
MIKROTIK TUTORIAL
WI-FI CHANNEL DESIGN
Why 960 Mbps
Beats 1.7 Gbps
Wi-Fi 5 @ 160 MHz vs Wi-Fi 6 @ 80 MHz
The smaller number can win
in the real world.
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Tutorial
LINE
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Two products. Two numbers.

Same 2×2 client — different standard and channel width

PRODUCT A

Wi-Fi 5

802.11ac · 2×2 · 160 MHz

1733 Mbps

PRODUCT B

Wi-Fi 6

802.11ax · 2×2 · 80 MHz

960 Mbps

Which one would you buy?

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The number on the box is only a PHY link rate.

A laboratory ceiling — not an outcome

- × Not throughput
- × Not capacity
- × Not user experience

Best possible instant ≠ real-world result

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Four steps to a better decision

Start with the number. End with channel-width choice.

01
Where the numbers come from

02
Three traps of 160 MHz

03
What Wi-Fi 6 actually changed

04
How to choose channel width

The middle two sections carry the core argument.

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อย่าแลก "channel reuse" ของทั้งระบบ เพื่อเอา peak speed ของ client ตัวเดียวมากเกินไป

"Although using 80-MHz-wide channel bonding may at first seem to boost an individual client's performance, in an environment with a high density of APs, the co-channel interference due to limited spectrum availability can potentially reduce the overall network performance."

https://www.cisco.com/c/en/us/products/collateral/wireless/access-points/enterprise-best-practices-ios-ipados-wp.html

1733 Mbps

Real math.

Ideal assumptions.

802.11ac · 160 MHz · MCS9 · 256-QAM · Short GI

$$468 \times 8 \times 5/6 \times 2 \div 3.6\ \mu s$$

subcarriers bits coding streams symbol

Peak PHY rate

is not delivered throughput.

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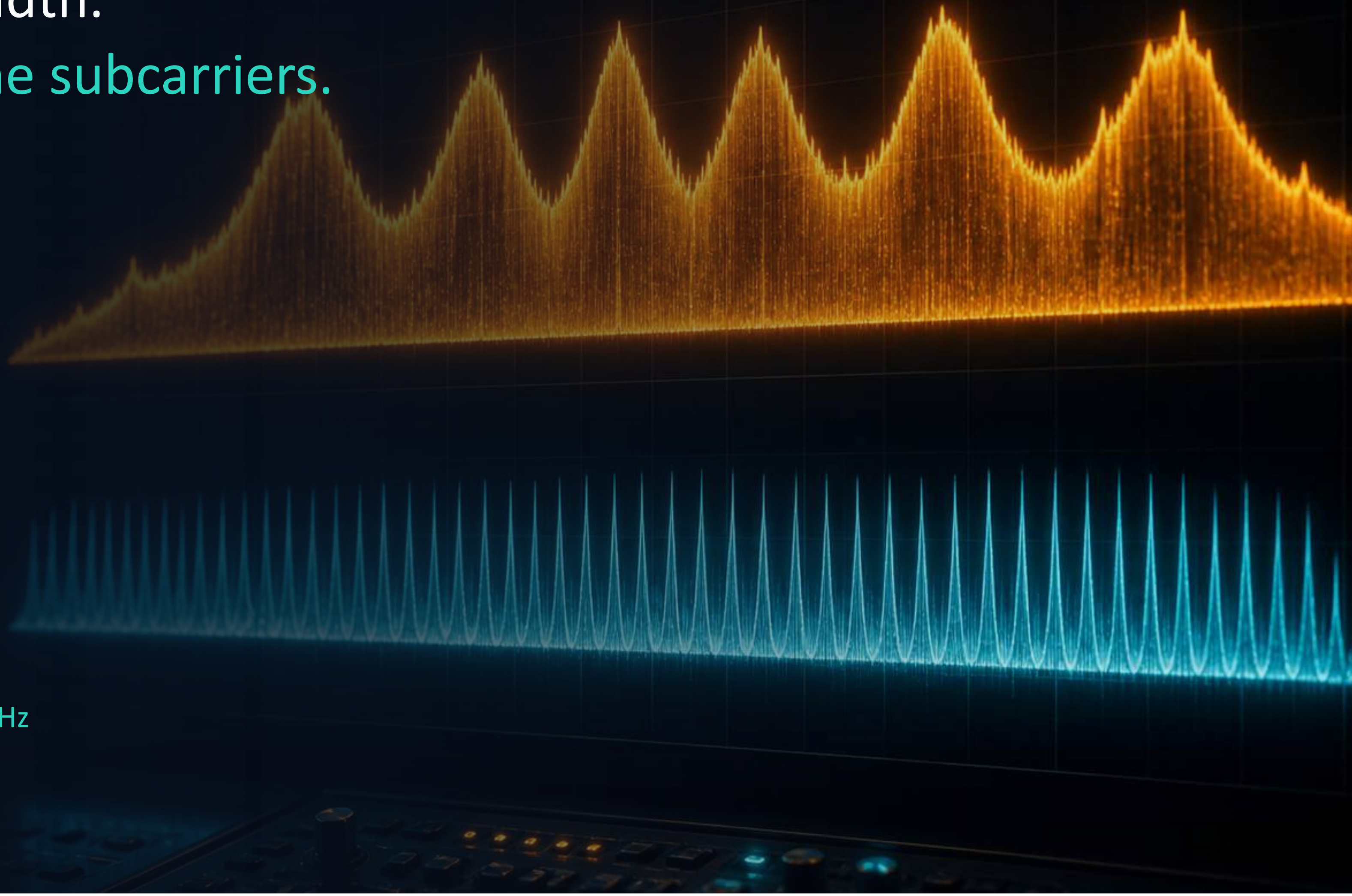
Half the channel width.
More than twice the subcarriers.

