HL7 FHIR 技術概要と開発

日本HL7協会　適合性認定委員長
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日本医療情報学会春季学術大会チュートリアル

http://www.hl7.org/fhir/?ref=learnmore
http://www.fhir.org

※この資料は技術委員会 平井先生の資料をベースに若干手を加えたものです。

Agenda

1. 実装面から見た、FHIRの技術概要
   - RESTful の基礎知識
   - リソース定義と、Profile、Extension
   - 4つのPardigm

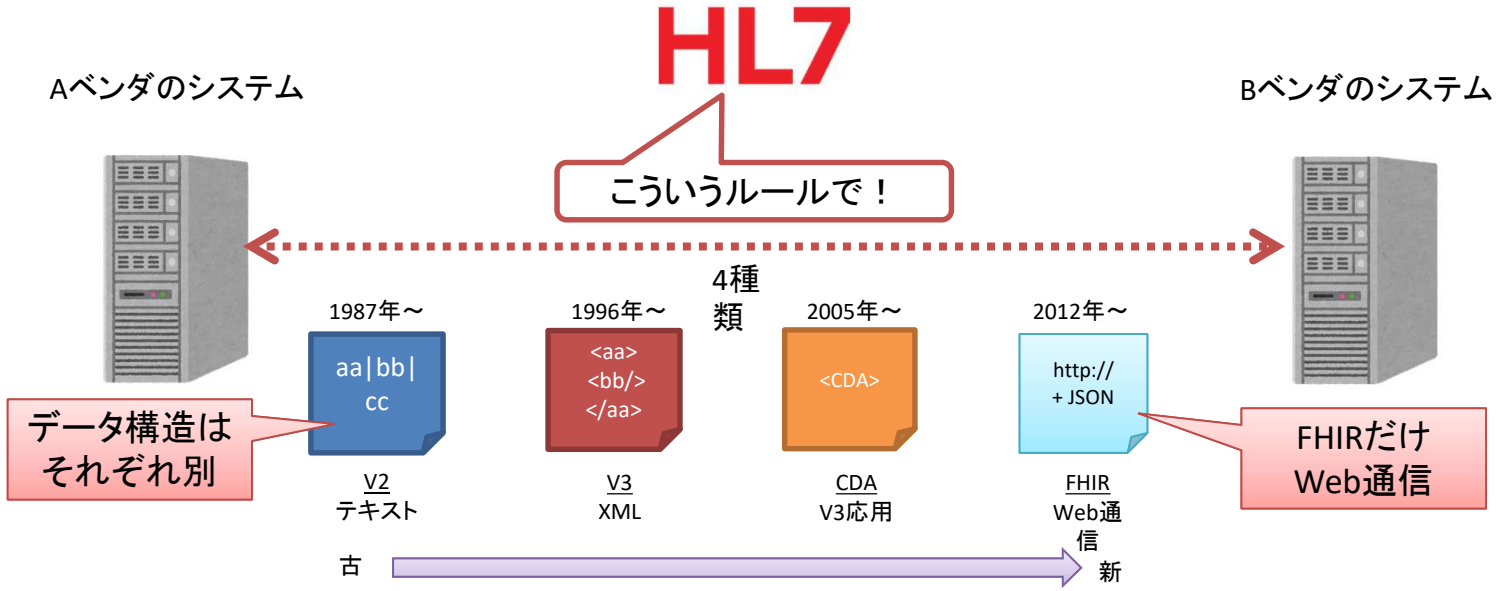
2. HL7 v2 メッセージ → FHIR の実例解説
   - 実装で使うツール類
   - HL7 v2 メッセージを FHIR Resource郡にマッピング
   - FHIR サーバへの Resource 生成と POST
   - FHIR サーバからの Resource Get

HL7 とは何か？

HL7はコンピュータ間での医療文書情報のデータ連携を標準化するための国際規格で、
V2（テキスト）、V3（XML）、CDA（V3の進化版）、FHIR（Web通信）の4種類がある。

それぞれ、データ構造（フォーマット）のルールを定めている。

FHIRのみ、Web通信での連携を前提としている。



何故FHIRなのか、FHIRとは何か

- 米国民全員が自身の医療情報にアクセスできる
  - ブッシュHealth IT Initiative、オバマHITECH(Meaningful Use)
  - 自身の健康管理に参加、重複処方、処方ミスの把握
- SOA(ROA)によるWEBサービス (スマホの普及)
  - SOAP(複雑、難解だが)→REST(ROA)=RFH(FHIR)
  - 多くの人、多くの(中小も)企業が開発に参加できる
  - ほとんどの国民が医療データにアクセスできる
- そして、重要な情報はCDAで→C-CDA
- さらに、米国 Standard Strategy
  - 今はUS Realm ➔ World Wide へ

Blue Button Download My Data

なぜリソース？

- ONCの方針
  - WEBサービス (Service Oriented Architecture)
    - SOA → REST→ RESTful･ROA

- HL7 V2･V3では多くの専門家が必要
  - 多くの人、多くの企業が参加できなければならない

RFH HL7 International ← HL5

WEB標準の復習：httpメッセージ

普段から我々が使用している環境

http://www.hl7.org/fhir

GET /www.hl7.org/fhir HTTP/1.1

```
10 6f 3f dc 59 c7 28 f0  76 45 dd d4 08 00 45 00   .o?.Y.(. vE....E.
01 12 00 00 40 00 40 06  66 0b c0 a8 0b 06 40 09   ....@.@. f.....@.
c8 23 cc b2 00 50 a5 ed  45 6b 0c 34 54 5b 80 18   .#...P.. Ek.4T[..
08 04 04 21 00 00 01 01  08 0a 1f 46 a5 47 00 00   ...!.... ...F.G..
00 00 47 45 54 20 2f 66  68 69 72 20 48 54 54 50   ..GET /f hir HTTP
2f 31 2e 31 0d 0a 63 61  63 68 65 2d 63 6f 6e 74   /1.1..ca che-cont
72 6f 6c 3a 20 6e 6f 2d  63 61 63 68 65 0d 0a 50   rol: no- cache..P
6f 73 74 6d 61 6e 2d 54  6f 6b 65 6e 3a 20 35 64   ostman-T oken: 5d
39 37 62 38 32 34 2d 61  64 64 64 2d 34 34 31 35   97b824-a ddd-4415
2d 38 35 34 38 2d 66 38  61 39 36 31 63 62 65 38   -8548-f8 a961cbe8
62 32 0d 0a 55 73 65 72  2d 41 67 65 6e 74 3a 20   b2..User -Agent:
50 6f 73 74 6d 61 6e 52  75 6e 74 69 6d 65 2f 37   PostmanR untime/7
2e 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   .6.0..Ac cept: */
2a 0d 0a 48 6f 73 74 3a  20 77 77 77 2e 68 6c 37   *..Host:  www.hl7
2e 6f 72 67 0d 0a 61 63  63 65 70 74 2d 65 6e 63   .org..ac cept-enc
6f 64 69 6e 67 3a 20 67  7a 69 70 2c 20 64 65 66   oding: g zip, def
6c 61 74 65 0d 0a 43 6f  6e 6e 65 63 74 69 6f 6e   late..Co nnection
3a 20 6b 65 65 70 2d 61  6c 69 76 65 0d 0a 0d 0a   : keep-a live....
```

```
0000  48 54 54 50 2f 31 2e 31  20 32 30 30 20 4f 4b 0d   HTTP/1.1  200 OK.
0010  0a 43 6f 6e 74 65 6e 74  2d 4c 65 6e 67 74 68 3a   .Content -Length:
0020  20 31 38 38 37 37 0d 0a  43 6f 6e 74 65 6e 74 2d    18877.. Content-
0030  54 79 70 65 3a 20 74 65  78 74 2f 68 74 6d 6c 0d   Type: te xt/html.
0040  0a 43 6f 6e 74 65 6e 74  2d 4c 6f 63 61 74 69 6f   .Content -Locatio
0050  6e 3a 20 68 74 74 70 3a  2f 2f 77 77 77 2e 68 6c   n: http: //www.hl
0060  37 2e 6f 72 67 2f 66 68  69 72 2f 69 6e 64 65 78   7.org/fh ir/index
```

```
0140  30 31 39 20 30 36 3a 30  36 3a 34 39 20 47 4d 54   019 06:0 6:49 GMT
0150  0d 0a 0d 0a ef bb bf 3c  21 44 4f 43 54 59 50 45   .......< !DOCTYPE
0160  20 48 54 4d 4c 3e 0d 0a  3c 68 74 6d 6c 20 78 6d    HTML>.. <html xm
0170  6c 6e 73 3d 22 68 74 74  70 3a 2f 2f 77 77 77 2e   lns="htt p://www.
0180  77 33 2e 6f 72 67 2f 31  39 39 39 2f 78 68 74 6d   w3.org/1 999/xhtm
0190  6c 22 20 78 6d 6c 3a 6c  61 6e 67 3d 22 65 6e 22   l" xml:l ang="en"
01a0  20 6c 61 6e 67 3d 22 65  6e 22 3e 0d 0a 3c 68 65    lang="e n">..<he
01b0  61 64 3e 0d 0a 20 20 3c  74 69 74 6c 65 3e 49 6e   ad>..  < title>In
01c0  64 65 78 20 2d 20 46 48  49 52 20 76 34 2e 30 2e   dex - FH IR v4.0.
```

```
<!DOCTYPE HTML>
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <title>Index - FHIR v4.0.0</title>
    <meta name="viewport" content="width=device-width, initial-
scale=1.0"/>
    <meta name="author" content="http://hl7.org/fhir"/>
    <link rel="stylesheet" href="fhir.css"/>
    <link rel="Prev" href="http://hl7.org/fhir/index.html"/>
```

