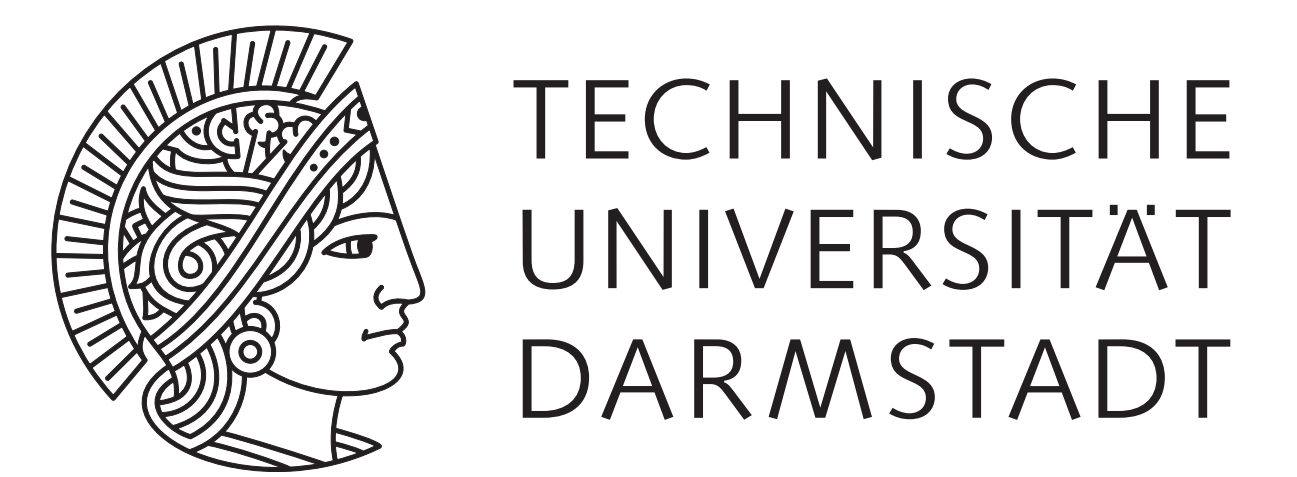


The EPICS-based Accelerator Control System of the S-DALINAC*



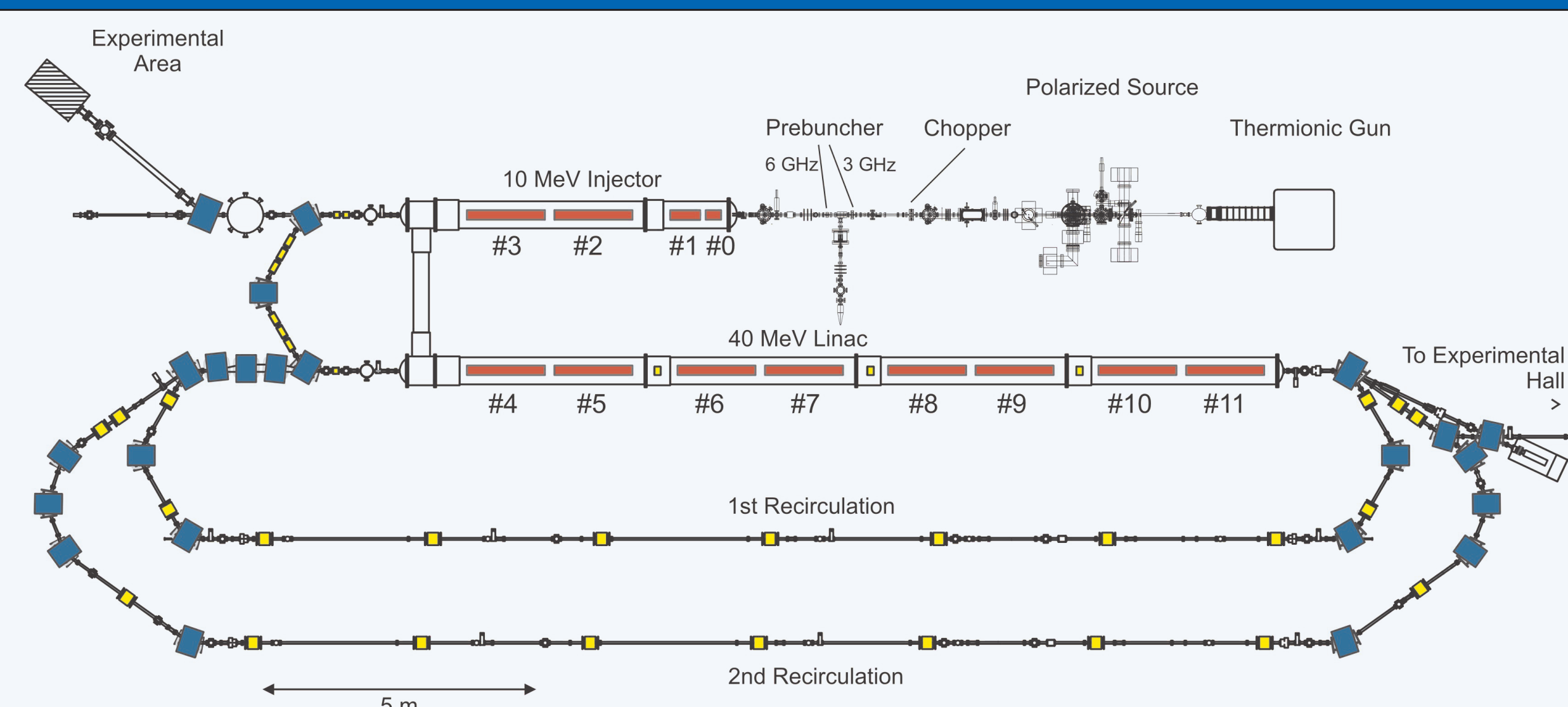
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S-DALINAC Accelerator Control System

