



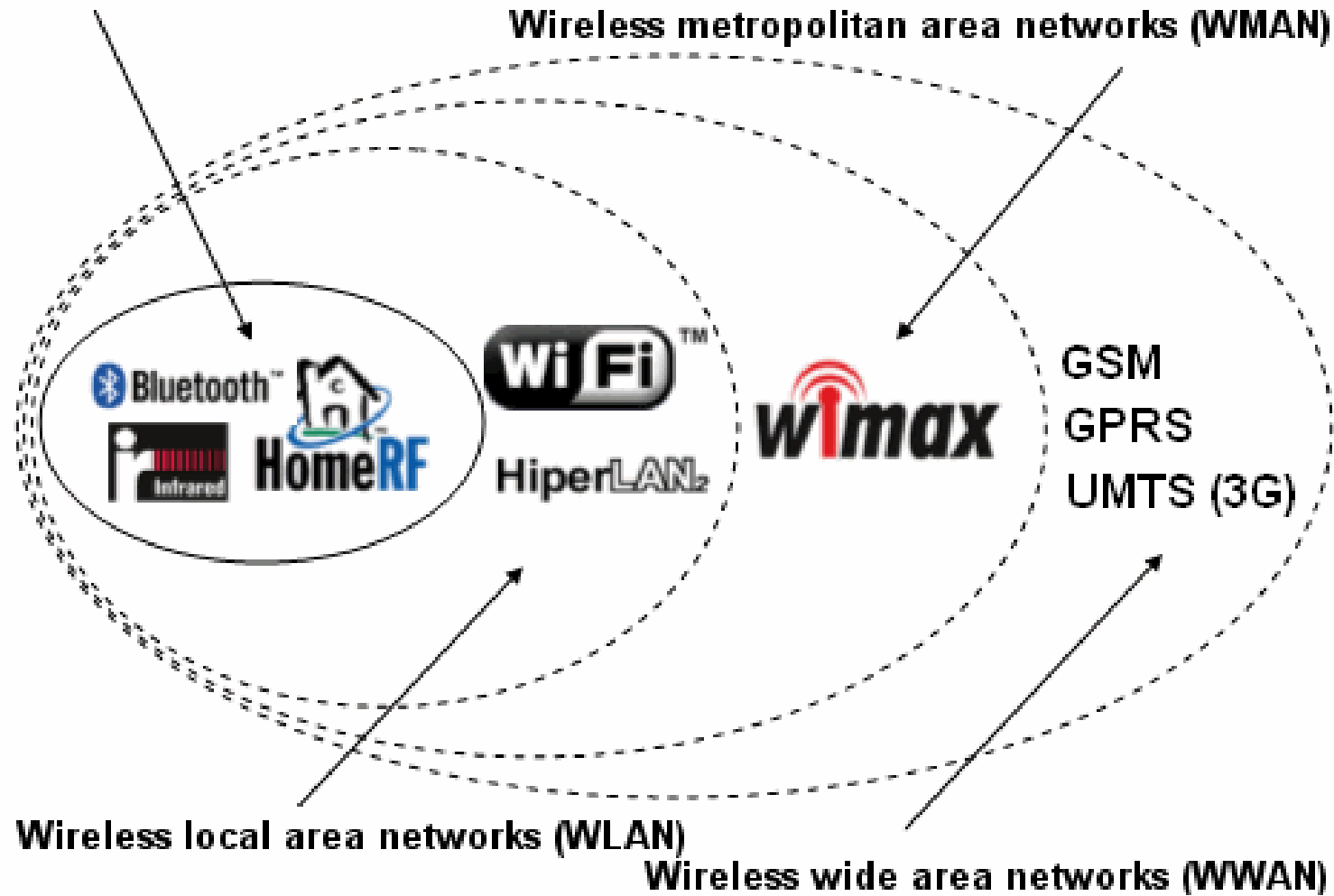
# Industrial Wireless Training Kit

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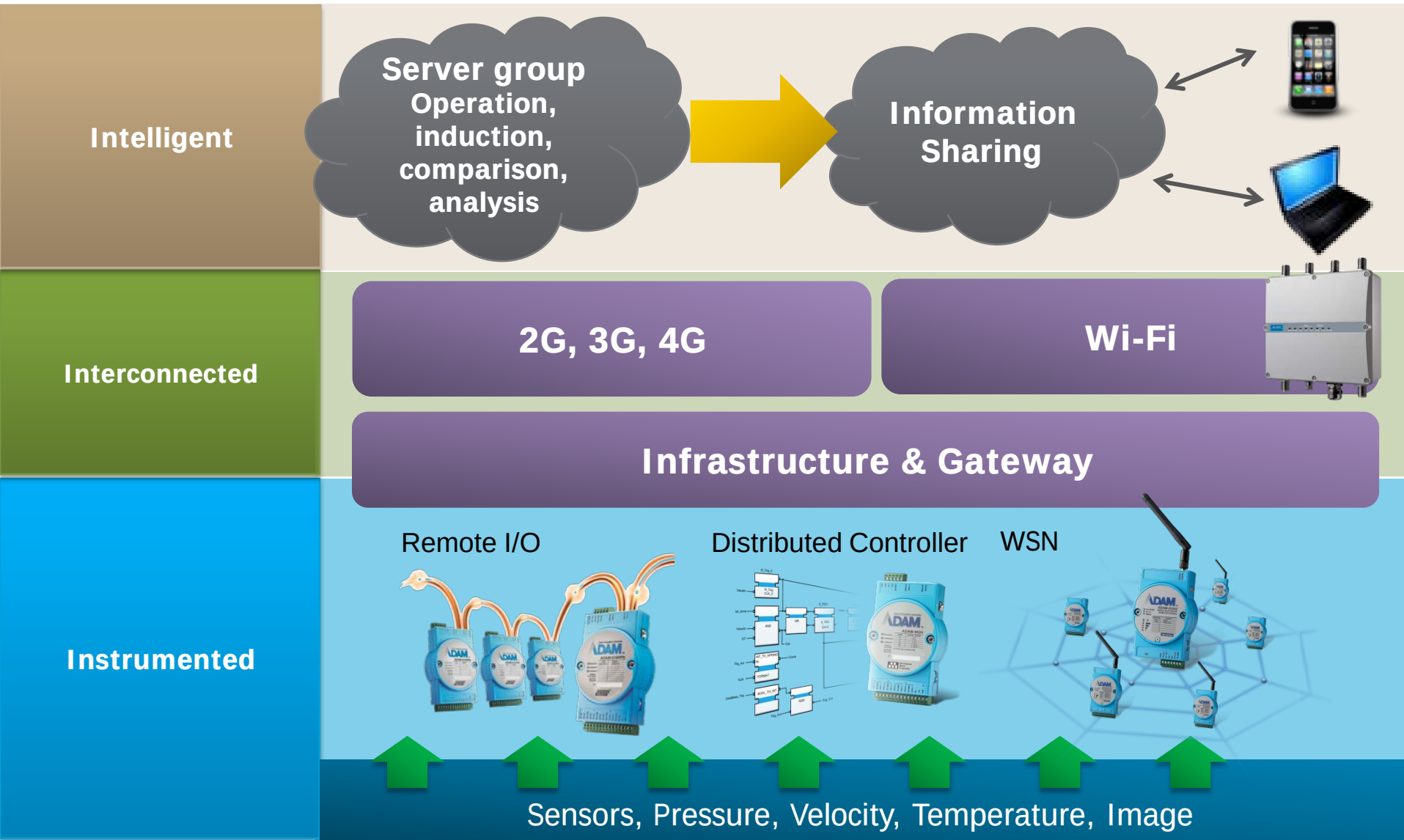
# Global Wireless Standards

Wireless personal area network (WPAN)

Wireless metropolitan area networks (WMAN)



# IoT Focused Segments



*Enabling an Intelligent Planet*

**ADVANTECH**

# Industrial Wireless LAN Product Offering

## Multiple Function Mesh AP/CPE



**EKI-6351**



**EKI-6340-1**



**EKI-6340-2**



**EKI-6340-3**



**EKI-6311GN**



**EKI-6331AN**

## Entry Level AP/CPE

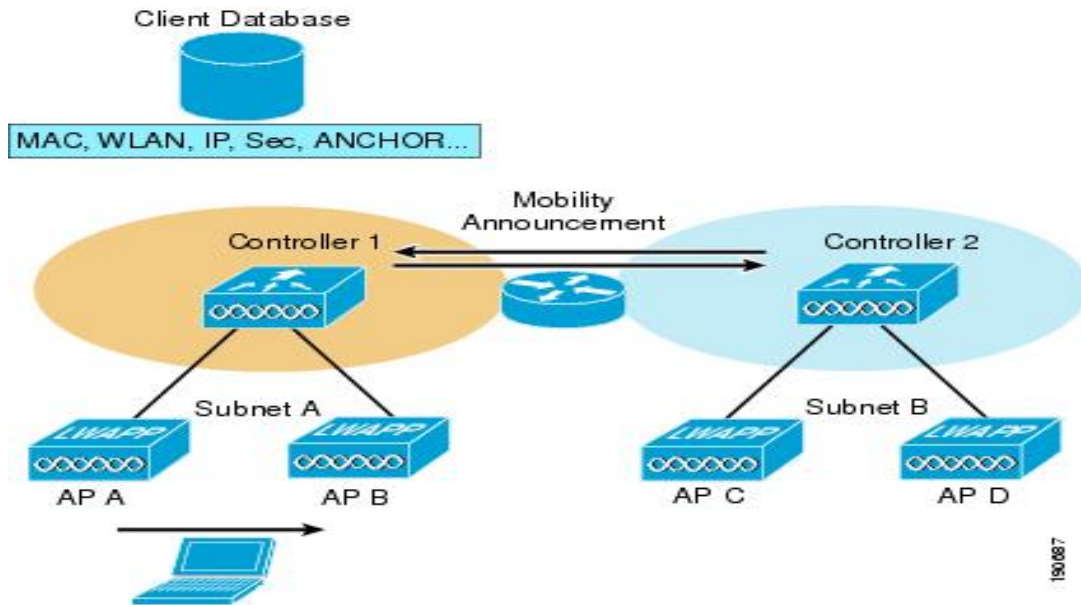
Single radio

Dual radio

Triple radio

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

# Types of WLAN Architecture



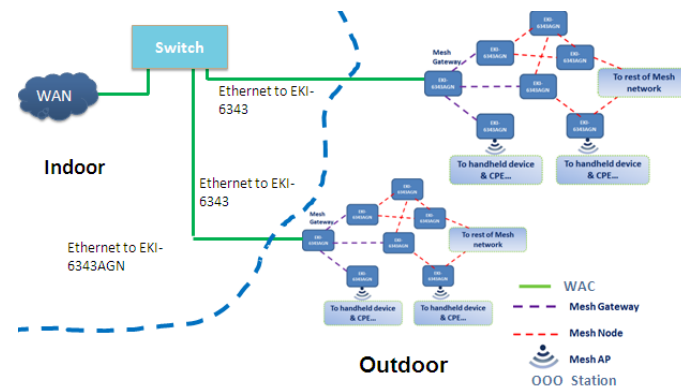
- Infrastructure mode follows Wi-Fi protocol
- Major for simple WLAN App.

