



RADWIN Introduction

RADWIN

Telco Grade Wireless Solutions

Rel 2.5



RADWIN



Company Introduction



RADWIN at a glance



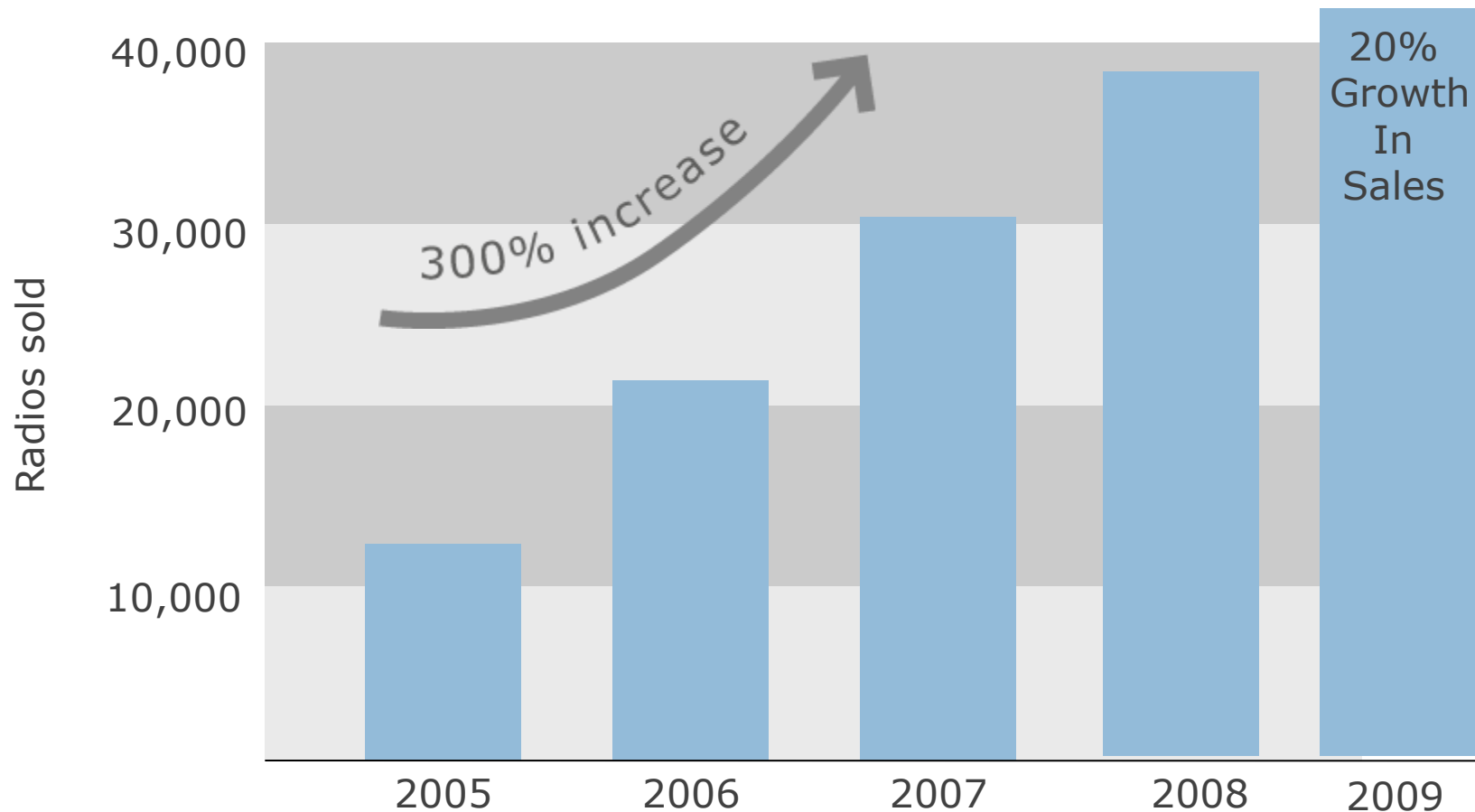
- Global provider of Telco Grade Wireless Links 2-6GHz
- Delivering 200Mbps Net Ethernet and 16 E1s over the air for short and long distance up to 120km
- More than 150,000 radios deployed in over 110 countries

RADWIN at a glance



- Established in 1997, Member of RAD Group
- Headquarters and Manufacturing in Tel Aviv
- Local Offices in Italy, UK, LA, India, Singapore, Thailand, USA, SA
- 200 employees, private, profitable and growing

RADWIN Ranks #8 on Deloitte Israel Technology Fast 50 List for 2nd Consecutive Year – 2009



Adopted by Tier 1 Customers



RADWIN Product Line



Telco Grade -Point to Point Wireless Links



RW2000C: 200Mbps net / 16E1s

RW2000L: 100Mbps net / 16E1s

RW2000PDH: 20Mbps net / 16E1s

WL1000: 44Mbps net / 4E1s

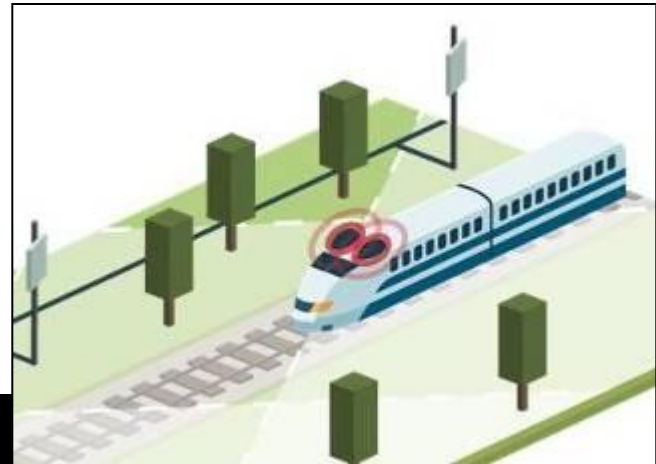
WL AccessPro: 12Mbps net



2x/3x/4x/5x/6 GHz

Wireless High Capacity Mobility Solutions

- High Capacity (30Mbps) Wireless Internet to Trains up to 150kmh
- Military Mobility Applications



Point to Point Links



RADWIN 2000C MODEL



Net Ethernet Capacity

✓ 40MHz – 100Mbps FD, **200Mbps** Aggregate

✓ Air Interface 270Mbps



ODU - Front View



ODU - Rear View

✓ 20MHz - **100Mbps** Aggregate Asymmetric Automatic

✓ Air Interface 130Mbps

✓ 10MHz - **50Mbps** Aggregate Asymmetric Automatic

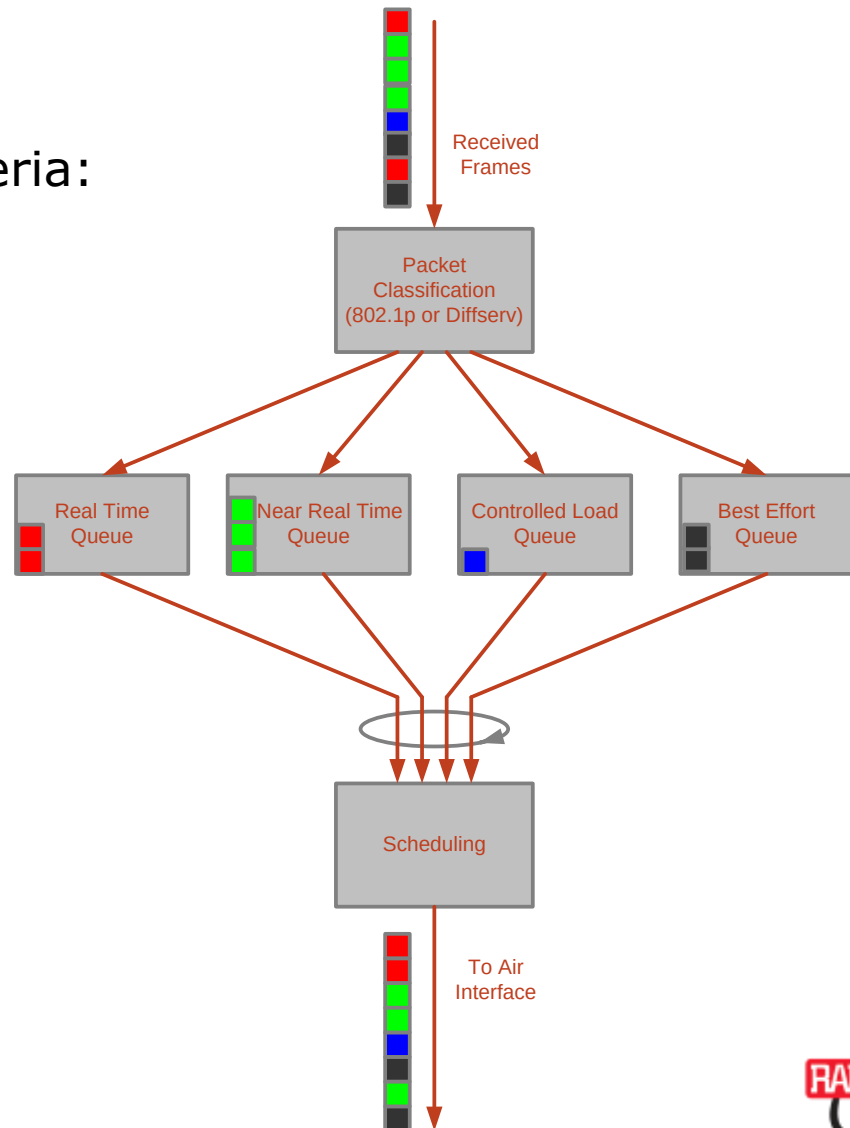
✓ Air Interface 65Mbps

RW2000C support QoS with 4 Queues

Supports two classification criteria:

