FUTURE INTERNET TESTBEDS
EXPERIMENTATION BETWEEN
BRAZIL AND EUROPE

Federation of the Monitoring Tools

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With contributions from Mayur and Jordan

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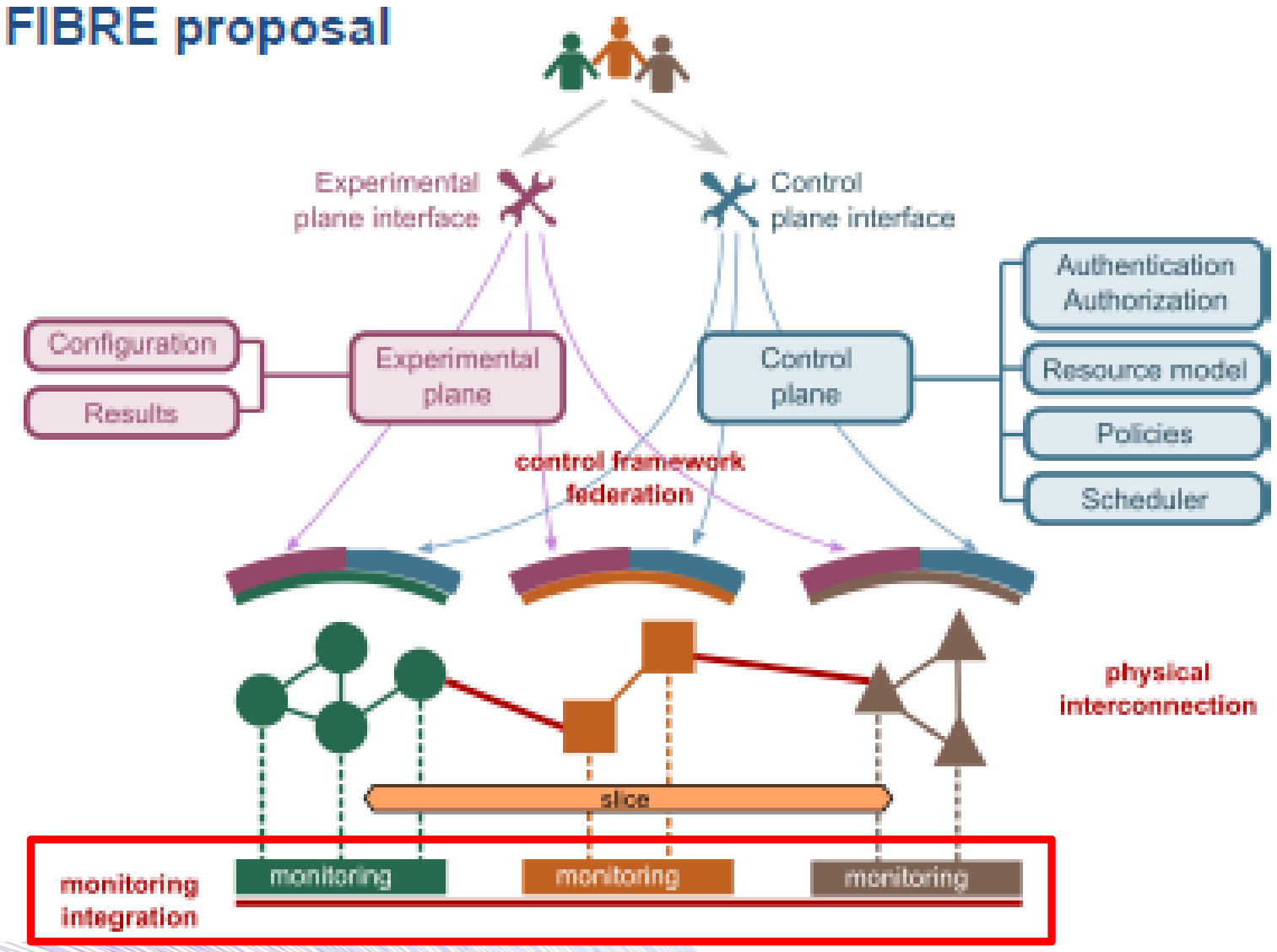
COOPERATION
CNPq 60 ANOS
European Commission
Ministério da Ciência, Tecnologia e Inovação
GOVERNO FEDERAL BRASIL PAÍS RICO É PAÍS SEM POBREZA


FIBRE proposal
Experimental plane interface
Control plane interface
Configuration
Results
Experimental plane
Control plane
Authentication Authorization
Resource model
Policies
Scheduler
control framework federation
physical interconnection
slice
monitoring integration
monitoring
monitoring
monitoring

Context

- FIBRE-EU:
  - OCF Islands
  - OMF Island
- FIBRE-BR:
  - OCF Islands
  - OMF Islands
  - ProtoGENI Island

- Both facilities already need to integrate/federate their own CMFs!

