



Fieldbus Foundation™
Freedom to Choose. Power to Integrate.

Fieldbus Foundation – India Marketing Committee

Technology Event

Fieldbus Foundation– Paradigm Change in Instrumentation Technology

Engineering of FF Projects Systems Perspective

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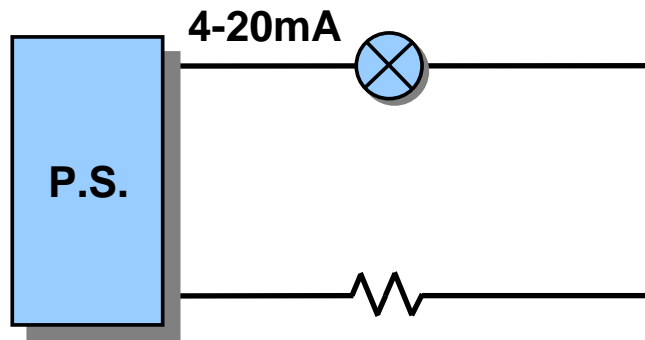
Engineering of FF Projects - Systems Perspective

Agenda :

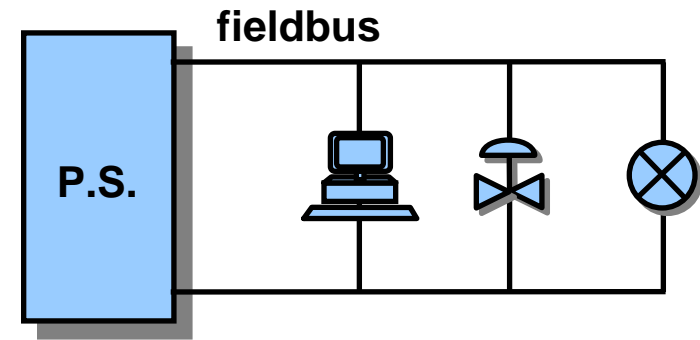
- **What's different with FF**
- **FF Topology**
- **FF Important Engineering Aspects**
- **FF Vs Conventional Implementation**
- **Summary**



What changes with FF based system?



