FUTURE INTERNET TESTBEDS
EXPERIMENTATION BETWEEN
BRAZIL AND EUROPE

Federation of the Monitoring Tools

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With contributions from Mayur and Jordan

Workshop PROCAD

São Carlos – June 18, 2012

COOPERATION

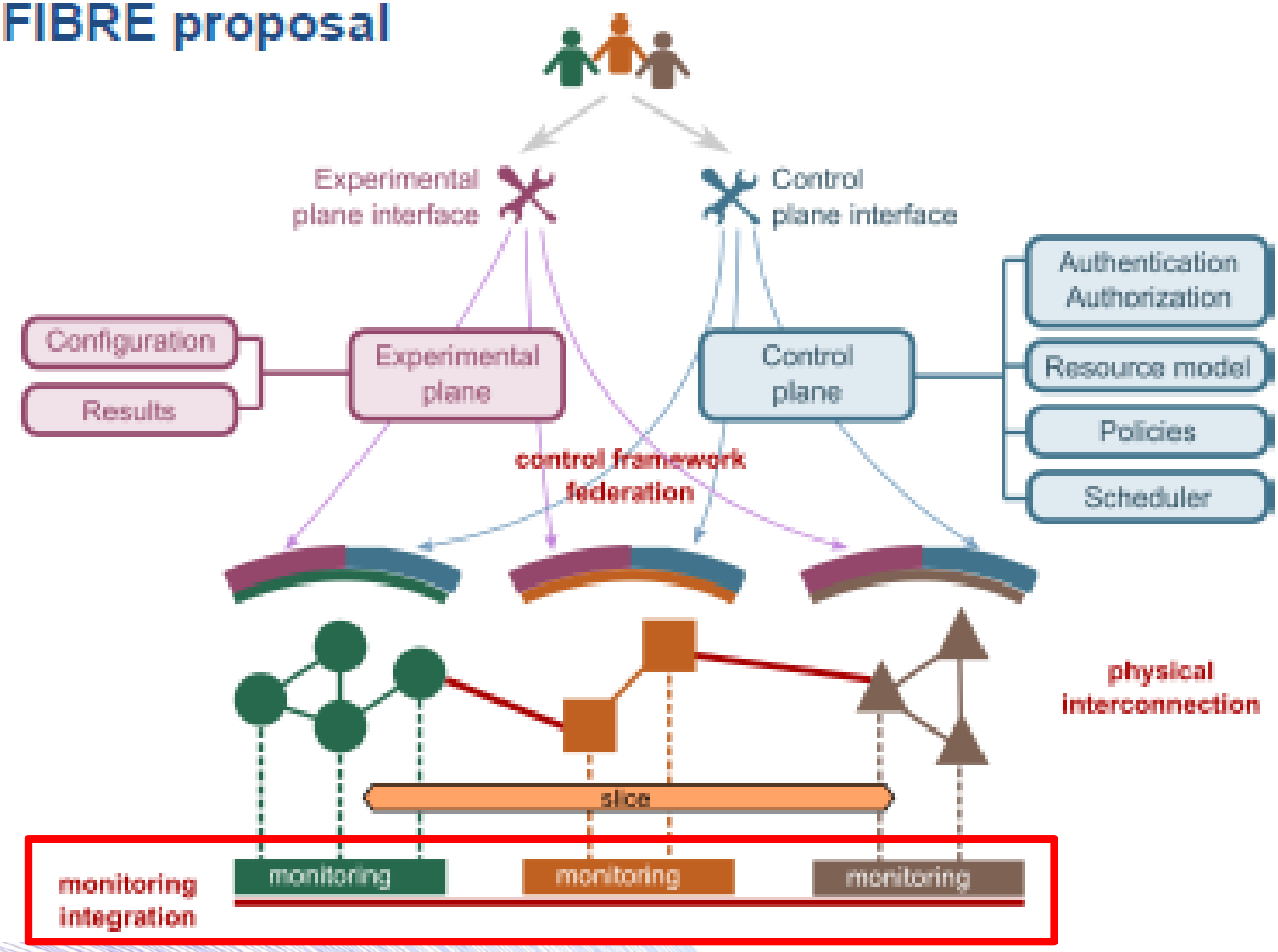
CNPq 60 ANOS

European Commission

Ministério da Ciência, Tecnologia e Inovação

GOVERNO FEDERAL BRASIL PAÍS RICO É PAÍS SEM POBREZA

FIBRE proposal



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

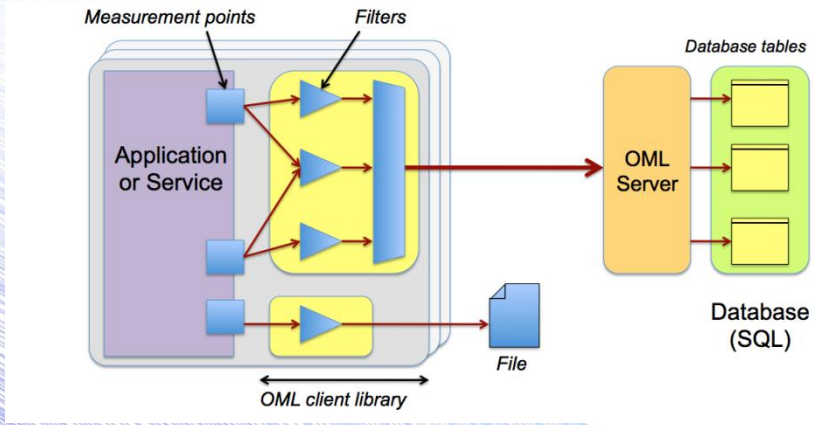
- Infrastructure Monitoring
  - For operators to make sure everything is working
  - For experimenters to check about network conditions
    - Which can be used for resources/islands selection
  - For experiment application
- Experiment/Slice Monitoring
  - Instrument slices and/or applications to collect 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]*)

