Cambium Networks™

HTSnet Increases Performance by 17% Through Dynamic Channel Selection Capabilities

"DCS is a great feature, and we can see significant throughput improvement when this is enabled, especially under high-interference conditions."

HARJANTO PRIBADI,
CTO,
HTSNET

HAWK TEKNOLOGI SOLUSI

PTP 550 Connectorized (above); PTP 550 Integrated (below)

PTP 550 is a Point-to-Point Gigabit throughput solution that operates in the 5 GHz wireless space, addressing the need for high-speed backhaul solutions.

Overview

EVERYONE NEEDS RELIABLE INTERNET SOLUTIONS. That's why PT Hawk Teknologi Solusi (HTSnet), based in Indonesia, decided to test between two scenarios with Cambium Networks' PTP 550 firmware. The test allowed HTSnet to see which situation provided the most reliable internet solutions to the businesses, small offices, home offices, hotels, apartments and residential areas they serve. HTSnet decided to test PTP 550 under two scenarios. The result: dynamic channel selection (DCS) leads to better performance in high-interference conditions.

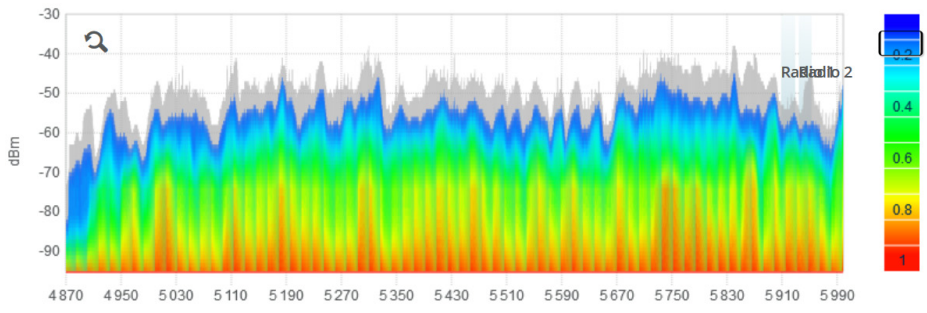
The Challenge

HTSNET, A PROMINENT INTERNET SERVICE PROVIDER (ISP) in Indonesia, has catered to thousands of customers since 2010. HTSnet, an active member of the Internet Provider Association, operates under four branches to provide information and technology services throughout the country. HTSnet needed a reliable fixed wireless backhaul solution, so they decided to test the latest PTP 550 firmware and its DCS capabilities.

The Solution

HTSNET TESTED THE LATEST PTP 550 FIRMWARE which included DCS features. With DCS enabled, the radio automatically switches to the cleanest available channel whenever the current frequency channel is affected by interference.

HTSnet tested between two setups: one scenario with two PTP 550 radios running on Firmware 4.4 (no DCS enabled) and a second scenario with two PTP 550 radios running on Firmware 4.5 (DCS enabled). In both scenarios, the radios were configured to run on two x 20 MHz channels, the test link used was less than 500 meters, channel bonding was enabled, there was a high level of interference, and live traffic was sent over the link for at least 24 hours in each scenario.



In both scenarios, there were high levels of RF interference. With DCS, the radios were able to reach higher modulation and coding scheme (MCS) values.

BEST PRACTICES WHEN SETTING DCS

- Interference Threshold: This is the minimum interference different in dBm between the current channel and a candidate channel, which is necessary for the channel switch. For volatile RF conditions, keep this metric high to avoid ping-pong effect.
- Hopping Margin: This is the minimum interval after which a channel switch can occur. For stable RF conditions, use high hopping margins. For high interference conditions, use lower hopping margins.
- Throughput Drop Threshold: When throughput degradation occurs, this will trigger channel switching. For aggressive networks, use lower throughput thresholds. For reliability, use higher throughput thresholds.

