万向人工智造：AI as a Ubiquitous Fabric

万向集团

About Wanxiang Group | 万向集团简介

Founded in | 成立于：1969

Headcount | 员工数：40,000+

National Innovation and
Entrepreneurship Demonstration Base
国家创新创业示范基地

Top 125/500 in China 中国五百强前125
Top 1 in Automotive Components 汽车零部件第一
Top 8 in Automotive 汽车行业第八
No. 58 in Manufacturing 制造业第58

Wanxiang Group: Hangzhou
China Wanxiang: Shanghai
Wanxiang America: Chicago

万向集团：杭州
万向控股：上海
万向美国：芝加哥

Revenue | 利润： 19B+

Industry 工业板块

Electric Vehicle 新能源汽车
Lithium-ion Battery 锂电池
Clean Energy 清洁能源
Automotive Component 汽车零部件

Average growth rate
平均增长率
25.89%

Agriculture 农业板块：

Chengde Lulu 承德露露
Ocean Family 大洋世家
WANXIANG DONEED 万向德农

Financial 金融板块：

Bank, Futures, 银行，期货
Trust, Insurance, 信托，保险
Fund, FinTech 基金，金融科技

22+Holding/Shared
listed companies
22+控股/参股上市公司

WXIP Roadmap | 万向工业互联网全景图

万向集团 WANXIANG GROUP

Internal design 内部设计资源
Expert support 专家支持
Task distribution 任务分发
Req. publish 需求发布
App promotion 应用推广
Capability Exchange|能力交易 wxiTrade

Order fulfilment 订单完成率
Device OEE 设计利用率
Energy Efficiency 能耗统计
Visualization|数据可视化 wxiBoard

No-code IDE 图形化开发
Edge Forge 边缘开发
Dev tools 开发工具
Algorithm 工业算法
Cloud Forge 云开发
Models 工业模型
DevOps
App Dev. Tools|应用开发工具 wxiForge

Industrial App Shop|应用商店 wxiShop

Industrial Cloud|工业云 wxiCloud
Edge Comp.|边缘计算 wxiEdge

OPENSHIFT
EDGE X FOUNDRY

APM
MRO
SCM
Asset Management | 设备管理
CAM
MES
Product Design | 产品设计
CAX
QMS
CRM
Production | 产品生产
Service | 产品服务

Vertical design ecosystem 行业设计生态
Industrial Apps 工业应用
Design data exchange 设计数据交换
Knowledge encapsulation 知识能力封装
Design SaaS|设计 RomaxCloud

Romax TECHNOLOGY

Value exchange 价值交换
Smart machines 智能机器
Value tracking 价值追溯
Quality tracing 质量追溯
Supply chain 区块链金融
Blockchain|区块链服务 wxiBlockchain

