



**PROPRIETARY WIRELESS PROTOCOLS**

**N-Streme and Nv2**

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**Nstreme and NV2 are Wireless Protocols created by  
Mikrotik to improve Point to Point and Point to Multi  
Point Wireless links.**

**Objective:** To make an understanding of n-streme, and Nv2 protocol, How it is an improvement over Standard 802.11x, and application of Nv2 in our classroom so as to replicate an outdoor point-to-multipoint scenario.

## Class Setup:

Please Set your Routers to Default Configuration using “system reset-configuration” in terminal window.

Set your Radio name to “your name\_xx” starting from the Left Serially, starting with xx=11. So first person on the left will be name\_11.

Setup your LAN ip to be 192.168.xx.1/24 in your laptop and . 254 in your router.

Please Set your routers to connect with Class Router by connecting to ssid “wclass” (802.11b/g mode)

Put IP 10.1.1.xx/24 on your wireless interface and add static gateway in ip>route : 10.1.1.254

Add masquerade rule in ip>firewall>NAT, (chain=src-nat, out int=wan1, action=masquerade)

Check Ping to the Gateway.



## Requirements and Compatibility

- Nv2 Requires Router OS version 5x
- Supported by Atheros AR 5413 and newer Chipsets
- Not Compatible with non Nv2 protocols such as 802.11 or other Proprietary protocols

## Why N-Streme / NV2 ???

802.11x



**CSMA/CA**

Problem:

Hidden Node  
Problem

Nstreme



**CSMA with POLLING**

Problem:

Increased  
Overhead due  
to polling

Nv2



**TDMA**

A Very Good  
Solution

**WHY ???????**

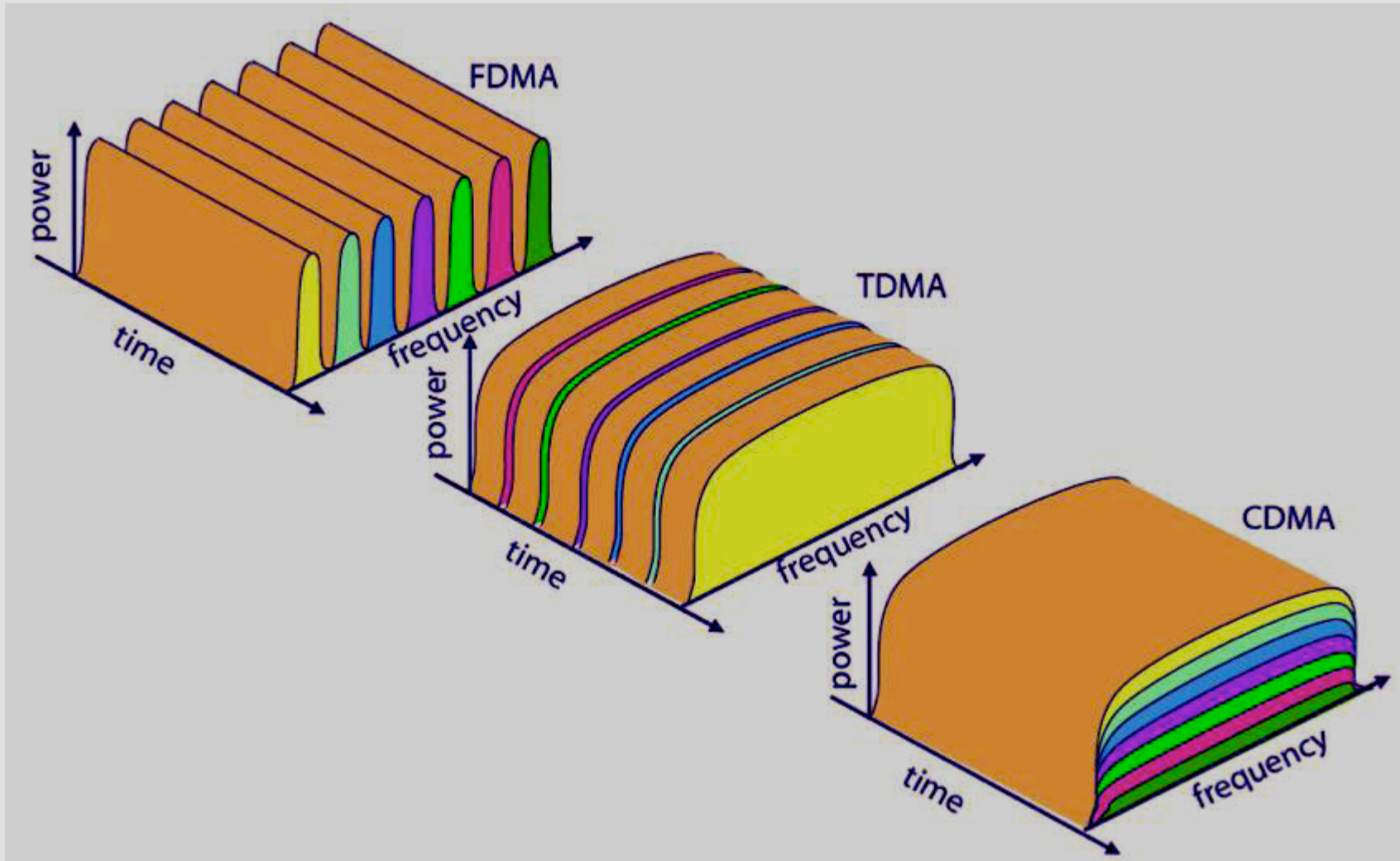
## **T D M A ==>> Time Division Multiple Access**

