N-TRON
THE INDUSTRIAL NETWORK COMPANY

White Paper Series

Setting up Dependable Overlapping VLANs for Industrial Applications

Facts

VLANs: *A brief history*

Dr. Dave Sincoskie (1954-2010) developed what is now called the VLAN in the late 1980s. His creation was the result of experiments to increase Ethernet bandwidth. At the time, VAX-11/780 computers were being used as routers. These units carried a hefty price tag of $400,000 each so a more affordable alternative would be necessary before widespread use of the technology would be practical. With Chase Cotton helping, Sincoskie proposed using the bandwidth of existing telephone networks to expand bandwidth. Sincoskie's research would later yield the first voice-over-IP technology, ushering in a new field of communications.

Source: Sincoskie, W.D. and Cotton, C.J. *Extended Bridge Algorithms for Large Networks*, Publiched IEEE Network 1988.

A VLAN is an administratively-configured LAN segment that limits the traffic in multiple broadcast domains. Instead of physically reconnecting a device to a different LAN, network administrators can accomplish this task by configuring a VLAN-compliant switch to create logical network segments. A key feature of N-Tron's VLAN (tagged and port) implementation is the concept of overlapping members.

In this paper, we'll discuss port and tagged VLANs.

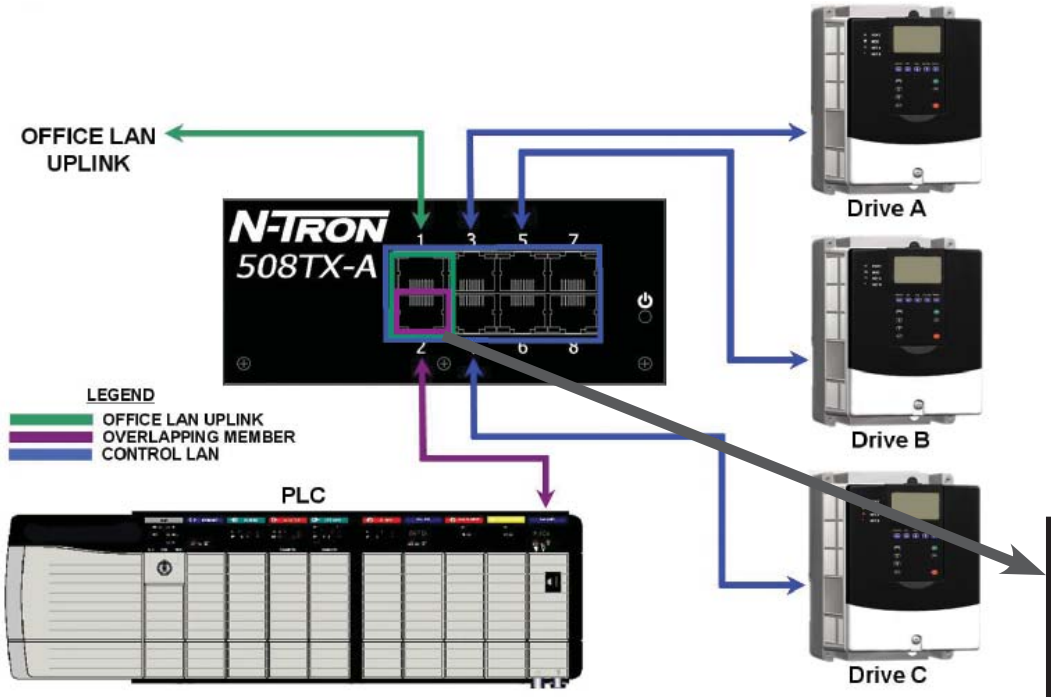
Overlapping Port VLANs

N-Tron uses the term **overlapping VLAN port** to refer to an individual port that is configured with membership in multiple VLANs.

Overlapping Port VLAN with N-Tron's 500 Series –A Option Switches

(see page 15 for Overlapping TAGGED VLANs with N-Tron 500 Series)

Referring to Figure 1, using a 508TX-A, consider the following example where the Office LAN uplink is on Port 1, the PLC is on Port 2, and the control devices being accessed by the PLC are on ports 3-8. In this case, the network administrator would like to set up VLAN partitions to keep the Office LAN separate from



Port 2 is a member of multiple overlapping groups.

