Mobile Care Services Discovery (mCSD)

Official URL: https://profiles.ihe.net/ITI/mCSD/ImplementationGuide/ihe.iti.mcsd

Version: 3.8.0

Active as of 2022-08-12 *Computable Name*: IHE_ITI_mCSD

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The Mobile Care Services Discovery (mCSD) Profile supports RESTful queries across related care services resources.

The loosely coupled design and flexible querying capability of the mCSD Profile means it can be deployed within a variety of eHealth architectures and support a wide array of care workflows.

Volume 1: Profiles

mCSD Introduction

The Mobile Care Services Discovery (mCSD) Profile supports discovery of care services resources using a RESTful interface in interrelated, federated environments.

Use cases and solutions using mCSD are outlined in the [mCSD White Paper](#).

The profile supports querying for:

1. **Organization** – Organizations are "umbrella" entities; these may be considered the administrative bodies under whose auspices care services are provided such as Healthcare Information Exchanges(HIEs), Integrated Delivery Networks (IDNs), Non-Government Organizations (NGOs), Faith-Based Organizations (FBOs) or even a one-physician family practice. An organization has a unique identifier and may have additional administrative attributes such as contact person, mailing address, etc. Departments of an institution, or other administrative units, may be represented as child Organizations of a parent Organization.
2. **Facility** – Facilities are physical care delivery sites such as hospitals, clinics, health outposts, physician offices, labs, pharmacies, etc. A Facility has a unique identifier, geographic attributes (address, geocode), contact attributes, attributes regarding its hours of operation, etc. Each Facility is defined by a pairing of Location and Organization.
3. **Location** – Locations are physical places where care can be delivered such as facilities, buildings, wards, rooms, or vehicles. Locations also include jurisdictions such as a village districts or regions. A Location has a unique identifier and may have geographic attributes (address, geocode), attributes regarding its hours of operation, etc. Each Location may be related to one Organization. A location may have a hierarchical relationship with other locations.
4. **Jurisdiction** – Jurisdictions are political administrative units or other territories over which authority is exercised. A Jurisdiction has a unique identifier, geographic

attributes, etc. Jurisdictions include political administrative units such as village districts or regions. Each Jurisdiction is defined by a pairing of Location and Organization.

5. **Practitioner** – A Practitioner is a health worker such as defined by WHO (in Chapter 1 of the [World Health Report 2006](#)); a Practitioner might be a physician, nurse, pharmacist, community health worker, district health manager, etc. Practitioners have contact and demographic attributes. Each Practitioner may be related to one or more Organizations, one or more Locations and one or more Healthcare Services. Specific attributes may be associated with the Practitioner relationship with these other entities.

6. **Healthcare Service** – Each healthcare service has a unique identifier. Examples include surgical services, antenatal care services, or primary care services. The combination of a Healthcare Service offered at a Location may have specific attributes including contact person, hours of operation, etc.

7. **Endpoint** - An Organization may be reachable for electronic data exchange through electronic Endpoint(s). An Endpoint may be a FHIR server, an IHE web services actor, or some other mechanism. If an Organization does not have an Endpoint, it may still be reachable via an Endpoint at its parent Organization or an affiliated Organization.

8. **OrganizationAffiliation** - An Organization may have relationships with other organizations that are not hierarchical. These relationships may indicate an electronic routing path to other organizations that cannot be reached directly. OrganizationAffiliation can be used to specify relationships such as supply chains or administrative reporting structures.

The capabilities detailed in this profile support consumer-centric queries such as finding "where is the closest youth mental health services clinic" or "what are the hours of a physiotherapist near my workplace". In addition, mCSD supports crucial health system management workflows. This can include reporting and analyses, such as "what are my health human resource capacities, by facility, by cadre," "what are all the services offered at this facility," or conversely, "where are all the facilities that offer this service." The mCSD Profile may be employed to support, for example, the Provider Queries listed by the US Office of the National Coordinator as part of the [Standards and Interoperability Framework](#). In addition, mCSD can enable connectivity by providing service endpoint lookup, such as "What is the FHIR server for this organization?".

The loosely coupled design and flexible querying capability of the mCSD Profile means it can be deployed within a variety of eHealth architectures and support a wide array of care workflows.

mCSD Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. Further information about actor and transaction definitions can be found in the IHE Technical Frameworks General Introduction [Appendix A: Actors](#) and [Appendix B: Transactions](#).

Figure 1:46.1-1 shows the actors directly involved in the mCSD Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.

Care Services Selective SupplierCare Services Selective ConsumerCare Services Update SupplierCare Services Update ConsumerFind Matching Care Services [ITI-90]

Request Care Services Updates [ITI-91]

Figure 1:46.1-1: mCSD Actor Diagram

Table 1:46.1-1 lists the transactions for each actor directly involved in the mCSD Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

Table 1:46.1-1: mCSD Profile - Actors and Transactions

Actors	Transactions	Initiator or Responder	Optionality	Reference
Care Services Selective Consumer	Find Matching Care Services [ITI-90]	Initiator	R	ITI TF-2: 3.90
Care Services Selective Supplier	Find Matching Care Services [ITI-90]	Responder	R	ITI TF-2: 3.90
Care Services Update Consumer	Request Care Services Updates [ITI-91]	Initiator	R	ITI TF-2: 3.91
Care Services Update Supplier	Request Care Services Updates [ITI-91]	Responder	R	ITI TF-2: 3.91

1:46.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in ITI TF-2: Transactions. This section documents any additional requirements on mCSD actors.

mCSD supports querying for Organization, Facility, Location, Practitioner, Healthcare Service, OrganizationAffiliation, and Endpoint. However, a Care Services Selective Supplier or Care Service Update Supplier is not required to contain data on all of these.

1:46.1.1.1 Care Services Selective Consumer

The Care Services Selective Consumer queries the Care Services Selective Supplier for information about mCSD resources.

No additional requirements. The following are two example capability statement resources that a Care Services Selective Consumer could support:

- IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Selective Consumer
- IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Selective Consumer Location Distance Option

1:46.1.1.2 Care Services Selective Supplier

The Care Services Selective Supplier processes received queries from Care Services Selective Consumers and returns information about mCSD resources.

The Care Services Selective Supplier shall publish an `instance` CapabilityStatement at the metadata endpoint following [ITI Appendix Z.3](#) using the [FHIR capabilities interaction](#). All supported search parameters and search methods (GET, POST) shall be specified. The [search parameters](#) and [message semantics](#) defined in [ITI-90] shall be supported, other parameters may be supported.

This capabilities response will typically include all of the capabilities inclusive of all grouped actors and additional functionality. The following are two examples:

- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Selective Supplier](#)
- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Selective Supplier Location Distance Option](#)

1:46.1.1.3 Care Services Update Consumer

The Care Services Update Consumer can query for updates since a previous refresh, to information about mCSD resources from one or more Care Services Update Suppliers.

No additional requirements. The following are two example capability statement resources that a Care Services Update Consumer could support:

- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Update Consumer](#)
- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Update Consumer Location Distance Option](#)

1:46.1.1.4 Care Services Update Supplier

The Care Services Update Supplier can provide updates about mCSD resources in response to a refresh request from a Care Services Update Consumer. The updates include new or modified information since a previous refresh.

The Care Services Update Supplier shall publish an `instance` CapabilityStatement at the metadata endpoint following [ITI Appendix Z.3](#) using the [FHIR capabilities interaction](#). All supported interactions shall be specified. The [search parameters](#) and [message semantics](#) defined in [ITI-91] shall be supported, other parameters may be supported.

This capabilities response will typically include all of the capabilities inclusive of all grouped actors and additional functionality. The following are two examples:

- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Update Supplier](#)
- [IHE ITI Mobile Care Services Discovery (mCSD) - Care Services Update Supplier Location Distance Option](#)

mCSD Actor Options

Options that may be selected for each actor in this profile, if any, are listed in Table 1:46.2-1. Dependencies between options when applicable are specified in notes.

