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IEEE Std 802.1CS™–2020

IEEE Standard for Local and Metropolitan Area Networks—

Link-local Registration Protocol

Developed by the

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 3 December 2020

IEEE SA Standards Board

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Abstract: Protocols, procedures, and managed objects for a Link-local Registration Protocol (LRP) to replicate a registration database from one end to the other of a point-to-point link and to replicate changes to parts of that database are specified in this standard. A facility is provided to purge the replicated database if the source becomes unresponsive. LRP is optimized for databases on the order of 1 Mbyte.

Keywords: Bridged Local Area Networks, bridges, bridging, IEEE 802®, IEEE 802.1CS™, IEEE 802.1Q™, Link-local Registration Protocol, local area networks (LANs), LRP, MAC Bridges, Time-Sensitive Networking, TSN, Virtual Bridged Local Area Networks (virtual LANs)

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Introduction

This introduction is not part of IEEE Std 802.1CS-2020, IEEE Standard for Local and Metropolitan Area Networks—Link-local Registration Protocol.

This standard defines the Link-local Registration Protocol.

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IEEE Standard for Local and Metropolitan Area Networks—

Link-local Registration Protocol

1. Overview

1.1 Scope

This standard specifies protocols, procedures, and managed objects for a Link-local Registration Protocol (LRP) to replicate a registration database from one end to the other of a point-to-point link and to replicate changes to parts of that database. A facility is provided to purge the replicated database if the source becomes unresponsive. Provision is made for a proxy system to operate LRP on behalf of a controlled system. LRP is optimized for databases on the order of 1 Mbyte.

1.2 Purpose

LRP is designed to facilitate the creation of applications that distribute information through all or part of a network.

1.3 State diagram conventions

This document uses the state diagram conventions defined in Annex E of IEEE Std 802.1Q-2018.[1] The programming language C (ISO/IEC 9899:2018) is also used to document the operation of conformant systems. C functions are distinguished with `this special fixed-width font` (e.g., 9.4.6).

1.4 Specification model

The model of operation documented by this standard is simply a basis for describing the functionality of a compliant equipment. Implementations can adopt any internal model of operation compatible with the externally visible behavior that this standard specifies. Conformance of equipment to this standard is purely in respect of observable protocol.

[1] Information on references can be found in Clause 2.

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1.5 Note on inter-table references

A number of state machine variables, managed objects, and interface primitives in this standard use the phrase "a reference to *xyz*" (see e.g., 7.3.2.8). Such a reference might be implemented by a pointer, an integer index into an array, the value of some other object in *xyz* that is sufficiently unique to make the reference unambiguous. Other techniques are also possible. This is an implementation choice and is not specified by this standard. This use of "a reference to" is also used for managed objects in Clause 11. The actual data representations of references to managed objects in Clause 12 and Clause 13, of course, are not arbitrary.

1.6 Specification precedence

If any conflict among parts of this standard become apparent, state machine diagrams (see 1.3) take precedence over other parts of the standard, followed by information in normative tables, followed by that in normative text, followed by that in normative figures, followed by YANG and MIB modules. Non-normative tables, figures, and text are in annexes and are clearly marked as such.

1.7 Introduction

The Link-local Registration Protocol (LRP) provides an LRP Database Synchronization (LRP-DS) service interface (Clause 10) that can be used by one or more LRP applications in a network, each of which needs to distribute information to some or all of the relay systems and end systems in a network. The information is passed hop-by-hop, in the sense that each information element is associated with a specific pair of connected ports in the network.

LRP accomplishes its task by creating point-to-point bi-directional associations between systems' application instances, each association consisting of two one-way paths, and each path consisting of an applicant database at one end, and a registrar database at the other. LRP quickly and reliably replicates each applicant database to its neighbor's registrar database. Locally to a system, the application instance performs any propagation or modification of information among the applicant and registrar databases on different ports within a system. Globally, the application instances plus LRP can propagate information throughout a network. This standard does not specify any LRP application that might use LRP. These basic relationships are illustrated in Figure 1-1.

