TETRA
The new era in emergency communication

Joint communications infra-stucture for

all public safety agencies

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The requirements for emergency preparedness of public safety authorities has become more demanding than ever before…

What has changed?

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Never before has
CRIME
been more

- **organised**
- **integrated to society**
- **technically capable**
- **international**
- **complex**

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…or MAN-MADE DISASTERS

- nuclear and chemical catastrophes, accidents, fire

and NATURAL CATASTROPHES

- floods, storms, earthquakes, avalanches

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Not to mention
TERRORISM
and violent RIOTS

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Myyrmanni Shopping Mall bomp blast 11 Oct 2002

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Yet most public safety agencies worldwide are using outdated analogue communication technologies

Analogue

- unsecure, easy to eavesdrop
- no privacy (anyone can listen to the communication)
- no priorities
- frequency inefficiency
- No wide area uniform communication infrastructure
- No advanced data services

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TETRA technology
(TErrestrial Trunked RAdio)

Objectives of developing TETRA technology:

- Define a purpose built new digital radio communication (PMR) technology to fulfill the needs of public safety and other professional users to substitute old analogue systems

- Unite fragmented PMR markets - harmonized use of spectrum

- Fulfill European authority communication requirements (Schengen Treaty) to enable European integration and cross-border operation

ETSI

European Telecommunications Standards Institute

Together with

Users
Manufacturers
Regulators
Operators

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TETRA is the only open digital PMR standard

Criteria	TETRA	Tetrapol	APCO25 ph.1	iDEN
Technology specified by	ETSI*	Matra	APCO** P25 / Motorola	Motorola
Parties involved in specification (A=Authority organisations, O=Operators, P=Private users, M=Manufacturers)	A/O/P/M	A/M	A/M	M
Number of independent infrastructure manufacturers as of March 2000	5	1	1	1
Number of independent terminal manufacturers as of March 2000	5	1	2-3	1
IPRs owned by	Multiple companies	Matra	Motorola	Motorola
Essential IPRs available for new entrants	With fair & reasonable terms as defined by ETSI			

* ETSI = European Telecommunication Standardisation Institute
** APCO = Association of Public-Safety Communications Officials (US)

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Unique features of TETRA

- Unique communication package in total

- Group calls (one-to-many)

- Individual calls (one-to-one)

- Fast call set-up time (~300 ms)

- Dispatching and command & control

- Direct Mode Operation (DMO)

- Queuing of channel resources

- Pre-emptive priorities

- Uncompromised security
  - authentication of radios (and networks)
  - air interface encryption, static or dynamic keys
  - end-to-end encryption support
  - disabling of stolen radios

- Intranet/internet access with IP packet data

- Interoperability, multivendor supply

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Complete Nokia TETRA offering

Nokia TETRA base station

Nokia TETRA exchange

Complete dispatching solution

Network management Nokia NetAct

Complete TETRA voice

Complete TETRA security

Complete TETRA data

Integrated command and control

Nokia complete services planning and deploying

TETRA applications

Intranet Internet

LAN WAN

PSTN PABX ISDN

Nokia connectivity products

Complete commitment Nokia TETRA terminals

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TETRA has become a global standard for public safety communication

