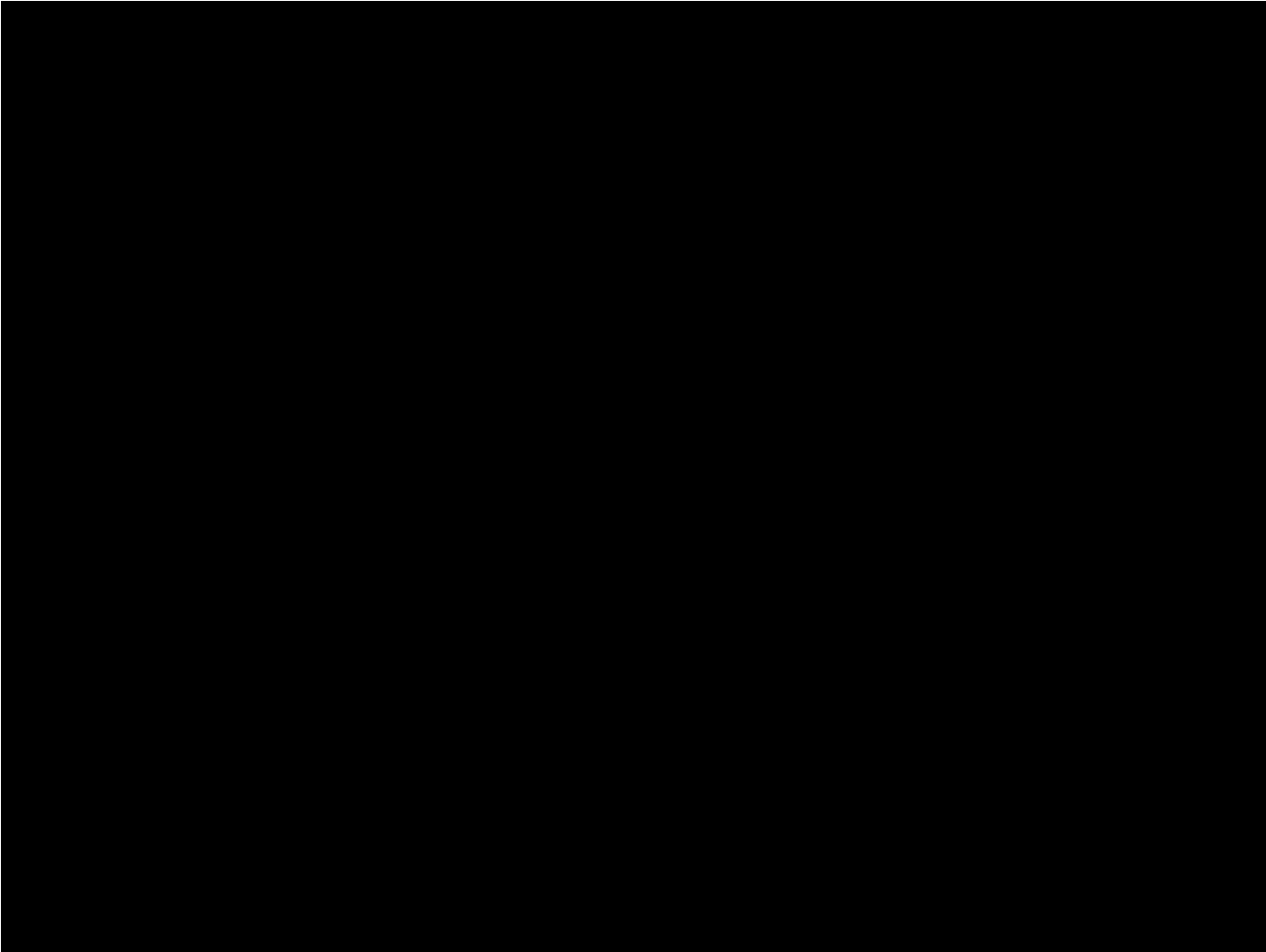


# Shared Awareness

*...The new competitive advantage*



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Source: New York Times Television – The Perfect War, 2004

