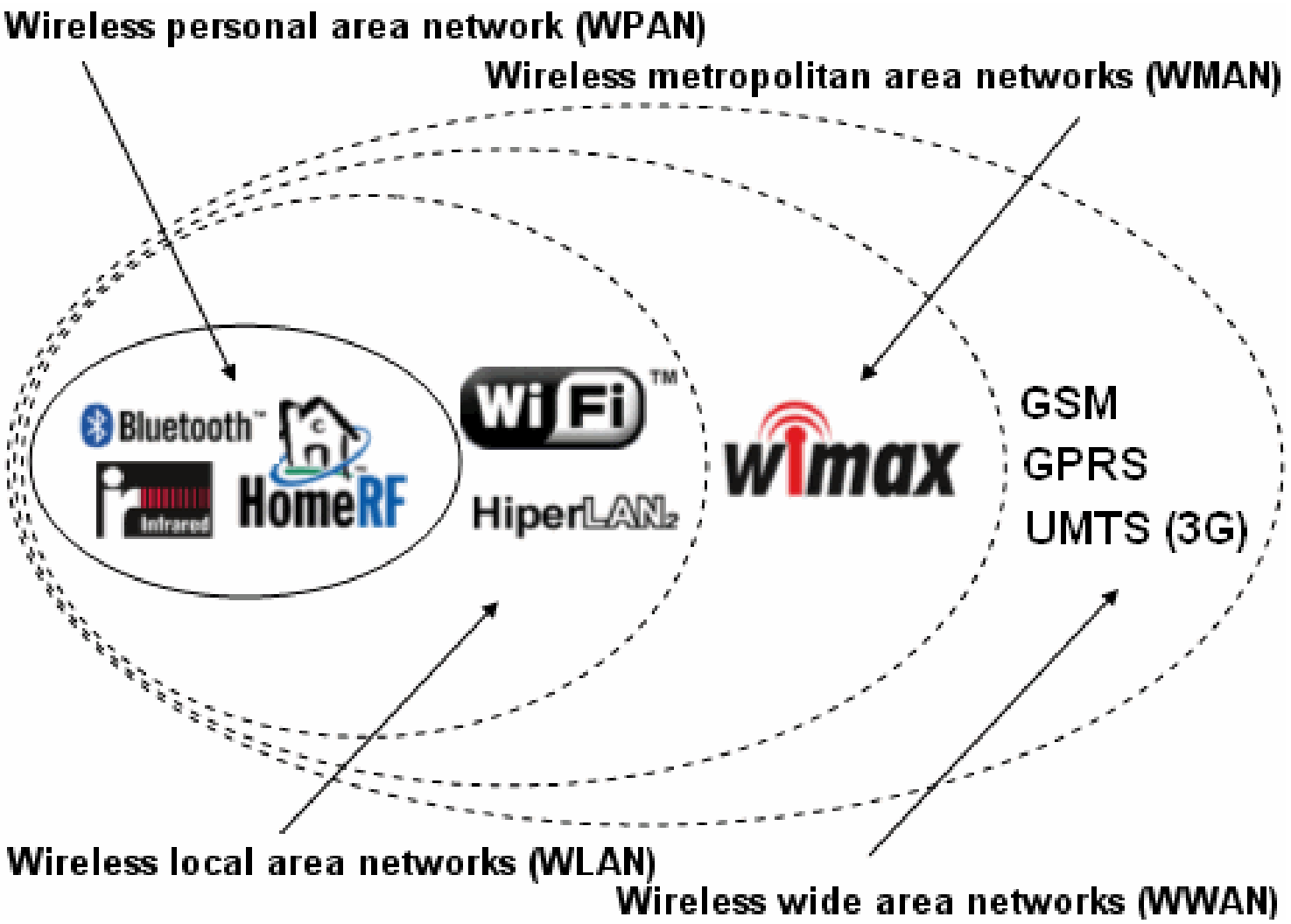
Industrial Wireless Training Kit

Global Wireless Standards



IoT Focused Segments

Intelligent

Server group
Operation, induction, comparison, analysis

Information Sharing

Interconnected

2G, 3G, 4G

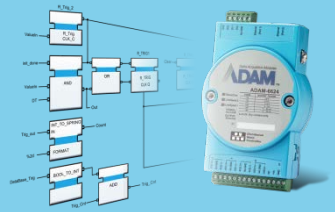
Wi-Fi

Infrastructure & Gateway

Instrumented

Remote I/O

Distributed Controller



WSN

Sensors, Pressure, Velocity, Temperature, Image

Industrial Wireless LAN Product Offering

Dual band

Single band

Multiple Function Mesh AP/CPE

EKI-6351

EKI-6340-1

EKI-6340-2

EKI-6340-3

Entry Level AP/CPE

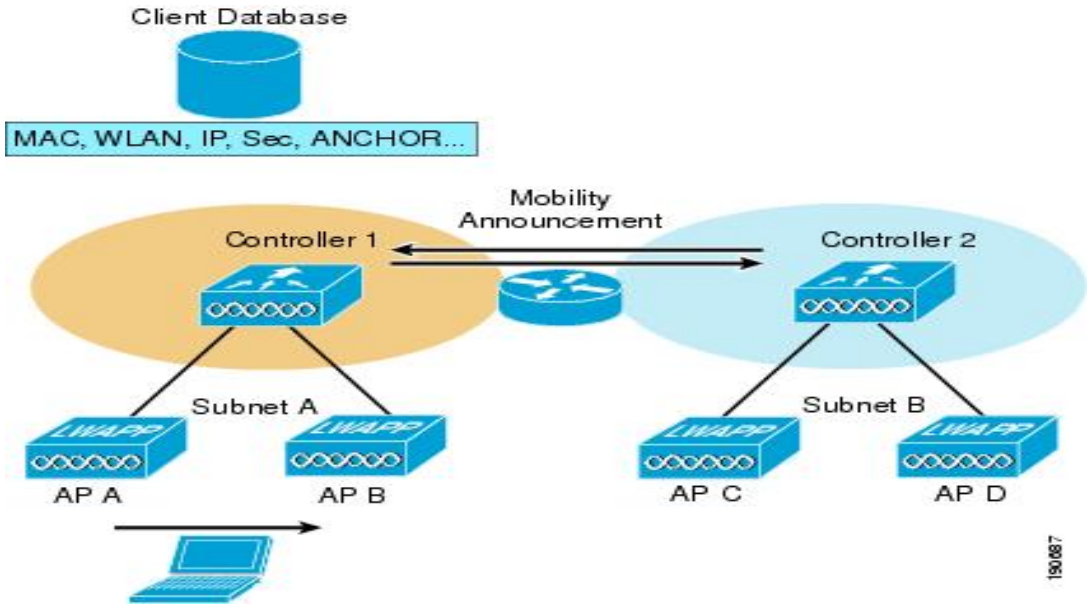
EKI-6311GN

EKI-6331AN

Single radio | Dual radio | Triple radio

Entry-Level AP/CPE
EKI-6311GN & EKI-6331AN

Types of WLAN Architecture



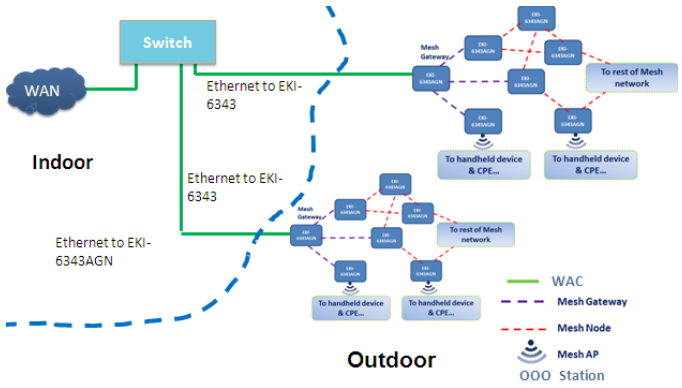
- Infrastructure mode follows Wi-Fi protocol
- Major for simple WLAN App.

Wi-Fi AP/CPE

EKI-6311GN & 6331AN

WMN Solution

- Wireless Mesh Network mode follows Wi-Fi & proprietary protocols
- Target industrial & outdoor users



802.11n MIMO Technology

Figure 1. Single Input Single Output (SISO) radio channel access mode

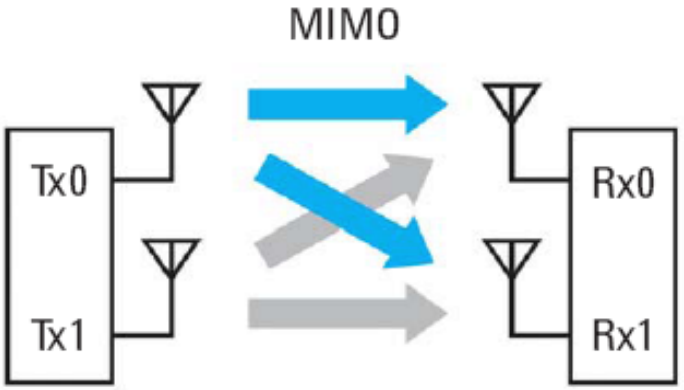


Figure 4. MIMO with two transmitters and two receivers with independent data content

MIMO (Multiple Input Multiple Output) Benefit

- **More transmission paths in Tx.**
  - **Hundreds of Mb/s in transmission.**
- **More receiving paths in Rx.**
  - **Greater reliability in received quality.**
  - **Slighter RF interference impact**

Advantech Wi-Fi AP/CPE Offering

802.11b/g/n,
w/MIMO 1X1
EKI-6311GN

802.11a/n,
w/ MIMO 2X2
EKI-6331AN

Rugged Design
• IP-55 rating housing • Embedded directional antenna • Operation temp: -20°C ~ 70°C

