

GeneOS - Data Model Migration

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Table of Contents

.....	vi
Document information	1
Copyright and Legal Notice	2
Data Model Migration	3
Introduction	3
TR-098 versus TR-181	3
Data Model Improvements	4
Device.VLANTermination	4
Ethernet.Link	4
Improved Interface Stack Layers	4
ACS Integration	6
Example Deployment Scenarios	7
Layer 2 Basic	7
Layer 3 Basic	9
Layer 3 VLAN per Service	12
Layer 3 VLAN per Customer	15
Hybrid VLAN per Service	19
Conclusion	22
Firmware Upgrade Procedure	23
Frequently Asked Questions	24
References	25

List of Figures

1. VLAN Termination object connections	4
2. Single VLAN Termination object connections	5
3. Multiple VLAN Termination object connections	5
4. Layer 2 VLAN per Port using GeneOS 2.3.0	8
5. Layer 2 VLAN per Port using GeneOS 3.0.0	9
6. Layer 3 Basic using GeneOS 2.3.0	11
7. Layer 3 Basic using GeneOS 3.0.0	12
8. Layer 3 VLAN per Service using GeneOS 2.3.0	14
9. Layer 3 VLAN per Service using GeneOS 3.0.0	15
10. Layer 3 VLAN per Customer using GeneOS 2.3.0	17
11. Layer 3 VLAN per Customer using GeneOS 3.0.0	18
12. Hybrid VLAN per Service using GeneOS 2.3.0	20
13. Hybrid VLAN per Service using GeneOS 3.0.0	21

List of Tables

1. LinkID Mapping	19
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Document information

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Data Model Migration

This document provides details of changes to the data model used to describe service interfaces from GeneOS 3.0.0 onwards.

Introduction

This technical note is pertinent to GeneOS products which support configuration through TR-069, irrespective of whether TR-069 is used for management or not, and for those operators who currently use GeneOS 2.3.0 or earlier.

This technical note describes the changes in data model used for describing interface stacks from GeneOS 3.0.0, and how to migrate from previous versions, including ACS integration changes necessary to configure interfaces using TR-069.

TR-098 versus TR-181

The Broadband Forum (previously DSL Forum) defined the TR-098 data model for Internet gateway devices. This provided a weak data model definition for VLAN-based services, and their layer 3 termination on CPEs. This situation was improved with the later introduction of the TR-181 issue 2 data model which uses a layered model for interface definition. GeneOS uses the TR-181i2 data model, and adds explicit support for VLAN Termination objects in GeneOS 3.0.0.

The advantages of using the VLAN Termination objects are:

- The standard data model defined by TR-181, therefore should be easier to integrate with ACSs
- Improved layered data model, results in the simpler configuration of layer 3 termination.

Data Model Improvements

The change in data model to using a VLAN Termination-aware TR-181 data model means two major changes:

1. A VLAN Termination object is inserted between each IP.Interface object and the corresponding Ethernet.Link object
2. In a VLAN per Service deployment, a single Ethernet.Link object is used for all IP.Interface objects in each of the upstream and downstream directions. In a VLAN per Customer deployment, each IP.Interface objects has its own associated Ethernet.Link object.

Device.VLANTermination

A VLAN Termination entry is typically stacked on top of a Link object to receive and send frames with the configured VLANID.

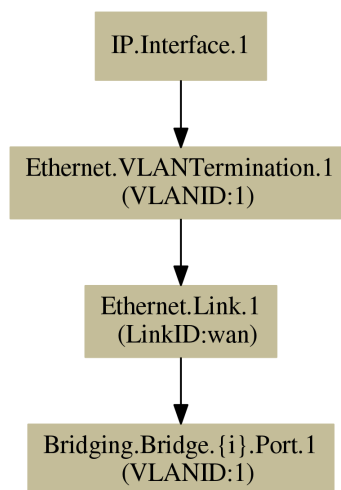
In GeneOS 3.0.0, support for VLAN Termination objects is added in the stack between each IP.Interface object and the relevant Ethernet.Link object. The VLAN Termination object holds the definition of the VLAN identifier used by the IP.Interface. Prior to GeneOS 3.0.0, the VLAN identifier was implicitly encoded in the interface name, e.g. vlan100.

Ethernet.Link

Ethernet link layer entries model the Logical Link Control (LLC) layer. It is expected that an Ethernet.Link interface can be stacked above any lower-layer interface object capable of carrying Ethernet frames. At most one enabled entry in this table can exist with a given value for MACAddress.

Improved Interface Stack Layers

Figure 1. VLAN Termination object connections

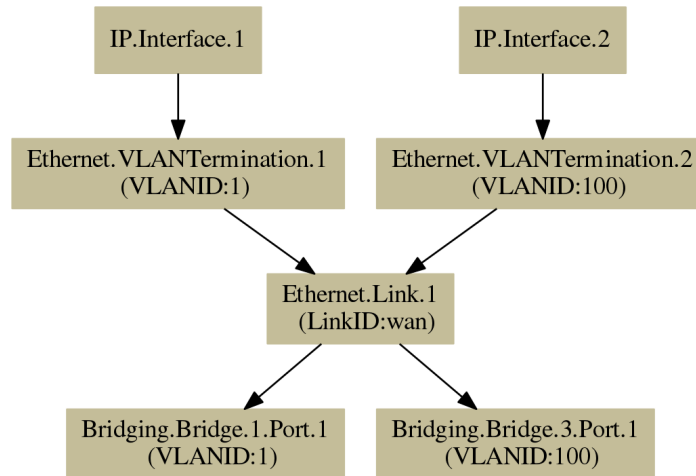


The above diagram shows basic connections between the objects are relatively straightforward. Compared to GeneOS 2.3.0, the only differences are:

1. The inclusion of the VLAN Termination object in the interface stack
2. Addition of the X_GENEXIS_EU_LinkID vendor extension parameter in the Ethernet.Link object - this provides details of the link identity and hence how the link is used.

The diagram shows the default upstream interface stack, with "wan" LinkID value.

