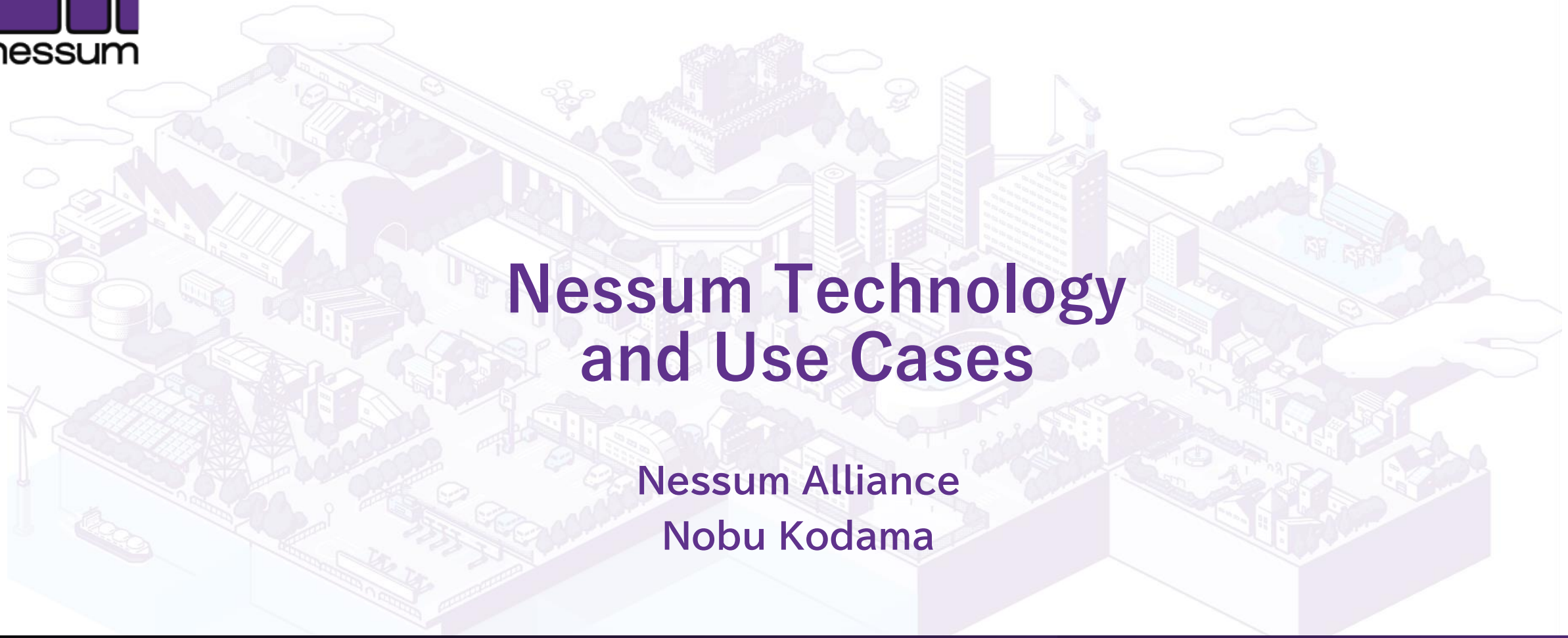


Nessum Technology and Use Cases

Nessum Alliance
Nobu Kodama

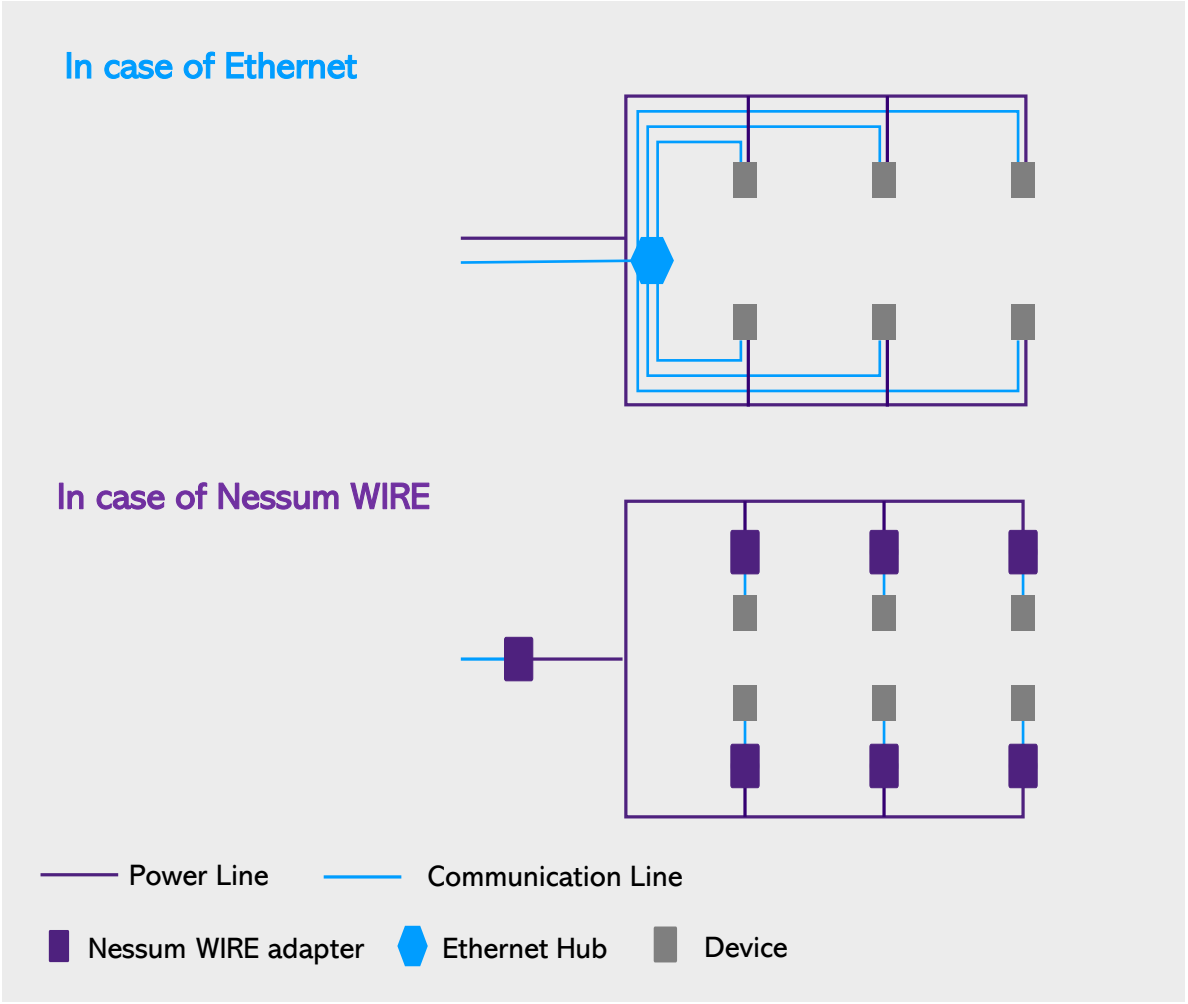
Nessum
EU Day 2024

6 strengths of Nessum WIRE

- **Simplified construction** and **low cost**
- **Long distance communication**
- **Speeding up** existing low-speed wired communication
- **Resistant** to shielded spaces
- **Higher security**
- **Reduction of lines**

Simplified Construction and Low Cost

Ability to build a network **by utilizing existing lines**



By utilizing existing wiring (dedicated lines and power lines), **the labor to install new LAN cables is reduced**. This also **shortens the construction time period** and **enables network construction at low cost**.

