

# AP-LMR1000

## LMR(Land-to-Mobile Radio) Gateway Radio Interface



Radio Dispatcher Console  
Application



**AddPac**

**AddPac Technology**

Sales and Marketing

# Contents

- Product Overview
- Hardware Specification
- LMR(Land-to-Mobile Radio) Service
- RoIP System Message Flow Diagram
- System Interface between LMR gateway and Radio System
- Peer-to-Peer LMR Gateway Service
  - Remote LMR Gateway Service via Internet
- Multicasting LMR Gateway Service Disadvantage
- SIP Call Manager + PTT Server Hybrid Scheme
- **Radio Dispatcher Console Application**

# Product Overview

- Radio over IP Service Support
- Radio Systems(Motorola, etc) are Extended to IP Network
- High Performance RISC & Programmable DSP Architecture
- Two(2) 10/100Mbps Fast Ethernet (IP Share ,etc)
- High Performance LAN-to-LAN Routing Capability
- One(1) Module Slots for Radio Interface (E&M, Radio, etc)
- VoIP Codec : G.711/G.726/G.723/G.729, VAD, etc
- Powerful Network Protocols (PPPoE, DHCP, Static Routing, etc)
- IPv4/IPv6 Dual Stack Support
- SIP/H.323 Dual Concurrent Signaling Protocols
- Firmware Upgradeable Architecture
- Advanced Voice QoS Mechanism
- Powerful Web based Management
- RS232C Port Support for Command Line Interface

# Hardware Specification

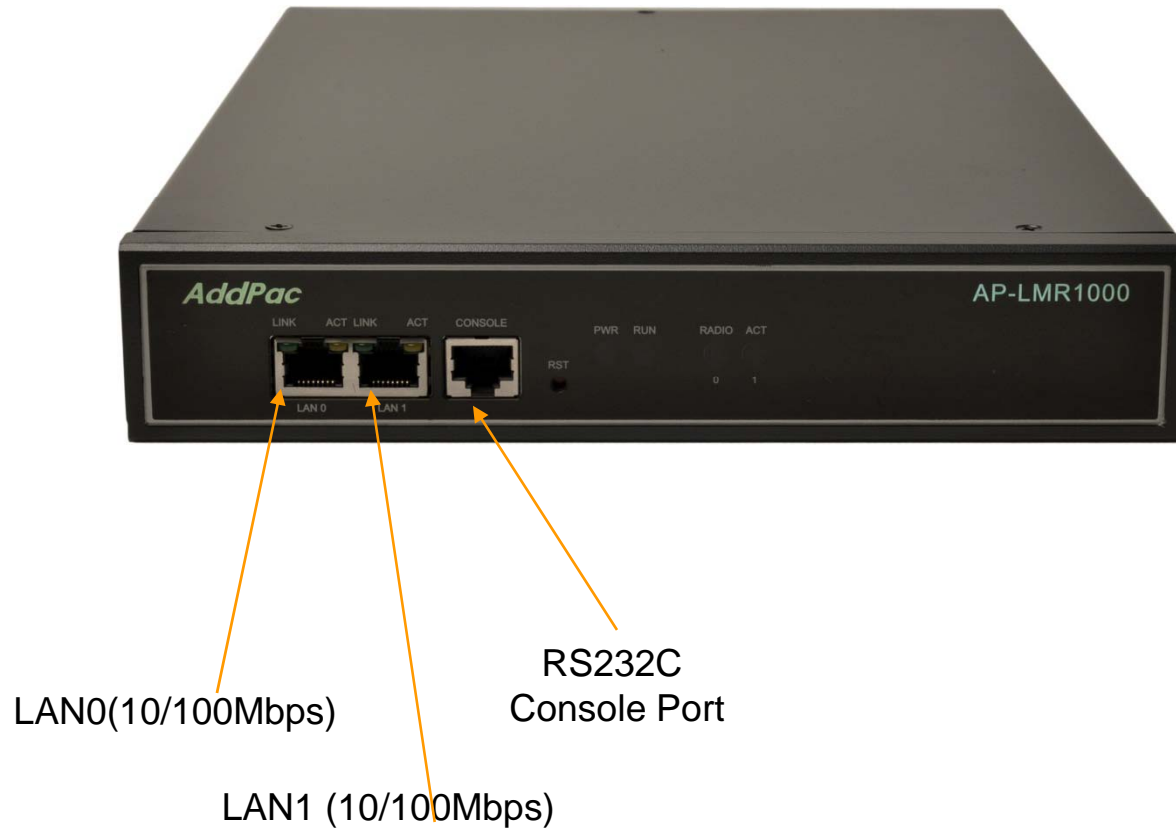
RISC  
CPU

High-end  
DSP

- RISC Microprocessor Computing Power
- Main Chassis
  - Network Interface
    - Two(2) 10/100Mbps Fast Ethernet
    - One(1) RS-232C Console (RJ45)
  - One(1) Radio Module Slots for E&M, etc
  - Internal Power Supply

