



Enabling Grids for E-scienceE

Fusion data management in the Grid

Nikolay MARUSOV, Vladimir VOZNESENSKY
RRC "Kurchatov Institute"

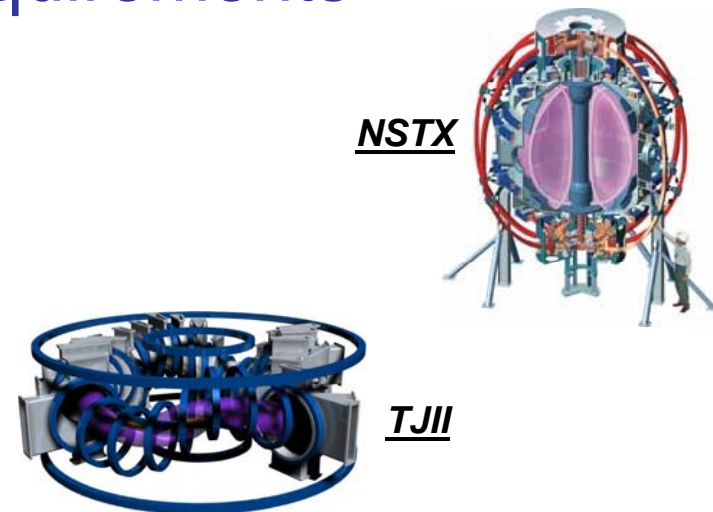
*EGEE 4th User Forum/OGF25 & OGF-Europe's 2nd
International Event*

www.eu-egee.org

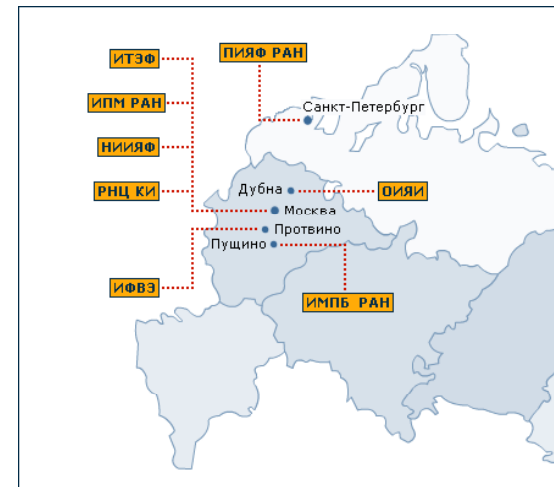
2-6 March 2009, Catania, Sicily, Italy



- On site laboratory storage
 - Centralized storage
 - Local access policy
 - High throughput, low latency
 - Laboratory-specific tools
 - Relatively low Security requirements
 - Direct operative support
 - Examples
 - Tokamak T-10 (Kurchatov)
 - NSTX (PPPL)
 - TJII (CIEMAT)
- + ~50 others over the world



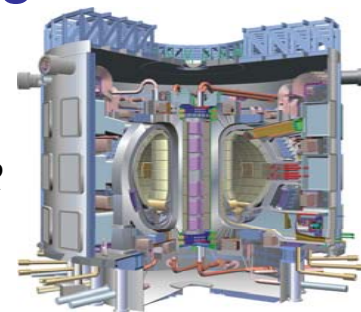
- National storage
 - Distributed storage
 - Access from/to several datacenters
 - Middle throughput, dedicated communication channels
 - Standard tools (IDL, MatLab, LabView, MDS+)
 - Inter-laboratory agreements, national laws
- Examples
 - EFDA (EU)
 - DOE (USA)
 - RosAtom (Russia)
 - ...



- International storage
 - Distributed storage
 - Interoperation between several datacenters
 - High latency (usually connected over the Internet)
 - Inter-government agreement
 - Standard tools (society-specific tools)
 - High security requirements
 - High fault tolerance requirements
 - High overall performance of data storages
- Examples
 - LHC (LCG)
 - ITER (CODAC - developing)



CMS



ITER

combine the best features of local and distributed storages?

