Hytera DMR Trunking System Intro

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Hytera DMR Trunking System Intro

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Part 1
What is DMR Tier 3

What is DMR Tier 3

- Positioning

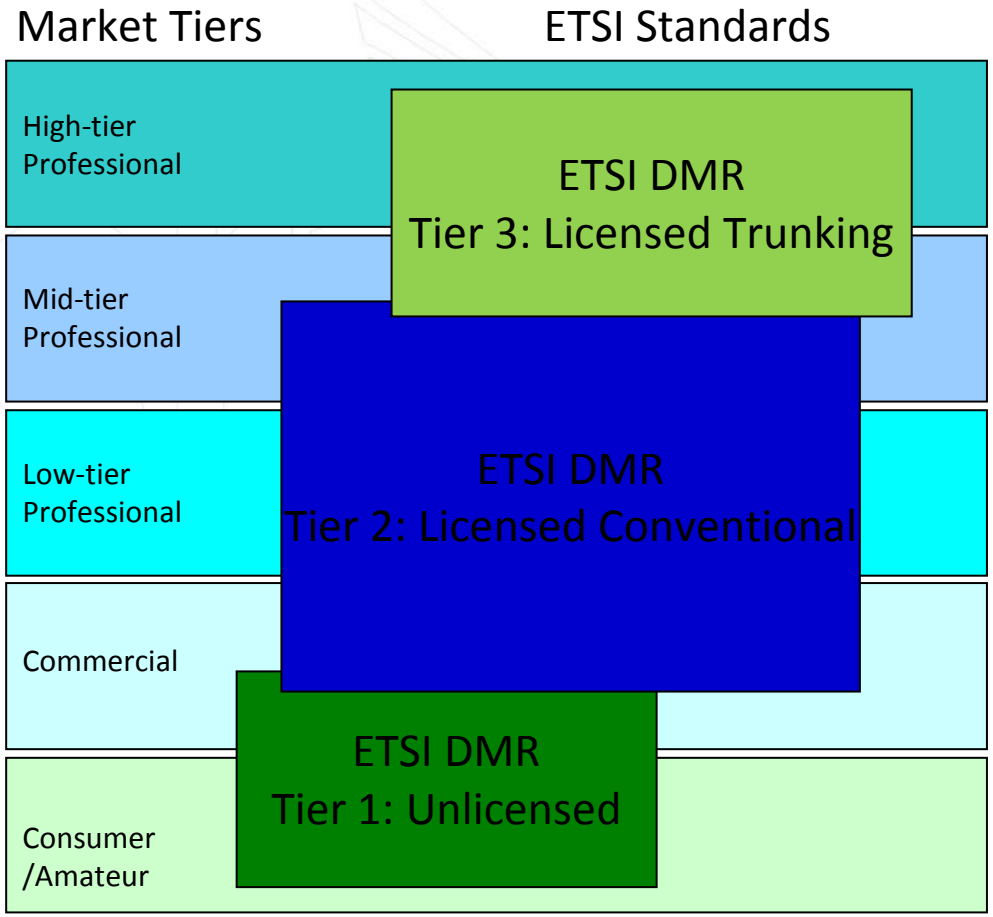
DMR（Digital Mobile Radio）is an open standard defined by ETSI, to provide low cost- effective radio solution for professional users.

Three Tiers of DMR by ETSI:

- Tier1: low cost dPMR446, using license free frequency, facing civil market. Work under direct mode, using FDMA.

- Tier2: facing professional market, work under direct/relay mode, using 2-time-slot TDMA.

- Tier3: facing professional market, applied in trunking and simulcast system. Using 2-time-slot TDMA, supporting network management.



What is DMR Tier 3

- DMR Association

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➢ DMR Association created to drive worldwide growth of digital mobile radio market.

➢ HYTERA is the first vendor who provides DMR Tier 3 Trunking

➢ Leading manufacturers and suppliers join forces to develop and promote affordable, interoperable and innovative digital radio solutions whereby HYTERA is a key member of the technical working group.

MOU Purpose:

•Ensure multi-vendor interoperability

•Drive market awareness

•Agree on future technologies

DMR
DIGITAL MOBILE RADIO ASSOCIATION

AEROFLEX	CML Microcircuits COMMUNICATION SEMICONDUCTORS	etherstack	FCS Federation of Communication Services	funkwerk kölleda
FYLDE MICRO	MOTOROLA	Hytera Respond & Achieve	democom RADIOCOMUNICACIONES	sepura
ICOM	KENWOOD	Vertex Standard	TAIT radio communications	SELEX Communications
Professioneller Mobilfunk e.K. ...reliably better!	Radio Activity Solutions	TeamSimoco		

What is DMR Tier 3

- Advantages of DMR Technology

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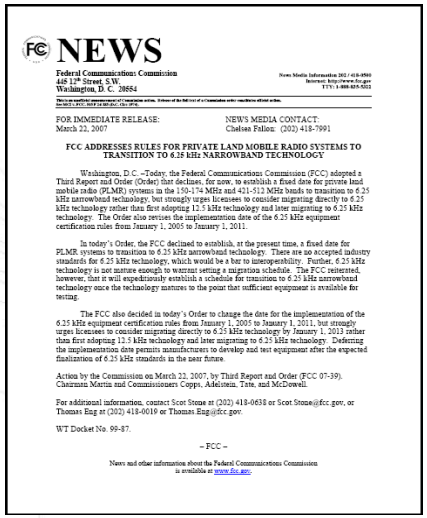
No.1 ***High Efficiency*** of Spectrum

FCC: Mandate by FCC that non frequency efficient (≥12.5kHz) equipment will not be approved after 2011 due to congestion. And all public safety equipments have to be migrated by 2013.

In another word:

High channel efficient technology is the trend of world to replace analog technology



NEWS

Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

FOR IMMEDIATE RELEASE:
March 22, 2007

NEWS MEDIA CONTACT:
Chelsea Fallon: (202) 418-7991

FCC ADDRESSES RULES FOR PRIVATE LAND MOBILE RADIO SYSTEMS TO TRANSITION TO 6.25 kHz NARROWBAND TECHNOLOGY

Washington, D.C. –Today, the Federal Communications Commission (FCC) adopted a Third Report and Order (Order) that declines, for now, to establish a fixed date for private land mobile radio (PLMR) systems in the 150-174 MHz and 421-512 MHz bands to transition to 6.25 kHz narrowband technology, but strongly urges licensees to consider migrating directly to 6.25 kHz technology rather than first adopting 12.5 kHz technology and later migrating to 6.25 kHz technology. The Order also revises the implementation date of the 6.25 kHz equipment certification rules from January 1, 2005 to January 1, 2011.

In today's Order, the FCC declined to establish, at the present time, a fixed date for PLMR systems to transition to 6.25 kHz narrowband technology. There are no accepted industry standards for 6.25 kHz technology, which would be a bar to interoperability. Further, 6.25 kHz technology is not mature enough to warrant setting a migration schedule. The FCC reiterated, however, that it will expeditiously establish a schedule for transition to 6.25 kHz narrowband technology once the technology matures to the point that sufficient equipment is available for testing.

The FCC also decided in today's Order to change the date for the implementation of the 6.25 kHz equipment certification rules from January 1, 2005 to January 1, 2011, but strongly urges licensees to consider migrating directly to 6.25 kHz technology by January 1, 2013 rather than first adopting 12.5 kHz technology and later migrating to 6.25 kHz technology. Deferring the implementation date permits manufacturers to develop and test equipment after the expected finalization of 6.25 kHz standards in the near future.

Action by the Commission on March 22, 2007, by Third Report and Order (FCC 07-39). Chairman Martin and Commissioners Copps, Adelstein, Tate, and McDowell.

For additional information, contact Scot Stone at (202) 418-0638 or Scot.Stone@fcc.gov, or Thomas Eng at (202) 418-0019 or Thomas.Eng@fcc.gov.

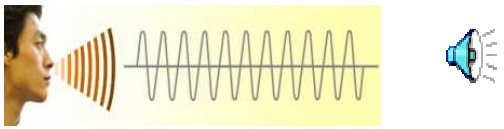
WT Docket No. 99-87.

– FCC –

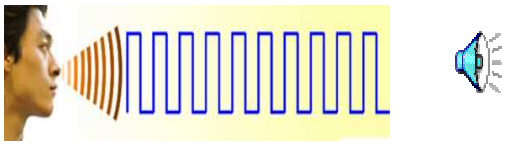
News and other information about the Federal Communications Commission is available at www.fcc.gov.

No.2 ***Better Digital Audio Quality***

Analogy



Digital



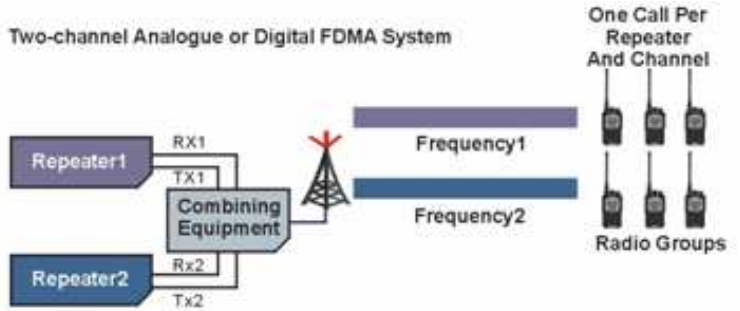
- Clearer voice over a greater range
- Expanded range
- Static and noise rejection

What is DMR Tier 3

- Advantages of DMR Technology

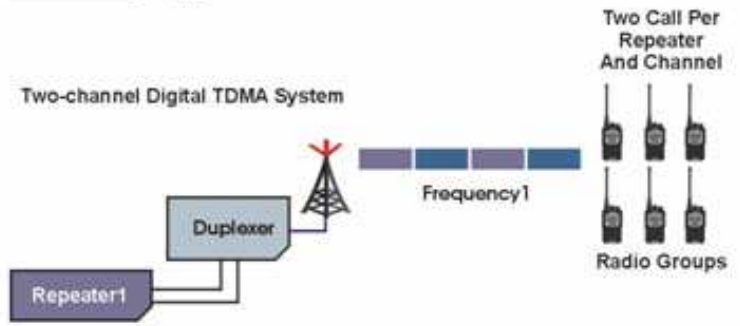
No.3 ***Reduced*** equipment ***cost***

Compared with FDMA solution, 2 slot TDMA solution allows 2 simultaneous calls through 1 repeater, which helps reduce minimum entry cost

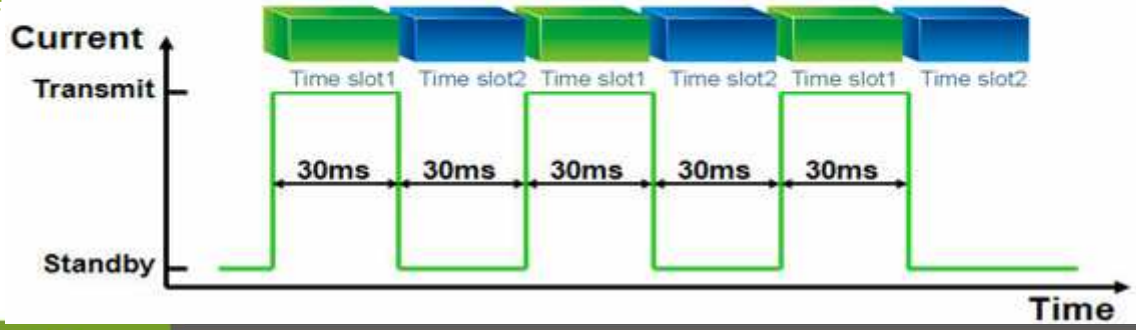


No.4 ***Longer Battery Life***

- 80% of battery is used for transmission;
- Two-slot TDMA, however, offers a good way forward. Since an individual call uses only one of the two timeslots, it requires only half of the transmitter's capacity.
- 40% Battery Life Improvement with TDMA