Same 256-QAM modulation



Wi-Fi 5 · 160 MHz

468 subcarriers

1733 Mbps

Wi-Fi 6 · 80 MHz

980 subcarriers

960 Mbps · +11% at the same 80 MHz

PHY LINK RATE · IDEAL CONDITIONS

A PHY rate captures one perfect instant.

Real networks don’t behave like test tracks.

One client. No interference. No retries.

THE NUMBER ASSUMES

01	02	03	04	05
One client	Zero interference	Maximum SNR	No retries	No overhead

Protocol work consumes part of every transmission.

Useful data receives only part of the airtime

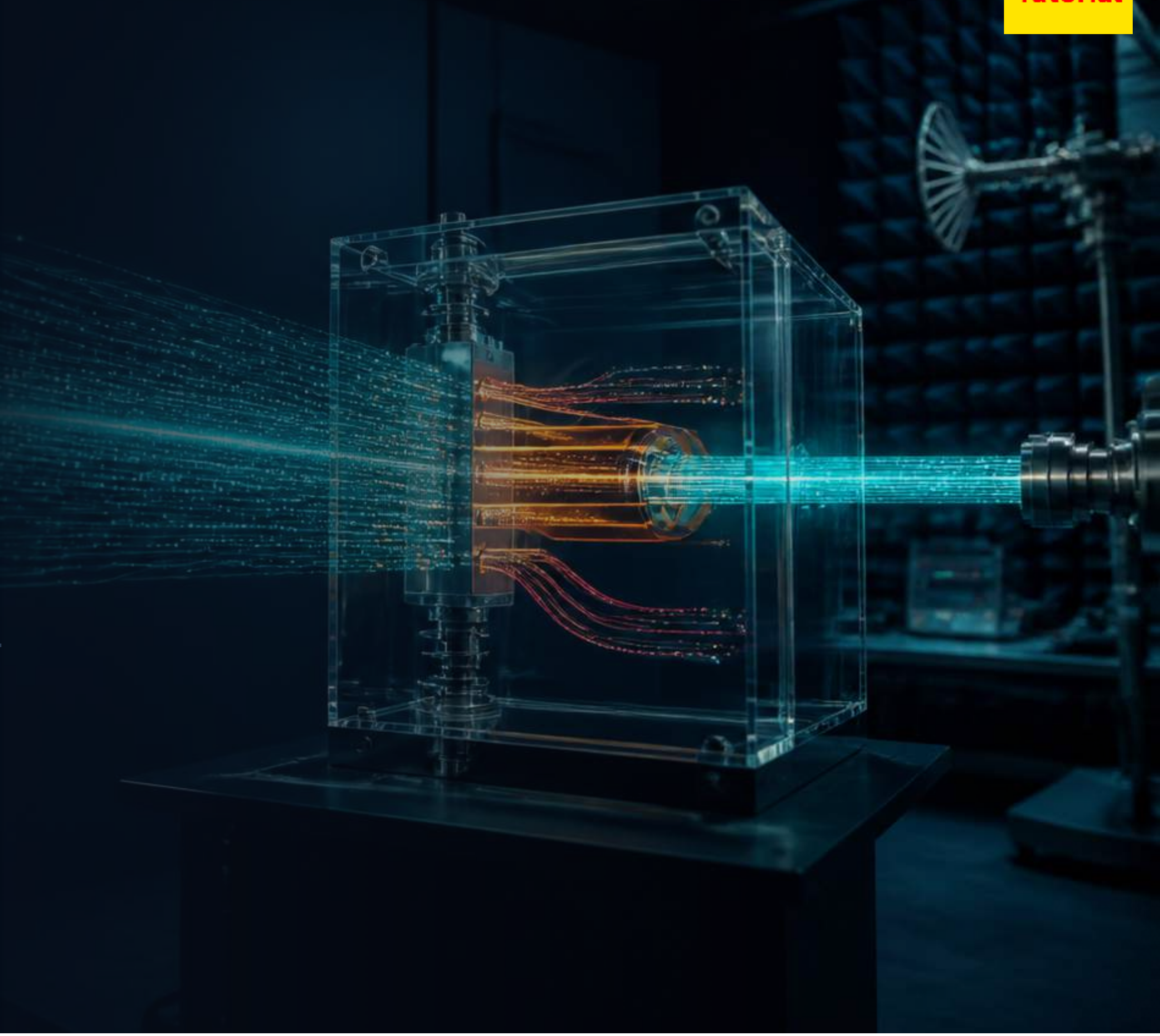
≈ 60–70%

of PHY rate reaches TCP throughput
in a best-case clean link

BACKOFF · PREAMBLE · IFS

HEADERS · ACK

The box number never owns the whole airtime.



Wi-Fi does not sell bandwidth.
It sells airtime.

One channel

One talker at a time

Everyone — including neighbours — shares the same clock.

The better question: how efficiently do we use the time?

THREE TRAPS

160 MHz

looks wide — and inherits
three unavoidable constraints.

01 Noise Floor

02 DFS

03 Channel Scarcity

None can be fixed by buying a more expensive AP.

