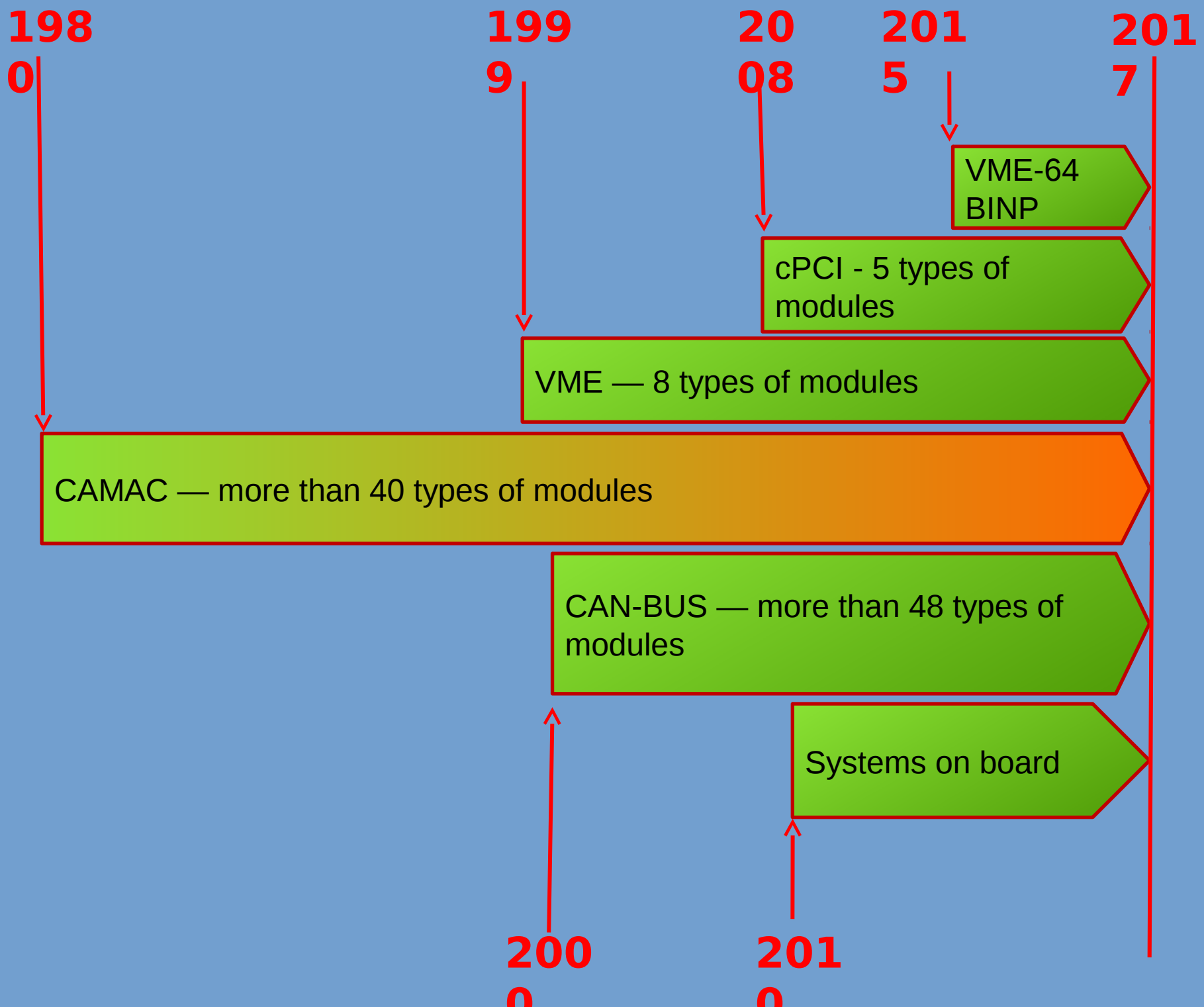
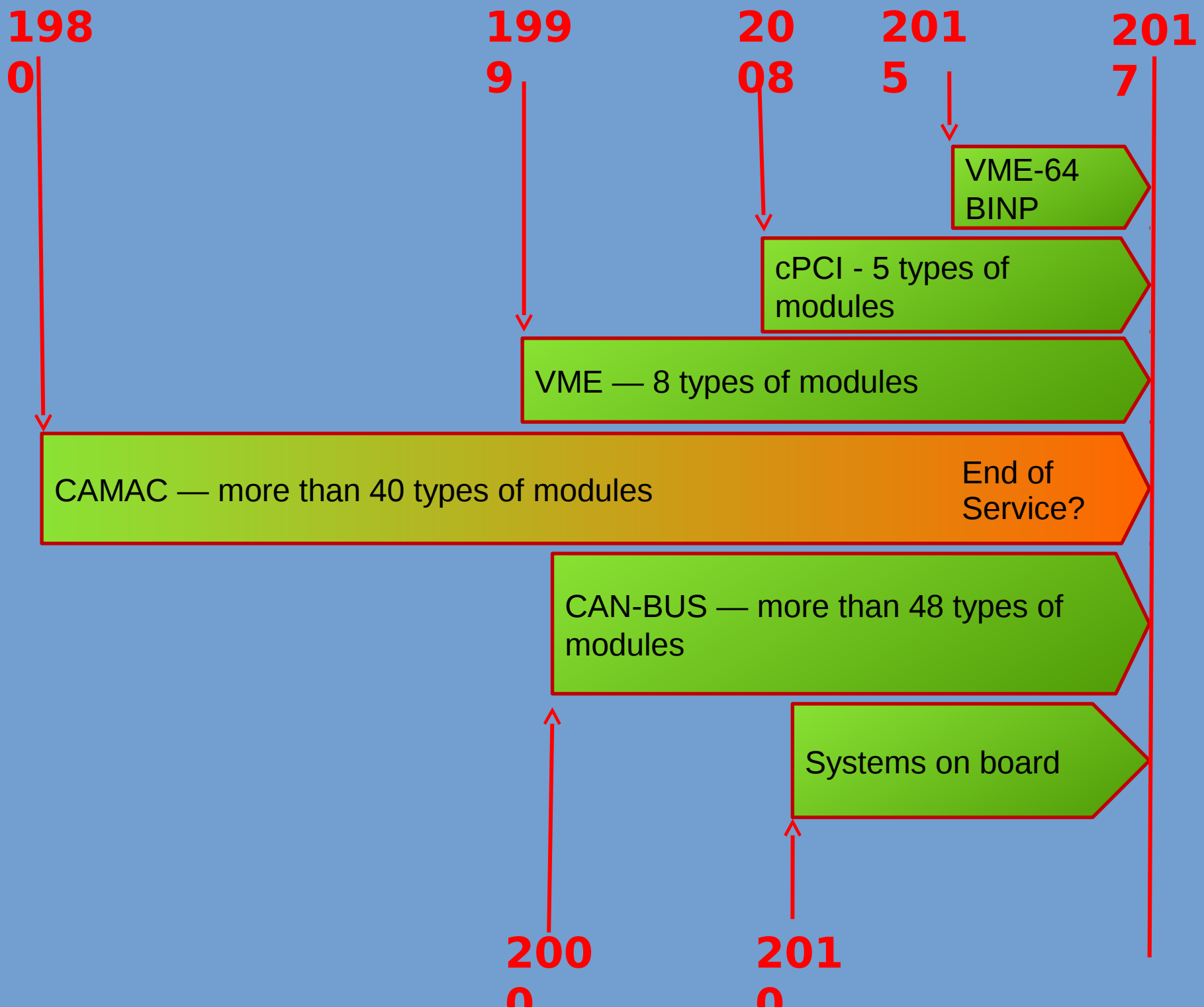
Hardware Developed at Budker Institute with Tango servers