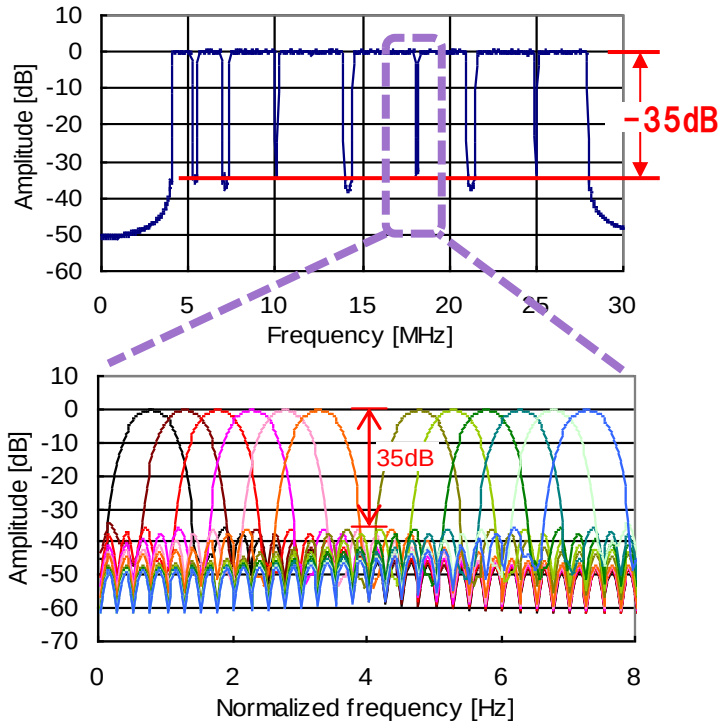
Example

surveillance cameras, intercoms, nurse call systems, etc. in stores, factories, hospitals, etc.

How to realize that feature

Flexible DEMOD to adapt to characteristics of the lines used for comm.

Wavelet OFDM (Original)

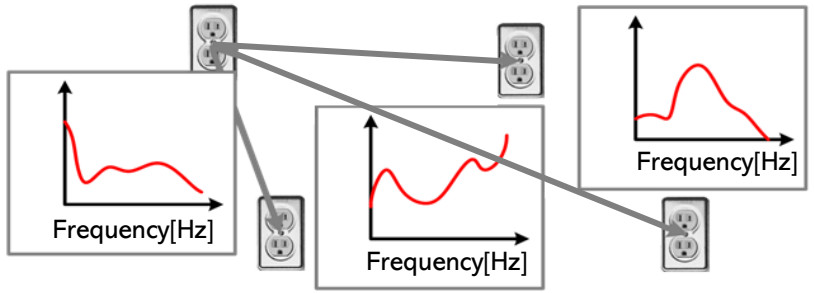


High frequency utilization efficiency
Less computation and less memory

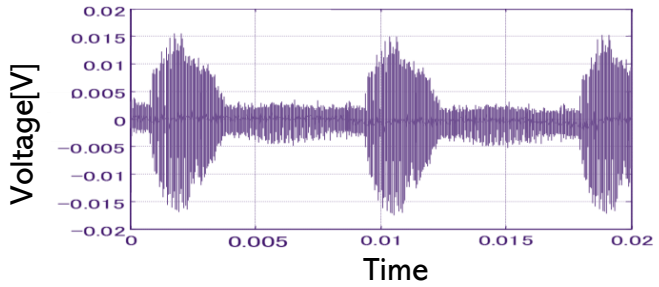
Compared to FFT-based OFDM

Channel Estimation technology for noise characteristics

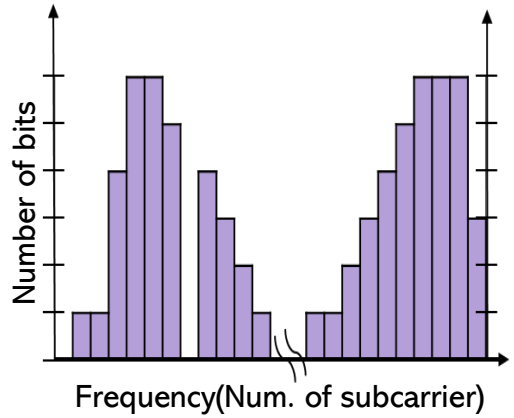
Estimates channel characteristics between Tx and Rx



Detects noise fluctuations on the channel



Periodically optimizes the amount of information per subcarrier according to signal-to-noise ratio

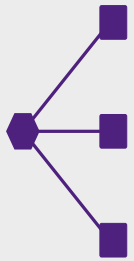


Always achieves communication speeds appropriate for transmission line conditions

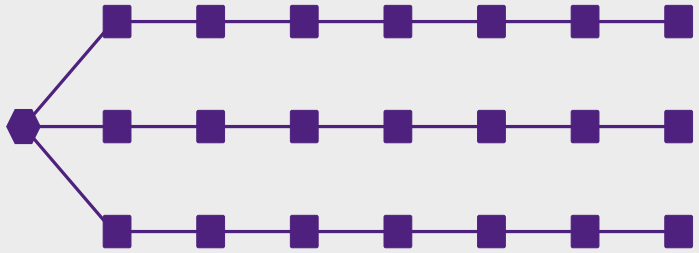
Long Distance Communication

Available communication **over several kilometers**

No Relay Function



Relay function available



“Multi-Hop” function, which relays multiple terminal units, enables communication over several kilometers* and can be used for buildings, factories, and other large-scale facilities, as well as for smart meters.

* Communication distance varies depending on the operating environment.

Example

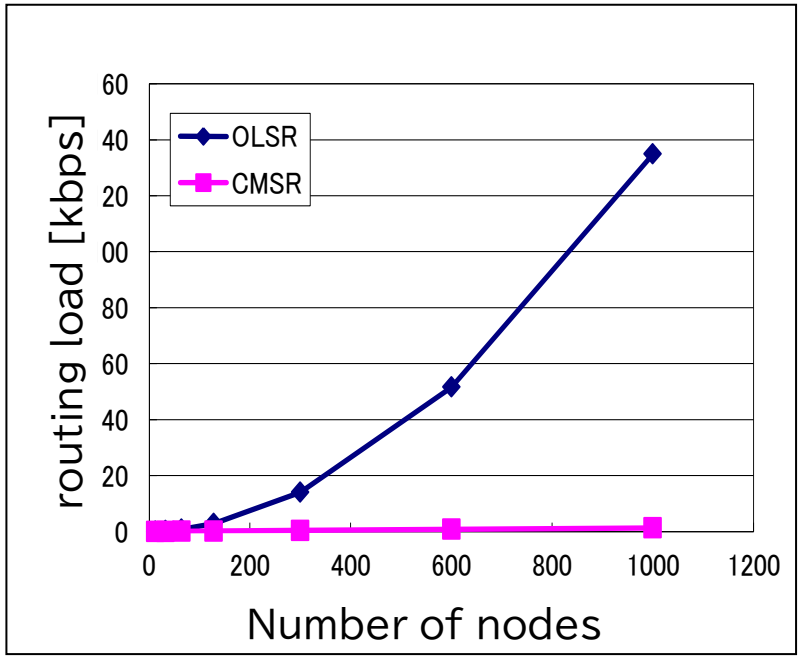
Smart meters, smart buildings, factories, smart street lighting, HVAC (heating, cooling, ventilation, and other air conditioning), solar power generation, etc..

