

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

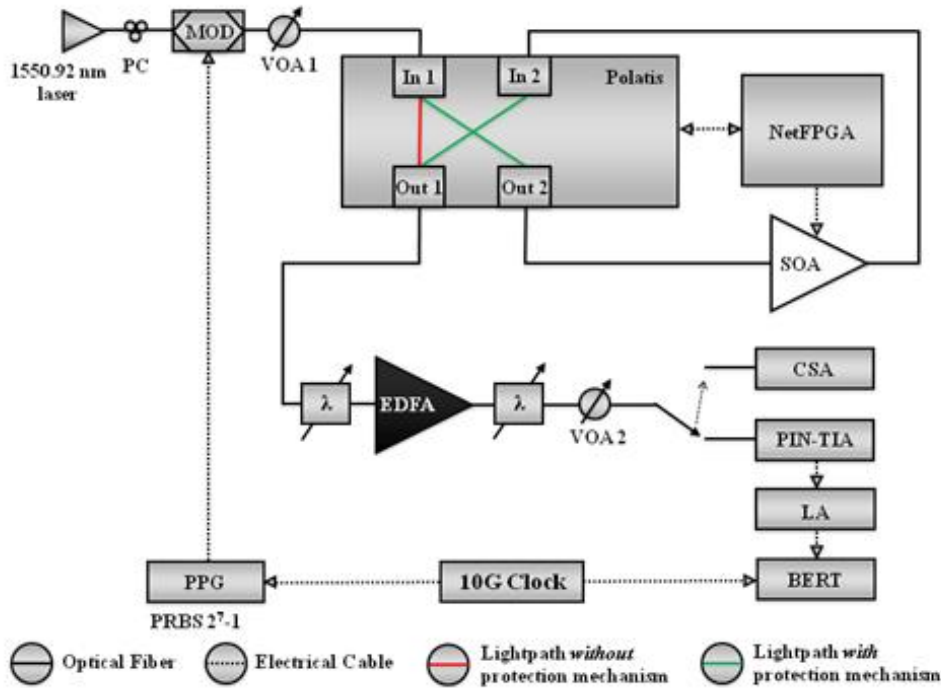
Michael S. Wang, Balagangadhar G. Bathula, Caroline P. Lai,
Cathy Chen, Keren Bergman

Cluster D Meeting at GEC8
7/20 – 7/22/2010

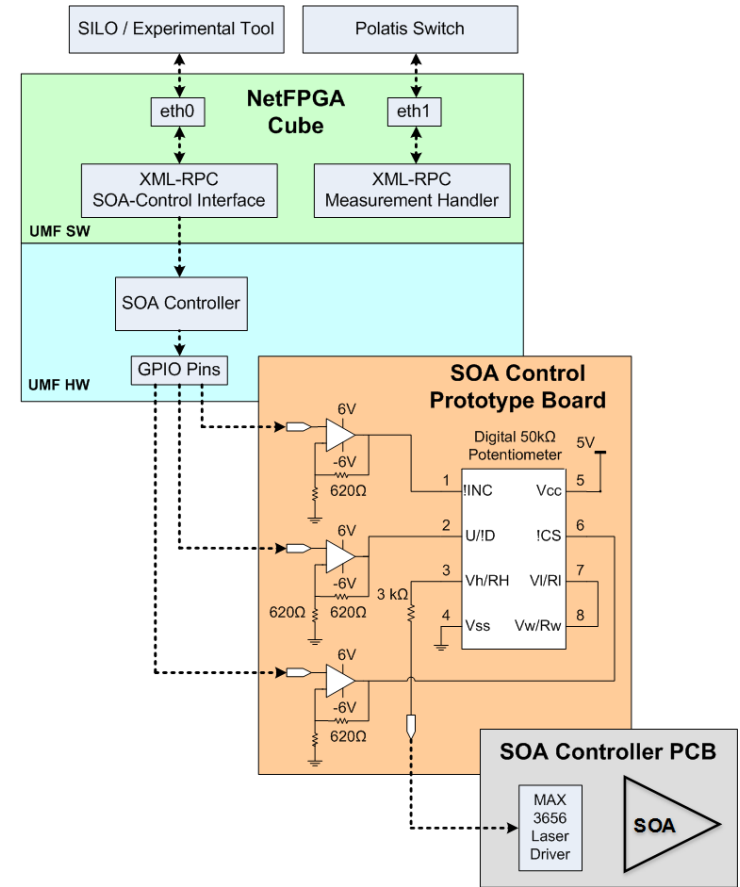
Spiral 2 Objectives

- Draft the data file format for the transfer of measurement data between the Infinera DTN and the IMF (*LEARN, due 11/16/09*)
- Design UMF prototype 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*) ← where we are now
 - 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 Experimental Use-Case at LRL