This example shows how to set up the PLC as an overlapping member to both VLAN group 2 (VID2) and VLAN group 3 (VID3). To accomplish this, we will create an abstract VLAN (VID4) that has all ports as a secondary member, and only port 2 (the overlapping member) with a PVID of 4. Please note that port 2 is a secondary member of the other two groups as well.

VLAN GROUP ASSIGNMENTS

PORTS	MEMBERSHIP
1 & 2	VID2
2 - 8	VID3
1 - 8	VID4

PVID ASSIGNMENTS

PORTS	PVID
1	2
3 - 8	3
2	4

Command Line Interface (CLI) entry to accomplish this configuration

```
CLI\SWITCH\VLAN> PORT [ENTER]

Port VLAN selected.
/       (Go to top of menu tree)
?       (Show menus/commands)
info    (Get information about VLAN)
enable  (Enable Port VLAN)
tagged  (Switch to Tagged VLAN)

group1  (configure Port VLAN Group 1)
group2  (configure Port VLAN Group 2)
group3  (configure Port VLAN Group 3)
group4  (configure Port VLAN Group 4)
group5  (configure Port VLAN Group 5)
group6  (configure Port VLAN Group 6)
group7  (configure Port VLAN Group 7)
group8  (configure Port VLAN Group 8)
cleargroups (clear Port VLAN Groups 2 through 8)

CLI\SWITCH\VLAN> GROUP4 [ENTER]
Configure Port VLAN Group 4.
Enter ports to Join VLAN Group 4 (Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 1,2,3,4,5,6,7,8 [ENTER]

These ports were removed from group1: 1 2 3 4 5 6 7 8
Would you like all these ports to have PVID=4 ?
Enter 'NO' or (YES):
CLI> NO [ENTER]

Enter ports to have PVID=4
(Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 2 [ENTER]

*** These ports now have null PVIDs: 1 3 4 5 6 7 8 ***
*** All ports should have valid PVIDs before configuration is complete. ***
CLI\SWITCH\VLAN> GROUP3 [ENTER]

Configure Port VLAN Group 3.
Enter ports to Join VLAN Group 3 (Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 2,3,4,5,6,7,8 [ENTER]

Would you like all these ports to have PVID=3 ?
Enter 'NO' or (YES):
CLI> NO [ENTER]

Enter ports to have PVID=3
(Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 3,4,5,6,7,8 [ENTER]
CLI\SWITCH\VLAN> GROUP2 [ENTER]

Configure Port VLAN Group 2.
Enter ports to Join VLAN Group 2 (Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 1,2 [ENTER]

Would you like all these ports to have PVID=2 ?
Enter 'NO' or (YES):
CLI> NO [ENTER]

Enter ports to have PVID=2
(Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 1 [ENTER]
```

CONTINUED ON NEXT PAGE

(Command Line Interface (CLI) entry for Overlapping Port VLAN with N-Tron's 500 Series –A Option Switches - Continued)

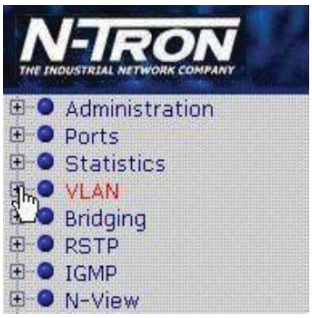
```
Setup Information and Enabling Port VLAN
CLI\SWITCH\VLAN> INFO [ENTER]
Port VLAN is DISABLED.
When enabled:
All outgoing pkts will be untagged.

VLAN GROUP1 includes these Ports: none
VLAN GROUP2 includes these Ports: 1 2
VLAN GROUP3 includes these Ports: 2 3 4 5 6 7 8
VLAN GROUP4 includes these Ports: 1 2 3 4 5 6 7 8
VLAN GROUP5 includes these Ports: none
VLAN GROUP6 includes these Ports: none
VLAN GROUP7 includes these Ports: none
VLAN GROUP8 includes these Ports: none
There is more info. Press 'SPACE BAR' to continue, or escape to exit >

Incoming pkts will use these PVIDs to determine group membership:
Port 1 PVID=2
Port 2 PVID=4
Port 3 PVID=3
Port 4 PVID=3
Port 5 PVID=3
Port 6 PVID=3
Port 7 PVID=3
Port 8 PVID=3
CLI\SWITCH\VLAN> ENABLE [ENTER]

Port VLAN is Enabled.
CLI\SWITCH\VLAN>
```

