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Communication Bus

MCTE 4324 * REAL-TIME SYSTEMS

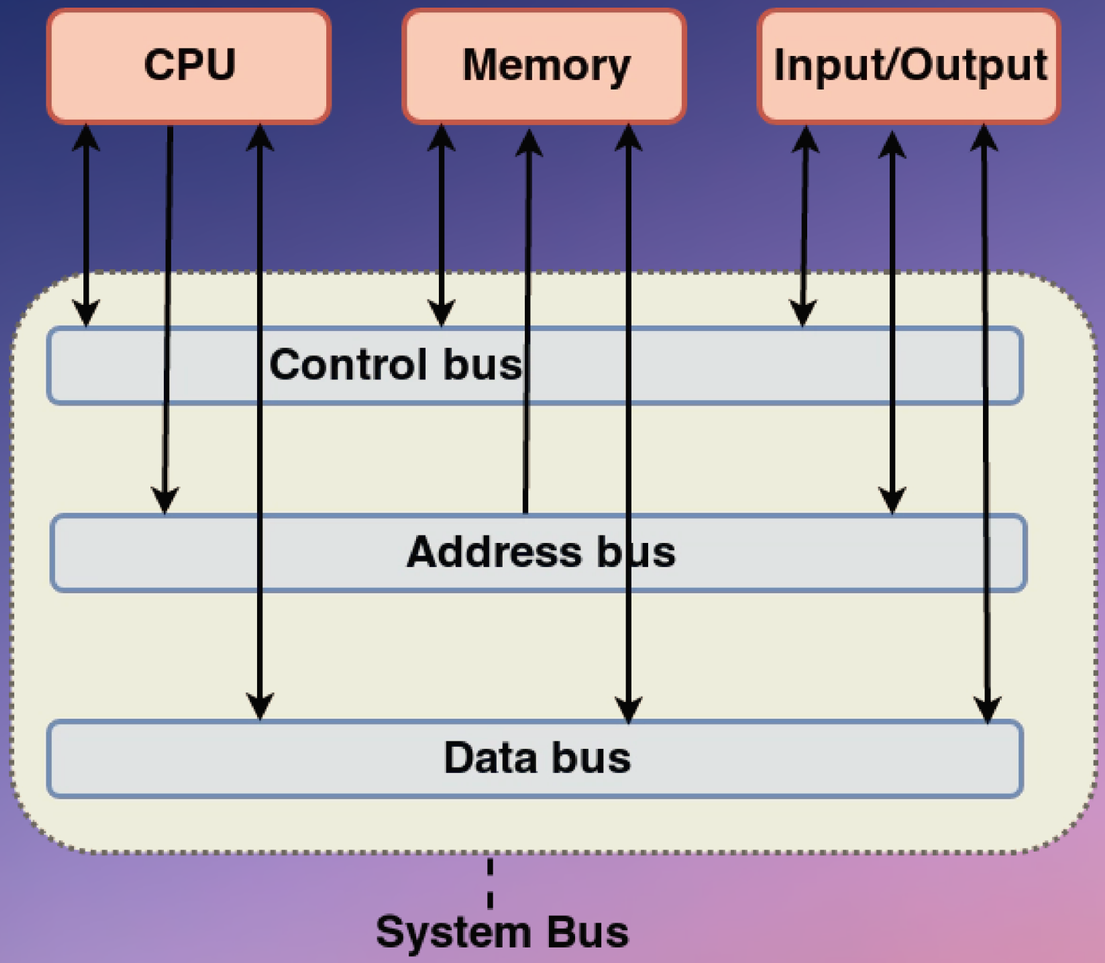
Communication Bus

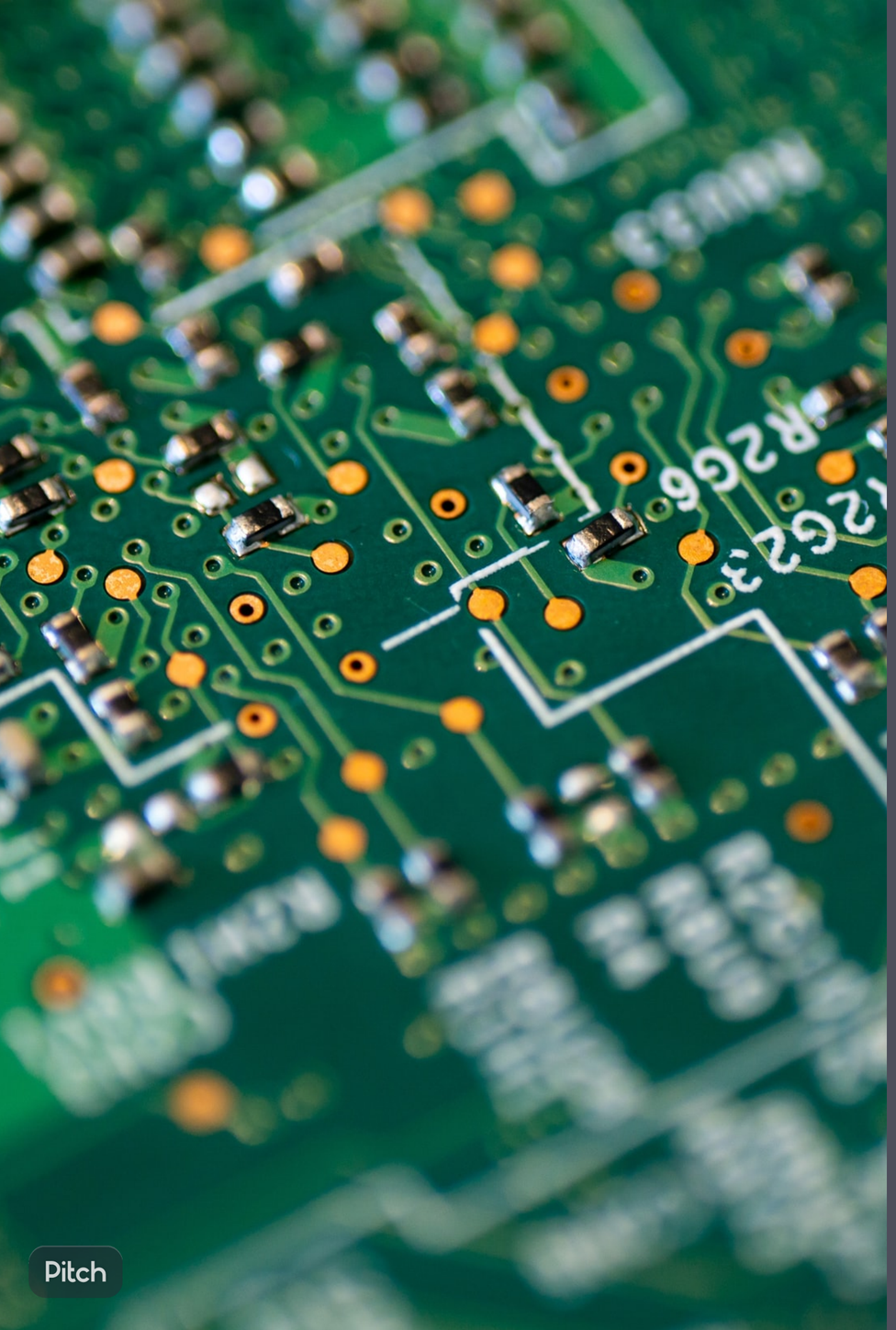
COMMUNICATION BUS/SYSTEM BUS

A bus can be defined as a set of wires/cables to carry binary information between components of computer like input/output device, CPU and Memory. It usually transmits binary numbers, one bit per wire.

TYPES OF BUSES:

1. Address Bus
2. Data Bus
3. Control Bus





Address Bus

- Address bus system is used to specify address of a data/memory location. CPU is connected to main memory by a set of parallel wires which is the Address bus, which carries address to Memory Address Register (MAR).
- The width of a bus determines the number of memory locations
- Address bus consists of 16 wires; thus, it consumes 16 bits, i.e., its width is 16 bits.
- For example 16-bit address bus can transfer 2^16 (65536) memory locations/addresses.