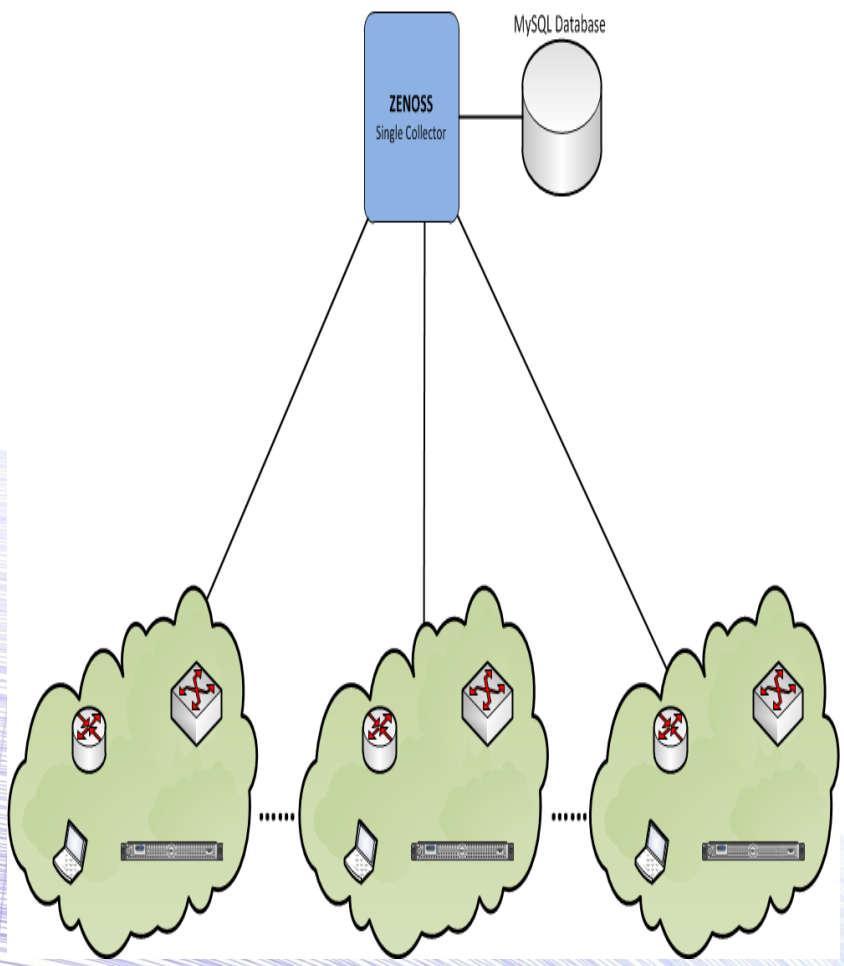
Infrastructure Monitoring

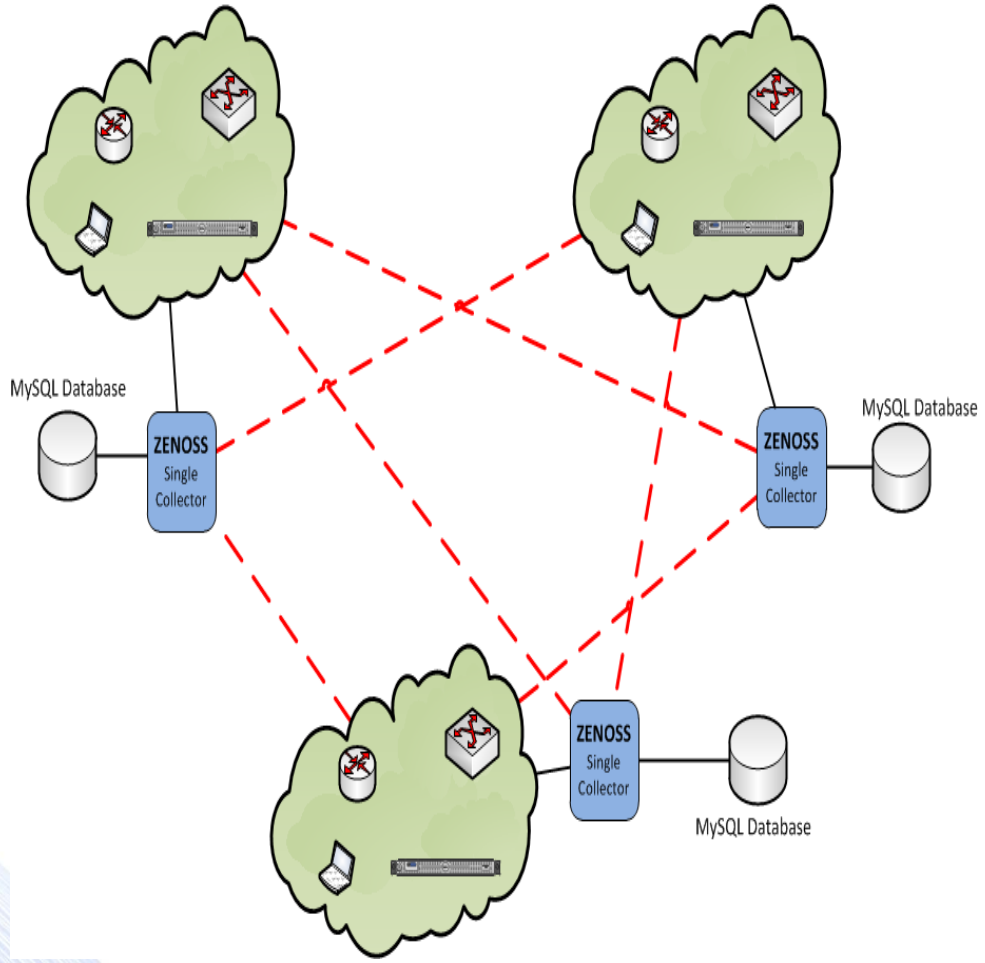
- Zenoss plus points
  - Centralized & Distributed setup possible
  - Allows prebuild vendor(dell,cisco etc.) packages (zenpacks) which allow easy monitoring
