
Unified Measurement Framework for Embedded Real-Time Measurements

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Motivation

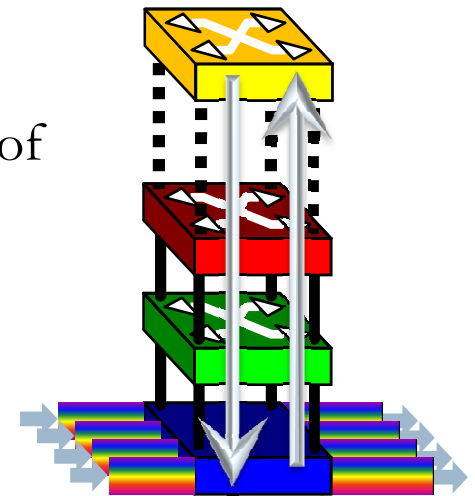
Next-generation transparent optical networks support

- mixed bit-rates
- different, co-existing modulation formats
- alien wavelengths
- dynamic optical routing
- cross-layer optimization
- ...

Increase in network flexibility calls for relaxed physical layer performance constraints which then have to be monitored.

Major GENI Challenges

- Support **embedded real-time measurements** and enabling **cross-layer communications/optimization** for dynamic, impairment aware traffic management
- Integration of measurement resources and appropriate interfaces into substrate and control plane framework(s) within the GENI prototyping efforts
- Evaluation of performance impact under several scenarios of bidirectional cross-layer information exchange
- Monitoring of underlying physical layer conditions during experiments



Measurements as a GENI Resource

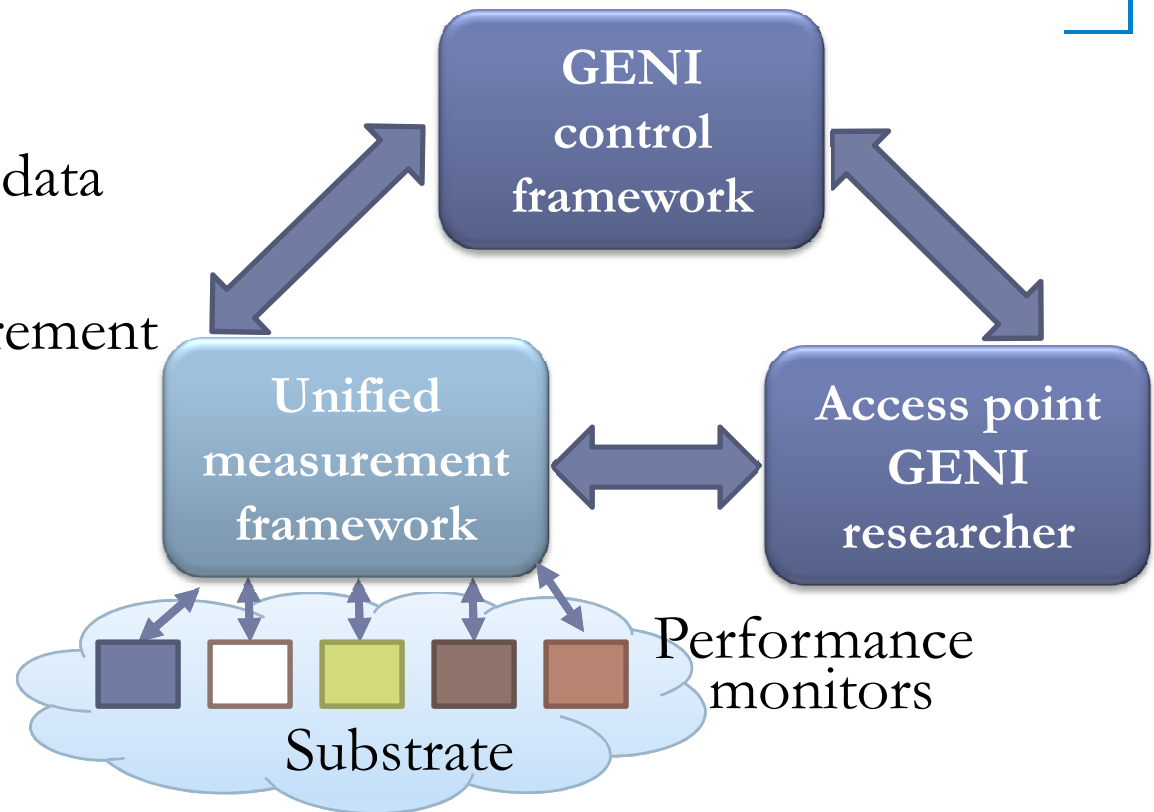
(Examples, there is much more)