Sagar Deshpande, Associate Product Manager, Cambium Networks

Table 1: Source End Radio Performance

MCS Rate	Weighted Capacity per MCS	Scenario 2 (With DCS) % of Radio 1 spent	Scenario 2 (With DCS) % of Radio 2 spent	Scenario 1 (Without DCS) % of Radio 1 spent	Scenario 1 (Without DCS) % of Radio 2 spent
DS MCS 9 - 256-QAM 5/6	400	4.10%	4.10%	0%	0.90%
DS MCS 8 - 256-QAM 3/4	360	7%	17.50%	0%	0.90%
DS MCS 7 - 64-QAM 5/6	300	19%	14.60%	0%	1.20%
DS MCS 6 - 64-QAM 3/4	270	15.90%	9.70%	0%	4.50%
DS MCS 5 - 64-QAM 2/3	240	19.10%	25.90%	85.10%	7.10%
DS MCS 4 - 16-QAM 3/4	180	6.10%	5.60%	13.80%	2.50%
DS MCS 3 - 16-QAM 1/2	120	0.30%	0.20%	0.30%	0%
DS MCS 2 - QPSK 3/4	90	0%	0%	0%	0%
DS MCS 1 - QPSK 1/2	60	0%	0%	0%	0%
SS MCS 9 - 256-QAM 5/6	200	9.70%	5.40%	0%	5.70%
SS MCS 8 - 256-QAM 3/4	180	17.70%	15.50%	0%	70.20%
SS MCS 7 - 64-QAM 5/6	150	0.40%	0.20%	0%	6.20%
SS MCS 6 - 64-QAM 3/4	135	0.30%	0.40%	0%	0.60%
SS MCS 5 - 64-QAM 2/3	120	0.30%	0.70%	0.70%	0.10%
SS MCS 4 - 16-QAM 3/4	90	0.10%	0.10%	0%	0%
SS MCS 3 - 16-QAM 1/2	60	0%	0%	0%	0%
SS MCS 2 - QPSK 3/4	45	0%	0%	0%	0%
SS MCS 1 - QPSK 1/2	30	0%	0%	0%	0%
Total		251.425	262.34	230.28	192.12

In Scenario 2 (with DCS), the Source End radio had a weighted average capacity of 513.7. In Scenario 1 (without DCS), the Source End radio had a weighted average capacity of 422.4. This is an overall improvement of 17.7%.

MCS Rate	Weighted Capacity per MCS	Scenario 2 (With DCS) % of Radio 1 spent	Scenario 2 (With DCS) % of Radio 2 spent	Scenario 1 (Without DCS) % of Radio 1 spent	Scenario 1 (Without DCS) % of Radio 2 spent
DS MCS 9 - 256-QAM 5/6	400	1.70%	2.40%	0%	0%
DS MCS 8 - 256-QAM 3/4	360	5.30%	16.50%	0%	0%
DS MCS 7 - 64-QAM 5/6	300	19.10%	15.0%	0%	0.40%
DS MCS 6 - 64-QAM 3/4	270	15.30%	9.10%	0%	2.90%
DS MCS 5 - 64-QAM 2/3	240	19.0%	26.30%	85.60%	5.20%
DS MCS 4 - 16-QAM 3/4	180	6.80%	6%	13.30%	2.40%
DS MCS 3 - 16-QAM 1/2	120	0.30%	0.20%	0.30%	0%
DS MCS 2 - QPSK 3/4	90	0%	0%	0%	0%
DS MCS 1 - QPSK 1/2	60	0%	0%	0%	0%
SS MCS 9 - 256-QAM 5/6	200	10.60%	5.60%	0%	5.10%
SS MCS 8 - 256-QAM 3/4	180	20.80%	17.40%	0%	76.30%
SS MCS 7 - 64-QAM 5/6	150	0.40%	0.20%	0%	6.80%
SS MCS 6 - 64-QAM 3/4	135	0.30%	0.50%	0%	0.60%
SS MCS 5 - 64-QAM 2/3	120	0.30%	0.70%	0.70%	0.20%
SS MCS 4 - 16-QAM 3/4	90	0.10%	0.10%	0%	0%
SS MCS 3 - 16-QAM 1/2	60	0%	0%	0%	0%
SS MCS 2 - QPSK 3/4	45	0%	0%	0%	0%
SS MCS 1 - QPSK 1/2	30	0%	0%	0%	0%
Total		242.79	257.16	230.58	184.62

In Scenario 2 (with DCS), the Destination End radio had a weighted average capacity of 499.9. In Scenario 1 (without DCS), the Destination End radio had a weighted average capacity of 415.2. This is an overall improvement of 16.9%.

WHY USE WEIGHTED AVERAGE?

