Overview of RIEDP
Reuse and Interoperation of Environmental Data & Processes

3D Geospatial Modeling & Simulation Summit
100th OGC Technical Committee
Orlando, FL USA

Jean-Louis GOUGEAT
Chair - RIEDP Product Development Group
19 September 2016
Sogitec at a glance

- **Flight Training Simulators**
  - Mirage Family (F1, -5, D, -9, H, …)
  - Rafale omnirole Fighter A/C
  - Helico (NH90, Dauphin, Cougar)

- **Users**
  - France
    - FAF, Army Light Aviation, Navy
  - Foreign countries
    - NATO
    - Middle East (Egypt, Qatar, UAE, …)
    - India
    - Taiwan
    - …
Environment Requirements for a Flight Simulator

Diversity of Terrain natures

Diversity of Target Applications

(Visual, Sensors, IGS, CGF, C2, etc.)
Always more Fidelity in the Environment

1- More fidelity is required
2- Not just Imagery

Elevation Grid: 25 m
Elevation Grid: 1 m
Typical Terrain Requirements
(e.g. France NH90 FFS)

- Large Areas
  - ½ Million km² and more
- Higher Fidelity
- For Training & Mission Rehearsal
Building a Simulator Database

Customer's Requirements

Source Data

Database Creation

Target Databases
- Visual DB
- Radar DB
- IR DB
- Other Sensors
- CGF DB
- Maps
- Others

- Find the data
- Solve IPR
- Not Easy

- Clean the data
- Correlate the data
- Create missing data
- Format the data
- Intensify the data
- Specialize the data

Operate!
Data Transformation Process – Two main phases

Source Data

Phase 1
Cleaning & Enhancement

Synthetic Environment Intermediate Data

Phase 2
DBs Generation

Target Databases
- Visual DB
- Radar DB
- IR DB
- Other Sensors
- CGF DB
- Maps
- Others

Manual Work: 80%
Computation Time: 20%

Standardize here at appropriate Intermediate Level
Main issues for Distributed Simulation
Reuse – Correlation – Interoperability ....

- Duplication of efforts
- Duplication of Cost
- Time to market

Requirements

Sim A - Provider 1
Sim B - Provider 2
Sim C – Provider 3

Consistency ?
Schedule ?

M&S Interoperability is even more critical in the International Arena with Multiple Providers and Multiple M&S Solutions
M&S Interoperability

• What it is Not
  – The same Product and associated Solutions for everyone
    • Does not work, certainly not in the Joint and International arenas
    • Puts innovation at risk
    • What product to choose? No single solution is sufficient

• What it is
  – Consistency in Modelling, associated Data and Semantics at Component Level
  – Allowing Components to work together at System & System-of-Systems Levels
  – Fostering Multiple-Provider Solutions
    • e.g. : I/ITSEC/OBW Federations

Interoperability relies on Appropriate Standards
Appropriate Standards

• What for?
  – Avoiding “reinvention of the wheel” and …
  – Establishing and Promoting Fair Competition

  – Allowing other Innovations on top of the standardized Solutions

• Conditions
  – Truly Open Standard Development and Maintenance Process

• For LVC M&S Community, this is the role of SISO
**Data Transformation Process – Improvement through RIEDP**

- **The Creation process may be made more efficient**
  - If Source data is consistent
    - Within each and between the layers (depends on Data providers)
  - If previous creation efforts may be reused
    - At Source Data Level (Linked to GIS World)
    - At Intermediate Level
      - Requires Common Processes, Representations, and Formats at this level

- **EDS**
  - Discovery & Access
  - Metadata
  - Data Quality

- ** ори́стичное**
  - Hardly Reusable / Capitalisable (Unless same target platforms)

**OGC SISO USGIF Summit - Orlando - 2016**
Scope of the SISO RIEDP Product Development Group

• Standardization efforts needed in following areas:
  – A Reference Process Model
  – An expressed Data Model for the specific applications
  – Formats with specified use/parameters
  – Standardized Attribution and Metadata