How to realize that feature

Provides stable and efficient Multi-hop

Centralized Metrics based Source Routing Efficient routing protocol while exchanging link information periodically

- ✓ Proactive routing protocol with very low traffic volume
- ✓ Approved as ITU-T G.9905 (August 2013)
- ✓ System construction of 1,024 nodes possible
- ✓ Stable communication with bi-directional link quality consideration



Simulation result of NB-PLC

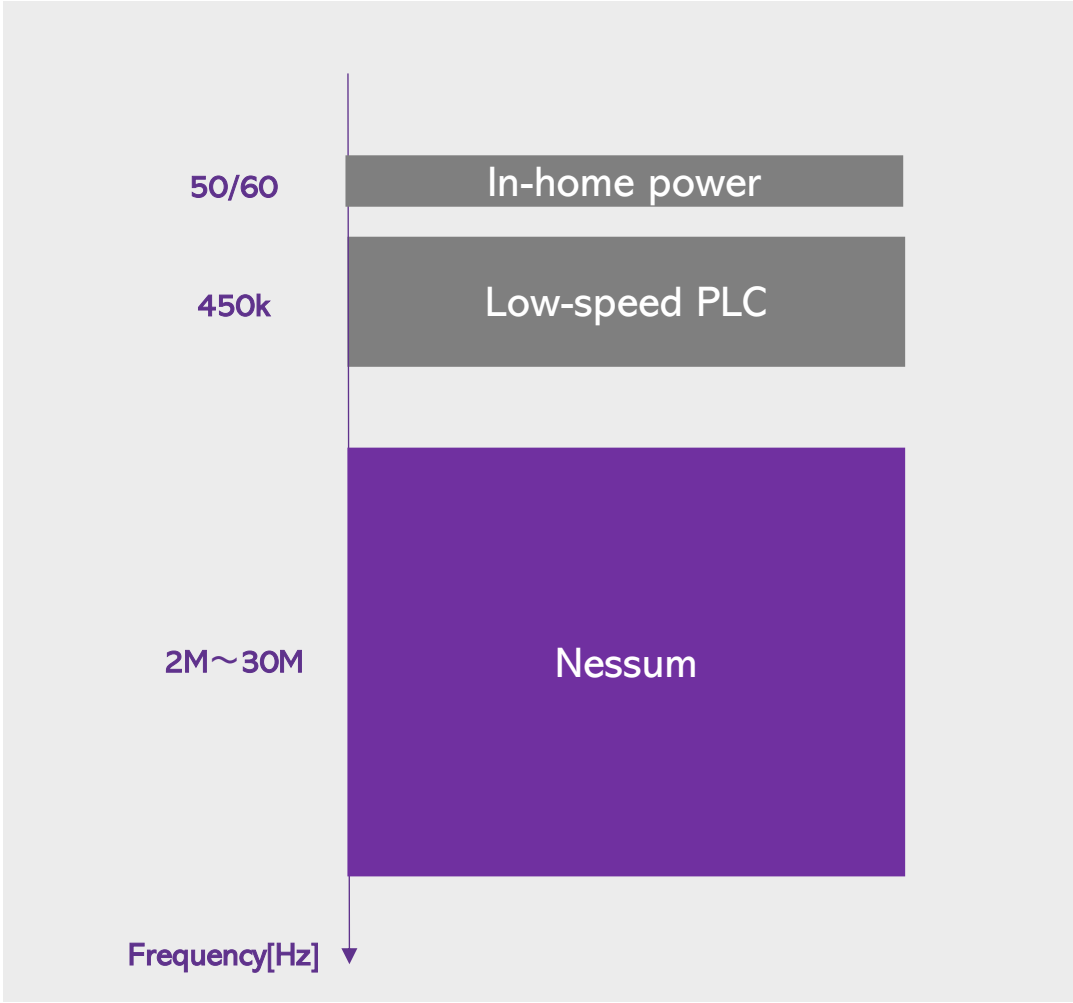
Speeds Up Existing Low-speed Wired Communications

High-speed communication on **the order of Mbps** is possible.

Communication standards such as “RS485 Modbus”, “low-speed PLC”, and “HBS (IEBus)” are increasing the need for higher speed in preparation for accelerated IoT utilization. By installing Nessum WIRE, high-speed communication in the order of Mbps will be possible without changing these wiring.

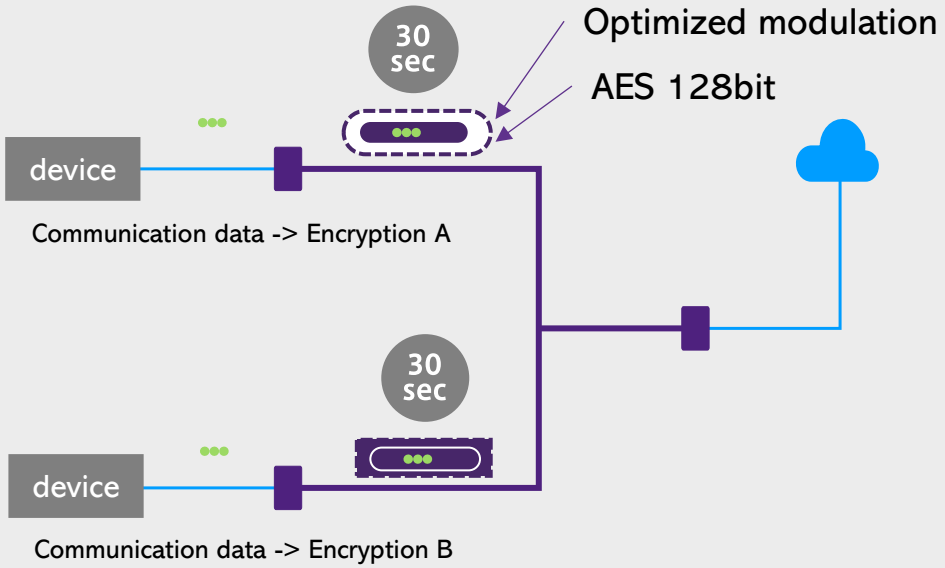
Example

Smart meters, commercial HVAC, solar power generation, etc.



Higher Security

Can be used in **places where wireless is prohibited**



Higher security is achieved through physical connection by wired lines, encryption of communication data, and review of optimal modulation within 30 seconds. It can reduce risk of information leakage and cyber attacks, enables network construction in facilities where wireless is prohibited due to security issues.

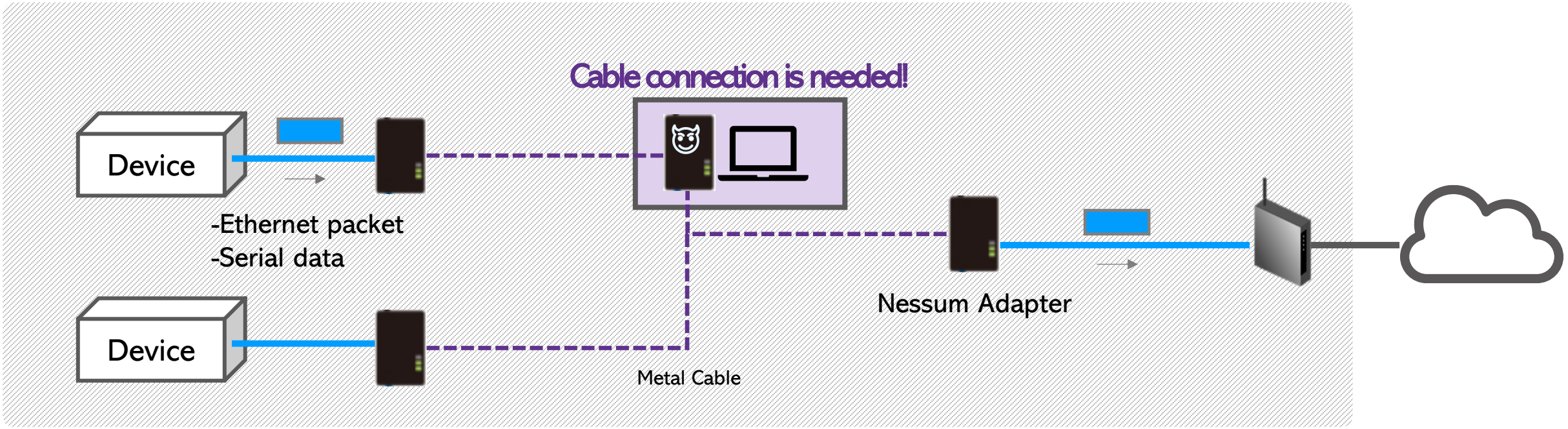
Example

Gas stations, plants where wireless use is prohibited, etc.