HL5

FHIR(ROA)のリソース

全てのリソースは一意なアドレスで識別される

Resource type

http://server.org/fhir/Patient/1234

endpoint

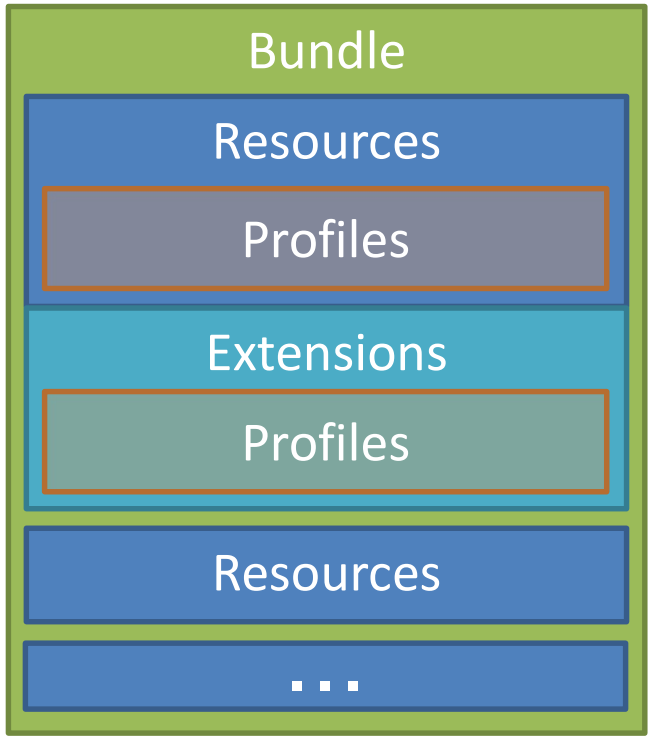
Resource id

FHIRリソースは

- データ交換の小さな論理的に独立したユニット
- 振る舞いと意味が定義されている
- 身元と所在が明確
- トランザクションの最小単位
- 医療に関連すること

Health Level Seven Internation
Index - FHIR v4.0.0
保護されていない通信 | www.hl7.org/fhir/?ref=learnmore
http://www.hl7.org/fhir/?ref=learnmore
FHIR®© FHIR R4
Home Getting Started Documentation Resources Profiles Extensions Operations Terminologies
仕様書
リソース
プロファイル
This is the Current officially released version of FHIR, which is R4.
For a full list of available versions, see the Directory of published versions.
FHIRリリース版選択
0 Welcome to FHIR®
FHIR is a standard for health care data exchange, published by HL7®.
First time here?
See the executive summary, the developer's introduction, clinical introduction, or architect's introduction, and then the FHIR overview / roadmap & Timelines. See also the open license (and don't miss the full Table of Contents and the Community Credits or you can search this specification).
概要とサマリー
Level 1 Basic framework on which the specification is built
Foundation
Base Documentation, XML, JSON, Data Types, Extensions
Level 2 Supporting implementation and binding to external specifications
Implementer Support
Downloads, Version Mgmt, Use Cases, Testing
Security & Privacy
Security, Consent, Provenance, AuditEvent
Conformance
StructureDefinition, CapabilityStatement, ImplementationGuide, Profiling
Terminology
CodeSystem, ValueSet, ConceptMap, Terminology Svc
Exchange
REST API + Search
Documents
Messaging
Services
Databases
仕様カテゴリー
5つのレベル
Level 3 Linking to real world concepts in the healthcare system
Administration
Patient, Practitioner, CareTeam, Device, Organization, Location, Healthcare Service
Level 4 Record-keeping and Data Exchange for the healthcare process
Clinical
Diagnostics
Medications
Workflow
Financial

FHIR のデータ構造定義



- 基本 Resource だけでは不十分である
  ⇒ 医療には多様な背景、状況がある
- 特定の実装・ユースケースには次のような要求がある
  - Resource の制約 ⇒ Profiles
  - Resource の拡張 ⇒ Extensions
  - 特殊なコードセット、用語
  - 特化したリソースの活用
- FHIR はプラットフォームの仕様である
  - Profile は特定の要件（目的）に適合するものである
  - 基本通信フォーマットは変更しない
- 実運用では Resource の組み合わせが使われる
  - Bundle は 複数の（拡張、制約を定義された）Resource をまとめて定義できる

FHIR の Paradigm 概念

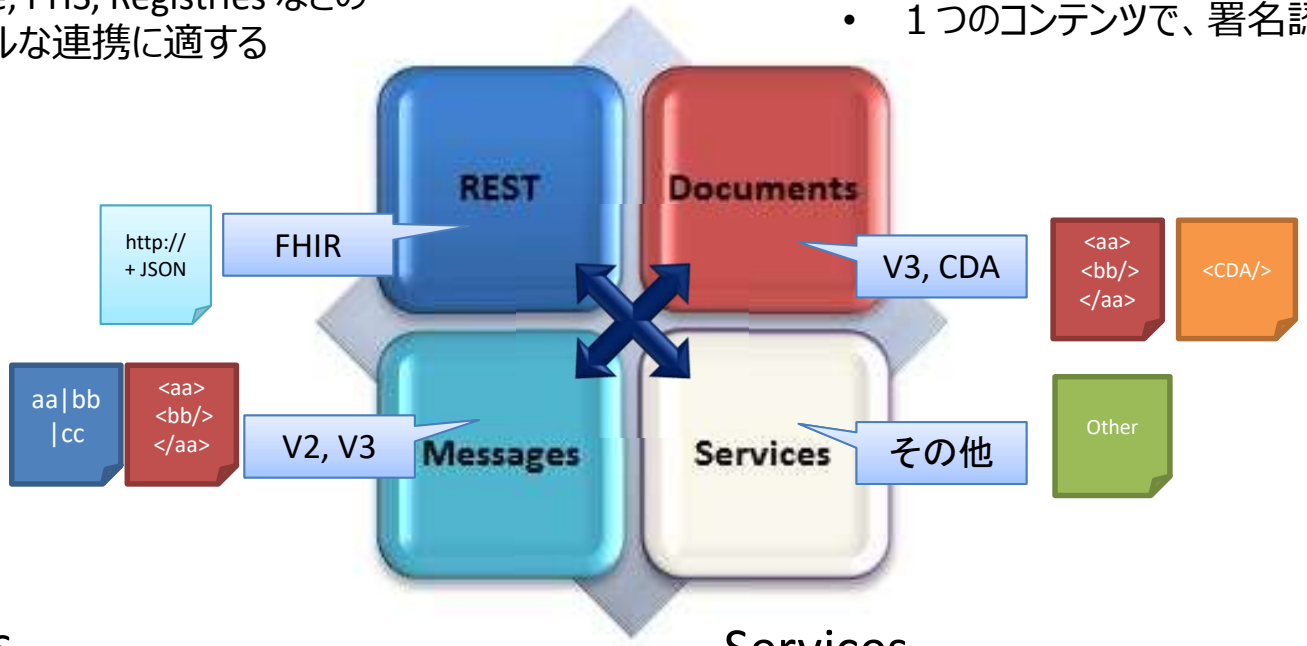
➢ 通信上の４つの Paradigms

REST (REpresentational State Transfer)

