

Resource Pool Management

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Feature Overview

Cisco Resource Pool Manager (RPM) enables telephone companies and Internet service providers (ISPs) to share dial resources for wholesale and retail dial network services. With RPM, telcos and ISPs can count, control, and manage dial resources and provide accounting for shared resources when implementing different service-level agreements. Resource pool management can be configured in a single, stand-alone Cisco Network Access Server (NAS) using RPM or, optionally, across multiple NAS stacks using one or more external Cisco Resource Pool Manager Servers (RPMS).

Before You Begin

The NAS and other equipment must be set up, configured, and verified for proper operation of the dial, PPP, VPDN, and AAA segments before enabling Cisco RPM. See the Cisco documentation in the Related Documents section for details.

This document presents the single, standalone NAS solution. For information on the Cisco Resource Pool Manager Server (RPMS) solution, see the Cisco Connection Online location at http://www.cisco.com/univercd/cc/td/doc/product/access/acs_soft/rpms/rpms_1-0/index.htm.

Benefits

Cisco Resource Pool Manager gives data network service providers the capability to

- Manage customer use of shared resources such as modems or HDLC controllers for data calls
- Offer advanced wholesale dial-up services using Virtual Private Dial-up Network (VPDN) to enterprise accounts and ISPs
- Efficiently use resource groups such as modems to offer differing over-subscription rates and dial service-level agreements
- Deploy Data over Voice Bearer Service (DOVBS)
- Accept or reject a call based on the incoming Dialed Number Information Service (DNIS) number before answering the call
- Have the flexibility to include local retail dial services in the same NAS with the wholesale dial customers

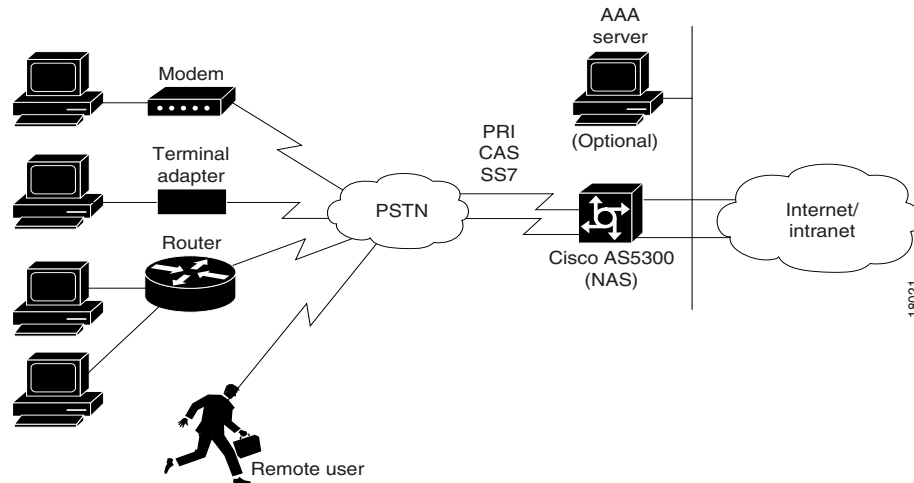
Resource Pool Management—Standalone NAS

Resource pool management can be used to provide wholesale (VPDN) dial service to corporate customers and retail dial service to end users from a single NAS using Cisco Resource Pool Manager (RPM).

Figure 1 shows multiple connections to a Cisco AS5300 NAS. In this scenario, some connections can be forwarded through VPDN tunnels for wholesale (VPDN) dial service. Others can be authenticated locally for retail dial service.

Note This configuration does not use Cisco RPMS. If more than one Cisco NAS is used, all configuration must be manually performed on each NAS using Cisco IOS commands, and resource usage information is not shared between NASs.

Figure 1 Resource Pool Management Scenario



Components of Cisco RPM

Cisco RPM manages both incoming calls and outgoing sessions. Cisco RPM differentiates dial customers through configured customer profiles based on the Dialed Number Information Service (DNIS) and call type determined at the time of an incoming call.

The components of incoming call management in the Cisco RPM are:

- Customer profiles
- DNIS groups
- Call types
- Resource groups
- Resource services
- Call discrimination

Cisco RPM may be used to answer all calls and then differentiate customers using VPDN profiles and groups. The components of outgoing session management in the Cisco RPM are:

- VPDN groups
- VPDN profiles

Resource Pool Management uses the following steps to determine if a call will be answered:

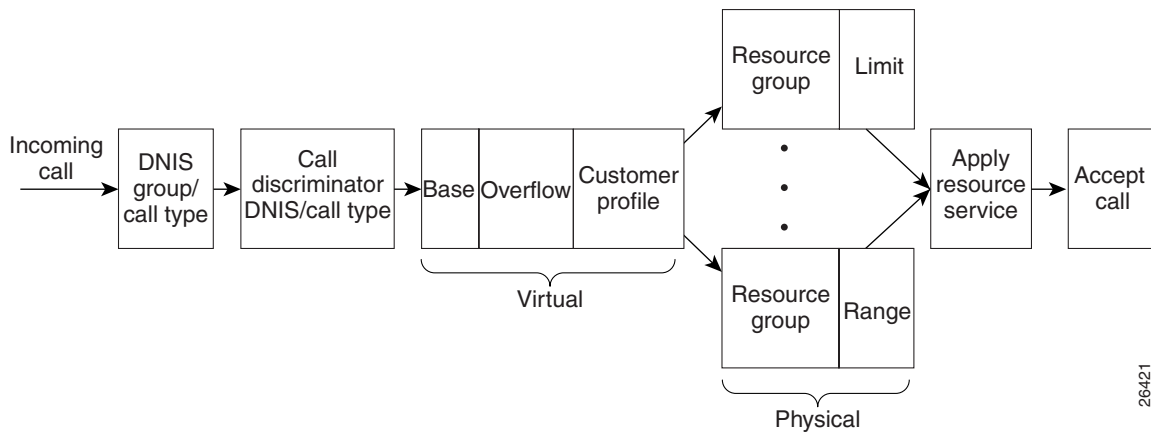
On the incoming call management of the customer profile,

- The incoming DNIS is mapped to a DNIS group; if there is no incoming DNIS number for whatever reason, or the DNIS number provided does not match up with any configured DNIS group, the DNIS group *default* is used.
- The mapped DNIS group is checked against any configured call discriminator profiles to confirm if this DNIS group/call type combination should be disallowed. If there is a match, the call is immediately rejected.
- Once a DNIS group is identified, the customer profile associated with that DNIS group and the call-type (from the Bearer Capability for ISDN call, statically configured for CAS calls) is selected. If there is no corresponding customer profile, the call is rejected.

- The customer profile includes a session limit value and an overflow limit value. If these thresholds have not been met, the call is then assigned the appropriate resource defined in the customer profile. If the thresholds have been met, the call is rejected.
- If there are resources available from the resource group defined in the customer profile, the call is answered. Otherwise, the call is rejected.
- As sessions are started and ended, the session counters are incremented and decremented so the customer profile call counters are kept current.

Figure 2 shows the components of Cisco RPM and how they work together to handle an incoming call.

Figure 2 RPM Functional Description for Incoming Call Management



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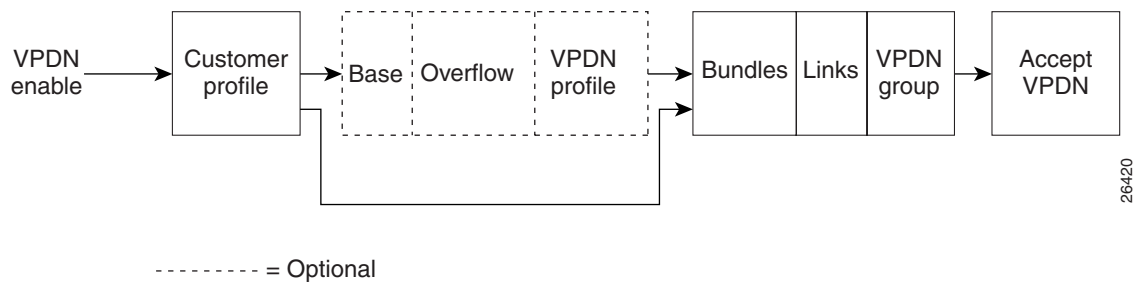
After the call is answered and if VPDN is enabled, the Cisco RPM checks the customer profile for an assigned VPDN group or profile.

The outgoing session management of the customer profile directs the answered call to the appropriate destination:

- To a local authentication, authorization, and accounting (AAA) server of retail dial applications and Internet/intranet access.
- To a tunnel that is established between the NAS or L2TP Access Concentrator (LAC) to a wholesale (VPDN) dial customer’s home gateway (HGW) or L2TP Network Server (LNS) using L2F or L2TP tunneling technology.

This Cisco RPM outgoing session management process is illustrated in Figure 3.

Figure 3 **Outgoing Call Management: RPM Functional Description for VPDN Profiles and Groups**



If a VPDN profile is found, the limits are checked and if they have not been exceeded the VPDN group data associated with that VPDN profile will be used to build a VPDN tunnel; if the VPDN limits have been exceeded, the call is disconnected. Otherwise, if a VPDN group is found within the customer profile, the VPDN group data will be used to build a VPDN tunnel. If the VPDN group limits (number of multilink bundles, number of links per bundle) have not been exceeded, a VPDN tunnel will be built; if the limits have been reached, the call will be disconnected.

If no VPDN profile is assigned to the customer profile and VPDN is enabled, non-RPM VPDN service will be attempted. If it fails, the call is processed as a retail dial service call if local AAA service is available.

Customer Profiles

A customer profile defines how and when to answer a call. Customer profiles include the following components:

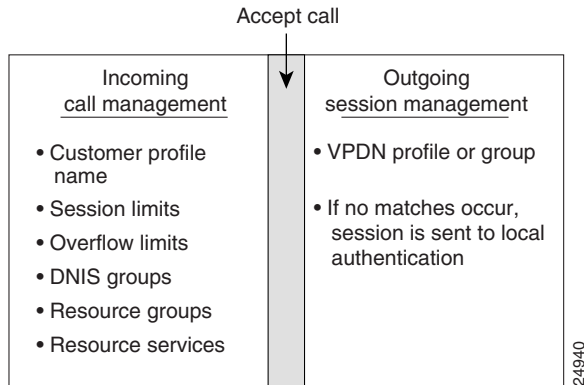
- Customer profile name.
- Session limits—Maximum number of standard sessions.
- Overflow limits—Maximum number of overflow sessions.
- DNIS groups
- Resource groups
- Resource services
- VPDN profiles or groups

A customer profile can be used in three different ways on a NAS:

- Customer profile—Associated with a specific DNIS group and used for a single NAS solution.
- Default customer profile—Associated with the default DNIS group and also used for a single NAS solution. This is most useful with domain-based VPDN services and for combining retail dial services with VPDN services. Up to four default customer profiles can be used, each differentiated by the call type (speech, digital, V.110, V.120).
- Backup customer profile—Functionally the same as the two profiles above, except that it's applicable with an RPMS solution and would be used only when connectivity between a NAS and the RPMS is lost. When the connection between the Cisco NAS and Cisco RPMS is restored, the call counters may be skewed or out of sync. See the RPMS documentation for a review of the RPMS fault tolerance and recovery mechanisms.

Figure 4 shows the major components of a customer profile.

Figure 4 Components of a Customer Profile



DNIS Groups

A DNIS group is a configured list of DNIS numbers that correspond to the numbers dialed to access particular customers, service offerings, or both. Cisco RPM checks the DNIS number of inbound calls against the configured DNIS groups.

- If a match is found, the configured information in the customer profile to which the DNIS group is assigned is used.
- If a match is not found, the configured information in the customer profile to which the default DNIS group is assigned is used.
- The DNIS/call type sequence can only be associated with one customer profile.

Call Types

Call types from calls originating from ISDN PRI, SS7, and CAS (CT1, CT3, and CE1) are used within a customer profile to assign calls to the appropriate resource. Call types for ISDN and SS7 are based on Q.931 bearer capability. Call types for CAS are assigned based on static DNIS group configuration. Supported call types are:

- Speech
- Digital
- V.110
- V.120

Voice over IP, Fax over IP, and dial-out calls are not supported in this release of resource pool management.

Resource Groups

Cisco RPM enables you to maximize the use of available shared resources within a Cisco NAS for various resource allocation schemes to support service-level agreements. Cisco RPM allows you to combine your Cisco NAS resource groups with call types (speech, digital, V.110, and V.120) and optional resource modem services. Resource groups and services are configured for customer profiles and assigned to incoming calls through DNIS groups and call types.

Resource groups are configured on the Cisco NAS and applied to a customer profile. Resource groups represent groupings of similar hardware and/or firmware that are static and do not change on a per-call basis. Resource groups can define resources that are port-based or not port-based.

- Port-based resources are identified by physical location, such as a range of port/slot numbers (for example, modems or terminal adapters).
- Non-port-based resources are identified by a single size parameter (for example, HDLC framers or V.120 terminal adapters—V.120 terminal adapters are currently implemented as part of the Cisco IOS software).

Note Resources not configured in the NAS as part of a resource group and not assigned to a customer profile cannot be used by Cisco RPM or Cisco RPMS.

Note To support ISDN Data over Voice Bearer Service (DOVBS), use a DNIS group and a configured customer profile to direct the speech call to the appropriate digital resource. The resource group assigned to this customer profile will be “digital resources” and also have a call type of “speech”, so the call will terminate on an HDLC controller rather than a modem.

Resource Services

A resource service contains a finite series of resource command strings that can be used to help dynamically configure an incoming connection.

Services supported by a resource group are determined by the combination of hardware and firmware installed. Currently, resource service options can be configured and applied to resource groups containing only MICA modems. Resource services can be defined to affect minimum and maximum speed, modulation, error correction, and compression, as shown in Table 1.

Table 1 Resource Services

Service	Options	Comments
min-speed	<300—56000>, any	Must be a V.90 increment.
max-speed	<300—56000>, any	Must be a V.90 increment.
modulation	k56flex, v22bis, v32bis, v34, v90, any	
error-correction	lapm, mn14	This is a hidden command.
compression	mmps, v42bis	This is a hidden command.

VPDN Groups

The VPDN group contains the data required to build a VPDN tunnel from the RPM NAS (LAC) to the LNS. In the context of RPM, VPDN is authorized by first associating a customer profile with a VPDN group, and second by associating the VPDN group to the DNIS group used for that customer profile. VPDN group data includes the endpoint IP addresses. Cisco RPM enables you to specify multiple IP endpoints for a VPDN group. If two or more IP endpoints are specified, Cisco RPM uses a load balancing method to ensure traffic is distributed across the IP endpoints.

- For DNIS-based VPDN dial service, VPDN groups are assigned to customer profiles based on the configured DNIS groups.

- For domain-based VPDN dial service, VPDN groups are assigned to customer profiles with the default DNIS group and matching call-type assignment.

The VPDN group provides call management by allowing limits to be applied to both the number of multilink PPP bundles per tunnel, as well as the number of links per multilink PPP bundle. Limits can also be imposed to restrict the number of sessions per IP endpoint. If more granular control of VPDN counters is required, VPDN profiles must be used.

VPDN Profiles

VPDN profiles allow for session and overflow limits to be imposed for a particular customer profile. These limits are unrelated to the limits imposed by the customer profile. A customer profile is associated with a VPDN profile, while a VPDN profile is associated with a VPDN group. VPDN profiles are required only when these additional counters are required for VPDN usage per customer profile.

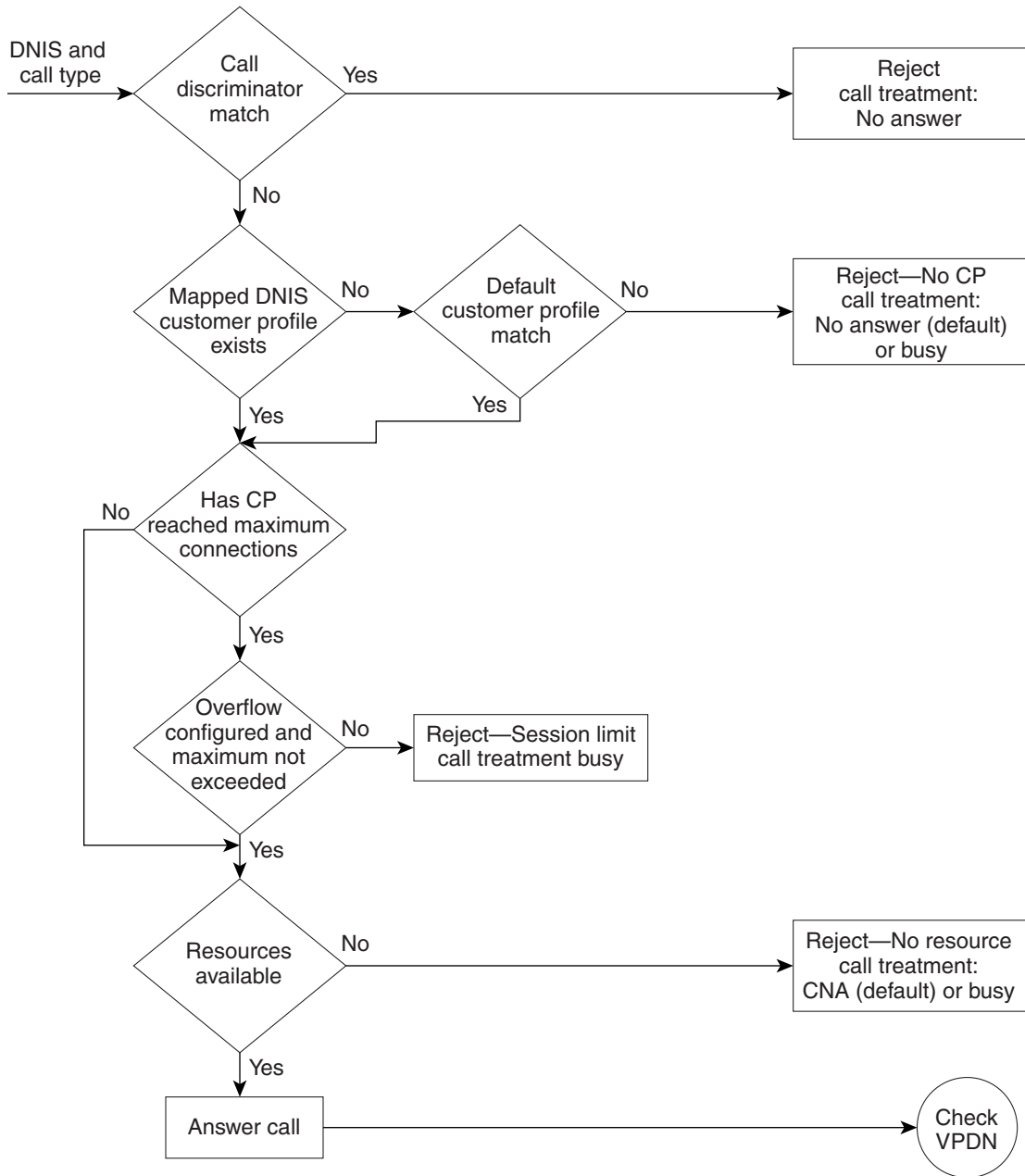
Details on RPM Processes

Call Treatments

Call treatment determines how calls are handled when certain events require the call to be rejected. For example, if the session and overflow limits for one of your customers has been exceeded, any additional calls will receive a busy signal.

