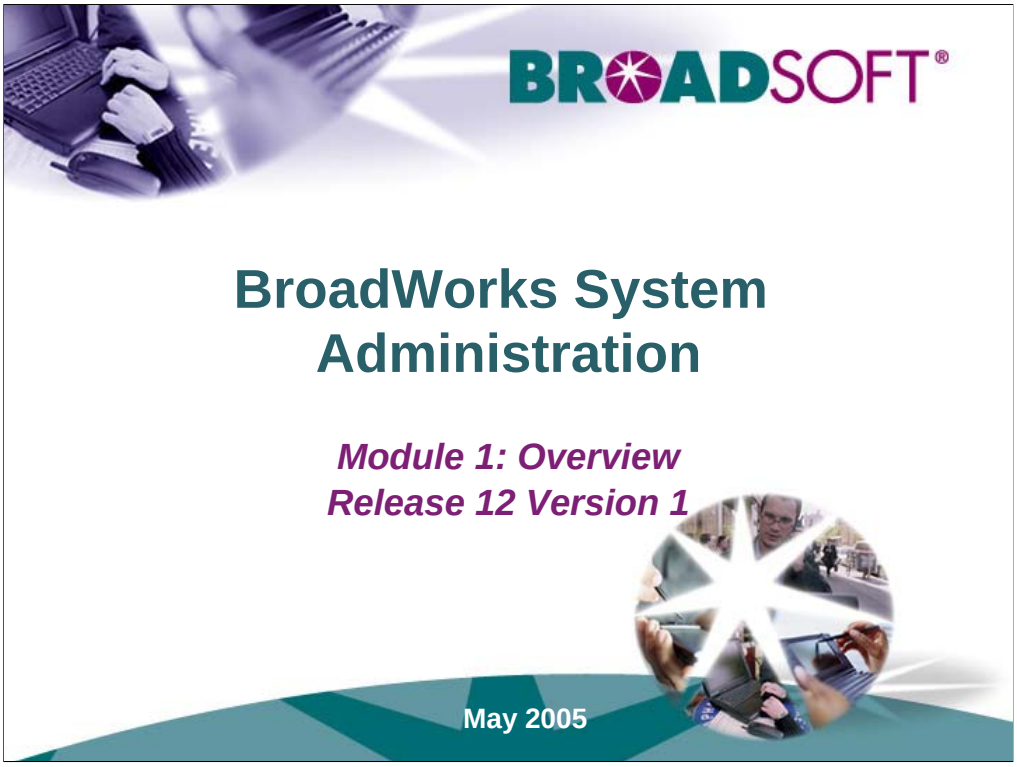
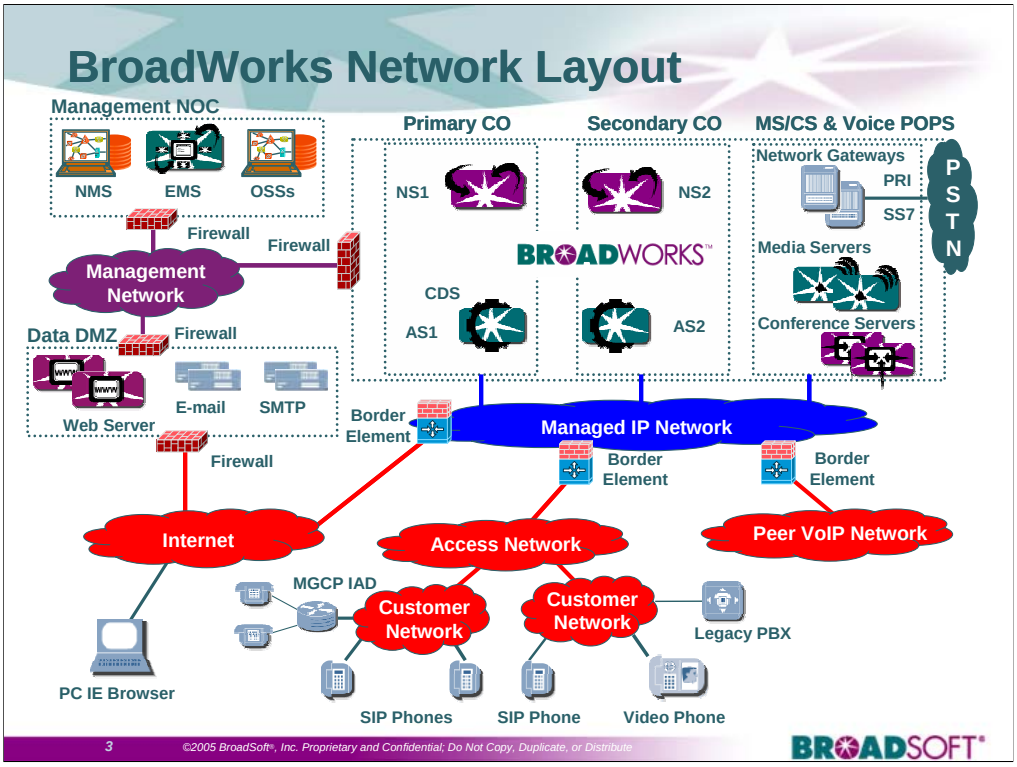

BROADSOFT®
BroadWorks System Administration
Module 1: Overview
Release 12 Version 1
May 2005

Module 1 Objectives

At the end of this module, you will be able to:

- Explain BroadWorks VoIP network functionality
- Explain BroadWorks VoIP network features
- State function of each BroadWorks server
- State features of each BroadWorks server
- List ancillary components used with BroadWorks servers
- State hardware requirements for each BroadWorks server
- State software requirements for each BroadWorks server
- State administration roles


BroadWorks Network Layout
Management NOC
NMS
EMS
OSSs
Firewall
Firewall
Management Network
Data DMZ
Firewall
Web Server
E-mail
SMTP
Firewall
Primary CO
Secondary CO
MS/CS & Voice POPS
NS1
NS2
BROADWORKS
CDS
AS1
AS2
Network Gateways
PRI
SS7
PSTN
Media Servers
Conference Servers
Border Element
Managed IP Network
Border Element
Border Element
Internet
Access Network
Peer VoIP Network
MGCP IAD
Customer Network
Customer Network
Legacy PBX
PC IE Browser
SIP Phones
SIP Phone
Video Phone
3
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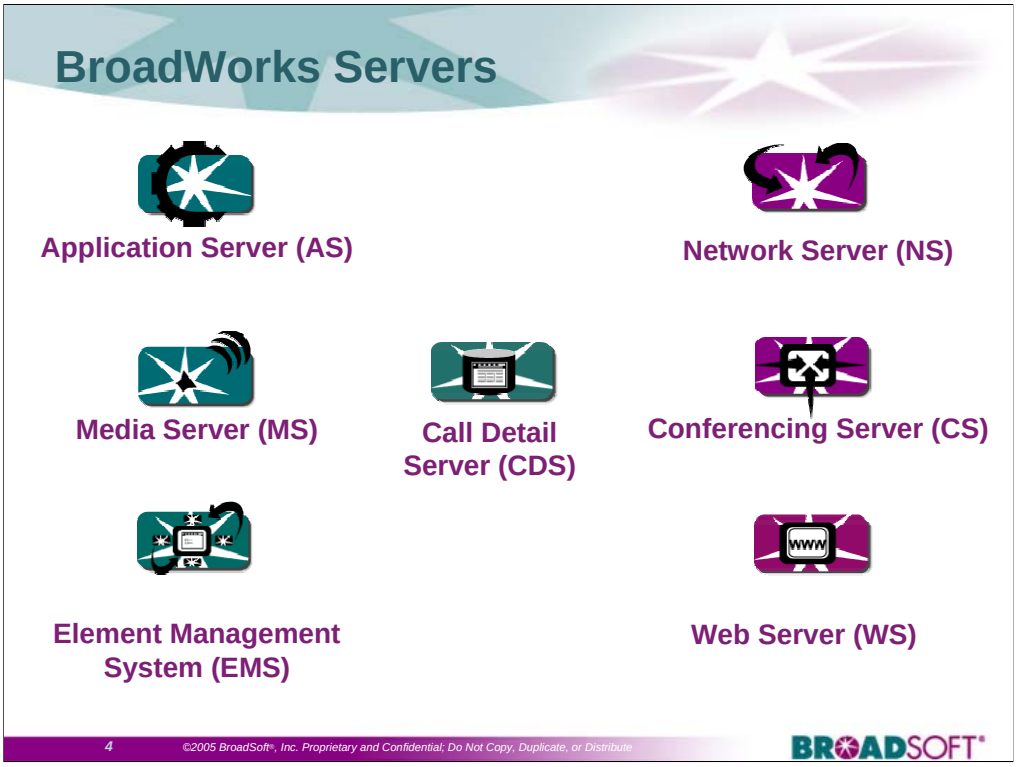


Application Server

Line-side softswitch.

Services delivery platform for end users.

Web portal for self service management.

Network Server

Centralized routing of calls.

Enterprise services to allow private dialing plans.

Location register that maps users to servers.

Media Server

Multimedia resources used by the Application Server for voice mail.

Interactive voice response (IVR) DTMF, prompt playback/recording.

Conference Server

Multimedia resource for dial-in conferencing and web collaboration to share PowerPoint, Excel, and Word documents.

Element Management System

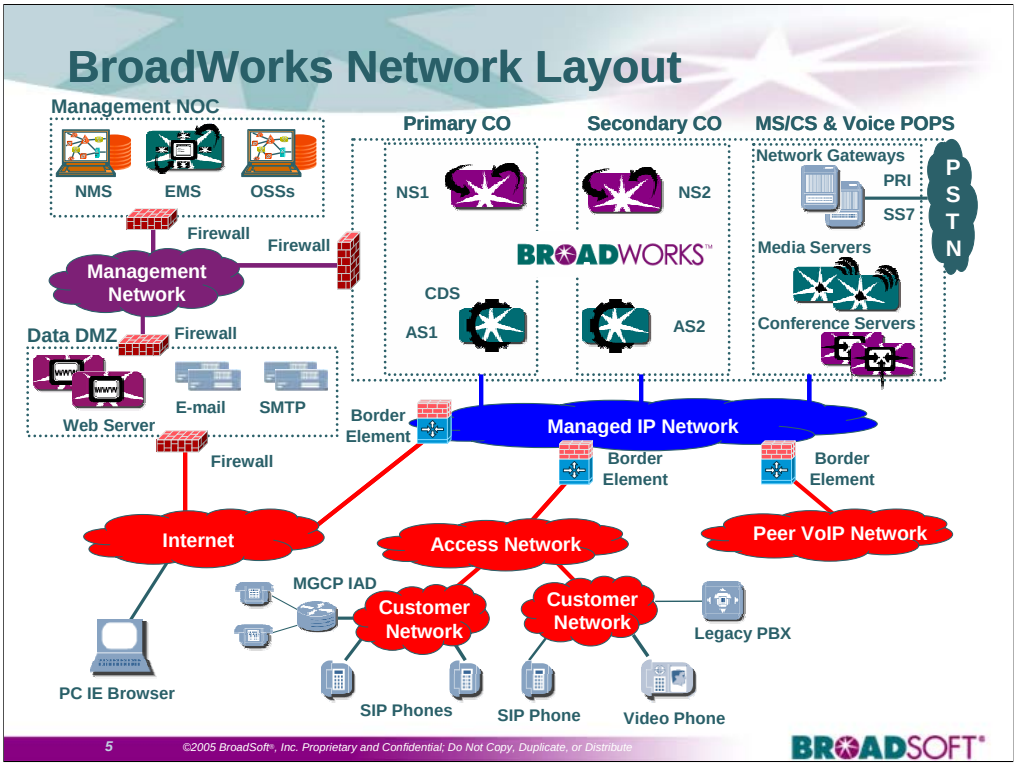
Alarm proxy, measurement collection, provisioning entry point, software management, web and CLI cut-through, diagnostics.

Web Server

Secure web server, provisioning entry point, client call control entry point, offload processing of web pages from Application Servers, expandability.

Call Detail Server

Stores the call logs of users with the Enhanced Call Logs feature. Once they have exceeded the configuration limits per service provider, call logs are automatically cleared out of the SQL database daily.



SMTP Server

Simple Mail Transfer Protocol (SMTP) server to transfer Internet e-mail messages, including short messages and voice messaging .WAV files.

POP3/IMAP Server

Post Office Protocol 3 (POP3) server for the voice messaging service.

POP3/Internet Messaging Access Protocol (IMAP) server is a storage device for voice messages communicating over standard protocols.

Any mail server meeting POP3/IMAP standards can be used.

DNS Server

DNS server to support A records and SRV records required for redundancy solution and public web portal access.

Hardware Overview

Application Server

- Small Configuration
  - 14 CPS
  - 50K BHCA
  - 10K Users
- Medium Configuration
  - 56 CPS
  - 260K BHCA
  - 50K Users
- Large Configuration
  - 278 CPS
  - 1000K BHCA
  - 100K Users

Network Server

- Small Configuration
  - 80 CPS
  - 250K BHCA
  - 75K Users
- Medium Configuration
  - 400 CPS
  - 1560K BHCA
  - 390K Users
- Large Configuration
  - 750 CPS
  - 6000K BHCA
  - 1500K Users

Media Server

- Small Configuration
  - 100 Ports
- Medium Configuration
  - 500 Ports

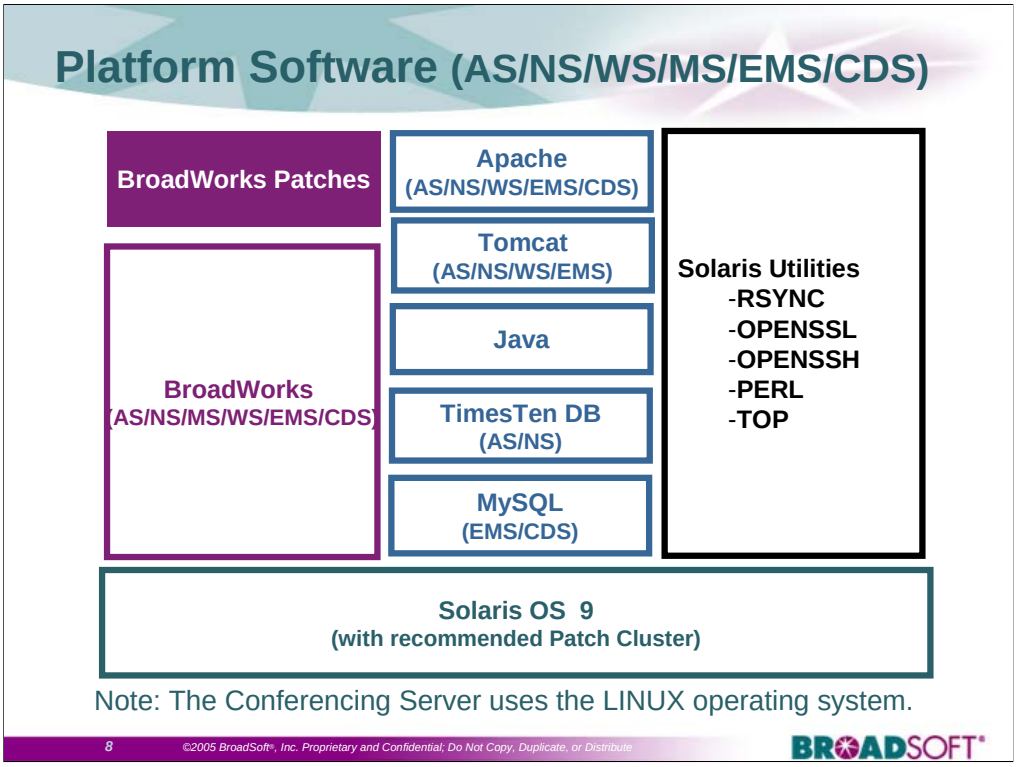
Conferencing Server

- Small Configuration
  - 300 Ports

Recommended Hardware

BroadWorks Server Types							
	Application Server	**Network Server**	**Media Server**	**Conference Server**	**Web Server**	**Element Manager System**	**Call Detail Server**
Small	Netra 120 (2 GB RAM)	Netra 120 (2 GB RAM)	Netra 120 (512 MB RAM)		Netra 120 (2 GB RAM)	Netra 120 (2 GB RAM)	Netra 120 (2 GB RAM)
Medium	Netra 240 (8 GB RAM)	Netra 240 (6 GB RAM)	Netra 240 (1 GB RAM)		Netra 240 (4 GB RAM)	Netra 240 (4 GB RAM)	Netra 240 (4 GB RAM)
Large *(Testing 2Q05)*	Netra 440 (16 GB RAM)	Netra 440 (8 GB RAM)					
Standard				Alliance Systems (2 GB RAM)			

NOTE: The large server size, Netra 1280, will be tested in 2Q05.



