GAN @ TESLA Test Facility

The TESLA Test Facility as a Prototype for the Global Accelerator Network

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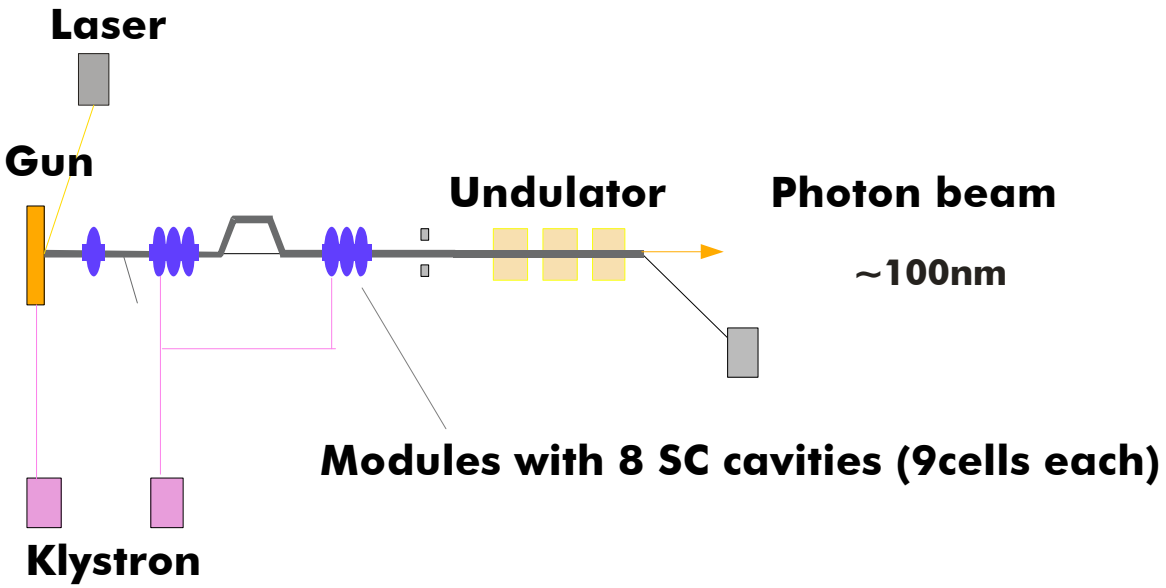
- TTF/TESLA Overview
- Requirements for Remote Operations
- Possible GAN Activities
- Conclusions/Outlook

Why GAN

- Build a [big] project within an international collaboration
  - make best use of world-wide competence, ideas and resources
  - maintain and foster the centers of excellence in accelerator physics around the world
  - model works for the HEP experiments
- Challenges
  - how to develop trust between people and cultures?
  - how to keep the people involved and responsible?
  - how to communicate and distribute the information?
  - ...

