

Introduction to Nessum and Building Automation Protocols

Ken Tamukai

Speaker Bio

Kengo (Ken) Tamukai

- Co-founder, ECOLINQX
- Technical advisor, Nessum alliance
- Consultant for MegaChips



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Background

- Over 25 years of experience in Wired and Wireless communications
- Developing Nessum technology since 2014

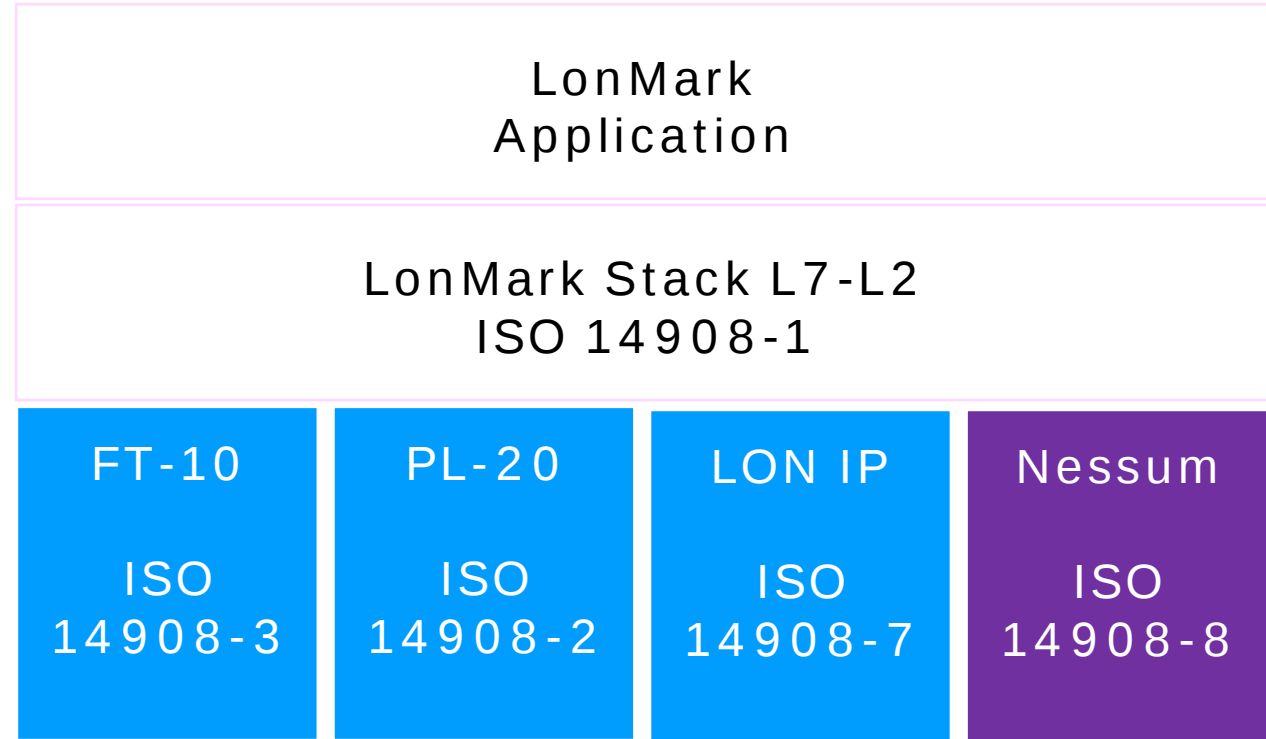
Why Building Automation Needs a New Physical / Link Layer ?

- Legacy field buses are bandwidth-limited
- Installation complexity (polarity, termination)
- Coexistence of non-IP and IP networks during transition
- Reuse of existing wiring is strongly desired

Agenda



LonMark Link Layer



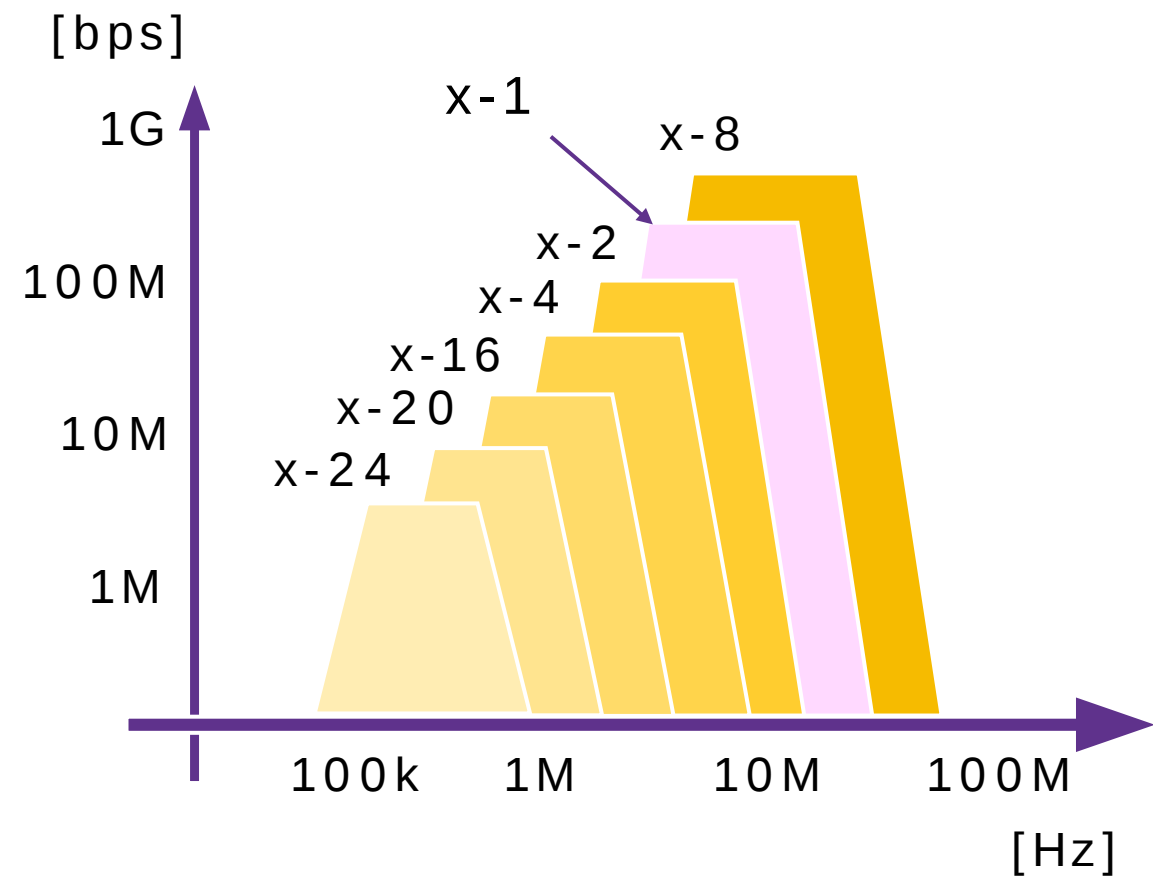
Nessum approved as one of link layer in 2020.

LonMark Link Layer Comparison

	FT-10	PL-20	Nessum(x-1) *with multi-hop
Topology	Free	Free	Free
Polarity	No	No	No
Termination	Required	No	No
Distance between two nodes	300m	3,000m	500 1,000m
Total cable length	500m	3,000m	2,000m
Data rate	78kbps	5.4kbps	10,000kbps

Nessum delivers higher bandwidth over existing wiring.

