

Example: Configure Automatic VLAN Administration Using GVRP

As a network expands and the number of clients and VLANs increases, VLAN administration becomes complex, and the task of efficiently configuring VLANs on multiple EX-series switches becomes increasingly difficult. To automate VLAN administration, you can enable GARP VLAN Registration Protocol (GVRP) on the network.



NOTE: Only trunk interfaces can be enabled for GVRP.

This example describes how to use GVRP to automate administration of VLAN membership changes within your network:

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Requirements

This example uses the following hardware and software components:

- Two EX 3200 access switches
- One EX 4200 distribution switch
- JUNOS Release 9.0 or later for EX-series switches

Before you configure GVRP on the access switches and on the distribution switch, be sure you have:

- Performed the initial software configuration on the switches. See *Connecting and Configuring an EX-series Switch (J-Web Procedure)*.
- Configured the VLANs on both the access switches and on the distribution switch. (Dynamic VLAN configuration is not supported.)
- Configured a trunk interface on all the switches.

Overview and Topology

When you are setting up your network, you should configure all VLANs on all switches, even though some switches are not actively participating in a VLAN. Then enable GVRP on the trunk interface of each switch. GVRP ensures that the VLAN membership information on the trunk interface is updated as the switch's access interfaces become active or inactive in the configured VLANs.

You do not need to take an extra step of explicitly binding a VLAN to the trunk interface. When GVRP is enabled, the trunk interface advertises all the VLANs that are active (bound to access interfaces) on that switch. A GVRP-enabled trunk interface does not advertise VLANs that have been configured on the switch but that are not currently bound to an access interface. Thus, GVRP provides the benefit of reducing network overhead—by limiting the scope of broadcast, unknown unicast, and multicast (BUM) traffic to interested devices only.

This example shows a network with three VLANs: finance, sales, and lab.

Access Switch A has been configured to support all three VLANs and all three VLANs are active, bound to interfaces that are connected to personal computers:

- `ge-0/0/1`— Connects PC1 as member of finance vlan, VLAN ID 100
- `ge-0/0/2`— Connects PC2 as member of lab vlan, VLAN ID 200
- `ge-0/0/3`— Connects PC3 as member of sales vlan, VLAN ID 300

Access Switch B has also been configured to support three VLANs. However, currently only two VLANs are active, bound to interfaces that are connected to personal computers:

- `ge-0/0/0`— Connects PC4 as member of finance vlan, VLAN ID 100
- `ge-0/0/1`— Connects PC5 as member of lab vlan, VLAN ID 200

The Distribution Switch is also configured to support the three VLANs (finance, lab, sales). However, the Distribution Switch does not have any access interfaces that are connecting devices as members of these VLANs. The Distribution Switch has two trunk interfaces:

- `xe-0/1/1`— Connects Distribution Switch to Access Switch A.
- `xe-0/1/0`— Connects Distribution Switch to Access Switch B.

Figure 1 on page 3 shows GVRP configured on two access switches and one distribution switch.

Figure 1: GVRP Configured on Two Access Switches and One Distribution Switch for Automatic VLAN Administration

