CONFIDENTIAL C

WiFi VLAN Application Note

Outline

- VLAN Introduction
- WiFi VLAN Ingress/Egress Flow Chart
- WiFi VLAN Command List
- Scenarios

VLAN INTRODUCTION

What is VLAN?

Create Separate Broadcast Domain

Logical grouping of devices in the same broadcast domain

A virtual LAN (VLAN) is any broadcast domain that is partitioned and isolated in a computer network at the data link layer. VLANs work by applying tags to network frames and handling these tags in networking systems

Isolate traffic

Reduce the ability to see anything not in your VLAN

A VLAN can be used to secure LAN traffic. This means that even with a route - if a computer isn't configured access to a VLAN they can't get into the VLAN.

What is VLAN?

Allow QoS

Prioritizes traffic so that important packets can pass first

VLAN allow QoS measures to be taken on devices normally fighting for shared bandwidth. The network admin can provide different QoS to different VLANs and prevent low priority packets from killing high priority packets

Separate the Network Logically

Keep network devices separate despite being connected to the same physical network.

Creating the appearance and functionality of network traffic that is physically on a single network but acts as if it is split between separate networks. In this way, VLANs can keep network applications separate despite being connected to the same physical network. VLAN also Allows hosts to be grouped together in the same broadcast domain even if they are not connected to the same switch.

Why Use VLAN?

- Separate broadcast domain
- Separate the network logically
- Isolate traffic
- Allow QoS

- Better network performance
- Better security
- More Flexibility

Category of VLANs

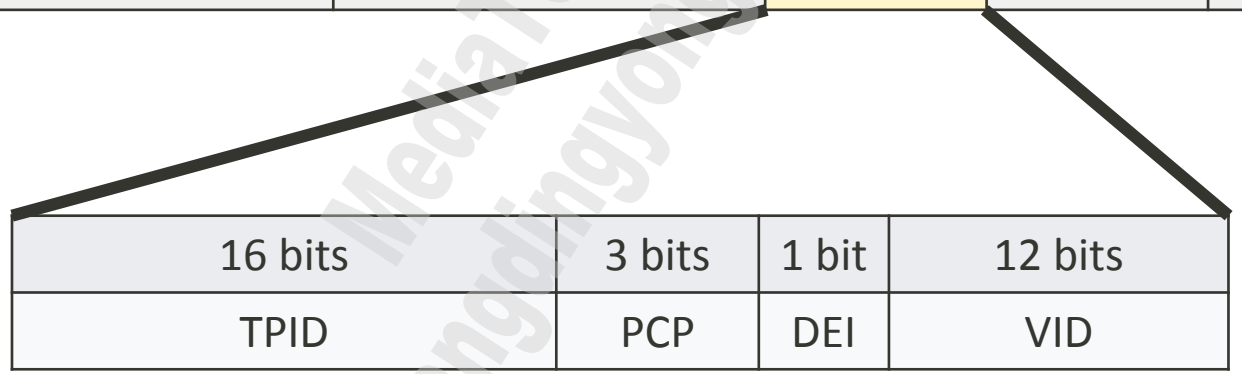
Port based
Mac based
Tag based
IP based
Q in Q

802.1Q Tag Format

Protocols

Standard	Cisco Proprietary
IEEE 802.1Q	VLAN Trunking Protocol (VTP) Inter-Switch Link (ISL)

Preamble	Destination MAC	Source MAC	802.1Q Header	Ethernet Type	Payload	CRC/FCS



802.1Q
0x8100

Priority code point
0 - 7

VLAN ID
1 - 4094
(0x000 and 0xFFF is reserved)