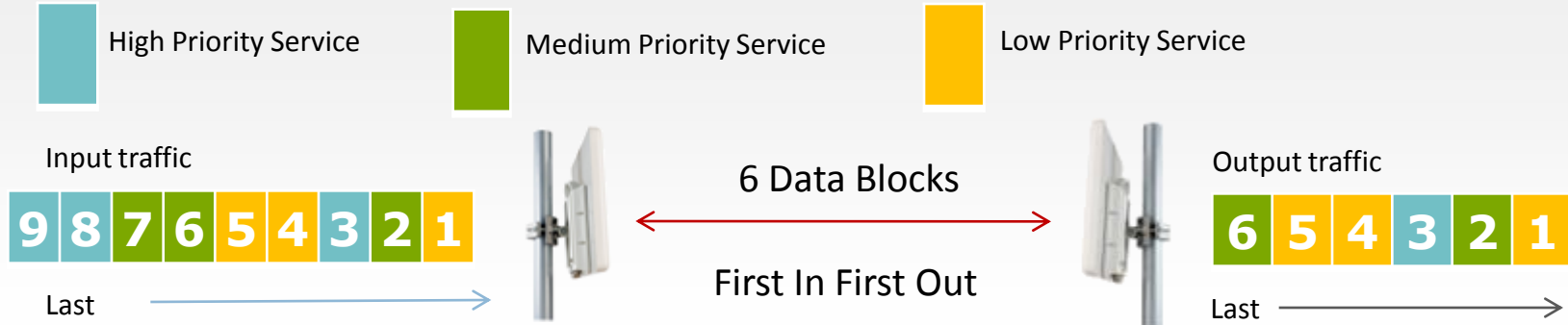
802.1p and Diffserv

- ✓ Real Time
- ✓ Near Real time
- ✓ Controlled load
- ✓ Best Effort

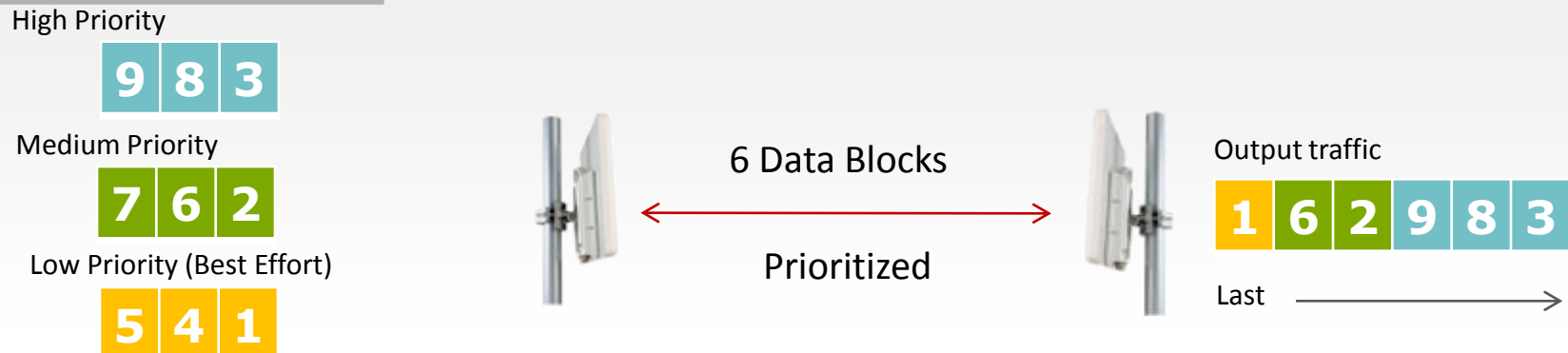


RW2000C support QoS with 4 Queues

BEFORE QoS



AFTER QoS



RADWIN 2000C MODEL



- ✓ Optimized for Heavy VOIP Traffic
- ✓ Can process 148,000 VOIP PPS
- ✓ Very Low Latency – 2 msec



RADWIN 2000L MODEL



Net Ethernet Capacity

✓ 20MHz - **50Mbps** Full Duplex Net Throughput

✓ Air Interface 130Mbps

✓ 10MHz - **25Mbps** Full Duplex

✓ Air Interface 65Mbps



ODU - Front View



ODU - Rear View

RW2000PDH – TDM Mobile Backhaul Link

- ✓ Cost Optimized for TDM Mobile BH
- ✓ 1-16 Native E1s Plus 10Mbps FD



RADWIN2000 Unique Capabilities



RADWIN2000 Unique Capabilities



Multi Band MIMO OFDM ODU Radios

- ✓ Universal 4.9-6GHz
- ✓ ETSI 5.4-1Watt / 5.8-4watts
- ✓ Wimax Bands 3.4GHz -3.7GHz
- ✓ WiFi Bands 2.4GHz
- ✓ Specialized Bands 4.8, 2.3GHz



RADWIN2000 Unique Capabilities



Support Ethernet Plus 1-16 Native E1s on the same Link

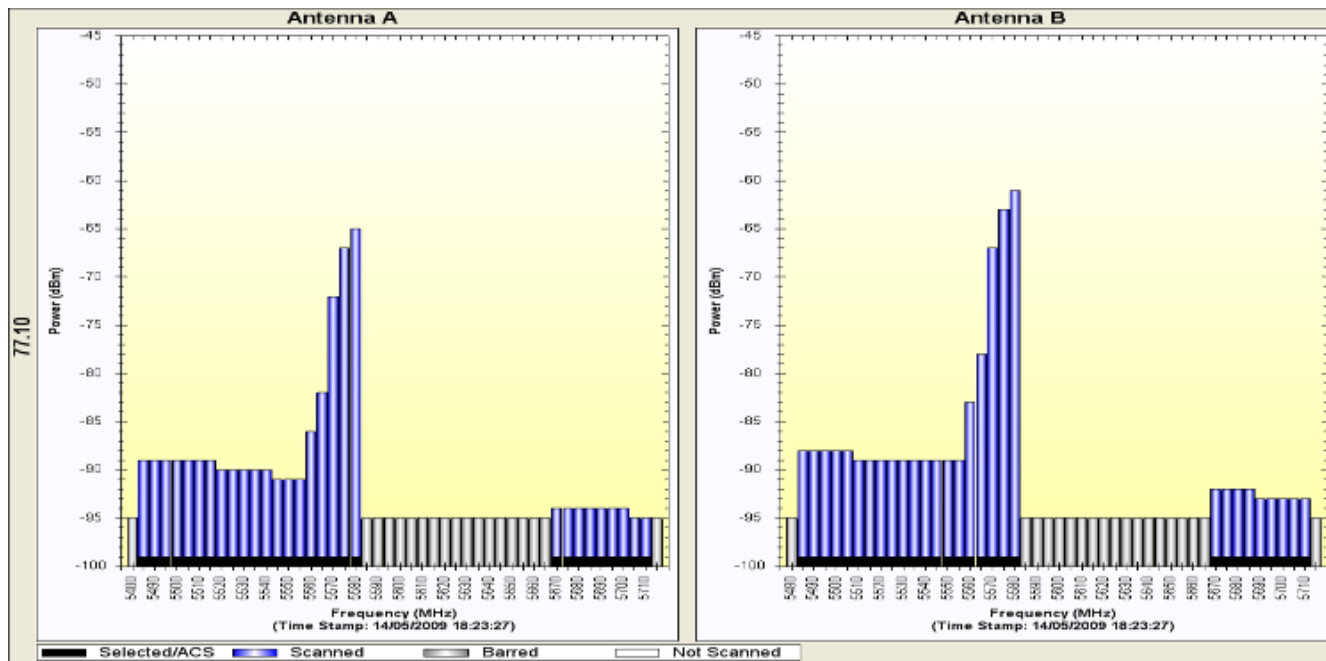
- ✓ Optimized for Mobile Backhaul
 - ✓ In Rural Areas
 - ✓ Near LOS
 - ✓ Cell on wheels
 - ✓ Temporary connections



RADWIN2000 Unique Capabilities

Spectrum Viewer

- Spectral power measurements in 5MHz channel granularity
- Indication of channels free from interference

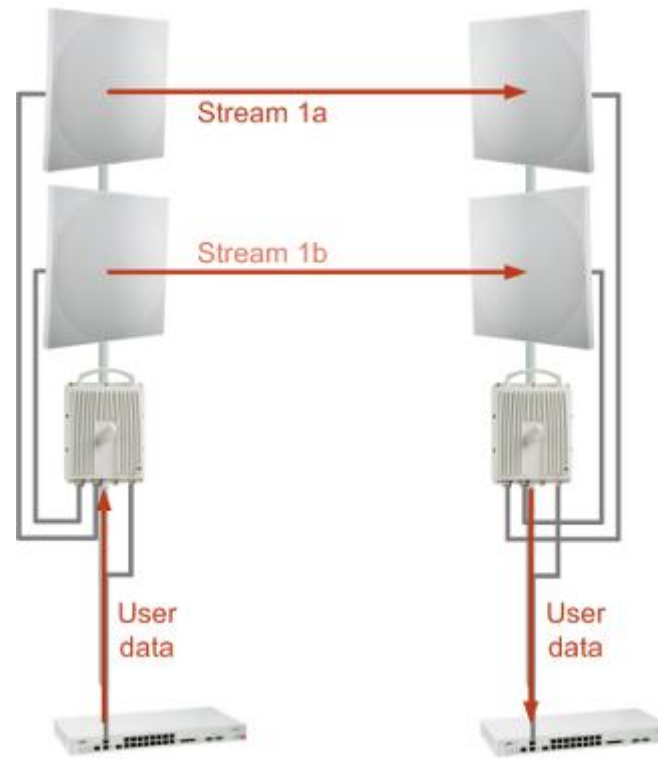


RADWIN2000 Unique Capabilities



Diversity Mode

- 1/2 the Bandwidth, X2 Robustness
- When high Robustness, High availability, nLOS is needed



RADWIN2000 Unique Capabilities



Designed for Long Range

- ✓ Adaptive Modulation
- ✓ 8 Levels BPSK to 64 QAM
- ✓ Max Tx Power 25db
- ✓ Range: Tested to 120km with LOS
- ✓ Can operate at Near LOS



RADWIN2000 Unique Capabilities



Small foot Print

✓ ODUs with Integrated 37x37cm antenna

✓ Low weight 3.5Kg



ODU - Front View



ODU - Rear View

✓ Or ODU Connectorized

✓ Low weight 1.8Kg

✓ 19x27cm



ODU - Front View



ODU - Rear View

WL1000 Medium Capacity



- ✓ 22/22Mbps Net Ethernet
- ✓ 1-4 Native E1s
- ✓ Great price per bit



All Models available as:

Universal - Multi Band
5X GHz

ETSI - Multi Band
5.4-1Watt / 5.8-4watts

WL AccessPro Low Capacity that can grow..

- ✓ Designed for Video Surveillance and Access Applications
- ✓ 6/6 Mbps net
- ✓ License key upgradable to 22/22Mbps
- ✓ 10 Watts power consumption

ODUs available as:

ETSI - Multi Band
5.4-1Watt / 5.8-4watts



IDUs / POE for RW2000 / WL 1000 /AccessPro

All ODUs can be powered via a small, Low Cost POE AC or DC

✓ 16x6cm



✓ Outdoor POE



Or Telco Grade IDUs

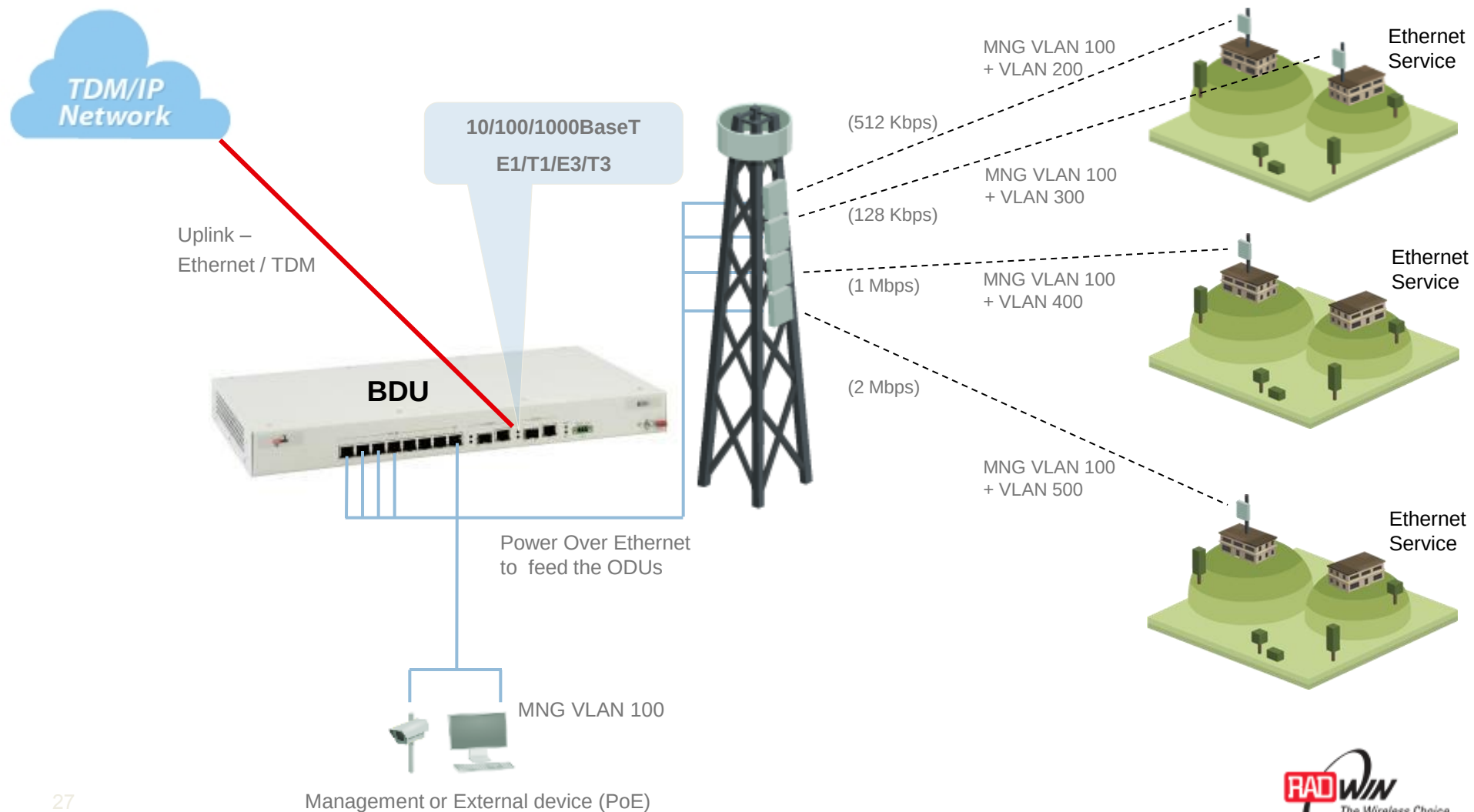
✓ IDU-E



✓ IDU-C

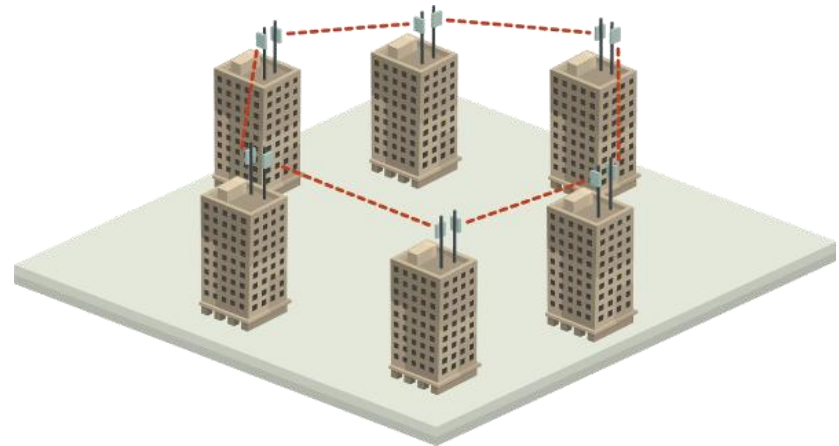


BDU support for WL1000 / AccessPro (8 POE switch)



RADWIN Unique Capabilities to ensure High Availability 5xNines

- ✓ Ring
- ✓ 1+1
- ✓ Radio synchronization

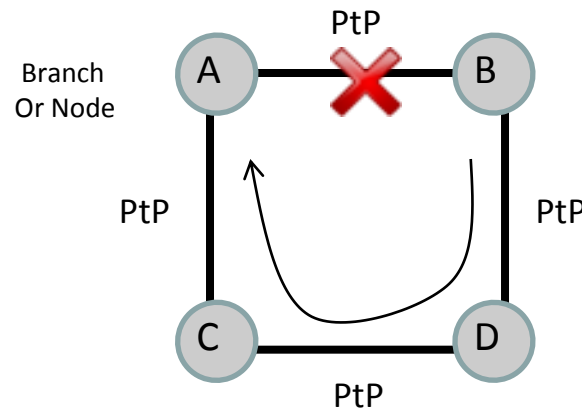


Radwin Unique Capabilities

Ring Support via IDUs



- ✓ Enables to provide SLA with 5x9s
- ✓ Great redundancy and fast service restoration within 50 msec
- ✓ Requires an IDU-C, or IDU-E

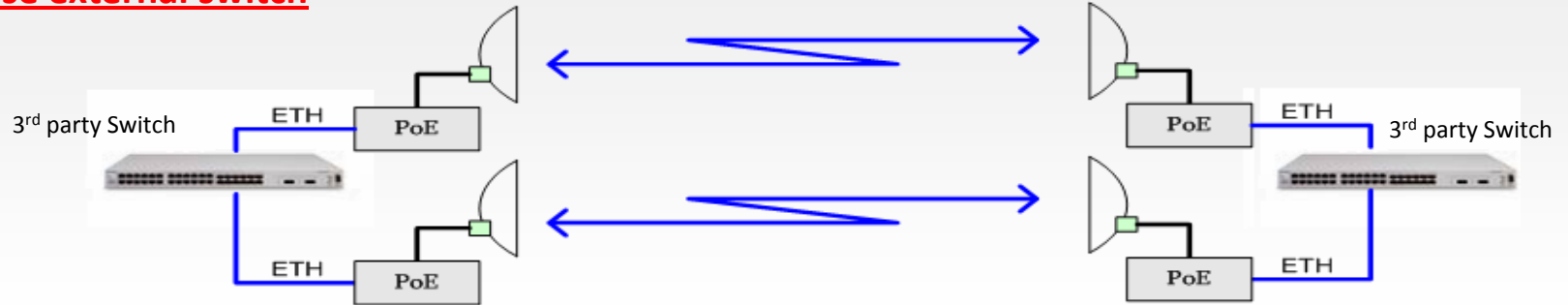


Radwin Unique Capabilities

1+1 Network Topology – Enable 5 Nines SLA

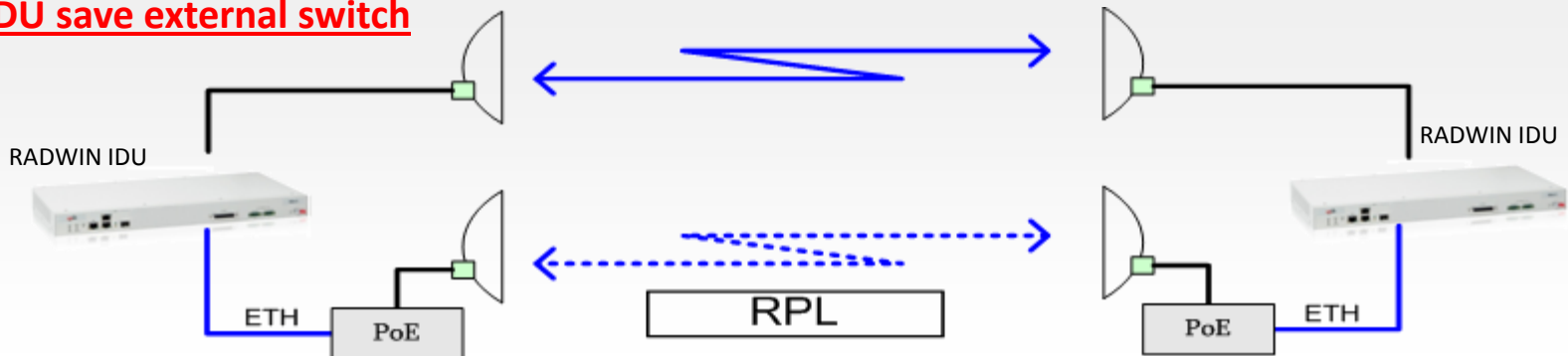
BEFORE 1+1

Use external switch



AFTER 1+1

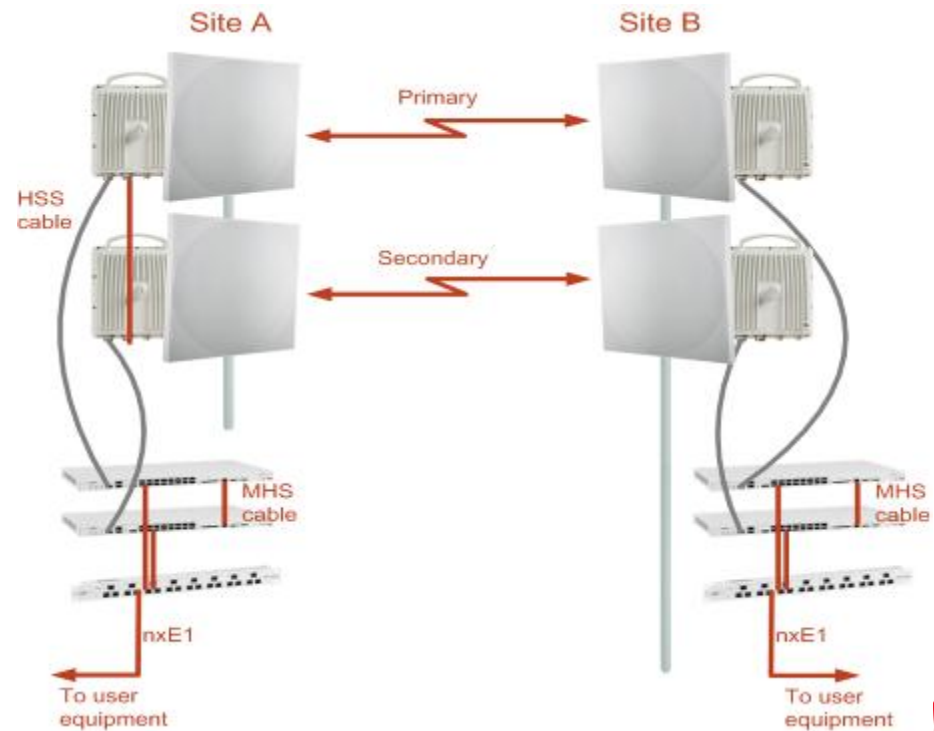
IDU save external switch



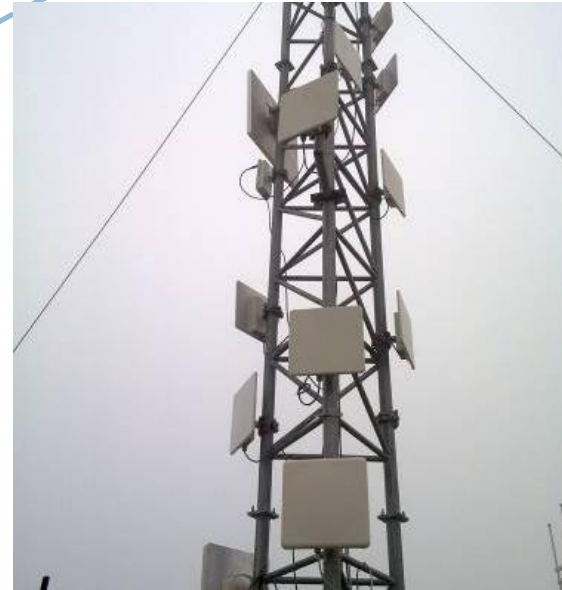
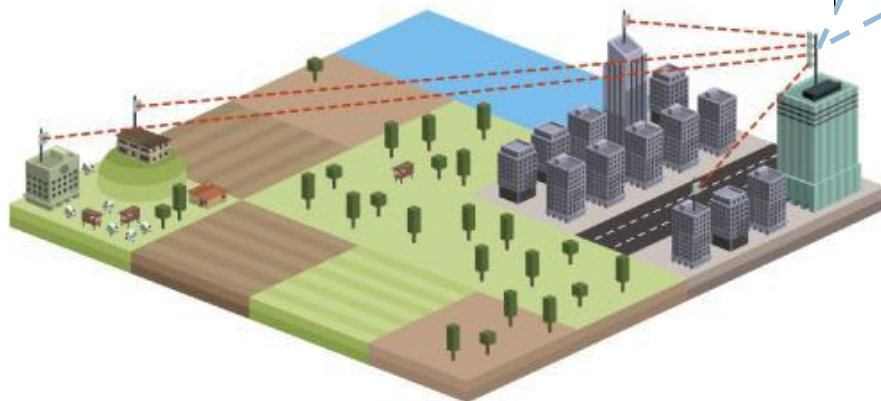
Radwin Unique Capabilities