Voice Call 1



Hytera DMR Trunking System

Part 2

Highlights for Hytera DMR Trunking System

Highlights for Hytera DMR Trunking System

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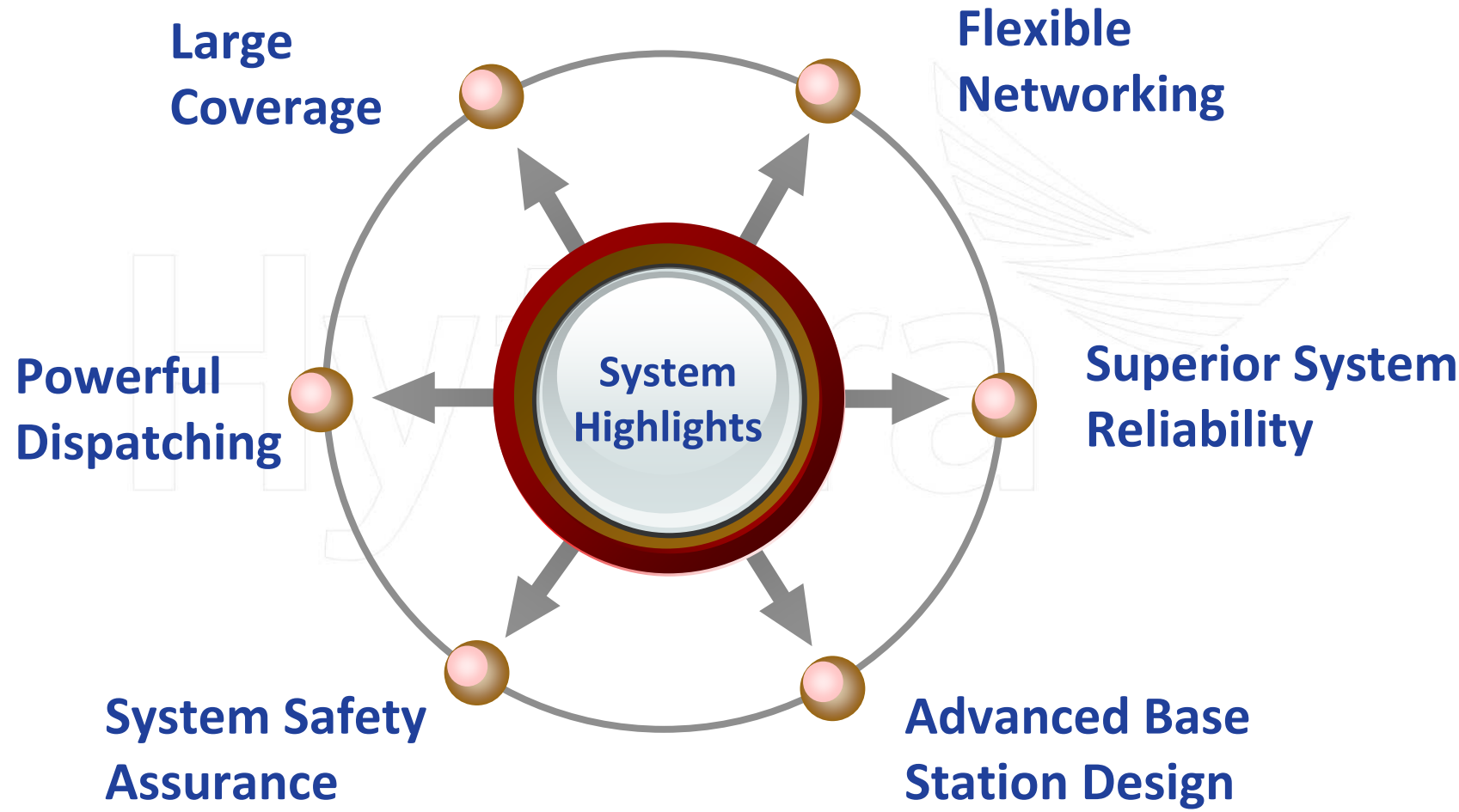
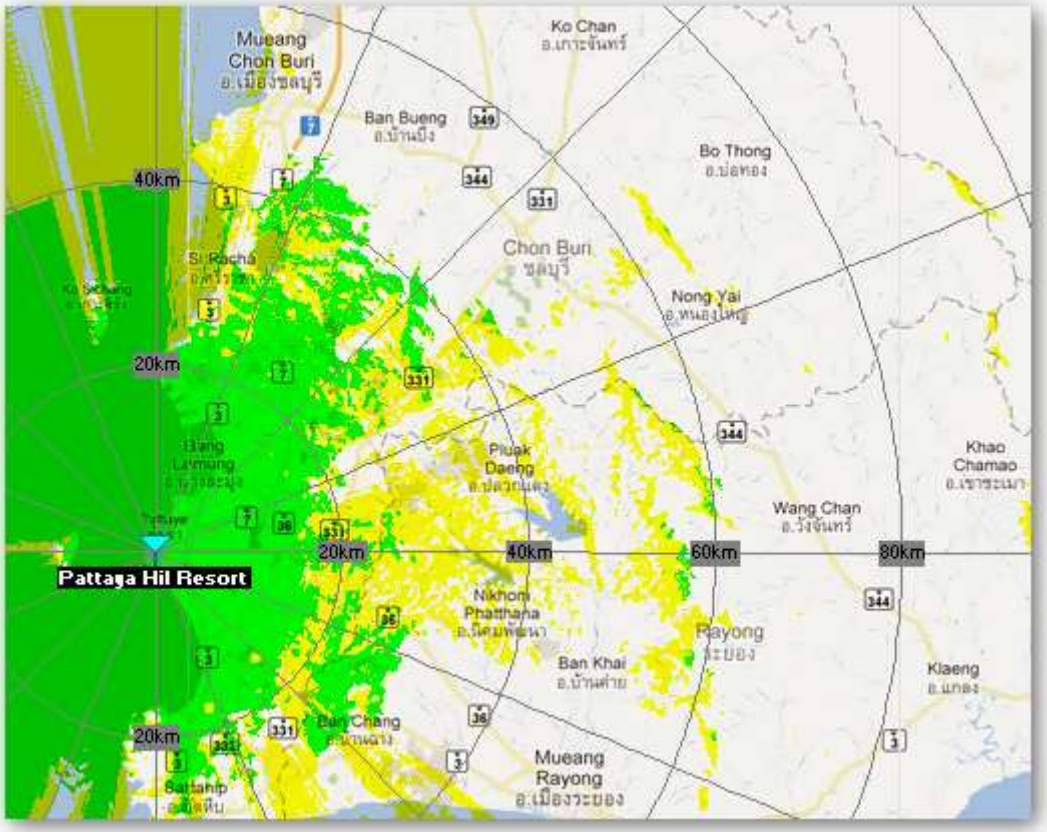


Large Coverage

- Large Coverage



BS RF Power:
50W, 100W

Mobile RF Power:
50W

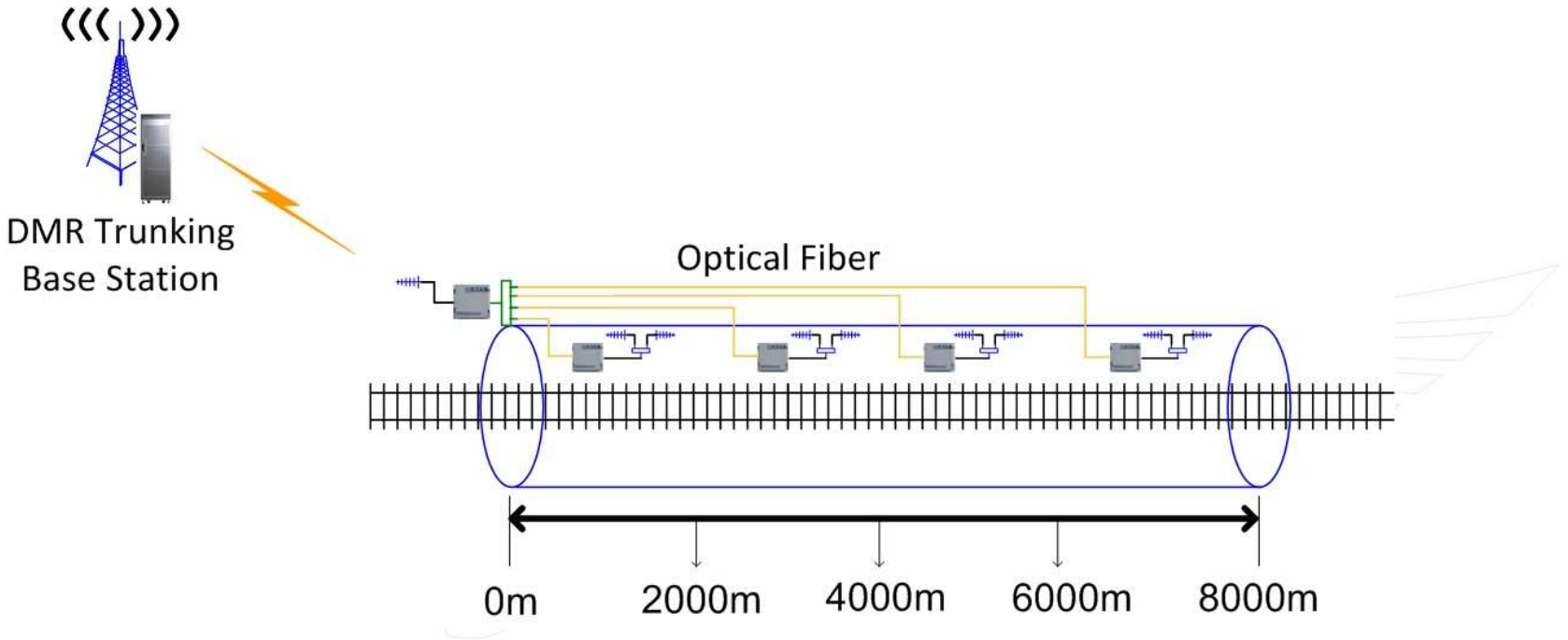
Portable RF Power:
5W

Network Size:
No limit for the number of sites

- Nonlinear amplifier and large coverage technologies
- Same area coverage could be achieved with fewer base stations
- simple network, improved network reliability and security
- Less investment for customers in basic facilities
- Reducing cost and facilitate both operation and maintenance

Large Coverage

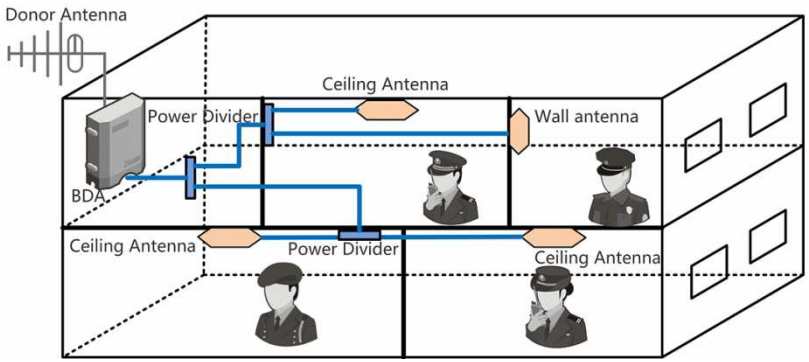
- BDA covering the signal blind area



BDA (Bi-directional Amplifier)

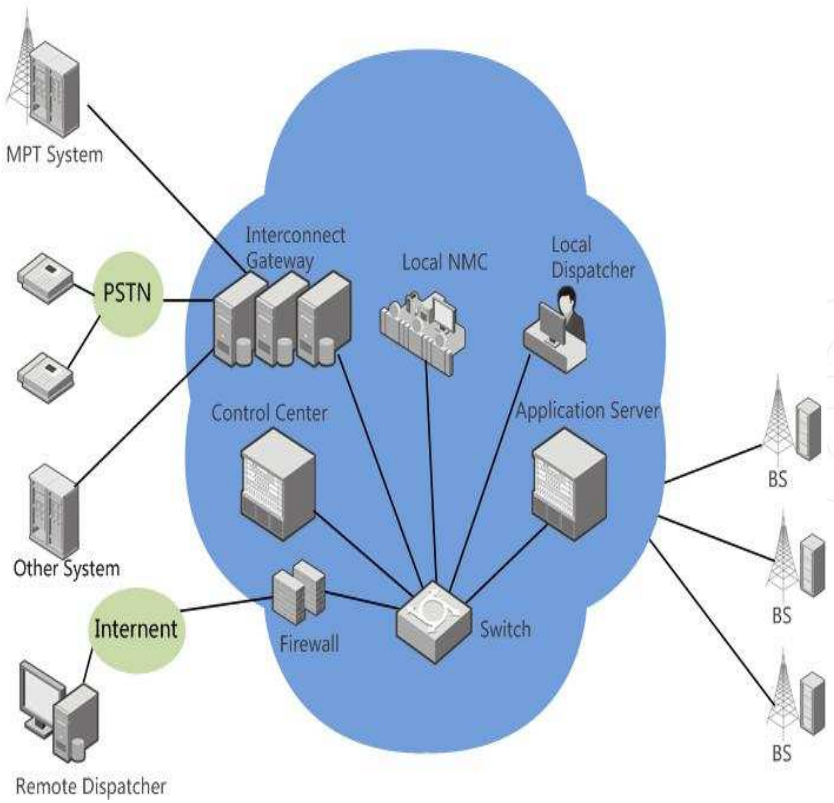
for Blind Areas.

For example Tunnels, Indoor coverage.

