



W I - F I D U A L - B A N D T E S T

NanoPing over Two Wi-Fi Bands

Latency of a live 7 Mbit/s video stream from a machine connected to one access point on both its 2.4 GHz and its 5 GHz radio, while other computers streamed video on each band, measured against a 100 ms budget: NanoPing over both bands at once, against each band on its own. Five comparisons.

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Each comparison is three one-minute runs back to back - 2.4 GHz only, 5 GHz only, both bands - all through NanoPing, so only the number of bands differs. Inside every dual-band run, NanoPing's own telemetry shows what each band did at the same moment.

Executive summary

Can one access point give a real-time stream diversity? A test machine was connected to the same access point twice - one Wi-Fi adapter on its 2.4 GHz radio, one on its 5 GHz radio - while two other computers watched YouTube, one on each band. It sent a live video stream at 7 Mbit/s and 30 frames per second for 60 seconds, three times in a row: over 2.4 GHz only, over 5 GHz only, and over both at once. All three went through NanoPing; only the number of bands differed. The receiving application has a 100 ms budget. The comparison was run five times.

With both bands, all 219,900 video packets arrived within the budget in every comparison; the slowest took 56 ms. Each band alone broke the budget - 2.4 GHz in 3 of 5 runs and 5 GHz in 2 of 5 runs - and made frames late: 10 over 2.4 GHz and 29 over 5 GHz. Neither was the safe choice: each failed in runs where the other did not.

The bands did not stop stalling when NanoPing used both: during the dual-band runs a band went over budget 8 times, for up to 254 ms. But never both at once (in no 100 ms window), and each time NanoPing moved the video to the other band within tens of milliseconds. The price is a little typical latency: the video moves at the pace of the slower band, so half the packets took 2.7 ms against 2.4 ms over 5 GHz alone.

FIVE COMPARISONS, 5 MIN EACH	● NANOPING (BOTH BANDS)	■ 2.4 GHZ ONLY	◆ 5 GHZ ONLY
Runs over the 100 ms budget, of 5	✓ 0	3	2
Times over the budget	✓ 0	4	8
Time over the budget	✓ 0.0 s	0.6 s	1.9 s
Frames late, of 9,000	✓ 0	10	29
999 of 1,000 packets within	✓ 39 ms	98 ms	176 ms
Slowest packet	✓ 56 ms	198 ms	374 ms

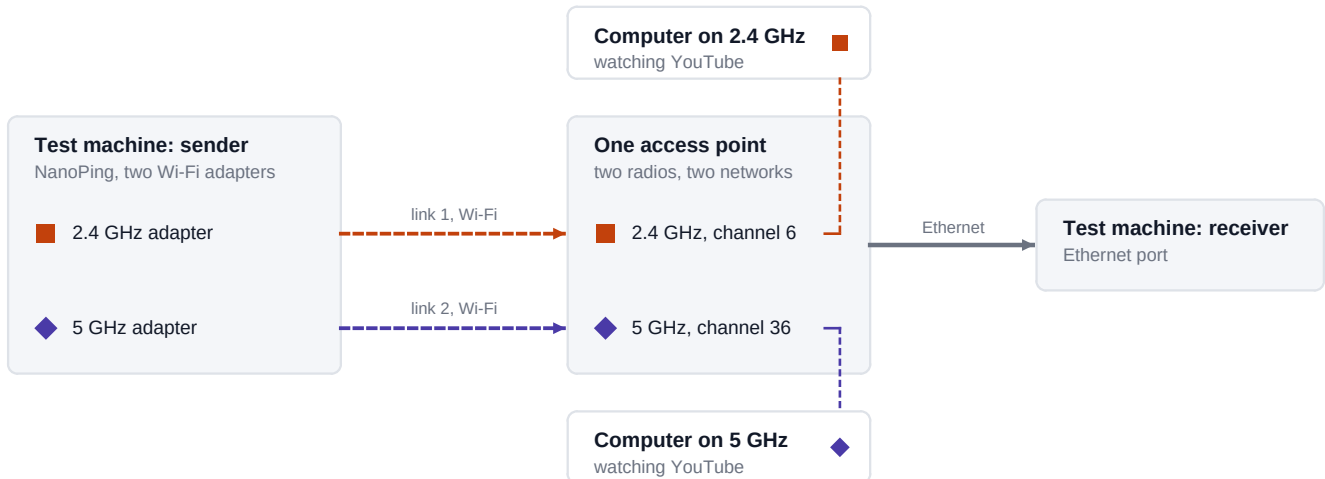
All five comparisons together; a check marks the best. Every figure is the application's view: the one-way latency of every video packet from the receiving program's record, sender and receiver on one clock. A 100 ms window is over budget if a packet sent in it arrived after 100 ms; windows less than 0.5 s apart count as one time. A frame is late if any of its packets is. No packet was lost in any run.

