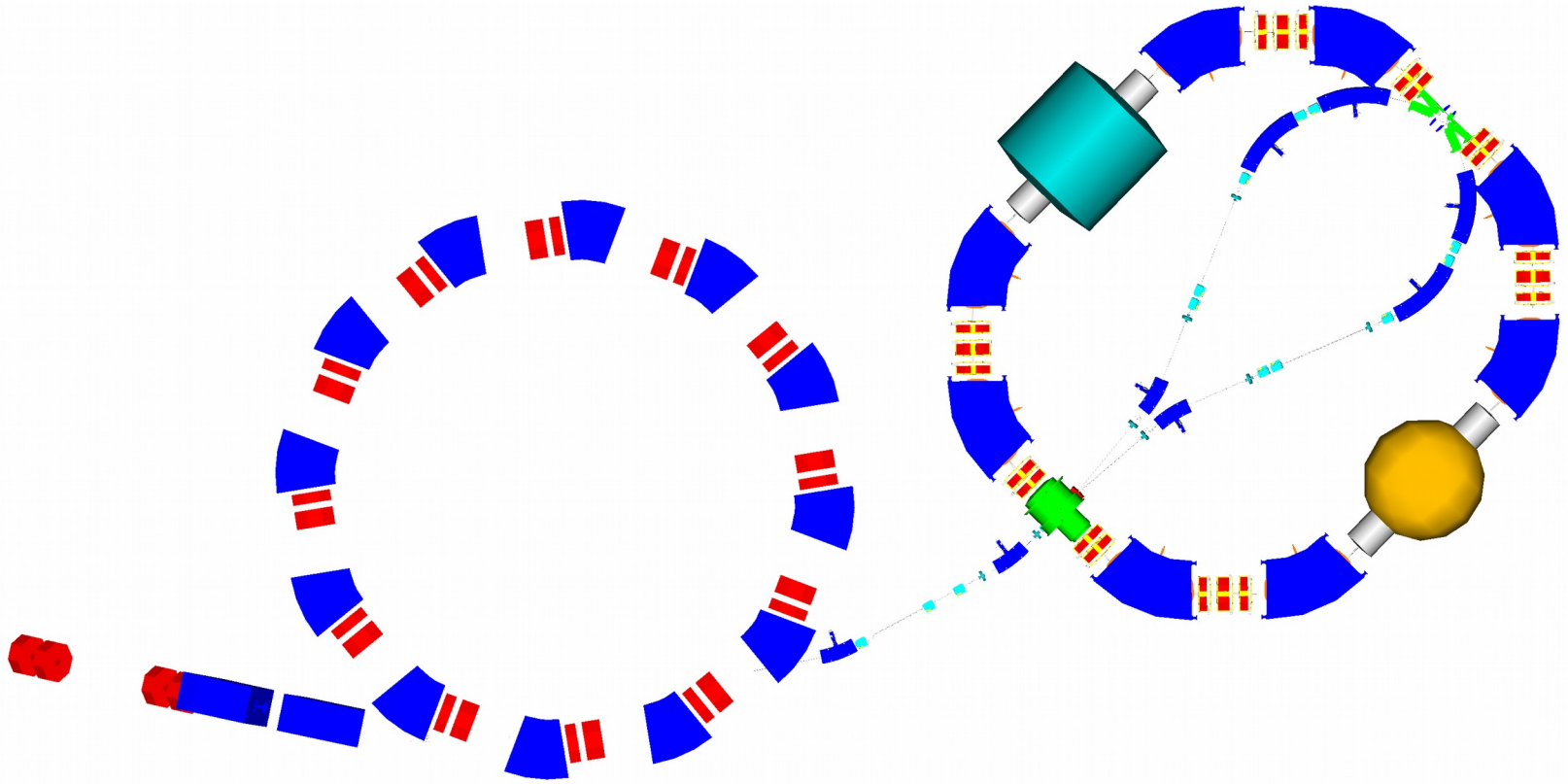
VEPP-2000 control system: operational experience

