MINISTRY OF DEFENCE

MOD Architectural Framework

White Paper on Strategic View 4 (StV-4): *Capability Clusters*

Version 1.0
3 March 2005

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Approved by:-

RECORD OF CHANGES

This page will be updated and re-issued with each amendment. It provides an authorisation for the amendment and a checklist to the current amendment number.

Issue No.	Date	Revision Details
Draft 0.1	27 October 2004	First draft for review
Draft 0.2	14 November 2004	Second draft incorporating new introduction and layout
Draft 0.3	22 December 2004	Fixed review comments, and added new MODAF data model excerpt. Changed name from "system of systems clusters"
Draft 0.4	11 January 2005	Changed following comments from review meeting on 5 Jan 05
Draft 0.5	21 January 2005	Data model excerpts removed for release
Draft 0.6	27 January 2005	Final revision prior to release
Version 1.0	3 March 2005	Updated to include linkage to MODAF meta model and finalised for publication

Introduction

The purpose of this paper is to describe the initial content and layout of the StV-4 view in a way which would allow peer review from stakeholders. With the exception of this section, the rest of the paper follows the layout of the DODAF volume II document. The intention is that this format will be retained and used in the final MODAF documentation, currently scheduled to be published July 2005.

The MOD Architectural Framework (MODAF) is being developed with the intention of providing a rigorous way to specify systems of systems, and is a key enabler to NEC[1]. The framework will predominantly be used for acquisition purposes, and a key driver for its adoption is the need to improve interoperability between systems. However, MODAF could equally well be used to analyse existing, operational systems and better enable their integration with other systems (both new and existing).

An architectural framework defines a set of key business and technical information for describing a system of systems architecture. The purpose of an architectural framework is to define the operational context (organizations, locations, processes, information flows, etc.), the system architecture (interfaces, data specifications, protocols, etc.), and the supporting standards and documents that are necessary to describe the system of systems. The information presented in an architectural framework is split into logical groupings – usually known as views. The same system and business elements may be present in more than one view, but the purpose of each view is different and so each provides a different viewpoint on the information.

The most mature and widely adopted architectural framework in the defence industry is the US DoD Architectural Framework (DoDAF). This framework has its origins in the C4ISR community and is seen as a fundamental part of the DoD's drive towards Network Centric Warfare. The MODAF is to be based on the DoDAF specification, and will use many of the aspects of DoDAF without alteration. MODAF will also add a number of new views needed to support MOD-specific processes and structures. In addition, other views will be modified, based on lessons learned by users of DoDAF.

The *Capability Cluster* view is one of the new strategic views (StV-4) which MODAF adds to the base DODAF standard. The purpose of the StV-4 view is to provide a high level view of how the systems of interest are interrelated. The idea is that this view provides a general way of describing the relationships between the different elements of the capabilities, and the groupings of those elements. This view differs from the SV1&2 views in that the elements represented in an StV-4 view do not necessarily map to individual systems or equipment items. Rather, the relationships and grouping of elements described in an StV-4 view provide a way of analysing the dependencies between capabilities. These capabilities may be satisfied by one or more systems.

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[1] CM(IS) NEC Next Steps paper of April 2003

Capability Clusters (StV-4)

Capability Clusters (StV-4) – Product Description

Product Definition – The *Capability Clusters (StV-4)* view describes the relationships between capability elements. It also defines logical groupings of capability elements.

Product Purpose – The StV-4 view is intended to provide a means for analysing the dependencies between capability elements. The groupings of capability elements are logical, and the purpose of the groupings is to guide acquisition – the dependencies and clusters may suggest appropriate liaisons between acquisition projects.

Product Detailed Description – An StV-4 view shows the capability elements which are of interest to the architecture. It groups those elements into logical groupings ("clusters"), based on the need for those elements to be integrated. These clusters serve to inform the acquisition process and the StV-3[2] Capability Phasing view.

The elements in an StV-4 view are not intended to represent individual systems or items of equipment – a capability may be satisfied by a group of systems, and an individual system can satisfy more than one capability (see StV-5[3] Capability to Systems Deployment Mapping). Rather, the capability elements in an StV-4 view are elements of functionality elements defined by the capabilities under analysis.

The preferred approach for describing an StV-4 view is graphical, and there are a number of potential approaches. Since the elements in an StV-4 view are essentially functional – i.e. they describe a required capability – the graphical notation is derived from the functional domain of systems engineering. The mandated notation is a functional dependency diagram which shows how functions are clustered together and the relationships between the individual functions or clusters of functions. An example functional dependency diagram is show in Figure 1 (and a UML variant is shown in Figure 3). It may also be useful to supplement the functional dependency diagram with a functional n-squared diagram– see Figure 2.

