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Integration of New Power Supply Controllers in the Existing Elettra Control System

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Outline of presentation

- Renewal of Elettra power supply (PS) controllers
- BeagleBone based controller
- Integration with control system
- Status and future developments

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Renewal of PS controllers

- VME boards running since 1993
- manufacturer ended service
- spare parts are being consumed
- key components are out of market

we can do some repairs in house...
but we cannot guarantee the controllers operations in the long term

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Renewal of PS controllers

We started a project to renew the PS controllers.

Requirements:

- extend the controls lifetime by at least 10 years
- use the existing PS electrical interface
- use “open design” components (hw & sw)
- simplify control system architecture
- extend diagnostic capabilities and functionalities

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Renewal of PS controllers

There are some constraints to be met:

- equal or better electrical performance and stability compared to present controllers
- easy installation and replacement
- integration of the new PS controller (NewPSC) with existing control system software must be transparent
- possibility to run the machine with a mix of old and new PS controllers

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BeagleBone based controller

The NewPSC is based on a BeagleBone board:

- AM3358/9 720 MHz “system-on-chip”
- 100 Mb/s Ethernet, connectors for I/O expansions
- open-source both hardware and software
- runs several flavors of GNU/Linux

Before the NewPSC the BeagleBone has already been succesfully used at Elettra in several applications.

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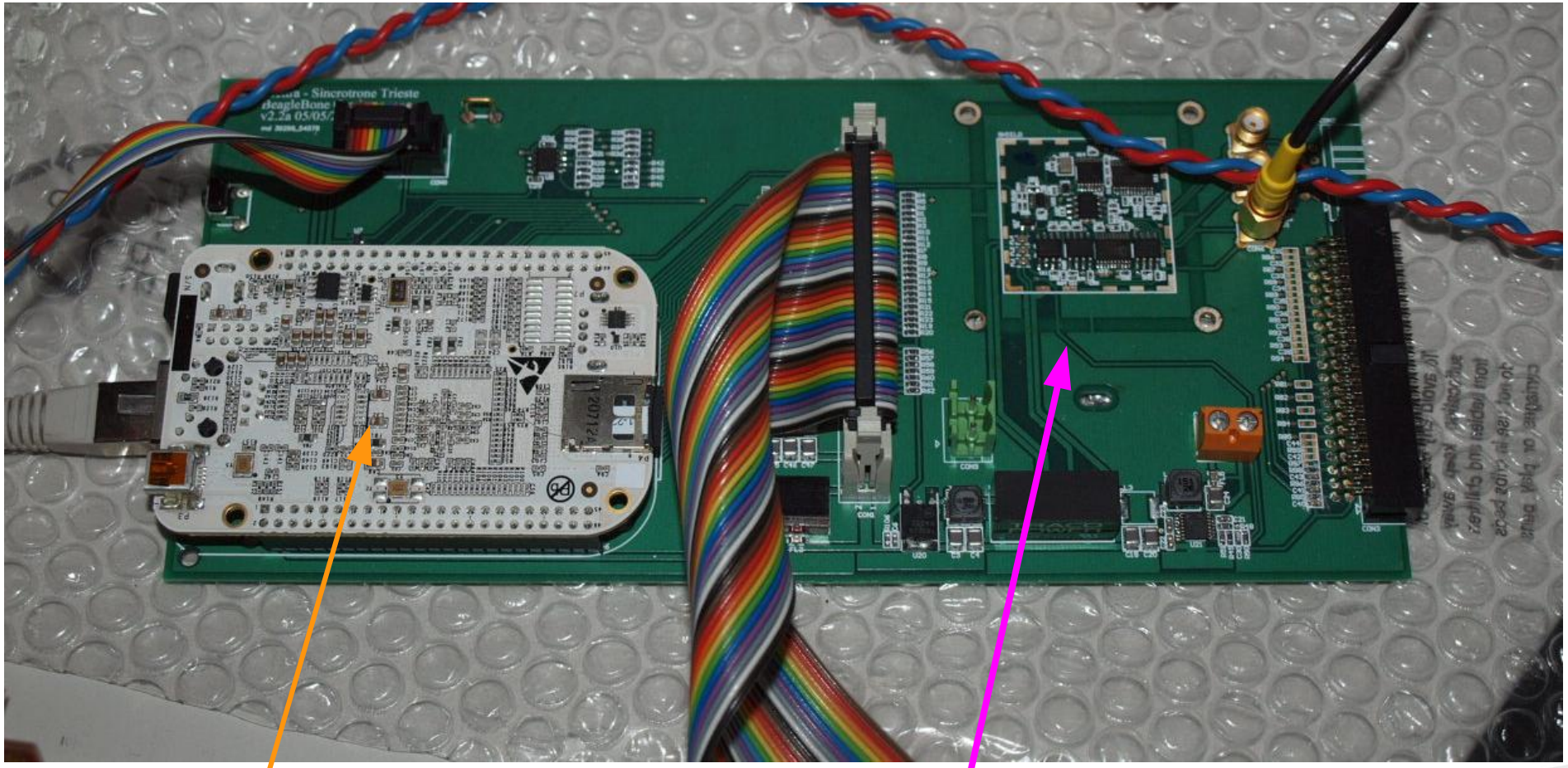
BeagleBone based controller