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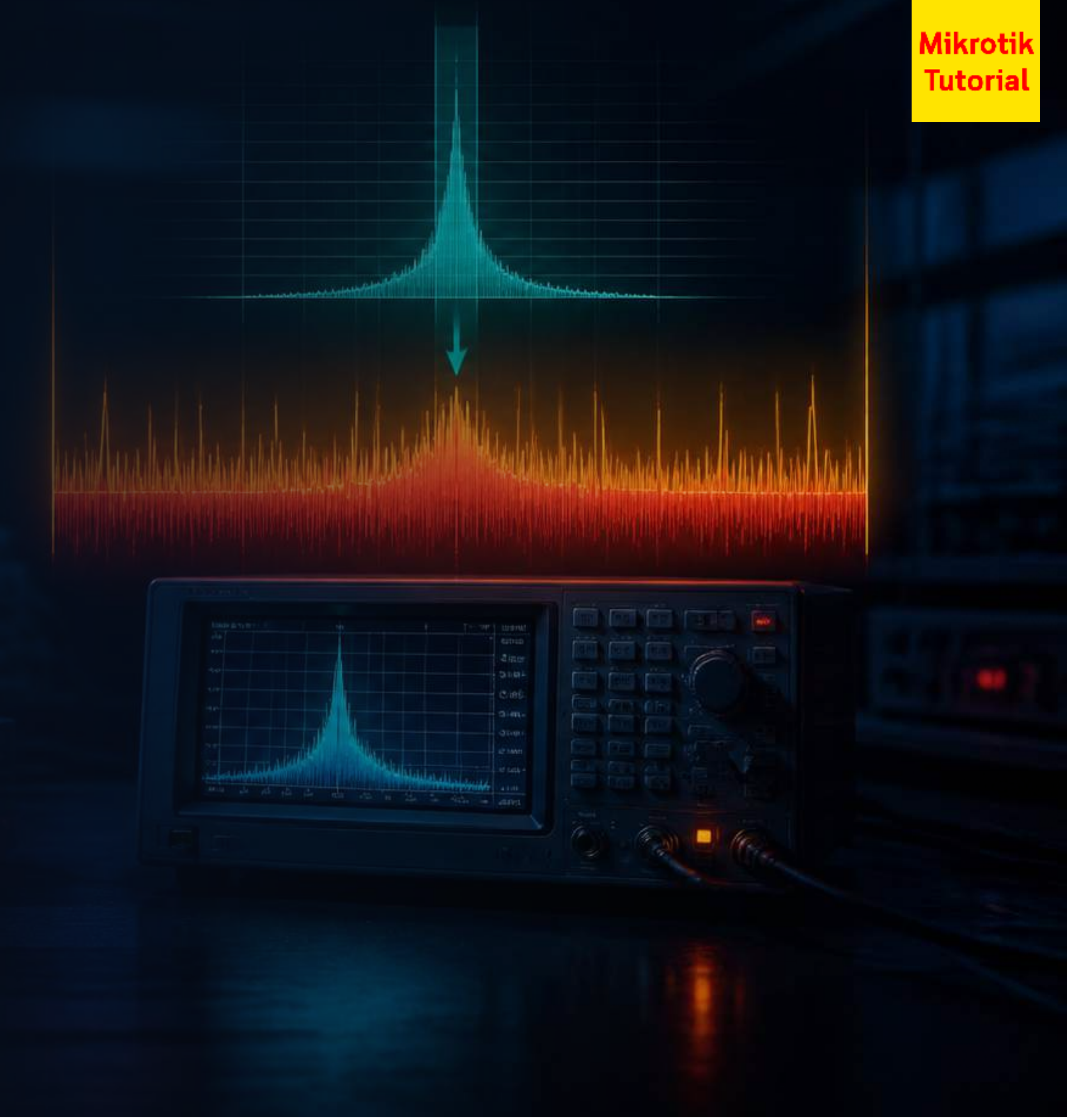
Wider channels collect more noise

Double the width → double the noise power → +3 dB



+9 dB

noise at 160 MHz
versus 20 MHz

20 MHz	40 MHz	80 MHz	160 MHz
+0 dB	+3 dB	+6 dB	+9 dB

Same signal. Higher noise. Lower SNR.

Top speed needs a stronger signal

Every doubling of channel width moves the target by 3 dB

20 MHz	−60 dBm
40 MHz	−57 dBm
80 MHz	−54 dBm
160 MHz	−51 dBm

SNR ≥ 35 dB

160 MHz is a close-range feature.

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At range, the narrower channel wins

Conceptual — the crossover depends on the environment

160 MHz

wins near the AP

---

80 MHz

wins past the crossover

Wide channels are a short-range feature.

