



Control System Retrofitting

- Overview -

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What does CS-Retrofitting mean?

Main objectives

- Project to replace the present control system by the full stack of the new common FAIR control system until 2018
- In scope: only SIS, ESR, FRS, HEST
- Out-of scope: UNILAC (modernisation is separate future project)
- CS-Retrofitting is part of the FAIR project within the Controls subproject (manpower, costs). Note that after recommissioning in 2018 further modernisations are to be covered by Operation

Main motivations

- Consequences of OpenVMS shutdown
- Seamless integration of SIS-18 into FAIR common Control System
- Overcome limits of the present system (e.g. FG, DAQ, ...) and allow new functions

CS-Retrofitting

Reminder OpenVMS Shutdown

- End of life and support for OpenVMS, shutdown was planned already for 2015 (but delayed to after the beam time 2016)
- All UNILAC operation programs (FORTRAN) have already been migrated to Linux and used in operation
- All SIS and other operation and NODAL programs are not available any more after VMS shutdown; NODAL obsolete, too

CS-Retrofitting

Substantial modifications within the CS-Retrofitting Project

(Details on next slides)

- Equipment Control → partial replacement)
- Timing System → full replacement
- Setting Management LSA → full replacement
- Applications → full replacement
- System Software → use full control fabric, new system services
- Introduction of new FAIR concepts (e.g. replacement of the “Virt Acc”, introduction of Beam Process, Sequence, Pattern, Beam Production Chain, Accelerator & Beam Mode, etc.) → *not discussed here, separate presentation suggested*

Control System Design

Control System Architecture

- Standard model (or: every system is the same...)
- Decentralized, distributed, OO system, ...
- modular design with well defined interfaces
- timing/synchronisation system based on time (instead of events)
- use industrial components wherever reasonable (slow controls)



