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IANA Considerations for RPC Net Identifiers and Universal Address Formats
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Abstract

This Internet-Draft lists IANA Considerations for RPC Network Identifiers (netids) and RPC Universal Network Addresses (uaddrs). This Internet-Draft updates, but does not replace, RFC1833.

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 [1].

Table of Contents

1. Introduction and Motivation

The concepts of an RPC (defined in RFC1831 [4]) Network Identifier (netid) and an RPC Universal Address (uaddr) were introduced in RFC1833 [2] for distinguishing network addresses of multiple protocols and representing those addresses in a canonical form. RFC1833 states that a netid ``is defined by a system administrator based on local conventions, and cannot be depended on to have the same value on every system.'' (The netid is contained in the field r_netid of the data type rpcb_entry, and the uaddr is contained in the field r_addr of the same data type, where rpcb_entry is defined in RFC1833.) Since the publication of RFC1833, it has been found that protocols like NFSv4.0 [5] and RPC/RDMA [6] depend on consistent values of netids and representations of uaddrs. Current practices tend to ensure this consistency. Thus, this document identifies the considerations for IANA to establish registries of netids and uaddr formats for RPC and specifies the initial content of the two registries.

2. Acknowledgements

Lars Eggert, Juergen Schoenwaelder, and Robert Sparks reviewed the document and gave valuable feed back.

3. Security Considerations

Since this document is only concerned with the IANA management of the Network Identifier (netid) and Universal Network Addresses (uaddrs) format registry, it raises no new security issues.

4. IANA Considerations

This section uses terms that are defined in RFC5226 [7].

4.1. IANA Considerations for Netids

IANA will create a registry called "ONC RPC Netids". The remainder of this section describes the registry.

All assignments to the ONC RPC Netids registry are made on one of two bases:

- o A First Come First Served basis subregistry per section 4.1 of RFC5226.

- A Standards Action basis subregistry per section 4.1 of RFC5226.

The XDR encoding allows netids to be up to 2^32 - 1 octets in length, but the registry will only allow a much shorter length. Assignments made on a Standards Action basis should be assigned netids one to eight octets long. Assignments made on a First Come First Served basis should be assigned netids nine to 128 octets long. Some exceptions are listed in Table 2.

Some portion of the netid name space is Reserved:

- All netids, regardless of length, that start with the prefixes "STDS" or "FCFS" are Reserved, in order to extend the name space of either Standards Action or First Come First Served bases.

- To give IESG the flexibility in the future to permit Private and Experimental Uses, all netids with the prefixes "PRIV" or "EXPE" are Reserved.

- To prevent confusion with the control protocol by the same name [8], netids with the prefix "ICMP" are Reserved.

- Since netids are not constructed in an explicit hierarchical manner, this document does not provide for Hierarchical Allocation of netids. Nonetheless, all netids containing the octet "." are Reserved for future possible provision of Hierarchical Allocation.

- The zero length netid is Reserved.

A recommended convention for netids corresponding to transports that work over the IPv6 protocol is to have "6" as the last character in the netid's name.

There are two subregistries of netids, one for Standards Action assignments, and one for First Come First Serve assignments. Each registry of netids is a list of assignments, each containing five fields for each assignment.

1. A US-ASCII string name that is the actual netid. The netid should be one to eight octets long for the Standards Action subregistry, and should be nine to 128 octets long for the First Come First Served subregistry. The netid MUST NOT conflict with any other registered netid. Despite the fact that netids are case sensitive, the netid, when mapped to all upper case MUST NOT conflict with the value of any other registered netid after the registered netid is mapped to upper case. In addition, when mapped to upper case, the prefix of the netid MUST NOT be equal to a Reserved prefix.

2. A constant name that can be used for software programs that wish to use the transport protocol associated with protocol. The name of the constant typically has the prefix: "NC_", and a suffix equal to the upper case version of the netid. This constant name should be a constant that is valid in the 'C' programming language. This constant name MUST NOT conflict with any other netid constant name. Constant names with the prefix "NC_STDS", "NC_FCFS", "NC_PRIV", "NC_EXPE", and "NC_ICMP" are Reserved. Constant names with a prefix of "NC_" and a total length of 11 characters or less should be for assignments made on the Standards Action basis. The constant "NC_" is Reserved. The constant name can be one to 131 octets long.