Monitoring User Cases

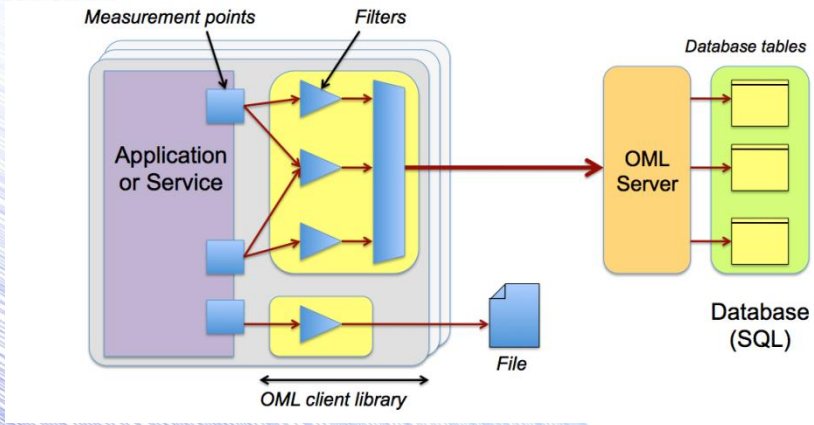
- Infrastructure Monitoring
  - For operators to make sure everything is working
  - For experimenters to check about network conditions
    - Which can be used for resources/islands selection
  - For experiment application
- Experiment/Slice Monitoring
  - Instrument slices and/or applications to collect performance and, eventually, also user-defined monitoring data, as transparent to the user as possible
    - This would be used by experimenters and other authorized researchers to evaluate a given experiment either on-line or off-line
    - Experiment Application
    - The slice may involve heterogeneous CMFs

Measurement Tools Available at ProtoGENI Island

- Two main measurement tools:
  - INSTOOLS = INStrumentation Tools
  - LAMP *(Leveraging and Abstracting Measurements with PerfSONAR)*
    - perfSONAR = performance Service Oriented Network monitoring ARchitecture
    - Ganglia (servers monitoring)
  - Currently they are being combined in the GEMINI project

Measurement Tools Available at OMF Islands

- OML is originally the OMF Measurement Library
- Today is a stand-alone project (can be used by other CMFs)
- Shortly, it is a framework (set of libraries and services) to collect and store measurements
- In NITOS testbed it is used to collect environmental data. Can be used also for measuring the spectrum, interference, etc.
- In the GENI context, through the GIMI project it is planned an integration with GEMINI, using perfSONAR services.



Monitoring in OFELIA

Mayur Channegowda

Monitoring

- Infrastructure monitoring via centralized ZenOSS tool
- VT & Opt-in manager provide experiment monitoring
  - User experiment monitoring difficult due to virtualized resources
- Interfaces available in AMs
  - Monitoring Interface:
    - **installMonitoringAction**(*action, mspec, [options]*)
    - **uninstallMonitoringAction**(*action, mspec, [options]*)
    - **listMonitoringAction**(*action, mspec, [options]*)