Presentation Tier



LSA

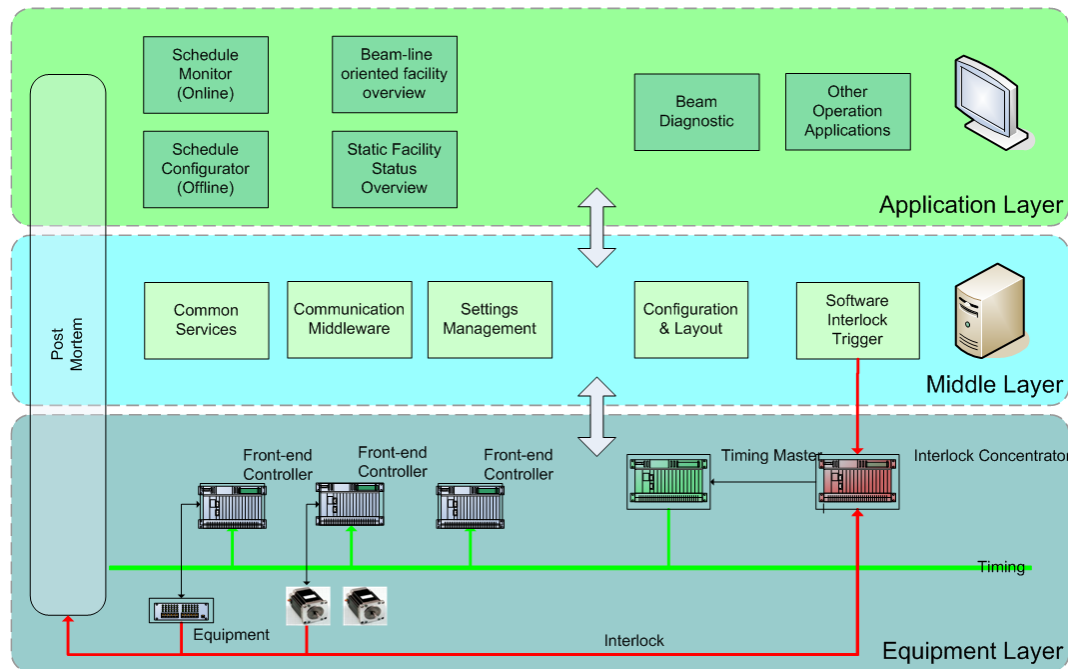
Middle Tier

powerful servers

Resource Tier

C++

FESA



Network

Middleware



Timing System

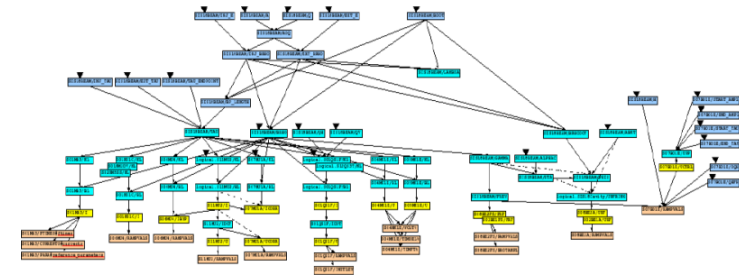
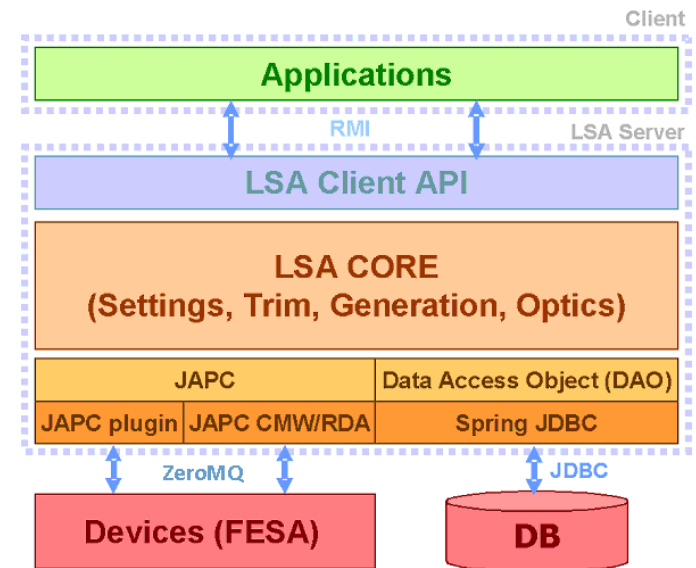


Settings Managment LSA

Settings Management System LSA

Retrofit: LSA will be used for SIS18 / HEBT / ESR

- Well developed framework for CERN accelerators, now maintained and enhanced in collaboration
- Contains optics, accelerator model, parameters (hierarchy from physics to devices)
- Consistent settings management on all levels
- Accelerator modeling is provided by the FAIR Data Supply project group, machine physicists
 - SIS18 model already tested in machine experiments
 - CRYRING model commissioned at the moment
 - HEBT / ESR not yet finished



Contact person: David Ondreka

Equipment Control (1)



Modifications

- consequently use new FESA framework for equipment control software
- consequently use SCU ecosystem (ACU, DIO, MIL I/F, ...)
- Replacement control of all ramped devices by SCU with new FG (allows smoother ramps by quadratic polynomial representation; lifts memory limits, ...)
 - Several SIS-18 power converters will be equipped with SCU/ACU
 - others will be transparently interfaced by existing MIL DeviceBus
 - RF equipment still to be discussed (expert meeting with RF scheduled)
- Replacement control of all “DC” (non-multiplexed) power converters by SCU with DeviceBus interface
- Replace as many post-UNILAC pulsed power converters as possible until 2018

Contact person: Udo Krause

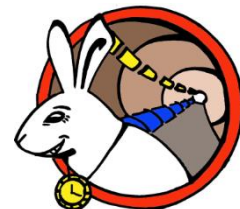
Equipment Control (2)

- All other equipment will not be modified (device control is realised via JAPC with Devicebus plugin)

General message for Equipment Specialists:

If you have not been contacted by CO yet, the change of control is transparent for your equipment

