



**CENTER** *for* **MEDICAL**  
**INTEROPERABILITY**

The Center for Medical Interoperability Specification  
Provisioning Flows

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**CMI-SP-F-PF-D01-20190311**

**DRAFT**

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<b>Work in Progress</b>	An incomplete document designed to guide discussion and generate feedback that may include several alternative requirements for consideration.
<b>Draft</b>	A document in specification format considered largely complete, but lacking review by Members and vendors. Drafts are susceptible to substantial change during the review process.
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## 1 Scope

### 1.1 Introduction and Purpose

This document addresses foundational requirements related to provisioning flows for clients. It specifies requirements for clients to connect to access and IP networks, acquire the necessary configuration parameters, and discover the platform to initiate care communications.

### 1.2 Requirements

Throughout this document, the words that are used to define the significance of particular requirements are capitalized. These words are:

"SHALL"	This word means that the item is an absolute requirement of this specification.
"SHALL NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighed before choosing a different course.
"SHOULD NOT"	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

## 2 References

### 2.1 Normative References

In order to claim compliance with this specification, it is necessary to conform to the following standards and other works as indicated, in addition to the other requirements of this specification. Notwithstanding, intellectual property rights may be required to use or implement such normative references.

All references are subject to revision, and parties to agreement based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

- [CMI SP F-TD]           “Terms and Definitions”, Center for Medical Interoperability, March 2019  
<https://medicalinteroperability.org/specifications/D01/CMI-DOC-TD-D01-20190311.pdf>
- [CMI-TR-F-SEC]        "Security Considerations for Foundational Efforts", Center for Medical Interoperability, March 2019  
<https://medicalinteroperability.org/specifications/D01/CMI-TR-F-SEC-D01-20190311.pdf>
- [CMI-SP-F-CP]         "Certificate Policy for The Center’s Public Key Infrastructure", Center for Medical Interoperability Certificate Policy, March 2019  
<https://medicalinteroperability.org/specifications/D01/CMI-SP-F-CP-D01-20190311.pdf>
- [CMI-SP-F-ANC]        "Access Network Connectivity Specification", Center for Medical Interoperability, March 2019  
<https://medicalinteroperability.org/specifications/D01/CMI-SP-F-ANC-D01-20190311.pdf>
- [CMI-SP-CDI-IHE-PCD-IST]   "Clinical Data Interoperability Based on IHE PCD –Identity & Secure Transport” , Center for Medical Interoperability, March 2019  
<https://medicalinteroperability.org/specifications/D01/CMI-SP-CDI-IHE-PCD-IST-D01-20190311.pdf>
- [IETF-RFC2131]        “Dynamic Host Configuration Protocol”  
<https://tools.ietf.org/html/rfc2131>
- [IETF-RFC3315]        “Dynamic Host Configuration Protocol for IPv6 (DHCPv6)”  
<https://tools.ietf.org/html/rfc3315>
- [IETF-RFC3646]        “DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)”  
<https://tools.ietf.org/html/rfc3646>

- [IETF-RFC5908] “Network Time Protocol (NTP) Server Option for DHCPv6”  
<https://tools.ietf.org/html/rfc5908>
- [IETF-RFC4704] “The Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Client Fully Qualified Domain Name (FQDN) Option”  
<https://tools.ietf.org/html/rfc4704>

## 2.2 Reference Acquisition

Center for Medical Interoperability (The Center), 8 City Boulevard, Suite 203 | Nashville, TN 37209, USA;  
Phone +1-615-257-6410; <http://medicalinteroperability.org/>

The Internet Engineering Task Force (IETF), IETF Secretariat®, c/o Association Management Solutions, LLC (AMS), 5177 Brandin Court, Fremont, CA 94538, USA; Phone: +1-510-492-4080;  
<https://www.ietf.org/>

## 3 Terms and Definitions

This specification uses the terms and definitions in [CMI SP F-TD].