Figure 5 shows a call processing flowchart and Table 2 provides the details about the types of events that require call treatment and the call treatment options.

Figure 5 RPM Call Processing Flowchart for a Standalone NAS



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Table 2 Call Treatment Table

Event	Call Treatment Option	Results
Customer profile not found	No answer (default)	The caller receives rings until the switch eventually times out. Implies that the NAS was appropriate, but resources were unavailable so the caller should try back later.
	Busy	The switch drops the call from the NAS and sends a busy signal back to the caller. The call is rejected based on not matching a DNIS group/call type and customer profile. Can be used to immediately reject the call and free up the circuit.
Customer profile limits exceeded	Busy	The switch drops the call from the NAS and sends a busy signal back to the caller.
NAS resource not available	Channel not available (default)	The switch sends the call to the next channel in the trunk group. The call can be answered, but the NAS does not have any available resources in the resource groups. Allows the switch to try additional channels until it gets to a different NAS in the same trunk group that has the available resources.
	Busy	The switch drops the call from the NAS and sends a busy signal back to the caller. Can be used when the trunk group does not span additional NASs.
Call discrimination match	No answer	The caller receives rings until the switch eventually times out.

Session and Overflow Session Limits

Cisco RPM enables you to set base and overflow session limits in each customer profile. The base session limit determines the maximum number of non-overflow sessions supported for a customer profile. When the session limit is reached, if overflow sessions are not enabled, any new calls are rejected. If overflow sessions are enabled, new sessions up to the session overflow limit are processed and marked as overflow for call handling and accounting. The RPM call counters and AAA accounting records will indicate whether a call is considered overflow for tracking and billing.

The session overflow limit determines the allowable number of sessions above the session limit. If the session overflow limit is greater than zero, overflow sessions are enabled and the maximum number of allowed sessions is the session limit plus the session overflow limit. While the session overflow limit has been reached, any new calls are rejected.

Enabling overflow sessions is useful for allocating extra sessions for preferred customers at premium rates. Overflow session can also be useful for encouraging customers to adequately forecast bandwidth usage or for special events when normal session usage is exceeded. For example, if a customer is having a corporate-wide program and many people are expected to request remote access, you could enable many overflow sessions and charge a premium rate for the extra bandwidth requirements.

Note An overflow call is a call received while the session limit is exceeded and is in an overflow state. When a call is identified as an overflow call, the call maintains the overflow status throughout its duration even if the number of current sessions returns below the session limit.

Table 3 Effects of Session Limit and Session Overflow Limit Settings Combinations

Base Session Limit	Session Overflow Limit	Call Handling
0	0	Reject all calls.
10	0	Accept up to 10 sessions.
10	10	Accept up to 20 sessions and mark sessions 11 to 20 as overflow sessions.
0	10	Accept up to 10 sessions and mark 1 to 10 sessions as overflow.
All	0	Accept all calls.
0	All	Accept all calls and mark all calls as overflow.

VPDN Session and Overflow Limits

Cisco RPM enables you to configure base and overflow session limits per VPDN profile for managing VPDN sessions.

Note The VPDN session and session overflow limits are independent of the limits set in the customer profiles.

The base session limit determines the maximum number of non-overflow sessions supported for a VPDN profile. When the session limit is reached, if overflow sessions are not enabled, any new VPDN calls using the VPDN profile sessions are disconnected. If overflow sessions are enabled, new sessions up to the session overflow limit are processed and marked as overflow for VPDN accounting.

The VPDN session overflow limit determines the number of sessions above the session limit allowed in the VPDN group. If the session overflow limit is greater than zero, overflow sessions are enabled and the maximum number of allowed sessions is the session limit plus the session overflow limit. While the session overflow limit has been reached, any new calls are disconnected.

VPDN MLP Bundles and Links-Per-Bundle Limits

To ensure resources are not consumed by a few users with multilink PPP protocol (MLP) connections, Cisco RPM also enables you to specify the maximum number of MLP bundles that can open in a VPDN group. In addition, you can specify the maximum number of links for each MLP bundle. For example, if standard ISDN users will access the VPDN profile, limit this setting to two links per bundle. If video conferencing will be used, increase this setting to accommodate the necessary bandwidth (usually six links). These limits have no overflow option and are configured under the VPDN group component.

VPDN Tunnel Limits

For increased VPDN tunnel management, Cisco RPM enables you to set an IP endpoint session limit for each IP endpoint. IP endpoints are configured for VPDN groups.

Accounting

Accounting data for network dial service usage can be generated in NAS AAA attribute format. The Cisco NAS can be configured to generate AAA accounting records for access to an external AAA server. The accounting start and stop records in AAA attribute format are sent to the external AAA server using either RADIUS or TACACS+ protocols for accounting data storage. Table 4 lists the new fields in the AAA accounting packets.

Table 4 AAA Accounting Records

Accounting Start Record	Accounting Stop Record
Call-Type	Disconnect-Cause
CAS-Group-Name	Modem-Speed-Receive
Customer-Profile-Name	Modem-Speed-Transmit
Customer-Profile-Active-Sessions	MLP-Session-ID
DNIS-Group-Name	
Overflow	
MLP-Session_ID	
Modem-Speed-Receive	
Modem-Speed-Transmit	
VPDN-Domain-Name	
VPDN-Tunnel-ID	
VPDN-HomeGateway	
VPDN-Group-Active-Sessions	

Data over Voice Bearer Services

Data over Voice Bearer Services (DOVBS) is a dial service that uses a customer profile and an associated resource group of digital resources to direct data calls with a speech call type to HDLC controllers.

To support ISDN DOVBS, use a DNIS group and a configured customer profile to direct the speech call to the appropriate digital resource.

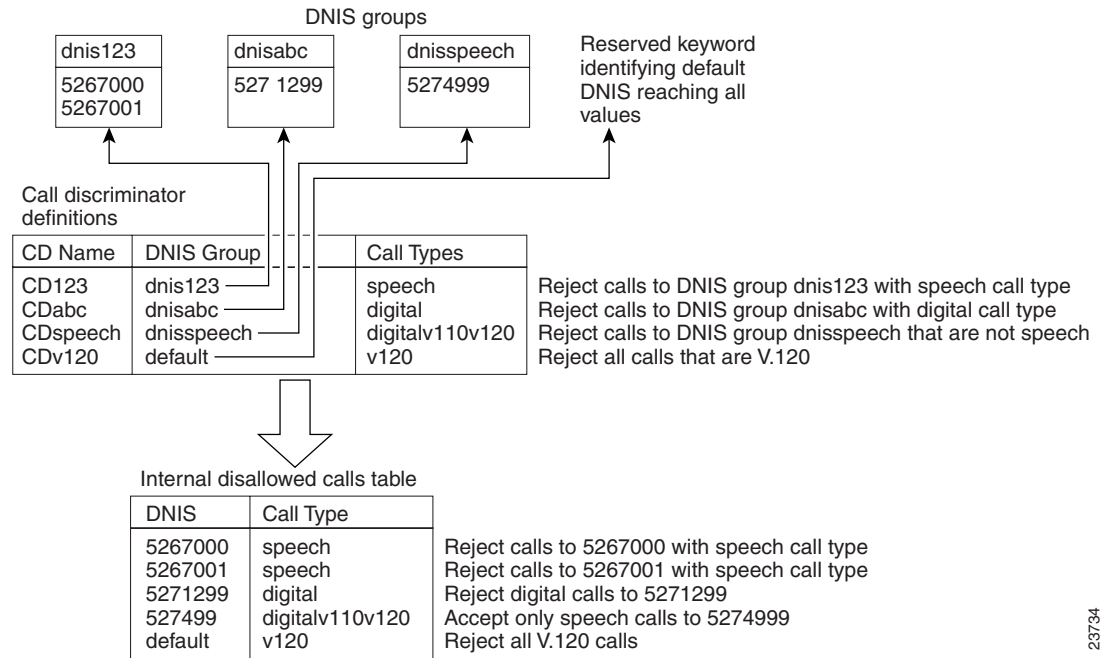
The resource group assigned to this customer profile will be “digital resources” and will also have a call type of speech, so the call will terminate on an HDLC controller rather than a modem.

Call Discrimination

Resource pool management offers a call discrimination feature that enables rejection of calls based on a DNIS group and call type filter. When a call arrives at the NAS, the DNIS and call type are matched against a table of disallowed calls. If the DNIS and call type match entries in this table, the call is rejected.

Call discrimination in Cisco RPM enables you to specify DNIS groups and call types to block and reject calls before they are assigned Cisco NAS resources or before any other Cisco RPM processing occurs. Call discrimination can be used by customers to manage billing of calls to different types of resources. If the service provider has a different billing structure for modem calls and for digital calls, each call type will be assigned a different DNIS. When a user calls the DNIS, the call type must be of the allowed call type or the call is rejected. For example, to restrict a specific DNIS group to only modem calls, create call discrimination settings for the DNIS group and the other call types (digital, V.110, and V.120) as shown in Figure 6.

Note Supported call types are speech, digital, V.110, and V.120.

Figure 6 Call Discrimination

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Resource Manager Protocol

Resource Manager Protocol (RMP) is a robust, recoverable protocol used for communication between Cisco RPMS and the NASs for the external server solution and within the NAS for the single NAS solution.

RPM Process with RPMS and SS7

For information on SS7 implementation for RPM, see the documents *Cisco Resource Pool Manager Server 1.0 SS7 Implementation* and *RPM Process—Cisco RPMS and SS7* in the Cisco Connection Online (CCO) at <http://www.cisco.com/univercd/cc/td/doc/product/software/ios120>.

Restrictions

Ear and Mouth Feature Group B (E&M-FGB) is the only signaling type supported for channel associated signaling (CAS) on T1 and T3 facilities; R2 is supported for E1 facilities. Feature Group (FG) D is not supported in this release.

The Cisco IOS software collects DNIS digits for E&M-FGB CAS signaling. For all other CAS signaling types, use the default DNIS group customer profiles.

The resource pool management application requires the NPE 300 processor when using the Cisco AS5800.

Resource services are used with MICA modems only.

Modem pooling and resource pool management are not compatible.

Related Features and Technologies

- Authentication, Authorization, and Accounting (AAA)
- Point-to-Point Protocol
- Virtual Private Dial-up Network (VPDN)
- SS7

Related Documents

- *Cisco AS5200 Universal Access Server Software Configuration Guide*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5200/52swcfg2/index.htm
- *Cisco AS5300 Software Configuration Guide*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/53swcf2/index.htm
- *Cisco Access VPN Solutions Using Tunneling Technology*
http://www.cisco.com/univercd/cc/td/doc/cisintwk/intsolns/vpn_soln/index.htm
- *Cisco Resource Pool Manager Server Configuration Guide*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_soft/rpms/rpms_1-0/rpmsconf/index.htm
- *Cisco Resource Pool Manager Server Installation Guide*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_soft/rpms/rpms_1-0/rpms_ins/index.htm
- *Cisco Resource Pool Manager Server Solutions Guide*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_soft/rpms/rpms_1-0/rpms_sol/index.htm
- *Dial Solutions Quick Configuration Guide (Cisco IOS Release 12.0)*
<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12supdoc/dsqcg3/index.htm>
- *Redundant Link Manager*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113aa/113aa_7/rlm_rel2.htm
- *Release Notes for Cisco Resource Pool Manager Server Release 1.0*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_soft/rpms/rpms_1-0/rpmsnote.htm
- *RPM Process—Cisco RPMS and SS7*
- *SS7 Continuity Testing for Network Access Servers*
http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113aa/113aa_5/cot.htm
- *SS7 Dial Solution System Integration*
http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/iosinfo/ios_mods/5420.htm

Supported Platforms

The following platforms support resource pool management in NAS stand-alone and external server scenarios for this Cisco IOS release:

- Cisco AS5200
- Cisco AS5300

Prerequisites

- For Cisco AS5200 and Cisco AS5300, Cisco IOS Release 12.0(4)X11 or later must be running on the NAS.
- A minimum of 64 MB must be available on the DMM cards.

Supported MIBs and RFCs

MIBs

- CALL-RESOURCE-POOL-MIB
- CISCO-VPDN-MANAGEMENT-MIB

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

None

Configuration Tasks

The following tasks must be done before configuring resource pool management:

- Verify the operation of the following features as described in the appropriate documentation listed in the Related Documents section:
 - Ensure AAA operation (if configured)
 - Ensure PPP operation
 - Ensure VPDN operation (if configured)

Do the following NAS configuration tasks for resource pool management:

- Enabling Resource Pool Management
- DNIS Groups (if configured)
- Discriminator Profiles (if configured)
- Resource Groups
- Service Profiles (if configured)
- Customer Profiles
- VPDN Profiles (if configured)

These tasks are detailed below.

Enabling Resource Pool Management

- With RPM disabled, the resource-groups still take effect (that is, modem pooling is still not possible).
- Local AAA is authorization *and* accounting for RPM.

```
Router # resource-pool {enable | disable}
Router # resource-pool call treatment profile {busy | no-answer}
Router # resource-pool call treatment resource {busy | channel-not-available}
Router # resource-pool aaa protocol local
```

Note If you have an RPMS, you do not need to define VPDN groups/profiles, customer profiles, or DNIS groups on the NAS—you only need to define resource groups. The rest of the configuration can be done using the RPMS system.

See the “Configuration Examples” section that follows.

DNIS Groups

- For default DNIS service, no DNIS group configuration is required.
- Each DNIS group/call type combination can apply to only one customer profile.
- Default DNIS groups can be used four times (one for each call-type).
- You must statically configure CAS call-types.
- You can use x, X or . as wildcards within each number.

```
Router # dialer dnis group {dnis-group-name}
Router # call-type cas {digital | speech}
Router # number number
```

See the “Configuration Examples” section that follows.

Discriminator Profiles

This enables you to discriminate based on call-type and DNIS combination; both must be explicitly specified.

```
Router # resource-pool profile discriminator WORD
Router # call-type {all | digital | speech | v110 | v120}
Router # dnis group {dnis-group-name | default}
```

See the “Configuration Examples” section that follows.

Resource Groups

Note For external Cisco RPMS environments, configure resource groups on the NAS before defining them on external RPMS servers. For standalone NAS environments, first configure resource groups before using them in customer profiles.

- Resource groups can apply to multiple customer profiles.
- You can separate the physical resources into groups.
- Do not mix MICA and Microcom modems.

```
Router # resource-pool group resource WORD
Router # range port s/p s/p
Router # range limit limit
```

See the “Configuration Examples” section that follows.

Service Profiles

- Services only apply to MICA modems (speech or V.110).
- Error-correction and compression are hidden options.

```
Router # resource-pool profile service WORD
Router # modem {min-speed {speed | any}} {max-speed {speed | any}} [modulation {k56flex
| v22bis | v32bis | v32terbo | v34 | v90 | any}] [error-correction {mnp4 | lapm | any |
none}] [compression {mnp5 | v42bis | any | none}]
```

See the “Configuration Examples” section that follows.

Customer Profiles

- Multiple resources of the same call type are used sequentially.
- The limits imposed are per customer (DNIS), not per resource.
- A digital resource with a call-type of speech allows for Data-Over-Speech-Bearer-Service (DOSBS).

```
Router # resource-pool profile customer WORD
Router # dnis group {dnis-group-name | default}
Router # limit base-size {number | all}
Router # limit overflow-size {number | all}
Router # resource WORD {digital | speech | v110 | v120} [service WORD]
```

See the “Configuration Examples” section that follows.

VPDN Profiles

- A VPDN profile is required only if you want to impose limits on the VPDN tunnel, separate from the customer limits.

```
Router # resource-pool profile customer WORD
Router # vpdn profile profile-name
Router # resource-pool profile vpdn profile-name
Router # limit base-size {number | all}
Router # limit overflow-size {number | all}
Router # vpdn group group-name
```

See the “Configuration Examples” section that follows.