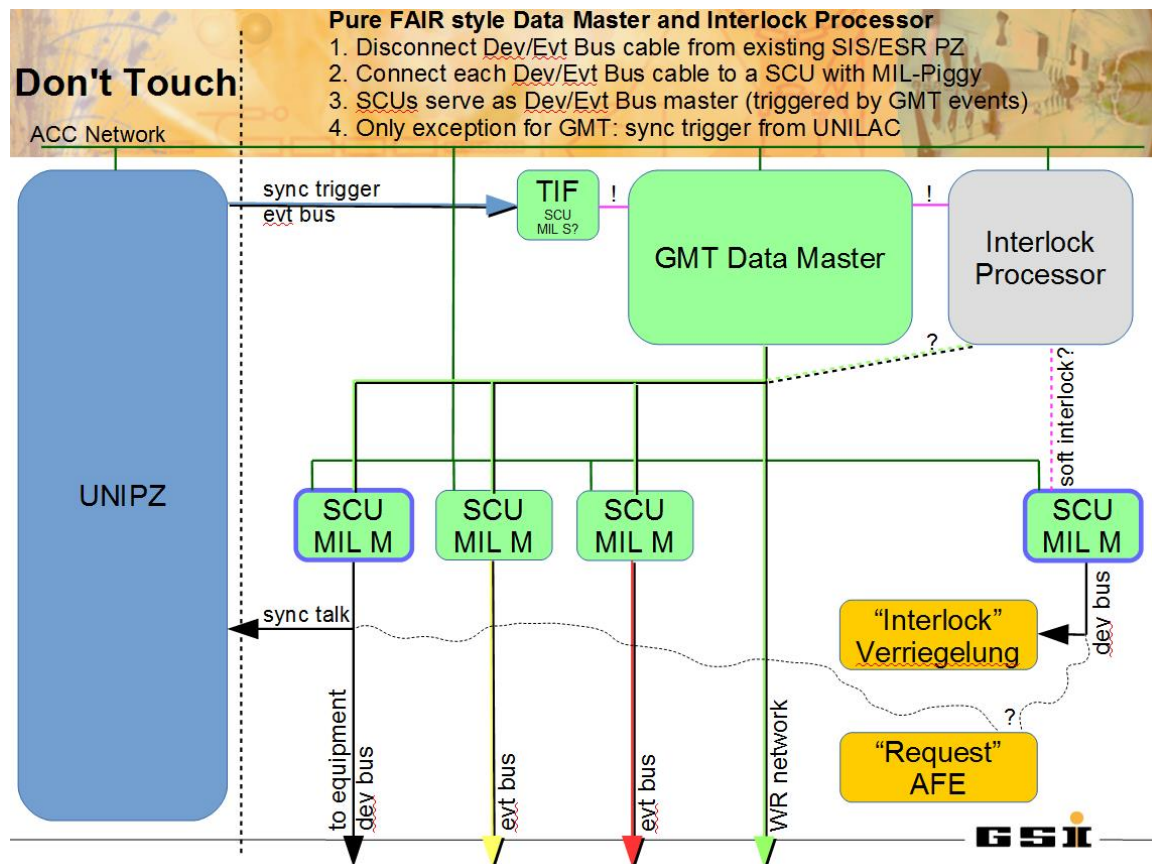
Timing System (1)



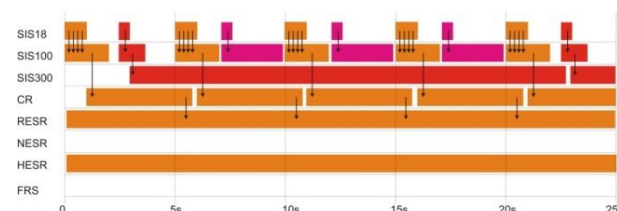
Modifications

- SIS-PZ and ESR-PZ will be obsoleted
- Implementation of the new FAIR White Rabbit based Timing System and WR network infrastructure, high precision time-stamp available
- Full replacement by FAIR Timing Master (already controls CRYRING)
- New equipment (e.g. SCUs) will receive native WR timing telegrams
- Timing gateway WR->MIL event-bus will be implemented to provide legacy MIL timing telegrams for present equipment, all present timing receiver equipment (SE, TIFs, ...) can continued to be used, event table unchanged
- Replacement of the “Verriegelungseinheit” – Timing Master has I/F to new Status Processor (present Vacuum, ZKS, equipment status/CAP-Alarms)

Timing System (2)



courtesy of Dietrich Beck



Operation Mode #5: pbar in HESR, CBM in SIS300 and high energy Atomic Physics.

