The Evolution Towards Decentralized C2

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What We Will Discuss

• Net-Centric decentralized C2 observed among some adversaries
• Top-level US strategic vision provides support for net-centric, decentralized C2
• Some progress towards net-centric, decentralized C2 in the US Military
• Doctrine is not necessarily an obstacle: Mission Command
• But Doctrine is not Enough
• DoD has made progress in web-enabled collaborative technologies
• Technological trajectories
US Joint Staff's Joint Capability Areas

Command and Control
- Organize
  - Establish & maintain unity of effort with mission partners
  - Structure organization to mission
  - Foster organizational collaboration
- Understand
  - Organize information
  - Develop knowledge & situational awareness
  - Share knowledge & situational awareness
- Planning
  - Analyze problem
  - Apply situational understanding
  - Develop strategy
  - Develop courses of action
  - Analyze courses of action
- Decide
  - Manage Risk
  - Select actions
  - Establish rule sets
  - Establish intent & guidance
  - Intuit
- Direct
  - Communicate intent and guidance
  - Task
  - Establish Metrics
- Monitor
  - Assess compliance with guidance
  - Assess effects
  - Assess achievement of objectives
  - Assess guidance

Net-Centric
- Information Transport
  - Switching and Routing
  - Wireless Transmission
  - Wired Transmission
- Enterprise Services
  - Core Enterprise Services
  - Information Sharing/Computing
  - Position Navigation and Timing
- Net Management
  - Optimized network functions & resources
  - Deployable, scalable & modular networks
  - Spectrum Management
  - Cyber Management
- Information Assurance
  - Secure Information Exchange
  - Protect data and networks
  - Respond to Attack/Event

Building Partnerships
- Communicate
  - Inform domestic and foreign audiences
  - Persuade partner audiences
  - Influence adversary & competitor audiences
- Shape
  - Partner with governments & institutions
  - Build capabilities & capacities of partners & institutions

Battlespace Awareness
- Intelligence, Surveillance, & Reconnaissance (ISR)
  - ISR planning and direction
  - Collection
  - Processing/Exploitation
  - Analysis & Production
  - ISR Dissemination
- Environment
  - Collect
  - Analyze
  - Predict
  - Exploit

C3I, C3ISR, C4I, C4ISR
C2 “Approach Space” of Alberts & Hayes


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Net-Centric Edge Organizations

- Experiments show edge organizations tend to solve problems better than hierarchies
- In a hierarchy, information does not automatically migrate to where it is needed
- Team leaders do not naturally act as brokers across stovepipes

- Four tenets of net-centric warfare (Alberts, 2002)
  - A robustly networked force improves information sharing.
  - Information sharing and collaboration enhance the quality of information and shared situational awareness.
  - Shared situational awareness enables self-synchronization
  - The above dramatically increase mission effectiveness.
Brehmer’s Factors Shaping C2 Systems

Adapted from Brehmer, 14th ICCRTS, (2009)
Burgess & Fisher Command Level Framework (CLeF)

- Cast in terms of conventional hierarchical descriptors

<table>
<thead>
<tr>
<th>CLeF No.</th>
<th>Key Function</th>
<th>Conventional descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is the problem? Who is: us, the enemy, our allies and others?</td>
<td>National Strategic</td>
</tr>
<tr>
<td>2</td>
<td>What can we do about it? Who plays and who pays?</td>
<td>Military Strategic</td>
</tr>
<tr>
<td>3</td>
<td>How and when will we deal with it? When, where - resources to be used?</td>
<td>Operational</td>
</tr>
<tr>
<td>4</td>
<td>Who? - team formation, preparedness, orchestrate the effects.</td>
<td>Joint</td>
</tr>
<tr>
<td>5</td>
<td>How? - Targets for effects</td>
<td>Tactical</td>
</tr>
<tr>
<td>6</td>
<td>Actions required - individual</td>
<td>Individual</td>
</tr>
</tbody>
</table>
• Traditional hierarchical command structure
• The “6,000-mile long screwdriver”

