

Accelerator Infrastructure, Services & Network(s) at IBPT

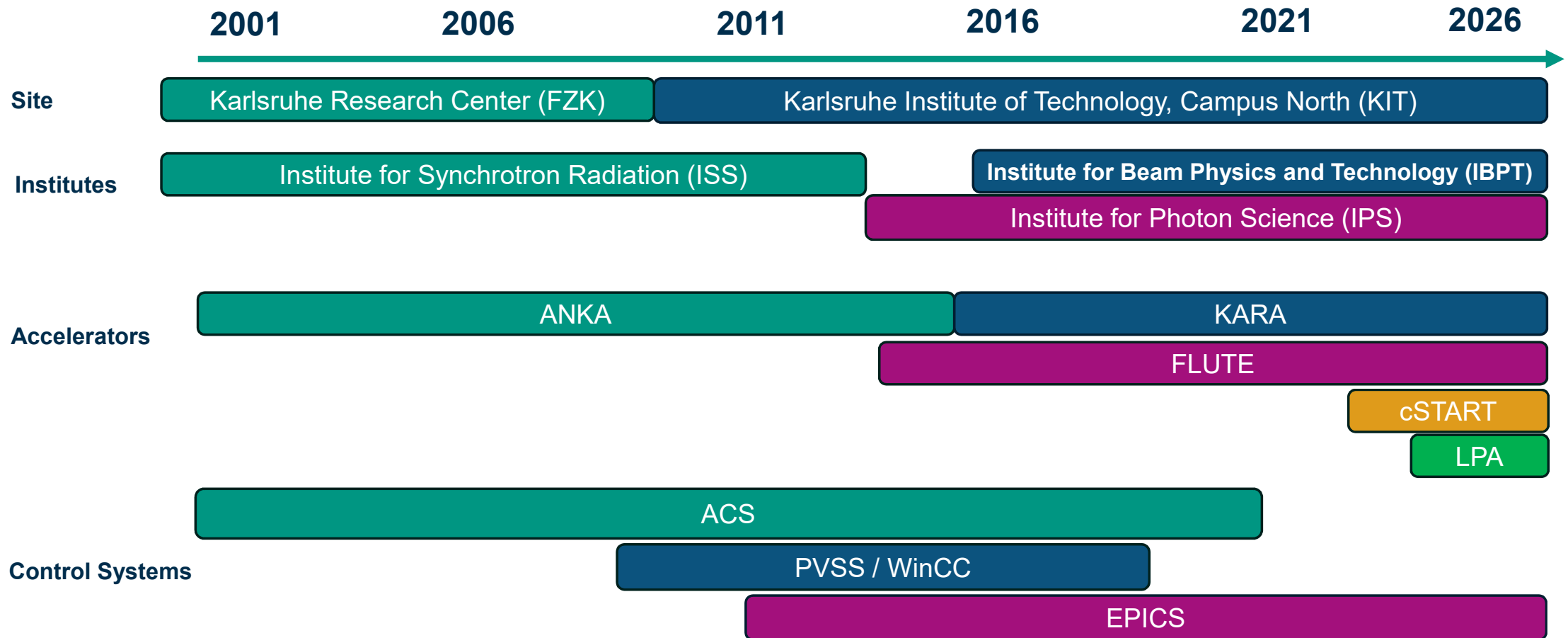
E. Blomley, 25.11.2025

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

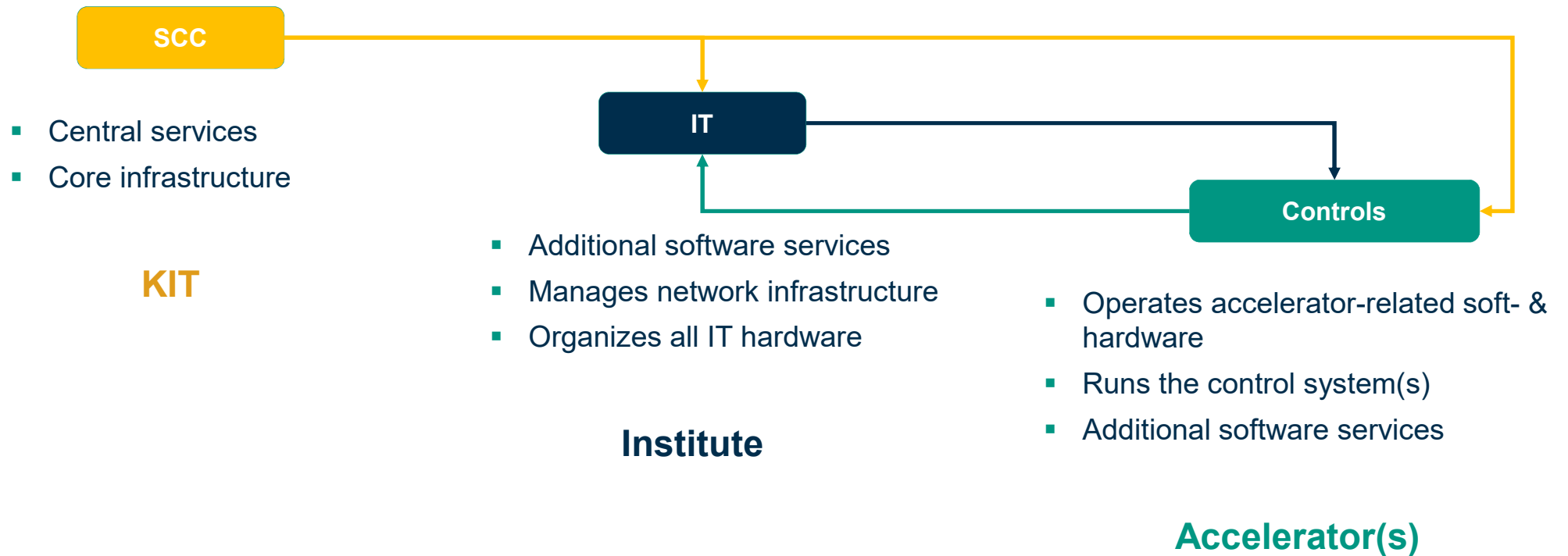
Overview

1

A Brief History...



SCC, IT, Controls... ?