TEST SETUP

How the test was run

One test machine was both ends of the stream. It sent the video over Wi-Fi to the access point and received it back over Ethernet, through the access point's network. Two other computers on the same access point watched YouTube throughout, one on each band.

HOW EVERY PACKET TRAVELS



Sender and receiver are one machine, so every packet's one-way latency is read on one clock.

THE STREAM

- 30 frames per second at 7 Mbit/s: each second one 113,750-byte I-frame and 29 P-frames of 26,250 bytes, 43,980 UDP packets per run. Every packet carries its send time, so each packet's one-way latency is exact.

THE BANDS

- One access point, two radios, each its own network: 2.4 GHz on channel 6 and 5 GHz on channel 36. The machine joined both, one USB Wi-Fi adapter for each.
- As each comparison began: 2.4 GHz -66 to -64 dBm, uplink rate 52-117 Mbit/s and 5 GHz -71 to -67 dBm, uplink rate 176-234 Mbit/s.
- The YouTube traffic on each band is from the test notes; it was not recorded, so how hard it loaded each band, and when, is not known.

THE RUNS

- Each comparison is three 60-second runs, back to back about 90 s apart and always in the same order: 2.4 GHz only, 5 GHz only, both bands. Five comparisons, 6-8 minutes apart, from 20:10 to 20:41 UTC on 8 October 2026.
- All three runs go through NanoPing (plumr 46.0.0) with a 100 ms timeout and no jitter buffer: one link for a single band, two for both. Only the number of bands differs.

WHAT IS MEASURED

- ✓ The 100 ms budget: a packet is usable if it arrives within 100 ms of being sent. A frame is late if any of its packets is.
- ✓ Inside the dual-band runs: every packet NanoPing sent over a band - video, repair and probe packets - shows what that band did at that moment, side by side with the other band.

RESULTS

Five comparisons against the 100 ms budget

Each band alone broke the budget in some runs and not in others, and the two failed in different runs: there was no safe band to pick in advance. With both bands, no run came near the budget.

