



F5G Workshop
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Application of Gigabit Optical Network in Industrial Manufacturing

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- Major network problems faced by small factories
- Industrial PON as an enabling solution for industrial customers
 - Key technologies
 - Enhanced solution for intra-factory network
- Customer use case #1: sheet metal manufacturing company
- Customer use case #2: typical cell-phone manufacturing factory
- Summary

Major Network Problems faced by Small Factories



Current major network problems from industry



Lacking of smart management



Prone to EM interferences



Hard to unify multiple protocols within the factory

Percentage of small factories
NOT ready for digital transformation

79%

- Small factories face several difficulties due to lack of digital transformation based on advanced networking
- Modernization of the underlying network is a crucial step

Gigabit optical network solution as industrial PON is a promising solution for these above problems

Difficulties on work flow scheduling



63%

% of on schedule

Difficulties on manufacturing



83%

% of qualified product rate

Difficulties on Raw material storage



25M CNY

cost of inventory in advance

Difficulties on Labor costs



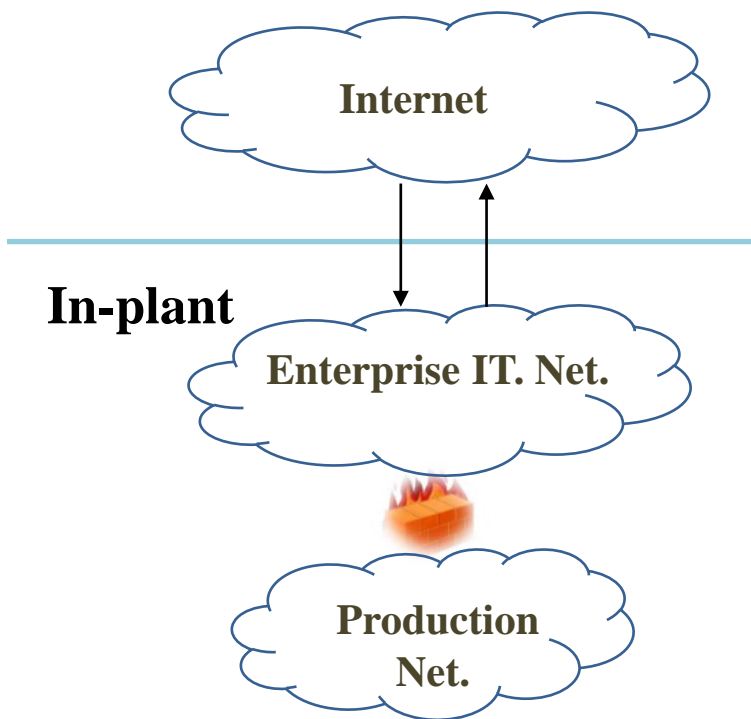
18.6 CNY

Labor costs per 100 CNY output

Difficulties faced by a typical small factory

Traditional Factory Network

- Isolated Networks
- Inefficient Performance
- Deeply Customized
- Information Silos