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:

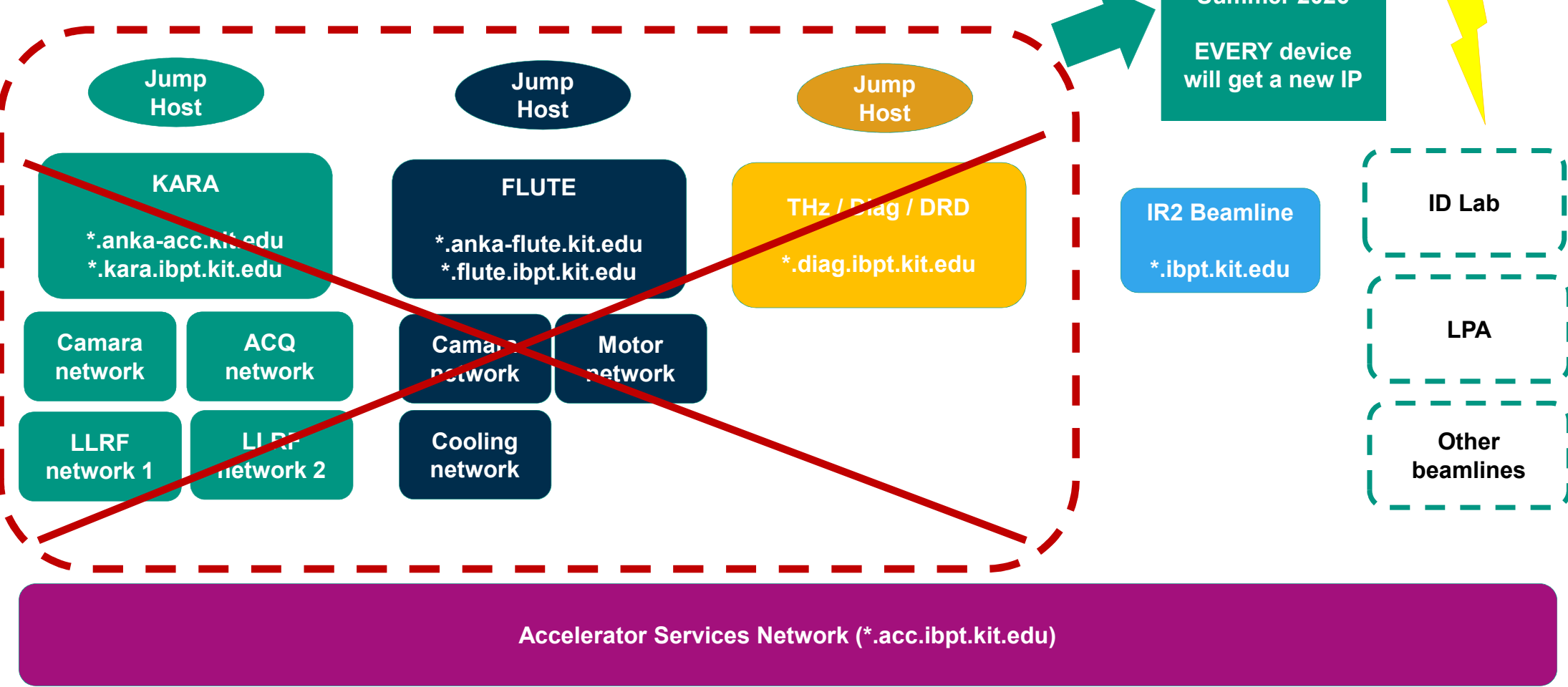
- Vpn2vlan
 - 2FA
 - Tun level
 - **Not via phones**
- Wifi2vlan
 - Direct access without VPN from KIT wifi
- Physical connection
 - Office buildings

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

2

KIT Account

- Central account used for most authentication 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

