C2 That!

**Command and Control over
Post-Industrial Armed Forces**

The Hague Centre for Strategic Studies

a TNO initiative

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15th ICCRTS - "The Evolution of C2"
Santa Monica, CA
**Track 1: C2 Concepts, Theory, and
Policy**
Thursday, June 24, 2010

"It's Our Mindset, Stupid!"

- Despite much recent lip service to ' uncertainty' (FR Livre Blanc, UK Green Paper, US QDR(s), NL Future Policy Survey), the current debate about defence continues to be dominated (and - unnecessarily - restrained) by **presentism**
  - ✓The current debate is overwhelmingly framed in terms of current ops (Afgh, Iraq,…) , still a bit in terms of the Cold War, and what little is left in terms of industrial-age warfare (Clausewitz, Jomini, etc.)
  - ✓We still primarily think physical technologies and organize in linear, hierarchical structures - we have industrial mindsets
- Need for a **new mindset**
  - ✓Good chance that defence is on the eve of major changes (fiscal tsunami, backlash against recent ops, value for money debate,…)
  - ✓Essential to develop human pull to collective work and problem solving to exploit the benefits of networks of people, competencies and capabilities.

Going Back to the Roots – 'Armed Force'

- **arm (2)**
- "weapon," 1300, from O.Fr. *armes* (pl.), from L. *arma* "weapons," lit. "tools, implements (of war)," from PIE base **ar-* "fit, join." The notion seems to be "that which is fitted together." Meaning "heraldic insignia" (in *coat of arms,* etc.) is 1330; originally they were borne on shields of fully armed knights or barons. The verb meaning "to furnish with weapons" is from 1205. *Arms race* first attested 1936.

- **army**
- c.1386, from O.Fr. *armée,* from M.L. *armata* "armed force," from L. *armata,* fem. of *armatus,* pp. of *armare* "to arm," lit. "act of arming," related to *arma* "tools, arms," from PIE **ar-* "to fit together." Originally used of expeditions on sea or land; the specific meaning "land force" first recorded 1786. The O.E. words were *here* (still preserved in derivatives like *harrier*), from PIE **kor-* "people, crowd;" and *fierd,* with an original sense of "expedition," from *faran* "travel." In spite of etymology, in the Anglo-Saxon Chronicle, *here* generally meant "invading Vikings" and *fierd* was used for the local militias raised to fight them.