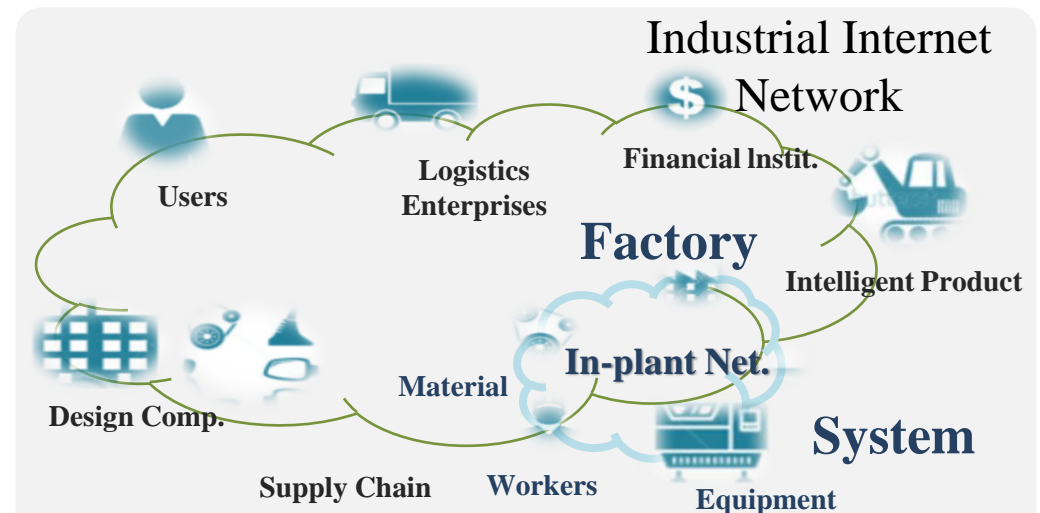
Requirements on Smart Factory Network

- All carried by one network solution
- Real-time data acquisition
- Cloud-based capabilities
- Safety & Robustness