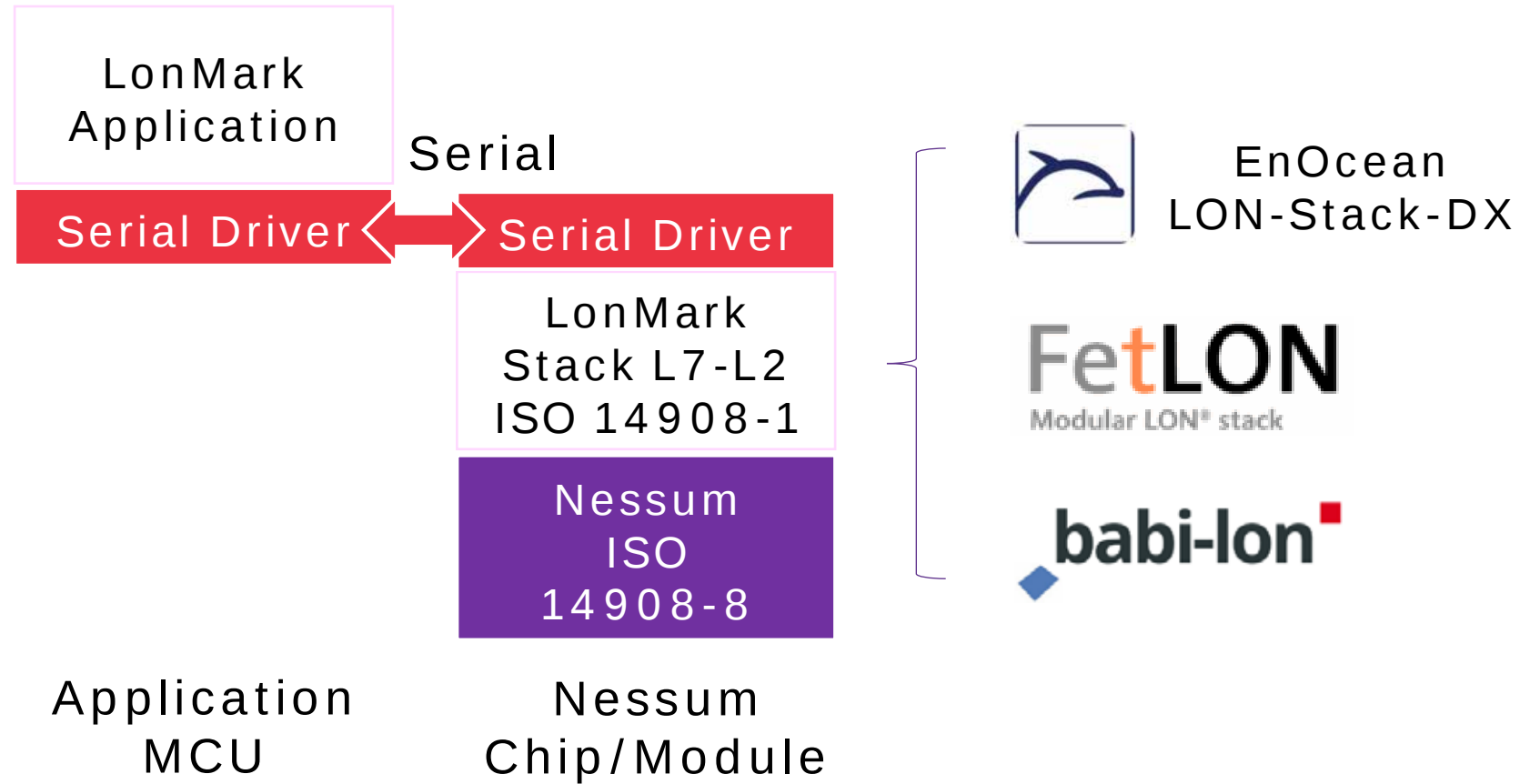
Nessum tips (Trade-off between Bandwidth and Distance)



Channels can be selected depending on required data rate and communication distance.

Nessum	Distance between two nodes [m]	Total cable length [m]	Data rate [bps] *with multi-hop
x-8	350 700	1,400	20M
x-1	500 1,000	2,000	10M
x-2	700 1,400	2,800	5M
x-4	1,000 2,000	4,000	2.5M
x-16	1,400 2,800	5,600	1.25M
x-20	2,000 4,000	8,000	0.67M
x-24	2,800 5,600	11,200	0.33M

LonMark Nessum Implementation



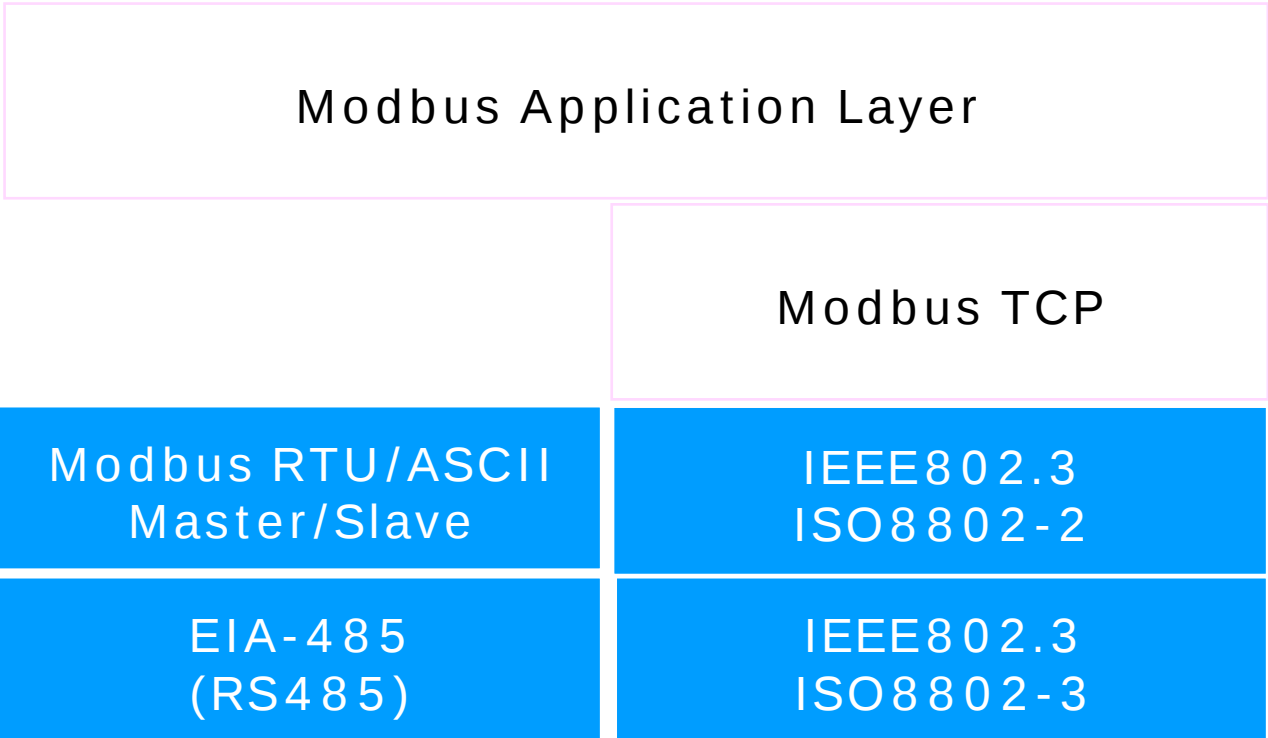
Lon-Nessum is available with combination software stack.

