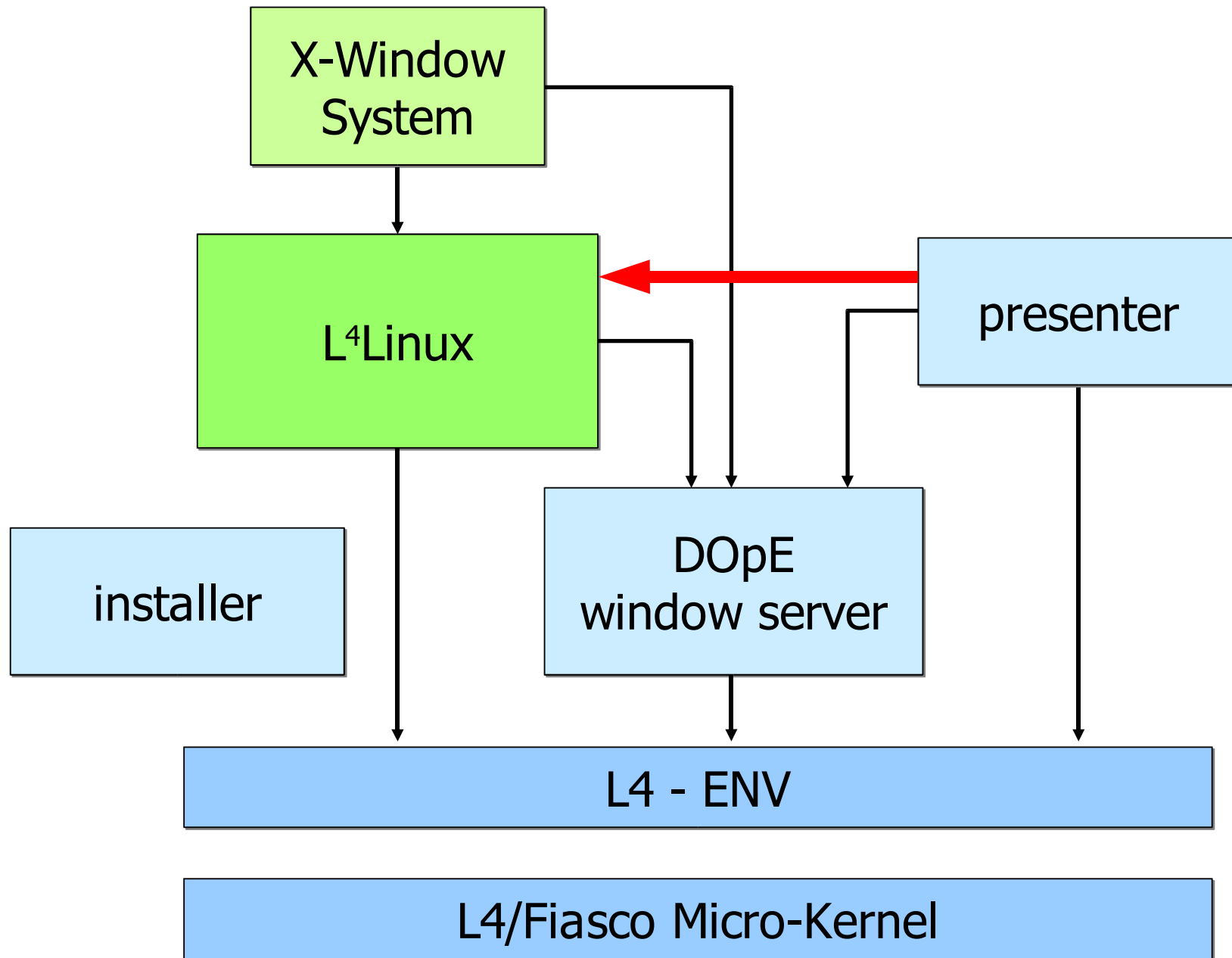