Contact person: Cesar Prados

Applications (1)

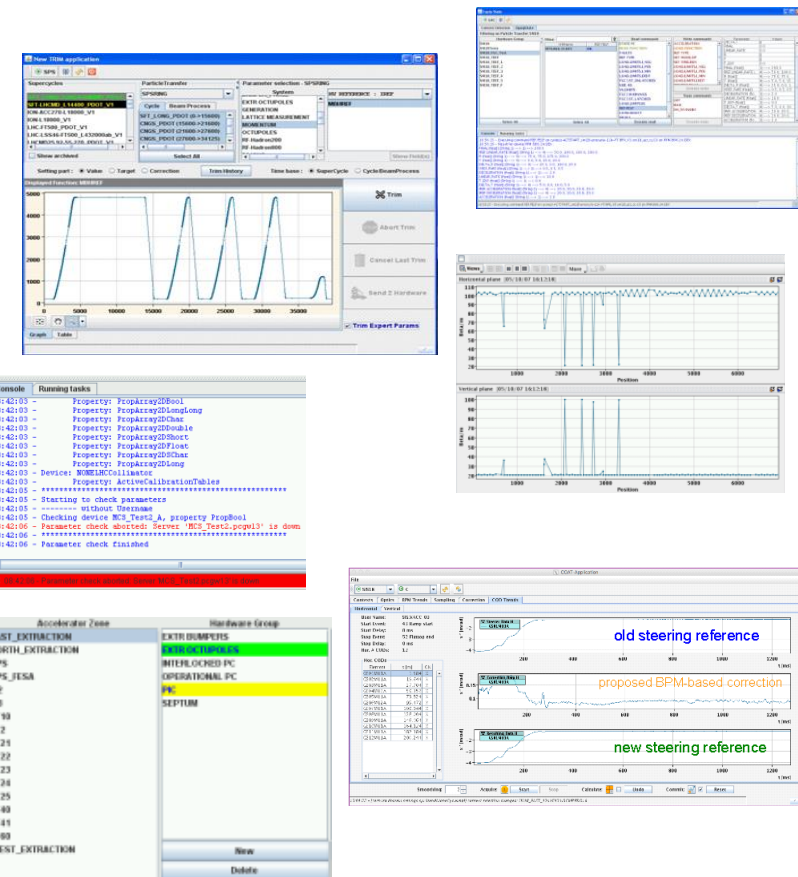
Applications provided by CO will cover all standard operation software
Retrofit: Java with JavaFX as GUI technology, replace existing applications,
first focus on basic functionality

Applications

- LSA & LSA-related apps
- New Scheduling Application
- Retrofit Apps e.g. ProfileGrid, Transmission, ...

Provide platform for beam-based applications

- e.g. Orbit Control



Contact person: Jutta Fitze

Applications (2)

