J-PARC status

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KEK, JAPAN

At EPICS Collaboration meeting in Stanford, April, 2005

J-PARC

- Japan Proton Accelerator Research Complex

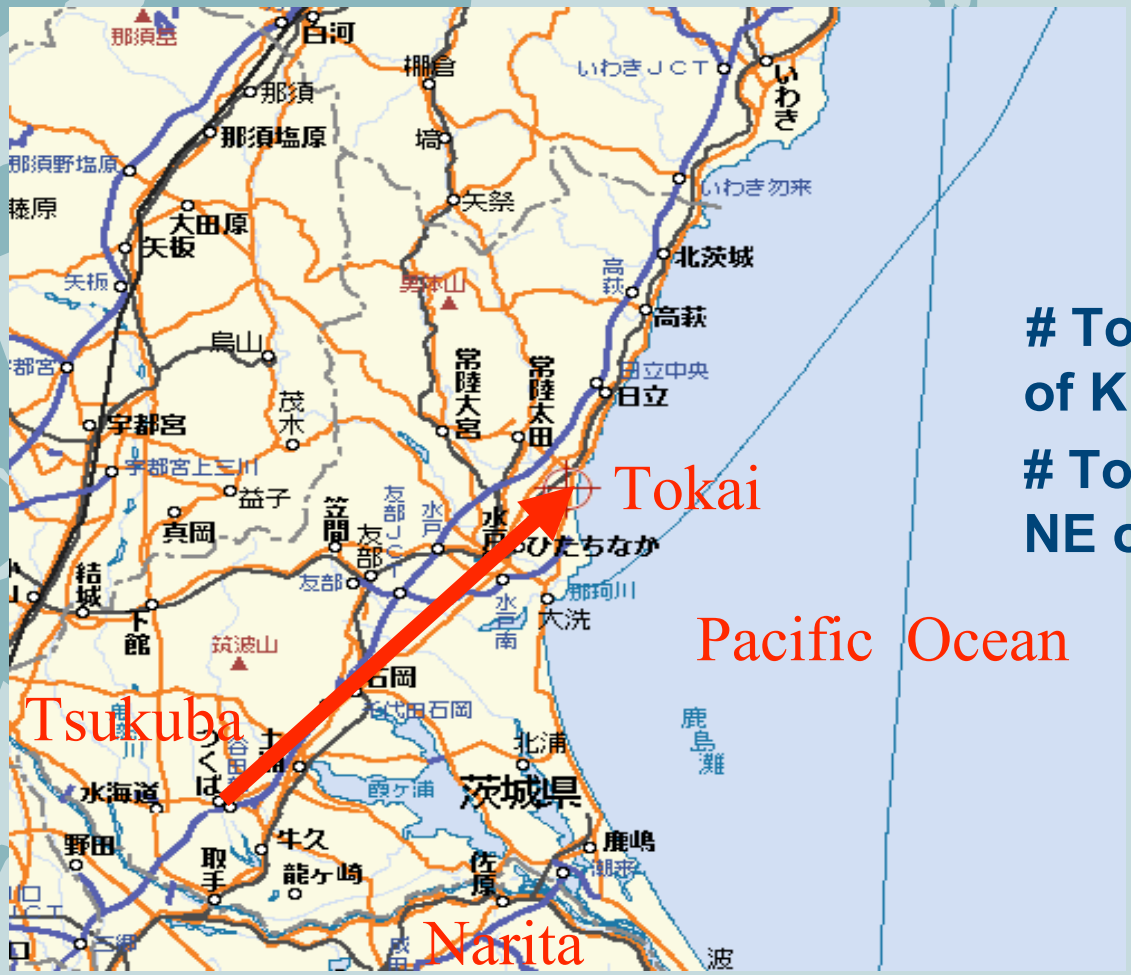
- A joint project between JAERI and KEK
  Under construction in JAERI-Tokai

