

EASY:

**a new SY1527-based
Embedded Assembly SYstem**

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Summary

- Background / previous CAEN HV/LV activities
- Birth of the EASY System
- EASY specifications
- EASY modules
- EASY integration in DCS

Background

- CAEN's Power Supplies R&D activities in the last 5 years:
 - SY1527/2527 family
 - OPC Server for the SY1527/2527
 - SASY2000 for Radiation Tolerant and Magnetic Field solutions → tested working devices up to:
 - 7 kGauss
 - $1 \cdot 10^{11}$ p/cm² TD - 15 kRad TID
 - $2 \cdot 10^{11}$ n/cm² TD
- Result:
 - existence of a series of building blocks for a new power supply concept

Birth of the EASY (I)

- Since 1996 CAEN has evaluated all preliminary requests from LHC experiments
- The SASY2000 allowed to perform Radiation & Magnetic Field tolerance evaluation (functional prototypes approach)

Birth of the EASY (II)

- The LHC experiments need common solutions:
 - Reduce R&D costs (Hardware & Software)
 - Reduce Hardware/Software proliferation:
 - Use of the same crates for all Sub-detectors
 - Use of the same modules where possible
 - Use of a Common Control System
 - Reduce Maintenance costs:
 - Use of Common spare units
- CAEN proposes a “catalog” approach with a limited set of modules

EASY Main Features

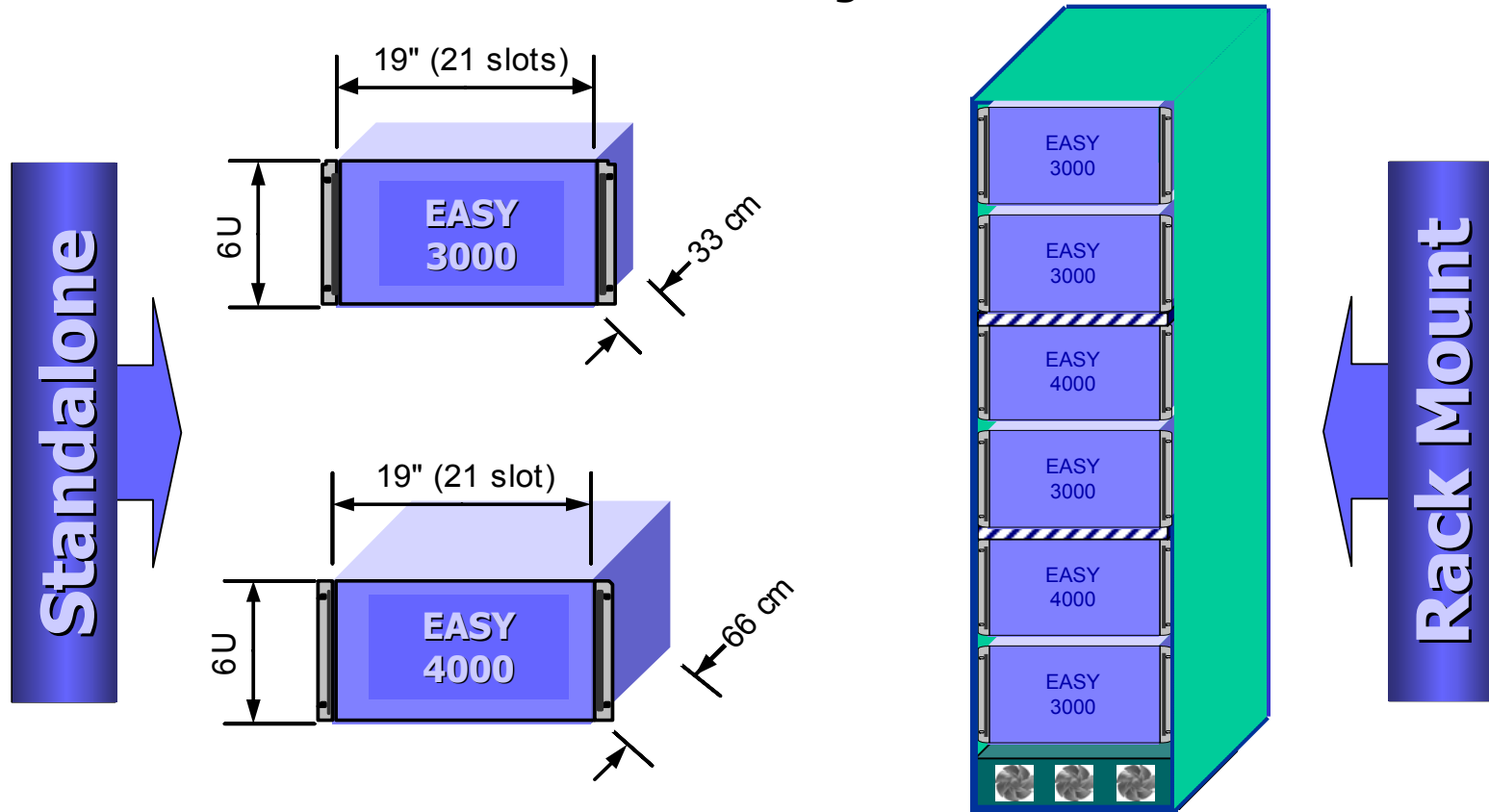
- Full integration in SY1527/SY2527 (it appears as a single SY1527 board)
- 21 slots per crate
- 3 kW Maximum Output Power
- Magnetic field capability: 2 kGauss
- Expected rad.tol.:
 - $5 \cdot 10^{10}$ p/cm² TD
 - $2 \cdot 10^{11}$ n/cm² TD
 - 15 kRad TID