WANXIANG BLOCKCHAIN 万向区块链

Certified Hardware

Device Store|硬件商店 wxiHWStore

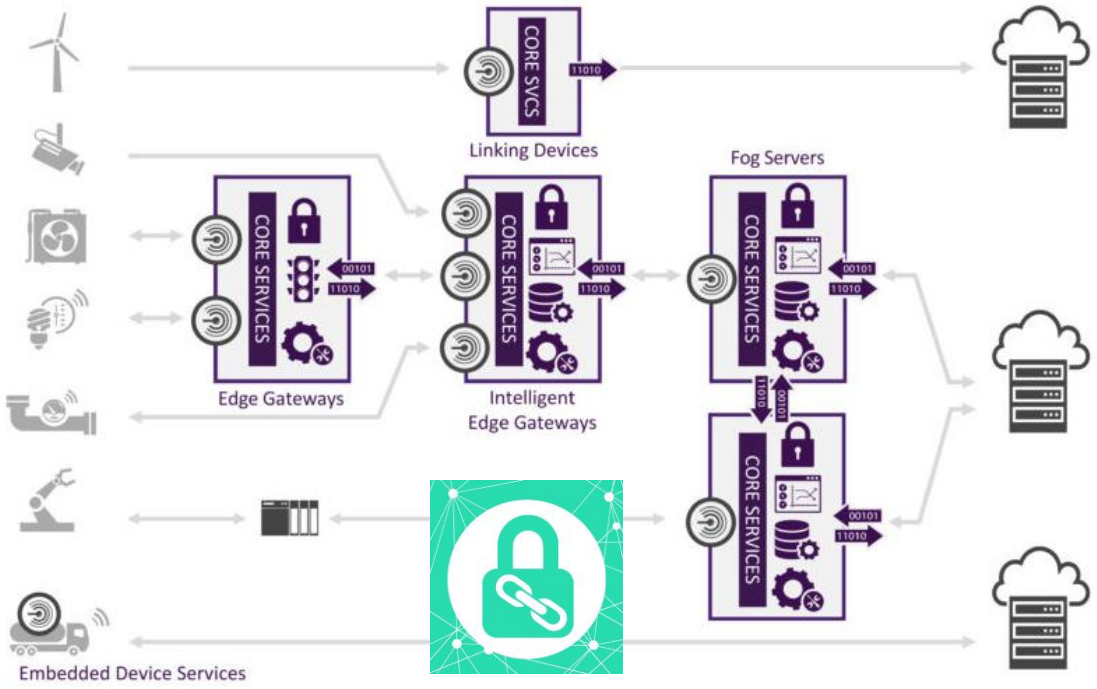
AI in WXIIP: Fundamental Capabilities

- An edge platform to connect to various brownfield production equipment and to provide necessary computation capability to enable edge analytics
- An analytic platform to collect, process, analyze large amount of machine, product and process data
- A knowledge graph that maps data, skills and user intention analytics
- A blockchain underpinning that ensures data integrity and and execution efficiency for AI's decision

- A machine learning model building and execute framework to build models deployable in the system for real-time pattern recognition and analytics
- An industrial app dev-op platform to enable agile intelligent industrial app development, deployment and execution from edge to cloud to optimize production processes.