TDM 1+1 Monitored Hot Standby (MHS)

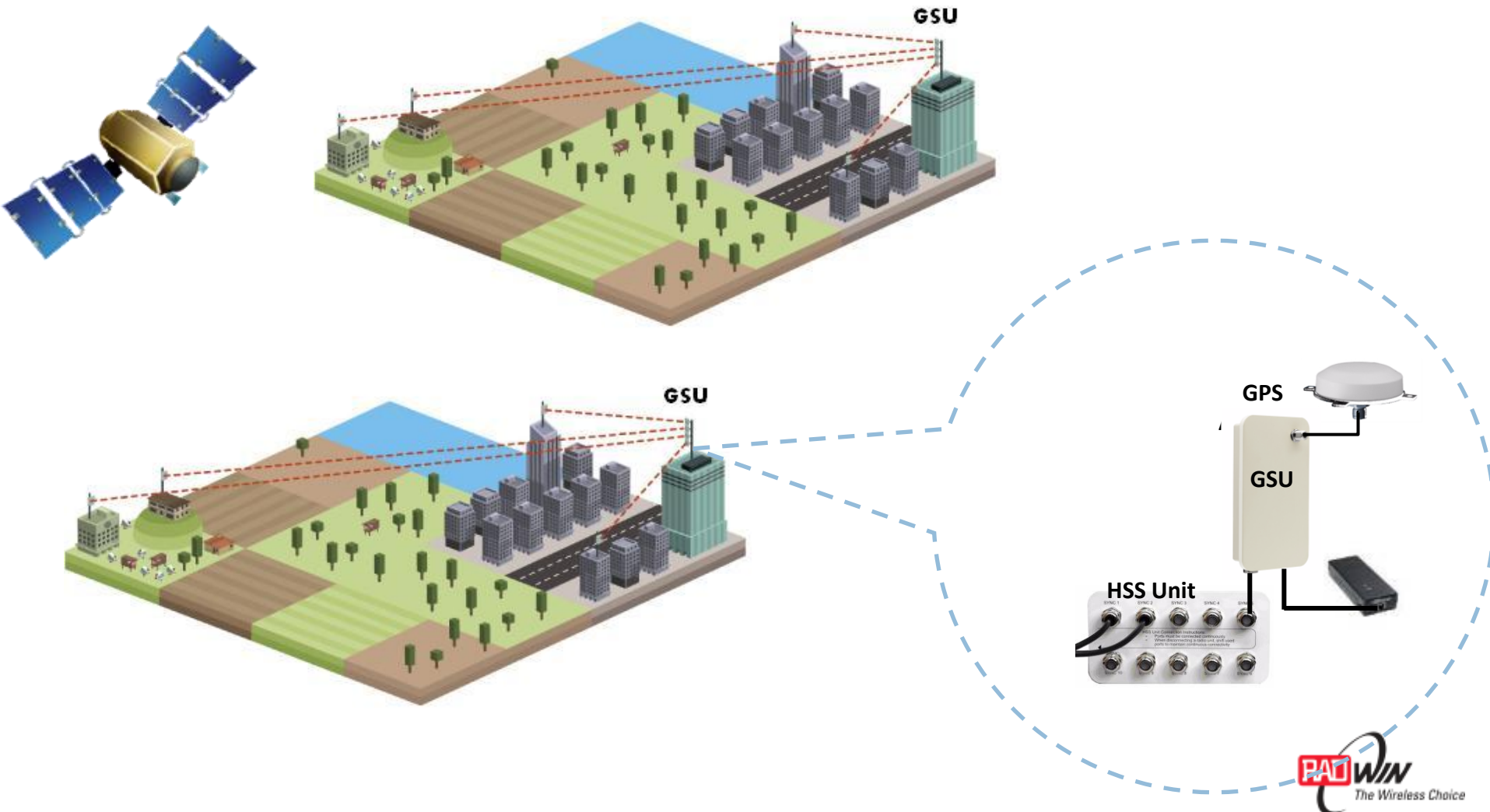
- 2 Complete links, one active one standby
- Redundancy and backup to TDM services up to 16E1s
- Automatic switch over in less than 50ms with no service interruption



RADWIN Eliminates Link Interference Via HSS and GPS Synchronization



RADWIN Eliminates Link Interference Via HSS and GPS Synchronization



IDU-C for RW2000 / WL1000

- ✓ Telco Grade Indoor Unit 19" 1U
- ✓ Dual Power Supply with redundancy
- ✓ 2 Ethernet Ports / Native TDM E1s / SFP support
- ✓ Independent clock per TDM port
- ✓ VLAN/QinQ,
- ✓ 1+1 Ethernet redundancy
- ✓ Ring topology
- ✓ -20 to -60V DC or 220V AC
- ✓ Dry contacts for Alarms



4 Models

Ethernet Only

Ethernet +

4E1

Ethernet +

8E1

Ethernet +

16E1

IDU-E for RW2000 / WL1000

- ✓ 2 Ethernet Ports / 2 E1 Ports
- ✓ 9.5 inch / 24cm
- ✓ 1+1 Ethernet redundancy
- ✓ Ring topology
- ✓ VLAN/QinQ
- ✓ Single power supply
- ✓ Independent clock per TDM port



2 Models

Ethernet Only

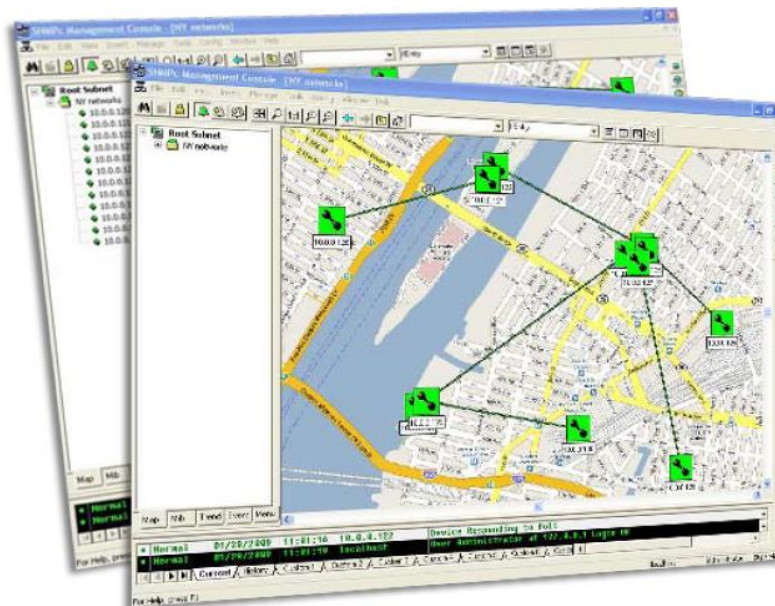
Ethernet +

2E1

RNMS - Network Management Software Package

Manage all RADWIN and 3rd party wireless links in a network from a centralized Network Operations Center (NOC)

Event monitoring, performance monitoring, trend reports and more





RADWIN Wireless Technology

SUPPERIOR Carrier Class RADIO TECHNOLOGY

- ROBUST MIMO OFDM operating at nLOS
- Telco / Military Grade Radio, designed by Radwin Radio Engineers

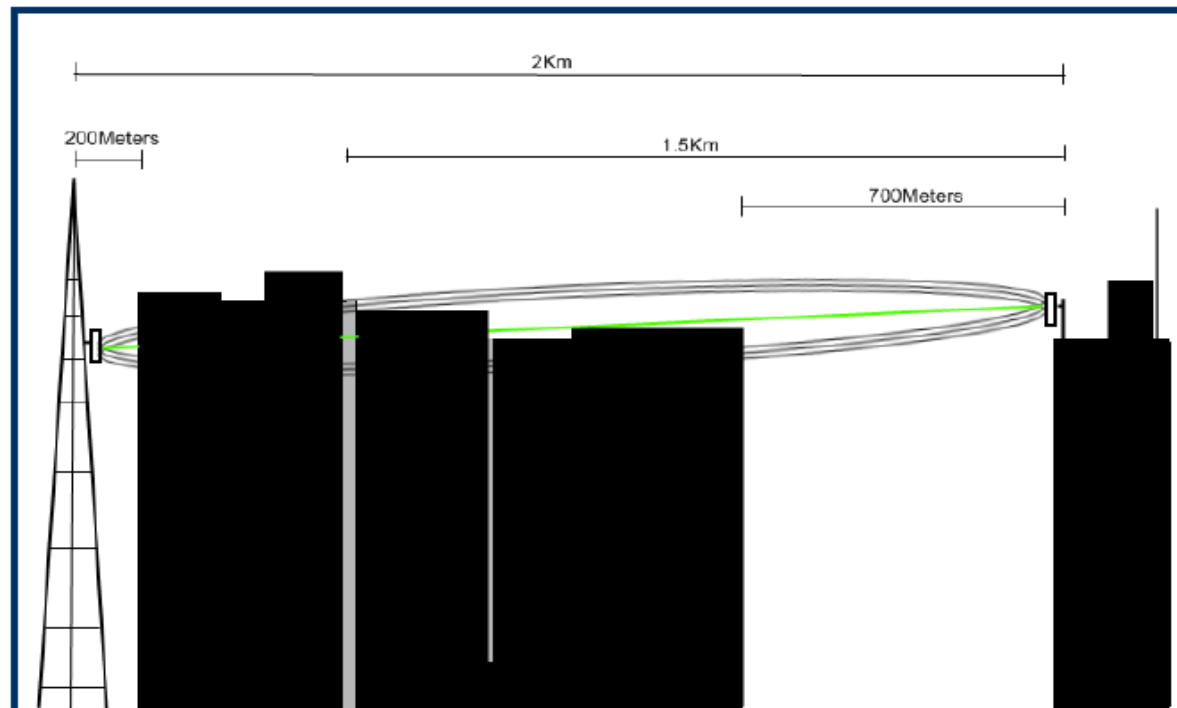
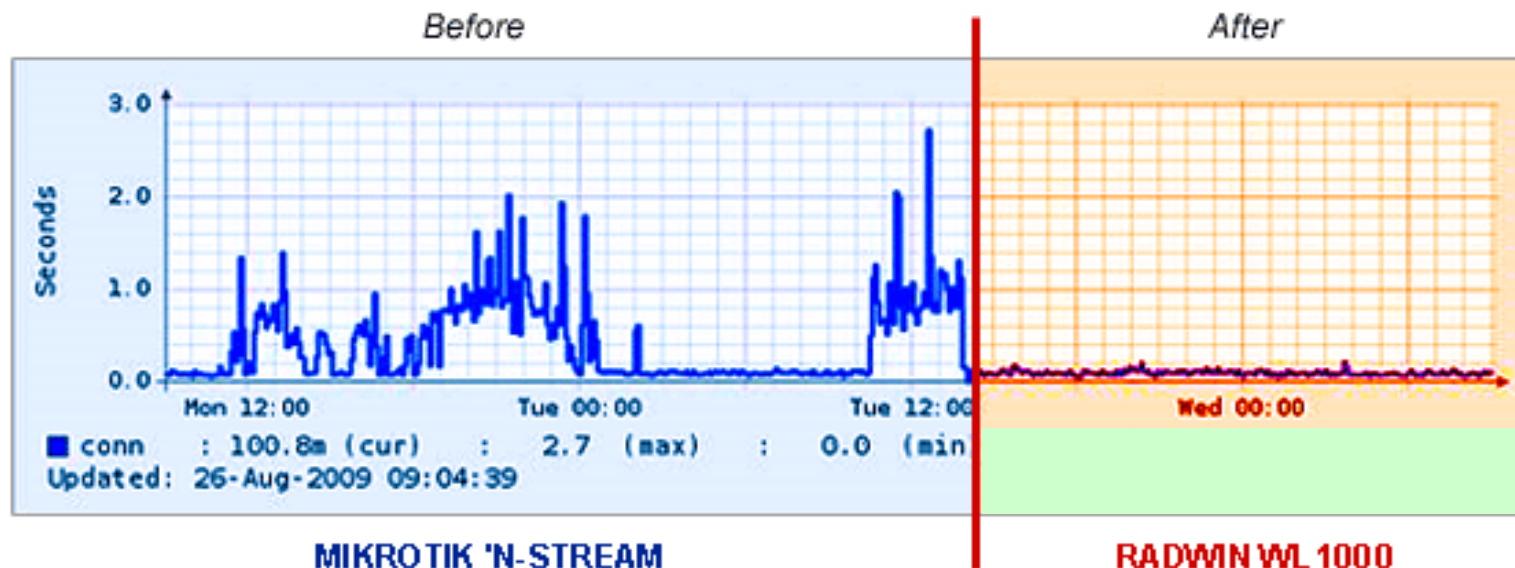


