

IIP Research Project TCP Performance Studies

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Presentation slides available at:

<http://www.cs.helsinki.fi/research/iwtcp/ws/>

Department of Computer Science

SUB-PROGRAMMES

- 1) Computer Science
- 2) Applied Computer Science
- 3) Teacher in Computer Science
- 4) Professional upgrading programme

SECTIONS IN CS

- 1) Algorithms
- 2) Intelligent Systems
- 3) Software Engineering
- 4) Distributed Systems and Data Communications
- 5) Information Systems

NODES Group

- 3 professors
- 8 lectures
- c. 25 researcher in projects
 - c. 15 M.Sc students
 - c. 10 Ph.D. students
- c. 15 Ph.D. students in industry

Motto:

*Any technology distinguishable
from magic is insufficiently
advanced.*
Gregory Benford

RESEARCH AREAS (The NODES Group):

Wireless Internet, Distributed Software Systems, Formal Methods for Protocol Development, Linux Development

- Studies how systems can be divided into independently working parallel parts, and how these parts communicate with each other
 - Functionality in the basic components,
 - the protocols between the parts,
 - performance evaluation

Some NODES Research Topics



- **Wireless Internet**

- Communication over wireless (all protocol layers)
- Middleware for mobile computing

- **Linux Developments**

- Timeliness and high availability in Linux
- Open Source Middleware for Linux OS