Overlapping Port VLAN with N-Tron's 700 and 7000 Series*

*(*Note: For the N-Tron 7014 Series, see page 5 for instructions.)*

1. Login to the web interface of the switch from PC1 using 192.168.1.201 (default IP)

2. Select **VLAN** in the left hand parameter column



3. Select **Configuration**

4. Select **Modify**

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	☑

Modify Refresh

5. Select **Add**

VLAN Groups					
VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt	Delete
0001	Default VLAN	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	☑	
Add					

Done Refresh

6. Create VLAN2 as pictured and select **Update**

ID	2
Name	VLAN2
Allow Management	☑
Change PVID Of Member Ports	☑

Group Ports

Port No	Port Name	Group Member	Untag On Egress
01	TX1	☑	☑
02	TX2	☑	☑
03	TX3	☑	☑
04	TX4	☑	☑
05	TX5	☑	☑
06	TX6	☑	☑
07	FX1	☑	☑
08	FX2	☑	☑

Update Cancel

Replace VID With Default Port VID	☐
Perform Ingress Filtering	☐
Discard Non-Tagged For Ports	(None)
Remove Ports From Default VLAN When Added To Other VLANs	☑

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	P1-P24, P25-P26	P1-P24, P25-P26	☑

NOTE: For units with **firmware v.3.5.8** or later, there is now a convenient check box option to remove ports in Group 1. The default setting is to **REMOVE** ports from default VLAN. If you want to keep the ports in the group, simply uncheck the box and the ports will remain in the group.

The selected ports have been removed from default VLAN Group 0001. If your application requires ports to remain in the default group, you must add them back after you have created all new groups.

7. Select **Modify**

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	(None)	(None)	☐
0002	VLAN2	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	☑

Modify Refresh

8. Select **Add**

VLAN Groups

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt	Delete
0001	Default VLAN	(None)	(None)	☐	
0002	VLAN2	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	☑	Delete
Add					

Done Refresh

9. Create VLAN3 as pictured and select **Update**

Tagged VLAN Group Configuration

ID	3
Name	VLAN3
Allow Management	☐
Change PVID Of Member Ports	☑

Group Ports

Port No	Port Name	Group Member	Untag On Egress
01	TX1	☐	☐
02	TX2	☑	☑
03	TX3	☑	☑
04	TX4	☑	☑
05	TX5	☑	☑
06	TX6	☑	☑
07	FX1	☑	☑
08	FX2	☑	☑

Update Cancel

10.Select **Modify**

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	(None)	(None)	☐
0002	VLAN2	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	☑
0003	VLAN3	TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX2, TX3, TX4, TX5, TX6, TX7, TX8	☐

Modify Refresh

11. Select **Add**

VLAN Groups

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt	Delete
0001	Default VLAN	(None)	(None)	☐	
0002	VLAN2	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX1, TX2, TX3, TX4, TX5, TX6, TX7, TX8	☑	Delete
0003	VLAN3	TX2, TX3, TX4, TX5, TX6, TX7, TX8	TX2, TX3, TX4, TX5, TX6, TX7, TX8	☐	Delete
Add					

Done Refresh

12. Create VLAN4 as pictured and select **Update**

Tagged VLAN Group Configuration

ID	4
Name	VLAN4
Allow Management	☑
Change PVID Of Member Ports	☑

Group Ports

Port No	Port Name	Group Member	Untag On Egress
01	TX1	☑	☑
02	TX2	☑	☑
03	TX3	☐	☐
04	TX4	☐	☐
05	TX5	☐	☐
06	TX6	☐	☐
07	TX7	☐	☐
08	TX8	☐	☐

Update Cancel

13. Go to Ports – Configuration on the side menu, note the ports' PVID

Port Configuration View

Port No	Port Name	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Force High Priority	Default Priority	RSTP State	PVID
01	TX1	Enabled	Down	Enabled	Auto	Auto	Disabled	Disabled	1	Disabled	2
02	TX2	Enabled	Up	Enabled	100	Full	Disabled	Disabled	1	Forwarding	3
03	TX3	Enabled	Up	Enabled	100	Full	Disabled	Disabled	1	Forwarding	3
04	TX4	Enabled	Down	Enabled	Auto	Auto	Disabled	Disabled	1	Disabled	3
05	TX5	Enabled	Down	Enabled	Auto	Auto	Disabled	Disabled	1	Disabled	3
06	TX6	Enabled	Down	Enabled	Auto	Auto	Disabled	Disabled	1	Disabled	3
07	FX1	Enabled	Down	Disabled	100	Full	Disabled	Disabled	1	Disabled	3
08	FX2	Enabled	Down	Disabled	100	Full	Disabled	Disabled	1	Disabled	3

