

MULTIHAUL™ TG N366

PRODUCT DESCRIPTION

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Document Information

Revision	Date	Author	Revision notes
A0	December 2020	SH	First Release.

Intended Audience

- Solution architects and network planning staff
- Telecom backhaul engineers
- Wireless service providers, business connectivity and wireless networks pre-sale engineers

Terminology used in this document assumes audience familiarity with millimeter wave radio communication and networking technologies.

Comments and suggestions are welcome to: info@siklu.com.

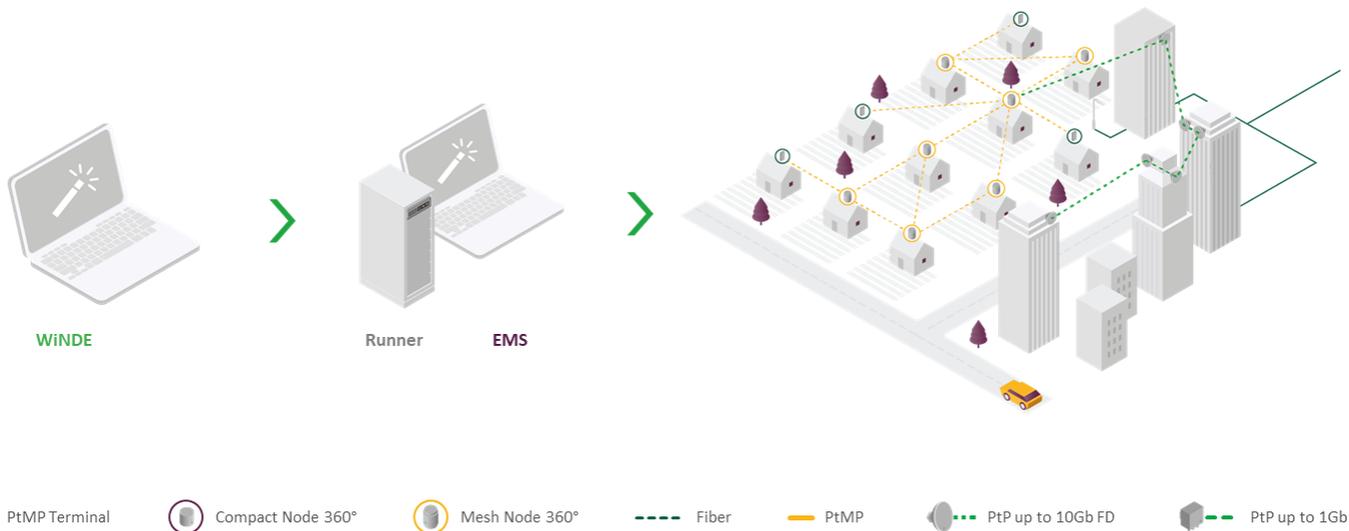
References

- MULTIHAUL™ TG SERIES - GENERIC SYSTEM DESCRIPTION



Introduction

MultiHaul™ TG family is an advanced solution for fixed wireless delivery of multi-Gigabit services to homes, businesses and within Smart cities Broadband IoT applications. It is complemented by additional Siklu solutions for the design and operations of the network, the SmartHaul™ suite of SaaS applications and services, together with EtherHaul™, a series of very high capacity PtP wireless links.



This document describes the MultiHaul™ TG N366. It expands the Generic System Description with the product specific information. The 2 documents can be reviewed in the order suitable to the reader.



MultiHaul™ TG N366 Main Features

Multihaul™ TG Node

MultiHaul™ TG N366 is a node unit in the TG series. Nodes are the backbone of the fixed wireless network with 4 wide-angle sectors, serving a number of Terminal Units (TU) which in turn connect the endpoints like homes and businesses, Wi-Fi Access Points or Small Cells.

Benefits

- N366 model features a similar and consistent operational experience with the MultiHaul™ TG series of units, reducing the cost to deploy and operate the fixed wireless network.