ONLINE ETYMOLOGY DICTIONARY

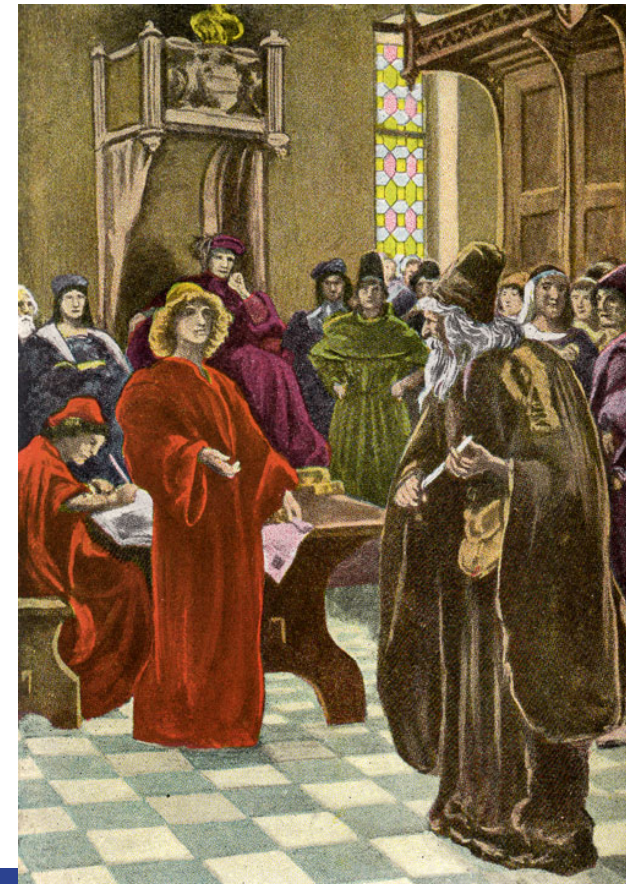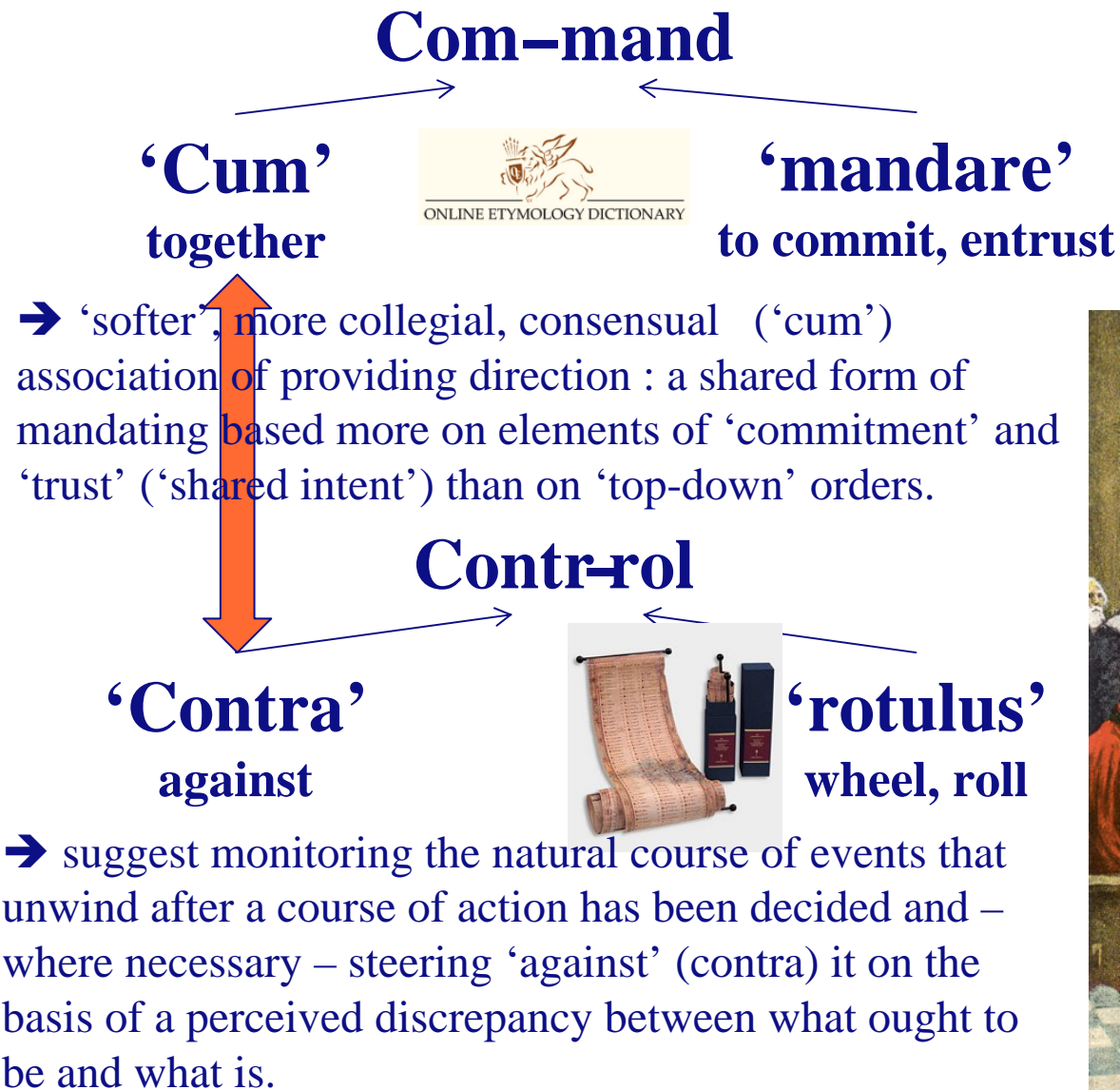# Going Back to the Roots – 'Command', 'Control'

- **command**
  c.1300, from Old French *comander* " to order, enjoin," from Vulgar Latin **commandare,* from Latin *commendare* "to recommend" (see **commend**), alt. by influence of **classical Latin** *mandare* "to commit, entrust" (see *mandate*). Replaced Old English *bebeodan*. The noun is attested from 1552. *Commandant* is 1687, from French *Commandment* is c.1280; pronounced as four syllables until 17c. "Of þe x commandements ... þe first comondement is þis, O God we ssul honuri" (c.1280).

- **control**
  c.1310, "to check, verify, regulate," from Anglo-Norm. *contreroller* "exert authority," from M.L. *contrarotulus* "a counter, register," **from L.** *contra-* "against" (see *contra*) *+ rotulus,* dim. of *rota* "wheel" (see *roll*). From a medieval method of checking accounts by a duplicate register. Sense of "dominate, direct" is c.1450.

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Going Back to the Roots –'Command'&'Control'

Com–mand

'Cum'
together

ONLINE ETYMOLOGY DICTIONARY

'mandare'
to commit, entrust

≠ **to order!**
≈**'a mandate'!**

➔ 'softer', more collegial, consensual ('cum') association of providing direction : a shared form of mandating based more on elements of 'commitment' and 'trust' ('shared intent') than on 'top-down' orders.

