

Module 5  
Harmonizing  $C^2$  with  
Focus and Convergence

Network Enabled Command and Control  
Short Course

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# Questions Addressed

- Can military organizations harmonize their C<sup>2</sup> with Focus and Convergence?
- Is there a Maturity Model for F&C?
- Is a more maturity approach better?

# Agenda

- Review of Focus and Convergence
- Harmonizing C<sup>2</sup> and F&C
- Maturity Model for F&C
- Uses of a Maturity Model
- Model Validation Efforts
- Overview of Case Studies and Experiments
- Requisite Maturity and Agility

# Focus and Convergence

- Focus and Convergence
  - recognizes the complex “Self” by moving from an entity to a collective perspective
  - adopts new language to reflect the heterogeneous nature of the Collective as well as the lack of a unified command chain and related inappropriate C2 connotations and practices

# Focus and Convergence

- Replaces the terms
  - Command and control
  - Management
  - Governance
- Focus = developing shared intent and rules of engagement without unified command or an overall management authority
- Convergence = progress toward a set of desired outcomes without the assumption of control

# Focus and Convergence

Focus and Convergence accomplishes the functions associated with command and control

*without*

- the existence of a unified chain of command
  - the assumption of control
- without implying a military approach
  - uniform technological capability

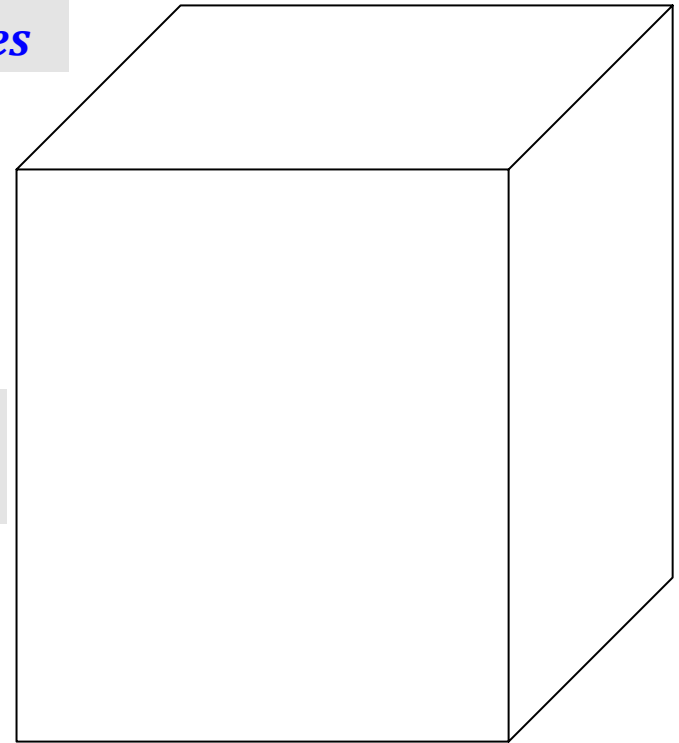
# Focus and Convergence Approach Space

the F&C Approach Space redefines  
the dimensions of the space

Distribution  
of Information  
*Among Entities*

Patterns of Interaction  
*Among Entities*

Allocation of  
Decision  
Rights  
*to the Collective*



# Harmonizing C<sup>2</sup> and F&C

- Harmonizing is about being able to add something that enhances what is already there
- The only feasible approach to collective action is Focus and Convergence
- In the case of complex endeavors, harmonizing C<sup>2</sup> refers to the ability to “add” a military organization to a Collective in a way that enhances the ability of the Collective to F&C
- A failure to harmonize has, in the past, resulted in the failure of the endeavor