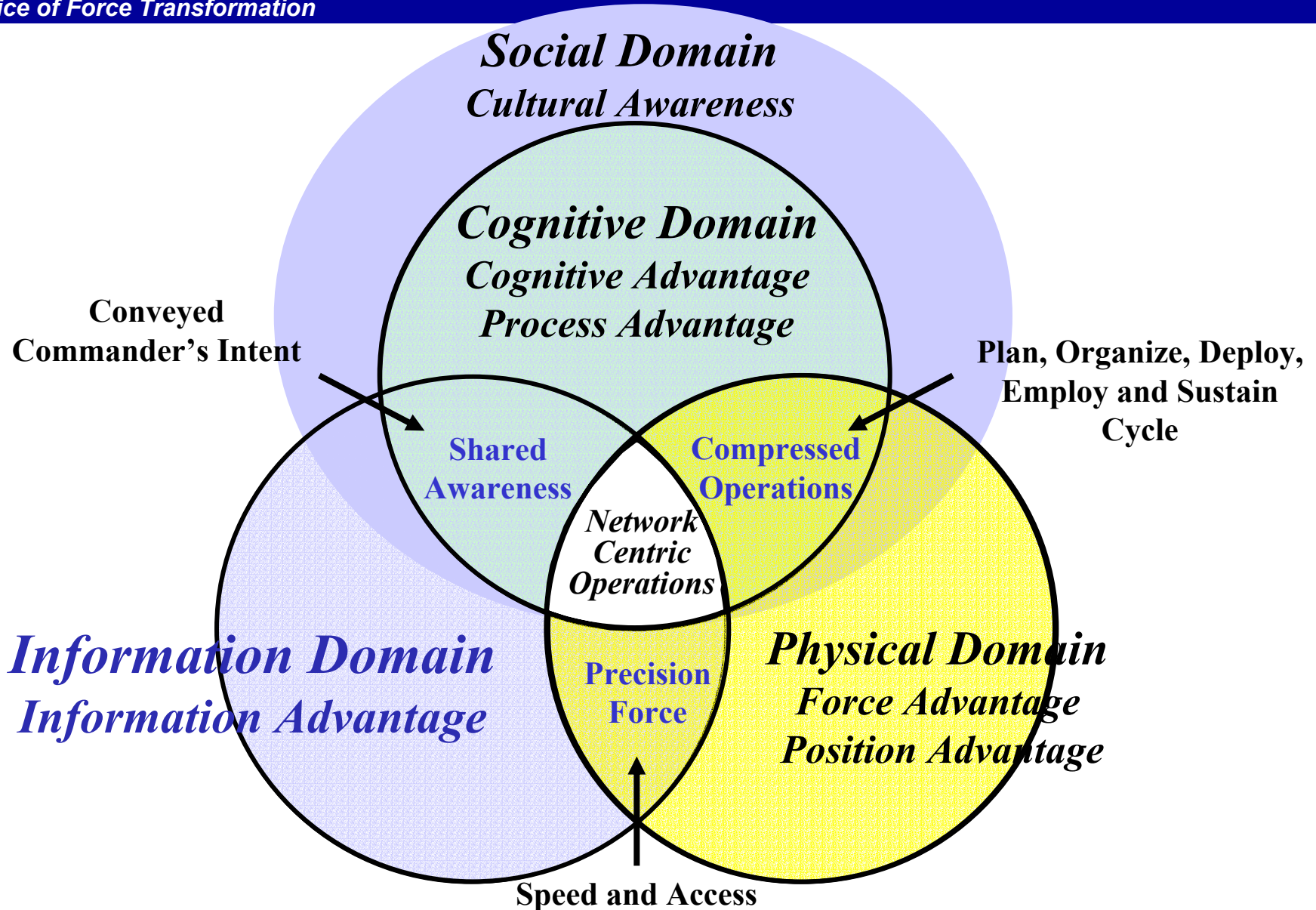


# Competing in the Information-Age

*...the power of Network-Centric Operations*



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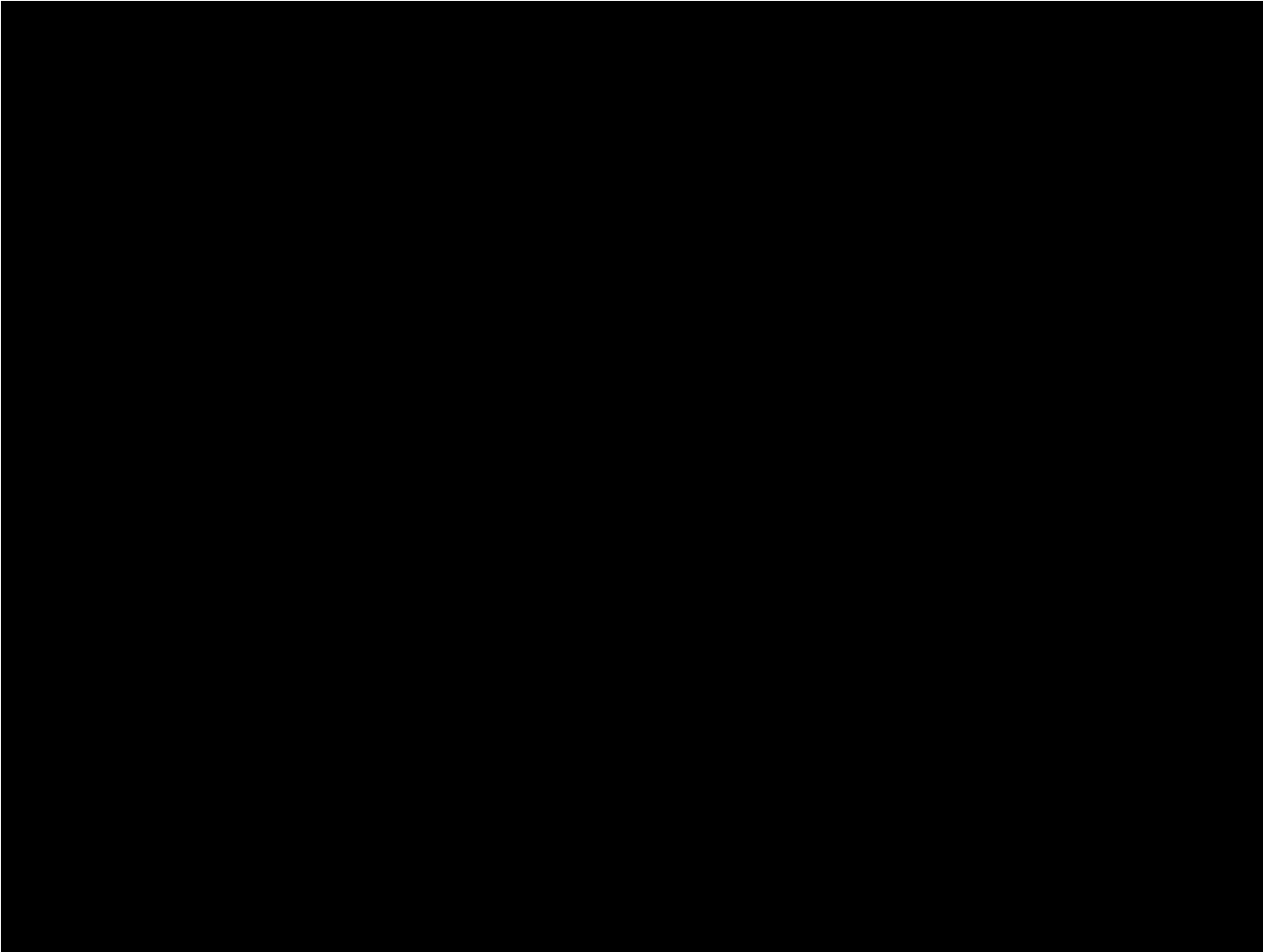


# Shared Awareness

*...in the cognitive and social domains*



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Source: New York Times Television – The Perfect War, 2004

