ESCWA SDMX Workshop

Session: SDMX Information Model
Introducing the Scope of SDMX
Session Roadmap

• High Level View of the Information Model
• Information Model as a Flow
• Use Cases – Practical Examples
SDMX Version 2.0/2.1: High Level Overview

- Process
- Data or Metadata Structure Definition
- Structure and Item Scheme Maps
- Category Scheme
- Categorisation
- Data or Metadata Source
- Data or Metadata Flow
- Data or Metadata Source or Metadata Source
- Data Provider
- Provision Agreement
- Registered Data Source or Metadata Source
- Content Constraint
- Attachment Constraint
- Categorisation
Data Structure

- Data Structure Definition
- Data Attributes
  - Concept
- Measures
  - Representation
    - Non-coded
    - Coded
- Dimensions
  - Concept Scheme
  - Code List
Reference Metadata: Quality Frameworks

• Examples
  – IMF SDDS
  – Eurostat
  – ILO
  – FAO

• Cross Domain Concepts
A new look, which conforms to the new standard presentation of all IMF websites, is effective April 12, 2010. There are no changes to the content of the DSBB. However, some navigation has changed, mostly to enhance the presentation and ease of access to data and metadata.

Special Data Dissemination Standard

Introduction

• Overview: Learn more about the IMF's SDDS
• Internationally accepted statistical methodologies
• Quick Start: How to navigate the SDDS section of this site
• Important Dates in SDDS:
  • Date of subscription to the SDDS and the date subscribers came into observance of the SDDS;
  • Date of first publication of external debt data on the National Summary Data Page (NSDP)
• Research on SDDS/GDDS
• Annual Observance Reports

Metadata

• By Country
Reference Metadata Example
How to Support Such Different Uses of Metadata

SDMX Metadata Structure Definition
Metadata Structure

Metadata Structure Definition

Metadata Report

Metadata Target

Target Object

Identification elements of target object

Concept

Metadata Attribute

Representation

Non-coded

Coded

Code List

Non-coded

Coded

Representation

Category Scheme

Concept Scheme

Code List

Organisation Scheme
SDMX Information Model

As a Flow
Data Flows and Data Providers

Data or Metadata Structure Definition

Data or Metadata Flow

Data Provider Scheme

Provision Agreement

Data Provider

© Metadata Technology
Registered Data and Reference Metadata
SDMX Information Model

Bringing it Alive
Use Cases
SDMX: Major Use Cases and Processes

- Data and Reference Metadata Exchange
  - reading, writing, validating SDMX structure and data/metadata set
- Create and Load Database
  - reading, writing, validating SDMX structure and data/metadata set
- Data Discovery
  - Query for data sources, reading, validating SDMX structure
- Data and Reference Dissemination via a Web Service
  - Query structural data, query data, read SDMX data query, write SDMX data set, process constraints, link to reference metadata
- Data and Reference Metadata Visualisation (tables, graphs, maps, charts)
  - read SDMX structural metadata, create SDMX data query, read SDMX data set, link to reference metadata create tables/graphs/maps/charts
# Use Cases – Data and Metadata Reporting and Exchange

<table>
<thead>
<tr>
<th>Use Case</th>
<th>System Processing Activity</th>
<th>Structural Metadata Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Reporting</td>
<td>Extract data from the source (database, file, spreadsheet)</td>
<td>Access to DSD.</td>
</tr>
<tr>
<td></td>
<td>Write an SDMX-ML or SDMX-EDI data set</td>
<td>Access to DSD and possibly code transformations and aggregations.</td>
</tr>
<tr>
<td></td>
<td>Validate the data set</td>
<td>Access to the DSD or an XML schema derived from it.</td>
</tr>
<tr>
<td>Load data into a database</td>
<td>Read an SDMX-ML or SDMX-EDI data set. Validate the data set. Write data to database</td>
<td>Access to DSD and possibly code transformations.</td>
</tr>
<tr>
<td>Report reference metadata</td>
<td>Extract metadata from a database</td>
<td>Access to MSD.</td>
</tr>
<tr>
<td></td>
<td>Write metadata set</td>
<td>Access to MSD.</td>
</tr>
<tr>
<td></td>
<td>Validate metadata set</td>
<td>Access to MSD or schema derived from it.</td>
</tr>
<tr>
<td>Load reference metadata into a database (often called a metadata repository)</td>
<td>Read SDMX-ML metadata. Write metadata to database</td>
<td>Access to MSD and possibly code transformations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access to MSD.</td>
</tr>
</tbody>
</table>
# Use Cases – Automated Data Reporting