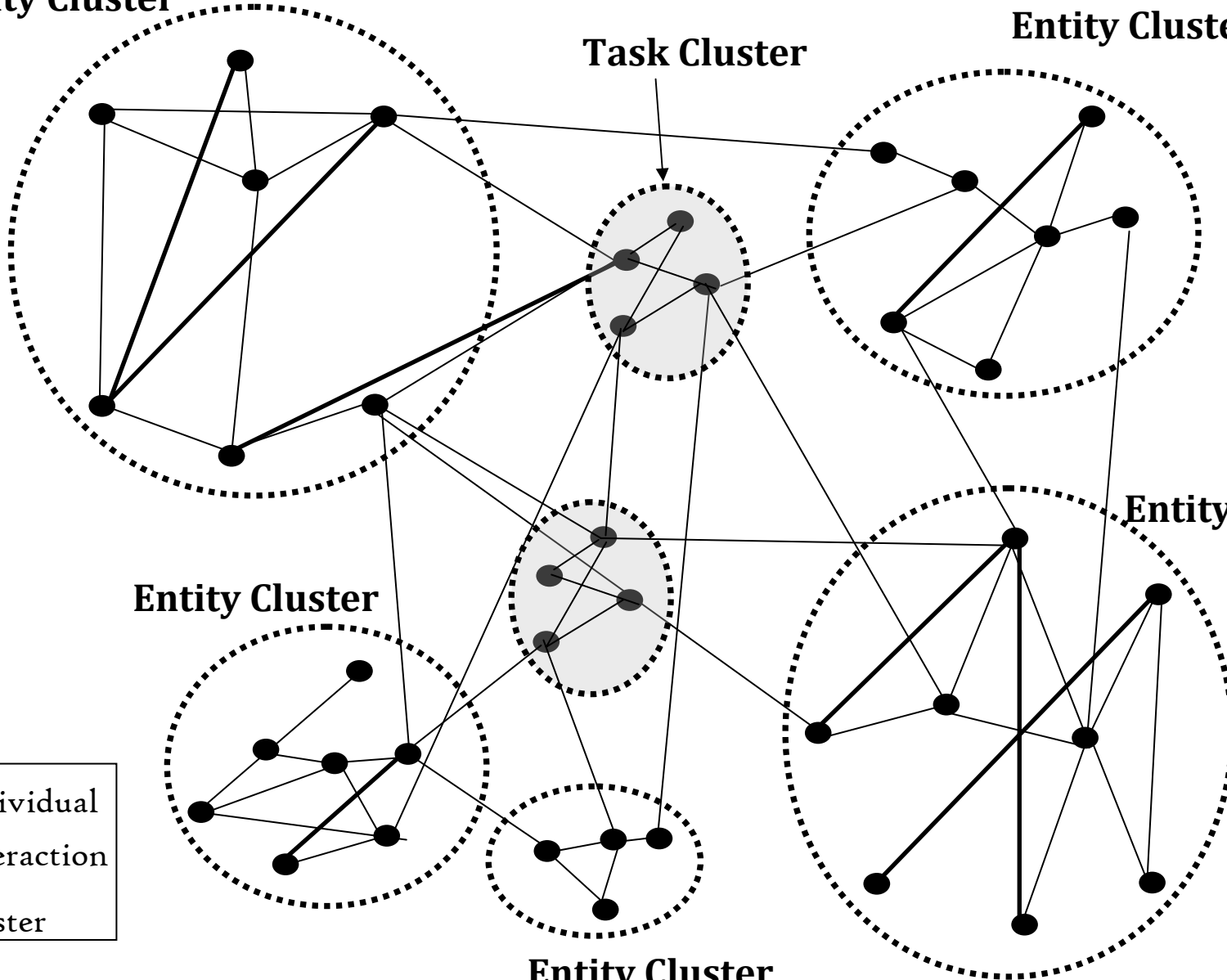


# Coordinated F&C

Entity Cluster

Task Cluster

Entity Cluster



Entity Cluster

Entity Cluster

Entity Cluster

- individual
- interaction