3. A description and/or a reference to a description of the how the netid will be used. For assignments made on a First Come First Served basis the description should include, if applicable, a reference to the transport and network protocols corresponding to the netid. For assignments made on a Standards Action basis, the description field must include the RFC numbers of the protocol associated with the netid, including if applicable, RFC numbers of the transport and network protocols.

4. A point of contact of the registrant. For assignments made on a First Come First Served basis,

   * the point of contact should include an email address.

   * subject to authorization by a Designated Expert, the point of contact may be omitted for extraordinary situations, such as the registration of a commonly used netid where the owner is unknown.

   For assignments made on a Standards Action basis the point of contact is always determined by IESG.

5. A numerical value, used to cross reference the netid assignment with an assignment in the uaddr format registry (see Section 4.2). If the registrant is registering a netid that cross references an existing assignment in the uaddr format registry, then the registrant provides the actual value of the cross reference along with the date the registrant retrieved the cross reference value from the uaddr format registry. If the registrant is registering both a new netid and new uaddr format, then the registrant provides a value of TBD1 in the netid request, and uses TBD1 in the the uaddr format request. IANA will then substitute TBD1 for cross reference number IANA allocates.

4.1.1. Initial Registry

The initial list of netids is broken into two subregistries: those assigned on a First Come First Serve basis in Table 1 and those assigned on a Standards Action basis in Table 2. These lists will change when IANA registers additional netids as needed, and the authoritative list of registered netids will always live with IANA.

Netid	Constant Name	Description and/or Reference	PoC	CR
"-"	NC_NOPROTO	RFC1833 [2], Section 4.2.3.2 of RFCTBD2		1
"ticlts"	NC_TICLTS	The loop back connectionless transport used in System V Release 4 and other operating systems. Although this assignment is made on a First Come First Served basis and is fewer than nine characters long, the exception is authorized. See [9].		0
"ticots"	NC_TICOTS	The loop back connection-oriented transport used in System V Release 4 and other operating systems. See [9]. Although this assignment is made on a First Come First Served basis and is fewer than nine characters long, the exception is authorized.		0
"ticotsord"	NC_TICOTSORD	The loop back connection-oriented with orderly-release transport used in System V Release 4 and other operating systems. See [9].		0

Table 1: Initial First Come First Serve Netid Assignments

PoC: Point of Contact. CR: Cross Reference to the Uaddr Format

Registry.

Netid	Constant Name	RFC(s) and Description (if needed)	PoC	CR
"dccp"	NC_DCCP	RFC4340 [10] RFC0791 [11]	IESG	2
"dccp6"	NC_DCCP6	RFC4340 [10] RFC2460 [12]	IESG	3
"rdma"	NC_RDMA	RFCTBD1 [6] RFC0791 [11]	IESG	2
"rdma6"	NC_RDMA6	RFCTBD1 [6] RFC2460 [12]	IESG	3
"sctp"	NC_SCTP	RFC2960 [13] RFC0791 [11]	IESG	2
"sctp6"	NC_SCTP6	RFC2960 [13] RFC2460 [12]	IESG	3
"tcp"	NC_TCP	RFC0793 [14] RFC0791 [11]	IESG	2
"tcp6"	NC_TCP6	RFC0793 [14] RFC2460 [12]	IESG	3
"udp"	NC_UDP	RFC0768 [15] RFC0791 [11]	IESG	2
"udp6"	NC_UDP6	RFC0768 [15] RFC2460 [12]	IESG	3

Table 2: Initial Standards Action Netid Assignments

4.1.2. Updating Registrations

Per section 5.2 of RFC5226 the registrant is always permitted to update a registration made on a First Come First Served basis "subject to the same constraints and review as with new registrations." IESG or a Designated Expert is permitted to update any registration made on a First Come First Served basis, which normally is done when the PoC cannot be reached in order to make necessary updates. Examples where an update would be needed include, but are not limited to: the email address or other contact information becomes invalid; the reference to the corresponding protocol becomes obsolete or unavailable; and RFC1833 is updated or replaced in such a way that the scope of netids changes, requiring additional fields in the assignment.