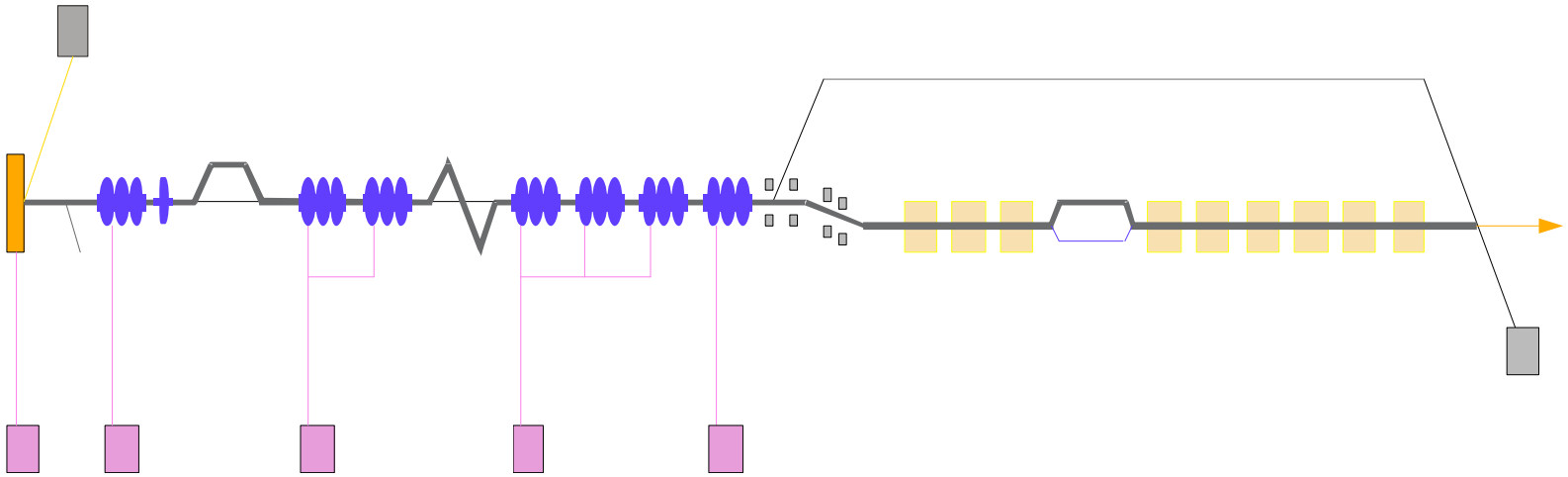
TESLA Test Facility Overview

TTF 1



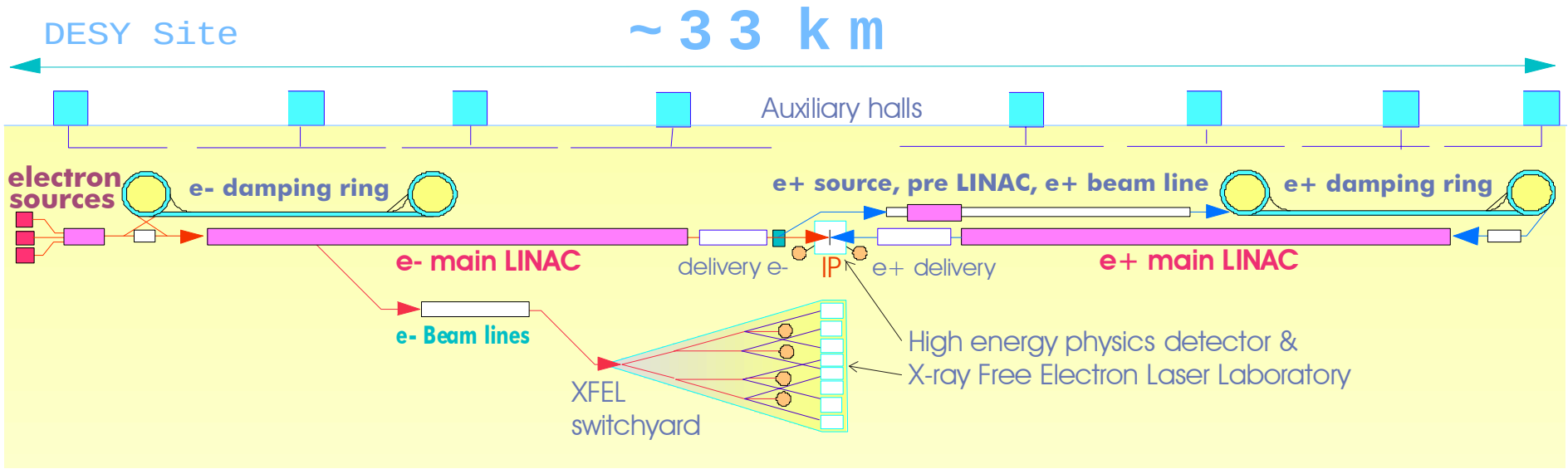
220 - 270 MeV

TTF 2



1 GeV

TESLA Overview



- ~ 20 000 cavities
- ~ 600 klystrons
- x 000 front-end computers
- ...

Remote Involvement

What is GAN?

- Remote operation
- Remote solving of problems
- Remote improvements/developments/measurements
- e-LogBook
- Remote meetings
- Share information and documentation
- ... collaborative work

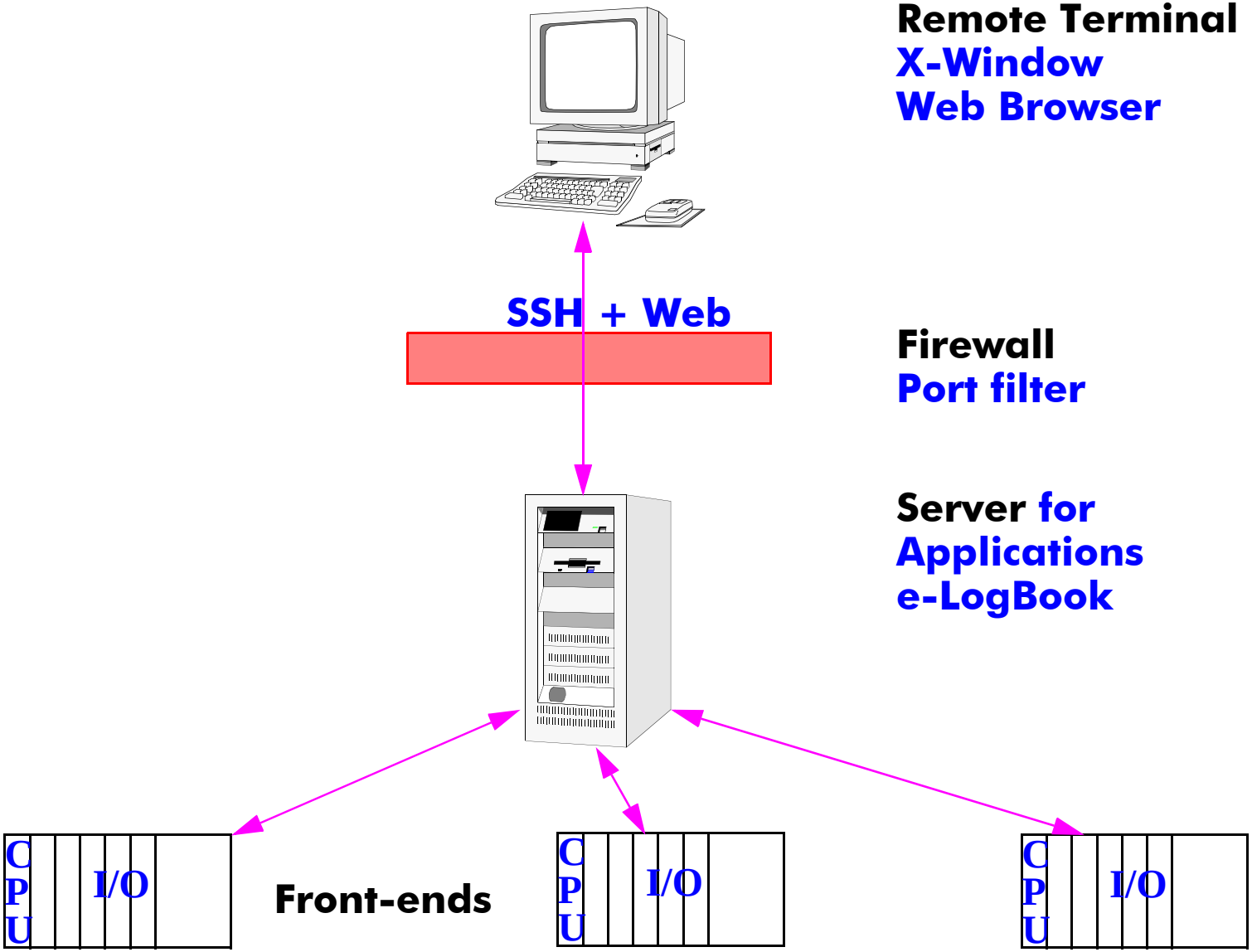
Design, construct, install, operate and maintain an accelerator/experiment