Fatkin G. A.
for Russian Tango Users Meeting 2017


1980
1999
2008
2015
2017
VME-64
BINP
cPCI - 5 types of modules
VME — 8 types of modules
CAMAC — more than 40 types of modules
CAN-BUS — more than 48 types of modules
Systems on board
2000
2010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VME-64
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cPCI - 5 types of modules
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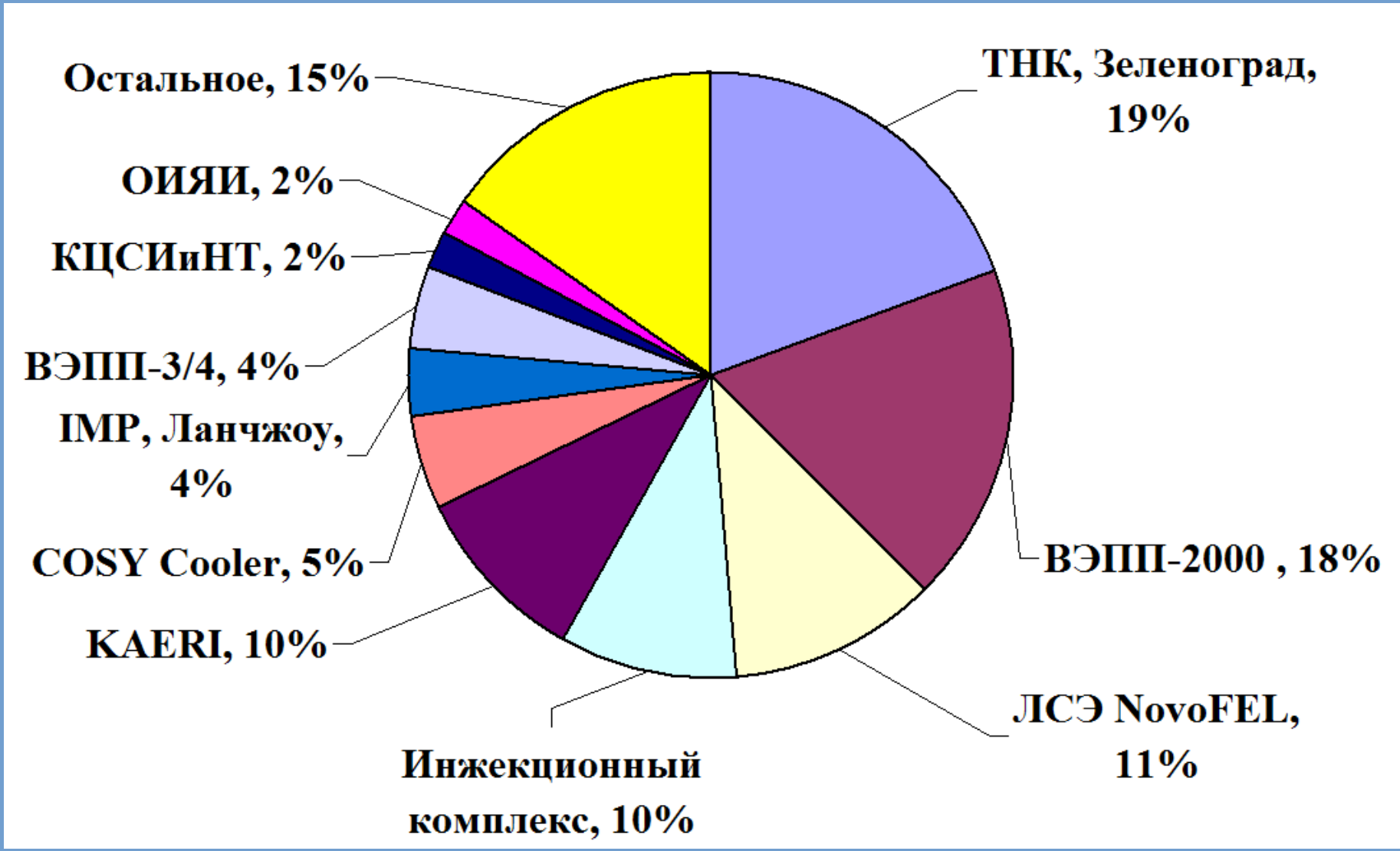
CAMAC — more than 40 types of modules
End of Service?
CAN-BUS — more than 48 types of modules
Systems on board
2000
2010

CAN-BUS

CAN-BUS

CANADC40 — 40-channel ADC with I/O registers
CANDAC16 — 16-channel DAC with I/O registers
CDAC20/CEDAC20 — precision DAC and 5-channel ADC with I/O registers
CEAC51 — precision DAC and 5-channel ADC with I/O registers
CEAC124 — precision 4-channel DAC and 12-channel ADC with I/O registers
CEAC121 — precision 1-channel DAC and 12-channel ADC
CAC208/CEAC208 — precision 8-channel DAC and 20-channel ADC
CAC168 — 8-channel DAC and 16-channel ADC with I/O registers
CEAD20 — 20(40)-channel precision ADC with I/O registers
CGVI8 — 8-channel programmable delay line with I/O registers
CPKS8 — 8-channel PWM module
SLIO24 — interface CANbus — 24-bit parallel bus
VSDC2/3 — precision digital integrator with CAN and VME versions

