Australian Government
Department of Defence
Defence Science and
Technology Organisation

Integration:
Why do it?
What does it mean?

Simon Ng, Dan Hall, Ruth Gani, and Thea Clark
Integrated Capability Analysis Group
Defence Systems Analysis Division

10th ICCRTS - 22 June 2005

Rationale

Australian Government
Department of Defence
Defence Science and Technology Organisation

'[How] different elements of capability, and different capabilities themselves, work together are critical to the effective conduct of operations. We have therefore sought to consider how the elements of the ADF can best work together to provide an ***integrated set of capabilities.****' (Department of Defence, 2000)*

Why Integrate? (1)

Australian Government
Department of Defence
Defence Science and Technology Organisation

Integrate for Efficiency:

Example:

- Integration of training across the military services.
- Integration of government departments to reduce duplication.

Integrate to Coordinate:

Example:

- Integration of U.S. intelligence services under the director of the CIA in 1947.

Why Integrate? (2)

Australian Government
Department of Defence
Defence Science and Technology Organisation

Integrate for Control:

Example:

- Integration of R&D groups within companies.
- Integration of coalition units under a single commander.

Integrate to Expand Scale or Scope:

Example:

- Corporate mergers of like businesses (expansion of scale)
- Corporate mergers of different businesses (expansion of scope)

Why Integrate? (3)

Integrate to Innovate:

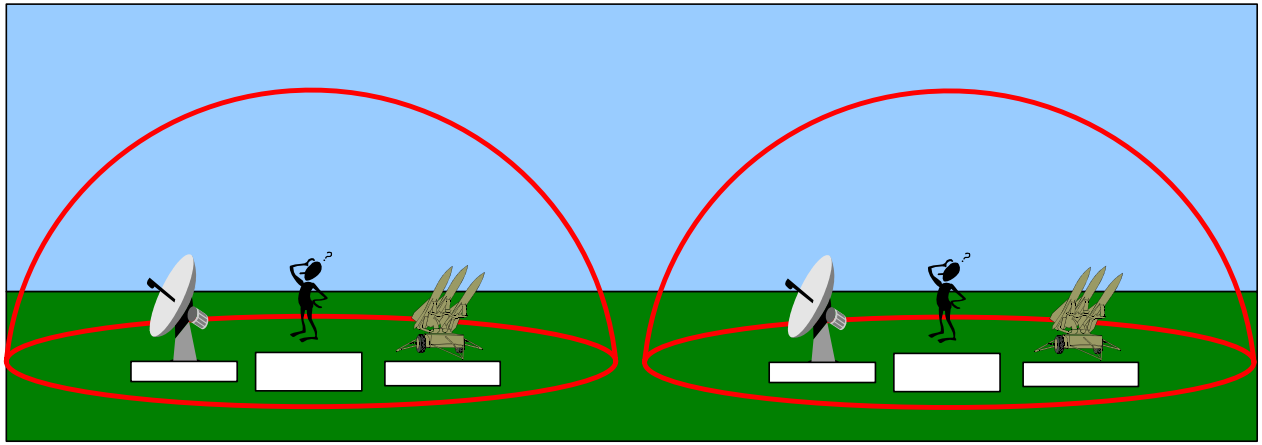
Example:

- Corporate partnerships to produce new products.
- Mission Capability Packages.

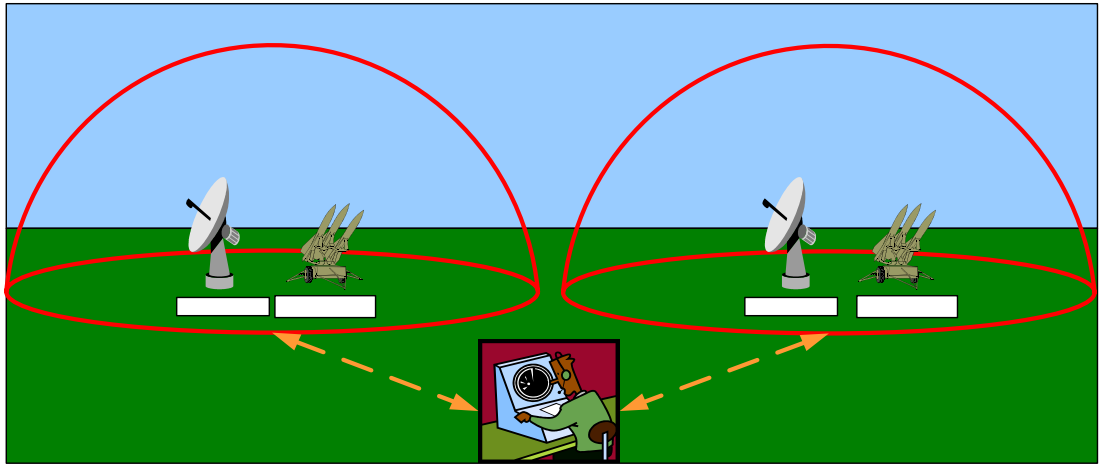
Case Study

Australian Government
Department of Defence
Defence Science and Technology Organisation