Burgess & Fisher (2008)
Command Level Framework (CLeF)

- The “Strategic Corporal” in a “3-block war”
- Consistent with Mission Command Concepts
“Modern” networked force
Decentralized C2 Observed Among Some Adversaries

- US Marines, Afghanistan, 2001-
- Israeli Defense Forces, Nablus, 2002

21st Century Internet/CellPhone Enabled Groups
- Al-Qaeda (9/11)
- Jemah Islamiya
- Grassroots Jihadi Networks (Madrid, 2004)
- “Leaderless Resistance” Cells

- IRA Splinter Groups under law-enforcement pressure
- Some insurgencies, e.g. Palestinian groups, Nablus, 2002
- Hezbollah (2006)

“Traditional” 20th Century Terrorist Groups
- Provisional IRA
- ETA

IRA = Irish Republican Army
ETA = Euskadi Ta Askatasuna (a Basque separatist group)
21st Century Internet/Cellphone-Enabled Groups

- **Al-Qaeda (9/11)**
  - Bin Laden probably knew plan, blessed operational concept
  - Probably did not know operational details (flight numbers, etc.)
  - Subordinates understood intent & were empowered to carry it out
  - Self synchronization
    - Unity of effort (shared fundamentalist faith)
    - Commander’s intent
    - Rules of engagement (collateral damage is the **point**)
  - Knowledge superiority
    - Effective use of information & communication technologies
    - Operational intelligence via cellphone, internet, etc.

- **Grassroots Jihadi Networks (Madrid, 2004)**
  - Ad hoc grouping with complex leadership web
  - Not always competent but autonomous, agile
  - Shared intent to carry out a terrorist bombing

- **“Leaderless Resistance” Cells**
  - Right-wing extremist groups in Germany & U.S.
  - Louis Beams: “leaderless resistance”
  - Effective use of Internet as actual C2 medium
Terrorist Groups not Always Decentralized

- “Traditional” 20th Century Terrorist Groups
  - Provisional IRA
  - ETA
- Often strictly hierarchical & centralized C2
- Sometimes splinter & decentralize under law-enforcement pressure

IRA = Irish Republican Army
ETA = Euskadi Ta Askatasuna (a Basque separatist group)
Takes a Network to Defeat a Network?

• Unproven assertion

• But consider Nablus 2002

• Israeli Defense Forces vs loose confederation of organizations
  • Hamas
  • Palestinian Jihad
  • Some forces from Palestinian Authority
  • Street gangs

• Groups were autonomous but appeared to self-synchronize in battle

• IDF response
  • Formed small networks
  • Gave field commanders autonomy
  • Engaged quickly, withdrew

• Cultural shift
“Hybrid Enemy:” Hezbollah 2006

- Hezbollah blended conventional & irregular warfare
- “Hybrid”
- Hezbollah C2 had both hierarchical & distributed elements
  - Formal chain of command, with command posts, landlines, encrypted radios
  - But also a distributed network of small units with autonomy
    - Unity of effort, self-synchronization
- IDF fought more conventionally
  - Conventional air operation
  - Somewhat belated ground response
- Hezbollah also had more decentralized & agile media strategy
  - Got message out fast
Decentralized C2 (where appropriate) is a stated US Goal

C2 Strategic Plan

Future C2 capabilities will reflect a paradigm shift in implementing C2 from the traditional centralized approach to one that emphasizes a distributed, collaborative, and cooperative net-enabled environment."

...will seek to acquire and implement an optimum mix of complementary, mutually supportive, and net-centric national, strategic, operational, and tactical C2 capabilities.”

