Nessum Technology and Use Cases （IEEE 1901-2020）

Nessum Alliance
Nobu Kodama

AHR Expo 2025

About myself

Nobutaka (Nobu) Kodama

- Head of Strategy and Execution, Nessum Project
- Technical Marketing, Nessum Alliance

- Have been working with Nessum for more than 10 years

Wired Communication

Nessum WIRE : Wired communication technology to carry data over existing cables

Flat cable

Twisted pair cable

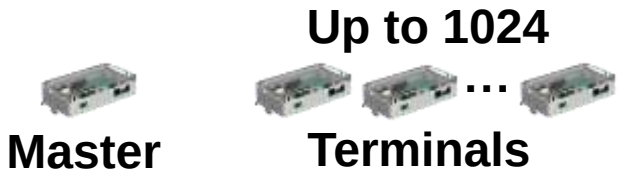
Coaxial cable

Power line

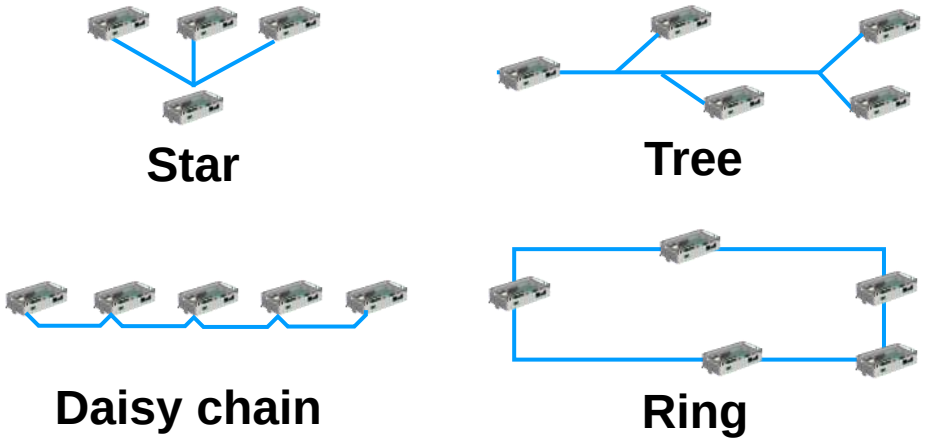
Various cables are available!

Three Main Features of Nessum WIRE

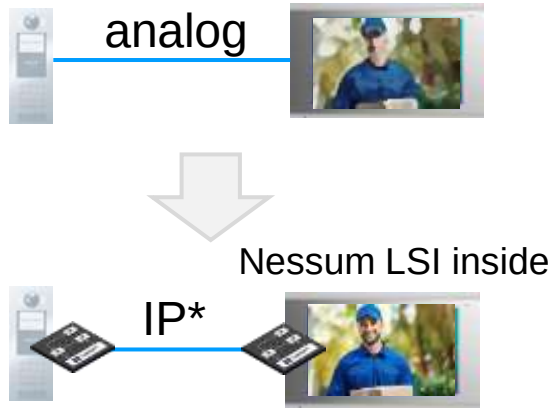
Large Scale Network



Free Topology



IP Communication



*Serial communication bridges are also possible.

Comparison of Network Standards

	Nessum WIRE	Ethernet	Wi-Fi
Low-cost network construction	++ **Almost no wiring required** *** A simple circuit design is required**	- **Wiring required**	+ No wiring required, but the signal reach must be designed
Communication distance (in case of no relay)	++ 200m to 2000m (depending on the type of cables and environment)	+ **100m**	+ About 100 m (When there are no obstacles)
Effective speed	-- Several Mbps to several tens of Mbps (Dependent on the cable material and number of hops)	++ A few Gbps	+ Several hundred of Mbps
Security	++ AES 128-bit encryption and Complex modulation pattern	- Addressed in upper layers	+ AES 128-bit encryption
Support topology	++ **Free topology**	+ **Only star topology**	
Portability	--	--	++

Legend : bad --, -, +, ++, good

Nessum Technical Overview

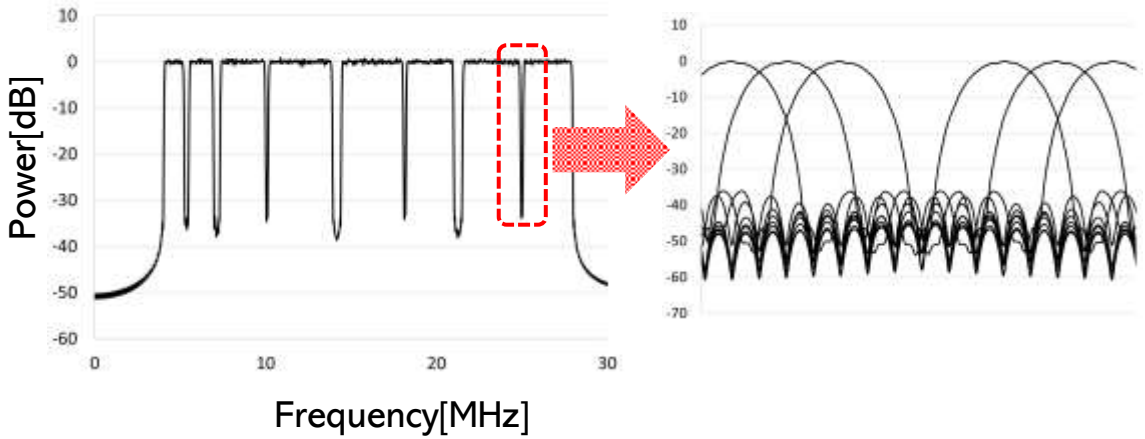
1. **Reduces impact on other communications**
   - Flexible & deeper notch (Max. 432 subcarriers, Freq. 2M-28MHz)