Content restricted to IIC Members
Not for External Publication

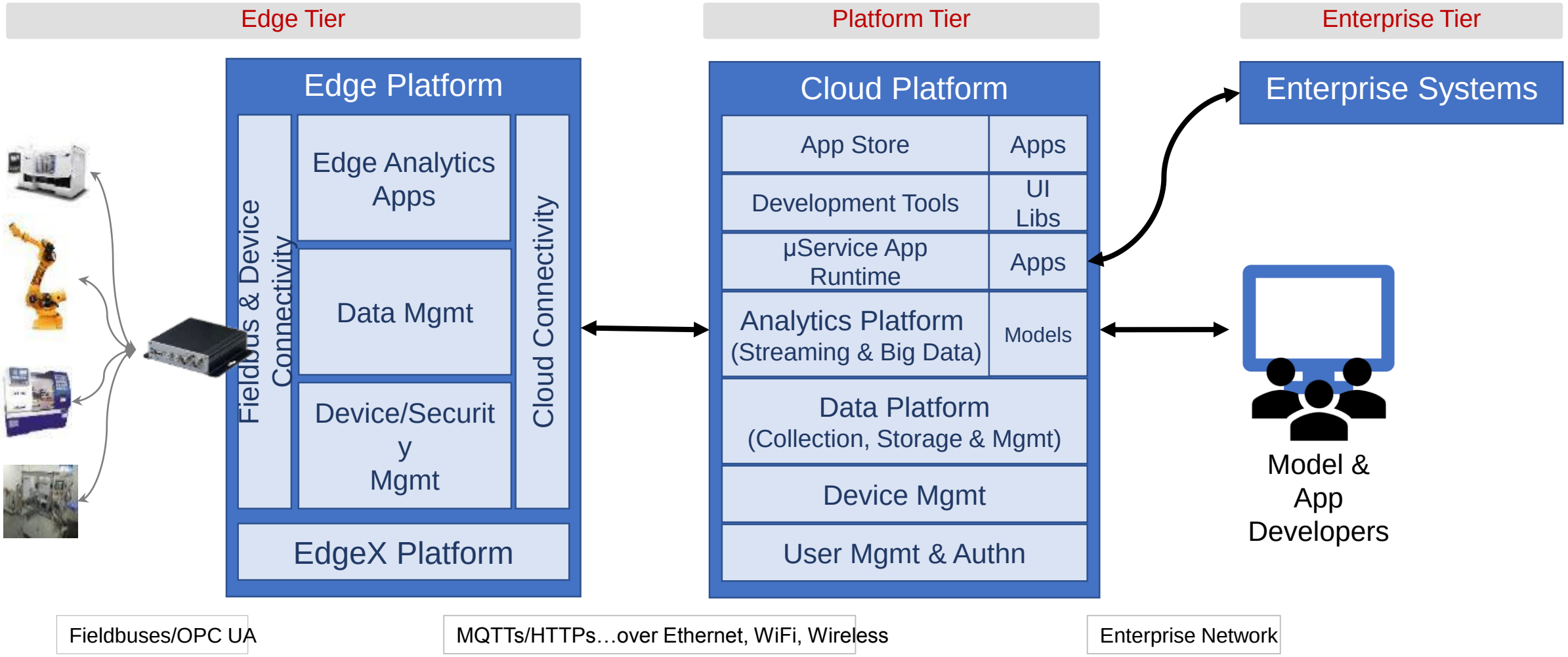
Wanxiang AI-on-Edge Strategy | 万向边缘智能策略



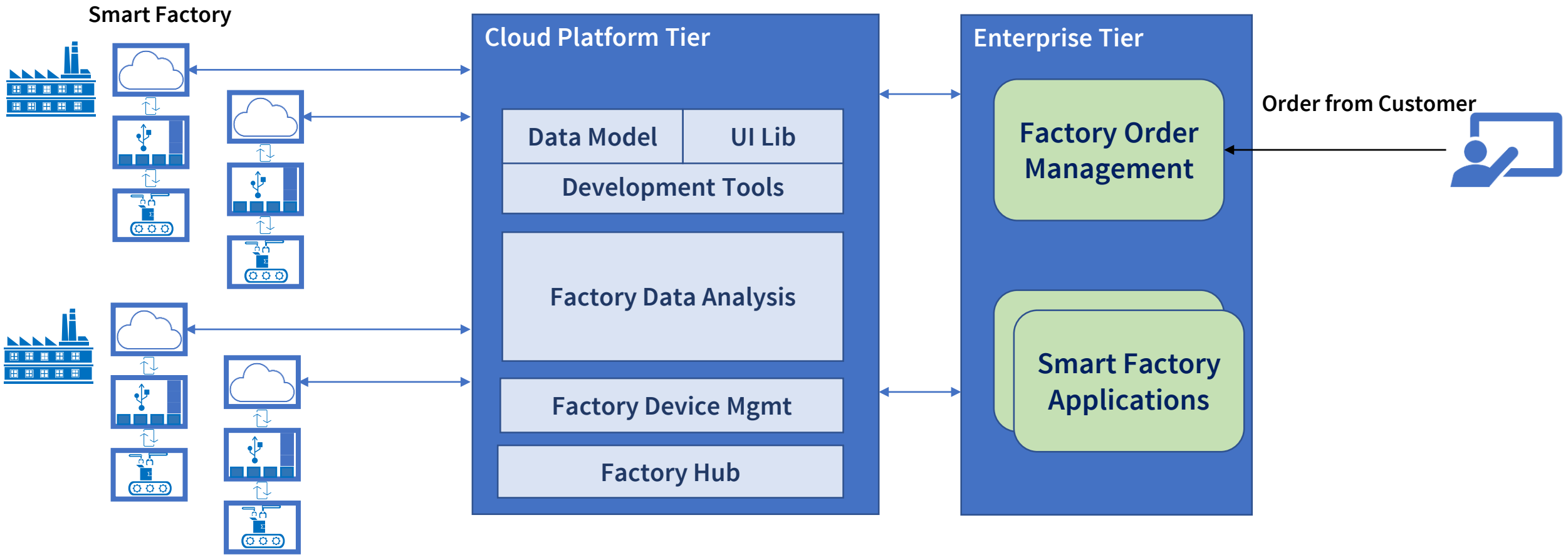
- Establishing standard edge computing platform, incubate hardware development ecosystem
- Incubating micro-service analysis and application development ecosystem
- Establish distributed trusted value exchange network of intelligent machines using blockchain technology

