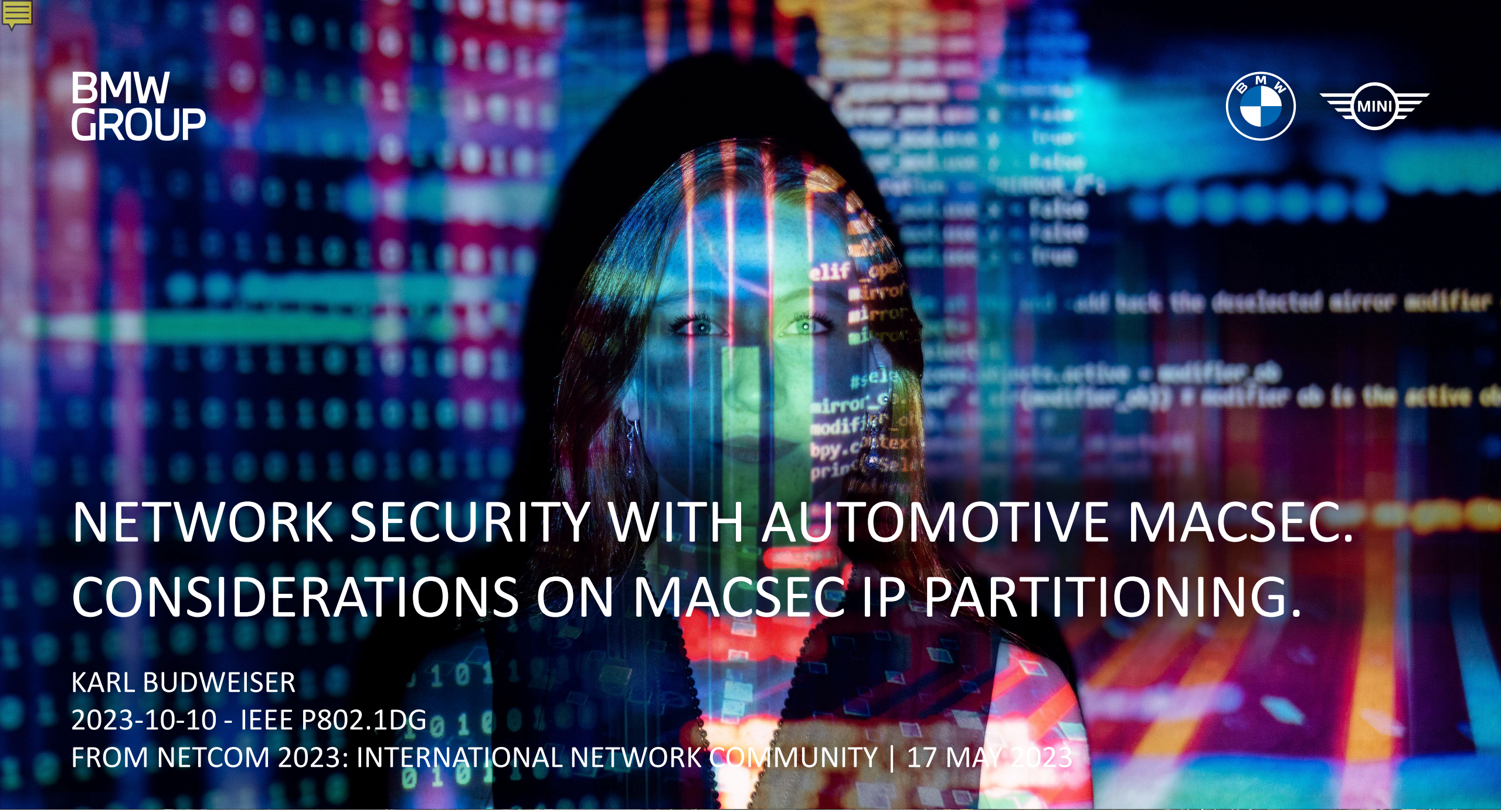


BMW GROUP

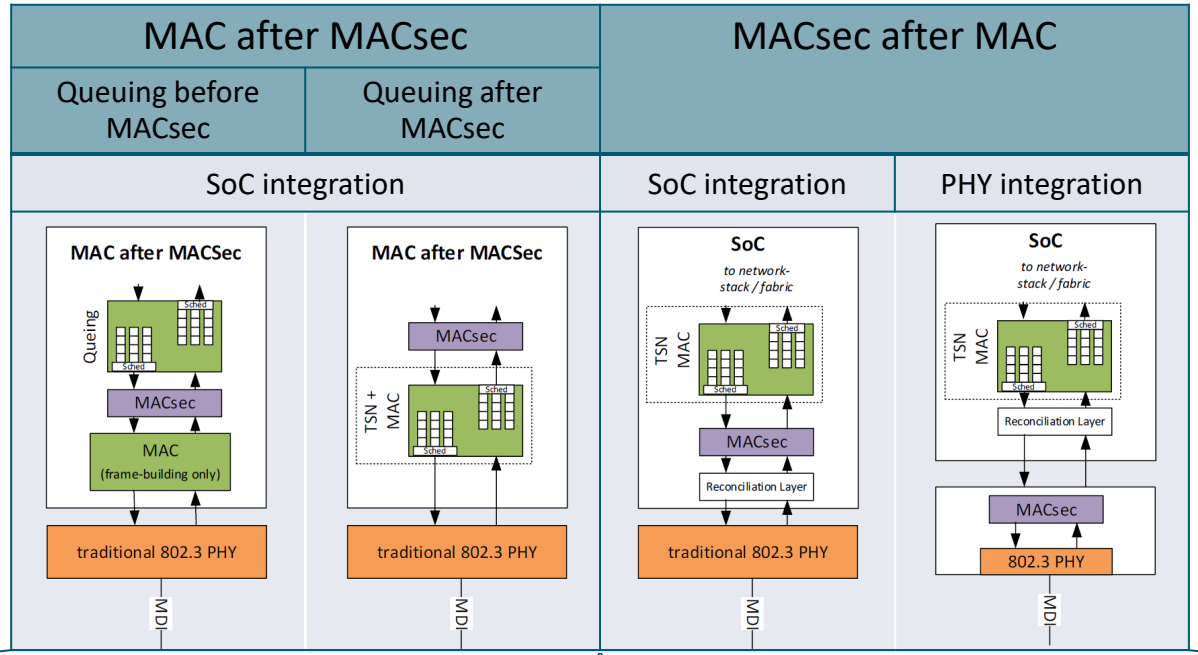
NETWORK SECURITY WITH AUTOMOTIVE MACSEC. CONSIDERATIONS ON MACSEC IP PARTITIONING.

KARL BUDWEISER

2023-10-10 - IEEE P802.1DG

FROM NETCOM 2023: INTERNATIONAL NETWORK COMMUNITY | 17 MAY 2023

NETWORK SECURITY WITH AUTOMOTIVE MACSEC. MACSEC INSIDE THE PHY.



MAC after MACsec

Pros	Cons
▪ Partitioning suggested by IEEE 802.1	▪ Incompatible with PHY integration
▪ TSN algorithms act on actual frame size (Queuing after MACsec)	▪ Frame re-ordering due to scheduling (Queuing after MACsec) → dedi. SCIs
▪ Easy flow control btw. MAC and MACsec	
▪ Traditional MAC timestamping	

MACsec after MAC

Pros	Cons
▪ Easy to „retro-fit“ into existing desings	▪ TX-SCI mapping logic in PHY needed
▪ MACsec acts on final frame ordering (re-ordering only with frame preemtion)	▪ Requires special attention to make MACsec const. latency
	▪ Flow control btw. MAC and MACsec
	▪ Poor latency due to Short-Length coding

THE ISSUES WITH MACSEC INSIDE THE PHY.
EVALUATION OF DIFFERENT FLOW CONTROL SCHEMES.

If rate at xMII is at the maximum, the rate after the MACsec block will be “above the maximum”, as **MACsec grows frames!**

→Some kind of **flow control** is required to throttle xMII on the sending-side, otherwise every 2nd frames might be corrupted.

Mechanism	TSN Compatibility	Support	Software Impact
Accept packet loss	⊖ ⊖	⊕ ⊕	⊕ ⊕
PAUSE frames	Tx/Rx timing jitter, PHY buffer ⊖ ⊖	Standard ⊕ ⊕	⊕ ⊕
Pre-gapped IPG	Bandwidth gurantee ⊖	No Standard ⊖ / ⊕	⊕ ⊕
Ab-use of COL/CRS pins	Scalability, bandwidth ⊖	Half-duplex only ⊕	⊕ ⊕
Pseudo-MACsec header	⊕ ⊕	⊖ / ⊕	⊕

https://cloud.wekanet.de/s/HspiHe3cqYgK7CD

THANK YOU FOR YOUR ATTENTION.