Telepath: Cluster-based Visualization Session Services

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Telepath: Goals

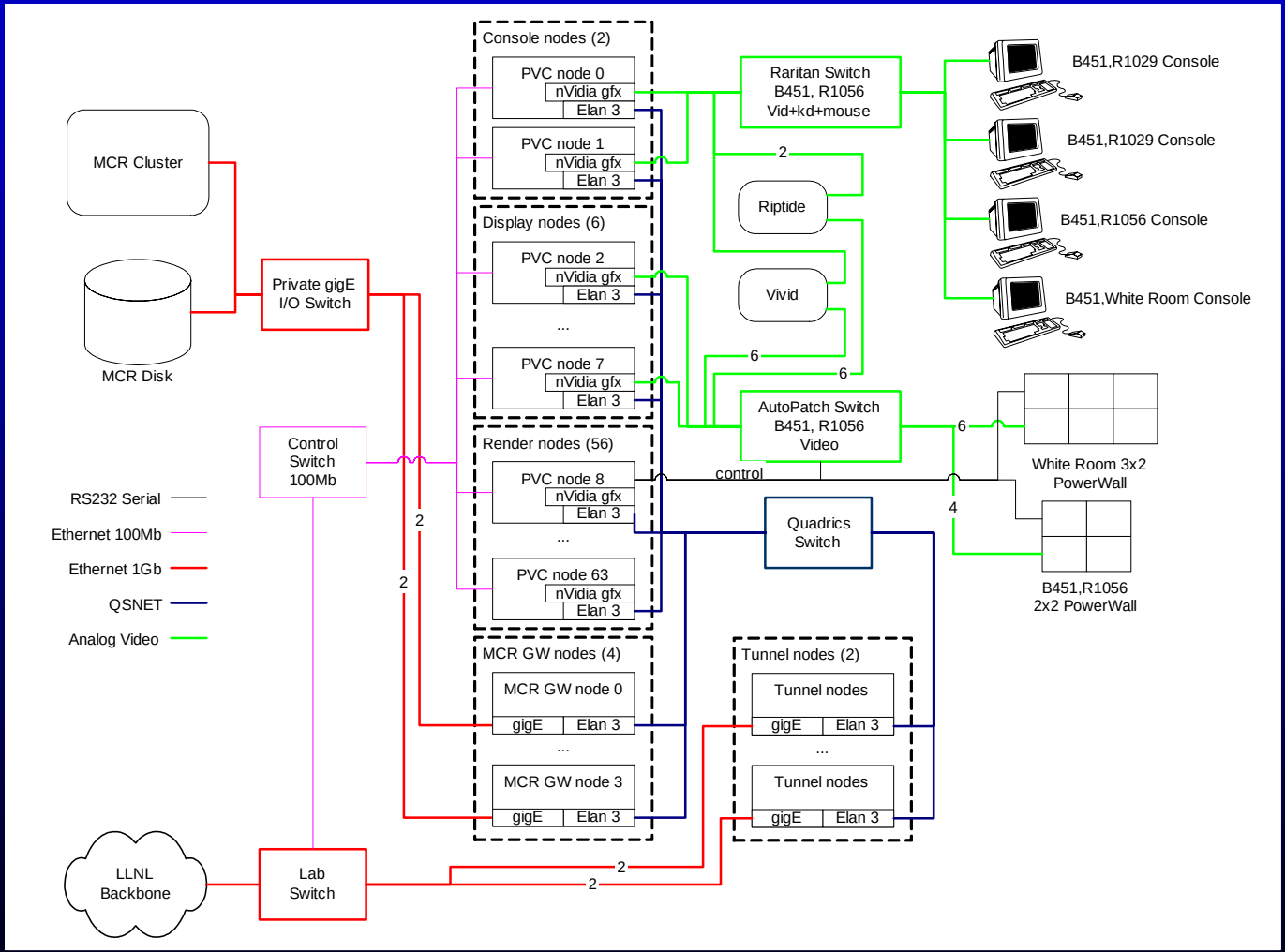
Provide a simple interface to the scheduling of resources and realization of multiple, simultaneous, dynamic, end-to-end visualization environments on a cluster.

- Schedule and allocate the hardware resources
- Set up the resources (displays, switches, etc)
- Launch application service layers
- Tear-down the session (session management)