Institute services

Accelerator 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

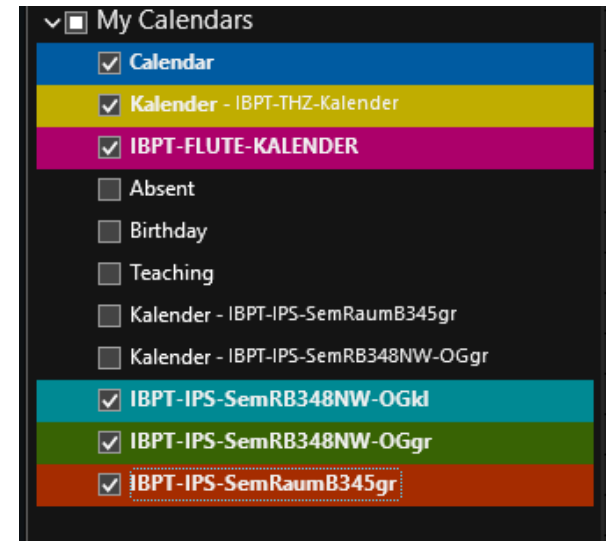
NET GROUP IBPT-Thz /DOMAIN

```
*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

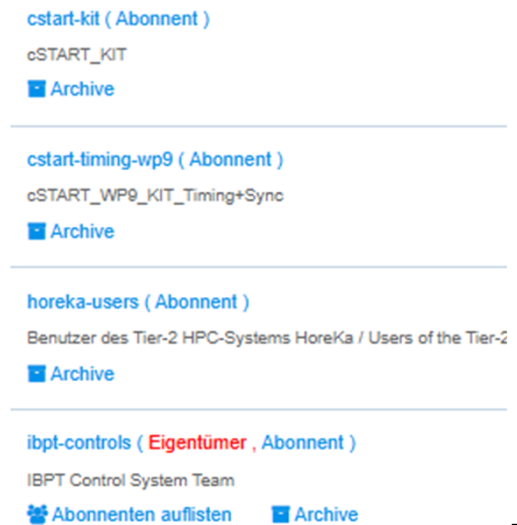
- KIT operates Exchange server with 8 GB e-mail account for your KIT account
- Web access: <https://owa.kit.edu>
- Can be added to all e-mail clients
- E-Mail signature & encryption
- Calendars, meetings & room booking
- E-Mail lists (IBPT-Thz@ibpt.kit.edu)



Self-Managed E-Mail Lists

+ KIT account
- AD groups

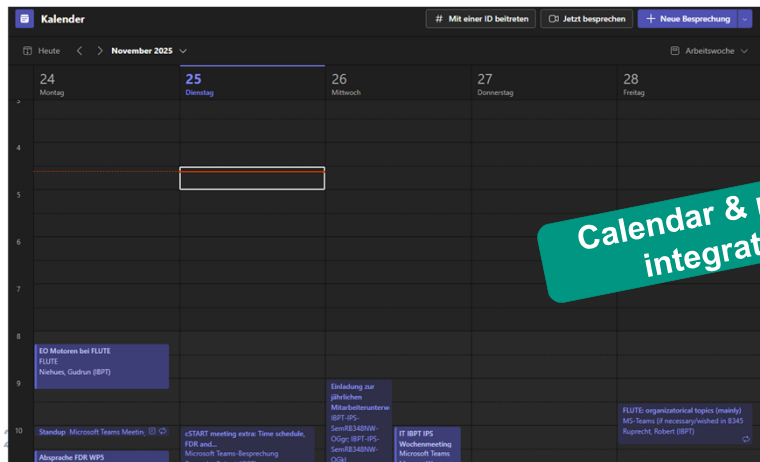
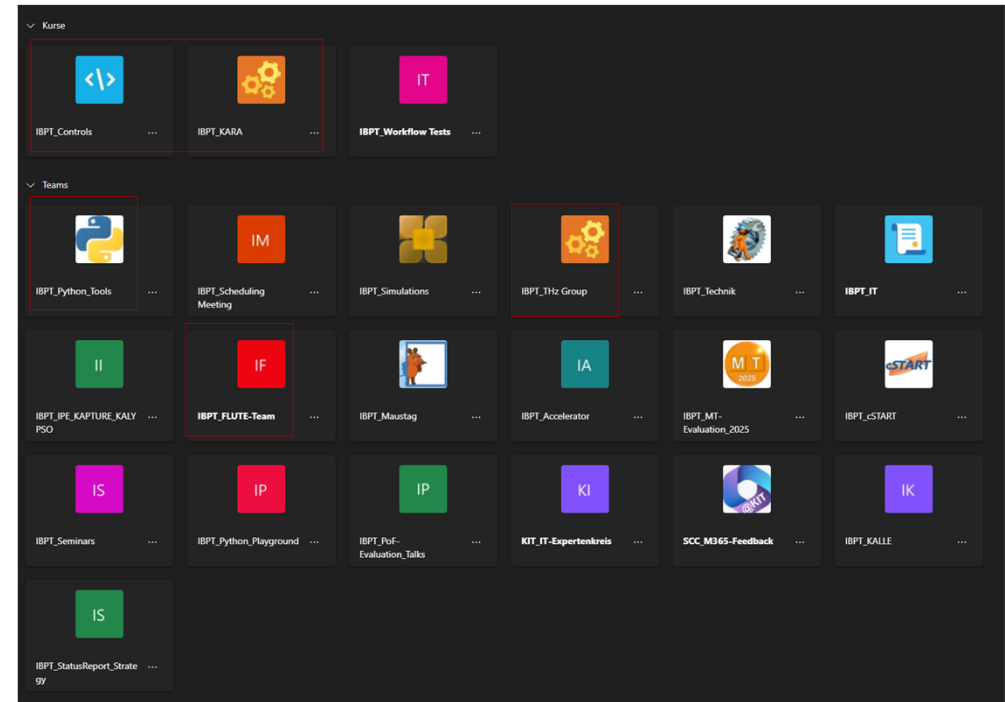
- <https://lists.kit.edu>
- Everyone can create lists, subscribe, etc.
- kara-operation@lists.kit.edu



MS Teams

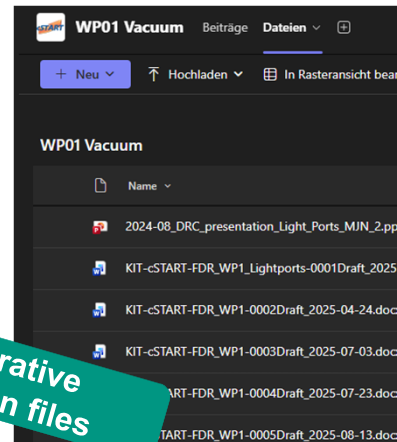
+ KIT account
- AD groups

- „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



Alternatives:
KIT Matrix
Zoom (for lectures)

Wish list: Controls
notifications 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

Institute for Beam Physics and Technology (IBPT)

Head of Institute: Prof. Dr. Anke-Susanne Müller

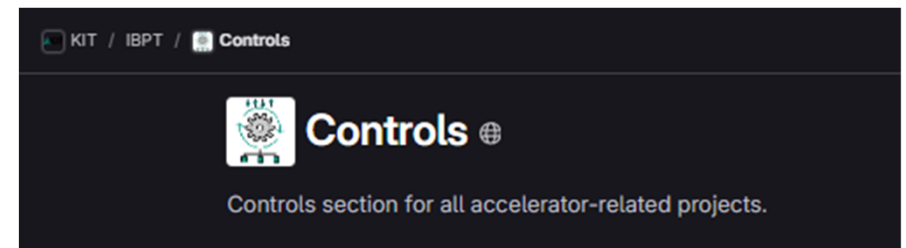
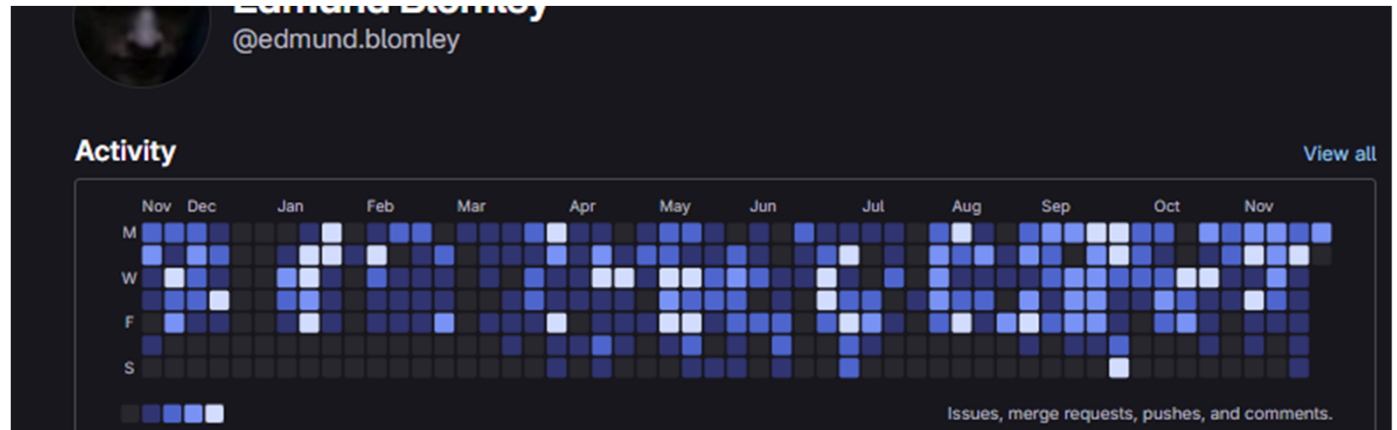
Events	25 events	⇒
Projects	2 events	⇒
Department Accelerator R&D + Operations I (ARD_O1)	empty	⇒
Department Accelerator R&D + Operations II (ARD_O2)	132 events	⇒
Test	3 events	⇒
Regular Meetings	59 events	⇒
Department Technology - Technik	empty	⇒
