Using GVRP (Dynamic VLANs)

GVRP is an industry-standard protocol designed to propagate VLAN information from device to device. With GVRP, a single switch is manually configured with all the desired VLANs for the network, and all other switches on the network learn those VLANs dynamically. An endnode can be plugged into any switch and be connected to that endnode's desired VLAN.

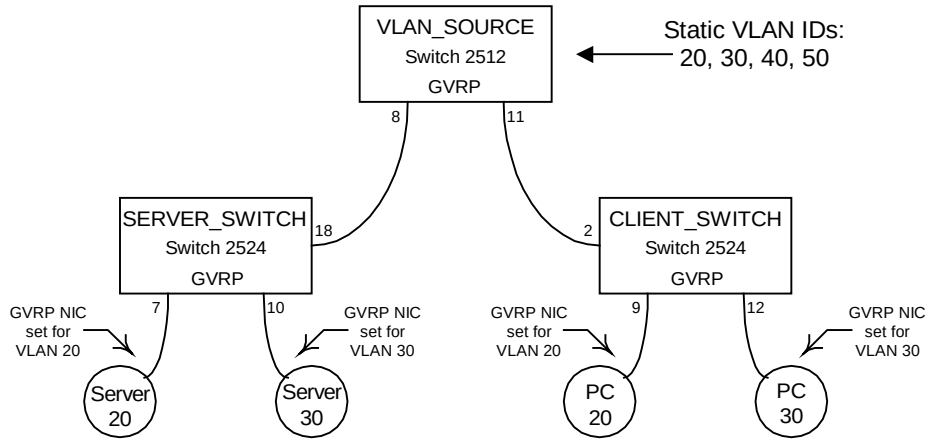
For endnodes to make use of GVRP, they need GVRP-aware Network Interface Cards (NICs). The GVRP-aware NIC is configured with the desired VLAN or VLANs, then connected to a GVRP-enabled switch. The NIC communicates with the switch, and VLAN connectivity is established between the NIC and switch.

This configuration example provides a simple GVRP installation with 4 VLANs configured on a switch named "VLAN_SOURCE". These 4 VLANs are "static" on the source switch; they are manually configured and always exist on that switch. Other switches in the network will learn the 4 VLANs as "dynamic" VLANs; they are not configured on those other switches. The DEFAULT_VLAN (with VLAN ID = 1) exists by default on all switches, but it is not involved in this GVRP example.

The configuration example assumes that we want to have all 4 VLANs learned on all other switches in the network. And a small amount of control is applied to the source switch - it is configured to "block" the learning of any additional ("unknown") VLANs. This ensures that the source switch will only advertise the 4 statically-configured VLANs. The DEFAULT_VLAN is not used in this example.

This configuration example applies to the following HP Series 2500 switch products:

- J4812A HP Procurve Switch 2512
- J4813A HP Procurve Switch 2524



REQUIREMENTS / RESTRICTIONS

1) In order to advertise VLANs, the VLANs on the source switch must be "active". That is, at least one port on the switch must be a member of a VLAN, and must detect linkbeat, in order for the switch to advertise that VLAN out all ports.

   In this configuration example, we ensure that all VLANs are active and advertised by configuring all VLANs on all ports of the source switch.

2) All GVRP-learned VLANs operate as tagged VLANs. So if a port on Switch_A is configured as an untagged member of VLAN_x, and Switch_A advertises VLAN_x to Switch_B, VLAN_x will be tagged on Switch_B's port, and communication between Switch_A and Switch_B over VLAN_x will fail.

   In this configuration example, we configure the source switch with all VLANs (other than the DEFAULT_VLAN) as tagged on all ports. (The DEFAULT_VLAN is untagged for all ports, when a Series 2500 switch starts in its factory-default configuration.)

WARNING

The example below was created from factory-default configurations on the switches. We recommend saving your current configurations if necessary. To reset a Series 2500 switch to a factory-default configuration, use the following command:

```
HP ProCurve Switch 2512# erase startup-config
```

CONFIGURATION COMMANDS (created on software version F.01.08)

