



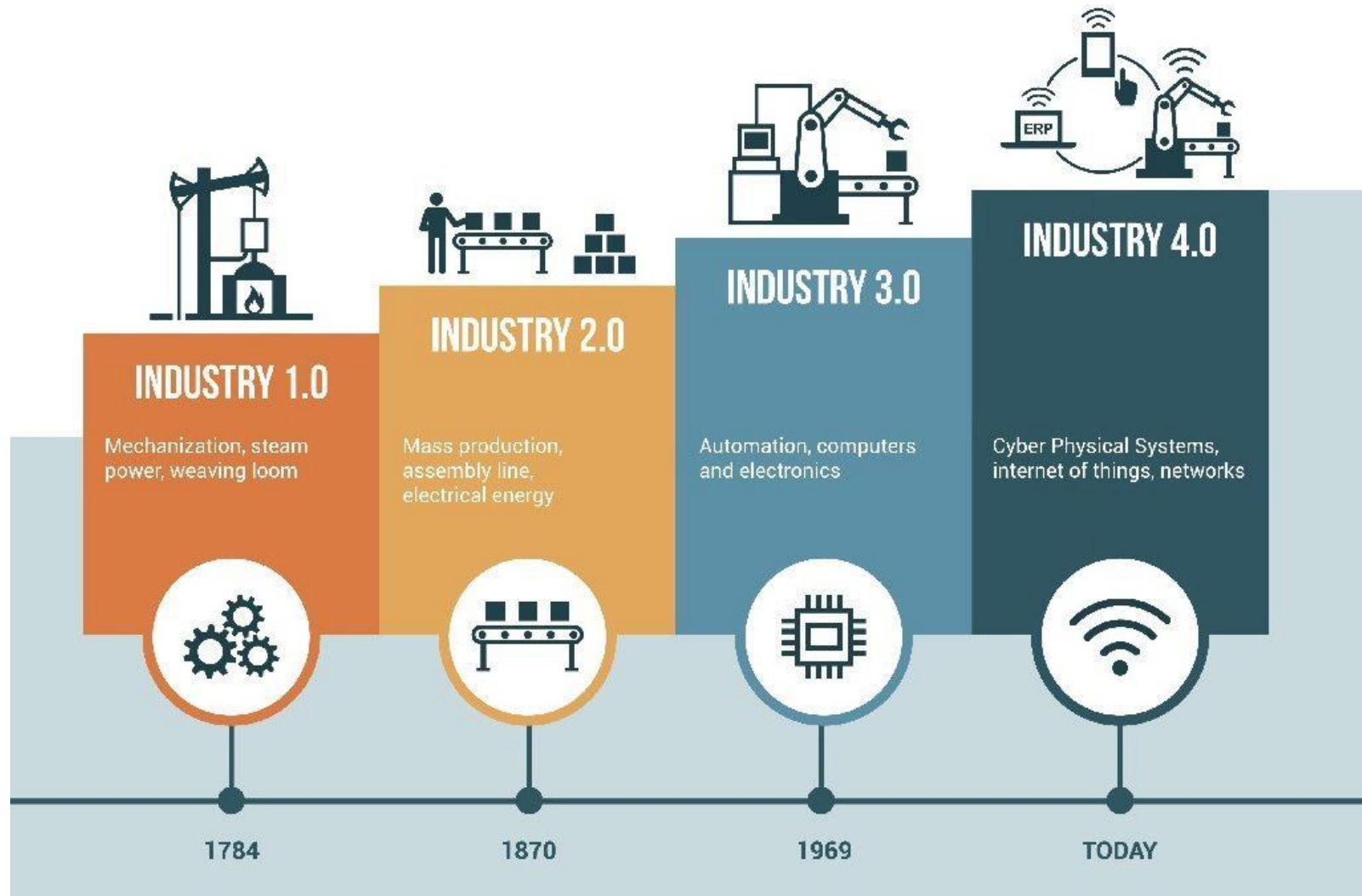
Industry 4.0 – The journey

M K Narayana Swamy

Agenda

- ▲ Industrial revolution
- ▲ What is Industry 4.0?
- ▲ The journey – so far
- ▲ Implementation challenges
- ▲ References & Credits