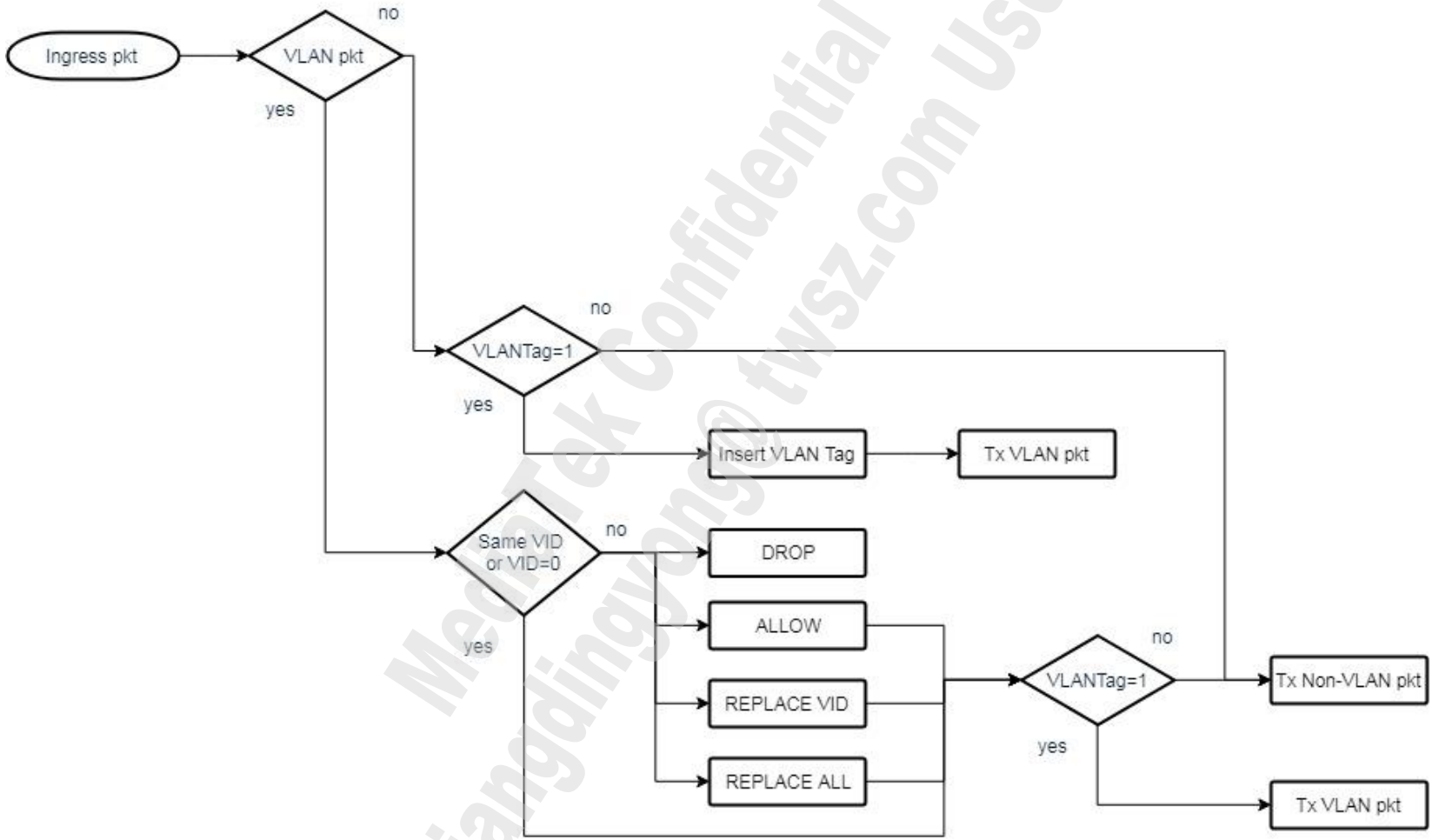
Flow Chart and Behavior

WIFI VLAN INGRESS/EGRESS FLOW CHART

Egress Behavior

Tx Behavior	Egress		
	Same VID VLAN pkt (or VID=0)	Diff VID VLAN pkt	Non-VLAN pkt
VLANTag=0	Untag	If policy is Drop,drop it Otherwise, Untag	N/A
VLANTag=1	Follow Policy		Insert PCP & VID
Policy : Drop (Default)	N/A	Drop	N/A
Policy : ALLOW	N/A	Allow	N/A
Policy : REPLACE VID	N/A	Replace VID	N/A
Policy : REPLACE ALL	N/A	Replace PCP&VID	N/A