Rugged Design
• IP-55 rating housing • Embedded directional antenna • Operation temp: -20°C ~ 70°C

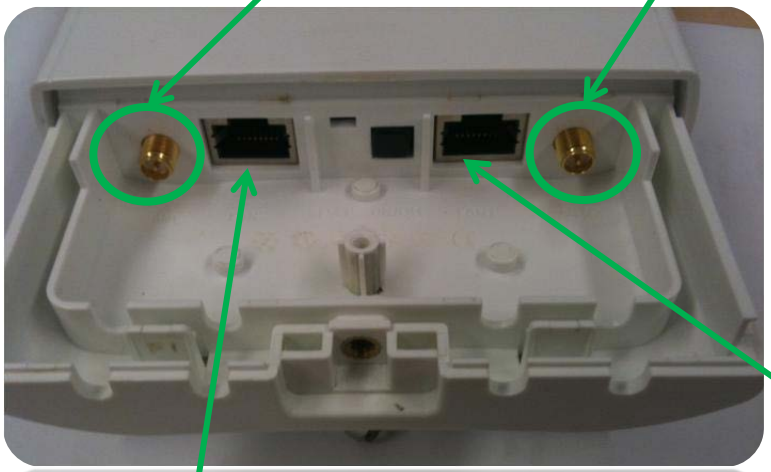
EKI-6331AN Product Introduction

- Supports IEEE802.11a/n wireless standards
  - **High throughput rate: 3 times higher than 11a**
  - **Up to 80Mbps TCP/IP throughput rate**
  - Prevent RF interference from 2.4Ghz
- Built-in MIMO 2x2 to enhance the wireless communication quality
- **Supports up to 10Km with distances with embedded 16dBi directional antenna**
- IP-55 protection grade
- Wide operating temperature range: -20~70°C
- External R-SMA connector for an optional antenna

- WEP/WPA/WPA2 Enterprise/ IEEE 802.1 x authentication security support

EKI-6331AN Product Introduction

External R-SMA connectors
for optional antennas



Passive 15V PoE Input

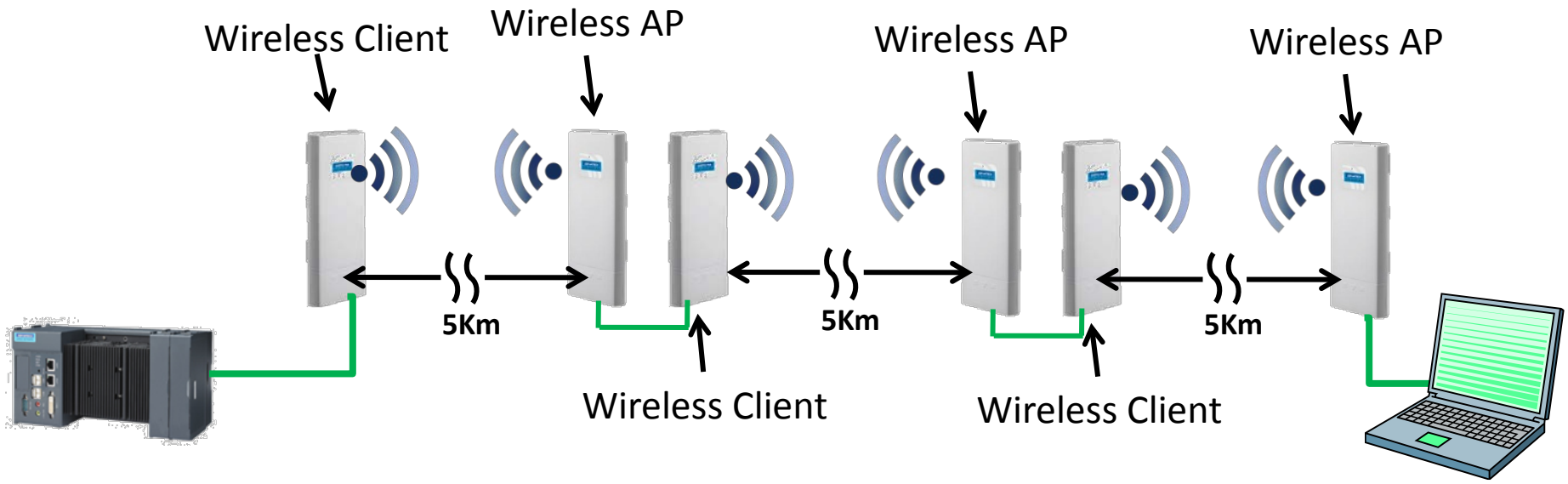
Passive 15V PoE output support
- Connects to EKI-6311GN or IP Camera

EKI-6311GN Product Introduction

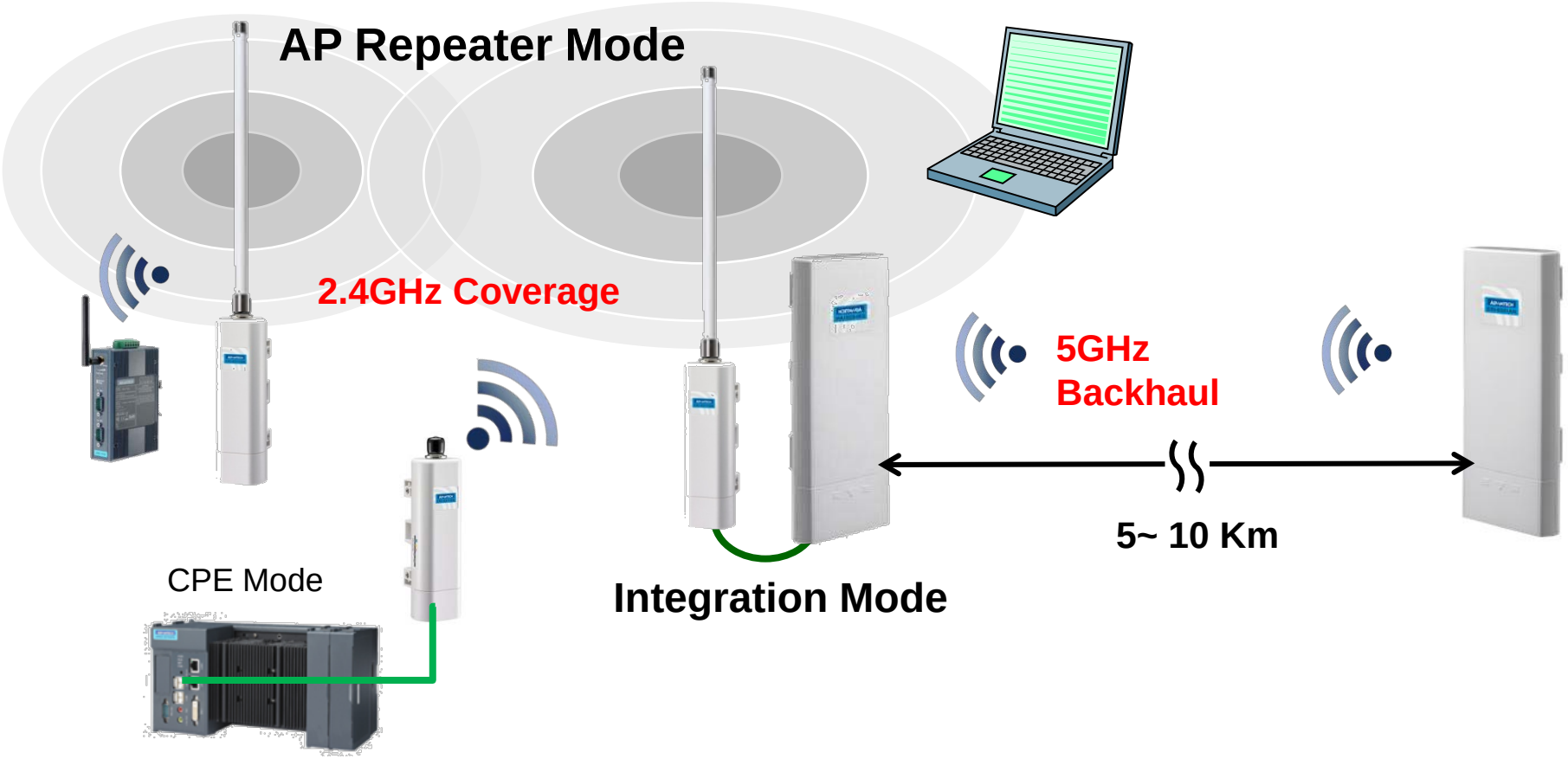
- External N-Type connector for an optional antenna
- Supports IEEE802.11 b/g/n wireless standards
  - **Higher throughput rate 3 times higher than 11g**
  - **Up to 80Mbps TCP/IP throughput rate**
- **Supports up to 10Km with distances with embedded 8 dBi directional antenna**
- **Attached with 5 dBi Omni antenna**
- IP-55 protection grade
- Wide operating temperature: -20~70°C
- WEP/WPA/WPA2 Enterprise / IEEE 802.1 x authentication security support

Daisy Chain- Extending Coverage Range

Features: Flexible operating mode in Multi-mode in AP, Client, WDS, Repeater



Integration Mode- Backhaul + Coverage



- EKI-6311GN, EKI-6331AN could also seamlessly work together to provide excellent 11n performance for middle-range backhaul + coverage solution.