Terragraph certified

MultiHaul™ TG N366 is Terragraph certified, and apply the most advanced and modern radio physical and MAC layers for long range access in the 60GHz spectrum.

Standard compliance

- IEEE 802.11ay - Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications-- Amendment: Enhanced Throughput for Operation in License-Exempt Bands Above 45 GHz

Benefits

- Wireless network is built upon a modern future-proof wireless interface, designed from the ground up for the unique characteristics of the 60GHz spectrum.
- A well thought feature-rich wireless interface, supporting the needs of many different applications.

Flexible Topology – Point to Multipoint

MultiHaul™ TG N366 supports point-to-multipoint topologies. The field proven SW controlled beamforming enables wide-angle sector coverage together with narrow beams, for high performance and immunity from other spectrum users.

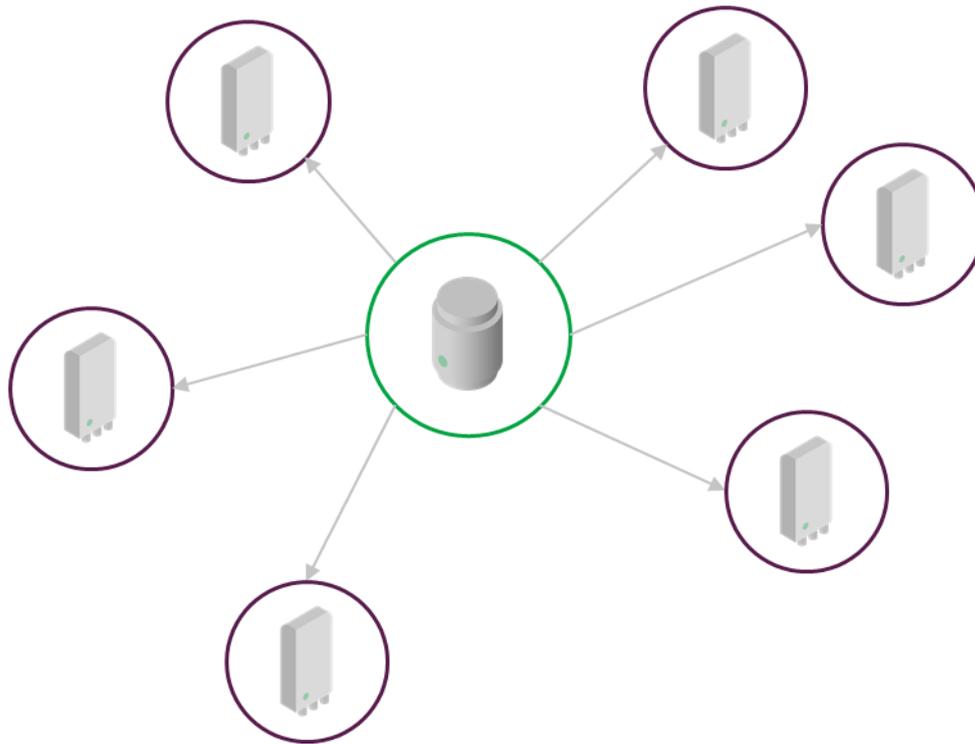


Figure 1: Point to Multi Point Topology

Benefits

- The single MultiHaul™ TG N366 connects to several Terminal Units, reducing network infrastructure and installation labor.
- The MultiHaul™ TG N366 serves several Terminal Units (TU), for efficient use of spectrum resources.

Mixed Sector Use

The sectors of MultiHaul™ TG N366 may be used simultaneously for 2 connections types: access (or drops) and self-backhaul (or mesh):

- The access or drop connection type serves a minimum of 8 and up to 15 Terminal Units per sector, model or license dependent.
- The self-backhaul connection allows linking a minimum of 1 and up to 2 other nodes per each of the sector(s) of the unit, extending the mesh network from one node to another one, on the same sector connecting TUs as explained above.

A self-backhaul connection in a sector reduces by 1 the max amount of TUs which can be served by the sector.