Approximately 180 contracts awarded to different vendors

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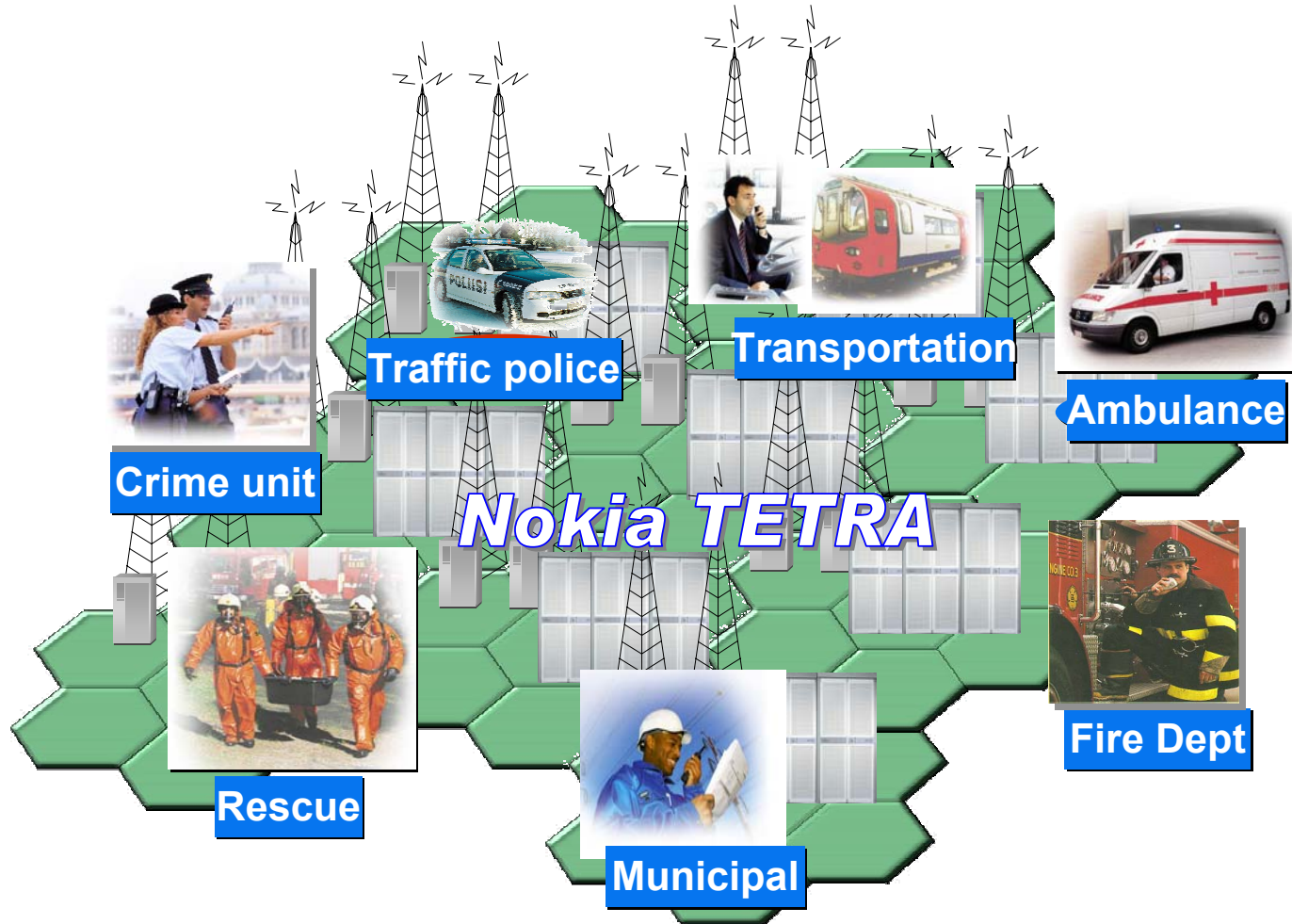# Multi-agency
public safety networks

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Traditionally - government agencies have multiple systems owned by each organisation

Rescue

Fire dept.

Transportation

Traffic police

Crime unit

Ambulance

Construction and maintenance
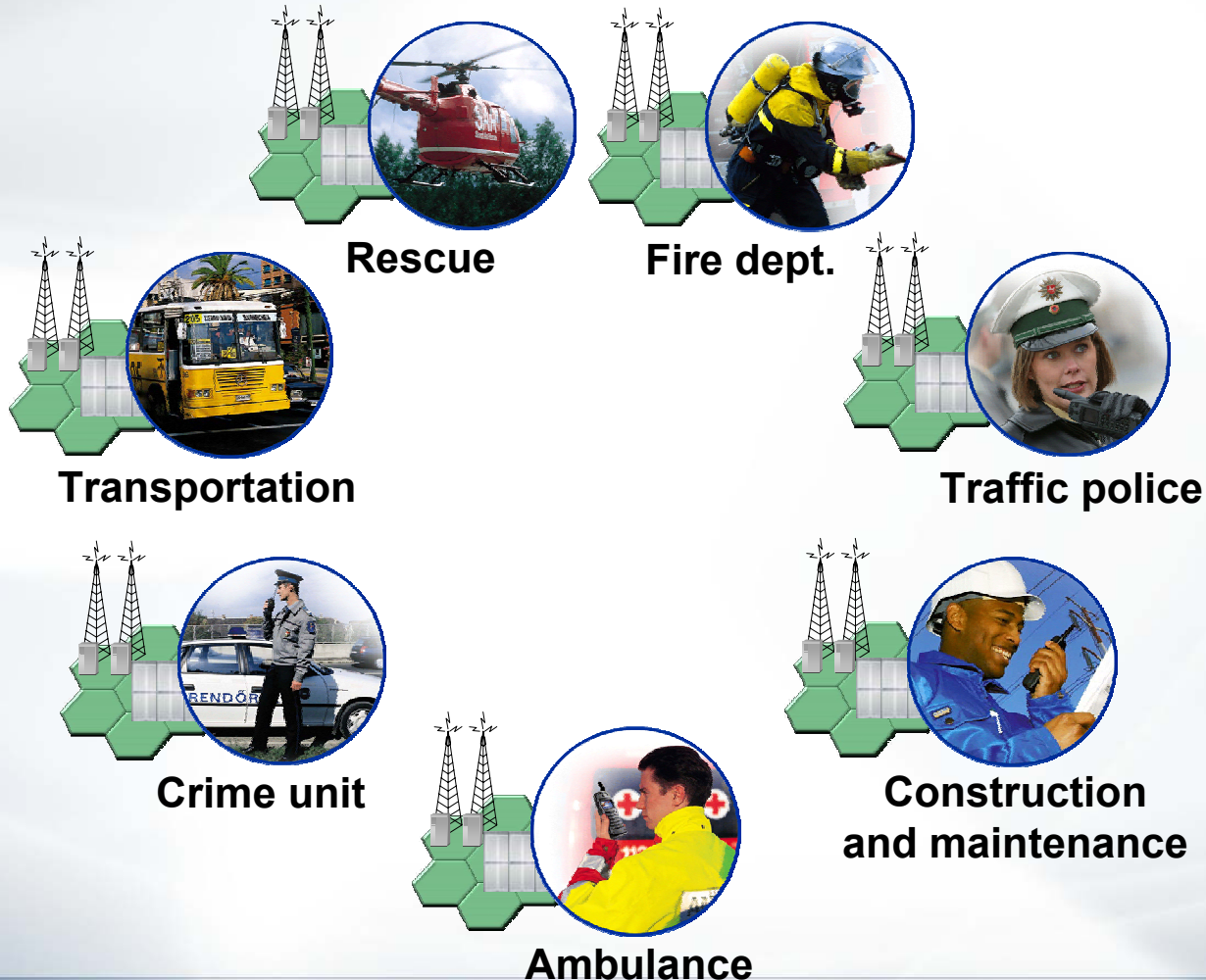
Co-operation through shared multi-agency TETRA system

