Credit-based Flow Control
PAR, 5 Criteria & Objectives

Results of 2/20/14 DCB TG CC discussion

PROJECT AUTHORIZATION REQUEST

Based on IEEE 802 LMSC Operations Manuals approved 15 November 2013

Need for project

There is significant customer interest and market opportunity for data center bridged networks that operate with link speeds of 100G and higher.

DCB defined PFC so networks could offer lossless operation for certain traffic types (such as FCoE, RoCE, iSCSI) but PFC has inherent inefficiencies in buffer optimization and potential bandwidth utilization, especially above 100G

- For a given buffer size and link speed, beyond a certain cable length, it becomes impossible to provide lossless operation

Ethernet needs a more predictable, dynamically controllable, and granular flow control mechanism

Purpose

Converged networks are being deployed to support LAN/Storage/HPC over single LAN physical infrastructure

Several of these protocols benefit from a lossless network behavior: FCoE, RoCE & iSCSI

802.1Qaz/bb defined PFC so networks could offer lossless operation for these traffic types but PFC has inherent inefficiencies in buffer utilization. Especially as link speeds increase beyond 100G

To address these inefficiencies, this project enhances IEEE 802.1 to support Credit-based Flow Control.

Scope

This standard specifies the protocols, procedures, and management objects for Credit-based Flow Control in IEEE 802.1Q networks.

Update 802.1Q Data Center Bridging to support a per-priority Credit-based Flow Control including:

- Credit advertising mechanism
- Credit processing and handling mechanism
- Credit loss / error handling
- Enhancements to Data Center Bridging eXchange protocol for capability sharing
- New or updated MIB modules

Is Completion dependent on another standard?

No

Project process requirements

(Based on IEEE 802 LMSC Operations Manuals that were approved 15 November 2013 and last edited 20 January 2014)

1.1.1 Managed objects

a) The definitions will be part of this project.

1.1.2 Coexistence

a) Will the WG create a CA document as part of the WG balloting process as described in Clause 13? No

b) If not, explain why the CA document is not applicable.

This is not a wireless standard.

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CRITERIA

(Section 1.2 - 5C requirements)

(Based on IEEE 802 LMSC Operations Manuals that were approved 15 November 2013 and last edited 20 January 2014)

Broad market potential

a) Broad sets of applicability:
   Data center bridges are used in many data centers transporting protocols such as FCoE, iSCSI, RoCE, etc. The deployment of these continues to grow.

b) Multiple vendors and numerous users:
   There are many vendors that build silicon and systems for bridges and end stations that would benefit from a standard definition of Credit-based Flow Control

Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q.

a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q? YES

- The proposed standard will be an amendment to IEEE 802.1Q, and will interoperate and coexist with all prior revisions and amendments of the IEEE 802.1Q standard.
- Any protocol changes and frame formats will be backwards compatible.
- Additional MIB objects will be required and these would be backwards compatible with the existing MIB module.

Distinct identity

a) Substantially different from other IEEE 802 standards:

   There is no other standard that defines Credit-based Flow Control for 802.1 networks.

b) One unique solution per problem (not two solutions to a problem) :

   The proposed standard is the only standard that provides robust flow control between 802.1 stations (end stations or bridges) that operates correctly regardless of round trip delay.

c) Easy for the document reader to select the relevant specification:

   IEEE 802.1Q is the natural reference for vendors and users of data center bridges.

Technical feasibility

a) Demonstrated system feasibility:
Other networking technologies (IB, FC) use various forms of credit-based flow control. These other networks are widely deployed. Contributions to 802.1 have shown mechanisms suitable for 802 networks and data center bridges and end stations

b) Proven technology via testing, modeling, simulation:
Mechanisms similar to what is being proposed exist in other networking technologies and have been shown to be reasonably testable.

Economic feasibility (1)

a) Balanced costs (Infrastructure vs attached station):
The proposed amendment provides robust flow control that operates correctly regardless of round trip delay. The cost of implementing and testing for similar mechanisms in other networking technologies has proven to be reasonable.

b) Known cost factors, reliable data:
The proposed amendment provides robust flow control that operates correctly regardless of round trip delay. The cost of implementing and testing for similar mechanisms in other networking technologies is known.

c) Consideration of installation costs:
The proposed standard will have no effect on the cost of installation.

d) Consideration of operational costs (e.g., energy consumption):
The proposed standard will have no effect on operational costs such as energy consumption.

Economic feasibility (2)

e) Other areas, as appropriate – N/A

OBJECTIVES

Draft Objectives (1)

a) Will be backwards compatible with 802.1Q
b) PFC, CFC or no flow control operation can be negotiated
c) Flow control mechanism can be individually enabled or disabled on a per-priority basis
d) Only a single type of flow control mechanism will be operational at a given time on any physical link
e) Flow Control mechanism will be hop-by-hop and operate between peer ports
f) No New tags
g) IF flow control is supported:
    - Below 400G, PFC is default, credit-based flow control optional
    - 400G and above, Credit-based flow control is default and PFC is optional

THANK YOU