



Shell Global Solutions

# Foundation Fieldbus

## End-users experiences with FF technology

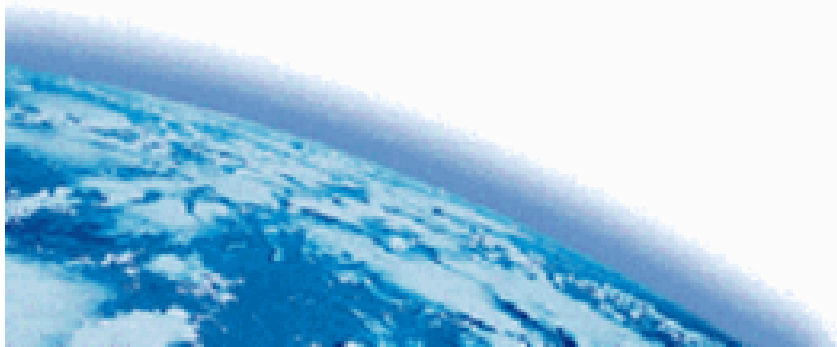
**B.S. Douma, P. Eigenraam**

**Measurement, Instrumentation & Plant Automation - OGES**



# Presentation

- **Introduction**
  - Shell Global Solutions
  - Measurement, Instrumentation & Plant Automation
- **Interoperability testing**
- **Project services & support**
  - Lessons learned



## Shell Global Solutions International -

### SGSI

Who we are:

An international technology service provider, supplying innovative technical, safety and environmental solutions primarily to the worldwide Oil & Gas industry

Some 2300 staff based in:



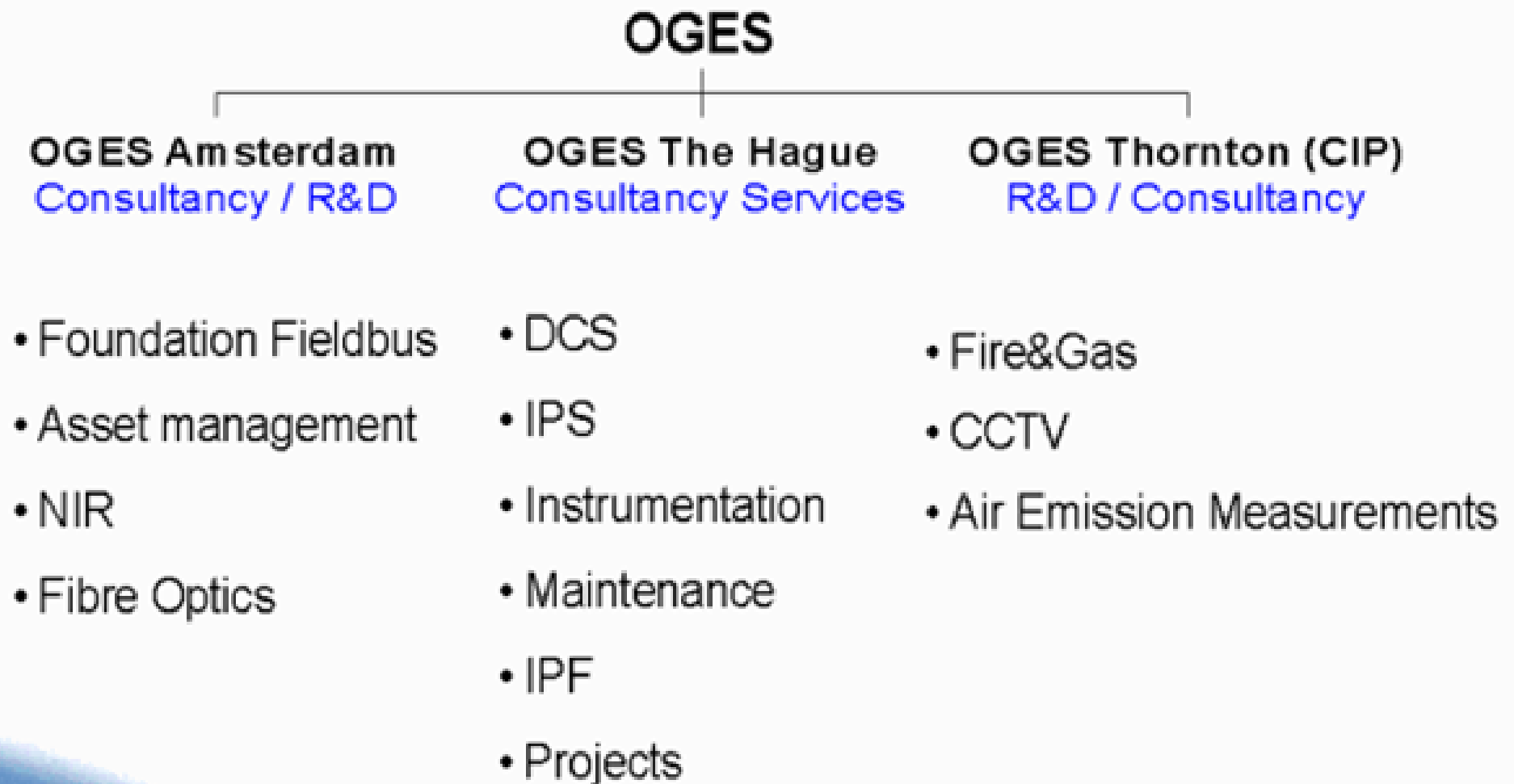
## OGES department

Measurement, Instrumentation and Plant Automation Business Group.

Located in The Hague, Amsterdam, Thornton (UK), - 22 staff

- Technical Service & Project Support primarily for Refinery, Up-stream and Gas businesses - both Shell and 3rd party customers. [Vendor independent advice](#)
- R&D for new product & service development
- Support for early implementations of new development

## OGES portfolio



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## Objectives of the FF interoperability test

Assess benefits and risks of an early implementation of Foundation Fieldbus systems in a Process Control environment.

