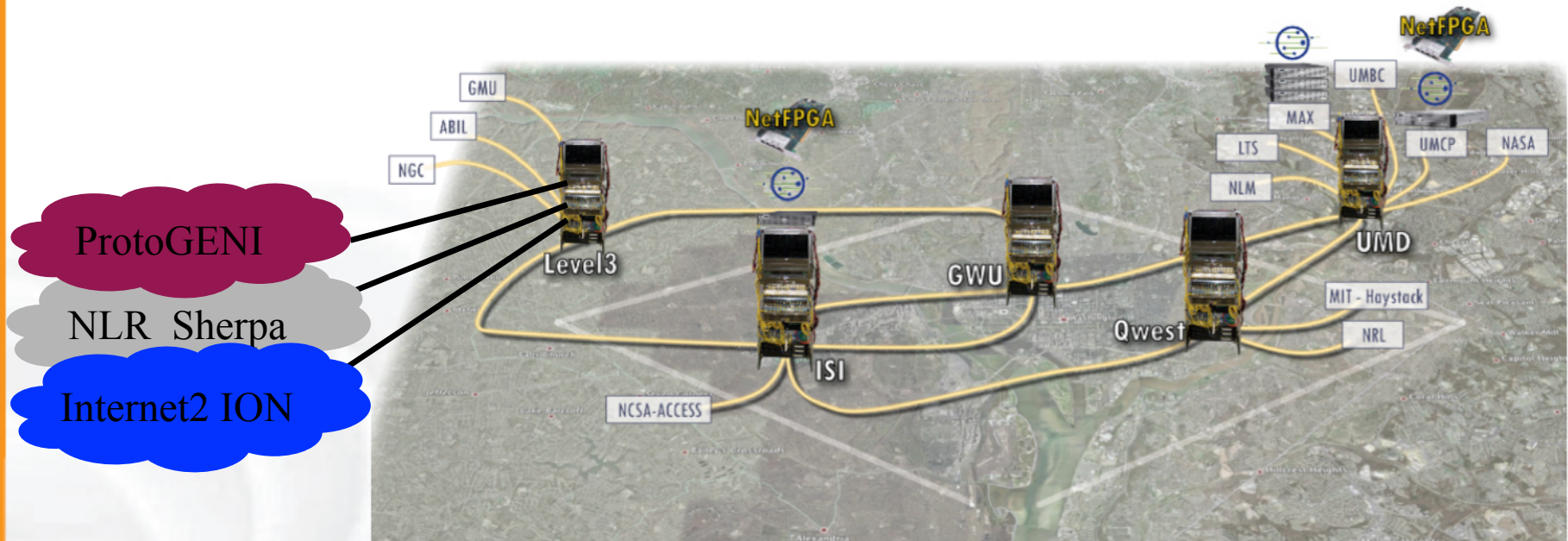


MAX Regional Network as a GENI Substrate



Mid-Atlantic Crossroads, University of Maryland

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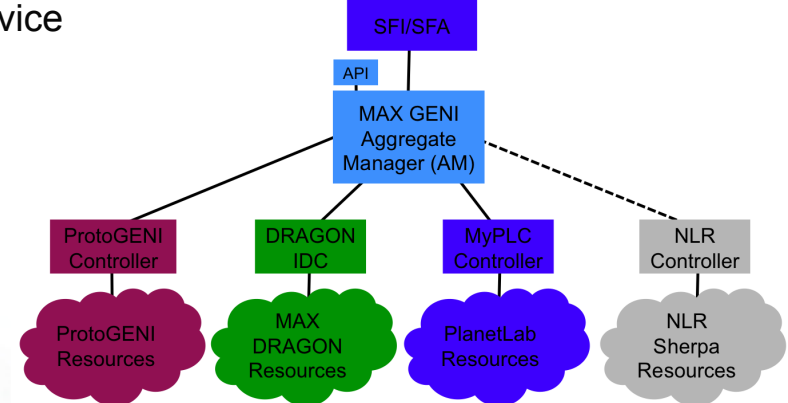
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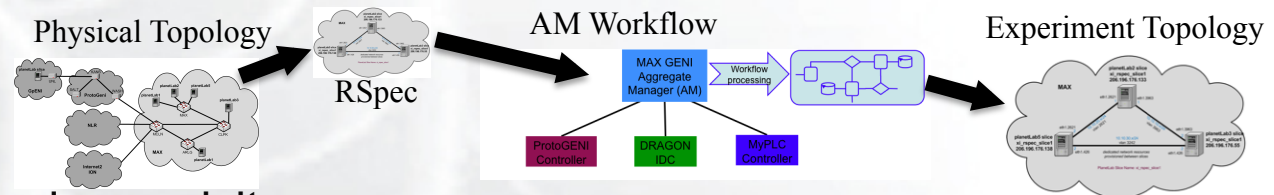
August 30, 2010