  # Tokai is 60km NE of KEK-Tsukuba

  # Tokai is 130km NE of Tokyo

  # JAERI – Japan Atomic Energy Research Institute

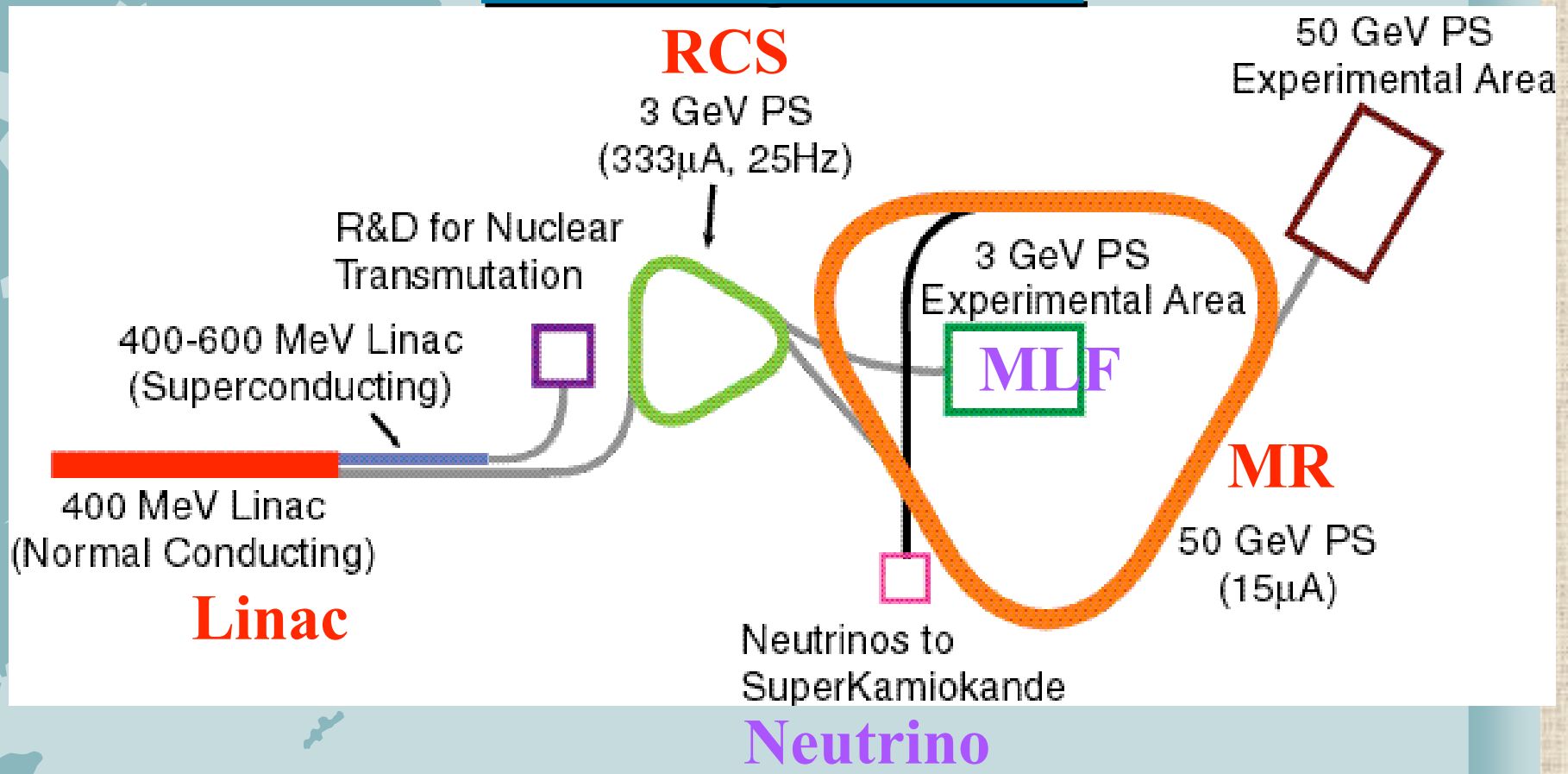
Tsukuba to Tokai



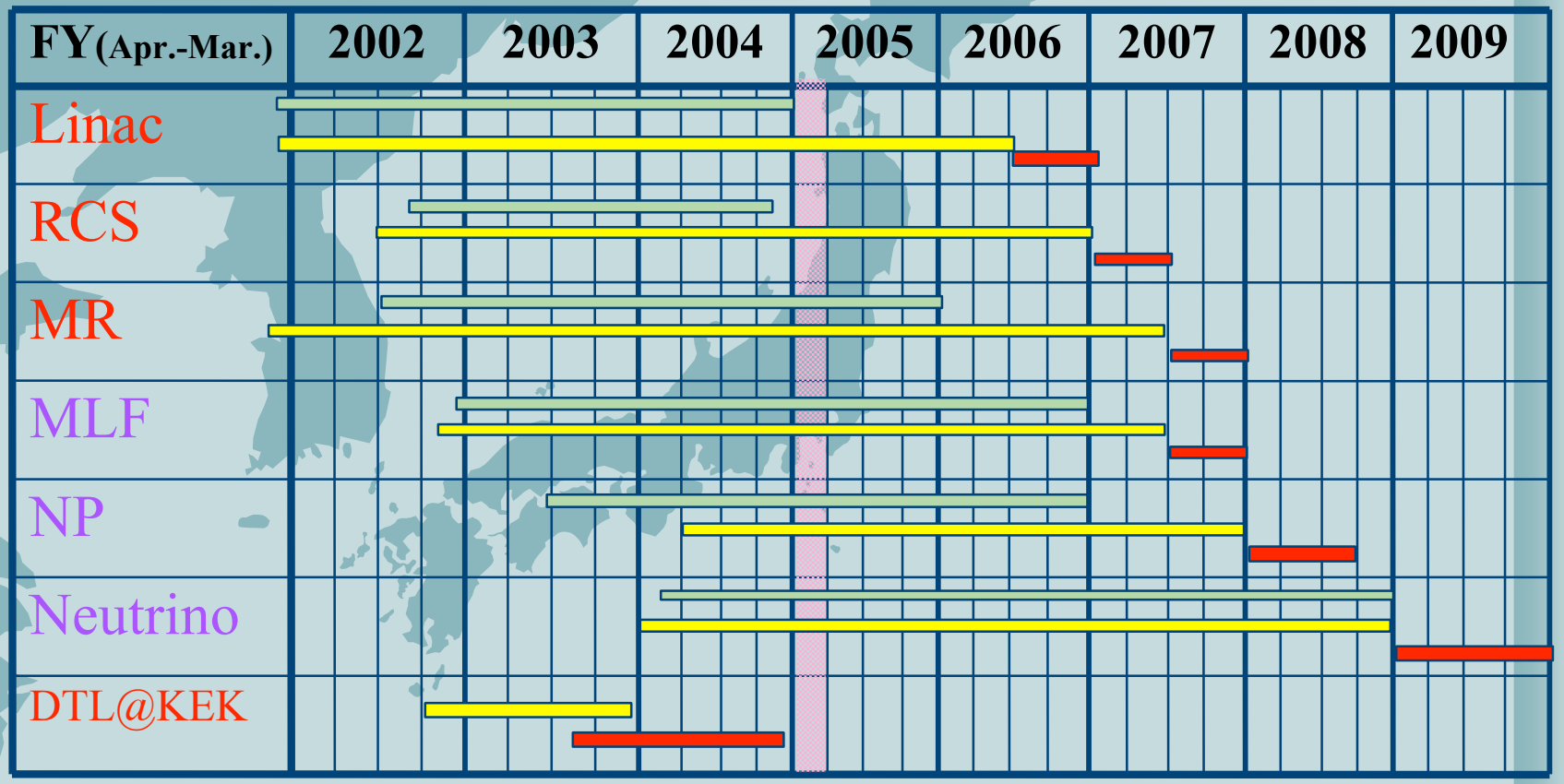
Tokai is 60km NE of KEK-Tsukuba

Tokai is 130km NE of Tokyo

Accelerator Facility - Configration



Schedule