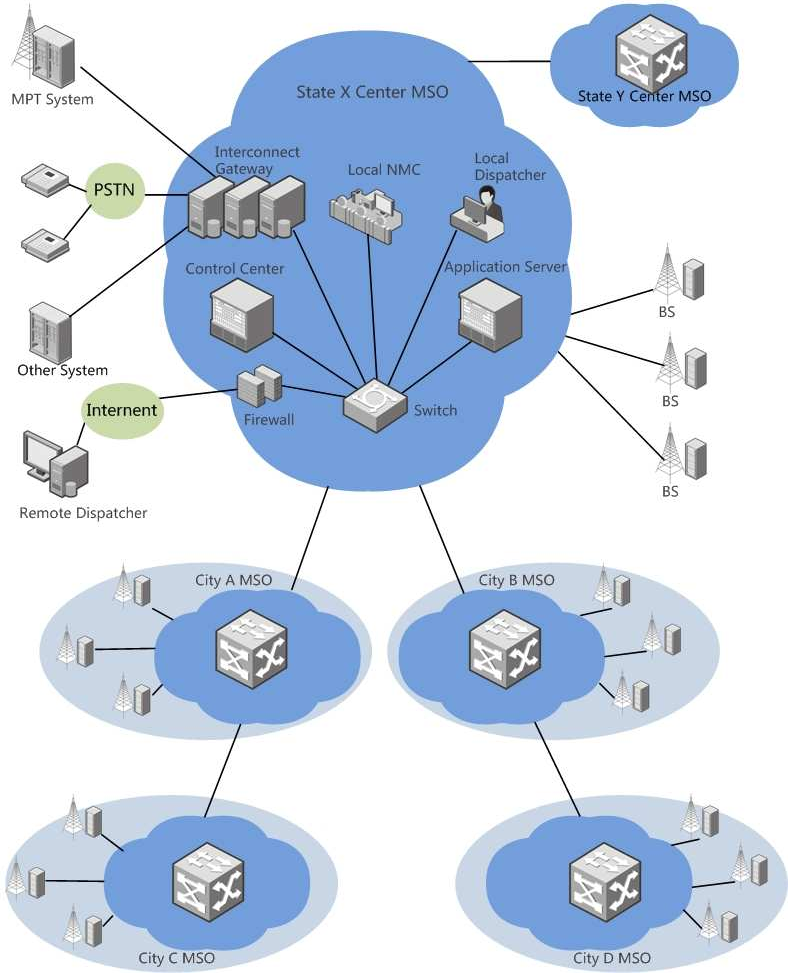


System Flexible Networking

- Flexible Networking Scale



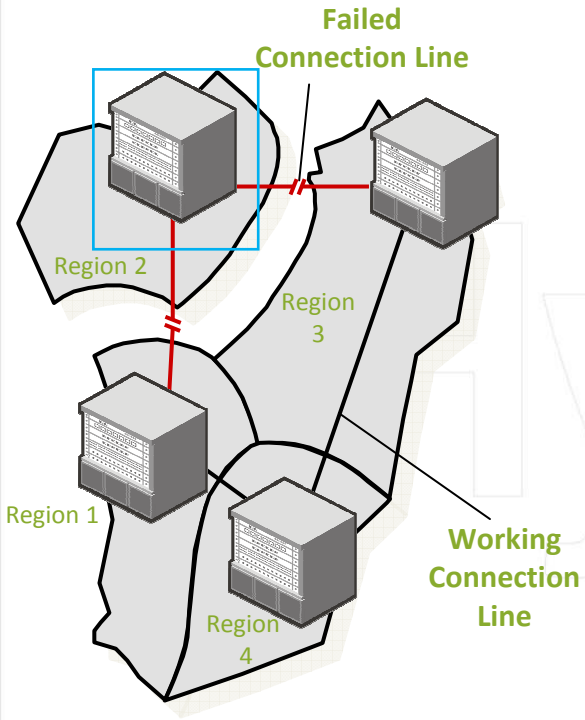
Single MSO System



Huge Trunking Network
Multi-MSO

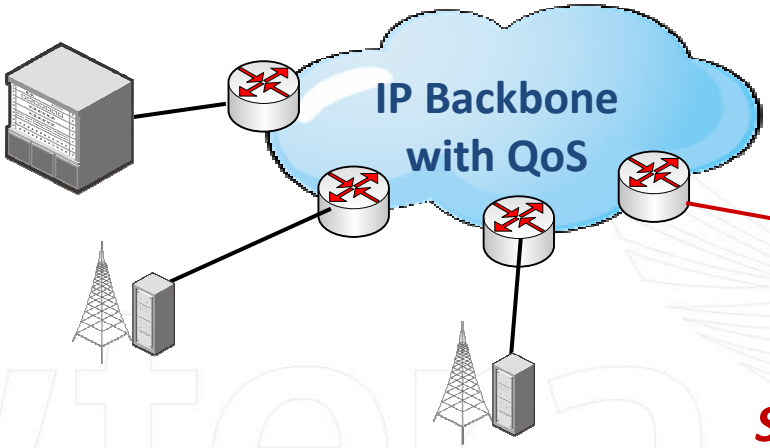
Superior System Reliability

- Multi-level Fallback Mode



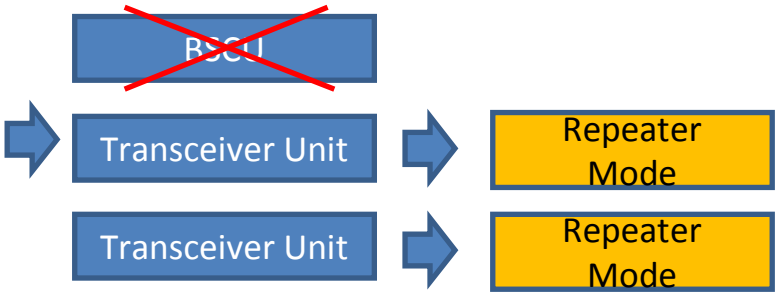
Level 1: Fallback to

Single MSO Mode



Level 2: Fallback to

Single Station Mode

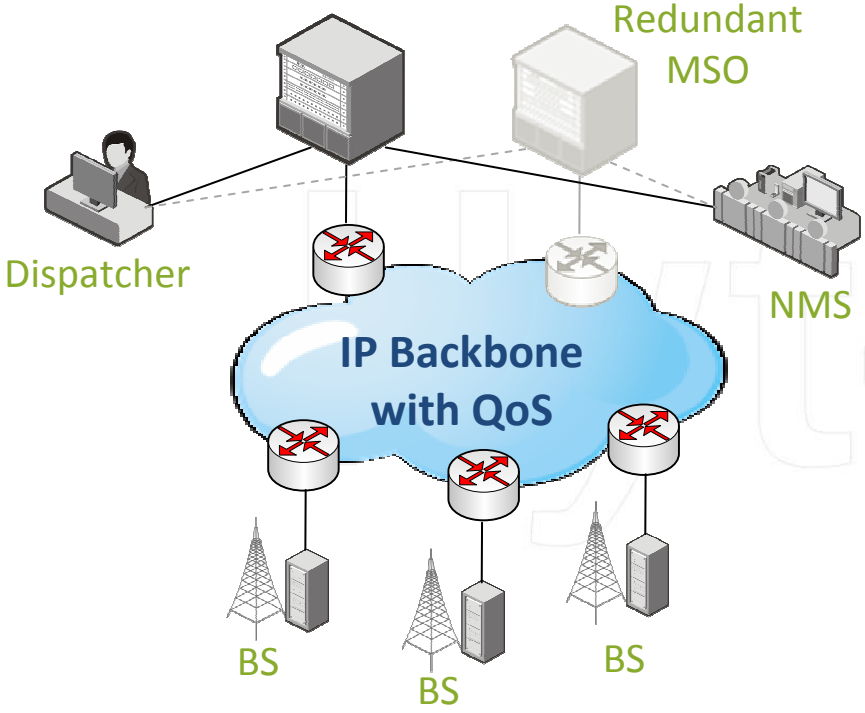


Level 3: Fallback to

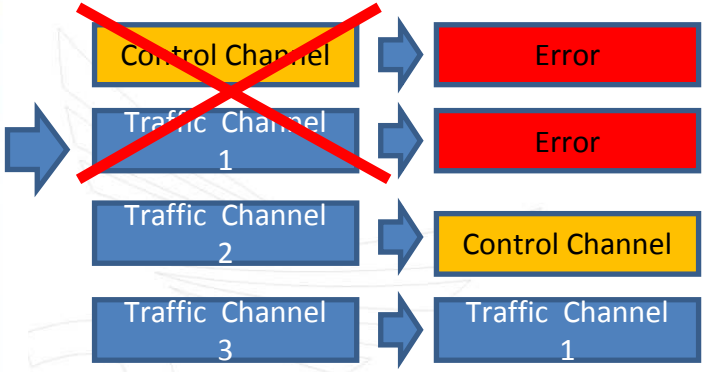
Conventional Repeater Mode

Superior System Reliability

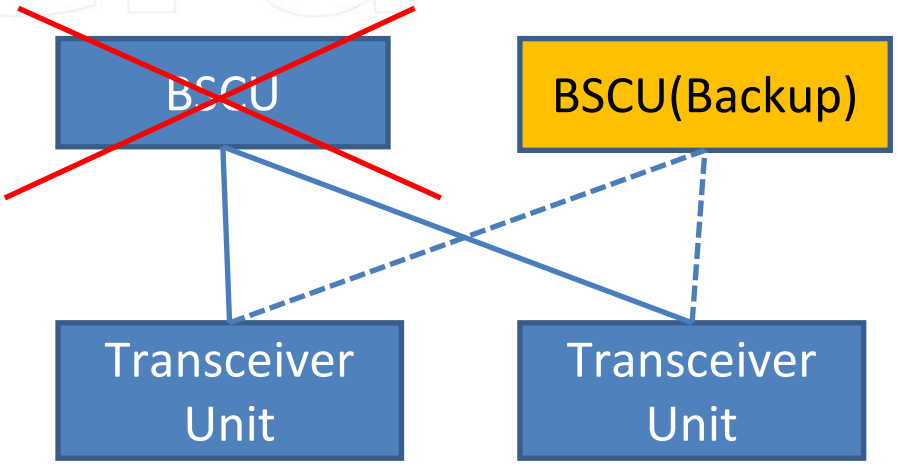
- Multi-level Redundancy



Redundant MSO for switching, gateways and management



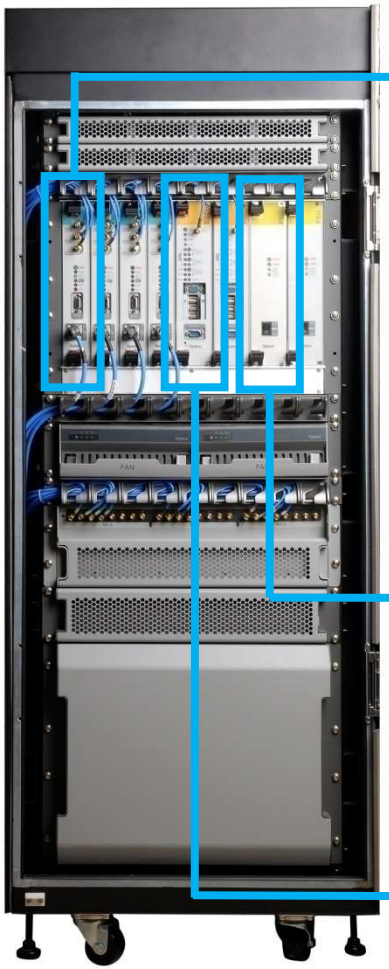
Control Channel Backup

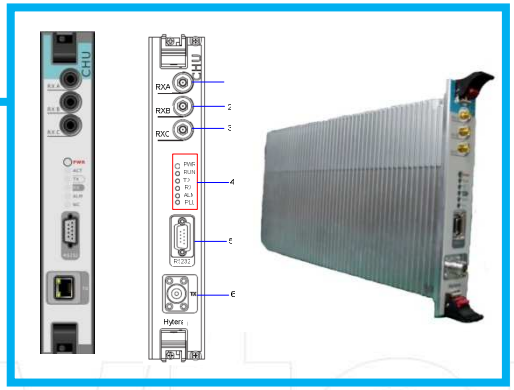


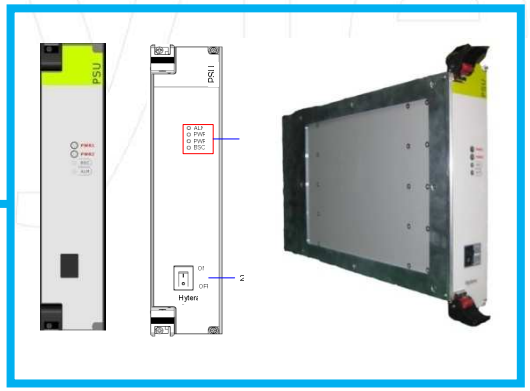
BSCU Redundant

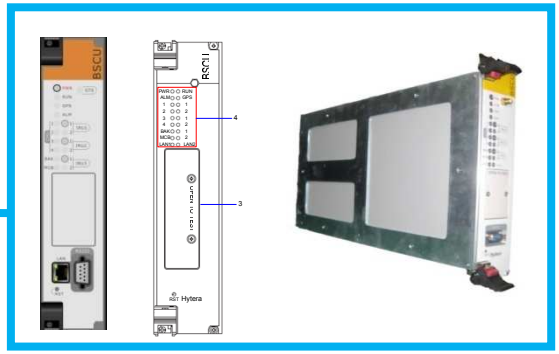
Advanced Base Station Design

- Blade-designed Unit





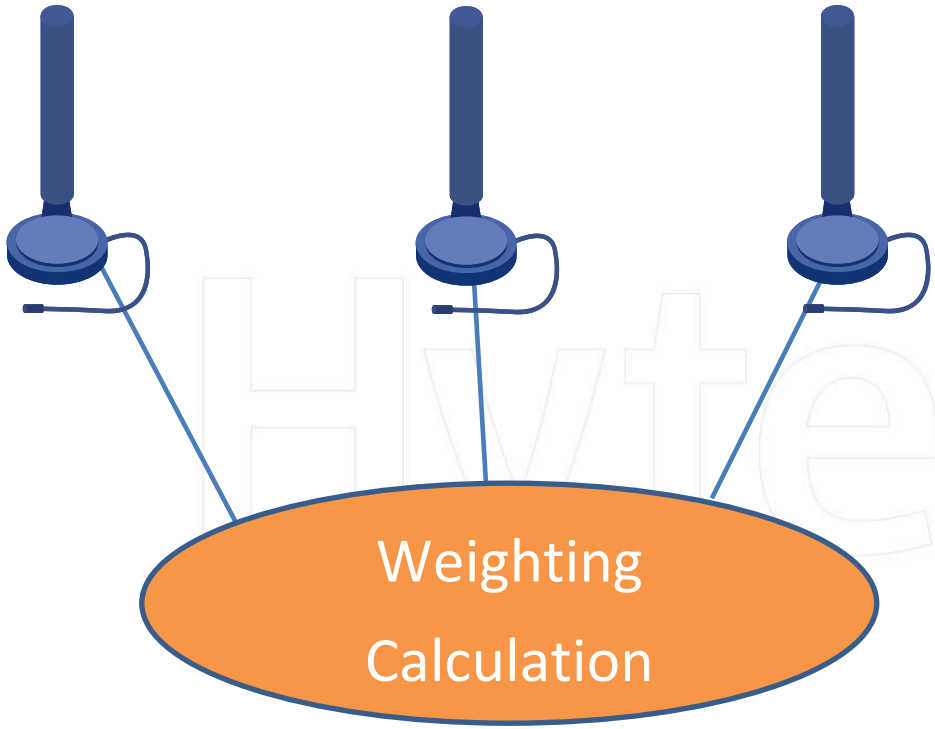




