

Nameserver Registration Lifecycle

The nameserver host lifecycle in the registry system is intricately connected with domain name management while maintaining its own distinct registration states and status values. This document outlines the complete nameserver lifecycle and how it relates to domain registration.

In this document, if a status is not clearly labeled as an EPP or RDAP status, it should be assumed the status is an EPP status, and the corresponding RDAP status also applies.

Nameserver Implementation Models

The EPP protocol defines two models for nameserver implementation:

1. **Host Objects Model:** Nameservers exist as independent objects with their own lifecycle and status values
2. **Host Attribute Model:** Nameservers exist as attributes of domain names without independent status

While the registry system recognizes both models in the EPP XML schema as required by the EPP RFCs, it internally implements only the Host Objects Model.

When EPP commands are received with nameserver information specified in the Host Attributes format (`<hostAttr>`), the system will not process these correctly as there is no implementation code path for this model. In this case, the system will return an erroneous response to the client.

Host Attributes Model

The Host Attributes Model is defined in the EPP XML schema but not implemented in the system code.

EPP commands using the Host Attributes Model syntax will not be processed correctly as the implementation only supports the Host Objects Model.

Host Objects Model Implementation

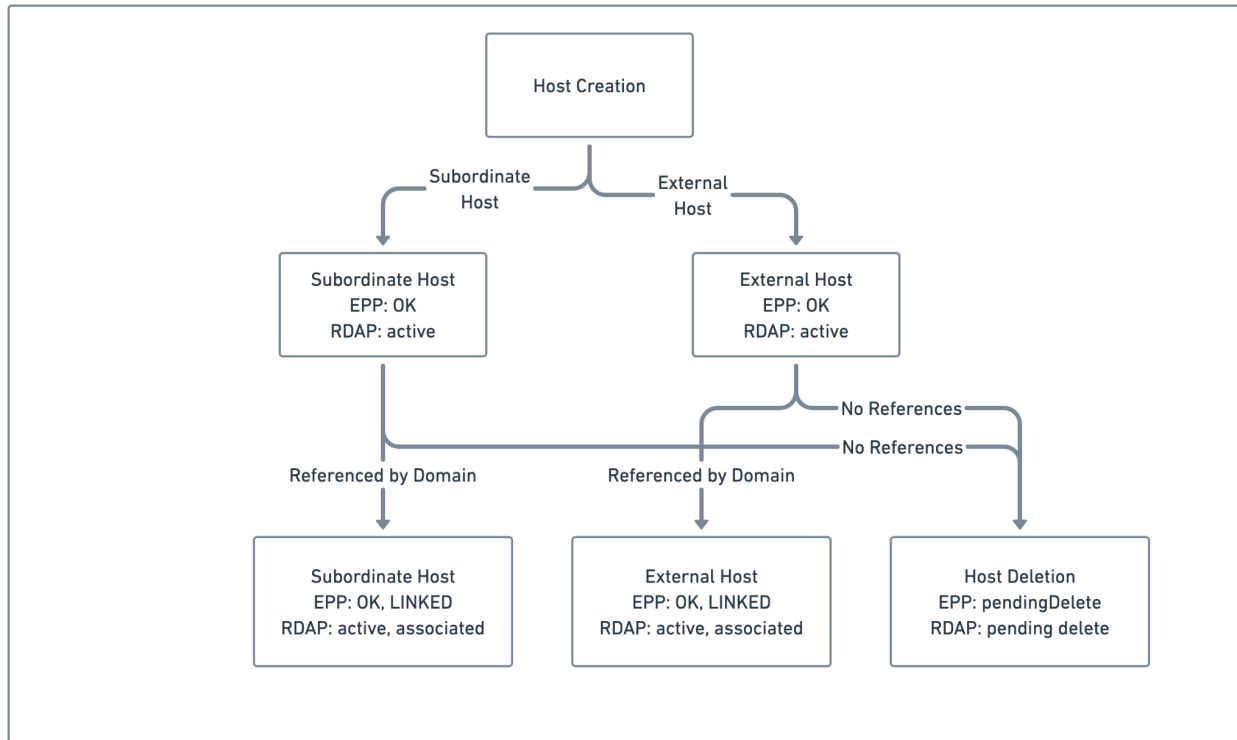
Creation Phase

The Host Creation process involves several validation steps and processing logic that vary based on the type of host being created:

