

# Cut-Through Forwarding (CTF) - Updates since September 2022

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(Self; Analog Devices, Inc.; Mitsubishi Electric Corporation; Phoenix Contact GmbH & Co. KG; PROFIBUS Nutzerorganisation e.V.; Siemens AG; Texas Instruments, Inc.)

# July 802.1 Closing Plenary Meeting Motions

## Motion

- 802.1 authorizes the IEEE 802 Nendica to hold joint meetings with the 802.3 NEA to discuss cut-through forwarding.
- Dates, times and agenda to be announced subject to notice of at least 10 days to the [802.1 Minutes email list](#) .
- Access information is posted on the Nendica page and will be updated as necessary.
  
- Proposed: Johannes Specht
- Second: Paul Congdon
- Approved by acclamation

Source: <https://www.ieee802.org/1/files/public/minutes/2022-07-closing-plenary-slides.pdf>

## No Objection

## Motion

- 802.1 authorizes the TSN TG to generate PAR and CSD at the September 2022 interim session for pre-circulation to the EC for an IEEE 802.1 standard on Cut-Through Forwarding.
  
- Proposed: Johannes Specht
- Second: Jordon Woods
  
- Move to call the question:
- In the WG (y/n/a): 21, 16, 6
  
- In the WG (y/n/a): 16, 23, 8

Source: <https://www.ieee802.org/1/files/public/minutes/2022-07-closing-plenary-slides.pdf>

## Objections Raised

- 3<sup>rd</sup> motion in series on the same subject.
- Prior to another motion, provide more technical clarity on uncertainties.
  - Uncertainty about the technical scope of P802.1DU.
  - Uncertainty on support for CTF below the ISS.

# EC Reports on the Nendica/NEA Joint Activity

## IEEE 802 Nendica perspective on the NEA/Nendica joint ad-hoc activity on CTF

### Nendica CTF History & 802.1 Status

- Nendica CTF Study Item opened in March 2021 and has met many times since
- 802.1 WG pre-submitted CTF PAR (P802.1DU) Jan. 2022
  - Withdrew the request in March in the face of comments
- held 7 Joint CTF meetings along with 802.3 NEA
  - April-June 2022
  - Outcome: no consensus yet
- Nendica met about 3 hours on CTF at July 2022 Plenary
  - No consensus on what supporting MAC an 802.1 Cut-Through Forwarding standard would use and, if needed, where to specify it.
- At 802.1 WG Closing of 2022-07-14, motions were made
  - *802.1 authorizes the IEEE 802 Nendica to hold joint meetings with the 802.3 NEA to discuss cut-through forwarding.*
    - Dates, times and agenda to be announced subject to notice of at least 10 days to the 802.1 Minutes email list.
    - Access information is posted on the Nendica page and will be updated as necessary.
    - In the 802.1 WG: approved by acclamation
  - *802.1 authorizes the TSN TG to generate PAR and CSD at the September 2022 interim session for pre-circulation to the EC for an IEEE 802.1 standard on Cut-Through Forwarding.*
    - In the 802.1 WG (y/n/a) 16/23/8 (motion failed)

Source: <https://mentor.ieee.org/802.1/dcn/22/1-22-0037-00-1Cne-cut-through-forwarding-status-update-from-nendica-perspective.pdf>

## IEEE 802.3 NEA perspective on the NEA/Nendica joint ad-hoc activity on CTF

- Discussion of joint 802.1 Nendica / 802.3 NEA Ad Hoc meetings
  - NEA has completed the scope of the charter by the 802.3 Working Group Chair with joint meetings with 802.1 Nendica.
  - If the cut-through proponents wish to change IEEE Std 802.3-2022 they need to follow the 802.3 process. The cut-through proponents may use the NEA for consensus building in preparation for a Call for Interest in the 802.3 Working Group (but are not required to utilize the NEA).
  - Other discussion is better suited for an architectural discussion and not the scope of the NEA.
  - Review NEA conclusion

Source: [https://www.ieee802.org/3/minutes/jul22/0722\\_NEA\\_close\\_report.pdf](https://www.ieee802.org/3/minutes/jul22/0722_NEA_close_report.pdf)

### IEEE 802.3 NEA Conclusion from the joint NEA / 802.1 Nendica meetings on cut-through forwarding.

The IEEE 802.3 Ethernet Media Access Control (MAC) and MAC Client service interface specified in IEEE Std 802.3-2022 only supports store and forward operation and is unable to support cut-through operation. To provide cut-through capability, a new definition of the IEEE 802.3 MAC is required.