By using Nessum resources, it becomes possible to use low cost MCU.

Agenda

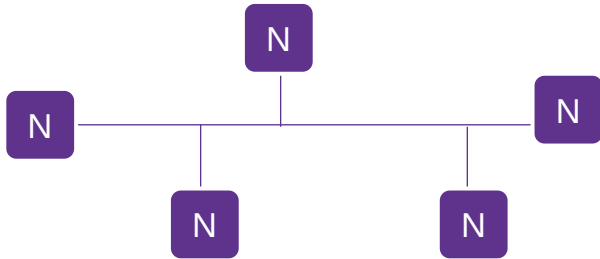


Modbus Link Layer

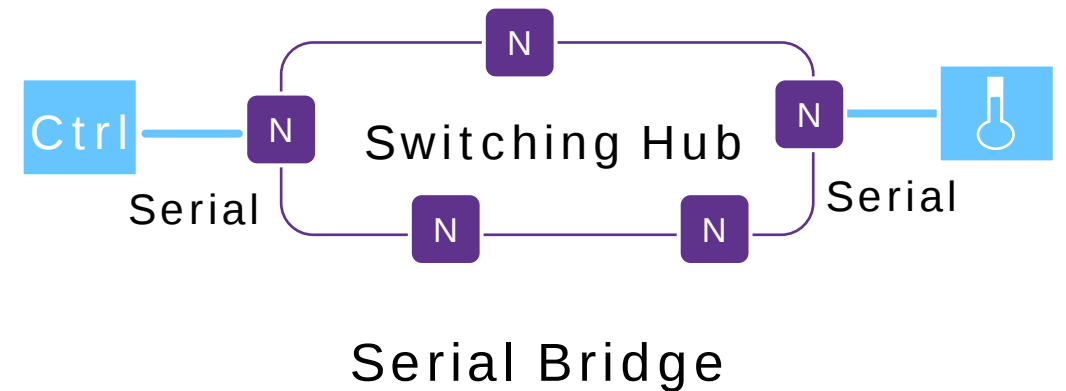
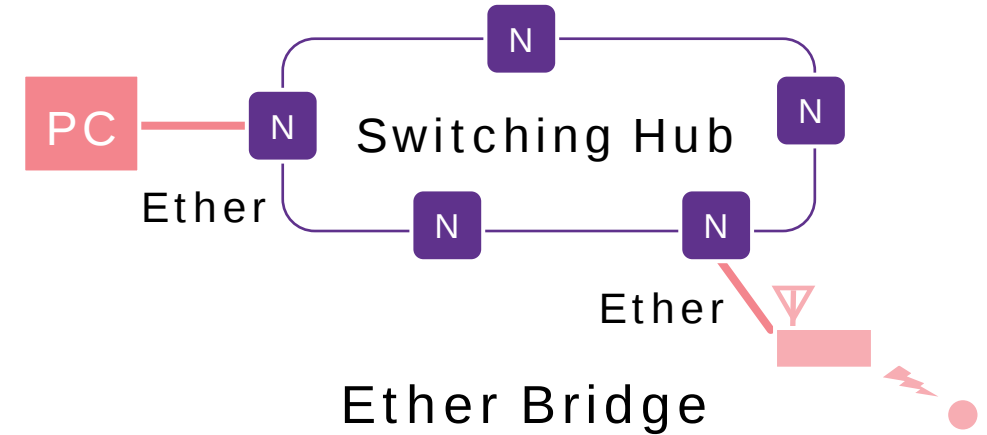


Nessum is not defined as a Modbus standard link layer, but can be transparently introduced at the physical layer.

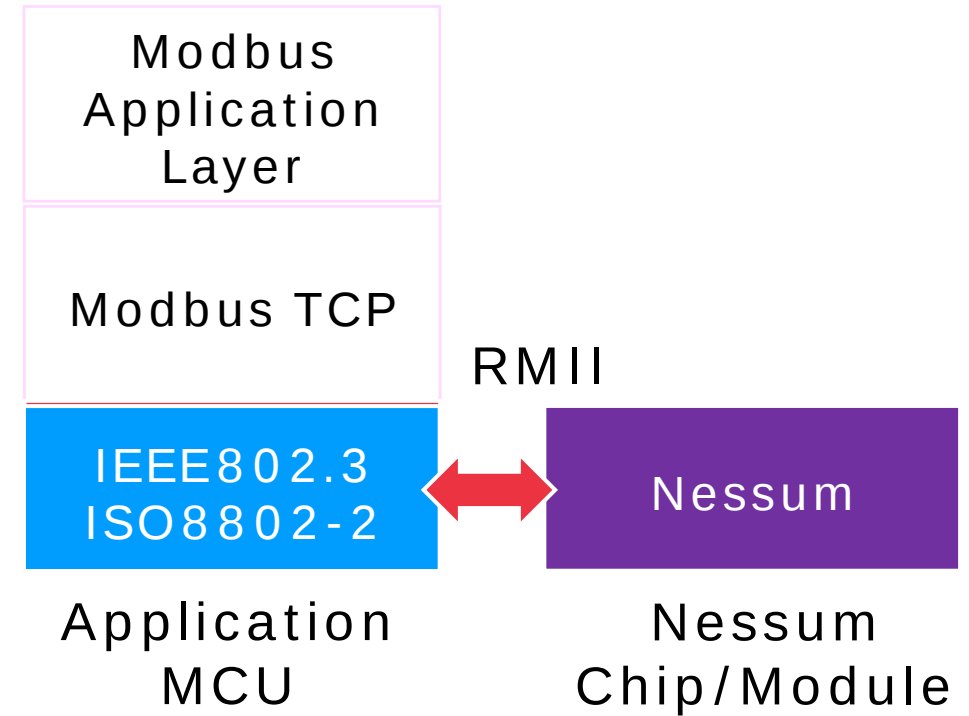
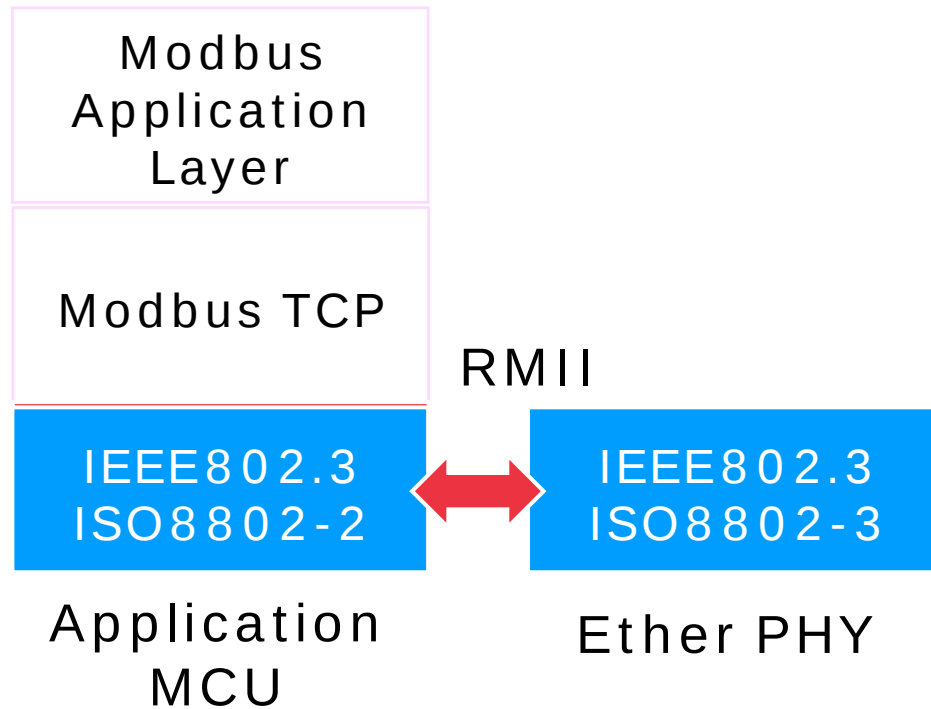
Nessum tips (Bridge functionality)



Nessum network acts as an L2 switch.
It also bridges serial communications
at the same time.

