KENWOOD
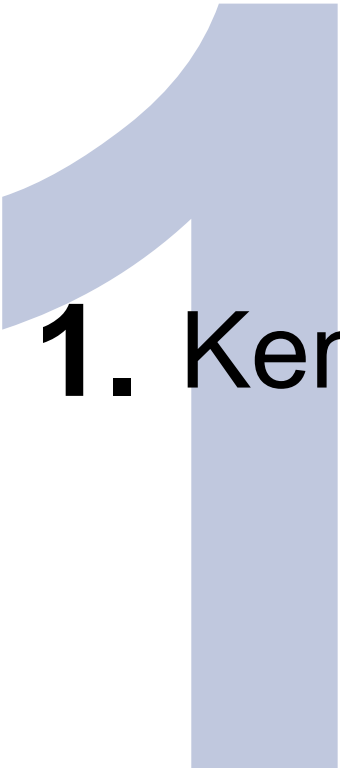
DMR Trunking Systems

JKUK: Gabi MURESAN

Stephen EDWARDS

Agenda

1. **Kenwood DMR Trunking Overview**
2. Kenwood DMR Tier III Trunking
3. Kenwood DMR-S Trunking
4. Kenwood DMR Tier III Terminals
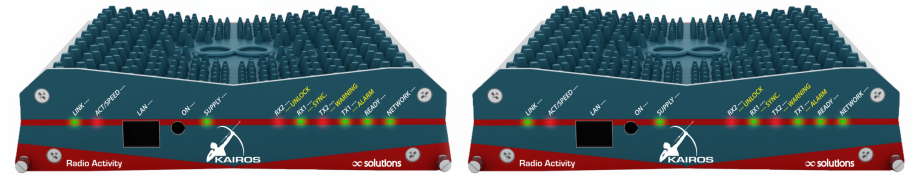5. Applications
6. Summary

1. Kenwood DMR Trunking Overview

Kenwood DMR Trunking type

◆ **Kenwood DMR Tier III Trunking**
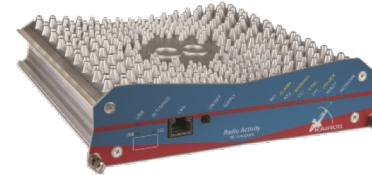
  * ETSI Compliant Trunking

◆ **Kenwood DMR-S Trunking**

  * Proprietary Trunking

Kenwood DMR Trunking Components

◆ **Repeater Kairos**

    ◆ Kairos KA-160 / KA-450 / KA-900

◆ **Mid Tier NX-3000**

    ◆ Portable   NX-3200/3300/3400/3220/3320/3420

    ◆ Mobile   NX-3720/3820/3920/

        ◆ FPU / FW Version 2.00 ~

◆ **High Tier NX-5000**

    ◆ Portable   NX-5200/5300/5400

    ◆ Mobile   NX-5700/5800/5900

        ◆ FPU / FW Version 3.00 ~

2. Kenwood DMR Tier III Trunking

Kenwood DMR Tier III Trunking Overview

◆ **System features**:

◻ DMR Tier III standard features (ETSI TS 102 361-4 V1.9.2;)

◻ Interoperability with third party manufacturers;

◻ Dedicated Control Channel

◻ Number of Sites: Unlimited

◻ Number of Channels per site: Up to 400

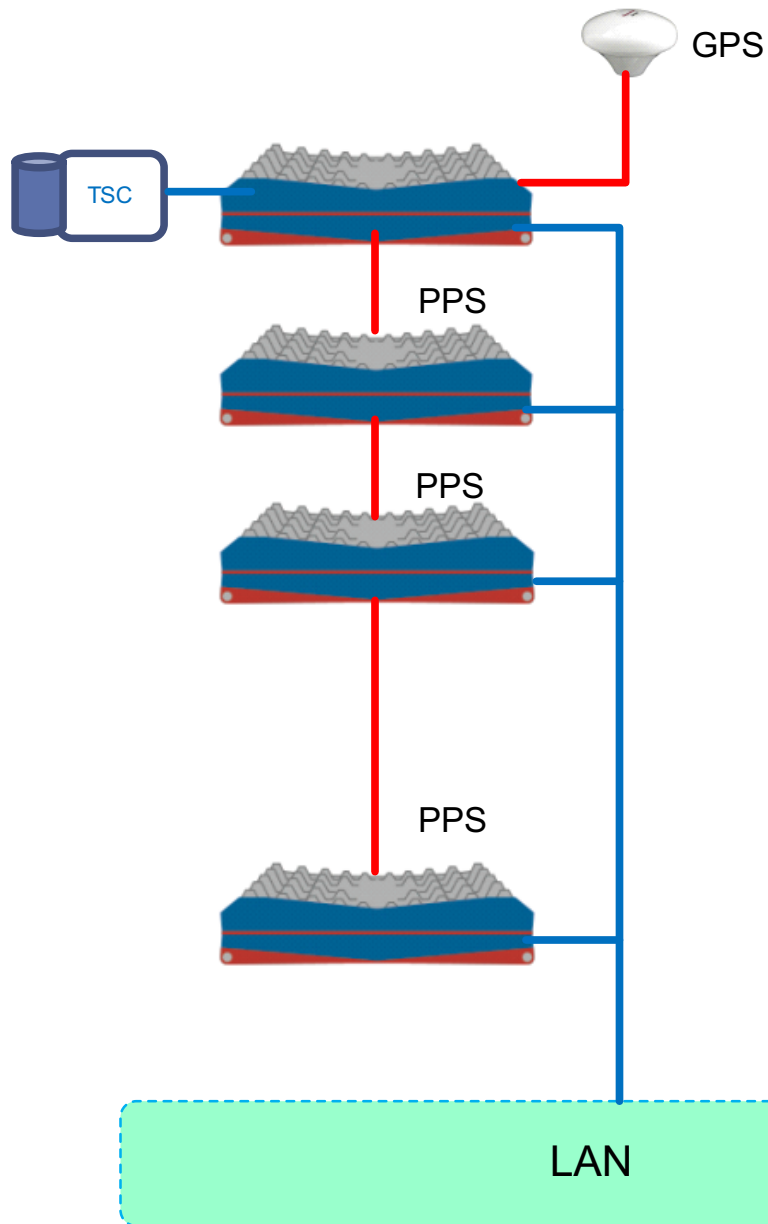# Kenwood DMR Tier III Trunking Overview

◆**Subscriber features**:

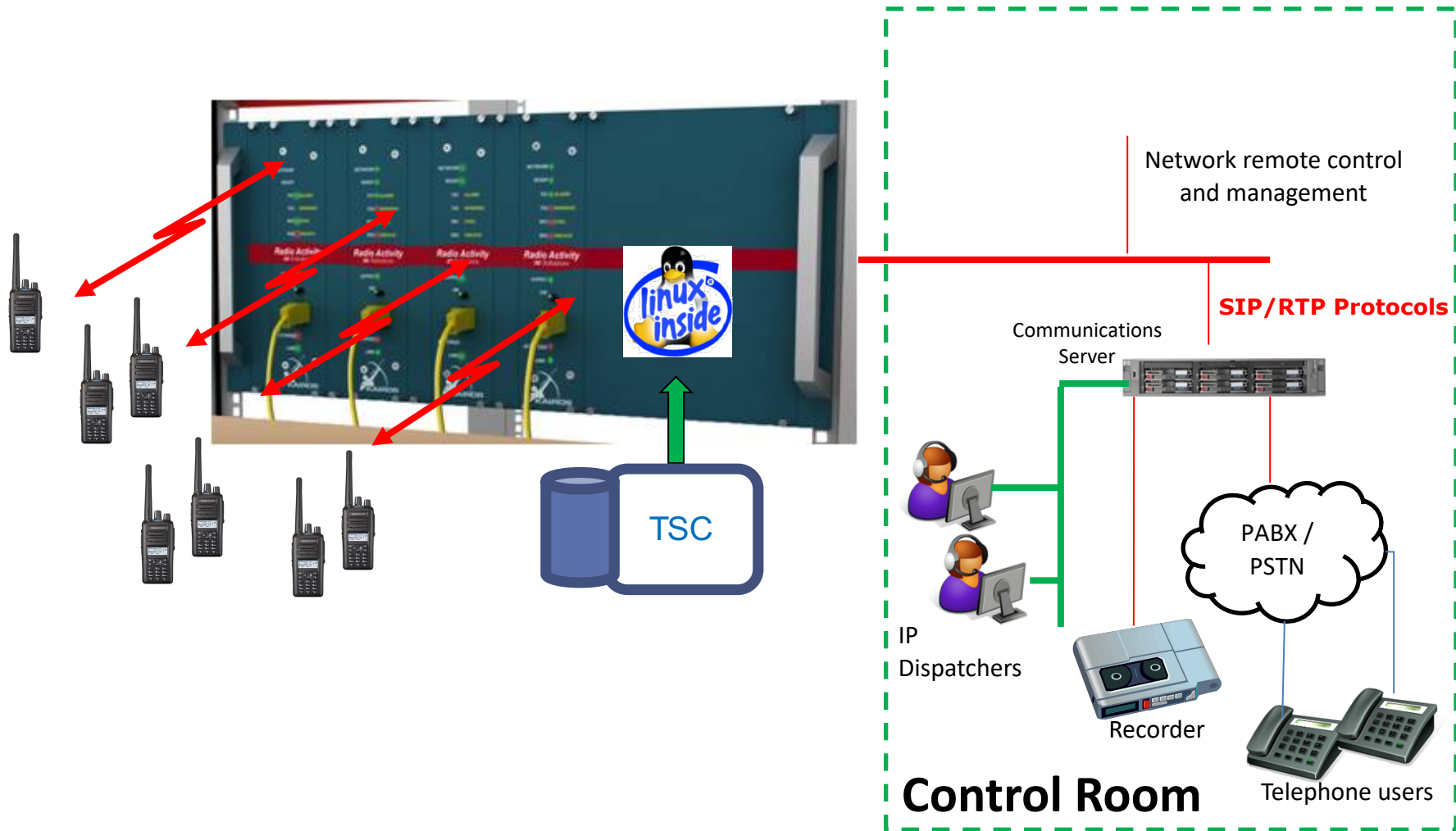|	
☐ Group Call	☐ Group Subscription
☐ Individual Call (FOACSU/OACSU)	☐ GPS
☐ Broadcast Call	☐ Dialling (Fleet Dialling Plan)
☐ Telephone Call	☐ Control Channel Hunt
☐ Status Call	☐ OAA (Over-the-Air-Alias)
☐ Short Data Call	☐ Emergency Status
☐ Emergency Call	☐ Group ID Scan/Single Zone Scan
☐ Emergency Alarm	☐ Alternate Zone-Channel
☐ Encryption Call	☐ Radio Check
☐ Power Save	☐ Long Data Call
☐ Authentication	☐ External PTT (Direct Channel)
☐ Remoter Stun/Revive/Kill (Decode Only)	
☐ Remote Monitor	