EASY Module Features

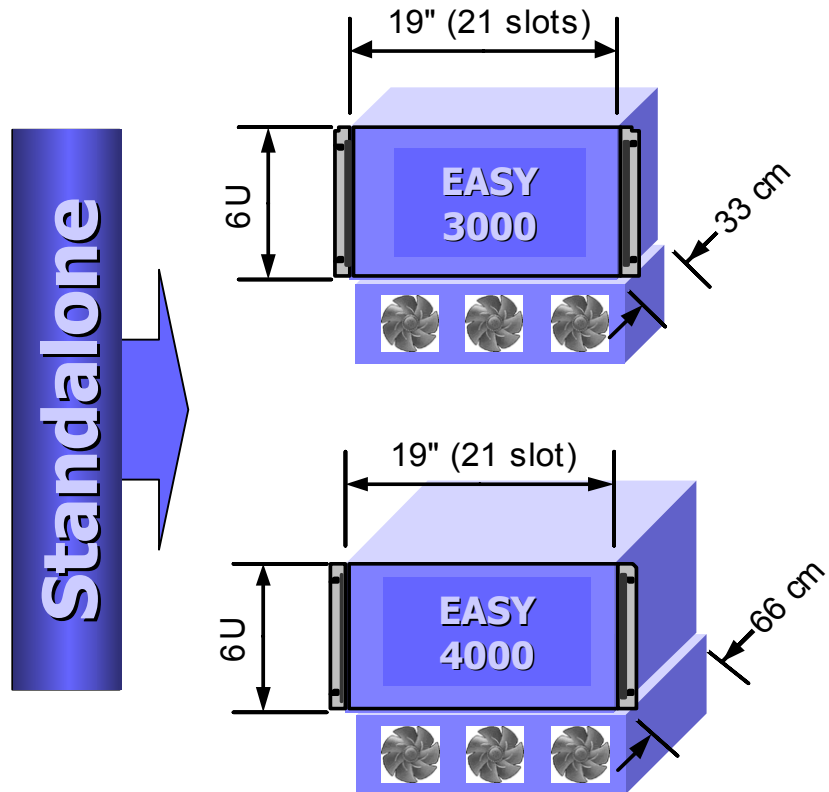
- Local microcontroller
- Firmware remotely upgradable
- Hardware Imax
- Per low voltage channel:
 - Independent ON/OFF
 - Vmon (Connector and Load)
 - Imon
 - Vset (Software or Hardware)
 - Programmable Trip
 - Sense wires
 - Status Signals

EASY3000/EASY4000

Radiation & Magnetic Field



EASY3000/EASY4000



NO Magnetic Field

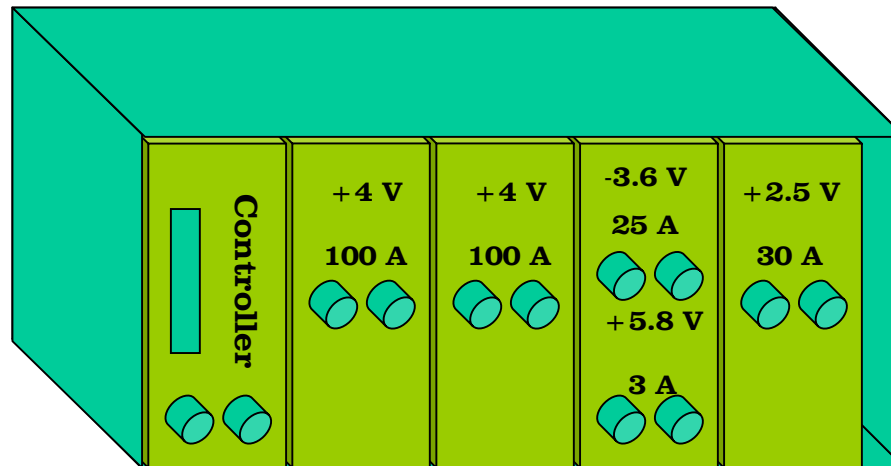
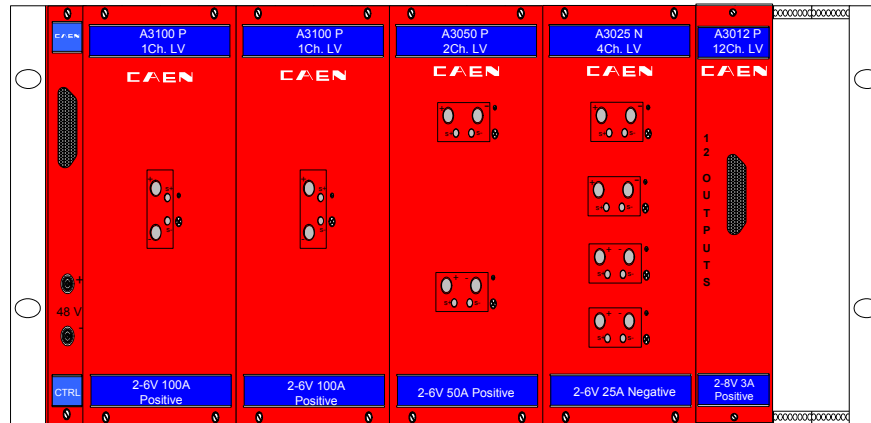
EASY Modules

Model	Channels per module	Voltage	Current	Width (slots)	Modules per Crate	MAX Channels per Crate	Hostile Area
A3003	12	2-8V	3A	2	10	120	Yes
A3005	12	2-5V	5A	2	10	120	Yes
A3010	6	2-8V	10A	4	5	30	Yes
A3015	6	2-6V	15A	4	5	30	Yes
A3025	4	2-6V	25A	4	5	20	Yes
A3050	2	2-6V	50A	4	5	10	Yes
A3100	1	2-6V	100A	4	5	5	Yes
A3506	9	600V	20mA	2	10	90	Yes
A3540	9	4kV	1mA	2	10	90	Yes
A3512	6	12kV	1mA	3	7	42	Yes
A4601	2 complex	7.5V 6.3V 600V	15A 8A 20mA	2	10	20 complex	Yes Yes Yes Yes
A4701	2 complex	7.5V 6.3V 600V	15A 8A 20mA	2	10	20 complex	No No No No