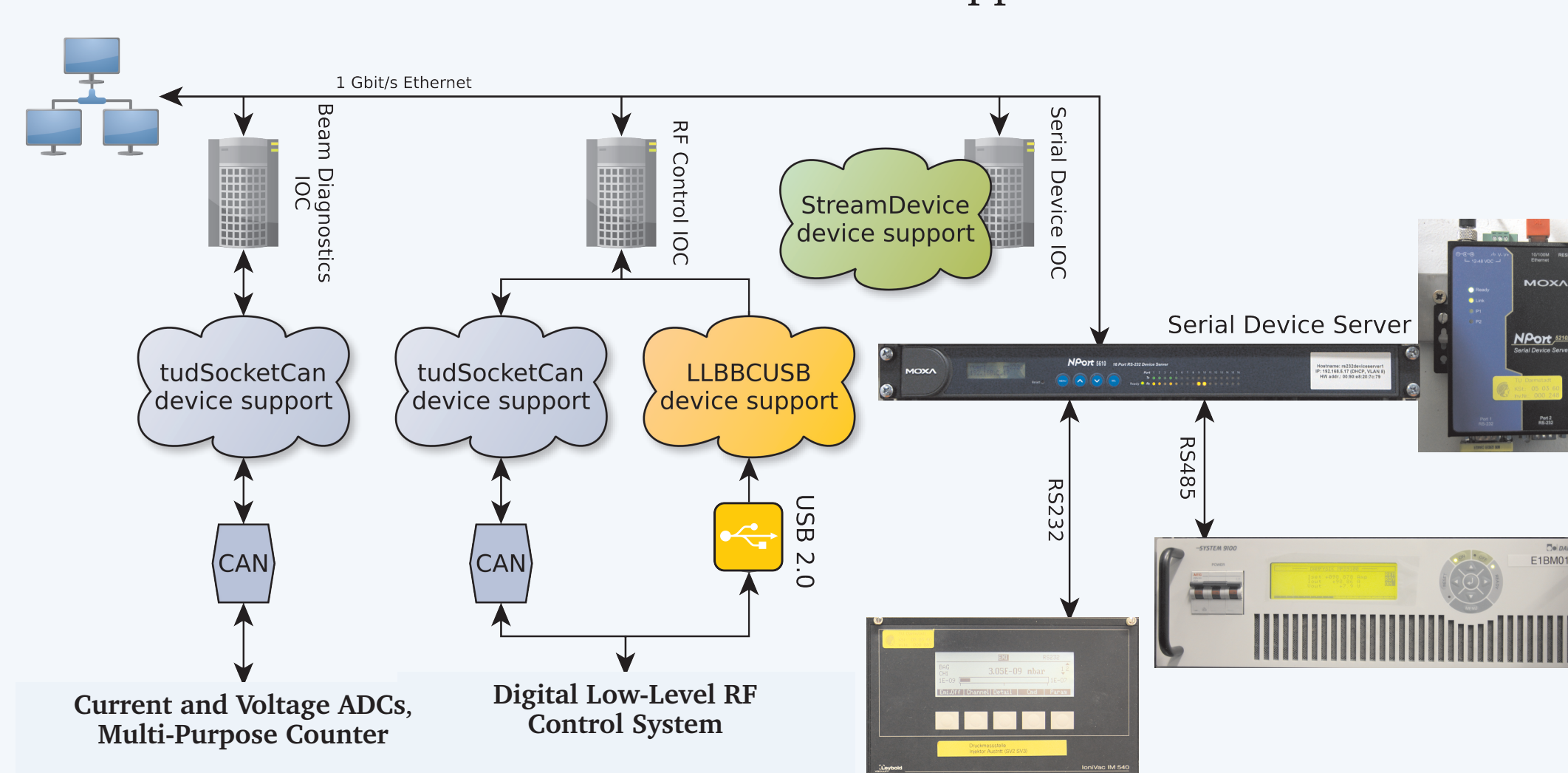


Superconducting Darmstadt Linear electron Accelerator

- polarized or unpolarized electrons
- Design energy: 130 MeV
- Beam Current: 20 μA at 130 MeV
- rf superconductivity at 3 GHz
- continuous wave operation
- double recirculation scheme

EPICS IOC Configuration

- Off-the-shelf PC hardware or VM, running Debian Squeeze Linux
- EPICS 3.14.12
- StreamDevice Device Support and SNL Sequencer are utilized
- Custom SocketCAN and USB 2.0 Device Support for custom hardware



SocketCAN Framework

- part of Linux kernel since 2.6.25
- many device drivers included
- analogous to internet protocols like TCP/IP
- uses BSD socket as connection end point

