Cut-Through Forwarding (CTF): Discussing Next Steps

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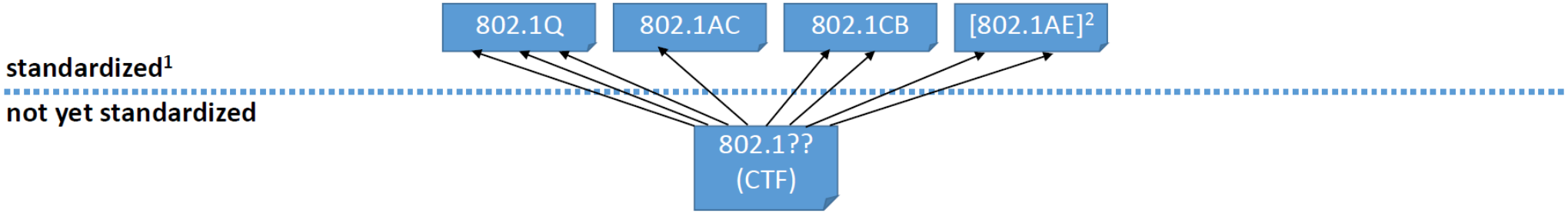
Context/Recap

IEEE 802 Plenary Tutorial on CTF

Administrative Follow Up Meeting on August 5

IEEE 802 Plenary Tutorial: Recap. (1)

Proposed Location in IEEE 802.1 Standards



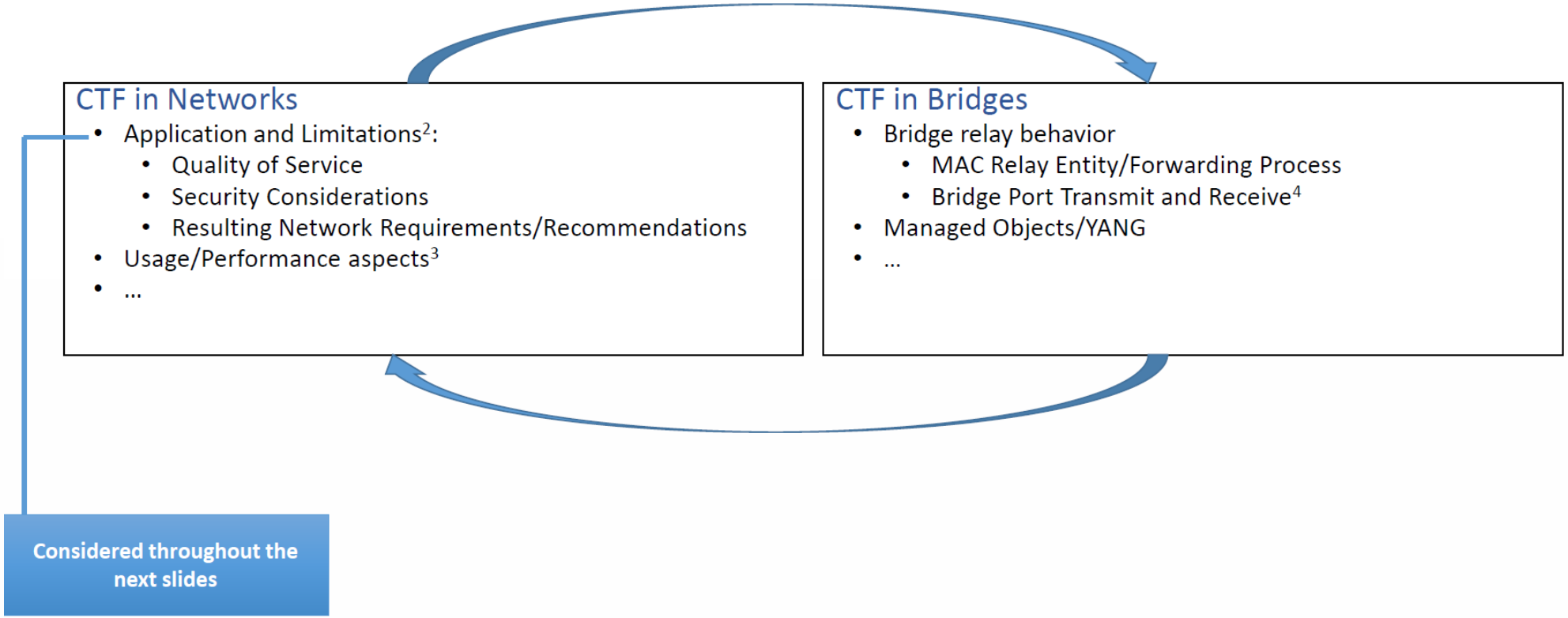
Separate stand alone IEEE 802.1 base standard for CTF

- **Single document**
  Avoids distribution of CTF across existing standards (compared to multiple amendment projects).
- **Exclusion, inclusion/re-use and adjustment of existing protocols**
  - Existing protocols not referred to are basically beyond specification.
  - If no adjustments for CTF are needed:
    Inclusion by reference (e.g., *"as specified in x.y.z of IEEE Std 802.1Xxx-20XX"*) can be sufficient.
  - If adjustments for CTF are needed:
    - Additional description of the differences can be sufficient.
    - Adjustments apply for CTF only; no side effects on existing protocols in absence of CTF support.

1) The latest published base standards, corrigenda, and a subset of the published amendments.
2) See later slide on security/privacy.