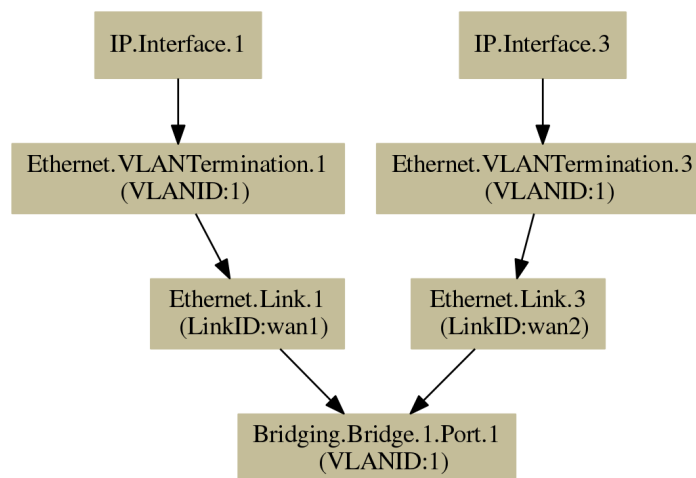
Figure 2. Single VLAN Termination object connections



The above diagram shows the addition of a second layer 3 interface. Both interface stacks use Ethernet.Link.1, since the Ethernet interfaces can use the same MAC address value because of VLAN separation. The LinkID value remains the default value of "wan".

This is the case in Basic, and VLAN per service deployment scenarios.

Figure 3. Multiple VLAN Termination object connections



The above diagram shows the addition of a second layer 3 interface using the same VLAN as the original. In this case a new Ethernet.Link object must be added to separately describe each Ethernet entity. Each Ethernet.Link objects can have at most one MAC address associated with it, and each interface stack must have a unique MAC address so they can operate correctly on the same VLAN.

This is the case in VLAN per customer deployment scenarios.

ACS Integration

All major ACS vendors support TR-181i2. The integration of GeneOS CPEs will need to be updated to use the TR-181i2 stack model instead of the TR-098 bridge model. This is a relatively straightforward process, which consists of two main parts

1. Insert VLAN Termination objects into layer 3 service interfaces
2. Rework Ethernet Link objects such that a single shared object is used for all service interfaces, except in the VLAN per Customer case, where an Ethernet Link object is used per IP.Interface stack.