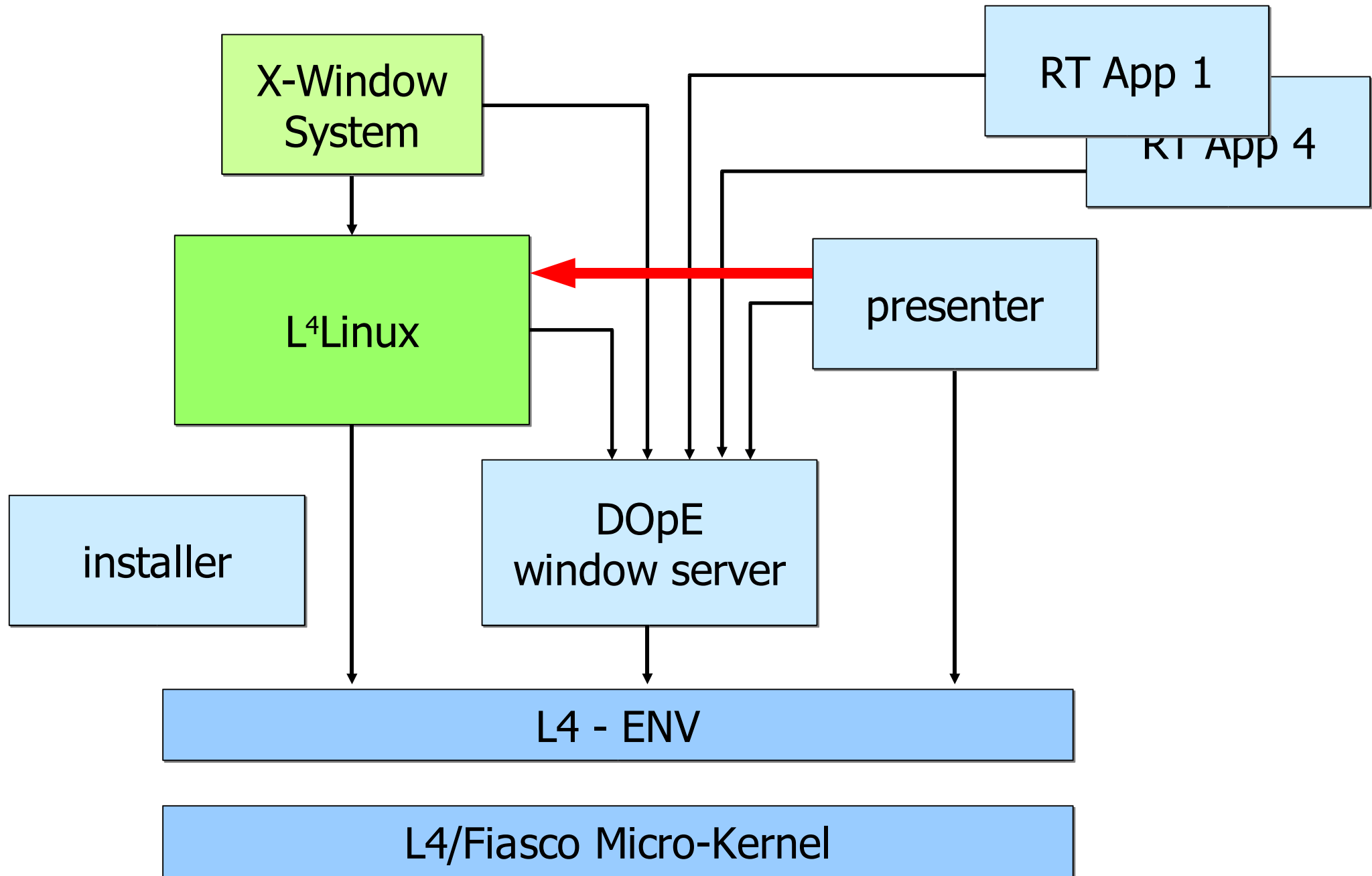# Betriebssysteme-Forschung