  - Different mechanism(snmp, ping, traceroute..) along with email, sms notification
  - Simple JSON API for easy integration coupled by a nice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

–DEMO

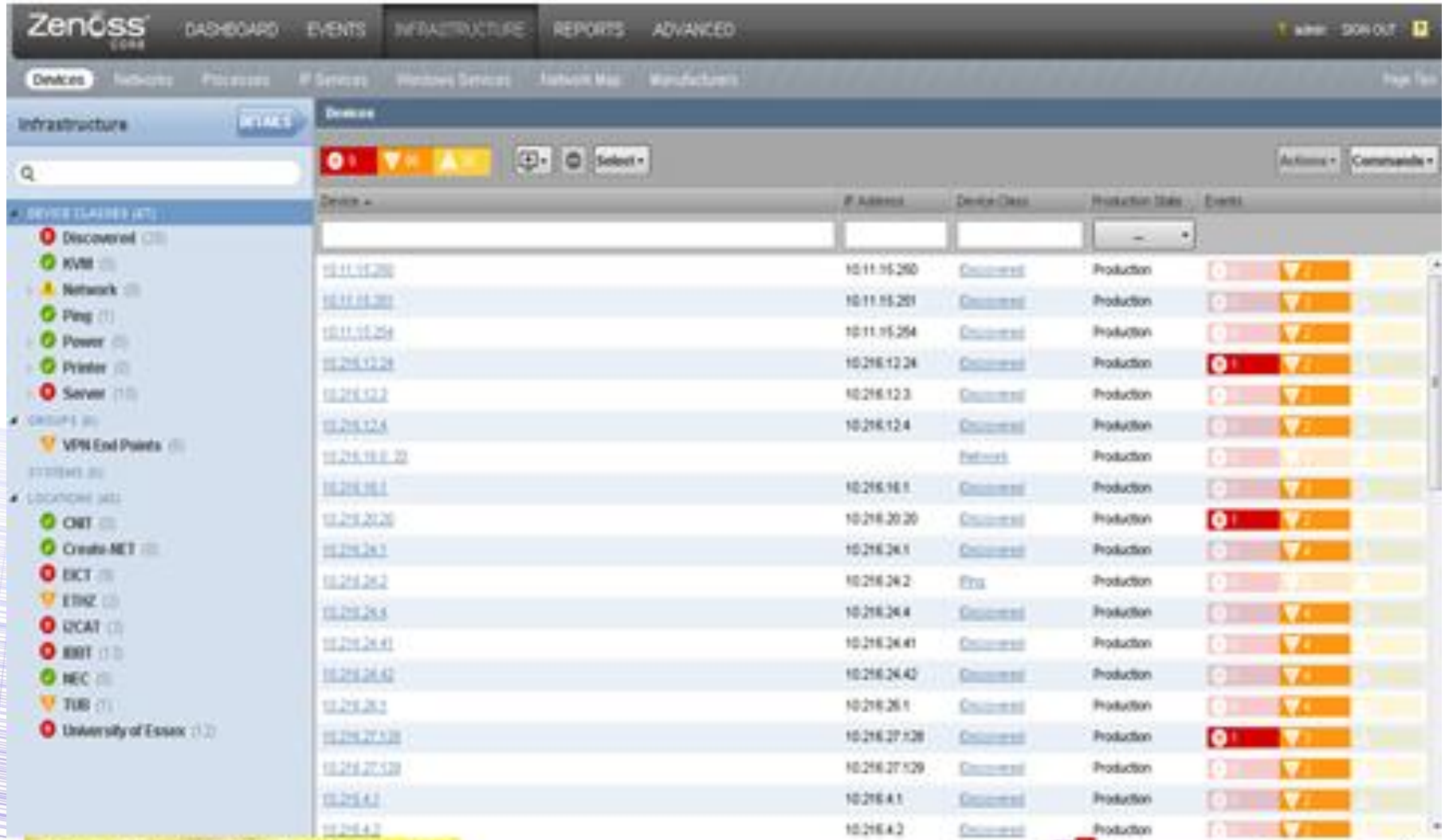
- PerfSonar (protogeni) compatibility with Zenoss ?