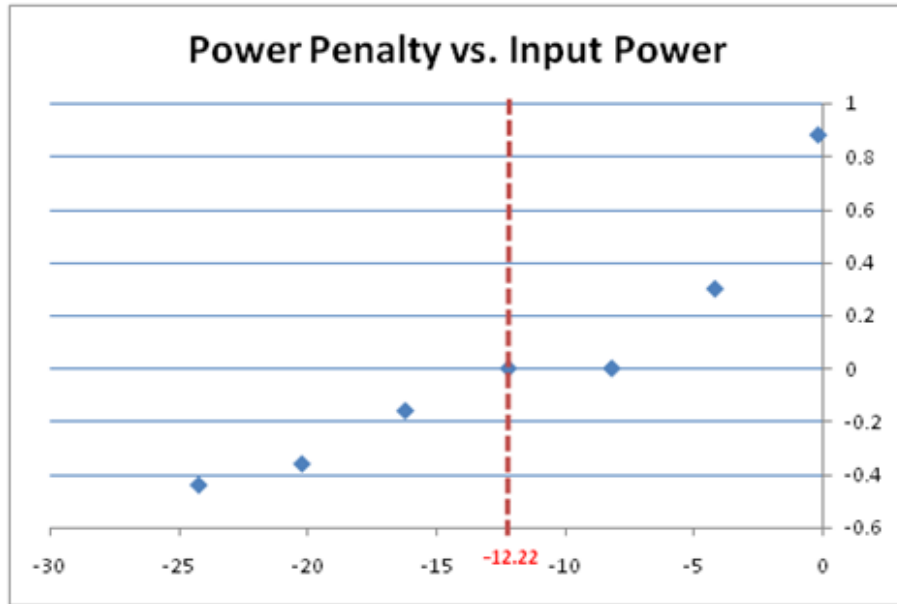


Experimental Setup

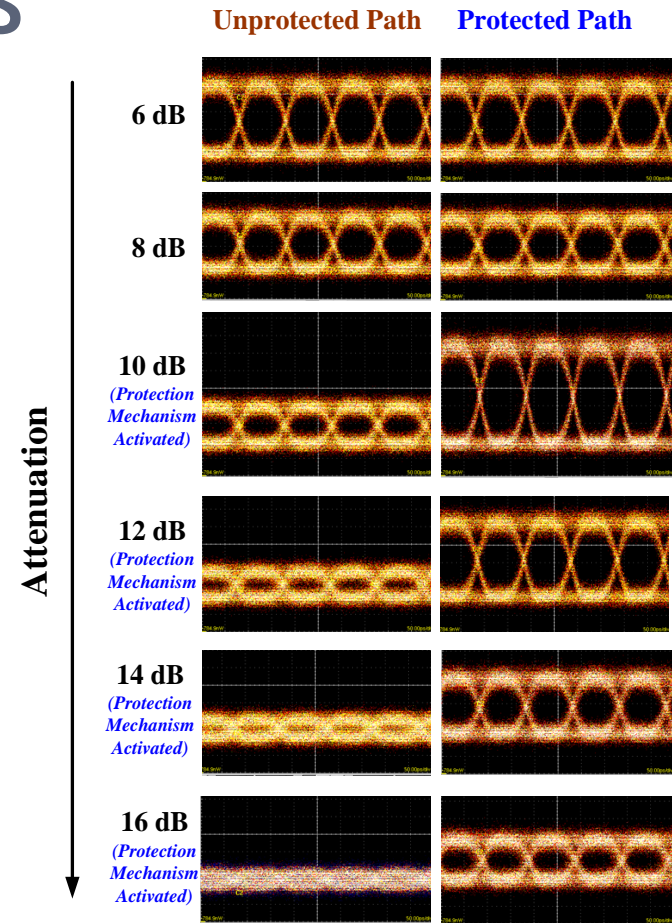


UMF Physical Setup

Experimental Results

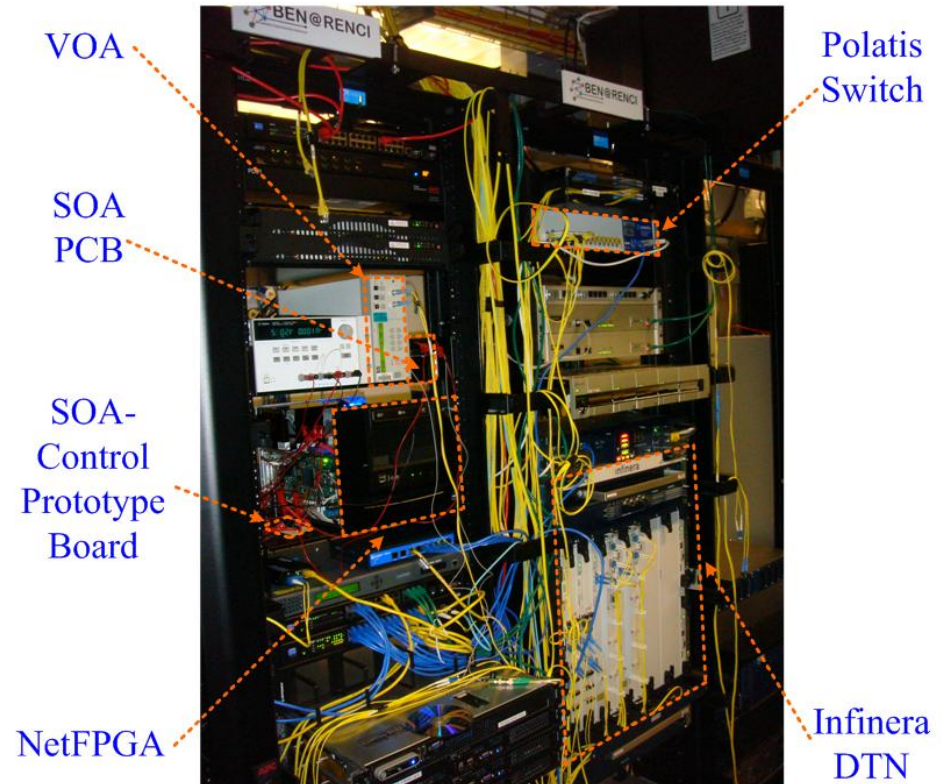
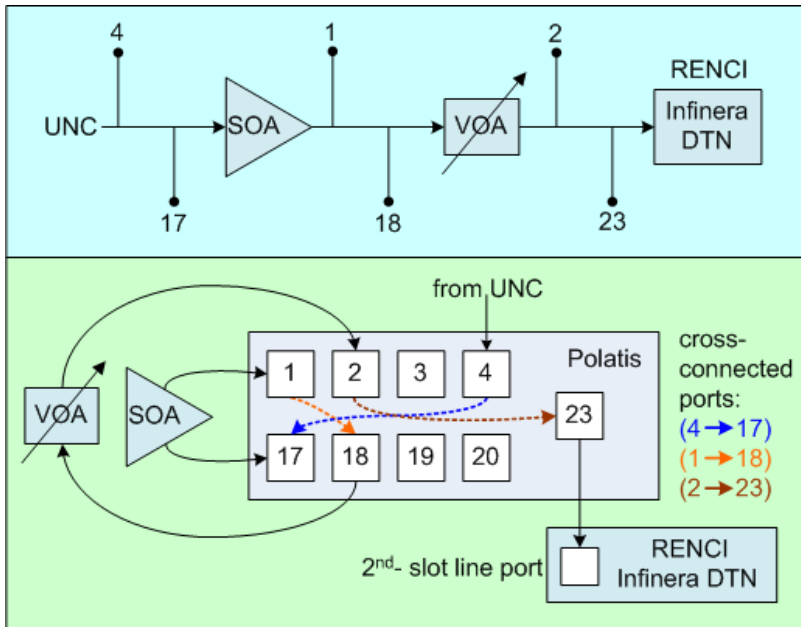


Determining Optimal Power Threshold



Eye Diagrams

ERM + IMF + LEARN: GEC 8 Demo



IMF Demo: Integrate UMF with IMF in BEN

IMF Infrastructure at BEN-RENCI

Next Steps

- Connectivity Capabilities
 - Currently:
 - PubSub interface provides abstraction of measurement capabilities.
 - SILO network architecture utilizes measurement to enable cross-layer communication.
 - Optical control plane can be controlled by SILO to further enable cross-layer management decisions based on optical layer performance.
 - Next step:
 - Integrate SILO with ORCA control framework
- Experiment Capabilities
 - Once SILO is integrated with ORCA, will be ready for use by outside researchers.
 - GEC8 Demo is just an example of what can be done:
 - SILO network architecture supports innovative cross-layered based network designs.
 - ERM: Optical control plane is used to enhance programmability of optical layer based on other optical performance metrics (other than power level).