



PELASTUSOPISTO

What are the future needs of
Mission Critical Communication at
rescue services?
"PELTI" project summary.

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Agenda

- Background and goals
- Organisation and collaborative directions
- Implementation, reporting and utilization of results
- Interfaces, Requirement comparison
- Summary
 - Scenarios
 - Facts
 - Recommendations
 - Additional explanations needed



Background and goals 1/2

- Empirical experiences are available about usage of existing mission critical communication (voice & data)
- The progress of technology is enabling alternative channels for communication

Studied:

- What are the future needs of Mission Critical Communication at rescue services
- What are the possibilities of existing and near future communication solutions

”PELTI ” is study of VIRVE and other wireless networks:

- Possibilities
- Usage
- Performance
- Limitation



Background and goals 2/2

- Introduction of the VIRVE network has enabled high level of multiauthority co-operation at the scene.
- All actors have same needs for the system and data communication but they all have also their own requirements:
 - intention to find mutual solutions and operation models:
 - ➔ Facilitating system integration
 - ➔ Enabling centred system design
 - ➔ Improved activities
 - ➔ Cost saving
 - ➔ Improved multiauthority co-operation at the scene

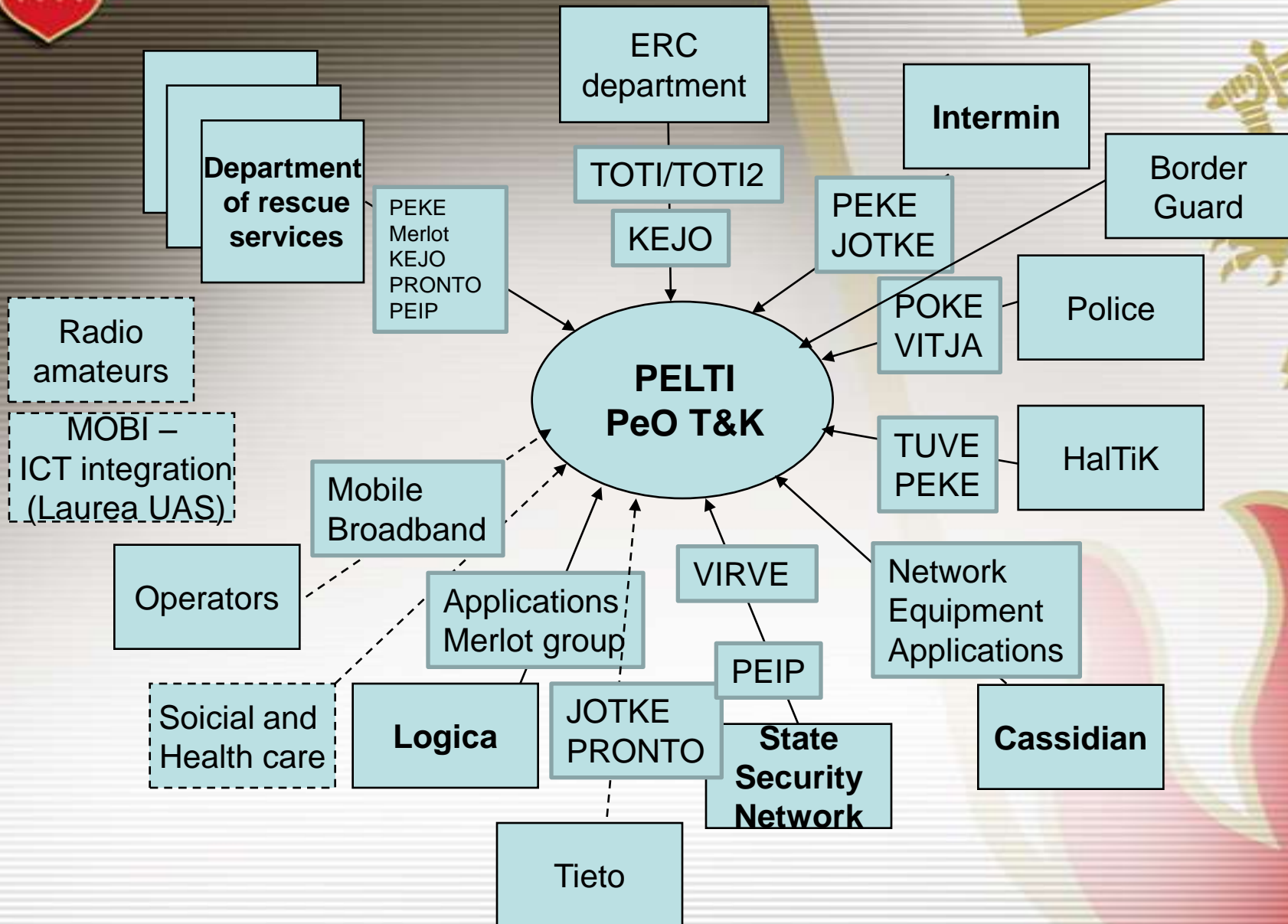


Organisation

- Organised by Emergency Services College /R&D:
 - Content and goals has been stated at the board meeting on December 2009
 - Activities started at March 2010 and the project ended at February 2011
- In addition of ESC personnel a broad group of experts from emergency services and from telecommunication experts have participated in the project.
- Fire Protection Fund has supported the project