# NCO Conceptual Framework

*A Robustly Networked Force Enables...*

*Robust  
Physical and  
Information  
Networks*

**Better Quality Networking and Information Sharing**

*Which can lead to ...*

**Improved Situation Awareness/Understanding**

**Enhanced Collaboration/Interactions**

**More Agile Command and Control**

*Robust Social  
Networks  
(People,  
Organizations  
and Processes)*

*Which can contribute to...*

**More Agile Force Elements/MCPs**

*Which ultimately leads to ...*

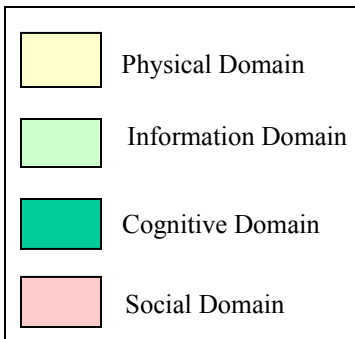
**Dramatically Improved Effectiveness**

Physical Domain

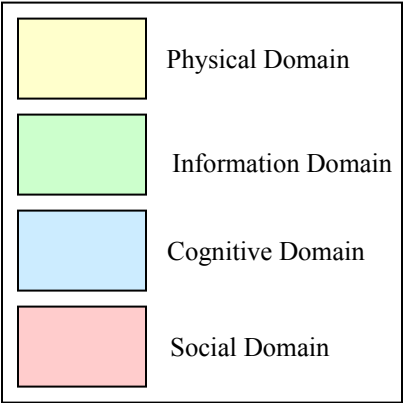
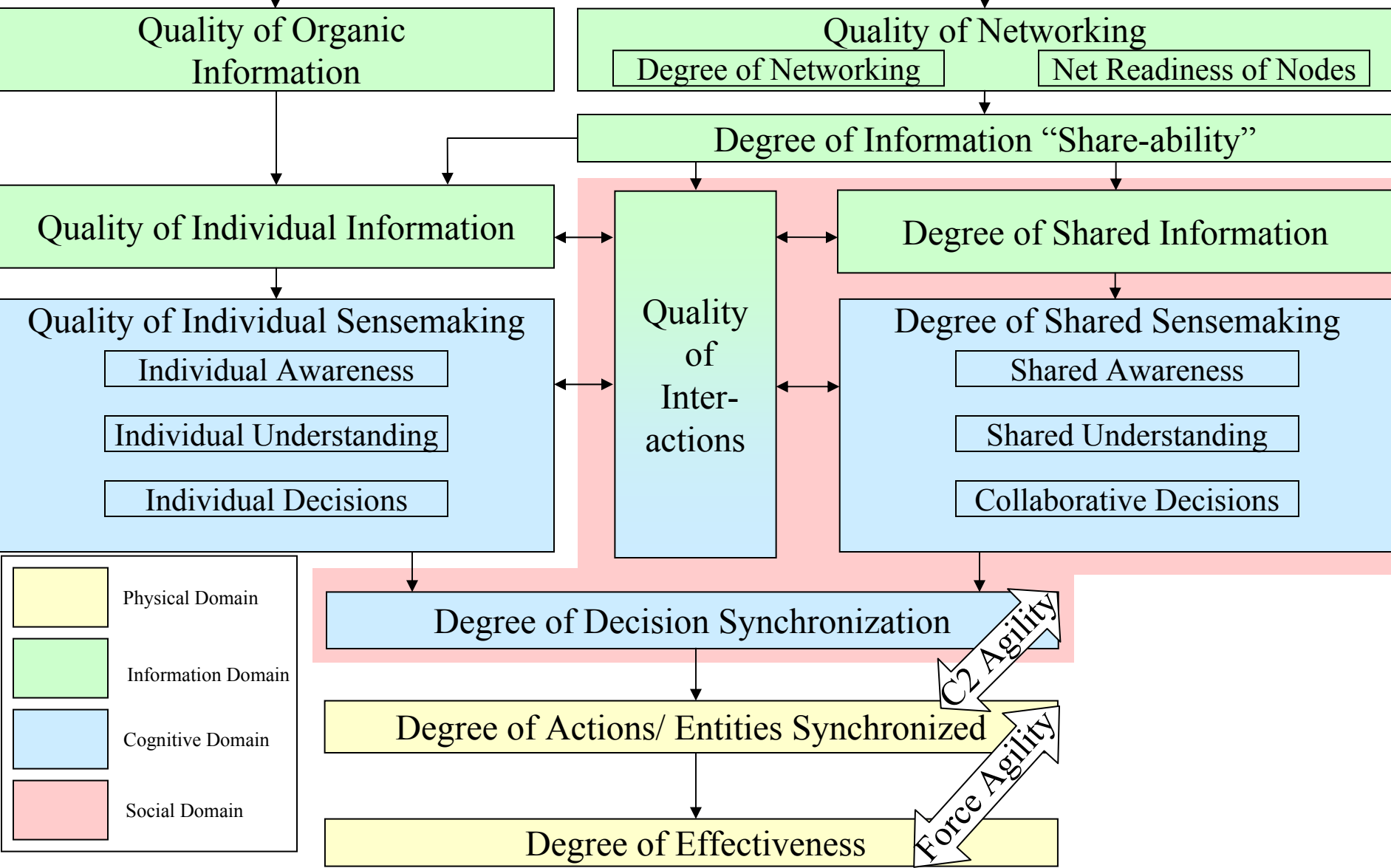
Information Domain

Cognitive Domain

Social Domain



# NCO Conceptual Framework





# Stryker Brigade

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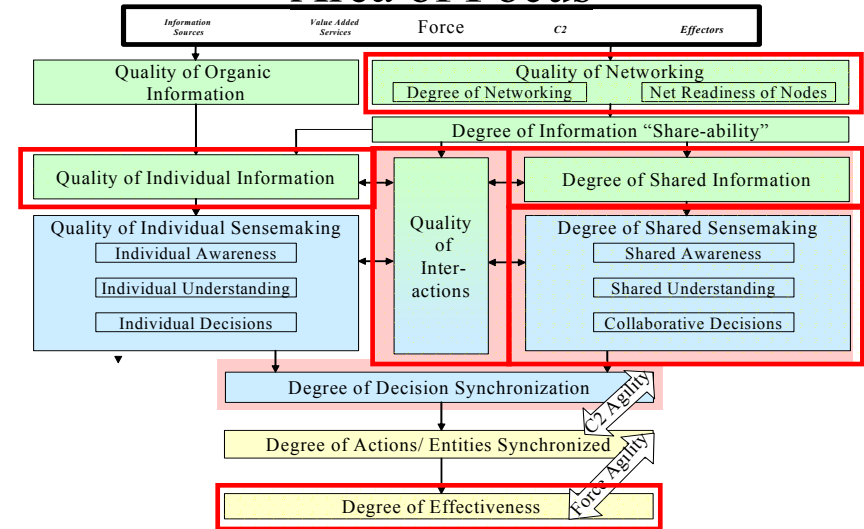
### Scenario

- SBCT attack on Shughart-Gordon
- Certification Exercise (CERTEx) at Joint Readiness Training Center, May 2003

### Hypotheses

- Stryker Bde NCO capabilities provide significant information and decision superiority and increase force effectiveness and are a source of combat power

### Area of Focus



### Findings

- Friendly :Enemy casualty ration decreased from 10:1 to 1:1
- Increase in Individual/ shared information quality from about 10% to ~80%
- Acceleration of speed of command from 24 to 3 hours in key engagement
- Bottom line result: allowed CMD ability to control the speed of command

# Stryker Brigade

## Multinational Operations

### Combined Task Force - 50

Area of Focus

### Air to Ground Operations

### Navy Special Warfare Group One (NSWG1) in OEF and OIF

### Joint US/ UK Combat Operations in Operation Iraqi Freedom

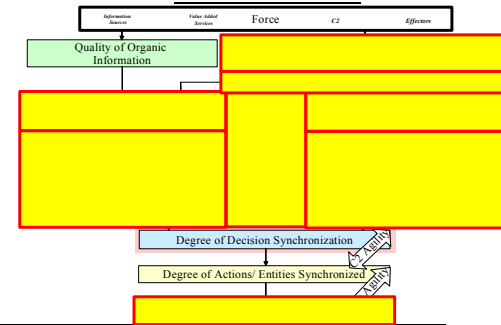
#### Scenario

- US/UK Combat Operations in OIF involving: CENTCOM, UKNCC, LCC, ACC, MCC, UK 1 Arm DIV (3 Bde, 7 Bde, 16 Bde), US1 MEF (15 MEU)
- Initial advance into Iraq during opening days of Operation Iraqi Freedom

#### Hypotheses

- During Operation TELIC/IRAQI FREEDOM, the direct accessibility to FBCB2/BFT by UK and US units provided:
  - Improved individual sense-making
  - Enhanced the quality of interactions
  - Improved shared sense-making
  - Increased mission effectiveness
 ... relative to previous operations and training without FBCB2/BFT.