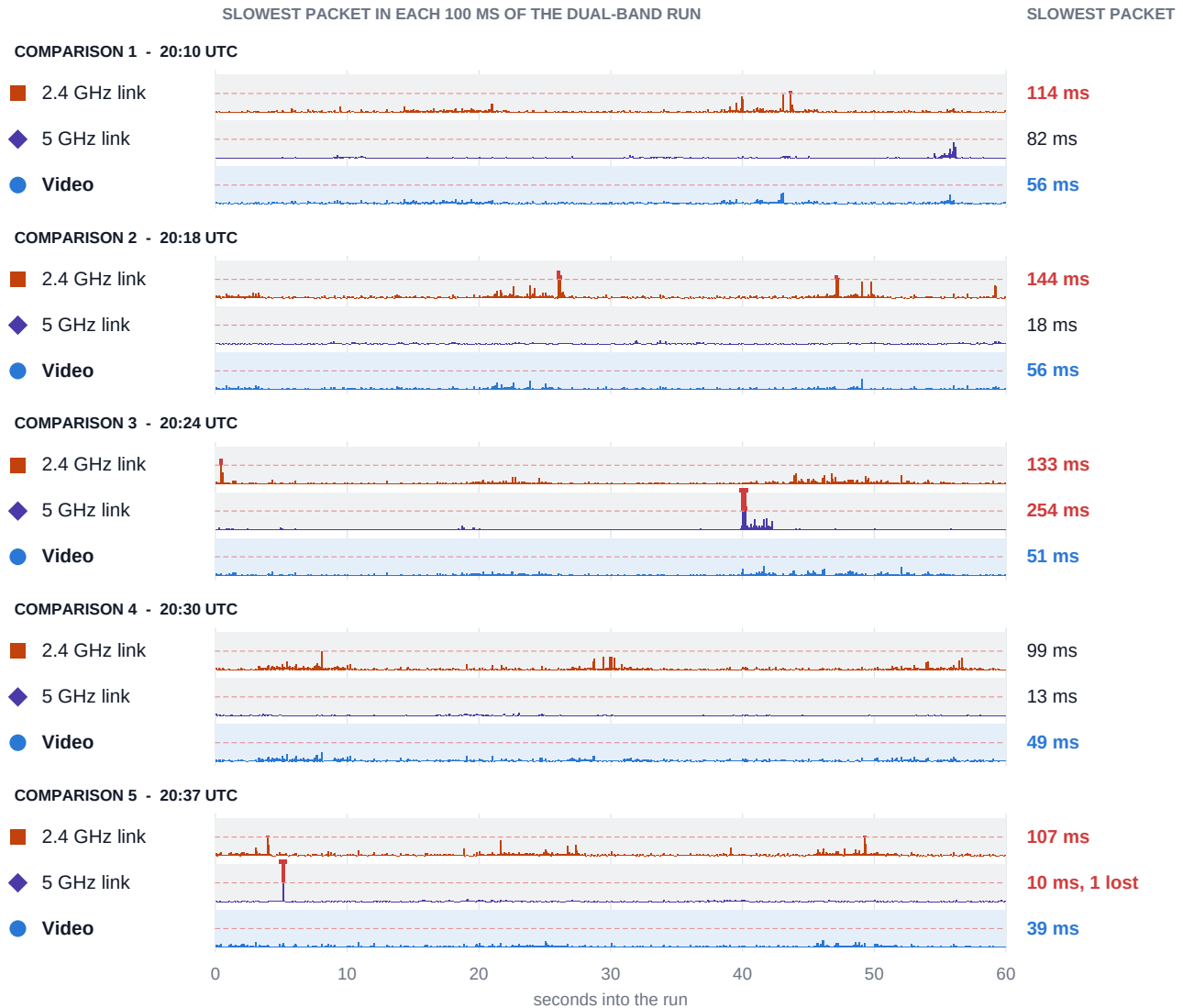


Each strip is one 60-second run, in the order they ran. A bar is the slowest video packet sent in each 100 ms, end to end; red past the dashed 100 ms budget line, capped at the top past 200 ms. Right: the run's slowest packet and the frames it made late.

RESULTS

Inside the dual-band runs: the bands still stalled

The disturbances did not stop while NanoPing ran: each band went over budget during the dual-band runs too. They never hit both bands at once, and the video went over whichever band was good.



Each band: the link transit of every packet NanoPing sent over it - video, repair and probe packets. Video: the application's latency, as on the previous page. Both bands were over budget in the same 100 ms window in none of the 3,000 windows.

