Project CAR-Benguet, Link Sto Tomas to Mt Pulag
LINKPlanner Installation Report

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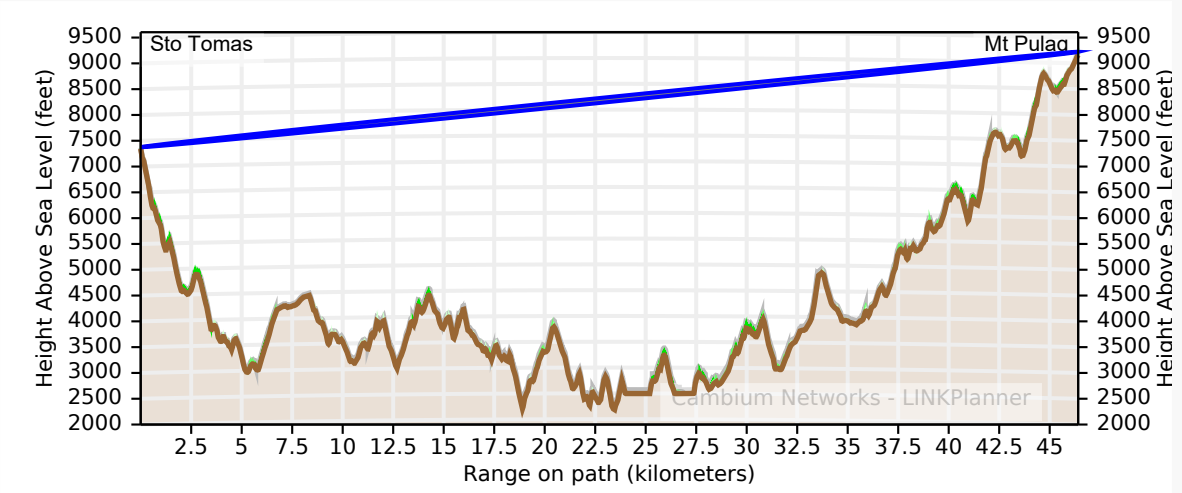
Summary	
Link Name	Sto Tomas to Mt Pulag
Customer Company Name	DICT CAR
Profile Type	Line-of-Sight
Equipment Type	PTP670
Fresnel Zone Clearance	16.4 feet
Link Distance	46.409 kilometers
Free Space Path Loss	141.03 dB
Excess Path Loss	0.00 dB
User IP Throughput Expectation Aggregate	Aggregate 214.27 Mbps assuming PTP-670 Series running the 670-03-60 software
RF Frequency Band	5.8 GHz (5725 to 5850 MHz)
RF Channel Bandwidth	45 MHz

Path Profile



Link Configuration	
Precise Network Timing	Disabled
Bandwidth	45 MHz
E1/T1	None
Optimization	IP
Sync	Disabled
Symmetry	Adaptive
Dual Payload	Enabled
Highest Mod Mode	256QAM 0.81
Lowest Ethernet Mode	BPSK 0.63 Sngl
Master	Sto Tomas
Slave	Mt Pulag

Bill of Materials

Part Number	Qty	Description
01010419001	4	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable
AR-E4PT6XX-WW	2	PTP 670 All Risks Advance Replacement, 4 additional years (per END)
C000065L007	2	LPU and Grounding Kit (1 kit per ODU)
C050067H010	2	PTP 670 Integrated 23dBi END with AC+DC Enhanced Supply (ROW - U.S. Line Cord). Kit includes ODU, power supply, mounting bracket and US line cord
WB3176	1	328 ft (100 m) Reel Outdoor Copper Clad CAT5E (Recommended for PTP)

Physical Installation Notes for Sto Tomas	
Link Name	Sto Tomas to Mt Pulag
Latitude	16.33479N
Longitude	120.56149E

Physical Installation Notes for Sto Tomas (continued)	
Site Elevation	7376 feet AMSL
Equipment Type	PTP670
Platform Variant	Integrated Antenna
Antenna Type	Cambium Networks High Gain Integrated
Antenna Beamwidth	10.0°
Antenna Gain	23.0 dBi
Antenna Height	32.8 feet AGL
Antenna Tilt Angle	0.5° (uptilt)
Bearing to Mt Pulag	53.12° from True North 56.17° from Magnetic North
Magnetic Declination	3.05° W ±0.28° changing by 0.10° W per year

Physical Installation Notes for Mt Pulag	
Link Name	Sto Tomas to Mt Pulag
Latitude	16.58616N
Longitude	120.90937E
Site Elevation	9224 feet AMSL
Equipment Type	PTP670
Platform Variant	Integrated Antenna
Antenna Type	Cambium Networks High Gain Integrated
Antenna Beamwidth	10.0°
Antenna Gain	23.0 dBi
Antenna Height	60.0 feet AGL
Antenna Tilt Angle	-0.9° (downtilt)
Bearing to Sto Tomas	233.22° from True North 236.35° from Magnetic North
Magnetic Declination	3.12° W ±0.28° changing by 0.10° W per year

Radio Commissioning Notes for Sto Tomas (Primary)	
Link Name	Sto Tomas to Mt Pulag
Site Name	Sto Tomas
Latitude	16.33479N
Longitude	120.56149E
Altitude	7376 feet
TDM Interface	None
Wireless Topology	Point to Point
Master Slave Mode	Master
Protection Mode	Disabled
Dual Payload	Enabled
Max Receive Modulation Mode	256QAM 0.81 Dual
Lowest Data Modulation Mode	BPSK 0.63 Sngl
Link Mode Optimization	IP Traffic
TDD Synchronization Mode	Disabled
Antenna Selection	Integrated

