Transmission of IPv6 Packets over PLC Networks

draft-hou-6lo-plc-01
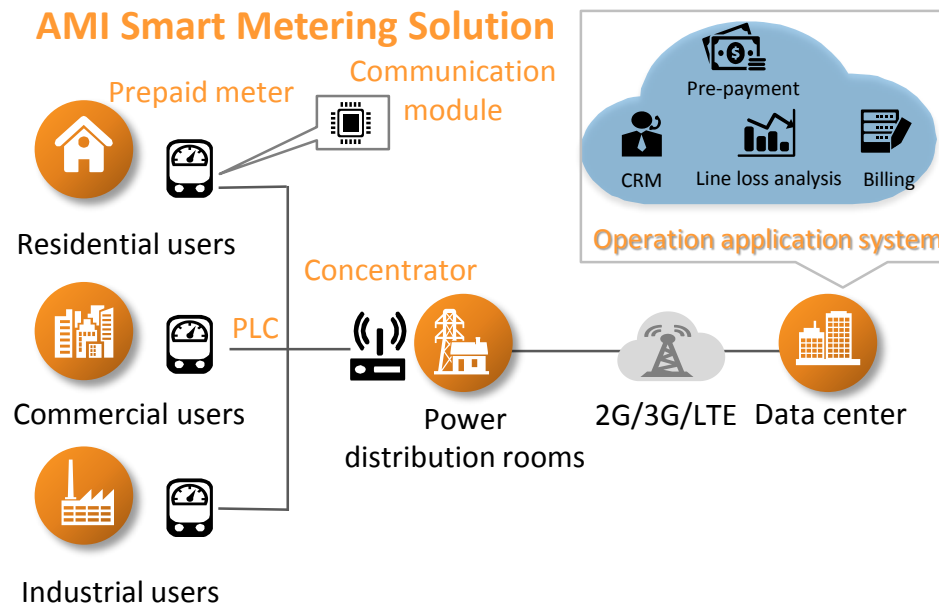
Jianqiang Hou (Huawei)

Yong-Geun Hong (ETRI)

Xiaojun Tang (State Grid EPRI)

Power Line Communication (PLC)

- Power Line Communication (PLC) uses the electric-power lines for indoor and outdoor communications
- Enables convenient two-way communications
- Widely applied to support Advanced Metering Infrastructure (AMI)

AMI Smart Metering Solution

Status

- draft-hou-6lo-plc-00 (March 10, 2017)
  - Presented in IETF98 (Chicago)
  - Comments from Samita, Stefano & Thierry
- draft-hou-6lo-plc-01 (June 23, 2017)
  - Updated parts:
    - Addressing modes
    - Unicast address mapping
    - Neighbor discovery
    - Command Frame Header
    - Connectivity and Topology

Comments after IETF98

- Stefano & Thierry (ITU-T SG15 Q15)
  - LOADng is a reactive protocol, operating in layer 2 or layer 3.
  - Stateless Address Autoconfiguration is performed the same way for G.9903 and 1901.2 devices.
  - 4.2.3 Unicast and Multicast Address Mapping, not relevant for G.9903. EUI-64 MAC address is only used by the pan device during the PAN bootstrapping protocol. Once the bootstrapping is completed, the short address is assigned and used for the rest of the time.
  - To be consistent with G.9903, it would be better to use Pan Coordinator instead of CO (coordinator) Pan Device instead of NO (node)
  - In Clause 5 PLC scenarios, could add: "LOADng enables direct pan device to pan devices (without being obliged to get through the pan coordinator) which significantly improved performances in typical use cases like charging station to EV communications."
  - Include more PLC standards in future? Yes, it's a good idea. No need to include ITU-T G.9902 (G.hnem) since currently it has no implementation.
  - [Stefano] Informal feedback at first, then exchange liaisons to make it official.

Updates (1)

- Addressing modes
  - IEEE EUI-64 address & 16-bit short address
    - Each PLC device joins the network by using the long address and communicates with other devices by using the short address after joining the network.
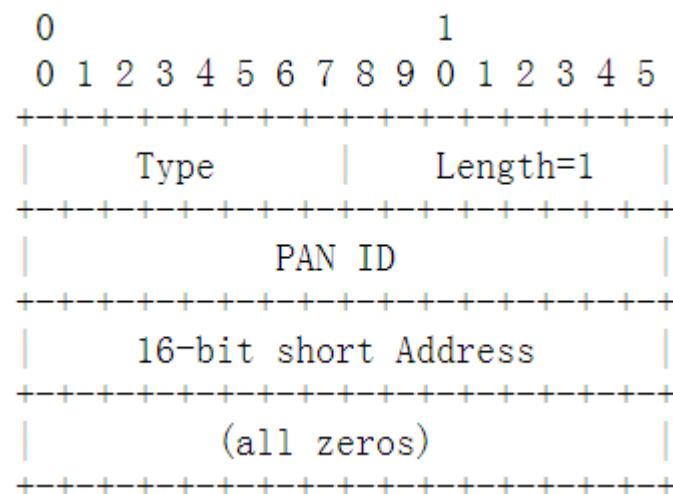
Updates (2)