Contr–rol

'Contra'
against

'rotulus'
wheel, roll

➔ suggest monitoring the natural course of events that unwind after a course of action has been decided and – where necessary – steering 'against' (contra) it on the basis of a perceived discrepancy between what ought to be and what is.

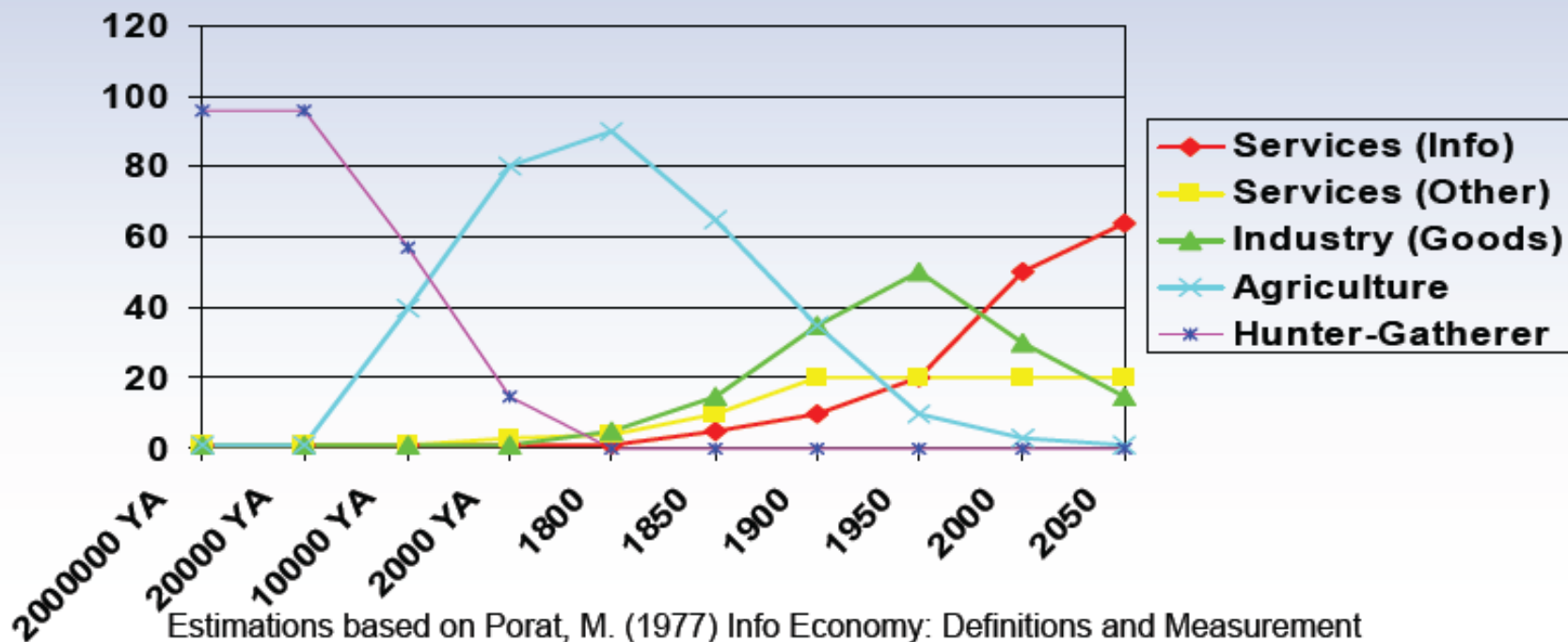Stephan De Spiegeleire (HCSS) and Peter Essens (TNO), 15th ICCRTS, June 2010
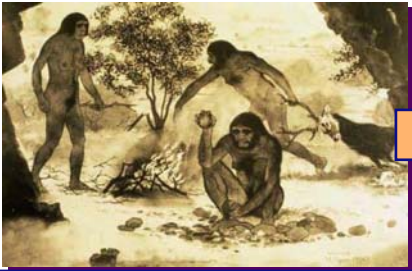
What Do the Roots Tell Us?

- The term 'command and control', despite all of the (deserved and undeserved) criticism, has proven remarkably resilient
- The original etymological meanings of 'command and control' are much closer to recent thinking (comprehensive approach, systemic operational design, etc.) than we suspect
  - ✓ More consensus-building than voluntaristic top-down
  - ✓ More based on aligning incentives than on physical coercion
  - ✓ More based on the (healthy) dialectical tension between the two, than on their merger in one person (or team)
- If we also look at the 'reality' of command and control – the historical story of C2 (e.g. Dupuy e.a.) also shows major changes across epochs

- ➔ rather than looking for new terms, we might want to go back to the original meanings

Epochal Change

Estimated world (pre-1800) and then U.S. Labor Percentages by Sector

Legend:
- Services (Info)
- Services (Other)
- Industry (Goods)
- Agriculture
- Hunter-Gatherer

