Accelerator Infrastructure, Services & Network(s) at IBPT

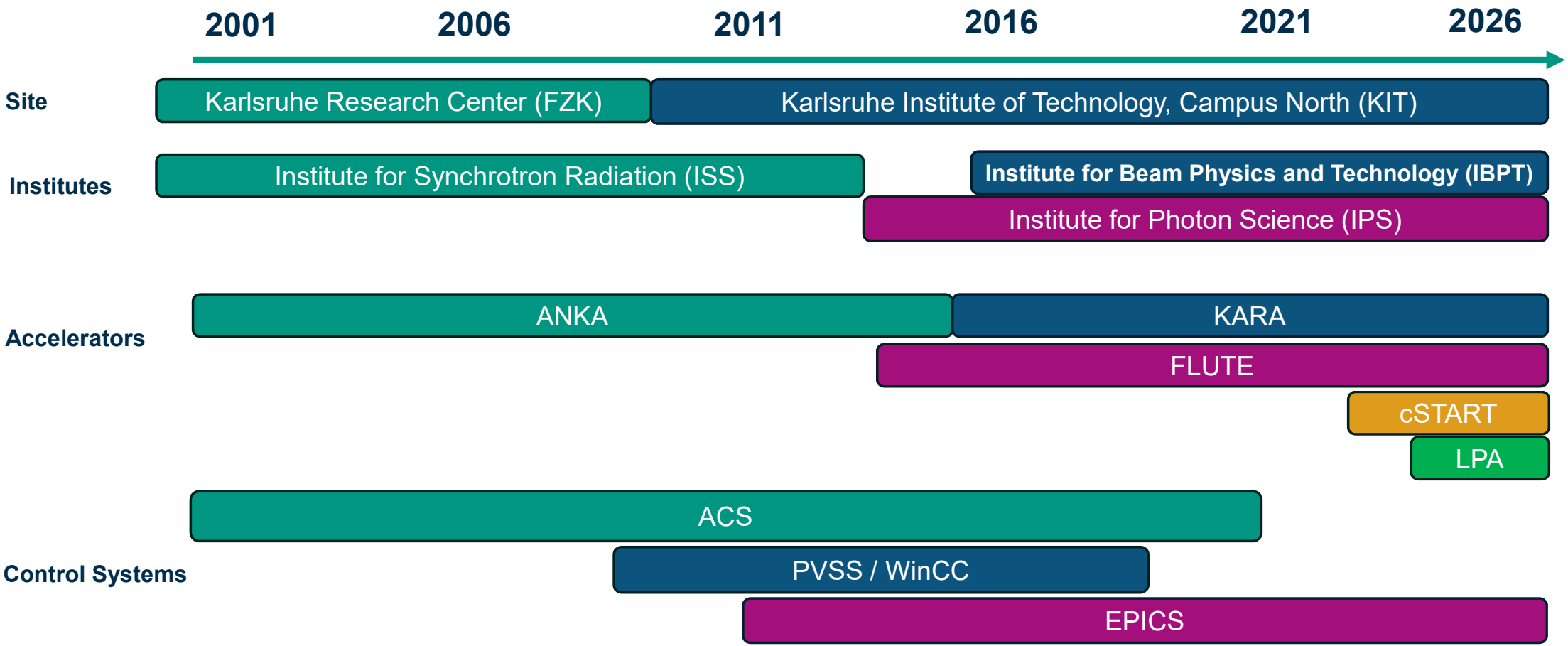
E. Blomley, 25.11.2025

1. Overview
2. KIT Services
3. IBPT Services
4. Controls Services
5. Shared Services
6. Special Projects

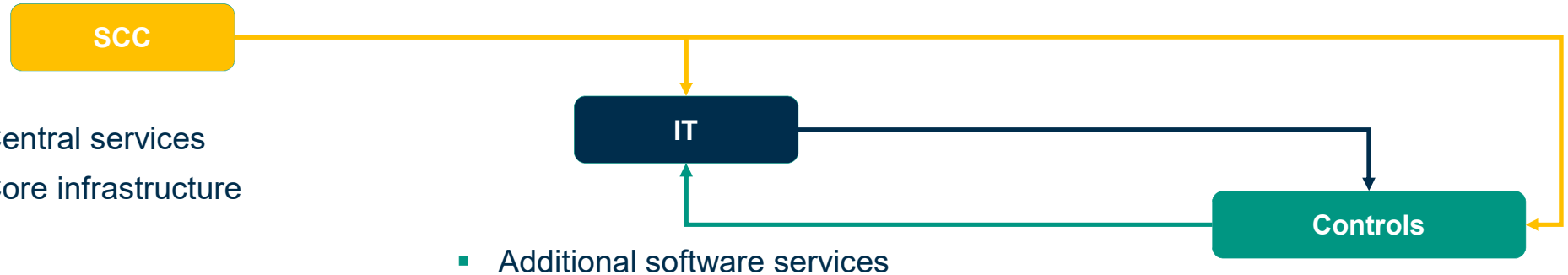
Overview

1

A Brief History...



SCC, IT, Controls... ?



- Central services
- Core infrastructure

KIT

- Additional software services
- Manages network infrastructure
- Organizes all IT hardware

Institute

- Operates accelerator-related soft- & hardware
- Runs the control system(s)
- Additional software services

Accelerator(s)

Balancing act:

Full control & independence ←→ Maintenance cost & accessibility

Network- and Firewall Layers

Internet

Access:

- From everywhere
- Public wifi at KIT
  - KA WLAN
  - eduroam

KIT

Access:

- KIT wifi
- KIT VPN
  - Tap level
  - Accessible via phone
- KIT physical connection

Institute

Access:

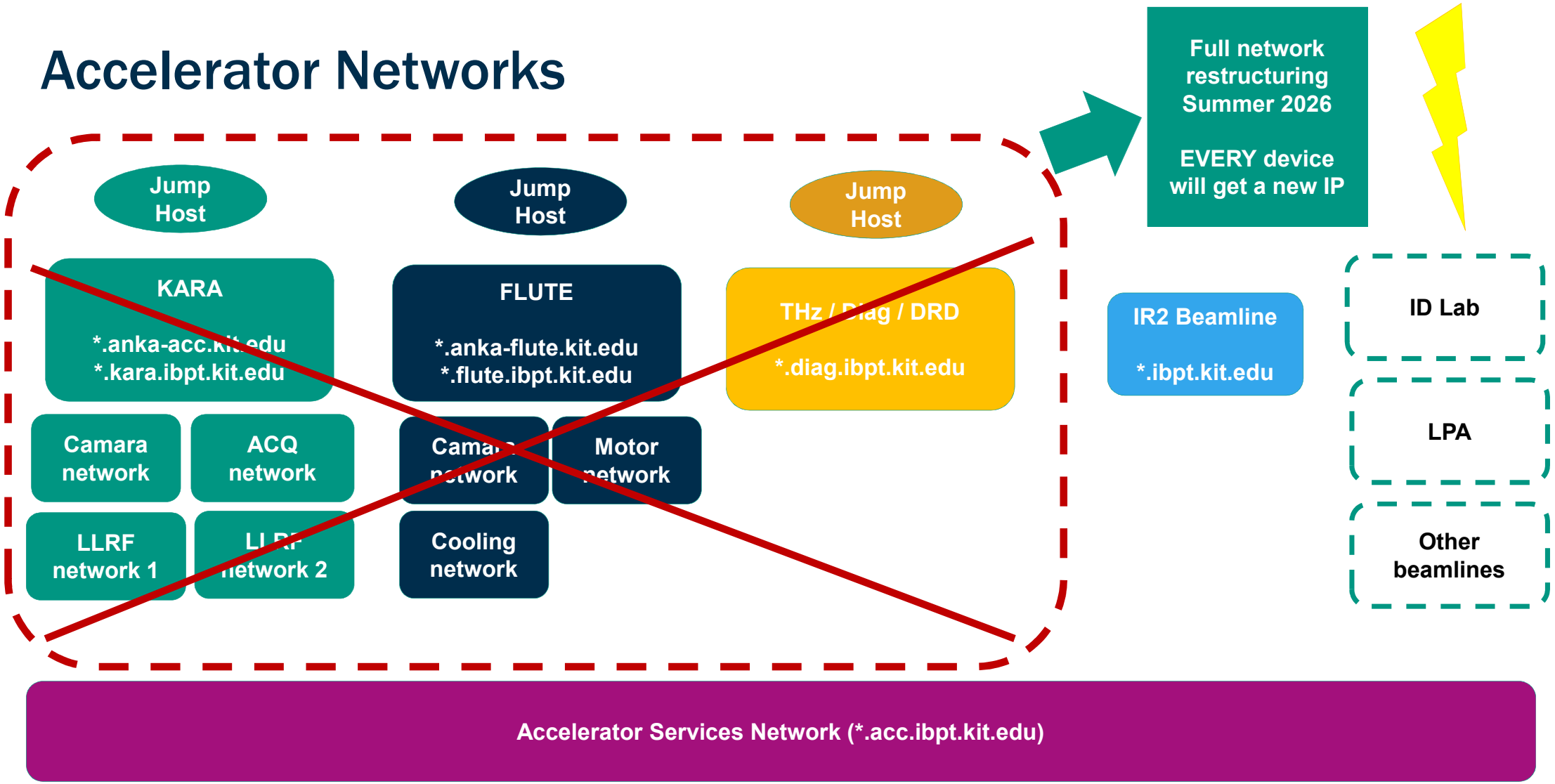
- Vpn2vlan
  - 2FA
  - Tun level
  - **Not via phones**
- Wifi2vlan
  - Direct access without VPN from KIT wifi
- Physical connection
  - Office buidings