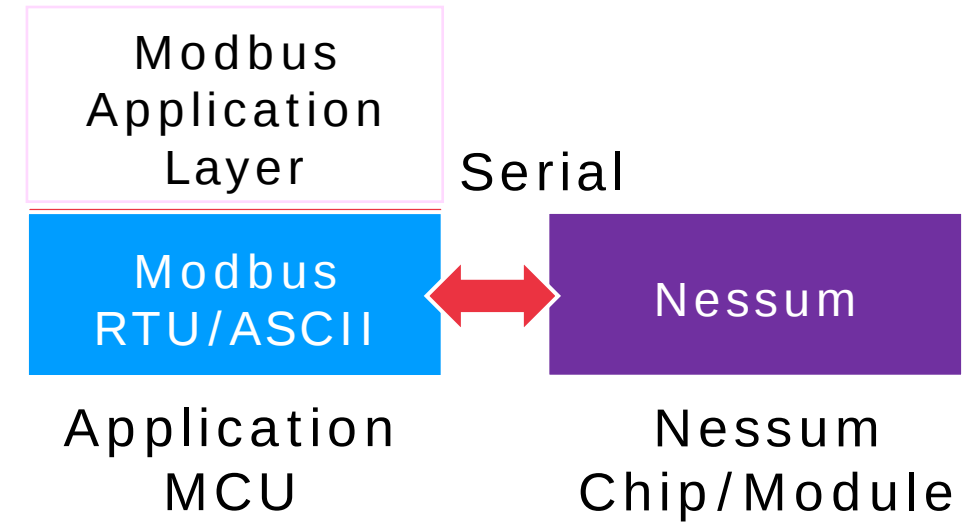
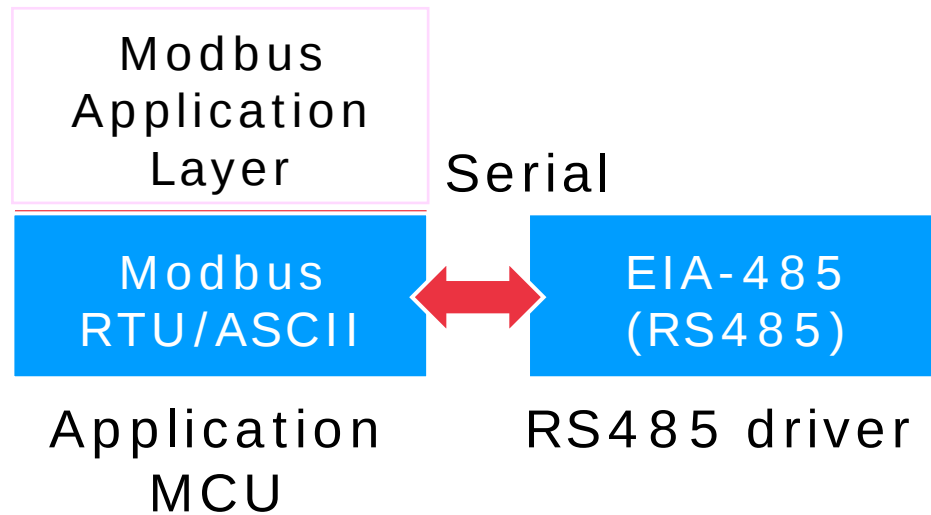


Modbus TCP/IP with Nessim implementation



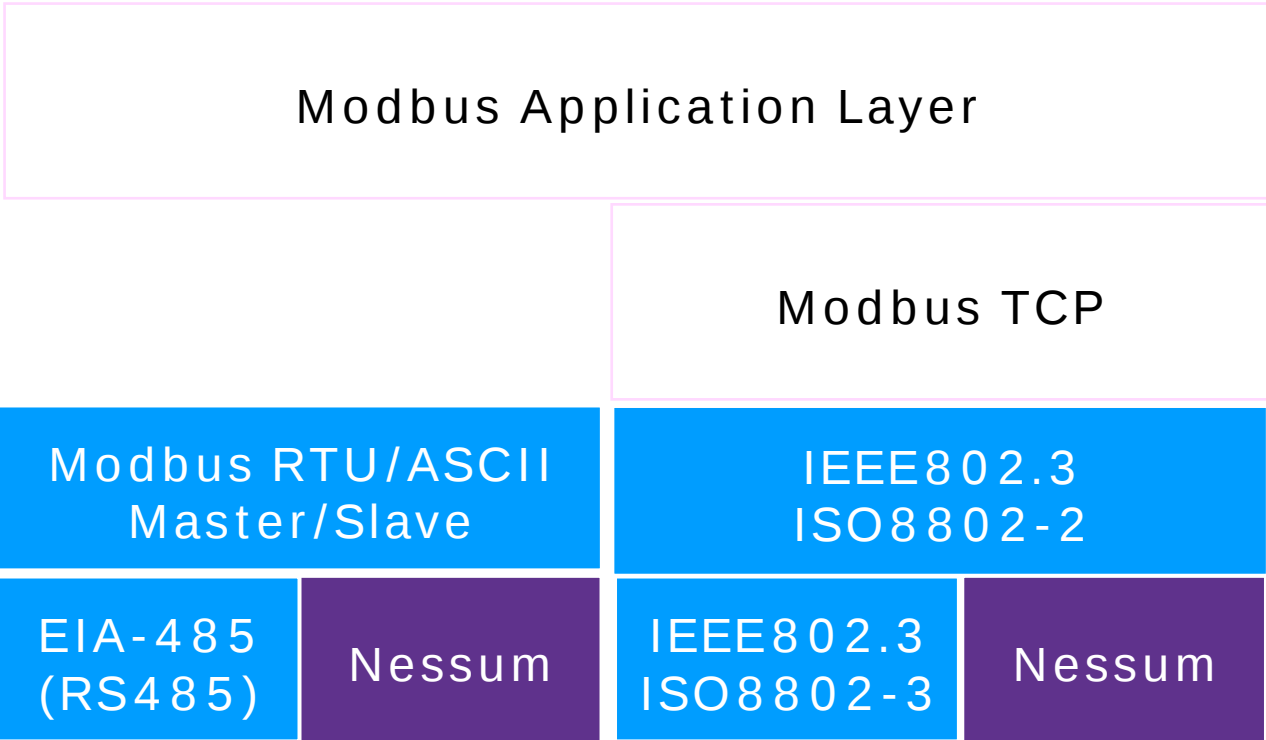
Nessim is enabled by replacing Ether PHY

Modbus RTU with Nessum implementation



Nessum is enabled by replacing RS485 driver

Modbus Link Layer



Nessum is enabled by replacing RS485 driver or Ether PHY.

Seamless coexistence of non-IP and IP networks.