Why Higher Security can be realized? (1)

HURDLES for CRACKING

1. **Cable Connection**
2. Network Password
3. Modulation Pattern

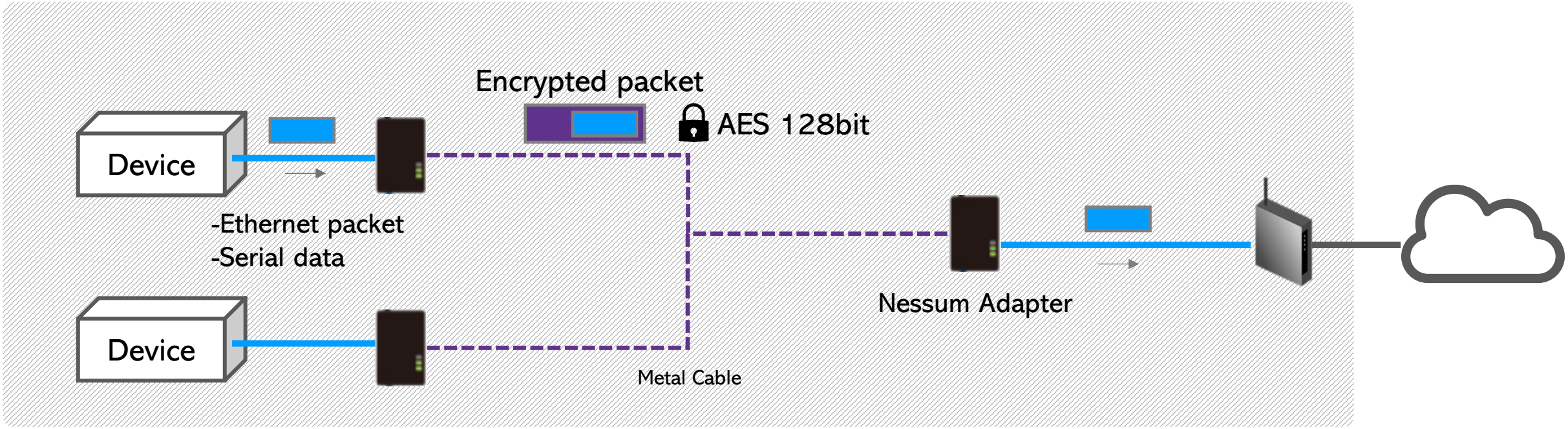


Why Higher Security can be realized? (2)

HURDLES for CRACKING

1. Cable Connection
2. **Network Password**
3. Modulation Pattern

128 powers of 2 (about 3.4 x 10^38)

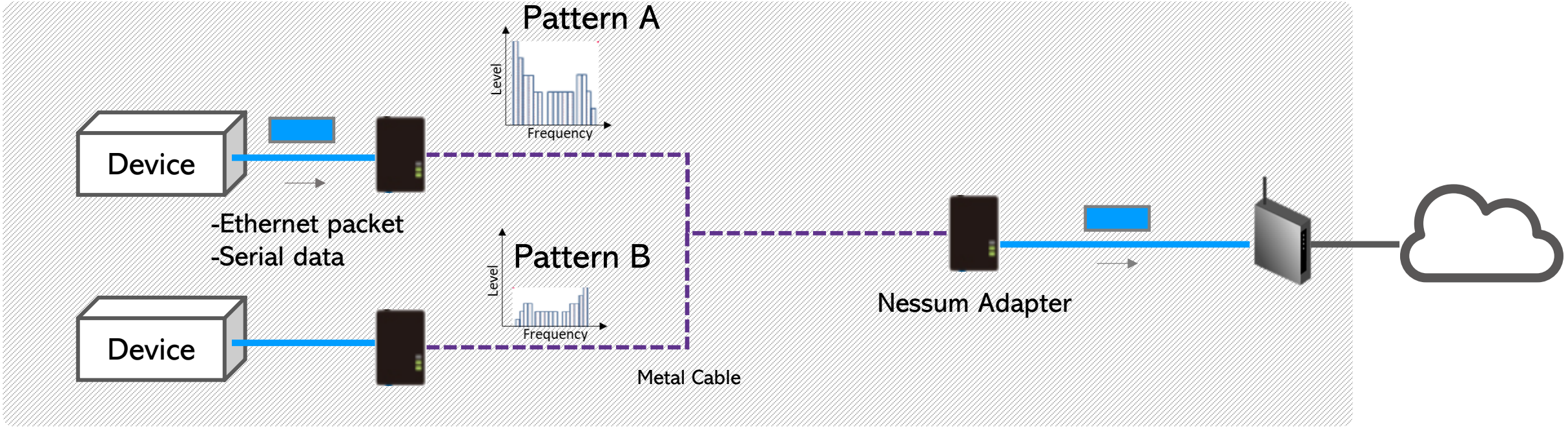


Why Higher Security can be realized? (3)

HURDLES for CRACKING

1. Cable Connection
2. Network Password
3. **Modulation Pattern**

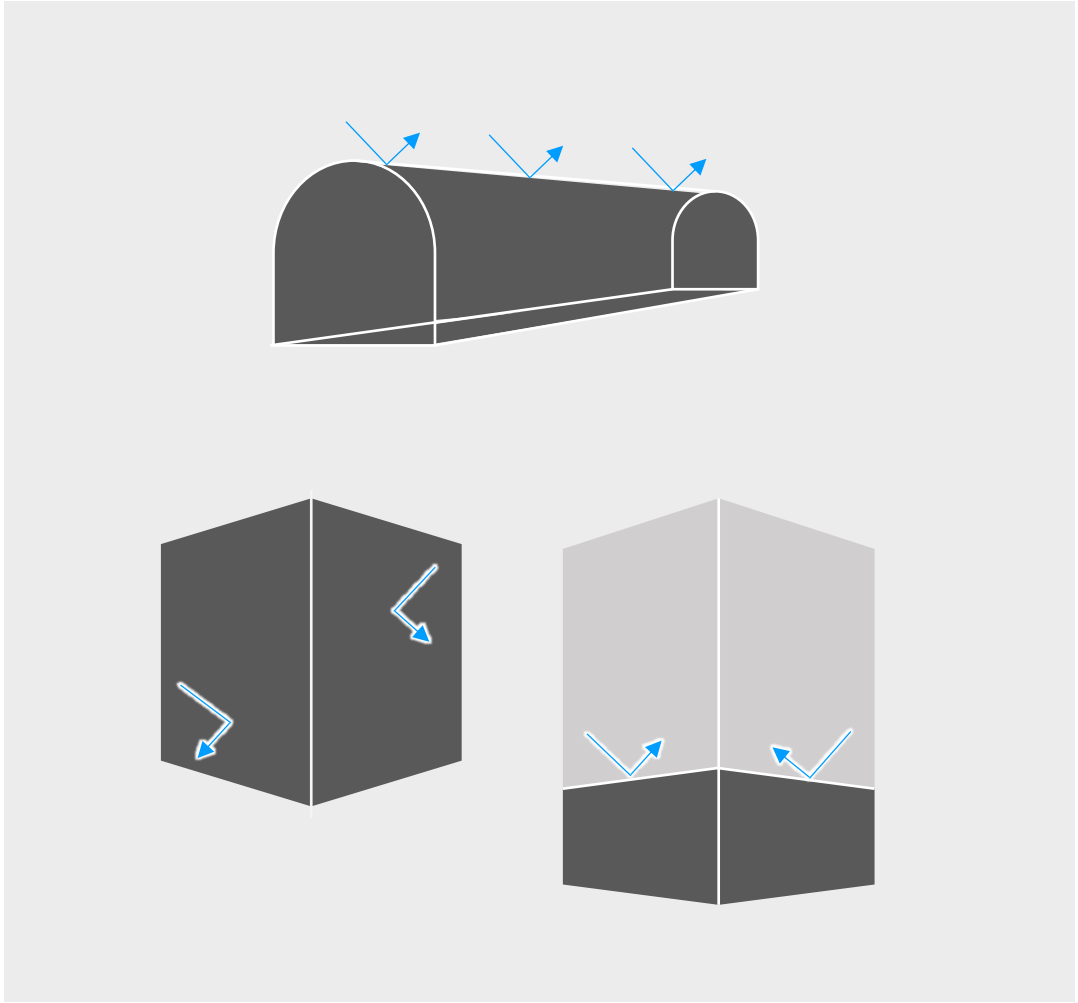
When communicating, Nessum determines modulation pattern according to frequency characteristics of transmission line for each point-to-point.
The pattern is 7 to the power of 360, and changes within 30 seconds.