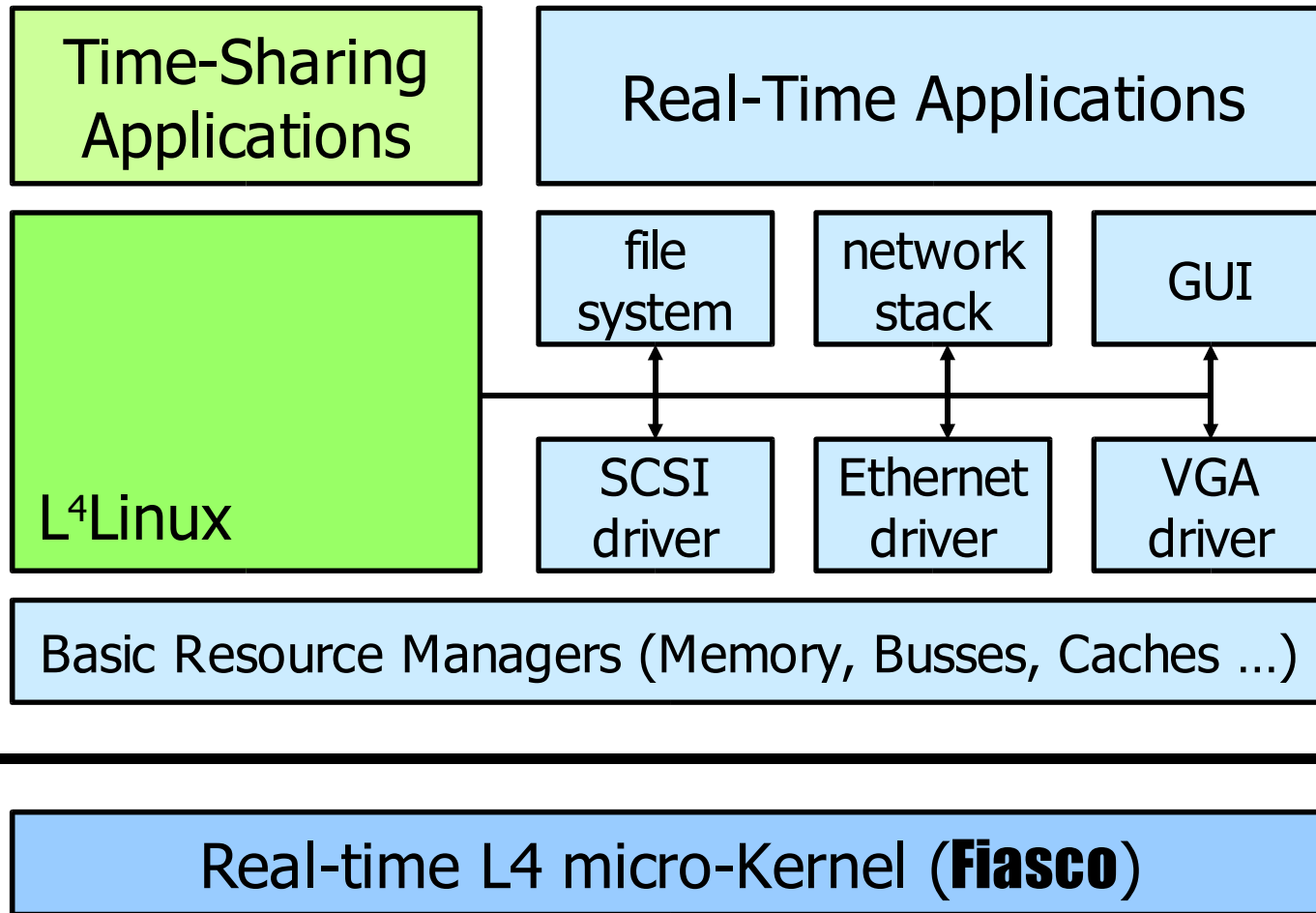an der

TU Dresden

Hermann Härtig

Objectives for Real-Time Systems

- Real-Time and Non-Real-Time share resources: computers, networks, ...

- Mathematically sound basis for Soft-Real-Time (imprecise computations)

- include all resources in scheduling (cpu, memory, caches, busses, disk, network, GUI, ...)

- extend methodology towards component-based SW engineering (DFG Forschergruppe COMQUAD)

DROPS Architecture

Time-Sharing Applications

Real-Time Applications

L⁴Linux

file system

network stack

GUI

SCSI driver

Ethernet driver

VGA driver

Basic Resource Managers (Memory, Busses, Caches ...)

user

kernel

Real-time L4 micro-Kernel (**Fiasco**)

5

Recent Results in Real-Time

- Quality Assuring Scheduling Deploying Stochastic Behavior to Improve Resource Utilization – RTSS 2001