Accelerators

Access:

- Requires institute access
- Key-based SSH via dedicated jump hosts
- Physical connection
  - Control room(s)
  - Only approved devices
- Labs, KARA & FLUTE are **segregated from each other**

Accelerator Networks



KIT Services

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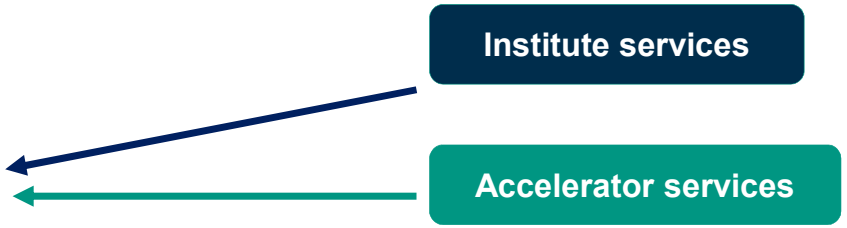
KIT Account



- Central account used for most authentification requirements
- Account types:

1. **Employees** (including PhD)
   - ab1234 + ab1234@kit.edu + full.name@kit.edu
   - IBPT OE
2. **Students**
   - uabcd + uabcd@students.kit.edu
3. **Guests and partners (GuP)** (Hiwis & contractor)
   - ab1234 + ab1234@partner.kit.edu
   - IBPT OE
4. **Service accounts**
   - ibpt-some(-)thing-0001
   - User independent accounts for shared access/services

Active Directory (AD) Groups

- KIT account can be added to AD groups for group-based permissions
- Only our IT department can modify AD groups
- Group types

1. User permission groups
   - IBPT-USR-*
   - Examples: IBPT-USR-KARA
2. Admin permission groups
   - IBPT-ADM-*
   - Examples: IBPT-ADM-Kara, IBPT-ADM-FLUTE
3. File permission groups
   - IBPT-FILE-*
   - Access to certain file storage areas
4. General group
   - IBPT-*
   - E-Mail lists & general permissions
   - Examples: IBPT-Thz, IBPT-flute-operator

Windows CMD: `NET USER hi0724 /DOMAIN`

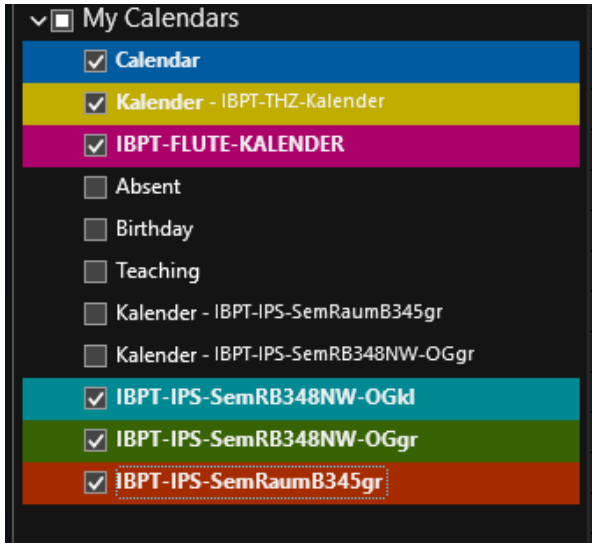
`NET GROUP IBPT-Thz /DOMAIN`

```
*ANKA-ADM-CheckMK
*IBPT-ACC
*ANKA-ADM-VEEAM-Operat
*ANKA-ADM-NETVS-ACC
*SCC-Entitlement-bwsyn
*IBPT-EDIT-GRAFANA
*ANKA-USR-GITLAB
*KIT-Staff-Nord
*IBPT-cstart-wp8
*IBPT-WLAN-ibpt-flute-
*IBPT-ADM-FLUTE-WIN
*ANKA-FILE-Archive-DOC
*IBPT-Thz
*IBPT-KARA-OPERATOR-CA
*IBPT-CHARM-OPERATOR
*IBPT-Mitarbeiter
*IBPT-USR-FLUTE-OC
*ANKA-ADM-ESX-FLUTE
*IBPT-controls-interna
*IBPT-cstart-wp9
*IBPT-cstart-all
*ANKA-USR-OC
*ANKA-USR-FLUTE-OC
*IBPT-flute
*ANKA-FILE-ibpt-doc-cS
*ANKA-ADM-ESX-IBPT
*ANKA-USR-CheckMK-Benu
*IBPT-Staff-IDM
*IBPT-USR-FLUTE-JUMP
*IBPT-eval_poster
*ANKA-USER_HOME_DRIVE
*ANKA-USR-BL-IMAGE
*Domain Users
*ANKA-ADM-GITLAB
*IBPT-Users-IDM
*ANKA-ADM-ESX-KARA
*IBPT-USR-KARA-OC
*IBPT-USR-XWIKI
*IBPT-KARA-Operator
```

E-Mails, Lists & Calendar

+ KIT account
+ AD groups

- KIT operates Exchange server with 8 GB e-mail account for your KIT account
- Web access: https://owa.kit.edu
- Can be added to all e-mail clients
- E-Mail signature & encryption
- Calendars, meetings & room booking
- E-Mail lists (IBPT-Thz@ibpt.kit.edu)



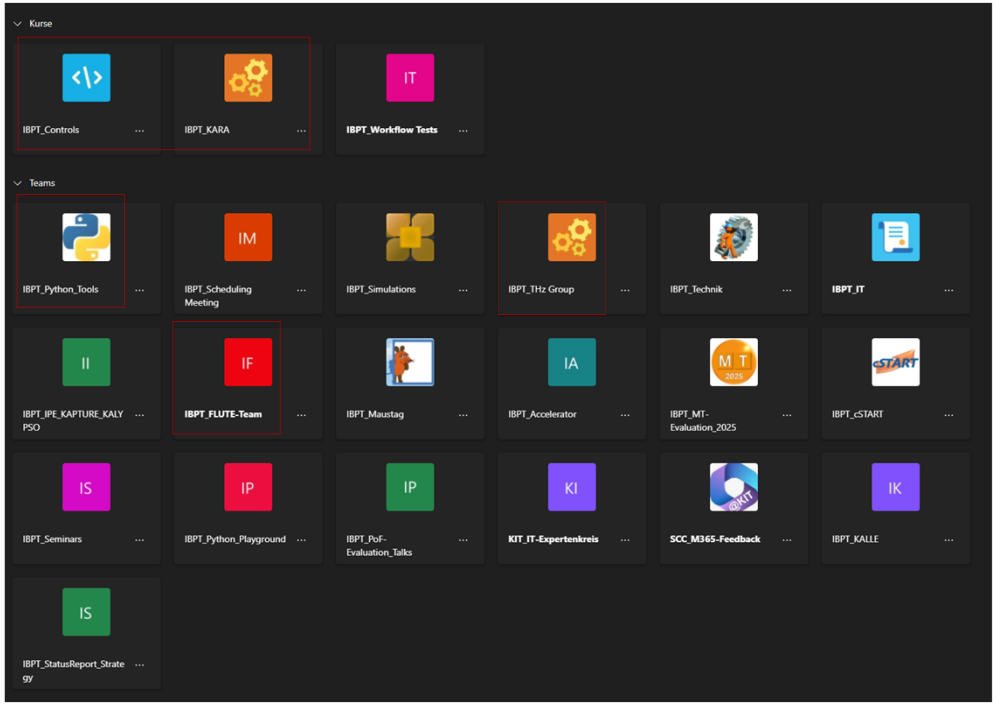
Self-Managed E-Mail Lists

+ KIT account
- AD groups

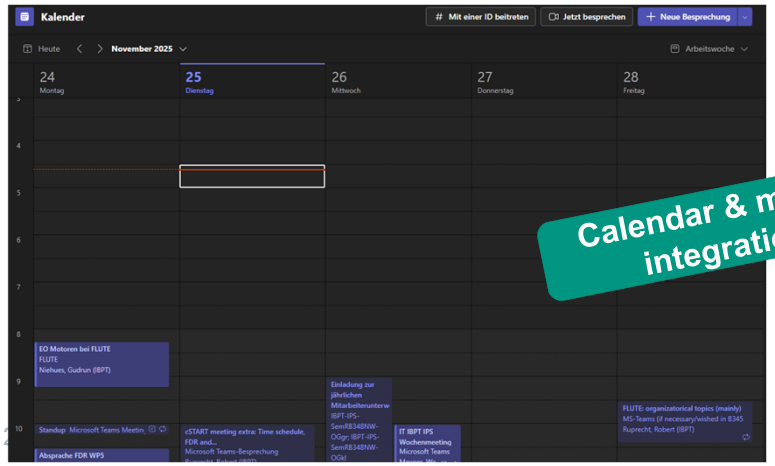
- https://lists.kit.edu
- Everyone can create lists, subscribe, etc.
- kara-operation@lists.kit.edu