PON

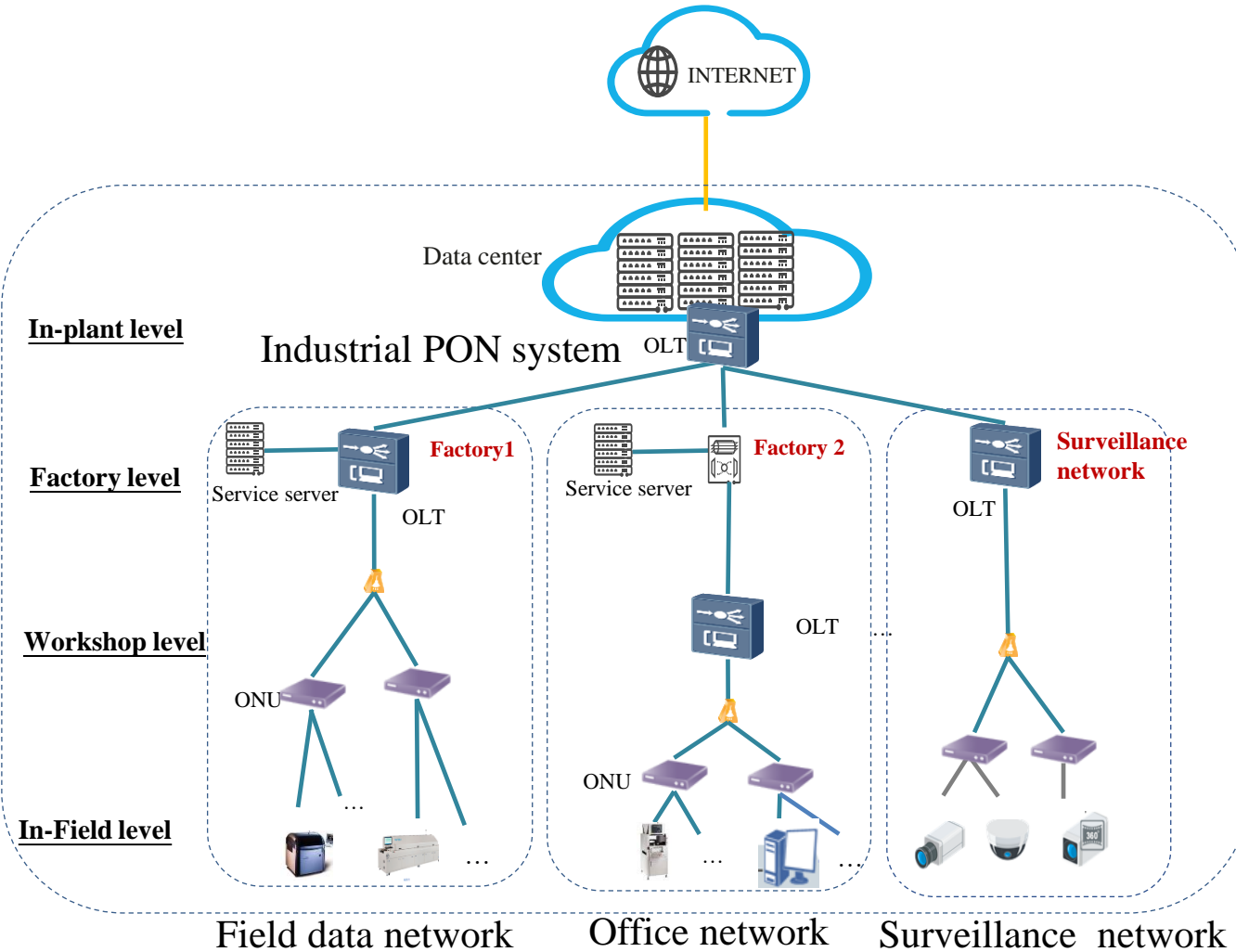
Achieve
IT & OT Convergence

Intelligent Operation Outstanding Performance Agile R&D Durability

Industrial PON can achieve IT & OT convergence for industrial customers

Key Technologies of Industrial PON



Deterministic Capability

- Latency & jitter can be well controlled and adaptive

Network Slicing

- Realize low-cost all-in-one multi-service-carrying PON system, simplifying the factory network

Network Resilience

- High network resilience and availability with standardized multiple protection mechanisms

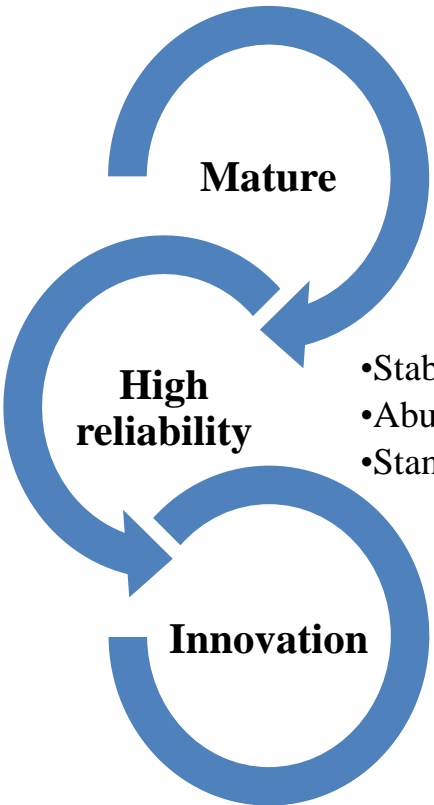
Intelligent Operation

- Network can be much smarter given SDN and AI new technologies

Industrial PON is an all-in-one network solution for factories

Industrial PON is an Enhanced Solution for Intra-Factory Network

- Breaks the barriers among many sub-networks inside the factory
 - Better efficiency and quality
 - Intelligent management and manufacturing
 - Cost efficiency