Survey of present applications done, shows 93 applications

Application development already started

Application development started already

Generic applications for CRYRING

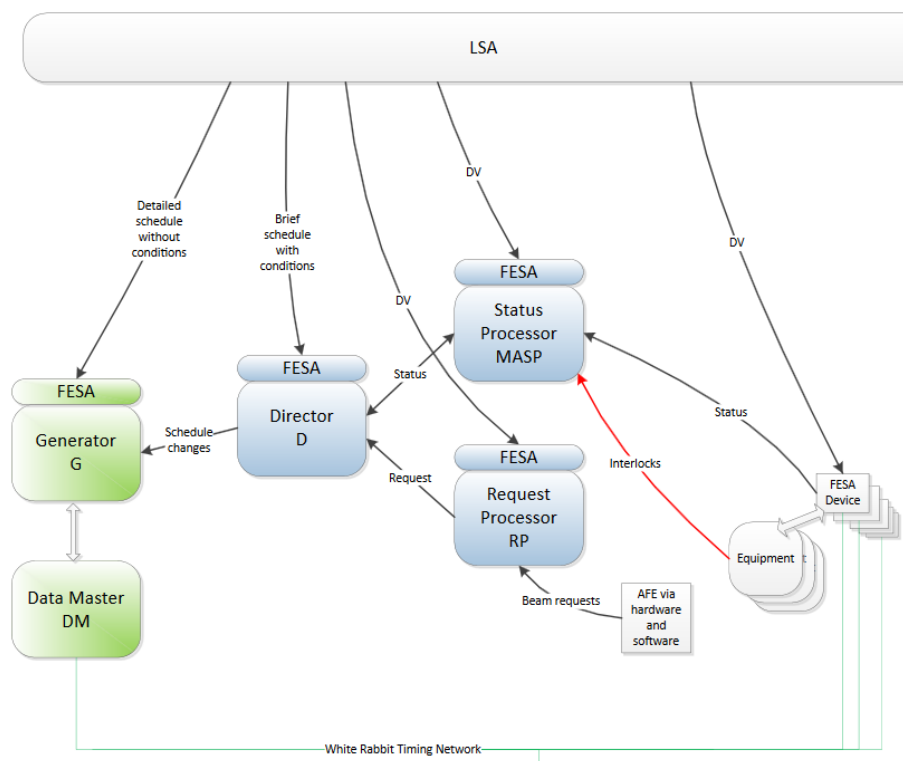
nothing to do for AP
obsolete
to do
Therapy mode - todo later