In TDMA mechanism, a specific node such as AP has responsibility to coordinate the nodes of the network.

The time on the channel is divided into time slots which are generally of fixed size.

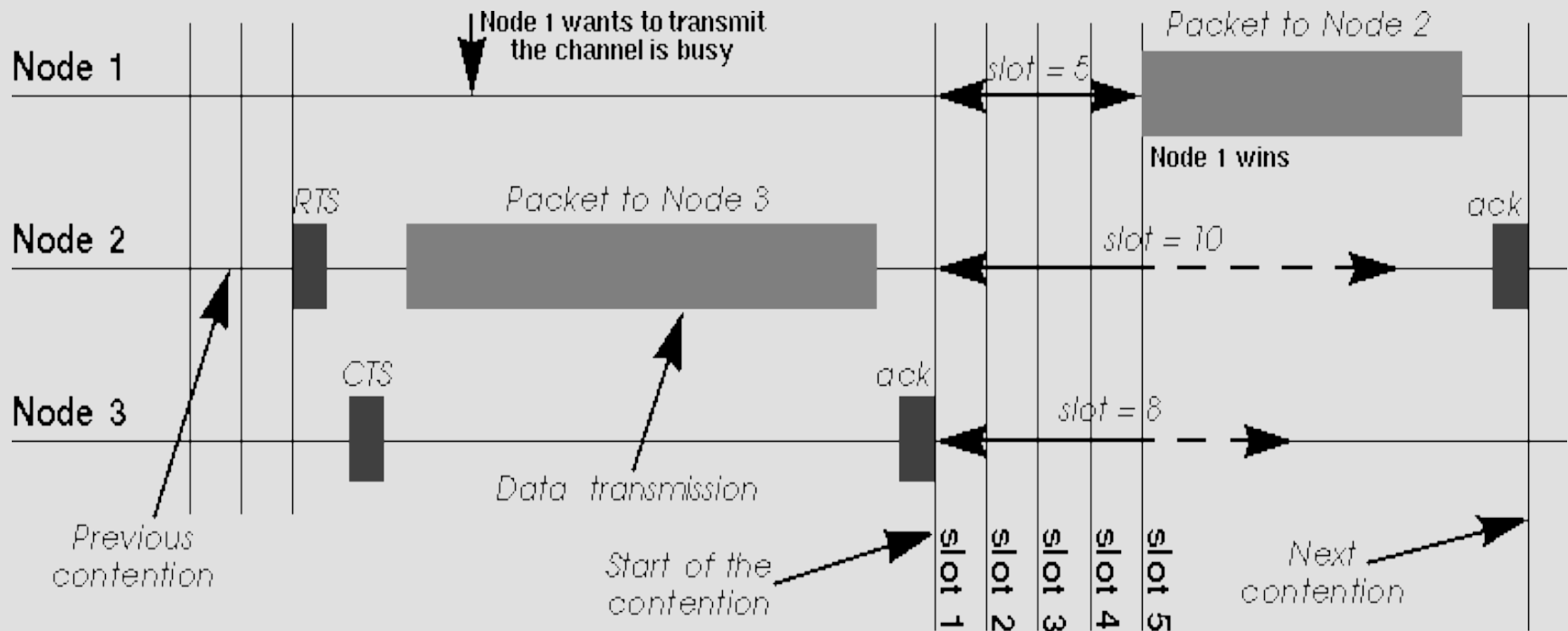
It reduces a lot of overhead in wireless networks and has benefits such as :

