Virtualisation of Simple Scientific Data Objects

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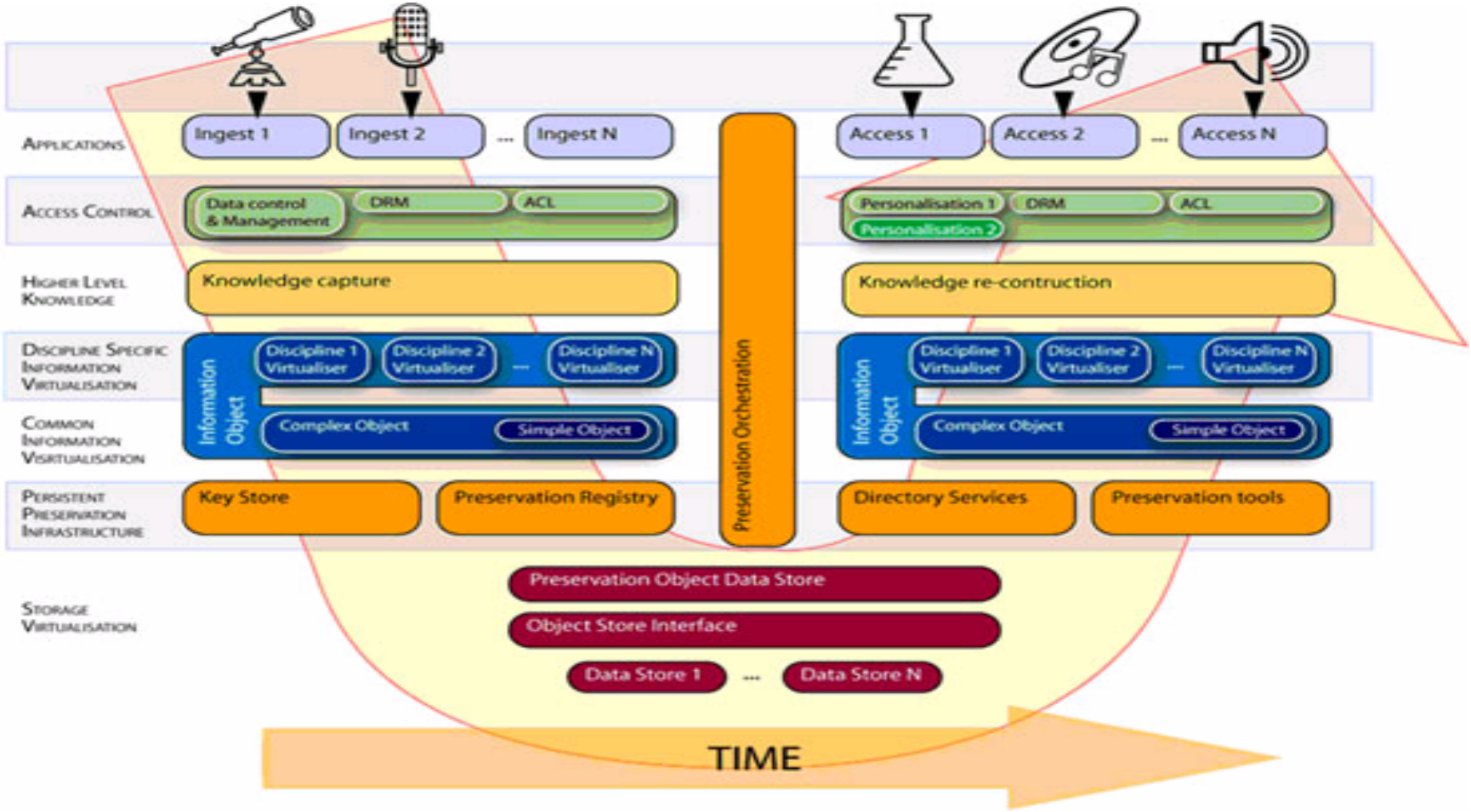
Aim

- To show that OAIS representation information can used to automate the reading and rendering of scientific data and help a future scientist to reuse data.
- To validate the concept of OAIS representation information.