Practically for non-VLAN per Customer deployments, which are by far the most common, only the VLAN Termination part needs to be considered.

Example Deployment Scenarios

The following deployment scenarios are described - an example configuration file is provided in each case to allow easy understanding of the scenario being used. Data model diagrams are provided for both 2.3.0 and 3.0.0, which show the differences implemented in each case.

- Layer 2 Basic
- Layer 3 Basic
- Layer 3 VLAN per Service
- Layer 3 VLAN per Customer
- Hybrid VLAN per Service

Layer 2 Basic

Layer 2 Basic.

```
geneos# show running-config
! version geneos-polar-2.3.0-R
!cwp acs username "000F94-Polar-W%2E0000430060" password ""

!management source-interface vlan1

username "operator" password ""
username "admin" password ""

catv

interface lan/ethernet1
vlan member 100
vlan untagged 100
no shutdown

interface lan/ethernet2
vlan member 100
vlan untagged 100
no shutdown

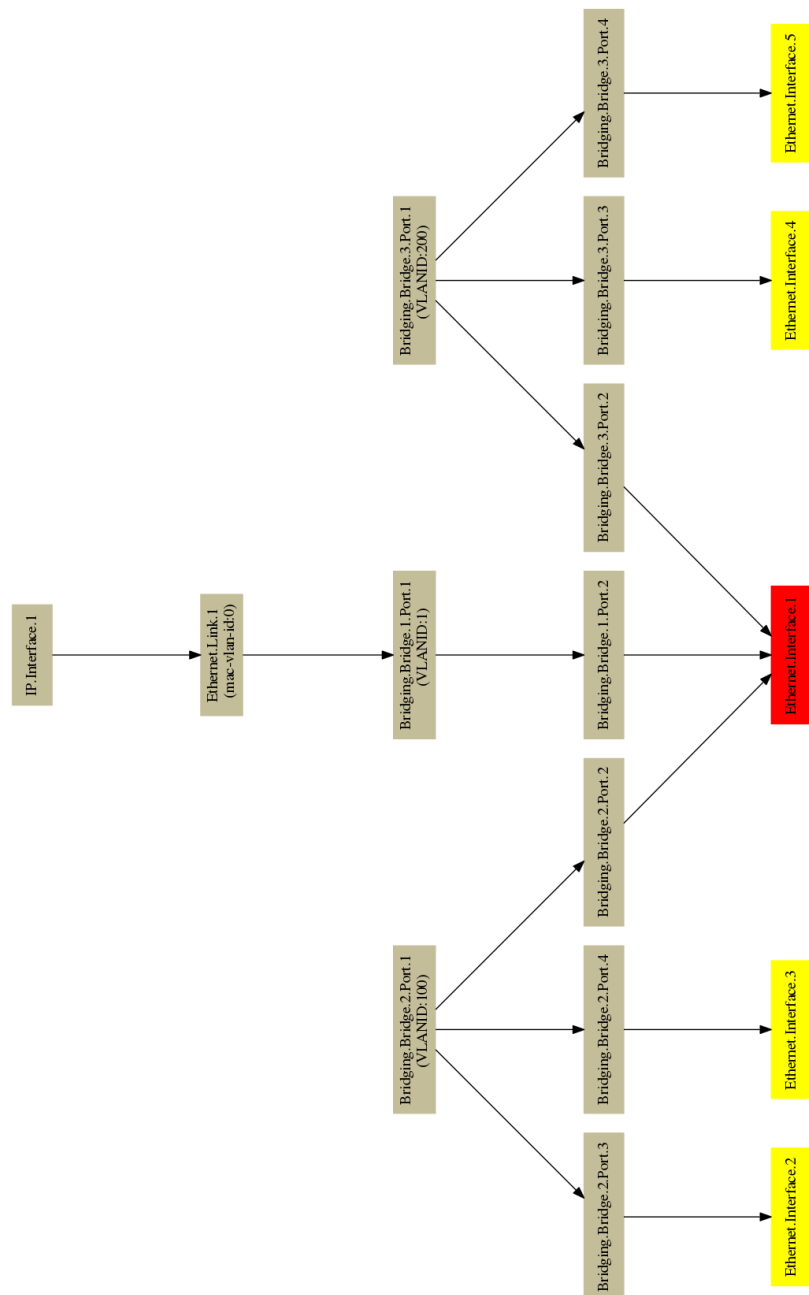
interface lan/ethernet3
vlan member 200
vlan untagged 200
no shutdown

interface lan/ethernet4
vlan member 200
vlan untagged 200
no shutdown

interface vlan1
!ip address dhcp

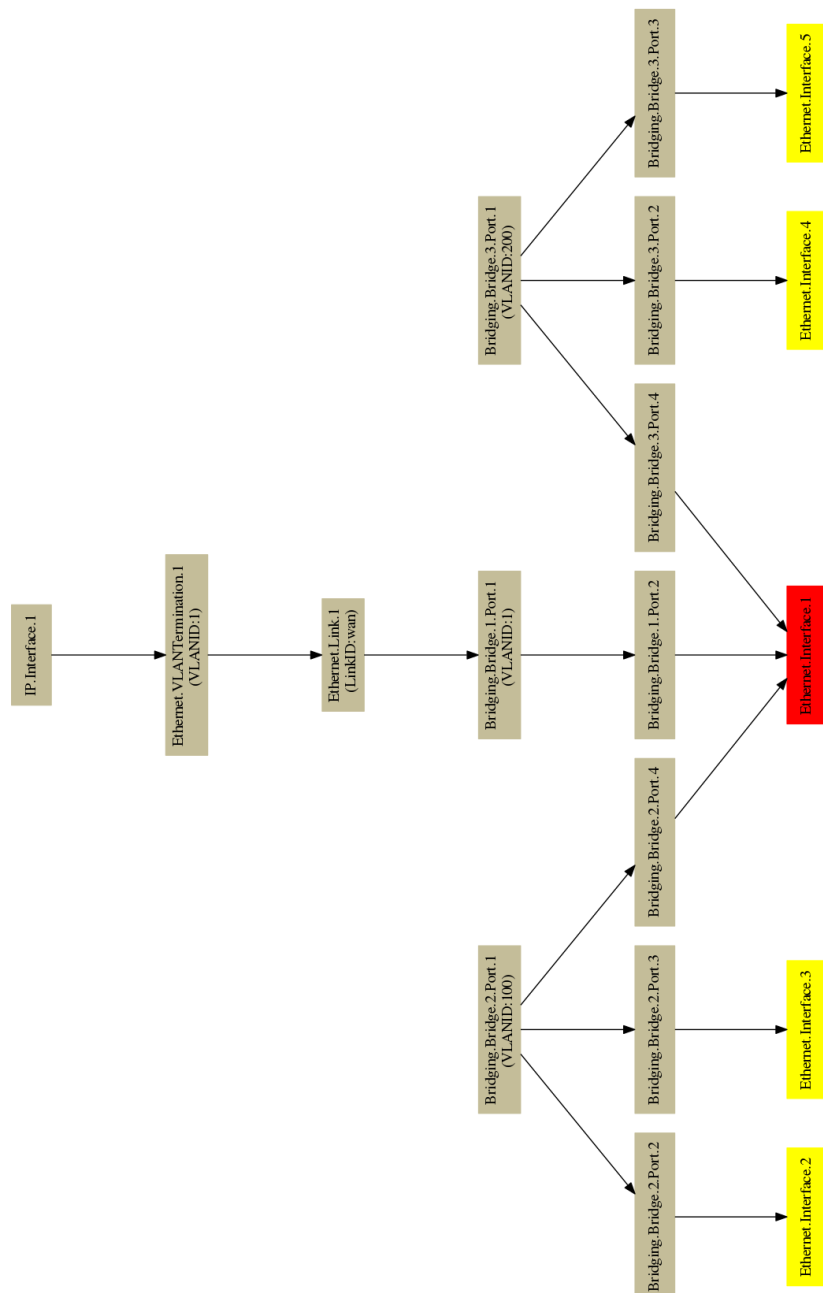
interface wan
vlan member 1,100,200
!vlan untagged 1

!end
```

