

# Fieldbus working group

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# History

- ◆ In the 90s Fieldbuses used in industrial applications
- ◆ LHC machine and experiments need fieldbuses
- ◆ Many fieldbuses used in industry
- ◆ A selection was required for standardisation
- ◆ In 1995 the Controls Board created a Working Group
- ◆ Wide CERN representation
- ◆ Collaboration with PLC

# The first proposal

- ◆ Analysis of CERN requirements
- ◆ Review of industry activities
- ◆ Mature products
- ◆ Workshops at CERN
- ◆ Proposed CERN standard

CAN, Profibus and WorldFIP  
and CERNwide support scheme

- ◆ Endorsed by CERN management

# Evolution

## ◆ Why do we need a new study ?

- The fieldbuses have evolved
- Did we make the right selection ?
- Emergence of Ethernet as “fieldnetwork”
- Review the support for fieldbusses

# New working group

## ◆ Working group

G. Baribaud (Chairman)/**SL**, R. Barillère/**IT**, D. Blanc/**ST**,  
M. Beharrell/**IT**, D. Brahy/**LHC**, R. Brun/**LHC**, E. Carlier/**SL**,  
P. Gayet/**LHC**, W. Heinze/**PS**, R. Rausch/**SL**

## ◆ Reporting line: CERN Controls Board

## ◆ New mandate

- review the evolution of the three fieldbuses standardized in 1996
- extend the recommendation if necessary
- select a process control layer for WorldFIP
- study the availability of the sensors and actuators
- recommend fieldbus protocols if appropriate
- recommend cabling and connectors (when not defined in the standards)
- review the support given by CERN to the recommended fieldbuses
- estimate the possible potential of Ethernet for controls

# Evolution of CAN/CANopen

- In 1993 only physical and data link layers (OSI)
- Flexibility, easy to use, cheap
- CANopen as upper layer
- CiA is supporting CAN/CANopen
- CANopen & Devicenet submitted to CENELEC (En50325)
- Good acceptance by Industry for moderate size systems
- 12 M in 1995, 200M in 2000 worldwide
- Mostly in automotive applications
- Also medical applications
- At CERN: used at ATLAS for ELMB and fan tray control

# Evolution of Profibus

- Profibus DP and Profibus FMS as standards (Din 19245)
- DP: good acceptance by industry, many manufacturers
- FMS is less used
- PROFIBUS PA has specifications (safety)
- In 1997 Profibus DP-V1: cyclic & acyclic traffic
- Profibus DP-V2: slave to slave com & high precision clock
- ProfiSafe for safe communication e.g. railways
- Profidrive v3.0: Digital servo loops through bus
- Profinet: Ethernet for transparent access to Profibus
- Field Device Tool: based on COM/DCOM, independence
- At CERN candidate for vacuum, gas, Isolde, SL kickers, String 2