Resistant To Shielded Spaces

Connects even in places where wireless communication is difficult

In closed spaces such as tunnels and underground facilities, where radio signals are difficult to reach, Nessum WIRE makes it possible to communicate in these locations **by utilizing existing lines**.

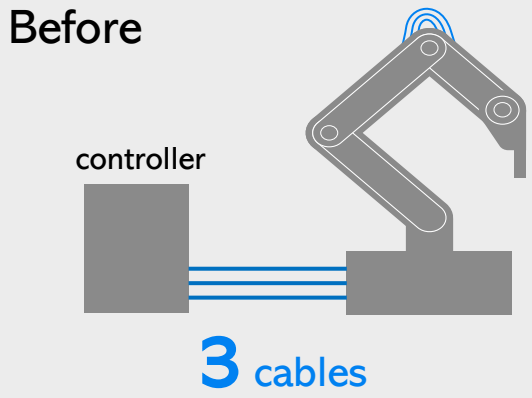


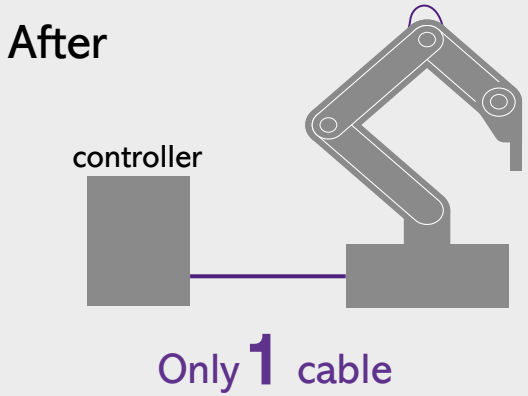
Example

Tunnels, underground facilities, elevators, RC buildings, etc.

Reduces The Number Of Lines

Reduces the risk of wire breakage and inspection work





By combining multiple control and signal lines, the number of wires can be reduced. This reduces the risk of wire breakage and failure rates, reduces weight, reduces manufacturing lead time, and shortens the time required for periodic inspections of elevators and other equipment.

Example

Elevators, robots, etc.

Nessum WIRE Adoption In Various Fields

1. Low-cost network construction
2. Faster wired communication
3. Higher security
4. Wireless complements
5. Long distance
6. Reduce cables


Camera


Doorbell


Street lights


PV


HVAC


Plants


Elevators


Underground and tunnel


Ship

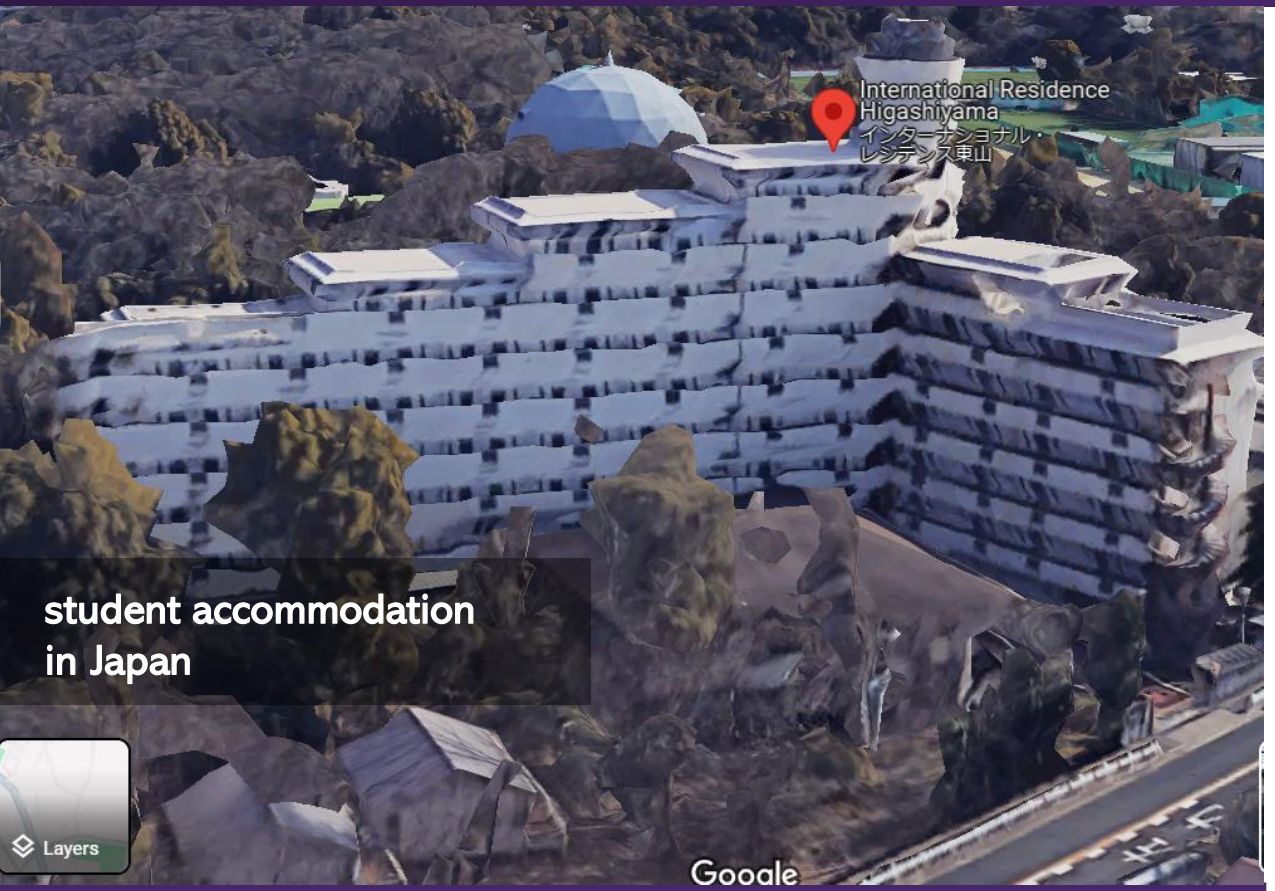

Smart Meters


Buildings


Factories


Robots

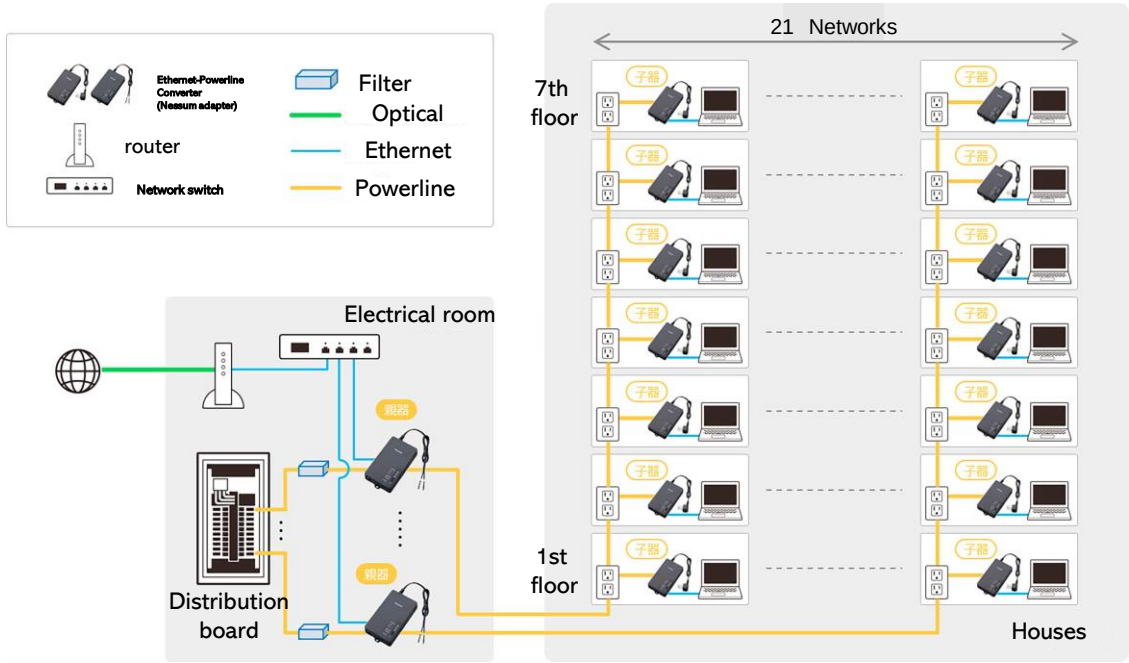
Low cost network construction (Power Line)