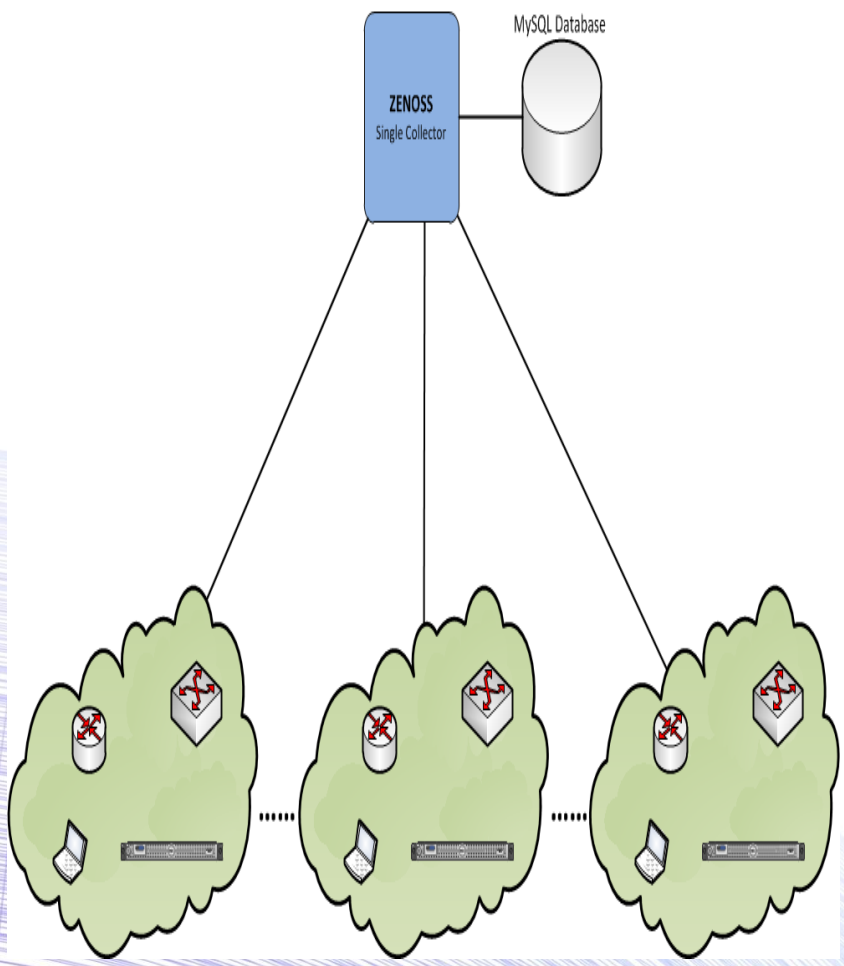
Infrastructure Monitoring

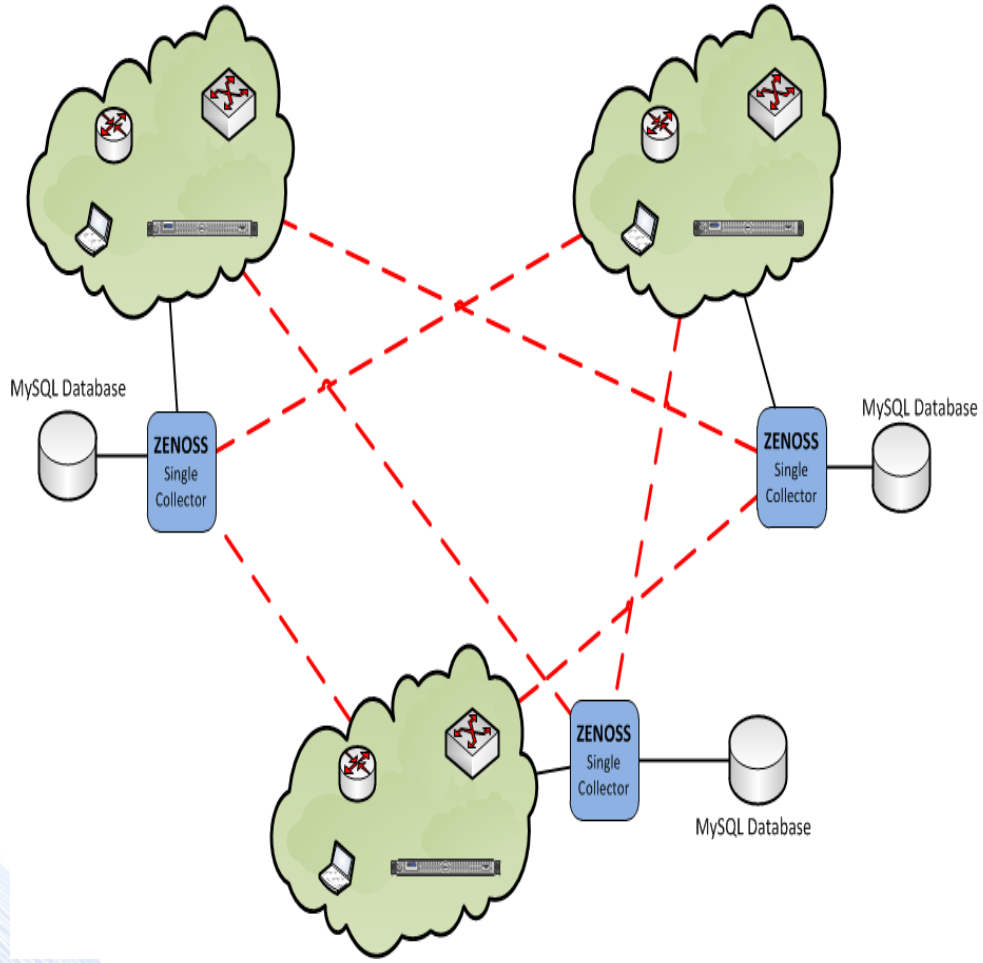
- Zenoss plus points
  - Centralized & Distributed setup possible
  - Allows prebuild vendor(dell,cisco etc.) packages (zenpacks) which allow easy monitoring
  - Different mechanism(snmp, ping, traceroute..) along with email, sms notification
  - Simple JSON API for easy integration coupled by a nice gui