Figure 4. Layer 2 VLAN per Port using GeneOS 2.3.0

Direct connection between **IP.Interface.1** and **Ethernet.Link.1** objects. The VLAN used by **IP.Interface.1** is inferred from the objects **.Name** parameter, i.e. **vlan1**

Figure 5. Layer 2 VLAN per Port using GeneOS 3.0.0



An Ethernet.VLANTermination object is added between IP.Interface.1 and the Ethernet.Link.1 objects. The VLAN used by the interface is no longer inferred, but is defined by Ethernet.VLANTermination.1.VLANID.

Layer 3 Basic

Layer 3 Basic.

```

geneos# show running-config
! version geneos-lunar-2.3.0-R
!cwmpp acs username "000F94-Lunar-W%2E0000430060" password ""

!dhcp server pool cpe-lan
!pool enable
pool size start 192.168.1.64 end 192.168.1.253

```

```
management source-interface vlan100

ip rule source-interface lan destination-interface vlan100

username "operator" password ""
username "admin" password ""

catv

interface lan
!ip address 192.168.1.254/24

interface lan/ethernet1
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet2
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet3
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet4
!vlan member 4001
!vlan untagged 4001

interface vlan100
!ip address dhcp

interface wan
vlan member 100
vlan untagged 100

interface wlan1

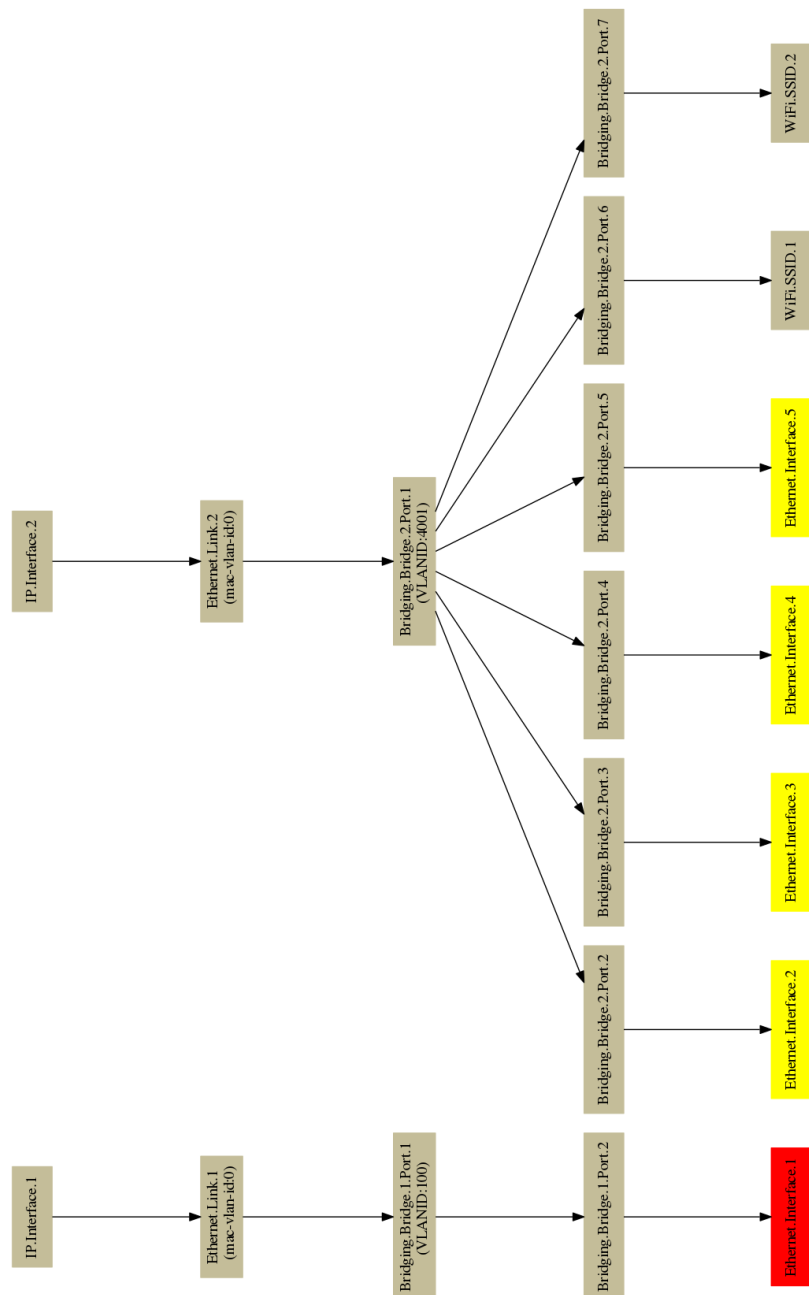
interface wlan2

voice
!country nl
!dial plan "(xx.T)"

voice line 1

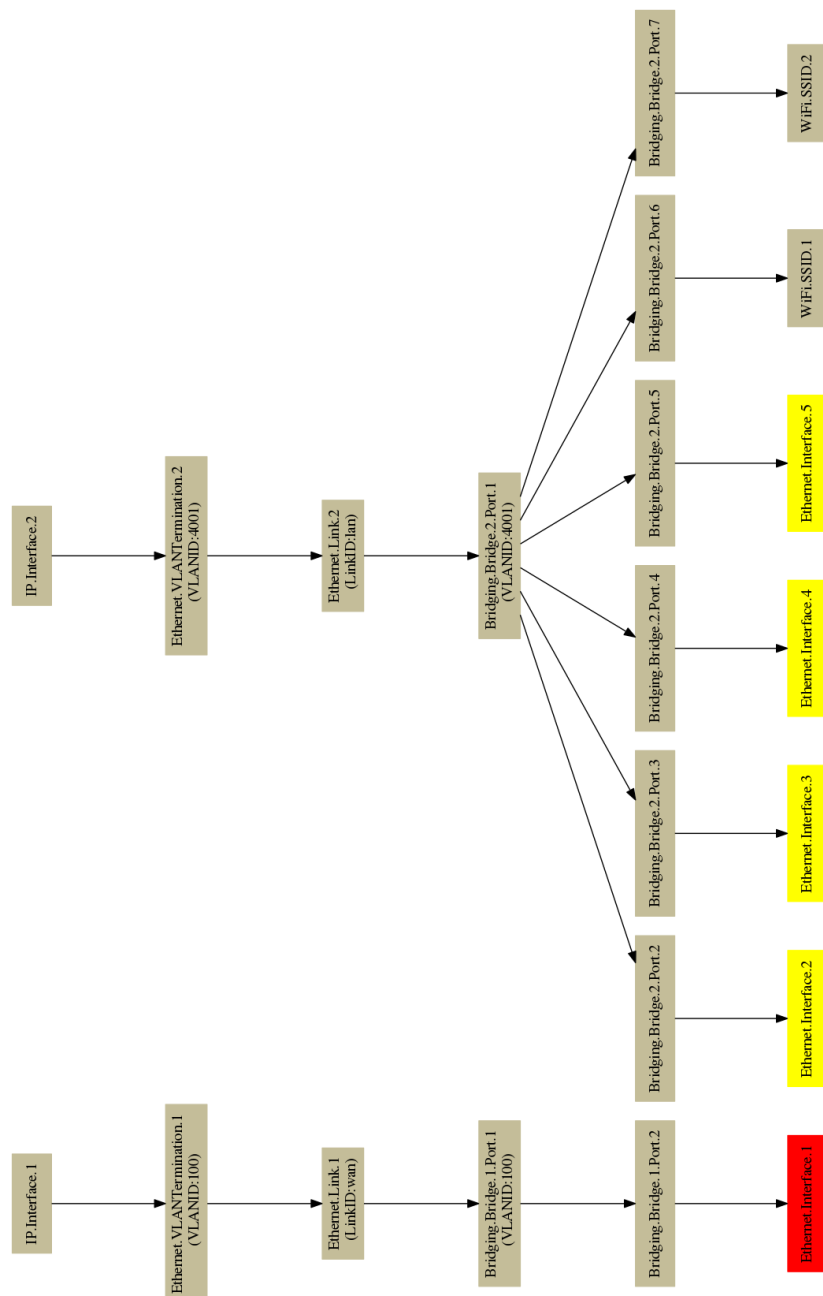
voice line 2
!end
```


Figure 6. Layer 3 Basic using GeneOS 2.3.0



Direct connection between the IP.Interface and Ethernet.Link objects on both WAN and LAN sides of the router. The VLAN used by IP.Interface is inferred from the object's .Name parameter, e.g. vlan100

Figure 7. Layer 3 Basic using GeneOS 3.0.0



An Ethernet.VLANTermination object is added between IP.Interface and the Ethernet.Link objects on the WAN and LAN sides of the router. The VLAN used by the interface is no longer inferred, but is defined by VLANID parameter of the corresponding Ethernet.VLANTermination object.

Layer 3 VLAN per Service

Layer 3 VLAN per Service.

```

geneos# show running-config
! version geneos-lunar-2.3.0-R
!cwm acs username "000F94-Lunar-W%2E0000430060" password ""
!dhcp server pool cpe-lan
  