- Project Objectives and Accomplishments:

- Enable the MAX Regional Network Infrastructure to be available as a GENI Substrate Resource
 - Advanced Regional Ethernet over Lambda Network, connecting multiple university and federal research laboratories
 - Dynamic Layer2 (Ethernet) Service Provisioning via InterDomain Controller (IDC) based control plane, including interconnect to Internet2 ION Service
- Add additional GENI specific capabilities
 - PlanetLab MyPLC controller and hosts
 - NetFPGA hosts
 - Interconnect to ProtoGENI
 - Interconnect to NLR



- Develop MAX GENI Aggregate Manager to integrate MAX base and GENI specific capabilities into a unified set of GENI Services, accessible via a GENI Control Framework



- For project details, please visit:

- GENI Project Wiki: <http://groups.geni.net/geni/wiki/Mid-Atlantic%20Crossroads>
- MAX GENI Project Web Page: <http://geni.maxgigapop.net>

Milestone & QSR Status

ID	Milestone	Status	On Time?	On Wiki?	GPO signoff?
S2.a	NetFPGA Integration into DRAGON	Completed placement of NetFGPA systems into DRAGON research network	On time	Yes	Yes
S2.b	NetFPGA as a GENI Resource Plan	Completed plan for how to integrate NetFPGA resources into MAX Aggregate Manager RSpec	On time	Yes	Yes
S2.c	DRAGON Aggregate Manager Enhancement Design	Completed Enhanced Aggregate Manger Design	On time	Yes	Yes
S2.d	Common Control Framework Design	Completed initial design of control framework based on PlanetLab style MAX RSpec	On time	Yes	Yes
S2.e	User Support	Worked with users allow access to MAX Substrate	On time	Yes	Yes
S2.f	DRAGON Aggregate Manager Documentation	Updated MAX GENI website to include Aggregate Manager documentation	On time	Yes	Yes
S2.g	NetFPGA as a GENI Resource Implementation	Incorporated NetFPGA machines as a resource in Aggregate Manager RSpec.	On time	Yes	Yes
S2.h	DRAGON Aggregate Manager Enhancement Initial Implementation	Completed implementation of core services for Aggregate Manger	On time	Yes	Yes
S2.i	Common Control Framework Design Update	Completed design for our control framework (GEN RSpec, MAX AM API)	On time	Yes	Yes
S2.j	Common Control Framework Implementation	Completed implementation for our control framework	On time	Yes	Yes

Milestone & QSR Status

ID	Milestone	Status	On Time?	On Wiki?	GPO signoff?
S2.k	Common Control Framework Documentation	Added documentation for control framework and API to project web site	On time	Yes	Yes
S2.l	User Tool Evaluation and Development Plan	Completed core set of user tools in form of reference client API	On time	Yes	Yes
S2.m	User Support	Worked with users allow for test and experimentation with MAX AM use	On time	Yes	Yes
S2.n	DRAGON Aggregate Manager Documentation	Added updated Aggregate Manager documentation to MAX GENI website	On time	Yes	Yes
S2.o	DRAGON Aggregate Manager Updated Implementation	Updated implementation included processing for handling updated RSpec	On time	Yes	Yes
S2.p	Aggregate Manager Common Control Framework Integration Plan	Completed Integration plan including Web Service APIs, WorkFlow/Resource manager, and PlanetLab SFA Plug-in	On time	Yes	Yes
S2.q	Aggregate Manager Common Control Framework Integration Implementation	Completed integration of slice topologies which include PlanetLab, ProtoGENI, and DRAGON resources	On time	Yes	Yes
S2.r	Aggregate Manager Common Control Framework Integration Testing	Completed testing of instantiation of slice topologies which include PlanetLab, ProtoGENI, and DRAGON resources	On time	Yes	Yes
S2.s	User Tool DRAGON Framework Implementation	Completed user tool in form of a JAVA API	On time	Yes	Yes