Source: [https://www.ieee802.org/3/minutes/jul22/0722\\_NEA\\_close\\_report.pdf](https://www.ieee802.org/3/minutes/jul22/0722_NEA_close_report.pdf)

# GSCF – below the ISS (1)

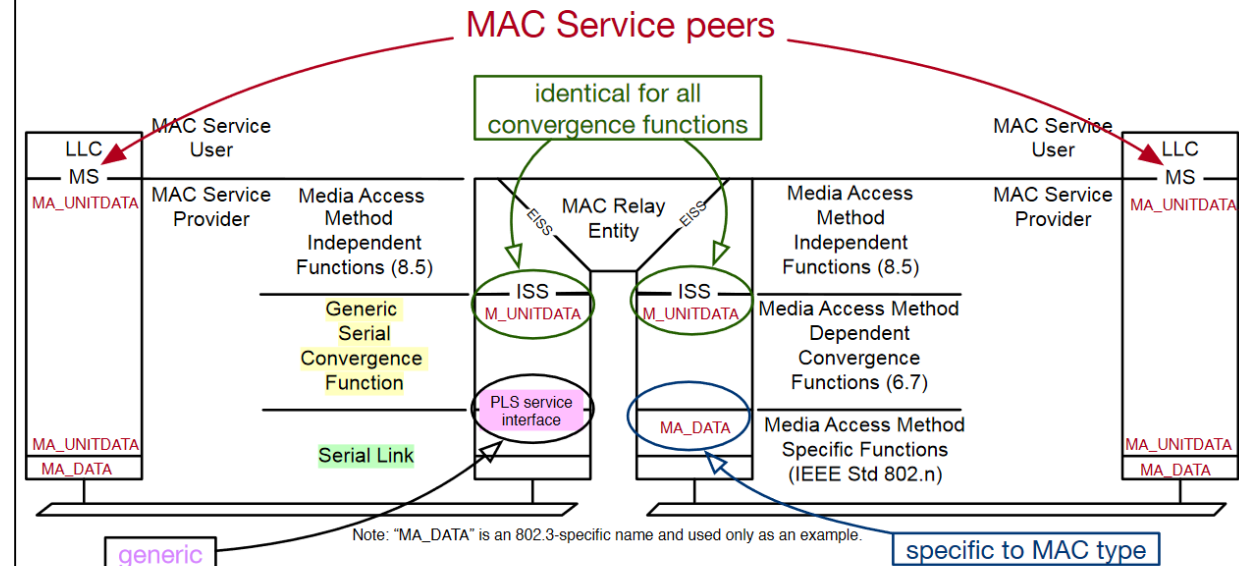
## Addressing the MAC Roadblock

- Approach:
  - Bypass the MAC roadblock by eliminating the MAC.
    - This could help enable cut-through forwarding (CTF).
    - Perhaps other advantages might also result.
- Presumption
  - collision-free LAN
    - support for only for full-duplex
    - medium access needs no control

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Source: <https://mentor.ieee.org/802.1/dcn/22/1-22-0040-03-1Cne-generic-serial-convergence-function-gscf.pdf>

## Architectural Model with GSCF & PLS



All Ethernet LANs support the PLS interface.  
Other LANs might, in principle, also support "reconciliation" to PLS.

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Source: <https://mentor.ieee.org/802.1/dcn/22/1-22-0040-03-1Cne-generic-serial-convergence-function-gscf.pdf>

# GSCF – below the ISS (2)

## GSCF is not “a MAC”

- It does not initiate or terminate the MAC service.
- It does not operate at a MAC SAP or have a MAC address.
- It is not a peer.
- It can function with a variety of MAC specs
- It does not match the functionality of any existing MAC.
  - e.g. it does not match the 802.3 MAC spec
  - though it includes some functions of the 802.3 MAC spec
- Its upper interface can be described by transactions that are more granular than a frame.
- The bridge using GSCF and CTF is closer to a repeater or hub.
  - But bridging makes it a selective repeater.
  - Bridging functionality is required, including:
    - filtering
    - egress queuing at busy ports
    - etc.

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Source: <https://mentor.ieee.org/802.1/dcn/22/1-22-0040-03-1Cne-generic-serial-convergence-function-gscf.pdf>

## Recommendations

- Future CTF project proposals could consider GSCF as a basis of documenting feasibility
  - Should determine whether the existing ISS M\_UNITDATA primitive specifications are compatible with using GSCF for CTF
    - If not, should consider supplementing ISS with the additional primitives based on transferring octets, DA, SA, and FCS
- Specification of GSCF could be developed in a new standard or as an amendment to IEEE Std 802.1AC
  - 802.1AC is where the “Media Access Method Dependent Convergence Functions” are specified.
    - Although the title is “Media Access Control (MAC) Service Definition,” the scope includes much more, including:
      - ISS specification
      - Media Access Method Dependent convergence functions supporting ISS
- CTF functionality at the bridge would be better specified elsewhere.