Host Creation Request Processing

1. **Host Type Determination:**
 - **External Hosts:** Hostnames under domains not managed in the registry (e.g., ns1.external-registry.com)
 - **Subordinate Hosts:** Hostnames under domains managed by the registry (e.g., ns1.example.tld)
2. **Validation Requirements:**
 - **Common Requirements:**
 - Valid hostname format following DNS rules
 - Unique hostname for new objects
 - Proper EPP authorization
 - **External Host Requirements:**
 - No IP addresses should be provided (will trigger an error if present)
 - External domain part must not match any TLDs managed in the registry
 - **Subordinate Host Requirements:**
 - IP addresses must be provided (required for glue records)
 - Superordinate domain must exist in the registry
 - Registrar must have permission to modify the superordinate domain
3. **Object Creation Process:**
 - A unique repository ID is assigned to the new host
 - Host is created with initial status values:
 - EPP: `OK` (if no other statuses apply)
 - RDAP: `active`
4. **Subordinate Host Additional Processing:**
 - The superordinate domain record is updated to include this host in its subordinateHosts list
 - Glue records are created in the DNS with the provided IP addresses
 - The lastSuperordinateChange timestamp is set
5. **Reference Status Assignment:**
 - If the host is immediately referenced by domains as a nameserver, additional statuses are applied:
 - EPP: `LINKED`
 - RDAP: `associated`
6. **Response Generation:**
 - The system generates an EPP response confirming the host creation
 - Response includes the host name and creation timestamp

The host creation process implements strict validation to ensure DNS integrity and proper hierarchical relationships between domains and their subordinate hosts. Once created, host objects become available for reference by domains as nameservers.



Active Registration Phase

During the **Active Registration Phase**, host objects may have various status values and can undergo several operations:

- **Standard Status Values:**
 1. EPP: OK (if no other statuses apply)
 2. RDAP: active
 3. EPP: LINKED (if referenced by active domains)
 4. RDAP: associated
- **Restriction Status Values:**
 1. **Client-settable restrictions:**
 - EPP: clientDeleteProhibited / RDAP: client delete prohibited
 - EPP: clientUpdateProhibited / RDAP: client update prohibited
 2. **Server-settable restrictions:**
 - EPP: serverDeleteProhibited / RDAP: server delete prohibited
 - EPP: serverUpdateProhibited / RDAP: server update prohibited

Host Operations During Active Phase

1. Update Operations:

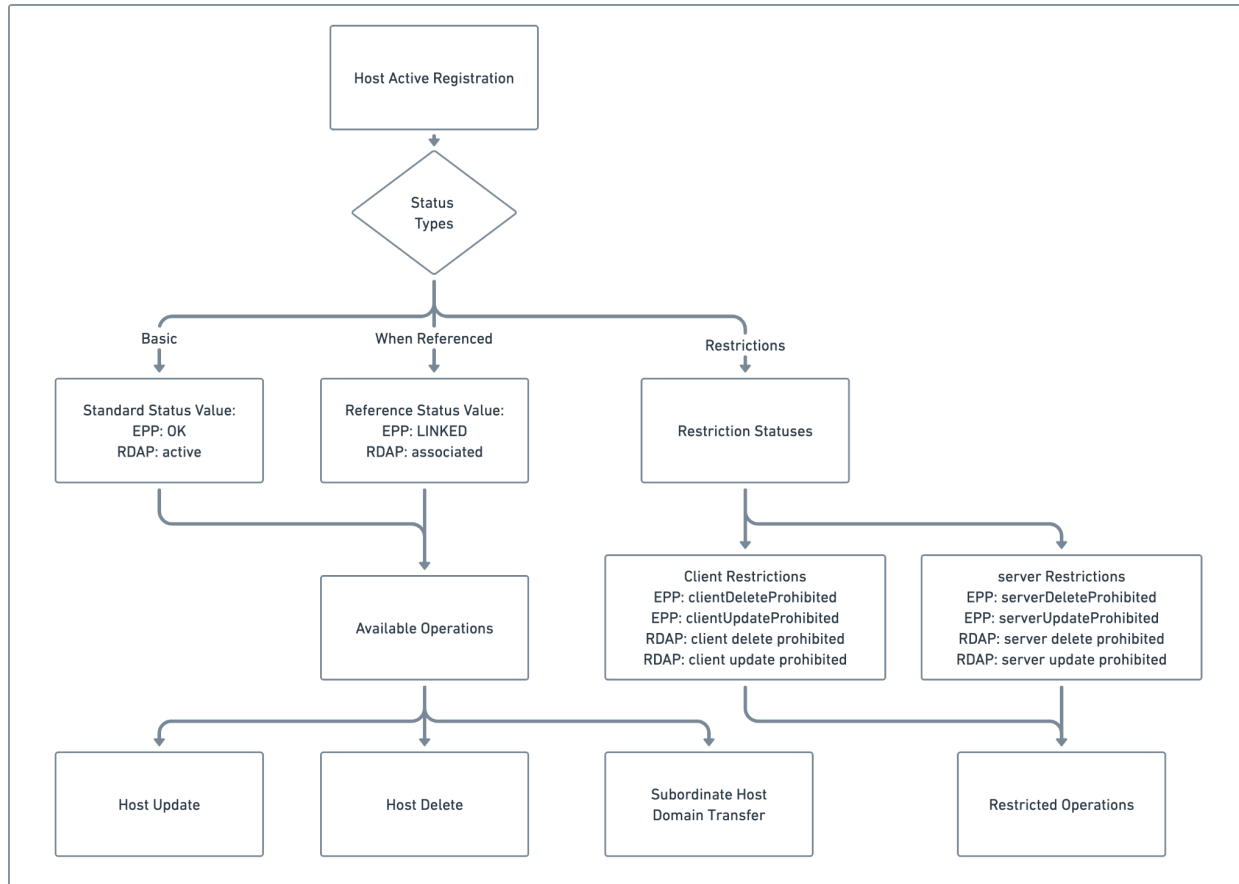
- IP address changes (for subordinate hosts)
- Status value modifications
- For subordinate hosts, rename operations require special handling as they may change the superordinate domain