- ⋯ cluster

# A Military C<sup>2</sup> Entity in a Coordinated Collective

Entity Cluster

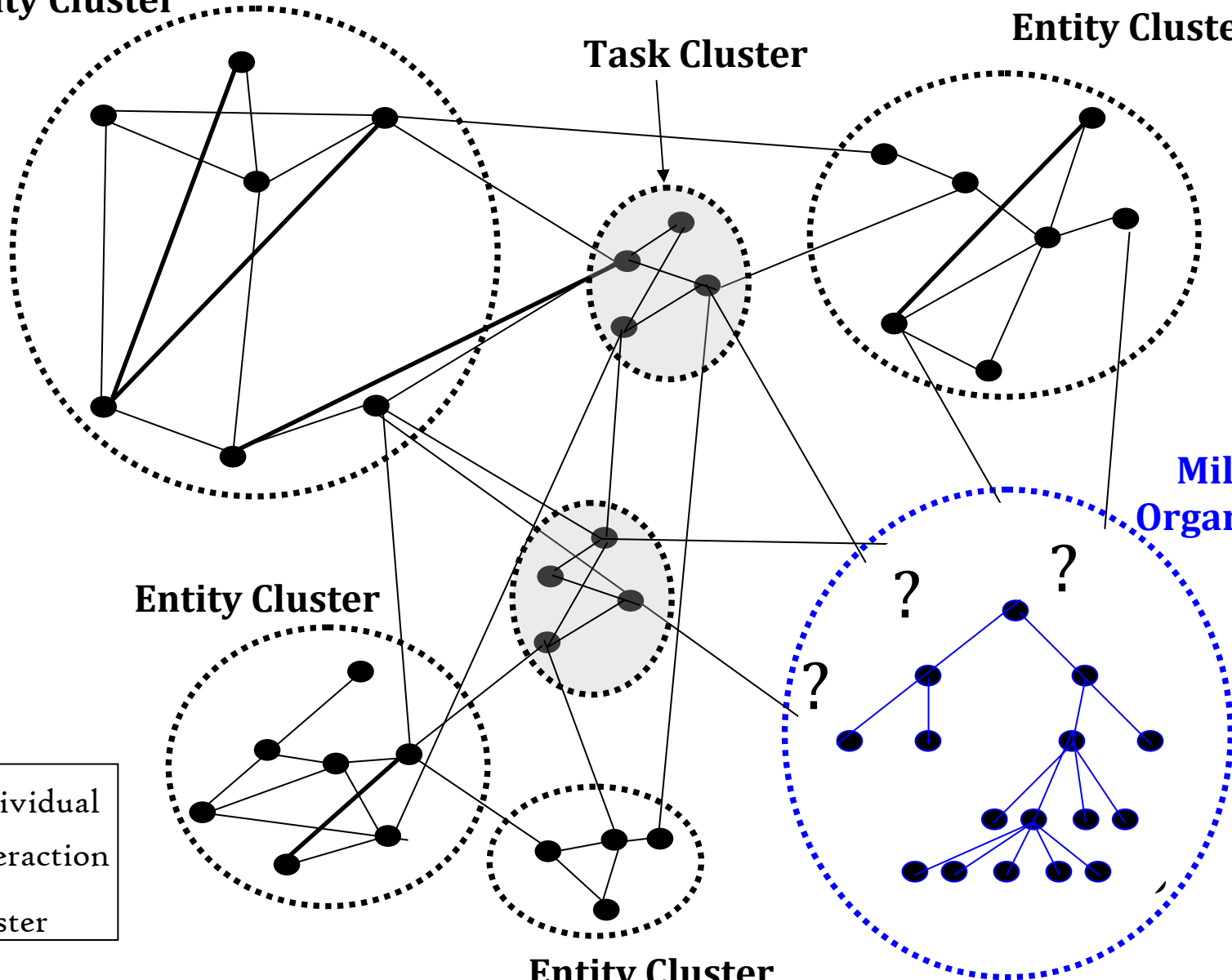
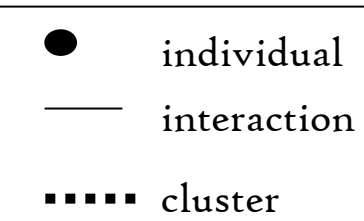
Entity Cluster

