On Cut-Through Forwarding/P802.1DU

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IEEE 802 November 2026 Plenary Session, Bangkok

Executive Summary & Project Status

Focus of this session

1. Timeline of Cut-Through in IEEE 802.1
2. Cut-Through Operation
3. Multi-Market Scope
4. Brownfield Interoperability
5. Vendor-Neutral Management
6. Consensus & Leadership
7. Today & Tomorrow

Timeline of Cut-Through in IEEE 802.1

1996

- Considerations on Cut-Through switching in the context of P802.1d

2016 - 2020

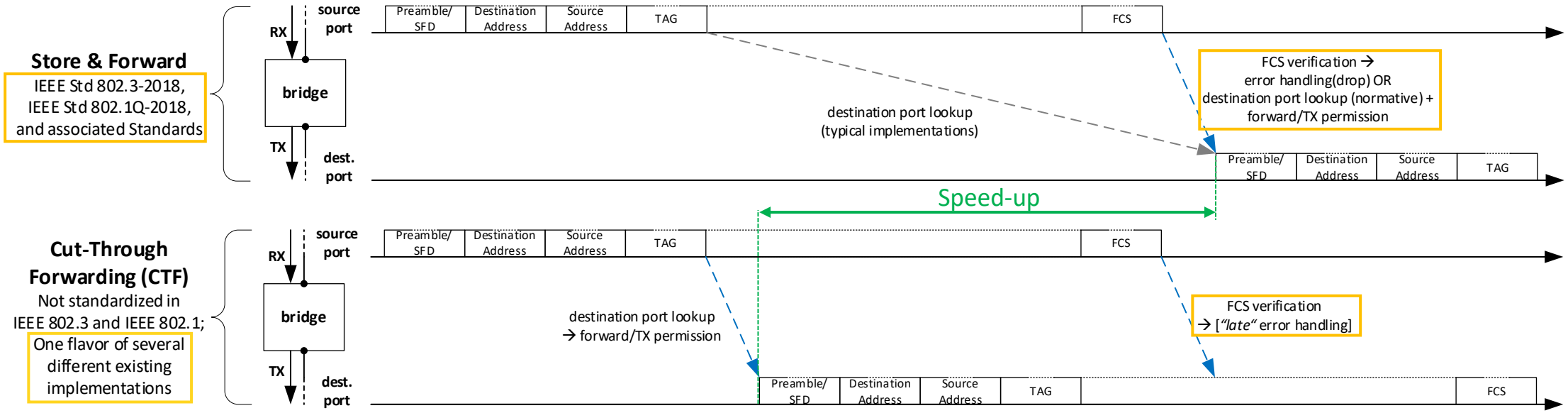
- Avnu Alliance requesting industrial guidance
- Contributions from different individuals in different IEEE 802.3/IEEE 802.1 venues
- Offline discussions

2021 - 2026

- Nendica: Study Item, analysis of cut-through and inter-WG discussions, Plenary Tutorial
- P802.1DU PAR & CSD – Standalone project (i.e., not an amendment to a base Standard)
- P802.1DU drafting
- Offline discussions
- P802.1DU drafting
- Nov 2026 (Bangkok Plenary): Draft 0.4

Cut-Through Operation

- **CTF is an alternative forwarding method to Store & Forward (S&F) in Bridges**



Enhanced delay performance

- Reduced residence times of frames in bridges (“speed-up”).
- Reduced frame length dependent jitter/delay variation.