SocketCAN Device Support

- approx. 1300 lines of plain C
- build dependencies: Linux kernel source and EPICS base
- independent of the PC CAN interface manufacturer

Supported Record Types

- analog, long and binary in/out
- multi binary (direct) in/out

Paper on SocketCAN Device Support:
<http://accelconf.web.cern.ch/AccelConf/pcapac2012/papers/thpd13.pdf>



Network Structure and General Services

General Network Structure

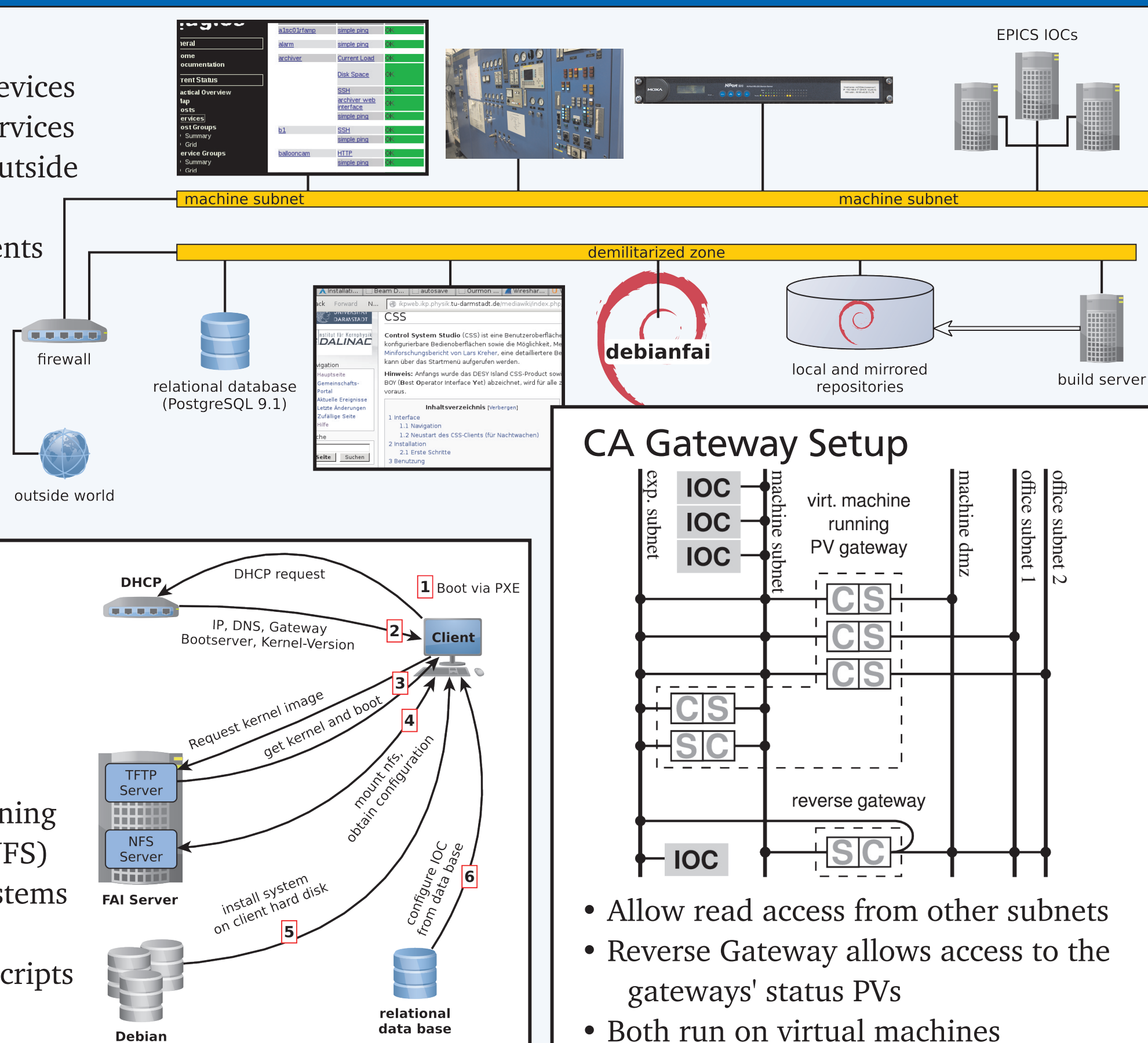
- Dedicated subnet for essential devices
- Demilitarized Zone (dmz) for services required to be accessed from outside
- CA Gateway allows to share PV access between network segments