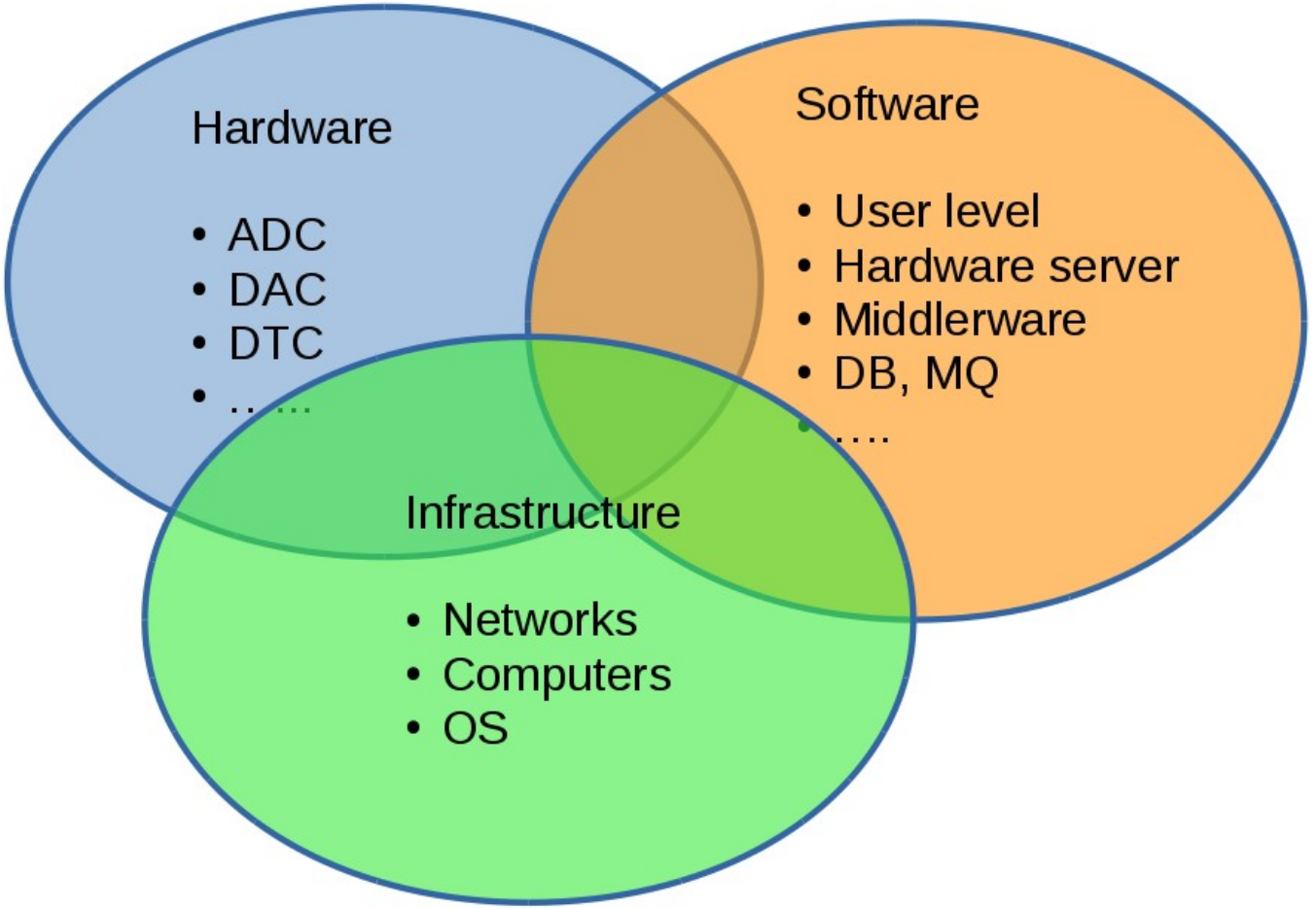
Senchenko Alexander
BINP

VEPP-2000



Circumference	24.388 m	Energy range	150 ÷ 1000 MeV
Number of bunches	1	Number of particles	1×10^{11}
Betatron tunes	4.1/2.1	Beta-functions @ IP	8.5 cm
Beam-beam parameter	0.1	Luminosity	1×10^{32} $cm^{-2}s^{-1}$