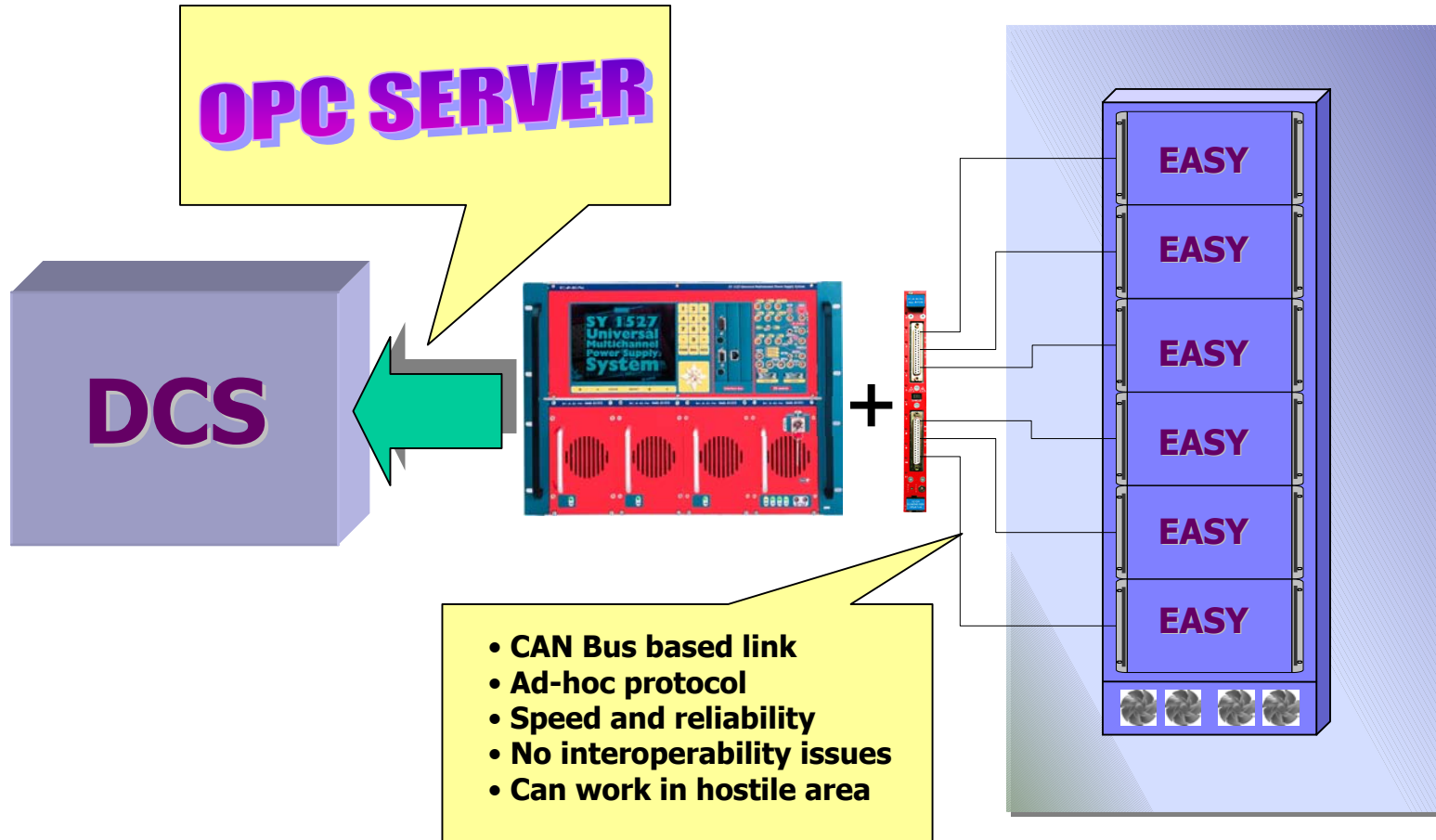
ATLAS Requirements

Detector	End Volts	V drop	Current (A)	Proposed board	Channels per module	Width (Slot)	Model
TGC	3,6	2,0	25	2-6V 25A	4	4	A3025
TGC	5,8	2,0	2	2-8V 3A	12	2	A3003
TGC	4	2,0	90	2-6V 100A	1	4	A3100
TGC	4	2,0	65	2-6V 100A	1	4	A3100
TGC/MDT	4000		0,001	4kV 1mA	9	2	A3504
MDT	3,3	2,5	15	2-6V 15A	6	4	A3015
RPC	5	1,0	3	2-8V 3A	12	2	A3003
			6	2-8V 10A	6	4	A3010
RPC	3,3	2,5	15	2-6V 15A	6	4	A3015
			25	2-6V 25A	4	4	A3025
			30	2-6V 50A	2	4	A3050
RPC	2	1,0	2	2-5V 5A	12	2	A3005
RPC	12000	0	0,001	12kV 1mA	6	3	A3512