14. Select Port 02 and change the PVID to 2, then select **Update**

TX2 - Port Configuration

Port Name	TX2
Admin Status	Enabled
Speed And Duplex	Auto-Negotiate
Flow Control	Disabled
Force High Priority	Disabled
Default Priority	1
PVID	2

Update Cancel

15. The VLAN configuration should match the example

VLAN Configuration View

Replace VID With Default Port VID	☐
Perform Ingress Filtering	☐
Discard Non-Tagged For Ports	(None)

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	(None)	(None)	☐
0002	vlan2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	☐
0003	vlan3	TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX2, TX3, TX4, TX5, TX6, FX1, FX2	☐
0004	vlan4	TX1, TX2	TX1, TX2	☑

16. The PVID port configuration should match the example

Port Configuration View

Port No	Port Name	PVID
01	TX1	4
02	TX2	2
03	TX3	3
04	TX4	3
05	TX5	3
06	TX6	3
07	FX1	3
08	FX2	3

Testing Segmentation by Pinging:

Set two PC's to the following IP addresses:

• PC1 – 192.168.1.1 mask: 255.255.255.0

• PC2 – 192.168.1.2 mask: 255.255.255.0

(Make Sure Windows Firewall is disabled)

Physical Layer Setup and Testing:

1. Connect PC 1 into port 1 of the switch

2. Connect PC 2 into port 2 of the switch

3. Try to ping from PC1 in Port 1 to PC2 in Port 2. You will find that you will be able to ping because Port 1 is in VLAN 2 and Port 2 is an overlapping port.

4. Move PC1 to Port 3 and try pinging between PC's again. You should be able to ping between PC's in the same VLAN.

5. Now move PC2 from Port 2 to Port 1, leaving PC1 in Port 3. You should not be able to ping between these ports.

Configuring Tagged VLANs

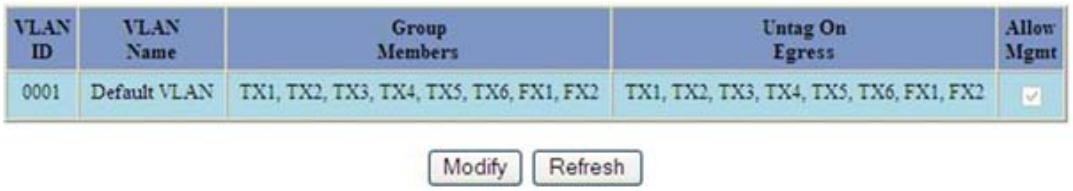
N-Tron uses the term **overlapping VLAN port** to refer to an individual port that is configured with membership in multiple VLANs.