CAN-BUS

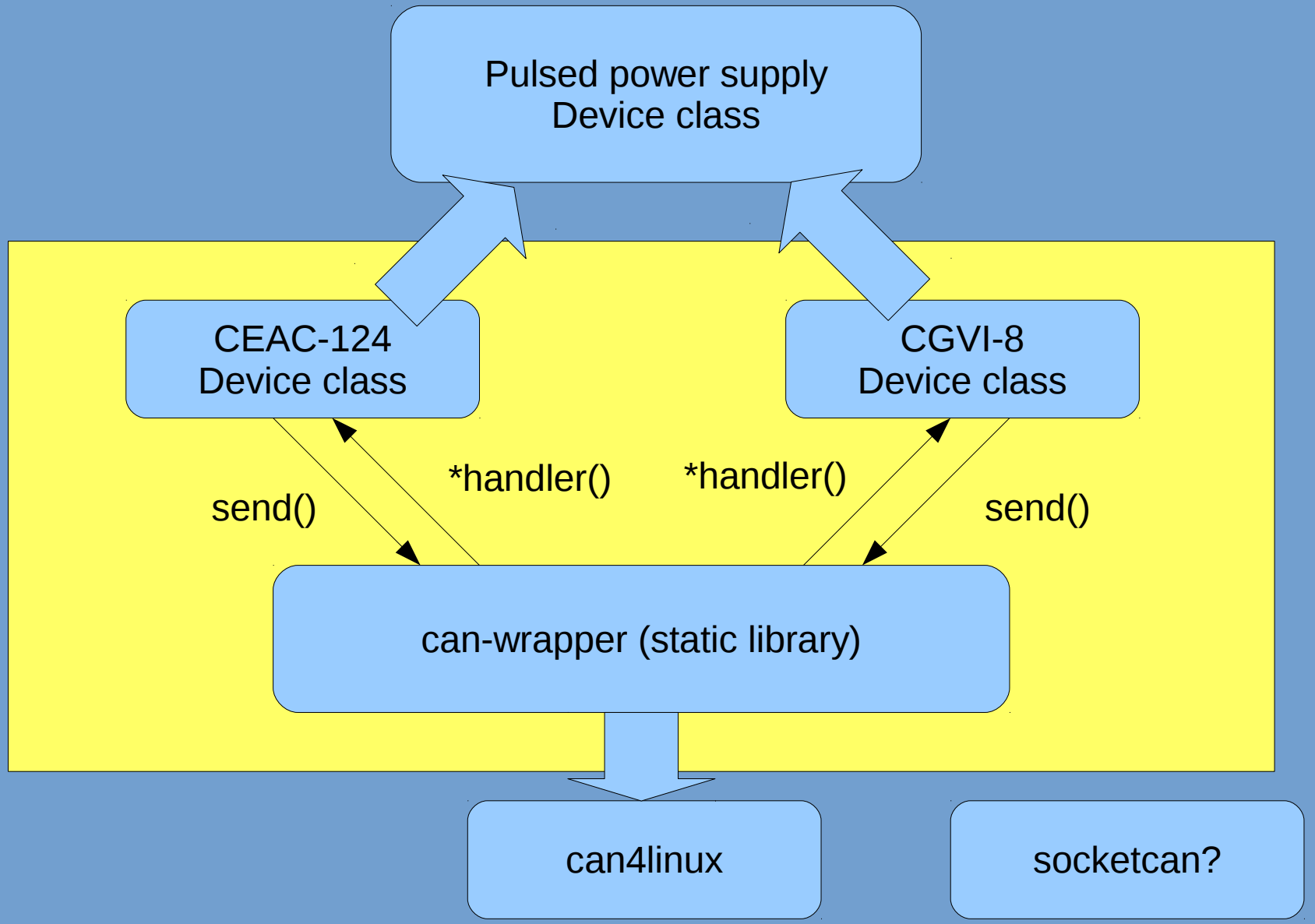

Остальное, 15%
ТНК, Зеленоград, 19%
ОИЯИ, 2%
КЦСИиНТ, 2%
ВЭПП-3/4, 4%
IMP, Ланчжоу, 4%
COSY Cooler, 5%
KAERI, 10%
ВЭПП-2000 , 18%
ЛСЭ NovoFEL, 11%
Инжекционный комплекс, 10%

CAN-BUS

CAN over Ethernet
2 isolated CAN ports
Ethernet, RS232
PowerPC
32 Mbytes RAM,
Embedded Linux
PC libraries
can4linux driver

