IO-Power Technology

DC UPS Power Supply and Outdoor MIMO AP Wireless Transmit Solutions Provider

Special Design for Outdoor CCTV Surveillance System

IO-Power Technology
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Outdoor WiFi 802.11n MIMO Wireless Access Point

•101R(H)

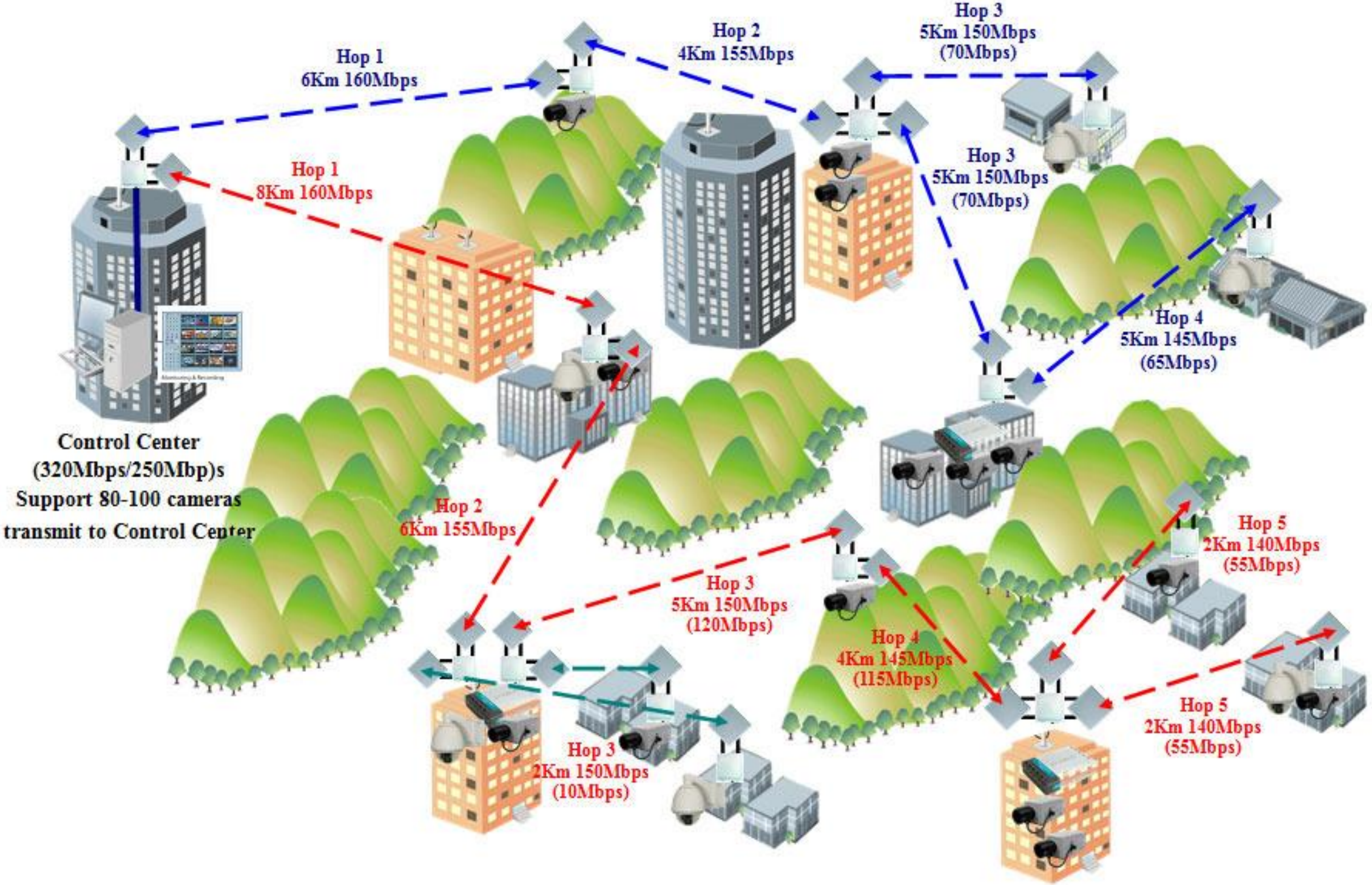
•102R(H)

•103R(H)

Outdoor 802.11n WiFi MIMO AP

Model	IOP-OAPMB-APM-101R IOP-APM-101RH	IOP-OAPMB-APM-102R IOP-APM-102RH	IOP-OAPMB-APM-103R IOP-APM-103RH
			
RF Module	802.11a/g/n MIMO 2*2 RF * 1	802.11a/g/n MIMO 2*2 RF * 2	802.11a/g/n MIMO 2*2 RF * 3
Output Power (dBm)	101R ~ 21dBm Max 101RH ~ 23dBm Max	102R ~ 21dBm Max 102RH ~ 23dBm Max	103R ~ 21dBm Max 103RH ~ 23dBm Max
RF Transmit Throughput	HT20MHz-70~80Mbps HT40MHz-140~160Mbps	HT20MHz-140~160Mbps HT40MHz-280~320Mbps	HT20MHz-210~240Mbps HT40MHz-280~320Mbps
System Operate Mode & Features	AP / Wireless Station (AC) / AP WDS Bridge / Router Multiple Hops / Mesh Network / Mesh Hi-mobile		
Special Features	1.Multiple Hopping Up to 10 hops with 120Mbps throughput and under 10ms latency 2.OSI Layer 2 Switch Mesh Network Technical, can support Multiple Gateway 3.Support Mesh SkyNet with 300Mbps Backhaul & 200Km/s 50~100Mbps Hi-mobile Throughput 4.Support Multiple Hops with Multiple Backhaul Backup Technical 5.Support CPE Function and Low Speed Roaming		

Outdoor WiFi MIMO AP Multiple Hops Features and Application

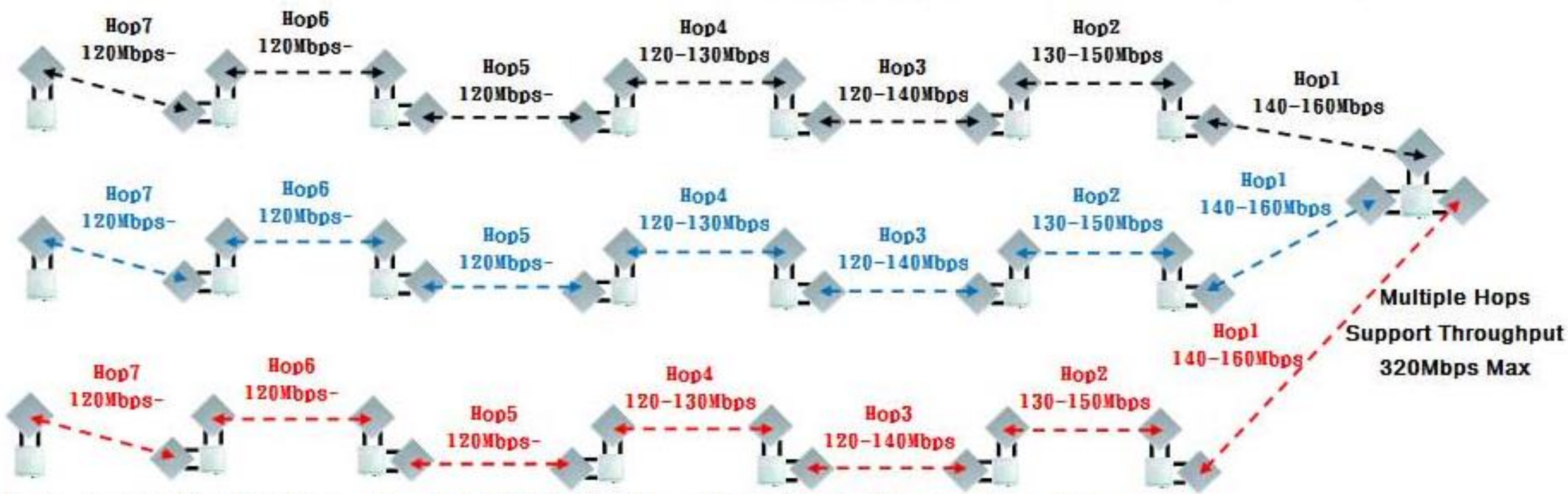


Outdoor WiFi MIMO AP Multiple Hops Features and Application

Outdoor Wireless Multiple Hops V.S. Double Bridge & Repeater (Backhaul Dead End)

Comprehensive Comparison Tables

IO-Power Outdoor WiFi MIMO Wireless **Multiple Hops** Backhaul System Structure



1. Design 2.4GHz & 5.8GHz dual band & 2*2 MIMO Multi three RF modules backhaul system solution.
2. Layer2 Multiple Hops features and lowest reduce on throughput, even after 5 times hops, it can support 120Mbps~ throughput.
3. Even after 10 times of Hops, the packet latency is under 10ms. It can support special wireless system demand.
4. Each PtP hop distance is more than 5Km, proper for big city or wide area wireless surveillance or long distance 30 Km multi backhaul systems.

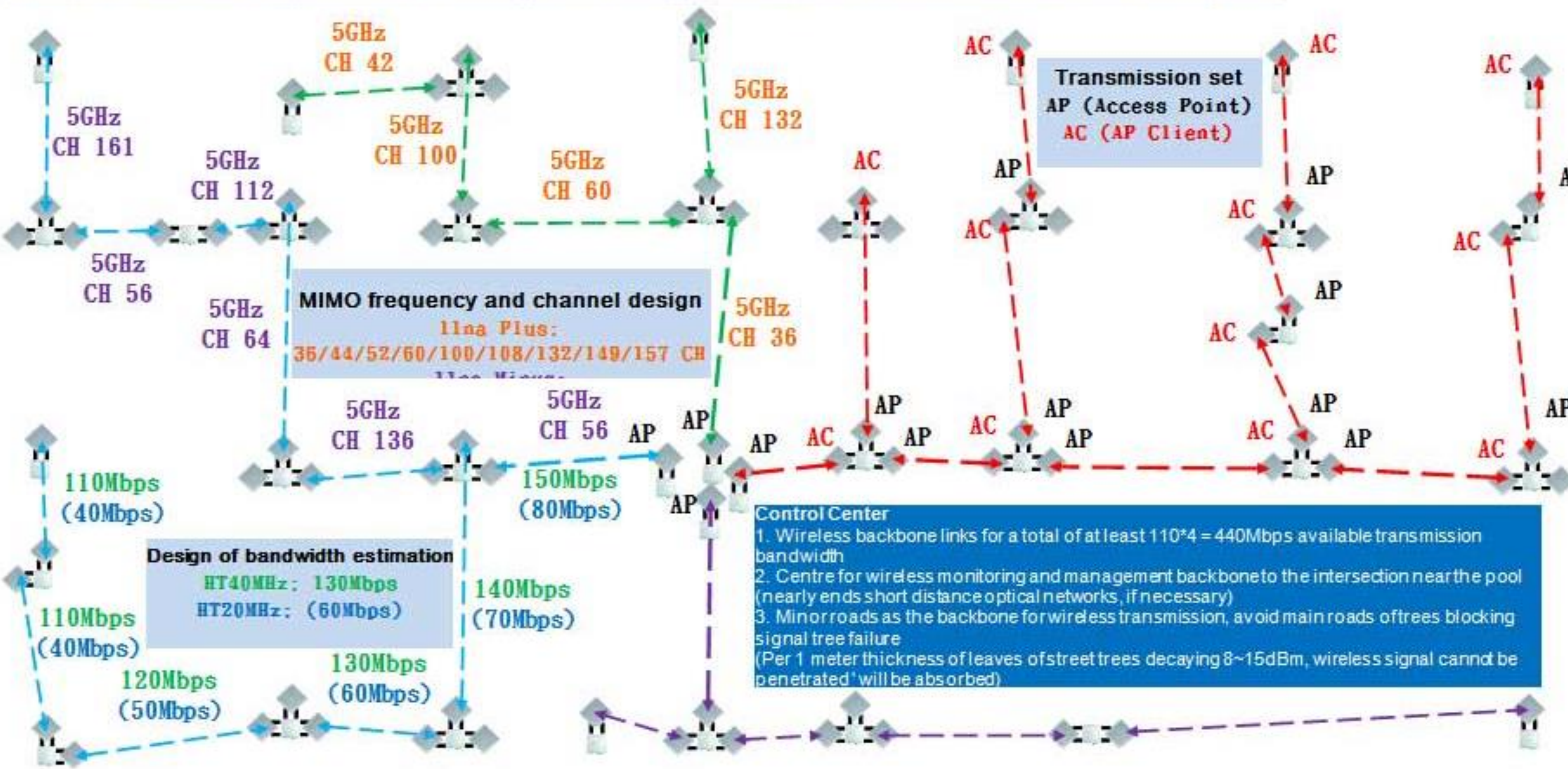
Outdoor MIMO AP Multiple Hops Features and Application

Case Study 1: City Wide Road Crossroads High Throughput MIMO WiFi Wireless Surveillance System

Wireless systems design guide: 1. design of multiple hops relay platform to not more than 6 jumped 2.The basis for the design, each wireless backbone links to no bandwidth over 60Mbps for design requirements 3. In the erection of three forks or crossroads, 103R three wireless module designs, reserved engineering change link direction to set up or increase future links to expand or equipment upgrade needs.

Outdoor MIMO AP Multiple Hops Features and Application

Design 4 Backhaul to provide 4 * 110Mbps = 440Mbps Throughput for Wireless Surveillance System



Wireless bandwidth prediction commentary: 1. the multiple hops relay platform technology, 1th hop 140~160Mbps, 2nd hops 130~150Mbps, 3rd hops 120~140Mbps, 4th hops 110~130Mbps, 5th hops after to maintain 110~120Mbps bandwidth, lower bandwidth will not increase the number of platform and response time not less than 10ms.

Outdoor MIMO AP Multiple Hops Features and Application

Outdoor WiFi MIMO Large-bandwidth Wireless Transmission System

At the sewage treatment plant surveillance and detection system transmit design.

1. Scene diagram (Sewage outfall video monitoring and real-time detection of water quality and related data return)

Implementation of the project company: Today's instrument company corp. **http://www.todays.com.tw/**

Outdoor MIMO AP Multiple Hops Features and Application

2. Outdoor WiFi MIMO wireless transmission system design.

Outdoor MIMO AP Multiple Hops Features and Application

3. Pictures of construction.

Outdoor MIMO AP Multiple Hops Features and Application







Outdoor MIMO AP Multiple Hops Features and Application

4. Radar of Military covers the signal and interference. (Resolved)

Substation Signal interference, Towers and Signs blocking transmission (Resolved)

Outdoor MIMO AP Multiple Hops Features and Application

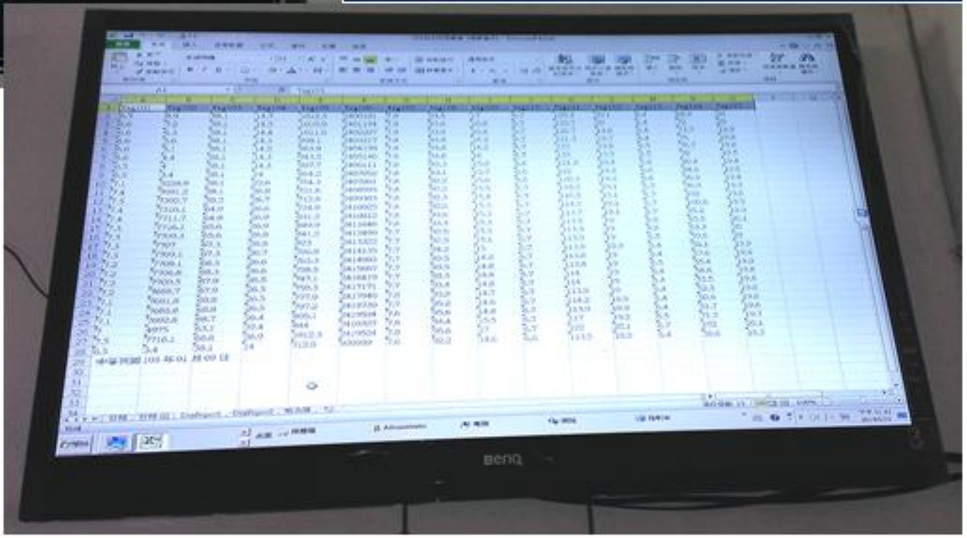
5. Program running after project complete.

Outdoor MIMO AP Multiple Hops Features and Application

WiFi MIMO Wireless Surveillance System Record Server Display

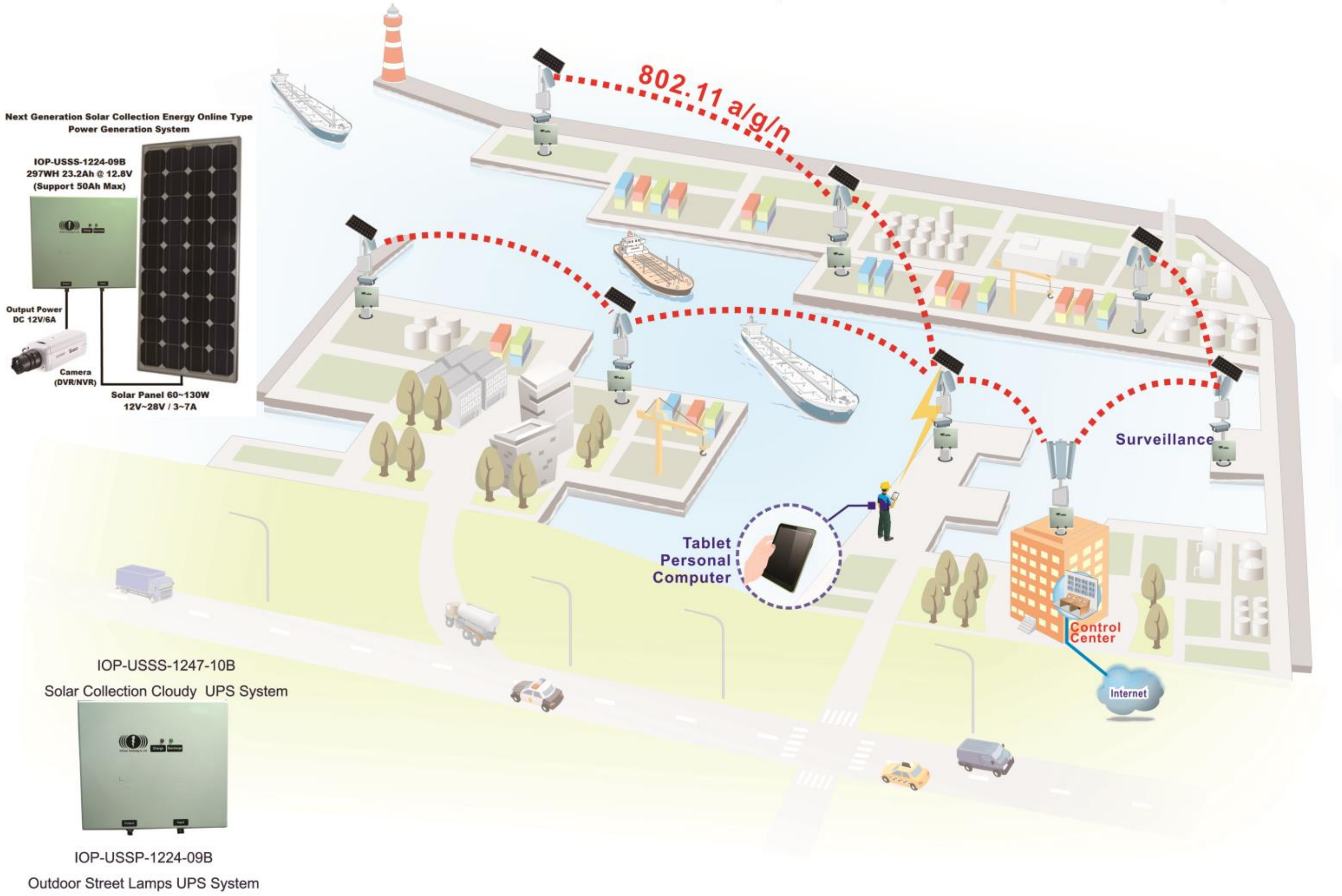
Wireless Surveillance System Record

Sensor Detect Data & Record for Analyze



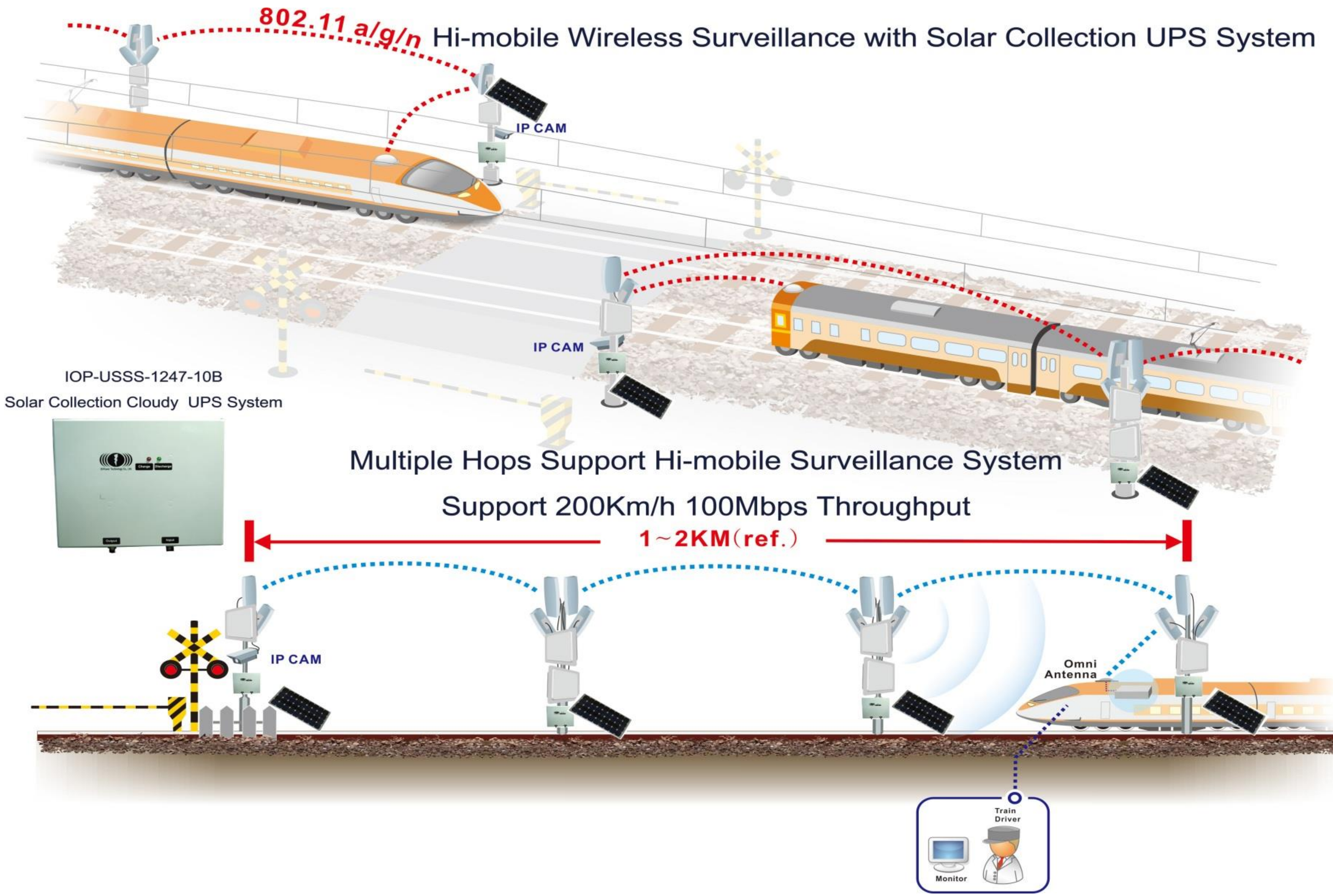
Outdoor MIMO AP Multiple Hops Features and Application

Outdoor Wireless Surveillance with Street Lamps & Solar Collection UPS System



•Hops 6th after, the bandwidth throughput will not reduce again (Keep on 120Mbps~), less than 10ms response time delay.

Outdoor MIMO AP Multiple Hops Features and Application



•Hops 6th after, the bandwidth throughput will not reduce again (Keep on 120Mbps~), less than 10ms response time delay.