Building Construction | Hardware Production & Installation | Beam Tests

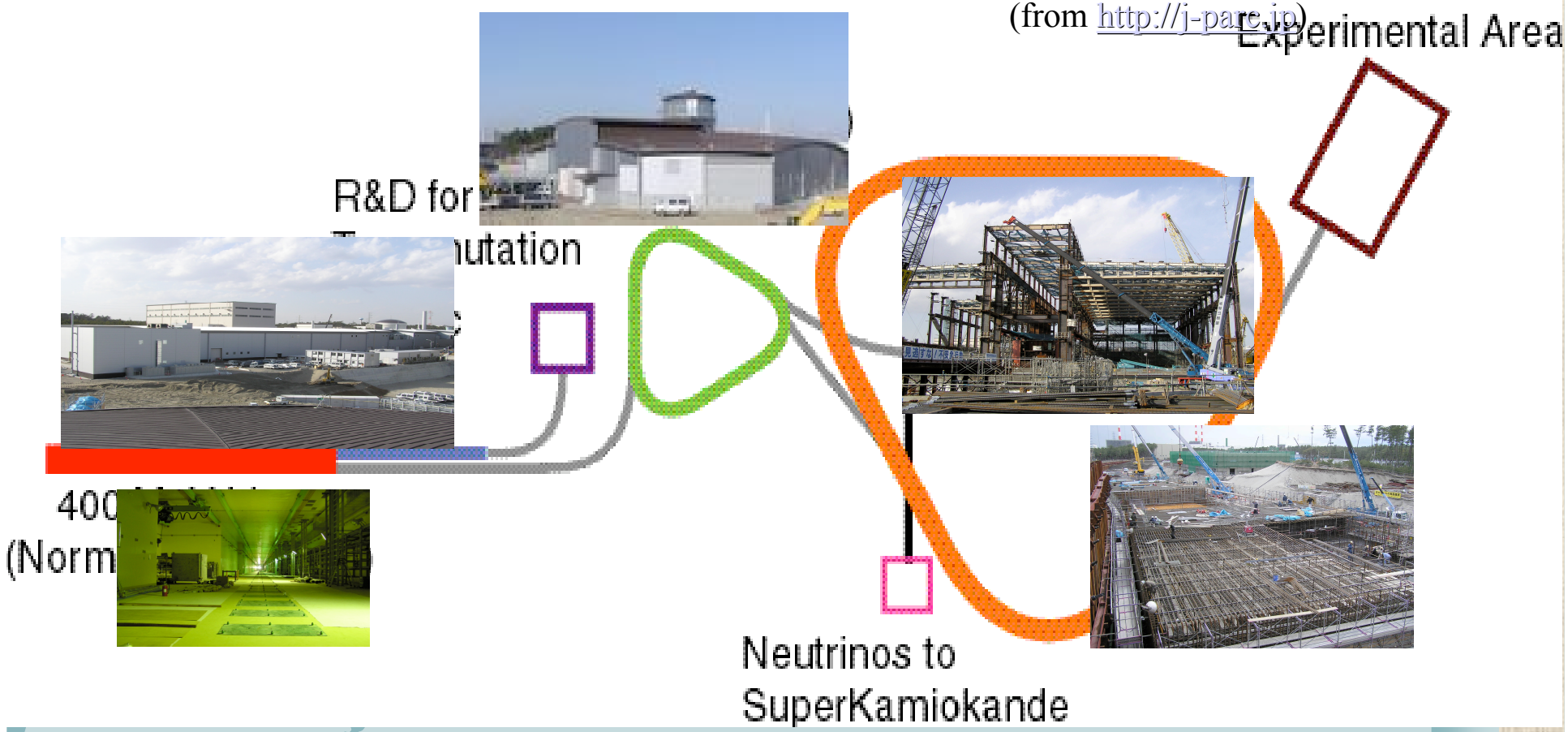
Accelerator Status

(from http://j-parc.jp)

Buildings Constructions at JAERI-Tokai : RCS (**Apr.2004**)

Accelerator Status

(from http://j-parc.jp)

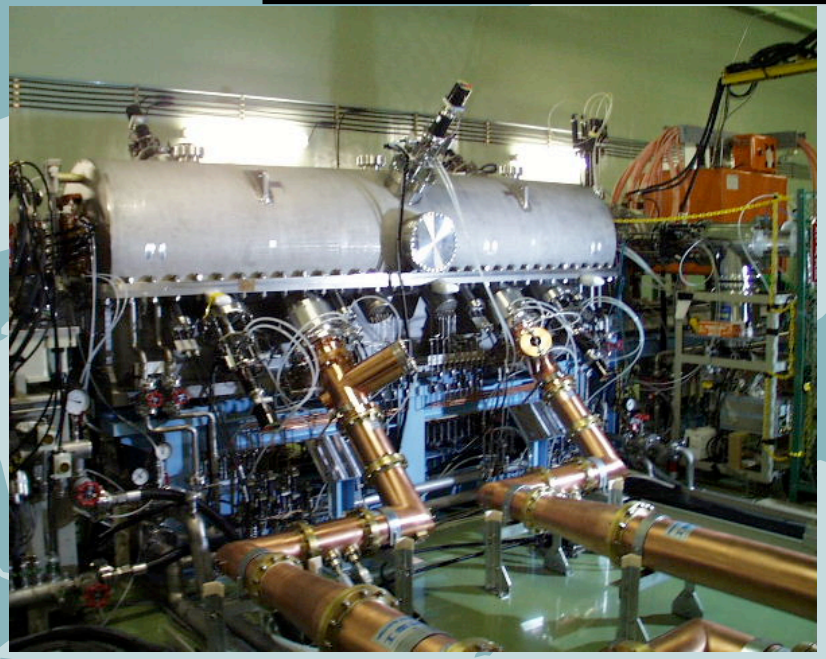


Buildings Constructions at JAERI-Tokai : RCS (Jan-Feb, 2005)

