Preparing for Broadband Access Aggregation

Before you begin to perform the tasks required to accomplish broadband access aggregation, there are several preparatory tasks that you can perform at your option to enable you to complete the aggregation task with more efficiency. This module presents three of those preparation tasks: configuring permanent virtual circuits (PVCs), configuring a virtual template interface, and configuring enhancements for broadband scalability.

In a digital subscriber line (DSL) environment, many applications require the configuration of a large number of PVCs. Configuring PVCs before you start broadband aggregation can save you time because configuring a range of PVCs is faster than configuring PVCs individually.

A virtual template interface saves time because all PPP parameters are managed within the virtual template configuration. Any configurations made in the virtual template are automatically propagated to the individual virtual access interfaces.

Using the enhancement for broadband scalability reduces the amount of memory that is used per terminated PPP session by creating virtual access subinterfaces. Determining if virtual access subinterfaces are available on your system and preconfiguring these enhancements can speed your aggregation process and improve system performance.

- Finding Feature Information, page 1
- Prerequisites for Preparing for Broadband Access Aggregation, page 2
- Restrictions for Preparing for Broadband Access Aggregation, page 2
- Information About Preparing for Broadband Access Aggregation, page 2
- How to Prepare for Broadband Access Aggregation, page 4
- Configuration Examples for Preparing for Broadband Access Aggregation, page 13
- Where to Go Next, page 16
- Additional References, page 17
- Feature Information for Preparing for Broadband Access Aggregation, page 18

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To
find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for Preparing for Broadband Access Aggregation

Before configuring broadband access aggregation, you will need to know the information that is presented in the "Understanding Broadband Access Aggregation" module.

Additional information can be found in these documents:

- Configuring a PVC range--For detailed information about configuring individual ATM PVCs, see "Configuring PVCs" in the Cisco IOS Wide-Area Networking Configuration Guide.
- Creating a virtual template--For detailed information see the "Configuring Virtual Template Interfaces" chapter in the Cisco IOS Dial Technologies Configuration Guide.

Restrictions for Preparing for Broadband Access Aggregation

Broadband scalability is not intended to improve the scalability of the following:

- Scaling for dial-out
- Scaling for PPP callback
- Scaling virtual profiles
- Scaling Multilink PPP (MLP)
- Various PPP (PPPoX) applications that terminate PPP on physical interfaces

Information About Preparing for Broadband Access Aggregation

Virtual-Access Interfaces

A virtual-template interface is used to provide the configuration for dynamically created virtual-access interfaces. It is created by users and can be saved in NVRAM.

Once the virtual-template interface is created, it can be configured in the same way as a serial interface.

Virtual-template interfaces can be created and applied by various applications such as virtual profiles, virtual private dialup networks (VPDN), PPP over ATM, protocol translation, and Multichassis Multilink PPP (MMP).

All PPP parameters are managed within the virtual-template configuration. Configuration changes made to the virtual template are automatically propagated to the individual virtual access interfaces. Multiple virtual-access interfaces can originate from a single virtual template; therefore, multiple PVCs can use a single virtual template.
Cisco IOS software supports up to 200 virtual-template configurations. If greater numbers of tailored configurations are required, an authentication, authorization, and accounting (AAA) server may be employed. Refer to the "Configuring Per-User Configuration" chapter in the Cisco IOS Dial Technologies Configuration Guide for additional information on configuring an AAA server.

If the parameters of the virtual template are not explicitly defined before the ATM PVC is configured, the PPP interface is brought up using default values from the virtual template. Some parameters (such as an IP address) take effect only if specified before the PPP interface comes up. Therefore, it is recommended that you explicitly create and configure the virtual template before configuring the ATM PVC to ensure that such parameters take effect. Alternatively, if parameters are specified after the ATM PVC has been configured, use the `shutdown` command followed by the `no shutdown` command on the ATM subinterface to restart the interface; this restart will cause the newly configured parameters (such as an IP address) to take effect.

Network addresses for the PPP-over-ATM connections are not configured on the main ATM interface or subinterface. Instead, they are configured on the appropriate virtual template or obtained via AAA.

The virtual templates support all standard PPP configuration commands; however, not all configurations are supported by the PPP-over-ATM virtual access interfaces. These restrictions are enforced at the time the virtual-template configuration is applied (cloned) to the virtual-access interface.

**Autosense for ATM PVCs**

The PPPoA/PPPoE Autosense for ATM PVCs feature enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) over ATM sessions and to create virtual access based on demand for both PPP types.

**Note**

The PPPoA/PPPoE Autosense for ATM PVCs feature is supported on SNAP-encapsulated ATM PVCs only. It is not supported on MUX-encapsulated PVCs.