#### Area of Focus



#### Findings

- FBCB2/BFT provided nearly 60% of US forces tactical SA compared to 10% in UK
- Enabled US forces to do “command on the move” unprecedented speed of maneuver
- The UK forces did not exploit the capabilities of BFT: gap in deployment, training, leadership plus optempo was not a driver
- The US forces attributed significantly higher confidence to FBCB2/BFT-provided information than their UK equivalents

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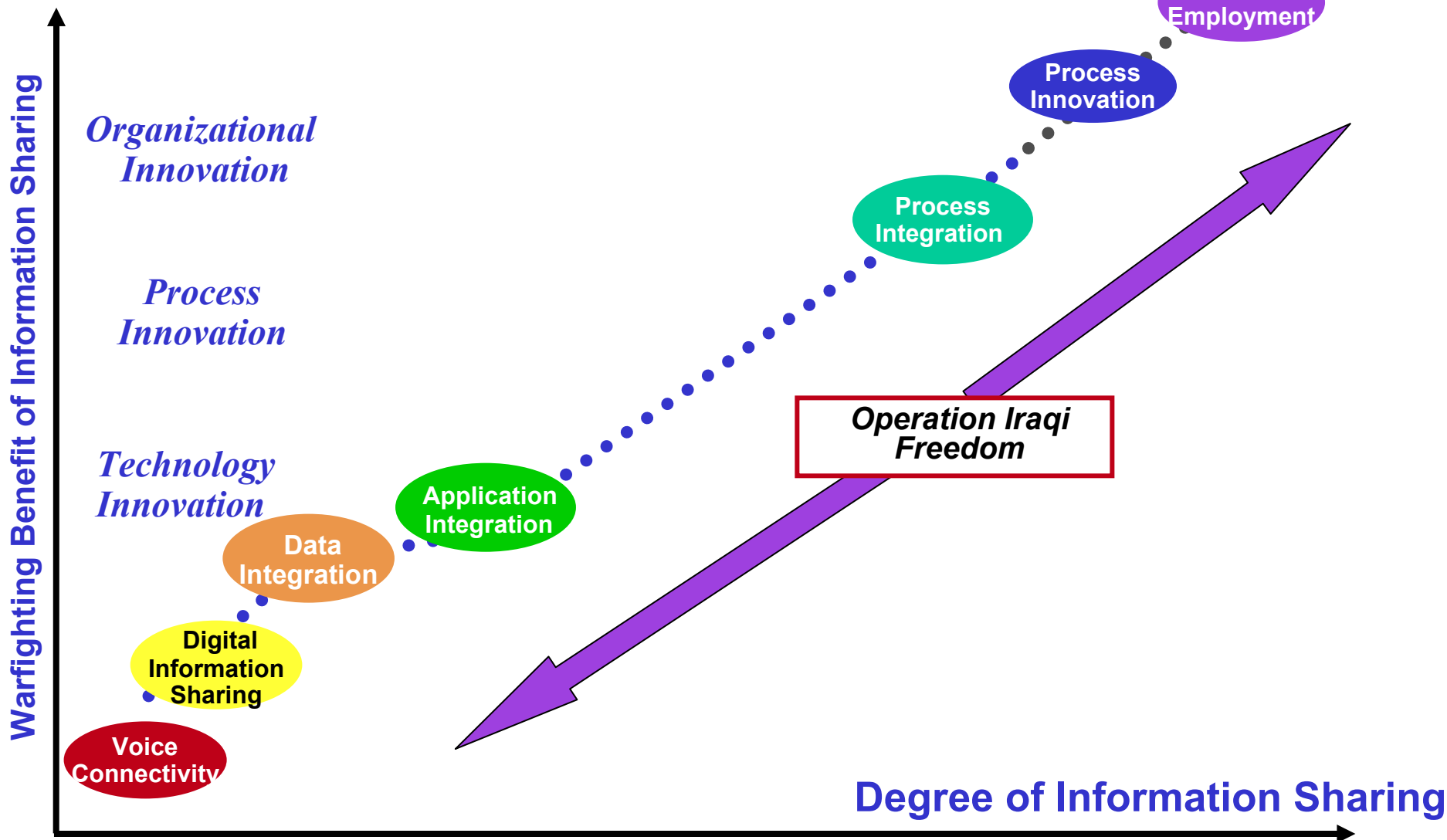


# Implementing NCW

## ...Trajectory of Innovation and Experimentation



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# Concept of Operation: Operation Iraqi Freedom (OIF)



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**Three Theaters:**  
**Southern – Center of Gravity**  
**West – Stop scuds, monitor movements**  
**North – Economy of Force**

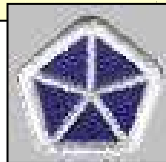


# OIF: Southern Iraq



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- Controlled by V Corps / 1<sup>st</sup> MEF
- Traditional land battle w/heavy Joint & Coalition flavor
  - **Very high operational tempo**
- Networking of distributed ground force commanders via SATCOM
- **Enhanced Relevant Common Operational Picture**
  - Multi-echelon C2
  - LCC to Brigade
  - Enabled by Blue Force Tracking



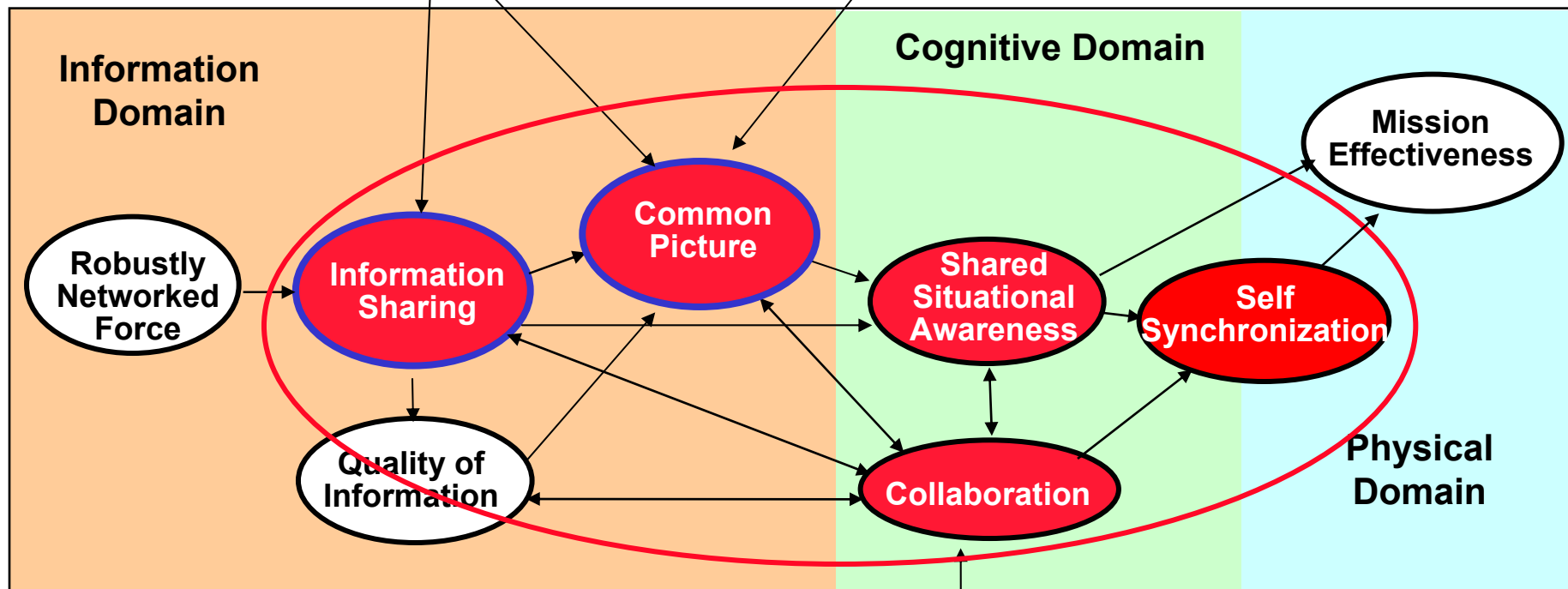


# Ground Maneuver in OIF: Key NCW Relationships



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FBCB2 / Blue Force Tracking    Joint COP