1. Login to the web interface of the switch from PC 1

2. Select **VLAN** in the left hand parameter column:

3. Select **Configuration**

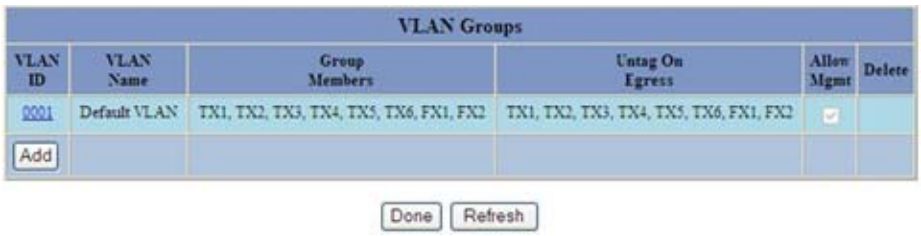
4. Select **Modify**



VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	☑

Modify Refresh

5. Select **Add**

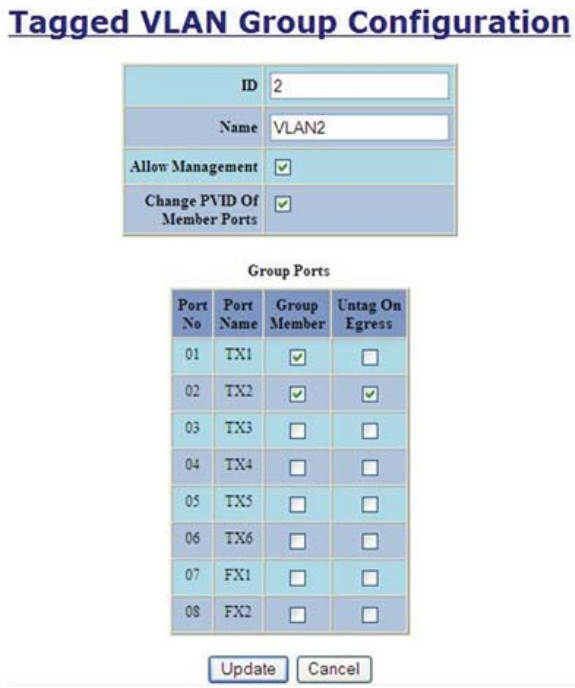


VLAN Groups

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt	Delete
0001	Default VLAN	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	TX1, TX2, TX3, TX4, TX5, TX6, FX1, FX2	☑	
Add					

Done Refresh

5. Configure as pictured and select **Update**



VLAN Configuration

VLAN ID	VLAN Name	Group Members	Untag On Egress	Allow Mgmt
0001	Default VLAN	TX3, TX4, TX5, TX6, FX1, FX2	TX3, TX4, TX5, TX6, FX1, FX2	☐
0002	VLAN2	TX1, TX2	TX2	☑

Testing Tagged VLAN's

1. Physical Layer Setup

   • Connect a patch cord between the two switches using port 1.

   • Connect PC 1 into port 2 of switch.

   • Connect PC 2 into port 2 of the other switch.

   • Run a continuous ping from PC1 to PC2 and from PC2 to PC1.

2. Check the status of the ping between PC 1 and PC 2. The pings should now be timing out.

3. Try to ping from PC 1 in port 2 of the switch to PC 2 in port 2 of the other switch. You should find that you will be able to ping because port 1 is tagged VLAN 2 and port 2 on both switches are also in VLAN 2. You created a trunked, tagged VLAN 2 link between switches for VLAN 2.

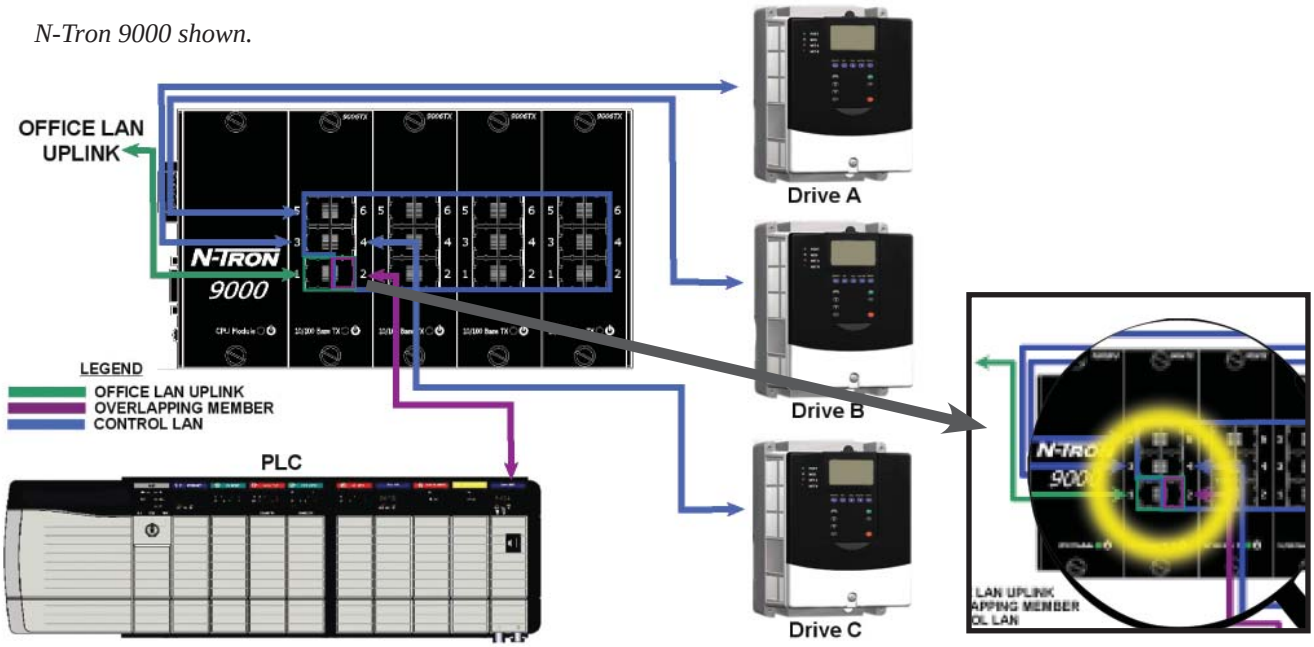
4. Move PC 2 on the other switch to port 3 and try pinging between PCs again. You should not be able to ping between PCs in the as the PCs are in separate VLANs.