Estimations based on Porat, M. (1977) Info Economy: Definitions and Measurement

'Armed Force' as a Reflection of the Age

	Nomadic (Hunter/gatherer)	Agrarian society	Industrial society
Age			
Weapons	Bare Hands	Cold	Hot
Energy	Human	Mechanical	Thermal

Post-industrial society: Information and knowledge society

Age			
Weapons	Knowledge		

Impact of Epochal Change

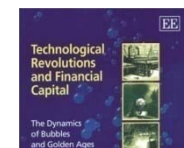|	Pre-industrial	Industrial	Post-industrial
ctors	Chieftains	'Princes' (link x nation states)	States + non-states
rmed Forces	Ad-hoc forces (no permanent larger than 3000 – v Creveld)	Permanent (industrial) armed forces	?
Arms'	Bare-handed/Cold	Industrial platforms/Hot	much more diverse (DIME+)
rganization	Clan	Linear	Network
tructure	Vertical simple hierarchy	Vertical multi-layered hierarchy	Heterarchy?
onnectedness	Singular force (all-in-one)	Connected (e.g. CS & CSS)	Distributed?
Weather	'Fair-weather'	Year-round 24/7	Pervasive
omain	Mostly land, some sea	Land-Air-Sea	Multi-domain (space, cyber)
ffects through	Concentration	Mass (economies of scale)	Network (economies)
evel	Tactical	Operational(/strategic)	Fused
rojection	Local	Line-of-sight	Global
Mode	Hit-and-run / Siege	Linear Attrition & Manoeuvre	Network ?
pecialization	All-in-one	Advanced role specialization	Network
ime of 'battle'	Punctuated	Punctuated	Pervasive
eadership	Heroic leadership	Increasingly sophisticated C2	Network
lanning	Rudimentary planning	Deliberate purposive planning	Adaptive planning

(Kondratieff/Schumpeter/)Perez Technology Revolution Cycle

INSTALLATION PERIOD → Turning Point ⊢ DEPLOYMENT PERIOD →

Degree of diffusion of the technological revolution

Previous Great Surge

MATURITY

Financial Search

SYNERGY

Crash

Production Surge

FRENZY

Bubble economy

IRRUPTION

Next Great Surge

Financial Revolution

Time

Big-bang

Crash

Institutional Re-composition

Next big-bang

Technological Revolutions and Financial Capital

The Dynamics of Bubbles and Golden Ages

(Kondratieff/Schumpeter/)Perez

		INSTALLATION		Turning Point	DEPLOYMENT	
GREAT STAGE	**Technological revolution Core Country**	IRRUPTION	FRENZY		SYNERGY	MATURITY
1st	**The Industrial Revolution** Britain	**1771**	Canal Mania **1793**	Panic **1797**	**1810** **1819**	**1825**
2nd	**Age of Steam and railways** Britain (spreading to continent and USA)	**1829**	**1836** Railway mania Revolutions 1848	Panic **1847**	**1857**	**1866** **1873**
3rd	**Age of Steel, Electricity and Heavy Engineering** USA and Germany overtaking Britain	**1875**	The "Great Depression" **1890** Argentina (Baring) **1893**	USA **1903** US 'Rich man's panic'	**1907**	**1920***
4th	**Age of Oil, Automobiles and Mass Production** USA (spreading to Europe)	**1908**	**1920*** **1929** US stock mania	1930s And WWII	**1960**	**1974*** "Oil Crises"
5th	**Age of Information and Telecommunications** USA (spreading to Europe and Asia)	**1971**	**1974*** "Oil Crises" **1987** 2nd W... DAQ	**?**		

NEC 1.0

NEC 2.0

Are...

Institutional recomposition

Big-bang

Crash

Bio – nano?

Technological Revolutions and Financial Capital

The Dynamics of Bubbles and Golden Ages

Post-industrial C2?