- HTTPの活用、操作は事前定義
- Mobile, PHS, Registries などの
  シンプルな連携に適する

Documents

- 独立型文書（CDA）または集約された
  Resource のタイプ
- １つのコンテンツで、署名認証などが可



Messages

- V2, V3 と同様でバンドルリソース集合
- 要求＋応答のバンドル
- イベント駆動型で非同期も可

Services

- SOA原則に基づき、自由にワークフローを実現
- 制約：FHIRリソースに適すること。

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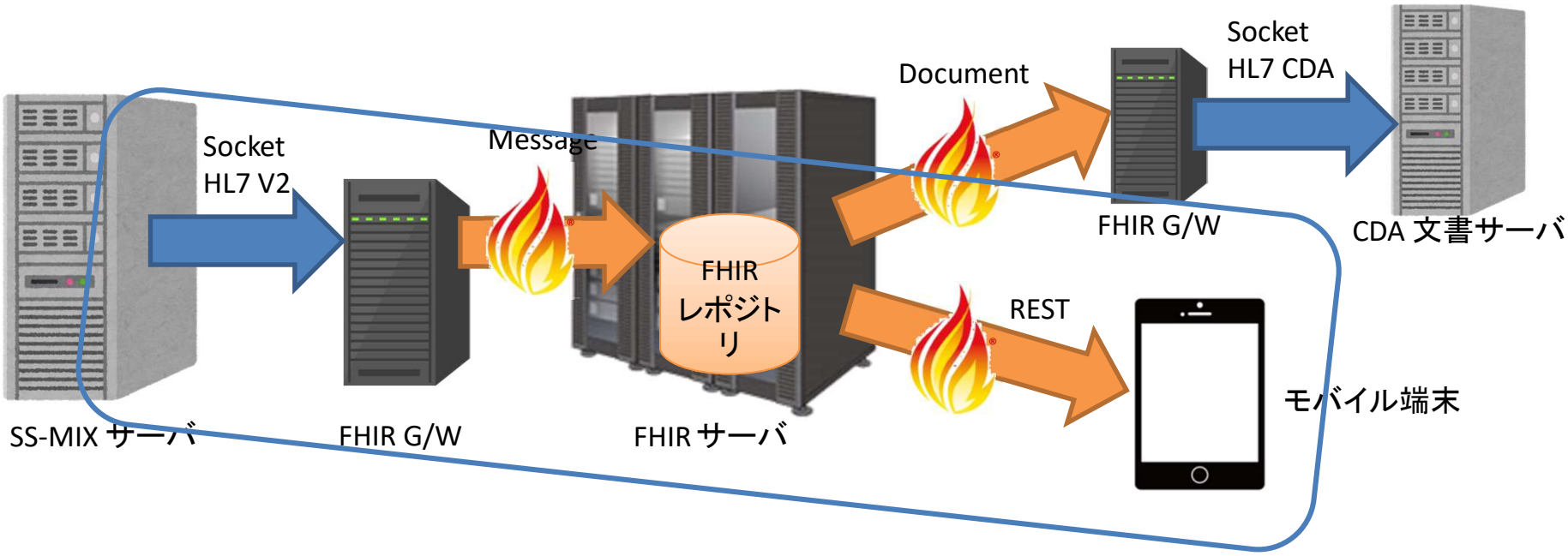
後方互換を意識した FHIR の Paradigm 概念

- 通信上の４つの Paradigms
  - SS-MIXサーバから、ストレージされていた HL7 V2 情報を FHIR G/W経由で FHIR サーバに送付。FHIR レポジトリに JSON、XML等で蓄積。
  - さらに別の Paradigm でそれを共有し、参照することができる。



↑ この部分の実装に Focus します。

リソース DEMO用 プログラム

HAPI Java開発Tutorialより

- サンプルプログラム
  https://github.com/FirelyTeam/fhirstarters

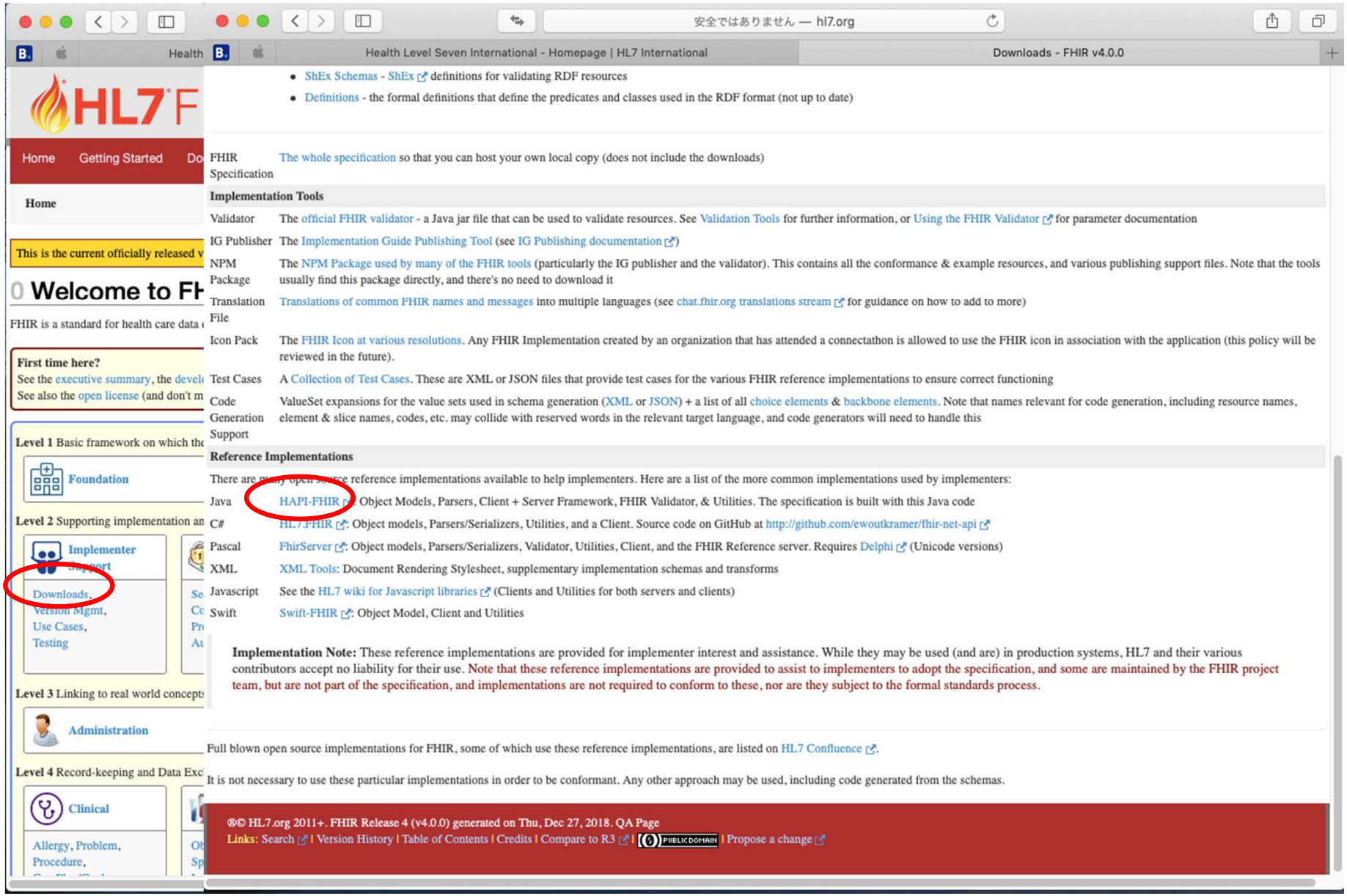
- RESTクライアント(Postman)
  https://github.com/FirelyTeam/fhirstarters/tree/master/postman/crud

- FHIR Hapiサーバ
  http://hapi.fhir.org/baseDstu3/Patient
  Header name → Key: Content-Type
  Header value → Value: application/fhir+json