Control system



VEPP-2000 Control system

- **2000 – start of construction**
- **2003 – control system assembling**
- **2006 – first beam(e^-)**
- **2007 – first luminosity**
- **2010 – first experimental season**
- **2013 – stopped for upgrade**
- **2016 – first beams after upgrade**

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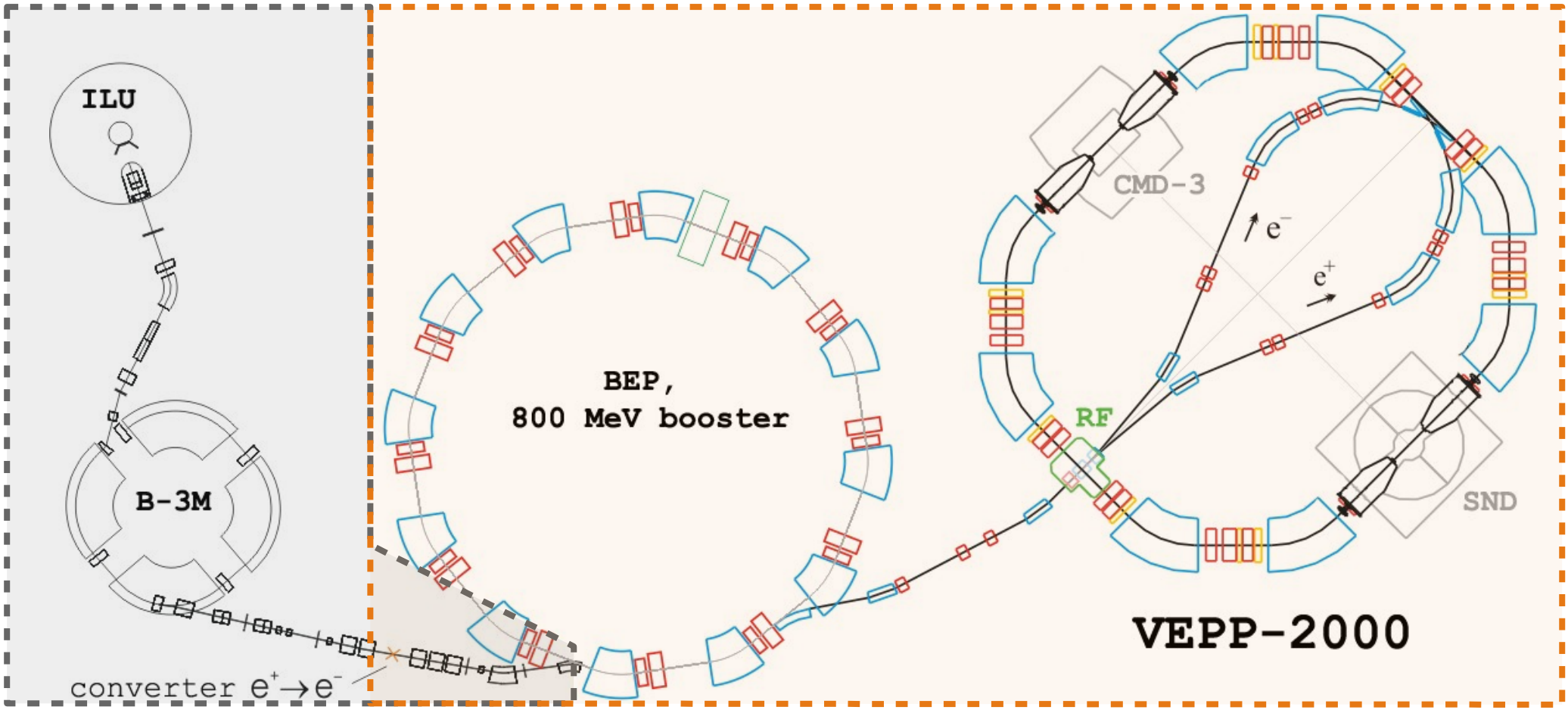
ILU
B-3M
converter $e^+ \to e^-$
BEP,
800 MeV booster
CMD-3
e^-
e^+
RF
SND
VEPP-2000