- During the project there have been several workshops and interviews with presentatives of interest groups



Collaborative directions





Interfaces to other projects

- Information gathered from TOTI -project of ERC department has been used to understand multiauthority co-operation.
- Results from the definition project of the next generation of command and control system (KEJO) was utilized for the definition of operative working procedures.
- **The PELTI project produced information for decision-making and planning purposes regarding development of operative systems design**



Implementation

1/2

- **Theoretical examination of the background**
 - Literature review and research reports
- **Current activities(workshops and interviews)**
 - History - Lessons learned
 - How wireless communication is used today
 - Key challenges
 - Development needs



Implementation 2/2

Developing the communication needs of authorities

- Key issues
- Needs

Assessment of the technology

- Evolution of the TETRA standard
- Other wireless technologies

Solutions for the secure communication networks

PEIP (IP backbone for the emergency services)

International assessment



Reporting

- **Report has three parts:**
 - Report itself (103 pages) and 2 annexes
 - Annex 1 (78 pages):
 - Description of supplementary network solutions (commercial networks)
 - Annex 2 (17 pages):
 - Short description of the biggest European TETRA networks
 - Résumé for international ICT projects for emergency services
 - Sources (66 files, 74Mt)
 - Listed Scenarios, Facts, Recommendations and Topics for the further investigation on the summary.



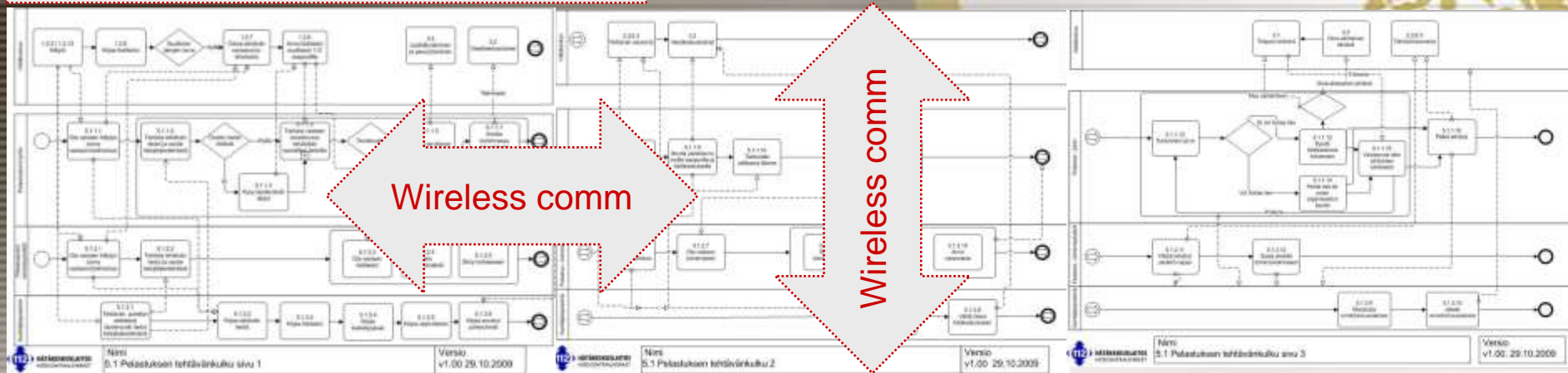
Exploitation of the results

- Results of the project can be used by emergency services and interest groups when developing future systems.
- Presentations on the conferences
- Report with annexes and source material is available At the web:
WWW.pelastusopisto.fi => Paloportti, (n.60Mt).