- ‘Non-integrated’ Air Defence



- ‘Integrated’ Air Defence



Why Integrate? (4)
Integrated Air Defence

Australian Government
Department of Defence
Defence Science and Technology Organisation

- Coordination ✓
- Control ✓
- Efficiency ?
- Scale & Scope ?
- Innovation ✗

What Is Integration? (1)

Australian Government
Department of Defence
Defence Science and Technology Organisation

Measuring Integration:

-Definitions generally allude to the *shared global function* of integrated systems as opposed to the *independent local functions* of non-integrated components.

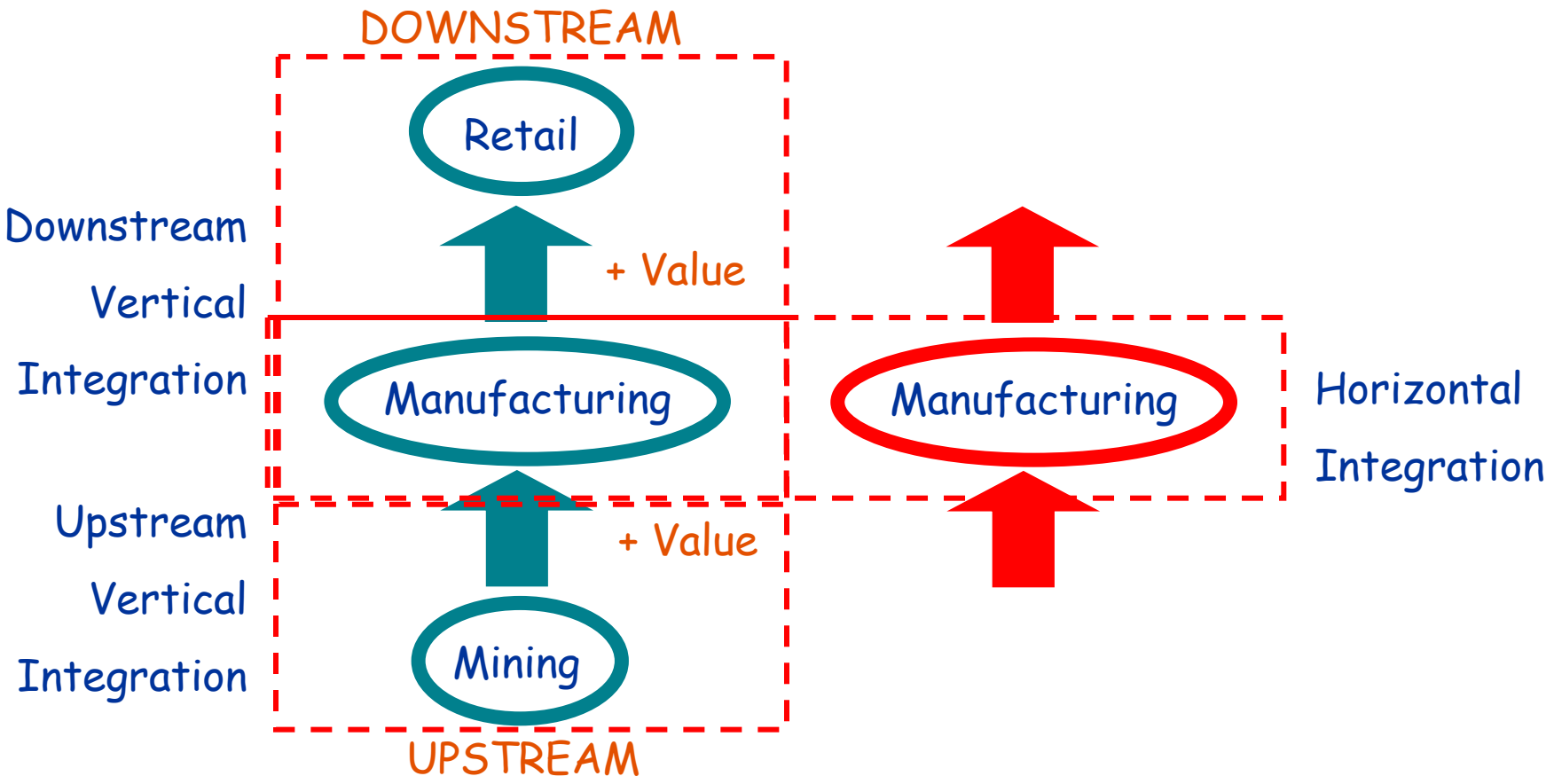
1. Loose vs. Tight coupling

- Tightly coupled components are dependent on the internal state of other components.

What Is Integration? (2)

Australian Government
Department of Defence
Defence Science and Technology Organisation

- **2. Vertical vs. Horizontal**



What Is Integration? (3)

Australian Government
Department of Defence
Defence Science and Technology Organisation