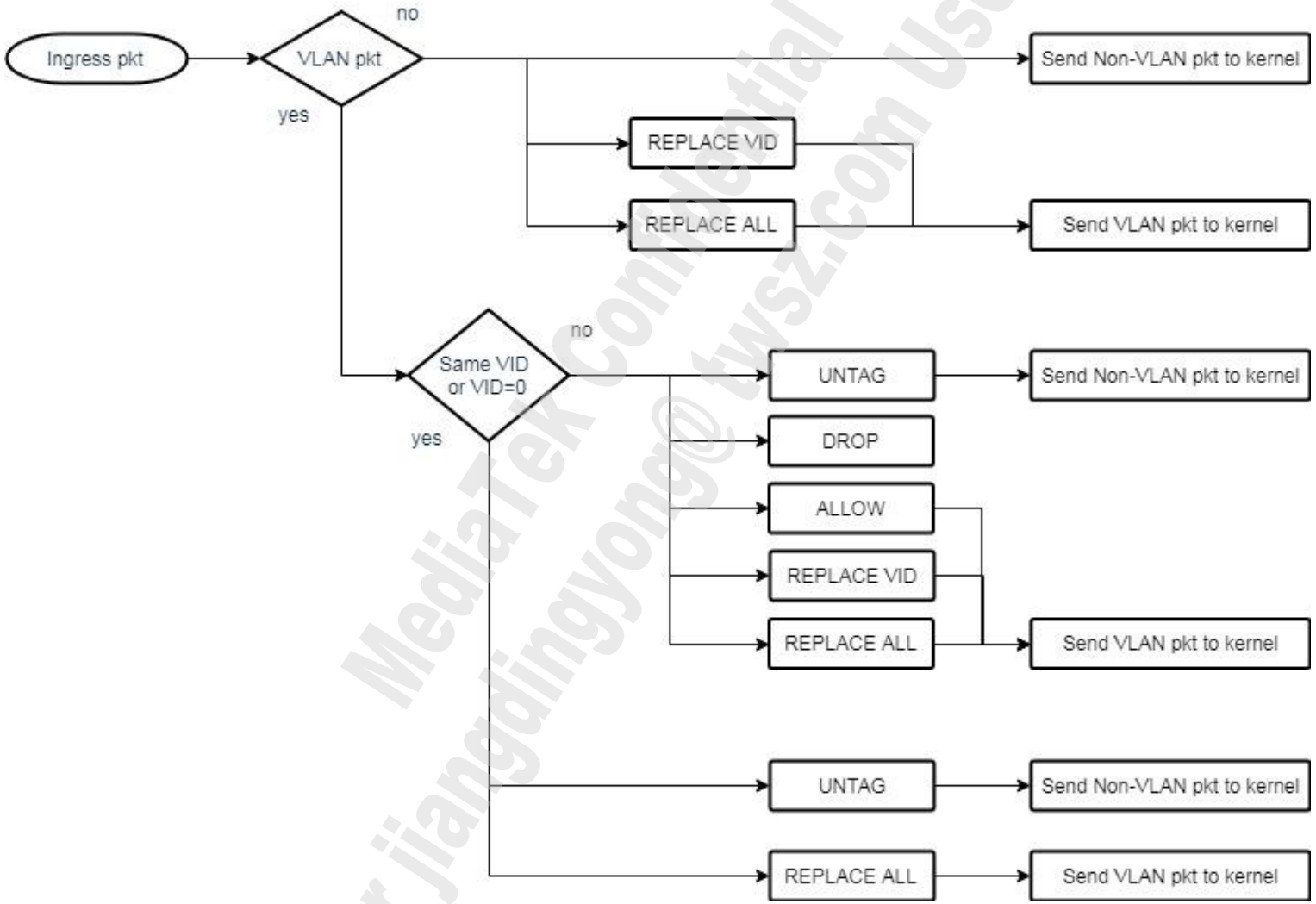
Egress Flow Chart



Ingress Behavior

Rx Behavior	Ingress		
	Same VID VLAN pkt (or VID=0)	Diff VID VLAN pkt	Non-VLAN pkt
Policy : Drop (Default)	N/A	Drop	N/A
Policy : Untag	Untag		N/A
Policy : ALLOW	N/A	Allow	N/A
Policy : REPLACE VID	N/A	Replace VID only	Insert VID only
Policy : REPLACE ALL	Replace PCP if PCP is diff	Replace VID & PCP	Insert VID & PCP

Ingress Flow Chart



COMMAND LIST

Command List (1/3)

- iwpriv [INTERFACE] show vlaninfo
  - All MBSS interfaces share the same RXPolicy

```
iwpriv ra0 show vlaninfo
iwpriv apcli0 show vlaninfo
```

```
root@OpenWrt:/# iwpriv ra0 show vlaninfo
[65701.944000] bVLAN_Tag=0
[65701.948000] VLANID=0
[65701.952000] VLANPriority=0
[65701.960000] VLANPolicy(Tx)=1
[65701.964000] VLANPolicy(Rx)=1
```

Command List (2/3)

- iwpriv [INTERFACE] set VLANTag=[VALUE]
  - VALUE = 0/1 : Egress packet will be untagged/tagged

```
iwpriv ra0 set VLANTag=0    # Tx frames will be no tagged
iwpriv ra0 set VLANTag=1    # Tx frames will be tagged
```

- iwpriv [INTERFACE] set VLANID=[VID]
  - VID = [0,4095] (0x000 and 0xFFF is reserved)

```
iwpriv ra0 set VLANID=1
iwpriv ra0 set VLANID=20
```

Command List (3/3)

- iwpriv [INTERFACE] set VLANPriority=[PCP]
  - PCP = [0,7]

```
iwpriv ra0 set VLANPriority=3
```

- iwpriv [INTERFACE] set VLANPolicy=[PATH]:[POLICY]
  - PATH = 0/1 : Set the Tx/Rx Policy
  - POLICY: refer to following slides

```
iwpriv ra0 set VLANPolicy=0:0    # Set Tx Policy
iwpriv ra0 set VLANPolicy=1:0    # Set Rx Policy
```

Tx Policy

- iwpriv [INTERFACE] set VLANPolicy=0:[POLICY]

POLICY	Policy Name	Description
0	DROP	If received packet from kernel has different VID, drop it
1	ALLOW	If received packet from kernel has different VID, do nothing
2	REPLACE VID	If received packet from kernel has different VID, replace VID
3	REPLACE ALL	If received packet from kernel has different VID, replace PCP & VID

```
iwpriv ra0 set VLANPolicy=0:1    # Set Tx ALLOW
iwpriv ra0 set VLANPolicy=0:1    # Set Tx REPLACE VID
```