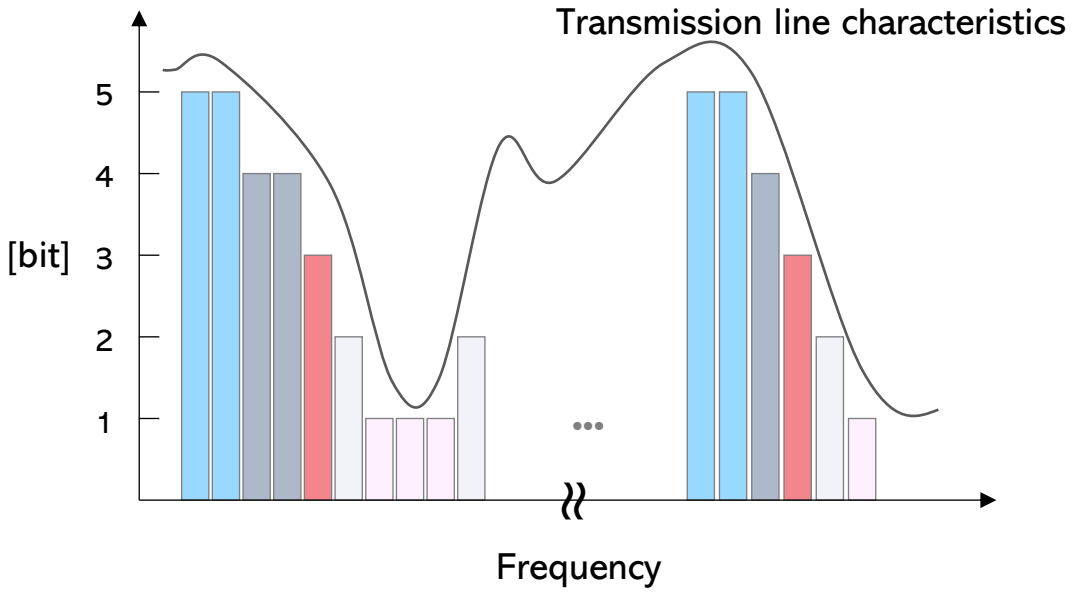
2. **Adaptation to the characteristics of the transmission line**
   - Optimize the amount of information for each subcarrier

3. **Robustness to noise**
   - Robust error correction

4. **Higer security**
   - Data encryption(AES-128)+ modulation pattern

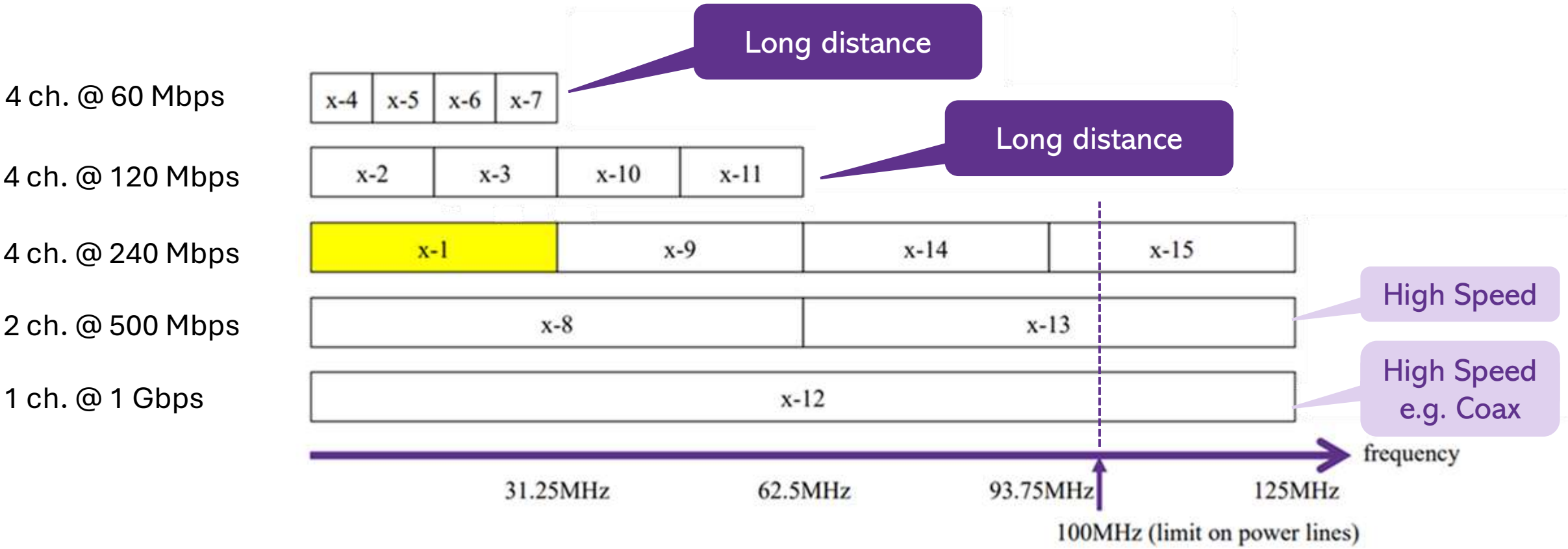
5. **International standard**
   - Adopted for IEEE 1901 and ITU-T G.9905