**Virtual Access Interface Precloning**

Precloning virtual-access interfaces for PPPoA at the NAS enables the virtual-access interface to be allocated at system start. This functionality significantly reduces the load on the system during call setup. When precloning is used, the virtual-access interface is attached to the session upon receipt of the first session-initiation packet from the client. The virtual-access interface is detached upon termination of the PPP session.

**Configuration Enhancements for Broadband Scalability**

The Configuration Enhancements for Broadband Scalability feature reduces the amount of memory that is used per terminated PPP session by creating virtual-access subinterfaces. Depending on the configuration of the source virtual template, virtual-access subinterfaces may be available. This feature also introduces a command to determine if a virtual template is compatible with virtual access subinterfaces.

**Virtual Access Subinterfaces**

The virtual-template command supports existing features, functions, and configurations. By default, the virtual-template subinterface command is enabled.
The virtual template manager will determine if the set of options configured on the virtual template are all supported on a subinterface. Virtual-access subinterfaces will be created for all virtual templates that support subinterfaces. If the user has entered any commands that are not supported on a subinterface, a full virtual access interface will be created and cloned for all PPP sessions using that virtual template. If the virtual-template subinterface command is disabled, full virtual-access interfaces will always be created.

Different applications can use the same virtual template even if one application is subinterface-capable and another is not. The virtual-template manager will be notified whether the application supports virtual-access subinterfaces and creates the appropriate resource.

The ppp multilink and ppp callback accept commands will not necessarily prevent subinterfaces from being created. Often, these commands are present in a virtual-template configuration, but PPP does not negotiate them. If neither of these features is negotiated, virtual-access subinterfaces will be created. If one or both of these features is negotiated, subinterfaces will not be created. The router will automatically determine if subinterfaces will be created depending on how PPP is negotiated on a case-by-case basis.

**Virtual Template Compatibility with Subinterfaces**

The test virtual-template subinterface privileged EXEC command determines whether a virtual template can support the creation of a virtual-access subinterface. If the virtual template contains commands that prevent the creation of subinterfaces, the test virtual-template subinterface command identifies and displays these commands.

If the creation of virtual-access subinterfaces is disabled by the no virtual-template subinterface command, the test virtual-template subinterface command produces no output.

The debug vtemplate subinterface command displays debug messages that are generated if you enter configuration commands on the virtual template that are not valid on a subinterface. These messages are generated only if the debug vtemplate subinterface command is enabled, the virtual-template subinterface command is enabled, and a virtual template is configured that can support the creation of subinterfaces. If the creation of virtual-access subinterfaces is disabled by the no virtual-template subinterface command, the debug vtemplate subinterface command produces no output.

**Benefits of Using Broadband Scalability Features**

Using broadband scalability reduces the amount of memory that is used per terminated PPP session by creating virtual-access subinterfaces. These virtual-access subinterfaces, along with improvements that are transparent to the user, speed up the cloning process.

**How to Prepare for Broadband Access Aggregation**

**Configuring PVCs**

In a digital subscriber line (DSL) environment, many applications require the configuration of a large number of ATM PVCs.

Perform the following tasks to configure PVCs:
Benefits of Configuring a PVC Range

A PVC range saves time because configuring a range of PVCs is faster than configuring a number of PVCs individually.

Using a PVC range saves nonvolatile random access memory (NVRAM) because a range of PVCs takes up less NVRAM on network service routers than a large number of individually configured PVCs.

Using a PVC range speeds boot-up time because the command parser is able to parse one configuration command instead of many.

Configuring an ATM PVC or PVC Range

Perform the following task to configure an ATM PVC or PVC range.

SUMMARY STEPS

1. enable
2. configure terminal
3. Do one of the following:
   - interface atm slot/port.subinterface-number [point-to-point | multipoint]
   - or
   - interface atm number.subinterface-number [point-to-point | multipoint]
4. Do one of the following:
   - pvc [name] vpi/vci
   - range [range-name] pvc start-vpi/start-vci end-vpi/end-vci
5. exit
6. show atm pvc [vpi/vci | name | interface atm interface-number]

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>configure terminal</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>
### Configuring PVCs