2. Deletion Attempts:

- **When Host is Referenced by Domains:**
 - Deletion is rejected with error message indicating the host is in use
 - The LINKED status prevents deletion until all domain references are removed
 - No transition to pendingDelete status is allowed
- **When Host Has Prohibition Statuses:**
 - If `clientDeleteProhibited` or `serverDeleteProhibited` is present, deletion is rejected
 - Error message indicates which prohibition status is blocking the operation
 - Client must first remove the `clientDeleteProhibited` status before attempting deletion again
- **When Host is Unreferenced and Has No Prohibitions:**
 - Deletion is permitted and the host enters `pendingDelete` status
 - The host is scheduled for final deletion

3. Transfer Implications (for Subordinate Hosts):

- When a domain is transferred, all its subordinate hosts are automatically transferred
- No explicit transfer commands are needed for the hosts themselves
- The hosts inherit the new sponsoring registrar from their superordinate domain



Subordinate Host Relationship with Domains

Subordinate hosts have a special relationship with their superordinate domains:

1. Domain Transfer Impact:

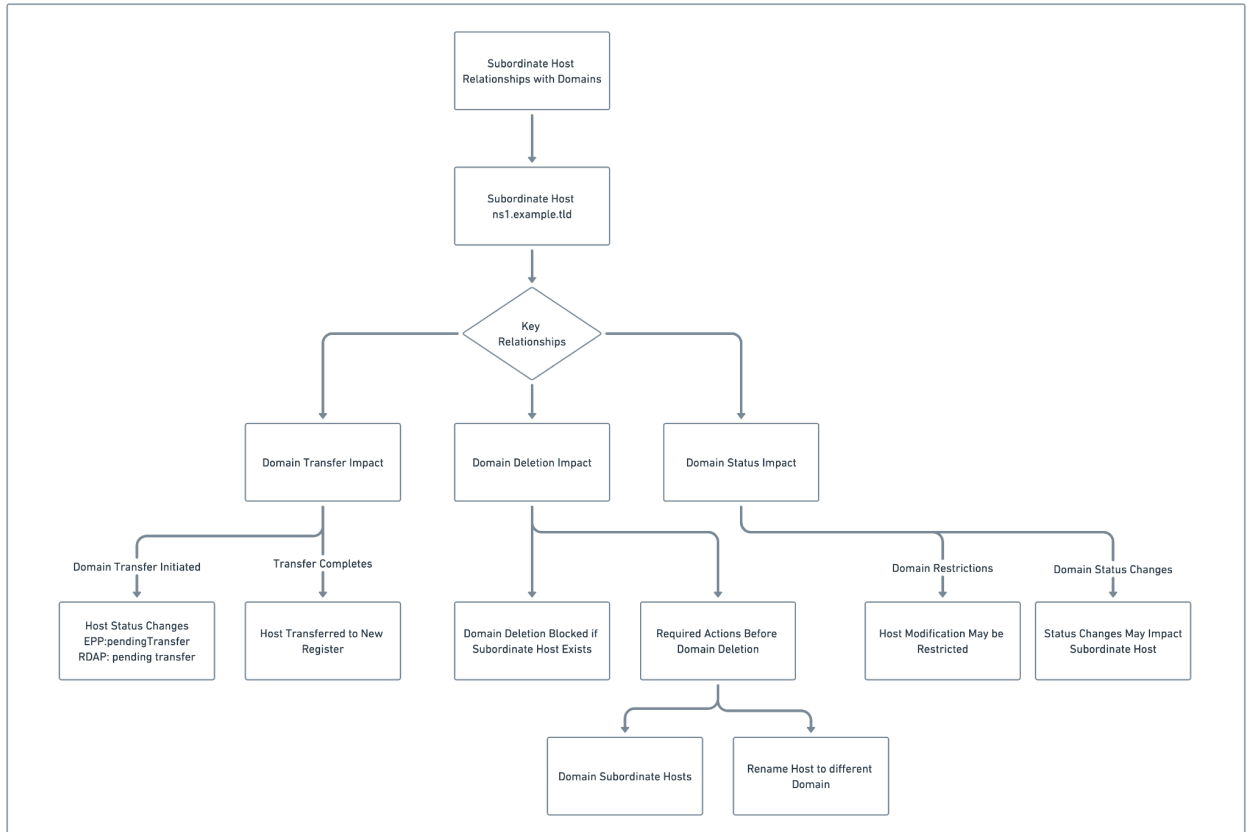
- When a domain is transferred, all subordinate hosts are automatically transferred to the gaining registrar
- During domain transfer, subordinate hosts receive:
 - EPP: `pendingTransfer`
 - RDAP: `pending transfer`

