

An Integrated Measurement Framework (IMF) for Enabling GENI Substrate Measurement and Control

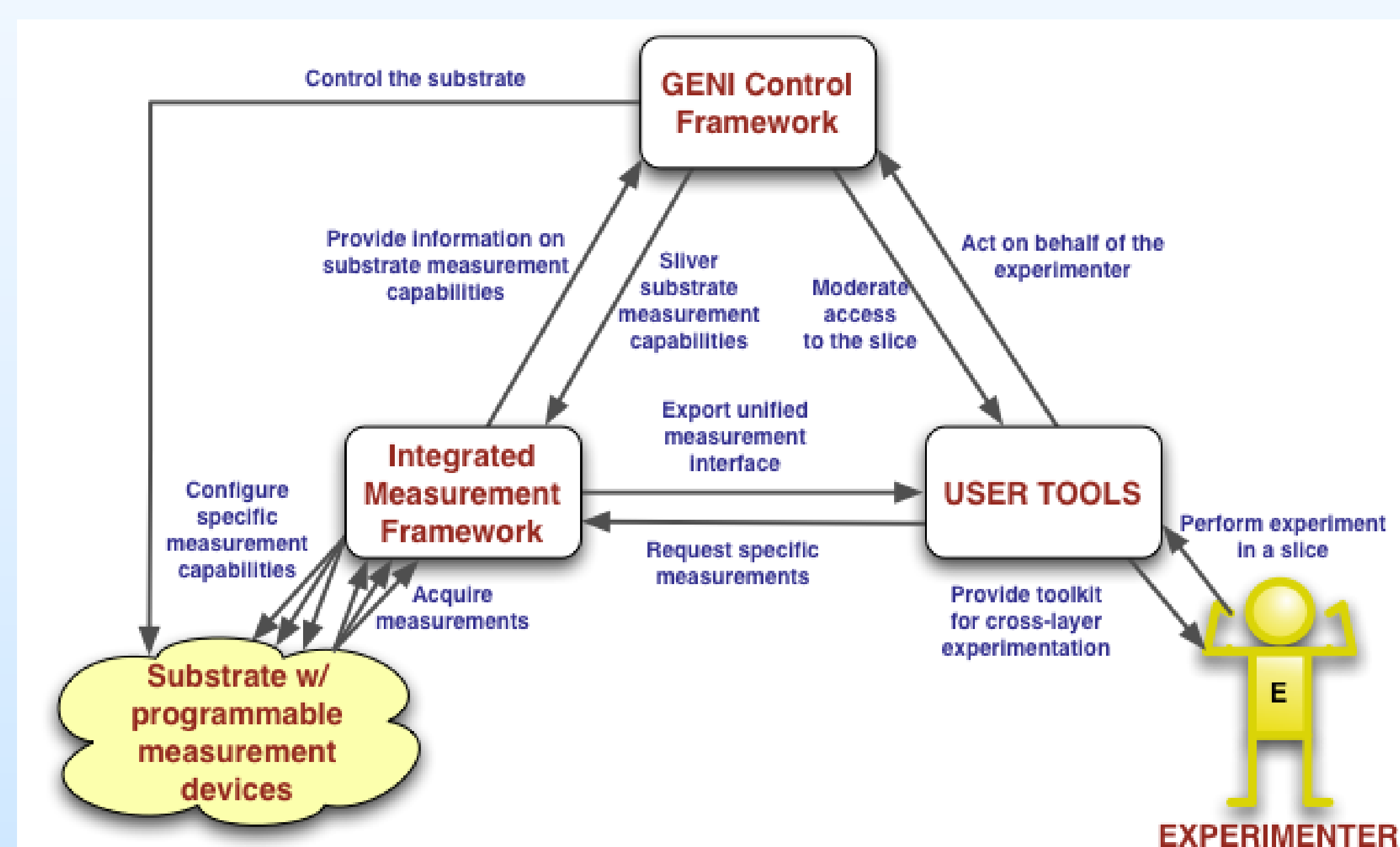
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IMF: Integrated Measurement Framework