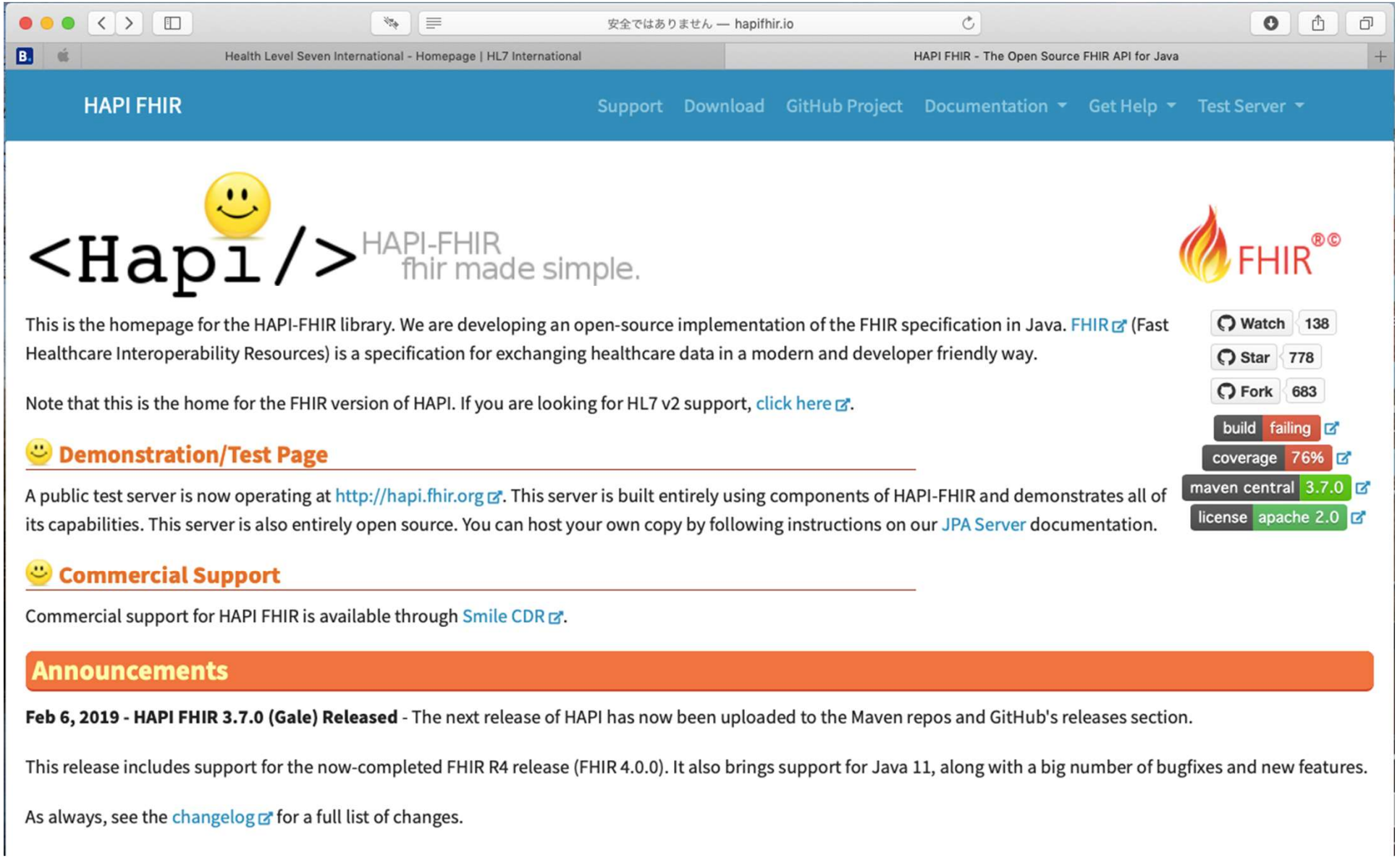
- JAVAクラス仕様 (R4 注:1月末STU3)
  http://hapifhir.io/apidocs-dstu3/index.html

※今日はスライド解説のみで DEMO は行いません。

FHIRツール


安全ではありません — hl7.org
Health Level Seven International - Homepage | HL7 International
Downloads - FHIR v4.0.0
Home
Getting Started
Welcome to FH
FHIR is a standard for health care data
Level 1 Basic framework on which th
Foundation
Level 2 Supporting implementation an
Implementer
Downloads,
Version Mgmt,
Use Cases,
Testing
Level 3 Linking to real world concept
Administration
Level 4 Record-keeping and Data Exc
Clinical
Allergy, Problem,
Procedure,
ShEx Schemas - ShEx definitions for validating RDF resources
Definitions - the formal definitions that define the predicates and classes used in the RDF format (not up to date)
FHIR Specification
The whole specification so that you can host your own local copy (does not include the downloads)
Implementation Tools
Validator
The official FHIR validator - a Java jar file that can be used to validate resources. See Validation Tools for further information, or Using the FHIR Validator for parameter documentation
IG Publisher
The Implementation Guide Publishing Tool (see IG Publishing documentation)
NPM Package
The NPM Package used by many of the FHIR tools (particularly the IG publisher and the validator). This contains all the conformance & example resources, and various publishing support files. Note that the tools usually find this package directly, and there's no need to download it
Translation File
Translations of common FHIR names and messages into multiple languages (see chat.fhir.org translations stream for guidance on how to add to more)
Icon Pack
The FHIR Icon at various resolutions. Any FHIR Implementation created by an organization that has attended a connectathon is allowed to use the FHIR icon in association with the application (this policy will be reviewed in the future).
Test Cases
A Collection of Test Cases. These are XML or JSON files that provide test cases for the various FHIR reference implementations to ensure correct functioning
Code Generation Support
ValueSet expansions for the value sets used in schema generation (XML or JSON) + a list of all choice elements & backbone elements. Note that names relevant for code generation, including resource names, element & slice names, codes, etc. may collide with reserved words in the relevant target language, and code generators will need to handle this
Reference Implementations
There are many open source reference implementations available to help implementers. Here are a list of the more common implementations used by implementers:
Java
HAPI-FHIR: Object Models, Parsers, Client + Server Framework, FHIR Validator, & Utilities. The specification is built with this Java code
C#
HL7.FHIR: Object models, Parsers/Serializers, Utilities, and a Client. Source code on GitHub at http://github.com/ewoutkramer/fhir-net-api
Pascal
FhirServer: Object models, Parsers/Serializers, Validator, Utilities, Client, and the FHIR Reference server. Requires Delphi (Unicode versions)
XML
XML Tools: Document Rendering Stylesheet, supplementary implementation schemas and transforms
Javascript
See the HL7 wiki for Javascript libraries (Clients and Utilities for both servers and clients)
Swift
Swift-FHIR: Object Model, Client and Utilities
Implementation Note: These reference implementations are provided for implementer interest and assistance. While they may be used (and are) in production systems, HL7 and their various contributors accept no liability for their use. Note that these reference implementations are provided to assist to implementers to adopt the specification, and some are maintained by the FHIR project team, but are not part of the specification, and implementations are not required to conform to these, nor are they subject to the formal standards process.
Full blown open source implementations for FHIR, some of which use these reference implementations, are listed on HL7 Confluence.
It is not necessary to use these particular implementations in order to be conformant. Any other approach may be used, including code generated from the schemas.
©© HL7.org 2011+. FHIR Release 4 (v4.0.0) generated on Thu, Dec 27, 2018. QA Page
Links: Search | Version History | Table of Contents | Credits | Compare to R3 | PUBLIC DOMAIN | Propose a change

Hapiツール


安全ではありません — hapifhir.io
Health Level Seven International - Homepage | HL7 International
HAPI FHIR - The Open Source FHIR API for Java
HAPI FHIR
Support
Download
GitHub Project
Documentation
Get Help
Test Server
<Hapi/>
HAPI-FHIR
fhir made simple.
FHIR
This is the homepage for the HAPI-FHIR library. We are developing an open-source implementation of the FHIR specification in Java. FHIR (Fast Healthcare Interoperability Resources) is a specification for exchanging healthcare data in a modern and developer friendly way.
Note that this is the home for the FHIR version of HAPI. If you are looking for HL7 v2 support, click here.
Watch 138
Star 778
Fork 683
build failing
coverage 76%
maven central 3.7.0
license apache 2.0
Demonstration/Test Page
A public test server is now operating at http://hapi.fhir.org. This server is built entirely using components of HAPI-FHIR and demonstrates all of its capabilities. This server is also entirely open source. You can host your own copy by following instructions on our JPA Server documentation.
Commercial Support
Commercial support for HAPI FHIR is available through Smile CDR.
Announcements
Feb 6, 2019 - HAPI FHIR 3.7.0 (Gale) Released - The next release of HAPI has now been uploaded to the Maven repos and GitHub's releases section.
This release includes support for the now-completed FHIR R4 release (FHIR 4.0.0). It also brings support for Java 11, along with a big number of bugfixes and new features.
As always, see the changelog for a full list of changes.