5. Move PC 1 onto the switch in port 4. You should be able to ping between switches again.

OVERLAPPING PORT VLAN with N-Tron 7014 and 9000 Series

For this example, we have used the N-Tron 9000 (below) to illustrate the VLAN procedure. However, the same steps can be used with 7014 Series switches. Consider the following example where the Office LAN uplink is on Port A1, the PLC is on Port A2, and the Control devices being accessed by the PLC are on ports A3-A6. As in the previous case, the network administrator would like to set up VLAN partitions to keep the Office LAN separate from the Control LAN, but still have the capability to access the PLC from a workstation connected to the Office LAN.

N-Tron 9000 shown.



Port 2 is a member of multiple overlapping groups.

This example shows how to set up the PLC as an overlapping member to both VLAN Group 2 (VID2) and VLAN Group 3 (VID3). To accomplish this, we will create an abstract VLAN (VID4) that has all ports that are being used as secondary members, and only port 2 (the overlapping member) with a PVID of 4. Please note that port 2 is a secondary member of the other two groups as well. Note: Default VLAN retains all ports not on Groups 2-4.

VLAN GROUP ASSIGNMENTS

PORTS	MEMBERSHIP
A1 & A2	VID2
A2 - A6	VID3
A1 - A6	VID4

PVID ASSIGNMENTS

PORTS	PVID
A1	2
A3 - A6	3
A2	4

Web Interface entry to accomplish this setup:

VLAN Status : Enable						
VLAN ID	VLAN Name	Untagged Port(s)	Tagged Port(s)	Mgmt Port	Admit	Mirror Port
1	Default VLAN	B1-B6,C1-C6,D1-D6	--	YES	All	0
2	Group 2	A1-A2	--	YES	All	0
3	Group 3	A2-A6	--	YES	All	0
4	Group 4	A1-A6	--	YES	All	0

Port No	Port Name	PVID
1	A1	2
2	A2	4
3	A3	3
4	A4	3
5	A5	3
6	A6	3

```
N-TRON/Admin#[54]vlan> vlan add 2 1 -name “Group 2” -untagged 1-2 -admit all [ENTER]
PVID of port 1 is set to 2.
PVID of port 2 is set to 2.
Vlan Added with Vlan id : 2
N-TRON/Admin#[55]vlan> vlan add 3 1 -name “Group 3” -untagged 2-6 -admit all [ENTER]
PVID of port 3 is set to 3.
PVID of port 4 is set to 3.
PVID of port 5 is set to 3.
PVID of port 6 is set to 3.
Vlan Added with Vlan id : 3
N-TRON/Admin#[56]vlan> vlan add 4 1 -name “Group 4” -untagged 1-6 -admit all [ENTER]
Vlan Added with Vlan id : 4
N-TRON/Admin#[57]vlan> port set pvid 2 4 [ENTER]
PVID of port 2 is set to 4.
N-TRON/Admin#[58]port/set> vlan show config [ENTER]
Vlan Configuration Information
--------------------------------------------------------------------------------
VID |Vlan Name |Untagged ports |Tagged ports |Mgmt|Admit |Mirror
--------------------------------------------------------------------------------
1E|Default VLAN| 7-26| | YES|ALL | ---
2E|Group 2 | 1-2| | YES|ALL | ---
3E|Group 3 | 2-6| | YES|ALL | ---
4E|Group 4 | 1-6| | YES|ALL | ---
--------------------------------------------------------------------------------
N-TRON/Admin#[59]vlan/show> stp set bridgeadminstatus 1 disable [ENTER]
Admin Status successfully Set
N-TRON/Admin#[60]stp/set> stp set bridgeadminstatus 2 disable [ENTER]
Admin Status successfully Set
N-TRON/Admin#[61]stp/set> stp set bridgeadminstatus 3 disable [ENTER]
Admin Status successfully Set
N-TRON/Admin#[62]stp/set> stp set bridgeadminstatus 4 disable [ENTER]
Admin Status successfully Set
N-TRON/Admin#[63]stp/set>
```