- Good Heat Dispersion
- High Space-utilization
- Easy For Extending & Maintenance

Advanced Base Station Design

- 3-Diversity Receiving



Receiving
Diversity Module

- Lower Multipath effect
- Increasing BS Sensitivity

Advanced Base Station Design

- 3-Diversity Receiving

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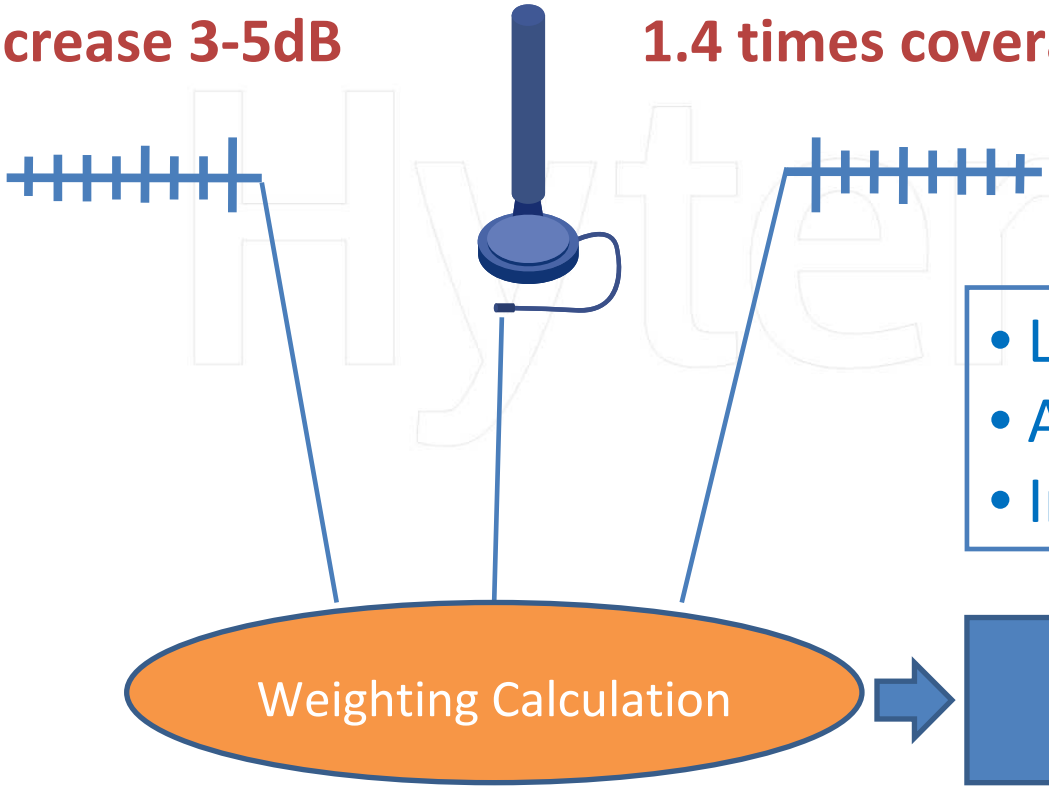
Increase 3-5dB

1.4 times coverage range that of before



- Lower Multipath effect
- Anti-fading Technology
- Increasing BS Sensitivity

System Safety Assurance

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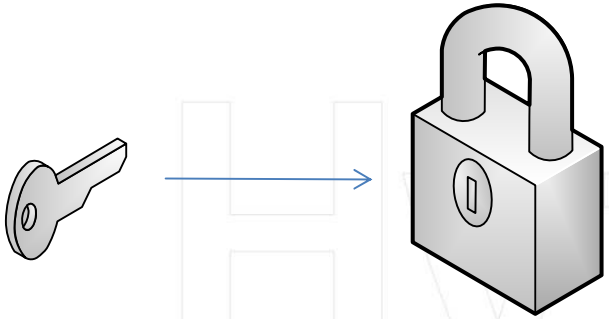
High Level Encryption

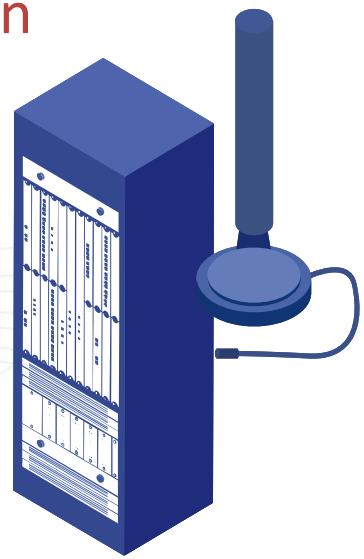


40/128/256 bit Secret

Various Encryption Algorithm

End to end encryption for both voice and data

System Authentication



Check Radio ESN

Two-way Check

Checking the legality via ESN

Powerful Dispatching & Management

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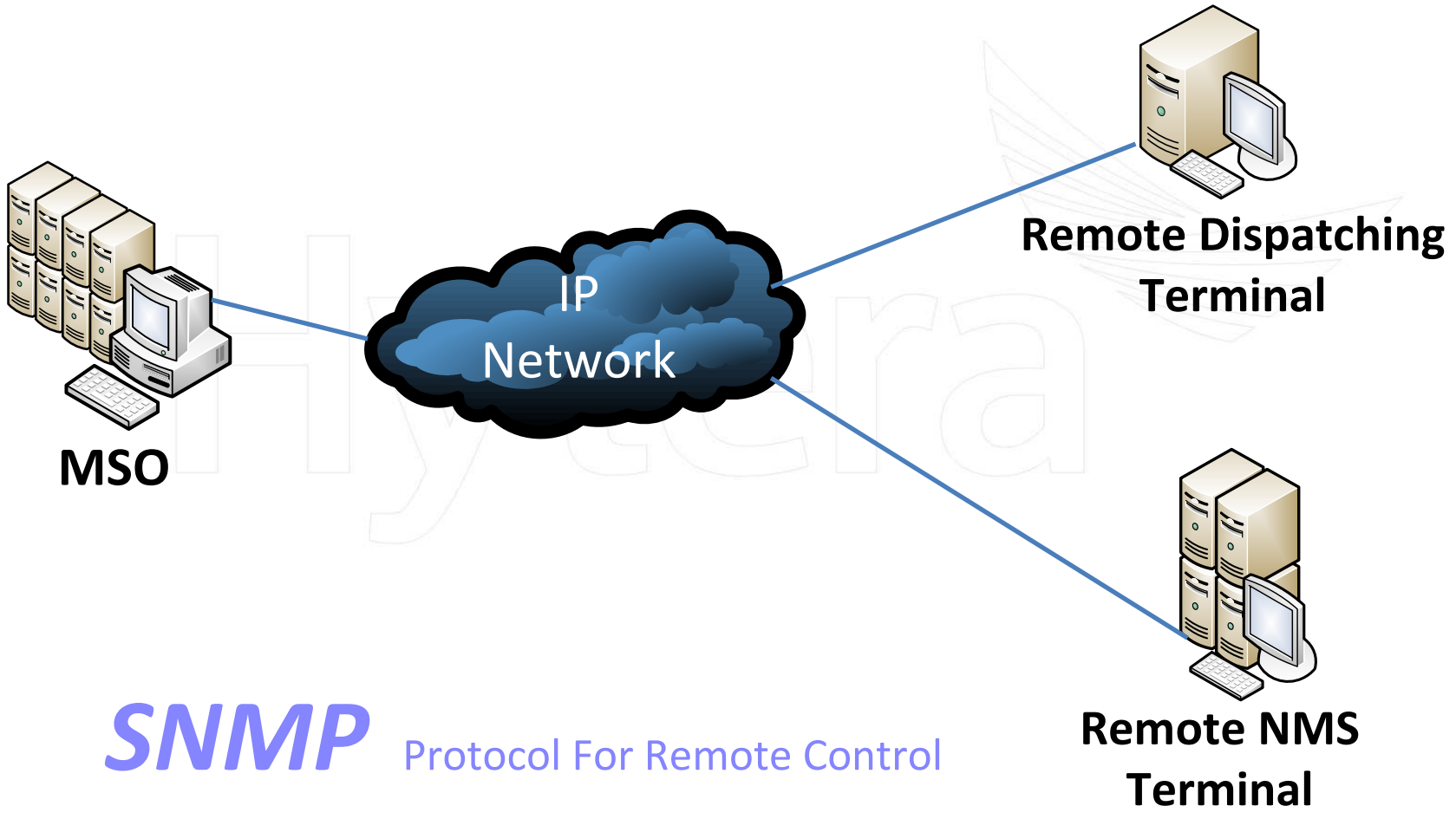