JPARC Central Control Building

This building will be a central development place for the control system for JPARC. Servers, Disks and network equipments has been moved from KEK to the new control buidling in Tokai Campus.

Accelerator Status #2

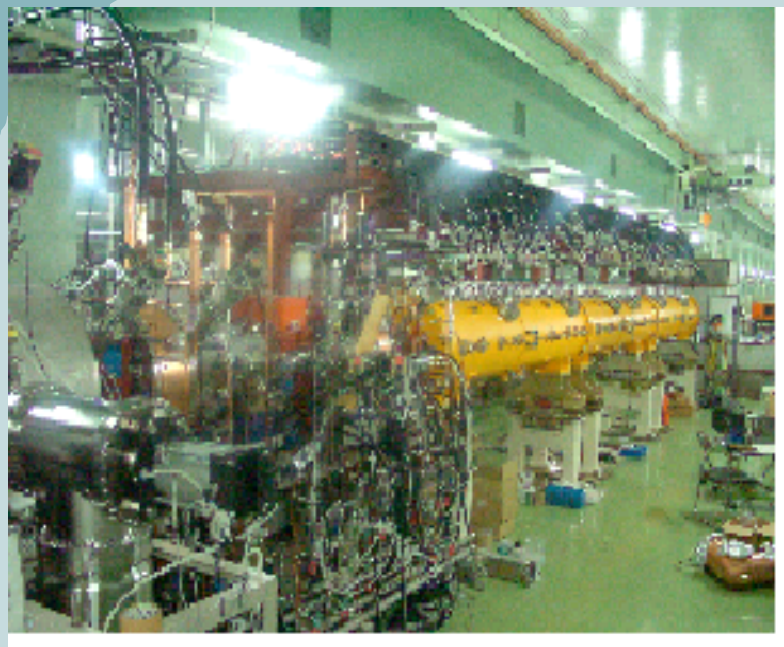


RFQ and the part of Ion Source

(photo by Y.Kondo)

