SDN in GENI: Issues, Considerations, and A Few Architecture Items

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July 11, 2012

Sponsored by the National Science Foundation

Overview

- Goal: To Characterize the Programmable Network Substrate GENI *Will Provide* To Network Researchers.
- Is GENI Now A “Provider”?
- This Is a Questionable Premise…
- Perhaps GENI Is An Enabler
- SDN Is An Opportunity To Actually Instantiate A Significant Advance

A Few Edits

- FROM “How Does GENI Infrastructure Provide a Sandbox for Experimenters?”
- TO: How Can Experimenters Discover, Extend, Enhance and manipulate Resources Within a GENI Environment? [“Slicing the Network”]
- FROM: “How Does an Experimenter Operate within that Sandbox?” [“Programming the network”]
- TO: How Can an Experimenter Have Complete Freedom Within that Sandbox?” [“Programming the network”]
- FROM: What Constraints Does GENI Impose on the Experimenter in Terms of Operating within the Sandbox?
- To: How Can GENI Remove Constraints Imposed On the Experimenter?
- FROM: “What Assumptions Can the Experimenter Make About the Isolation Properties of that Sandbox?”
- TO: “How Can the GENI Design Minimize Concerns About Isolation Properties?”

A Few More Edits

- ***Role of OpenFlow? One of Many (and an Increasing Number of) SDN Techniques***
- FROM Role of OpenFlow in "*allowing"* Experimenters to Manipulate that Sandbox?
- TO: Role of OpenFlow in "Enabling" Experimenters to Manipulate that Sandbox?
- FROM: "What Software Abstraction of the Network Should GENI Provide to Experimenters for "Deep Programming"?"
- TO: "GENI Will Enable the Highest Level of Software Abstraction of the Network Possible to Provide Experimenters With Capabilities for "Deep Programming"
- FROM: What Impact Does Our Approach to Stitching Across Campuses Have on the Experimenter's Ability to Program their Network Substrate?
- TO: Stitching Across campuses Will Not Limit the Experimenter's Ability to Program Their Network Substrate
- FROM: Should Experimenters be Provided with Visibility and Control to (unrequested) Intermediate Nodes?
- TO: Experimenters Will be Provided with Visibility and Control to (Unrequested) intermediate nodes?
- FROM: How Close Can We Come To the Goal of Providing Sandboxes Without Human-in-the-Loop?
- TO: Sandboxes Will Be Provided Without a Human In the Loop:

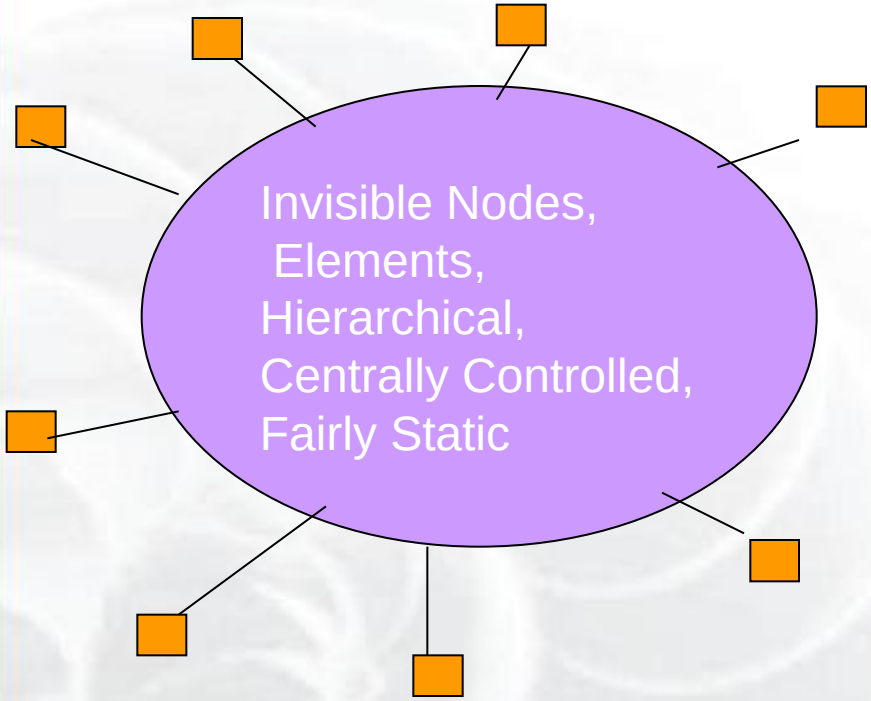
Research And Risk

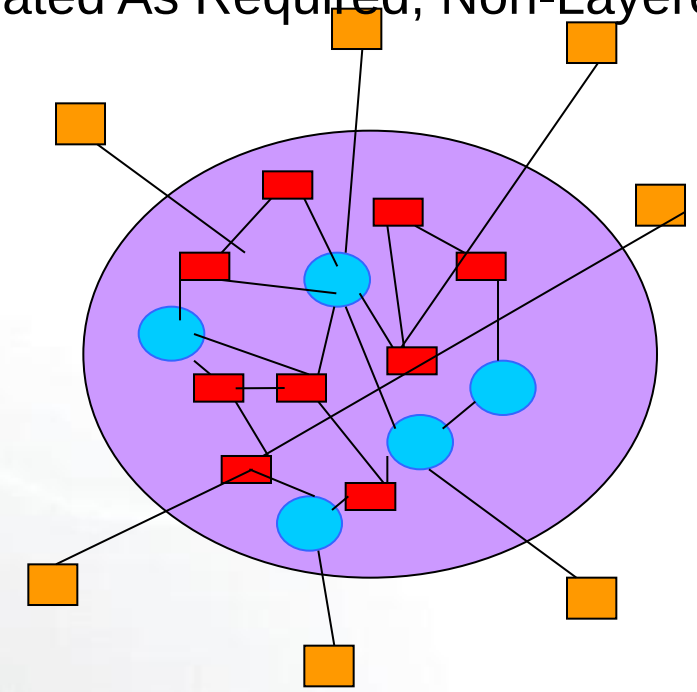
- Research Requires Risk
- Without Risk, It's Engineering Not Research
- If it Can't Be Broken, It Isn't a Research Environment
- Note RENCI's "Breakable Experimental Network"
- Too Many Compromises With Production Networks Are Toxic To Research Activities
- The Environment Should Be Designed "By Researchers for Researchers."