2. Domain Deletion Impact:

- A domain cannot be deleted if it has subordinate hosts
- These hosts must be deleted or renamed before domain deletion

3. Domain Status Impact:

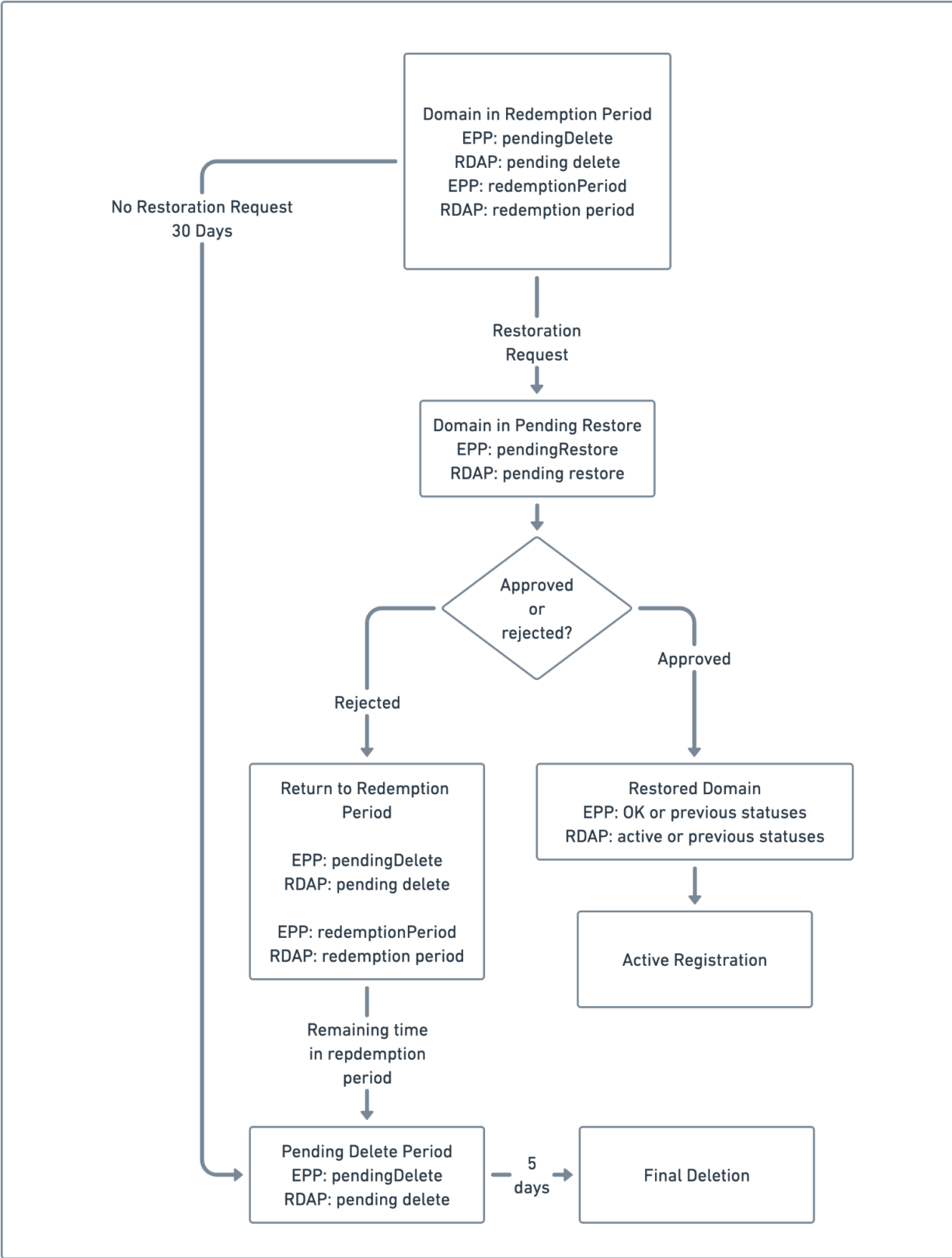
- Server-imposed domain restrictions may affect the modification of subordinate hosts