Modbus Link Layer Comparison

	RS-485		10Base-T1L	Nessum(x-1) *with multi-hop
Topology	Bus*	Daisy chain	Peer-to-Peer*	Free
Polarity	Required	Required	No	No
Termination	Required*	Required	Required*	No
Node-to-Node Distance	2,000m	1,200m	1,000m	500 1,000m
Total cable length	2,000m	1,200m	1,000m	2,000m
Data rate	10kbps	100kbps	10,000kbps	10,000kbps
Connectivity Resilience	Low		Medium	High

Nessum simplifies network deployment by combining Free Topology with Autonomous Connectivity Resilience.

Nessum tips (Media Independent)

Non twisted pair



Redundant Pair Wiring



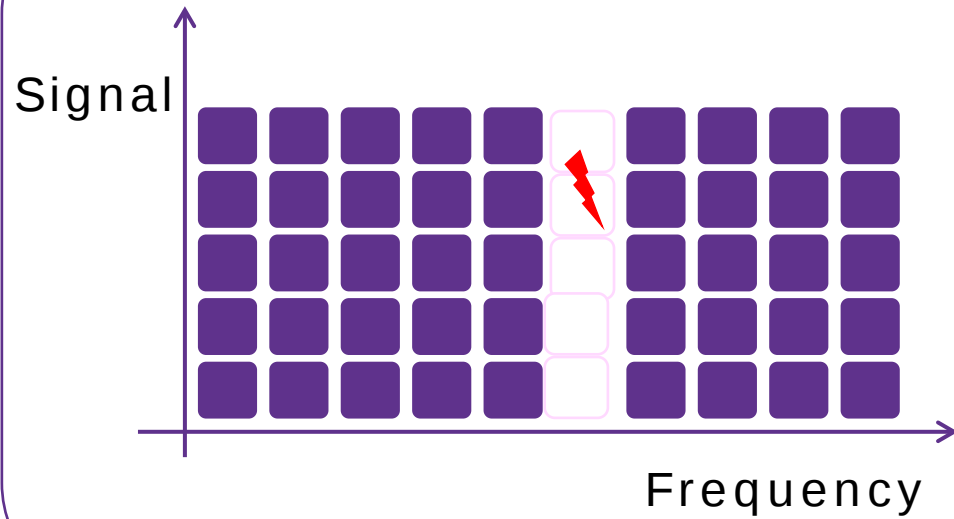
Power line



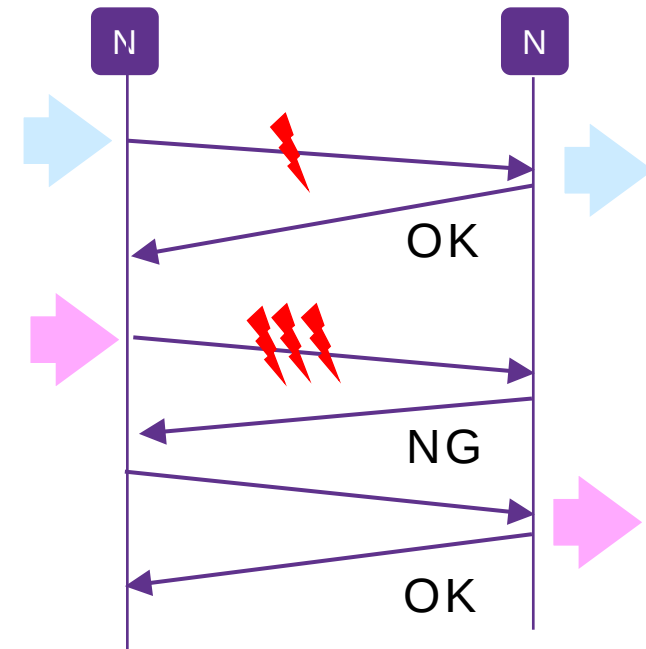
AC 24V / DC 30V
LV / MV

Nessum tips (Noise Immunity)

Multi carrier

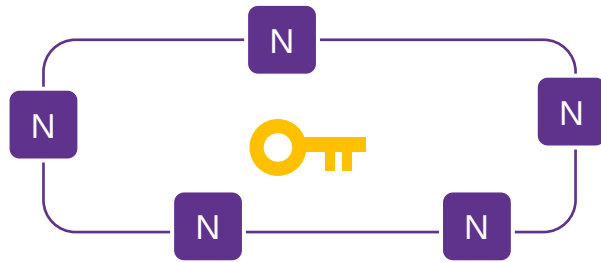


Error Correction + Retransmission



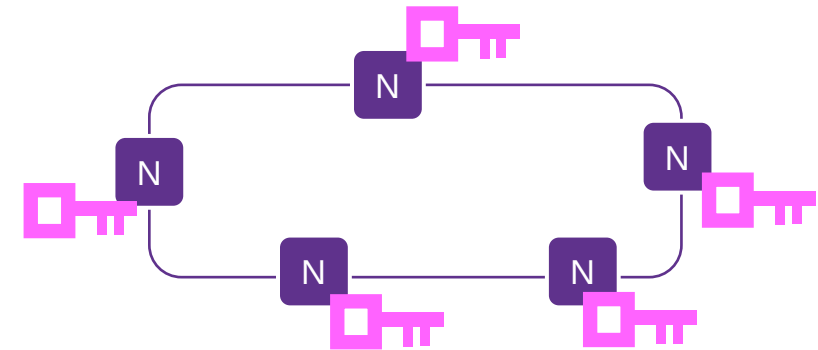
Nessus tips (Security)

