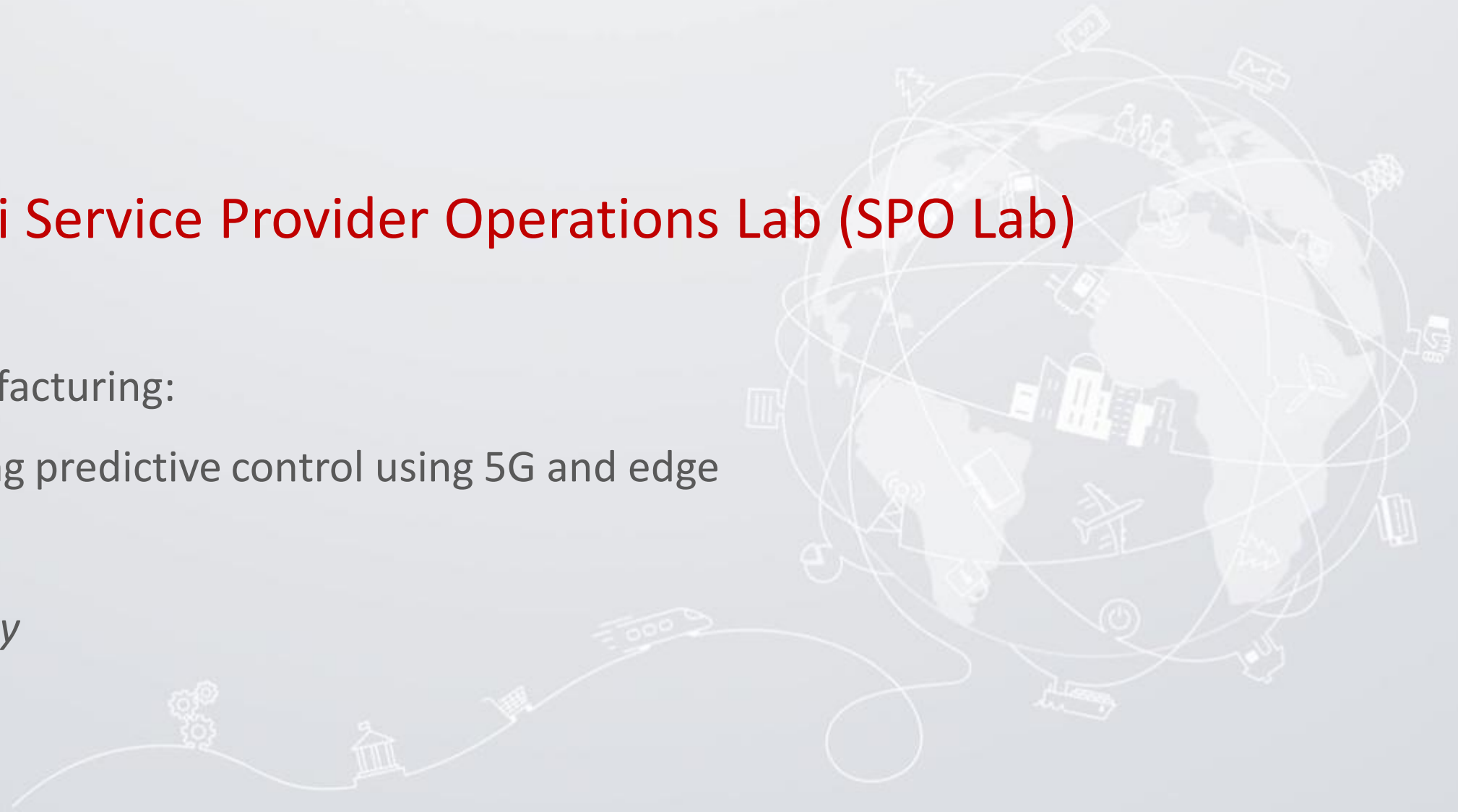
- # Huawei Service Provider Operations Lab (SPO Lab)

  - Smart Manufacturing:
  - Implementing predictive control using 5G and edge

  - *Dave Mohally*



Digital transformation in Smart Manufacturing

Agenda

Moderator: Martin Creaner, Huawei Advisor

Webinar, 13:00-15:00, Apr. 28th(GMT)