Benefits

- One mesh node does it all, access and backhaul, reduces the amount of hardware to be installed on site. This also reduces the amount of power and management overhead.

Flexible Topology – Mesh and Self-backhaul

MultiHaul™ TG N366 takes the point to multipoint concept to a new level with self-backhaul and mesh topologies. The N366s can be interconnected wirelessly to extend the reach and the coverage of the wireless network, while building a high capacity, highly redundant infrastructure. A single fixed network connection point is necessary, and the capacity is extended across a complete neighborhood wirelessly.

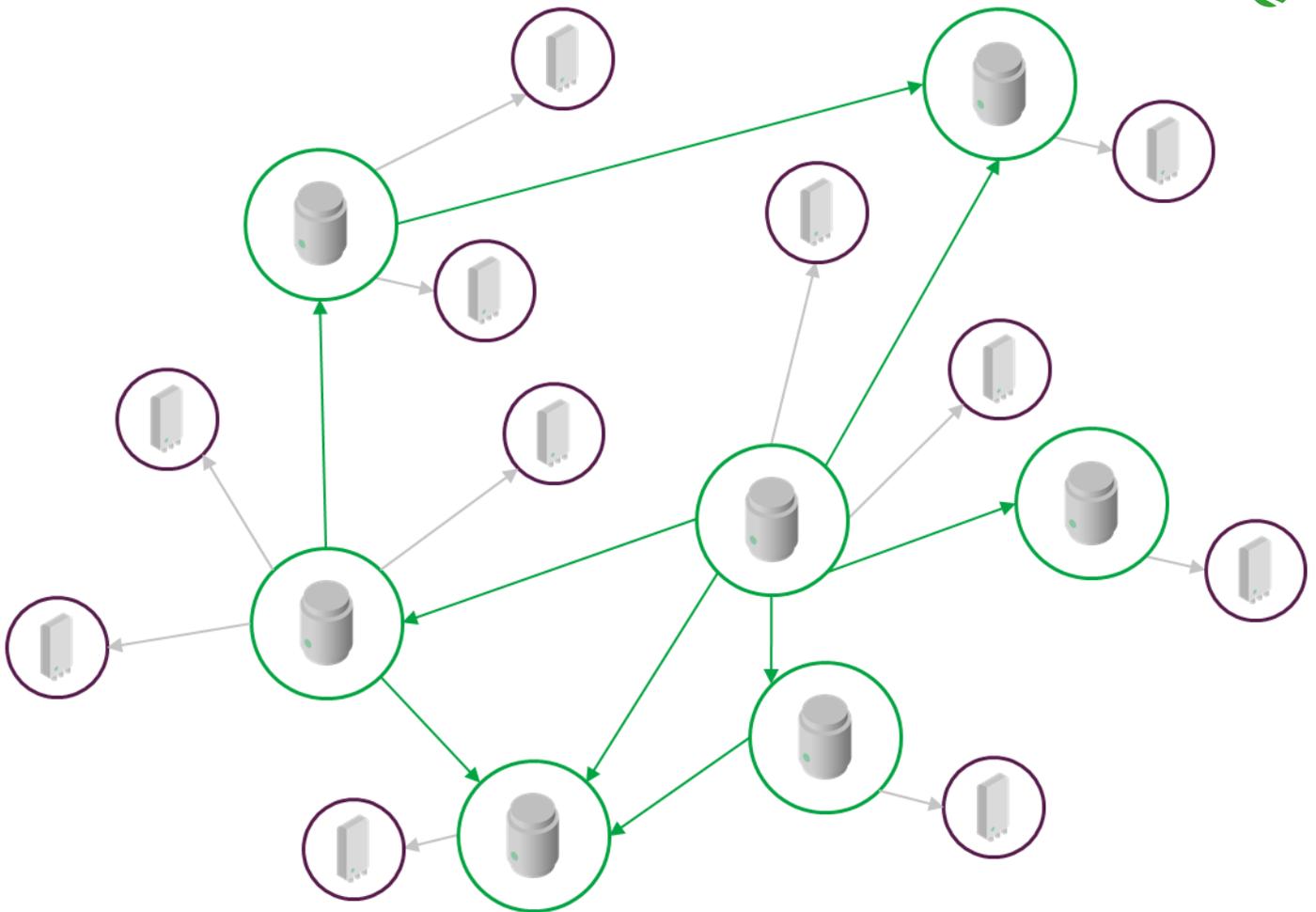


Figure 2: Mesh topology

Benefits

- A single device for the wireless backhaul and for the access to the end points, reduces labor and infrastructure demands
- A highly resilient neighborhood network, with multipaths backhaul.

L2 SDN Mesh

Forwarding of the traffic between N366s is performed by mean of bridging the traffic at layer 2 of the OSI stack, to remove any of the complexities associated with higher layers routing methods. The result is a very high-performance network relying on switching and forwarding rules, based on L2 standards such as VLANs.