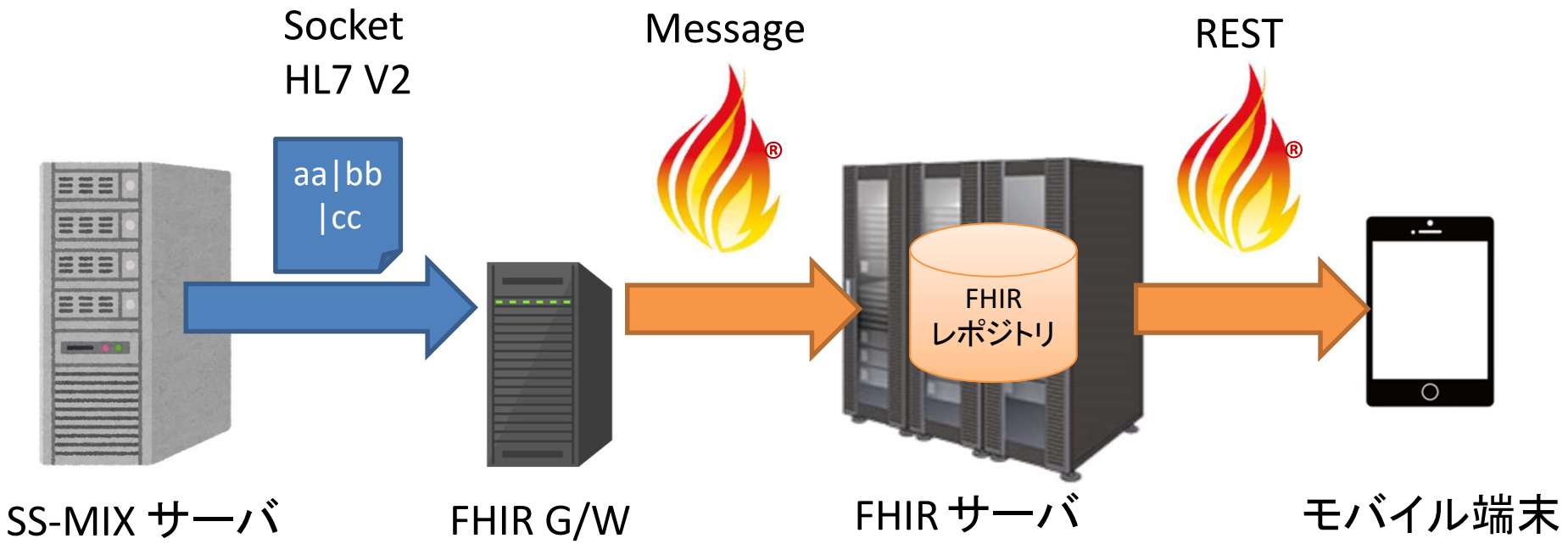
統合開発環境支援:Eclipse

```
package ca.uhn.fhir.example;

import org.hl7.fhir.dstu3.model.HumanName;
import org.hl7.fhir.dstu3.model.Identifier;
import org.hl7.fhir.dstu3.model.Patient;

public class Example01_CreateAPatient {
  public static void main(String[] theArgs) {
    // Create a resource instance
    Patient pat = new Patient();
    // Add a "name" element
    HumanName name = pat.addN
    name.setFamily("Simpson").ad
    // Add an "identifier" element
    Identifier identifier = pat.addId
    identifier.setSystem("http://acr
    // Model is designed to be chai
    pat.addIdentifier().setSystem("
  }
}
```

HL7 v2 メッセージ → FHIR の実例解説

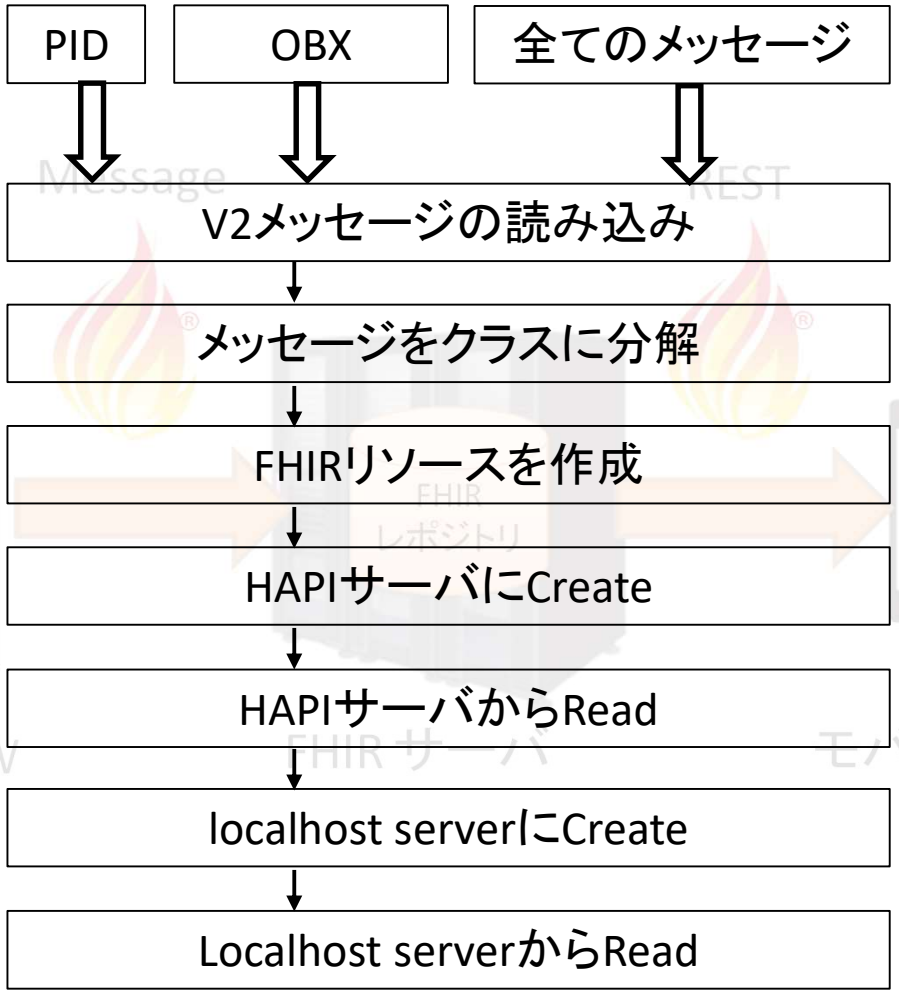


試行過程

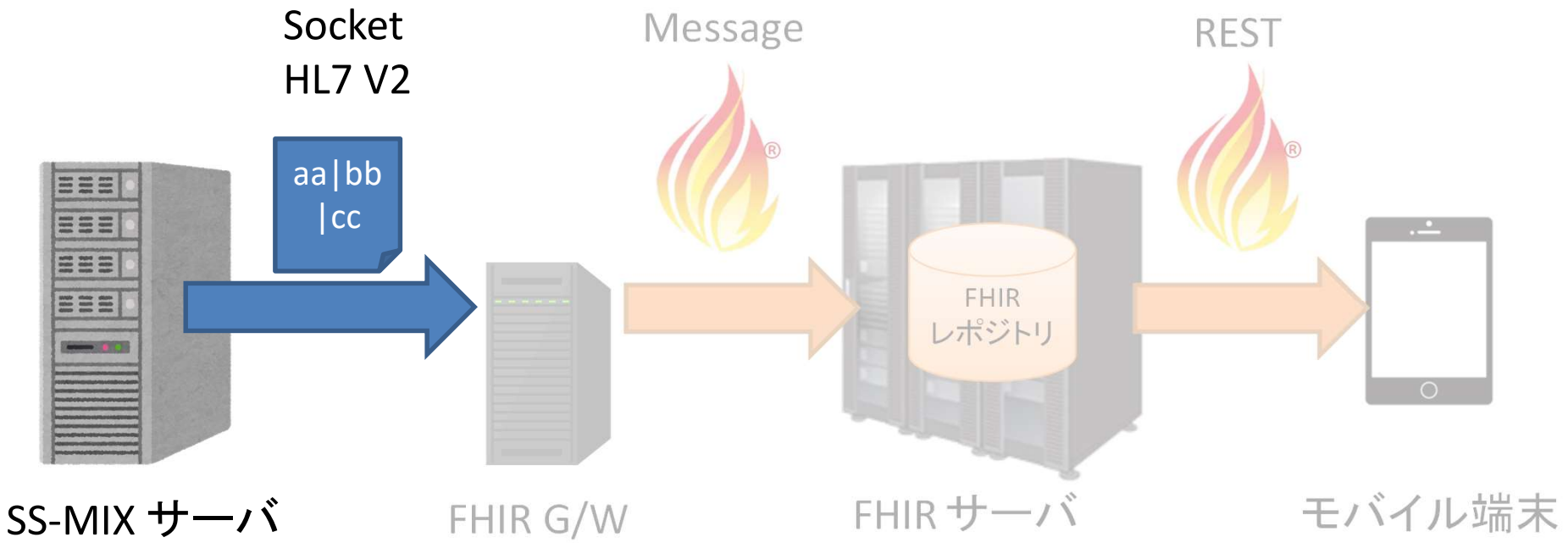
- Main.java
- Ex01CreatePatient.java
- Ex02CreateObservation.java
- Ex03CreateBudle.java

