IEEE 1451: Empowering the Smart Sensor Revolution

"Smart sensors and distributed architecture"

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Smart Sensor Systems

What is a Simple Sensor?

A device that converts a physical, biological, or chemical parameter into an electrical signal.

Example: Thermocouple

What is a Simple Actuator?

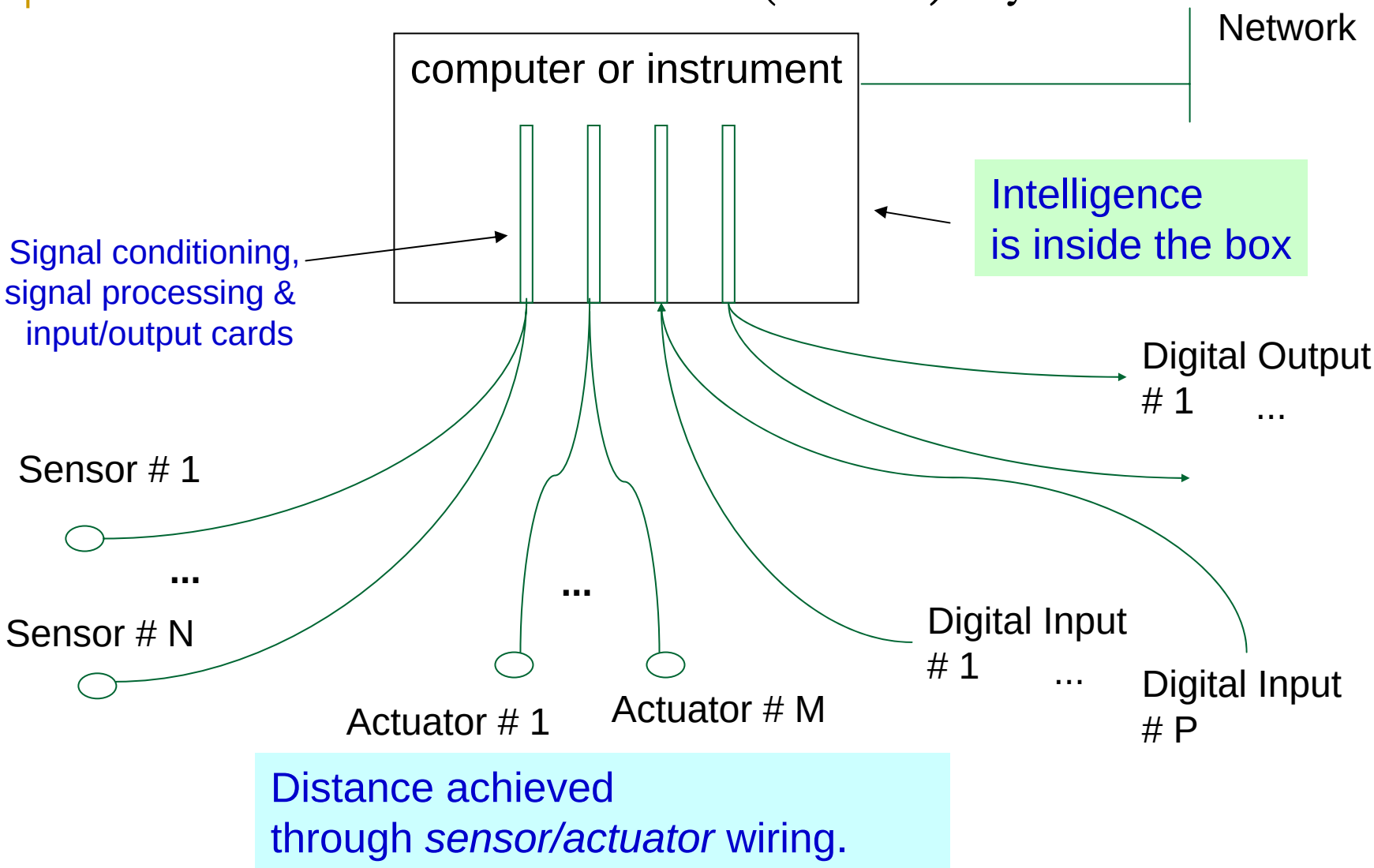
A device that accepts an electrical signal and converts it to a physical, chemical or biological action.

