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Enabling Grids for E-science

Bridging Network Monitoring & Grid

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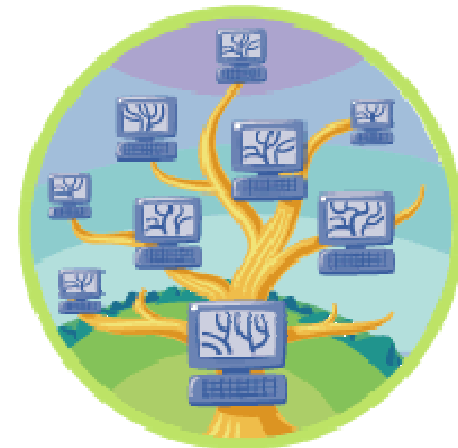
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- **Introductions**
 - EGEE, GGF NM-WG, PerfSONAR
 - Research Cause
- **Grid Middleware Use Cases**
- **Analysis of Use Cases**
- **Architecture**
- **Prototypes**
- **Future Work**
- **How to get involved**
- **Conclusion & References**



- **Enabling Grids for E-Science**
 - 2 year project started in April 2004
 - Likely to continue into EGEE-II from April 2006
- **Organized into 11 Activities**
 - 5 NAs (Networking Activity)
 - 2 SAs (Service Activity)
 - 4 JRAs (Joint Research Activity)
- **EGEE JRA4 deals with Network Services Development**
 - Network Performance Monitoring (NPM)
 - Bandwidth Allocation and Reservation (BAR)
- **Partners in EGEE JRA4**
 - The University of Edinburgh (replaced UCL)
 - DANTE
 - CNRS-UREC
 - GARR
 - DFN
 - CCLRC

- **PERFormance Service Oriented Network Monitoring ARchitecture**
 - Joint Effort by GEANT2 JRA1 Project Partners, Internet2, ESnet and University of Delaware
- **Service Oriented Architecture**
 - Collection of Services
 - Services can be used either singularly or in conjunction, to accomplish a particular task
- **Some examples of existing services**
 - Measurement Archive Service for RRDs,
 - Measurement Point Service for Ping, BWCTL
 - Lookup Service

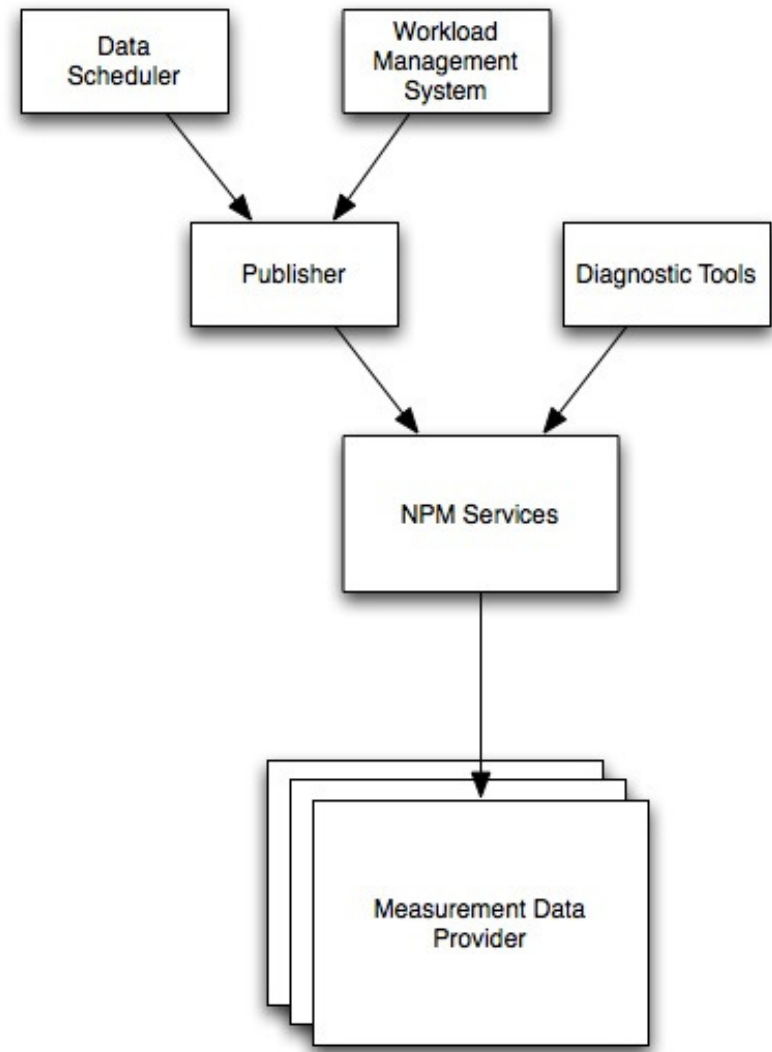
- **Global Grid Forum – Network Measurements Working Group**
- **Works include**
 - Two versions of XML Schemas for measurement data exchange
 - Categorization of network metrics in use by monitoring tools
- **Work in progress**
 - Version 2 of XML Schemas
- **Relation between EGEE, PerfSONAR and GGF NM-WG**
 - EGEE and PerfSONAR: Early Adopters of GGF NM-WG work
 - First demonstration of single access to heterogeneous NPM frameworks (GGF13, March 2005)
 - Feedback to NM-WG about Schemas
- **Mailing list info: nm-wg@gridforum.org**