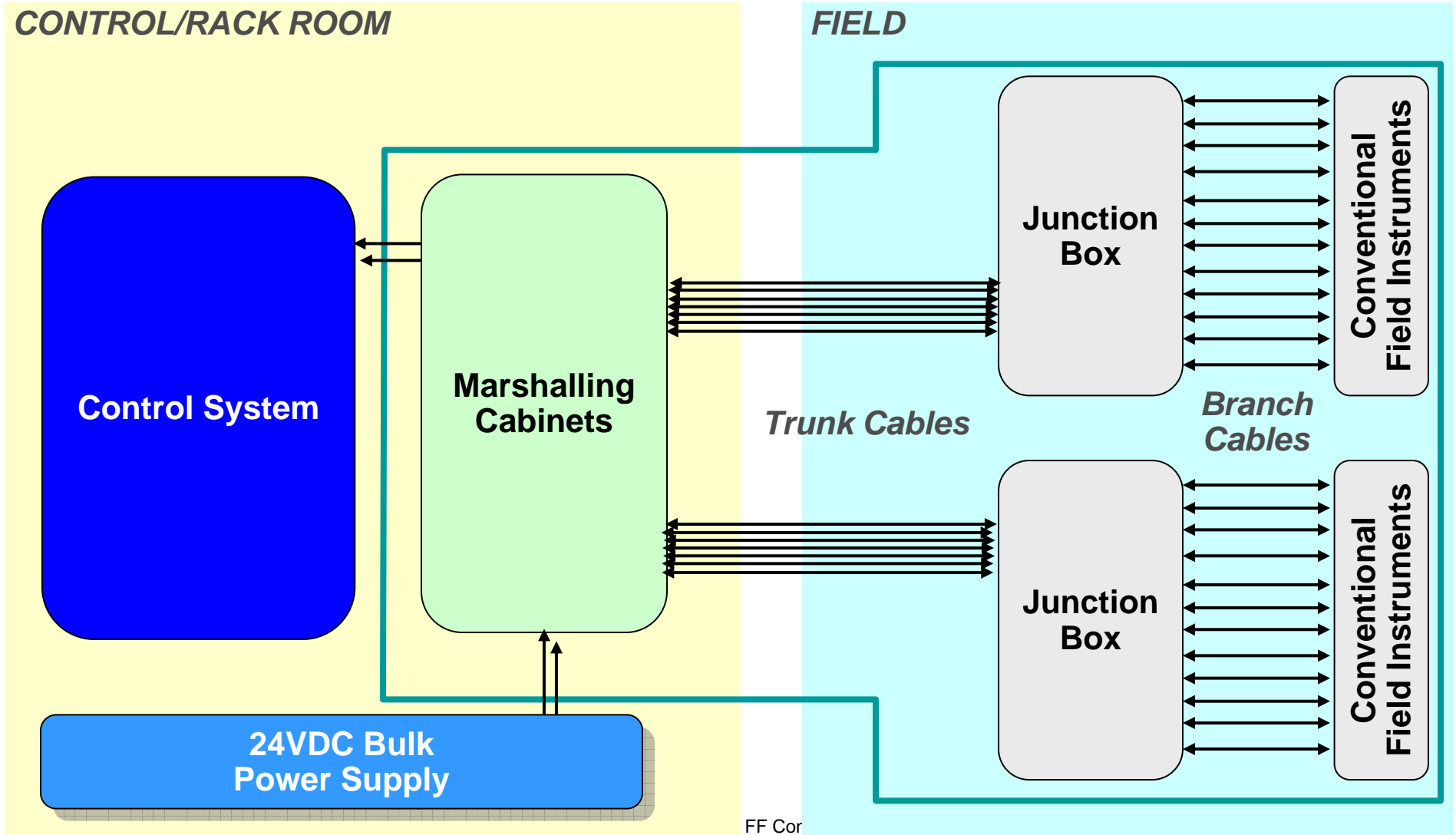
- Analog communication (4-20ma)
- Only PV
- Point to Point connectivity
- Signal & Power on same or separate wire
- Control loop in DCS Controller
- Selectable scan time



- Fully Digital communication
- Data/diagnostic/configuration
- Multi-drop connectivity
- Upto 16 devices per segment
- Signal & power on same wire
- Control loop in DCS controller or on wire
- Selectable macrocycle



