SWITCH LATENCY IN INDUSTRIAL APPLICATIONS

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BACKGROUND

- During the November, 2016 IEEE 802 Plenary. Avnu presented a liaison requesting guidance regarding the problem of accumulated latency in industrial networks.
- Subsequently, there have been a number of the contributions on the subject.
- As a result of these contributions, the IEEE 802.1 working group agreed that existing and long-standing practices, addressing this problem within long-line industrial Ethernet networks, may violate certain aspects of the IEEE802.1 and IEEE802.3 standards.
- It was therefore proposed that we seek guidance from the IEEE 802.3 Ethernet working group regarding the best approach to address this problem in a manner that insures standardized and interoperable behavior.

SYNOPSIS OF THE PROBLEM

- Industrial applications, such as machine control, are typically built in long line configurations. For these installations, to minimize wiring cost and complexity, typical installation uses “daisy chain” where each node has (2) external switched ports and an internal port that goes to the end-node.
- A common application is motion control where fast loop times are required. 100 µs cycle rate is common. To support this, low latency for messages through the network is a high priority.
- Even Gigabit data rates are not sufficient to solve this problem. For instance, in a line topology of 64 hops, accumulated latency would exceed a 100 µs control loop even at Gigabit speeds.
  - It is also worth noting that a control loop is typically divided into three parts: the time to transmit inputs, the time to calculate outputs and the time to transmit outputs, so the actual budget for transmission is on the order of 33 µs.
- These systems often also have high EMC and there is a desire in some applications to support brown-field wiring. For these applications 100Mb/s rates are desired. These applications typically have higher control loop times but the lowest possible latency is needed to get the maximum number of hops.

ACTIONS TAKEN THIS WEEK (NOV 2017)

- As requested, representatives of the IEEE802.1 WG have informally approached the Chair & Secretary of the IEEE802.3 WG seeking guidance regarding how to introduce the topic to the IEEE802.3 WG.
- We were informed that the IEEE802.3 WG has a process for introducing new initiatives to the WG the New Ethernet Applications (NEA) Initiative.
- The goal of this activity is to:
  - Assess emerging requirements for the development of Ethernet standards
  - Identify gaps not currently addressed by IEEE 802.3™ standards
  - Facilitate building industry consensus towards proposals to initiate new standards development efforts

RESULT

- A request for the formation of an NEA ad hoc on the topic of "Switch Latency in Industrial Applications.“ has been forwarded to the NEA ad hoc chair.
  - *http://ieee802.org/1/files/public/docs2017/new-woods-NEA-acc-latency-1117-v14.pdf*
- The intent is to kick the NEA effort off at the January Interim which is co-located with the IEEE802.3 Interim.

THANK YOU