Hardware

- **CAMAC**
  - Legacy systems
  - Heavy traffic (fast ADC, BPM)
- **CANBus**
  - Control and slow monitoring
    - ADC
    - TDC
    - Table DAC

Infrastructure

- **Private network**
  - Reliability
  - Security
  - Wi-Fi
    - Experimental hall
    - Control equipment room
    - Control room
- **Linux**
  - Gentoo

Software

- **In-house**
- **Open Source based**
- **Distributed CS**
  - Text-based RPC protocol

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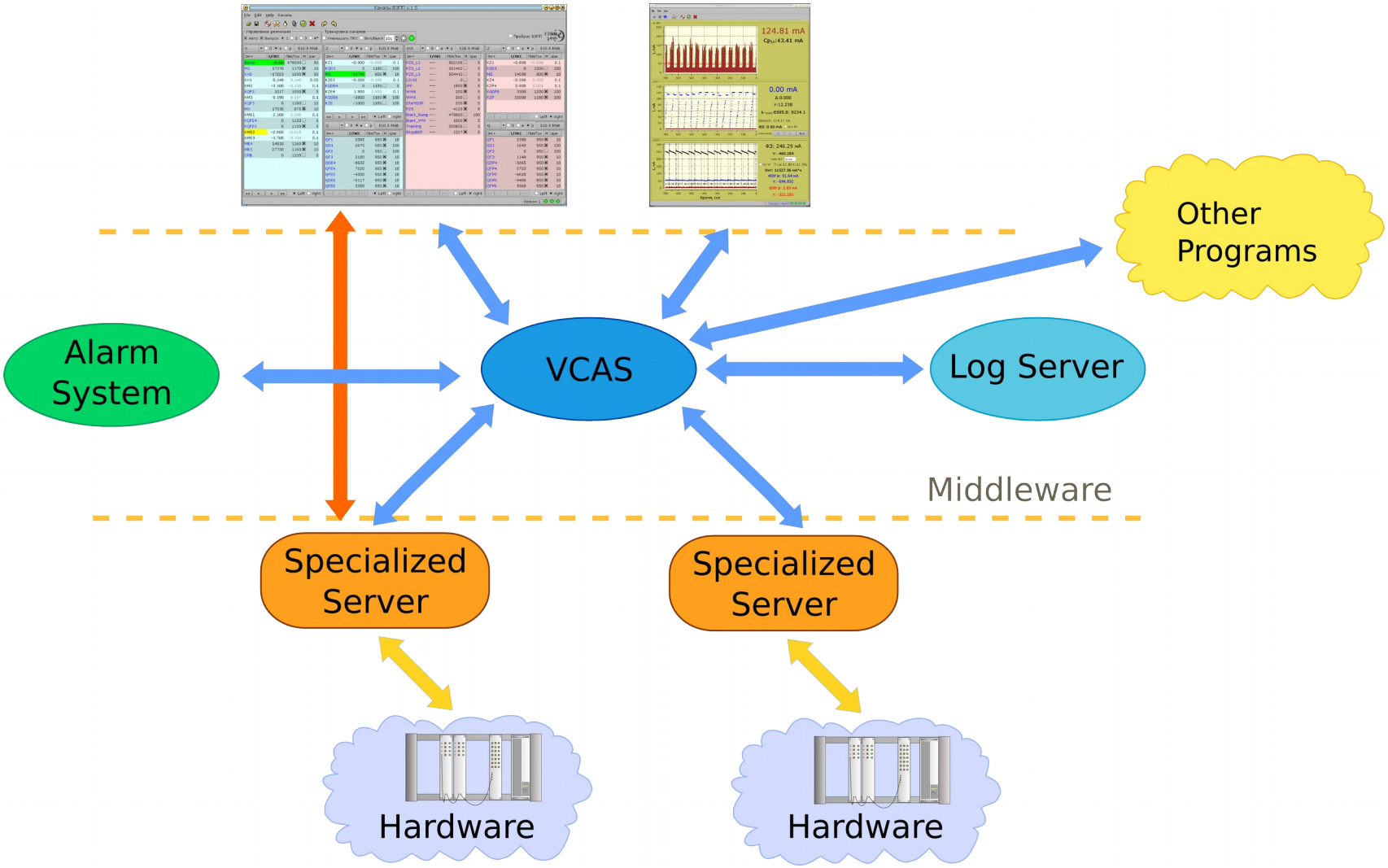
Software


