Integrating the Healthcare Enterprise

IHE IT Infrastructure
Technical Framework Supplement

Healthcare Provider Directory
(HPD)

Rev. 1.7 – Trial Implementation

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Foreword

This is a supplement to the IHE IT Infrastructure Technical Framework V15.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on July 24, 2018 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the IT Infrastructure Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/ITI_Public_Comments.

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **bold strikethrough**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

General information about IHE can be found at http://www.ihe.net.

Information about the IHE IT Infrastructure domain can be found at http://www.ihe.net/IHE_Domains.

Information about the structure of IHE Technical Frameworks and Supplements can be found at http://www.ihe.net/IHE_Process and http://www.ihe.net/Profiles.

The current version of the IHE Technical Framework can be found at http://www.ihe.net/Technical_Frameworks.

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Introduction

This introduces the Healthcare Provider Directory (HPD) Profile that supports queries against, and management of, healthcare provider information that may be publicly shared in a directory structure. HPD directory structure is a listing of the following two categories of healthcare providers that are classified by provider type, specialties, credentials, demographics and service locations.

- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.

- Organizational Provider – Organization that provides or supports healthcare services, such as hospital, Healthcare Information Exchange (HIE), Managed Care, Integrated Delivery Network (IDN), and Association.

This profile is scoped to include the following:

- Two transactions
  - Provider Information Feed
  - Provider Information Query
- Three Actors
  - Provider Information Directory
  - Provider Information Consumer
  - Provider Information Source
- Environments where a single Provider Information Directory is sufficient for providing responses to Provider Information Feeds and Provider Information Query transactions.

Open Issues and Questions

- HPD029:
  - Issue: We would like to have an alternative to DSML. Any alternative suggestions to DSML are welcome.

Closed Issues

- HPD001:
  - Issue: Comparison of standards identifies two groups of candidate standards. HL7[1] V3 Provider Directory and LDAP and its extensions (PWP, ISO/TS 21091).
  - Resolution: 2/18/10 (updated during July F2F: 7/12/10) Based on the research that was done the HPD will be based on LDAP and the use of ISO 21019 schema.

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[1] HL7 is the registered trademark of Health Level Seven International.

- **LDAP considerations**: HPD is likely to have a high volume of lookups. For small deployments, this will lead to efficient use of system resources. For very large deployments, LDAP is likely to be the best or only viable option: LDAP Schema extensibility makes it easy to add in new objects and attributes and to update the capabilities of existing ones: Good tooling support: LDAP is much more extensively implemented and there are many products and open source solutions designed for LDAP deployment, and so use of LDAP simplifies application integration: HPD Profile shall consider applying DSMLv2 to express LDAP requests and responses in SOAP bindings. DSMLv2 is a systematic translation of LDAP's ASN.1 grammar (defined by RFC2251) into XML-Schema.

  Furthermore, LDAP standard is commonly used for the personnel directories within organizations. Provider information has quite an overlap with the personnel information; therefore, the reuse of this standard and available software tooling on LDAP is preferable. Federation is supported via an option.

- **HL7® v3 standard consideration**: Our research did not identify open tools that support HL7® v3 provider schema. The perceived complexity of HL7® v3 interfaces could pose barrier to implementation. Other significant challenge is that there is a limited implementation of HL7®v3 provider or personnel directory in production environments.

- HPD002:

  - Issue: Are transactions for subscribe and notify critically needed or should this be scoped to future work?

  - Resolution (2/4/10): Transactions for subscribe and notify are not critically needed for this version and are not part of the scope of this profile. They were identified to meet the need of consumers who would like to keep a local copy of the HPD (or a subset of the HPD) current.

- HPD003:

  - Issue: Does a data modeling tool need to be identified, and if so, which one should we use, and why?

  - Resolution (2/4/10) – A data modeling tool does not need to be identified. The data model is not being built for the profile. Entities and attributes are being identified in this document. The data format will be defined by the Provider Information Directory.

- HPD004:

  - Issue: Do we need to include "Provider Privileges at an organization" as an attribute to be defined in this standard?

  - Resolution (2/18/10) – This profile does not include "Provider Privileges" because the privileges change frequently and have inconsistent meanings within each

organization. Also, in many organizations Provider Privileges are associated with different areas of the organization. In some, a provider may have multiple different privileges associated with different departments.

- HPD005:

  - Issue: Do we need to include "Provider Role" as an attribute of provider?

  - Resolution (2/18/10) – This profile does not include "Provider Role" because the role has an inconsistent meaning to different organizations. A use case has not been identified where this would be a necessary piece of information.

- HPD006:

  - Issue: How will attributes which contain content that is not the most recent content, be handled? Possibilities where this might be an issue are:

    - Name

    - Addresses

    - Identifiers

    - Credentials

    - Specialty

  - Resolution (4/22/10): Where it makes sense, each of these attributes will have a status which will identify the content as inactive or active. There will be no need to mark Name as active or inactive. Primary name will be designated, and all other names are included, whether they are currently being used or not.

- HPD007:

  - Issue: How will we identify the limited number of locations of a provider, if the provider works at a subset of the locations of an organization?

  - Resolution (4/22/10): A provider address must be associated with the provider directly and cannot be derived from the address of the organization provider that this individual is a member of.

- HPD008:

  - Issue: How will global identifiers be handled? This discussion came up as a result of a discussion on NPI numbers.

  - Resolution (3/15/10) – NPI numbers cannot be used as unique identifiers for multiple reasons; Not all Providers have NPI numbers; Some providers have multiple NPI numbers; Registration to NPI is self-directed; NPI is not a global identifier. Global identifiers will be handled by providing the capability for multiple identifiers, including an identifier type which defines the "type of identifier". There is no

240   specification of particular identifiers. Identifier type will be defined regionally or nationally.

- HPD009:

    - Issue: Should the Validation attribute structure be included in the schema for the initial profile, or be extended in a later update of the profile? This attribute structure indicates whether or not validation of this information has been done (Flag), when the validation was done (Date), who did the validation (Source). The validation attribute structure can be included for multiple areas in the schema, but most importantly for overall validation of the Organization and Individual Provider attributes, the Relationship information, and the Certification, Specialty, and Degree information.

    - Resolution (4/26/10): The validation attribute will NOT be included in the schema for the initial profile. It is assumed that the HPD Actor will validate the feed. That needs to be clearly stated in the document (see Section3.59.4.1.4).

- HPD0010:

    - Issue: Currently, language, as a multiple attribute, is associated with Individual Provider only. Should language be considered an attribute for Organizational Provider? A Use Case has not been defined for this.

    - Resolution (4/26/10): Language should be considered an attribute for Organizational Provider as well as Individual Provider. A Use Case has been added to reflect this.

- HPD0011:

    - Issue: How should addresses be defined so that the definition meets global needs?

    - Resolution: (4/26/10): Change Zip Code to postal code. Otherwise, represent the address as currently defined, minimum requirement is $addr, but we will allow all of the defined fields.

- HPD0012:

    - Issue: Categories have been identified that have a set of values specified by a standard. Those standard specifications were originally included in this document in Section 3.58.4.1.2.3. Some of the existing standards do not include all of the values required for this profile. How will those values be extended?

    - Resolution (4/22/10, updated 7/16/10): The specification examples for the values were removed in most cases, as the values will ultimately be defined by international, national, or regional organizations.

- HPD0013:

    - Issue: The following Category attributes do not have agreed to value definitions:

        - Identifiers

        - Addresses

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- Resolution (4/22/10):
  - Identifiers – The values will be defined by national or regional organizations.
  - Addresses – This profile only addresses three address types, each of which is a separately defined attribute in the auxiliary class (Billing Address, Mailing Address, and Practice Address).

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- HPD0014:
  - Issue: Currently *Department* has been included as an attribute for Organizational Provider. Should this be kept? There is no Use Case for this.
  - Resolution (4/26/10): Department can be handled as another Organization, if the HPD Actor determines that the department should be included. This will allow for more

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    flexibility in the HPD. An Organizational Provider which is a department can be a member of another Organizational Provider, such as a hospital. This will be controlled by the Organizational Provider Type.

- HPD0015:
  - Issue: Currently *Contact* has been included as an attribute for Organizational Provider

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    to store contact information for only clinical contacts and not administrative contacts as ISO 21091 only allows for clinical contacts. Should an administrative contact be required? If needed, should it be a single contact, or multiple contacts? If a single contact, then Contact Type would not be required. There is no Use Case for this.
  - Resolution (4/26/10): Multiple contacts will be required. Administrative person is out

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    of scope of this profile, however, since Department has become an Organizational Provider, Contact for Department could be set up to be an Administrative Role. Contact name may be a role or a name. The profile schema should define this as close to "person" information as possible, including name/role, address, phone number (including fax, and phone number).

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- HPD0016:
  - Issue: Currently *Specialty Role* has been included as an attribute for Organizational Provider. Should this be kept?
  - Resolution (4/07/10) – Specialty is associated with the Organizational provider. However, the role such as Primary Care, Consulting, etc., which is defined as "the

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    functional involvement of the provider with the clinical activity", changes frequently. It is difficult to maintain currency of the data. Also, there is no Use Case defined that demands this attribute.

- HPD0017:
  - Issue: Does the Provider Feed transaction include only Add and Change, or does it

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    also include Deactivate and Delete?

- - Resolution (4/20/10, updated 7/16/10) – LDAP standard has a delete method, as well as a method for Add and Modify (Update). This profile provides operation for Add, Update and Delete. Any existing record can be deactivated using the LDAP Modify method and marking the status of provider as Inactive. An entry can also be deleted from HPD permanently using the LDAP Delete method. Once an entry is deleted from HPD, it cannot be queried. It is an implementer's choice whether to allow delete method for deleting a provider entry.

- HPD0018:

  - Issue raised during a discussion of Section 3.59.4.1 Provider Feed Request: As of 4/20/10 the profile reflects the decision made at the F2F in February that for a Provider Feed request, the only response provided by the HPD Actor would be an acknowledgement that the transaction has been received. Data administration issues such as data reconciliation, data validation, data integrity, etc., associated with the Add/Update/Delete operations are considered back-end processes for the purpose of this profile and proposed to be addressed by the policies and procedures of the organization managing the HPD. The profile would not provide any guidance on any expected actions or back-end processes to be executed, or policies to be followed by the HPD Actor. If that is the case then this transaction would be an optional transaction. This may have been misunderstood, or an invalid conclusion and needs re-addressing by the IHE committee.

  - Resolution (4/26/10, updated May, 2010): Initially, this was thought to be a required transaction for the Provider Information Directory; however, it was later realized that Transaction Feed is an optional transaction, and it is reflected as such in the document. If the Provider Information Feed Transaction is implemented then the required actions for the HPD Actor are that the HPD Actor is required to have a policy to conform to LDAP specification for processing add, delete, and update. The HPD Actor must have a policy to validate feeds and handle data integrity prior to publishing the date.

- HPD0019:

  - Issue: Transaction Names have not been finalized. The names identified here (as of 4/20/01) do not conform to what is typically used in IHE. Recommendations are

    - Replace Add/Update Provider   with Provider Feed

    - Replace HPD Lookup Provider   with Provider Information Query

  - Resolution (4/22/10): Transactions have been renamed.

- HPD020:

  - Issue: For the Provider Feed request transaction, do we use LDAP or SOAP? Discussion was initiated, but resolution was not documented.

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- Resolution (4/22/01) – The profile defines SOAP but LDAP can also be used.
- HPD021:
    - Issue: Currently "Degrees" has been added as a separate attribute for Individual Provider. We realize, if we consolidate "Degrees" with "Credentials", then we only need to add a single structure class, HPDProviderCredential. If we consolidate "Degrees" with "Credentials" and add type to the HPDProviderCredential class to distinguish the two, then the profile is simpler. NOTE: "Degrees" is not valid for Organizational provider. What approach should we take?
    - Resolution (04/28/10): Degrees (i.e., Medical Degree, PharmD, PHD, etc.) will be included in HPDProviderCredential, distinguished by type.
- HPD022:
    - Issue: In previous discussion it had been agreed that "TYPE" would be included with the "Name" attribute, and that the Type value set would be the values in HL7® 0200 standard (with some exceptions). It has now been determined that including TYPE would add complexity to how the names are currently stored in the schema. Is Type necessary for Name or is it sufficient to provide the capability for multiple names, without identifying TYPE.
    - Resolution 4/28/10: We do not need to include "TYPE" for name. This means we will not be able to distinguish between aka (also known as), maiden name, and others. This discussion has been dealt with in the PWP Profile, and therefore does not need to be dealt with again, here. A reference to the PWP schema regarding Name will be included in the document.
- HPD023:
    - Issue: This issue was identified as a result of Issue HPD011. Do we need to define a Delivery Address? This is the preferred address where deliveries are to be made.
    - Resolution (4/28/10 updated July 2010 – F2F): This profile does not define a delivery address as part of the schema. The consensus at the July 2010 F2F was that this directory would not be used for this purpose. A provider who is sending deliveries would know where those deliveries are to go.
- HPD024:
    - Issue: Use of Address Structure:
        - First Option is to make an address as an attribute with syntax dstring *("$" dstring) similar to that of the postal code but additionally enforce format of "key=value" that allows for key to be of different kinds: address status and address components. This would allow adding new types without redefining the schema and allow us to search for &(status=primary, city=Nowheresville).

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- • Second option is to have two different attributes as LDAP Postal Address syntax to distinguish primary and other addresses. E.g., *hpdPrimaryProviderPracticeAddress* and *hpdProviderPracticeAddress.* In this option, the Address Status attribute is not maintained and assumes Primary Address as always active.

- • Third option is to search based on a value stored in a subordinate Address object. In that case, we have to obtain that object and then perform a second search on the object's parent's DN to obtain the entire entry making provider search based on address inefficient.

- • Resolution (4/26/10): First Option

- • HPD025:

  - • Issue: For "memberof" query, ex: find the organizations that this provider is a memberof. Who is responsible for defining how many "memberof" relationship levels should be searched and returned. 1) Should the HPD always search and return all levels, 2) Should the HPD only search one level at a time, and have the Consumer request subsequent searches, 3) Should the consumer identify "up to" how many levels the HPD should search 4) Should the consumer identify "up to" what type of organization to search to.

  - • Resolution (4/28/10): This is determined by the LDAP standards and will not be defined in this profile.

- • HPD026:

  - • Issue: Profile name (HPD) and Actor name (HPD) make this profile confusing.

  - • Resolution (4/30/10): Profile name will stay the same. Actor names change as follows:

    - • Healthcare Provider Directory (HPD) Actor – Provider Information Directory

    - • Provider Directory Source – Provider Information Source

    - • Provider Directory Consumer – Provider Information Consumer

    - • Provider Feed – Provider Information Feed

    - • Provider Information Query – Provider Information Query

- • HPD027:

  - • Issue: The Provider Information Query transaction is dependent on the System Directory for Document Sharing (SDDS) Profile for some of the use cases identified. SDDS has been delayed and will not be ready for release for Public Comment before the deadline.

- Resolution: 7/12/2010: Profile HPD to store system URL pointing to a) Web services Definition Language (WSDL) defining the service end points. However, the automatic processing of WSDL in an interoperable manner by the Provider Information Consumer is out of scope of this profile. b) System directory end point c) other emerging standard.

  While SDDS Profile is still in development, HPD implementer can choose to implement an option 'a' as stated above. Once SDDS Profile is published, option b would reference system endpoints maintained in the SDDS.

- HPD028:

  - Issue: The Provider Information Feed returns only an acknowledgement, and not results of the action (whether the action was successful or not). There is a concern that ACID properties that guarantee Provider Information Feed transaction is processed reliably are not adhered to in this profile. ACID properties are defined as Atomicity, Consistency, Isolation, and Durability.

    - Atomicity means that the Provider Information Directory allows updates to Provider Information Feed transaction either all or none. These updates from the source's perspective are not atomic in the sense that the changes may not be completed based on Provider Information Directory's policy decisions. Lack of atomicity may mean that only some of the changes might be applied to the directory.