Data Bus

- It is an electrical path that connects the CPU, memory, input/output devices and secondary storage devices/data bus carries data in binary form.
- Data bus contains set of parallel wires which is used to transmit data.
- The numbers of lines in bus affects the speed at which the data travels between different components. Example: Speed of 16 bit data bus is more than 8 bit data bus.
- Data bus is **bi-directional** bus because same bus is used for data transmission from microprocessor to memory location or input/output device and vice versa.

Control Bus

- Control bus carries control information from the control unit to the other units.
- The control information is used for directing the activities of all units.
- The control unit controls the functioning of other units like: input/output devices, secondary storage.

Apart from the above described important bus systems, a separate type of bus called I/O bus connects the input, output and other external devices to the system.

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AC 800M
Communication Protocols

Source: AC 800M Communication Protocols

MODBUS

MODBUS RTU

- MODBUS RTU is a standard protocol widely spread because of its ease of use and the fact that it supports communication over a wide variety of media, such as wire, fiber optics, radio and the telephone.
- MODBUS is executed serially and asynchronously according to the master/slave principle, and in one direction at a time. MODBUS is used mainly for reading and writing variables between control network devices, using point-to-point or multidrop communication. Message framing is implemented in RTU mode, which is a binary format. The MODBUS protocol is designed to transfer data securely by checking each byte as well as the entire message for transmission errors.

MODBUS TCP

- MODBUS is an open industry standard protocol that is widely used. It is a request response protocol and offers services specified by function codes.
- MODBUS TCP combines the MODBUS RTU with standard Ethernet and universal networking standard, TCP. It is an application-layer messaging protocol, positioned at level 7 of the OSI model.
- MODBUS TCP is an open Industrial Ethernet network which has been specified by the MODBUS-IDA User Organization in co-operation with the Internet Engineering Task Force (IETF) as an RFC Internet standard.