Figure 36 Link path sketch

SUPERIOR Carrier Class MIMO OFDM RADIO TECHNOLOGY

- Superior and stable Latency at 2-3msec at noisy environment
- Comparing to WiFi Technology with latency reaching 2.7 seconds ! in a noisy environment

16km actual link – WL1000 replacing a Microtik Link



RADWIN WIRELESS LINKS UNIQUE BENEFITS



- ✓ Immunity to Interference
- ✓ Optimized TCP algorithm
- ✓ Comply to IP67 for extreme weather
- ✓ Non-interrupted Transmission
- ✓ Directional Antenna
- ✓ Quick and simple Installation via Intuitive GUI



Automatic Channel Selection (ACS)

- Automatic selection of “best-quality” channel for transmission
- Enhanced robustness and increase availability

Link Configuration Wizard

Channel Settings
Any changes to the Channel field may result in a Link re-synchronization.

Operating Channel [GHz] Other... 5.810

Channel Bandwidth [MHz] 20

☒ Automatic Channel Selection

Available Channels List [GHz]

☒ 5.740	☒ 5.755	☒ 5.770	☒ 5.785	☒ 5.800	☒ 5.815
☒ 5.745	☒ 5.760	☒ 5.775	☒ 5.790	☒ 5.805	☒ 5.820
☒ 5.750	☒ 5.765	☒ 5.780	☒ 5.795	☒ 5.810	☒ 5.825

< ||| >

Reselect Channel Select All Clear All

< Back Next > Cancel

Monitor Link

Radio Interface	A	B
RSS [dBm]	-63	-62

RADWIN WIRELESS LINKS UNIQUE BENEFITS



- ✓ ODU with INT antenna
 - ✓ For use up to 10km – Non ETSI
 - ✓ For use up to 4-5km – ETSI

- ✓ ODU Connectorized for Long distance
 - ✓ Non ETSI up to 120km
 - ✓ ETSI 5.4GHz-1Watt up to 25km
 - ✓ ETSI 5.8GHz-4Watt up to 35km



60cm dish



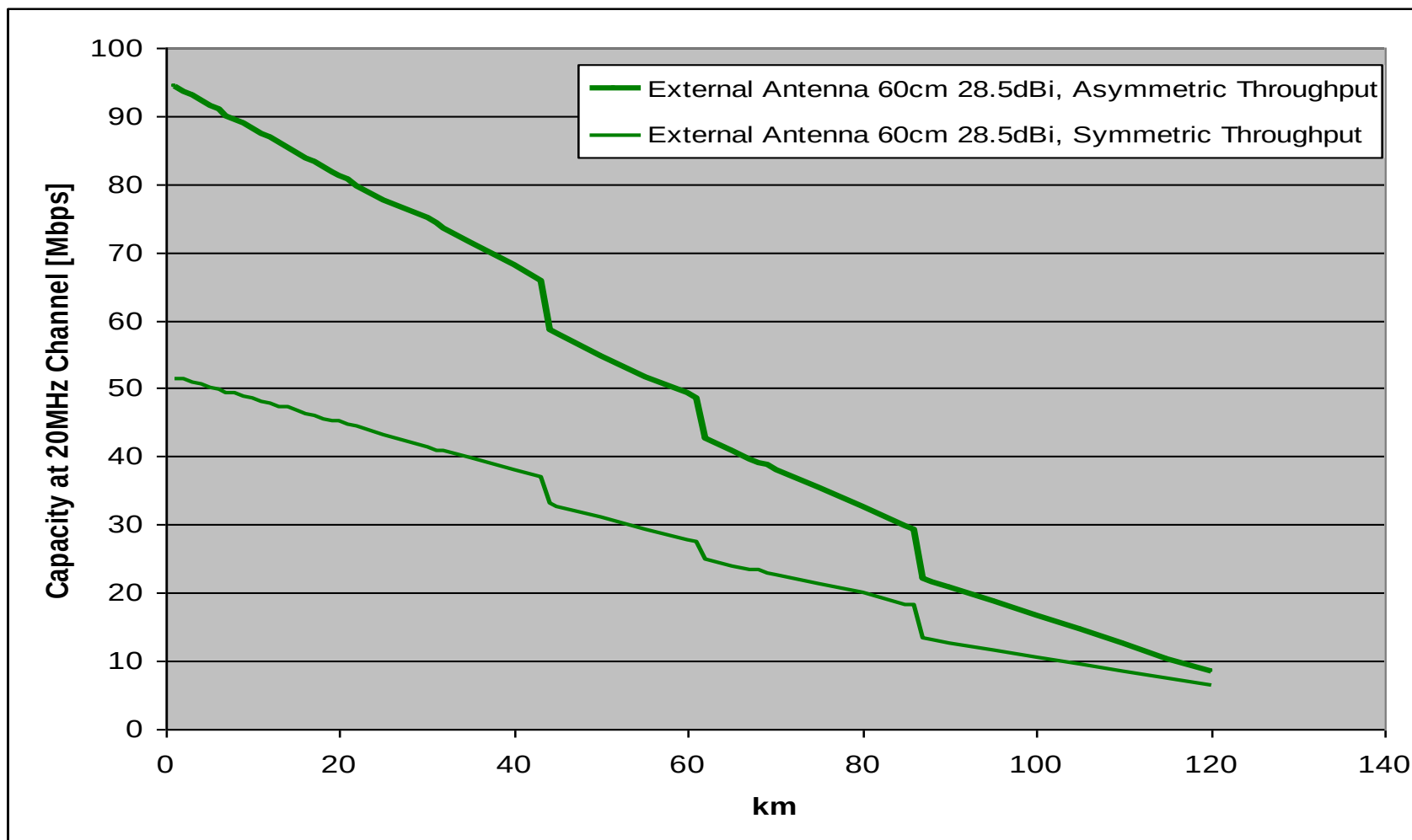
RADWIN WIRELESS LINKS UNIQUE BENEFITS



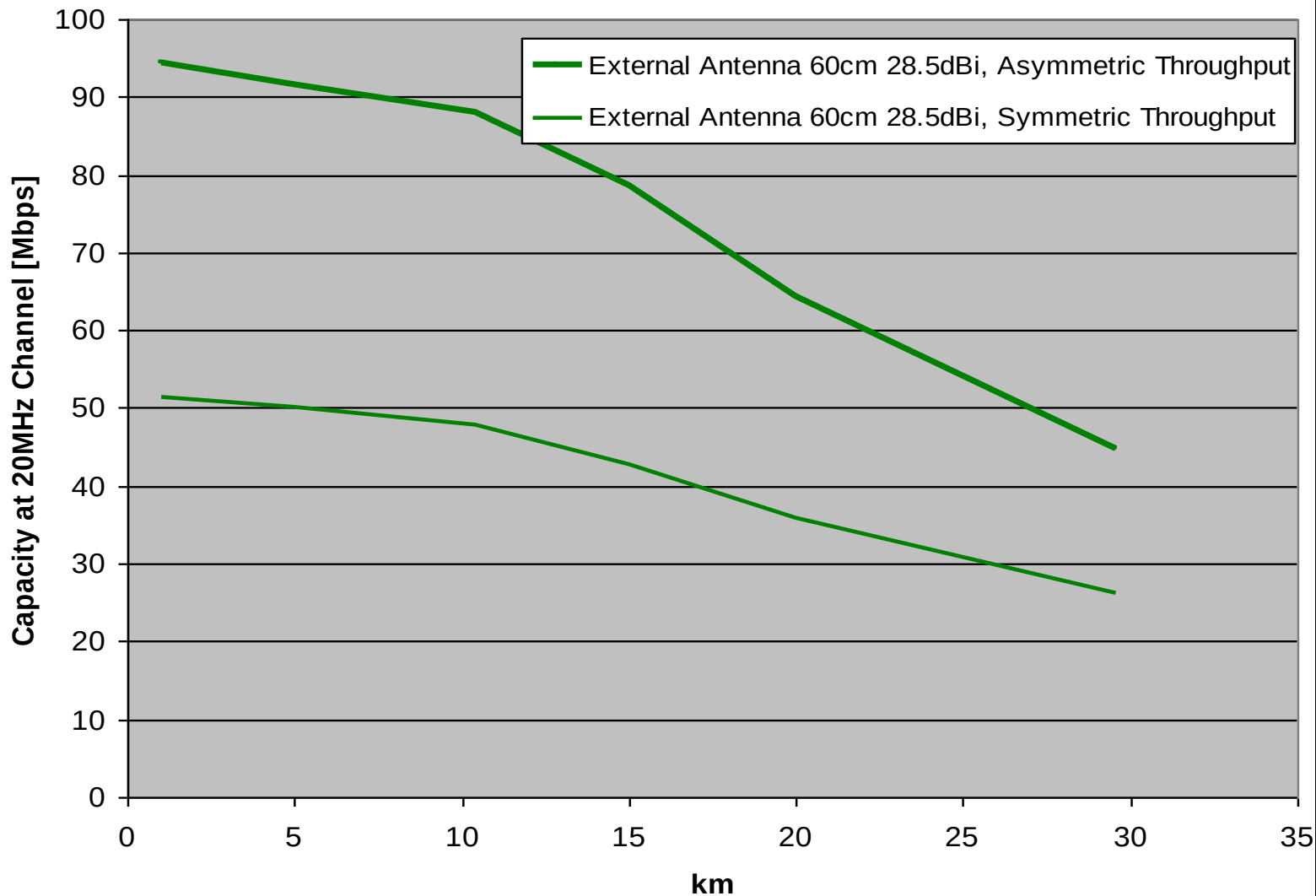
- ✓ 3 levels of Encryption
 - ✓ 128 AES
 - ✓ dedicated SSID
 - ✓ proprietary Air Interface
- ✓ Used by NATO, UK MOD, Police forces, and Security agencies