Kenwood DMR Tier III Trunking - Single Site Configuration

- ◆ KAIROS Repeaters;
- ◆ KA-VOC-2;
- ◆ Flat Cable;
- ◆ KAIROS Manager;
- ◆ KAIROS Web;
- ◆ KAIROS Network Management System (KA NMS)

GPS

TSC

PPS

PPS

PPS

LAN
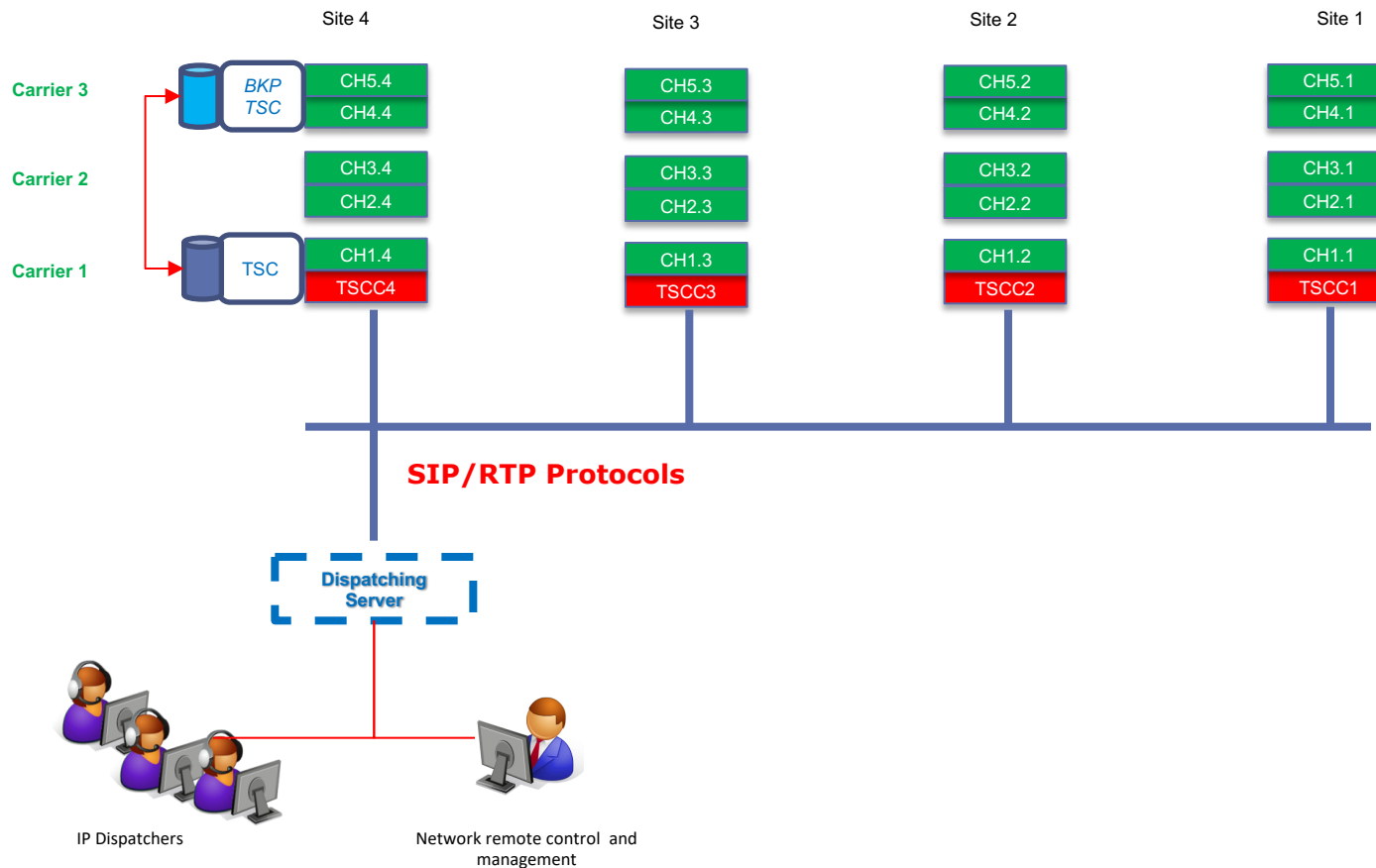
Kenwood DMR Tier III Trunking - Single Site Configuration

◆ **KAIROS Repeater**: One physical channel can be used for two channels of logical channels.

◆ **KA-VOC-2:** This is DMR Vocoder. It's better installed on the KAIROS main unit for the future maintenance.

◆ **Flat Cable**: Used for Synchronization between KAIROS located in the same site.

◆ **KAIROS Manager**: Software for Windows PC. KAIROS frequency setting, Color Code setting, Tier II/III switching, writing of Tier III Controller firmware, Tier III setting (part), etc.

◆ **KAIROS Web**: Connect to the Web Server in KAIROS using Browser, set the dedicated IP address of the Trunking Site Controller (TSC), start TSC, etc. Firefox is required as a browser.

◆ **KAIROS Network Management System (KA NMS)**: Use Browser to connect to Tier III Controller in KAIROS and make detailed settings for Tier III. Firefox is required as a browser.

