



UNIVERSITY OF JYVÄSKYLÄ

# Research at Telecommunication Laboratory, University of Jyväskylä

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# Outline

- Resources
- Competence areas
- Past projects
- Current projects
  - NGNAP
  - LaiLa
  - WIMALE
- Future projects
  - IMS
  - E2E QoS

## Resources

- Staff:

- 3 professors
- 6 post docs
- 15 PhD students
- Tens of MSc students

- Laboratory premises:

- Routers, switches, DSLAMs, firewalls, WLAN APs, ...
- Flash-OFDM / @450 client devices
- IPTV, VoD, VoIP, etc. servers
- IPTV SetTop Boxes, Mobile clients, etc.

## Competence areas

- Quality of Service
  - Scheduling algorithms
  - Performance monitoring
  - Radio resource management
- Triple play services
  - IPTV
  - VoD
  - VoIP
- Wireless networks and their protocols
- Network management and monitoring

## Some of the Past Projects

- TeraBitti (1999-2004)
  - QoS issues on IP and MPLS networks and pricing based scheduling items were studied
  - Digita, Kesnet, Yomi Fusion, WTS, Jyväskylä science park
- PalHaLa (2004-2006)
  - Triple play network was built to the laboratory
  - Pilot customers tested the services with their ADSL connections
  - Digita, Elisa, Yomi Service, Nokia Networks, Ortikon Interactive, SofiaDigital
- VizTool (2004-2006)
  - A network monitoring software was implemented with Nokia Networks
- VerHo (2004-2006)
  - Co-operation with Jyväskylä polytechnic
  - In this project, vertical handovers were studied and a mobility management software was implemented to mobile device
- Broadband internet connection to the trains

# Current Projects

## LaiLa

- LaiLa (Langattomien laajakaistapalveluiden hallinta multiaccess- verkoissa) is a TEKES funded project
  - 1.6.2006-31.5.2008
- Companies
  - Digita, Arena Partners, SysopenDigia, NSN, WTS Networks
- The target of the project is to study the issues of managing heterogeneous access networks and triple play applications at there
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## LaiLa – Current Activities

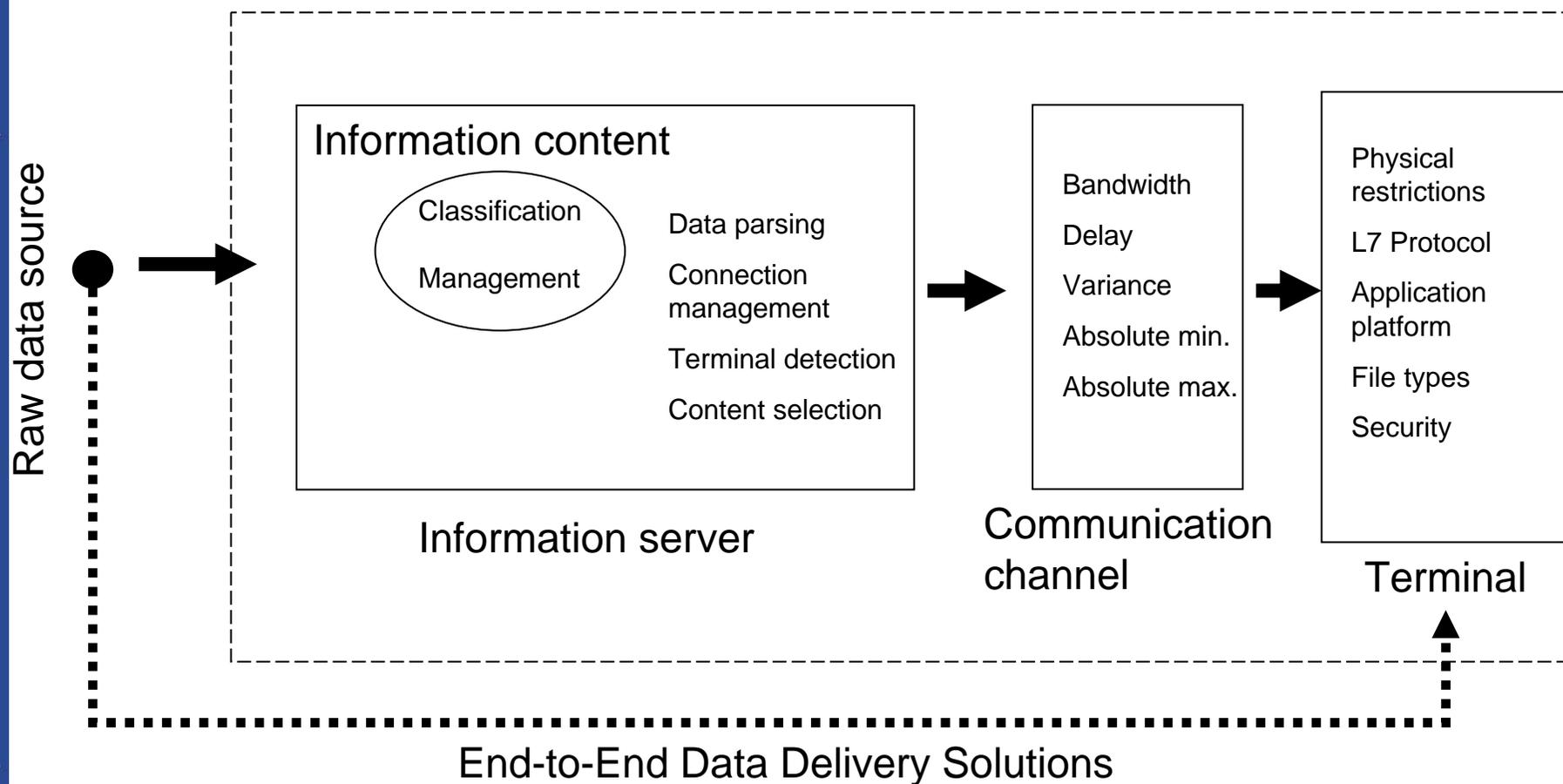
- VoIP management in heterogeneous access networks
  - VoIP QoS in @450 / Flash-OFDM
  - VoIP performance monitoring
  