MS Teams

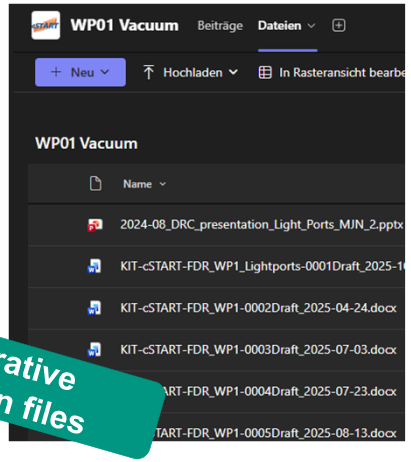
+ KIT account
- AD groups



- „Temporarily“ added during Covid with limited features
- Now not so temporary anymore…
- „Organic“ growth of „Teams“
  - but members of each team have to be managed individually…
  - Probably less teams with more channels would be better…
  - Mostly used for meetings
  - Teams and channel based chats could replace quite a few e-mail chains, but currently too fractured



Calendar & meeting integrations



Collaborative working on files

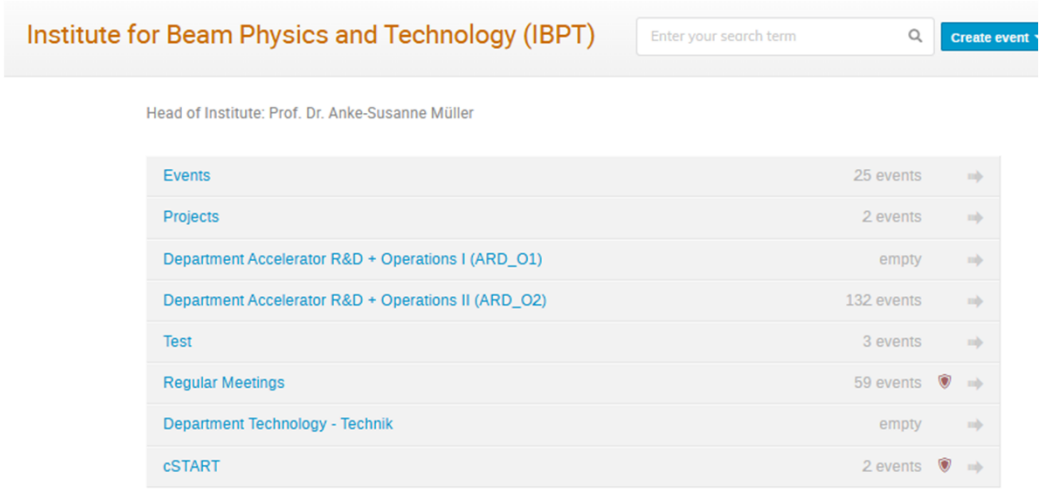
Alterantives:

KIT Matrix
Zoom (for lectures)

Wish list: Controls notificiations in MS Teams

Indico

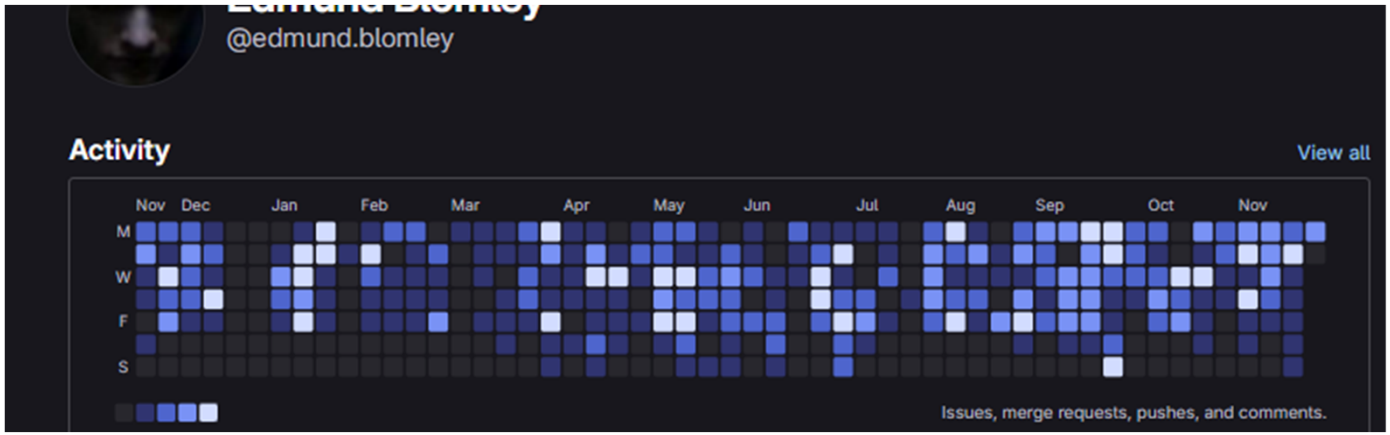
- KIT account
- AD groups



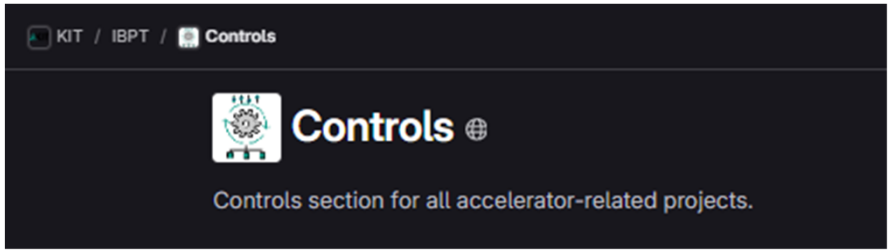
- https://indico.kit.edu
- Meeting and conferencing tool developed by CERN
- Since recently “official” KIT service, but no KIT account support yet…
- Regular meetings restricted
- Used for group meetings

GitLab

+ KIT account
- AD groups



- https://gitlab.kit.edu
- GitLab ultimate license
- No container registry or GitLab Pages
- To get access:
  - Allow GitLab for your account
  - Login once
  - Now can be (manually) added to IBPT group…
  - Also have to be manually removed…
- Cumbersome for external collaborators
- But: **Main** tool for controls development(!!)
  - More on that later…
- Also used for project management (controls & cSTART)

