AUSTRALIAN LAND DATA MODEL

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Scope

• The Problem – Need for AS LDM.

• What / Where is AS LDM?

• What / Where is DDS?

• How can I write apps for Army using AS LDM and DDS?

• Has anyone written apps using AS LDM?

• What is the AS LDM Governance lifecycle?
The Problem – Need for LDM
Army

AS Combat Vehicle

(Military-today.com, 2017)
Army AS Combat Vehicle

- Collection of components (sensors, weapons, effectors etc)
- Interlinked through a communications network

HTTPS://WWW.SLIDESHARE.NET/VIKAS27OCT/CONTROLLED-AREA-NETWORKBASICLEVEL
(https://www.slideshare.net/vikas27oct/controlled-area-networkbasiclevel, 2017)
AS Combat Vehicle

LAVOSAR NATO GVA - THINK DEFENCE

(Think Defence, 2017)


UNCLASSIFIED
ENTERPRISE SERVICE BUS
For seamless information exchange we need

- Common communication language – Land Data Model (LDM)
- Common communication medium – Data Distribution Service (DDS)
AS Combat Vehicle

LAVOSAR NATO GVA - THINK DEFENCE


UNCLASSIFIED
What / Where is LDM?
• What is AS LDM

  – Definition of open software interfaces
  – Defines message types for information exchange in an AS GVA vehicle
  – Derived from UK GVA DM
  – Logical and technical representations
GVA AS LDM

• AS LDM Modules

- Acoustic Gunshot Detection System
- Alarms
- Arbitration
- Automatic Weapon
- Brakes
- Engine
- Environmental Control
- HMI Input Devices
- HMI Presentation
- Laser Range Finder
- Laser Warning System
- Meteorological Sensor
- Mount
- Navigation Reference
- Power
- Routes
- Sensor Data Fusion
- Single Shot Grenade Launcher Array
- Tactical Effector
- Tactical Sensor
- Transmission
- Usage and Condition Monitoring
- Vehicle Configuration
- Video
- Video Tracking
• Logical Representation
  – LNIC logical modelling tool – IBM Rational Rhapsody
  – Modelled in Unified Modelling Language (UML) 2.0
  – UML class, sequence and use case diagrams

• Technical Representation
  – Interface Definition Language (IDL) from OMG
• Logical Representation – Acoustic Gunshot Detection
### Class Definitions – Acoustic Gunshot Detection

**Acoustic_Gunshot_Detection**

*This defines the specific information to an acoustic gunshot detection.*

<table>
<thead>
<tr>
<th>Association Ends:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>sourceEquipment</strong></td>
</tr>
<tr>
<td><em>The equipment that issued the detection.</em></td>
</tr>
<tr>
<td>Association with Acoustic_Gunshot_Detection_System, Multiplicity of 1, Bi-directional, Navigable</td>
</tr>
</tbody>
</table>

**Superclasses:**
- Detection
- Public

**Attributes:**
- **calibre**
  *This contains the identified caliber of a detected shot.*
  Type of Double, Public, Multiplicity of 1
- **calibreIdentified**
  *If TRUE, indicates that the calibre of the detected shot has been identified.*
  *If FALSE, the value in the "calibre" field is invalid.*
  Type of Boolean, Public, Multiplicity of 1
- **machWaveDate**
  *The date when the mach wave has been detected.*
  *Only relevant if a mach wave has been detected.*
  Type of DateTimeType, Public, Multiplicity of 1
- **machWaveDetected**
  *If TRUE, indicates that a mach wave has been detected.*
  Type of Boolean, Public, Multiplicity of 1
- **muzzleWaveDate**
  *The date when the muzzle wave has been detected.*
  *Only relevant if a muzzle wave has been detected.*
  Type of DateTimeType, Public, Multiplicity of 1
• Use Cases – Acoustic Gunshot Detection
Sequence operational context:
An acoustic gunshot detection system detects a sound and informs the whole system about this situation.