# Hardware Specification

AP-LMR1000 Front Side



# Hardware Specification

## AP-LMR1000 Back Side



Power Inlet

Power Switch

Radio Interface Module

# Hardware Specification

Example : AP-RADIO2 Interface Module for Radio Interworking



# Hardware Specification

## Example : E&M Interface for Radio Interworking

| Lead Name             | Pin     | Description   |
|-----------------------|---------|---|
| E (Ear or Earth)      | Pin 7   | Signal wire asserted by the router toward the connected device. Typically mapped to the push-to-talk (PTT) lead on the radio.   |
| M (Mouth or Magnet)   | Pin 2   | Signal wire asserted by the router toward the connected device. Typically mapped to the push-to-talk (PTT) lead on the radio.   |
| SG (Signal Ground)    | Pin 8   | Used on E&M signaling Types II, III, and IV.  |
| SB (Signal Battery)   | Pin 1   | Used on E&M signaling Types II, III, and IV.  |
| <b>Two-Wire Mode</b>  |         |   |
| T1/R1 (Tip-1/Ring-1)  | Pin 4,5 | In two-wire operation, the T1/R1 leads carry the full-duplex audio path.  |
| <b>Four-Wire Mode</b> |         |   |
| T/R (Tip/Ring)        | Pin6,3  | In a four-wire operation configuration, this pair of leads carries the audio in from the radio to the router and would typically be connected to the line out or speaker of the radio.  |
| T1/R1 (Tip-1/Ring-1)  | Pin5,4  | In a four-wire operation configuration, this pair of leads carries the audio out from the router to the radio and would normally be connected to the line in or microphone on the radio |



# Hardware Specification

Example : TTL Level Custom Interface for Radio Interface (RJ45)

| Lead Name | Pin   | Description                          |
|-----------|-------|--------------------------------------|
| PTT Rx    | Pin 2 | TTL Level : 0V~5V , PTT In Signal    |
| PTT Tx    | Pin 7 | TTL Level : 0V~5V , PTT Out Signal   |
| Audio IN  | Pin 4 | Analog Voice Signal, Rx Voice Signal |
| Audio Out | Pin 5 | Analog Voice Signal, Tx Voice Signal |