- ReadMessage.java
- CreatePatient.java
- CreateObservation.java
- V2_Patient.java
- V2toFHIR.java

- MSH.java
- PID.java
- SPM.java
- OBR.java
- ORC.java
- OBX.java
- CE.java
- CQ.java
- CWE.java
- DR.java
- EI.java
- EIP.java
- HD.java
- PL.java
- PV1.java
- SPS.java
- XCN.java
- XPN.java
- XTN.java

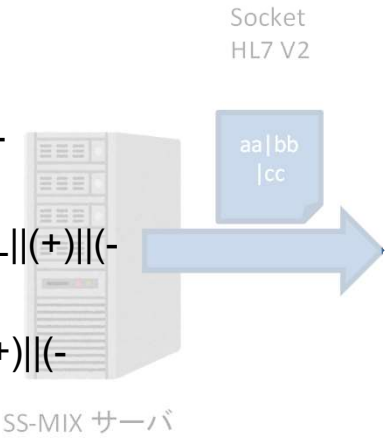


HL7 v2 メッセージ → FHIR の実例解説

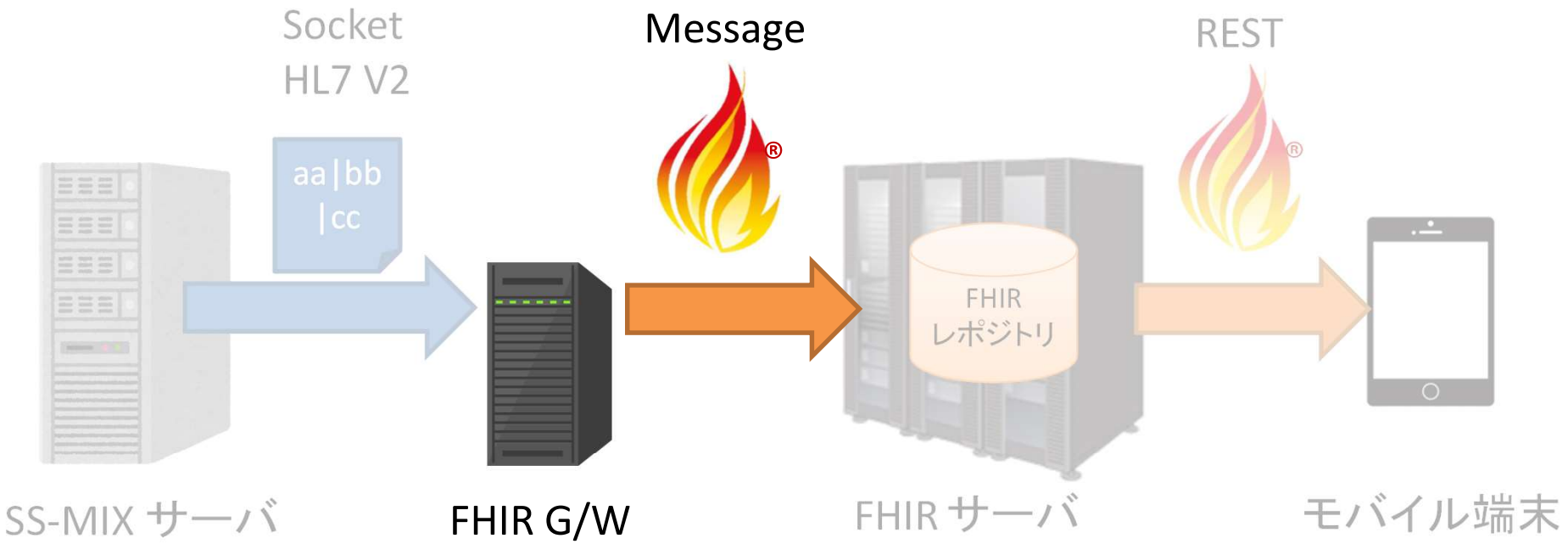


SS-MIX(旧)(HL7 V2) → FHIR変換

MSH|^~¥&|DOCX|HIS|GW|GW|20060424190111710||OML^O33^OML_O33|20060424000001|P|2.5||||||~ISO IR87||ISO 2022-1994
ZGW|1014360|20050401000000|OML-01^検体検査オーダ^L|000000003005077|UPD|002^内科^L
PID|0001||1014360||駿河^葵^^^^^L^I~スルガ^アオイ^^^^^L^P||19520717|F
PV1|0001|O|002^^^^^C||||298^医師298^^^^^^^^L|||002
ZIN|1^政府管掌健康保険^HL7-0072
SPM|0001|||015^便^JC10^40^便^L
ORC|NW|000000003005077|||||||20050401000000|298^医師298^^^^^^^^L||298^医師298^^^^^^^^L|002^^^^^C||||002^内科^L|Fu^^L|||登呂病院|^静岡市駿河区登呂3-1-1^^^422-8033^jpn|054-284-9122||||||O^外来患者^HL7-0482
OBR|0001|000000003005077|000000003005077|4^一般^L||20030401160212|20030401|20030401|||||||015&便&JC10&40&便&L|298^医師298^^^^^^^^L||||||20030401172022
OBX|0001|ST|^便潜血^JC10^44100^便潜血^L||||(-)|||||||20050401000000
OBX|0002|ST|1B035000001590111^ オルトトリジン^JC10^44101^ オルトトリジン^L||(2+)|||||||||20050401000000
OBX|0003|ST|1B030000001590111^ グアヤック脂^JC10^44102^ グアヤック脂^L||(+-)|||||||||20050401000000
OBX|0004|ST|1B040000001502311^ヒトヘモグロビン^JC10^44103^ヒトヘモグロビン^L||(+)||(-)|||||||20050401000000
OBX|0005|ST|^クロストリジウムトキシンA^JC10^44129^クロストリジウムトキシンA^L||(+)||(-)|||||||20050401000000



HL7 v2 メッセージ → FHIR の実例解説



Patient リソースの生成とXML出力

```
MSH|^~¥&|DOCX|HIS|GW|GW|20060424190111710||OML^O33^OML_O33|20060424000001|
      P|2.5|||||~ISO IR87||ISO 2022-1994
PID|0001||1014360||駿河^葵^^^^^L^I~スルガ゛^アオイ^^^^^L^P||19520717|F
```

```
package hl7.v2;

import org.hl7.fhir.dstu3.model.Patient;

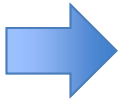
import ca.uhn.fhir.context.FhirContext;
import ca.uhn.fhir.parser.IParser;

public class Ex01CreatePatient {

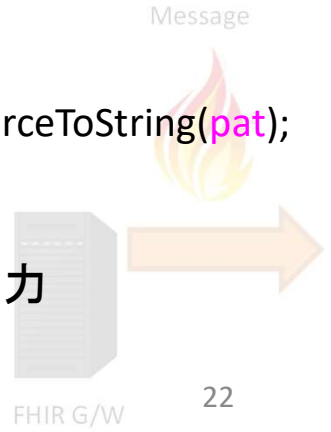
public static void main(String[] args) {
ReadMessage rd = new ReadMessage();
rd.readV2Message(args[0]); // read V2
message
```

```
/**
* FHIRPatientリソース生成
*/
Patient pat = (new CreatePatient()).cPatient(rd);
// FHIRコンテクストに変換
FhirContext ctx = FhirContext.forDstu3();
// IParser parser = ctx.newJsonParser(); // Json変換
IParser parser = ctx.newXmlParser(); // XML変換

parser.setPrettyPrint(true);
String encode = parser.encodeResourceToString(pat);
System.out.println(encode);
```



PatientリソースのXML出力



Patient ←→PID

Name	Flags	Card.	Type
Patient	N		DomainResource
identifier	Σ	0..*	Identifier
active	?! Σ	0..1	boolean
name	Σ	0..*	HumanName
telecom	Σ	0..*	ContactPoint
gender	Σ	0..1	code
birthDate	Σ	0..1	date
deceased[x]	?! Σ	0..1	
deceasedBoolean			boolean
deceasedDateTime			dateTime
address	Σ	0..*	Address
maritalStatus		0..1	CodeableConcept
multipleBirth[x]		0..1	
multipleBirthBoolean			boolean
multipleBirthInteger			integer
photo		0..*	Attachment
contact	I	0..*	BackboneElement
relationship		0..*	CodeableConcept
name		0..1	HumanName
telecom		0..*	ContactPoint
address		0..1	Address
gender		0..1	code
organization	I	0..1	Reference(Organization)
period		0..1	Period
communication		0..*	BackboneElement
language		1..1	CodeableConcept
preferred		0..1	boolean
generalPractitioner		0..*	Reference(Organization | Practitioner | PractitionerRole)
managingOrganization	Σ	0..1	Reference(Organization)
link	?! Σ	0..*	BackboneElement
other	Σ	1..1	Reference(Patient | RelatedPerson)
type	Σ	1..1	code