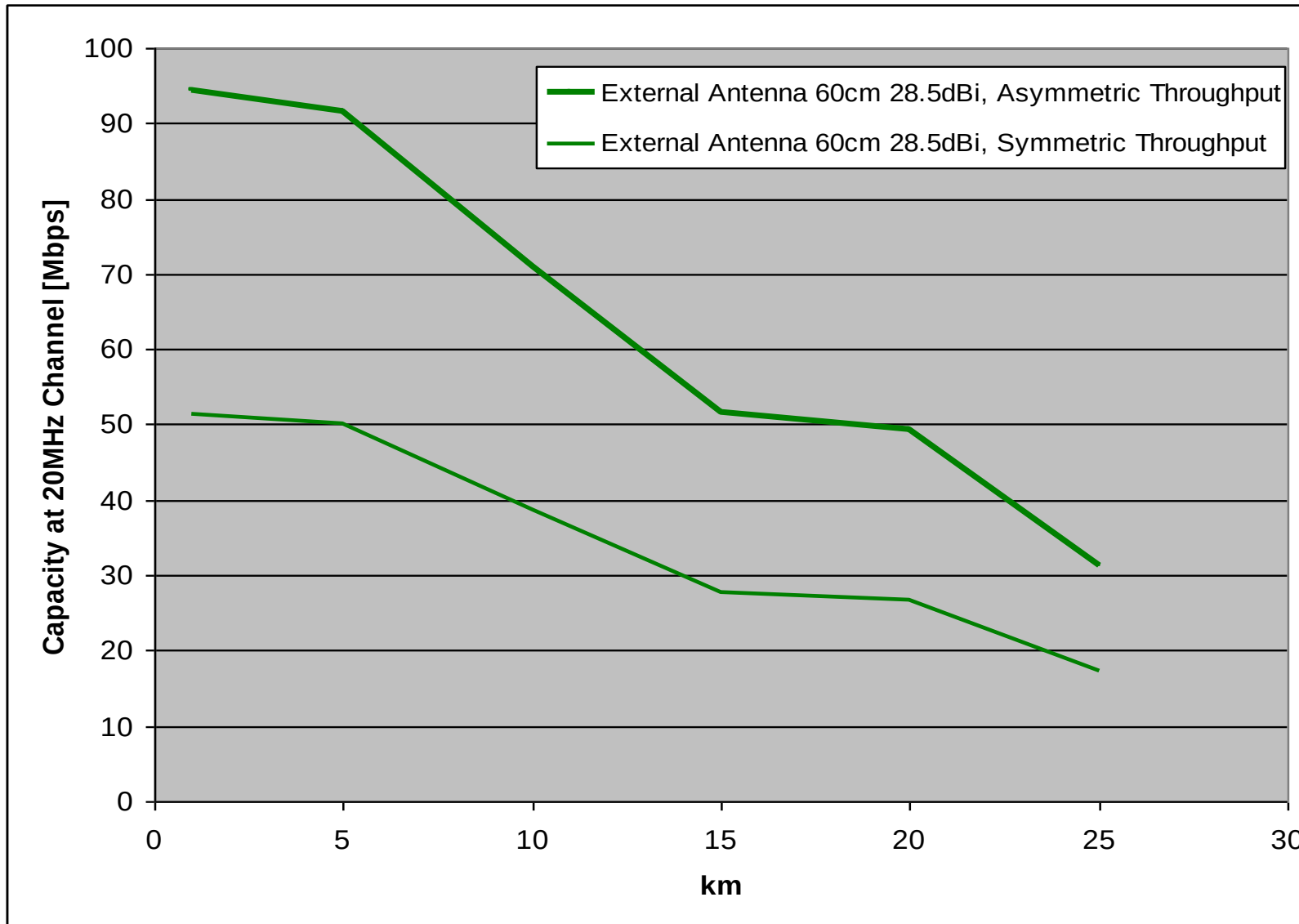
RADWIN2000C 5.4 Universal High Capacity – Long Range



RADWIN2000C 5.8 ETSI 4 Watts (UK, Finland, Denmark, Norway, Germany) High Capacity – Long Range



RADWIN2000C 5.4 ETSI 1Watt High Capacity – Long Range



Applications for sub 6GHz Wireless Links



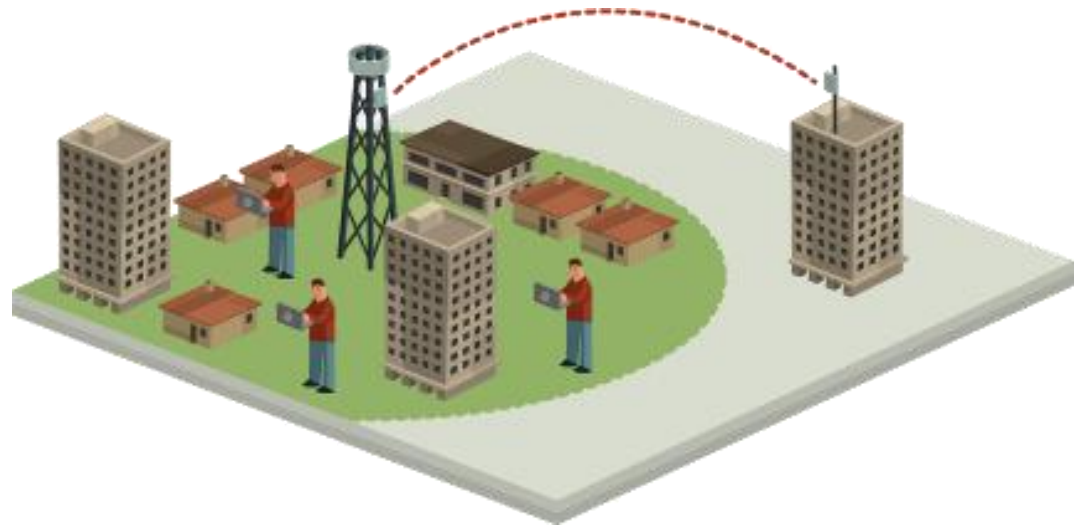
Application – Mobile Backhaul



- Mobile Operators

Motivation:

- *In city at nLOS*
- *In Rural Areas*
- *Backup and offload Licensed Links*
- *Cell On Wheels*
- *Temporary Links*
- *Replace leased Lines*



Cellular Backhaul for Special Events - COW

- Used by VODA UK for Cell on Wheels for Special events

Motivation:

- Fast deployment
- Low weight ODU 3.5kg with INT antenna
- Small size 37x37cm flat antenna
- High Capacity 16 Native E1s + 36Mbps Ethernet (18/18)
- Multi Band Radio 5.8/5.4GHz
- Low Power consumption, 25-35Watts
- Telco Grade Radio Link



Cellular backhaul (US)



- Customer: T-Mobile, USA
- Temporary carrier-class backhaul links
- Immediate connectivity until wired infrastructure established
- Same-day revenue generation

RURAL connectivity



- NSN and RADWIN coping to provide GSM connectivity in rural areas
- RADWIN links are used to backhaul NSN rural base stations - GAPs (GSM Access Points)
- RADWIN links are part of NSN's portfolio expanding its services in rural areas

"Following extensive testing, Nokia Siemens Networks verifies that RADWIN's WinLink radios meet the stringent capacity, range and performance requirements, as well as the challenges posted by the rural environment"

Mika Skarp, Head of Village Connectivity Product Management, Nokia Siemens Networks



Cellular Backhaul – VIBO, Taiwan



Customer: VIBO, 3G Operator, Taiwan

Project: Hundreds of RADWIN links deployed in Taiwan for cellular backhaul

Why RADWIN:

- After testing several systems – RADWIN's links were the only ones that worked in challenging city environment
- Links operate in difficult nLOS conditions
- Work in cities where there is major interference in 5.8 GHz
- Eliminate high costs and regulatory delays of leased lines and licensed radios

Cellular Backhaul in Rural Village – SmarTone, Hong Kong



Customer: SmarTone (Vodafone Hong Kong), Hong Kong

Project: Cellular backhaul in rural village with nLOS

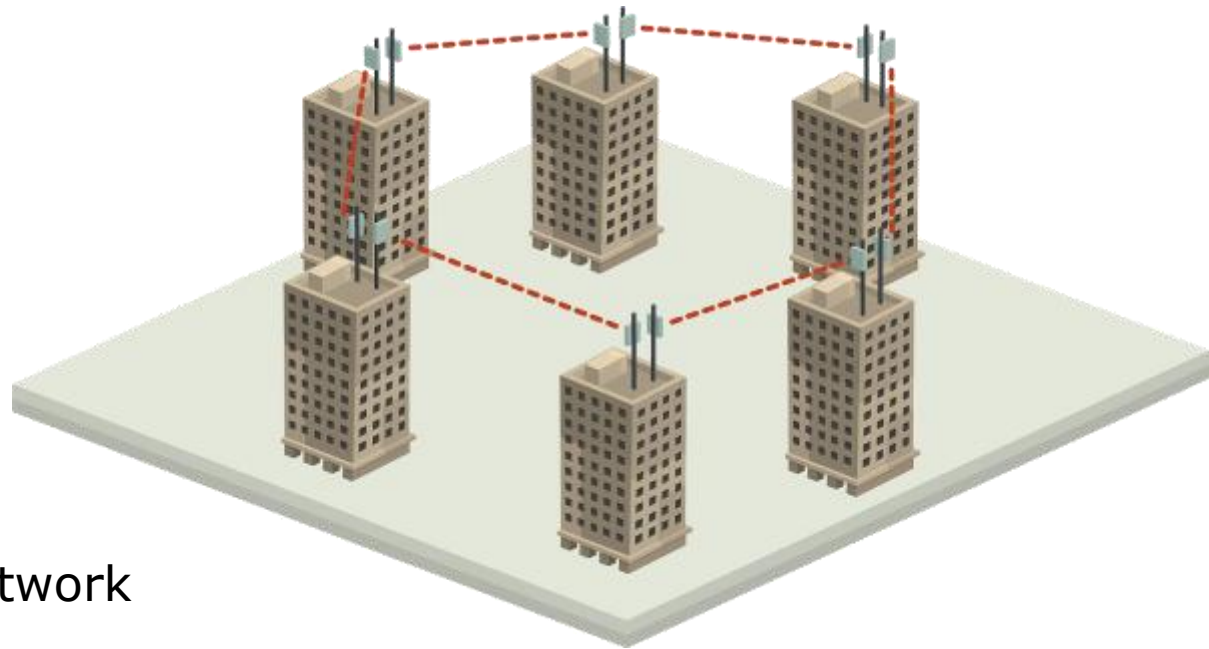
Why WinLink 1000:

- Fast and simple installation
- Carrier-class – operated where other solutions failed
- Robust and reliable – operates in high humidity
- OFDM technology enables operation in nLOS