cSTART	2 events	⇒

Simulations, Integration and Modeling (SIM)	5 events	⇒
Group Meeting	37 events	⇒
Controls Meeting	17 events	⇒

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

3

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)

Blog

- Sandbox
- DPG 2025
- IPAC 2025
- Task Manager
- File Manager
- IPAC2025-Paper
- THz CVs
- Betriebstagebuch 2024
- Betriebstagebuch 2024
- Betriebstagebuch 2024
- Betriebstagebuch 2026
- Betriebstagebuch bis 2025
- Betriebstagebuch bis ende 2025
- DPG 2026
- IPAC 2026

Navigation

- > Beamlines
- > Blog
- > CAT-ACT
- > cSTART - Large Acceptance Storage Ring
- > Data Management
- > EnergyUsage
- > FLUTE project
- > General
 - IBPT Knowledge Base
- > IBPT (temporary archive for accelerator report, etc.)
- > IT - Beamline Kontrollsysteme
- > IT - Public
 - IT-Advanced
 - > computing cluster und storage
 - Digitally sign a PDF / PDF signieren
 - Integrieren Sie eine funktionale Mailbox / Integrate functional mailbox
 - Sicherheitskonzept IBPT
 - SSH Key Authentication
 - > Upgrade Virtueller Maschinen auf Windows 11
 - Windows Update Regeln
 - > IT-Anleitungen/Instructions
- > IT - Services & Infrastructure
 - > Dienste
 - > Infrastruktur
- > JIRA

IT - Public

Last modified by [David Haas](#) on 2024/09/04 15:06

Themengebiete des Spaces

Willkommen zum Dokumentationswiki der IT.