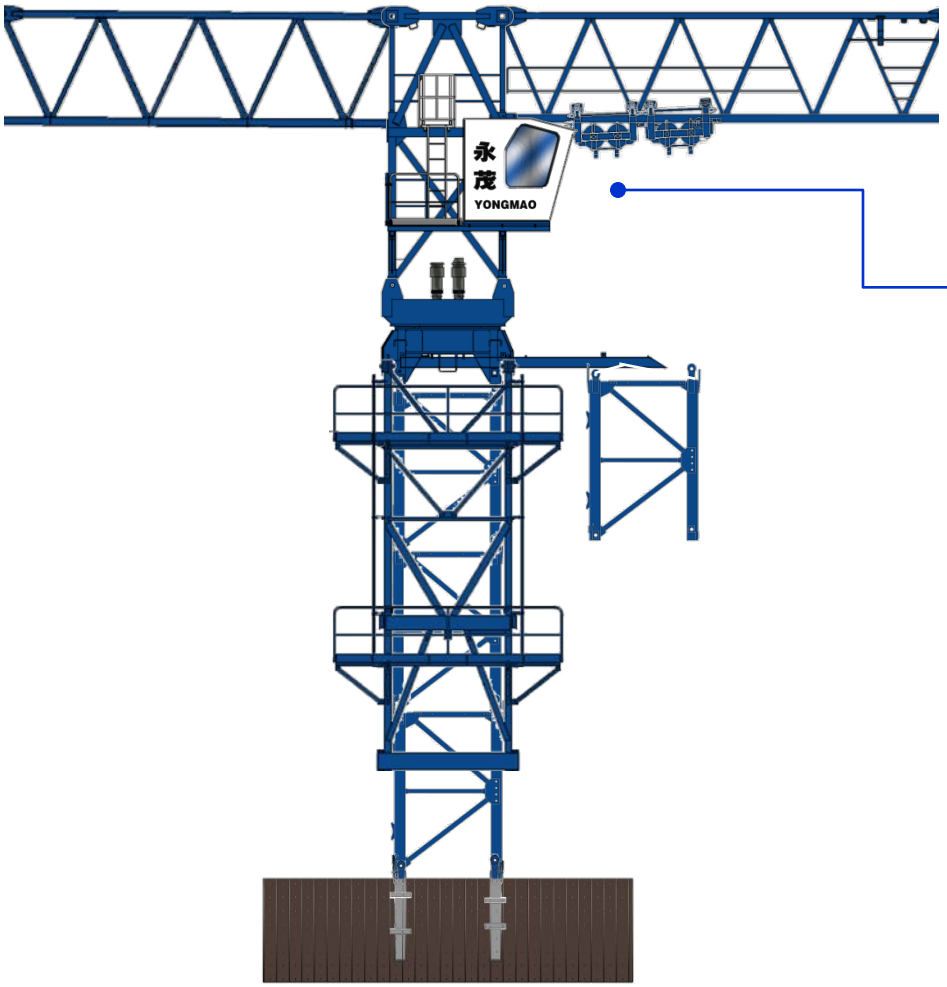
Application(1): Man-less Factory Monitoring

- ✓ Ease of installation
- ✓ High Throughput

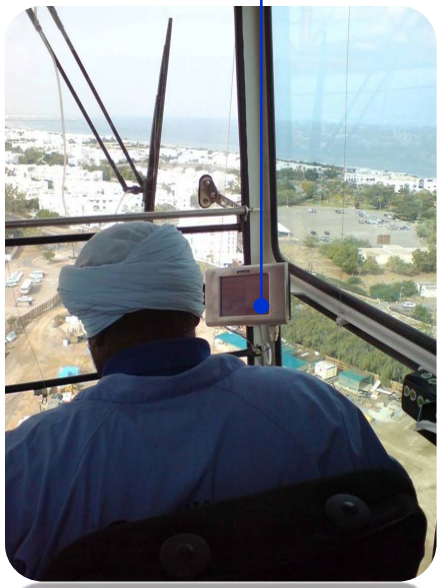
- Factory Area monitor
- Wireless Data transmission

Application(2): Coal Mining in China

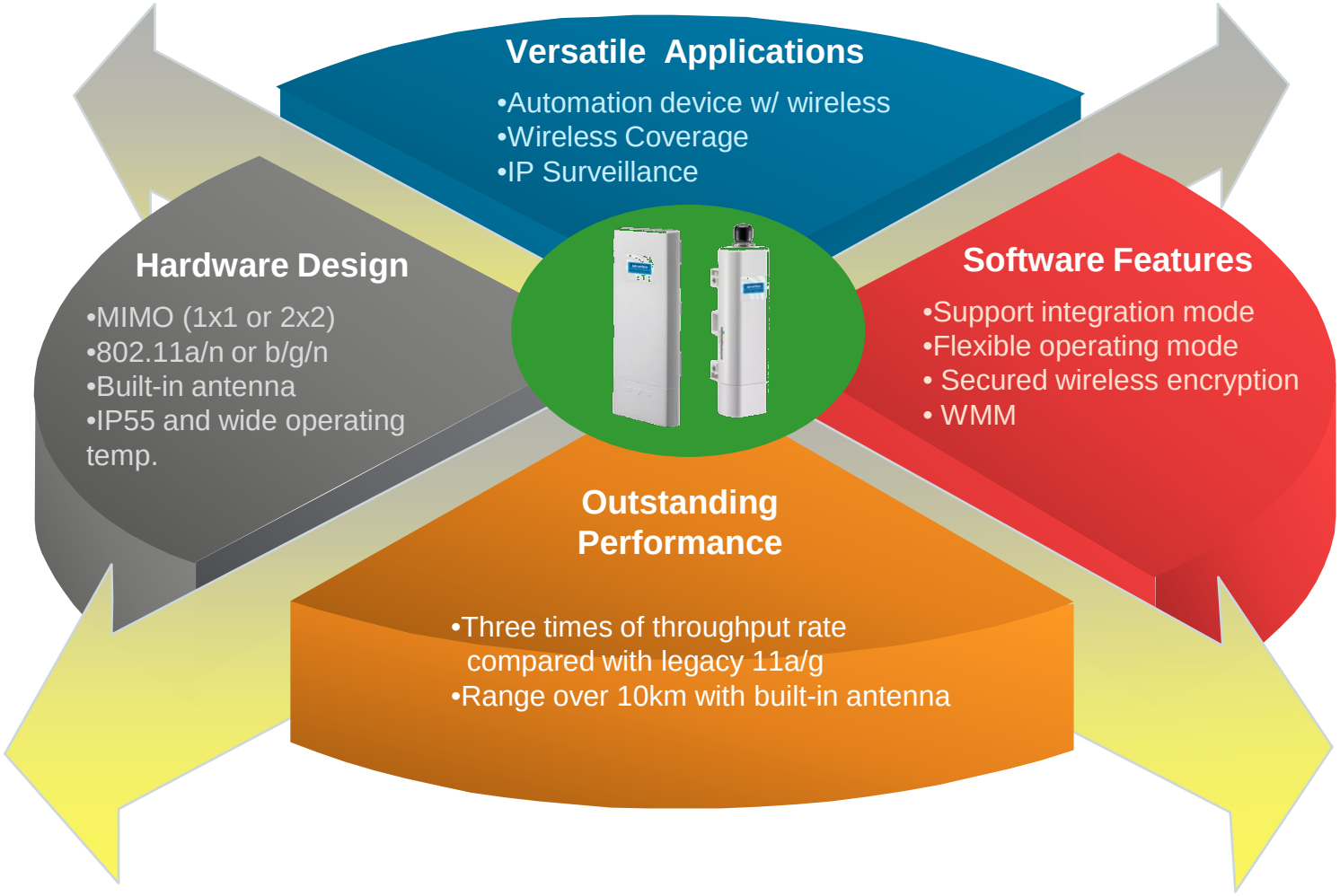
Application(3): P-2-P for Crane Anti-Collision