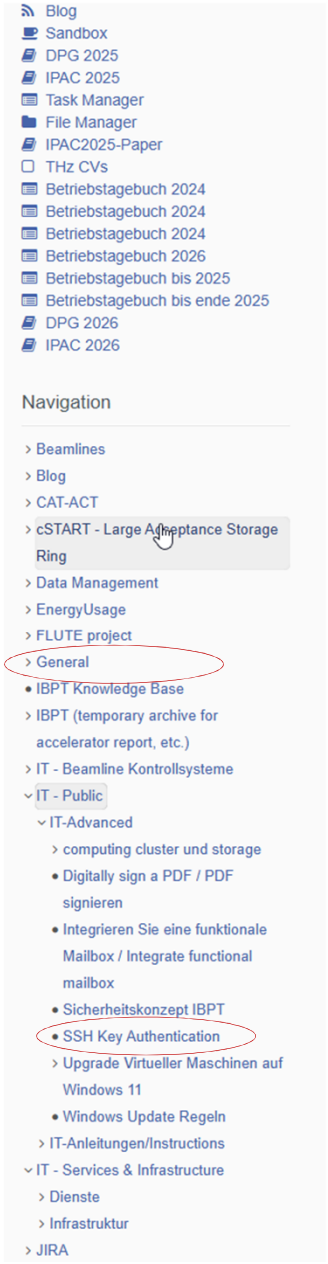


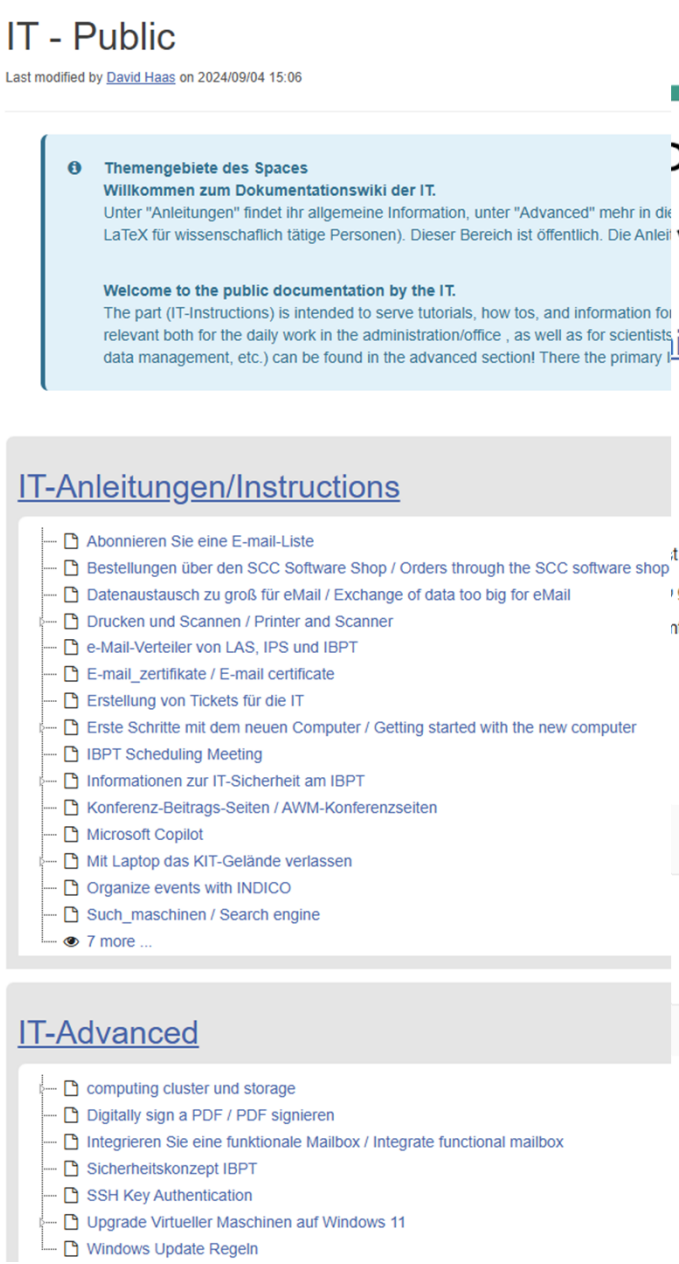
IBPT Services

xWiki

+ KIT account
+ AD groups

- https://xwiki.ibpt.kit.edu
- Wiki platform
- „Recently“ migrated from Confluence (ankawiki.anka.kit.edu)
- 10+ years of more or less uncontrolled „documentation“, including two migrations
- Used for abstract management for IPAC conferences
- General, institute level documentation
- Not really suited for controls or device documentation (anymore)





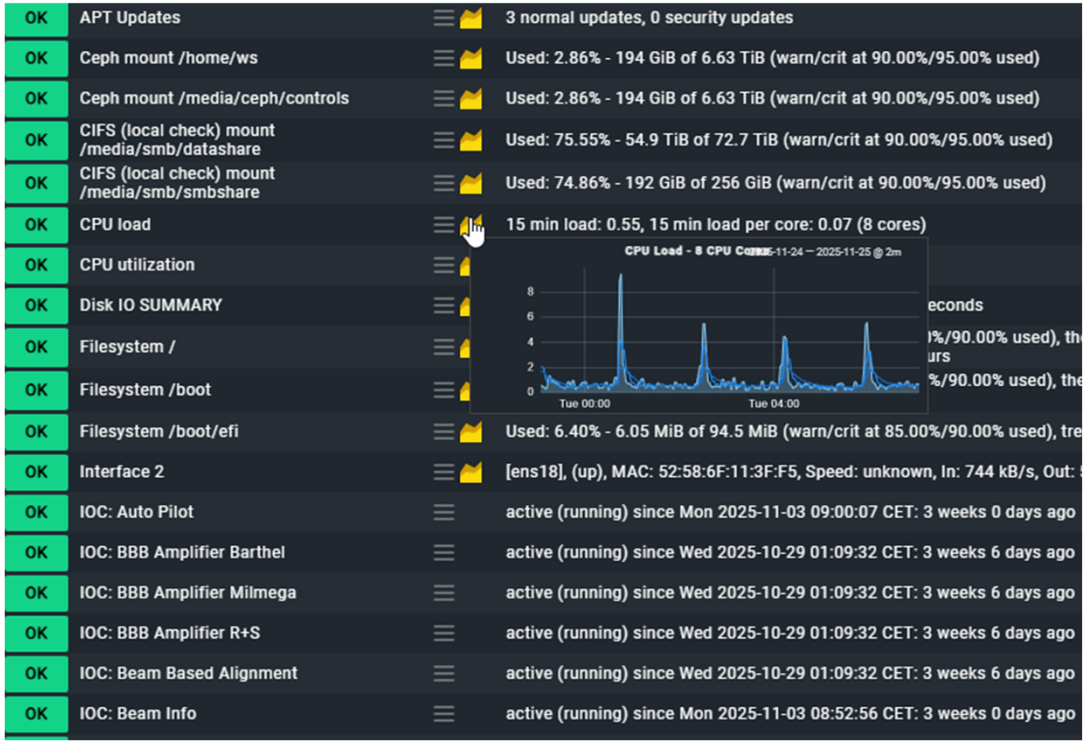
Flex Office

- 4 shared workplaces
  - 2 with KIT network (students with private notebooks)
  - 2 with IBPT network (with IBPT notebooks)
  - Docking station
  - 2 monitors, mouse keyboard
- Access via KIT card
- Can be booked via calendar
- More details:
  - https://xwiki.ibpt.kit.edu/xwiki/bin/view/GEN/IBPT%20Shared%20Office/

Check MK – IT Monitoring

+ KIT account
+ AD groups

- Professional IT monitoring tool
- Used by the IT for institute server infrastructure
- Used by controls for acclerator PCs and server
- Monitors:
  - CPU load
  - Memory usage
  - Available space
  - Mounts available (and space)
  - If IOC services are running
- Logging and notification system
- KARA and FLUTE are their own satellite environment

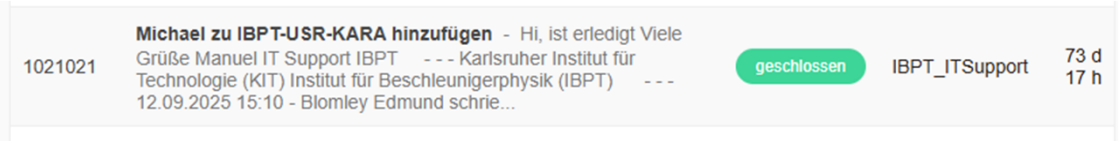


Wishlist: Additional status monitors for FLUTE and KARA for displaying current issues + automated workflow for „ping“ alarms for all IP devices

Veeam - Backups

- Professional backup solution
- Used by IT group
- Most accelerator infrastructure does not need backups
  - Central management server
  - Central file shares
  - Logbooks
- Was a target during recent hacking attempt, currently in re-building process

IT Tickets



- Uses a central SCC service for tickets
- Ticket system is limited to „service desk“ feature
- Not suitable for controls issues & project tracking
- Writing e-mail to itsupport@ibpt.kit.edu will create a ticket
  - Alternative: https://ts.scc.kit.edu/
- Documentation: https://xwiki.ibpt.kit.edu/xwiki/bin/view/IT%20-%20Public/IT-AnleitungenInstructions/Znuny%20Ticket%20System/