Traffic police

Transportation

Ambulance

Crime unit

Nokia TETRA

Fire Dept

Rescue

Municipal

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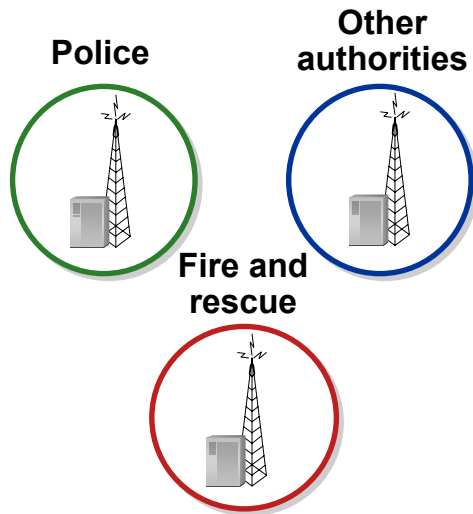# Multi-agency network is an optimum solution for authority communication

- Enables efficient co-operation between authorities but retains privacy

- Equal communication readiness everywhere

- Secure communication – no eavesdropping

- Seamless integration with '112/911' emergency centres

- Provides superior network economy over private networks

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Multi-agency use brings in significant savings compared to private networks

- Multi-agency use means better economy in all areas – CAPEX, IMPEX, OPEX
- Example: three authorities in a common network instead of using private networks. Business modelling shows …
  - more than 60% less base stations (CAPEX savings)!
  - more than 50% lower operating cost!
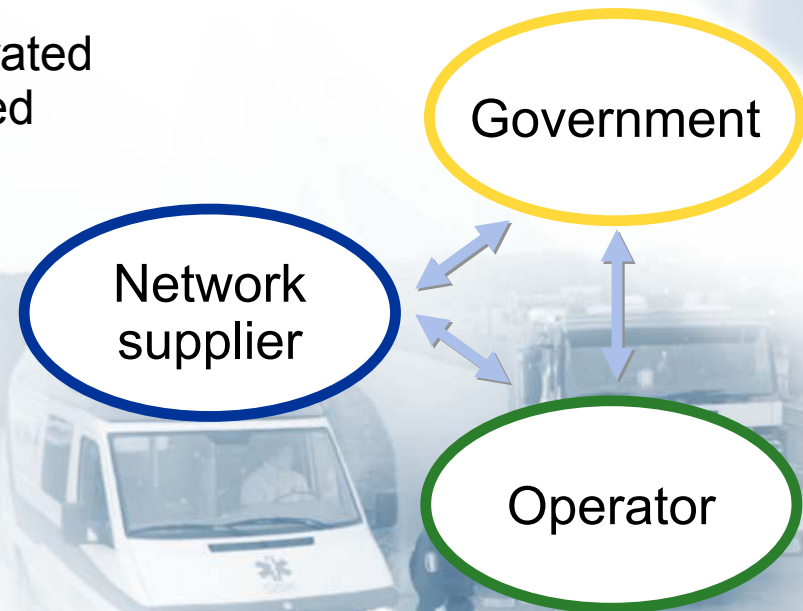 - more than 50% IMPEX savings!