Benefits

- A sophisticated mesh, yet at the most accepted networking level for the access networks.
- A most optimal ratio of power consumption or cost for optimal performance and throughput.

Scanning Antenna

MultiHaul™ TG N366 features 4 compact integrated wide-sector scanning antennas, which auto-align the narrow-beam links with other N366s, or with TUs. The alignment is performed at power-on autonomously and continuously by the SW, to recover from failures and to continuously optimize the performance of the link.

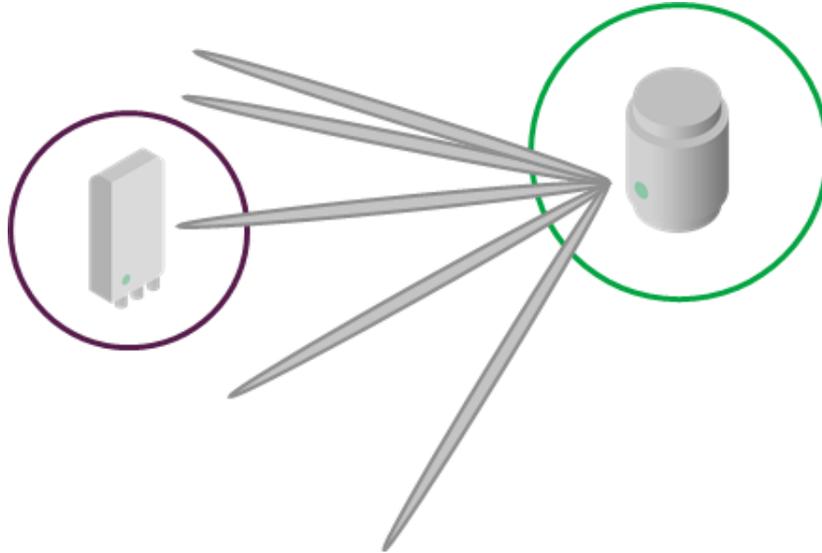


Figure 3: MultiHaul™ TG Scanning Antenna

Benefits

- With the MultiHaul™ TG N366 already in service, a single person is required at the TU to complete the installation and get the link in service, reducing the labor requirement by half, and lowering the time needed for installation by more than half.
- MultiHaul™ TG N366 narrow beams are immune to interferences.

Full 360° coverage

MultiHaul™ TG Nodes include up to 4x 90° sectors to optimize the coverage and the traffic capacity of the Node. A single installation for full 360° coverage, when mounted at the top of the pole.