SNMP Protocol For Remote Control

Powerful Dispatching Capability

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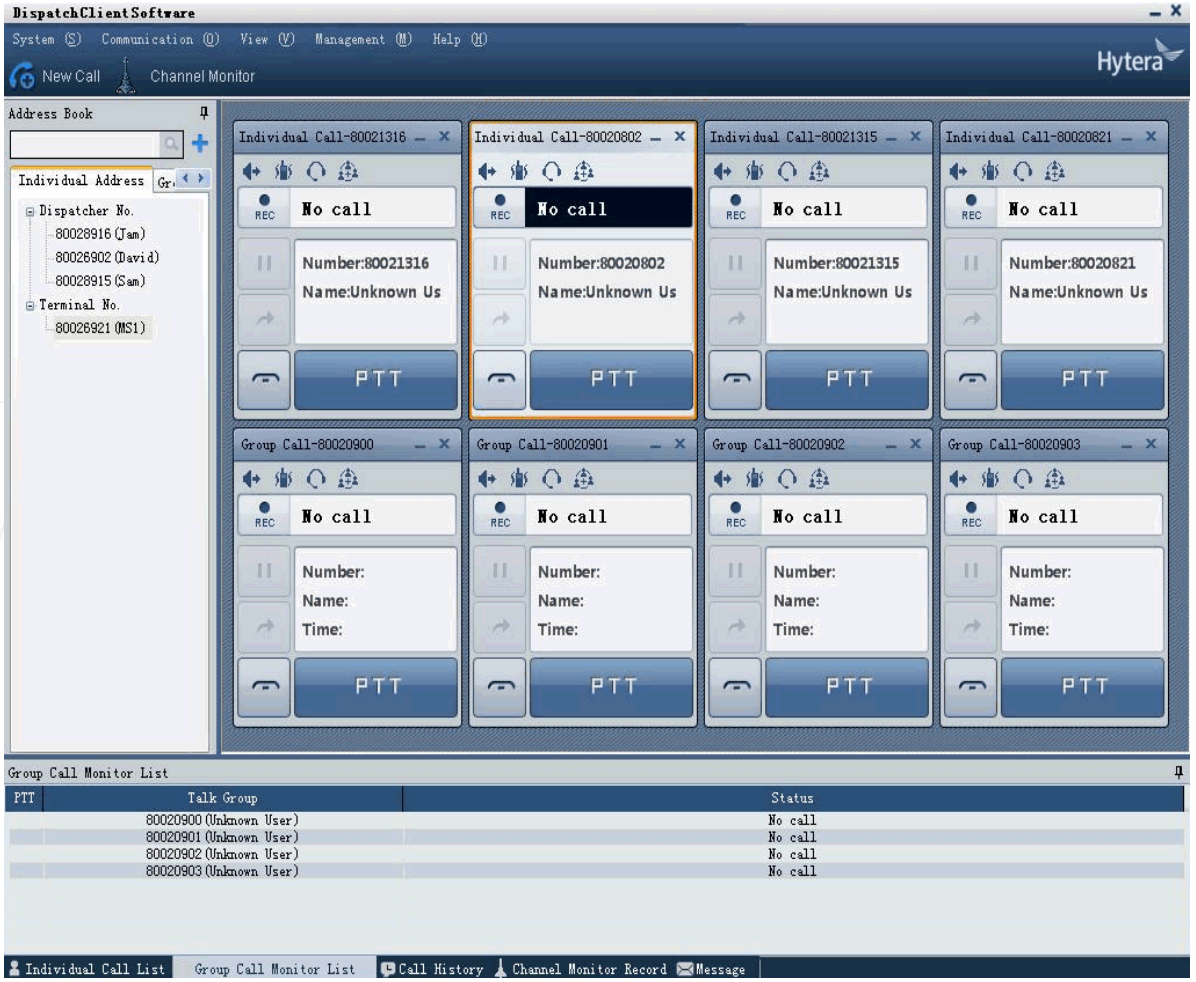
- Dispatcher

- Fruit Function，meets different uses' requirement；
- Humanization design, interface open, friendly；
- All IP network connection, easy installed；
- Flexible deployment, various solution provided；
- Efficient network management function, timely response provided to emergency security；
- Real time monitor of network, system state displayed clearly.

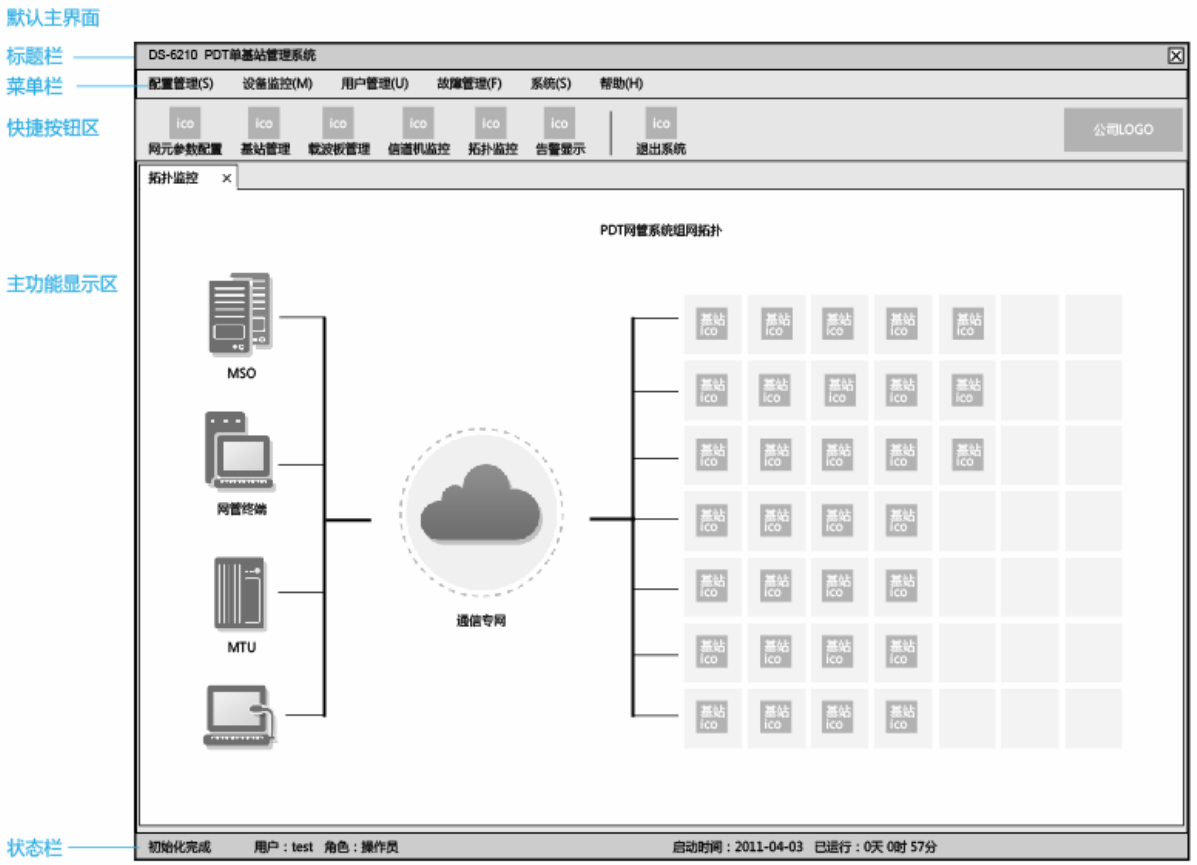


Dispatch system consists of dispatch terminal (PC), software, sound box, microphone.

Powerful Dispatching Capability

- Network Management Terminal

- Support SNMP protocol
- High networking ability and expansion capability by means of adopting C/S structure
- Centralized and topological management，friendly user interface and complete function
- Support of remote update and maintenance functions



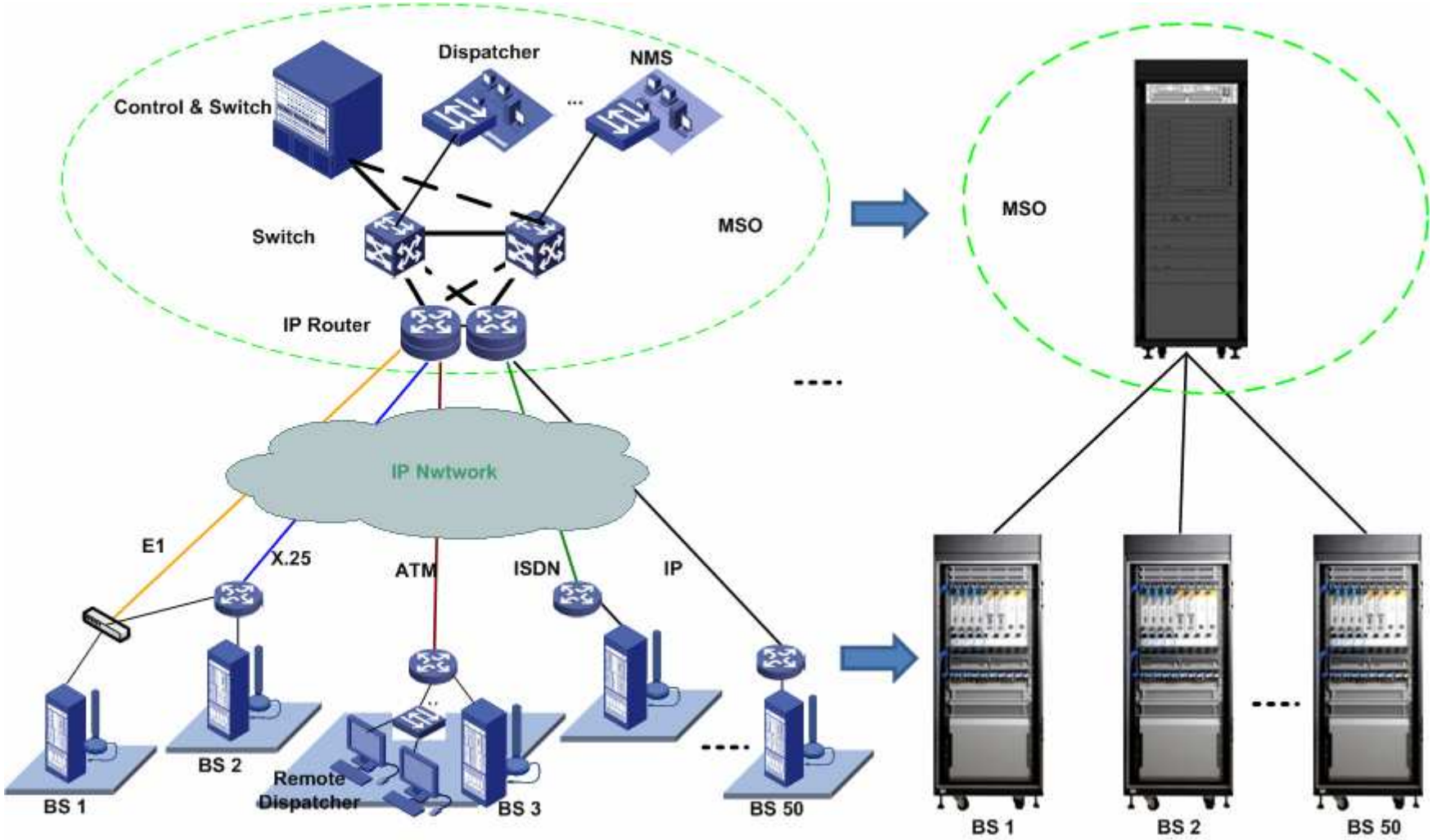
The NMS is made up of the following components: NMS Client, NMS Server, NMS software.

Hytera DMR Trunking System Intro

Part 3
Hytera DMR Trunking System Intro

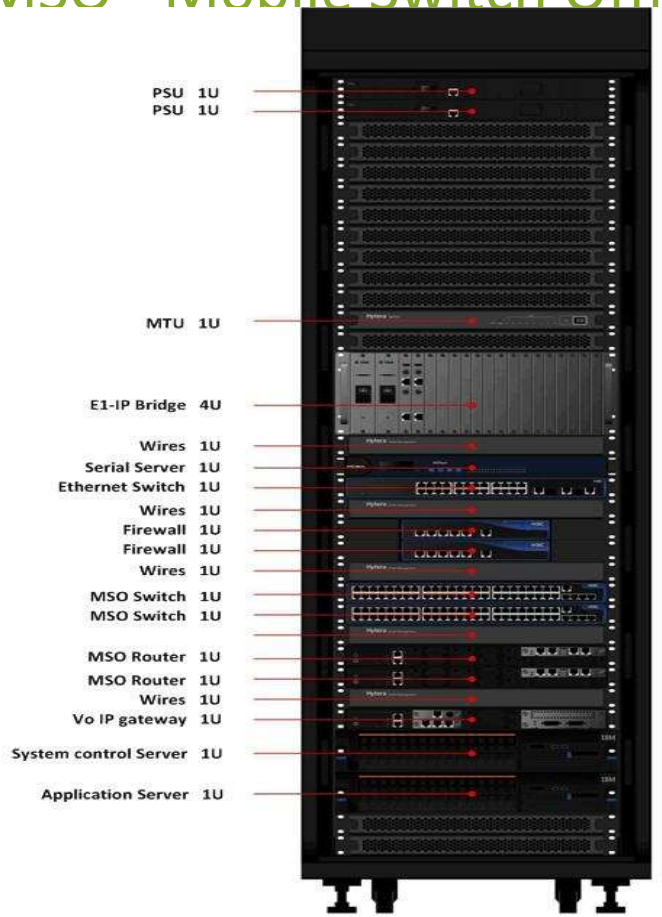
Hytera DMR Trunking system Intro

- MSO - Mobile Switch Office



Hytera DMR Trunking system Intro

- MSO - Mobile Switch Office



- IP Based architecture, support several networking topologies, having great flexibility and expansibility;
- Modular design, the system function and components can be subscribed by the customers freely;
- Support SNMP for remote network management and operational maintenance;
- Based on off the shelf equipments (server, switch and router, etc.), more convenient and low cost;
- High reliability by redundancy.