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

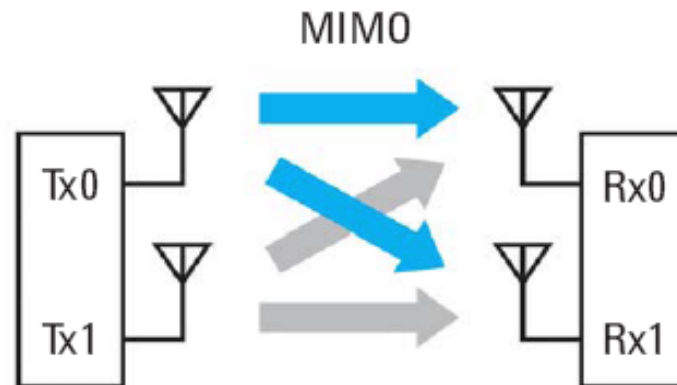


Figure 4. MIMO with two transmitters and two receivers with independent data content

## 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
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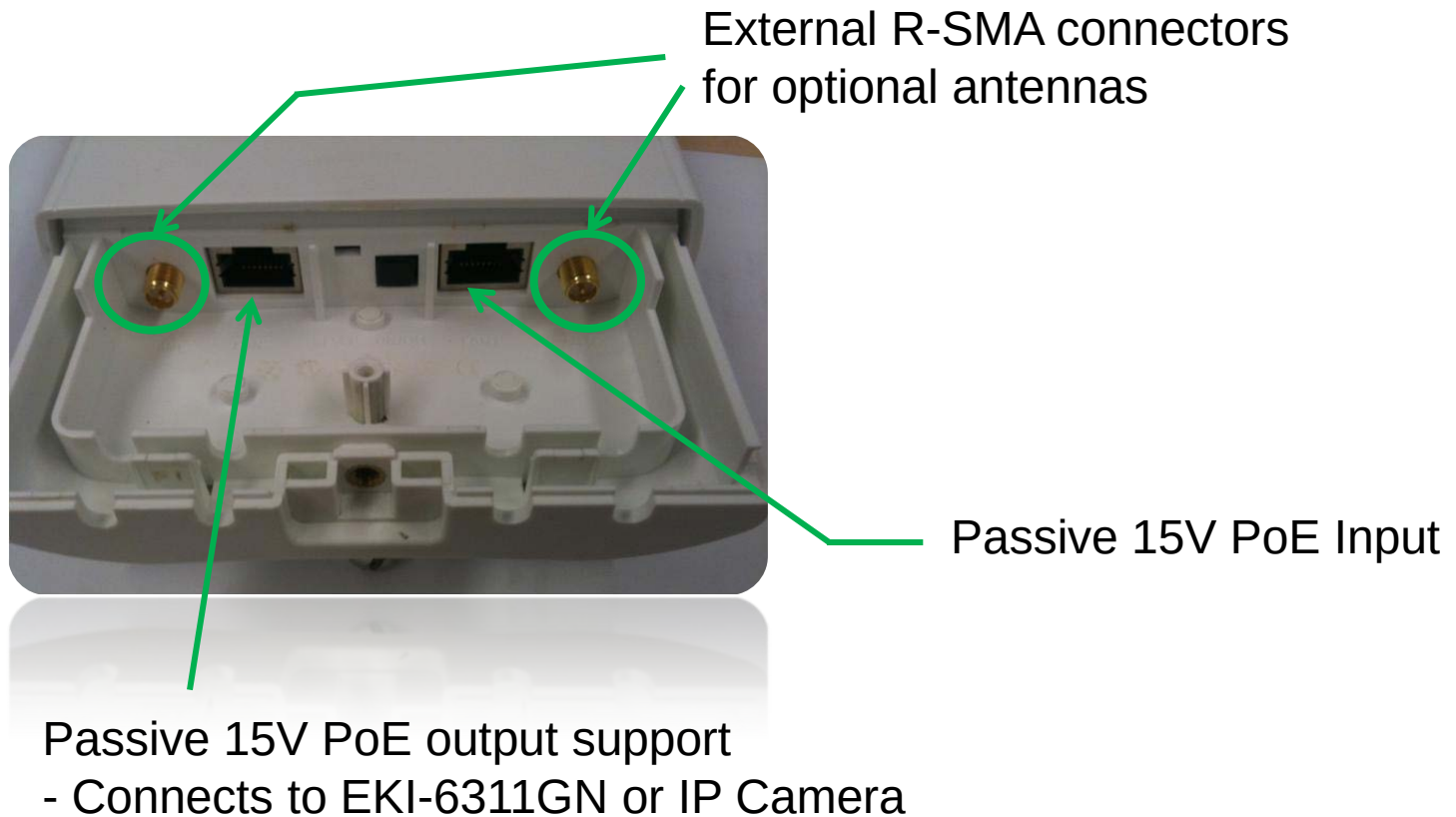
# EKI-6331AN Product Introduction