New Concepts  
& TTP

Defense Collaborative Tool Suite





# Self Synchronization

*...in the cognitive and social domains*



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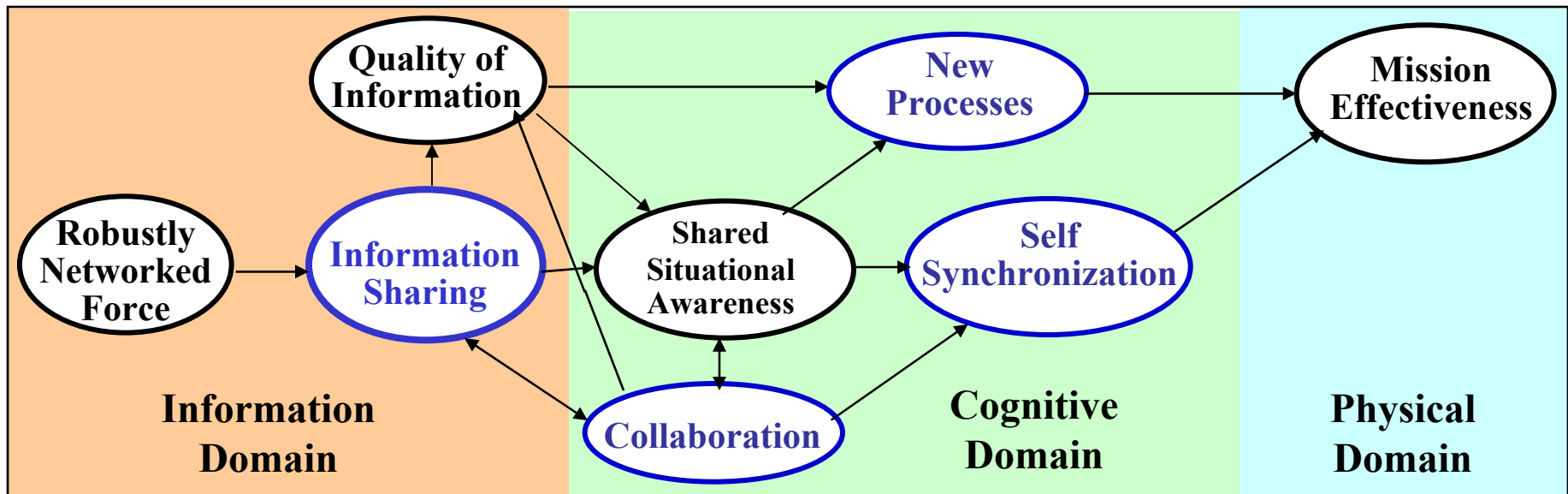
# Tenets of Network-Centric Operations

*...The new value chain*



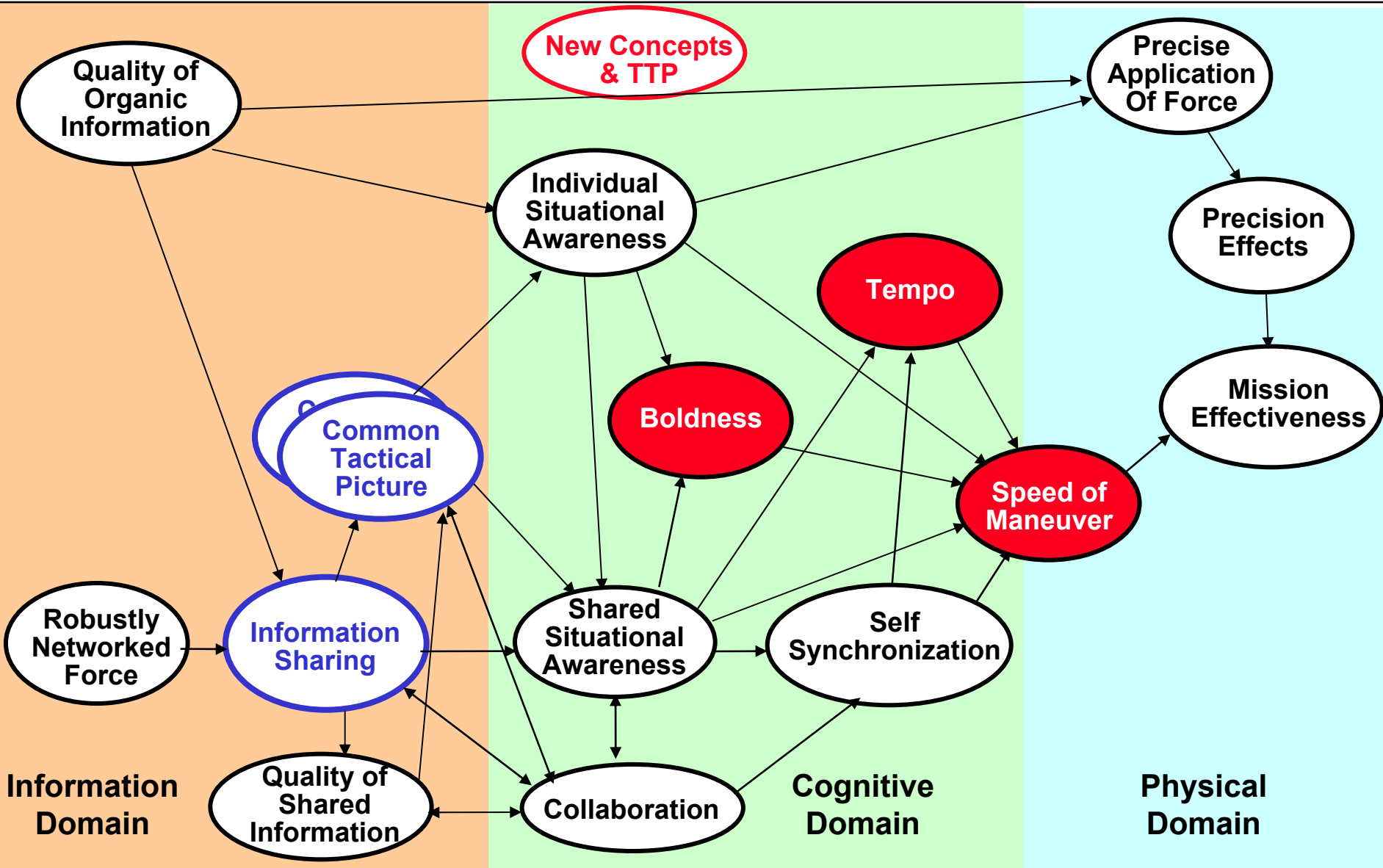
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- These in turn dramatically increase mission effectiveness





