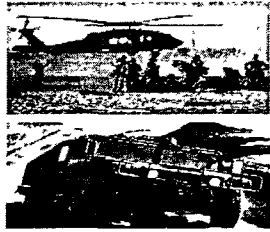


**모토로라 테트라 솔루션 및  
구축사례**

***김경훈(MOTOROLA)***



# MOTOROLA TETRA Solution & Military 구축사례



your name here Business, our way F.A. PC

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목차

- TETRA 표준
- Motorola & TETRA
- Dimetra™ IP
  - 구조/기능/신뢰성/확장성
  - 보안/비화/암호화
- Dimetra™ for Military



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## TETRA 소개

- Terrestrial Trunked Radio.
- 유럽표준기관(ETSI)에 의한 디지털 주파수공용통신시스템 표준규격
- 공공안전망을 구축을 위하여 1991년 ETSI에 의해 발의됨



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## Tetra 시스템 환경

- |           |   |
|-----------|---|
| • 통신접속방식  | <b>TDMA with 4 time slot per carrier</b>                    |
| • 채널간격    | <b>25kHz</b>  |
| • 신호전송속도  | <b>36 kbit/s</b>  |
| • 변조방식    | <b>pi/4 QPSK(Quad Phase Shift Keying)</b>                   |
| • 음성코딩방식  | <b>ACELP (Algebraic Coded Excitation Linear Prediction)</b> |
| • RF 송신출력 | <b>25W</b>  |
| • 데이터전송속도 | <b>7.2 kbps/slot</b>  |
| • 주파수밴드   | <b>380-400MHz, 410-430MHz, 800MHz</b>                       |

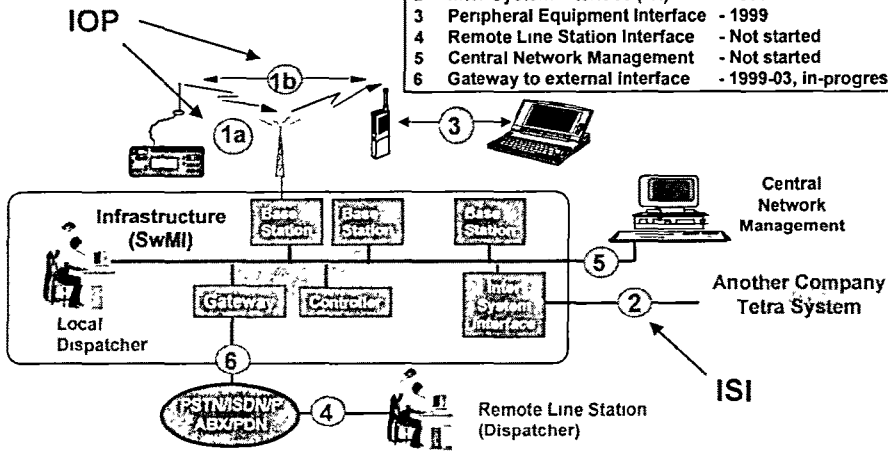


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## TETRA Interface Standards

1a	Air interface	- 1996
1b	Direct mode	- 1998
2	Inter-System Interface (ISI)	- 2003
3	Peripheral Equipment Interface	- 1999
4	Remote Line Station Interface	- Not started
5	Central Network Management	- Not started
6	Gateway to external interface	- 1999-03, in-progress



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## TETRA Release 2 (Release 2)

- TETRA가 시장흐름에 맞추어 개선되어야 한다는 것을 인식
- 사용자 요구사항:
  - 고속 데이터 전송
  - 향상된 음성 코딩방식
- 이에 대한 가능성을 연구하기 위해 ETSI내에 'TETRAFOT'라는 TETRA 연구 그룹이 구성됨(규격화 계획은 1999년부터 시작)
  - FOT = 'Future Of TETRA'
  - TETRA Release 2

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- Dimetra™ for Military



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**TETRA 세계의 성공 사례 MOTOROLA**

- **1994. 12:** TETRA MoU 창립 회원
- **1997. 2:** 세계 최초 상용 TETRA 시스템 계약 - Garadermoen (Oslo) 공항, 노르웨이
- **2000. 3:** 사상 최대 규모의 TETRA 기반 전국규모(2,500 사이트)의 국가통합지휘무선통신망 계약 - BT Airwave, 영국
- **2000. 6:** 세계최초 E2E Encryption Military TETRA - Mt. Rose, 이스라엘
- **2000. 10:** 아시아 최초의 TETRA 80MHz 계약 - KCRC, 홍콩
- **2000. 12:** 국내 최초 800MHz TETRA 시스템 계약 - 4개 지방경찰청, 한국
- **2002. 10:** 세계 최초 고속철 계약 - THSR, 대만
- **2003. 3:** 아시아 최대규모의 공안 통신망 계약 - HKP CCI, 홍콩