Network remote control and management

SIP/RTP Protocols

Communications Server

TSC

IP Dispatchers

PABX / PSTN

Recorder

Telephone users

Control Room

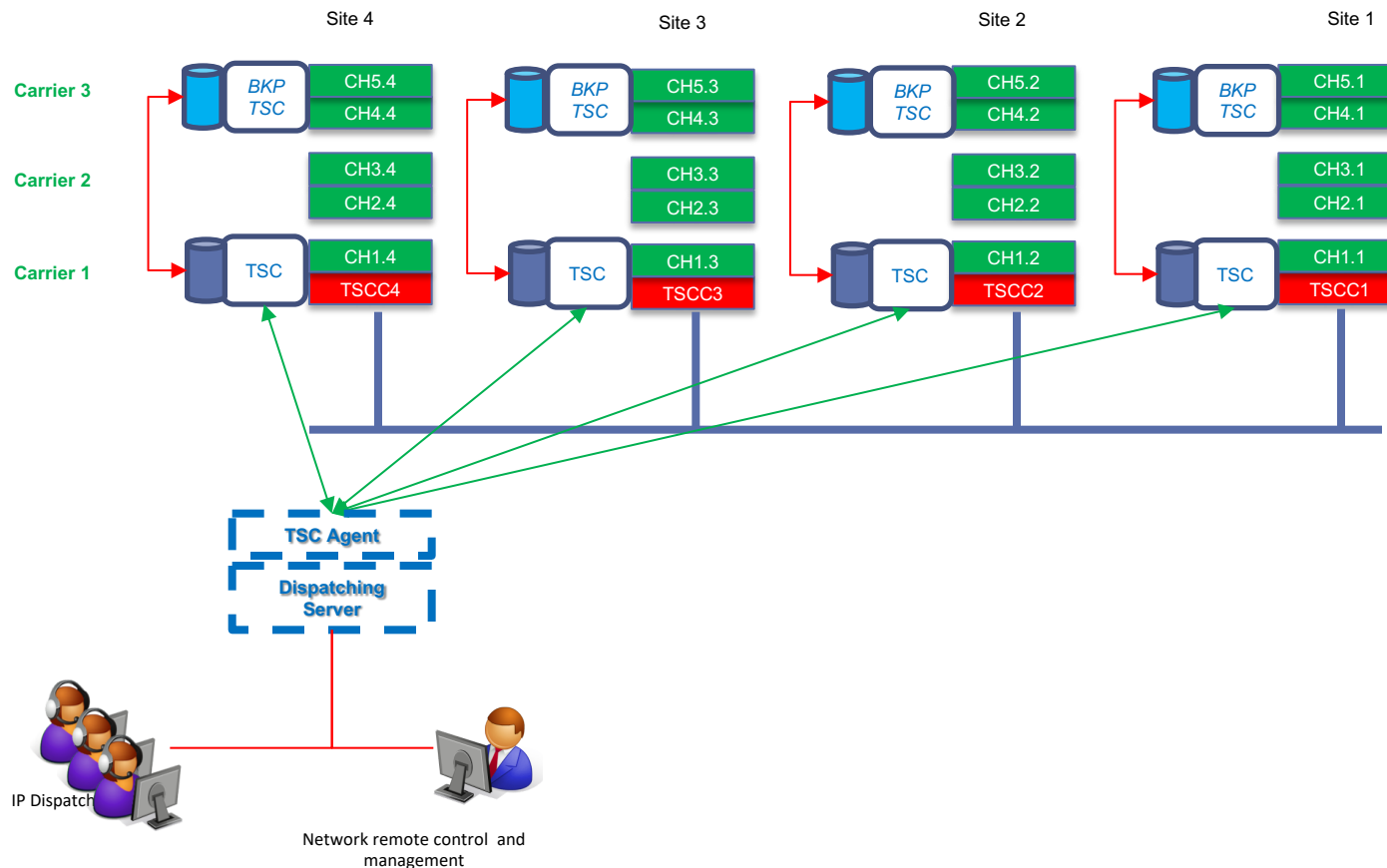# DMR Tier III Trunking – Multisite Multifrequency (Centralised)

◆ Centralised Built-in DMR Tier III Controller

◆ The network has a main System Controller (TSC) and the backup replica (BKP TSC)

◆ Cost effective solution with minimum IP bandwidth requirements

DMR Tier III Trunking – Multisite Multifrequency (Distributed)

- ◆ Distributed Built-in DMR Tier III Controller

- ◆ Each site has got its Controller (TSC) and the backup replica (BKP TSC)

- ◆ Robust architecture without a "single point of failure"

Kenwood DMR Tier III Trunking – Multisite Simulcast Configuration

◆ Built-in DMR Tier III Controller

◆ Simulcast

◆ Automatic and "click-less" roaming and handover ;

Group & Individual calls
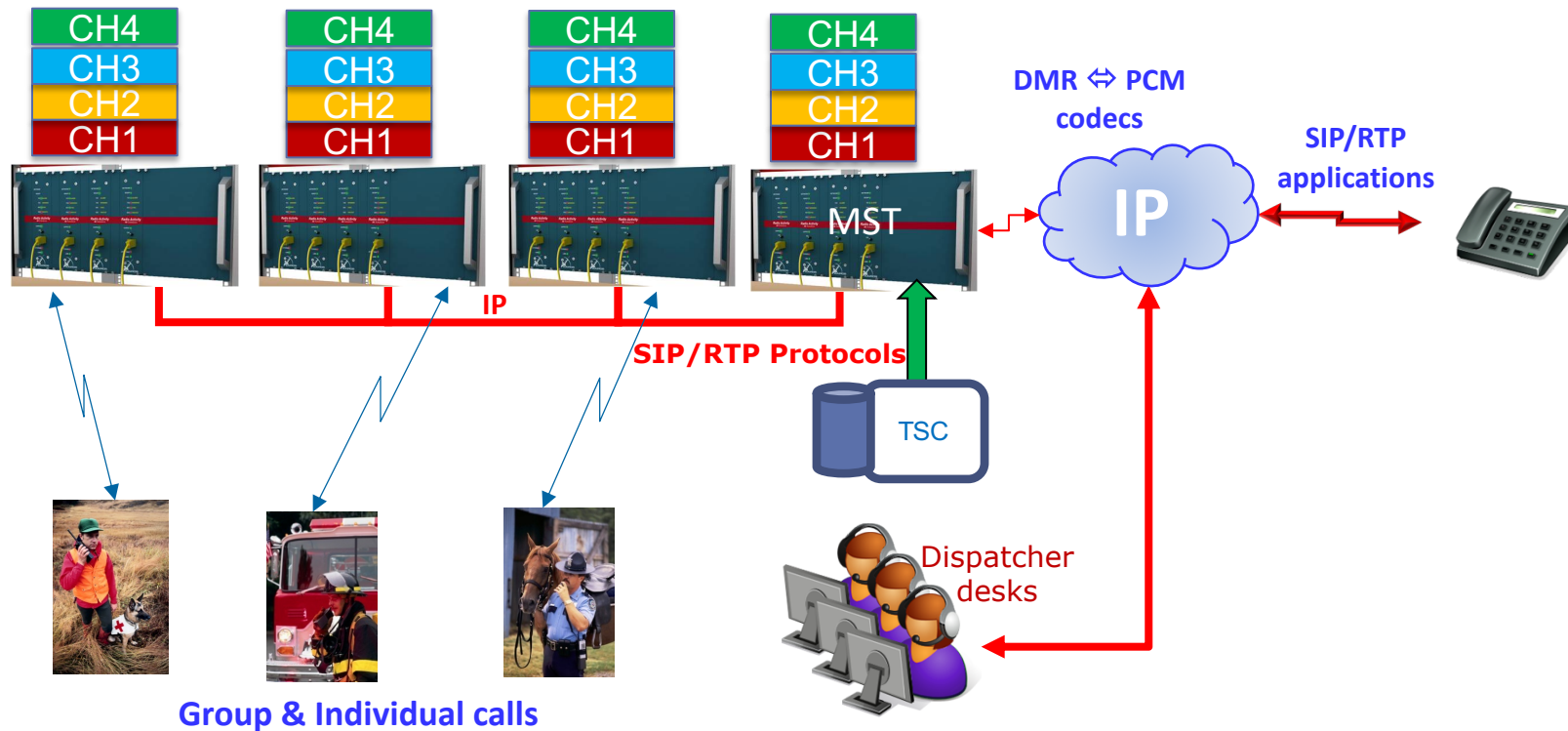
◆ TIER III with Distributed Built-in Controller Mixed Zones simulcast/multifrequency
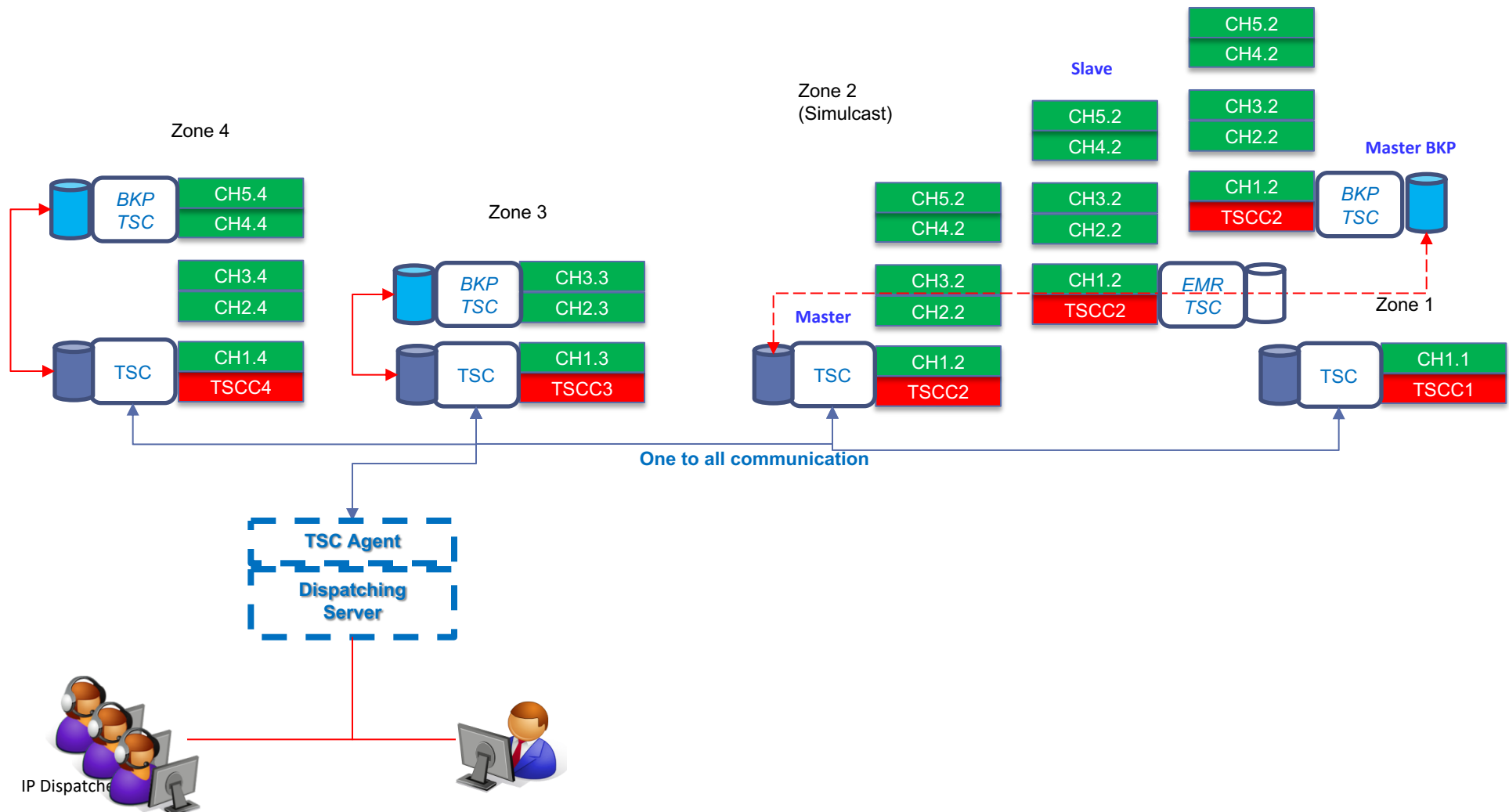
3. Kenwood DMR-S Trunking