Involve the members of the collaboration

Requirements for Remote Op's

- network security (fire wall, SSH)
- machine protection system (interlock system)
- access to all devices (diagnostics .. reset buttons)
- integrated environment on one control system
- some level of automation
- operator training
- e-logbook
- video conferencing (shift turnover and meetings)

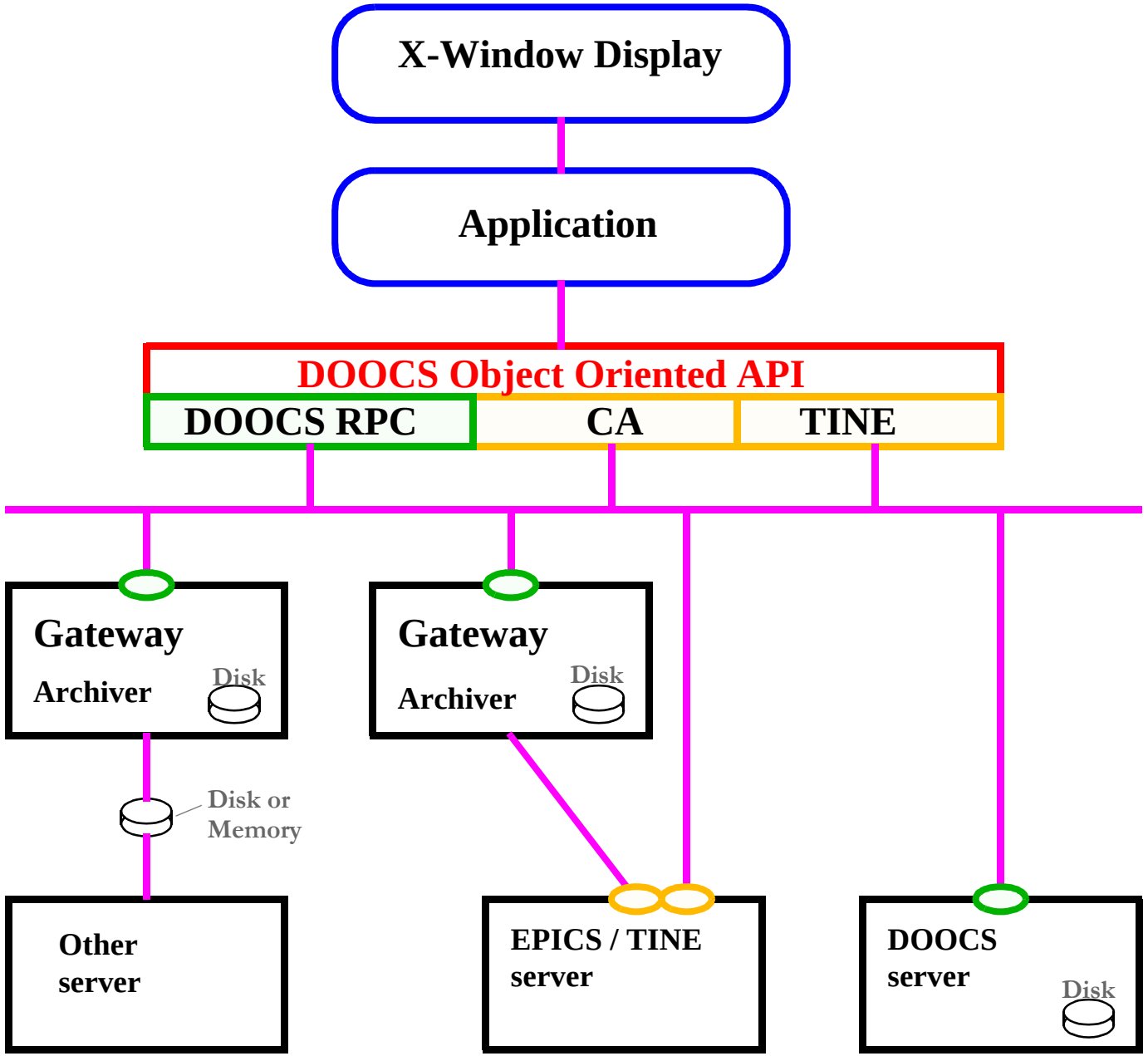
Network Security



Integration of Subsystems

- TTF contributions with different control systems
  - Klystrons: FNAL ('Classic Protocol')
  - Injector: Orsay/Saclay (EPICS)
  - Screens/OTR: INFN (Mac with shared memory)
  - Laser: Max Born (shared memory)
  - Wire alignment: INFN (file sharing)
  - Beam loss: HMI (file sharing)
  - Magnets: DESY (TINE)
- DOOCS is the integrating part