Deletion Process

Host objects follow a distinct deletion process based on their status:

1. **Hosts with Active References:**
 - Deletion is prohibited for hosts referenced by active domains
 - EPP: `LINKED` / RDAP: `associated` prevents deletion
2. **Unreferenced Hosts:**
 - Can be deleted immediately
 - No grace period is applied
3. **Pending Delete Status:**
 - After deletion request, hosts enter:
 - EPP: `pendingDelete`
 - RDAP: `pending delete`



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Host Update Process

The Host Update process allows registrars to modify host object properties while maintaining DNS integrity and proper authorization:

1. Authorization Requirements:

- For external hosts: The registrar must be the sponsoring registrar of the host
- For subordinate hosts: The registrar must be the sponsoring registrar of both the host and its superordinate domain

2. Updatable Properties:

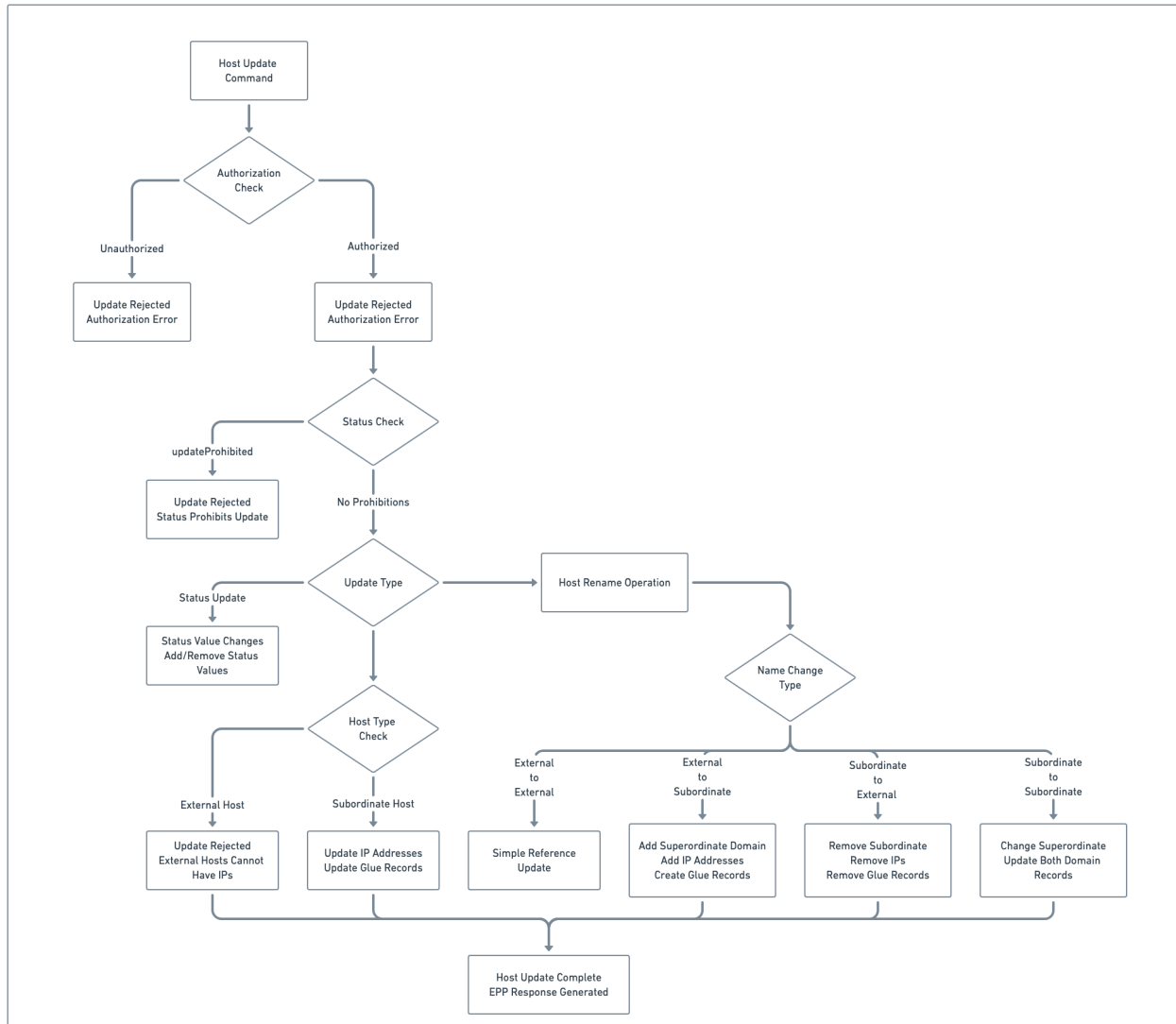
- **IP Addresses:**
 - Can be added or removed for subordinate hosts only
 - External hosts cannot have IP addresses
 - IP address updates trigger DNS glue record updates
- **Host Name:**
 - Renaming a host is supported but follows special processing rules
 - Changing between subordinate and external types requires thorough validation
 - Renaming triggers updates to all referencing domains
- **Status Values:**
 - Client-settable status values can be added or removed
 - Server-settable status values cannot be modified by clients

