SEDRIS visualization using X3D, and Language Bindings

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Contents

- General concepts
- STF development process
- SEDRIS visualization using X3D
- SEDRIS to X3D conversion
- SEDRIS language bindings
- Using the SEDRIS Components
- Technology Components of SEDRIS
- Application Data Models
Technology Components of SEDRIS

• Spatial Reference Model (SRM): Unified and robust description of the coordinate systems, along with an accurate, efficient, and fast software implementation

• Environmental Data Coding Specification (EDCS): Provides “thing” level semantics (the “dictionary” of the language) (classify/attribute scheme)

• Data Representation Model (DRM): Provides syntax and structural semantics for representing environmental data and databases (the “grammar” of the “language”)

• SEDRIS Application Program Interface (API):  
  – Allows ease of access  
  – Lowers the barrier-to-entry in software development  
  – Provides read, write, and modify capabilities

• SEDRIS Transmittal Format (STF): Platform independent storage and transmission of data
Step 1: Native Requirements & Data Analysis: Define use or application plus data exchange requirements

Step 2: Develop Mapping Document: Use DRM, EDCS and SRM

Step 3: Develop Validation Criteria -- TCRS

Step 4: Develop Production software: Add in API and STF

Step 5: Validate Transmittal: Add in tools and applications

- STF development steps are easier to follow than early development steps.
  - Engineer want to find integrated examples with fragmentary examples
  - Commercial approach usually use partial functions instead of SEDRIS full functions
  - Engineer want to specialize particular function for their technical area
Step 1: Native Requirements & Data Analysis: Define use or application plus data exchange requirements

Step 2: Develop Mapping Document: Use DRM, EDCS and SRM

Step 3: Develop Validation Criteria -- TCRS

Step 4: Develop Production software: Add in API and STF

Step 5: Validate Transmittal: Add in tools and applications

Step 6: Visualize SEDRIS data

- STF development steps are easier to follow than early development steps.
  - Engineer want to find integrated examples with fragmentary examples

- Commercial approach usually use partial functions instead of SEDRIS full functions
  - Engineer want to specialize particular function for their technical area
Tasks done by Data Provider

- Verify Transmittal
- Develop Transmittal Production Software
- Map Native Data Model To SEDRIS
- TCRS
- Mapping Document

Native Data Set “X”

Market Need, Use Cases, & Env Data Exchange Needs

SEDRIS Components and STF

Tech. Components
- SEDRIS Concept
- DRM
- EDCS
- SRM

SEDRIS SDK
- SEDRIS Tools
- STF
- API
SEDRIS Language Binding

Tasks done by Data Provider:
- Map Native Data Model to SEDRIS
- Mapping Document
- Develop Transmittal Production Software
- Verify Transmittal

SEDRIS Tools:
- SEDRIS Language Bi
- SEDRIS SDK
- SEDRIS Tools

Tech. Components:
- SEDRIS Concept
- SEDRIS SDK
- EDCS
- SRM
- DRM

Native Data Set “X”
Market Need, Use Cases, & Env Data Exchange Needs

STF
The Current Working Step

Current Working Process

1. Market Need
2. Mapping Document
   - List native data elements
   - Categorize (primitive data, organizing elements, description, modifier)
   - Learn SEDRIS DRM Diagram
   - Learn SEDRIS components (DRM, SRM, EDCS)
4. Extract and Relate DRM Classes
5. Learn SEDRIS API
6. Develop Transmittal Production Software
7. Create Transmittal
8. Verify Transmittal

Tasks done by Data Provider:

- Native Data Set “X”
- Market Need, Use Cases, & Env Data Exchange Needs
- Map Native Data Model To SEDRIS
- Mapping Document
- TCRS
- Develop Transmittal Production Software
- Verify Transmittal

STF
The SEDRIS Production and Consumption Process (X3D)

Tasks done by Data Provider

- Native Data Set “X”
- Market Need, Use Cases, & Env Data Exchange Needs
- Map Native Data Model To SEDRIS
- Mapping Document
- Develop Transmittal Production Software
- Verify Transmittal