Kenwood DMR-S Trunking Overview

◆ **System features:**

- ☐ Cost effective DMR trunking solution;

- ☐ Based on DMR Tier III standard features;

- ☐ JVCKENWOOD proprietary;

- ☐ KENWOOD subscriber only (Restricted registration for other manufacture radio);

- ☐ Number of Sites: Up to 15;

- ☐ Number of Channels per site: Up to 8 repeaters (1CCH & 15 Payload Channel);

- ☐ Control channel intermittent transmission (Transmit Beacon)

Kenwood DMR-S Trunking Overview

◆ **System features**:
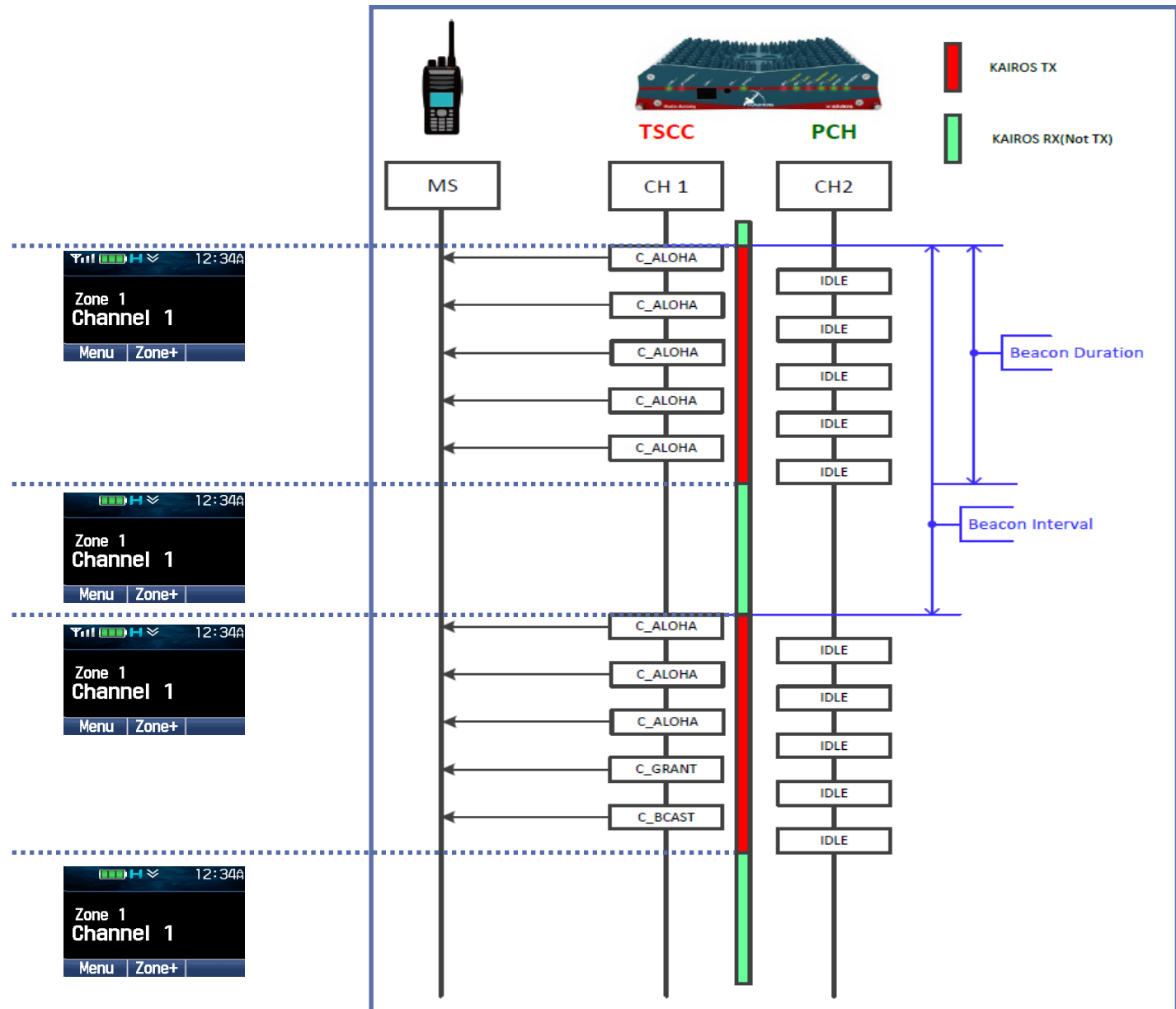
Kenwood DMR S-Trunking Overview

◆**Subscriber features**:

- Group Call
- Individual Call (FOACSU/OACSU)
- Broadcast Call
- Telephone Call
- Status Call
- Short Data Call
- Emergency Call
- Emergency Alarm
- Encryption Call (AES/DES/Scrambler)
- Emergency Status
- Group ID Scan/Single Zone Scan
- Radio Check

- Authentication
- Remoter Stun/Revive/Kill (Decode Only)
- Remote Monitor
- Group Subscription
- GPS
- Dialing (Fleet Dialing Plan)
- Control Channel Hunt
- OAA (Over-the-Air-Alias)
- Long Data Call
- External PTT (Direct Channel)
- Call Interrupt

4. Kenwood DMR Tier III / DMR-S Terminals

Kenwood DMR Tier III / DMR-S Terminals

◆ **Features NX-5000**

- ▢ Portable   NX-5200/5300/5400

- ▢ Mobile   NX-5700/5800/5900

  * NX-5700H does not support DMR mode.

- ▢ Firmware   Version 3.00

- ▢ FPU   Version 3.00

- ▢ Radio Feature License

  - • KWD-5300CV (DMR Conventional must be activated in advance)