- Monitor & evaluate Industry developments
  - Hardware, Interoperability, Tools
- Quantify Total Cost of Ownership
- Create a knowledge base for vendor independent project implementation support - own assessment and hands-on experience

## FF Evaluation layout



Control Room



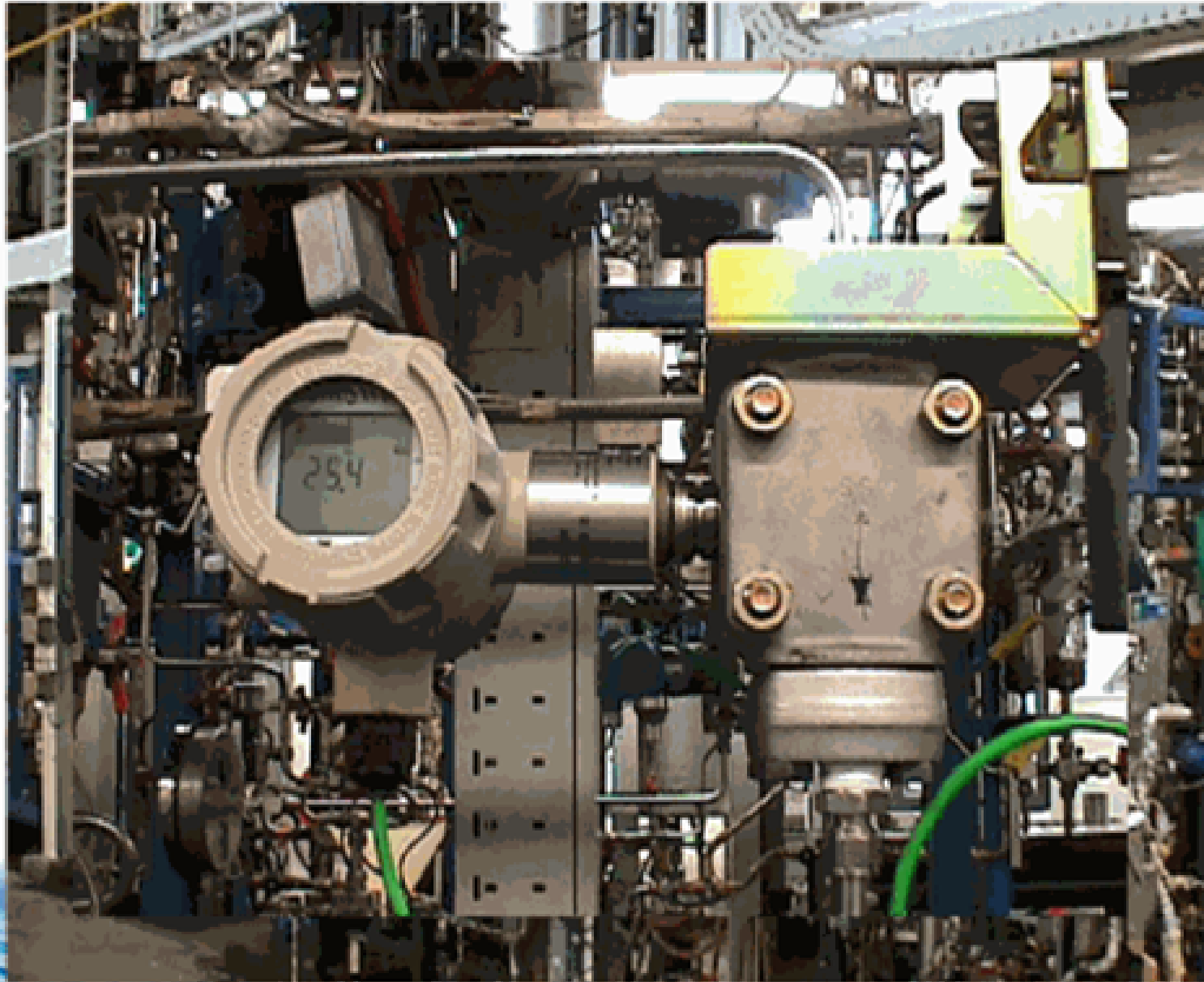
HydroCracker Pilot Plant

400 m of type B cable

## Test Site Views – Control Room



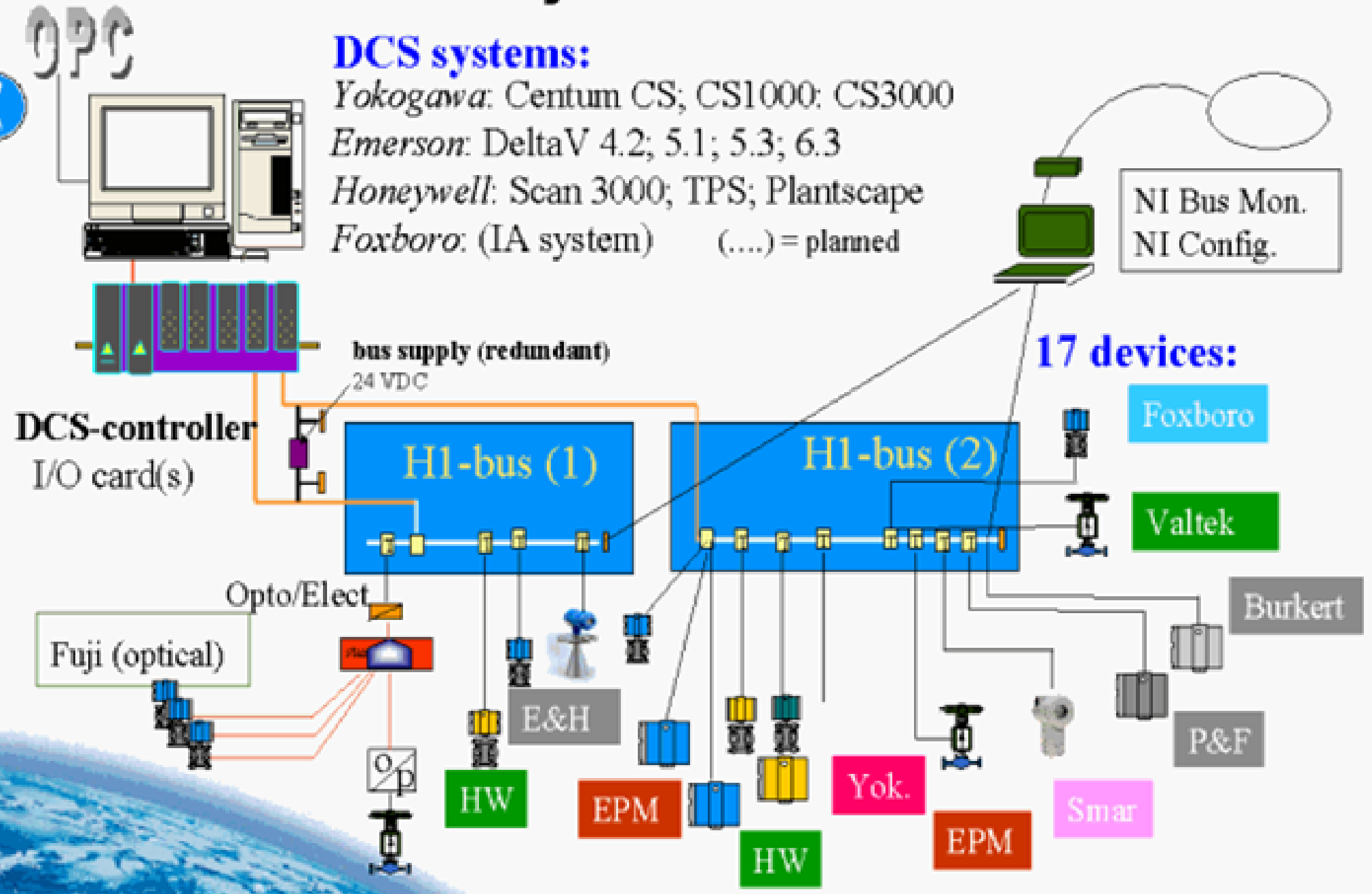
