The evolution of the Elettra Control Sytem

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Summary

- where we started from (1991-1993)
- from 3 tier to 2 tier (1998)
- network evolution (1999-2001)
- preparing for new projects (2003)
- moving to new tools – Tango
- keeping old and new together

What is Elettra?

- a third generation synchrotron light source
- commissioned in 1993
- operates as user facility: 24x7 operations

the 1990-91 choices

- VME bus, Motorola 68000/68010 cpu
- HP workstations, PA-RISC cpu, 48/64 MB

- MIL-1553 field bus, 1 Mbit/s
- Ethernet, 10 Mbit/s, shared (yellow cable)

the standard model

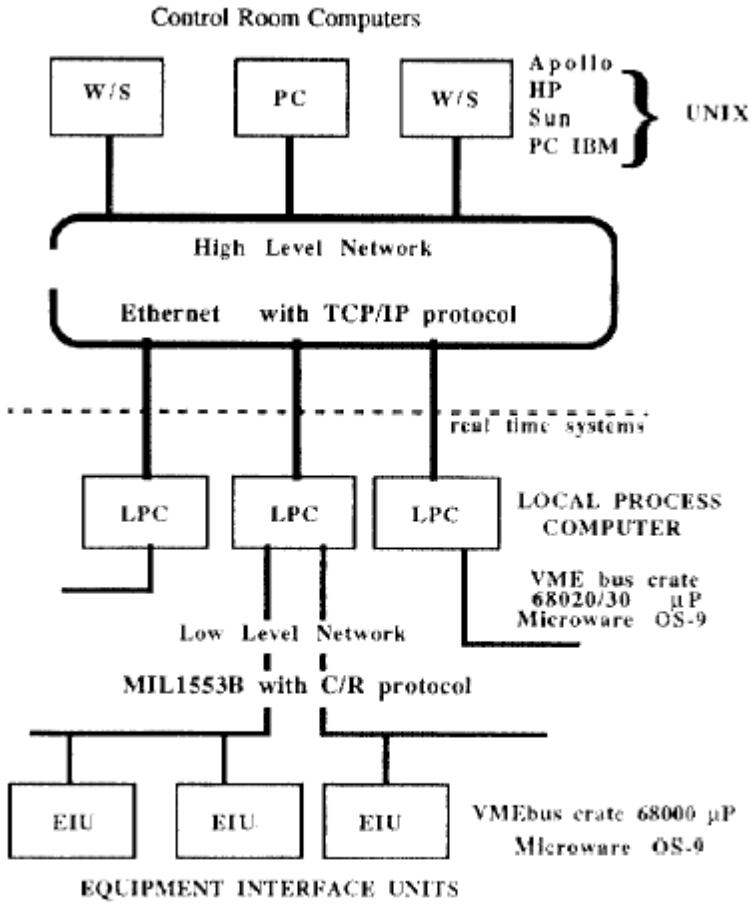
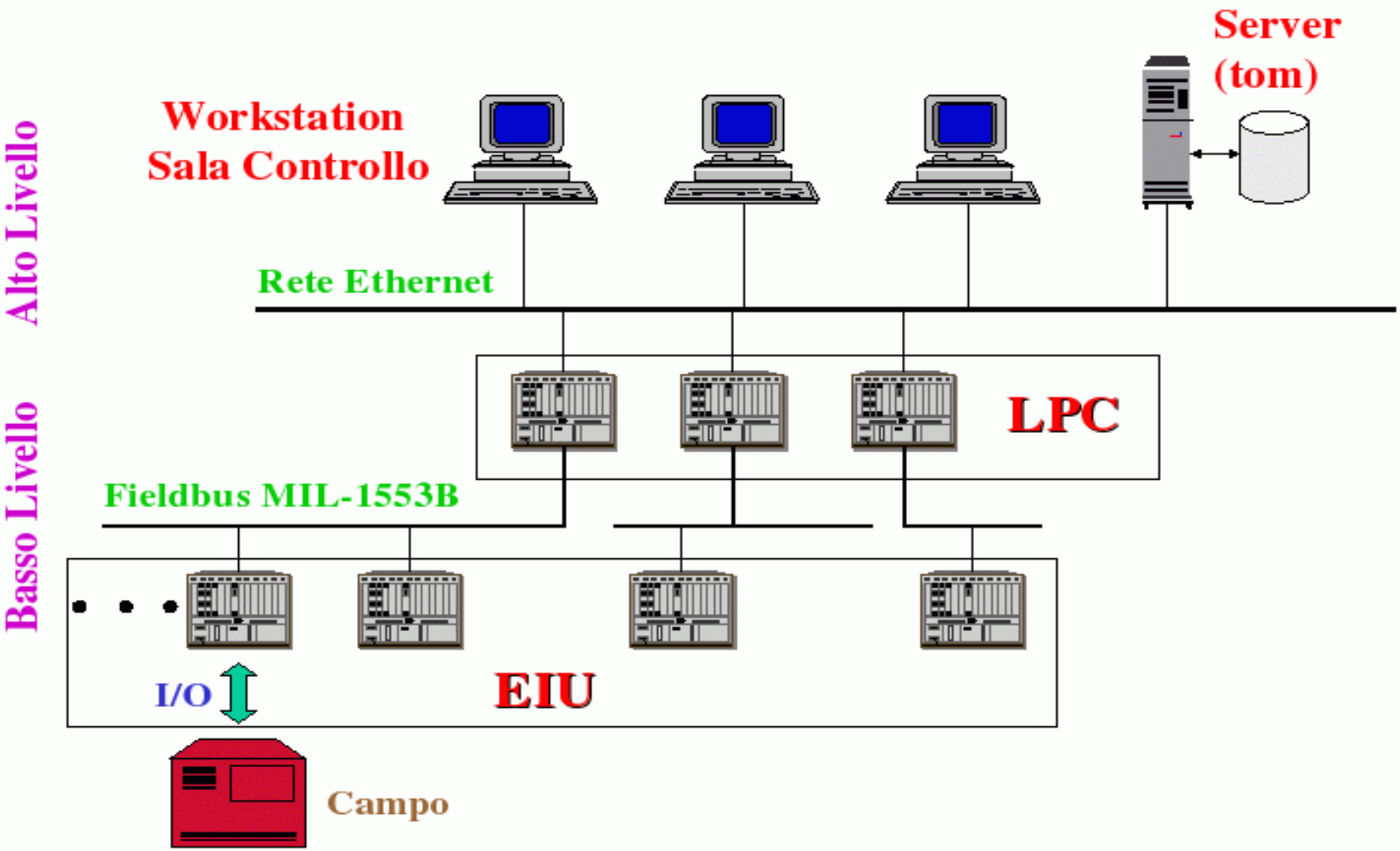