CASPAR – Cultural, Artistic and Scientific Knowledge for Preservation, Access and Retrieval

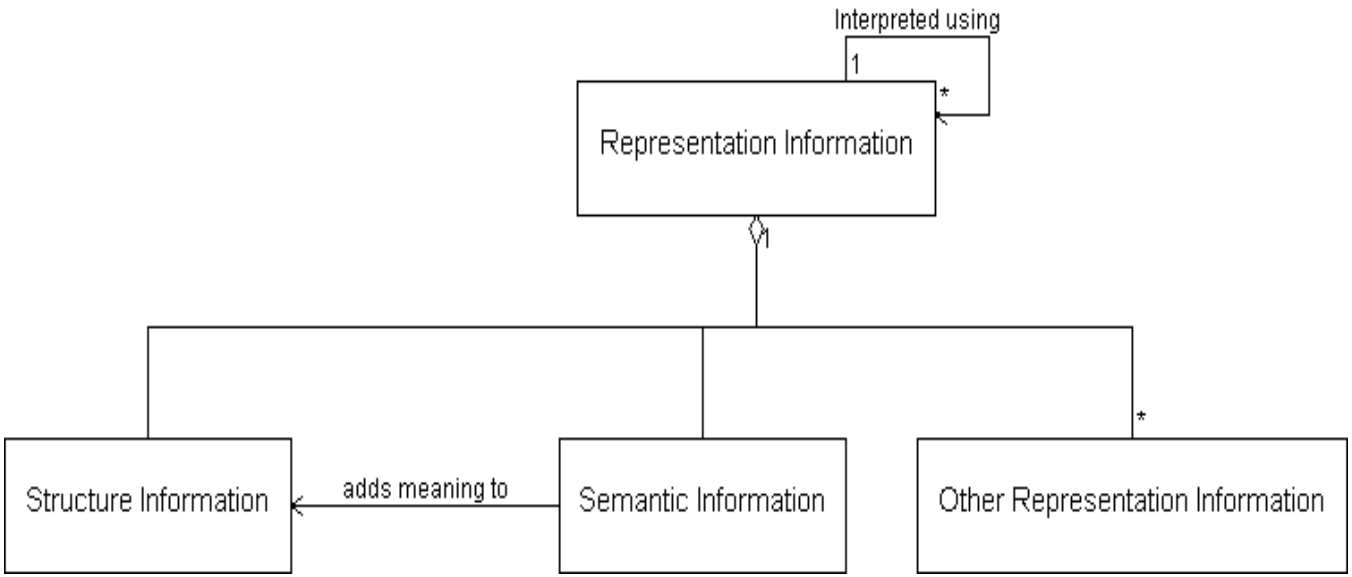
- **CASPAR, a new EU FP6 Integrated Project.**
- The ambitious goal is to build up a common preservation framework for heterogeneous data, along with a variety of innovative applications.
- The Reference Model for an Open Archival Information System (OAIS, ISO 14721) forms the basis of CASPAR.
- http://www.casparpreserves.eu/
- CASPAR consortium (CCLRC - the lead partner and ESA), cultural (UNESCO) and creative expertise (INA, CNRS, University of Leeds, IRCAM and CIANT). Commercial partners (ACS, ASemantics, MetaWare, Engineering, and IBM/Haifa), experts in knowledge engineering (CNR and FORTH) and other leaders in the field of information preservation (University of Glasgow and University of Urbino).
- Publication - http://www.ercim.org/publication/Ercim_News/enw66/giaretta.html

CASPAR Virtualisation Model.