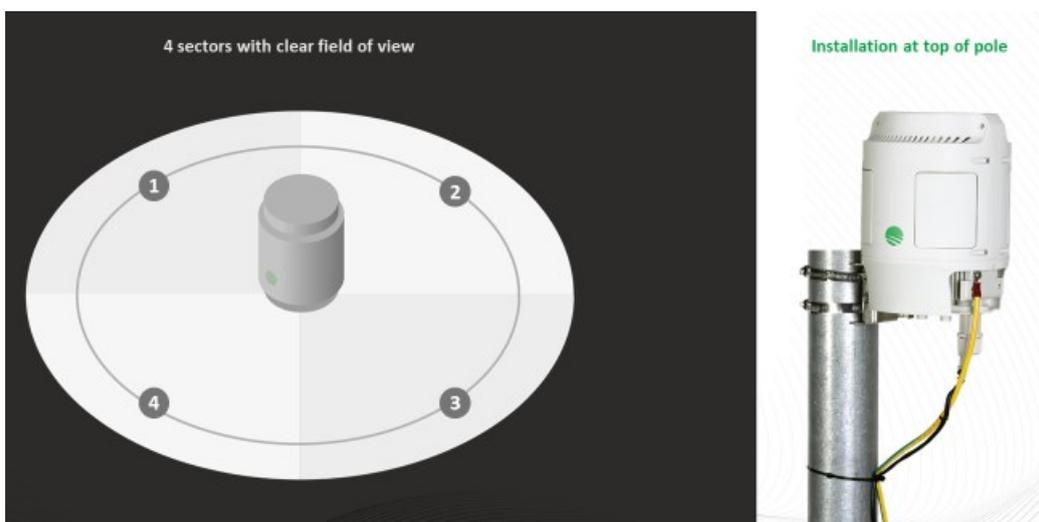


Figure 4: Full 360° coverage

Benefits

- A single unit provides 360° field of view.
- micro-POP applications can be realized with a single unit.
- Pole attachment rights are minimal with a single unit.

Full capacity from mid-pole

MultiHaul™ TG Nodes can be mounted with no additional accessories at mid-pole height. This is necessary when the organization cannot or may not mount the Node all the way to the top, for example in case of utility lines installed at the top. The size and material of the pole will obstruct some of the field of view of the unit, however the 4 sectors are otherwise fully functional and will carry full capacity and performance.

For example, in case of a pole with diameter = 4", the reduction in the field of view is 40°.

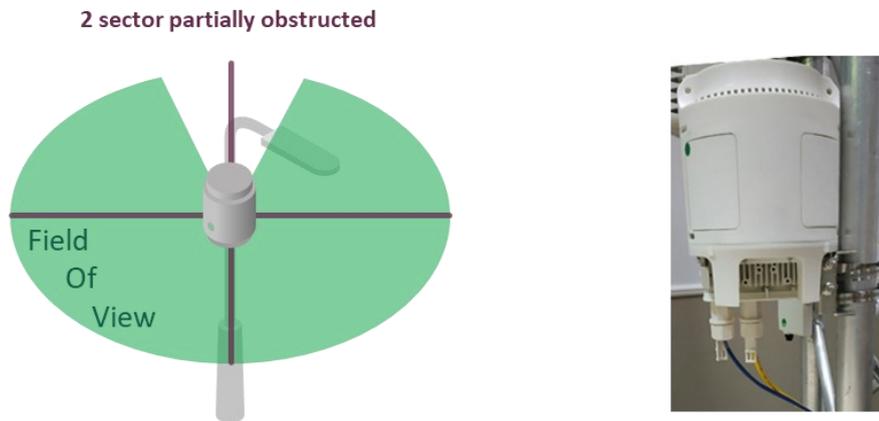


Figure 5: Full Performance can Capacity – middle of the pole

Benefits

- Mounting scenarios tailored to the needs of the organization.
- Full performance in terms of link count or capacity.
- Pole attachment rights are minimal with a single unit.

Flexible Channel Plans

MultiHaul™ TG N366 can operate on any of 4 standard 2.16GHz wide channels, per IEEE 802.11ay. In case of a multi-sector unit, each sector can operate on any of these 4 channels, independently of the other 3 sectors. This allows utmost in flexibility for the design of the fixed wireless network.

Channel	Center Frequency [GHz]
1	58.32
2	60.48
3	62.64
4	64.8

Benefits

- Choice in use of 1 or more channels per network, to optimize for capacity and spectrum use.
- Optimization of the channel plan to suit the performance targets of the organization.
- Choice of better spectrum for more demanding longer links.