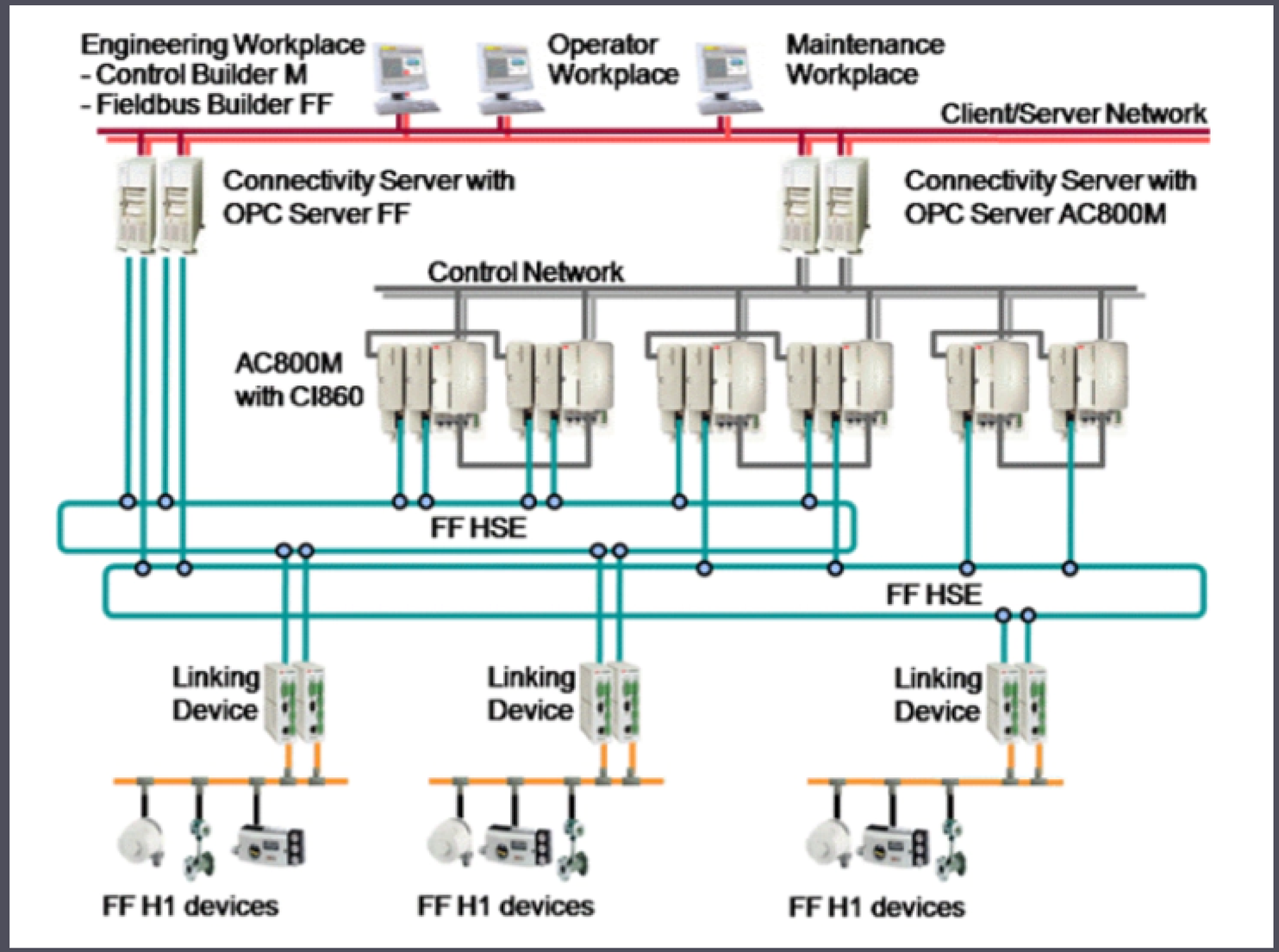
Protocol	Description	Protocol	Description
FC1	Read coil status	FC6	Preset single register
FC2	Read input status	FC7	Read exception status
FC3	Read holding registers	FC8	Diagnostic request
FC4	Read input registers	FC15	Force multiple coils
FC5	Force single coil	FC16	Preset multiple registers

MODBUS protocol commands

FOUNDATION Fieldbus HSE

FOUNDATION Fieldbus (FF) is a bi-directional protocol used for control system communication and meets ISA SP50 requirements. It is a fieldbus used for communication with distributed I/O units and fulfills the regulations and safety demands in high risk (explosive) environments, and supports process control without involving a controller. It is an open protocol, which means that devices from different certified manufacturers are compatible (interoperability).

FF defines two communication profiles, H1 and HSE. The H1-Profile with a data transmission rate of 31.25 kbit/s is preferably used for direct communication between field devices in one link (H1 link). The HSE profile with a transmission rate of 100 Mbit/s serves first and foremost as a powerful backbone for the link between H1 segments. FF linking devices serve as a gateway between the field devices on the H1 segments and the HSE backbone.



Architecture of a system including engineering and operator station workplaces, controllers with FOUNDATION Fieldbus HSE CI860 communication interface units, linking devices, FF HSE devices, and H1 devices

PROFIBUS

INTRODUCTION

- PROFIBUS (PROcess FIeld BUS) is a fieldbus standard, especially designed for communication between systems and process objects. This protocol is open and vendor independent. With PROFIBUS, devices from different manufacturers can communicate without special interface adjustments. PROFIBUS can be used for both high speed, time critical transmission and extensive, complex communication tasks. PROFIBUS DP-V1 is implemented in AC 800M by using the CI854 module.

PROFIBUS DP

- The PROFIBUS DP communication profile is designed for efficient data exchange at the field bus level. The central automation devices, such as controllers, communicate through a fast serial connection with distributed field devices such as I/Os, drives, valves and measuring transducers. Data exchange with distributed devices is mainly cyclic.
- PROFIBUS DP is suitable as a replacement for conventional, parallel signal transmission with 24V in manufacturing automation, as well as for analog signal transmission with 4-20mA or HART in process automation.