Transitioning UPDM to the Unified Architecture Framework

MC Hause (Mhause@PTC.com)
Agenda

• UAF Overview
• Smart City Example
• Security Views
PDM 3.0->UAFP 1.0

UML profile based

MODAF v1.2.004

MODEM

NAF v4.0

DoDAF 2.02

DNDAF

Other influences...

IDEAS based

MODAF

MODEM

DMM

NAF v4.0

DoDAF 2.02

Other influences...
<table>
<thead>
<tr>
<th>Metadata</th>
<th>Taxonomy Md-Tx</th>
<th>Structure Sr</th>
<th>Connectivity Cn</th>
<th>Processes Pr</th>
<th>States St</th>
<th>Interaction Scenarios Is</th>
<th>Information If</th>
<th>Parameters Pm</th>
<th>Constraints Ct</th>
<th>Roadmap Rm</th>
<th>Traceability Tr</th>
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</table>

Dictionary * Dc

Summary & Overview Sm-Ov

Requirements Req
Grid Overview

• Perspectives (Rows)
  – Metadata (Md)
  – Strategic (St)
  – Operational (Op)
  – Services (Sv)
  – Personnel (Pr)
  – Resources (Rs)
  – Security (Sc)
  – Projects (Pj)
  – Standards (Sd)
  – Actual Resources (Ar)
  – Dictionary (Dc)
  – Summary and Overview (SmOv)
  – Requirements (Rq)

• Representation (Columns)
  – Taxonomy (Tx)
  – Structure (Sr)
  – Connectivity (Cn)
  – Processes (Pr)
  – States (St)
  – Interactions Scenarios (Is)
  – Constraints (Ct)
  – Traceability (Tr)
  – Roadmap (Rm)

• Cross cutting concerns
  – Information (If)
  – Parameters (Pm)

• View Specifications exist at the intersections
<table>
<thead>
<tr>
<th>Metadata Md</th>
<th>Taxonomy Tx</th>
<th>Structure Sr</th>
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<th>States St</th>
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<th>Information If</th>
<th>Parameters Pm</th>
<th>Constraints Ct</th>
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<th>Traceability Tr</th>
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<td>CV-2 BDD</td>
<td>CV-1 IBD</td>
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</table>

**Dictionary**

*b* Dc (AV-2)

**Summary & Overview SmOv** (AV-1, OV-1 graphic)

**Requirements Rq**
Smart City Example
• 1. General Background

– The city of Autoville has just elected a new city council with a mandate to reduce traffic on the highways and thoroughfares.

– After receiving a grant of $200M from the federal government, they have decided to acquire a traffic management system to help them identify areas and times of high traffic density so they can take measures to alleviate the effects of it.

– The city of Autoville has 100 miles of highway with 10 interchanges and 300 miles of thoroughfares with 100 major intersections.

– Systems will include controlled parking facilities, availability monitoring and dissemination, emergency management, traffic control and prediction, and support for electric vehicles.
The system shall identify traffic levels on all highways and thoroughfares.

The system shall provide traffic data for intervals not greater than 1 mile for highways and ¼ mile for thoroughfares.

Satisfied by:
Rule(System) Sensor Spacing

Syntax: Req [Package] User Requirements [Diagram]
Operational Concept with Boxes
Operational Concept with Graphics
Traffic Management Use Cases and Stakeholders

- **Car Drivers**: Travel To Destination, Park Car, Recharge Car, Provide Funding
- **Electric Car Driver**: Travel To Destination, Park Car, Recharge Car
- **Highway Commission**: Provide Funding
- **City Government**: Control Room Operator
- **Public**: Provide Traffic Updates, Minimize Pollution
- **Environmental Protection Agency**: Maintain Roads
- **Road Maintenance**: Manage Traffic Events
- **Emergency Organizations**: Control Room Operator

**OV-1d [Whole Life Enterprise] Traffic Whole Life Enterprise [OV-1d]**
Capability Taxonomy with Implementing Resources

CV-2 [Architectural Description] Capabilities [CV-2 Resources]

- **Capability**
  - Calculate Traffic Levels
  - **exhibitingElement**
    - EnterprisePhase Traffic Architecture Phase1
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Flow Calculation SW

- **Capability**
  - Traffic Prediction
  - **exhibitingElement**
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Prediction SW

- **Capability**
  - Respond to Traffic Event
  - **exhibitingElement**
    - Software Emergency Services SW
    - EnterprisePhase Traffic Architecture Phase1
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Event SW

- **Capability**
  - Traffic Control
  - **exhibitingElement**
    - Performer (System) Control Center
    - Performer (System) Control Room
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Control SW
    - Performer (System) Traffic Display Board
    - Software Traffic Signal SW

- **Capability**
  - Coordination
  - **exhibitingElement**
    - Software Traffic Control SW
    - EnterprisePhase Traffic Architecture Phase1
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Control SW