EKI-6331AN
802.11n Wireless AP

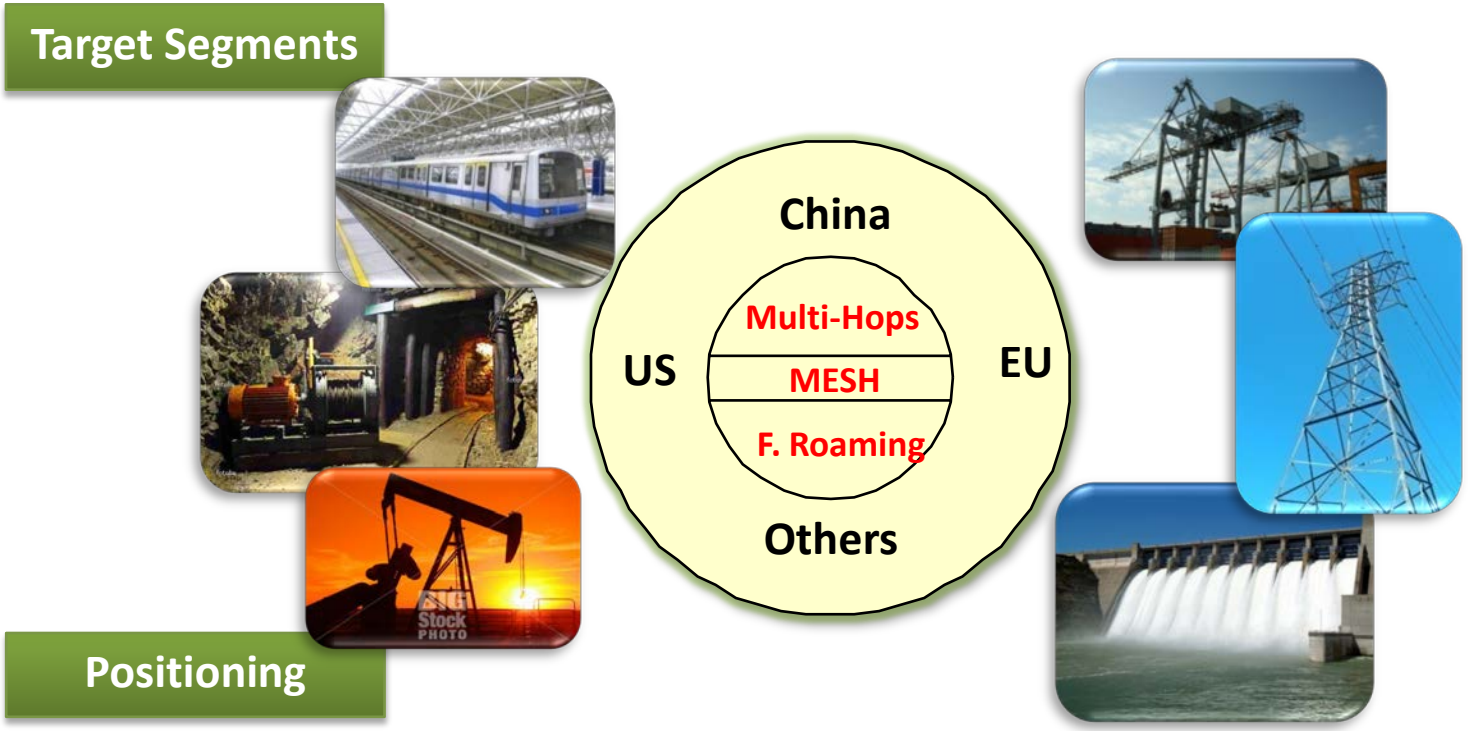


EKI-6331AN/ 6311GN Key Selling Points



EKI-6340
Industrial Wireless Mesh AP

TA Segments & Product positioning



EKI-6340 & EKI-6351 are the Industrial Wireless MESH System
providing quick and reliable deployment and seamless wireless data communication to free customer from concerns on communication loss

Offered Values by EKI-6340 Series

	Features	Performance
Functional Perspective	IEEE 802.11n+MIMO	300Mbps data rate
	Network Auto-healing	Self-healing
	Multi-hopping	Throughput ≥100 Mbps @ 10 hops
	Fast roaming	Handover switching time ≤20ms
	Security	WPA, WPA2-PSK/ EAP, 802.11i
Usage Perspective	Graphical “Ping” Utility	Graphical on-line tool
	RSSI Calculator	Graphical antenna gain calculation tool
	Fresnel Zone Calculator	Graphical antenna & device installation guiding tool
	Antenna Alignment Tool	

Target Markets for Wireless Mesh AP

- Automated Guided Vehicles

- Docks

- Open coal mines

EKI-6340 Series

Outdoor Wireless Mesh AP

EKI-6340-1

EKI-6340-2

EKI-6340-3

EKI-6341
EKI-6342
EKI-6343

- -Mesh (Self-forming & Self-healing)
- - Multi-hopping w/high throughput
- - Ultra fast roaming
- - MIMO 2x2
- -35~75℃
- - 12~48V_{DC} / PoE Supply
- - High security
- -IP67 protection

EKI-6351

Wireless Mesh AP/ Station

EKI-6351

EKI-6351

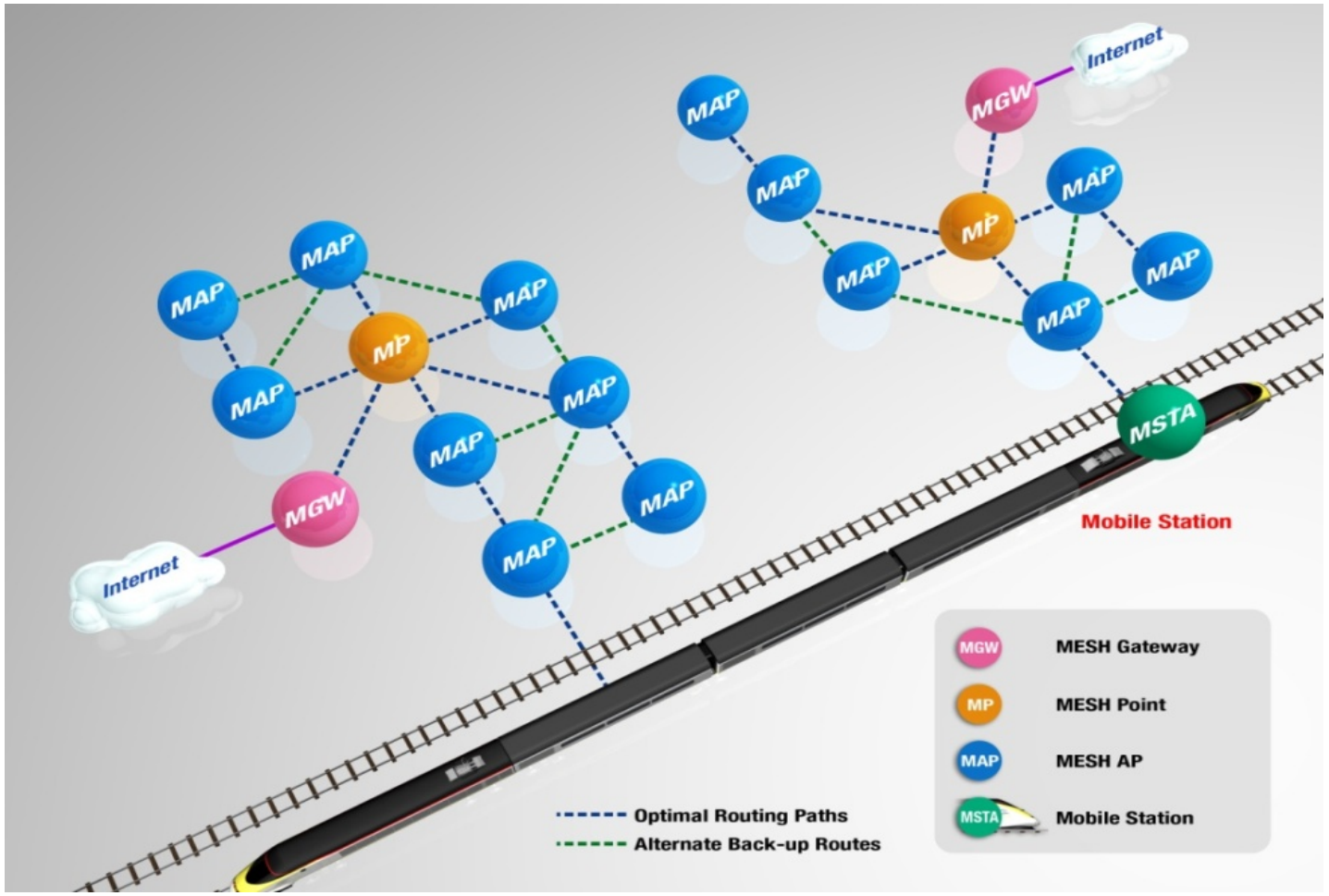
- Mesh (Self-forming & Self-healing)
- Ultra fast roaming
- IP30 protection
- -35℃~ 75℃
- Support 12-48V_{DC}
- Support 802.3at PoE
- Dual-band (2.4GHz/5GHz)
- MIMO 2x2

Position of Each Model in System

EKI-6340-1	EKI-6340-2	EKI-6340-3	EKI-6351
			
Fast roaming AP -road side with fiber cables installed	**Multi-Hopping App.** -Extend wireless signal coverage along river, railroad, highway or inside tunnel	**Mesh Points or Multi-Hopping App.** -Community, campus, park or factory side -As backhaul for road side without fiber cables installed	**Mesh Station** -Indoor client station