| Existing Program | Consolid | Description | Future place of functionality | Responsible | Status | Milestone |
|------------------|------------|--|--|---------------------------------|------------------------------|-------------|
| ALIAS | S2, S3 | Beam Loss measurement, wird langfristig durch LASSIE ersetzt | | LOB | refactoring | |
| ALIASX | S2, S3 | Beam Loss measurement expert program, wird langfristig durch LASSIE ersetzt | | LOB | refactoring | |
| BPM | S2, S3 | Duplikat zu TOPOS | | | | |
| BTM | S2, S3 | Beam Transmission Monitoring (Anzeigeprogramm) | BTM | CosyLab + CSCOV + CSCOAP | open | ? |
| Color | S1 | Screenshot black/white, color | not needed, see CopyXt | | nothing to do | |
| Copy... | S2 | Screenshot, Printing (Printer or File), file via ftp to Windows share (not needed for new Windows Mgr Fat + Script) | | CSCOV + **** | open | CRYRING |
| CUPID | S2, S3 | Control Unit for Profile and Image Data | | LOB | adaptation to WR timing | |
| DEVUTM | S2, S3 | CSCOV Properties, ist schon neu | berails neu | CSCOV | nothing to do | |
| DI | S2, S3 | Leuchttierprogramm | obsolete | | obsolete | |
| DI | S2, S3 | Simulator, see below | new Application needed | LOB + CSCOAP | open | S18 |
| DTG_AH | HT | Integr. Currenttransformer (Hochtemperaturmessplatz, über FRS) | | | open -> Günther klärt | |
| DTG_EN | HT | Integr. Strahlstrom (Hochtemperaturmessplatz, über FRS) | | | open -> Günther klärt | |
| DTL | S1, S2, S3 | Measurement of slow current transformer | new Trafo App | LOB + CSCOAP | NEW | S18 |
| DTS | S1 | Measurement of fast current transformer | new Trafo App | LOB + CSCOAP | NEW | S18 |
| DTSTEX | S1 | Text printing for current transformers | new Trafo App | LOB + CSCOAP | NEW | S18 |
| DTX | E2 | Trafo | | | open -> Günther klärt | |
| E_CTRL | E2 | Kontrolle der ESR-Geräte | DeviceControl | CSCOAP | todo | ESR |
| ECOD | E2 | Extraktionskür | Laufzeit des Günter-Bedenprogramm | SEBC + CSCOAP | todo | ESR |
| EF | S2 | Einfach-Eingabe für Experimentatoren, für Simulationskür | Settings Mgmt? | LOB + CSCOAP + FAIR-DV | clarify -> Haris, Andreas | S18 |
| EPROFI | E2 | ESR-Strahlprofilmonitor | | | open -> Barbara fragen | |
| ESR_DS | E2 | Schrittmotor wird automatisch im ESR Superzyklus getrieben (?) Laut Markus: ist Presi | Settings Mgmt | SEES + FAIR-DV + CSCOAP | todo | ESR |
| ESR ***** | | Presi-entriebe ESR, siehe Schrittmotor | Settings Mgmt | SEES + FAIR-DV + CSCOAP | todo | ESR |
| ESREXP | E2 | ESR Expert | Settings Mgmt | SEES + CSCOAP + FAIR-DV | todo | CRYRING/ESR |
| ESRT | E2 | SISModi Testprogramm -> obsolete | not needed | | obsolete | |
| ESR Stoch. Kuer. | | Stochastische Kühlung ESR | berails neu | SEBC | todo | ESR |
| ESRM | E2 | ESR-Modifikation | Settings Mgmt | SEES + CSCOAP + FAIR-DV | open | CRYRING/ESR |
| FS | S2, S3, E2 | Node: Generiere Gerätee | Proprietary/EquipState | CSCOV, CSCOAP | nothing to do | |
| FSN | T2 | Schrittmotor | Schrittmotor portiert (Vincos) | | nothing to do | |
| GAS | E2 | Internes Dargestell, Programm ist obsolet evtl. neu benötigt? | neues Gasprogramm benötigt? Ulli Pop | | open -> Ulli Pop | ESR |
| GRFR | S1 | Geräteprotokoll Therapiemaschine, Ausdruck für Patientenspeicherung, evtl. sogar obsolet? | | | Node -> Petre | S18+ky |
| GSNOT | HT | Get Shot von A.Hug (Hochtemperaturmessplatz, über FRS) | | | Node -> Petre | |
| HALLB2 | CC, FS | Hallsonden auslesen FRS | | | | |
| HTP | S2, S3 | Maschinenexperimente HTP | stays | LOB | refactoring | |
| HTPFC | S2 | HT-Experimente, um Einzelteil f. Maschinenexperimente der Strahlungsphase (Juss, FRS) | stays | LOB | nothing to do | |
| HYDM | S2, S3 | CAEN HV Setzprogramm | Settings Mgmt | LOB + CSCOAP + FAIR-DV | todo -> Andreas, Carl fragen | GS+HBT |
| IBS | S2, S3 | Inbetriebnahme Hochstrom | Settings Mgmt, (Archiving, BTM) | CSCOAP, (CSCOV) | todo | CRYRING |
| INTMON | S2 | Bedienprogramm HBT-Detektoren | | | Node -> Petre | |
| IPRMS | S2 | Ionisation Profile Monitoring (Tina) (Inbetriebn., QT, Fine Wire Kameras, Überarbeitung) | stays | LOB | refactoring | S18 |
| KDMS | S2, S3 | Konsolenmanager | first step: launcher, second step: new Console Manager | | | |
| LASSIE | S2, S3 | Large Analogue Signal and Scaling Information Environment | stays | | refactoring | |
| LOGIN | S2, S3 | open shell | stays as is | CSCOV | nothing to do | |