## 4 Abbreviations and acronyms

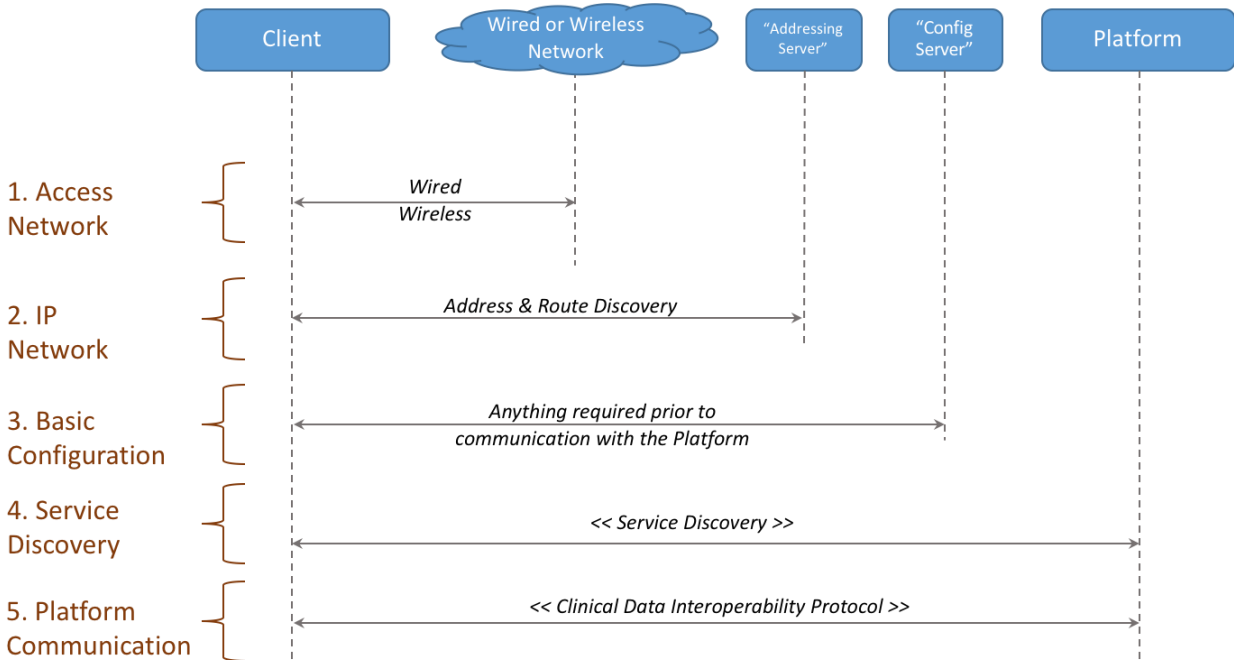
This specification uses the following abbreviations:

<b>CMI</b>	Center for Medical Interoperability
<b>HL7</b>	Health Level Seven International
<b>IHE PCD</b>	Integrating the Healthcare Enterprise Patient Care Device
<b>MLLP</b>	Minimum Lower Layer Protocol
<b>NTP</b>	Network Time Protocol
<b>PKI</b>	Public Key Infrastructure
<b>TLS</b>	Transport Layer Security
<b>WG</b>	Working Group

## 5 Overview

A client that is connecting with a health care system for the first time or due to reinitialization goes through the following steps: access network connectivity, IP network connectivity, basic configuration and service discovery.

These steps, and their ordering, are logically depicted in Figure 1.



**Figure 1 - High-Level Provisioning Flow**

### 5.1 Access Network Connectivity

A client that controls access network communications SHALL connect to a wired or wireless network as specified in [CMI-SP-F-ANC].

### 5.2 IP Network Connectivity

After a client is connected to an access network, it connects to an IP network for care related communications. A client that communicates via an IPv4 network and has responsibility to obtain its IP address SHALL use [IETF-RFC2131]. A client that communicates via an IPv6 network and has responsibility to obtain its IP address SHALL use [IETF-RFC3315]. If a client that has responsibility to obtain its IP address supports both IPv4 and IPv6, then the client SHALL prioritize IPv6 and fallback to IPv4 if IPv6 access is unavailable. The client uses the corresponding backoff and retry mechanisms when errors occur during the specified processes. Future revisions may address additional backoff and retry mechanisms associated with IP network connectivity.



### 5.3 Basic Configuration

A client is also responsible for obtaining specific additional information during initialization: NTP server address, domain name server, and the domain name. These are all obtained via DHCP. A client requests these additional options during the DHCP process. For DHCPv4, the client SHALL request DHCP options #4 (time server), #6 (DNS Server) and #15 (domain name). For DHCPv6, the client SHALL request DHCP options specified in [IETF-RFC5908], [IETF-RFC3646] and [IETF-RFC4704]. Future versions of this document may provide more information on these options.

