HANDLE.NET REGISTRY POLICIES & PROCEDURES
(as of November 23, 2015)

a. Overview

The Handle.Net® Registry ("HNR"), an activity of Corporation for National Research Initiatives ("CNRI"), is based on components of the Digital Object ("DO") Architecture originally developed and deployed by CNRI. The DO Architecture provides a means for uniquely identifying "digital objects" (also known as "digital entities"), and for using the identifiers to store and retrieve records containing state information about the digital objects. These identifiers are generically known as digital object identifiers or, more colloquially, handles. The HNR Services provide a mechanism for the creation, administration, and resolution of such identifiers, and their associated handle records.

The term digital object is used to denote structured data in the form of a set of bit sequences that can be interpreted and otherwise processed by a computer or other computational facility. Each sequence consists of a type-value pair, at least one of which is the identifier for the DO. The sequences need not all be stored in one place, or stored at all, but if they are stored (as opposed to being computed on-the-fly), they are generally assumed to be accessible from one or more known locations.

Handles consist of a prefix and a suffix that is separated from the prefix by a slash "/". A prefix containing one or more "dots" is described as a prefix with one or more delimiters. A prefix containing no dots is a zero delimiter prefix. The prefix for a handle is not permitted to contain a slash; and the suffix may be any string selected by an individual or organization authorized by the HNR to provide identifier and/or resolution services. Such an individual or organization is generally referred to as a local handle service provider ("LHS").

b. Identifier Records

Identifier records (otherwise known as "handle records") contain state information about the digital objects (DOs) to which they correspond. One example of state information is the location(s) of the DO. Another example is selected metadata about the DO, generally known as key metadata. Type information is an example of key metadata. Type information can itself be stored as a DO, having an associated unique identifier that can be resolved to relevant state information about the types, e.g., how to interpret the type's values.

Except where an LHS notifies the HNR that it would like to continue to be allotted its existing prefix(es), or prefix(es) derived from such prefix(es) (known as "legacy prefixes"), initially, it is assumed that each new prefix allotted to an LHS by the HNR will begin with the HNR's identifier "20.500" followed by a dot (".") followed by a number consisting of a 4 or more digits (e.g., "20.500.1234"). Prefix handle records for prefixes with two or more delimiters are maintained in the HNR. Each prefix handle record in the HNR contains the "service information" that client and server software need in order to locate the LHS responsible for handle records with identifiers beginning with the designated prefix. The required information in any prefix handle record created by the HNR shall typically include an HS_SITE value in the associated prefix handle record indicating where handle records beginning with such prefixes may be found or from which further relevant information may be available.

LHSs may wish to operate identifier and/or resolution systems using different interface specifications than that provided in the Handle.Net software made available by CNRI. To operate such a system, an LHS must request a waiver from the HNR Administrator of the requirement that LHS Services be compatible with Handle.Net Registry Policies & Procedures as set forth herein. As part of the registration procedure, an LHS should request such a waiver and provide the requested information necessary for the HNR

Services to have an effective means of responding to resolution requests relating to the LHS's alternative identifier and/or resolution services. There may be additional fees associated with the registration process in this case.

c. General Service Considerations

Each LHS shall maintain a reasonable quality of service, including, but not limited to, the following considerations:

- Compatibility and smooth interaction among LHS system components, and the interaction of those components with the HNR and with the Global Handle Registry (GHR) as well as with users of LHS's identifier and/or resolution services;
- Consistency and reliability in service performance;
- Proper system management and performance tracking;
- Non-interrupted access to/from the HNR Services and GHR Services; and
- Overall system security.

In the event LHS enters into an agreement with a third party to provide its identifier and/or resolution services using a prefix allotted to LHS, or derived from such prefix for which the LHS has paid the requisite fee, the third party is not required to enter into a separate Handle.Net Registry Service Agreement ("Service Agreement") with CNRI for this purpose, but must register with the HNR and agree to be bound by the Handle.Net Public License Agreement. In addition, LHS shall flow down in its agreement with the third party the applicable terms and conditions of its Service Agreement with CNRI, it being understood that responsibility for fulfilling the obligations of the Service Agreement remain with LHS.

d. Specific Operational Considerations for an LHS

Client software is used to resolve identifiers with a given prefix; the resolution process produces an identifier record for a DO containing state information, such as location information for LHS Services, public keys, and authentication information. The prefix handle record is used by client software to determine the identifying address where the corresponding identifier record may be found.

Accordingly, the LHS shall:

- Maintain all such identifier records at identifying address(es) (e.g., IP addresses, service identifiers or other system coordinates), which shall be provided by the LHS Administrator to the HNR Administrator, as directed, and which is sufficient to permit the HNR Services to redirect a client application to the LHS Services where the designated identifier records are stored. The LHS shall be responsible for ensuring that authoritative resolution responses are generated from these identifying address(es);
- Provide identifier and/or resolution LHS Services at the identifying address(es) for LHS's identifier records; such LHS Services shall be limited to those that are under the common ownership and/or control of the LHS;
- Provide secure maintenance of related private keys;
- Use the secure channel set up by the HNR Administrator to send to the HNR information about its LHS Services configuration and other relevant issues;
- Provide timely reports to the HNR Administrator of service configuration changes, such as LHS moving its current identifier and/or resolution services locations.

An LHS may maintain one or more mirrors for its handle records. In such cases, the identifying address(es) of up to six (6) mirrors may be provided to the HNR Administrator for insertion in the appropriate prefix handle record; and requests for inclusion of additional identifying address(es) shall be addressed to the HNR Administrator at: hdladmin@cnri.reston.va.us. Responses from the mirrors are not considered authoritative, even if the responses are properly signed.

If an LHS wishes to provide services that do not meet the criteria listed above, the LHS should contact the HNR Administrator to request permission for alternate arrangements; and the HNR, at its sole discretion, reserves the right to determine whether to permit such services. For example, it is often the case that an LHS may wish to operate its LHS Services using multiple components (e.g., multiple machines, multiple software instances or mobile programs), where each component has its own identifying address. In this case, each machine would contain a subset of all the records and a hashing algorithm is used to access the specific machine holding the requested handle record. Such machines would not be mirrors of each other but rather each would contain a subset of the handle records at that site. In other words, an LHS that wishes to run a resolution service, using a single prefix, and have the identifier records uniformly distributed across multiple machines with different addresses, or where a single IP address is used with different network ports, shall provide sufficient information to the HNR Administrator about the separate components of the LHS Services to enable the capability from the HNR Services.

Further, if an LHS wishes to operate private identifier and/or resolution services (such as those maintained behind a firewall that are not publicly accessible), it must so notify the HNR Administrator in advance and request permission to do so. Various strategies have been discussed as to how best to accomplish this. For the present, if the HNR authorizes an LHS to provide such services, the LHS must either resolve the resolution request itself for the handle record or provide sufficient resolution information to enable the resolution request to be handled elsewhere.

Wherever feasible and economic to do so, both IPv4 and IPv6 addresses should be made available for use by client software to access each LHS.

LHSs that wish to allot derived prefixes containing three or more delimiters to themselves or to third parties for purposes of providing identifier and/or resolution services and not make them known to the HNR Services must notify the HNR Administrator and request approval at the time of registration, or any time thereafter, provided that such notification is received and approved prior to allotting such derived prefixes. Permission from the HNR to do so will generally involve qualification of the LHS making the request, payment of additional service fees and compliance with procedures commensurate with such authorization. Since these derived prefixes will not be known to the HNR, the LHS generating them must agree to provide resolution services for those prefixes and must store the associated handle records at that LHS or else provide useful information to client software as to how to access the associated handle records.