Flexible Channel Wavelet physical layer

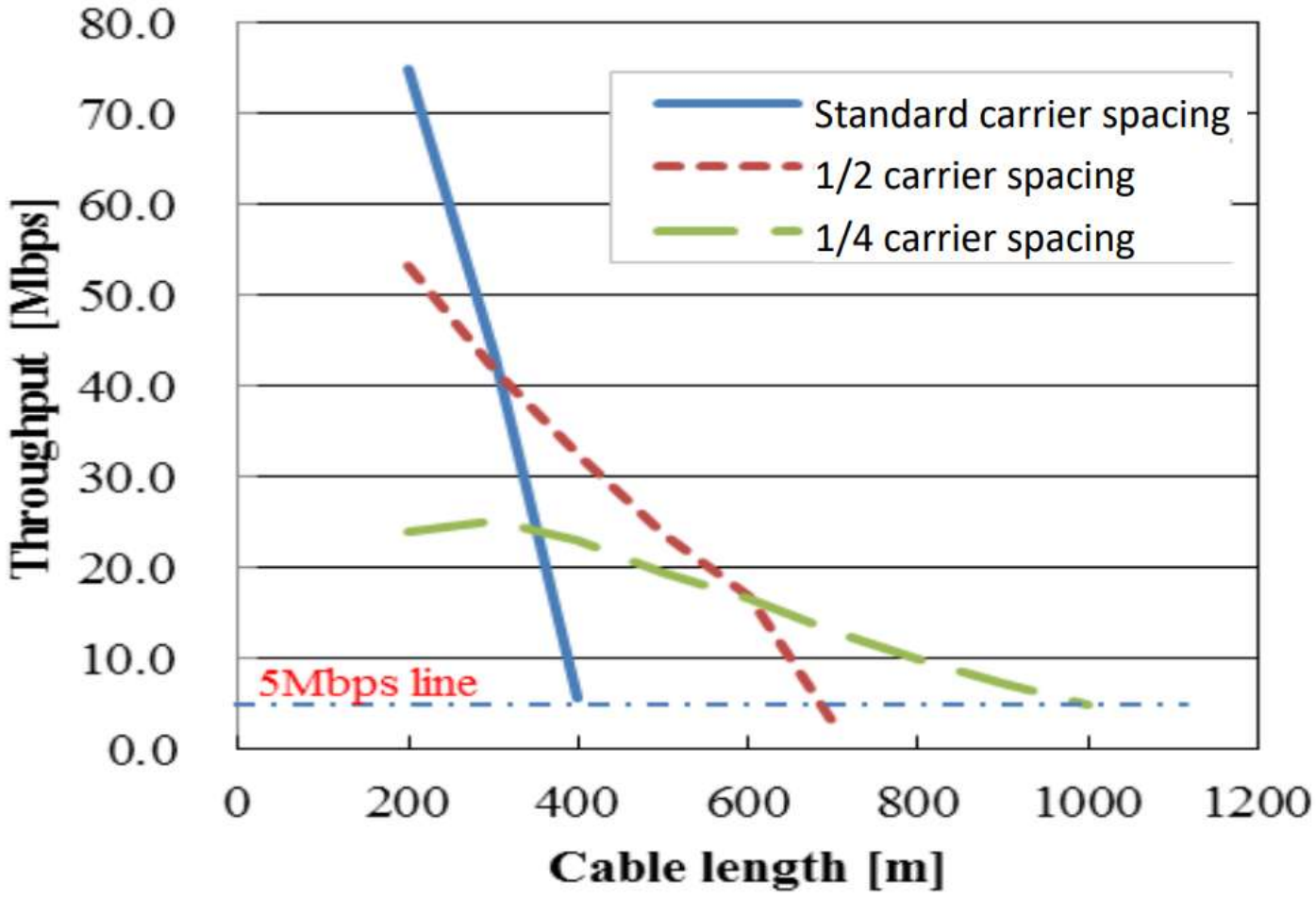
Nessum supports Flexible Channel mode



x-1 Basic channel (2M to 28MHz)