  - • KWD-5301TR

Kenwood DMR Tier III / DMR-S Terminals

◆ **Features NX-3000**

 □   Portable   NX-3200/3300/3400/3220/3320/3420

 □   Mobile   NX-3720/3820/3920/

 □   Firmware   Version 2.00

 □   FPU   Version 2.00

 □   Radio Feature License

   •   KWD-3302TR

Kenwood DMR Tier III System code

◆ **System Code**

◆ DMR Tier III Trunking system has an unique System Code (16 bit) based on Network Model, Network ID, Site ID and Partition Category.
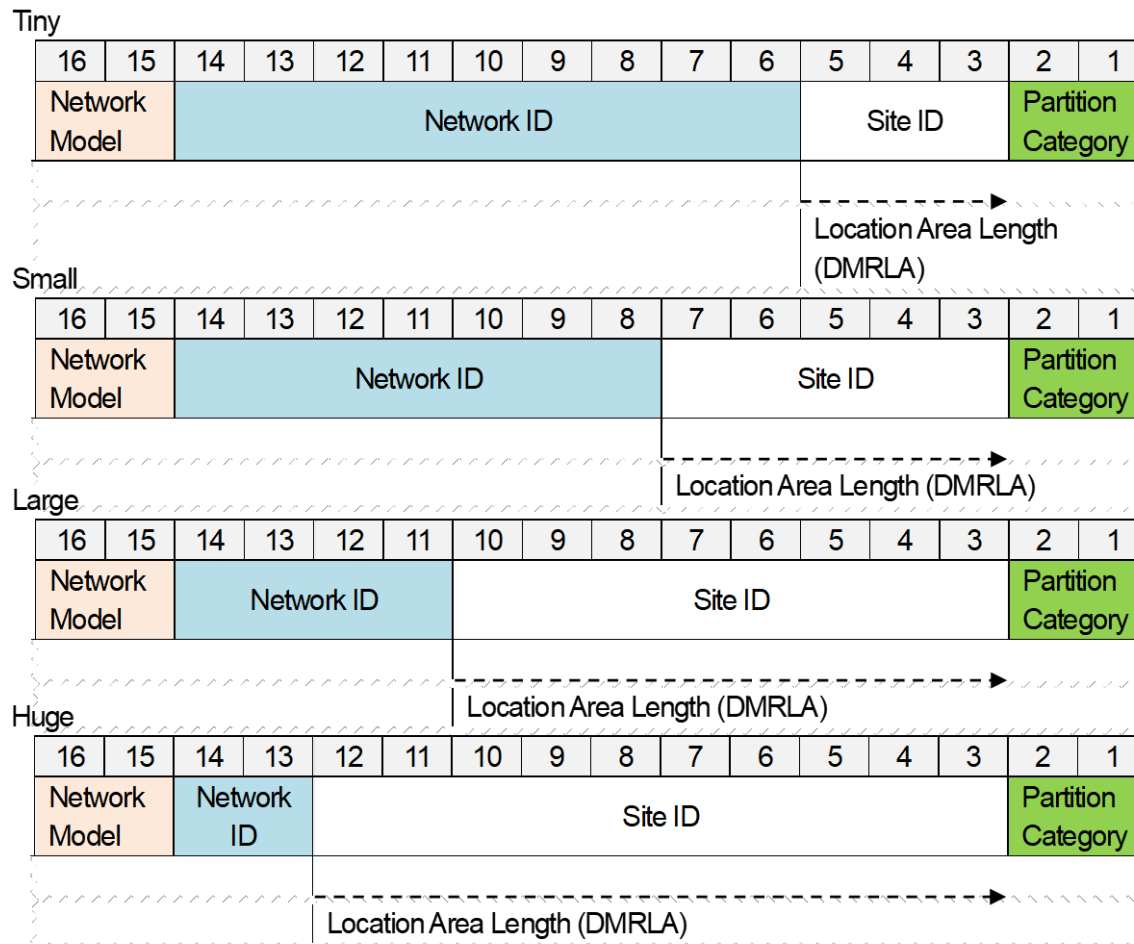
Kenwood DMR Tier III System code

◆ **System Code**

   ◆ DMR Tier III Trunking system has an unique System Code (16 bit) based on Network Model, Network ID, Site ID and Partition Category.

[KPG-D1]

DMR Network - Network Information

Top

Network Number	1			Network Name	JKUK_Demo

Network Model: Small
Network ID: 10
Location Area Length (DMRLA): 5
Location Area ID: 0
Location Site ID: 0
Site ID: 0
Coverage Type: Intra-Network
System Code (bin): 01 0001010 00000 xx
Lowest Frequency Number: 1
Highest Frequency Number: 4094

[KPG-D3]

System

Network Model: Small
Network ID: 10
Location Area Length (DMRLA): 5
Location Area ID: 0
Location Site ID: 0
Site ID: 0
Coverage Type: Intra-Network
System Code (bin): 01 0001010 00000 xx
Lowest Frequency Number: 1
Highest Frequency Number: 4094
☐ Group Subscription

Kenwood DMR Tier III Trunking Plan

◆ **Trunking plan**

    ◆ DMR Tier III Trunking plan Fixed (MPT style) or Flexible (NXDN style)

[KPG-D1]

DMR Network - Trunked Channel Plan

Top

Plan Number | 1 | ↑ ↓ | Plan Type | Fixed

Base Receive Frequency [MHz] | 163.000000

Base Transmit Frequency [MHz] | 158.400000

Step [kHz] | 12.5

[KPG-D3]

⚙ Channel Plan

DMR Trunked Channel Plan

Plan Number | 1 | Plan Type | Fixed

Base RX Frequency [MHz] | 155.100000

Base TX Frequency [MHz] | 160.100000

Step [kHz] | 12.5

Kenwood DMR Tier III Trunking Fleet Dialing

- ◆ Full Dialling (Fleet Dialling Plan) is a function to make a voice call and data transmission using dialling code.

- ◆ Dialling code is compliant with ETSI TS 102 361-4 Annex E.

[KPG-D3]

Dialing Codes

- ☑ PABX Call
- ☑ PSTN Call
- ☑ All Call
- ☑ Priority Call
- ☑ Emergency Call
- ☑ Broadcast Call
- ☑ Status Call
- ☑ Short Data Call
- ☐ Interfleet Individual Call
- ☐ Interfleet Group Call
- ☐ Interprefix Individual Call
- ☐ Interprefix Group Call

Range of Individual Number 899

Range of Group Number 999

	Normal Call	High Priority Call	Emergency Call
Individual Call nn... = 8 digit（NP+FIN+IN） nn... = 5 digit（FIN+IN） nn... = 3 digit（IN）	nn...	*8*nn...	*9*nn...
Group Call nn... = 8 digits（NP+FGN+GN） nn... = 5 digits（FGN+GN） nn... = 3 digits（GN）	nn...	*8*nn...	*9*nn...
Broadcast Call nn... = 8 digits（NP+FGN+GN）	*11*nn...	*11*8*nn...	*11*9*nn...
nn... = 5 digits（FGN+GN） nn... = 3 digits（GN）		*8*11*nn...	*9*11*nn...
All Call Destination is ALLMSID(FFFFFF)	*1987	*1981	*1982
PSTN Call nn... = 4 to 32 digits	01nn...	*8*01nn...	*9*01nn...
PABX Call nn... = 4 to 32 digits	02nn...	*8*02nn...	*9*02nn...
Status Call ss = 00～99（Status Number） nn... = 8 digits（NP+FIN/FGN+IN/GN） nn... = 5 digits（FIN/FGN+IN/GN） nn... = 3 digits（IN/GN）	*0ss*nn...		
Short Data Call nn... = 8 digits（NP+FIN/FGN+IN/GN） nn... = 5 digits（FIN/FGN+IN/GN） nn... = 3 digits（IN/GN） dddd... = Max. 489 digits（Short Message）	*2*nn...*dddd...		

Kenwood DMR Tier III Trunking Zone Alternate

◆ Alternante Zone – Channel

[KPG-D3]

Out of Range
- ☑ Out of Range Indicator
- Out of Range Tone   Cycle ▼
- ☐ In-service Tone

Alternate Zone-Channel
- Zone   2: Zone 2 ▾
- Channel   1: Per 1 ▾
- Hold Time [s]   60
- Search Interval Time [s]   60

Out of range and hold time

DMR Tier 3 Trunking

Alternate Zone-CH
(Conventional)

Searches the control channel
on search interval time.

Zone 1
Channel 1
Failsoft
Menu | Zone+
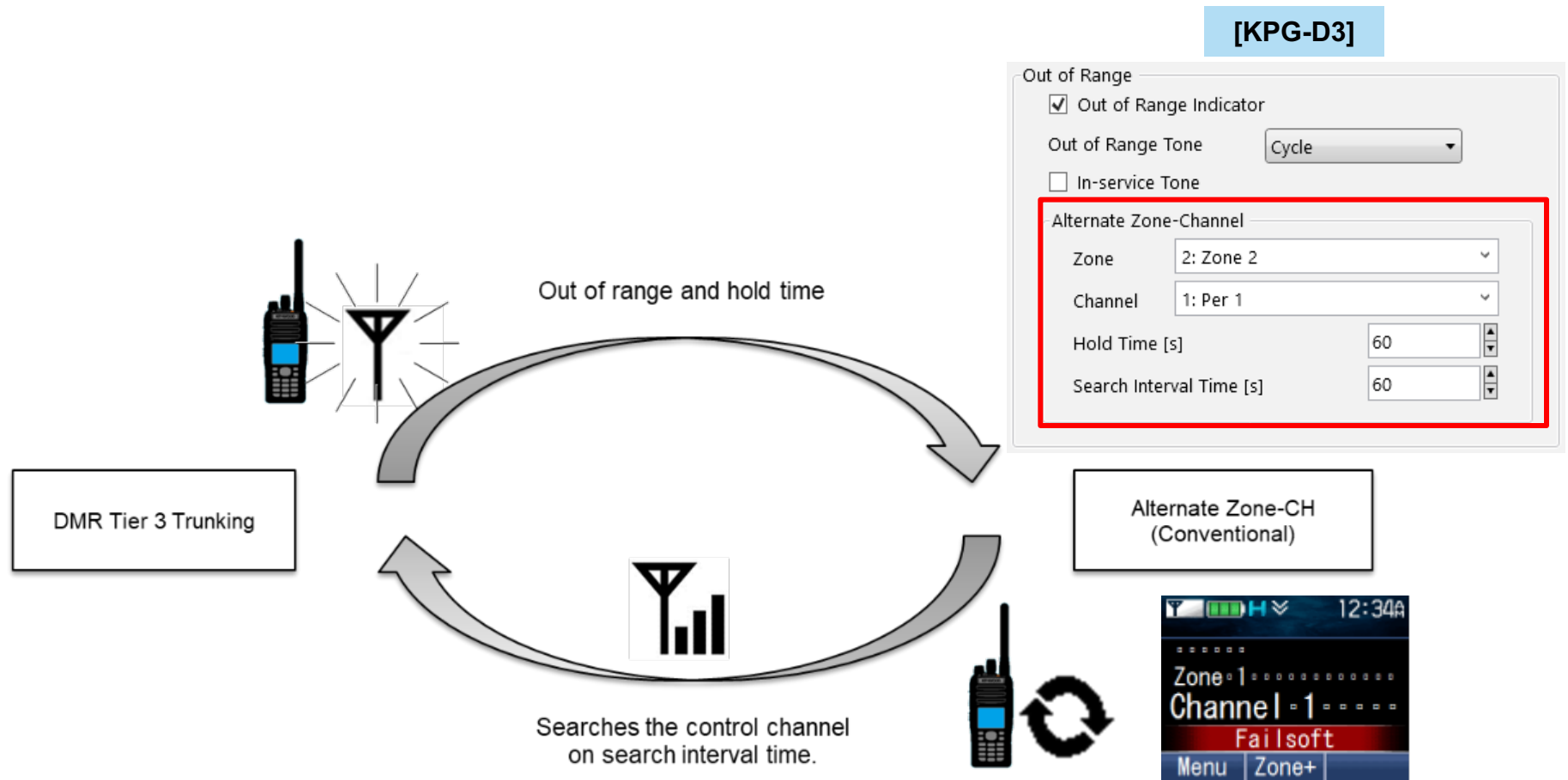
5. Applications