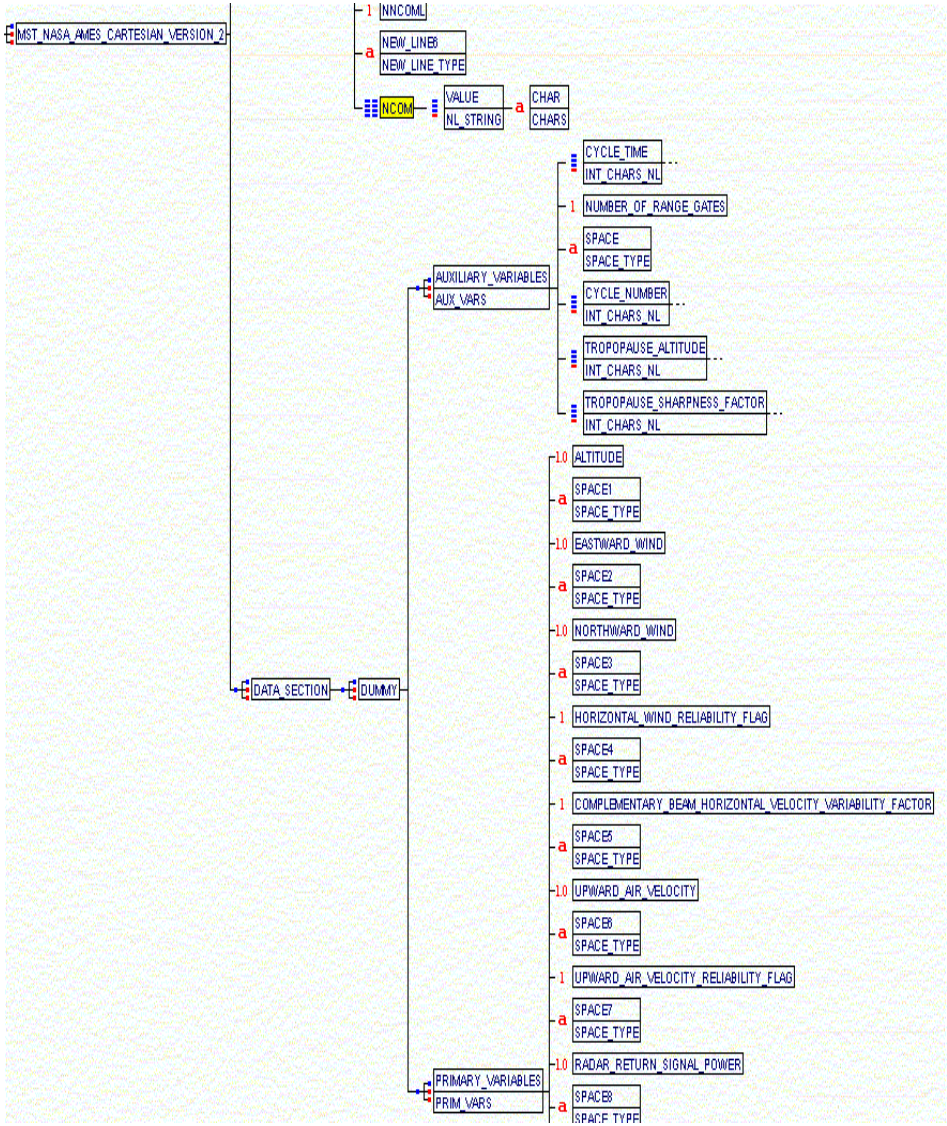
OAIS Representation Information

- Representation Information Registry Repository at http://registry.dcc.ac.uk.
- API for RepInfo registry at http://cvsweb.dcc.rl.ac.uk (registry)
- Tools being developed.



EAST Logical Structure

- Hierarchical Data Description.
- Structure Types – Record, Array, Repeat Variable (List) and Enumeration.
- Value Types – Integer, Real, String, Character.
- Access Paths - MST_NASA_AMES_CARTESIAN_VERSION_2.DATA_SECTION.DUMMY.PRIMARY_VARIABLES.ALTITUDE



EAST Physical Structure (the bits)

- EAST can describe data structures at the bit level in a very general way.
- Allows you to define the bit structure of a Real, Integer, Enumeration – this includes octet order (byte order) and array storage.
- Can do conditional structures and restrictions – potential for data validation and identification - authenticity?
- Can not do everything that I need – no pointers or simple expressions that are required for more complex file formats.

Data Entity Dictionary Specification Language (DEDSL)