Paradigm Shift – Ubiquitous Services Based on Large Scale Distributed Facility vs Isolated Services Based on Separate Component Resources

Traditional Provider Services:
Invisible, Static Resources,
Centralized Management,
Highly Layered

Distributed Programmable Resources,
Dynamic Services,
Visible & Accessible Resources,
Integrated As Required, Non-Layered





Limited Services, Functionality,
Flexibility, Expandability

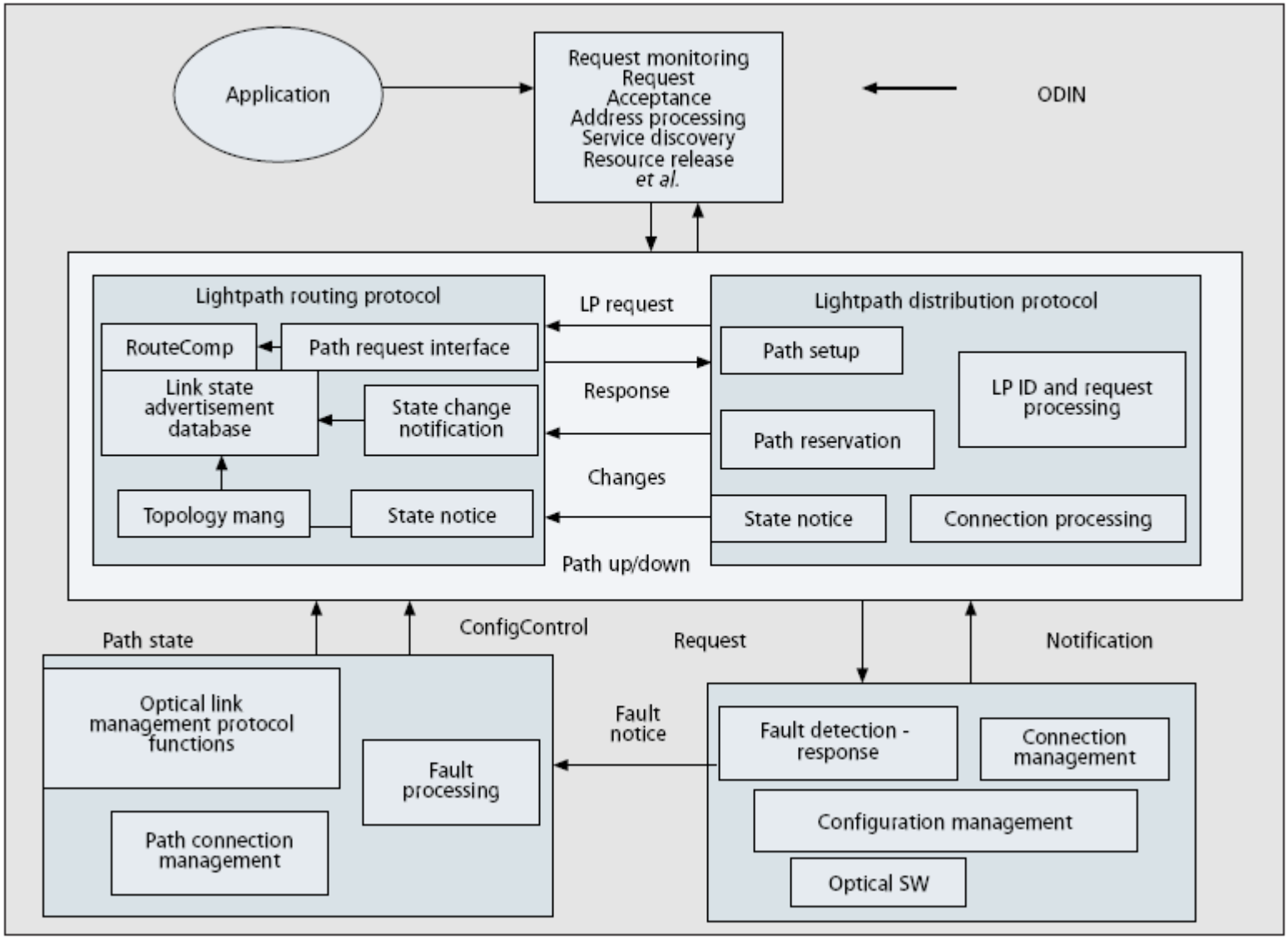
Unlimited Services, Functionality,
Flexibility, Expandability

Releasing the Fully Potential of Digital Technologies

A Few Architecture Issues

- Critically Important: Separation of Data Plane and Control Plane
- Edge Signaling
- Messaging for Edge Signaling
- State Information Generation and Processing On Large Scale Infrastructure
- Real-Time Analytics of State Information For Edge Processes

Path Creation Processes



The Future Is Based On Programmable Networks!

- Thanks!!

Boston Harbor