subrack organization



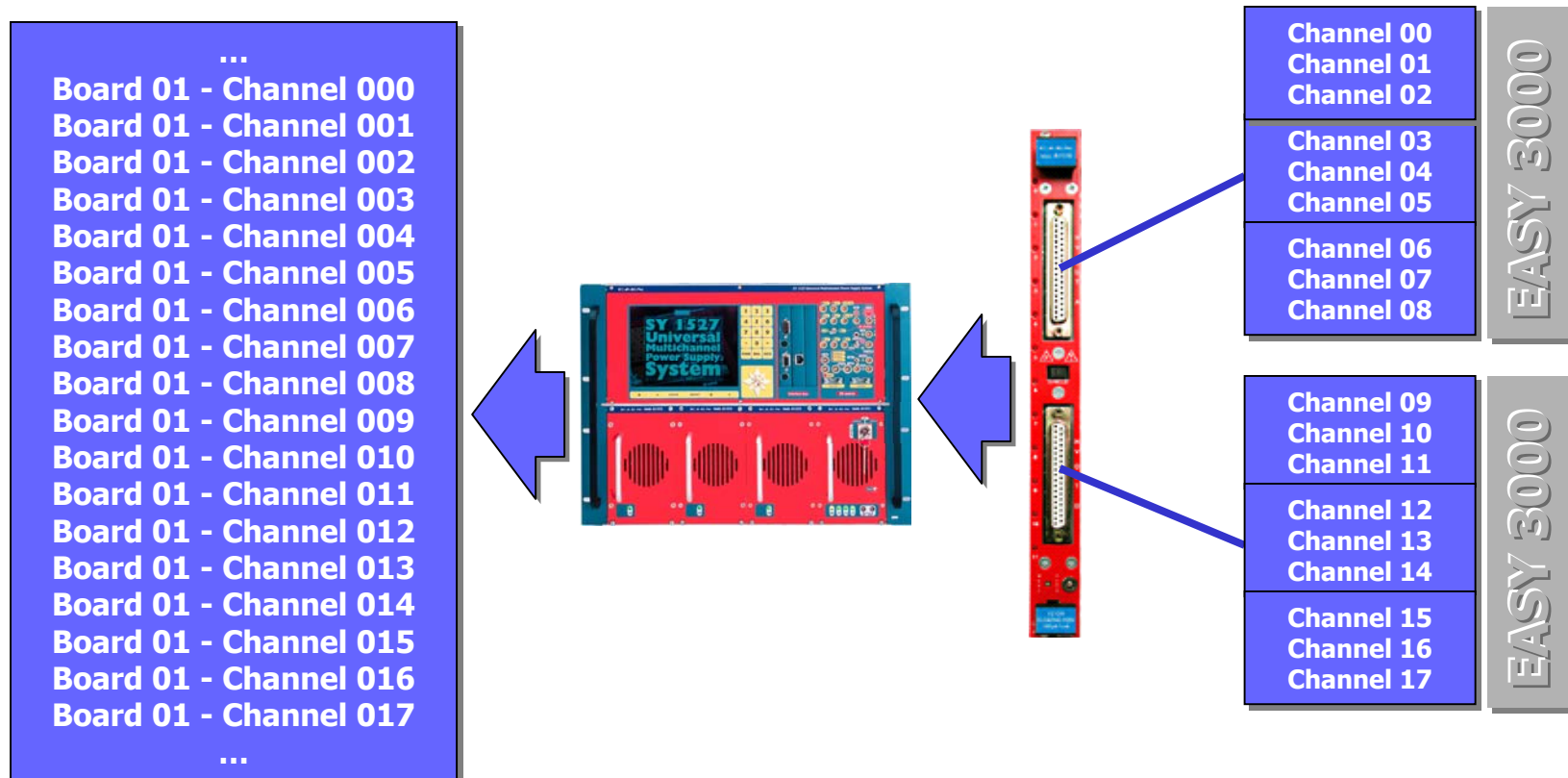
EASY Architecture



A1676 Branch Controller

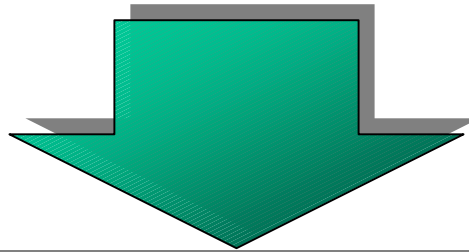
- Single slot on SY1527/SY2527:
 - 16 boards per SY1527
 - 6 boards per SY2527
- Up to 6 independent EASYs
- CANBus based bus protocol