- 建立开放的边缘计算软件框架标准，培育边缘网关硬件开发者生态
- 基于EdgeX开放的微服务框架，培育边缘微服务以及边缘分析应用开发者生态
- 在EdgeX中引入区块链技术，建设分布式可信价值交换网络和智能机器社区
- 建设Testbed，邀请合作伙伴共同建设工业边物联网边缘计算平台，帮助万向解决工业企业的痛点问题

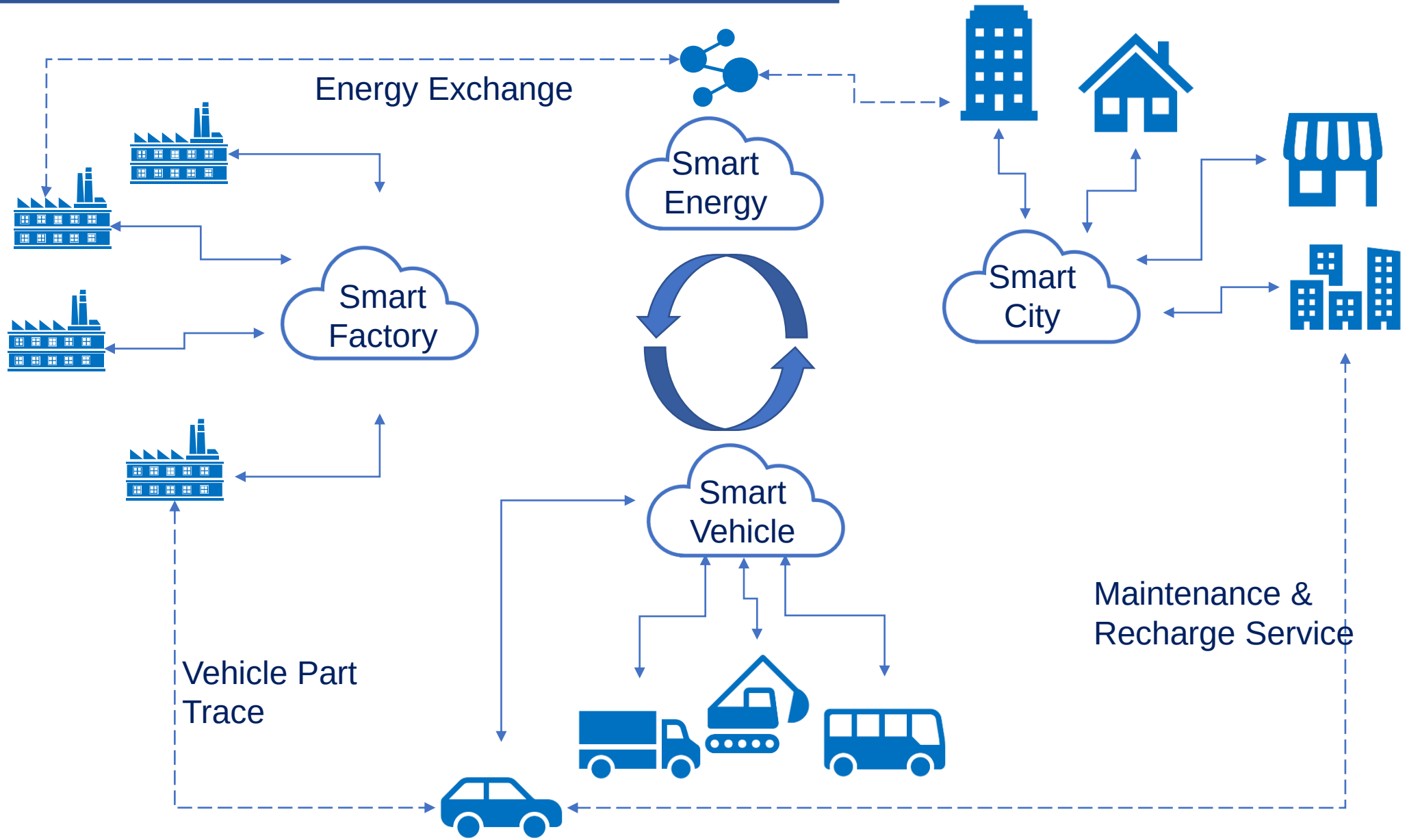
Vertical Integration– Smart Manufacturing Line