- **Standardization**

- IETF, OMG, W3C

Wireless Internet Project Family

IIP Mixture
2003-2004

MIND:
2001-2002

IIP Wireless
2002

TranSat:
2001-2003

Fuego Core:
2002-2004

BRAIN:
2000-2001

IIP Mobile
2001

Monads:
1998-2000

wCORBA 1998-2000

IWTCP
1999-2000

DOLMEN: 1995-1998

Mowgli: 1994-1999

<http://www.cs.Helsinki.FI/Kimmo.Raatikainen/#projects>

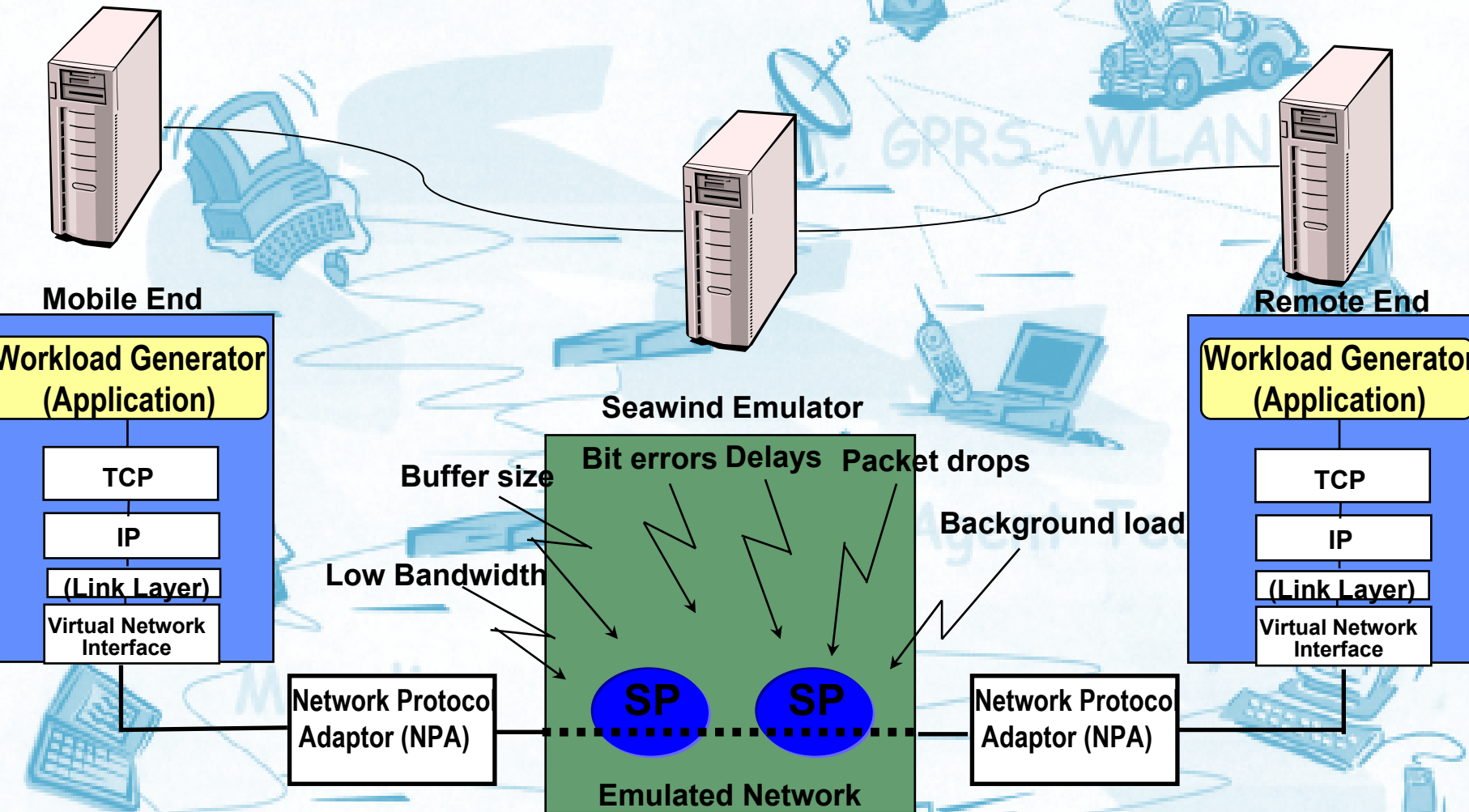
IIP: Major Achievements

- **Protocol enhancements and evaluation of protocol behavior**
 - TCP F-RTO algorithm and other minor TCP enhancements implemented in Linux OS
 - The new enhancements and various existing enhancements evaluated through a set of performance studies
- **Contributions to the IETF:**
 - draft-sarolahti-tsvwg-tcp-frto (work in progress) and contributions to other documents of IETF working groups PILC and TSVWG
 - Contributions completed during IIP-Mobile: RFC 3135, RFC 3150, RFC 3155
- **Seawind network emulator has been developed further and is now a mature tool licensed by other academic institutes**
- **Strengthening the team expertise:**
 - the project has substantially helped in recruiting new international Ph.D students
 - 3 new Ph.D candidates have joined the group (two of them have started in the follow-up project IIP Mixture in 2003)

Intellectual contribution

- Good understanding of TCP behavior in a wireless environment
 - Performance measurements executed in the project have further broaden the previous understanding
- New TCP algorithms and variations of existing algorithms developed
- Seawind has proven to be an excellent tool for studying Internet protocol behaviour in wireless environment
 - Seawind allows evaluation of real Internet protocol implementations and has advanced features not present in other tools
 - Seawind is also appreciated by other academic users

Seawind



NODES Contributions to Wireless Internet



- Improved Wireless Communication
 - TCP enhancements: *RFCs, Internet draft and Linux kernel*
 - Localized RSVP for resource allocation in access network alone: *Internet draft*
 - IP QoS in access networks using DiffServ
 - Wireless CORBA: *OMG standard*
 - Wireless JAVA RMI: *to be contributed into JSR*
 - Efficient Agent communication: *FIPA standard*
 - TCP-friendly Adaptive Link Layer protocol for satellite links: *under construction in an ESA project*
 - SOAP over wireless links: *under construction*

Environment under study in the recent IIP experiments

narrow bandwidth, corruption losses, variable and constant delays

congestion losses, queuing delay

Mobile Host

Fixed Host

Last-hop Router

Wireless link

congestion losses, latency, reordering

Internet