–DEMO

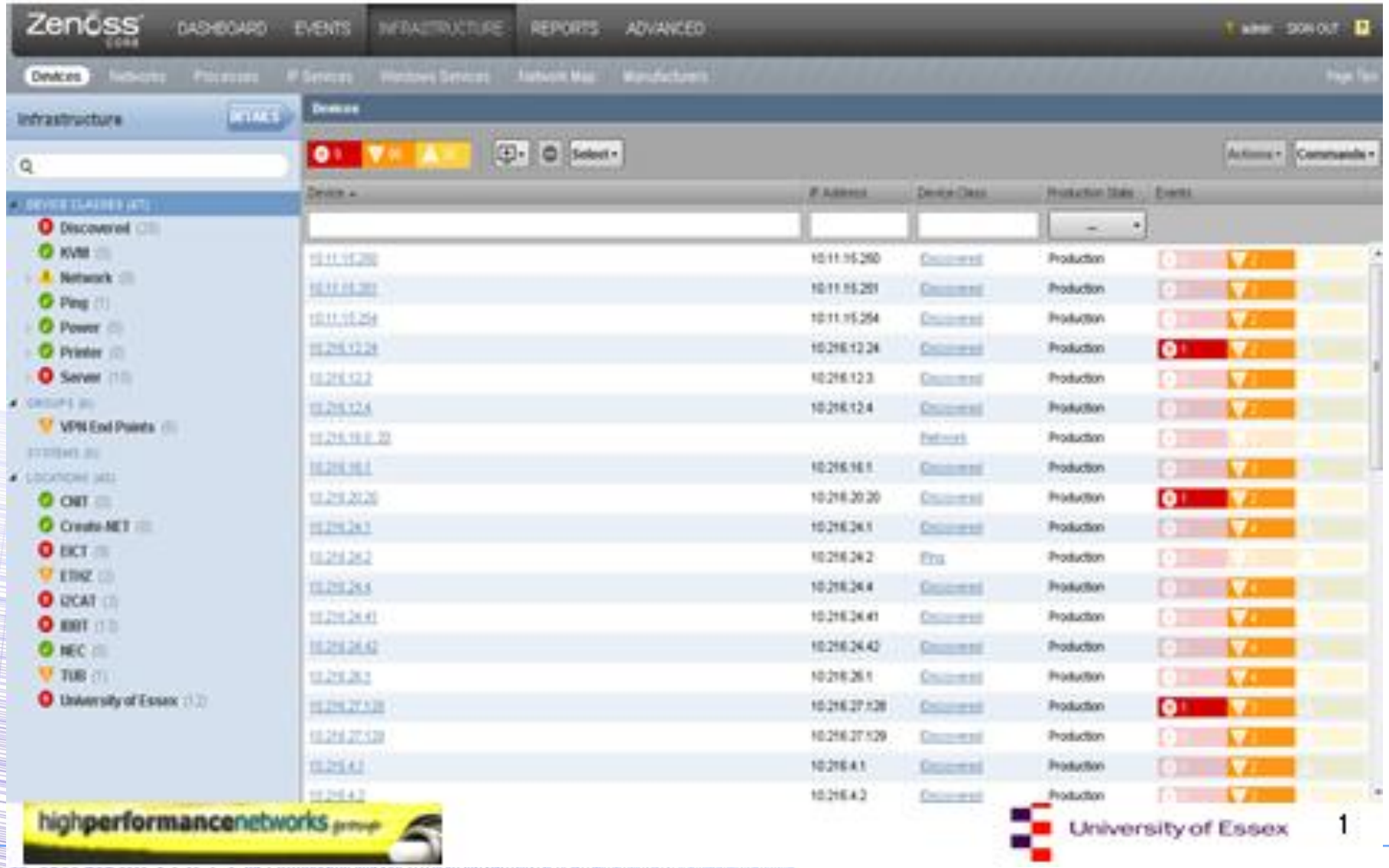
- PerfSonar (protogeni) compatibility with Zenoss ?