In the presence of multiple DHCP responses, the client selects one that provides the options listed in this sub-section as specified in [IETF-RFC2131] or [IETF-RFC3315]. If one or more of the options are not provided, then the client SHALL continue to retry the DHCP process. Future versions of this document may specify: backoff process to avoid DHCP avalanches, guidance on DHCP lease, and roaming behavior to ensure consistent network connectivity.

### 5.4 Service Discovery

For this version of the document, service discovery identifies two network components; the platform and the management entity. To keep this process lightweight the client leverages parameters obtained via DHCP and DNS resolution. Specifically, the client SHALL discover the platform using the following fully qualified domain name and attempt to resolve it via the DNS server provided via DHCP:

<CMI\_PLATFORM>.<domain or sub-domain name obtained via DHCP>

The client SHALL also discover the management entity using the following fully qualified domain name and attempt to resolve it via the DNS server provided via DHCP:

<CMI\_MGMT>.<domain or subdomain name obtained via DHCP>

Note that the platform and the management entity can be the same network component. If the client is unable to connect to either the platform or the management entity during operations, then it SHALL attempt to resolve the IP address via DNS and use the returned address. If the DNS server is unable to resolve the platform, management entity, or both, the client SHALL retry periodically. A future revision of this document may specify specific retry and backoff mechanisms.

### 5.5 Communication with the Platform

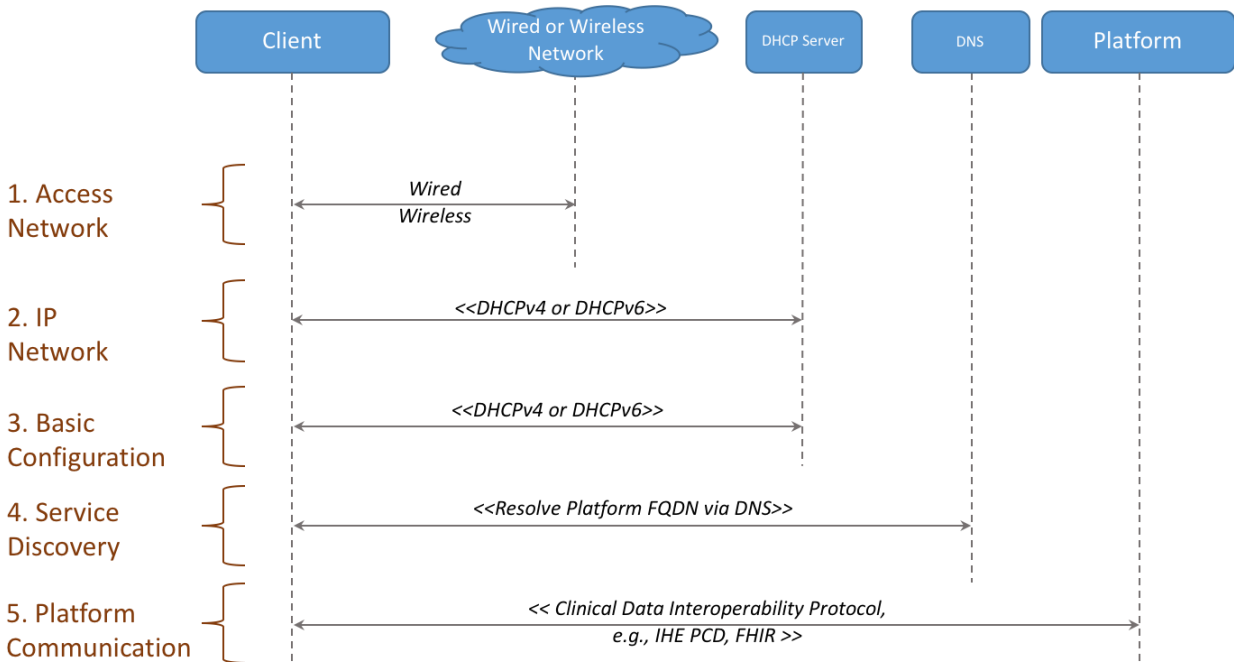
The clinical data communication protocol for use with the Platform is specified by the clinical data interoperability documents.

### 5.6 Communication with the Management Entity

The management protocol for use with the Platform is specified by foundational efforts, such as secure software update.

## 5.7 Provisioning Flow

The client SHALL follow the steps specified in this section in the order specified in Figure 2. This diagram redraws Figure 1 with additional clarity based on the chosen protocols.



**Figure 2 - Provisioning Flow Specifics**

## Appendix I. Acknowledgements

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