- 1> More Throughput
- 2> Lower Latency
- 3> Good for Point to Multipoint Networks
- 4> Solves Hidden Node Problem



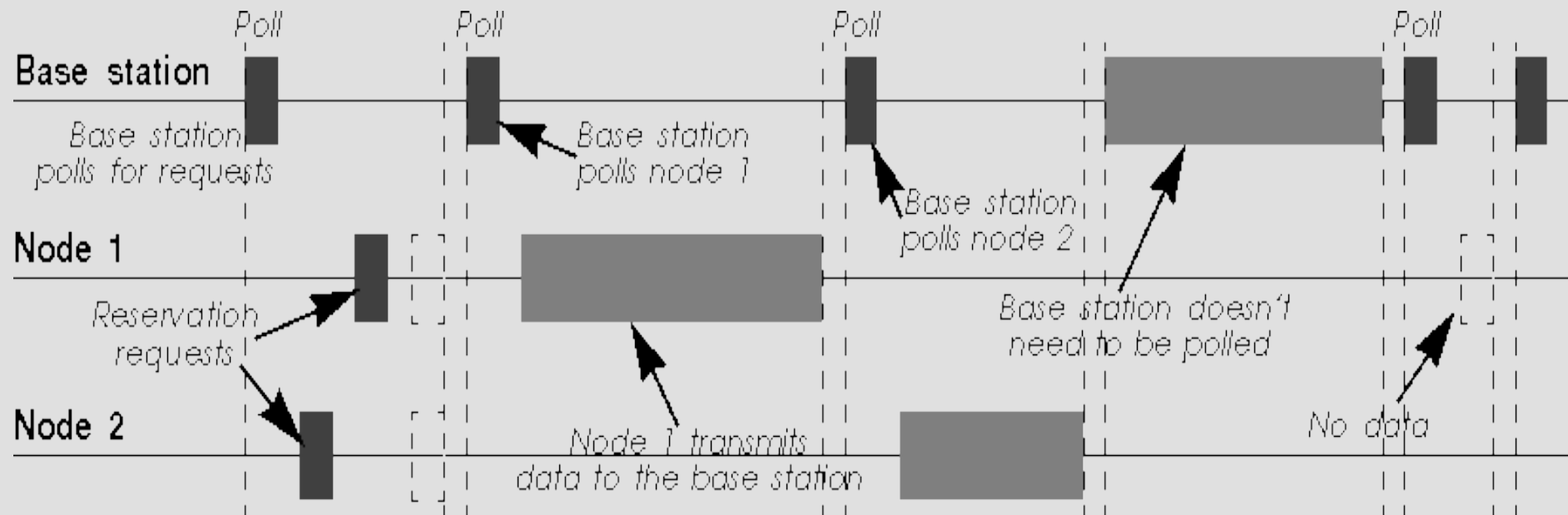


## CSMA/CA MECHANISM



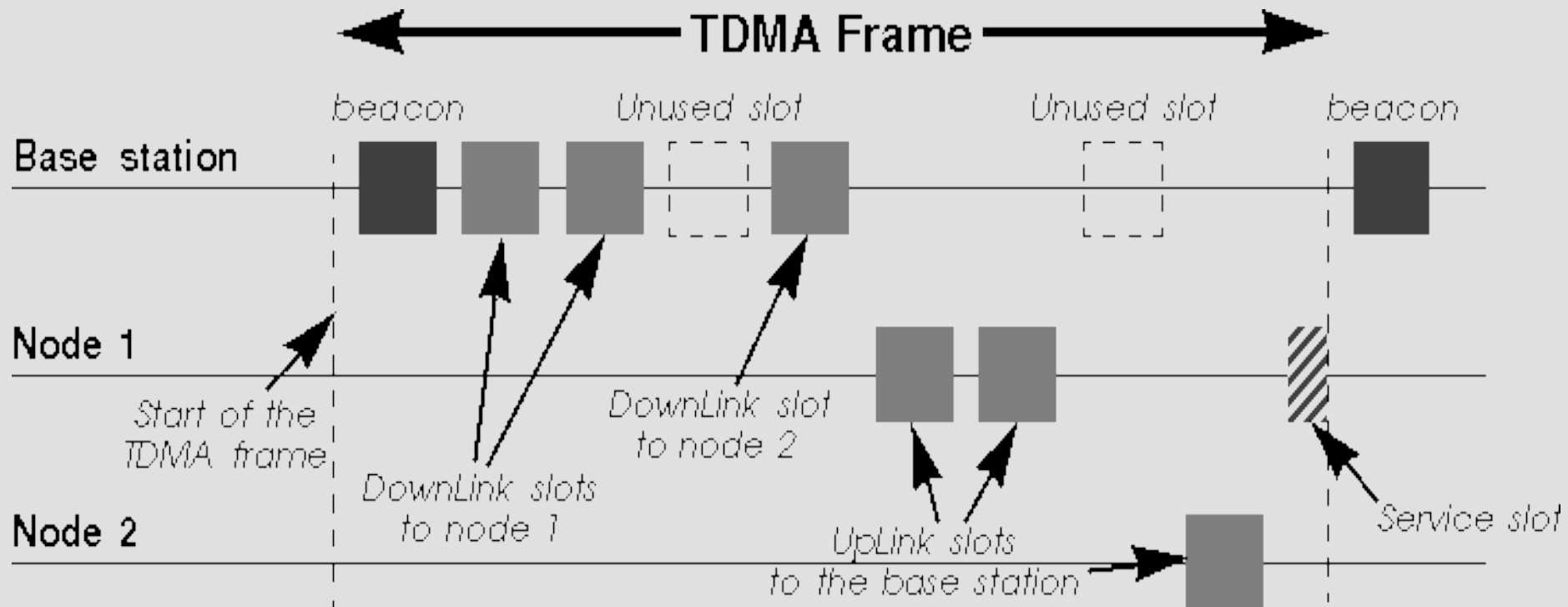
❖ Used by 802.11 Standard

## POLLING MAC MECHANISM



❖ Used by Mikrotik Nstreme Protocol

## TDMA MECHANISM

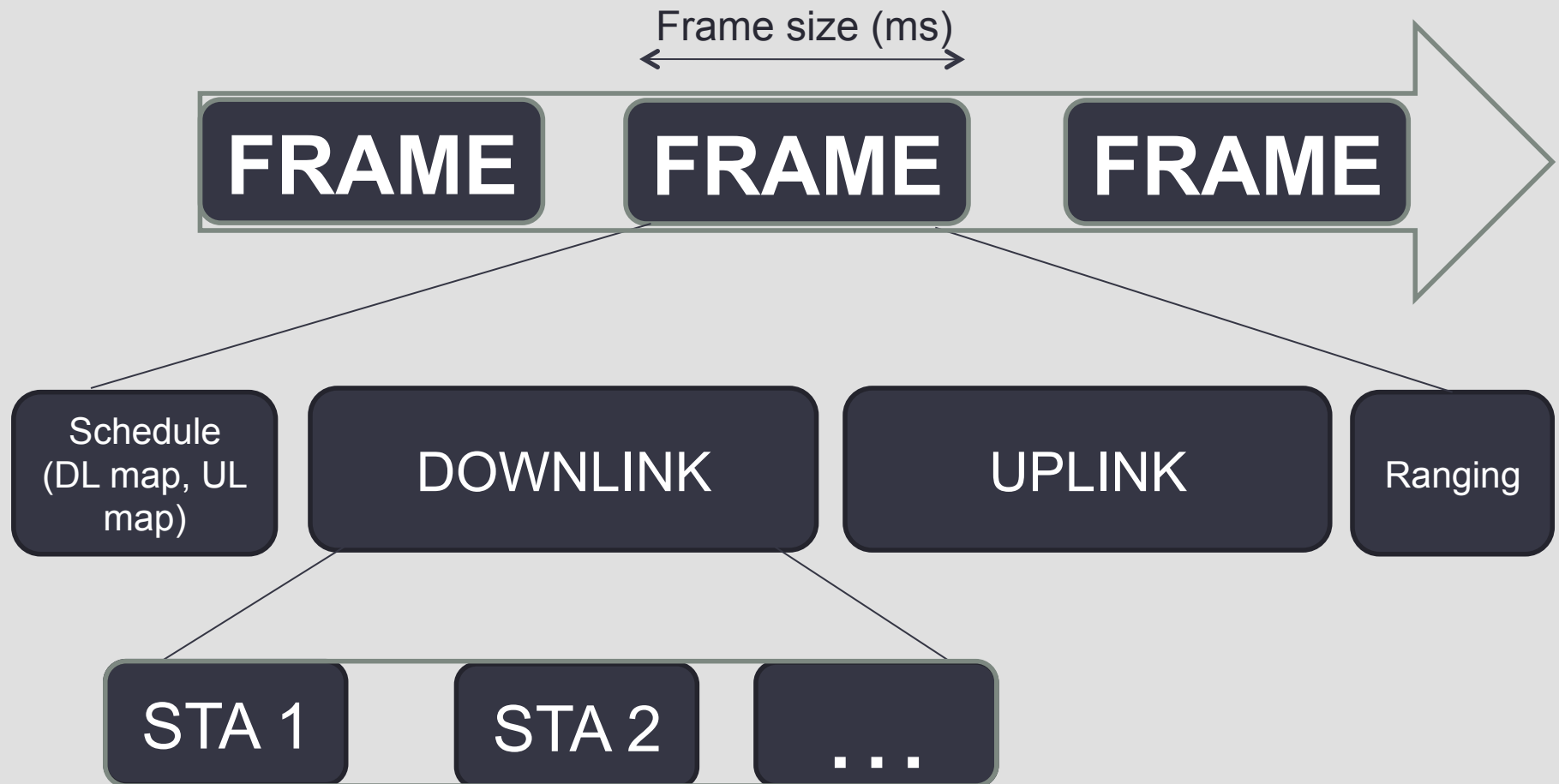


❖ Used by Mikrotik Nv2 Protocol

## Nv2 Mechanism

- Media access is controlled by Nv2 AP
- Time is divided dynamically by AP in “periods”:
  - > Downlink (from AP to Clients)