VPDN Groups

- The *dnis-group-name* is required to authorize the VPDN-group with RPM.
- This data can optionally be on an AAA server.

```
Router # vpdn-group group-name
Router # request dialin {l2f | l2tp} ip A.B.C.D {dnis dnis-group-name | domain Word}
Router # multilink {link | bundle} number
Router # loadsharing ip A.B.C.D [limit number]
Router # backup ip A.B.C.D [limit number] [priority number]
```

See the “Configuration Examples” section that follows.

Configuration Examples

This section provides the following configuration examples:

- Sample Configuration for Resource Pool Management
- Sample VPDN Configuration
- VPDN Load Sharing and Backing Up Between Multiple HGW/LNSs
- Sample Customer Profile Configuration for Data Over Voice Bearer Service

Sample Configuration for Resource Pool Management

The following example configuration illustrates the general use of RPM. Digital calls to 301001 will be associated with the customer ACME using the resource group isdn-ports. Speech calls to 301001 will be associated with the customer ACME using the resource group MICA-modems, and will allow for V.90 connections (anything less than V.90 will also be allowed). Digital calls to 301005 will be denied. All other speech calls to any other DNIS number will be associated with the customer profile “DEFAULT” using the resource group MICA-modems, and will allow for V.34 connections (anything more than V.34 will not be allowed, anything less than V.34 will be allowed). All other digital calls to any other DNIS number will not be associated with a customer profile and will therefore not be allowed.

In this case the customer profile named “DEFAULT” serves as the default customer profile for speech calls only. If the solution uses an external RPMS server, this same configuration could be used for backup resource pooling if communication is lost between the NAS and RPMS.

```
resource-pool enable
resource-pool call treatment resource busy
resource-pool call treatment profile no-answer
```

```
!  
resource-pool group resource isdn-ports  
  range limit 46  
resource-pool group resource MICA-modems  
  range port 1/0 2/23  
!  
resource-pool profile customer ACME  
  limit base-size 30  
  limit overflow-size 10  
  resource isdn-ports digital  
  resource MICA-modems speech service gold  
  dnis group ACME_dnis_numbers  
!  
resource-pool profile customer DEFAULT  
  limit base-size 10  
  resource MICA-modems speech service silver  
  dnis group default  
  
resource-pool profile discriminator deny_DNIS  
  call-type digital  
  dnis group bye-bye  
!  
resource-pool profile service gold  
  modem min-speed 33200 max-speed 56000 modulation v90  
resource-pool profile service silver  
  modem min-speed 19200 max-speed 33200 modulation v34  
!  
resource-pool aaa protocol local  
!  
dialer dnis group ACME_dnis_numbers  
  number 301001  
dialer dnis group bye-bye  
  number 301005
```

Sample VPDN Configuration

In addition to the “Sample Configuration for Resource Pool Management” section above, adding the following commands will allow for VPDN operation using a VPDN profile and VPDN group. Note that if the limits imposed by the VPDN profile are not required, the VPDN profile need not be configured and the command **vpdn profile ACME_VPDN** under the customer profile ACME should be replaced with the command **vpdn group outgoing-2**.

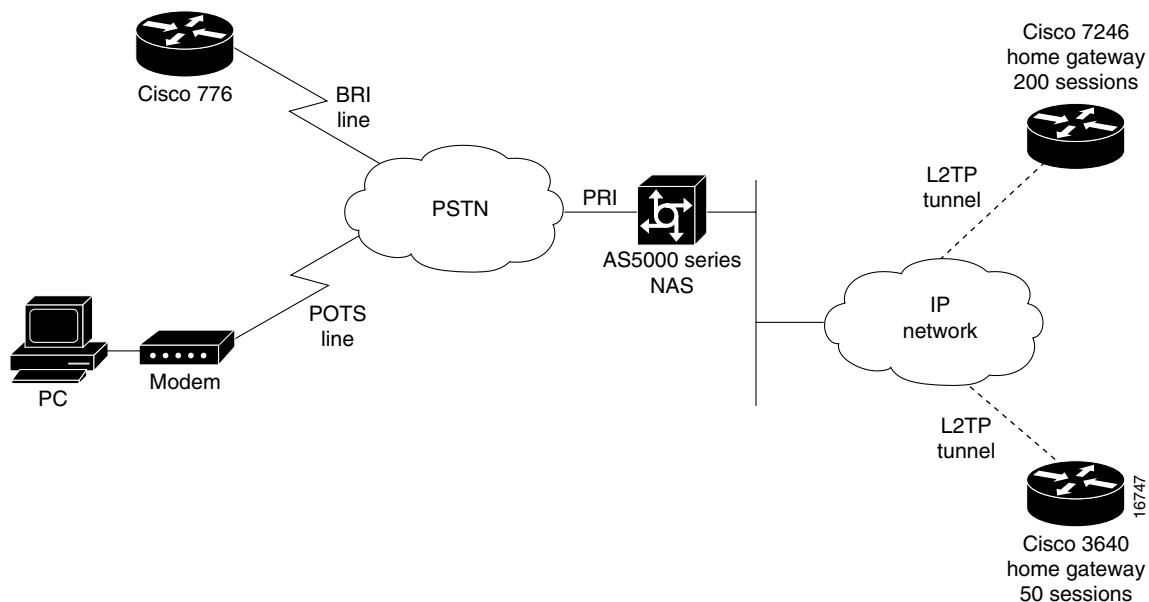
```
resource-pool profile vpdn ACME_VPDN
  limit base-size 6
  limit overflow-size 0
  vpdn group outgoing-2
!
resource-pool profile customer ACME
  limit base-size 30
  limit overflow-size 10
  resource isdn-ports digital
  resource MICA-modems speech service gold
  dnis group ACME_dnis_numbers
  vpdn profile ACME_VPDN

vpdn enable
!
vpdn-group outgoing-2
  request dialin 12f ip 172.16.1.9 dnis ACME_dnis_numbers
  local name HQ-NAS
  multilink bundle 1
  multilink link 2
  dnis ACME_dnis_numbers
!
dialer dnis group ACME_dnis_numbers
  number 301001
```

VPDN Load Sharing and Backing Up Between Multiple HGW/LNSs

The Cisco IOS software enables you to balance and backup VPDN sessions across multiple tunnel endpoints (HGW/LNS). When a user or session comes into the NAS/LAC, a VPDN load-balancing algorithm is triggered and applied to the call. The call is then passed to an available HGW/LNS. You can modify this function by limiting the number of sessions supported on a HGW/LNS router and limiting the number of MLP bundles and links.

Figure 7 shows an example of one NAS/LAC directing calls to two HGW/LNS routers by using the L2TP tunneling protocol. Each router has a different number of supported sessions and works at a different speed. The NAS/LAC is counting the number of active simultaneous sessions sent to each HGW/LNS.

Figure 7 Home Gateway Load Sharing and Backup

In a standalone NAS environment (no RPMS server used), the NAS has complete knowledge of the status of tunnel endpoints. Balancing across endpoints is done by a “least-filled tunnel” or a “next-available round robin” approach. In an RPMS-controlled environment, RPMS has the complete knowledge of tunnel endpoints. However, the NAS still has the control over those tunnel endpoints selected by RPMS.

A standalone NAS uses the following default search criteria for load-balancing traffic across multiple endpoints (HGW/LNS):

- 1 Select any idle endpoint—an HGW/LNS with no active sessions.
- 2 Select an active endpoint that currently has a tunnel established with the NAS.
- 3 If all specified load-sharing routers are busy, select the backup HGW.
If all endpoints are busy, report that it cannot find an IP address to establish the call.

Note This default search order criteria is independent of the Cisco Resource Pool Manager Server application scenario. A standalone NAS uses a different load-sharing algorithm than the Cisco Resource Pool Manager Server. This search criteria will change as future enhancements become available.

```

vpdn enable
!
vpdn-group outgoing-2
 request dialin l2tp ip 172.16.1.9 dnis ACME_dnis_numbers
 local name HQ-NAS
 loadsharing ip 172.16.1.9 limit 200
 loadsharing ip 172.16.2.17 limit 50
 backup ip 172.16.3.22

```

Sample Customer Profile Configuration for Data Over Voice Bearer Service

To allow ISDN calls with a speech bearer capability to be directed to digital resources, the following change is made to the configuration shown in the section, “Sample Configuration for Resource Pool Management”:

```
resource-pool profile customer ACME
  limit base-size 30
  limit overflow-size 10
  resource isdn-ports digital
  resource isdn-ports speech
  dnis group ACME_dnis_numbers
```

This change causes ISDN speech calls (in addition to ISDN digital calls) to be directed to the resource “isdn-ports”, thus providing Data Over Voice Bearer Service.

Verification

The following commands are available for providing call counter and call detail output for the different RPM components. An example for each command follows.

- **show resource-pool call**
- **show resource-pool customer** *WORD*
- **show resource-pool discriminator** *WORD*
- **show resource-pool resource** *WORD*
- **show dialer dnis** {*group* | *number*}*WORD*
- **show resource-pool vpdn** {*group* | *profile*} *WORD*
- **clear resource-pool** {*customer* | *discriminator* | *resource*} {*WORD* | *all*}

show resource-pool call

This command provides the details for all current calls, including the customer profile and resource group being used and the matched DNIS group.

```
Router # show resource-pool call
Shelf 0, slot 0, port 0, channel 15, state RM_RPM_RES_ALLOCATED
  Customer profile ACME, resource group isdn-ports
  DNIS number 301001
Shelf 0, slot 0, port 0, channel 14, state RM_RPM_RES_ALLOCATED
  Customer profile ACME, resource group isdn-ports
  DNIS number 301001
Shelf 0, slot 0, port 0, channel 11, state RM_RPM_RES_ALLOCATED
  Customer profile ACME, resource group MICA-modems
  DNIS number 301001
```

show resource-pool customer

This command provides the call counters for a given customer profile. These counters include historical data and can be cleared.

```
Router # show resource-pool customer ACME
  3 active connections
  41 calls accepted
```

```

3 max number of simultaneous connections
11 calls rejected due to profile limits
2 calls rejected due to resource unavailable
0 minutes spent with max connections
5 overflow connections
1 overflow states entered
11 overflow connections rejected
10 minutes spent in overflow
214 minutes since last clear command

```

show resource-pool discriminator

This command provides the call counters for a given discriminator profile. These counters include historical data and can be cleared.

```

Router # show resource-pool discriminator
List of Call Discriminator Profiles:
  deny_DNIS
Router # show resource-pool discriminator deny_DNIS
  1 calls rejected

```

show resource-pool resource

This command provides the call counters for a given resource group. These counters include historical data and can be cleared.

```

Router # show resource-pool resource
List of Resources:
  isdn-ports
  MICA-modems

Router # show resource-pool resource isdn-ports
46 resources in the resource group
2 resources currently active
8 calls accepted in the resource group
2 calls rejected due to resource unavailable
0 calls rejected due to resource allocation errors

```

show dialer dnis

This command provides the call counters for a given DNIS group. These counters include historical data and can be cleared.

```

Router # show dialer dnis group ACME_dnis_numbers
DNIS Number:301001
  11 total connections
  5 peak connections
  0 calltype mismatches

```

show resource-pool vpdn

This command provides the call counters for a given VPDN profile or the tunnel information for a given VPDN group. These counters include historical data and can be cleared.

```

Router # show resource-pool vpdn profile ACME_VPDN
  2 active connections
  2 max number of simultaneous connections
  0 calls rejected due to profile limits
  0 calls rejected due to resource unavailable

```

```

0 overflow connections
0 overflow states entered
0 overflow connections rejected
215 minutes since last clear command

```

```

Router # show resource-pool vpdn group outgoing-2
VPDN Group outgoing-2 found under VPDN Profiles: ACME_VPDN

```

```

Tunnel (L2F)
-----
dnis:301001
dnis:ACME_dnis_numbers

```

Endpoint	Session Limit	Priority	Active Sessions	Status	Reserved Sessions
172.16.1.9	*	1	2	OK	-
Total	*		2		0

clear resource-pool

This command clears the call counters.

Troubleshooting

ISDN, CAS, SS7, PPP, AAA, and VPDN should be tested and verified before RPM is implemented. Once RPM is implemented, the only commands needed for troubleshooting RPM are:

- **debug resource-pool**
- **debug aaa authorization**

The **debug resource-pool** command is useful as a first step to ensure proper operation. It is usually sufficient for most cases. The **debug aaa authorization** command can be useful for troubleshooting a few VPDN and modem service problems.

What problems might typically occur?

- No DNIS group found or no customer profile uses a default DNIS
- Call discriminator blocks the DNIS
- Customer profile limits exceeded
- Resource group limits exceeded

Successful Resource Pool Connection

The following sample output of **debug resource-pool** shows a successful RPM connection. The bold entries are of particular importance. Also, always enable the debug and log timestamps when troubleshooting RPM.

```

*Mar 1 02:14:57.439: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:21
*Mar 1 02:14:57.439: RM: event incoming call
*Mar 1 02:14:57.443: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST DS0:0:0:0:21
*Mar 1 02:14:57.447: RM:RPM event incoming call
*Mar 1 02:14:57.459: RPM profile ACME found
*Mar 1 02:14:57.487: RM state:RM_RPM_RES_AUTHOR event:RM_RPM_RES_AUTHOR_SUCCESS
DS0:0:0:0:21
*Mar 1 02:14:57.487: Allocated resource from res_group isdn-ports

```

```
*Mar 1 02:14:57.491: RM:RPM profile "ACME", allocated resource "isdn-ports"
successfully
*Mar 1 02:14:57.495: RM state:RM_RPM_RES_ALLOCATING event:RM_RPM_RES_ALLOC_SUCCESS
DS0:0:0:0:21
*Mar 1 02:14:57.603: %LINK-3-UPDOWN: Interface Serial0:21, changed state to up
*Mar 1 02:15:00.879: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0:21,
changed state to up
```

Troubleshooting DNIS Group Problems

The following example output of **debug resource-pool** shows when a customer profile is not found for a particular DNIS group.

```
*Mar 1 00:38:21.011: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:3
*Mar 1 00:38:21.011: RM: event incoming call
*Mar 1 00:38:21.015: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST DS0:0:0:0:3
*Mar 1 00:38:21.019: RM:RPM event incoming call
*Mar 1 00:38:21.103: RPM no profile found for call-type digital in default DNIS number
*Mar 1 00:38:21.155: RM:RPM profile rejected do not allocate resource
*Mar 1 00:38:21.155: RM state:RM_RPM_RES_AUTHOR event:RM_RPM_RES_AUTHOR_FAIL
DS0:0:0:0:3
*Mar 1 00:38:21.163: RM state:RM_RPM_DISCONNECTING event:RM_RPM_DISC_ACK DS0:0:0:0:3
```

Troubleshooting Call Discriminator Problem

The following example output of **debug resource-pool** shows when an incoming call is matched against a call discriminator profile.

```
*Mar 1 00:35:25.995: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:4
*Mar 1 00:35:25.999: RM: event incoming call
*Mar 1 00:35:25.999: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST DS0:0:0:0:4
*Mar 1 00:35:26.003: RM:RPM event incoming call
*Mar 1 00:35:26.135: RM:RPM profile rejected do not allocate resource
*Mar 1 00:35:26.139: RM state:RM_RPM_RES_AUTHOR event:RM_RPM_RES_AUTHOR_FAIL
DS0:0:0:0:4
*Mar 1 00:35:26.143: RM state:RM_RPM_DISCONNECTING event:RM_RPM_DISC_ACK DS0:0:0:0:4
```

Troubleshooting Customer Profile Counts

The following example output of **debug resource-pool** shows what happens once a customer profile's limits have been reached.

```
*Mar 1 00:43:33.275: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:9
*Mar 1 00:43:33.279: RM: event incoming call
*Mar 1 00:43:33.279: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST DS0:0:0:0:9
*Mar 1 00:43:33.283: RM:RPM event incoming call
*Mar 1 00:43:33.295: RPM count exceeded in profile ACME
*Mar 1 00:43:33.315: RM:RPM profile rejected do not allocate resource
*Mar 1 00:43:33.315: RM state:RM_RPM_RES_AUTHOR event:RM_RPM_RES_AUTHOR_FAIL
DS0:0:0:0:9
*Mar 1 00:43:33.323: RM state:RM_RPM_DISCONNECTING event:RM_RPM_DISC_ACK DS0:0:0:0:9
```

Troubleshooting Resource Group Counts

The following example output of **debug resource-pool** shows the resources within a resource group all in use.

```
*Mar 1 00:52:34.411: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:19
*Mar 1 00:52:34.411: RM: event incoming call
```

```
*Mar 1 00:52:34.415: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST DS0:0:0:0:19
*Mar 1 00:52:34.419: RM:RPM event incoming call
*Mar 1 00:52:34.431: RPM profile ACME found
*Mar 1 00:52:34.455: RM state:RM_RPM_RES_AUTHOR event:RM_RPM_RES_AUTHOR_SUCCESS
DS0:0:0:0:19
*Mar 1 00:52:34.459: All resources in res_group isdn-ports are in use
*Mar 1 00:52:34.463: RM state:RM_RPM_RES_ALLOCATING event:RM_RPM_RES_ALLOC_FAIL
DS0:0:0:0:19
*Mar 1 00:52:34.467: RM:RPM failed to allocate resources for "ACME"
```

Troubleshooting VPDN

What problems might typically occur?