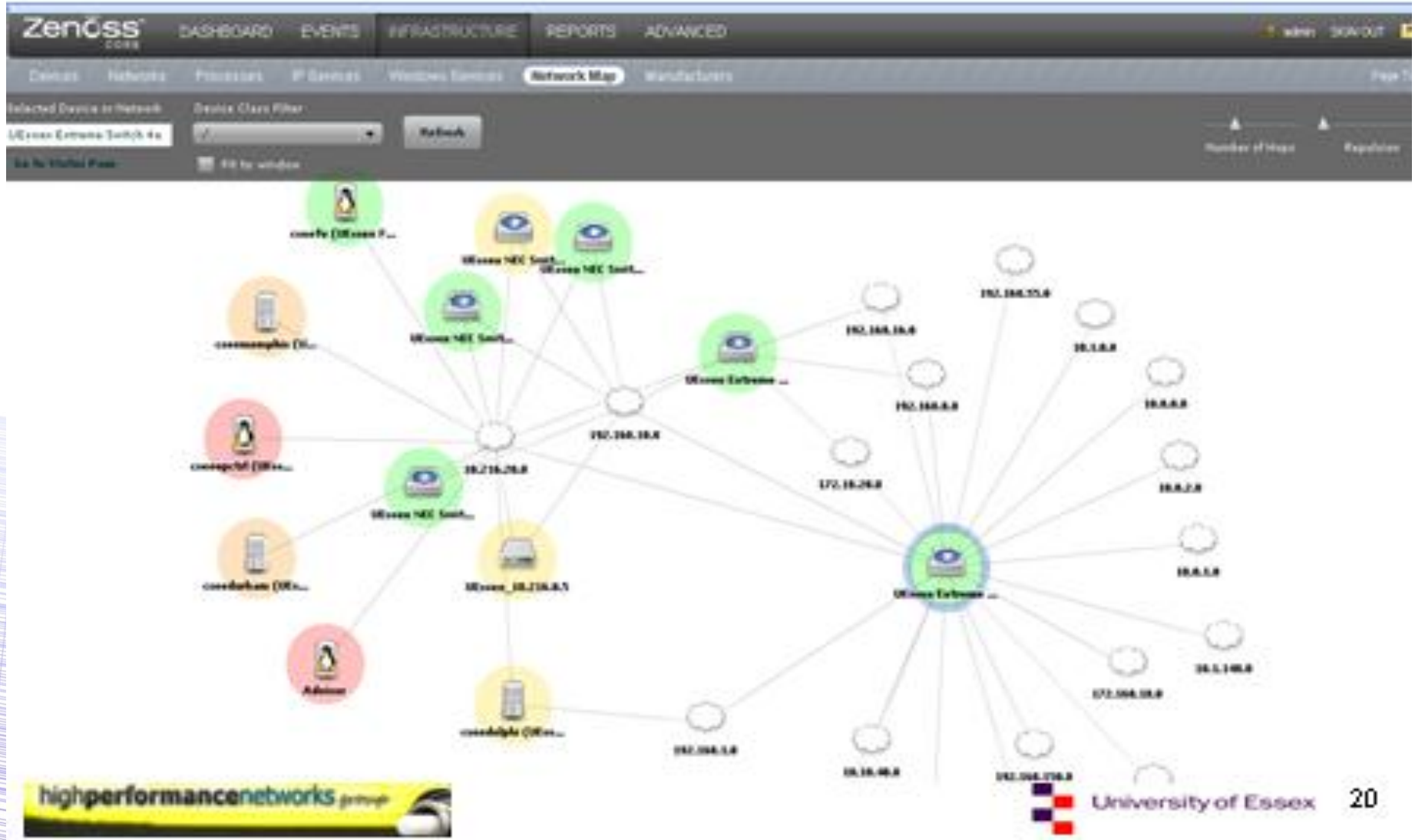
Centralized & Distributed Infrastructure Monitoring





ZENOSS Monitoring (2/2)


Zenoss
DASHBOARD
EVENTS
INFRASTRUCTURE
REPORTS
ADVANCED
Devices
Infrastructure
Discovered
KVM
Network
Ping
Power
Printer
Server
VPN End Points
CNIT
Create-NET
EICT
ETHZ
I2CAT
IBBT
NEC
TUB
University of Essex
Device
IP Address
Device Class
Production State
Events
Production