- **Grid Middleware and applications require network measurement data**
 - Optimize their performance
 - Select the best resource available
 - Adapt to changing network conditions
 - Provide Network support for Grid users
- **Many measurement tools have so far been designed to operate within single administrative domains**
 - Lack of mechanisms to publish measurement data to Grid Applications
- **Paper is the result of work of EGEE and its partners, with the help of PerfSONAR and GGF NM-WG**
 - Address Grid requirements
 - Highlight factors to be considered while satisfying them
 - Demonstrate the results

- **Job Scheduling**
 - Scheduling policies applied to jobs submitted to the Grid Middleware
 - Goal is to maximize individual task execution efficiency
 - Current focus is on policies which aim to minimize task ‘completion time’
- **Data Transport**
 - Different scenarios in which data transfer is needed
 - Fetch, Point-to-Point, Point-to-Multipoint
 - Heavily dependent on network conditions
 - Mainly Achievable Bandwidth metric
- **Operations**
 - Access to network measurement data from different domains
 - Debugging Grid user’s problems and providing support

- **Metrics of Interest to Grid**
 - TCP Achievable Bandwidth
 - Round Trip Packet Loss, Round Trip Time
 - IPDV (Jitter)
 - Available Bandwidth
 - And others to help network problem debugging
- **Middleware Functional requirements**
 - Most recent data (up to 24 hrs)
 - Historical and most recent data for detecting network problems
 - Fast access to data
- **Access to Data from Different domains raises some issues**
 - Security and Data disclosure policies
 - Communication Protocol differences
 - Meeting Data Analysis, Processing and Presentation requirements
 - Discovering Data Providers

- **Solutions to satisfy given Use Cases**
 - Consider arising issues
- **High Level Architecture**
 - EGEE's focus is on
 - NPM Services
 - Publisher
 - Diagnostic Tools
 - Multi-staged approach