## Test Site Views – Pilot Plant



## FF Evaluation layout

### DCS systems:

- Yokogawa: Centum CS; CS1000; CS3000
- Emerson: DeltaV 4.2; 5.1; 5.3; 6.3
- Honeywell: Scan 3000; TPS; Plantscape
- Foxboro: (IA system) (...)= planned

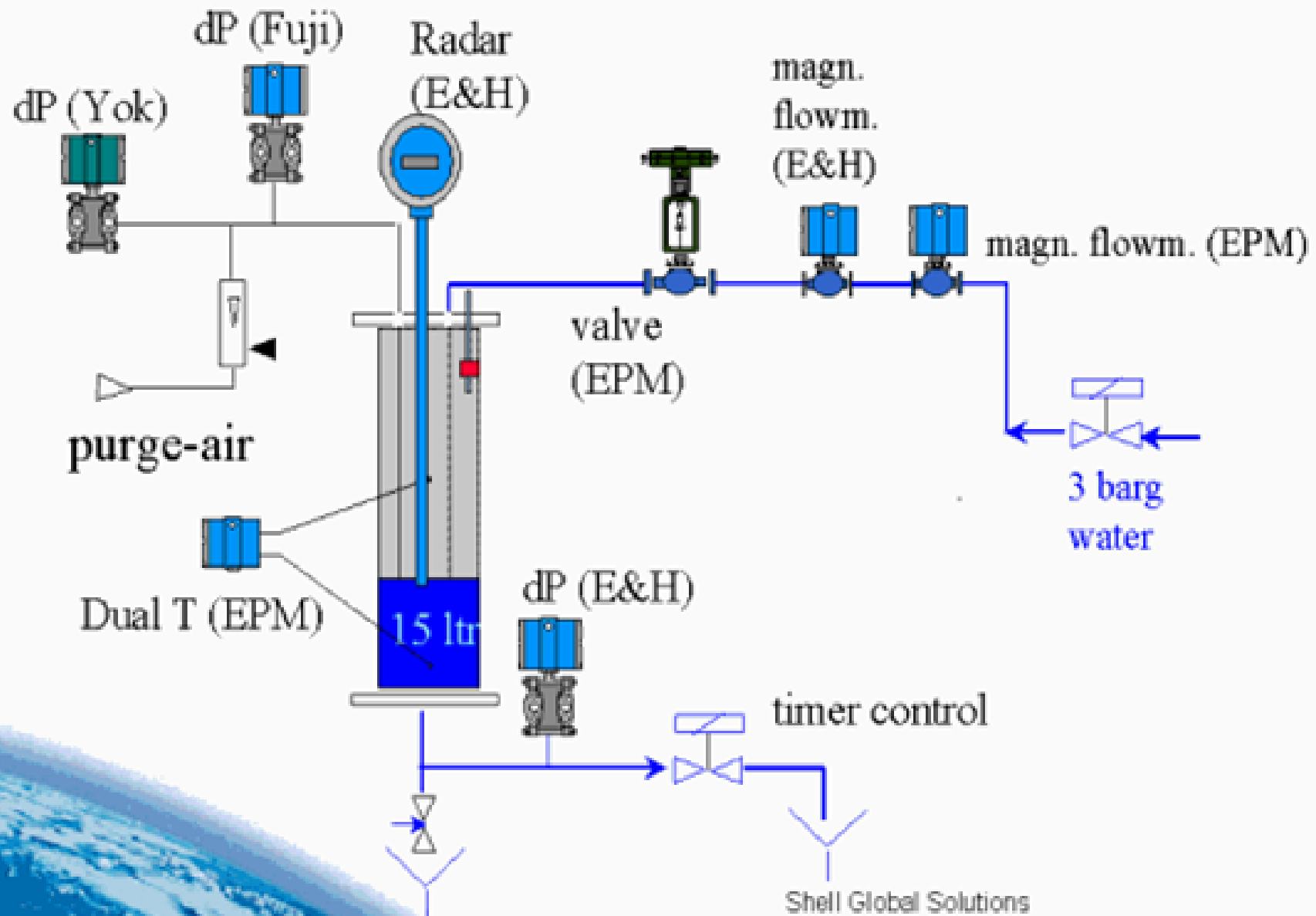


NI Bus Mon.  
NI Config.

### 17 devices:

- Foxboro
- Valtek
- Burkert
- P&F
- Yok.
- Smar
- EPM
- HW
- E&H
- HW

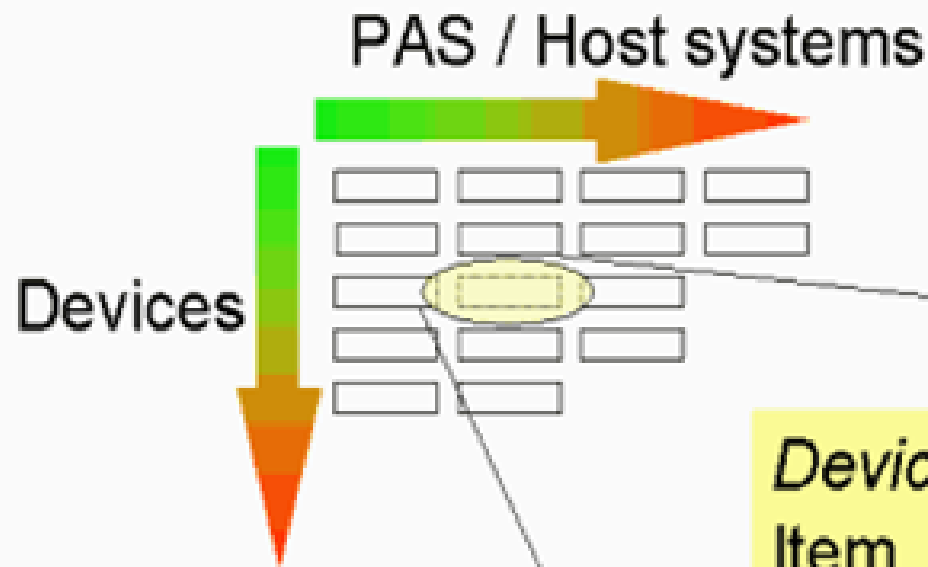
## Cascade level-flow control loop in the field