Task Cluster

Military Organization

Entity Cluster

Entity Cluster



# A Military C<sup>2</sup> Entity in a Collective

Entity Cluster

Task Cluster

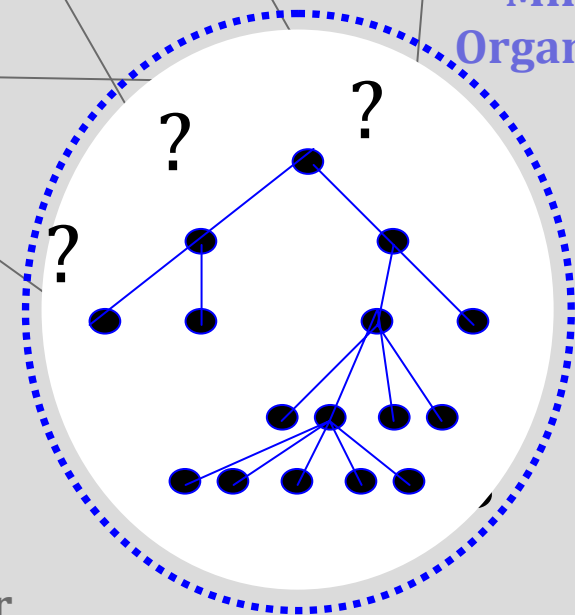
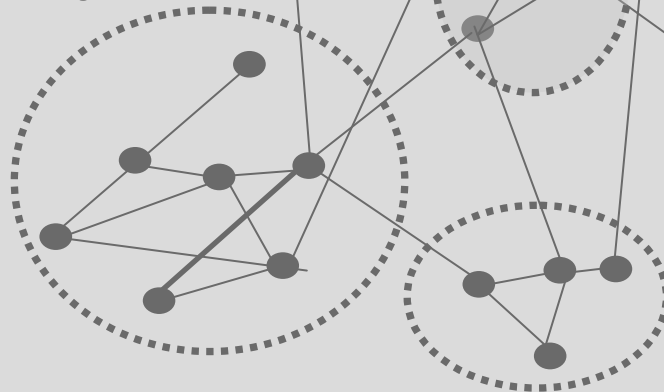
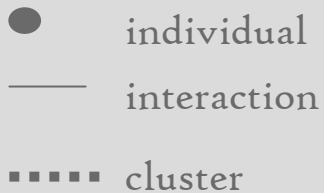
Entity Cluster

How does the approach to C<sup>2</sup> practiced by the military entity affect the ability of the Collective to function?

- How does it affect the distribution of information?
- How does it change the patterns of interactions?
- What happens when the military entity does not cede any decision rights to the collective?

Entity Cluster

Military Organization



Entity Cluster

# Harmonizing C<sup>2</sup> with F&C

- NEC2 is far more compatible with F&C than are traditional approaches to C<sup>2</sup>
- Thus, military organizations that have developed a networked enabled capability are better “equipped” to work with others in Collectives
- However, the degree to which C<sup>2</sup> is harmonized with F&C depends on the maturity of the NEC2 adopted by the military

# What is a Maturity Model?

- A Maturity Model identifies different levels of capability that are achievable and what is required to move from one level to the next
- It is usually assumed that entities, as they mature, will be able to achieve higher levels of capability
- Some Maturity Models map maturity levels to a measure of value and/or to the specific characteristics of a number of key value-related variables
- The maturity levels must be empirically measurable

# NATO NEC C<sup>2</sup> Maturity Model\*

- The NNEC C<sup>2</sup> Maturity Model was developed specifically for operations that can be characterized as Complex Endeavors
- It was recognized that traditional C<sup>2</sup> was inappropriate for Complex Endeavors, thus the term C<sup>2</sup> should be read as F&C
- However, this maturity model can be applied to the lesser included case of more traditional military operations
- Thus, the maturity model can be applied to either individual military entities and/or heterogeneous collections of entities
- Maturity Levels are associated with the degree to which a Collective or entity is able to conduct network-enabled operations (NEC capability levels)
- Maturity Levels are defined in terms of specific regions of the Approach Space

\* source: NATO Research Group - SAS-065

# Maturity Levels

A Maturity Level is defined by  
the specific approaches that the entity (collective)  
is capable of employing  
appropriately

# Maturity Levels & Approaches

## F&C Maturity Levels

	1	2	3	4	5
Edge					
Collaborative					
Coordinated					
De-Conflicted					
Conflicted					