Release 12 operates on Solaris OS 9.

BroadWorks maintenance or emergency patches are applied on top of the active software release.

Third-party software includes the following:

TimesTen Database for the Application Server and Network Server.

JAVA, Tomcat, and Apache for the web portal interface.

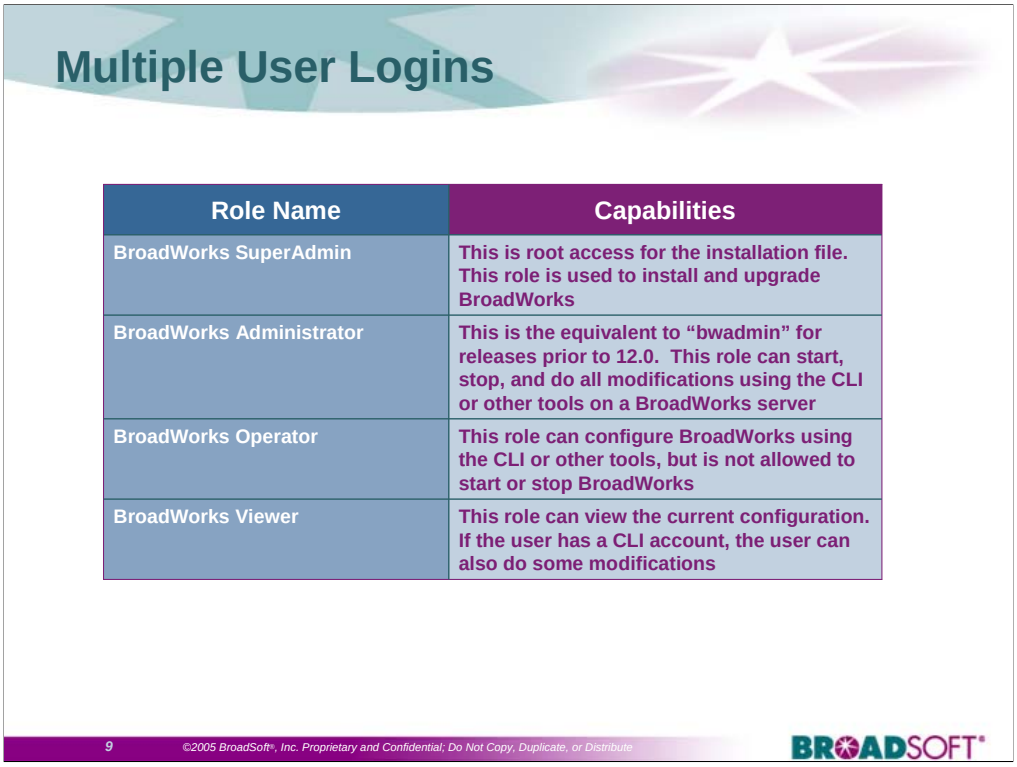
MySQL for the EMS and CDS databases.

Solaris utilities include the following:

RSYNC is used to replicate files between servers.

OPENSSL and OPENSSH are used for secure logins to the servers.

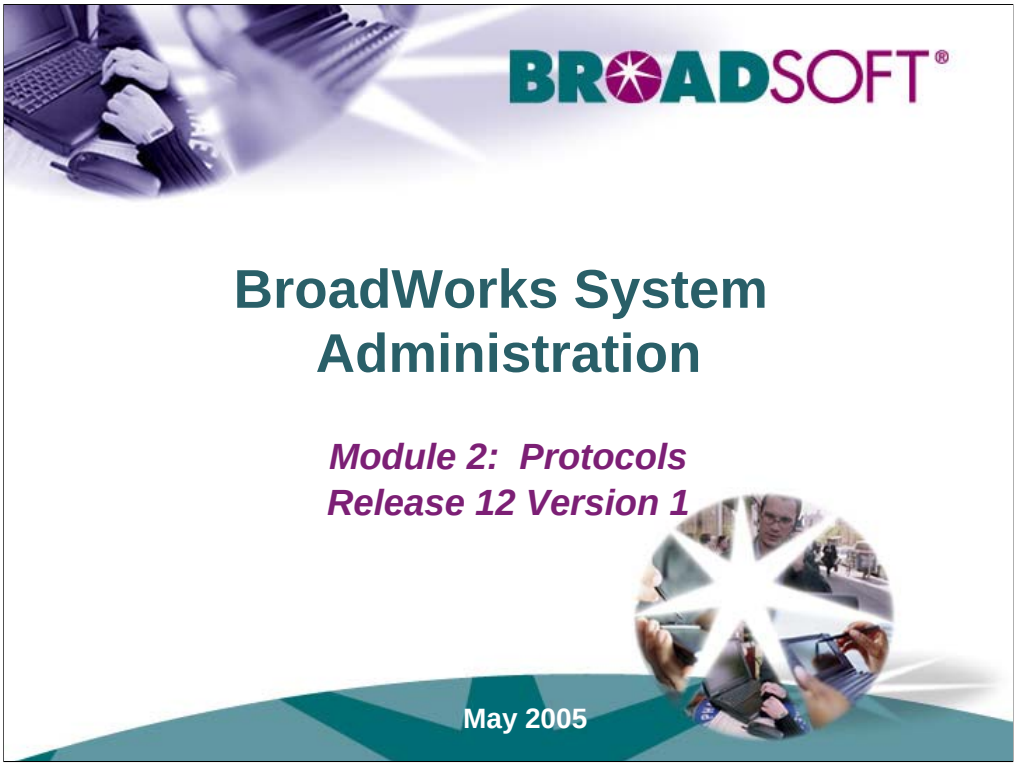
TOP is a diagnostic program that shows the top fifteen processes that are running, as well as memory and CPU usage.



Multiple user logins for system level administration

- Allow operators to choose the console login ID for a BroadWorks administrator.
- A new dummy user, named *bworks*, is created. It has no password and therefore you cannot log in as *bworks*. BroadWorks processes will run as this user. BroadWorks Administrator is the only role allowed to start and stop processes as *bworks*. The user *bworks* should only be allowed to create new files. Files created at runtime, logs and WAV files, are owned by *bworks*. Other files, typically all files installed by BroadWorks, are owned by bwadmin. By default bwadmin is also a user with no password.
- A skeleton directory is created with bwadmin environment variables and aliases. New users are based on the template files located in the skeleton directory. Additionally, BroadWorks Operators and BroadWorks Administrators are part of the bwadmin UNIX group. The UNIX umask is used to ensure that each role can perform its task with the minimum rights and permissions possible.
- The operator is prompted about administrator/operator/viewer user IDs during installation. It is possible to add as many users, of any type, as desired. By default, the proposed administrator user ID is bwadmin. It is also possible to add users later on with the use of a helper script.

Questions


BROADSOFT®
BroadWorks System Administration
Module 2: Protocols
Release 12 Version 1
May 2005

Module 2 Objectives

At the end of this module, you will be able to:

- List protocols used by and between each BroadWorks server
- State basic call flows of SIP

BroadWorks Open Protocols

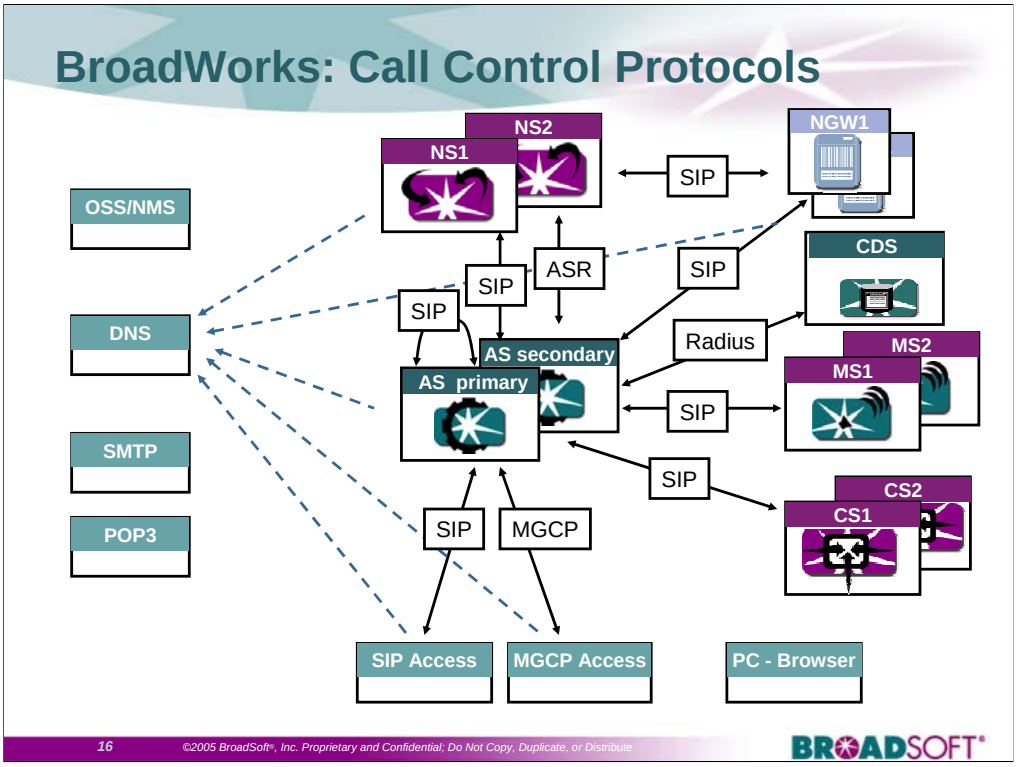
- **SIP: Session Initiation Protocol**
  - Call control, IM&P SIMPLE, UDP/TCP support
- **MGCP: Media Gateway Control Protocol**
  - Call control
- **RTP: Real-Time Transport Protocol**
  - Multimedia streaming
- **CORBA: Common Object Request Broker Architecture**
  - OSS provisioning interface for Application Server or Network Server XML over CORBA
- **HTTP/HTTPS: HyperText Transfer Protocol or HyperText Transfer Protocol Secure**
  - Web access to Application Server/Network Server, encrypted HTTP transactions for required pages
- **SMTP: Simple Mail Transfer Protocol**
  - Voice mail forwarding, call notification e-mail
- **POP3/IMAP: Post Office Protocol/Internet Message Access Protocol**
  - Voice mail storage and retrieval
- **DNS: Domain Name Server**
  - Access device or network device for Application Server or Network Server lookups

BroadWorks Open Protocols (Cont'd)

- **SSH (Telnet): Secure Shell**
  - Management access
- **SNMP: Simple Network Management Protocol**
  - BroadWorks server traps and performance measurements
- **Radius Accounting Protocol**
  - Call detail records, enhanced call logs
- **SOAP: Simple Object Access Protocol**
  - Subset of CAP messages
- **SSL: Secure Socket Layer**
  - Secures LDAP administrator passwords
- **LDAP: Lightweight Directory Access Protocol**
  - SSL for LDAP
- **NTP: Network Timing Protocol**
  - Network timing

BroadWorks Proprietary Protocols

- **MSS: Media Server Selection**
  - Application Server to Network Server request for list of geographically located Media Servers
- **ASR: Application Server Redundancy**
  - Application Server to AS/AS to Network Server redundancy active node tracking
- **CPP: CommPilot Push Protocol**
  - Call Manager control and updates
- **ACAP: Attendant Console Protocol**
  - Attendant Console control and updates
- **SyncAPI: Network Server Synchronization**
  - Application Server to Network Server automatic propagation of group and user information (XML over CORBA)
- **LocationAPI: Network Server Portal API**
  - Application Server to Network Server lookup for serving Application Server for user (XML over CORBA)
- **TTREP: TimesTen Replication**
  - TimesTen Database replication between Application Server and Network Server cluster peers
- **RSYNC**
  - File synchronization (system prompts, greetings)



DNS

Each device and server has a DNS lookup to get the address for the correct server or device to communicate to next.

SIP/MGCP

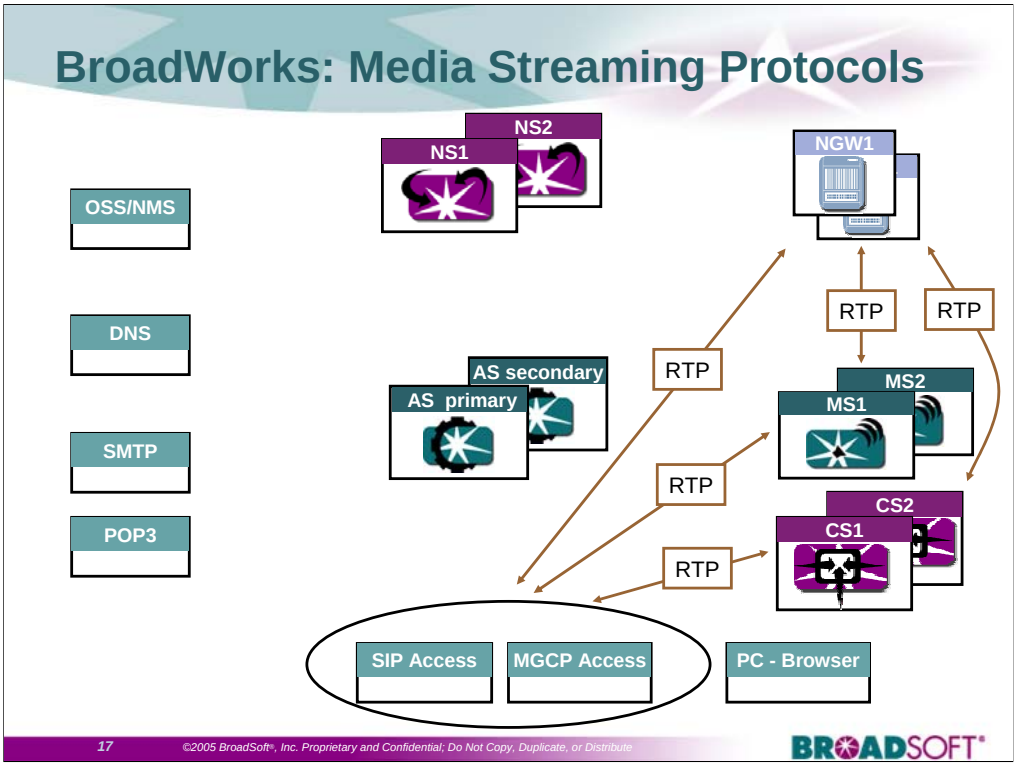
Access devices use SIP/MGCP to initiate a call.