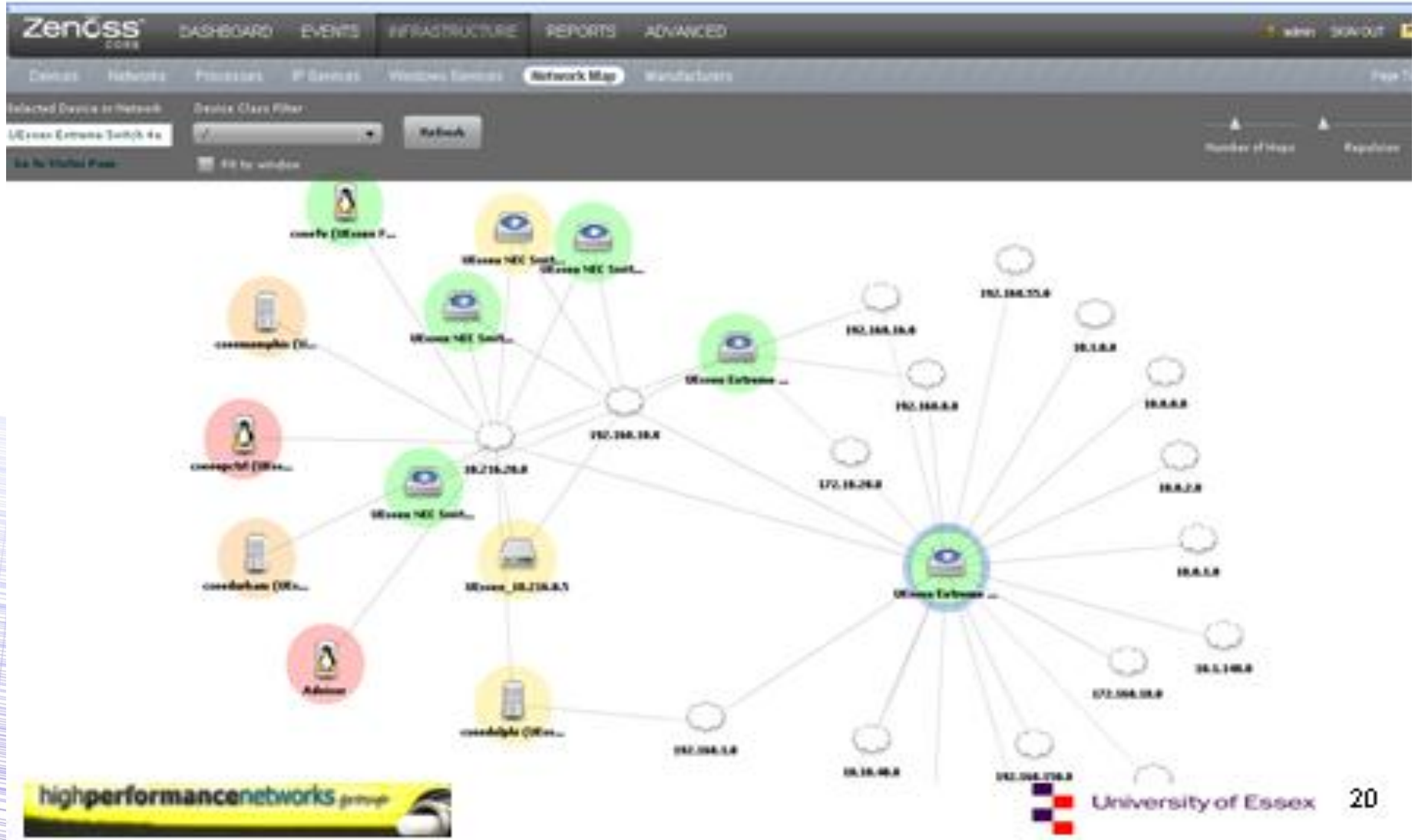
Centralized & Distributed Infrastructure Monitoring