Zenoss
DASHBOARD
EVENTS
INFRASTRUCTURE
REPORTS
ADVANCED
Network Map

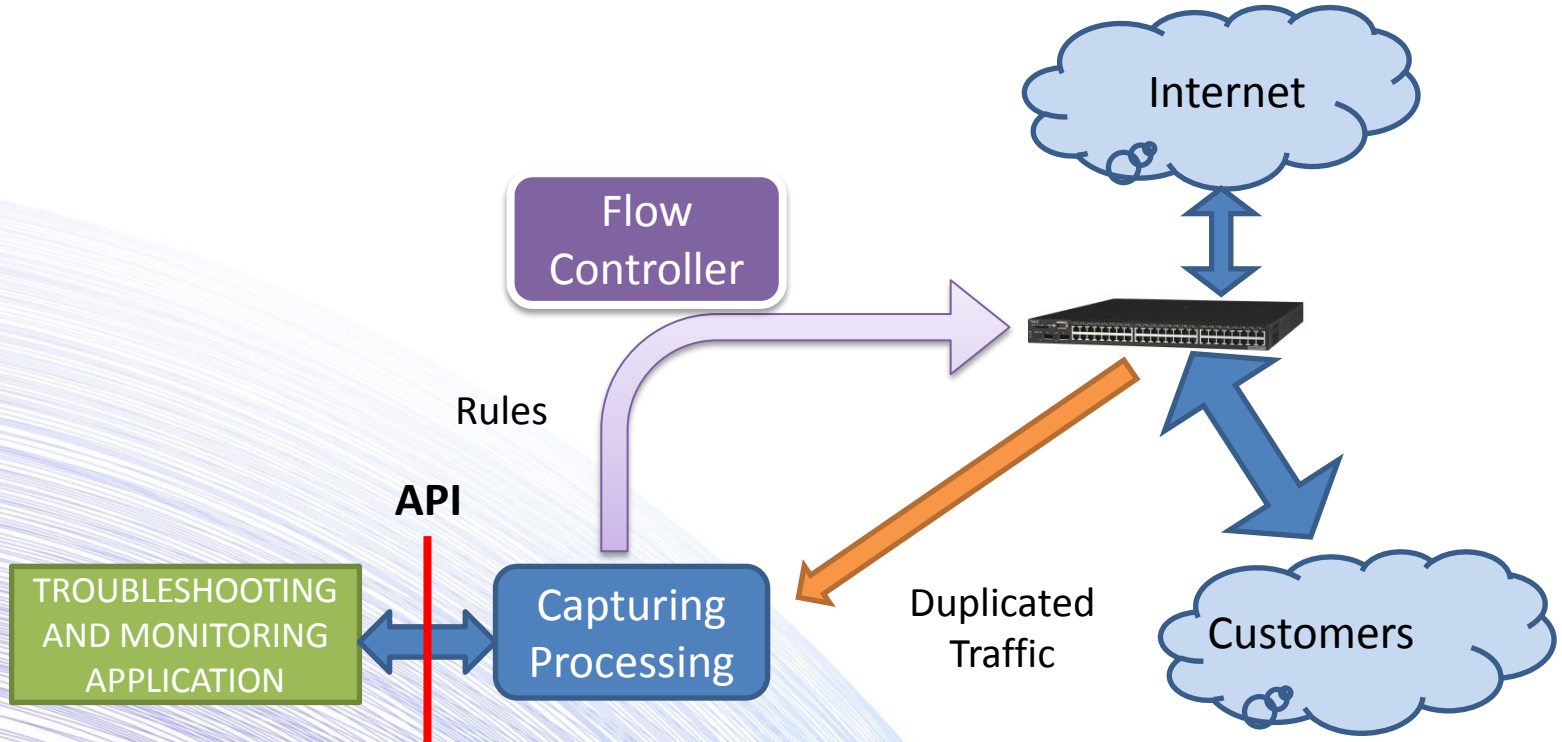
Experiment Monitoring

- Experiment monitoring is tricky in OFELIA

- Suggestions:
  - Mirror all OpenFlow traffic to a endpoint and use SFlow/NetFlow to filter experiment traffic
  - OpenFlow Monitoring: similar to FACT*: Flow-Based Approach for Connectivity Tracking

OpenFlow Monitoring: Still under research

- SDN for future high-performance network troubleshooting and traffic monitoring applications.