Fig. 1 ELETTRA control and data acquisition system. The dashed line defines the real time environment.

the standard model



the 1990-91 choices

- OS9
- HPUX – Unix from HP
- C language
- X11 and Motif
- RPC over TCP/IP and socket library
  - based on published or de facto standards
  - source code availability

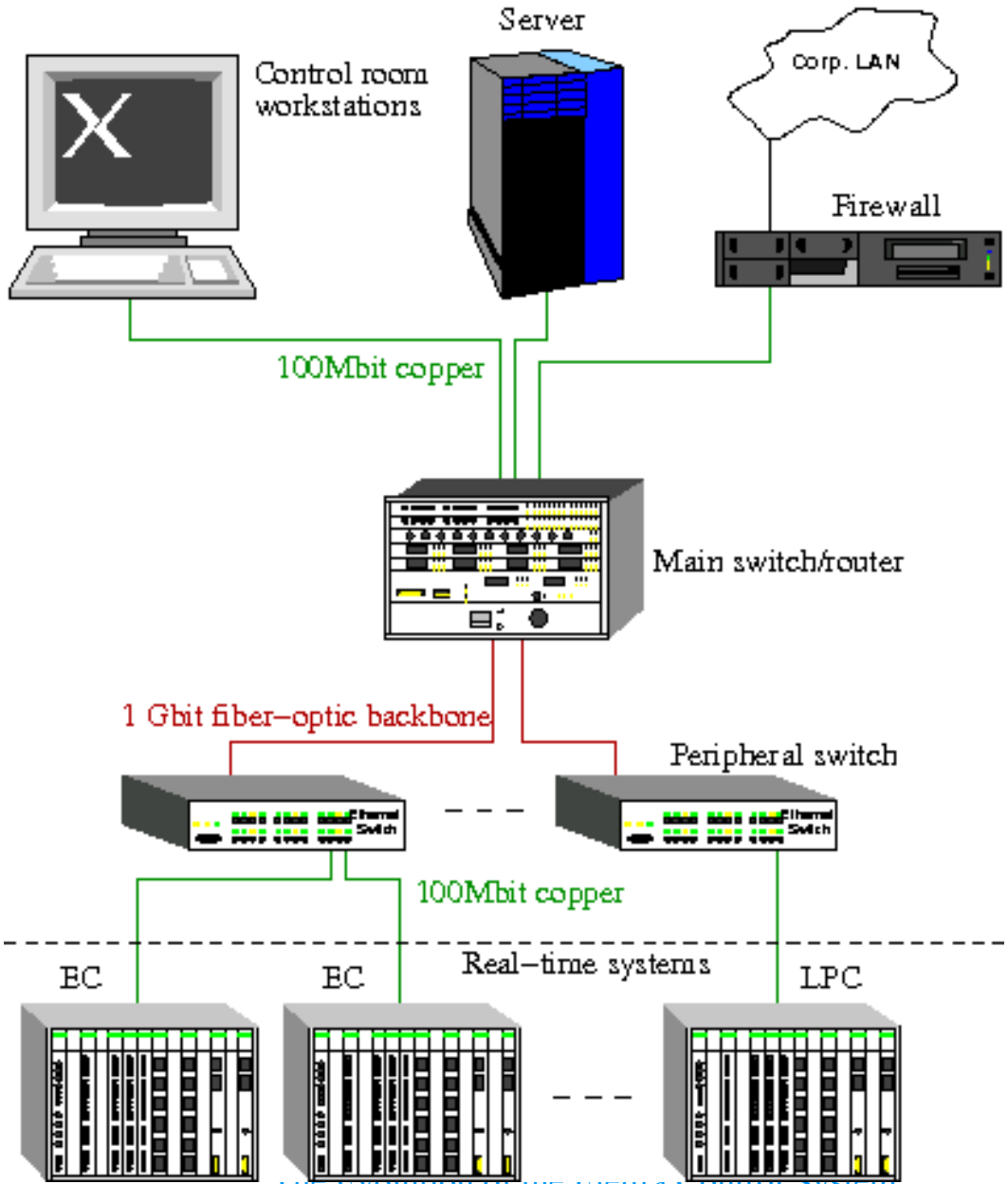
1998 : first evolution

- new VME systems use Motorola 68040
- I/O front end directly connected to the network : 2 tier architecture
- local database + poller architecture for field servers
  - asynchronous readings improved overall performances
  - client access to equipment unchanged

1999-2001: going faster

- HP workstations upgrade
  - model C200, 256 MB of memory
- fully switched network
  - star topology
  - 1 Gbit/s fiber backbone
  - 100 Mbit/s host connection
- firewall for filtering unwanted and harmful traffic

2 tier architecture



2003: new projects

- new booster injector project launched
- shrinking budgets
- changing markets
  - OS9 disappeared
  - Unix workstations almost disappeared
  - standard PC became powerful enough
- open source software!
- old software architecture limits became too restrictive