Accelerator Services

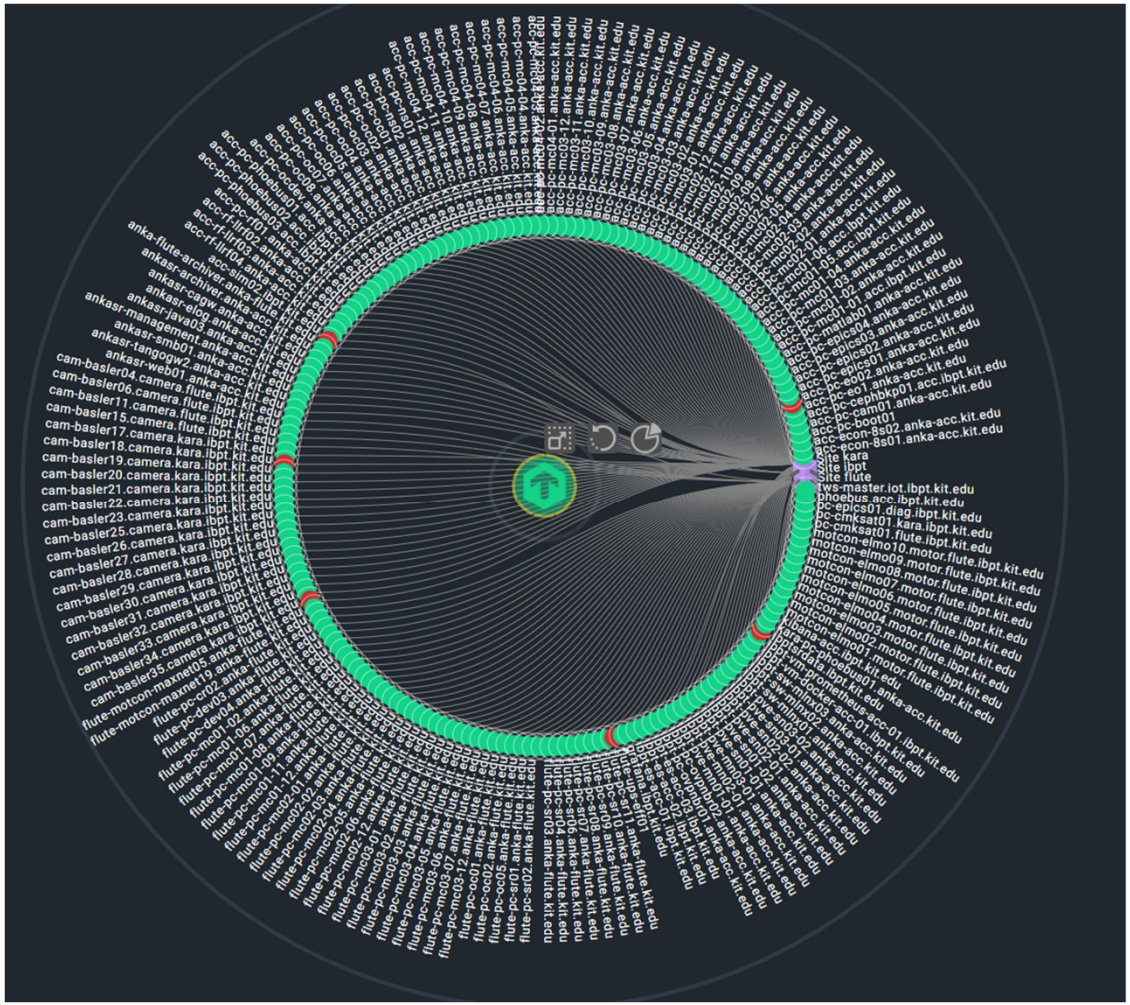
4

Accelerator Infrastructure

- Core services run in a cluster-setup
  - Bldg. 348 server room (next to this room)
  - Bldg. 348 KARA floor
  - Bldg. 351 cellar
- **Virtualization** cluster: PROXMOX
- **File** cluster: CephFS
  - New, currently 8 TB of space
  - Will replace SMB and NFS shares
- **NoSQL archive** cluster: Cassandra
  - One full cluster per accelerator
  - ~100 TB of data since 2012
- **Phoebus** cluster (control system GUI and related services)
  - Elastic search cluster
  - Kafka cluster
- Most servers and terminals run **Ubuntu LTS**

Virtual and Physical Infrastructure

- Most services run as Docker containers
- Most servers are virtual machines
  - Except real-time requirements (NTP server)
  - Except file servers
  - Except archive cluster
  - Except USB is required
- Most servers run Ubuntu
  - KARA: 2 Windows server
  - FLUTE: Quite a few laptops
- Around ~130 servers & terminals (without devices)



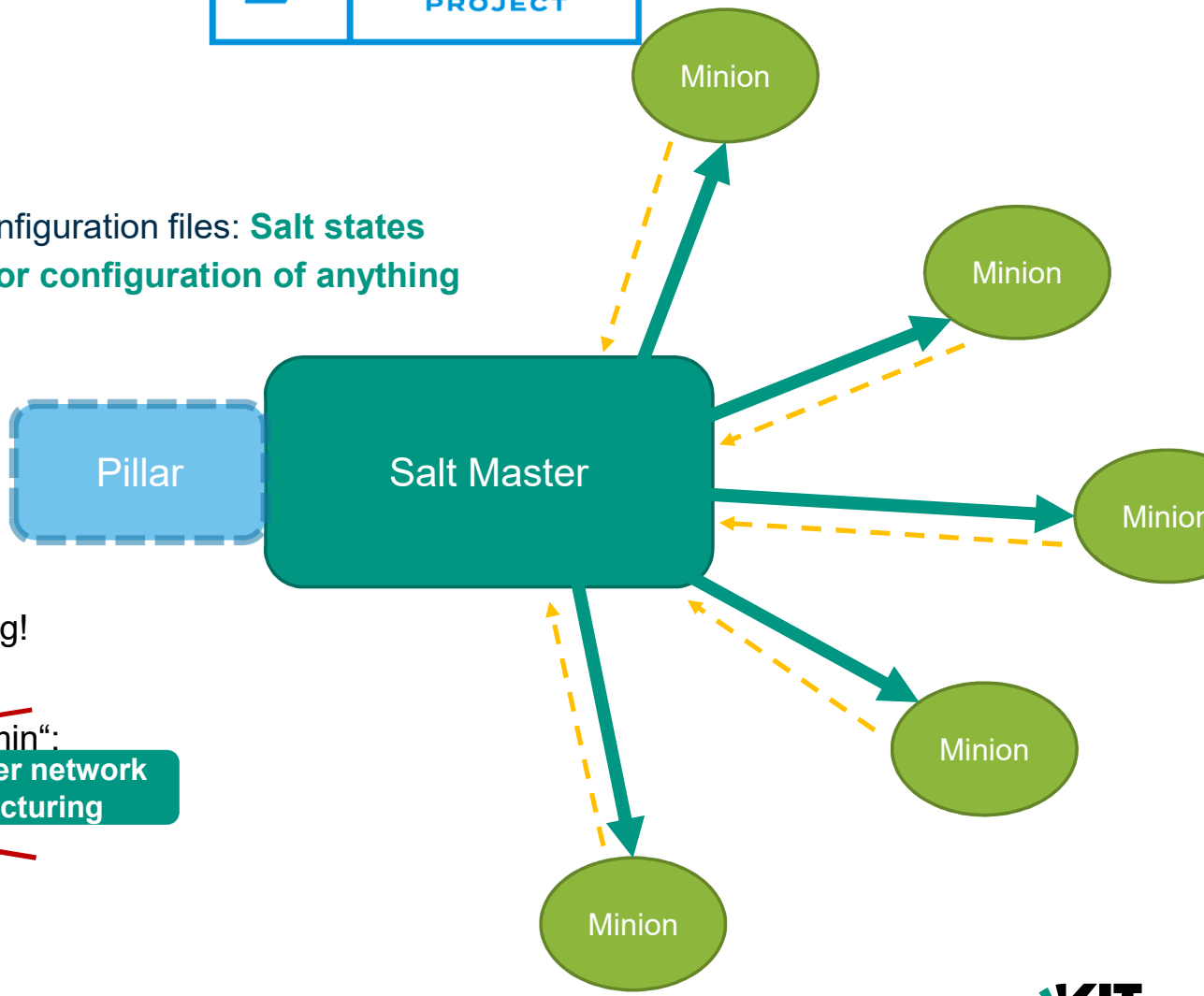
Server & PC Management: Salt

- Central management VM
- Every modification of any PC is written in YAML configuration files: **Salt states**
  - **Absolutley no „manual“ or direct installtion or configuration of anything**
- Combines documentation & deployment
  - Single source of truth
- Overall > 600 states
- Replacing, updating or adding another terminal or server of an existing system takes around 5 minutes
- Expert only! Requires root with access to everything!

- Two „regular, simple tasks“ also require „super-admin“:
  - Adding devices to network
  - Updating panels

Gone after network restructuring

Gone with Phoebus



Wishlist: Git support (2026)

Salt for Windows?