• Divided along two axes leading to two products:
  – RIEDP Data Model Foundations with two coupled parts:
    • The Reference Process Model (RPM) - High Level representation of the database creation process model
    • Reference Abstract Data Model (RADM) - High level Database concepts: Including principles of Tiles, Layers, Library, Spatial Reference, Relationships, ...
  – RIEDP Detailed Features description:
    • Objects: Identification of geo-specific object instances and templates (features, 3D objects, textures) within the Library, and the linkage between instances and templates;
    • Dictionary: choice of semantics and mapping with existing dictionaries;
    • Attribution: Identification of a common list of features, attributes, attribution rules, range values ...
Sharing data with the highest possible added value

OGC SISO USGIF Summit - Orlando - 2016
RIEDP Reference Process Model

Data Flow

Define Requirements
Collect Source Data
Clean Source Data
Align Source Layers
Establish Baseline Data
Intensify Baseline Data
Specialize Data for Target Applications
Generate RT Databases
Create/Modify Library Data
Export RIEDP Database
Export RIEDP Library

Source Data
Clean Source Data
Aligned Source Data
Baseline Data
Intensified Data
Specialized Data
Runtime Databases

Repository Catalog
Internal Catalog
Database Content Requirements
Application Specific Requirements

Define
Collect Source
Clean Source
Align Source
Establish
Intensify
Specialize
Generate
Create
Modify
Export
Library

From all Stages
To

Define Acquire Application Specific Requirements

ASR

Archive in community repository

DCR

DB Library

OGC SISO USGIF Summit - Orlando - 2016
RIEDP Profiles

- RIEDP supports data sharing from specific RPM stages
- RIEDP-compliant Data Products shall conform to one of the RIEDP Profiles
- A Profile specifies:
  - A stage in the RPM
  - Mandatory and Optional Data in accordance with the RADM

<table>
<thead>
<tr>
<th>RADM Classes</th>
<th>Collect Source</th>
<th>Cleaned</th>
<th>Library Creation</th>
<th>Aligned</th>
<th>Baseline</th>
<th>Intensified</th>
<th>Specialized</th>
<th>RunTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Metadata</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Spatial Reference</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Tile or Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevation</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Imagery</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Other Raster</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Feature Instance</td>
<td>O</td>
<td>O</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary Metadata</td>
<td>-</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3D Model</td>
<td>-</td>
<td>M</td>
<td>O</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Texture</td>
<td>-</td>
<td>M</td>
<td>O</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Special Area</td>
<td>-</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Feature Template</td>
<td>-</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Reference Table</td>
<td>-</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

Profiles

- N/A
- Basic-Cleaned
- Library-Only
- Basic-Aligned
- Basic-Baseline
- Full-Intensified
- Full-Specialized
- N/A
## RIEDP vs other International M&S Standardization Efforts