Unter "Anleitungen" findet ihr allgemeine Information, unter "Advanced" mehr in die Tiefe (z.B. für die Erstellung von LaTeX für wissenschaftlich tätige Personen). Dieser Bereich ist öffentlich. Die Anleitungen sind für die tägliche Arbeit in der Administration/Büro, sowie für Wissenschaftler (z.B. Datenmanagement, etc.) zu finden. Der primäre Inhalt befindet sich im Bereich "Advanced".

Welcome to the public documentation by the IT.

The part (IT-Instructions) is intended to serve tutorials, how tos, and information for relevant both for the daily work in the administration/office, as well as for scientists (e.g. data management, etc.) can be found in the advanced section! There the primary content is located.

IT-Anleitungen/Instructions

- Abonnieren Sie eine E-mail-Liste
- Bestellungen über den SCC Software Shop / Orders through the SCC software shop
- Datenaustausch zu groß für eMail / Exchange of data too big for eMail
- Drucken und Scannen / Printer and Scanner
- e-Mail-Verteiler von LAS, IPS und IBPT
- E-mail_zertifikate / E-mail certificate
- Erstellung von Tickets für die IT
- Erste Schritte mit dem neuen Computer / Getting started with the new computer
- IBPT Scheduling Meeting
- Informationen zur IT-Sicherheit am IBPT
- Konferenz-Beitrags-Seiten / AWM-Konferenzseiten
- Microsoft Copilot
- Mit Laptop das KIT-Gelände verlassen
- Organize events with INDICO
- Such_maschinen / Search engine
- 7 more ...

IT-Advanced

- computing cluster und storage
- Digitally sign a PDF / PDF signieren
