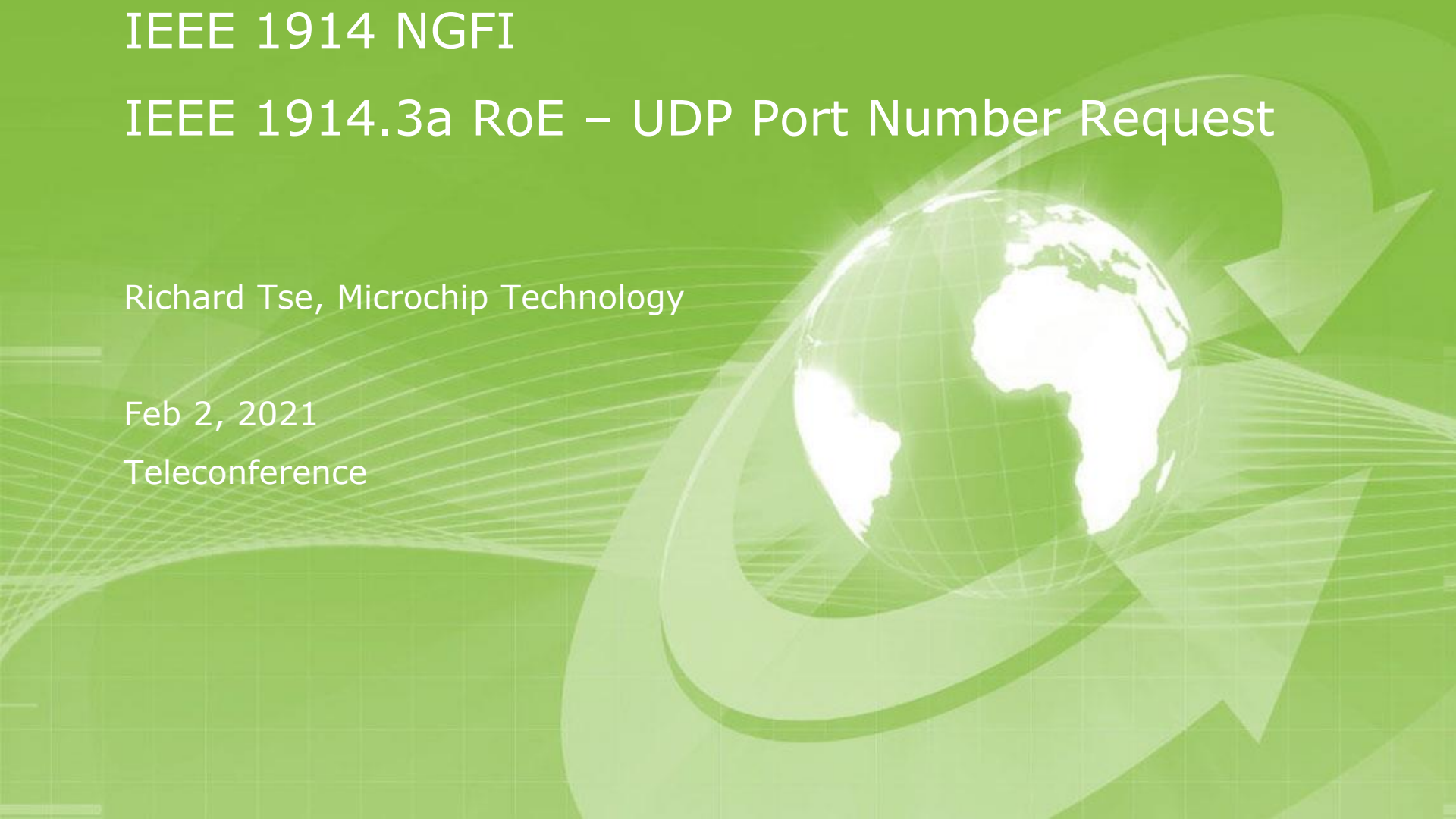# IEEE 1914 NGFI

IEEE 1914.3a RoE – UDP Port Number Request

Richard Tse, Microchip Technology

Feb 2, 2021

Teleconference

The question to be answered

- Why does RoE (per P1914.3a) need a registered UDP port number instead of dynamically assigned UDP port number(s)?