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160 MHz cannot avoid DFS in 5 GHz

Only two non-overlapping blocks exist — both include radar channels

2 usable 160 MHz blocks

CHANNEL 50

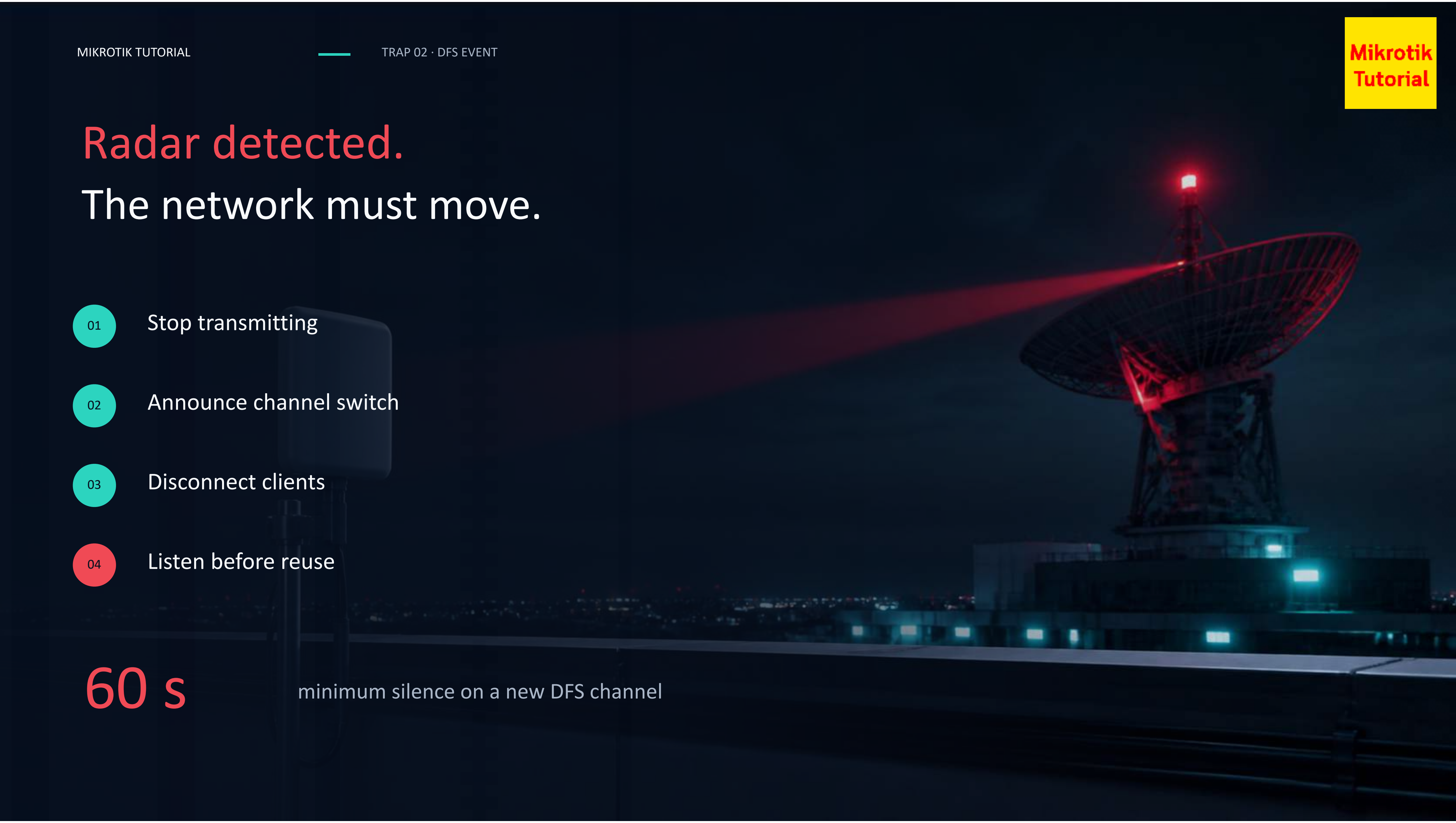
36–64

CHANNEL 114

100–128

NO THIRD OPTION

160 MHz enters radar territory by design.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TRAP 02 · DFS EVENT
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Radar detected.
The network must move.
01 Stop transmitting
02 Announce channel switch
03 Disconnect clients
04 Listen before reuse
60 s
minimum silence on a new DFS channel

A wider road leaves fewer roads to reuse

Three APs. Two channels. Someone must share airtime.

80 MHz	160 MHz
6 channels	2 channels

3 APs ÷ 2 channels

More APs do not create more airtime on the same channel.

Density rewards narrower channels

Vendors recommend 40 MHz — or even 20 MHz — for ultra-high-density networks

40 MHz

or even

20 MHz

ARUBA WI-FI 6 NETWORKS DEPLOYMENT GUIDE

Capacity comes from reuse — not one oversized channel.

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Three checks before enabling 160 MHz

The AP specification is only half of the link

01 — CLIENT WIDTH

02 — NEIGHBOUR LOAD

03 — DFS SUPPORT

Check the client mix — not only the AP.

REFRAME

Not how wide
the road is.

How well the traffic
is managed.

Wi-Fi 6 changes the scheduler — not just the speed limit.

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WI-FI 5 · WHOLE CHANNEL

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One client books the entire road