- All in a secure/reliable fashion…

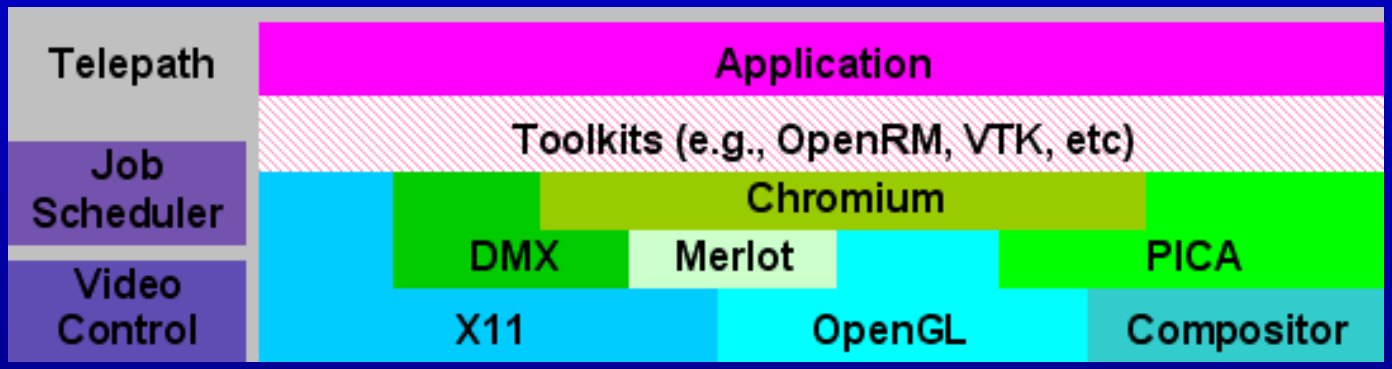
Telepath: Hardware Environment

“Classic” COTS clusters



Telepath: Software Environment

VIEWS scalable rendering stack



Services

- XFree86/OpenGL, DMX, Chromium, MIDAS, etc

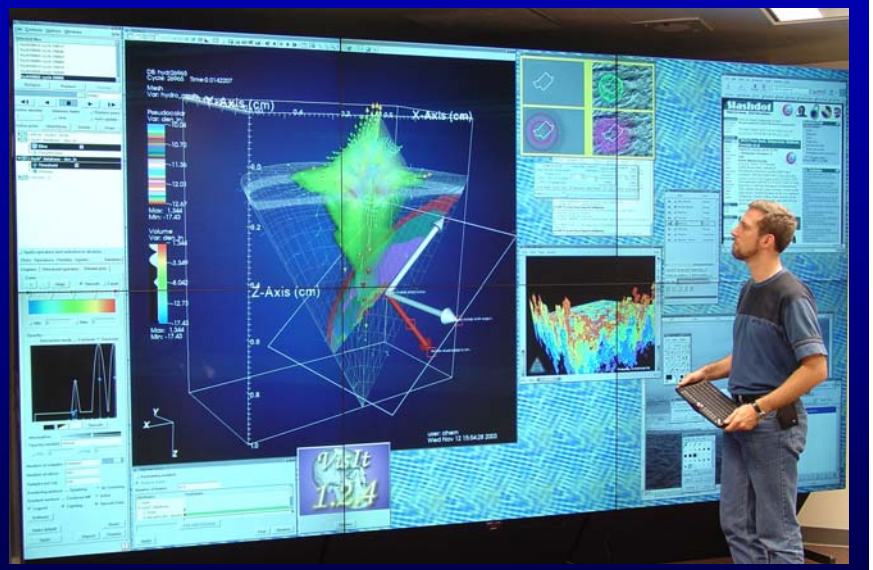
Applications

- VisIt, EnSight, TeraScale Browser, Blockbuster

Telepath: Requirements

User requirements

- Multi-user, simultaneous, dynamic
- Reliability, fault tolerance (“session repair”)
- SIMPLE!!!



System requirements

- Scheduler w/node “attributes”
- Co-exist with non-viz jobs

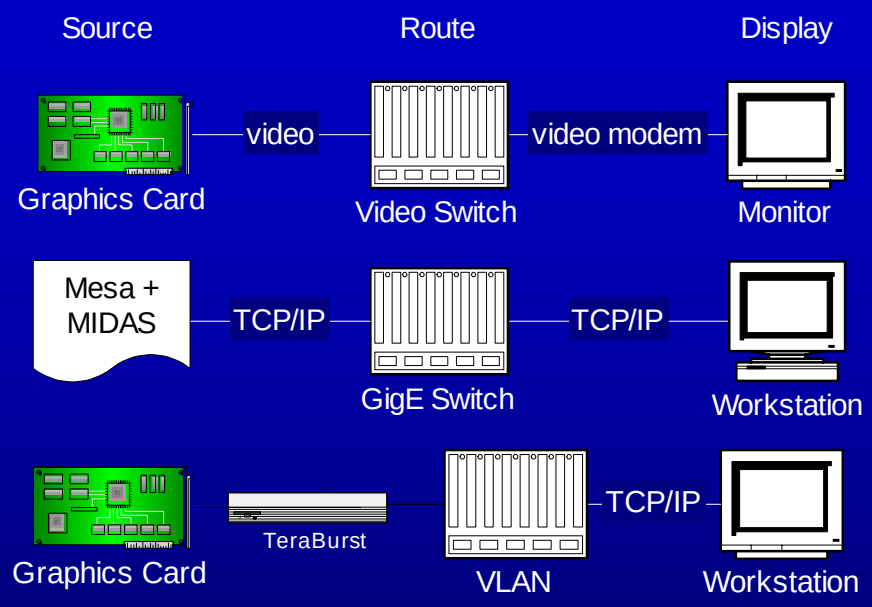
Security requirements

- Known, “rest” state
- Secure transport, authorization, authentication
- Wherever possible, user space services