International residence Higashiyama - Google Maps

<Background>

Customer Request	In COVID19 situation, they would like to introduce an Internet connection to each house as soon as possible for remote classes.
Building	7 floors 137 houses



Nessum divides comm. speed based on the number of connected devices. For 137 houses, it's 146kbps per house. This is insufficient for remote classes, so filters are added to split each system, achieving 2.8Mbps per house. If high speed is not needed, filter costs can be reduced.

Total cost was reduced by 60% compared to Ethernet

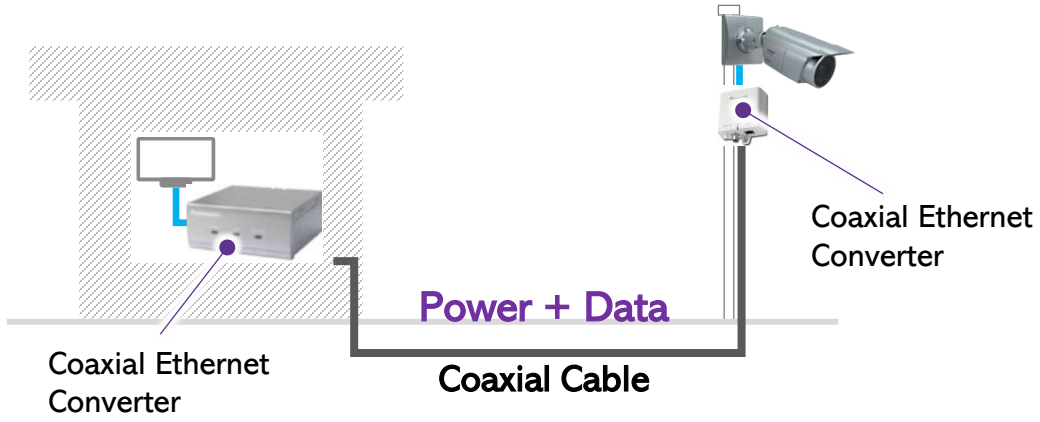
	All Ethernet	Nessum WIRE
Total cost	96,300 USD	38,500 USD
Const. period	20 days	3 days
Details	-	- Nessum Adapter: $25,600($161 x 159 unit) - Other devices : $4,400* - Installation : $8,500

Low cost network construction (Coaxial Cable)

Customer needs

- **Customers want to replace analog camera to IP camera**
- **The cost of replacing coaxial to Ethernet cable is high.**

By using a coaxial Ethernet converter,
existing coaxial wires can be used.



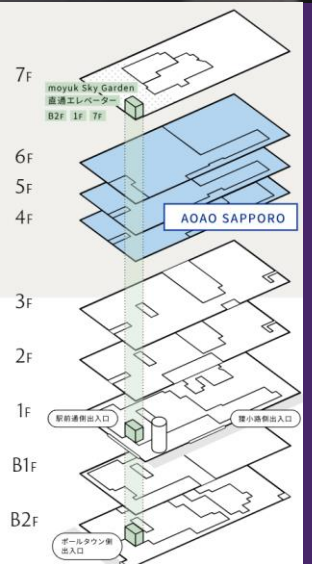
Reduce network construction costs!

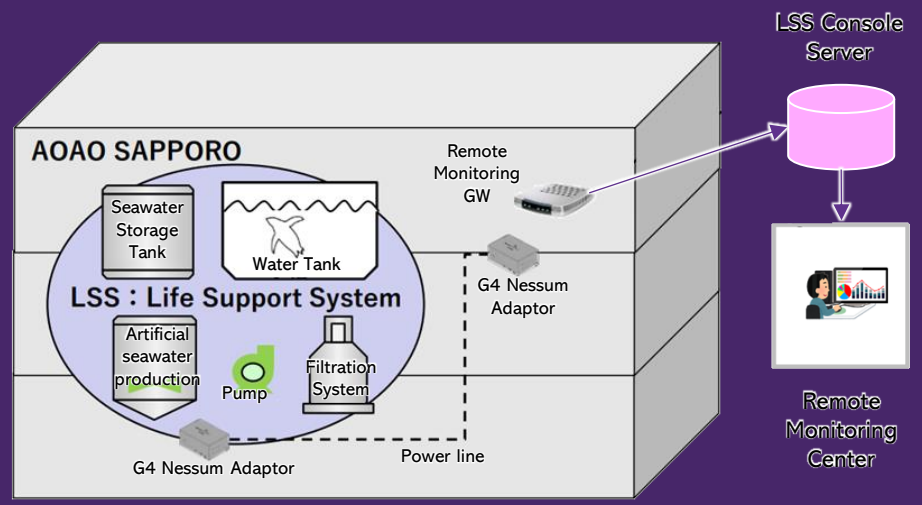
Adapted from material “Nessum Introduction” prepared by Panasonic.

Aquarium in the Complex (Japan)

Aquarium in the complex

Source：施設案内 | モユクサッポロ (moyuk.jp), Mirait-One Nessum Alliance Webinar(28 Nov, 2023)



