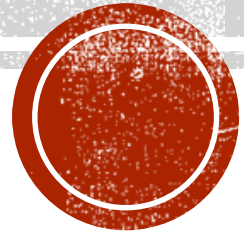
SMART PRODUCT DEVELOPMENT ACCELERATED



Vani Rao S

Sr. Product Manager @SAP Labs India

AGENDA

- Introduction
- IOT & Industry 4.0
- Challenges of Owners / Operators and OEM
- Design Principals of Open Industry 4.0
- Role of Open source

INTRODUCTION

Mainframe & PCs
1960s – 1980s

Client Server & Internet
1990s – 2000s

Cloud, Mobile, & Big Data
2000s – 2010s

Intelligent Technologies
2010s – 2020s

ENABLING TECHNOLOGIES

- Transistors & silicon revolution
- Large scale mainframe computing adoption
- Emergence of PCs
- Plant floor automation

- Widespread PC adoption
- Broadband Internet
- ERP and business process technologies

- Mobile & smartphone ubiquity
- Cloud computing
- Social networks
- Big Data

- Machine learning & Artificial Intelligence
- IoT & distributed computing
- Blockchain

CUSTOMER VALUE CREATION

Industrial Automation

Business Process Automation

Digital Transformation

Intelligent Enterprise

INTRODUCTION

"NEXT PRACTICE"

Capabilities

Visibility

the ability to collect and connect data that was previously siloed and recognize unseen patterns

Focus

the ability to simulate the impact of potential options and direct scarce resources to the areas of maximum impact

Agility

the ability to respond faster to changes in the marketplace or the business and pivot business processes towards the right customer outcomes

Outcomes

Do more with less and empower employees

through process automation and freeing up people to do more meaningful work

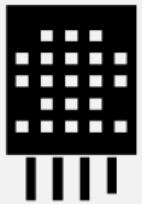
Deliver best-in-class customer experience

by anticipating and proactively responding to end-customer needs

Invent new business models and revenue streams

by monetizing data-driven capabilities and applying core competencies in new ways

IMPACT OF IOT



Experts predict there will be more than **1 trillion** sensors by 2030.

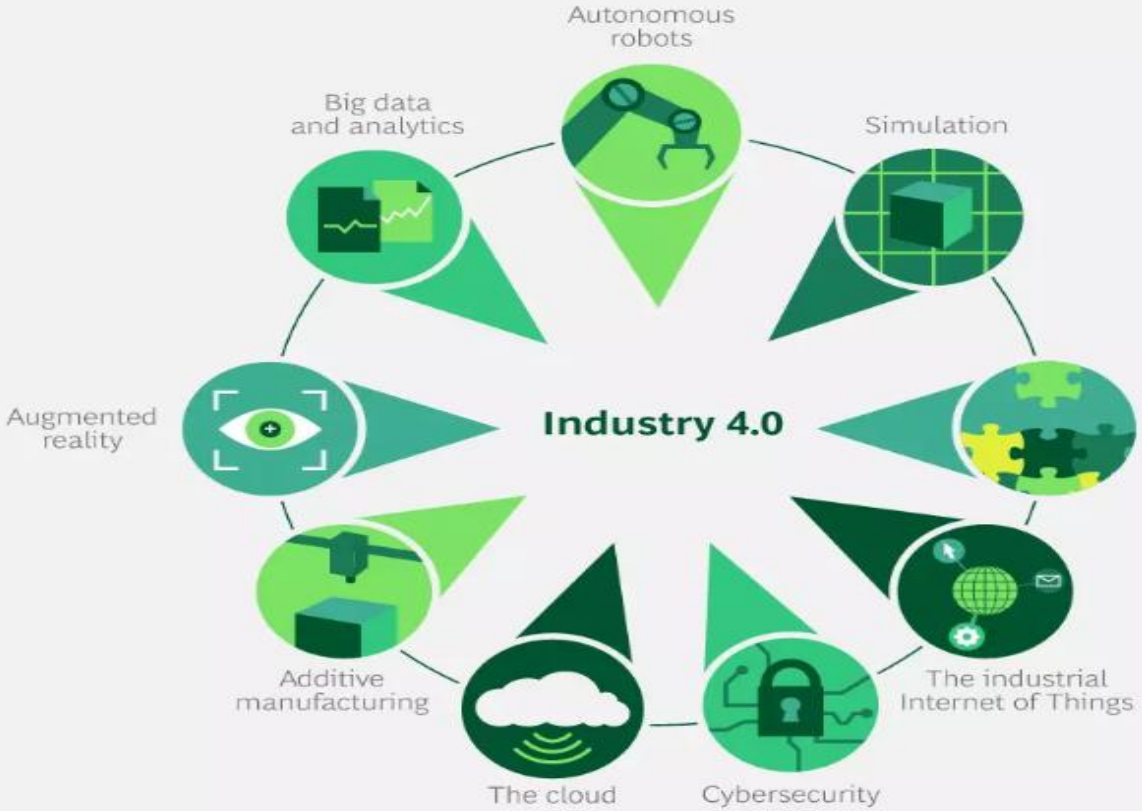
Image, speech, and voice recognition will advance to **99% accuracy** by 2020.