Rx Policy

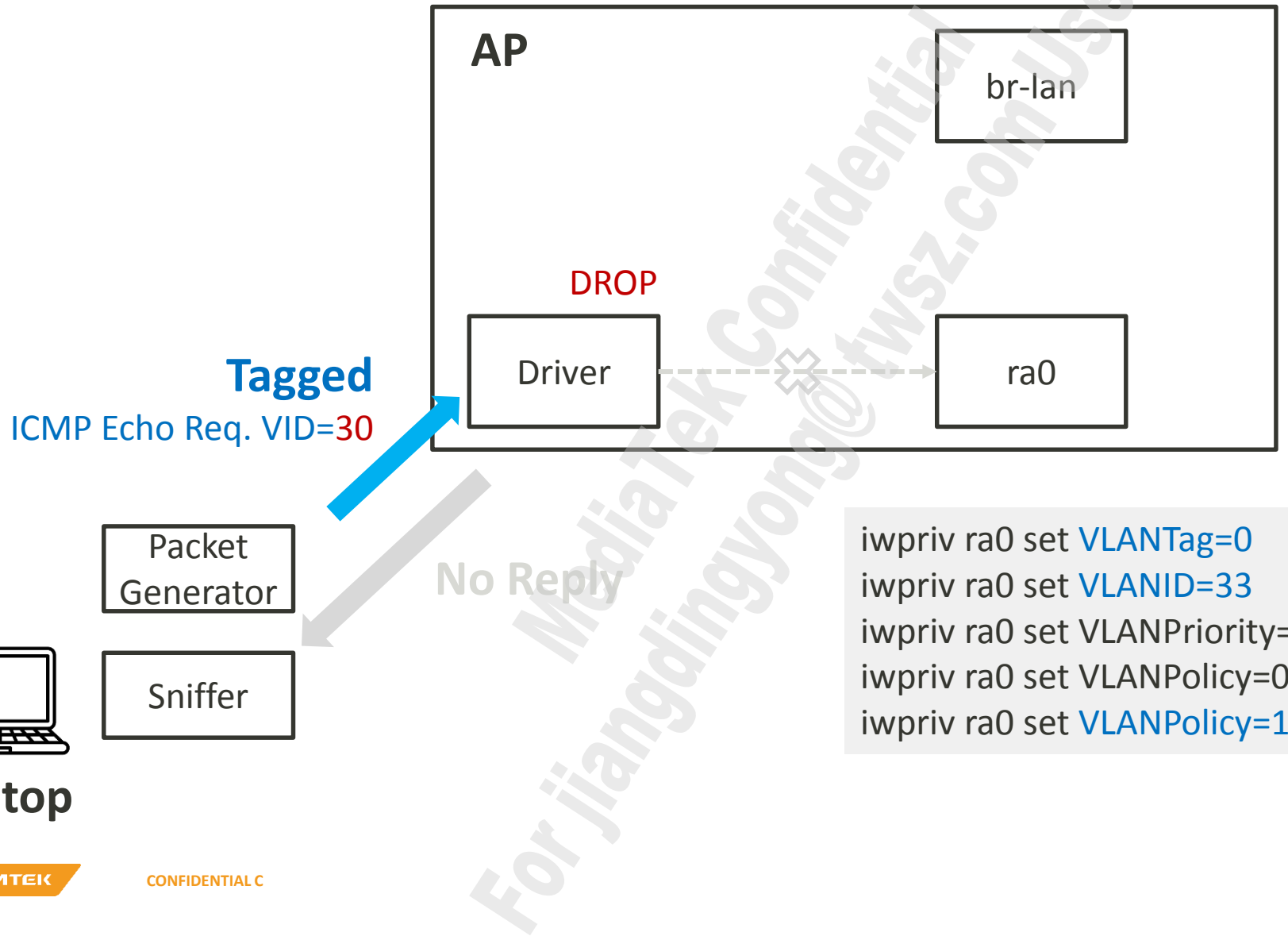
- iwpriv [INTERFACE] set VLANPolicy=1:[POLICY]

POLICY	Policy Name	Description
0	DROP	If ingress VLAN pkt has different VID, drop it
1	UNTAG	If ingress pkt is tagged, un-tag it
2	ALLOW	If ingress VLAN pkt has different VID, do nothing
3	REPLACE VID	If ingress VLAN pkt has different VID, replace VID Insert the VLAN Tag if the ingress pkt is non-vlan
4	REPLACE ALL	If ingress VLAN pkt has different VID, replace PCP & VID Insert the VLAN Tag if the ingress pkt is non-vlan

```
iwpriv ra0 set VLANPolicy=1:1    # Set Rx UNTAG
iwpriv ra0 set VLANPolicy=1:4    # Set Rx REPLACE ALL
```