ERM: Embedded Real-Time Measurements

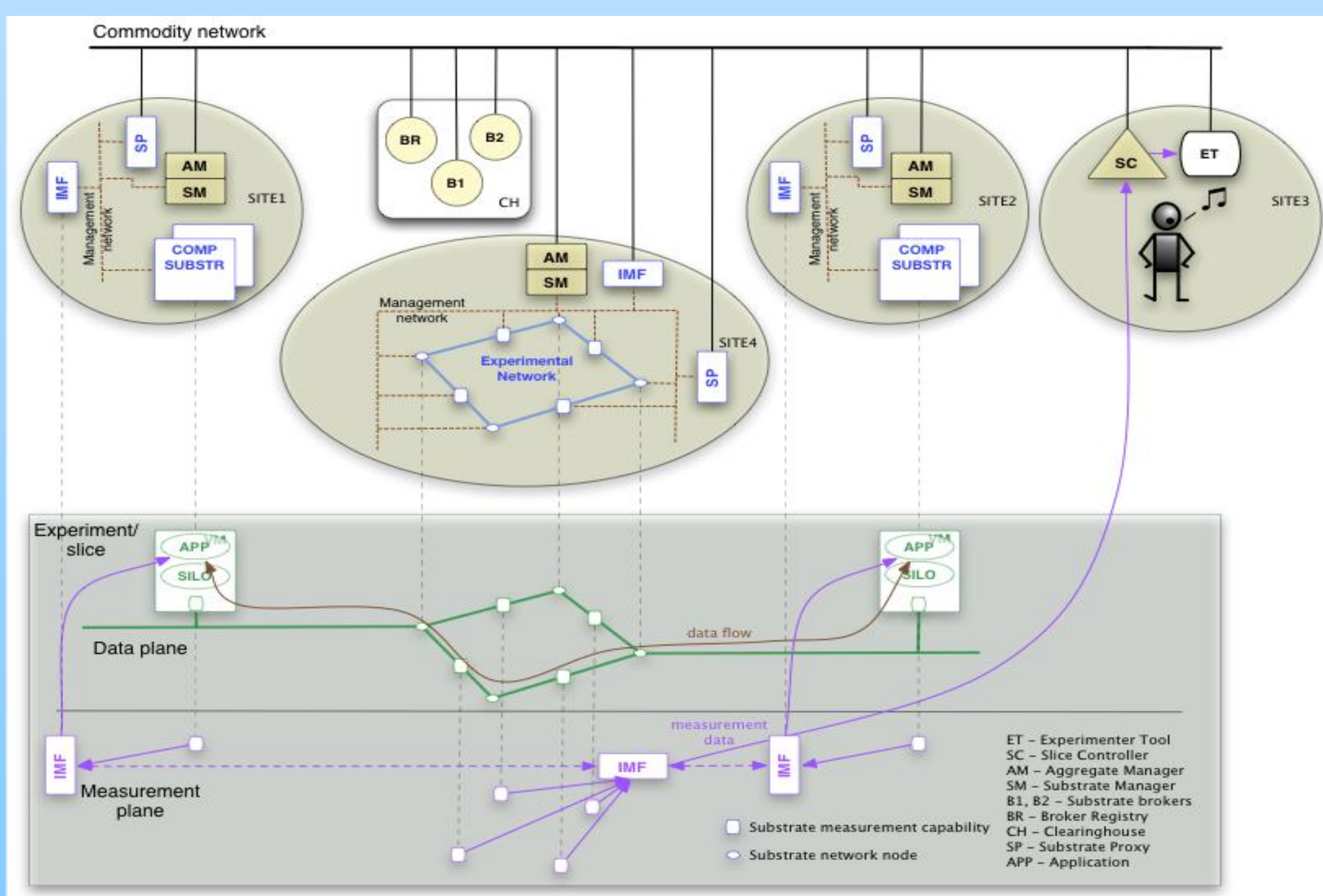
LEARN: Programmable Measurements over Texas-Based Research Network

IMF Overview



IMF provides an abstraction of measurement capabilities available within the GENI substrate by allowing experimenters to measure properties within the substrate, such as physical layer attributes (e.g. optical or RF power) and performance parameters (e.g. BER, packet loss, CPU usage) through a unified measurement interface.

