

# Integrating ORCA with BEN

**Yufeng Xin, Ilia Baldine**  
**Renaissance Computing Institute**

**{yxin,ibaldin}@renci.org**

**Jeff Chase**

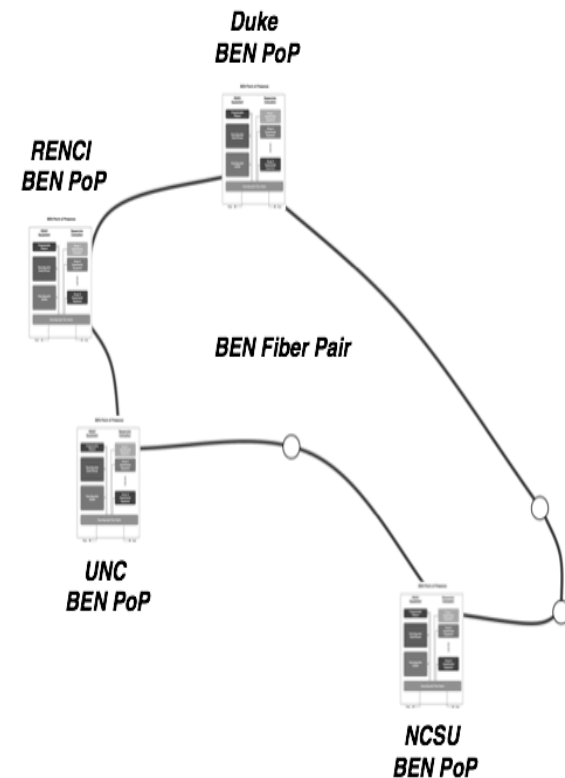
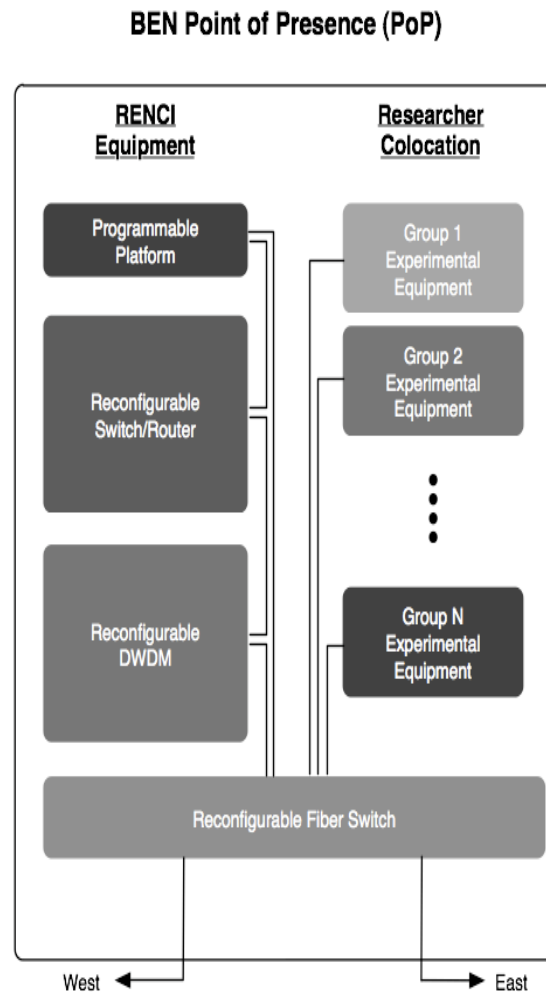
**Duke University**