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong></td>
<td>Do one of the following:</td>
<td>Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the <code>interface atm</code> command.</td>
</tr>
<tr>
<td></td>
<td>• `interface atm slot/port.subinterface-number [point-to-point</td>
<td>multipoint]`</td>
</tr>
<tr>
<td></td>
<td>• or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• `interface atm number.subinterface-number [point-to-point</td>
<td>multipoint]`</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# interface atm 6/0.200 point-to-point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# interface atm 1/0/0.4 multipoint</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Do one of the following:</td>
<td>Configures the PVC or a range of PVCs.</td>
</tr>
<tr>
<td></td>
<td>• <code>pvc [name] vpi/vci</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <code>range [range-name] pvc start-vpi/start-vci end-vpi/end-vci</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-subif)# pvc cisco 0/5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-subif)# range range1 pvc 1/200 1/299</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td><code>exit</code></td>
<td>(Optional) Exits the configuration session and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-subif)# exit</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>`show atm pvc [vpi/vci</td>
<td>name</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# show atm pvc 0/5</td>
<td></td>
</tr>
</tbody>
</table>
To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Example

The following is sample output from the show atm pvc command with the vpi/vci argument specified:

Router# show atm pvc 0/41
ATM2/0: VCD: 3, VPI: 0, VCI: 41
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
ILMI VC state: Not Managed
InARP frequency: 15 minutes(s)
InProc: 15785, OutProc: 26472, Broadcasts: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
F3 OutEndloop: 0, F3 OutSegloop: 0, F3 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0
F3 OAM cell drops: 0
Status: UP
PPPOE enabled.

Configuring an Individual PVC Within a PVC Range

Perform this task to configure an individual PVC within a range.

SUMMARY STEPS

1. enable
2. configure terminal
3. interface atm number [point-to-point | multipoint]
4. range [range-name] pvc start-vpi/start-vci end-vpi/end-vci
5. pvc-in-range [pvc-name] [[vpi]/vci]
6. end
7. show atm pvc [vpi/vci | name | interface atm interface-number]
8. exit

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
</tbody>
</table>
### Configuring a Virtual Template

Before configuring the ATM PVC for PPP over ATM, you typically create and configure a virtual template. Use the following commands to create and configure a virtual template.

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router# configure terminal</code></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>`interface atm number [point-to-point</td>
<td>multipoint]`</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config)# interface atm 5/0.1 multipoint</code></td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td><code>range [range-name] pvc start-vpi/start-vci end-vpi/end-vci</code></td>
<td>Defines a range of PVCs and enables PVC range configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config-if)# range range-one pvc 1/100 4/199</code></td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td><code>pvc-in-range [pvc-name] [[vpi]/vci]</code></td>
<td>Defines an individual PVC within a PVC range and enables PVC-in-range configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config-if-atm-range)# pvc-in-range pvc1 3/104</code></td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td><code>end</code></td>
<td>Ends the PVC range configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config-if-atm-range-pvc)# end</code></td>
<td></td>
</tr>
<tr>
<td>Step 7</td>
<td>`show atm pvc [vpi/vci</td>
<td>name</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config-if)# show atm pvc pvc1 3/104</code></td>
<td></td>
</tr>
<tr>
<td>Step 8</td>
<td><code>exit</code></td>
<td>Exits interface configuration mode and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>Example: <code>Router(config-if)# exit</code></td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY STEPS

1. enable
2. configure terminal
3. interface virtual-template number
4. encapsulation ppp
5. ip unnumbered ethernet number
6. ppp authentication chap
7. no ip route-cache

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> interface virtual-template number</td>
<td>Creates a virtual template, and enters interface configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config)# interface virtual-template 1</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> encapsulation ppp</td>
<td>Enables PPP encapsulation on the virtual template.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# encapsulation ppp</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> ip unnumbered ethernet number</td>
<td>(Optional) Enables IP without assigning a specific IP address on the LAN.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# ip unnumbered ethernet 1</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> ppp authentication chap</td>
<td>(Optional) Enables CHAP authentication.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# ppp authentication chap</td>
<td></td>
</tr>
</tbody>
</table>
Precloning Virtual-Access Interfaces

Precloning virtual-access interfaces at the NAS reduces the load on the system during call setup. Use the following procedure to preclone a virtual-access interface.

SUMMARY STEPS

1. enable
2. configure terminal
3. virtual-template template-number pre-clone number
4. show vtemplate

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>configure terminal</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>
### Configuring Enhancements for Broadband Scalability

To configure enhancement for broadband scalability, you will perform the following tasks:

#### Verifying Virtual-Template Compatibility with Virtual-Access Subinterfaces

Perform the following task to test a virtual template to determine if it is compatible with the creation of virtual access subinterfaces.

**SUMMARY STEPS**

1. enable
2. test virtual-template *template* subinterface

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
</tbody>
</table>
### Command or Action

**Example:**

```
Router> enable
```

**Purpose**

- Enter your password if prompted.

