MSTP Technical Report – North Campus

Priority Normalization, Per-Platform Configuration and Operator Link Repair

Author: Antonio Pérez

Position: Network Engineer – St. Francis School

Date: December 7, 2025

1 Executive Summary

This report documents the complete normalization of MSTP in the North Campus, defining hierarchical priorities aligned with the network architecture, applying standardized configurations across all platforms (Aruba, Cisco, Arista and Dell), and fixing a critical event that occurred after enabling MST on the Cisco C9500, where the link towards the service provider was blocked due to an STP inconsistency.

The main goals were to ensure that:

- The **primary root** and **secondary root** are correctly defined on the Core (Aruba 6400).
- **Distribution** and **access** devices do not compete for the root role.
- The Cisco C9500, located at the edge towards the provider, does not interfere with the campus MST topology.

2 MSTP Priority Matrix

Role / Location	**Platform**	**Priority**	**Justification**
North Core (Primary root)	Aruba 6400 A	0	Must be the definitive root of the campus.
North Core (Secondary root)	Aruba 6400 B	1	Immediate successor if chassis A fails.
North Distribution	Aruba 6300	4	Must not exceed the Core, but must provide stability.
North Access	Aruba 2930/3810	8	Edge switches; must not compete as root.
Provider Edge	Cisco C9500	32768	Must not act as root inside the MST domain.
DC Hypervisor Edge	Arista	32768	Keeps independence from the campus MST domain.
Datacenter Access	Dell N3048P	32768	Operates only as an edge bridge.

Table 1: MSTP priorities per platform.

3 Configuration Applied per Platform

3.1 Aruba 6400 – North Core (Primary Root)

```
conf t
spanning-tree mode mstp
spanning-tree config-name NET-MSTP
spanning-tree config-revision 1

spanning-tree instance 1 vlan 500-509
spanning-tree instance 2 vlan 510-519
spanning-tree instance 3 vlan 520-529
spanning-tree instance 4 vlan 530-532

spanning-tree priority 0
spanning-tree instance 1 priority 0
spanning-tree instance 2 priority 0
spanning-tree instance 3 priority 0
spanning-tree instance 4 priority 0
end
write mem
```

3.2 Aruba 6400 – North Core (Secondary Root)

```
conf t
spanning-tree mode mstp
spanning-tree config-name NET-MSTP
spanning-tree config-revision 1

spanning-tree instance 1 vlan 500-509
spanning-tree instance 2 vlan 510-519
spanning-tree instance 3 vlan 520-529
spanning-tree instance 4 vlan 530-532

spanning-tree priority 1
spanning-tree instance 1 priority 1
spanning-tree instance 2 priority 1
spanning-tree instance 3 priority 1
spanning-tree instance 4 priority 1
end
write mem
```

3.3 Aruba 6300 – Distribution

```
conf t
spanning-tree mode mstp
spanning-tree config-name NET-MSTP
spanning-tree config-revision 1

spanning-tree instance 1 vlan 500-509
spanning-tree instance 2 vlan 510-519
spanning-tree instance 3 vlan 520-529
spanning-tree instance 4 vlan 530-532

spanning-tree priority 4
spanning-tree instance 1 priority 4
spanning-tree instance 2 priority 4
spanning-tree instance 3 priority 4
spanning-tree instance 4 priority 4
end
write mem
```

3.4 Aruba 2930 / 3810 – Access

```
conf t
no spanning-tree mode rapid-pvst
spanning-tree mode mstp
spanning-tree config-name NET-MSTP
spanning-tree config-revision 1

spanning-tree instance 1 vlan 500-509
spanning-tree instance 2 vlan 510-519
spanning-tree instance 3 vlan 520-529
spanning-tree instance 4 vlan 530-532

spanning-tree priority 8
spanning-tree instance 1 priority 8
spanning-tree instance 2 priority 8
spanning-tree instance 3 priority 8
spanning-tree instance 4 priority 8
end
write mem
```

3.5 Cisco Catalyst 9500 – Provider Edge

```
conf t
spanning-tree mode mst
spanning-tree extend system-id
no spanning-tree mst simulate pvst global

spanning-tree mst configuration
 name NET-MSTP
 revision 1
 instance 1 vlan 500-509
 instance 2 vlan 510-519
 instance 3 vlan 520-529
 instance 4 vlan 530-532
 exit

spanning-tree mst 0 priority 32768
spanning-tree mst 1 priority 32768
spanning-tree mst 2 priority 32768
spanning-tree mst 3 priority 32768
spanning-tree mst 4 priority 32768
end
write mem
```

