Project Information

CELTIC
Telecommunication Solutions

Survivable Ad Hoc Networks for 4G and beyond

SAN project aims at developing a 4G broadband mobile wireless communication system endowed with a wide range of ad-hoc and relaying/mesh capabilities. SAN will provide a solution based on rapidly deployable, self-configurable mobile wireless network with no need of fixed infrastructures, external control / management systems. SAN will develop robust and cost-efficient solution for rescue teams and first responders organizations in a variety of scenarios when other communication networks are unavailable due to disaster, military actions, etc.

Main focus

Today, the telecommunication infrastructures are usually not properly protected against unexpected events/crisis situations. During earthquakes, several base stations may collapse, the remaining network is overloaded, and therefore in practical situations the network seems to stop working. Therefore, it is essential to invest into the R&D of solutions which enable people to communicate in such situations. SAN will especially focus into the develop-
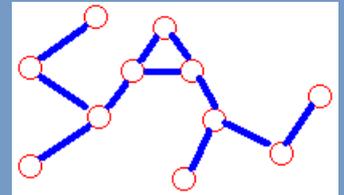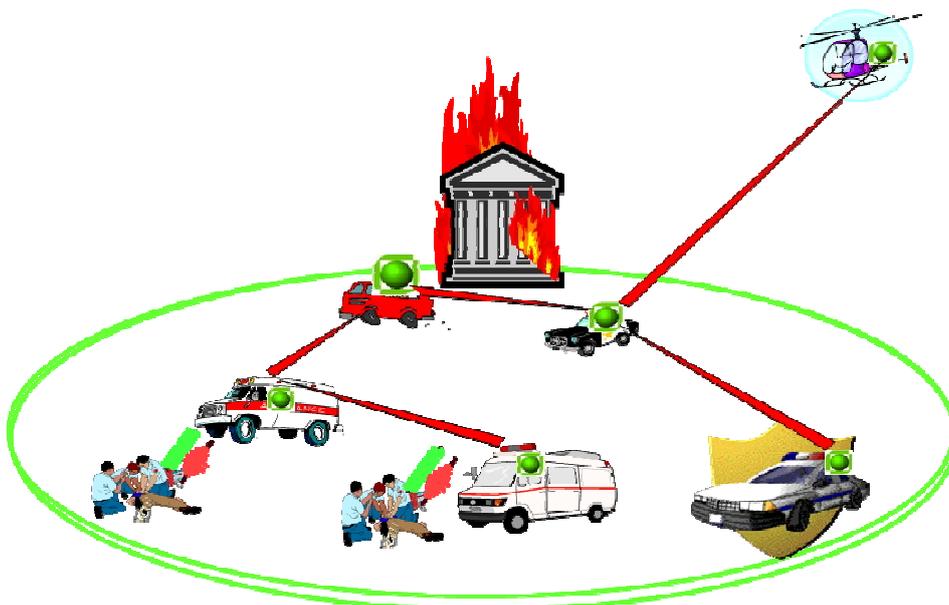
ment of survival ad hoc Network for 4G relying on the dynamic networking paradigms enabling people to communicate in a secure manner even if the fixed network infrastructure does not work at all.

SAN aims at resolving several fundamental shortcomings of modern wireless communication systems:

♦ Inability of direct communication between user equipments even when the link quality between them would allow transmission at high bit rates

♦ Need in complex radio planning to guarantee system performance,

♦ Need in cumbersome fixed infrastructure to connect nodes and base stations, and thus inability of rapid deployment required in many scenarios (disasters, military actions, etc.)

Approach

SAN project encompasses the whole LTE stack from bottom to top to end up with the integration of all these techniques in a demonstrator and the assessment of its

SAN

performance through a simulator:

♦ PHY level methods and algorithms for radio interface control, e.g. dynamic frequency allocation without prior planning, interference mitigation, efficient link adaptation and spectrum utilization, etc.

♦ Medium Access Control (MAC) level mechanisms, e.g. ad-hoc mobile relay mechanisms, robust and energy efficient advertising of link topology, link layer self-* capabilities in dynamic environment.

♦ Network and upper layer techniques, e.g. real-time topology discovery with optimized overhead, robust mesh routing in dynamic topology, multicasting and broadcasting in dynamic environment.

♦ An integrated SAN prototype system, for demonstration and evaluation purposes.

♦ System level simulator enabling the characterization in a global deployment, of the technology developed.

Main results

SAN's solution bases on a new concept and architecture for 4G broadband mobile wireless systems. The following technological innovations are foreseen as a result of the project:

♦ Innovative concept offering Broadband Mobile Dynamic network where *all components* of the network are mobile with no external network management. Such a network is assumed to be *survivable* also in unexpected events such as earth quakes, etc. A special challenge in such a network is enabling *secure operation* even if connection to any security infrastructure is not necessarily available at the time of deployment.

♦ Self-organizing broadband wireless systems - no need for a network engineer in the field and fully operational in matter of minutes.

♦ New channel models for self-organizing ad-hoc/mesh systems

♦ Direct device to device communication, multi-hop relay, broadcast and multicast, ...

♦ Incorporate *mobile multi-hop* relays into the current standardization process.

Impact

The potential commercial application of the developed technology is foreseen in just a few years after successful project completion. By the time LTE (considered as pre-4G technology) is widely available and demand grows in the market for more advanced technologies, SAN technologies will already be ripe, competitive and able to augment pre-4G and 4G systems with their unique features of autonomous operation, dynamic topology support, etc. Thus, with SAN technologies available to them industrial partners will be in a very good competitive position in the mobile communications market, which yields new revenues and new jobs both, for project partners and for respective national economies.

About Celtic

Celtic is a European research and development programme, designed to strengthen Europe's competitiveness in telecommunications through short and medium term collaborative R&D projects. Celtic is currently the only European R&D programme fully dedicated to end-to-end telecommunication solutions.

Timeframe: 8 years, from 2004 to 2011

Clusterbudget: in the range of 1 billion euro, shared between governments and private participants

Participants: small, medium and large companies from telecommunications industry, universities, research institutes, and local authorities from all 35 Eureka countries.

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