    - Consistency--One would hope that this property would be assured. You don't want an inconsistent directory.

    - Isolation--In a typical database I start a transaction, perform a number of operations, and then commit the transaction. These transactions might occur simultaneously and it is important that changes in one transaction would not be seen in another simultaneous or overlapping transaction. Of course it is possible that the changes in these simultaneous transactions may be inconsistent with one another, which would mean that some of these transactions would be automatically aborted and the client would know this.

    - Durability--It does not appear that we have durability in HPD. So, for example when a source has its update acknowledged, one has no assurance that the update was performed even if policy would have permitted it. If the database crashed after acknowledgement, but before processing completed then it would lose the feed's update. This leaves the source unsure of the final contents of the Provider Information Directory.

  - Resolution: 7/12/2010: IHE agrees with the validity of the concern as noted in this open issue. The data management issues related to handling of Provider Information Feed in all or in part, or none immediately or with delays, thus affecting the ACID properties of the Provider Information Directory, are currently considered as complex

460   and not yet fully identified. The implications of such issues are suggested to be further explored during the HPD trial implementation period and a feedback from trial implementation shall be provided by the implementers to IHE. In the current version, HPD Profile proposes that such issues shall be managed by back office procedures that are currently beyond the scope this profile. It is also noted that a back office procedure and governance policies between the Provider Information Source and the Provider Information Directory need to be established for results handling associated with the processing of the Provider Information Feed.

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Volume 1 – Integration Profiles

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1.7 History of Annual Changes

> *Add the following bullet to the end of the bullet list in Section 1.7*

- Added the HPD Profile which supports a healthcare provider directory.

475 ## 2.1 Dependencies among Integration Profiles

> *Add the following to Table 2-1*

HPD	None		None

> *Add the following section to Section 2.2*

480 ## 2.2.28 Health Care Provider (HPD)

The Healthcare Provider Directory Profile supports management (persistence and access) of healthcare provider information in a directory structure. HPD directory structure is a listing of the following two categories of healthcare providers that are classified by provider type, specialties, credentials, demographics and service locations:

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- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.

- Organizational Providers – Organizations that provide or support healthcare services, such as hospitals, Counseling Organizations (e.g., Drug, Alcohol) Healthcare Information Exchanges (HIEs), Managed Care, Integrated Delivery Networks (IDNs), and
490 Associations.

> *Add Section 28*

28 Health Provider Directory (HPD) Integration Profile

This profile introduces the Healthcare Provider Directory which supports management
495 (persistence and access) of healthcare provider information in a directory structure. HPD directory structure is a listing of the following two categories of healthcare providers that are classified by provider type, specialties, credentials, demographics and service locations:

- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.

500 • Organizational Provider – An organization that provides or supports healthcare services, such as hospitals, Counseling Organizations (e.g., Drug, Alcohol) Healthcare Information Exchanges (HIEs), Managed Care, Integrated Delivery Networks (IDNs), and Associations.

505 Typical provider information maintained by the directory is demographics, address, credential and specialty information as well as electronic endpoint to facilitate trusted communications with a provider. The directory can also maintain relationships. Some examples of a relationship are: a Health Information Exchange (HIE) and its members: Integrated Delivery Networks and their care delivery members, hospitals and their practitioners, hospitals and their sub organizations including departments, physician Practice Groups and their practitioners, practitioners and the

510 hospitals they are associated with (members of), and Medical Associations and their members.

Different kinds of data sources and consumers interface with the Provider Information Directory to:

• Send new and updated provider information

• Query provider information

515 It is intended that provider information comes from authorized international, regional, state and national sources, as stewards of the most accurate and current data. Some identified sources are:

• State licensing bureaus

• National Associations

• Commercial registries

520 • Delivery Networks

• Information Exchanges, etc.

The scope of this profile focuses initially on the minimum "foundational" attribute set required for defining a provider information directory, resulting in a usable work product as well as recommendations for future phase expansions. This profile is readily adaptable and scalable to

525 production environments needing to operate trusted provider directory services that link multiple endpoints spanning enterprise, regional, national, and global jurisdictions. This profile is extendable to information not explicitly defined in the profile.

28.1 Actors/ Transactions

Figure 28.1-1 shows the actors directly involved in the HPD Integration Profile and the relevant

530 transactions between them. Other actors that may be indirectly involved due to their participation in other related profiles, etc. are not necessarily shown.
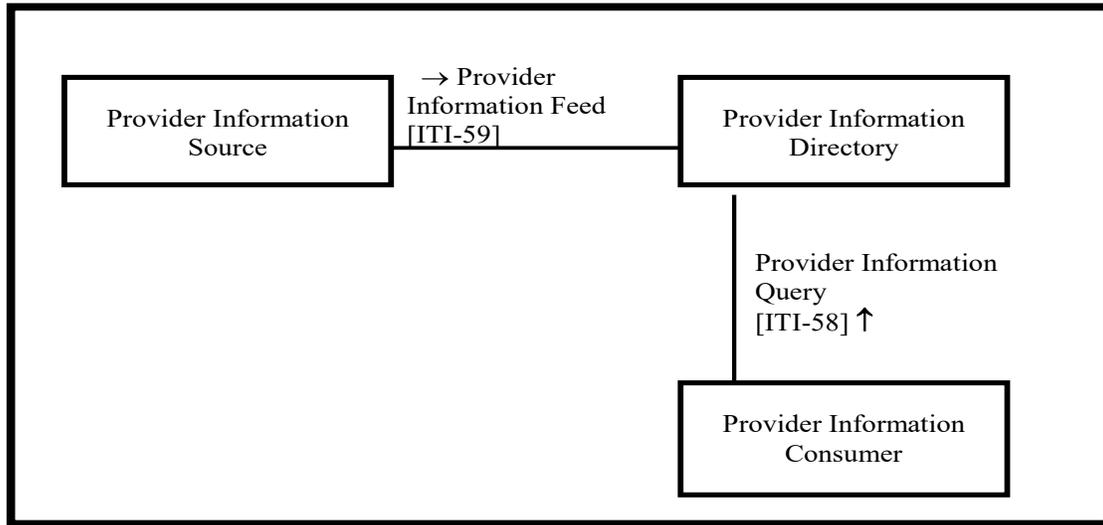
Figure 28.1-1: HPD Profile Actor Diagram

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Table 28.1-1 lists the transactions for each actor directly involved in the HPD Profile. In order to claim support of this Integration Profile, an implementation must perform the required transactions (labeled "R"). Transactions labeled "O" are optional. A complete list of options defined by this Integration Profile and that implementations may choose to support is listed in Section 28.2.

Table 28.1-1: HPD Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2b
Provider Information Directory	Provider Information Query	R	3.58
	Provider Information Feed	O	3.59
Provider Information Consumer	Provider Information Query	R	3.58
Provider Information Source	Provider Information Feed	R	3.59

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28.1.1 Actors

28.1.1.1 Provider Information Directory

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The Provider Information Directory performs the function of processing Provider Information Query to search for providers based on a search criteria received from the Provider Information Consumer. The Provider Information Directory also performs the function of processing the Provider Information Feed received from the Provider Information Source. Both functions are described briefly below:

Provider Information Query: The Provider Information Directory responds to a Provider Information Query request from the Provider Information Consumer. The Provider Information Query request includes search criteria for the provider and the type of information the Provider Information Consumer is looking to receive in the response. The Provider Information Directory shall return zero, one, or more providers (individual or organization) based on the search criteria.

Provider Information Feed: The Provider Information Feed specifies one or more of the following actions:

- An "Add" to add new provider entries

- A "Delete" to delete any existing entries

- An "Update" to modify or update any existing entries

Upon receiving the Provider Information Feed, the Provider Information Directory acknowledges to the source that the information has been received. This acknowledgement does not imply that the contributed directory entry information has been processed and the directory has been updated. This is a workflow management process, which is usually dependent on the type of directory information, and the policies associated with the vetting of the information, its availability constraints, and many other factors which are beyond the scope of this profile. This may be subject to the development of future profiling within IHE. Additionally, a directory may not choose to trust any authoritative sources other than itself. Therefore, this transaction is optional for the Provider Information Directory. This profile does not restrict Provider Information Directory to receive feeds in formats other than what is profiled by this specification.

Provider Information Entities and Attributes: The following diagram illustrates examples of supporting provider entries with or without relationships in a Provider Information Directory.
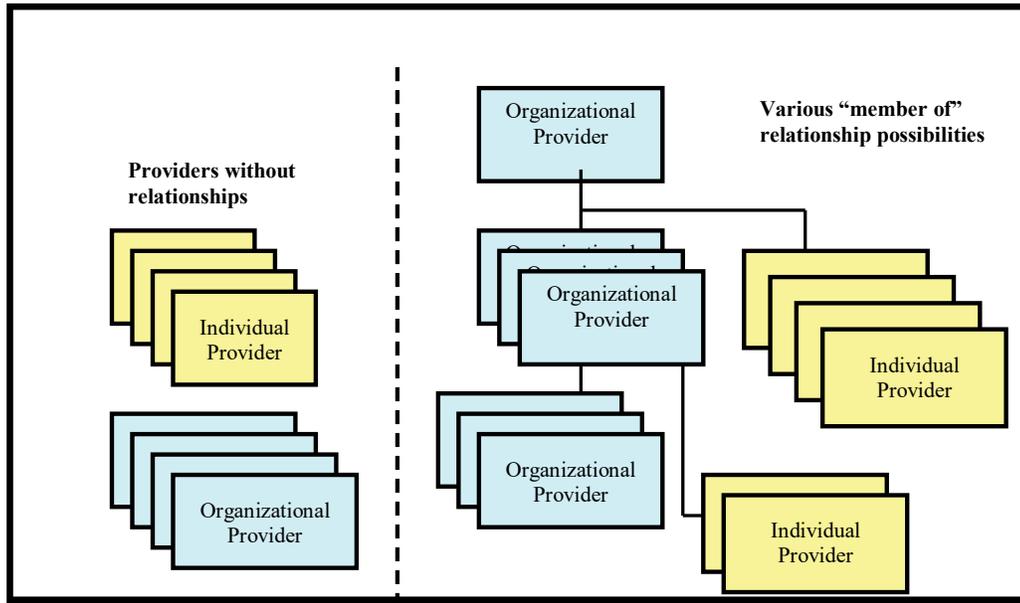
Figure 28.1.1.1-1: Different Provider Information Directory Structures

The schema of directory is flexible and allows for a variation of structures to support
relationships between providers. As depicted in the right half of the figure above, an
Organizational provider defined at a top level could be a Health Information Exchange (HIE) or
an Integrated Delivery Network (IDN). Underneath this organizational provider, it has multiple
members listed both as the individual (practitioners, etc.) and as organizational (hospitals, labs,
pharmacies, etc.) providers. Additionally, an organization provider (hospital) holds a relationship
with individual providers (physicians, nurses, etc.) who practice at this hospital, and
organizational providers that represent departments or sub-organizations. The left half of the
figure shows that individual or organizational provider can be maintained stand-alone without
any relationship to other providers.

28.1.1.2 Provider Information Source

The Provider Information Source sends a Provider Information Feed to the Provider Information
Directory. The feed consists of Add, Update, or Delete requests, a single request at a time, or in
batches.

After initiating the Provider Information Feed transaction, the Provider Information Source
receives an acknowledgement from the Provider Information Directory indicating that the
Provider Information Feed transaction has been received. The acknowledgement does not
include the result of the Provider Information Feed request. The Provider Information Source
will not know if the request was successfully applied. In order to assure that updates were
applied successfully the Provider Information Source would need to become a Provider
Information Consumer and execute a Provider Information Query.

28.1.1.3 Provider Information Consumer

The Provider Information Consumer initiates a Provider Information Query request to the Provider Information Directory indicating search criteria in the request. The Provider Information Consumer includes, in that request, the set of information that should be returned in the response to the query.

The Provider Information Consumer receives a response to the Provider Information Query request from the Provider Information Directory. The Provider Information Consumer must be able to handle a response which consists of zero, one, or more providers matching the search criteria.

28.2 HPD Integration Profile Options

Options that may be selected for this HPD Integration Profile are listed in the Table 28.2-1 along with the actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 28.2-1: HPD - Actors and Options

Actor	Options	Vol. & Section
Provider Information Directory	Provider Information Feed	ITI TF-1: 28.2.1
	Federation	ITI TF-1: 28.2.2
Provider Information Source	No options defined	- -
Provider Information Consumer	Federation	ITI TF-1: 28.2.2

28.2.1 Provider Information Feed Option

When the Provider Information Feed Option is declared, the Provider Information Directory shall support the Provider Information Feed [ITI-59] transaction.

28.2.2 Federation Option

The Provider Information Consumer, that supports the Federation Option, shall be able to include the Federation elements within the Provider Information Query [ITI-58] transaction query request (see ITI TF-2b: 3.58.4.1.2.2.5).

A Provider Information Directory that supports the Federation Option shall support the Federation elements in the Provider Information Query [ITI-58] transaction (see ITI TF-2b: 3.58.4.1.2.2.5).

28.3 Healthcare Provider Directory (HPD) Process Flow

28.3.1 Use Cases

28.3.1.1 Provider Information Query Transaction Use Cases

Yellow Pages Lookup: A patient is referred to an endocrinology specialist for an urgent lab test. The referring physician needs to get the contact data of close-by endocrinologists in order to ask whether one of them can perform this test in their own lab. The patient prefers a female endocrinologist who can converse in Spanish regarding medical information.

Current Situation: The physician has a card catalog with names of local endocrinology specialists. Office staff calls each in turn to ask if they are available to run the test. Each is questioned regarding their availability and ability to speak Spanish. Presumably the card catalog name would indicate the Gender of the physician.

Use of HPD: As a Provider Information Consumer, a computer application running in the office of physician is used to lookup provider information. The office staff enters the specialty, geographic indicators like zip code, city or state, language and gender. The application sends a query request to the Provider Information Directory which returns information about every provider satisfying the search, in particular the physical and electronic address, and contact information. An appropriate endocrinologist is chosen based on the attributes included in the response, an appointment is made, and the referral documentation is electronically sent to the physician using the electronic address specified.

Query providers and their associations for Social Services Disability Determination: A citizen, as a claimant, applies for disability benefits from the Social Services Department. This disability is due to a medical condition. In order to receive benefits, an application must be made, medical evidence must be provided, and a determination made on the claim.

- Some of the medical evidence is more than six months old, and the doctor providing the service has since retired.

- Some medical evidence comes from a physician who works in a clinic that has multiple office locations.

- Some of the medical evidence comes from a hospital that has since merged with another and changed its name.

- Some of the medical evidence comes from a physician who has recently moved his offices to a different location.

The claimant, in the claim, includes a list of the providers seen (names or practices) and other medical services he has obtained, related to his disability. The Social Services department needs to gather medical evidence from all the reported providers and wants to direct their queries to the specific providers mentioned. For that purpose, the Social Services department needs to obtain the provider's contact information, electronic address, and provider's relationship with other organizations such as an HIE, for each of the providers supplied by the claimant.

Current Situation: The Claims Processor searches through an electronic file or card catalog of providers to look up providers that the claimant has named. If the Claims Processor finds a provider in the file, or catalog, the Claims Processor faxes a request for medical evidence along with a release form signed by the patient. Often research has to be done before a fax number can be determined (phone calls need to be made, or additional contact information needs to be identified). If the Claims Processor does not find a provider in the file, or catalog, extensive research may need to be done before the correct provider is identified. This must be done for every provider on the claim.

Because limited or outdated information is often given by the claimant, identifying each provider can take quite a long time, substantially delaying the process and the disability determination.

Use of HPD: The disability software application collects healthcare services provider data from a list of filed claims. Acting as Provider Information Consumer, this application sends a query request to the Provider Information Directory for each provider on the claim. The Provider Information Directory returns information about the providers, in particular, the electronic address where the Medical Evidence Requests (MERs) are serviced for that provider.