BACKGROUND

RoE with UDP/IP/ENET Encapsulation

- The UDP port number is the field that identifies UDP/IP encapsulated RoE packets for routed networks (i.e., Layer-3 equivalent to EtherType for Ethernet encapsulated RoE packets)
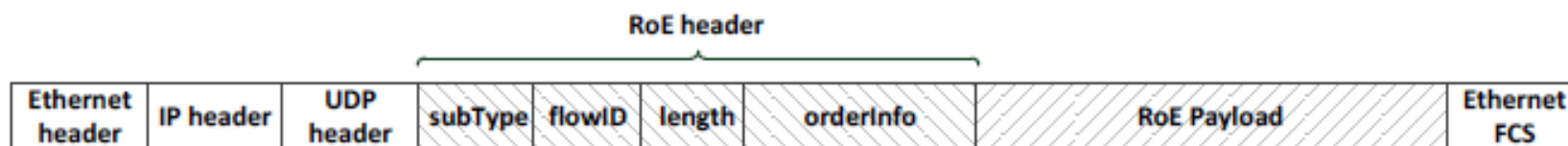

Figure 7a —RoE packet in an Ethernet frame with optional IP and UDP encapsulations

UDP Port Numbers

- Link for UDP port number requests:
  - https://tools.ietf.org/id/draft-cotton-tsvwg-iana-ports-00.html

- UDP port number types and allocations
  - Well Known (System) Port#: 0 – 1023
    - Used by system or root processes
  - Registered (User) Port#: 1024 – 49551
    - Used as service identifier
  - Private (Dynamic) Port#: 49552 – 65535
    - For local and dynamic use
    - Are short lived
    - Cannot be registered
    - Applications acquire a number on an end system and register the number of the contact port for that service with a rendezvous or look-up service

Registered (User) Port # Description

- From https://tools.ietf.org/id/draft-cotton-tsvwg-iana-ports-00.html

  - This port number range is the main range for any application or service requiring a known and stable port number across all hosts. Before requesting a registration, requesters should carefully consider if a rendezvous mechanism, such as DNS SRV RRs, together with the use of port numbers in the Dynamic Ports range can satisfy the application requirements. It is expected that primarily rendezvous or look-up services or applications and services that must operate in environments where such services are unavailable will need to use registered ports.

Private (Dynamic) Port # Description

- From https://tools.ietf.org/id/draft-cotton-tsvwg-iana-ports-00.html

  - Private ports are usable by any application in a dynamic fashion. Usage of private ports for server type applications or services are possible through the use of rendezvous or location look-up mechanisms, e.g., the DNS. Applications acquire a particular dynamic port number on an end system and register the port number of the contact port for that service with a rendezvous or look-up service. It is RECOMMENDED that application that are capable of using such mechanisms utilize them, in order to minimize consumption of the finite port number space.

- Also known as Ephemeral ports. Below from Wikipedia:

  - An ephemeral port is a short-lived port number used by an Internet Protocol (IP) transport protocol.

  - The allocations are temporary and only valid for the duration of the communication session. After completion (or timeout) of the communication session, the ports become available for reuse. Since the ports are used on a per request basis they are also called dynamic ports.

ARGUMENTS

Characteristics of RoE Usage

- RoE is a type of service

- An RoE connection is semi-permanent and occupies the UDP port number indefinitely

- RoE packet format (already standardized in IEEE Std 1914.3a-2018) has no unique identifier that allows it to share a registered UDP port number that is already defined for another IEEE protocol

- An RoE connection could span across one or more network domains that are serviced by different operators

- Management service capabilities might be minimal at RUs

- RoE packets need H/W identification for timestamping

- A single Ethernet/IP address could terminate many RoE endpoints concurrently

◈IEEE

RoE vs Dynamic UDP Port Numbers

- A very large number of UDP port numbers (e.g., one for each RoE (de)mapper → many thousands) could be occupied indefinitely

- RoE connections that span across multiple network domains might not be amenable to efficient assignment of dynamic port numbers

- RUs might not have management look-up services to get a dynamic port number

- DUs and some RUs would have to maintain and identify many sets of {port numbers, RoE flowIDs} instead of just {RoE flowIDs}

- Makes H/W timestamping difficult to implement as sets of {port numbers, RoE flowIDs} need to be identified in H/W instead of just the single registered UDP port number

◈IEEE

Notes on H/W Identification

- RoE packet rate can be very high at an Ethernet port (e.g., 23.5Mpps on 100GE link, 42ns per 512 byte RoE packet)

- RoE packet services require a small latency (< 100us end-to-end) so identification and processing will (very likely) be done by H/W

- Accurate timestamping of RoE packets is required (delay measurement, detection of late arriving packets) so identification must be done by H/W

- For H/W implementations, the number of combinations of {port numbers, RoE flowIDs} must be kept small

◆IEEE

CONCLUSION

Conclusion

- RoE is "an application or service requiring a known and stable port number across all hosts."

◈IEEE