3. Host Rename Implications:

- **External to External:** Simple rename with reference updates
- **External to Subordinate:**
 - New superordinate domain must exist and be sponsored by the same registrar
 - IP addresses must be provided for the new subordinate host
 - Superordinate domain updated with new subordinate host record
- **Subordinate to External:**
 - IP addresses are removed as external hosts cannot have IPs
 - Original superordinate domain's subordinateHosts collection is updated
- **Subordinate to Subordinate (different domain):**
 - Original superordinate domain's subordinateHosts collection is updated
 - New superordinate domain's subordinateHosts collection is updated
 - IP addresses are transferred to the new host record

4. Update Restrictions:

- Updates are rejected if the host has `clientUpdateProhibited` or `serverUpdateProhibited` status
- Special status-update exception allows removing the `clientUpdateProhibited` status
- Pending operations may temporarily block updates



Subordinate Domain Transfer

The transfer of a superordinate domain has significant implications for all subordinate hosts within that domain:

1. Transfer Initiation:

- The transfer is initiated on the superordinate domain, not on individual hosts
- All subordinate hosts are implicitly included in the transfer operation
- No separate host transfer commands are required or supported

2. Status During Transfer:

- When the superordinate domain enters `pendingTransfer` status:
 - All subordinate hosts automatically receive `pendingTransfer` status

- EPP: `pendingTransfer` / RDAP: `pending transfer`
- Host objects remain fully functional during the transfer period

