      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 [4] Network Identifier (netid) and an RPC
   Universal Address (uaddr) were introduced in [2] for distinguishing
   network addresses of multiple protocols and representing those
   addresses in a canonical form. [2] 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 [2].) Since the publication of [2], it has
   been found to be necessary that protocols like [5] and [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. **Security Considerations**

   See section 9 of [7].

3. **IANA Considerations**

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

3.1. **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 First Come First Served basis per section 4.1 of [7].

   o Standards Action per section 4.1 of [7].

   Netids can be up to 2^32 - 1 octets in length. However, to ensure
   that practical values for Standards Track protocols are not
   exhausted, the values of netids one to eight octets long should be
   used for netids assigned on the Standards Action basis. Assignments
   made on a First Come First Served basis should be assigned netids of
   length 9 to 128 octets long. All netids, regardless of length, that
   start with the prefixes "STDS" or "FCFS" are Reserved, in order to
   extend the name space of either basis. In addition, to give IESG the

flexibility in the future to permit Private and Experimental Uses, all netids with the prefixes "PRIV" or "EXPE" are Reserved. The zero length netid is Reserved. Some exceptions are listed in Table 2. 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.

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

The 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. This name MUST NOT conflict with any other netid. This string name can be zero to 128 octets long.

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", or "NC_EXPE" 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 name can be 1 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. This field can be up to 1024 octets. If more space is required, an RFC should be published.

4. A point of contact of the registrant. The point of contact can consume up to 256 octets (or more if IANA permits). 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 IESG.

5. A numerical value, used to cross reference the netid assignment
   with an assignment in the uaddr format registry (see
   Section 3.2). 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.

3.1.1. Initial Registry

The initial list of netids is broken into 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 3.2.3.2 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 9 characters long, the exception is authorized. See [8].		0

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| "ticots"    | NC_TICOTS    | The loop back             |     | 0  |
|             |              | connection-oriented      |     |    |
|             |              | transport used in System |     |    |
|             |              | V Release 4 and other    |     |    |
|             |              | operating systems.  See  |     |    |
|             |              | [8].  Although this      |     |    |
|             |              | assignment is made on a  |     |    |
|             |              | First Come First Served  |     |    |
|             |              | basis and is fewer than 9|     |    |
|             |              | characters long, the     |     |    |
|             |              | exception is authorized. |     |    |
| "ticotsord" | NC_TICOTSORD | The loop back             |     | 0  |
|             |              | connection-oriented with |     |    |
|             |              | orderly-release transport|     |    |
|             |              | used in System V Release |     |    |
|             |              | 4 and other operating    |     |    |
|             |              | systems.  See [8].       |     |    |
+-------------+--------------+--------------------------+-----+----+
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             Table 1: Initial First Come First Serve Netid Assignments

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

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+---------+--------------+----------------------------+------+----+
| Netid   | Constant     | RFC(s) and Description (if  | PoC  | CR |
|         | Name         | needed)                    |      |    |
+---------+--------------+----------------------------+------+----+
| "dccp"  | NC_DCCP      | RFC4340 [9] RFC0760 [10]   | IESG | 2  |
| "dccp6" | NC_DCCP6     | RFC4340 [9] RFC2460 [11]   | IESG | 3  |
| "icmp"  | NC_ICMP      | RFC0777 [12] RFC0760 [10]  | IESG | 4  |
| "icmp6" | NC_ICMP6     | RFC0777 [12] RFC2460 [11]  | IESG | 4  |
| "rdma"  | NC_RDMA      | RFCTBD1 [6] RFC0760 [10]   | IESG | 2  |
| "rdma6" | NC_RDMA6     | RFCTBD1 [6] RFC2460 [11]   | IESG | 3  |
| "sctp"  | NC_SCTP      | RFC2960 [13] RFC0760 [10]  | IESG | 2  |
| "sctp6" | NC_SCTP6     | RFC2960 [13] RFC2460 [11]  | IESG | 3  |
| "tcp"   | NC_TCP       | RFC0675 [14] RFC0760 [10]  | IESG | 2  |
| "tcp6"  | NC_TCP6      | RFC0675 [14] RFC2460 [11]  | IESG | 3  |
| "udp"   | NC_UDP       | RFC0768 [15] RFC0760 [10]  | IESG | 2  |
| "udp6"  | NC_UDP6      | RFC0768 [15] RFC2460 [11]  | IESG | 3  |
+---------+--------------+----------------------------+------+----+
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             Table 2: Initial Standards Action Netid Assignments