- Pragmatic nonblocking synchronization for real-time systems – Usenix 2001

- Cost and benefit of separate address spaces in real-time operating systems, RTSS 2002
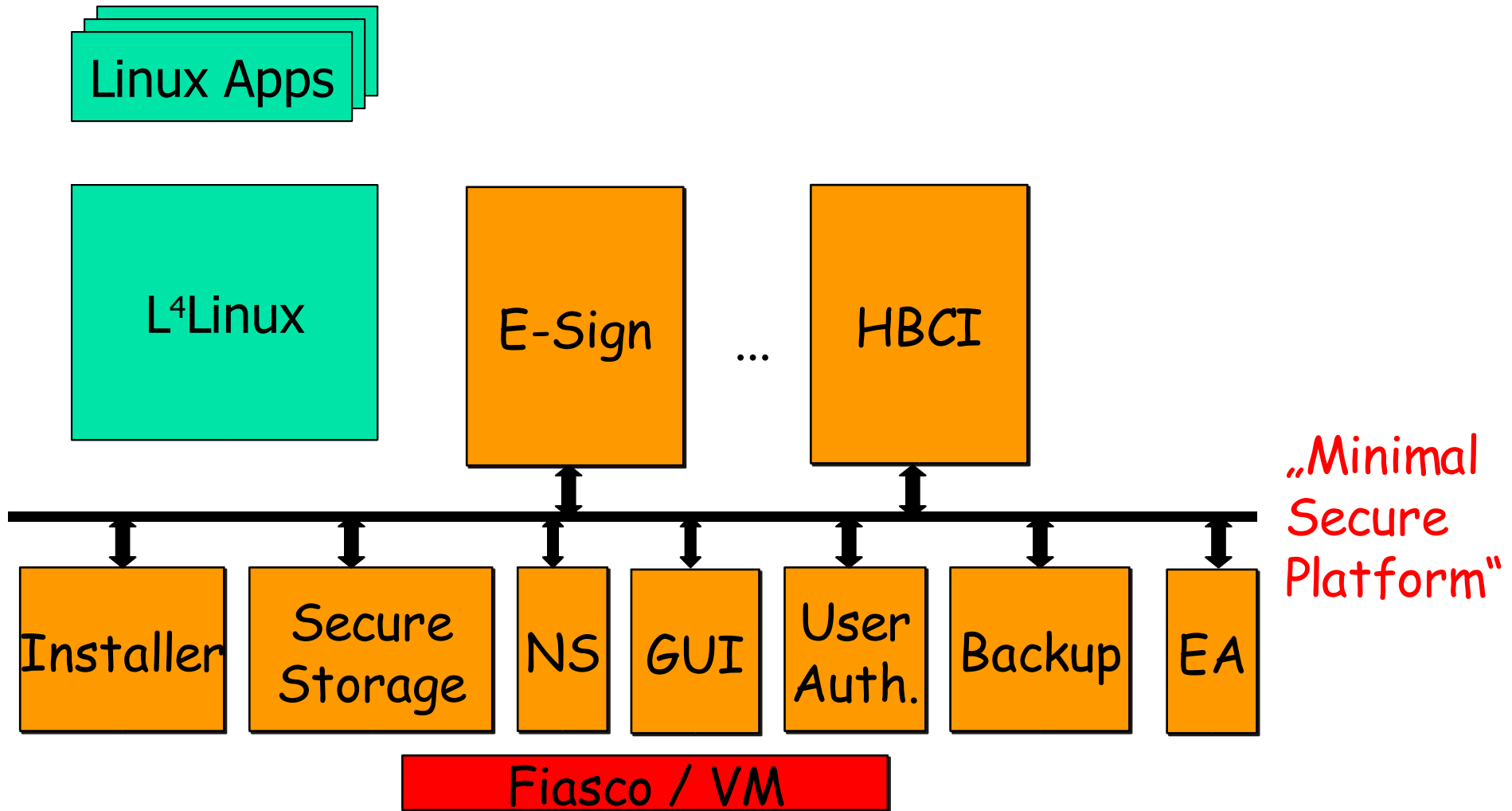
Recent Results in Real-Time, cont

