Developing Coherent, Concise and Comprehensive User Requirements Using the MoD Architectural Framework (MODAF)

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Introduction – The Problem

- The Military is Good At Doing – Bad At Describing
- Unambiguous & Comprehensive v Clear & Digestible
- Unintended Constraints
- Insufficient Information To Support Future Decisions
- Difficult To Review Text Based User Requirements For Completeness And Coherence With An Increasingly Complex System Of Systems
Identify Capability Gap

Understand Scope

Understand ‘As Is’

Determine Desired ‘To Be’

Articulate ‘To Be’ in an Architecture

Develop URD

Analyse Coherence
Using Architecture to Inform URD

LE CBM Architecture

- Strategic / Capability
  - Capability Vision
  - Capability Functions
  - Capability Phasing
  - System of Systems
  - Capability to System Deployment Mapping

- OV-2 Orgs
- OV-5 Processes
- OV 7 Information
- SVs System Views

Explicit Business Knowledge

Part 1 is informed by Capability Views and other

Functional
- Process Based
- Info Exchange Based
- Derived

Non Functional
- LOD
- Training
- Equipment
- Personnel
- Information
- Doctrine & Concept
- Organisation
- Infrastructure
- Logistics
Using Architecture to Inform URD

PART 1

Process Models used to Derive Process User Requirements

Process Based
Info Exchange Based
Derived

Non Functional LOD

- Concepts & Doctrine
- Training
- Structures & Estates
- People
- Sustainability
- Usability
- Security
- Interoperability
Using Architecture to Inform URD

LE CBM Architecture

- Strategic / Capability
  - Capability Vision
  - Capability Functions
  - Capability Phasing
  - System of Systems
  - Capability to System Deployment Mapping

- Measures of Performance

URD

- PART 1
- PART 3

Architecture used to guide Information use context

- Info Exchange Based
- Information & data models used to derive Information URs

LOD

- Concepts & Doctrine
- Training
- Structures & Estates
- People
- Sustainability
- Usability
- Security
- Interoperability
Using Architecture to Inform URD

LE CBM Architecture

Strategic / Capability
- Capability Vision
- Capability Functions
- Capability Phasing
- System of Systems
- Capability to System
- Deployment Mapping

OV-2 Orgs

OV-5 Processes

OV 7 Information

SVs System Views

Measures of Performance

Process Based
Info Exchange Based
Derived

Derived URs support Process URs

Architecture Informs nature of Derived URs

Concepts & Doctrine
Training
Structures & Estates
People
Sustainability
Usability
Security
Interoperability

Need Articulated by

PART 1
PART 3

URD
Using Architecture to Inform URD

LE CBM Architecture

- Strategic / Capability
  - Capability Vision
  - Capability Functions
  - Capability Phasing
  - System of Systems
  - Capability to System Deployment Mapping

OV-2 Orgs
OV-5 Processes
OV 7 Information
SVs System Views

 Measures of Performance

URD

PART 1

PART 3

Functional
- Process Based
- Info Exchange Based
- Derived

Non Functional
- LOD
  - Concepts & Doctrine
  - Training
  - Structures & Estates
  - People
  - Sustainability

Usability
Security
Interoperability

Need Articulated by

EE
x
x
x

x
x
x
x

x
x
x
x
x
x
x
x

Using MODAF to Construct the URD

OV-2 Organisation Views

StV 1-5 Strategic Views

OV-5 Processes

SV 1-5 System Views

3.4 Conduct Threat Analysis

3.1 Conduct Int Estimate

3.2 Collect Ref Data

Project X

Done By:
Inf Bn
Div HQ

3.5 Conduct Mission Planning

Title

User Ability

Context

EE

Owner

Justification

Verification

Conduct Threat Analysis

The user shall be able to . . .

Threat analysis is required in order to . . .

Stretch: abc
Plan: xyz
Now: Not done

Div HQ
Supported by .

OV-5 3.4 Mission planning will be incomplete and . . . Without it

Bde level field exercise

Whole MODAF Informs

Copied Into

Expanded Into

Owners Derived

Reference Copied Into

XV-Requirements

Using MODAF to Construct the URD
So What?

- Improved Articulation of the Requirement
  - Communicate the Intended Meaning and Provenance
  - Communicate the Context of each Requirement
  - Inform the Requirement Trading Process
  - Reduce UNINTENDED constraints
  - Understand the impact of business changes on projects under development

- Enables Analysis of URs based on complex relationships – Requirements Coherence Analysis Tool (RCAT)
Complex Relationships

OV - 2

Collate Intelligence Reports

is performed by

is dependant on

is informed by

OV - 5

Brigade G2

is performed by

is dependant on

is informed by

XV - Req

The User Shall Be Able To Collate Intelligence Reports

is dependant on

is performed by the same organisation as

The User Shall Be Able To Analyse Intelligence Reports
Sources and Types of Relationships

- **Sources**
  - Relationships articulated in the architecture
  - Relationships derived by RCAT analysis
  - Relationships derived (and implemented) in the architecture

- **Types**
  - Encapsulation
  - Dependency
  - Reference:
    - A requirement is derived from . . . (one to one)
    - A requirement is informed by . . . (many to one)
The British Army’s Requirement Engineering Tools

- MooD Transformation Toolset
- MooD Instantiation of the Defence Architecture Solution (MIDAS)
- Land Environment Command and Battlespace Management Architecture
- Requirement Coherence Analysis Tool
Types of Analysis – Thread Analysis

In Model: OV-5

Activity A → Activity D → Activity E → Activity R

URD Alpha

User Req 1 → User Req 3 → User Req 2 → User Req 4

Alert: UR 1 Priority May need to be raised to Key

Priority

Key

One

Two

Display Time

1.0 min

1.2 min

0.2 min

2.0 min

0.8 min

Alert: Time exceeds preset limit

Cumulative Time
Create and Analyse a Single URD

**User Requirement Document**

**Architecture Models**

**Semantic and Lexicon Language Analysis**

**Thread Analysis**

**In model: OV-5**

<table>
<thead>
<tr>
<th>Activity</th>
<th>User Req 1</th>
<th>User Req 2</th>
<th>User Req 3</th>
<th>User Req 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**URD Alpha**

**Priority**

- User Req 1: High
- User Req 2: High
- User Req 3: Medium
- User Req 4: Low

**Display Time**

- User Req 1: 1.0 min
- User Req 2: 1.2 min
- User Req 3: 0.8 min
- User Req 4: 2.0 min
The user shall be able to...

The user shall be able to...

Must: display time
Stretched display
Now: display time...

Must: display time
Stretched display
Now: display time...

Activity A
Activity D
Activity E
Activity R

User Req 1
User Req 3
User Req 4

User Req 2

User Req 5
User Req 7

Priority
One
Two
One

Key

Display Time
1.0 min
1.2 min
2.0 min
0.2 min
0.8 min

Analyse Coherence Against Existing URDs
Summary

- Requirements Derived from, referenced to and stored in MODAF

- Comprehensive Coverage That is Understandable by Users and Industry

- Coherence Analysis of URs based on complex relationships expressed in an Architecture