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

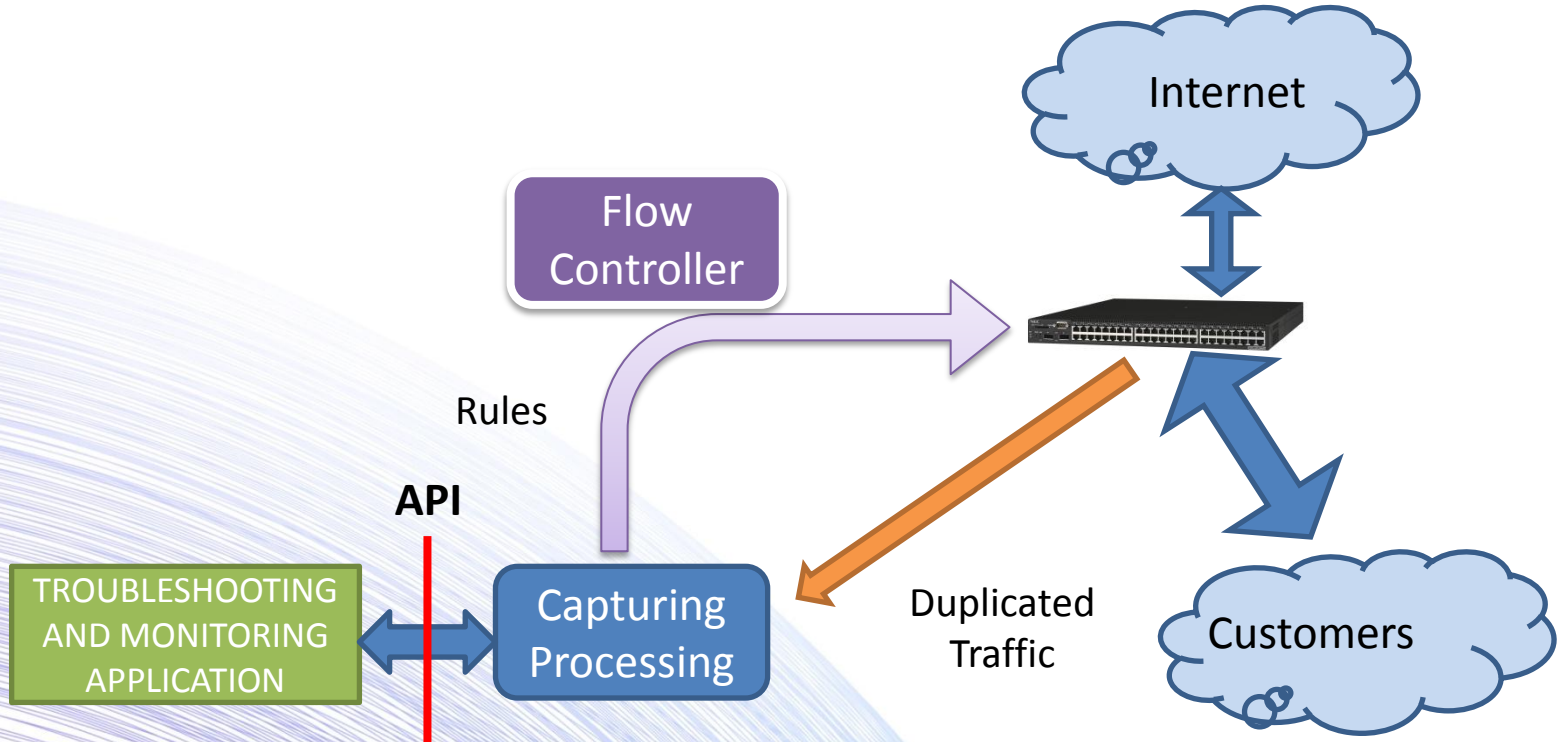
Experiment Monitoring

- 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.