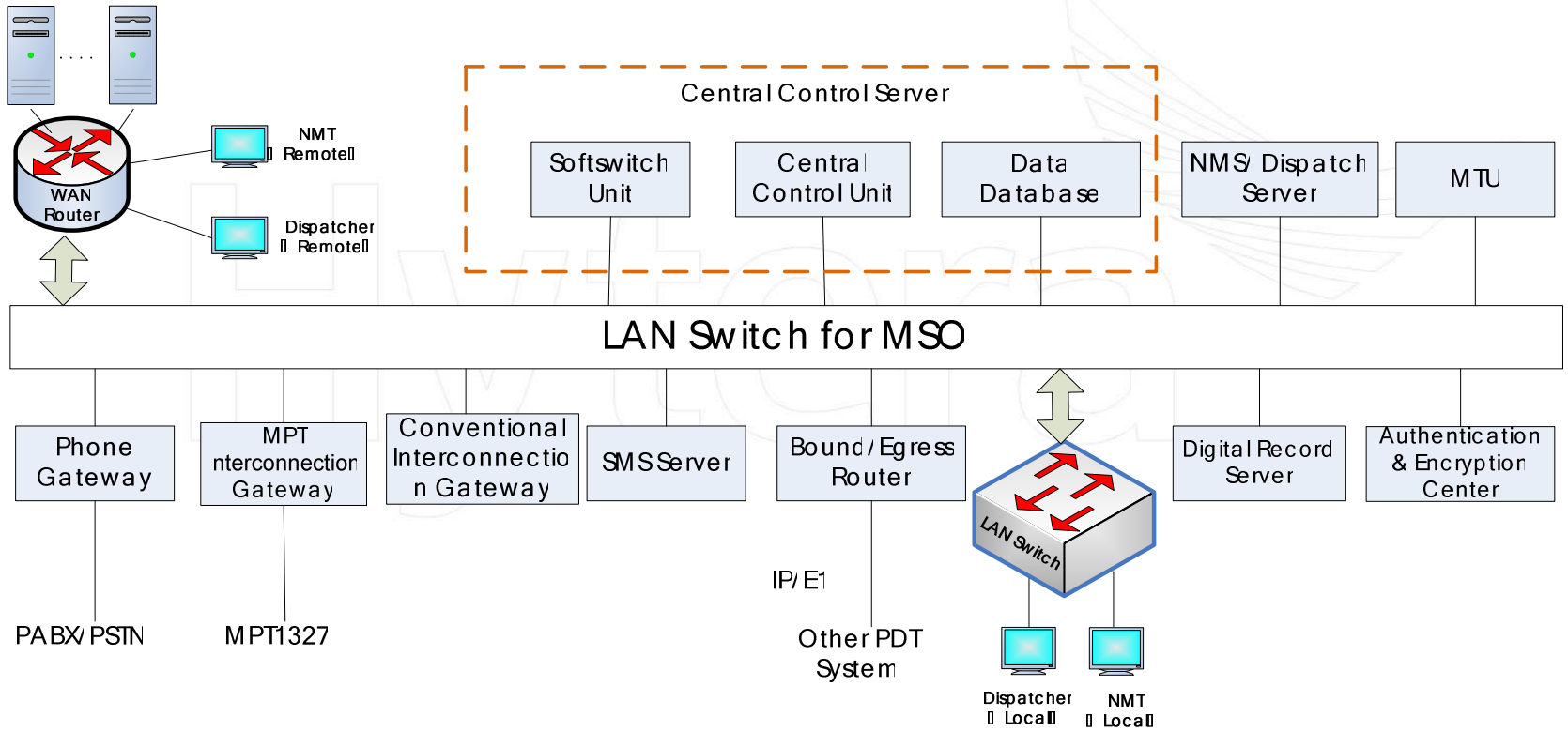
Hytera DMR Trunking system Intro

- MSO - Mobile Switch Office

Element	Function
Center Controller	The core of the whole system, processing system wide calls, mobility management and the IP link management.
Core Switch	Interconnect all the IP devices in a mobile switch center.
Core Router	It routes IP data packet between the MSO devices , remote devices and remote base stations , and provides appropriate transferring interfaces.
MTU (media translating unit)	Translating audio formats among the IP voice devices and the DMR terminals.

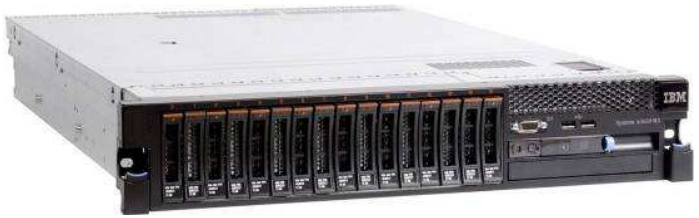
Hytera DMR Trunking system Intro

- MSO - Logic architecture



Hytera DMR Trunking system Intro

- MSO - Mobile Switch Office



System Server

- For whole network control and traffic exchange, realizing system signal process, call process and resource management.

MSO Switch

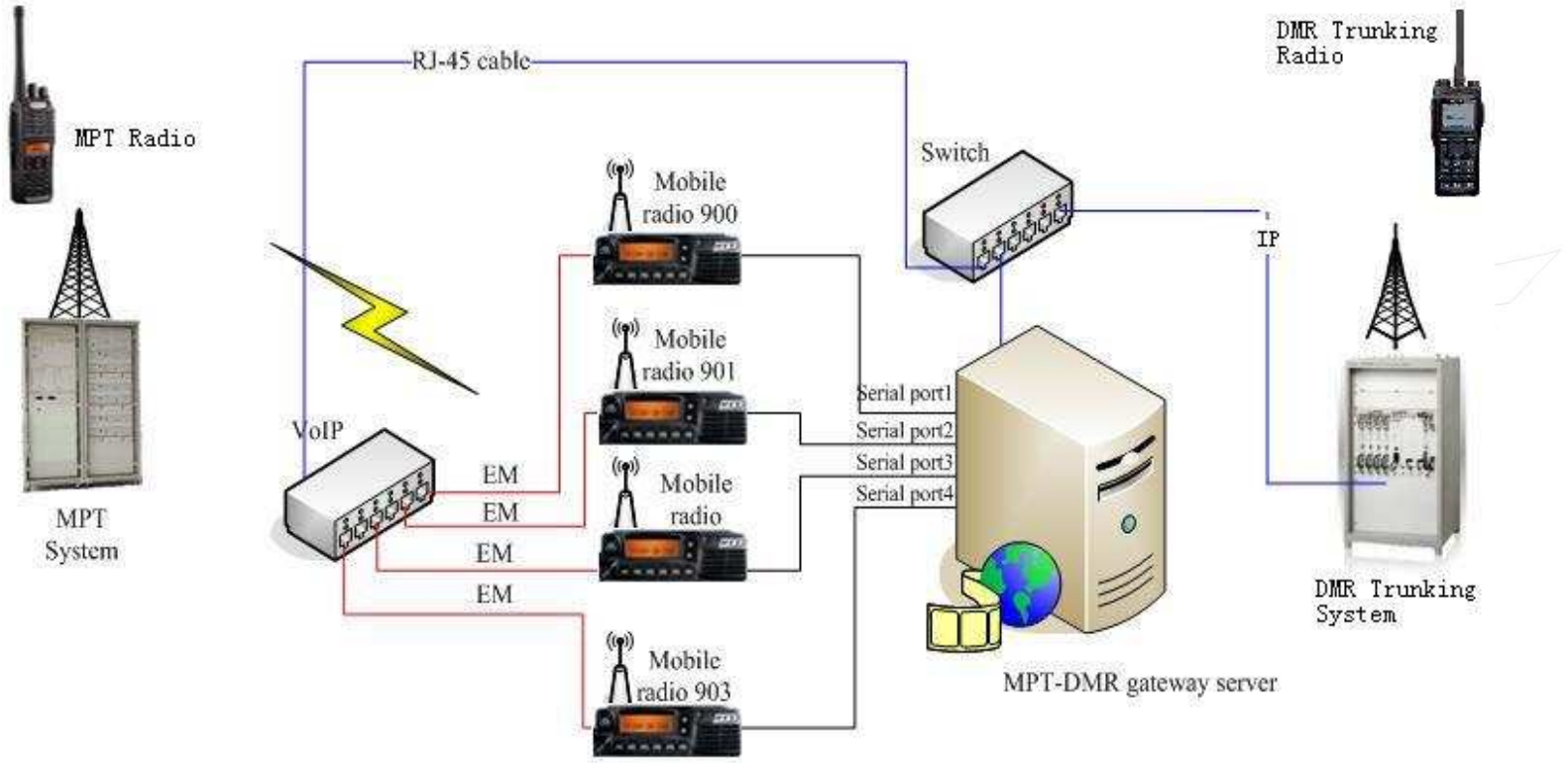
- Realizing interconnect of all devices in MSO.

MTU

- Translating voice data of different style, realizing voice transformation between DMR and other systems, and voice transformation between line dispatcher and radio terminal in DMR system.

Hytera DMR Trunking system Intro

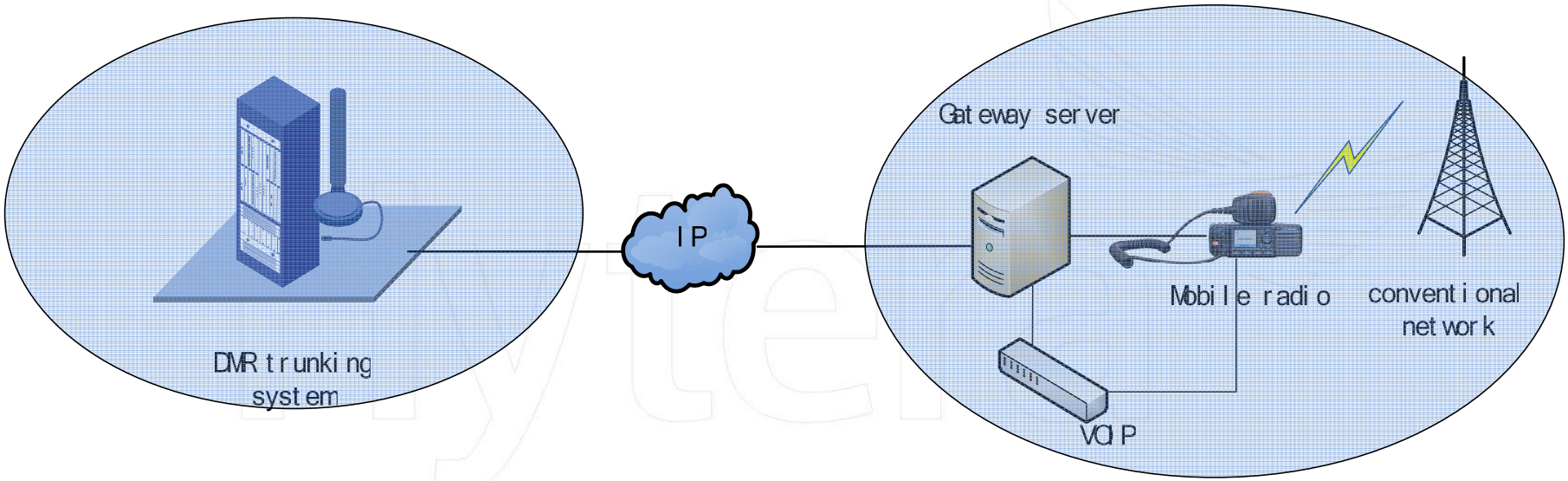
- MPT Gateway



- Group call between MPT system and DMR system realized;
- At most 2 calls can be supported at the same time per VoIP;
- Hytera DMR system can interconnect with vendors' MPT system;
- Mobile radio should be located in good coverage region of MPT system.

Hytera DMR Trunking system Intro

- Conventional Interconnect Solution



Mobile radio + VOIP + gateway server

Feature:

- 1.group call two way
- 2.Mobile radio must put down inside the coverage of conventional network