EASY Channels Representation



EASY Integration

- Controlled by SY1527/SY2527 power supplies

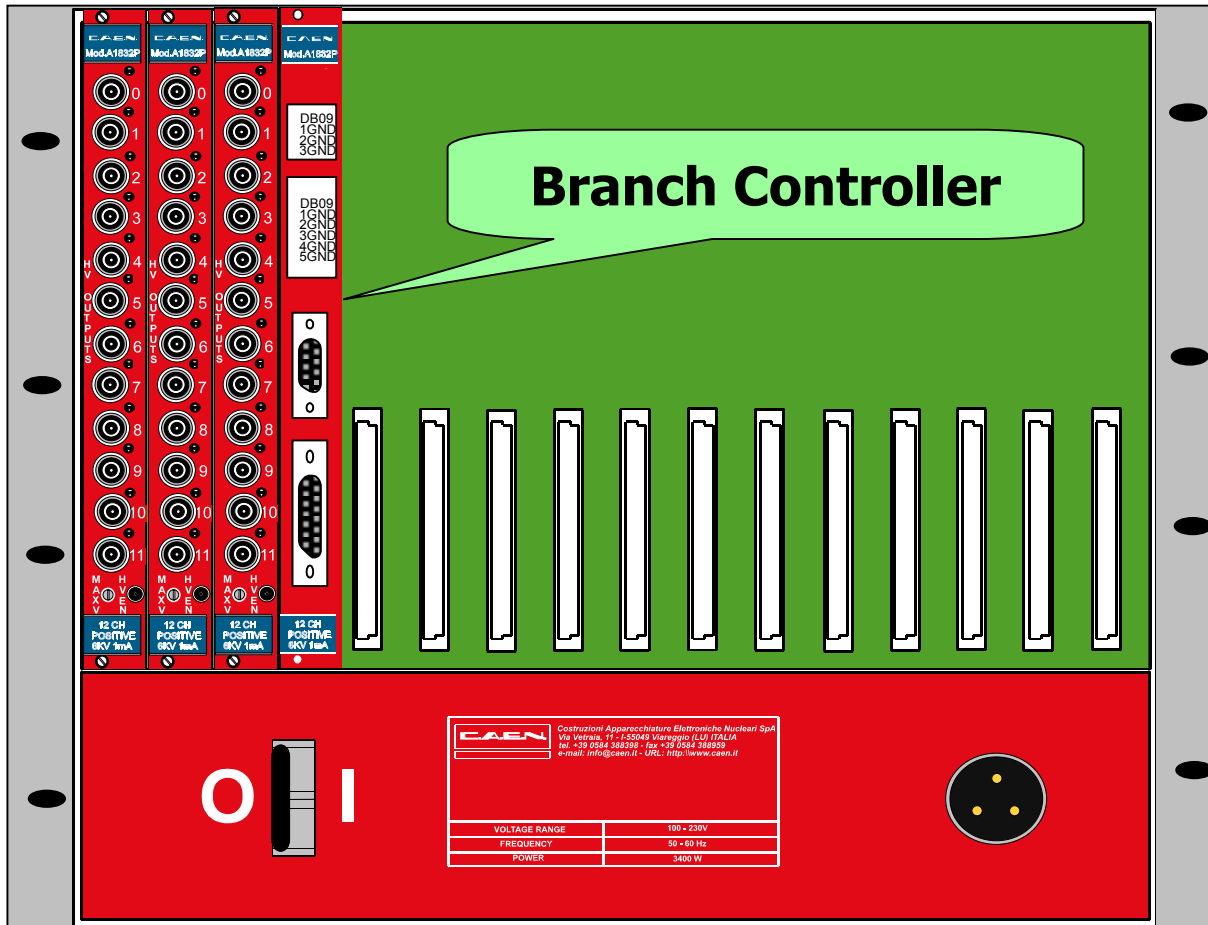


- Full integration with the software developed for SY1527/SY2527:
 - OPC Server
 - Wrapper libraries (Linux/Win32)

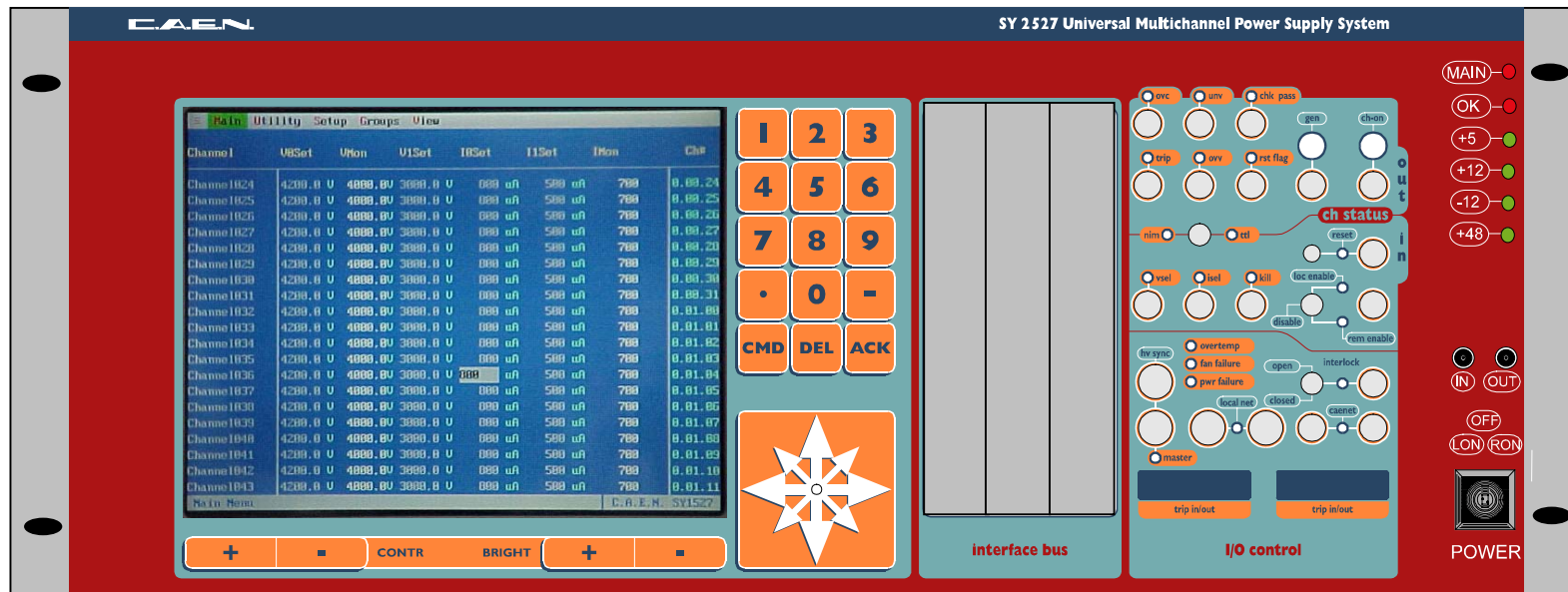
SY1527 (front view)