SIP

Application Servers use SIP:

- To get a new contact NGW1 from the Network Server
- To set up a call with the new contact NGW1
- To set up and dial in to a conference call
- For voice mail operations with the Media Server
- To set up a call within a group on the Application Server itself

Network Server uses SIP to return contacts to the network gateway and the Application Servers.

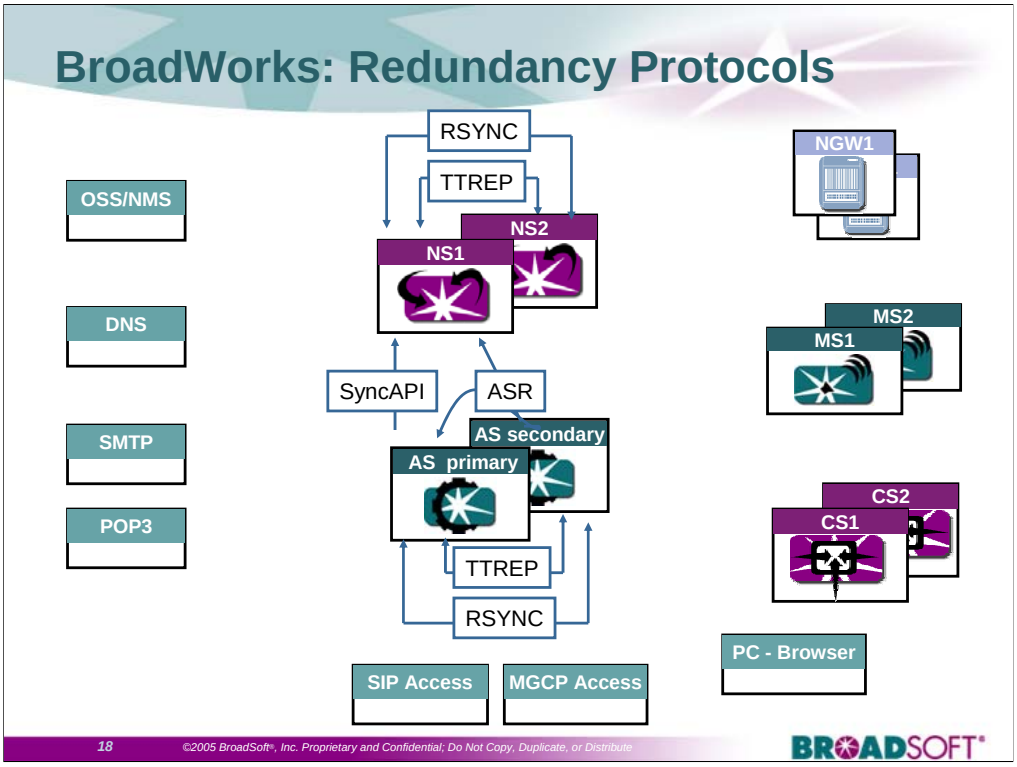


RTP

Used to transfer audio between the access device and the gateway for the standard call.

Media Server uses RTP for IVR prompts, as well as recording and playing back voice mail .WAV files and video .MOV files to video-enabled devices.

Conference Server uses RTP to provide voice for conference calls between access devices and gateways.



Redundancy Protocols

TTREP

Times Ten Replication is used to push changes made to the database on one server to the remote peer(s).

RSYNC

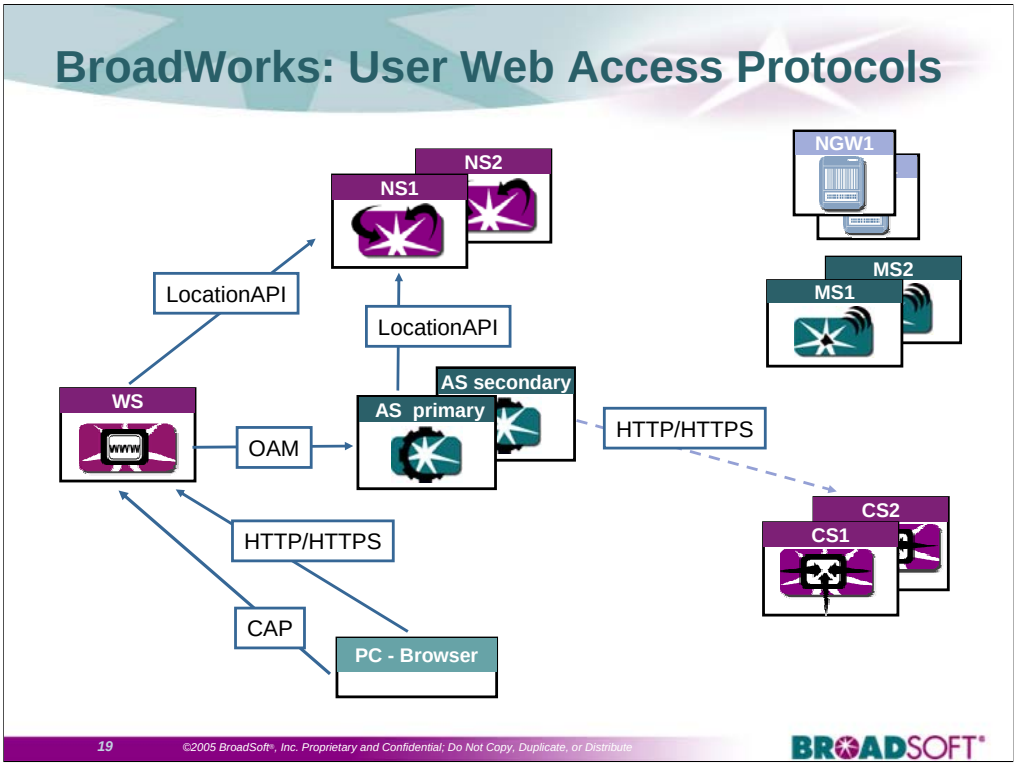
This is used to ensure that files and directories specified are at the same time stamp.

ASR

Application Server Redundancy tells the Network Server and remote Application Server that the local Application Server is hosting the end user.

SyncAPI

Application Server sends new group and user information to the Network Server to be associated to the provisioned Enterprise for call routing.



Web Access Protocols

HTTP/HTTPS

Users access the primary Application Server via the web with a secure login to set up their own services.

CPP

CommPilot Push Protocol provides the user with a pop-up call control window.

ACAP

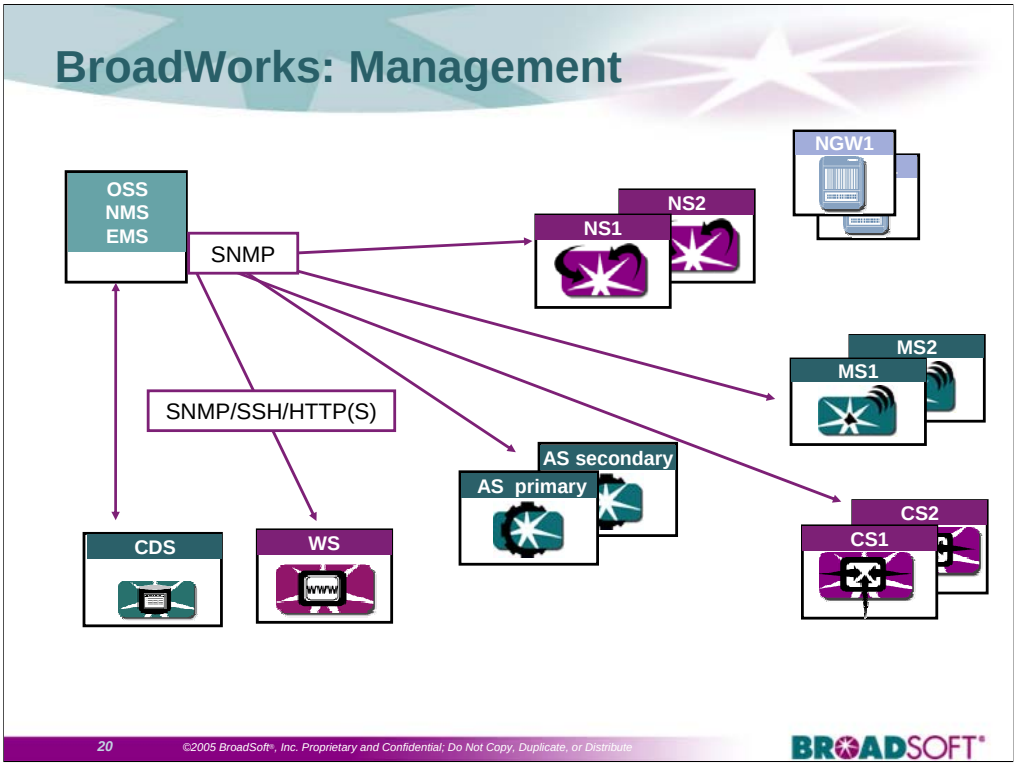
Attendant Console Application Protocol sets up an Attendant Console web interface.

LocationAPI

The secondary Application Server queries the Network Server for the URL of the primary Application Server to redirect the user to the correct Application Server to log in to.

OAM

Provisioning interface that runs over RMI or HTTP/HTTPS.



Management Protocols

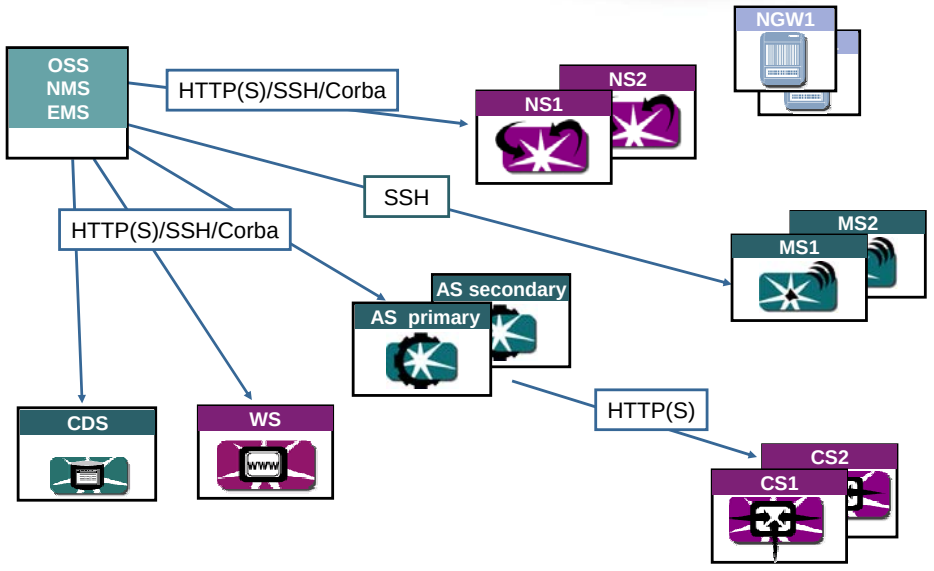
SNMP

Traps and Gets between the BroadWorks servers and the EMS/OSS.

HTTP(S)/SSH/CORBA

Used by the OSS to bulk provision BroadWorks servers.

BroadWorks: Management



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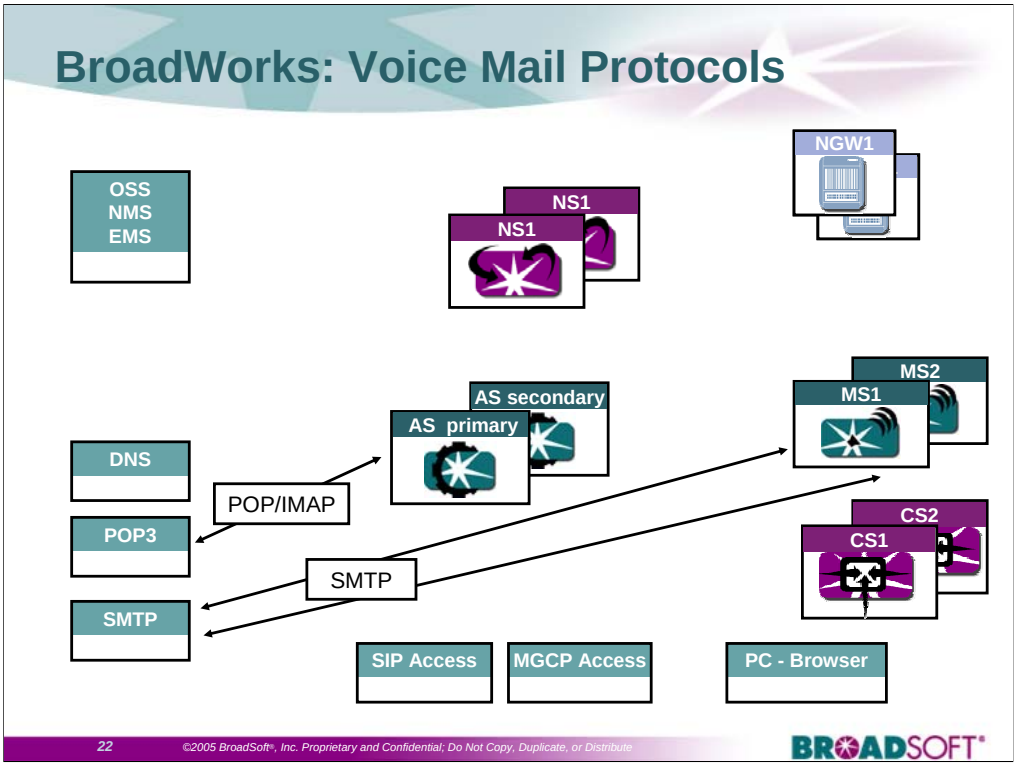


Voice Mail Protocols

SMTP

Media Server uses SMTP to send a recorded .WAV file in an e-mail to the SMTP server to deliver the e-mail to the recipient's e-mail account.

POP/IMAP

Application Server uses one of these protocols to ensure that there is enough storage for another voice message.