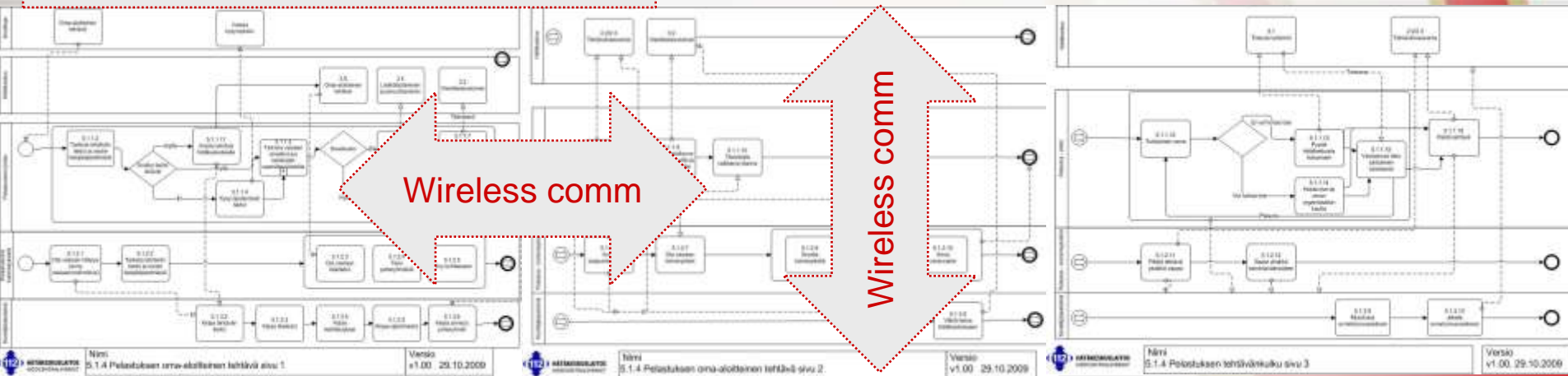


Operational model of Emergency services from ERC point of view)