The Industrial revolution

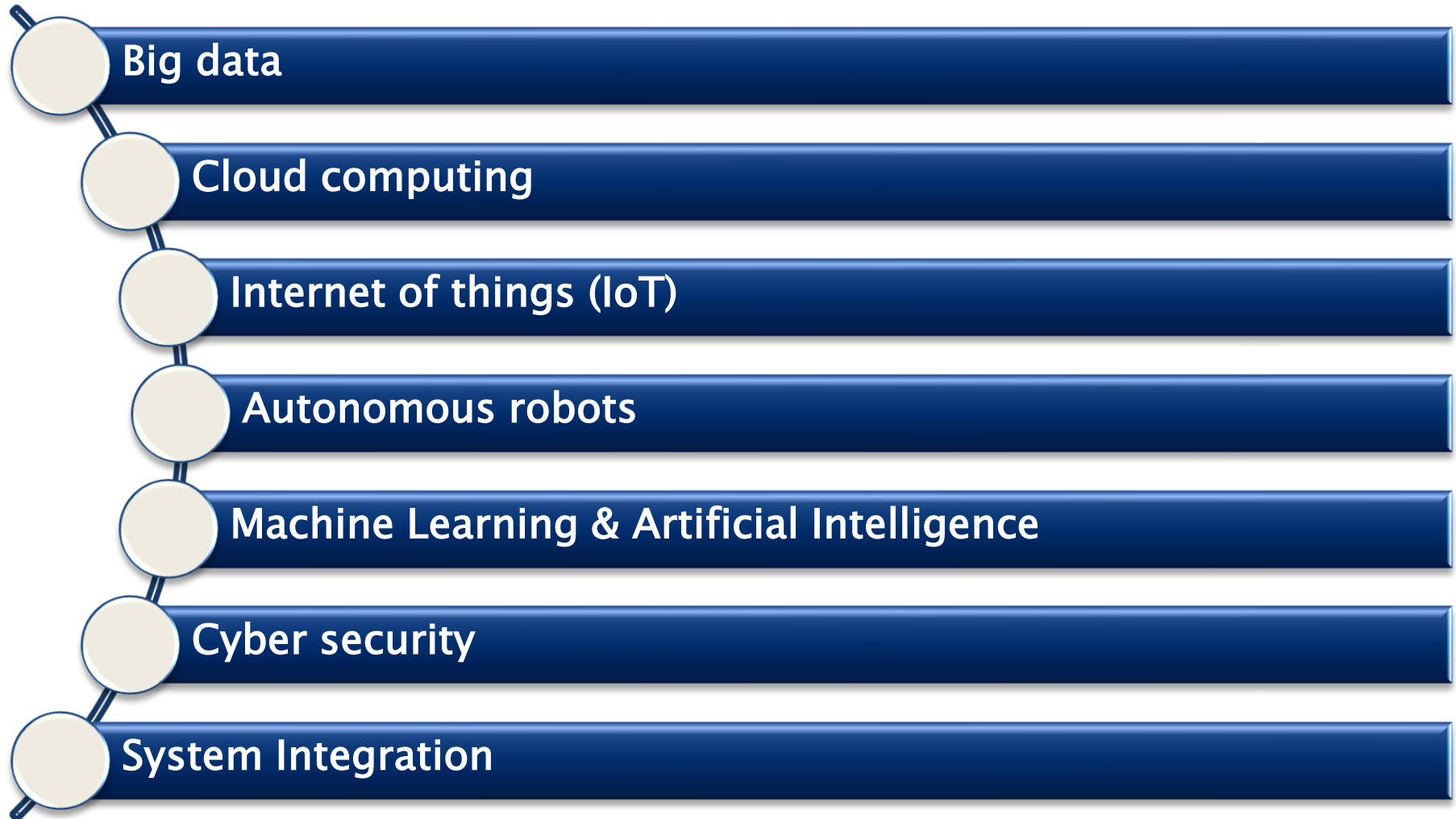


Industry 4.0 ?

- ▲ Capture data from machines
- ▲ Convey insights to operators
- ▲ Make quicker and smarter decisions
- ▲ Minimize costs
- ▲ Optimize supply chains, factories and distribution
- ▲ Integrate, Improve and evolve.