```

```
!pool enable
pool size start 192.168.1.64 end 192.168.1.253

management source-interface vlan100

ip rule source-interface lan destination-interface vlan200

username "operator" password ""
username "admin" password ""

catv

interface lan
!ip address 192.168.1.254/24

interface lan/ethernet1
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet2
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet3
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet4
!vlan member 4001
!vlan untagged 4001

interface vlan100
!ip address dhcp

interface vlan200
ip address dhcp

interface vlan300
ip address dhcp

interface wan
vlan member 100,200,300
vlan untagged 100

interface wlan1

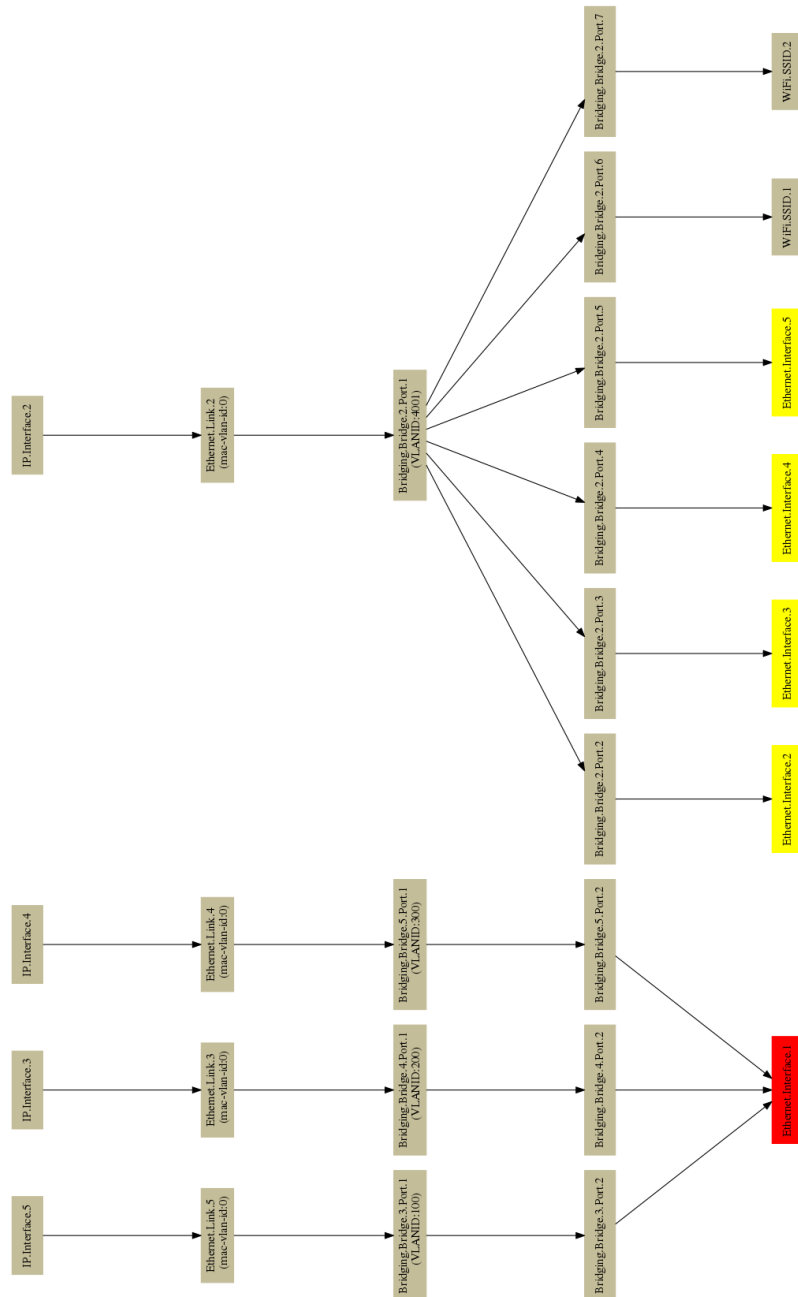
interface wlan2

voice
!country nl
!dial plan "(xx.T)"

voice line 1

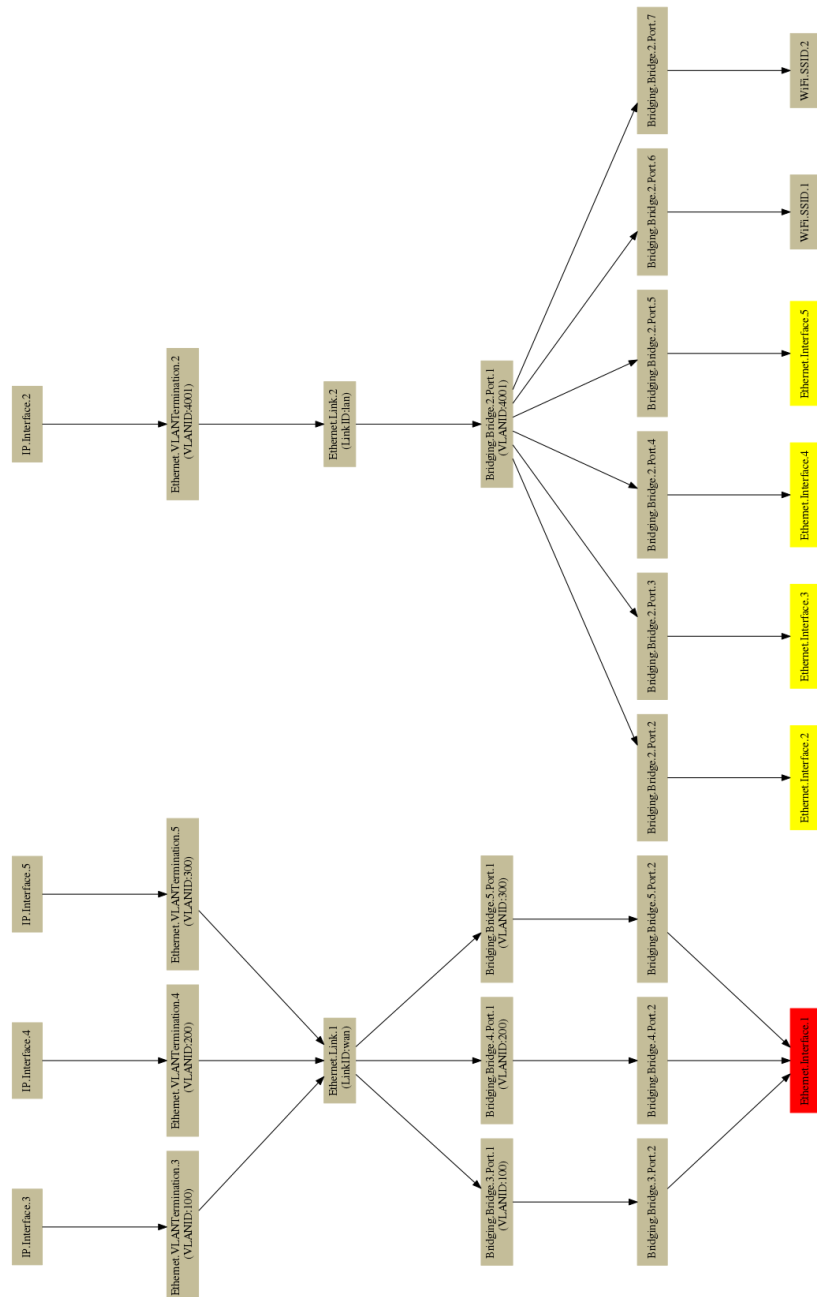
voice line 2
!end
```

Figure 8. Layer 3 VLAN per Service using GeneOS 2.3.0



Each interface stack consists of IP.Interface and Ethernet.Link objects.