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[2] Document reference: MODAF-M07-003
[3] Document reference: MODAF-M07-005
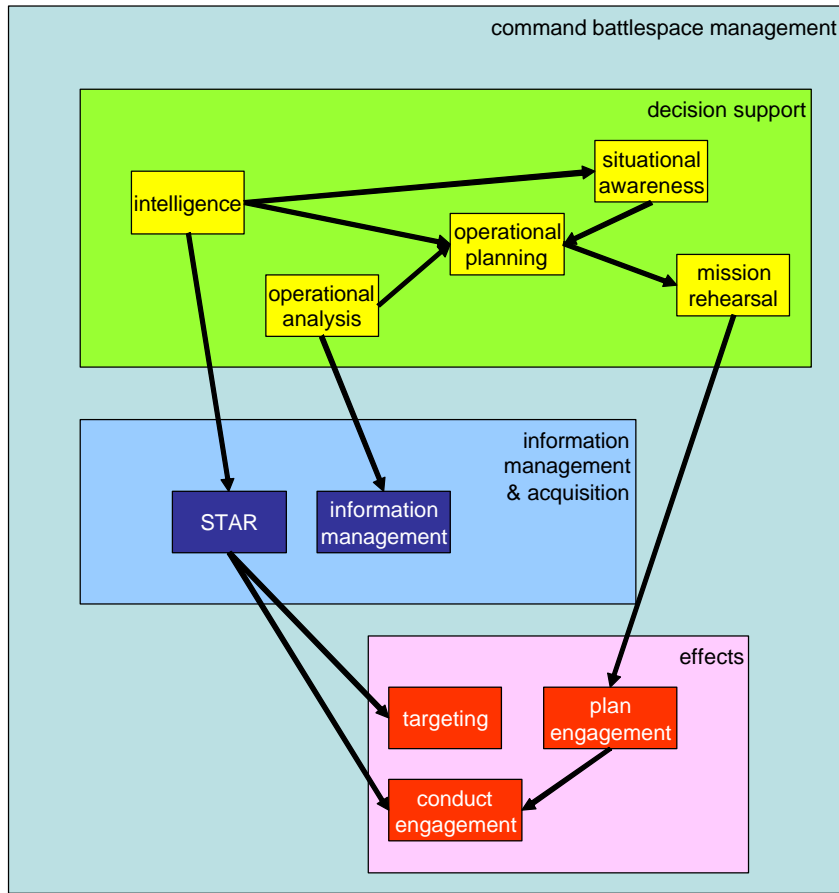
Figure 1 – Functional Dependency Diagram

	A	B	C	D	E	F	G	H	I	J
A										
B										
C	X	X		X						
D	X									
E			X							
F	X									
G		X								
H						X				
I					X					
J						X			X	

A = Intelligence   B = Operational Analysis C = Operational Planning
D = Situational Awareness E = Mission Rehearsal F = STAR
G = Information Management H = Targeting I = Plan Engagement
J = Conduct Engagement

Figure 2 – Functional N-Squared Diagram

Taxonomies

An MOD taxonomy will be developed to support MODAF, and will specialise the ERM data element definitions with terminology and classifications that support MOD business.

UML Representation

StV-4 views lend themselves well to UML representation. Capabilities are represented as stereotyped classes, with sub-capabilities contained within them (which may involve many levels of containment). Dependencies between capabilities are shown as stereotyped UML dependency relationships.
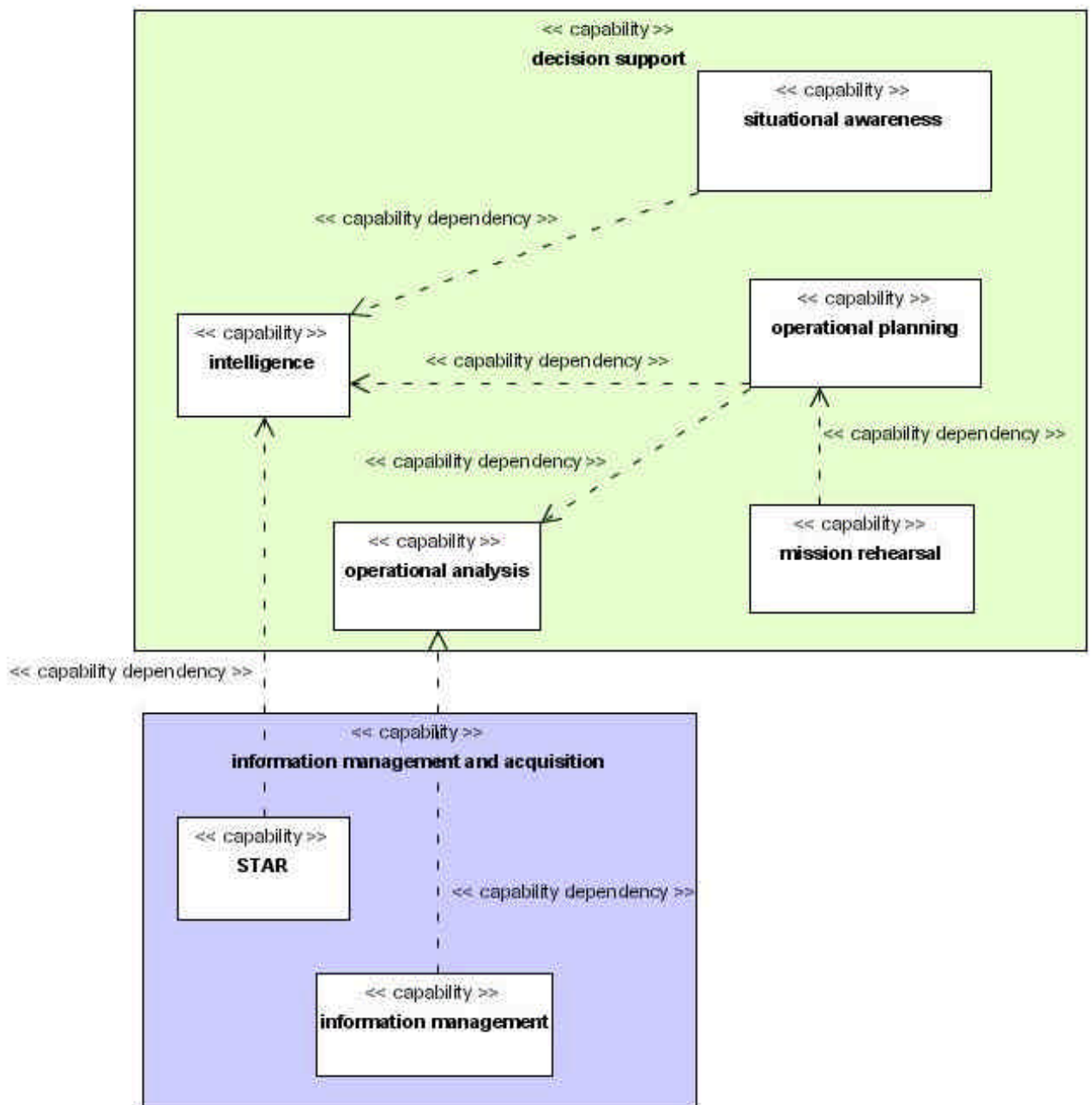
Figure 3 – UML Representation of StV-4

