

State of Oregon Open Source Application Use in the Enterprise

Case Study: Asterisk used to create powerful audio conferencing service For large Agency user.

Background:

Data and Video Services (DVS), a business section within the Information Resources Management Division (IRMD) offers a wide variety of audio and video services to state agencies and other public service, educational, or other non-profit groups. DVS has just recently begun to offer an audio conferencing service with recording. The service offers users a cost effective solution for audio conferencing, Audio/video conferencing and audio session recording.

DVS has worked closely with many of the groups who are using the conferencing service to make sure that special user needs be met to satisfy their business requirements.

One of the largest subscribers to the conferencing services is the Office of Administrative Hearings (OAH). The OAH hears the contested cases of almost 80 agencies, including unemployment insurance, motor vehicle licensing, social services, licensing boards and commissions, forestry, environmental quality, agriculture, child support, and many others.

The OAH conducts an average of 500 hearings a week via audio conference. Hearings are scheduled for either 1½ or 2 hour time blocks and vary in size from 3 to 6 participants.

Data and Video Services worked with the Hearings group to develop a service that met the following criteria:

- 150 ports available on the audio bridge. The service would allow up to 150 concurrent ports to be used in any combination of conference events.
- Set up different blocks of numbers (both toll and toll-free) to allow OAH to correctly bill back to appropriate program groups.
- Match audio conference access codes to OAH case numbers.
- Bilingual IVR greeting and conference access messages.
- An automated centralized digital recording system to replace existing manual tape recordings that administrative law judges were making on site.
- Web-based recording management. The system would allow judges to start and stop recording sessions and verify that their conference was being recorded.
- An automated uploading process to transfer recordings to a designated OAH file repository. The transfer process needed to include a checksum process to verify that the file transfer was successfully accomplished and to ensure that the original hearing recording file had not been altered.
- The option of adding video endpoint to conferences in the future.

Before the advent of the automated recording and transfer process the OAH Administrative Law Judges (ALJs) conducted hearings using their PBX built-in conference features and recording using a desktop phone recording system. While functional, the system was not able to grow to match the OAH's needs. By utilizing a

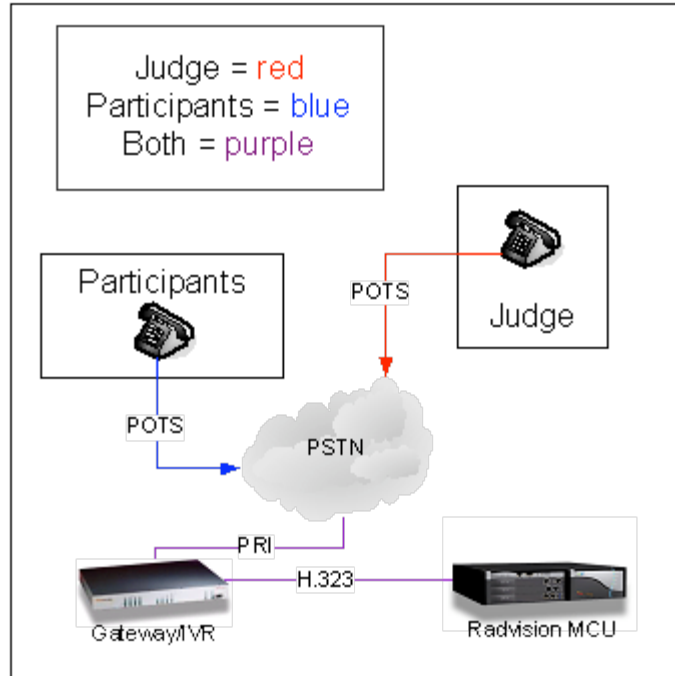
combination of existing conference bridge infrastructure and open source software, DVS was able to provide a feature-rich centralized solution for minimal expense.

OAH Conference Service without automated Recording

Initially, DVS provided only audio conferencing services. The service was created by utilizing a Radvision Gateway to perform IVR and TDM-to-H.323 conversion. The conferences were—and still are—being created on Radvision ViaIP bridges.