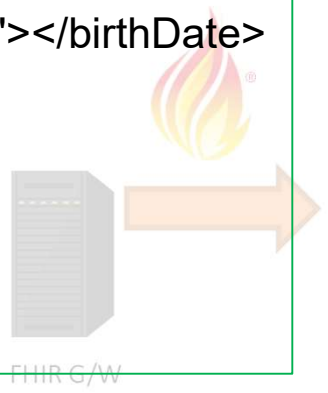
SEQ	LEN	DT	OPT	RP/#	ELEMENT NAME
1	4	SI	O		Set ID - PID
2	20	CX	B		Patient ID
3	250	CX	R	Y	Patient Identifier List
4	20	CX	B	Y	Alternate Patient ID - PID
5	250	XPN	R	Y	Patient Name
6	250	XPN	O	Y	Mother's Maiden Name
7	26	TS	O		Date/Time of Birth
8	1	IS	O		Administrative Sex
9	250	XPN	B	Y	Patient Alias
10	250	CE	O	Y	Race
11	250	XAD	O	Y	Patient Address
12	4	IS	B		County Code
13	250	XTN	O	Y	Phone Number - Home
14	250	XTN	O	Y	Phone Number - Business
15	250	CE	O		Primary Language
16	250	CE	O		Marital Status
17	250	CE	O		Religion
18	250	CX	O		Patient Account Number
19	16	ST	B		SSN Number - Patient
20	25	DLN	B		Driver's License Number - Patient
21	250	CX	O	Y	Mother's Identifier
22	250	CE	O	Y	Ethnic Group
23	250	ST	O		Birth Place
24	1	ID	O		Multiple Birth Indicator
25	2	NM	O		Birth Order
26	250	CE	O	Y	Citizenship
27	250	CE	O		Veterans Military Status
28	250	CE	B		Nationality
29	26	TS	O		Patient Death Date and Time
30	1	ID	O		Patient Death Indicator
31	1	ID	O		Identity Unknown Indicator
32	20	IS	O	Y	Identity Reliability Code
33	26	TS	O		Last Update Date/Time
34	241	HD	O		Last Update Facility
35	250	CE	C		Species Code
36	250	CE	C		Breed Code
37	80	ST	O		Strain
38	250	CE	O	2	Production Class Code
39	250	CWE	O	Y	Tribal Citizenship

V2 message を FHIR リソースへ (XML)

MSH|^~¥&|DOCX|HIS|GW|GW|20060424190111710||OML^O33^OML_O33|20060424000001|
P|2.5|||||~ISO IR87||ISO 2022-1994
PID|0001||1014360||駿河^葵^^^^^L^I~スルガ゛^アオイ^^^^^L^P||19520717|F

```
<Patient xmlns="http://hl7.org/fhir">
  <identifier>
    <system
value="http://www.hl7.jp"></system>
    <value value="1014360"></value>
  </identifier>
  <name>
    <extension
url="http://hl7.org/fhir/StructureDefinition/iso
21090-EN-representation">
      <valueCode
value="IDE"></valueCode>
    </extension>
    <family value="駿河"></family>
    <given value="葵"></given>
  </name>
```

```
<name>
    <extension
url="http://hl7.org/fhir/StructureDefinition/iso21
090-EN-representation">
      <valueCode value="SYL"></valueCode>
    </extension>
    <family value="スルガ゛"></family>
    <given value="アオイ"></given>
  </name>
  <gender value="female"></gender>
  <birthDate value="1952-07-17"></birthDate>
</Patient>
```



PatientリソースをHAPI-FHIRサーバにCreate

POST

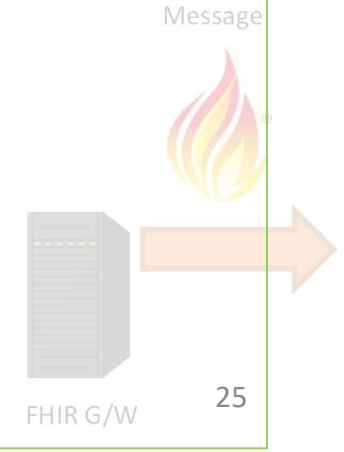
PatientリソースID

バージョン番号

付加された情報

```
<Patient xmlns="http://hl7.org/fhir">
   <id value="1977167"/>
   <meta>
      <versionId value="1"/>
      <lastUpdated value="2019-07-
08T00:52:56.065+00:00"/>
   </meta>
   <text>
      <status value="generated"/>
      <div xmlns="http://www.w3.org/1999/xhtml">
         <div class="hapiHeaderText">葵
            <b>駿河 </b>
         </div>
         <table class="hapiPropertyTable">
            <tbody>
               <tr>
                  <td>Identifier</td>
                  <td>1014360</td>
               </tr>
               <tr>
                  <td>Date of birth</td>
                  <td>
                     <span>17 July 1952</span>
                  </td>
               </tr>
            </tbody>
         </table>
      </div>
   </text>
```

```
   <identifier>
      <system value="http://www.hl7.jp"/>
      <value value="1014360"/>
   </identifier>
   <name>
      <extension
url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-
representation">
         <valueCode value="IDE"/>
      </extension>
      <family value="駿河"/>
      <given value="葵"/>
   </name>
   <name>
      <extension
url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-
representation">
         <valueCode value="SYL"/>
      </extension>
      <family value="スルガ゛"/>
      <given value="アオイ"/>
   </name>
   <gender value="female"/>
   <birthDate value="1952-07-17"/>
</Patient>
```



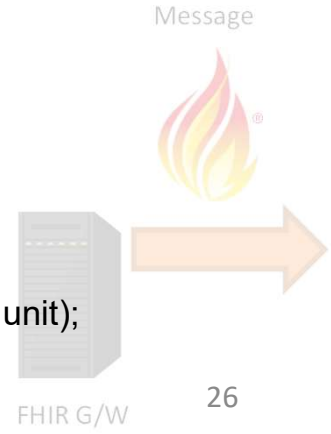
OBXからObservationリソースを生成

OBX|0004|NM|1A0300000000390301^比重^JC10^40003^比重^L||1.020||1.005～1.030|||||||20050402000000

```
Observation obs = new Observation();
obs.setStatus(ObservationStatus.FINAL);
OBX ox = rd.obx[obxInd];
if (ox.date != null)
        obs.setEffective(new DateTimeType((new V2toFHIR()).dateTime(ox.date)));
Identifier id = obs.addIdentifier();
id.setSystem(organization).setValue(rd.obr.svID.ID);
obs.getSubject().setDisplay("駿河 葵").setReference("Patient/1977167");
CodeableConcept cd = new CodeableConcept();
cd.addCoding().setSystem(ox.obsId.uri)
        .setCode(ox.obsId.ID)
        .setDisplay(ox.obsId.Tx);
obs.setCode(cd);
obs.addReferenceRange().setText(ox.reRg);

if (ox.type.equals("ST")) {
        StringType value = new StringType(ox.value);
        obs.setValue(value);
}
else {
    Quantity value = new Quantity();
    value.setValue(Float.parseFloat(ox.value)).setSystem(ox.obsId.uri).setCode(ox.unit);
    obs.setValue(value);
}
```