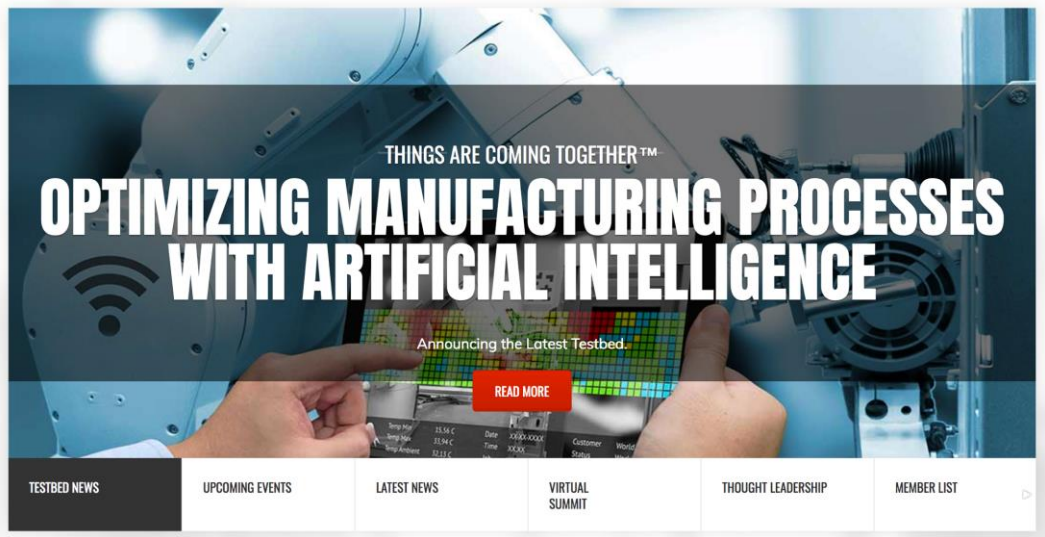
Horizontal Integration– Smart Factory



“Big Integration” - Smart Ecosystem



AI as Computer Vision in Manufacturing



- **Optimizing Manufacturing Process with Artificial Intelligence (OMPAI)**
- An open industrial internet platform equipped with both edge computing and cloud based procedure optimization solutions.
  - Realtime control via interfaces of industrial control system.
  - Local data processing and procedure optimization with edge based microservices.
  - Intelligent decision making and management optimization with cloud based big data and deep learning solutions.
  - Open API for developers, building an ecosystem for both edge and cloud platforms.

- **基于AI优化生产过程测试床(OMPAI)**
- 2018年5月在芬兰IIC Q2 member meeting全球发布，No. 27
- 旨在建设一个开放的工业互联网平台，利用边缘与云协同计算优化生产工艺和过程
  - 利用基于微服务的边缘计算进行本地数据处理与过程优化
  - 通过云平台实现大数据分析和模型训练，提供智能决策和优化
  - 开放的边缘与云接口API，提供给开发者生态共建边缘与云平台应用