Table 1:46.2-1: mCSD - Actors and Options

Actor	Option Name	Reference
Care Services Selective Consumer	Location Distance Option	Section 1:46.2.1
Care Services Selective Supplier	Location Distance Option	Section 1:46.2.1
Care Services Update Consumer	No options defined	--
Care Services Update Supplier	No options defined	--

1:46.2.1 Location Distance Option

The Location Distance Option enables querying Location resources based on relative distances.

A Care Services Selective Consumer or Care Services Selective Supplier that supports the Location Distance Option will implement the semantics for the Location Distance Option of the Find Matching Care Services [ITI-90] transaction. See ITI TF-2: 2:3.90.4.1.2.2 and ITI TF-2: 2:3.90.4.2.2.2.

mCSD Required Actor Groupings

An actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile *in addition to all* of the requirements for the grouped actor (Column 2).

Section 1:46.5 describes some optional groupings that may be of interest for security considerations and Section 1:46.6 describes some optional groupings in other related profiles.

Table 1:46.3-1: mCSD - Required Actor Groupings

mCSD Actor	Actor to be grouped with	Reference	Content Bindings Reference
Care Services Selective Consumer	None	--	--
Care Services Selective Supplier	None	--	--
Care Services Update Consumer	None	--	--
Care Services Update Supplier	None	--	--

1:46.4.1 Concepts

The Mobile Care Services Discovery (mCSD) Profile supports queries for resources related to care services discovery. The relationship between these entities is illustrated in Figure 1:46.4.1-1.
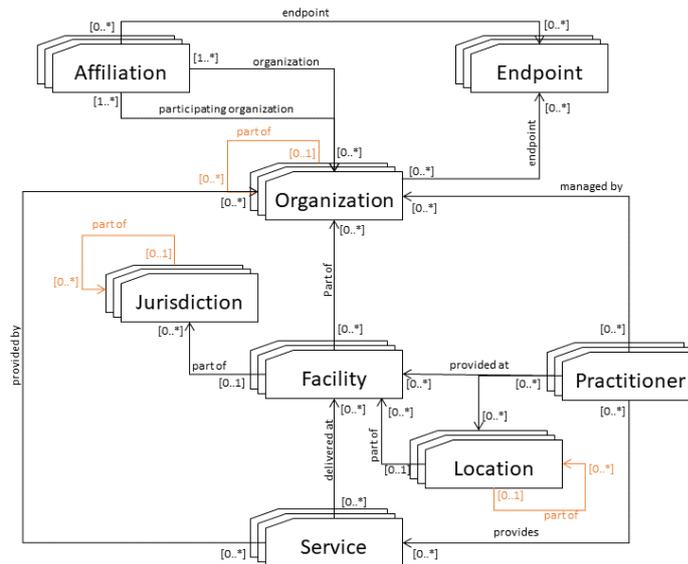

Figure 1:46.4.1-1: Top-level Relationships between Care Services Entities

1:46.4.1.1 Create, Update, and Delete Services

This profile enables tracking of changes to, searching for, and retrieval of, a set of resources. The creation, update, deletion and other maintenance activities of those resources is out of the scope of this profile.

1:46.4.2 Use Cases

1:46.4.2.1 Use Case #1: Practitioner Query

1:46.4.2.1.1 Practitioner Query Use Case Description

The patient, Vera Brooks, consults with her physician who recommends surgery. The physician can assist the patient in finding a suitable surgeon, taking into consideration the location and specialty of the surgeon.

1:46.4.2.1.2 Practitioner Query Process Flow

- Vera Brooks sees her family physician, Dr. West, regarding a recent knee injury.
- Dr. West diagnoses the problem as a torn ACL and decides to refer Vera to an orthopedic surgeon.

- Dr. West uses her EMR query tool, which implements a Care Services Selective Consumer to search for orthopedic surgeons within 30km of Vera's home.
- The EMR retrieves the information from a Healthcare Worker Registry (HWR) and displays it to Dr. West.
- Vera and Dr. West decide on an orthopedic surgeon; Dr. West prepares a referral.

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.1.2-1.

VeraDr. WestEMR (Care Services Selective Consumer)HWR (Care Services Selective Supplier)My knee hurtsdiagnosis = torn ACLuse EMR's custom query toolsearch for orthopedic surgeons,within 30km of Vera's homeFind Matching Care Services [ITI-90] requestFind Matching Care Services [ITI-90] responsecontaining PractitionerRole listResolve ReferencesReview resultswith office address, hours of operationReview and discuss options

create Referral

Figure 1:46.4.2.1.2-1: Provider Query Use Case

1:46.4.2.2 Use Case #2: Provider Lookup During an Emergency Event
1:46.4.2.2.1 Provider Lookup During an Emergency Event Use Case Description

During an emergency event, medical volunteers may report to assist. At an emergency site, the mCSD service can be queried to quickly identify and grant permission to credentialed providers to enter the scene.

During Hurricane Katrina, health care volunteers were turned away from disaster sites because there was no means available to verify their credentials. During the Ebola outbreak in West Africa, it was unclear which health workers were available and had been trained in clinical care techniques.

Resources from jurisdictional areas can be reported up to a central location so there is a single point of access. This would make it easier for responders on location to verify the credentials of a reporting health worker.

1:46.4.2.2.2 Provider Lookup During an Emergency Event Process Flow

- A jurisdictional (state/district) Care Services Update Supplier will provide data to a central Care Services Update Consumer (National HIE).
- The National HIE will be a Care Services Update Consumer grouped with a Care Services Selective Supplier.
- An emergency responder (e.g., police on site controlling access) can use a Care Services Selective Consumer to validate the credentials of a reporting health worker from the central Care Services Update Supplier.
- Based on the result, the emergency responder can allow or deny access to the reporting health worker.

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.2.2-1.

Health WorkerEmergency ResponderCare Services Selective ConsumerNational HIECare Services Update ConsumerCare Services Selective SupplierState HIECare Services Update Supplierloop[Regular update of practitioner information]Request Care Services Updates request [ITI-91]Request Care Services Updates response [ITI-91]FHIR Bundle of Updated resourcesReports for volunteer dutyFind Matching Care Services request [ITI-90]Find Matching Care Services response [ITI-90]FHIR Bundle of matching resources

Allow or deny access

Figure 1:46.4.2.2.2-1: Federated Data Site Management Workflow

1:46.4.2.3 Use Case #3: Cross-jurisdictional Site Management
1:46.4.2.3.1 Cross-jurisdictional Site Management Description

Projects like the U.S. President's Emergency Plan for AIDS Relief (PEPFAR)'s Data for Accountability, Transparency, and Impact (DATIM) need to have public health and service delivery indicators reported from a large number of sites (health facilities, communities, warehouses) within an Operating Unit (country/region). Within an Operating Unit, there are multiple, possibly overlapping, jurisdictions in operation which are managed by multiple organizations (e.g., ministries of health (MoH), faith-based organizations, international non-governmental organizations). The project needs to receive indicator submissions from pre-existing data systems hosted by these organizations. This data exchange requires a way to share site lists and implement identifier mapping between the sites in these lists.

Cross-Jurisdictional Data Exchange

Operating UnitCare Services Update ConsumerMinistry of HealthCare Services Update SupplierImplementing PartnerCare Services Update Supplier

Figure 1:46.4.2.3.1-1: Cross-Jurisdictional Data Exchange

1:46.4.2.3.2 Cross-jurisdictional Site Management Process Flow

An Operating Unit (OU) will run a Care Services Update Consumer and Care Services Update Supplier for a specific geographic area (e.g., country). This Update Consumer will query other organizations (ministries of health, partners) operating in the geographic area to get updated site data for the sites managed by the OU.