Outdoor WiFi MIMO AP Multiple Hops Test Report

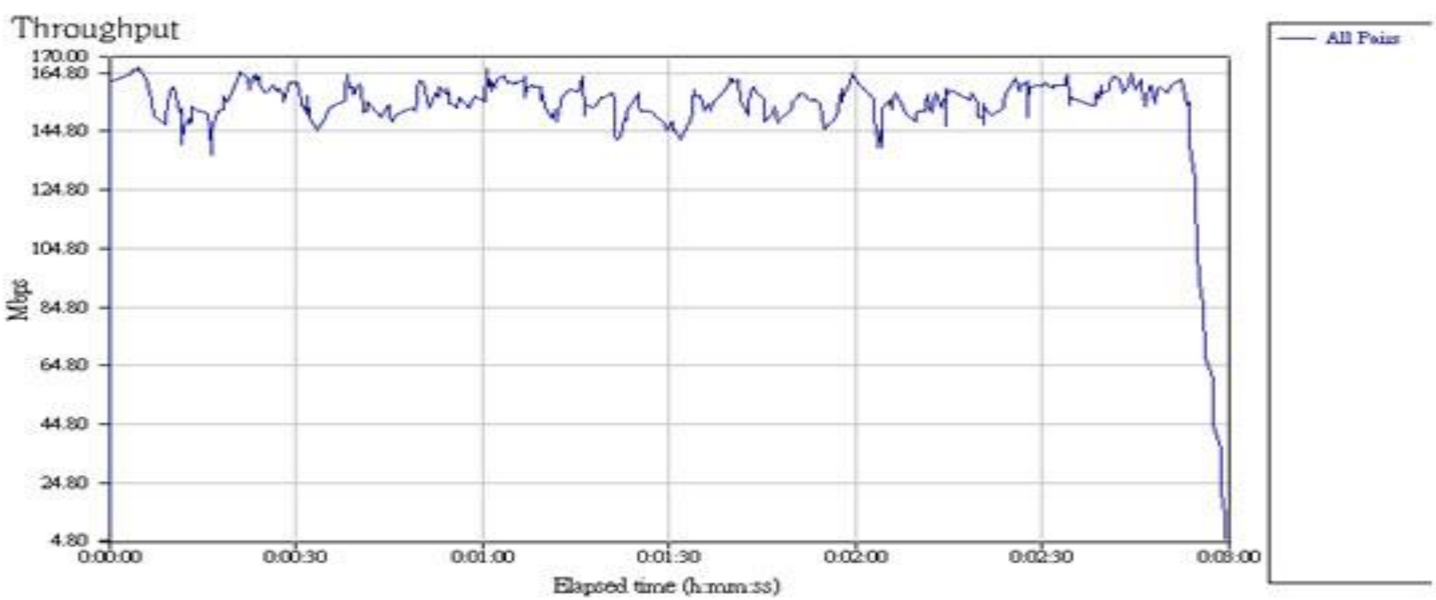
3 Hops 2Km 101R←102R→102R→101R @11naHT40 Throughput 153Mbps

2Km / Hops 3 Times / 40MHz Expand Bandwidth/ Throughput 153Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs	WMM Enable	WPA2 Security
40MHz	2T2R	On(400)	8T8R	Yes	No
Report	**Total Throughput(Mbps)**	**Response Time**		**Transaction Rate**	
	153.193	**8.472**		**1.948**	

Throughput

Pair 16	13.519	7.345	25.245
Totals:	153.193	3.596	25.245



Outdoor WiFi MIMO AP Multiple Hops Project Design

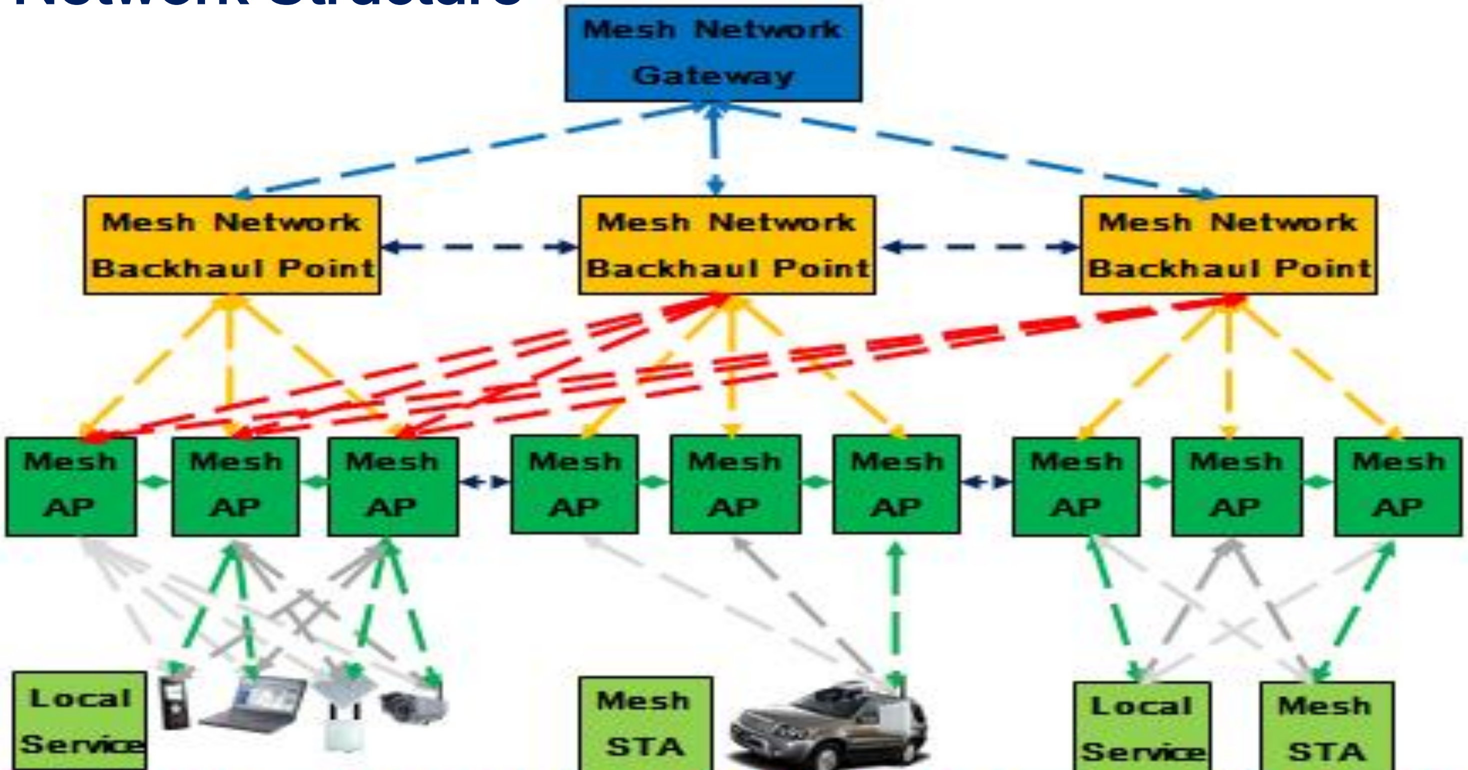
4. MIMO WiFi wireless backbone transmission design (consider the trees cover the wireless signal problem)

Wireless systems design guide: 1. design of multiple hops relay platform to not more than 6 jumped 2.The basis for the design, each wireless backbone links to no bandwidth over 60Mbps for design requirements 3. In the erection of three forks or crossroads, 103R three wireless module designs, reserved engineering change link direction to set up or increase future links to expand or equipment upgrade needs.

Outdoor WiFi MIMO AP Mesh Network & Backhaul Back up Solution

Outdoor MIMO Wireless Multiple Hops Bridge Mesh Network Structure

Mesh Network Structure



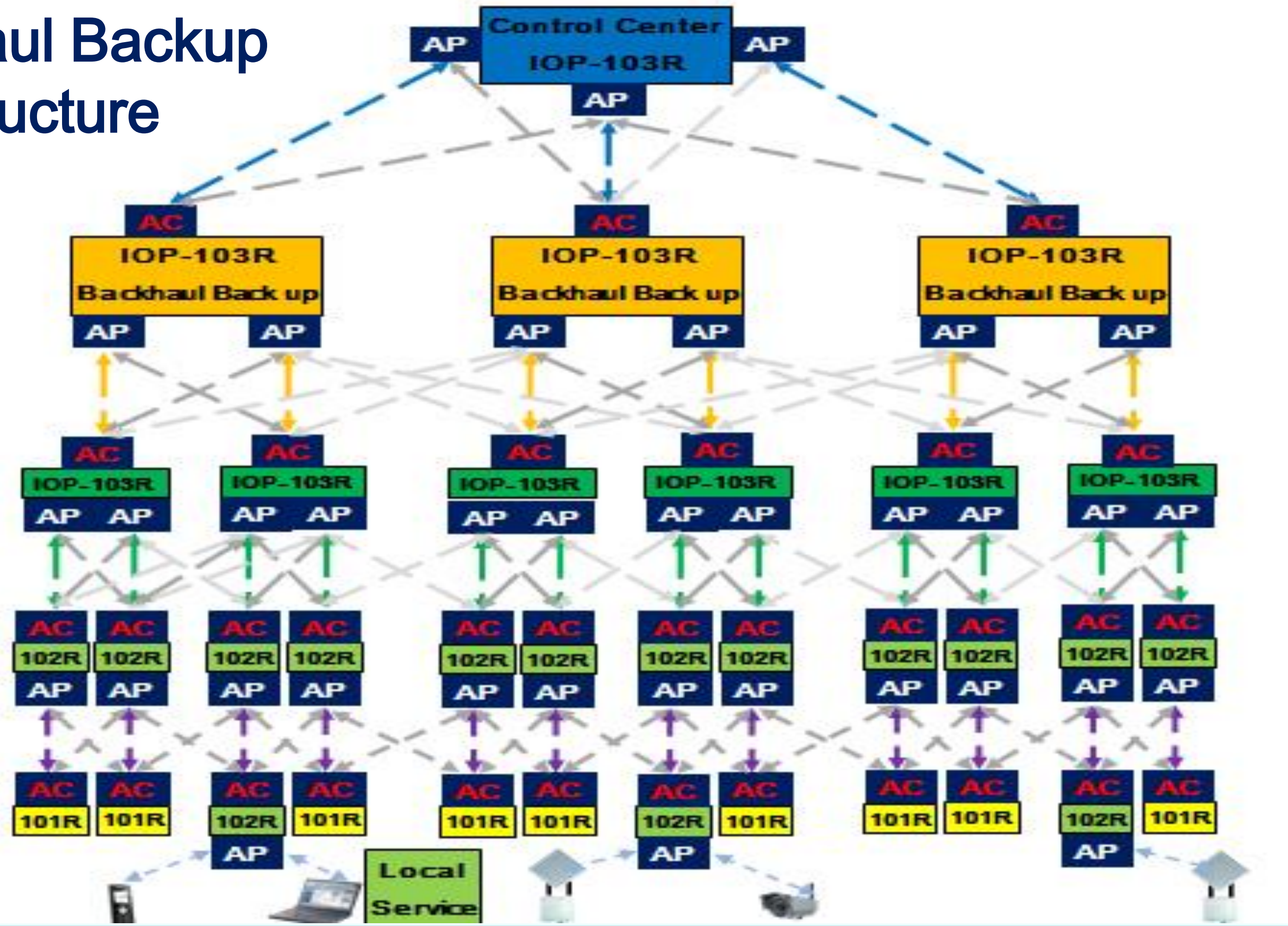
1. IO-Power Mesh Network have 4 system level structure by dual band & multi RF module (Mesh have no AP & AC mode, only have Node mode and level link structure.)
2. Mesh Network have many kind features need setting to run backup and upgrade configuration and bandwidth control...
3. Mesh Network SI need deployment technical skill and more site survey loading and define the right application Antenna
4. Local Service is provide general link service; Mesh STA – Mesh Mobile Station, it is for Hi-mobile data transmit system

Outdoor WiFi MIMO AP Mesh Network & Backhaul Back up Solution

Outdoor MIMO Wireless Multiple Hops Bridge

Special Design Wireless Surveillance Backhaul Backup Structure

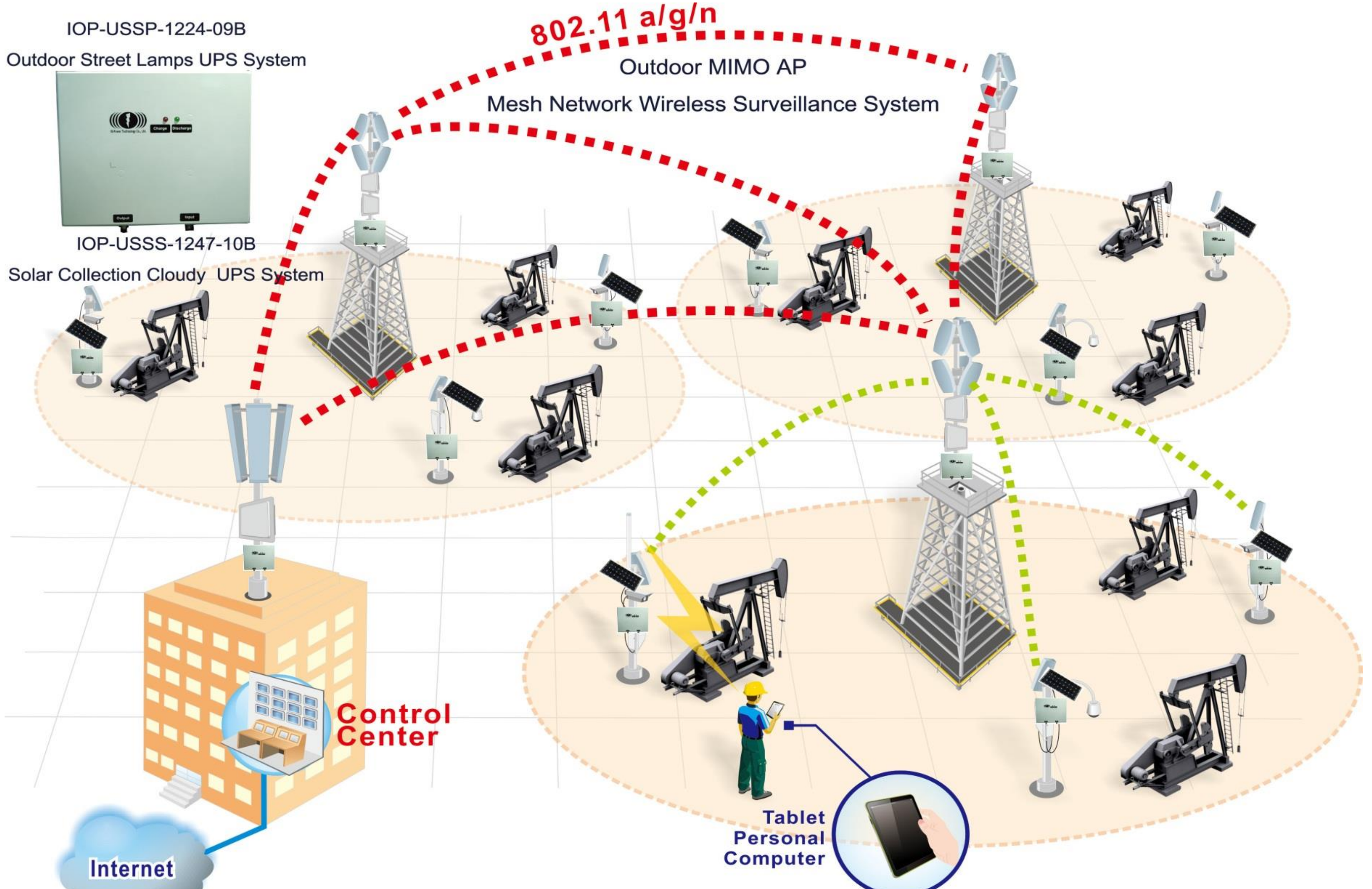
Backhaul Backup Structure



Outdoor WiFi MIMO AP Mesh Network System Application

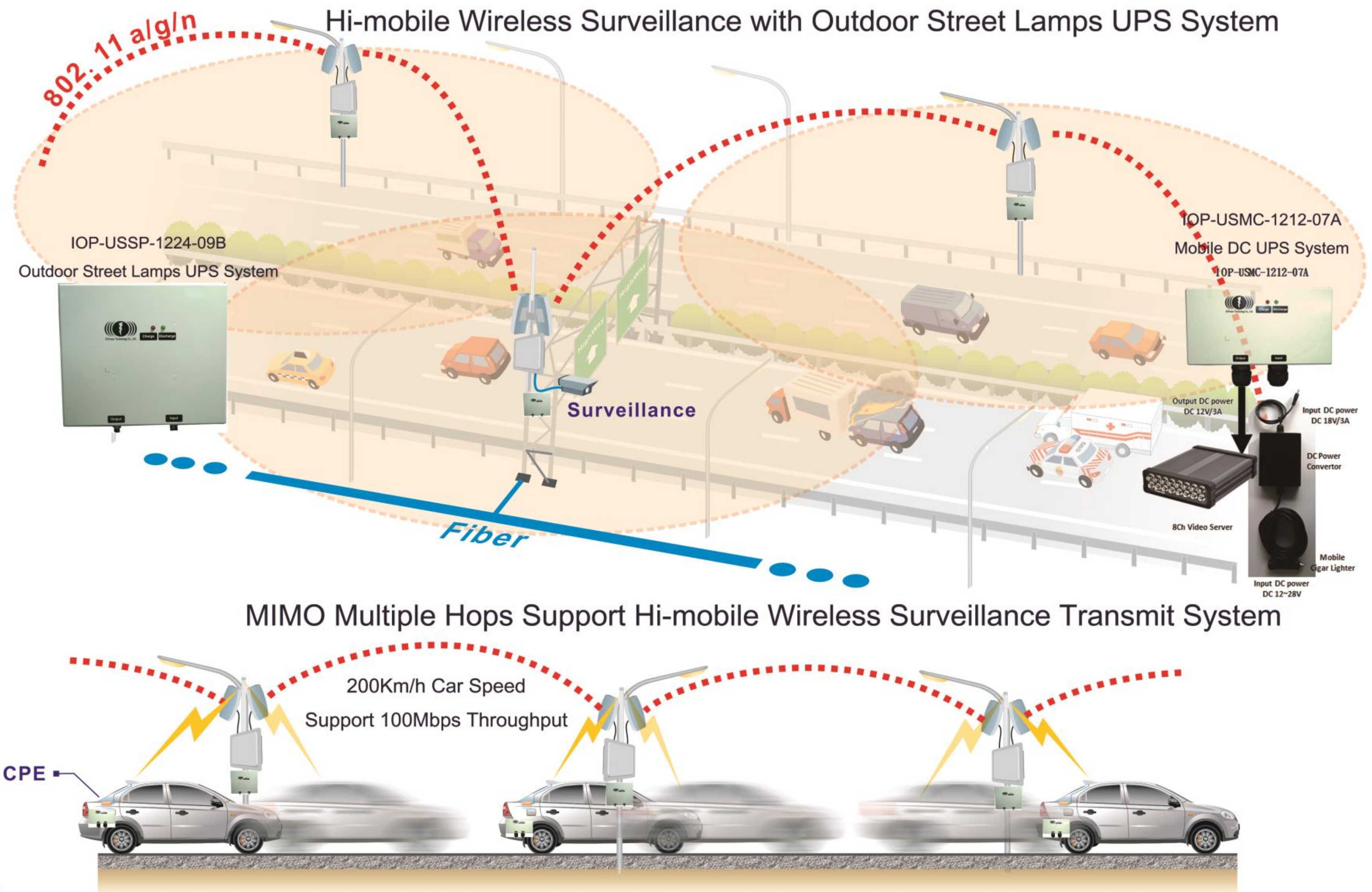
■ Sea Port WiFi MIMO Mesh Skynet Surveillance System

Outdoor WiFi MIMO AP Mesh Network System Application



Outdoor Wireless Surveillance with Street Lamps & Solar Collection UPS System

Outdoor WiFi MIMO AP Mesh Network System Application



Outdoor WiFi MIMO AP P to P 3Km Throughput Test Report

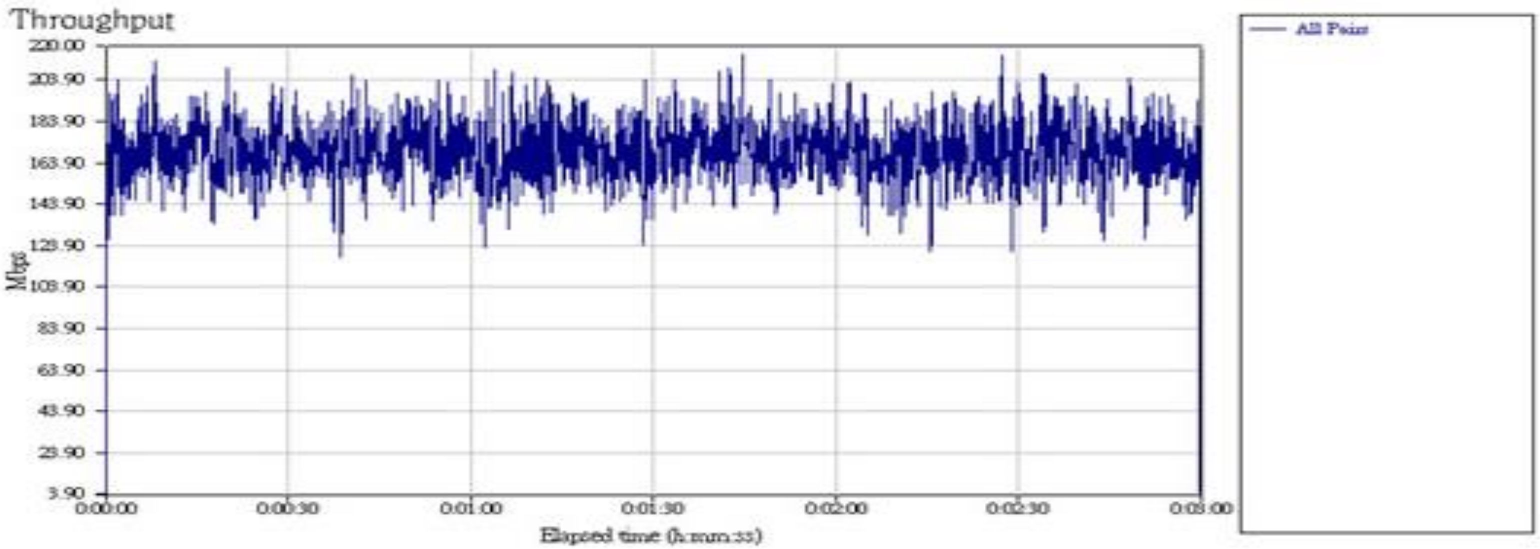
P to P 3Km 101RH←→ 101R @11naHT40 Throughput 168Mbps

A MIMO RF Module to spread spectrum +20dBi 40MHz 5GHz +15 15 dual-polarization MIMO antennas receive ' interval reduced from 3Km to 168Mbps Throughput

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
40MHz	2T2R	On(400)	15T15R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	168.048	0.143	211.014

Throughput

Pair 30	5.230	0.704	13.333	0.179
Totals:	168.048	0.303	20.000	



Outdoor WiFi MIMO AP P to P 16Km Throughput Test Report

P to P 16Km 101RH ←→ 101RH @11naHT40 Throughput 128Mbps

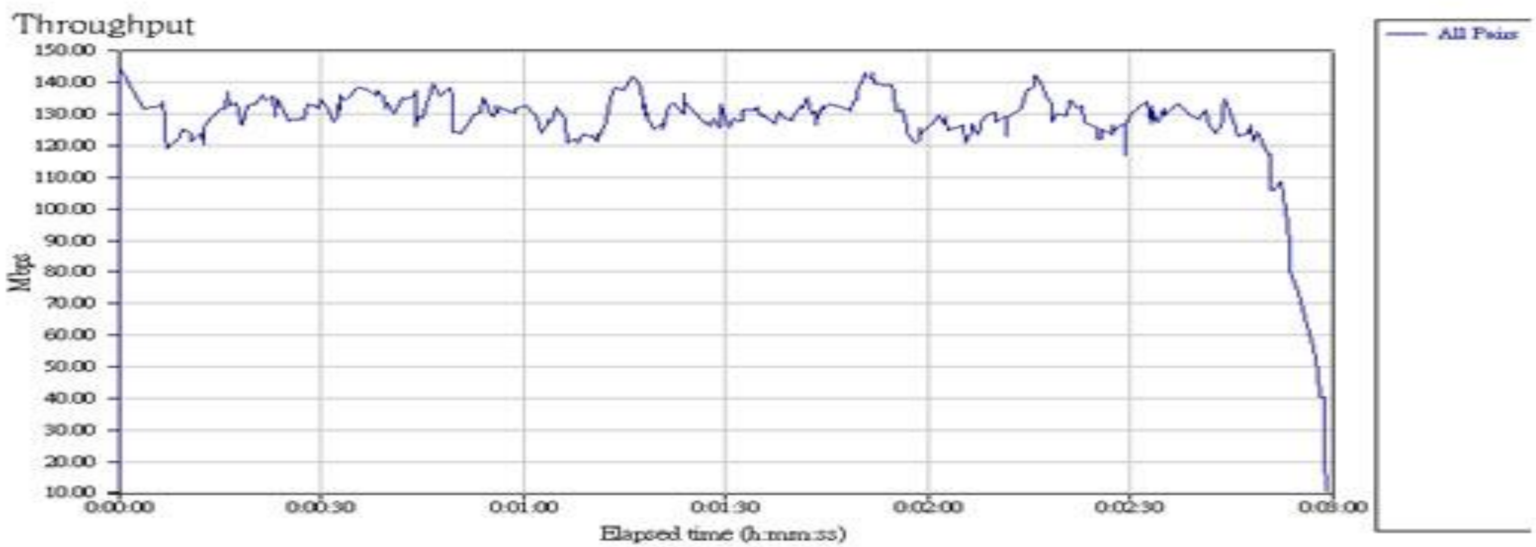
A high-power MIMO RF Module, to spread spectrum 40MHz +29dBi 5GHz dual-polarization MIMO antenna 8 received' interval reduced from 16Km to 128Mbps Throughput

(MIMO RF Module output power maximum 21dBm general power, high-power MIMO RF Module output power maximum 24dBm)

Frequency	Channel Width	RF Model	IxChariot pairs
Channel - 36	40MHz	High Power	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	128.006	9.856	1.641

Throughput

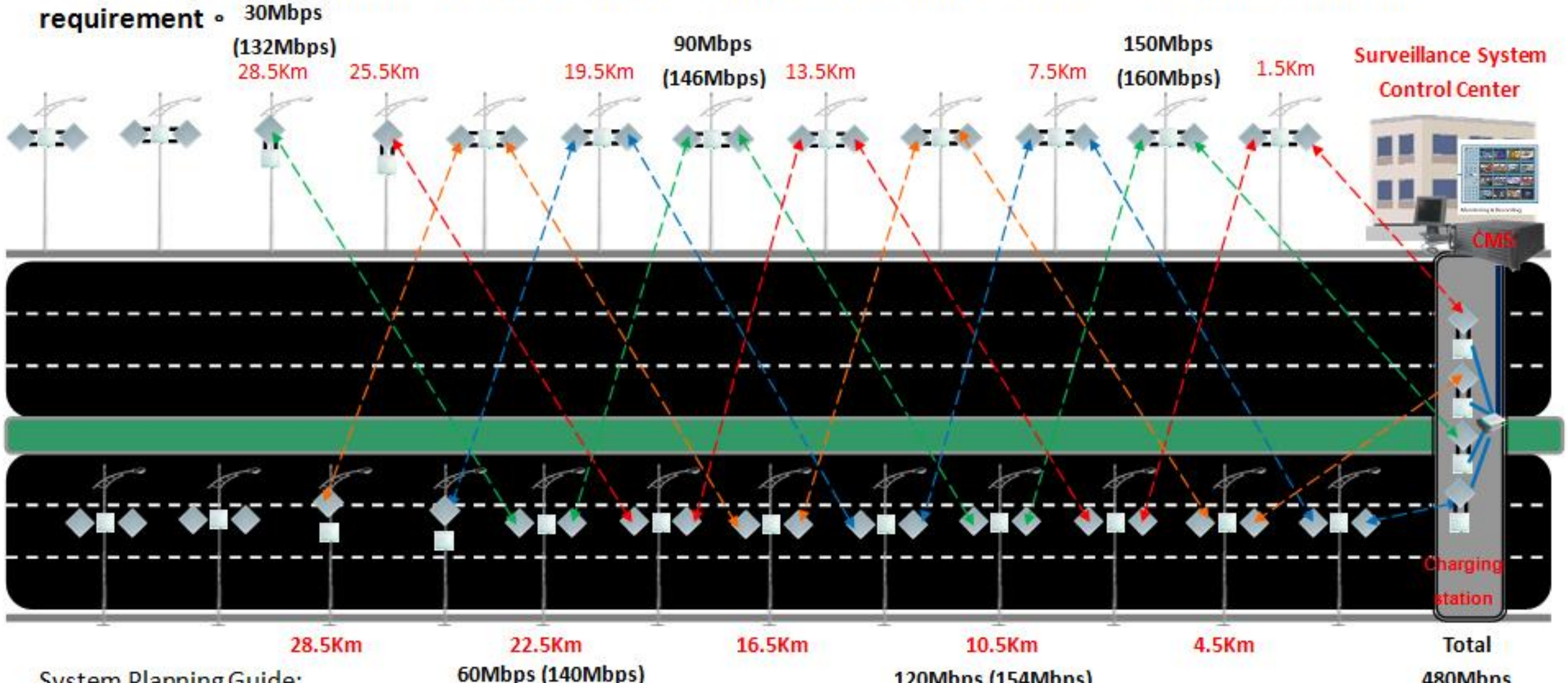
Pair 16	7.643	4.435	15.379
Totals:	128.006	4.227	22.284



Outdoor WiFi WiFi MIMO Wireless Surveillance System

30Km Highway Wireless Surveillance System with Street Lamps DC UPS

The upper level Multiple Hops: 30Km Throughput 480Mbps for IP Camera * 100 about 300Mbps bandwidth requirement。



System Planning Guide:

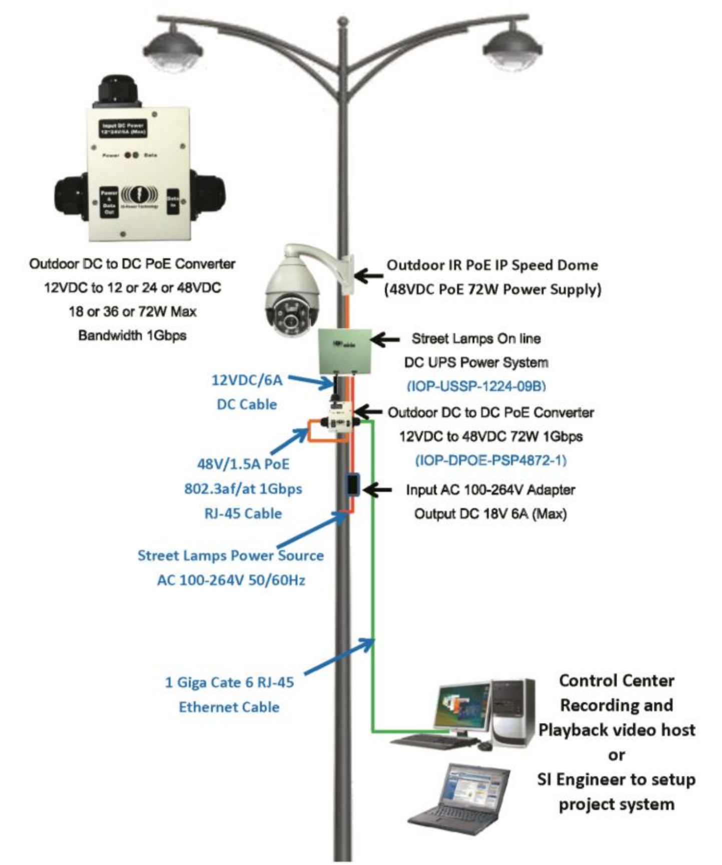
1. Multiple Hops each repeater hop, about 5~8Mbps bandwidth reduction, after the fifth repeater hops, the bandwidth will keep on 120~140Mbps, no longer reduces bandwidth.
2. Upper formation backbone the end each link must withstand 30+30+30+30+30=150Mbps to collect the total bandwidth, the load is very heavy, suggested that the IP Camera bandwidth setup 2Mbps, Speed Dome setup 3Mbps is suitable, which will bring together reduce total bandwidth to 115Mbps.
3. Wireless by straight line transmission primarily, if the highway has the curve area, must additionally build a repeater hop spot in the curve area, or increase or decrease adjustments to two points apart.

