Web Services for Integrated Management: a Case Study

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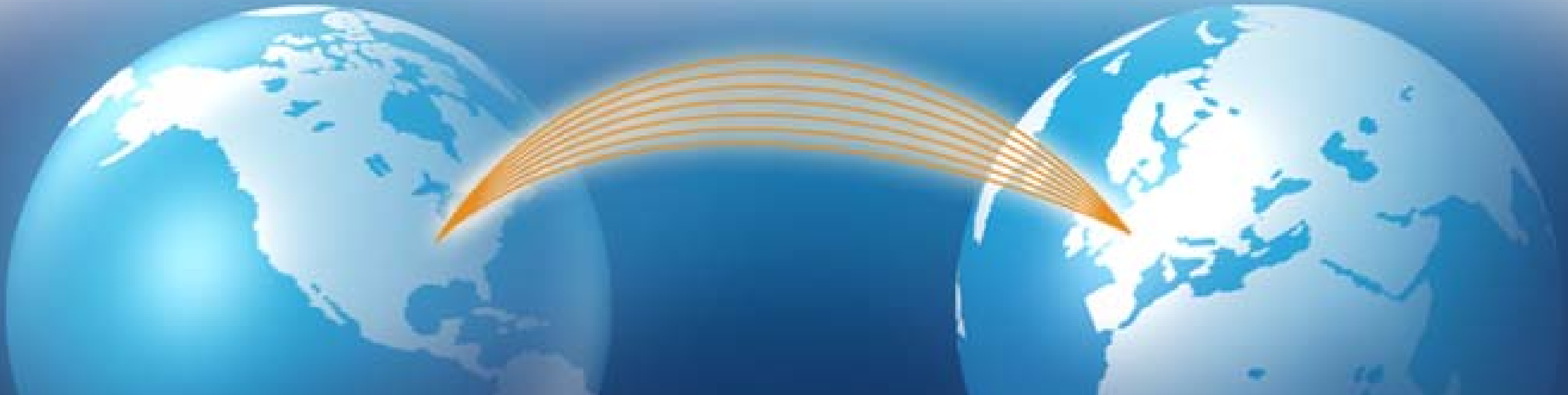


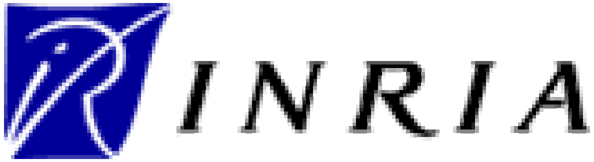
ECOWS 2004, Erfurt, Germany, 29 September 2004

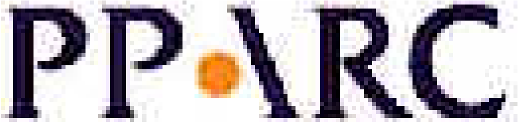
Outline

- DataTAG testbed and project
- NSM, WIMA and JAMAP
- Suitability of Web Services for NSM:
  - This talk: UDDI
- Lessons Learned

