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# Embedding Real-Time Substrate Measurements for Cross-Layer Communications (ERM)

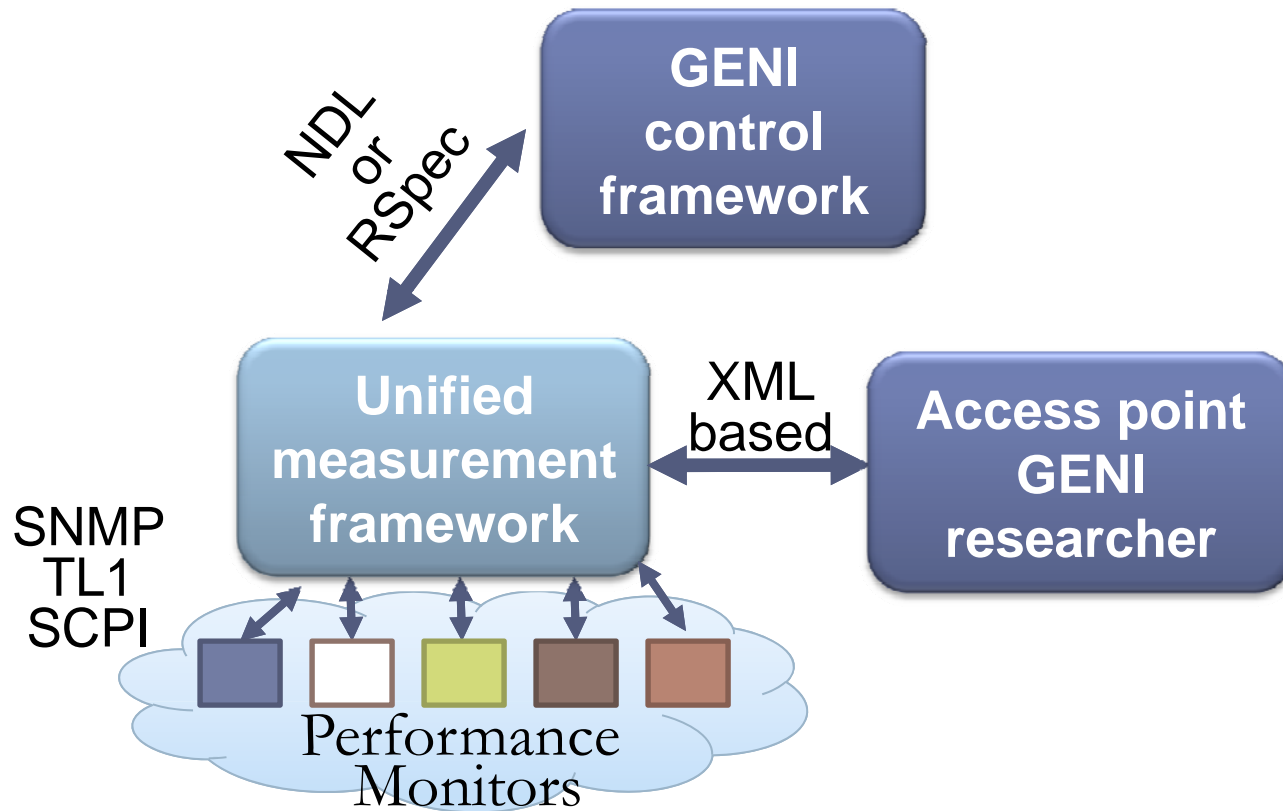
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Columbia University

Instrumentation and Measurement Working Group Meeting at GEC6  
11/16 – 11/18/2009