# Command and Control of a Networked Force







# Getting the Theory Right: Command and Control of a Networked Force



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## *What's Different?*

- **“Common” Operational Picture**
  - Reduced “Fog” of War
- **Shared Situational Awareness (SA)**
  - **Significantly increased SA for :**
    - Commander
    - Subordinate Commanders
    - Individual Warfighters
  - **Decreased “cognitive loading” in developing SA**
- **Command Intent**
  - Increased shared situational understanding
  - Enhanced by capabilities for real-time collaboration
- **Enhanced Speed of Decision Making**
- **Increased Tactical Agility**
- **Reduced Risk**



# Security Environment

... *Four Challenges*



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VULNERABILITY

## Irregular

Higher ↑

Those seeking to erode American influence and power by employing unconventional or irregular methods (e.g., terrorism, insurgency, civil war and emerging concepts like “unrestricted warfare”)

**Likelihood:** *very high; strategy of the weak*  
**Vulnerability:** *moderate, if not effectively checked*

## Catastrophic

Those seeking to paralyze American leadership & power by employing WMD or WMD-like effects in unwarned attacks on symbolic, critical or other high-value targets (e.g., 9/11, terrorist use of WMD, rogue missile attack)

**Likelihood:** *moderate and increasing*  
**Vulnerability:** *unacceptable; single event could alter American way of life*

← Lower

## Traditional

Those seeking to challenge American power by instigating traditional military operations with legacy and advanced military capabilities (e.g., conventional air, sea and land forces and nuclear forces of established nuclear powers)  
**Likelihood:** *decreasing (absent preemption) due to historic capability-overmatch and expanding qualitative lead*  
**Vulnerability:** *low, only if transformation is balanced*

Lower ↓

## Disruptive

Higher →

Those seeking to usurp American power and influence by acquiring breakthrough capabilities (e.g., sensors, information, biotechnology, miniaturization on the molecular level, cyber-operations, space, directed-energy and other emerging fields)  
**Likelihood:** *Low, but time works against U.S.*  
**Vulnerability:** *unknown; strategic surprise puts American security at risk*

LIKELIHOOD

No hard boundaries distinguishing one category from another



# Network Centric Warfare

*...Implementing Network Enabled Capabilities: The Key Elements*



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*Today*

*Future*

Leadership / Leader Development

Personnel (Culture)

Training

Organization

Doctrine (Process/Tactics/Techniques/Procedures)

Material (Technology)

Facilities



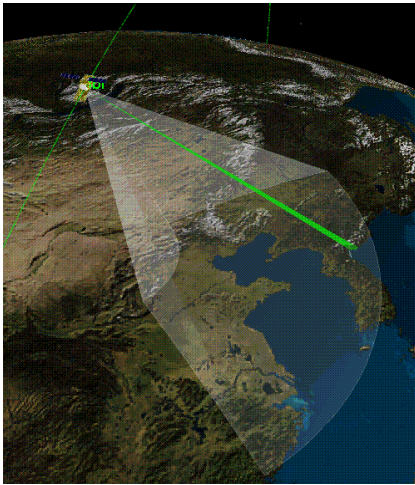


# Network Centric Warfare

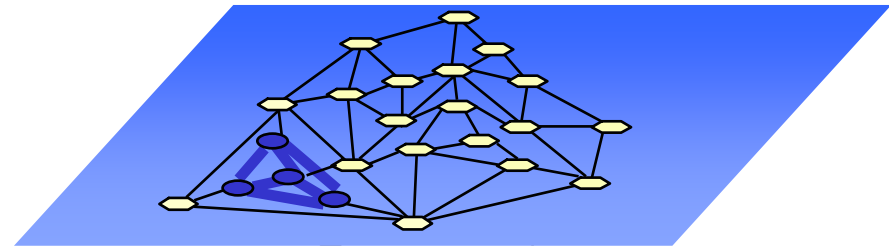
*...Implementing Network Enabled Capabilities*



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**Sensors**



**Networks**

*People*

**Command & Control**



**Effectors (Shooters)**





# Education for Transformation

... *OFT Initiatives*



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- **Transformation Chairs Program**
  - Focused on facilitating the diffusion of emerging knowledge related to **Information Age Warfare and Defense Transformation at DoD Educational Institutions**
- **Transformation Research Program**
  - Focused on creating new knowledge relating to **Defense Transformation by facilitating collaborative cutting edge research by the faculty of DoD Educational Institutions and their research partners**
- **Transformational Leadership Certificate Program**
  - Focused on creating a coherent program of instruction on **Defense Transformation – to be offered initially at NDU’s School for National Security Executive Education**
- **Transformation Short Course**
  - Focused on facilitating the diffusion of emerging knowledge related to **Network Centric Operations within the US and to Allied and Coalition partners**
  - **Innovation & Experimentation: Focused on facilitating the diffusion of knowledge related to innovation and experimentation as a key enabler of Defense Transformation**