VLAN_SOURCE:

```
HP ProCurve Switch 2512# config
HP ProCurve Switch 2512(config)# hostname VLAN_SOURCE
VLAN_SOURCE(config)# vlan 20
  20: VLAN added.
VLAN_SOURCE(vlan-20)# tag 1-14
VLAN_SOURCE(vlan-20)# vlan 30
  30: VLAN added.
VLAN_SOURCE(vlan-30)# tag 1-14
VLAN_SOURCE(vlan-30)# vlan 40
  40: VLAN added.
VLAN_SOURCE(vlan-40)# tag 1-14
VLAN_SOURCE(vlan-40)# vlan 50
  50: VLAN added.
VLAN_SOURCE(vlan-50)# tag 1-14
VLAN_SOURCE(vlan-50)# exit
VLAN_SOURCE(config)# gvrp
VLAN_SOURCE(config)# int 1-14
VLAN_SOURCE(eth-1-14)# unknown-vlans block
```

```
VLAN_SOURCE(eth-1-14)# end
VLAN_SOURCE# write mem
```

SERVER_SWITCH:

```
HP ProCurve Switch 2524# config
HP ProCurve Switch 2524(config)# hostname SERVER_SWITCH
SERVER_SWITCH(config)# gvrp
SERVER_SWITCH(config)# end
SERVER_SWITCH# write mem
```

CLIENT_SWITCH:

```
HP ProCurve Switch 2524# config
HP ProCurve Switch 2524(config)# hostname CLIENT_SWITCH
CLIENT_SWITCH(config)# gvrp
CLIENT_SWITCH(config)# end
CLIENT_SWITCH# write mem
```

RESULTING CONFIGURATION

VLAN_SOURCE:

```
VLAN_SOURCE# show config

IN-FLASH CONFIGURATION

; J4812A Configuration Editor; Created on release #F.01.08

time daylight-time-rule None
hostname "VLAN_SOURCE"
interface 1
   unknown-vlans Block
   exit
interface 2
   unknown-vlans Block
   exit
interface 3
   unknown-vlans Block
   exit
interface 4
   unknown-vlans Block
   exit
interface 5
   unknown-vlans Block
   exit
interface 6
   unknown-vlans Block
   exit
interface 7
   unknown-vlans Block
   exit
```

```
interface 8
   unknown-vlans Block
   exit
interface 9
   unknown-vlans Block
   exit
interface 10
   unknown-vlans Block
   exit
interface 11
   unknown-vlans Block
   exit
interface 12
   unknown-vlans Block
   exit
interface 13
   unknown-vlans Block
   exit
interface 14
   unknown-vlans Block
   exit
ip timep dhcp
snmp-server community "public" Unrestricted
vlan 1
   name "DEFAULT_VLAN"
   untagged 1-14
   ip address dhcp-bootp
   exit
vlan 20
   name "VLAN20"
   tagged 1-14
   exit
vlan 30
   name "VLAN30"
   tagged 1-14
   exit
vlan 40
   name "VLAN40"
   tagged 1-14
   exit
vlan 50
   name "VLAN50"
   tagged 1-14
   exit
gvrp
```

SERVER_SWITCH:

```
SERVER_SWITCH# show config

IN-FLASH CONFIGURATION

; J4813A Configuration Editor; Created on release #F.01.08

time daylight-time-rule None
hostname "SERVER_SWITCH"
ip timep dhcp
```

```
snmp-server community "public" Unrestricted
vlan 1
   name "DEFAULT_VLAN"
   untagged 1-26
   ip address dhcp-bootp
   exit
gvrp
```

CLIENT_SWITCH:

```
CLIENT_SWITCH# show config

IN-FLASH CONFIGURATION

; J4813A Configuration Editor; Created on release #F.01.08

time daylight-time-rule None
hostname "CLIENT_SWITCH"
ip timep dhcp
snmp-server community "public" Unrestricted
vlan 1
   name "DEFAULT_VLAN"
   untagged 1-26
   ip address dhcp-bootp
   exit
gvrp
```

VERIFICATION COMMANDS

GVRP and VLAN "show" commands:

show gvrp	display the per-port GVRP settings
show vlans	display the vlans available on the switch
show vlan #	display the port membership and per-port GVRP settings of vlan #

Output of "show gvrp":

VLAN_SOURCE:

```
VLAN_SOURCE# sho gvrp

 GVRP support

  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN
  GVRP Enabled : Yes

  Port Type      | Unknown VLAN
  ---- --------- + ------------
  1    10/100TX  | Block
  2    10/100TX  | Block
```

```
 3    10/100TX  | Block
 4    10/100TX  | Block
 5    10/100TX  | Block
 6    10/100TX  | Block
 7    10/100TX  | Block
 8    10/100TX  | Block
 9    10/100TX  | Block
 10   10/100TX  | Block
 11   10/100TX  | Block
 12   10/100TX  | Block
 13             | Block
 14             | Block
```

