802.1AS-rev: Assumptions for Profile Gateway

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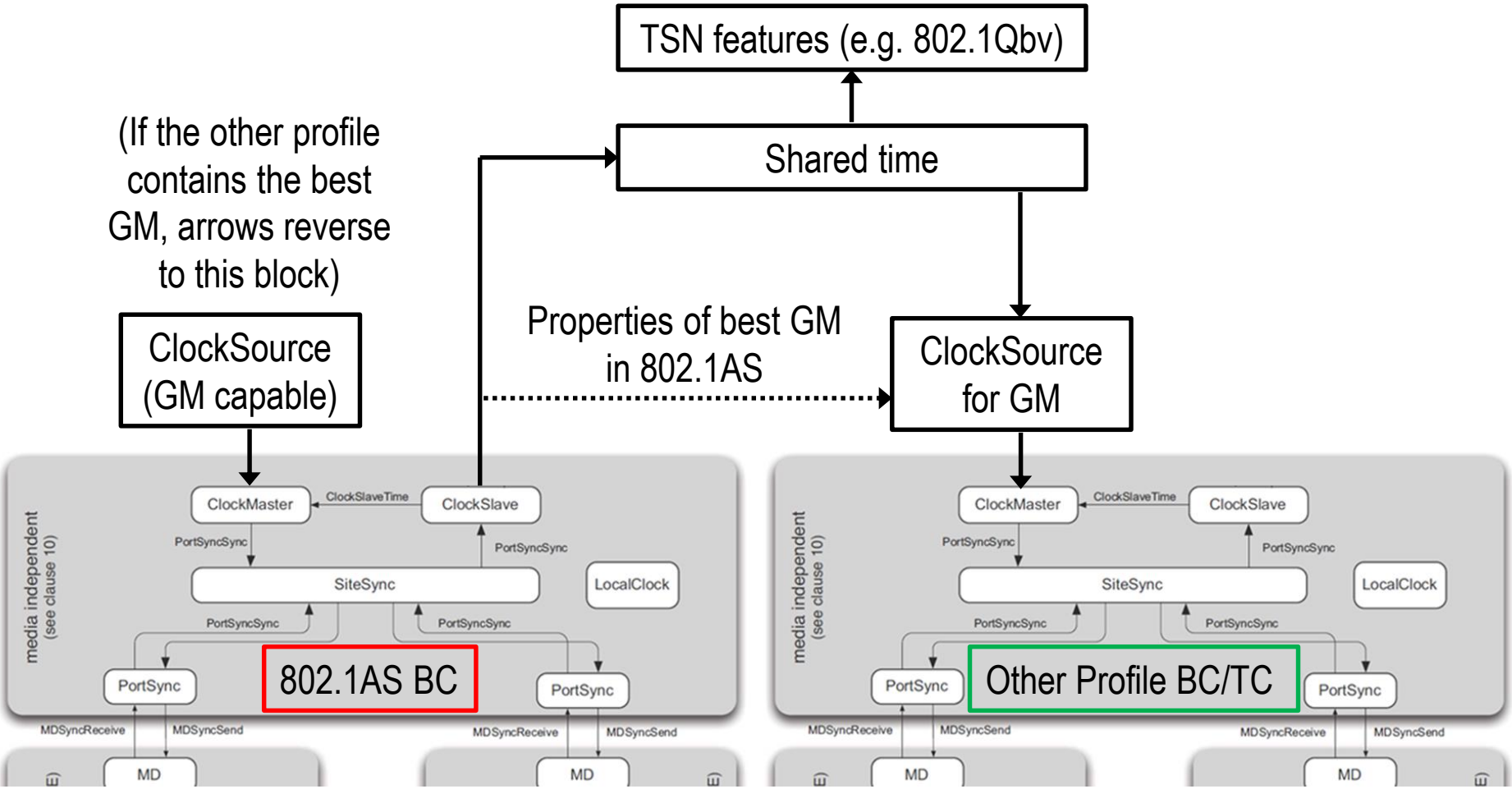
Summary from Budapest (1 of 3)



Summary from Budapest (2 of 3)

- Each profile controls its own ports
  - Mix of BC/TC in the gateway is conformant to 1588
- Nothing changes in profile specs
  - Profile can be
    isolated,
    run its own BMCA,
    run its own redundancy algorithm,
    ...

