

# Networking for Communications Challenged Communities

Notes on an EU FP7 Project  
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# The target of the N4C project

- ◆ The development, testing and deployment of ubiquitous, delay- and disruption-tolerant networking (DTN) for communications in highly challenged areas.
- ◆ In a manner consistent with an overall vision for a future Internet that can encompass not just users and applications in well connected regions, but that can also reach out to remote communities.

# Why N4C

## *Beating the Economics of Isolation*

- Communications:
  - A key enabler for economic growth
- Isolated communities with no effective communication
  - Risk deprivation spiral in existing culture
  - Inhibits development of new opportunities
- Access to the Internet is a key tool

# Challenges in Isolation

## Economic and Cultural

- ◆ Avoid diversity reduction
  - ◆ Support existing cultures
  - ◆ Maintain diverse and pristine landscapes
  - ◆ Add new opportunities
    - ◆ rather than replace old ones
- ◆ Keep the tool affordable
  - ◆ Infrastructure and running
  - ◆ Avoid need for high profit margin economics
- ◆ Support 'nomadicity'
  - Traditional and modern

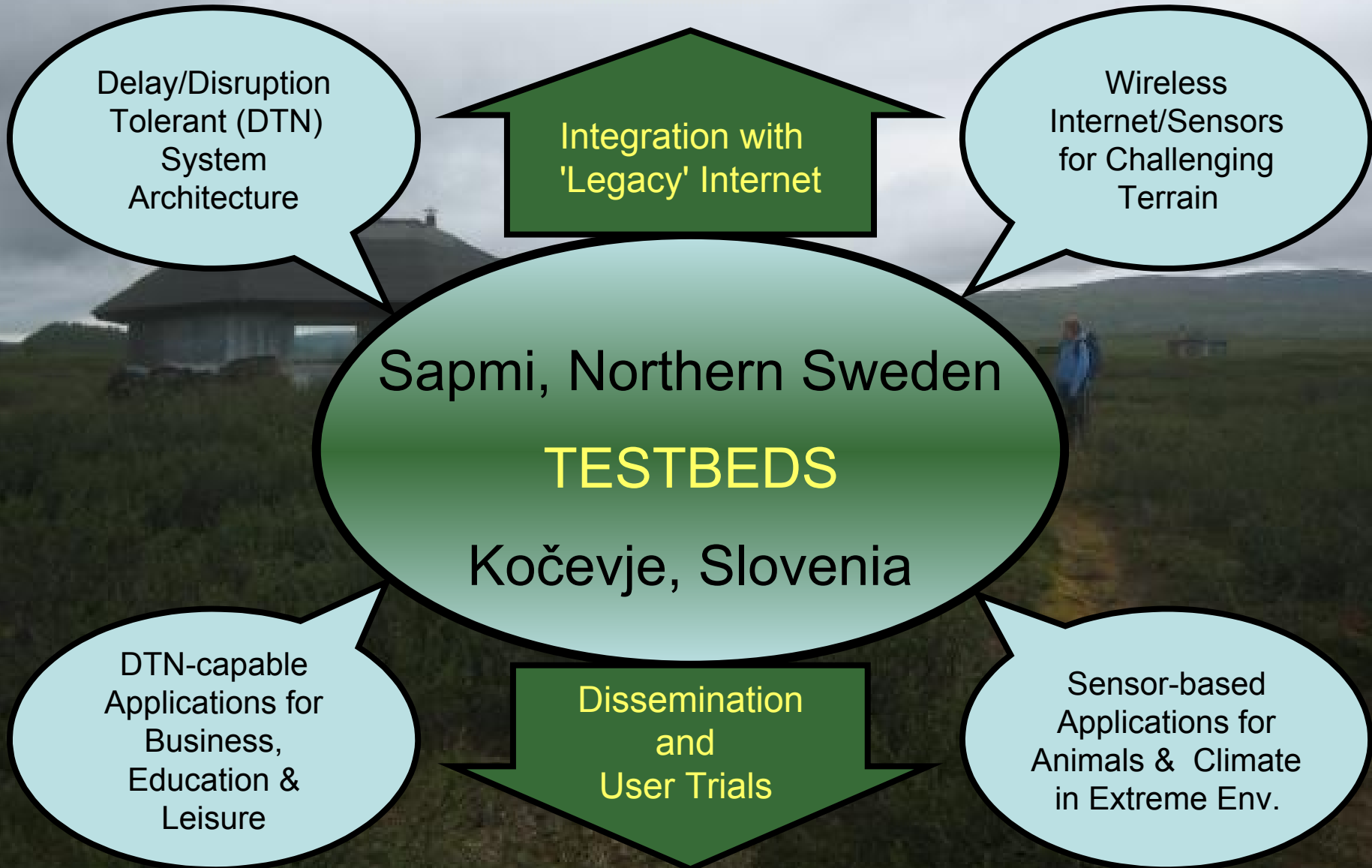
## Physical and Technical

- ◆ Living with the environment
  - ◆ Long distances
  - ◆ Low population density
  - ◆ Challenging topography
  - ◆ Extremes of climate
- ◆ Coping with minimal infrastructure
  - ◆ No 'mains' power
  - ◆ Limited physical access
  - ◆ Infrequent maintenance
- ◆ Utilizing intermittent connectivity

# Solution Space

- Handling intermittent connectivity via Delay Tolerant Networking (DTN)
  - Integration with the conventional Internet
  - Applications for human users and sensors
- Wireless connectivity for
  - Very wide areas with challenging topography
  - Applications with severely restricted power availability

# N4C Components

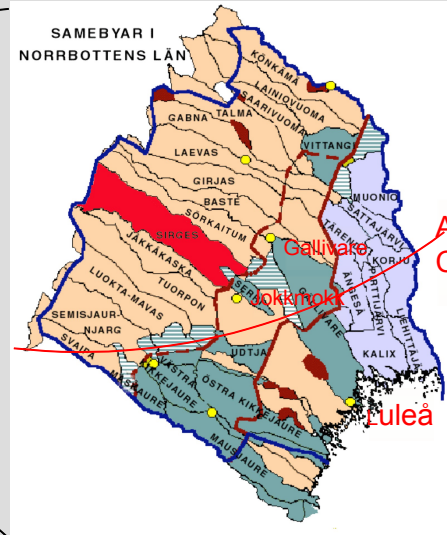


# N4C Technical Challenges

- ◆ Dealing with 'challenged' situations where synchronous communications not possible
- ◆ Issues:
  - ◆ Integration with 'legacy' Internet
    - ◆ interface gateways
    - ◆ use of unidirectional wireless
    - ◆ Vanilla applications when possible
  - ◆ Addressing and Routing - PРоPHET protocol
    - ◆ extending previous work
  - ◆ Security
  - ◆ Adapting applications to delay tolerant model
    - ◆ Web Usage
    - ◆ Transaction based, e.g. banking apps



# Test Bed Locations



Sapmi, Arctic Sweden



Kočevje, Slovenia



# N4C Partners

*Architecture, Test beds, Innovative Alliances*

Luleå Tekniska Universitet, Sweden (coordinator)

Albentia Systems, S.A., Spain

Universidad Politécnica de Madrid, Spain

INTEL Performance Learning Solutions Ltd., Ireland

Trinity College Dublin, Ireland

Norut IT AS, Norway

ITTI Ltd., Poland

Instituto Pedro Nunes, Portugal

MEIS storitve za okolje d.o.o., Slovenia

Tannak AB, Sweden

Power Lake AB, Sweden

Folly Consulting Ltd., UK



Thank you...

Questions?