SERVER_SWITCH:

```
SERVER_SWITCH# sho gvrp

 GVRP support

  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN
  GVRP Enabled : Yes

  Port Type      | Unknown VLAN
  ---- --------- + ------------
  1    10/100TX  | Learn
  2    10/100TX  | Learn
  3    10/100TX  | Learn
  4    10/100TX  | Learn
  5    10/100TX  | Learn
  6    10/100TX  | Learn
  7    10/100TX  | Learn
  8    10/100TX  | Learn
  9    10/100TX  | Learn
  10   10/100TX  | Learn
  11   10/100TX  | Learn
  12   10/100TX  | Learn
  13   10/100TX  | Learn
  14   10/100TX  | Learn
  15   10/100TX  | Learn
  16   10/100TX  | Learn
  17   10/100TX  | Learn
  18   10/100TX  | Learn
  19   10/100TX  | Learn
  20   10/100TX  | Learn
  21   10/100TX  | Learn
  22   10/100TX  | Learn
  23   10/100TX  | Learn
  24   10/100TX  | Learn
  25             | Learn
  26             | Learn
```

CLIENT_SWITCH:

```
CLIENT_SWITCH# show gvrp

 GVRP support

  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN
  GVRP Enabled : Yes

  Port Type      | Unknown VLAN
  ---- --------- + ------------
  1    10/100TX  | Learn
  2    10/100TX  | Learn
  3    10/100TX  | Learn
  4    10/100TX  | Learn
  5    10/100TX  | Learn
  6    10/100TX  | Learn
  7    10/100TX  | Learn
  8    10/100TX  | Learn
  9    10/100TX  | Learn
  10   10/100TX  | Learn
  11   10/100TX  | Learn
  12   10/100TX  | Learn
  13   10/100TX  | Learn
  14   10/100TX  | Learn
  15   10/100TX  | Learn
  16   10/100TX  | Learn
  17   10/100TX  | Learn
  18   10/100TX  | Learn
  19   10/100TX  | Learn
  20   10/100TX  | Learn
  21   10/100TX  | Learn
  22   10/100TX  | Learn
  23   10/100TX  | Learn
  24   10/100TX  | Learn
  25             | Learn
  26             | Learn
```

Output of "show vlans":

VLAN_SOURCE:

```
VLAN_SOURCE# sho vlans

 Status and Counters - VLAN Information

  VLAN support : Yes
  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN

  802.1Q VLAN ID Name          Status
  -------------- ------------- -------------
  1              DEFAULT_VLAN  Static
  20             VLAN20        Static
  30             VLAN30        Static
```

```
  40             VLAN40        Static
  50             VLAN50        Static
```

SERVER_SWITCH:

```
SERVER_SWITCH# sho vlans

 Status and Counters - VLAN Information

  VLAN support : Yes
  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN

  802.1Q VLAN ID Name          Status
  -------------- ------------- -------------
  1              DEFAULT_VLAN  Static
  20             GVRP_20       Dynamic
  30             GVRP_30       Dynamic
  40             GVRP_40       Dynamic
  50             GVRP_50       Dynamic
```

CLIENT_SWITCH:

```
CLIENT_SWITCH# sho vlans

 Status and Counters - VLAN Information

  VLAN support : Yes
  Maximum VLANs to support : 8
  Primary VLAN : DEFAULT_VLAN

  802.1Q VLAN ID Name          Status
  -------------- ------------- -------------
  1              DEFAULT_VLAN  Static
  20             GVRP_20       Dynamic
  30             GVRP_30       Dynamic
  40             GVRP_40       Dynamic
  50             GVRP_50       Dynamic
```

Output of "show vlan 20" BEFORE Connecting Endnodes:

VLAN_SOURCE:

```
VLAN_SOURCE# sho vlan 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name          : VLAN20
  Status        : Static

  Port Information Mode     Unknown VLAN Status
  ---------------- -------- ------------ ----------
  1                Tagged   Block        Down
```

```
2                Tagged   Block        Down
3                Tagged   Block        Down
4                Tagged   Block        Down
5                Tagged   Block        Down
6                Tagged   Block        Down
7                Tagged   Block        Down
8                Tagged   Block        Up
9                Tagged   Block        Down
10               Tagged   Block        Down
11               Tagged   Block        Up
12               Tagged   Block        Down
13               Tagged   Block        Down
14               Tagged   Block        Down
```

SERVER_SWITCH:

```
SERVER_SWITCH# sho vlan 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name           : GVRP_20
  Status         : Dynamic

  Port Information Mode     Unknown VLAN Status
  ---------------- -------- ------------ ----------
  18               Auto     Learn        Up
```