“Interoperability, understanding, timeliness, accessibility, simplicity, completeness, agility, accuracy, relevance, robustness operational trust.”
C2 Strategic & Implementation Plans

DoD Command and Control (C2) Strategic Plan

- Strategic direction and policy guidance to:
  - define, prioritize, acquire, govern, manage, & implement C2 capabilities

C2 Implementation Plan

C2 SP + C2 IP together

- Satisfy (DoDD) O - 5100.30, DoD Command and Control
- To develop and maintain a DoD C2 Roadmap

C2 SP + C2 IP together

- = C2 Capability Portfolio Strategic Plan
- (DoDD 7045.20, Capability Portfolio Management, September 25, 2008).
US Making Progress Towards Decentralized C2 When Appropriate

MC Afghanistan experience
- Large battlespace, roughly 200 x 200 miles
- Patrolled by regiment
- 10 years ago would have been whole division
- Operational units getting smaller
- Battalion was once the smallest unit doing independent operations
- Now companies; Even platoons
  (Afghanistan)

Mission command Doctrine
- Marines continue to experiment
- Marine Corps Warfighting Lab
- Distributed Operations Concept (later Enhanced Company Operations (ECO))
- Experiments with more autonomous squads & platoons showed increased command speed, more effective

- Enablers
  - Technologically simple
  - Voice & Data equipment
  - Associated training

- Needs
  - Comms
  - C2 S/W
  - Collaboration tools
US Making Progress Towards Decentralized C2 When Appropriate

Special Forces—Afghanistan/Pakistan 2001
- A-Teams, each about 20-25 soldiers
- Highly autonomous operation, distributed decisionmaking
- Each team had one person in charge of communicating with other teams
- Tactical Web page

Albot (2004) example
- USAF plane noticed vehicle lights
- Relayed info to webmaster
- Webmaster communicated with dispersed teams
- One team able to investigate
- Got info back to planes
- Plane destroyed Taliban column
Doctrine not necessarily an Obstacle: Mission Command

Command comes from *Auftragstaktik*, 19th century Prussian concept.

Centralized command concept

Commander gives orders in a manner that ensures thatordinates understand
His intentions
Their own missions
Context of those missions

Mission command is not synonymous with net-enabled centralized C2

But it can provide a fertile soil for edge organizations to grow
And it can be facilitated by net-centric technologies

Count Helmuth von Moltke
Mission Command

Army, U.S.:
“Mission command relies on subordinates effecting necessary coordination without orders. While mission command stresses exercising subordinates’ initiative at the lowest possible level, all soldiers recognize that doing so may reduce synchronization of the operation. Thus, commanders accept the uncertainty that accompanies subordinates exercising initiative. Their trust in subordinates they have trained gives them the assurance that those subordinates will direct actions that will accomplish the mission within the commander’s intent.”

[U.S. Army Field Manual FM-06, 2003]

Land Doctrine, Canada:
“Mission Command ... has three enduring tenets: the importance of understanding a superior commander’s intent, a clear responsibility to fulfill that intent, and timely decision-making. The underlying requirement is the fundamental responsibility to act within the framework of the commander’s intentions.” (CFP 300(3) Land Force Command)

Land Doctrine, UK:
“Mission command also contributes to an effects-based approach as it stresses the importance of understanding what effect is to be achieved rather than determining the ways by which it would be achieved. At the tactical level, network-enabled capabilities enhance forward command.” (UK ADP 2015-2020)
The Marine Corps’ concept of command and control is based on accepting uncertainty as an inescapable fact and being able to operate effectively despite it. The Marine Corps’ command and control system is thus built around mission command and control which allows us to create tempo, flexibility, the ability to exploit opportunities but which also requires us to decentralize and rely on low-level initiative.”

Mission command and control tends to be decentralized, informal, and flexible. Orders and plans are as simple and informal as possible, relying on subordinates to effect the necessary coordination and on the human capacity for implicit communication—mutual understanding with minimal information exchange.

The decentralizing of decisionmaking authority, mission command and control seeks to increase tempo and improve the ability to deal with fluid and disorderly situations.”

MCDP 6 (1996)

Equipment that permits over control of units in battle is in conflict with the Marine Corps’s philosophy and is not justifiable.”