Emergency Responders Identification in planning for an emergency event: Emergency response planning requires the identification of potential providers who can assist in an emergency. Providers must meet specific credentialing criteria and must be located within a reasonable distance of the emergency event.

Current Situation: The planners of the emergency event search for potential provider participants by manually initiating searches on the internet, contacting associations for candidates, and looking through the local yellow pages. Once phone number contact information for these providers is identified, contact is initiated.

Use of HPD: Using HPD, an emergency planning team member can initiate a single search for a list of providers based on specialty, geographic indicators like zip code, city or state, and other criteria. The Provider Information Directory returns information about every provider satisfying the search, including e-mail addresses. An e-mail can be generated to all identified providers requesting participation.

Other Provider Information Query Use cases which refine the requirements introduced above:

Provider Authorization and lookup during an emergency event: During Hurricane Katrina, health care volunteers were turned away from disaster sites because there was no means available to verify their credentials. At an emergency site, the Provider Information Directory can be queried to quickly identify and grant permission to credentialed providers to enter the scene.

Forwarding of Referral Documents to a Specialist: A primary care provider (PCP) needs to send referral documents (e.g., CDA[2]/CCD[3]) to a specialist. The PCP knows the name and

---

[2] CDA is the registered trademark of Health Level Seven International.

[3] CCD is the registered trademark of Health Level Seven International.

---

phone number of the Specialist but needs to identify the electronic address such as email where the patient's documentation should be sent.

695 **Forwarding of Referral Documents to a Hospital:** A PCP refers a patient to the Hospital for admission. The PCP needs to send various documentation to the Hospital to be part of their EHR when the patient arrives. The PCP needs to identify the Hospital's electronic address such as email or service end point where the patient's documentation should be sent.

Keeping agency provider information current: A German government agency dealing with
700 healthcare services for its constituents wishes to keep its agency's healthcare provider information current. The agency determines that it will use the Provider Information Directory to access the most current provider information. The German agency only requires a subset of the Provider Information Directory available information. On a regular basis, the Provider Information Directory provides, to the agency, a list of the updated information needed.

705 **Providing Personal Health records to a new Primary Care Physician:** An individual has changed health plans. As a result that individual must change his Primary Care Physician. The individual has a Personal Health Record and would like to provide that information to his new Primary Care Physician. The individual needs to determine where to have the Personal Health Record transmitted to.

710 **Certificate Retrieval:** National regulations in many European countries require that an electronically transmitted doctor's letter be encrypted in a way that only the identified receiver is able to decrypt. In order to encrypt the letter, the sender has to discover the encryption certificate of the receiver.

Language Retrieval: An individual who only speaks Italian requires healthcare services at an
715 Outpatient Clinic. That individual would like to be able to communicate with the Clinic personnel, if at all possible. The individual, or his caregiver, needs to determine which clinic supports Italian and provides the service that is required.

28.3.1.2 Provider Information Feed Transaction Use Cases

Add Provider: The following are a list of possible events that would result in the addition of a
720 Healthcare Provider to the Provider Information Directory.

- A provider adds himself/herself to the Provider Information Directory.

- An agent for the provider adds the provider to the Provider Information Directory.

- An HIE, not yet in the Provider Information Directory, adds itself, its Organizations (hospitals, etc.), the Organization's associated departments, and its providers to the
725 Provider Information Directory.

- An entity already on the Provider Information Directory, like an HIE or Organization, adds providers (Individual or Organization).

- A credentialing organization has credentialed new members and would like to add them to the Provider Information Directory (Providers may not exist; this should be an add
730 request.).

Update Provider: The following are a list of possible events that would result in the updating of a Healthcare Provider to the Provider Information Directory.

- A provider updates information for themselves: adds/deletes/changes his/her location, or adds/deletes a relationship, changes his/her name, adds/deletes/updates a credential,
735 adds/deletes/updates identifiers.

- A provider retires and wishes to dissociate himself/herself from the Provider Information Directory. Provider Information Directory does not allow delete to preserve the historical information but allows deactivating of a provider entry.

- An agent for the provider updates information for the provider: adds/deletes/changes the
740 provider location, or adds/deletes a relationship, changes the provider name, adds/deletes/updates a credential, adds/deletes/updates identifiers.

- A credentialing organization has renewed credentials for its members.

- An entity already on the Provider Information Directory, like an HIE or Organization, has modified Provider information (Individual or Organization). The location has changed,
745 providers have disassociated themselves with the organization, a new location has been added, or a provider has retired.

Current Situation: Healthcare provider directories which are maintained via a "push" process, meaning additions and changes are sent to the directory on a regular basis, for processing:

- May receive adds and updates from only one source

750 or

- Must have the capability for different modes of communications if it receives updates from more than one source.

If a single source of healthcare provider information "pushes" adds and updates to multiple directories, then that source may need to communicate with each healthcare provider directory
755 differently.

Use of HPD: The Provider Information Directory is maintained by receiving information in the standardized format regardless of the source "pushing" that information. Adding another source is transparent to the Provider Information Directory.

If a single source "pushes" data to multiple Provider Information Directories that subscribe to the
760 HPD Profile then only one form of communication is required. Adding another Provider Information Directory would be transparent to the source.

28.3.1.3 Provider Information Query Federation Use Cases

1. A State HIE would like to establish a common service that can be used by providers to look up other providers for referrals without requiring prior knowledge of other existing directories within the state. The State HIE will onboard the directory operators along with their local Provider Directories so that they can be accessed via a single service. This can also be a service provided by other local or regional HIEs.

2. A State HIE would like to establish a service that can query other state directories for provider information on behalf of providers within the state for out-of-state referrals, disaster response, and other uses. Any state would only query the established directories for each state. This service can also be provided by other local or regional multi-state HIEs.

3. A national directory operator would like to provide a service for providers across the nation to query for information about other providers locally or nationally.

4. A local directory operator would like to play the role of provider data aggregator and expose a standards compliant service for multiple local directories which support proprietary protocols for query.

5. eHealth Exchange would like to create a directory of all the electronic service endpoints of the participants so that they can be discovered for health information exchange purposes.

28.3.2 Detailed Interactions

28.3.2.1 Detail Interactions – Transactions

As described in Figure 28.3.2.1-1, there are two main interactions with the Provider Information Directory. One is the Provider Information Source Actor's interaction with the Provider Information Directory, and the other is the Provider Information Consumer Actor's interaction with the Provider Information Directory.

- Provider Information Source initiates a Provider Information Feed transaction and receives a Provider Information Feed acknowledgement indicating that the Provider Information Feed transaction has been received. The Provider Information Directory processes the Provider Information Feed request but does not indicate to the Provider Information Source whether or not the Provider Information Feed was successfully processed. The data management actions taken by the Provider Information Directory associated with the Provider Information Feed transaction are outside the scope of this profile.

- Provider Information Consumer initiates a Provider Information Query request to the Provider Information Directory, identifying search criteria and specifying the types of information the consumer is looking for. The Provider Information Directory searches for content matching the search criteria and returns the types of information requested. The

800   Provider Information Directory may return zero, one, or many response elements
       depending on what is found to match the search criteria.
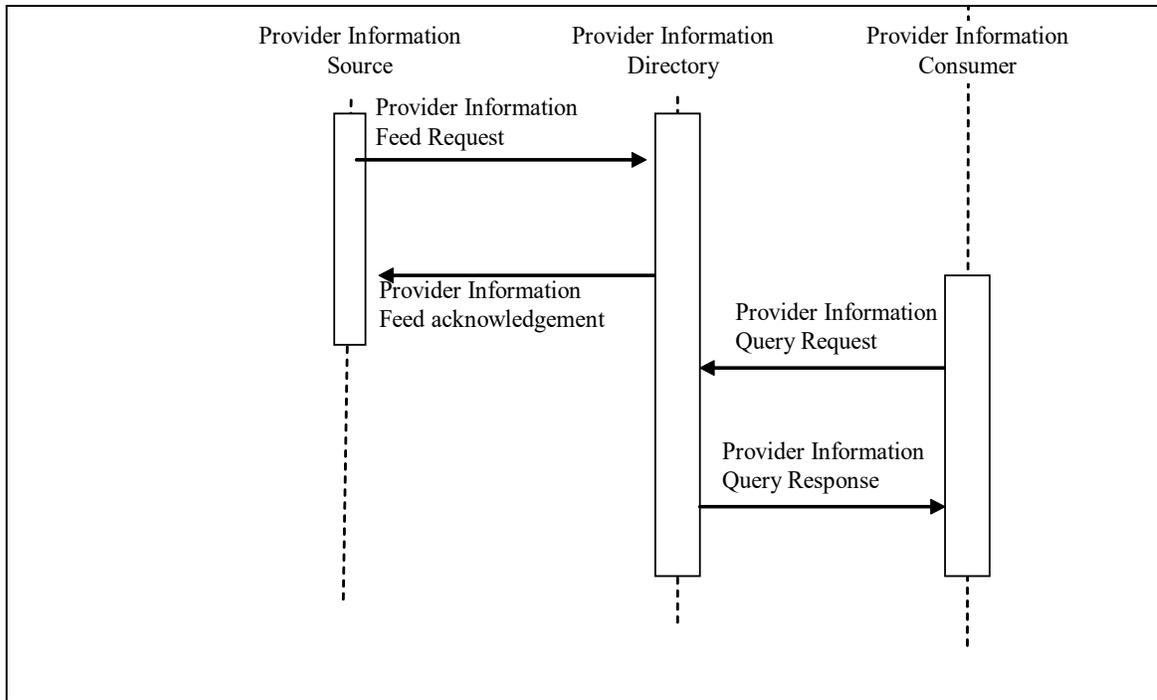
Figure 28.3.2.1-1: Basic Process Flow in HPD Profile

28.3.2.2 Detail Interactions – Entities and Attributes

805   The following tables show a summary of the entities and attributes found in the Provider
       Information Directory. The healthcare providers that this profile deals with are classified into
       two groups.

1. Organizational Provider – An organization that provides or supports healthcare services,
   such as hospitals, Healthcare Information Exchanges (HIEs), Integrated Delivery
810   Networks (IDNs), and Associations (Table 28.3.2.2-1).

2. Individual Provider – A person who provides healthcare services, such as a physician,
   nurse, or pharmacist (Table 28.3.2.2-2).

In addition to information about the healthcare providers, the HPD schema also provides the
ability to manage relationships between organizational providers and other organizational
815   providers, and between individual providers and organizational providers.

This means that the HPD schema can be used to feed and query the following:

1. What other organizational providers an organizational provider is a member of

2. What other organizational providers are members of a particular organizational provider

3. What organizational providers an individual provider is a member of

820   4. What individual providers are members of a particular organizational provider

An Organizational Provider or an Individual Provider shall not have a "member of" relationship with an Individual Provider.

Organizational Provider Attributes

The figure below depicts the data model pertaining to an Organizational Provider as defined by
825   the Provider Information Directory. The cardinality 0..N implies an attribute is optional but could have many values. 1..N implies that an attribute is required and could have many values.

Figure 28.3.2.2-1: Organizational Provider Entity and its Attributes

830   An Organizational Provider has attributes to capture information related to Address, Name, Identifier, Credential and Specialty that are further described in the table below. An Organizational Provider may be composed of multiple Organizational Providers such as departments (or any business structure for an organization). These are depicted as sub-Organizational Providers in this figure. The relationship between organizations is maintained
835   through the concept of Relationship groups. An Organizational provider can own one or many Relationship groups. A Relationship group could have one or more members of both provider types: organizational and individual. Sub-organizations such as departments are associated with their parent organization through Relationship group.

840 The table below provides a summarized description of the attributes of the Organizational Provider. A field by field level description may be found in the specification of the transactions in ITI TF-2b: 3.58.4.1.2.2.3.

Table 28.3.2.2-1: Organizational Provider Attributes

Attribute	Description
Type	The type of organization represented. Some values are: Hospitals HIEs IDNs Associations Labs Clinics, Departments Pharmacies Practice
Status	The status of this organization. Active – This organization is currently in existence. Inactive – This organization is no longer in existence
Name	This attribute contains multiple names for an organization.
Contact	Multiple individuals who can be contacted in reference to this organization, including a phone number and e-mail address. An individual role can be included in the name, instead of an individual.
Electronic Service URI	Reference to an entry in a systems directory or to a services definition page where this organization has its electronic access points defined.
Medical Records Delivery Email Address	Electronic mailing address of an organization where medical or administrative records can be sent.

Address	Physical address information for an organization. Each type of address can be primary or secondary. Addresses that are no longer valid are marked as Inactive.
	Billing Address
	    • One primary address-the preferred billing address for the organization
	    • Multiple secondary billing addresses
	    • Multiple inactive addresses which were once used as billing addresses but are no longer valid.
	Mailing Address
	    • One primary address-the preferred mailing address for the organization
	    • Multiple secondary mailing addresses
	    • Multiple inactive addresses which were once used as mailing addresses but are no longer valid.
	Practice Address
	    • Multiple primary addresses-All locations where healthcare services are provided
	    • There are no secondary practice addresses
	    • Multiple inactive addresses which were once used as practice addresses but are no longer valid.

Language	Language(s) that an Organization supports.
Credential	This includes certifications or licenses earned by an organization.

Attribute	Description
Specialty	Organization's specialization, a specific medical service, a specialization in treating a specific disease. Some specialties are: • Psychiatry • Radiology • Endocrinology
Identifier	National, Regional or local identifier that uniquely identifies an organization, that may be publicly shared. Some examples are: • National Provider Identifier # • Tax ID #
Certificate	Various kind of certificates (encryption, signing, attribute) information for the organization.
Relationship	Business associations either between an organization and an individual provider or between an organization and another organization. There can be multiple types of relationship but this profile generically categorizes all relationship as "member-of".

