

IEEE-1588 Precision Time Protocol and C37.238 Power Profile: Update March 2015

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Outline

- History
- Ongoing activities
- Related activities
- New activities
- Closing thoughts

History

- IEEE 1588-2002 (V1) - first edition
 - Not widely implemented
- IEEE 1588-2008 (V2) - second edition
 - Not backwards compatible to V1
 - New device type added: Transparent Clock
- IEEE C37.238-2011 - first Power Profile

IEEE 1588-2008 network

grandmaster (role):

top level clock of the time domain
 master of the top subdomain,
 defines **grandmaster identity**

master port

(sends the Sync & Announce:
 sets "sourcePortIdentity" for
 this subdomain)

Transparent Clock

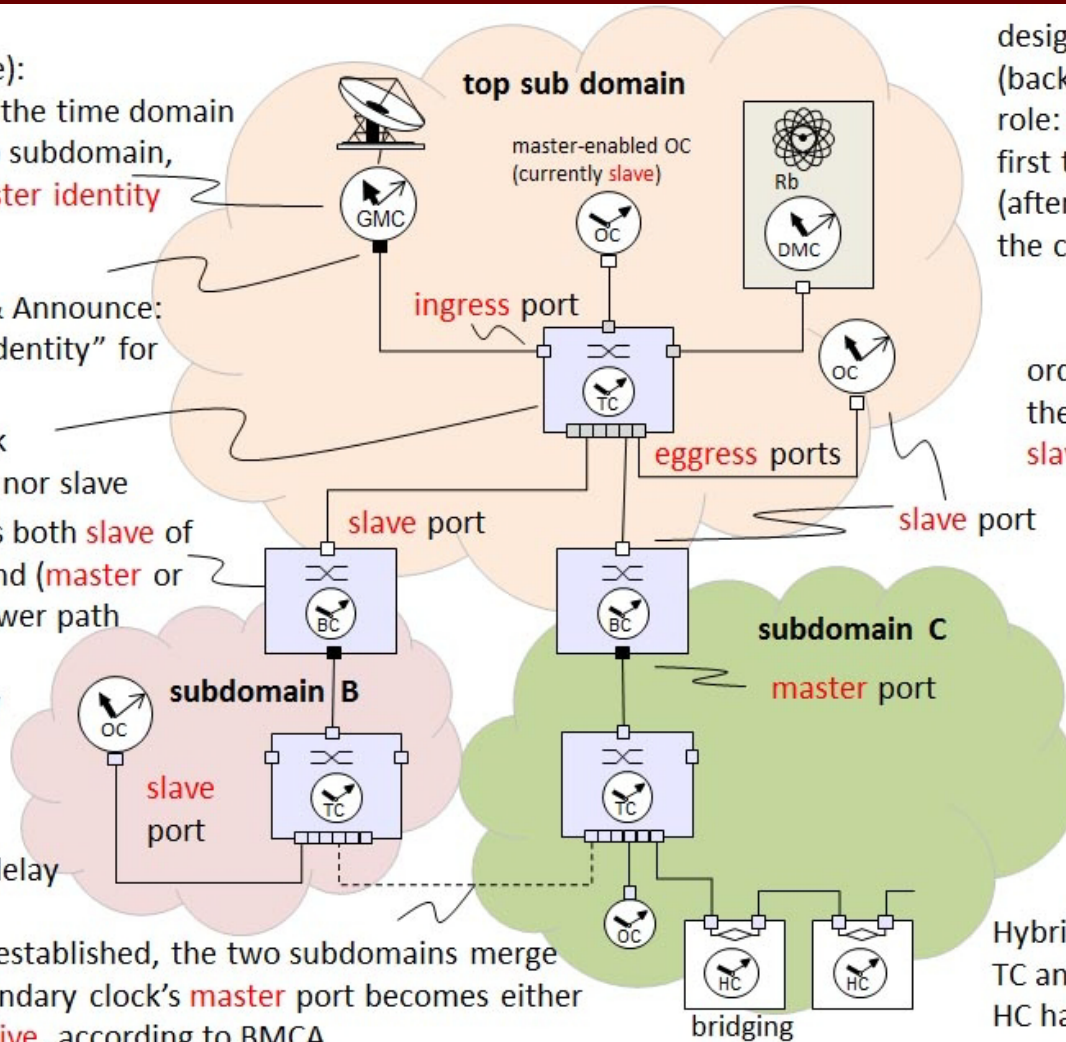
is neither master nor slave

Boundary Clock is both **slave** of
 the upper path and (**master** or
passive) of the lower path

sourcePortIdentity

identifies the
master in Sync &
 Announce
 and the peer in Pdelay

if this link is established, the two subdomains merge
 and one boundary clock's **master** port becomes either
slave or **passive**, according to BMCA



designated master
 (back-up clock of domain)
 role: **slave**, but
 first to become **master**
 (after BMCA) if
 the current master stops

ordinary clock can take
 the role of **master** or
slave

Sync & Announce
 carry the MAC
 address of the
master, not of the
grandmaster)