  - > Uplink (from Clients to AP)
- Uplink time is divided between the connected clients based on their requirements for bandwidth.
- At the beginning of each period AP broadcasts schedule that tells clients when they should transmit and the amount of time they can use.

# NV2 Frames



## Registration of New Client

- Nv2 AP periodically assigns uplink time for new client.
- This time interval is used by new client to initiate registration to AP
- The AP estimates propagation delay between AP and client and starts periodically scheduling uplink time for this client in order to complete registration and receive data from new client.

## Nv2 Special Features

- Reliable communications across Nv2 links
- Dynamic rate selection on per-client basis.
- QoS with variable number of priority queues.
- > Built-in default QoS scheduler that can be accompanied with fine grained QoS policy based on firewall rules.

## Nv2 Settings

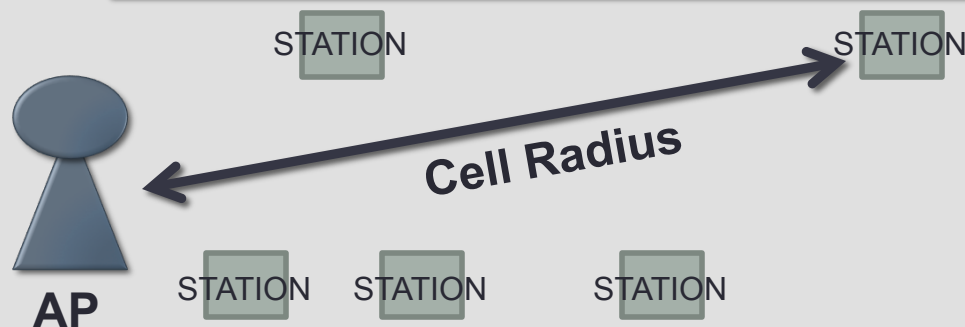
### ➤ Nv2-cell-radius

> Specifies distance to farthest client in Nv2 network in km.