845 **Individual Provider Attributes**

The figure below depicts the data model as it pertains to Individual Providers defined by the Provider Information Directory. The cardinality 0..N implies an attribute is optional but could have many values. 1..N implies that an attribute is required and could have many values.
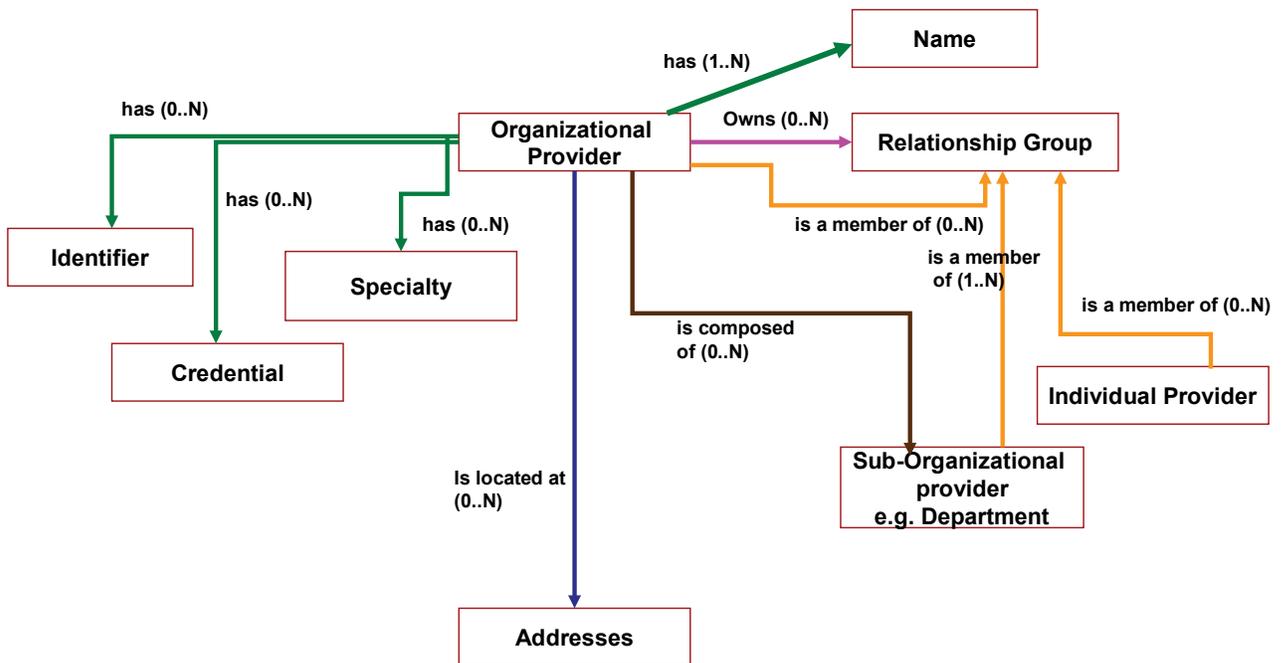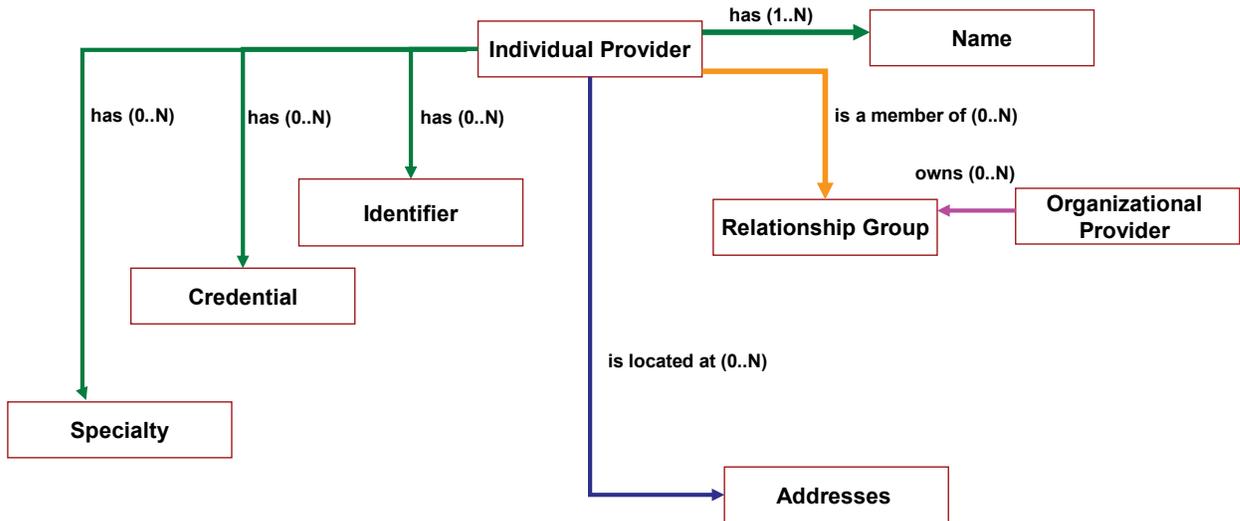

850

Figure 28.3.2.2-2: Individual Provider Entity and its Attributes

Individual Provider has information related to Address, Name, Identifier, Credential and Specialty as described in the table below. The relationship between individual and an organizational provider is modeled using the concept of group. As shown in the figure, an
855 organizational provider can own one or multiple groups. Each group could have several individual members.

The table below provides a high-level description of the attributes of the Individual Provider. A field by field level description may be found in the specification of the transactions in volume ITI TF-2b: 3.58.4.1.2.2.

860

Table 28.3.2.2-2: Individual Providers Attributes

Attribute	Description
Type	Type of individual provider. Some values are: Physician Pharmacist Nurse Nurse Practitioner Physical Therapist
Status	The status of this individual. Active – currently practicing Inactive – currently not practicing Retired Deceased
Name	Names that a provider has, or is, known by.
Language	Language(s) that the provider is fluent in.
Gender	
Medical Records Delivery Email Address	Electronic mailing address of an individual where medical or administrative records can be sent.
E-Mail	Electronic mailing addresses to receive general purpose communication but not related to medical records.
Electronic Service URI	Reference to an entry in a systems directory or to a services definition page where this individual provider has its electronic access points defined.
Address	Physical address information for an individual. An address can be designated as primary or secondary. Addresses that are no longer valid are marked as Inactive. Three types of addresses are supported: Billing Address - One primary address-the preferred billing address for the individual - Multiple secondary billing addresses - Multiple inactive addresses which were once used as billing addresses but are no longer valid. Mailing Address - One primary address-the preferred mailing address for the individual - Multiple secondary mailing addresses - Multiple inactive addresses which were once used as mailing addresses but are no longer valid. Practice Address - Multiple primary addresses-All locations where the individual provides healthcare services - There are no secondary practice addresses - Multiple inactive addresses which were once used as practice addresses but are no longer valid.

Attribute	Description
Credentials	Includes certification(s), license(s) and degree(s) earned by an individual provider. Information includes the Credential #, the name of credential, issuing authority, issue date, valid dates. Some examples are: Preventive Cardiology Diabetes Counseling PharmD MD
Specialty	Individual's specialization, a specific medical service, a specialization in treating a specific disease. Some types are: Psychiatry Radiology Endocrinology
Identifiers	National, Regional or local identifier that uniquely identifies an individual that is okay to be publicly shared. Some examples are: National Provider Identifier # Tax ID # Hospital Issued Identifier The profile does not include sensitive identifiers such as Drivers' license or Social Security Number, as only publicly shared information is included
Certificate	Various kind of certificate information (encryption, signing, attribute) for the individual.
Relationship	Business associations with an organization. There can be multiple types of relationship but this profile generically categorizes all relationship as "member-of".

28.3.2.3 Detail Interactions – Federation

This section will identify the actors in a federated directory environment and interactions between them.

865
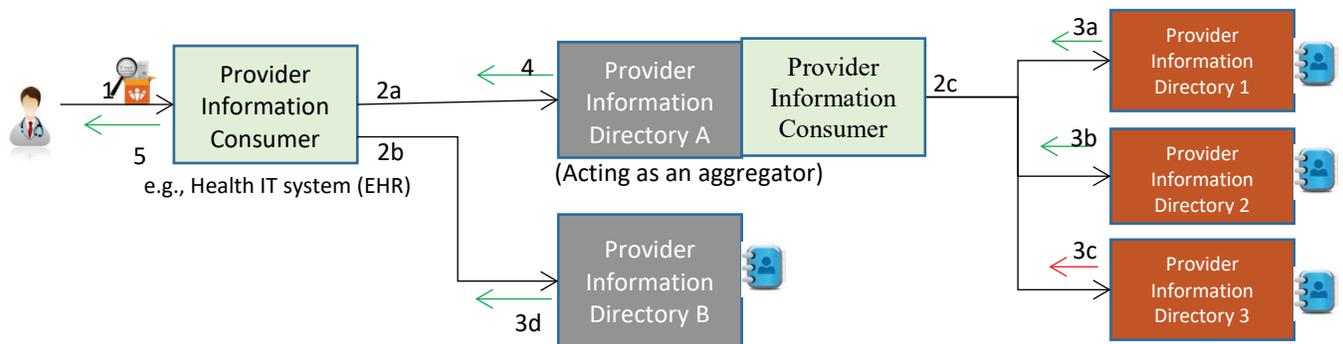
Figure 28.3.2.3-1: Federation Actor Interactions

870 In Figure 28.3.2.3-1, there is a single Provider Information Consumer querying two Provider Information Directory Actors (A & B) for information. Provider Information Directory A in-turn queries Provider Information Directories 1, 2, and 3 and then aggregates the responses from all three directories before returning the aggregated response to the Provider Information Consumer. On the other hand, Provider Information Directory B is a directory that has no federation partners and provides the response based on the directory data that it owns.

875 A detailed step-by-step description of the events is described below:

1. Healthcare provider uses their HealthIT system to locate a provider

2a. The Provider Information Consumer (the HealthIT system) sends the request to a Provider Information Directory A which federates multiple directory sources as shown in the diagram

2b. The Provider Information Consumer (the HealthIT system) can also send a request to a
880 Provider Information Directory B that does not federate the request to any other directory sources.

2c. The Provider Information Directory A federates the request to a set of known additional Provider Information Directories (1, 2, and 3).

3(a, b, c, d). Provider Information Directories provide a complete response, an error, or an
885 incomplete response.

4. Provider Information Directory A aggregates responses (including complete responses, errors, and incomplete responses) and provides the response to the Provider Information Consumer.

5. The Provider Information Consumer (the HealthIT system) receives the responses, including incomplete and error responses, and presents the data to the user.

890 ## 28.4 HPD Security Considerations

This profile assumes that the provider information being dealt with here is information that may be publicly shared and therefore this profile does not include specific security mechanisms that would be required based on the policies where this profile is implemented. However it includes the necessary capability to be combined with one or more security and privacy profiles
895 developed by IHE or other entities. This section provides an overview of the typical risks that should be mitigated if desired and recommends the corresponding IHE profile(s) that should be combined with HPD.

IHE requires that HPD schema be validated against national privacy regulations, and possibly other state and contractual requirements for publicly sharing provider information. If there is any
900 information, in part, or whole, as defined by the HPD Profile schema or any extensions to the given schema, that is considered private or sensitive, then appropriate security and privacy procedures shall be considered to protect that information.

For general IHE risks and threats please see ITI TF-1: Appendix G.

Some categories of risks currently identified for consideration are:

905   •   The possibility of inaccurate or unverified provider data being fed to the Provider Information Directory.

•   Accidental release of provider information protected by additional regulation or law.

•   Malicious attacks to the data, modifying the data either in transmission or at the Provider Information Source or at Provider Information Directory sites.

910   •   Policies and procedures for the verification, validation, and reconciliation of data are ineffective or inconsistent.

•   Any activity performed on HPD data by Provider Information Consumer with the expectation that data are authoritative. For instance, PHI could be transmitted to a FAX number, a mailing address, or a health internet address with the expectation that the

915   addresses are authoritative.

The following shall be considered by implementers of the profile, as part of the planning process for implementation:

•   Implement and enforce policies and procedure to validate the provider information before it is stored and published by Provider Information Directory

920   •   The Audit Trail and Node Authentication (ATNA) Profile should be considered to ensure that nodes in a network are authenticated.

•   The ATNA Profile to capture and record audit trail events related to the Provider Information Feed transaction.

•   The Enterprise User Authentication (EUA) Profile to authenticate Provider Information
925   Source and/or Provider Information Consumer if access to query or feed information is limited and controlled. If HPD is going to be public, open and searchable by anyone, the user authentication may not be applicable.

•   The Cross-Enterprise User Assertion (XUA) to assert Provider Information Consumer credentials for the purpose of enforcing Role Based Access Control (RBAC) and
930   protecting any non-public sensitive information if access to query information is limited and controlled.

•   The Personnel White Pages (PWP) Profile provides a repository that may be used to hold system users' identification data.

•   The best practices for Infrastructure and Network Security: Protecting Application and
935   Data zone by the Demilitarized zone (DMZ)

•   The best practices of operations management for network monitoring, intrusion detection and secured data backups.

Implementers may follow these IHE profiles to fulfill some of their security needs. It is understood that institutions must implement policy and workflow steps to satisfy enterprise
940   needs and to comply with regulatory requirements.

The HPD implementer is further advised that many risks associated with physical security, operational management cannot be mitigated by the HPD Profile and instead responsibility for mitigation is transferred to the HPD implementer.

945 **Appendix A – Actor Summary Definitions**

Provider Information Directory - Supports a directory of healthcare providers. The directory can include:

- Only Individual Providers

- Only Organizational Providers

950 - Organizational Providers and Individual Providers

Provider Information Source - Submits healthcare provider data to a Provider Information Directory and receives an acknowledgement that the submission has been received.

Provider Information Consumer - Accesses healthcare provider data from a Provider Information Directory.

955 **Appendix B – Transaction Summary Definitions**

Provider Information Feed - Supports the addition or update of provider data in a Provider Information Directory.

Provider Information Query - Supports the ability to query a Provider Information Directory for information about providers

960

Glossary

Add the following terms to the Glossary:

None

Volume 2b – Transactions

965

Add Sections 3.58 and 3.59

3.58 Provider Information Query

This section corresponds to transaction ITI-58 of the IHE Technical Framework. This transaction is used by the Provider Information Consumer and Provider Information Directory Actors.

970 **3.58.1 Scope**

This transaction supports the ability to lookup information about healthcare providers from a healthcare provider directory on the following:

- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.

975
- Organizational Provider – An organization that provides or supports healthcare services, such as hospitals, Healthcare Information Exchanges (HIEs), Managed Care, Integrated Delivery Networks (IDNs), and Associations.

- Relationship between providers. The scope of this transaction considers one type of relationship; member of. Examples of this relationship are:

980
  1. Hospitals, clinics, labs, other organization providers, and physicians are *members of* an HIE

  2. A list of physicians *are members of* a hospital

  3. A physician is *a member* in a list of organization providers

The current minimal foundational attributes that are in scope for this transaction are defined in
985 Tables 3.58.4.1.2.2.2-1 and 3.58.4.1.2.2.3-1. A provider directory entry shall contain all required attributes and some or all of the optional attributes. A Provider Information Directory shall be able to act on all of the attributes. General definitions of the attributes can be found in ITI TF-1: 28.3.2.2.

3.58.2 Use Case Roles
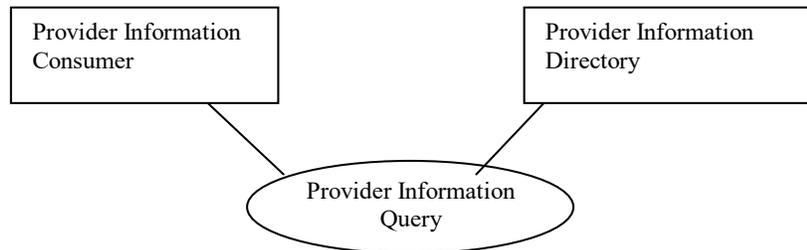
990

Actor: Provider Information Consumer

Role: Sends lookup request to the Provider Information Directory. Receives response from the Provider Information Directory. The consumer only queries for the information that is
995   meaningful for its purpose.

Actor: Provider Information Directory

Role: Receives lookup requests from the Provider Information Consumer. Fulfills those requests and returns requested information on zero to many Organization and Individual Providers.

3.58.3 Referenced Standards

1000   LDAP (Lightweight Directory Access Protocol), an open standard built on the X.500 framework, is adopted by this profile as the minimal specifications for exchange standards of provider information. Furthermore, the International Organization for Standards (ISO), defined as ISO 21091, is referenced to define the attributes of health professionals and organizations to represent health care regulatory information, clinical credentials, multiple affiliations, etc. By leveraging
1005   the ISO 21091 and the underlying LDAP standard, this schema and associated transactions are designed for interoperable communications. The usage of standard LDAP schema makes the adoption of HPD by the HIT vendors easier and extensible with respect to their existing implementations.

This transaction schema applies DSMLv2 to express LDAP requests and responses in SOAP
1010   bindings. DSMLv2 is a systematic translation of LDAP's ASN.1 grammar (defined by RFC2251) into XML-Schema. DSMLv2 provides advantages in the adoption of this transaction for an interoperable electronic exchange. First, tools for marshaling XML into SOAP messages are readily available, making development much easier. Second, firewalls are often configured to allow HTTP and HTTPS protocols to pass. This make it possible for DSML, carried in the HTTP
1015   or HTTPs protocol, to become the method for carrying provider information on the internet in an interoperable manner.