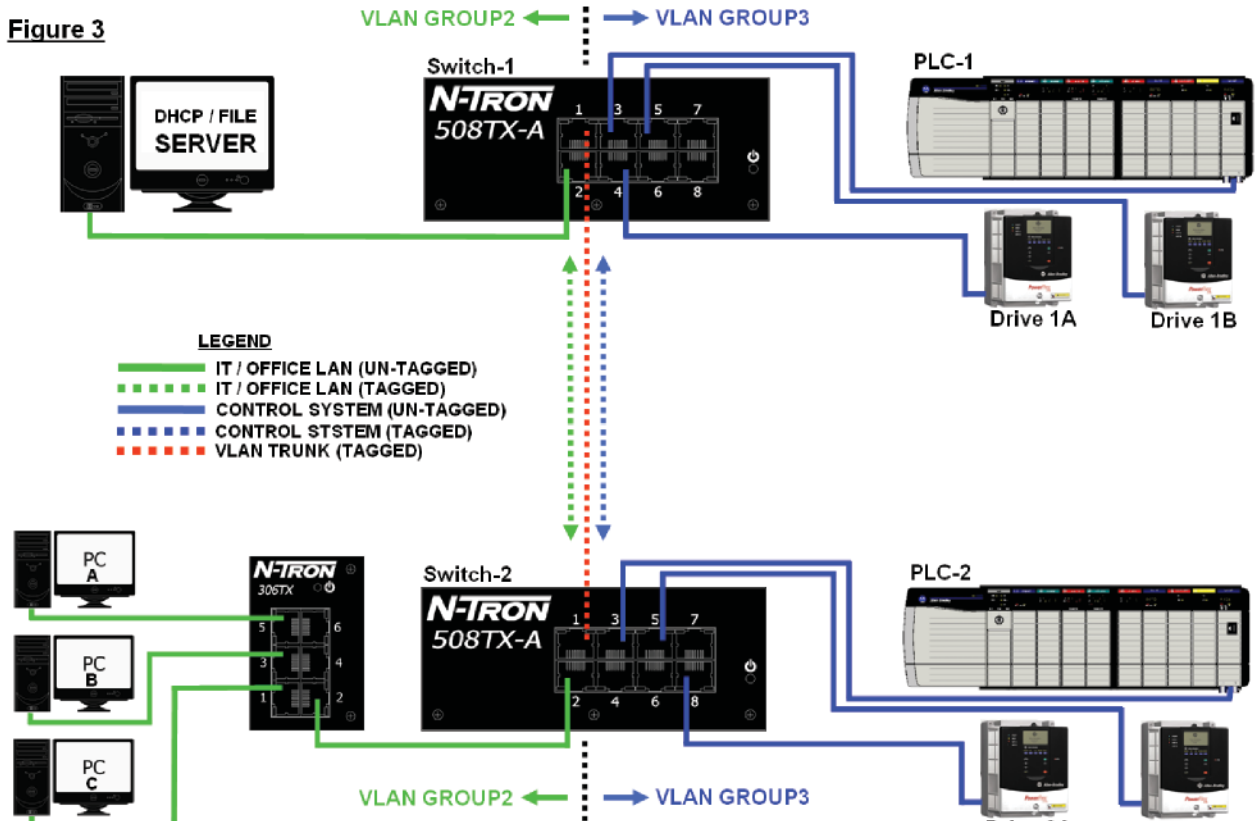
Note: RSTP is disabled in the code above for all VLANs

OVERLAPPING TAGGED VLANs

Tagged VLAN allows switch segmentation to span across multiple managed switches. This type of VLAN is ideal for LANs that consist of various types of communication groups such as Office LANs, Controls Systems, and IP Cameras. When used properly, it will effectively isolate two or more groups from each other in a logical manner. This means that Broadcast, Multicast, and Unicast frames in one VLAN will not interfere with another isolated VLAN group.