SIP Overview

Session Initiation Protocol (SIP)

- **Internet Engineering Task Force (IETF) standard for multimedia conferencing over IP**
  - SIP is an ASCII-based, application-layer control protocol (defined in RFC 3261) that can be used to establish, maintain, and terminate calls between two or more end points
  - SIP provides the capabilities to:
    - **Determine location of target end point**
    - **Determine media capabilities of target end point—via Session Description Protocol (SDP)**
    - **Determine availability of target end point**
    - **Establish a session between originating and target end points**
    - **Handle transfer and termination of calls**
  - BroadWorks Application Server acts as a back-to-back user agent
    - **Terminates incoming call-half, applies services, and if necessary, originates an outgoing call-half**

SIP Overview

SIP (Methods) Requests

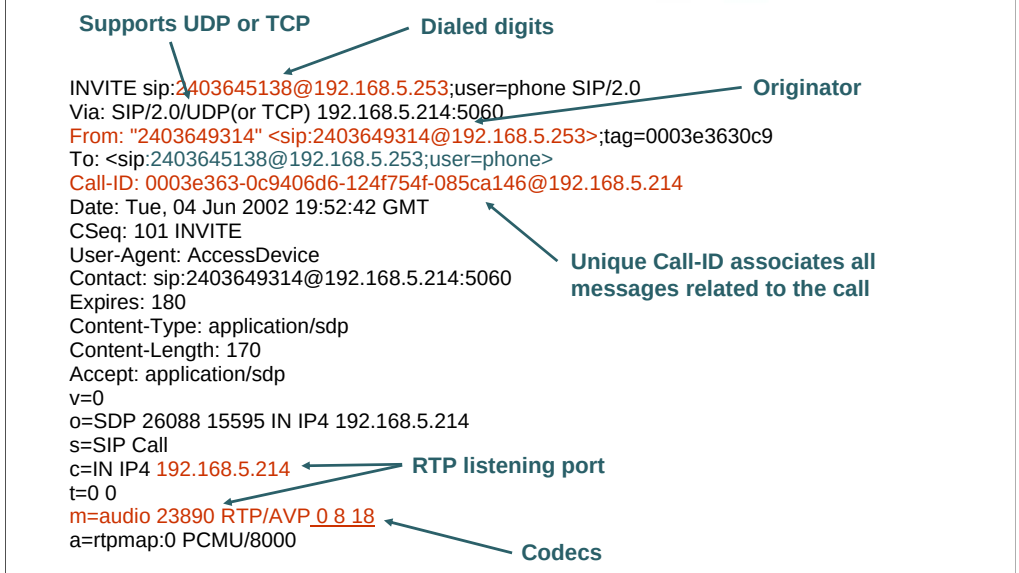
- INVITE—Indicates a user or service is being invited to participate in a call session
- ACK—Confirms that the client has received a final response to an INVITE request
- BYE—Terminates a call and can be sent by either the caller or the callee
- CANCEL—Cancels any pending searches but does not terminate a call that has already been accepted
- OPTIONS—Queries the capabilities of servers
- PRACK – Provisional acknowledgement
- REGISTER—Registers the address listed in the To header field with a SIP server

SIP Overview

Types of responses used in response to a Request

- SIP 1xx—Informational Responses (for example, 180 Ringing)
- SIP 2xx—Successful Responses (for example, 200 OK)
- SIP 3xx—Redirection Responses (for example, 302 Temporarily Moved)
- SIP 4xx—Client Failure Responses (for example, 404 User Not Found)
- SIP 5xx—Server Failure Responses
- SIP 6xx—Global Failure Responses
- Registration Process
- Registration occurs when a SIP client must inform the Application Sever of its location
- During this process, client sends a REGISTER request to the Application Server and includes the address (or addresses) at which it can be reached
- Registrations can require Authentication (shared secret)

SIP INVITE Message



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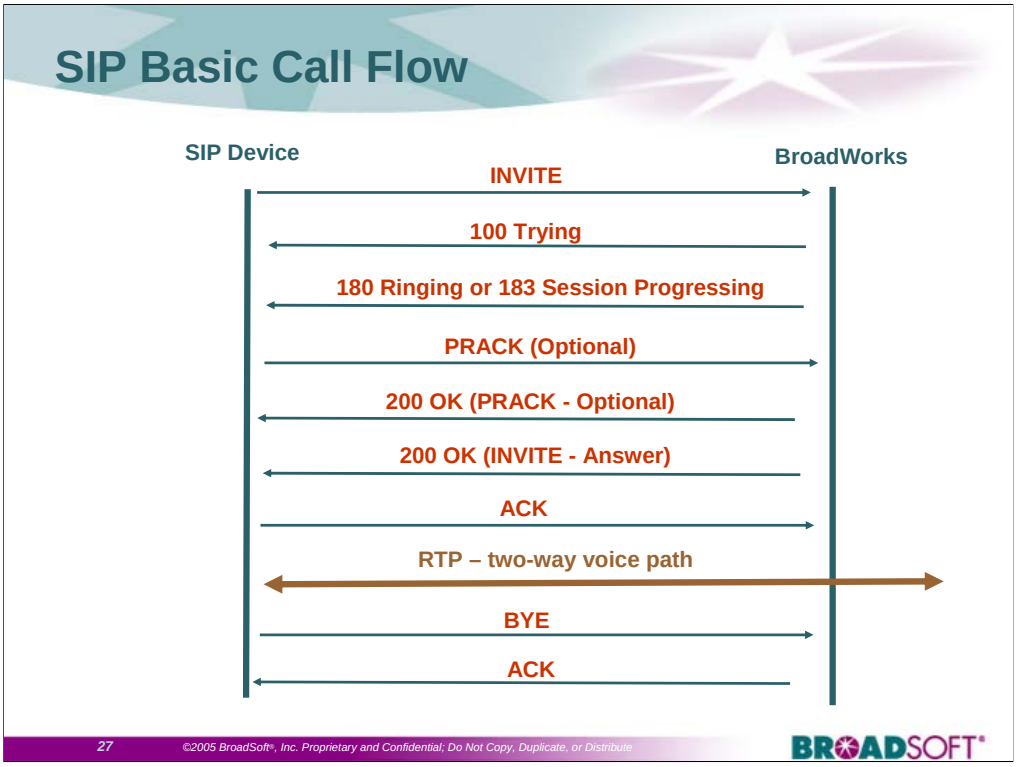


Invitation Process

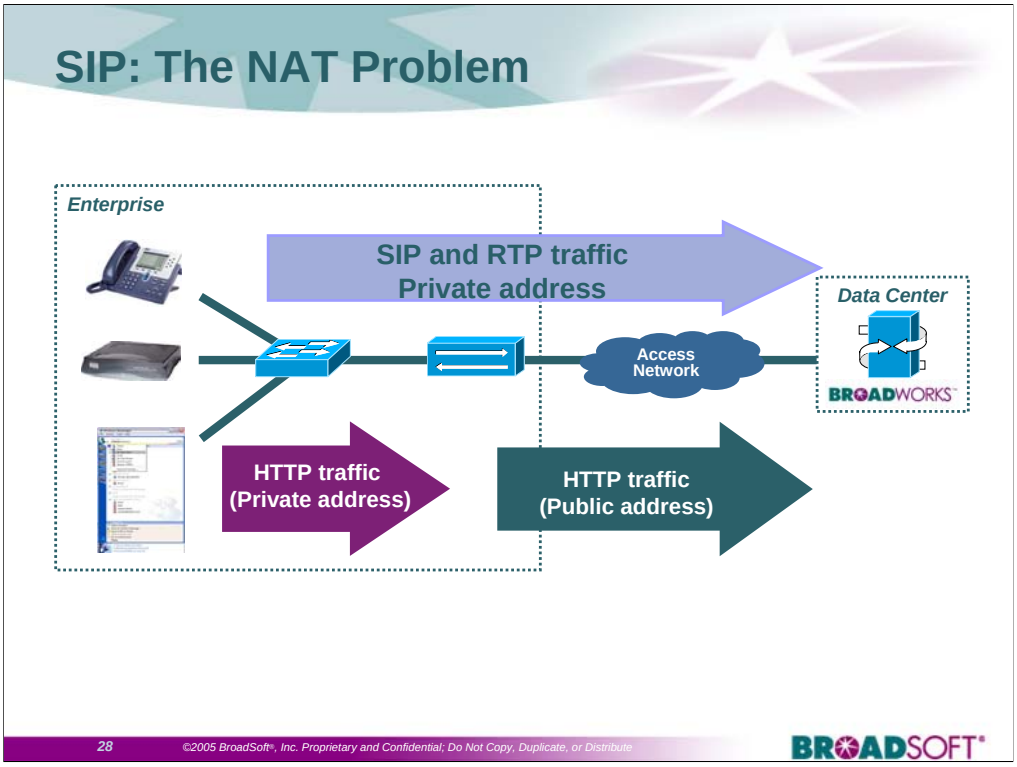
An invitation occurs when one SIP end point (user A) “invites” another SIP endpoint (user B) to join in a call.

User A sends an INVITE message to the Application Server requesting that user B join or set up a call.

Application Server processes the request and returns an appropriate response (for example, 100 Trying, 487 User Busy).

If necessary, the Application Server initiates a terminating call-half to user B and mediates the two call-halves.

If user A wants to end the call, it sends a BYE message.



SIP and SIMPLE Functionality Impacted by NATs

NATs do not handle SIP/RTP messaging.

Private addresses embedded inside SIP and RTP message bodies.

Other applications (BroadWorks, gateways, IP phones) unable to use these private addresses.

Problem affects SIP-based IP phones and soft clients.

Third-Party ALG Border Element Solutions

Interop vendors: Kagoor, AcmePacket.

Best suited for large scale carrier deployments.

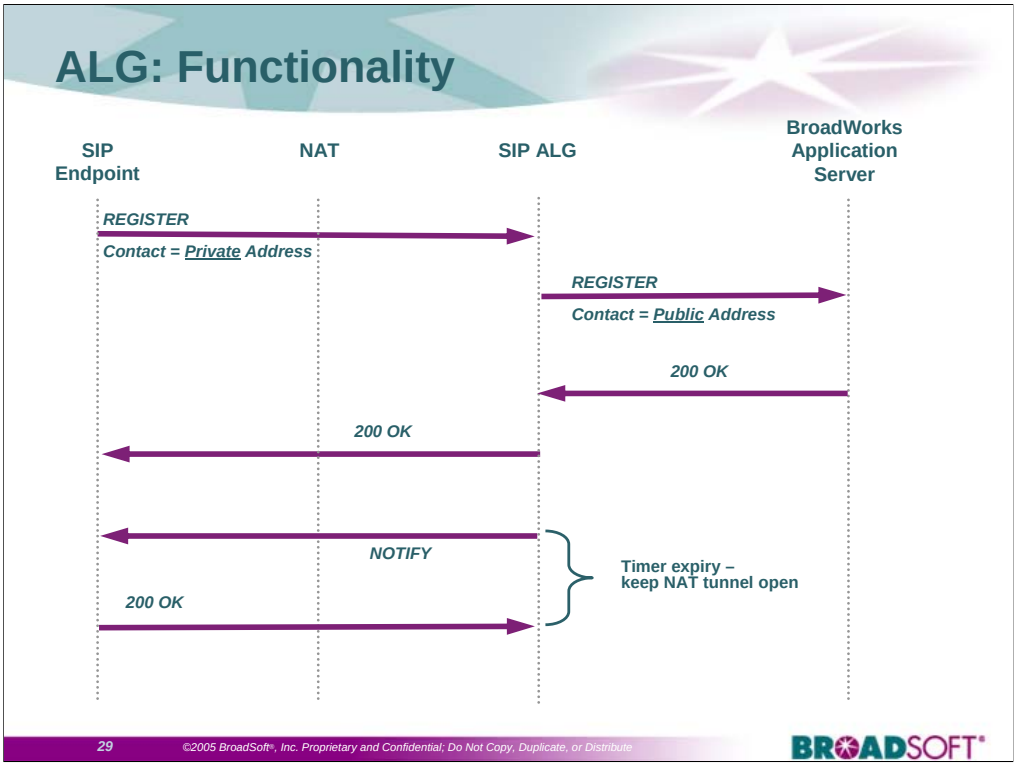
Hosted NAT Traversal – MGCP and SIP, VoIP Security, QoS.

SIP ALG Support on CPE NAT Routers and Firewalls

Should be used when a customer edge router is capable.

Not all edge routers provide support.

Limited availability for example, Cisco IOS, PIX.



SIP Translation

Manipulates SIP and SIMPLE messages.

Replaces an un-routable private IP address with a publicly addressable address.

Supports VoIP and IM sessions.

RTP Translation

Manipulates RTP packets.

Replaces a un-routable private IP address with a publicly addressable address.

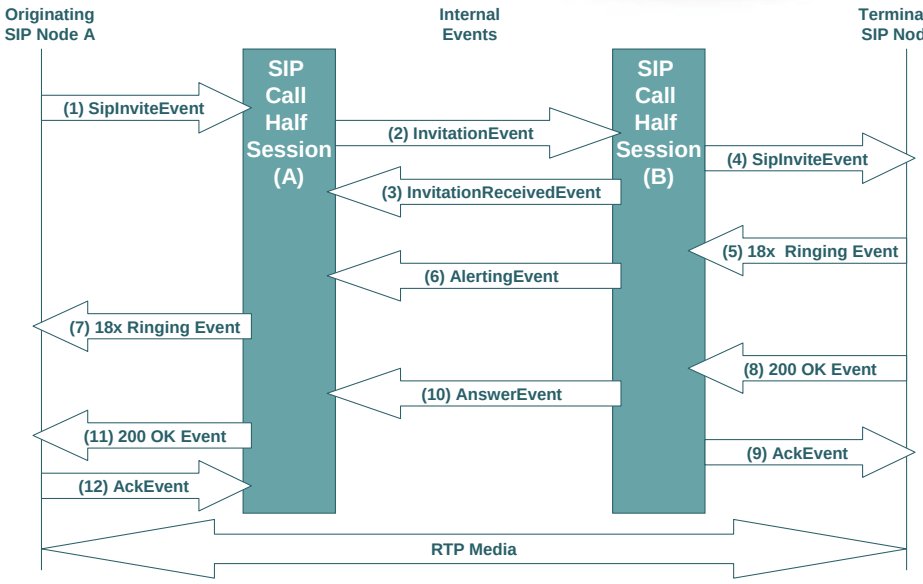
Relays audio and video streams.

SIP Tunneling (Hosted ALG)

Keeps signaling tunnel open to communicate with SIP clients.

Periodic SIP NOTIFY keeps NAT bindings open.

Call-Half Model: Typical Call Setup



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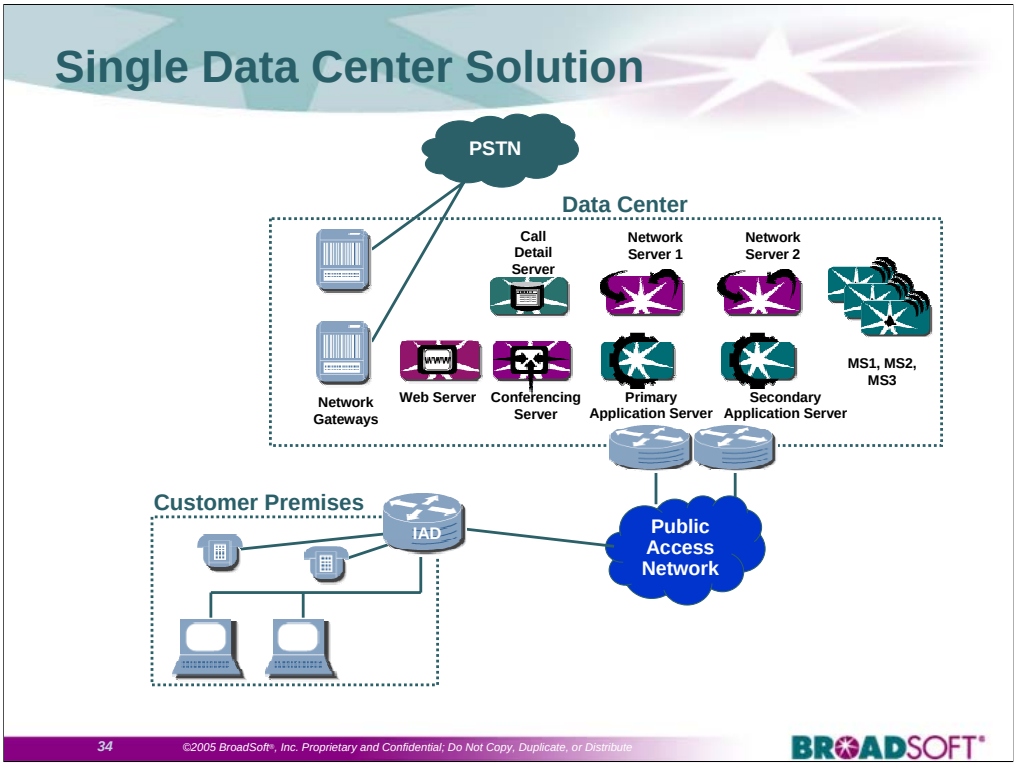
Questions