## Status interoperability trial (started 1996)

- Phase I** - Focused on Fibre Optic System from Fuji; finished 1998
- Phase II** - Hybrid system (2 segm), test of infrastructure; finished 1999
- FF Performance – stability, robustness, configuration and updating
  - Interoperability - horizontal and vertical
  - Safety (barriers, MTL, SMAR, ABB)
  - Redundancy - Segment power, Backup LAS
- Phase III** - Hybrid system (2 segm.), test of diagnostics; ongoing
- Asset management tools and advanced diagnostics
  - TCoO assessment - Model available for Capex, Opex being addressed
  - Redundant primary LAS/H1 cards, Segment power, Power conditioners

## Interoperability matrix



### Main issues with CFF files

(typing errors, missing parameters, hex- non hex, delimiters, bit reversal, etc.)

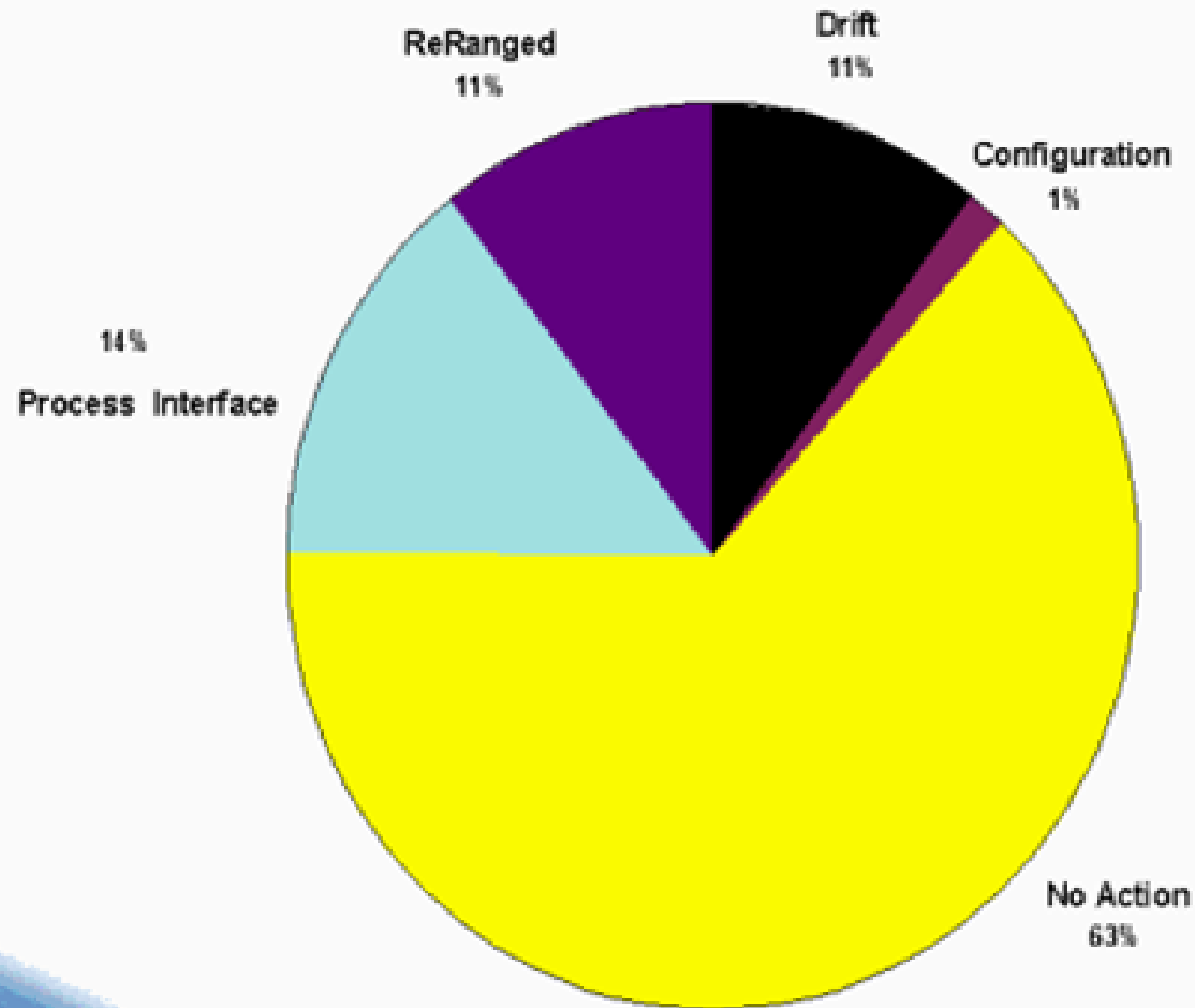
ITK testing of more FBs: ISEL, MAI, MIO, etc.