Long Range PHY

Distance can be increased by 2.5 times by using a ¼ carrier spacing

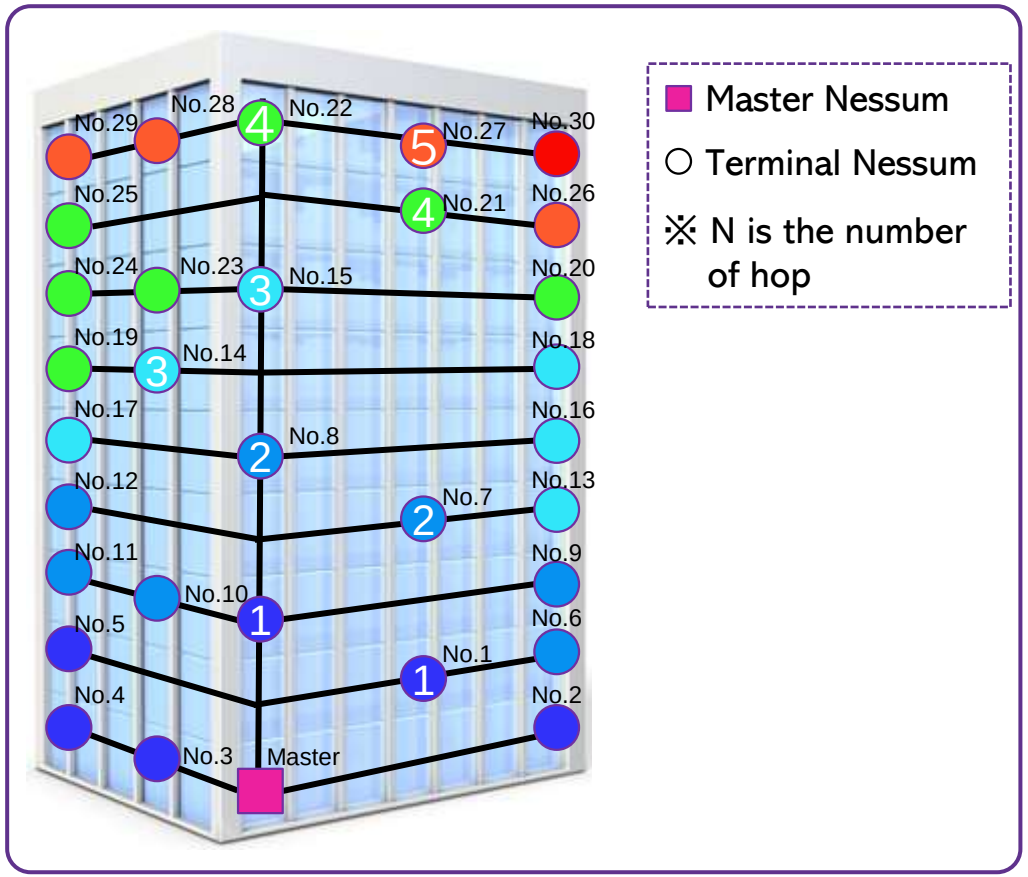


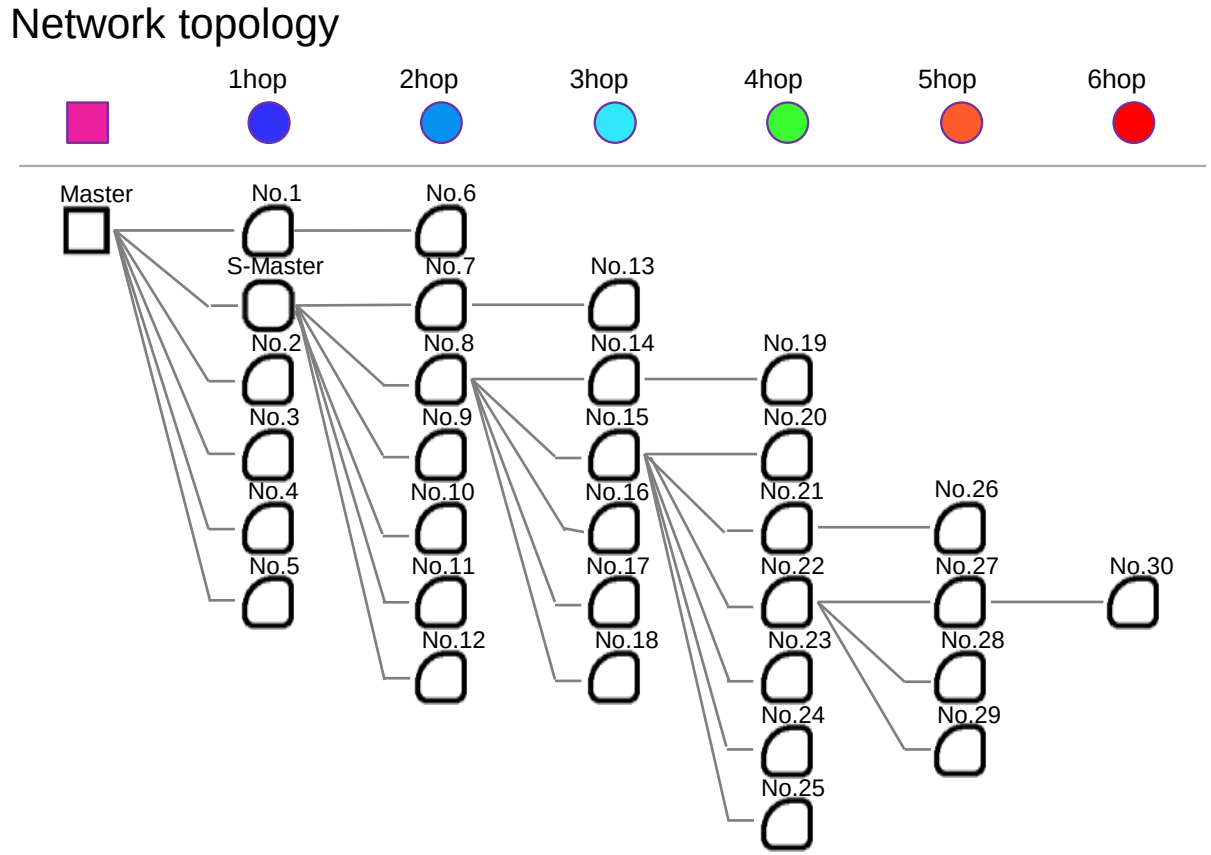
Simulation on VVF cable

What is Multi-Hop

Data can be forwarded to locations that are not directly connected.

- The communication distance is several kilometers with 10 hops.
- Up to 1024 terminals can be managed by a single master.





Check the communication status every 30 sec. and always select the optimal path.

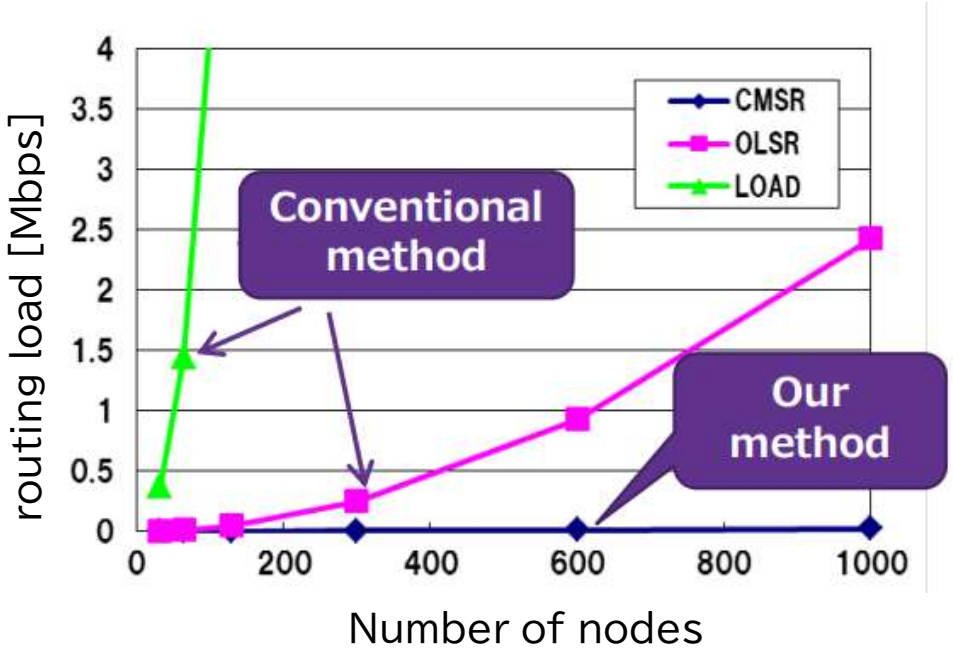
What is special about Nessum's Multi-Hop?