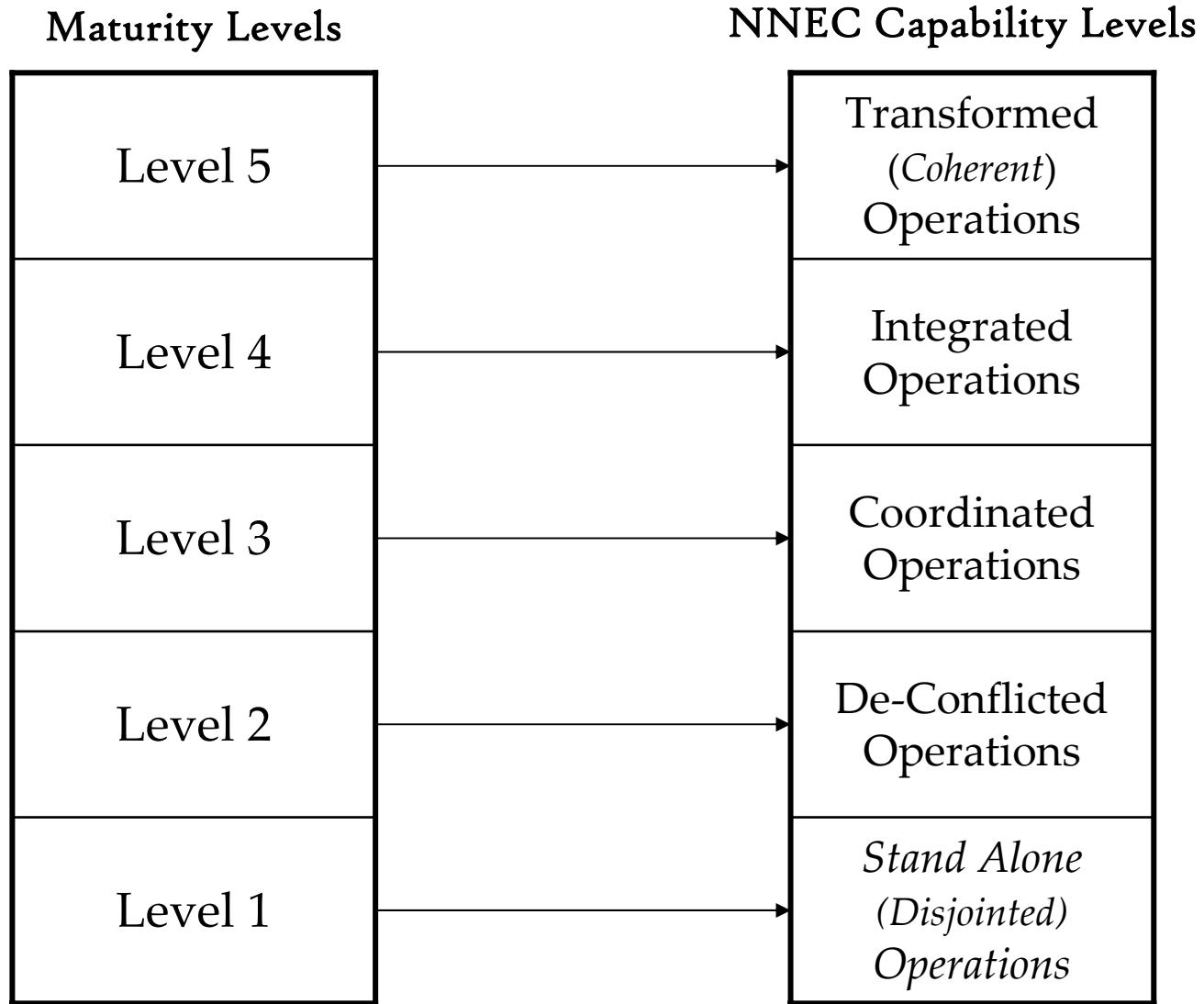
# Maturity Levels

A Maturity Level is defined by  
the specific approaches that the entity (collective)  
is capable of employing  
*appropriately*

# F&C Maturity Levels

Maturity Levels	Approaches in Toolkit	Situation Recognition	Transition Requirements
<b>Level 5</b>	Edge	Emergent	Fluid
<b>Level 4</b>	Collaborative Coordinated De-Conflicted	locate situation in one of 3 Regions and match to approach	Collaborative ↕ Coordinated ↕ De-Conflicted
<b>Level 3</b>	Coordinated De-Conflicted	locate situation in one of 2 Regions and match to approach	Coordinated ↕ De-Conflicted
<b>Level 2</b>	De-Conflicted	None	None
<b>Level 1</b>	Conflicted	None	None