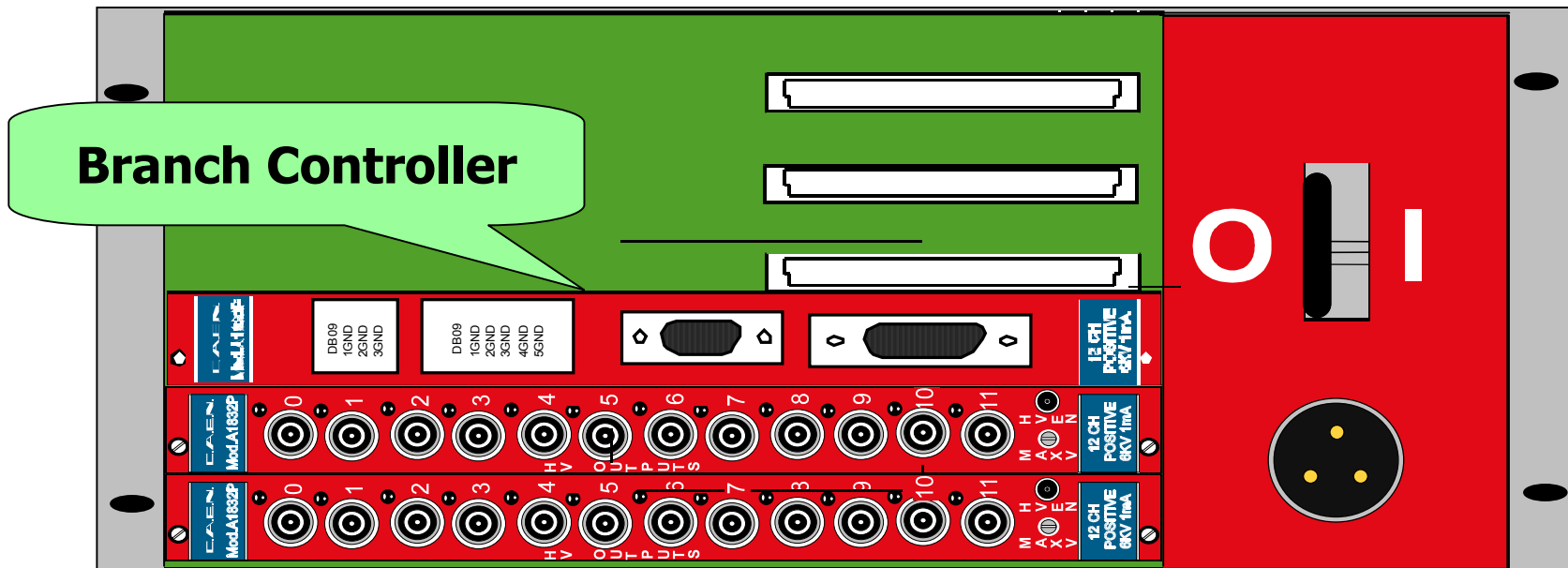
SY1527 (rear view)



SY2527 (front view)



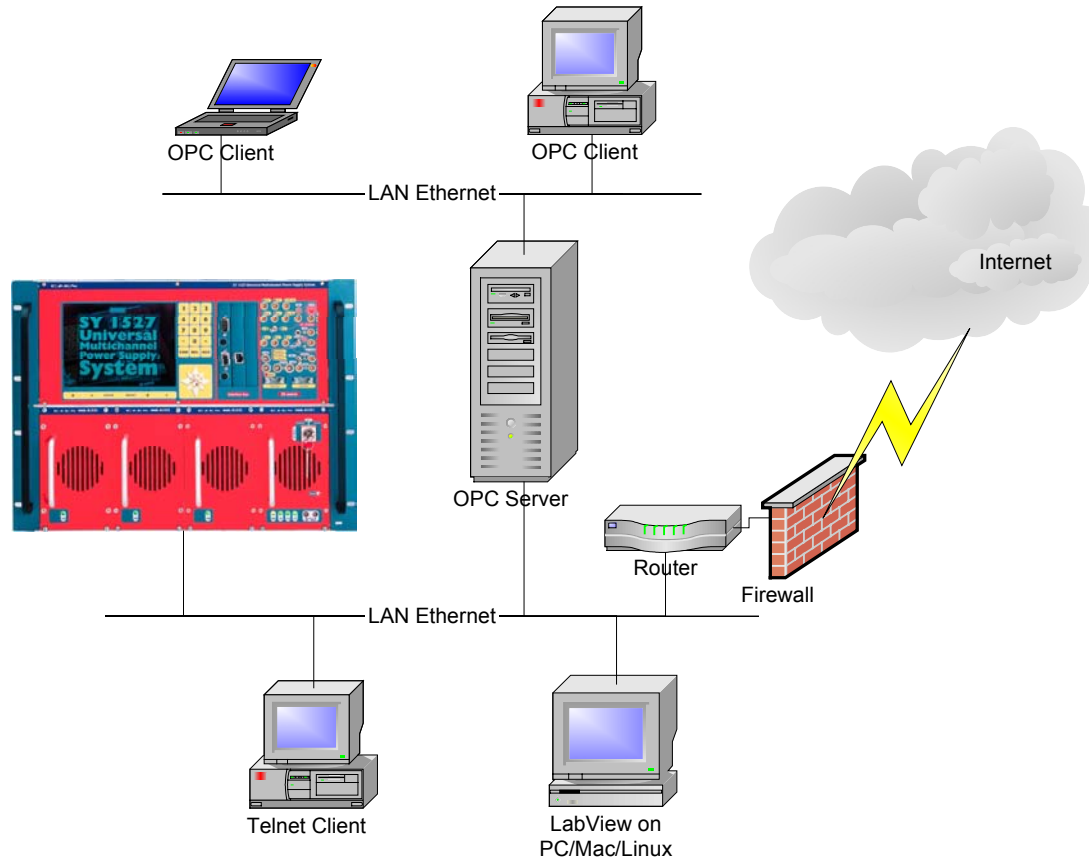
SY2527 (rear view)