DOOCS Architecture



The display is ´by default remote´

All application programs are using the same API

The API talks three protocols

Other systems are connected by gateways

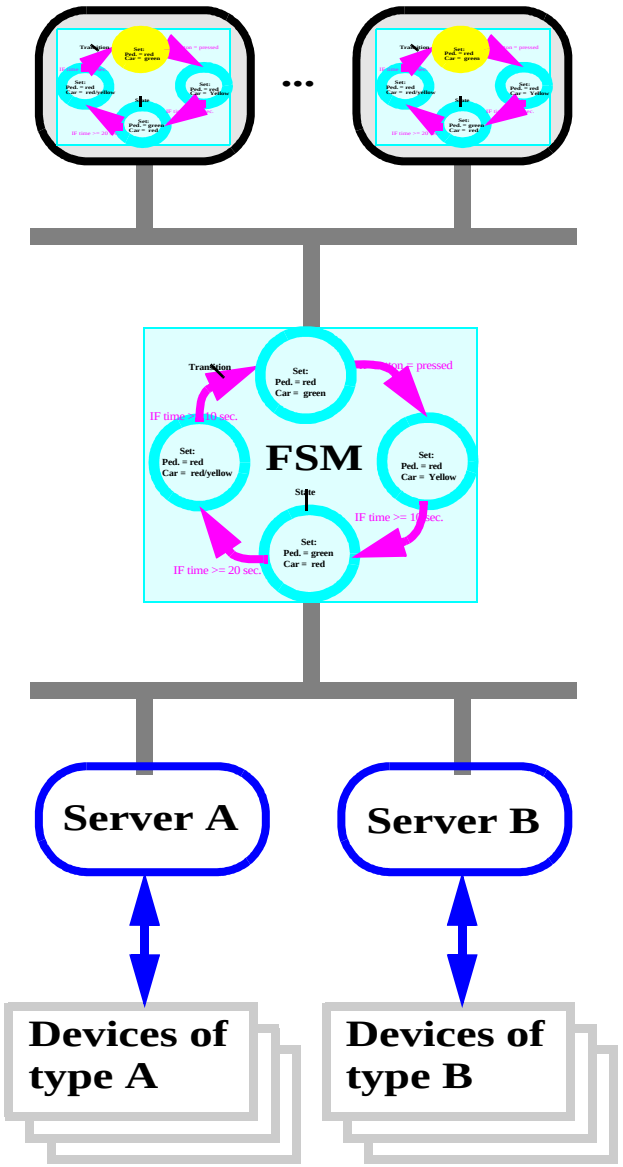
Gateway communication by shared file or memory or protocol

Different server processes

DOOCS Design Goals

- Distributed Object Oriented Control System (DOOCS) design idea:
  - devices and data properties defined in objects
  - object oriented C++ libraries
  - most functions are implemented in device servers and middle layer servers
  - OO API for all programs to access all data of TTF
  - modular and scalable
  - online configuration
  - automated procedures in middle layer
  - access authorization at server
  - runs on UNIX (X-Windows)

Automated Processes



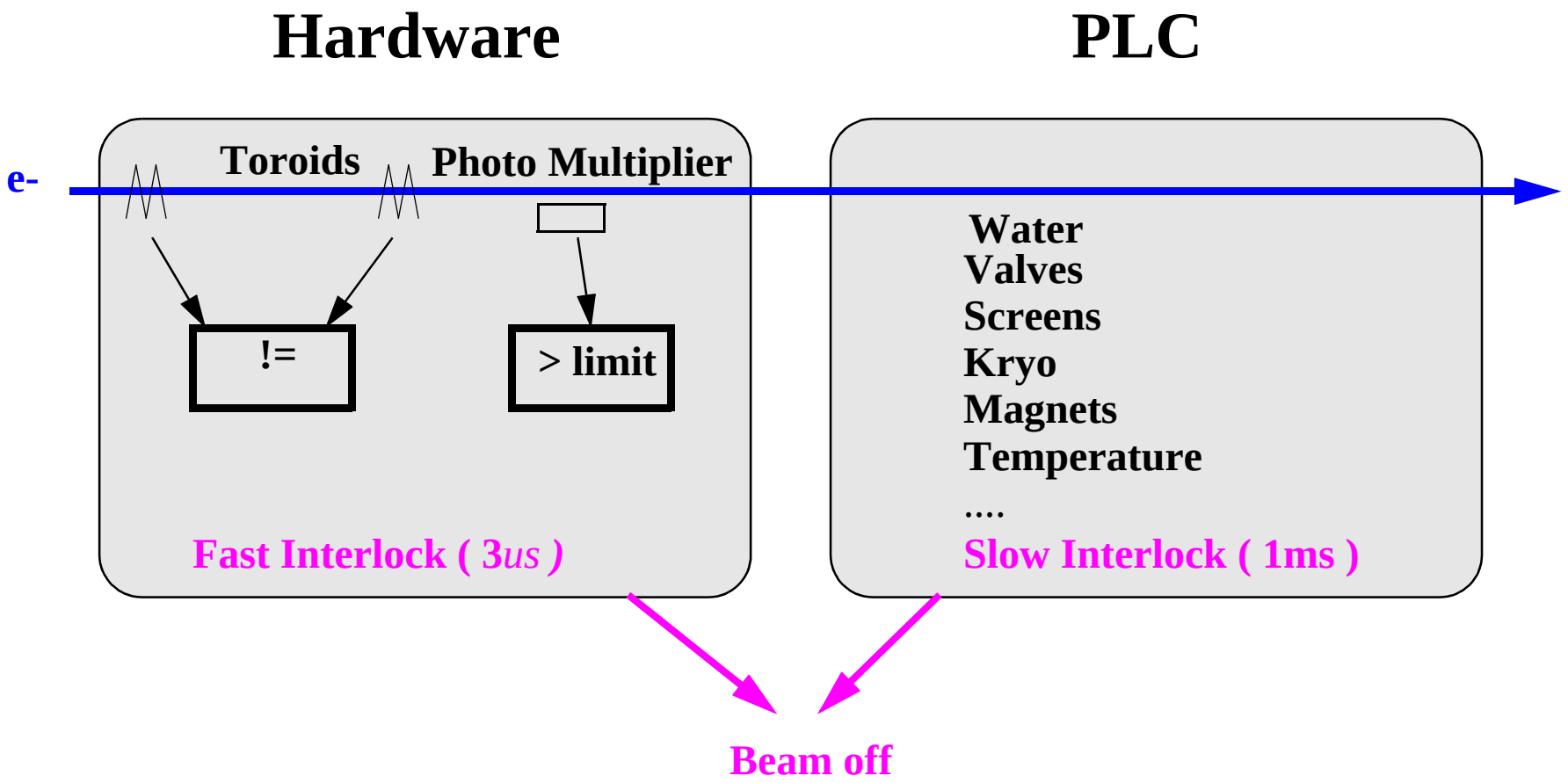
User application:
shows the status of the FSM
creates the states