# Maturity Levels & NNEC Capability Levels



# Uses of NATO NEC C<sup>2</sup> Maturity Model

- **CD&E** - Development of new concepts, formulation of hypotheses and design campaigns of experimentation and exercises
- **Doctrine** - Development of new concepts and assessment of current doctrine
- **Operational Analysis (OA)** - Structuring field data collection and lessons learned analyses
- **Education and Training** - help individuals and organizations to better understand what is being modelled
- **Modelling & Simulation (M&S)** - Framework for development of conceptual and executable models for exploration and assessment
- **Operational Design and Force Planning** - assessment of capabilities to face current and future challenges
- **Programming and Budgeting** - investment decision support

# Verification and Validation Effort

- Purpose of Verification and Validation effort
  - Is the articulation of the Maturity Model Clear?
  - Can the model be usefully applied?
  - Is the Maturity Model a valid representation of reality?
- Types of Validity
  - Expert (face) Validity
  - Construct Validity
  - Empirical Validity
- SAS-065 Approach to Verification and Validation
  - Conduct case study applications across a range of relevant situations
  - Conduct analyses of relevant experimentation
  - Peer Review

# SAS065 Case Studies and Experiments

<b>Mission</b>	<b>Case Studies</b>	<b>Dates</b>
Combat Exercises	Brigade Exercises	2005
Combat Operations	Iraq	2003-2005
WISE Wargames	UK C <sup>2</sup> Alternatives	2006-2007
Peace Operation	IFOR in Bosnia	1995-1996
Peace Operation	KFOR in Kosovo	1999
Small Natural Disaster	Elbe River Flood Germany	2002
Small Natural Disaster	Strong Angel III in US	2006
Small Natural Disaster	Golden Phoenix in US	2007
Complex Disaster Response	Katrina in US	2005
Complex Disaster Response	Pakistan Earthquake	2005
Complex Disaster Response	Tsunami	2004
Situation Awareness	ELICIT Experimentation	2006-2008

# Combat Operations: C<sup>2</sup> Approaches

## Variables Defining Collective C2 Maturity Levels

Edge C2	1/25 SBCT	1/25 SBCT	1/25 SBCT
Collaborative C2	3/2 SBCT Stryker Ex.	3/2 SBCT Stryker Ex.	3/2 SBCT Stryker Ex.
Coordinated C2		101 Abn Light Inf	101 Abn Light Inf
De-Conflicted C2	101 Abn Light Inf		
Conflicted C2			
C2 Approach	Allocation of Decision Rights to the Collective	Inter-entity Information Sharing Behaviors	Distribution of Information (Entity Information Positions)

## Required Patterns of Interaction

	1/25 SBCT	1/25 SBCT 3/2 SBCT Stryker Ex.
1/25 SBCT	3/2 SBCT Stryker Ex.	
3/2 SBCT Stryker Ex.	101 Abn Light Inf	
101 Abn Light Inf		101 Abn Light Inf
Cluster Attractor	Degree of Inter-cluster Connectivity	Frequency/Continuity of Interaction

1/25 = Stryker Brigade Combat Team (SBCT)

Stryker Ex = Stryker Exercise

Light Inf = Standard US Light Infantry Brigade Force

101 Abn = 101<sup>st</sup> Airborne Division

3/2 = SBCT

# Combat Operations: MoEs


## Expected Values of Measures of C2 Effectiveness


Edge C2			
Collaborative C2	<i>1/25 SBCT</i> <i>3/2 SBCT</i> <i>Stryker Ex</i>	<i>1/25 SBCT</i> <i>3/2 SBCT</i> <i>Stryker Ex</i>	<i>1/25 SBCT</i> <i>3/2 SBCT</i>
Coordinated C2	<i>101 Abn</i>	<i>101 Abn</i>	<i>Stryker Ex</i>
De-Conflicted C2	<i>Light Inf</i>	<i>Light Inf</i>	<i>101 Abn</i> <i>Light Inf</i>
Conflicted C2			
C2 Approach	Degree of Shared Awareness	Degree of Shared Understanding	Adaptability of the Collective C2 Process