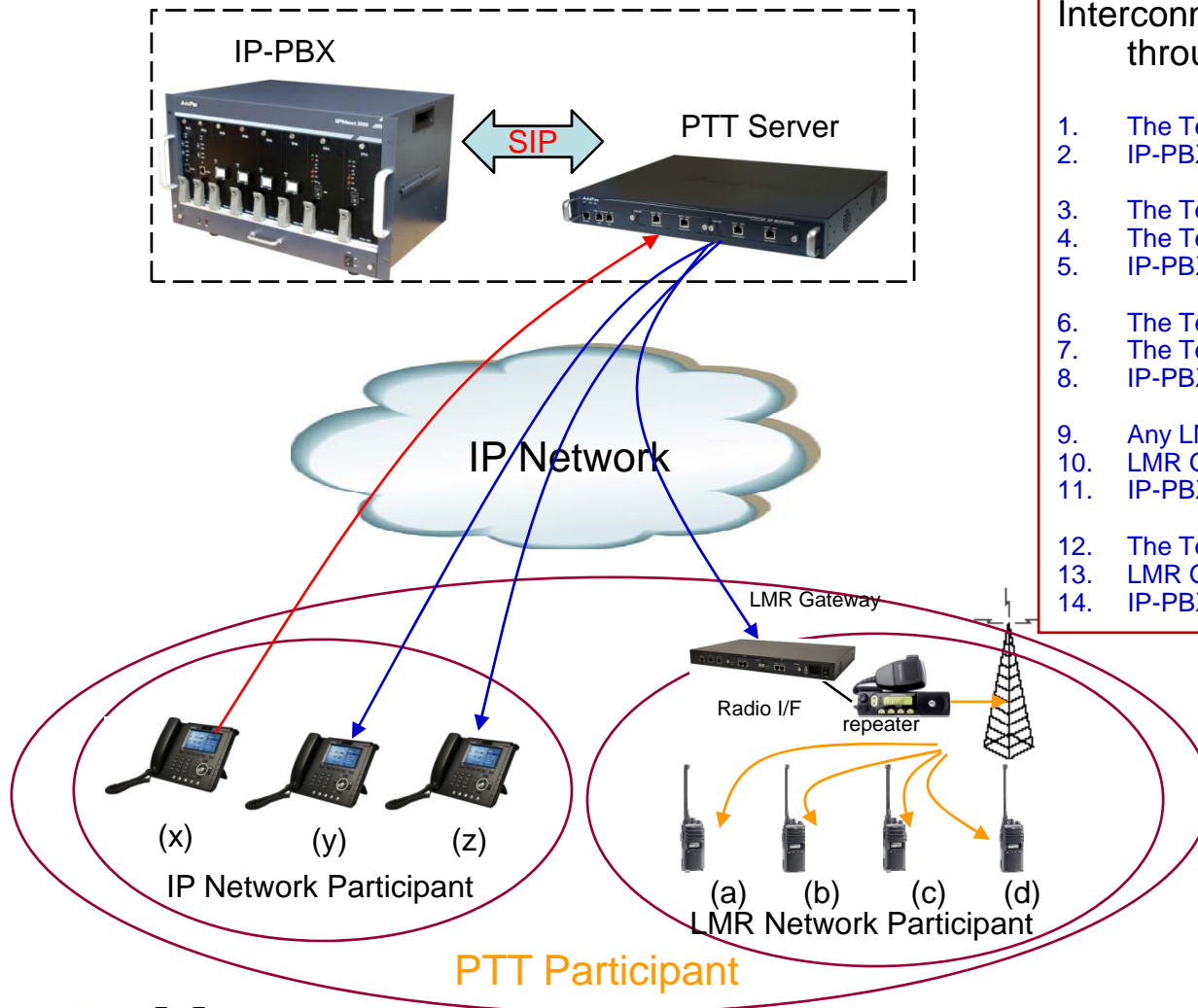
# LMR Service

- LMR system overview
  - A LMR(Land Mobile Radio) system is a collection of portable and stationary radio units designed to communicate with each other.
  - LMR is deployed wherever organizations need to have instant communication between geographically dispersed and mobile personnel.
  - Typical LMR system users are public safety organizations (ex: police departments, fire departments, etc).
  - The systems are extended the range of communications by repeaters.
  - The systems are required interoperability with IP network.

# LMR Service

- **AddPac RoIP Solution Features**
  - LMR Gateway(AP-LMR2000) joins the LMR systems to the IP network through open SIP standard and RTP.
  - The radios are connected to LMR gateway through AddPac radio interface (reference LMR signal).
  - AddPac IP PTT terminals (AP-IP230, AP-IP300 IP Phones, AP-WP100 WiFi-Phone, etc) support the traditional radio user interface(PTT).
  - AddPac IP PTT terminals easy PTT group management user interface.
  - IP-PBX support call management, PTT group management, PTT control and various additional service.
  - PTT Server(AP-PTS3000) support powerful media data relay, broadcasting, multicasting and PTT group management.
  - RoIP Solution supports emergency and group PTT service.