Outdoor WiFi MIMO Wireless Surveillance System

30Km Highway Wireless Surveillance System with Street Lamps DC UPS

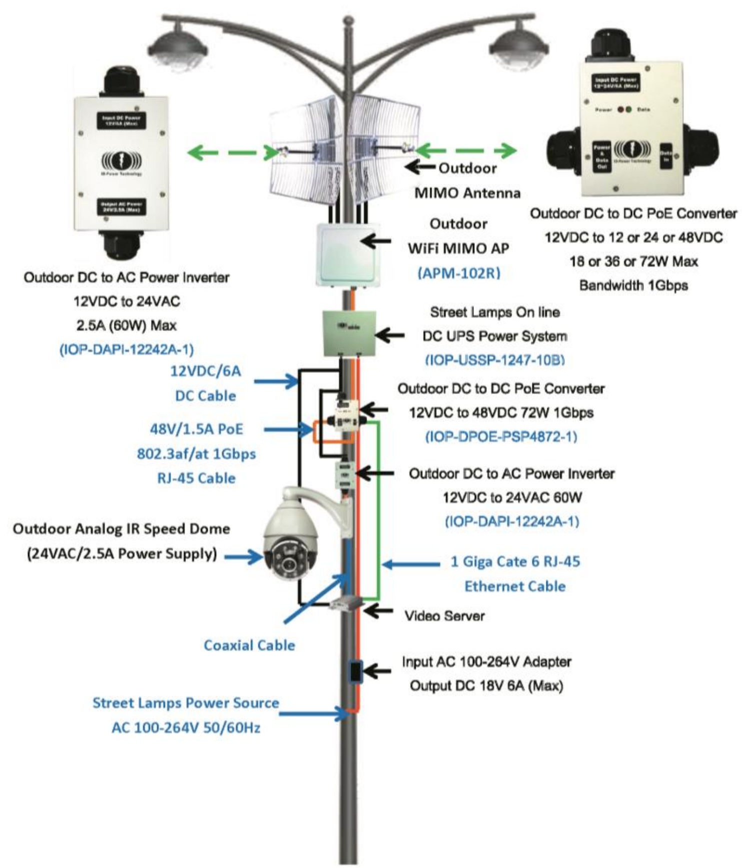
Road Cross Surveillance System

with Street Lamps DC UPS & DC to DC PoE Converter for IP Speed Dome Power Solution



Outdoor WiFi MIMO Wireless Road Cross Surveillance System

with Street Lamps DC UPS & DC to DC PoE & DC to AC Power Inverter Solution



Outdoor WiFi MIMO Wireless Surveillance System

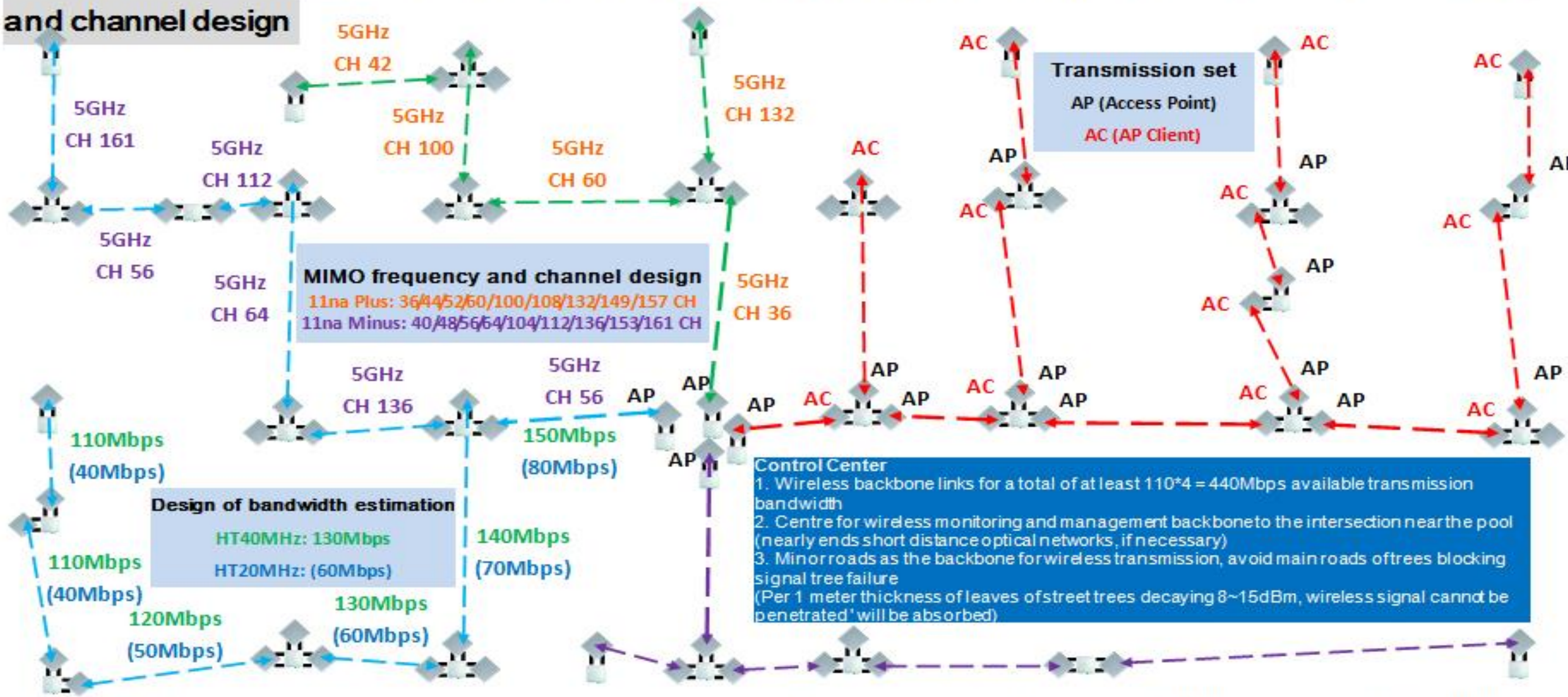
City Wide Road Crossroads High Bandwidth Wireless Surveillance System

3. Set up environment and camera mapping

Outdoor WiFi MIMO Wireless Surveillance System

City Wide Road Crossroads High Bandwidth Wireless Surveillance System

5. MIMO WiFi wireless backbone transmission module, set design and frequency and bandwidth estimation and channel design

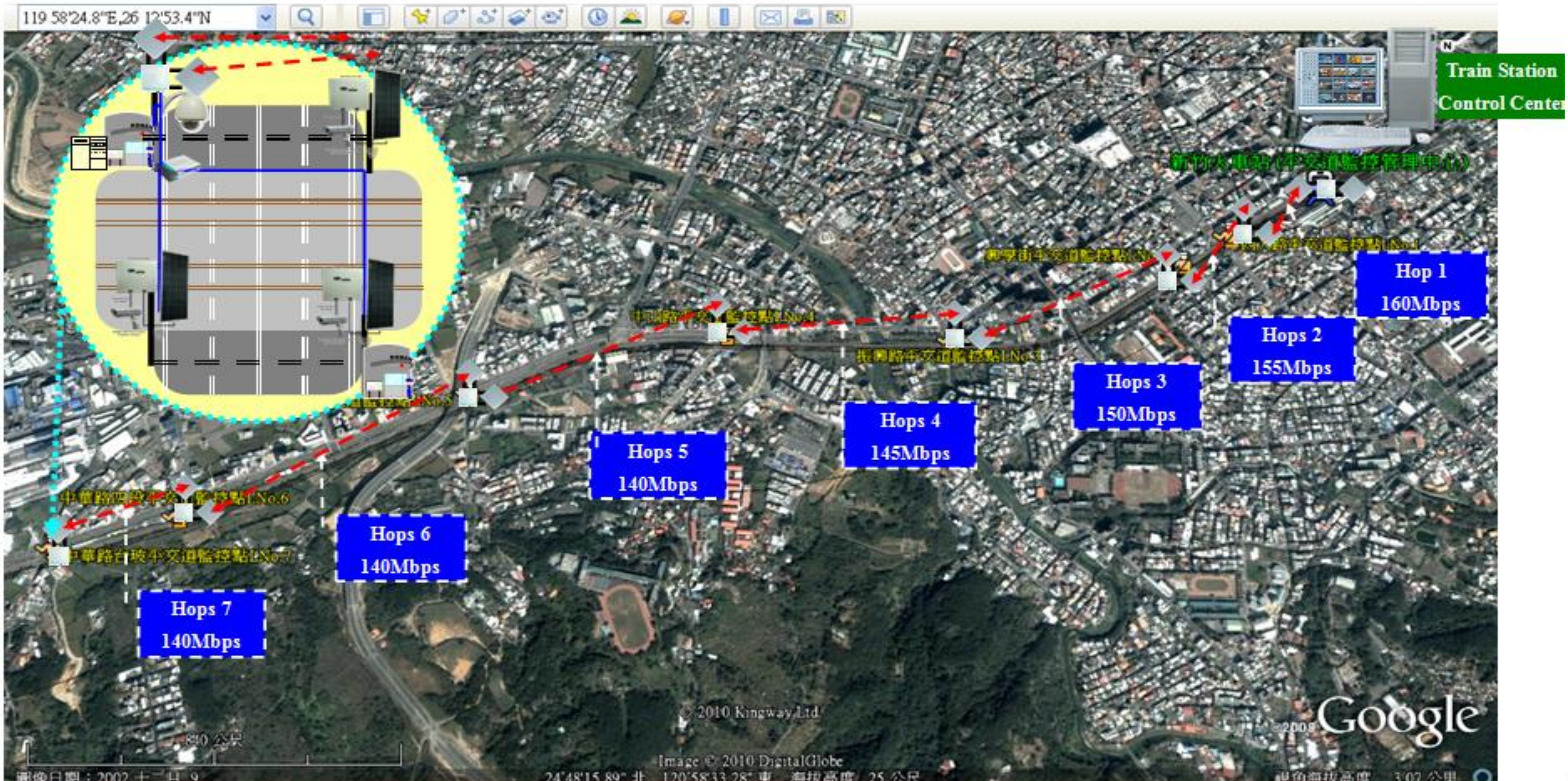


Wireless bandwidth prediction commentary: 1. the multiple hops relay platform technology, 1th hop 140~160Mbps, 2nd hops 130~150Mbps, 3rd hops 120~140Mbps, 4th hops 110~130Mbps, 5th hops after to maintain 110~120Mbps bandwidth, lower bandwidth will not increase the number of platform and response time not less than 10ms.

Outdoor WiFi MIMO Wireless Surveillance System

Train Crossings Long-distance Range Wireless Surveillance System

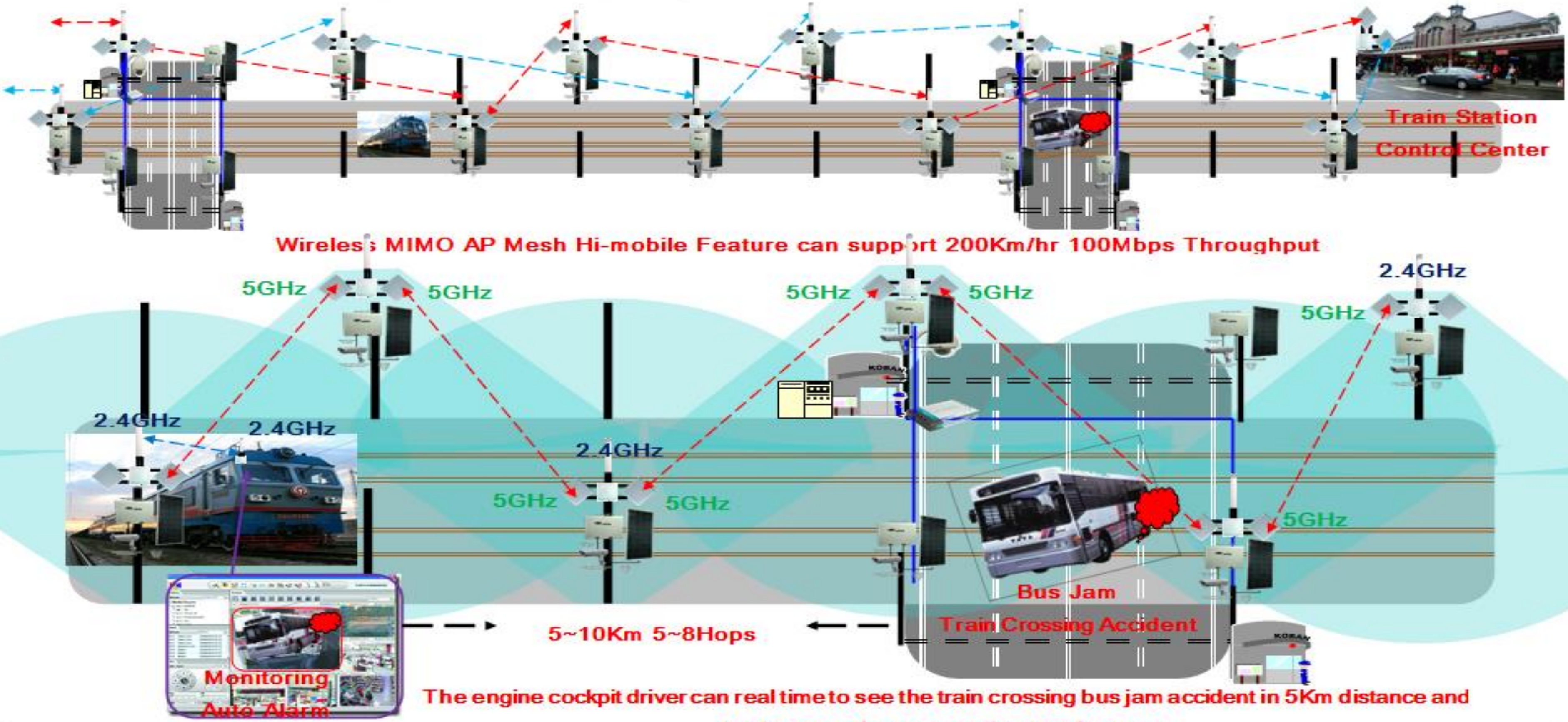
6-2. Train station left crossings: MIMO Wireless relay platform transmission design (Multiple Hops)



Outdoor WiFi MIMO Wireless Surveillance System

Train Crossings Long-distance Range Wireless Surveillance System

8-4.『Solar DC UPS power system with outdoor wireless MIMO Mesh AP for train crossing wireless Hi-mobile surveillance system』the diagram



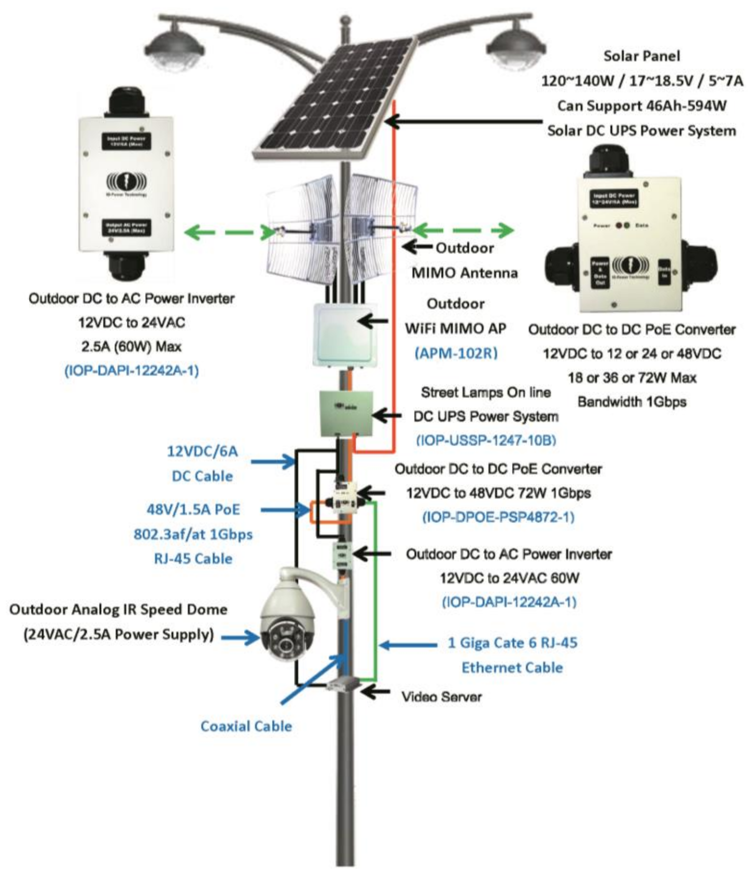
The engine cockpit driver can real time to see the train crossing bus jam accident in 5Km distance and try to start the stop train step by step.

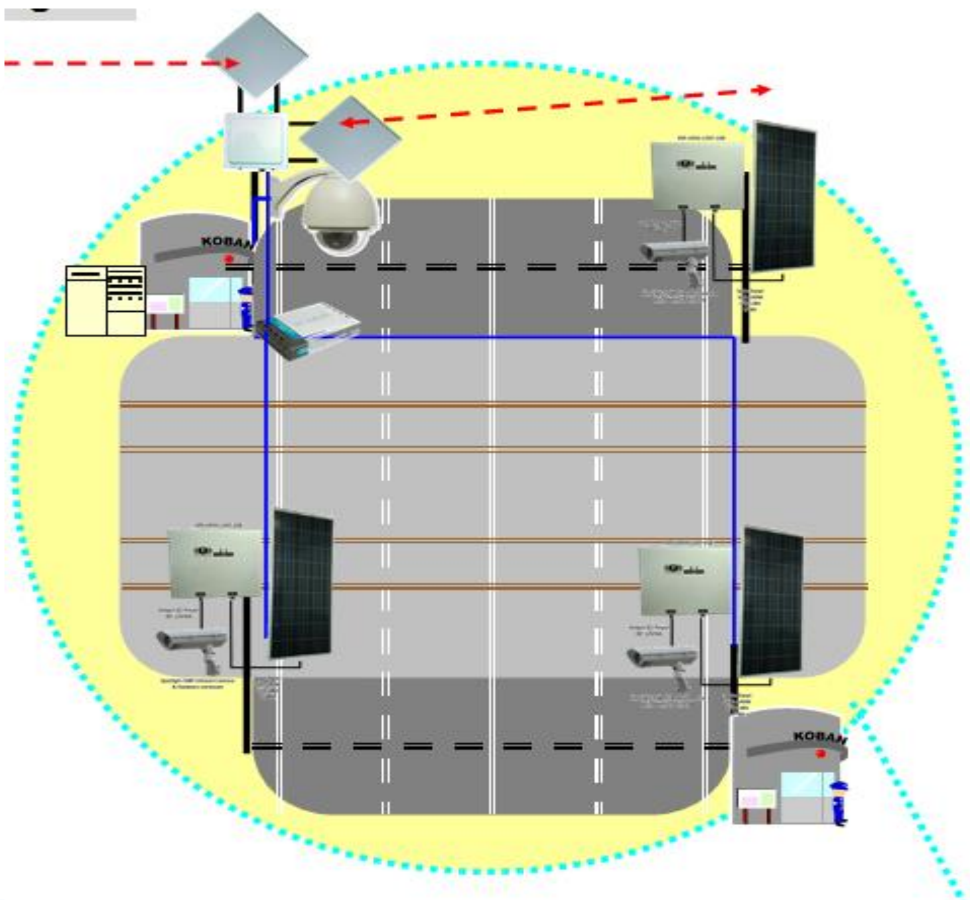
Outdoor WiFi MIMO Wireless Surveillance System

Train Crossings Wireless Surveillance System with Solar DC UPS Solution

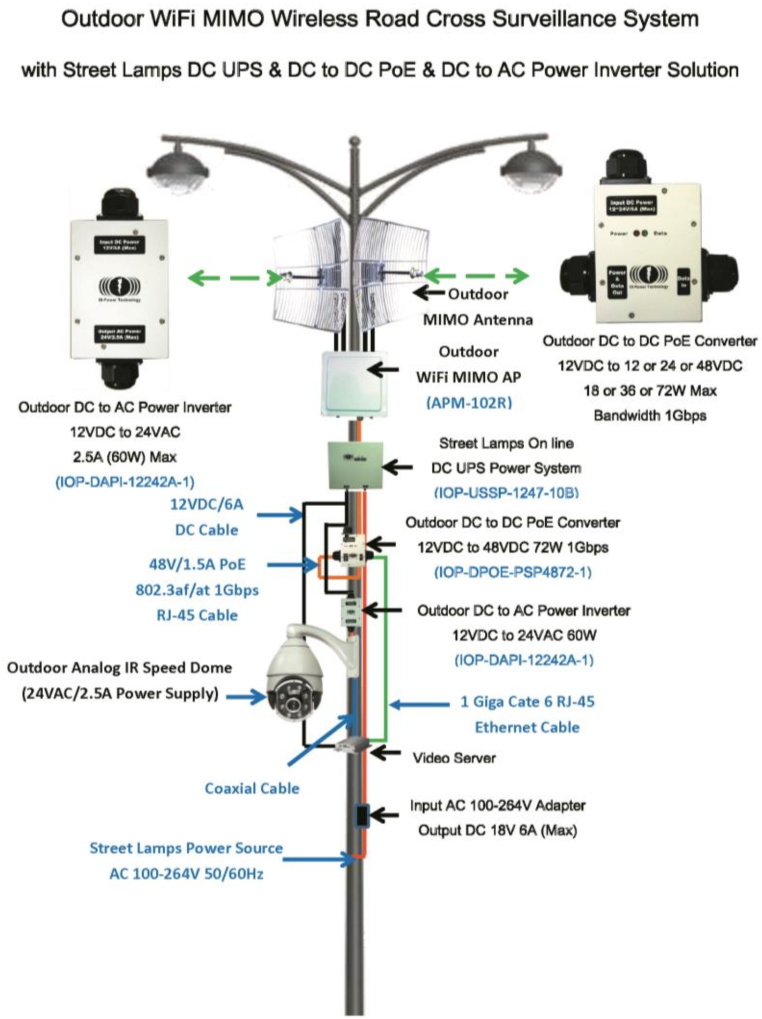
Outdoor WiFi MIMO Wireless Road Cross Surveillance System