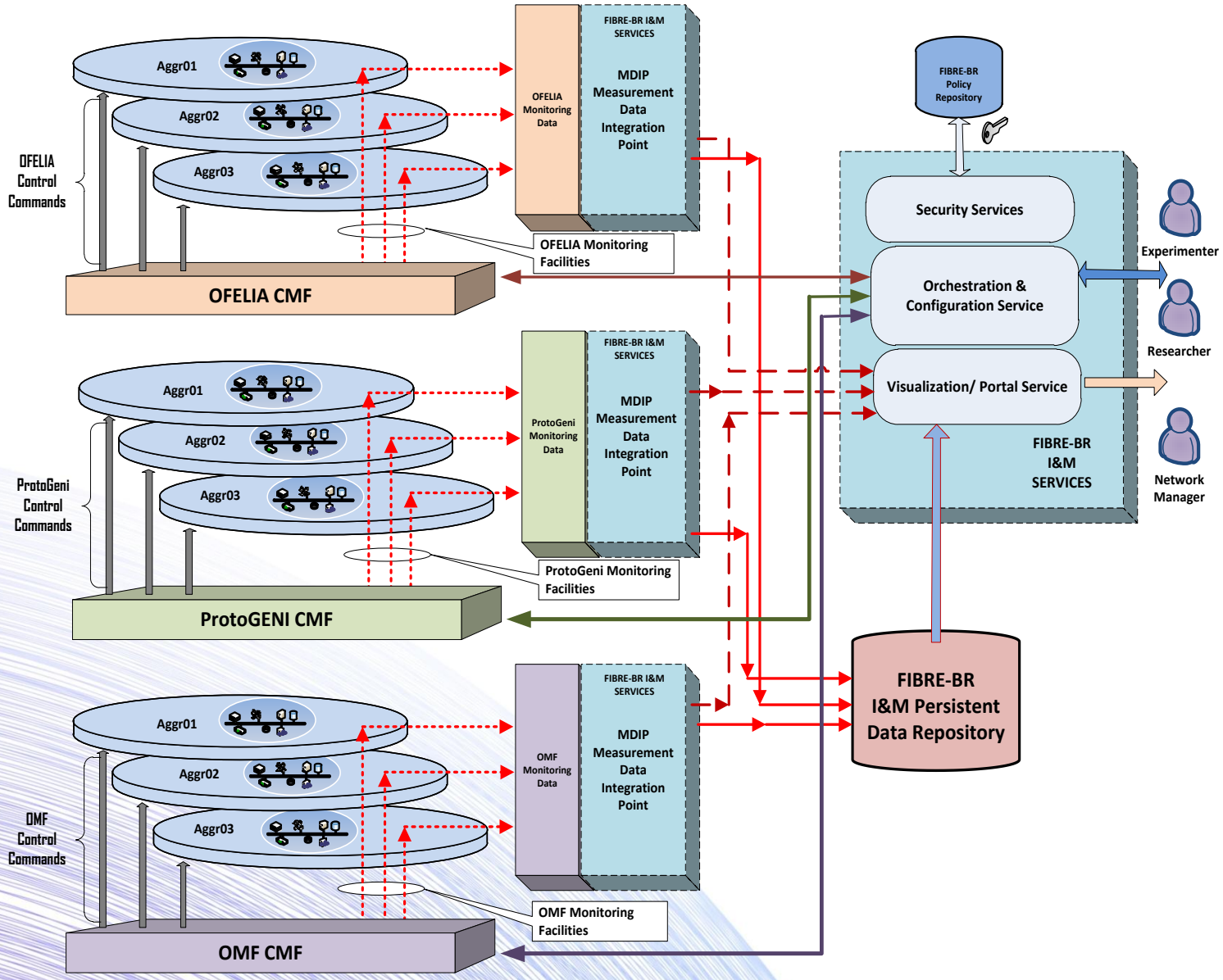


FIBRE-BR I&M
Proposed Approach

FIBRE-BR Proposed Approach

- **An Instrumentation and Measurement Architecture Supporting Multiple Control Monitoring Frameworks**
- Our target is:
  - to provide, possibly, with a maximum reuse of the available CMFs I&M services over a new integrated and federated network structure;
  - To provide instrumentation and monitoring considering different I&M Services through FIBRE-BR (Monitoring Orchestration);
  - Multiple CMFs I&M data integration.