Typical Conventional Topology



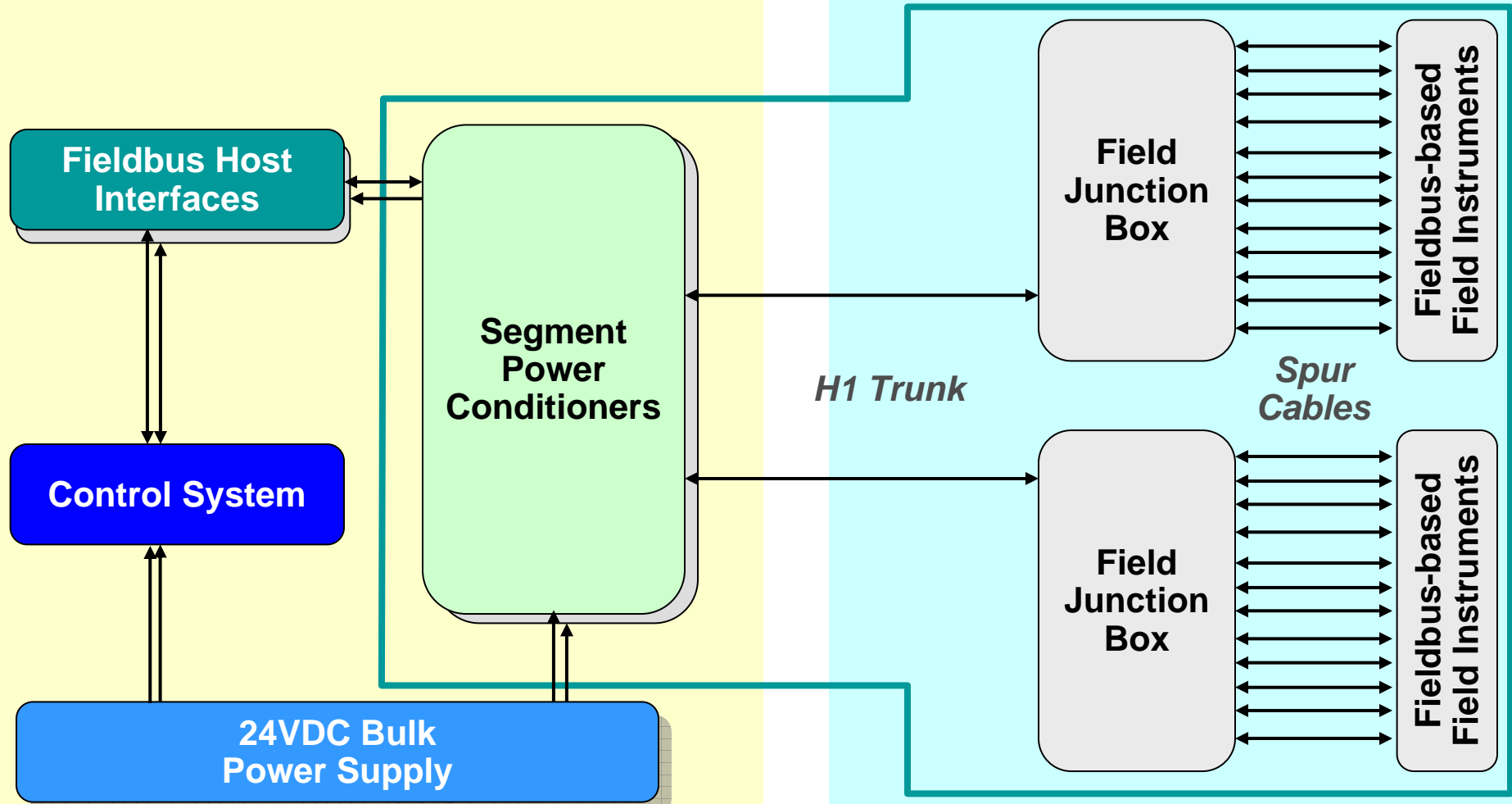
FF Cor



Typical Fieldbus Topology

CONTROL/RACK ROOM

FIELD

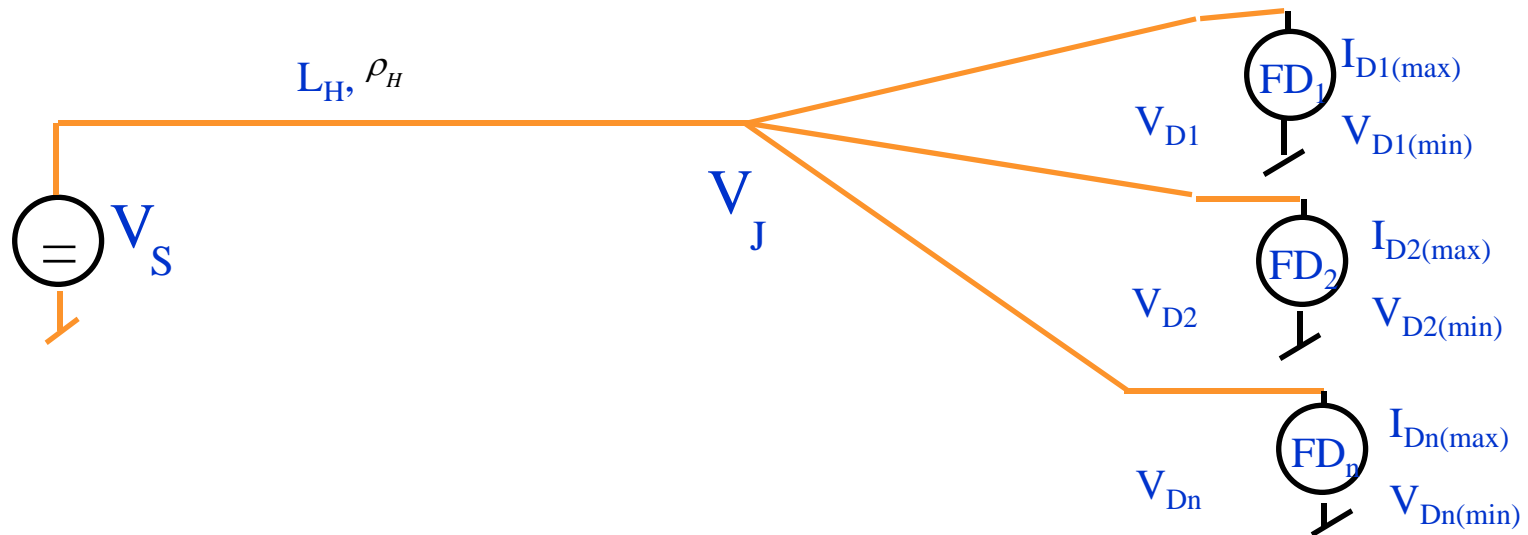


FF Cor



Power Distribution

$$V = \text{Sum}(I \cdot R)$$



The number of devices on a FieldBus segment is limited by ohm's law:

- The voltage of the power supply,
- The resistance of the cable and
- The amount of current drawn by each device



Important Engineering considerations

- Segment design – No. of devices & Macrocycle
- Close loop distribution – On the wire or in controller
- Open loop distribution – Dedicated segments or mixed with close loops
- Future expandability – Spares Philosophy for FIM, devices & function blocks
- Device capabilities – Available blocks, BLAS capability, Block scan times



Important Engineering considerations

Segment design :

No. of device

- No. of devices per segment to be limited to 12 (Close+Open)
- No. of close loops per segment to be limited to Four
- Loops to be segregated into levels depending on their criticality
- For critical loops no. of valves per segment to be limited to two
- For a Loop the sensing element & valve should reside the same segment
- Normally open loops should be implemented on separate segments

Macrocycle design:

- Best possible scan times with control on wire 250 to 300 msec
- Configure macro cycle times of 250, 500 & 1000 msec
- 250 msec – Limit no. of close loops to One
- 500 msec - Limit no. of close loops to Two
- 1000 msec - Limit no. of close loops to Four