VME-CAN
2 isolated CAN ports
can4linux driver

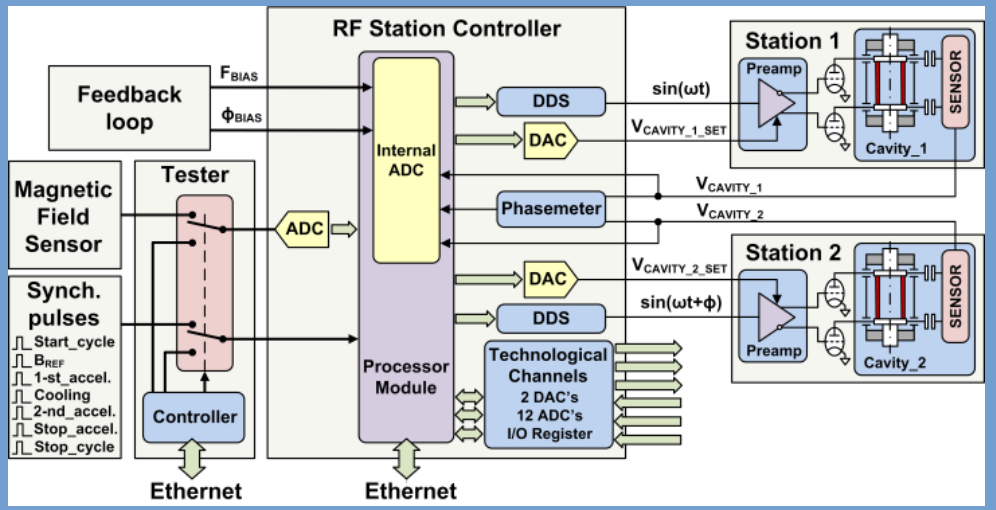
Tango support for CAN devices



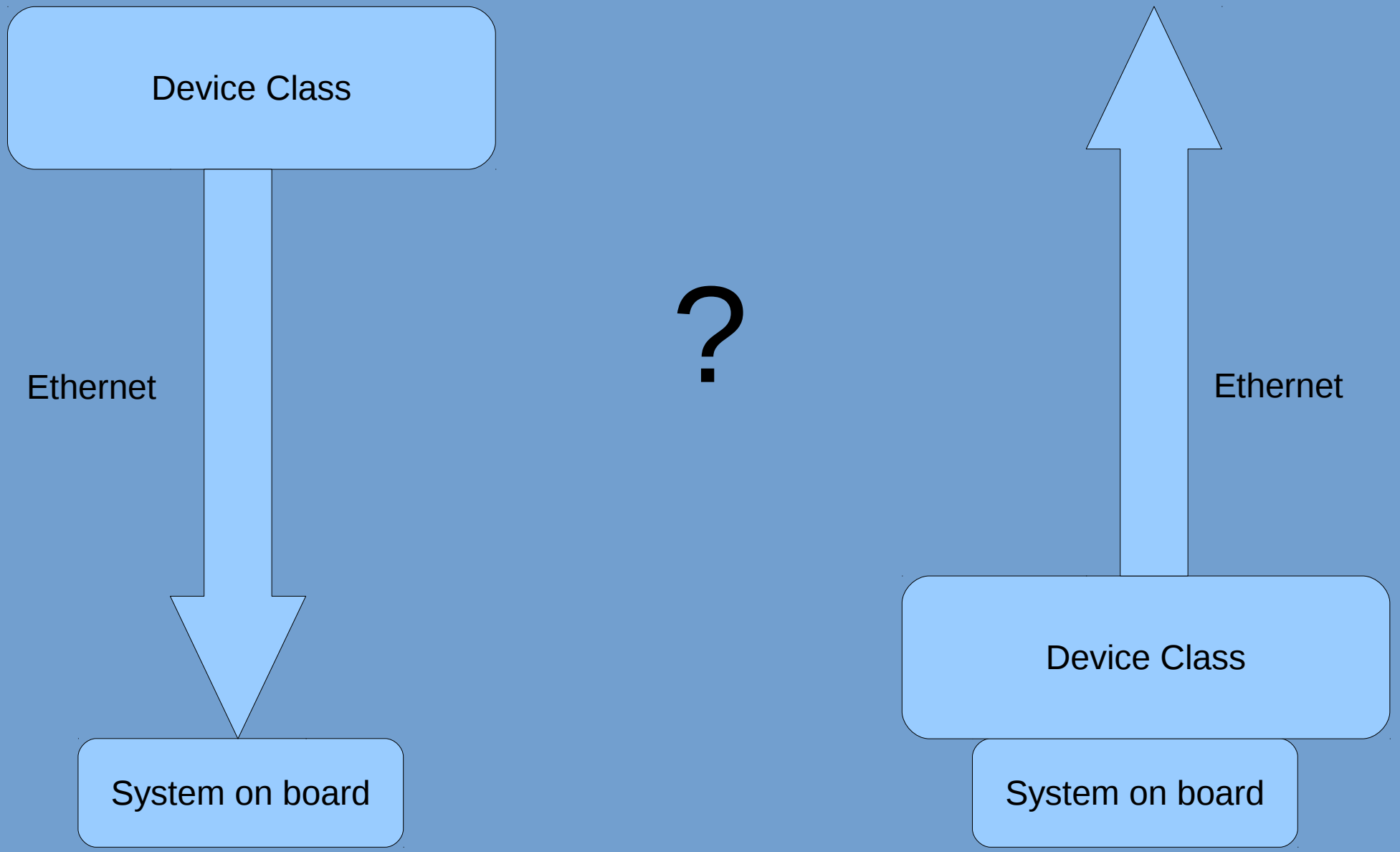
Systems on board

Beam position monitor Processor (VEPP-4)