**chase@cs.duke.edu**

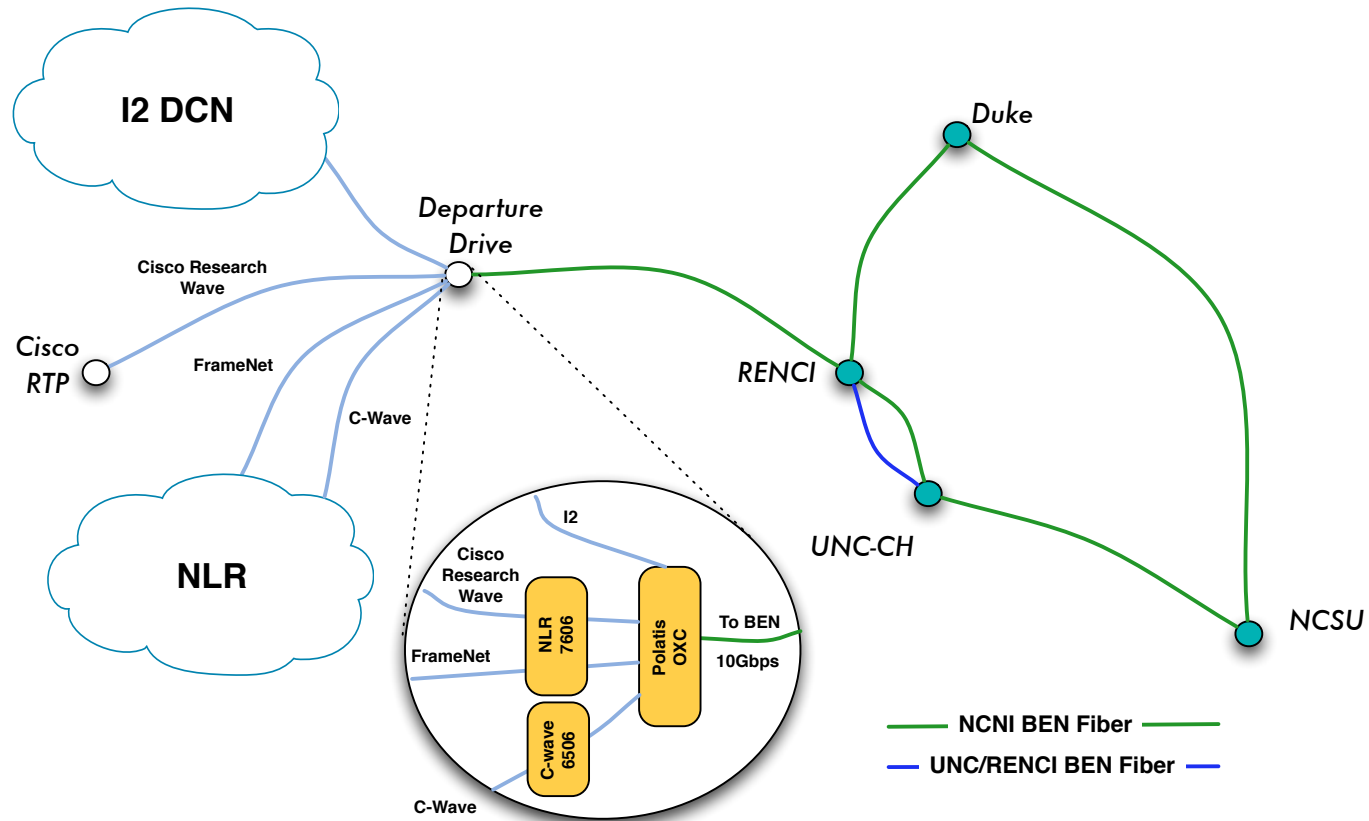


# BEN Overview

- Each PoP is equipped with
  - Polatis fiber switch
  - Infinera DTN (DWDM)
  - Cisco 6509
  - Blades for VM instantiation