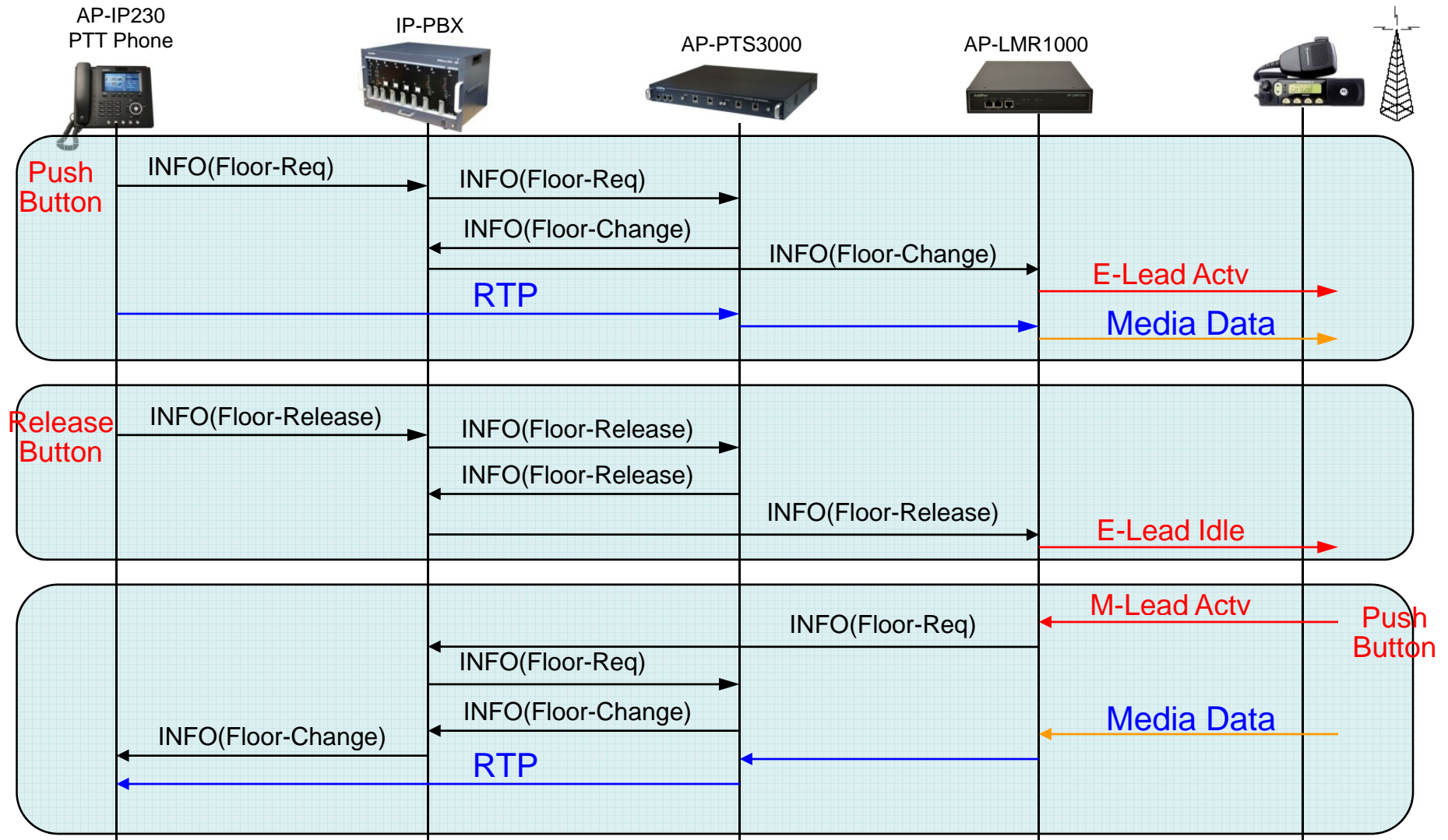
# LMR Service Examples



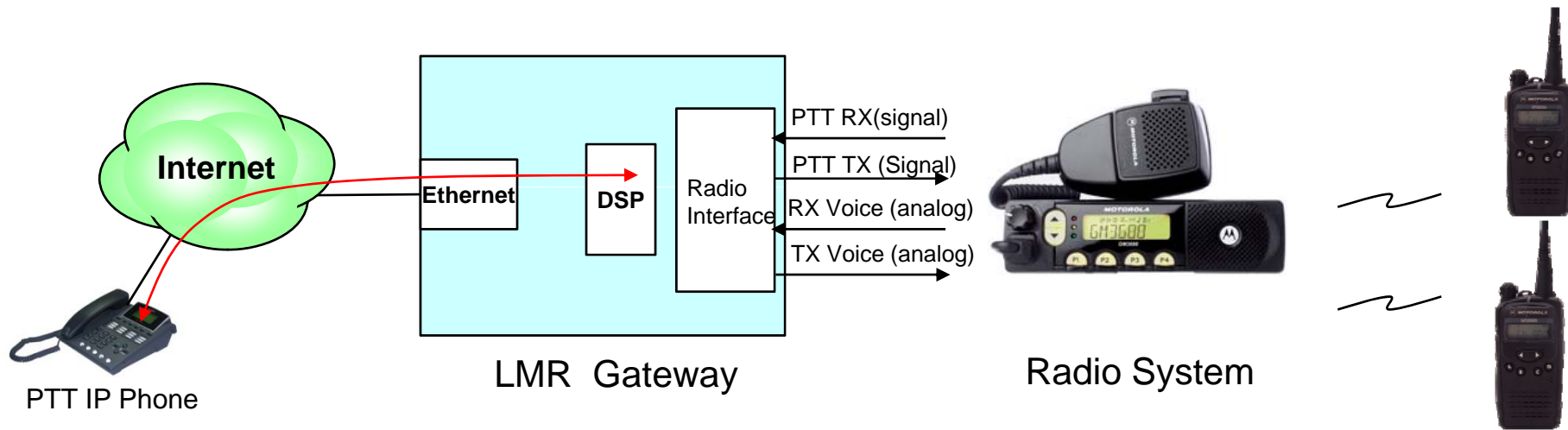
- Interconnection LMR systems to IP network through AddPac RoIP solution.
1. The Terminal(x) originate a PTT conference.
  2. IP-PBX send invitation message to all participant.
  3. The Terminal(x) presses the 'floor button' to talk.
  4. The Terminal(x) send a 'floor-request' message.
  5. IP-PBX and PTT servers control media-relay.
  6. The Terminal(x) releases the 'floor button'.
  7. The Terminal(x) send a 'release-request' message.
  8. IP-PBX and PTT servers control media-relay.
  9. Any LMR Terminal(a~d) presses the 'floor button' to talk.
  10. LMR Gateway send a 'floor-request' message.
  11. IP-PBX and PTT servers control media-relay.
  12. The Terminal(a) releases the 'floor button'.
  13. LMR Gateway send a 'release-request' message.
  14. IP-PBX and PTT servers control media-relay.

|                                       |                     |
|---------------------------------------|---------------------|
| <span style="color: red;">—</span>    | RTP (floor)         |
| <span style="color: blue;">—</span>   | RTP (Participant)   |
| <span style="color: yellow;">—</span> | Radio (Participant) |