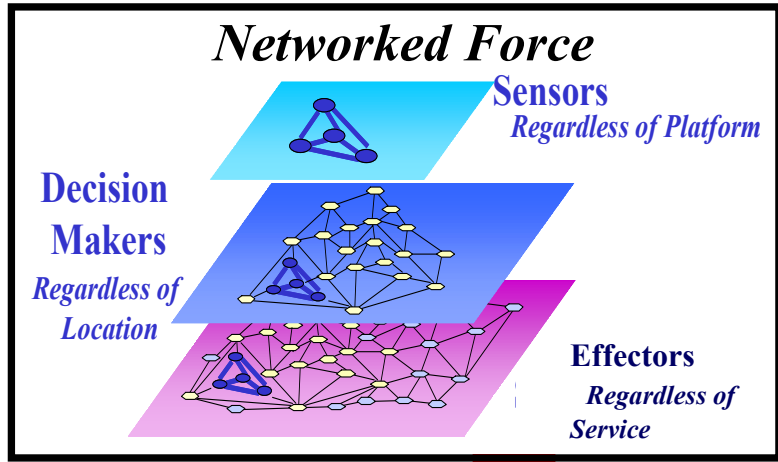


# Applying the Theory Enterprise Wide: Supporting Key Force Development Decisions

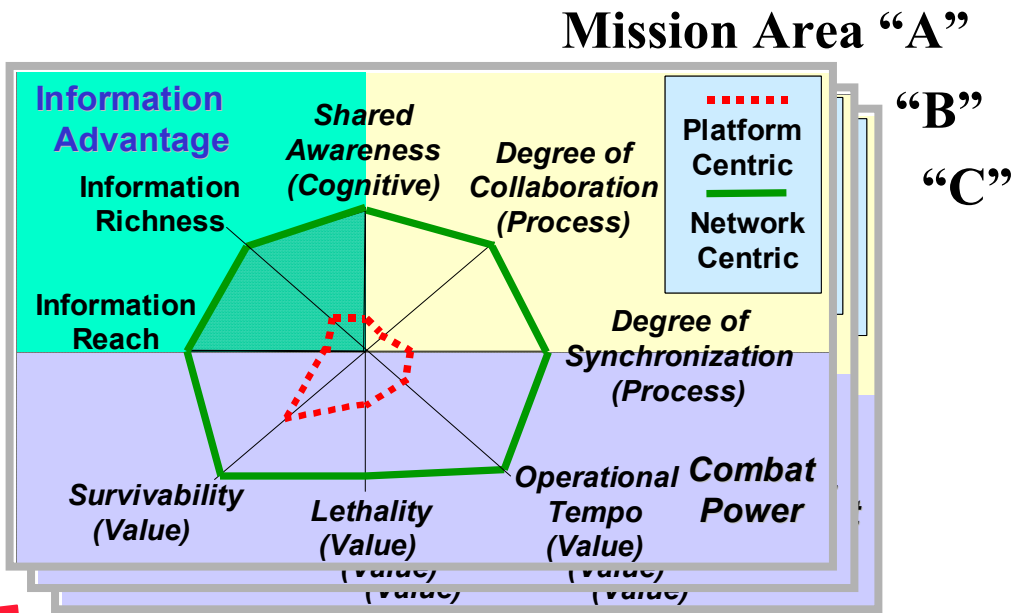


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## Alternative Force Structures

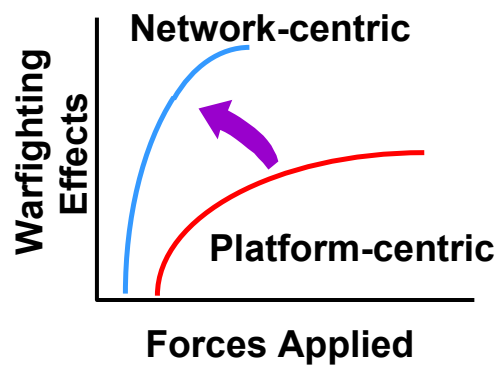


## Mission Effectiveness



**New Concepts & TTP**

## Campaign Level Effectiveness





# Conclusion: Take A Ways



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- **Network Centric Warfare: An Emerging Military Response to the Information Age**
  - *Evidence exists and is compelling*
  - *Clear linkage between Information Advantage and Warfighting Advantage*
  - *Ideas and concepts have “traction”*
- **Early NCW adopters are reaping significant gains**
  - **Armed Services: Increased Combat Power**
  - **Industry: New Business**
- **A New Mental Model is emerging to navigate the ongoing Transformation from the Industrial Age to the Information Age**



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*Questions???*

*[www.oft.osd.mil](http://www.oft.osd.mil)*





# Multinational Operations

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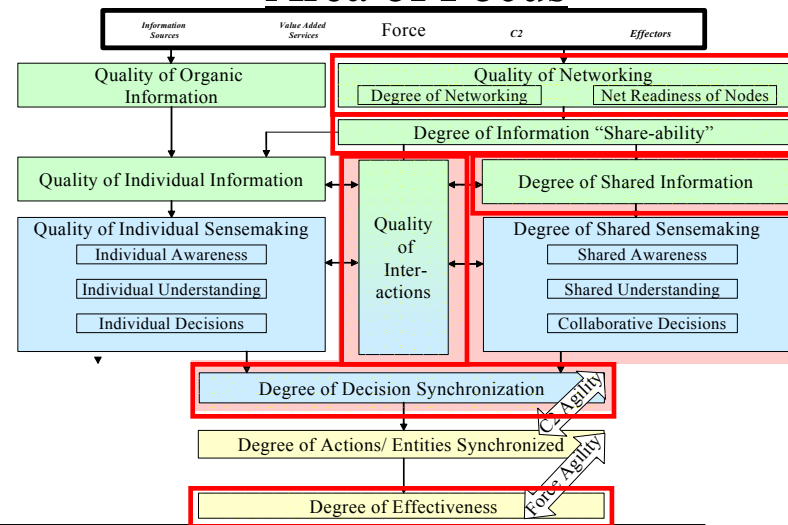
### Scenario

- C2 experiment (IRTF (L)) and Operation Amber Fox in Macedonia
- Involved: ACE Mobile Force (Land) (AMF (L), and Task Force Fox
- Use of ISIS (an Information Management tool) in IRTF (L) and TFF

### Hypotheses

- To what extent were NCO capabilities applied during the NATO trial on the IRTF (L) concept with AMF(L)?
- To what extent were NCO capabilities applied in OOTW by Task Force Fox during Operation Amber Fox?
- What was the nature of the processes that enabled the transformation to NCO?

### Area of Focus



### Findings

- Information sharing improved dramatically (CROP provided by ISIS)
- Collaboration and Trust across multinational participants increased
- Leadership is essential for adoption and effective use of new technologies and practices
- Cultural and organizational differences still remain obstacles to NCO



# Combined Task Force - 50

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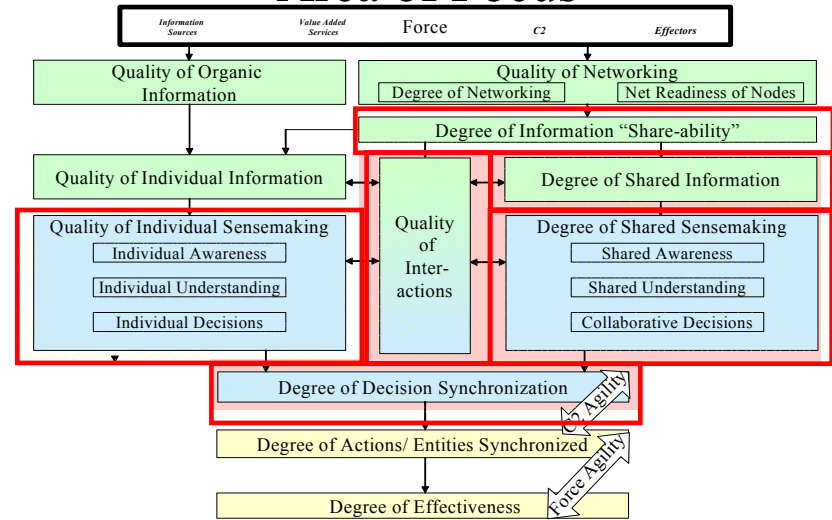
## Scenario

- U.S. Navy’s Commander Task Force Fifty (CTF-50) aboard the USS Carl Vinson (CVN 70) during Operation Enduring Freedom, July 2001 – January 2002
- Exploration of the use of the Knowledge Web

## Hypotheses

- How did CTF-50 use of Network Centric Warfare capabilities to enable:
  - Self-synchronization
  - Speed of command
  - Mission effectiveness

## Area of Focus



## Findings

- Over 59 coalition ships were able to coordinate decision making and actions
- Knowledge Web facilitated extensive shared situational awareness
- Resulted in dramatic changes to the standard operating procedures (no power point briefings)
- Increased confidence and trust throughout
- Leadership and training was central for success