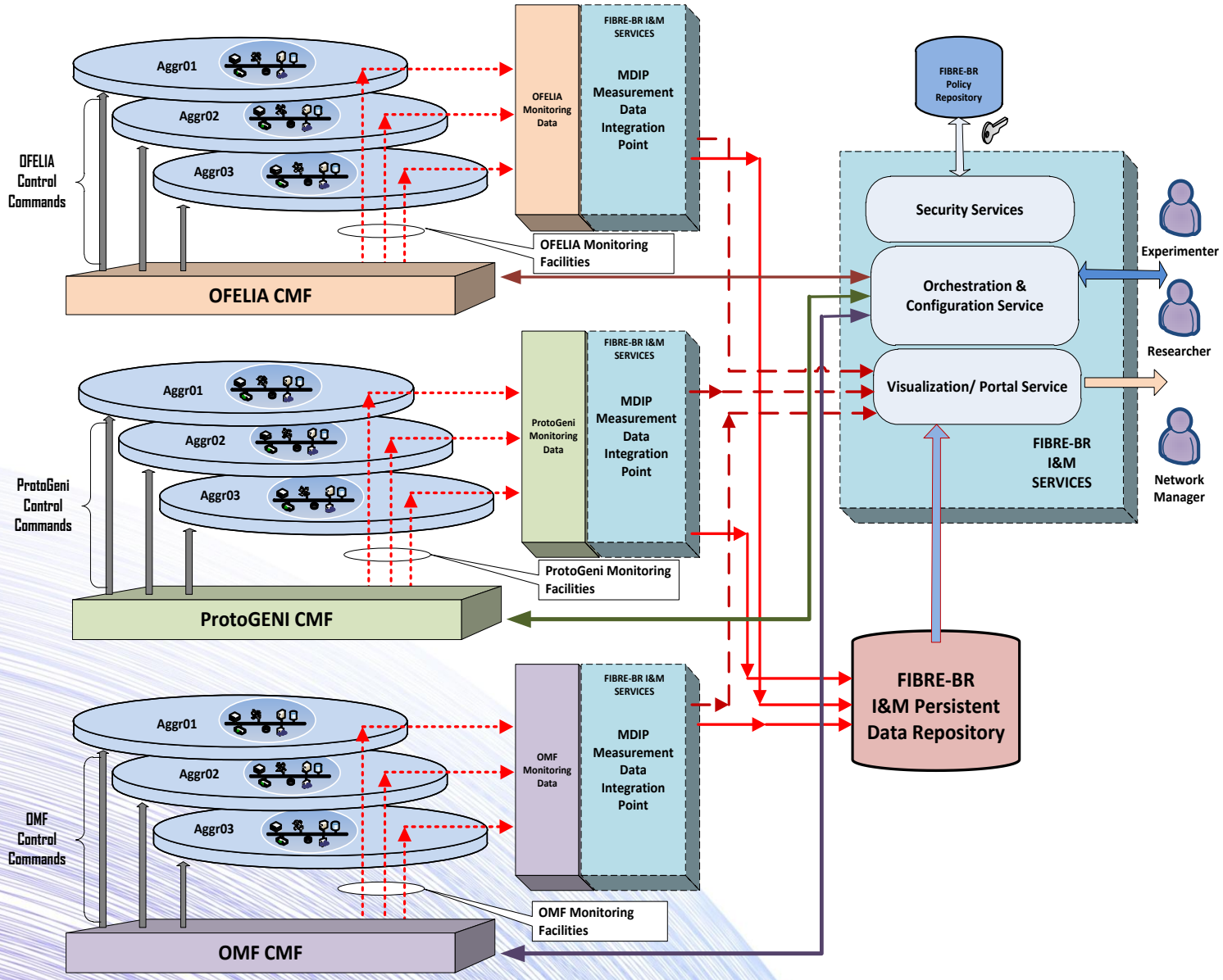


FIBRE-BR I&M
Proposed Approach

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.