The OAH Administrative Law Judges (ALJs) continued to manually record every conference and send the tapes in for archiving and transcription, but the judges and hearing participants called in to a scheduled DVS conference bridge to conduct the hearing

As conference use continued to grow the OAH asked DVS if it was possible to add additional features, most notable central recording, to the service. DVS investigated commercial solutions that could have offered the additional features, but was not able to find a product on the market that could integrate into the existing infrastructure cost-effectively. Consequently, DVS developed an internal solution based on the open source Asterisk voice over IP system and coupled it with existing Cisco Call Manager resources.



Phase One: Only Bridging

Building a Custom Solution

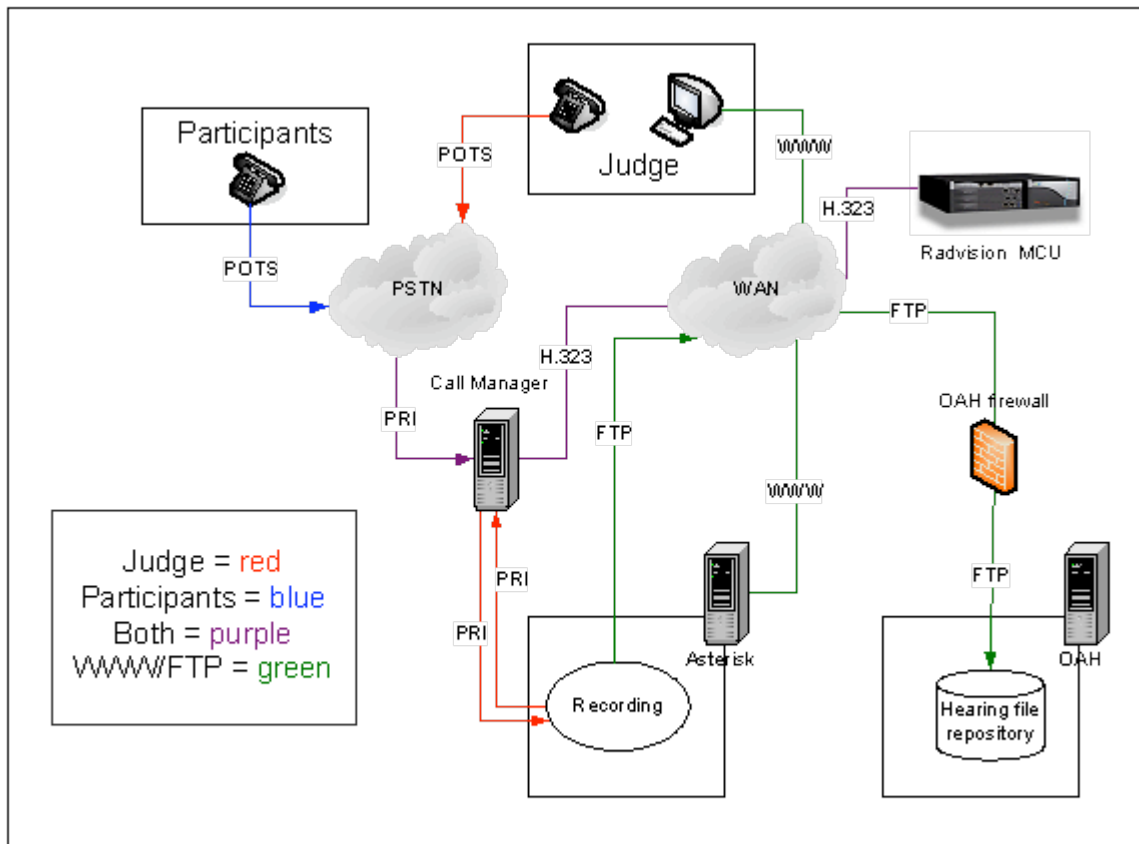
DVS engineering staff conducted an initial search to determine if there was an available commercial product that would meet the criteria for centralized recording and monitoring services and that could be easily scaled up to meet future recording demand. We were not able to find a commercial offering that was able to satisfy these criteria.