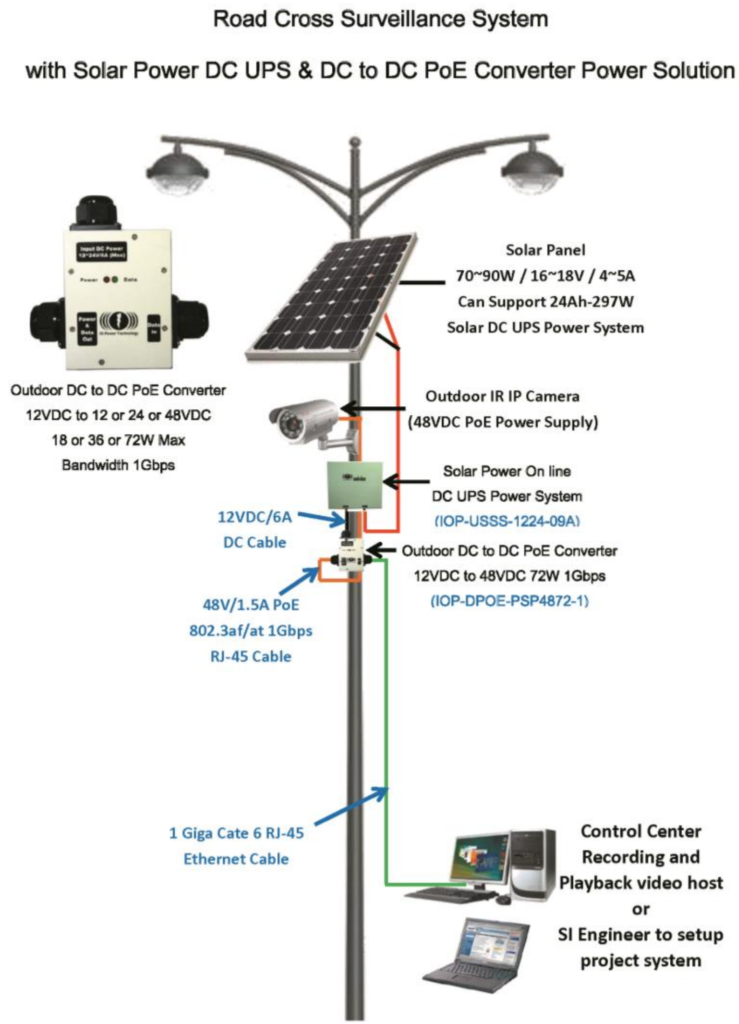
with Solar Power DC UPS & DC to DC PoE & DC to AC Power Inverter Solution





Outdoor Wireless Surveillance System with DC UPS System and Special design DC to DC PoE Converter & 12VDC to 24VAC Inverter

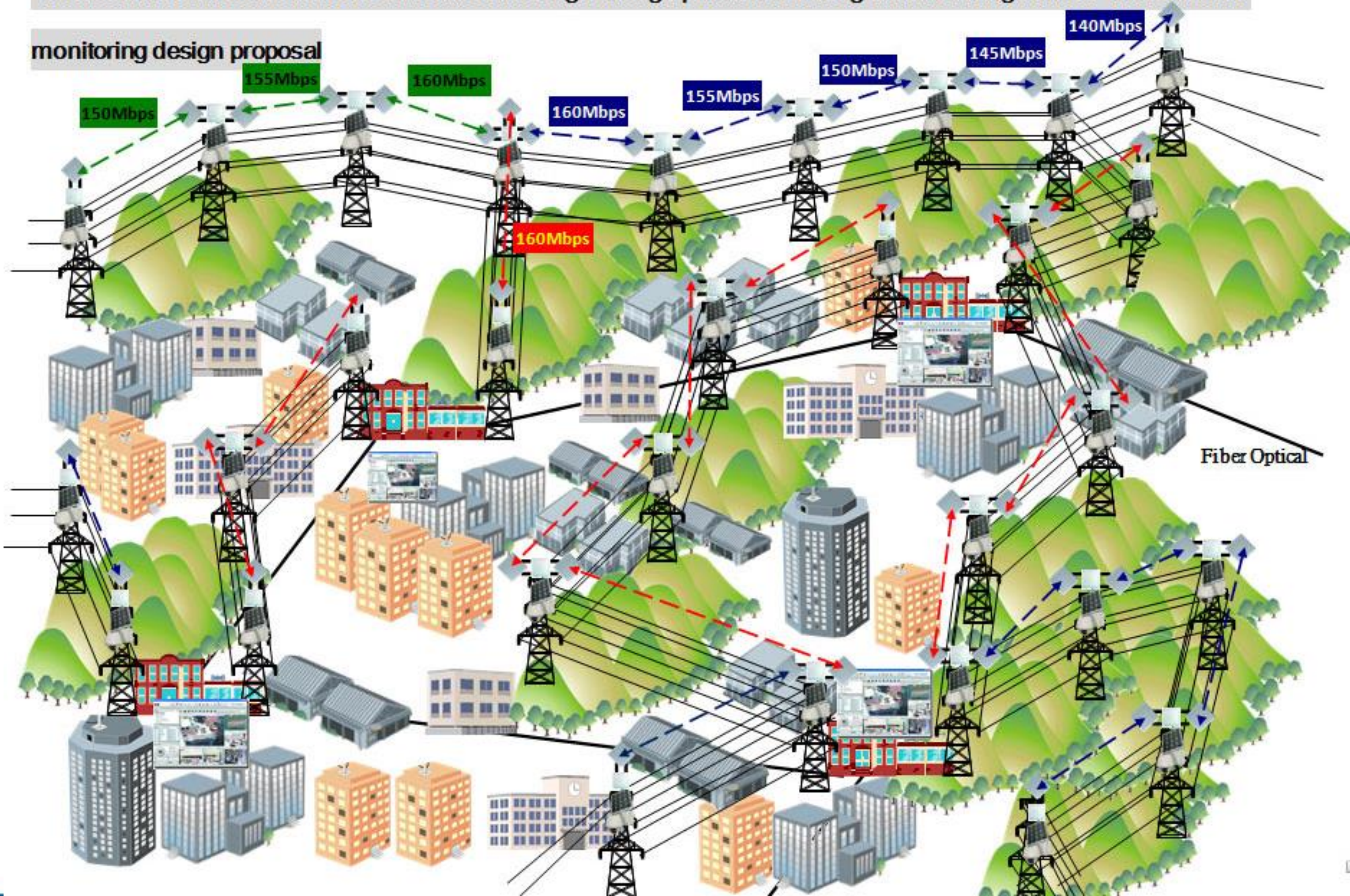




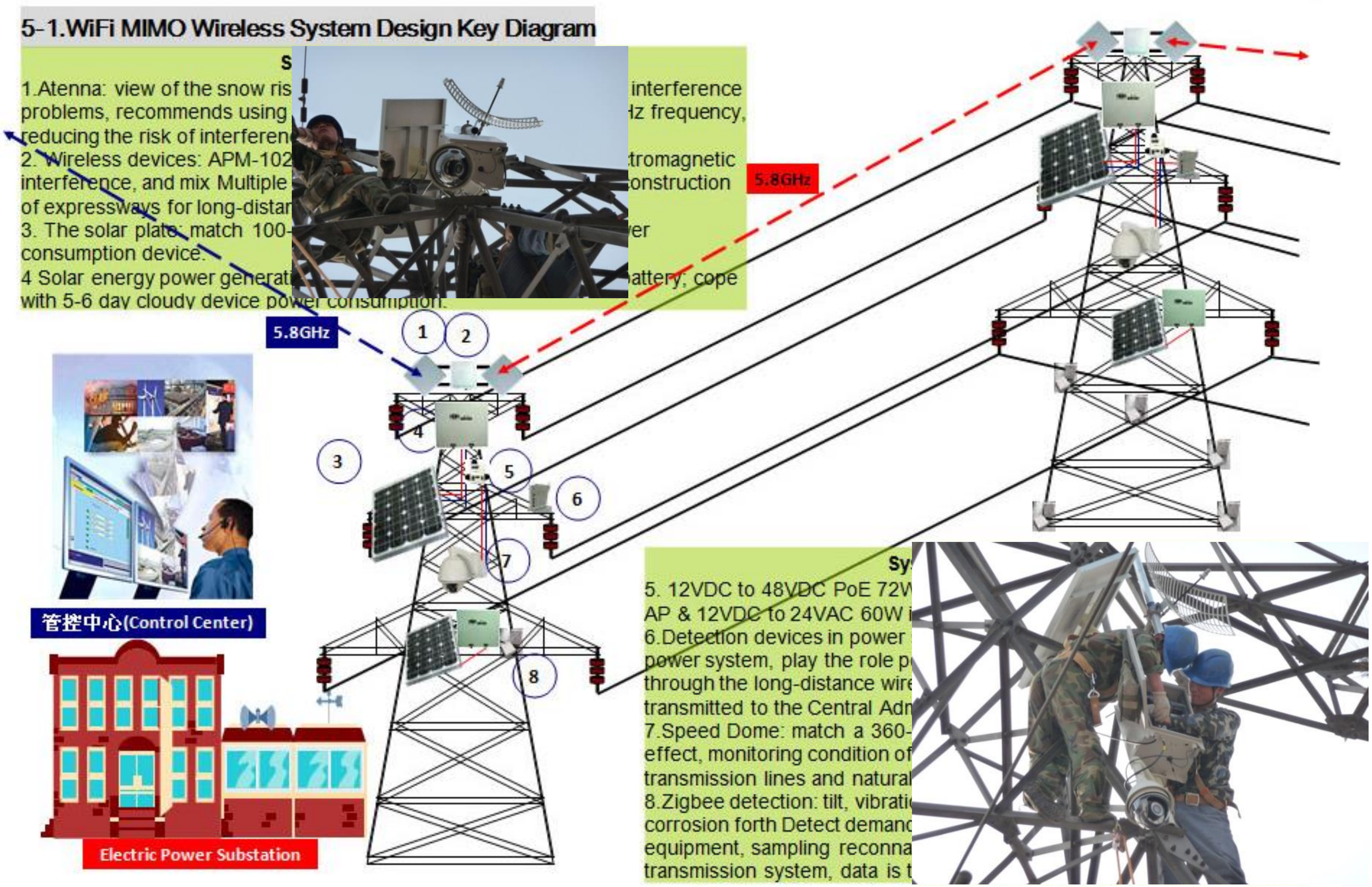
Outdoor Wireless Surveillance System with DC UPS System and Special design DC to DC PoE Converter & 12VDC to 24VAC Inverter

Outdoor Wireless Surveillance System with Solar DC UPS System & Special design DC to DC PoE Converter & 12VDC to 24VAC Inverter

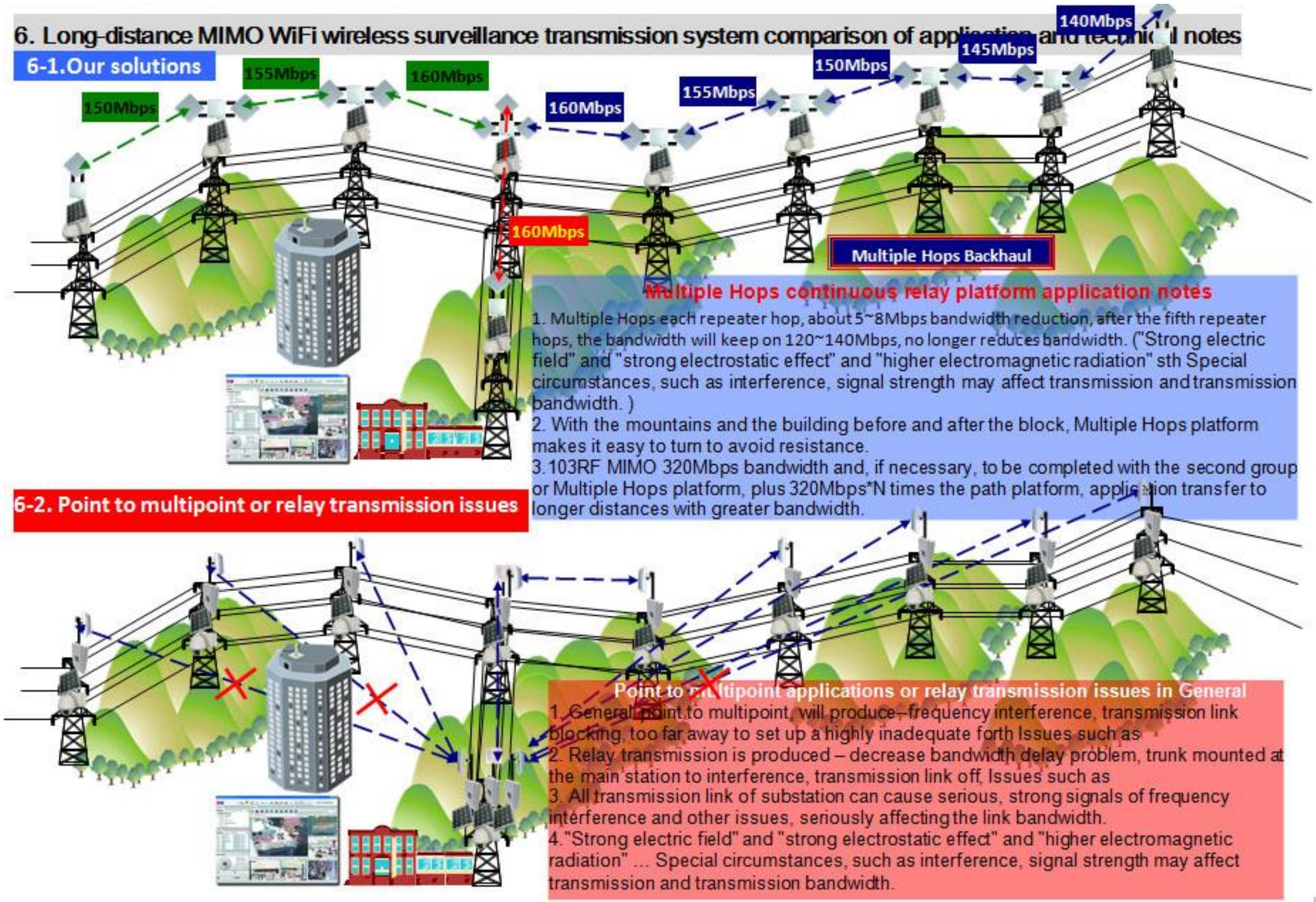
4. Multi-urban 30Km transformer substation and high-voltage power tower long-distance range MIMO WiFi wireless monitoring design proposal



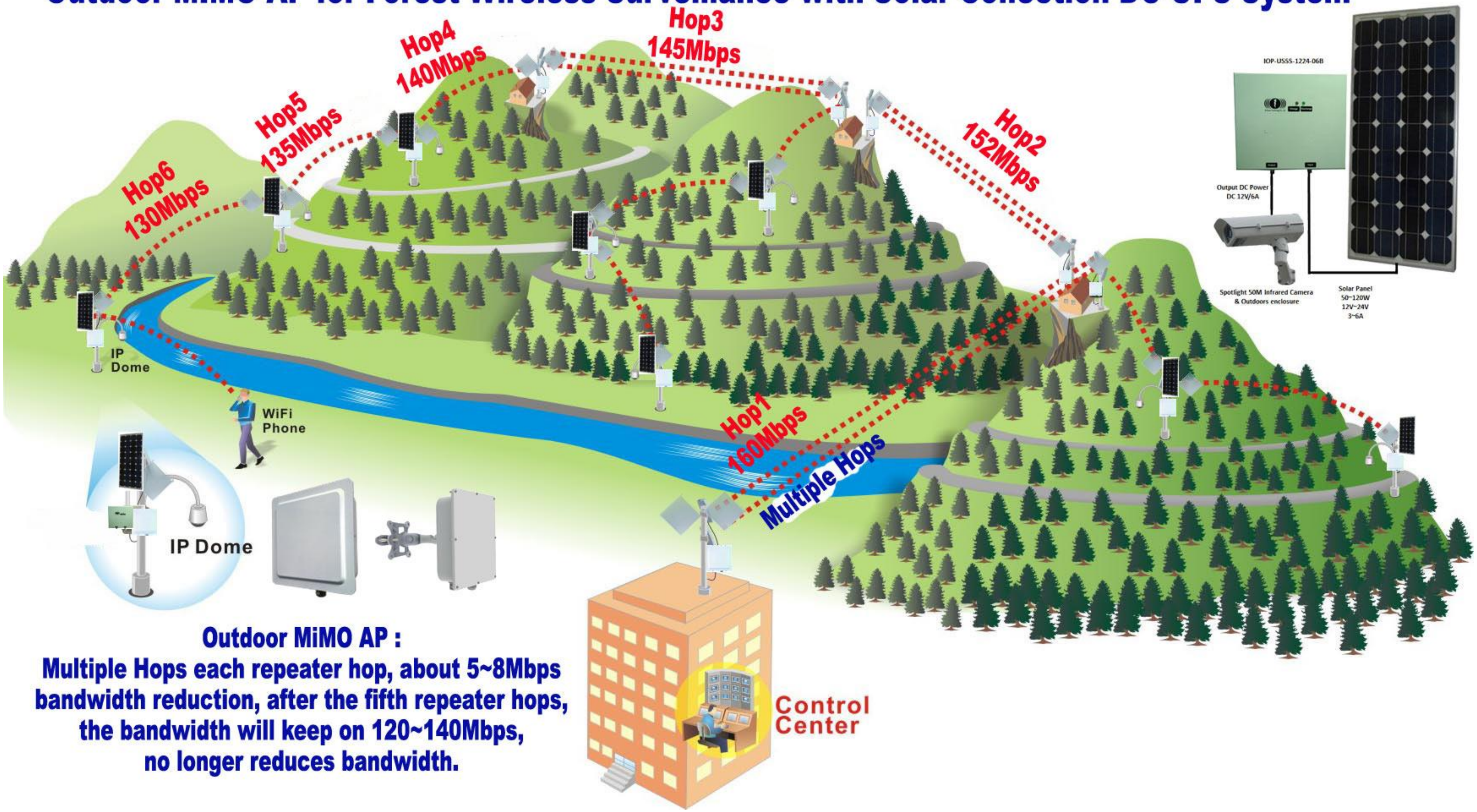
Outdoor Wireless Surveillance System with Solar DC UPS System & Special design DC to DC PoE Converter & 12VDC to 24VAC Inverter



Outdoor Wireless Surveillance System with Solar DC UPS System & Special design DC to DC PoE Converter & 12VDC to 24VAC Inverter



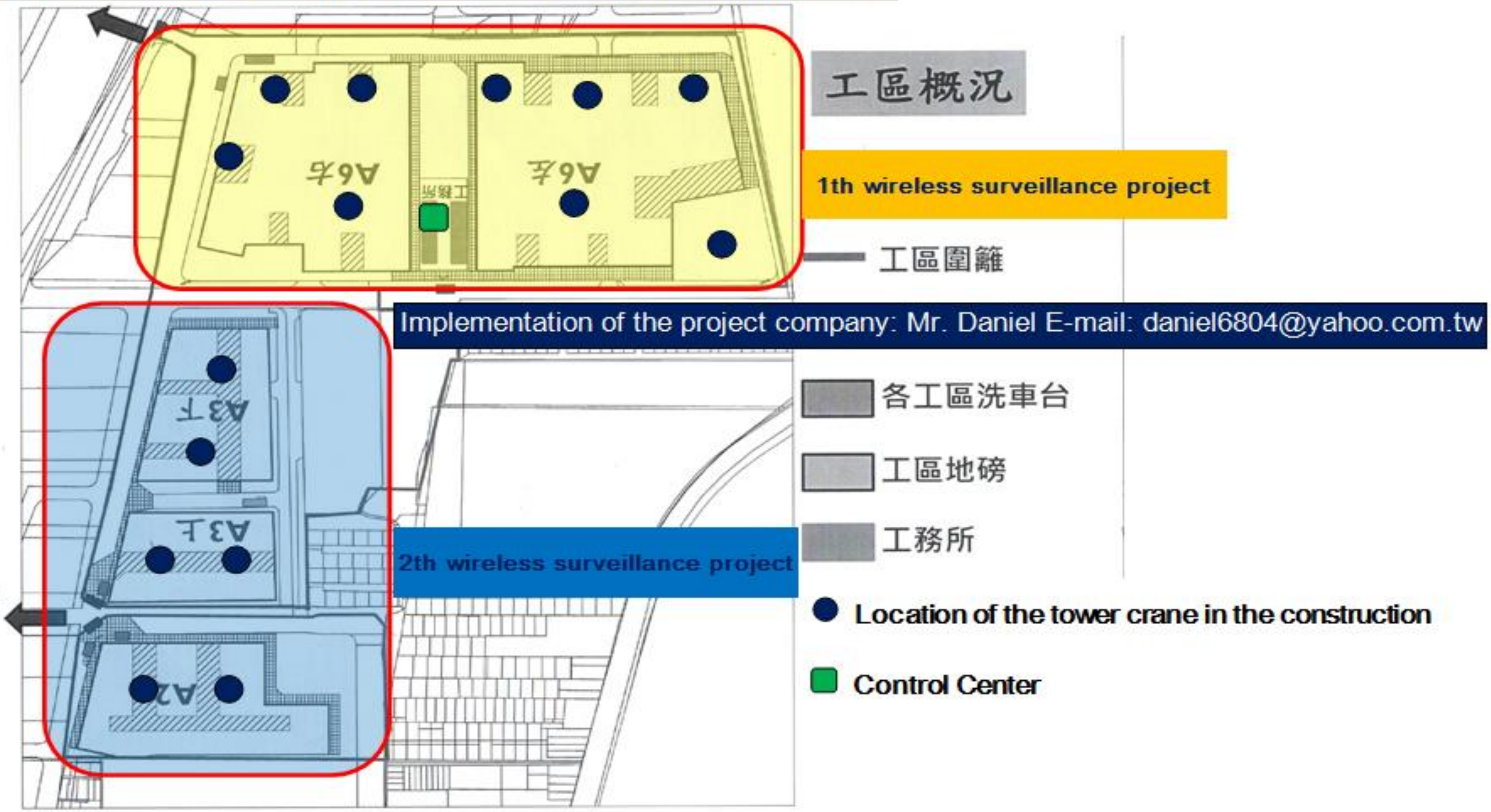
Outdoor MIMO AP for Forest Wireless Surveillance with Solar Collection DC UPS System



Outdoor MiMO AP :
Multiple Hops each repeater hop, about 5~8Mbps bandwidth reduction, after the fifth repeater hops, the bandwidth will keep on 120~140Mbps, no longer reduces bandwidth.

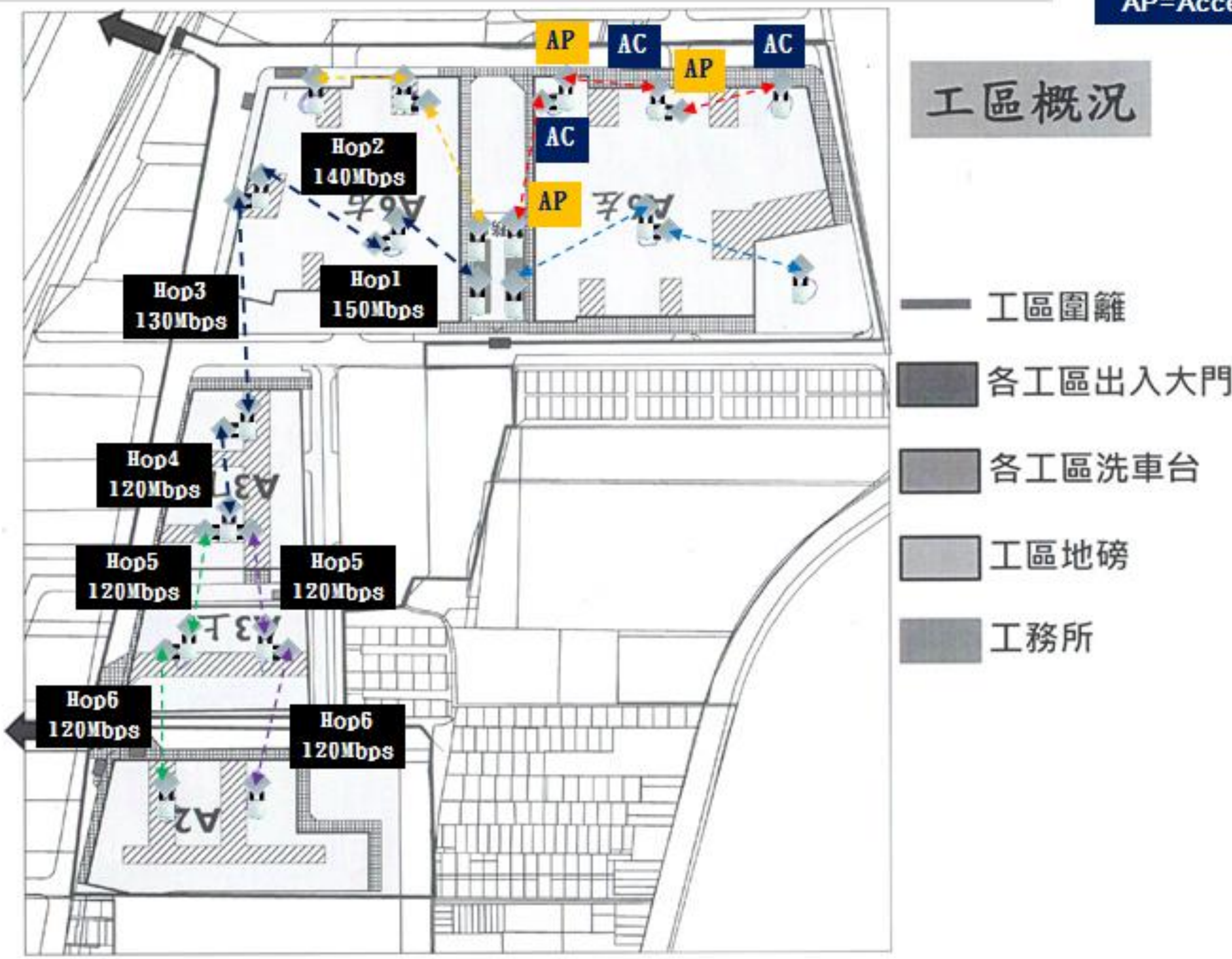
Construction Site High-tower Crane Wireless Surveillance Multiple Hops Transmission System

1、Location of tower crane (Large-scale construction in Taiwan)

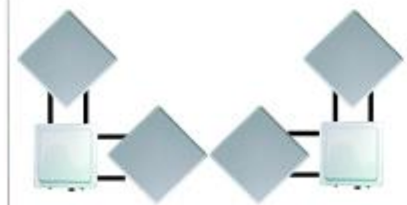


2、The design of tower crane wireless transmission in construction

AC=AP Client=Client side
AP=Access Point=Receive side



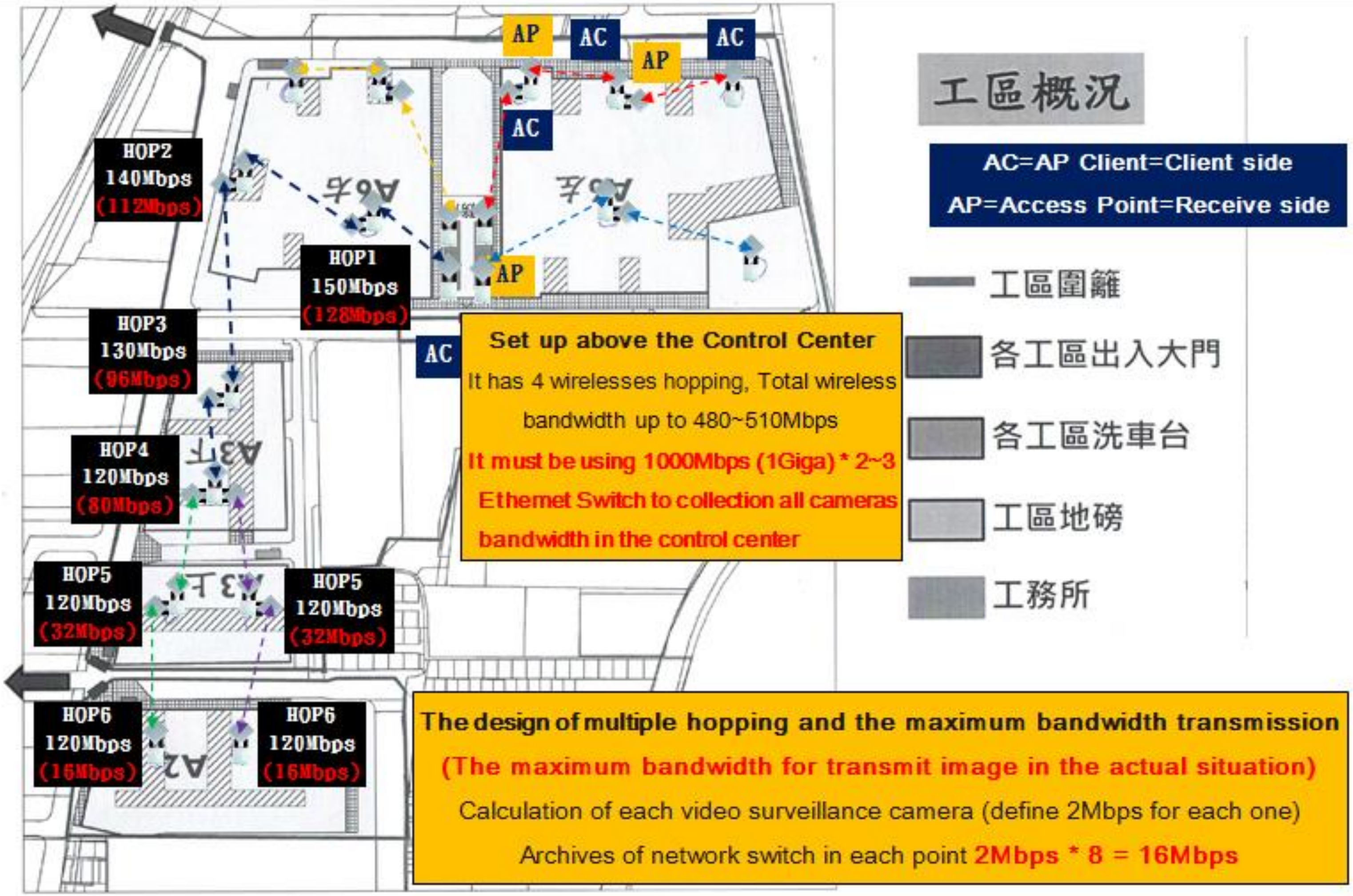
Outdoor wireless AP
Type: APM-101R (1RF)
Antenna: MIMO 5GHz 20dBi
Bandwidth/Distance:150Mbps/5Km



Outdoor wireless AP
Type: APM-102R (2RF)
Antenna: MIMO 5GHz 20dBi
Bandwidth/Distance: 300Mbps/5Km

Outdoor wireless AP
Type: APM-103R (3RF)
Antenna: MIMO 5GHz 20dBi
Bandwidth/Distance: 350Mbps/5Km

3、The design of wireless surveillance transmission system applied to the camera image transmission.