A tiny packet reserves the same full channel as a large packet

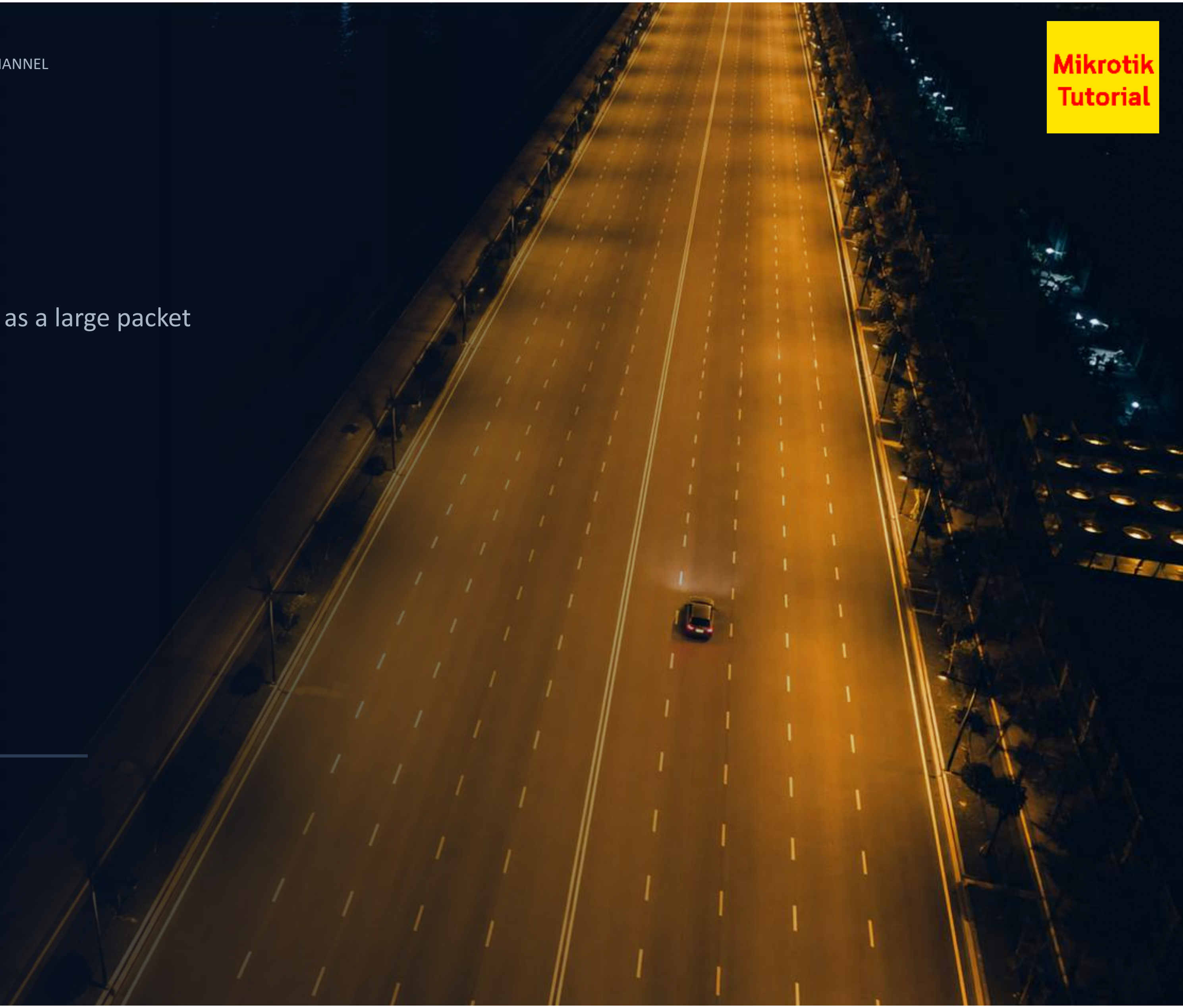
100 bytes

or

1500 bytes

ONE TRANSMISSION

one client · whole channel



One transmission can serve many clients

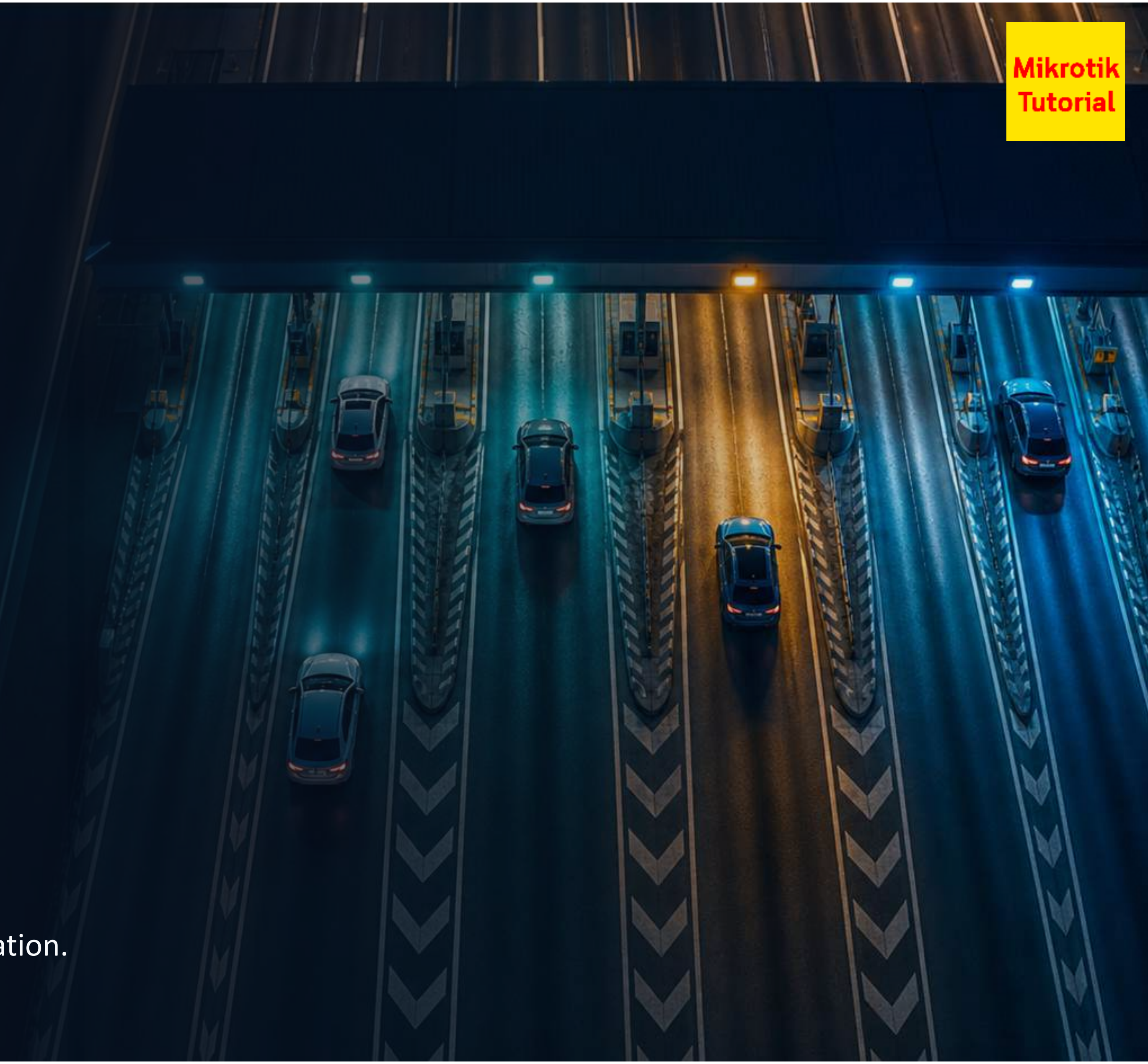
The channel is divided into assigned Resource Units