- An OU Update Consumer will query a sub-unit Care Services Update Suppliers (e.g., MoH) to get an updated list of sites under the sub-unit.
- An OU Update Consumer will query a subunit Care Services Update Suppliers (e.g., partner) to get an updated list of sites under the subunit.
- The OU Update Consumer will use entity matching to determine if there are duplicated sites in the combined data and flag them for review. (See https://wiki.ohie.org/display/documents/OpenHIE+Entity+Matching+Service.)

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.3.2-1.

OU ReviewerOperating UnitCare Services Update ConsumerMOHCare Services Update SupplierPartnerCare Services Update SupplierRequest Care Services Updates [ITI-91] requestRequest Care Services Updates [ITI-91] responseRequest Care Services Updates [ITI-91] requestRequest Care Services Updates [ITI-91] responseFlag possible duplicates for reviewLook at flagged Locations

Resolve flagged Locations

Figure 1:46.4.2.3.2-1: Cross-jurisdictional Site Management Workflow

1:46.4.2.4 Use Case #4: Master Facility List
1:46.4.2.4.1 Master Facility List Description

A developing country has decided to implement a Master Facility List (MFL) based on recommendations from the WHO in the [MFL Resource Package](). This resource includes a minimum data set to uniquely identify, locate, and contact a specific facility. Since this will be a single source of information for the country, there may be differing hierarchies that need to be supported for the facilities. For example, one hierarchy would be the administrative hierarchy for the country (region, district, county). Another would be the supply chain hierarchy where hubs may be located separately from administrative regions. Yet another could be a reporting hierarchy used to send data to international organizations.

1:46.4.2.4.2 Master Facility List Process Flow

A Master Facility List (MFL) will run a Care Services Update Supplier and Care Services Selective Supplier for an entire country. A Human Resources Information System (HRIS) will run a Care Services Update Consumer to retrieve the list of facilities. A Logistics Management Information System (LMIS) will run a Care Services Update Consumer to retrieve the list of facilities.

- An HRIS will query the MFL for an updated list of facilities where Practitioners can provide care.
- An LMIS will query the MFL for an updated list of facilities for the supply chain to deliver health care supplies.
- The MFL will return updated facilities to each of these systems with multiple hierarchies.

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.4.1-1.

MFLCare Services Update SupplierHRISCare Services Update ConsumerLMISCare Services Update ConsumerRequest Care Services Updates [ITI-91] requestRequest Care Services Updates [ITI-91] responseRequest Care Services Updates [ITI-91] request

Request Care Services Updates [ITI-91] response

Figure 1:46.4.2.4.2-1: Master Facility List Workflow

In this use case, a healthcare worker needs to identify the organizations active in the State/Province Health Information Exchange (HIE) that have been added since 2017, to make contact with new organizations and negotiate future clinical exchange.

Membership in an HIE is a more dynamic and transitory business relationship than the "parent-child" hierarchy represented by Organization.partOf. For these more flexible business relationships, the OrganizationAffiliation resource allows for organizations to relate to each other in non-hierarchical and more dynamic business relationships. Unlike partOf, the relationship is itself a resource, so it can be categorized with codes, status, etc.

In the example below:

- Organization B has a parent Organization A.
- Organization B has been a part of its State/Province HIE since 2018 and is a member in good standing.

The `organization` defines a role for the relationship, e.g., "HIE/HIO" or "member", and the `participatingOrganization` fills the role.

Organization.partOf vs. Affiliation

Organization BParent Organization AState/Province HIEidentifier = 1.2.3:OrganizationAffiliationcode = HIE/HIOactive = trueperiod.start = 3/1/2018partOfparticipatingOrganization

organization

Figure 1:46.4.2.5.1-1: Organization.partOf vs. Affiliation

- A healthcare worker searches for organizations active in the State/Province HIE that have been added since 2017.
- The EMR searches for OrganizationAffiliations where the `organization` is the HIE, `active` is true, and `period.start` is 2017 or later.
- The EMR searches for details on the participating Organizations.
- The EMR presents the results to the healthcare worker.

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.5.2-1.

Health WorkerEMRCare Services Selective ConsumerHIE DirectoryCare Services Selective Suppliershow me active members of theState/Province HIE added since 2017Find Matching Care Services [ITI-90] request:OrganizationAffiliationFind Matching Care Services [ITI-90] responseFind Matching Care Services [ITI-90] request:OrganizationFind Matching Care Services [ITI-90] response

Review list

Figure 1:46.4.2.5.2-1: Health Information Exchange (HIE) Membership Discovery Workflow

Users in Health IT systems often need to be able to obtain clinical information electronically from outside systems, for example, in preparation for an encounter. This use case describes how a user in a system identifies the organizations a patient has received care from, as well as criteria for the kinds of clinical documents of interest, and then how their EMR queries the directory for a Health Information Exchange (HIE) to search for each organization and a compatible services endpoint the EMR can use.

An HIE publishes a directory that contains all of its member organizations and their electronic endpoints.

Note: Guidance for usage of endpoints in directories is provided here.

- Endpoints are not limited to RESTful FHIR servers; they may point to systems that implement other mechanisms. This IG provides two profiles: a general endpoint, and an endpoint to an IHE Document Sharing actor.
- Organizations might support one or many communication channels, each of which might have one or more distinct endpoints. For example, a FHIR communication channel might require only a single endpoint (i.e., a single Service Base URL), while an IHE XCA communication channel might require separate endpoints for each transaction.

The diagram below shows an excerpt of the HIE directory, showing one participant in the HIE that implements IHE XCA with two Endpoints, and another that only uses one.

Health Information Exchange Directory Excerpt

Participant A:Organizationname = "Participant A":EndpointconnectionType = ihe-xcaextension:specificType = XCA-RespGateway-Queryaddress = http://exampleA.org/iti-38/:EndpointconnectionType = ihe-xcaextension:specificType = XCA-RespGateway-Retrieveaddress = http://exampleA.org/iti-39/Participant B:Organizationname = "Participant B":EndpointconnectionType = ihe-xcaextension:specificType = XCA-RespGateway-Query, XCA-RespGateway-Retrieveaddress = http://exampleB.org/xca/

Figure 1:46.4.2.6.1-1: Health Information Exchange

- In preparation for a patient visit, a healthcare worker knows and identifies the organizations that have provided care for this patient, and identifies document types of interest.
- The EMR will query the HIE directory for the relevant organizations and their endpoints.
- For each organization obtained, the EMR will check for endpoints that support the needed XCA transactions, and make requests against these endpoints to obtain clinical documents.
- The EMR presents the obtained documents to the healthcare worker, who reviews them.

The interactions between the various actors in this use case are shown in Figure 1:46.4.2.6.2-1.

Health WorkerEMRCare Services Selective ConsumerXCA Initiating GatewayHIE Endpoint DirectoryCare Services Selective SupplierParticipantXCA Responding GatewayPrepare for patient visitidentify care organizationsidentify document types of interestFind Matching Care Services [ITI-90] requestFind Matching Care Services [ITI-90] responsecontaining Organizations with their Endpointsloop[each Organization]Check for XCA EndpointsQuery [ITI-38] and Retrieve [ITI-39] documents of interestreturn documents

Review obtained documents

Figure 1:46.4.2.6.2-1: Health Information Exchange (HIE) Endpoint Discovery Workflow

mCSD Security Considerations

Actors are expected to follow the recommendations and requirements found in ITI TF-2: Appendix Z.8 "Mobile Security Considerations".

The resources exchanged in this profile may contain information which pose a privacy risk, or in some cases, a safety risk, to providers and other personnel, as well as patients. For example, practitioner phone numbers and home addresses may be conveyed. Implementers should determine what data will be exposed by the system and what level of public access there will be if any.

The Endpoint Resources exchanged in this profile will expose information about the particular APIs and web services running on the underlying host systems. This might attract malicious activity or provide hints to potential attackers on how to attack a particular host system. Implementers should consider this when determining the access policies for these Resources. System administrators for the underlying host systems must follow industry best practices for authentication, authorization, auditing, timely application of software patches, etc.