Provides **stable** and **efficient** Multi-hop

Centralized **M**etrics based **S**ource **R**outing

- ✓ Proactive routing protocol with very low traffic volume
- ✓ Approved as ITU-T G.9905 (August 2013)
- ✓ Stable communication with bi-directional link quality consideration

Efficient routing protocol while exchanging link information periodically



Communication Overhead for establishing communication path

Nessum WIRE Adoption In Various Fields

1. Low-cost network construction

Camera

Doorbell

Street lights

2. Faster wired communication

PV

HVAC

3. Higher security

Plants

4. Wireless complements

Elevators

Underground and tunnel

Ship

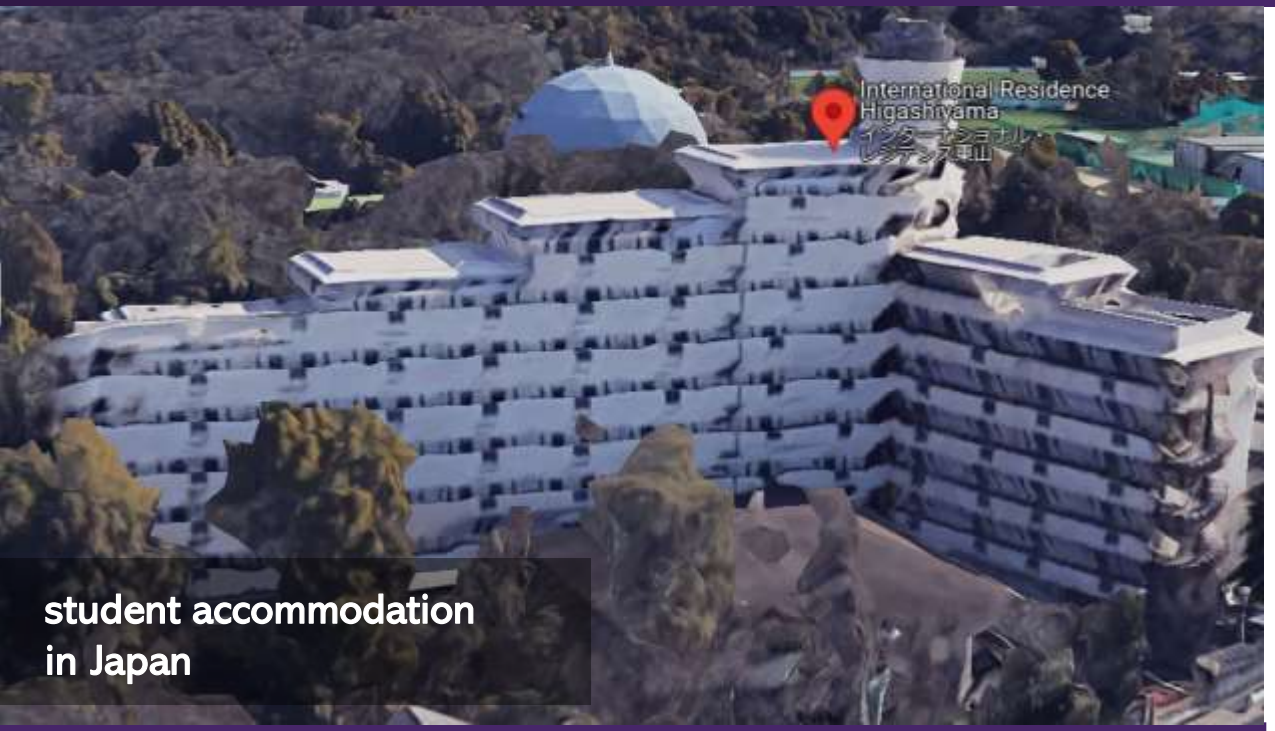
5. Long distance

Smart Meters

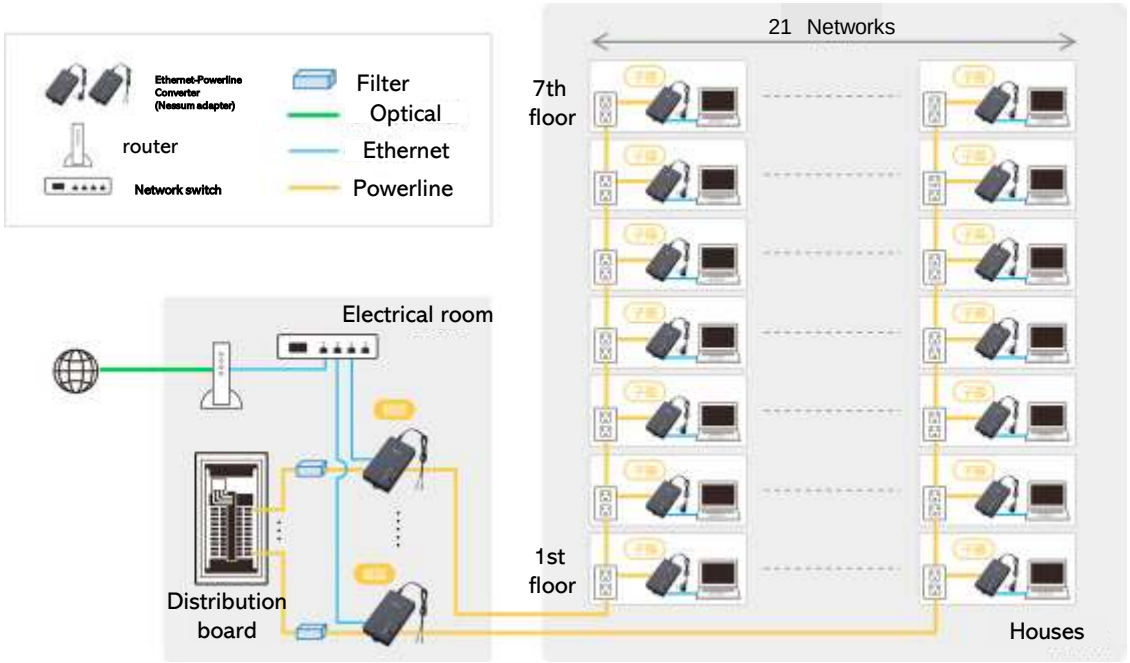
Buildings

Factories

Low-cost network construction (Power Line)



International residence Higashiyama - Google Maps



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.