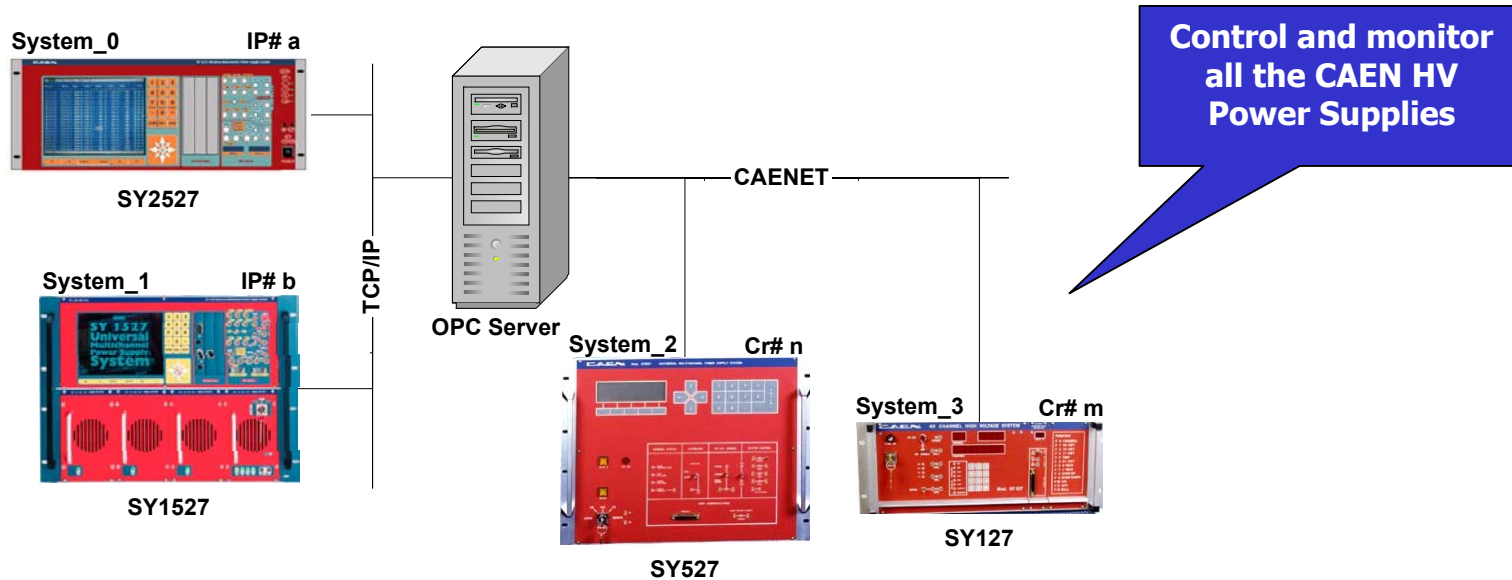
SY1527/SY2527

- Modular and Expandable (2 versions)
- Flexible (catalog HV and LV boards, EASY3000/4000 I/F)
- Reliable
- Easy Firmware upgrading and Remote Maintenance
- Officially chosen by CMS ECAL for the APD PS