Milestone & QSR Status

ID	Milestone	Status	On Time?	On Wiki?	GPO signoff?
S2.t	User Support	Worked with users allow for test and experimentation with MAX AM use	On time	Yes	Yes
S2.u	DRAGON Aggregate Manager Documentation	Updated information on project web site, included detailed deployment documents	On time	Yes	Yes
OSR1	QSR: 4Q2009	Published on GENI project wiki	On time	Yes	Yes
OSR2	QSR: 1Q2010	Published on GENI project wiki	On time	Yes	Yes
QSR3	QSR: 2Q2010	Published on GENI project wiki	On time	Yes	Yes

Accomplishments 1: Advancing GENI Spiral 2 Goals

- Integration
 - MAX Aggregate Manager (AM) integrates a diverse set of sliceable resources including PlanetLab, NetFPGA hosts, Dynamic Circuit Network (provisioning across MAX DRAGON, Internet2 ION, and beyond)
 - From a user perspective these are integrated in the form of an RSpec topology specification, and the MAX AM takes care of resource integration
 - MAX Substrate also includes interconnect to other key infrastructures such as Internet2 ION, NLR, and ProtoGENI network
- Interoperability - The MAX AM design includes multiple methods to accomplish interoperability:
 - MAX AM is part of PlanetLab Control Framework (MAX RSpec and SFA Plug-in is available in the PlanetLab repository)
 - Also a Web Service API (reference java client available) is available for native interface use by experimenters/systems who do not use PlanetLab SFA
 - As part of RSpec processing, MAX AM understands and can control PlanetLab, ProtoGENI, and DRAGON resources thru their control frameworks
 - MAX AM designed to allow integration of other resources in the future

Accomplishments 2: Other Project Accomplishments

Regional Networks as a GENI Resource – Reference Implementation

- The current research and education network infrastructure is based on a wide area network---regional network---campus network interconnect construct
- An important component of providing GENI services is being able to expose current network capabilities in the form of "GENI Services"
- In the MAX GENI project we have attempted to demonstrate a reference implementation showing how regional networks can take their existing capability set and expose it as a GENI resource alongside their production operations, without disruption.
- In addition we feel we have designed an Aggregate Manager architecture that will accommodate future substrate capabilities as they mature (like OPENFLOW) and adapt to future control frameworks (like SFA 2.0) as they evolve.
- We expect that collaborations with other networks deployments will result – initial work with people from Korea is ongoing now

- We have no major issues with respect to being able to complete current SoW/ milestones
- From a larger perspective, we think Aggregate Managers and Substrates have evolved to the point where additional focus is needed on tools to facilitate experimenter use. This applies to both single substrate and multiple substrate experiments, but the biggest issue is for multiple substrate experiments.
- Since GENI substrate resources, aggregate managers, and RSpecs are a heterogeneous group, it will be somewhat difficult for an experimenter to navigate their way thru the multiple RSpec and aggregates needed to accomplish a multi-aggregate experiment (even with common API, SFA 2.0+, these issues remain)
- Some things that are missing that would facilitate this: i) mechanisms for aggregate managers to share topology and substrate interconnection information, ii) ability for aggregate managers to accept constraints on provisioning requests (such as a specific VLAN range to facilitate stitching), iii) intelligent slice managers which can do resource/path computation using the above information, iv) additional work on federation of resources across substrates is also needed
- We believe some “canned” experiment workflows will be needed to get people started prior to the above being available

- What are your plans for the remainder of Spiral 2?
 - Complete the testing of the MAX Aggregate Manager Plug-in for PlanetLab SFA, update to latest available SFA implementation
 - Evaluate possibility of using using GUSH (via the PlanetLab SFA) to access MAX AM resources
 - Updated MAX Aggregate Manager Documentation
 - User Outreach and Support
- The GPO is starting to formulate goals for Spiral 3. What are your thoughts regarding potential Spiral 3 work?
 - Integration of dynamic provisioning across NLR Sherpa into the MAX Aggregate Manager
 - Updates for SFA2 and other changes as they evolve
 - Add Eucalyptus Clusters as another resource under the MAX Aggregate Manager
 - Development of “canned” user experiment topologies setups and experiment workflows
 - Meso-Scale Buildout integration: Utilize MAX AM control of Internet2 ION, NLR, and ProtoGENI network paths to connect to sites where meso-scale buildouts are located. Utilize the “canned” experiments workflows to build experiment topologies which span MAX Substrate and a Meso-Scale location.
 - User Outreach and Support