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>test virtual-template template subinterface</td>
<td>Tests the specified virtual template to determine if it is compatible with the creation of virtual access subinterfaces.</td>
</tr>
</tbody>
</table>

**Example:**

```
Router# test virtual-template virtual-template1 subinterface
```

### Step 2: Test Virtual Template for Compatibility

The output generated by the `test virtual-template subinterface` command describes the compatibility of the virtual template with the creation of subinterfaces.

This example shows output indicating that the virtual template is not compatible. This output also includes a list of the commands, which are configured on the virtual template, that cause the incompatibility.

```
Router# test virtual-template virtual-template1 subinterface
Subinterfaces cannot be created using
Virtual-Template
Interface commands:
traffic-shape rate 50000 8000 8000 1000
```

### Disabling Virtual-Access Subinterfaces

When a virtual template is not compatible with the creation of subinterfaces, use the following task to configure a router to always create full virtual-access interfaces instead of virtual-access subinterfaces.

**Note**

The `virtual-template subinterface` command is enabled by default and does not appear in the running configuration.

### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `no virtual-template subinterface`
DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td>no virtual-template subinterface</td>
<td>Disables the creation of virtual-access subinterfaces.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config)# no virtual-template subinterface</td>
<td></td>
</tr>
</tbody>
</table>

Note: The `virtual-template subinterface` command is enabled by default.

Configuration Examples for Preparing for Broadband Access Aggregation

ATM PVC Range on a Point-to-Point Subinterface Example

In the following example, a PVC range called "range1" is created with a total of 100 PVCs in the range. A point-to-point subinterface will be created for each PVC in the range. Routed bridge encapsulation is configured on this range.

```
interface atm 6/0.200 point-to-point
ip unnumbered loopback 1
atm route-bridged ip
range range1 pvc 1/200 1/299
end
```

ATM PVC Range on a Multipoint Subinterface Example

In the following example, a PVC range called "range-pppoa-1" is created with a total of 500 PVCs in the range. PVC parameters are configured for the range, including the assignment of a VC class called "classA."

```
interface atm 6/0.110 multipoint
range range-pppoa-1 pvc 100 4/199
```
Individual PVC Within a PVC Range Configuration Example

In the following example, "pvc1" within the PVC range called "range1" is deactivated.

```
interface atm 6/0.110 multipoint
range range1 pvc 100 4/199
class-range classA
pvc-in-range pvc1 3/104
shutdown
```

Virtual-Access Subinterfaces Configuration Examples

This section provides the following configuration examples:

**Virtual-Access Subinterface Configuration Example**

The example that follows shows a virtual template that is compatible with virtual-access subinterfaces.

```
interface Virtual-Template1
 ip unnumbered Loopback0
 peer default ip address pool pool-1
 ppp authentication chap
 ppp multilink
```

The following example shows a configuration in which the creation of virtual-access subinterfaces has been disabled by the **no virtual-access subinterface** command. When this command is configured, virtual-access interfaces are not registered with the SNMP code on the router. In network environments that do not use SNMP to manage PPP sessions, this saves the memory and CPU processing that would be used to register the virtual-access interfaces with the SNMP code.

```
Current configuration :6003 bytes
!
! Last configuration change at 10:59:02 EDT Thu Sep 19 2004
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service internal
service udp-small-servers
service tcp-small-servers
!
hostname ioswan5-lns
```
! enable password lab
! username cisco password 0 cisco
clock timezone EST -5
clock summer-time EDT recurring
aaa new-model
!
    aaa authentication ppp default local
    aaa authorization network default local
    aaa session-id common
    ip subnet-zero
    no ip gratuitous-arps
    ip cef
    !
    no ip domain lookup
    ip name-server 10.44.11.21
    ip name-server 10.44.11.206
    !
    ip vrf vpn1
    rd 10:1
    route-target export 10:1
    route-target import 10:1
    !
    vpdn enable
    !
    vpdn-group 1
    accept-dialin
    protocol l2tp
    virtual-template 1
    terminate-from hostname ioswan5-lac
    local name tunnell1
    l2tp tunnel password 7 01100F175804
    !
    !
    no virtual-template subinterface
    no virtual-template snmp
    virtual-template 1 pre-clone 10
    !
    !
    buffers small permanent 20000
    buffers middle permanent 7500
    !
    !
    interface Loopback1
    ip address 10.111.1.1 255.255.255.0