The speed of analytics will grow **thirtyfold by 2030**, with 95% of queries answered in milliseconds.

Sensors will be commonplace in the 111 million new cars and the **2 billion smartphones** that will be purchased in 2020.

The Internet of Everything market could grow to **$14.4 trillion** by 2022.

INDUSTRY 4.0



Nine Technologies Are Transforming Industrial Production

Source: BCG analysis.

CHALLENGES OF OWNERS / OPERATORS AND OEM

Owner / Operator Challenges

(e.g. Volkswagen)

How do I …

- … easily onboard, and subsequently manage (e.g. firmware) a diverse fleet of ‚things' in my factory, plant or warehouse → ‚Easy Standards-Based Connectivity'
- … compute / process / refine / convert the data from the machines into insight as cost-effectively as possible → ‚Secure Hybrid Architecture'
- … manage the data securely, and share only what I want to share → Asset Central in conjunction with Asset Intelligence Network
- … avoid intrusions into my factory / plant / warehouse → One hole / one pipe industrial grade security PLUS OT partner expertise
- … benefit from all the good work that have been done by Platform Industrie 4.0, Industrial Internet Consortium and other standards bodies → standardization of asset models and embracing sematic standards
- … achieve quick results → Pre-build Edge to Cloud to App Integration

Factories

Plants

Warehouse

OEM Challenges

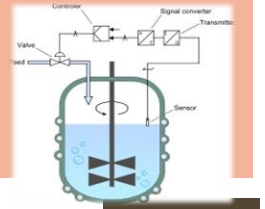
(e.g. KUKA or Endress & Hauser)

HOW DO I …

- … REACH MY CUSTOMER'S EQUIPMENT, AND DELIVER THE DOCUMENTATION (E.G. THE DIGITAL BIRTH CERTIFICATE DOCUMENTATION) TO ANYWHERE IN THIS WORLD → USING A GLOBAL, SHARED AND STANDARDIZED PLATFORM OFFERING,
- … PROVIDE VALUE ADDED SERVICES AND NEW BUSINESS MODELS TO MY CUSTOMER WHEN MY EQUIPMENT SITS BEHIND MULTIPLE LEVELS OF SECURITY / FIREWALLS IN A FACTORY / WAREHOUSE / PLANT → VIA AIN INTO THE CUSTOMER'S 'SECURE HYBRID'
- … PROVIDE (AND MONETIZE) REMOTE SUPPORT AND UPGRADES (E.G. FIRMWARE, ALGORITHMS, APPS) FOR MY SMART EQUIPMENT → VIA THE APPSTORE LINKED TO AIN
- … CREATE AN OT SYSTEM INTEGRATION BUSINESS UTILIZING THE PORTFOLIO OF CAPABILITIES OF MY COMPANY, AND THAT OF MY FRIENDS → BUILDING ON A STANDARDIZED, WELL ACCEPTED, GLOBALLY SUPPORTED OFFERING