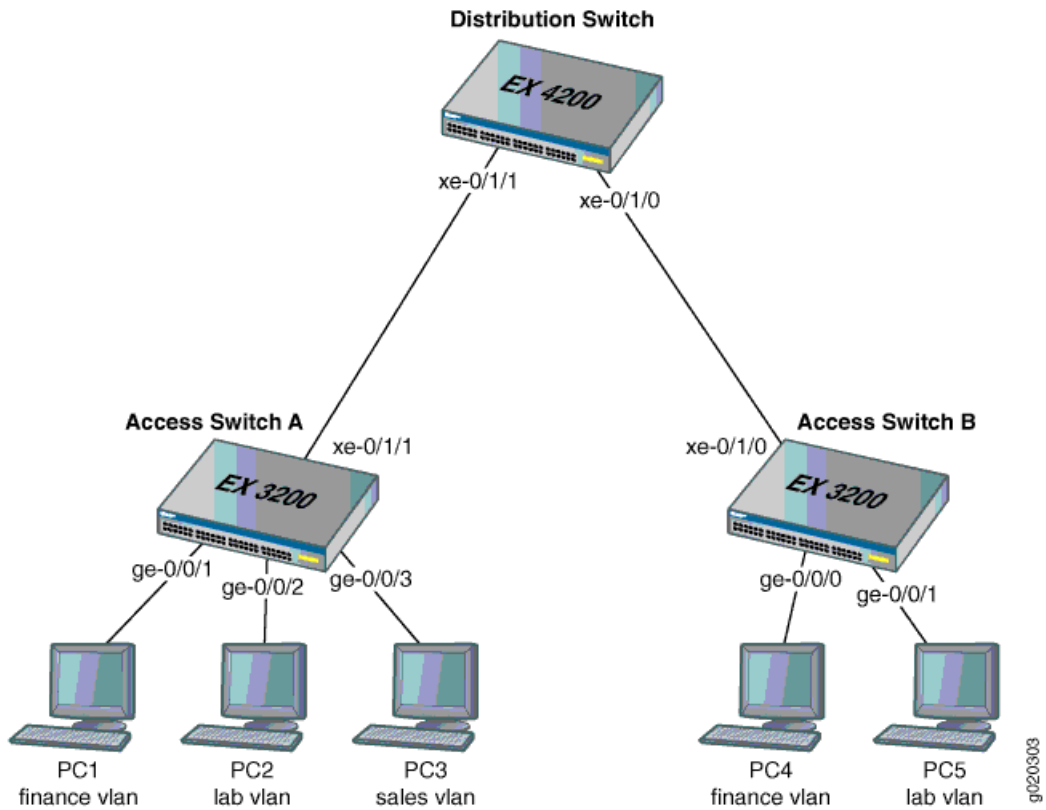


Table 1: Components of the Network Topology

Property	Settings
Switch hardware	<ul style="list-style-type: none"> ■ Access Switch A–EX 3200 switch ■ Access Switch B–EX 3200 access switch ■ Distribution Switch–EX 4200 switch
VLAN names and tag IDs	finance, tag 100 lab, tag 200 sales, tag 300

Table 1: Components of the Network Topology (continued)

Interfaces	<p>Access Switch A Interfaces</p> <ul style="list-style-type: none">■ <code>ge-0/0/1</code>— Connects PC1 to Access Switch A.■ <code>ge-0/0/2</code>— Connects PC2 to Access Switch A.■ <code>ge-0/0/3</code>— Connects PC3 to Access Switch A.■ <code>xe-0/1/1</code>— Connects Access Switch A to Distribution Switch. (trunk) <p>Access Switch B Interfaces</p> <ul style="list-style-type: none">■ <code>ge-0/0/0</code>— Connects PC4 to Access Switch B.■ <code>ge-0/0/1</code>— Connects PC5 to Access Switch B.■ <code>xe-0/1/0</code>— Connects Access Switch B to Distribution Switch. (trunk) <p>Distribution Switch Interfaces</p> <ul style="list-style-type: none">■ <code>xe-0/1/1</code>— Connects Distribution Switch to Access Switch A. (trunk)■ <code>xe-0/1/0</code>— Connects Distribution Switch to Access Switch B. (trunk)
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When VLAN access interfaces become active or inactive, GVRP ensures that the updated information is advertised on the trunk interface. Thus, the Distribution Switch does not forward traffic to inactive VLANs.

Configuring VLANs and GVRP on Access Switch A

To configure three VLANs on the switch, bind access interfaces for PC1, PC2, and PC3 to the VLANs (finance, lab, sales), and enable GVRP on the trunk interface of Access Switch A, perform these tasks:

CLI Quick Configuration To quickly configure Access Switch A to support the three VLANs, bind interfaces for the three PCs to the appropriate VLANs, and enable GVRP on the trunk interface, copy the following commands and paste them into the switch terminal window of Switch A:

```
[edit]
set vlans finance vlan-id 100
set vlans lab vlan-id 200
set vlans sales vlan-id 300
set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members finance
set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members lab
set interfaces ge-0/0/3 unit 0 family ethernet-switching vlan members sales
set interfaces xe-0/1/1 unit 0 family ethernet-switching port-mode trunk
set protocols gvrp interface xe-0/1/1.0
```



NOTE: As we recommend, default GVRP timers are used in this example. The default values associated with each GVRP timer are: 200 ms for the `join-timer`, 600 ms for the `leave-timer`, and 1000 cs (10000 ms) for the `leaveall-timer`. Modifying timers to inappropriate values may cause an imbalance in the operation of GVRP. Refer to IEEE 802.1D [2004] Clause 12 for more information. The timer values are displayed when you use the `show gvrp` command to verify that GVRP is enabled. For more information on the timers, see `gvrp` and its associated configuration statements.