<i>Infinera DTN</i>	<i>Adva Optical Networking</i>	<i>Ekinops</i>	<i>Polatis fiber switch</i>	<i>NetFPGA</i>
Bit error counter (FEC) optical power monitor	Bit error counter (FEC) optical power monitor	Bit error counter (FEC)	Optical power monitor Optical power control	Freely programmable FPGA
Proto-GENI BEN	MAX GpENI	GpENI	BEN	SSP Overlay Proto-GENI

Milestone 1, [http://groups.geni.net/geni/wiki/Embedded Real-Time Measurements](http://groups.geni.net/geni/wiki/Embedded%20Real-Time%20Measurements)

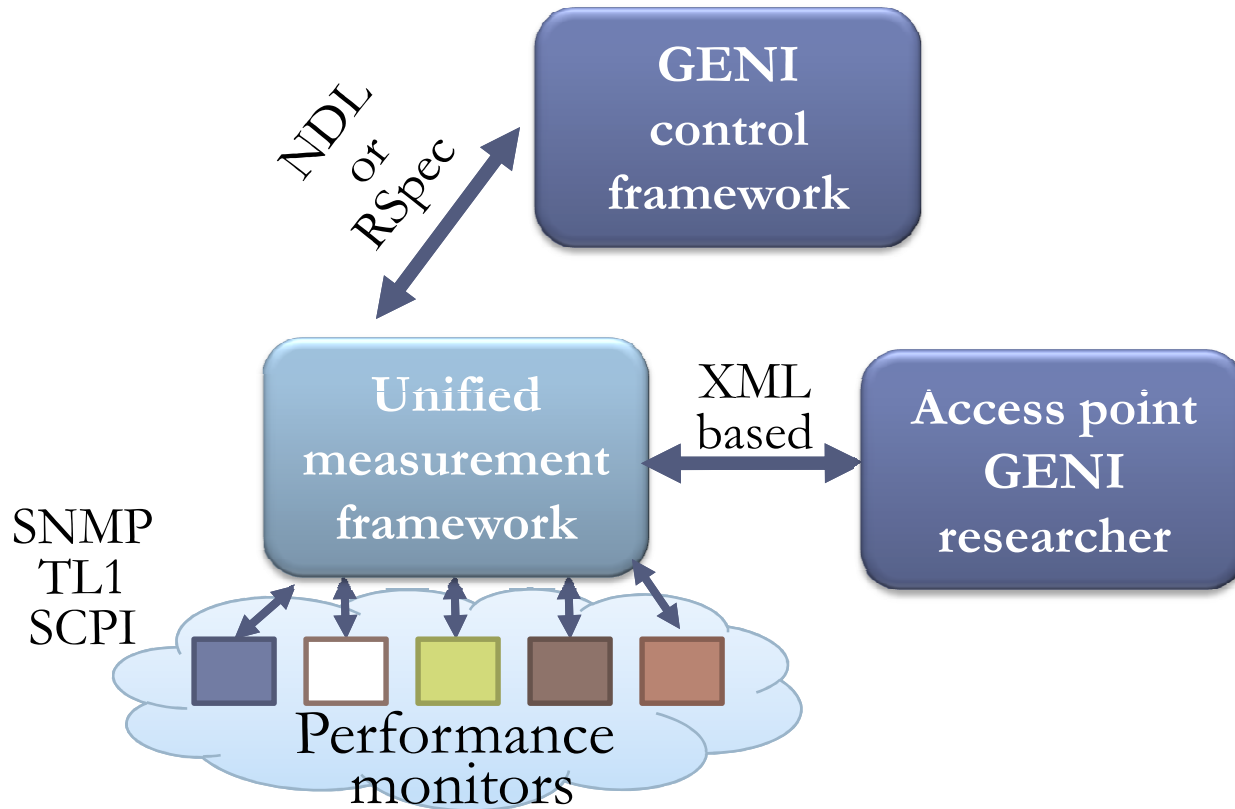
Unified Measurement Framework Requirements