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

- 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

# EKI-6331AN Product Introduction

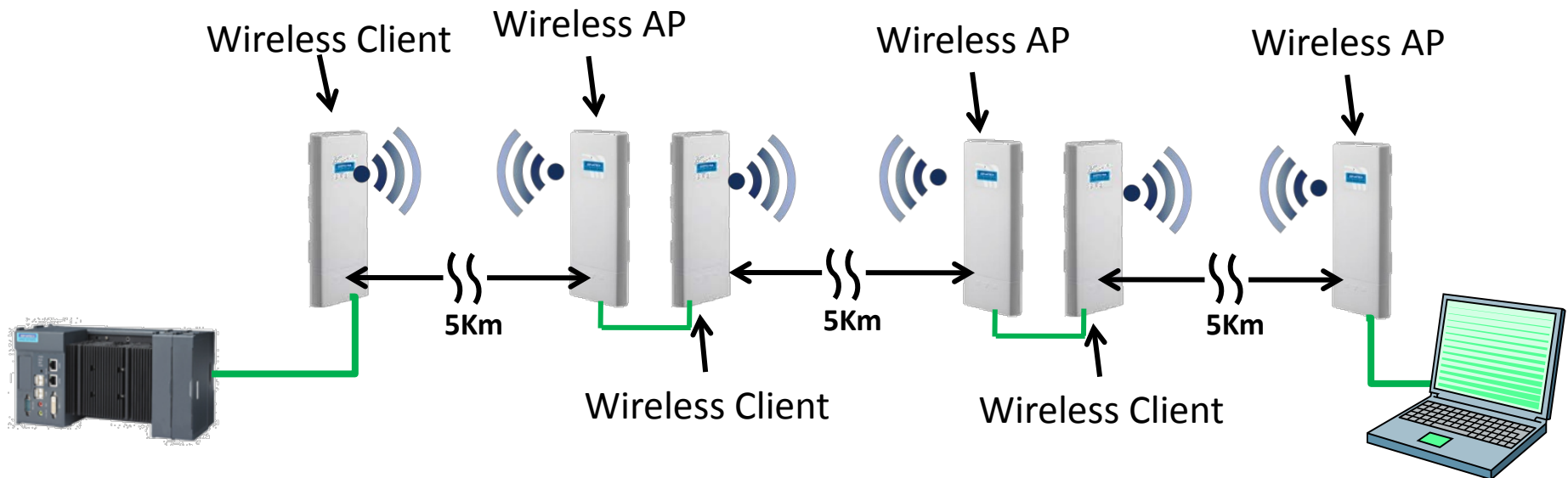


# EKI-6311GN Product Introduction

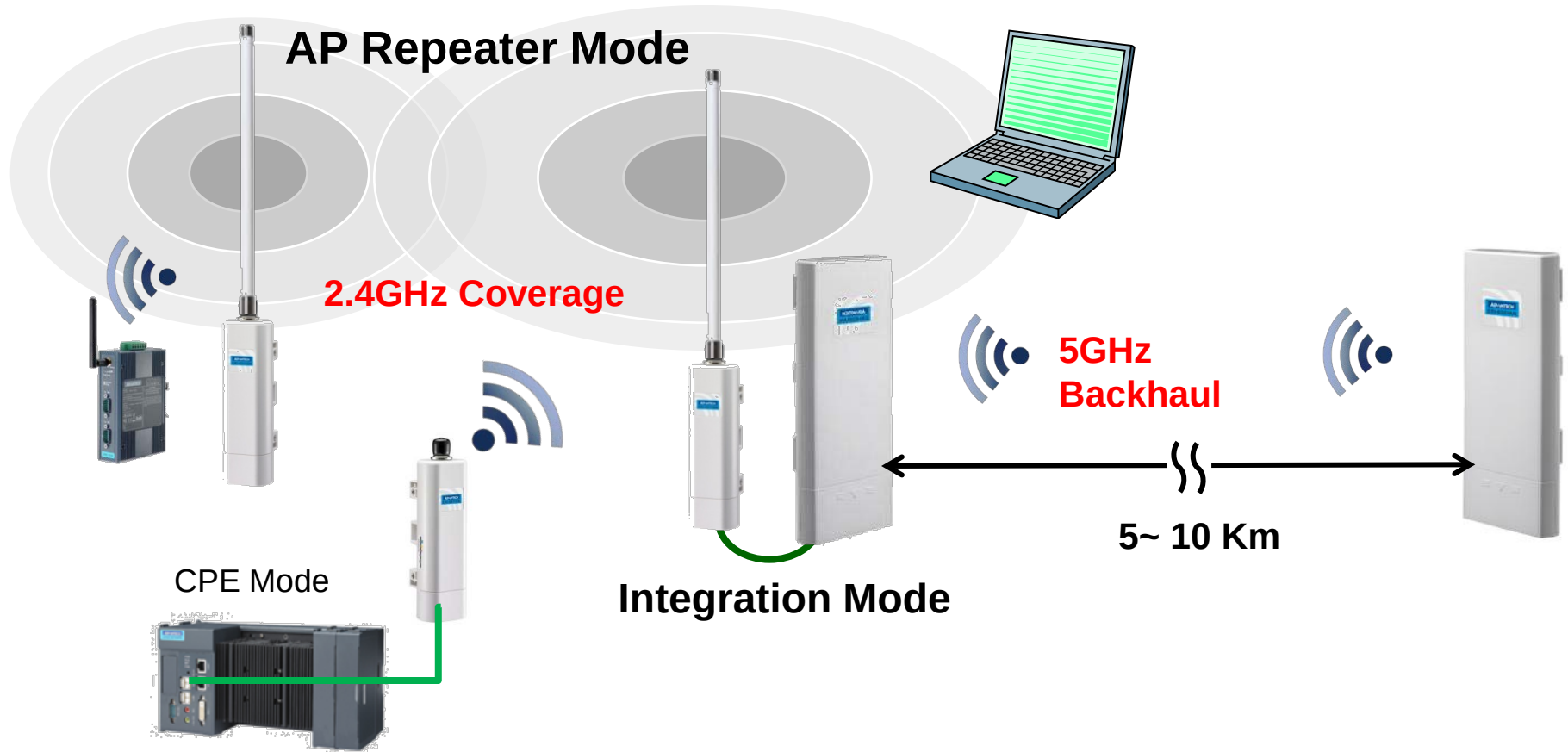
- 
- The image shows a white, vertical, rectangular industrial device. It has a black N-Type connector at the top. There are four green callout lines pointing to specific features: the top connector, a port below it, a port further down, and the bottom of the device.
- External N-Type connector for an 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.

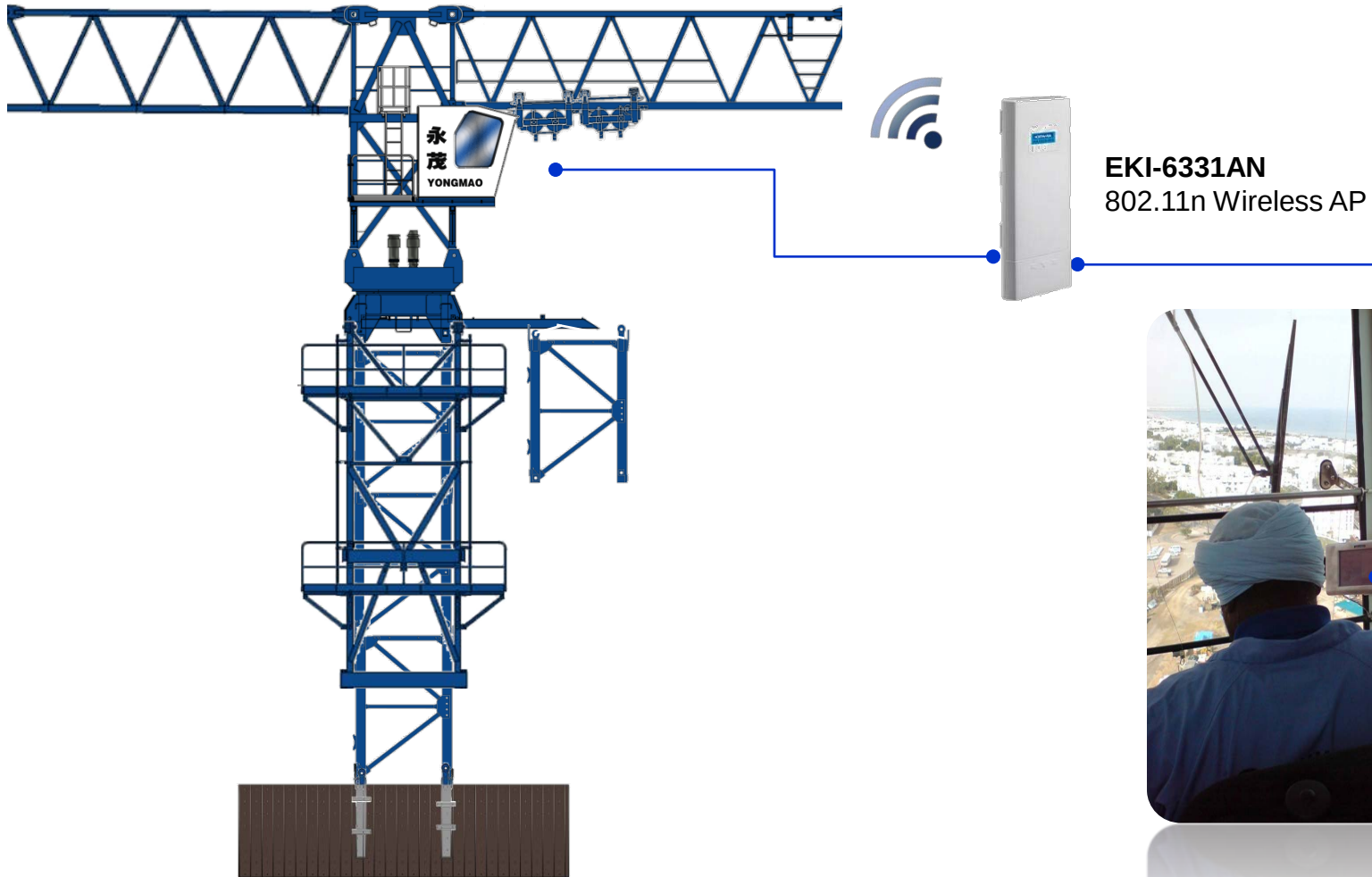
# Application(1): Man-less Factory Monitoring