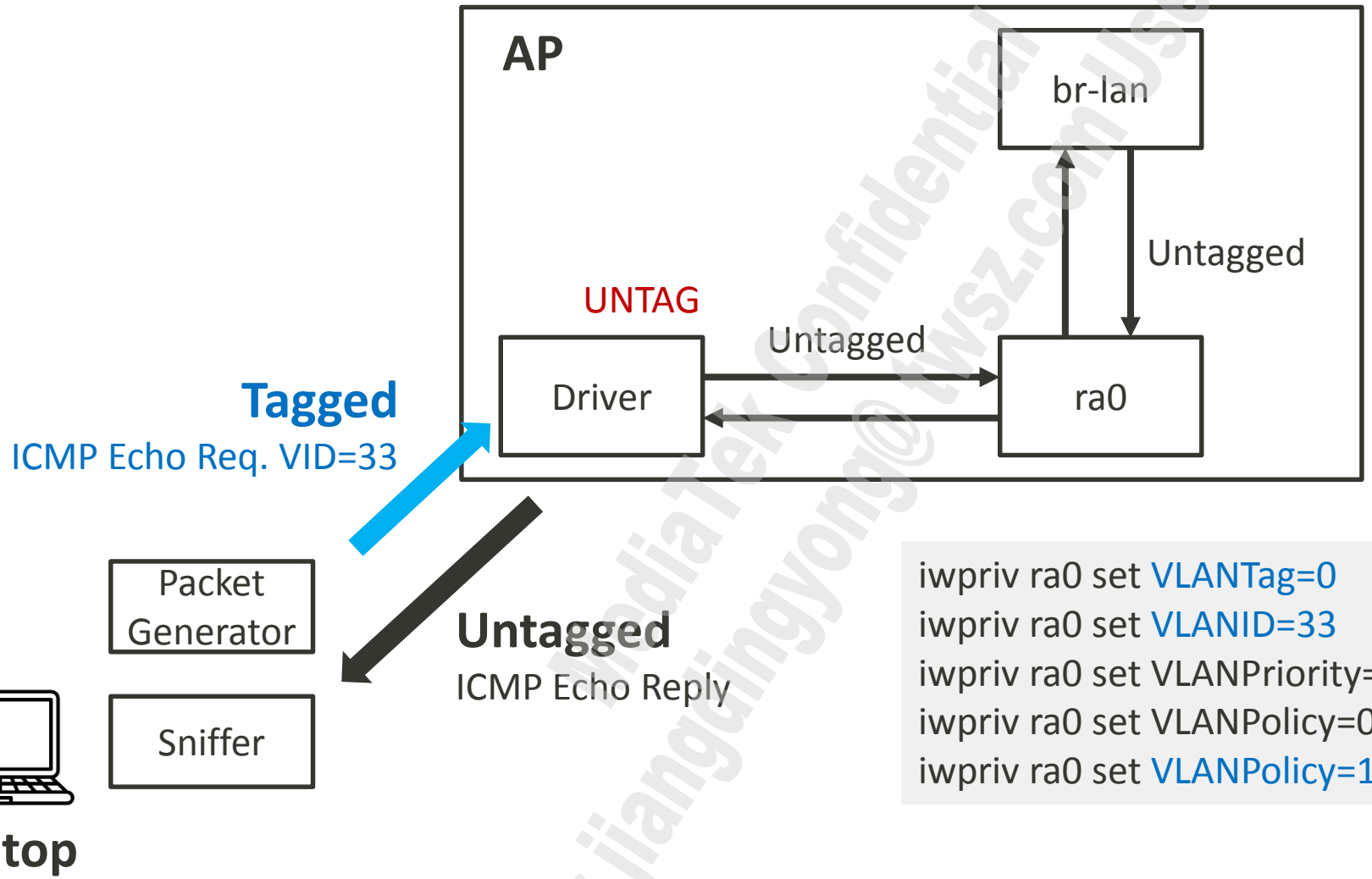
TEST SCENARIOS

Ingress Rule Test - DROP



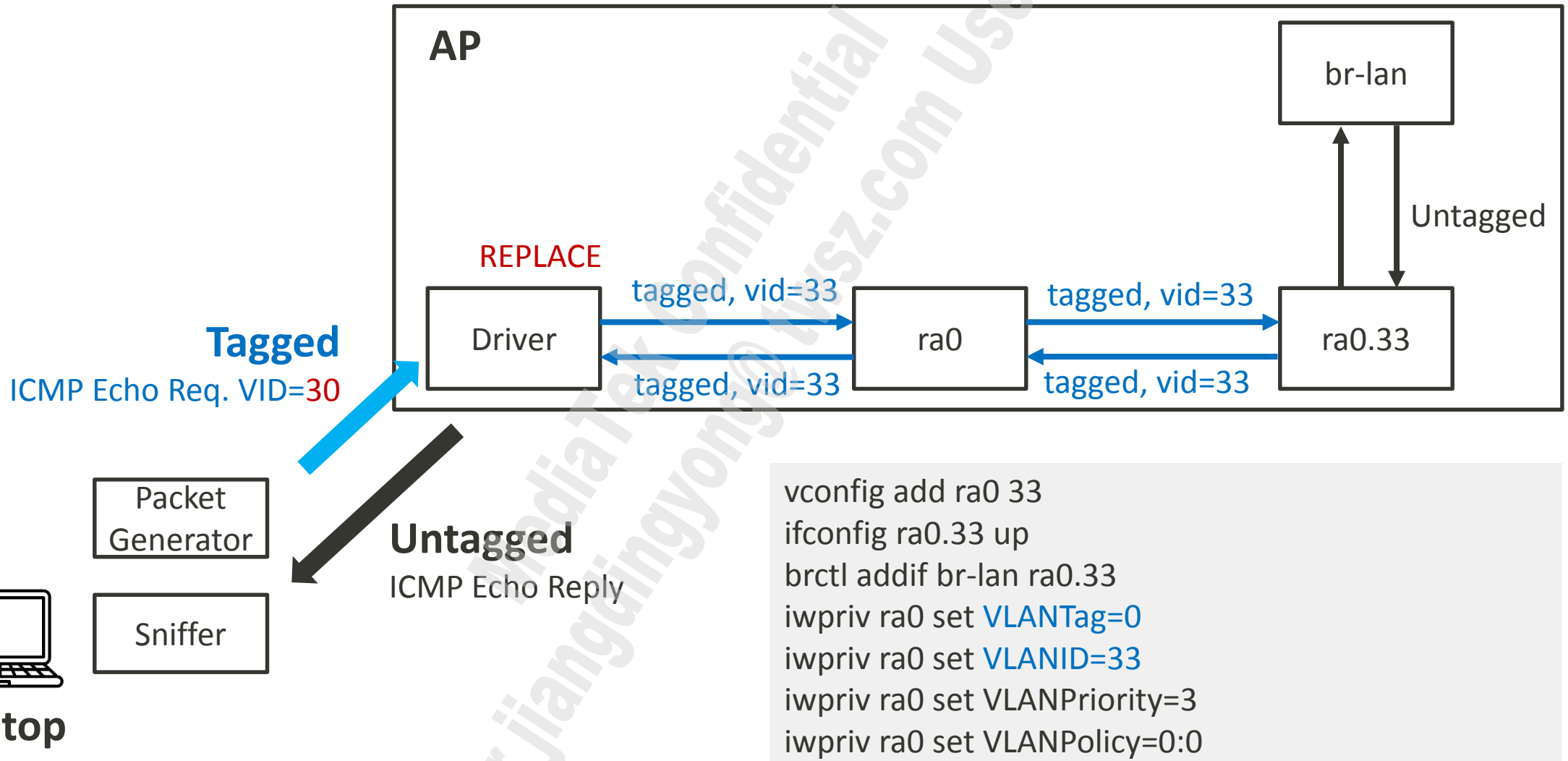

```
iwpriv ra0 set VLANTag=0
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:0