<table>
<thead>
<tr>
<th>Use Case</th>
<th>System Processing Activity</th>
<th>Structural Metadata Requirements</th>
</tr>
</thead>
</table>
| Report data by means of the “pull” method | Extract data  
Write data set  
Validate data set | Access to DSD |
| | Place the file at a URL location | |
| | Publish the existence of the dataset by means of an SDMX Registration | Provision Agreement in an SDMX Registry. |
| Database Administration (automatic generation of database tables) | Create database tables | Access to DSD |
| | Load database | Access to DSD |
| Enable database to be compatible with SDMX Web Services | Accept and process and SDMX structure query | Access to SDMX structural metadata such as DSD, MSD, Dataflow, Metadata flow, Data Provider, Provision Agreement, Constraint, Category Scheme. |
| | Accept and process an SDMX data query | Access to DSD. |
| | Write SDMX data set | Access to DSD. |
# Use Cases – Data Discovery

<table>
<thead>
<tr>
<th>Use Case</th>
<th>System Processing Activity</th>
<th>Structural Metadata Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Discovery</td>
<td>Locate data source</td>
<td>Category Scheme and links to Dataflow, Provision Agreement and Data Registration</td>
</tr>
<tr>
<td>Data and Metadata Query and Visualisation</td>
<td>Query an SDMX structural repository. Access to SDMX structural metadata.</td>
<td>Access to DSD.</td>
</tr>
<tr>
<td></td>
<td>Create an SDMX query from the user selections</td>
<td>Access to code lists and concepts.</td>
</tr>
<tr>
<td></td>
<td>Access a metadata repository to extract referential metadata pertaining to the data.</td>
<td>Access to code lists and concepts.</td>
</tr>
<tr>
<td></td>
<td>Transform the SDMX data and referential metadata into tables, graphs, charts etc</td>
<td>Access to DSD and metadata code lists and concepts.</td>
</tr>
</tbody>
</table>
Example Website
How was this Done with SDMX?

1. create database tables
2. load database
3. data discovery
4. logical data query
5. SDMX data query
6. query for related metadata
7. visualise data
## Process Flow

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Retrieve the DSD from a structural metadata source (e.g. an SDMX Registry), and create database tables.</td>
</tr>
<tr>
<td>②</td>
<td>Read an SDMX data set file and load the data into the database</td>
</tr>
<tr>
<td>③</td>
<td>Data discovery system continually synchronises its metadata with the structural metadata source. A user makes a data selection from choices built from the information held in an SDMX Registry (structural metadata such as category scheme, dataflow, DSD, data provider, provision agreements and data registration)</td>
</tr>
<tr>
<td>④</td>
<td>These choices are logical choices, built from the dimension selections.</td>
</tr>
<tr>
<td>⑤</td>
<td>The logical choice is formatted as an SDMX data query. This is passed to the Data Base which responds with an SDMX data set.</td>
</tr>
<tr>
<td>⑥</td>
<td>Reference metadata relevant to the data returned is retrieved from a metadata repository.</td>
</tr>
<tr>
<td>⑦</td>
<td>The data and metadata are passed to a visualization tool to display the data in tables, charts, graphs, maps etc. Often a download is offered in various formats. The download options often include also the DSD or MSD.</td>
</tr>
</tbody>
</table>
Data Discovery and Query - Demonstration

Structural Metadata Source

Category Scheme

Category

Categorisation

Data Flow

Data Structure Definition

Category

Categorisation

Data Discovery and Query - Demonstration
Data Dissemination via a Web Service

Demonstration

Schematic Architecture
Architecture of an SDMX web dissemination system

- **Data Storage Web Service**
  - SDMX Data query
  - SDMX Data set

- **Structural Metadata Web Service** (e.g. Registry)
  - SDMX Structure Query
  - SDMX Structure

- **Metadata Repository Web Service**
  - Query for metadata
  - SDMX metadata set

- **Web Dissemination Web Service**

- **Presentation Layer (Website)**
Data Dissemination: SDMX Structural Metadata Contents

- Code Lists
- Concept Schemes
- Structure Definition
- Constraints
- Data Flow
- Provision Agreement
- (Subject Domain) Category Scheme
- (Subject Domain) Category

Constraints contain actual codes present in the data source and actual keys.

Data structures - dimensionality

Identification of the type of data

Identification of the data publisher

Constraints exchange rates
categorisation

High level categorisation of data e.g. Economic Statistics

Data Provider: ECB

Currency exchange rate type

Effective exchange rates
SDMX Data Visualisation (1)
Dimension values for selection are derived from the codelist
Data Visualisation (3)
Data Visualisation (3)