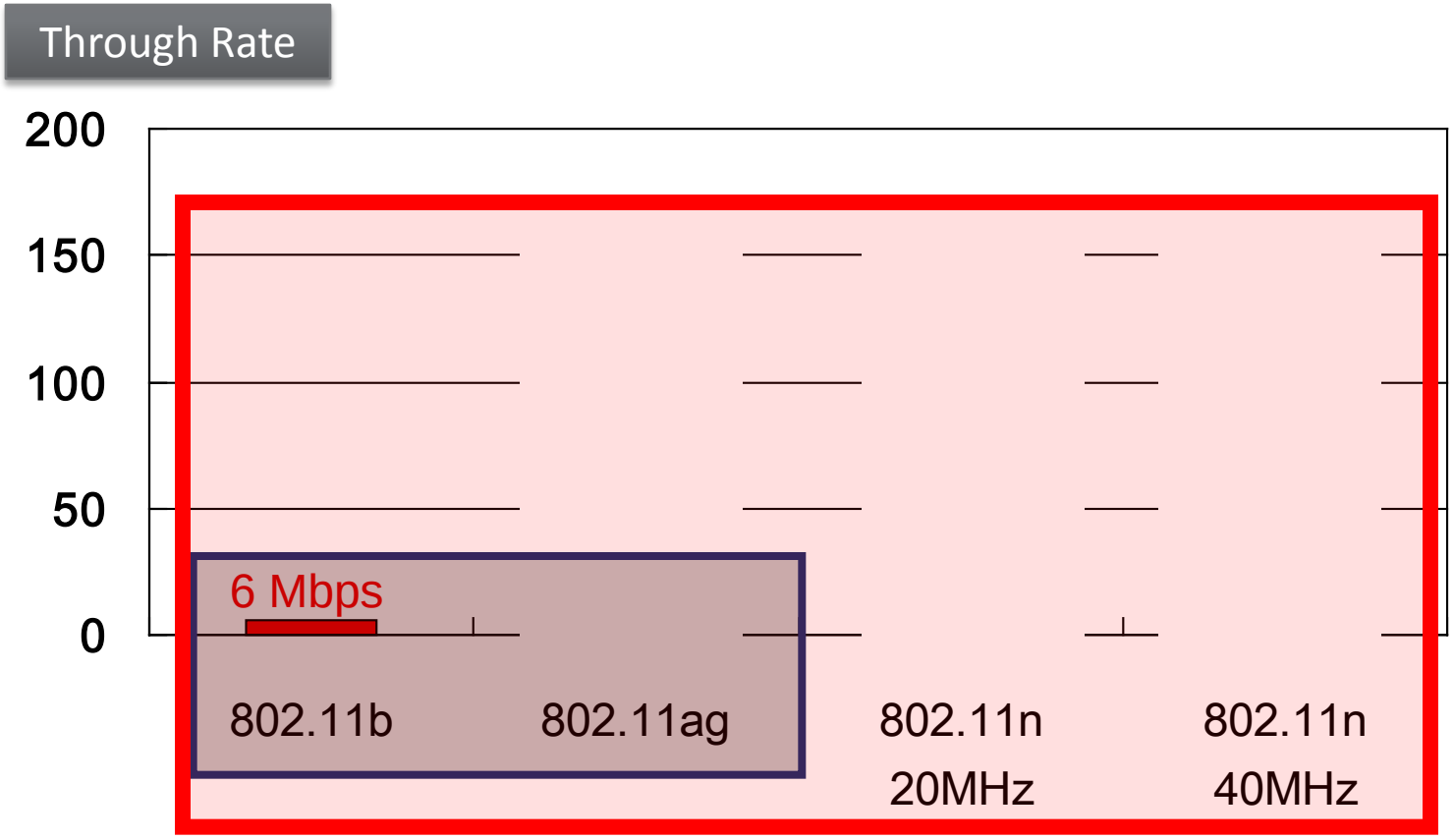
Wireless MESH Network Structure

Reliable Network & Ultra Fast Roaming



IEEE 802.11n

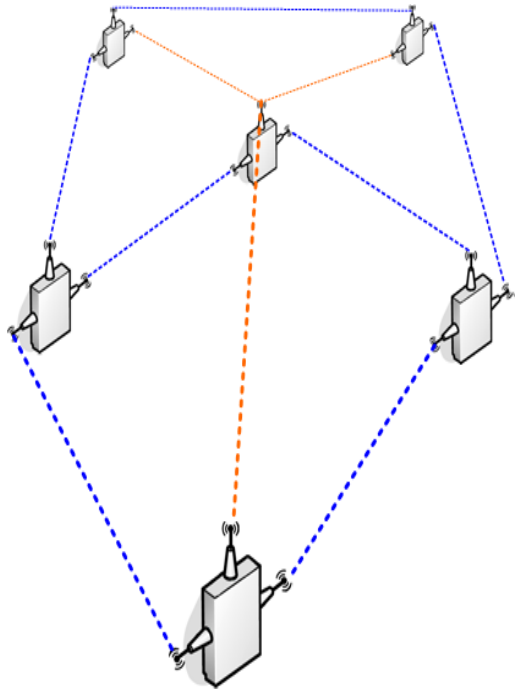
Significant Throughput Improvement



- 802.11n performances are based on 2 Spatial Steams
- 802.11n 2X2 throughput is around 170 Mbps (Data rate: 300M bps)
- 802.11 a/g is around 27 Mbps (Data rate: 54M bps)

Self-Forming & Healing Algorithm

- The self-healing and route choosing algorithms is following the calculation of number of hops and radio signal quality.
- Each wireless connection in a wireless mesh network will have a "*path score*" to represent the signal quality between nodes.
- A *path score* calculation includes RSSI , noise level and bandwidth flow information.
- A number of hops from source to destination will be minor consideration in routing algorithm.



Fast-roaming Algorithm

- Fast roaming is the unique feature of Mesh Station (EKI-6351, not regular Wi-Fi clients)
- Mesh APs are set to periodically & proactively broadcast info. to nearby Mesh Stations.
- The Mesh Stations those who are under the coverage of Mesh APs can periodically generate a list of "*path score*" .
- Once a new "*path score*" is generated and it's better than the "*path score*" of current link, the Mesh Station will handover to another Mesh AP right away without going the procedure of authentication & association.
- The reason that Mesh Station doesn't need to process the authentication & association at the occasion of each handover because those two steps were done already as the Mesh Station joined this Mesh System by processing the registration.

Reference against Competitors

	Brand	Advantech	Motorola	Motorola	Cisco	Moxa
	Model	EKI-6340-3	AP 7161	AP 5181	Aaironet 1552E	AWK-4131
	Photo					
Wireless	**Wi-Fi**	**802.11 a/b/g/n**	**802.11 a/b/g/n**	**802.11 a/b/g**	**802.11 a/b/g/n**	**802.11 a/b/g/n**
	Freq.	**2.4/ 5 Ghz**	**2.4/ 5 Ghz**	**2.4/ 5 Ghz**	**2.4/ 5 Ghz**	**2.4/ 5 Ghz**
	MIMO	**2X2**	**3x3**	**SISO**	**2x3**	**2x2**
	Radio #	**3**	**2**	**2**	**2**	**1**
Ethernet	Port #	1	1	1	1	1
	Speed	10/100/1000	?	10/100	10/100/1000	10/100/1000
	Fiber	n/a			Fiber SFP	1000 baseSFP
Operation	**MESH**	**Y**	**Y**	**Y**	**Y**	**n/a**
	Fast roaming	**< 20 ms**	**?**	**?**	**?**	**Controller-based**
	Muti-hopping	**Y**	**?**	**?**	**?**	**?**
	AP/CPE	**Y**	**Y**	**Y**	**Y**	**Y**
Power	PoE	802.3at	802.3at	802.3af	802.3af	802.3af
	Input voltage	12~48 Vdc	36~57Vdc	48dc	12 Vdc	12~48 Vdc
	Redudant DC power input	Y	?	?	?	Y
Reliability	IP rating	67	67	56	67	68
Temperature	Operation	-35~75	-40~70	-30~55	-40 to 55°C	-40 to 75°C
Warranty		5 yrs	1 yr	1 yr	90 days	5 yrs

Target Application & Industries

App. Industry	Selling Points
Oil field video monitoring	Multi-hopping and high throughput rate
Driving school exam. system	High throughput rate, fast roaming
Off-shore video monitoring	Mesh(self-forming & self-healing)
Harbor container management	Mesh & high throughput rate
Electric power tower video monitoring	Multi-hopping and high throughput rat
Factory site video monitoring	Multi-hopping and high throughput rate

Oil Field Application

Fully meet application requirements:

Multi-hopping

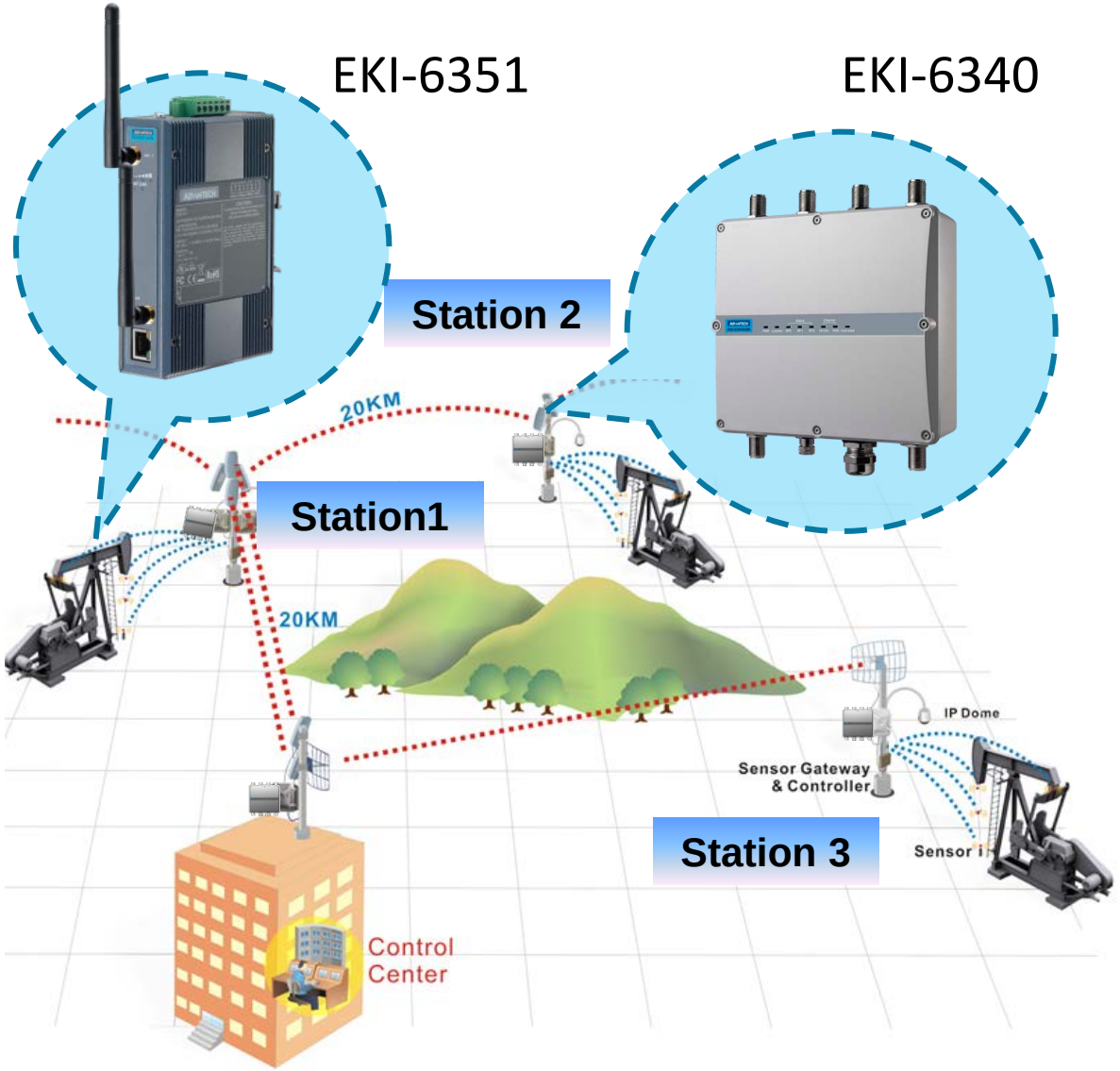
- Throughput≥150 Mbps @ 2 hops
- Throughput ≥100 Mbps @ 10 hops