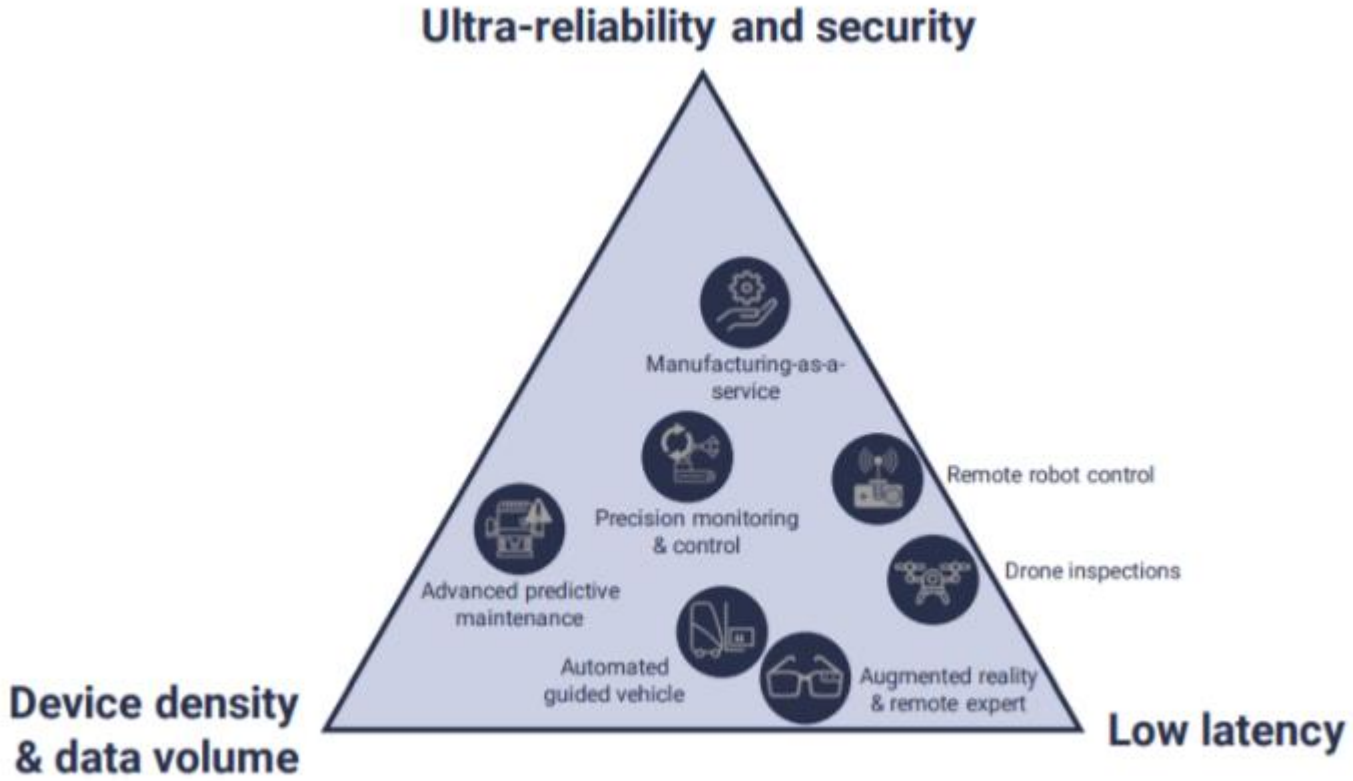
Topic	Speaker Name	Organization	Time
TBD	Gunther Koschnick	ZVEI	13:00-13:15
TBD	Hatsuko Koroku	IVI	13:15-13:45
The Path to Digital Transformation	Stephen Mellor	IIC	13:45-14:00
TBD	TBC	AII	14:00-14:15
What industry applications require to 5G network	Dan Liu	SAC/TC 124	14:15-14:30
Implementing predictive control using 5G and edge	David Mohally	SPO Lab	14:30-14:45
Free talk and discussion	Martin Creaner	Huawei Advisor	14:45-15:00

5G's unique capabilities enable new and improved use cases

5G has unique capabilities that allow it to play a significant role in using data – machine, plant, product, and environment data – more effectively.

For the manufacturing industry, the three most important advantages stemming from 5G are:

1. The ability to **connect many <u>more devices</u>** and **capture more data**;
2. Ensuring **connections are <u>ultra-reliable</u>** and secure to avoid loss of data;
3. **<u>Reduce latency to ultra-low levels</u>** of below 10 milliseconds so that data is captured real-time.



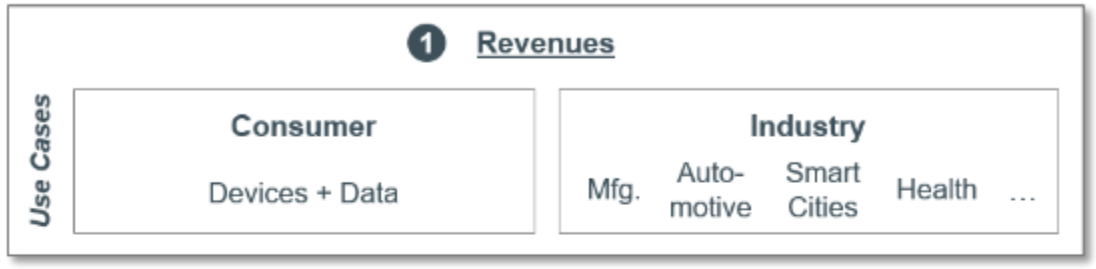
Source: STL Partners

As shown above, this opens opportunities across a range of applications, which leverage these benefits to different degrees depending on the nature of the application's requirements.