- Salt can also be used for Windows
- But most states could not simply be re-used
- Not enough resources to support parallel states for Windows

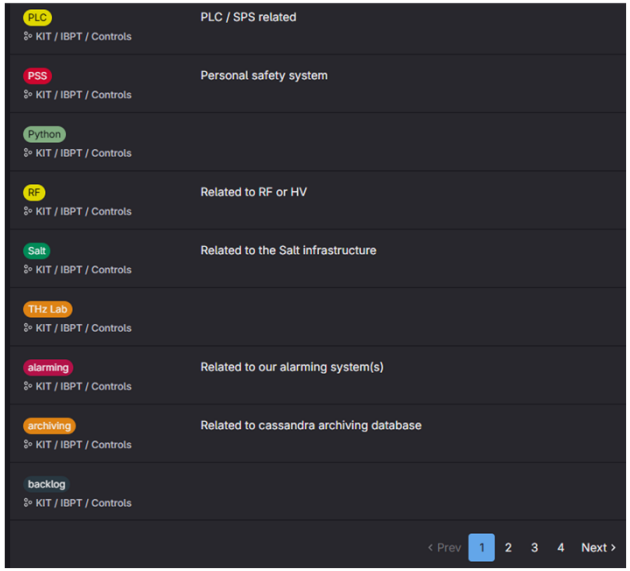
→ won’t be required for panels in the future

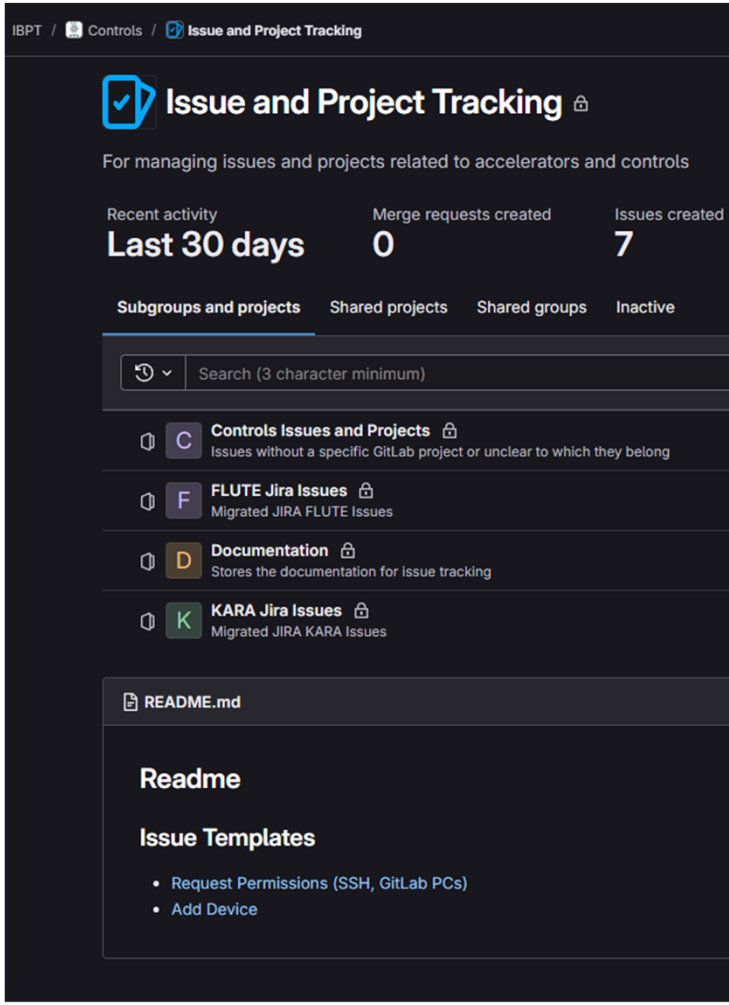
→ with network restructure summer 2026 OPSI should be available

GitLab – Issue Tracking

- After shutdown of JIRA we now use GitLab issues
  - All JIRA issues have been migrated
- General issues: https://gitlab.kit.edu/kit/ibpt/controls/issues
  - (Or open issue in the relevant project)
- Fill as much info as you can
- Device integration: please provide manuals…
- Extensive list of labels

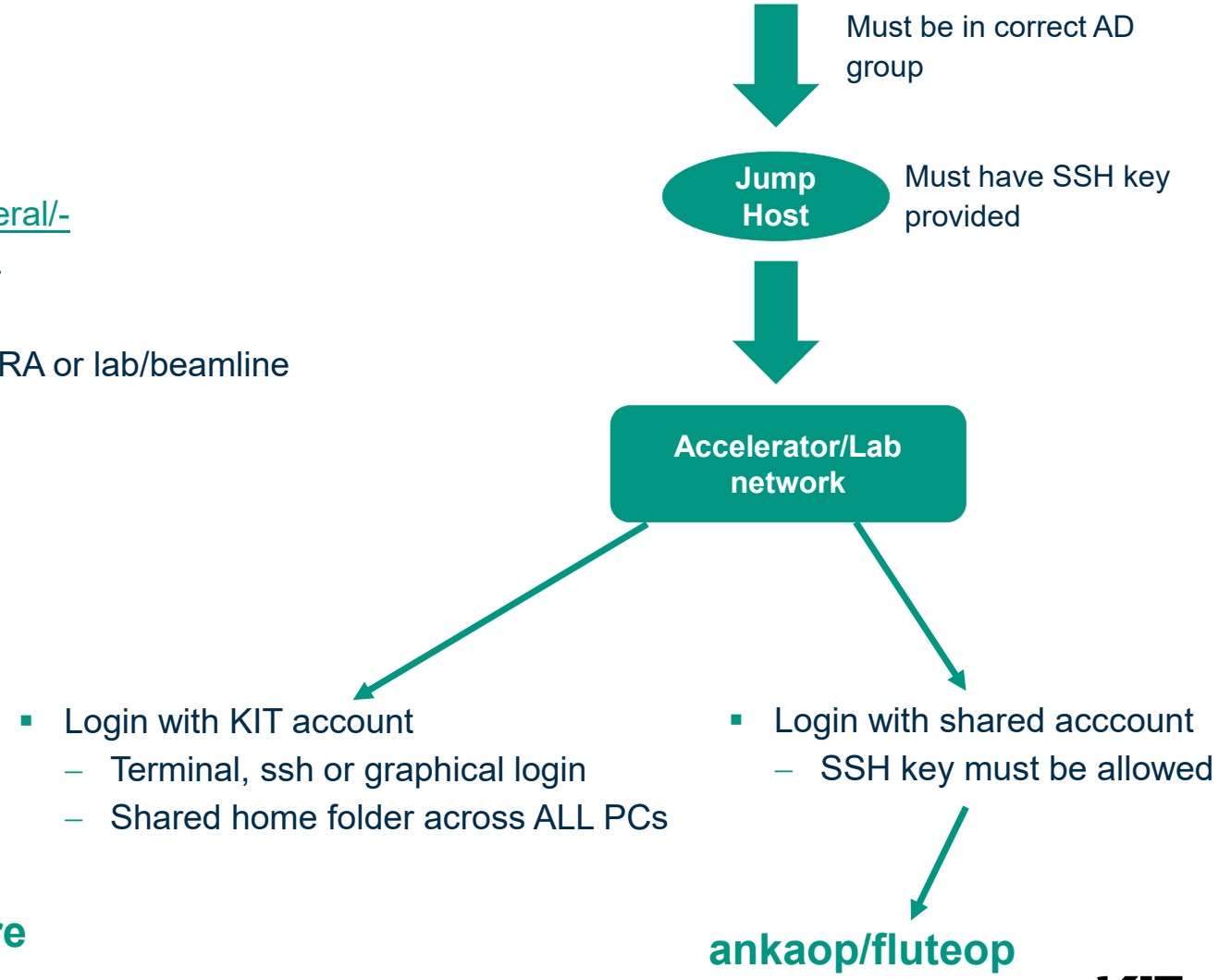
- More templates will be added
- More documentation will be added





Control Network Access

- Initial access request via GitLab issue: https://gitlab.kit.edu/kit/ibpt/controls/issues/general/-/issues/new?description_template=permissions
- Access per SSH only
- Access can be made to also only FLUTE or KARA or lab/beamline
- In the future this will be more granular
  - Only access to operator consoles
  - Access to server infrastructure