Industrial age   **Information age**

LOW   Variety in   HIGH by design
                             C2 system

LOW by design   Variety in the   HIGH
                            Action system

MEDIUM   Variety in the Context   HIGH

Focus on 3 changes:
- The changes in the nature of the armed forces themselves (and what they mean for C2);
- Changes in the role armed forces will play in emerging security ecosystems (and what they mean for C2); and
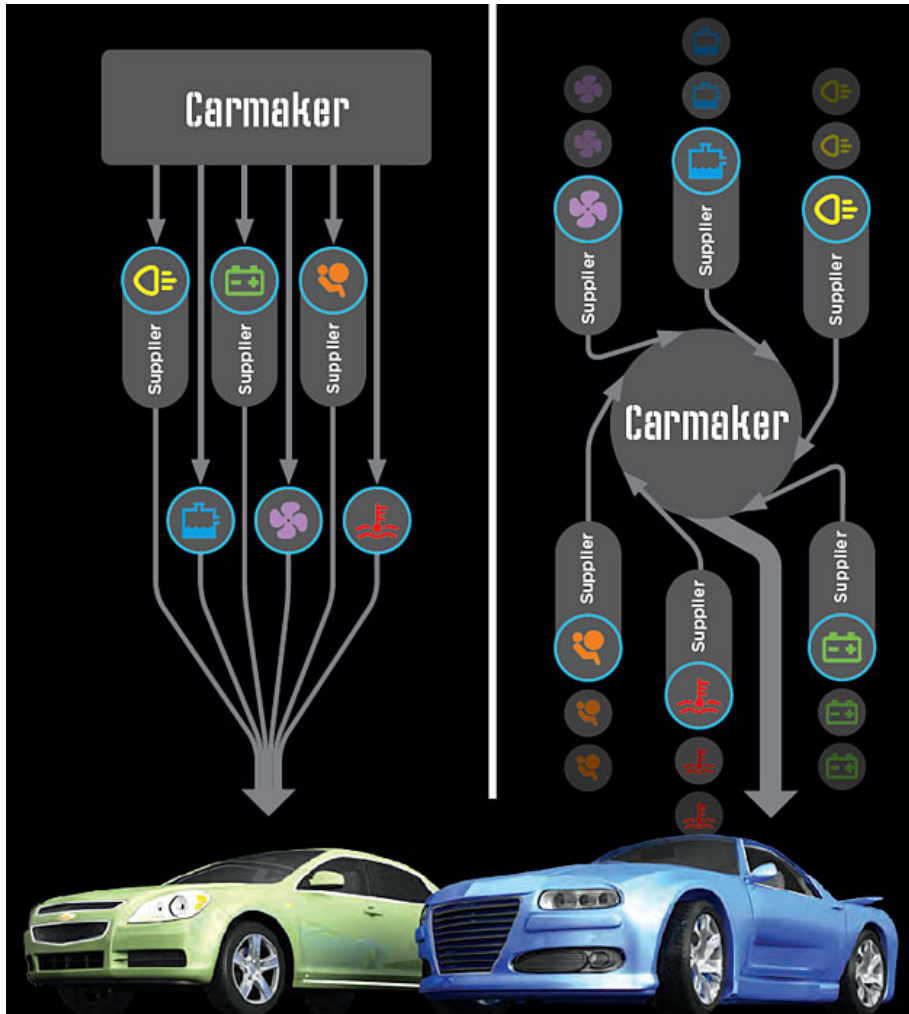- The extent to which the 'command' and the 'control' functions may have to be
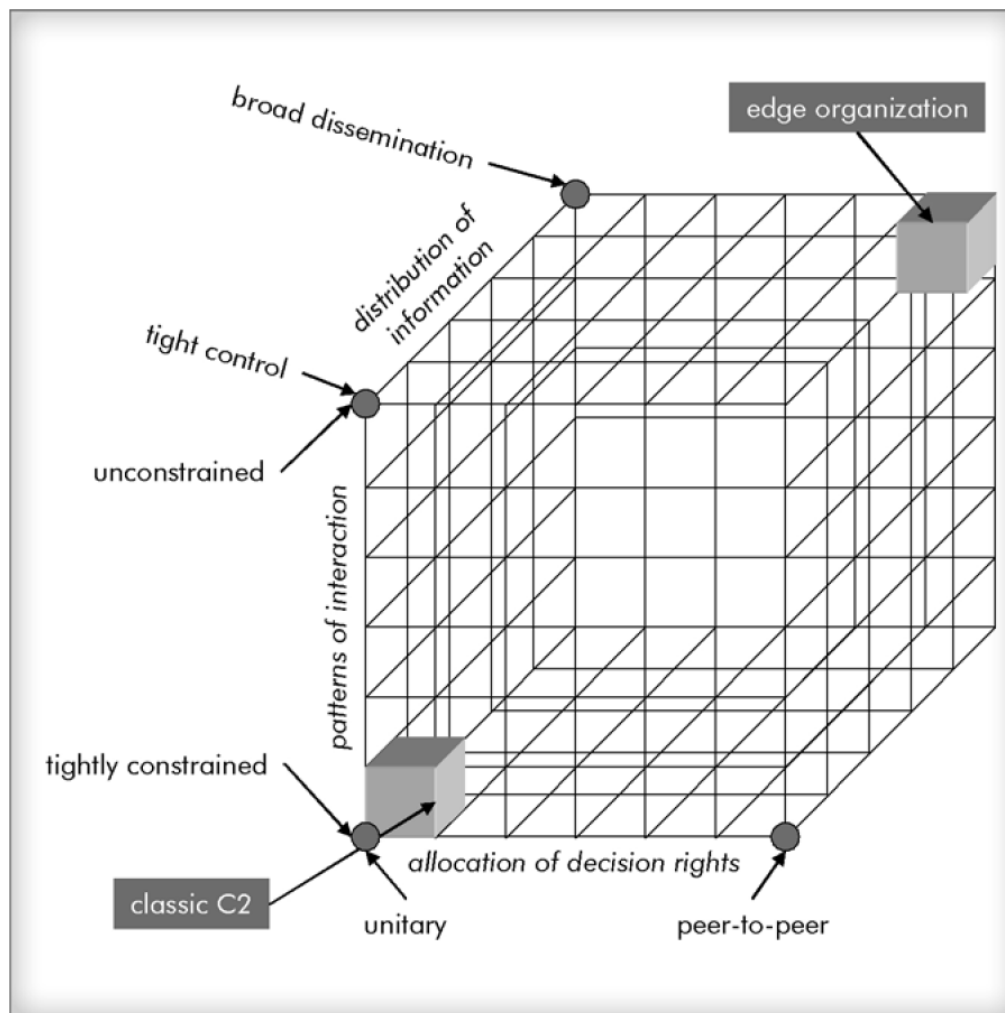
C2 That!