> Affects the size of contention time slot that AP allocates for clients to initiate connection and also size of time slots used for estimating distance to client.

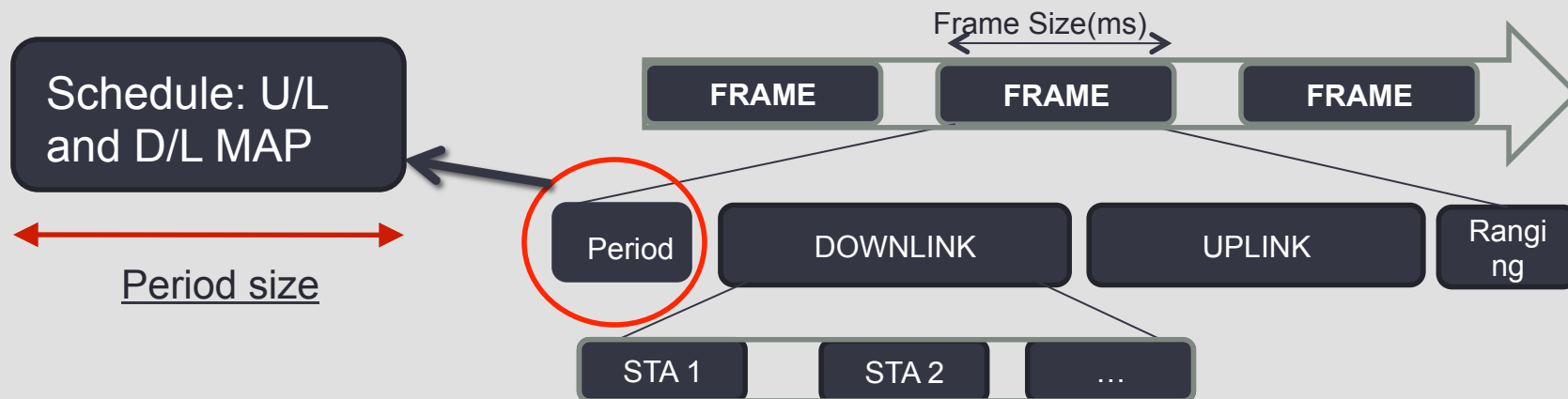
> If this setting is too small, clients that are further away may have trouble connecting and/or disconnect with "ranging timeout" error.

> In order to maintain maximum performance, it is advised not to increase this setting if not necessary, so AP is not reserving time that is actually never used, but instead allocates it for actual data transfer.





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➤ tdma-period-size

> It is the size in ms of time periods that Nv2 AP uses for media access scheduling. Smaller period can potentially decrease latency (because AP can assign time for client sooner), but will increase protocol overhead and therefore decrease throughput. Increasing period will increase throughput but also increase latency

> It may be required to increase this value for especially long links to get acceptable throughput.

# Nv2 Setting

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admin@D4:CA:6D:27:5B:D3 (Soumil@MUM) - WinBox v5.16 on R8751U-2HnD (mipsbe)

Safe Mode

The screenshot displays the MikroTik WinBox interface. On the left sidebar, the 'Wireless' menu item is circled in red. In the 'Wireless Tables' section, the 'wlan1' interface is selected and circled in red. The 'Interface <wlan1>' configuration window is open, showing the 'General' tab. The 'Wireless Protocol' is set to 'nv2' and is circled in red. A red arrow points from this setting to the 'Interface <wlan1>' window on the right, which is also titled 'Interface <wlan1>' and has 'NV2' selected in the 'Nstreme' dropdown. In this window, the 'Queue Count' is set to '2' and the 'QoS' is set to 'default', both of which are enclosed in a blue box. A blue arrow points from this box to the text 'Nv2 QoS'.