Wishlist: No shared accounts anymore

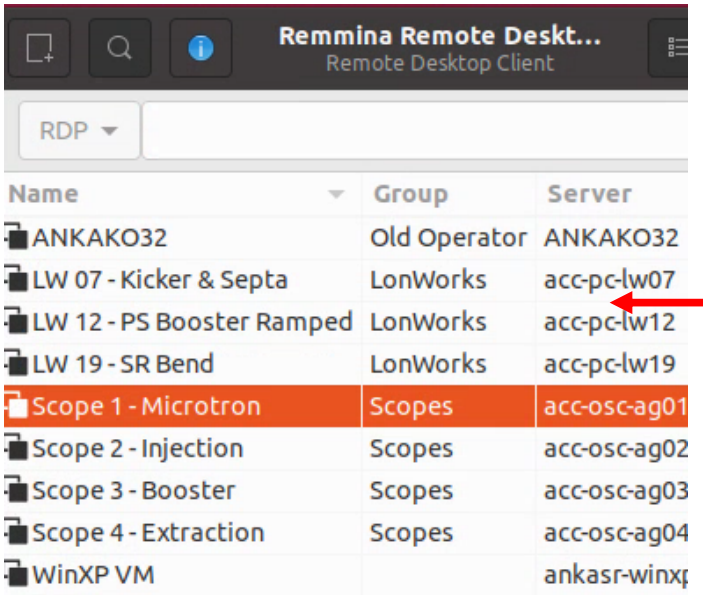
Operator Console

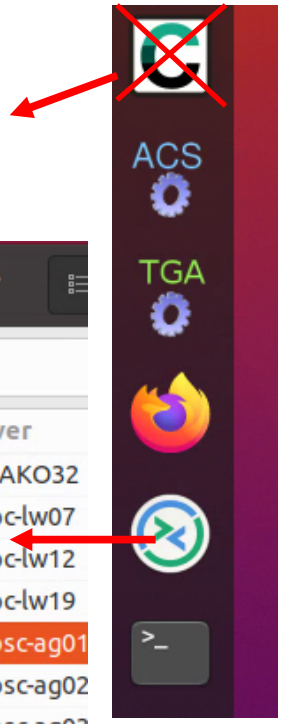
- Operator consoles are the terminial PCs typically used to operate KARA or FLUTE
- Operator consoles have a „special“ feature: restore to default profile of the **shared user**
- All OCs should behave the same
- Launcher, Firefox, remote desktop configurations…
- Desktop files, screenshots, …, will be lost

- There are no backups of operator consoles(!)

- Things which are not lost during restart:
  - CSS panel modifications
  - ~/data/ folder (local files without backup!)

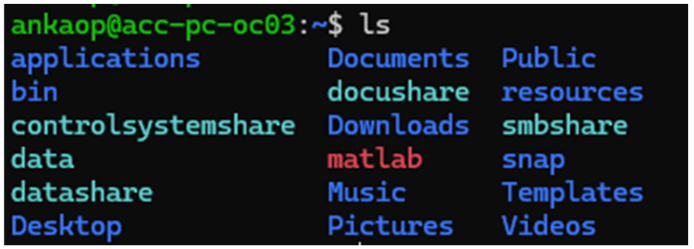
- We need this feature less and less and will disappear without shared users





File Shares

- Where to put files so that they are not lost?
  - Measurement files, scripts, configuration files, …



- SCC, IBPT and accelerator shares are available
  - /media/smb/*
  - /media/ceph/*
  - Write access should be possible with shared user and your user account
  - Linked in home folder of shared user
- Your (KIT account-based) user-space
  - /home/ws/ab1234/

- Docushare: SCC OE folder „Documentation“ — SCC
- Datashare: IBPTSRDATA/{IBPT-KARA|ibpt-flute}/ — IT
- Smbshare: accelerator specific SMB — Controls
- Docs: xWiki – „Network Shares“
  https://xwiki.ibpt.kit.edu/xwiki/bin/view/GEN/IBPT%20Services/Network%20Shares%20%20data%20transfer/

File Shares II

- Webview / HTTP acccess:
  - https://share.flute.ibpt.kit.edu

FLUTE Shares

- datashare
- docushare
- smbshare

- **docushare**
  - Read-only
  - Location to put device documentation and files
  - Vendor -> Device -> manuals, firmwares, etc.

- Webview / HTTP acccess:
  - https://share.kara.ibpt.kit.edu

KARA Shares

- controlsystemshare
- datashare
- docushare
- smbshare

Index of /docushare/cStart/

Name↓	Last Modified:
../	
_Example/	2025-Jun-17 10:6
Arista/	2025-Jul-04 15:1
Bergoz/	2025-Aug-12 10:4
Caen_ELS/	2025-Mar-14 06:1
[redacted]	2025-Jan-21 15:1
Danfysik/	2025-Jun-17 10:6
Gamma_Vacuum/	2025-Jun-17 10:6
Instrumentation_Technologies/	2025-Jun-30 18:2
iTest/	2025-May-21 13:1
MRF-Timing/	2025-Jun-26 22:6
nVent/	2025-Feb-26 13:3
Pfeiffer_Vacuum/	2025-Jun-17 10:6
PSI/	2025-Jun-30 17:2
[redacted]	2025-Nov-10 12:1
Scanditronix/	2025-Jul-17 14:1
[redacted]	2025-Aug-12 11:6
VAT_Vacuum/	2025-Mar-21 09:1
000-Readme-First.txt	2025-Jan-23 17:1

Logbook & Remote Desktop

- ELog service
  - Manual entries (changes to accelerator)
  - Semi-manual entries (injection logs at KARA)
  - Fully automated entries (created by measurement scripts)
  - Python API

- Remote Desktop via NoMachine
  - Either to support operators
  - „Change” something

Due to security considerations are both options currently blocked from the institute network

New logbook service next year as part of Phoebus, looking into alternatives for NoMachine

Aptly & Docker

- We run our own ubuntu package repository
  - https://apt-repo.ibpt.kit.edu

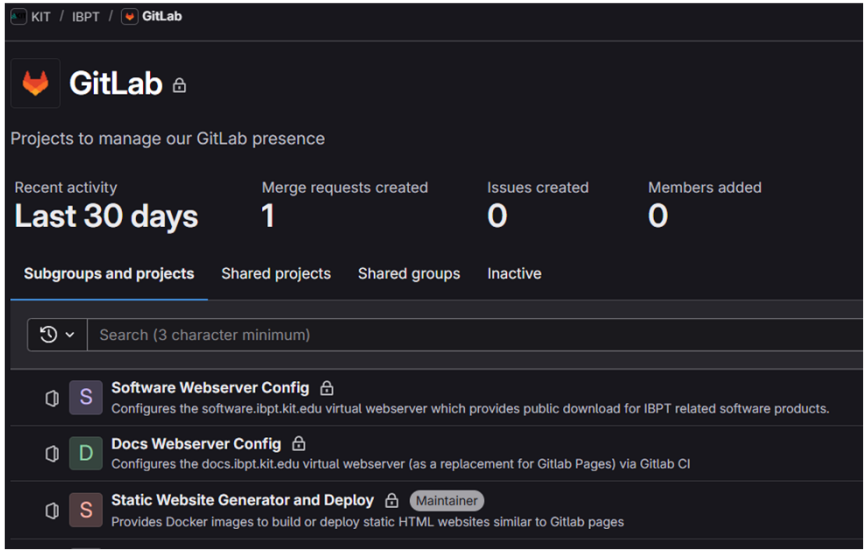
- Each official ubuntu package can be installed (via Salt)
- We build certain packages ourself (EPICS, but also some Python packages)
  - https://gitlab.kit.edu/kit/ibpt/controls/aptly

- For more complex applications containers can be used
  - Docker for server-side deployments
  - Apptainer for user applications (for example Badger)

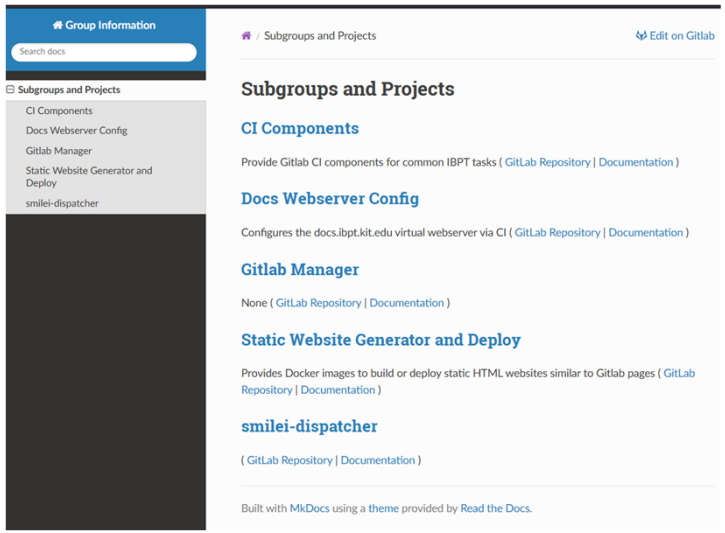
GitLab – Documentation

- How to document source code? As part of the GitLab repository!
- Accessibility is not ideal…
- GitLab “Pages” does not exist…

- Build our own solution:
  - Webserver from SCC: https://docs.ibpt.kit.edu/
  - GitLab CI to publish docs
  - Simply just releases readme with read-the-docs theme
  - More complex options available as group index generation, etc
- Code: https://gitlab.kit.edu/kit/ibpt/gitlab/static-website
- Documentation: https://docs.ibpt.kit.edu/gitlab/static-website/
- Docmentation is hosted by SCC
  - Accessible without VPN(!!)
  - If in IBPT network: no authorization
  - If outside: KIT account login