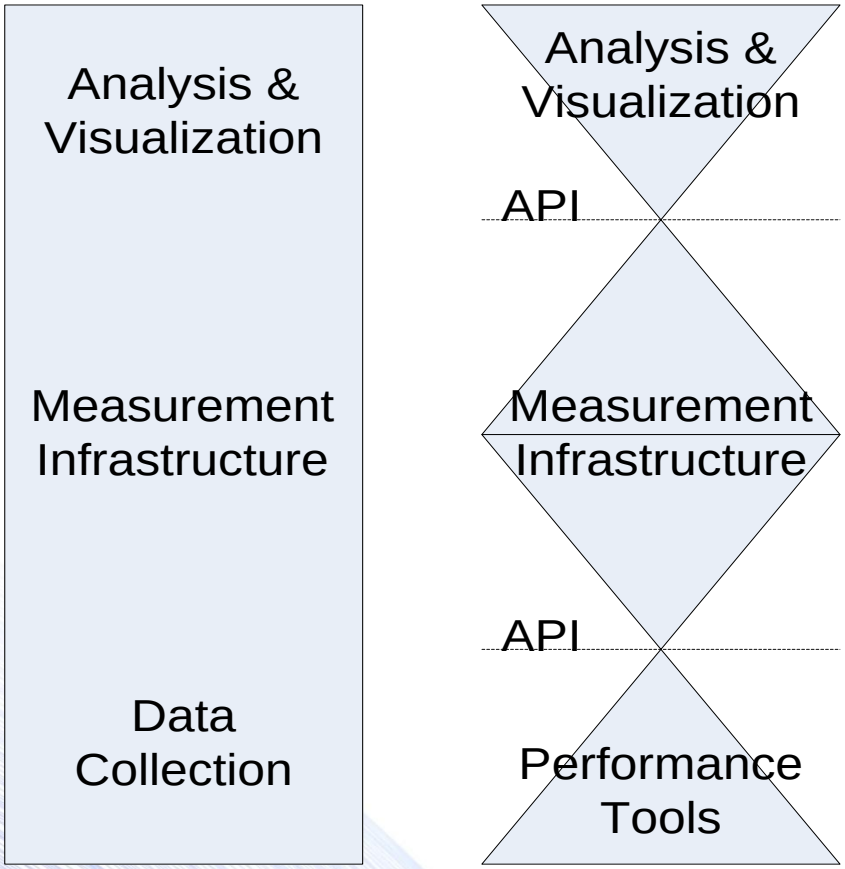
FIBRE-BR I&M Proposed Architecture



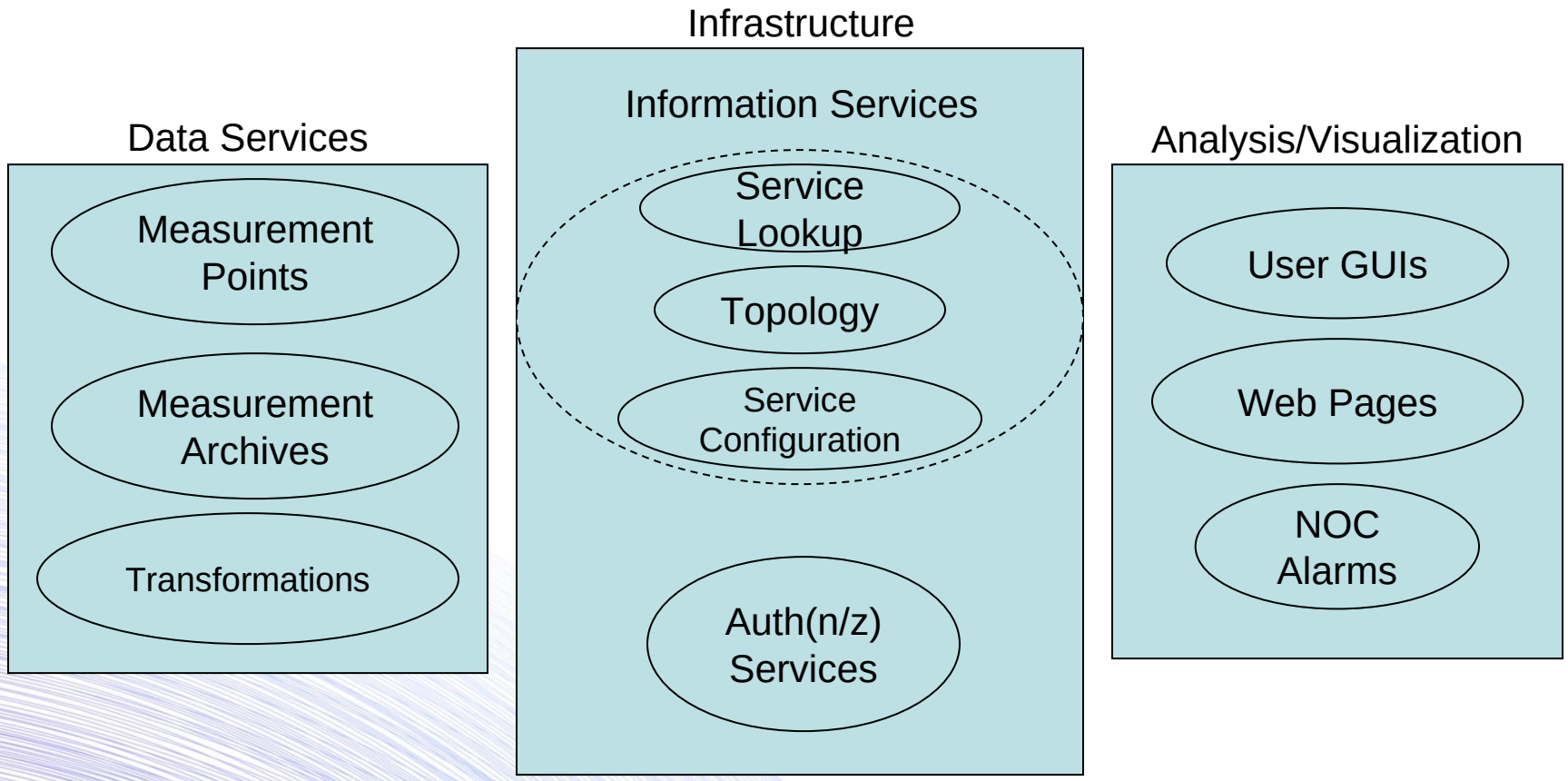
A Case for perfSONAR

- 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
- Measurement Tools
- Composition/Presentation Tools
- Data processing (transformation)
- Data formats
- Ontologies
- Persistent Storage

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RSpecs

- AP: Collect and compare how Rspecs are being used for including monitoring resources in the following CMFs/tools:
- OMF:
  - NICTA/GIMI [MO]
  - NITOS [DG]
- PLE/MySlice and TopHat [JA]
- protoGENI [RD]:
  - Instools
  - LAMP
  - GEMINI (http://groups.geni.net/geni/wiki/GEMINIIntegrationTasks)