3. Transfer Completion:

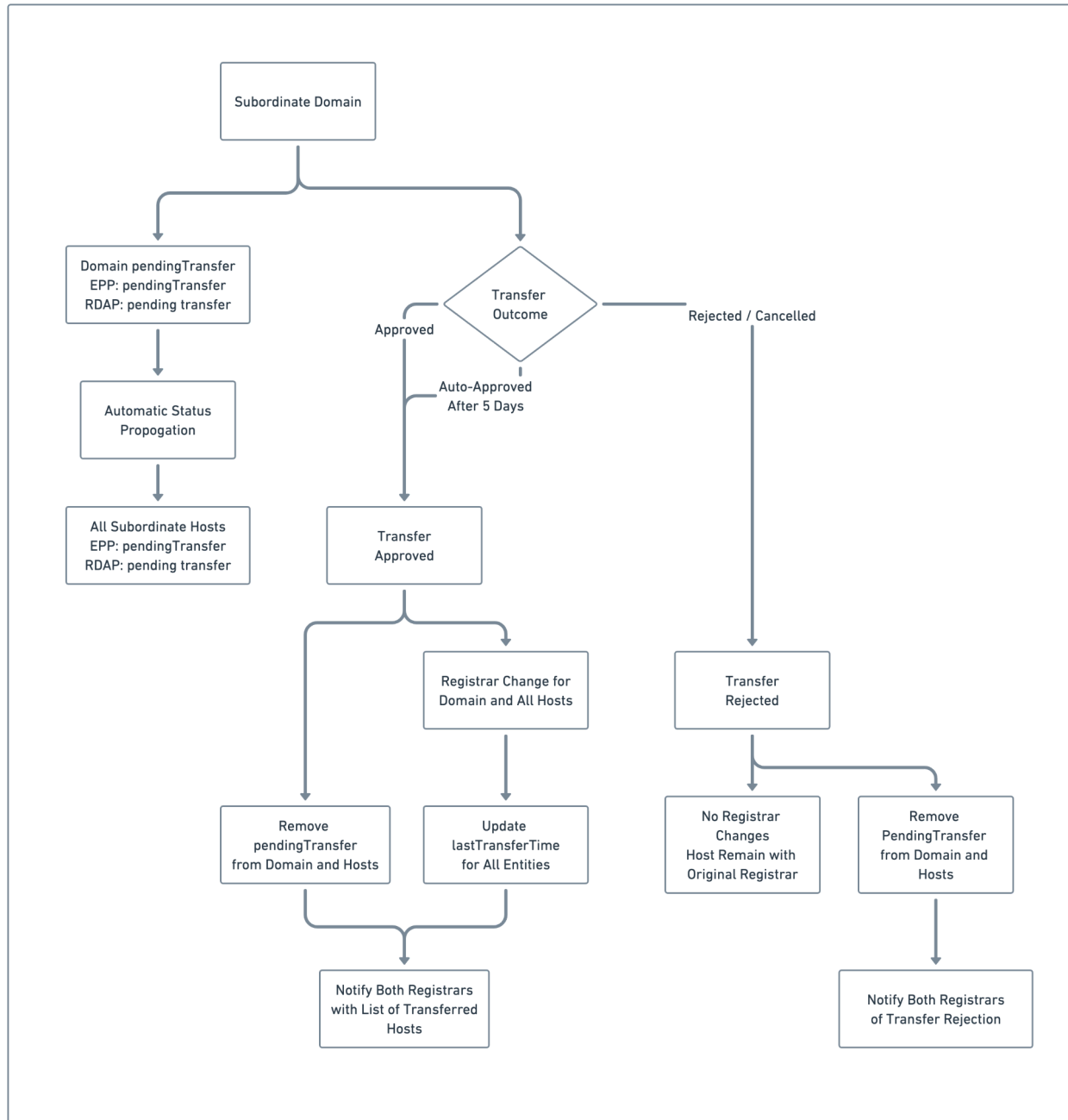
- Upon transfer approval and completion:
 - All subordinate hosts' sponsoring registrar is changed to the gaining registrar
 - Last transfer time is updated for all affected hosts
 - `pendingTransfer` status is removed from hosts
- Upon transfer rejection:
 - `pendingTransfer` status is removed from all hosts
 - No sponsorship changes occur

4. Post-Transfer Management:

- Gaining registrar acquires full management rights to all subordinate hosts
- Domain-host relationships are preserved through the transfer
- DNS records remain unchanged

5. Notification:

- Both losing and gaining registrars receive notifications about the transfer
- Notifications include lists of affected subordinate hosts



Restricted Operations

Host objects support various restriction statuses that control what operations can be performed:

1. Client Restriction Statuses:

- **clientUpdateProhibited:**
 - Prevents updates to host properties
 - Cannot modify IP addresses or rename the host
 - Special exception: Client can remove this status itself
 - EPP: `clientUpdateProhibited` / RDAP: `client update prohibited`
- **clientDeleteProhibited:**
 - Prevents deletion of the host
 - Client must first remove this status before deletion
 - EPP: `clientDeleteProhibited` / RDAP: `client delete prohibited`