*Device; type; model; version*

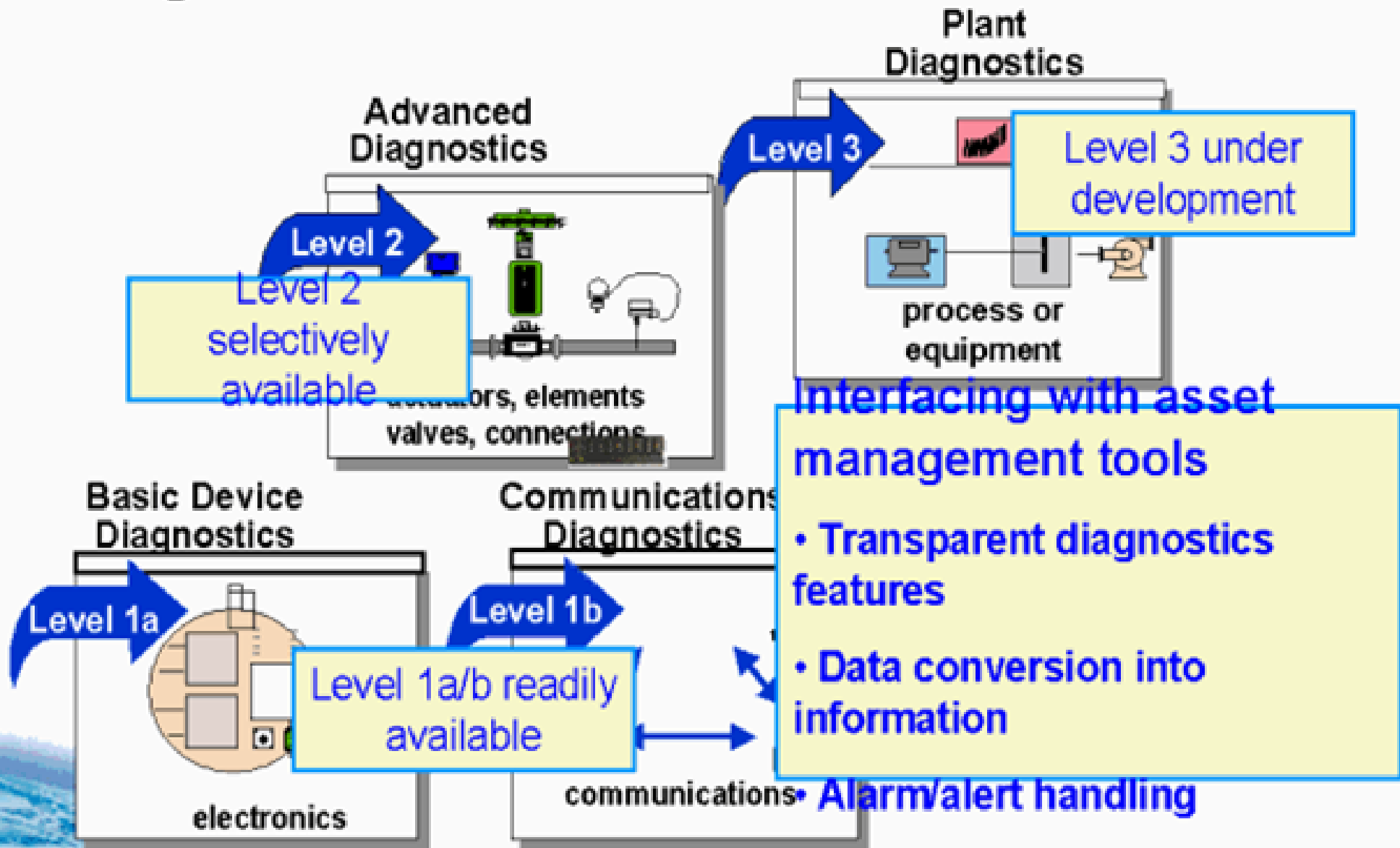
Item	Host 1	Host 2 ..
General	DD&CFF	template
Resource Bl.	Π	Π
Transducer Bl.		Π Π
List Function Bl.	limited	limited
Specials (Adv. Diagn.)	no	Π
LAS	7 P/S	no