- Rotational-Position-Aware Real-Time Disk Scheduling ... RTSS 2003

- DOpE a Window Server for Real-Time and Embedded Systems – RTSS 2003

- Impact of PCI-Bus Load on Applications in a PC Architecture – RTSS 2003

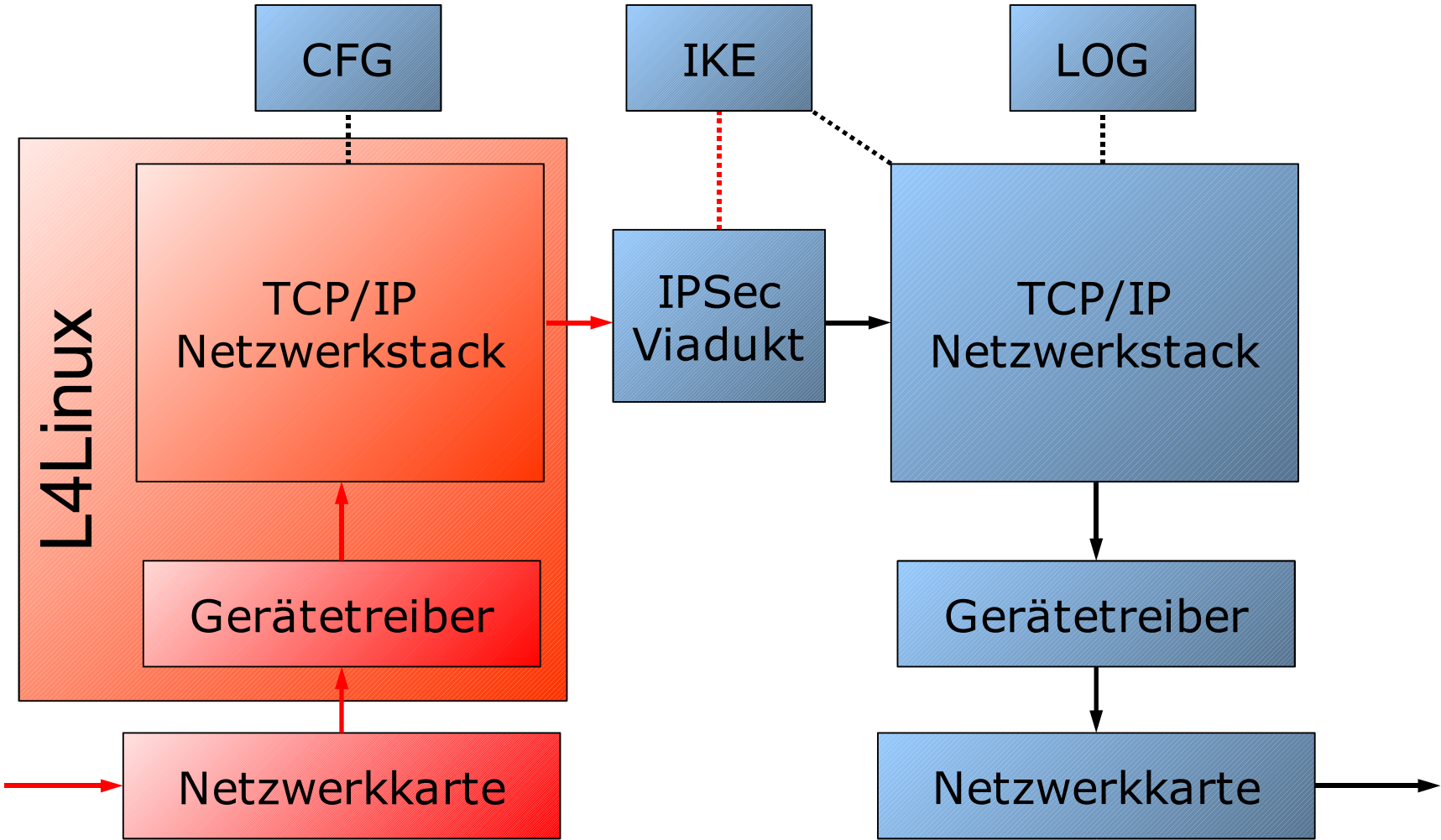- High-Bandwidth Hard Real-Time ober Switched Ethernet (to be published)

Objectives for System Security

- Applications with very high security demands share computers with *rubbish* applications

- extremely small trusted computing base

- try to formally verify important properties of the Fiasco kernel (DFG: Vfiasco, with theory group)

- demonstrate results with an application

NIZZA Architecture

Linux Apps

L⁴Linux E-Sign ... HBCI

„Minimal Secure Platform"

Installer Secure Storage NS GUI User Auth. Backup EA

Fiasco / VM

9

Micro-Sina

Recent Results in System Security

- Security Architectures Revisited – European SigOps 2002

- demonstratable (but incomplete) system with extremely small TCB

- L4 interface extended by *capabilities* (with Jon Shapiro, EROS John Hopkins)

- Micro-Sina-VPN as an application (almost)

- visit us at CEBIT

Not so recent, but still :-)