Other Programs
Alarm System
VCAS
Log Server
Middleware
Specialized Server
Specialized Server
Hardware
Hardware

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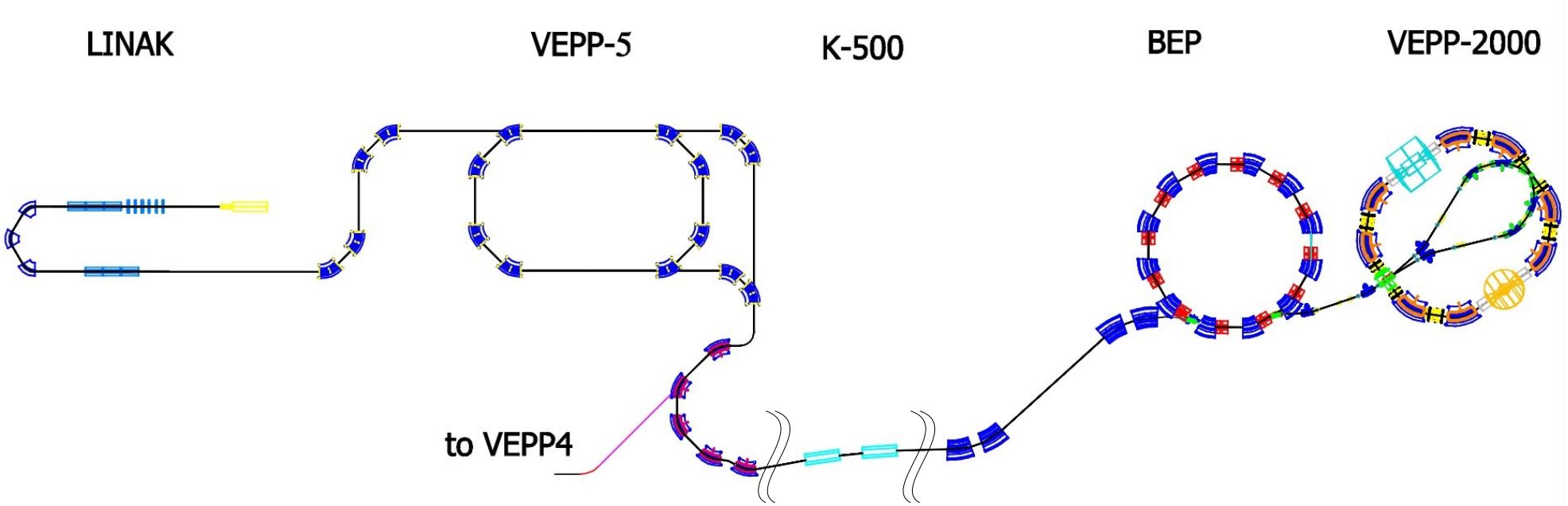

Hardware

- **CAMAC**
  - Almost removed
- **CANBus**
  - Stable and sufficient
- **Ethernet**
  - Beam diagnostics(BPM, CCD)

Software

- **Drawbacks of text-based protocol**
  - Performance
  - Memory overhead
- **Additional binary protocols**

Software

- **Continuous improvement**
- **User feed-back**
  - Strong cooperation with operators
  - Participating in shifts

Infrastructure

- **OS Long Term Support**
  - Rare upgrades (1-3 years)
  - Regular updates
- **Computers**
  - x86 and x64
  - Outdated hardware
- **Network**
  - Access to internal services

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Injection Complex integration

- **Control systems integration**
  - ✔ Synchronization system
  - Beam scheduling

Conclusion

- **Analysis of requirements**
  - Minimize changes
  - Reduce technology stack
  - Facilitate maintenance
- **Plan further changes**
- **CS framework**(TANGO,EPICS,*In-house…*)

Thank you!