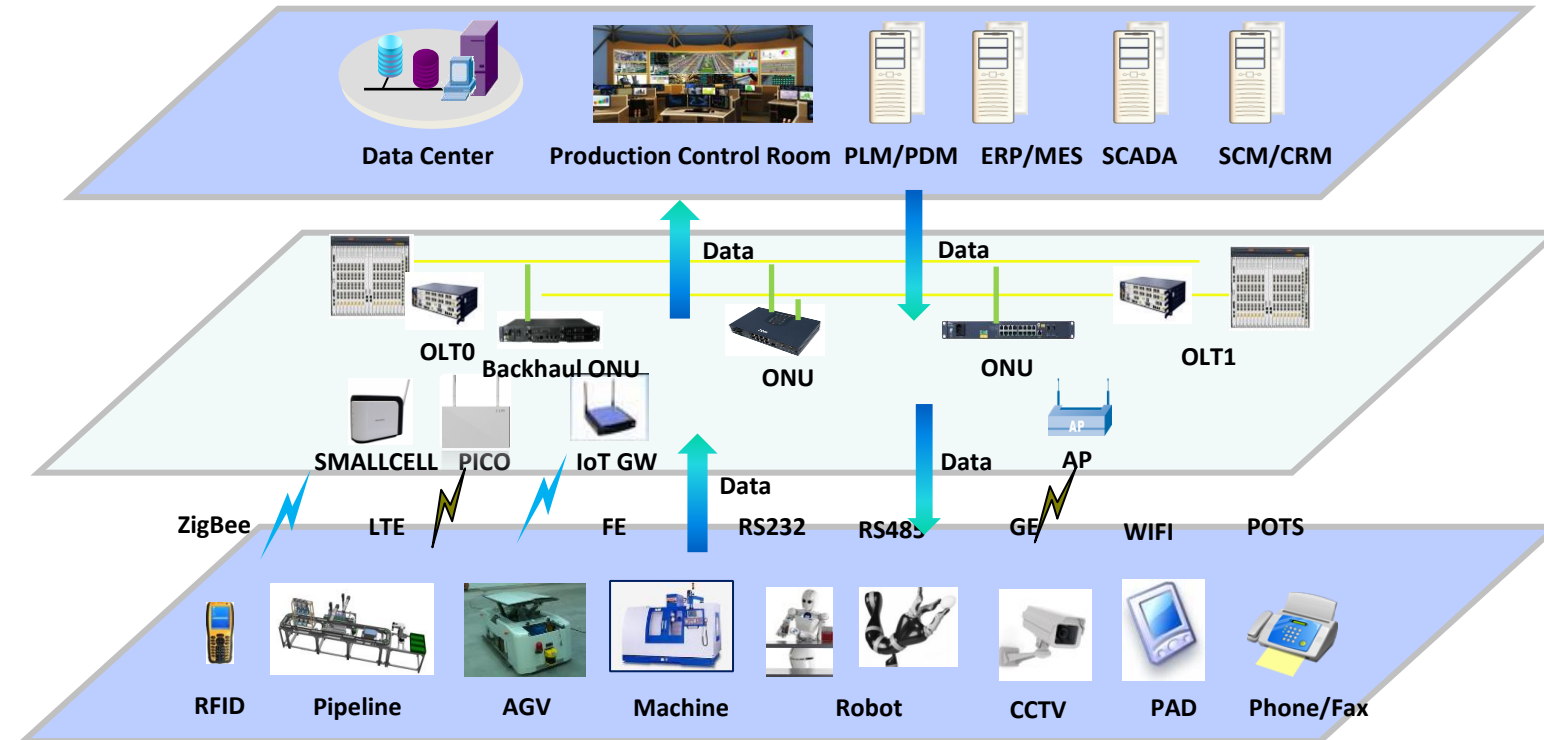


Industrial PON

- Massively deployed in operator network,
- long standing and proven
- cost-effective

- Stable fibre connection
- Abundant security algorithms
- Standardized protection mechanisms

- Latency control
- Edge computing
- Industrial data acquisition interface and protocol conversion
- SDN evolution



PON based industrial network solution overview

Customer Use Case #1: sheet metal manufacturing company (1/2)



