

# Computer and Network Architectures laboratory

## CNA Scope

**We are carrying out research to enhance the computer and network platform for future distributed applications**

## CNA staff

- Manager:** Bengt Ahlgren, PhD
- Lab advisor:** Stephen Pink, prof (Univ. of Arizona)
- Full time:** Henrik Abrahamsson  
Lars Albertsson (PhD student)  
Laura Feeney (guest researcher)  
Björn Grönvall (PhD student)  
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Assar Westerlund
- Part time:** Olof Hagsand, PhD (Dynarc AB)  
Gunnar Karlsson, prof (KTH/IT)  
Peter Magnusson (Virtutech AB)  
Olov Schelén, PhD (LTU)

## Future of networking

- **All communication, fixed, mobile or otherwise, will be run over the Internet, or at least using Internet technology (“everything on IP” and “IP on everything”)**
- **Always connected trend – the logical continuation of the development of mobile communication**
- **Appliances, i.e., tiny things, will be connected to the global infrastructure**
- **IP over Wave Division Multiplexing (WDM) makes ATM and SONET unnecessary**

## Areas of research

- **Protocols and Networks**
- **Mobile Computing and Communication**
- **Scalable Distributed Applications**
- **Computer Architecture Simulation**

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# Protocols and Networks

## *Research issues:*

- **simple mechanisms for prioritising traffic: differentiated services – diffserv**
- **network and traffic class *dimensioning*: modelling, simulation and measurements – delay and loss as functions of bandwidth, number of sources and buffer size**
- **traffic analysis and modelling**
- **pricing – charging**
- **operating system support for communicating real-time applications**

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# Mobile Computing and Communication

## *Research issues:*

- **coping with network heterogeneity**
- ***ad-hoc* and *spontaneous* networks: routing, Internet connectivity, power consumption/management, and policy/security**
- **protocol implementations with *small memory footprint* for appliances**
- ***proxy* server support for minimal protocol implementations**
- **security for small units**

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# Scalable Distributed Applications

## *Research issues:*

- **very large distributed systems – millions of users**
- ***peer-to-peer* paradigm vs. client/server**
- **availability, latency hiding, scalability, minimising bandwidth use**
- **security functions**
- **application layer framing, network consciousness**

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# Computer Architecture Simulation

## *Research issues:*

- **instruction set simulation effective approach to functional and perf. analysis**
- **verifying *real-time properties* of applications using an instruction set simulator – timing analysis**
- **verifying *dependability properties* of applications using an instruction set simulator – fault injection**

## Some CNA results

- **IP address lookup in HW: 50M lookups/sec**
- **JetFile: a scalable distributed filesystem using IP multicast**
- **One of the first IPv6 implementations (HP-UX)**
- **SimICS, an instruction set simulator, now commercialised in a spin-off company: Virtutech**
- **An empirical web client traffic source model**
- **Voice over IP: link and traffic class dimensioning models**
- **IPv6 header compression standard in the IETF (collaboration with Luleå Technical University)**