Communication

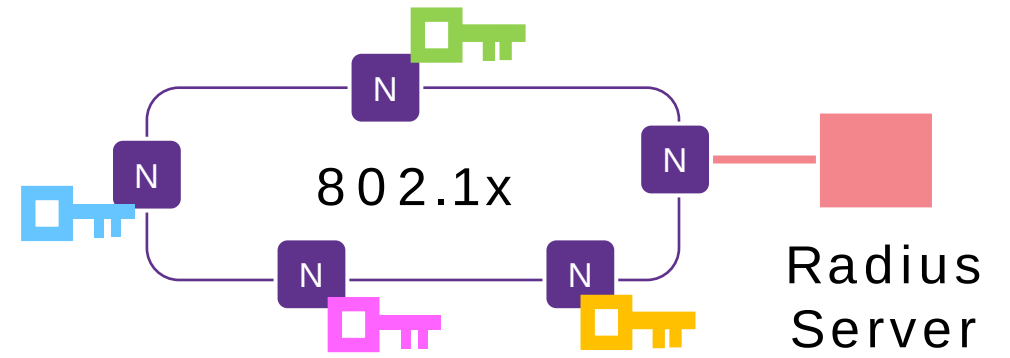


- AES-128
- Dynamic Update

Authentication



Common key



802.1x

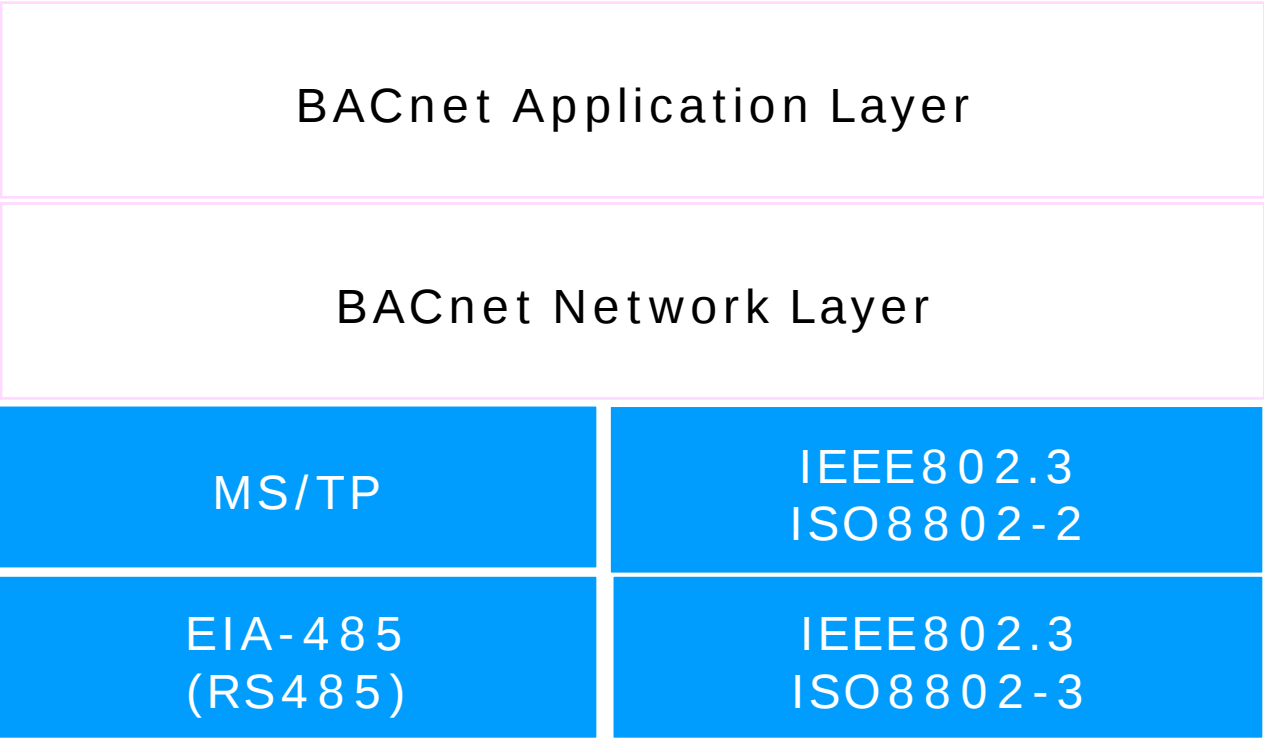
Radius
Server

Private key

Agenda

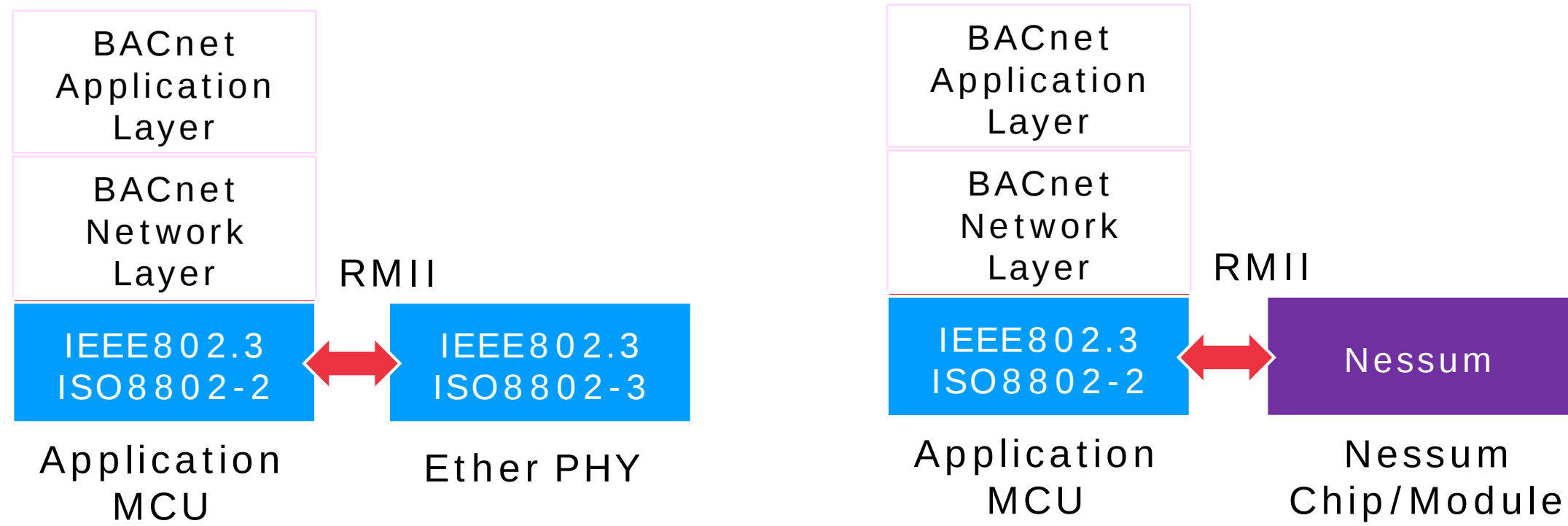


BACnet Link Layer



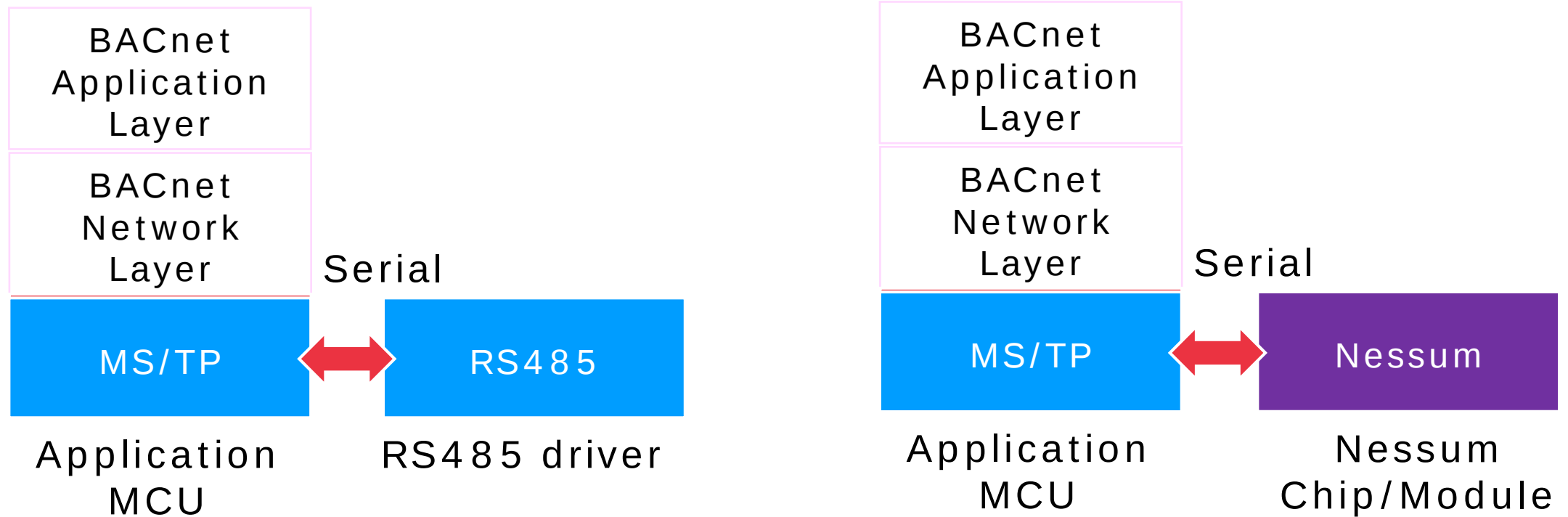
Nessum is not defined as a BACnet standard link layer, but can be transparently introduced at the physical layer.