- **Capability**
  - Traffic Surveillance
  - **exhibitingElement**
    - Software Sensor Processing SW
    - EnterprisePhase Traffic Architecture Phase1
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Display SW
    - System Traffic Sensor
    - System User Interface
    - System Video
    - Software Video Processing SW

- **Capability**
  - Traffic Reporting
  - **exhibitingElement**
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Report Generation SW

- **Capability**
  - Provide Traffic History
  - **exhibitingElement**
    - EnterprisePhase Traffic Architecture Phase2
    - Software Traffic Data Archive SW
### CV-3 Capability Phasing and System Deployment

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</table>
PV-2 Actual Project Timeline

[Architectural Description] Actual Projects [PV-2]

Phase 1 Surveillance (Traffic Management)
- 2012-01-02 00:00:00: Control Start
- 2012-03-01 00:00:00: Surveillance Inc
- 2012-05-01 00:00:00: Surveillance Dep

Phase 2 Traffic Control (Traffic Management)
- 2012-07-01 00:00:00: Control Start
- 2012-09-30 00:00:00: Control Inc

Traffic Management:
- Equipment
- Training
- Logistics
- Organization
- Not Applicable
- Complete
- Not Started
- In Progress
### SV-8 Systems Evolution Description

<table>
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<tr>
<th>Capability</th>
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<td>«Software» Traffic Data Archive SW</td>
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<td>«Software» Emergency Services SW</td>
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<td>«Materiel» User Interface</td>
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Operational Structure
# Interaction Summary (ICD)

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<td>CS - TC</td>
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<td>TP - TC</td>
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Traffic Management Systems
Personnel Competencies

SV-9/SvcV-9 [Architectural Description] Competencies [SV-9]

- **Traffic Management Architect**
  - **providedCompetence**
    - «Skill» Communicate Effectively
    - «Skill» Enterprise Architecture
    - «Skill» Manage Requirements

- **Traffic Management Project Manager**
  - **providedCompetence**
    - «Skill» Manage People
    - «Skill» Manage Projects
    - «Skill» Communicate Effectively
    - «Skill» Manage Budget

- **City Mayor**
  - **providedCompetence**
    - «Skill» Navigate Politics
    - «Skill» Procure Funding
    - «Skill» Manage Budget
    - «Skill» Manage People

- **Control Room Operator**
  - **providedCompetence**
    - «Skill» Computer Control
    - «Skill» Communicate Effectively
    - «Skill» Traffic Management

[Architectural Description] Human Activities [SV-4]
System Connection Matrix – $N^2$
SV-2 Software Interfaces and Interactions

SV-2/SvcV-2 [System] Control System [SV-2]

[System] Control Room [SV-6]

[Architectural Description] Resources [SV-3]

[Architectural Description] System Activities [SV-4]
Security Views
The security domain (Sc) describes security assets and security enclaves. Sc views define the hierarchy of security assets and asset owners, security constraints (policy, laws, and guidance) and detail where they are located (security enclaves).

**Stakeholders:** Security Architects, Security Engineers. Systems Engineers, Operational Architects.

**Concerns:** addresses the security constraints and information assurance attributes that exist on exchanges between resources and Operational Performers.

**Definition:** illustrates the security assets, security constraints, security controls, families, and measures required to address specific security concerns.
Security Taxonomy

- Defines the hierarchy of security assets and asset owners that are available to implement security, security constraints (policy, guidance, laws and regulations) and details where they are located (security enclaves).
• Actual security classifications that will be used in the model

```
Pm-Me [Architectural Description] Security [Actual Measurements]

«ActualMeasureSet»
securityCategories1 : SecurityCategoryProperties
securityClassification = UNCLAS

«ActualMeasureSet»
securityCategories2 : SecurityCategoryProperties
securityClassification = Sec27
```
• Shows the structure of security information and where it is used

![Diagram showing security structure with Sc-Sr (Architecture Description), SecurityDomain, ResourceMitigation, Communication redundancy, ResourceArtifact, Email communication system, and EMS Dispatch system.]
Security Process

- Security Profile Showing Security Controls’ Allocation to Assets/Resources
Security Constraints

Specifies textual rules/non-functional requirements that are security constraints on resources, information and data (e.g. security-related in the form of rules (e.g. access control policy).

<table>
<thead>
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</table>
Security Constraints

- Risk and risk mitigation associated with systems and information/data
Security Decomposition

- System composition across security enclaves
- Cyber Defense system composition and interactions
Lists security exchanges across security assets; the applicable security controls; and the security enclaves that house the producers and consumers of the exchanges. Measurements can optionally be included.

[Capability Configuration] Cyber Defense [matrix]

<table>
<thead>
<tr>
<th>Resource Exchange</th>
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Summary and conclusion

- UAF has the potential to improve communication, collaboration and interoperability between
  - Nations
  - Government and Industry
  - Industry to Industry
- Grid approach allows different industries to reuse, extend or create new views appropriate to them (Fit for purpose)
- Improving the discovery and reuse of architectural artifacts
- Supports SoS modeling and SoSE
  - Military and Civilian Projects
Questions and Answers

Thanks for your attention!