- 50% of macro cycle time should be available for unscheduled communications



Important Engineering considerations

Control on the wire or in controller

- All complex loops should be implemented in the controller
- All other loops can be on the wire
- For a close loop the sensing element and valve should be on the same segment

Open loop

- Open loop should be implemented on dedicated segments
- Macrocycle can be set at one second
- This allows implementation of 8 to 12 devices per segment
- Frees up the macro cycle for close loop segments



Important Engineering considerations

Future expandability – Needs to be defined in terms of

- Addition of H1 Host to the system or controller
- Addition of devices to an existing segment – Open loop & close loop
- Addition of new FF function blocks in controller for new devices
- Addition of function block to an existing device

Spares philosophy – Needs to be defined in terms of

- Installed Spares for FIM or segment
- Installed spare for devices (Open or close)
- Installed spare for field mega blocks
- Each segment to be loaded to a max of 60% VCR's
- Each controller to be loaded to max of 60% FF function blocks



FF Vs Conventional – Project Execution

Pre-engineering (FEED)

- *More time invested in the beginning will save of lot of time in the end*
- Be aware of devices, firmware revisions, DD files

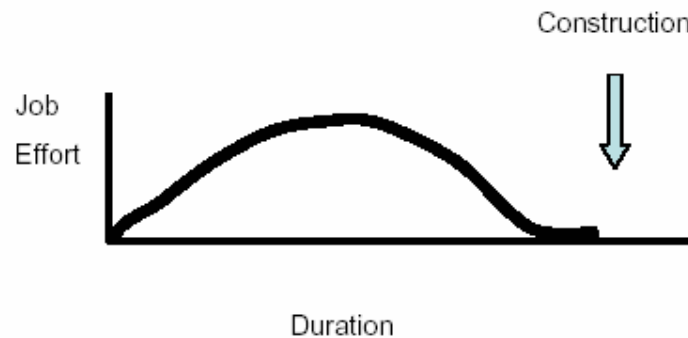
Project phases

- Small differences up to the FAT
- Time for FAT depends on strategy
- Time for SAT/Commissioning is Less