Overlapping TAGGED VLANs with N-Tron 500 Series

Referring to Figure 3, we will create an 802.1Q Tagged VLAN trunk (using Port 1 on each switch) between two 500 Series switches. This application will logically isolate the IT / Office LAN from the Controls System LAN. It will also allow you to use a single physical connection as the VLAN Trunk connecting the two switches. Note that only the two N-Tron switches need to understand tagged VLAN to achieve this, as all other traffic is untagged. You may choose to use the Port Trunking feature between the two 508TX-A switches to provide higher bandwidth and media redundancy.



Command Line Interface (CLI) entry to accomplish this configuration on the N-Tron 500-A Series. These units offer advanced management features.

```
CLI\SWITCH\VLAN> group2 [ENTER]

Configure Tagged VLAN Group 2.

Enter VID or <(ESC)> to exit> 2 [ENTER]
Enter ports to Join VLAN Group 2 (Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 1 2 [ENTER]

Would you like all these ports to have PVID=2 ?
Enter 'NO' or (YES):
CLI> yes [ENTER]

For incoming pkts with tagged VID=2, the outgoing pkts are untagged
for ports: 1 2
Would you like to change that ? Enter 'YES' or (NO):
CLI> yes [ENTER]
For VID=2 enter ports for outgoing untagged pkts: 2
Wait......

These ports were removed from group1:
1 2

CLI\SWITCH\VLAN> group3 [ENTER]
Configure Tagged VLAN Group 3.
Enter VID or <(ESC)> to exit> 3 [ENTER]
Enter ports to Join VLAN Group 3 (Example: '367<enter>')
Enter Port Numbers (or ESC to exit)> 1 3 4 5 6 7 8 [ENTER]

Would you like all these ports to have PVID=3 ?
Enter 'NO' or (YES):
CLI> yes [ENTER]

For incoming pkts with tagged VID=3, the outgoing pkts are untagged
for ports: 1 3 4 5 6 7 8
Would you like to change that ? Enter 'YES' or (NO):
CLI> yes [ENTER]
For VID=3 enter ports for outgoing untagged pkts: 3 4 5 6 7 8
Wait......

These ports were removed from group1:
3 4 5 6 7 8

CLI\SWITCH\VLAN> info [ENTER] (to verify configuration)
Tagged VLAN is DISABLED.

When enabled:
All incoming untagged pkts are sent to PVID group.
VLAN GROUP1 has a VID of: 1, and includes these Ports: none
GROUP1 outgoing pkts are untagged for ports: none
VLAN GROUP2 has a VID of: 2, and includes these Ports: 1 2
GROUP2 outgoing pkts are untagged for ports: 2
VLAN GROUP3 has a VID of: 3, and includes these Ports: 1 3 4 5 6 7 8
GROUP3 outgoing pkts are untagged for ports: 3 4 5 6 7 8

There is more info. Press 'SPACE BAR' to continue, or escape to exit >
```

CONTINUED ON NEXT PAGE

(Command Line Interface (CLI) entry for OVERLAPPING TAGGED VLANs with N-Tron 500 Series - Continued)

```
For each port, untagged incoming pkts will use these PVIDs
to determine group membership:
Port 1 PVID=3
Port 2 PVID=2
Port 3 PVID=3
Port 4 PVID=3
Port 5 PVID=3
Port 6 PVID=3
Port 7 PVID=3
Port 8 PVID=3

CLI\SWITCH\VLAN> enable [ENTER]
Tagged VLAN is Enabled.
CLI\SWITCH\VLAN>

[***CYCLE POWER OF SWITCH***]
```

NOTE: Repeat above steps on second switch.

N-TRON® Corporation is recognized around the world for developing and manufacturing high-quality ruggedized products for Industrial Ethernet automation. Our network solutions are the benchmark for quality and reliability, providing exceptional performance for mission-critical data acquisition and control applications. N-Tron offers a complete line of affordable unmanaged and managed Ethernet switches, media converters, Power over Ethernet (PoE), and wireless access devices for industrial environments. The company is headquartered in Mobile, Alabama, with operations located throughout the United States, Canada, EMEA, India and the Pacific Rim. N-Tron products are distributed in over 75 countries worldwide.

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