RouterOS WinBox

Quick Set  
Interfaces  
**Wireless**  
Bridge  
PPP  
Switch  
Mesh  
IP  
MPLS  
Routing  
System  
Queues  
Files  
Log  
Radius  
Tools  
New Terminal  
MetaROUTER  
Make Supout.nif  
Manual  
Exit

Wireless Tables  
Interfaces  
Nstreme  
wlan1

Interface <wlan1>  
General Wireless Data Rates Advanced HT ...  
Mode: ap bridge  
Band: 2GHz-B/G/N  
Channel Width: 20MHz  
Frequency: 2412 MHz  
SSID: Soumil AP  
Radio Name: SOUMIL\_BLINKNET  
Scan List: default  
**Wireless Protocol: nv2**  
Security Profile: default  
Frequency Mode: manual bpower  
Country: no\_country\_set  
Antenna Gain: 0 dBi  
DFS Mode: none  
Proprietary Extensions: post-2.9.25  
WMM Support: disabled  
Bridge Mode: enabled  
Default AP Tx Rate: bps  
Default Client Tx Rate: bps  
☒ Default Authenticate  
☒ Default Forward  
☐ Hide SSID  
Multicast Helper: default

Interface <wlan1>  
Nstreme: **NV2** Tx Power Current Tx Power Status ...  
TDMA Period Size: 2 ms  
Cell Radius: 30 km  
☐ Security  
Preshared Key:  
Queue Count: 2  
QoS: default  
Nv2 QoS

## Quality of Service

- QoS in Nv2 is implemented by means of variable number of priority queues
- Queue is considered for transmission based on rule recommended by 802.1D-2004 - only if all higher priority queues are empty:
  - > at first all frames from queue with higher priority will be sent, and only then next queue is considered
- QoS policy must be designed with care so that higher priority queues do not make lower priority queues starve
- QoS policy in Nv2 network is controlled by AP, clients adapt policy from AP

## QoS

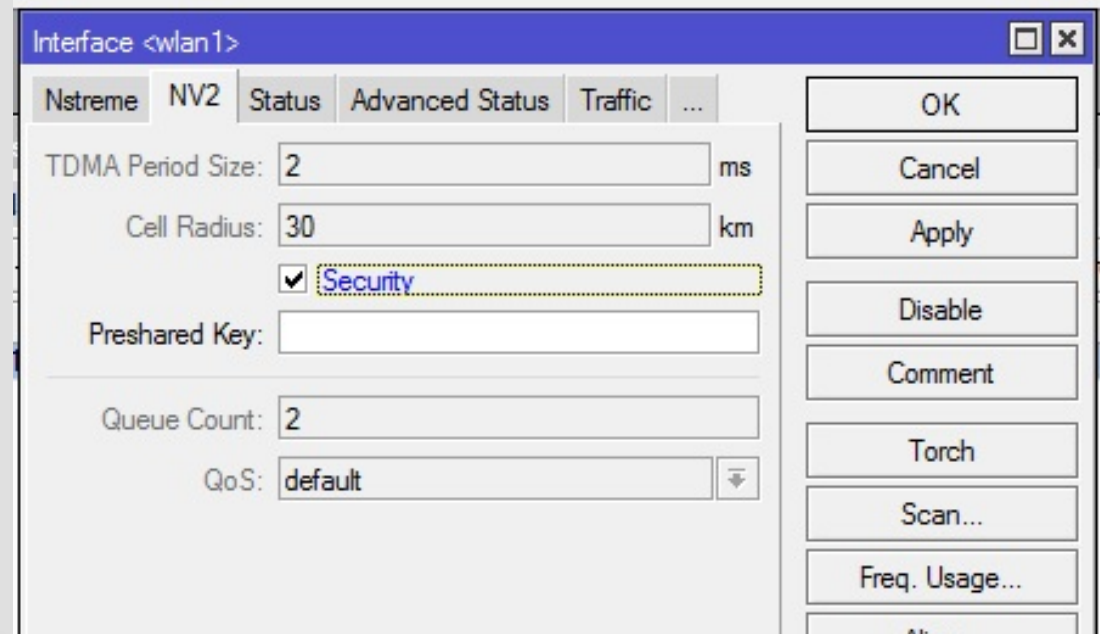
- nv2-queue-count
  - > specifies how many priority queues are used in Nv2 network
- nv2-qos=default
  - > outgoing frame at first is inspected by built-in QoS policy algorithm that selects queue based on packet type and size
  - > If built-in rules do not match, queue is selected based on frame priority field, as in nv2-qos=frame-priority mode
- nv2-qos=frame-priority
  - > QoS queue is selected based on frame priority field
  - > frame priority field is not some field in headers and therefore it is valid only while packet is processed by given device
  - > frame priority field must be set either explicitly by firewall rules or implicitly from ingress priority by frame forwarding process, for example, from MPLS EXP bits