Figure 9. Layer 3 VLAN per Service using GeneOS 3.0.0



An Ethernet.VLANTermination object is added between each IP.Interface and the Ethernet.Link objects on the WAN and LAN sides of the router. In this deployment scenario, a single Ethernet.Link object is used to model the use of the same MAC address on each interface. The VLAN used by the interface is no longer inferred, but is defined by VLANID parameter of the corresponding Ethernet.VLANTermination object in each interface stack.

Layer 3 VLAN per Customer

Layer 3 VLAN per Customer.

```
! version geneos-lunar-2.3.0-R
!cwm acs username "000F94-Lunar-W%2E0000430060" password ""
!dhcp server pool cpe-lan
```

```
!pool enable
pool size start 192.168.1.64 end 192.168.1.253

!management source-interface vlan1

ip rule source-interface lan destination-interface vlan1/1

username "operator" password ""
username "admin" password ""

catv

interface lan
!ip address 192.168.1.254/24

interface lan/ethernet1
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet2
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet3
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet4
!vlan member 4001
!vlan untagged 4001

interface vlan1
!ip address dhcp

interface vlan1/1
ip address dhcp

interface vlan1/2
ip address dhcp

interface vlan1/3
ip address dhcp

interface wan
!vlan member 1
!vlan untagged 1

interface wlan1

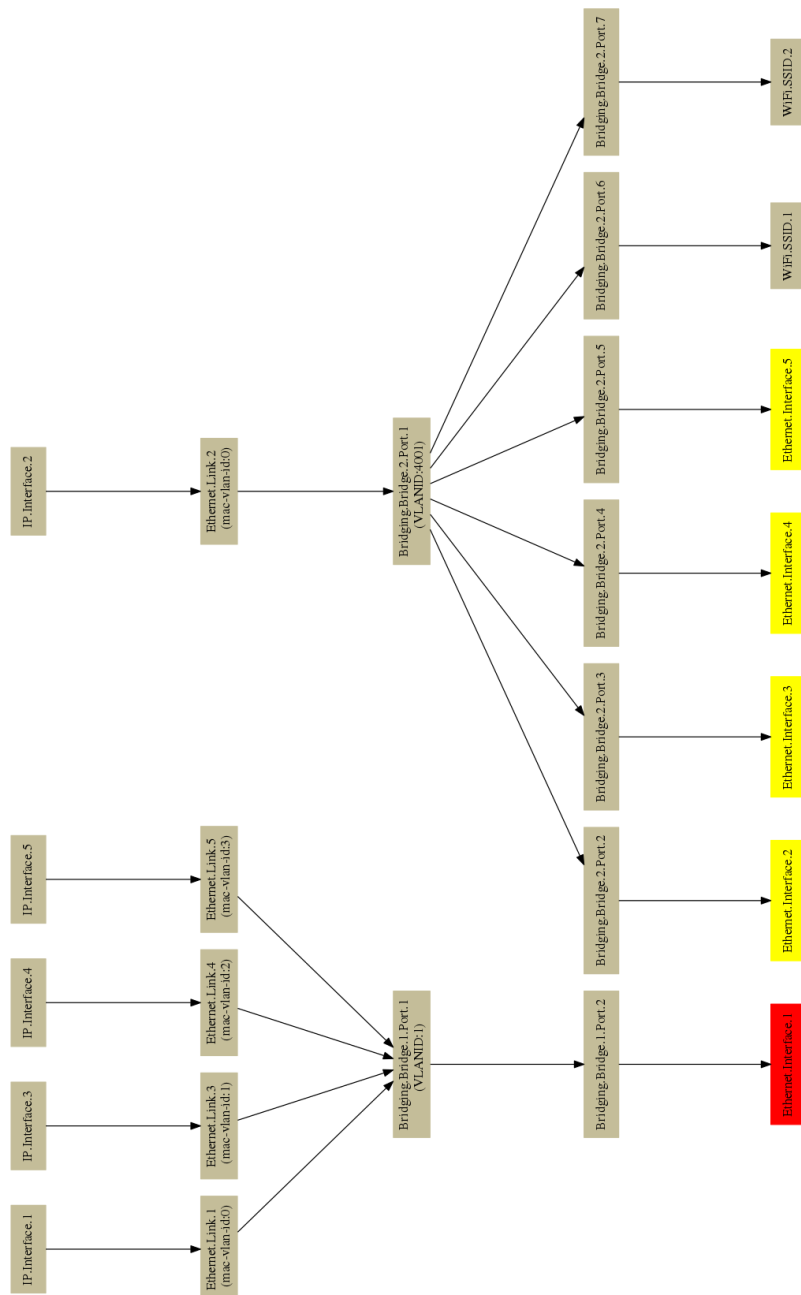
interface wlan2

voice
!country nl
!dial plan "(xx.T)"

voice line 1

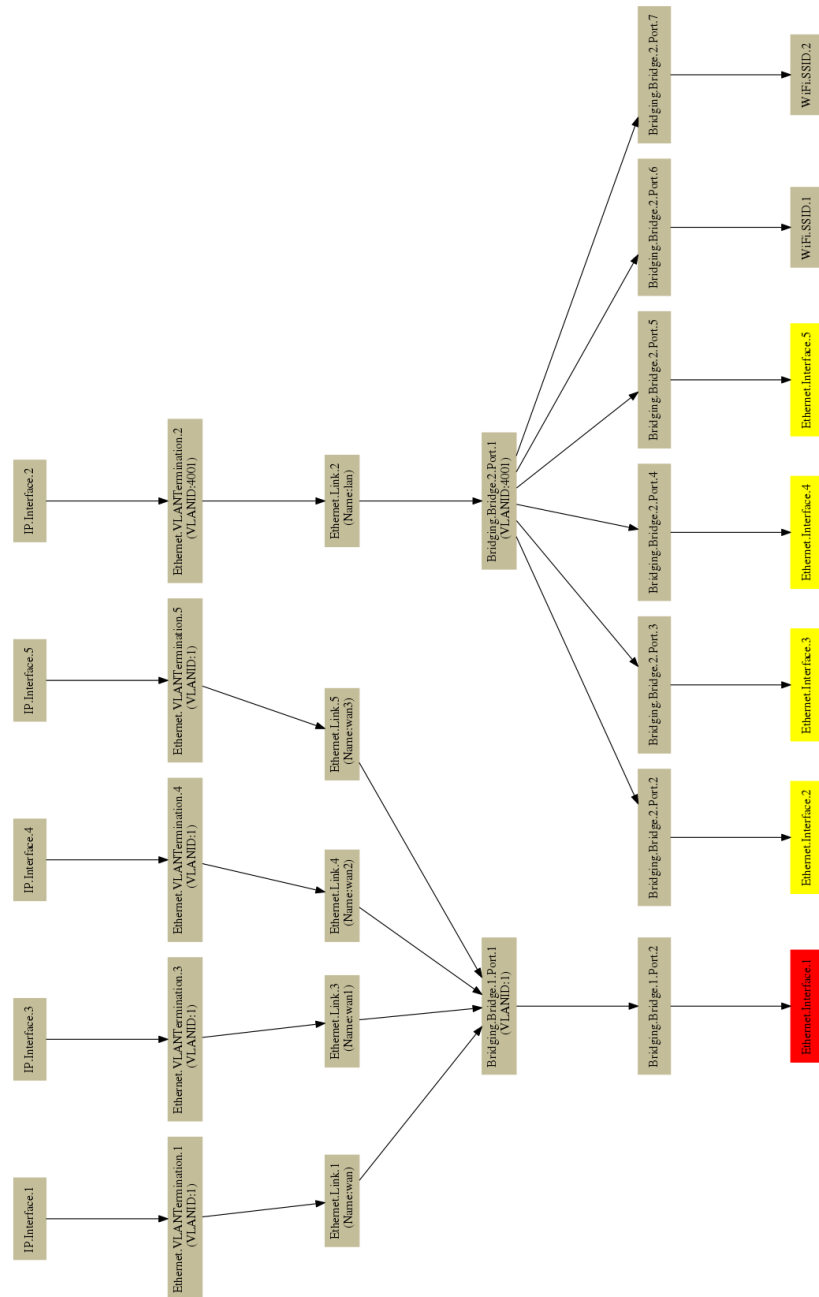
voice line 2
!end
```

