

Mid-Atlantic Crossroads (MAX)

SDN Vision and Experiences

Roadmap to Operational SDN Workshop

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Mid-Atlantic Crossroads (MAX)

- MAX is regional network in the Washington D.C. metropolitan area
- Multi-ring dark fiber, DWDM, Wavelength Switched
- 100Gbps services at Layer 1, 2, 3
- Providing local services and connections to the national R&E Infrastructure, i.e. Internet2 and ESnet
- Organized as a Center within UMD College Park
- Investigating SDN for the following parts of the infrastructure:
 - Regional Network Core
 - ScienceDMZ, Other Edge Systems
 - Software Defined Exchange (SDX)
 - UMD Campus Enterprise

What do we want from SDN?

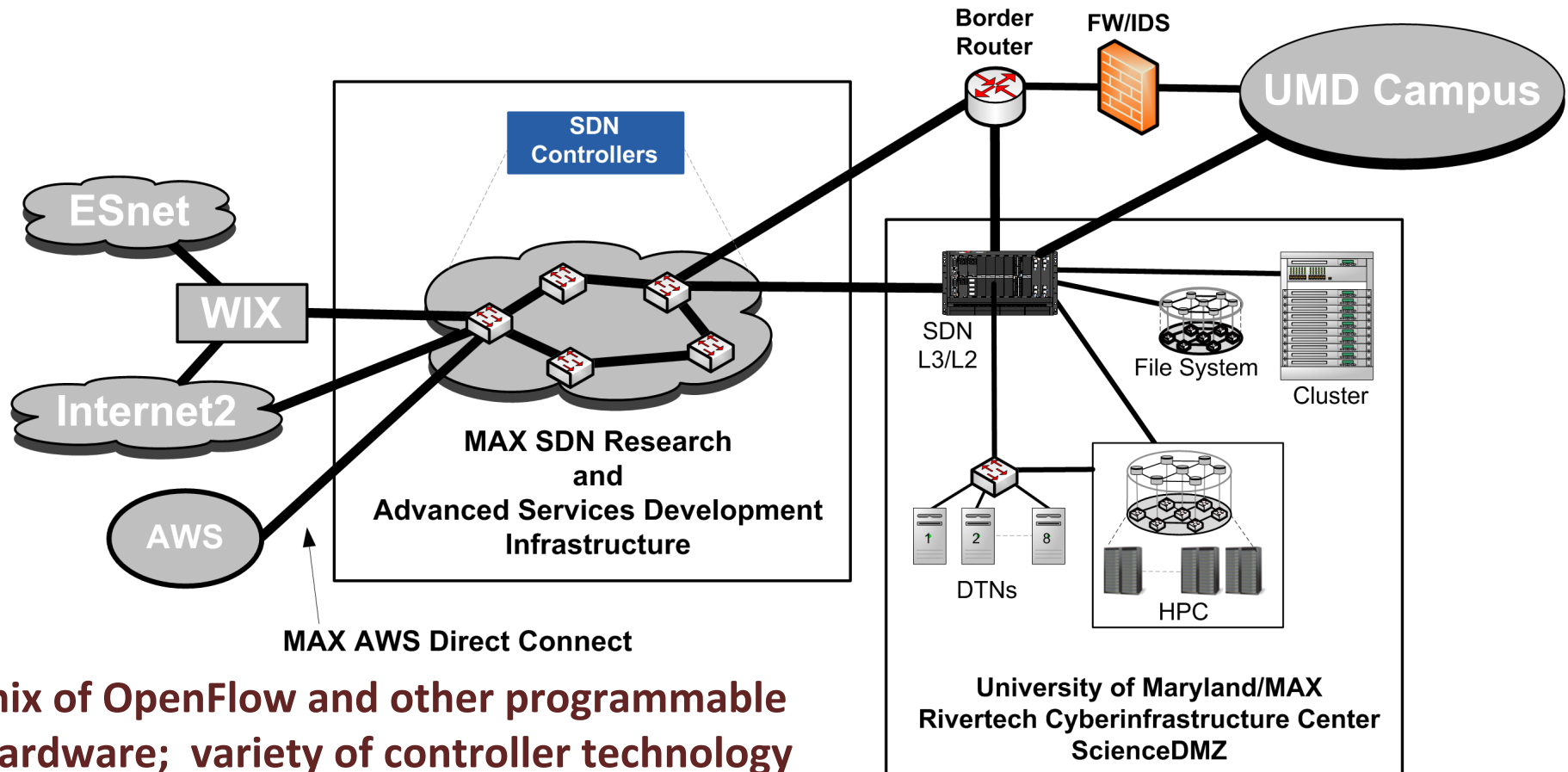
- **Fine grained Flow Management**
 - flow identification
 - flow steering/modification
- **Dynamic Network Services/Topologies**
 - network virtualization with hard isolation
 - workflow specific services and topologies (pt-to-pt, mpoint)
- **All in support of Advanced Cyberinfrastructure Services**
 - integration/orchestration of compute, storage, instruments, and networks

While it is not possible, or desirable, to manage all flows in the network, it should be possible to manage “any” flow in the network.

How are we approaching SDN?

- **Deploying SDN network infrastructure parallel and interconnected to our production network**
- **Integrating edge resources like ScienceDMZs, DTNs, HPC, Clouds (AWS, OpenStack), science specific systems**
- **Using and testing multiple solutions/software; Internet2 OESS/FSFW, ESnet OSCARS, ONOS, ODL, Vendor Solutions, OpenFlow, others**
- **Conducting research and developing solutions in the area of multi-resource and multi-vendor modeling and orchestration**

SDN Research and Advanced Services Infrastructure



mix of OpenFlow and other programmable hardware; variety of controller technology being evaluated.

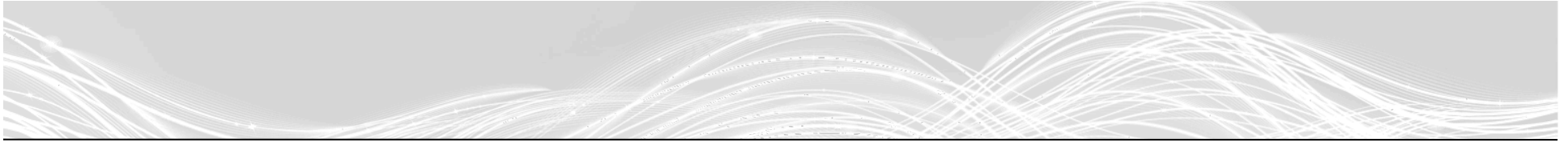
variety of edge systems, including OpenStack, DTNs, HPC, vendor proprietary

Main interest is SDN features in the context of edge system integration

What are the biggest challenges?

- **Multi-Domain Orchestration of Services**
 - end-to-end needed to realize full value
- **Resources Discovery and Description**
 - need a common method (model/language) for everyone to describe their resources, services, and what others are permitted to do with them
 - abstraction is key
- **Fine Grained, Multi-Domain, Authentication and Authorization**
 - user level, flow level, resource level
 - needs allow for dynamic adhoc “mini-federation” formation

The R&E community is uniquely positioned to address these issues. Past experience indicates that commercial efforts may not focus on these due to business considerations.



Thank-you