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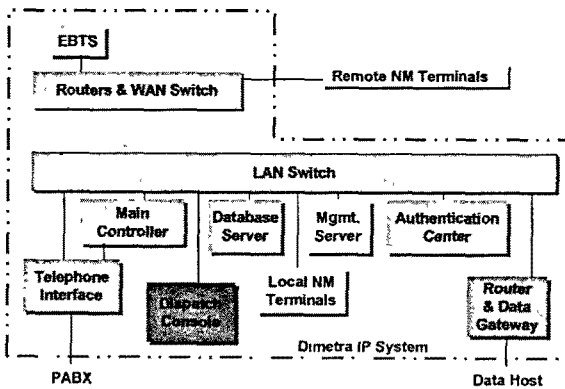


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### Dimetra™ Modern Architecture - Full IP Network

- 라우터들과 스위치들로 구성된 완벽한 IP 기반
- 고성능의 서버들의 네트워크는 여러 기능들을 제공
- 확장이 용이



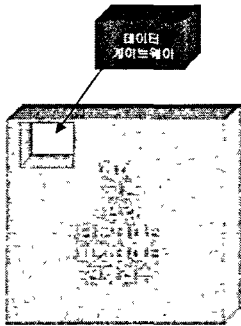
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동작 중인 상태에서 신규 기능 및 서비스 추가

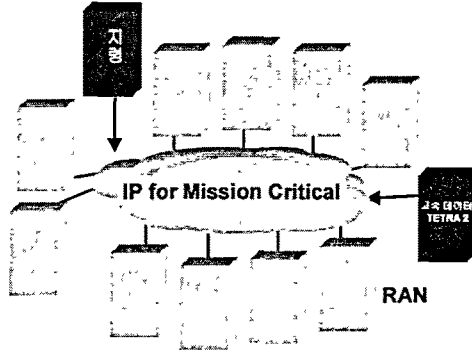
전통적인 망 설계

교환기는 내부 카드 교체가 필요함  
시스템은 가동이 중지됨(off Line)



중요 업무용 IP 망 설계

서비스가 중단되지 않는다!  
새로운 망 구성요소를 통신망 서비스가 유지되는 동안  
간단히 추가가능



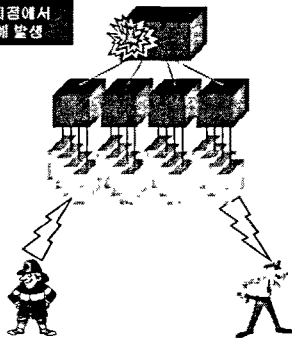
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동작 중인 IP 망으로 인한 망 가용성 확보

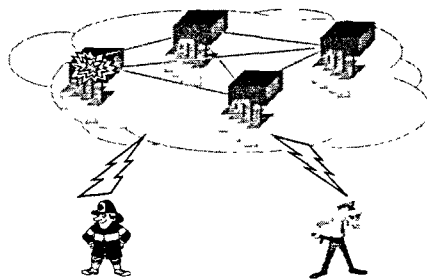
전통적인 망 설계  
(수직 망 구조)

한 지점에서  
장애 발생



중요 업무용 IP 망 설계  
(수평 망 구조)

높은 신뢰성!  
장애 발생에 대비한 분산형 구조 및 장치 이중화

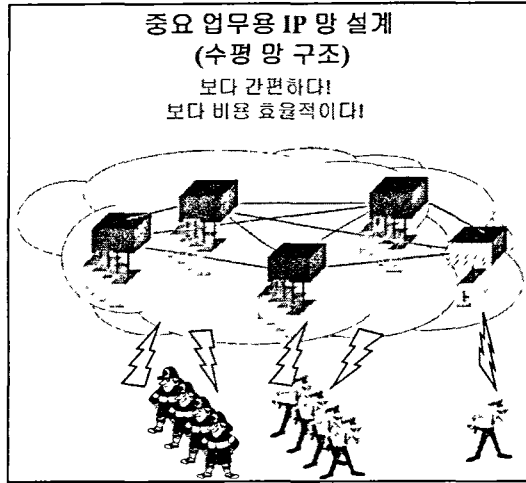
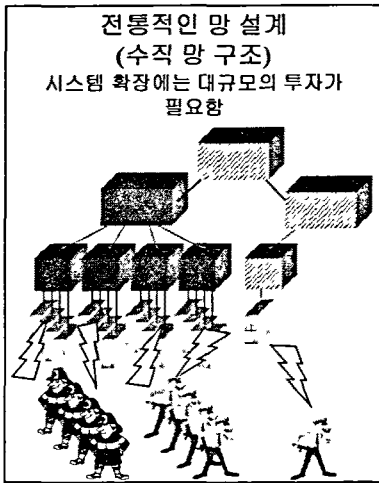


