**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | **Comments on TCT Routing Functionality** | |
| Date Submitted | September 4, 2014 | |
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| Re: |  | |
| Abstract | Comments on the functionalities of TCT routing in doc. IEEE 802.15-14-0520-00. | |
| Purpose | This document is to be used to compare the proposals in terms of functionalities | |
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**Introduction**

This document presents the revision of the TCT routing functionalities described in doc. IEEE802.15-14-0520-00.

1. **Functionalities from the TGD**

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| **Functionality** | **NICT** | **OKI** | **ETRI 1(Hybrid L2R)** | **ETRI 2 (TCT)** |
| Mesh topology discovery | Yes  (enhanced beacons)  Topology: Hierarchical mesh tree | Yes  (Hello frames)  Topology: Tree | Yes  (PANN and PANN RP)  Topology: Tree | Yes  (scan/listen frames)  Topology:  Tiered cluster tree + intra/inter mesh link |
| Mesh Routing | Yes  -US: Hop-by-hop from child to parent or brother using neighbor table  -DS:  \* Hop-by-hop parent to child or brother using neighbor table,  \* Proactive source routing  -P2P: Combination of US and DS | Yes  -US: Hop-by-hop child to parent using neighbor table  -DS: source routing  -P2P: Combination of US and DS | Yes  -US, DS: Hop-by-hop using routing table  -P2P: route establishment with PREQ and PREQ RP, then Hop by hop using routing table | Yes  -US, DS: cluster-by-cluster using cluster table,  hop-by-hop within a cluster using Cskip addressing and route table  -P2P: Combination of US and DS |
| Extensible mesh routing architecture (metric alternative, selection, notification, new metrics) | Using the Link quality metric field in EB for 1 or more metrics | Using the Neighbor metric container in Hello frames for 1 or more metrics | Using the Metric field in PANN and PREQ for 1 metric | Using the link quality metric field in link management frame and the route metric field in route management frame |
| Unicast | Yes | Yes | Yes | Yes |
| Broadcast | Yes: packet forwarded once if at least 1 child exists | Flooding with random jitter |  | Yes: frame relaying on default link or shared link |
| Route discovery | Proactive | Proactive | US/DS: proactive  P2P: reactive | Proactive: scheduled update  Reactive: on demand update |
| Low power operation | To see from the simulations results | | | |
| Mesh Security | Only devices from the same PAN sharing the same security credentials can belong to a routing tree | KMP |  | Low level: frame encryption with TG9 KMP  High level: AAA server for link network |
| Routing metrics | Any metric.  SINR used in simulation | Any metric.  Hop count used in simulation | Inactive Overhead Aware Link Metric | Any metric.  -Link cost: Function of link type, link quality, load balance  -Route cost: number of hops |
| Discovery and association | EBR/EB | Hello request/Hello | PANN/PANN RP | scan/listen frame/ link setup  (SETUP\_REQ/RESP) |
| Network acknowledgement | Not specified | E2E-ACK | Not specified | Link layer flow control (FLOW\_REQ/RESP) |
| Addressing modes | 16/64 bits | 16/64 bits | 16/64 bits | 16(c-skip)/64bits |
| Changes to the MAC and PHY | New IEs  -HMT construction IE  -L2R routing IE  -Data aggregation IE  -Destination announcement IE | New IE with nested IEs  -L2R IE  \*Address list IE  \*Hello Param IE  \*Routing Instance IE  \*Hello request parameter IE  \*Route record parameter IE  \*MGT request parameter IE  \*MGT response parameter IE  \*KMP relay parameter IE  \*FA notification parameter IE  \*FA channel update IE  \*MC request parameter IE  \*MC response parameter IE  \*Neighbor metrics container IE  \*PIB ID list IE  \*KMP content IE | New control frames  - PANN  - PANN-RP  - PREQ  - PREQ-RP | New IEs  -L2R IE  \*setup req  \*release req  \*Hello req  \*setup resp  \*release resp  \*hello resp  -L2R payload IE  \*Cluster req  \*Update req  \*Leave req  \*flow req  \*cluster resp  \*Update resp  \*leave resp  \*flow\_resp |
| Multiple entry and exit points | Yes  Using the service/gateway, Tree root IDs fields |  |  | Yes  Using the cluster root router |

1. **Other functionalities**

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| **Functionality** | **NICT** | **OKI** | **ETRI 1(Hybrid L2R)** | **ETRI 2 (TCT)** |
| Cross PAN routing | n/a | n/a | Yes | n/a |
| Data aggregation | Yes | n/a | n/a | n/a |
| High reliability (retransmission to alternative neighbor) | Yes | n/a | n/a | Yes  Redundant link path on a dedicated link |
| Multicast routing | Yes  Using multicast subscription IE |  |  | Yes  Hierarchical multiple 1-1 link path at a cluster root |
| Transparent link to network layer |  |  |  | Virtual link:  Multi-hop link connection through the routers which perform frame relaying |
| Multiple grades of mesh connection |  |  |  | Dedicated link/ shared link/ default link |
| Multiple grade of data service |  |  |  | Multiple grades frame forwarding:  selecting link type and flow control on a link path |