There are many reasonable methods of security for interoperability transactions which can be implemented without modifying the characteristics of the transactions in the mCSD Profile. The use of TLS is encouraged, specifically the use of the ATNA Profile (see ITI TF-1: 9).

User authentication on mobile devices and browsers is typically handled by more lightweight authentication schemes such as HTTP Authentication, OAuth 2.0, or OpenID Connect. IHE has a set of profiles for user authentication including Internet User Authentication (IUA) for REST-based authentication. The network communication security and user authentication are layered in the HTTP transport layer.

mCSD Cross Profile Considerations

1:46.6.1 Aggregate Data Exchange – ADX

The IHE QRPH Aggregate Data Exchange (ADX) Profile enables reporting of public health and service delivery indicators in various locations. A reporting system may play the role of a

Care Services Update Consumer to ensure that it has an updated list of the resources for the reporting locations.

Additionally, a service that contains information on practitioners (and may be a Care Services Selective Supplier or Care Services Update Supplier) can also be used to generate an ADX message to satisfy the use case of a district health manager running an aggregate report on staffing levels by facility and health worker type from the ITI Care Services Discovery (CSD) Profile.

1:46.6.2 Care Services Discovery – CSD

A Care Services Directory in the CSD Profile can be grouped with the Care Services Update Supplier from mCSD. The CSD Care Services InfoManager could implement the mCSD Care Services Update Consumer and the Care Services Selective Supplier Actors. The CSD Service Finder could implement the mCSD Care Services Selective Consumer. This enables the CSD actors to allow RESTful transactions without having to change the underlying data store.

1:46.6.3 Health Provider Directory – HPD

A Provider Information Source in HPD can also implement the Care Services Update Supplier from mCSD. Note that in this case the Provider Information Source would be queried for updates instead of pushing the updates to the Consumer. The HPD Provider Information Directory could implement the mCSD Care Services Update Consumer and the Care Services Selective Supplier Actors. The HPD Provider Information Consumer could implement the mCSD Care Services Selective Consumer. This enables the HPD actors to allow RESTful transactions without having to change the underlying data store.

1:46.6.4 Mobile Alert Communication Management – mACM

The mACM Profile defines the means to send an alert to practitioners. The mCSD Profile provides a way to query that list of practitioners. A mACM Alert Reporter can be grouped with a Care Services Update Consumer or a Care Services Selective Consumer to ensure that it has an updated list of practitioners.

mCSD Deployment Considerations
1:46.7.1 Simple Deployment

A deployment may only have a single server that will maintain data. In this case, you would only need the Care Services Selective Supplier (or Care Services Update Supplier) to send search results back to one or more Care Services Selective Consumers (or Care Services Update Consumer). See Figure 1:46.7.1-1 below.

ClientServerCare Services Update ConsumerCare Services Update Supplier

Find Matching Care Services[ITI-90]

Figure 1:46.7.1-1: Simple Deployment

A Federated Deployment has multiple levels of the Care Services Update Suppliers linked to Care Services Update Consumers. These Update Consumers may also support being Care Services Update Suppliers so that higher level Update Consumers can receive their updates. They may also support being a Care Services Selective Supplier so that Selective Consumer clients can query that level of information. See Figure 1:46.7.2-1 below.

Interrelated content is maintained by the Care Services Update Consumer. The Care Services Update Consumer routinely obtains new or updated content from Care Services Update Suppliers by polling them. These updates may refresh a data cache which the Update Consumer maintains. The Update Consumer's cache is refreshed at an appropriate interval specified by the implementing jurisdiction. The implementing jurisdiction will consider the implications of out of date information when setting the refresh interval between cache updates. The normal delays in updating listings will also be part of this consideration.

The various data sources would maintain definitive data regarding one or more of: Organization, Location, Healthcare Service, or Practitioner and implement the Care Services Update Supplier. These Care Services Update Suppliers would respond to a Care Services Update Consumer's request for new or updated content since a specified date and time. To support this capability, a Care Services Update Supplier should support time stamped updates. Data elements that are deprecated should not simply be deleted, but rather are updated to an appropriate status indicating their deprecation.

This deployment may also have cross-jurisdictional considerations if any of the Update Suppliers have overlap in the data they manage. In this instance, the Care Services Update Consumer would need to resolve any conflicts before sharing this information as either a Care Services Update Supplier or a Care Services Selective Supplier. The way in which these conflicts are resolved is defined by the implementing jurisdiction of the Care Services Update Consumer.
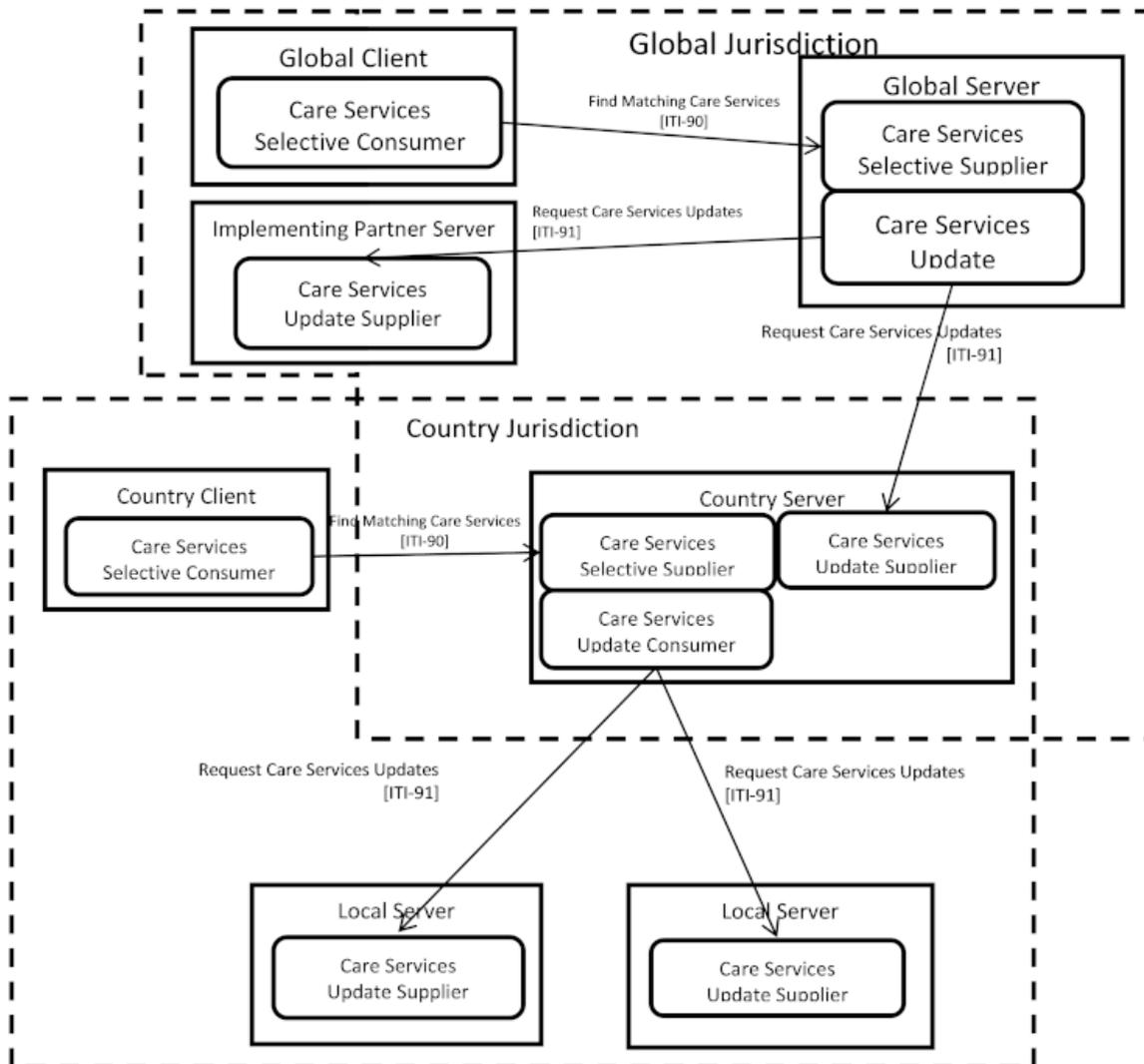
Figure 1:46.7.2-1: Federated and Cross Jurisdictional Deployment

The Care Services Selective Consumer is the actor that queries for information about interrelated care services. These queries are sent to the Care Services Selective Supplier who develops a response based on the content in its local data store. When a Care Services Selective Supplier is combined with a Care Services Update Consumer (Global and Country servers from Figure 1:46.7.2-1), it should maintain a cache of the aggregated information from all the configured Care Services Update Suppliers it is linked to.