| LS_CTRL | S1 | Kontrolle der MEDCI Geräte | DeviceControl | CSCOV | | |
| MS | S1 | Node: Bumper | Proprietary/EquipState | CSCOV, CSCOAP | nothing to do | |
| MS | S1 | Node: Elektrostatische Saeps | Proprietary/EquipState | CSCOV, CSCOAP | nothing to do | |
| MEDI | S1 | Settings Mgmt for Therapy Mode | Settings Mgmt | CSCOAP + PESP | open | S18+ky |
| MEDT | S1 | SISModi Testprogramm | | | obsolete | |
| MGEKAL | E1, FS | Skalierung Magnetwerte | Settings Mgmt | REFS + CSCOAP + FAIR-DV | in progress | FRS |
| MI | S1 | Magnetsetzprogramm Initialisierung | Settings Mgmt | CSCOAP + FAIR-DV | todo | CRYRING |
| MIRFS | S1 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MIRHD | S1 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MIRHT | S1 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MIRKO | S1, S2, S3 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MIRS2 | S1 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MIRTK | S1 | Mirko | JMirko | PESP + CSCOAP | todo | CRYRING |
| MK | S1 | Node: E und Q-Körner -> CSCOV | Proprietary/EquipState | CSCOV, CSCOAP | nothing to do | |
| AMPLOT | S2 | Therapie-Plot mit IOL | | | | S18+ky |
| MSET | S2, S3 | Magnetsetzprogramm (part of SD) (Beitrag von Theoriegr., der Experimentatoren, zu Settings Mgmt, bzw. Erweiterung für Super REFS + CSCOAP + FAIR-DV) | | | todo | FRS |
| MODAL | S1 | Node | | | obsolete | |
| OS-SIS | T2 | SIS-Diagnose mit SOROTIMUL | | | open -> Günther klärt | |
| OT | S2 | Beam Transmission Monitoring (Datenaufnahmeprogramm) | BTM | CosyLab + CSCOV | open | ? |
| Paper | S1 | Screenshot paper/file | not needed, see CopyXt | | obsolete | |
| PQFAST | S2 | Schnelles Auslesen der Profilitter | new ProfileGrid Program | CSCOAP | todo | S18 |
| PSI | S1, S2 | obsolet für SIS, nicht für ESR | Topos | | clarify | |
| PSIDSH | S2, S3, E2 | Positionssonden | new ProfileGrid Program | LOB + CSCOAP | NEW | S18 |
| PROF | S2, S3 | Profilitter | | | | S18+ky |
| PTH | S1 | Therapie-Protokoll | | | | |
| PZ | S1 | Nodeprogramm Pulzentrone -> obsolet | new timing system tools | | obsolete | |
| PZIEG | S1 | Pulzentrone/Vorriegelungsprogramm: Interlocksystem SIS | Settings Mgmt, Interlocksystem | CosyLab, CSCOV, CSCOAP, FAIR-DV | todo | ? |
| PZSUZY | S1, S3 | Superzyklus Show | new SchedulingApplication | CSCOAP | todo | CRYRING |
| PZEDIT | S1 | Superzyklus Edit, Show, Change | new SchedulingApplication | CSCOAP | todo | CRYRING |
| PZSIVEG | S1 | Anzeige der Interlocks | Interlock System | CosyLab, CSCOV, CSCOAP | open | ? |
| S_CTRL | S1 | SIS Control | DeviceControl | CSCOAP | todo | S18 |
| S_DIAG | E2 | Schottky Diagnose | new Schottky Application | CSCOAP | | |
| SOTOT | S1 | Messung des Argonnen Hochstrom Trafo | new Trafo App | LOB + CSCOAP | open | S18 |
| SALM | S1 | Anlagenüberwachung SIS, Sammlung von SIS Alarmen, obsolet | Interlock System, Device Control | | | |
| Schottky | | Node Schottky Einstellprogramm | Settings Mgmt + new Schottky Application | CSCOAP | open | S18 |
| SCHOTT | E2 | SchottkyDiag. (auch SCHOTT_ESR) | new Schottky Application | CSCOAP | | |
| SCOD | S3 | Kühlerprogramm SIS18 | | SEBC + CSCOAP | | |
| S2, S3 | S2, S3 | SD | DeviceControl | CSCOAP | todo | S18 |
| SIMO | S1 | SISModi | Settings Mgmt | CSCOAP + PESP + FAIR-DV | in progress | S18 |
| SISEXP | S1 | SIS Expert | Settings Mgmt | CSCOAP + PESP + FAIR-DV | in progress | S18 |
| SIST | S1 | SISModi Testprogramm -> obsolete | not needed | | obsolete | |
| S2, S3 | S2, S3 | Bedienprogramm Schutzschrittmotoren in der Strahlführung | DeviceControl, Settings Mgmt | CSCOAP + FAIR-DV | open | S18 |
| SPEKY | S2, S3 | Spektrum Analyzer, SIS Radio | neues Speky Programm | CSCOAP + LOB | todo | S18 |
| SPRES | S3 | Strahlungsdiagnoseprogramm SPRES | | | obsolete | |
| TLCLR | S1 | Freigabe X-Terminal, obsolet | | | obsolete | |
| TDP | S1 | Transmission display | BTM | CosyLab + CSCOV + CSCOAP | open | ? |
| THI | S2 | Info Therapiemaschine, Anzeige Trafo, ERI, etc. | Settings Mgmt, Trafoprogramm, Archiving | CSCOAP, CSCOV | | S18+ky |
| THPR | S1 | Annahmeprotokoll Therapie | Archiving? | CSCOV | | S18+ky |
| TIMGEN | S2, S3, E2 | Timing-generator (SIS/ESR) | | | Ullid fragen -> Node ? | |
| TOPOS | S2, S3 | Rein? fragen | | LOB | refactoring (FSB 2.00) | |