ONE MOMENT

many clients

A B C D E

Small packets stop wasting a full-width reservation.



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Narrower lanes create more conversations

RU sizes divide airtime into exactly the capacity each client needs

9
clients · 20 MHz

18
clients · 40 MHz

37
clients · 80 MHz

20 MHz

Wi-Fi 5 1

Wi-Fi 6 9

2.25× more simultaneous clients

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The AP becomes
the chairman.

WI-FI 5 UPLINK

Everyone contends.
Collisions happen.

WI-FI 6 UPLINK

Trigger Frame assigns
who speaks, when, and where.

Scheduled airtime replaces shouting.

OFDMA and MU-MIMO solve different problems

They can operate together

OFDMA

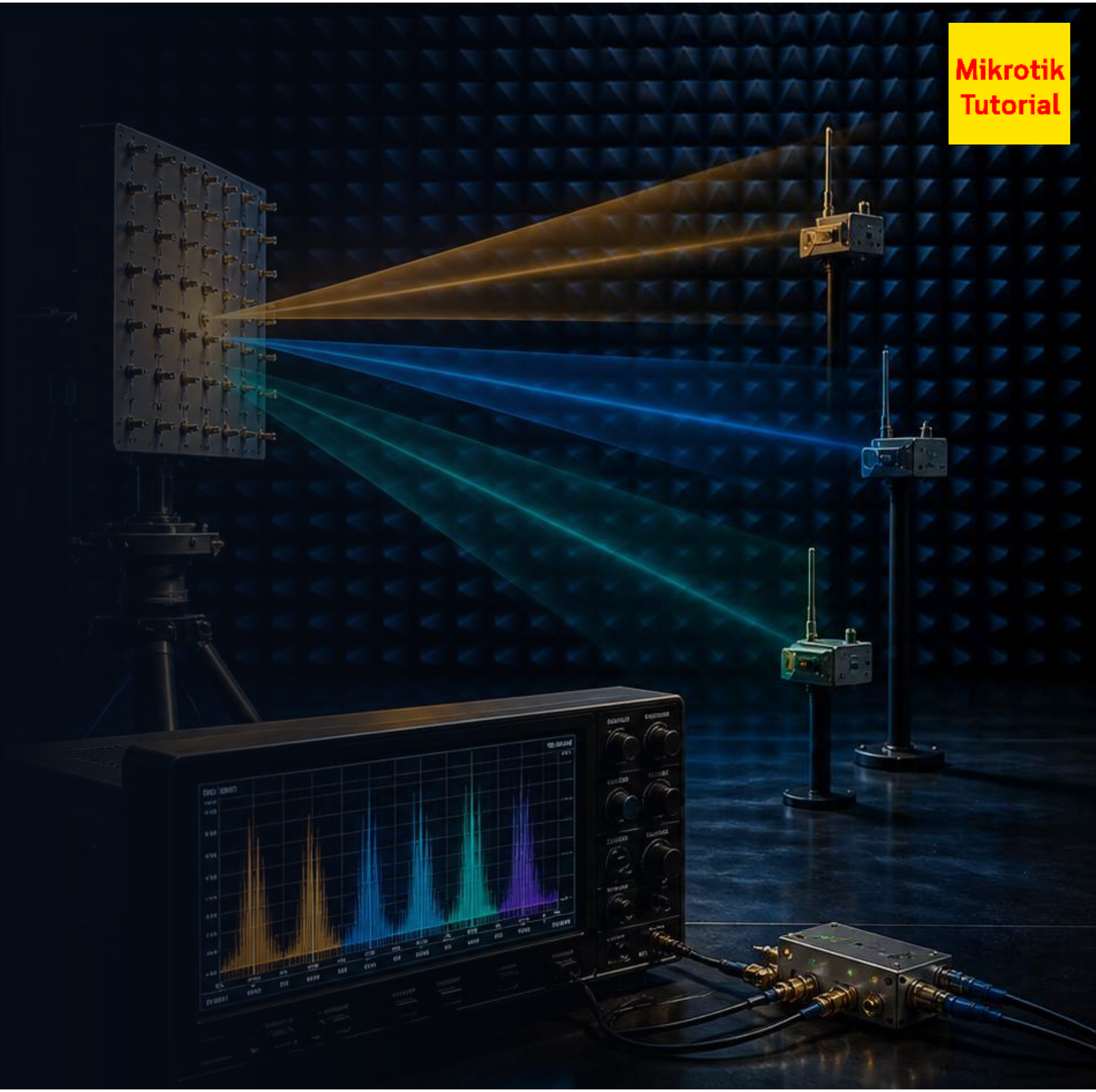