Figure 10. Layer 3 VLAN per Customer using GeneOS 2.3.0



Each interface stack consists of IP.Interface and Ethernet.Link objects.

Figure 11. Layer 3 VLAN per Customer using GeneOS 3.0.0



An Ethernet.VLANTermination object is added between each IP.Interface and the Ethernet.Link objects on the WAN and LAN sides of the router. In this deployment scenario, a separate Ethernet.Link object is used in each interface stack to model the use of a unique MAC address on each interface. A vendor extension parameter, .LinkID, is used in each Ethernet.Link object to model the virtual interface.

Table 1. LinkID Mapping

LinkID	Virtual Interface
wan	vlanX
wan1	vlanX/1
wan2	vlanX/2
wan3	vlanX/3
wan4	vlanX/4
lan	lan

The VLAN used by the interface is no longer inferred, but is defined by VLANID parameter of the corresponding Ethernet.VLANTermination object in each interface stack.

Hybrid VLAN per Service

Hybrid VLAN per Service.

```

geneos# show running-config
! version geneos-lunar-2.3.0-R
!cwmpp acs username "000F94-Lunar-W%2E0000430060" password ""

!dhcp server pool cpe-lan
!pool enable
pool size start 192.168.1.64 end 192.168.1.253

management source-interface vlan100

ip rule source-interface lan destination-interface vlan200

username "operator" password ""
username "admin" password ""

catv

interface lan
!ip address 192.168.1.254/24

interface lan/ethernet1
!vlan member 200
!vlan untagged 200

interface lan/ethernet2
!vlan member 200
!vlan untagged 200

interface lan/ethernet3
!vlan member 4001
!vlan untagged 4001

interface lan/ethernet4
!vlan member 4001
!vlan untagged 4001

interface vlan100
ip access-group wan in
!ip address dhcp

interface vlan200
ip address dhcp

interface vlan300
ip address dhcp

interface wan