Staff then researched the open source market, and were quite pleased to find, after conducting a series of tests, that the Asterisk VOIP PBX software provided a very cost effective, flexible, and scalable solution for centralized recording and monitoring services.

Changes were also made to the media termination (TDM-to-H.323) and IVR system along with development of recording and monitoring functions via the Asterisk PBX. These changes needed to be made to accommodate growth of the audio conferencing and recording service and to provide a method to more easily address IVR message tree complexity and conference security features.

The Asterisk server is being used to create digital recordings of the hearings, to FTP completed hearing files to a designated OAH file server, and to provide Judges with the ability to start and stop recordings as well as monitor conference recording status during a conference via a web interface.

A Cisco Call Manager has replaced the Radvision gateway and is being used to provide PSTN media termination, expanded IVR functionality, and conference security.



Phase Two: Bridging and Recording

Process Description: What's Going On

- The Cisco Call manager provides the PSTN termination and the IVR functions (using Cisco IPCC) and the Call Manager is routing participants to the MCU via an H.323 stream.
- The Asterisk system provides the recording and file transfer features. To initiate a recording, the ALJ dials into a specified phone number that rings through the Call Manager infrastructure to the Asterisk server. The ALJ enters their conference code into the Asterisk IVR and the Asterisk server attaches a recording process to the call and connects the call back through the Call Manager to the MCU via H.323.
- When the conference ends, the Asterisk server creates a checksum and transfers the recording and the checksum files to a repository on a server on the OAH network.

DVS staff developed a web-based interface using Apache and PHP. The web interface is installed on the Asterisk server and allows the ALJ to stop, start, and verify the status of the recording. The Asterisk Manager API serves as the interface between PHP and the Asterisk server.

The communication path into and out of the Asterisk server uses a PRI interface. This particular method was chosen after testing showed that SIP traffic put too great a load on the Call Manager servers and there were unacceptable dropouts occurring with calls using the H.323 stack.

The Final Analysis

The Asterisk VOIP PBX provided the perfect solution that allowed DVS to craft a custom service that we could not find in a commercial product. Parts of the service existed but were prohibitively expensive, and other automated recording and storage features did not exist. The PBX is very robust, has performed extremely well in a production environment, and has provided the kind of flexibility and extensibility to allow DVS staff to easily develop the necessary processes and interfaces to offer a reliable, easy to use, inexpensive, centralized recording function as part of the DVS audio conferencing service.

Other Open Source Applications that DVS uses to support the Enterprise

DVS also uses many other open source programs for network monitoring, mail hub services, spam and virus filtering, application development, DNS administration, and database administration.

Below is a list of open source software and how it's being used.

BIND	DNS server for all Agencies and State of Oregon customers
Nessus	Vulnerability scanner
Nmap	Network Mapper - network exploration and security auditing
Snort	Sniffer/packet filter, intrusion detection utility
RRDTool	(Round Robin Database) stores and displays time-series data. DVS uses to display Netflow data
cflowd	Traffic Flow Analysis tool. Used to analyze Cisco NetFlow data
Argus	System and network monitor. DVS uses to monitor server connectivity, daemons, and processes. Provides outage notification and displays status via web interface.
linux	Open source OS
Apache	Web server
innd	News group server
sendmail	Mail server
SpamAssassin	Spam filter
mimedefang	Spam filter
clamav	Virus filter
mysql	Database management program
FreeRADIUS	Radius server
Open H.323	H.323 module for Asterisk
sox	Sound eXchange scriptable command line sound sample translator and mixer

ncftp	Scriptable command line FTP tools
md5sum	File checksum utility
PHP	Hypertext processor (Apache module)
WebDAV	http file transfer (Apache module)
Perl	an interpreted programming language
VNC	Remote control
Tripwire	Intrusion Detection
SquirrelMail	Web Based email reader
proftpd	FTP server
punbb	Web Based discussion board