Only IESG, on the advice of a Designated Expert, can update a registration made on a Standards Action basis.

4.2. IANA Considerations for Uaddr Formats

IANA will create a registry called "ONC RPC Uaddr Format Registry" (called the "format registry" for the remainder of this document). The remainder of this section describes the registry.

All assignments to the format registry are made on one of two bases:

o First Come First Served basis per section 4.1 of RFC5226.

o Standards Action per section 4.1 of RFC5226.

The registry of formats is a list of assignments, each containing four fields for each assignment.

1. The basis for the assignment, which can be either FCFS for First Come First Served assignments, or STDS for Standards Action assignments.

2. A description and/or reference to a description of the actual uaddr format. Assignments made on a Standards Action basis always have a reference to an RFC.

3. For assignments made on a First Come First Served basis, a point of contact, including an email address. Subject to authorization by a Designated Expert, the point of contact may be omitted for extraordinary situations, such as the registration of a commonly used format where the owner is unknown. For assignments made on a Standards Action basis, the point of contact is always determined by IESG.

4. A numerical value, used to cross reference the format assignment with an assignment in the netid registry. The registrant provides a value of TBD1 for the cross reference field when requesting an assignment. IANA will assign TBD1 to a real value.

All requests for assignments to the format registry on a Standards Action basis must undergo Expert Review and must be approved by IESG.

4.2.1. Initial Registry

The initial list of formats is in Table 3. This lists will change when IANA registers additional formats as needed, and the authoritative list of registered formats will always live with IANA.

Basis	Description and/or Reference	PoC	CR
FCFS	System V Release 4 loopback transport uaddr format. Section 4.2.3.1 of RFCTBD2		0
FCFS	Uaddr format for NC_NOPROTO. Section 4.2.3.2 of RFCTBD2		1
STDS	Uaddr format for IPv4 transports. Section 4.2.3.3 of RFCTBD2	IESG	2
STDS	Uaddr format for IPv6 transports. Section 4.2.3.4 of RFCTBD2	IESG	3

Table 3: Initial Format Assignments

4.2.2. Updating Registrations

The registrant is always permitted to update a registration made on a First Come First Served basis "subject to the same constraints and review as with new registrations." IESG is permitted to update any registration made on a First Come First Served basis, which normally is done when the PoC cannot be reached in order to make necessary updates. Examples where an update would be needed include, but are not limited to: the email address or other contact information becomes invalid; the reference to the format description becomes obsolete or unavailable; and RFC1833 is updated or replaced in such a way that the scope of uaddr formats changes, requiring additional fields in the assignment.

Only IESG, on the advice of a Designated Expert, can update a registration made on a Standards Action basis.

4.2.3. Uaddr Formats

4.2.3.1. Uaddr Format for System V Release 4 Loopback Transports

Although RFC1833 specifies the uaddr as the XDR data type string (hence, limited to US-ASCII), implementations of the System V Release 4 loopback transports will use an opaque string of octets. Thus the format of a loopback transport address is any non-zero length array of octets.

4.2.3.2. Uaddr Format for Netid "-"

There is no address format for netid "-". This netid is apparently for internal use for supporting some implementations of RFC1833.