Kairos Applications – Remote Control Capabilities

Remote Control Protocols:

◆ Proprietary IP based protocols;

◆ HTML to internal WEB server;

◆ DMR over an RF access.

◆ SNMP;

Remote Control:

◆ Direct IP connection;

◆ 3G/GSM access point;

◆ Via RF link using another KAIROS;

◆ From a terminal using a TXT msg.

Remote Control Applications:

◆ **Kairos_Manager** setup tools;

◆ **NetControl** system survey;

◆ **WEB server**;

◆ SNMP Server.

Kairos_Manager
NetControl
WEB Server
SNMP

GSM/UMTS WWW

RadioActivity
Infinite Solutions

TXT msg DMR

IP

UMTS Wi-Fi

Kairos_Manager
NetControl
WEB Server

Kairos_Manager
NetControl
WEB Server
SNMP
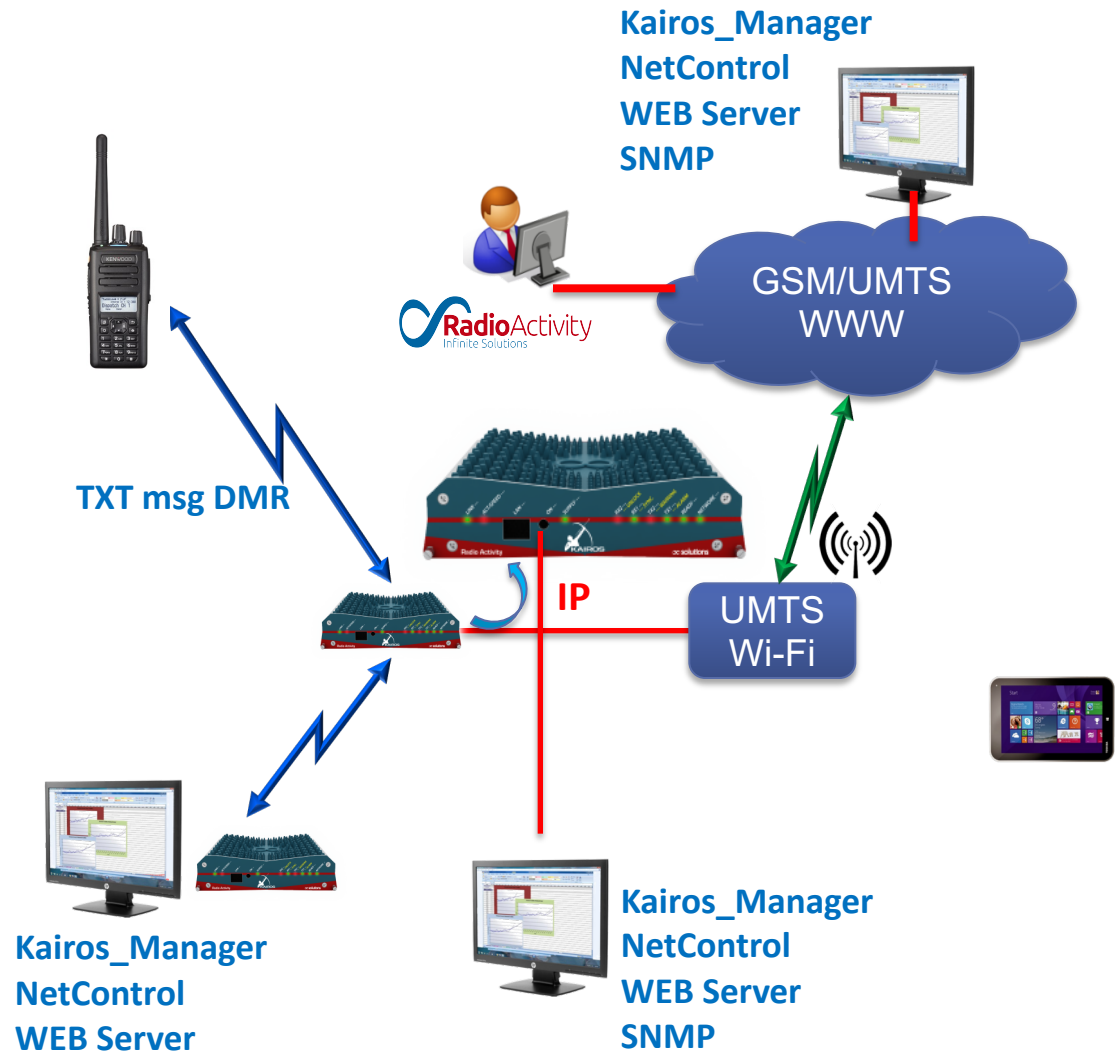
Application – Kairos Manager (Setup Tools)

- Single device access;

- All setup parameters available;

- Direct opening from DMR_NetControl;

- Very detailed operation;

- IP and/or RF connection;

- Proprietary protocol;

- Windows/Linux.

GPS status

RX filters

Statistics

Runtime status

Application – NetControl System (Survey Tools)

◆ Simple overview report;

◆ IP and/or RF connection;

◆ Polling mode;

◆ Proprietary protocol.
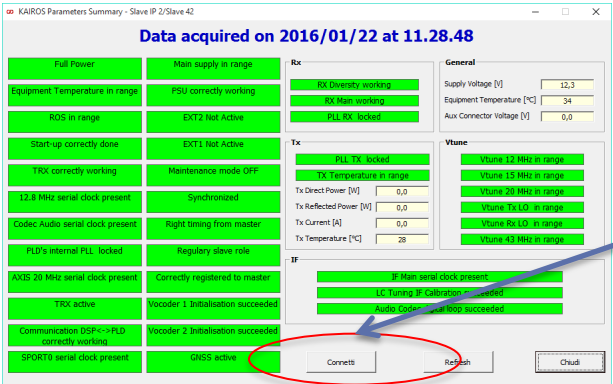
Click to open KAIROS_Manager

Alarms/warning detail
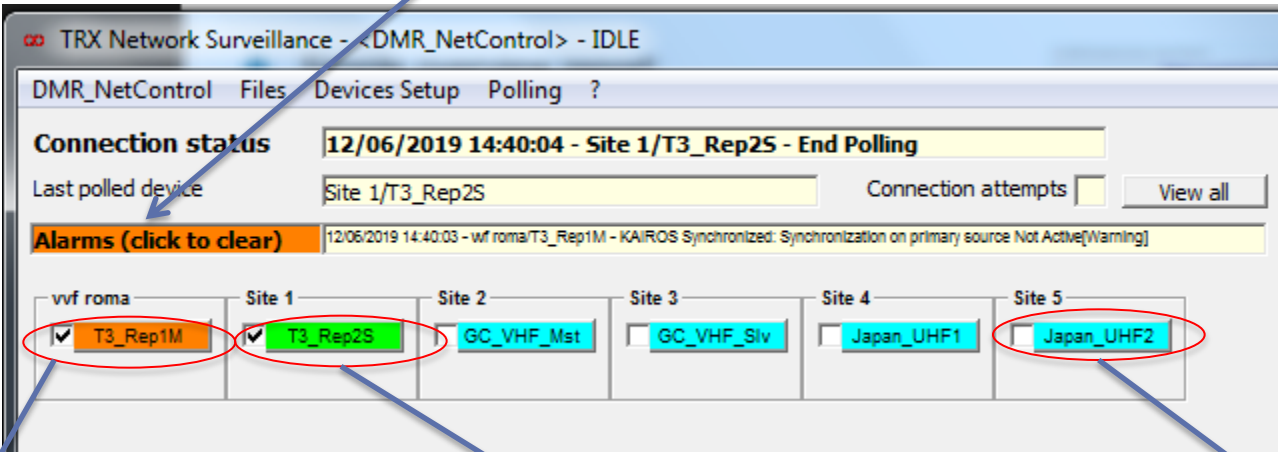
All parameters ok

Excluded from polling

Warning advice

Application – Network Management Software (NMS)