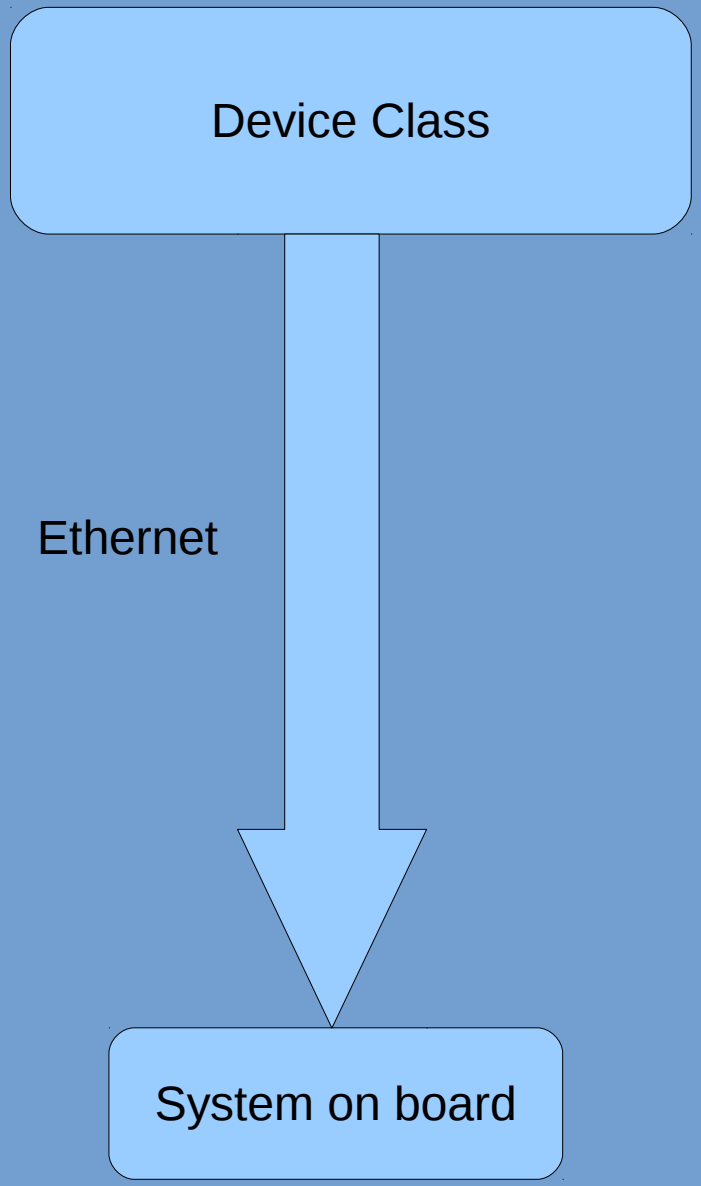
NICA RF Controller



Tango for Systems on Board



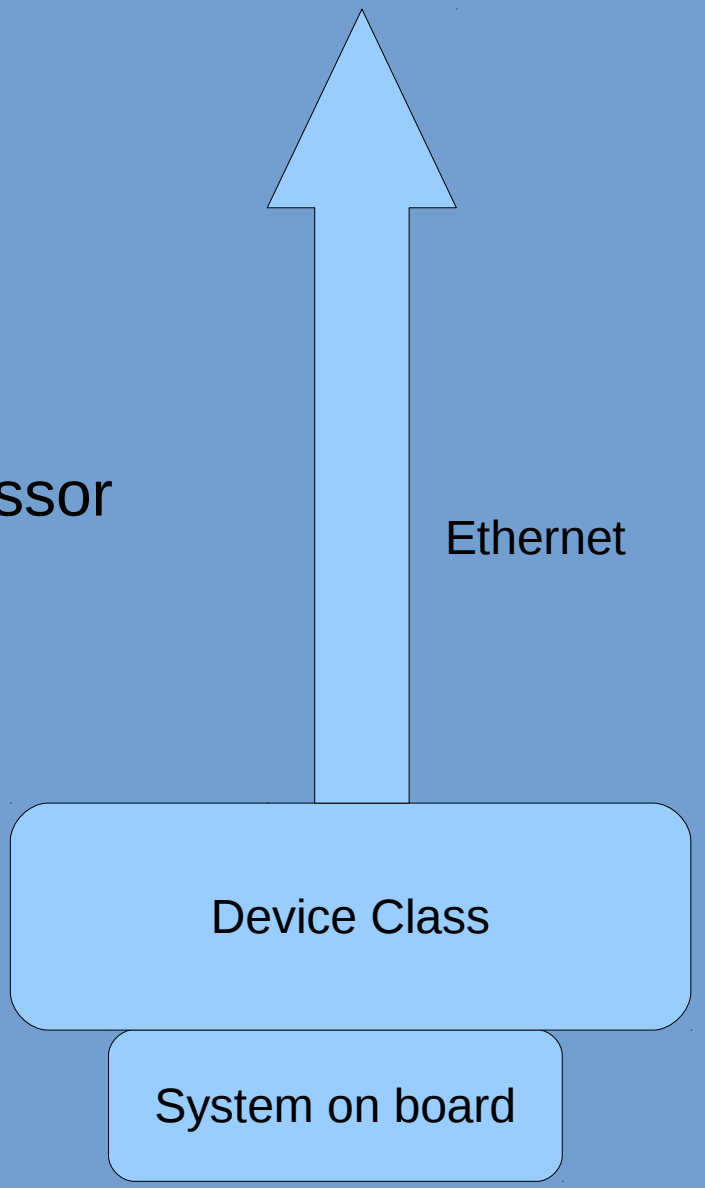
Tango for Systems on Board



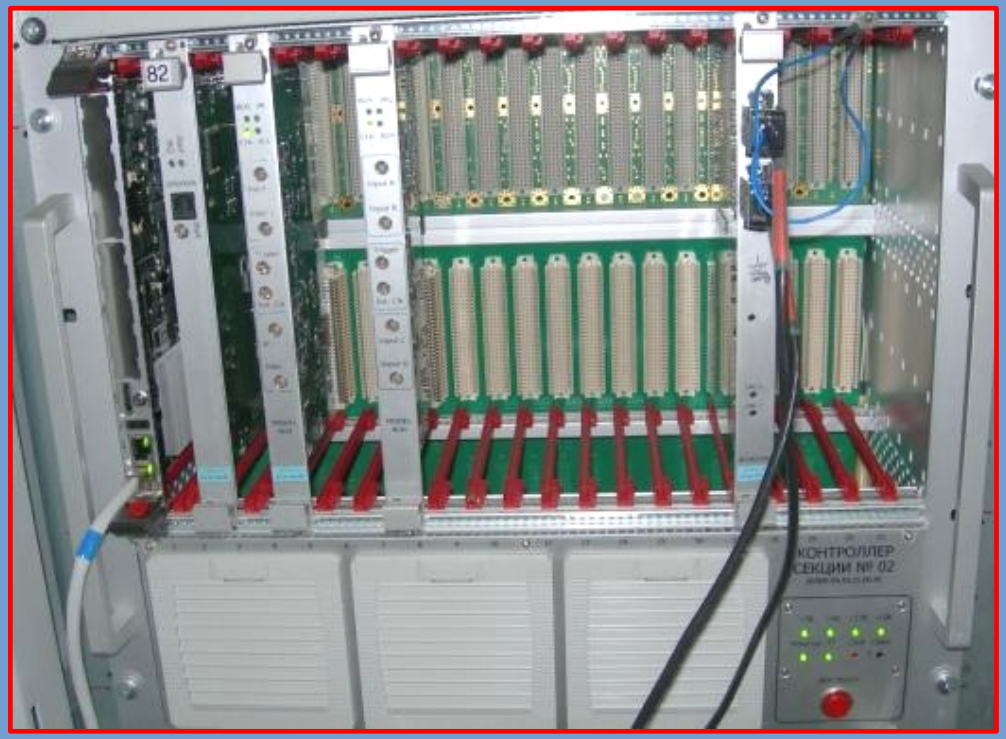
As most of the embedded TCP/IP stacks are specific, middle industrial PC with «full-scale» OS is required