3.1.2. Updating Registrations

   Per section 5.2 of [7] the registrant 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 [2] 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.

3.2. 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 [7].

   o Standards Action per section 4.1 of [7].

   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. This field can be up to 1024
       octets. If more space is required, an RFC should be published.

   3. For assignments made on a First Come First Served basis, a point
       of contact, including an email address. The point of contact can
       consume up to 256 octets (or more if IANA permits). 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 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 filed when
    requesting an assignment. IANA will assign TBD1 to a real value.

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

3.2.1. 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 3.2.3.1 of RFCTBD2		0
FCFS	Uaddr format for NC_NOPROTO. Section 3.2.3.2 of RFCTBD2		1
STDS	Uaddr format for IPv4 transports. Section 3.2.3.3 of RFCTBD2	IESG	2
STDS	Uaddr format for IPv6 transports. Section 3.2.3.4 of RFCTBD2	IESG	3
STDS	Uaddr formation for ICMP. Section 3.2.3.5 of RFCTBD2	IESG	4

Table 3: Initial Format Assignments

3.2.2. Updating Registrations

The registrant 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.", but as with new registrations,
any requested changes to any field other the point of contact
requires Expert Review. 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 format description
becomes obsolete or unavailable; and RFC1833 [2] 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.

3.2.3. Uaddr Formats

3.2.3.1. Uaddr Format for System V Release 4 Loopback Transports

Although [2] identifies the uaddr as 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 format of a
loopback transport address is any non-zero length array of octets.

3.2.3.2. Uaddr Format for Netid "-"

There is no address format for netid "-". This netid is apparently
for internal use for supporting some implementations of [2].

3.2.3.3. Uaddr Format for Most IPv4 Transports

Most transport protocols that operate over IPv4 use 16 bit port
numbers, including DCCP [9], 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

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 TCP and UDP
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
of 0x0A010307 and there is a service listening on, in big endian
order, port 0x020F (decimal 527), then the complete uaddr is
"10.1.3.7.2.15".

3.2.3.4. Uaddr Format for Most IPv6 Transports

Most transport protocols that operate over IPv6 use 16 bit port
numbers, including DCCP [9], 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

   The suffix "p1.p2" is the service port, and is computed the same way
   as with uaddrs for transports over IPv4 (see Section 3.2.3.3). 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 [3].
   Additionally, the two alternative forms specified in Section 2.2 of
   [3] are also acceptable.

3.2.3.5. 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.

3.3. 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.

4. References

4.1. 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.

4.2. Informative References

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          Specification Version 2", RFC 1831, August 1995.

   [5]   Shepler, S., Callaghan, B., Robinson, D., Thurlow, R., Beame,
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          Transport for Remote Procedure Call",
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   [7]   Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA
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   [8]   American Telephone and Telegraph Company, "UNIX System V,
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   [9]   Kohler, E., Handley, M., and S. Floyd, "Datagram Congestion
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   [10]   Postel, J., "DoD standard Internet Protocol", RFC 760,
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          Specification", RFC 2460, December 1998.

   [12]   Postel, J., "Internet Control Message Protocol", RFC 777,
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   [13]   Stewart, R., Xie, Q., Morneault, K., Sharp, C., Schwarzbauer,
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          Paxson, "Stream Control Transmission Protocol", RFC 2960,
          October 2000.

   [14]   Cerf, V., Dalal, Y., and C. Sunshine, "Specification of
          Internet Transmission Control Program", RFC 675, December 1974.

   [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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