From private networks...

Police

Other authorities

Fire and rescue

…to multi-agency use

Police

Special forces

Border guard

Multi-agency TETRA

Other authorities

Fire and rescue

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Freedom to choose the most suitable network operating model with Nokia TETRA

- Network ownership and operation can be chosen freely
  - government owned, government operated
  - government owned, company operated
  - company owned, company operated

- Nokia TETRA supports all these models
  - separated technical and operative management
  - flexible numbering schemes to fit organisations' needs
  - subscriber management based on organisation blocks
  - Virtual Private Networks (VPNs) grant privacy

Government

Network supplier

Operator

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Case study VIRVE
A new communications infrastructure for all public safety organisations in Finland

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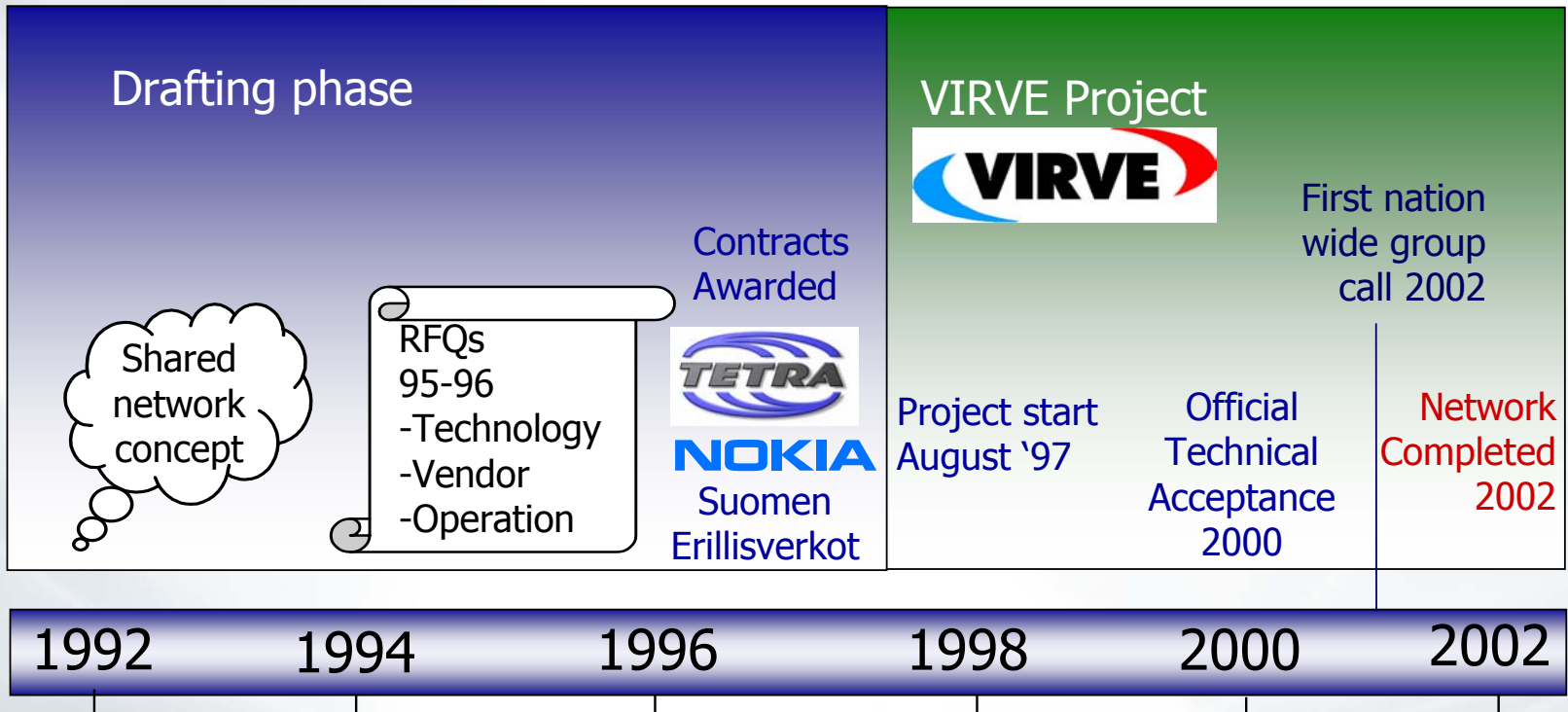# Finland has challenges for public safety and emergency preparedness