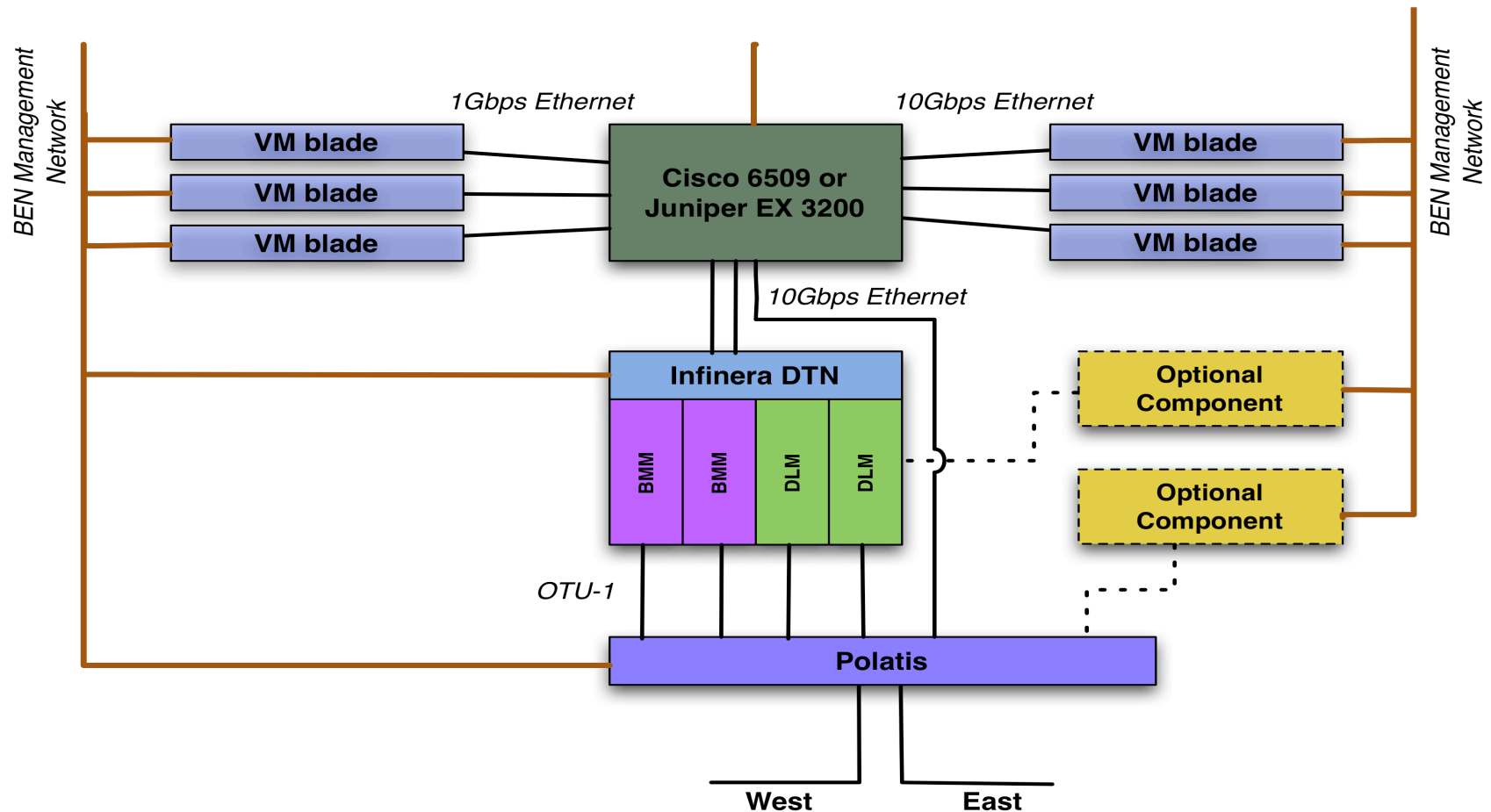


# BEN is Reaching Out

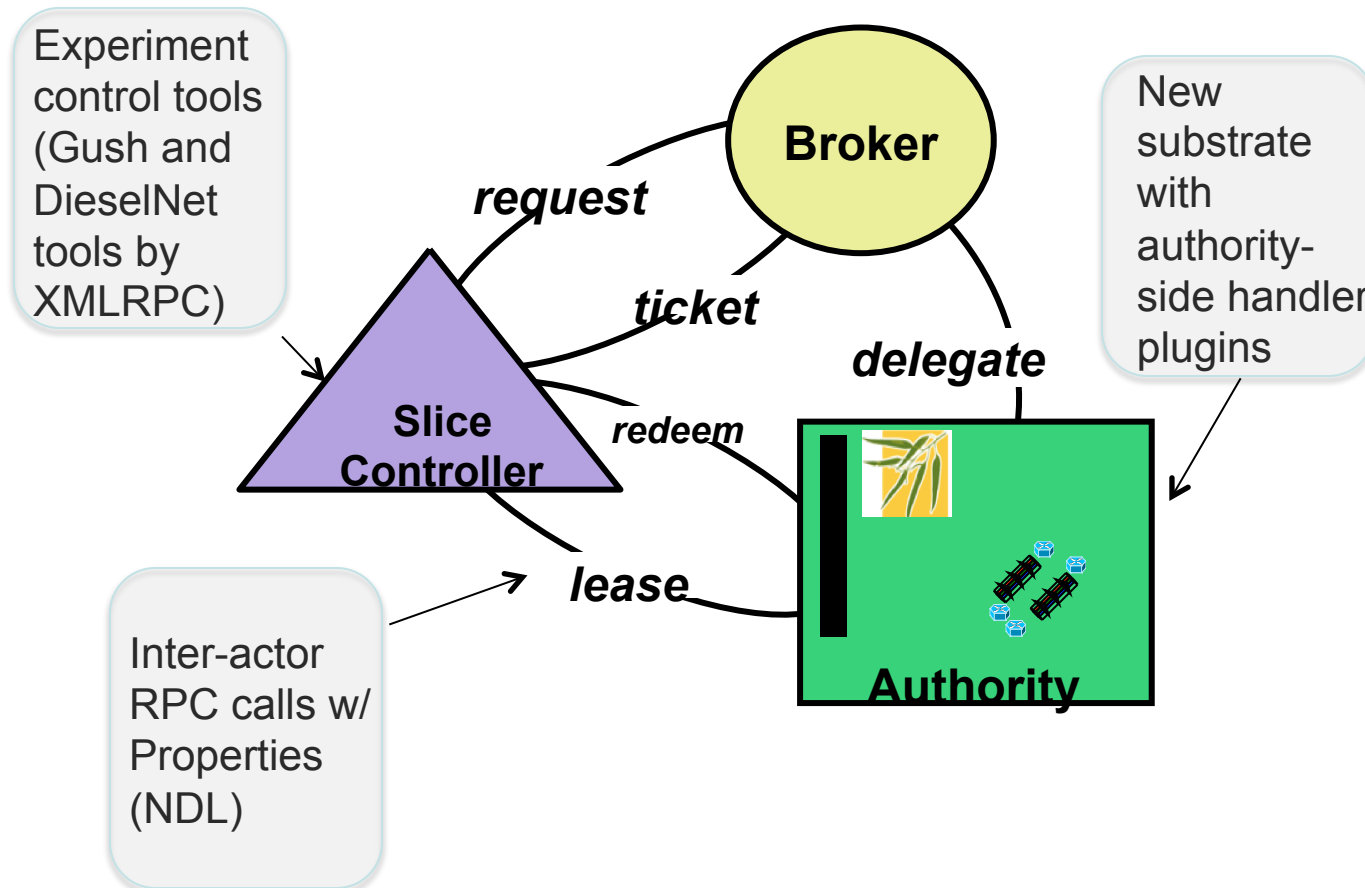


BEN proposed connectivity diagram

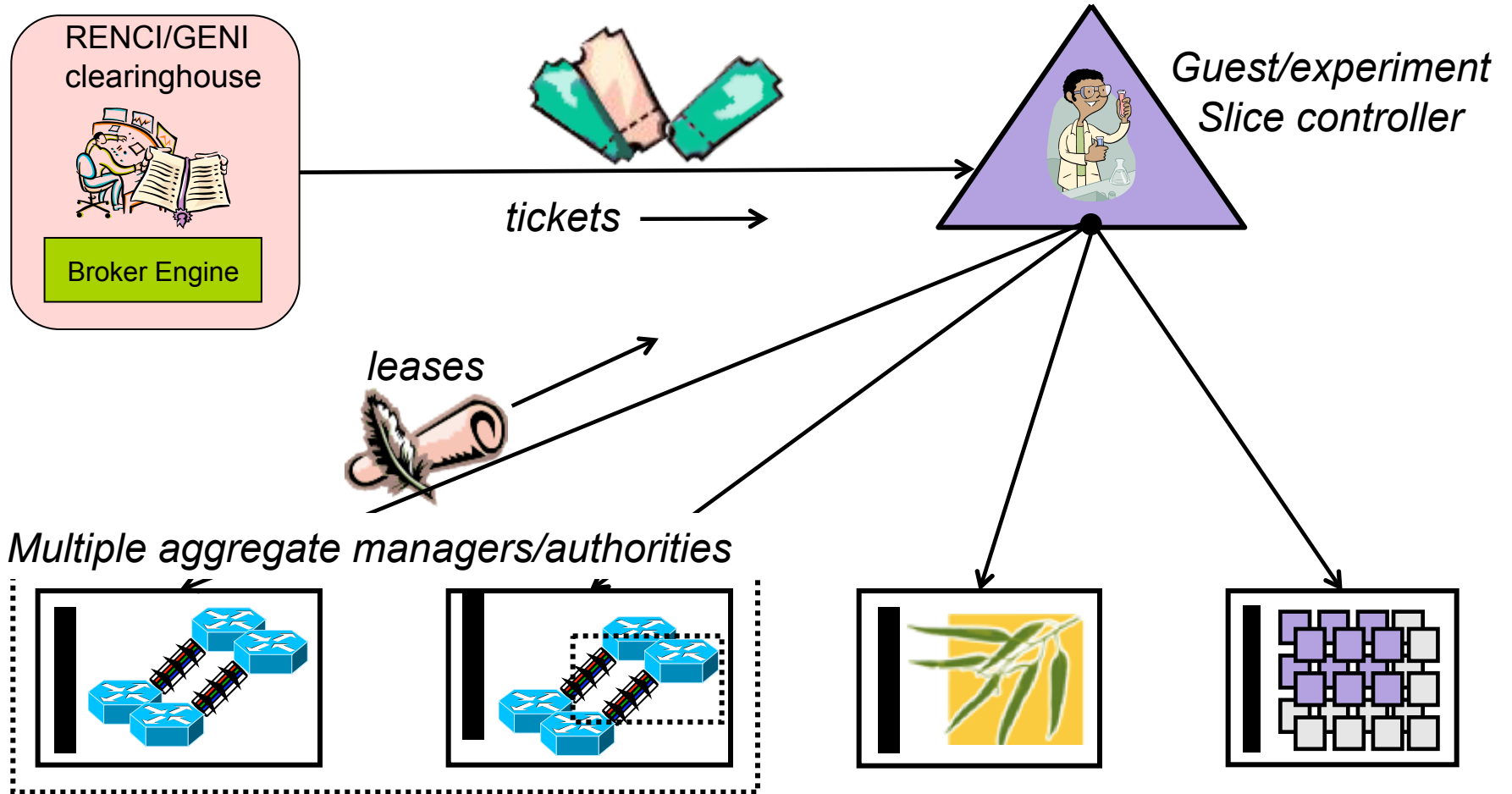
# Substrate: BEN PoP



# ORCA Overview