# Our Involvement in Cluster-D

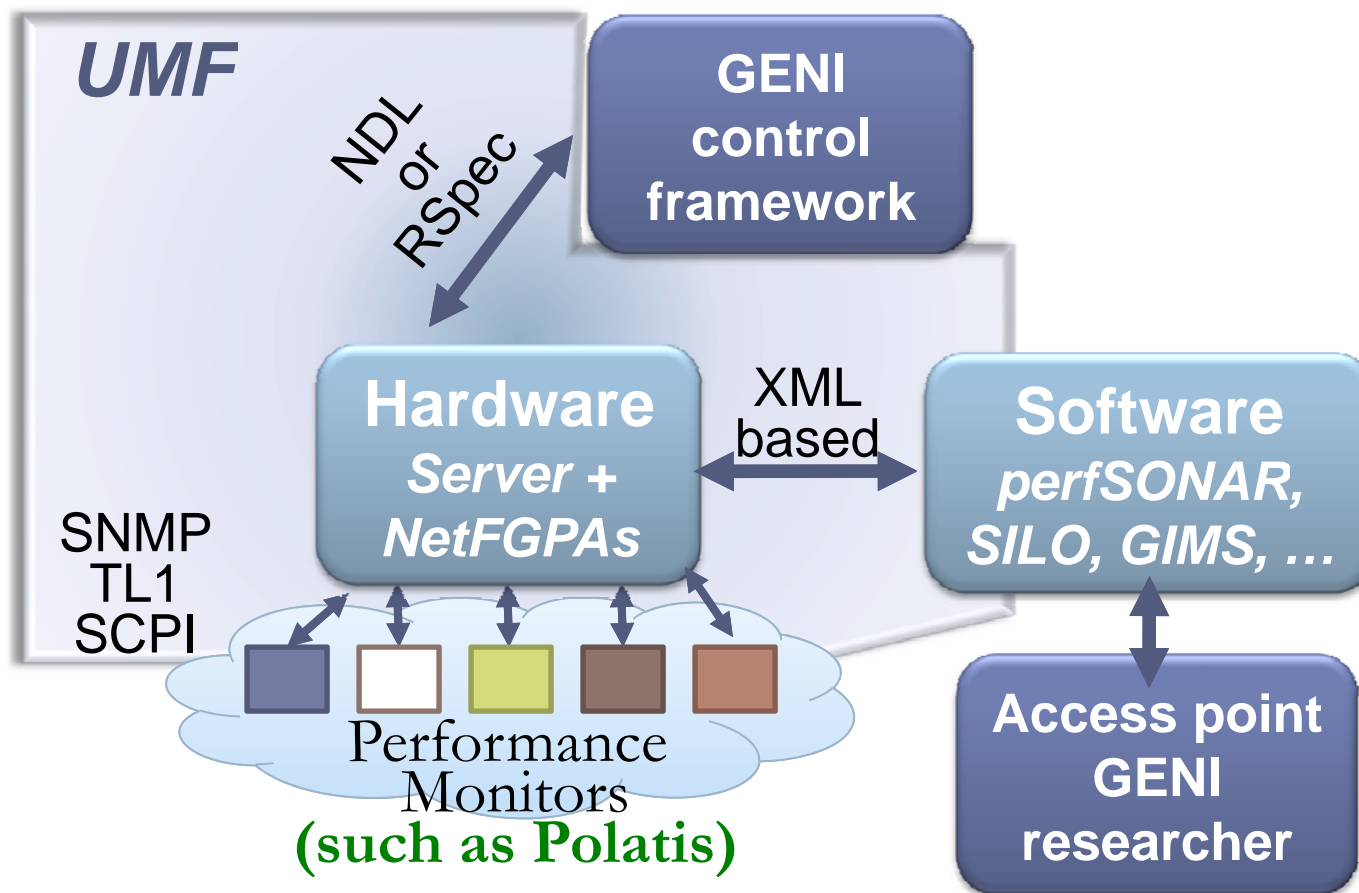
- Starting from Spiral 1
  - Embedded Real-Time Measurement (*ERM*)
- Starting from Spiral 2
  - Integrated Measurement Framework and Tools for Cross Layer Experimentation (*IMF*)
  - Programmable Measurements over Texas-based Research Network (*LEARN*)

# Year 1: 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)

# Year 1: 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)

# ERM Spiral 2 - Objectives

- Draft the data file format for the transfer of measurement data between the Infinera DTN and the IMF (*LEARN*, due 11/16/09)
- Prototype UMF implementation by means of a NetFPGA (*ERM*, due 12/03/09)
  
- Demo working interface from UMF to embedded measurement system, e.g. monitor power with Polatis switch (*ERM*, due 03/04/10)
- Integrate the IMF and UMF with devices in BEN that include performance monitoring capabilities, and demonstrate gathering measurements from these devices. (*IMF* / *LEARN*, due 03/16/10)
  
- Demo UMF in an experimental use-case with Lightwave Research Lab test-bed at Columbia University (*ERM*, due 06/03/10)
  
- Integrate the IMF and UMF with SILO, and demonstrate a simple cross-layer experimental use-case, e.g., where an optical layer measurement influences routing.
  - Version 0.5 of IMF-SILO software. (*IMF*, due 07/20/10)
  - Version 0.8 of IMF-SILO software (*ERM*, due 08/31/10)
  - Version 1.0 of IMF-SILO software (*IMF*, due 09/30/10)
  
- GENI Outreach - Plan to integrate UMF and IMF within another infrastructures (*ERM* / *IMF*, due 09/30/10)

# ERM Spiral 2 - Challenges

- Interfacing NetFPGA implementation of UMF with different performance measurement devices (Polatis, Infinera DTN, etc)
- Interfacing UMF with intermediate measurement software architecture (SILO, perfSONAR, GIMS)
- Interfacing UMF with BEN network and its performance monitoring devices

# ERM Spiral 2 - Approach