◆ Settings and Monitoring Software;

Application – Network Management Software (NMS)

◆ Monitoring tools;

Application – Network Management Software (NMS)

◆ Communications ;

Application – Network Management Software (NMS)

◆ Mobile Positioning;
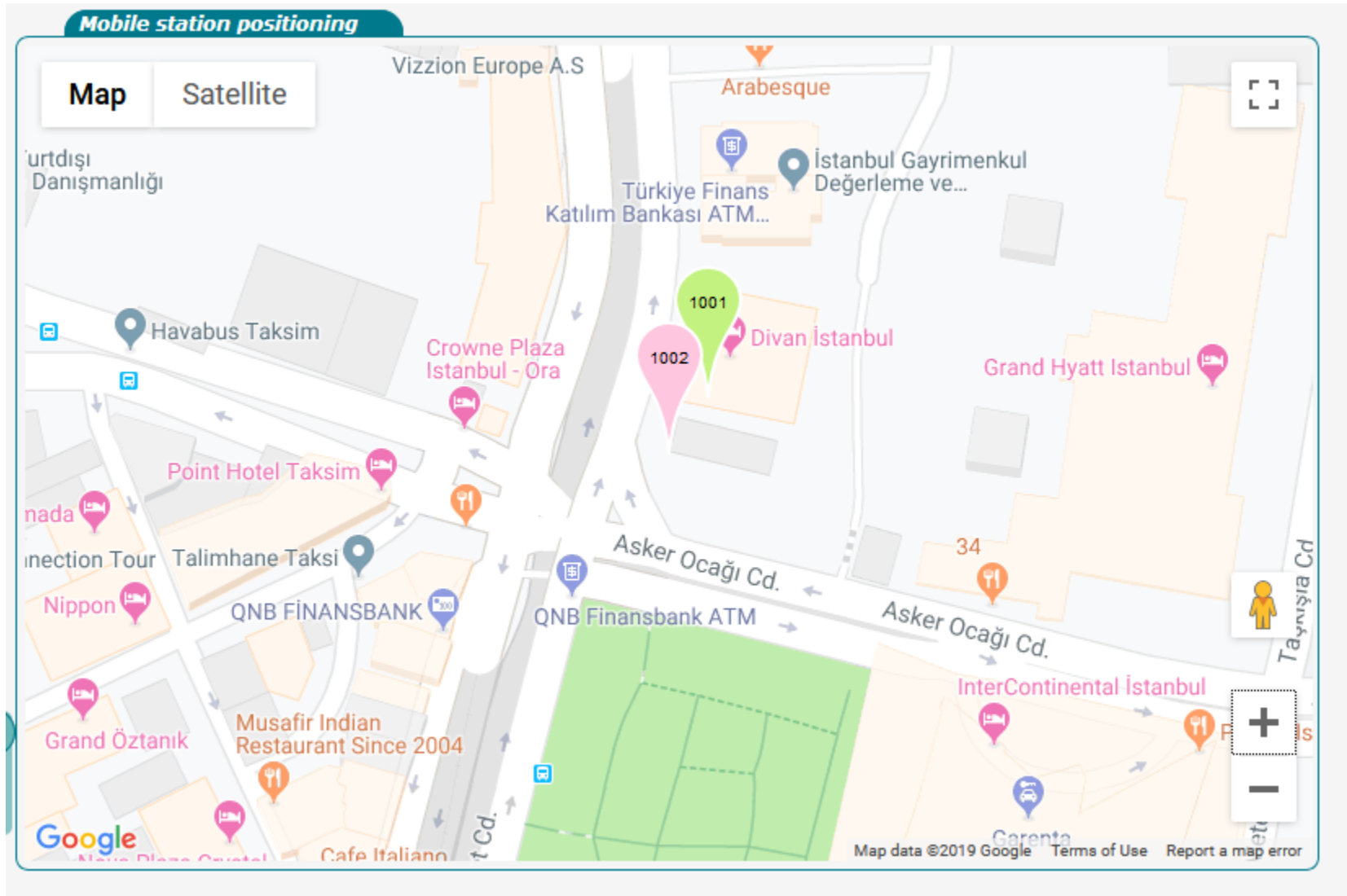
Applications – IP Gateway

◆ **Features**

- ☐ Supports DMR KAIROS System

- ☐ Dell Server & Linux Based System

- ☐ Programming/Firmware Update/Backup & Restore by Web Browser

- ☐ Available 3rd Party Interface for Console - AIS(Application Interface Specification)

- ☐ Available 3rd Party Interface for Voice Logger – VLI (Voice Logging Interface)

- ☐ Console Connection & GID per Console

- ☐ Voice Logger Connection

- ☐ Communication Log record size (Server HDD size)

◆ **RF Systems:**

☐ Kairos DMR Tier III Trunking;

☐ Kairos DMR-S Trunking.

SIP/RTP Protocols

RF System

IP Gateway

KPG-180AP

KAS-20/3rd Party

AIS Protocol

Voice Logger (3rd Party)

IP Gateway Configuration

◆ **Features**

- ☐ Supports KAIROS DMR Tier III Trunking;

- ☐ Supports KAIROS DMR-S Trunking;

- ☐ DMR Tier II Conventional

- ☐ Support IP Interface connection via IP Gateway;

- ☐ Existing applications require just DMR Trunk License Upgrade

Applications – KAS-20

◆ **RF Systems:**

▫ Kairos DMR Tier III Trunking;

▫ Kairos DMR-S Trunking.

▫ Kairos DMR Tier II

AIS Protocol

RF System

IP Gateway

SIP/RTP Protocols
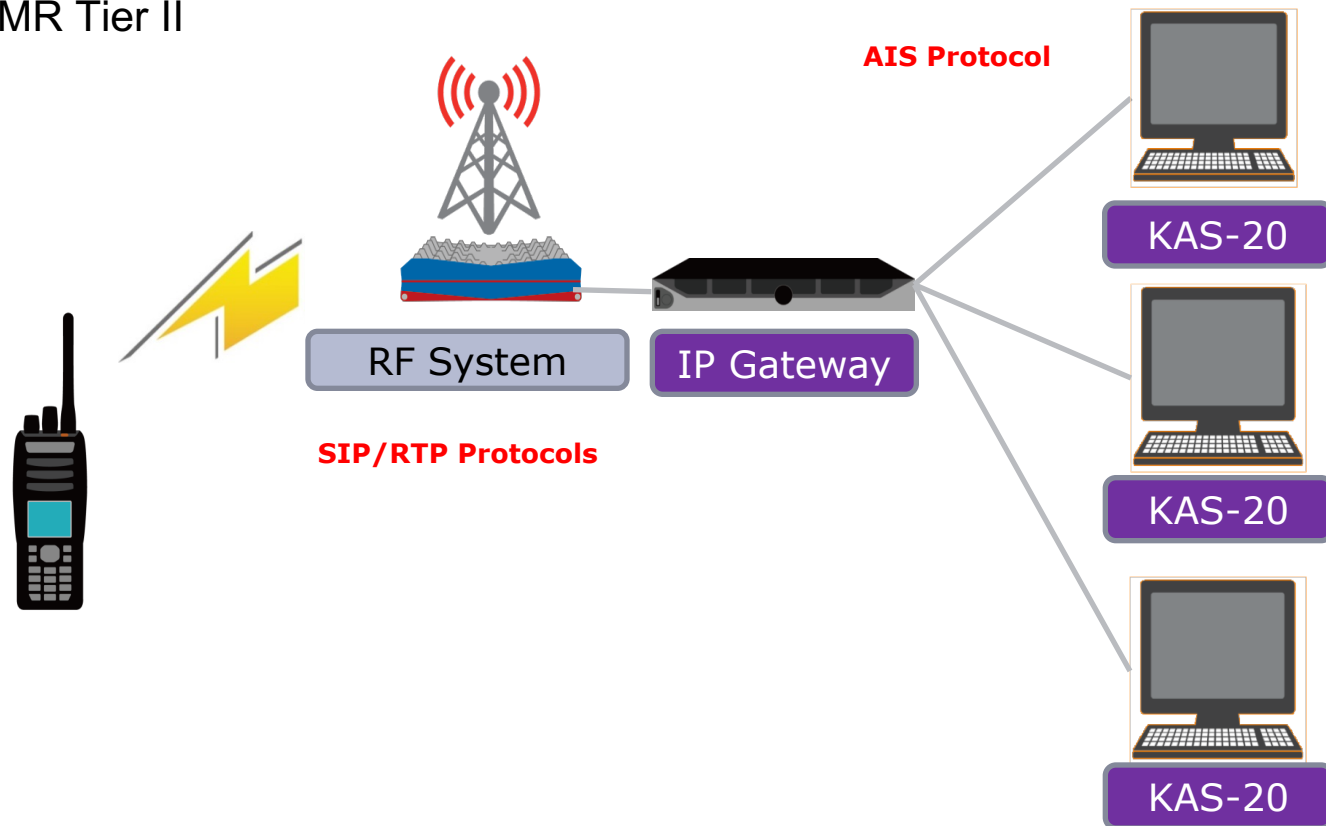
KAS-20

KAS-20

KAS-20

Applications – KAS-20 Main Features

◆ Voice & Data Call

- ❑ Group Call
- ❑ Individual Call
- ❑ Encryption (Scrambler/Enhanced)
- ❑ All Call/Broadcast Call
- ❑ Emergency Call Receive
- ❑ Call Interruption
- ❑ Over-the-Air Alias (OAA)
- ❑ Text Message
- ❑ Status Message
- ❑ Emergency Status Receive
- ❑ Emergency Alarm Receive