IMF Architecture

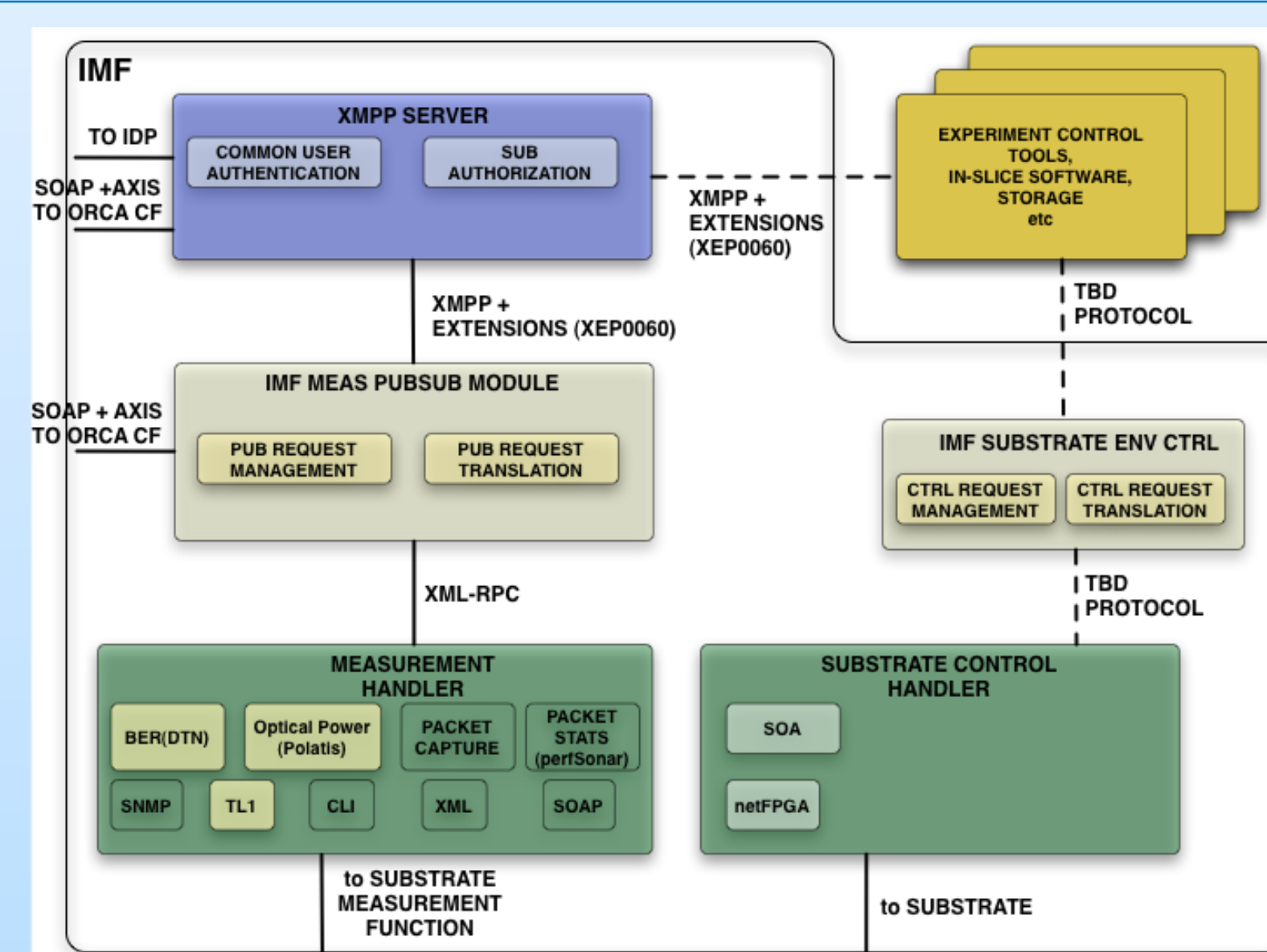


An experiment slice is created by instantiating slivers of resources from multiple sites and interconnecting them. The *data plane* of a slice reflects the topology desired by user. The *measurement plane* of a slice represents the measurement functions available within the slice. A slice also has *substrate environment control* capability so that the precise environment of a slice may be controlled and manipulated.

Consumers of Measurement Data

- User/experimenter tools existing outside the slice (ET)
- In-slice functions that operate on the measurement data in order to provide closed feed-back loop (SILO)
- Storage functions that collect and store the measurement data for later retrieval

IMF Components



XMPX Server

- Track subscribe requests from measurement data consumers.
- Receive publish events from the measurement PubSub Module, which contain measurement data or meta-data.

Measurement PubSub Module (PSM)

- Allows consumer to subscribe only to the measurement data one is interested in and receives the published data at the frequency that the data is generated, thus removing the need for explicit polling by data consumers.
- Translate information between physical topology of the substrate and virtual topology of the slice.

Measurement Handler (MH)

- Presents a uniform interface to configure and query substrate measurement capabilities.

Substrate Environment Control module (SEC)

- Same function as PSM module, but applied to substrate environment control, rather than measurement data collection.

Substrate Control Handler (SCH)

- Presents a uniform interface to functions and components within the substrate that can help control and manipulate the experiment environment.