EVERY TIME A BAND WAS OVER BUDGET DURING A DUAL-BAND RUN

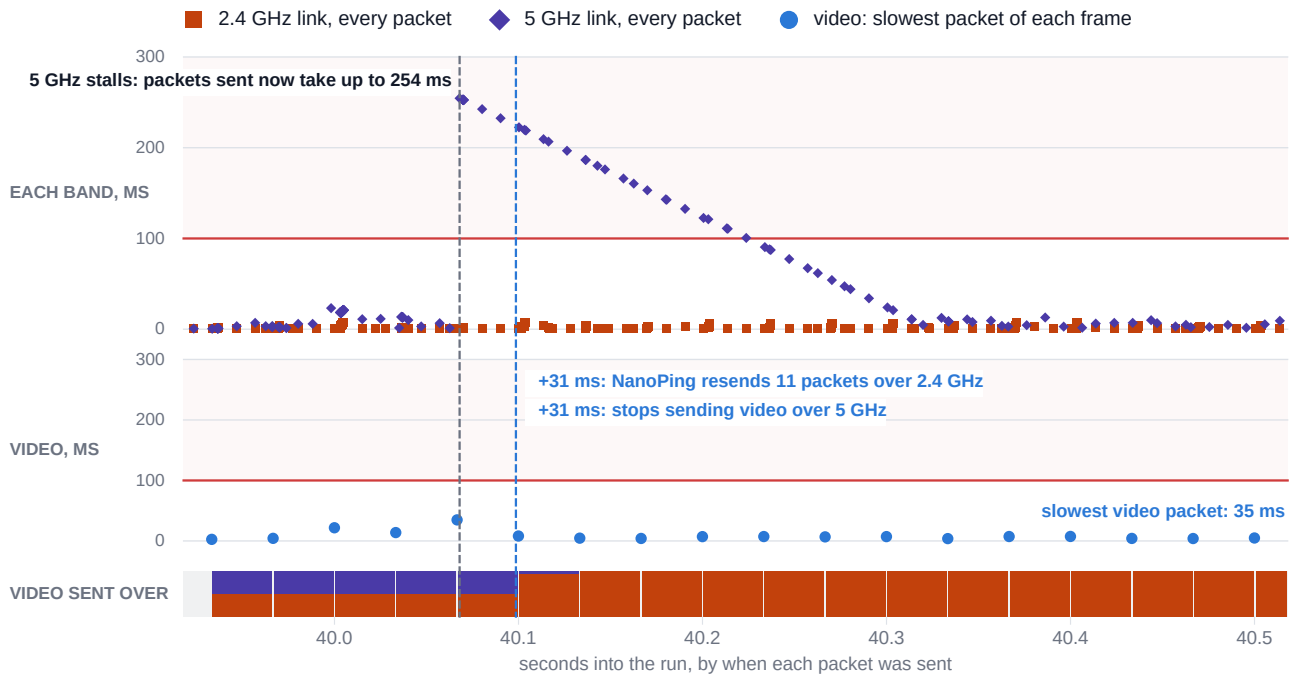
	BAND	AT	BAND'S SLOWEST	VIDEO'S SLOWEST
Comparison 1	2.4 GHz	43.6 s	114 ms	4 ms
Comparison 2	2.4 GHz	26.0 s	144 ms	11 ms
Comparison 2	2.4 GHz	47.1 s	123 ms	5 ms
Comparison 3	2.4 GHz	0.4 s	133 ms	15 ms
Comparison 3	5 GHz	40.0 s	254 ms	35 ms
Comparison 5	2.4 GHz	3.9 s	107 ms	14 ms
Comparison 5	5 GHz	5.1 s	a packet lost	22 ms
Comparison 5	2.4 GHz	49.2 s	107 ms	24 ms