iwpriv ra0 set VLANPolicy=1:0
```

Ingress Rule Test - UNTAG



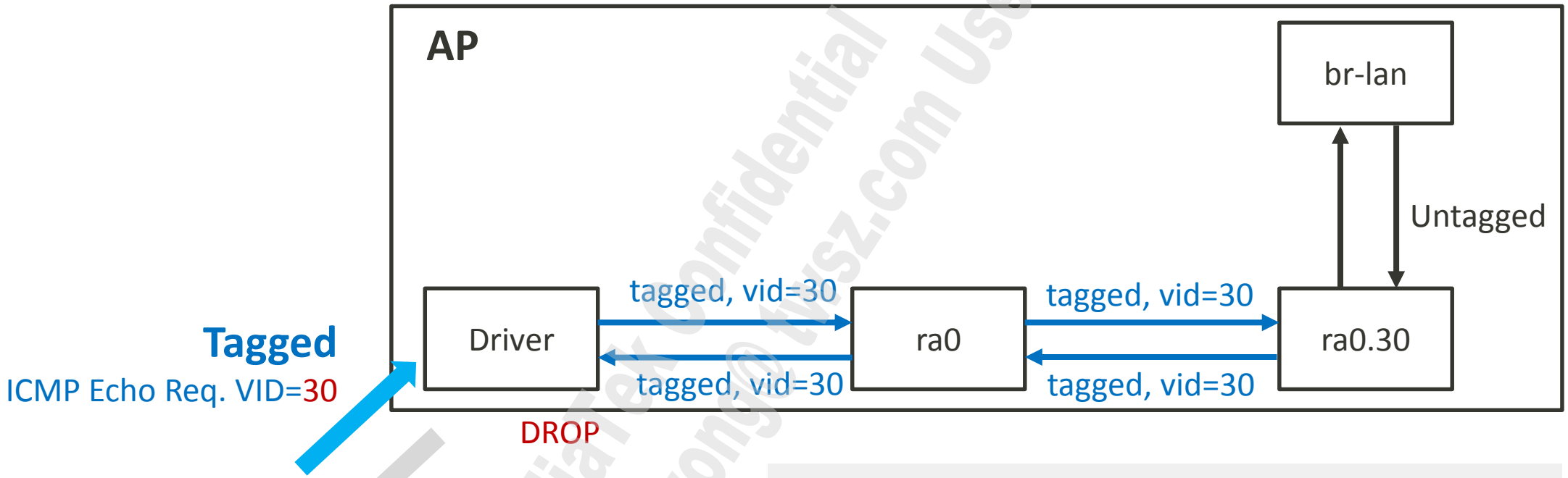

```
iwpriv ra0 set VLANTag=0
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:0
iwpriv ra0 set VLANPolicy=1:1
```