splits frequency

MU-MIMO

splits space

frequency × space

more efficient airtime



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Efficiency matters more when conditions get worse

802.11ax vs 802.11ac · MAC-level throughput · same conditions

+29%

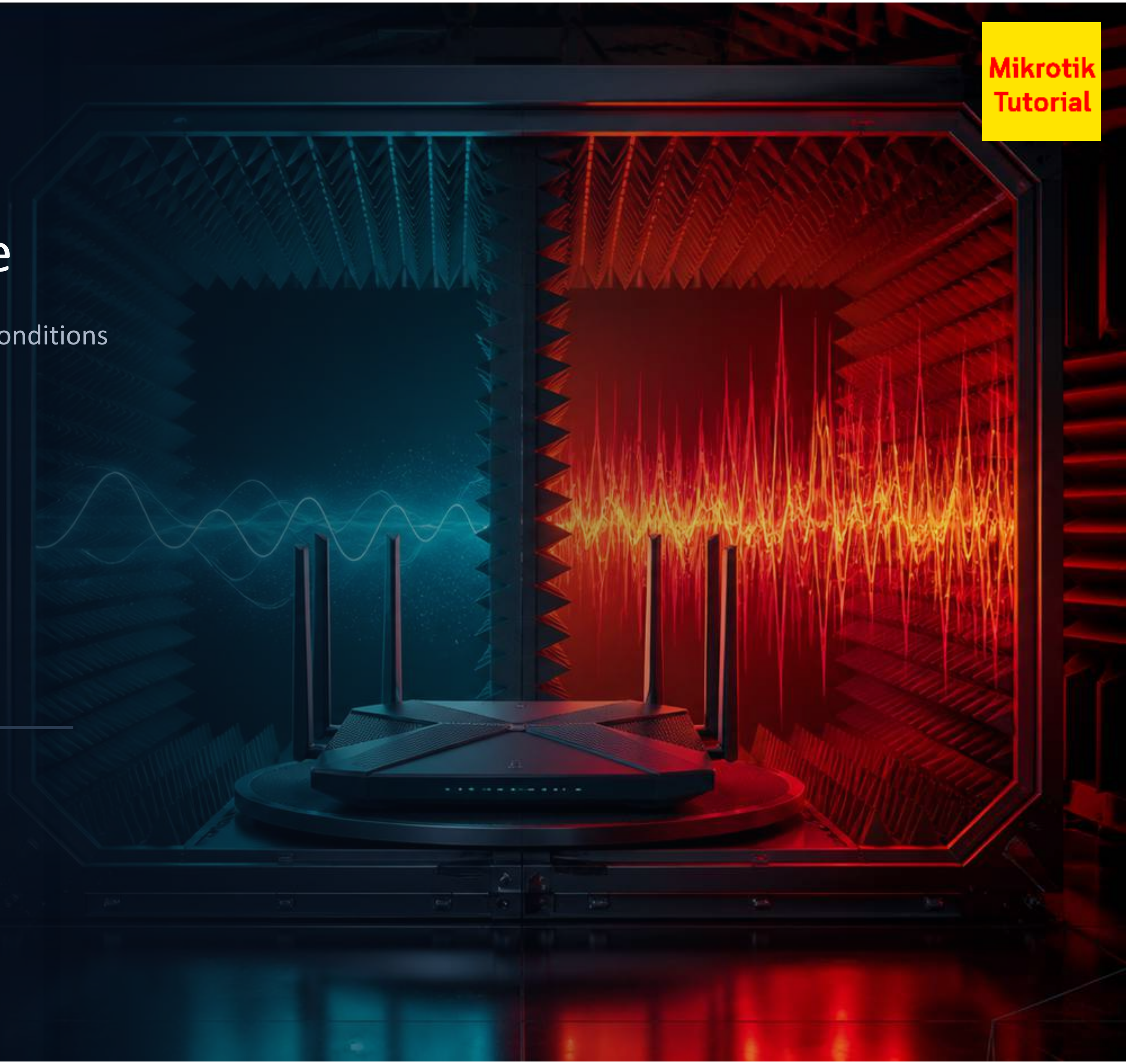
clean channel

+48%

noisy channel

More clients → bigger efficiency gap

The gain grows when airtime becomes scarce.



Better airtime control continues beyond OFDMA

BSS COLOR

Recognize neighbour traffic
and reuse space when safe.

TARGET WAKE TIME

Schedule device wake-up.
Reduce contention and battery drain.

Manage time. Reuse frequency.

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6 GHz fixes two of three traps.