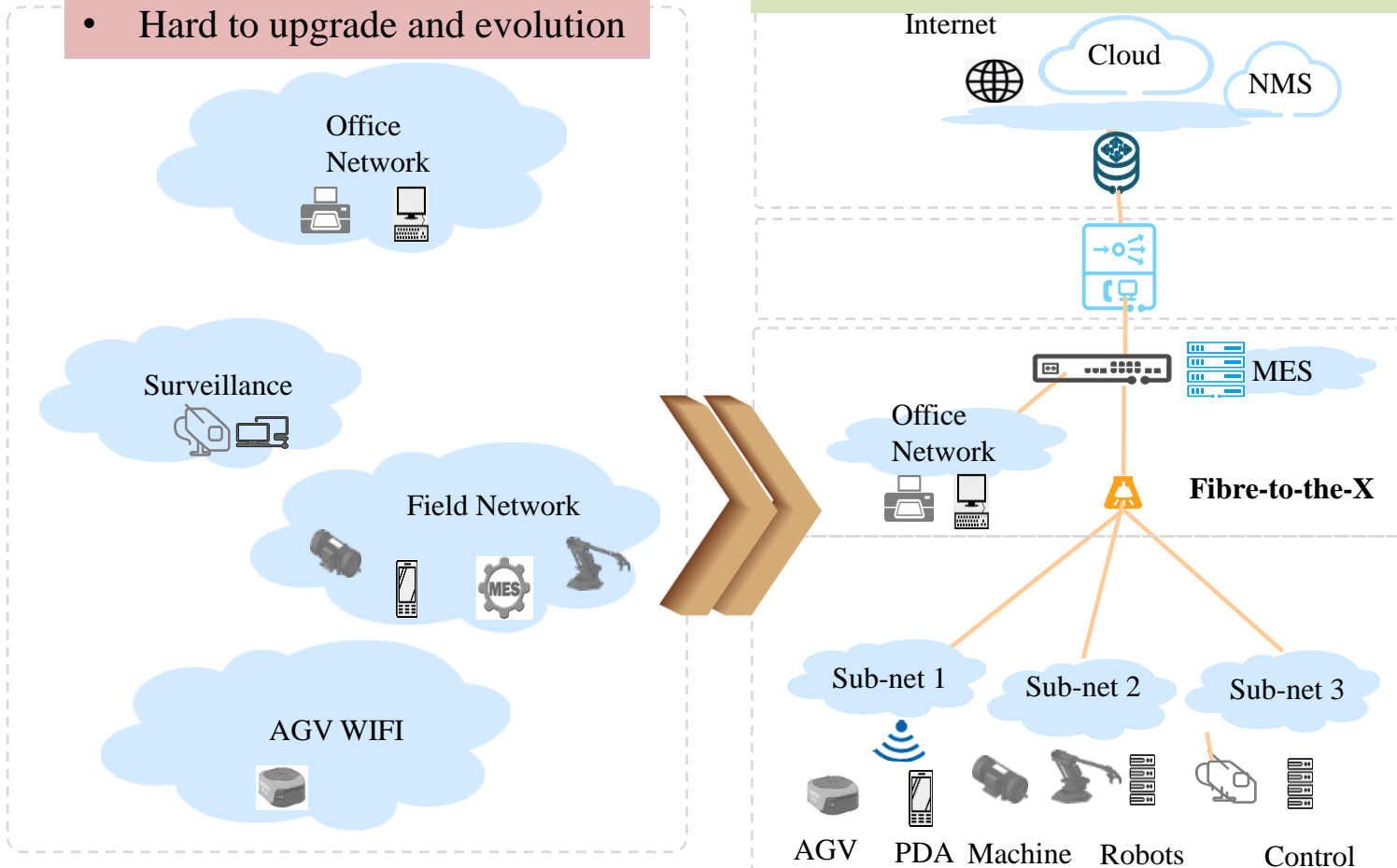
Before: Legacy network

- Business driven networking,
- Isolated topologies
- Lack of coordination
- Hard to upgrade and evolution

After industrial PON deployed:

- Unified topology
- Coordination among all the sub-net
- Stable & lower cost

- From separated sub-nets into a unified all optical network
- Capable of 20 years lifetime with optical fibre networking



Industrial PON solution helps customer made great progress in digital transformation

Customer Use Case #1: sheet metal manufacturing company (2/2)



86%
% of rack space saved

90%
% of wire saved

74%
% construction cost saved

80%
% of energy saved

90%
% of failure rate improved

Significant improvements on various key aspects

Improvements on work flow scheduling



38%
% of on schedule improved

Improvements on manufacturing



16%
% of qualified product rate improved

Improvements on Raw material storage



90%
cost of inventory reduced

Improvements on Labor costs



38.6%
% of Labor costs reduced

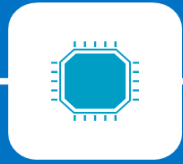
Small manufacturing factories can benefit greatly from gigabit optical networks

Customer Use Case #2: typical cell-phone manufacturing factory (1/3)