beagleboard.org

carrier board
(in-house developed)

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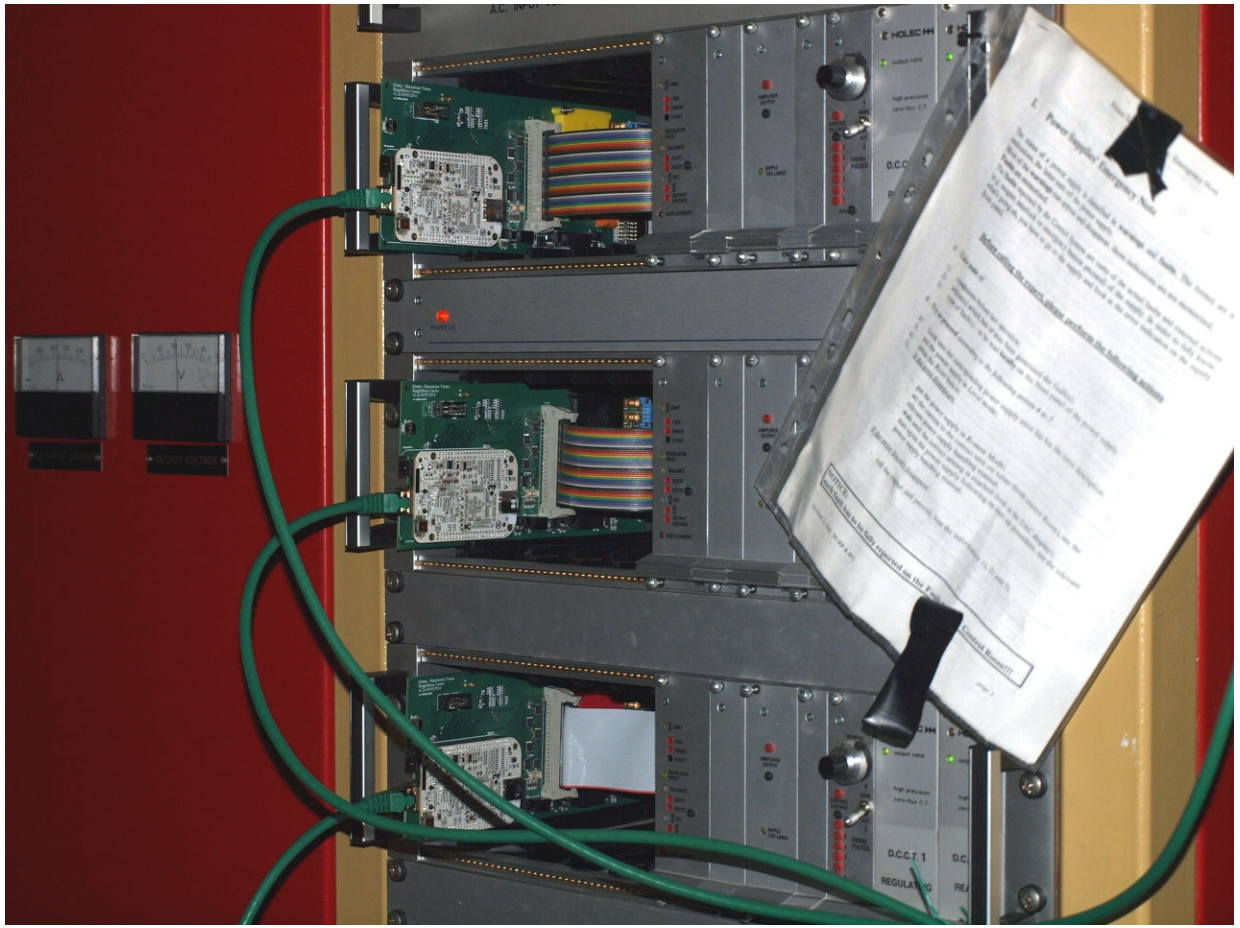
BeagleBone based controller