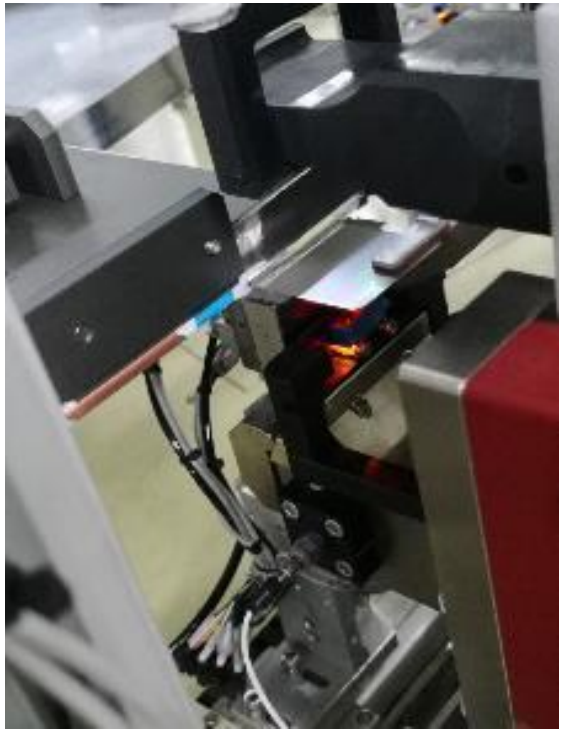
The Industrial Internet Consortium *is the world's leading organization transforming business and society by accelerating the Industrial Internet of Things (IIoT).*

Scenario – Defect detection

- Use online image processing and machine learning to improve the accuracy of product defect detection.
- Use edge computing for online image processing and machine learning to enable real-time response to defect detection
- Use cloud computing to process the historical images to continuously improve the machine learning model to increase accuracy

- 利用在线的图像处理和机器学习技术提升瑕疵检测的识别精度
- 在边缘侧进行实时的识别检测处理
- 在云平台进行持续的历史图像处理，训练更好的模型

Scenario – Battery cell welding quality control



- Welding quality is an important factor affecting battery quality. Unstable welding points may cause battery internal short-circuiting or even explosion.
- The relationship between the welding parameters and welding quality is analyzed by machine learning to control, predict and optimize the welding quality.

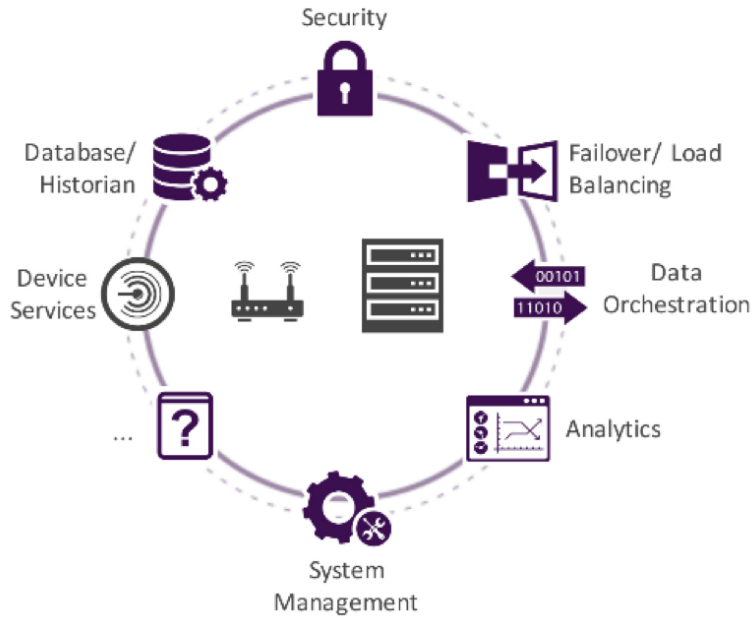
- 焊接工艺是电池整体质量的很重要因素。不可靠的焊接点会导致电池内部短路甚至爆炸！
- 在云平台机器学习分析20多个焊接参数与焊接质量之间的关系，利用边云协同控制、预测、优化焊接质量