Key manufacturing processing steps



SMT



Board testing



Board processing



Pre-assembling



Assembling



Testing

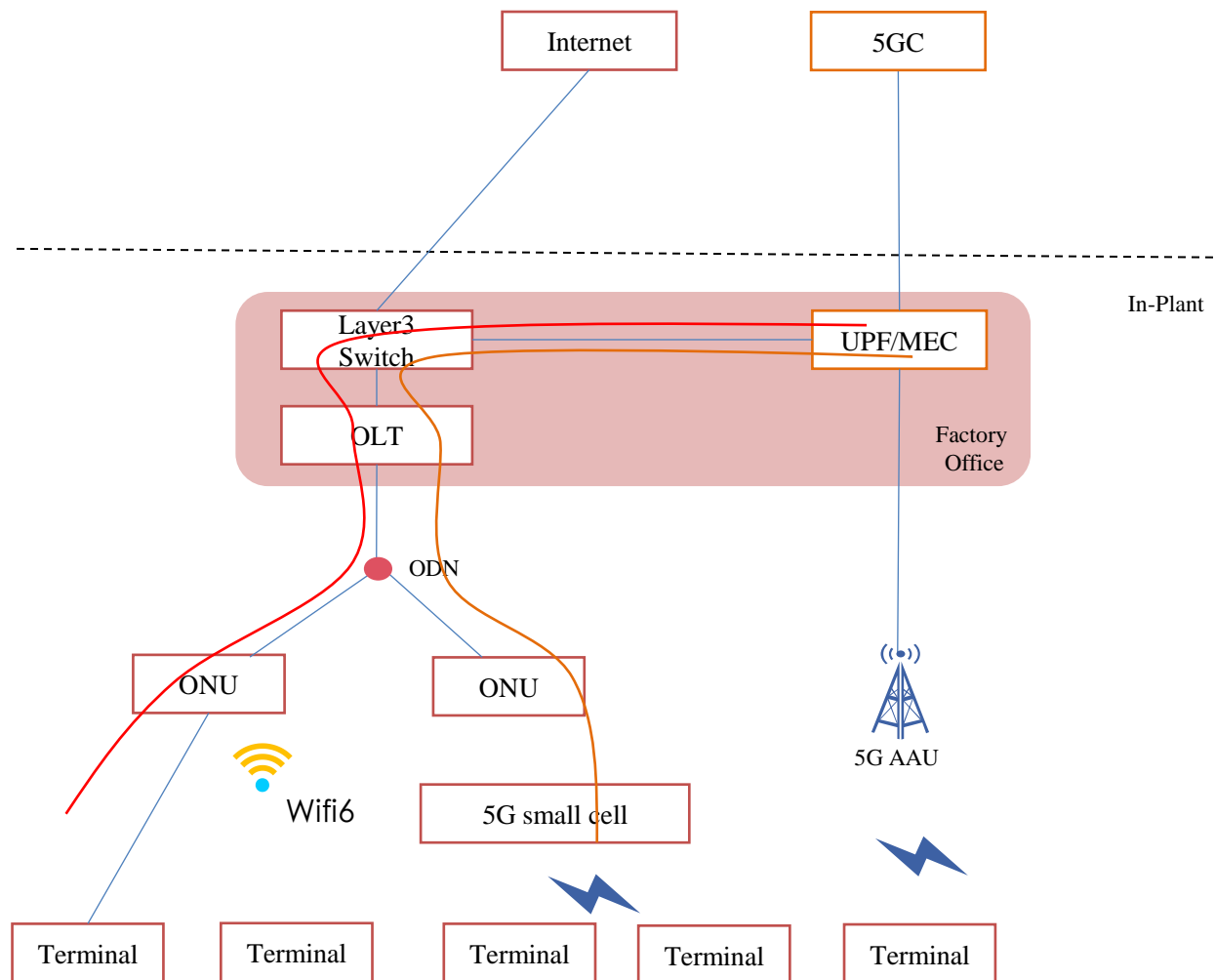


Packaging



**A use case shows Industrial PON+5G
Dual gigabit convergence with MEC
Fulfill the requirements of a smart factory**

Customer Use Case #2: typical cell-phone manufacturing factory (2/3)



Service requirements:

- Wireless and wireline network be covered in manufacture, office and dormitory areas.
- Isolated sub networks: surveillance, factory management network, office network, etc.

Solution:

- Industrial PON + 5G
- PON network deployed in the whole area: Wi-Fi/5G backhaul and wireline
- Network slicing for sub-nets

Industrial PON+5G, dual gigabit network solution

Customer Use Case #2: typical cell-phone manufacturing factory (3/3)

+70% 

+115% 

+400% 

-21% 

No. of sub-nets

Data traffic

Network capacity

Construction cost

Network Solutions		No. of Use cases (sub-net)	Data traffic directions	Bandwidth (Gbps)
Industrial PON based gigabit optical network solution	Industrial PON	20	18	10+
	5G	8	5	10+
	Wifi 6 on Industrial PON	5	5	9.6
Legacy Ethernet based solution	Copper based ethernet	15	10	5+
	Wifi 5	4	3	6.9

Comparison of different network solutions

Very impressive improvements on network performance with cost down

- **Gigabit optical network is a promising bearing network solution for various manufacturing factories**
- **Industrial PON can provide gigabit, all optical wired access, and also can coordinate with 5G to form a dual gigabit solution for the industrial customers**

Thank You