Task from ERC



Initiative tasks



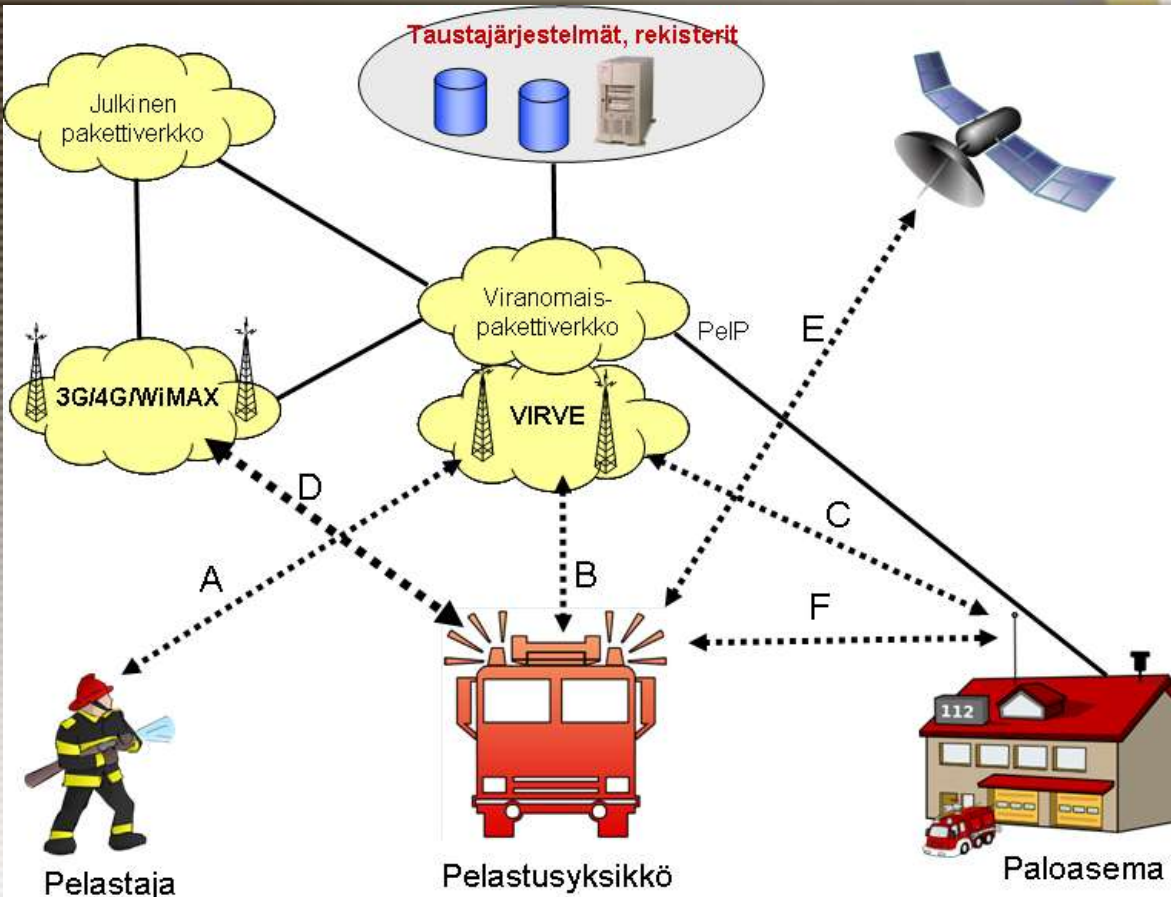


Administrative challenges

- Emergency services is a municipal service
- Other safety and security authorities are administrated by the Ministry of Interior:
 - Cause complicate for development and implementation of the common system
- HALTIK is ICT service provider only for the Ministry of Interior
 - How can we secure availability of the same services for municipal authorities ?
- Must be common procedures, processes and guides for each sector
- Group of actors (Voluntary Fire Brigades, Sea Salvage Societies, Security companies etc.) are blocked out from IT systems
 - Development of centralised ICT-system have challenges create by municipal autonomy