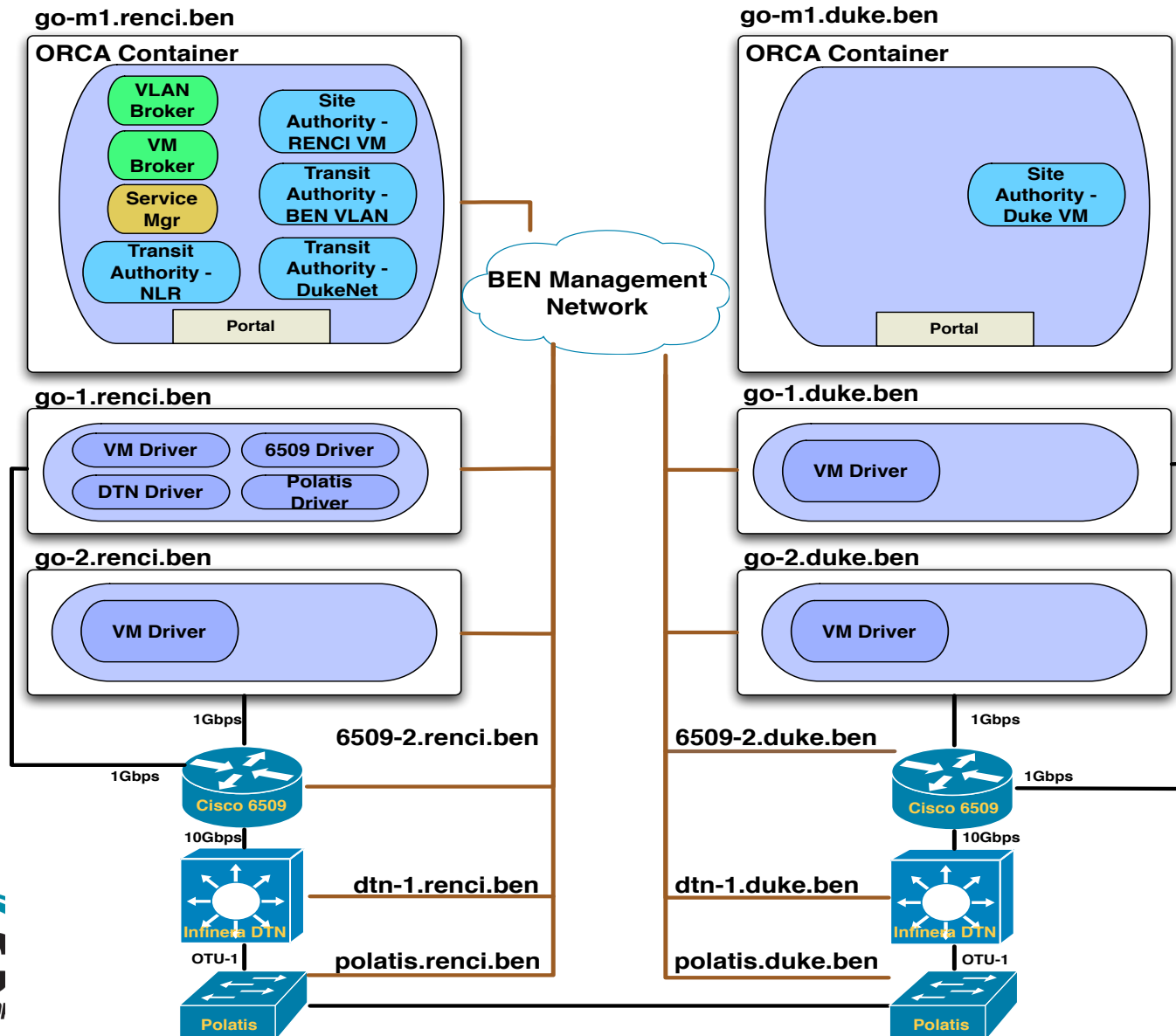
# Slice Setup and Stitching



Exchange of labels, tokens, configuration attributes etc. through SC



# BEN/ORCA Horizontal View





# Substrate Description in NDL- OWL

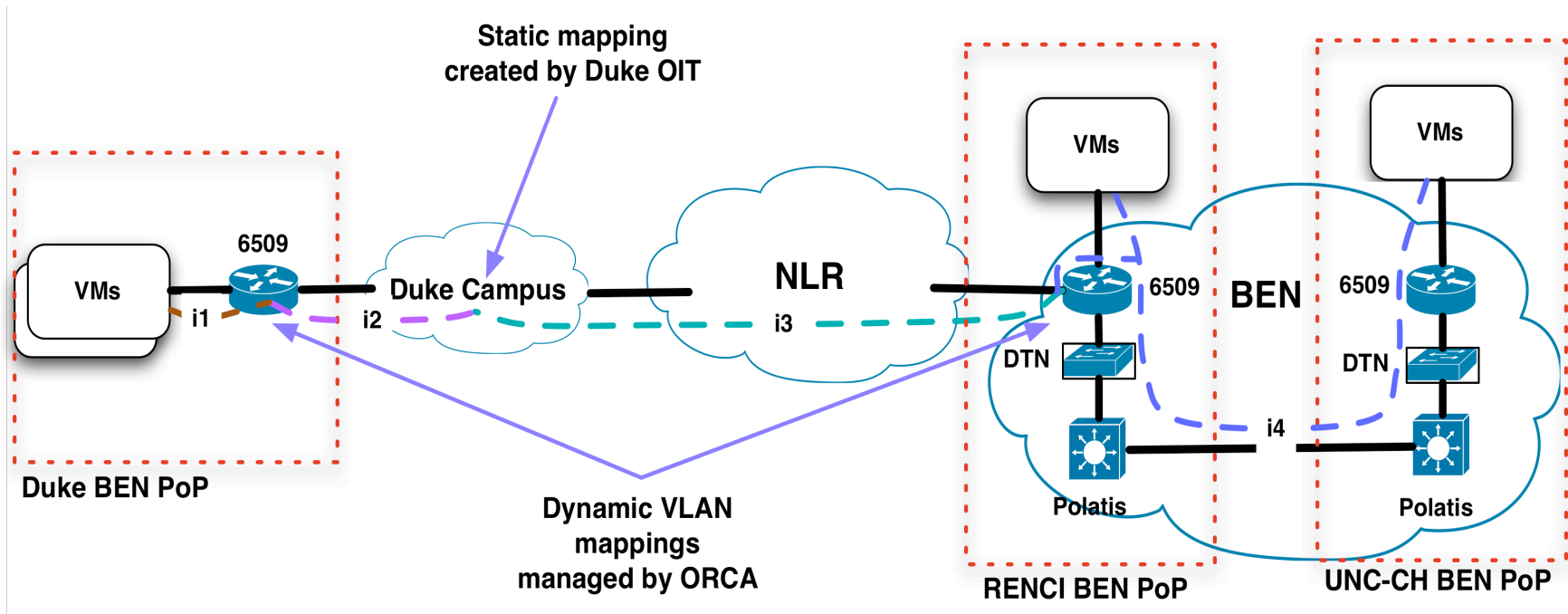
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-<topology:Interface rdf:about="#UNC/Infinera/DTN/fB/1/fiber">  
-<rdf:type rdf:resource="https://geni-orca.renci.org/owl/  
dtn.owl#FiberNetworkElement"/>  
  
-<dtn:availableOCGSet rdf:resource="#UNC/Infinera/DTN/fB/1/fiber/  
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-<dtn:usedOCGSet rdf:resource="#UNC/Infinera/DTN/fB/1/fiber/  
usedOCGSet"/>  
  
-<dtn:OCG rdf:resource="#UNC/Infinera/DTN/fB/1/ocgB/1"/>  
  
-<topology:interfaceOf rdf:resource="https://geni-orca.renci.org/owl/  
ben.rdf#UNC/Infinera/DTN"/>  
  
-<topology:linkTo rdf:resource="https://geni-orca.renci.org/owl/  
ben.rdf#UNC/Polatis/f6-22"/>  
  