2003: new projects

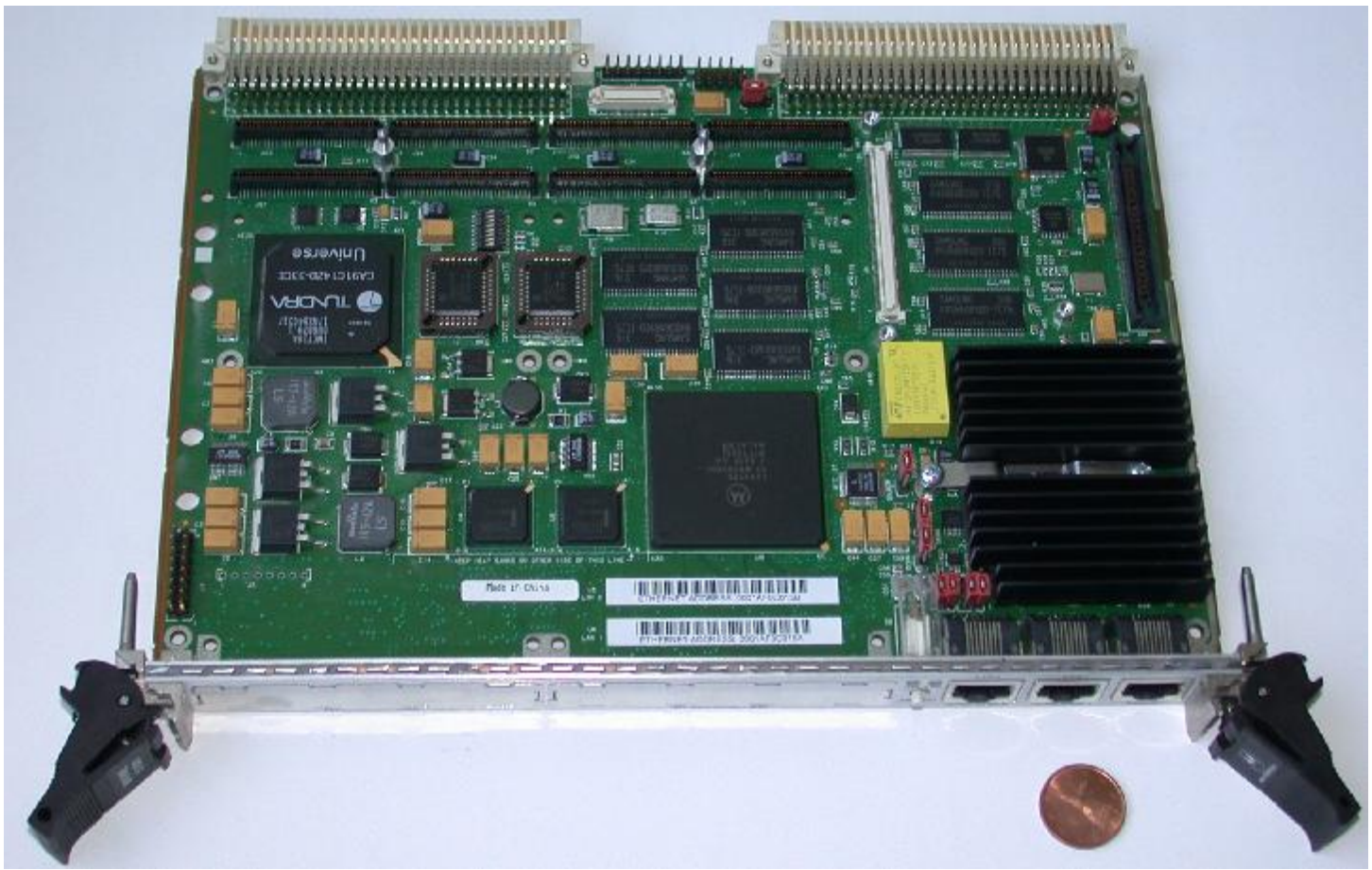
- extensive inquiry to select new hardware platform for field level computers