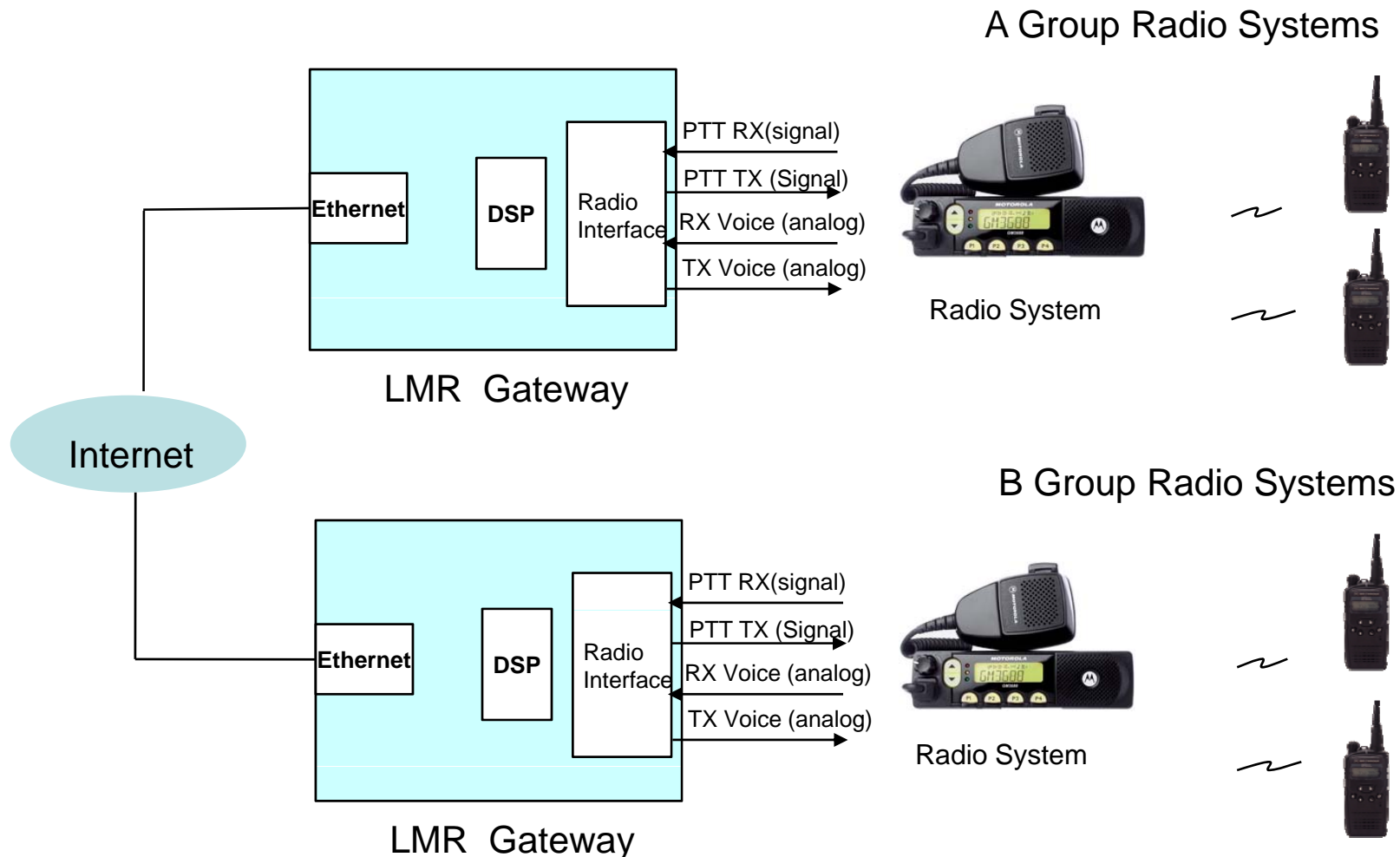
# RoIP System Message Flow



# System Interface between LMR