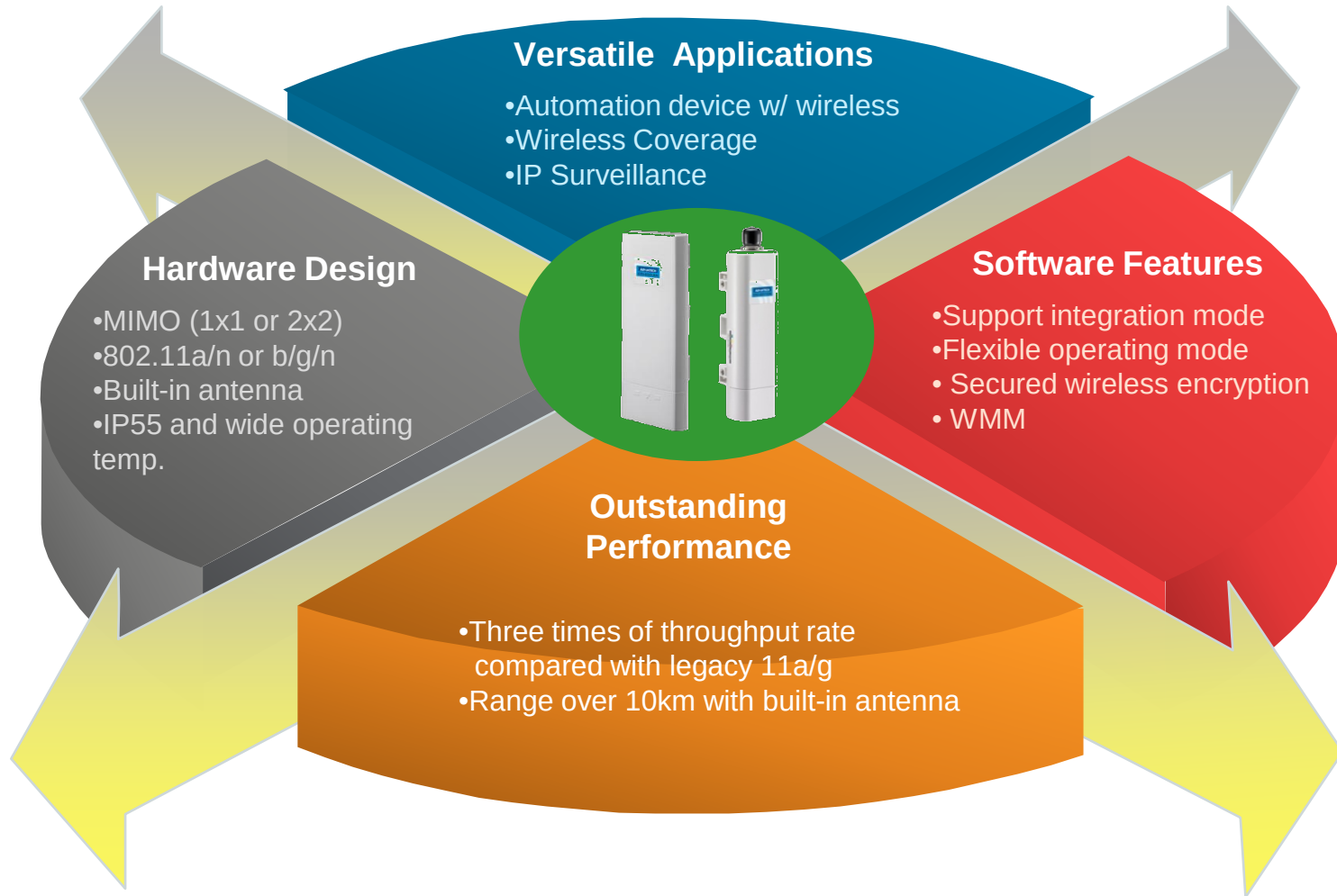
# Application(2): Coal Mining in China



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



# EKI-6331AN/ 6311GN Key Selling Points





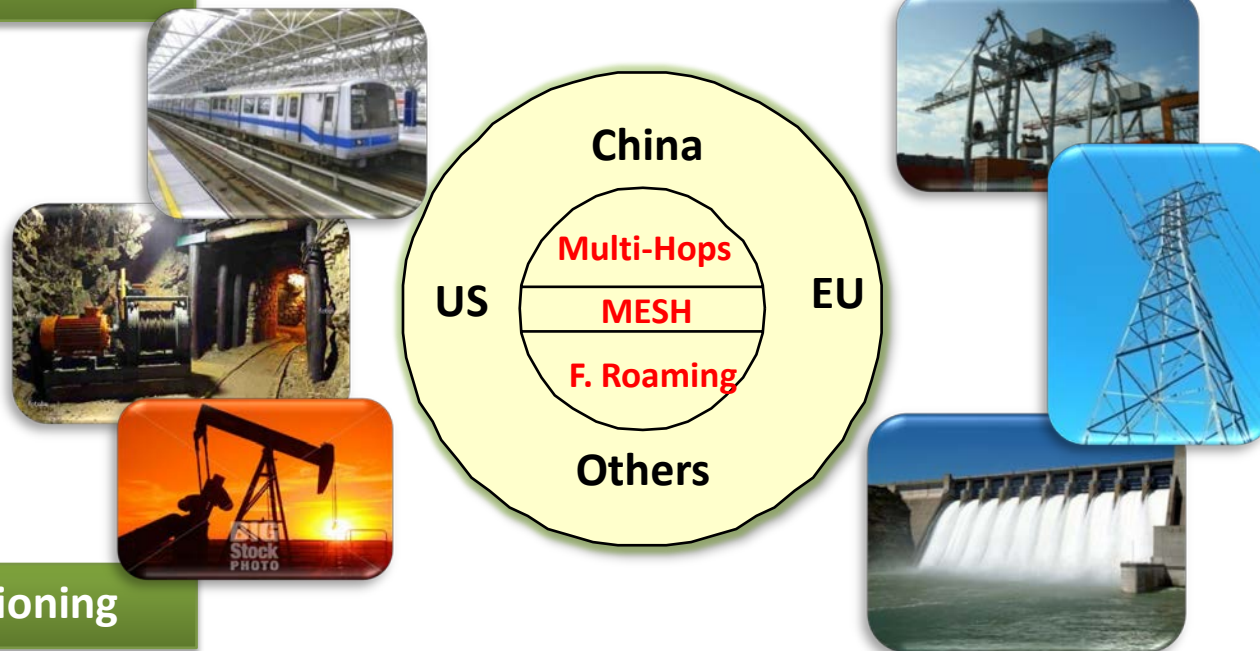
**EKI-6340**

# **Industrial Wireless Mesh AP**

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# TA Segments & Product positioning

## Target Segments



## 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 $\geq 100$ Mbps @ 10 hops                 |
|                        | Fast roaming             | Handover switching time $\leq 20$ ms                 |
|                        | 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
- 12~48V<sub>DC</sub> / PoE Supply
- High security
- -35~75°C
- IP67 protection

# EKI-6351

## Wireless Mesh AP/ Station



EKI-6351

## EKI-6351

- Mesh (Self-forming & Self-healing)
- Ultra fast roaming
- IP30 protection
- -35°C ~ 75°C
- Support 12-48V<sub>DC</sub>
- Support 802.3at PoE
- Dual-band (2.4GHz/5GHz)
- MIMO 2x2

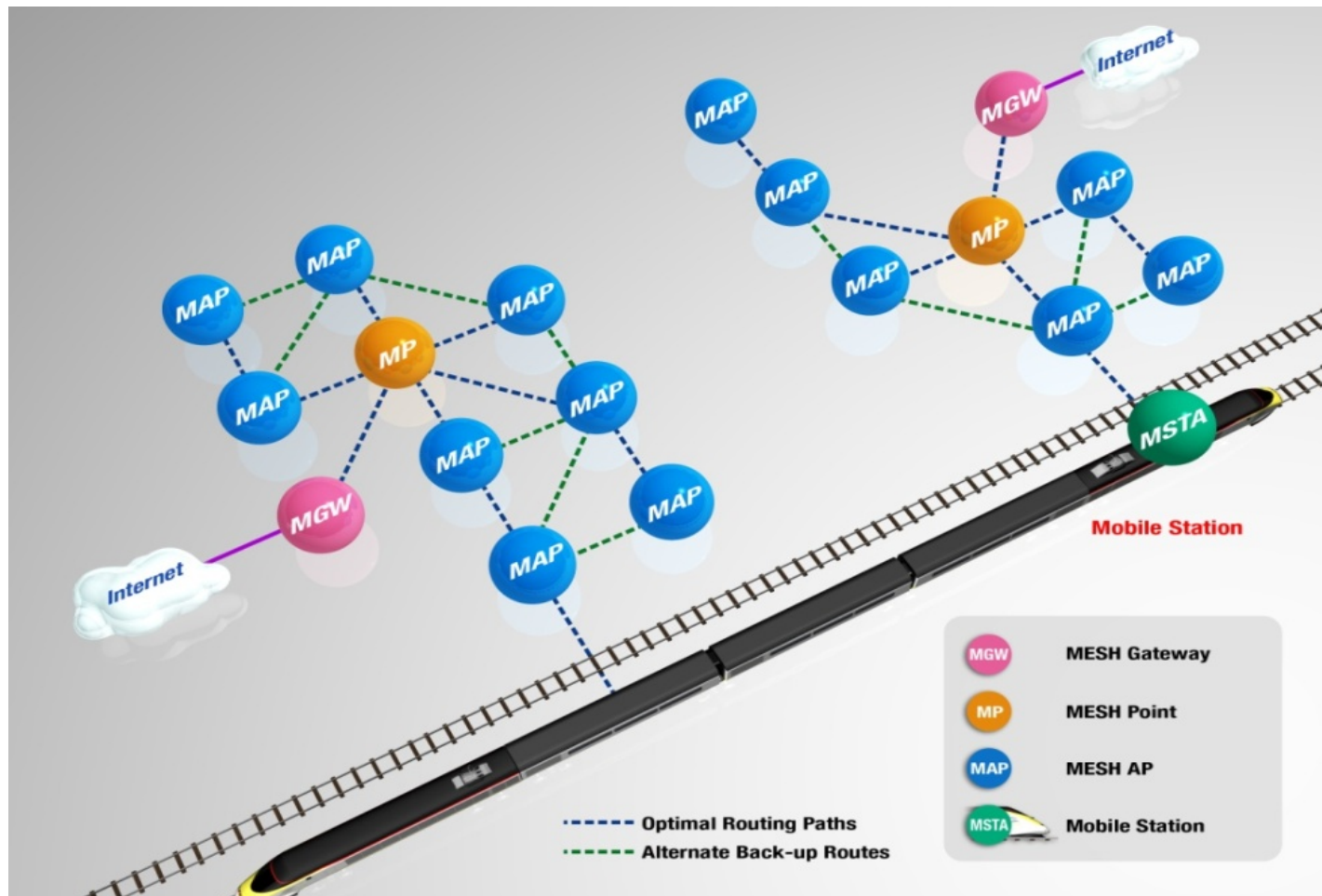


# Position of Each Model in System

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

# Wireless MESH Network Structure

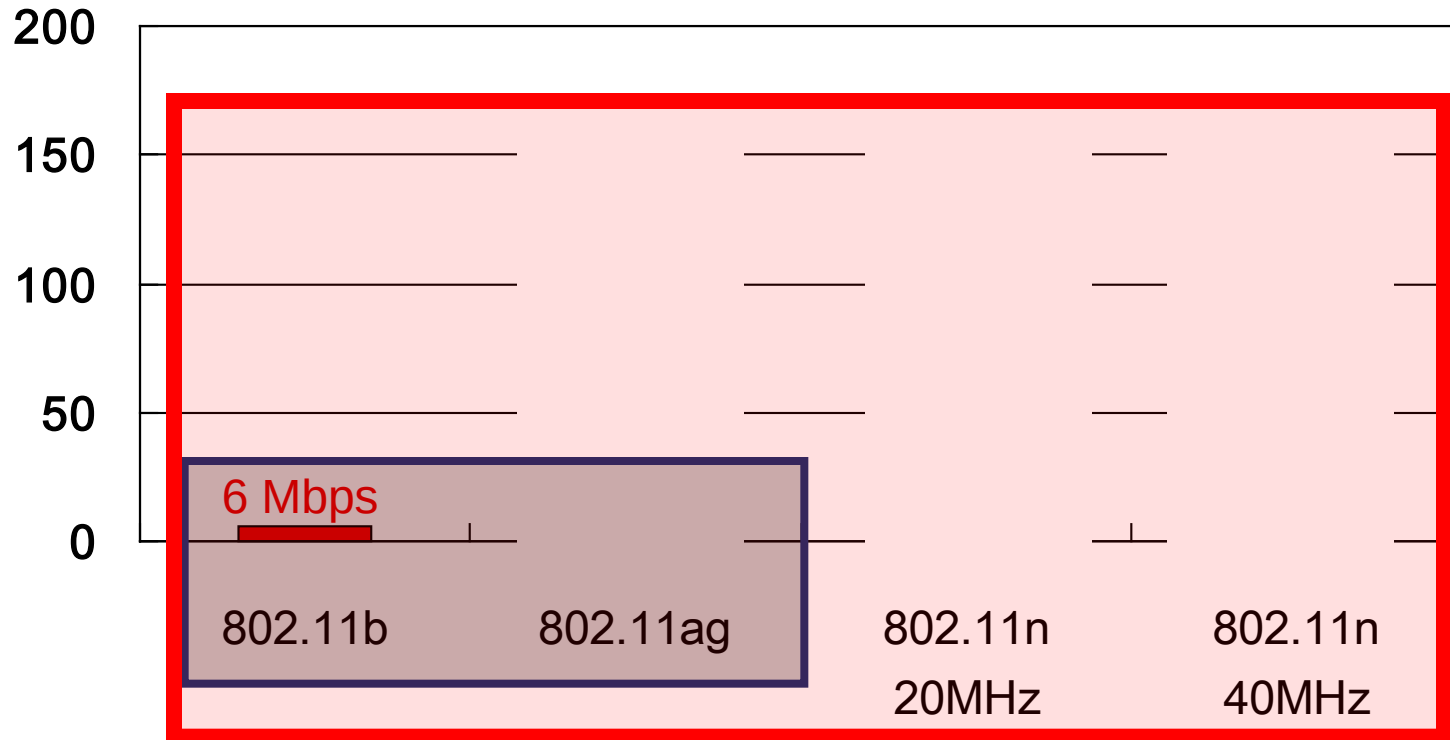
## Reliable Network & Ultra Fast Roaming