Ingress Rule Test – REPLACE VID



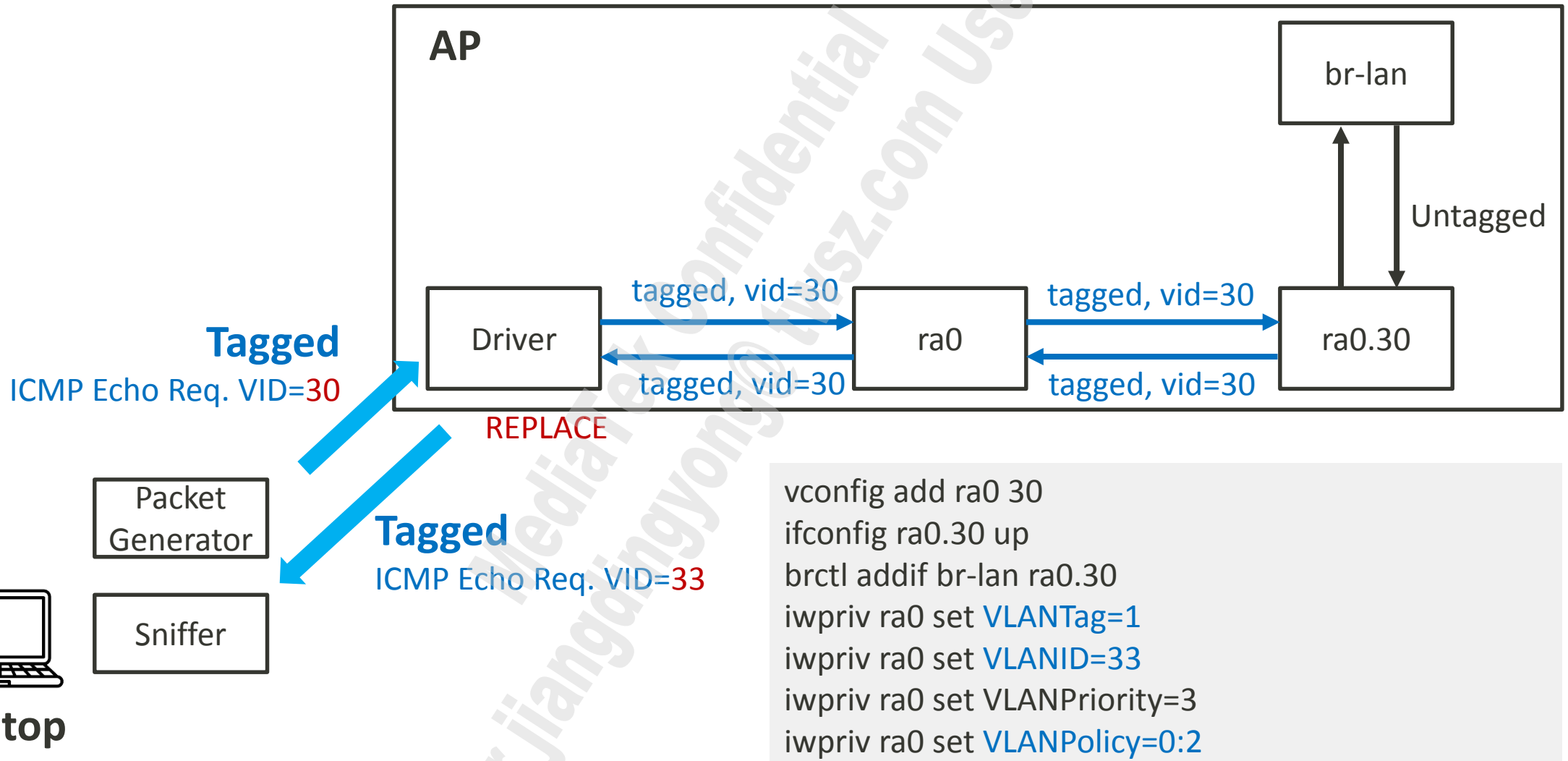

```
vconfig add ra0 33
ifconfig ra0.33 up
brctl addif br-lan ra0.33
iwpriv ra0 set VLANTag=0
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:0
iwpriv ra0 set VLANPolicy=1:3
```

