General AG Troubleshooting

Retreat 2003

Why does the AG fail?

- AG is (inherently?) complex
- Multisite interactions are (inherently?) complex
- Formal meetings can be complex

Complexity...

- An AG node is a complex system
  - Several computers, some with nontrivial amounts of hardware installed
  - Software installed on these computers needs to work together
  - A wide area network requiring precise configuration of protocols that maintain wide-area state
  - A professional-grade audio system
  - Multiple video cameras
  - Multiple projectors
  - Many cables

Complexity...

- Multisite interactions are complex
  - Managing multiple schedules
  - Difficult to get all of the right people in all of the right places at the right (same!) time
    - Especially in the context of multiple installations at the same site
    - The FL Thursday Problem
  - Exacerbated in the face of technical problems

Complexity...

- Large formal meetings are hard at a **single** site
  - The PowerPoint distribution problem with flash cards and thumb drives and wireless networks and file sharing and... and ...
  - Physical space logistics
  - (This meeting has taken a LOT of planning and footwork)
- Multiply by multiple sites, and the problem space explodes

What to do?

- Chasing individual problems after they happen is frustrating and inefficient
  - Live meetings cannot tolerate the interruptions
  - Difficult to find the experts at the right time
  - Diagnostics might be intrusive or hinder workarounds

Classes of problems that require this approach

- Multicast
  - Need network engineers online
  - Need to know who the network engineers are
  - Need access to routers at multiple sites
  - Need the session to be live (which means tearing it down to bring up unicast replacement renders the problem undebuggable)
  - Ordinary users can gather some information, but not all
  - Can be hard to gather all required information

Problem classes, cont.

- Audio
  - Details of room audio setup subtle and complex
  - Software interface to echo cancellation gear nontrival
  - Each room configuration is unique, requiring a local expert to solve problems

Problem classes, cont.

- Meeting management
  - Dedicated person to managing presentations required
  - Scheduling important
  - Ownership of the meeting important

More problems

- Hazards of complexity
  - Complex systems need to be robust in the face of failure
  - Component failures should not cause the entire system to fail
- Unfortunately, that is not the case in the AG currently

Brittle Failure Modes

- Brittle: a small failure leads to overwhelming system failure
- Examples in the AG
  - Audio. One important site with bad (overdriven, off, unheard, distorted) audio
  - Network. One sender/receiver pair not working properly in a multicast session
  - Software. One misconfigured computer in a node.
  - Hardware. A flaky microphone in a room, or a badly-terminated network cable.
  - People. One site that has nobody in the room that knows anything about the node.

Robust Failure

- Eliminating brittle failures is a design goal
- System should fail gracefully
- This is **hard**.
- But it is a design goal for the AG2 project.

Simplicity

- It may not seem like it, but an AG node is an understandable device
- Small number of basic functions:
  - Send audio from room to network
  - Send audio from network to room
  - Send video from room to network
  - Show video from network to room

Simplicity, cont.

- Audio appears complex, but is made up of distinct components
  - EC device + microphones + speakers
  - Audio capture hardware
  - Audio capture software
- Each can be understood separately
- Understanding role of each can lead to insights in problem solving

Breaking up the problem

- Problem: One site sounds bad.
- Potential reasons:
  - Network is lossy
  - Sending computer is overloaded
  - Receiving computer is overloaded
  - Sender’s audio gear is misconfigured
  - Receiver’s audio gear is misconfigured

Eliminating possibilities

- Is the network bad?
  - Does everyone hear the same bad audio?
  - Check the rat reception monitor.
    - Does it show green for traffic from the problem site to the local site?
- Is the sending computer overloaded?
  - Ask them! See what the CPU utilization on the audio machine is.

Eliminating possibilities

- Is the receiving computer overloaded?
  - Have a look! See what the CPU utilization on the audio machine is.
- Sender's audio gear is misconfigured?
  - Does everyone hear the problem?
  - Does the badness sound familiar?

Eliminating possibilities, cont.

- Receiver audio gear misconfigured?
  - Is anyone else having the problem?
  - Do I only hear the problem from one site?
  - Can I play an MP3 and have it come out okay?
- Check the configuration on the node; everything in all the right places?

Troubleshooting Recommendations

- Become familiar with your node.
  - Read all the documentation that's out there.
  - Read the fine manuals (to your echo cancellation gear, to your microphones, to your cameras). You might pick up some lingo or learn new capabilities of the system
  - Test it out. Press all the buttons, wiggle all the knobs.

Experiment!

- Don’t be afraid!
- (Learn how to save and restore EC configurations)
- Experiment with the audio system; play with the echo canceller control app
- See what happens when you drive the gains up on the microphones.
- Install the PIG software on your laptop, listen in while you experiment.
- Try to recreate known-bad configurations and see what they sound like, and what they look like in the software.

Experiment, cont.

- Tune up your node:
  - Put the EC console up on the projectors
  - Wander around the node and tweak the audio for best performance.
- Fire up the UCL reflector and sing a round with yourself
- Hook up a telephone and play with telco bridging. AG prank calls to your friends.
- Trace the wires to see where they go
- Not really any black magic, just that which is inside the EC hardware

Network problems

- These can be difficult to trace
- Determine the following information:
  - Sender IP address (click on the source in rat or vic)
  - Receiver IP address
  - Multicast group
  - Detailed information on manifestation of problem
- Send these to your **local network folks** ad to multicast-support@accessgrid.org
  You do know, by now, who they are, right?
- Give them a tour if they haven't seen the AG yet

Network, cont.

- Other things to do ahead of time
  - Run a beacon
  - Check the beacon matrix if you are having problems to see if it shows up there
- Leave a PIG session up on your meeting so you can monitor it periodically.
- Learn to use MSB and Quickbridge to bridge around broken multicast.

Software

- Badly-configured software can just not work
  - Pieces of the distributed system cannot find each other
  - Happens fairly often
    - Laptops that move from network to network
    - A network renumbering
- On the display computer, multiple eventsrv.exe processes running

Futures...

- Design goal for AG2.x: individual components must remain as independent as possible, and fail robustly where possible
- Richer AG2.x software environment allows the extraction of higher-level abstractions
  - Greater elegance
  - System becomes much easier to understand
  - Development becomes easier as well

Questions?

- You may have thought this was a gory details discussion of troubleshooting topics...
- ... but it wasn't as the area is just too big to what people really need to know.
- Now's the time for questions with gory details.