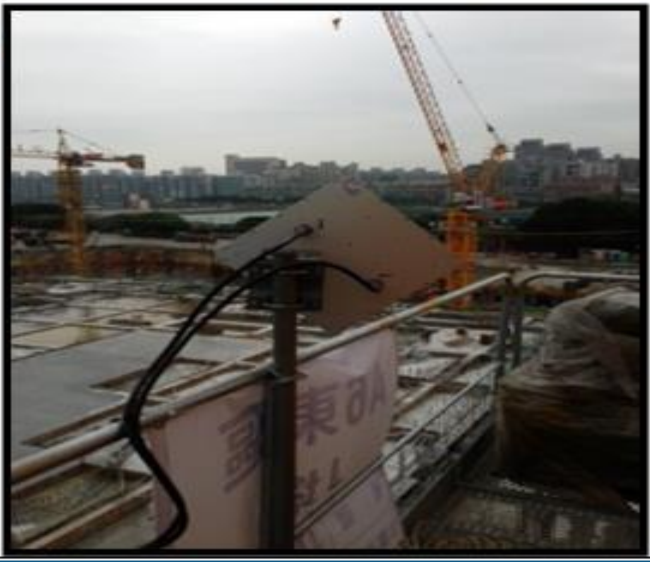
4-1. Tower crane: Tower B equipment set up

4-2 Tower crane: Tower H equipment set up

Remote live screen images from the control center

4-3. Tower crane: Tower J equipment set up

4-4. Tower crane: Tower C equipment set up



4-7. Tower crane: Tower R equipment set up

Remote live screen images from the control center

4-8. Tower crane: Tower V equipment set up

Remote live screen images from the control center

4-9. Tower crane: Tower N equipment set up

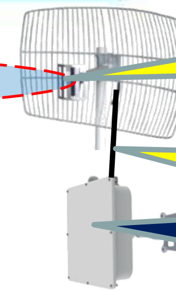
Q & A

TX Antenna Gain dBi

RF Cable Loss < = 1 dB

RF Output Power dBm

Air Space Loss = - 92.4dBm -20*LOG(Frequency)-20*LOG(Distance)



RX Antenna Gain dBi

RF Cable Loss < = 1 dB

RF Receive Sensitivity dBm

Point to Point Receive Sensitivity (RSSI) Suggest

1. for Wireless Backbone System : -50dBm < RSSI < -30dBm
2. for Wireless Surveillance System : -55dBm < RSSI < -35dBm
3. for Wireless Surf Internet Coverage System : -60dBm < RSSI < -40dBm

Note: Receive Sensitivity (RSSI) don't under > -20dBm, it will have effect of Hearing Loss

無線鏈路訊號值(dBm)計算 (Wireless PtP Signal Sensitivity Calculation)

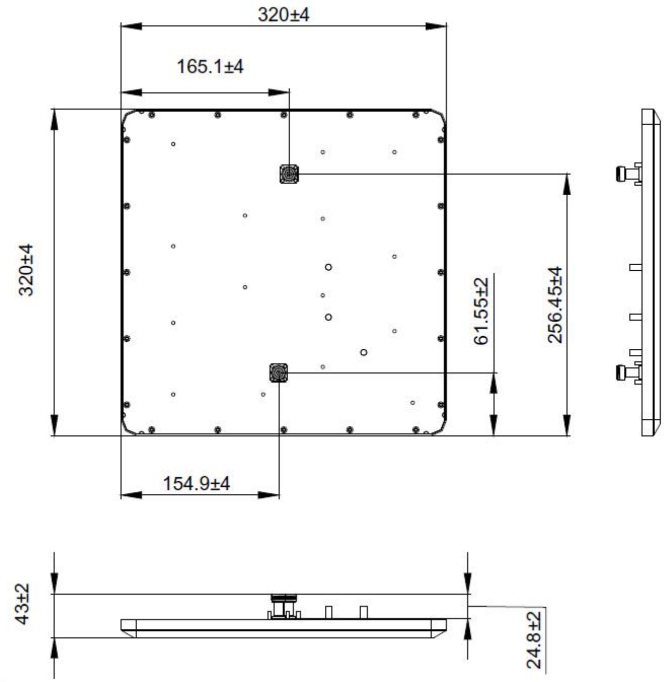
傳輸鏈路訊號計算 (Signal Selectivity Calculation)	RF Output Power dBm (Maxmium)	RF Cable Loss Db (1m=0.6dB)	TX Antenna Gain dBi	Space Loss = 92.4	Frequence Loss GHz	Distance Loss Km	Rain Loss = 2 dB	Tree Loss 1m=5dB	RX Antenna Gain dBi	RF Cable Loss Db (1m=0.6dB)
參數定義 (Parameter definition)	無線最大輸出功率	RF線損耗	天線增益	空間衰減	頻率衰減	距離衰減	雨衰	樹衰	天線增益	RF線損耗
請填入數據 (Please fill in your data)	21	1	20	92.4	5.15	8	0	0	20	1
計算結果 (Calculation results)	-65.70									

無線鏈路距離值(KM)計算 (Wireless PtP Signal Sensitivity Distance Calculation)

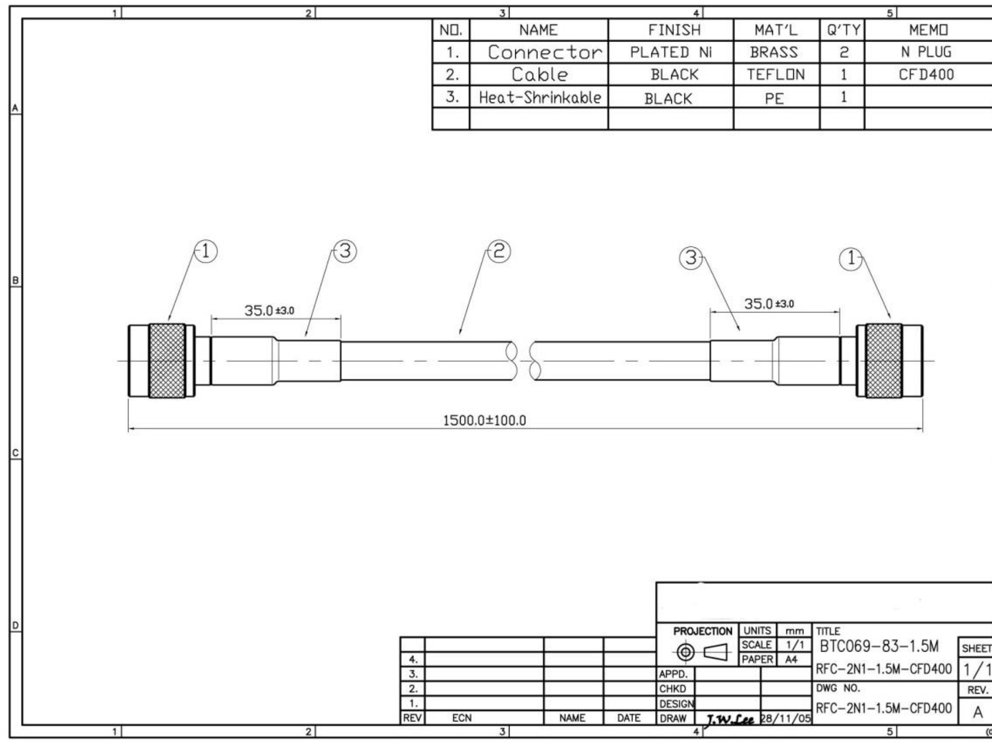
傳輸鏈路訊號計算 (Signal Selectivity Calculation)	RF Output Power dBm (Maxmium)	RF Cable Loss Db (1m=0.6dB)	TX Antenna Gain dBi	Space Loss = 92.4	Frequence Loss GHz	Define Sensertivity dBm	Rain Loss = 2 dB	Tree Loss 1m=5dB	RX Antenna Gain dBi	RF Cable Loss Db (1m=0.6dB)
參數定義 (Parameter definition)	無線最大輸出功率	RF線損耗	天線增益	空間衰減	頻率衰減	自己定義最低RSSI	雨衰	樹衰	天線增益	RF線損耗
請填入數據 (Please fill in your data)	21	1	20	92.4	5.15	-65	0	0	20	1
Calculation1	17.36									
Calculation2	0.87									
計算結果 (Calculation results)	7.38									

5GHz 20dBi Dual Polarization MIMO Panel Antenna

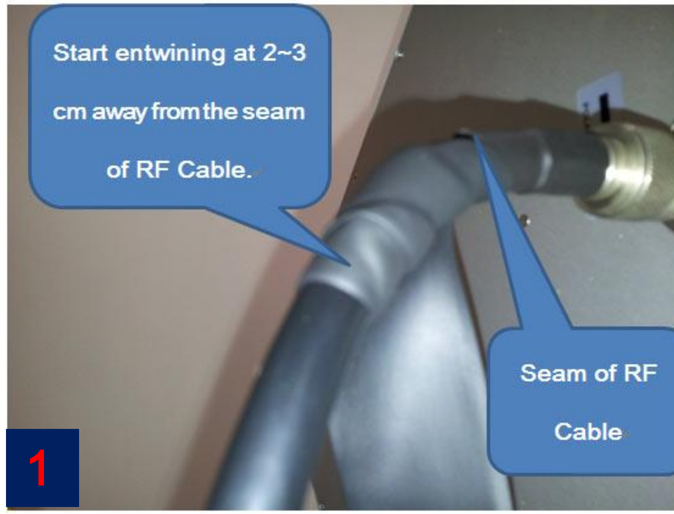
Electrical Specification	
Frequency range	5150 - 5875 MHz
Gain	20 dBi
VSWR	2 : 1 Max.
Polarization	Dual Linear, +- 45˚
HPBW / Horizontal	10˚
HPBW / Vertical	10˚
Standard compliance	N / A
Front to back ratio	-30dB (Max)
Isolation	24dB (Min)
Power handing	6W (cw)
Impedance	50 Ohms
Connector	N Jack x 2
Environmental & Mechanical Characteristics	
Survival wind speed	216Km/hr
Temperature	-40℃ to +80℃
Humidity	95% @ 55℃
Lightning protection	DC ground
Radome color	Gray
Radome material	PC, UV resistant
Weight	1245g
Dimensions	320 x 320 x 20 mm
Waterproof	IP-67
Mounting kit	Pole mount & Wall mount



CFD-400 N-Type 1.5M Antenna RF Cable



Self-Bonding Rainproof Insulating Tape



No.	Item	Lead-acid Solar DC UPS	General Li-Ion Solar DC UPS	C-LiFePO4 Lithium Solar DC UPS (IO-Power)	Remark
1	Battery Management	Non	Yes, but only high level power system, general level is Non	Yes	Lead-acid battery cannot cell management charging & discharge
2	Battery cycle life (for Indoor Used)	300~450 times, Left 50-60% Power capacity	500~1000 times, Left 80% Power capacity	>2000 times, Left 80% Power capacity	Real outdoor to test UPS of C-LiFePO4 Lithium Batteries after 1200 times are still have 95% power capacity
3	Service life (for Indoor Used)	1~1.5 years	1.5~2.5 years	>7 years	Solar DC UPS of C-LiFePO4 Lithium Batteries for indoor used, will have more battery cycle life
4	Battery cycle life (for Outdoor Used)	150~300 times, Left 50-60% Power capacity	300~600 times, Left 70% Power capacity	>1500 times, Left >80% Power capacity	At the time of system design, you want plus the power attenuation and doubled the capacity of the number and replacement of time and frequency
5	Service life (for Outdoor Used)	0.5~1 year (need replace 6 times in 3 years)	1~1.5 year (need replace 3 times in 3 years)	>5 year	Outdoor UPS of C-LiFePO4 Lithium Batteries real outdoor tested 3 years still 95%~ power capacity
6	Operation of high and low temperature	-0 ~ 45 ℃ (with Housing can support -10~55℃)	-5 ~ 45 ℃ (with Housing can support -20~55℃)	-20 ~ 70 ℃ (with Housing can support -30~75℃)	The cycle life for Lead-Acid battery is 300 times @ 25℃ . When the temperature raises every 8℃, its cycle life cuts half. Therefore, it is 150 times @ 33℃ , 75 times @ 41℃ while 30 times @ 49℃. Working temperature over 55℃ is considered as dangerous.
7	Proportional to the design capacity plus	More than 200% (Deep cycle battery required bonus 160%)	More than 160%	More than 110%	For the sake of the system enough power capacity of the equipment operation, designs are subject to decay to add on, to cope with the operation of the system power supply enough
8	Match Solar Panel	Design wattage required bonus 200%	Design wattage required bonus 160%	Design wattage required bonus 110%	Having regard to the increase in battery capacity to match more of the solar panel, so will affect the set up costs and space used for erection and erection equipment difficulties, for the system is satisfied that requirements for the assessment of projects.
9	Set up space and erection harder	Solar panel need more wattage and size	Solar panel need more wattage and size	Solar panel wattage can match the design and area	Solar panel is too large, would create a wind pressure of an area to improve many, resulting in erection and maintenance of security risks increase, too heavy batteries, too
10	Memory effect	Yes	No	No	C-LiFePO4 Lithium Batteries can fast charge and large current discharge
11	Security	Releasing toxic gas and explosion hazards	Have explosion hazards risk in 50~60℃	No explosion risk**	Solar DC UPS of C-LiFePO4 Lithium Batteries @short circuit conditions, maximum temperature up to 120~130℃, at the same time have the security design of the pressure relief valve, so no explosion risk (please see the test report)
12	Maintenance costs	Very higher	Higher	Lowest	General Li-Ion batteries for use in outdoor environments, will face 3 times in 3 years replacement cost ; While operation due to frequent battery replacement issues, resulting in low system properly rate
13	Battery cost	Cheap	Expensive	Very Expensive	Cost for 1 given to lead-acid battery < deep Lead-acid as 3 times< General Li-Ion as 4~5 times < C-LiFePO4 Lithium as 6~7 times

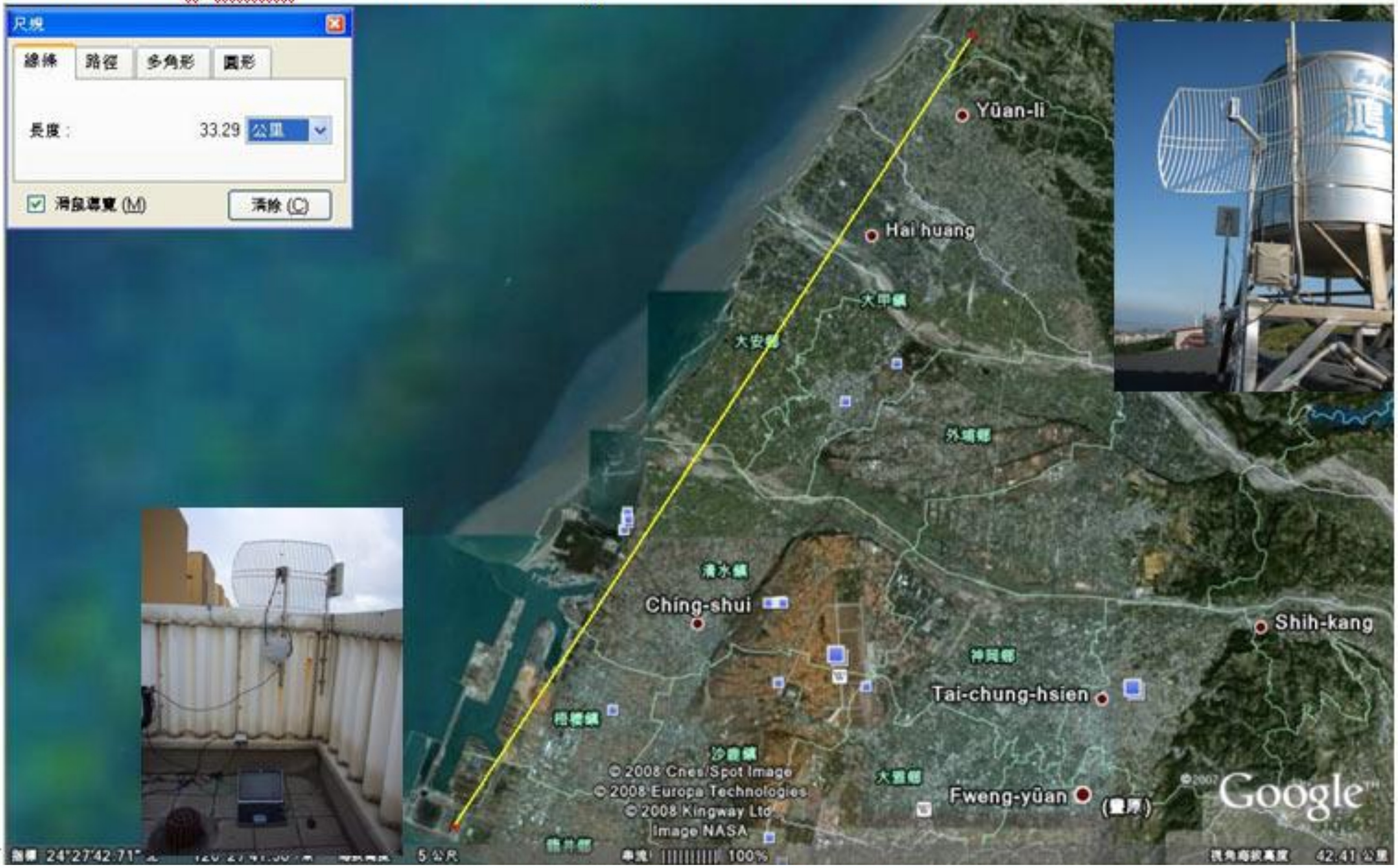
2003-2010
Wireless Projects Case Studies

PtP--33Km 12Mbps Surveillance Application

- Taiwan 33.29Km 2008/11/04~Now

Test Place and Test Plan Distance by Google Earth

Taiwan Yuan-li (Miaoli) ←→ Taiwan Taichung Port South area   Total Distance : 33.29Km。   2008 / 11 / 4



PtP--33Km 12Mbps Surveillance Application

- Earth Bulge Effects + Fresnel Zone Radius > 60 meter

Taiwan Yuan-li (Miaoli) Height above sea level : 72 Meter

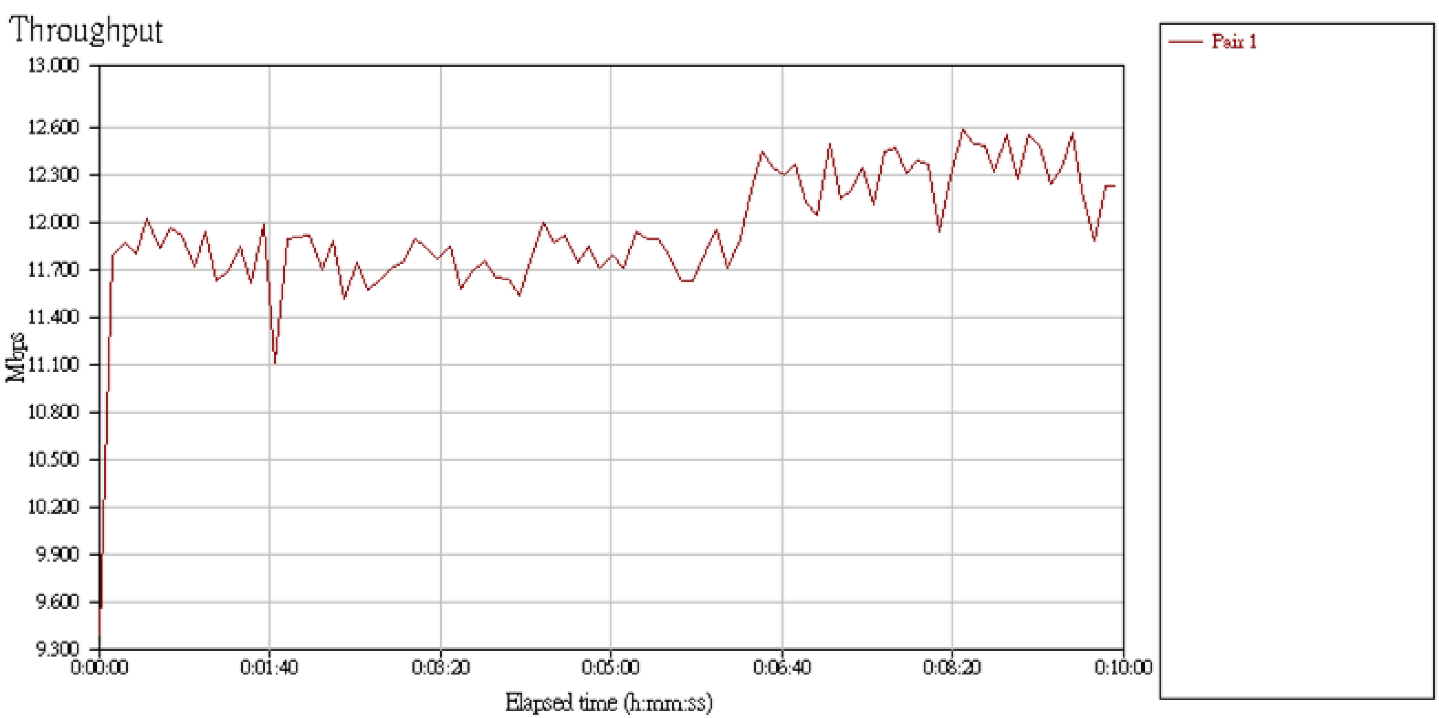
Taiwan Taichung Port South area Height above sea level : 61 Meter