"60MeV linac" (up to DTL) at KEK-Tsukuba

(will be moved to Tokai in 2005)



DTL section

Prototype Control System for DTL-Linac in KEK

- Computers
  - IOC – VME (5 for develop. + 5 for operation)
    - PowerPC board (Force and Advanet) + VxWorks 5.4
  - One HP-UX 11.0 server machine
    - main development, file service (nfs) , nis server, etc.
  - Network-based interfaces
- Software Environment
  - EPICS 3.13.6/3.14.4
  - netDevDriver and WE7111(Oscilloscope module)
  - Channel Archiver 2.1.1
  - SAD and Python

Network-based interfaces

- PLC
  - FA-M3 by Yokogawa widely used
  - For Ion source, timing, RF, vacuum, ..
- WE7000
  - Commercial product by Yokogawa
  - WE7111 (100MS Osc) for beam monitors
- BPMC
  - BPM Electronics for JPARC-MR
- EMB-LAN
  - Developed as an embedded controller for magnet power-supplies
  - For MEBT steering (6), DTL-Q pulsed (77)

NetDev

- Framework for Network based PLC
  - Just needs to write request builder and responce analyser routines.
- Tested in DTL-Linac operation
  - Also used in RIKEN, PF-AR, KEK-ATF, KEKB...
  - SSRC/SSRF may use this driver.
- Now supports:
  - EMB-LAN
  - MR-BPMC
  - Yokogawa FA-M3 PLC -> see "Demo"
  - Omron PLC
  - Mitsubishi MELSEC PLC

Network-based interfaces (EMB-LAN)

Power-supply for a MEBT steering magnet

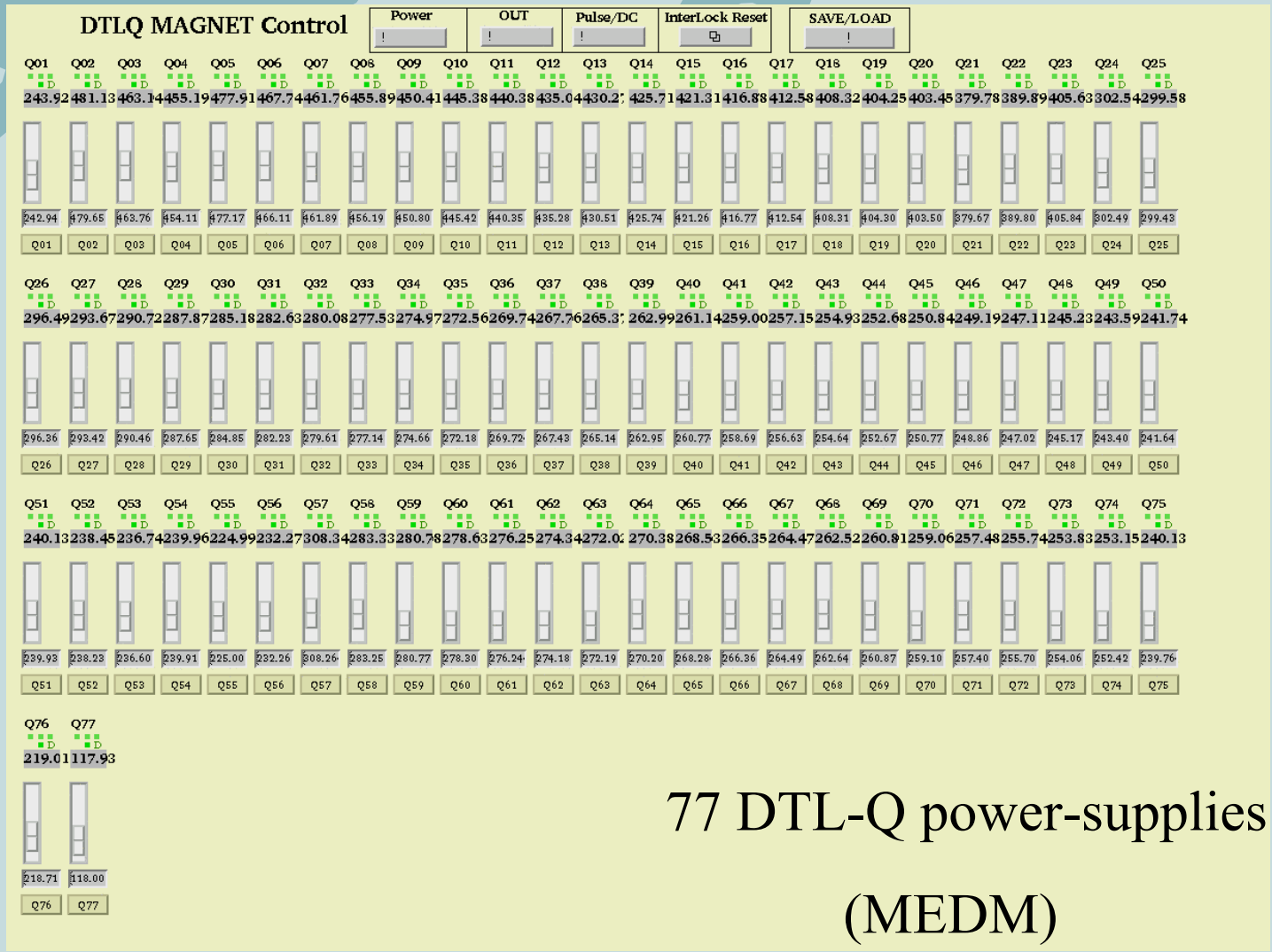
EMB-LAN (100Mbps)