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## 일관성



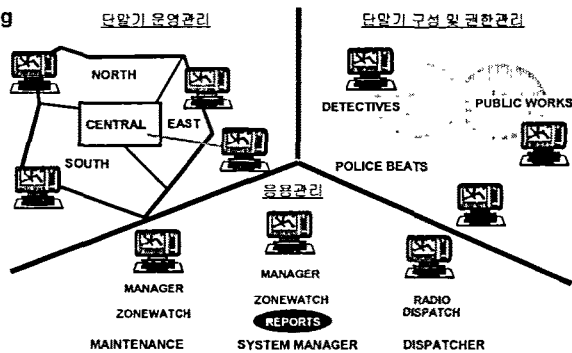
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## 이차원 IP = 망 확장성 확보

- 패스워드를 이용한 보안
- 단계별 사용자 권한 부여
- 보안을 위한 **Partitioning**
  - 지역별
  - 부서별
  - 응용프로그램별
  - 사용자별



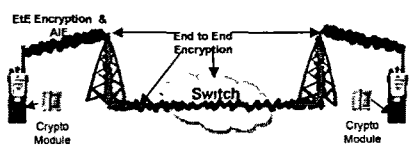
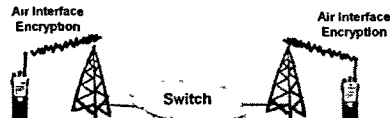
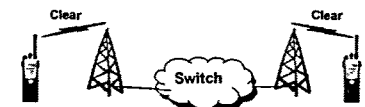
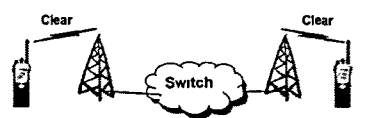
각 운영형태에 따른 고유 가상망 구현 가능

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# TETRA - 4세대 이동통신



**TETRA 기본**  
 복잡한 디지털 신호처리방식  
 • TDMA,  $\pi/4$  DQPSK, Trunked  
 일반적인 도청으로부터 보호

**인증:**  
 비밀키 'K'를 이용하여 사용자와 시스템 ID를 확인  
 확인된 ID에 서비스 제공 위장과 침입으로부터 보호

**무선구간 비화:**  
 • 인증교환의 비화  
 • 메시지(음성 및 데이터)의 비화  
 • 시그널링(ID, 시스템정도)의 비화  
 '전문적인' 도청, 트래픽 분석 및 서비스 방해로부터 보호

**End-to-End 비화:**  
 • 유무선 구간에서 강력한 비화 기능 구현  
 • 중간 단계의 강청 위험요소 제거  
 • 무선 구간 비화와 함께 시그널링 및 ID 보호  
 특별히 높은 보안을 필요로 하는 사용자들을 위한 보호수단



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## Main Objectives

- A wide area communication system for mobile subscribers, based on COTS technology (commercial of the shelf).
- Wide variety of operational scenarios.
- Secure Voice and Data services.
- Full Interoperability with the strategic Military Switching Telephone Network.
- Increased survivability



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## High Level Design Principles

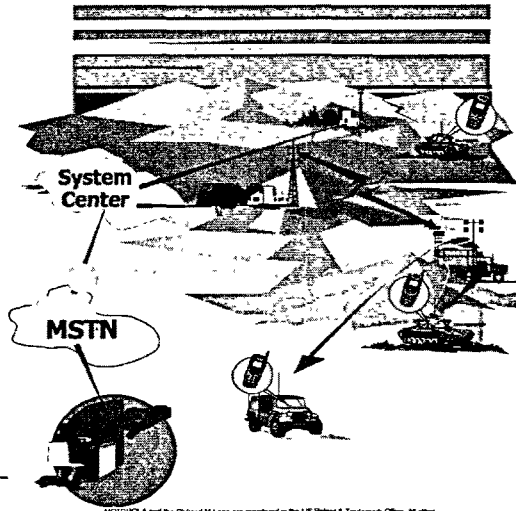
- Wide Area Secure system featuring interconnect, data & Dispatch
- Broadcast & Group calls.
- Multi level priority.
- Data Service: Packet & SDS
- Survivability by the TETRA means
  - Local Site Trunking
  - Fully Redundant SwMI Components
  - High Overlap Site coverage
  - DMO (Direct Mode Operation)
- Mobile subscribers with standard cellular phones features
- 2 levels of encryption: A1E & E2E
- Be highly resistant to rugged environmental conditions.
- Operate on TETRA Bands (380-400, 410-430, 800/900 MHz)
- Can be installed in a wide range of Armored vehicles and be integrated with intercom systems.
- Have a suitable solution for Transportable communications sites facilitating fast deployment of sites in rural areas for fast extending coverage.