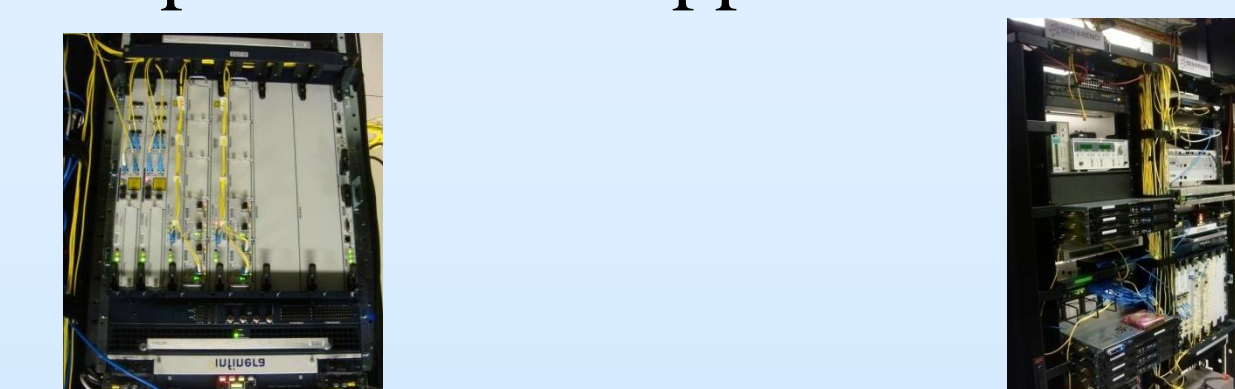
LEARN: Completed Work and Roadmap

Completed Work

- Developed MH for Infinera to measure BER and optical power.
- Developed XML-RPC code to interface with PSM and MH.
- Setup and test the XMPX server and PSM.

Roadmap

- Expand the list of GENI substrates that can generate measurements and further develop the MH to support them.



ERM: Completed Work and Roadmap

Completed Work

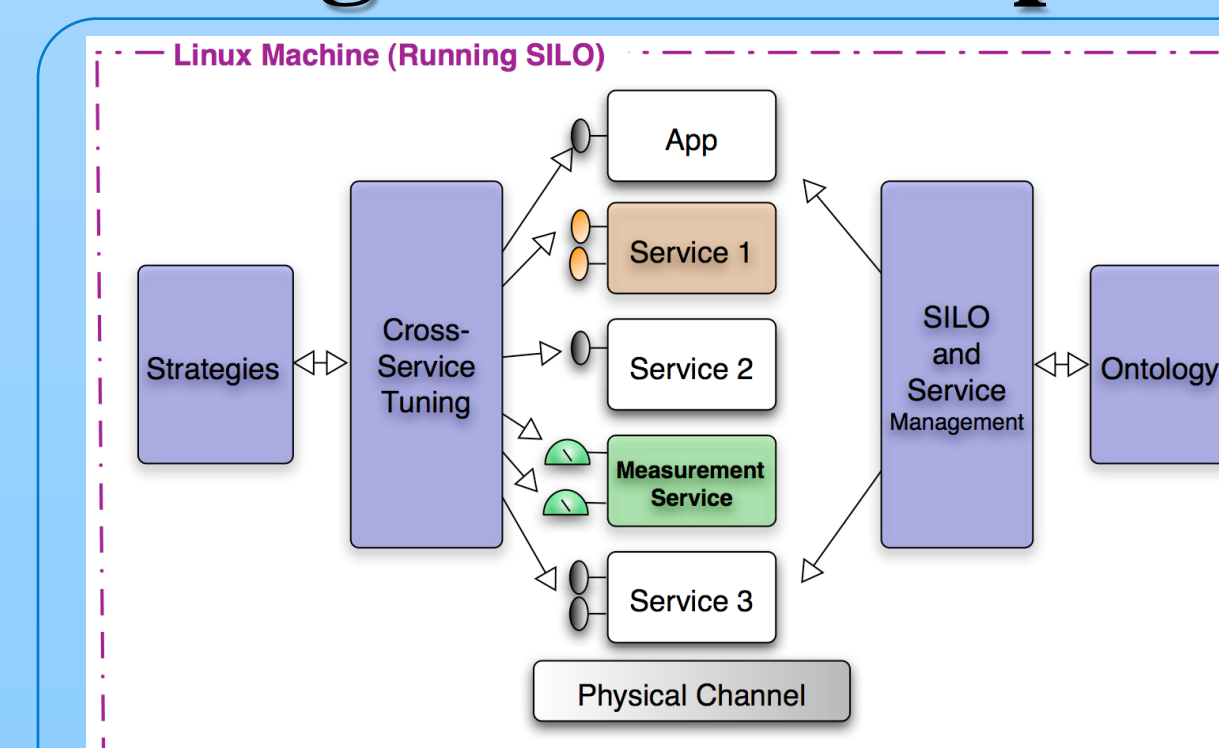
- Developed MH for Polatis to measure optical power.
- Assist in setting up and testing the XMPX server and PSM.

Roadmap

- Develop SCH and SEC for a variety of substrate control components.
- Further develop MH for expanding list of GENI substrates.



Using IMF: An Experimental Use-Case with SILO



Use-Case: Run SILO applications on ORCA-BEN. *SILO: Services Integration, control, and Optimization.*

- The SILO Measurement Service can access IMF substrates to obtain measurement data or control substrate environment.
- MH substrates include Polatis, DTN, and Cisco (future).
- SCH substrates may include SOAs, NetFPGAs, programmable attenuators, etc.