- Improve the fault tolerance
- Reduce latencies
- Save functionality of local storage (**quick browsing**)
- Provide data granularity up to signal time slice (**to be discussed**)
- Ensure data consistency
- Reduce hardware performance requirements
- Manage great amount of data

Use the Grid

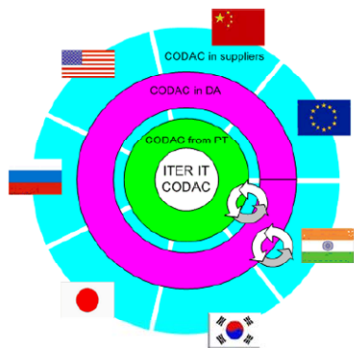
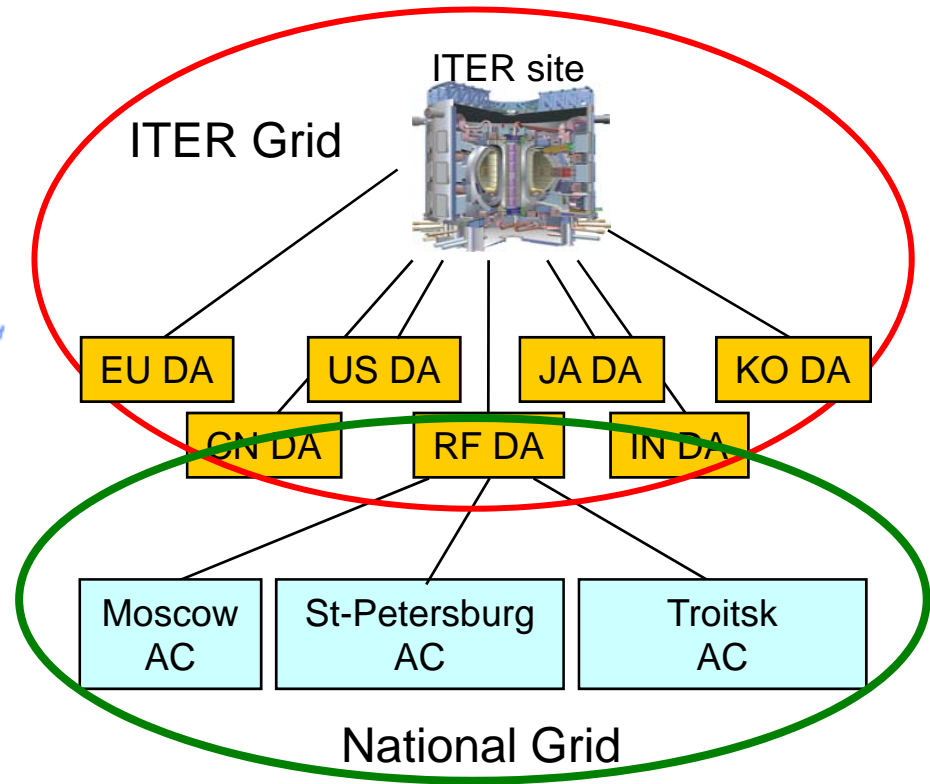
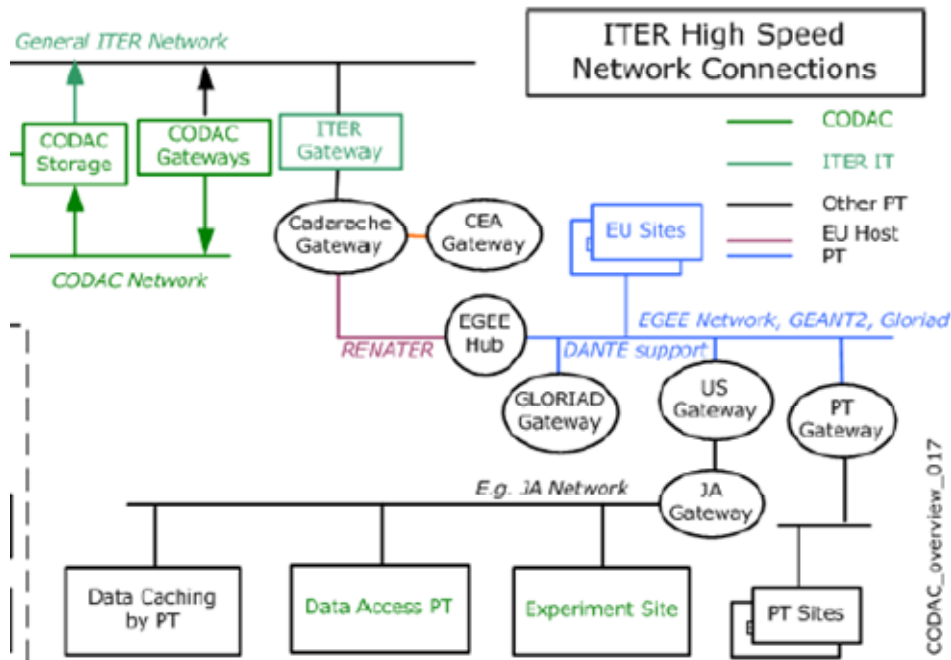
- *Cut data into small pieces and use existing Grid services for international data exchange*
- *Use fusion-specific services for fine-granular data exchange*