Scenario – Process Cadence

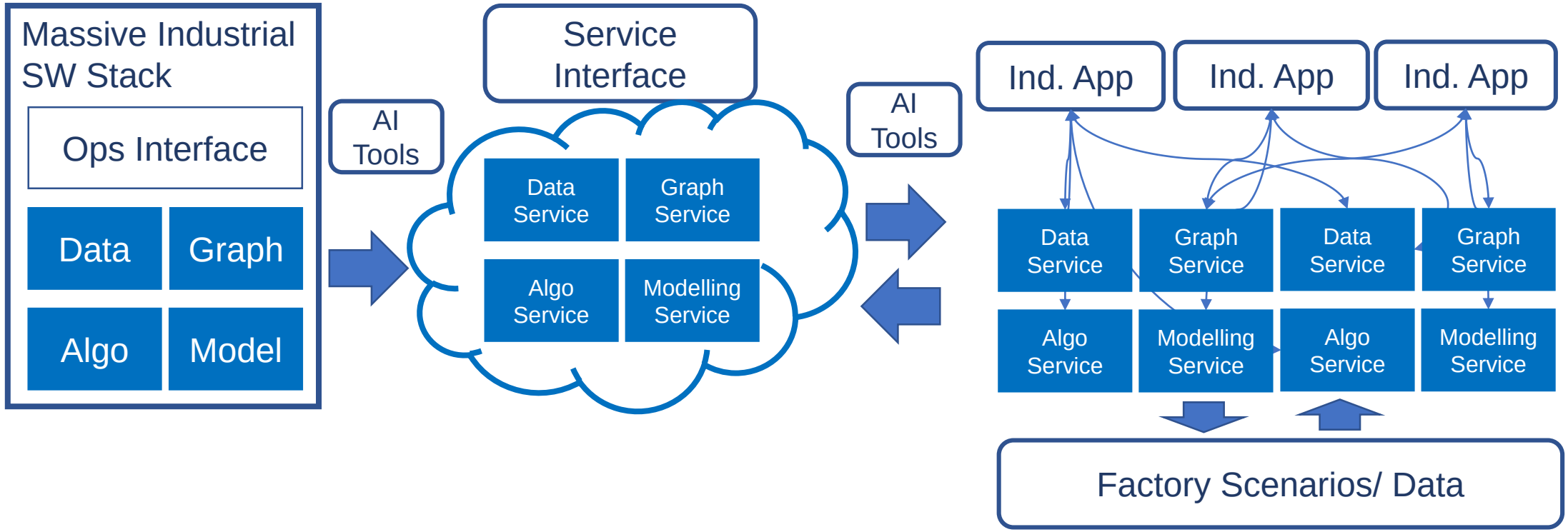
- Through big data analytics of production pace of various equipment and workstations in the production line, production bottlenecks can be identified
- The equipment and workstations pace can be adjusted and balanced to optimize the full production line output, equipment utilization and overall efficiency.

AI + Blockchain: Smart Equipment Social Network

- **Demand → Order Management**：a factory gateway can process orders via its own blockchain account; this account then assigns tasks as blockchain transactions to individual machines via sub-orders; transactions can be settled token-based and through smart contracts within and outside the factory.
- **Smart Diagnostics and Maintenance**：through AI-on-Edge, equipment as a blockchain network node monitors its own work status, detects abnormality, assesses pending impact on the overall production factory capability and availability of resources, and initiates repair order through smart contracts.
- **Industrial Provenance**：blockchain's distributed ledger enables tamper-free data tracking from production to usage, and ensures AI's data analytics be applied quickly and reliably. This creates economic value by reducing the volume of product recall with surgical precision（a pending AII testbed from WXIIP）.
- **Verification & Authentication**：a complete E2E data stack for any particular product via blockchain's "Trust Machine" practically makes any verification & authentication process instantaneous
- **Device Collaboration**：when executing an order, blockchain's trusted communication enables an automated machine data exchange network, on which AI can optimize resources use and productivity.



AI in Large-Scale Industrial SaaS Deployment



- AI, as a cloud-based tool, can assist in adapting large-scale industrial SW stacks to the cloud platform, and develop and maintain API.
- AI coordinates access to cloud-based tools and assets from multiple vendors, toward scenario-specific industrial apps.
- AI uses real-world data to calibrate the apps and ultimately the PaaS tools and assets

Knowledge – Skills – User Intention – Value Mapping

Cloud Platform

Knowledge Conversio

Discovery

Skills & Insights

Industrial App Knowledge Kit

Knowledge Embedding

Max Innovation Min Labor Intensity

Analytic s

Full Life Cycle Industrial Data

Drive

Feedbac k

Industrial Middleware—— Design SW、Equipment、Products and Services

Design Simulation、Test Equipment、Machine Tool、Robotics

开放共享·创新聚能