Land Battlespace Communications

Interdisciplinary Framework for Architecture and Engineering Development of Land Battlespace Communications

by Dr Mansoor Syed

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   - ICT Perspective
   - Organisational Perspective/ Dilemma
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2. BCS(L) Interdisciplinary Development Framework
   - Purpose, Scope, and Key Risks
   - Development Methodology
   - Development Process and Deliverables
   - Development Key Building Blocks
   - Product (End State) Realisation
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1. Project JP2072 is required to provide an integrated Battlespace Communications System (Land) (BCS(L)).

2. BCS(L) collectively represents a System-of-Communications systems providing Voice, Data and Video services in Deployed Land Battlespace.

3. BCS(L) is delivered in predefined nodal construct in mounted and dismounted configuration.

4. BCS(L) interfaces with User Applications, Platforms (Land, Maritime, Air), Strategic Networks, Joint and Coalition Networks, Public Information Networks, Defence Information Networks, to name a few.

5. The System and Communications systems are required to be specified, verified and repeatedly delivered in nodal construct. Typically, ASDEFCON Complex 2 or higher, EIA-632 Systems Engineering process and Regulatory Framework TRAMM-L are applicable.
1. BCS(L) manifests itself in a Deployable Communications Network Infrastructure that will enable discrete Information Capabilities in the Land Battlespace environment.

The diagram is an Australianised version of the Future Combat Systems (FCS) Brigade Combat Team (BCT) Network diagram described on http://en.wikipedia.org/wiki/FCS_Network

2. The Deployable Communications Network Infrastructure is built upon Communications, Network and Applications layers to enable Secured Information Services for the Users.

3. The Deployable Communications Network collectively represents Network-of-Networks formed by nodes. The networks are to be planned, managed and supported to enable required Information Services.

4. The Network interfaces with Strategic Networks, Joint and Coalition Networks, Public Information Networks, Defence Information Networks, to name a few.

5. The Network is required to be developed using ICT Architecture discipline and mapped to higher architectures/ ICT guidance (NBA, BTIA, PIN, SIE). Typically, DoDAF development process and ITIL are applicable. No Regulatory Framework.
1. Land Communications Development Problem Space

1.3 Organisational Perspective/ Dilemma

**BCS(L) Architecture, Capability and Engineering Ownership Outlook**

**BCS(L) REFERENCE ARCHITECTURE (ENTERPRISE, INFORMATION, SECURITY)**

**BCS(L) CAPABILITY SYSTEM – DEFENCE WIDE**

**JP2072 Area of Influence**

**Legend**

- CDG: Capability Manager Ownership
- DMO: JP2072 Ownership
- PSI: JP2072 Ownership for Development & Configuration Management

Notes:

1. The diagram is conceptual only. The timeline is not exact.
2. The BCS(L) Prime System is an Evolving Construct made of discrete acquisitions from JP2072 Phases.
3. The PSI is responsible for the interfaces of the BCS(L) Prime System with other materiel systems contributing to and/or part of BCS(L) Defence - wide.
1. The System-of Systems / Network-of-Networks must be defined, specified, verified, and delivered through a recognisable engineering process to ensure repeatable outcome, ready for Technical Certification under TRAMM-L.

2. Engineering development could not be carried out only on the basis of typical Systems Engineering. The ICT discipline must be embraced.

3. Processes, artefacts and outcome from traditional Systems Engineering and ICT Architecture approaches need to be woven to guide the development process.

4. BCS(L) must, and has, embraced the shift from development of traditional military Communications System to enduring and agile Communications Network Infrastructure that enables Information Services in the Land Battlespace.

5. BCS(L) networks are to be built upon open interfaces allowing Communications, Networking and Applications layers to be developed independent of each other. An interface architecture needs to be developed.
Purpose:
- To define and develop *deployable Communications Network Infrastructure*, that will enable discrete Information Capabilities in the Land battlespace environment.

Scope (Current):
- Defence wide BCS(L) Reference Architecture (Business Architecture)
- JP2072 wide BCS(L) Solution Architecture (Vendor Independent Solution)
- JP2072 wide BCS(L) System Architecture (System and Operational Behaviour)
- JP2072 wide BCS(L) Physical Architecture (Network System Design)
- JP2072 wide BCS(L) Product Architecture (Recommended Product List)

Key Risks:
- Unspecified end state
- Legitimisation of children born before parents
- Evolving BCS(L) Materiel System acquired through various vendors
- System-of-systems integration (processes, data, materiel systems)
- Legacy and existing systems integration, phase-out and obsolescence
- Capability interfaces (over 80 projects) and System interfaces
- Technology evolution, and
- Most importantly *System/ Network qualification*
2. BCS(L) - Interdisciplinary Development Approach

2.2 Development Methodology

- BCS(L) Development is achieved through an interdisciplinary approach involving Architecture, CDD, Systems Engineering and Communications Engineering as applied to development of ICT systems, Communications systems, and large scale Defence systems.