NewPSCs installed at Elettra since march 2014
electrical performance is better than that of the old system

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Integration with control system

NewPSC : embedded Tango device running on the BeagleBone

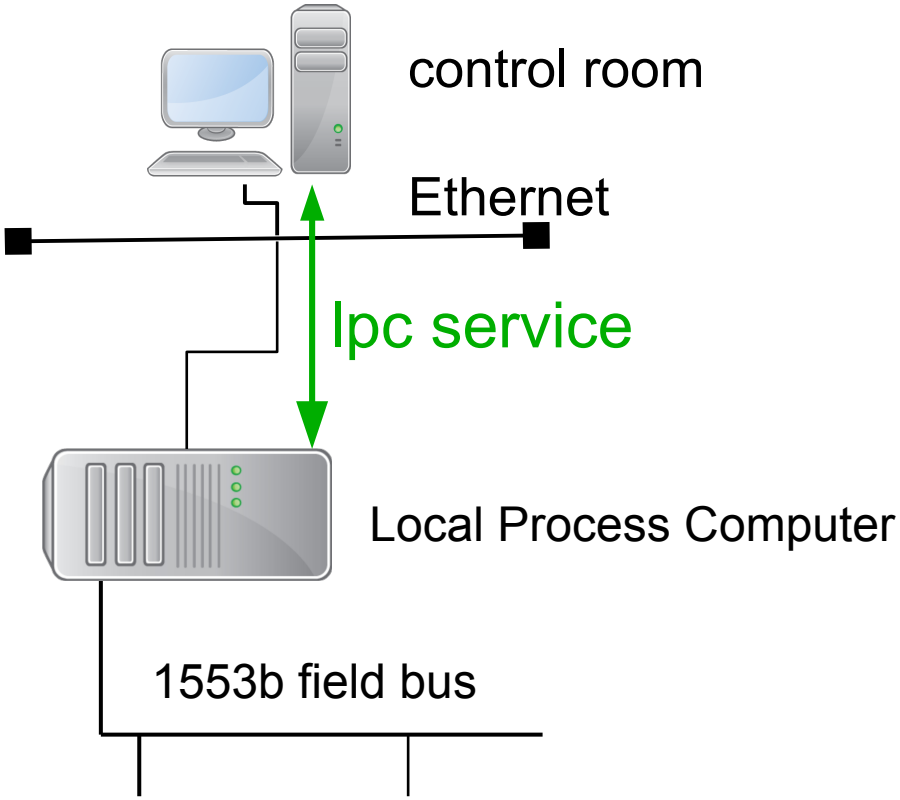
Many parts of the old control sytem are still based on CERN nc/rpc services, among them:

- power supplies
- high level programs

It was **mandatory** to integrate the NewPSC with the legacy programs to gurantee **regular** and **uninterrupted** operations and to test the performances of the NewPSC **without un-needed changes** in the operating conditions.