4.2.3.3. Uaddr Format for Most IPv4 Transports

Most transport protocols that operate over IPv4 use 16 bit port numbers, including DCCP [10], RDMA [6], SCTP [13], TCP [14], and UDP [15]. The format of the uaddr for the above 16 bit port transports (when used over IPv4) is the US-ASCII string:

```
h1.h2.h3.h4.p1.p2
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The prefix, "h1.h2.h3.h4", is the standard textual form for representing an IPv4 address, which is always four octets long. Assuming big-endian ordering, h1, h2, h3, and h4, are respectively, the first through fourth octets each converted to ASCII-decimal. The suffix, "p1.p2", is a textual form for representing a service port.

Assuming big-endian ordering, p1 and p2 are, respectively, the first and second octets each converted to ASCII-decimal. For example, if a host, in big-endian order, has an address in hexadecimal of 0xC0000207 and there is a service listening on, in big endian order, port 0xCB51 (decimal 52049) then the complete uaddr is "192.0.2.7.203.81".

4.2.3.4. Uaddr Format for Most IPv6 Transports

Most transport protocols that operate over IPv6 use 16 bit port numbers, including DCCP [10], RDMA [6], SCTP [13], TCP [14], and UDP [15]. The format of the uaddr for the above 16 bit port transports (when used over IPv6) is the US-ASCII string:

```
x1:x2:x3:x4:x5:x6:x7:x8.p1.p2
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The suffix "p1.p2" is the service port, and is computed the same way as with uaddrs for transports over IPv4 (see Section 4.2.3.3). The prefix, "x1:x2:x3:x4:x5:x6:x7:x8", is the preferred textual form for representing an IPv6 address as defined in Section 2.2 of RFC4291 [3]. Additionally, the two alternative forms specified in Section 2.2 of RFC4291 are also acceptable.

4.2.3.5. Uaddr Format for ICMP over IPv4 and IPv6

As ICMP is not a true transport, there is no uaddr format for ICMP. The netid assignments "icmp" and "icmp6" and their shared uaddr "format" are listed to prevent any registrant from allocating the netids "icmp" and "icmp6" for a purpose that would likely cause confusion.

4.3. Cross Referencing Between the Netid and Format Registry

The last field of the netids registry is used to cross reference with the last field of the format registry. IANA is under no obligation to maintain same numeric value in cross references when updating each registry; i.e. IANA is free to "re-number" these corresponding fields. However, if IANA does so, both the netid and format registries must be updated atomically.

5. References

5.1. Normative References

[1]   Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, March 1997.

[2] Srinivasan, R., "Binding Protocols for ONC RPC Version 2", RFC 1833, August 1995.

[3] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, February 2006.

5.2. Informative References

[4] Srinivasan, R., "RPC: Remote Procedure Call Protocol Specification Version 2", RFC 1831, August 1995.

[5] Shepler, S., Callaghan, B., Robinson, D., Thurlow, R., Beame, C., Eisler, M., and D. Noveck, "Network File System (NFS) version 4 Protocol", RFC 3530, April 2003.

[6] Talpey, T. and B. Callaghan, "Remote Direct Memory Access Transport for Remote Procedure Call", draft-ietf-nfsv4-rpcrdma-09 (work in progress), December 2008.

[7] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 5226, May 2008.

[8] Postel, J., "Internet Control Message Protocol", STD 5, RFC 792, September 1981.

[9] American Telephone and Telegraph Company, "UNIX System V, Release 4 Programmer's Guide: Networking Interfaces, ISBN 0139470786", 1990.

[10] Kohler, E., Handley, M., and S. Floyd, "Datagram Congestion Control Protocol (DCCP)", RFC 4340, March 2006.

[11] Postel, J., "Internet Protocol", STD 5, RFC 791, September 1981.

[12] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", RFC 2460, December 1998.

[13] Stewart, R., Xie, Q., Morneault, K., Sharp, C., Schwarzbauer, H., Taylor, T., Rytina, I., Kalla, M., Zhang, L., and V. Paxson, "Stream Control Transmission Protocol", RFC 2960, October 2000.

[14] Postel, J., "Transmission Control Protocol", STD 7, RFC 793, September 1981.

[15] Postel, J., "User Datagram Protocol", STD 6, RFC 768, August 1980.

Appendix A. RFC Editor Notes

[RFC Editor: please remove this section prior to publication.]

[RFC Editor: Please replace occurrences of RFCTBD1 with the RFCxxxx where xxxx is the RFC number assigned to the document referenced in [6].]

[RFC Editor: Please replace occurrences of RFCTBD2 with the RFCyyyy where yyyy is the RFC number assigned to this document.]

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