DataTAG Testbed and Project

Project Overview





http://www.datatag.org/

1 Jan 2002 – 31 Mar 2004

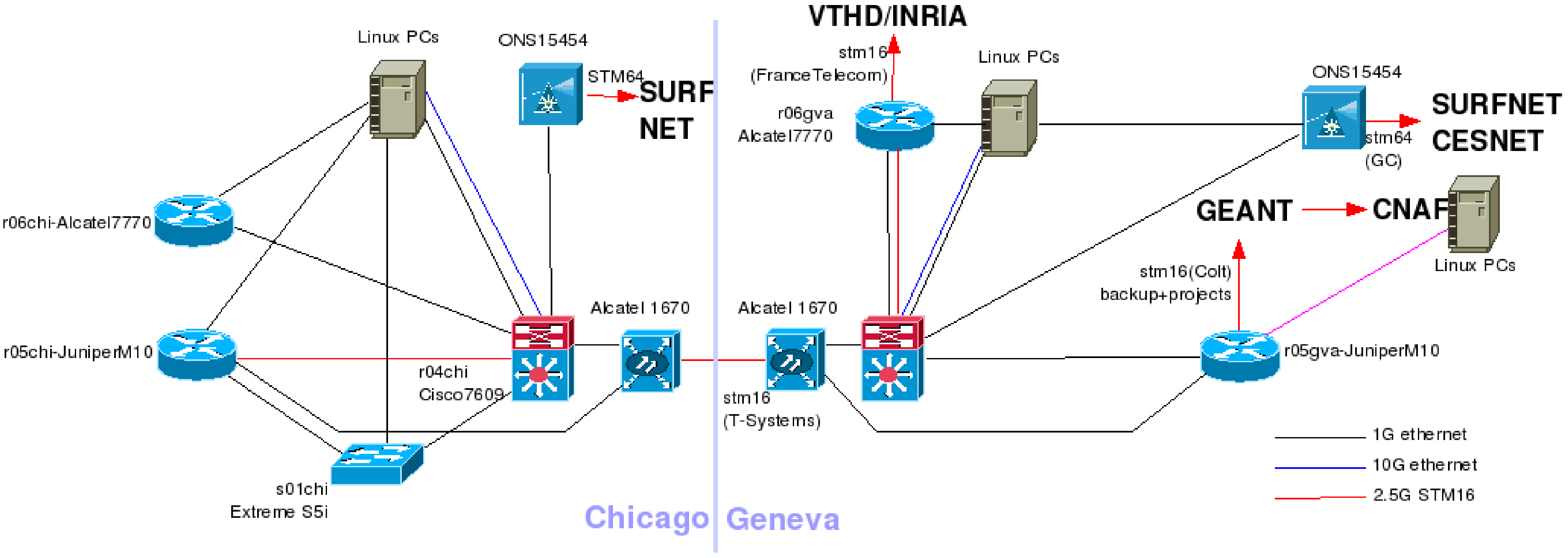
budget: EUR 4M

50 people (50% funded)

Main Objectives

- Build a testbed to experiment with massive file transfers (terabytes) across the Atlantic
- Provide new network protocols and services to better exploit the gigabit networks that underpin data-intensive Grids
- Guarantee interoperability between major HENP Grid projects in Europe and the USA

DataTAG Testbed Topology during this Work



Source: Edoardo Martelli

NSM, WIMA and JAMAP

NSM (1/2)

- NSM = Network and Systems Management:
  - For the sake of simplicity, we ignore service mgmt in this talk
- IM = Integrated Management of networks, systems, applications, services, etc.
- Management architecture [X.701]:
  - Organizational model:
    - Manager-agent paradigm
  - Information model
  - Communication model
  - Functional model

NSM (2/2)

- Functional model [X.700] [M.3400]:
  - Fault management
  - Configuration management
  - Accounting management
  - Performance management
  - Security management
- Classification based on data flows [Martin-Flatin 2002]:
  - Regular management
  - Ad hoc management
  - Configuration management
  - Background analysis