Interfaces of wireless communication



A: VIRVE Air interface of handheld radio

B: VIRVE Air interface of vehicle radio/modem

C: VIRVE Air interface of station radio/modem

D: Air interface for commercial networks
Multichannel

E: SATCOM

F: WLAN Interface between Rescue vehicle and Fire station LAN/Intranet

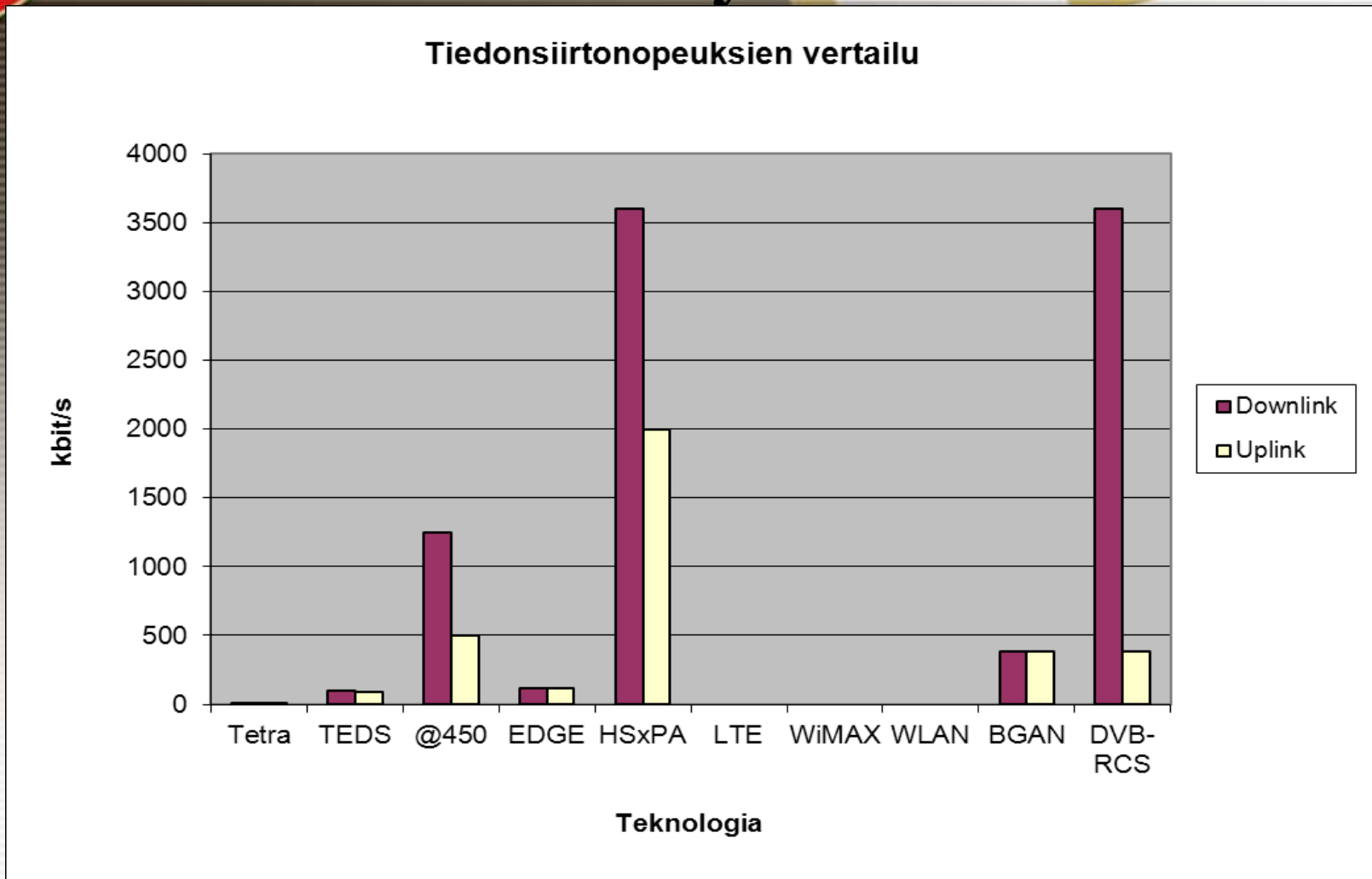


Specific requirements for data transfer

- **Classification and prioritisation**
 - **Critical:** task completed and/or data transferred always without delay
 - **Non-critical:** task completed and/or data transferred always but delay accepted
 - **Best effort:** completion of task nor transfer of data has impact to the operation
- **Application intelligence, mobile awareness :**
 - Command and coordination system must be aware about environment and behave according to limitation caused.
- **Standard interfaces**
 - Toward auxiliary systems and services (TOTI, background systems , registers,...)
- **Transfer of common operational picture between systems**
 - Both horizontally and vertically
- **Multichannel**
 - Radioterminal/ multichannel router must be aware about coverage and statuses of each wireless system (VIRVE/3G/4G/WiMAX/WLAN/...)
 - **"WLAN - fire plug"** availability



Comparison of dataspeed of different systems



- Usability, availability, capacity, reliability of different radio access systems must be taken into account



Conclusions: Role of VIRVE

- **Voice services (Reliable, Fast connection setup, good coverage)**
 - Voice services of VIRVE are working well and customers are satisfied
 - There is not coming big changes for voice services in the near future.
- **Data services(Slow, low capacity, reliable, good coverage)**
 - Customers are quite unsatisfied for data services offered by VIRVE
 - Not visible improvements in the near future that fulfill future needs
 - Possibility of TEDS upgrade may bring partial solution for problems of data services



Concl: Other technologies 1/2

- **Role of complementary technologies in the future.**
(more detailed information , see ANNEX 1)
- **Datame (@450/ WiMAX/CDMA,LTE)**
 - Good coverage and usability according to tests performed by police
 - Uncertainty of future radio technology
- **2G/EDGE/GPRS**
 - End of life cycle
- **3G/HSPA**
 - Good coverage with U900 (better than 2G)
 - Problems on the availability/capacity of commercial networks on major accidents at crowded areas
- **4G/LTE**
 - First networks at 2.6 GHz
 - not suitable for rural coverage
 - ➔ **Coming 800MHz for LTE/4G**



Concl: Other technologies 2/2

- **WLAN**

- Three user cases for data transfer:
 - Vehicle - Fire station at the garage
 - Local wireless network around fire truck at the scene
 - Vehicle - public WLAN : "**WLAN fire plug**"

- **Satellite technologies**

- Complementary role :
 - No terrestrial coverage
 - Long term usage and not available other solution (fixed lines etc)
 - Satellite transmission for temporary site
- 06/2011 TeliaSonera start EutelSat KA-SAT -services
 - Big dish not suitable for moving vehicles



Three Scenarios for future

- Possible or hypothetical future trends:
 - Sketched evolution paths and consequences of those for communication of authorities.
 - Variables:
 - VIRVE's development in the future
 - Development of other commercial networks
 - Will authorities get dedicated spectrum for mobile broad band
 - Amount and Location on the spectrum
 - Access technology
 - What is the global progress of mission critical communication.