Example: Open or close a switch with an electric signal.

What is a Transducer?

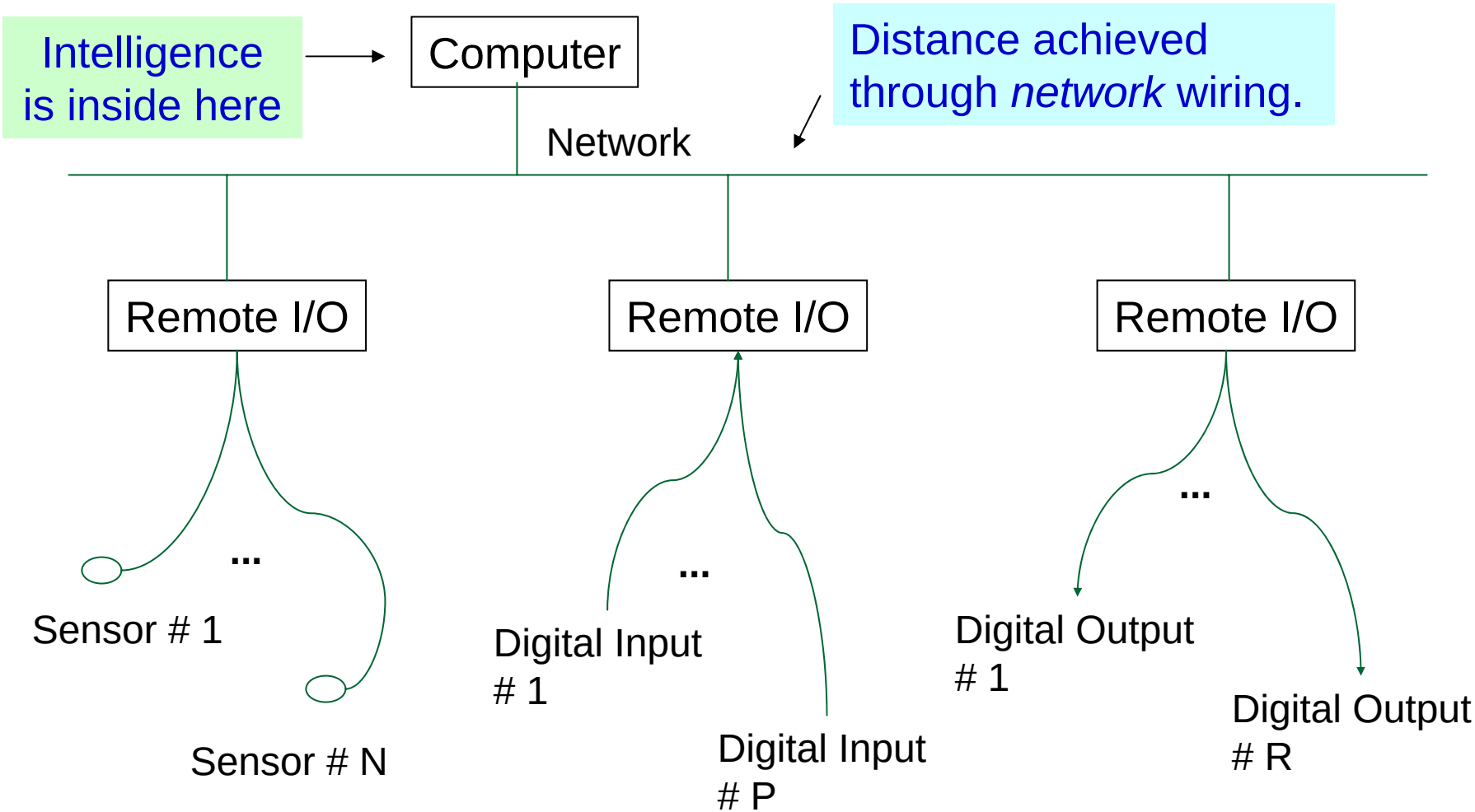
A transducer is a sensor or an actuator.

Measurement & Control (M&C) System



Distance achieved
through *sensor/actuator* wiring.

Distributed M&C System



Smart Transducer

- A smart transducer is a transducer that provides functions beyond those necessary for generating a correct representation of a sensed or controlled quantity.
- This functionality typically simplifies the integration of the transducer into applications in a networked environment.