16bit input, 16bit output

256w in/out register

Ethernet connection to IOC

Network-based interfaces (EMB-LAN)



77 DTL-Q power-supplies

(MEDM)

Network-based interfaces (WE7000)

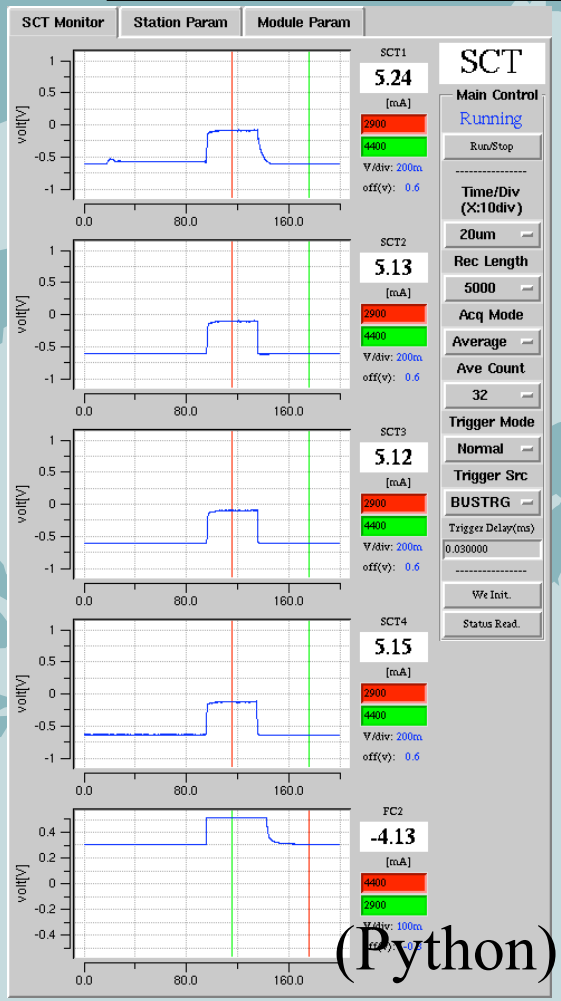
WE7000 station

Ethernet module
(WE7052)

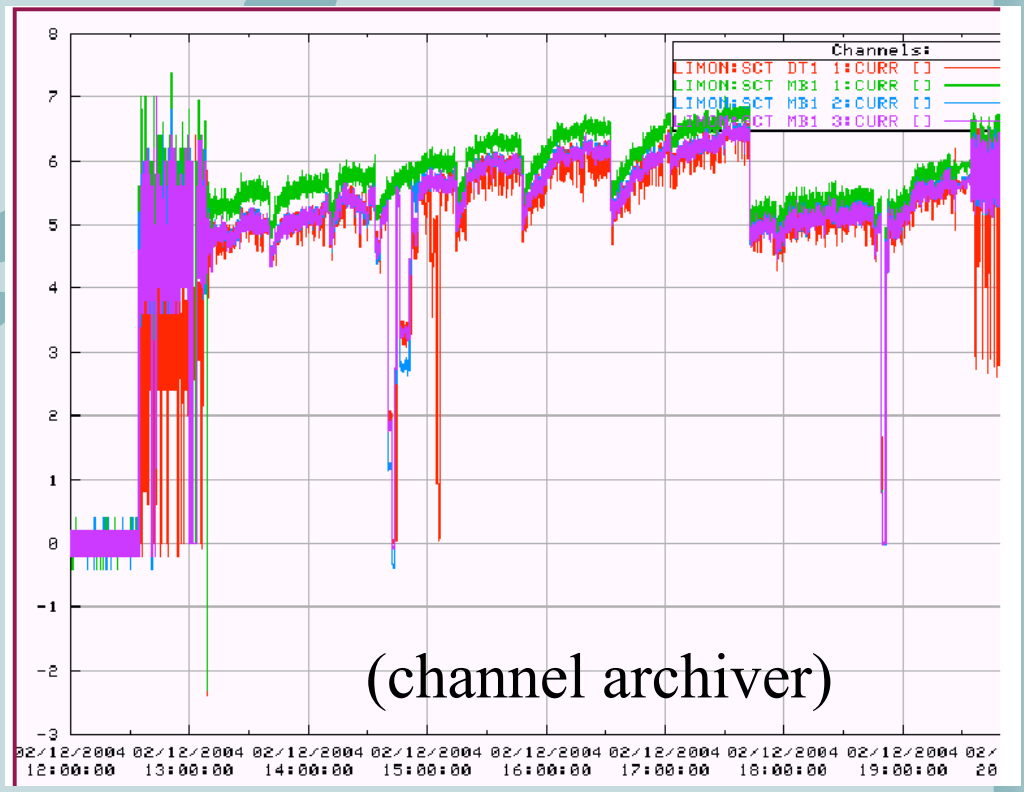
100MS/s oscilloscope
(WE7111)