In order for the Care Services Update Consumer's (Global and Country servers) cached content to be able to serve its role as an interlinked data source, the following conditions should be met by Care Services Update Suppliers who maintain content.

1. Implementing jurisdictions may mandate terminologies for Organization Type, Service Type, Location Type, Location Status, Practitioner Type, Practitioner Status, Contact Point Type, Credential Type, Specialization Code, and language code. Care

Services Update Suppliers would be configurable to use these terminologies, where mandated. In the case of a cross jurisdictional deployment, mapping between the terminology used by the various jurisdictions may need to be maintained.

2. Implementing jurisdictions may mandate conventions regarding the types, components and formatting of Name, Address and Address Line elements. Care Services Update Suppliers would be configurable to use these formatting conventions, where mandated.

3. Implementing jurisdictions may mandate the source of truth regarding Organization ID, Healthcare Service ID, Location ID and Practitioner ID. Care Services Update Suppliers would ensure that all cross-referenced IDs match corresponding resources in the jurisdictionally mandated sources of truth.

For guidance on handling challenges regarding the representation of names across multiple languages and in different cultures, refer to the ITI TF-2: 3.24.5.2.3.1. This section in the ITI Technical Framework describes the use of the language tag as documented in IETF RFC1766 and the HL7 XCN name data type.

1:46.7.2.1 Terminology Services

All referenced terminologies from a Care Services Selective Supplier or Care Services Update Supplier may be pre-coordinated or they may be resolvable from one or more terminology services. Though it is out of scope of the mCSD Profile to define the means of interacting with a terminology service, this could be provided, for example, through the Sharing Valuesets, Codes, and Maps (SVCM) Profile.

mCSD Endpoint Usage Considerations

This section provides guidance for populating and using Endpoint resources in an mCSD directory to enable electronic communication, for example defining local points of connectivity within a community, or defining a Health Information Exchange (HIE) that allows multiple communities to interoperate.

Many current Endpoint directories based on FHIR are purpose-built, which is to say they are deployed to a server that only hosts Organization and Endpoint resources, and only for the use case of Endpoint lookup. For this reason, directories often reflect network details directly in the Organization resource, such as:

- The organization's role in the network, like participant or sub-participant, expressed as the type of organization.
- The organization's relationship to its connectivity vendor, expressed as the organization hierarchy (i.e., partOf).
- The organization's connectivity state as an extension.
- Supported profiles, purposes of use, etc. as extensions.
- The organization's identity as a home community ID, for use in IHE Document Sharing profiles.

When the organization's structure and its network capabilities need to vary independently (e.g., an organization uses two connectivity vendors), directories typically handle this by creating parallel instances of the Organization resource that then have to be merged by custom code to display.

We anticipate these conflicts increasing over time due to many forces:

- Implementers taking advantage of profiles like mCSD to represent more comprehensive organizational and personnel structures.
- Implementers scaling by delegating maintenance of organization sub-trees to the organizations themselves.
- Directories consolidating/federating over time into more comprehensive "phonebooks", where a given organization participates in multiple HIEs. One example would be the USA ONC TEFCA Recognized Coordinating Entity, which will be maintaining a directory that consists of entries supplied by each Qualified Health Information Network (QHIN).

In this guidance, we allow organization structure and network details to vary independently by moving network details out of the Organization and into the Endpoint and OrganizationAffiliation resources.

1:46.8.1 Endpoint to an Organization

The simplest usage model for a client is when the organization it needs to contact has a dedicated Endpoint resource in Organization.endpoint. Because this Endpoint is Organization-specific, it does not matter to the client who hosts it. Some examples follow.

Note: The managingOrganization of an Endpoint is who users need to contact for support. It may or may not be the same as the organization that hosts it. Since hosting is not reflected in the directory, we are indicating it in the diagrams below by the URLs.

Organization A hosts its own Endpoint:

Organization AEndpoint for Aaddress = https://orgA.orgendpoint

managingOrganization

Figure 1:46.8.1-1: Organization-specific Endpoint Hosted by the Organization

Organization A is directly reachable by an endpoint hosted by its parent Organization B:

Organization AParent Organization BEndpoint for Aaddress = https://orgB.org/orgApartOfendpoint

managingOrganization

Figure 1:46.8.1-2: Organization-specific Endpoint Hosted by Parent

Organization C is directly reachable by an endpoint hosted by its affiliated Organization D:

Organization CAffiliated Organization DOrganizationAffiliationEndpoint for Caddress = https://orgD.org/orgCparticipatingOrganizationorganizationendpoint

managingOrganization

Figure 1:46.8.1-3: Organization-specific Endpoint Hosted by Affiliation

Organization E is directly reachable by an endpoint hosted by a hidden (i.e., not in the directory) Intermediary F:

Organization EEndpoint for Eaddress = https://intermediaryF.org/orgEIntermediary Fnot listed in directory.endpoint

managingOrganization

Figure 1:46.8.1-4: Organization-specific Endpoint Hosted by Hidden Intermediary

1:46.8.2 Endpoint to a Structure

When an Organization with an Endpoint has a complex structure, for example, sub-organizations, clients can often make use of this structure:

Organization AOrganization BEndpointOrganization CpartOfendpoint

partOf

Figure 1:46.8.2-1: Endpoint to Organizational Hierarchy

Typical directories will take an organizational hierarchy to imply accessibility to parts of the structure, for example:

- For FHIR REST endpoints, the URL is simply the Service Base URL as specified in FHIR R4 3.1.0.1.2. Clients can expect to find resources related to Organizations A, B and C.
- For XCA endpoints, a client querying Organization A for documents (e.g., using [ITI-38]) may receive documents from Organizations A, B and C. If these organizations have identifiers of type Home Community ID in the directory, clients can expect to see these identifiers in the returned document metadata.
- For XDR endpoints, a client sending a Provide and Register Document Set-b ([ITI-41]) request to Organization A can optionally specify Organizations B and/or C in intendedRecipient.
- For MHD endpoints, a client sending a Provide Document Bundle ([ITI-65]) request to Organization A can optionally specify Organizations B and/or C in intendedRecipient.

Specific details of addressing to federated recipients are out of the scope of this IG.

Examples of this kind of federated structure are shown in ITI TF-1: Appendix E.9, for XCA Responding Gateways.

By contrast, OrganizationAffiliations by themselves do not necessarily imply this kind of electronic accessibility. For this reason, this IG defines the code "DocShare-federate", which explicitly declares that the participatingOrganization is accessible as a federated organization via the OrganizationAffiliation.endpoint.

The following diagram shows the same accessibility, but using OrganizationAffiliation.

Organization AOrganization BEndpointOrganization C:OrganizationAffiliationcode = DocShare-federate:OrganizationAffiliationcode = DocShare-federateparticipatingOrganizationorganizationparticipatingOrganizationorganizationendpointendpoint

endpoint

Figure 1:46.8.2-2: Endpoint to Organizational Affiliates

In addition, these mechanisms may be combined. This may be useful, for example, when adding an existing organizational structure to an HIE.