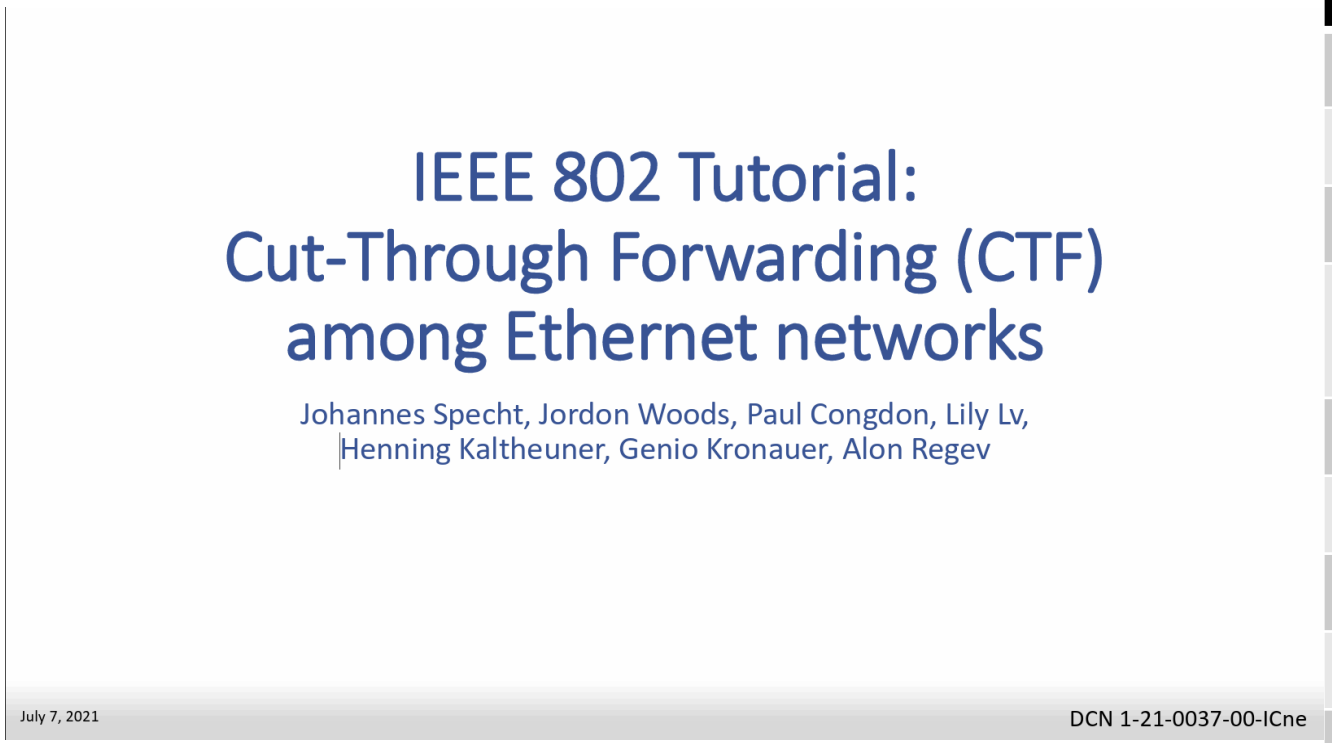
Challenges

- Forwarding and transmission of erroneous frames under reception:
  - ➢ Potentially to the wrong destination port(s) and/or traffic classes.
  - ➢ Limited handling options after subsequent late error discovery (e.g., FCS verification).
- S&F operation manifested in IEEE 802.1 and 802.3 standards, at least to a certain extent.

Different flavors of CTF

- Forwarding to destination port(s): After lookup v.s. after 64 octets
- Late error handling in destination port(s): Truncating v.s. (just) marking such frames
- …
- ➢ ***A good reason for standardizing CTF, regardless of the decisions which flavor(s) to standardize!***

July 7, 2021: IEEE 802 Cut-Through Tutorial



Section	Speaker
1. Introduction	Johannes Specht
2. Use-Cases	
• Industrial Automation	Jordon Woods
• Professional Audio/Video	Henning Kaltheuner, Genio Kronauer
• Data Center Networks	Paul Congdon, Lily Lv
3. Summary: Goals and Objectives	Johannes Specht
4. IEEE 802.1 Considerations	Johannes Specht
5. IEEE 802.3 Considerations	Alon Regev
6. Call to Action	Johannes Specht
7. Q&A	All