Finite State Machine Server:
controls the sequence of the devices
hierarchical org. of states
implemented as a middle layer server

Device server:
controls devices of a certain class

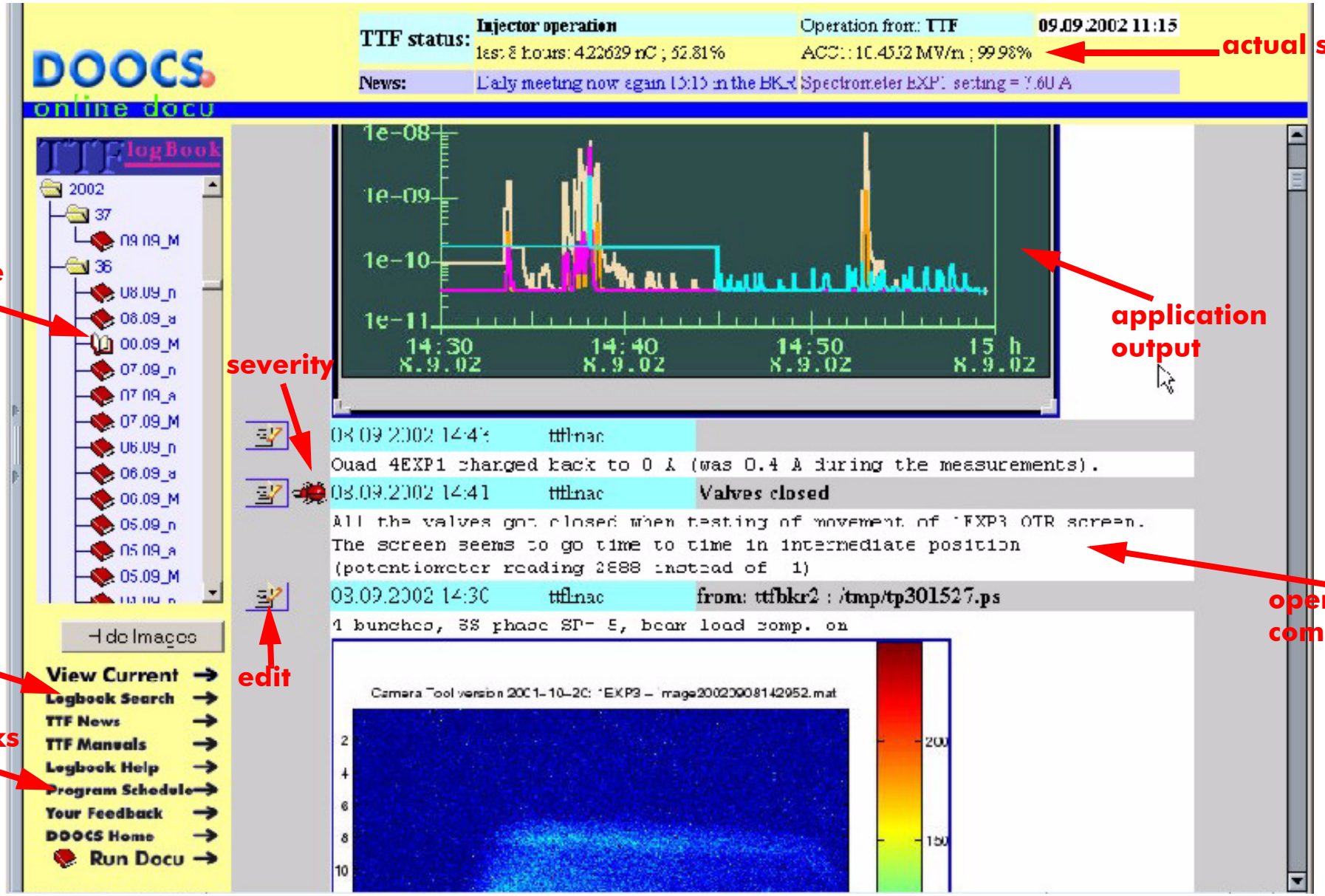
DOOCS Finite State Machine

Machine Protection



A reliable machine protection is very important for remote AND local operation!

e-logbook


DOOCS
online docu
TTF status:
Injector operation
Operation from: TTF
09.09.2002 11:15
last 8 hours: 4.22629 nC ; 52.81%
ACC1: 10.4532 MV/m ; 99.98%
actual status
News:
Daily meeting now again 10:15 in the BKR
Spectrometer EXP1 setting = 7.60 A
TTF logBook
2002
37
09.09_M
36
08.09_n
08.09_a
00.09_M
07.09_n
07.09_a
07.09_M
06.09_n
06.09_a
06.09_M
05.09_n
05.09_a
05.09_M
Hide Images
View Current
Logbook Search
TTF News
TTF Manuals
Logbook Help
Program Schedule
Your Feedback
DOOCS Home
Run Docu
navigate
search
quick links
severity
edit
1e-08
1e-09
1e-10
1e-11
14:30
14:40
14:50
15 h
8.9.02
application output
08.09.2002 14:41
ttflnac
Valves closed
All the valves got closed when testing of movement of EXP3 OTR screen.
The screen seems to go time to time in intermediate position
(potentiometer reading 2888 instead of 1)
operator comments
03.09.2002 14:30
ttflnac
from: ttfbkr2 : /tmp/tp301527.ps
1 buncher, SS phase SP= 5, beam load comp. on
Camera Tool version 2001-10-20: EXP3 – image20020908142952.mat