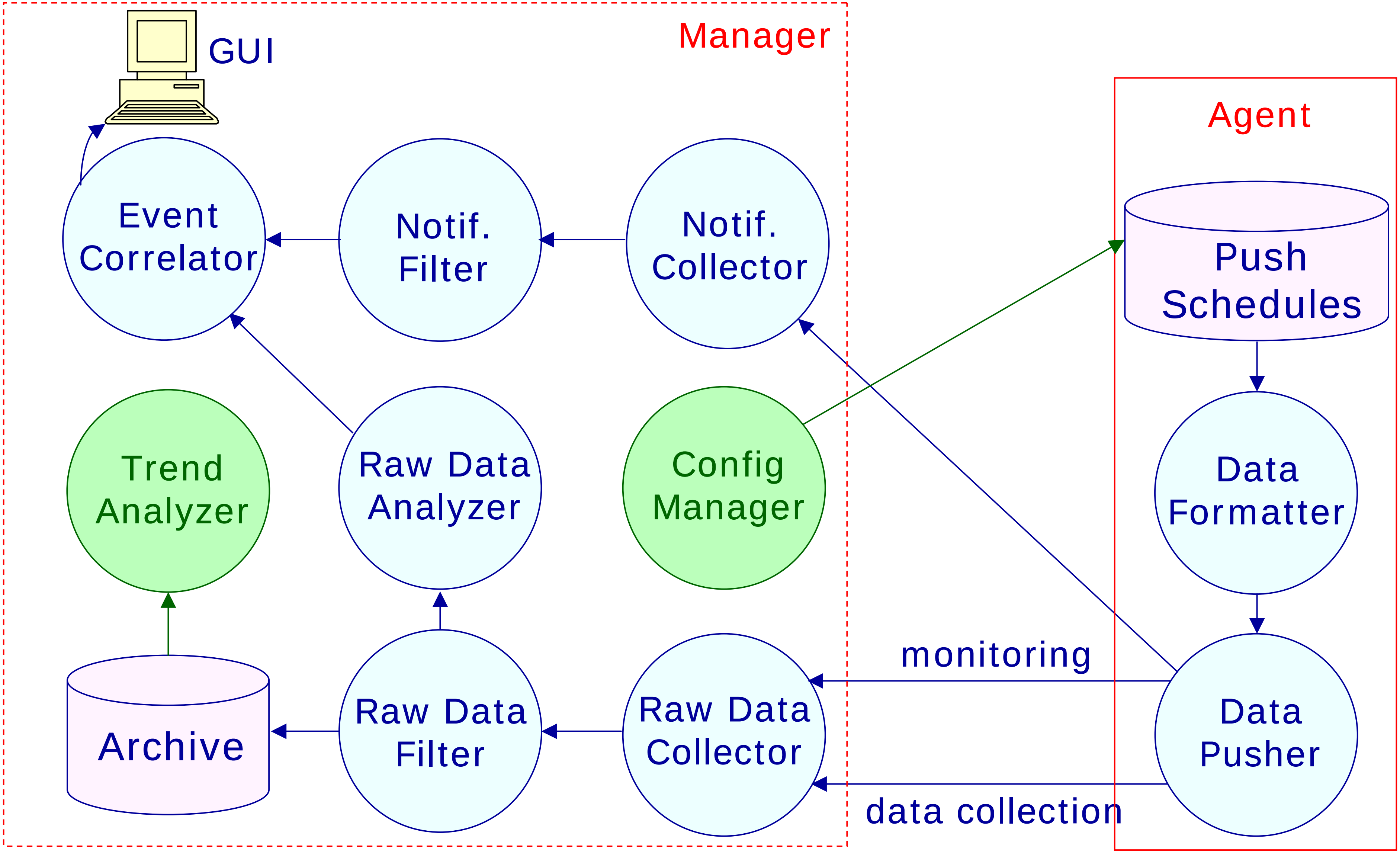
WIMA: the Big Picture (1/2)

- WIMA = Web-based Integrated Management Architecture
- Push
- Web technologies
- Distributed hierarchical management
- Multiple information models
- Information model independent of communication model

WIMA: the Big Picture (2/2)

- Configuration management:
  - Attended mode: Java applets and servlets
  - Unattended mode: XML + DBMS
- Manager = independent coarse-grained components:
  - Can be physically distributed