SY1527/SY2527 Connectivity



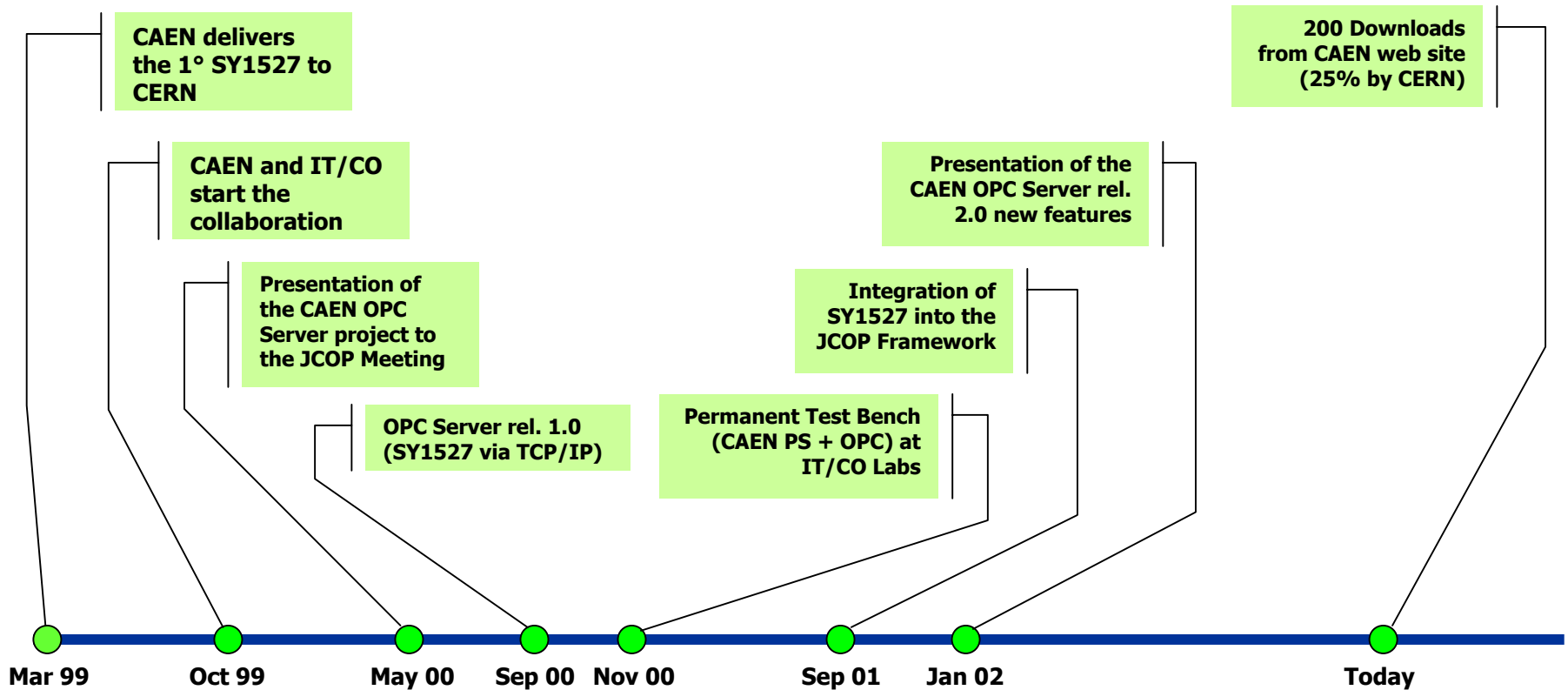
CAEN OPC Server Configuration



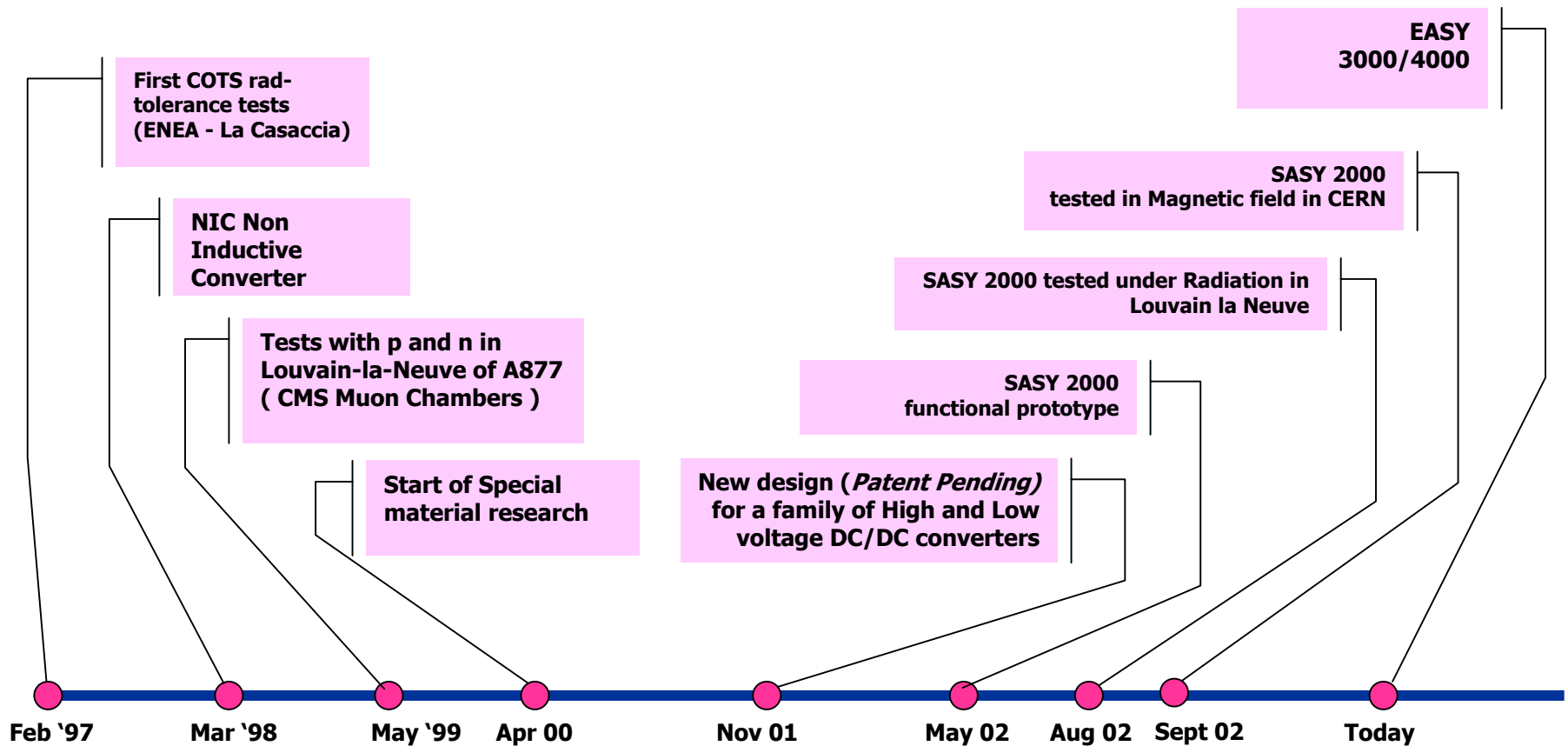
Simple configuration

P.S. Name	Conn.	Address
System_0	TCP/IP	IP #a
System_1	TCP/IP	IP #b
System_2	CAENET	Crate #n
System_3	CAENET	Crate #m

CAEN OPC Server Milestones



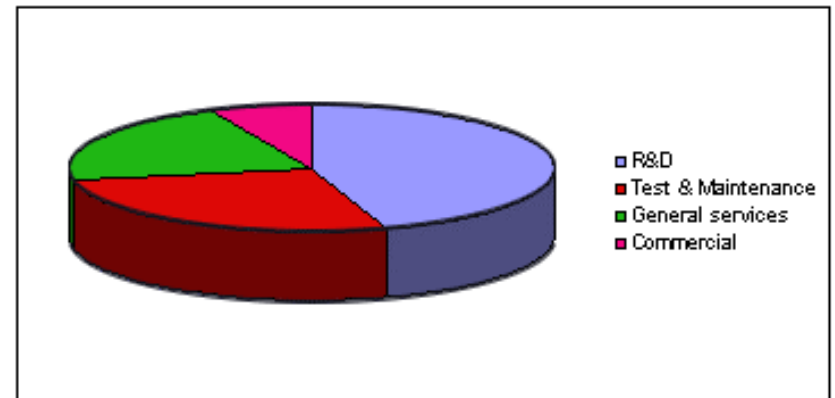
Hostile Area Experience Milestones



Last comments

- CAEN Employees: 116 (Production excluded)

- R&D 45%,
- Test & Maintenance 27%,
- General services 21%,
- Commercial 7%



- We are involved in several projects → priorities will be established on a “**first come first serve**” basis

Conclusions

- CAEN has completed all developments in Magnetic Field and Radiation
- Integration in DCS (OPC Server + SY1527) is well established and already in use
- The architectures of the EASY System and modules are completely defined



CAEN is ready to work with ATLAS to the final phase!

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