- Access control
- Acquire measurement data
- Basic processing
- Abstraction of measurement capabilities
- Single point of access
- Storage capacity
- Unified interfaces to researcher and control framework



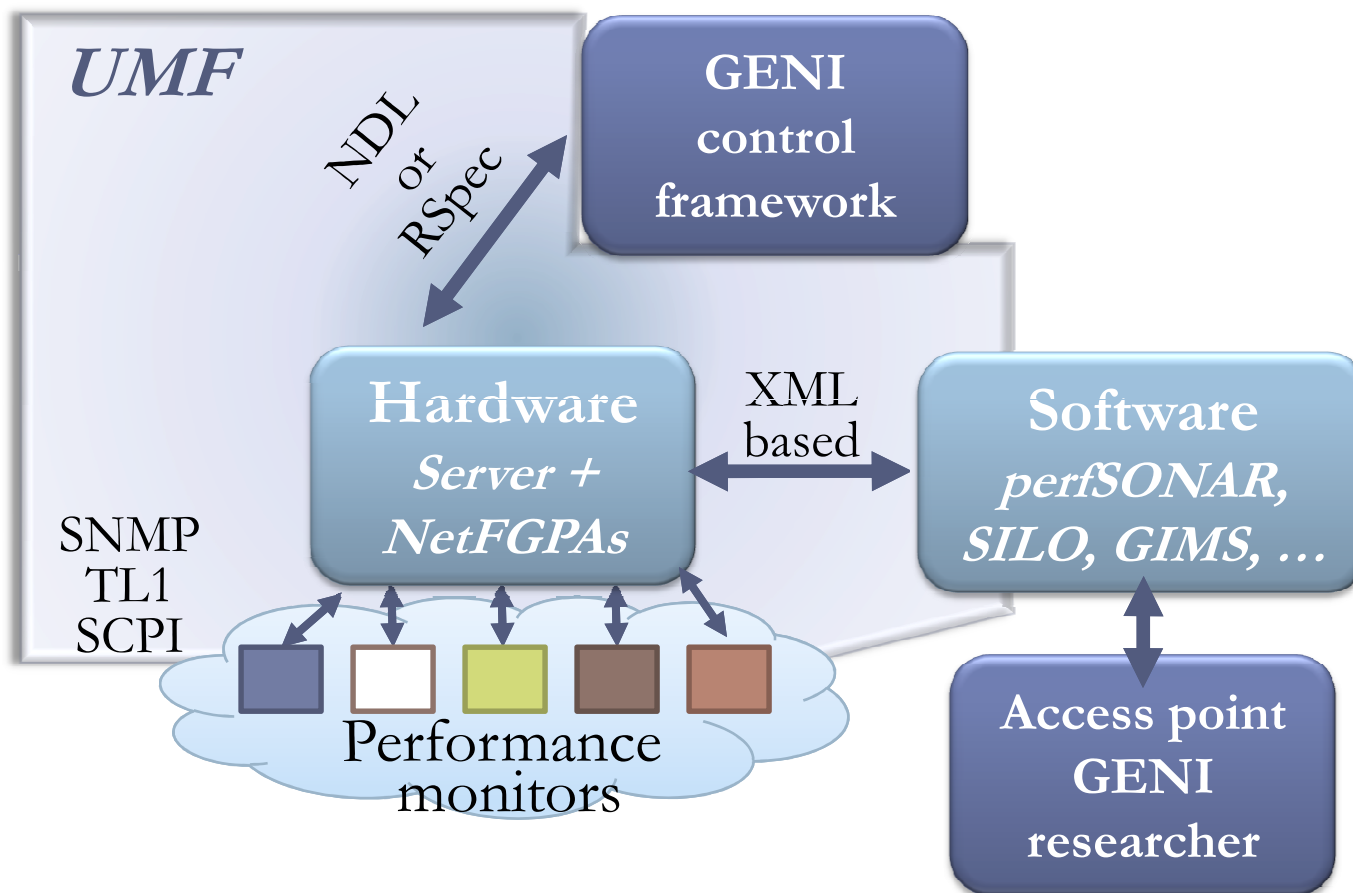
Present a uniform view of measurement capabilities within the substrate and make them sliceable/accessible.