- ✓ No DFS
- ✓ More channels
- × Noise-floor physics remains
- × Walls cost more signal

160 MHz is viable here — when range and density agree.

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Choose the narrowest width that meets the target

Start from environment and reuse — not the biggest number

HOME · 1 AP · 5 GHz	80 MHz
OFFICE / HOTEL · MANY APs	40 MHz
HIGH DENSITY · HALL / CLASSROOM	20–40 MHz
6 GHz · SHORT RANGE · FEW APs	160 MHz

RULE Pick the narrowest width that still meets the speed target.

Which one would you buy now?

PRODUCT A · 1733 Mbps

2 metres · one client
no radar · no neighbours

PRODUCT B · 960 Mbps

37 clients at once
6 channels · no DFS risk

The smaller number is built for the real room.

Three ideas that change Wi-Fi design

01 **A link rate is a best case**

It is not delivered throughput.

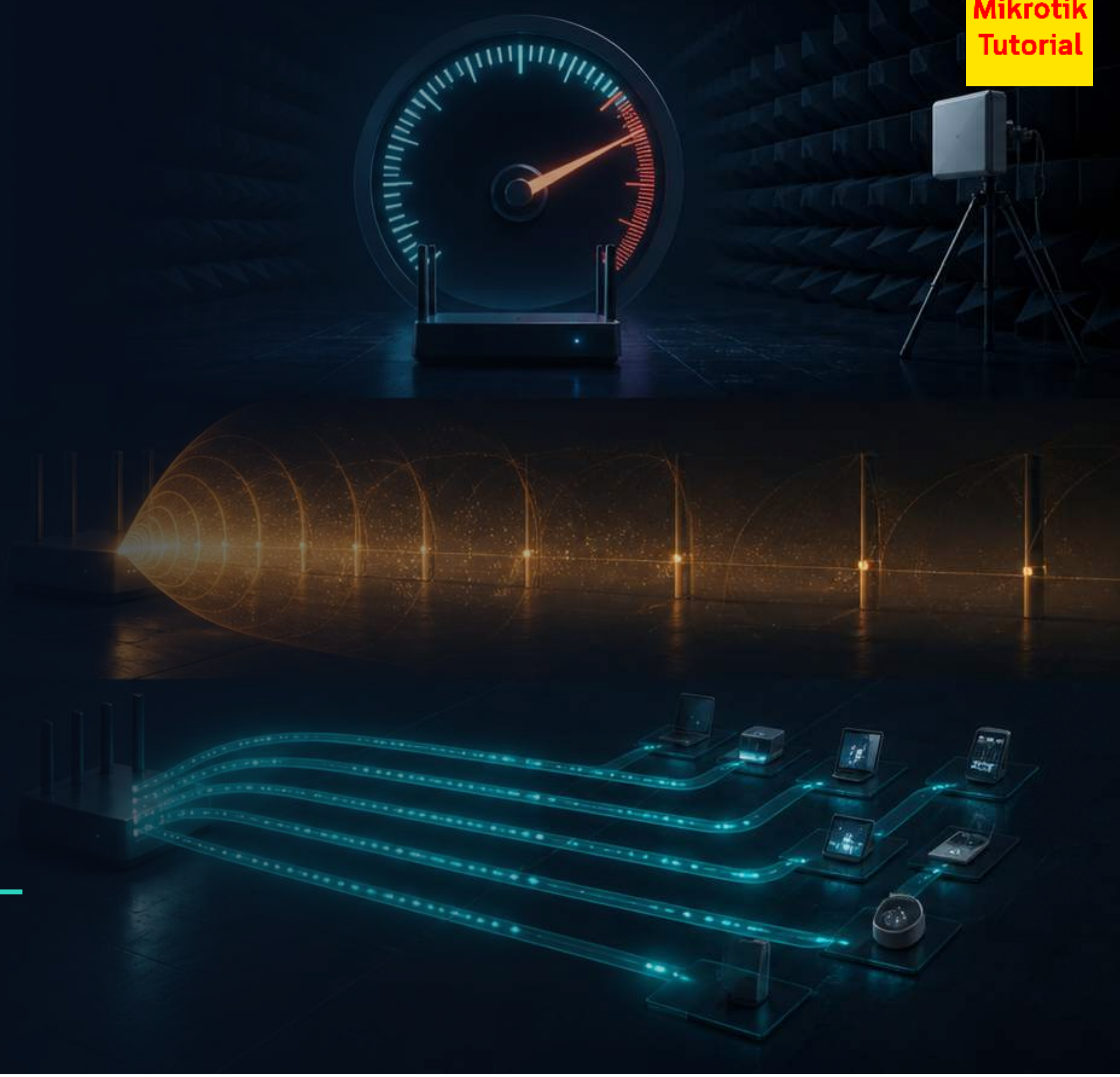
02 **Wide channels are short range**

Every doubling raises the noise floor.

03 **Wi-Fi 6 manages airtime**

Scheduling beats a bigger speed-limit sign.

Design for airtime. Size for the room.



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References

Core sources used throughout the seminar

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02 Cisco — Identify Radar Detection in DFS Channels

03 Aruba (HPE) — Aruba Wi-Fi 6 Networks Deployment Guide

04 Khorov et al. — IEEE 802.11ax HE WLANs · IEEE COMST 21(1), 2019

05 Sharon & Alpert — 802.11ax vs 802.11ac MAC Throughput · WSN 9(5), 2017

06 Cisco Meraki — Wi-Fi 7 (802.11be) Technical Guide

Questions?

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