## Breakdown maintenance on DP flow

Current design instruments DP type: 36 % of total flow



## Diagnostics



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## Project Implementation

*Larger Systems have DCS, F&G, Safety Systems*



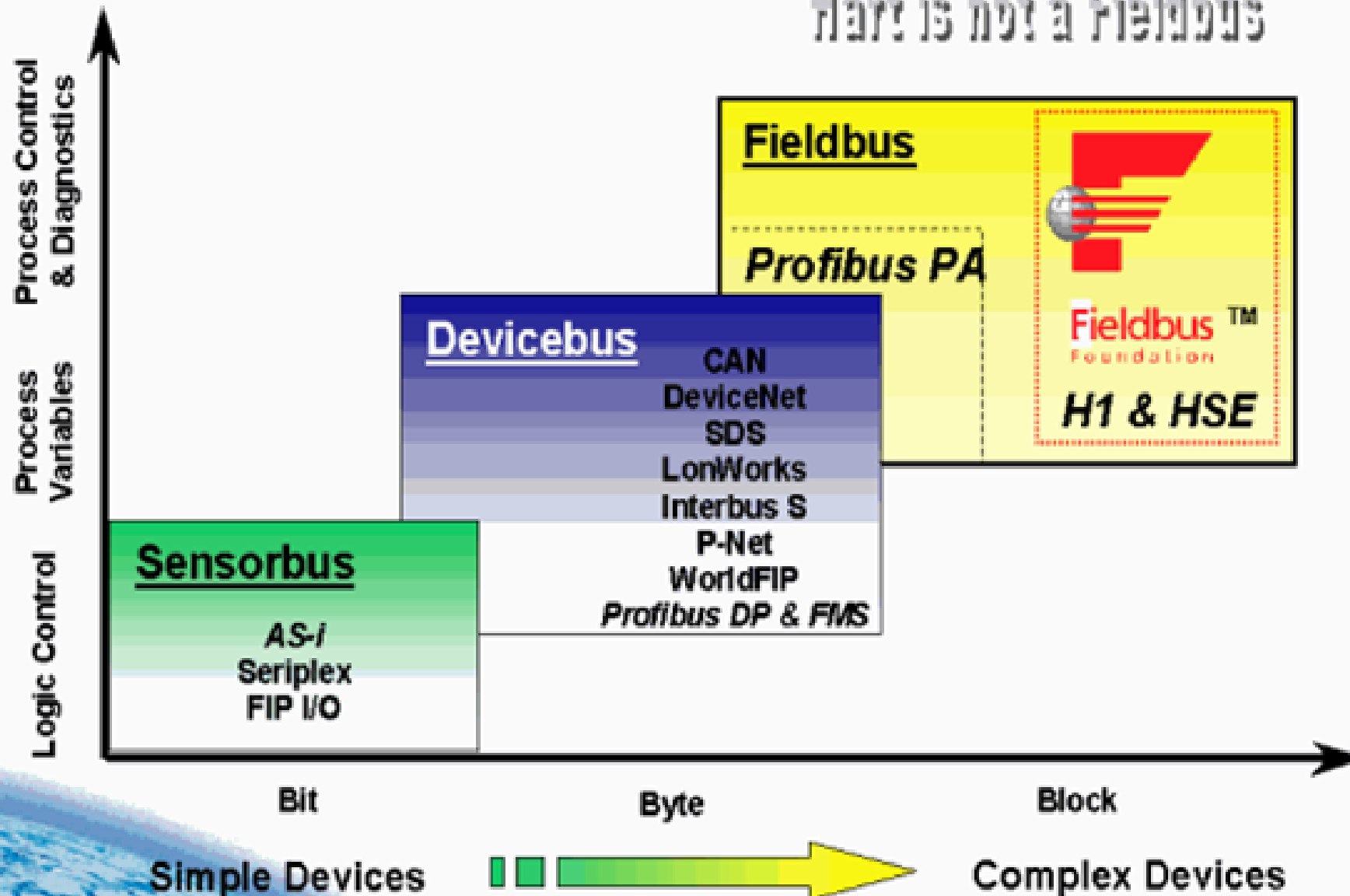
## FF and Safety Systems

*Safety Systems still with hardwired I/O*



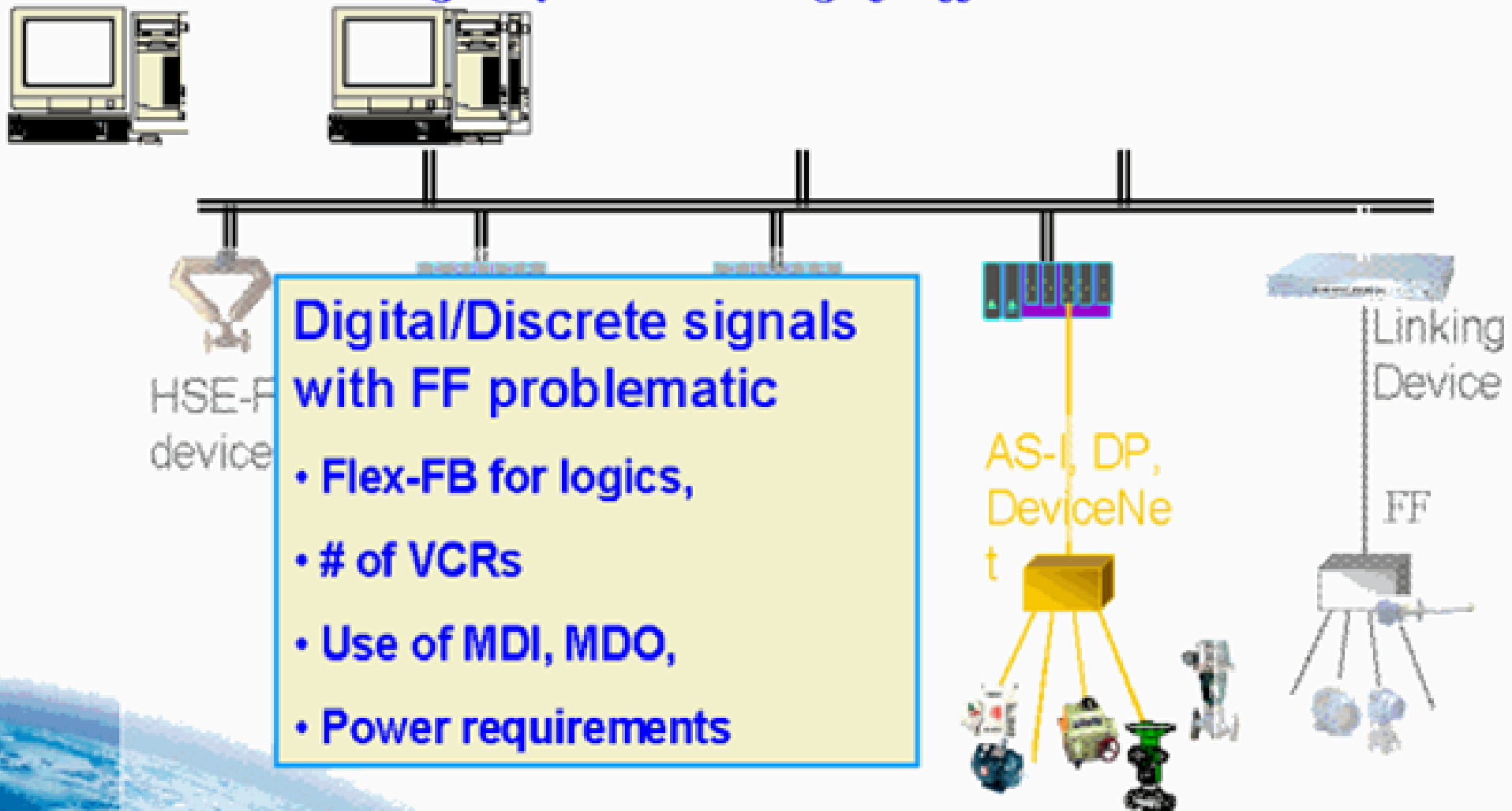
## Classification of Fieldbusses

Hart is not a Fieldbus



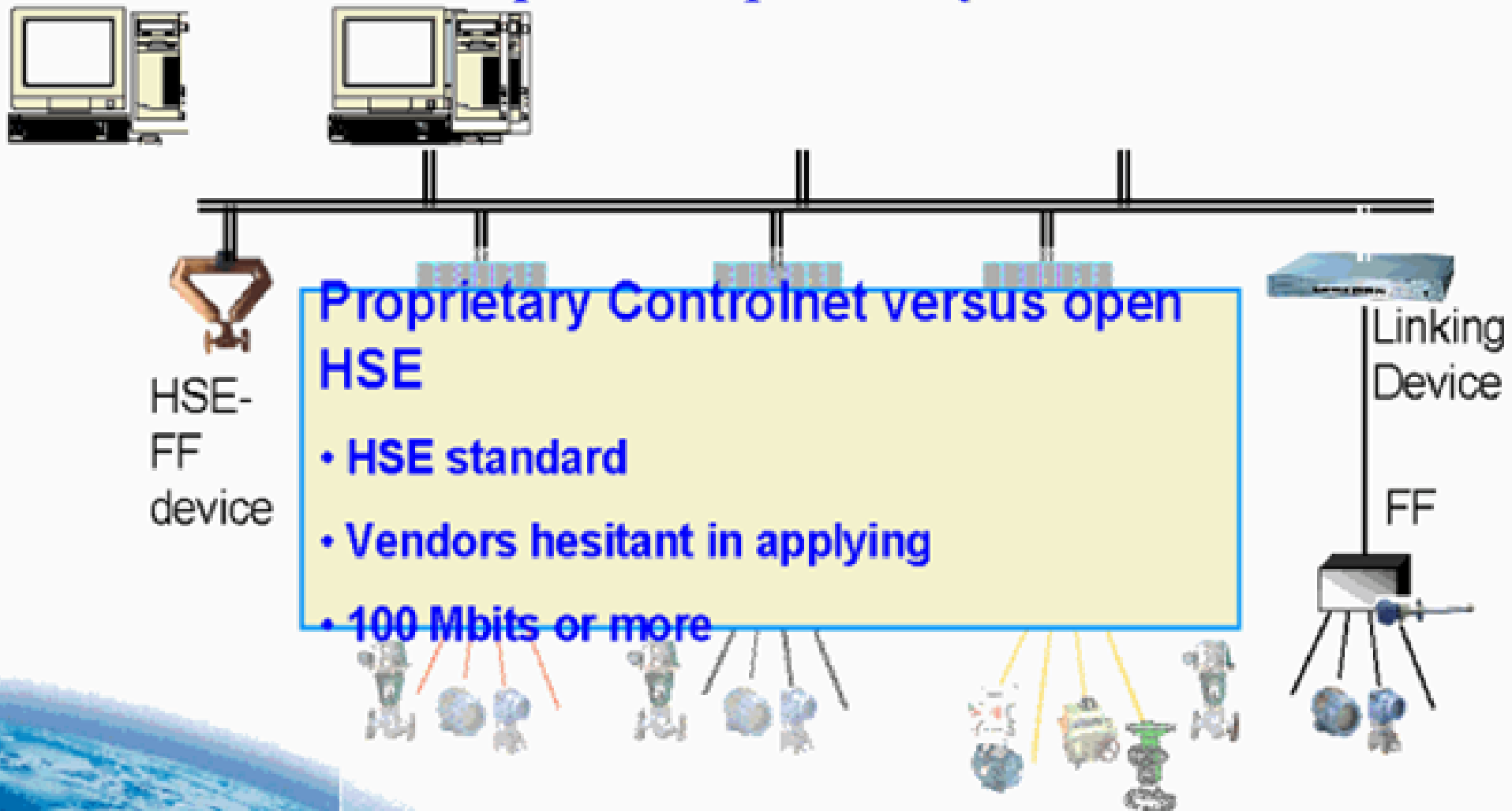
## FF and Digital/Discrete

*Larger System: mixing of different busses*

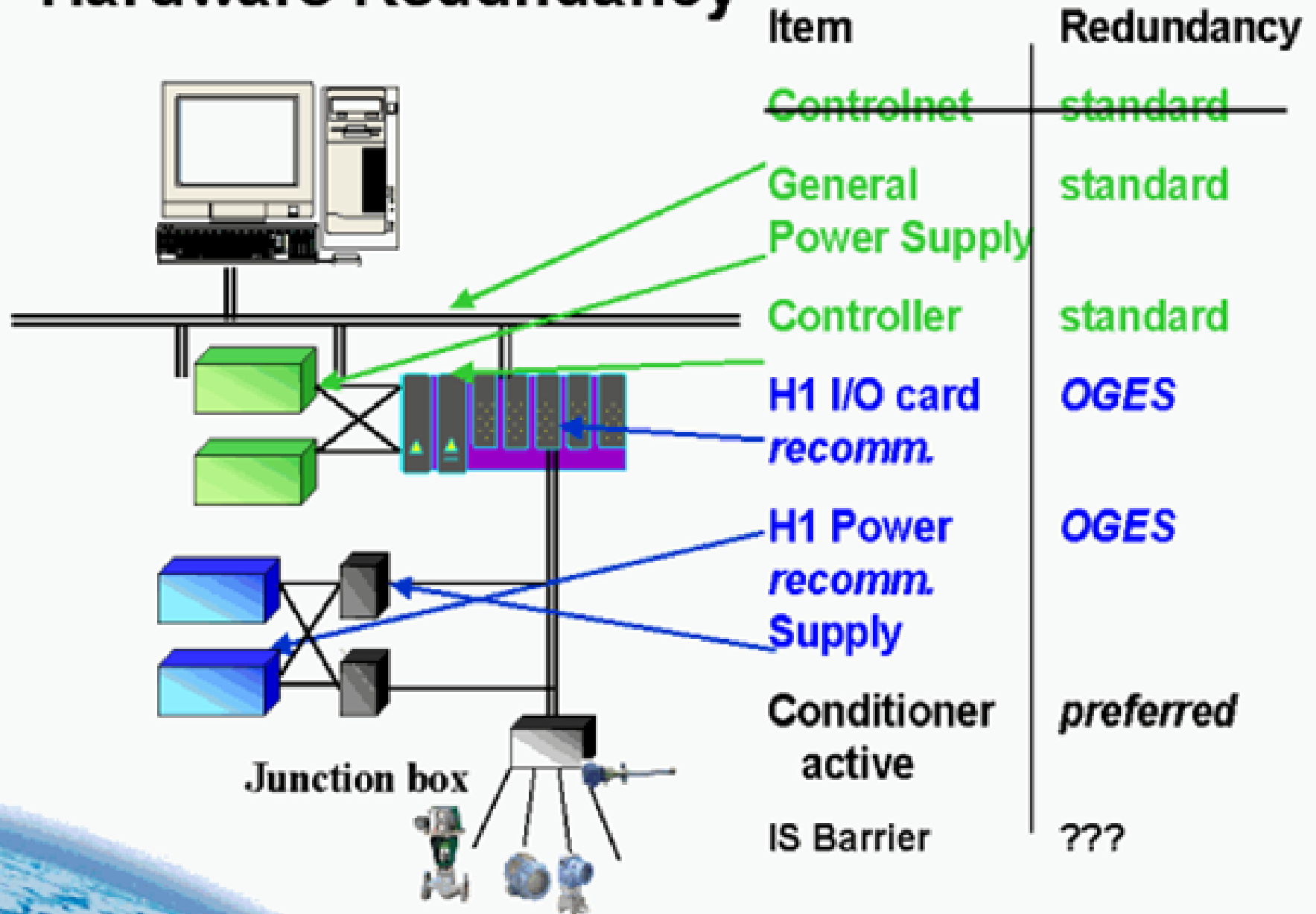


## High Speed Ethernet

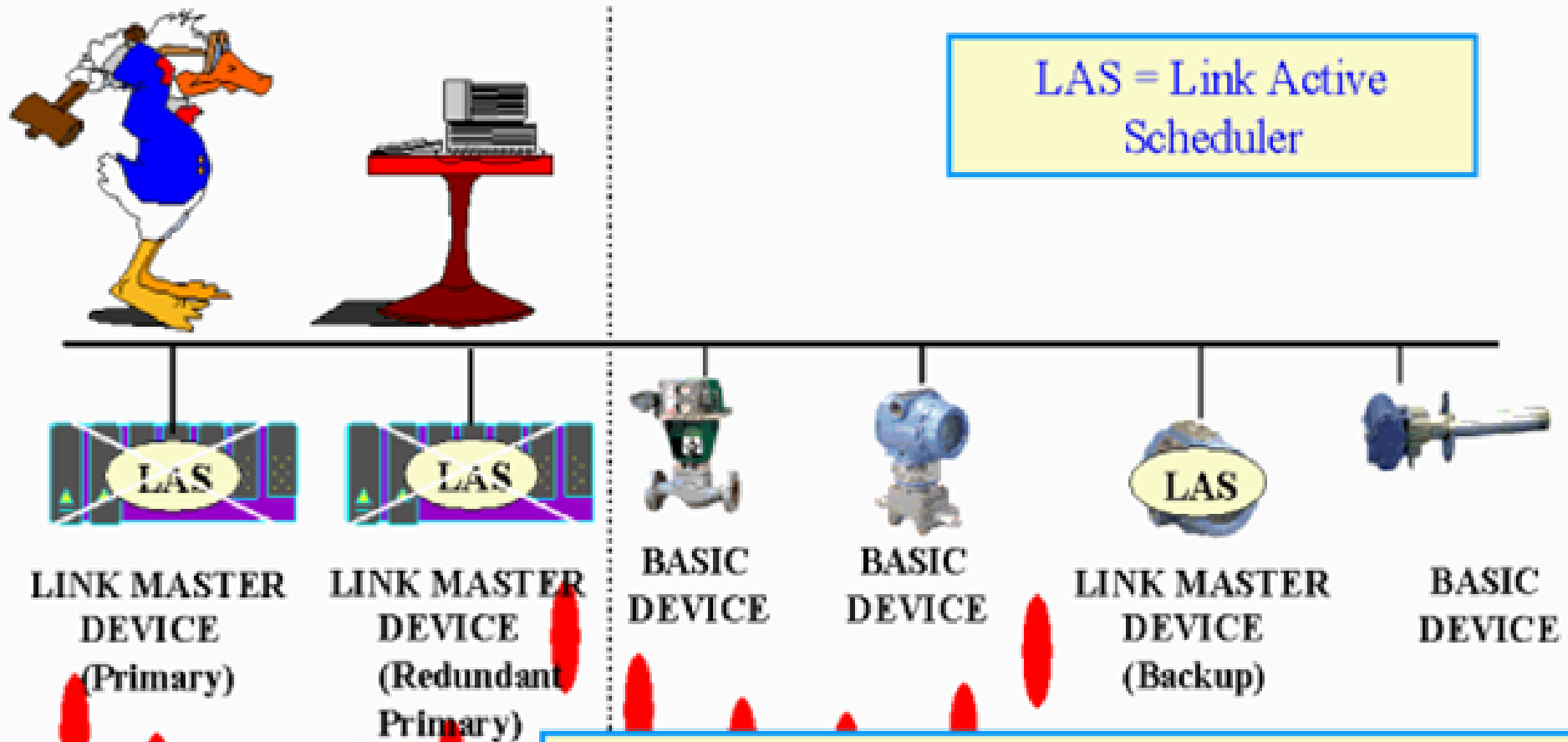
*FF HSE development complementary to H1 architecture*



## FF Hardware Redundancy



## Communication Redundancy



LAS = Link Active Scheduler

Not all vendors provide H1 redundancy (yet)  
BackupLAS per vendor quality differs

## Services and Support Capabilities

- Technology awareness sessions
- Technology justification
  - FF Viability study
  - FF saving estimates compared to traditional
- Project support
  - Basis of Design, Project Specification