<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

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

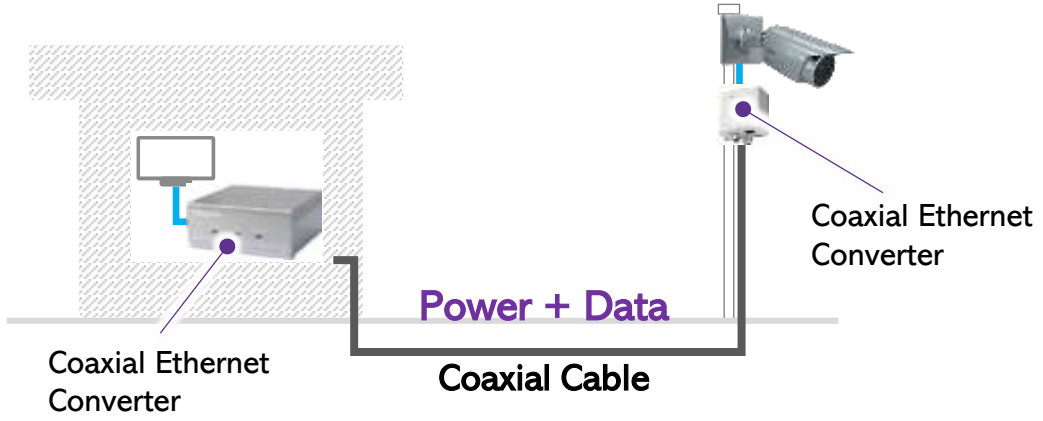
Low-cost network construction (Coaxial Cable)

Surveillance camera

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.



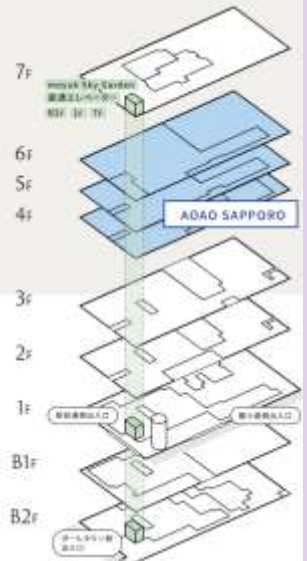
Reduce network construction costs!

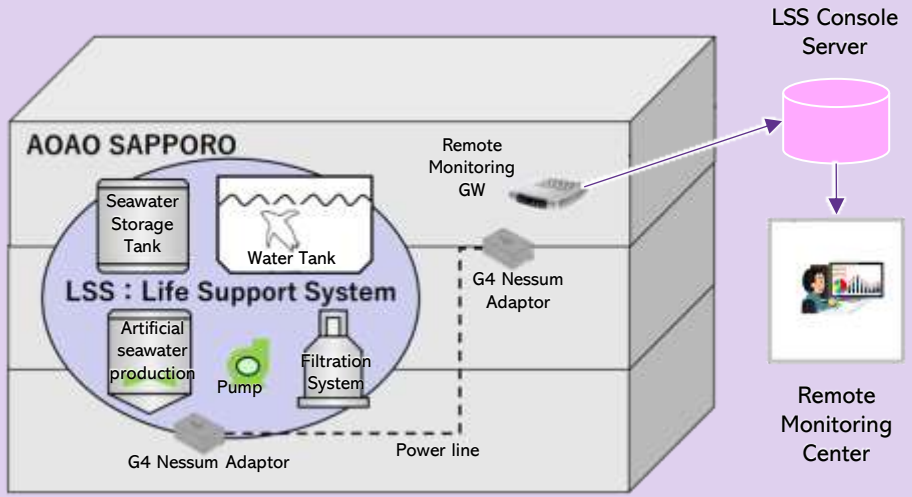
Adapted from material “Nessum Introduction” prepared by Panasonic.

Aquarium in the Complex (Powerline)

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)