BROADSOFT®
BroadWorks System Administration
Module 3: System Redundancy
Release 12 Version 1
April 2005

Module 3 Objectives

At the end of this module, you will be able to:

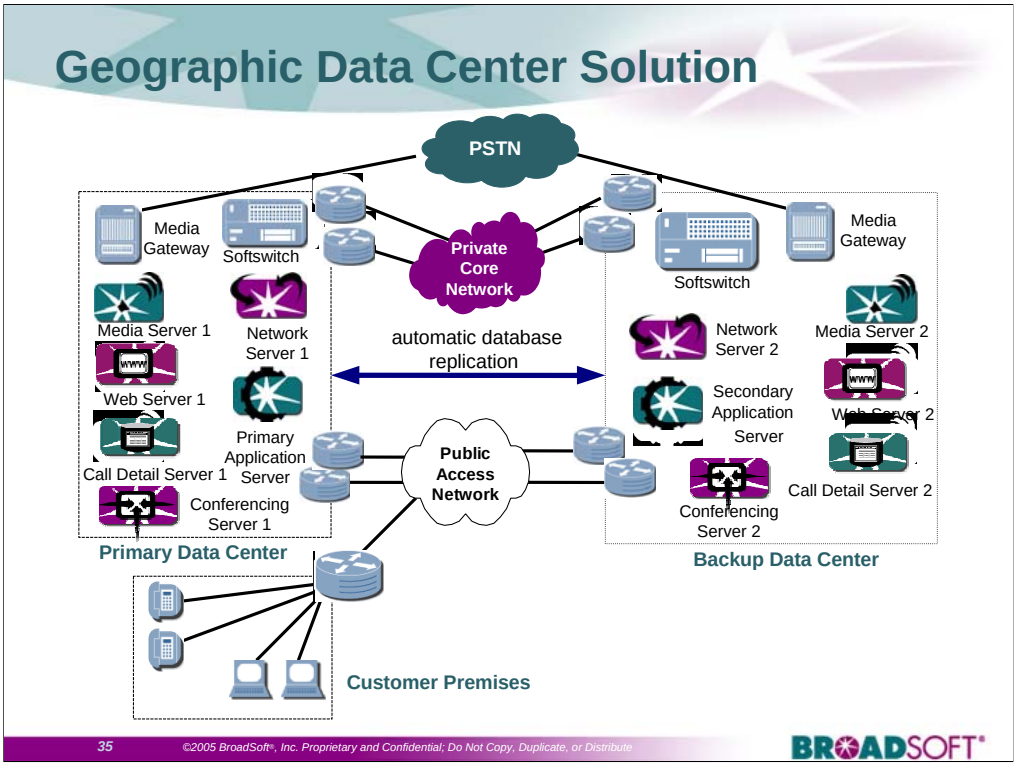
- List redundancy configurations the BroadWorks servers are deployed in
- State differences between the redundancy configurations deployed by BroadWorks



Single Data Center Solution

Redundant servers deployed at a single site.

Common solution for business line off-load application using PRI gateways.



Geographic Data Center Solution

Redundant servers deployed across geographically dispersed sites.

Protects against data center blackouts.

Pre-empts disaster recovery.

Data center elements mirrored.

Common solution for softswitch-based deployments.

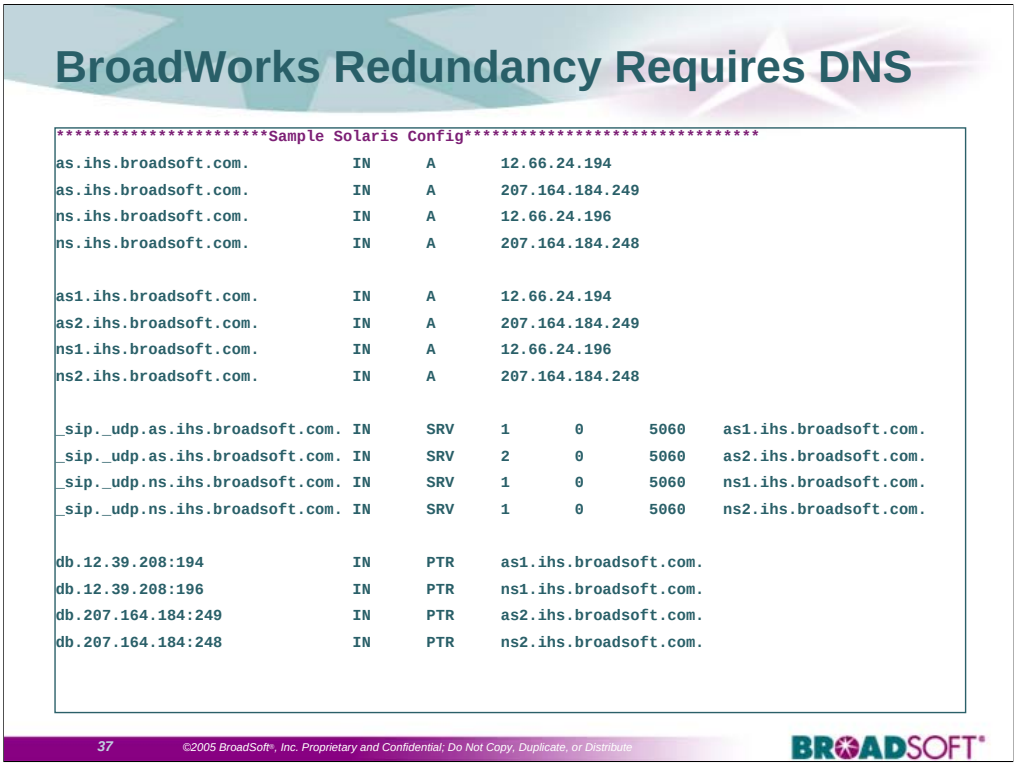
Ideal solution for geographically redundant network with SS7 interface to PSTN.

Bandwidth between servers must be at least 1 MB of throughput or higher.

BroadWorks Redundancy

BroadWorks redundancy characteristics

- No single point of failure
- No loss of dial tone
- No loss of active calls when there is an Application Server deficiency
- Seamless failover for access and network devices
- CommPilot Web Portal support for failover
- Any server in an Application Server cluster can take over users or calls



DNS

BroadWorks redundancy solution requires DNS.

Single FQDN that represents the Application Server primary/secondary pair (both A and SRV records) and another FQDN representing the Network Server cluster (both A and SRV records).

Application Server FQDN A/SRV records must be returned in fixed order.

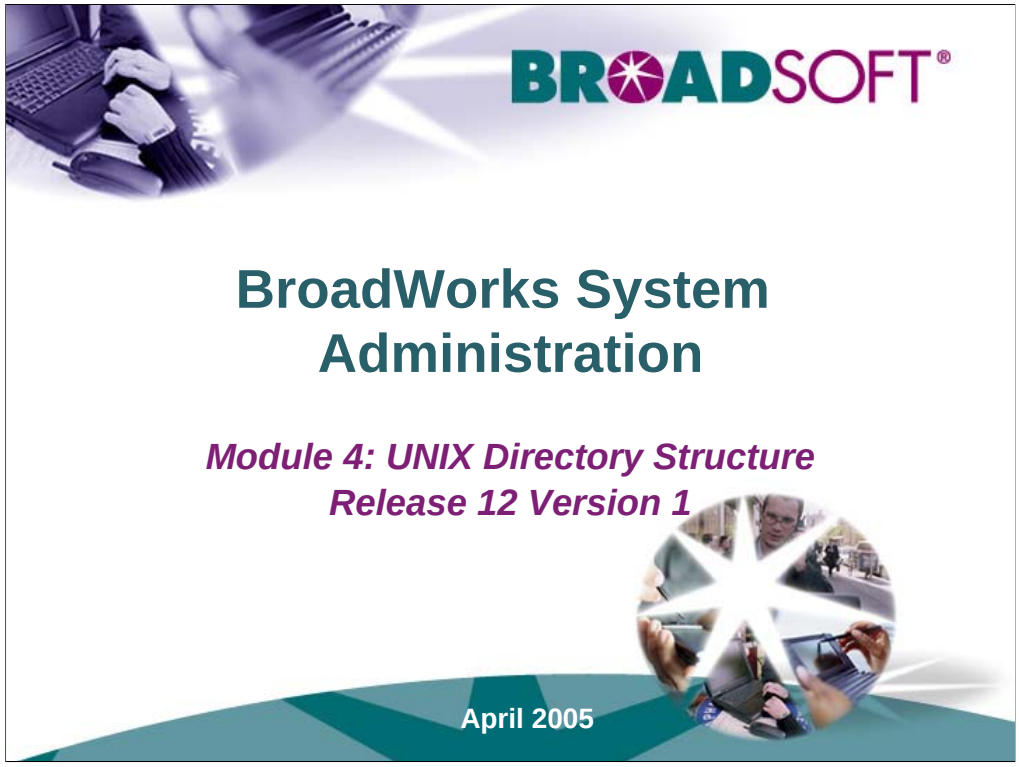
Network Server FQDN A/SRV records can be load balanced or fixed order.

Some devices use A records (for example, 2421), some prefer SRV (for example, 79x0 SIP phone, 36xx/53xx network gateways), but in both cases you would set up the device to use the proper FQDN.

Basic Definitions

Term	Definition
Cluster	Multiple servers deployed in a data sharing model Typically one Network Server cluster for the entire network, based on N+1 model (1 cluster = ~1.5M end users) Many Application Server clusters, two servers per cluster (1 cluster = ~50k end users)
Node (Peer)	A member of a cluster Nodes do not have to be collocated
Primary Application Server	One node in an Application Server cluster is identified as the primary All end users have the same primary in the cluster
Active Application Server	Application Server node currently active for a given end user
Rollover (Failover)	Capacity of a network element to revert control of endpoints or signaling to an alternate network element when a failure condition is detected
Rollback	Capacity to bring back an endpoint to its primary server

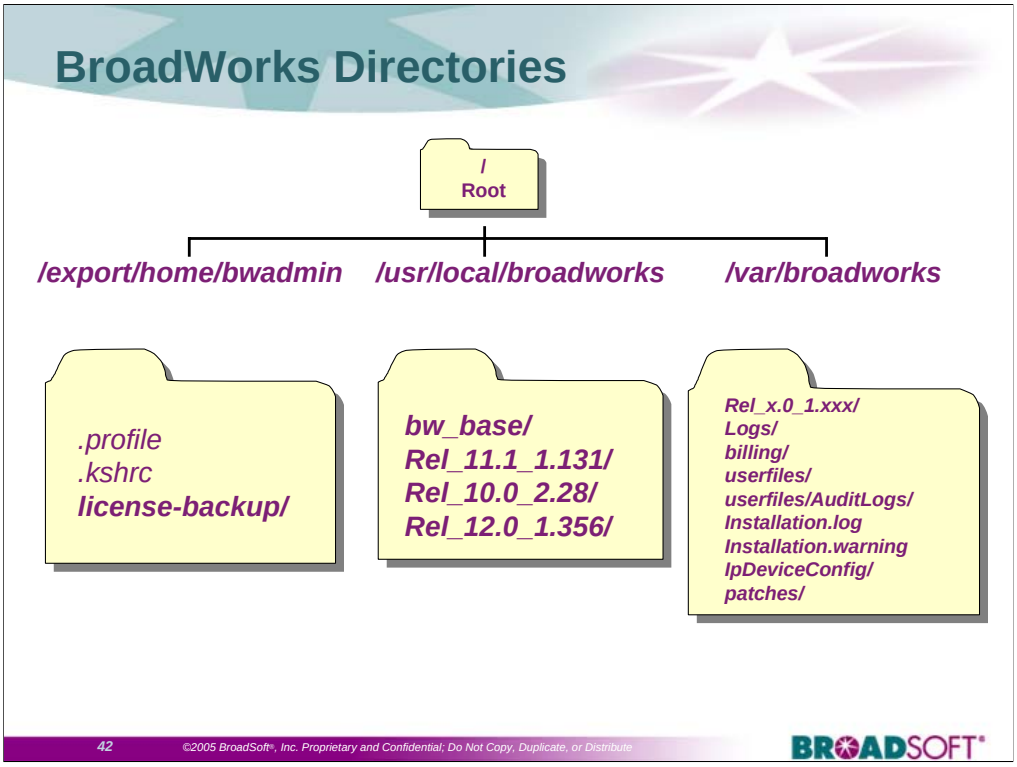
Questions


BROADSOFT®
BroadWorks System Administration
Module 4: UNIX Directory Structure
Release 12 Version 1
April 2005

Module 4 Objectives

At the end of this module, you will be able to:

- Understand BroadWorks UNIX directory structure
- Understand BroadWorks web and command line administrative interfaces
- Understand basic BroadWorks administrative commands



usr/local/broadworks

BroadWorks working directory. On the Application Server and Network Server, each release has its own release-specific directory, for example, Rel_11.0_1.7/. Active release can be reached via bw_base link.

Under release-specific directories:

bin/ directory: Contains scripts used by install process and other useful scripts (for example, patchbw-query, broadworksctl, bwshowver).

conf/ directory: Contains .properties and .xml files used by BroadWorks for configuration.

/export/home/bwadmin

license-backup/ directory: Created during install (backup of BroadWorks license).

.profile file: Defines $PATH variable.

.kshrc file: Add aliases that are available each time you log in.

/var/broadworks

Rel_x.0_1.xxx/ directory: Copy of install/upgrade CD contents (install and uninstall directories).

Logs/ directory: Where BroadWorks logs are dumped (appserver/ on AS, routingserver/ on NS, mediaserver0/ on MS).

billing/ directory: Call detail records and accounting XML files.

userfiles/ directory: System prompts/greetings (personal voice mail greetings in VM/).

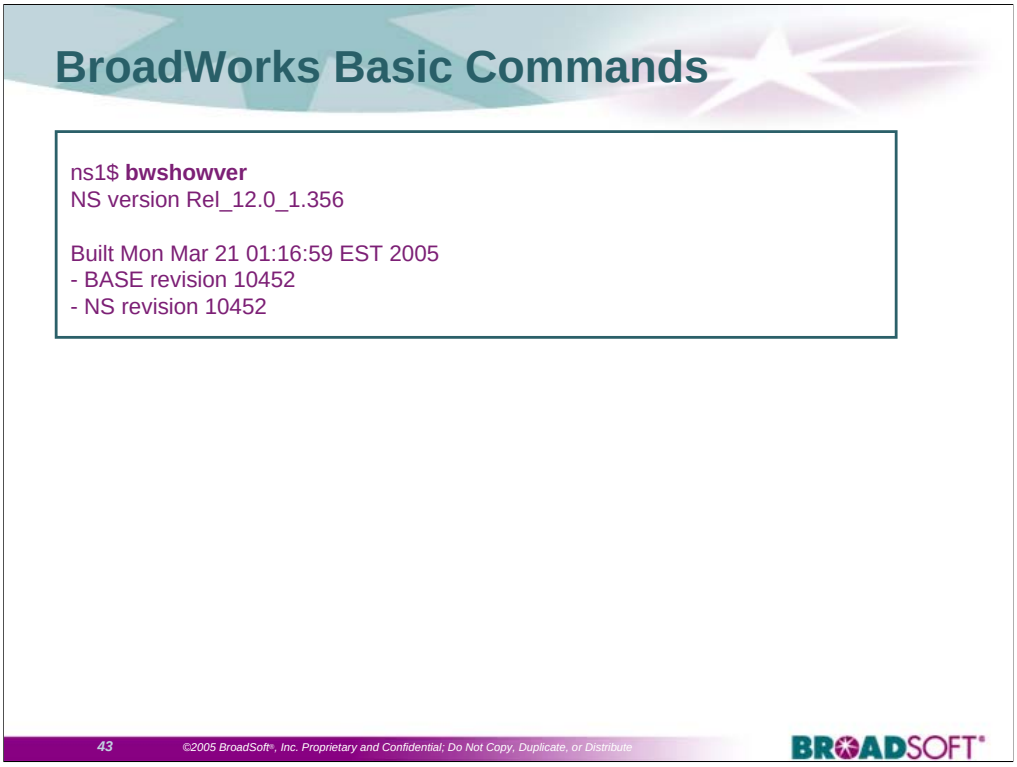
userfiles/AuditLogs/ directory: Audit trail logs (record of all administrator activity: user creation/deletion, feature modifications).