Step-by-Step Procedure To configure Access Switch A to support the three VLANs, bind interfaces for the three PCs to the appropriate VLANs, and enable GVRP on the trunk interface, copy the following commands and paste them into the switch terminal window of Switch A:

1. Configure the finance VLAN:

```
[edit]
user@Access-Switch-A# set vlans finance vlan-id 100
```

2. Configure the lab VLAN:

```
[edit]
user@Access-Switch-A# set vlans lab vlan-id 200
```

3. Configure the sales VLAN:

```
[edit]
user@Access-Switch-A# set vlans sales vlan-id 300
```

4. Configure an Ethernet interface as a member of the finance VLAN:

```
[edit]
user@Access-Switch-A# set interfaces ge-0/0/1 unit 0 family
ethernet-switching vlan members finance
```

5. Configure an Ethernet interface as a member of the lab VLAN:

```
[edit]
user@Access-Switch-A# set interfaces ge-0/0/2 unit 0 family
ethernet-switching vlan members lab
```

6. Configure an Ethernet interface as a member of the sales VLAN:

```
[edit]
user@Access-Switch-A# set interfaces ge-0/0/3 unit 0 family
ethernet-switching vlan members sales
```

7. Configure a trunk interface:

```
user@Access-Switch-A# set interfaces xe-0/1/1 unit 0 family
ethernet-switching port-mode trunk
```

8. Enable GVRP on the trunk interface:

```
[edit]
user@Access-Switch-A# set protocols gvrp interface xe-0/1/1.0
```

Results Check the results of the configuration:

```
interfaces {
  ge-0/0/0 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/0/1 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members finance;
        }
      }
    }
  }
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members lab;
        }
      }
    }
  }
  ge-0/0/3 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members sales;
        }
      }
    }
  }
  xe-0/1/1 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
      }
    }
  }
  ge-0/1/2 {
    unit 0 {
```

```

        family ethernet-switching;
    }
}
ge-0/1/3 {
    unit 0 {
        family ethernet-switching;
    }
}
}
protocols {
    igmp-snooping {
        vlan all;
    }
    lldp {
        interface all;
    }
    lldp-med {
        interface all;
    }
    gvrp {
        interface xe-0/1/1.0;
    }
    rstp;
}
ethernet-switching-options {
    storm-control {
        interface all {
            level 50;
        }
    }
}
}
vlangs {
    finance {
        vlan-id 100;
    }
    lab {
        vlan-id 200;
    }
    sales {
        vlan-id 300;
    }
}
}

```

Configuring VLANs and GVRP on Access Switch B

To configure three VLANs on the switch, bind access interfaces for PC4 and PC5 to the VLANs (finance and lab), and enable GVRP on the trunk interface of Access Switch B, perform these tasks:

CLI Quick Configuration To quickly configure Access Switch B to support the three VLANs, bind interfaces for the two PCs to the appropriate VLANs, and enable GVRP on the trunk interface, copy the following commands and paste them into the switch terminal window of Switch B:

[edit]

```
set vlans finance vlan-id 100
set vlans lab vlan-id 200
set vlans sales vlan-id 300
set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members finance
set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members lab
set interfaces xe-0/1/0 unit 0 family ethernet-switching port-mode trunk
set protocols gvrp interface xe-0/1/0.0
```

Step-by-Step Procedure To configure Access Switch B to support the three VLANs, bind interfaces for the two PCs to the appropriate VLAN, and enable GVRP on the trunk interface, copy the following commands and paste them into the switch terminal window of Switch B:

1. Configure the finance VLAN:

```
[edit]
user@Access-Switch-B# set vlans finance vlan-id 100
```

2. Configure the lab VLAN:

```
[edit]
user@Access-Switch-B# set vlans lab vlan-id 200
```

3. Configure the sales VLAN:

```
[edit]
user@Access-Switch-B# set vlans sales vlan-id 300
```

4. Configure an Ethernet interface as a member of the finance VLAN:

```
[edit]
user@Access-Switch-B# set interfaces ge-0/0/0 unit 0 family
ethernet-switching vlan members finance
```

5. Configure an Ethernet interface as a member of the lab VLAN:

```
[edit]
user@Access-Switch-B# set interfaces ge-0/0/1 unit 0 family
ethernet-switching vlan members lab
```

6. Configure a trunk interface:

```
user@Access-Switch-B# set interfaces xe-0/1/0 unit 0 family
ethernet-switching port-mode trunk
```

7. Enable GVRP on the trunk interface:

```
[edit]
user@Access-Switch-B# set protocols gvrp xe-0/1/0.0
```



NOTE: As we recommend, default GVRP timers are used in this example. The default values associated with each GVRP timer are: 200 ms for the **join-timer**, 600 ms for the **leave-timer**, and 1000 cs (10000 ms) for the **leaveall-timer**. Modifying timers to inappropriate values may cause an imbalance in the operation of GVRP. Refer to IEEE 802.1D [2004] Clause 12 for more information. The timer values are displayed when you use the `show gvrp` command to verify that GVRP is enabled. For more information on the timers, see `gvrp` and its associated configuration statements.