PtP--33Km 12Mbps Surveillance Application

Throughput

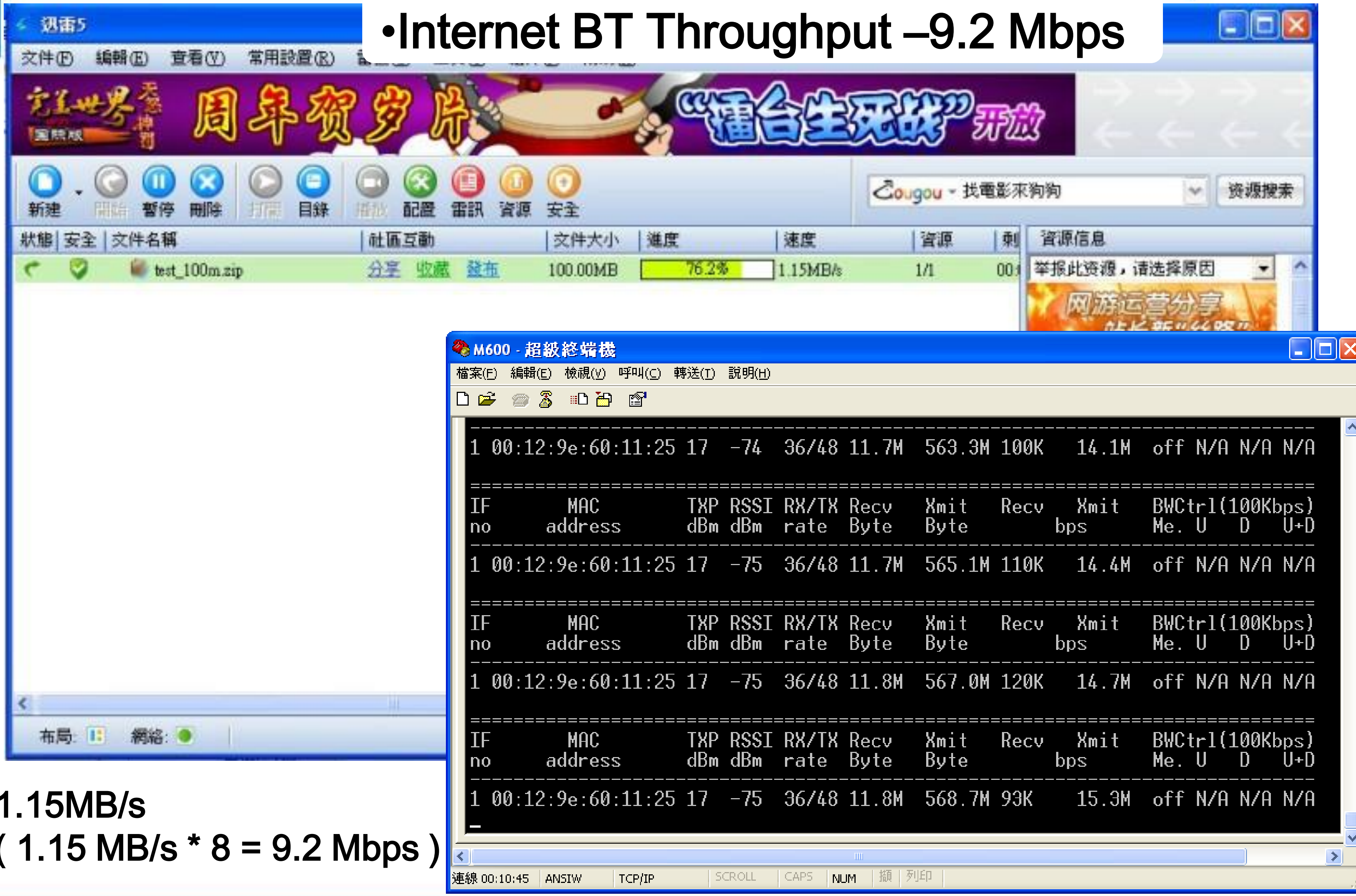
- Throughput 802.11a –14Mbps 802.11g--12Mbps

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	11.936	9.385	12.594			
Pair 1	11.937	9.385	12.594	0.098	596.486	0.819
Totals:	11.936	9.385	12.594			



PtP--33Km 12Mbps Surveillance Application

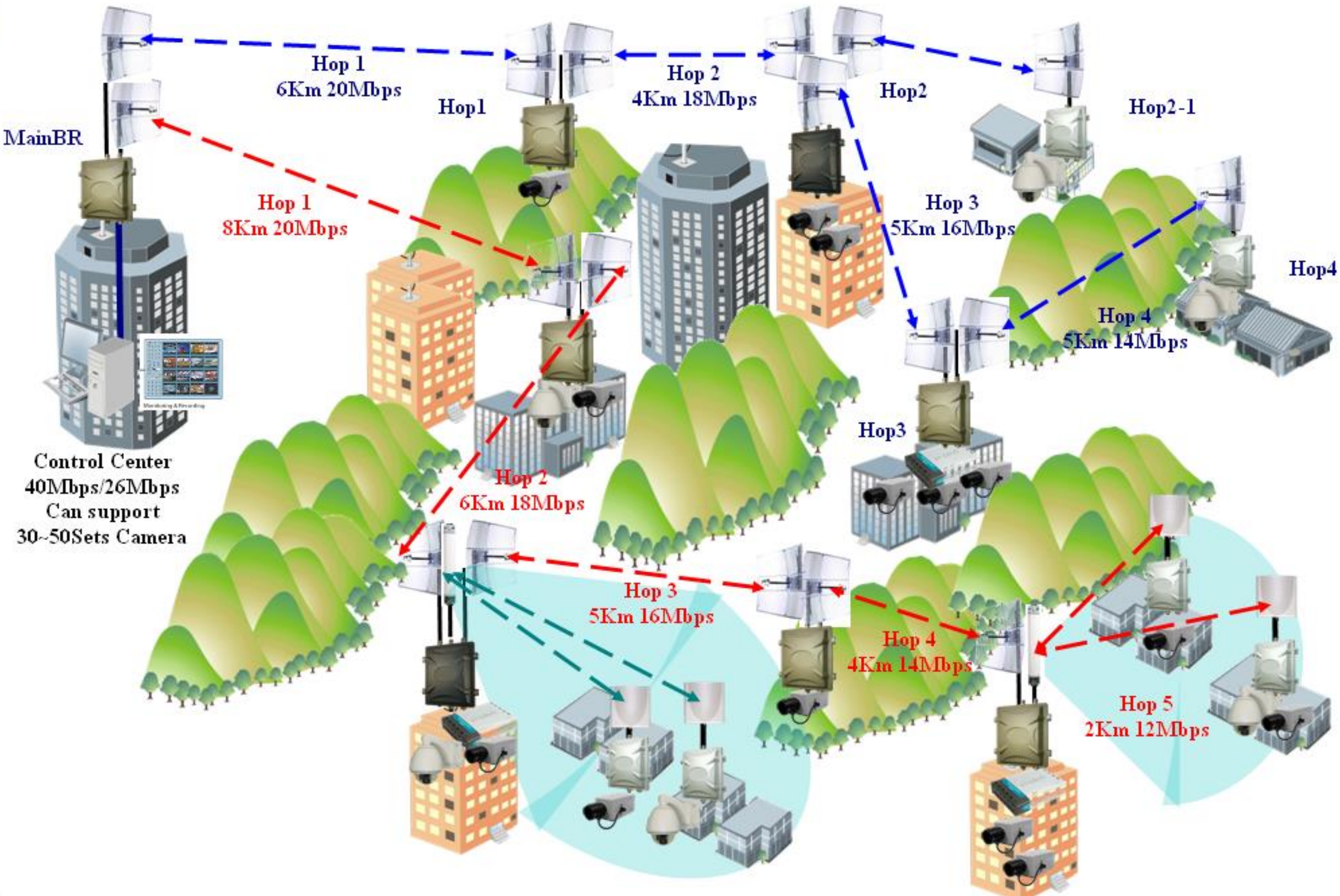
- Internet BT Throughput –9.2 Mbps



1.15MB/s

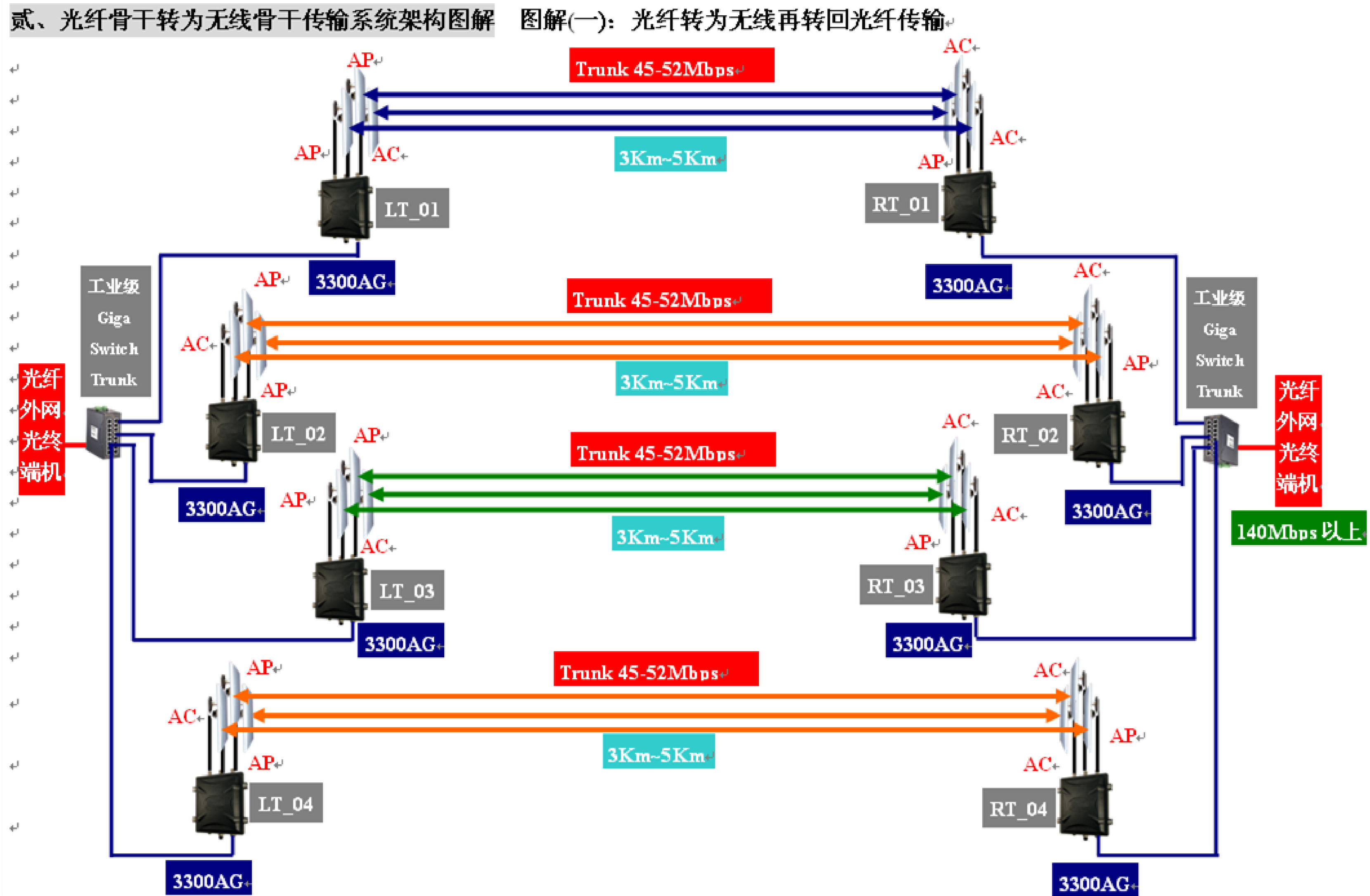
(1.15 MB/s * 8 = 9.2 Mbps)

Daisy Chain Hops Surveillance Applications



Wireless Trunk Technical Applications

Interface Integrate & Intelligent Package Control



Daisy Chain Wireless Hot Zone Applications

- Double Level Daisy Chain Backhaul Design

二、太原鋼鐵廠 WiFi Trunk 大骨幹與 Daisy Chain 跳台覆蓋規畫(上)

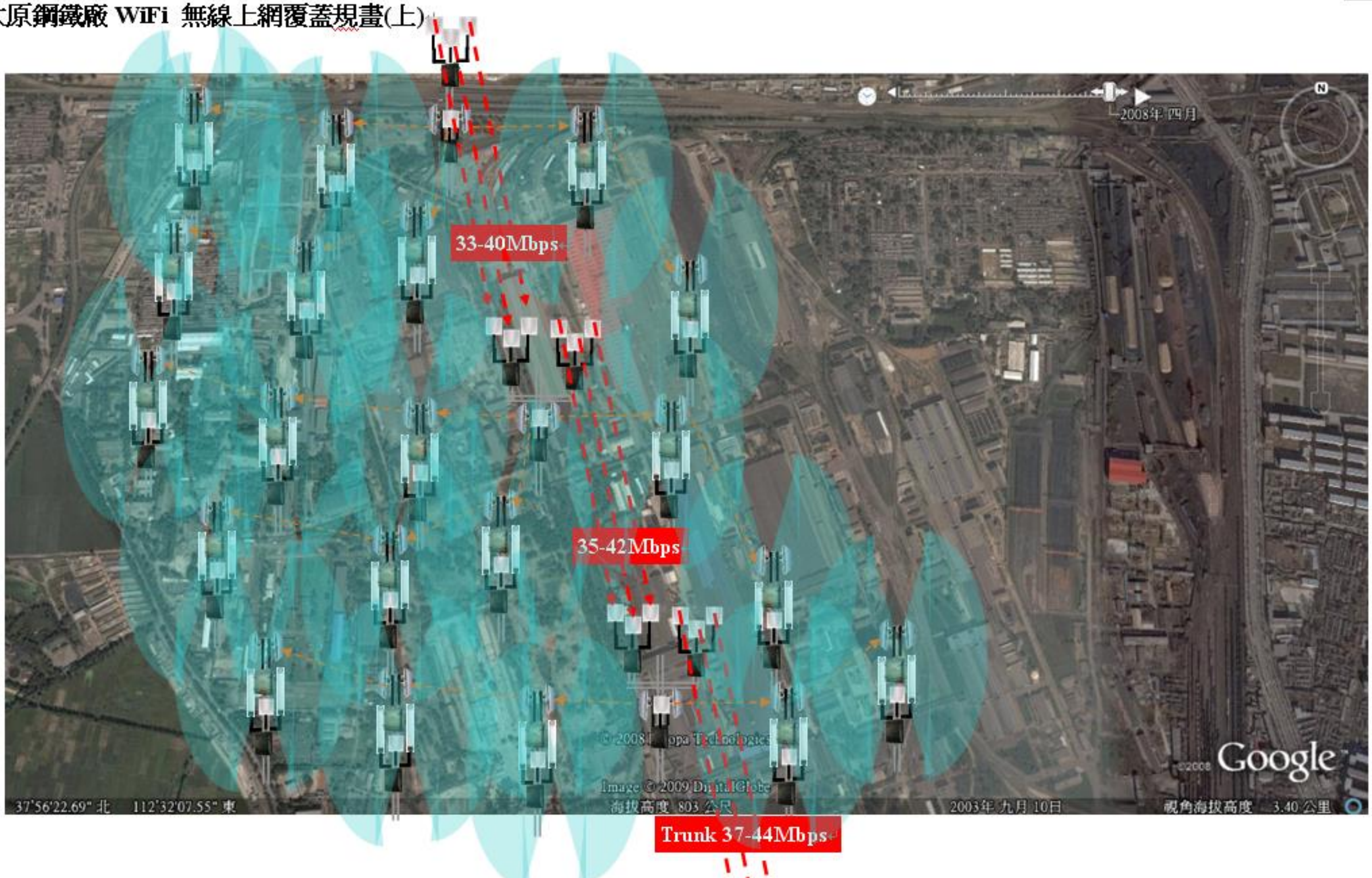
Daisy Chain Wireless Hot Zone Applications

- Multi Daisy Chain Backhaul Design

Daisy Chain Wireless Hot Zone Applications

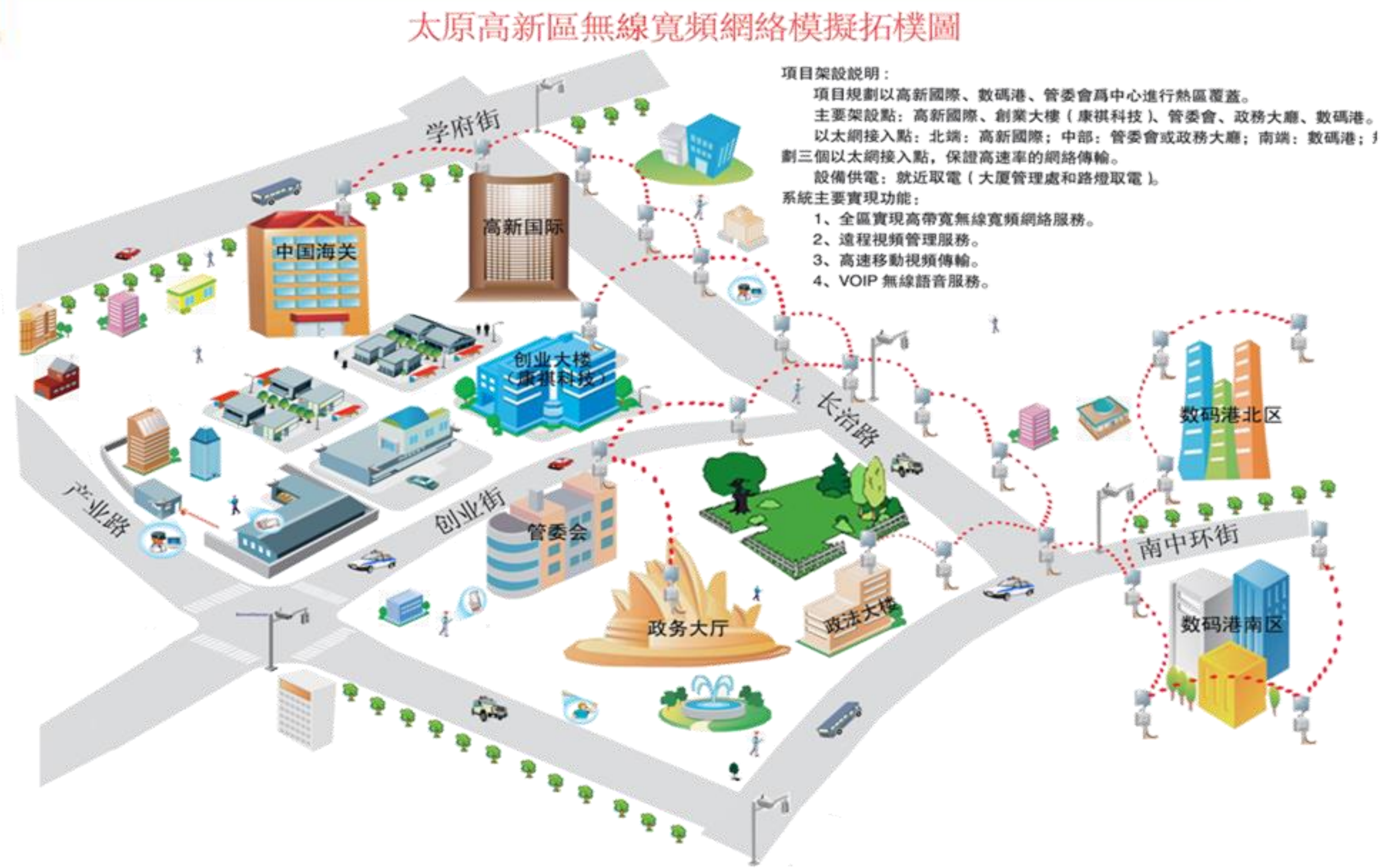
- Double Level Daisy Chain Backhaul & Hot Zone

太原鋼鐵廠 WiFi 無線上網覆蓋規畫(上)

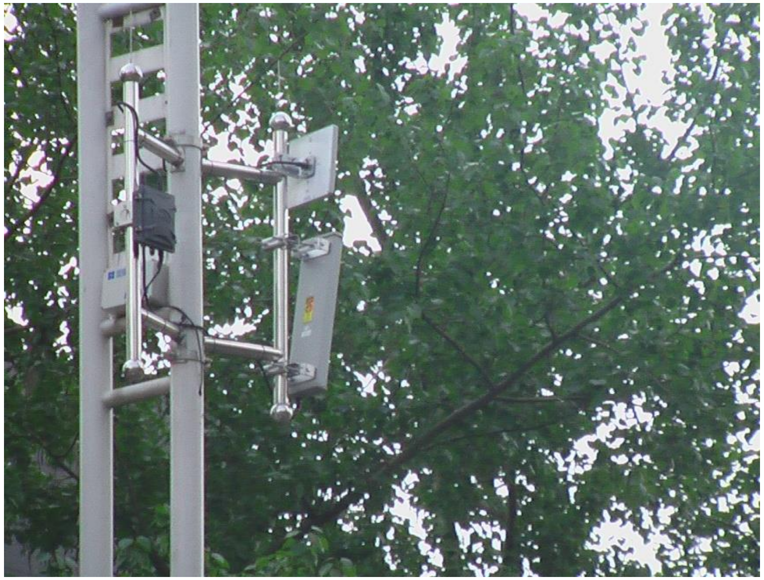


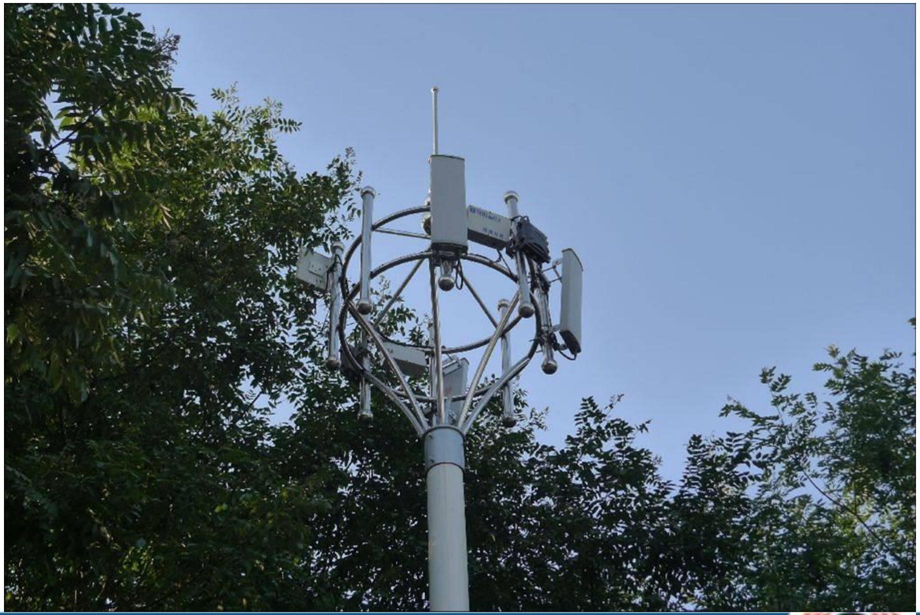
註：33-40Mbps 出口總骨幹帶寬，可提供約 2000 人的上網需求。覆蓋總骨幹帶寬約 135Mbps。覆蓋連線總帶寬約 960Mbps。

Daisy Chain Hops Hi-Mobile Surveillance Applications



Daisy Chain Hops Hi-Mobile Deployment





Outdoor Wireless System Solutions Design

Hot Spot / Hot Line / Hot Zone Case Studies
Long Distance Wireless Surveillance Case Studies
Hi-Mobile Wireless Surveillance Case Studies
WiFi SIP Phone System Application

Outdoor Wireless System Solutions Design

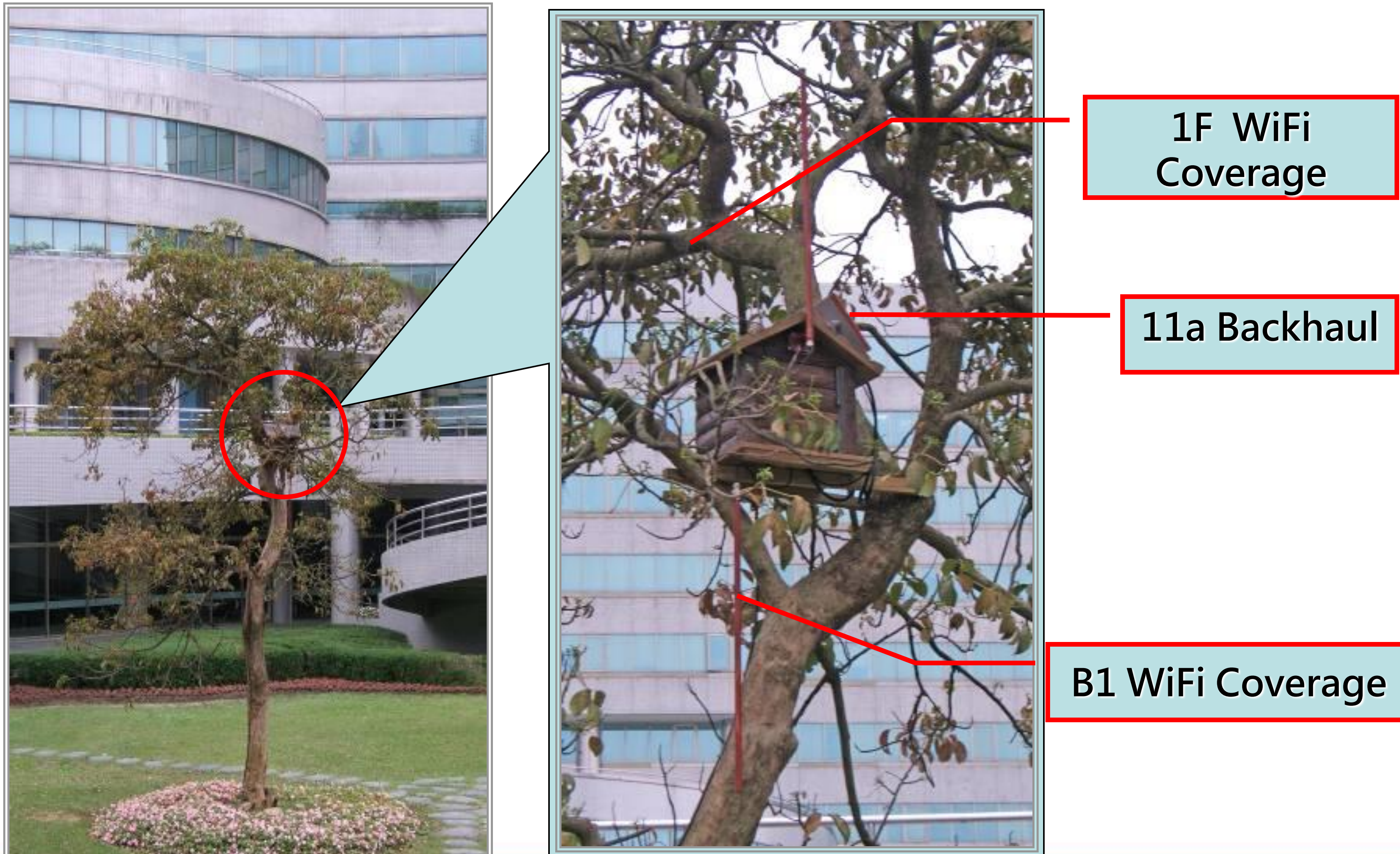
College Hot Spot / Downtown Hot Line Cases

Outdoor Wireless System Solutions Design

- Club and Shopping Mall Hot Spot Case Studies

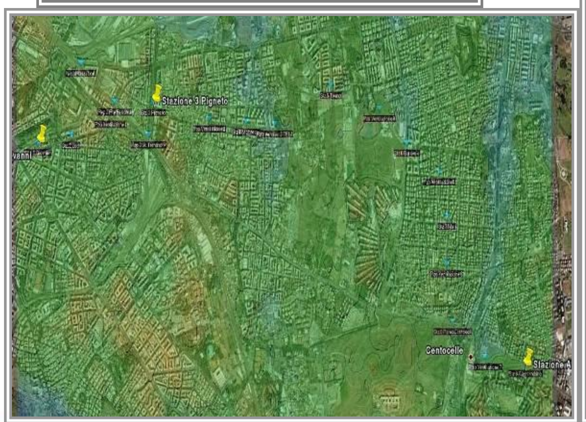
Outdoor Wireless System Solutions Design