Network-based interfaces (WE7000)

5 SCT beam-monitors



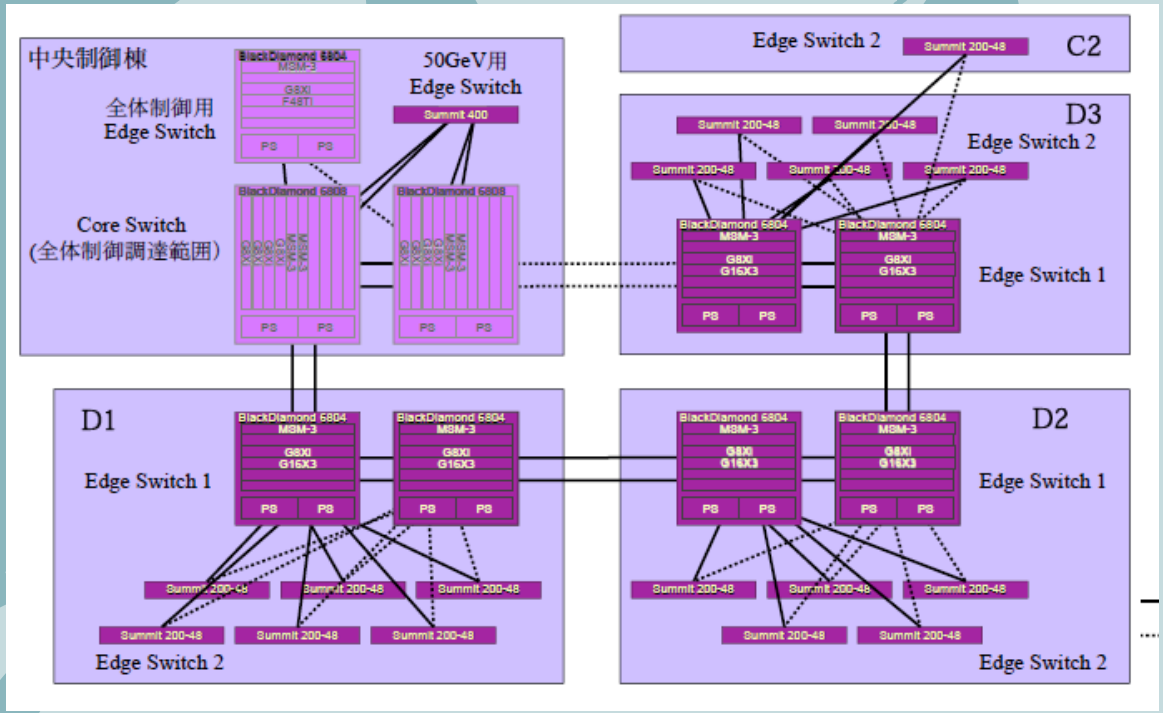
(Python)