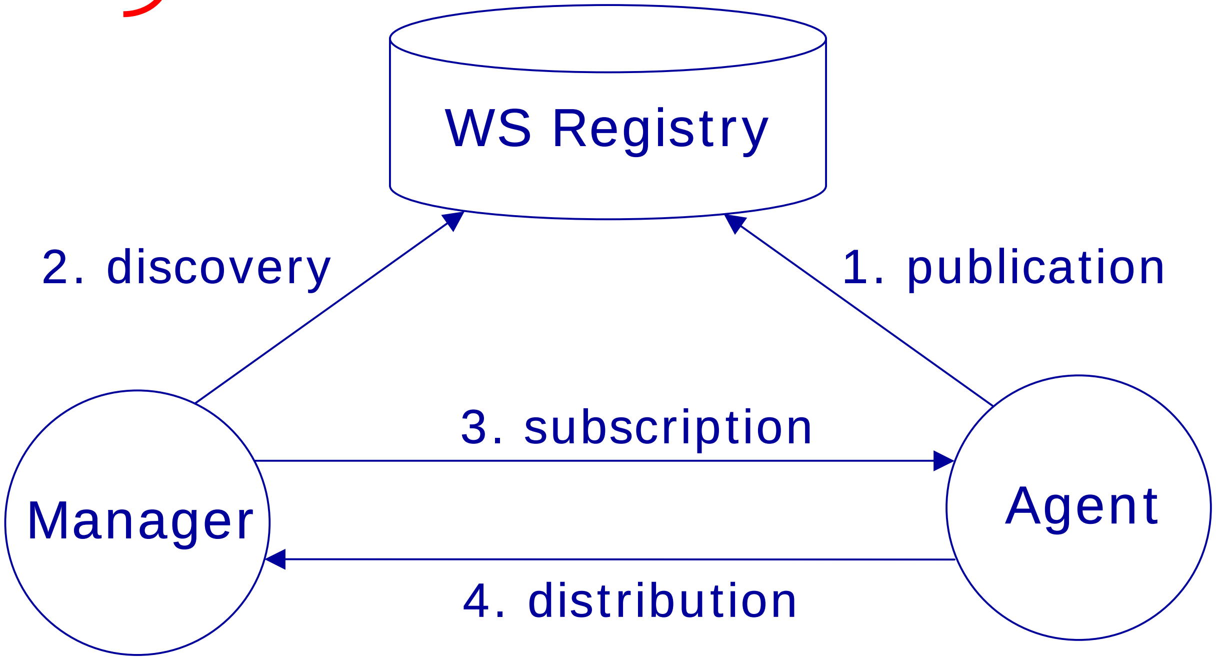
Manager = Independent Coarse-Grained Components



Four Phases of Monitoring & Data Collection

- Publication
- Discovery
- Subscription
- Distribution

Web Services?



JAMAP

- JAva MAnagement Platform
- Implementation of WIMA in Java
- Research prototype
- Platform to test out different designs
- Not optimized for performance
- Available under GPL at:
  - http://cern.ch/jpmf/projects/jamap.html

Suitability of UDDI for NSM

UDDI (1/2)

- *businessEntity:*
  - High-level description of a company
  - Equiv. to yellow pages
  - Name, description, contact info:
    - e.g., CERN, HENP research lab, URL of PR office website
- *businessService:*
  - High-level description of a service provided by the company, in business terms:
    - e.g., do fundamental research in HENP
  - Equiv. to taxonomic entries in white pages

UDDI (2/2)

- *bindingTemplate:*
  - Technical description of a given business service
  - Access point (e.g., URL or email) or indirection mechanism leading to access point
  - *instanceDetails* and *instanceParms* do not allow us to store the required info model/XML schema
- *tModel:*
  - A technical model contains pointers to technical docs used by WS developers and metadata about these docs
  - Primarily used as sources for determining compatibility between WS providers and WS consumers, and as keyed namespace refs