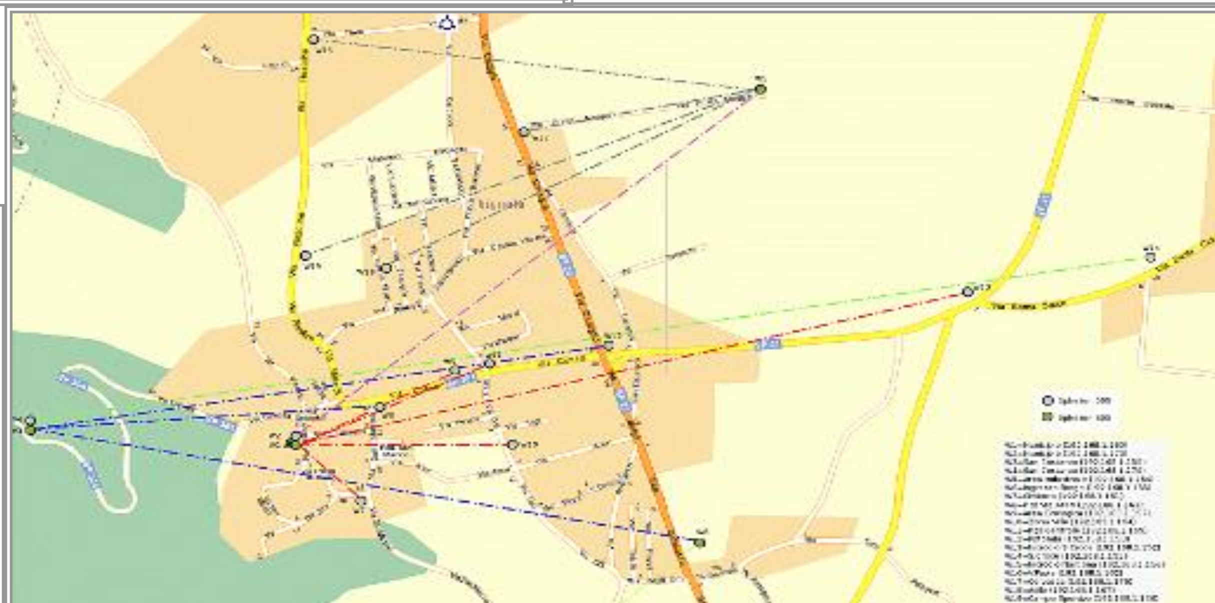
- Industry Science Park Wireless Hot Zone Cases



Outdoor Wireless System Solutions Design

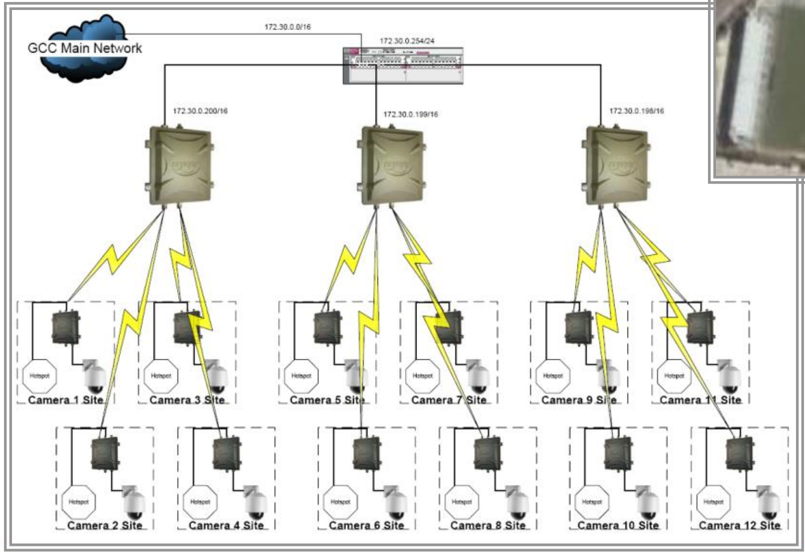
- Long Distance Wireless Surveillance—Holland / Italy

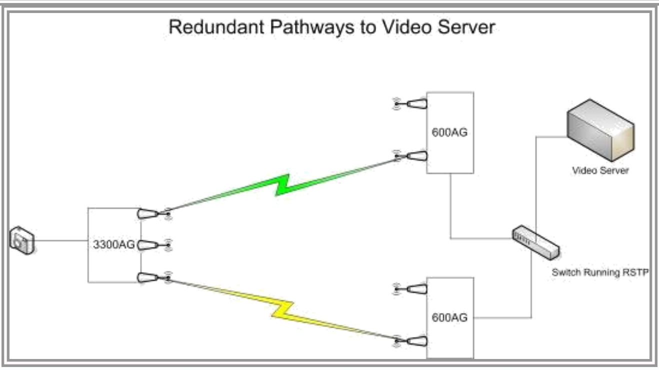




Outdoor Wireless System Solutions Design

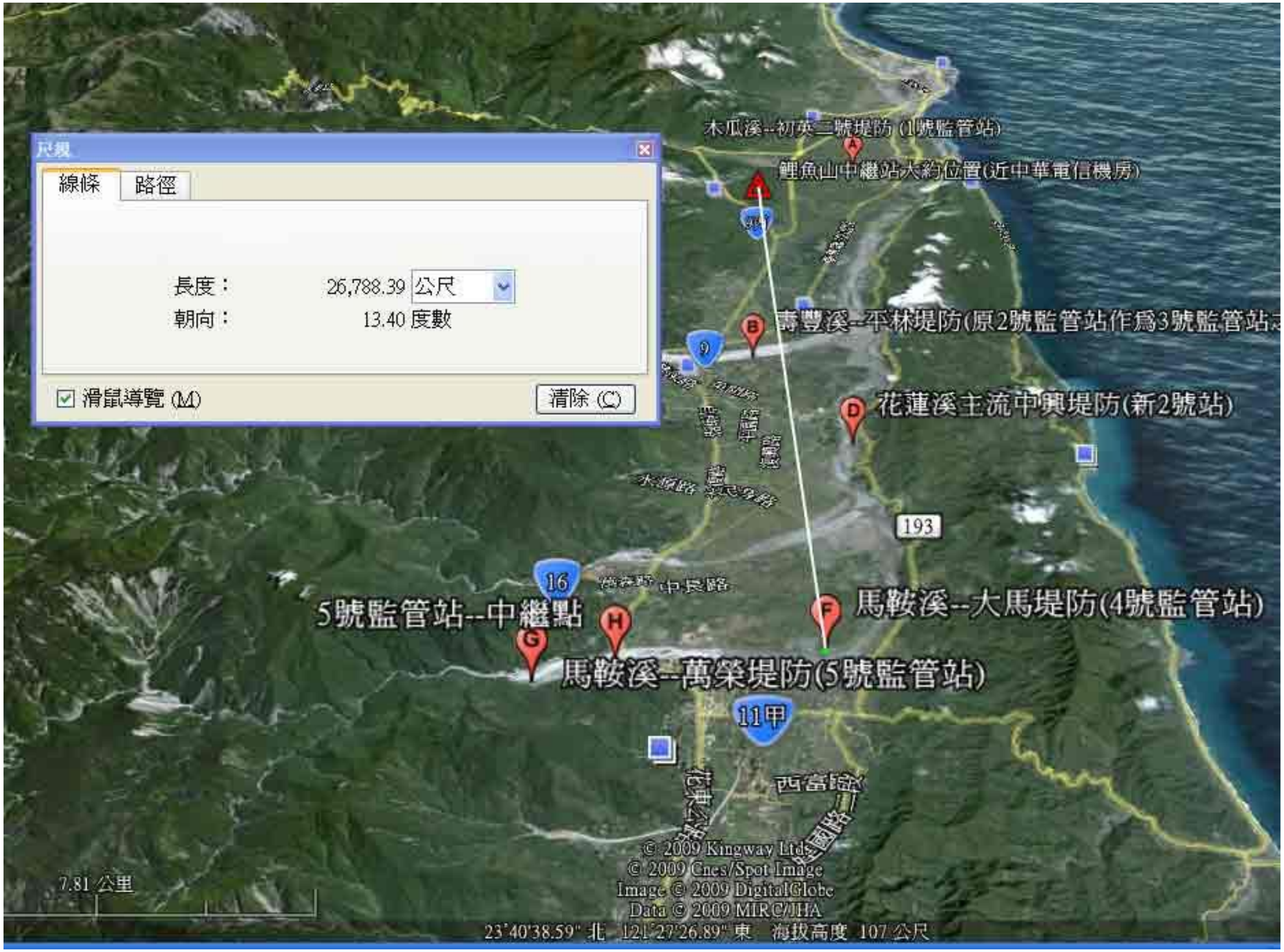
- Long Distance Wireless Surveillance--Austria (Traffic Light Control)





Outdoor Wireless System Solutions Design

- 27Km– River Surveillance Application--Taiwan

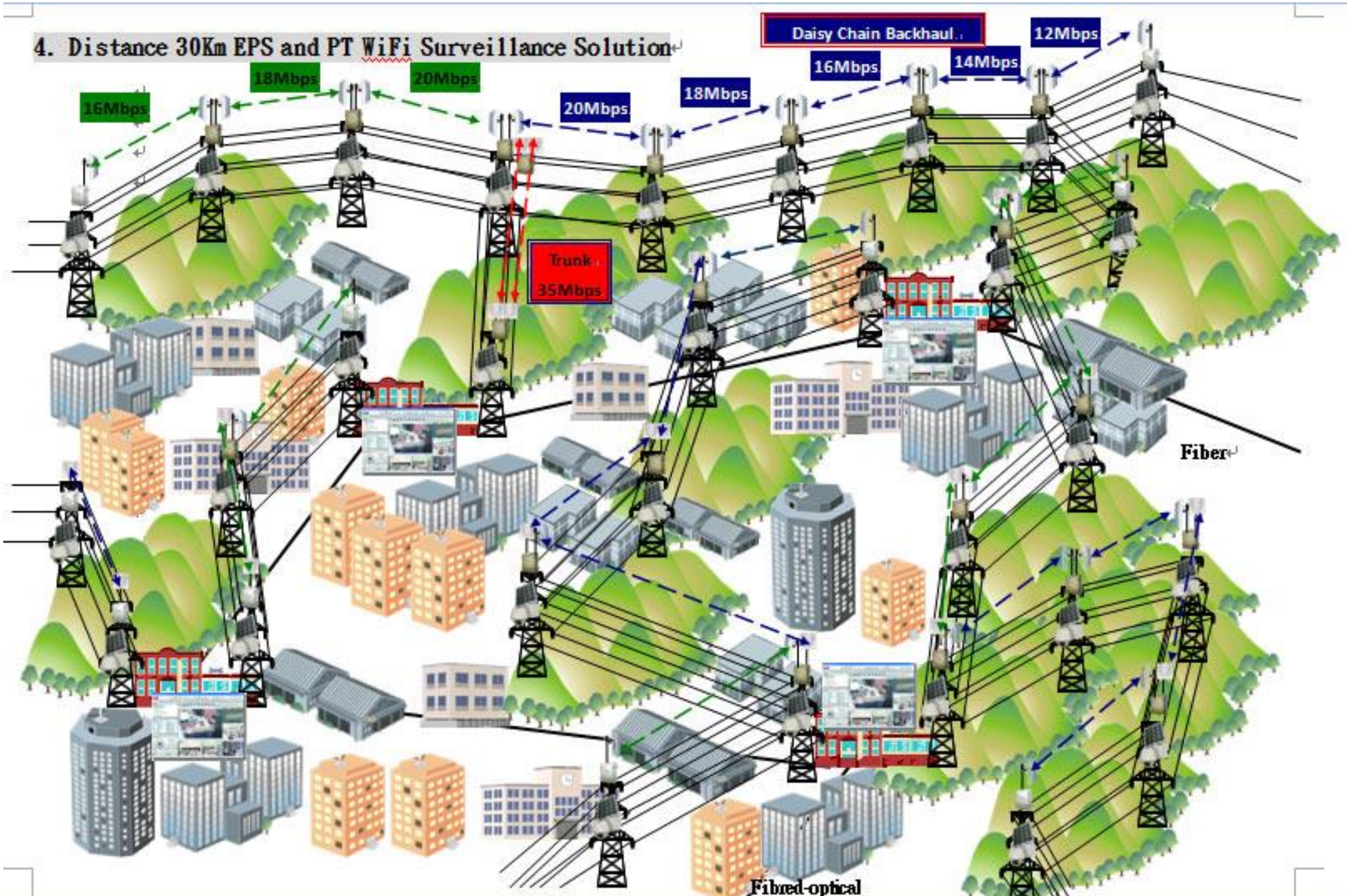


Outdoor Wireless System Solutions Design

- 27Km– River Surveillance Application--Taiwan

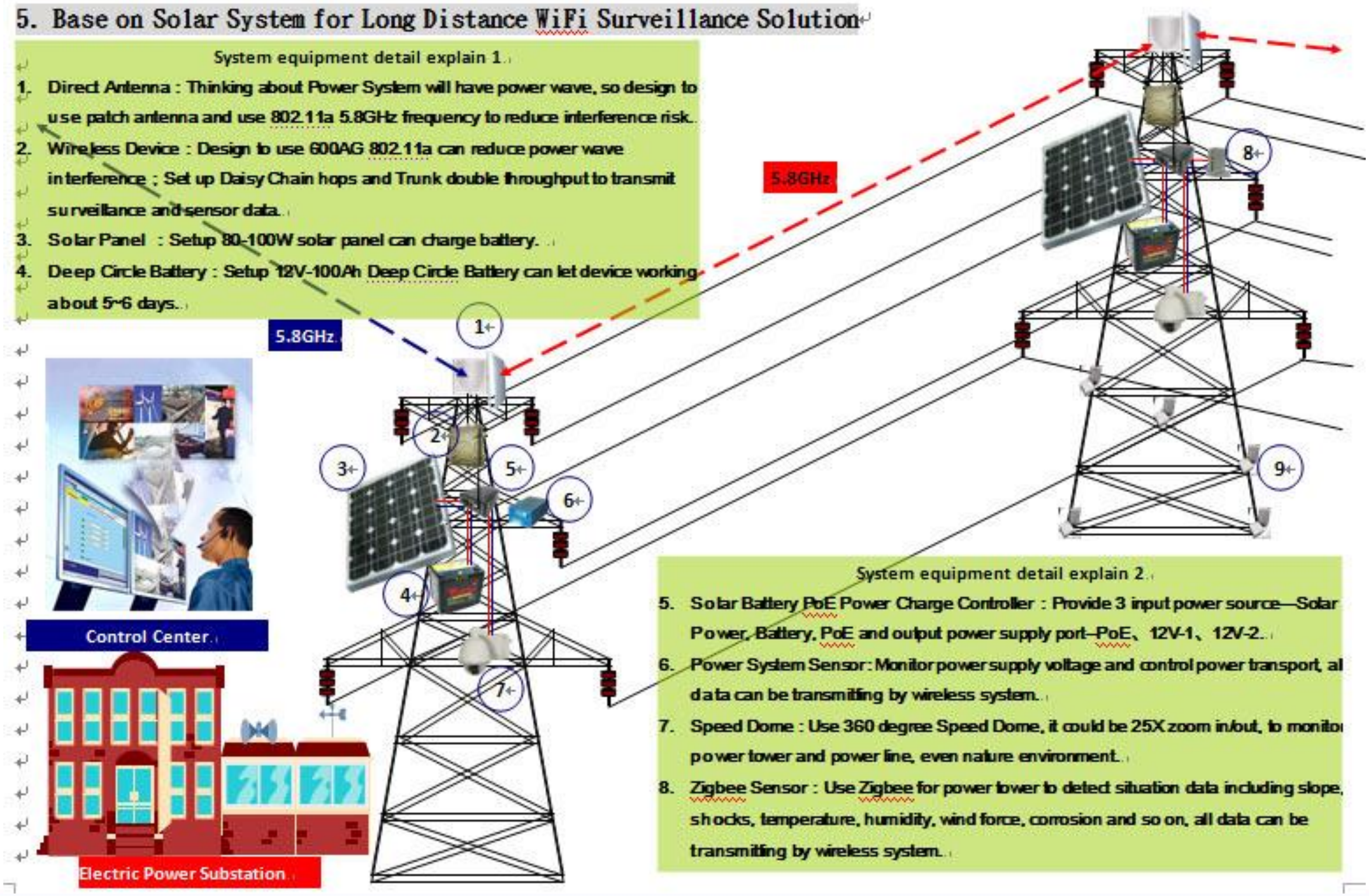
Outdoor Wireless System Solutions Design

- Long Distance High-voltage Power Tower Wireless Surveillance



Outdoor Wireless System Solutions Design

High-voltage Power Tower Solar Power System Solution



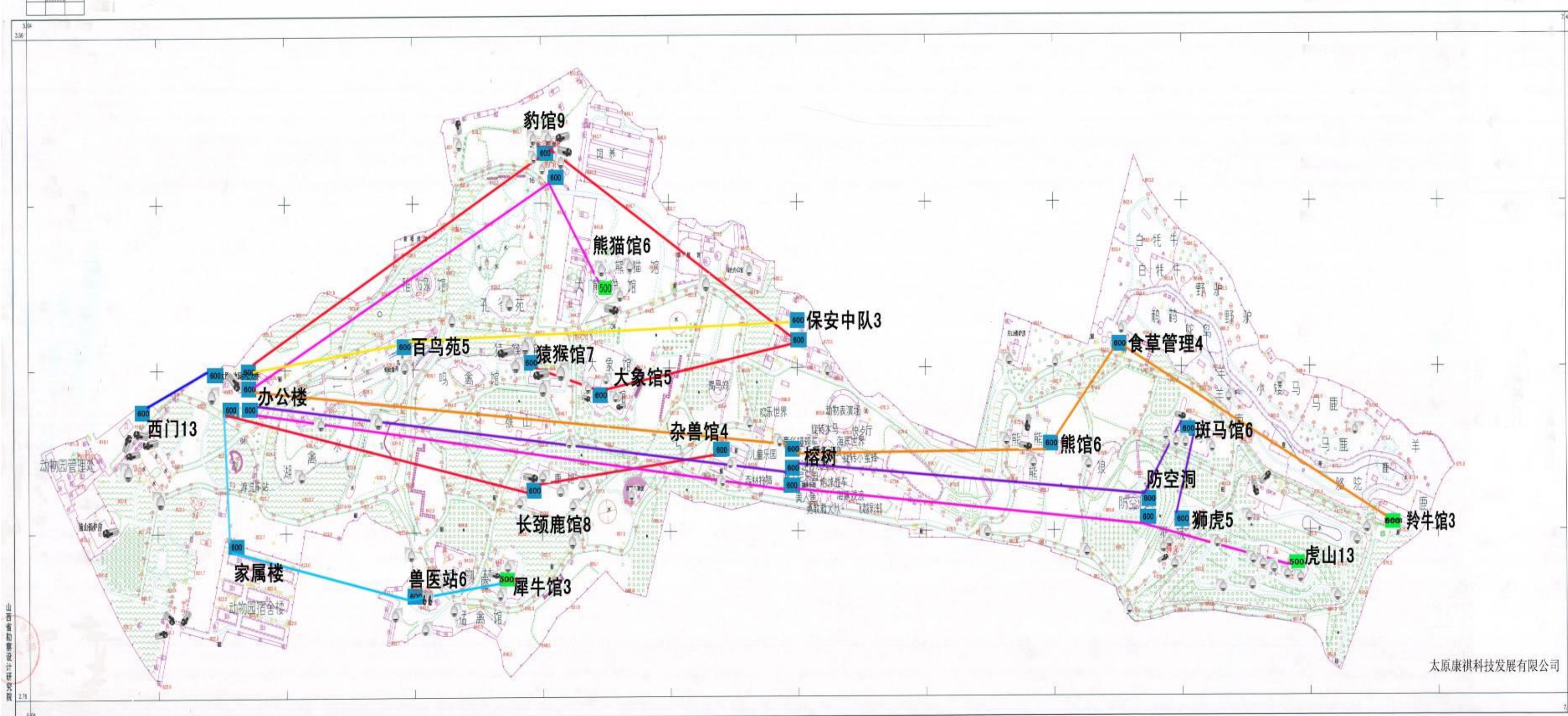
Outdoor Wireless System Solutions Design

- High-voltage Power Tower Deployment Wireless Surveillance

Outdoor Wireless System Solutions Design

Zoo Park Wireless Surveillance + WiFi Phone + Digital Broadcast

动物园远程无线监控基站布点架设图



设备清单			
序号	设备名称	数量	单位
1	500AG	4	台
2	600AG	26	台
3	5.8G Grid	56	套
4	馈线	56	根

主干	颜色表示	路线
1	→	羚牛馆— 食草— 熊馆— 榕树— 办公楼
2	→	狮虎— 斑马— 防空洞— 榕树— 办公楼
3	→	熊猫— 豹馆— 办公楼
4	→	杂兽— 长颈鹿— 办公楼
5	→	犀牛馆— 兽医站— 家属楼— 办公楼
6	→	猿猴— 大象— 保安中队— 豹馆— 办公楼
7	→	保安中队— 百鸟苑— 办公楼
8	→	虎山— 防空洞— 榕树— 办公楼
9	→	西门— 办公楼

Outdoor Wireless System Solutions Design

- Zoo Park Wireless Surveillance Deployment Control Center

Outdoor Wireless System Solutions Design

- Zoo Park Wireless Surveillance Deployment--China

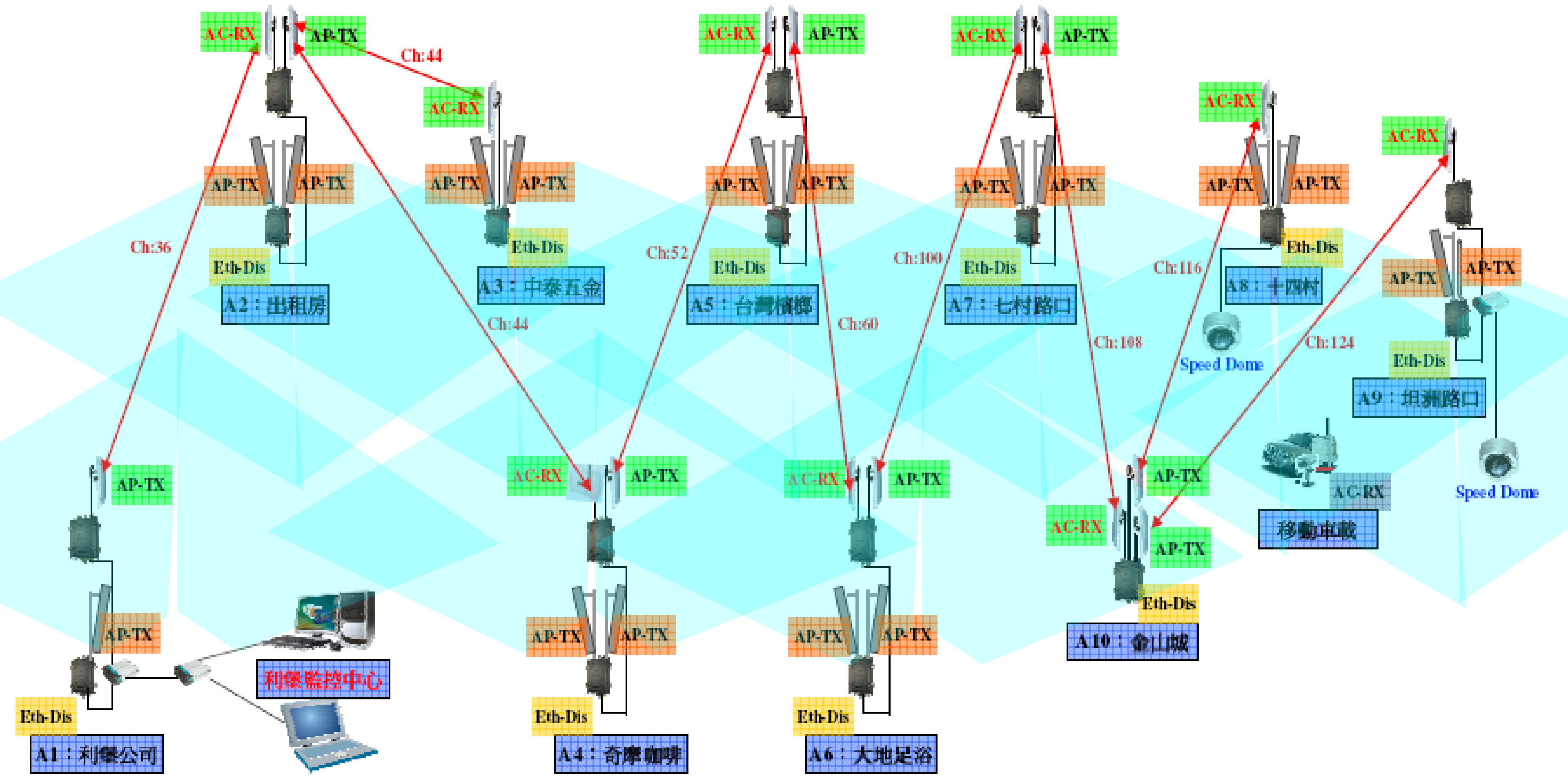
Outdoor Wireless System Solutions Design

- Hi-Mobile Wireless Real Time Surveillance Remote Control

A1-A10 :双层架构, 距离5Km,骨干2台+移动2台摄影机,带宽10~12Mbps

Outdoor Wireless System Solutions Design

- Wireless Hi-Mobile Design for Surveillance & Surf Internet



A1-A10 :双层架构, 距离5Km,骨干2台+移动2台摄影机,带宽10~12Mbps

Outdoor Wireless System Solutions Design

Daisy Chain Hi-Mobile Handover under 20ms (0.02sec)

```
Mode: Station       ,ESSID: 1   , AP BSSID: 00129e7008f4
Freq is 2412 MHz  (channel 1 ) , Bit Rate:24Mb/s
Link Quality is 34 ,RSSI -61 dBm, Noise -105 dBm
Tx:     1001 Kbps ,Rx:       26 Kbps ,Total     1027 Kbps
==================================================================
Mode: Station       ,ESSID: 1   , AP BSSID: 00129e7008f4
Freq is 2412 MHz  (channel 1 ) , Bit Rate:24Mb/s
Link Quality is 33 ,RSSI -62 dBm, Noise -105 dBm
Tx:     1439 Kbps ,Rx:       31 Kbps ,Total     1471 Kbps
==================================================================
STA[ath0] change AP from 00:12:9e:70:08:f4 to 00:12:9e:70:09:15

Switch AP time is 4.831 msec (finished time 943924973.778645 sec)
STA[ath0] change AP from 00:12:9e:70:09:15 to 00:12:9e:70:08:f4

Switch AP time is 5.541 msec (finished time 943924973.824168 sec)
Mode: Station       ,ESSID: 1   , AP BSSID: 00129e7008f4
Freq is 2412 MHz  (channel 1 ) , Bit Rate:36Mb/s
Link Quality is 35 ,RSSI -60 dBm, Noise -105 dBm
Tx:     1140 Kbps ,Rx:       29 Kbps ,Total     1170 Kbps
==================================================================
Mode: Station       ,ESSID: 1   , AP BSSID: 00129e7008f4
Freq is 2412 MHz  (channel 1 ) , Bit Rate:24Mb/s
Link Quality is 35 ,RSSI -60 dBm, Noise -105 dBm
Tx:     1298 Kbps ,Rx:       30 Kbps ,Total     1329 Kbps
==================================================================
Mode: Station       ,ESSID: 1   , AP BSSID: 00129e7008f4
Freq is 2412 MHz  (channel 1 ) , Bit Rate:24Mb/s
```