-<topology:connectionDirection rdf:resource="https://geni-orca.renci.org/  
owl/layer.owl#BIDirectional"/>  
-</topology:Interface>
```

# Further BEN integration

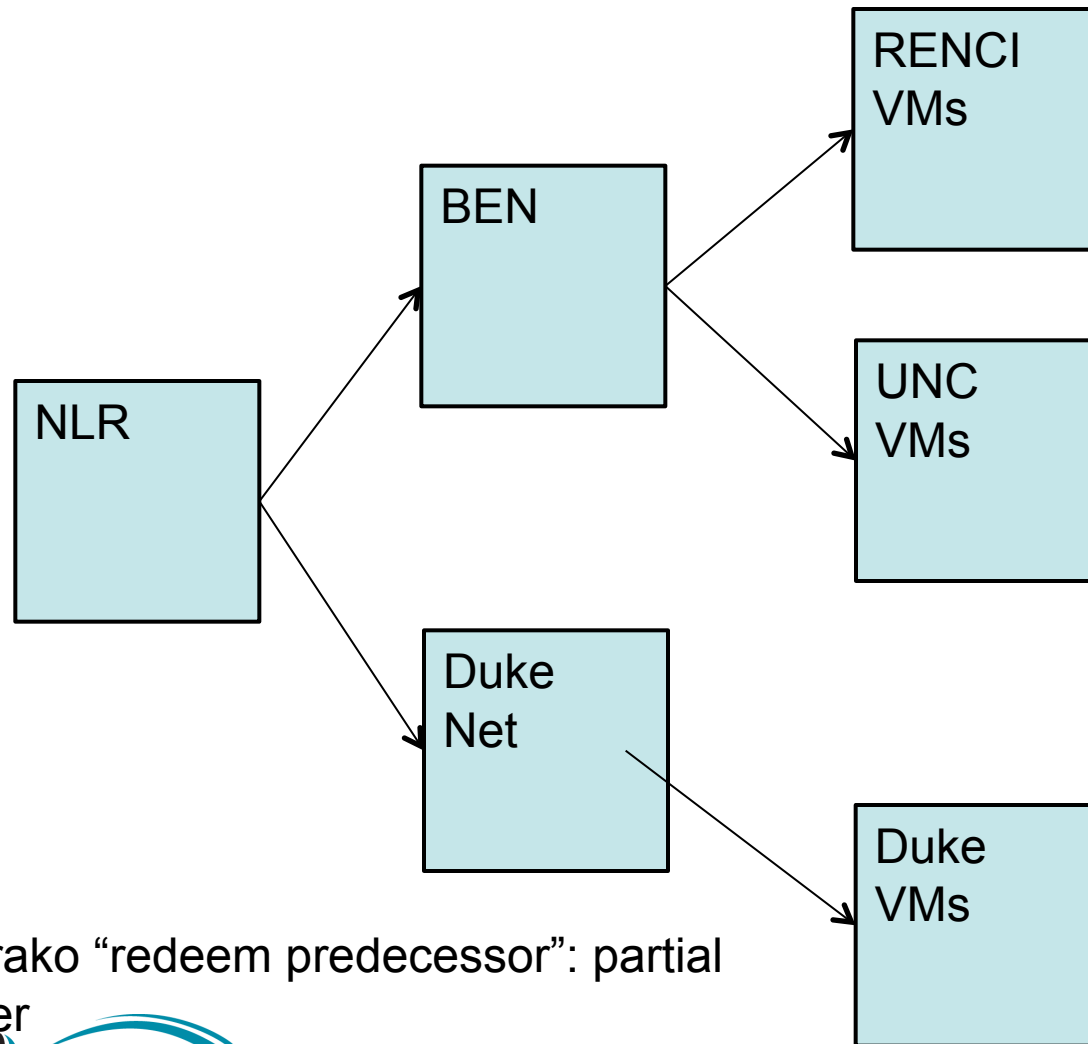
- **NDL-OWL Java tool kit**
  - **NDL-OWL extends NDL in OWL: Richer semantics and inference capability**
  - **Unified semantic for substrate description, request description, and slice configuration**
  - **Dynamic cross-layer path and configuration computation**
- **Developed universal driver framework for network elements and driver implementation for 6509, Infinera DTN and Polatis)**
  - **May add Juniper EX3200 XML driver**
- **Future work**
  - **Replace ORCA resource model with NDL/OWL ontology-based one**
  - **Enhance supporting DTN platforms : GMPLS, etc.**
  - **Advanced cross-layer path validation and then computation**
  - **VM substrate**
    - Eucalyptus/EC2 (mostly done)
    - VMWare/other virtualization technologies
    - Wireless (together with Cluster E)

# BACKUP

# End-to-End Slice “Stitching”



# Sequenced Stitching



Propagate VLAN tags to successors

As configuration properties

Under SC control

Secure stitching?

Shirako "redeem predecessor": partial order

# BEN VLAN Slice view

