# draft-gomez-lpwan-ipv6-analysis-00

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# Motivation

- Connecting LPWAN to the Internet
  - Use of IPv6 over LPWAN
- 6Lo(WPAN) traditionally used for constrained node networks
- However, some LPWAN technologies/setups even more constrained than typical 6Lo(WPAN) ones:
  - Lack of L2 fragmentation support
  - Maximum payload size one order of magnitude less
  - Bit rate several orders of magnitude less
  - Further limited message rate
    - E.g. due to regulatory constraints on the duty cycle
- Challenge for 6Lo(WPAN) mechanisms

# Goals of this document

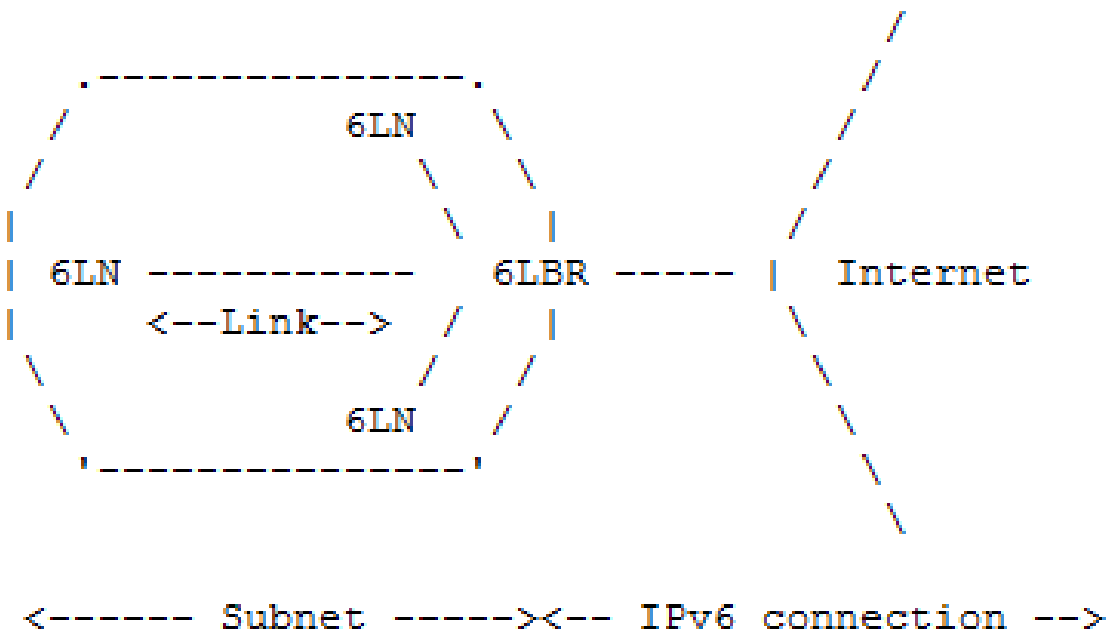
- Analysis of IPv6 over LPWAN
  - Analyze the applicability of existing 6Lo(WPAN) functionality
  - Identify possible challenges
- Guideline for future IPv6 over foo (LPWAN) technologies
  - Design space dimensions, aspects to consider, and recommendations

# Protocol stack

- (If several options are possible) Which lower layer should interface with the adaptation layer?
  - Ability of enabling a link
  - Fragmentation support
  - Multiplexing upper layer protocols

# Network topology and subnet model

- LPWAN typically follow the star topology
- Multi-link subnet model



# Address autoconfiguration

- IIDs traditionally derived from layer two address in 6Lo(WPAN)…
- Privacy concerns
  - LPWAN devices should not embed their link layer address in the IID by default

# Fragmentation

- Needed to satisfy the IPv6 MTU requirement
- If LPWAN technology supports fragmentation
  - Analysis needed: fragmentation may be performed at L2 or at the adaptation layer
- Otherwise, fragmentation at the adaptation layer
- 6Lo(WPAN) fragmentation header
  - High overhead for LPWAN
  - Only supports maximum L2 payload size ≥ 13 bytes
- Optimized approach
  - E.g. draft-gomez-lpwan-fragmentation-header

# Neighbor Discovery (ND) (I/III)

- RFC 6775 defined optimized ND for 6LoWPAN
  - Host-initiated interactions
  - Multicast-based host address resolution replaced by address registration mechanism
  - Multihop extensions (prefix dissemination, DAD)
    - Not needed in star topology networks
  - Optional support for header compression

- Suitable for LPWAN ?

# Neighbor Discovery (ND) (III/III)

- Behavior is tunable
  - Default Router Lifetime (RS/RA)
    - Max: 18 hours
  - Valid Lifetime in PIOs (RS/RA)
    - Max: infinity
  - Valid Lifetime in 6CO (RS/RA)
    - Max: 45 days
  - Address Registration Lifetime (NS/NA)
    - Max: 45 days

# Neighbor Discovery (ND) (II/III)

- OK for some not so challenged LPWAN setups
  - Maximum payload size ≥ ~ 60 bytes
  - Duty-cycle-free or equivalent operation

- High overhead for more challenged LPWAN setups
  - Maximum payload size ~ 10 bytes
  - Message rate ~ 0.1 message/minute

  - More challenged LPWAN setups need further functionality/optimization beyond RFC 6775

# Header Compression (HC)

- RFC 6282 defines 6LoWPAN HC
  - Stateless and stateful
  - 2-byte base encoding
  - 1-byte encoding for context-based HC
    - 16 contexts may be defined
    - Context may be disseminated by using 6CO in RAs
    - Each 6CO adds 16-24 bytes
  - Minimum compressed header with fully compressed global addresses: 3 bytes
    - Limited to 16 global addresses
  - Minimum compressed header with compressed prefix of only source or only destination: 11 bytes
  - Minimum compressed header with compressed prefix of both source and destination: 19 bytes

- More challenged LPWAN setups need further functionality/optimization beyond RFC 6282

# Thanks!

# Questions?

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