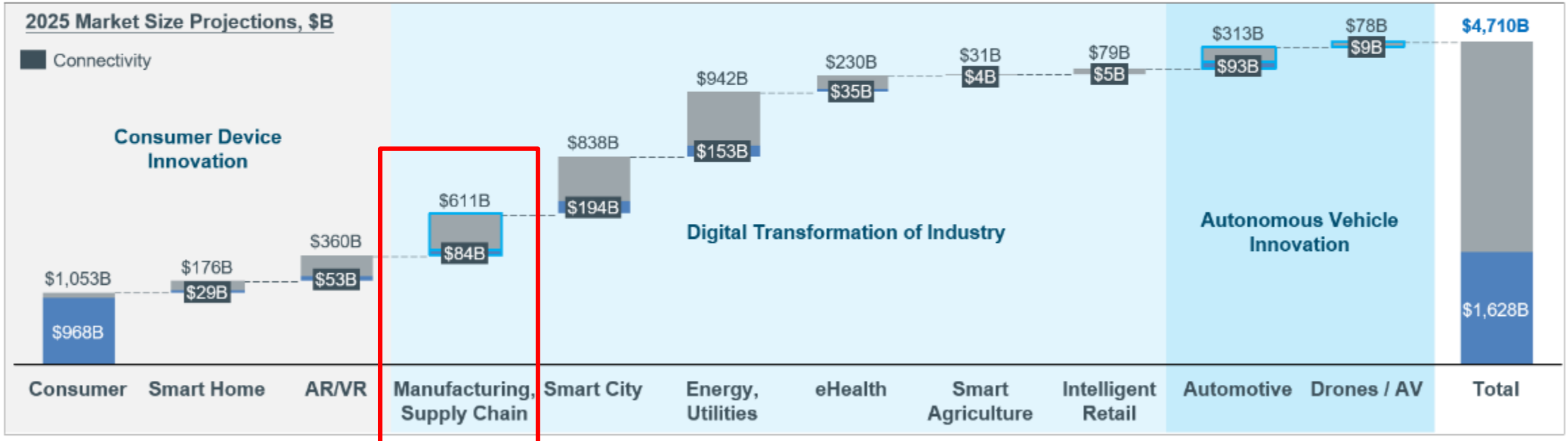
Source: STL Partners – The impact of 5G on the Manufacturing Industry

5G Revenues driven by both consumer and industrial use cases (2025)

HUAWEI



- **Consumer devices are expected to remain largely unbundled**, as connectivity services continue to offer inherent value to customers (e.g. phone data)
- **Industry connectivity revenue will be primarily tied to full-stack solutions**, though some customers will employ general connectivity to service various use cases



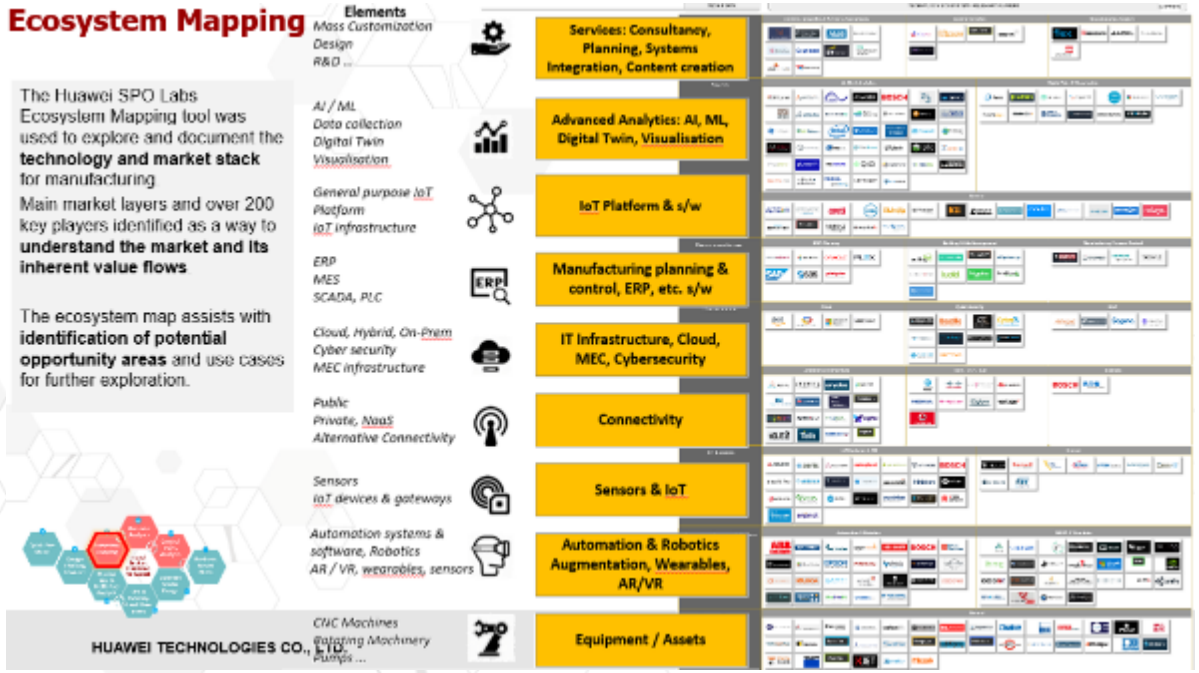
	Consumer	Smart Home	AR/VR	Manufacturing, Supply Chain	Smart City	Energy, Utilities	eHealth	Smart Agriculture	Intelligent Retail	Automotive	Drones / AV	Total
% Connectivity:	92%	16%	15%	13%	23%	16%	15%	15%	7%	30%	11%	35%
Total CAGR:	4%	20%	64%	22%	17%	20%	20%	22%	8%	22%	142%	16%