# IEEE 802.11n

## Significant Throughput Improvement

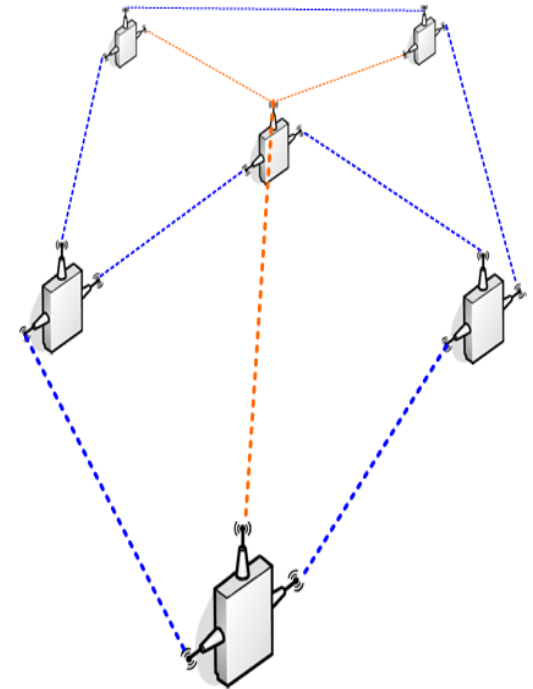
Through Rate



- 802.11n performances are based on 2 Spatial Streams
- 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 Model             | Advantech EKI-6340-3                                                              | Motorola AP 7161                                                                   | Motorola AP 5181                                                                    | Cisco Aironet 1552E                                                                 | Moxa 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

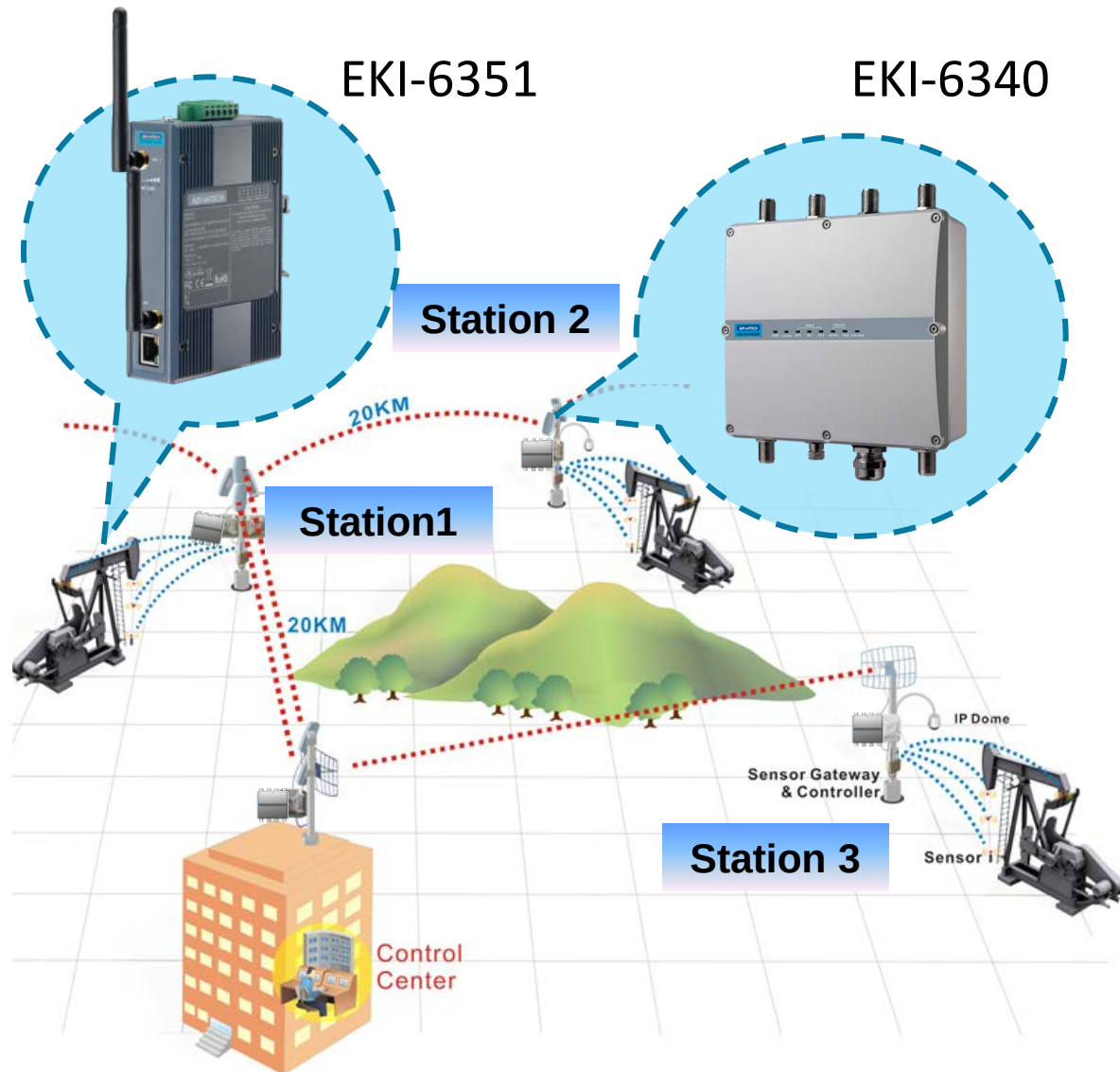
- Throughput  $\geq 150$  Mbps @ 2 hops
- Throughput  $\geq 100$  Mbps @ 10 hops

## Mesh Network

- Self-healing

## Anti-harsh environment

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.:  $-35 \sim 75^{\circ}\text{C}$



# Open Cut Coal Mine

Fully met application requirements:

## Multi-hopping

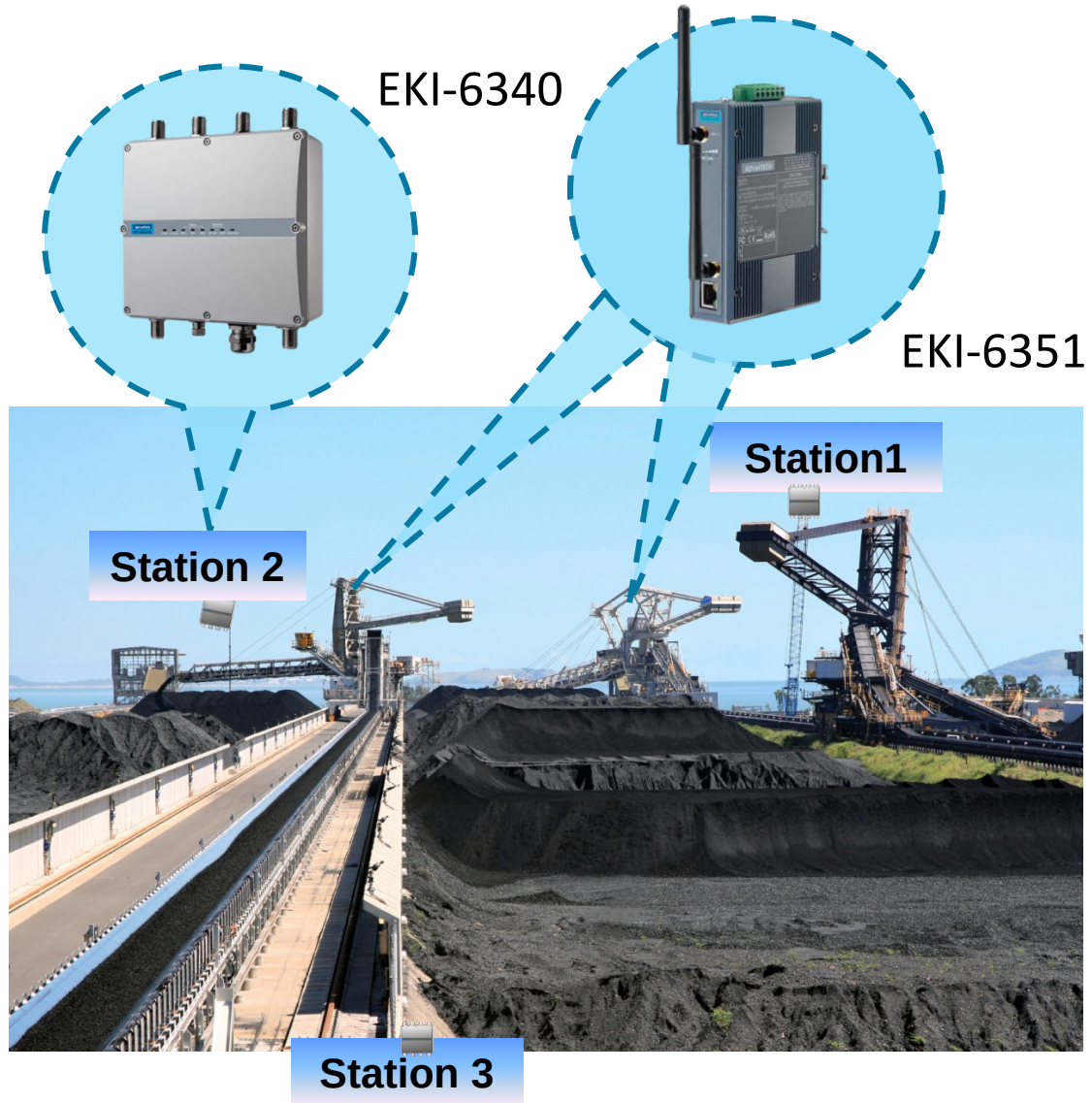
- Throughput  $\geq 150$  Mbps @ 2 hops
- Throughput  $\geq 100$  Mbps @ 10 hops

