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Terminology in Low power And Lossy Networks
draft-vasseur-roll-terminology-01.txt

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Abstract

The documents defines a terminology for discussing routing requirements and solutions for networks referred to as Low power and Lossy Networks (LLN). A LLN is typically composed of many embedded devices with limited power, memory, and processing resources interconnected by a variety of links. There is a wide scope of application areas for LLNs, including industrial monitoring, building automation (Heating, Ventilating, and Air Conditioning also referred to as HVAC, lighting, access control, fire), connected home, healthcare, environmental monitoring, urban sensor networks, energy management, assets tracking, refrigeration.

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Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

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1. Introduction

This document defines a terminology for discussing routing requirements and solutions for networks referred to as Low power and Lossy Networks (LLN).

Low power and Lossy networks (LLNs) are typically composed of many embedded devices with limited power, memory, and processing resources interconnected by a variety of links, such as IEEE 802.15.4, Low Power WiFi. There is a wide scope of application areas for LLNs, including industrial monitoring, building automation (HVAC, lighting, access control, fire), connected home, healthcare, environmental monitoring, urban sensor networks, energy management, assets tracking and refrigeration.

Since these applications are usually highly specific (Industrial Automation, Building Automation, ...), it is not uncommon to see a number of disparate terms to describe the same device or functionality. Thus it was needed to specify common terms for all LLNs to avoid confusion and discrepancies. Terminology specific to a particular application are out of the scope of this document.

It is expected that all routing requirements documents defining requirements or specifying routing solutions for LLN will use the common terminology specified in this document.

2. Terminology

Actuator: a field device that controls a set of equipments. An actuator can control and/or modulates the flow of a gas or liquid, control electricity distribution, perform a mechanical operation, ...

AMI: Advanced Metering Infrastructure that makes use of Smart Grid technologies. Encompasses smart-metering applications.

Channel: Radio frequency sub-band used to transmit a modulated signal carrying packets.

Channel Hopping: A procedure by which field devices synchronously change channels during operation.

Commissioning Tool: Any physical or logical device temporarily added to the network for the expressed purpose of setting up the network and device operational parameters. The commission tool can also be temporarily added for scheduled or unscheduled maintenance.

Closed Loop Control: A process whereby a device controller controls

an actuator based on information sensed by one or more field devices.

Controller: A field device that can receive sensor input and automatically change the environment in the facility by manipulating digital or analog actuators.

DA: Distribution Automation, part of Smart Grid. Encompasses technologies for maintenance and management of electrical distribution systems.

Downstream: Data direction traveling from outside of the LLN (e.g. traffic coming from a LAN, WAN or the Internet) via a LBR.

Field Device: physical devices placed in the network's operating environment (plant, urban, home, ...). Field devices include sensors, actuators as well as routers and Low power and lossy network Border Router (including LBR). A field device is most of the time (but not always) a constrained device with limited CPU, memory footprint, storage capacity, bandwidth and sometimes power constrained (battery operated). At the time of writing, for the sake of illustration, a typically sensor or actuator would have a few KBytes of RAM, a few dozens of KBytes of ROM/Flash memory, a 8/16/32 bit microcontroller and communication capabilities ranging from a few Kbits/s to a few hundreds of KBits/s. Although it is expected to see continuous improvements of hardware and software technologies, such devices will likely continue to be seen as constrained devices compared to computers and routers used in the Internet.

Flash memory: non-volatile memory that can be re-programmed.

FMS: Facility Management System. A global term applied across all the vertical designations within a building including, Heating, Ventilating, and Air Conditioning also referred to as HVAC, Fire, Security, Lighting and Elevator control.

HART: "Highway Addressable Remote Transducer", a group of specifications for industrial process and control devices administered by the HART Foundation (see [HART]). The latest version for the specifications is HART7 which includes the additions for WirelessHART.

HVAC: Heating, Ventilation and Air Conditioning. A term applied to the comfort level of an internal space.

ISA: "International Society of Automation". ISA is an ANSI accredited standards-making society. ISA100 is an ISA committee whose charter includes defining a family of standards for industrial automation. [ISA100.11a] is a working group within ISA100 that is

working on a standard for monitoring and non-critical process control applications.

LAN: Local Area Network.

LBR: Low power and lossy network Border Router. The LBR is a device that connects the low power and lossy network to another routing domain such as a Local Area Network (LAN), Wide Area Network (WAN) or the Internet where a possibly different routing protocol is in operation. The LBR acts as a routing device and may possibly host other functions such as data collector or aggregator.

LLN: Low power and Lossy networks (LLNs) are typically composed of many embedded devices with limited power, memory, and processing resources interconnected by a variety of links, such as IEEE 802.15.4, Low Power WiFi. There is a wide scope of application areas for LLNs, including industrial monitoring, building automation (HVAC, lighting, access control, fire), connected home, healthcare, environmental monitoring, urban sensor networks, energy management, assets tracking and refrigeration..

Open Loop Control: A process whereby a plant operator manually

manipulates an actuator over the network where the decision is influenced by information sensed by field devices.

RAM: Random Access Memory. The RAM is a volatile memory.

ROM: Read Only Memory.

ROLL: Routing Over Low power and Lossy networks.

Schedule: An agreed execution, wake-up, transmission, reception, etc., time-table between two or more field devices.

Sensor: device that measures a physical quantity and converts it to a analog or digital signal that can be read by a program or a user. Sensed data can be of many types: electromagnetic (current, voltage, power, resistance) , mechanical (pressure, flow, liquid density, humidity, ...), chemical (oxygen, carbon monoxide, ...), acoustic (noise, ultrasound), ...

Smart Grid: a broad class of applications to network and automate utility infrastructure.

Timeslot: A fixed time interval that may be used for the transmission or reception of a packet between two field devices. A timeslot used for communications is associated with a slotted-link

Upstream: Data direction traveling from the LLN via the LBR to outside of the LLN (LAN, WAN, Internet).

WAN: Wide Area Network.

[3.](#) IANA Considerations

This document includes no request for IANA action.

[4.](#) Security Considerations

Since this document specifies terminology and does not specify new procedure or protocols, there are no security issues associated with

it.

[5.](#) Acknowledgements

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[6.](#) References

[6.1.](#) Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[6.2.](#) Informative References

[I-D.ietf-roll-home-routing-reqs]
Brandt, A., Buron, J., and G. Porcu, "Home Automation Routing Requirement in Low Power and Lossy Networks", [draft-ietf-roll-home-routing-reqs-03](#) (work in progress), September 2008.

[I-D.ietf-roll-indus-routing-reqs]
Networks, D., Thubert, P., Dwars, S., and T. Phinney, "Industrial Routing Requirements in Low Power and Lossy Networks", [draft-ietf-roll-indus-routing-reqs-01](#) (work in progress), July 2008.

[I-D.ietf-roll-urban-routing-reqs]
Dohler, M., Watteyne, T., Winter, T., Jacquenet, C., Madhusudan, G., Chegaray, G., and D. Barthel, "Urban WSNs

Routing Requirements in Low Power and Lossy Networks", [draft-ietf-roll-urban-routing-reqs-01](#) (work in progress), July 2008.

[I-D.martocci-roll-building-routing-reqs]
Martocci, J., Riou, N., Mil, P., and W. Vermeylen, "Commercial Routing Requirements in Low Power and Lossy Networks", [draft-martocci-roll-building-routing-reqs-00](#)

(work in progress), September 2008.

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