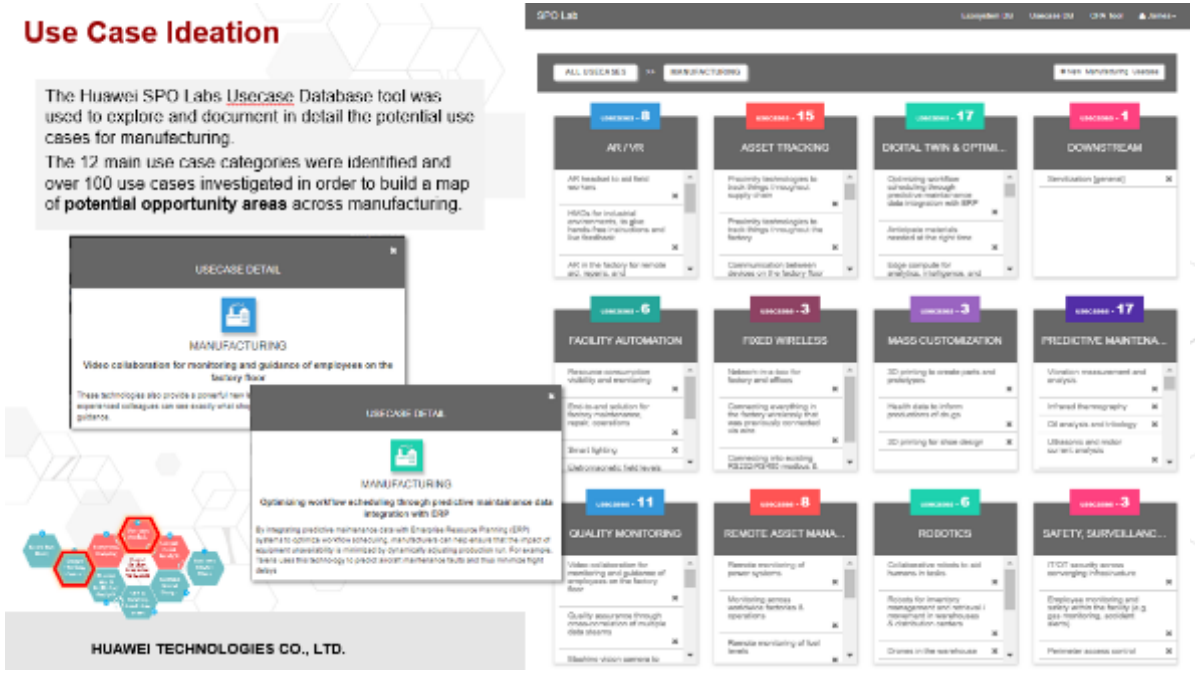
25% Bundled	75% Bundled	50% Bundled	41% Bundled*
Connectivity has intrinsic value	*Connectivity value is tied to use case solutions*	*Connectivity is bundled for large-scale solutions*	

Ecosystem Mapping and Use Case Analysis

The Huawei SPO Labs Ecosystem Mapping tool was used to explore and document the **technology and market stack** for manufacturing. Main market layers and over **200 key players** identified as a way to **understand the market and its inherent value flows**.