- **Prototype Design**

- Publisher

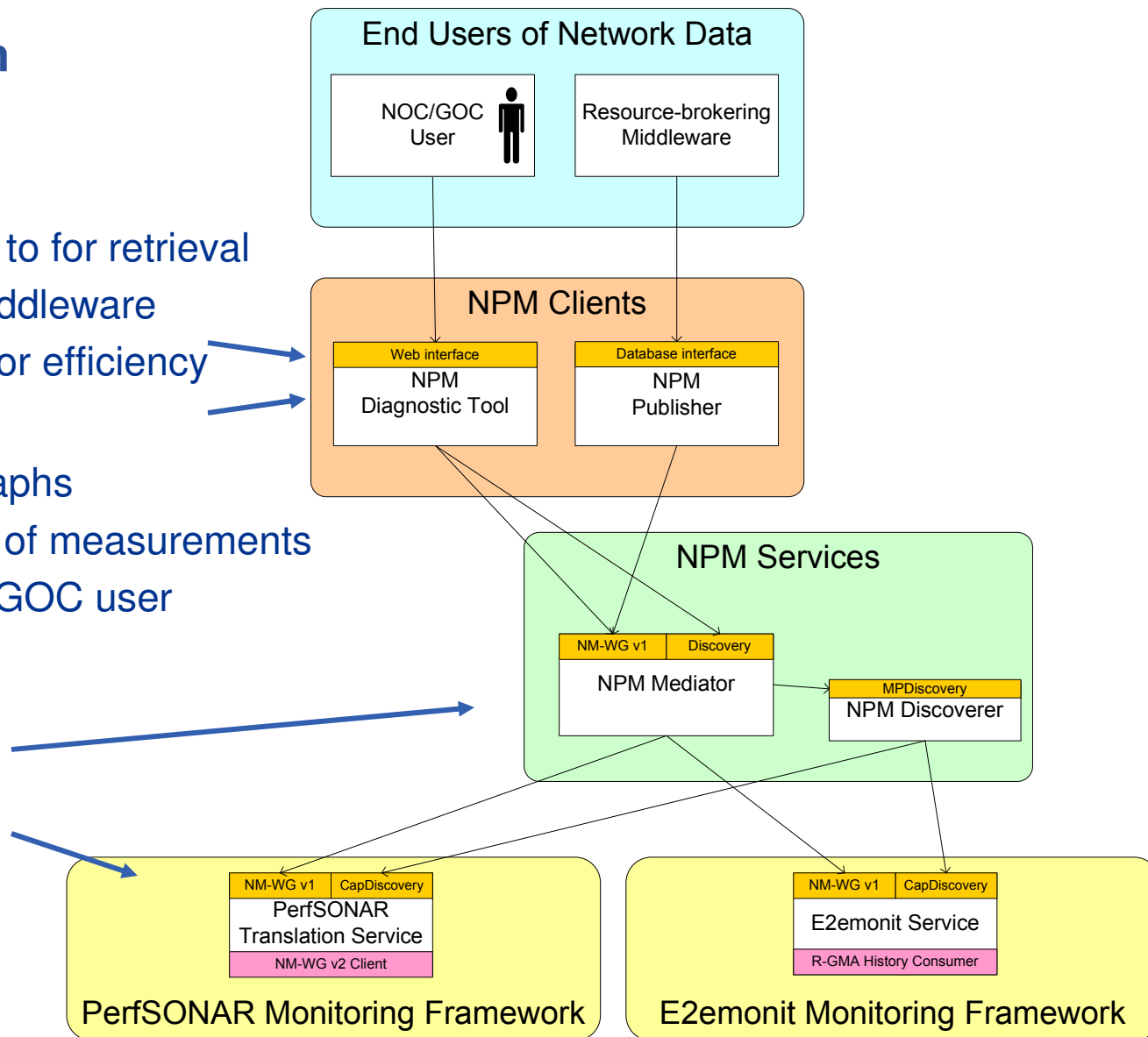
- Publish Data to for retrieval by Grid Middleware
 - Cache data for efficiency