Unified Measurement Framework Interface Specifications



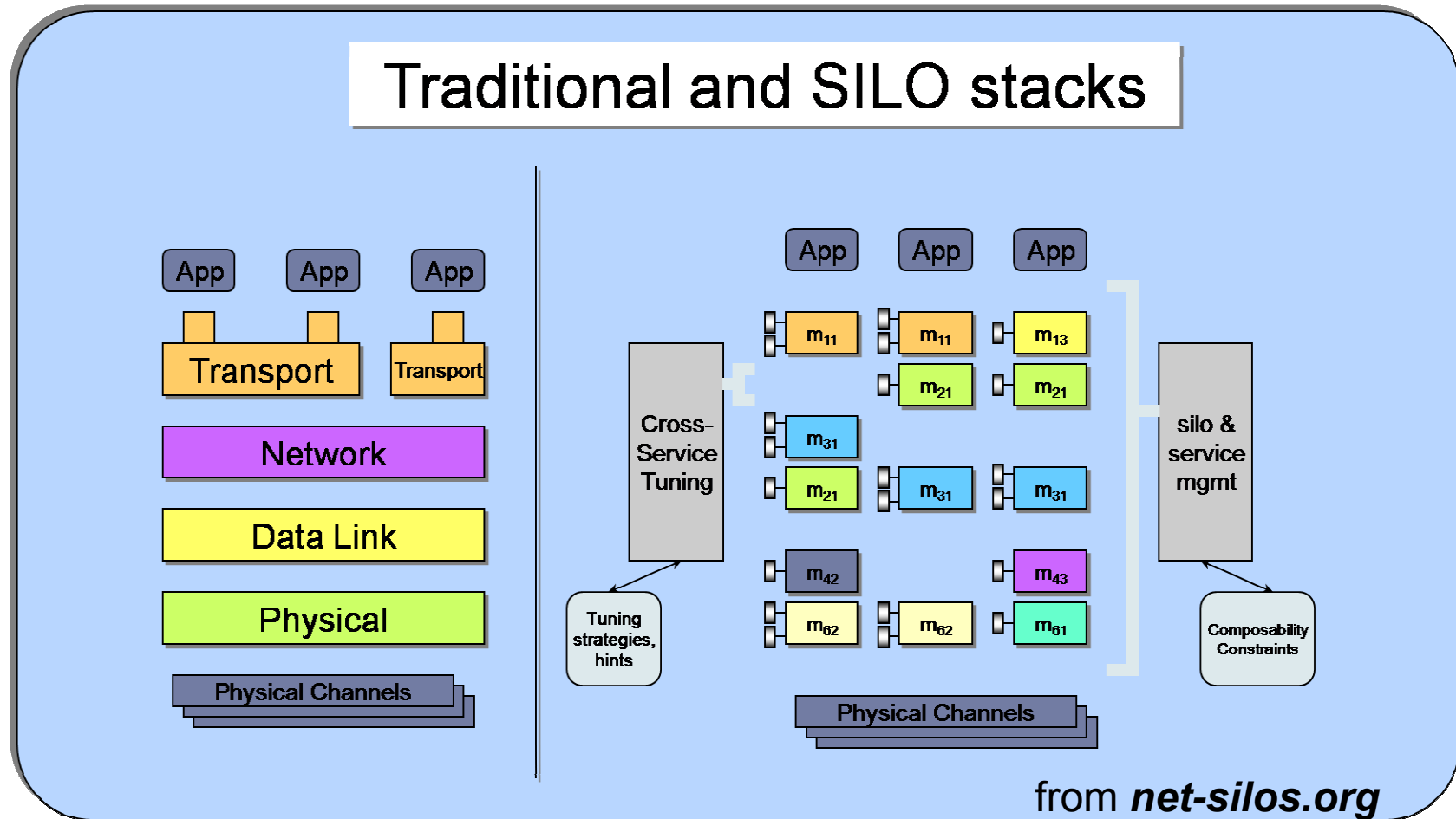
Milestone 3, [http://groups.geni.net/geni/wiki/Embedded Real-Time Measurements](http://groups.geni.net/geni/wiki/Embedded%20Real-Time%20Measurements)

Unified Measurement Framework Implementation (Example)