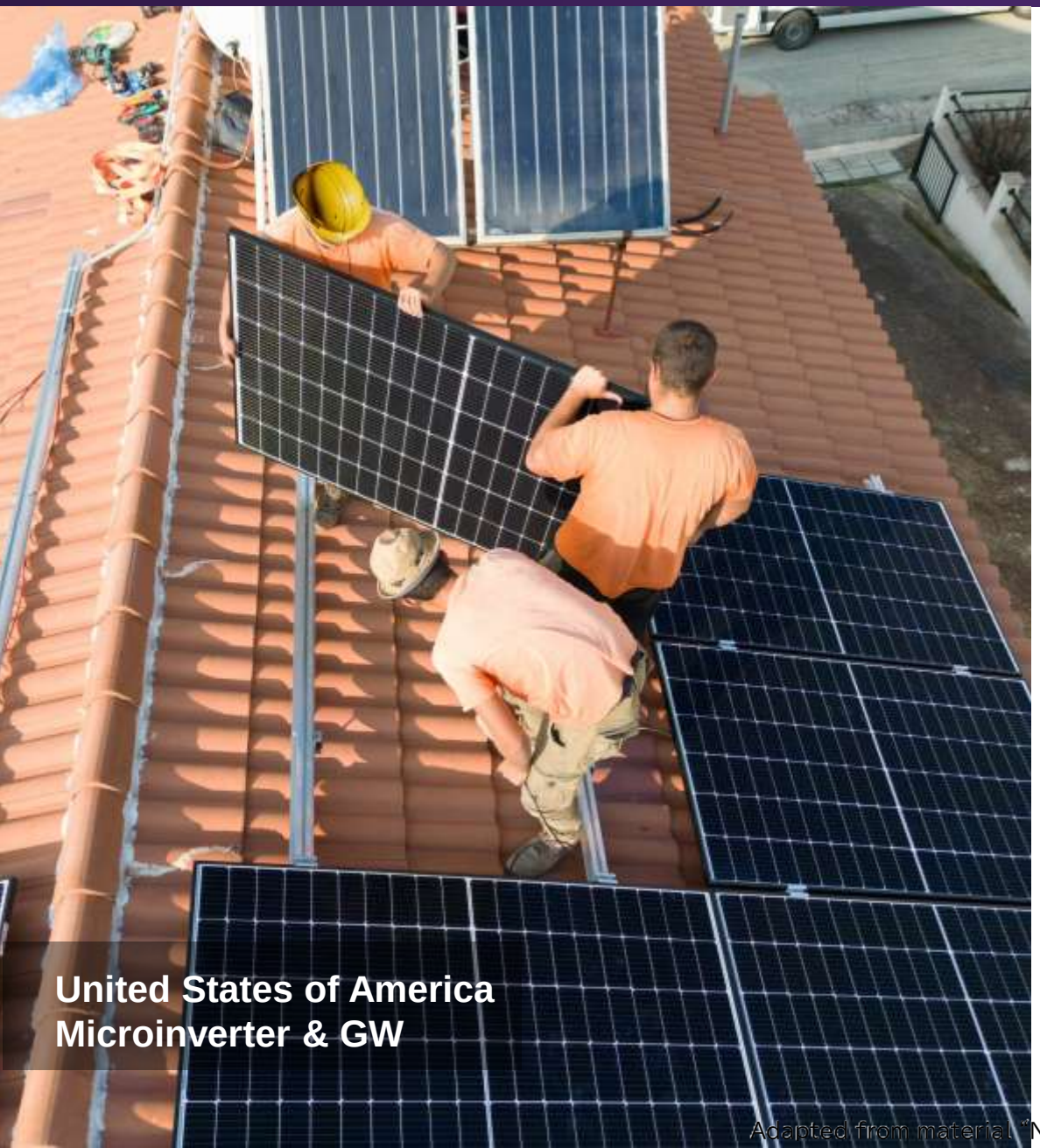


<Background>

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.

Higher Security

Japan
Industrial plant

<Background>
Some chemical plants prohibit wireless communication because of counterterrorism

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

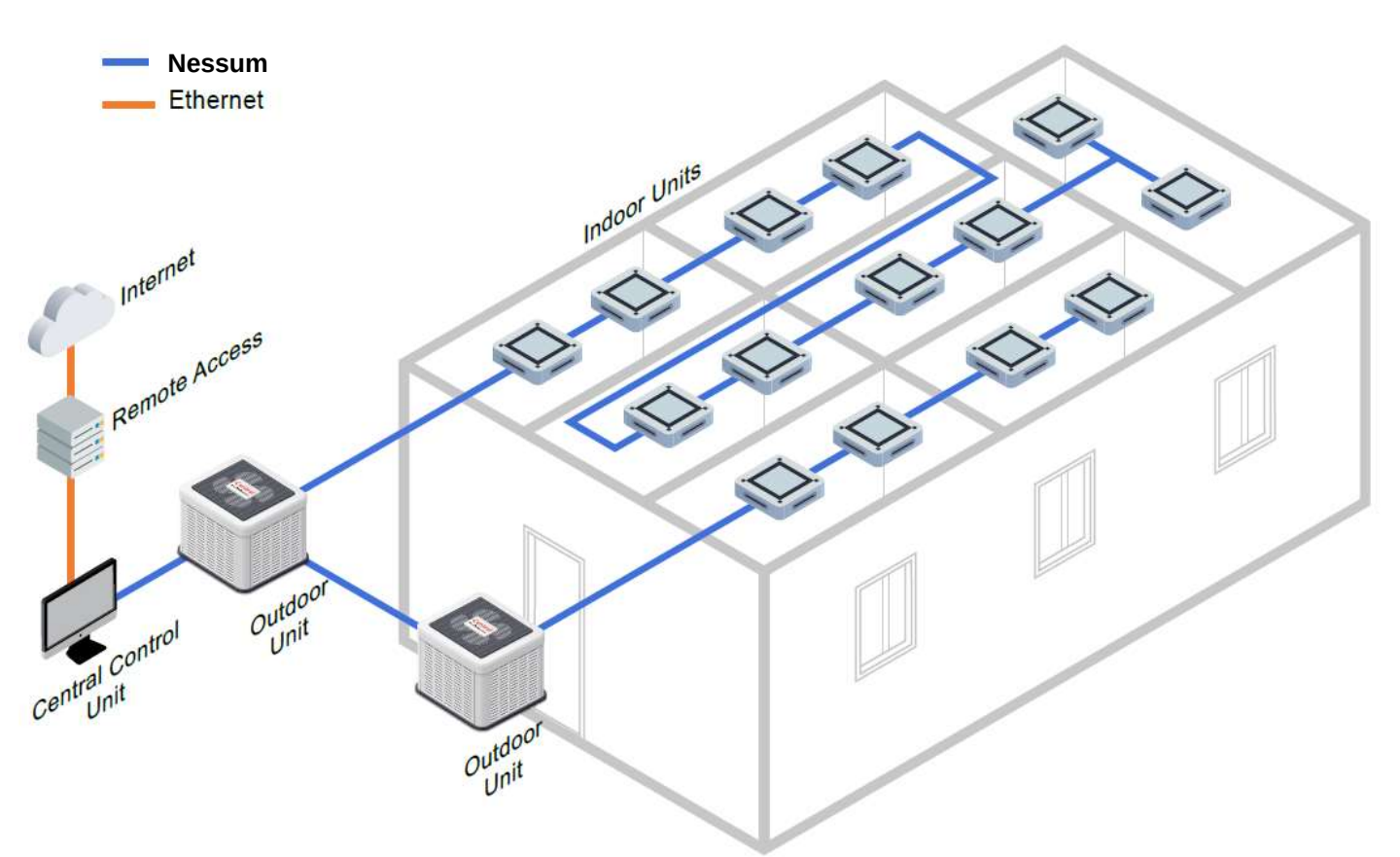
Adapted from material “Nessum Introduction” prepared by Panasonic.

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.