Organization AOrganization BEndpointOrganization COrganization DOrganization E:OrganizationAffiliationcode = DocShare-federateparticipatingOrganizationorganizationendpointendpointpartOfpartOf

partOf

Figure 1:46.8.2-3: Endpoint to Hybrid Organizational Structure

1:46.8.3 Grouping Actors

Grouped actors may be represented as well, although not explicitly. In the following example, Participant A is reachable by either an MHD endpoint or XDR endpoints. The directory does not reflect which endpoint is the adapter or the adaptee.

:Organizationname = "Participant A":EndpointconnectionType = ihe-xcaextension:specificType = XDR-DocRecipient:EndpointconnectionType = hl7-fhir-restextension:specificType = MHD-Recipient-ProvideRegMHD support also shown in CapabilityStatement

Figure 1:46.8.3-1: Endpoints to Grouped Actors

1:46.8.4 Endpoint Discovery Usage

The following example shows the steps used by a Care Services Selective Consumer to navigate a directory to find suitable electronic service Endpoints to some desired Organizations. In this example, a "suitable" Endpoint means it supports an IHE Document Sharing profile, and is based on .connectionType, .extension:specificType, .payloadType, .payloadMimeType, and status (both Endpoint.status as well as the actual status of the electronic service). The example uses the [mCSD-profiled OrganizationAffiliation] StructureDefinition-IHE.mCSD.OrganizationAffiliation.DocShare.html) that indicates federated connectivity for Document Sharing (e.g., affiliated organizations may be addressed as intendedRecipient). The pseudocode below uses a depth-first, first-match search, and does not protect against loops.

Until a suitable Endpoint is found or the search is complete, check the following in this order:

- Locate the desired Organization resource.
- Check if it has a suitable Organization.endpoint.
- Find OrganizationAffiliation resources where the Organization is the .participatingOrganization, and OrganizationAffiliation.code = DocShare-federate.
- For each OrganizationAffiliation found:
  - Check if it has a suitable OrganizationAffiliation.endpoint.
  - Check if it has a suitable OrganizationAffiliation.organization.endpoint.

- Continue searching for a suitable Endpoint by traversing the OrganizationAffiliation resources recursively (i.e., where the OrganizationAffiliation.organization of the current resource is the .participatingOrganization of the next resource).
- If there is an Organization.partOf (i.e., a parent), check if it has a suitable Organization.endpoint.
  - Continue searching for a suitable Endpoint by traversing Organization.partOf recursively.

Rather than a first-match search, the Care Services Selective Consumer might search for and decide among multiple electronic paths to the same Organization. For example:

- It finds a suitable Endpoint resource for the target Organization, but instead uses an Endpoint for an Organization two levels higher to make a broader search for records.
- It finds suitable Endpoint resources for equivalent mechanisms, XDR [ITI-41] and MHD [ITI-65], and chooses MHD as the preferred transaction.
- It finds suitable Endpoint resources to the same Organization via two different HIEs, and prefers one HIE based on lower fees and authorization differences.

Volume 2: Transaction Detail

Find Matching Care Services [ITI-90]

2:3.90.1 Scope

The Find Matching Care Services transaction returns a list of matching care services resources based on the query sent. A Care Services Selective Consumer initiates a Find Matching Care Services transaction against a Care Services Selective Supplier.

2:3.90.2 Actor Roles

Actor	Role
Care Services Selective Consumer	Requests a list of resources from the Care Services Selective Supplier based on query parameters
Care Services Selective Supplier	Accepts the query request and returns a list of matching resources

2:3.90.3 Referenced Standards

- HL7 FHIR standard Release 4 http://hl7.org/fhir/R4/index.html

2:3.90.4 Messages

Care Services Selective ConsumerCare Services Selective Supplier1. Find Matching Care Services Request [ITI-90]2. Find Matching Care Services Response [ITI-90]3. Retrieve Care Services Resource Request [ITI-90]

4. Retrieve Care Services Resource Response [ITI-90]

Figure 2:3.90.4-1: Interaction Diagram

The Find Matching Care Services message is a FHIR search operation on the mCSD Resources.

2:3.90.4.1.1 Trigger Events

A Care Services Selective Consumer triggers a Find Matching Care Services Request to a Care Services Selective Supplier according to the business rules for the query. These business rules are outside the scope of this transaction.

2:3.90.4.1.2 Message Semantics

A Care Services Selective Consumer initiates a search request using HTTP GET or POST as defined at http://hl7.org/fhir/R4/http.html#search on the mCSD Resources. The Care Services Selective Supplier shall support both GET and POST based searches. The query parameters are identified below. A Care Services Selective Consumer may query any combination or subset of the parameters.

A Care Services Selective Supplier shall support responding to a request for both the JSON and the XML messaging formats as defined in FHIR. A Care Services Selective Consumer shall accept either the JSON or the XML messaging formats as defined in FHIR. See ITI TF-2: Z.6 for more details.

A Care Services Selective Supplier shall implement the parameters described below for the mCSD resources it supports. A Care Services Selective Supplier may choose to support additional query parameters beyond the subset listed below. Any additional query parameters supported shall be supported according to the core FHIR specification.

See ITI TF-2: Appendix W for informative implementation material for this transaction.

2:3.90.4.1.2.1 Common Parameters

The Care Services Selective Supplier shall support the `:contains` and `:exact` modifiers in all of the string query parameters below.

The Care Services Selective Supplier shall support the following search parameters as defined at http://hl7.org/fhir/R4/search.html#all.

```
_id
_lastUpdated
```

The Care Services Selective Supplier shall also support the following prefixes for the `_lastUpdated` parameter: `gt`, `lt`, `ge`, `le`, `sa`, and `eb`.

2:3.90.4.1.2.2 Organization Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the Organization Resource as defined at http://hl7.org/fhir/R4/organization.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
active
identifier
name
partof
type
_include=Organization.endpoint
_revInclude=Location:organization
_revInclude=OrganizationAffiliation:participating-organization
_revInclude=OrganizationAffiliation:primary-organization
```

2:3.90.4.1.2.3 Location Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the Location Resource as defined at http://hl7.org/fhir/R4/location.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
identifier
name
organization
partof
status
type
_include=Location:organization
```

2:3.90.4.1.2.4 Practitioner Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the Practitioner Resource as defined at http://hl7.org/fhir/R4/practitioner.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
active
identifier
name
given
family
```

2:3.90.4.1.2.5 PractitionerRole Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the PractitionerRole Resource as defined at [http://hl7.org/fhir/R4/practitionerrole.html#search] (http://hl7.org/fhir/R4/practitionerrole.html#search).

```
active
location
organization
practitioner
role
service
specialty
_include=PractitionerRole:practitioner
```

The Care Services Selective Supplier shall support the following search parameters on the HealthcareService Resource as defined at http://hl7.org/fhir/R4/healthcareservice.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
active
identifier
location
name
organization
service-type
```

2:3.90.4.1.2.7 Location Distance Option Message Semantics

The Care Services Selective Supplier supporting the Location Distance Option shall support the following search parameters on the Location Resource as defined at http://hl7.org/fhir/R4/location.html#search.

```
near
```

2:3.90.4.1.2.8 Endpoint Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the Endpoint Resource as defined at http://hl7.org/fhir/R4/endpoint.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
identifier
organization
status
```

2:3.90.4.1.2.9 OrganizationAffiliation Resource Message Semantics

The Care Services Selective Supplier shall support the following search parameters on the OrganizationAffiliation Resource as defined at http://hl7.org/fhir/R4/organizationaffiliation.html#search. String parameter modifiers are defined at http://hl7.org/fhir/R4/search.html#string.