CLIENT_SWITCH:

```
CLIENT_SWITCH# sho vlan 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name           : GVRP_20
  Status         : Dynamic

  Port Information Mode     Unknown VLAN Status
  ---------------- -------- ------------ ----------
  2                Auto     Learn        Up
```

Output of "show vlan 20" AFTER Connecting Endnodes:

VLAN_SOURCE: (no change after endnodes are connected; VLAN 20 is static)

```
VLAN_SOURCE# sho vlan 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name           : VLAN20
  Status         : Static
```

```
 Port Information Mode     Unknown VLAN Status
 ---------------- -------- ------------ ----------
 1                Tagged   Block        Down
 2                Tagged   Block        Down
 3                Tagged   Block        Down
 4                Tagged   Block        Down
 5                Tagged   Block        Down
 6                Tagged   Block        Down
 7                Tagged   Block        Down
 8                Tagged   Block        Up
 9                Tagged   Block        Down
 10               Tagged   Block        Down
 11               Tagged   Block        Up
 12               Tagged   Block        Down
 13               Tagged   Block        Down
 14               Tagged   Block        Down
```

SERVER_SWITCH:

```
SERVER_SWITCH# sho vla 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name           : GVRP_20
  Status         : Dynamic

  Port Information Mode     Unknown VLAN Status
  ---------------- -------- ------------ ----------
  7                Auto     Learn        Up
  18               Auto     Learn        Up
```

CLIENT_SWITCH:

```
CLIENT_SWITCH# sho vla 20

 Status and Counters - VLAN Information - Ports - VLAN 20

  802.1Q VLAN ID : 20
  Name           : GVRP_20
  Status         : Dynamic

  Port Information Mode     Unknown VLAN Status
  ---------------- -------- ------------ ----------
  2                Auto     Learn        Up
  9                Auto     Learn        Up
```

ADDITIONAL GVRP INFORMATION

It is useful to understand how GVRP propagates VLAN information from switch to switch.

1) When GVRP is enabled on a switch, the switch sends GVRP packets out all ports. The GVRP packets advertise all the VLANs known to that switch.

2) When a GVRP-enabled switch receives a GVRP packet advertising a set of VLANs, the receiving port becomes a member of those advertised VLANs - and the switch begins advertising those VLANs out all ports (other than the port on which the VLANs were learned).

An interesting effect of this behavior is that every port on every switch is not a member of all VLANs. The VLAN information is propagated from the source switch to all other switches, but only one port on each receiving switch becomes a member of the VLANs it learned - the port that receives the VLAN information.

To complete the picture, an endnode with GVRP-aware NIC connects to a switch. This GVRP-aware NIC, configured for a specific VLAN or VLANs, begins advertising its configured VLAN(s) to the directly-connected switch. The receiving port on the switch becomes a member of the VLAN(s) it learned - and then advertises the VLAN(s) out all other ports.

This GVRP behavior can be observed in this configuration example by studying the output of "show vlan 20" before and after endnodes are connected:

> Before endnodes are connected, VLAN 20 is advertised by VLAN_SOURCE switch ports 8 and 11. That advertisement is received by SERVER_SWITCH port 18 and CLIENT_SWITCH port 2.
>
> After endnodes are connected, SERVER_SWITCH receives advertisements of VLAN 20 on port 7 from Server 20, and CLIENT_SWITCH receives advertisements of VLAN 20 on port 9 from PC 20.

The receiving port of each switch becomes a member of VLAN 20, based on the advertisement (effectively, a request) from the endnodes. And that "request" from each endnode is propagated all the way to the VLAN source switch, thereby completing connectivity of VLAN 20 from client to server through multiple switches. This is why GVRP is often referred to as "VLANs on demand".

Unexpected VLANs

It should be noted that one could connect two endnodes to either SERVER_SWITCH or CLIENT_SWITCH, and configure those endnodes' NICs for an unexpected VLAN (for example, VLAN 77. Because GVRP is enabled on the switch, and based on the GVRP behavior explained above, VLAN 77 would be dynamically created on the switch, and the endnodes would be connected via VLAN 77 on that one switch.

However, an unexpected VLAN would never be added to the VLAN_SOURCE switch, because that switch is configured to "block" any "unknown VLANs". That "block" configuration provides a limited amount of control for the network administrator, by preventing an unexpected VLAN like VLAN 77 from being propagated throughout the network.