Balloon
(30 km)

Concorde
(15 km)

Mont Blanc
(4.8 km)



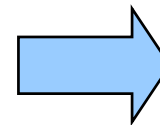


LHC-like network hierarchy:

T0 — ITER site

T1 — Domestic agencies

T2 — National laboratories



Use LHC Grid tools

- Distributed storage, data replication
- Use present Grid infrastructure
- Common data storage model
- Use conventional IT standards
- Self-descriptive data
- Use Grid VOMS security model
- Provide data URLs for Grid jobs (in JDL)

- AMGA is the Metadata Catalogue for gLite
- Used for low-level files manipulation in the Grid
- AMGA works in **2 modes**:
 - *Side-by-Side a File Catalogue (LFC): File Metadata*
 - Standalone: General relational data on Grid
- AMGA has **2 front-ends**:
 - SOAP standardised interface
 - Text-based TCP streaming protocol (proprietary, documented)

SOAP - Simple Object Access Protocol



- **Entry** (aka row)
 - Live in a **schema**, assign **values** to **attributes**
- **Attribute** (aka columns)
 - Has **name** (string),
type (depends on backend, support for basic types)
 - Belongs to **schema**
 - An entry in a schema has a value for each attribute
- **Schema** (aka table, think directory)
 - Has hierarchical **name** and **list of attributes**
 - In AMGA: Every entry belongs to one schema, schemas are hierarchical: /collaboration1/jobs
- **Query**
 - **SELECT ... WHERE ...** clause in **SQL-like query language**