Gateway and Radio



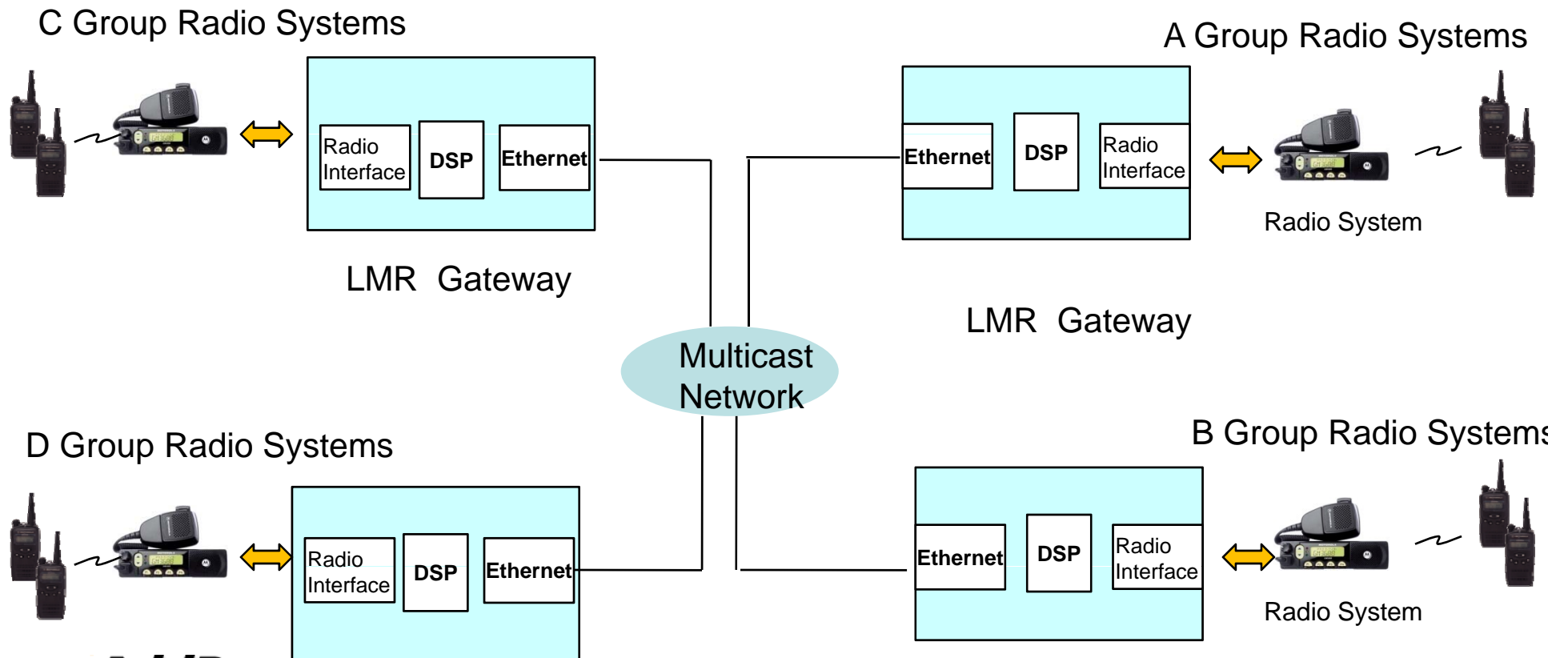
# Peer-to-Peer LMR Gateway Service (Remote)