Summary from Budapest (3 of 3)

- Rodney C volunteered to create text for .1AS-rev draft
  - New normative clause for Profile Gateway
    - Formalize the architecture
    - Specify managed objects
    - Start with 1588 default profiles (only)
  - Conformance: Profile Gateway is a Major Capability
    - Optional at top level, but mandates if you support it
    - Work with AVnu on conformance testing

- http://www.ieee802.org/1/files/public/docs2016/as-cummings-resolving-0516-v00.pdf

Assumptions for Profile Gateway

External vs Internal Profiles

- External
  - Profiles specified by organizations external to 802.1
    - 802.1 has no control over these profiles
  - Assumption: No change to these profiles or their products
  - First part of presentation focuses on external profiles
    - Gateway between 802.1AS and an external profile
- Internal
  - .1AS-rev D3.0 adds TC to its profile
    - Non-conformant to 1588
  - Profile gateway is a potential model that can fix this
  - Second part of presentation proposes options

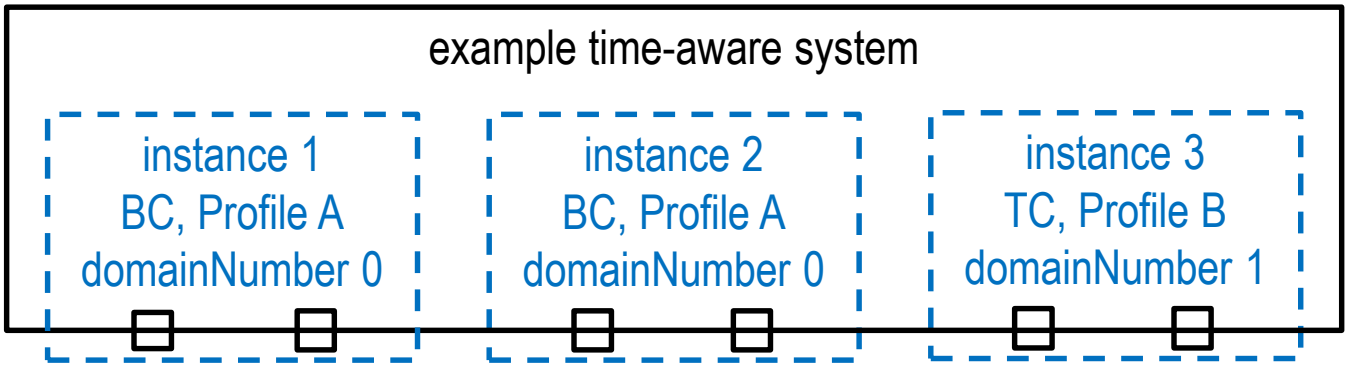
Why Start with 1588 Default Profiles?

- Avoid 'boiling the ocean'
  - 1588 (PTP) profiles are consistently specified
  - 1588's default profiles use standard GM properties & BMCA
    - 802.1AS uses the same GM properties
    - Profiles with alternate BMCA can use profile-specific GM properties
- Assumption: Support the three 1588-rev profiles
  - Default E2E, Default P2P, and High Accuracy
  - Support for other standards is product-specific
- 802.1 can add other profiles in future .1AS projects
  - Assumption: Add on a case-by-case basis (e.g. liaison)

Profiles Cannot be Auto-detected

- 1588 specifies a profileIdentifier data type
  - OUI/CID plus organization-specific ID and version
  - Can be read using management only
- No field in 1588 messages explicitly identifies the profile
  - Some profiles use profile-specific fields / TLVs, but 1588 default profiles do not
  - Detecting .1AS vs 1588 is possible, but detecting which 1588 profile is difficult-to-impossible
- Assumption: Management configures the gateway
  - Configure where each profileIdentifier is used
  - Done at install-time, and afterward BMCAs are plug&play