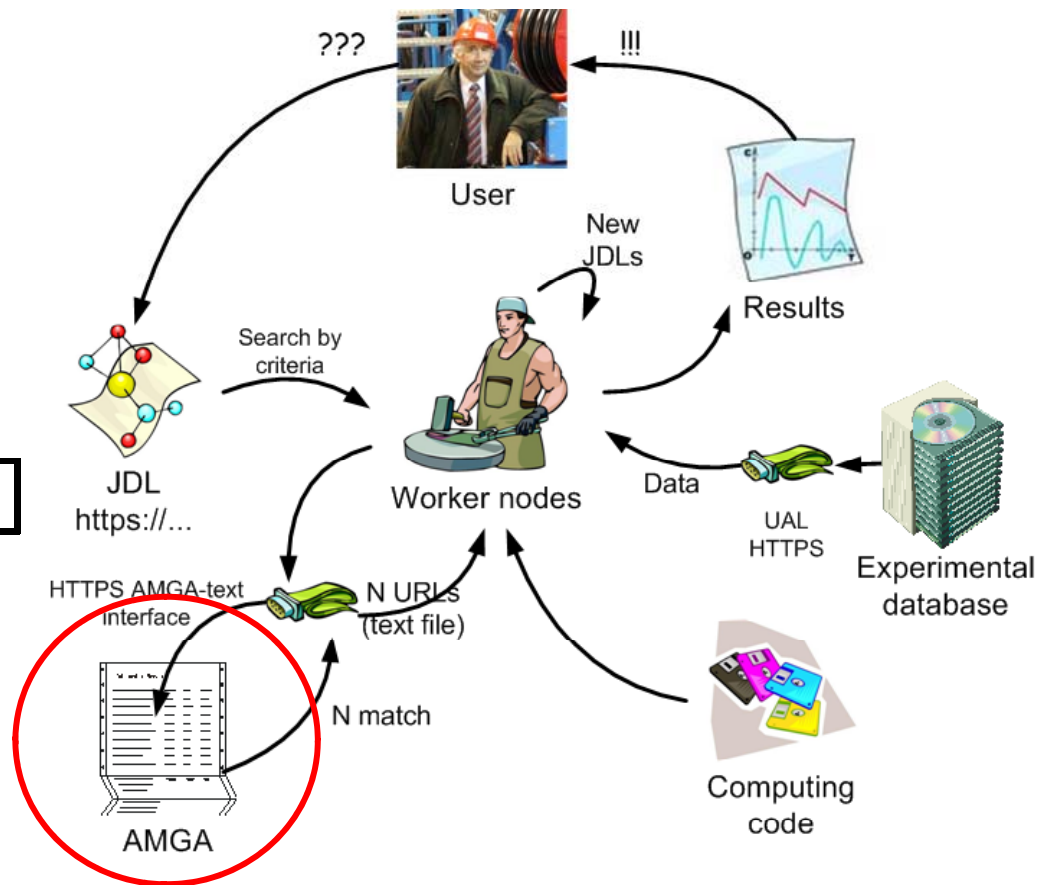
Using AMGA we can

- Match shots by **criteria**
- Take **LFN** of specific signal file

LFN	Device	Shot	Ip	ECR...
-----	--------	------	----	--------

LFN	Device	Shot	Signal
-----	--------	------	--------

Files containing URLs or LFNs of actual signals



LFN – Logical File Name

lfn:/grid/<MyVO>/<MyDirs>/<MyFile>

UAL - fusion community standard describing fusion-related data structures

- MDSplus & HDF5 underlying storages
- Client-server architecture, typically for centralized storages

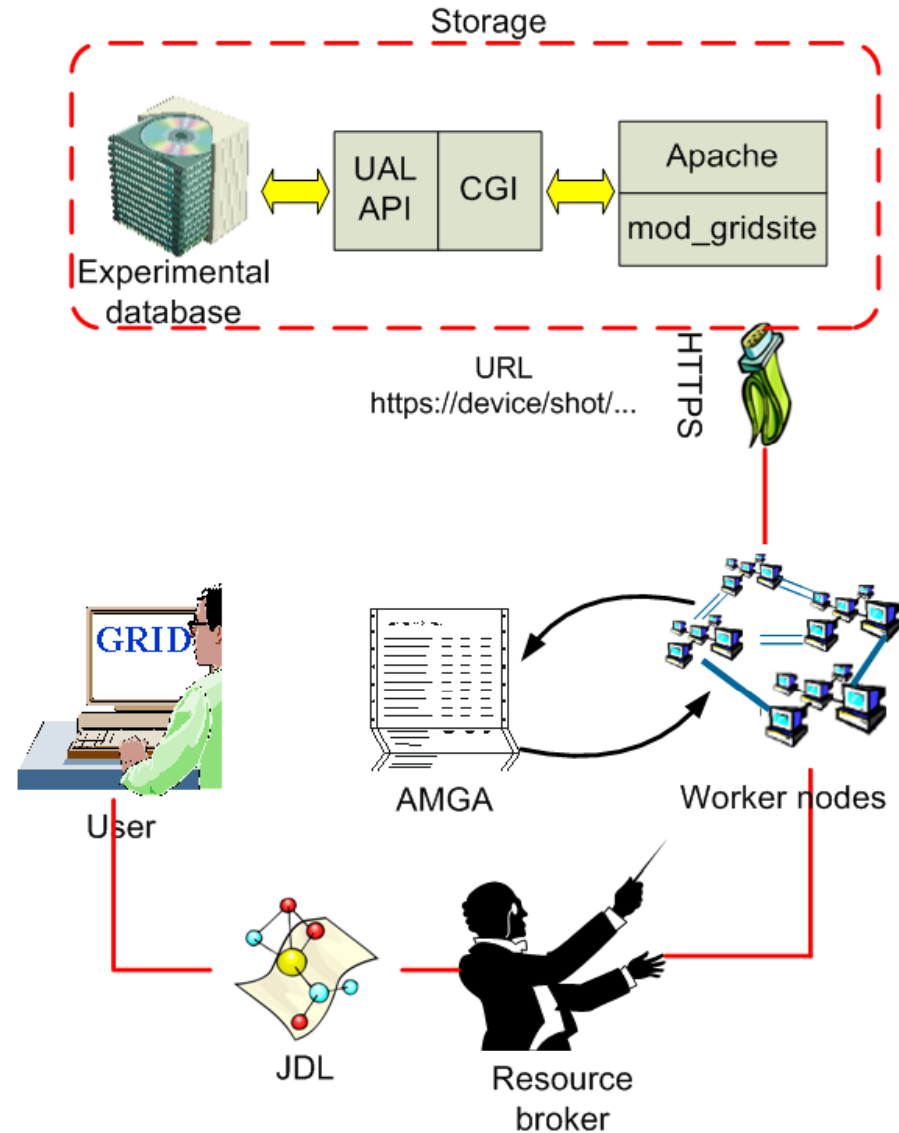
but...