Adaptive Coding and Modulation (ACM)

Please refer to the heading by the same name in the Generic System Description.

Adaptive Transmit Power Control (ATPC)

Please refer to the heading by the same name in the Generic System Description.

Time Division Multiple Access (TDMA MAC)

Please refer to the heading by the same name in the Generic System Description.

MultiHaul™ TG N366 Networking Features

Integrated Ethernet switch

MultiHaul™ TG N366 includes an integrated multi Gigabit Ethernet switch with 3 ports.

- Eth1: 100M, 1 / 2.5 / 5 / 10GbE copper (802.3bz/an) with PoE-in
- 1GbE copper with PoE-Out
- 10GbE SFP+

Each port can be configured to support:

- Auto negotiation enabled/disabled (RJ-45 connectors only, always on for speeds above 1Gbps)
- Speeds: 100/1,000/2,500/5,000/10,000 Mbps (port and model dependent).
- Full-duplex / half-duplex
- Delivery of data and/or management traffic

Benefits

3 Ethernet ports on the N366 are an ideal number of interfaces at a hub site, where the ports connected can match the network needs flexibly. This enables:

- Direct connection to a fiber drop (10GbE or 1GbE FD)
- Direct connection to a high capacity network device under the roof (up to 10GbE, fiber or copper)
- Wireless backhaul options, via a Siklu EtherHaul™ E-Band radio (10GbE FD, copper or fiber)
- Daisy chain of units in same site for extreme density requirements (10GbE FD, copper or fiber)
- Services to multiple local users, without additional equipment
- Integrated multi Gigabit Ethernet switch with advanced networking features allows all outdoor installation

Transparent Bridge (IEEE 802.1d)

Please refer to the heading by the same name in the Generic System Description.

Virtual LAN (VLAN, IEEE 802.1q)

Please refer to the heading by the same name in the Generic System Description.

Provider Bridge (IEEE 802.1ad)

Please refer to the heading by the same name in the Generic System Description.

MultiHaul™ TG N366 OAM and Management Concepts

Please refer to the heading by the same name in the Generic System Description.

MultiHaul™ TG N366 Power

PoE-In

MultiHaul™ TG N366 simplifies powering by leveraging the data cable for power, with the standard Power Over Ethernet concept, 802.3bz. Power draw varies with the configuration and or the application:

- Without PoE-Out: 55W.
- With PoE-Out: 95W.

Standard compliance

- IEEE 802.3bt - Physical Layer and Management Parameters for Power over Ethernet over 4 pairs (PoE-in/out, PSE, PD).

Benefits

Thanks to the efficient system design and high integration, MultiHaul TG N366:

- Reduces the power consumption and accordingly the associated energy costs.
- Simplifies the installation scenario, by enabling use of a single cable for both power and data.
- “Power-less operation”, when the MultiHaul TG unit can be powered from a 3rd party switch aggregating several functions in the site.

48VDC Power

MultiHaul™ TG N366 can also be powered with a simple 48VDC feed, for example in those sites where 48VDC is the common power. An adaptor is required for this application, available from Siklu as EH-PoE-DC-adaptor. Power draw varies with the configuration and or the application:

- Without PoE-Out: 55W.
- With PoE-Out: 95W.

Benefits

- Operations from standard Telco grade power.

PoE-Out

MultiHaul™ TG N366 supports standard PoE-Out on Eth2, toward other TG series radios or 3rd party devices such as Wi-Fi Access Points, Small Cells or CCTV / PTZ cameras:

- Max power out: 35W (effective power controlled according to IEEE 802.3bt).

Standard compliance

- IEEE 802.3bt - Physical Layer and Management Parameters for Power over Ethernet over 4 pairs.

Benefits

- Simplifies the installation of other devices when their power supply can be eliminated.
- Improves availability of the service, when the most failure prone element, the power-supply, can be eliminated.