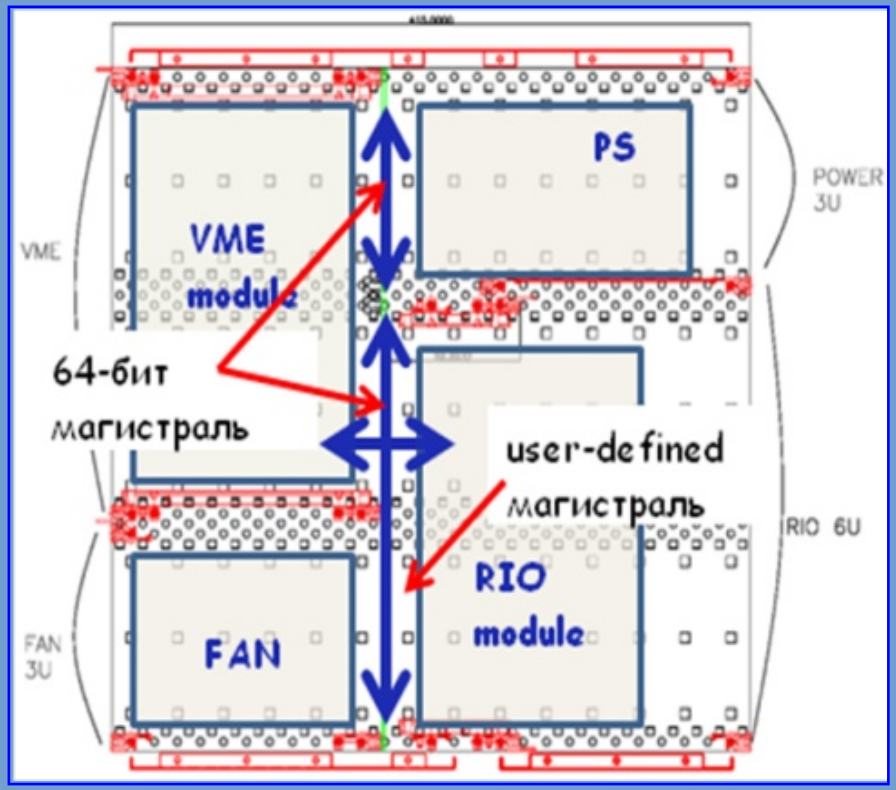
Tango for Systems on Board

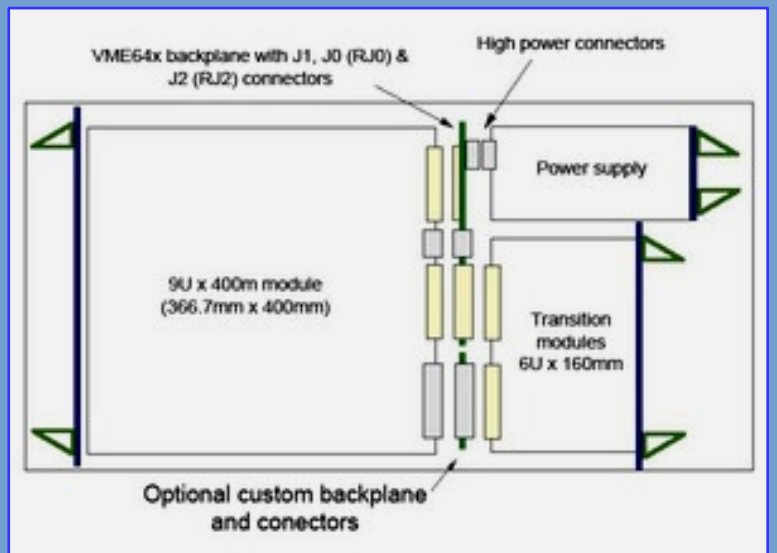
«Full scale» OS could be run
on separate core of the multi-core processor



VME-64 BINP



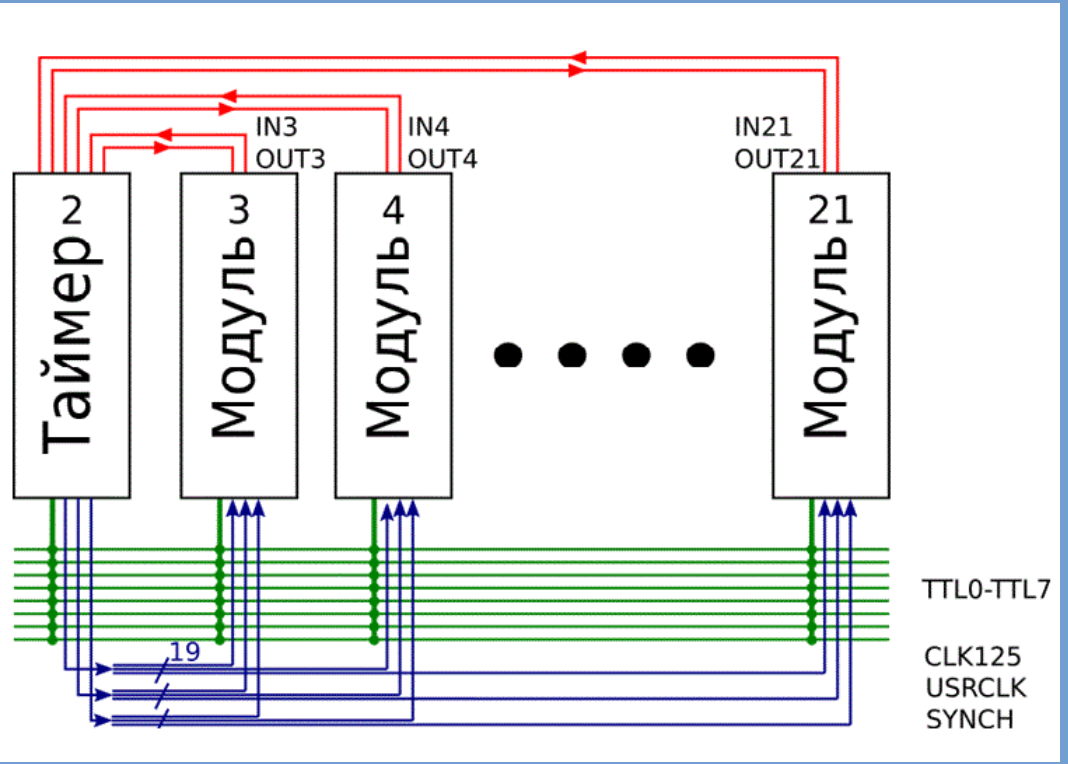




VME-64 CERN

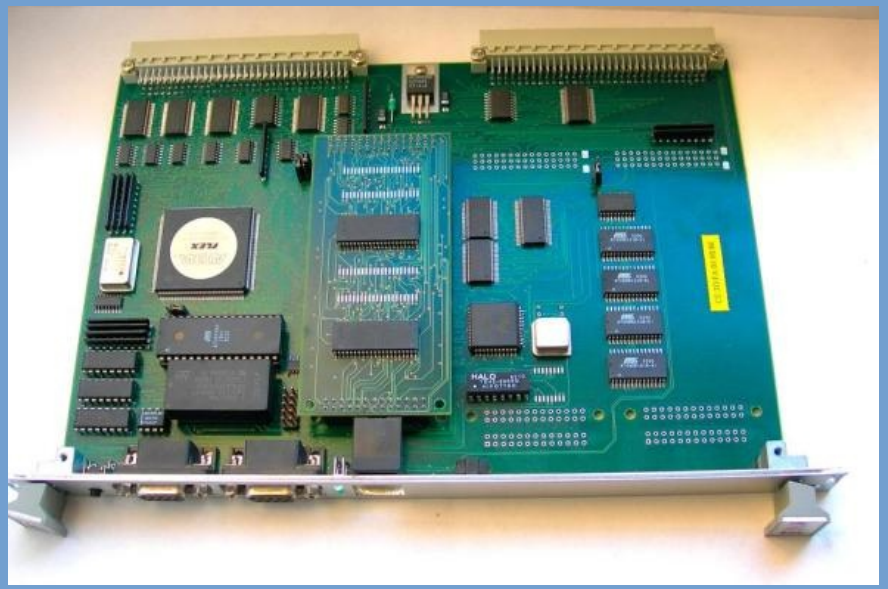
VME-64 BINP

21 Slots
VME-64x compatible
64 RIO lines
Inter-module synchronistaion:
System clock 125 MHz
Precise individual starts
UserClk
Daisy-chain lines
400 Watt power supply
Health monitor with individual CAN-line