## Mesh Network

- Self-healing

## Works in harsh environments

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.:  $-35 \sim 75^{\circ}\text{C}$



# Transportation Application

Fully meet application requirements:

**Fast roaming:**  $\leq 20\text{ms}$

**High throughput:**  $\geq 100\text{Mbps}$

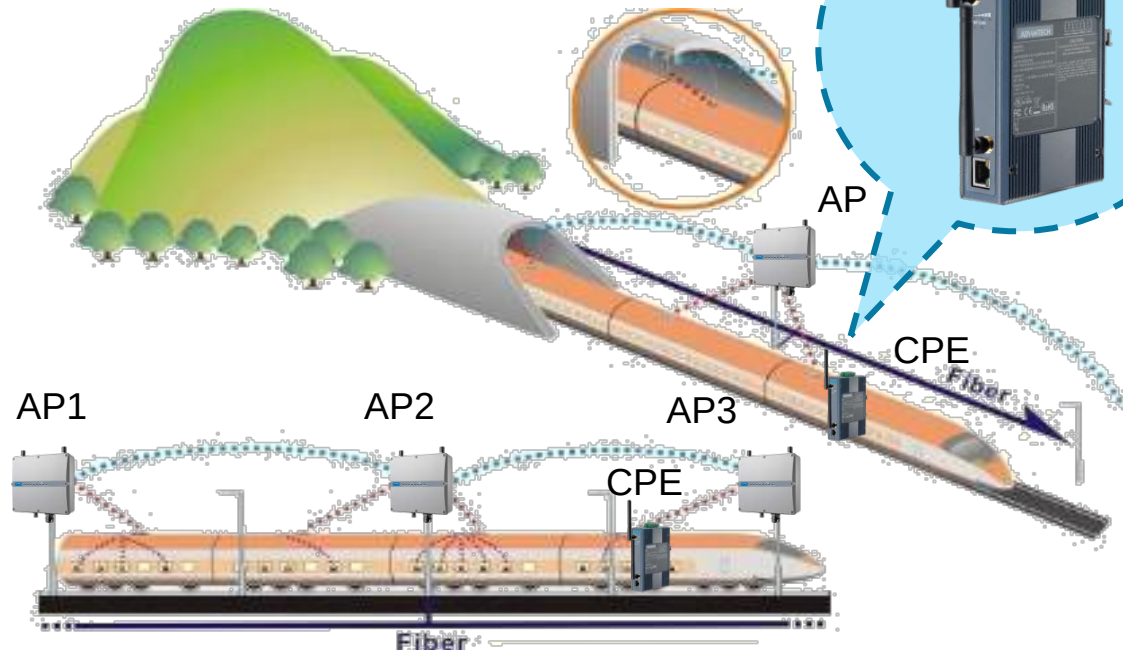
**Anti-harsh environment**

- IP67 (EKI-6340)
- IP30 (EKI-6351)
- Working temp.:  $-35\sim 75^{\circ}\text{C}$



EKI-6340

EKI-6351

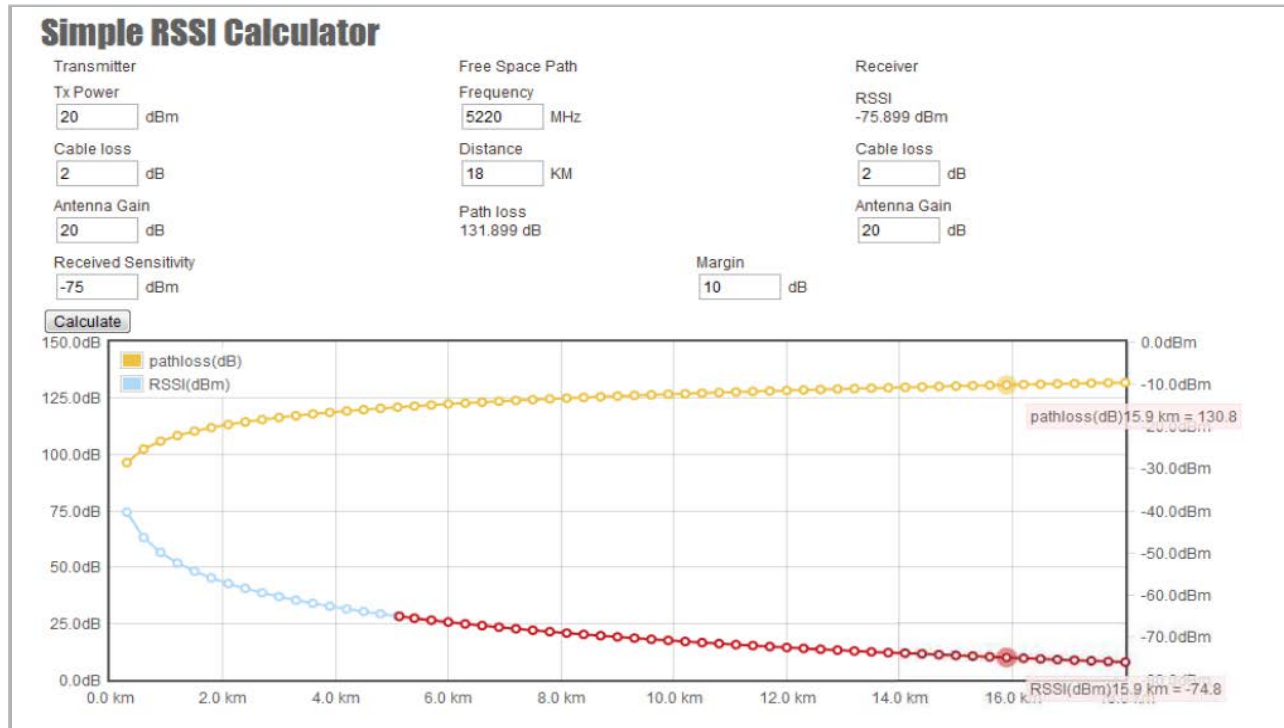


# Valuable Tools for Installation & Antenna / Accessory Kits



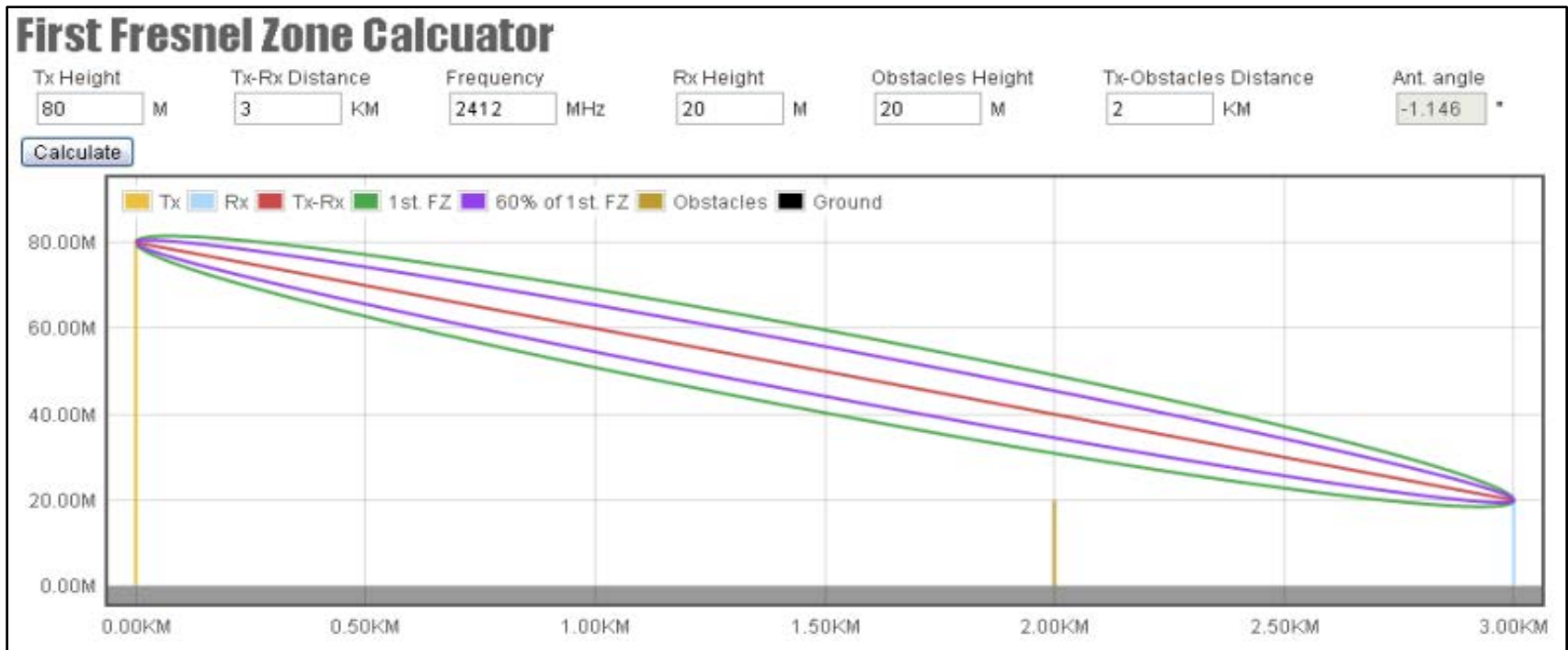
# RSSI Calculator

RSSI(Received Signal Strength Indication)