The Provider Information Query transaction will conform to the following standard specifications:

- Health informatics — Directory services for health care providers, subjects of care, and other entities (ISO/TS 21091)
- IETF LDAP v3 [RFC2068, RFC2251, RFC2256, RFC2985, RFC2798, RFC2985, RFC5646, RFC4512, RFC4517]
- DSMLv2
- SOAP 1.2

3.58.4 Interaction Diagram
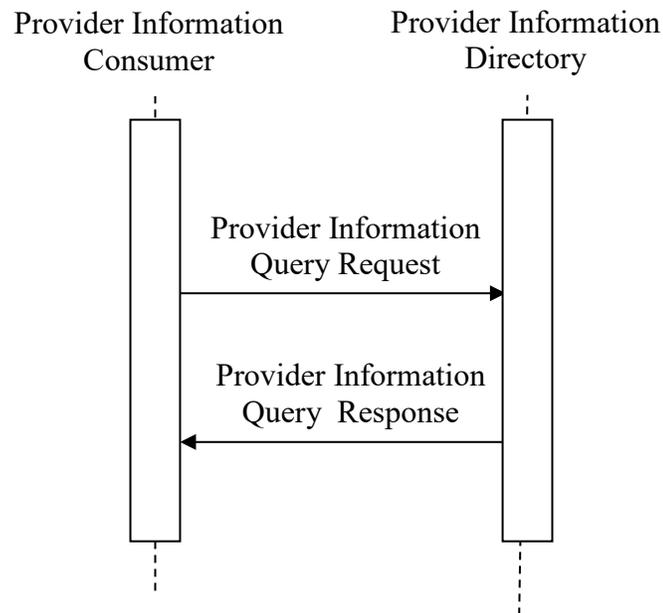
Figure 3.58.4-1: Basic Process Flow for Provider Information Query

3.58.4.1 Provider Information Query Request

Provider Information Consumer initiates a Provider Information Query Request to the Provider Information Directory. The Provider Information Query Request includes search parameters and defines the response set that is expected to be returned.

3.58.4.1.1 Trigger Events

This message is sent from a Provider Information Consumer to a Provider Information Directory to get additional information about an Individual or an Organizational Provider or a list of providers. The Provider Information Consumer shall provide search information and identify the information that the Provider Information Consumer is interested in receiving in response.

3.58.4.1.2 Message Semantics

The Provider Information Query request uses SOAP based DSMLv2 batchRequest message to express a query.

The query operation for looking up provider entries in the Provider Information Directory shall be done through the use of searchRequest operation. For querying individuals, the base object is HCProfessional and for querying organizations, the base object is HCRegulatedOrganization. The relationships can be looked up by querying the groupOfNames object.

The searchRequest allows specifying a list of attributes to be returned for matching query. If this list is empty or a special value of * is used, then all user attributes are returned. The request transaction shall support all LDAP standard search filters.

This transaction does not limit any restriction on the search scope, size limit, time limit or list of attributes. If needed, those can be constrained by the Provider Information Directory implementer.

The examples for Provider Information Query Request transaction can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.58.4.1.2.1 HPD Schema Structure

The HPD schema defines LDAP *organizationalUnit* (OU) containers to organize the information on Providers. Object classes within OU represent Individual Provider, Organization Provider and Relationships that are managed using the schema from ISO/TS 21091 and LDAP.

The directory naming context shall be o=HPD Owner, dc=HPD where HPD Owner value shall be replaced with the name of organization hosting the Healthcare Provider Directory.

There are nodes that are subordinate to dc=HPD.

- ou=HCProfessional for storing individual provider information.

- ou=HCRegulatedOrganization containing information on an organizational provider and its relevant information.

- ou=Relationship – a groupOfNames for holding the "member-of" relationships among providers. Groups holding the members that are related are represented by standard LDAP groupOfNames class. Each Group has a group owner organization that owns the relationship and has group members that are Individual and Organization providers.

- ou=HPDCredential to include health related credentials of providers.

The Directory Information Tree for this transaction is shown in the following diagram.
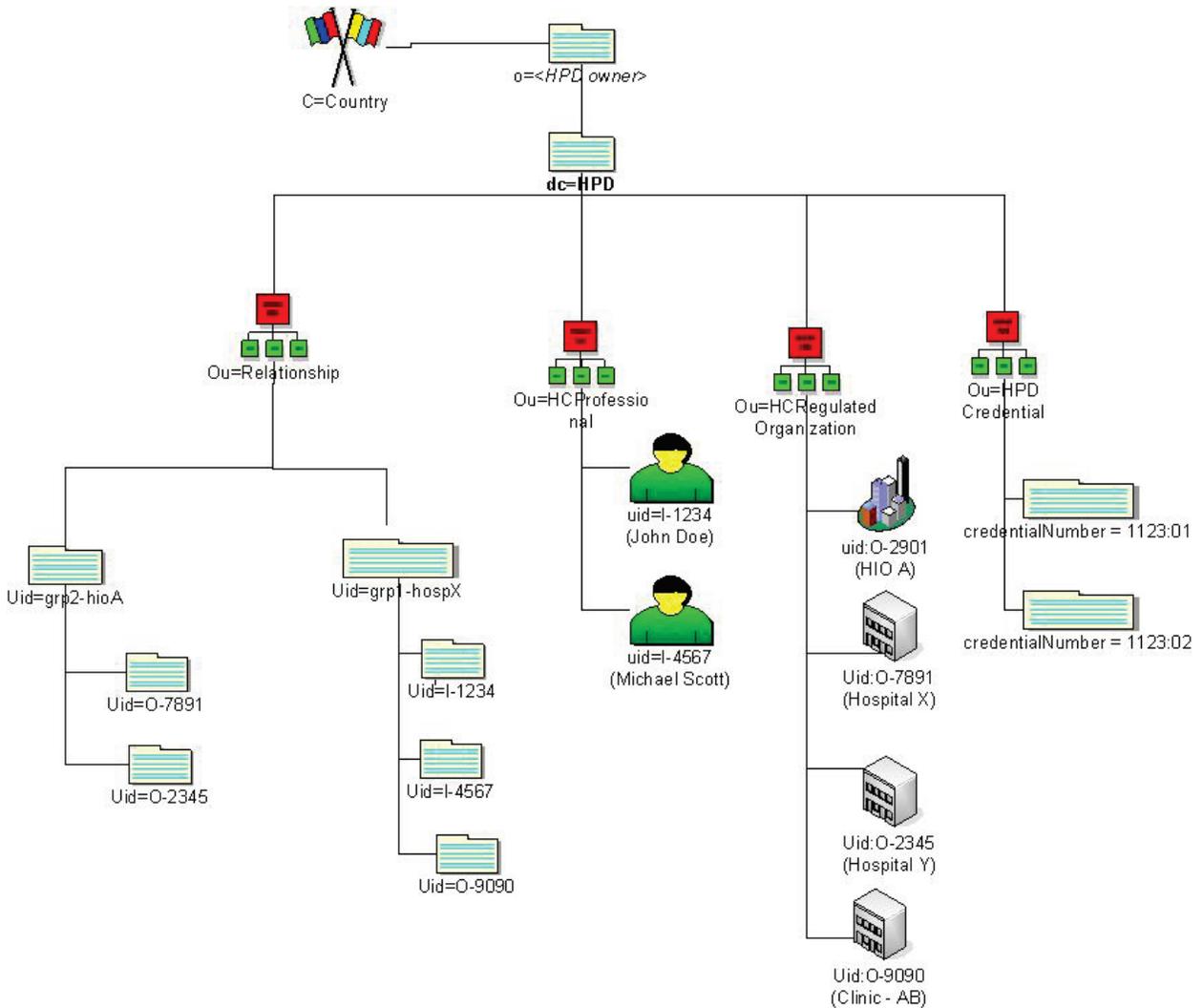
Figure 3.58.4.1.2.1-1: Transaction Information Tree

1070 **3.58.4.1.2.2 HPD Schema Content**

This section describes the mapping of the HPD schema attributes and ISO 21091/LDAP standard object classes. The HPD schema extends the ISO 21091 schema to include other attributes that are not covered by ISO 21091.

3.58.4.1.2.2.1 Object Classes

1075 **HCProfessional**

This is an object class defined by ISO 21091 to store information about Individual provider.

Object Class: HCProfessional

Superior Object Class:	InetOrgPerson
OID:	1.0.21091.1.2
1080 *Object Class Type:*	Structural

HCRegulatedOrganization

This is an object class defined by ISO 21091 to store information about Organization provider.

Object Class:	HCRegulatedOrganization
1085 *Superior Object Class:*	Organization
OID:	1.0.21091.1.4
Object Class Type:	Structural

HPDProvider

1090 The HPD schema defines an 'Auxiliary' object class HPDProvider to include additional provider attributes (for both Individual and Organizational Provider) that are not defined in the ISO 21091 schema. Being an Auxiliary object, the HPDProvider class attributes can be "mixed-in" with HCProfessional and HCRegulatedOrganization object classes. This class has the object class, *top*, as its superior. The OID for this class is assigned by IHE.

1095 *Object Class:*	HPDProvider
Superior Object Class:	top
OID:	1.3.6.1.4.1.19376.1.2.4.1
Object Class Type:	Auxiliary

Table 3.58.4.1.2.2.1-1: HPDProvider Optional Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdProviderStatus	1.3.6.1.4.1.19376.1.2.4.1.1	Maintain status of provider in directory Values are defined in Table 3.58.4.1.2.3-1	Directory String	Case Ignore Match	S

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdProviderLanguageSupported	1.3.6.1.4.1.19376.1.2.4.1.2	Languages that the provider supports Recommended best practice is to use RFC5646 [RFC5646] which, in conjunction with ISO 639 [ISO639], defines two- and three-letter primary language tags with optional subtags. Examples include "en" or "eng" for English, "akk" for Akkadian, and "en-GB" for English used in the United Kingdom."	Directory String	Case Ignore Match, Case Ignore Substrings Match	M
hpdProviderBillingAddress	1.3.6.1.4.1.19376.1.2.4.1.3	The provider billing address field. It shall be represented in the format described in Section 3.58.4.1.2.4.	Postal Address	Case Ignore Match, Case Ignore Substrings Match	M
hpdProviderMailingAddress	1.3.6.1.4.1.19376.1.2.4.1.7	The provider mailing address field. . It shall be represented in the format described in Section 3.58.4.1.2.4.	Postal Address	Case Ignore Match, Case Ignore Substrings Match	M
hpdProviderPracticeAddress	1.3.6.1.4.1.19376.1.2.4.1.4	The provider practice address field. . It shall be represented in the format described in Section 3.58.4.1.2.4.	Postal Address	Case Ignore Match, Case Ignore Substrings Match	M
hpdMedicalRecordsDeliveryEmailAddress	1.3.6.1.4.1.19376.1.2.4.1.5	Electronic mailing address of provider where medical records can be sent	String	Case Ignore Match	S
memberOf	1.3.6.1.4.1.19376.1.2.4.1.6	Group to which provider is a member of. A provider can be a member of zero, one or many groups. The Provider Information Directory shall reuse existing LDAP functionality that offers memberOf as an operational attribute. See Section 3.58.4.1.2.2.4 for details.	DN	Case Ignore Match	M
hpdCredential	1.3.6.1.4.1.19376.1.2.4.1.8	Detailed Health related credentials earned by provider; DN to one or more credential entries in the HPDCredential object class	DN	Case Ignore Match	M
hpdProviderLegalAddress	1.3.6.1.4.1.19376.1.2.4.1.10	Provider Legal address (e.g., the address where the provider has registered the business, receives legal correspondence, other based on local convention) It shall be represented in the format described in Section 3.58.4.1.2.4.	Postal Address	Case Ignore Match, Case Ignore Substrings Match	S

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdHasAService	1.3.6.1.4.1.19376.1.2.4.1.11	Reference to descriptions of electronic services supported by the Provider, See HPDElectronicServices.	DN	Case Ignore Match	M

1100

HPDProviderCredential

HPDProviderCredential is defined as a 'Structure' object class to contain credential attributes (for both Individual and Organizational Provider). This class has the object class, *top,* as its superior. The OID for this class is assigned by IHE.

1105
Object Class:	HPDProviderCredential
Superior Object Class:	top
OID:	1.3.6.1.4.1.19376.1.2.4.2
Object Class Type:	Structure

Table 3.58.4.1.2.2.1-2: HPDProviderCredential Mandatory Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
credentialType	1.3.6.1.4.1.19376.1.2.4.2.1	Type of Credential<degree, certificate, credential> Degree is not a valid type for Organizational Provider's credential	Directory String	Case Ignore Match	S
credentialName	1.3.6.1.4.1.19376.1.2.4.2.2	Name of Credential, degree, or certification that belongs to provider. Follows the ISO21091 naming format as that of the HCStandardRole: credentialName@organization_domain_name where credentialName is the standard name of the credential, and organization_domain_name is the domain name of the organization for those credentials local to the organization, or credential@Locality where credential is the standard name of the structural role if applicable to the Locality (i.e., state).	Directory String	Case Ignore Match	S

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
credentialNumber	1.3.6.1.4.1.19 376.1.2.4.2.3	Credential Identifier Follows the ISO 21091 UID format: (Issuing Authority OID: ID) The issuing authority OID could be used to identify the issuing agency, state and country. ID is the national/regional identifier assigned to the provider's credential. E.g., a certificate number.	Directory String	Case Ignore Match	S

1110

Table 3.58.4.1.2.2.1-3: HPDProviderCredential Optional Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
credentialDescription	1.3.6.1.4.1.19 376.1.2.4.2.4	Additional information on the credential	Directory String	Case Ignore Match	S
credentialIssueDate	1.3.6.1.4.1.19 376.1.2.4.2.5	Date when credential was issued to the provider	Date	Case Ignore Match	S
credentialRenewalDate	1.3.6.1.4.1.19 376.1.2.4.2.6	Date when credential is due renewal	Date	Case Ignore Match	S
credentialStatus	1.3.6.1.4.1.19 376.1.2.4.2.7	Values are defined in Table 3.58.4.1.2.3-1	Directory String	Case Ignore Match	S

1115 **HPDProviderMembership**

HPDProviderMembership is defined as a 'Structure' object class to contain membership attributes associated with an Individual Provider and an Organizational Provider. Specifically it holds the Electronic Services which the individual leverages within an organization. This class has the object class, top, as its superior.

1120 *Object Class:*   HPDProviderMembership

Superior Object Class: top

OID: 1.3.6.1.4.1.19376.1.2.4.3

Object Class Type: Structure

Table 3.58.4.1.2.2.1-4: HPDProviderMembership Mandatory Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdMemberId	1.3.6.1.4.1.19 376.1.2.4.3.1	Unique Identifier for this Membership relationship	String	Case Ignore Match	S
hpdHasAProvider	1.3.6.1.4.1.19 376.1.2.4.3.2	Reference to Individual Provider	DN	Case Ignore Match	S
hpdHasAnOrg	1.3.6.1.4.1.19 376.1.2.4.3.3	Reference to Organizational Provider	DN	Case Ignore Match	S

1125

Table 3.58.4.1.2.2.1-5: HPDProviderMembership Optional Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdHasAService	1.3.6.1.4.1.19 376.1.2.4.1.11	Only present if this electronic service information is specific to the Individual-Organization relationship	DN	Case Ignore Match	M
telephoneNumber	2.5.4.20	Only present when this telephone number is specific to the Individual-Organization relationship	TelephoneNumber	telephoneNumberMatch	M
facsimileTelephoneNumber	2.5.4.23	Only present when this facsimile number is specific to the Individual-Organization relationship	TelephoneNumber	telephoneNumberMatch	M
mobile	0.9.2342.1920 0300.100.1.41	Only present when this mobile number is specific to the Individual-Organization relationship	TelephoneNumber	telephoneNumberMatch	M
pager	0.9.2342.1920 0300.100.1.42	Only present when this pager number is specific to the Individual-Organization relationship	TelephoneNumber	telephoneNumberMatch	M
mail	0.9.2342.1920 0300.100.1.3	Used for general purpose email communication. Only present when this general purpose email is specific to the Individual-Organization relationship.	String	Case Ignore Match	M

HPDElectronic Service

HPDElectronic Service is defined as a 'Structure' object class to contain attributes that describe an electronic service for health information exchange. These attributes include the service type, the service address and possible payloads. This class has the object class, top, as its superior.