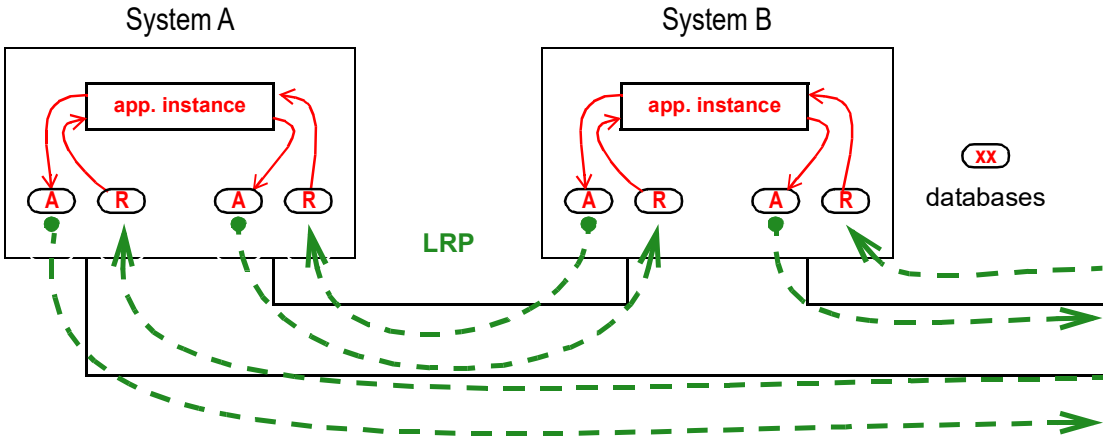


Figure 1-1—LRP simplified

LRP also supports a mode where a Proxy system operates the application instance, databases, and LRP on behalf of a Controlled system.

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2. Normative references

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NOTE—The inclusion of a document in this list of normative references indicates that information in that document is necessary to implement the present standard. It does not imply that any other part of that referenced document is required to be implemented by a system conformant to the present standard.[2]

IEEE Std 802®, IEEE Standard for Local and metropolitan area networks—Overview and Architecture.[3, 4]

IEEE Std 802.1AB™-2016, IEEE Standard for Local and metropolitan area networks—Station and Media Access Control Connectivity Discovery.

IEEE Std 802.1Q™, IEEE Standard for Local and metropolitan area networks—Bridges and Bridged Networks.

IEEE Std 1003.1™, IEEE Standard for Information Technology—Portable Operating System Interface (POSIX™) Base Specifications, Issue 7.

IETF RFC 793, Transmission Control Protocol, September 1981.[5]

IETF RFC 2578, Std 58, Structure of Management Information Version 2 (SMIv2), April 1999.

IETF RFC 2579, Std 58, Textual Conventions for SMIv2, April 1999.

IETF RFC 2580, Std 58, Conformance Statements for SMIv2, April 1999.

IETF RFC 2863, The Interfaces Group MIB, June 2000.

IETF RFC 3232, Assigned Numbers: RFC 1700 is Replaced by an On-line Database, January 2002.

IETF RFC 4001, Textual Conventions for Internet Network Addresses, February 2005.

IETF RFC 6335, Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry, August 2011.

IETF RFC 7950, The YANG 1.1 Data Modeling Language, August 2016.

Internet Assigned Numbers Authority (IANA) database, Service Name and Transport Protocol Port Number Registry.[6]

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ISO/IEC 8473-1:1998, Information technology — Protocol for providing the connectionless-mode network service: Protocol specification.[7]

ISO/IEC 9899:2018, Information technology—Programming languages—C.

OMG® Unified Modeling Language™ (OMG UML®), Version 2.5, March 2015.[8, 9]

[7]ISO publications are available from the International Organization for Standardization (https://www.iso.org/) and the American National Standards Institute (https://www.ansi.org/). IEC publications are available from the International Electrotechnical Commission (https://www.iec.ch) and the American National Standards Institute (https://www.ansi.org/).