- Doesn't involve Grid benefits (such as replication and security policies)
- No data description: cannot browse metadata

- HTTPS interface to UAL-enabled data storage

hence

- It can use UAL as Grid interface to all experimental data bases



- High level data description (RDF)
- Already works in AstroGrid-D community
- Enables to make self-descriptive system
- Can involve UAL metadata hierarchy as subset of data description
- Ready to use
- User-friendly data navigation can be easily realized
- Academy & training
 - To be discussed

AstroGrid-D Information Service - Mozilla Firefox

Файл Правка Вид Журнал Закладки Инструменты Справка

http://vo.nfi.kiae.ru:24000/query/

Query form SPARQL help | Status | Query | Introspection

Query Status

Execution time: -

Result links: [xml](#), [json](#)

Error:

```

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX dust: <http://vo.nfi.kiae.ru/pub/dust.html#>
SELECT ?ID ?AssemblingTime ?AssemblingTime_New ?Date
WHERE {
  ?ID dust:BzExt ?BzExt;
  dust:Zborder ?Zborder;
  dc:Date ?Date.
  filter (?Zborder=21.68)
  filter (?BzExt=3.0)
  optional {?ID dust:AssemblingTime_New ?AssemblingTime_New;
  dust:AssemblingTime ?AssemblingTime.}
}
ORDER BY desc (?Date)
    
```

ID	AssemblingTime	AssemblingTime_New	Date
http://vo.nfi.kiae.ru/pub/data/dust/marusov_tx_TNSYAU86Yv7qS38Tsyg	34.6	34.6	2008-06-26
http://vo.nfi.kiae.ru/pub/data/dust/marusov_EBKqpyF9W35K8ZxwBVjSsA	26.1	26.1	2008-06-26
http://vo.nfi.kiae.ru/pub/data/dust/marusov_yCnsX2gaNoUwGqcCeaKEoQ	46.8	26.6	2008-06-26
http://vo.nfi.kiae.ru/pub/data/dust/marusov_3Ei8YcvbDzJwPZ4mNI7AjQ	19.1	19.1	2008-06-25
http://vo.nfi.kiae.ru/pub/data/dust/marusov_M9VXGHLd6QVNG6RkHfgJw	21.4	18.8	2008-06-25
http://vo.nfi.kiae.ru/pub/data/dust/marusov_1RWs_9mO3AhmQgdnYT03Ww	31.7	31.7	2008-06-25
http://vo.nfi.kiae.ru/pub/data/dust/marusov_z5_5jc2kCTj4RIyh6G_Rgg	28.9	28.9	2008-06-25
http://vo.nfi.kiae.ru/pub/data/dust/marusov_SwTeW12euXrTddrf2lCYew	47.0	47.0	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_8nKLxGvX0NI1gqhxxgwI6gA	64.8	64.8	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_nHYHGtUwfQCU801p0rG2qg	67.9	67.9	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_bHV0ik0o2-MxAdm1-upfPQ	19.6	19.6	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_hi8Bb1gmlWY7KvkI3pshIw	38.9	38.9	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_WVvo2YgyAEt4vAp4kKefw	89.7	89.7	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_DOokSOuXGq-dv4KmHPnGGw	83.7	60.7	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_IIV4ctXYySxMkKVebWCA	71.0	71.0	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_3wYafRo1OLwOH-zzt_CN9g	41.3	41.3	2008-06-24
http://vo.nfi.kiae.ru/pub/data/dust/marusov_Uu2Ticte06_ZzkDQewwQ4w	36.4	36.4	2008-06-23
http://vo.nfi.kiae.ru/pub/data/dust/marusov_kaNK20BAY6EMc7_CmAWJEQ	55.5	55.5	2008-06-23
http://vo.nfi.kiae.ru/pub/data/dust/marusov_uC9V0-0ikMe09fR1EiWxg	35.7	35.7	2008-06-23

Готово

SPARQL query area

Results area

Numerical Modeling of Electrodynamic Aggregation of Magnetized Dust in Electric Discharges

A.B. Kukushkin, N.L. Marusov, P.V. Minashin, V.S. Neverov

- HTTPS data service with UAL interface is prototyped
- AMGA HTTPS interface is proposed
- Stellaris information service is good as a component for self-descriptive data storages

To be discussed:

- Granularity of data needed (consistent description (CPO) is too large, time slice is too small, simultaneous processing of small chunks of data)
- File formats to be supported by UAL data service (HDF5?)
- Use cases needed!!!

Grazie !