- Customer profile isn't associated with a VPDN profile or VPDN group (the call will be locally terminated in this case. Regular VPDN can still succeed even if RPM/VPDN fails).
- VPDN profile limits have been reached (call answered but disconnected)
- VPDN group limits have been reached (call answered but disconnected)
- VPDN end point is not reachable (call answered but disconnected)

Troubleshooting VPDN—Success

The following sample output of **debug resource-pool** shows a successful RPM/VPDN connection. The bold entries are of particular importance. Also, always enable the debug and log timestamps when troubleshooting RPM.

```
*Mar 1 00:15:53.639: Se0:10 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 00:15:53.655: RM/VPDN/ACME_VPDN: VP LIMIT/ACTIVE/RESERVED/OVERFLOW are now
6/0/0/0
*Mar 1 00:15:53.659: RM/VPDN/ACME_VPDN: Session reserved for outgoing-2
*Mar 1 00:15:53.695: Se0:10 RM/VPDN: Session has been authorized using
dnis:ACME_dnis_numbers
*Mar 1 00:15:53.695: Se0:10 RM/VPDN/session-reply: NAS name HQ-NAS
*Mar 1 00:15:53.699: Se0:10 RM/VPDN/session-reply: Endpoint addresses 172.16.1.9
*Mar 1 00:15:53.703: Se0:10 RM/VPDN/session-reply: VPDN tunnel protocol 12f
*Mar 1 00:15:53.703: Se0:10 RM/VPDN/session-reply: VPDN Group outgoing-2
*Mar 1 00:15:53.707: Se0:10 RM/VPDN/session-reply: VPDN domain dnis:ACME_dnis_numbers
*Mar 1 00:15:53.767: RM/VPDN: MLP Bundle SOHO Session Connect with 1 Endpoints:
*Mar 1 00:15:53.771: IP 172.16.1.9 OK
*Mar 1 00:15:53.771: RM/VPDN/rm-session-connect/ACME_VPDN: VP
LIMIT/ACTIVE/RESERVED/OVERFLOW are now 6/1/0/0
*Mar 1 00:15:54.815: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0:10,
changed state to up
*Mar 1 00:15:57.399: %ISDN-6-CONNECT: Interface Serial0:10 is now connected to SOHO
```

Troubleshooting Customer/VPDN Profile

The following sample output of **debug resource-pool** shows a successful RPM/VPDN connection. The bold entries are of particular importance. Also, always enable the debug and log timestamps when troubleshooting RPM.

```
*Mar 1 03:40:16.483: Se0:15 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 03:40:16.515: Se0:15 RM/VPDN/rm-session-request: Authorization failed
*Mar 1 03:40:16.527: %VPDN-6-AUTHORERR: L2F NAS HQ-NAS cannot locate a AAA server for
Se0:15 user SOHO
*Mar 1 03:40:16.579: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
```

```

*Mar 1 03:40:17.539: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0:15,
changed state to up
*Mar 1 03:40:17.615: %LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1,
changed state to up
*Mar 1 03:40:19.483: %ISDN-6-CONNECT: Interface Serial0:15 is now connected to SOHO
*Mar 1 04:03:49.846: Se0:19 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 04:03:49.854: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997):
Port='DS0:0:0:19' list='default' service=RM
*Mar 1 04:03:49.858: AAA/AUTHOR/RM vpdn-session: Se0:19 (3912941997) user='301001'
*Mar 1 04:03:49.862: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
service=resource-management
*Mar 1 04:03:49.866: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
protocol=vpdn-session
*Mar 1 04:03:49.866: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
rm-protocol-version=1.0
*Mar 1 04:03:49.870: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
rm-nas-state=3278356
*Mar 1 04:03:49.874: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
rm-call-handle=27
*Mar 1 04:03:49.878: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): send AV
multilink-id=SOHO
*Mar 1 04:03:49.878: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): found list
"default"
*Mar 1 04:03:49.882: Se0:19 AAA/AUTHOR/RM vpdn-session (3912941997): Method=LOCAL
*Mar 1 04:03:49.886: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
service=resource-management
*Mar 1 04:03:49.890: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
protocol=vpdn-session
*Mar 1 04:03:49.890: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
rm-protocol-version=1.0
*Mar 1 04:03:49.894: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
rm-nas-state=3278356
*Mar 1 04:03:49.898: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
rm-call-handle=27
*Mar 1 04:03:49.902: Se0:19 AAA/AUTHOR/RM/local (3912941997): Received AV
multilink-id=SOHO
*Mar 1 04:03:49.906: Se0:19 AAA/AUTHOR/VPDN/RM/LOCAL: Customer ACME has no VPDN group
for session dnis:ACME_dnis_numbers
*Mar 1 04:03:49.922: Se0:19 AAA/AUTHOR (3912941997): Post authorization status = FAIL

```

Troubleshooting VPDN Profile Limits

The following example output of **debug resource-pool** shows VPDN profile limits have been reached.

```

*Mar 1 04:57:53.762: Se0:13 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 04:57:53.774: RM/VPDN/ACME_VPDN: VP LIMIT/ACTIVE/RESERVED/OVERFLOW are now
0/0/0/0
*Mar 1 04:57:53.778: RM/VPDN/ACME_VPDN: Session outgoing-2 rejected due to Session
Limit
*Mar 1 04:57:53.798: Se0:13 RM/VPDN/rm-session-request: Authorization failed
*Mar 1 04:57:53.802: %VPDN-6-AUTHORFAIL: L2F NAS HQ-NAS, AAA authorization failure for
Se0:13 user SOHO; At Session Max
*Mar 1 04:57:53.866: %ISDN-6-DISCONNECT: Interface Serial0:13 disconnected from
SOHO, call lasted 2 seconds
*Mar 1 04:57:54.014: %LINK-3-UPDOWN: Interface Serial0:13, changed state to down
*Mar 1 04:57:54.050: RM state:RM_RPM_RES_ALLOCATED event:DIALER_DISCON DS0:0:0:13
*Mar 1 04:57:54.054: RM:RPM event call drop
*Mar 1 04:57:54.054: Deallocated resource from res_group isdn-ports

```

Troubleshooting VPDN Group Limits

The following example output of **debug resource-pool** shows VPDN group limits have been reached. From this output, it is not readily obvious what the problem could be, and **debug aaa authorization**, described in the section, “Troubleshooting debug aaa authorization“, should be enabled to troubleshoot further.

```
*Mar 1 05:02:22.314: Se0:17 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 05:02:22.334: RM/VPDN/ACME_VPDN: VP LIMIT/ACTIVE/RESERVED/OVERFLOW are now
5/0/0/0
*Mar 1 05:02:22.334: RM/VPDN/ACME_VPDN: Session reserved for outgoing-2
*Mar 1 05:02:22.358: Se0:17 RM/VPDN/rm-session-request: Authorization failed
*Mar 1 05:02:22.362: %VPDN-6-AUTHORFAIL: L2F NAS HQ-NAS, AAA authorization failure for
Se0:17 user SOHO; At Multilink Bundle Limit
*Mar 1 05:02:22.374: %ISDN-6-DISCONNECT: Interface Serial0:17 disconnected from
SOHO, call lasted 2 seconds
*Mar 1 05:02:22.534: %LINK-3-UPDOWN: Interface Serial0:17, changed state to down
*Mar 1 05:02:22.570: RM state:RM_RPM_RES_ALLOCATED event:DIALER_DISCON DS0:0:0:0:17
*Mar 1 05:02:22.574: RM:RPM event call drop
*Mar 1 05:02:22.574: Deallocated resource from res_group isdn-ports
```

Troubleshooting VPDN Endpoint Problems

The following example output of **debug resource-pool** shows the IP endpoint for the VPDN group is not reachable.

```
*Mar 1 05:12:22.330: Se0:21 RM/VPDN/rm-session-request: Allocated vpdn info for domain
NULL MLP Bundle SOHO
*Mar 1 05:12:22.346: RM/VPDN/ACME_VPDN: VP LIMIT/ACTIVE/RESERVED/OVERFLOW are now
5/0/0/0
*Mar 1 05:12:22.350: RM/VPDN/ACME_VPDN: Session reserved for outgoing-2
*Mar 1 05:12:22.382: Se0:21 RM/VPDN: Session has been authorized using
dnis:ACME_dnis_numbers
*Mar 1 05:12:22.386: Se0:21 RM/VPDN/session-reply: NAS name HQ-NAS
*Mar 1 05:12:22.386: Se0:21 RM/VPDN/session-reply: Endpoint addresses 172.16.1.99
*Mar 1 05:12:22.390: Se0:21 RM/VPDN/session-reply: VPDN tunnel protocol l2f
*Mar 1 05:12:22.390: Se0:21 RM/VPDN/session-reply: VPDN Group outgoing-2
*Mar 1 05:12:22.394: Se0:21 RM/VPDN/session-reply: VPDN domain dnis:ACME_dnis_numbers
*Mar 1 05:12:25.762: %ISDN-6-CONNECT: Interface Serial0:21 is now connected to SOHO
*Mar 1 05:12:27.562: %VPDN-5-UNREACH: L2F HGW 172.16.1.99 is unreachable
*Mar 1 05:12:27.578: RM/VPDN: MLP Bundle SOHO Session Connect with 1 Endpoints:
*Mar 1 05:12:27.582: IP 172.16.1.99 Destination unreachable
```

Troubleshooting debug aaa authorization

In general, **debug aaa authorization** is not required for RPM troubleshooting—unless **debug resource-pool** is too vague.

Typically, **debug aaa authorization** is more useful for troubleshooting with RPMS.

```
Router # debug aaa authorization
AAA Authorization debugging is on
Router # show debug
General OS:
  AAA Authorization debugging is on
Resource Pool:
  resource-pool general debugging is on
```

The following example output of **debug resource-pool** and **debug aaa authorization** shows a successful RPM connection.

```

*Mar 1 06:10:35.450: AAA/MEMORY: create_user (0x723D24) user='301001'
ruser='port='DS0:0:0:0:12' rem_addr='102' authen_type=NONE service=NONE priv=0
*Mar 1 06:10:35.462: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907):
Port='DS0:0:0:0:12' list='default' service=RM
*Mar 1 06:10:35.466: AAA/AUTHOR/RM call-accept: DS0:0:0:0:12 (2784758907) user=
'301001'
*Mar 1 06:10:35.470: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
service=resource-management
*Mar 1 06:10:35.470: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
protocol=call-accept
*Mar 1 06:10:35.474: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
rm-protocol-version=1.0
*Mar 1 06:10:35.478: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
rm-nas-state=7513368
*Mar 1 06:10:35.482: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
rm-call-type=speech
*Mar 1 06:10:35.486: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
rm-request-type=dial-in
*Mar 1 06:10:35.486: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): send AV
rm-link-type=isdn
*Mar 1 06:10:35.490: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): found list
"default"
*Mar 1 06:10:35.494: DS0:0:0:0:12 AAA/AUTHOR/RM call-accept (2784758907): Method=LOCAL
*Mar 1 06:10:35.498: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received
DNIS=301001
*Mar 1 06:10:35.498: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received CLID=102
*Mar 1 06:10:35.502: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received
Port=DS0:0:0:0:12
*Mar 1 06:10:35.506: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
service=resource-management
*Mar 1 06:10:35.510: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
protocol=call-accept
*Mar 1 06:10:35.510: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
rm-protocol-version=1.0
*Mar 1 06:10:35.514: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
rm-nas-state=7513368
*Mar 1 06:10:35.518: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
rm-call-type=speech
*Mar 1 06:10:35.522: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
rm-request-type=dial-in
*Mar 1 06:10:35.526: DS0:0:0:0:12 AAA/AUTHOR/RM/local (2784758907): Received AV
rm-link-type=isdn
*Mar 1 06:10:35.542: AAA/AUTHOR (2784758907): Post authorization status = PASS_REPL
*Mar 1 06:10:35.546: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV service=resource-management
*Mar 1 06:10:35.550: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV protocol=call-accept
*Mar 1 06:10:35.554: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-protocol-version=1.0
*Mar 1 06:10:35.558: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-response-code=overflow
*Mar 1 06:10:35.558: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-call-handle=47
*Mar 1 06:10:35.562: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-call-count=2
*Mar 1 06:10:35.566: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-cp-name=ACME
*Mar 1 06:10:35.570: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-rg-name#0=MICA-modems
*Mar 1 06:10:35.574: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-rg-service-name#0=gold
*Mar 1 06:10:35.578: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-call-treatment=busy
*Mar 1 06:10:35.582: DS0:0:0:0:12 AAA/AUTHOR/RM/call-accept (2784758907): Processing
AV rm-call-type=speech

```

Command Reference

This section documents the new or modified commands for the resource pool management feature. All other commands are documented in the *Cisco IOS Release 12.0 Command Reference*.

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backup

To configure an IP backup endpoint address, enter the **backup** VPDN group configuration command. To remove this function, use the **no** form of this command.

```
backup ip ip-address [limit number [priority number]]
no backup ip ip-address [limit number [priority number]]
```

Syntax Description

ip <i>ip-address</i>	IP address of the HGW/LNS at the other end of the tunnel. This is the IP endpoint at the end of the tunnel, which is an HGW/LNS router.
limit <i>number</i>	(Optional) Limits sessions per backup. The limit can range from 0 to 32767. The default is no limit set.
priority <i>number</i>	(Optional) Priority level. Loadsharing is priority 1. Backup priority is between 2 and 32,767. The highest priority is 2, which is the first home gateway router to receive backup traffic. The lowest priority is 32,767. The priority group is used to support multiple levels of loadsharing and backup. The default is the lowest priority.

Default

No default behavior or values. This function will be used only if it is configured.

Command Mode

VPDN group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced in Cisco IOS Release 12.0(4)XI1 and applies to Cisco AS5200s and Cisco AS5300s only.

Usage Guidelines

Use the **backup** VPDN group configuration command to configure an IP backup endpoint address.

Example

The following example shows that the **backup** command is not available in the command line interface until you enter the **request dialin** command.

```
Router(config)# vpdn-group customer1-vpdngroup
Router(config-vpdn)# ?
VPDN group configuration commands:
  accept  Accept a tunnel open request
  default Set a command to its defaults
  exit    Exit from VPDN group configuration mode
  no      Negate a command or set its defaults
  request Request to open a tunnel

Router(config-vpdn)# request dialin l2tp ip 10.2.2.2 domain customerx
Router(config-vpdn)# ?
VPDN group configuration commands:
  backup      Add backup address
  default     Set a command to its defaults
  dnis        Accept a DNIS tunnel
  domain      Accept a domain tunnel
  exit        Exit from VPDN group configuration mode
  force-local-chap Force a CHAP challenge to be instigated locally
  l2tp        L2TP specific commands
  lcp         LCP specific commands
  loadsharing Add loadsharing address
  local       local information, like name
  multilink   Configure limits for Multilink
  no          Negate a command or set its defaults
  request     Request to open a tunnel

Router(config-vpdn)# backup ip 10.1.1.1 limit 5
```

Related Commands

Command	Description
request dialin	Specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

call progress tone

To specify the country code for retrieving the call progress tone parameters from the call progress tone database, use the **call progress tone** configuration mode command. To cancel the previous setting and to generate the call progress tones according to modem settings, use the **no** version of this command.

call progress tone *country*
no call progress tone *country*

Syntax Description

country Selects default call progress tones (ring and cadence settings) for the specified country.

Valid entries are: **argentina, australia, austria, belgium, brazil, canada, china, colombia, cyprus, czech-republic, denmark, finland, france, germany, greece, hongkong, hungary, iceland, india, indonesia, ireland, israel, italy, japan, korea, luxembourg, malaysia, mexico, netherlands, peru, philippines, poland, portugal, russia, singapore, slovakia, slovenia, south-africa, spain, sweden, switzerland, taiwan, thailand, turkey, unitedkingdom, usa, and venezuela.**

For compliance with the ISO 3166 country name standards, which use a two-letter code to represent a country, use the entries shown in Table 5.

Table 5 Call Progress Tone Command Entries

Command Entry	Country
ar	Argentina
au	Australia
at	Austria
be	Belgium
br	Brazil
ca	Canada
cn	China
co	Colombia
cy	Cyprus
cz	Czech Republic
dk	Denmark
fi	Finland
fr	France
de	Germany
gr	Greece
hk	Hong Kong
hu	Hungary

Command Entry	Country
is	Iceland
in	India
id	Indonesia
ie	Ireland
il	Israel
it	Italy
jp	Japan
kr	Korea Republic
lu	Luxembourg
my	Malaysia
mx	Mexico
nl	Netherlands
pe	Peru
ph	Philippines
pl	Poland
pt	Portugal
ru	Russian Federation
sg	Singapore
sk	Slovakia
si	Slovenia
za	South Africa
es	Spain
se	Sweden
ch	Switzerland
tw	Taiwan
th	Thailand
tr	Turkey
uk	United Kingdom
usa	United States
ve	Venezuela

Default

Modem default settings. (Generally *northamerica* for Cisco IOS Release versions before 12.0(3)XG; *us* for 12.0(3)XG and higher.)

Command Mode

Configuration mode.

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **call progress tone** configuration command to specify the country for call progress tone generation. While in many cases the country will be chosen automatically based on the modem setting, it won't work for all users because many modems do not support all countries and many users will choose the "us" or "default-t1" or "default-e1" setting on their modem.

This command affects the tones generated at the local interface. It does not affect any information passed to the remote end of a connection or any tones generated at the remote end of a connection.

For dial platforms (AS5200 and AS5300), call progress tones are used only for the resource pool management application. Resource pool management assumes that the call progress tone selection is global—only one call progress tone set should be selected for the whole box and it will globally override country settings on all ports.