Mesh Network

- Self-healing

Anti-harsh environment

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.: -35~75℃



Open Cut Coal Mine

Fully met application requirements:

Multi-hopping

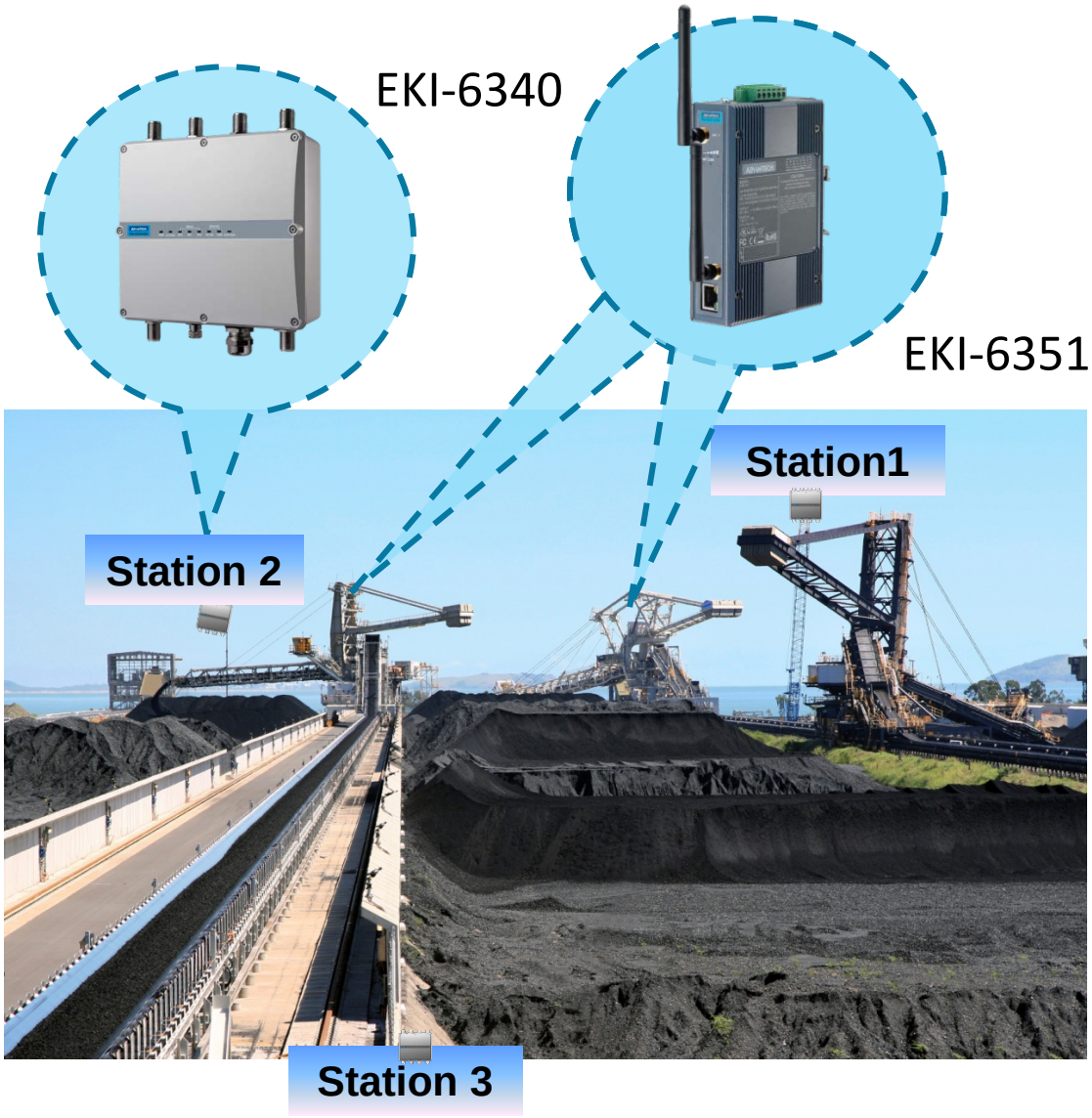
- Throughput ≥150 Mbps @ 2 hops
- Throughput ≥100 Mbps @ 10 hops

Mesh Network

- Self-healing

Works in harsh environments

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.: -35~75℃



Transportation Application

Fully meet application requirements:

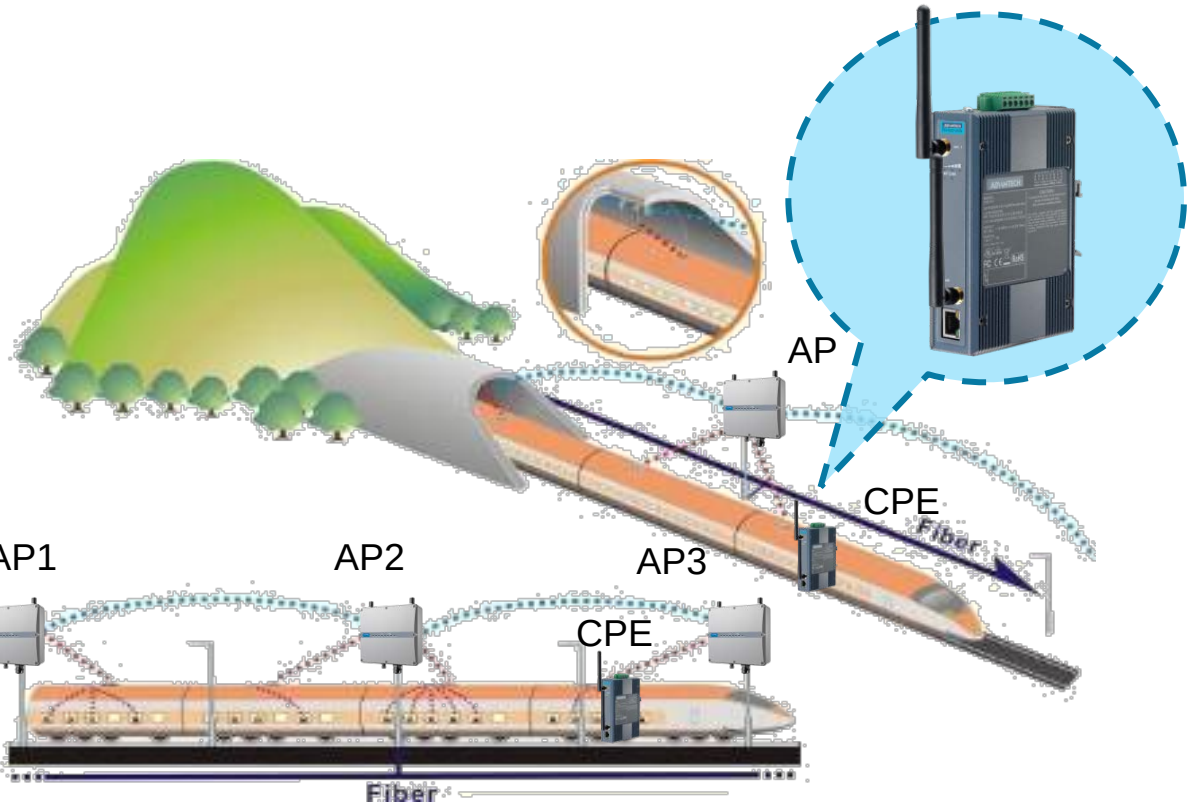
Fast roaming: ≤20ms

High throughput: ≥ 100Mbps

Anti-harsh environment

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.: -35~75℃

EKI-6351

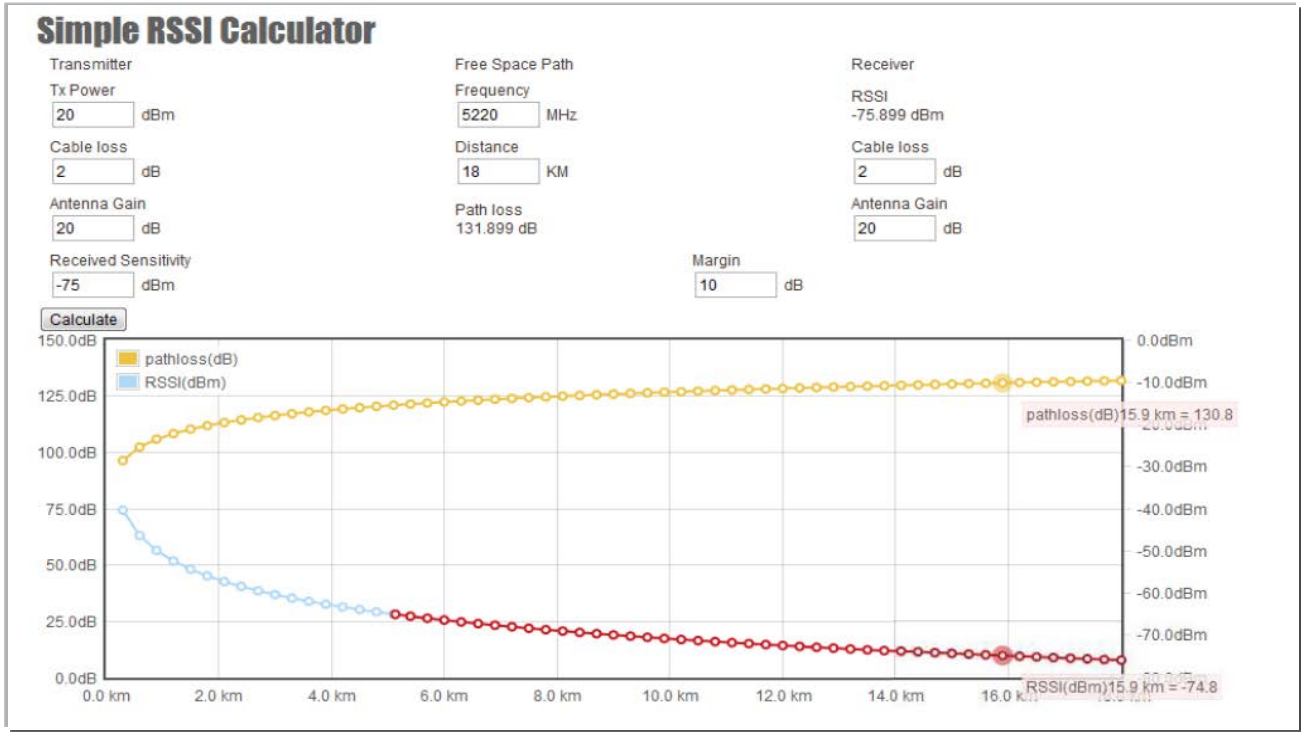


EKI-6340

Valuable Tools for Installation & Antenna / Accessory Kits

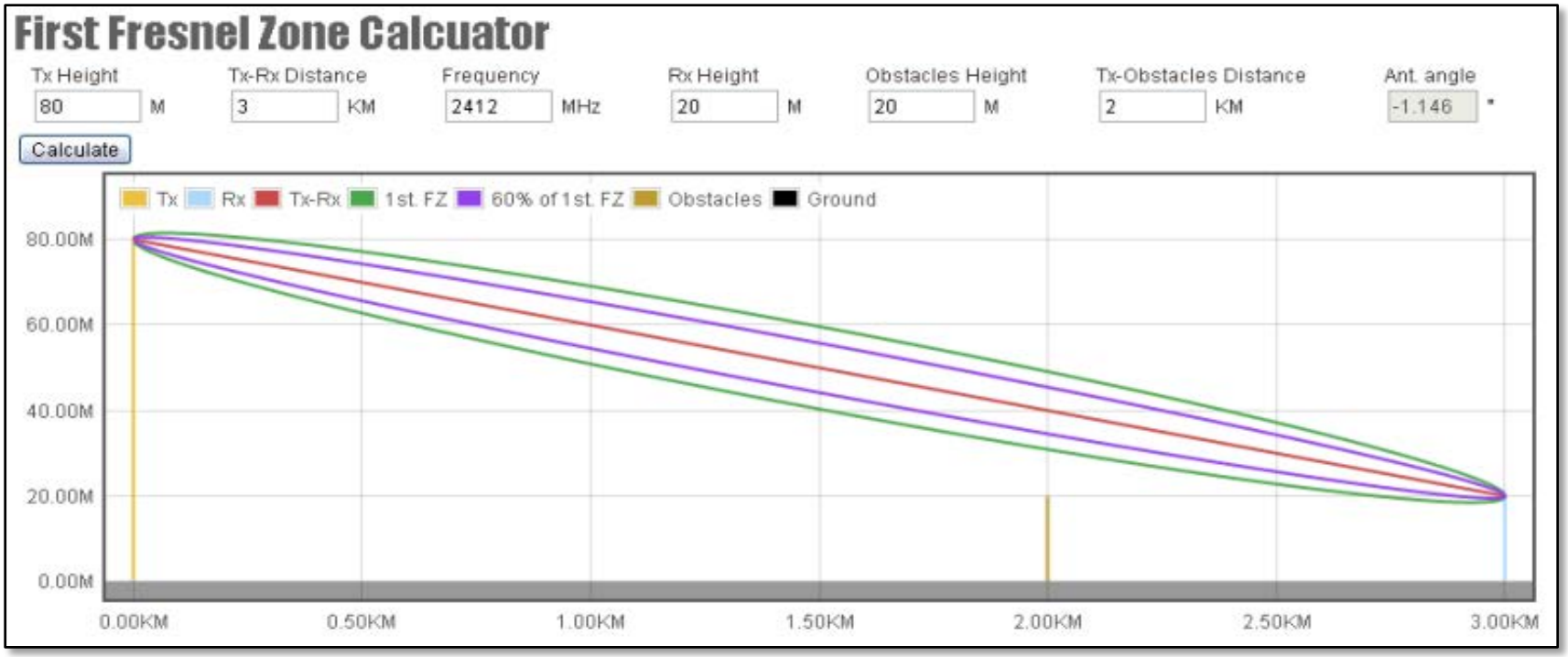
RSSI Calculator

RSSI(Received Signal Strength Indication)



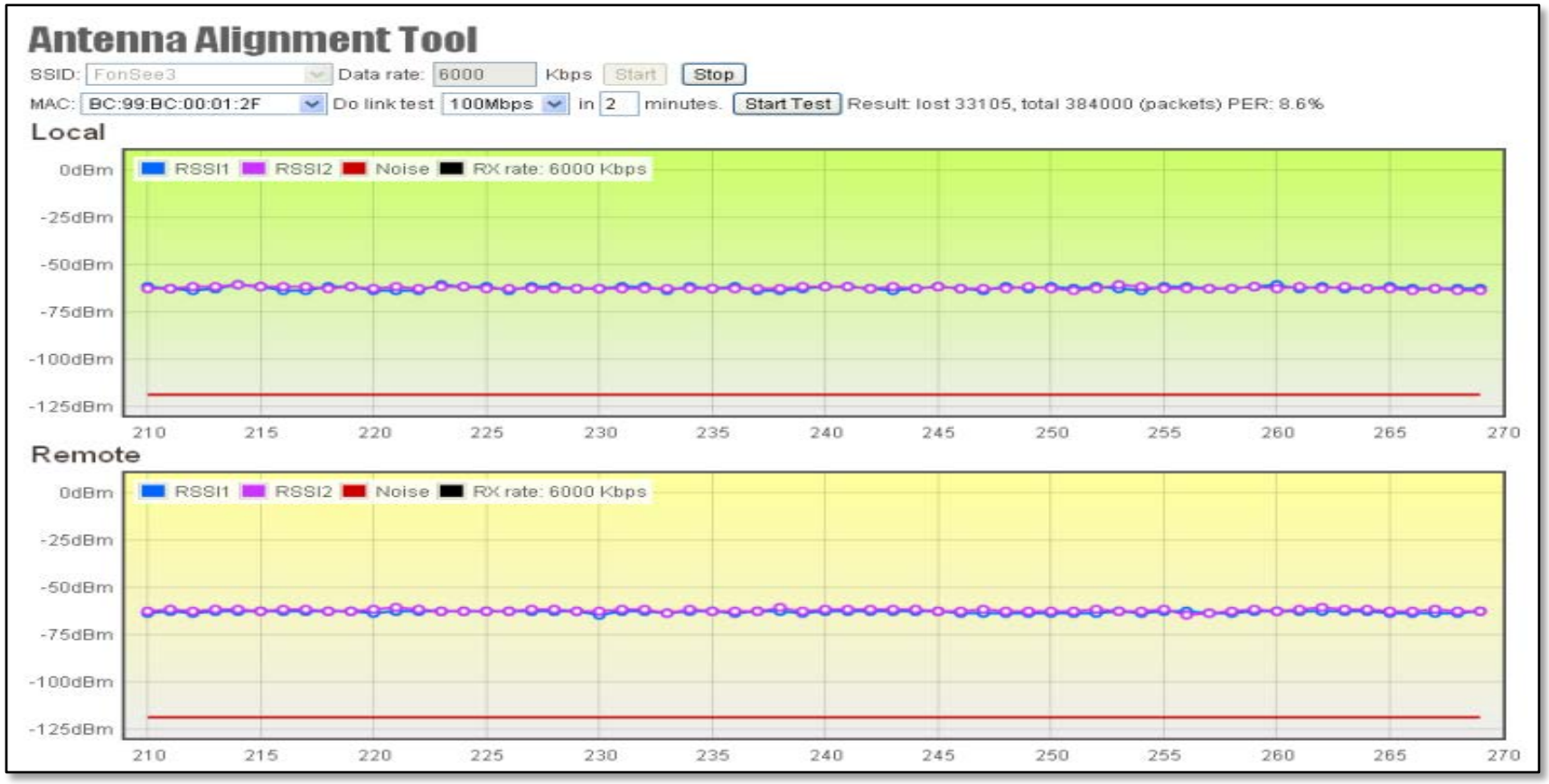
1. Simple RSSI Calculator estimate likely RSSI & path loss
2. Help evaluate selected cable loss & antenna gain by inputting device Tx power and frequency on transmitting and receiving side.
3. Graphically display changes of path loss and RSSI.

Fresnel Zone Calculator



1. The Calculator can estimate the likely obstruction from existing object between two devices
2. The calculator of ***antenna angle*** calculation can help align the vertical angle of the directional antenna.

