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IANA Registries for the Remote Direct Data Placement (RDDP) Protocols

Abstract

The original RFCs that specified the Remote Direct Data Placement (RDDP) protocol suite did not create IANA registries for RDDP error codes, operation codes, and function codes. Extensions to the RDDP protocols now require these registries to be created. This memo creates the RDDP registries, populates them with values defined in the original RDDP RFCs, and provides guidance to IANA for future assignment of code points within these registries.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc6580.

Table of Contents

1. Introduction

The original RFCs that specified the RDDP protocol suite [RFC5040] [RFC5041] [RFC5043] [RFC5044] did not create IANA registries. Extensions to the RDDP protocols [RFC6581] [RMP-EXT] now require creation and use of IANA registries. This memo creates the RDDP-related IANA registries, specifies their initial contents based on the values defined in the original RDDP RFCs, and provides guidance to IANA for future assignments from these registries. In addition, this memo allocates operation code and function code points for experimental use [RFC3692].

2. Security Considerations

Since this document is only concerned with creation and IANA management of RDDP registries, it raises no new security issues.

However, a few words are necessary about the use of the experimental code points defined in Sections 3.4 and 3.5. Potentially harmful side effects from the use of the experimental values need to be carefully evaluated before deploying any experiment across networks that the owner of the experiment does not entirely control. Guidance given in [RFC3692] about the use of experimental values needs to be followed.

3. IANA Considerations

Allocation requests for the registries created by this memo may come with a suggested numerical value or values that should be assigned. Such suggestions are useful when early implementations have already chosen particular code points before the final RFC is published. If the allocation request in general is accepted, such suggestions may be honored if the suggested value is still free to be assigned.

This memo creates the following RDDP registries for IANA to manage:

- o RDMAP Errors (Section 3.1)
- o DDP Errors (Section 3.2)
- o MPA Errors (Section 3.3)
- o RDMAP Message Operation Codes (Section 3.4)
- o SCTP Function Codes for DDP Stream Session Control (Section 3.5)

Each of the following sections specifies a registry, its initial contents, and the allocation policy in more detail.

3.1. RDMAP Errors

Name of the registry: "RDMAP Errors"

Namespace details: An RDMAP (Remote Direct Memory Access Protocol) error is a 16-bit field divided into three subfields [RFC5040]:

- o 4-bit Layer, always 0x0 for RDMAP errors
- o 4-bit Error Type
- o 8-bit Error Code

The Error Code field is optional for this registry, as Error Codes are not used with all RDMAP Error Types. When no numerical Error Code is registered, any 8-bit value may be used as the Error Code, as the Layer and Error Type values are sufficient to specify the error. For this reason, if an RDMAP Error Type is registered without an Error Code, an entry must not be added to this registry with an Error Code for the same Error Type.

Information that must be provided to assign a new value: An IESG-approved Standards-Track specification defining the semantics and interoperability requirements of the proposed new value and the fields to be recorded in the registry.

Fields to record in the registry: Layer/Error-Type/Error-Code, Error-Type-Name/Error-Code-Name, RFC Reference. The Error-Code and Error-Code-Name are omitted for Error-Types that do not have Error-Codes.

When a specific Error Code is not registered, the registry entry contains the string "ALL" for the Error Code instead of a numerical value, and the Error Code Name is omitted from the registry entry.

Initial registry contents:

0x0/0x0/ALL , Local Catastrophic Error, [RFC5040]

0x0/0x1/0x00, Remote Protection Error / Invalid Steering Tag, [RFC5040]

0x0/0x1/0x01, Remote Protection Error / Base or bounds violation, [RFC5040]

0x0/0x1/0x02, Remote Protection Error / Access rights violation, [RFC5040]

0x0/0x1/0x03, Remote Protection Error / Steering Tag not associated with RDMAP Stream, [RFC5040]

0x0/0x1/0x04, Remote Protection Error / Tagged Offset wrap, [RFC5040]

0x0/0x1/0x09, Remote Protection Error / Steering Tag cannot be invalidated, [RFC5040]

0x0/0x1/0xff, Remote Protection Error / Unspecified Error, [RFC5040]

0x0/0x2/0x05, Remote Operation Error / Invalid RDMAP version, [RFC5040]

0x0/0x2/0x06, Remote Operation Error / Unexpected OpCode, [RFC5040]

0x0/0x2/0x07, Remote Operation Error / Catastrophic error, localized to RDMAP Stream, [RFC5040]

0x0/0x2/0x08, Remote Operation Error / Catastrophic error, global, [RFC5040]

0x0/0x2/0x09, Remote Operation Error / Steering Tag cannot be Invalidated, [RFC5040]

0x0/0x2/0xff, Remote Operation Error / Unspecified Error, [RFC5040]

All combinations not listed above that combine 0x0 as the Layer with an Error Type and Error Code are Unassigned and available to IANA for assignment.

Allocation Policy: Standards Action [RFC5226]

3.2. DDP Errors

Name of the registry: "DDP Errors"

Namespace details: A DDP (Direct Data Placement) error is a 16-bit field divided into three subfields [RFC5041]:

- 4-bit Layer, always 0x1 for DDP errors
- 4-bit Error Type
- 8-bit Error Code

The Error Code field is required for this registry, except for the registry entry that reserves a set of errors for use by the Lower Layer Protocol. When no numerical Error Code is registered, any 8-bit value may be used as the Error Code, as the Layer and Error Type values are sufficient to specify the error. For this reason, if a DDP Error Type is registered without an Error Code, an entry must not be added to this registry with an Error Code for the same Error Type.

Information that must be provided to assign a new value: An IESG-approved Standards-Track specification defining the semantics and interoperability requirements of the proposed new value and the fields to be recorded in the registry.