- Unicast address mapping
  - 16-bit short address mode only
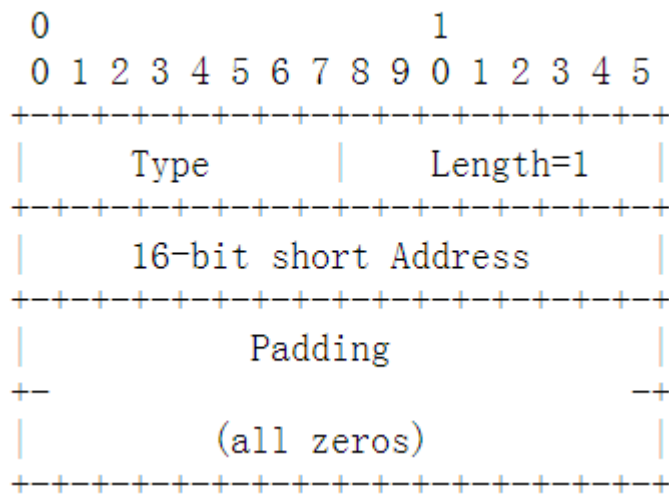
IEEE 1901.2
Suggested in Annex F referring to RFC 4944

ITU-T G.9903

Updates (3)

- Neighbor Discovery
  - IEEE 1901.2
    - RPL-based network, the neighbor discovery process in IEEE 1901.2 networks SHALL refers to [RFC6775] with no modifications.
    - If DHCPv6 is used to assign addresses, DAD SHOULD not be required
    - LOADng-based network SHOULD NOT use [RFC6775] address registration. An implementation for mesh-under operation MUST use [RFC6775] mechanisms for managing IPv6 prefixes and corresponding header compression context information.
  - ITU-T G.9903
    - LOADng-based network SHOULD NOT proceed the address registration as described in [RFC6775]. G.9903 supports the 6LoWPAN Context Option (6CO) specified in [RFC6775]. An implementation for mesh-under operation MUST use [RFC6775] mechanisms for managing IPv6 prefixes and corresponding header compression context information. For sending Router Solicitations and processing Router Advertisements, the G.9903 PLC devices MUST follow Sections 5.3 and 5.4 of [RFC6775].
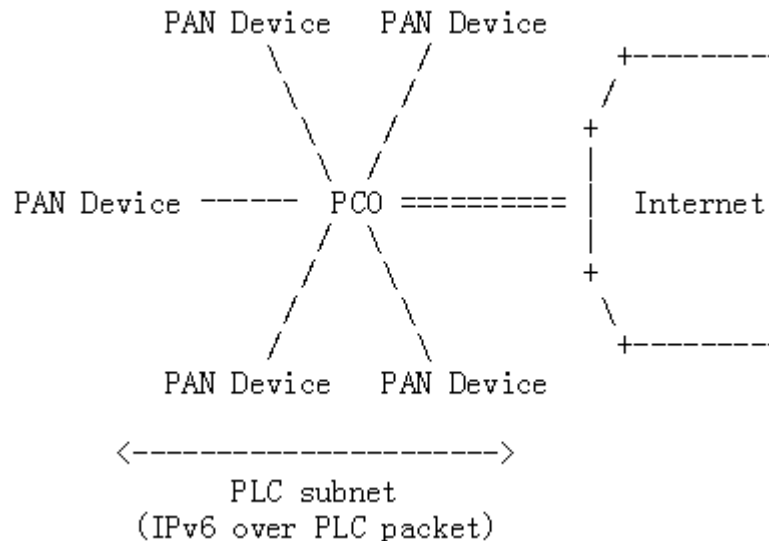
Updates (4)

- Command Frame Header (Command ID)
  - Order
    - in the last position if more than one header is present
    - before the LoWPAN_IPHC dispatch type
- Example
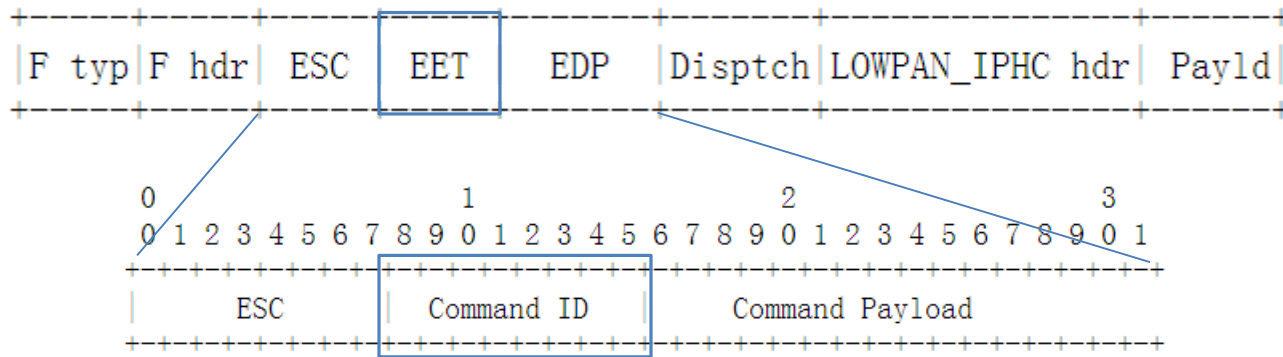
Updates (5)

- Connectivity and Topology
  - Star, Tree, Mesh
    - logical connectivity, not physical links
  - Name change (In consistent with ITU-T G.9903)
    - CO->PCO (PAN Coordinator), Node->PAN Device

```
       PAN Device    PAN Device
              \          /                +---------
               \        /                /
                \      /                +
                 \    /                 |
PAN Device ------ PCO ========= |  Internet
                 /    \                 |
                /      \                +
               /        \                \
              /          \                +---------
       PAN Device    PAN Device

   <-------------------->
            PLC subnet
      (IPv6 over PLC packet)
```

Future Work

- Discussion
  - Include more PLC standards in future? Yes
    - Current: IEEE 1901.2, ITU-T G.9903 (G3-PLC)
    - More PLC standards: ITU-T G.9904 (PRIME), ITU-T G.9902 (G.hnem), IEEE 1901.1
- Next Steps
  - WG Adoption?
    - Liaison and official feedback
- Welcome feedback!