- **3. Linear vs. Complex interactions**
  - Technical Sytems (Linear Interactions)
  - Socio-Technical Systems (Complex Interactions)
- **4. Transient vs. Permanent association**
  - MCPs (transient)
  - Corporate Partnerships (transient)
  - Corporate Mergers (permanent)

What Is Integration? (4)
Integrated Air Defence

Australian Government
Department of Defence
Defence Science and Technology Organisation

- High level of global functionality
- Horizontal Integration
- Permanent rather than transient
- Linear rather than complex interactions

Integration Framework

Australian Government
Department of Defence
Defence Science and Technology Organisation

Mapping of Forms to Values:

VALUE	Direction		Attachment		Coupling		Interactions	
	vertical	*horizontal*	*transient*	*permanent*	*tight*	*loose*	*linear*	*complex*
Control	✓	-	-	✓	✓	✗	✓	✗
Coordination	-	✓	-	✓	-	-	-	✗
Scope or scale	-	✓	✓	✓	-	✓	-	✓
Efficiency	-	✓	✗	✓	-	✗	-	✓
Innovation	-	✓	✓	✗	✗	✓	✗	✓

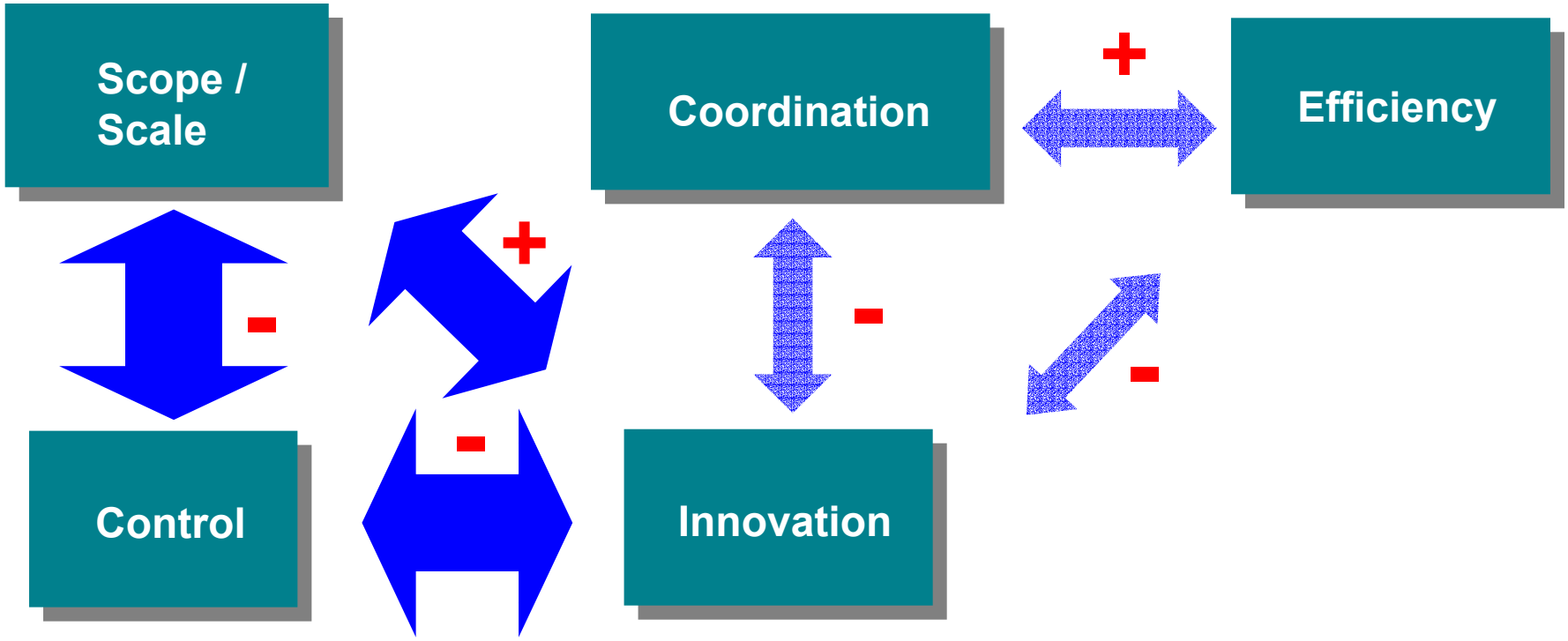
Integration Framework (2)