Egress Rule Test – DROP




```
vconfig add ra0 30
ifconfig ra0.30 up
brctl addif br-lan ra0.30
iwpriv ra0 set VLANTag=1
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:0
iwpriv ra0 set VLANPolicy=1:2
```

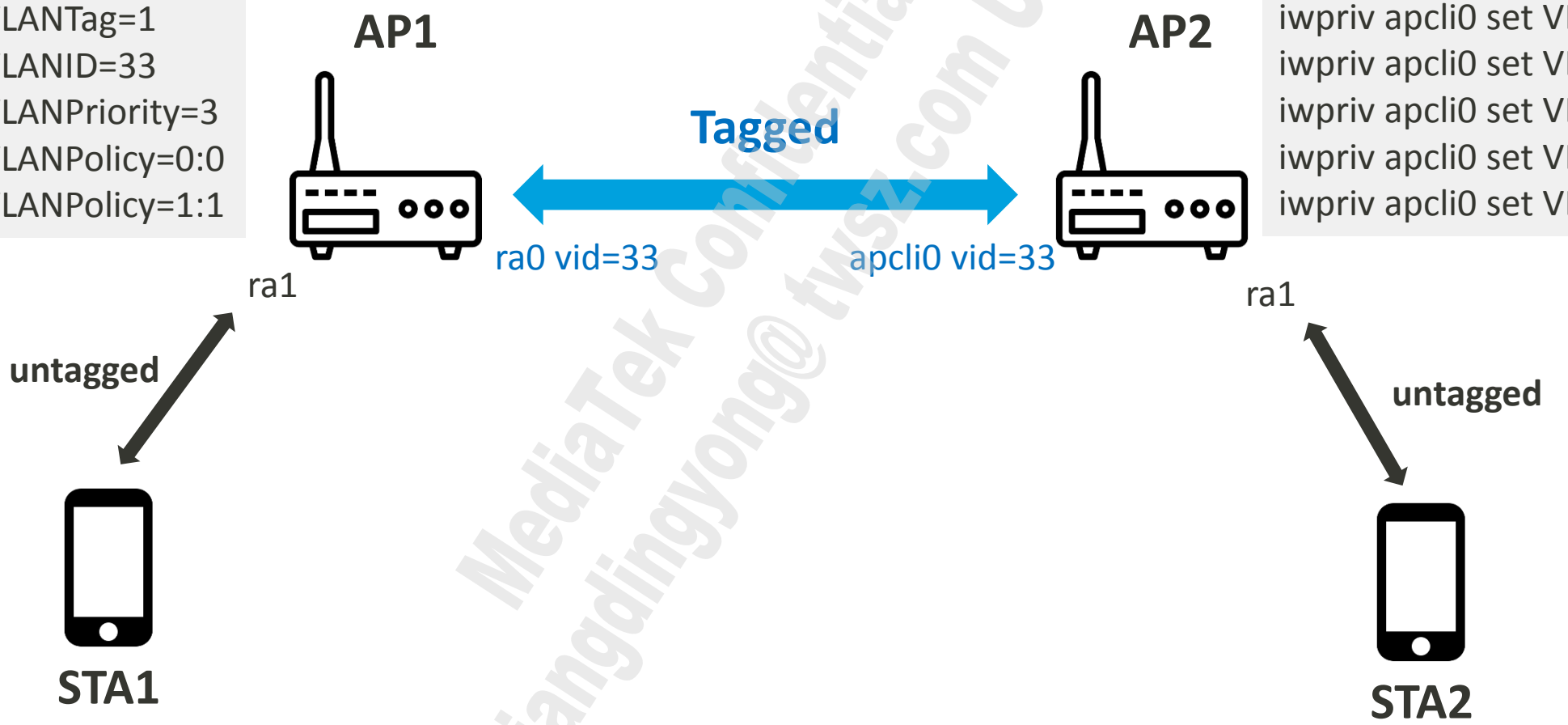
Egress Rule Test – REPLACE VID




```
vconfig add ra0 30
ifconfig ra0.30 up
brctl addif br-lan ra0.30
iwpriv ra0 set VLANTag=1
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:2
iwpriv ra0 set VLANPolicy=1:2
```

Backhaul Link is VLAN

```
iwpriv ra0 set VLANTag=1
iwpriv ra0 set VLANID=33
iwpriv ra0 set VLANPriority=3
iwpriv ra0 set VLANPolicy=0:0
iwpriv ra0 set VLANPolicy=1:1
```




```
iwpriv apcli0 set VLANTag=1
iwpriv apcli0 set VLANID=33
iwpriv apcli0 set VLANPriority=3
iwpriv apcli0 set VLANPolicy=0:0
iwpriv apcli0 set VLANPolicy=1:1
```

everyday genius