Instance Concept from 1588-rev



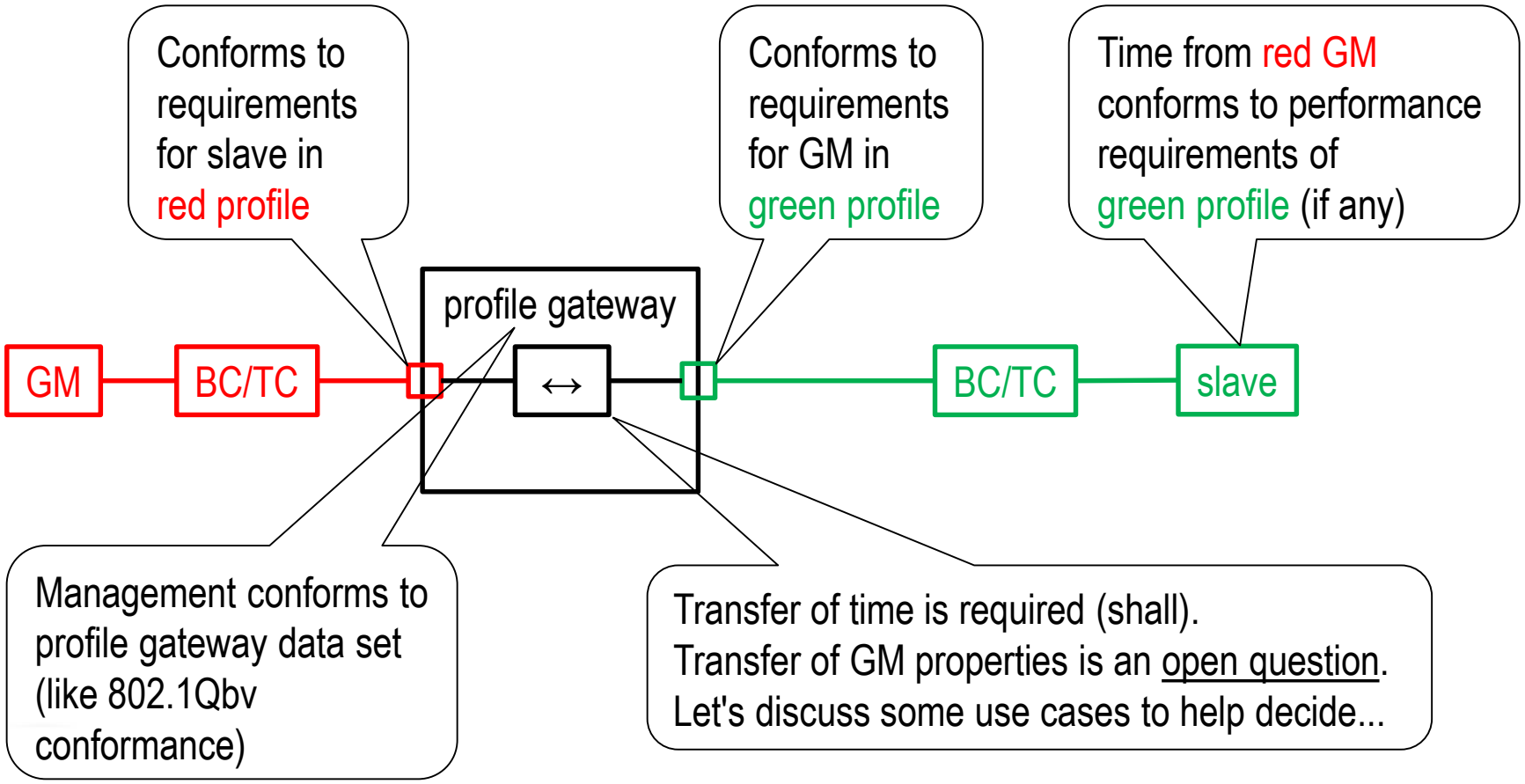
- Each instance is a distinct time domain
- Instance has distinct local ID: cannot use profileIdentifier, domainNumber, or port number
  - E.g. two instances can use same port
- Assumption: .1AS-rev managed objects will use instance concept to represent multiple domains

Managed Objects for Assumptions

- Profile Gateway Data Set (per system)
  - supportedProfiles
    - List of supported profileIdentifier values; read-only
    - Can include multiple versions of same profile
  - profileIdentifier[] (per instance)
    - Instances and their port(s): Base .1AS management, not gateway
    - This list in gateway configures a profile for each instance; read-write
  - enable
    - Boolean to enable/disable gateway function; read-write
    - Default is false (disabled), meaning all instances are 802.1AS
  - status
    - Gateway function can fail in some corner cases; read-only
    - Possibly a boolean (true=failure) and text description of failure

What to Make Normative

- Example for assumptions:



Use Case: Compatible BMCAs

- If BMCA of profile A and B contains the same GM properties and makes the same decision, we can 'merge' BMCAs
- Step 1: Run each profile's BMCA simultaneously
- Step 2: Transfer GM properties between profiles
  - Receive Announce, translate, transmit Announce as GM
  - Includes translation for GM on gateway itself
- Step 3: Translation results in agreement on best GM
- Step 4: Transfer time from best profile to non-best

'Working Clock' Assumptions

- 'Working clock' requirement
  - Time in all slaves on the network shall be continuous and monotonically increasing within a specified accuracy. This requirement shall be met as long as the time is enabled in the network.
    - I.e. While time is in use (e.g. 802.1Qbv), any 'jump' must be small
- Property of GM itself, but there are other factors
  - Accuracy must be met as time propagates through bridges
  - Must be met when a GM fails, so redundancy needed
- This requirement is ignored by all BMCA algorithms
  - Can be met by any network, but standards don't state it
- Only end customer knows if profile(s) meet requirement

Incompatible BMCAs

- Use case: External profile with alternate BMCA
  - Worst-case: Impossible to translate GM properties (BMCAs)
  - Best-case: Requires liaison work
- Use case: Working clock requirement
  - Profile A meets requirement but profile B does not
  - Profile A's best GM meets profile B's requirements
    - Maybe profile B wants traceability, but profile A's GM provides this
  - The GM must be located in profile A, but only customer knows
- Assumption: Customer requires a mechanism to 'force' which profile contains the GM

External Port Config

- Both 1588-rev and .1AS-rev provide optional feature to disable BMCA
  - Config each port's master/slave state using management
  - Can include disabling Announce
- Use case: Profile A disables BMCA, profile B uses BMCA
  - GM for profile A is not in gateway (all gateway ports are slave)
  - If profile B's BMCA selects a GM on its side (over profile A's), that is a failure of gateway function (i.e. cannot have two GMs)
- Assumption: Customer requires a mechanism to 'force' which profile contains the GM

Mandate Transfer of GM Properties?

- Advantages of 'No'
  - 802.1 Working Group
    - Avoid liaisons with profile's organization to formalize mapping
    - Less work for .1AS (avoid profile specifics)
  - Profile gateway vendor
    - Transfer is product feature, matched to application needs; More profiles
  - End customer
    - Profiles are independent; 'forcing' limited to gateway (e.g. no Announce)
- Advantages of 'Yes'
  - End customer
    - After initial management, network operates as a merged profile
    - GM property transfer consistent across all gateways (less proprietary)
    - 'Forcing' done with priority1 in GM (common practice)

'Forcing' in Gateway

(assuming 'No' mandate of GM property transfer)

- In Profile Gateway Data Set (per system)
  - sourceInstance
    - Force the instance that contains the source of time (GM); read-write
      - Integer, local to system
    - Special 'auto' value (e.g. all 'F') : Gateway decides GM location
      - If BMCAs compatible, gateway may 'merge', but not required
      - Specify this value as the default

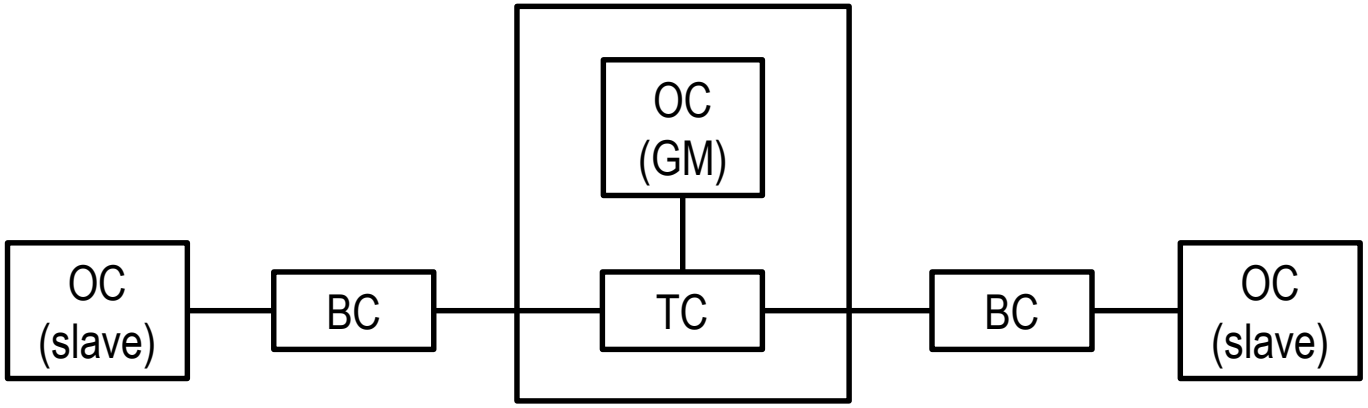
802.1AS Profile (Internal)