## Measures of Endeavor Effectiveness


<i>1/25 SBCT</i> <i>3/2 SBCT</i> <i>Stryker Ex</i>	<i>1/25 SBCT</i> <i>3/2 SBCT</i> <i>Stryker Ex</i>	<i>1/25 SBCT</i> <i>3/2 SBCT</i> <i>STRYKER EX</i>
<i>101 Abn</i> <i>Light Inf</i>	<i>101 Abn</i> <i>Light Inf</i>	<i>101 ABN</i> <i>LT INF</i>
Relative Effectiveness	Efficiency, Given Effectiveness	Agility of the Collective C2 Process

 1/25 = Stryker Brigade Combat Team (SBCT)

 Stryker Ex = Stryker Exercise

 Light Inf = Standard US Light Infantry Brigade Force

 3/2 = SBCT

 101 Abn = 101<sup>st</sup> Airborne Division



# Peace Operations: C<sup>2</sup> Approaches

## Variables Defining Collective C<sub>2</sub> Maturity Levels

Edge C2			
Collaborative C2	<i>IFOR/Mil</i> <i>KFOR/UN</i>	<i>IFOR/Mil</i> <i>KFOR/UN</i>	<i>IFOR/Mil</i> <i>KFOR/UN</i>
Coordinated C2		<i>KFOR Air</i>	<i>KFOR Air</i>
De-Conflicted C2	<i>IFOR/CIV</i> <i>KFOR Air</i> <i>KFOR Bde</i>	<i>IFOR/CIV</i> <i>KFOR Bde</i>	<i>IFOR/CIV</i> <i>KFOR Bde</i>
Conflicted C2	<i>KFOR NGO</i>	<i>KFOR NGO</i>	<i>KFOR NGO</i>
<b>C2 Approach</b>	<b>Allocation of Decision Rights to the Collective</b>	<b>Inter-entity Information Sharing Behaviors</b>	<b>Distribution of Information (Entity Information Positions)</b>


## Required Patterns of Interaction

<i>IFOR/Mil</i> <i>KFOR/UN</i>	<i>IFOR/Mil</i> <i>KFOR/UN</i>	<i>IFOR/Mil</i> <i>KFOR/UN</i>
<i>KFOR Air</i>	<i>KFOR Air</i>	<i>KFOR Air</i>
<i>IFOR/CIV</i> <i>KFOR Bde</i>	<i>IFOR/CIV</i> <i>KFOR Bde</i>	<i>IFOR/CIV</i> <i>KFOR Bde</i>
<i>KFOR NGO</i>	<i>KFOR NGO</i>	<i>KFOR NGO</i>
<b>Cluster Attractor</b>	<b>Degree of Inter-cluster Connectivity</b>	<b>Frequency/Continuity of Interaction</b>