3.6 Arista – DC Hypervisor Edge

```
configure terminal
spanning-tree mode mstp

spanning-tree mst configuration
 name NET-MSTP
 revision 1
 instance 1 vlan 500-509
 instance 2 vlan 510-519
 instance 3 vlan 520-529
 instance 4 vlan 530-532
 exit

spanning-tree mst 0 priority 32768
spanning-tree mst 1 priority 32768
spanning-tree mst 2 priority 32768
spanning-tree mst 3 priority 32768
spanning-tree mst 4 priority 32768
end
write memory
```

3.7 Dell N3048P – DC Access

```
configure
spanning-tree mode mstp

spanning-tree mst configuration
 name NET-MSTP
 revision 1
 instance 1 add vlan 500-509
 instance 2 add vlan 510-519
 instance 3 add vlan 520-529
 instance 4 add vlan 530-532
 exit

spanning-tree priority 32768
spanning-tree mst 1 priority 32768
spanning-tree mst 2 priority 32768
spanning-tree mst 3 priority 32768
spanning-tree mst 4 priority 32768
end
write memory
```

4 Operator Link Repair

After enabling MST, the Cisco C9500 blocked the port-channel towards the Juniper, showing:

```
Po1  Desg BKN*1000  Bound(STP) *PVST_Peer_Inc
```

This indicates an inconsistency between STP domains.

Applied Fix

```
conf t
interface Port-channel1
 spanning-tree bpdufilter enable
 spanning-tree portfast trunk
end
write mem
```

Effect:

- The link stops processing BPDUs from the provider.
- The PVST_Peer_Inc condition is avoided.
- The port-channel moves to FWD state in all MST instances.

5 Conclusion

MSTP normalization in the campus is now fully aligned with the network architecture. The root bridge is correctly defined on the Aruba 6400 and the priorities per hierarchical level guarantee predictable and stable operation.

The incident with the provider was fixed by applying STP filters on the Cisco C9500, restoring WAN traffic without affecting the internal MST topology.

6 Multicast Recommendations for Zultys Phones

Zultys phones (ZIP 43G, 47G, 59G and similar models) use multicast traffic for services such as *paging*, *intercom*, *music-on-hold* (MoH) and SIP audio broadcast groups. To keep multicast flows stable, it is essential to configure an appropriate **IGMP Membership Report Interval** on each phone.

On ArubaOS–CX platforms (2930F, 6300, 6400), Cisco Catalyst and Arista EOS, IGMP Snooping and Querier timers follow the RFC defaults and are not always manually configurable. Therefore, optimization must be performed directly on the phones to ensure stability without generating unnecessary IGMP traffic.

6.1 Recommended Timers for Zultys Phones

Table 2: *

Recommended IGMP Values for Zultys Devices

Service	**Recommended timer**	**Technical rationale**
Paging / Intercom	**75 s**	Prevents IGMP membership expiration during continuous audio.
Music on Hold	**60–75 s**	Keeps the session active with moderate IGMP traffic.
General multicast (239.x.x.x)	**60–90 s**	Safe range in networks with static querier (Aruba/Cisco).
Critical events or failover	≤ 60 **s**	Ensures fast renewals during STP reconvergence or querier changes.

6.2 Technical Basis Applied to Zultys

The phones use IGMPv2 to join multicast groups.

To guarantee that they keep receiving audio, they must periodically send an *IGMP Membership Report*. If this report does not arrive before the timeout, the switch removes the entry and stops the multicast flow.

On ArubaOS–CX switches, the relevant values are:

- **IGMP Query Interval:** 125 s (fixed in Aruba).
- **Other Querier Timeout:** 255 s.
- **Max Response Time:** 10 s.

Report intervals that are too long → risk of audio loss. Intervals that are too short → unnecessary load on the voice VLAN.

6.3 Why 75 Seconds is the Optimal Value

1. Prevents IGMP Snooping Expiration An interval of 75 s guarantees at least three reports within the expiration window (255 s), even during network events such as:

- Switchover between queriers (Cisco–Aruba).
- Spanning-tree reconvergence.
- Micro-outages on the MX-E system.

2. Minimizes Unnecessary IGMP Traffic Intervals below 30 s generate constant IGMP traffic in the voice VLAN. A value of 75 s balances stability and efficiency.

3. Works in Mixed Networks Compatible with Aruba, Cisco, Arista and Juniper. ZIP phones maintain multicast audio without drops in heterogeneous networks.

6.4 Final Recommended Configuration

- Configure on all phones:

IGMP Report Interval = 75 s

- Benefits:
  - Zero audio loss during paging.
  - Tolerance to querier changes.
  - Good balance between stability and IGMP traffic.
  - Full compatibility with IGMP Snooping on Aruba 6300/6400.

6.5 Verification on Aruba Switches

To confirm that phones maintain their membership:

```
show ip igmp snooping vlan <VOICE_VLAN>
```

The operator should verify:

- Phones appear listed under `Active Groups`.
- The `Reports` counter increases every 60–90 s.
- `Querier Expiration Time` stays close to 255 s.