Installation.log file: Screen dump of all ./install script executions.

Installation.warning file: Install/upgrade warning information.

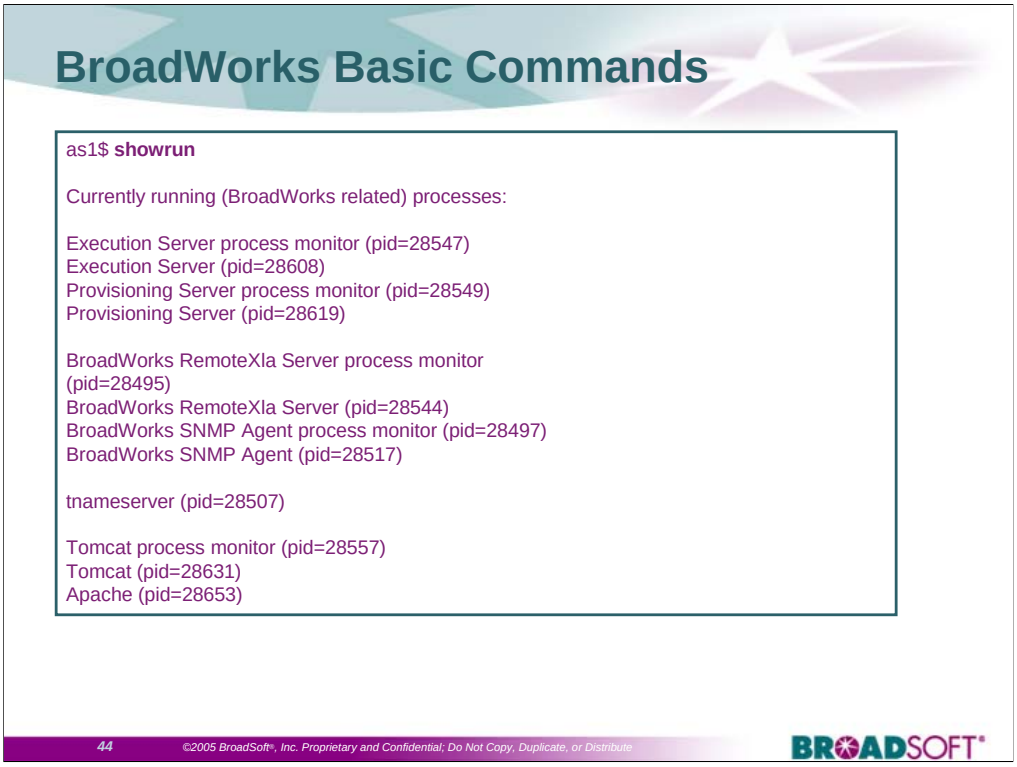
IpDeviceConfig/ directory: Contains the template files for the IP phones to be used to configure them.

patches/ directory: Contains the maintenance and emergency patches for each release.



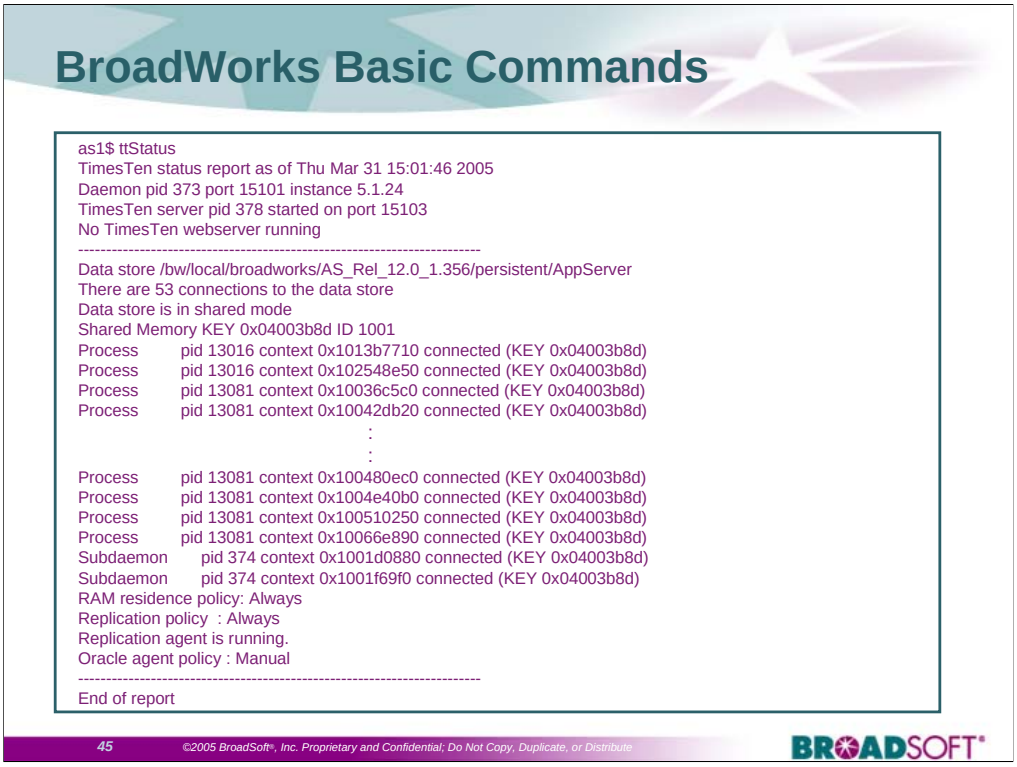
bwshowver

Provides information on the active release as well as patches that can be applied (run as bwadmin).



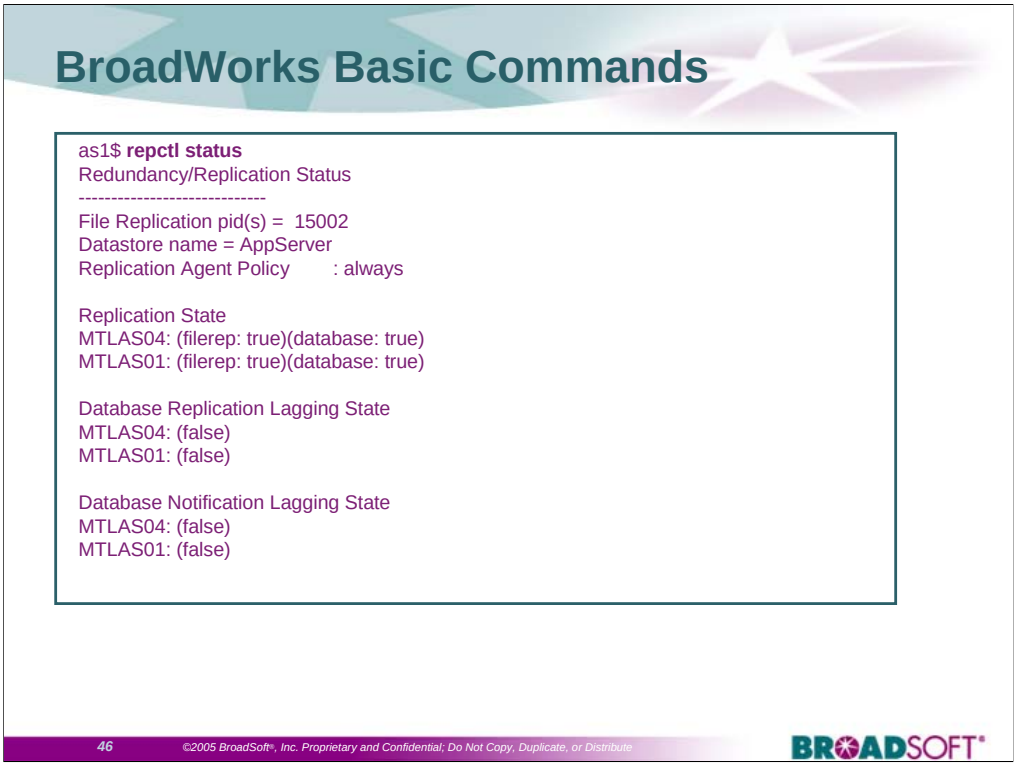
showrun

Provides information on running BroadWorks-related processes (run as bwadmin).



ttStatus

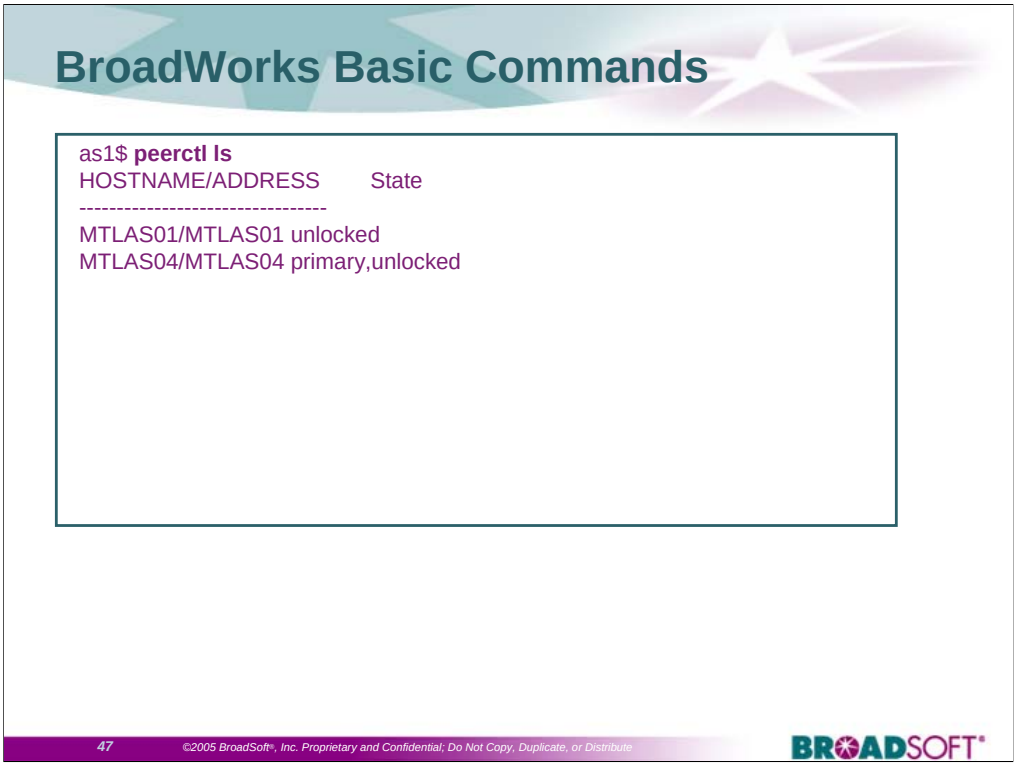
Provides information that describes the current state of TimesTen database, for example, the number of connections to the database (run as bwadmin).



repctl status

Provides status information on TimesTen replication and RSYNC file replication (run as bwadmin).

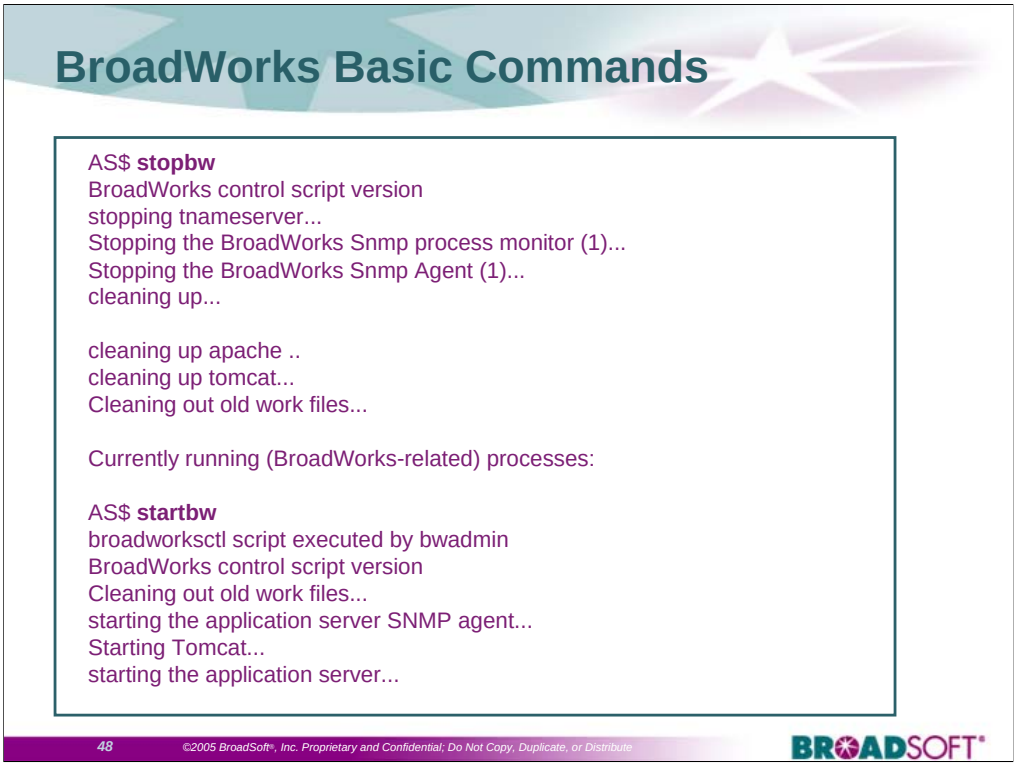
Information also available through `CLI AS_CLI/System/Peering> status`.



Peerctl ls

Provides information on TimesTen replication and RSYNC file replication.