- Integrieren Sie eine funktionale Mailbox / Integrate functional mailbox
- Sicherheitskonzept IBPT
- SSH Key Authentication
- Upgrade Virtueller Maschinen auf Windows 11
- Windows Update Regeln

Flex Office

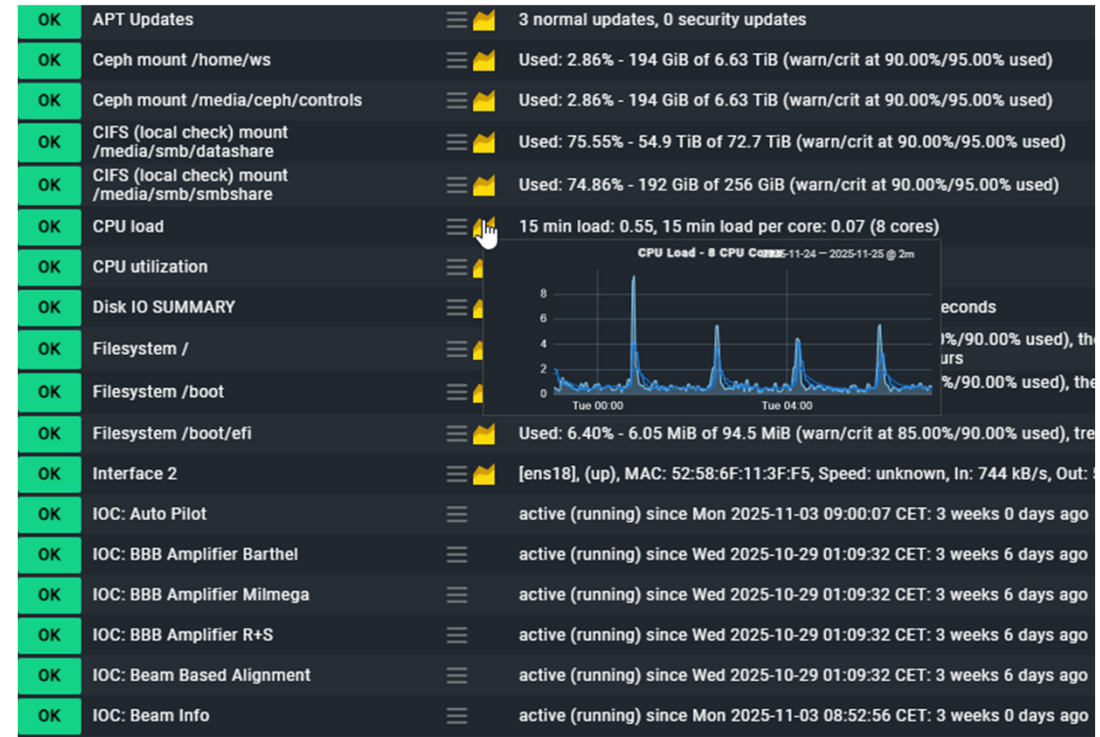
- 4 shared workplaces
 - 2 with KIT network (students with private notebooks)
 - 2 with IBPT network (with IBPT notebooks)
 - Docking station
 - 2 monitors, mouse keyboard
- Access via KIT card
- Can be booked via calendar
- More details:
 - <https://xwiki.ibpt.kit.edu/xwiki/bin/view/GEN/IBPT%20Shared%20Office/>



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/>

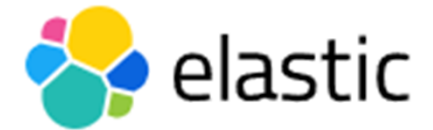
1021021	Michael zu IBPT-USR-KARA hinzufügen - Hi, ist erledigt Viele Grüße Manuel IT Support IBPT --- Karlsruher Institut für Technologie (KIT) Institut für Beschleunigerphysik (IBPT) --- 12.09.2025 15:10 - Blomley Edmund schrie...	geschlossen	IBPT_ITSupport	73 d 17 h
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Accelerator Services

4

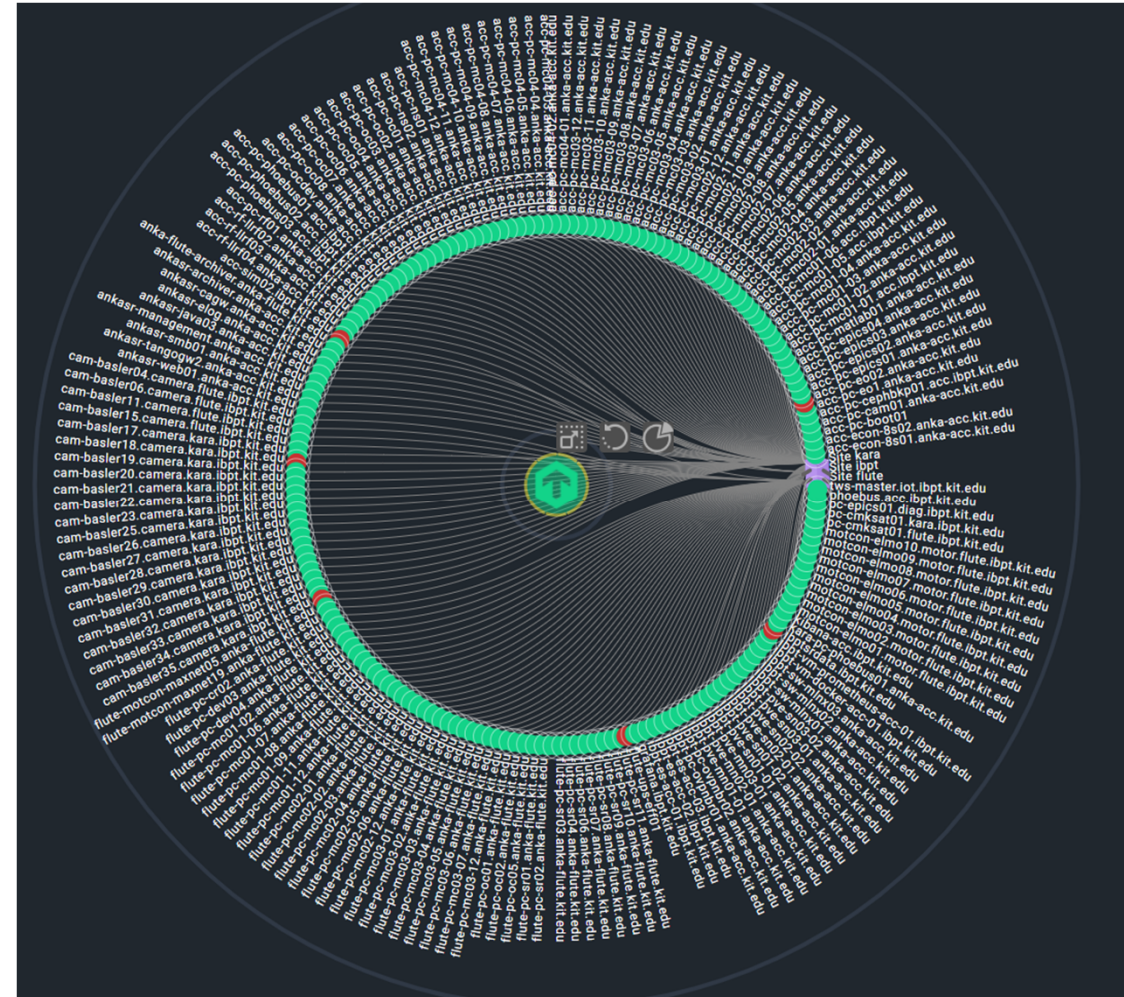
Accelerator Infrastructure

- 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

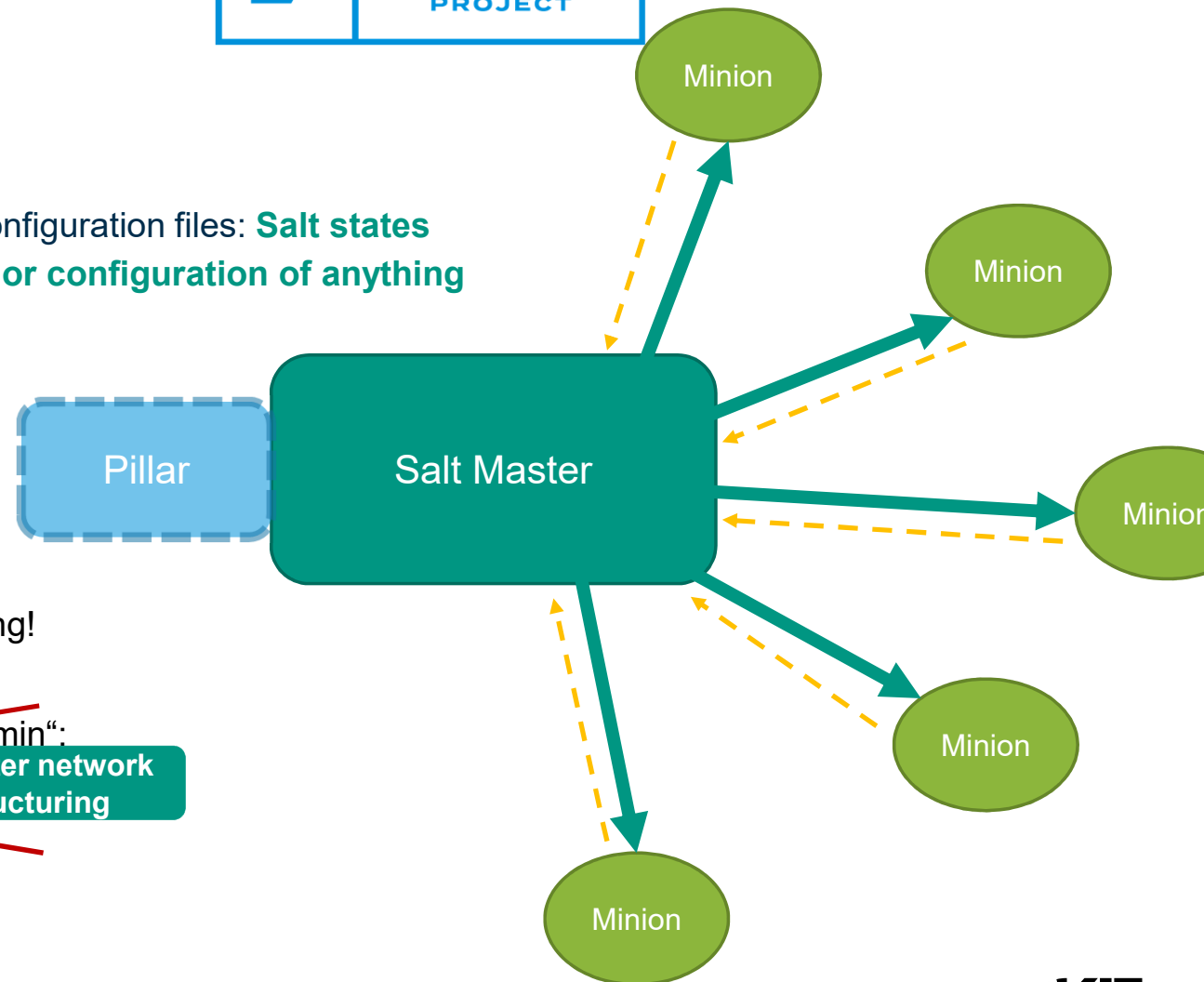
- Most services run as Docker containers
- Most servers are virtual machines
 - Except real-time requirements (NTP server)
 - Except file servers
 - Except archive cluster
 - Except USB is required
- Most servers run Ubuntu
 - KARA: 2 Windows server
 - FLUTE: Quite a few laptops