## Frame Priority Mapping

- If number of queues is 2 (default), mapping is as follows:
  - > priority 0,1,2,3 -> queue 0
  - > priority 4,5,6,7 -> queue 1
  
- If number of queues is 4, mapping is as follows:
  - > priority 0,3 -> queue 0
  - > priority 1,2 -> queue 1
  - > priority 4,5 -> queue 2
  - > priority 6,7 -> queue 3
  
- If number of queues is 8 (maximum possible), mapping is as follows:
  - > priority 0 -> queue 2
  - > priority 1 -> queue 0
  - > priority 2 -> queue 1
  - > priority 3 -> queue 3
  - > priority 4 -> queue 4
  - > priority 5 -> queue 5
  - > priority 6 -> queue 6
  - > priority 7 -> queue 7

## Security In NV2

- Nv2 does not support Standard WPA Encryption.
- The Encryption is done by Pre-Shared Key between AP and Clients.
- Security can be activated from the NV2 menu in Wireless Configuration.



## Advantage of NV2 over 802.11x

### ➤ Media access is scheduled by AP

> eliminates hidden node problem and allows to implement centralized media access policy - AP controls how much time is used by every client and can assign time to clients according to some policy instead of every device contending for media access

### ➤ Reduced frame propagation delay

> There are no per-frame ACKs in Nv2 - this significantly improves throughput, especially on long distance links where data frame and following ACK frame propagation delay significantly reduces the effectiveness of media usage

### ➤ Reduced per frame overhead

> Nv2 implements frame aggregation and fragmentation to maximize assigned media usage and reduce per-frame overhead (inter-frame spaces, preambles)

## Advantage of NV2 over N-streme

### ➤ Reduced polling overhead

- > instead of polling each client, Nv2 AP broadcasts uplink schedule that assigns time to multiple clients, this can be considered "group polling"
- > no time is wasted for polling each client individually, leaving more time for actual data transmission. This improves throughput, especially in PtMP configurations

### ➤ Reduced frame propagation delay

- > Nv2 must not poll each client individually, this allows to create uplink schedule based on estimated distance (propagation delay) to clients such that media usage is most effective. This improves throughput, especially in PtMP configurations

### ➤ More control over latency

- > reduced overhead, adjustable period size and QoS features allows for more control over latency in the network



## Disadvantages of NV2

- Only RouterOS devices will be able to participate in Nv2 network and only RouterOS devices will see Nv2 AP when scanning.
- Nv2 network will disturb other networks in the same channel and Nv2 network may be affected by any (Nv2 or not) other networks in the same channel.
- Nv2 enabled device will not connect to any other TDMA based network.
- Does not Support 802.11x standard WPA/WPA 2 Security Protocols

## Lab : Performance of NV2

- We shall change different Qos Features on your Nv2 link.
- What is the best possible setting ????

# SUMMARY

- ✓ Nv2 is Stable.
- ✓ Nv2 has More Control.
- ✓ Nv2 uses TDMA which is excellent in any kind of wireless scenario.
- ✓ Nv2 has additional QoS features.
- ✓ Nv2 is Mikrotik !

**THANKING YOU**

**SOUMIL GUPTA BHAYA**

**BLINKNET SOLUTION Pvt Ltd.**

**Mikrotik Consultants, and Master  
Distributor**

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