

Why 802.11k/r/v Testing?

Multi-AP and dual-band-AP installations are ubiquitous in commercial and consumer networks today. High-availability and high-bandwidth client applications demand seamless AP and band roaming performance. Verify your product meets customer expectations with KRAVE-2 before you ship.

Convenient 802.11k/r/v Testing

The KRAVE-2 testbed provides quick and repeatable STA or AP black box testing in a benchtop form factor.

OEMs can easily validate production releases without obtrusive test instrumentation or debug code stubs. Network operators can quickly perform conformance testing on products and product updates before rollout to the customer.

Flexible DUT Options

PCIe, miniPCIe, M.2, and external standalone hardware DUT formats are supported, using either cabled or air RF interfaces.

Comprehensive Test Coverage

AP and STA 802.11k/r/v protocol validation
 AP and STA 802.11k Radio Measurements
 AP and STA 802.11r Fast Transition (FT), both over-the-air and over-the-DS
 AP and STA 802.11v BSS Transition Management (BTM) stress testing

KRAVE Testing-as-a-Service (TaaS)

Leverage dB Performance's extensive expertise to provide full turnkey Testing-as-a-Service to a standard test plan, or a custom test plan. dB Performance has been a leader in CCKM and 802.11k/r/v testing since 2011.

The screenshot displays the Krave2 Log web interface in a Mozilla Firefox browser. The interface shows test statistics and execution logs. A terminal window is overlaid on the bottom right, showing the output of a self-test script.

Test Statistics

Total Statistics	Total	Pass	Fail	Elapsed	Pass / Fail
Critical Tests	1	1	0	00:00:00	1 / 0
All Tests	1	1	0	00:00:00	1 / 0

Test Execution Log

```

Suite: Krave2
Full Name: Krave2
Source: /home/dbperformance/Downloads/krave2
Start / End / Elapsed: 20200101 21:43:09.337 / 20200101 21:43:09.430 / 00:00:00.093
Status: 1 critical test, 1 passed, 0 failed
1 test total, 1 passed, 0 failed

Suite: Robot Framework
Full Name: Krave2.Robot Framework
Source: /home/dbperformance/Downloads/krave2/robot_framework
Start / End / Elapsed: 20200101 21:43:09.352 / 20200101 21:43:09.429 / 00:00:00.077
Status: 1 critical test, 1 passed, 0 failed
1 test total, 1 passed, 0 failed

Suite: FastTransition
Full Name: Krave2.Robot Framework.FastTransition
Source: /home/dbperformance/Downloads/krave2/robot_framework/FastTransition
Start / End / Elapsed: 20200101 21:43:09.422 / 20200101 21:43:09.428 / 00:00:00.006
Status: 1 critical test, 1 passed, 0 failed
1 test total, 1 passed, 0 failed

Capabilities
  
```

Terminal Output:

```

calculating roam time...
Last data packet ack from original AP:
Packet Number: 12862
Timestamp: 1577988183.838323211 seconds
Reassociation Request to new AP:
Packet Number: 12894
Timestamp: 1577988183.983849100 seconds
Reassociation Response from new AP:
Packet Number: 12896
Timestamp: 1577988183.986489448 seconds
First data packet ack from new AP:
Packet Number: 12899
Timestamp: 1577988183.997229689 seconds

Roam time (Data to Data): 159 milliseconds
Roam time (Reassoc Request to Data): 13 milliseconds

Test results saved in results/ft_self_test_5_20200102_11-03-22.pcapng
Self Test 1.0 complete
  
```

Simultaneous Channel Monitoring

The KRAVE-2 testbed can monitor up to three channels at the same time. The tester will always get the full picture when the STA roams to another channel on the same band, or to another band.

Captive Client Support

dB Performance simplifies real-life client loading with integrated Wi-Fi captive clients. These captive clients can associate to the same SSID as the STA to generate non-DUT traffic, and include independent RF attenuation settings to simulate numerous loading scenarios.

Automated Wireshark Analysis

Eliminate the tedious effort of scrolling through packet capture files to determine proper operation and roam timing, especially for long-duration tests.

Suitable for Mesh Networks

The KRAVE-2 testbed supports up to three dual-band APs, and supports a variety of roaming scenarios.