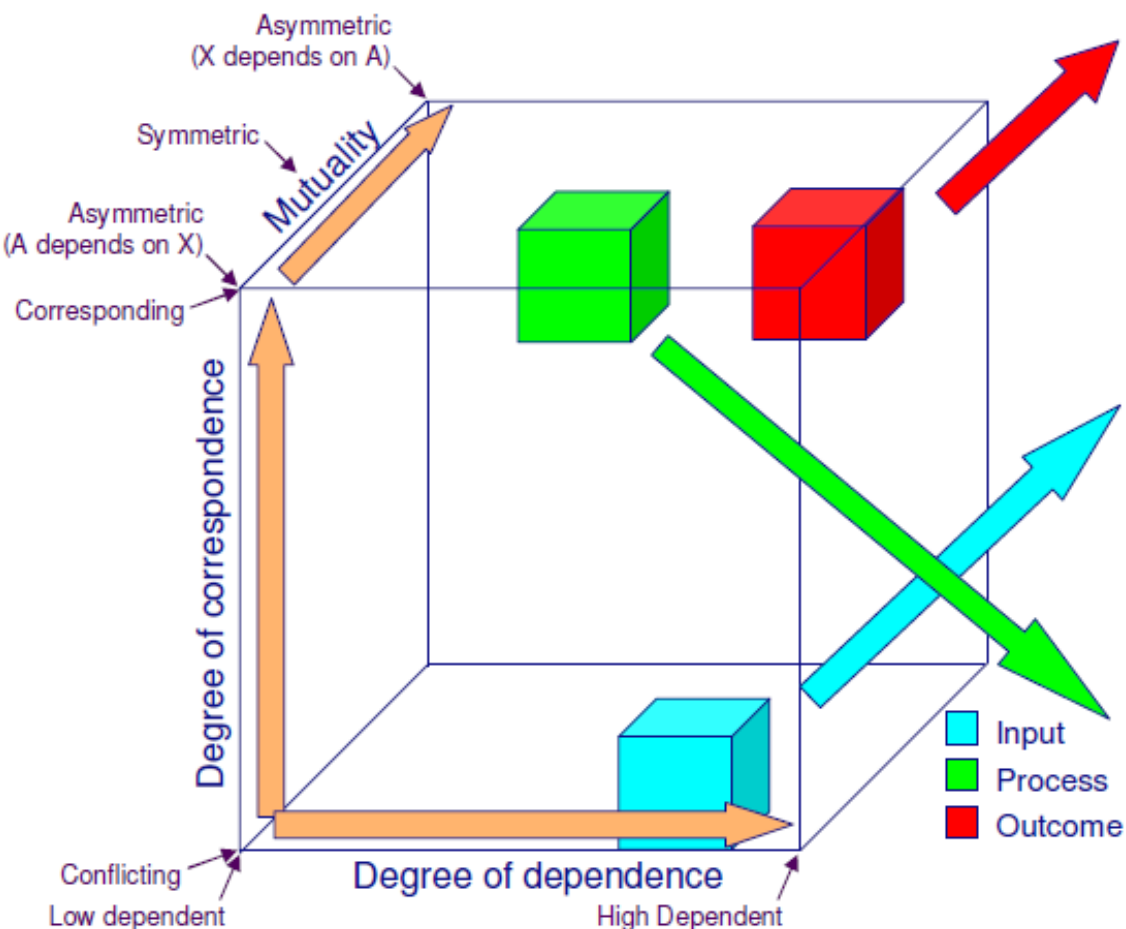**A Universe of Modular Business Services Allows Even Small Businesses and Start-ups to Become Globally Integrated**