- Diagnostic Tool

- Data and Graphs
 - Presentation of measurements for a NOC/GOC user

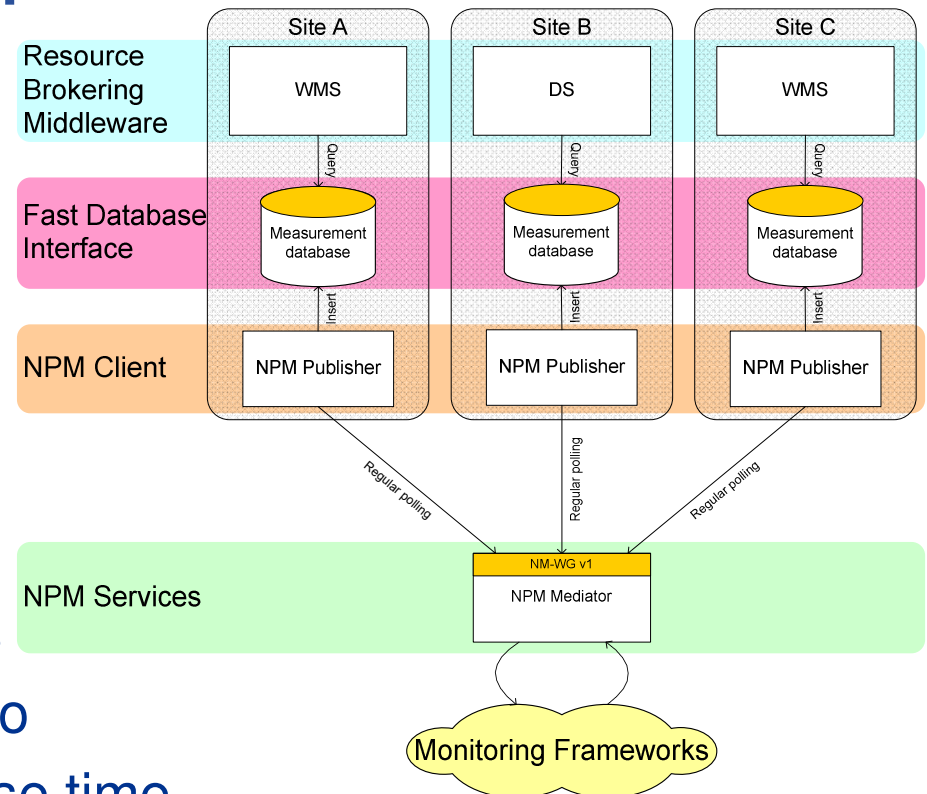
- NPM Services

- Mediator
 - Discoverer
 - Translation



- **Publisher Prototype Design**

- Client of the Mediator
- Regularly retrieves current data (up to 24 hrs old)
- Stores retrieved data in a database
- Provides CE/SE \leftrightarrow NMP mapping
- Database allows rapid access by local WMS/DS services: to meet the 0.2 second response time requirement



- Diagnostic Tool: Seamless access to multi-domain data

NPM Diagnostic Tool



Query

Time Range
 Start: 2006-01-27 08:00:00
 Start: 2006-01-27 08:00:00
 Focus: 2006-01-27 08:30:03
 End: 2006-01-27 12:30:00
 Period: 270 Minutes
 Tolerance [s]: minus 1803 plus 14397