# Evolution of WorldFIP

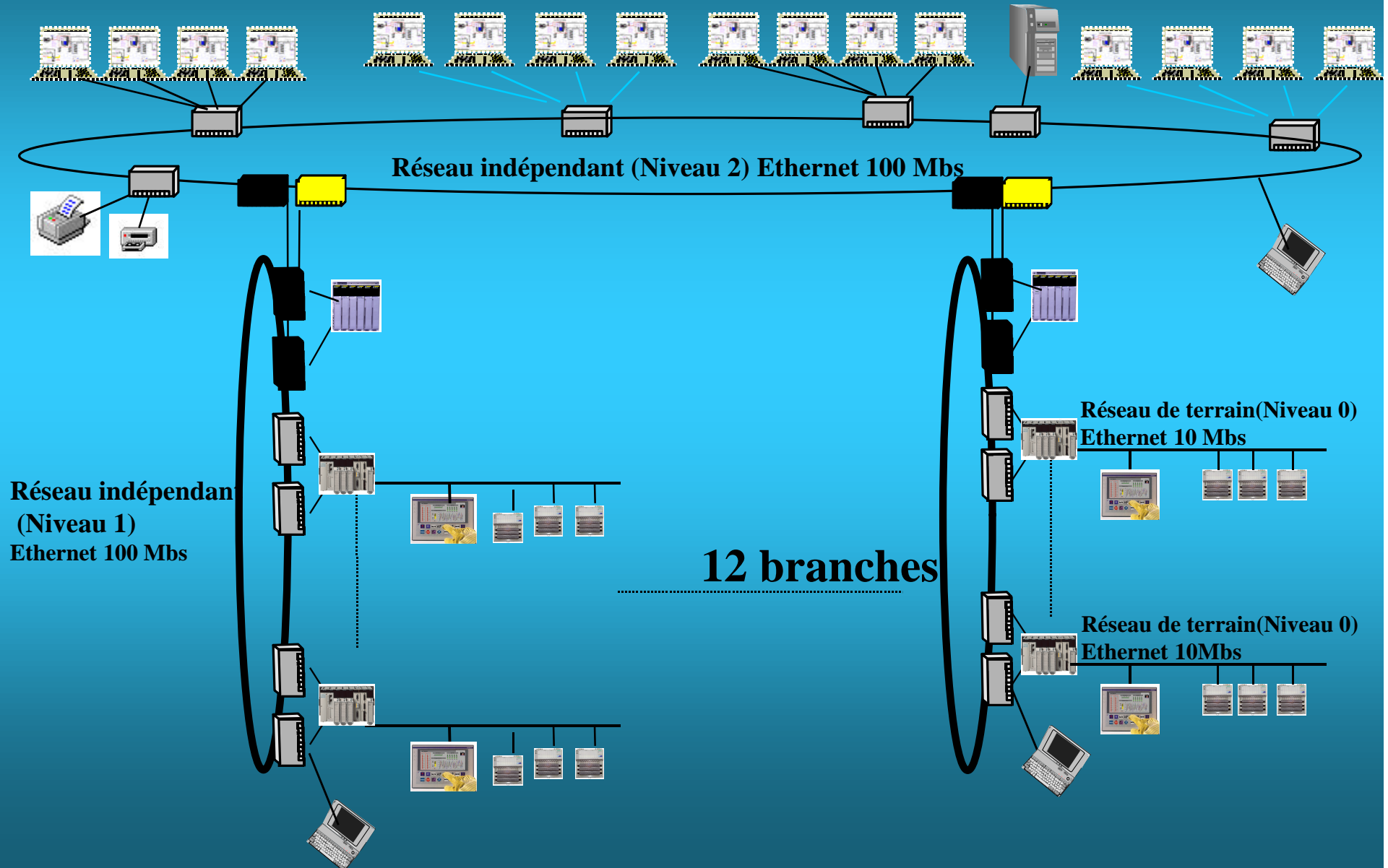
- Factory Instrumentation Protocol (UTE-C-46-601/607)
- **Determinism & redundant medium**
- Aperiodic traffic & centralised bus arbiter
- 2.5 M, 1M and 31.25 Kbits/s
- FIPWebgate:TCP/IP on WorldFIP
- 5Mbits/s and video
- 25Mbits/s & multi-services :TCP/UDP
- Imbedded Web servers
- Instrumentation bus : bridge to HART
- Foundation Fieldbus : in US for sensors & actuators
- **At CERN: for LHC power converter controls  
String 2, cooling and ventilation(?)**