**Testing a Virtual Template for Compatibility with Subinterfaces Example**

This example shows the process for testing a virtual template to determine if it can support virtual-access subinterfaces. The following command displays the configuration for virtual template 1:

```
Router# show running interface virtual-template 1
Building configuration...
!
interface Virtual-Template1
ip unnumbered Loopback0
peer default ip address pool pool-1
ppp authentication chap
traffic-shape rate 50000 8000 8000 1000
end
```
The **test virtual-template subinterface** command tests virtual template 1 to determine if it can support subinterfaces. The output shows that the **traffic-shape rate** command that is configured on virtual template 1 prevents the virtual template from being able to support subinterfaces.

```
Router# test virtual-template 1 subinterface
Subinterfaces cannot be created using Virtual-Template1
Interface commands:
traffic-shape rate 50000 8000 8000 1000
```

**Where to Go Next**

To configure broadband access, first select one of the three main configuration tasks:

1. If you want to provide protocol support for PPPoE sessions, refer to the "Providing Protocol Support for Broadband Access Aggregation of PPPoE Sessions" module. Then go to 2.

   or

   If you want to provide protocol support for PPP over ATM sessions, refer to the "Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions" module. Then go to 2.

   or

   If you want to provide connectivity from a remote bridged ethernet network to a routed network using ATM routed bridge encapsulation, refer to the "Providing Connectivity Using ATM Routed Bridge Encapsulation" module.

1. If you are using a RADIUS server for access and accounting, refer to the "Identifying the Physical Subscriber Line for RADIUS Access and Accounting" module. Then go to 3.

2. If you are setting up PPPoE services, you can select the following options:
   - If you want to establish PPPoE session limits for sessions on a specific permanent virtual circuit or VLAN configured on an L2TP access concentrator, refer to the "Establishing PPPoE Session Limits per NAS Port" module.
   - If you want to use service tags to enable a PPPoE server to offer PPPoE clients a selection of service during call setup, refer to the "Offering PPPoE Clients a Selection of Services During Call Setup" module.
   - If you want to control subscriber bandwidth, refer to the "Controlling Subscriber Bandwidth" module.
   - If you want to enable an L2TP access concentrator to relay active discovery and service selection functionality for PPPoE over a L2TP control channel to an LNS or tunnel switch, refer to the "Enabling PPPoE Relay Discovery and Service Selection Functionality" module.
   - If you want to configure the transfer upstream of the session speed value, refer to the "Configuring Upstream Connections Speed Transfer" module.
   - If you want to use Simple Network Management Protocol (SNMP) to monitor PPPoE sessions, refer to the "Monitoring PPPoE Sessions with SNMP" module.
   - If you want to identify a physical subscribe line for RADIUS communication with a RADIUS server, refer to the "Identifying a Physical Subscriber Line for RADIUS Access and Accounting" module.
   - If you want to configure a Cisco Subscriber Service Switch, refer to the "Configuring Cisco Subscriber Service Switch Policies" module.
Additional References

The following sections provide references related to the "Preparing for Broadband Aggregation" module.

### Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuring a PVC range</td>
<td>&quot;Configuring PVCs&quot; chapter in the Cisco IOS Wide-Area Networking Configuration Guide</td>
</tr>
<tr>
<td>Broadband access aggregation concepts</td>
<td>&quot;Understanding Broadband Access Aggregation&quot; module of the Cisco IOS Broadband Access Aggregation and DSL Configuration Guide</td>
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<tr>
<td>Broadband access commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples</td>
<td>&quot;Wide-Area Networking Commands&quot; in the Cisco IOS Wide-Area Networking Command Reference, Release 12.3</td>
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<tr>
<td>Creating a virtual template</td>
<td>&quot;Configuring Virtual Template Interfaces&quot; chapter in the Cisco IOS Dial Technologies Configuration Guide</td>
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### Standards

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### MIBs

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<td>None</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
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### RFCs

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Technical Assistance

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<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
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</table>

Feature Information for Preparing for Broadband Access Aggregation

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to . An account on Cisco.com is not required.

Table 1: Feature Information for Preparing for Broadband Aggregation

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Software Releases</th>
<th>Feature Configuration Information</th>
</tr>
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<tbody>
<tr>
<td>Configuration Enhancements for Broadband Scalability</td>
<td>12.2(13)T 12.2(15)B 12.2(33)SRC</td>
<td>This feature reduces the amount of memory that is used per terminated PPP session by creating virtual-access subinterfaces. Depending on the configuration of the source virtual template, virtual-access subinterface may be available. This feature also introduces a command to determine if a virtual template is compatible with virtual-access subinterfaces.</td>
</tr>
<tr>
<td>PPPoA/PPPoE Autosense for ATM PVCs</td>
<td>12.2(4)T 12.2(4)T3</td>
<td>This feature enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) over ATM sessions and to create virtual access based on demand for both PPP types.</td>
</tr>
</tbody>
</table>