```

```

vlan member 100,200,300
vlan untagged 100

interface wlan1

interface wlan2

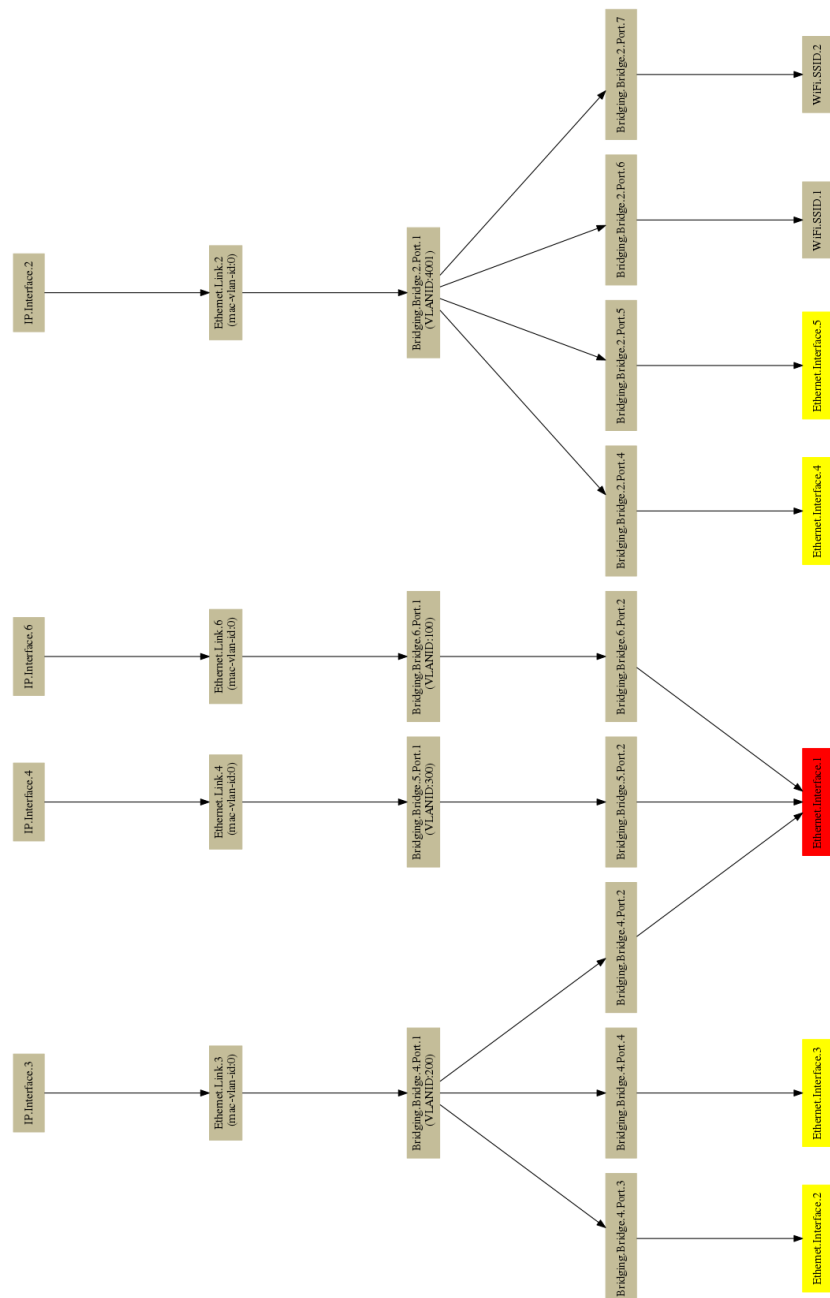
voice
!country nl
!dial plan "(xx.T)"

voice line 1

voice line 2
!end

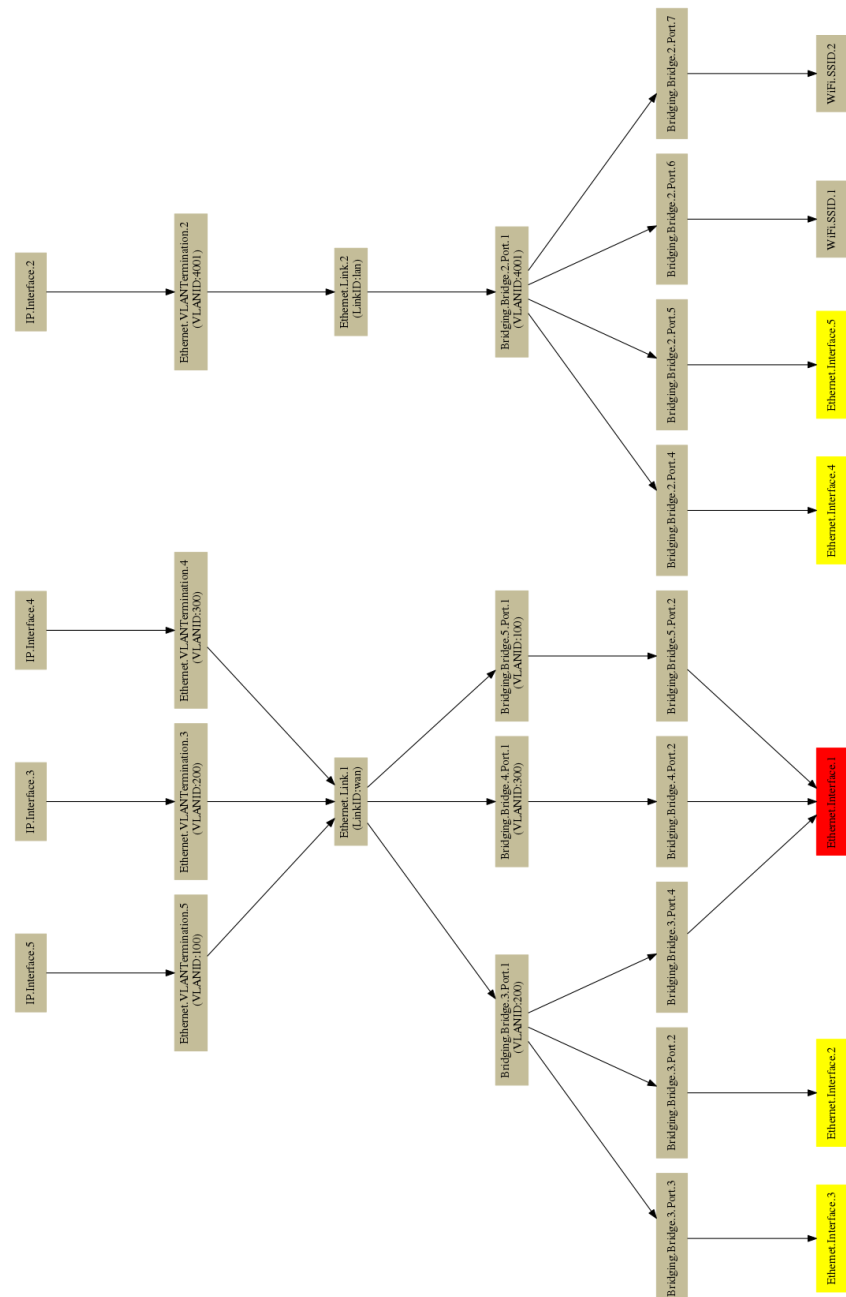
```

Figure 12. Hybrid VLAN per Service using GeneOS 2.3.0



Each interface stack consists of IP.Interface and Ethernet.Link objects.

Figure 13. Hybrid VLAN per Service using GeneOS 3.0.0



An Ethernet.VLANTermination object is added between each IP.Interface and the Ethernet.Link objects on the WAN and LAN sides of the router. In this deployment scenario, a single Ethernet.Link object is used to model the use of the same MAC address on each interface. The VLAN used by the interface is no longer inferred, but is defined by VLANID parameter of the corresponding Ethernet.VLANTermination object in each interface stack.

Conclusion

As has been shown in the previous sections the migration from GeneOS 2.3.0 to GeneOS 3.0.0 is dependent upon the deployment scenario in use, but all are relatively straightforward.

For each service termination, the standard stack representation for VLAN-aware termination is introduced as IP.Interface - VLAN.Termination - Ethernet.Link.

Depending upon the deployment scenario, either one Ethernet.Link object is shared or one per interface is used. The Bridging.Bridge objects no longer hold the VLANID for VLAN termination, but are needed to model the configuration of the internal switch hardware.

Firmware Upgrade Procedure

Since the persistently stored database used by earlier versions of GeneOS contains incompatible data model information, the database will be removed following the reboot after the firmware upgrade. As a result the device will need to be reconfigured after the firmware upgrade completes.



All operator and end user configuration from firmware versions earlier than GeneOS 3.0.0 will be deleted as part of the upgrade procedure.



Firmware downgrade may result in loss of connection to the device. Downgrade to firmware earlier than GeneOS 3.0.0 requires a factory reset as part of the downgrade.

Frequently Asked Questions

- Why is the configuration database automatically deleted?

The persistent configuration database needs to be replaced with one which supports the updated data model.

- When do I have to do a factory reset?

You do not need to manually perform a factory reset, this will happen automatically as part of the reboot after the firmware upgrade. Please see *Firmware Upgrade Procedure*

- Can i downgrade firmware to a version earlier than GeneOS 3.0.0?

Yes, but you will need to perform a factory reset as part of the process. Contact Genexis Support for further information.

References

[TR069] Broadband Forum TR-069 Amendment 5

[TR098] Broadband Forum TR-098 Amendment 2 - Data model v1.14

[TR181] Broadband Forum TR-181i2 - Data model v2.9