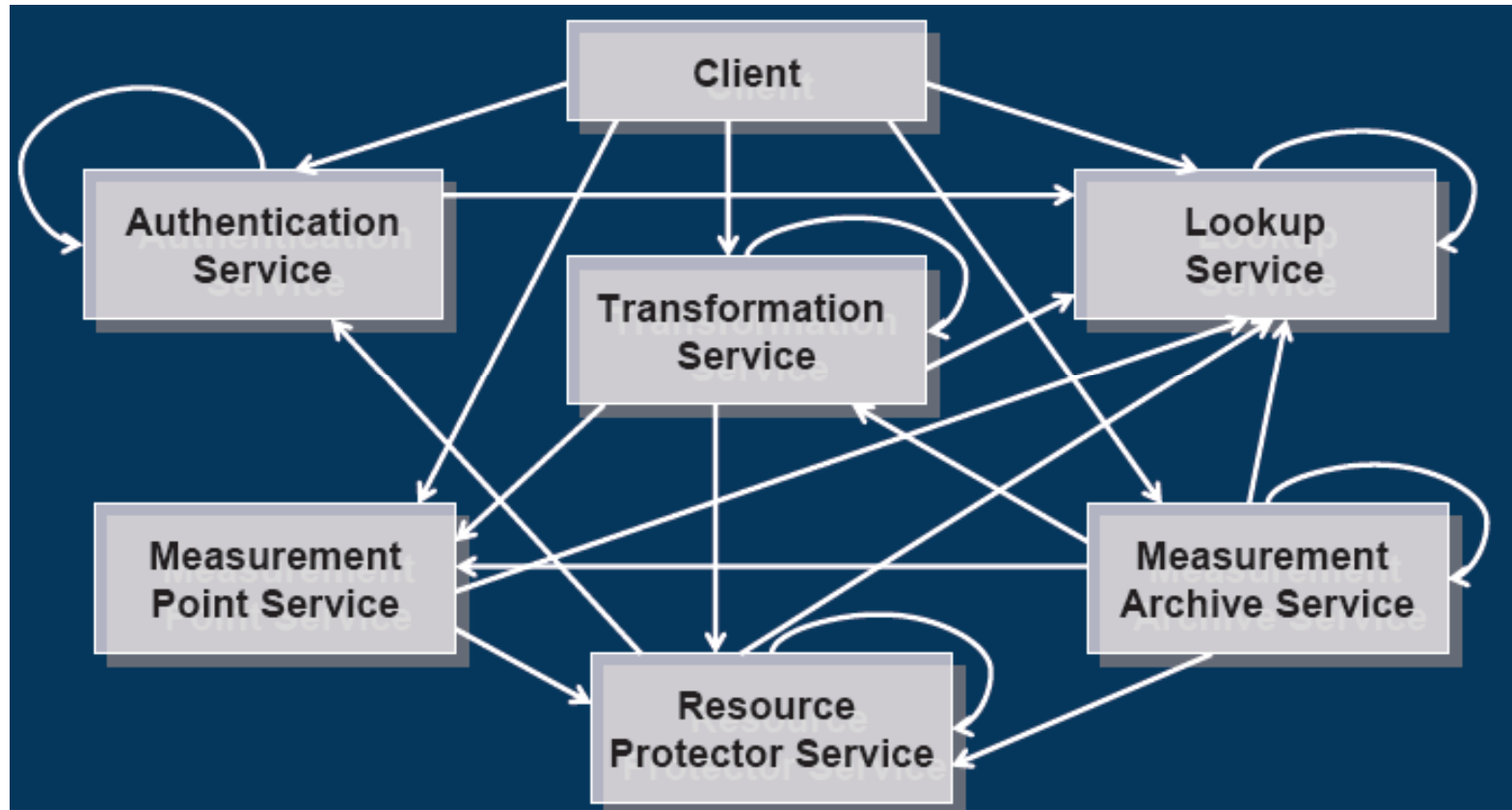


Milestone 3, [http://groups.geni.net/geni/wiki/Embedded Real-Time Measurements](http://groups.geni.net/geni/wiki/Embedded%20Real-Time%20Measurements)

SILO - Overview



perfSONAR - Overview



from *perfsonar.net*

Summary

- Control and acquire measurement data in a unified way
- Abstract measurement capabilities and equipment
- Provide a single point of access for the GENI researcher (via a software framework) and the control framework (via NDL/RSpecs)
- Enable basic processing of the measurement data
- Provide some storage capacity
- Allow for easy reconfiguration
- Reduce software, hardware, and design overhead

