Communication Networks & Systems NETS

Bengt Ahlgren
Lab manager
People

• **Staff**
  - Anders Gunnar, Ph Lic
  - Bengt Ahlgren, Ph D
  - Björn Grönvall
  - Henrik Abrahamsson
  - Ian Marsh, Ph Lic
  - Javier Ubillos
  - Laura Feeney

• **Visitors**
  - Prof. Holger Karl, Univ Paderborn (Nov 17-28)
Research areas

- **Internet traffic management**
  - Objective: enhance the performance and utilisation of networks
  - Topics: traffic characterisation, flow optimisation, network monitoring

- **Future Internet architectures**
  - Objective: research towards next generation Internet infrastructure
  - Topics: network architecture, multi-access systems, delay tolerant networking, naming & addressing, network of information

- **Communication in multi-hop wireless networks**
  - Objective: increase performance and energy efficiency of multi-hop wireless networks
  - Topics: energy saving protocols, cross-layer issues, challenged networks, sensor networks

- **Support for real-time media communication**
  - Objective: control quality of packetised voice over IP
  - Topics: VoIP handover, VoIP over WiFi, voice quality assessment

- **Support for small systems**
  - Objective: make small devices integral part of networked systems
  - Topics: protocol and OS implementation, sensor networks, interconnection with fixed networks
4WARD Architecture and Design for the Future Internet

- EU Integrated project 2008-2009
- Coordinated by Ericsson, EU budget 14.4 MEUR
- Research on network architecture and technology beyond today's Internet and mobile systems

SICS' contributions:

- **Network of information**  building a network architecture using an information-centric communication paradigm rather than node-centric

- **Multi-path routing**  increasing reliability by utilising multiple paths

- **Self-organising management plane**  schemes for collaborative identification and isolation of threats or faulty components
WISENET

- Interdisciplinary center for wireless sensor networks
  - Micro-systems technology; sensors; wireless communication; operating systems; networking; security; applications

- VINNOVA-funded VINN Excellence Center
  - Led by Uppsala University; Prof. Per Gunningberg
  - Partners include SICS, Swedish Defense Research Agency and Swedish Railroad Administration and several SME's
  - Ten year framework: 2007-2017 (up to 200 researchers)

- NETS topics: networking and energy management
  - Energy efficient media access control
  - Configuration and deployment issues
Decentralized wireless sensor networks

- Energy efficient media access control
  - Devices sleep to reduce energy consumption
  - Adaptively coordinate sleep schedule and media access; improve efficiency of both
  - Idea: Simple CSMA MAC with an asynchronous TDMA overlay

- Deployment scenarios
  - Co-located sensor networks from different administrative domains ... is cooperation possible?
SICS Center for Networked Systems

- A center of excellence started 2007
- Total budget 13.11 M SEK/year (approx 1.5 M Euro/year)
- Duration: 3 + 3 years with evaluation in between
- Builds on a vision of the reliable Internet
- SICS labs: NETS, CSL, IAM, SPOT
- Industry: ABB, Ericsson, Saab, T2Data, TeliaSonera
- Academia: KTH, Mälardalen University, Uppsala University
- Research areas:
  - 1. Networking and communication systems
  - 2. Networked systems management and security
  - 3. New networked environments
Internet traffic management

Traffic information

"Investigate methods for estimating the traffic matrix from link loads.

"Investigate variability and other characteristics of Internet traffic.

Optimization

"The traffic engineering is modeled as a flow optimization problem.

"Investigate different cost functions to obtain solutions with desired properties.

"Trade-off between efficiency (shortest-paths) and load-balancing.

Routing

"Investigate methods for optimizing the weight-settings in legacy routing protocols.

"New routing mechanisms based on optimization techniques.

"Evaluate the robustness of traffic engineering techniques and how they manage to handle Internet traffic dynamics.
REA  Routing Architectures  Evaluation

- Collaboration with Ericsson AB
- Research on mitigation of BGP routing scaling issues. E.g.
  - Provider independent addressing of edge/corporate networks
  - Edge/corporate network multi-homing
  - Resulting in too large routing tables
- REA will implement and review a Six/One router prototype
  - Six/One router divides the global namespace into
    - Routing namespace
    - Host namespace
  - Uses address translation rather than tunneling
    - Permitting backwards compatibility
    - Lowering packet overhead

| IPv6 | 1000:AAA:1:1234 | e52d:3ae2:6b28:f82 |
Resource Management for IP-Based Mobile Communication Systems

- Collaboration between
  - Huazhong University of Science and Technology, Tsinghua University and Shanghai Jiao Tong University in China
  - KTH and SICS in Sweden
  - Funded by VINNOVA and MOST over four years
  - Goal to establish close cooperation

- Topics
  - resource allocation in the context of virtualized networks
  - traffic engineering methods for supporting traffic shifts due to mobility
Nordunet3 projects

- **NordicHIP**
  - Host Identity Protocol development
  - PI: Andrei Gurtov, Helsinki University of Technology

- **Adimus**
  - Adaptive Internet Multimedia Streaming
  - PI: Wolfgang Leister, Norsk Regnesentral
  - Other partners: SICS (Ian Marsh), VTT
ADIMUS (Adaptive Multimedia Streaming)

- Network and terminal support for video streaming
- SICS's work focusses on quality estimation
Some past projects

- **RUNES** Reconfigurable Ubiquitous Networked Embedded Systems
  - EU Integrated Project research on small embedded systems which communicate, platforms and tools
  - *SICS contributions:* Network and operating systems, Software development and verification

- **Ambient Networks**
  - EU Integrated Project research towards mobile systems beyond 3G systems
  - Main idea: *Automatic network composition*
  - *SICS contributions:* Design and prototype implementation of a dynamic Internet architecture with node and network mobility built-in
More info...

www.sics.se/nets