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OML

- Provide current development roadmap for OML [MO]
- Provide information regarding new features for OML in the next version [MO]
- Provide information regarding available prototypes and their use in current or next OML versions [MO]

- Proposed Strategy:
  - First stage: use of OML predefined slice/infrastructure measurements for OMF and OCF.
    - Define OML predefined slice/infrastructure measurements for OMF [MO, JA, IL]
    - Define OML predefined slice/infrastructure measurements for OCF [LB, IS]
  - Second stage: OML use for experiment defined data in OMF, OCF, and ProtoGENI
    - Identify/design a tool for the user to consult the already defined measurement characteristics when specifying experiment data, and help in specifying a new one and its semantics in case none is found [MO, JA, IL, LB, IS, RD]
    - Mapping to XML schema [MO, JA, IL, LB, IS, RD]

- perfSONAR services will be used for :
  - infrastructure measurements (MPs – Measurement Points) and
  - for accessing measured data (MA – Measurement Archive).

OF Related Measurements

- Verify the availability of OF related data from:
  - UEssex/OFELIA Partner [MC]
  - Other FlowVisor and controllers measurement data [MC, IS, MP]

ZenOSS (used by OFELIA)

- Study explore complementariety/integration with perfSONAR [IS, MP]
- Check how to export the collected data in perfSONAR format style [IS, MP, HM, LS, RD]
- Check how to develop a pS protocol plug-in to access MA services [MC, IS, MP, HM, LS, RD]

Ganglia (used by LAMP on ProtoGENI)

- Compare its functionalities and applicability with ZenOSS [RD, MP]
- Decide for its adoption or substitution in FIBRE protoGENI islands [JS, JM, RD, MP]

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TopHat

Tophat can be used for composing and presenting the measured data directly accessing the measurement tools or through perfSONAR. It is also possible to implement a perfSONAR service to expose the data obtained by TopHat.

- Discuss the details of implementing a gateway between “typical” perfSONAR services and TopHat [JS, JA, LS, HM, RD]
  - Define which are the services of interest (starting with those which will be most useful for FIBRE)
- TopHat can be used integrated with MySlice or independently [JA]

Others

- Which other composition and/or presentation tools would we consider for accessing and presenting the data.
- Candidates are:
  - The proposed FIBRE-BR Portal [MP]
  - OFELIA GUI Interface [LB]

Building Blocks

- Rspecs
- Measurement Tools
- Composition/Presentation Tools
- Data processing (transformation)
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Data Processing (Transformation)

- Consider when analyzing the data to be collected, the need for processing (transforming) the measured data on the fly (filtering the stream of data in OML style) or after storing them depending on the query [JA]

Building Blocks

- Rspecs
- Measurement Tools
- Composition/Presentation Tools
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- Data formats
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Data Formats

Explore the available schemas:

- OGF's NM-WG schema (Network Measurement) [RD]
- perfSONAR current Topology schema (and NML-WG) [RD]
- Node characteristics collected by Ganglia in LAMP [RD]
- Check eventually new schemas proposed in the GEMINI or GIMI contexts [RD, MO]

Building Blocks

- Rspecs
- Measurement Tools
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Ontologies

The use of a network measurement ontology was proposed in OpenLab in other to express the semantics of network performance characteristics obtained from several measuring tools [JA]

- Network Measurement Characteristics [JA, LS]
- Network Topology [JA, LS]
- Node Characteristics [JA, LS]
- [How the user can extend these ontologies or create his/her own?] [JA, LS]

Building Blocks

- Rspecs
- Measurement Tools
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Persistent Storage

Candidates:

- iRODS (www.irods.org) [MP, RD]
  - Verify the availability of an iRODS pS MA service (eg., in the GEMINI project) [RD]
- Others (?)

Measurements and Tools

- Experiment Related Measurements
- Slice Measurements
- Infrastructure Measurements

Experiment Related Measurements

- OML (2nd phase because of Experimenter flexibility on defining his/her own data)

Slice Measurements

- Check Pilot Project Measurement Requirements (WP5)
- OML (predefined set of measurements options with a known schema and semantics)
- OF Measurements (Uessex/OFELIA partner)

Infrastructure Measurements

- perfSONAR Services per Island:
  - 1 server with BWCTL MP and MA,
  - 1 server with OWAMP MP and MA, SNMP MA, Status MA
- perfSONAR service at intermediate nodes (circuit intermediate endpoints)
  - It would be useful to have a Status MA at each of the intermediate connection points
- ZenOSS (servers and switches measurement data):
  - Explore complementariety/integration with perfSONAR
  - centralized (per continent?) x distributed (per island, per continent) infrastructure
  - hierarchy: BR or EU islands, BR – EU

Action Points

- Propose the next meeting by videoconference [JS]
- Provide Pilot Projects Network Measurement Requirements [WP5: Alessandro, etc.]

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Thank you / Obrigado

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