 IFOR/CIV = IFOR – Civilian interactions

 KFOR/UN = KFOR – UN interactions

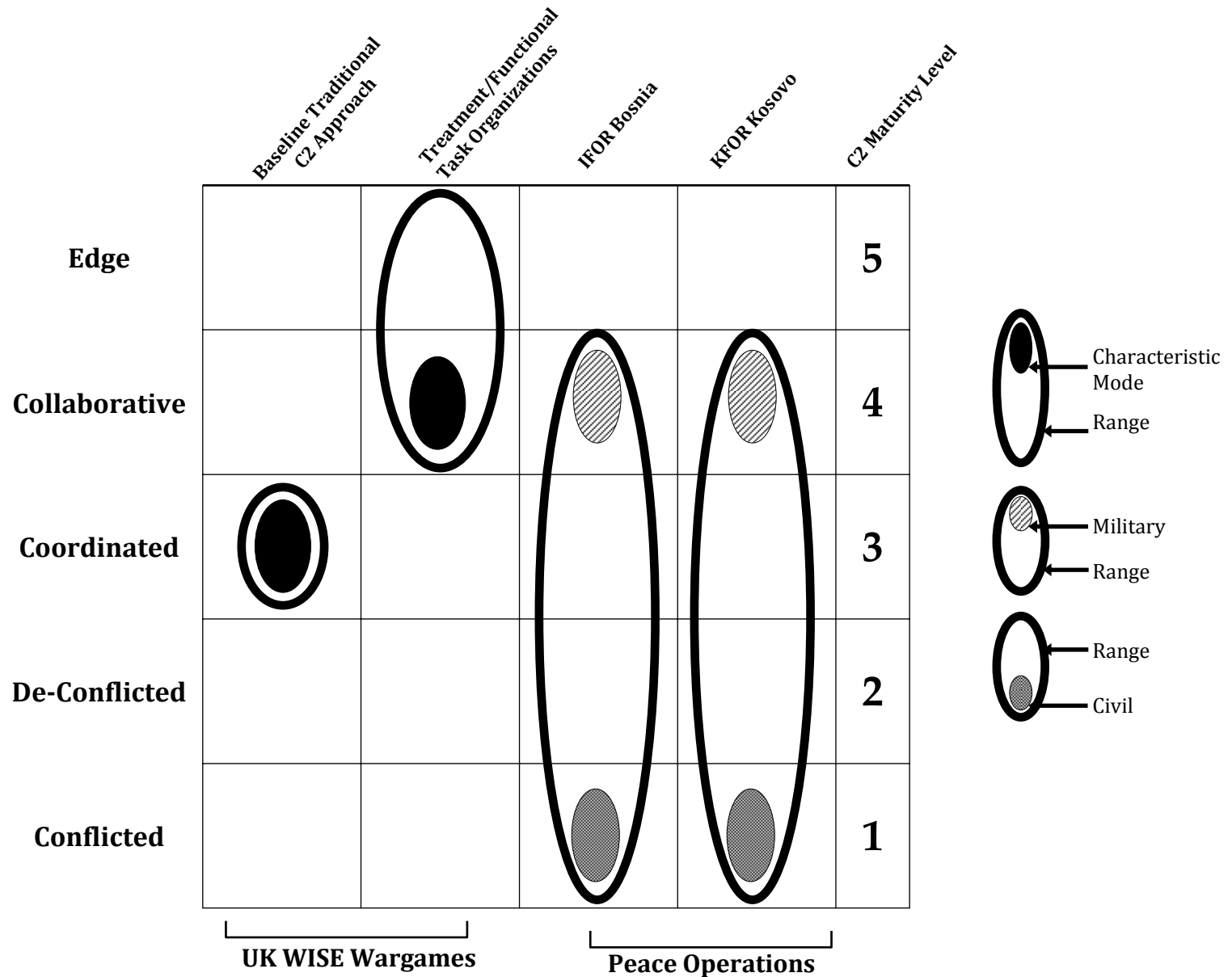
 IFOR/MIL = IFOR – within Military

 KFOR Air = Air Campaign

 KFOR Bde = Inter-Brigade (first year)

 KFOR NGO = Interactions with NGO (first year)

# UK WISE Wargames and Peace Operations



# Maturity Model Impacts (summer 2009)

- Germany developing a guideline for CD&E analysis using N2C2M2 to support assessment of C2 related concepts (**CD&E**)
- Italy conducting experiments using the N2C2M2 in a synthetic environment (**M&S, CD&E**)
- Portugal: experiments focused on the five levels of C2 Maturity (**CD&E**)
- UK developed approach using N2C2M2 for NEC Maturity Assessment (**Programming and Budgeting**)
- UK exploited the N2C2M2 in the development of its Command Doctrine as part of the High Level Operational Conceptual Framework (**Doctrine**)
- US developing empirical field metrics for applying the N2C2M2 (**OA**)
- C2CoE collaboration in NATO Response Force (NRF) Assessment (**Operational Design and Force Planning**)
- Switzerland using N2C2M2 for Strategic Exercise STABILO 2012 (**Operational Design and Force Planning**)
- Singapore incorporating N2C2M2 into their Innovation Hub (**CD&E**)
- Presented N2C2M2 to NCW 2009 and NNEC Conference 2009 (Total of 800+ participants) (**Education and Training**)
- HFM-156 used C2CRM as a basis for research hypotheses (**CD&E**)

# Requisite Maturity

- The appropriate approach to employ depends on the situation and circumstances
- Complex endeavors are dynamic; thus it is often the case that the approach that is appropriate changes during the endeavor
- For this reason, collectives need to be able to 1) employ different approaches, 2) recognize the approach that is appropriate and, 3) if necessary, transition to that approach
- The evidence shows that if the collective is less mature than is required, the mission will not succeed
- Requisite maturity is the minimum level of maturity that is adequate for the situation – including how the situation is likely to evolve