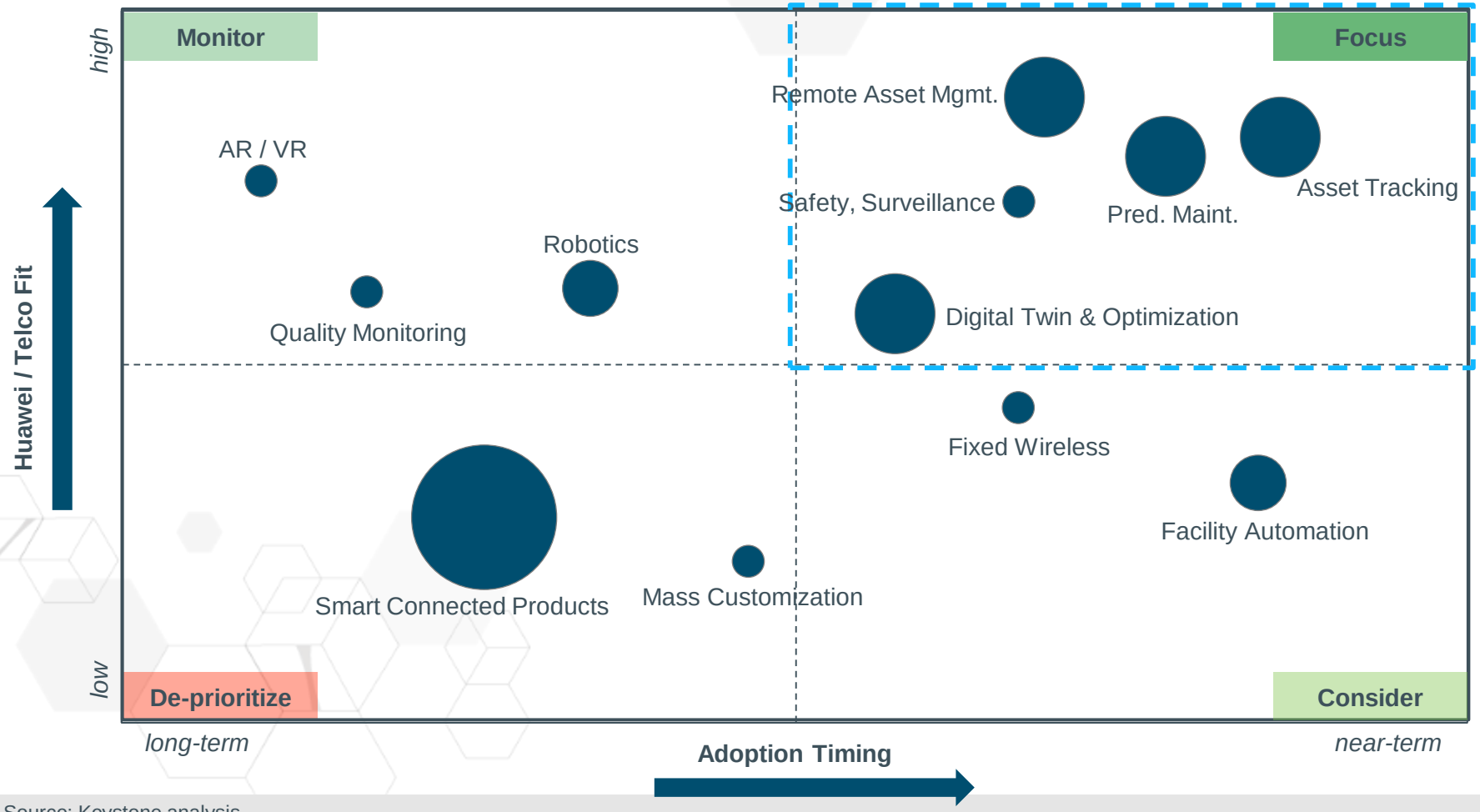
The Huawei SPO Labs Use case Database tool was used to explore and document in detail the potential use cases for manufacturing. The 12 main use case categories were identified and over 100 use cases investigated in order to build a map of **potential opportunity areas** across manufacturing.





Prioritization of use case opportunity areas

Prioritize the opportunity areas based on affinity for telco and timescales for adoption – predictive maintenance, asset tracking and management, and digital twin are strong candidates



Opportunity Sizing:

Size of bubble corresponds to relative opp. size

Focus on the near-term use cases where there is a strong affinity for Huawei and the telco industry

Source: Keystone analysis

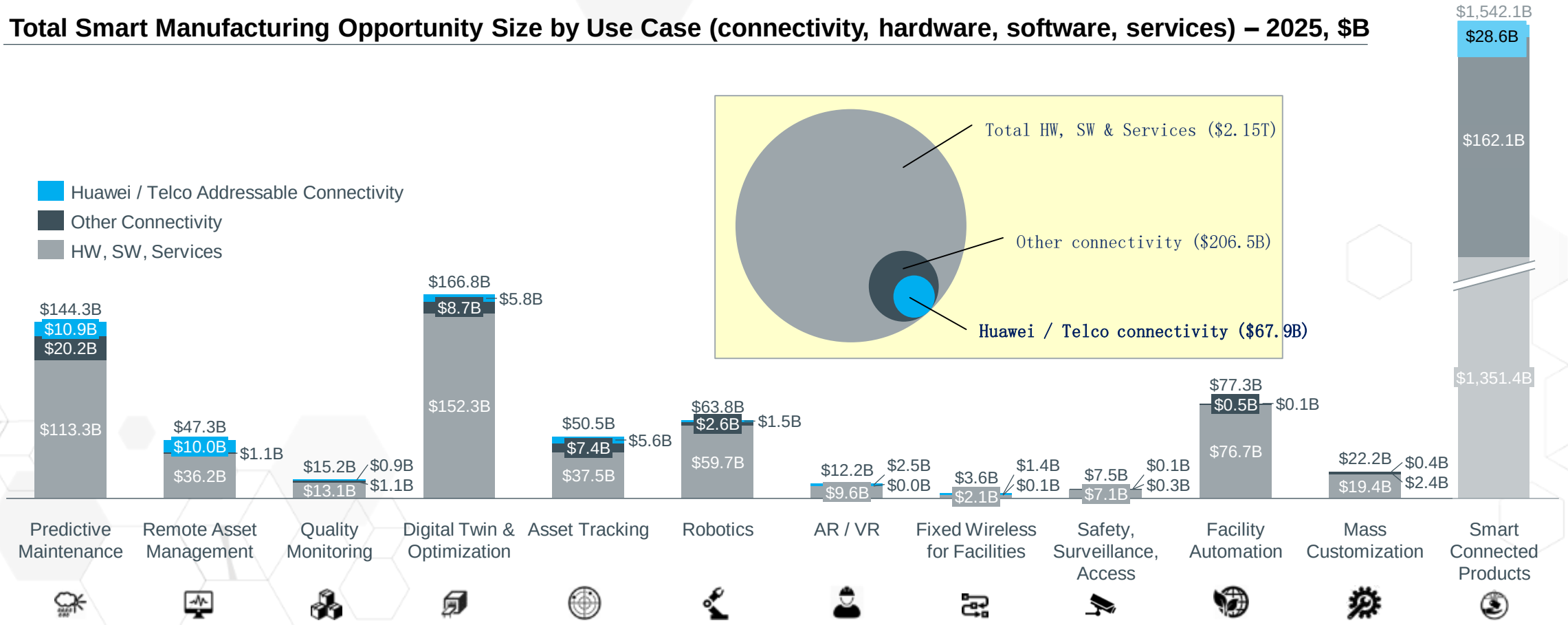
Sizing the Market Opportunity:

Total use case category opportunity sizes broken out by stack component (2025)

Connectivity is a key enabler, but the majority of revenue in these use cases comes from the overall solution value proposition

Connectivity revenue averages ~13.7% of the total, of which telcos and Huawei can capture 47%

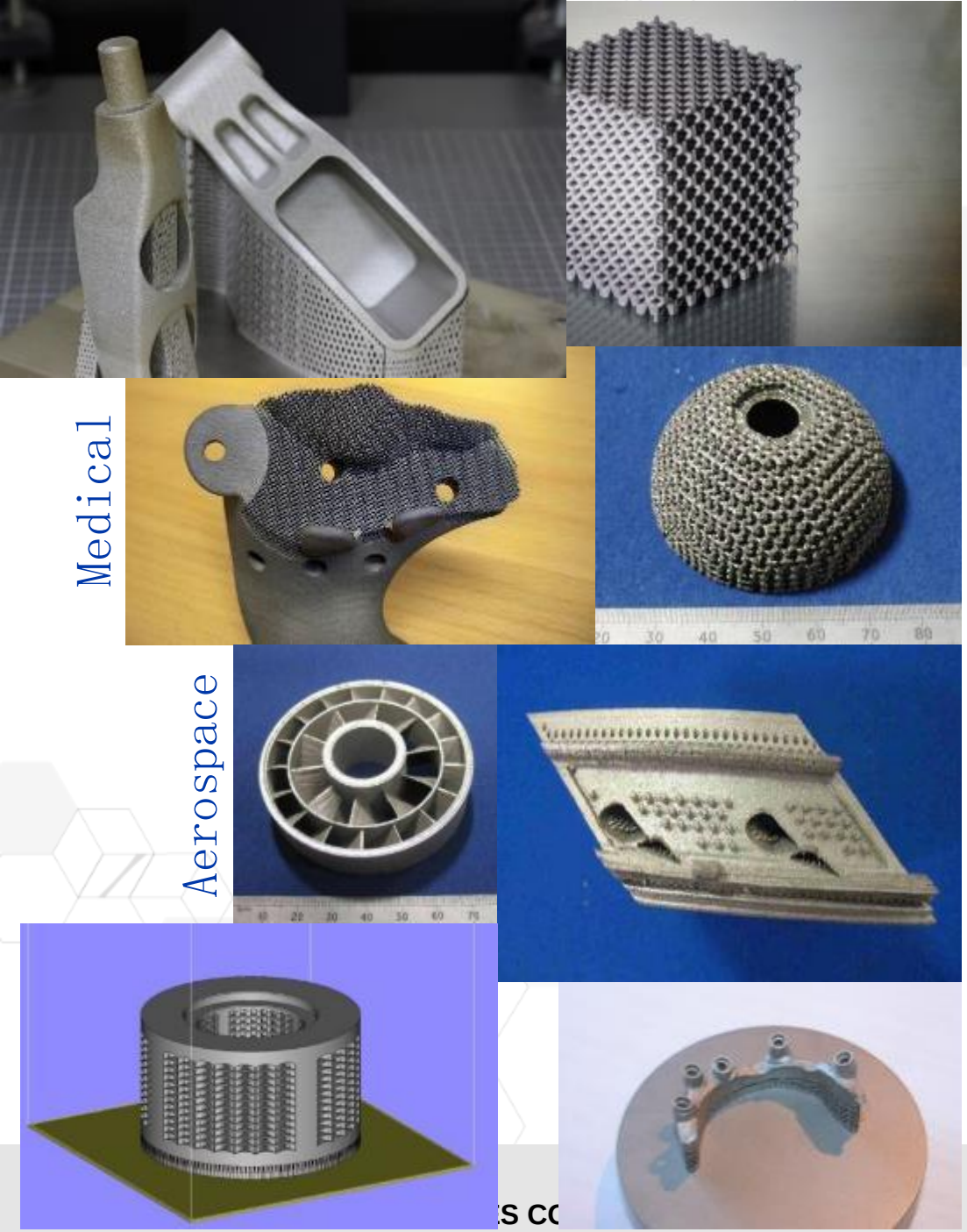
Total Smart Manufacturing Opportunity Size by Use Case (connectivity, hardware, software, services) – 2025, $B



Source: Keystone analysis

Note: **Connectivity revenue averages a weighted 13.7% of total opportunity size** across the manufacturing use cases (excluding smart connected products). An estimated **47% of connectivity** is addressable by Huawei / Telcos.