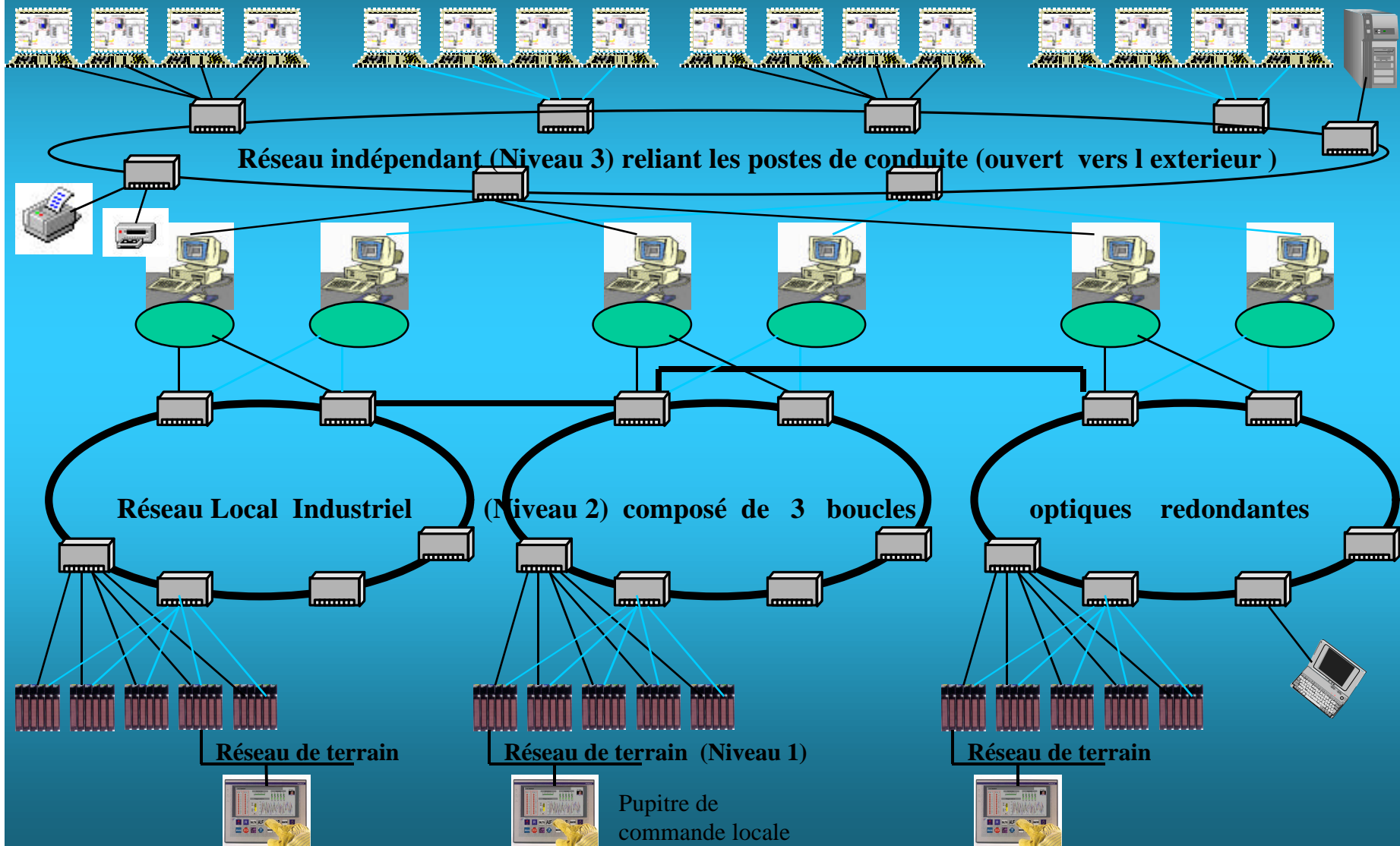
# Emergence of Ethernet

- Emergence of Ethernet in the fieldbus domain : fieldnetwork
- A fast progressing event
- Determinism can be ensured under specified conditions
- PLC interface : Market is leading to TCP/IP for communications
- Coupling with other fieldbuses
- Transparency for PLC configuration tools
- Industrial components: industrial standards, redundancy
- At CERN:LHC cryogenics, cooling and ventilation
  - ◆ Potential exists
  - ◆ Must be thoroughly investigated for standard

# Example of architecture (1)



# Example of architecture (2)



# Where we are at present

- ◆ Study evolution of fieldbuses
- ◆ WorldFIP versus Foundation Fieldbus
- ◆ Device profiles
- ◆ Cables and connectors for Profibus and WorldFIP
- ◆ Interim report is ready
- ◆ Ethernet in industry
  - Potential of Ethernet is real
  - Practical architecture cases presented
  - Workshop/seminar at CERN soon
- ◆ Support for fieldbuses at CERN
  - Requirements still to be defined
  - Scope

# Conclusion

- ◆ The working group is operational
- ◆ Members are motivated but busy
- ◆ Within the mandate
- ◆ The interim report is ready
- ◆ Decision on Ethernet is getting urgent
- ◆ <http://www.lhc.cern.ch/IndCtrl/FB/Welcome.html>

Thank you  
for your attention