Handover

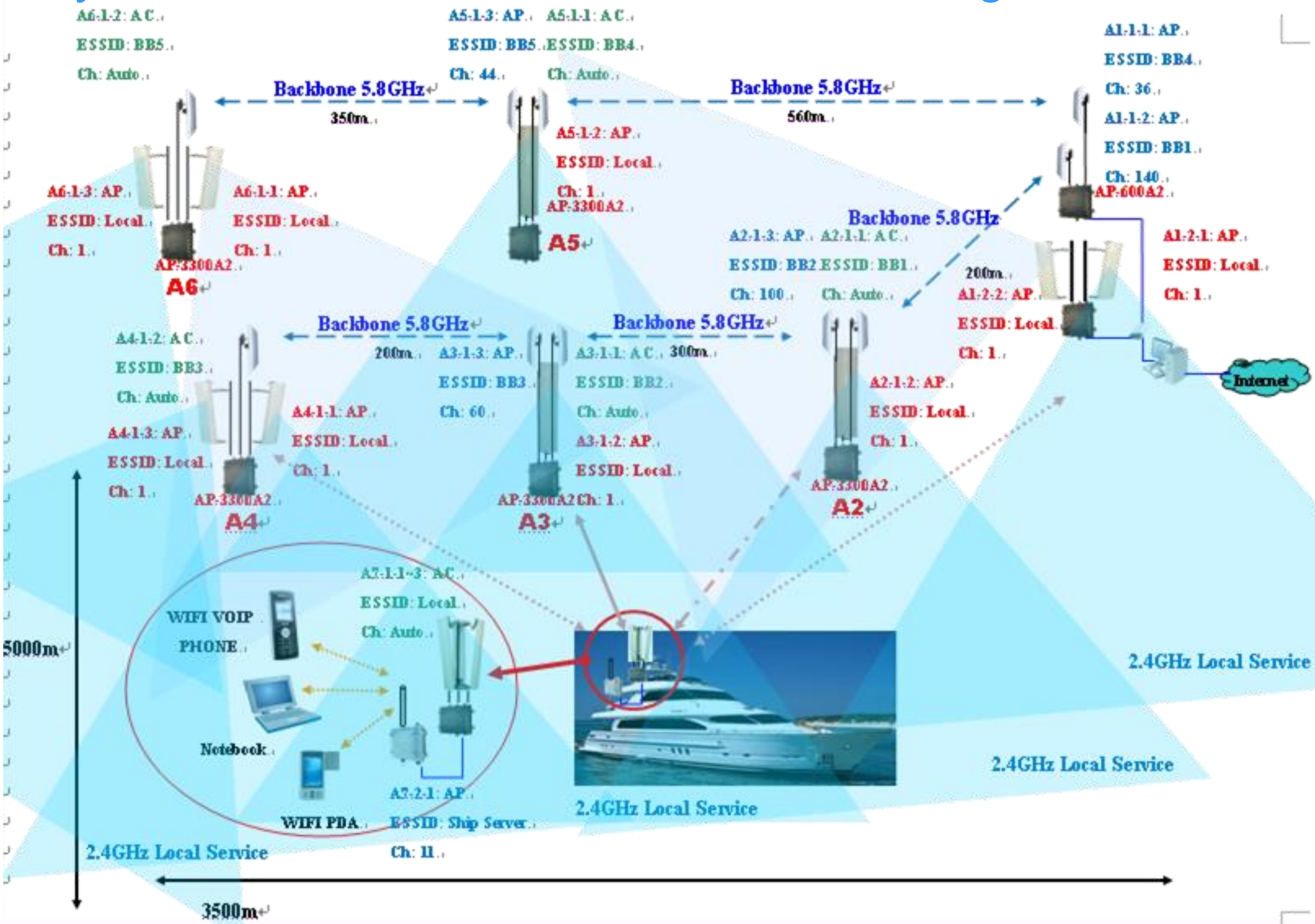
4.831ms

Outdoor Wireless System Solutions Design

- Daisy Chain Hi-Mobile for Coastal Port, Storage, Inshore Fishing

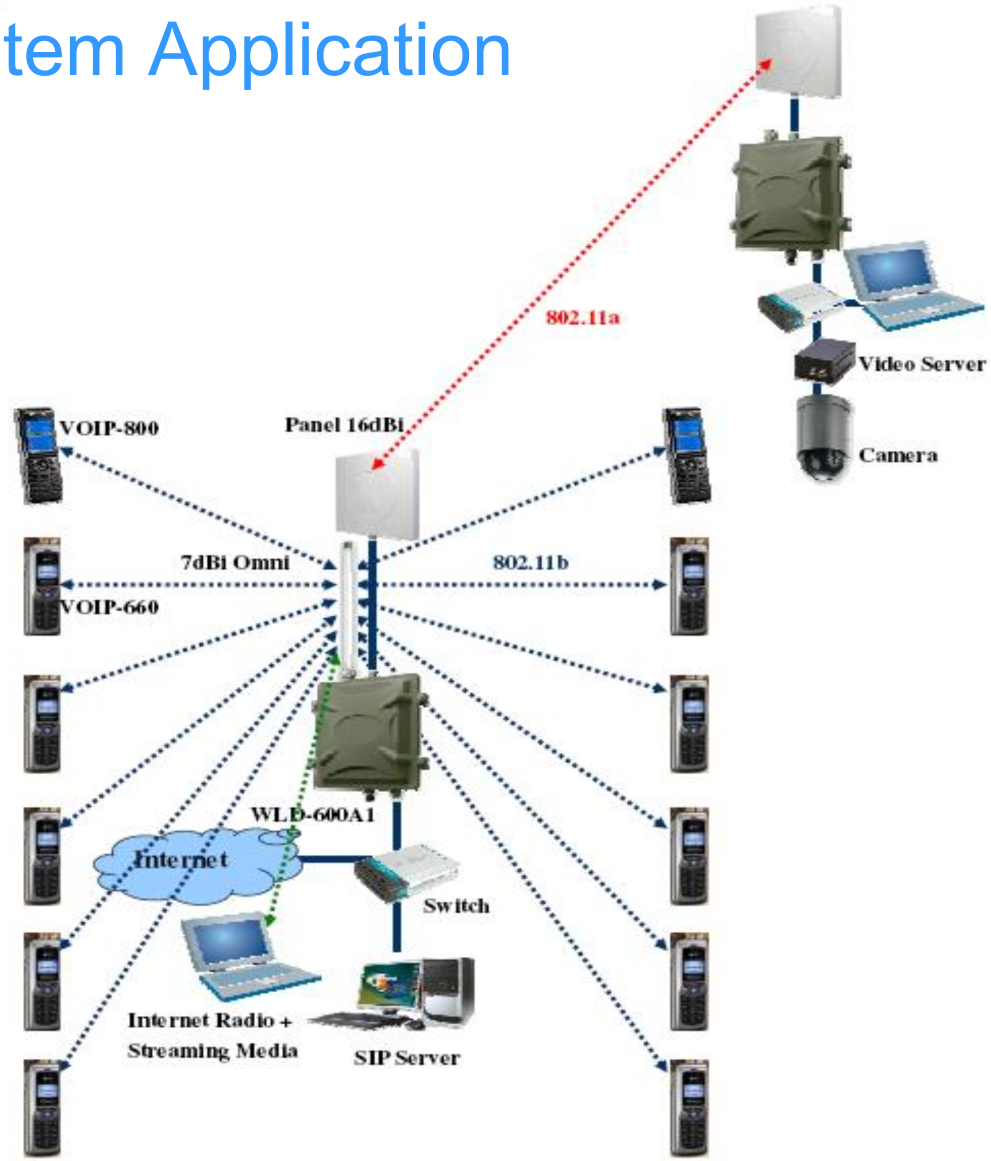
Outdoor Wireless System Solutions Design

- Daisy Chain Hi-Mobile for Coastal Port, Storage, Inshore Fishing



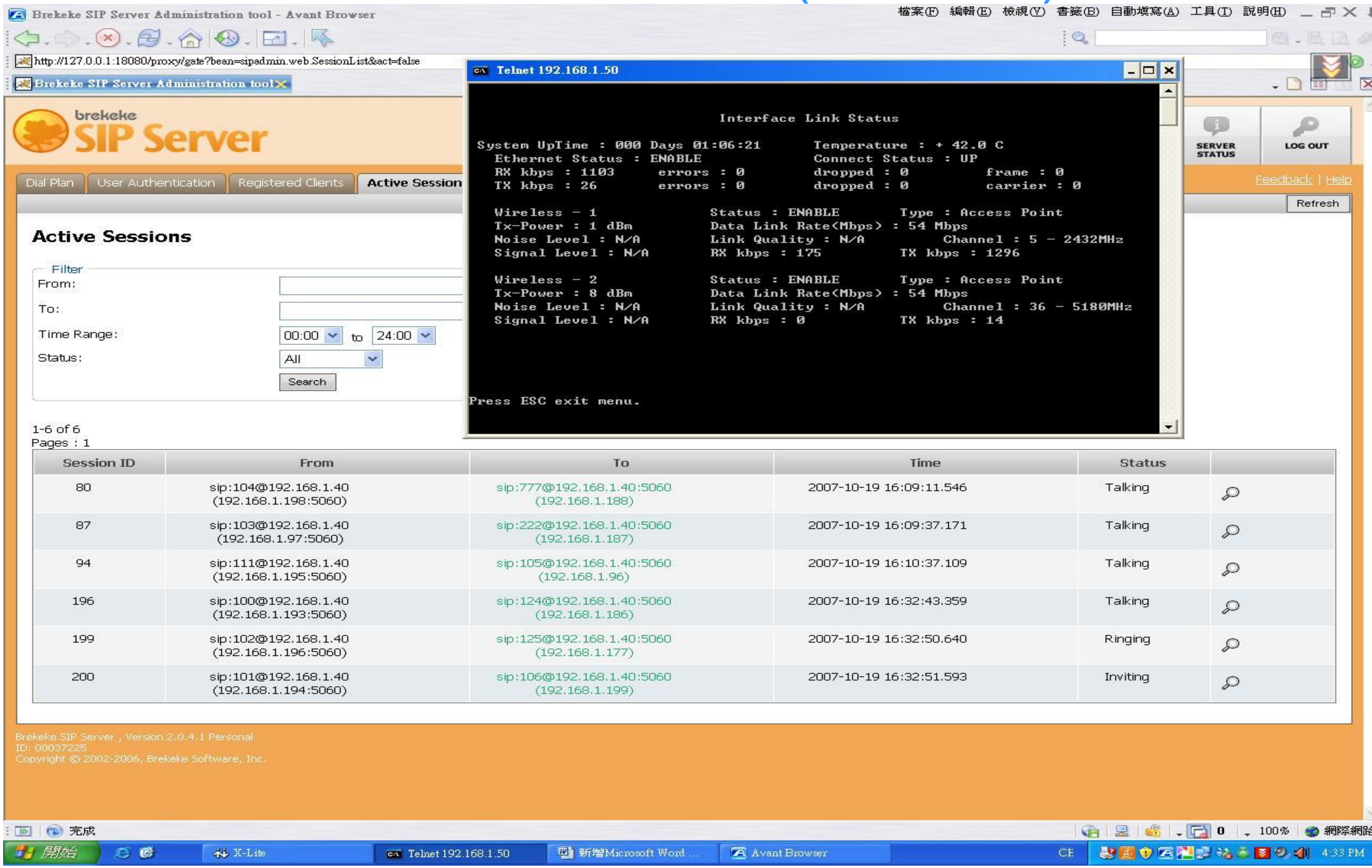
Outdoor Wireless System Solutions Design

- WiFi SIP Phone System Application



Outdoor Wireless System Solutions Design

WiFi SIP Phone SIP Server (Software)



Wireless System Deployment Case Studies

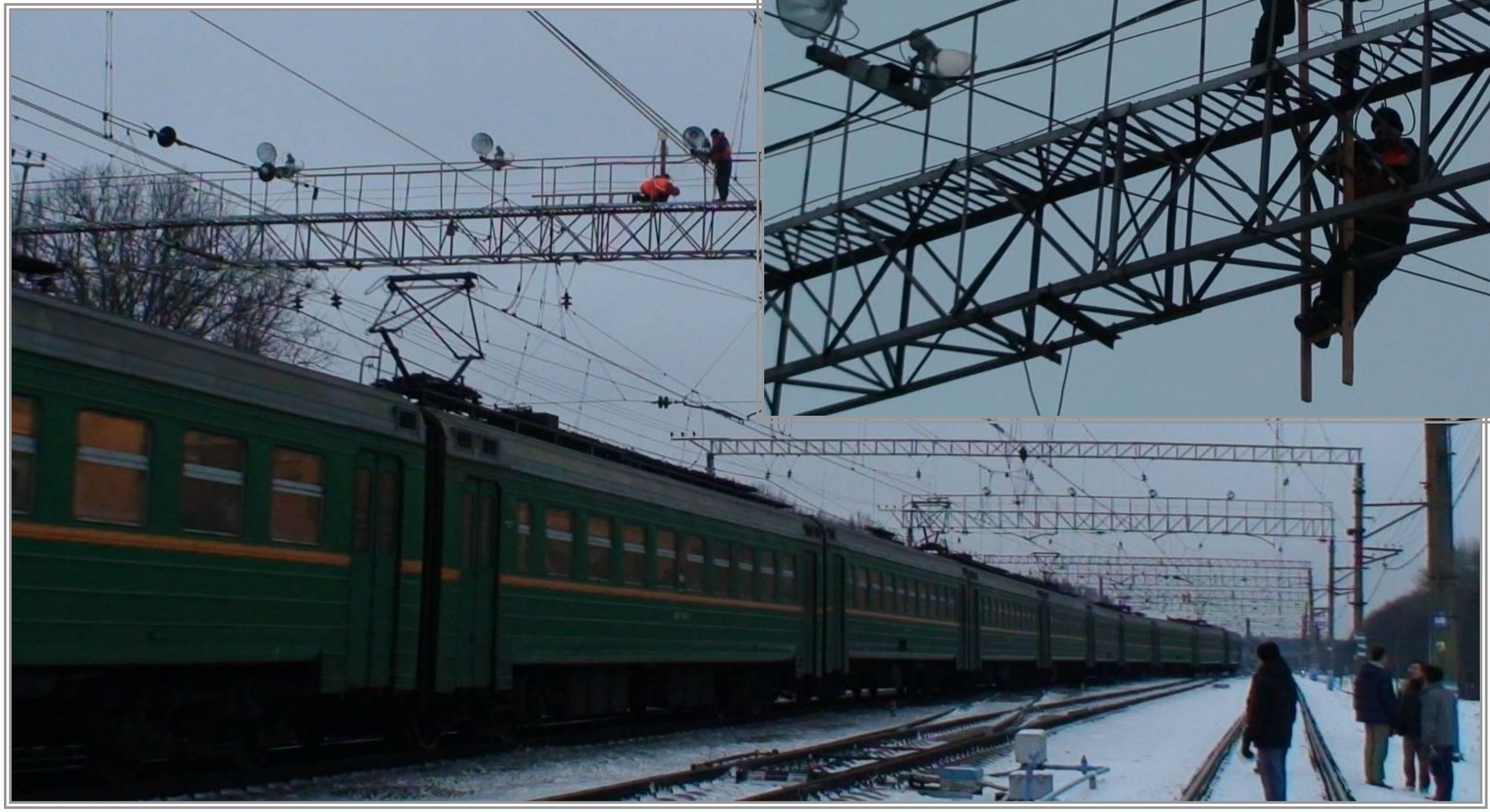
Wireless Hot Spot Coverage System Deployment
Hi-Mobile Wireless Train Surveillance System
Daisy Chain Train E-Ticket Wireless System
Daisy Chain Islands Wireless Surveillance System
Hi-Mobile Wireless Highway Surveillance System
Hi-Mobile Wireless Army Surveillance System

Wireless System Deployment Case Studies

Wireless Hot Spot Coverage System

Wireless System Deployment Case Studies

- Hi-Mobile Wireless Train Surveillance System



Wireless System Deployment Case Studies

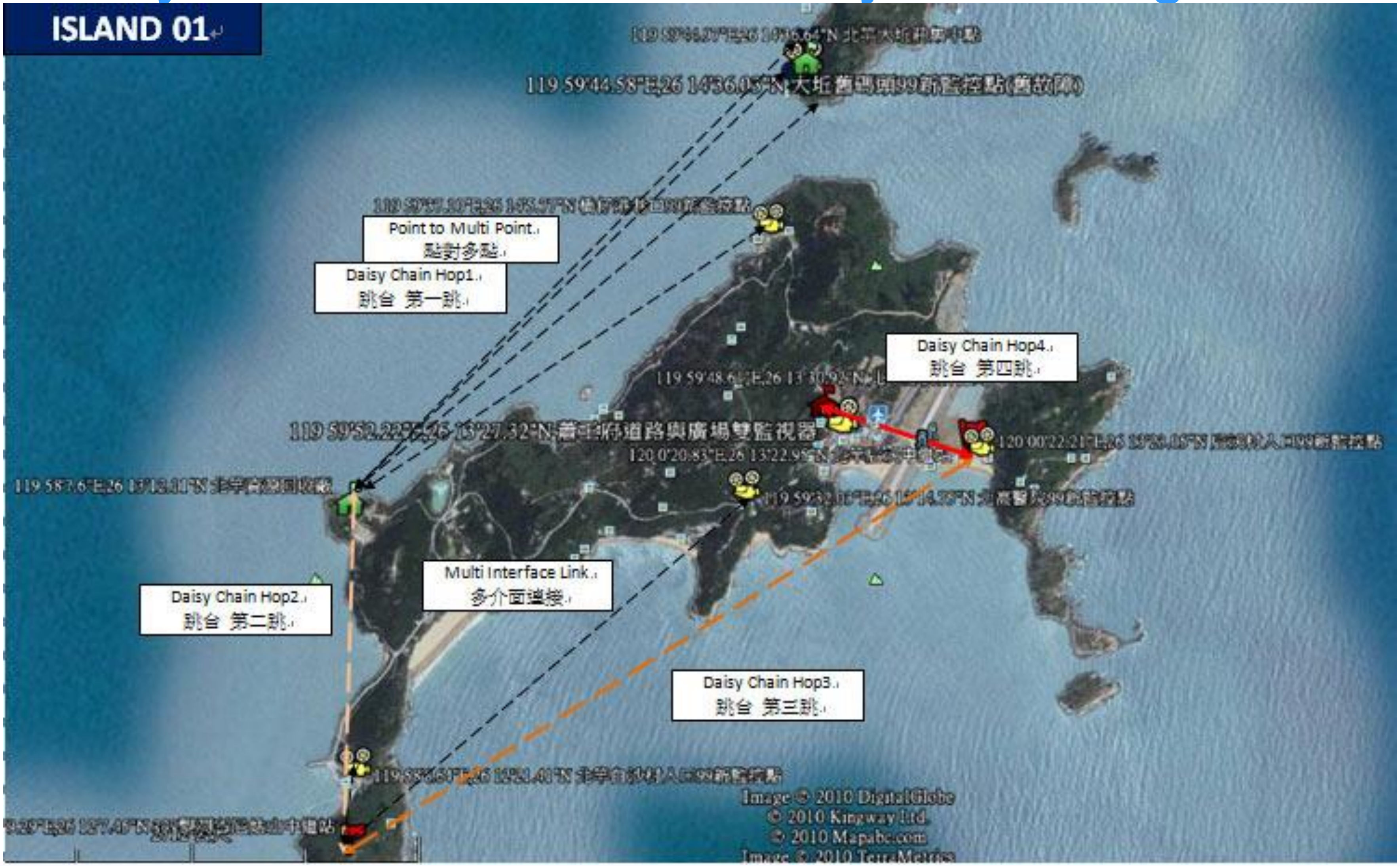
Hi-Mobile Wireless Train Surveillance System

Wireless System Deployment Case Studies

Daisy Chain Train E-Ticket Wireless System

Wireless System Deployment Case Studies

Daisy Chain Islands Wireless System Design



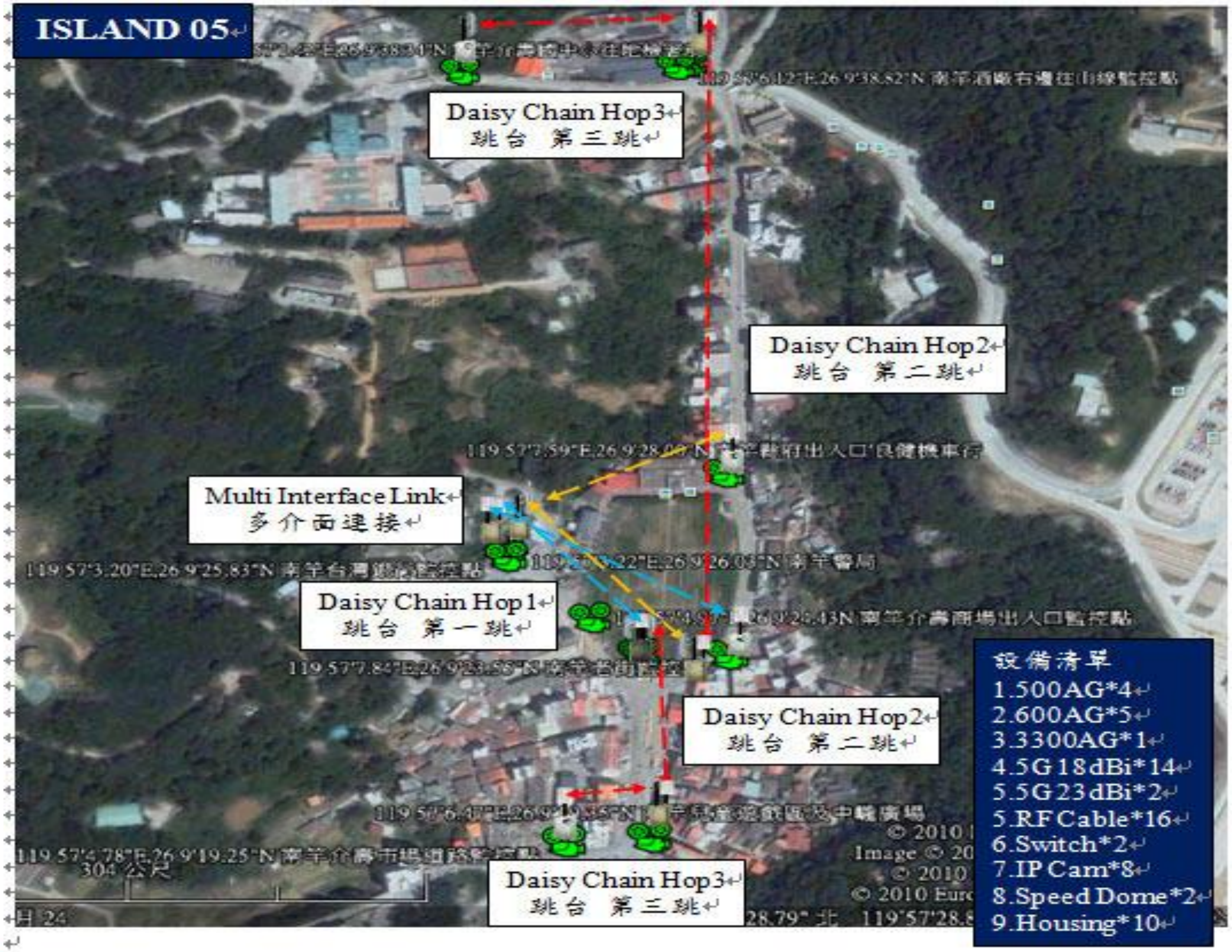
Wireless System Deployment Case Studies

Daisy Chain Islands Wireless System Deployment



Wireless System Deployment Case Studies

Daisy Chain Islands Wireless System Design



Wireless System Deployment Case Studies

Daisy Chain Islands Wireless System Deployment

Wireless System Deployment Case Studies

Hi-Mobile Wireless Highway Surveillance System

Wireless System Deployment Case Studies

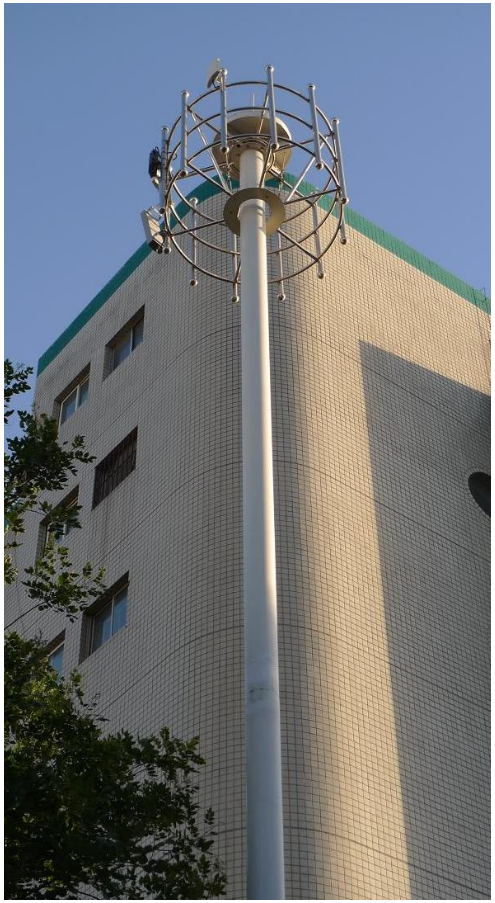
Hi-Mobile Wireless Highway Surveillance System

Wireless System Deployment Case Studies

Hi-Mobile Wireless Highway Surveillance System

Wireless System Deployment Case Studies

Hi-Mobile Wireless Science Park Surveillance System



Wireless System Deployment Case Studies

Hi-Mobile Wireless Army / Police Surveillance System