Key components of Industry 4.0



Readiness: Industry 4.0

Smart
factory

Smart
products

Employees

Strategy and
organisation

Smart
operations

Data-driven
services

- Digital modelling
- Equipment infrastructure
- Data usage
- IT systems

- Communication add-on functionalities
- Data analytics in usage phase

- Skill acquisition
- Employee skill sets

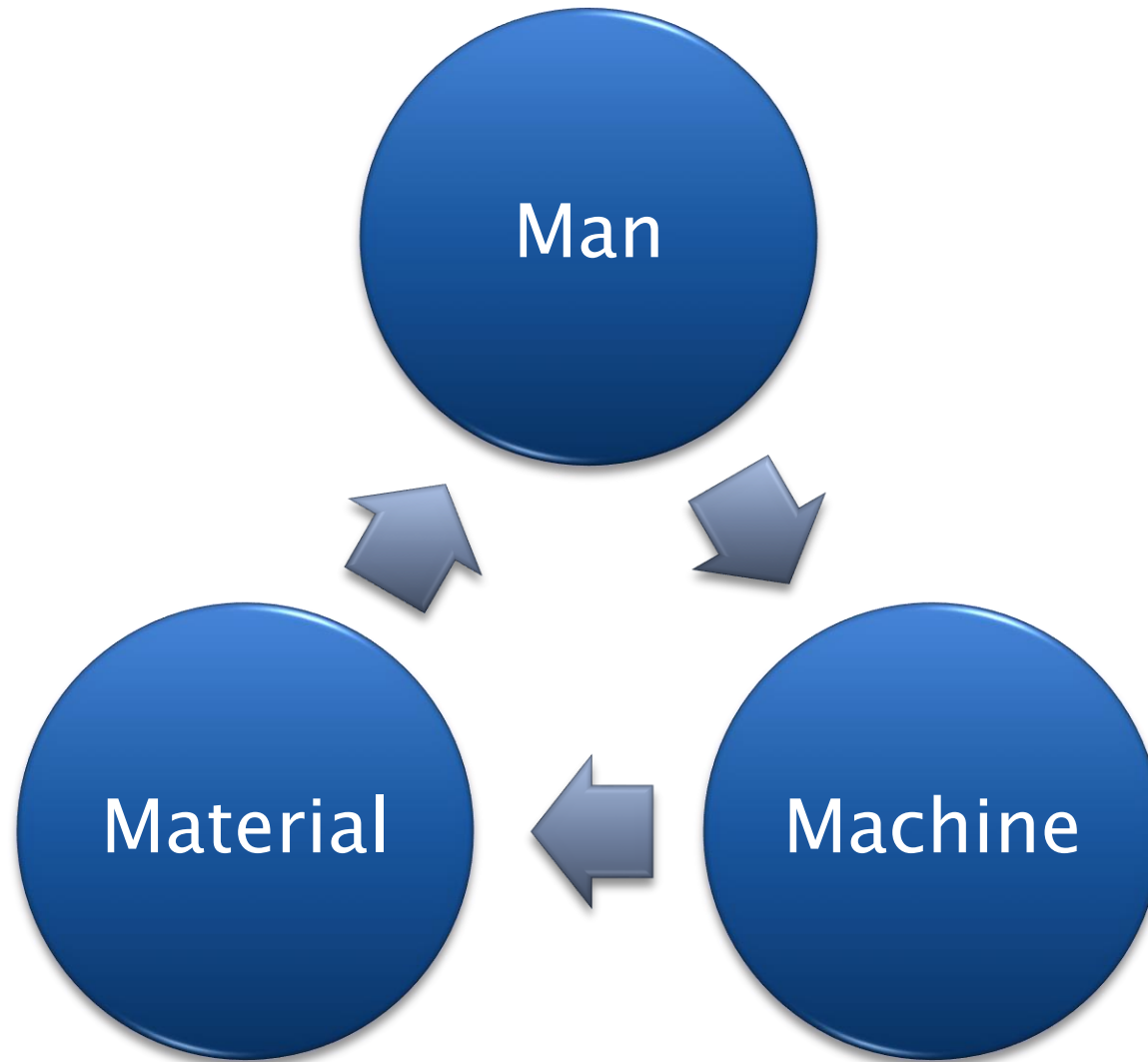
- Strategy
- Investments
- Innovation Management

- Cloud usage
- IT security
- Autonomous processes
- Information sharing

- Data-driven services
- Share of revenue

Note: The parameters/categories may vary based on type of industry

What gets connected?