Telepath: Session Components

Abstract components:

- Compute resources
  - Nodes to run applications
- "Source": Produces imagery
- "Route": Transports imagery
  - Source to display
  - Switches, networks, etc
- "Display": Presents imagery to a user
  - Includes "nulldisplay"
- "Services": User requested session capabilities
  - X11, OpenGL, DMX,…; Explicit or implicit
- "Stream": Defines imagery characteristics



Telepath: Python Modules

A python module exists for each type of component in a given site's deployment.

Stream definition

- Resolution, refresh rate, color depth, etc
- Handshake between components

Standardized module interfaces

- Reset, Query, Setup, Resolve functions
- Communication to devices hidden from Telepath

External site configuration tables

- Layouts, devices, dependencies, etc

Telepath: Execution

Register phase

- Verify availability of resources
- Identify dependencies & build pipeline via recursive table parse

Resolve phase

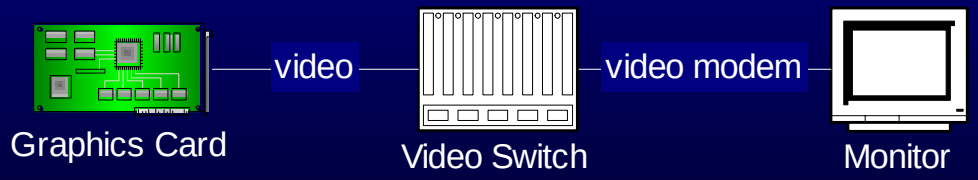
- Two pass – validate & constrain the stream.

Setup phase

- Initiate the components and enable the devices
- Unwind on error and "reset"

User session phase

- Users run applications

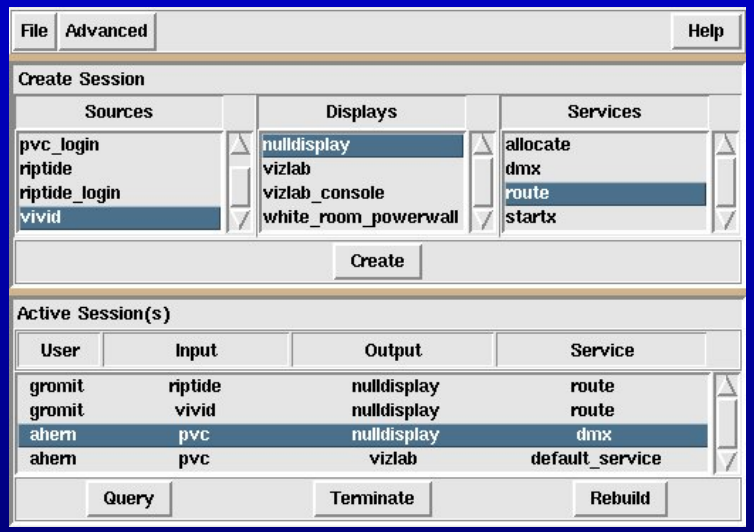


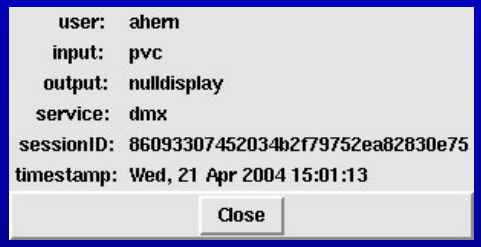
Reset phase

- Unwind the setup operation and bring to "rest" state

Examples

GUI interface





Command line

```
telepath --output=white_room_powerwall --service=dmx
telepath --output=white_room_powerwall \
     --service='dmx;inputfrom=pvc9:0;chromium‘
telepath --input='pvc;nodes=8' --output=nulldisplay \
     --service=startx
telepath --query
```

Telepath: Technologies

Python and related software

- Python, Pyro, Pexpect, TkInter

Other software layers

- Conman, OpenSSL, LCRM (DPCS)

Hardware

- Cyclades terminal server
- Lightwave, Autopatch switches
- Clarity, Barco … projectors/displays

Status and Futures

Complete version (1.0) running in the OCF on PVC and vivid clusters (some support for SGI)

- Currently driving various walls
- Vivid testbed and PVC production

SCF deployment underway on gViz cluster

- Initial version will not control the displays/switches
- Full version deployed as SGI system retired

Future: many, many ideas…

- Additional services, improved application launching, better use of node attributes, more devices, scheduled reservations…

A Cast of Thousands…

Required input from and participation by a large number of contributors: devices, architecture, coding, interoperability and security (and gentle prodding ☺).

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