- Wide geographical area 350.000 km^2, sparsely populated with app. 15 inhabitants per km^2

- Aging nuclear power plants in neighbouring countries

- Globalisation, terrorism (Myyrmanni bomb explosion)

- The longest outer border between EU- and non-EU countries

- Obligations set by the Schengen Treaty for border control

The reasons leading to the decision to start the VIRVE project

- Common will to improve the level of public safety and emergency preparedness
  - Tschernobyl nuclear catastrophe Apr 1986
  - Estonia ferry disaster Sep 1994
  - Ratification of Schengen Treaty 1996
  - Globalisation

- Savings - Encouraging results of the studies of shared network principles

- The need - Outdated existing technology

- Open mindset to exploit new digital wireless communication technologies

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From plans to reality

Drafting phase

Shared network concept

RFQs
95-96
-Technology
-Vendor
-Operation

Contracts Awarded

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Suomen Erillisverkot

VIRVE Project

VIRVE

First nation wide group call 2002

Project start August '97

Official Technical Acceptance 2000

Network Completed 2002

| 1992 | 1994 | 1996 | 1998 | 2000 | 2002 |

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Up-to-date technology at lower cost

- Modern 3G/IP based architecture, 15 switches, over 1200 base stations
- Implementation completed, fully on time
- Government owned, operated by operator company State Security Networks Ltd.
- Low operating cost - **€400**/user/annum
  - Common infrastructure
  - Centralised network management 24h/7d
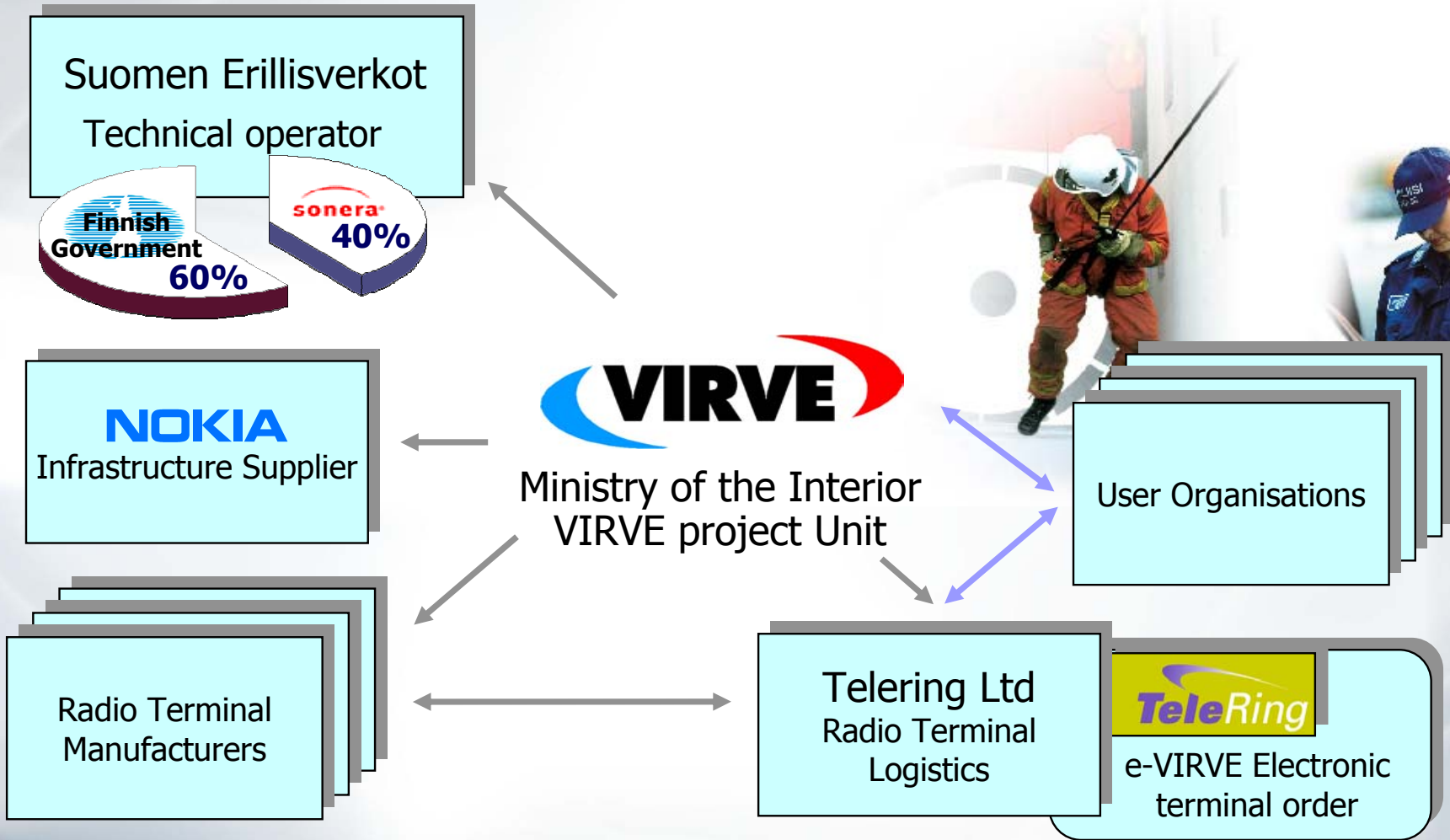 - Remote updates and network supervision - fewer site visits