1130

Object Class: HPDElectronicService

Superior Object Class: top

OID: 1.3.6.1.4.1.19376.1.2.4.4

Object Class Type: Structure

1135 **Table 3.58.4.1.2.2.1-6: HPDElectronicService Mandatory Attributes**

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdServiceId	1.3.6.1.4.1.19376.1.2.4.4.1	An identifier assigned by the provider directory whose purpose is to uniquely identify a unique Electronic Service Object.	String	Case Ignore Match	S
hpdServiceAddress	1.3.6.1.4.1.19376.1.2.4.4.2	The electronic service address possibly in URI or email address form	String	Case Ignore Match	S

Table 3.58.4.1.2.2.1-7: HPDElectronicService Optional Attributes

Attribute	OID	Description	Syntax	Matching rules	Multi-Valued
hpdIntegrationProfile	1.3.6.1.4.1.19376.1.2.4.4.3	A string which describes the integration profile. Values are defined through local configuration.	String	Case Ignore Match	M
hpdContentProfile	1.3.6.1.4.1.19376.1.2.4.4.4	A string which describes the content profile preferred in situations when content is being pushed to the service. Content not conforming to one of the specified content profiles may result in unpredictable results. When IHE content profiles are used, this is the formatCode. Values are defined through local configuration.	String	Case Ignore Match	M
hpdCertificate	1.3.6.1.4.1.19376.1.2.4.4.5	Public Digital Certificate for this service	Binary	Not Applicable	M

3.58.4.1.2.2.2 Individual Provider

Entries for Individual Provider in the Provider Information Directory use the attributes of
1140 HCProfessional object class that extends from inetOrgPerson object class. HPDProvider,
HPDProviderCredential and Natural Person (described in RFC2985) auxiliary object classes are
mixed-in to define additional attributes. See Section 3.58.4.12.2.6 for Optionality values.

Table 3.58.4.1.2.2.2-1: Individual Provider Mapping

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Unique Entry Identifier	String	inetOrgPerson	uid	S	R	RDN Format as defined by ISO 21091 Section 9.2 (Issuing Authority Name:ID)
Provider "Identifiers"	String	HCProfessional	hcIdentifier	M	R	Format as defined by ISO 21091 (Issuing Authority:Type:ID:Status) Type values will be defined by national or regional organizations. Status is defined in Section 3.58.4.1.2.3

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Provider Type	String	HCProfessional	hcProfession	M	R	The values will be defined by national or regional organizations. An example of possible types is the list of Individuals or Groups Values from the Healthcare Provider Taxonomy Published by the American Medical Association twice a year. An example of this document can be found at the following reference URL: http://www.adlda ta.com/Downloa ds/Glossaries/tax onomy_80.pdf. Encoding is based on ISO 21091. Additionally, it adds an optional 4th component for the code's display name: (Issuing Authority: Code System: Code: Code Display Name).
Provider Type description	String	inetOrgPerson	description	M	T	This HPD concept has been retired. Use the Code Display Name in the Provider Type instead.
Provider Status	String	HPDProvider	hpdProviderStatus	S	O	Values found in Table 3.58.4.1.2.3-1

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Provider Primary Name	String	inetOrgPerson	displayName	S	R	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Provider Title	String	inetOrgPerson	title	S	O	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Provider First name	String	inetOrgPerson	givenName	M	R2	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Provider Middle Name	String	inetOrgPerson	initials	M	O	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Provider Last Name	String	inetOrgPerson	sn	M	R	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Provider Known names	String	inetOrgPerson	cn	M	R	Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a 3.24.5.2.3.1

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Provider Language Supported	String	HPDProvider	hpdProviderLanguageSupported	M	O	Supported written or spoken language for a person. Values for this attribute type MUST conform to the definition of the Accept-Language header field defined in [RFC2068] with one exception: the sequence "Accept-Language" ":" should be omitted. The following example indicates that this person supports French, supports British English 80%, and general English 70%. (e.g., fr, en-gb;q=0.8, en;q=0.7)
Provider Gender	String	Natural Person	gender	S	O	Using Natural Person auxiliary class as defined in RFC2985
Provider medical records deliver email address	String	HPDProvider	hpdMedicalRecordsDeliveryEmailAddress	S	O	Intended for sending medical records via email
Provider e-mail address	String	inetOrgPerson	mail	M	O	Intended for general purpose email communication

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
S-MIME Certificate	Binary	inetOrgPerson	userSMIMECertificate	M	O	RFC2798: PKCS#7 SignedData used to support S/MIME; typically used for encrypting MIME messages over an email. Other purposes and constraints can be found by looking inside the certificates.
Signing Certificate	Binary	HCProfessional	hcSigningCertificate	M	O	Public key and certificate for the user's non-repudiation signing certificate used for health transactions
User Certificate	Binary	inetOrgPerson	userCertificate	M	O	RFC2256: X.509 user certificate for general purpose use; purposes and constraints can be found by looking inside the certificates
Electronic Service URI	String	groupofURLs	labeledURI	M	O	Points to a service entry in a systems directory or to a webservices definition page defining the end points of services.
Creation Date	Date	N/A	createTimestamp	S	R	This is an operation attribute that LDAP directory server maintains to capture the time when an entry was created.

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Last Update Date	Date	N/A	modifyTimestamp	S	R	This is an operation attribute that that LDAP directory server maintains to capture the time when an entry was modified.
Provider Facility Name	String	inetOrgPerson	physicalDeliveryOf ficeName	M	R2	This attribute contains the facility name that a postal service uses to identify a provider's facility.
Provider Mailing Address	Postal Address	HPDProvider	hpdProviderMailin gAddress	M	R2	Mailing address
Provider Billing Address	Postal Address	HPDProvider	hpdProviderBilling Address	M	O	Business billing or legal address
Provider Practice Address	Postal Address	HPDProvider	hpdProviderPractic eAddress	M	R2	Practice or Service address
Provider Practice Organizatio n	DN	HCProfessional	HcPracticeLocation	M	O	DN of organization the provider practices
Provider Business Phone	Telephone Number	inetOrgPerson	telephoneNumber	M	R2	As per ITI TF-2a: 3.24
Provider Mobile Phone	Telephone Number	inetOrgPerson	mobile	M	R2	As per ITI TF-2a: 3.24 Business Mobile
Provider Pager	Telephone Number	inetOrgPerson	pager	M	R2	As per ITI TF-2a: 3.24
Provider Fax	Facsimile Telephone Number	inetOrgPerson	facsimileTelephone Number	M	R2	
Provider "Credential"	DN	HPDProvider	hpdCredential	M	O	Detailed Health related credentials earned by provider

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Provider Specialty	String	HCProfessional	hcSpecialisation	M	O	A major Grouping i.e., Dermatology, Oncology, Dental, Internal Med. Populate with ISO 21298 defined medical specialties. May also be populated with other specialties specified by jurisdiction or organization. Encoding is based on ISO 21091. Additionally, it adds an optional 4th component for the code's display name: (Issuing Authority: Code System: Code: Code Display Name).
Provider Relationship	DN	HPDProvider	memberOf	M	O	Groups to which this provider belongs; In search scenarios, it is desirable for a Provider Information Consumer to be able to determine which organizations this individual provider is a member of.
Legal Address	Postal Address	HPDProvider	hpdProviderLegalA ddress	S	O	
Electronic Service	DN	HPDProvider	hpdHasAService	M	O	

1145   3.58.4.1.2.2.3 Organizational Provider

Object Classes: HCRegulatedOrganization, HPDProvider

Entries for Organization Provider in the Provider Information Directory uses the attributes of HCRegulatedOrganization object class that extends from 'Organization' object class. HPDProvider and uidObject (described in RFC4517, Section 3.14) auxiliary object classes are

1150   used to define additional attributes. See Section 3.58.4.12.2.6 for Optionality values.

Table 3.58.4.1.2.2.3-1: Organizational Provider Mapping

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Unique Entity Identifier	String	uidObject	uid	S	R	RDN Format as defined by ISO 21091 Section 9.2 (Issuing Authority Name:ID)
Org Identifiers	String	HCRegulatedOrganization	hcIdentifier	M	R	Format as defined by ISO 21091 (Issuing Authority:Type:ID: Status) Type values will be defined by national or regional organizations. Status is defined in Section 3.58.4.1.2.3
Organization known names	String	Organization	O	M	R2	Organization known name. Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Organization Name	String	HCRegulatedOrganization	HcRegistere dName	M	R	The legal name of the entity as registered with the health care regulating authority. Use of language tag and HL7 Name Data Type (XCN) as per ITI TF-2a: 3.24.5.2.3.1
Org Type	String	Organization	businessCat egory	M	O	The values will be defined by national or regional organizations. An

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
						example is the list of Non Individual Values from the Healthcare Provider Taxonomy Published by the American Medical Association twice a year. An example of this document can be found at the following reference URL: http://www.adldata.com/Downloads/Glossaries/taxonomy_80.pdf. Encoding is based on ISO 21091. Additionally, it adds an optional 4th component for the code's display name: (Issuing Authority: Code System: Code: Code Display Name).
Org Type Description	String	Organization	description	M	T	This HPD concept has been retired. Use the Code Display Name in the Org Type instead.
Org Status	String	HPDProvider	hpdProvider Status	S	O	Values found in Table 3.58.4.1.2.3-1
Org Contact	DN	HCRegulatedOrganization	ClinicalInformationContact	M	O	Clinical contacts; DN to HCProfessional entry
Org Practice Address	Postal Address	HPDProvider	hpdProvider PracticeAddress	M	R2	Practice or Service address
Org Billing Address	Postal Address	HPDProvider	hpdProvider BillingAddress	M	O	Business billing or legal address

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
Org Mailing Address	Postal Address	HPDProvider	hpdProvider MailingAdd ress	M	R2	Mailing address
Org Credentials	DN	HPDProvider	hpdCredenti al	M	O	Detailed Health related credentials earned by provider; Degree is not a valid type for Organizational Provider
Provider Language Supported	String	HPDProvider	hpdProvider LanguageSu pported	M	O	Language that the organization supports. Values for this attribute type MUST conform to the definition of the Accept-Language header field defined in [RFC2068] with one exception: the sequence "Accept-Language" ":" should be omitted. The following example indicates that this person supports French, supports British English 80%, and general English 70%. (e.g., fr, en-gb;q=0.8, en;q=0.7)
Org Specialty	String	HCRegulatedOrganization	HcSpecialis ation	M	O	Populate with ISO 21298 defined medical specialties. May also be populated with other specialties specified by jurisdiction or organization. Encoding is based on ISO 21091. Additionally, it adds an optional 4th component for the code's display name: (Issuing Authority: Code System: Code:

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optionality	Comments
						Code Display Name).
Electronic Service URI	String	groupofURLs	labeledURI	M	O	Points to a service entry in a systems directory or to a webservices definition page defining the end points of services.
Signing Certificate	Binary	HCRegulatedOrganization	HcSigningCertificate	M	O	Public key and certificate for the user's non-repudiation signing certificate used for health transactions
Organization Certificate	Binary	HCRegulatedOrganization	HcOrganizationCertificates	M	O	Used for storing health care organization certificates; Certificate purposes and constraints can be found by looking inside the certificates.
Org Business Phone	Telephone Number	Organization	telephoneNumber	M	R2	
Org Fax	Facsimile Telephone Number	Organization	facsimileTelephoneNumber	M	R2	
Provider Relationship	DN	HPDProvider	memberOf	M	O	Groups to which this provider belongs; In search scenarios, it is desirable for a Provider Information Consumer to be able to determine which organizations this organization provider is a member of.
Creation Date	Date	N/A	createTimestamp	S	R	This is an operation attribute that LDAP directory server maintains to

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optio nality	Comments
						capture the time when an entry was created.
Last Update Date	Date	N/A	modifyTime stamp	S	R	This is an operation attribute that that LDAP directory server maintains to capture the time when an entry was modified.
Electronic Service	DN	HPDProvider	hpdHasASe rvice	M	O	
Legal Address	Postal Address	HPDProvider	hpdProvider LegalAddre ss	S	O	

3.58.4.1.2.2.4 Relationships

The profile schema allows maintaining relationships between providers. The scope of this transaction considers one type of relationship; *Member Of*. Examples of this relationship are:

1. Hospitals, clinics, labs, other organization providers, and physicians are *members of* an HIE

2. A list of physicians *are members of* a hospital

3. A number of hospitals, practitioners are *members of* an Integrated Delivery Network

4. Departments or clinics are organizations which are *members of* a Hospital

5. A physician is *a member of* one or more organization providers

6. What organizational providers are at the root of a provider hierarchy

   - Search for all organizational providers whose memberOf attribute is empty. A 'real' root organization must additionally appear as owner in at least one relationship entry.

This means that the transaction schema can be used to determine the following:

1. What other organizational providers an organizational provider is *a member* of

   - Attribute memberOf in the Organization schema (see Section 3.58.4.1.2.2.3)

2. What other organizational providers are *members of* a particular organizational provider

   - Through use of groupofNames schema (an LDAP standard object class)

3. What organizational providers an individual provider is *a member* of

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- Attribute *memberOf* in the Individual Provider schema (see Section 3.58.4.1.2.2.2)

4. What individual providers are *members of* a particular organizational provider

- Through use of groupofNames (an LDAP standard object class)

In the current schema, it is not possible to attach any extra information to the DN value to show the business reason for the relationship. It is also important to note that an Individual provider cannot be an owner of the group as an Organizational Provider or an Individual Provider shall not have a "member of" relationship with an Individual Provider.

Relationships in this transaction are represented by LDAP objects using the groupOfNames class. Owner attribute references the DN of an organization that owns the group, while member attribute references the DN of an individual or an organization that is a member of the owner organization. A provider entry must exist in the directory before adding it to a groupofNames entry that this provider is a member of. See Section 3.58.4.12.2.6 for Optionality values.

Table 3.58.4.1.2.2.4-1: Relationship Mapping

HPD Concept	LDAP Syntax	Object Class	Attribute within Object Class	Single/ Multi Valued	Optionality	Comments
Relationship Name	String	groupOfNames	cn	S	R	Name of the relationship group. The name value is not defined, but it makes sense to derive it from the owning organization entry.
Owning organization	DN	groupOfNames	owner	S	R2	Reference to the organizational provider that owns this group, i.e., superior to the members of this group. Note that the groupOfNames object class defines this attribute as being optional
Member providers	DN	groupOfNames	member	M	O	References to organizational or individual providers that are members of this group, i.e., subordinate to the group owner

1185   LDAP servers usually implement the memberOf attribute to be "operational" as defined in
        RFC4512, Section 3.4. This means that the LDAP server calculates the inverse relationship of
        member entries in a groupOfNames relationship and provides this inverse relationship as read-
        only attribute in a search result.

        The Provider Information Source shall add or remove a provider relationship reference by adding
1190   or removing the DN of the provider from the member attribute of the corresponding
        groupOfNames entry. Particularly, the Provider Information Source shall not add or remove a
        provider relationship reference directly by modifying the memberOf attribute of that provider.

3.58.4.1.2.2.5 Federation Option - Data Elements

        Provider Information Directory and Provider Information Consumer Actors that support the
1195   Federation Option shall implement the data structures and data elements defined in this section.
        All of the data related to federation are provided as part of "control" elements within the request
        and response messages. The data structures within the control elements are described in the
        HPDFederatedStructures.xsd schema available through ITI TF-2x: Appendix W.

Federation Data Elements in Provider Information Query Request

1200   If the Provider Information Consumer supports the Federation Option it shall be able to include
        in the Provider Information Query Request a FederatedRequestData element within the DSML
        batchRequest/searchRequest/control element. An example control element is shown in the
        snippet below.

1205   ```
        <searchRequest>
        …
        <control type="1.3.6.1.4.1.19376.1.2.4.4.6" criticality="false">
              <controlValue xsi:type="xsd:base64binary">
                    "Base64 encoded data conforming to FederatedRequestData element"
1210   </controlValue>
        </control>
        …
        </searchRequest>
        ```

        The control element's type attribute shall contain "1.3.6.1.4.1.19376.1.2.4.4.6" which is
1215    the FederatedRequestOID and tells the Provider Information Directory that a Provider
        Information Query transaction shall be federated if the Provider Information Directory is
        configured for federation. A searchRequest element shall not contain more than one control
        element with FederatedRequestOID.