BACnet / IP with Nessim implementation



Nessim is enabled by replacing
Ether PHY

BACnet MS/TP with Nessum implementation



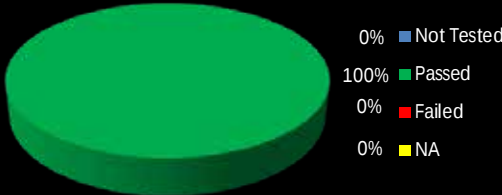
Nessum is enabled by replacing RS485 driver.

BACnet MS/TP requires strict token-passing timing.

BACnet MS/TP with Nessum Test Report (BTL)



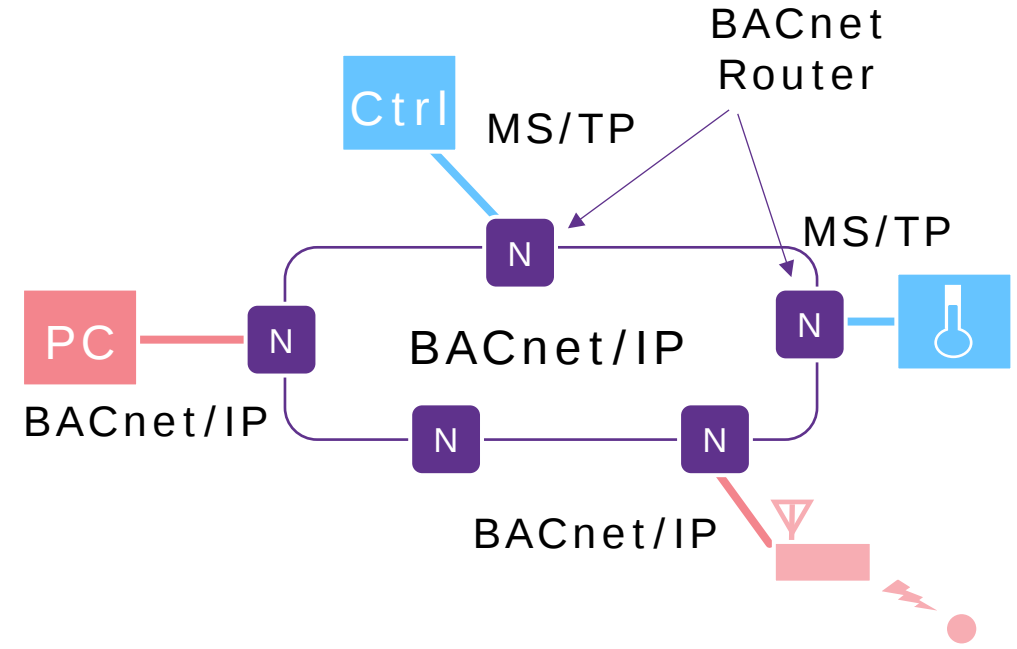
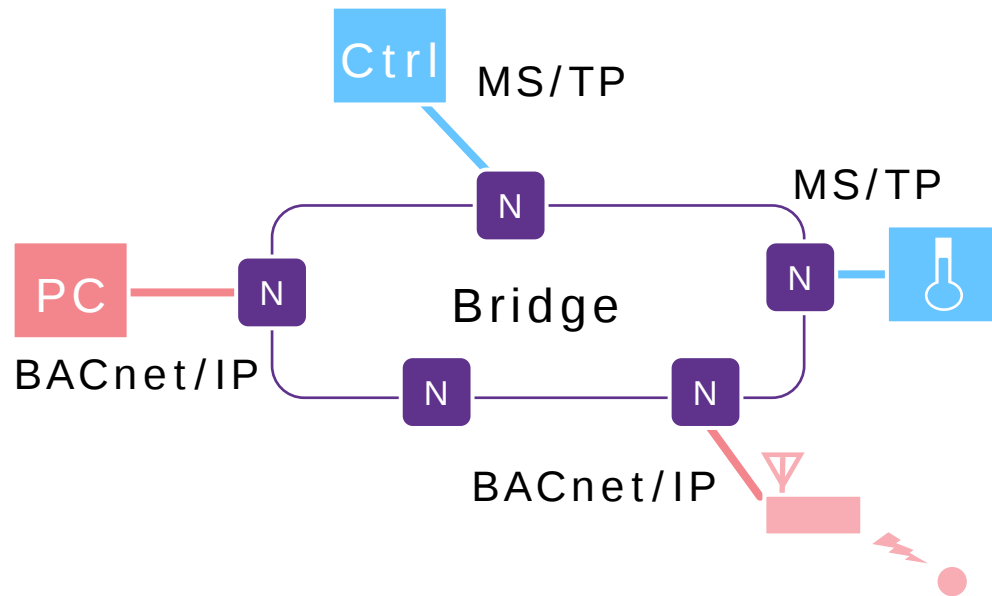
TestProcedureReport_MegaChips_Nessum_MSTP_Testing

Report Information		Test Summary																					
Project Name:	Nessum Converters	MSTP TestCases <table><tr><td>Not Tested</td><td>0</td></tr><tr><td>Passed</td><td>32</td></tr><tr><td>Failed</td><td>0</td></tr><tr><td>NA</td><td>0</td></tr><tr><td>Total Tests</td><td>32</td></tr></table>  0% 100% 0% 0% ■ Not Tested ■ Passed ■ Failed ■ NA	Not Tested	0	Passed	32	Failed	0	NA	0	Total Tests	32	Test Multiple MSTP Cases <table><tr><td>Not Tested</td><td>0</td></tr><tr><td>Passed</td><td>8</td></tr><tr><td>Failed</td><td>0</td></tr><tr><td>NA</td><td>0</td></tr><tr><td>Total Tests</td><td>8</td></tr></table>  0% 100% 0% 0% ■ Not Tested ■ Passed ■ Failed ■ NA	Not Tested	0	Passed	8	Failed	0	NA	0	Total Tests	8
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Passed	8																						
Failed	0																						
NA	0																						
Total Tests	8																						
Client	MegaChips, Japan																						
In-charge	Ameet Kothari/Swapnil Zaveri/Pooja Ugale																						
Module	Dolphin and GEN4BPL Converters																						