MultiHaul™ TG N366 – Detailed Specifications

Sector(s)	4x 90° sector, for 360° coverage, Horizontal scanning: 90° per sector, Vertical scanning: 40°.
Frequency & Duplexing	57-66GHz, TDD/TDMA.
Network synchronization	On-board GPS
Channels & Width	4x non-overlapping channels, 2160MHz wide, Any sector any of 4 channels, for optimal RF performance.
Modulation & Coding	10 levels of adaptive coding and modulation.
Radio OTA Rate (over the air)	Up to 4,600 Mbps per sector.
Aggregate Throughput	> 3,800 Mbps per sector, > 16 Gbps per node.
System Gain (link budget)	110dB (Node to Node/TU, including antenna gain).
Typical Reach (Node to Node/TU)	890ft. / 270m. Detailed performance calculations - see Siklu's online link budget calculator: lbc.siklu.com .
Interfaces	1x RJ-45 10/5/2.5/1GbE with PoE-In 1x RJ-45 1GbE with PoE-Out (up to 35W) 1x SFP+ 10GbE.
Conformance	Radio: US FCC 47 CFR Part 15.255; EN 303 722, EMC: US FCC 47 CFR Part 15; EN 301 489, Safety: UL/IEC 62368-1; UL/IEC 60950-22.
Terragraph	Terragraph certified.
Power	Power-in: Eth1, PoE-PSE (IEEE 802.3bt) or passive, or 48VDC, 55W no POE-Out, up to 90W with POE-Out. PoE-Out: Eth2, PoE-PD (IEEE 802.3bt), up to 35W.
Environmental	Operating Temperature: -49° ± +131°F (-45° ± +55°C); Ingress Protection Rating: IP67.
Dimensions	9.4 x 7.3 in. / 236 x 186 mm. (height x diameter).
Weight	7.9 lbs. / 3.6 Kg.

MultiHaul™ TG N366 – Standards Compliance

Environmental

- EN 300 019-1-1 Class 1.2 (storage, weatherprotected, not temperature-controlled)
- EN 300 019-1-2 Class 2.2 (transportation)
- EN 300 019-1-4 Class 4.1E (operations, non-weatherprotected locations – extended)
- Ingress Protection Rating: IP67
- NEMA rating: enclosure type 4

Please refer also to the heading by the same name in the Generic System Description.

Acronyms

ACM	Adaptive Modulation and Coding	VLAN	Virtual Local Area Network (LAN)
AES	Advanced Encryption Standard	YANG	Yet Another Next Generation data modelling language
AN	Network Assigned Name / ID		
ATPC	Automatic/Adaptive Transmit Power Control		
BU	Base Unit		
CLI	Command Line Interface		
FD	Full Duplex		
FTP	File Transfer Protocol		
GbE	Gigabit Ethernet		
Gbps	Gigabit per second		
IoT	Internet of Things		
ISP	Internet Service Provider		
MAC	Medium Access Control		
Mbps	Megabit per second		
MMF	Multi-Mode Fiber		
NETCONF	Network Configuration Protocol		
NNI	Network Network Interface		
PD	Powered Device (over PoE)		
PSE	Power Supplying Equipment (over PoE)		
PoE	Power over Ethernet		
PtMP	Point to Multi Point		
PtP	Point to Point		
RF	Radio Frequency		
SaaS	Software as a Service		
SDN	Software Defined Network		
SFTP	Secure File Transfer Protocol		
SLA	Service Level Agreement		
SMF	Single Mode Fiber		
SSH	Secure Shell		
SSID	Service Set Identifier		
SW	Software		
TDMA	Time Division Multiple Access		
TG	MultiHaul™ Terragraph compliant series		
TU	Terminal Unit		

About Siklu

Siklu delivers Gigabit capacity millimeter wave wireless backhaul solutions operating in the 60, 70 and 80 GHz bands. Ideal for dense, capacity-hungry urban security networks, the ultra-high capacity wireless links can be easily and discreetly installed on the very same street fixtures as the security cameras. The most deployed mmW radios in the world, thousands of units are delivering carrier grade performance in varying weather conditions around the world.

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