Multi-mode DMR Radios

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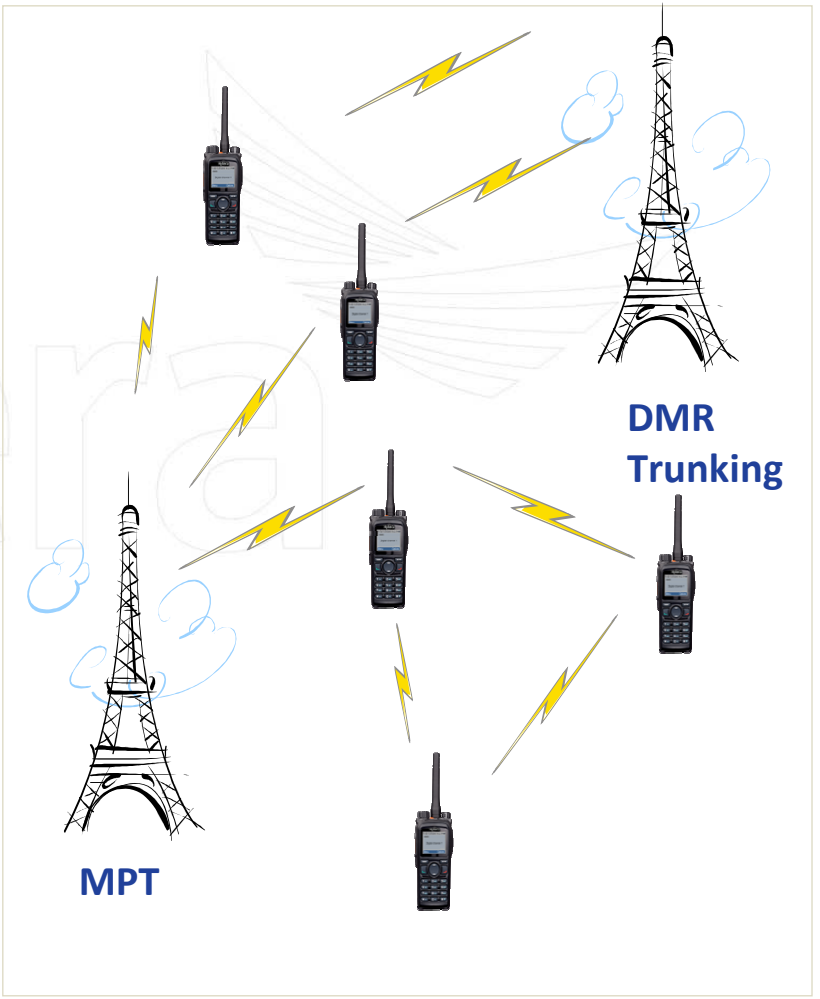
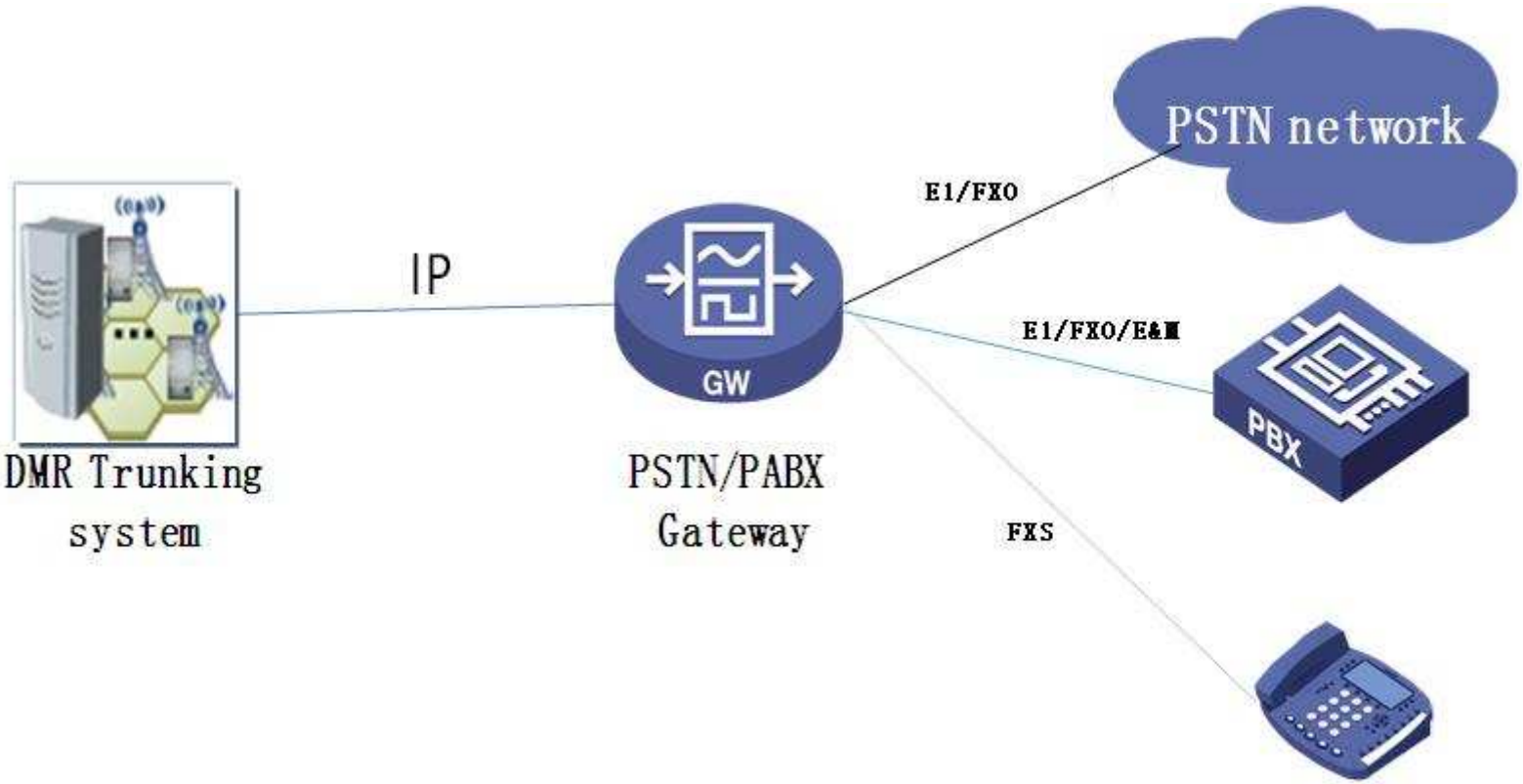
Supporting Multi-mode Operation:

- DMR Trunking Mode
- DMR Conventional Mode
- Analog conventional
- MPT Trunking

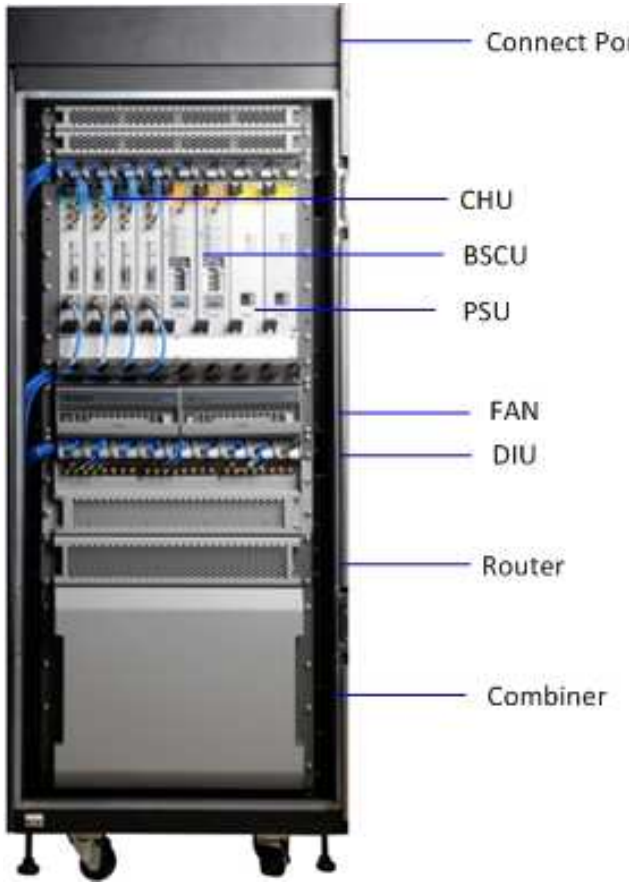


PSTN Gateway



Provide the interface of
E1 75 ohm (BNC) ,E1 120 ohm(RJ45), FXO(RJ11) and FSX(RJ11).

Hytera DMR Trunking Base Station



- Blade architecture, compact size and easy to operate;
- Tri-diversities receiving (optional), improving base station coverage;
- High reliability, the key hardware parts redundancy backup (power backup, control channel backup, BSCU backup) ;
- IP interconnect

Hytera DMR Trunking Base Station

Element	Function
Antenna System	It Includes combiner , branching unit , antennas and so on. It can divide or combine RF signals carried by different carriers, and allow multiple TX signals to share the TX antenna, or multiple RX signals to share the RX antenna.
Channel Unit (TRx)	It processes and converts protocols for the physical layer and data link layer of the PDT air interface. Channel machine features include: baseband signal processing, RF launch and RF diversity (optional) to receive.
Base Station Controller Unit (Trunking controller)	It implements the following functions: manage mobile service; control call connection; manage radio resources; operate and maintain devices in the base station; control interface between base station and mobile switching office.
Router	It connects different links to realize routing and addressing.
Power Support Unit	It provides constant power to each module. Its input can be AC90 for 260 V AC.

Main Functions

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Basic Services

Type	Function	Description	Mark
Mobility Management	Registration	this feature allows the terminal to register on the system. It occurs when the terminal power-up.	Available
	Power-off Deregistration	The registered terminal deregisters from the network when it is switched off.	Available
	Roaming	The mobile terminal updates its location information when it moves from one base station to another.	Available
	Handover	The communication carries on seamlessly when the mobile terminal moves from one base station to another.	Available

Main Functions

Hytera
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Basic Services

Type	Function	Description	Mark
Basic Voice Services	Individual Call	OACSU (Off Air Call Set Up): The call can be put through automatically without operation of the called terminal. FOACSU (Full Off Air Call Set Up): The call should be put through or terminated manually by the called terminal.	Available
	Group Call	It is a half-duplex call initiated by one member in the group to the other members. The member can be either the mobile terminal or the dispatcher.	Available
	Dispatcher Call	It is a call between the mobile terminal and the dispatcher.	Available
	Conventional terminal Call	It is a call between the DMR Trunking terminal and the conventional terminal.	Available
	All Call	It is a call that involves system-wide subscribers, allowing the initiating party to talk only.	R2.01
	Broadcast Call	It is a call intended for one or multiple mobile terminals, allowing the initiating party to talk only.	R2.01
	MPT Call	It is a call between the DMR Trunking terminal and the MPT terminal.	R2.01
	Telephone Call	It is a call between the mobile terminal and the PABX/PSTN terminal.	R2.01

Main Functions

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Basic Services

Type	Function	Description	Mark
Basic Data Services	Short Message	It is convenient to communicate via short message between terminals, or between the terminal and the dispatcher.	Available
	GPS Data Polling	The terminal sends GPS information to the system upon request.	Available
	Status Message	The quick text such as “Patrolling” and “Refueling” can be predefined for both receiving and transmitting parties.	R2.01
Security Services	Authentication	The mobile terminal should be authenticated by an encryption algorithm before accessing certain services.	R2.01
	Encryption	The system supports air interface encryption and end-to-end encryption.	R2.02

Main Functions

Supplementary Services

Function	Description	Mark
Dynamic Site Assignment	Dynamic site assignment is to dynamically assign a channel to the site which really needs, enhancing the efficiency of channel utilization.	Available
Dynamical Talk Time Limit	This feature is to prevent any subscriber from occupying the channel for a long time.	Available
Late Entry	This feature allows a subscriber to join an in-progress call. It is enabled after a call is established.	Available
Caller Display	If this service, available for the called mobile terminal only, is enabled, the system will forward the number of the calling party to the called party. In this way, you can learn who is calling in case of an incoming call.	Available
Talker Identity	When a mobile terminal is authorized to talk after a group call is initiated, its number will be displayed on all the members' screen.	Available

Main Functions

Supplementary Services

Function	Description	Mark
Emergency Call	**Emergency Button:** You can press this button to make an emergency call, and with the Hot Mic function, you can directly speak into the microphone without holding down the PTT. At this moment, only the dispatcher can cut in. **Emergency Number:** You can also make an emergency call by dialing your desired emergency number. The emergency call can be sent to anyone to settle the urgencies.	R2.01
Call Priority	Priority call is used to set multiple levels of priority for subscribers, enabling the most critical one to access to the network quickly during busy period. It includes Pre-emptive priority, Super group call, Emergency call, Normal call.	R2.01
Stun / Revive	Stun :This feature enables the dispatcher to temporarily disable a lost mobile terminal to avoid unauthorized use. Revive :This feature allows the authorized subscriber to activate a stunned mobile terminal for normal use.	R2.01
Kill	This feature allows the authorized dispatcher to disable a mobile terminal.	R2.01

Main Functions

Supplementary Services

Function	Description	Mark
Forced break-in/ Forced disconnect	Forced break-in: This feature allows the dispatcher to forcedly terminate the active call made by the mobile terminal and start talking. Forced disconnect: This feature allows the authorized dispatch terminal to forcedly end the active call.	R2.02
Dynamic Group Number Assignment	Dynamic group number assignment is used to create, modify or delete groups by means of air interface without re-programming the mobile terminal.	R2.02
Discreet Listening	Discreet listening allows an authorized dispatcher to monitor a mobile terminal discreetly and record the conversation.	R2.02
Ambience Listening	Ambience listening is generally used for the subscribers' safety (for example, **a control center can acquire the current status of a subscriber in a dangerous environment**). This service is achieved by a dispatcher (or an authorized mobile terminal) and the network management terminal.	R2.02

Main Functions

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Supplementary Services

Function	Description	Mark
Queue	When all channels are in use, the system will send a message to the mobile terminal prompting "the system is busy and your call has been in a queue" if a subscriber attempts to initiate a call. At this moment, the call is in a waiting status without been ended.	R3.0
Automatic Callback	After a subscriber initiates a call, the system will reject it when the called party is unavailable, and then monitors the called party. The called mobile terminal would end the call after receiving the rejection information from the system. The automatic connection attempt is started by the system as soon as the called party is available.	R3.0
Call Forwarding	**Targeted at your own terminal**: You can forward a call that is targeted at your own terminal by configuring the forwarding conditions, services to be forwarded and the target address. This service can be cancelled when unnecessary. **Targeted at another terminal**: You can forward a call that is targeted at another mobile terminal by configuring the forwarding conditions, services to be forwarded and the target address. This service can only be cancelled by the party requesting it.	R3.0
Call Barring	The system can bar an incoming or outgoing call without the knowledge of the target terminal.	R3.0
Last Dispatcher Notification	Last dispatcher notification is used to avoid the situation that there is no dispatcher in a talk group. When the last dispatcher is about to exit, the system will give a message to confirm its exiting.	R3.0

Main Functions

Dispatching Service

No.	Service	Description
1	Call Services	The dispatcher supports individual call, group call, late entry, talk time limit, group call ID display, etc.
2	Mobility Management	Registration: The dispatcher is assigned with a unique number in the network. It sends a request to TSC for registration while logging in. In case of registration failure, the dispatcher cannot request other services. Deregistration: The dispatcher sends a request to TSC for deregistration when logging out.
3	Call Management	Call Log Query: You can query all the call logs involving the dispatcher according to the exact requirements. Record: You can record and replay the call involving the dispatcher.
4	Basic Data Services	Message: The dispatcher supports message (text message and status message) communication with mobile terminal or other dispatchers. GPS: The GPS information of terminals can be transferred by the dispatcher on a case-by-case or regular basis over the trunking system. Accordingly, the geographical location can be displayed on the map for visible dispatching.
5	Contact Management	The contact information under a dispatcher's governing can be displayed in the list.
6	System Status Display	It displays the system status, time, dispatcher number, software name and version information.