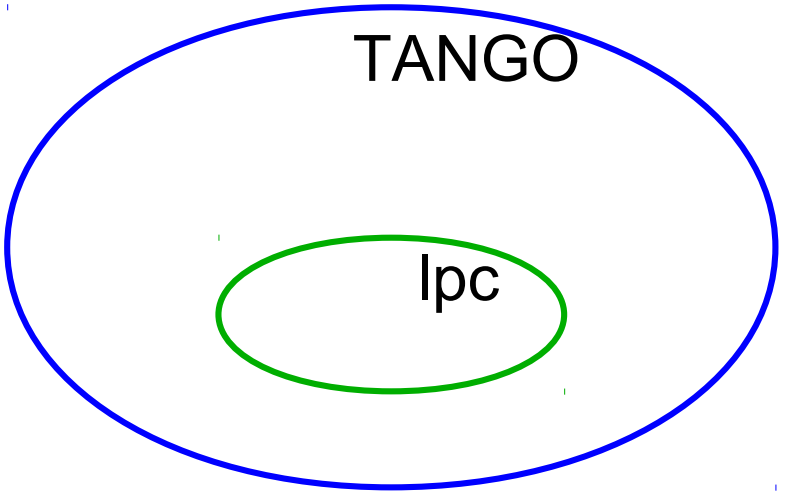
Integration with control system

present situation



lpc service:

- based on CERN nc/rpc
- read/write *named* variables
- execute *named* commands



Equipment Interface Unit

lpc service: a sub-set of TANGO

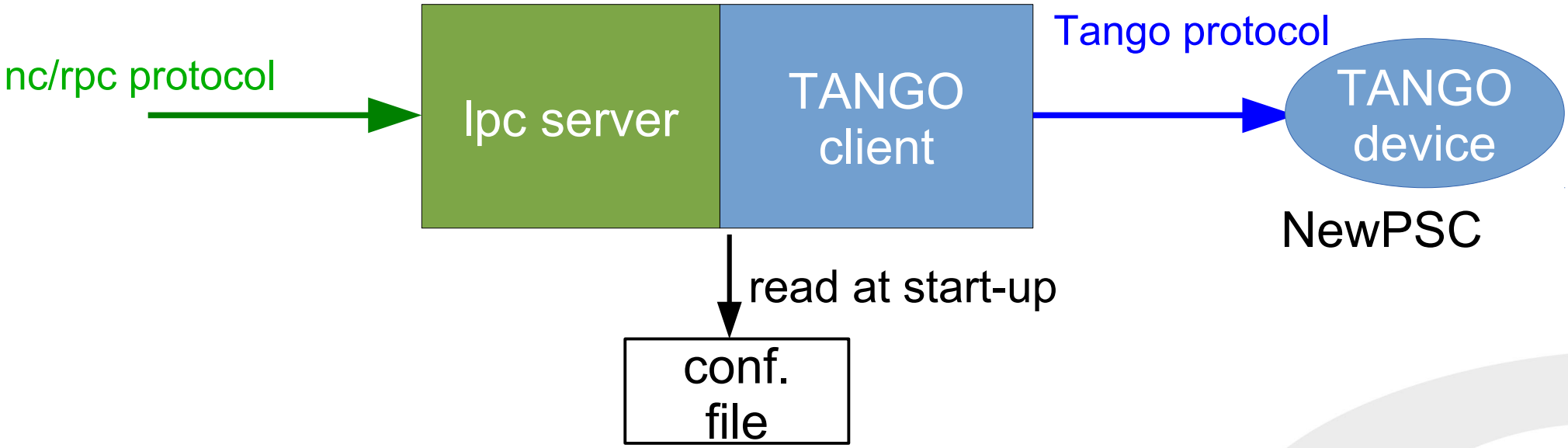
lpc2tango bridge

lpc service operations are easily mapped to TANGO:

named variable ➲ *device/attribute*

named command ➲ *device->command_inout*

we have developed a protocol bridge doing the mapping:



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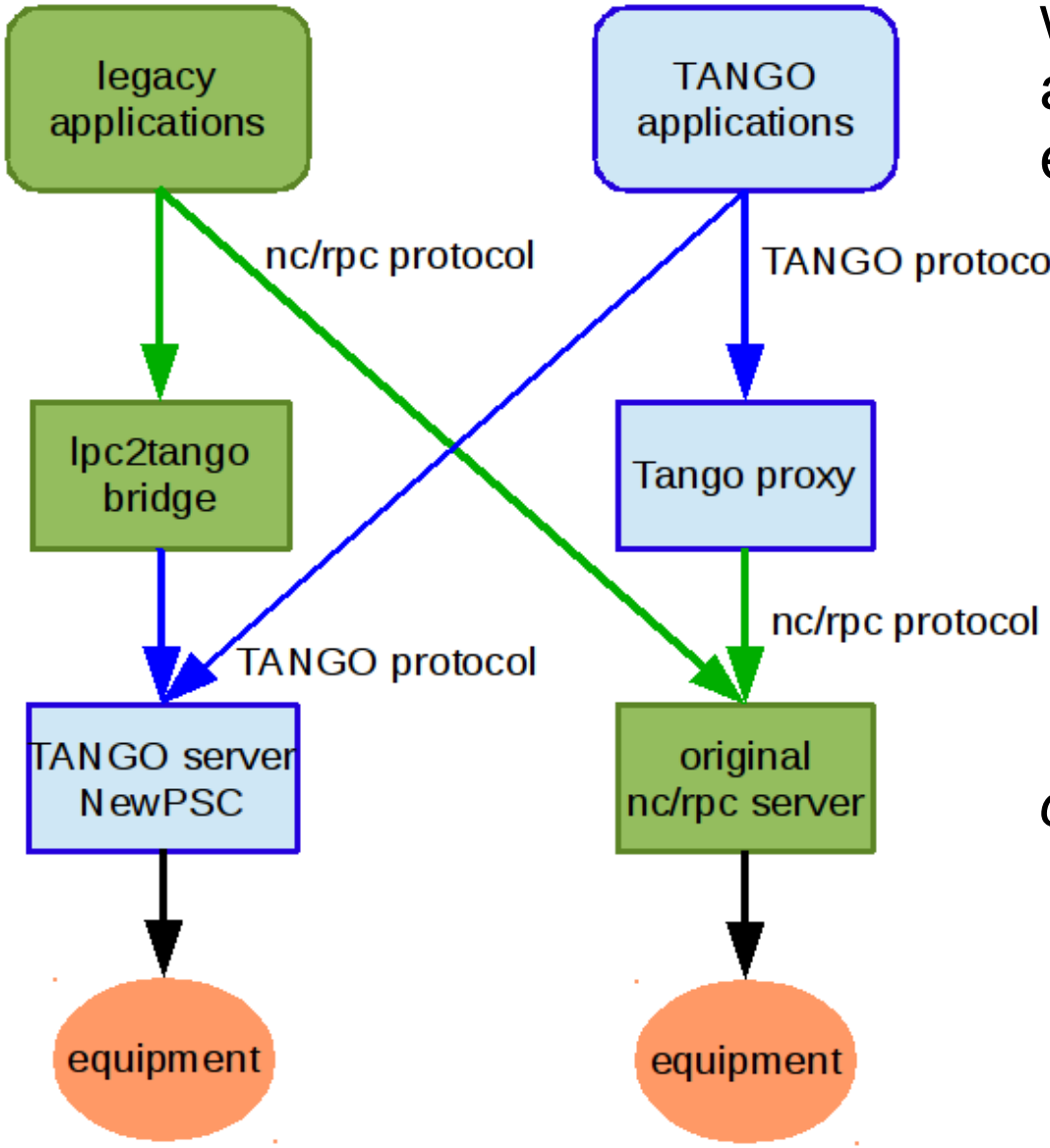
hybrid environment



with TANGO proxies TANGO applications can access old equipment

Careful analysis and design of the interfaces and behavior is of the utmost importance!

status and future developments

- 3 big power supplies are controlled by NewPSC at Elettra
- in operation since march 2014
- integration in the control system is fully transparent:
  - legacy and TANGO based applications work seamlessy
  - lpc2tango bridge and TANGO proxies are effective and reliable
- no downtime or impairment of operations due to NewPSC

- procurement for all the big power supplies is under way
  - we need 42 + spares NewPSCs
- local control touch-screen LCD panel is under development
- we are designing a BeagleBone controller for the steerer power supplies
  - may also include a digital PWM power module for hardware upgrade

Thank you!