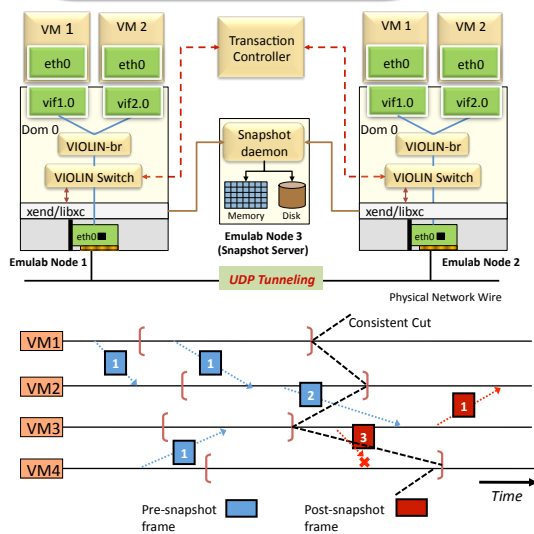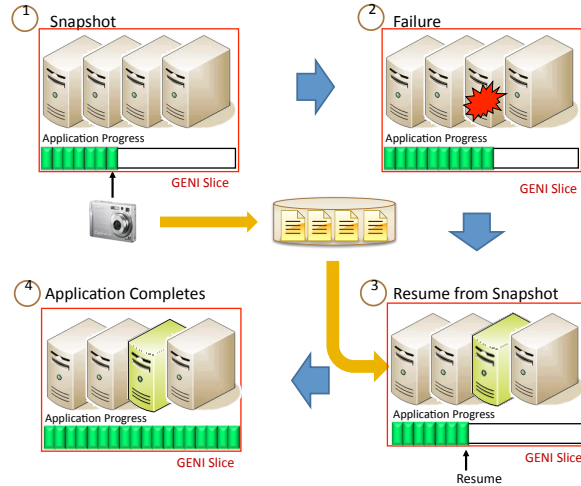**PURDUE**
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GENI-VIOLIN:
Distributed Suspend and Resume for GENI Experiments

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Motivation

- Provide *live snapshot capability* to *GENI Slices* for:
  - *Fault Tolerance*
  - *Debugging*
  - *Slice Management*
- Minimal disruption to application performance
- Transparent to the applications and guest OSes
- Non-stop execution of the application ("Live Snapshot" capability)

1. Snapshot — Application Progress — GENI Slice
2. Failure — Application Progress — GENI Slice
3. Resume from Snapshot — Application Progress — Resume — GENI Slice
4. Application Completes — Application Progress — GENI Slice

VM 1 — eth0 — vif1.0 — Dom 0 — VIOLIN-br — VIOLIN Switch — xend/libxc — eth0
VM 2 — eth0 — vif2.0
Transaction Controller
Snapshot daemon — Memory — Disk
Emulab Node 3 (Snapshot Server)
Emulab Node 1
Emulab Node 2
UDP Tunneling
Physical Network Wire

VM1, VM2, VM3, VM4 — Consistent Cut — Time
Pre-snapshot frame — Post-snapshot frame

Current VIOLIN Based Approach

- Leverage *VM live migration* capability to copy VM's memory image
  - Requires multiple iterations, but minimal disruption to VM execution
- *Mattern's distributed snapshot algorithm*
  - Guarantees causal consistency for messages exchanged during snapshot process
- Message coloring is handled by VIOLIN switches

OpenFlow Based Design

- Use out of the box Xen features such as *live VM migration* and *Remus*
- Snapshot servers act as the target of migrations and store VM images
- *OpenFlow* is used for :
  - Packet delivery rule enforcement
  - Packet coloring
  - Packet buffering
- Transaction manager to coordinate tasks among VM Servers, Snapshot Servers and OpenFlow Controllers
- *Demonstration* of the new design will be shown during *GENI-alpha* plenary sessions at *GEC9*

Site 1 — Snapshot Servers — VM Servers — OpenFlow Controller
Site 2 — Snapshot Servers — OpenFlow Controller — VM Servers
WAN Link
OpenFlow

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Exploring Networks of the Future