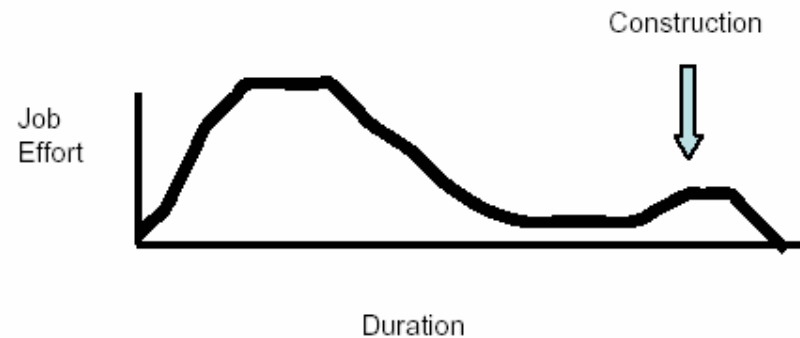


FF Vs Conventional - Engineering

Additional Engineering support required early in the design and during construction



Conventional



Fieldbus

FF Vs Conventional – Factory Acceptance Test (FAT)

All devices connected

- additional effort during the FAT to set up the system
- reduced time for site commissioning
- impractical for large systems

Representative number of loops tested

- each type of device tested
- make a selection out of the segments
- still additional effort during the FAT
- test loop on wires

No devices connected

- reduction of time for the FAT
- increase of time for SAT
- impractical because of HIGH RISK





FF Vs Conventional – Commissioning

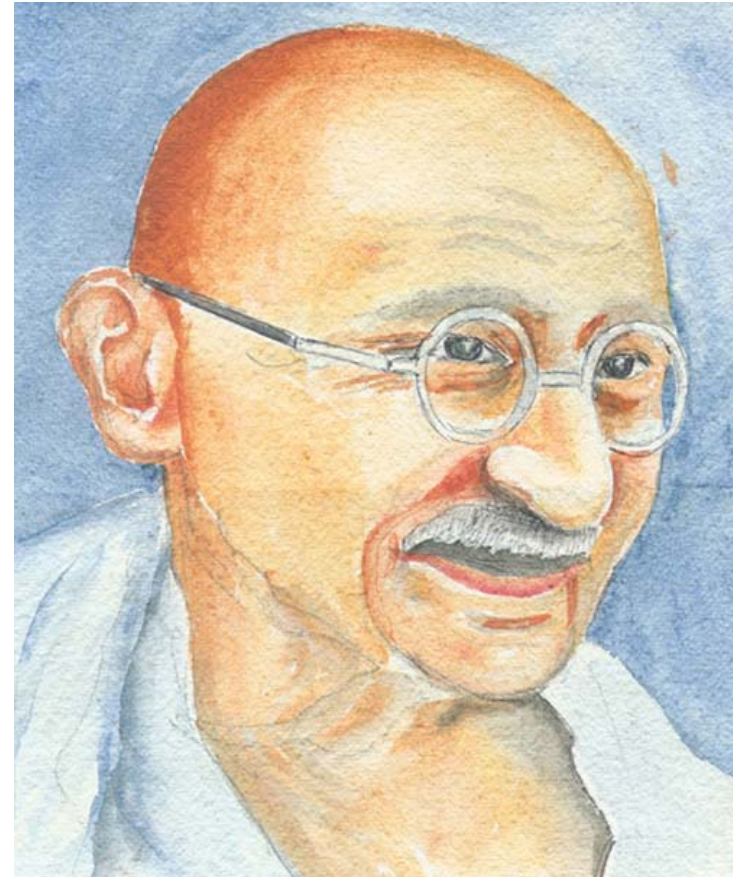
- Loop-check will take less time
- Easy trouble shooting due to extensive diagnostics
- Saves over-all commissioning time and facilitates early start-up





Summary

Power
of
Simplicity



Foundation Fieldbus – Simple & Powerful



Fieldbus Foundation™
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Thank You



Automation 2008 - FF Conference