Sensors

Machines



Controls

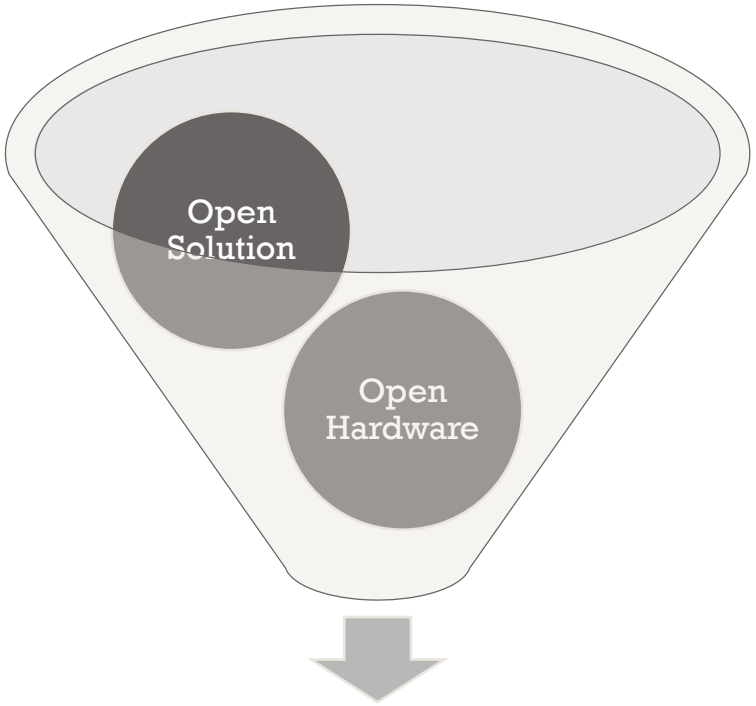
DESIGN PRINCIPALS OF OPEN INDUSTRY 4.0

- The O4I solution is a **distributed cloud and edge computing platform for Industry 4.0** scenarios in discrete and process manufacturing (factories, plants, and warehouses); edge components are **orchestrated from the cloud**
- It provides **common semantic** equipment and data **models** from the edge to the cloud, managed and **shared** by **manufacturers** and **operators** in a **central asset repository** instance as well as a **common onboarding** approach
- **Edge and cloud components** at the operator are integrated through a single connector (“**single pipe**”) with common configuration and lifecycle management, orchestrated from the operator’s cloud tenant
- The solution includes **open**, **extensible**, and interoperable **data pipelines,** data **processing,** and data **persistence** at the **edge** and in the **cloud**
- **Data filtering, anonymization, and sharing** from the operator’s edge to their manufacturers (e.g. for support or optimization) is **governed by the operator**
- Operators can install and manage distributed **edge and cloud applications from a central marketplace**; the solution provides a **container-based distributed** edge and cloud **orchestration environment** (but does not include LoB applications)