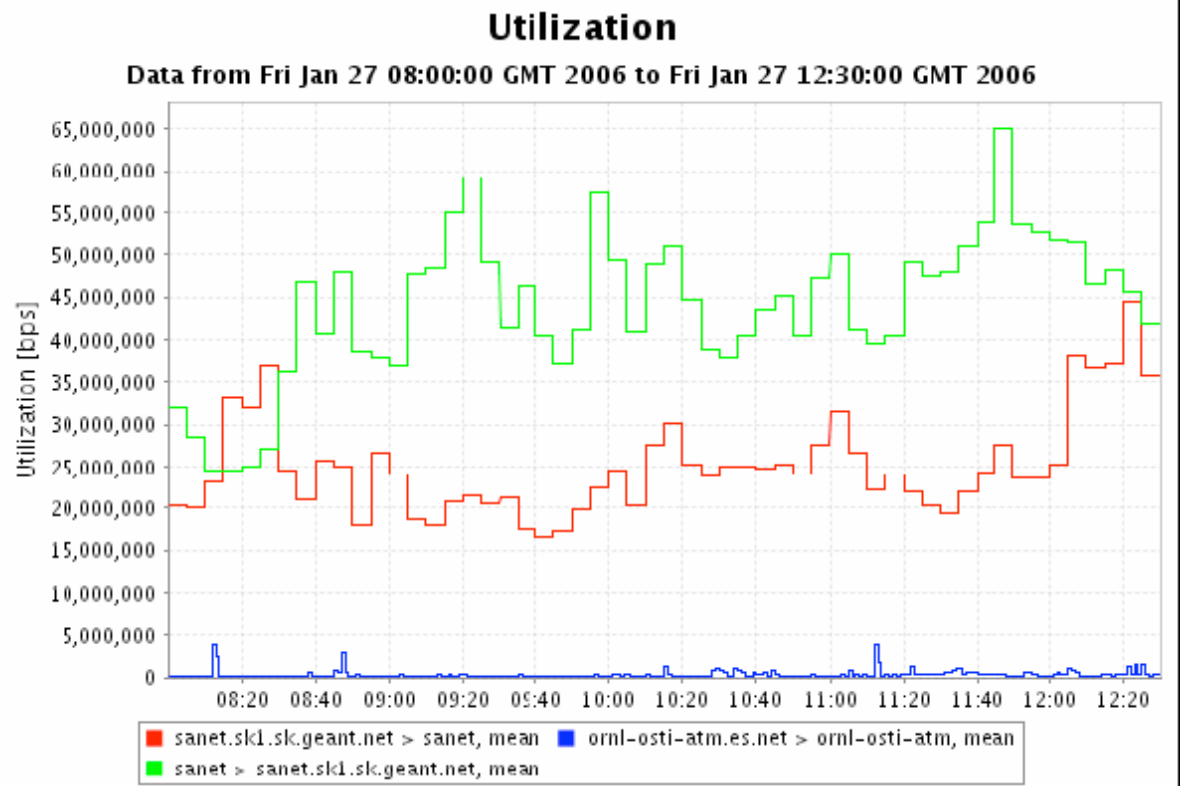
Max Results
 Maximum number of results

Test Path
 Source: ornl-orau.es.net, ornl-osti, ornl-osti-atm, ornl-osti-atm.es.net
 Destination: ornl-osti-atm
 Choose New Source Add Path

Metric
 Metric: Utilization Packet Size: byte

Statistic
 Statistic: Average 5

View As
 Data Table Matrix



- **EGEE (until March 2006)**
 - Further requirements capture from operation centres
 - End-to-end monitoring (e2emonit)
 - Hardening and pilot deployment
- **EGEE-II (April 2006 - March 2008)**
 - Current Plans
 - Focus on providing measurement data access **service**
 - Use available deployments in EGEE-I and new additions to provide this service
 - Further development of Diagnostic Tool and Middleware Interface
 - *Replace access-list security with VOMS*
 - Virtual **O**rganization **M**embership **S**ervice
- **PerfSONAR**
 - More Services = capability to export more types of measurements

- **Become a Data provider**
 - Use GGF NM-WG Schemas
 - Web Services
- **Deploy PerfSONAR Services**
 - Many services developed, many in the oven
 - Ongoing effort
- **Get involved with PerfSONAR Development Effort**
 - If you need services other than the ones available
 - PerfSONAR provides a framework
- **Provide feedback on the interface of the clients, metrics gathered and/or deployment of NMPs**

- **EGEE aims to provide a variety of data from heterogeneous frameworks as per user requirements**
 - Grid Operation Centre (GOC) users
 - Middleware
- **PerfSONAR aims to provide the necessary infrastructure to facilitate easy exchange of measurement data with clients such as EGEE**
- **For Sensitive data, Data Disclosure Policies need to be set up and necessary measures will be used to uphold agreements**
- **Questions?**

- **EGEE:**
 - <http://egee-intranet.web.cern.ch/egee-intranet/gateway.html>
- **EGEE JRA4:**
 - <http://egee-jra4.web.cern.ch/EGEE-JRA4/>
- **GGF NM-WG:**
 - Old: http://www-didc.lbl.gov/NMWG/old_index.html
 - New: <http://nmwg.internet2.edu/>
 - Mailing list archives:
 - http://www-unix.gridforum.org/mail_archive/nm-wg/maillist.html
- **DANTE and GEANT2**
 - <http://www.dante.net>
 - <http://www.geant2.net>
- **PerfSONAR and GEANT2 JRA1**
 - <http://www.geant2.net/server/show/nav.754>
 - <http://www.perfsonar.net>