Tasks done by Data Consumer (Conversion X3D)

- Market Need, Use Cases, & Env Data Exchange Needs
- Map Native Data Model To SEDRIS
- Mapping Document
- Develop Transmittal Consumption Software (X3D)
- X3D Data

STF
SEDRIS To X3D Conversion

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The SEDRIS API is an encapsulation of functionality which provides applications the ability to access DRM objects. The SEDRIS API is Transmittal Access API, DRM API, SRM API, EDCS API. The Transmittal Access API implementation relies on the DRM, SRM, and EDCS APIs. The Transmittal Access API deals with transmittals and objects within those transmittals. Every object has a unique string within a transmittal, referred to as the “object id”.
Using the SEDRIS Components

- the DRM, EDCS, and the SRM to model environmental data
- the EDCS as a stand-alone component
- an interchange mechanism
- to examine environmental data
- basis for developing new tools

- STF
- Transmittal Access API
- Tools
- C
- C++

- DRM API
- EDCS
- SRM

- expressing data requirements to validate data sets that claim compliance to those requirements

- the DRM, EDCS, and the SRM to specify environmental data content

- the SRM as a stand-alone component
Transmittal Access API Functionality

- Transmittal Functionality
  - SE_OpenTransmittalByFile
  - SE_OpenTransmittalByName
  - SE_CloseTransmittal
  - SE_GetTransmittalFromObject
  - SE_FreeTransmittal
  - SE_GetTransmittalFile
  - SE_GetTransmittalName
  - SE_GetTransmittalVersionInformation
  - SE_GetUniqueTransmittalID
  - SE_SetTransmittalName
  - SE_TransmittalsAreSame

C++ Language Binding
JavaScript Language Binding
Transmittal Access API Functionality

- **Object instance functionality:**
  - SE_GetRootObject
  - SE_SetRootObject
  - SE_CreateObject
  - SE_CloneObject
  - SE_RemoveFromTransmittal
  - SE_FreeObject
  - SE_GetIDForObject
  - SE_GetObjectForID
  - SE_GetPackedHierarchy
  - SE_FreePackedHierarchy
  - SE_GetRemainingObjectsList
  - SE_FreeRemainingObjectsList
  - SE_GetRemainingPackedHierarchiesList
  - SE_FreeRemainingPackedHierarchiesList
  - SE_GetDRMClass
  - SE_GetFields
  - SE_PutFields
  - SE_ObjectsAreSame

C++ Language Binding
JavaScript Language Binding
Transmittal Access API Functionality

- **Relationship Management:**
  - SE_AddAssociateRelationship
  - SE_AddComponentRelationship
  - SE_RemoveAssociateRelationship
  - SE_RemoveComponentRelationship
  - SE_GetObjectReferenceCount
  - SE_GetRelationCounts

- **Traversal/Extraction:**
  - SE_GetAggregate
  - SE_GetAssociate
  - SE_GetComponent
  - SE.InitializeAggregateIterator
  - SE.InitializeAssociateIterator
  - SE.InitializeComponentIterator
  - SE_GetIterationLengthRemaining
  - SE_GetNextObject
  - SE_FreeIterator

C++ Language Binding
JavaScript Language Binding
Transmittal Access API Functionality

• Search Criteria
  ✓ SE_CreateSearchFilter
  ✓ SE_FreeSearchFilter
  ✓ SE_CreateSpatialSearchBoundary
  ✓ SE_DetermineSpatialInclusion
  ✓ SE_FreeSpatialSearchBoundary

• Data Tables
  ✓ SE_GetDataTableData
  ✓ SE_PutDataTableData

• Images
  ✓ SE_GetImageData
  ✓ SE_PutImageData

• Auto Conversion
  ✓ SE_SetColourModel
  ✓ SE_SetSRFParameters

C++ Language Binding
JavaScript Language Binding
Conclusions

- SEDRIS visualization using X3D
  - X3D conversion
  - X3D viewers

- Language bindings for SEDRIS API
  - C++ language binding
  - Javascript language binding

- SEDRIS viewer development for testing language bindings