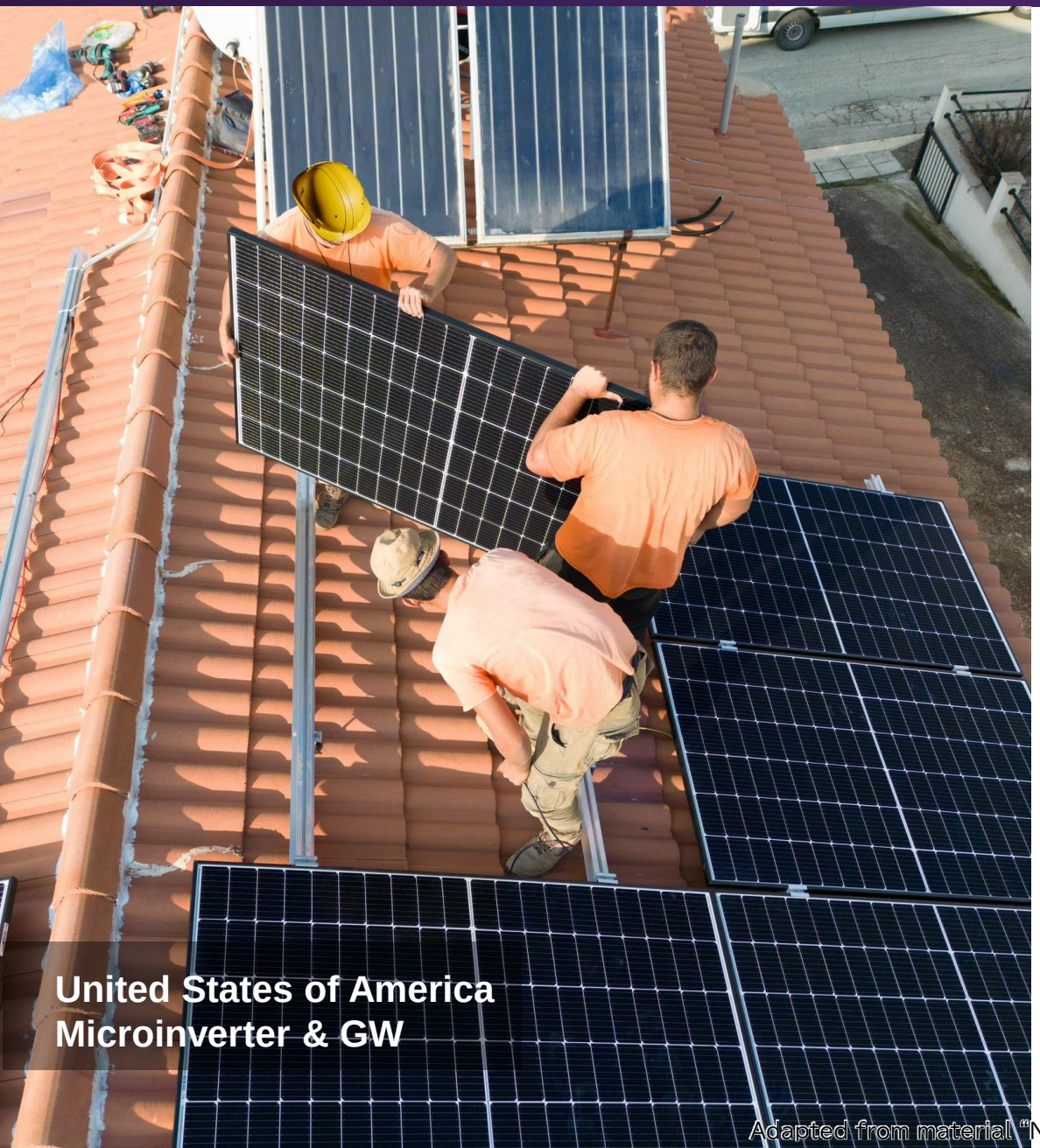


<Background>

The needs of customer is the introduction of monitoring systems for water tanks, pumps, filtration equipment, etc. However, it was a difficult environment for new wiring and piping.

Build a network without new wiring by using power lines

Faster wired communication



United States of America
Microinverter & GW

<Background>

Customers' needs are to make power generation more efficient, which requires more frequent monitoring and control of conditions.

Replacing a narrow-band PLC (kbps) with Nessum WIRE (Mbps)

Adapted from material "Nessum Introduction" prepared by Panasonic.

Example for Higher Security

Japan
Industrial plant

Some chemical plants prohibit wireless communication because of counterterrorism

Since information is conveyed on physical lines, risks of information leakage and intrusion are reduced.

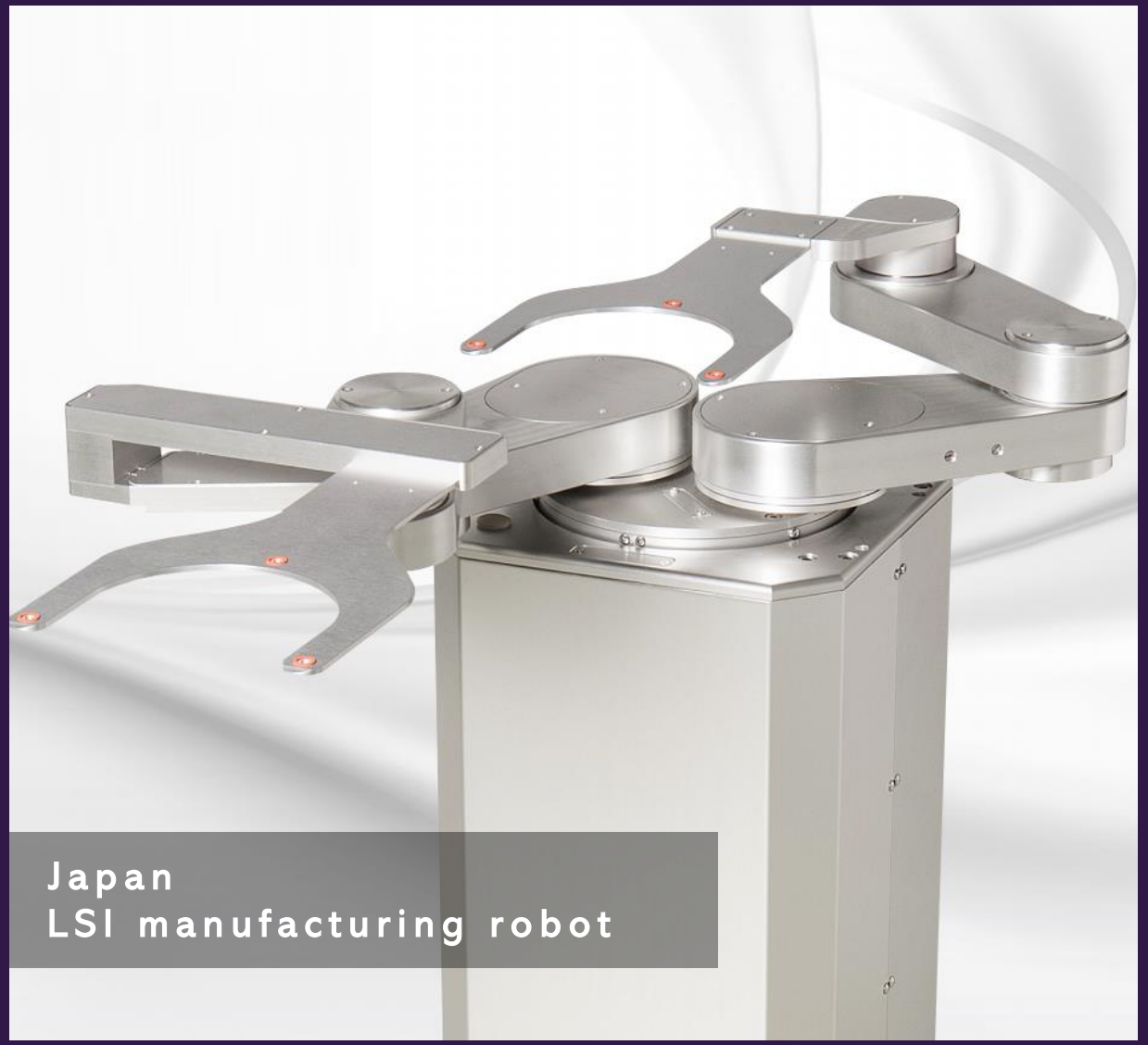
Adapted from material “Nessum Introduction” prepared by Panasonic.

Resistance to shielded spaces

Electricity meters are generally located in the basement…
And it is difficult to reach the wireless communication in the basement

Smart meter in the condominium and Apartment. Applicable to LV/MV/HV Powerline infrastructure.