Main Functions

Network Management Service

No.	Service	Description
1	Subscriber Management	You can create or delete one or multiple accounts, modify the subscriber information, search the subscriber database, manage the configuration of mobile terminal subscribers, handle the supplementary services, as well as record the calls.
2	Configuration Management	You can configure, query or modify the settings, as well as add or delete network elements. In this way, it is easy to learn about the equipment configuration and its operation status. This function is for authorized staff only.
3	Fault Management	You can monitor the system state and troubleshoot a fault in time to ensure its normal operation.
4	Performance Statistics	Statistics of system performance can provide substantial data for future improvement, such as call traffic statistic and equipment performance statistic.
5	Security Management	The network security can be ensured from the aspects below: The subscriber must enter matching ID and password to avoid any unauthorized access. The access and operation authorities is assigned according to subscriber type. The system will create a log for all operations.
6	Other Services	You can enjoy further services, such as topology management, remote upgrading, etc.

Hytera DMR Trunking System Intro

Part 4
Terminal Intro

Hytera DMR Trunking Portable

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Freq. Band	**330-400MHz, 136-174MHz 450-520MHz, 400-470MHz 800MHz**
Dimension	**125*55*37 mm**
Weight	**355g**
CH. Space	**12.5 KHz/ 20KHz/ 25KHz**
Channels	**1024CH**
RF Power	**UHF:4W/1W VHF:5W/1W**
Battery	**2000mAh Li**
Audio Power	**1.5W**

- 1.8 inch TFD LCD Display and full keypad
- IP67
- Vibration
- Compatible with Analog mode
- Open Application interface (API) for 3rd Partner*

- Man-down
- GPS option
- Encryption *

Notes： ** indicates functions is available later*

Hytera DMR Trunking Mobile

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Freq. Band	**330-400MHz, 136-174MHz 450-520MHz, 400-470MHz**
Dimension	**60*174*200 mm**
Weight	**1.7KG**
CH. Space	**12.5 KHz/ 20KHz/ 25KHz**
Channels	**1024CH**
RF Power	**UHF:45W/25W VHF:50W/25W**
Audio Power	**3W**

- 2.0 TFT color LCD display with intuitive navigator buttons
- IP54
- Encryption *
- Open Application interface (API) for 3rd Partner*
- GPS option
- Compatible with Analog mode

Notes： ** indicates functions available in later version*

Hytera DMR Trunking Covert Radio

Hytera
Respond & Achieve

Freq. Band	**330-400MHz, 136-174MHz 450-520MHz, 400-470MHz**
Dimension	**115*54.4*18.5 mm**
Weight	**190g**
CH. Space	**12.5 KHz/ 20KHz/ 25KHz**
Channels	**16CH**
RF Power	**UHF:4W/1W VHF:5W/1W**
Battery	**1100mAh Li**

- Man-down
- Encryption
- Compatible with analog mode
- Optional Wireless audio accessory*
- Vibration
- GPS
- IP67

Notes： ** indicates functions available in later version*

Hytera DMR Trunking System Intro

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Part 5
Case Study

Shenzhen Customs

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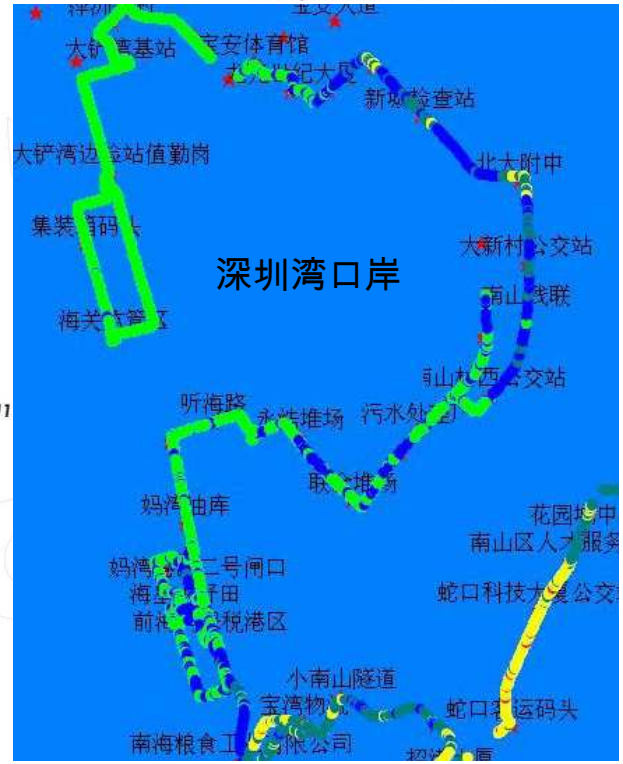
Universiade SHENZHEN 2011



- 5 BS, 1 BDA and 1 IDS, 300 portable Terminal , realising coverage of frontier and office building.

- All frontier BSs connect to the general station to realise dispatch together, to ensure 2011 Shenzhen Universe Sport's inspection

序号	范围（dBm）	色彩表示
1	＜-111	
2	-110～-96	
3	-95～-86	
4	-85～-76	
5	-75～-68	

GuiYang Ethnic Minority Sport

Hytera
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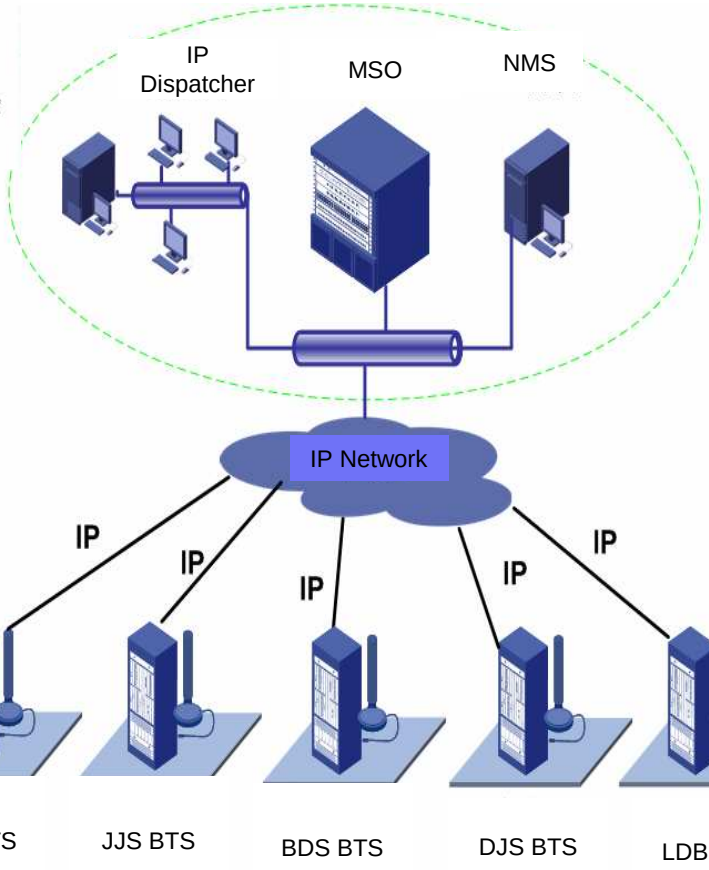
中华人民共和国
第九届少数民族传统体育运动会
2011·贵州

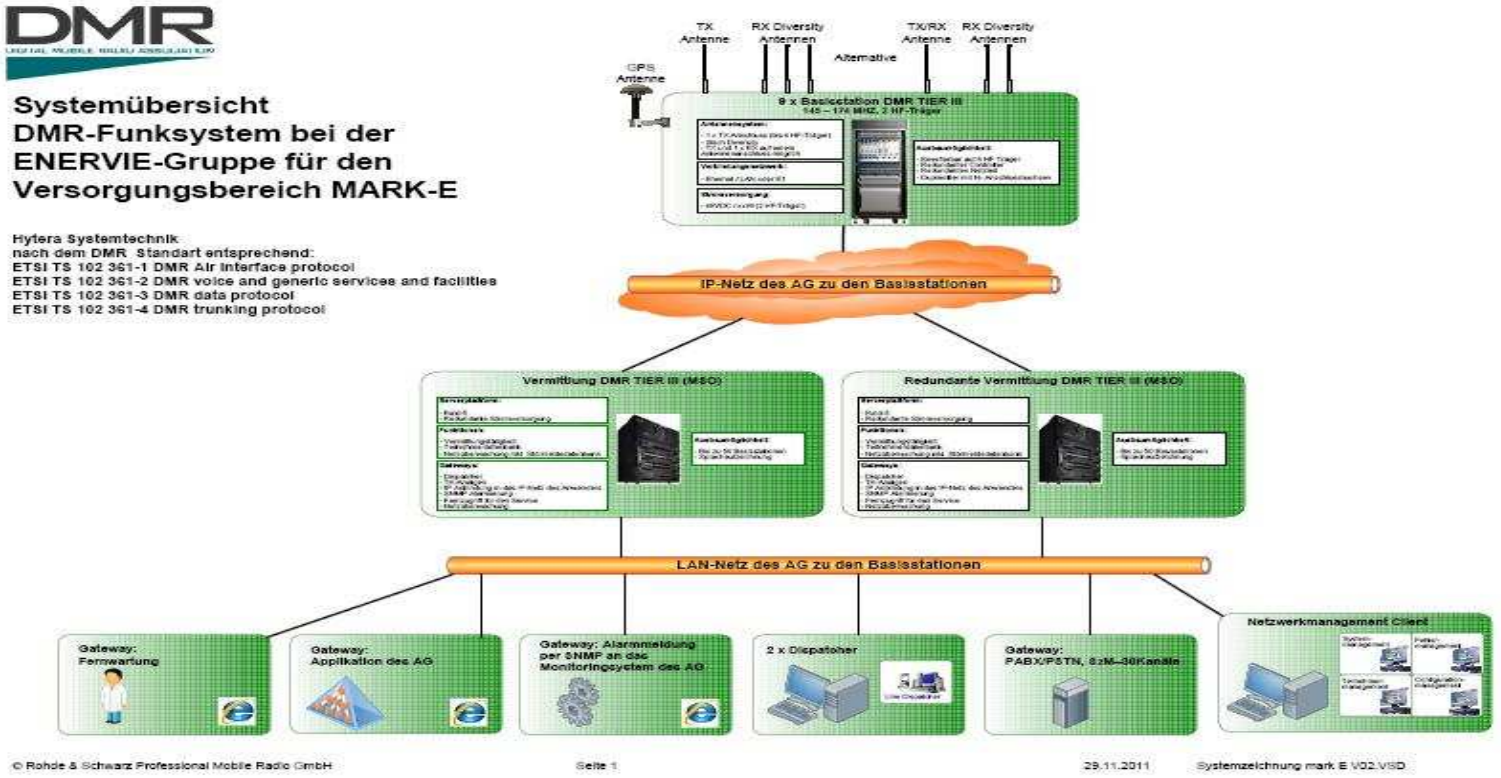


竞赛表演项目场馆地点分布图

- Project finished in 2011.8, support all the Ethnic Minority Sports successfully.
- All IP architecture adopted, 5 BS and 265 terminals distributed in different regions to ensure Ethnic Minority Sport's traffic and safety.

A Energy Project In Germany

Hytera
Respond & Achieve



- System: 9 BS, 1 MSO, 1NMS, 2 Dispatcher and PSTN Gateway
- 300 portable Terminal
- All IP architecture adopted, realizing the whole line coverage.
- 3-diversity receiving design can ensure the large area coverage.

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THANKS