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Networking for Communications Challenged Communities (N4C)

Many regions do not have access to the optical fibres, copper cables and radio waves linking up the world's networks. Even access via satellite is denied to much of the Arctic region. The Networking for Communications Challenged Communities (N4C) project aims to extend Internet access to people, businesses and authorities operating in these remote locations. In cooperation with users in Swedish Lapland and the Kočevje region in the Slovenian mountains, the project will conduct field trials of architecture, design, infrastructure and applications.

N4C is funded by the European Commission's FP7 IST programme's FIRE initiative, grant no. 223994.

N4C

N4C Context

Remote regions are often vast and sparsely populated, with a relatively poor economic base so that deployment of conventional access technologies is not viable. Combined with the huge distances involved, this means that constant connectivity will not be made available in these regions. However, existing movement of people and transport within these areas, provides other opportunities to carry data to these regions. N4C aims to use emerging, novel technologies in these remote areas by creating an **opportunistic networking architecture** to exploit these communication opportunities.

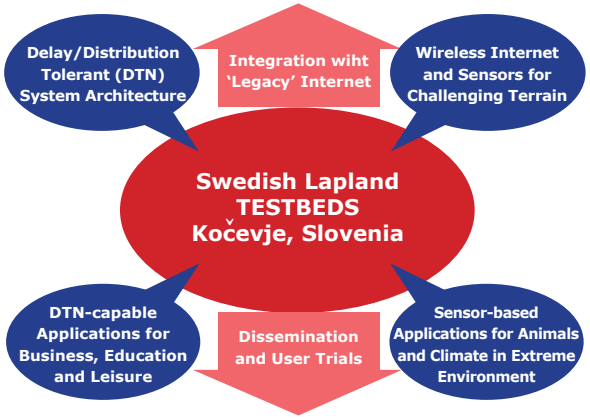
Gender and Cultural Perspectives

The ambition is to make broadband available in remote areas, specifically involving the local communities. N4C therefore has two main ethical concerns:

- the implementation should have a positive impact on the local community, supporting and enhancing the local culture and traditions, and
- employ gender-sensitive design and implementation to ensure that the whole community benefits from the project.

The Technical Approach

A key role in N4C is played by **Delay and Disruption Tolerant Networking (DTN)** technology, which addresses a wide range of technical problems, from interplanetary applications to terrestrial. DTN using an extended 'store and forward' paradigm to move 'bundles' of data across a DTN region of the network. A local connection between a pair of nodes can move a bundle, using only local protocol exchanges. This avoids the need for constant connectivity and the multiple end-to-end exchanges on the Internet, which could delay delivery.



N4C Architecture

The opportunistic networking architecture envisaged for N4C builds on **the Sámi Network Connectivity (SNC) architecture.** The SNC model uses a Delay Tolerant Network to relay data between nodes, within the DTN regions. Nodes can be either fixed or mobile, but both can act as relays within a DTN region. Bundles are guided by a novel form of opportunistic routing, PRoPHET, which was developed initially during the SNC project.

N4C Test Beds – Today and Tomorrow

At the core of N4C will be two ongoing testbeds demonstrating how DTN-based networking can be integrated with the existing Internet and investigating business models appropriate for communication challenged regions. **N4C will participate in the FIREworks Support Action** (http://www.ict-fireworks.eu/) supporting its efforts to create and maintain a European infrastructure of ongoing testbeds providing a realistic environment for testing new communications technology.

Standardisation

N4C will contribute to the standardisation efforts of **The Internet Engineering Task Force (IETF) and The Worldwide Interoperability for Microwave Access (WiMAX) forum.** The innovative PRoPHET routing protocol has already been introduced at the IETF and N4C aims to make its work available to a wider community through standardization.