Example

```
Router (config) # call progress tone country japan  
Router (config) # exit
```

If you enter show run, the display will show:

```
Router (config) # show run  
call progress tone country japan
```

Related Commands

Command	Description
show call progress	Displays the contents of the internal call progress tone database.

call-type

To reject particular types of calls, enter the **call-type** call discriminator command. Enter the **no** form of this command to disable this feature.

```
call-type {all | digital | speech | v110 | v120}
no call-type {all | digital | speech | v110 | v120}
```

Syntax Description

all	Rejects all calls.
digital	Rejects digital calls.
speech	Rejects speech calls.
v110	Rejects V.110 calls.
v120	Rejects V.120 calls.

Default

All calls are accepted by the network access server.

Command Mode

Call discriminator profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **call-type** call discriminator command to reject particular types of calls. Call type “all” is mutually exclusive for all other call types. If call type “all” is set in a discriminator, no other call types are allowed in the discriminator. Also, once a DNIS is associated with a call type in a discriminator, it cannot be used in any other discriminator.

Example

```
Router (config-call-discrim)# call-type ?
  all      Reject all calls
  digital  Reject digital calls
  speech   Reject speech calls
  v110     Reject V.110 calls
  v120     Reject V.120 calls
```

Related Commands

None

call-type cas

To statically set the call-type override for incoming CAS calls, enter the **call-type cas** DNIS group configuration command. Enter the **no** form of this command to disable this service.

```
call-type cas {digital | speech}
no call-type cas {digital | speech}
```

Syntax Description

digital	Override call-type to digital. The incoming call with the DNIS in the called group is treated as a digital call type.
speech	Override call-type to speech. The incoming call with the DNIS in the called group is treated as a speech call type.

Default

None.

Command Mode

DNIS group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **call-type cas** DNIS group configuration command to set the call-type override. From the resource pooling call-type perspective, use CT1 (CAS) to support either analog calls (speech) or digital calls (switched 56K). Switched 56K calls are digital calls that connect to HDLC framers. Unlike ISDN, it is impossible to communicate the call type in CT1. Therefore, switched 56K services in CT1 can be differentiated by the DNIS numbers. This command identifies that the call arriving with the DNIS in the DNIS group is assigned to the call type specified in the command.

Example

```
Router(config)# dialer dnis group modem-group1
Router(config-called-group)# call-type cas ?
  digital  Override call-type to digital
  speech  Override call-type to speech
```

Related Commands

None

clear dialer dnis

To reset the counter statistics associated with a specific DNIS group or number, enter the **clear dialer dnis** EXEC command. There is no **no** form of this command.

```
clear dialer dnis {group name | number number}
```

Syntax Description

group <i>name</i>	Clears dialer DNIS group statistics.
number <i>number</i>	Clears dialer DNIS number statistics.

Default

None.

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **clear dialer dnis** EXEC command to reset the counter statistics associated with a specific DNIS group or number. This command clears the counters for a DNIS group to reset the counter statistics associated with a specific DNIS group or number. If an ISP were charging a customer for the number of calls to a DNIS, it could clear the number after a week or month by using this command.

Example

```
Router# show dialer dnis group dg1
DNIS Number:71028
  4 total connections
  3 peak connections
  1 calltype mismatches
DNIS Number:4156266541
  8 total connections
  5 peak connections
  0 calltype mismatches
DNIS Number:4085541628
  3 total connections
  2 peak connections
  0 calltype mismatches
DNIS Number:71017
  2 total connections
  1 peak connections
  0 calltype mismatches
```

```
Router# clear dialer dnis group dg1
```

```
Router# show dialer dnis group dg1
DNIS Number:71028
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:4156266541
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:4085541628
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:71017
  0 total connections
  0 peak connections
  0 calltype mismatches
```

Related Commands

Command	Description
show dialer dnis	Displays how many calls a specific DNIS group has had.

clear resource-pool

To reset the counter statistics associated with a specific customer profile, call discriminator, or physical resource, enter the **clear resource-pool** privileged EXEC command.

```
clear resource-pool { customer | discriminator | resource } { name | all }
```

Syntax Description

customer	Clears a customer profile.
discriminator	Clears a call discriminator.
resource	Clears a physical resource. Checks the counters maintained for resource groups.
<i>name</i>	Clears a specific customer profile, discriminator, or physical resource in the access server.
all	Clears all customer profiles, discriminators, or physical resources in the access server.

Default

None.

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **clear resource-pool** privileged EXEC command to reset the counter statistics associated with a specific customer profile, call discriminator, or physical resource.

Example

```
Router# clear resource-pool customer ?
  WORD  Customer profile name
  all   Clear all customer profiles

Router# clear resource-pool customer customer_isp
Router#
```

Related Commands

Command	Description
show resource-pool customer	Displays the contents of one or more customer profiles.
show resource-pool resource	Displays the resource groups set up in the access server.
show resource-pool call	Displays all active call information for all customer profiles and resource groups.

dialer dnis group

To create a DNIS group, enter the **dialer dnis group** global configuration command. Enter the **no** form of this command to remove a specific DNIS group from the running configuration.

```
dialer dnis group name
no dialer dnis group name
```

Syntax Description

name Assigns a name to the DNIS group number.

Default

A dialer DNIS group named *default*.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **dialer dnis group** global configuration command to create a DNIS group. This command enables you to create and populate a DNIS group, which is then added to a profile (customer or discriminator) using the **dnis group** command within that profile's configuration mode.

Example

```
Router(config)# dialer dnis group modem-group1
Router(config-dnis-group)# ?
Dialer Called Configuration Commands:
  call-type  set call-type override
  default    Set a command to its defaults
  exit       Exit from dialer configuration mode
  help       Description of the interactive help system
  no         Negate a command or set its defaults
  number     Enter number in dnis group
```

The following example creates a customer profile called `isp_1`, associates a DNIS group called `dnis_isp_1` with the customer profile, and assigns DNIS numbers 1234 and 5678 to the DNIS group. Only DNIS numbers 1234 and 5678 are allocated physical resources by the `isp_1` customer profile, which counts and manages the resources for these two DNIS numbers and ignores all other DNIS numbers.

```
Router(config)# resource-pool profile customer isp_1
Router(config-customer-pro)# dnis group dnis_isp_1
Router(config-customer-pro)# exit
Router(config)# dialer dnis group dnis_isp_1
Router(config-called-group)# number 1234
Router(config-called-group)# number 5678
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.
dnis group	Includes a group of DNIS numbers in a customer profile.

dnis

To support additional DNIS for a specific VPDN tunnel, use the **dnis** VPDN group configuration command. To remove a DNIS from a VPDN group, use the **no** form of this command.

Note When resource pool management is enabled, this command uses the keyword designator *dnis-group-name*. When resource pool management is disabled, this command uses the keyword designator *dnis-number*.

dnis *dnis-group-name*
no dnis *dnis-group-name*

Syntax Description

<i>dnis-group-name</i>	DNIS group name—If resource pool management is enabled and the VPDN group is configured under the incoming customer profile <i>dnis-group-name</i> is used.
<i>dnis-number</i>	DNIS group number—If resource pool management is disabled, the <i>dnis-number</i> is used. Or, if a call is associated with a customer profile without any VPDN group configured for the customer profile, <i>dnis-number</i> is used.

Default

Disabled.

Command Mode

VPDN group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **dnis** VPDN group configuration command to support additional DNIS for a specific VPDN tunnel. The **dnis** command is available in the command line interface after you enter the **request dialin** command for the first time. DNIS allows a VPDN tunnel to be authorized using the DNIS number or DNIS group name.

Note Configure the **vpdn group** command with the **request dialin** command to enable VPDN. The requestor initiates a dial-in tunnel. The acceptor accepts a request for a dial-in tunnel.

Example

The following example tunnels multiple DNISs to one HGW/LNS router at 10.1.1.1. Note that the **dnis** command does not display in the command line interface until you enter the **request dialin** command.

```

Router(config)# vpdn-group california_users
Router(config-vpdn)# ?
VPDN group configuration commands:
  accept  Accept a tunnel open request
  default  Set a command to its defaults
  exit    Exit from VPDN group configuration mode
  no      Negate a command or set its defaults
  request Request to open a tunnel

Router(config-vpdn)# request dialin l2tp ip 10.1.1.1 dnis 1234
Router(config-vpdn)# ?
VPDN group configuration commands:
  backup      Add backup address
  default     Set a command to its defaults
  dnis       Accept a DNIS tunnel
  domain     Accept a domain tunnel
  exit       Exit from VPDN group configuration mode
  force-local-chap Force a CHAP challenge to be instigated locally
  l2tp       L2TP specific commands
  lcp        LCP specific commands
  loadsharing Add loadsharing address
  local      local information, like name
  multilink  Configure limits for Multilink
  no         Negate a command or set its defaults
  request    Request to open a tunnel

Router(config-vpdn)# dnis 5678
Router(config-vpdn)# dnis 9101
Router(config-vpdn)# dnis 1121
Router(config-vpdn)# ^Z

```

Related Commands

Command	Description
request dialin	Specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

dnis group

To include a group of DNIS numbers in a customer profile, enter the **dnis group** customer profile configuration command. Use the **no** form of this command to remove a DNIS group from a customer profile.

```
dnis group { default | name name }
no dnis group { default | name name }
```

Syntax Description

default	Allows a specified customer profile to accept all DNIS numbers coming into the access server. For example, a stray DNIS number not listed in any customer profile passes through this default DNIS group. Most customer profiles do not have this option configured.
name	Assigns a name to a DNIS group.
<i>name</i>	The name can have up to 23 characters.

Default

No DNIS groups are associated with a customer profile.

Command Mode

Customer profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **dnis group** customer profile configuration command to include a group of DNIS numbers in a customer profile or discriminator.

Example

The following example includes the DNIS group called “customer1dnis” in the “customer1” customer profile.

```
router(config)# resource-pool profile customer customer1
router(config-customer-profile)# dnis group customer1dnis
```

dnis group

Related Commands

Command	Description
dialer dnis group	Creates a DNIS group.
resource-pool profile	Creates a customer profile.

domain

To support additional domain names for a specific VPDN group, use the **domain** VPDN group configuration command. To remove a domain name from a VPDN group, use the **no** form of this command.

domain *name*
no domain *name*

Syntax Description

name Domain name.

Default

This function will be used if it is configured. Otherwise, it is disabled.

Command Mode

VPDN group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **domain** VPDN group configuration command to support additional domain names for a specific VPDN group. The **domain** command becomes available in the command line interface after the **request dialin** command is entered for the first time. The **domain** command allows a VPDN tunnel to be authorized using the domain name.

Note Configure the **vpdn group** command with the **request dialin** command to enable VPDN. The requestor initiates a dial-in tunnel.

Example

The following example tunnels multiple domains to one HGW/LNS router at 10.1.1.1. Note that the **domain** command does not display in the command line interface until after you enter the **request dialin** command.

```

Router(config)# vpdn-group california_users
Router(config-vpdn)# ?
VPDN group configuration commands:
  accept  Accept a tunnel open request
  default Set a command to its defaults
  exit    Exit from VPDN group configuration mode
  no      Negate a command or set its defaults
  request Request to open a tunnel

Router(config-vpdn)# request dialin l2tp ip 10.1.1.1 domain la.com
Router(config-vpdn)# ?
VPDN group configuration commands:
  backup      Add backup address
  default     Set a command to its defaults
  dnis        Accept a DNIS tunnel
  domain      Accept a domain tunnel
  exit        Exit from VPDN group configuration mode
  force-local-chap Force a CHAP challenge to be instigated locally
  l2tp        L2TP specific commands
  lcp         LCP specific commands
  loadsharing Add loadsharing address
  local       local information, like name
  multilink   Configure limits for Multilink
  no          Negate a command or set its defaults
  request     Request to open a tunnel
Router(config-vpdn)# domain sandiego.com
Router(config-vpdn)# domain sanjose.com
Router(config-vpdn)# domain sf.com
    
```

Related Commands

Command	Description
request dialin	Specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

limit base-size

To define the base number of simultaneous connections that can be done in a single customer or VPDN profile, enter the **limit base-size** customer profile configuration command. Enter the **no** form of this command to remove the limitation.

```
limit base-size {number | all}
no limit base-size {number | all}
```

Syntax Description

<i>number</i>	Sets the maximum number of simultaneous connections or sessions that can be done in a specified customer or VPDN profile.
all	Accepts all calls. Use this command if you don't want to limit or apply overflow session counting to a customer or VPDN profile.

Default

No limits are set for a customer profile. The base size is set to **all**.

Command Mode

Customer profile configuration/VPDN profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **limit base-size** customer or VPDN profile configuration command to define the base number of simultaneous connections that can be done in a single customer or VPDN profile. The session limit applies to all the physical resource groups and pools configured in a single customer profile. If you want to define the number of overflow calls granted to a customer profile by using the command **limit overflow-size**, do *not* set the command **limit base-size** to "all". Instead, specify a number for **limit base-size**.

Example

The following example limits the total number of simultaneous connections to a base size of 48:

```
router(config)# resource-pool profile customer customer1_isp
router(config-customer-profile)# limit base-size 48
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.
limit overflow-size	Defines the number of overflow sessions allowed by a single customer profile.

limit overflow-size

To define the number of overflow calls granted to one customer or VPDN profile, enter the **limit overflow-size** customer profile configuration command. Enter the **no** form of this command to remove the overflow configuration.

```
limit overflow-size {number | all}
no limit overflow-size {number | all}
```

Syntax Description

<i>number</i>	Specifies the number of overflow calls.
all	Allows an unlimited number of overflow calls.

Default

The overflow size is set to 0.

Command Mode

Customer profile configuration/VPDN profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **limit overflow-size** customer or VPDN profile configuration command to define the number of overflow calls granted to one customer or VPDN profile. The overflow will not be applied if the **limit base-size** command is set to “all”.

Example

The following example grants 20 overflow calls to the customer profile called customer1_isp:

```
router(config)# resource-pool profile customer customer1_isp
router(config-customer-profile)# limit overflow-size 20
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.
limit base-size	Defines the base number of simultaneous standard sessions allowed by a single customer profile.

loadsharing

To configure endpoints for loadsharing, use the **loadsharing** VPDN group configuration command. To remove this function, use the **no** form of this command.

loadsharing ip *ip-address* [**limit** *number*]

Syntax Description

ip <i>ip-address</i>	IP address of the HGW/LNS at the other end of the tunnel. This is the IP endpoint at the end of the tunnel, which is a HGW/LNS router.
limit <i>number</i>	(Optional) Limits sessions per loadshare. The limit has a range from 0 to 32,767 sessions. The default is no limit set.

Default

This function is not used when not configured.

Command Mode

VPDN group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **loadsharing** VPDN group configuration command to configure endpoints for loadsharing.

Example

In the following example, one VPDN group called customer1-vpdng is created. L2TP IP traffic is loadshared between two HGW/LNSs. The IP addresses for the HGW/LNS's WAN ports are 172.21.9.67 and 172.21.9.68. The characteristics for 172.21.9.67 are defined under the **request dialin** command. The characteristics for 172.21.9.68 are defined under the **loadsharing** command.

A backup home-gateway router is specified at 172.21.9.69 by using the **backup** command. This router serves as a backup device for two load-sharing HGW/LNS.

```
!  
vpdn-group customer1-vpdng  
  request dialin l2tp ip 172.21.9.67 domain cisco.com  
  loadsharing ip 172.21.9.68 limit 100  
  backup ip 172.21.9.69 priority 5  
  domain cisco2.com  
!
```

Related Commands

Command	Description
request dialin	Specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

modem min-speed max-speed

To configure various modem-service parameters, enter the **modem min-speed max-speed** service profile configuration command. Enter the **no** form of this command to remove modem parameters.

modem min-speed {*speed* | **any**} **max-speed** {*speed* | **any** [**modulation value**]}

no modem min-speed {*speed* | **any**} **max-speed** {*speed* | **any** [**modulation value**]}

Syntax Description

min-speed	Configures the minimum modem speed for all the modems used by this service profile.
<i>speed</i>	Specifies the minimum and maximum bps rate for the modems, which can be between 300 and 56,000 bps. Must be in V.90 increments.
any	Specifies any minimum or maximum speed.
max-speed	Configures the maximum modem speed for all the modems used by this service profile. Must be in V.90 increments.
modulation value	(Optional) Specifies the maximum negotiated speed. Replace the value argument with one of the following choices: any , k56flex , v22bis , v34 , or v90 .
error-correction	(Hidden command) lapm, mn14
compression	(Hidden command) mnps, v42bis

Default

No modem service parameters are defined by default (Any default services provided by the modems will be available).

Command Mode

Service profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **modem min-speed max-speed** service profile configuration command to configure various modem-service parameters.

Example

```
Router(config)# resource-pool profile service user1sample
Router(config-service-prof)# ?

Router(config-service-prof)# modem min-speed ?
<300-56000> Minimum speed
any          Any Minimum speed

Router(config-service-prof)# modem min-speed any max-speed any modulation ?
any          Any modulation
k56flex     k56flex
v22bis     v22bis
v32bis     v32bis
v34        v34
v90        v90
```

Related Commands

None

multilink

To limit sessions authorized for all multilink users, enter the **multilink** VPDN group configuration command. To remove this function, use the **no** form of this command.

```
multilink {bundle number | link number}  
no multilink {bundle number | link number}
```

Syntax Description

bundle number	Configures the number of bundles supported for a VPDN Group. In general, each user requires one bundle. The limit has a range from 0 to 32,767.
link number	Configures the number of links or sessions supported for each bundle. The limit has a range from 0 to 32,767.

Default

No limit is set.

Command Mode

VPDN group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **multilink** VPDN group configuration command to limit sessions authorized for all multilink users. Each user requires one bundle—regardless if the user is a remote modem client or ISDN client.

One modem client using one B channel requires one link. One ISDN BRI node may require up to two links for one BRI line connection. The second B channel of a ISDN BRI node comes up when the maximum threshold is exceeded.

Example

The following example creates one VPDN group called joe_eastcoast. One L2TP tunnel is set up to the home gateway router at IP address 10.2.2.2. Ten MLPPP bundles can be authorized for ten users. Each user dials into the domain called bostonjoe.com. Each bundle can be authorized to support a maximum of 5 links. This means that all 10 users can consume a maximum of 50 simultaneous sessions dialing into bostonjoe.com.