Commercial Air Conditioner (Global)

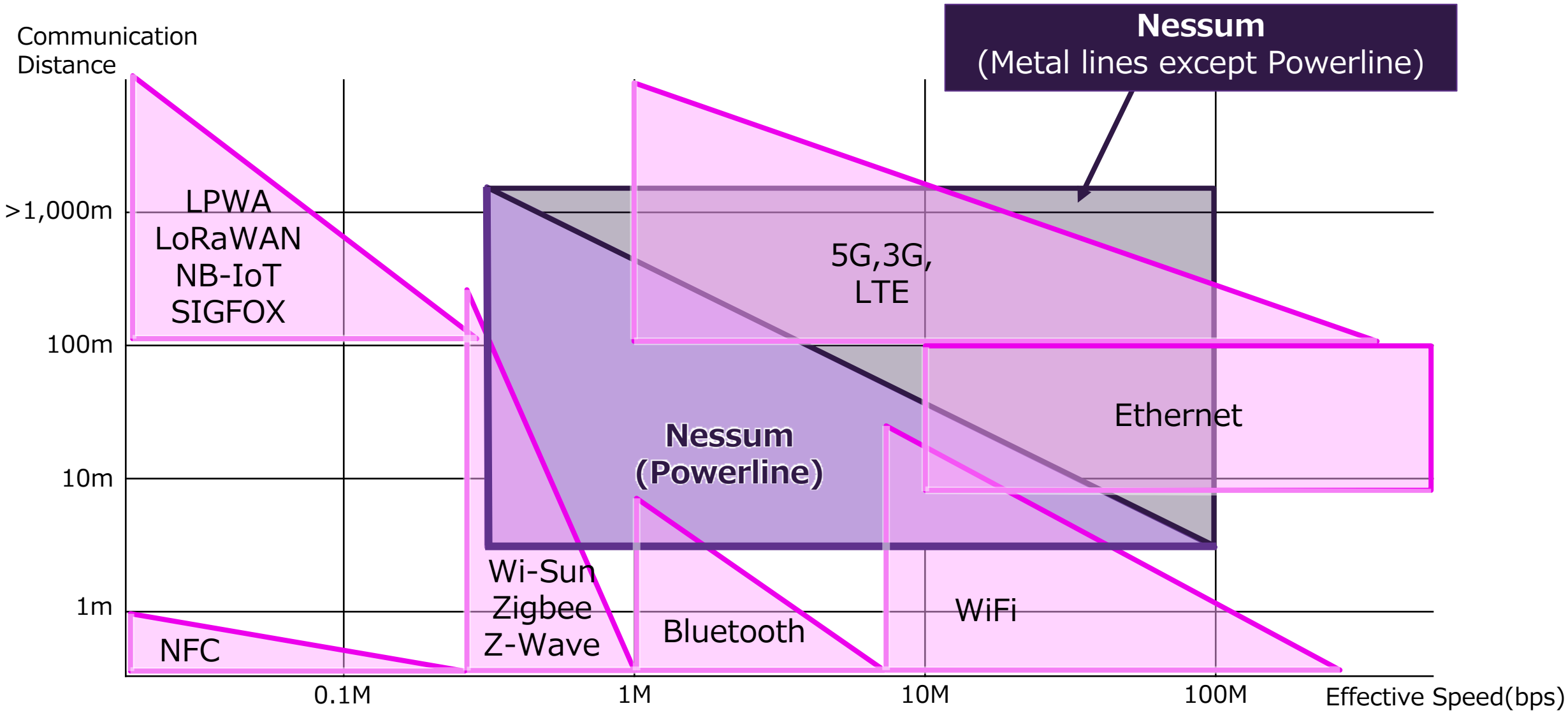


NEEDS

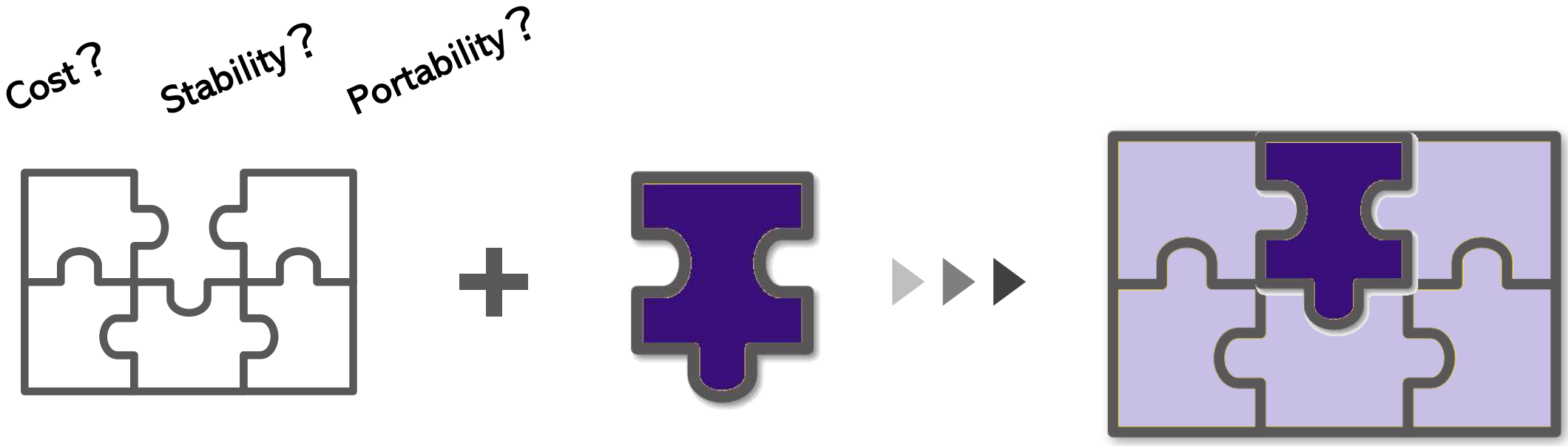
The current communication for indoor-outdoor unit systems is about 10kbps. They want to frequently monitor and control to improve energy efficiency, but the speed is not enough.

With Nessum WIRE using the same wiring, the speed has improved by **1,000** to **10,000** times!

Positioning of “Nessum” in IoT communication technology



An Important Piece that Fills Customer Network Needs



Aiming for standard adoption in smart city communication infrastructure

Thank you

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