Source: https://mentor.ieee.org/802.1/dcn/21/1-21-0037-00-ICne-ieee-802-tutorial-cut-through-forwarding-ctf-among-ethernet-networks.pdf

Video: https://www.ieee802.org/1/files/public/tutorial/Cut-Through-Forwarding_tutorial_0721.mp4

Multi-Market Scope (Part 1: Industrial & Automotive In-Vehicle Networks)

Addressing Low-Latency Constraints

- **Industrial Automation Operational Technology**
  - Bounded low-latency for tight control loops (e.g., 100–125 µs) in long line/ring topologies (64+ hops) where Store-and-Forward latency accumulates significantly.
  - Significant end-to-end latency reduction especially at lower link speeds (100 Mbit/s and 1 Gbit/s).
- **Automotive In-Vehicle Networks**
  - Software-Defined Vehicles (SDVs) to link zonal controllers/ECUs with central compute clusters at minimal forwarding delay.
  - Source: https://www.design-reuse.com/blog/56229-how-time-sensitive-networking-powers-the-software-defined-vehicle/

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Multi-Market Scope (Part 2: ProAV, DCN & Ecosystem Impact)

…

- **Professional Audio/Video**
  - Ultra-low latency (~100 µs per network hop) across daisy-chained venue networks.
  - Meet end-to-end latency budgets (< 2–3 ms) for live performance and Public Address / Voice Alarm (PA/VA) infrastructure.
- **Data Center Networks**
  - Reduces per-hop switch latency to nanosecond levels for HPC, and AI/Big Data workloads.
  - Bypasses Store-and-Forward queuing bottlenecks for RDMA and NVMe-over-Fabrics.

→ **Impact & Markets**

- A single, unified IEEE standard enables vendors and integrators to leverage a common architecture across Industrial, Automotive, ProAV, and Data Center domains, expanding the total addressable market.

Brownfield Interoperability

Harmonizing Legacy Solutions with the IEEE 802.1 Architecture

- **Compatibility**
  - Broadly support “flavors” of Cut-Through.
- **Coexistence with IEEE 802.1 Stds**
  - Interoperability with standard IEEE 802.1Q forwarding, VLAN tagging, and IEEE 802.1CB Frame Replication and Elimination.
- **Fallbacks / Error Handling**
  - Standardized fallbacks to Store-and-Forward.
  - Marking mechanism indicating corrupted frames along the path (late error handling).

Vendor-Neutral Management

Standardized YANG Modeling for Heterogeneous Networks

- **Standardized Configuration & Diagnostics**
  - Common YANG for Cut-Through capabilities, status variables, and port state management.
- **Vendor-Neutral**
  - Avoiding proprietary management extensions in favor of open IEEE standards.
  - Allowing interoperability, usability and testability.
- **Multi-Vendor Integration**
  - Consistent operational behavior and configuration interfaces for centralized network controllers (e.g., IEEE 802.1Qcc).
  - Guidance to using standardized Cut-Through in Bridged Networks.

Consensus & Leadership

IEEE P802.1DU Standardization

- **Consensus driven**
  - Fair, neutral, and unbiased progression of P802.1DU.
- **Objective comment resolution**
  - Resolution of ballot comments representing diverse technical input.
- **Technical quality & convergence**
  - Precise & implementable contents.

Today & Tomorrow

P802.1DU draft version 0.4 published on Nov 5, 2026

- Intermediate draft not for balloting.
- Incorporating dispositions against D0.3.
- Further insights gained.
- Link: https://www.ieee802.org/1/files/private/du-drafts/d0/802-1DU-d0-4.pdf

Next steps

- Work on open issues.
- Taking input from this session into account.
- If you are interested in this project, please contact me by email or at today's social event.

Thank You for Your Attention!



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