```
Router(config)# vpdn-group joe_eastcoast

Router(config-vpdn)# request dialin l2tp ip 10.2.2.2 domain bostonjoe.com

Router(config-vpdn)# multilink ?
    bundle  Configure number of bundles per VPDN Group
    link    Configure number of links per bundle

Router(config-vpdn)# multilink bundle 10
Router(config-vpdn)# multilink link 5
```

Related Commands

Command	Description
request dialin	Specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

number

To add a DNIS number to a dialer DNIS group, enter the **number** DNIS group configuration command followed by the specifying number. Use the **no** form of this command to remove a DNIS number from a DNIS group.

number *number*
no number *number*

Syntax Description

number Specifies a DNIS number, which have up to 65 digits.

Default

None.

Command Mode

DNIS group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **number** DNIS group configuration command to enter a DNIS number to a dialer DNIS group. The Cisco IOS software also includes a feature that streamlines the DNIS configuration process. By replacing any digit with an X (for example, issuing the **number 555222121x** command), clients dialing different numbers, such as 5552221214 or 5552221215, are automatically mapped to the same customer profile. The X variable is a place holder for the digits 1 through 9.

Example

The following example creates a DNIS group called `dnis_isp_1` and assigns DNIS numbers 1234 and 5678 to the DNIS group.

```
Router(config)# dialer dnis group dnis_isp_1  
Router(config-called-group)# number 1234  
Router(config-called-group)# number 5678
```

Related Commands

Command	Description
dnis group	Includes a group of DNIS numbers in a customer profile.

range

To associate a range of modems or other physical resources with a resource group, enter the **range** resource configuration command. To remove a range of modems or other physical resources, use the **no** form of this command.

```
range { limit number | port range }
no range { limit number | port range }
```

Syntax Description

limit <i>number</i>	Specifies the maximum number of simultaneous connections supported by the resource group. Replace the <i>number</i> argument with the session limit you want to assign. Your access server's hardware configuration determines the maximum value of this limit. Applicable to ISDN B-channels or HDLC controllers.
port <i>range</i>	Specifies the range of resource ports to use in the resource group. For the Cisco AS5200 and AS5300, replace the <i>range</i> variable with <i>slotport slotport</i> .

Default

No range is configured.

Command Mode

Resource group configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **range** resource configuration command to associate a range of modems or other physical resources with a resource group.

Specify the range for port-based resources by using the resource's physical location. Do not identify non-port-based resource ranges by using location. Rather, specify the size of the resource group with a single integer limit.

Specify non-contiguous ranges by using multiple **range port** commands within the same resource group. Do not configure the same ports in more than one resource-group and do not overlap multiple port ranges.

For resources that are not pooled and have a 1-to-1 correspondence between DS0s, B channels, and HDLC framers use the **range limit number** command. Circuit switched data calls and V.120 calls use these kinds of resources.

Note Do not put heterogenous resources in the same group. Do not put MICA modems in the same group as Microcom modems. Do not put modems and HDLC controllers in the same resource group. Port and limit cannot be configured in the same resource group.

Example

The following example shows the range limit set for 48 simultaneous connections being supported by the resource group.

```
router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# resource-pool group resource hdlc1
router(config-resource-group)# range limit 48
```

The following example shows the ports set for modem 1 ranging from port 0 to port 47.

```
router(config)# resource-pool group modem1
router(config-resource-group)# range port 1/0 1/47
```

Related Commands

None

request dialin

To specify a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS), use the **request dialin** VPDN group configuration command. To remove this function, use the **no** form of this command.

```
request dialin {l2f | l2tp} {ip ip-address} {domain domain-name | dnis dnis-number | dnis-group-name}
```

```
no request dialin {l2f | l2tp} {ip ip-address} {domain domain-name | dnis dnis-number | dnis-group-name}
```

Syntax Description

dnis <i>group-name</i>	Name of the DNIS group.
dnis <i>dnis-number</i>	Dialed number used for authorizing a specific tunnel that forwards traffic to the HGW/LNS.
domain <i>domain-name</i>	Case-sensitive name of the domain to tunnel.
ip <i>ip-address</i>	IP address (www.xxx.yyy.zzz) of the HGW/LNS at the other end of the tunnel.
l2f l2tp	Select L2F or L2TP tunnel protocol.

Default

None. **request dialin** must be explicitly configured.

Command Mode

VPDN group configuration

Command History

Release	Modification
11.3(5)AA	This command first appeared in Cisco IOS Release 11.3(5)AA.
12.0(4)XI	The command request dialin modified for 12.0.

Usage Guidelines

Use the **request dialin** VPDN group configuration command to specify a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or Dialed Number Information Service (DNIS).

This command starts a tunnel to a remote peer defined by a specific IP address if a dial-in tunnel is received for users under a specific domain name or if a specific DNIS is called. Configure the VPDN group command to use **request dialin**; **request dialin** indicates a dial-in tunnel is requested.

Note Configure the **vpdn group** command with the **request dialin** command to enable VPDN. The requestor initiates a dial-in tunnel. The acceptor accepts a request for a dial-in tunnel.

To add additional domain names or DNIS to a VPDN group, use the **domain** and **dnis** commands, which are available in the CLI after you enter the **request dialin** command for the first time.

Examples

The following example requests an L2TP dial-in tunnel to a remote peer at IP address 172.17.33.125 for a user in domain partner.com:

```
request dialin l2tp ip 172.17.33.125 partner.com
```

The following example tunnels multiple domains to one LNS (for L2TP) router at 10.1.1.1. Note that the **domain** and **dnis** commands do not display in the command line interface until after you enter the **request dialin** command.

```
Router(config)# vpdn-group california_users
Router(config-vpdn)# ?
VPDN group configuration commands:
  accept  Accept a tunnel open request
  default Set a command to its defaults
  exit    Exit from VPDN group configuration mode
  no      Negate a command or set its defaults
  request Request to open a tunnel

Router(config-vpdn)# request dialin l2tp ip 10.1.1.1 domain la.com
Router(config-vpdn)# ?
VPDN group configuration commands:
  backup      Add backup address
  default     Set a command to its defaults
  dnis        Accept a DNIS tunnel
  domain      Accept a domain tunnel
  exit        Exit from VPDN group configuration mode
  force-local-chap Force a CHAP challenge to be instigated locally
  l2tp        L2TP specific commands
  lcp         LCP specific commands
  loadsharing Add loadsharing address
  local       local information, like name
  multilink   Configure limits for Multilink
  no          Negate a command or set its defaults
  request     Request to open a tunnel
Router(config-vpdn)# domain sandiego.com
Router(config-vpdn)# domain sanjose.com
Router(config-vpdn)# domain sf.com
Router(config-vpdn)# ^Z
Router# show running
Building configuration...

Current configuration:
!
---- cut ----
!
vpdn-group california_users
  request dialin l2tp ip 10.1.1.1 domain la.com
  domain sandiego.com
  domain sanjose.com
  domain sf.com
!
---- cut ----
```

Related Commands

Command	Description
accept dialin	At the HGW/LNS side, sets up a tunnel.

resource

To assign resources and supported call-types to a customer profile, enter the **resource** customer profile configuration command. Enter the **no** form of this command to disable this function.

```
resource name { digital | speech | v110 | v120 } [service name]  
no resource name { digital | speech | v110 | v120 } [service name]
```

Syntax Description

resource <i>name</i>	Assigns a name to a group of physical resources inside the access server. This name can have up to 23 characters.
digital	Accepts digital calls. Specifies circuit switched data calls that terminate on a HDLC framer (unlike asynchronous analog modem call that use start and stop bits).
speech	Accepts speech calls. Specifies normal voice calls, such as calls started by analog modems and standard telephones.
v110	Accepts V.110 calls.
v120	Accepts V.120 calls. By specifying this keyword, the access server begins counting the number of v120 software encapsulations occurring in the system.
service <i>name</i>	(Optional) Configures a service profile. This option is not supported for digital or V.120 calls.

Default

No resources are assigned to the customer profile by default.

Command Mode

Customer profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource** customer profile configuration command to assign resources and supported call-types to a customer profile. This command specifies a group of physical resources to be used in answering an incoming call of a particular type for a particular customer profile. For example, calls started by analog modems are reciprocated with the **speech** keyword.

Example

The following example creates a physical resource group called modem1. Forty-eight integrated modems are then assigned to modem1, which is linked to the customer profile called customer1_isp.

```
Router(config)# resource group resource modem1
Router(config-resource-gro)# range port 1/0 1/47
Router(config-resource-gro)# exit
Router(config)# resource-pool profile customer customer1_isp

Router(config-customer-pro)# resource modem1 ?
  digital  Accept digital calls
  speech   Accept speech calls
  v110     Accept V.110 calls
  v120     Accept V.120 calls
Router(config-customer-pro)# resource modem1 speech
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.

resource-pool

To enable or disable resource pool management, use the **resource-pool** global configuration command. There is no **no** form of this command.

resource-pool { enable | disable }

Syntax Description

enable	Enables resource pool management.
disable	Disables resource pool management.

Default

Resource management is disabled.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool** global configuration command to enable and disable the resource pool management feature.

Example

```
Router(config)# resource-pool enable  
Router(config)# resource-pool disable
```

Related Commands

None

resource-pool aaa accounting ppp

To include enhanced start/stop resource manager records to AAA accounting, enter the **resource-pool aaa accounting ppp** global configuration command. Enter the **no** form of this command to disable this feature.

```
resource-pool aaa accounting ppp
no resource-pool aaa accounting ppp
```

Syntax Description

This command has no additional keyword options.

Default

Disabled. The default of the **resource-pool enable** command is to *not* enable these new accounting records.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool aaa accounting ppp** global configuration command to include enhanced start/stop resource manager records to AAA accounting. The **resource-pool aaa accounting ppp** command adds new resource pool management fields to the AAA accounting start/stop records. The new attributes in the start records will also be in the stop records, in addition to those new attributes added exclusively for the stop records.

If you have configured your regular AAA accounting, this command directs additional information from resource manager into your accounting records.

Note If you configure only this command and never configure AAA accounting, nothing will happen. The default functionality for the resource-pool enable command does not include this functionality.

The following new fields are added to the start and stop records:

New Start Record Fields	New Stop Record Fields
Call-type	ModemSpeed-receive
Customer-profile-name	ModemSpeed-transmit
Customer-profile-active-sessions	MLP-session-ID (multilink users)
MLP-session-ID (multilink users)	
Resource-group-name	
Overflow-flag	
VPDN-tunnel-ID (VPDN users)	
VPDN-homegateway (VPDN users)	
VPDN-domain-name (VPDN users)	
VPDN-group-active-session (VPDN users)	



Caution This list of newly supported start and stop fields is not exhaustive. Cisco reserves the right to enhance this list of records at any time. Use the **show accounting** command to display the contents of each active session.

Note Cisco recommends that you *thoroughly* understand how these new start/stop records will affect your current accounting structure *before* you enter this command.

Example

The following example inserts the new AAA accounting start/stop records into an existing AAA accounting infrastructure.

```
Router(config)# resource-pool aaa accounting ppp
```

Related Commands

Command	Description
show accounting	Steps through all active sessions and displays all accounting records for actively accounted functions.

resource-pool aaa protocol

To specify which protocol to use for resource management, enter the **resource-pool aaa protocol** global configuration command. Enter the **no** form of this command to disable this feature and go to local.

```
resource-pool aaa protocol { local | group name }
no resource-pool aaa protocol
```

Syntax Description

local	Specifies local authorization.
group <i>name</i>	Specifies an authorization method that is not local; for example, using an external AAA server group. The Resource Pool Management Server(s) (RPMS) is defined in a AAA server group.

Default

Defaults to local.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool aaa protocol** global configuration command to specify which protocol to use for resource management. The AAA server group is most useful when you want to have multiple RPMSs configured as a fall-back mechanism.

Example

```
Router(config)# resource-pool aaa protocol local
```

Related Commands

None

resource-pool call treatment

To set up the signal sent back to the telco switch in response to incoming calls, enter the **resource-pool call treatment** global configuration command. Enter the **no** form of this command to disable this function.

```
resource-pool call treatment {profile {busy | no-answer} | resource {busy |
channel-not-available}}
no resource-pool call treatment {profile {busy | no-answer} | resource {busy |
channel-not-available}}
```

Syntax Description

busy	Answers the call; then, sends a busy signal when profile authorization or resource allocation fails.
no-answer	Does not answer the call when profile authorization fails.
profile	Call treatment when profile authorization fails.
resource	Call treatment when resource allocation fails.
channel-not-available	Send channel not available code when resource allocation fails.

Default

No answer for a customer profile; CNA for a resource.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool call treatment** global configuration command to set up the signal sent back to the telco switch in response to incoming calls.

Example

```
res_pool(config)# resource-pool call treatment profile ?
busy          Send busy code when profile authorization fails
no-answer     Don't answer when profile authorization fails
```

Related Commands

None

resource-pool group resource

To create a resource group for resource management, enter the **resource-pool group resource** global configuration command. Enter the **no** form of this command to remove a resource group from the running configuration.

```
resource-pool group resource name
no resource-pool group resource name
```

Syntax Description

resource *name* Assigns a name to a group of physical resources inside the access server. This name can have up to 23 characters.

Default

No resource groups are set up.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool group resource** global configuration command to create a resource group for resource management. When calls come into the access server, they are allocated physical resources as specified within resource groups and customer profiles. See the **range** command for more information. If some physical resources are not included in any resource groups, then these remaining resources are not used and will be considered to be part of the default resource group. They may be used in certain cases to answer calls before profile allocation occurs but they will not be used other than in the connection phase.

Note For standalone NAS environments, configure resource groups before using them in customer profiles. For external RPMS environments, configure resource groups on the NAS before defining them on external RPMS servers.

When enabling RPM for calls delivered to a NAS using SS7 signaling, like resources in the NAS must be in a single group—all modems must be in one group, all HDLC controllers must be in a different group, all V.110 ASICs must be put into another group, and all V.120 resources must be in a separate group. All resource group types must have the same number of resources and that number must equal the number of interface channels available from the public network switch. This grouping scheme will prevent the signal “Channel Not Available” (CNA) from being sent to the signaling point. For SS7 signaling, Microcom and MICA modems must be in the *same* group. If SS7 signaling is not used, Cisco recommends assigning Microcom and MICA modems to separate groups to avoid skewing RPM statistics.

resource-pool group resource

Example

The following example shows the configuration options within a resource group:

```
Router(config)# resource-pool group resource modem1
```

Related Commands

None

resource-pool profile customer

To create a customer profile, enter the **resource-pool profile customer** global configuration command. Enter the **no** form of this command to delete a customer profile from the running configuration.

```
resource-pool profile customer name
no resource-pool profile customer name
```

Syntax Description

name Name of the customer profile. This name can have up to 23 characters.

Default

No customer profiles are set up.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool profile customer** global configuration command to create a customer profile.

Example

The following example creates the customer profile called isp-abc. The **?** command displays the options you can set within the customer profile.

```
Router(config)# resource-pool profile customer isp-abc
Router(config-customer-pro)# ?
Customer Profile Configuration Commands:
  dnis      Assign dnis group with this profile
  default   Set a command to its defaults
  exit      Exit from resource-manager configuration mode
  help      Description of the interactive help system
  limit     Configure limits for the profile
  no        Negate a command or set its defaults
  resource  Assign resource and supported call-type
  vpdn     Assign VPDN group/profile with this profile
```

Related Commands

Command	Description
resource-pool group	Creates a resource group for resource management.

limit base-size	Defines the base number of simultaneous standard sessions allowed by a single customer profile.
limit overflow-size	Defines the number of overflow sessions allowed by a single customer profile.
dnis group	Includes a group of DNIS numbers in a customer profile.
resource	Assigns resources and supported call-types to a customer profile.

resource-pool profile discriminator

To create a call discrimination profile, enter the **resource-pool profile discriminator** global configuration command. Enter the **no** form of this command to remove a profile from the running configuration.

```
resource-pool profile discriminator name
no resource-pool profile discriminator name
```

Syntax Description

name Name of the call discriminator profile. This name can have up to 23 characters.

Default

No discrimination of calls.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool profile discriminator** global configuration command to create a call discrimination profile.

Example

The following example creates a discrimination profile called user1.

```
res_pool(config)# resource-pool profile discriminator user1
```

Related Commands

Command	Description
dnis group	Includes a group of DNIS numbers in a discriminator profile.
call-type	Rejects particular types of calls.

resource-pool profile service

To set up the service profile configuration, enter the **resource-pool profile service** global configuration command. Enter the **no** form of this command to disable this function.

resource-pool profile service *name*
no resource-pool profile service *name*

Syntax Description

name Name of the service profile. This name can have up to 23 characters.

Default

No service profiles are set up.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool profile service** global configuration command to set up the service profile configuration.

Example

```
Router(config)# resource-pool profile service user1
```

Related Commands

None

resource-pool profile vpdn

To set up for VPDN session counting for one or more VPDN groups and to limit sessions that can be authorized for VPDN groups, enter the **resource-pool profile vpdn** global configuration command. Enter the **no** form of this command to disable this function.

```
resource-pool profile vpdn name
no resource-pool profile vpdn name
```

Syntax Description

name Name of the VPDN profile.