Setup Your Resources	Build Your Product	Reach Your Customers	Service Your Customers	Support Your Business
Microsoft Office Live Essentials Beta	Alibaba.com — Global trade starts here	YAHOO! SMALL BUSINESS	RIGHT NOW TECHNOLOGIES	QuickBooks
skype	amazon web services	volusion	salesforce.com — Success On Demand	ADP Small Business Services
monster		RIGHT NOW TECHNOLOGIES	FULFILLMENT by amazon	PAYCHEX
BizFilings		salesforce.com — Success On Demand	IRONLINX	D&B Small Business Solutions
Google — Google Apps for Your Domain		Technorati	PayPal	EQUIFAX
		Microsoft	IBM	FREIGHT101.COM
				NETSUITE

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C2 That!

The Alberts and Hayes C2 Cube

The TNO Interdependence Cube

Asymmetric
(X depends on A)

Symmetric

Asymmetric
(A depends on X)

Corresponding

Mutuality

Degree of correspondence

Conflicting
Low dependent

Degree of dependence

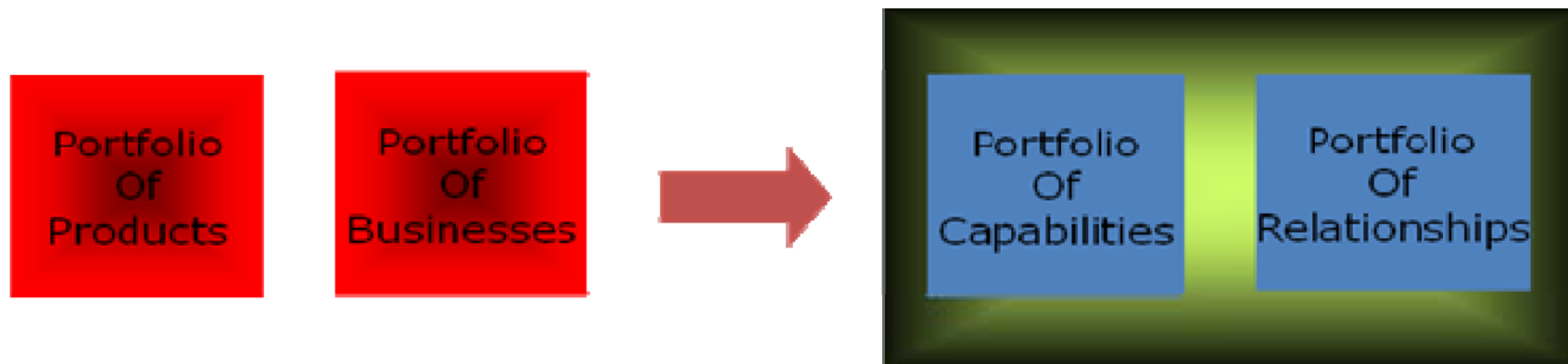High Dependent

Input
Process
Outcome

1. You are also highly dependent upon the other party for reaching your goal
2. The other party is equally dependent on you for reaching its' goals
3. Your goals and the other parties' goals are corresponding

1. You are highly dependent upon another party for certain resources
2. The other party needs these same resources too
3. The other party does not depend on you for resources

1. You have to interact to some extent with the other party to perform you mission
2. This is not conflicting with the activities of the other party
3. The other party also needs to interact with you to perform its' mission

C2 That!