Pdelay carry the
 MAC address of
 source port)

Hybrid clocks combine a
 TC and an OC,
 HC have two **slave** ports

Ongoing activities - C37.238

- C37.238 revision
 - Responding to issues raised by IEC TC57 WG10 and other constituents
 - Currently in ballot process with significant changes expected in response to balloters' comments
 - Co-sponsored by IEEE Power and Energy Society's Power System Relaying (H24) and Substations (C7) committees

Ongoing activities - IEEE 1588

- P1588 revision
 - Expected to be published 2017-2018
 - All new features optional and backward compatible
 - SNMP compatible MIB
 - Security, High Accuracy extensions
 - HSR/PRP mapping probably just pointer to IEC document
 - Clock ID changes reflect changes imposed by RAC

So far so good...

- But as is often the case, life can throw us a curve-ball...
- ...which in this case resulted in proposals for competing (and confusingly similar) profiles

Related activities - IEC 62439-3

- Standard for redundant industrial networking: PRP and HSR
 - Now at edition 3, FDIS
- Latest edition adds two PTP profiles
- One of them was to be a 'power utility profile'
- Similar to C37.238 without TLV

Concerns related to this standard

- Competing 'Power Profile' and 'power utility profile' would be confusing to customers
- Originated from frustration of WG10 and IEC SC15C with 'non responsiveness' of IEEE PSRC to their requests
- Desire to have one harmonized profile
- How to solve this problem?

Differences in IEEE - IEC approach

- IEEE PES applications (synchrophasors, for instance) need real-time assurance of time inaccuracy
- IEC applications mostly design for a given level of performance at the engineering phase
- IEEE wanted TLV with this additional information; IEC felt this was not necessary and burdensome

A compromise appears...

- Resolving the differences
- Creating a 'baseline' profile
- Allowing extensions
- Harmonizing standards with IEEE/IEC
- Facilitating joint development and maintenance
- This is a GREAT result, thanks to hard work from many, many folks...

New activity - IEEE/IEC 61850-9-3

- New 'Level 1' power profile
 - Joint development of IEEE and IEC (subject to IEC responses)
 - Common attributes of C37.238 and requests from WG10 (IEC 61850 group)
 - Baseline features only
 - No C37.238 TLV or GmShortId
 - Additional features to be added using 'Level 2' profiles
 - C37.238 revision now to be a Level 2 profile referencing 61850-9-3

How did this come about?

- Meeting of IEC TC57 WG10, Tokyo
September 2014
 - Power profile discussion attended by H24/C7, PSRC and IEEE-RAC reps via phone bridge
 - Several outstanding issues resolved
 - GmShortId - removed (not adequate anyway)
 - ‘Power utility profile’ to be removed from IEC 62439-3 and moved to new IEC 61850-9-3
 - ‘Layering’ approach: 61850-9-3 to be Level 1; additional features (TLV) added with Level 2

What has happened since Tokyo?

- IEC 62439-3 keeping its PTP profile, but calling it 'automation profile'
 - SC15C was not bound by Tokyo agreement
- WG10 moving forward with 61850-9-3 per Tokyo agreement
- IEC and IEEE subsequently agreed to official joint development of 61850-9-3
- IEC to release 61850-9-3 initially as PAS (Publicly Available Specification)

Where does this leave us?

- IEEE C37.238-2015(?) will refer to IEEE/IEC 61850-9-3, with additions
 - TLV: GmTimeInaccuracy, NetworkTimeInaccuracy
 - Similar to (and superseding) C37.238-2011
- 61850-9-3 will be jointly maintained by IEEE and IEC
 - Minimizes possibility of future 'split' in direction
- Profile of IEEE 1588-2008

Schedule

- Note: these are TARGET dates, depending on successful votes etc.
 - IEC 61850-9-3 PAS: May 2015
 - IEEE/IEC 61850-9-3: Late 2015
 - IEEE C37.238-2015: Late 2015- early 2016 (contingent on approval of IEEE/IEC 61850-9-3)

Thanks!

Questions?