Machine

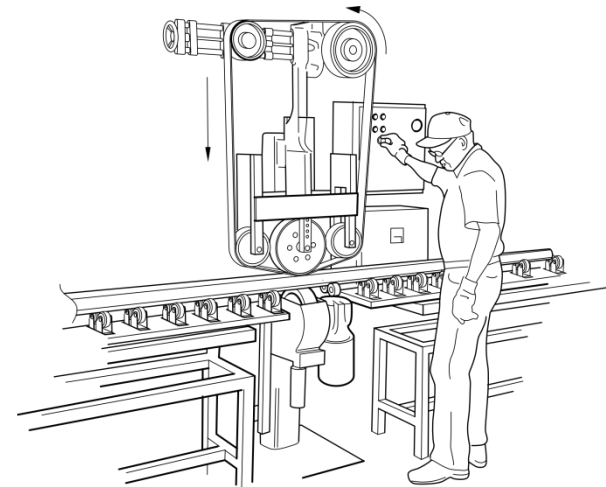
- Total production?
- Is data reliable?
- Good/bad parts? (Quality)
- Up-time (Availability)?
- Target Vs Production
- OEE (Overall Equipment Efficiency)?
- Down-time?
 - Reason?
 - Reason repeating?
- Energy cost of production per component?
- Process parameters (temp/pressure etc.,) maintained?
- And more...

Material

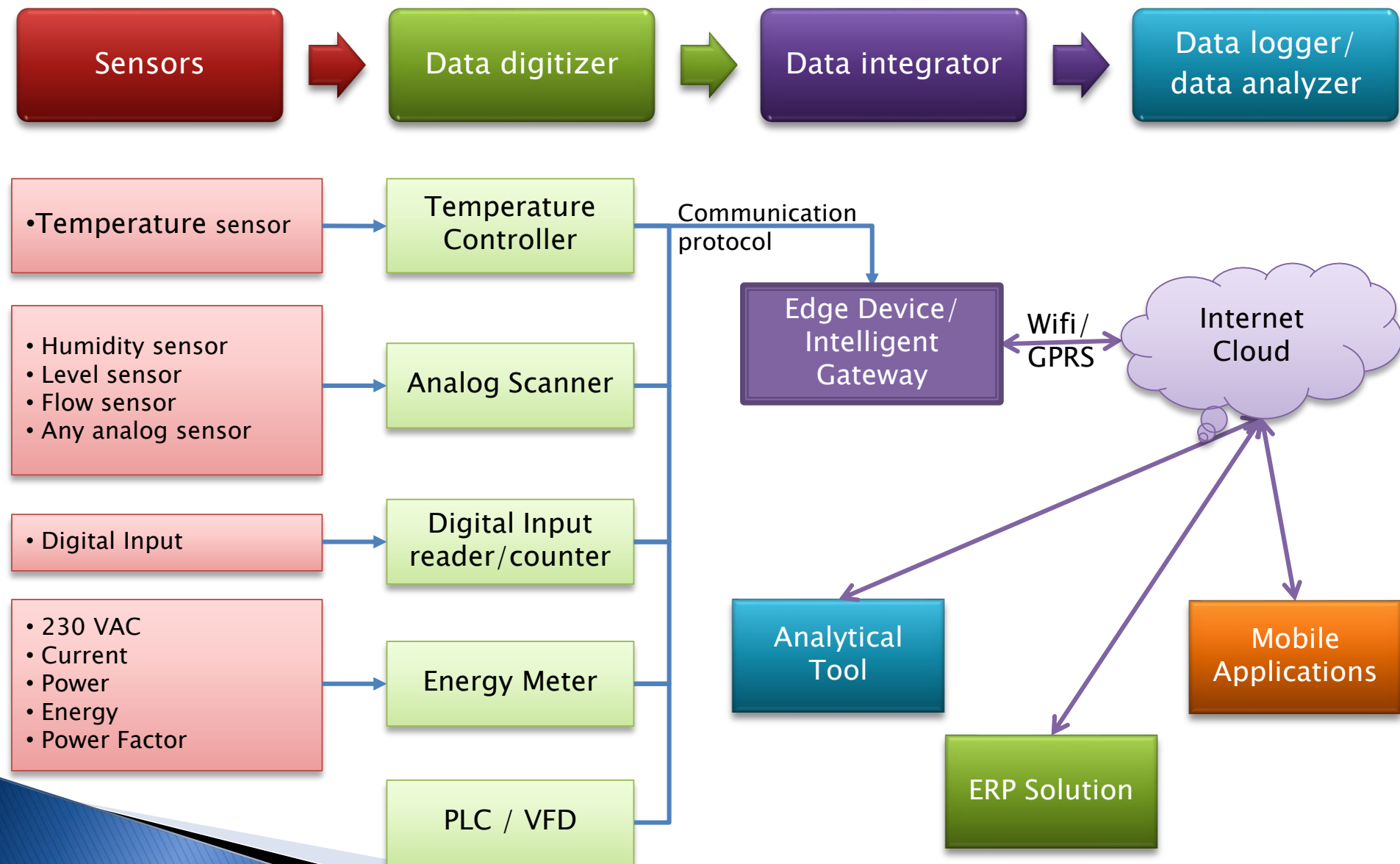
- Raw material Supplier?
- Batch?
- End product Traceability?