Results Check the results of the configuration:

```
[edit]
user@Access-Switch-B #show
interfaces {
  ge-0/0/0 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members finance;
        }
      }
    }
  }
  ge-0/0/1 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members lab;
        }
      }
    }
  }
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/0/3 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/1/0 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/1/0 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
      }
    }
  }
}
```

```

    }
  }
  ge-0/1/1 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/1/1 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/1/2 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/1/3 {
    unit 0 {
      family ethernet-switching;
    }
  }
}
protocols {
  igmp-snooping {
    vlan all;
  }
  lldp {
    interface all;
  }
  lldp-med {
    interface all;
  }
  gvrp {
    interface xe-0/1/0.0;
  }
  rstp;
}
ethernet-switching-options {
  storm-control {
    interface all {
      level 50;
    }
  }
}
vlans {
  finance {
    vlan-id 100;
  }
  lab {
    vlan-id 200;
  }
  sales {
    vlan-id 300;
  }
}
}

```

Configuring VLANs and GVRP on the Distribution Switch

CLI Quick Configuration To quickly configure the finance, lab, and sales VLANs on the Distribution Switch and to enable GVRP on the trunk interface of the Distribution Switch, copy the following commands and paste them into the switch terminal window of the Distribution Switch:

```
[edit]
set vlans finance vlan-id 100
set vlans lab vlan-id 200
set vlans sales vlan-id 300
set interfaces xe-0/1/1 unit 0 family ethernet-switching port-mode trunk
set interfaces xe-0/1/0 unit 0 family ethernet-switching port-mode trunk
set protocols gvrp interface xe-0/1/1.0
set protocols gvrp interface xe-0/1/0.0
```

Step-by-Step Procedure To configure the three VLANs on the Distribution Switch, to configure the trunk interfaces, and to enable GVRP on the trunk interface of the Distribution Switch:

1. Configure the finance VLAN:

```
[edit]
user@Distribution-Switch# set vlans finance vlan-id 100
```

2. Configure the lab VLAN:

```
[edit]
user@Distribution-Switch# set vlans lab vlan-id 200
```

3. Configure the sales VLAN:

```
[edit]
user@Distribution-Switch# set vlans sales vlan-id 300
```

4. Configure the trunk interface to Access Switch A:

```
[edit]
user@Distribution-Switch# set interfaces xe-0/1/1 unit 0 family
ethernet-switching port-mode trunk
```

5. Configure the trunk interface to Access Switch B:

```
[edit]
user@Distribution-Switch# set interfaces xe-0/1/0 unit 0 family
ethernet-switching port-mode trunk
```

6. Enable GVRP on the trunk interface for xe-0/1/1 :

```
[edit]
user@Distribution-Switch# set protocols gvrp interface xe-0/1/1.0
```

7. Enable GVRP on the trunk interface for xe-0/1/0 :

```
[edit]
user@Distribution-Switch# set protocols gvrp interface xe-0/1/0.0
```

Results Display the results of the configuration:

```
[edit]
user@Distribution Switch-D #show
interfaces {
  ge-0/0/0 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/0/1 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/0/3 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/1/0 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
      }
    }
  }
  ge-0/1/1 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/1/1 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
      }
    }
  }
  ge-0/1/2 {
    unit 0 {
      family ethernet-switching;
    }
  }
  ge-0/1/3 {
```

```

        unit 0 {
            family ethernet-switching;
        }
    }
}
protocols {
    igmp-snooping {
        vlan all;
    }
    lldp {
        interface all;
    }
    lldp-med {
        interface all;
    }
    gvrp {
        interface xe-0/1/0.0;
        interface xe-0/1/1.0;
    }
    rstp;
}
ethernet-switching-options {
    storm-control {
        interface all {
            level 50;
        }
    }
}
vllans {
    finance {
        vlan-id 100;
    }
    lab {
        vlan-id 300;
    }
    sales {
        vlan-id 300;
    }
}
}

```

Verification

To confirm that the configuration is updating VLAN membership, perform these tasks:

- Verifying That GVRP Is Enabled on Access Switch A on page 14
- Verifying That GVRP Is Updating VLAN Membership on Switch A on page 14
- Verifying That GVRP Is Enabled on Access Switch B on page 14
- Verifying That GVRP Is Updating VLAN Membership on Switch B on page 15
- Verifying That GVRP Is Enabled on the Distribution Switch on page 15
- Verifying That GVRP Is Updating VLAN Membership on the Distribution Switch on page 15

Verifying That GVRP Is Enabled on Access Switch A

Purpose Verify that GVRP is enabled on the switch.