Full 802.1X Support

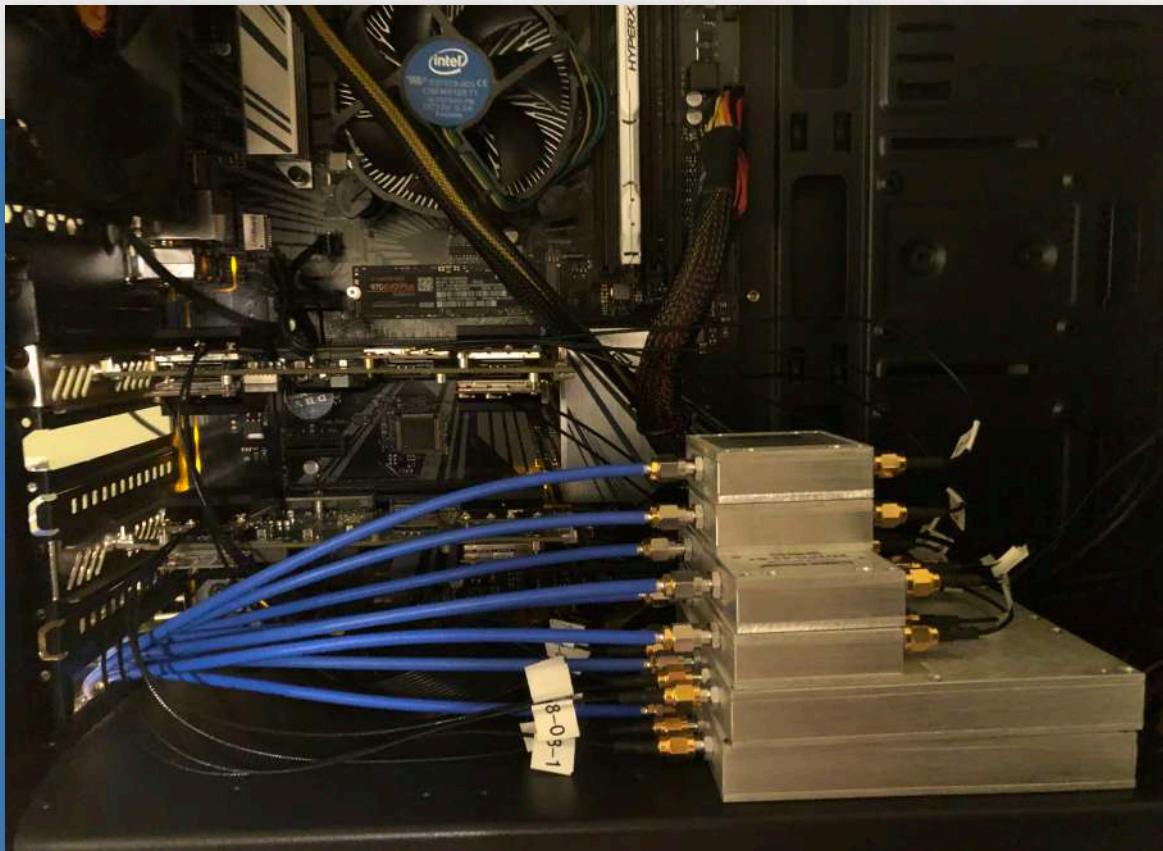
An integrated RADIUS server allows testing the same security configuration a commercial customer would use.

Advanced Features

Simultaneous IPv4 and IPv6 testing, along with 2x2 MIMO support with per-chain attenuation for impairment testing, allows testing for mixed-mode scenarios.

Future-proof

Radios can be upgraded as Wi-Fi technology evolves.



KRAVE Testing Specifications

PROTOCOL

- 802.11n/ac/ax 2x2 MIMO
- 802.11a/b/g legacy mode support
- WPA2-PSK with AES encryption
- WPA2-Enterprise with AES encryption
- 802.11k:
 - Beacon Report – Active
 - Beacon Report - Passive
 - Beacon Report – Beacon Table
 - Link Measurement Report
 - Neighbor Report
 - Transmit/Stream Measurement
- 802.11r:
 - FT-over-air mode
 - FT-over-DS mode
- 802.11v:
 - BSS Transition Management
- IPv4 and IPv6 traffic generation

DEVICE UNDER TEST (DUT)

- STA or AP mode
- Cabled or air RF interface
- Dual-band STA DUT support
- Up to 3 dual-band AP DUTs
- PCIe, miniPCIe, M.2, or external standalone hardware form factor

REFERENCE STA and AP

- Internal 2.4/5 GHz reference STA included
- Programmable reference APs (2.4 GHz only)
- Optional External APs

MONITORING

- Up to 3 simultaneous packet capture channels across 2.4 and 5 GHz bands

TRAFFIC GENERATION

- Up to 3 captive STAs available to generate traffic to a designated AP
- Industry-standard iperf profiles

ATTENUATORS

- Per-chain attenuation of each captive STA
- Per-chain attenuation of each AP
- Typical 25 dB end-to-end cabled loss (2 APs)
- Typical 30 dB end-to-end cabled loss (3 APs)

PLATFORM CONFIGURATIONS

- Linux 5.6+, desktop tower PC form factor

Standard Configuration:

- Support for 2 dual-band APs
- 2 x 2.4/5 GHz packet capture
- 2 x 2.4/5 GHz captive clients
- 1 x 2.4/5 GHz reference STA

Extended Configuration:

- Support for 3 dual-band APs
- 3 or 2 x 2.4/5 GHz packet capture
- 2 or 3 x 2.4/5 GHz captive clients

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