RESULTS

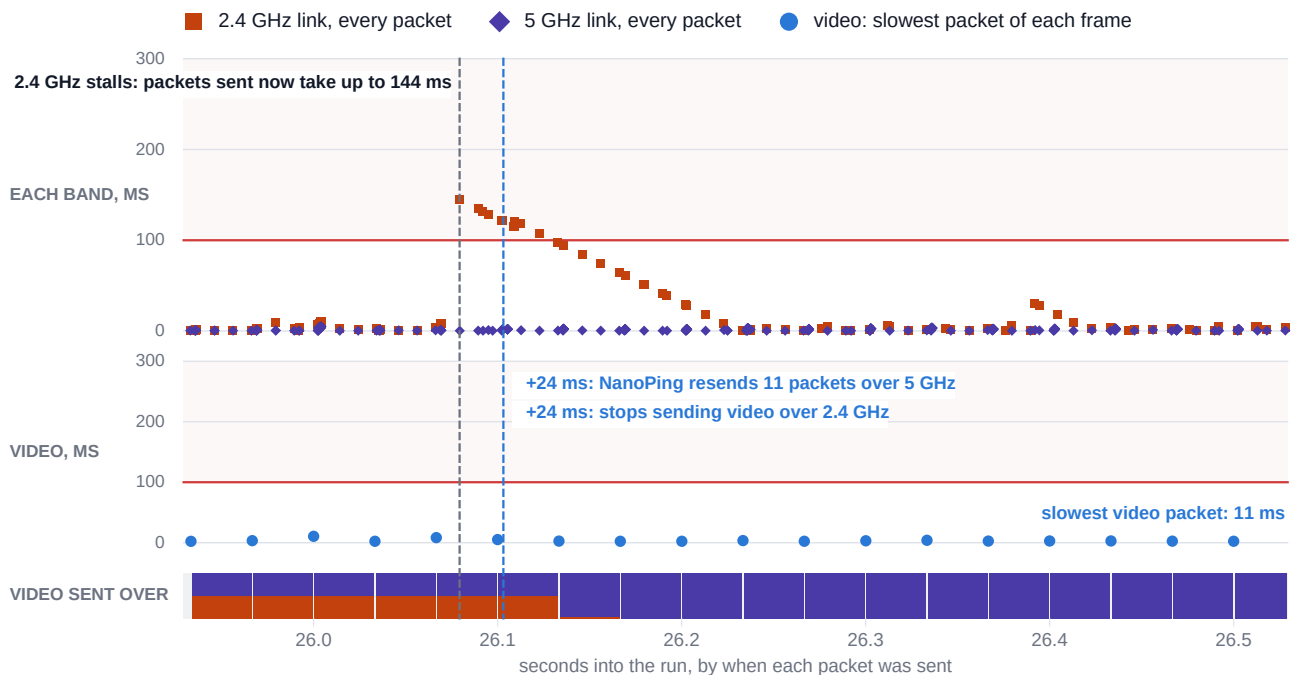
A stall up close

What NanoPing did when a band stalled, packet by packet: within tens of milliseconds it resent what was stuck over the other band and stopped sending new video into the stalled one. Below, the worst stall of each band.