Fields to record in the registry: Layer/Error-Type/Error-Code, Error-Type-Name/Error-Code-Name, RFC Reference.

The last registry entry in the initial registry contents below reserves a set of errors for use by the Lower Layer Protocol. That entry uses "ALL" for the Error Code and omits the Error Code Name. The use of "ALL" is unique to that entry; all other entries in this registry are required to contain a numeric Error Code and an Error Code Name.

Initial registry contents:

0x1/0x0/0x00, Local Catastrophic, [RFC5041]

0x1/0x1/0x00, Tagged Buffer Error / Invalid Steering Tag, [RFC5041]

0x1/0x1/0x01, Tagged Buffer Error / Base or bounds violation, [RFC5041]

0x1/0x1/0x02, Tagged Buffer Error / Steering Tag not associated with DDP Stream, [RFC5041]

0x1/0x1/0x03, Tagged Buffer Error / Tagged Offset wrap, [RFC5041]

0x1/0x1/0x04, Tagged Buffer Error / Invalid DDP version, [RFC5041]

0x1/0x2/0x01, Untagged Buffer Error / Invalid Queue Number, [RFC5041]

0x1/0x2/0x02, Untagged Buffer Error / Invalid Message Sequence Number - no buffer available, [RFC5041]

0x1/0x2/0x03, Untagged Buffer Error / Invalid Message Sequence Number - Message Sequence Number range is not valid, [RFC5041]

0x1/0x2/0x04, Untagged Buffer Error / Invalid Message Offset, [RFC5041]

0x1/0x2/0x05, Untagged Buffer Error / DDP Message too long for available buffer, [RFC5041]

0x1/0x2/0x06, Untagged Buffer Error / Invalid DDP version, [RFC5041]

0x1/0x3/ALL , Reserved for use by Lower Layer Protocol, [RFC5041]

All combinations not listed above that combine 0x1 as the Layer with an Error Type and Error Code are Unassigned and available to IANA for assignment.

Allocation Policy: Standards Action [RFC5226]

3.3 MPA Errors

Name of the registry: "MPA Errors"

Namespace details: An MPA (Marker PDU Aligned Framing) error is a 16-bit field divided into three subfields [RFC5044]:

- 4-bit Layer, always 0x2 for MPA errors
- 4-bit Error Type
- 8-bit Error Code

The Error Code field is required for this registry.

Information that must be provided to assign a new value: An IESG-approved Standards-Track specification defining the semantics and interoperability requirements of the proposed new value and the fields to be recorded in the registry.

Fields to record in the registry: Layer/Error-Type/Error-Code, Error-Type-Name/Error-Code-Name, RFC Reference.

The string "ALL" is not used for the Error Code in this registry; every entry is required to contain a numeric Error Code and an Error Code Name.

Initial registry contents:

0x2/0x0/0x01, MPA Error / TCP connection closed, terminated, or lost, [RFC5044]

0x2/0x0/0x02, MPA Error / MPA CRC Error, [RFC5044]

0x2/0x0/0x03, MPA Error / MPA Marker and ULPDU Length field mismatch, [RFC5044]

0x2/0x0/0x04, MPA Error / Invalid MPA Request Frame or MPA Response Frame, [RFC5044]

All combinations not listed above that combine 0x2 as the Layer with an Error Type and Error Code are Unassigned and available to IANA for assignment.

Allocation Policy: Standards Action [RFC5226]

3.4 RDMAP Message Operation Codes

Name of the registry: "RDMAP Message Operation Codes"

Namespace details: RDMAP Operation Codes are 4-bit values [RFC5040].

Information that must be provided to assign a new value: An IESG-approved Standards-Track specification defining the semantics and interoperability requirements of the proposed new value and the fields to be recorded in the registry.

Fields to record in the registry: RDMAP Message Operation Code, Message Type, RFC Reference

Initial registry contents:

0x0, RDMA Write, [RFC5040]

0x1, RDMA Read Request, [RFC5040]

0x2, RDMA Read Response, [RFC5040]

0x3, Send, [RFC5040]

0x4, Send with Invalidate, [RFC5040]

0x5, Send with Solicited Event, [RFC5040]

0x6, Send with Solicited Event and Invalidate, [RFC5040]

0x7, Terminate, [RFC5040]

0xF, Reserved (Experimental) [RFC6580]

All other values are Unassigned and available to IANA for assignment.

Allocation Policy: Standards Action [RFC5226]

3.5 SCTP Function Codes for DDP Stream Session Control

Name of the registry: "SCTP Function Codes for DDP Session Control"

Namespace details: SCTP (Stream Control Transmission Protocol) function codes for DDP session control are 16-bit values [RFC5043].

Information that must be provided to assign a new value: An IESG-approved Standards-Track specification defining the semantics and interoperability requirements of the proposed new value and the fields to be recorded in the registry.

Fields to record in the registry: SCTP Function Code, SCTP Function Name, RFC Reference

Initial registry contents:

0x0001, DDP Stream Session Initiate, [RFC5043]

0x0002, DDP Stream Session Accept, [RFC5043]

0x0003, DDP Stream Session Reject, [RFC5043]

0x0004, DDP Stream Session Terminate, [RFC5043]

0xFFFF, Reserved (Experimental) [RFC6580]

All other values are Unassigned and available to IANA for assignment.

Allocation Policy: Standards Action [RFC5226]

4. Normative References

[RFC5040] Recio, R., Metzler, B., Culley, P., Hilland, J., and D. Garcia, "A Remote Direct Memory Access Protocol Specification", RFC 5040, October 2007.

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5. Informative References

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[RFC6581] Kanevsky, A., Ed., Bestler, C., Ed., Sharp, R., and S. Wise, "Enhanced Remote Direct Memory Access (RDMA) Connection Establishment", RFC 6581, April 2012.

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