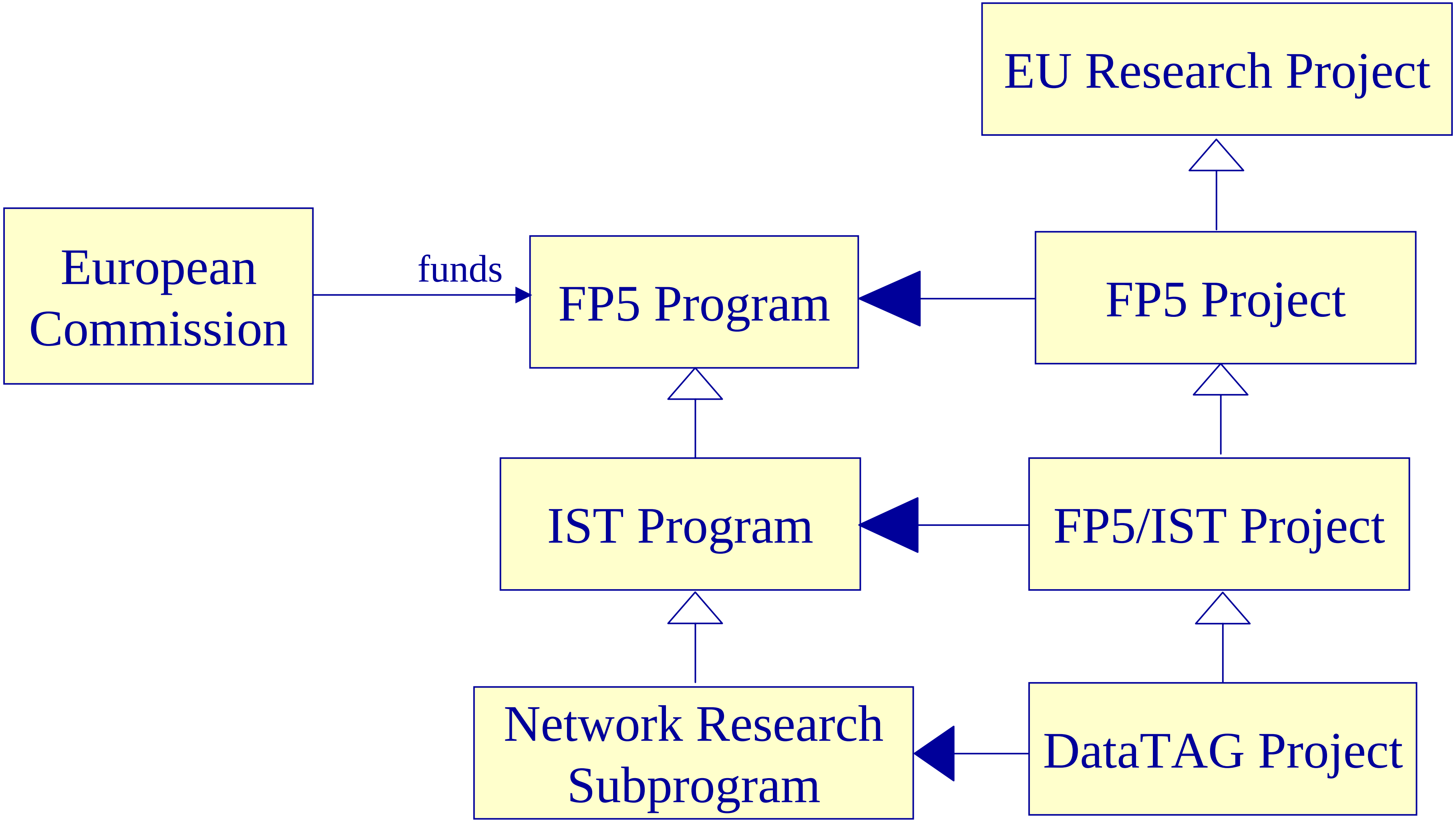
What UDDI Can Do

- UDDIv1 and UDDIv2: CERN can advertise to the world that it is a research lab in HENP
- UDDIv3: CERN can also advertise internally that the IT Dept. offers IT services to all CERN staff
- Very coarse-grained WSs