- Standards and Tools: (DoDAF-V2.02, WSAF, EIA 632) using (System Architect, CORE and DOORS)

- Development Stage 1 is comprised of development and alignment of:
  - Business Reference Architecture (Capabilities – Activities – Business Services)
  - Capability Interface Definition (Capability System Interfaces, 8/80 projects)
  - Capability Definition (Integrated OCD/FPS/TCD)

- Development Stage 2 is comprised of development and alignment of:
  - Solution Architecture (Tech Services – Vendor Independent Solution Patterns)
  - System Architecture (System Services – Behaviour Patterns - Functional Systems)
  - System Specifications (SSS, IRS, SSSPEC, HMISPEC)

- Development Stage 3 is comprised of development and alignment of:
  - Physical Architecture (Communications Network System Design)
  - Product Architecture (Communications Products Recommendations/ Standardisation)
  - Technical/ Product Specifications / Recommended Product List
# BCS(L) - Interdisciplinary Development Approach

## Development Process & Deliverables (Arch & Eng)

### BCS(L) System Development Process – Definition Level Maturity

<table>
<thead>
<tr>
<th>Reference Architecture and Capability Definition</th>
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<td>BCS(L) Network Architecture Description</td>
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### Logical Solution for System of Systems (SoS)

- **Single Information Environment (SIE)**
- **Defence Architecture Engagement Framework**
- **Defence Corporate Architecture (DCA)**
- **Integrated Defence Architecture (iDA)**
- **Network Centric Warfare (NCW)**
- **Networked Battlespace Architecture (NBA-2020+)**

### System Solution for System of Systems (SoS)

- **Tactical Communication Network Specifications**
- **Integrated Battlefield Telecommunication Network (IBTN) Specifications**
- **Other Subsystems**
- **Requirements Allocation**

### Sub-system specification and design follows the same process as the SoS, for each sub-system specified in the BCS(L)
2. BCS(L) - Interdisciplinary Development Approach

2.3 Development Process & Deliverables (Architecture)
2. BCS(L) - Interdisciplinary Development Approach

2.3 Development Process (System Behaviour Analysis)
# BCS(L) - Interdisciplinary Development Approach

## Development Process (Entities & Layers Alignment)

### Higher Level Reference Architectures / Guidance/ Doctrine

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### References

- **Arch. Views**
  - Conceptual Information DIV-1
  - Logical Data DIV-2
  - Operational Information/Data Flows between Activity Nodes (OV-3)

- **Documentation**
  - Defence: Policy, Directives
  - BCS(L) Architecture Descriptions:
    - EAD, CAD, NAD, IAD, SecAD, CID

- **Logical Data (DIV-2)**
  - Physical Data (DIV-3)
  - Operational Information/Data Flows between Activity Nodes (OV-3)

- **Detailed Logical Data (DIV-2)**
  - Physical Data (DIV-3)
  - Detailed Data Flows from and into System (SV 2/6)
  - Detailed Data Flows between Services (SvC 2/6)

- **Data to Services definition**
  - (SvC 3/A/B)

- **Documentation**
  - CDG: CDD (OCDD / OCD)
  - AHQ: CONOPS, others
  - BCS(L) Architecture Descriptions:
    - EAD, CAD, NAD, IAD, SecAD, CID
  - BCS(L) Eng Descriptions:
    - MSDD, IDD, NEMDD, CNDD, NSMDD, HMDD, SECDD, etc
2. BCS(L) - Interdisciplinary Development Approach

2.4 Development Key Building Blocks

1. Business Services / Operational Needs
2. Vendor Independent Solution Patterns (Tech Services + Activities + Systems)
3. Capability Definition Documents (OCD, TCD, FPS)
4. System Definition Descriptions (Solution Patterns + FPS Requirements/ Tech Services)
5. System Specifications (SSS, IRS, HMISPEC, SSSPEC)
6. System Functional Analysis /Behaviour
7. System Configuration Items development
8. System Design Descriptions (Communications Network Design)
9. Technical/Product Specifications
10. System T&E artefacts
11. Technical Data
12. System Design Acceptance and Technical Certification under TRAMM-L
2. BCS(L) - Interdisciplinary Development Approach
2.5 Product (End State) Realisation

- Mission Simulation System (MSS)
- Mission Reference System (MRS)
- Battlespace Communications Support Centre (BCSC)
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2.5 Process Control

**DEFINE**
- Reference Architecture
- Capability Definition
- System Definition

**SPECIFY**
- Solution Architecture
- System Architecture
- System Specifications

**DESIGN/DEVELOP**
- Physical Architecture/Sys Design
- Product Architecture/Standards
- Tech Specifications

**INTEGRATE/IMPLEMENT**
- Intersystem Test
- Integration Test
- Install. Specifications

**T&E**
- System Test
- Acceptance Test
- Operational Test

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**LEGEND**

- CDR - Capability Definition Review
- SDR - System Definition Review
- PDR - Preliminary Design Review
- DDR - Detail Design Review
- TRR - Test Readiness Review
- CCB – Configuration Control Board
- DA – Design Acceptance
- TC – Technical Certification

Note: Each Engineering Review/Gate is preceded with an Architecture Review
Questions