Sequence starting point:
The acoustic gunshot detection system detects the sound

Notes:
- The way the data published by the Acoustic Gunshot Detection System service is used by other system resources is out of scope of the Acoustic Gunshot Detection System domain data model. Data flows are only shown on this diagram if they represent milestones/triggers from the point of view of the whole sequence.
- The internal functions performed by the Acoustic Gunshot Detection System service or any other represented role is out of scope of the Acoustic Gunshot Detection System domain data model.
- This diagram addresses the following roles:
  - The Acoustic Gunshot Detection System management service,
  - A generic Platform Resource (whose actual implementation in terms of domain(s) is out of scope of the Acoustic Gunshot Detection System domain data model), that monitors the detections issued by the acoustic gunshot detection system.
Technical – Acoustic Gunshot Detection

```c
#include "LDM_Common.idl"

// This package defines
// - data produced by sound detector systems and intended to be shared with other subsystems,
// - commands exposed by sound detector systems and expected to be called by other subsystems.

module P_Acoustic_Gunshot_Detection_System_PSM {

tenor T_Acoustic_Gunshot_Detection_System_StateType {
    L_Acoustic_Gunshot_Detection_System_StateType_BLANKING,
    L_Acoustic_Gunshot_Detection_System_StateType_ENABLED,
    L_Acoustic_Gunshot_Detection_System_StateType_terminationState_0
};

// This describes the specific information to an acoustic gunshot detection.
//
// struct C_Acoustic_Gunshot_Detection {
//    P_LDM_Common::T_IdentifierType A_sourceID; //@key
//    P_LDM_Common::T_DateTimeType A_timeOfDataGeneration;
//    P_LDM_Common::T_Boolean A_machWaveDetected;
//    P_LDM_Common::T_Boolean A_muzzleWaveDetected;
//    P_LDM_Common::T_Double A_calibre;
//    P_LDM_Common::T_Boolean A_calibreIdentified;
//    P_LDM_Common::T_DateTimeType A_machWaveDate;
//    P_LDM_Common::T_DateTimeType A_muzzleWaveDate;
//    P_LDM_Common::T_IdentifierType A_sourceEquipment_sourceID;
//    P_LDM_Common::T_IdentifierType A_Tactical_Sensor_Detection_sourceID;
//};

// This describes the static capabilities of an acoustic gunshot detection system.
//
// struct C_Acoustic_Gunshot_Detection_System_Specification {
//    P_LDM_Common::T_IdentifierType A_sourceID; //@key
//    P_LDM_Common::T_DateTimeType A_timeOfDataGeneration;
//    P_LDM_Common::T_Boolean A_isMinimumDetectionRangeSupported;
//    P_LDM_Common::T_Boolean A_isSetMinimumDetectionRangeSupported;
//    sequence <P_LDM_Common::T_IdentifierType> A_specifiedAcousticGunshotDetectionSystems_sourceID;
//};
```
Does an open AS LDM degrade cyber security? No, because

- If an adversary can access a tactical combat vehicle network – BIGGER PROBLEMS!!!!!
- Very easy to reverse engineer proprietary data models / message types
- Open & Transparent systems -> More eyes to identify and fix vulnerabilities (Linux)
- Varied degrees of openness amongst LDM modules
- LDM security architecture is platform specific and not published on the public domain
- Not all interfaces are published
- Easy to identify deviation from data/message types, resource consumption and production
• LDM is awesome – where is it?

  – Currently hosted on Govdex ([www.govdex.gov.au](http://www.govdex.gov.au))

  – Email access request to [asgva.office@defence.gov.au](mailto:asgva.office@defence.gov.au)

  – Video (1) – Download AS LDM
What / Where is DDS?
Software Systems Integration Types

- File Transfer
- Shared Database
- Remote Procedure Invocation
- Messaging
  - Point to Point (Request / Reply)
  - Publish / Subscribe
• Software Systems Integration Types¹
  – File Transfer
  – Shared Database
  – Remote Procedure Invocation
  – Messaging
    • Point to Point (Request / Reply)
    • Publish / Subscribe

• Need a common ‘System Event Bus’

AS Combat Vehicle

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• Video (2) – What is DDS?

• Which DDS IDLs does Australian Army provide?
  
  • Open Source / Community (free) – OpenSplice
  
  • Proprietary – RTI, Adlink (PrismTech)
Video (3) – How can I write apps using LDM?
Has anyone written apps using AS LDM?
• **LNIC**
  
  – Emulators for various modules (GPS, AGDS, Alarms etc)
  
  – Compliance Assessment Test (CAT)
- Weapons Integrated BMS capability demo (Mar 18)
What is the LDM Governance Lifecycle?
Governance

• How / Who do I talk to someone in Army about LDM?

  – AS LDM Discussion Forum on Govdex - Video (4)

  – Email - asgva.office@defence.gov.au
Governance

• How do I request changes & flexibility to LDM?
  – Submit request through asgva.office@defence.gov.au
  – LNIC Internal technical analysis
  – Present to AS LDM Governance Board for approval
  – Upon approval, change request presented to UK GVA
    • If approved – new versions of UK LDM and AS LDM released
    • In not approved – Optional AS LDM entity will be created to maintain backwards compatibility with UK GVA
Summary

- For a combat system, AS LDM offers the following benefits
  - Agility to the war fighter
  - Dramatically lower development risk through
    - Transparency of systems design
    - Continuous design disclosure
    - Government, academia and industry peer reviews
  - Modular designs based on standards
  - Ease of technology insertion & system updates (Loose coupling)
  - Ensures competitive playing field for Australian startups, SMEs
AUS LAND DATA MODEL

THE SOLUTION TO ALL THE WORLD'S PROBLEMS
Questions

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