Reduce cables



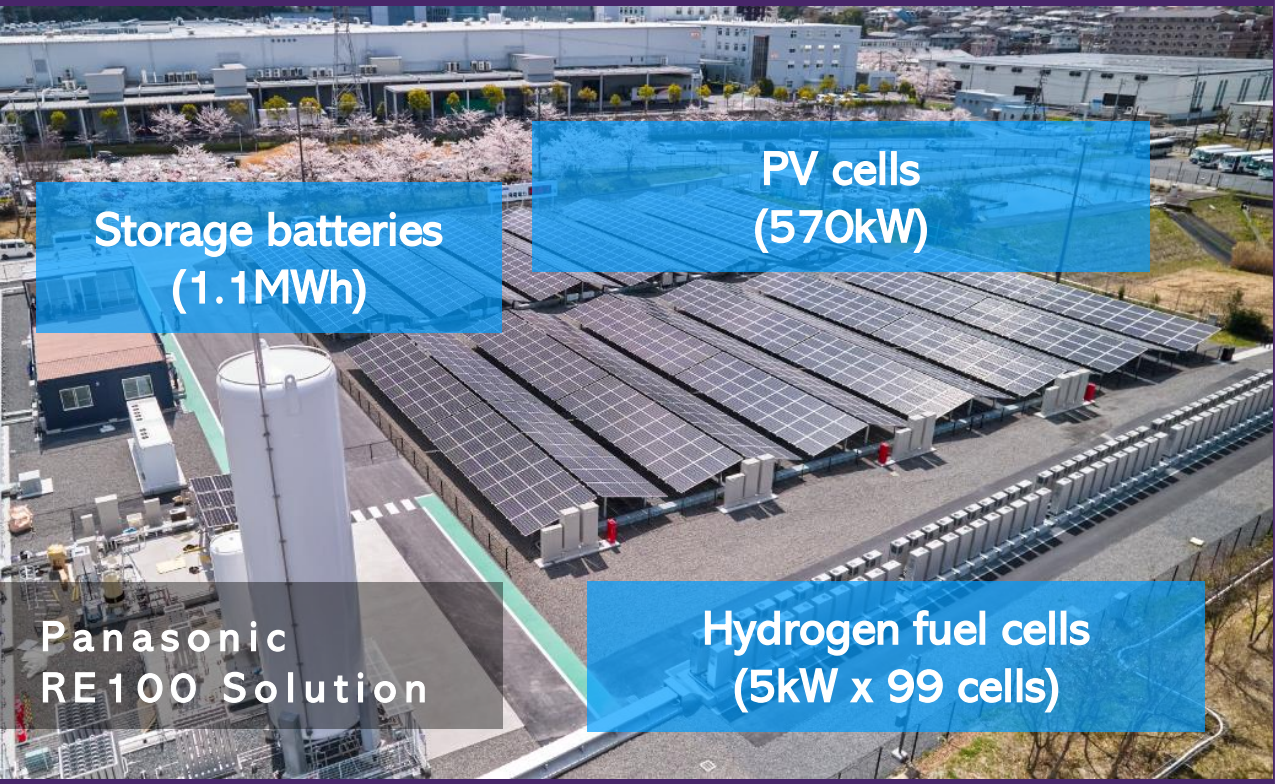
Japan
LSI manufacturing robot

Number of cables
38 → 9

- Weight saving
- Reduce failure rate
- Reduce assembly time

https://www.daihen.co.jp/products/cleanrobot/pdf/wafer/wafer.pdf

Panasonic RE100 Solution



2024: Hydrogen fuel cell with Nessum to be released

Why Nessum WIRE?

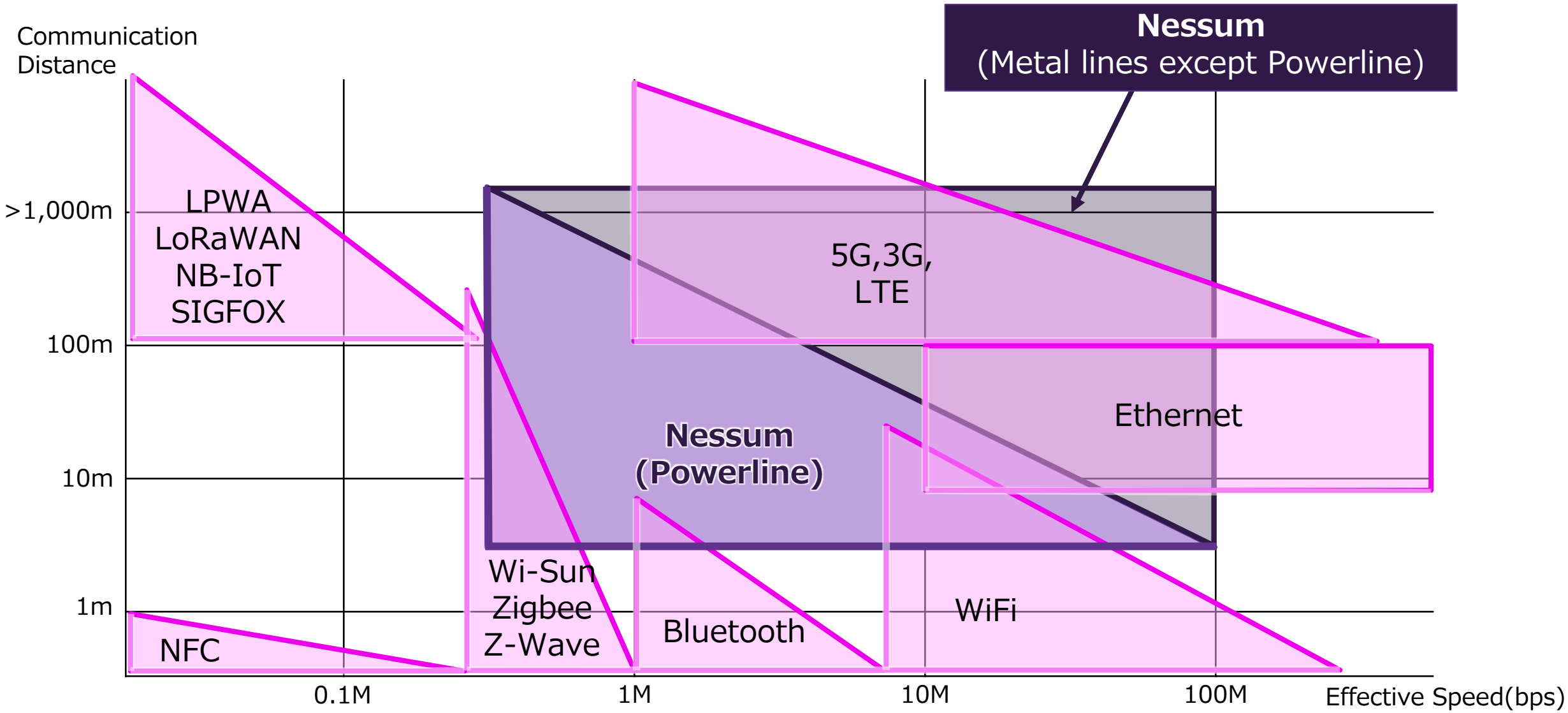
✓ Reduction of network construction costs

There is no need to install a hub every 100 meters like a LAN cable.
Daisy chaining is also possible, so wiring is reduced.
Construction is possible in a short period of time.

✓ Reliable communication

Enables robust and secure communication

Positioning of “Nessum” in IoT communication technology

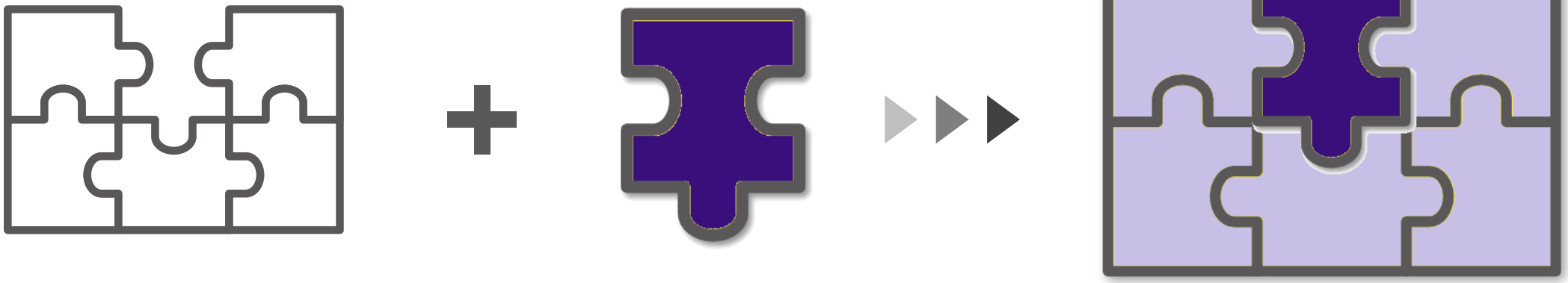


An Important Piece that Fills Customer Network Needs

Cost?

Stability?

Portability?



Ethernet/Wi-Fi/
Bluetooth/5G etc…

Nessum WIRE

Best NW Solution

Aiming for standard adoption in smart city communication infrastructure

Thank you

Nessum

EU Day 2024

nessum

nessum WIRE

nessum AIR

6 strengths of Nessum WIRE

- Simplified construction and low cost
- Long distance communication
- Speeding up existing low-speed wired communication
- Resistant to shielded spaces
- Higher security
- Reduction of lines