Infrastructure

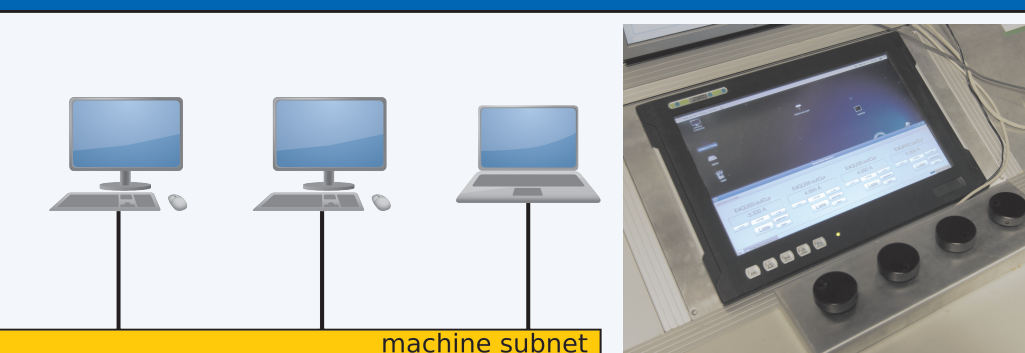
- Debian Squeeze used
- Provides packaging system
- Debian FAI offers to centralize configuration and automate installation process

Debian Fully Automatic Installation

- PXE boot
- Load kernel via TFTP
- Mount NFS file system
- ⇒ Installation system now running
- Obtain configuration (via NFS)
- Setup partitions and file systems
- Install Debian packages
- Run custom configuration scripts
- ⇒ Reboot after approx. 4 min



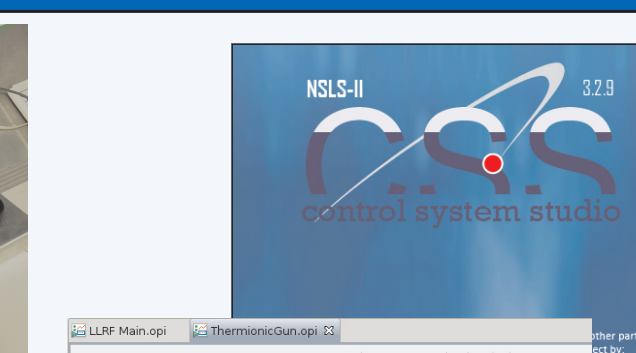
User Interface



Operator Workstations + Touchscreen PCs

GUI based on CSS and BOY

- CSS NSLS II used so far
- Touchscreen PC + rotary knobs add a comfortable interface
- Some applications are Qt-based and rely on the old non-EPICS control server
- Consistent style is not defined - not even within our BOY OPIs ⇒ to be done
- There are still systems which do not offer any digital read out
- Alarms are not displayed in a single view, but scattered on many different OPIs