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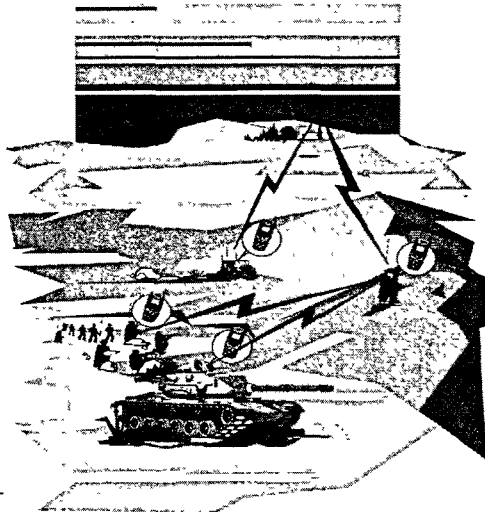
# System Configuration



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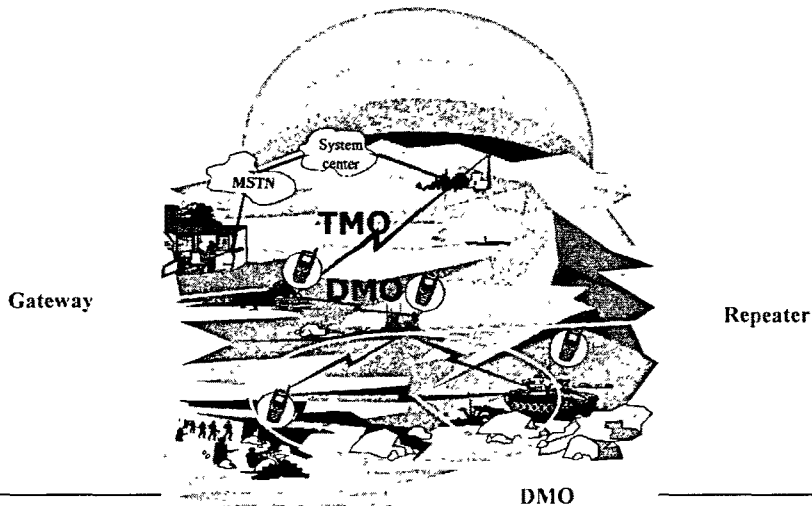
# Direct Mode Operation - DMO



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## DMO & Repeater & Gateway Operation



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## Why Choose Motorola's Dimetra Solution

- **Versatility** – High level of standard services
- **Interoperability** – Seamless connectivity between different users
- **Deployability** – Packed for rapid transport and mobile
- **Scalability** – Ability to expand or contract the network with ease
- **Prioritization** – Managing critical information
- **Capacity** – Ability to transport large amount of information
- **Flexibility** – Ease to configure and reconfigure
- **Security** – Superior encryption ,protection of information
- **Spectrum - Efficiency**
- **Immunity** – System level solution
- **Cost Effectiveness** - Operational requirements satisfied with low cost

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"Mountain Rose"

Vol. XXIV · Issue 5 · 2000

ISSN 0722-3226

# MILITARY TECHNOLOGY

• US \$ 6.50 • £ 5.75  
• DM 15.00  
• HK\$ 18.00  
• LPA 18 000.00  
• OS 106.00  
• PTE 860.00  
• PF 60.00 • FB 300.00



## Motorola Cellular Phones For The IDF

Motorola Israel has won the tender issued by the Israeli MoD for encrypted cellular phones for the Israeli Defence Forces (IDF). The project has an estimated value in the region of US\$85 million, and will be completed by 2003.

The IDF will be one of the very first armed services in the world to supply its field commanding officers with a state-of-the-art, secure cellular communications system. The requirements cover operational capabilities as well as flexibility and adaptability to the specific demands of various customers in the military environment, such as: Country-wide system; Capability of handling a diverse array of operational scenarios; Support military encryption (secure voice and data services); Support full duplex commu-

nications; Possess wide-area or district immunity against hostile jammers, as well as high resistance to adverse environmental conditions with increased survivability; Can be installed in a wide range of AFVs and be integrated with intercom systems.

The winning Motorola design is a premier TDMA system for military applications, based on the company's new DIMETRA system, compliant to ETSI's TETRA standards. According to Motorola, the TETRA protocol was chosen because it was specifically designed for professional users such as the military, and it thus offers many important features which are essential elements in mission-critical military applications. TETRA mobile units offer Direct Mode Operation (DMO) which

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