- Around ~130 servers & 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

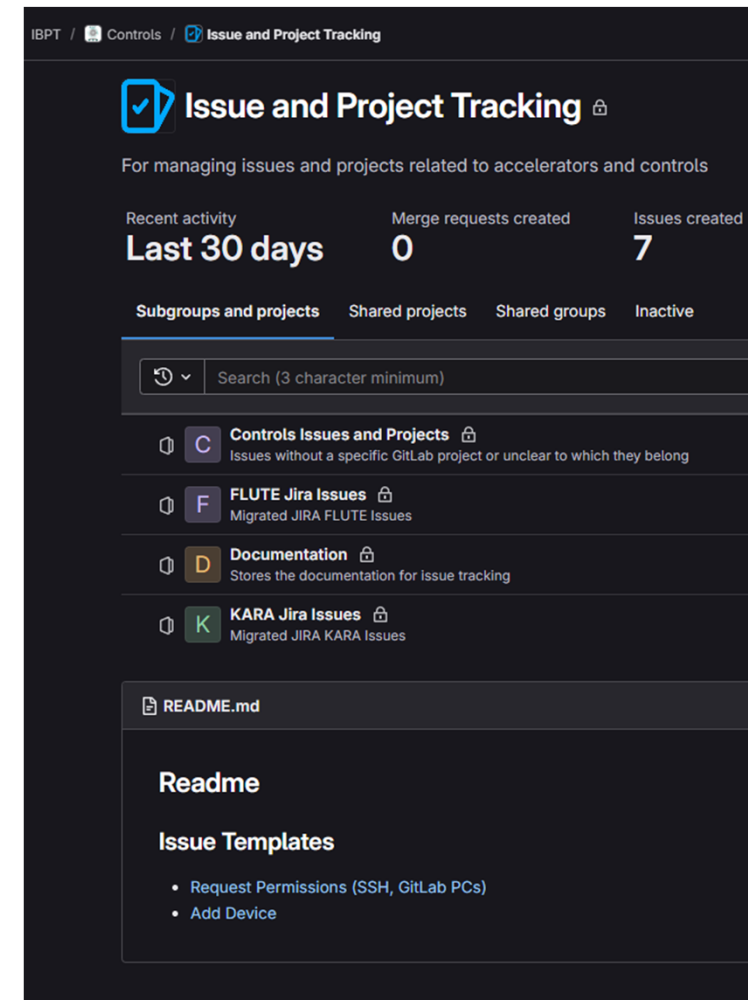
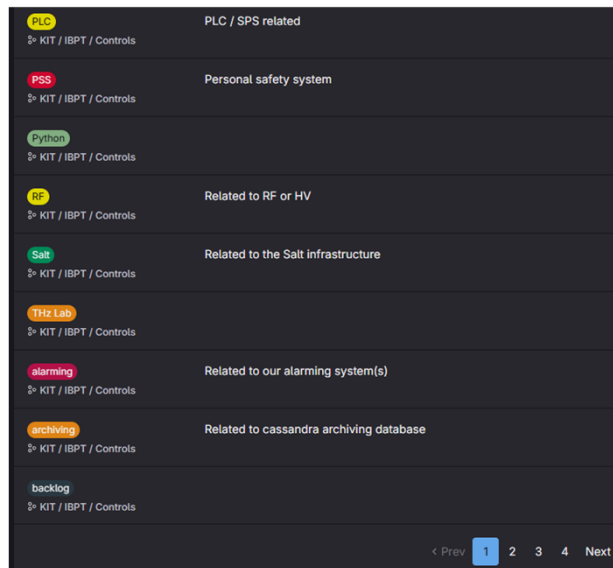
→ won't be required for panels in the future

→ with network restructure summer 2026 OPSI should be available

GitLab – Issue Tracking

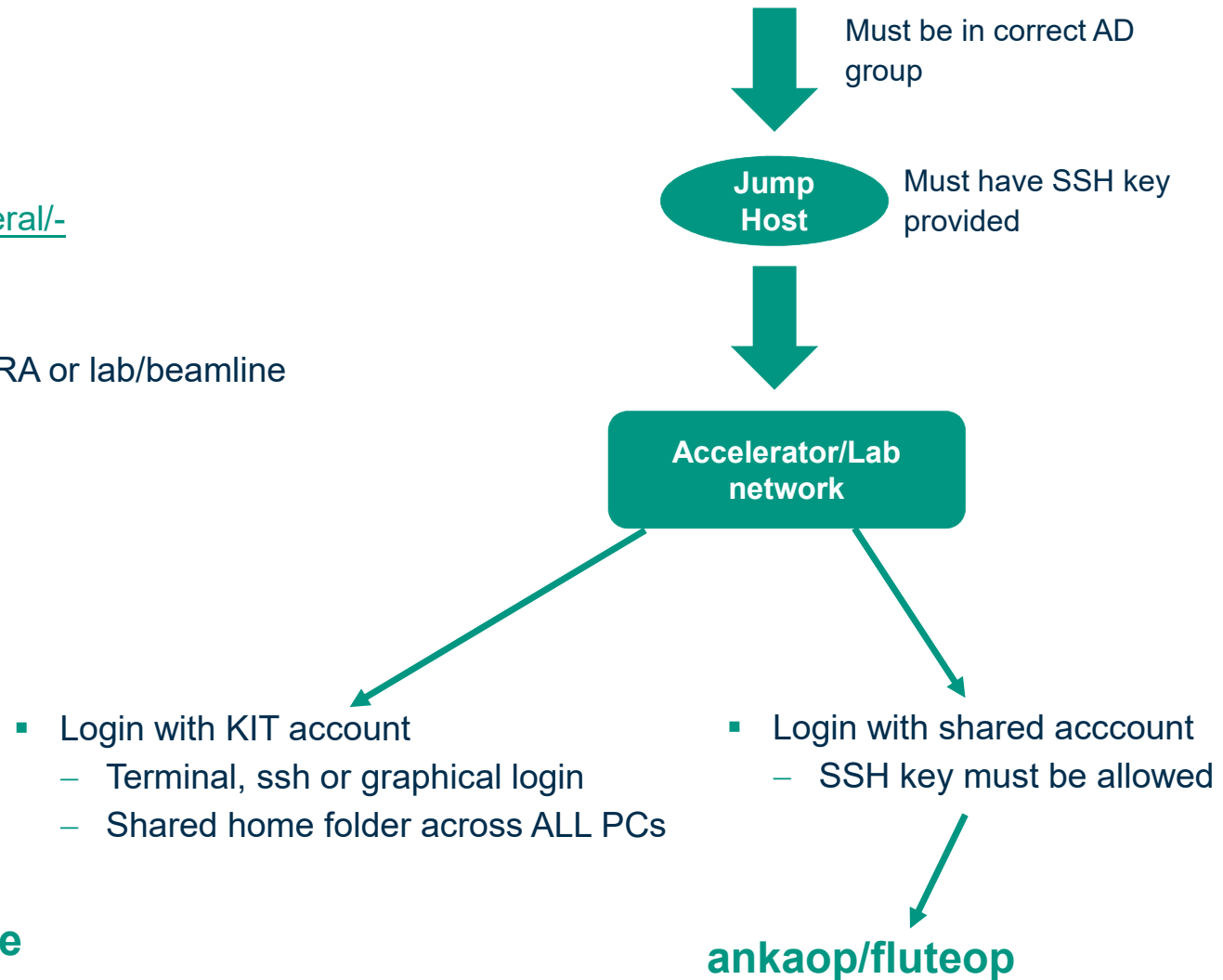
- After shutdown of JIRA we now use GitLab issues
 - All JIRA issues have been migrated
- General issues: <https://gitlab.kit.edu/kit/ibpt/controls/issues>
 - (Or open issue in the relevant project)
- Fill as much info as you can
- Device integration: please provide manuals...
- Extensive list of labels

- 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

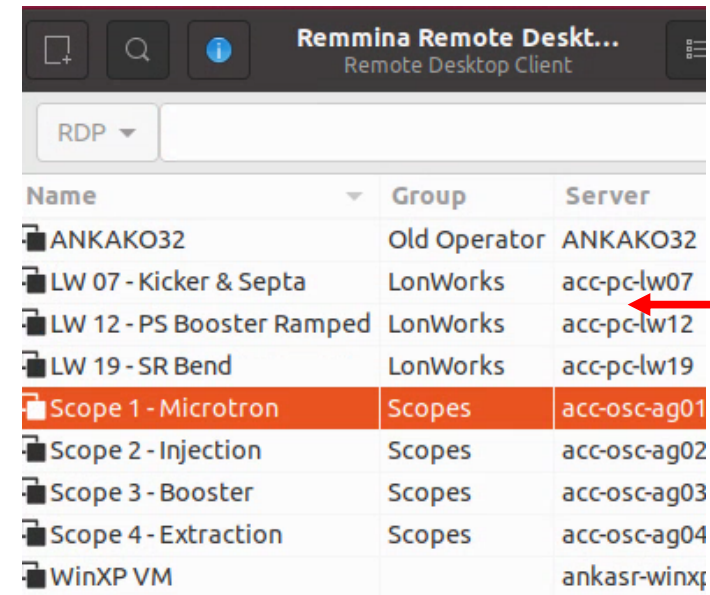
Operator Console

- Operator consoles are the terminal 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!)

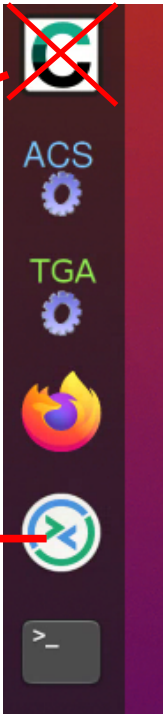
- We need this feature less and less and will disappear without shared users



Remmina Remote Desk...
Remote Desktop Client

RDP ▾

Name	Group	Server
ANKAKO32	Old Operator	ANKAKO32
LW 07 - Kicker & Septa	LonWorks	acc-pc-lw07
LW 12 - PS Booster Ramped	LonWorks	acc-pc-lw12
LW 19 - SR Bend	LonWorks	acc-pc-lw19
Scope 1 - Microtron	Scopes	acc-osc-ag01
Scope 2 - Injection	Scopes	acc-osc-ag02
Scope 3 - Booster	Scopes	acc-osc-ag03
Scope 4 - Extraction	Scopes	acc-osc-ag04
WinXP VM		ankasr-winxp



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/