Australian Government
Department of Defence
Defence Science and Technology Organisation

	Values					
'Integration' models	Control	Coordination	Scale/Scope	Efficiency	Innovation	***All-round***
DvAtClIl	2	-1	2	-2	1	-
DvAtClIc	-1	-1	3	-1	3	-
DvAtCtIl	3	0	1	-1	-1	-
DvAtCtIc	1	-1	2	0	1	-
DvApClIl	2	1	2	0	-1	-
DvApClIc	0	0	3	1	1	yes
DvApCtIl	4	1	1	1	-3	-
DvApCtIc	2	0	2	2	-1	-

Implications from the Framework

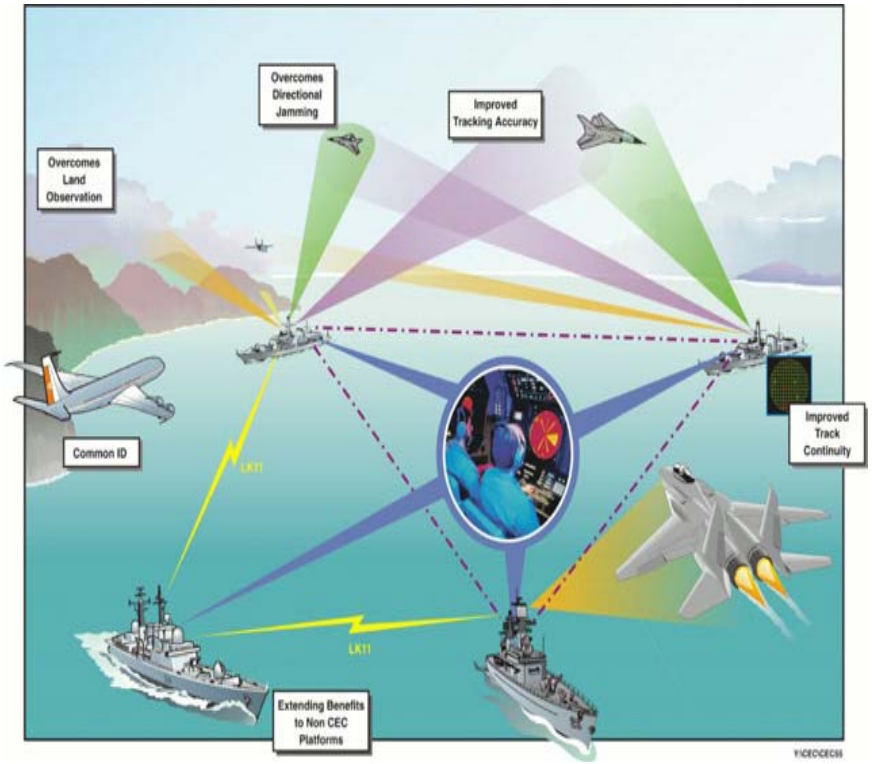
Australian Government
Department of Defence
Defence Science and Technology Organisation



Integrated Capabilities…

Australian Government
Department of Defence
Defence Science and
Technology Organisation

- What Model of Integration is most relevant for capabilities?
- What are the key tradeoffs?
- What models of integration are compatible with our future warfighting concepts?



Conclusion

Australian Government
Department of Defence
Defence Science and Technology Organisation

- Current understanding of Integration is somewhat intuitive.
- Formal framework for understanding integration:
  - Why do it – values / motivations.
  - What is it – forms.
- Best model for integrated capabilities?
- Future work?
  - Further validation of framework.
  - Measure of Integration for IC's.