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For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[10]

This standard makes use of the following terms defined in IEEE Std 802:

— end station
— frame

This standard makes use of the following terms defined in IEEE Std 802.1Q:

— Edge Control Protocol (ECP)

The following terms are specific to this standard:

applicant: One of the two roles (with registrar) an application instance can have with respect to a Portal. The applicant controls a database that the Link-local Registration Protocol (LRP) replicates to the registrar in the neighbor Portal.

application instance: An instance of a Link-local Registration Protocol (LRP) application running in a particular Native or Proxy system.

Controlled system: An end system or relay system that has one or more target ports, but not their associated Portals.

Edge Control Protocol (ECP): A protocol that provides reliable delivery of control service data units (SDUs). (From IEEE Std 802.1Q)

Edge Control Protocol Data Unit (ECPDU): The basic unit of information transmitted or received by the Edge Control Protocol.

end station: A functional unit in an IEEE 802 network that acts as a source of, and/or destination for, link layer data traffic carried on the network. (From IEEE Std 802)

end system: A system attached to a network that is an initial source or a final destination of data transmitted across that network.

NOTE—The term “end system” is often used in this document in places where the reader of IEEE 802 standards would expect the term “end station,” in order to avoid confusion caused by standards relating to routers. For example, a router, as defined by IETF, is an IEEE 802 “end station,” but not an “end system,” because it is not typically an initial source or final destination. Where this standard specifically refers to the use of IEEE 802 services, the term “end station” is used. Where it refers to more generalized instances of connectionless services, the term “end system” is used.

frame: The format of aggregated bits from a medium access control (MAC) sublayer entity that are transmitted together in time. (From IEEE Std 802)

local target port: A target port within the same Native system as an application instance using the port, or a target port within a Controlled system serviced by an application instance in a Proxy system using the port.

[10] *IEEE Standards Dictionary Online* is available at https://dictionary.ieee.org. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

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LRP application: A protocol, identified by an application ID, that makes use of the Link-local Registration Protocol (LRP).

Native system: An end system or relay system that has one or more target ports and their associated Portals.

Neighbor Portal: The one Portal to which a Portal has been connected.

neighbor target port: A target port in a system directly connected to a local port.

port: An entity defined by a {Chassis ID, Port ID} pair that is unique over the union of systems interconnected by the Link-layer Registration Protocol (LRP). A port can be tied to a Service Access Port (SAP) providing access to an instance of the MAC Service described in IEEE Std 802.1AC.

NOTE—See IEEE Std 802.1AC™ [B3].[11]

Portal: An instantiation of the Portal interface, along with instances of the applicant and/or registrar state machines and databases, associated with a single application instance, residing in a Native or Proxy system, and associated with a target port.

Proxy system: A system that has Portals, but not the associated target ports.

record: A subset of a database that is transferred as a single unit from the applicant to the registrar by the Link-local Registration Protocol (LRP).

registrar: One of the two roles (with applicant) an application instance can have with respect to a Portal. The registrar receives the copy of the database that the Link-local Registration Protocol (LRP) replicates from the applicant in the neighbor Portal.

relay system: A router or a bridge.

NOTE—The term “relay system” is often used in this document in places where the reader of IEEE 802 standards would expect the term “bridge.” A relay system can, in theory, be a router, a bridge, or any other device that forwards a frame from one port to another, such that the frame is, in some useful sense, identifiable to other systems as being the same frame. Where this standard specifically refers to one or the other, the terms “router” or “bridge” are used. Where it refers to more generalized instances of connectionless services, the term “relay system” is used.

system: An end system or a relay system.

target port: A port in a Native or Controlled system with which a Portal is associated.

[11]The numbers in brackets correspond to those of the bibliography in Annex D.

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