Time-Sharing Applications

L^{4}Linux

Fiasco

(Härtig, Hohmuth, Liedtke, Schönberg, Wolter: The Performance of μ-Kernel based Systems, SOSP 1997)
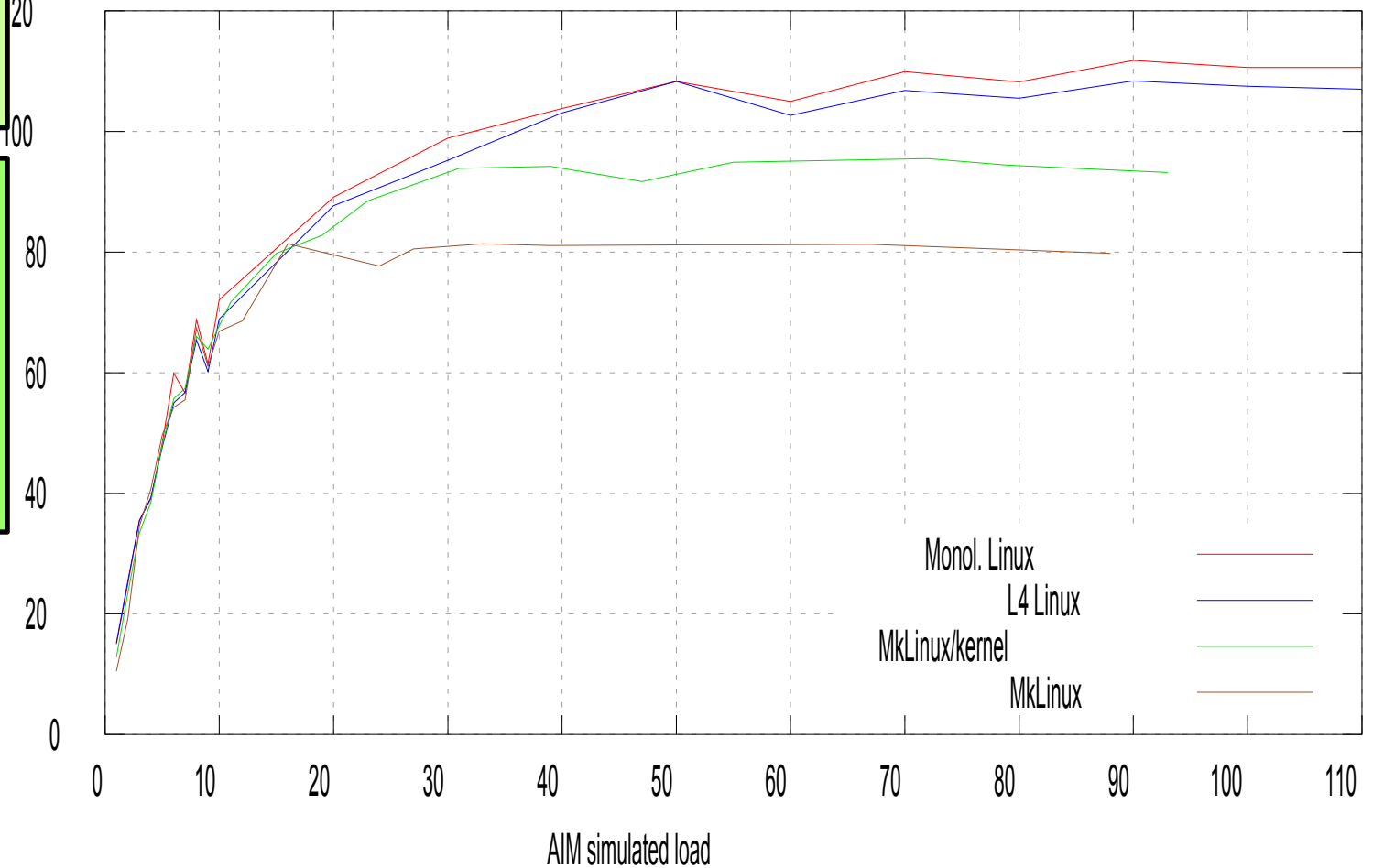
jobs per minute

simulated load

Linux on L4 Performance, compared to MACH

Time-Sharing Applications

L⁴Linux

Fiasco

AIM Suite-VII benchmark - jobs per minute

- Monol. Linux
- L4 Linux
- MkLinux/kernel
- MkLinux

AIM simulated load

Some of our Partners and Sponsors

L4: UKA, UNSW (Sydney), (John Hopkins ?)

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Zurich New York, ST Microelectronics, HP
Palo Alto, ...

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Copenhagen, U Saarbrücken, ...

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