Scen1: all communication with VIRVE

- In addition to VIRVE no need nor demand to use commercial services:

A: Voice + Slow data (TETRA Rel 1) = now

- This is existing situation and start point of all scenarios. Data speed 2-4 kbit/s.

B: Voice + Wideband data (TETRA Rel 2 = TEDS)

- TEDS is implemented with limited coverage.
- Additional capacity for SDS data transfer for congested areas
- Improving quality and capacity of voice services.

C: Voice + Broadband data (TETRA Rel 3)

- Assuming that there exist Broadband on TETRA
- Assuming that there exist sufficient spectrum for authorities.
- chronologically around 10 years from now

Development path: A → B → C

Risks:

Ten year delay for mobile broadband services for authorities.

Great uncertainty.

Not desirable Scenario



Scen2 : Voice&SDS with VIRVE broadband with commercial networks

- D: Voice + Slow data (Tetra Rel1) + Wideband data (3G/4G)
 - Existing VIRVE completed with mobile broadband from commercial operators
 - In practise phase A complete with multichannel router
- E:Voice + Wideband data (TEDS) + Wideband data (3G/4G)
 - In practise phase B completed with multichannel router.

Development paths: A → D → E → C?

A → D → E → E

A → D → E → F?

- Attractive because it offers immediate broadband services
- At the end of timeline most choices.
 - Options depends realisation of phases C and F

Risks:

How much we turn to commercial broadband services

What is availability of those on major accident scenes



Scen3: TETRA ramp down in ten years

Same as scen2, but assuming that existing TETRA based services have become end of lifecycle and is ramping. End of the period is described as follow:

F: Does not exist harmonised spectrum for authorities.

- Does not exists TETRA Rel3.
- TETRA is not enough anymore
- Some other technology is dominating on:
 - Both commercial and authority services
 - Exist cost-effective countrywide coverage
 - On the implementation of the network prioritised requirements of authorities has been taken into account
- Commercial and authorities can share same network if:
 - Authorities have guaranteed with minimum capacity strictly allocated for them.
 - The is perhaps cognitive radio interface with flexible capacity allocation where needed

Development paths : A → D → E → F

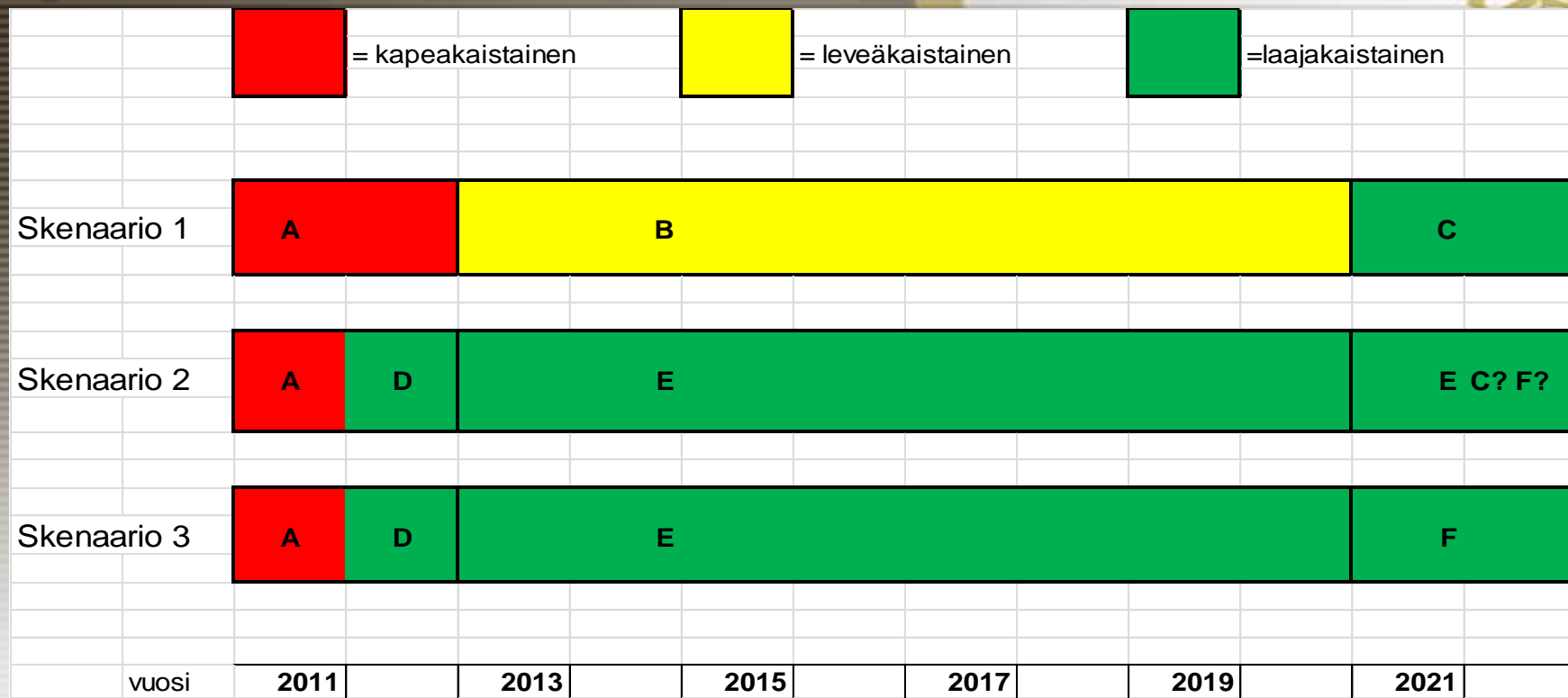
Risks:

Bottleneck is support for critical communication on other than TETRA technology. It may be so that technology of VIRVE will be changed but critical communication characteristics remain.

→ *Attractiveness an possibility growth significantly.*



Summary of scenarios



- Scenarios 2 and 3 are both attractive due early broadband availability
- In addition Scenario 2 give most of choices at the end of the timeline

➔ At the long run Scen 2 is most recommended.



Summary of present state , facts (F)

F1: VIRVE is best choice for voice communication of authorities,

- Does not exist competition.

F2: Data of VIRVE does not fulfil future needs.

- Slow data is robust and working well
- Wideband data (=TEDS) is possible to implement but doesn't solve all problems.
- TERA Rel 3 is not available before 2020 including some degree of uncertainty about implementation

F3:In addition to TETRA complementary technologies are needed anyway.

- Choices including 3G/HSPA, 4G/LTE, WLAN and SATCOM.
- As black horse @450 remain best choice regardless future of it .

F4:There is strong demand for dedicated broadband capacity for authorities now



Recommendations (S) for next steps 1/3

S1: Clarify, does it make sense to implement TEDS to VIRVE

- What is the planned coverage for the service,
 - What is rollout plan and
 - What is impact to the end users .
 - Comprehensive cost analysis (OPEX + CAPEX) is needed.
- ➔ State Security Network is responsible of this clarification task and decision making on it.



Recommendations (S) for next steps 2/3

S2: Clarify markets of multichannel routers

- Evaluation of potential choices and
- Selection of vendors
- Influence to the manufacturer to get features needed to have future proof products.
 - Important to have support for desired networks
 - Pay special attention for security characteristics, smoothness of handover between nodes and systems.
 - Handling of extraordinary situations ,
 - local and remote administration of the router
 - Type of interfaces and protocols toward C^3 systems .
- Multichannelrouter must be productized for authorities make it easy to use and robust packet.



Recommendations (S) for next steps 3/3

S3: Clarify that the requirements of next generation of CCC system (KEJO) and ERC system (TOTI) comply with governmental IT strategy guidelines:

- **Interoperability:** Architecture and interfaces
- **Reliability**
- **Security:** Information security and access rights

- Considering the interface definitions, especially definition of air interface must comply with:
 - Independent from any vendor (goal is multivendor environment)
 - Classification of prioritisation of data traffic



Additional future work (L)

L1: Classification of CCC system data on radio interface :

- Definition of the KEJO must be completed (by user cases) by message oriented and info element oriented classifications,
 - Make it possible to prioritise traffic on congested situations
- In addition clarification of possibilities of future network SW releases for message prioritisation.

L2: Follow up development of technology at @450network.

- When technology is clear assess possibilities of network for critical communication of authorities
- Before assess is done abstain reinvestments on it
- At least operator must compensate costs related technology swap.

L3: Clarify suitability of Satcom from TeliaSonera to broadband access for

authorities:

- Clarification includes field trials and guidelines created by experiences from trials.