Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [A suggestion for harmonized PAC frame structure]
Date Submitted: [Jan. 19th, 2014]
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Abstract: [This document contains a suggestion for PAC frame structure aiming to harmonize both contention-based access and contention-free access]

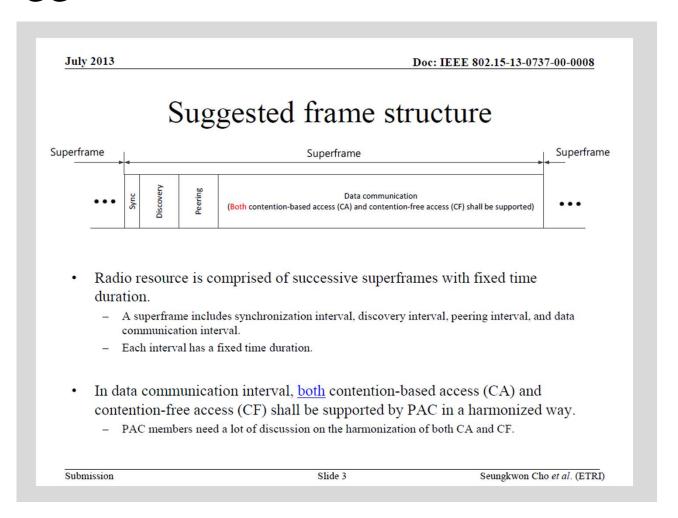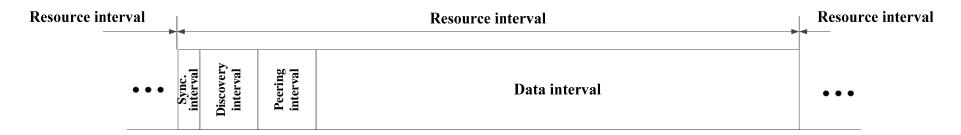**Purpose:** [To provide discussion materials for 802.15.8 TG members]

A suggestion for harmonized PAC frame structure

- Revision history:
  - DCN 737r0 was presented in the 1st teleconference took place in Dec. 2013.
    - Little discussion due to lack of teleconference time.
  - Not enough discussion on radio resource structure in the 2nd teleconference.
    - DCN 737r0 came up in the discussion.
  - Revised text was sent to the email reflector in Jan. 17, 2014.
    - Too late to get comments from PAC members who might be on their way to LA.

- Motivation to our submission of revised document.
  - Recent reflector emails regarding resource structure revealed that some PAC members have different thoughts on the degree/depth of a big picture of radio resource structure to be included in PFD.
    - Some PAC members mentioned a little more detail description of radio resource structure.
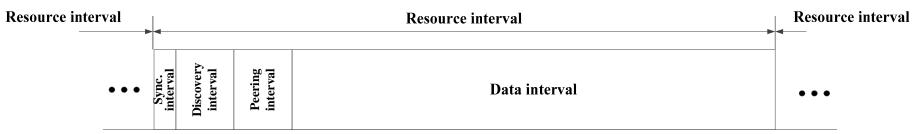
Suggested frame structure in 737r0

Suggested frame structure
(revised based on 730r0)

Resource interval   Resource interval   Resource interval

Sync. interval | Discovery interval | Peering interval | Data interval

1.   Radio resource is comprised of successive resource intervals with fixed time duration.

2.   A resource interval includes synchronization interval, discovery interval, peering interval, and data communication interval.

3.   Each interval in a resource interval has a fixed time duration.

4.   Synchronization interval is utilized for synchronization in a distributed manner and additional synchronization mechanism can be designed within the resource interval according to the detail structure of a resource interval.

Suggested frame structure (revised based on 730r0)

Resource interval | Resource interval | Resource interval

Sync. interval | Discovery interval | Peering interval | Data interval

5. Discovery and peering takes place in a discovery interval and peering interval, respectively.

6. Discovery interval and peering interval is utilized according to the requirements imposed by discovery function and peering function, respectively.

7. Data communication interval is a time interval where user data in conjunction with control/management message except discovery and peering are exchanged among peered PDs.