IEEE 802 Plenary Tutorial: Recap. (2)

Proposed Content Categories and (some) Contents[1]



1) Illustration of technical contents, not a clause structure.
2) Issues introduced by CTF (cmp. https://ieee802.org/1/files/public/docs2017/new-tsn-thaler-cut-through-issues-0117-v01.pdf and ttps://www.ieee802.org/1/files/public/docs2019/new-seaman-cut-through-scissors-0119-v01.pdf) that can be addressed on a network level.
3) See the introduction of this slide set.
4) To the extent possible in IEEE 802.1.

IEEE 802 Plenary Tutorial: Recap. (3)

Problem Statements: Introduction

Background

- It is intended to move forward towards standardizing CTF in IEEE WG 802.1.
- We now dive into 802.3 and its interface with IEEE 802.1.

Potential Problem Summary

It is unclear whether particular elements of the MAC are in conflict with CTF at all. If yes, it is unclear how these conflicts can be resolved. Aspects identified so far:

1. Frame-level synchronous operations of the MAC service interface.
2. Invalid MAC frame handling, in particular in presence of the optional MAC Control sublayer.
3. The minimum frame size.
4. Normative statements are not always clear (where the style guidelines are not strictly followed).

Refinement

- The subsequent slides detail these aspects further.

IEEE 802 Plenary Tutorial: Recap. (4)

IEEE 802.3 Considerations: Implementation vs. Model

Background

IEEE Std 802.3-2018 differentiates between an implementation and the model in state machines and the procedural models:

- *It is important to distinguish, however, between the model and a real implementation. The model is optimized for simplicity and clarity of presentation, while any realistic implementation **shall** place heavier emphasis on such constraints as efficiency and suitability to a particular implementation technology or computer architecture* [4A.2.2 of IEEE Std 802.3-2018].
- *It is the functional behavior of any unit that **must** match the standard, not its internal structure. The internal details of the model are useful only to the extent that they specify the external behavior clearly and precisely* [1.2.1 of IEEE Std 802.3-2018].
- *it is the behavior of any MAC sublayer implementations that **shall** match the standard, not their internal structure. The internal details of the procedural model are useful only to the extent that they help specify that behavior clearly and precisely* [item b) in 4.2.2.1 and 4A.2.2.1 of IEEE Std 802.3-2018].
- *The handling of incoming and outgoing frames is rather stylized in the procedural model, in the sense that frames are handled as single entities by most of the MAC sublayer and are only serialized for presentation to the Physical Layer. In reality, many implementations **will** instead handle frames serially on a bit, octet or word basis. This approach has not been reflected in the procedural model, since this only complicates the description of the functions without changing them in any way.* [item c) in 4.2.2.1 and 4A.2.2.1 of IEEE Std 802.3-2018].

Observations

- The requirement for implementations is conformance to the externally visible behavior, not the specified structure, in certain areas of IEEE Std 802.3-2018 (but not all).
- It seems to be a statement of fact that many implementations would not be limited to the S&F operation implied by the MAC service interface.

Administrative Follow Up: Brief Recap

IEEE 802 Plenary Tutorial: Brief Recap. (2)

802.1 Considerations

- Specific Stds proposal: Dedicated base 802.1 Standard
  - Network Aspects
  - Bridge Operation

→ Straight forward to me, at least on the higher layers

802.3 Considerations

- Open questions
  - Proper interpretation of IEEE Std 802.3 (e.g., Model vs. Implementation/MAC Service Interface)
  - Invalid MAC frame handling (appear to only affect the optional MAC control sublayer)
  - Minimum frame size

Open technical issues

- Questions on the lower layers for IEEE 802.3 WG, but partially affecting IEEE 802.1 WG, too.

→**Today's motivation**

- **Best results are expected if both WGs work together!**
- **Administrative discussion of the setup/how this can be done.**

Discussing Next Steps

Discussing Next Steps: Topics

Based on the earlier work and associated discussions, it may be reasonable to distinguish between two topics, while working on both in 802 Nendica and with the WGs (IEEE WG 802.1 and IEEE WG 802.3)

- **Model**
  There is an existing model spanning across IEEE Std 802.3 and IEEE 802.1 (MAC Service Interface, Pascal Code, [E]ISS, timing, etc.).
- **Conformant implementations**
  Defined by the external visible behavior. This behavior can be derived from the elements of the model in IEEE 802.1 and IEEE 802.3 Standards.

A way to work on these topics

- Identify questions
- Work on technical answers in 802 Nendica
- Ask questions to the WGs/experts from both WGs

Discussing Next Steps: Questions

Some initial questions

- **Q1**: Where are the limits of conformant implementations/what would violate the standardized external visible behavior?:
  - IEEE 802.1 conformant Bridge implementations appear to be no issue, at least if the behavior of CTF Bridges would be standardized in a new standalone IEEE 802.1 Standard (see earlier slides).
  - IEEE 802.3 conformant MAC implementations appear to be in the focus.
- **Q2**: Is there need/interest in IEEE WG 802.1 and IEEE WG 802.3 to introduce a common model with support for CTF?
- **Q3**: Could the CTF-Bridge behavior be specified in IEEE 802.1 …
  - … based on 802.3 conformant implementations, and …
  - without introducing ambiguity (compared to the already standardized Bridge behavior)?
- **Q4:** Assuming the answer to Q3 is TRUE, and the initial answer to Q2 is FALSE, is it possible to move forward towards standardizing CTF-Bridge behavior while permitting later addition of a common model if the answer to Q2 changes to TRUE?

Thank you for your Attention!

Questions, Opinions, Ideas?

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