Hard-wired subsystems

- Magnet flux measurement (rotating coil)
- Vacuum Valve control
- Neither offers a digital interface



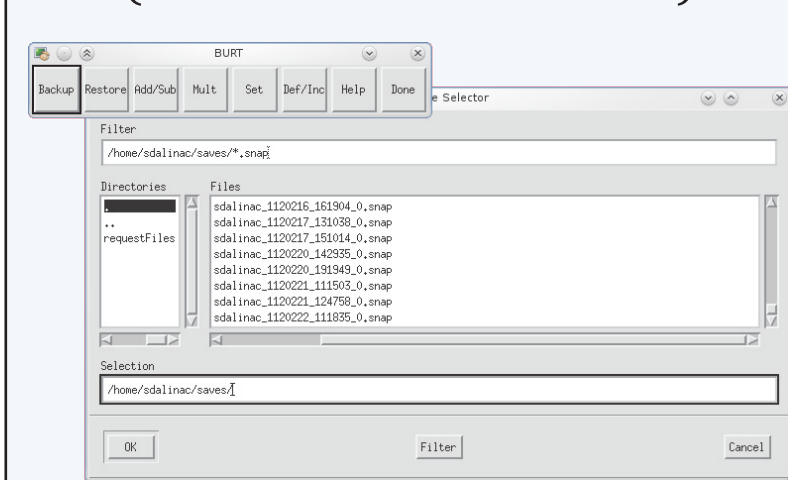
Non-EPICS GUI software

- Analog video signals are routed by a video multiplexer to four crt displays
- An extremely handy Qt application based on the old non-EPICS control server controls the multiplexer
- Left/Right clicking moves the OTR target/chooses the desired display
- No comparable BOY widget available

Service Layer

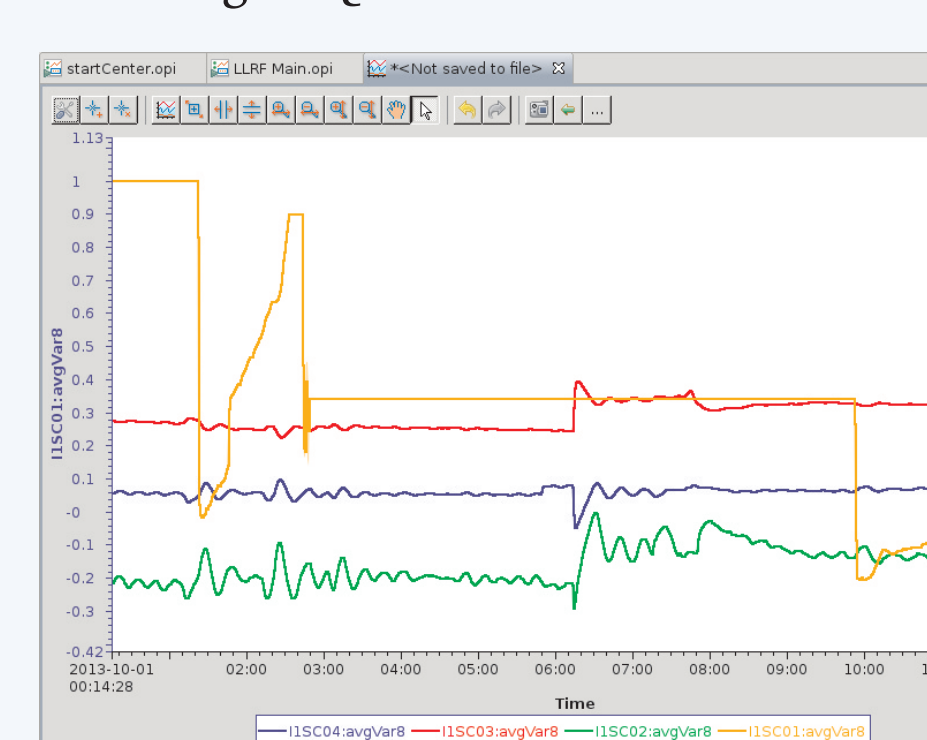
Save/Restore

- BURT
- File based
- Files rsync'd between different machines
- ⇒ Looking for better solution (based on rel. data base)