Information also available through CLI `AS_CLI/System/Peering/Peers> get.`

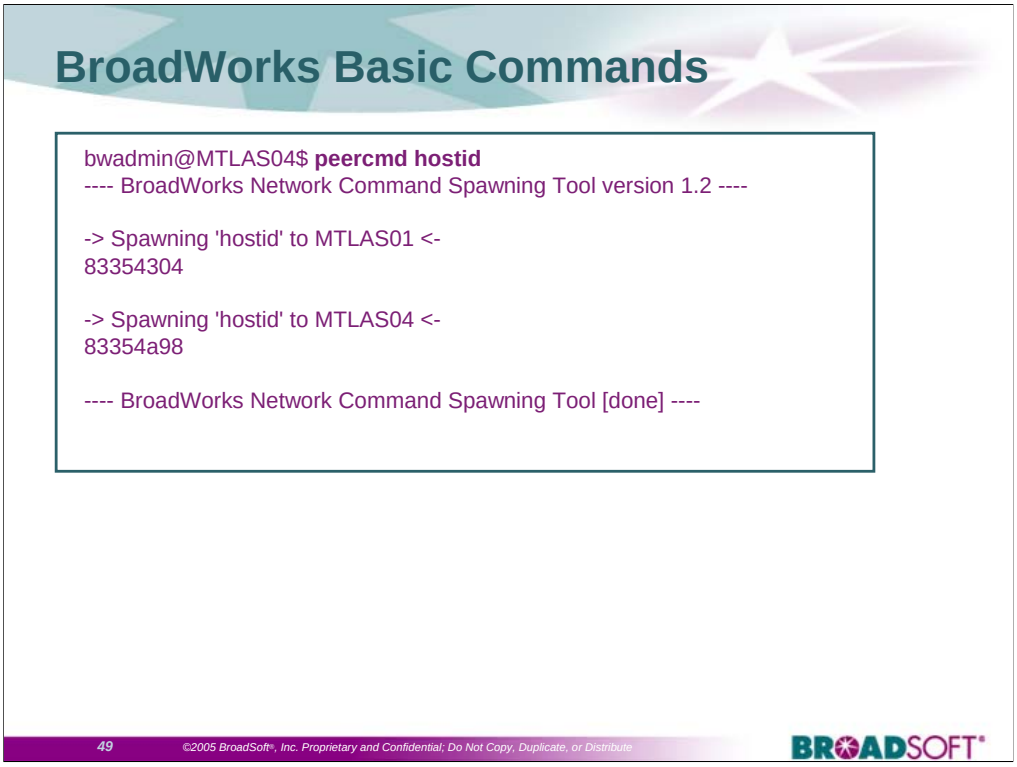


stopbw

Gracefully shuts down all BroadWorks-related processes (run as bwadmin).

startbw

Starts up all BroadWorks-related processes (run as bwadmin).



peercmd

Spans commands on all cluster peers at the same time.

Start the BWCLI and Log in

To start the BroadWorks Server CLI, enter:

1. AS1$ **bwcli** ↵

```
============================================================
BroadWorks Command Line Interface
Type HELP for more information
============================================================

CLI>
```

To log in to the BroadWorks server, enter:

1. **login <userid on BroadWorks>** ↵

2. After the Password: prompt, enter your assigned password. For security, the password does not display when you type it.

   Password: ↵

   Server Administrator logging in...

BWCLI Main Menu Screen

```
AS_CLI> help
  0)  System : go to level System
  1)  Interface : go to level Interface
  2)  SubscriberMgmt : go to level SubscriberMgmt
  3)  Service : go to level Service
  4)  Monitoring : go to level Monitoring
  5)  OpenClientServer : go to level OpenClientServer
  6)  login : establish a session with BroadWorks
  7)  Maintenance : go to level Maintenance

 h (help),  e (exit),  q (quit),  r (read),  w (write),  t (tree),
 c (config),  cd (cd),  a (alias),  hi (history),  p (pause),  re (repeat)
```


Read – To read commands from a file.

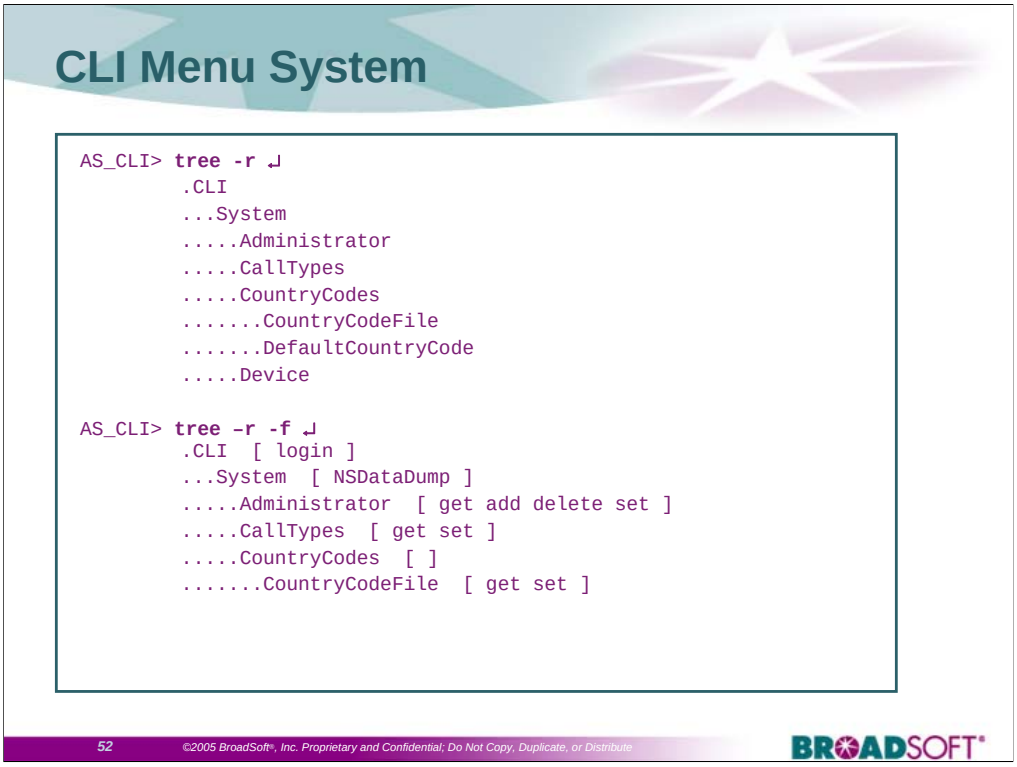
Write – To redirect CLI output to a file.

Config – To configure some aspects of CLI.

History – To show the history of a command.

Pause – To pause the CLI session remain idle for the amount of time specified.

Repeat – To execute a given CLI command a number of repetitions with a pause between each command.



BroadWorks Server CLI Menu System

Menu system is hierarchical, with menus and submenus.

The tree command allows you to see the hierarchy.

To see the complete tree structure, from the top level enter:

`tree –r ↵`

To see the complete tree structure for the CLI including available commands, from the top level, enter:

`tree –r -f ↵`

CLI Navigation and Help

Navigation	Steps	Examples

To change to a lower level	Type the level name, abbreviation, or the corresponding number	`system ↵`
		`s ↵`
		`0 ↵`

To go directly to a level	Type each of the level names making up the level path separated by a semi-colon (;)	To go to System/Device /Media> `system;device;media ↵`
	Use an abbreviated form (as long as it is unique)	`s;d;m ↵`
To return to a previous level	Type q or quit	`Quit ↵` `q ↵`
To return directly to top level	Type q all or quit all	`quit all ↵` `q all ↵`

To get help at any level	Type ? or help or h	`? ↵`
		`help ↵`
		`h ↵`

To get help on a command	Type help followed by the command	**`help get ↵`** **`? get ↵`**

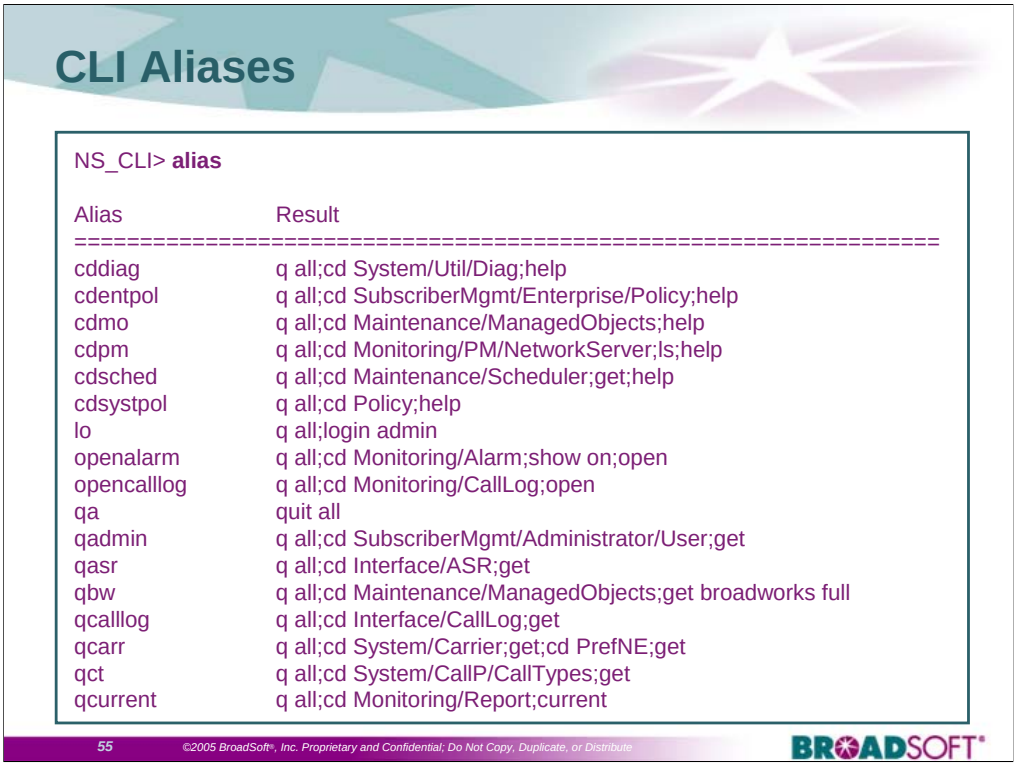
CLI Aliases

```
AS_CLI> h alias
An alias is a command that contains one or more CLI commands separated by "\;".
The alias command runs as if the commands it contains were run sequentially.
Parameters typed after the alias command name are passed as parameters
to the last command defined in the alias. Upon completion, the alias command
returns the CLI session at the level it was when the alias command was typed,
unless "stayInContext" is specified.

This command lists currently defined CLI command aliases:
  alias              to get an overview of all aliases defined
  alias <alias name>  to get detailed information for an alias
This command also supports the creation/modification of new/existing aliases:
  alias <alias name> "<command(s) to run>"
This command also supports the deletion of existing aliases:
  alias <alias name> ""
Example:
  alias cmds "quit all\;tree -r -f"
cmds, typed from any level, lists all CLI levels and commands.
Options:
"stayInContext" set to TRUE specifies that the CLI session stays in the current
 context when aliases are invoked. FALSE allows the current context to change
 when aliases are invoked. The default is TRUE.
"description" gives a short explanation of the alias.
=========================================================================
alias
   [<alias>, String {1 to 80 characters}]
      [<result>, String {0 to 256 characters}]
      [<attribute>, Multiple Choice = {stayInContext, description}]
         <stayInContext>, Choice = {false, true}
         <description>, String {0 to 80 characters}]
```


To create an alias command:

alias qasr “q all\;cd Interface/ASR\;get” stayInContext true description “View ASR Interface attributes”

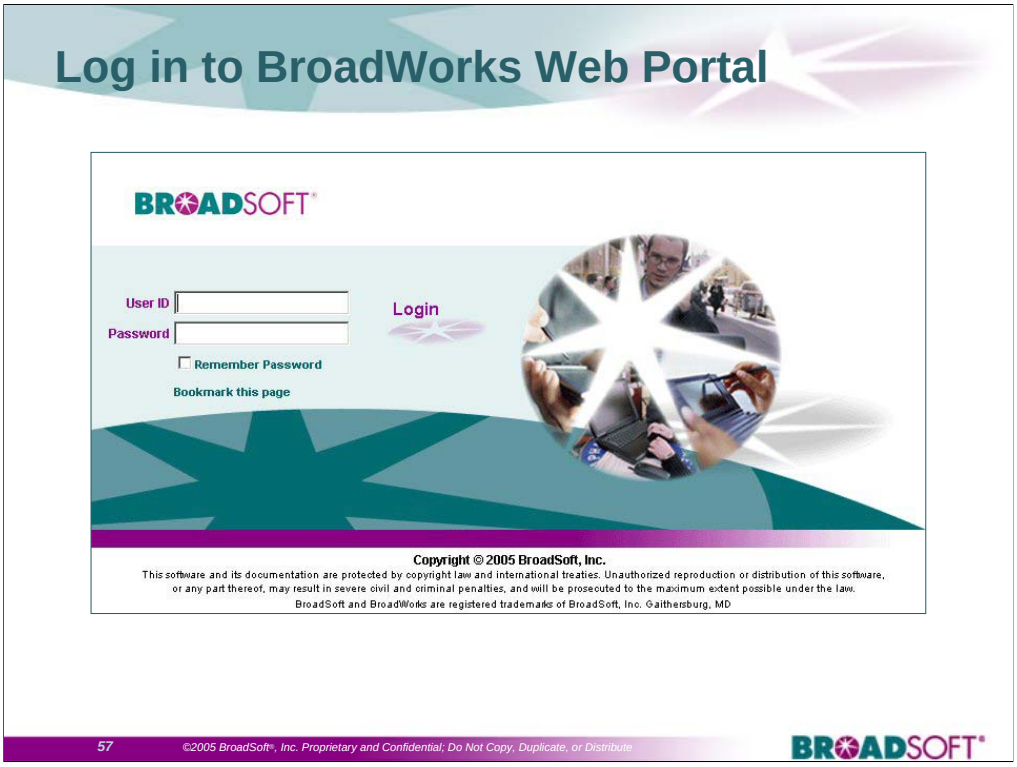


The alias commands are stored as the bwcli_aliases.txt file in the /usr/local/broadworks/bw_base/conf.

CLI History

AS_CLI> **h history**
The history command prints out (at the CLI window) recent commands that were typed in for the current CLI session. This is useful to view, re-enter, or edit, past commands. The default history size is 20.

This command prints out the past history:
history
To set the history size:
history <size>
To execute a command from the history do:
!<cmd_id>
To re-execute the last command do:
!!
==========
history
[<size>, Integer {10 to 1000}]



Log In

1. In the **User ID** text box, enter the login name assigned to you.
2. Press the Tab key or click in the **Password** box.
3. Type your password.
4. Click **Bookmark this page** and type the name in the Add Favorite dialog box to access this page from your Internet Explorer menu.
5. Press the Enter key or click **Login**.

Log Out

1. On any page in the system, click **Logout**.
2. Once you log out, to log in again you can log in with your existing User ID and password or log in with a different User ID and password.

Hands-On Training

LAB 1
BroadWorks Basic Administration

Lab 1: BroadWorks Basic Administration

In Lab 1, you learn the basic administrative access steps and commands that allow you to manage BroadWorks. After you complete the lab, you will be able to:

- Log in to a BroadWorks server and verify which load is active and if the load is running
- Verify TimesTen database replication and RSYNC status
- Identify if a BroadWorks server is configured for redundancy and also identify if it is the primary peer
- Navigate the BroadWorks UNIX directory structure
- Log in to the BroadWorks Command Line Interface (CLI) and navigate the menus
- Log in to the BroadWorks web server and navigate the menus

BroadWorks UNIX Commands

BroadWorks runs on a standard Solaris UNIX platform. A number of BroadWorks-specific commands are available from the UNIX prompt (as part of the ***bwadmin*** environment settings).

1. Log in to the Application Server as ***bwadmin.***
2. From the UNIX prompt, enter **bwshowver**.
   Which version of the Application Server is active? _____
   Which BroadWorks patches are applied? _____
3. From the UNIX prompt, enter **showrun**.
   Is the provisioning server running? How can you tell? _____
   What is the execution server process ID (PID)? _____
4. From the UNIX prompt, enter **ttStatus**.
   What is the name of the active Data Store (DSN)? _____
   How many connections are there to the Data Store? _____
5. From the UNIX prompt, enter **peerctl ls**.
   How may peers are associated with this Application Server cluster? _____
   What is the host name of the other peer? _____
6. From the UNIX prompt, enter **repctl status**.
   Is TimesTen database replication running? _____
   Is RSYNC file replication running? _____

BroadWorks UNIX Directory Structure

BroadWorks runs on a standard Solaris UNIX platform. Installation of BroadWorks creates a BroadWorks-specific UNIX directory structure on each platform.