e-LogBook

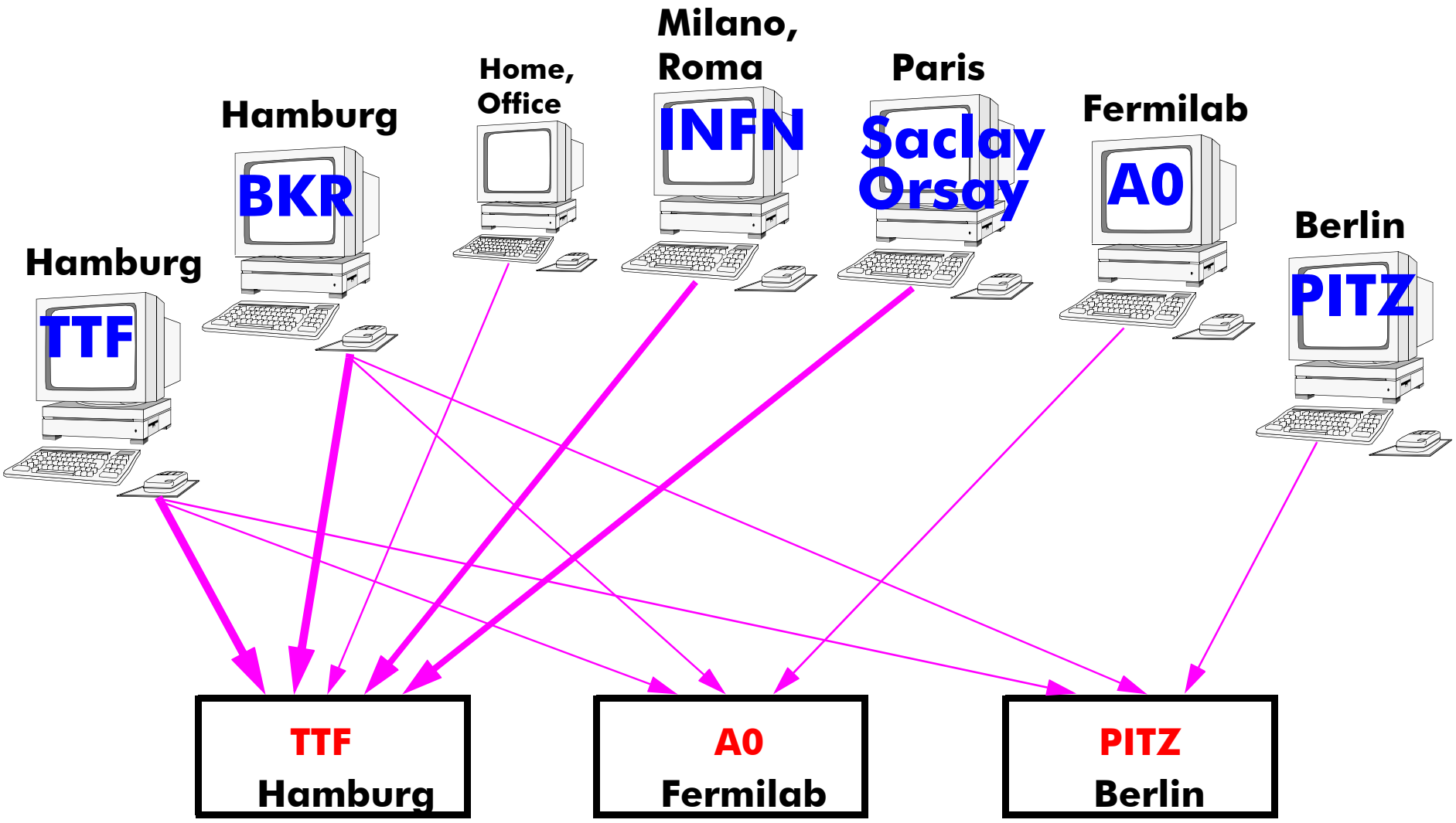
- e-LogBook is a must for remote operations
- involves more people in the machine operations
- allows experts to give comments, hints or warnings
- search function
- common place for all measurement results
- good information source for the management
- has limitations for long term info since it is shift based

➡ **e-LogBook is an important GAN tool**

Video

- MS-Netmeeting:
  - point to point only
  - bad echo cancellation
- VRVS: www.vrvs.org
  - needs a reflector
  - multipoint
  - supports standards (H.323 ...)
  - runs on multiple computer platforms, free download
  - speaker/microphone set with echo cancellation available
  - requires administration
- Next step: improve video in control room for shifts and meetings