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User expectations were the driving force for VIRVE technology selection

- Each public safety organisation had their requirements included in the RFQ '96

- Availability of the service – no service breaks, coverage

- Security

- Enhanced services - voice and data

- Low prices - open standard, open competition
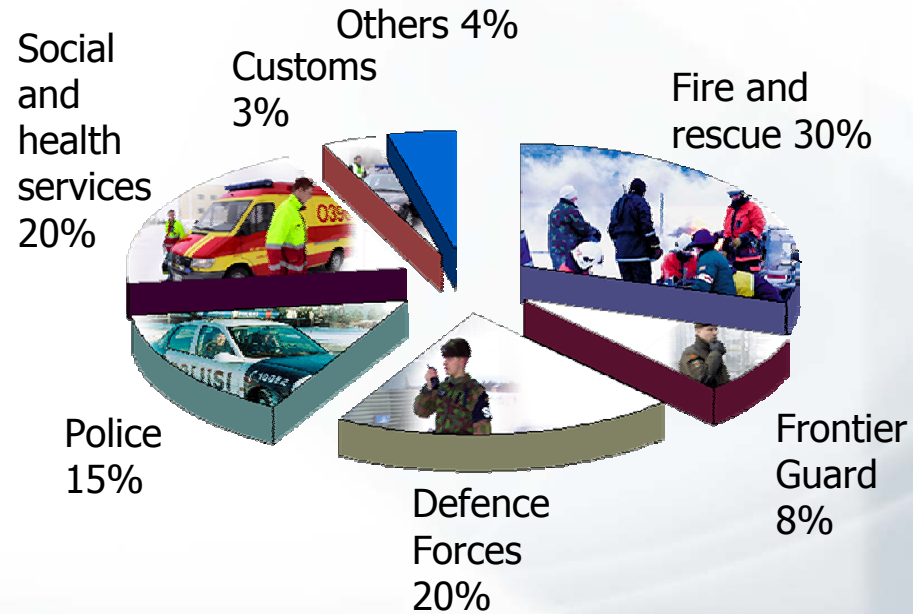
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VIRVE – participants

Suomen Erillisverkot

Technical operator

Finnish Government **60%**

sonera **40%**

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Infrastructure Supplier

VIRVE

Ministry of the Interior
VIRVE project Unit

User Organisations

Radio Terminal
Manufacturers

Telering Ltd
Radio Terminal
Logistics

TeleRing

e-VIRVE Electronic
terminal order

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In use today, nationwide

- Network roll-out completed, fully on schedule

- Full nationwide coverage, full seamless nationwide functionality e.g. nationwide group calls

- Meets Schengen requirements

- Seamless integration with nationwide emergency response center network

- Co-operation with the Estonian marine border guard

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In use today ~50.000 users

- True multiagency operation, ~50.000 users from different organisations

VIRVE today 2002, ~50.000 users

Others 3%
Customs 2%
Social and health services 10%
Police 10%
Defence Forces 5%
Frontier Guard 10%
Fire and rescue 60%

VIRVE 2005, ~100.000 users

Others 4%
Customs 3%
Social and health services 20%
Fire and rescue 30%
Police 15%
Defence Forces 20%
Frontier Guard 8%

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Nationwide Emergency Response Center (ERC) Project in Finland

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Emergency Response Center renewal complements VIRVE and vice versa

Objectives:

- Establish 15 regional ERCs with multiskilled personnel to receive 112-calls

  – police

  – rescue services

  – ambulance

  – social services

- Sheltered, underground EMP protected premises

- Use VIRVE/TETRA as wireless communication infrastructure for all public safety organisations

- Four pilot regions 1996-2001, positive experiences resulted to extension to a nationwide concept