Man

- Machine operator?
- Shift In-charge?
- Efficiency?



Sensor to Analytics – Data flow





Implementation challenges

Implementation challenges

- ▲ New business models—the definition of a new strategy?
- ▲ Rethinking your organization and processes to maximize new outcomes
- ▲ Conducting successful pilots and POCs
- ▲ Helping your team to understand where action is needed
- ▲ Change management
- ▲ The genuine interconnection of all departments and other existing productivity systems
- ▲ Recruiting and developing new talent

- ▲ Which machines should I connect first?
- ▲ What communication protocol should be standardised across machines?
- ▲ What about legacy machines, can I get data from them?
- ▲ Will my machine OEM support with necessary details, what happens to warranty?
- ▲ What speed and how much data should I acquire?
- ▲ Should I go with a hardware/instrumentation company, software company or analytics company for implementing?
- ▲ Wired or wireless? Wifi/GPRS/Ethernet?
- ▲ Should I go for local server or cloud?
- ▲ What happens to data safety and security if I go to cloud?
- ▲ Do I have the infrastructure and bandwidth of IT team to manage this huge amount of data
- ▲ How to design dashboards, that not only gives the real-time/historical data but also gives insights and actionable items?
- ▲ How to Integrate with existing software systems like ERP/MES etc.,

References & Credits

- ▲ Grant Thornton (A Instinct for Growth) with CII
 - India's Readiness for Industry 4.0
- ▲ iiot-world.com