Example: Predictive Control using 5G for a Selective Laser Melting (SLM) Machine



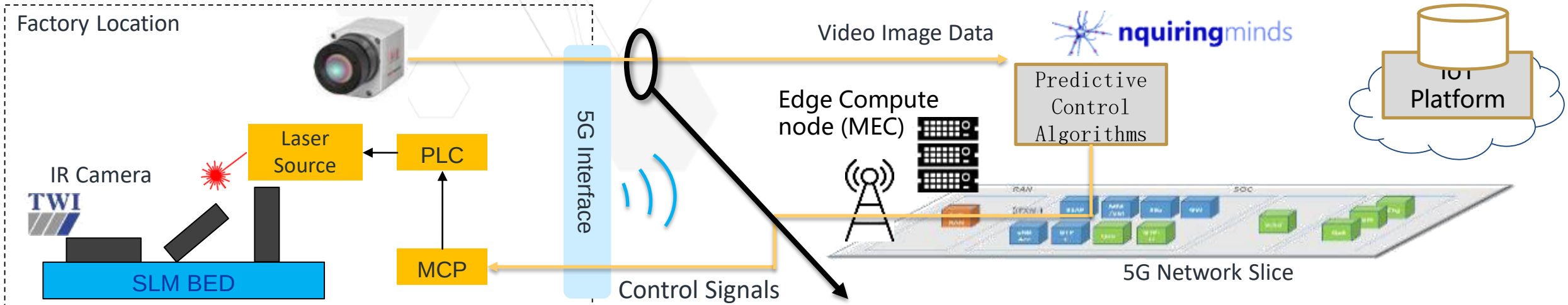
TWI Selective Laser Melting (SLM)
Additive manufacturing using high power laser to melt metal powder, depositing layers to create a piece.

Requires protective atmosphere and very precise control over the laser power in order to create a good build.

nquiringminds

Nquiringminds – AI Analytics company with a proven track record in industrial applications

SPO Lab Project: Cloud-hosted Predictive Control using 5G



At scale a 3D Printing Bureau can generate ~200TB video data per hour

Control response round-trip latency of 80-120ms is required

The SLM (Selective Laser Melting) build process is resource-intensive in terms of materials, technician skills, and time – so failed builds have a direct cost (as well as less tangible costs in terms of missed deadlines and customer disappointment).

Business Case for a site with 200 machines ~ £24.5M savings per annum

Assumptions: Assume we have failed builds up to 20% of the time and a failed build is a total loss.

Assume each machine can complete up to 14 builds per week (2 x 12-hr builds each day) – so we can have ~3 failed builds per machine per week.

Failed Build Direct Costs:

0.5kg materials @ £330/kg = £165

3hr technician time @ £100/hr = £300

8hr machine time @ £40/hr = £320

Total failed build cost = £785

Annual Direct Costs per Machine:

3 builds per week x 52 weeks = 156

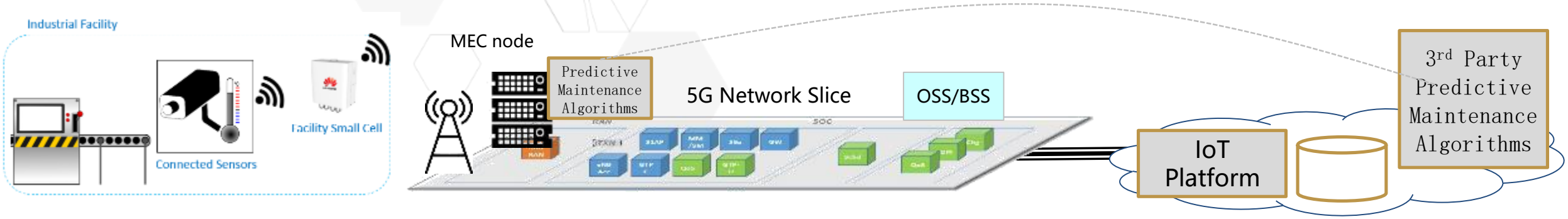
156 failures @ £785 = £122,460

Total cost = £122.5K per m/c per annum

Large manufacturing site with 200 machines:

200 x £122.5K = £24.5M savings per annum

Example Solution Packaging: Predictive Maintenance



Connected Machines	5G Small Cell infrastructure	Edge Compute delivered via MEC node	Dedicated 5G network slice	General-purpose IoT Platform	Specialist predictive maintenance application
Machine Tool OEM	Telco / SI partner	Telco	Telco	Telco / 3rd party	3rd party