```
ankaop@acc-pc-oc03:~$ ls
applications  Documents  Public
bin           docushare  resources
controlsystemshare Downloads  smbshare
data         matlab     snap
datashare    Music      Templates
Desktop      Pictures   Videos
```

- Docushare: SCC OE folder „Documentation“
- Datashare: IBPTSRDATA/{IBPT-KARA|ibpt-flute}/
- Smbshare: accelerator specific SMB
- Docs: xWiki – „Network Shares“

SCC

IT

Controls

<https://xwiki.ibpt.kit.edu/xwiki/bin/view/GEN/IBPT%20Services/Network%20Shares%20%20data%20transfer/>

File Shares II

- Webview / HTTP access:
 - <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 access:
 - <https://share.kara.ibpt.kit.edu>

KARA Shares

- [controlsystemshare](#)
- [datashare](#)
- [docushare](#)
- [smbshare](#)

Index of /docushare/cStart/

Name↓	Last Modified:
../	
.._Example/	2025-Jun-17 10:00
Arista/	2025-Jul-04 15:10
Bergoz/	2025-Aug-12 10:40
Caen ELS/	2025-Mar-14 06:10
[REDACTED]	2025-Jan-21 15:10
Danfysik/	2025-Jun-17 10:00
Gamma_Vacuum/	2025-Jun-17 10:00
Instrumentation_Technologies/	2025-Jun-30 18:20
iTest/	2025-May-21 13:10
MRF-Timing/	2025-Jun-26 22:00
nVent/	2025-Feb-26 13:30
Pfeiffer_Vacuum/	2025-Jun-17 10:00
PSI/	2025-Jun-30 17:20
[REDACTED]	2025-Nov-10 12:10
Scanditronix/	2025-Jul-17 14:10
[REDACTED]	2025-Aug-12 11:00
VAT_Vacuum/	2025-Mar-21 09:10
000-Readme-First.txt	2025-Jan-23 17:10

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

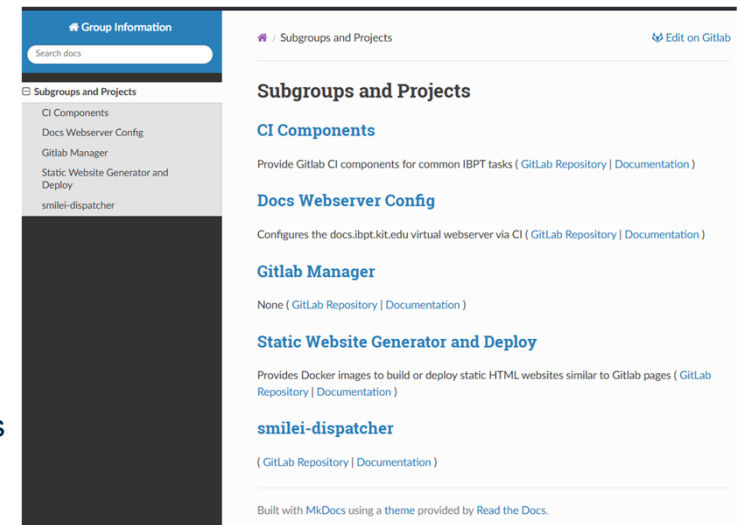
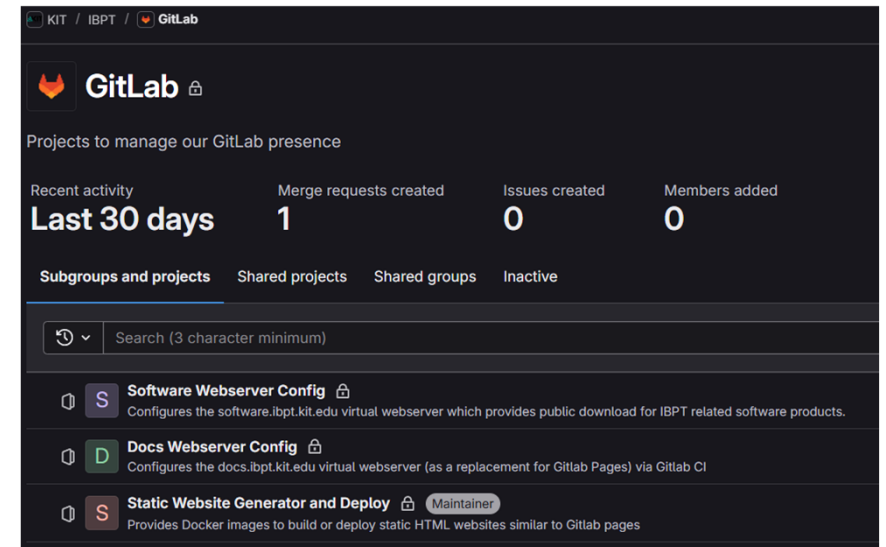
- We run our own ubuntu package repository
 - <https://apt-repo.ibpt.kit.edu>
- Each official ubuntu package can be installed (via Salt)
- We build certain packages ourself (EPICS, but also some Python packages)
 - <https://gitlab.kit.edu/kit/ibpt/controls/aptly>
- For more complex applications containers can be used
 - Docker for server-side deployments
 - Apptainer for user applications (for example Badger)



GitLab – Documentation

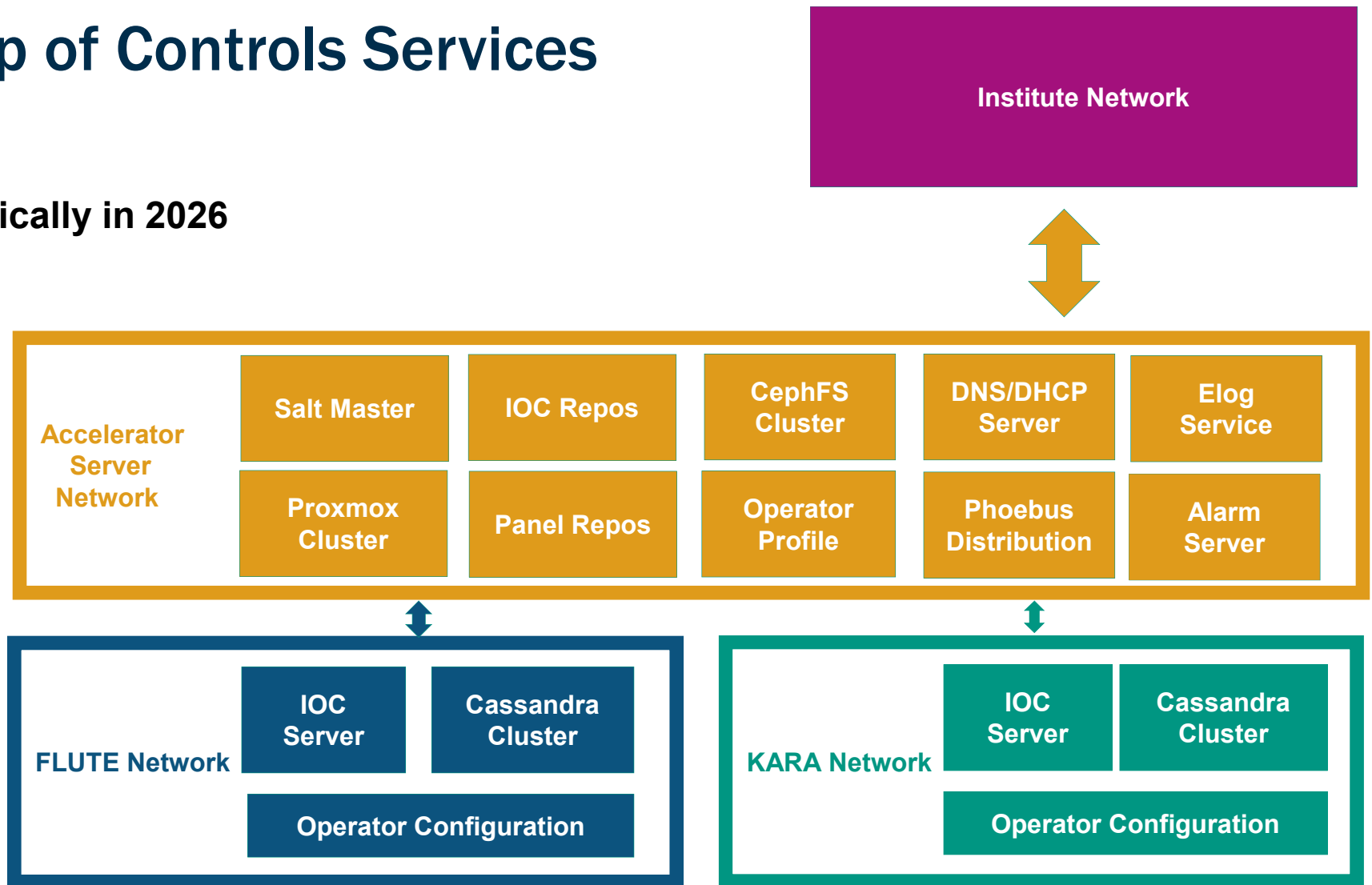
- How to document source code? As part of the GitLab repository!
- Accessibility is not ideal...
- GitLab “Pages” does not exist...
- Build our own solution:
 - Webserver from SCC: <https://docs.ibpt.kit.edu/>
 - GitLab CI to publish docs
 - Simply just releases readme with read-the-docs theme
 - More 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/>
- Documentation 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
- Docker host
- Proxmox VMs
- Webserver
- Docker host
- Apptainer runtime

File Storage

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

Special Projects

6

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>

A screenshot of a GitLab repository structure. The main group is 'transfer-lines' (T), described as 'Sub-group for transfer lines'. It contains several sub-groups: 'booster-kara' (B), 'flute-cstart' (F), 'booster' (B), 'cstart' (C), 'flute' (F), 'General Information' (G) with a description 'Documentation, overview, readme, and issues, discussions and files that belo', 'kalle' (K) 'KArlsruhe Low-energy LINAC for Education', 'kara' (K), and 'TransferLine' (T).

A screenshot of a Docker repository structure. The main group is 'docker', described as 'Simulation codes docker repositories'. It contains several sub-repositories: 'Astra' (A), 'BLonD' (B) 'Docker image for BLonD (Beam Longitudinal Dynamics)', 'elegant' (E) 'Docker repository for the elegant tracking code', 'fluka' (F) 'Docker image for the CERN FLUKA version <https://fluka.cern>', 'Genesis 1.3' (G) 'Docker image of the FEL code Genesis 1.3', 'Inovesa' (I) 'Docker image for INOVESA (<https://github.com/Inovesa/inovesa/>)', 'MAD8' (M) 'Docker image for the unmaintained code [Methodical Accelerator Design 8](#)', 'MADX' (M) 'Docker repo for mad-x', 'ocelot' (O) 'This is the docker repo to build ocelot', and 'Spectra' (S) 'SPECTRA and SPECTRA web'.

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>

The screenshot shows a GitLab package registry page for Python tools. At the top, there is a 'packages' section with a lock icon and the text 'Place for all Python-Tool packages'. Below this, there is a list of packages, each with a letter icon, a name, and a description:

- A Accelerator**: Accelerators that can be dependency injected into the other projects
- A Analysis**
- C cassandra**: Cassandra wrapper
- E elog**: Allows interaction with our ELOG
- E epics**: Wrapper for pyepics
- I io**: Interface to measurement data files (highlighted in blue)
- M Measurement**
- P Package Overview**
- P physics**
- P pvs**: Provides easier access to PVs
- R Remote**: Tools for remote interaction with IBPT resource
- S Save and Restore client**: Python client library for the CSS Save & Restore
- U utils**