```
active
date
identifier
participating-organization
primary-organization
role
_include=OrganizationAffiliation.endpoint
```

2:3.90.4.1.3 Expected Actions

The Care Services Selective Supplier shall process the query to discover the resources that match the search parameters given, and return a response as per Section 2:3.90.4.2 or an error as per http://hl7.org/fhir/R4/search.html#errors.

2:3.90.4.2.1 Trigger Events

The Care Services Selective Supplier sends the Find Matching Care Services Response to the Care Services Selective Consumer when results to the query are ready.

2:3.90.4.2.2 Message Semantics

The Care Services Selective Supplier shall support the search response message as defined at http://hl7.org/fhir/R4/http.html#search on the following Resources.

- Organization, as defined at http://hl7.org/fhir/R4/organization.html
- Location, as defined at http://hl7.org/fhir/R4/location.html
- Practitioner, as defined at http://hl7.org/fhir/R4/practitioner.html
- PractitionerRole, as defined at http://hl7.org/fhir/R4/practitionerrole.html
- HealthcareService, as defined at http://hl7.org/fhir/R4/healthcareservice.html
- Endpoint, as defined at http://hl7.org/fhir/R4/endpoint.html
- OrganizationAffiliation, as defined at http://hl7.org/fhir/R4/organizationaffiliation.html

All References (Reference.reference element) to Resources defined in this transaction shall be populated with an accessible URL (see https://www.hl7.org/fhir/references-definitions.html#Reference.reference), unless the referenced resource is not available at a URL known to the server.

2:3.90.4.2.2.1 FHIR Organization Resource Constraints

A Care Services Selective Consumer may query on Organization Resources. A Care Services Selective Supplier shall return a Bundle of matching Organization Resources. The Organization Resource shall be further constrained as described in the Organization Profile for mCSD.

A Care Services Selective Consumer may query on Organization Resources when working with Facilities. A Care Services Selective Supplier shall return a Bundle of matching Organization Resources when working with Facilities. The FHIR Organization Resource shall be further constrained as described in the Organization for Facilities Profile for mCSD.

A Care Services Selective Consumer may query on Organization Resources when working with Jurisdictions. A Care Services Selective Supplier shall return a Bundle of matching Organization Resources when working with Jurisdictions. The FHIR Organization Resource shall be further constrained as described in the Organization for Jurisdictions Profile for mCSD.

2:3.90.4.2.2.2 FHIR Location Resource Constraints

A Care Services Selective Consumer may query on Location Resources. A Care Services Selective Supplier shall return a Bundle of matching Location Resources. The Location Resource shall be further constrained as described in the Location Profile for mCSD.

When the resource is a Facility, the Location Resource shall be paired with an Organization Resource using the managingOrganization element in Location. A Care Services Selective Consumer may query on Location Resources when working with Facilities. A Care Services Selective Supplier shall return a Bundle of matching Location Resources when working with Facilities. The FHIR Location Resource shall be further constrained as described in the Location for Facilities Profile for mCSD.

When the resource is a Jurisdiction, the Location Resource shall be paired with an Organization Resource using the managingOrganization element in Location. A Care Services Selective Consumer may query on Location Resources when working with Jurisdictions. A Care Services Selective Supplier shall return a Bundle of matching Location Resources when working with Jurisdictions. The FHIR Location Resource shall be further constrained as described in the Location for Jurisdictions Profile for mCSD.

When a geographic boundary is available for the Jurisdiction Location, the location-boundary-geojson extension defined at http://hl7.org/fhir/extension-location-boundary-geojson.html shall be used to store this information.

When supporting the Location Distance Option, the Location Resource shall be further constrained as described in the Location with Distance Option Profile for mCSD.

2:3.90.4.2.2.3 FHIR Practitioner Resource Constraints

A Care Services Selective Consumer may query on Practitioner Resources. A Care Services Selective Supplier shall return a Bundle of matching Practitioner Resources. The Practitioner Resource shall be further constrained as described in the Practitioner Profile for mCSD.

2:3.90.4.2.2.4 FHIR PractitionerRole Resource Constraints

A Care Services Selective Consumer may query on PractitionerRole Resources. A Care Services Selective Supplier shall return a Bundle of matching PractitionerRole Resources. The PractitionerRole Resource shall be further constrained as described in the PractitionerRole Profile for mCSD.

2:3.90.4.2.2.5 FHIR HealthcareService Resource Constraints

A Care Services Selective Consumer may query on HealthcareService Resources. A Care Services Selective Supplier shall return a Bundle of matching HealthcareService Resources. The HealthcareService Resource shall be further constrained as described in the HealthcareService Profile for mCSD.

2:3.90.4.2.2.6 FHIR OrganizationAffiliation Resource Constraints

A Care Services Selective Consumer may query on OrganizationAffiliation Resources. A Care Services Selective Supplier shall return a Bundle of matching OrganizationAffiliation Resources. The OrganizationAffiliation Resource shall be further constrained as described in the OrganizationAffiliation Profile for mCSD.

When the OrganizationAffiliation contains an Endpoint to an IHE document sharing environment, it shall further be constrained as described in the [OrganizationAffiliation for Document Sharing Profile for mCSD](#).

2:3.90.4.2.2.7 FHIR Endpoint Resource Constraints

A Care Services Selective Consumer may query on Endpoint Resources. A Care Services Selective Supplier shall return a Bundle of matching Endpoint Resources. The Endpoint Resource shall be further constrained as described in the [Endpoint Profile for mCSD](#).

When the Endpoint is to an IHE document sharing environment, it shall further be constrained as described in the [Endpoint for Document Sharing Profile for mCSD](#).

2:3.90.4.2.3 Expected Actions

The Care Services Selective Consumer has received the response and continues with its workflow.

2:3.90.4.3 Retrieve Care Services Resource message

This message represents an HTTP GET from the Care Services Selective Consumer to the Care Services Selective Supplier and provides a mechanism for retrieving a single Care Services Resource with a known resource identifier.

2:3.90.4.3.1 Trigger Events

When the Care Services Selective Consumer possesses a Care Services Resource identifier (either through query, database lookup, or other mechanism) for which it requires additional or new information, it issues a Retrieve Care Services Resource interaction.

2:3.90.4.3.2 Message Semantics

The Retrieve Care Services Resource is conducted by executing an HTTP GET against the Care Services Selective Supplier's Care Services Resource URL, providing the resource id of the resource being retrieved. The target is formatted as:

```
GET [base]/[resource]/[resourceId]
```

The Care Services Selective Supplier shall respond to this query by sending a single Care Services Resource instance.

The `resourceId` included in the request always represents the unique identifier for the Resource within the scope of the URL. For example, while `http://example1.org/ihe/Practitioner/1` and `http://example2.com/ihe/Practitioner/1` both contain the same `[resourceId]`, they reference two different resource instances.

Note: The use of "http" or "https" in URL does not override requirements to use TLS for security purposes.

The Care Services Selective Supplier shall retrieve the record indicated by the Resource identifier on the HTTP GET supplied by the Care Services Selective Consumer. The Care Services Selective Supplier shall respond to the retrieve request as described by the following cases:

Case 1: The Care Services Selective Supplier finds the care services record matching the `resourceId` sent in the HTTP request.

`HTTP 200` (OK) is returned as the HTTP status code.

A Care Services Resource is returned representing the result.

Case 2: The Care Services Selective Supplier fails to find the care services record matching the `resourceId` sent in the HTTP request.

`HTTP 404` (Not Found) is returned as the HTTP status code

An `OperationOutcome` Resource is returned indicating that the Care Services Resource could not be found, in an issue having:

Attribute	Value
severity	error
code	not-found

The Care Services Selective Supplier may return other HTTP status codes to represent specific error conditions. When HTTP error status codes are returned by the Care Services Selective Supplier, they shall conform to the HTTP standard [RFC2616](). Their use is not further constrained or specified by this transaction.

2:3.90.4.4 Retrieve Care Services Resource Response message

The Care Services Selective Supplier's response to a successful Retrieve Care Services Resource message shall be an `HTTP 200` (OK) Status code with a Care Services Resource, or an appropriate error code. See the [Retrieve Care Services Resource message expected actions]() for additional details.

2:3.90.4.4.1 Trigger Events

The Care Services Selective Supplier found a record matching the Resource identifier specified by the Care Services Selective Consumer.

2:3.90.4.4.2 Message Semantics

The Retrieve Care Services Resource response is sent from the Care Services Selective Supplier to the Care Services Selective Consumer as a single Care Services Resource.

See ITI TF-2: Appendix Z.6 for more details on response format handling. See ITI TF-2: Appendix Z.7 for guidance on Access Denied.

If the Care Services Selective Supplier is unable to produce a response in the requested format, it shall respond with an `HTTP 400` error indicating that it was unable to fulfill the request. The Care Services Selective Supplier may be capable of servicing requests for response formats not listed, but shall, at minimum, be capable of producing XML and JSON encodings.

2:3.90.4.4.2.1 Care Services Resource Definition in the Context of Care Services Resource Response

The Care Services Resource definition in the context of a retrieve interaction is the FHIR definition of the various Care Services Resources. Table 2:3.90.4.4.2.1-1 lists the resources with where to find the additional constraints.

Table 2:3.90.4.4.2.1-1: Care Services Resource Constraints

Resource	Section
Organization	2:3.90.4.2.2.1 FHIR Organization Resource Constraints
Location	2:3.90.4.2.2.2 FHIR Location Resource Constraints
Practitioner	2:3.90.4.2.2.3 FHIR Practitioner Resource Constraints
PractitionerRole	2:3.90.4.2.2.4 FHIR PractitionerRole Resource Constraints
HealthcareService	2:3.90.4.2.2.5 FHIR HealthcareService Resource Constraints

2:3.90.5 Security Considerations

See ITI TF-1: 46.5 for security considerations for the mCSD Profile.

See ITI TF-2: Appendix Z.8 for common mobile security considerations.

2:3.90.5.1 Security Audit Considerations

Note that the same audit message is recorded by both Care Services Selective Supplier and Care Services Selective Consumer. The difference being the Audit Source element. Both sides record to show consistency between the message sent by the Consumer and the action taken at the Supplier.

The actors involved shall record audit events according to the Audit Event for Find Matching Care Services for Read by the Care Services Selective Supplier and Consumer or the Audit Event for Find Matching Care Services for Query by the Care Services Selective Supplier and Consumer.

2:3.91.1 Scope

The Request Care Services Updates transaction is used to return a list of updated care services resources. A Care Services Update Consumer initiates a Request Care Services Updates transaction against a Care Services Update Supplier.

2:3.91.2 Actor Roles

Actor	Role
Care Services Update Consumer	Requests a list of updated resources from the Care Services Update Supplier.
Care Services Update Supplier	Accepts the update request and returns a list of updated resources.

2:3.91.3 Referenced Standards

- HL7 FHIR standard Release 4

2:3.91.4 Messages

Care Services Update ConsumerCare Services Update Supplier1. Request Care Services Updates Request [ITI-91]

2. Request Care Services Updates Response [ITI-91]

Figure 2:3.91.4-1: Interaction Diagram

2:3.91.4.1 Request Care Services Updates Request Message

A Request Care Services Updates message is a FHIR history operation, optionally using the `_since` parameter, on the mCSD Resources.

2:3.91.4.1.1 Trigger Events

A Care Services Update Consumer triggers a Request Care Services Updates Request to a Care Services Update Supplier according to the business rules for the query. These business rules are outside the scope of this transaction.

2:3.91.4.1.2 Message Semantics

A Care Services Update Consumer initiates a history request using HTTP GET as defined at http://hl7.org/fhir/R4/http.html#history on the mCSD Resources.

A Care Services Update Supplier and Care Services Update Consumer shall support the following parameters.

```
_since
```

They shall also support the requirements in ITI TF-2: Z.6, Populating the Expected Response Format.

A Care Services Update Supplier shall support receiving a request for both the JSON and the XML messaging formats as defined in FHIR. A Care Services Update Consumer shall accept either the JSON or the XML messaging formats as defined in FHIR.

See ITI TF-2: Appendix W for informative implementation material for this transaction.

2:3.91.4.1.3 Expected Actions

The Care Services Update Supplier shall process the query to discover the resources that match the search parameters given, and gives a response as per Section 2:3.91.4.2 or an error as per http://hl7.org/fhir/R4/search.html#errors.

2:3.91.4.2 Request Care Services Updates Response Message

The Request Care Services Updates [ITI-91] transaction uses the response semantics as defined at http://hl7.org/fhir/R4/http.html#history as applicable for the resources.

2:3.91.4.2.1 Trigger Events

The Care Services Update Supplier sends the Request Care Services Updates Response to the Care Services Update Consumer when results are ready.

2:3.91.4.2.2 Message Semantics

The Care Services Update Supplier shall support the history response message as defined at http://hl7.org.fhir/R4/http.html#history on the following Resources:

- Organization, as defined at http://hl7.org/fhir/R4/organization.html
- Location, as defined at http://hl7.org/fhir/R4/location.html
- Practitioner, as defined at http://hl7.org/fhir/R4/practitioner.html
- PractitionerRole, as defined at http://hl7.org/fhir/R4/practitionerrole.html
- HealthcareService, as defined at http://hl7.org/fhir/R4/healthcareservice.html

  All References (reference.reference element) to Resources defined in this transaction shall be populated with an accessible URL (see https://www.hl7.org/fhir/references-definitions.html#Reference.reference), unless the referenced resource is not present on a server accessible to the client.

2:3.91.4.2.2.1 FHIR Organization Resource Constraints

A Care Services Update Consumer and a Care Services Update Supplier shall query or return an Organization Resource. The Organization Resource shall be further constrained as described in the Organization Profile for mCSD.

When the Organization represents a Facility and is paired with a Location, the FHIR Organization Resource shall be further constrained as described in the Organization for Facilities Profile for mCSD.

When the Organization represents a Jurisdiction and is paired with a Location, the FHIR Organization Resource shall be further constrained as described in the Organization for Jurisdictions Profile for mCSD.

2:3.91.4.2.2.2 FHIR Location Resource Constraints

A Care Services Update Consumer and a Care Services Update Supplier shall query or return a Location Resource. The Location Resource shall be further constrained as described in the Location Profile for mCSD.

When the Location represents a Facility and is paired with an Organization, the FHIR Location Resource shall be further constrained as described in the Location for Facilities Profile for mCSD.

When the Location represents a Jurisdiction and is paired with an Organization, the FHIR Location Resource shall be further constrained as described in the Location for Jurisdictions Profile for mCSD.

When supporting the Location Distance Option, the FHIR Location Resource shall be further constrained as described in the Location with Distance Option Profile for mCSD.

2:3.91.4.2.2.3 FHIR Practitioner Resource Constraints

A Care Services Update Consumer and a Care Services Update Supplier shall query or return a Practitioner Resource. The Practitioner Resource shall be further constrained as described in the Practitioner Profile for mCSD.

2:3.91.4.2.2.4 FHIR PractitionerRole Resource Constraints

A Care Services Update Consumer and a Care Services Update Supplier shall query or return a PractitionerRole Resource. The PractitionerRole Resource shall be further constrained as described in the PractitionerRole Profile for mCSD.

2:3.91.4.2.2.5 FHIR HealthcareService Resource Constraints

A Care Services Update Consumer and a Care Services Update Supplier shall query or return a HealthcareService Resource. The HealthcareService Resource shall be further constrained as described in the HealthcareService Profile for mCSD.

2:3.91.4.2.3 Expected Actions

The Care Services Update Consumer has received the response and continues with its workflow.

2:3.91.5 Security Considerations

See [ITI TF-1: 46.5](#) for security considerations for the mCSD Profile.

See [ITI TF-2: Appendix Z.8](#) for common mobile security considerations.

2:3.91.5.1 Security Audit Considerations

Note that the same audit message is recorded by both Care Services Update Supplier and Care Services Update Consumer. The difference being the Audit Source element. Both sides record to show consistency between the message sent by the Supplier and the action taken at the Consumer.

The actors involved shall record audit events according to the [Audit Event for Request Care Services Updates by the Care Services Update Supplier and Consumer](#).