Default

No VPDN profiles are set up.

Command Mode

Global configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **resource-pool profile vpdn** global configuration command to set up for VPDN session counting for one or more VPDN groups and to limit sessions that can be authorized for VPDN groups.

Example

```
Router(config)# resource-pool profile vpdn lg-hmgate
```

Related Commands

Command	Description
limit base-size	Defines the base number of simultaneous standard sessions allowed by a single customer profile.
limit overflow-size	Defines the number of overflow sessions allowed by a single customer profile.

show call progress tone

To display the contents of the internal call progress (CP) tone database for a specific country, use the **show call progress tone** EXEC mode command. There is no **no** version of this command.

show call progress tone *country* [*tone-type*]

Syntax Description

<i>country</i>	(Optional) Enter the country code for the country's call progress tone database you want to display.
<i>tone-type</i>	(Optional) Enter the tone type parameters you want to display. Options are: <ul style="list-style-type: none">• busy—Busy tone• congestion—Congestion tone• dialtone—Dial tone• disconnect—Disconnect tone• error—Error tone• off-hook-alert—Off-hook alert tone• off-hook-notice—Off-hook notice tone• pbx-dialtone—PBX dialtone• ringback—Ringback tone• routing—Routing tone

Default

The default provided by the modem.

Command Mode

Configuration mode.

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

This command enables the user to display the exact settings as they are programmed in the call progress tone database.

Example

This command shows the contents of the internal call progress tone database for a specific country.

```
Router>show call progress tone japan
Call progress tone: Japan

Dial tone:
0   Forever          425Hz -15.0/-15.0/-15.0 dBm0

PBX Dial tone:
0   Forever          425Hz -15.0/-15.0/-15.0 dBm0

Busy tone:
0   250ms           425Hz -20.0/-20.0/-20.0 dBm0
1   250ms           Silence

Congestion tone:
0   250ms           425Hz -20.0/-20.0/-20.0 dBm0
1   250ms           Silence

Error tone:
0   330ms           950Hz -15.0/-15.0/-15.0 dBm0
1   330ms           1400Hz -15.0/-15.0/-15.0 dBm0
2   330ms           1800Hz -15.0/-15.0/-15.0 dBm0
3   5000ms          Silence

Routing tone:
0   125ms           600Hz -24.0/-24.0/-24.0 dBm0
1   125ms           Silence
2   125ms           600Hz -24.0/-24.0/-24.0 dBm0
3   Forever          Silence

Disconnect tone:
0   330ms           600Hz -15.0/-15.0/-15.0 dBm0
1   330ms           Silence
2   330ms           600Hz -15.0/-15.0/-15.0 dBm0
3   Forever          Silence

Ringback tone:
0   1000ms          425Hz -19.0/-19.0/-19.0 dBm0
1   4000ms          Silence

Off-hook Notice tone:
0   100ms 1400x2040Hz -24.0/-24.0/-24.0 dBm0 -24.0/-24.0/-24.0 dBm0
1   100ms           Silence

Off-hook Alert tone:
0   100ms 1400x2040Hz -15.0/-15.0/-15.0 dBm0 -15.0/-15.0/-15.0 dBm0
1   100ms           Silence
```

Table 6 show show call progress tone Display Field Description

Field	Description
Cadence number	CP tones consist of cadences—periods of sound or silence with certain parameters that do not change during the cadence. Cadence number shows the number of a particular cadence within the CP tone definition. Cadence numbers start at the number 0.
Cadence duration	Cadence duration in “Forever” means that the sound or silence can be heard forever, like in dialtone.

Table 6 show show call progress tone Display Field Description

Field	Description
Cadence type	Silence—no tone is generated 440Hz—a single frequency is generated. 440x530Hz—two frequencies are added (mixed).
Amplitudes for corresponding frequency components	Amplitudes for the corresponding frequency components. Different amplitudes are used on different trunk types.

For a specific call progress tone (Japan, busy):

```
Router# show call progress tone japan busy
Busy tone for Japan:
0      2000ms  440x480 Hz -17.0/-17.0/-19.0 dBm0 -17.0/-17.0/-19.0 dBm0
1      4000ms      Silence
```

Related Commands

Command	Description
call progress tone	Specifies the country code for retrieving call progress tone parameters from the call progress tone database.

show dialer dnis

To display how many calls DNIS groups have had, use the **show dialer dnis** privileged EXEC command. There is no **no** form of this command.

```
show dialer dnis {group [name] | number [number]}
```

Syntax Description

group	Displays DNIS group statistics.
<i>name</i>	(Optional) DNIS group name.
number	Displays DNIS group number statistics.
<i>number</i>	(Optional) DNIS group number.

Default

None. If there are no DNIS groups configured, and resource pooling is enabled, then no calls will be accepted. All calls are identified by calltype/DNIS combinations.

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show dialer dnis** EXEC command to display how many calls DNIS groups have had or how many calls a specific DNIS group has had. Each DNIS group can be configured with multiple numbers. This command displays tables of statistics for each DNIS number received at the NAS.

Example

```

Router# show dialer dnis ?
      group  DNIS group statistics
      number DNIS number statistics

Router# show dialer dnis group
List of DNIS Groups:
  default
  mdm_grp1

Router# show dialer dnis group mdm_grp1
DNIS Number:2001
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:2002
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:2003
  0 total connections
  0 peak connections
  0 calltype mismatches
DNIS Number:2004
  0 total connections
  0 peak connections
  0 calltype mismatches

Router# show dialer dnis number
List of Numbers:
  default
  2001
  2002
  2003
  2004

Router# show dialer dnis number 2001
DNIS Number:2001
  0 connections total
  0 peak connections
  0 call-type mismatches
    
```

See Table 7 for a description of the output display fields.

Table 7 show dialer dnis Field Descriptions

Field	Description
List of DNIS Groups	List of DNIS groups assigned.
List of Numbers	List of DNIS numbers currently assigned.
DNIS Number	Dialed Number Information Service number assigned to specific customers.
Total connections	Cumulative number of connections since the last clear command was used.
Peak connections	Cumulative number of peak connections since the last clear command was used.
Calltype mismatches	Cumulative number of calltype mismatches since the last clear command was used.

Related Commands

None

show resource-pool call

To display all active call information for all customer profiles and resource groups, enter the **show resource-pool call** EXEC command. There is no **no** form of this command.

show resource-pool call

Syntax Description

There are no keywords or arguments for this command.

Default

If no calls are up, then there is no output. The command will display valid information for all current calls.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show resource-pool call** EXEC command to display all active call information for all customer profiles and resource groups. This command is used to display output when one call is up.

Example

The following is sample output for the **show resource-pool call** command. See Table 8 for a description of the output display fields.

```
Router# show resource-pool call
Shelf 0, slot 0, port 0, channel 2, state RM_RPM_RES_ALLOCATED
Customer profile cpl, resource group isdn1
DNIS number 71017
```

Table 8 show resource-pool call Field Descriptions

Field	Description
Shelf	The shelf number on which the call is being handled.
Slot	The slot number on which the call is being handled.
Port	The port number on which the call is being handled.
Channel	The channel number on which the call is being handled.
State	The state of the call.
Customer profile	The customer profile name (alphanumeric).
Resource group	The name of the resource group being used for the call.

Field	Description
DNIS number	The DNIS number for the call.

Related Commands

None

show resource-pool customer

To display the contents of one or more customer profiles, enter the **show resource-pool customer** EXEC command. There is no **no** form of this command.

show resource-pool customer [*name*]

Syntax Description

name (Optional) Specifies the name of a specific customer profile. The name can have up to 23 characters.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show resource-pool customer** EXEC command to display the contents of one or more customer profiles.

Example

See Table 9 for field descriptions.

```
Router# show resource-pool customer customer1_isp
 0 active connections
 0 calls accepted
 0 max number of simultaneous connections
 0 calls rejected due to profile limits
 0 calls rejected due to resource unavailable
 0 overflow connections
 0 overflow states entered
 0 minutes spent in overflow
 0 minutes since last clear command
```

Table 9 show resource-pool customer Field Descriptions

Field	Description
Active connections	Lists the number of active connections in the specified customer profile.
Calls accepted	Cumulative number of calls accepted, since the last clear command, in the customer profile regardless of call type.
Max number of simultaneous connections	Maximum number of simultaneous connections assigned for this customer profile.

Field	Description
Calls rejected due to profile limits	Cumulative number of calls rejected, since the last clear command, because the maximum number of allowable simultaneous connections was exceeded. Each customer profile can be configured to not exceed a simultaneous call limit. This feature stops a single customer profile from consuming all the system resources.
Calls rejected due to resource unavailable	Cumulative number of calls rejected, since the last clear command, because no system resources were available to accept the call (such as a free modem for an analog call or an HDLC framer for a circuit switched data call).
Overflow connections	Number of overflow connections, since the last clear command, active.
Overflow states entered	Number of overflow states, since the last clear command, processed.
Minutes spent in overflow	Number of minutes, since the last clear command, that the overflow session has been in process.
Minutes since last clear command	Number of minutes, since the clear command, has been used.
List of Customer Profiles:	Lists the customer profiles set up on the access server.

Related Commands

None

show resource-pool discriminator

To display how many times an incoming call has been rejected due to a specific DNIS/call-type combination, enter the **show resource-pool discriminator** EXEC command. There is no **no** form of this command.

show resource-pool discriminator [*name*]

Syntax Description

name (Optional) Specifies the name of the specific DNIS/call-type that will be rejected. The name can have up to 23 characters.

Default

None. You must configure a call discriminator for it to work or be displayed.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show resource-pool discriminator** EXEC command to display how many times an incoming call has been rejected due to a specific DNIS/call-type combination.

Example

See Table 10 for field descriptions.

Example 1

```
Router# show resource-pool discriminator
List of Call Discriminator Profiles:
  cd1
  cd2
  cd3
  cd4
Router# show resource-pool discriminator cd1
0 calls rejected
```

Table 10 show resource-pool discriminator Command Field Descriptions

Field	Description
List of Call Discriminator Profiles	A list of the Call Discriminator Profile names currently assigned.
Calls rejected	Number of calls rejected since the last clear command was used (This is cumulative).

Related Commands

None

show resource-pool process statistics

Note For Cisco Release 12.0(4)XI1, this command is disabled and will not display meaningful information. This command will be removed for the next release. The other **show** commands will provide suitable statistical information.

show resource-pool resource

To display the resource groups configured in the network access server (NAS), enter the **show resource-pool resource** EXEC command. There is no **no** form of this command.

```
show resource-pool resource [name]
```

Syntax Description

name (Optional) Displays the contents of a specifically named resource group, which was set up by using the **resource-pool group resource name** command. The name can have up to 23 characters.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show resource-pool resource** EXEC command to display the resource groups configured in the network access server (NAS). To display the contents of a specific resource group, use the **show resource-pool resource name** command.

Example

The following example displays the output for the **show resource-pool resource** EXEC command. See Table 11 for a description of the output display fields.

```
Router# show resource-pool resource
List of Resources:
  modem1
  rg1
  hi

Router# show resource-pool resource modem-group-1
  2 resources in the resource group
  0 resources currently active
  0 calls accepted in the resource group
  0 calls rejected due to resource unavailable
  0 calls rejected due to resource allocation errors
```

Table 11 **show resource-pool resource name Command Field Descriptions**

Field	Description
Resources in the resource group	Number of resources allocated to this pool. For example, a range of modems may be limited to five. A range of circuit switched data calls may be limited to 50.
Resources currently active	Number of resources that are currently used in the resource group.
Calls accepted in the resource group	Number of calls accepted in the resource group (This is cumulative).
Calls rejected due to resource unavailable	Number of calls rejected because a resource was not available (This is cumulative).
Calls rejected due to resource allocation errors	Number of times the access server had an available resource, but the resource had an error when the access server tried to allocate it (for example, a bad modem). Therefore, the call was rejected. (This is cumulative.)

Related Commands

None

show resource-pool vpdn

To display the contents of a specific VPDN group or specific VPDN profile, enter the **show resource-pool vpdn** EXEC command. There is no **no** form of this command.

```
show resource-pool vpdn {group | profile} [name]
```

Syntax Description

group	Displays all the VPDN groups configured inside the NAS.
profile	Displays all the VPDN profiles configured inside the NAS.
<i>name</i>	(Optional) Specifies the name of a specific VPDN group or profile.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show resource-pool vpdn** EXEC command to display the contents of a specific VPDN group or specific VPDN profile.

Examples

Use the **show resource-pool vpdn group** *name* command to display the contents of a specific VPDN group. This example contains one domain name, one DNIS group, and one end point. See Table 12 and Table 13 for field descriptions.

Example 1

```
Router# show resource-pool vpdn group customer2-vpdng
VPDN Group customer2-vpdng found under Customer Profiles: customer2

Tunnel (LTP)
-----
dnis:customer2-calledg
hp.com

Endpoint          Session Limit Priority Active Sessions Status Reserved Sessions
-----
172.21.9.97      *              1           0              OK              -----
Total            *              -----           0              0
```

Example 2

```
Router# show resource-pool vpdn group
List of VPDN Groups under Customer Profiles
Customer Profile user1: big
Customer Profile user2: green
List of VPDN Groups under VPDN Profiles
VPDN Profile lggate: vpdnlgate
VPDN Profile yellow: hi
```

Table 12 show resource-pool vpdn group Command Field Descriptions

Field	Description
Endpoint	IP address of HGW/LNS router.
Session Limit	Number of sessions permitted for the designated endpoint.
Priority	Loadsharing HGW/LNSs are always marked with a priority of 1.
Active Sessions	Number of active sessions on the NAS. These are sessions successfully established with endpoints (not reserved sessions).
Status	Only two status types are possible: OK and busy.
Reserved Sessions	Authorized sessions that are waiting to see if they can successfully connect to endpoints. Essentially, these sessions are queued calls. In most cases, reserved sessions become active sessions.
*	No limit is set.
List of VPDN Groups under Customer Profiles	A list of VPDN groups that have been assigned to customer profiles. The customer profile name will be listed first, followed by the name of the VPDN group assigned to it.
List of VPDN Groups under VPDN Profiles	A list of VPDN groups that have been assigned to customer profiles. The VPDN profile name will be listed first, followed by the VPDN group assigned to it.

Example 3

```
Router# show resource-pool vpdn profile
% List of VPDN Profiles:
lg-hmgate
lggate
yellow
```

Example 4

```
Router# show resource-pool vpdn profile lggate
0 active connections
0 max number of simultaneous connections
0 calls rejected due to profile limits
0 calls rejected due to resource unavailable
0 overflow connections
0 overflow states entered
0 overflow connections rejected
3003 minutes since last clear command
```

Table 13 show resource-pool vpdn profile Command Field Descriptions

Field	Description
List of VPDN Profiles	A list of the VPDN profiles that have been assigned.
Active connections	Number of active VPDN connections counted by the VPDN profile.
Max number of simultaneous connections	Maximum number of VPDN simultaneous connections counted by the VPDN profile. This value helps you determine how many VPDN sessions to subscribe to a specific profile.
Calls rejected due to profile limits	Number of calls rejected, since the last clear command, because the profile limit has been exceeded.
Calls rejected due to resource unavailable	Number of calls rejected, since the last clear command, because the assigned resource was unavailable.
Overflow connections	Number of overflow connections being used since the last clear command.
Overflow states entered	Number of overflow states entered since the last clear command.
Overflow connections rejected	Number of overflow connections rejected since the last clear command.
Minutes since last clear command	Number of minutes elapsed since the last clear command was used.

Related Commands

None

show vpdn domain

To view all VPDN domains and DNIS groups configured on the NAS, enter the **show vpdn domain** EXEC command. There is no **no** form of this command.

show vpdn domain

Syntax Description

There are no keywords or arguments used with this command.

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show vpdn domain** EXEC command to view all VPDN domains and DNIS groups configured on the NAS.

Example

See Table 14 for field descriptions.

```
Router# show vpdn domain
Tunnel          VPDN Group
-----          -
dnis:cg2        vgdnis (L2F)
domain:twu-ultra test (L2F)
```

Table 14 show vpdn domain Command Field Descriptions

Field	Description
Tunnel	The assigned name of the tunnel endpoint.
VPDN Group	The assigned name of the VPDN group using the tunnel.

Related Commands

None

show vpdn group

To display a summarization of the relationships among VPDN groups and customer/VPDN profiles or to summarize the configuration of a VPDN group including domain/DNIS, loadsharing information and current session information, enter the **show vpdn group** EXEC command. There is no **no** form of this command.

```
show vpdn group name [domain | endpoint]
```

Syntax Description

<i>name</i>	Name of vpdn-group.
domain	DNIS/domain information.
endpoint	Endpoint session information.

Default

None.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show vpdn group** EXEC command to display a summarization of the relationships among VPDN groups and customer/VPDN profiles or to summarize the configuration of a VPDN group including domain/DNIS, loadsharing information, and current session information. To summarize relationships among VPDN groups and Customer/VPDN profiles, use the syntax **show vpdn group** *group-name*.

Examples

```
Router > show vpdn group

VPDN Group  Customer Profile  VPDN Profile
-----
1           -             -
2           -             -
3           -             -
lisun       cp1             -
outgoing-2 -             -
test       -             -
*vg1       cpdnis         -
*vg2       cpdnis         -
vgdnis     +cp1          vp1
vgnumber   -             -
vp1        -             -

* VPDN group not configured
+ VPDN profile under Customer profile
```

Note VPDN group is marked with “*” if it doesn’t exist but is used under customer/VPDN profile.