Archiving of Process Variables

- CSS ArchiveEngine
- PostgreSQL back-end

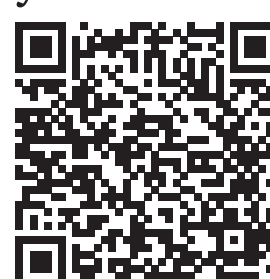


CSS Archiver With PostgreSQL

- 2x Intel Xeon E5-2643 @3.3 GHz
- 128 GB DDR3 reg. ECC
- 36x SAS 300 GB

- Debian Squeeze + Postgres 9.1
- Hardware and software configured in respect of high availability and performance

Paper on PostgreSQL-based archiver:
<http://accelconf.web.cern.ch/AccelConf/pcapac2012/papers/wepd03.pdf>



Future Work

Online-Simulation of Beam Dynamics

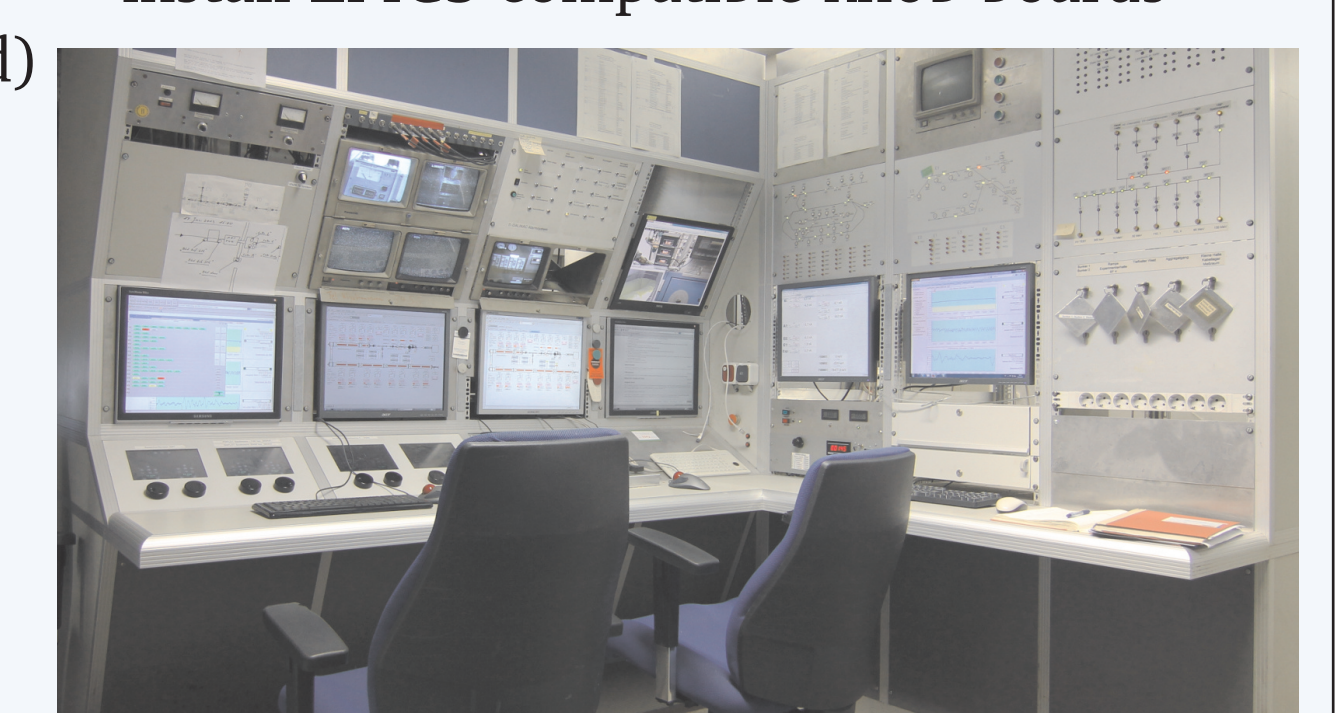
- XBeam (matrix formalism)
- VCode (moment-based)

Custom CSS S-DALINAC product ?

- Would simplify setup of CSS for the users
- A lot of work, but little effect at this time (CSS NSLS2 is almost exactly what we need)

Re-Design of Control Room

- digitize video signals
- install EPICS compatible knob boards



*Work supported by DFG through CRC 634

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