# Multicast Connection

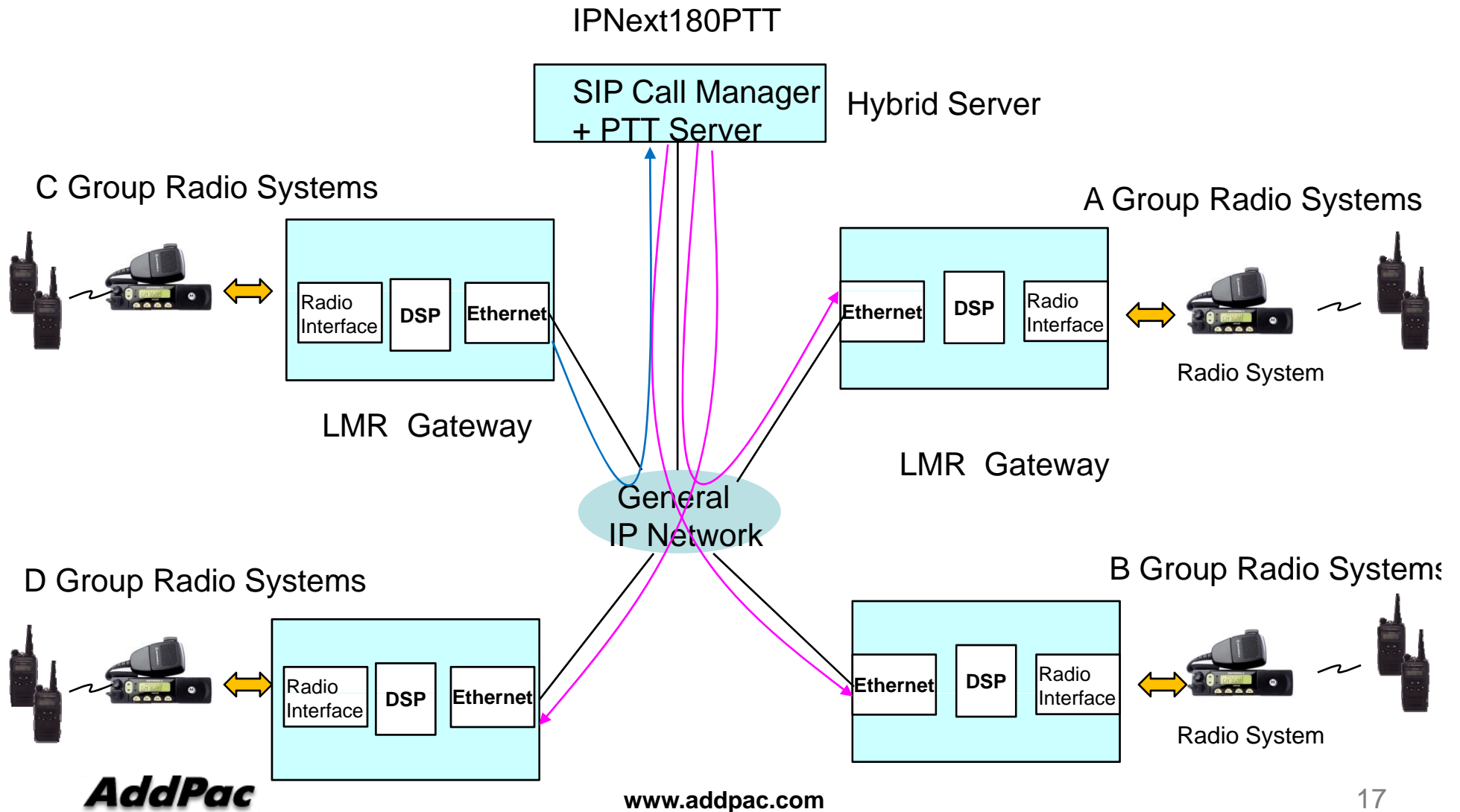
## Disadvantage

- No Flow Control → Voice Quality is Poor (Packet Drop, Mixing, etc)
- General Network does not support Multicast IP routing scheme.