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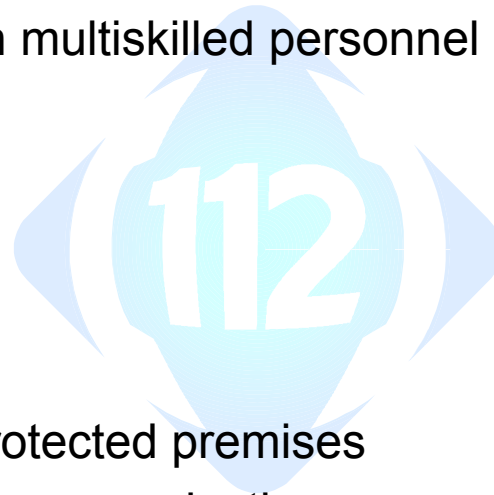
New concept of ERC
Advanced & optimised alarming

- Same person handles the whole event chain in the emergency response centre

- Managed co-operation and communication at incident scene using VIRVE

call

Emergency call center
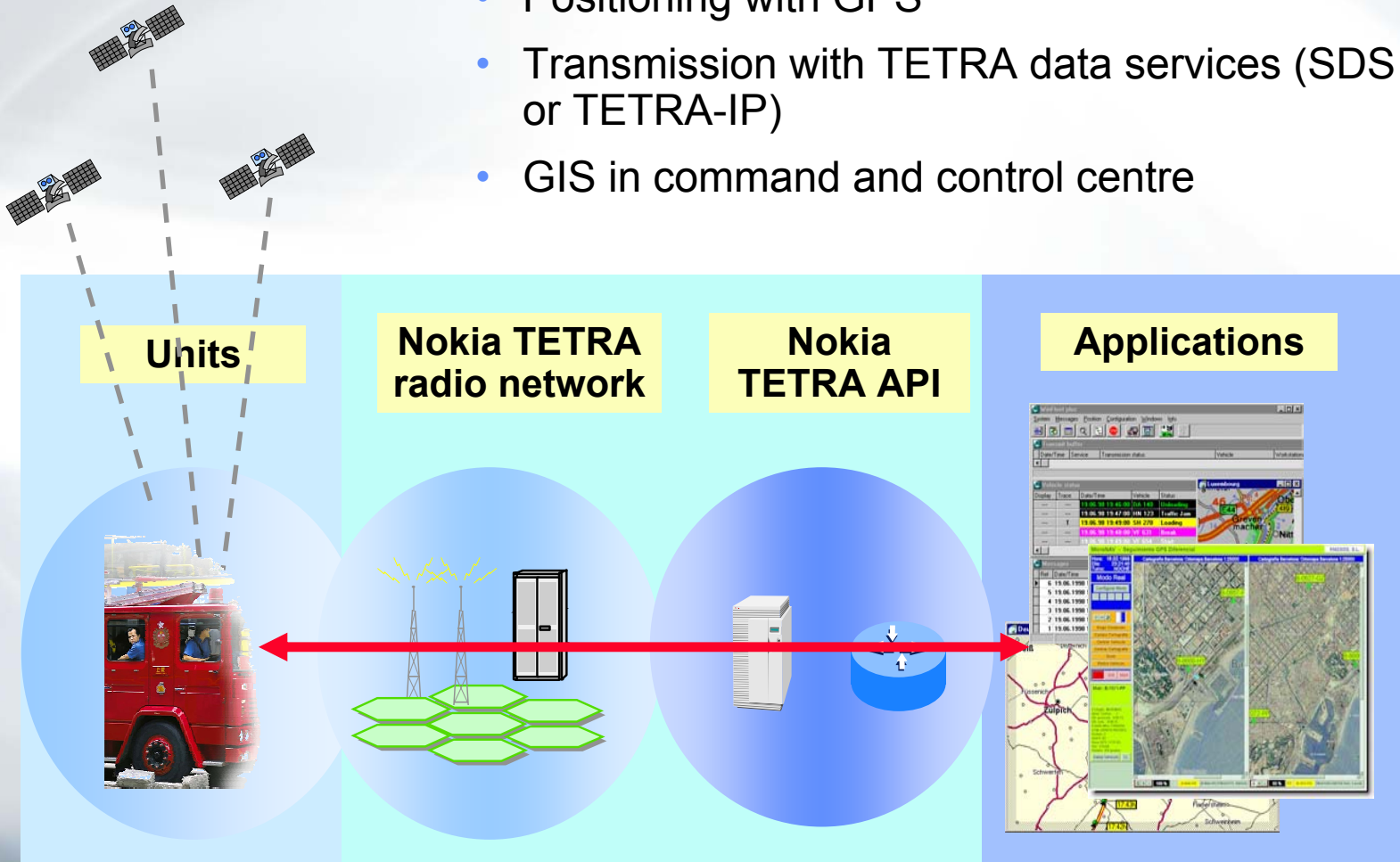
Field unit

Field commmander

Field unit

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Common Layout and technology for all ERCs