Comparison 3, both bands: 5 GHz stalls at 40.07 s



Comparison 2, both bands: 2.4 GHz stalls at 26.08 s

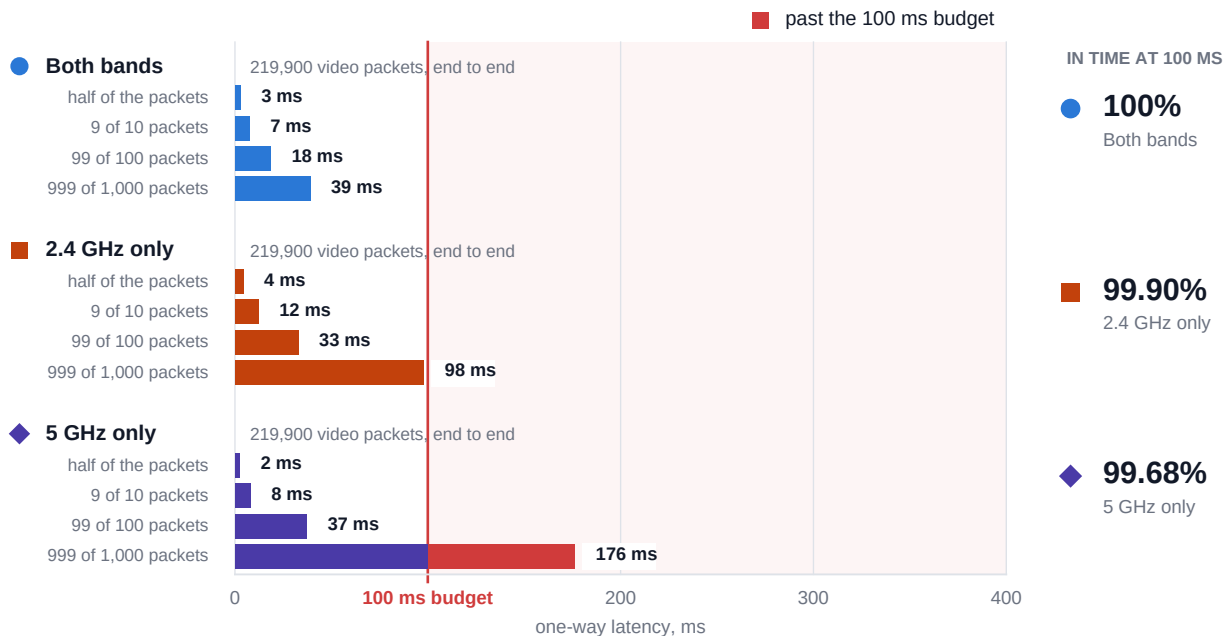


Top panel of each: the link transit of every packet NanoPing sent over each band, by when it was sent. Middle: the slowest video packet of each frame, application to application. Bottom: for each frame, the share of its packets NanoPing sent over each band.

RESULTS

What it costs: a little typical latency

With both bands the video's tail is far shorter, but its middle is a little slower than over 5 GHz alone: the video moves at the pace of the slower band.



All five comparisons together. Each bar runs from 0 to the latency within which that share of video packets had arrived, application to application; red where it crosses the budget.

COMPARISON BY COMPARISON

	2.4 GHZ ONLY	5 GHZ ONLY	BOTH BANDS
Comparison 1	4.3 / 40 / 165	2.1 / 16 / 52	2.5 / 17 / 56
Comparison 2	4.0 / 23 / 79	2.2 / 14 / 173	2.5 / 15 / 56
Comparison 3	4.0 / 36 / 158	2.2 / 8 / 16	2.7 / 20 / 51
Comparison 4	4.1 / 36 / 198	2.1 / 8 / 12	3.2 / 22 / 49
Comparison 5	5.4 / 33 / 81	6.4 / 126 / 374	2.5 / 18 / 39

Milliseconds within which half and 99 of 100 video packets arrived, and the slowest; red where the slowest broke the budget.

WHY THE MIDDLE IS SLOWER

- NanoPing hands the stream on in order, so a packet that crossed 5 GHz waits for the one before it on 2.4 GHz. In the dual-band runs, half the video packets sent over 2.4 GHz arrived within 2.8 ms and half of those over 5 GHz within 2.7 ms - the same - although 5 GHz itself was the faster band (0.9 ms median transit against 2.0 ms).
- NanoPing sent 47% of the video over 2.4 GHz, so the slower band set the pace.
- On the three runs where 5 GHz alone stayed in budget, 99 of 100 packets arrived within 8-16 ms over 5 GHz alone and 17-22 ms over both bands - well inside the budget either way. The tail is where live video breaks, and there both bands win: 999 of 1,000 within 39 ms, against 98 ms over 2.4 GHz alone and 176 ms over 5 GHz alone.

Conclusion

Yes: the two bands of one access point gave real diversity, and it was enough to keep a live 7 Mbit/s video inside a 100 ms budget. In five comparisons, with other computers streaming video on both bands, NanoPing over both bands never broke the budget; the slowest of its 219,900 packets took 56 ms. Each band alone did break it - 2.4 GHz in 3 of 5 runs and 5 GHz in 2 of 5 runs - in different runs, and the worst made 26 frames late in a minute.

The stalls did not go away when both bands were in use. Each band stalled during the dual-band runs, for up to 254 ms, but never both at once, and NanoPing moved the video to the other band within tens of milliseconds each time. That is the diversity gain: not better bands, but bands that fail at different moments, and a stream that uses whichever is good.

It costs a little typical latency - half the packets in 2.7 ms against 2.4 ms over 5 GHz alone - because the video moves at the pace of the slower band. For a real-time stream, the tail matters more than the median: 999 of 1,000 packets within 39 ms over both bands, against 98 ms over 2.4 GHz and 176 ms over 5 GHz.

WHAT THIS TEST DOES NOT SHOW

- The runs were back to back, not simultaneous, and always in the same order, and the background load came and went between them. This is why the dual-band runs' own telemetry matters: each band stalled during them too, and the video did not notice.
- The YouTube traffic was not recorded. How hard it loaded each band, and when, is not known.
- Both bands share one access point - its processor, its wired uplink, its power. A failure of the access point itself would take both bands down at once; none happened here. Bands of separate access points would not share it.
- Five minutes per mode, from one machine standing still in one place.