Capacity can change over the course of one day. Weighted average is used because over 24 hours of live traffic data, one throughput test does not accurately represent the link's capacity. The method used to calculate the weighted average is to multiply the MCS level percentage by the weighted capacity per MCS level.

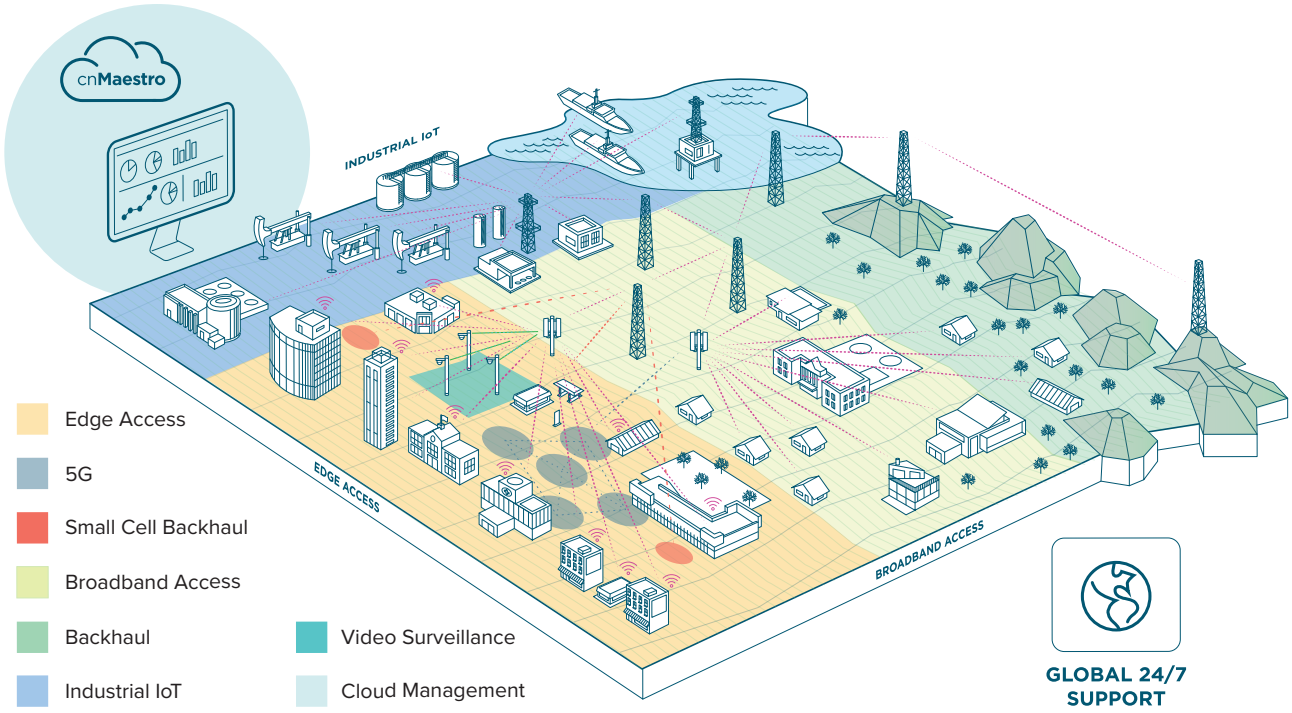
These two tables show the performance of the Source End radio and the Destination End radio. In each table, there is one scenario without DCS enabled and a second scenario in which DCS is enabled.

The Results

HTSNET FOUND THAT WITH DCS ENABLED, the radios are highly efficient at channel optimization. In Scenario 1, live traffic data ran for 25 hours, over 800 Gigabytes of data was sent across the radio, and the weighted average capacity of the link was 837.6. In Scenario 2, live traffic data ran for 37 hours, over 1.28 Terabytes of data was sent across the radio, and the weighted average capacity was 1013.7. This translates to a 17% improved performance with DCS enabled. In both scenarios, there was a high level of interference.

Other significant results include:

- The dropped packet rate remained the same in both scenarios, below 0.5%
- MCS 9 reached with DCS enabled, whereas previously only MCS 5 was reached



Cambium Networks' Gigabit wireless solutions enable municipal, enterprise and service provider operators to tailor connectivity to meet exact requirements and grow as needs evolve.