- Integrated command & control systems for call-taking and alarming
- Harmonised and redundant IT-systems in the whole country
- Wireless voice communication and wireless data access using TETRA (VIRVE)


Police HQ

Rescue HQ

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Data applicationss complement voice - AVL

- Positioning with GPS

- Transmission with TETRA data services (SDS or TETRA-IP)

- GIS in command and control centre

Units

Nokia TETRA radio network

Nokia TETRA API

Applications

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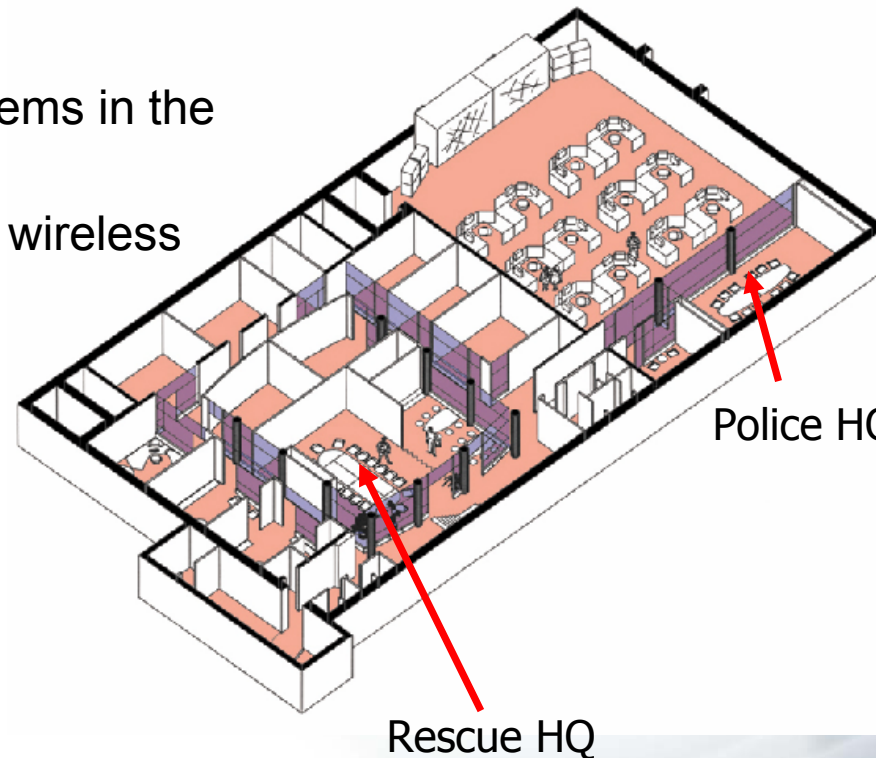
Data applications complement voice – Exploiting Images

- Transmit image from incident scene for better understanding of the overall situation

- Broadcast images to field units

- TETRA IP one slot packet data is sufficient for image transmission
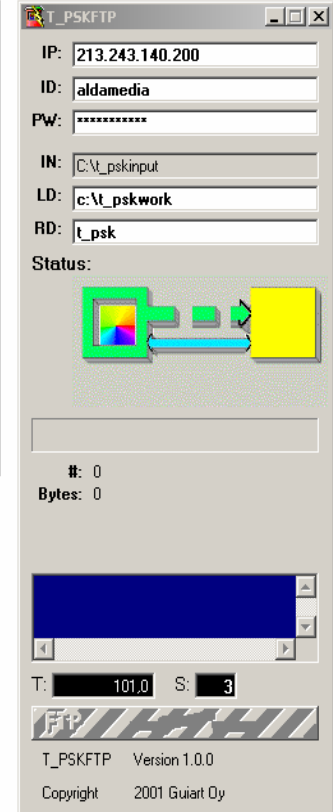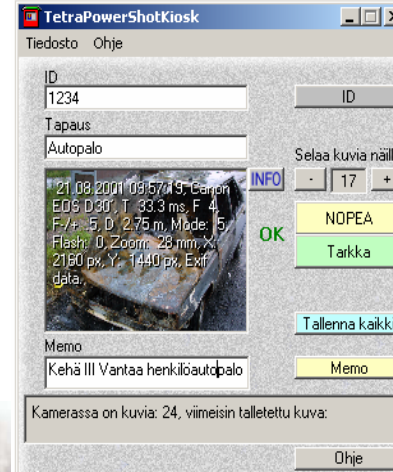
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Is VIRVE and Finnish ERCs fulfilling user expectations for emergency communication?

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1953

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