Deploying an Information Centric Smart Lighting System in the Wild

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Introduction

● Build a unified host-centric IoT platform->Information-centric
● ICN (Information Centric Networking) offers:
  ○ Name based routing to deliver packets and provides inherent multicast
  ○ Great flexibility over naming and security
  ○ Avoids dependencies on separate protocols and various middleware in IoT networks.
NDN (Named Data Networking)

(1) Consumer sends Interest packet
(2) Node receives packet: query local CS (content store)
   (a) Hit: send back to consumer
   (b) Miss:
      (i) update PIT (Pending Interest Table) table, forwards the packet
      (ii) Interest found: send back to consumer, store the packet into local CS, delete PIT record
System: smart lighting

- Data dissemination from luminosity detectors
- Data dissemination from occupancy detectors
- Light Control

Fig. 1. NDN smart lighting architecture
Naming scheme

Fig. 3. Naming scheme
Message flow-send data

- Use “public” to distinguish Interest notification name and regular name
- Register name prefixes `me/luminosity/publish` in the FIB (Forwarding Information Base) to subscribe
Fig. 6. Controlling lights via pull based communication
Command sending

- Unicast: /home/light/<floor>/<room>/<light-ID>/<command>.
- Multicast: /home/light/floor1/ (each light node is required to reply with ACK Data by appending own light ID to the received Interest name)
Performance Evaluation

Cloud’s delay is higher than in NDN due to processing overhead in the cloud platform and its protocol stack.

Fig. 7. CDF of message delivery delay
Conclusion

- Explored the flexibility of NDN over two main aspects of IoT applications, including **data dissemination** and **command execution** with a prototype implementation.
- Keeping consistent naming in both **application and network layer**
- Enable periodic and event based data dissemination with a lower message overhead and latency