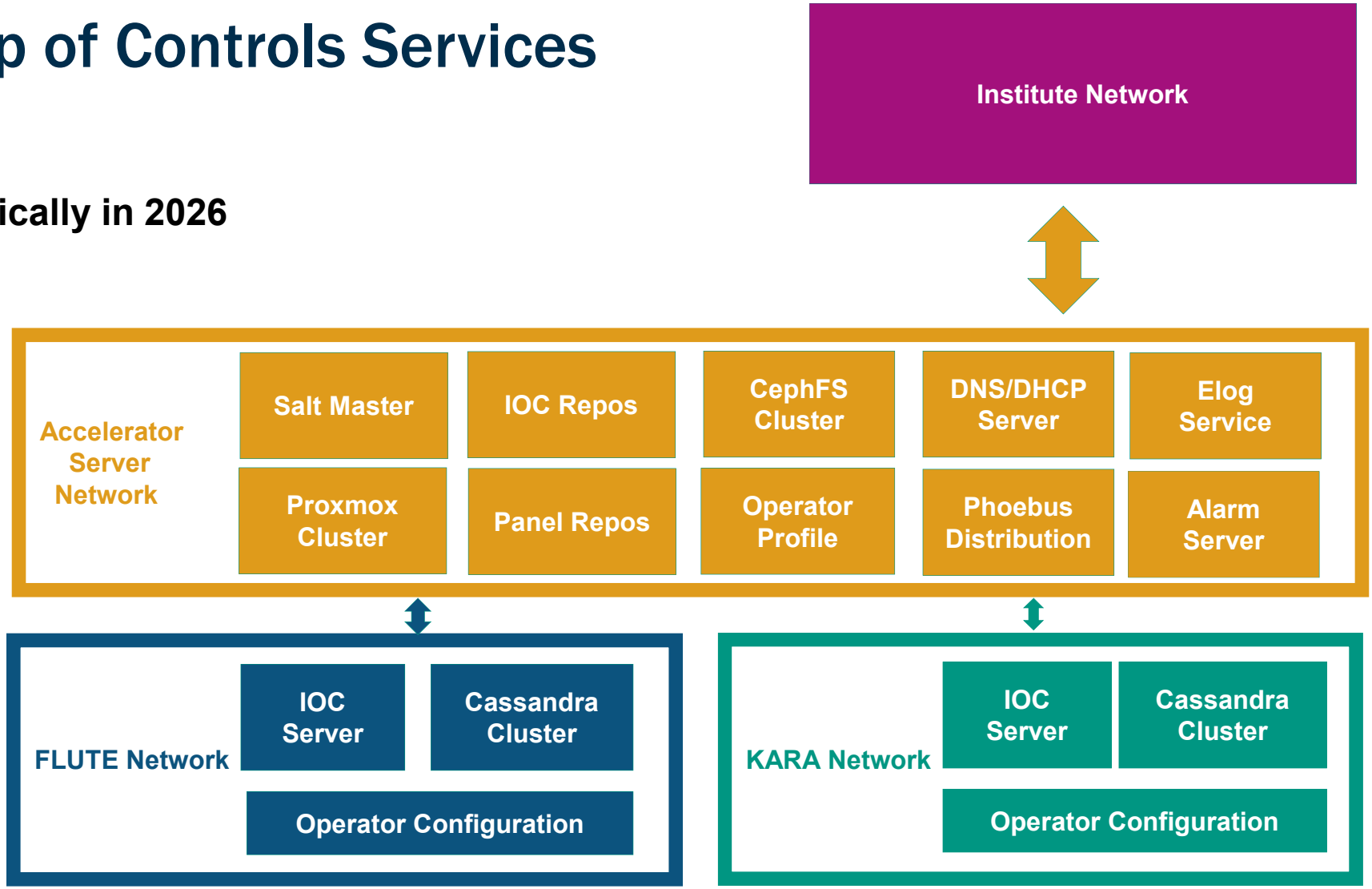


Follows the same structure as GitLab without „kit/ibpt/“



Future Setup of Controls Services

Will evolve dramatically in 2026



Shared Services

5

KIT | Institute | Accelerators

Simulations

- BWUniCluster
- Acc-Sim02 VM (CPU only)
- Flute-pc-sr12 (GPU & CPU)

Virtualization

- ESX VMs
- Webserver
- Docker host
- Proxmox VMs
- Docker host
- Apptainer runtime

File Storage

- LSDF
- KIT account drive
- KIT IBPT shared space
- Bwsyncandshare
- IBPTSRDATA
- Ceph cluster (KARA only for now)
- SMB server

Special Projects

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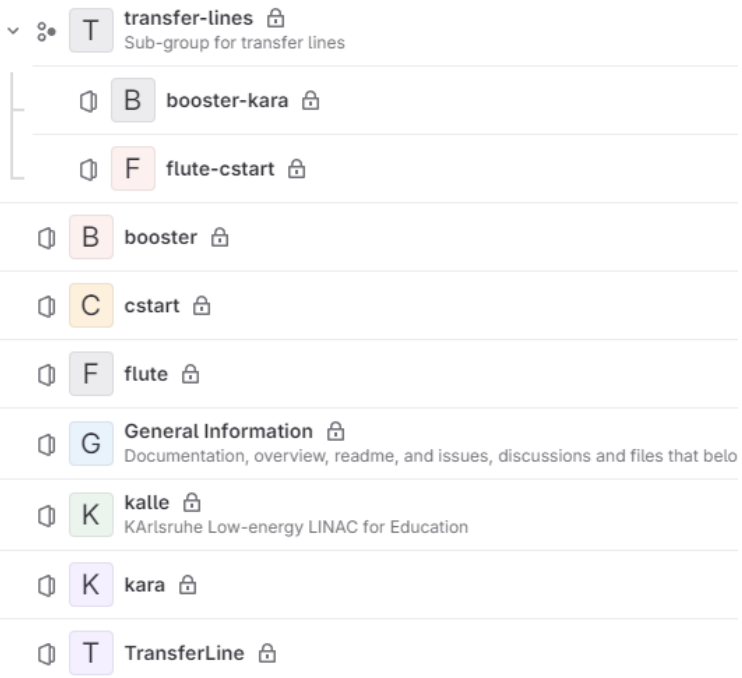
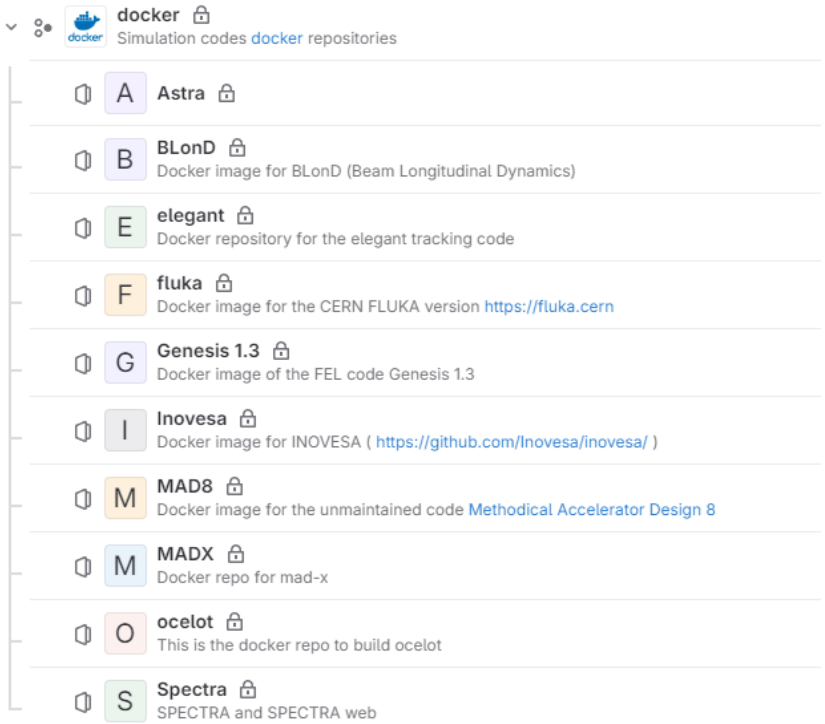
Accelerator Models

- Basic idea: provide central lattices & containerized simulation codes
- Project a bit stale at the moment
- https://gitlab.kit.edu/kit/ibpt/acc-models





IBPT Python Tools

- User-friendly access to accelerator resources
- Started around 2020
- Currently undergoing modernization in packaging and workflow
- https://gitlab.kit.edu/kit/ibpt/python-tools