        There shall be a single FederatedRequestData element within the control.

1220    The criticality attributed of the control element shall always be set to "false".

**FederatedRequestData**

        The FederatedRequestData structure contains data elements that allow the Provider Information
        Consumer to provide to the Provider Information Directory identifiers used during federation.
        The contents of the FederatedRequestData element are:

1225

- **federatedRequestId** - This is a required globally unique request id of type GUID that is created by the Provider Information Consumer who initiates a Provider Information Query transaction. There shall be a single federatedRequestId within the federatedRequestData element. The federatedRequestId shall be forwarded by all intermediaries that federate the request to additional directories. In other words it should

1230
  not be modified. Use of the federatedRequestId ensures that there are no loops during federation, where a request is sent back to an originator of the request.

- **directoryId** -The optional directoryId element contains a non-empty string which is used to identify the specific directory to which a request would be sent by an intermediary. There shall be at most a single directoryId within the FederatedRequestData element. In

1235
  case of no intermediaries, the directoryId, if present, will be the same as the destination directoryId.

- This is intended to be used for searches after the consumer has determined the directory which potentially has the required information.

An example of the FederatedRequestData element, prior to base64 encoding, is:

1240

```
<FederatedRequestData>
    <federatedRequestId>5464a392-13aa-475a-b36e-4b9e87db44bf
    </federatedRequestId>
</FederatedRequestData>
```

1245 **Federation Data Elements in Provider Information Query Response**

Federation Data Elements are present in multiple places within the Query Response:

1. A SearchResultEntryMetadata element is associated with each entry returned in the query response.
2. A single FederatedSearchResponseData element holds a list of FederatedResponseStatus

1250
  elements, each of which holds the result of a directory participating in the search response.

SearchResultEntryMetadata

The SearchResultEntryMetadata element describes identifiers for the directory which provided the associated entry in the response. It is within the searchResultEntry/control element which is part of the searchResponse element of DSML.

1255

```
<searchResultEntry>
….
<control type="1.3.6.1.4.1.19376.1.2.4.4.7" criticality="false">
     <controlValue xsi:type="xsd:base64binary">
```
1260
```
      "Base64 encoded data conforming to SearchResultEntryMetadata element"
     </controlValue>
</control>
…
</searchResultEntry>
```

1265   The control element's type attribute shall contain "1.3.6.1.4.1.19376.1.2.4.4.7" which is the FederatedEntryResponseOID and tells the Provider Information Consumer that this control contains identifiers for the associated directory.

There shall be a single SearchResultEntryMetadata element within the control.

The criticality attribute of the control element shall always be set to "false".

1270   The SearchResultEntryMetadata element contains two values:

- **directoryId** - This required element indicates the identity of the directory which provided the associated entry in the response.

    Note: This could be used by the Provider Information Consumer to target subsequent queries without broadcasting or federating to all the directories.

1275   - **directoryURI** - This optional element indicates the endpoint address of the directory which provided the response. The element shall contain a URI.

    Note: This could be used by the Provider Information Consumer to target subsequent queries without broadcasting or federating to all the directories.

1280   Note: In a federated environment, where the directories that are being federated are not compliant with HPD Interface, then the Directory ID and URI will correspond to the directory which is performing the federation.

An example of the SearchResultEntryMetadata element, prior to base64 encoding, is:

1285
```
<SearchResultEntryMetadata>
    <directoryId>DummyOrganization TestDirectory-1234</directoryId>
    <directoryURI>
      https://DummyOrg.com/pdti-server/ProviderInformationDirService
    </directoryURI>
1290 </SearchResultEntryMetadata>
```


FederatedSearchResponseData

Each directory that is part of the federation could potentially return a different success/error result code. The Provider Information Directory shall aggregate these individual status responses
1295   and return them back to the Provider Information Consumer within the FederatedSearchResponseData element, which contains a list of federatedResponseStatus elements, each of which describes the return status of a participating directory. There will be as many elements within FederatedSearchResponseData as the number of directories being federated. It is within the searchResultDone/control element which is part of the searchResponse
1300   element in DSML.

```
<searchResultDone>
…
```

___

```
      <control type="1.3.6.1.4.1.19376.1.2.4.4.8" criticality="false">
1305      <controlValue xsi:type="xsd:base64binary">
           "Base64 encoded data conforming to FederatedSearchResponseData"
          </controlValue>
      </control>
      …
1310  </searchResultDone>
```

The control element's type attribute shall contain "1.3.6.1.4.1.19376.1.2.4.4.8" which is the FederatedResponseOID and tells the Provider Information Consumer that this control contains results from each federated directory.

1315   The criticality attribute of the control element shall always be set to "false".

There shall be a single FederatedSearchResponseData element within the control which contains a list of federatedResponseStatus elements.

Each federatedResponseStatus element contains four values:

- **federatedRequestId** - This required element shall contain the same value as was
1320   received in the federatedRequestId element in the query request. This is provided by the Provider Information Directory back to Provider Information Consumer to help with the correlation of requests and responses.

- **directoryId** – This required element indicates the identity of the directory which provided a part of the response

1325 - **resultCode** – This required element shall contain the LDAPResultCode from DSML specification indicating success or failures. The following error codes shall be used

  - LDAPResultCode of "loopDetect" shall be used when a federation loop is detected by using the FederatedRequestId.

  - LDAPResultCode of "unwillingToPerform" shall be used when a directory is not
1330   willing to execute the query due to any purpose.

  - For all other scenarios, individual Provider Information Directories shall use an applicable LDAPResultCode from the DSML specification.

  - The Provider Information Directory which is federating across multiple directories shall return an LDAPResultCode of "success" when all directories return "success"
1335   and shall use the value "other" when any of the directories in the federation have an error.

- **resultMessage** – This optional element contains a textual description for the resultCode.

An example of the FederatedSearchResponseData element, prior to base64 encoding, is below:

```
1340    <FederatedSearchResponseData>
            <federatedResponseStatus>
                <federatedRequestId>5464a392-13aa-475a-b36e-4b9e87db44bf
                </federatedRequestId>
                <directoryId>DummyOrganization TestDirectory-1234</directoryId>
1345            <resultCode>success</resultCode>
                <resultMessage>Operation successful</resultMessage>
            </federatedResponseStatus>
        </FederatedSearchResponseData>
```

3.58.4.1.2.2.6 Optionality

1350 The following values are used in the "Optionality" columns in Tables 3.58.4.1.2.2.2-1, 3.58.4.1.2.2.3-1, and 3.58.4.1.2.2.4-1.

R   Required. The attribute referenced in the mapping is required by HPD, regardless of whether or not it is mandatory in the schema.

R2   Required if known. The attribute referenced in the mapping is required by HPD, if the
1355   sending application has data for the element. This is only used in conjunction with optional schema elements.

O   Optional. The attribute referenced in the mapping may be included by the sending application but is not required. This is only used in conjunction with optional schema elements.

1360 T   Retired Mapping. This mapping between an attribute in the HPD schema and the HPD concept has been retired. The attribute may still be used, but it no longer carries the meaning of the HPD concept.

3.58.4.1.2.3 Status Code Values

Table 3.58.4.1.2.3-1 defines the value sets for the different status attributes. Not all values are
1365 valid for each status attribute.

The first column lists the attribute. A "Y" in any other column in the row indicates that the value identified in the header of the row is valid for that attribute.

Active – The information related to this attribute is currently true. An active Individual Provider is an Individual Provider who is currently a participant in the healthcare field as defined by the
1370 metadata about this Individual Provider.

Inactive – The information related to this attribute was true at one time but is currently not true. An inactive Individual Provider is an Individual Provider who once participated in the healthcare field as defined by the metadata about this Individual Provider.

Retired – The information related to this Individual Provider was true at one time. The Individual
1375 Provider is currently no longer working.

Deceased - The information related to this Individual Provider was true at one time. The Individual Provider is no longer living.

Revoked – An action was taken against the provider (Individual or Organizational) to remove the information related to this attribute, which was true at one time, but is currently no longer valid. This implies an action taken by someone other than the provider.

1380

Suspended – An action was taken against the provider (Individual or Organizational) to put on hold the information related to this attribute, which was true at one time.

Primary – Most important, and still valid.

Secondary – Valid, but not most important.

1385

Table 3.58.4.1.2.3-1: Status Code Category Values

Status Attribute	Active	Inactive	Retired	Deceased	Revoked	Suspended	Primary	Secondary
Individual Provider	Y	Y	Y	Y				
Organizational Provider	Y	Y						
Address		Y					Y	Y
Credential	Y	Y			Y	Y		
Identifier	Y	Y			Y	Y		

3.58.4.1.2.4 Coding Address Elements

Postal Addresses in general use the LDAP syntax as described in RFC4517, Section 3.3.28, i.e., address elements are delimited by a DOLLAR ('$') character. Address elements shall

1390 additionally be coded in a form 'element=value' as explained in Table 3.58.4.1.2.4-1.

These elements should be used when applicable, and may be extended when necessary, e.g., for jukyo hyoji addresses.

It is recommended that implementations should specify as many of the optional elements as possible to enable effective searching.

1395

Table 3.58.4.1.2.4-1: Coding Address Elements

Attribute element	Required	Description
addr	Y	The addr element shall contain the full textual mailing address. Elements of this address like city, state, country shall use the same code values as specified below. The overall format for this element will be defined by national or regional organizations.
status	Y	The status attribute shall contain a value as specified in in Table 3.58.4.1.2.3-1
streetNumber	N	The streetNumber element shall contain the house number on the street

Attribute element	Required	Description
streetName	N	The streetName element shall contain the name of the street, unless otherwise specified by a national or regional organization.
city	N	The city element shall contain the name of the city. City values will be defined by national or regional organizations. An example of a possible list of City values may be found in the World Gazetteer. Reference URL: http://www.commondatahub.com/city_source.jsp CDH GC05 – Cities in US and Canada CDH GC06 – Large Cities in US and Canada DCH GC07S- Large Cities in the world (population > 20,000)
state	N	The state element shall contain the state code and shall use code values based on the ISO Standard 3166, unless otherwise specified by a national or regional organization.
postalCode	N	The postalCode element shall contain the postal code of the address, unless otherwise specified by a national or regional organization.
country	N	The country element shall contain the country code and shall use code values based on the ISO Standard 3166, unless otherwise specified by a national or regional organization.

Example:

```
status=primary
$ addr = 1221 Circle Lane Nowheresville CA 98765 US
$ streetNumber=1221
$ streetName=Circle Lane
$ city=Nowheresville
$ state=CA
$ postalCode=98765-4321
$ country=US
```

3.58.4.1.3 Expected Actions

The Provider Information Directory shall search the directory for the provider information that meets the criteria in the Provider Information Query request.

Provider Information Directory shall accept queries using any of the attributes in the HPD data model. If their backend implementations do not have the associated data element in their database those query fields shall be ignored. The Provider Information Directory shall return all required attributes and may return other attributes that are present within their database.

Provider Information Directory shall support all the DSML filters within the DSML specification except Extensible filters.

A Provider Information Directory that supports the Federation Option shall:

- not perform federation when the federation controls are NOT specified in the request. This means that if no federation controls are in the request, the Provider Information Directory shall search locally for requests and not further route the query.

- route federation requests containing directoryId to the associated directory

1420
- route federation requests without a directoryId to an appropriate collection of directories, which may be only itself.

- allow searches for the entire sub-tree of HPD root (dc=hpd). This allows federated queries to be successful without requiring Provider Information Consumers to use RDNs (for e.g., "o=example") specific to a directory.

1425
- use the federatedRequestId to prevent cycles in a federated environment. Loops occur between directories when they federate with each other (e.g., Consumer A invokes Directory B which federates to Directory C which federates to Directory D which may federate back to Directory B).

A Provider Information Directory supporting the Federation Option may optionally honor the
1430 sizeLimit and timeLimit parameters specified by a Provider Information Consumer in a batchRequest depending on local policies.

> Note: Provider Information Directory supporting the Federation Option may choose to implement federation by consuming Provider Information Feeds [ITI-59] and creating a local cache with additional services such as de-duplication and normalization of data. These types of deployments are supported by the transaction. Also Provider
> 1435 Information Directory may use various policies of their choice for caching and data governance and IHE does not limit these choices in any way.

3.58.4.2 Provider Information Query Response

The Provider Information Directory responds to a Provider Information Query Request initiated by the Provider Information Consumer. The Provider Information Directory will provide the
1440 response set requested. The response set may have zero to many providers based on the search criteria. If no providers are found then an empty response set is returned. If one provider is found then one record is returned. If more than one provider meets the criteria specified then a list of providers is returned.

The Provider Information Consumer shall make use of the returned information as appropriate
1445 for its use.

3.58.4.2.1 Trigger Events

This message is sent from a Provider Information Directory once the directory search resulting from a Provider Information Query request has been completed.

3.58.4.2.2 Message Semantics

1450 Provider Information Query Response uses SOAP based DSMLv2 batchResponse message of searchResponse element type to send response for searchRequest.

Inc.

The Provider Information Query Response shall contain the requestID to associate the response to the Provider Information Query Request.

The examples for Provider Information Query Response can be found online on the IHE FTP
1455   site, see ITI TF-2x: Appendix W

3.58.4.2.3 Expected Actions

There is no defined expected action to be taken by the Provider Information Consumer once the response has been received.

The Provider Information Consumer processes the response in accordance with the functions of
1460   its application.

In a federated environment, the Provider Information Consumer may obtain multiple entries for the same provider based on the number of relationships the provider has with different organizations and if those organizations are exposing their directories as part of the federation. In this environment, a Provider Information Consumer should have policies in place to handle
1465   duplicate entries.

A Provider Information Consumer may choose to specify the sizeLimit and timeLimit parameters for a batchRequest indicating the actor's preference; however, a Provider Information Directory may not honor these parameters. Hence the Provider Information Consumer that supports the Federation Option shall be capable of handling responses from Provider Information
1470   Directories that do not honor these parameters.

3.58.5 Security Considerations

No transaction specific security considerations.

3.58.6 Protocol Requirements

The Provider Information Query request and response will be transmitted using Synchronous
1475   Web Services Exchange, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL snippet describes the type for this message:

```
<types>
<xsd:schema targetNamespace="urn:oasis:names:tc:DSML:2:0:core"
1480        xmlns:dsml="urn:oasis:names:tc:DSML:2:0:core">
  <xsd:include  schemaLocation="../schema/DSML/DSMLv2.xsd "/>
</xsd:schema>
</types>
<message name="ProviderInformationRequestMessage">
1485    <documentation>Provider Information Query/Feed Request
Message</documentation>
    <part name="body" element="dsml:batchRequest" />
</message>
<message name="ProviderInformationResponseMessage">
```

1490
```
    <documentation>Provider Information Query/Feed
ResponseMessage</documentation>
    <part name="body" element="dsml:batchResponse"/>
</message>
```

1495 The following WSDL snippets specify the Provider Information Query Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

```
<portType name="ProviderInformationDirectory_PortType">
    <operation name="ProviderInformationQueryRequest">
1500        <input message="tns:ProviderInformationRequestMessage"
            wsaw:Action="urn:ihe:iti:2010:ProviderInformationQuery"/>
        <output message="tns:ProviderInformationResponseMessage"
            wsaw:Action="urn:ihe:iti:2010:ProviderInformationQueryResponse"/>
    </operation>
1505 </portType>
```

Informative WSDL for the Provider Information Directory is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.59 Provider Information Feed

1510 This section corresponds to transaction ITI-59 of the IHE IT Infrastructure Technical Framework. This transaction is used by the Provider Information Source and Provider Information Directory Actors.

3.59.1 Scope

The Provider Information Feed specifies one or more of the following actions:

- An "Add" to add new provider entries

1515 - A "Delete" to delete any existing provider entries

- An "Update" to modify or update any existing provider entries

Two categories of healthcare providers are included in the Provider Information Feed:

- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.

1520 - Organizational Provider – An organization that provides or supports healthcare services, such as hospitals, Healthcare Information Exchanges (HIEs), Integrated Delivery Networks (IDNs), and Associations.