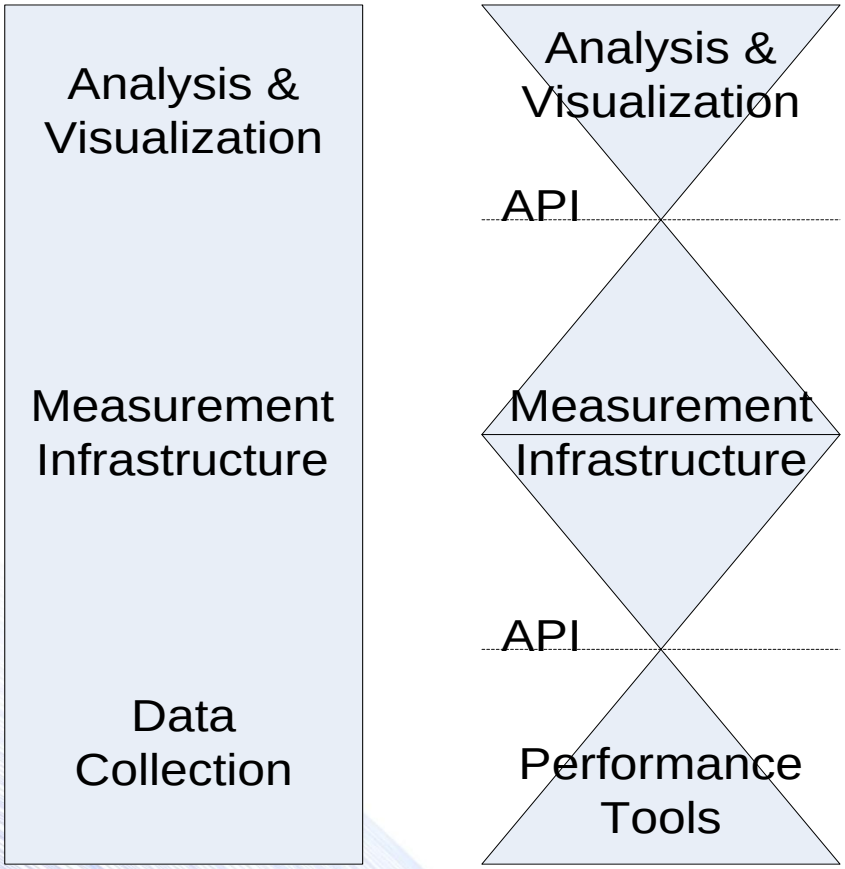
FIBRE-BR I&M Proposed Architecture



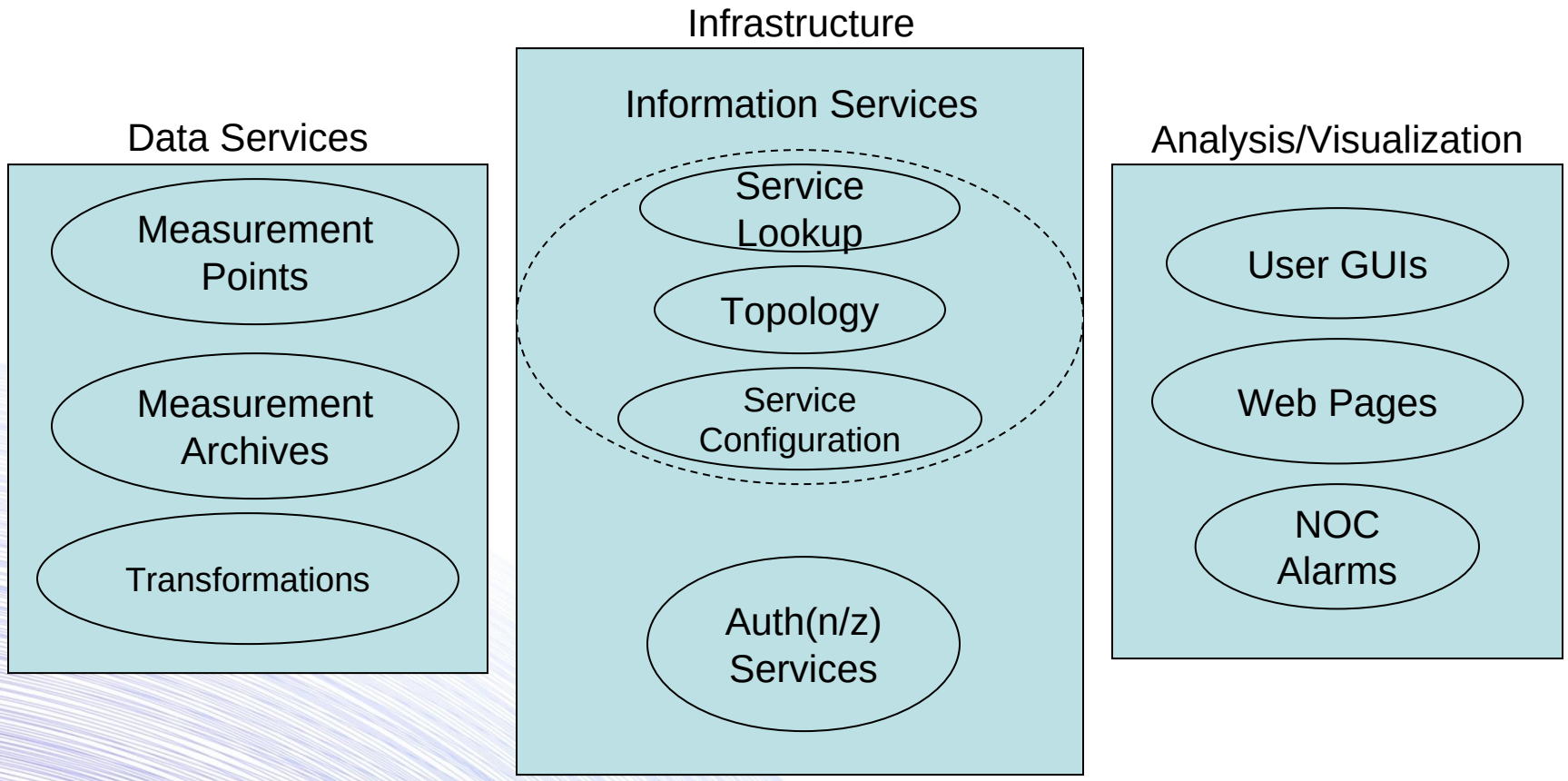
A Case for perfSONAR

- Besides our previous experience with perfSONAR
- perfSONAR schema and protocols are being considered and evolving to support GIMS (GENI Instrumentation and Measurement Service)
  - Project GEMINI
  - Project GIMI
- Therefore, we believe that it should be considered also for FIBRE integration

perfSONAR as a Middleware



perfSONAR Architecture Overview



- Base network measurement schema
  - OGF Network Measurement Working Group (NM-WG)
- Topology Schema
  - OGF Network Markup Language (NML-) WG
  - Includes Topology Network ID
- perfSONAR Protocol Documents
  - OGF Network Measurement and Control (NMC-) WG

OneLab Federation Tools: MySlice and TopHat

Jordan Augé

Preliminary Thoughts towards a FIBRE I&M Federation Architecture

Measurement Data Sources

- OML will be used by:
  - TopHat (data processing/visualization of OMF data)
  - OMF (native)
  - OCF (proposed for slice monitoring)
- Infrastructure Measurement:
  - TDMI
  - perfSONAR
  - ZenOSS
  - Ganglia

Building Blocks

- RSpecs
  - Including monitoring resources

- Data formats (eg., perfSONAR)
- Data processing (transformation) before (on the fly, OML style) or after storing them.
- Ontology for Measurement Characteristics

Remarks

- FIBRE-BR I&M is still a proposal
  - We are currently working on the details of mapping the CMF data to NM-WG schema (and necessary extensions both in schema and CMF data semantics)
  - In particular for OML, because of experimenter's flexibility on specifying his/her data
    - This is also true for TopHat
  - It is also necessary to orchestrate/configure I&M services.
- We can collaborate in providing TopHat access to perfSONAR services and dat
- We could leverage on TopHat extending it to support other experiment measurement data
- **Work on Pilot Projects Measurement Requirements!!!**

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Thank you / Obrigado

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