1. In which directory are new software images copied into as part of the installation process?

   _____

2. In which directory would you find the **MoExtensions.pl** script associated with the active software?

   _____

BroadWorks Command Line Interface

All platforms provide a BroadWorks command line interface (BWCLI) that is used to configure each platform.

1. Log in to the BroadWorks command line interface level as ***admin.***

   Which UNIX command did you use to enter the CLI? _____

2. The "?" command provides context-sensitive help information depending on when it is used. What information does "?" provide in the following cases (from `AS_CLI` level)?

   ?: _____

   ? login: _____

   login ?: _____

3. To view all available CLI subdirectories, enter **tree –r**.

   How many subdirectories are present under `AS_CLI`? _____

4. To view all available CLI subdirectories and commands, enter **tree –r –f**.

   Which level would you go to find information on SIP interface parameters? _____

   Which CLI level would you go to get information on RoutingXLA? _____

   Provide two ways a user can go to the `AS_CLI/System/CallP/Routing/ RoutingXLA` level with a **single command string**?

   _____

   Which command would be used to return to the `AS_CLI` directory root? _____

5. The CLI supports standard **get**, **set**, **add,** and **delete** commands to manipulate or view parameters and to add or delete data entities.

   In which level would you find the SIP T2 timer value? _____

   Can the T2 timer be set to 5000 milliseconds? _____

   Which parameters are available to add a Network Server under `AS_CLI/System/Device/NetServ`? _____

   Which parameters are mandatory and which are optional? _____

6. Exit from the BroadWorks CLI using the **exit** command.

BroadWorks Web Server

BroadWorks provides a web interface for the Application Server and Network Server that can be used for administration and user self-management.

1. Using Internet Explorer, log in to the Application Server web server as a system provider. (The default user ID is ***admin*** and the default password is ***admin***).

   How many links are available from the system provider level? _____

   Which menu option would a system provider use to change the Web Portal Branding?

   _____

NS CLI Tree

NS_CLI [login]
...System [ ]
.....Alias [get add delete]
.....CallP [ ]
.....CallTypes [get add set delete]
.....CountryCodes [get add set delete]
.....DialPlan [get add set delete]
.....Entry [get add set delete]
.....NDC [get add set delete]
.....LCA [get add set delete]
.....Zones [get add set delete]
.....DMI [get add set delete]
.....PolicyPrecedence [get set]
.....Translation [get set SaveLCA]
.....LCA [get add delete]
.....NNACL [get add set delete]
.....Treatment [get add set delete]
.....Carrier [get add set delete]
.....PrefNE [get add set delete]
.....ClientSession [ ]
.....InactivityTimer [get set]
.....LoginAuthLevel [get set]
.....Device [ ]
.....HostingNE [get add set delete]
.....Address [get add set delete]
.....Node [get add set delete]
.....Monitor [ ]
.....NetworkDevice [get set]
.....ResourceNE [get add set delete]
.....Address [get add set delete]
.....MSSelect [get add set delete]
.....RoutingNE [get add set delete]
.....Address [get add set delete]
.....Routing [get add set delete viewDMI]
.....WebServerFarm [get add set delete]
.....Address [get add set delete]
.....Node [get add set delete]
.....Licensing [get set]
.....Alarm [get set]
.....NetworkControlList [ ]
.....ServiceControlProxy [get add set delete]
.....Peering [get set lock start status stop unlock]
.....Peers [get add delete]
....Peering [get set lock start status stop unlock]

.....Util [ ]
.....ASUpload [upload]
.....Diag [PingDevice]
.....Policy [get load]
.....Verif [vmss vtr]
...Interface [ ]
.....ASR [get set]
.....CallLog [get set]
.....MSS [get set]
.....SIP [get set]
.....SNMP [ ]
.....AccessList [get add delete]
.....Agent [get set]
.....Reporting [get set generateReport]
.....FTP [get add set delete]
.....Trap [get add delete]
.....V3User [get add set delete]
.....ServiceControlProxy [get set]
...SubscriberMgmt [ ]
.....Administrator [ ]
.....HostingNEUser [get add delete]
.....User [get add set delete]
.....Enterprise [get add set delete]
.....DnUrl [get detail add set delete setOverflow]
.....AutoMigrate [get set]
.....Policy [ ]
.....EntMediaSrvSel [get add set delete]
.....SiteList [get add set delete]
.....EntNGWRouting [get add set delete]
.....AuthHost [get add delete]
.....Properties [get add set delete]
.....RoutingList [get add set delete]
.....EntSIMPLE [get add set delete]
.....Gateway [get add set delete]
.....EntSubLocation [get add set delete]
.....ExtDialing [get add set delete]
.....FarEndHopOff [get add set delete]
.....AuthHost [get add delete]
.....RoutingList [get add set delete]
.....voiceVPN [get add set delete]
.....DialPlan [get add set delete]
.....Properties [get add set delete]
.....Site [get add set delete]
.....UserGroup [get add set delete]
.....MaxFailedLoginAttempts [get set]
.....MinLoginIdLength [get set]
.....Numbers [get set]
.....UnassignedNumbers [get add delete]
.....PasswordRules [get set]

...Policy [ ]
.....CallScreening [get add set delete]
.....CallTyping [get add set delete]
.....EqualAccess [get add set delete]
.....FarEndRtg [get add set delete]
.....MediaSrvSel [get add set delete]
.....RouteList [get add set delete]
.....NearEndRtg [get add set delete]
.....NumberPortability [get add set delete]
.....PortedInNumbers [get add set delete]
.....PortedOutNumbers [get add set delete]
.....OrigRedirect [get add set delete]
.....PreCallTyping [get add set delete]
.....DialPlan [get add set delete]
.....Profile [get add set delete]
.....RCBasedRtg [get add set delete]
.....LataRoutingList [get add set delete]
.....ZoneRoutingList [get add set delete]
.....SIMPLE [get add set delete]
.....Gateway [get add set delete]
.....SubLocation [get add set delete]
.....SvcCtrRtg [get add set delete]
.....GWController [get add delete]
.....SCRL [get add set delete]
.....TrunkGroup [get add set delete]
.....TandemOverflow [get add set delete]
.....UrlDialing [get add set delete]
Monitoring [ ]
.....Alarm [get set clear ShowConfig close open show]
.....AuditTrail [get set]
.....CallLog [close open]
.....PM [ ]
.....Mib-II [get set cd ls pwd]
.....NetworkServer [get set cd ls pwd]
.....SMC [get set cd ls pwd]
.....Sun [get set cd ls pwd]
.....Report [get set current history recent]
.....Threshold [get add set delete]
...Maintenance [ ]
.....ManagedObjects [get set lock reset start stop unlock]
.....Scheduler [get add delete]
.....Tools [backupdb healthmon importdb restoredb tech-support]

AS CLI Tree

.AS_CLI [login]
...System [ ]
.....Alias [get add delete]
.....CallP [ ]
.....AccessRouting [get set]
.....CallForwarding [get set]
.....CallTypes [get add delete]
.....CountryCodes [get add set delete]
.....DigitCollection [get set]
.....GroupCalling [get set]
.....LongCallAcctg [get set]
.....NetProgression [get set]
.....OverloadControls [get set]
.....Routing [ ]
.....MediaServerSelection [get set]
.....MediaServerDevice [get add set delete clear]
.....Route [get add delete]
.....Device [get add set delete]
.....RouteParms [get set]
.....RoutingXLA [get add set delete]
.....SessionAudit [get set]
.....Treatment [get set]
.....Carrier [get add set delete]
.....ClientSession [ ]
.....InactivityTimer [get set]
.....LoginAuthLevel [get set]
.....ServerAddresses [get set]
.....Device [ ]
.....Codec [get add delete]
.....InstantConf [get detail add set delete resetUserPwd resyncCS]
.....Element [get add set delete]
.....IpDeviceMgmt [get set rebuildDefaultFile reset setConfigFile]
.....Fileserver [get add set delete]
.....Monitor [ ]
.....AccessDevice [get add set delete]
.....NetworkDevice [get set]
.....NetServ [get add set delete clear]
.....SMDI [get add set delete]
.....Routing [get add set delete]
.....Domain [get set]
.....EventNotification [get set]
.....Subscription [get detail delete]
.....Licensing [get set]
.....NetworkAccessLists [get set]
.....CAP [get add set delete]
.....ExtAuth [get add set delete]
.....SIP [get add set delete]
.....SMDI [get add set delete]

....Peering [get set lock start status stop unlock]
.....Peers [get add set delete]
Redundancy [get set]
.....MigratedUsers [get]
.....Registration [get set]
.....Contacts [get delete]
.....StartupParam [get set]
.....Util [ ]
.....ASDump [dump]
.....CallTrace [run]
.....Diag [audit auditAll dump heap kill killAll list pingDevice release]
.....QueryGroup [get]
.....QueryService [get]
.....QueryUser [get]
.....QueueStats [get set]
...Interface [ ]
.....ASR [get set]
.....Accounting [ ]
.....BroadWorksCDRInterface [get set]
.....File [get set]
.....FTP [get set]
.....Radius [get set]
.....Browser [get browse]
.....EventInterface [get set]
.....CAP [get set]
.....CallLogs [get set]
.....INServiceControl [get set]
.....LDAPDirectory [get set clear]
.....MGCP [get set clear]
.....Mail [get set]
.....NetServSync [get set]
.....SIP [get set clear]
.....ContentType [get add set delete]
.....SMDI [get set]
.....SNMP [ ]
.....AccessList [get add delete]
.....Agent [get set]
.....Reporting [get set generateReport]
.....FTP [get add set delete]
.....Trap [get add delete]
.....V3User [get add set delete]
...SubscriberMgmt [ ]
.....Administrator [get add set delete]
.....Domain [get detail add delete]
.....Group [get detail add set delete clear]
.....Administrator [get add set delete]
.....Policy [get set]
.....Department [get add set delete clear]
.....Administrator [get add set delete]

.....Device [get detail add set delete clear lineOrder]
.....DigitCollection [get set]
.....Domain [get detail add delete]
.....Extensions [get set]
.....GroupCallerID [get set]
.....GroupServices [ ]
.....Assign [get add delete]
.....Authorize [get set]
.....InstantConfPorts [get set]
.....LDAPDirectory [get set clear]
.....Numbers [get add delete]
.....PasswordRules [get]
.....Policy [get set]
.....UserServices [ ]
.....Authorize [get set]
.....ExistingUser [add delete]
.....NewUser [get add delete]
.....VPPasscodeRules [get set]
.....Numbers [get]
.....Utilization [get]
.....PasswordRules [get set]
.....Policy [get set]
.....ServiceProvider [get detail add set delete]
.....Administrator [get add set delete]
.....Policy [get set]
.....Carrier [get add set delete]
.....Department [get add set delete clear]
.....Device [get detail add set delete clear]
.....DigitCollection [get set]
.....Domain [get detail add delete]
.....GroupServices [get set]
.....InstantConfPorts [get set]
.....LDAPDirectory [get set clear]
.....Numbers [get add delete]
.....PasswordRules [get]
.....ServicePacks [get detail add set delete addService]
.....UserServices [get set]
.....VPPasscodeRules [get set]
.....SupportedLanguages [get add set delete]
.....SystemConfig [get set]
.....User [get detail add set delete clear]
.....Util [ ]
.....ChangeUserId [set]
.....VPPasscodeRules [get set]
...Service [ ]
.....AutomaticCallback [get set]
.....CallCenter [get set]
.....CallNotify [get set]
.....CallingNameRetrieval [get set clear]
.....Conferencing [get set]

.....EmergencyZones [get set]
.....VoiceMsg [get set]
.....HuntGroup [get set]
.....INServiceControl [get set]
.....InventoryReport [get set]
.....OutgoingCPCallTypes [get add delete]
.....VoiceMailNotification [get set]
.....WindowsMessenger [get set]
...Monitoring [ ]
.....Alarm [get set clear ShowConfig close open show]
.....AuditTrail [get set]
.....PM [ ]
.....ApplicationServer [get set cd ls pwd]
.....Mib-II [get set cd ls pwd]
.....OpenClientServer [get set cd ls pwd]
.....SMC [get set cd ls pwd]
.....Sun [get set cd ls pwd]
.....ProtocolMonitor [get add set delete dumpToCLI dumpToFile]
.....Report [get set current history recent]
.....Threshold [get add set delete]
...WebServer [ ]
.....HttpAlias [get add set delete]
.....Protocol [get set]
.....System [get set]
.....WebBranding [get set]
...OpenClientServer [get set]
.....AppServ [get add set delete clear]
.....NetServ [get add set delete]
...Maintenance [ ]
.....ManagedObjects [get set lock reset start stop unlock]
.....Scheduler [get add delete]
.....Tools [backupdb healthmon importdb restoredb tech-support]

MS CLI Tree

.MS_CLI [ ]
...System [get set]
.....AccessControlList [get set]
.....SIP [get add delete]
.....Licensing [get]
...Interface [ ]
.....RTP [get add set delete]
.....SIP [get add set delete]
.....SNMP [ ]
.....AccessList [get add delete]
.....Agent [get set]
.....Reporting [get set generateReport]
.....FTP [get add set delete]
.....Trap [get add delete]
.....V3User [get add set delete]
...Service [ ]
.....Conferencing [get set]
.....Codec [get add delete]
.....IVR [get set]
.....AudioCodec [get add delete]
.....VideoCodec [get add delete]
.....LiveAudio [ ]
.....Codec [get add delete]
...Monitoring [ ]
.....Alarm [get set clear ShowConfig close open show]
.....PM [ ]
.....MediaServer [get set cd ls pwd]
.....Mib-II [get set cd ls pwd]
.....SMC [get set cd ls pwd]
.....Sun [get set cd ls pwd]
.....Report [get set current history recent]
.....Threshold [get add set delete]
...Maintenance [ ]
.....ManagedObjects [get set lock reset start stop unlock]
.....Scheduler [get add delete]
.....Tools [healthmon tech-support]

WS CLI Tree

.WS_CLI [ ]
...System [get set]
...WebBranding [get set]
...HttpAlias [get add set delete]
...Protocol [get set]
...OpenClientServer [get set]
.....AppServ [get add set delete clear]
.....NetServ [get add set delete]
...Monitoring [ ]
.....Alarm [get set clear ShowConfig close open show]
.....PM [ ]
.....ExternalWebServer [get]
.....Mib-II [get set cd ls pwd]
.....OpenClientServer [get set cd ls pwd]
.....SMC [get set cd ls pwd]
.....Sun [get set cd ls pwd]
...Interface [ ]
.....SNMP [ ]
.....AccessList [get add delete]
.....Agent [get set]
.....Trap [get add delete]
.....V3User [get add set delete]
...Maintenance [ ]
.....ManagedObjects [get set lock reset start stop unlock]
.....Scheduler [get add delete]
.....Tools [healthmon tech-support]

EMS CLI Tree

.EMS_CLI [ ]
...OpenClientServer [get set]
.....AppServ [get add set delete clear]
.....NetServ [get add set delete]
...Monitoring [ ]
.....Alarm [get set clear ShowConfig close open show]
.....PM [ ]
.....Mib-II [get set cd ls pwd]
.....OpenClientServer [get set cd ls pwd]
.....SMC [get set cd ls pwd]
.....Sun [get set cd ls pwd]
...Interface [ ]
.....SNMP [ ]
.....AccessList [get add delete]
.....Agent [get set]
.....Trap [get add delete]
.....V3User [get add set delete]
...Maintenance [ ]
.....ManagedObjects [get set lock reset start stop unlock]
.....Scheduler [get add delete]
.....Tools [backupdb healthmon restoredb tech-support]