Smart Sensor Attributes

- Electronic Data Sheet at sensor
- Signal Conditioning at sensor
- Intelligence at sensor
- Connects to network
- Interoperability with other vendors
- Hot-swap without re-calibrating system

Smart Thermocouple Example

- Transmit temperature to computer
- Remove vendor A thermocouple from network and replace with vendor B thermocouple without recalibrating
- Transmit only if exceeds a temperature limit
- Take a temperature reading only when an event occurs

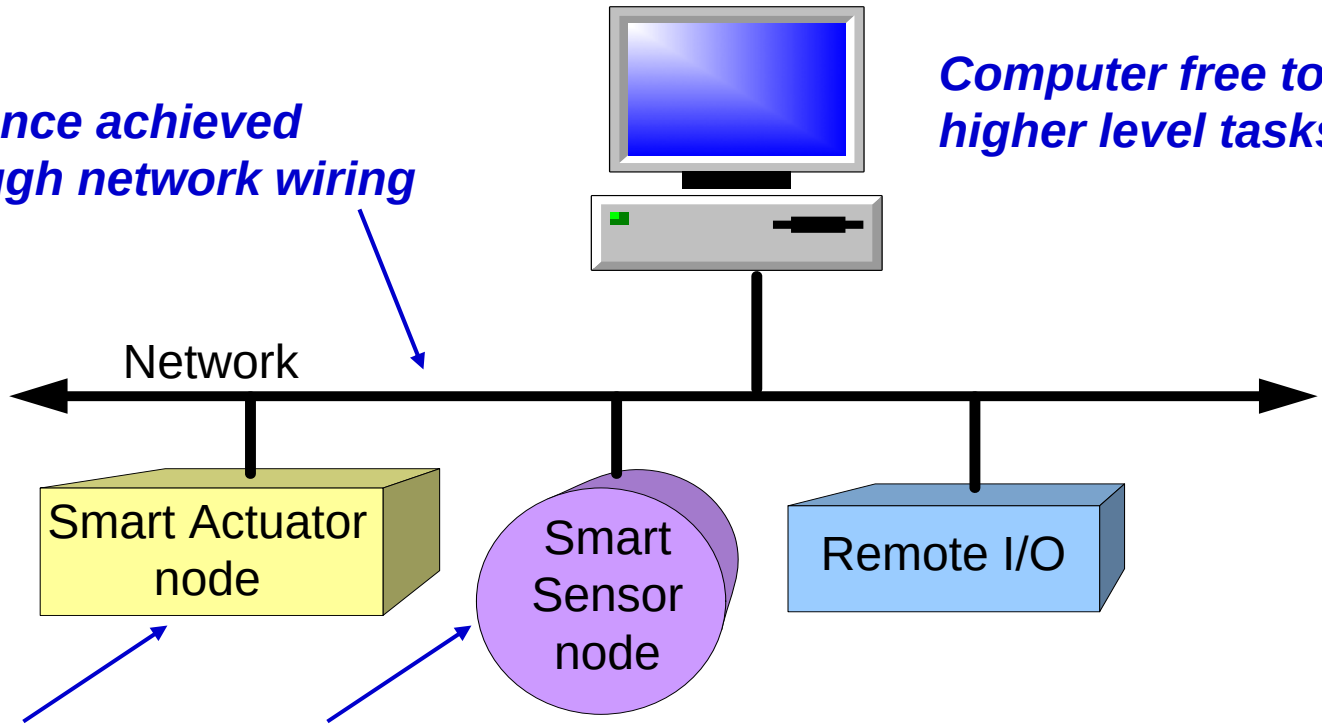
Smart Actuator Attributes

- Electronic Data Sheet at actuator
- Signal Conditioning at actuator
- Interoperability with other vendors
- Hot-swap without re-calibrating system
- Intelligence at actuator
- Connects to network

Smart Switch Example

- Remove vendor A's switch and replace with vendor B's switch.
- Inserted in existing network that is already calibrated without need to re-cal
- Open and close at programmed interval
- Opens or closes only when an event occurs.

Distributed Smart Sensor/Actuator System



Distance achieved through network wiring

Computer free to do higher level tasks

Intelligence is inside each node, so decisions can be made there.

Therefore less traffic on network.