- @450 / Flash-OFDM service operator case study
  
- Network management systems interoperability using NGOSS model by TeleManagement Forum
  - OSS/J API usage
  - The advantages of SID model
  
- Co-operation in WiMAX studies

# NGNAP

- Next generation network applications in process industry
- Consortium
  - University of Jyväskylä
  - Tekes
  - TeliaSonera
  - Metso Paper
  - Liqum
- The goal is to find new business opportunities in the field of process industry
  - Networking, service and management solutions
  - Remote and mobile methods
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# NGNAP - Framework

Integration Operations



# WIMALE

- A co-operative project with Nokia Research Center / Nokia Siemens Networks
- The project has been active since 2005
- Currently 4 PhDs, 3 PhD students and several MSc students are involved
- The target of the project is to implement a complete WiMAX / 802.16e extension to the NS-2 network simulator
- The simulator is being used to study the peculiarities of WiMAX networks
  
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## WIMALE - WINSE

- WiMAX (802.16) extension to NS-2 network simulator has been implemented (*WINSE*)
- WINSE has been used in several studies as the main tool to validate the analytical results
- It includes most of the MAC layer features defined in IEEE 802.16e specification
  - Signaling between SSs and BS
  - Fragmentation, packing
  - ARQ, contention resolution, multicast polling, QoS scheduling
  - Network entry and leave, ...
- Some emulative PHY layer is also included
  - OFDM / OFDMA frame structures

## WIMALE – Research topics

- QoS scheduler for the base stations
- Contention resolution parameter optimization
- Adaptive contention resolution tuning algorithm
- Multicast polling parameter optimization
- Optimal ARQ parameters
- Optimal MAC PDU size
- ARQ aware scheduling
- Optimal parameters for VoIP connections

## WIMALE results

- 1 PhD thesis and 2 MSc theses
- 1 journal article and 9 conference articles have been accepted / published
  - Several others are on progress
  - List of articles can be found from: <http://research.jyu.fi/winse>
- 2 PhD students and several MSc students are working with their theses

# Projects in future

## Projects beginning at 2008

- Three new projects are being prepared on following subjects:
  - 802.21 (Contact persons: Tapio Väärämäki – [taolvaar@jyu.fi](mailto:taolvaar@jyu.fi) and Jani Puttonen - [jani.puttonen@magister.fi](mailto:jani.puttonen@magister.fi))
  - User management and IMS possibilities (Timo Hämäläinen – [timoh@mit.jyu.fi](mailto:timoh@mit.jyu.fi))
  - E2E QoS (Timo Hämäläinen – [timoh@mit.jyu.fi](mailto:timoh@mit.jyu.fi))
  
- WIMALE project will also hopefully continue in future

**Thanks for your attention!**

Questions?

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