Pass all test items

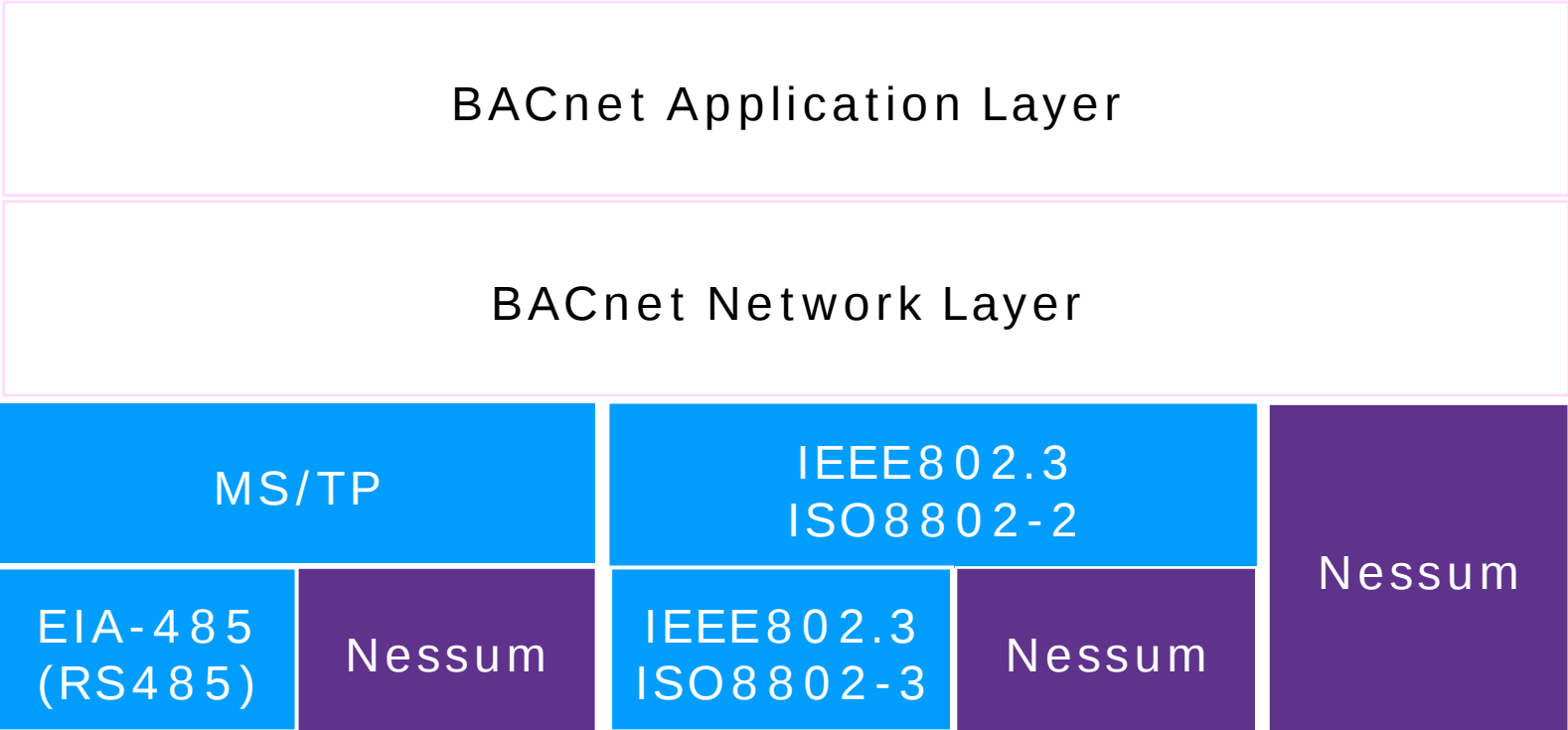
Pass all test items

Nessum tips (BACnet Router function)



Nessum's BACnet/IP MS/TP router function
unify BACnet/IP and BACnet MS/TP

BACnet Link Layer



Nessum is enabled by replacing RS485 driver or Ether PHY.

We plan to propose Nessum as a Link Layer option for enhanced interoperability.

BACnet Link Layer Comparison

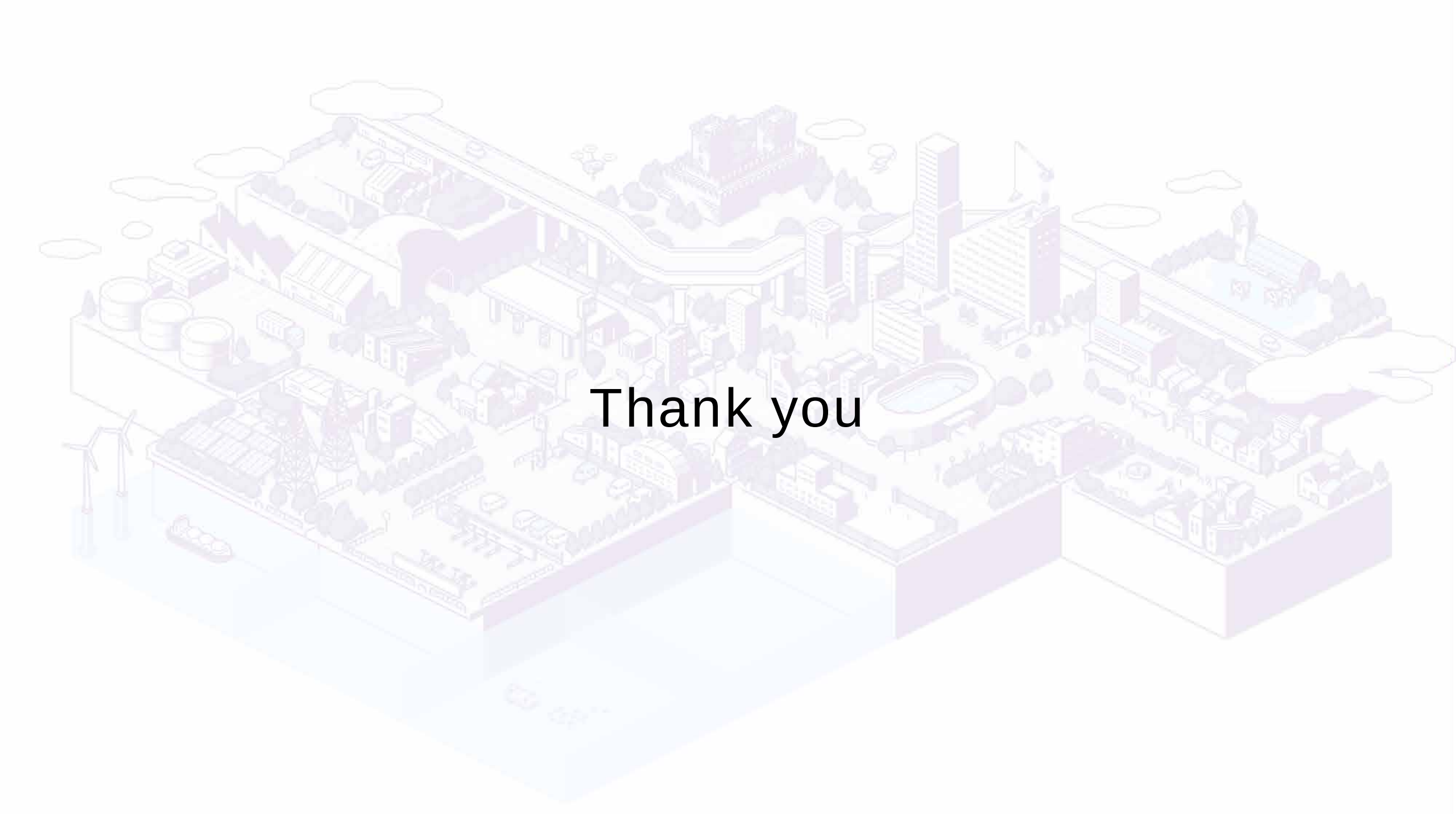
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Nessum simplifies network deployment by combining Free Topology with Autonomous Connectivity Resilience.

Conclusion

Protocol	Bridging Capability	Standardization Status
 LONMARK [®] INTERNATIONAL	-	Yes
 Modbus	Yes	-
 ASHRAE BACnet [™]	Yes	Planned
 KNX	Under Research	Under Research

Nessum brings Ethernet-class performance and simplify installation without changing existing wiring.

An isometric illustration of a city scene. The city is built on a series of raised platforms or blocks. It features a variety of buildings, including tall skyscrapers, smaller commercial buildings, and residential-style houses. There are roads with cars, a winding river or canal, and several green spaces with trees. A large stadium or arena is visible in the center. The overall style is clean and modern, with a color palette dominated by light blues, greys, and greens. The text "Thank you" is centered in the middle of the image.

Thank you