Sensors to Analytics

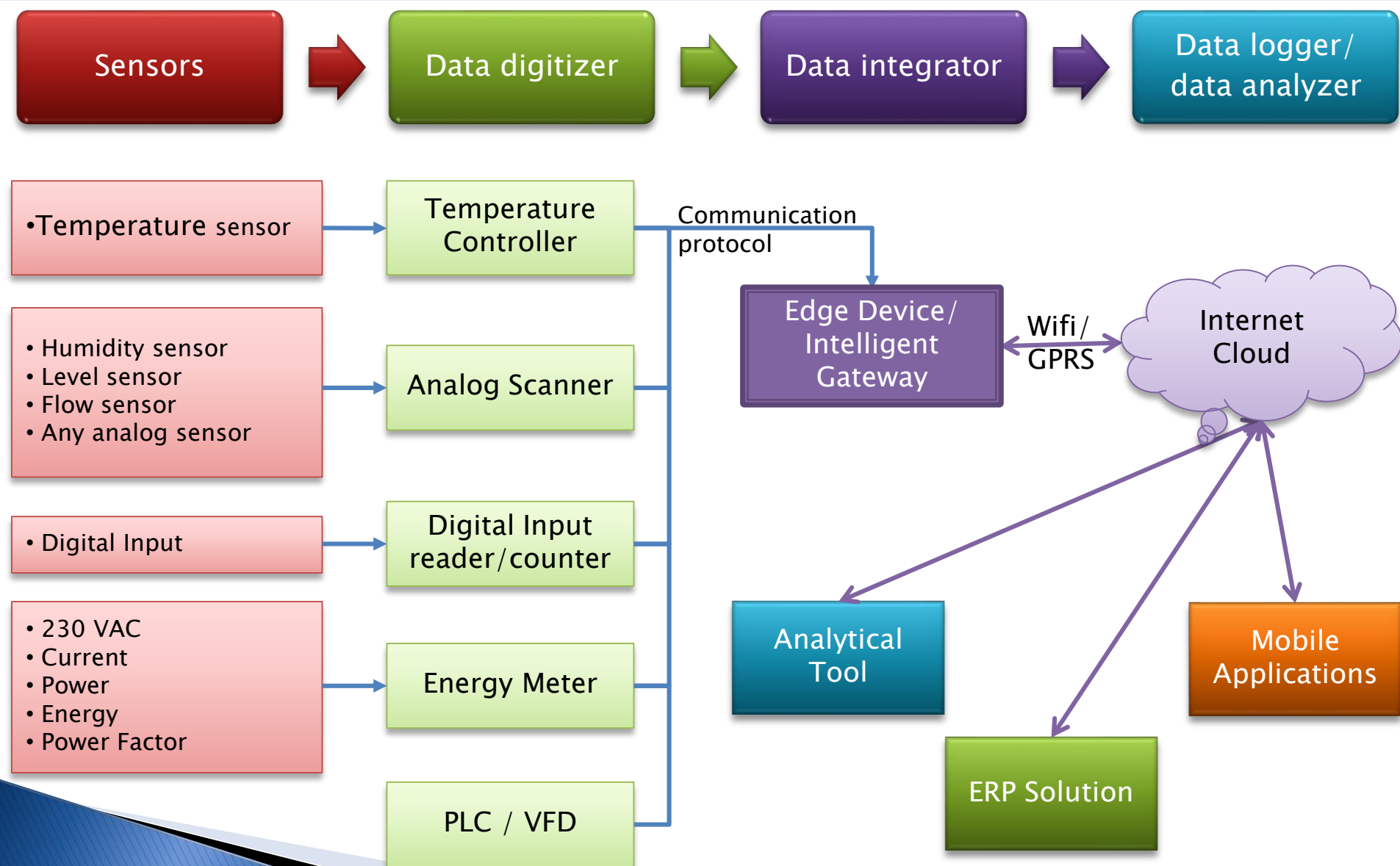
M K Narayana Swamy
September 20, 2018

Agenda



- ▲ Sensors
- ▲ Hardware
- ▲ Software
- ▲ Data

Sensor to Analytics – Data flow



Analytics



Sensor?



- ▲ A device* to detect events or changes in its environment and send the information to other electronics,



* (device, module or a subsystem)

Types of sensors



- Temperature Sensor
- Pressure Sensor
- Proximity Sensor
- Ultrasonic Sensor
- Humidity Sensor
- Accelerometer
- IR Sensor (Infrared Sensor)
- Smoke, Gas and Alcohol Sensor
- Touch Sensor
- Colour Sensor
- Flow Sensor
- Level Sensor
- And more...

Proximity sensors



▲ Optical

- Infra-red, Laser, photocell-reflective

▲ Inductive

▲ Magnetic

▲ Ultrasonic

▲ Capacitive

▲ Radars

▲ Sonars

▲ Hall-effect



Industrial Sensors Types and output



Sensor Types

Analog

Digital

Counters

Sensor Outputs

Current (4–20mA, 0–20mA, 0–5A)

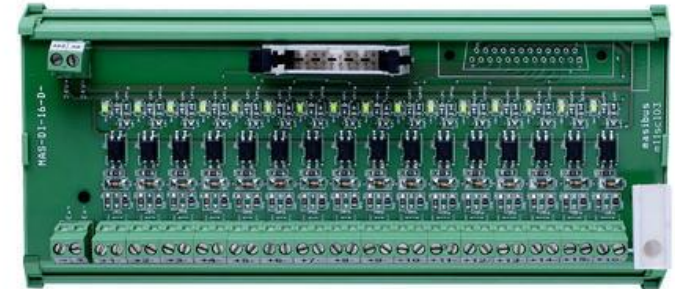
Voltage (0–5V, 0–10V, 0–50mA)

Frequency/Pulses

Pulse-width variations

Capacitance

Digitizers



Digitizers	Input type
Digital Temperature Controllers	Voltage/Current
On/Off Controllers	Voltage/Current
PID Controllers	Voltage/Current
4 Channel Scanners	Voltage/Current
8/16/24 Channel Scanners	Voltage/Current
Totalizers	Freq / Pulse
Digital Input Cards	Digital Input
Energy Meter	Voltage & Current