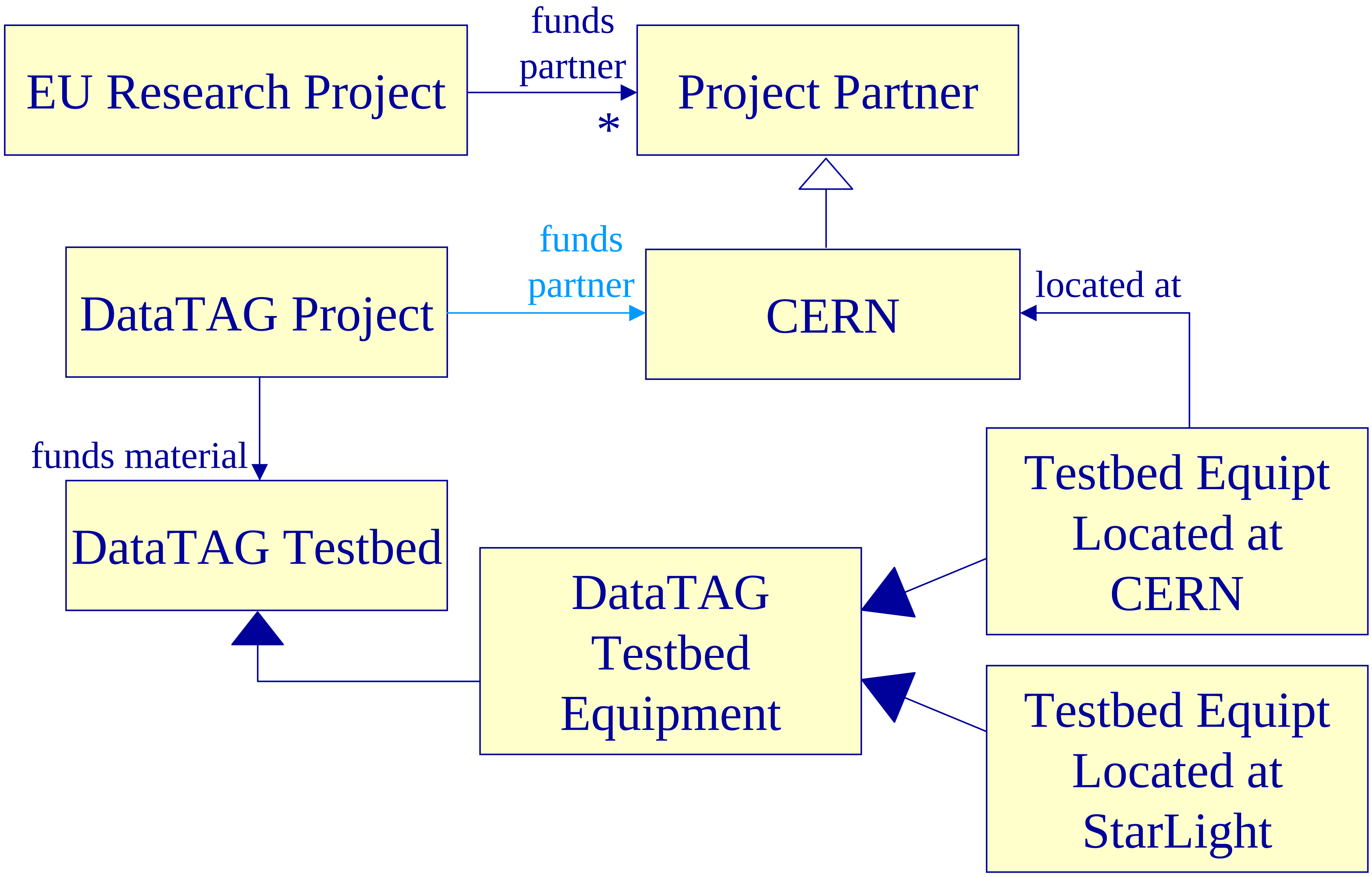
What UDDI Cannot Do

- Publish/subscribe for most WSs
- Service discovery for most WSs
- Problem: UDDI schema lacks flexibility

Scenario for NSM (1/4)



Scenario for NSM (2/4)