- CompactPCI or VME64 ?
- VME64 was selected:
  - wide choice of boards
  - compatible with our legacy equipment

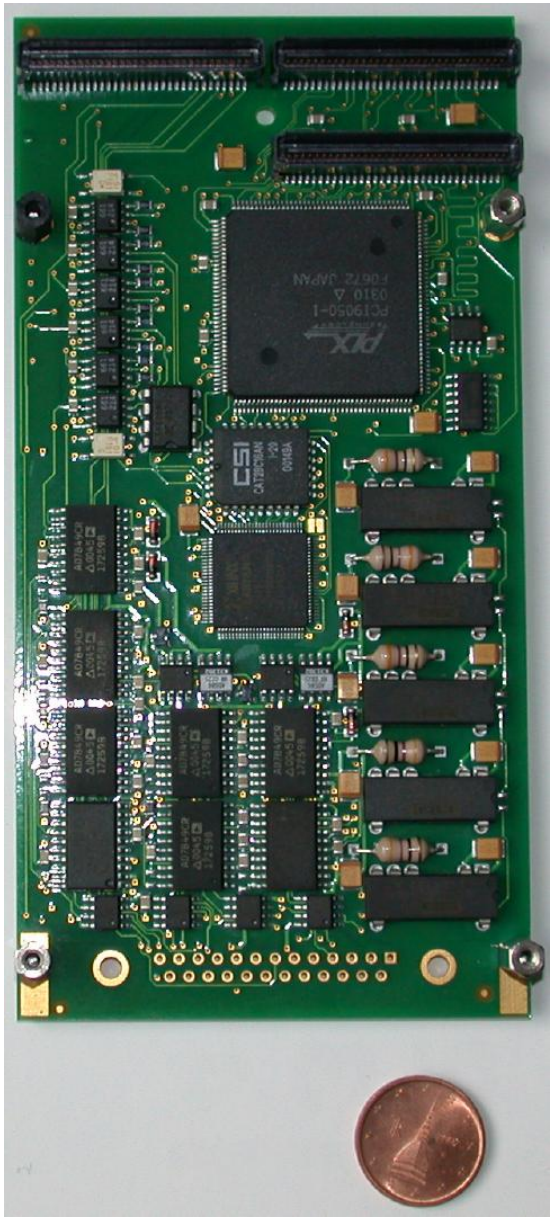
2003: new projects

- Motorola MVME 51xx CPU boards
  - Power PC series processor
  - up to 2 on-board PCI mezzanine card (PMC)
  - AltiVec processor
- Industry Pack (IP) board support on dedicated carriers

MVME 51xx CPU



PMC and IP cards



New operating systems

- Linux chosen for VME boards
  - RTAI real time extensions where needed
- Linux chosen for operator consoles
- cut in licensing and maintenance costs
  - we migrated (ported) all the control system software to Linux
  - smooth process, no disruption of services
- We have all the sources!

new development tools

- Object oriented
- Distributed Object Model
  - CORBA based
- compatibility with existing C libraries:

- C++ as main programming language
- Qt library for GUI programming
  - worked also on HP-UX during transition phase

from RPC to Tango

- Tango has been chosen as our D.O.O. system
- Elettra joined the Tango collaboration at the beginning of 2004

  - Device model
  - generic interface
  - event support
  - central database
  - multithreaded
  - open source
  - performances
  - C++, Java, Python,...
  - collaboration

Stitching Old and New

- since 2004 we used Tango for the renovation of several plants of the storage ring (RF distribution, injection)
- we can map the semantics of old RPC calls to equivalent Tango calls
- a configurable Tango to RPC bridge server has been written: all legacy applications work without any modifications

Summary

- Elettra control system has evolved during the last 15 years
  - some of its parts are still the original ones
  - improved performances, reduced costs
- we always ensured smooth transitions
  - we have the sources!
  - we selected tools with a degree of backward compatibility