Experience with Remote Op's

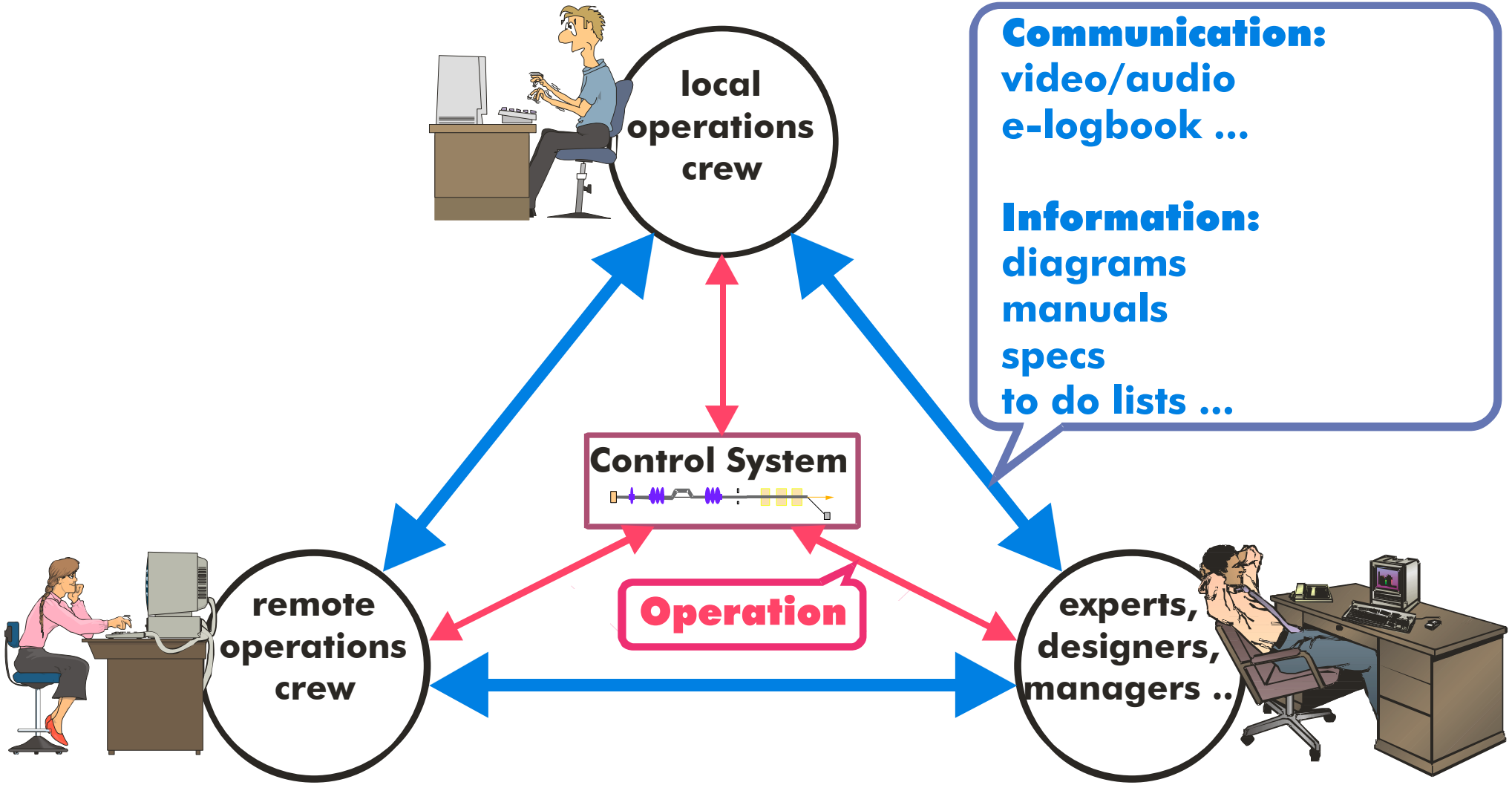


Facility to Control

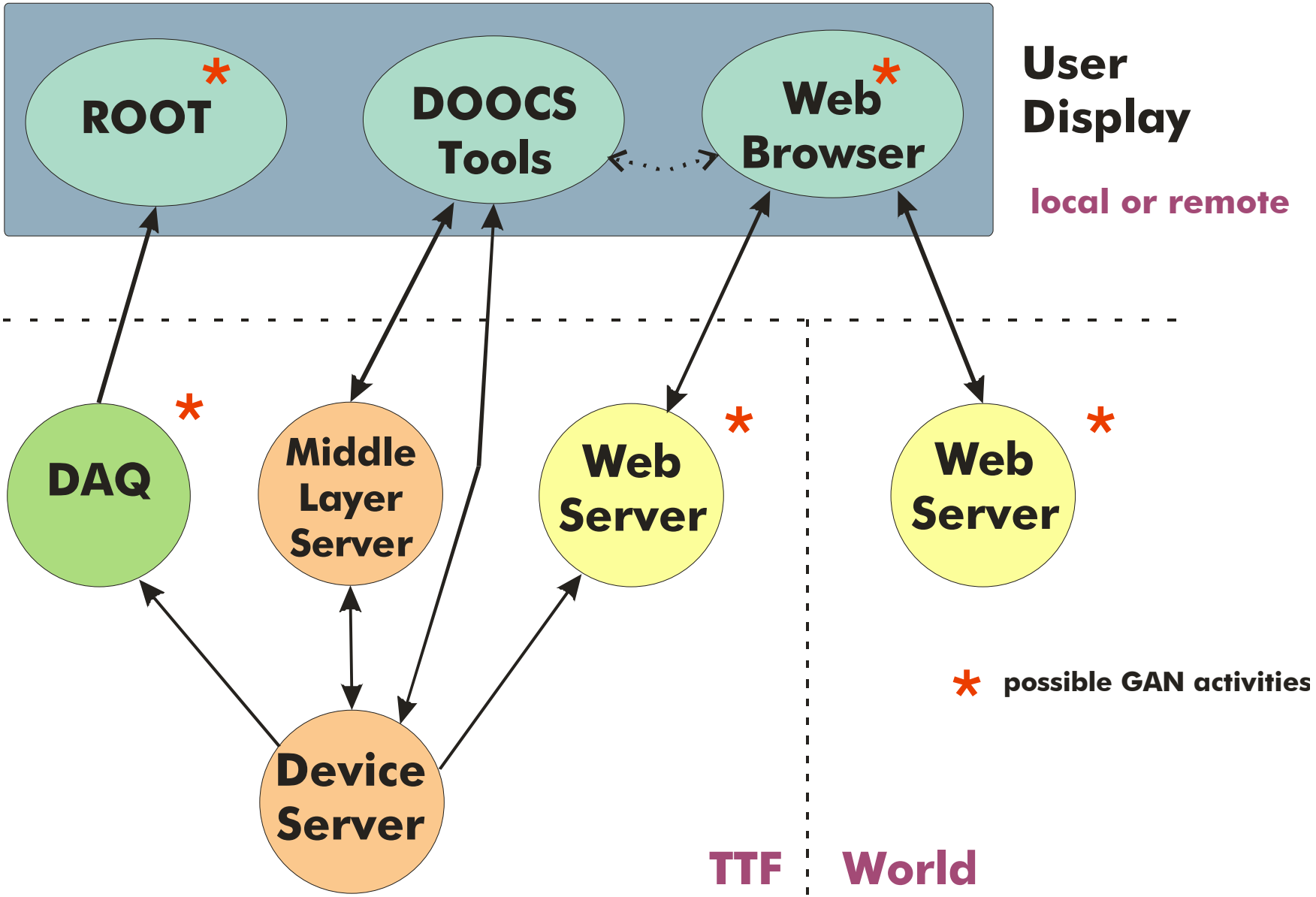
Experience with Remote Op's (2)