  - System supplier selection
  - System review
  - Review/support for EPC phase
  - FAT/SAT support
  - Training
  - Dedicated testing
  - Trouble shooting

# Shell Global Solutions FF Track Record

#	Customer	Start	Type of Support
0	Internal R&D	'96 – '99	Interoperability Tests – horizontal & vertical in Hydrocracker pilot plant
1	PDO, Oman	Oct '99	FAT Support for Thuleilat Project ( <i>Emerson Delta V based</i> )
2	Rockwell Autom.	Nov '99	3 <sup>rd</sup> Party Test; new hardware interoperability testing
3	PDO, Oman	Feb '00	FAT/SAT Support for Al-Huwaisah project ( <i>Honeywell TPS based</i> )
4	PDO, Oman	Feb '00	Awareness training; Management , Operator , Maintenance
5	PDO, Oman	June '00	NI tools training
6	Woodside, Australia	Dec '00	FOUNDATION Fieldbus Viability Study for LNG 4 Extension Project
7	Sakhalin Upstream	Dec '00	Technical advice wrt FF technology during Early involvement, MAC selection, IIB ( <i>Yokogawa CS3000 based</i> )
8	AOSP, Canada	Jan '01	System Review ( <i>Foxboro IA based</i> )
9	PDO, Oman	Mar '01	Construction and SIT/FAT support for Yibal project ( <i>Emerson Delta V based</i> )
10	NAM	Apr '01	Trouble shooting Saaksum installation ( <i>Emerson Delta V based</i> )
11	NAM	Apr '01	Awareness and feasibility study for the Neptune project
12	Deer Park Houston	June '01	Evaluation of FF implementation at Effluent treater; support technology decision for CatCracker application
13	Nanhai	July '01	Technical support on technology selection
14	NAM	Sept '01	Study on Information Model
15	Brent Alpha	Oct '01	Full FF support ( <i>Yokogawa CS3000 based</i> )
16	PDO, Oman	Nov '01	Project specification GGP Yibal ( <i>Honeywell TPS based</i> )
17	PDO, Oman	Dec '01	FAT support Musallim project ( <i>Emerson Delta V based</i> )
18	PDO, Oman	Jan '02	FAT support Qaharir project ( <i>Emerson Delta V based</i> )

## Benefits of FF Technology

**FF Technology provides an infrastructure to realise a reduction in lifecycle cost**

**Higher Operating Profits by:**

- Lower installation cost, fast commissioning
- Platform for asset management and adv. diagnostics
- Increased plant availability
  - Reduced process upsets
  - Reduced maintenance

**FF Technology: Now our project standard  
for both new building and re-instrumentation projects**