Antenna Alignment Tool



1. The tool aligns and checks the antenna directions.
2. Graphically present RSSI changes in figure help adjust the directional antenna's horizontal and vertical angle to get the best RSSI level.

Antenna, Normal function







Advantech P/N	ANT-1208-G2E	ANT-2209-G2E	ANT-2216-G2E	ANT-3215-G2E	ANT-1208-G5E	ANT-2218-G5E	ANT-3213-G5E
Frequency Range	2.4-2.5G	2.4-2.5G	2.4-2.5G	2.4-2.5G	4.9-5.35G	4.9-5.9G	4.9-5.9G
Antenna Type	Omni	Patch	Patch	Sector	Omni	Patch	Sector
Antenna Gain	8 dBi	9.5 dBi	16 dBi	15 dBi	8 dBi	18 dBi	13.5 dBi
Impedance	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm
Polarization	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical
HPBW/Vertical	360/15	50/50	25/25	90/8	360/12	23/19	120/6
V.S.W.R.	2.0:1 (Max.)	1.5:1 (Max.)	1.5:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)
Power Handling	20 W (cw)	20 W (cw)	20 W (cw)	50 W (cw)	20 W (cw)	5 W (cw)	10 W (cw)
Connector	N-Jack	N-Jack	N-Jack	N-Jack	N-Jack	N-Jack	N-Jack
Conntector Q'ty	1	1	1	1	1	1	1
Operating temp.	-40 to +80	-40 to +80	-40 to +80	-40 to +80	-40 to +80	-40 to +80	-40 to +80
IP rating	IP55	IP45	IP57	IP55	IP55	IP55	IP55
Weight	0.34 kg	0.14 kg	1.5 kg	1 kg	0.28 kg	0.825 kg	0.55 kg

Antenna, Dual Function (Freq., or Antenna)

Advantech P/N	ANT-2216M-G2E	ANT-3214M-G2E	ANT-2216M-G5E	ANT-3215M-G5E	ANT-1205D-G25E	ANT-1210D-G25E	ANT-2215D-G25E	ANT-3215D-G25E
Frequency Range	2.4-2.5G	2.4-2.5G	5.1-5.9G	5.1-5.9G	2.4-5G; 5.1-5.9G	2.4-5G; 5.1-5.9G	2.4-5G; 5.1-5.9G	2.4-5G; 4.9-5.9G
Antenna Type	Patch	Sector	Patch	Sector	Omni	Omni	Patch	Sector
Antenna Gain	16 dBi	14 dBi	16 dBi	15 dBi	4/7 dBi	8/10 dBi	13.5/15.5 dBi	12/15 dBi
Impedance	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm
Polarization	Linear, vertical/horizontal	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical	Linear, vertical
HPBW/Vertical	25/25	90/13	19/21	90/8	360/30	360/13	30/30	70/18
V.S.W.R.	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)	2.0:1 (Max.)
Power Handling	6 W (cw)	10 W (cw)	6 W (cw)	6 W (cw)	2 W (cw)	5 W (cw)	10 W (cw)	10 W (cw)
Connector	N-Jack	N-Jack	N-Jack	N-Jack	N-Plug	N-Jack	N-Jack	N-Jack
Conntector Q'ty	2	2	2	2	1	1	1	1
Operating temp.	-40 to +80	-40 to +80	-40 to +80	-40 to +80	-40 to +70	-40 to +80	-40 to +80	-40 to +80
IP rating	IP67	IP55	IP55	IP55	IP55	IP67	IP55	IP55
Weight	1.1 kg	0.8 kg	0.8 kg	1.4 kg	0.07 kg	0.394 kg	0.4 kg	0.462 kg

Antenna Cable, Surge Protector






Advantech P/N	ANT-5115	ANT-5130	ANT-5210	ANT-5230	ANT-5260	ANT-5290
Description	1.5M N-Plug to SMA-Plug cable	3M N-Plug to SMA-Plug cable	1M N-Plug to N-Plug cable	3M N-Plug to N-Plug cable	6M N-Plug to N-Plug cable	9M N-Plug to N-Plug cable
Cable Type	ULA-168	ULA-168	ULA400	ULA400	ULA400	ULA400
VSWR	1.5 : 1 Max.@ DC~3.0 GHz 2.0 : 1 Max.@ 3.0~6.0 GHz	1.5 : 1 Max.@ DC~3.0 GHz 2.0 : 1 Max.@ 3.0~6.0 GHz	1.5 : 1 Max.@ DC~6.0 GHz	1.5 : 1 Max.@ DC~6.0 GHz	1.5 : 1 Max.@ DC~6.0 GHz	1.5 : 1 Max.@ DC~6.0 GHz
Insertion loss	2.0 dB Max.@ DC~3.0 GHz 2.5 dB Max.@ 3.0~6.0 GHz	3.5 dB Max.@ DC~3.0 GHz 4 dB Max.@ 3.0~6.0 GHz	0.7 dB Max.@ DC~3 GHz 1.0 dB Max.@ 3~6.0 GHz	1.1 dB Max.@ DC~3 GHz 1.6 dB Max.@ 3~6.0 GHz	1.8 dB Max.@ DC~3 GHz 2.7 dB Max.@ 3~6.0 GHz	3.0 dB (Max.) @ DC - 3 GHz 4.0 dB (Max.) @ 3 - 6 GHz
Connector Type	N-plug to RP SMA-plug	N-plug to RP SMA-plug	N-plug to N-plug	N-plug to N-plug	N-plug to N-plug	N-plug to N-plug
Cable Length	1.5M	3M	1M	3M	6M	9M



Advantech P/N	ANT-5501	ANT-5502	ANT-5601
Description	1KV Surge Arrestor N-Jack to N-Jack	1KV Surge Arrestor N-Plug to N-Jack	Bulkhead adapter N-Jack to N-Jack
Surge Protection	1KV	1KV	N/A
VSWR	1.25:1 Max @DC~4GHz 1.45:1 Max @4~6GHz	1.3:1 Max @DC~4GHz 1.5:1 Max @4~6GHz	1.2:1 Max @DC~3GHz 1.4:1 Max @3~6GHz
Insertion loss	0.8 dB	0.8 dB	N/A
Connector Type	N Jack to N Jack	N plug to N Jack	N-jack to N-jack

Cellular Gateway

GPRS IP Gateway

Compact

- Compact and Slim with solid mounting

Advanced

- Supports versatile gateway features

Efficient

- Supports various communication interfaces

Simplicity

- Easy to use software features

Accurate

- High redundancy with dual SIM and SD slots for data buffering

Reliability

- Robust HW design

EKI-132x Hardware Overview

10/100/1000
Ethernet

5 Band GPRS

Operating Temp
-30 to 65° C

Serial Ports
RS-232/422/485

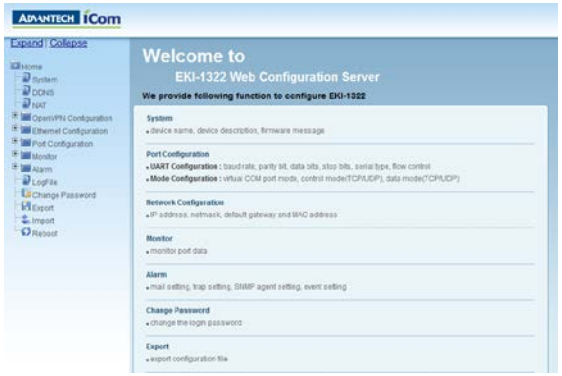
Dual Power Inputs (12 to 48 VDC)
Reverse Power Polarity Protection
Fault Relay for external PLC/Controller

Dual SIM
SD Slot

Serial ESD Protection: 15KV
2KV EFT/Surge protection for Power
2KV isolation (EKI-1321)

EKI-1321 : 1-port
EKI-1322 : 2-port

Simplicity: Reduced Software Complexity



- Advantech Device Server Utility
- Easy Configuration thru Web
- 3~5 Steps to startup…

iGateway Application

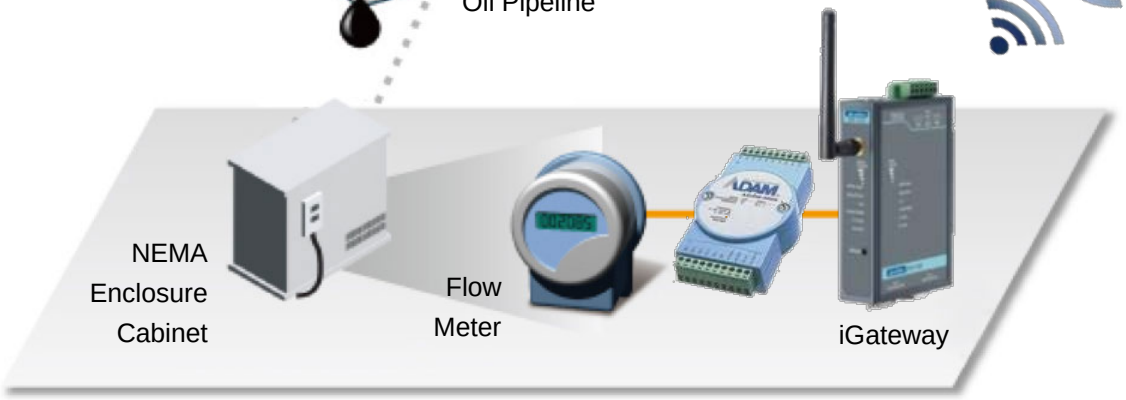



- Internet
- Frame Ready
- VPN

Wireless
Telco Network

Oil Pipeline

Pipeline Control Room



NEMA
Enclosure
Cabinet

Flow
Meter

iGateway

THANK YOU