EU Research Project

funds partner

*

Project Partner

DataTAG Project

funds partner

CERN

located at

funds material

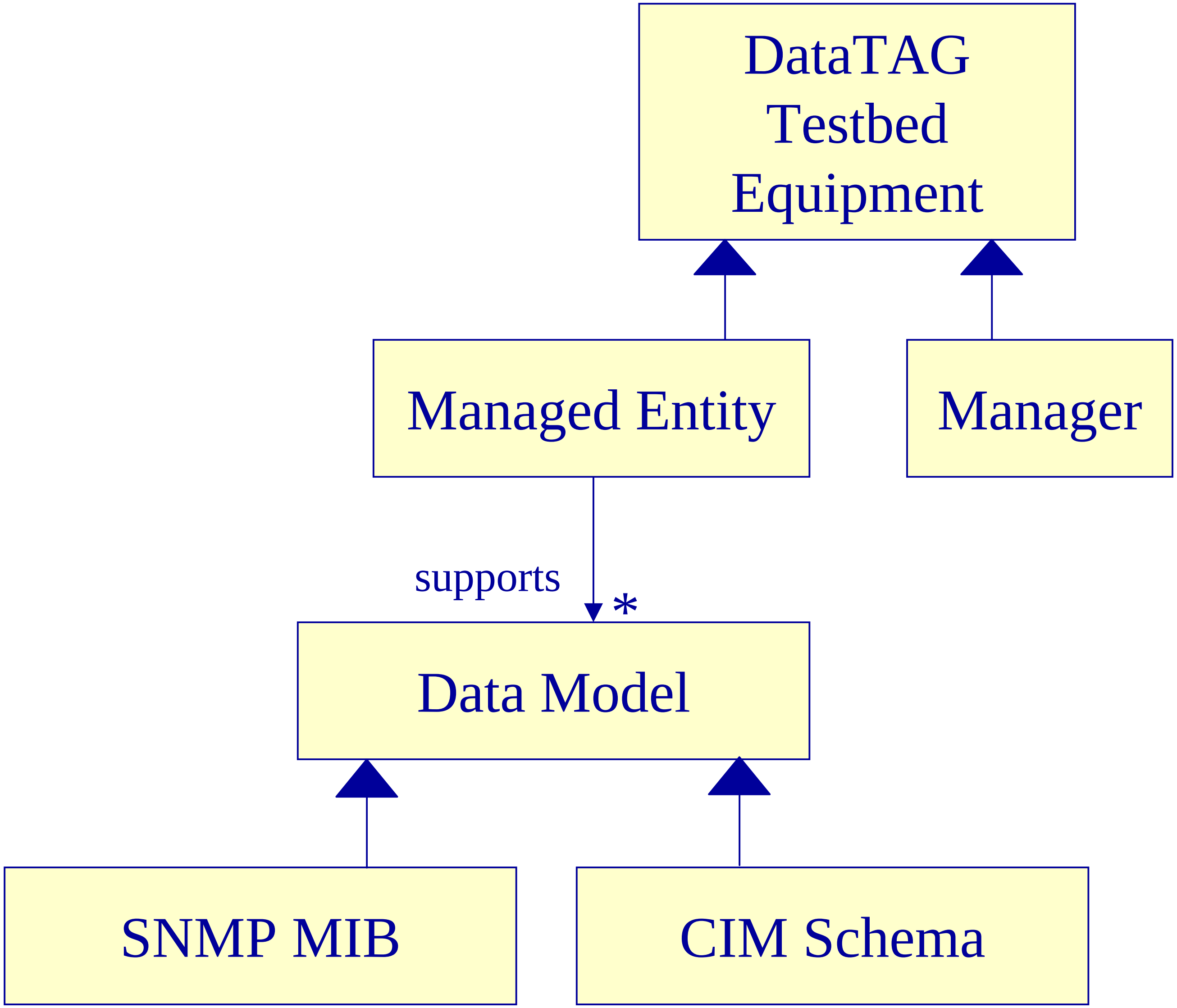
DataTAG Testbed

DataTAG Testbed Equipment

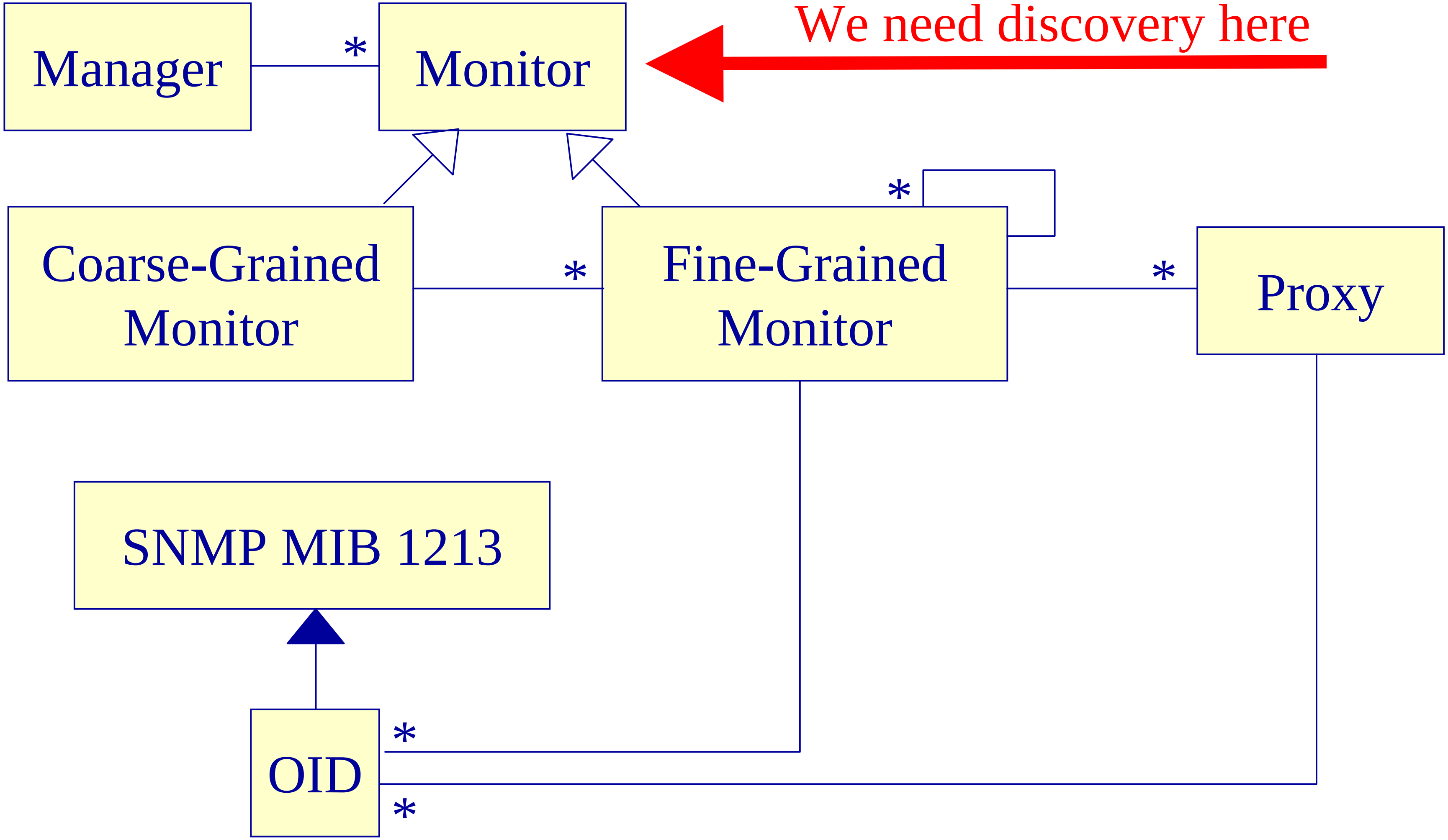
Testbed Equipt Located at CERN

Testbed Equipt Located at StarLight

Scenario for NSM (3/4)



Scenario for NSM (4/4)



Lessons Learned and Conclusion

Lessons Learned (1/3)

- XML is easy to use:
  - Simple API for XML (SAX): parse an XML doc in Java and validate against an XSD file
- XML is portable:
  - Tested under Linux 2.4.20, Windows 2000, Windows XP
  - Suitable for configuration files
  - Facilitates integration in a heterogeneous environment
- XML parsing and validation are slow in JDK 1.4

Lessons Learned (2/3)

- SOAP may be used to transfer mgmt data:
  - Slower than SNMP
  - With Axis, several limitations:
    - No way to set socket options or TCP options
    - No way to use long-lived HTTP/TCP connections
- Axis 1.1 (WS) has teething problems:
  - WSs discovered in a WSDL repository cannot be invoked dynamically if they use “complex” types:
    - “Complex” means neither integer, nor string
    - In NSM, we need “complex” types everywhere
  - Invoking a WS within an applet is overly complex:
    - Security issues

Lessons Learned (3/3)

- WSDL is appropriate for describing coarse-grained and fine-grained used in NSM
- UDDI is inappropriate for NSM:
  - It imposes its own 3-layer schema:
    - Not enough flexibility
    - If used normally: coarse-grained white-page service
    - If used abnormally: flat hierarchy of services:
      - Ignores the entity or service granularity
      - Useless in NSM
  - It is not a general-purpose mechanism for publish-subscribe
  - It is not a general-purpose WS discovery mechanism
- We still lack a standard way of publishing, discovering and subscribing to monitoring services in NSM

Directions for Future Work

- Make it possible to define your own detailed schema and link it to a generic root schema (e.g., through containment or inheritance):
  - By analogy with CIM Core Schema, Common Schemas and Extended Schemas
- Allow coarse-grained components of the manager to discover and bind to one another using Web Services:
  - What is the performance hit?