FMFM 1 (1989)
**But Doctrine is not Enough**

Can’t just cut & paste doctrine

Culture is important & can be slow to evolve

Inculcating mission command took Prussia/Germany a century!

Higher levels of command:
- Delegate
- Not overspecify
- Not micromanage

Lower levels:
- Take initiative
- Not expect/need detailed orders

British Army in WW2 was theoretically operating on decentralized doctrine, but did not behave accordingly or reap benefits

Studies show significant variation in importance accorded to command intent, and in expectations of detailed orders—even in doctrinally decentralized organizations

In real world, pressure to micromanage can be significant
Web-Enabled Collaborative Technologies

“Web 2.0”

Big Progress in DoD

Examples

• Knowledge Web (Kweb)
• Strategic Knowledge Integration Web (SKIWeb)
Captured value-added information already being created by several command staffs throughout the battle force and displaying it on a single Web site.

Captured value-added information already being created by several command staffs throughout the battle force and displaying it on a single Web site.

Cal time-sensitive info via secure chat
D of command no longer tied to briefing cycle
KWeb, lots of time spent on preparing
KWeb, brief from dynamically updated
pages
KWeb, meetings concentrated on strategy & tactics

- Tested during Global Wargame 2000
- But Carrier Battle Group 3 reached Arabian Sea on eve of 9/11; became Carrier Task Force 50
- KWeb used in OEF; the time it saved allowed more & better contingency planning
- Within weeks after Adm. Zelibor left, much was reversed
- Navy integrated Kweb into larger framework; became more difficult to use
- Use also dependent on commander
Strategic Knowledge Integration Web (SKIWeb)

Web-based asynchronous collaboration system

28,000 DoD users (end 2009)

Introduced under Leadership of General Cartwright at STRATCOM

- Blogged & encouraged broad participation

Foxhole to 4-Star

People who really knew things first hand could submit without filtering

Raw first reports were quickly refined and corrected at various levels

General posted himself and asked questions

Got responses from much lower levels

System survived Cartwright’s departure, but depended crucially on him to get up & running, and catch on

“The metric is what the person has to contribute, not the person’s rank, age, or level of experience. If they have the answer, I want the answer. When I post a question on my blog, I expect the person with the answer to post back. I do not expect the person with the answer to run it through you, your OIC [Officer-in-Charge], the branch chief, the exec, the Division Chief, and then...
Technological Trajectories

Make “Classic” C2 better faster
Disseminate information broadly and stimulate interaction patterns
Transformational: Enable edge operation, when enabled with appropriate organizational culture & rules

The technology may fit in different categories depending on how used
Technological Trajectories

Make “Classic” C2 better and faster
Faster computers, better comms, in classic model

Disseminate information more broadly and stimulate new interaction patterns
E.g. Web enabled collaborative technologies
- Kweb
- SKITWeb

Transformational: Enable true edge operation, when coupled with appropriate
organization culture & rules
Innovations arise not necessarily in C2 writ small, but from areas of C4ISR
- Communications technologies for dispersed tactical units in remote
  environments
  - Eg. Data bandwidth comparable to that available in forward operating
    bases
  - Without bulky antennas
- Secure Mobile ad-hoc networks
- Handheld multimedia devices
- Organic ISR assets effectively integrated into mobile communications
  architecture
Main Points

Net-centric Decentralized C2 can improve information sharing, collaboration, and situational awareness, thereby enabling self-synchronization and increasing mission effectiveness.

Net-Centric decentralized C2 is observed among some adversaries

Top-level US strategic vision provides support for net-centric, decentralized C2

Some progress towards net-centric, decentralized C2 is observed in the US Military

Doctrine is not necessarily an obstacle: Mission Command

But Doctrine is not Enough

DoD has made progress in web-enabled collaborative technologies

Technological trajectories

• A—Make Classic C2 better & faster
• B—Increase information dissemination and stimulate new interaction patterns
• C—Transform to edge-like character, with appropriate policies & culture