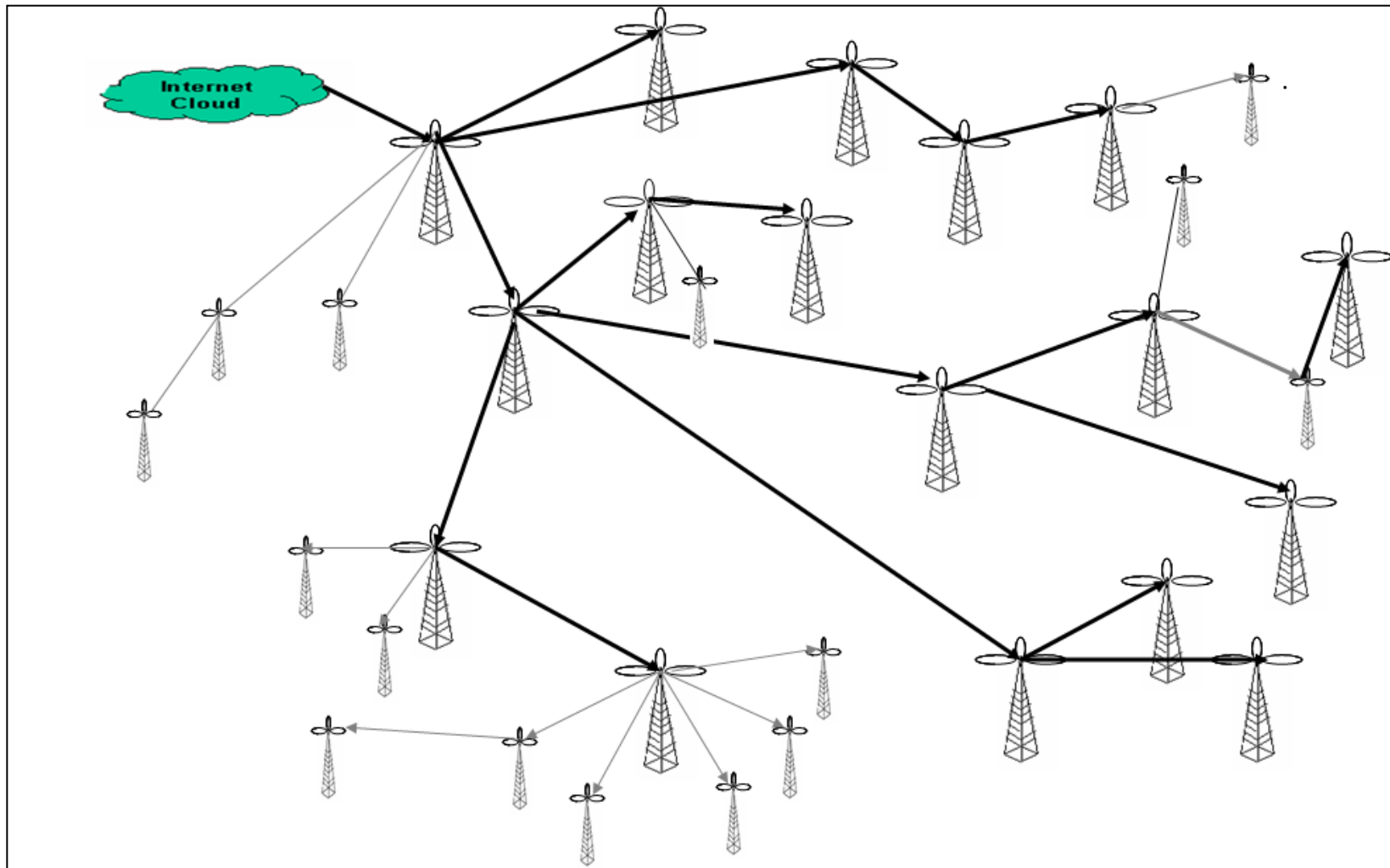
Application – Private Networks



- Corporate with Multiple Locations
- Government agencies
- Schools, Universities
- Military bases
- Motivation:
 - Save on leased Lines
 - DRP / Backup
 - Fully secured own network
 - No High Capacity infrastructure such as fiber available
 - Fast deployment - in hrs



Application – Nation Wide Private Networks



Connecting 1000 Offices



Customer: Entel, ISP, Chile

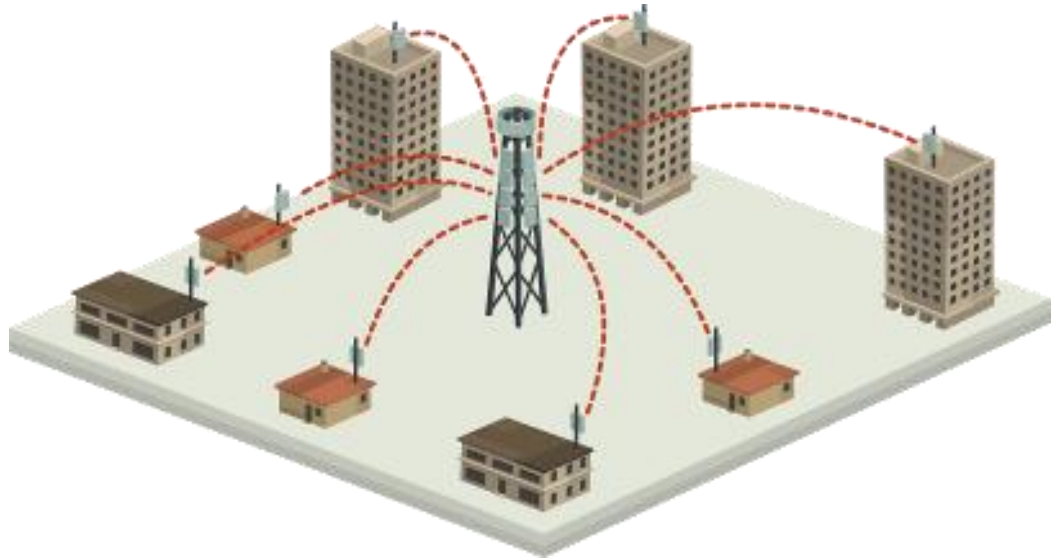
Project: Deliver broadband access to over 1000 lotto offices in Chile

Why RADWIN:

- Narrow channel bandwidth – enables installing more links simultaneously
- Robust air interface
- Reliability
- Fast supply times

Application - Access

- WISPs, ISPs
- Alternative Telcos



- Motivation:
 - Provide Internet Access & Telephony in rural areas not fully covered by the Telecom due to poor copper lines or distance
 - Compete with the Telecom on corporate clients
 - Fast deployment of own infrastructure

Data Connectivity in NYC



“This solution offered the best performance by far. It beats the competition hands-down in terms of both speed and size.”

Russell Hamm, CEO, Rainbow Broadband

rainbow
B R O A D B A N D



Customer: Rainbow Broadband, WISP, New York City, USA

Project: Provide high bandwidth services to demanding SMEs

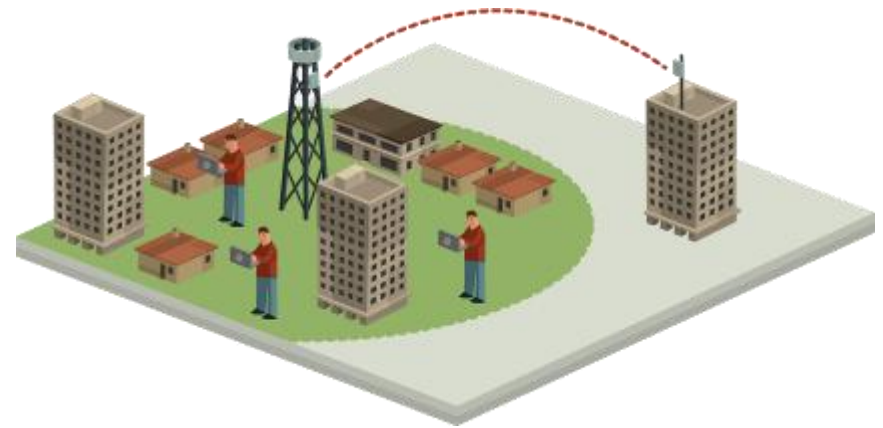
Example – Masterdisk Corp., a recording studio that needs to transfer massive files of master recordings for client approval

RADWIN Benefits:

- Replace expensive T1 leased lines with x10 higher capacity
- Perfect operation in high-interference urban environment

Applications – IP Backhaul

- WISPs and Alternative Telecoms



- Motivation:
 - Delivering 100Mbps to a remote town or business area
 - Backhaul the access last mile network
 - Wifi Access point Backhaul

Backhaul in Military environment



1.2 meter dual pole dish



- Setup in 7 minutes
- Deployed in hostile environment
- Long Range

RW2000 connectorized Radio

Largest WiFi Backhauling Network in the World – Taipei City Taiwan



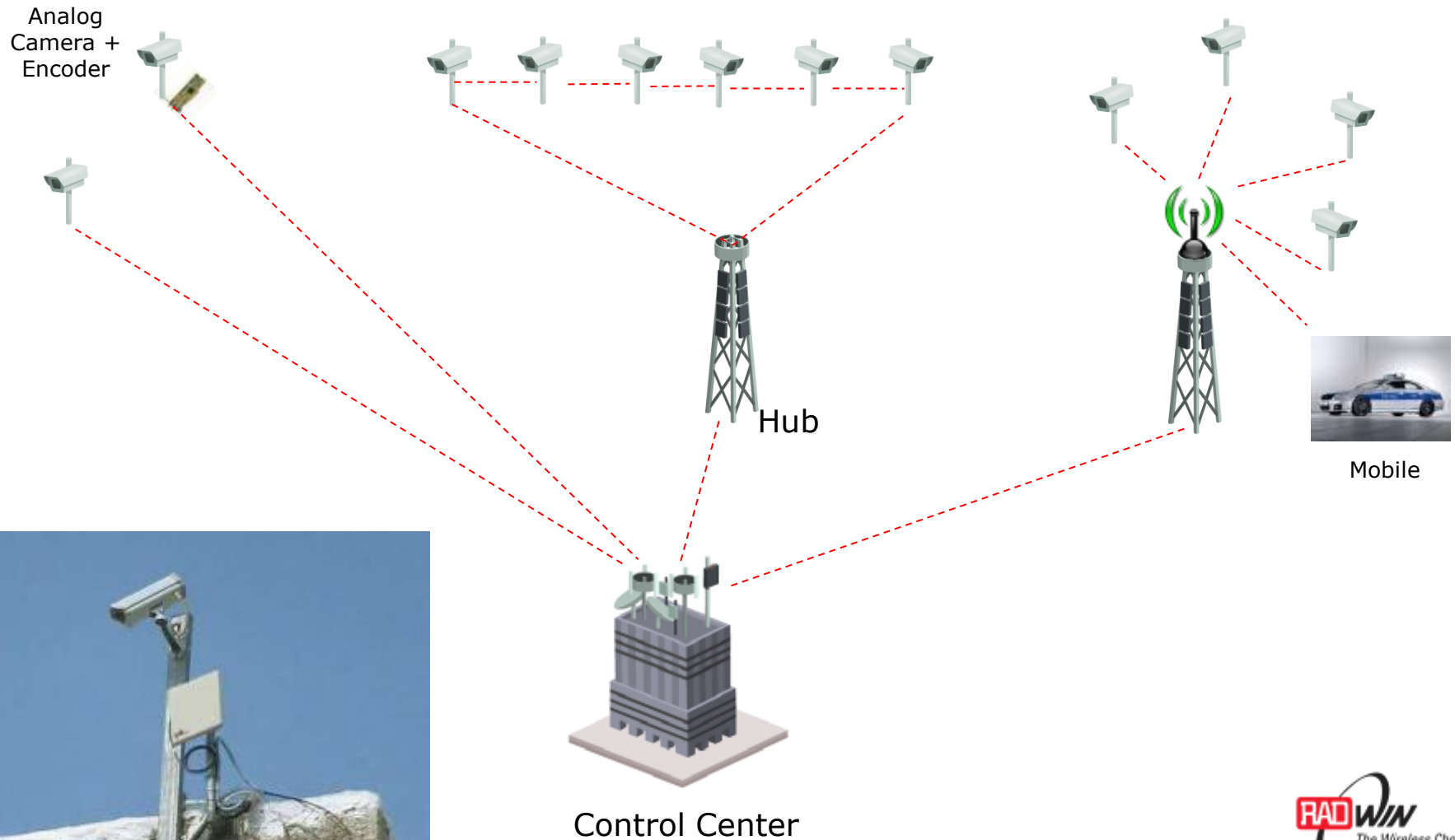
- Backhaul connectivity from outdoor WiFi Access Points to the network
- More than 1000 Ethernet links deployed
- Operates in crowded wireless environments and N-LOS conditions
- Selected due to high performance and robustness