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Source: <https://mentor.ieee.org/802.1/dcn/22/1-22-0040-03-1Cne-generic-serial-convergence-function-gscf.pdf>

# Next Steps - in IEEE 802 Nendica and IEEE WG 802.1

- Continue to develop “Technical Descriptions for Cut-Through Forwarding in Bridges” and gather feedback in IEEE Nendica, by e-mail, etc.
- Determine the “vehicles” for the next steps in standardization
- On the basis of “Technical Descriptions for Cut-Through Forwarding in Bridges”, ask 802.1 WG, at IEEE 802 Plenary Session in November 2023, to authorize TSN for PAR/CSD pre-submission(s) towards IEEE 802 Plenary Session in March 2023

***^ September 2022 Interim***

***→ here we are ...***

# Meetings during this IEEE 802 Plenary Session

- IEEE 802.1 TSN: Tuesday, 14:30-15:30 ICT → **Now!**
  - Overview of the Document
  - Why P802.1DU/Vehicles (non-technical)
- IEEE 802 Nendica: Tuesday, 19:30 – 21:30 ICT → **You're welcome!**
  - Introduction to GSCF
  - Technical Discussions on the Document
- IEEE 802.1: Thursday, 13:30 – 18:00 ICT
  - Closing Plenary
  - **PAR/CSD Motion** on P802.1DU

# Providing Technical Clarity to WG 802.1 (1)

1 Technical Descriptions for  
2 Cut-Through Forwarding in Bridges  
3 DCN 1-22-0042-12-ICne  
4 Author: Johannes Specht  
5 November 14, 2022

179 1. Purpose  
180 Purpose of this document is to provide input for technical discussion in pre-PAR activities of IEEE 802, the *IEEE 802 Network Enhancements for the Next Decade Industry Connections Activity* (Nendica) in particular. The contents of this document are technical descriptions for the operations of Cut-Through Forwarding (CTF) in bridges. The intent is to provide more technical clarity, demonstrate technical feasibility, and thereby satisfy the request expressed by individuals during the IEEE 802.1 closing plenary meeting in July 2022.

187 2. Relationship to IEEE Standards  
188 This document **IS NOT** an IEEE Standard or an IEEE Standards draft, it is an individual contribution by the author containing technical descriptions. This allows readers to focus on the technical contents in this document, rather than additional aspects that are important during standards development. For example:

206 3. Status of this Document  
207 This document is work-in-progress. It contains technical and editorial errors, omissions, simplifications and certain descriptions can be enhanced. Readers discovering such issues are encouraged for making enhancement proposals, e.g. by proposing textual changes or additions to the author (johannes.specht.standards@gmail.com).

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**Work-in-progress → Feedback welcome!**



# Providing Technical Clarity to WG 802.1 (2)

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**Work-in-progress → Feedback welcome!**

# Vehicle Options/Why P802.1DU

Item	DCN 1-22-0042-12-ICne	Options
Modeling of Service Primitives	Part II, 5.2	<b>P802.1DU</b> , P802.1AC**?
Parameter-based Modeling	Part II, 5.3	<b>P802.1DU</b> , P802.1Q**?
Temporal Control	Part II, 5.4	<b>P802.1DU</b> , P802.1Q**?
Generalized Serial Convergence Operations	Part II, 6	<b>P802.1DU</b> , P802.1AC**, outside IEEE 802?
Bridge Port Transmit and Receive Operations	Part II, 7	<b>P802.1DU</b> , P802.1Q**?
Bridge Relay Operations	Part II, 8	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1CB**</u> )?
Management Parameters	Part II, 9	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1?*</u> )?
Cut-Through Forwarding in Bridged Networks	Part III	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1CB** + ...</u> )?
Interaction of the Lower Layer Interface (LLI) with existing Lower Layers, PLS	Part IV, A.1	<b>P802.1DU</b> , (P802.?** + ...), outside IEEE 802?

# Vehicle Options/Why P802.1DU

Item	DCN 1-22-0042-12-ICne	Options
Modeling of Service Primitives	Part II, 5.2	<b>P802.1DU</b> , P802.1AC**?
Parameter-based Modeling	Part II, 5.3	<b>P802.1DU</b> , P802.1Q**?
Temporal Control	Part II, 5.4	<b>P802.1DU</b> , P802.1Q**?
Generalized Service Primitives	Part II, 6	<b>P802.1DU</b> , P802.1AC**, <u>outside IEEE 802?</u>
Bridge Port Transitions	Part II, 7	<b>P802.1DU</b> , P802.1Q**?
Bridge Relay Operations	Part II, 8	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1CB**</u> )?
Management Parameters	Part II, 9	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1?*</u> )?
Cut-Through Forwarding in Bridged Networks	Part III	<b>P802.1DU</b> , (P802.1Q** + <u>P802.1CB** + ...</u> )?
Interaction of the Lower Layer Interface (LLI) with existing Lower Layers, PLS	Part IV, A.1	<b>P802.1DU</b> , (P802.?** + ...), outside IEEE 802?

Good reasons for not “just” making CTF an 802.1Q amendment ...

Good reasons for not “just” making CTF an 802.1Q amendment ...

# Thank You for Your Attention!

Questions,  
Comments,  
Opinions,  
Ideas?