◆ Remote Control

- ❑ Radio Check
- ❑ Radio Stun/Kill/Revive
- ❑ Radio Monitor

◆ GPS
- ❑ Voice with GPS Report
- ❑ GPS Data

- ❑ Patch Group
- ❑ Voice Recorder

Applications – OTAP

◆ **Features**

- ◻ Supports KAIROS DMR Tier III Trunking;

- ◻ Support DMR Protocol

- ◻ Support KAIROS Repeater

- ◻ Support IP interface connection for KAIROS repeater & IP Gateway

- ◻ Support Serial interface connection for NX-5000 & NX-3000 Series

- ◻ Editable DMR Tier III Authentication Key

- ◻ Selectable OTAP Data DES Encryption by DMR IP connection (Up to 4 Keys);

- ◻ The existing KPG-180AP will work automatically with DMR once updating the application.
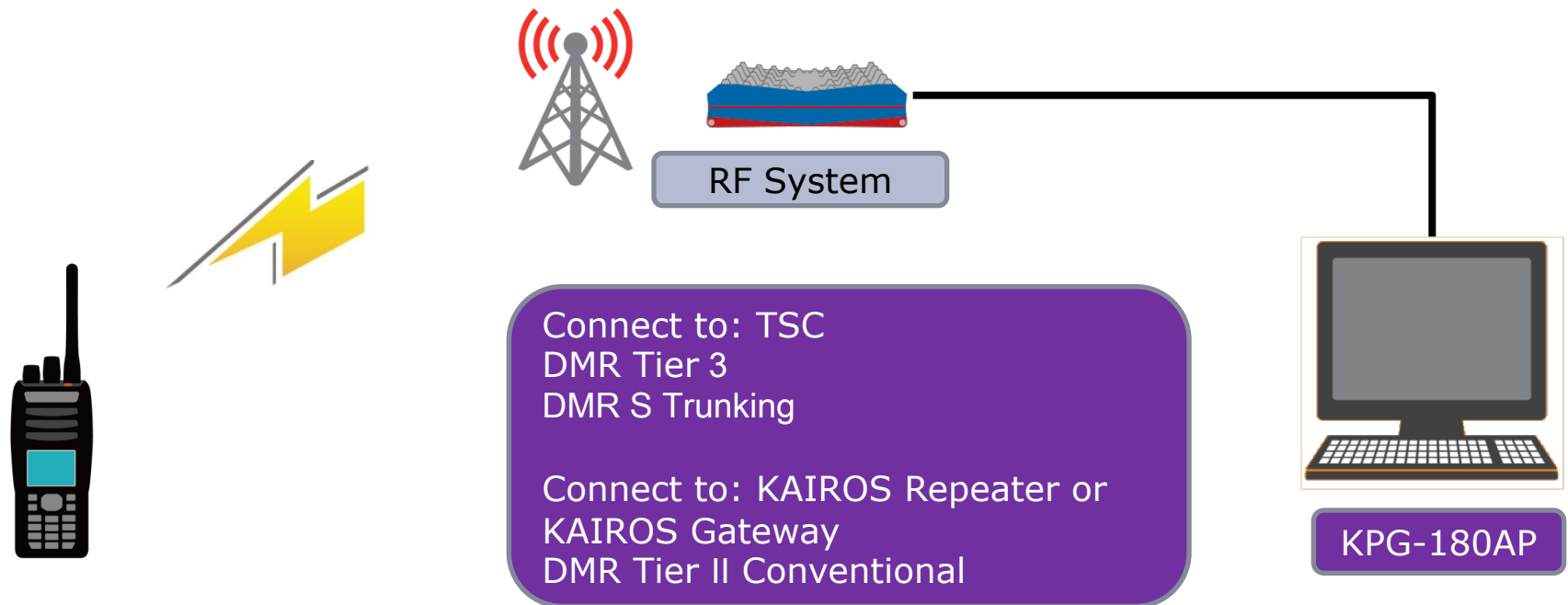
Applications – OTAP Serial Interface

◆ **RF Systems:**

◻ Kairos DMR Tier III Trunking;

◻ Kairos DMR-S Trunking.

◻ Kairos DMR Tier II

RF System

KPG-180AP
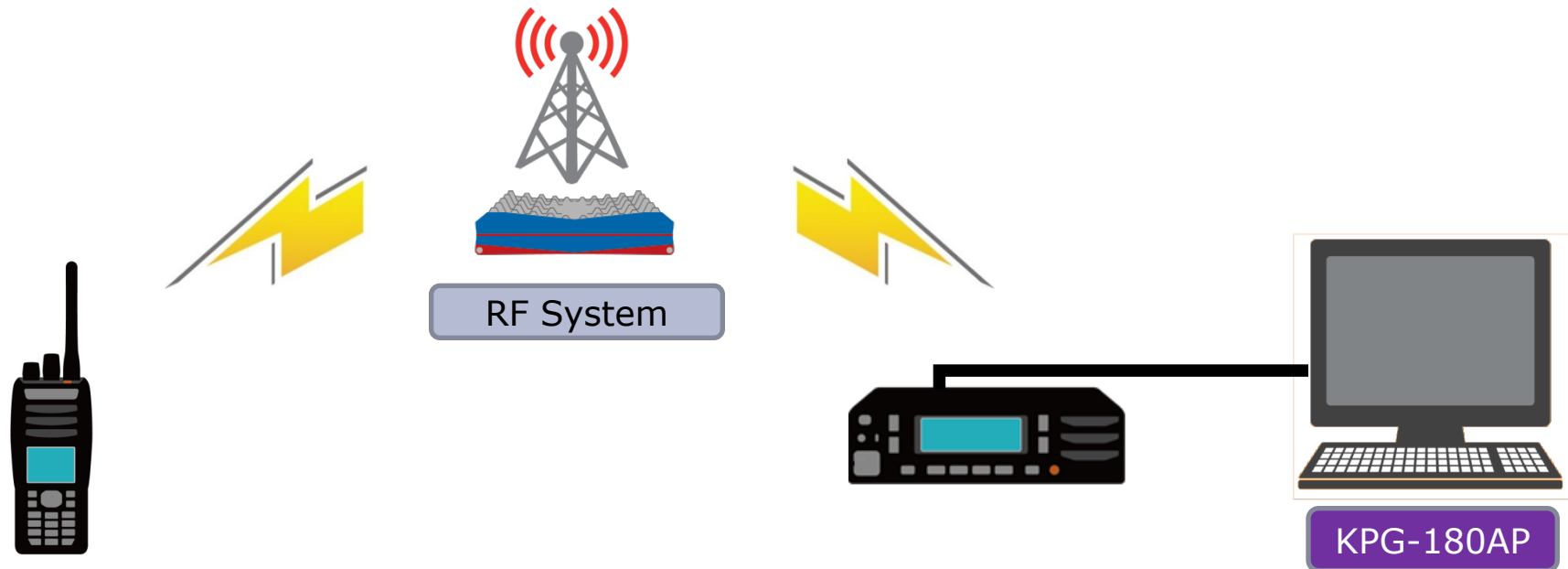
Applications – OTAP IP Interface

◆ **RF Systems:**

☐ Kairos DMR Tier III Trunking;

☐ Kairos DMR-S Trunking.

☐ Kairos DMR Tier II

RF System

Connect to: TSC
DMR Tier 3
DMR S Trunking

Connect to: KAIROS Repeater or
KAIROS Gateway
DMR Tier II Conventional

KPG-180AP

Applications – OTAP IP Interface (Gateway)

◆ **RF Systems:**

- ☐ Kairos DMR Tier III Trunking;

- ☐ Kairos DMR-S Trunking.

- ☐ Kairos DMR Tier II

RF System

IP Gateway

KPG-180AP

KPG-180AP

KPG-180AP

KENWOOD