<table>
<thead>
<tr>
<th>Nature</th>
<th>Standards</th>
<th>Projects</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SIF</td>
<td>SEDRIS</td>
<td>NPSI</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>US DOD</td>
<td>US Navy</td>
</tr>
<tr>
<td>Date</td>
<td>2004</td>
<td>2006</td>
<td>2004</td>
</tr>
<tr>
<td>Name</td>
<td>AFCD</td>
<td>CDB</td>
<td>SE Core</td>
</tr>
<tr>
<td>Origin</td>
<td>USAF</td>
<td>USSOCOM</td>
<td>US Army</td>
</tr>
<tr>
<td>Introduction</td>
<td>2006</td>
<td>2008</td>
<td>NATO</td>
</tr>
<tr>
<td>Date</td>
<td>2010</td>
<td>2006</td>
<td>e.g. French</td>
</tr>
<tr>
<td>Name</td>
<td>NPSI</td>
<td>Missionland</td>
<td>Air Force</td>
</tr>
<tr>
<td>Origin</td>
<td>US Navy</td>
<td></td>
<td>US DoD</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Yes</td>
<td>User Standard</td>
<td>User Standard</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Introduction</td>
<td>1991</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Date</td>
<td>2004</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Open Standard</td>
<td>Yes</td>
<td>limited</td>
<td>limited</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Nature</td>
<td>SEDRIS</td>
<td>CDB</td>
<td>SE Core</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>USSOCOM</td>
<td>US Army</td>
</tr>
<tr>
<td>Introduction</td>
<td>1991</td>
<td>2004</td>
<td>NATO</td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td>2006</td>
<td>e.g. French</td>
</tr>
<tr>
<td>Name</td>
<td>NPSI</td>
<td>Missionland</td>
<td>Air Force</td>
</tr>
<tr>
<td>Origin</td>
<td>US Navy</td>
<td></td>
<td>US DoD</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>AFCD</td>
<td>CDB</td>
<td>SE Core</td>
</tr>
<tr>
<td>Origin</td>
<td>USAF</td>
<td>USSOCOM</td>
<td>US Army</td>
</tr>
<tr>
<td>Introduction</td>
<td>2006</td>
<td>2008</td>
<td>NATO</td>
</tr>
<tr>
<td>Date</td>
<td>2010</td>
<td>2006</td>
<td>e.g. French</td>
</tr>
<tr>
<td>Standard</td>
<td>Yes</td>
<td>User Standard</td>
<td>User Standard</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Introduction</td>
<td>1991</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Date</td>
<td>2004</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Open Standard</td>
<td>Yes</td>
<td>limited</td>
<td>limited</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Nature</td>
<td>AFCD</td>
<td>SEDRIS</td>
<td>NPSI</td>
</tr>
<tr>
<td>Origin</td>
<td>USAF</td>
<td>USSOCOM</td>
<td>US Army</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td>2008</td>
<td>NATO</td>
</tr>
<tr>
<td>Date</td>
<td>2010</td>
<td>2006</td>
<td>e.g. French</td>
</tr>
<tr>
<td>Standard</td>
<td>Yes</td>
<td>User Standard</td>
<td>User Standard</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Introduction</td>
<td>1991</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Date</td>
<td>2004</td>
<td>ISO</td>
<td>User Standard</td>
</tr>
<tr>
<td>Open Standard</td>
<td>Yes</td>
<td>limited</td>
<td>limited</td>
</tr>
<tr>
<td>Origin</td>
<td>US DOD</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Introduction</td>
<td>2004</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Date</td>
<td>2006</td>
<td>ISO</td>
<td>limited</td>
</tr>
<tr>
<td>Approach</td>
<td>Format according to standard</td>
<td>Standardized Semantics and Data Model + Format according to standard</td>
<td>Based on de-facto Standard Formats (GIS Source) but No Consistent Semantics or Data Model</td>
</tr>
<tr>
<td>Availability of Commercial Support Tools</td>
<td>Obsolete</td>
<td>Tools developed in SEDRIS COI</td>
<td>Commercial Tools for de-facto and Standard Formats</td>
</tr>
</tbody>
</table>

**Definitions:**
- AFCD: Air Force Common database
- COI: Community of Interest
- EDS: Enterprise Data Services
- NPSI: NAVAIR Portable Source Initiative
- SIF: SSDB (Standard Simulator Database) Interchange Format
- SE Core: Synthetic Environment Core
Appropriate standards – Environmental Data: RIEDP

- Use resources from existing Standards (SISO, ISO, NATO)
  - Specification of Entity Identification (SISO SWG Enumerations)
  - Specification of Position and Orientation Data (ISO/IEC SEDRIS/SRM)
  - Identification of Objects / Features and their Attributes (ISO/IEC SEDRIS/EDCS)
  - Definition of a Representation Model of the Environment (ISO/IEC SEDRIS/DRM)
  - Specification of Metadata (ISO 19115, DCMI, DDMS, FGDC, EDS)
  - Alliance M&S Standards Profile (NATO MSG)

- Complement this Foundation for M&S applications (RIEDP Focus)
  - Make use of “de-facto” standards from the Military and GIS communities
  - Develop additional elements to address M&S-specific needs

- RIEDP Initial Focus:
  - Aircrew Training & Mission Rehearsal, extensible to the broader M&S COI
RIEDP PDG – Get Involved

• Please Join SISO by becoming a SISO Member
  • by attending the SIW Meetings
  • by registering on the Web Site ($ 90)

• Then share with the community
  – PDG SISO Discussion - **Register** for Discussion:
    • Logon to SISO Discussions and select
      – SAC-PDG-RIEDP  (Don’t forget to select SUBMIT !)
  – PDG SISO Webpage - **Complete Affiliation Form**:
    • Standards Activities > Development Groups >
      – Reuse and Interoperation of Environmental Data and Processes  (RIEDP) PDG
  – PDG SISO Library File Folder – Access PDG Documents:
    • SISO Digital Library > Development Groups > RIEDP PDG

OGC SISO USGIF Summit - Orlando - 2016
Conclusion

• Thank you for your attention!

• Any questions?

• Full version of the Brief available on the Wiki