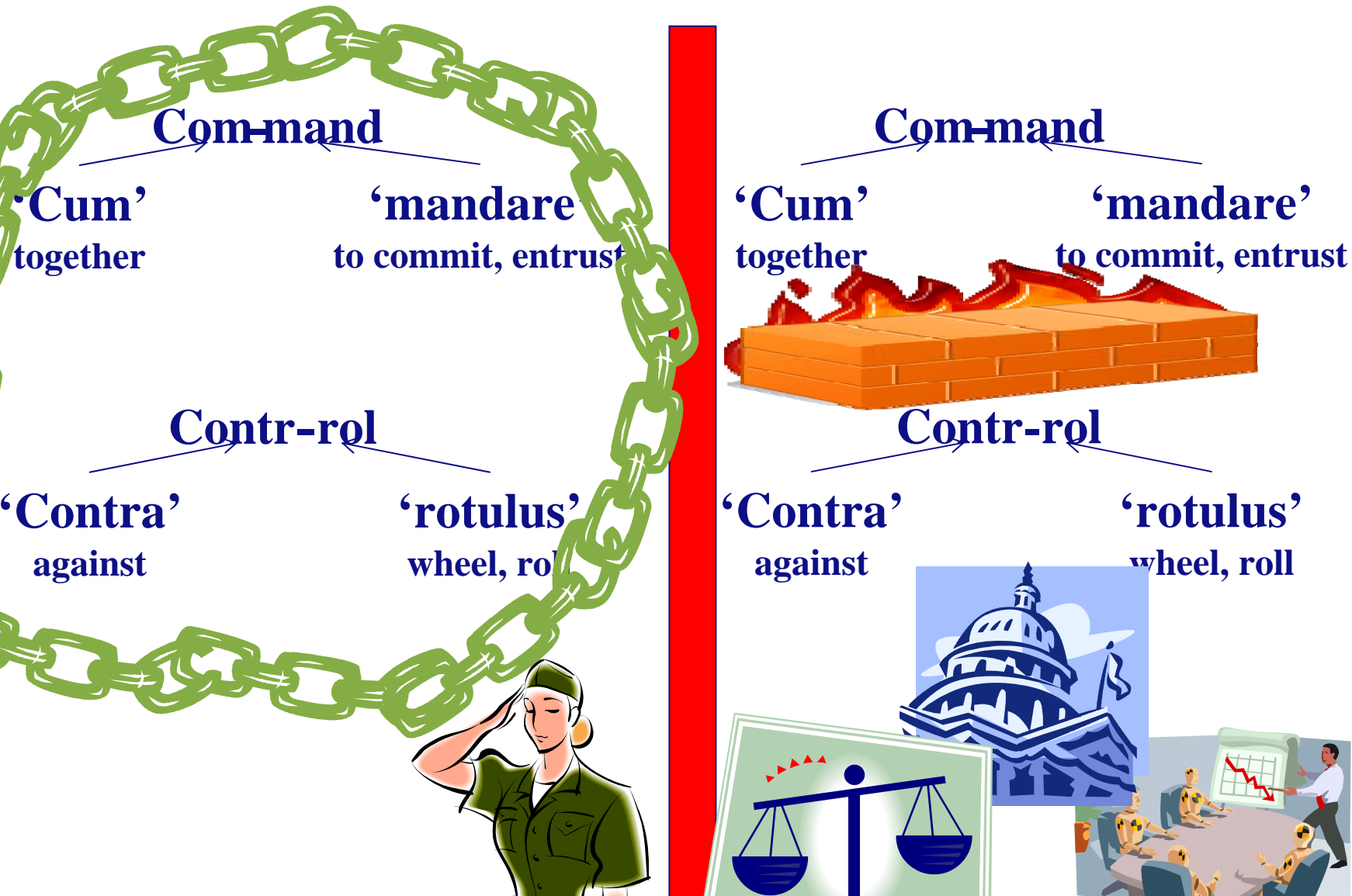| Portfolio Of Products | Portfolio Of Businesses | → | Portfolio Of Capabilities | Portfolio Of Relationships |

- Firm-centric
- Vertical Integration
- Ownership

- Network-centric
- Virtual Integration
- Relationships

Source: "Strategy 2.0: Winning in a Network Era"
Professor N. Venkatraman, Boston University, May 2007

Uncoupling Command and Control?

Com-mand

'Cum'

together

'mandare'

to commit, entrust

Contr-rol

'Contra'

against

'rotulus'

wheel, roll

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wheel, roll

Main takeaways (1/2)

- **Epochs matter** enormously to both armed forces and to C2 systems – in ways that cannot be fully anticipated.
- **'Armed forces' (/C2) today may look as different from their future instantiations as from their stone- age counterparts**
- The (forgotten) **etymological roots of command and control may be of some assistance in navigating the transition** from an industrial to a post-industrial age. They suggest :
  - ✓ a more consensual ('cum-mandare') and less directive form of command
  - ✓ a different view of control – more in line with the way control is conceived in other areas of public and private life ('contrarotulus').
- The broadening of the role of diverse partners in missions and the (societal) need for independent views on progress brings forward the requirement that the functions of **command and control may once again have to be segregated from each other** – as they are in many other walks of life.

Main takeaways (2/2)

- **from NEC 1.0** (using the physical technologies of the ICT-revolution to obtain desired security effects by enabling the same organization to do the same things better, faster, cheaper,…)
- **to NEC 2.0** (developing and applying new social technologies to obtain desired security effects by having transformed defense organizations do different things in a network (ecosystem) with other security-providers):
    - **Internally**, future armed forces may prove to be much **more 'modular' and 'loosely coupled'** than today's . This means command and control will have to adapt to this, and will have to find different ways to maintain collective alignment and commitment.
    - **Externally**, future armed forces may have to behave less like 'stars' and more like 'galaxies' with a wide variety of value chain partners that will not be subordinate to (and hence 'controllable' by) the defence organization. Exercising command and control over such a 'galaxy' will undoubtedly require other mechanisms – more likely to be based on relationships and contracts than on 'commands' as currently understood.