ROLE OF OPEN SOURCE

open source™

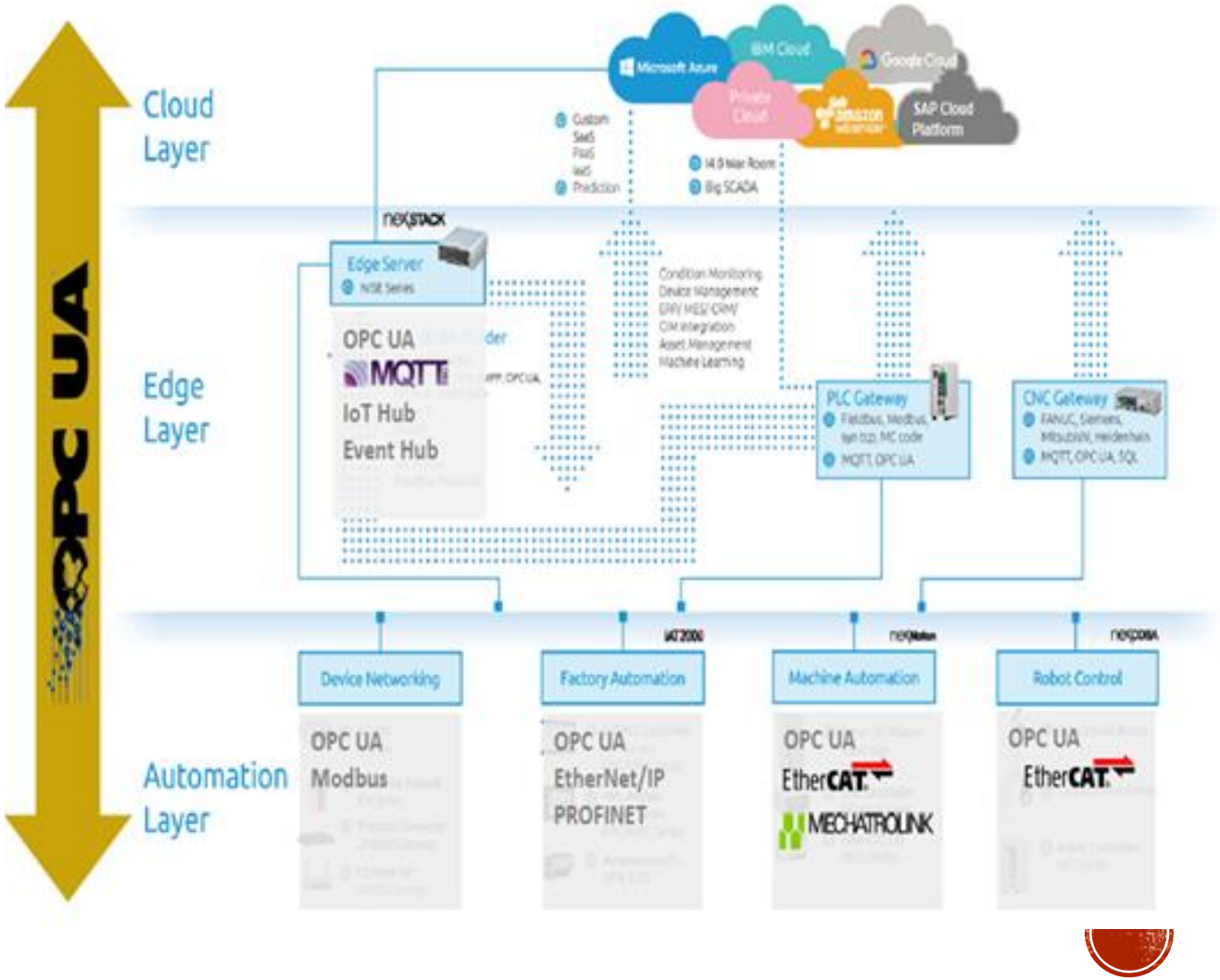
open source hardware



Hybrid Solution

OPC UA


Functional equivalence
Comprehensive information modeling
OPC UA
Platform independence
Extensible
Secure


OPC UA
Cloud Layer
Edge Layer
Automation Layer
Microsoft Azure
IBM Cloud
Google Cloud
Private Cloud
amazon web services
SAP Cloud Platform
Edge Server
OPC UA
MQTT
IoT Hub
Event Hub
PLC Gateway
CNC Gateway
Device Networking
Factory Automation
Machine Automation
Robot Control
OPC UA
Modbus
OPC UA
EtherNet/IP
PROFINET
OPC UA
EtherCAT
MECHATROLINK
OPC UA
EtherCAT

THANK YOU