Action Show the GVRP configuration, using the `show gvrp` command:

```
user@Access-Switch-A> show gvrp

Global GVRP configuration
  GVRP status : Enabled
  GVRP Timers (ms)
    Join      : 200
    Leave     : 600
    LeaveAll  : 10000
Interface Name      Protocol Status
-----
xe-0/1/1.0          Enabled
```

Meaning The results show that GVRP is enabled on the trunk interface of Switch A and that the default timers are used.

Verifying That GVRP Is Updating VLAN Membership on Switch A

Purpose To verify that GVRP is updating VLAN membership, display the Ethernet switching interfaces and associated VLANs that are active on switch A:

Action List Ethernet switching interfaces on the switch, using the `show ethernet-switching interfaces` command:

```
user@Access-Switch-A> show ethernet-switching interfaces
Interface  State  VLAN members      Blocking
ge-0/0/1.0 up     finance           unblocked
ge-0/0/2.0 up     lab               unblocked
ge-0/0/3.0 up     sales            unblocked
xe-0/1/1.0 up     finance          unblocked
           up     lab              unblocked
```

Meaning GVRP has automatically added `finance` and `lab` as VLAN members on the trunk interface, because they are being advertised by Access Switch B.

Verifying That GVRP Is Enabled on Access Switch B

Purpose Verify that GVRP is enabled on the switch.

Action Show the GVRP configuration:

```
user@Access-Switch-B> show gvrp

Global GVRP configuration
  GVRP status : Enabled
  GVRP Timers (ms)
    Join      : 200
    Leave     : 600
    LeaveAll  : 10000
Interface Name      Protocol Status
```

```
-----
xe-0/1/0.0      Enabled
-----
```

Meaning The results show that GVRP is enabled on the trunk interface of Switch B and that the default timers are used.

Verifying That GVRP Is Updating VLAN Membership on Switch B

Purpose To verify that GVRP is updating VLAN membership, display the Ethernet switching interfaces and associated VLANs that are active on switch B:

Action List Ethernet switching interfaces on the switch:

```
user@Access-Switch-B> show ethernet-switching interfaces
Interface  State  VLAN members      Blocking
ge-0/0/0.0 up     finance           unblocked
ge-0/0/1.0 up     lab               unblocked
xe-0/1/1.0 up     finance           unblocked
           lab               unblocked
           sales            unblocked
```

Meaning GVRP has automatically added finance , lab, and sales as VLAN members on the trunk interface because they are being advertised by Access Switch A.

Verifying That GVRP Is Enabled on the Distribution Switch

Purpose Verify that GVRP is enabled on the switch.

Action Show the GVRP configuration:

```
user@Distribution-Switch> show gvrp

Global GVRP configuration
  GVRP status : Enabled
  GVRP Timers (ms)
    Join       : 200
    Leave      : 600
    LeaveAll   : 10000
Interface Name      Protocol Status
-----
xe-0/1/0.0          Enabled
xe-0/1/1.0          Enabled
```

Verifying That GVRP Is Updating VLAN Membership on the Distribution Switch

Purpose To verify that GVRP is updating VLAN membership on the distribution switch, display the Ethernet switching interfaces and associated VLANs on the Distribution Switch:

Action List the Ethernet switching interfaces on the switch:

```
user@Distribution-Switch> show ethernet-switching interfaces
Interface  State  VLAN members      Blocking
xe-0/1/1.0 up     finance           unblocked
           lab               unblocked
```

```
xe-0/1/0.0 up      sales      unblocked
                  finance     unblocked
                  lab        unblocked
```

Meaning The Distribution Switch has two trunk interfaces. Interface `xe-0/1/1.0` connects the Distribution Switch to Access Switch A and is therefore updated to show that it is a member of all the VLANs that are active on Access Switch A. Any traffic for those VLANs will be passed on from the Distribution Switch to Access Switch A, through interface `xe-0/1/1.0`. Interface `xe-0/1/0.0` connects the Distribution Switch to Access Switch B and is updated to show that it is a member of the two VLANs that are active on Access Switch B. Thus, the Distribution Switch sends traffic for **finance** and **lab** to both Access Switch A and Access Switch B. But the Distribution Switch sends traffic for **sales** only to Access Switch A.

- Related Topics**
- Example: Setting Up Basic Bridging and a VLAN for an EX-series Switch
 - Understanding Bridging and VLANs on EX-series Switches