MODAF Meta-Model Support for StV-4

The MODAF Meta-Model defines a UML profile for exchanging information between MODAF tools using the XMI file format. For StV-4 the appropriate section of meta-model needed to exchange that view's information is shown in Figure 4. It should be noted that the classes shown for one view may be used in several other views.

The classes defined in the MODAF Meta-Model specify the allowable UML stereotypes that may be exchanged in an XMI file. As it is a meta-model, all relationships that feature in the view are also modelled as classes. Rather than define a class for every conceivable item that could appear in a view, the meta-model defines generic classes and allows references to the MODAF Taxonomy. For example, the MOD would be represented in XMI as an Organization stereotype, with a tagged value referring to the element in the taxonomy which says "Ministry of Defence".

For more information on the use of XMI in MODAF, refer to the document "XMI UML & MODAF", available from www.modaf.com
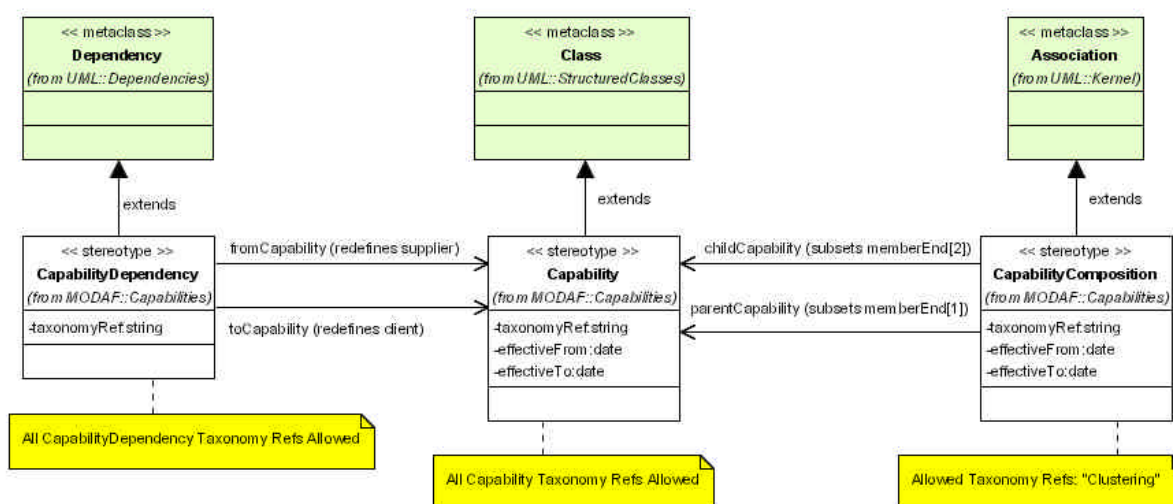

Figure 4 – MODAF Meta-Model Excerpt for StV-5

Model Element Definitions

Capability – A high level user requirement, usually functional.

CapabilityComposition – A parent-child relationship between two capabilities – i.e. the relationship indicates one capability (child) is a sub-capability of the other (parent). In StV-4, only "clustering" compositions are allowed.

CapabilityDependency – A relationship which asserts that a capability (toCapability) is dependent on another (fromCapability) capability.