- it works
- TTF has now two control rooms at DESY
  - all data points are available in the control system
  - scope and camera images are available with Netscape
  - ==> second control room was no problem
- remote maintenance from Paris (several years)
- remote shifts from Milano (INFN)
- "a bit slower than local (but okay)"
- measurements at Fermilab (A0) and Berlin (PITZ)
- video conferencing of shift turnover meetings is missing

GAN Aspects


local operations crew
Communication:
video/audio
e-logbook ...
Information:
diagrams
manuals
specs
to do lists ...
Control System
Operation
remote operations crew
experts, designers, managers ..

GAN @ TTF: Overview

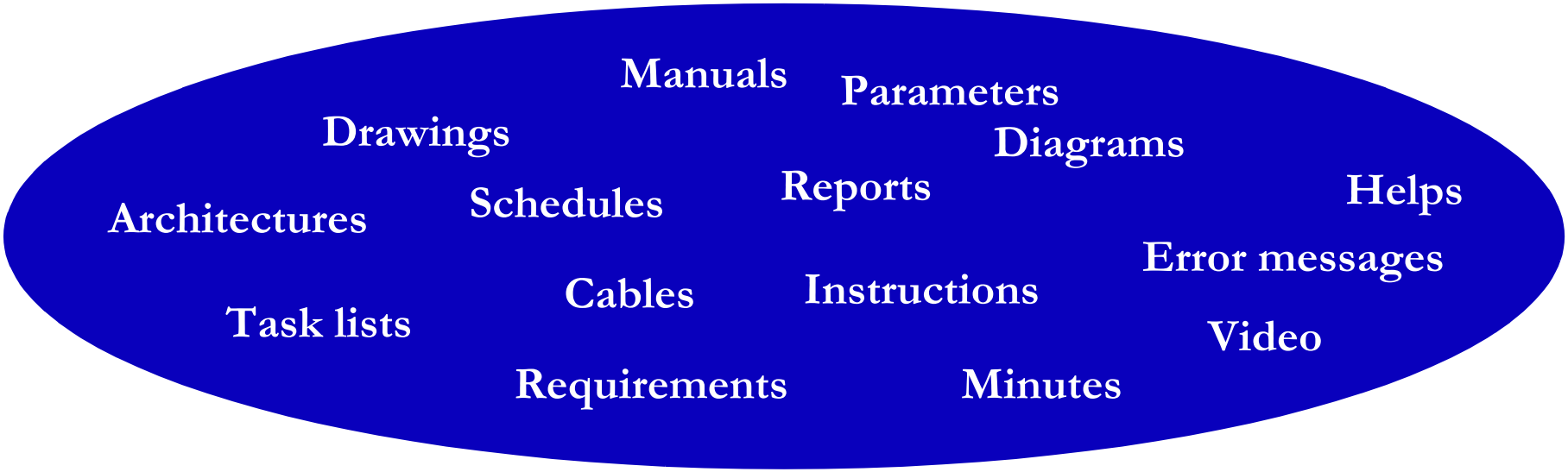


GAN Activities: DAQ

- **The goal is to better understand, improve and maintain the linac**
  FEL operation has very high requirements on the subsystems
  - **error statistics: find reasons of faults, improve reliability of subsystems**
  - **operation optimizations, find best parameters**
  - **allow experiments to correlate measurements with the machine**
- **Record all beam relevant data of the linac**
- **Will be developed in collaboration with Cornell/Ohio State**
  - **GAN-involved development (use GAN tools)**

Collaborative Tools

- Goal: provide all required information to the international team
- To-do:
  - define the requirements
  - evaluate tools
  - find solutions/standards for international info exchange
  - involve more people (designers, operators..)
  - learn to use the tools and select/modify them
  - establish the tools in the daily work



Conclusions/Outlook (Goals)

- **The goal is to better understand:**
  - **social aspects**
    learning to work in virtual teams
    involvement, trust, commitment, responsibility .. of people
  - **organizational aspects**
    define and share responsibility, interfaces and tasks etc. in international projects
  - **collaborative tools**
    define, evaluate and use tools
    involve more people from all special fields
  - **technologies**
    e.g. security, bandwidth/delay on Ethernet, Web ...
  - **system aspects**
    e.g. authorization, reliability, operability, integration ...

Conclusions

- Remote operation works
  - the control system provides the tools
  - good experience with shifts and maintenance from remote
- First GAN tools
  - e-LogBook based on XML ➡ R. Kammering, Wednesday ~10:30h
  - error and info server (XML) ➡ O. Hensler, WE-P10
- Next steps
  - install video conference for shifts and meetings
  - GAN-involved development of DAQ