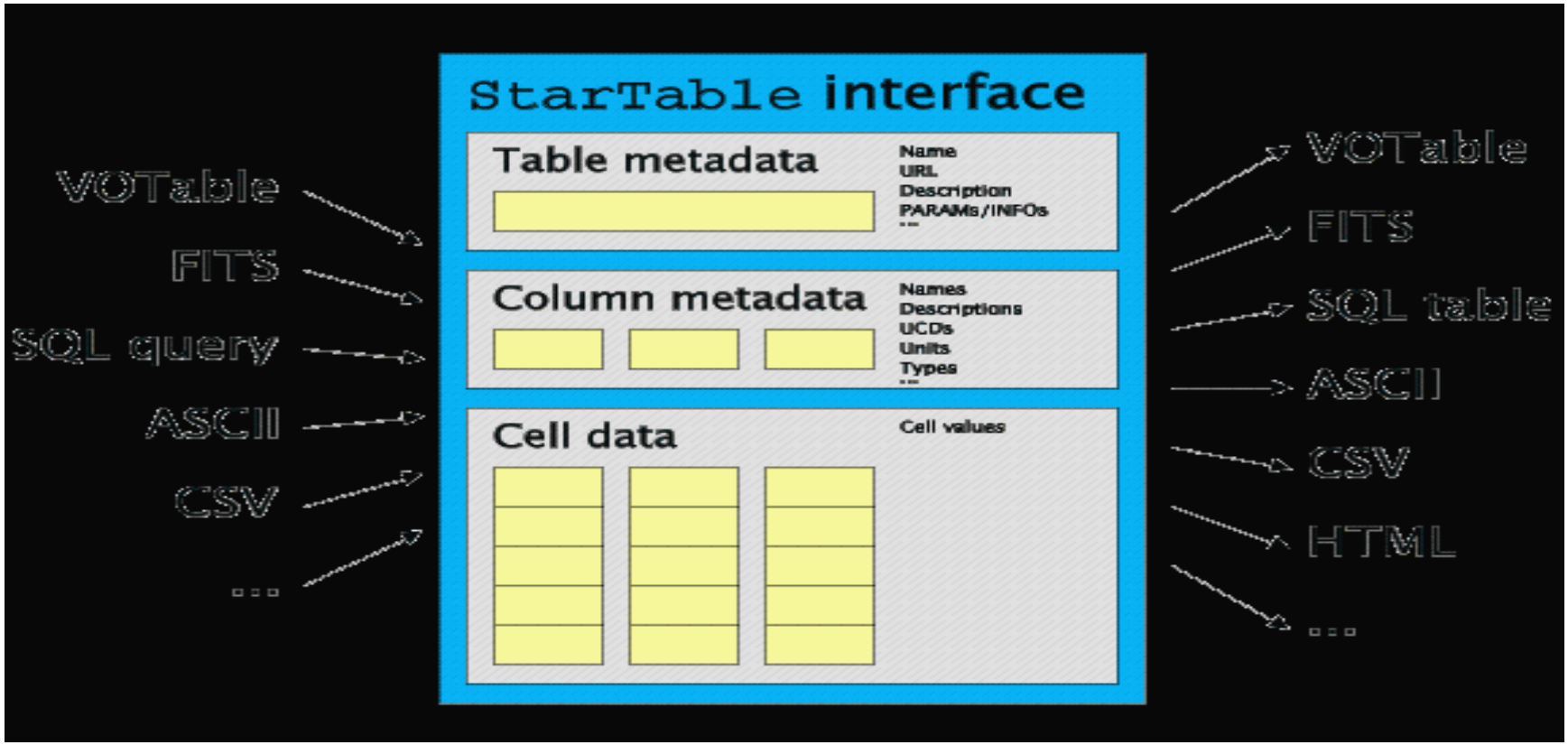
- Abstract, PVL, and XML(DTD) syntax for defining some simple data semantics.
- Only a small number of required attributes for a given data structure, NAME, DEFINITION, UNITS (conditional), *ENTITY*_TYPE (conditional), ENUMERATION_VALUES (conditional), TEXT_SIZE (conditional).
- You can define your own attributes.
- You can reuse definitions from other dictionaries.
- **Link the data structures to the semantics via the EAST access path, i.e. define a new attribute – EAST_PATH (OASIS tool does this).**

EAST and DEDSL Tools

- CNES EAST tools (http://east.cnes.f), OASIS, EAST C Library (reference implementation).
- Also DEBAT (BEST Tools) http://debat.c-s.fr/
- JNI Wrapper for EAST C Library in our CVS repository (jnieast) http://cvsweb.dcc.rl.ac.uk.
- Interfaces for a more general data description language and semantics API in our CVS (DSSIL).

A Simple Object Example (Table Data)

- Using an existing table object definition (STIL, http://www.starlink.ac.uk/stil) – Mark Taylor)