System Service Software (1)

New Central System Services to be implemented

- Master Accelerator Status Processor (**MASP**, Mini-MASP for 2018) to collect, aggregate and process system and equipment status (replacement of “PZ-Verriegelung”), includes Interlock-System
- **Request Processor**: handles Beam Requests (see next pages)
- **Director Process**: processes and translates run-time conditions to the Timing Master (Data Master)



System Service Software (2)

Archiving System

- Specification discussed in FC2WG
- Presently under development by SLO in-kind partner
- Shall already be available as prototype for beam time 2018

BTM (Beam Transmission Monitor) System

- Specification to be refined until end of 2016
- Shall already be available as prototype for beam time 2018 (including UNILAC data)

Main Control Room (HKR)

Retrofitting Project has little impact on HKR

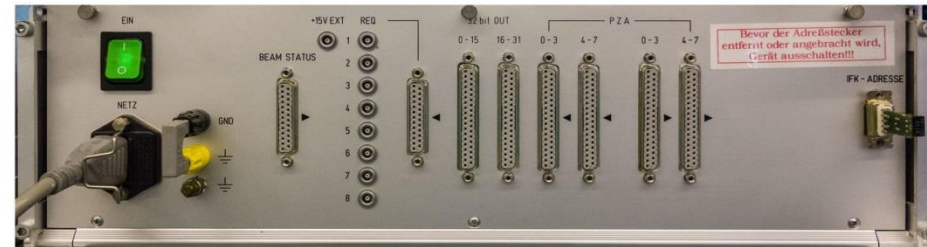
- New Java-based GUI programs need other console computers and displays (CRYRING style)
- Design still not finalised (-> Stephan Reimann, OP)

Not part of CS-Retrofitting (but still to be done due to “SE-Sanierung”)

- ACC Computing Centre moves from SE.1.124 to Green Cube in January 2017
- Network switches for HKR need to be moved from SE.1.124 to HKR
- Digitisation of analogue Signals

Beam Request Unit

(aka “Anfordereinheit” AFE)



Proposal to obsolete present AFE discussed during HIC4FAIR workshop (August 2016)

All experiments / beam users present and accounted are OK with SW-only interfaces

CS-retrofitting Implementation plan:

- AFE will be obsoleted
 - Hardware signals will be provided by Timing Receivers
 - Experiment will be provided a mini-Console station to request/block beam
 - SW-API to the Beam Requestor process will be provided for SW interface
- (Details still to be worked out, e.g. regarding network domain, privileges, ...)

Comment: Fast beam abort will be continued to be featured (Cave-A/M)

Thank you