Nomadic HLS (Home Land Security) Application

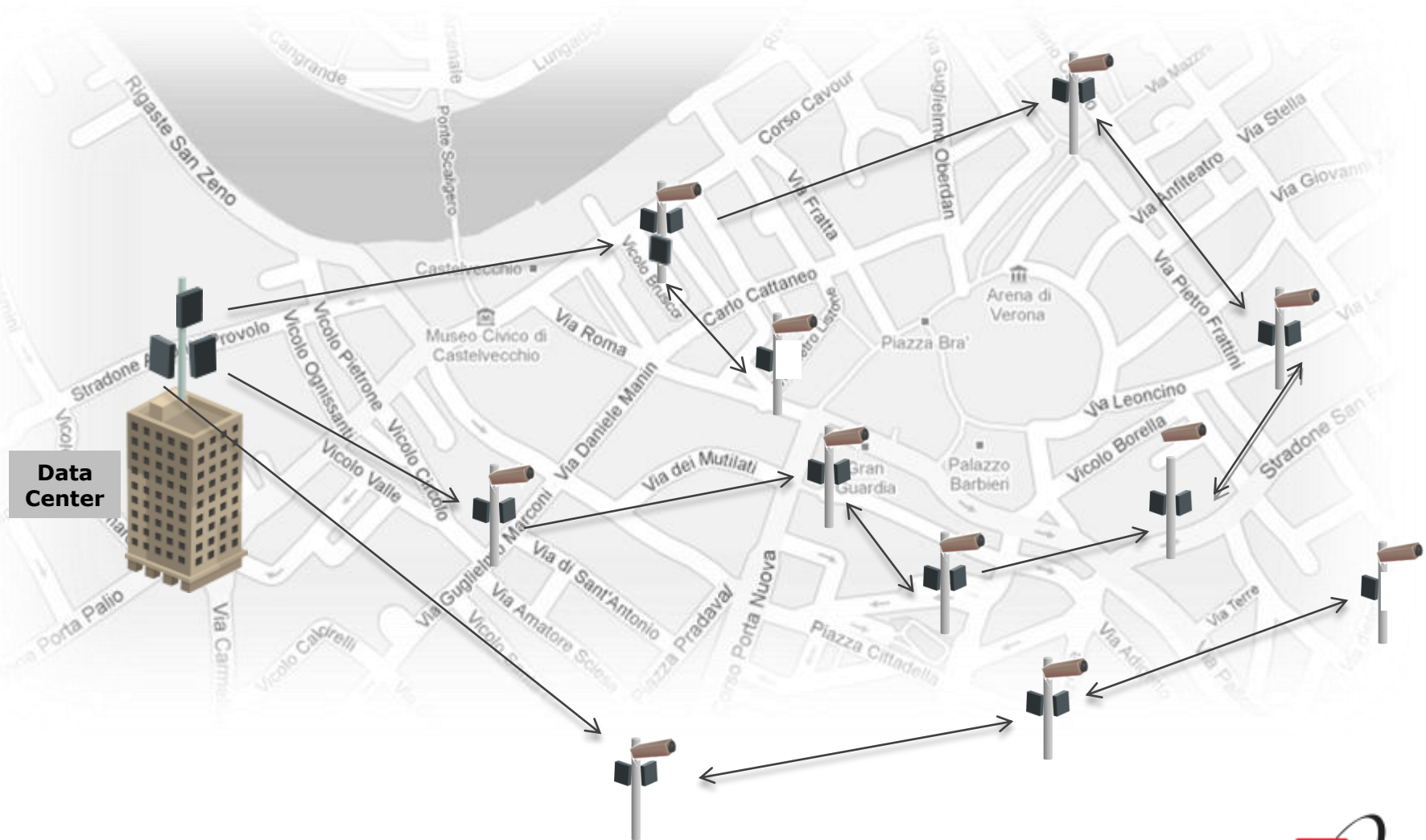


- Military Application
- Connectivity between command vehicles and headquarters
- Broadband connectivity delivering video, data and voice

Application – CCTV Networks



City Surveillance CCTV



Application – CCTV Networks

- Municipalities,
 - Police,
 - Traffic agencies,
 - Utilities,
 - Trains
 - Military
-
- Traffic, & Security surveillance



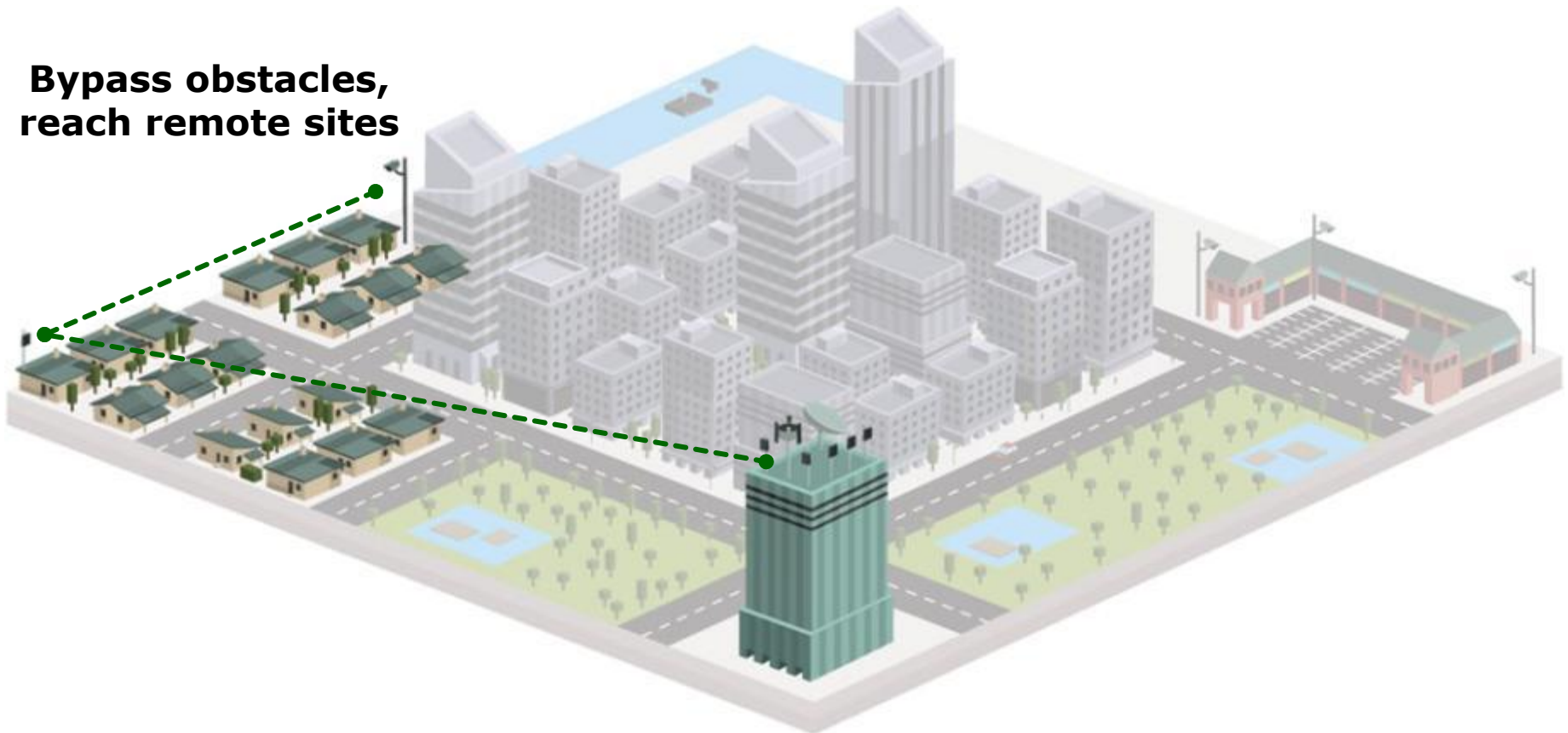
City Surveillance Scenarios



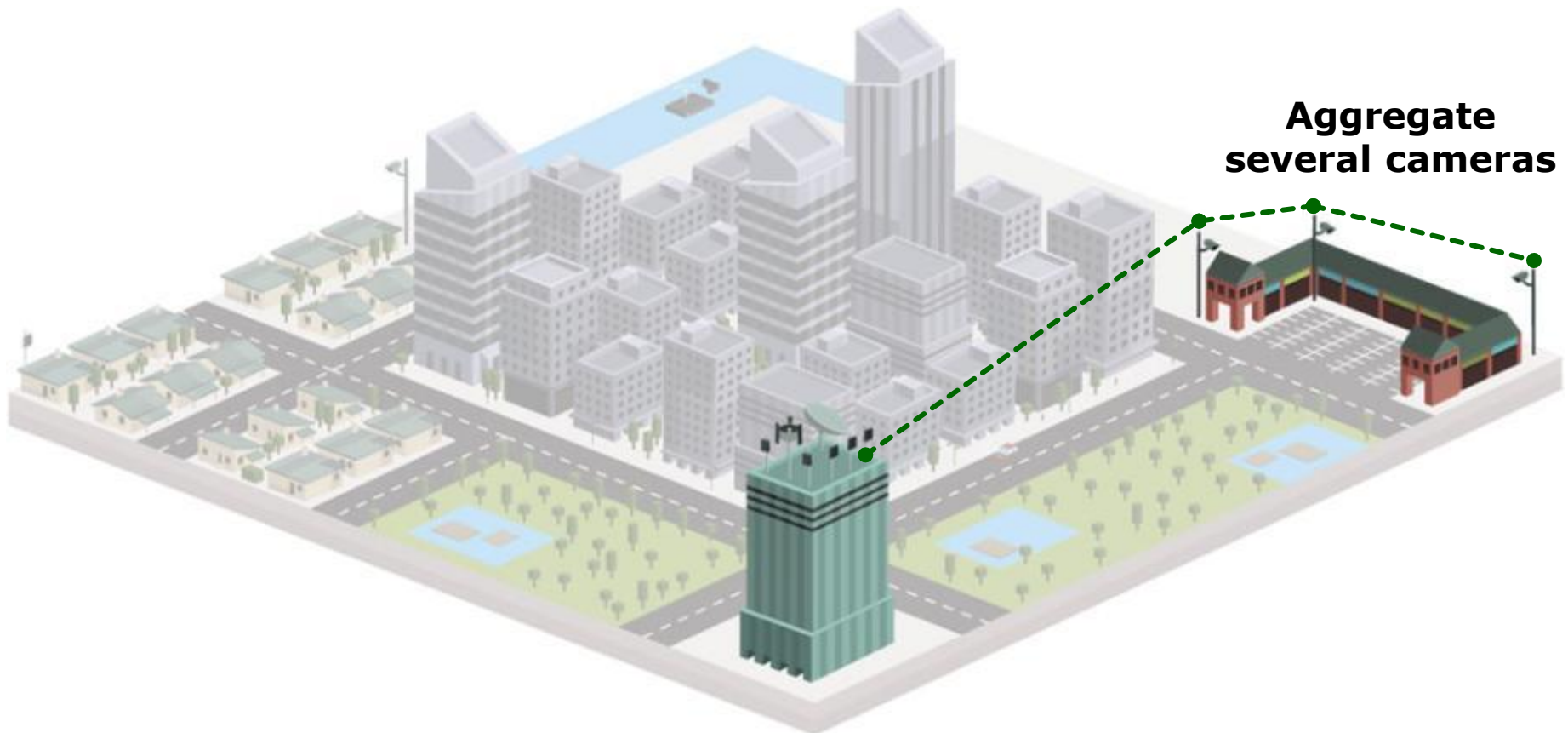
City Surveillance Scenarios



**Bypass obstacles,
reach remote sites**



City Surveillance Scenarios



**Aggregate
several cameras**

Mobility Solution – Application Diagram