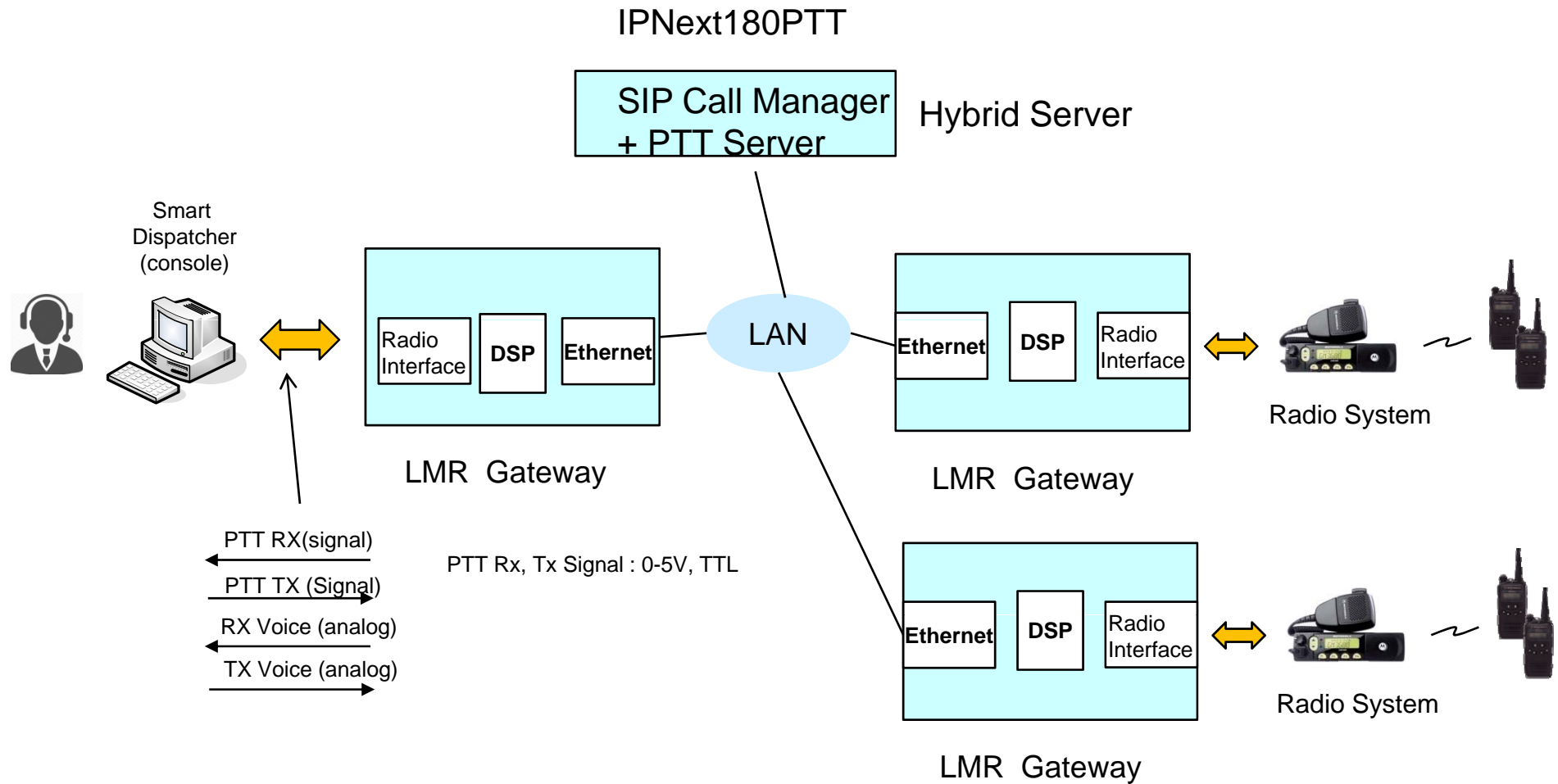




# General Radio LMR Interwork Solution



# General Radio LMR Interwork Solution (Dispatcher Console)





# Thank you!

**AddPac Technology Co., Ltd.**  
Sales and Marketing

Phone +82.2.568.3848 (KOREA)

FAX +82.2.568.3847 (KOREA)

E-mail [sales@addpac.com](mailto:sales@addpac.com)