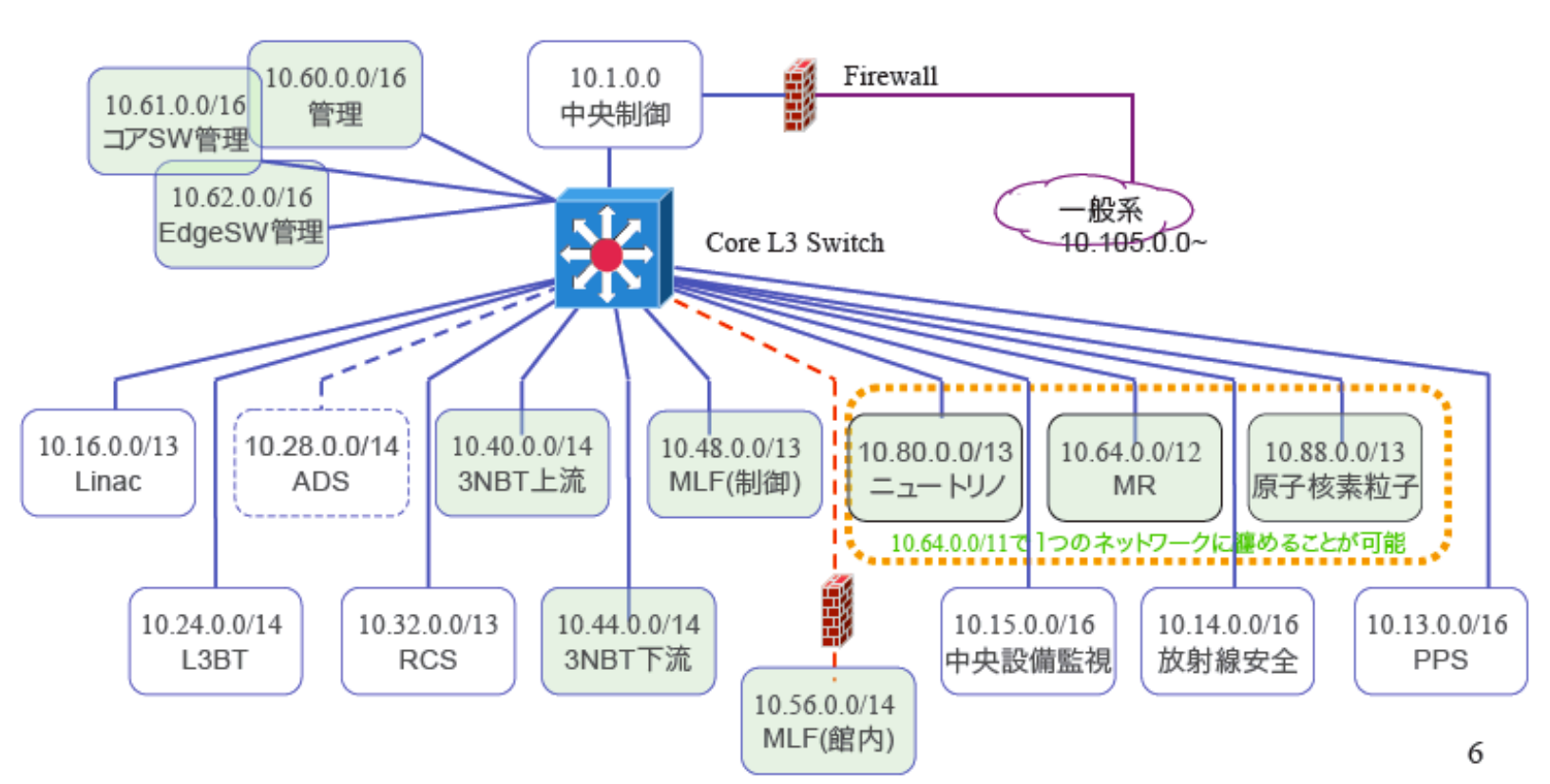
(channel archiver)

Network

- GbE Backbone
  - Redundant connection for backup



Logical Network structure



Each Facility has its own subnet/VLAN

RCS control

- contracted with the company for RCS controls
- Relationa Database(PostgreSQL) will be used:
  - EPICS database generation
  - Data Archiving/Correlation
- Synchronized data aquisition/retrival
  - RDBMS as storage

LINAC controls:IBCS

- Integrated Beam Control System
  - We have to avoid unwanted beam loss
    - Strong beam intensity
    - Tight Radiation safety requlation
      - JPARC is build within the JAERI, Tokai.
- Central place to control beam handling.
  - Control Access to HW should be authorized from this system.
  - Complize the standard IEC61508 as much as possible.

Stand-alone IOC (New in Apr.04)

OpenBlockS266 - a commercial Linux-Box

- PPC 266MHz, 64MB memory, 3inch disk (or Flash), Linux 2.4.20
- http://online.plathome.co.jp/products/openblocks/openblocks266/

– EPICS 3.14.4 + NetworkDriver (by JAERI)

– Basic communication with an Agilent oscilloscope succeeded (get a waveform-height)

Conclusion

- J-PARC accelerators
  - Under construction at JAERI-Tokai
    - Construct buildings; start beam delivery in 2007
  - The 60MeV linac is in commissioning at KEK-Tsukuba
    - Beam acceleration with a DTL tank succeeded
    - Began to Move to Tokai.
  - Start instration of equipments to the main control building.

- Prototype Control system for the 60MeV linac
  - Developing+Evaluating an EPICS-based prototype
    - Network devices (PLC/EMB-LAN + netDevDriver, WE7000)
  - Providing hints and feedbacks to the future JAERI-Tokai control system

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Do more in the 60MeV control

- Add missing records at the 60MeV linac
  - Vacuum
  - Safety (beam switch / beam mode)
  - Utilities (cooling water etc.)
- Beam studies by SAD
  - Add more CPU power
    - (soon) Introduce Linux server machines
  - Encourage non-control staffs to develop software
- Monitor - DAQ rate of WE is not high enough
  - 3-5Hz achieved with WE7111 oscilloscopes
  - More studies at KEK to improve DAQ rate