Radio Commissioning Notes for Sto Tomas (Primary) (continued)	
Regulatory Band	44 - 5.8 GHz
Connectorized Antenna Type	Directional, Integrated flat plate
Channel Bandwidth	45 MHz
Link Symmetry	Adaptive
Maximum Transmit Power	27 dBm
Ranging Mode	Auto 0 to 100 kilometers
Predicted Receive Power	-68 dBm ± 5 dB
Predicted Link Loss	141.28 dB ± 5.00 dB
Horizontal Accuracy	
MSN	
Vertical Accuracy	

Radio Commissioning Notes for Mt Pulag (Primary)	
Link Name	Sto Tomas to Mt Pulag
Site Name	Mt Pulag
Latitude	16.58616N
Longitude	120.90937E
Altitude	9224 feet
TDM Interface	None
Wireless Topology	Point to Point
Master Slave Mode	Slave
Protection Mode	Disabled
Dual Payload	Enabled
Max Receive Modulation Mode	256QAM 0.81 Dual
Lowest Data Modulation Mode	BPSK 0.63 Sngl
Link Mode Optimization	IP Traffic
TDD Synchronization Mode	Disabled
Antenna Selection	Integrated
Regulatory Band	44 - 5.8 GHz
Connectorized Antenna Type	Directional, Integrated flat plate
Channel Bandwidth	45 MHz
Maximum Transmit Power	27 dBm
Ranging Mode	Auto 0 to 100 kilometers
Predicted Receive Power	-68 dBm ± 5 dB
Predicted Link Loss	141.28 dB ± 5.00 dB
Horizontal Accuracy	
MSN	
Vertical Accuracy	

Regulatory Conditions	
Country	Argentina (Private)
Band	5.8 GHz
Region Code	44

Regulatory Conditions (continued)	
Max EIRP	50.0 dBm
Output Power	27.0 dBm

Installation Instruction

Perform the following checks during the installation (Check the deployment guide and the User Guide.)

1. Check with a GPS that you are installing at the correct location.

2. Check carefully the direction to the other end of the link. Either use a corrected compass or use the GPS waypoint feature about 300 meters from the installation location.

3. When aligning antennas, it is important to find the centre of the main beam. This is done by adjusting the antenna at each end of the link in turn and monitoring the receive level until the peak is found. Once the peak level is found, it should be checked against the prediced receive power to ensure that the antennas have not been aligned on a side lobe.

4. An hour after disarm check that the mean value for the link loss is as predicted (141.28 dB ± 5.00 dB). Also check that the received power is not greater than -35dBm.

Sto Tomas Performance *	
Mean IP Throughput Predicted	107.14 Mbps
Mean IP Throughput Required	5.00 Mbps
Minimum IP Throughput Required	1.00 Mbps
Minimum IP Throughput Availability Predicted	100.0000% (unavailable for 11 secs/year)

Mt Pulag Performance *	
Mean IP Throughput Predicted	107.14 Mbps
Mean IP Throughput Required	5.00 Mbps
Minimum IP Throughput Required	1.00 Mbps
Minimum IP Throughput Availability Predicted	100.0000% (unavailable for 11 secs/year)

* Multipath availability calculated using ITU-R P.530-17

Mode	Max Aggregate User IP Throughput (Mbps)	Sto Tomas				Mt Pulag			
		Max User IP Throughput (Mbps)	Fade Margin (dB)	IP Throughput Availability (%) *	Receive time in Mode (%)	Max User IP Throughput (Mbps)	Fade Margin (dB)	IP Throughput Availability (%) *	Receive time in Mode (%)
256QAM 0.81 Dual	426.00	213.00	-12.02	0.0001	0.0001	213.00	-12.02	0.0001	0.0001
64QAM 0.92 Dual	358.92	179.46	-7.28	0.0017	0.0016	179.46	-7.28	0.0017	0.0016
64QAM 0.75 Dual	293.30	146.65	-3.16	0.0980	0.0963	146.65	-3.16	0.0980	0.0963
16QAM 0.87 Dual	228.18	114.09	0.97	78.3528	78.2548	114.09	0.97	78.3528	78.2548

(continued)

Mode	Max Aggregate User IP Throughput (Mbps)	Sto Tomas				Mt Pulag			
		Max User IP Throughput (Mbps)	Fade Margin (dB)	IP Throughput Availability (%) *	Receive time in Mode (%)	Max User IP Throughput (Mbps)	Fade Margin (dB)	IP Throughput Availability (%) *	Receive time in Mode (%)
16QAM 0.63 Dual	164.03	82.02	4.59	99.8984	21.5456	82.02	4.59	99.8984	21.5456
256QAM 0.81 Sngl	213.00	106.50	-8.36	0.0000	0.0000	106.50	-8.36	0.0000	0.0000
64QAM 0.92 Sngl	179.46	89.73	-3.99	0.0000	0.0000	89.73	-3.99	0.0000	0.0000
64QAM 0.75 Sngl	146.65	73.33	-0.03	0.0002	0.0002	73.33	-0.03	0.0002	0.0002
16QAM 0.87 Sngl	114.09	57.04	4.03	0.0005	0.0002	57.04	4.03	0.0005	0.0002
16QAM 0.63 Sngl	82.02	41.01	8.54	99.9960	0.0971	41.01	8.54	99.9960	0.0971
QPSK 0.87 Sngl	57.04	28.52	11.87	99.9993	0.0033	28.52	11.87	99.9993	0.0033
QPSK 0.63 Sngl	41.01	20.50	15.89	99.9998	0.0006	20.50	15.89	99.9998	0.0006
BPSK 0.63 Sngl	20.50	10.25	19.99	100.0000	0.0002	10.25	19.99	100.0000	0.0002

* Multipath availability calculated using ITU-R P.530-17