2. Server Restriction Statuses:

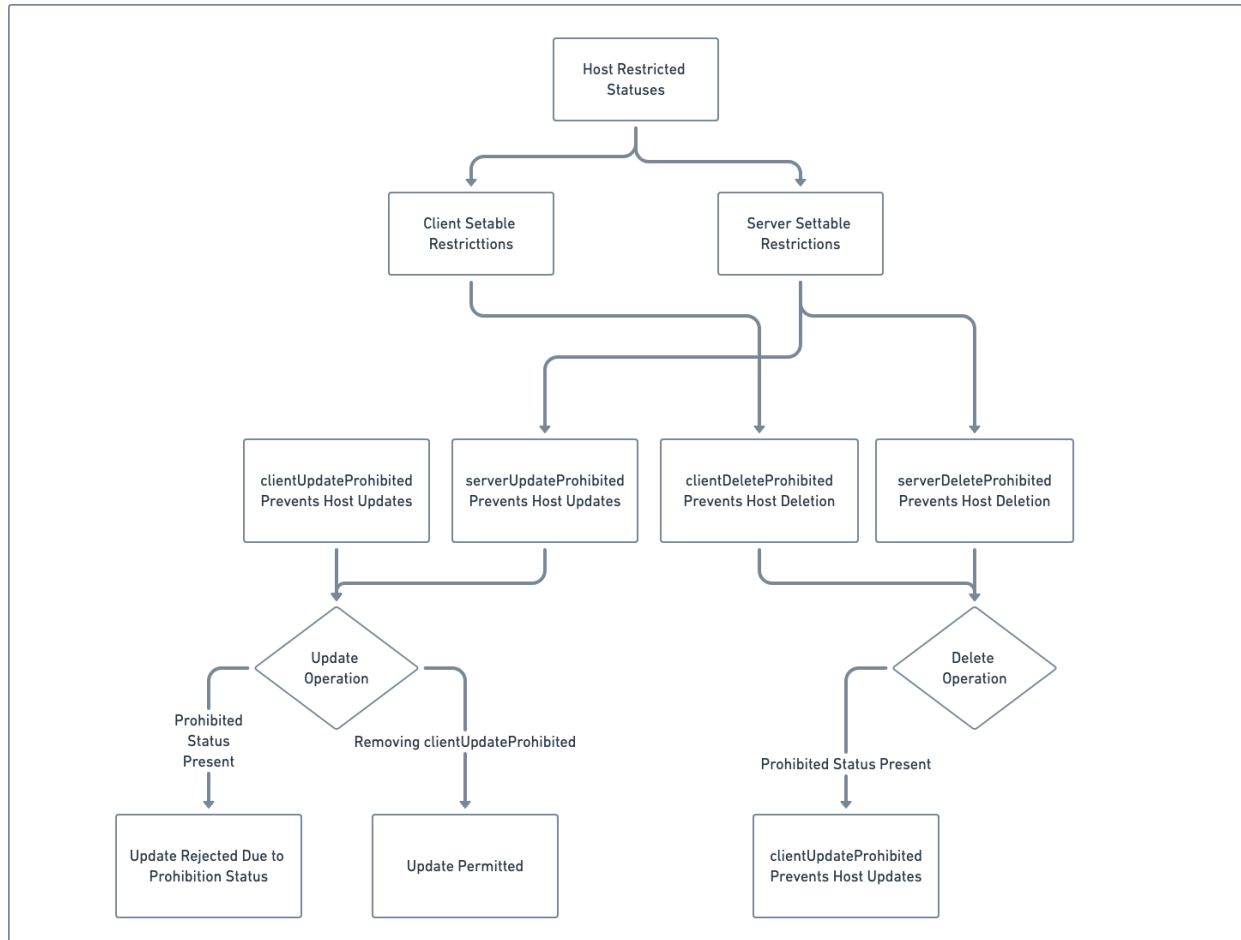
- **serverUpdateProhibited:**
 - Prevents updates to host properties
 - Set by the registry for administrative or policy reasons
 - Cannot be removed by clients
 - EPP: `serverUpdateProhibited` / RDAP: `server update prohibited`
- **serverDeleteProhibited:**
 - Prevents deletion of the host
 - Set by the registry for administrative or policy reasons
 - Cannot be removed by clients
 - EPP: `serverDeleteProhibited` / RDAP: `server delete prohibited`

3. Restriction Effects:

- Each restriction status affects specific operation types only
- Multiple restrictions may be present simultaneously
- Restrictions apply regardless of whether the host is subordinate or external
- Registry-set restrictions take precedence over client-set restrictions

4. Registry Administrative Override:

- Registry administrators may override restrictions in exceptional circumstances
- Administrative actions are logged and auditable
- Used for dispute resolution, technical corrections, or legal compliance



Implementation in RDAP and EPP

The registry system provides consistent access to nameserver information through both protocols:

- **EPP:** Host objects are managed through standard EPP commands with full status tracking
- **RDAP:** Nameserver information is accessible through the /nameserver endpoint with complete status representation

The system ensures synchronization between EPP and RDAP status values, maintaining a consistent representation of nameserver state regardless of query protocol.