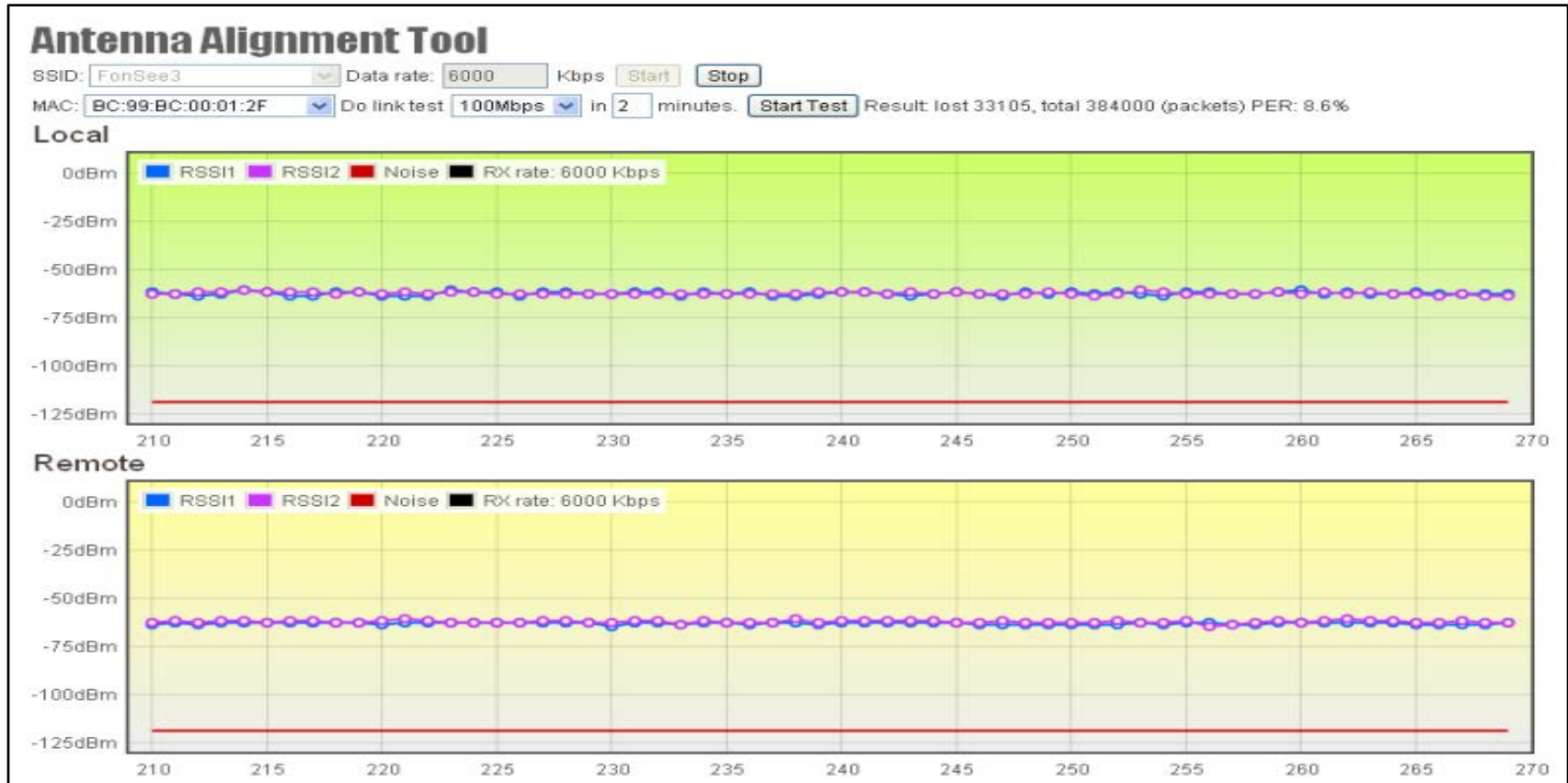
1. Simple RSSI Calculator estimate likely RSSI & path loss
2. Help evaluate selected cable loss & antenna gain by inputting device Tx power and frequency on transmitting and receiving side.
3. Graphically display changes of path loss and RSSI.

# 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           |
| Connector 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           |
| Connector 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         |

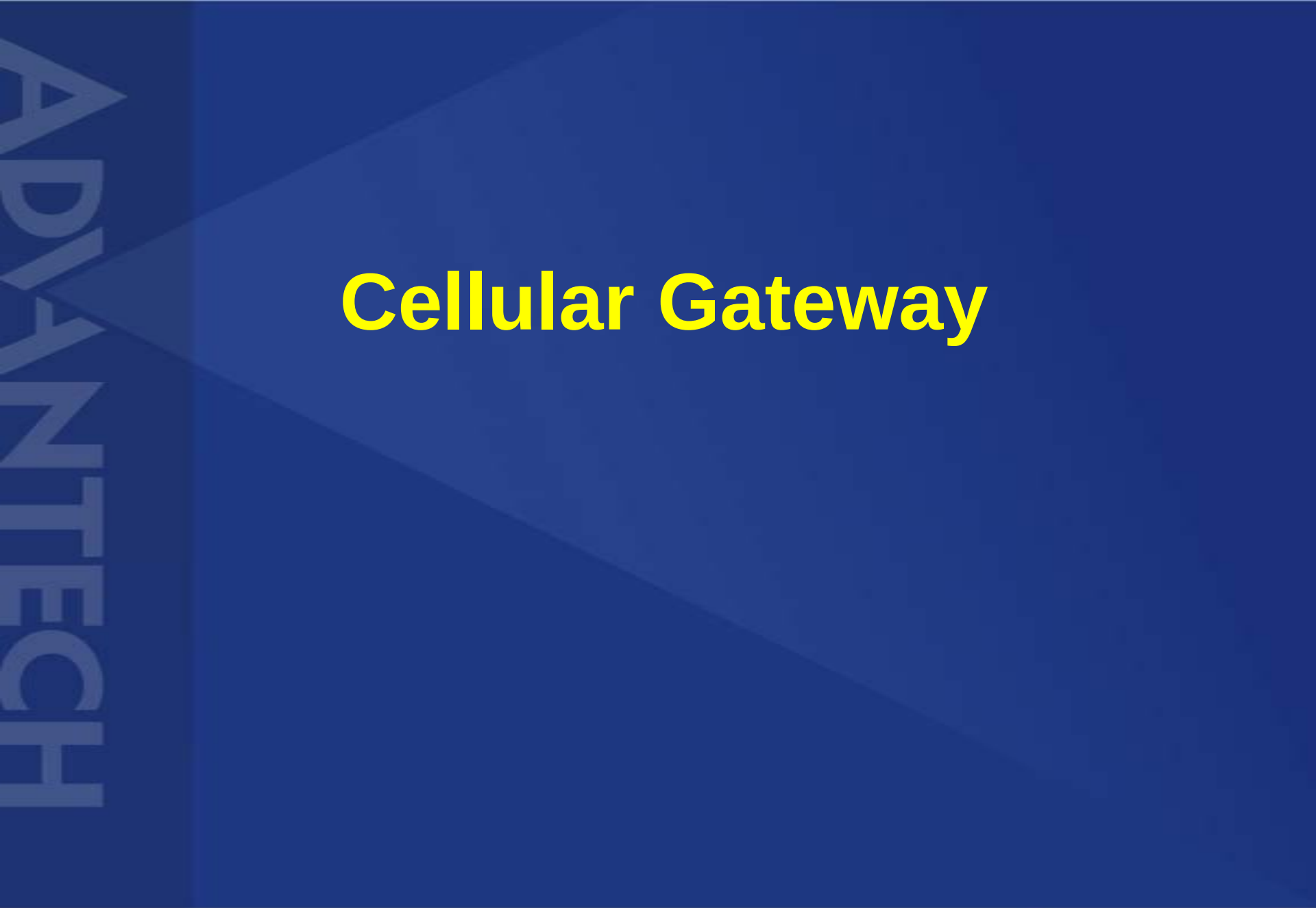
# Antenna Cable, Surge Protector



| 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<br>2.0 : 1 Max.@ 3.0~6.0 GHz | 1.5 : 1 Max.@ DC~3.0 GHz<br>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<br>2.5 dB Max.@ 3.0~6.0 GHz   | 3.5 dB Max.@ DC~3.0 GHz<br>4 dB Max.@ 3.0~6.0 GHz     | 0.7 dB Max.@ DC~3 GHz<br>1.0 dB Max.@ 3~6.0 GHz | 1.1 dB Max.@ DC~3 GHz<br>1.6 dB Max.@ 3~6.0 GHz | 1.8 dB Max.@ DC~3 GHz<br>2.7 dB Max.@ 3~6.0 GHz | 3.0 dB (Max.) @ DC - 3 GHz<br>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<br>1.45:1 Max @4~6GHz | 1.3:1 Max @DC~4GHz<br>1.5:1 Max @4~6GHz | 1.2:1 Max @DC~3GHz<br>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                        |