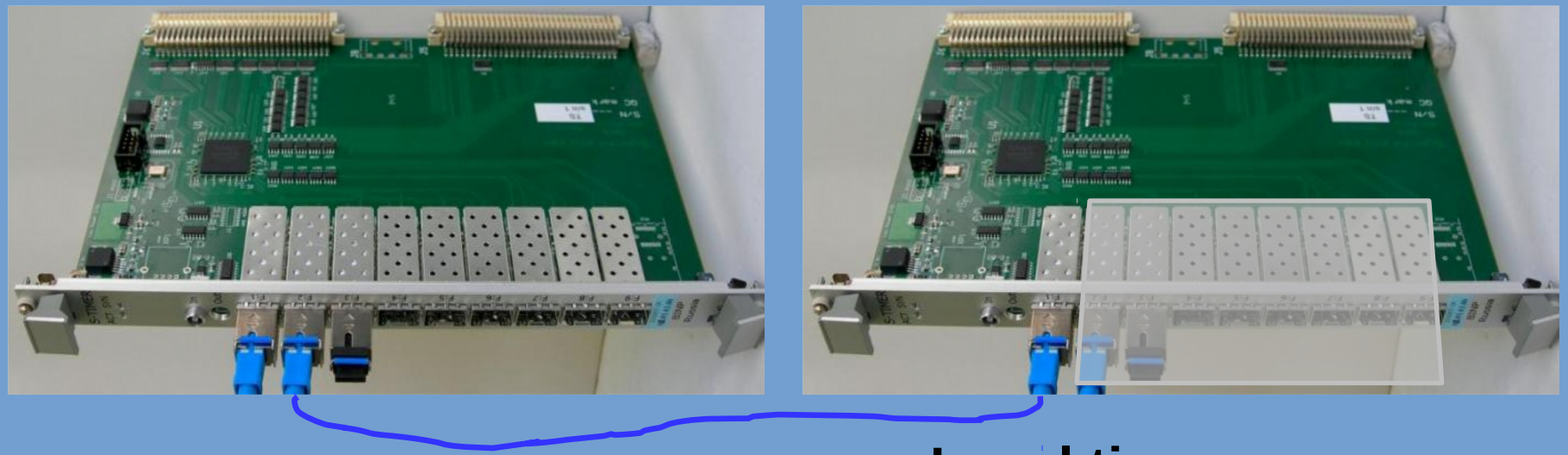


VME-64 BINP Modules

BIVME-2 controller
Motorolla MC68EN360
32 Mhz
16 Mbytes RAM
128 kbytes BootROM
8 Mb flash
1 Ethernet 10base-T
2 RS232



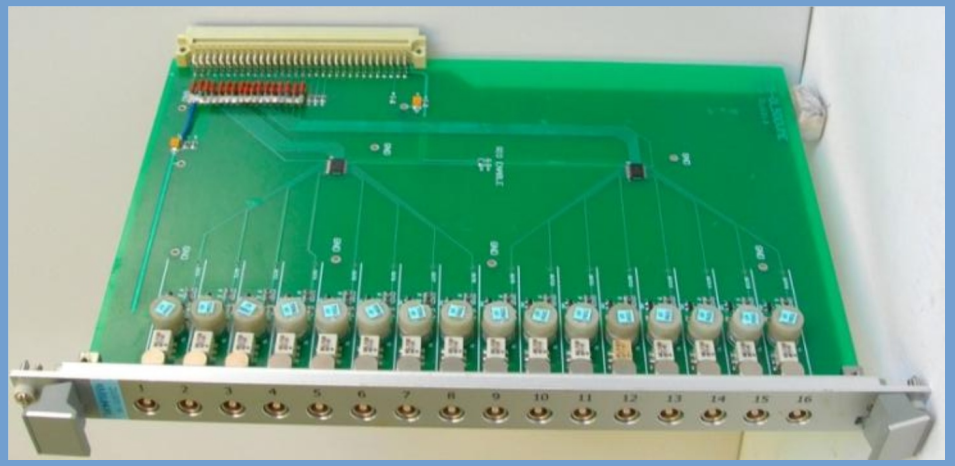
VME-64 BINP Modules



System timer
9 optical outputs
Delay measurement
Master clock and event transfer
4 ns clock precision

Local timer
1 optical input
Delay measurement
Clock syntonisation
Event decoding
Output clock 125 MHz
Output user clock
8 trigger lines
In/Out cross-commutation