The summary of the current minimal foundational attributes that are in scope for this transaction are defined in Tables 3.58.4.1.2.2.2-1 and 3.58.4.1.2.2.3-1. A provider directory entry shall
1525 contain all required attributes and some or all of the optional attributes. A Provider Information

Directory shall be able to act on all of the attributes. General definitions of the attributes can be found in ITI TF-1: 28.3.2.2.

3.59.2 Use Case Roles

1530   **Actor:** Provider Information Source

Role: Sends add, update, and delete of provider information to the Provider Information Directory. Receives acknowledgements from the Provider Information Directory that the Provider feed transaction has been received. The source only feeds the information that is meaningful for its purpose.

1535   **Actor:** Provider Information Directory

Role: Receives add, update, and delete information from the Provider Information Source. Performs data management operations as per its policies and procedures. Informs the Provider Information Source that this information has been received.

3.59.3 Referenced Standards

1540   LDAP (Lightweight Directory Access Protocol), an open standard built on the X.500 framework, is adopted by this profile as the minimal specifications for exchange standards of provider information. Furthermore, the International Organization for Standards (ISO) defined as ISO 21091 is referenced to define the attributes of health professionals and organizations to represent health care regulatory information, clinical credentials, multiple affiliations, etc. By leveraging

1545   the ISO 21091 and the underlying LDAP standard, this schema and associated transactions are designed for interoperable communications. The usage of standard LDAP schema makes the adoption of HPD by the HIT vendors easier and extensible with respect to their existing implementations.

This transaction schema applies DSMLv2 to express LDAP requests and responses in SOAP

1550   bindings. DSMLv2 is a systematic translation of LDAP's ASN.1 grammar (defined by RFC2251) into XML-Schema. DSMLv2 provides advantages in the adoption of this transaction for an interoperable electronic exchange. First, tools for marshaling XML into SOAP messages

are readily available, making development much easier. Second, firewalls are often configured to allow HTTP and HTTPS protocols to pass. This make it possible for DSML, carried in the HTTP or HTTPs protocol, to become the method for carrying provider information on the internet in an interoperable manner.

The Provider Information Feed transaction will conform to the following standard specifications:

- Health informatics — Directory services for health care providers, subjects of care, and other entities (ISO/TS 21091)

- IETF LDAP v3

- DSMLv2

- SOAP 1.2

3.59.4 Interaction Diagram

Provider
Information Source

Provider Information
Directory

Provider Information
Feed

Provider Information
Feed Acknowledgement

3.59.4.1 Provider Information Feed Request

The Provider Information Source initiates a Provider Information Feed Request message. The request includes Organizational Provider and/or Individual Provider information to be added, updated or deleted in a Provider Information Directory. Upon receiving the Provider Information Feed Request, the Provider Information Directory acknowledges to the source that the information has been received. The Provider Information Feed Request specifies one or more of the following actions:

- An "Add" to add new entries

- A "Delete" to delete any existing entries from directory

- An "Update" to modify or update any existing entries

1575 The Provider Information Directory shall support the implementation of Add/Update/ and Delete operations. However, these data administration operations that include data maintenance, data reconciliation, data validation, and data integrity checks are considered back-end processes by this profile and are therefore governed by the policies and procedures of the organization managing the Provider Information Directory and not by this transaction.

3.59.4.1.1 Trigger Events
1580

This message is sent from a Provider Information Source to a Provider Information Directory when a Provider (Organizational or Individual) is to be added to the Provider Information Directory, or when provider information expected to be on the Provider Information Directory is to be updated or deleted

3.59.4.1.2 Message Semantics
1585

The Provider Information Feed request uses the SOAP-based DSMLv2 batchRequest message to express a Provider Information Feed request through the following four LDAP operations:

1. An add operation allows for creating new provider entries in the Provider Information Directory as defined by addRequest element. As per the LDAP standard, new entry shall
1590 provide the distinguished name (DN) of the provider entry to be created and a set of attributes related to provider, including all required attributes.

A new groupofNames object representing a "member of" relationship is added using addRequest element. A new group entry shall provide the DN for group and the DN for group owner, an organization that owns a relationship with its members. If the DN of
1595 group member (Individual or Organization) is known at the time of add, then the member DN shall be provided in the add operation. An organization entry must exist in the directory before adding a groupofNames entry that this organization owns.

2. An update operation allows for updating an existing provider entry as defined by the modifyRequest element. To update an existing entry the distinguished name (DN) of the
1600 entry to be modified must be specified along with a set of modifications (add, delete, replace) to be applied. The add modification operation allows for adding a new attribute values for an existing provider entry; the replace modification operation replaces an existing attribute value with the new value; the delete modification operation deletes an attribute value from the directory.

1605 The **modifyRequest** command allows for adding a new member to an existing "member-of" group using an *add* modification operation. Feed must specify member (provider) DN and group DN to add a member to its group. A provider entry must exist in the directory before adding it to a groupofNames entry that this provider is a member of. The *delete*

1610   modification operation allows for deleting a member from its existing group. Any existing provider entry can be deactivated using this command and marking the status of provider as *Inactive*.

3. An **update** operation allows for updating an existing provider entry or a group entry as defined by the **modDNRequest** command to rename the distinguished name of an existing entry. The rename entry must specify the distinguished name of the entry to be
1615   renamed and the new distinguished name for the entry.

4. A **delete** operation for physically removing a provider entry or a groupofNames entry from the Provider Information Directory as defined by **delRequest** type. The deleted entry only provides the distinguished name of the entry to be deleted. Once deleted from directory, the entry cannot be queried in the directory. Once an entry is deleted from
1620   HPD, it is removed permanently and cannot be queried. It is an implementer's choice to allow delete method for physically deleting a provider entry

The examples for Provider Information Feed Request can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.59.4.1.3 Schema Structure

1625   This schema uses the HPD schema defined in Section 3.58.4.1.2.1.

3.59.4.1.4 Expected Actions

Upon receiving the Provider Information Feed Request, the Provider Information Directory shall perform one or more of the following actions:

- An "Add" to add new entries

1630   - A "Delete" to delete any existing entries from a directory

- An "Update" to modify or update any existing entries

The data administration operations that include data maintenance, data reconciliation, data validation, and data integrity checks are considered back-end processes by this profile and shall be executed as defined by the policies and procedures of the organization managing the Provider
1635   Information Directory.

The Provider Information Directory shall perform a requested operation of add/update/delete on the Provider Information Feed in all or in part, immediately or with delays, depending on the data administration policy or processing procedures of the Provider Information Directory. Although the Provider Information Directory is required to support the full HPD schema, it is up
1640   to a data administrator to populate a whole or sub-set of information received in the feed. The Provider Information Directory is not required to operate on ACID (atomicity, consistency, isolation, durability) properties for this transaction that guarantees that Provider Information Feed is processed reliably. Once the provider information is published on a Provider Information Directory, it implies that the information has been validated and can be provided in response to
1645   subsequent query requests. In order to assure that updates were done successfully the Provider

Information Source would need to become a Provider Information Consumer and execute a Provider Information Query.

3.59.4.2 Provider Information Feed Response

1650 The Provider Information Directory responds to the Provider Information Feed Request by issuing a Provider Information Feed Response, which may be a simple acknowledgement that the request has been received or may be a code indicating the result of processing the request.

3.59.4.2.1 Trigger Events

This message is sent by a Provider Information Directory to the Provider Information Source whenever the Provider Information Directory receives an Add/ Update / Delete Provider request,
1655 irrespective of whether the request was processed successfully or not.

The Provider Information Directory maintenance activities to process the request are outside of the scope of this transaction.

3.59.4.2.2 Message Semantics

Provider Information Feed response uses SOAP based DSMLv2 batchResponse message of
1660 LDAPResult element type to send acknowledgements for four LDAP operations: Add, Modify, Rename (modify DN) and Delete.

The resultCode for an acknowledgement may be reported as "0" to imply simple acknowledgement or successful processing. Other resultCode values may be used to signal failures. The response may contain errorMessage elements to describe processing errors in more
1665 detail. Any errors that occur prior to the processing of the Provider Information Feed Request shall be communicated via a SOAP Fault.

```
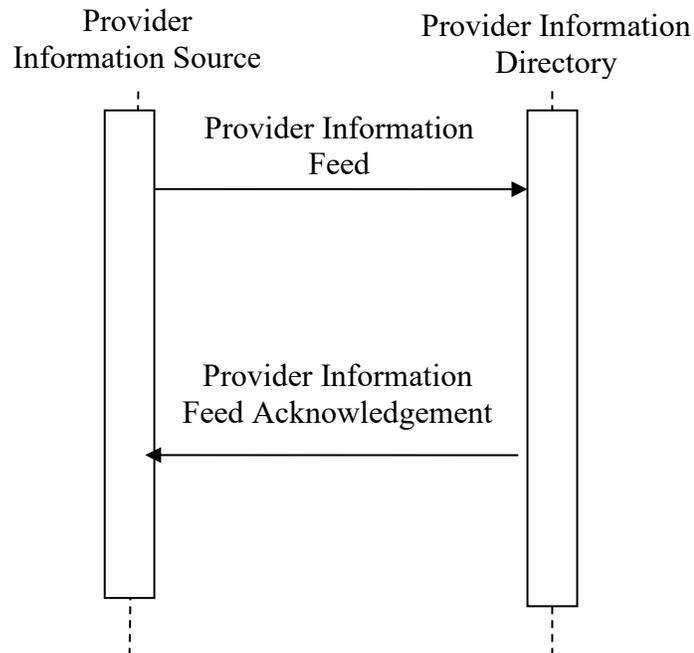<xsd:complexType name="LDAPResult">
        <xsd:complexContent>
                <xsd:extension base="DsmlMessage">
                        <xsd:sequence>
                                <xsd:element name="resultCode" type="ResultCode"/>
                                <xsd:element name="errorMessage" type="xsd:string"
minOccurs="0"/>
                                <xsd:element name="referral" type="xsd:anyURI"
minOccurs="0" maxOccurs="unbounded"/>
                        </xsd:sequence>
                </xsd:extension>
        </xsd:complexContent>
</xsd:complexType>
```

1670

1675

1680

Examples of the Provider Information Feed Response transaction can be found online on the IHE FTP site as referenced in the ITI TF-2x: Appendix W.

3.59.4.2.3 Expected Actions

There is no expected action to be taken by the Provider Information Source once the response
1685 has been received.

3.59.5 Security Considerations

No transaction specific security considerations.

3.59.5.1 Security Audit Considerations

1690 The profile recommends but does not require auditing for the Patient Information Feed. The Provider Information Feed transaction does not require auditing of the returned result because the result contains only acknowledgement. Implementers are free to audit more extensively if it is desired.

If the actors choose to audit, the actors involved shall record audit events according to the following:

1695 ### 3.59.5.1.1 Provider Information Source audit message

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110106, DCM, "Export")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-59", "IHE Transactions", "Provider Information Feed")
Source (Provider Information Source) (1)			
Human Requestor (0..n)			
Destination (Provider Information Directory) (1)			
Audit Source (Provider Information Source) (1)			
Provider (1..n)			

Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	the process ID as used within the local operating system in the local system logs.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address

	Field Name	Opt	Value Constraints
Human Requestor (if Known) **AuditMessage/Active Participant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*U*	*not specialized*
	NetworkAccessPointID	*U*	*not specialized*

Destination AuditMessage/ ActiveParticipant	UserID	M	SOAP endpoint URI.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address

Audit Source AuditMessage/AuditSo urceIdentification	*AuditSourceID*	*U*	*not specialized*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

1700

Provider (AuditMessage/ ParticipantObjectIde ntification)	ParticipantObjectTypeCode	M	"1" (Person) or "3" (Organization)
	ParticipantObjectTypeCodeRole	M	"15" (Provider)
	ParticipantObjectDataLifeCycle	M	Use "1" (Origination, Creation) for a new provider entry, "3" (Amendment) for an updated provider entry, "15" (Permanent Erasure, physical destruction) for a deleted provider entry, and "5" (Translation) for a renamed provider entry
	ParticipantObjectIDTypeCode	M	EV(99SupHPD-ISO21091-RDN, IHE, "ISO 21091 Relative Distinguished Name")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The Unique Entry Identifier (Person) or Unique Entity Identifier (Organization) in ISO 21091 Section 9.2 RDN format (Issuing Authority Name:ID). For Rename operations, use the identifier as it was before the modification.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectDetail	C	For Rename operations the element shall contain: Type: "old uid" (literal string) Value: the Unique Entry Identifier (Person) or Unique Entity Identifier (Organization) in ISO 21091 Section 9.2 RDN format as it was before the modification

3.59.5.1.2 Provider Information Directory audit message

	Field Name	Opt	Value Constraints
Event AuditMessage/ EventIdentification	EventID	M	EV(110107, DCM, "Import")
	EventActionCode	M	"U" (Update)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-59", "IHE Transactions", "Provider Information Feed")
Source (Provider Information Source) (1)			
Human Requestor (0..n)			
Destination (Provider Information Directory) (1)			
Audit Source (Provider Information Directory) (1)			

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Provider (1..n)

Where:

Source AuditMessage/ ActiveParticipant	*UserID*	*M*	*not specialized*
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address

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Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*U*	*not specialized*
	NetworkAccessPointID	*U*	*not specialized*

Destination AuditMessage/ ActiveParticipant	UserID	M	SOAP endpoint URI.
	AlternativeUserID	U	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*not specialized*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Provider (AuditMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"1" (Person) or "3" (Organization)
	ParticipantObjectTypeCodeRole	M	"15" (Provider)
	ParticipantObjectDataLifeCycle	M	Use "1" (Origination, Creation) for a new provider entry, "3" (Amendment) for an updated provider entry, "15" (Permanent Erasure, physical destruction) for a deleted provider entry, and "5" (Translation) for a renamed provider entry
	ParticipantObjectIDTypeCode	M	EV(99SupHPD-ISO21091-RDN, IHE, "ISO 21091 Relative Distinguished Name")
	ParticipantObjectSensitivity	*U*	*not specialized*

	ParticipantObjectID	M	The Unique Entry Identifier (Person) or Unique Entity Identifier (Organization) in ISO 21091 Section 9.2 RDN format (Issuing Authority Name:ID). For Rename operations, use the new identifier.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectDetail	C	For Rename operations the element shall contain: Type: "old uid" (literal string) Value: the Unique Entry Identifier (Person) or Unique Entity Identifier (Organization) in ISO 21091 Section 9.2 RDN format as it was before the modification

3.59.6 Protocol Requirements

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The Provider Information Feed request and response will be transmitted using Synchronous Web Services Exchange, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL snippet describes the type for this message:

1715
```
<types>
<xsd:schema targetNamespace="urn:oasis:names:tc:DSML:2:0:core"
      xmlns:dsml="urn:oasis:names:tc:DSML:2:0:core">
  <xsd:include  schemaLocation="../schema/DSML/DSMLv2.xsd "/>
</xsd:schema>
```
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```
</types>
<message name="ProviderInformationRequestMessage">
    <documentation>Provider Information Query/Feed Request
Message</documentation>
    <part name="body" element="dsml:batchRequest" />
```
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```
</message>
<message name="ProviderInformationResponseMessage">
    <documentation>Provider Information Query/Feed
ResponseMessage</documentation>
    <part name="body" element="dsml:batchResponse"/>
```
1730
```
</message>
```

The following WSDL snippets specify the Provider Information Feed Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

1735
```
<portType name="ProviderInformationDirectory_PortType">
    <operation name="ProviderInformationFeedRequest">
        <input message="tns:ProviderInformationRequestMessage"
          wsaw:Action="urn:ihe:iti:2010:ProviderInformationFeed"/>
        <output message="tns:ProviderInformationResponseMessage"
```
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```
          wsaw:Action="urn:ihe:iti:2010:ProviderInformationFeedResponse"/>
    </operation>
</portType>
```

Informative WSDL for the Provider Information Feed is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

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