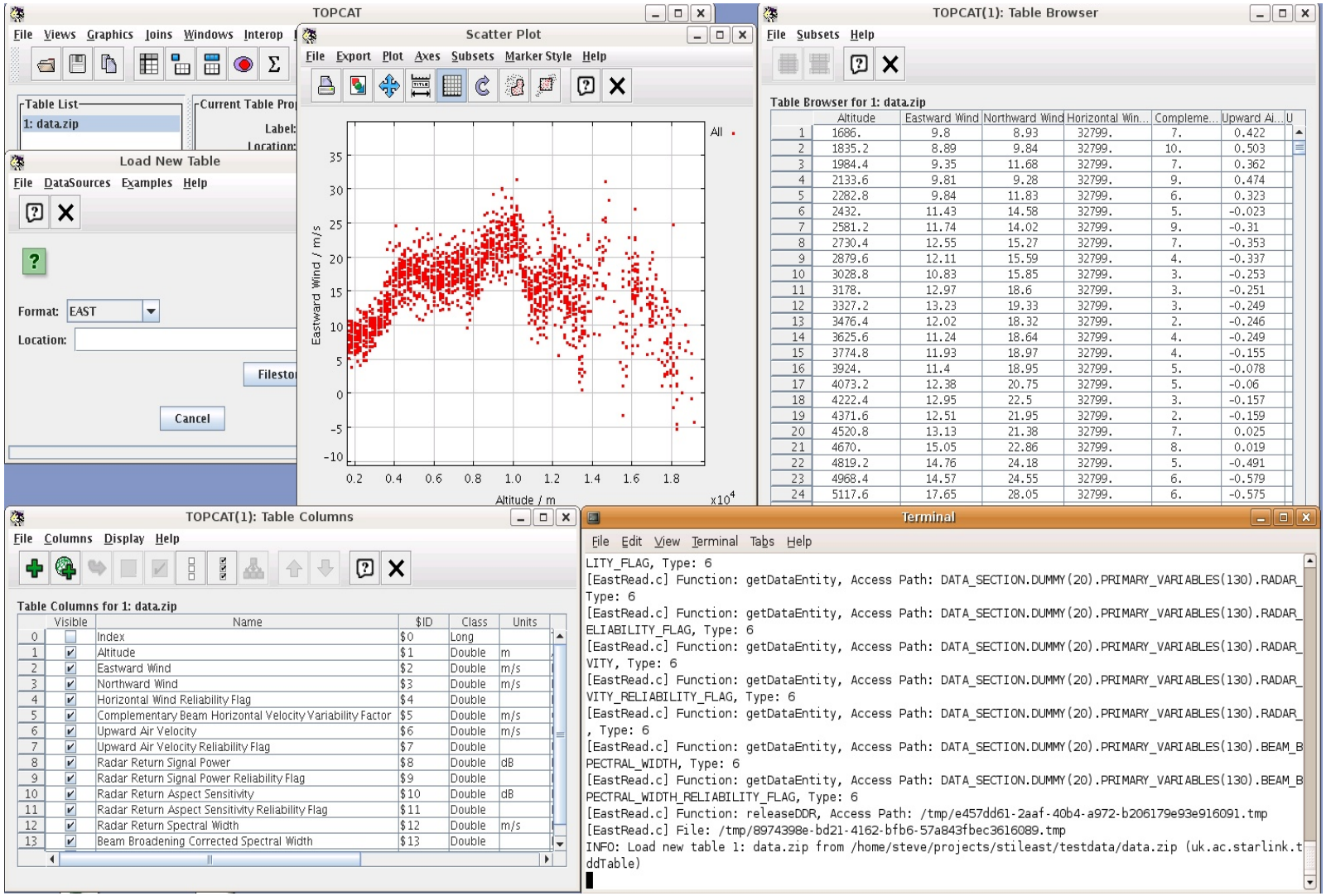
Additional Metadata Required for Virtualisation (Access)

- The structures and the semantics are linked via the access path (pointer to structure and metadata).
- Add additional attributes to say if a structure is a TABLE, COLUMN, ROW or an individual VALUE.
- Currently I take the NAME, DEFINITION, UNITS and *ENTITY*_TYPE in the DEDSL description to populate the table object metadata.
- There are only so many possible ways of describing a table, column or row within an EAST description:
- COLUMN = 1D ARRAY
- COLUMN = List of VALUES
- ROW = RECORD
- TABLE = nD ARRAY
- TABLE = List of RECORDS
- TABLE = ARRAY of RECORDS
- Etc…

Additional Metadata Required for Virtualisation (Rendering)

- Knowing which table columns are useful to plot against one another is important information.
- Many types of plot – scatter, line etc – domain specific.
- An ontology for plots?
- The plot metadata needs to be kept with the other semantic information?

Demonstration Application



Conclusions Future Work

- It does look possible to use structure and semantic descriptions to virtualise simple scientific data objects, if the correct metadata is defined for the object.
- Need more object descriptions and to create a simple object API.
- Need to think about plots, and define them.
- Future – extend EAST to include pointers etc.
- Future – Other structure and semantic descriptions, DFDL?