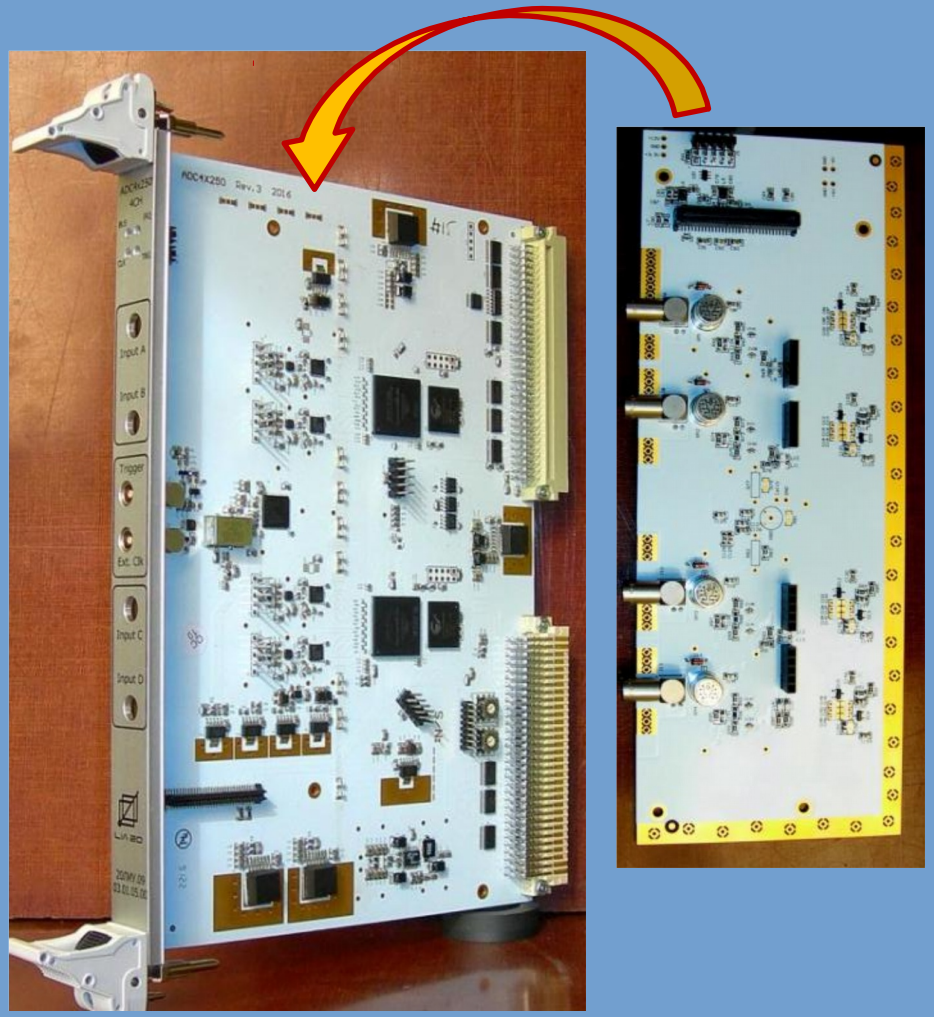
VME-64 BINP Modules



Delay line
16 + 8 channels
4 ns precision
17 s range
125 MHz synchronisation

RIO module
16 isolated outputs
Iout = 200 mA
0.5 us width
5 ns front
Short-circuit protection

VME-64 BINP Modules



Platform

4 ADC with 450 MHz bandwidth
12 bit precision
3 Mwords memory
Internal 250 MHz clock
Jitter 0.7ps
VME-Binp synchronisation

ADC4x250 – 4ch

4 synchrous channels
Ranges: ±0.5, ±1.0, ±2.0, 4.0 V
Bandwidth 80 MHz
ENOB – 10.1 bit @ 11 MHz
Memory 0.75 MWords/Channel
On-board calibration

ADC4x250 – 1ch

1 channel
Ranges ±0.5, ±1.0, ±2.0, 4.0 V
Bandwidth 300 MHz
ENOB – 7.3 bit @ 110 MHz
Memory 3 Mwords/Channel
On board calibration

ADC4x250 – 4ch-optic 4 channels (current), 2 ranges, bandwidth 100 MHz, photodiode current compensation

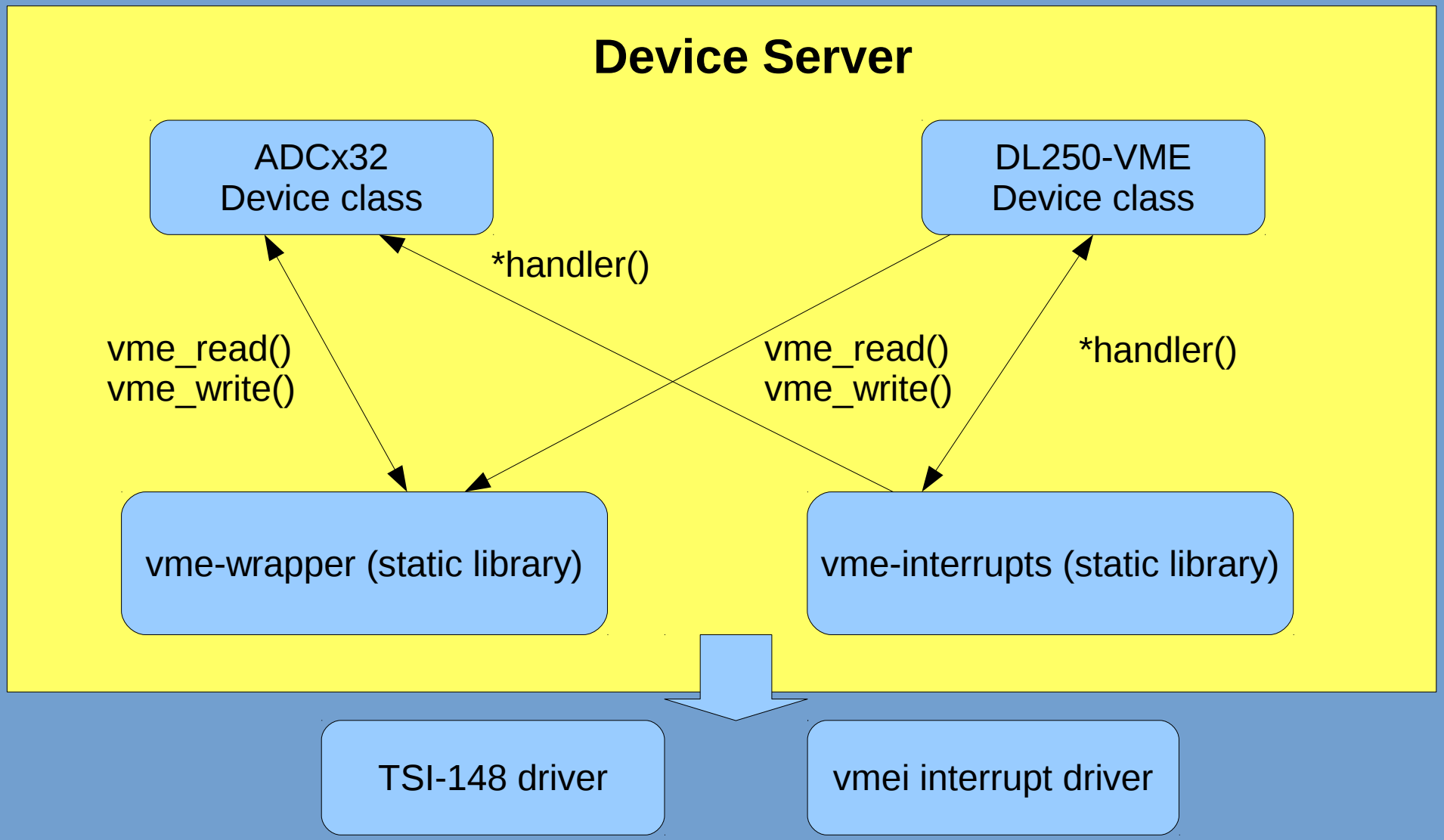
VME-64 BINP Modules

VME ADCx32
32 channels (4 multiplexed ADC`s)
Max speed 1 MSPS
Ranges: ±0.5, ±1.0, ±2.0, ±4.0 V
12 bit ADC
Differential inputs
Programmable channel sequencer
80 kWords/channel
VME-BINP synchronisation
Post-Trigger mode
Built-in calibration
RIO-module available

VME-64 BINP Modules

VSDC-3 Precision digital integrator
2 channels
Ranges: ±0.2, ±2.0 V
Absolute error @ 50 ms 5e-5
Absolute error @ 10 ms 1e-5
24-bit ADC
ENOB @ 100 kHz 18 bit
ADC non-linearity ±2e-5
Sampling speed 312 kSPS
Synchronisation precision ± 1 ns

Tango for VME64-BINP



Tango for VME64-BINP