IoT Gateways

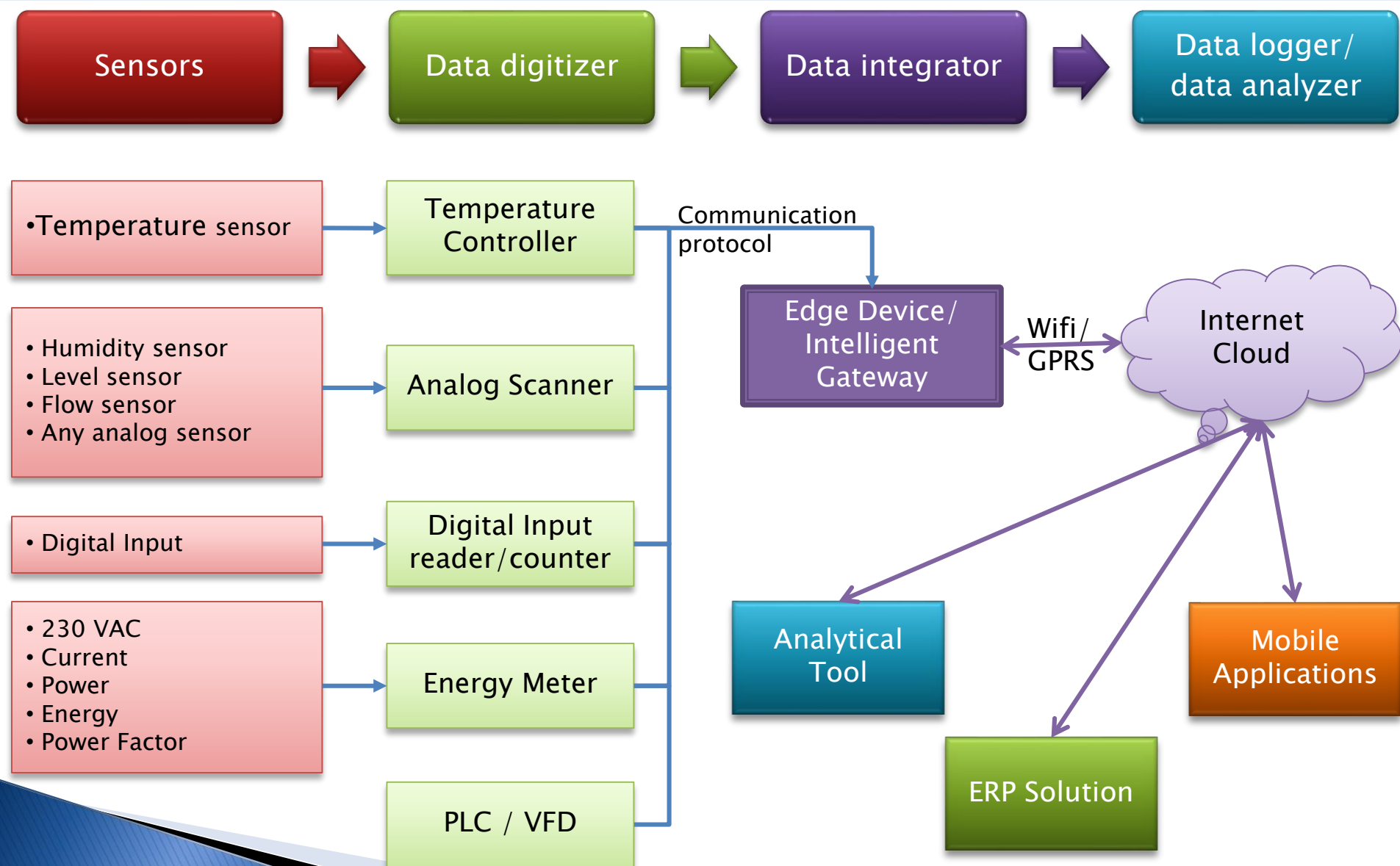


- ▲ Shared Cloud hosting
- ▲ Dedicated Public Cloud hosting
- ▲ Private cloud hosting
- ▲ Private Server (On-premise) Hosting

All you need is an IP address

- ▲ Data acquisition (Wired/wireless)
- ▲ Data transmission from Gateway to Server
- ▲ Secured Storage
- ▲ Retrieval consistency
- ▲ Analysed data transmission from Servers to end-users
 - Web-front end
 - Mobile Apps
- ▲ API exposure for integrating with other systems

Sensor to Analytics – Data flow





METI

Embedding Engineering Excellence

Questions?