Example of Service Offering: Predictive Maintenance with 5G

Connectivity

Network-as-a-Service for the facility

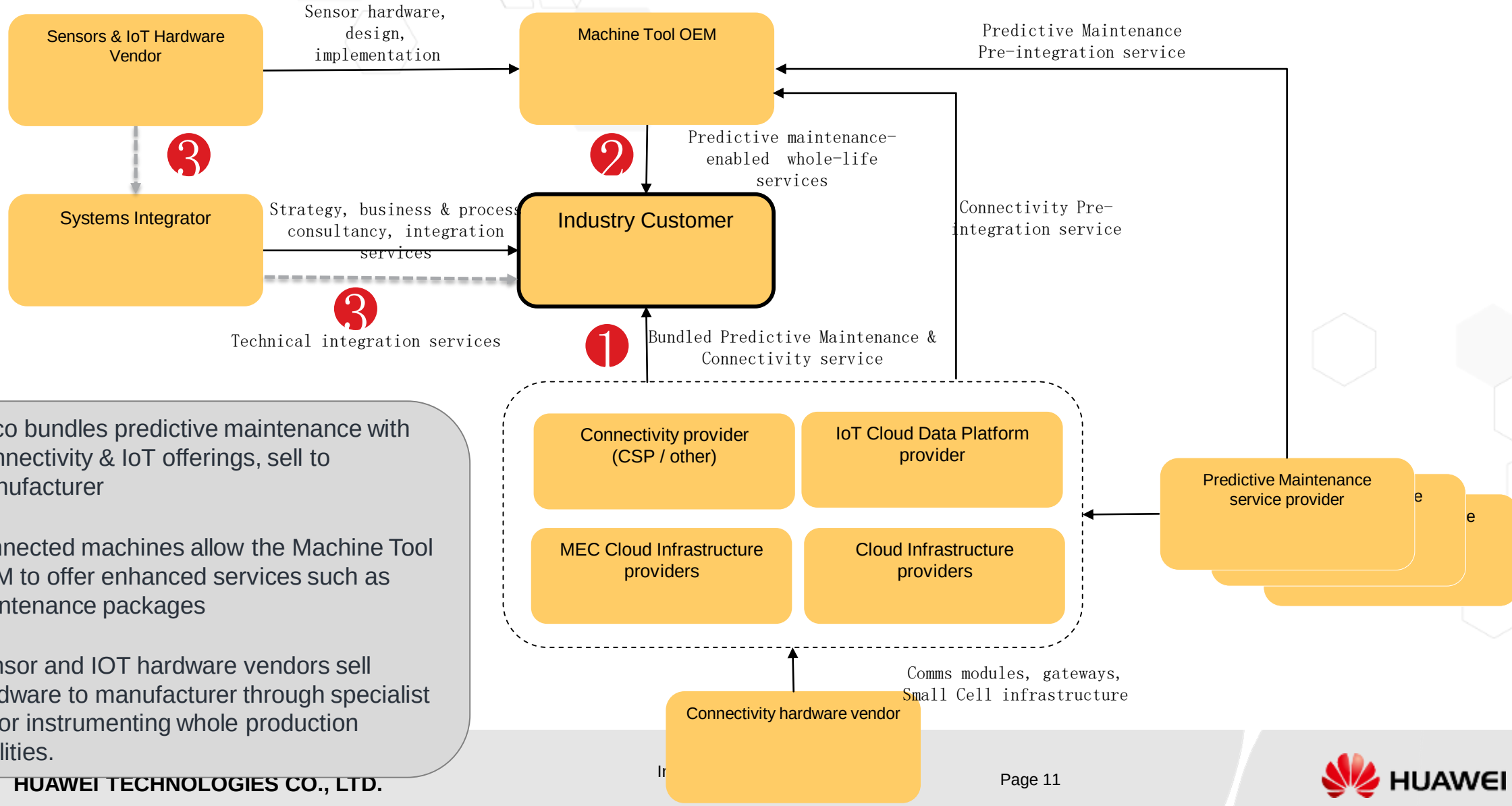
- Small-cell deployments as required
- Dedicated 5G network slice
- Fixed-line backhaul
- MEC-based Edge Cloud

+

Predictive Maintenance

- Predictive maintenance application (partner technology)
- General purpose IoT platform
- Range of machine tool products pre-integrated
  - Fitted with appropriate sensors at assembly or retro-fit
  - Predictive maintenance algorithms trained with sample data
- Pre-qualified systems integrators assist with deployment and integration

Predictive Maintenance/Control Value Network
- Identifying the main players and the nature of the relationships between them



1. Telco bundles predictive maintenance with Connectivity & IoT offerings, sell to Manufacturer

2. Connected machines allow the Machine Tool OEM to offer enhanced services such as maintenance packages

3. Sensor and IOT hardware vendors sell hardware to manufacturer through specialist SI for instrumenting whole production facilities.

Thank you

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