8. Both contention-based access (CA) and contention-free access (CF) shall be supported in a data communication interval.
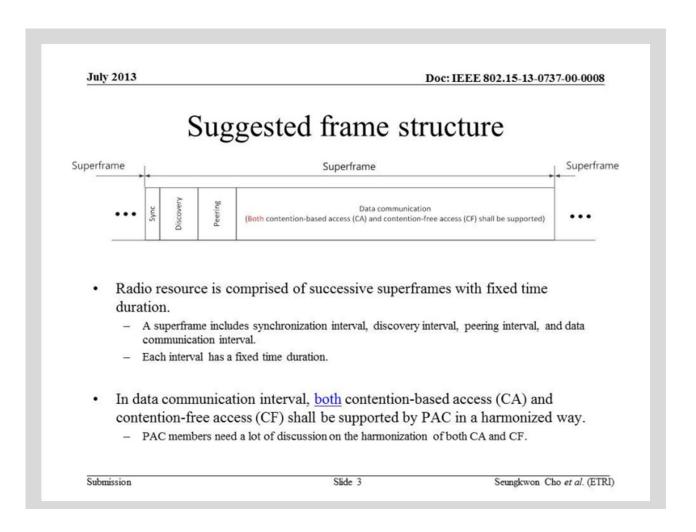
APPENDIX

- DCN 737r0

737r0 in the 1ˢᵗ Teleconference

Background

- As of this writing, it seems that all TG members have consensus on finalizing draft PFD by the next meeting in Jan. 2014.
  - As all of TG members know, the latest draft PFD (DCN 328r8) is a merely mechanically merged version with all the submitted proposals.

- However, we have not discussed the pros and cons of each proposals.
  - We are not ready to harmonize different ideas in the next meeting.
  - As was usually the case with previous face-to-face meetings, the next meeting will be less likely to be sufficient time for full and frank technological discussion.

- To solicit a heated debate, hopefully, we would like to suggest a PAC frame structure with consideration for the harmonization of both contention-based access and contention-free access.

737r0 in the 1st Teleconference

Suggested frame structure

| Superframe | Superframe | | | | Superframe |

Sync | Discovery | Peering | Data communication (Both contention-based access (CA) and contention-free access (CF) shall be supported)

- Radio resource is comprised of successive superframes with fixed time duration.
  - A superframe includes synchronization interval, discovery interval, peering interval, and data communication interval.
  - Each interval has a fixed time duration.

- In data communication interval, both contention-based access (CA) and contention-free access (CF) shall be supported by PAC in a harmonized way.
  - PAC members need a lot of discussion on the harmonization of both CA and CF.

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737r0 in the 1ˢᵗ Teleconference

Rationale behind the suggested structure

- Even though there are a lot of achievable features of PAC, discovery is the key feature which can distinguish PAC from other existing D2D systems.
  - We imagine PDs to be discovered anytime if they are in proximity.
  - To be discovered, a PD shall maintain discovery transmission or reception in low duty cycling mode.

- Even though PAC members consider many usage scenarios, battery-powered hand-held devices must be in the most application scenarios.

- The outstanding advantage of synchronous operation is its potential ability to achieve high power saving effect.
  - By explicitly specifying discovery time interval, PDs in power save mode can awake in time for discovery without dissipating unnecessary power.

737r0 in the 1st Teleconference

Rationale behind the suggested structure (Cont')

- A PD is also supposed to be ready for peering in low duty cycling mode.
  - It is because a PD does not know when another PD send peering request to it.

- Adoption of fixed interval for peering is also needed to conserve power.

- Above considerations motivates PAC to adopt superframe structure based on synchronous operation with fixed discovery interval and fixed peering interval, respectively.

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737r0 in the 1ˢᵗ Teleconference

Remarks

- Authors of this document assume that PAC would adopt not multiple but a single MAC layer specification.
  - Should PAC have multiple MAC specifications, proposers of each MAC specification will have a possibility of suffering from lack of comments/contributions from other PAC members, which will result in an imperfect MAC specification.

- Readers are requested to regard the frame structure presented in this documents as one way of harmonize all the proposals presented in July meeting in Geneva, Switzerland.
  - Please, do not hesitate to suggest another way of harmonization.
  - Any comments on the suggested structure will be greatly appreciated.

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737r0 in the 1ˢᵗ Teleconference

737r0 in the 1ˢᵗ Teleconference