Some Facts for Transparent Clock (TC)

- Fact: Some people insist on TC
- Fact: Today these TC people are using an external profile
- Fact: 802.1 has received no liaison request from an external profile's organization to add TC to 802.1AS
  - No request to deprecate their profile into 802.1AS
- Fact: TC in .1AS D3.0 does not conform to IEEE 1588
  - 1588-2008 or 1588-rev

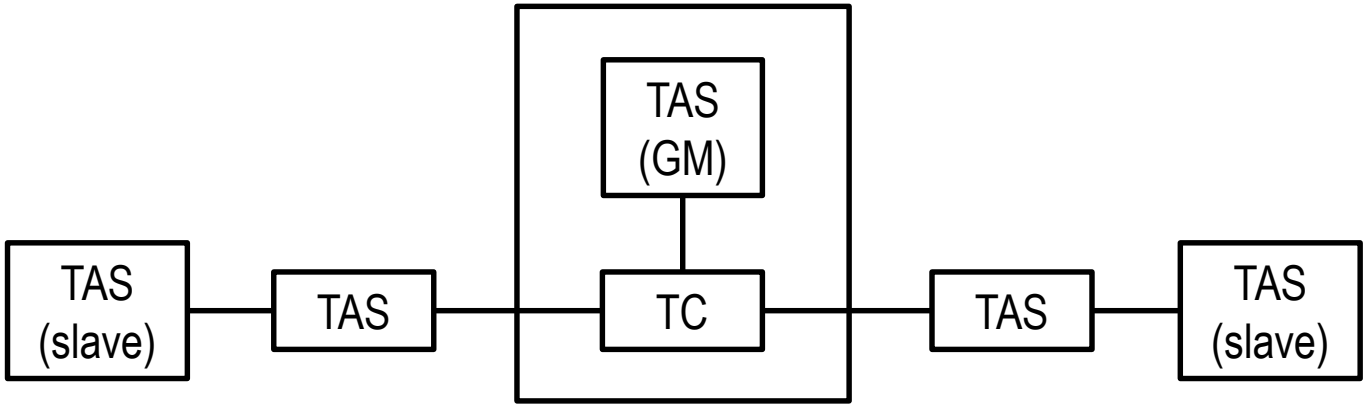
TC in External Profiles

- Fact: Uncommon for box to be BC and TC at same time
- Fact: Common for box to be OC and TC at same time
  - GM and TC capable switch/router (OC on internal port)
- Fact: Common for network to mix OC, BC and TC boxes
  - Intended usage of 1588



Equivalent in 802.1AS-rev

- Specify Transparent Clock system
  - Reference 1588 TC; Don't invent something new
  - Re-use specs of .1AS D3.0 'sync locked' (i.e. compatible)
  - TC does not run BMCA (i.e. just forwards Announce)
  - Use 1-port TAS for GM-capability, so box is still plug&play
    - 1-port TAS is internal-only, so no management needed



Options to Move Forward

1. TC people keep using their external profile
   - Remove non-conformant TC from .1AS-rev
   - Use .1AS-rev profile gateway with external profiles
   - No change to external profile's standards, or products in field
2. Add TC to .1AS-rev
   - Similar to .1AS D3.0, but no per-port mix
3. Keep trying to invent something new to work with old
   - I.e. Per-port mix of TC/BC with plug&play
   - Impractical, not needed, non-conformant

Consensus from July Meeting

Consensus from July Meeting

(to be filled in if time remains)

- External
  - Specify the three 1588 default profiles ?
  - Avoid auto-detection (i.e. use management) ?
  - Use 1588-rev instance concept for .1AS-rev managed objs ?
  - Normative: Profile specs, transfer time, gateway mgmt ?
    - Transfer GM properties ?
  - 'Major Capability' for conformance and PICS ?
- Internal
  - 1. External TC profile, or 2. add TC to .1AS ?

Thank you