# Air to Ground Operations



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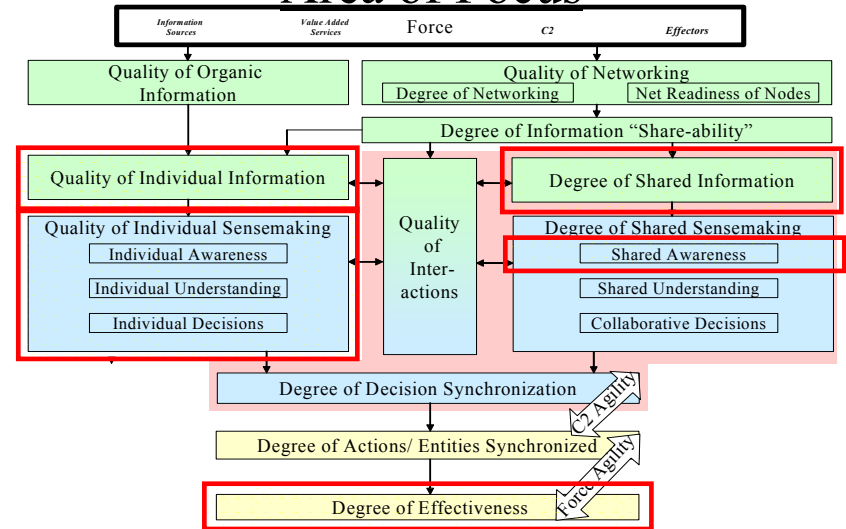
### Scenario

- Air-Ground Interaction (focusing on Close Air Support) using the DCX1 Exercise, and operations in OEF and OIF
- Involved USAF, USA, SOF and/or USMC
- Technology used included: SADL, GBU-12, and AGM-65D equipped F-16's/ A/OA-10, pioneer video system, ...

### Hypotheses

- Networked systems (voice plus data links) would improve the effectiveness of CAS by increasing the shared situational awareness and trust between air and ground elements

### Area of Focus



### Findings

- The use of digitized technologies resulted in the first ever defeat of an OPFOR at night in DCX1
- Shared digital display technologies between air and ground (both seeing same picture in real time) was used in OIF and had dramatic impact in mission effectiveness
- Other digitalization systems facilitated CAS, especially Western Iraq



# Navy Special Warfare Group One (NSWG1) in OEF and OIF



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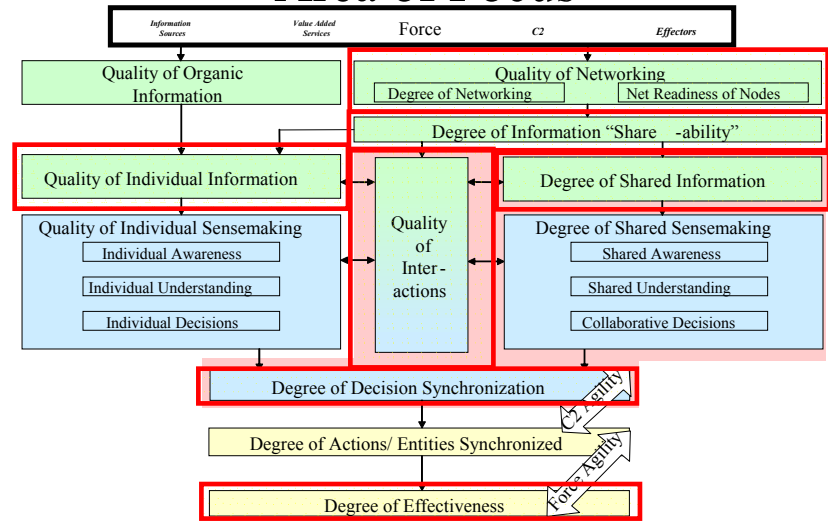
### Scenario

- NSWG1 mission support center’s application of new technologies (i.e. MSC, A3, WEBBE, GBS) in OIF and OEF added greater capability to the planning and execution of special operations
- Missions: Cave Clearing Ops., Khairullah Capture, ALfaw Oil Field, GOPLAT Operations, Maritime Interdictions, etc.

### Hypotheses

- The evolution (between OEF and OIF) of the NSWG1 Mission Support Center would improve how Naval Special Operations conducted mission planning and mission execution
  - i.e. did changes in organization, facilities, technologies and practices make a difference?

### Area of Focus



### Findings

- Increased number of operations possible
- 70-75% reduction in forward footprint
- Dramatically improved mission planning process: more timely mission planning, better quality plans
- Improved mission effectiveness – situational awareness (BFT) of SOF elements provided to COP



# Joint US/ UK Combat Operations in Operation Iraqi Freedom



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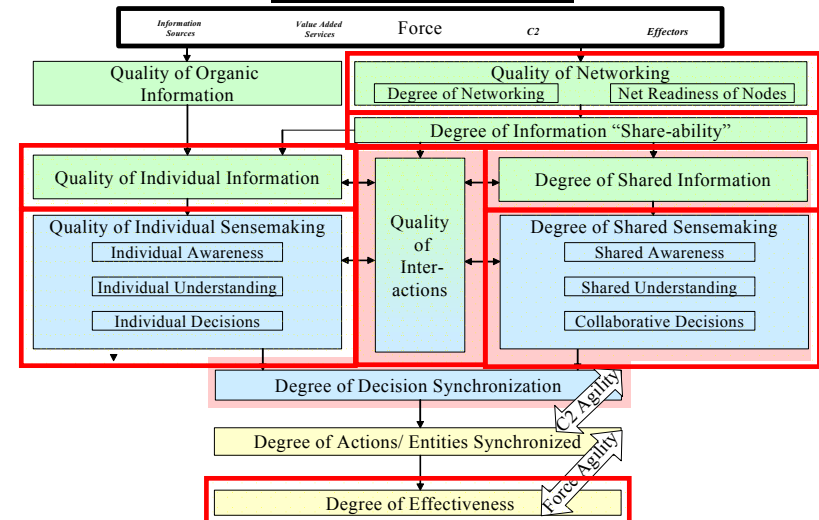
## Scenario

- US/UK Combat Operations in OIF involving: CENTCOM, UKNCC, LCC, ACC, MCC, UK 1 Arm DIV (3 Bde, 7 Bde, 16 Bde), US1 MEF (15 MEU)
- Initial advance into Iraq during opening days of Operation Iraqi Freedom

## Hypotheses

- During Operation TELIC/IRAQI FREEDOM, the direct accessibility to FBCB2/BFT by UK and US units provided:
  - Improved individual sense-making
  - Enhanced the quality of interactions
  - Improved shared sense-making
  - Increased mission effectiveness
 ... relative to previous operations and training without FBCB2/BFT.

## Area of Focus



## Findings

- FBCB2/BFT provided nearly 60% of US forces tactical SA compared to 10% in UK
- Enabled US forces to do "command on the move" unprecedented speed of maneuver
- The UK forces did not exploit the capabilities of BFT: gap in deployment, training, leadership plus optempo was not a driver
- The US forces attributed significantly higher confidence to FBCB2/BFT-provided information than their UK equivalents