ADVANTECH

# 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

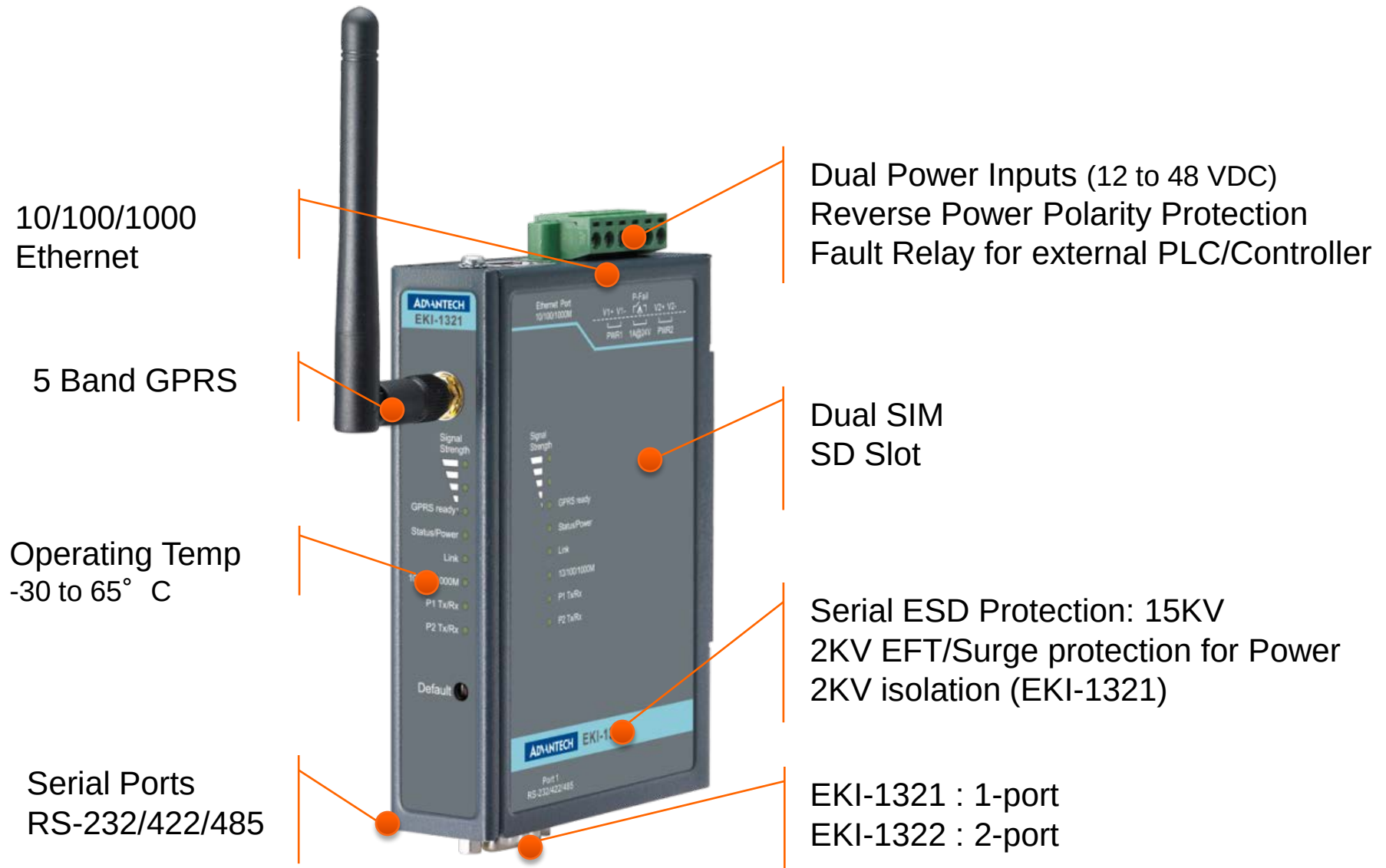
- High redundancy with dual SIM and SD slots for data buffering

## Reliability

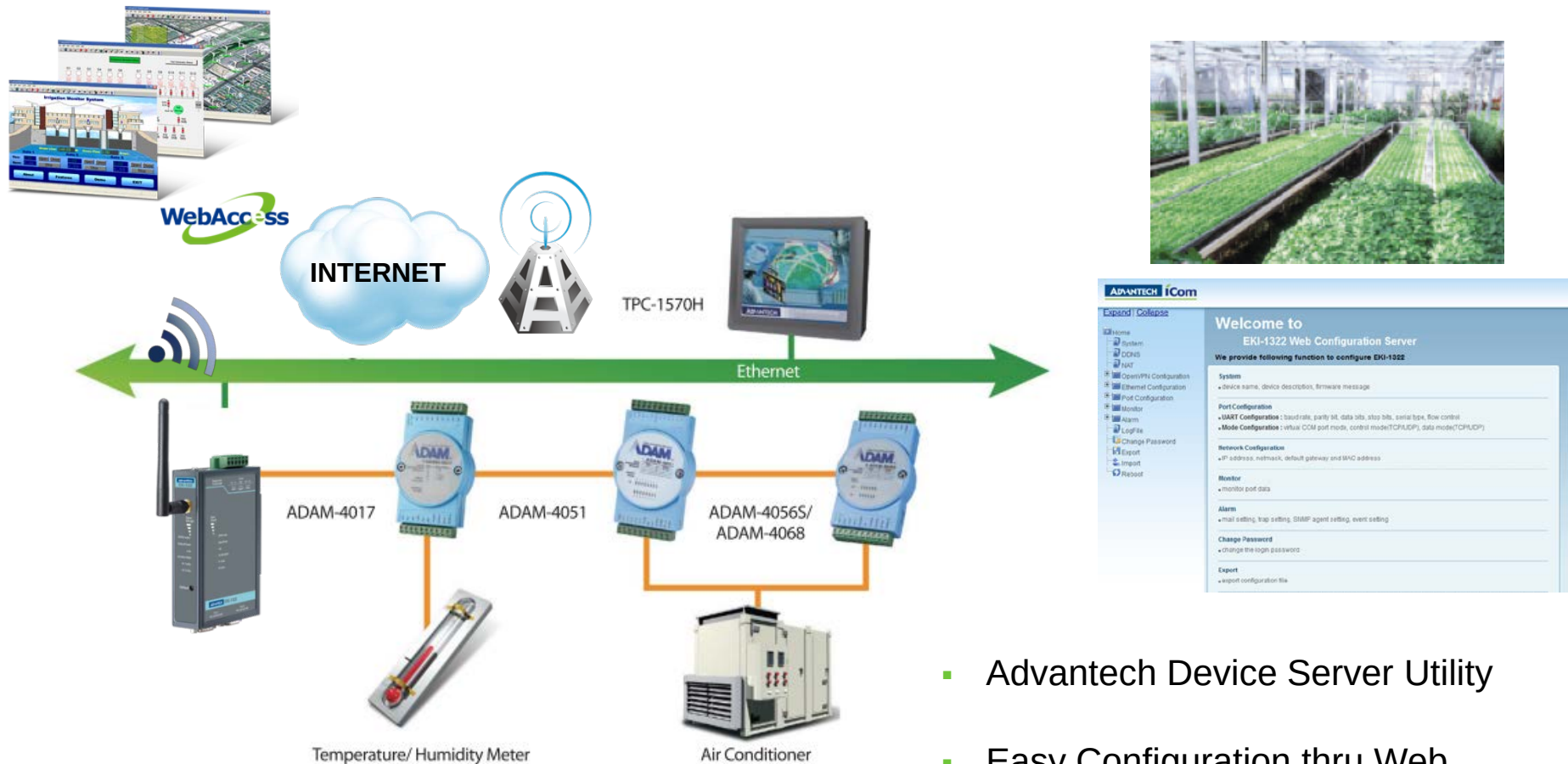
- Robust HW design



# EKI-132x Hardware Overview



# Simplicity: Reduced Software Complexity



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

# iGateway Application

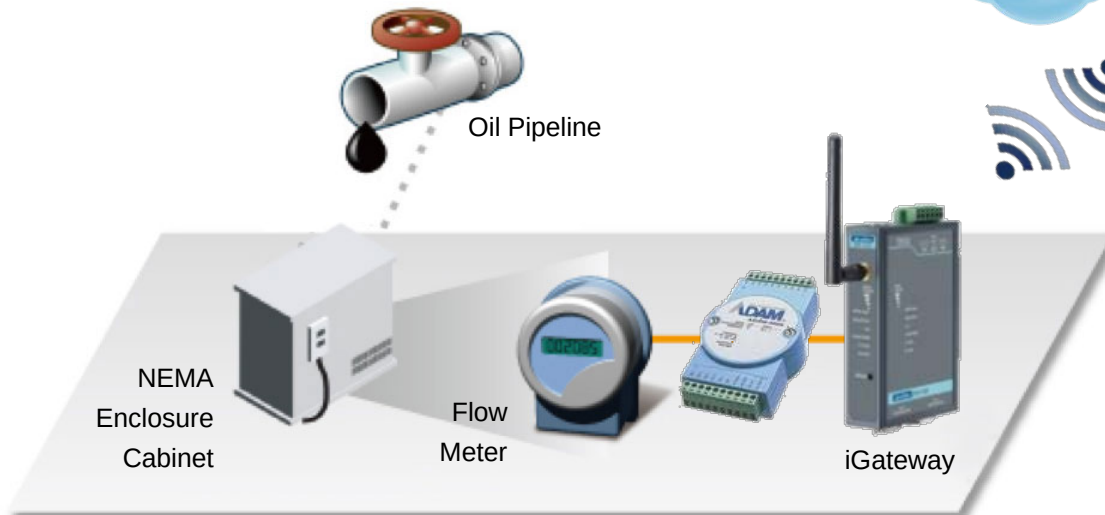


- Internet
- Frame Ready
- VPN

Wireless  
Telco Network



Pipeline Control Room



# THANK YOU



*Enabling an Intelligent Planet*

**ADVANTECH**