Note Customer profiles are marked with “+” if the corresponding VPDN group is not directly configured under customer profile. Instead, the corresponding VPDN profile is configured under the customer profile.

```
Router > show vpdn group vgdnis

Tunnel (L2TP)
-----
dnis:cg1
dnis:cg2
dnis:jan
cisco.com

Endpoint          Session Limit Priority Active Sessions Status Reserved Sessions
-----
172.21.9.67      *              1           0              OK          -
-----
Total             *              0           0              0
```

Note Tunnel section lists all domain/DNIS. The DNIS will be prefixed with “dnis:”.

“*” indicates that there is no session limit specified for the endpoint in the total row; it is the sum of the session limits of all endpoints and is marked with “*” if there is no limit (indicated by “*” for any endpoint.

If the endpoint has no session limit, reserved sessions are marked with “-”.

See Table 15 for field descriptions.

```

Router# show vpdn group

VPDN Group      Customer Profile  VPDN Profile
-----
customer1-vpdng customer1         customer1-profile
customer2-vpdng customer2         -

Router# show vpdn group customer1-vpdng

Tunnel (L2TP)
-----
cisco.com
cisco1.com
dnis:customer1-calledg

Endpoint          Session Limit Priority Active Sessions Status Reserved Sessions
-----
172.21.9.67      *           1       0             OK
172.21.9.68      100         1       0             OK
172.21.9.69      *           5       0             OK
-----
Total            *           0       0             0

```

Table 15 show vpdn group Command Field Descriptions

Field	Description
VPDN Group	The assigned name of the VPDN group using the tunnel.
Customer Profile	The name of the assigned customer profile.
VPDN Profile	The name of the assigned VPDN profile.
Tunnel	The assigned name of the tunnel endpoint.
Endpoint	IP address of HGW/LNS router.
Session Limit	Number of sessions permitted for the designated endpoint.
Priority	Loadsharing HGW/LNSs are always marked with a priority of 1.
Active Sessions	Number of active sessions on the NAS. These are sessions successfully established with endpoints (not reserved sessions).
Status	Only two status types are possible: OK and busy.
Reserved Sessions	Authorized sessions that are waiting to see if they can successfully connect to endpoints. Essentially, these sessions are queued calls. In most cases, reserved sessions become active sessions.

Related Commands

None

show vpdn multilink

To display the multilink sessions authorized for all VPDN groups, enter the **show vpdn multilink** EXEC command. There is no **no** form of this command.

show vpdn multilink

Syntax Description

There are no keywords or options for this command.

Command Mode

User and privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **show vpdn multilink** EXEC command to display the multilink sessions authorized for all VPDN groups.

Example

See Table 16 for field descriptions.

```
L2F Tunnel and Session Information (Total tunnels=1 sessions=1)

NAS CLID HGW CLID NAS Name          HGW Name          State
24      10      centi3_nas          twu253_hg         open
                172.21.9.46        172.21.9.67

CLID  MID   Username                               Intf  State
10    1     twu@twu-ultra.cisco.com              Se0:22 open

Router# show vpdn multilink

Multilink Bundle Name  VPDN Group Active links Reserved links Bundle/Link Limit
-----
twu@twu-ultra.cisco.com vgdnis      1           0           */*
```

Table 16 show vpdn multilink Command Field Descriptions

Field	Description
NAS CLID	The network access server (NAS) Caller Line Identification number (CLID).
HGW CLID	The home gateway (HGW) Caller Line Identification number (CLID).
NAS Name	The name assigned to the NAS.

Field	Description
HGW Name	Name assigned to the HGW.
State	Operational state of the designated piece of equipment.
CLID	Calling Line Identification number.
MID	Modem Identification.
Username	Assigned user name.
Intf	Type of interface.
State	Operational state of the designated piece of equipment.
Multilink Bundle Name	The name of the multilink bundle.
VPDN Group	Name of the VPDN group.
Active Links	Number of active links.
Reserved Links	Number of reserved links.
Bundle/Link limit	Limit of bundles/links available.

Related Commands

None

vpdn group

To associate a VPDN group to a customer or VPDN profile, enter the **vpdn group** configuration command. Enter the **no** form of this command to remove the VPDN group from a customer profile or VPDN profile.

vpdn group *name*
no vpdn group *name*

Syntax Description

name Name of the VPDN group.

Default

None.

Command Modes

Customer profile configuration/VPDN profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **vpdn group** configuration command to associate a VPDN group to a customer or VPDN profile. The sessions for an entire VPDN group can be counted under a single VPDN profile.

To add a VPDN group to a customer profile or VPDN profile, you can use either the **vpdn profile** or the **vpdn group** command:

- VPDN group under customer profile allows VPDN connections for this customer profile.
- VPDN groups under VPDN profile allows combined session counting over these VPDN groups.

Examples

Example 1

```
Router(config)# resource profile vpdn lggate
Router(config-vpdn-profile)# vpdn group ?
WORD Enter name of VPDN group
```

Example 2

```
Router(config)# resource profile customer customer1

Router(config-customer-pro)# vpdn group ?
WORD Enter name of VPDN group
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.

vpdn profile

To do combined session counting over VPDN groups, enter the **vpdn profile** customer profile configuration command. Enter the **no** form of this command to remove a VPDN profile from a customer profile.

vpdn profile *name*
no vpdn profile *name*

Syntax Description

name Name of the VPDN profile.

Default

None.

Command Modes

Customer profile configuration

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **vpdn profile** configuration command to do combined session counting over VPDN groups. Configure VPDN groups under the VPDN profile only, using the **vpdn profile** command—and then link these VPDN groups to the customer profile using the **vpdn group** VPDN profile configuration command.

Examples

Example 1

```
Router(config)# resource profile customer user1

Router(config-customer-pro)# vpdn profile ?
WORD Enter name of VPDN group
```

Related Commands

Command	Description
resource-pool profile	Creates a customer profile.

Debug Commands

This section documents a new debug command. All other commands used with this feature are documented in the Cisco Release 12.0 command references.

- **debug resource pool**

debug resource-pool

To display and trace resource pool management activity, enter the **debug resource-pool** debug command. To disable this function, use the **undebug** version of this command.

debug resource-pool
undebug resource-pool

Syntax Description

This command has no keywords or arguments.

Default

Disabled.

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(4)XI	This command was first introduced.

Usage Guidelines

Use the **debug resource-pool** debug command to display and trace resource pool management activity.

Table 17 Resource Pooling States

State	Description
RM_IDLE	No call activity
RM_RES_AUTHOR	Call waiting for authorization, message sent to AAA
RM_RES_ALLOCATING	Call authorized, resource-grp-mgr allocating
RM_RES_ALLOCATED	Resource allocated, connection acknowledgment sent to signaling state. Call should get connected and become active.
RM_AUTH_REQ_IDLE	Signaling module disconnected call while in RM_RES_AUTHOR. Waiting for authorization response from AAA.
RM_RES_REQ_IDLE	Signaling module disconnected call while in RM_RES_ALLOCATING. Waiting for resource allocation response from resource-group manager.
RM_DNIS_AUTHOR	An intermediate state before proceeding with RPM authorization.
RM_DNIS_AUTH_SUCCEEDED	DNIS authorization succeeded.
RM_DNIS_RES_ALLOCATED	DNIS resource allocated.
RM_DNIS_AUTH_REQ_IDLE	DNIS authorization request idle.
RM_DNIS_AUTHOR_FAIL	DNIS authorization failed.

Table 17 Resource Pooling States

State	Description
RM_DNIS_RES_ALLOC_SUCCESS	DNIS resource allocation succeeded.
RM_DNIS_RES_ALLOC_FAIL	DNIS resource allocation failed.
RM_DNIS_RPM_REQUEST	DNIS resource pool management requested.

The resource-pool state can be used to isolate problems. For example, if a call fails authorization in the RM_RES_AUTHOR state, investigate further with AAA authorization debugs to determine whether the problem lies in the resource-pool manager, AAA, or dispatcher.

Example

The following example shows different instances where you can use the **debug resource-pool** command. See Table 18 for field descriptions.

```

Router # debug resource-pool
RM general debugging is on

Router # show debug
General OS:
  AAA Authorization debugging is on
Resource Pool:
  resource-pool general debugging is on
Router #
Router # ping 21.1.1.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 21.1.1.10, timeout is 2 seconds:
*Jan  8 00:10:30.358: RM state:RM_IDLE event:DIALER_INCALL DS0:0:0:0:1
*Jan  8 00:10:30.358: RM: event incoming call

/* An incoming call is received by RM */

*Jan  8 00:10:30.358: RM state:RM_DNIS_AUTHOR event:RM_DNIS_RPM_REQUEST
DS0:0:0:0:1

/* Receives an event notifying to proceed with RPM authorization while
in DNIS authorization state */

*Jan  8 00:10:30.358: RM:RPM event incoming call
*Jan  8 00:10:30.358: RPM profile cp1 found

/* A customer profile "cp1" is found matching for the incoming call, in
the local database */

*Jan  8 00:10:30.358: RM state:RM_RPM_RES_AUTHOR
event:RM_RPM_RES_AUTHOR_SUCCESS DS0:0:0:0:1

/* Resource authorization success event received while in resource
authorization state*/

*Jan  8 00:10:30.358: Allocated resource from res_group isdn1
*Jan  8 00:10:30.358: RM:RPM profile "cp1", allocated resource "isdn1"
successfully
*Jan  8 00:10:30.358: RM state:RM_RPM_RES_ALLOCATING
event:RM_RPM_RES_ALLOC_SUCCESS DS0:0:0:0:1

/* Resource allocation success event received while attempting to
allocate a resource */

```

```

*Jan 8 00:10:30.358: Se0:1 AAA/ACCT/RM: doing resource-allocated
(local) (nothing to do)
*Jan 8 00:10:30.366: %LINK-3-UPDOWN: Interface Serial0:1, changed state
to up
*Jan 8 00:10:30.370: %LINK-3-UPDOWN: Interface Serial0:1, changed state
to down
*Jan 8 00:10:30.570: Se0:1 AAA/ACCT/RM: doing resource-update (local)
cpl (nothing to do)
*Jan 8 00:10:30.578: %LINK-3-UPDOWN: Interface Serial0:0, changed
state to up
*Jan 8 00:10:30.582: %DIALER-6-BIND: Interface Serial0:0 bound to
profile Dialer0...
Success rate is 0 percent (0/5)
Router #
*Jan 8 00:10:36.662: %ISDN-6-CONNECT: Interface Serial0:0 is now
connected to 71017
*Jan 8 00:10:52.990: %DIALER-6-UNBIND: Interface Serial0:0 unbound from
profile Dialer0
*Jan 8 00:10:52.990: %ISDN-6-DISCONNECT: Interface Serial0:0
disconnected from 71017 , call lasted 22 seconds
*Jan 8 00:10:53.206: %LINK-3-UPDOWN: Interface Serial0:0, changed state
to down
*Jan 8 00:10:53.206: %ISDN-6-DISCONNECT: Interface Serial0:1
disconnected from unknown , call lasted 22 seconds
*Jan 8 00:10:53.626: RM state:RM_RPM_RES_ALLOCATED event:DIALER_DISCON
DS0:0:0:0:1

/* Received Disconnect event from signalling stack for a call which
has a resource allocated. */

*Jan 8 00:10:53.626: RM:RPM event call drop

/* RM processing the disconnect event */

*Jan 8 00:10:53.626: Deallocated resource from res_group isdn1
*Jan 8 00:10:53.626: RM state:RM_RPM_DISCONNECTING
event:RM_RPM_DISC_ACK DS0:0:0:0:1

/* An intermediate state while the DISCONNECT event is being processed
by external servers, before RM goes back into IDLE state.
*/

```

Table 18 debug resource-pool Command Field Descriptions

Field	Description
RM state: RM_IDLE	Resource manager state that displays no active calls.
RM state: RM_RES_AUTHOR	Resource authorization state.
RES_AUTHOR_SUCCESS DS0: shelf:slot:port:channel	Actual physical resource that is used
Allocated resource from res_group	Physical resource group that accepts the call.
RM profile "x", allocated resource "x"	Specific customer profile and resource group names used to accept the call.
RM state: RM_RES_ALLOCATING	Resource manager state that unifies a call with a physical resource.

Related Commands

None

Glossary

Backup customer profile—Configured locally on the NAS to be used when the link between the NAS and RPMS is out of service, backup customer profiles allow the NAS to answer calls for specific customers when there is no connection to the Cisco RPMS. The backup customer profile can contain all elements defined in a standard customer profile, including base-size or overflow parameters. However, when the connection between the NAS and Cisco RMPS is out of service, session counting and session limits are not applied to incoming calls on the RPMS—it will be applied only on the NAS. Also, after the connection is reestablished, there will be no synchronization of call counters between the NAS and Cisco RMPS.

Call discrimination—Ability to reject a call before answering based on DNIS, call type (bearer capability), or DNIS and call type. The NAS or Cisco RPMS matches the call against the DNIS number and call type (bearer capability) restrictions. If a match is found, the call is rejected and a no answer call treatment is sent to the switch. Otherwise, call processing continues.

Call treatment—The signaling return code sent by resource pool management when a call is not accepted. Call treatments are:

- no answer—the caller receives rings until the switch eventually times out or the caller disconnects.
- busy—the NAS drops the switch, which sends a busy signal to the caller.
- channel not available—the NAS directs the switch to send the call to the next available channel in the trunk group.

Call type—Equivalent to a bearer capability in ISDN, but also applies to Channel Associated Signaling (CAS). The call type is used to differentiate calls (digital or analog) for call discrimination and to assign calls to appropriate resources. Call types are:

- Speech
- Digital
- V.110
- V.120

Cisco RPMS—Cisco Resource Pool Manager Server. A central server that provisions customer profiles and group resources over several NASs.

CLI—Command line interface for the Cisco IOS software.

Customer profile—A customized configuration that identifies a customer and specifies the types of resources and services to be used by the customer's dial plan. Customer profiles allow for configuration and resource usage statistics for:

- active sessions
- session limit
- overflow sessions
- overflow session limit
- session counts
- DNIS groups

- domain groups
- call type
- resource groups
- resource services
- call treatment
- VPDN active sessions
- VPDN multilink bundles
- VPDN multilink sessions within each bundle
- VPDN endpoints
- VPDN groups
- VPDN session limits.

Default customer profile—Profile configured to accept unmapped calls—those calls having no DNIS information or having DNIS info but not mapped to a standard customer profile.

- If this profile is configured, a call is answered automatically.
- If this profile is not configured, unmapped calls are rejected.

Configured by not entering the DNIS or domain group value, or by entering the reserved keyword value “default” for the DNIS or domain group. Identical to standard customer profile, but does not have any associated DNIS groups. Used to provide session counting, resource assignment and VPDN tunnel creation for customers using domain-based or retail dial service rather than DNIS-based service. These calls are assigned to resources based only on call type and answered. If a VPDN is used, during user authorization the domain information received by the NAS is compared with the VPDN tunnels associated with the default customer profile. If a match is found, a new tunnel is created or the call is assigned to an existing tunnel, and VPDN session counting occurs. Otherwise, the call is rejected.

DNIS—Dialed Number Information Service or Dialed Number Identification Service, also known as the called party number. The telephone number of the called party after translation occurs in the PSTN (Public Switched Telephone Network). A given destination may have a different DNIS number based on how the call is placed (for example, 800 or direct dial).

DNIS group—A collection of DNIS entries associated with a customer profile or call discriminator profile. Call types can also be associated with a DNIS group to support more than one call type, which can map to a specific resource and service group in a profile. There is no set limit on the number of DNIS groups or DNIS entries supported by a NAS.

NAS—Network access server, such as a Cisco AS5200, AS5300, or AS5800.

Overflow billing—State assigned to calls that occur after the session limit has been reached. Once a call is identified as an overflow call, it maintains the overflow status throughout its duration—even if the current number of calls returns below the session limit.

Physical resources—Also called resource group. Providers can configure these physical resources by specifying a range of ports. These resources groups can be shared between customer profiles.

RADIUS—Remote Authentication Dial-In User Service. RADIUS is a distributed client/server system that secures networks against unauthorized access. RADIUS clients run on Cisco routers and send authentication requests to a central RADIUS server containing all user authentication and network-service access information.

Resource groups—A group of similar NAS resources to access for incoming calls. For example, separate resource groups may be created for 56K modems, V.110 terminal adapters, and calls terminating on HDLC framers (ISDN). Resource groups used by Cisco RPMS must be configured on the NAS and the resource group names must match.

Resource Manager Protocol—A proprietary behind-the-scenes metaprotocol running between the NASs and RPMS that defines what information needs to be passed between the NAS and the RPMS. The RMP protocol displays in debug mode as AAA messages. Use the **debug aaa authorization**, **debug aaa accounting**, **debug resource-pool**, and **debug tacacs+** commands to display these parameters.

TACACS+—Terminal Access Controller Access Control System. TACACS+ is a protocol that provides detailed accounting information and flexible administrative control over authentication and authorization processes. TACACS+ is implemented through AAA and can be enabled only through AAA commands.

VPDN group—For configured VPDN sessions, the home gateway and limit data required to set up or reject a VPDN session. This data includes an associated domain name or DNIS, endpoint IP address, maximum MLP bundles per VPDN group, and maximum links per MLP bundle.

VPDN session—A communication channel between a user and an HGW/LNS router.

VPDN tunnel—An IP connection established between a NAS/LAC and an HGW/LNS router.

Note For a list of other internetworking terms, see the Internetworking Terms and Acronyms document available on the Documentation CD-ROM and Cisco Connection Online (CCO) at the following URL: <http://www.cisco.com/univercd/cc/td/doc/cisintwk/ita/index.htm>.