Patient リソースから



Observationリソースの作成とCreate(POST)

```
        Observation obs = (new CreateObservation()).CreateObservation(rd, 4);

        FhirContext ctx = FhirContext.forDstu3();
//      IParser parser = ctx.newJsonParser();       // Json変換
        IParser parser = ctx.newXmlParser();        // XML変換
        parser.setPrettyPrint(true);                // 清書

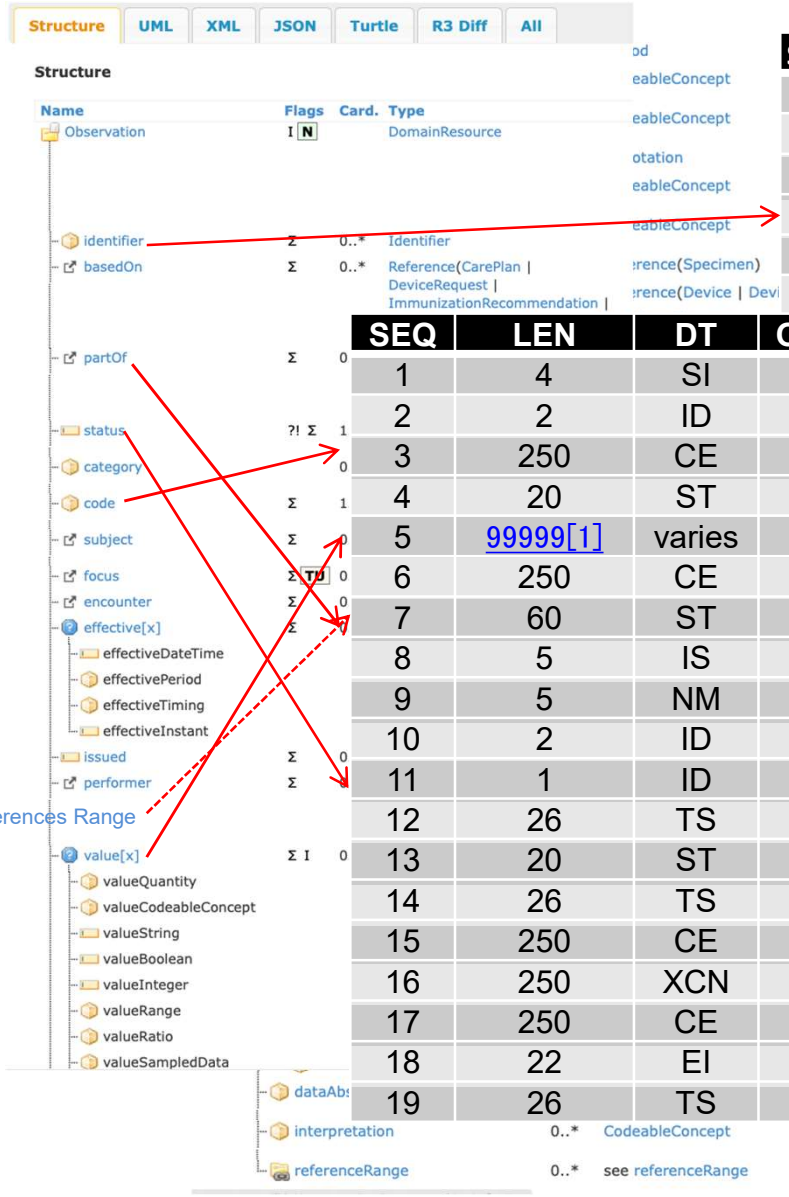
        String encode = parser.encodeResourceToString(obs);
        System.out.println(encode);
```

```
        String serverBaseUrl = "http://hapi.fhir.org/baseDstu3";

        IGenericClient client = ctx.newRestfulGenericClient(serverBaseUrl);

//      Observation リソースのCreate
        MethodOutcome outcome = client
                .create()
                .resource(obs)
                .execute();
//      リソースIDの取得
        System.out.println(outcome.getId());
```

Observation リソース
OBX←→Observation



OBR

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
1	4	SI	O			237	Set ID - OBR
2	22	EI	C			216	Placer Order Number
3	22	EI	C			217	Filler Order Number
4	250	CE	R			238	Universal Service Identifier
5	2	ID	X			239	Priority – OBR
6	26	TS	X			240	Requested Date/Time

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O			569	Set ID – OBX
2	2	ID	C		125	570	Value Type
3	250	CE	R			571	Observation Identifier
4	20	ST	C			572	Observation Sub-ID
5	99999[1]	varies	C	Y[2]		573	Observation Value
6	250	CE	O			574	Units
7	60	ST	O			575	References Range
8	5	IS	O	Y	78	576	Abnormal Flags
9	5	NM	O			577	Probability
10	2	ID	O	Y	80	578	Nature of Abnormal Test
11	1	ID	R		85	579	Observation Result Status
12	26	TS	O			580	Effective Date of Reference Range
13	20	ST	O			581	User Defined Access Checks
14	26	TS	O			582	Date/Time of the Observation
15	250	CE	O			583	Producer's ID
16	250	XCN	O	Y		584	Responsible Observer
17	250	CE	O	Y		936	Observation Method
18	22	EI	O	Y		1479	Equipment Instance Identifier
19	26	TS	O			1480	Date/Time of the Analysis

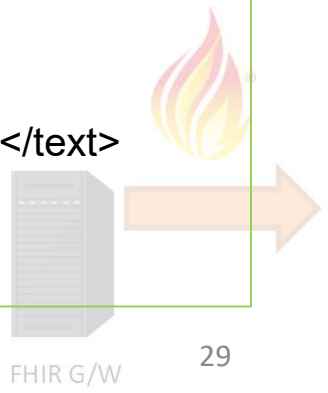
Create Observation Resource

POST http://hapi.fhir.org/baseDstu3/Observation

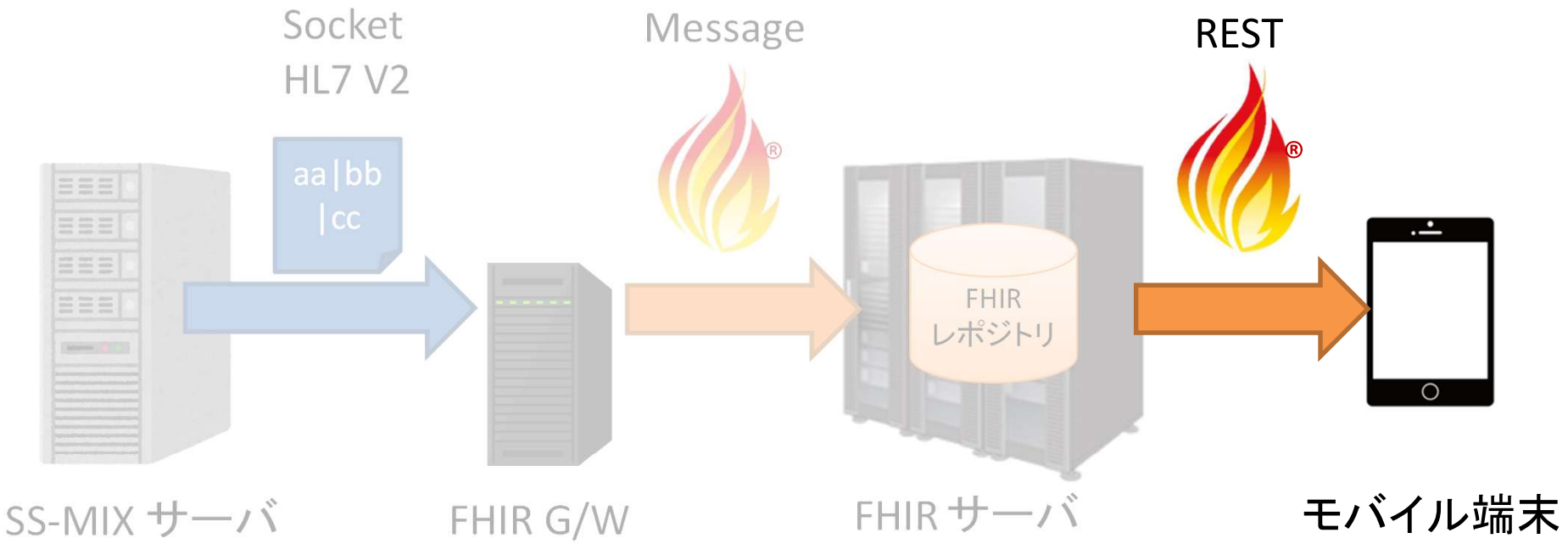
OBX|0004|NM|1A030000000390301^比重^JC10^40003^比重^L||1.020||1.005～1.030|||||||20050402000000

```
<Observation xmlns="http://hl7.org/fhir">
  <identifier>
    <system value="http://www.hl7.jp"></system>
    <value value="4"></value>
  </identifier>
  <status value="final"></status>
  <code>
    <coding>
      <system value="http://www.jslm.org"></system>
      <code value="1A030000000390301"></code>
      <display value="比重"></display>
    </coding>
  </code>
```

```
  <subject>
    <reference value="Patient/1977167"></reference>
    <display value="駿河 葵"></display>
  </subject>
  <effectiveDateTime value="2005-04-02T00:00:00+09:00"></effectiveDateTime>
  <valueQuantity>
    <value value="1.020"></value>
    <system value="http://www.jslm.org"></system>
  </valueQuantity>
  <referenceRange>
    <text value="1.005～1.030"></text>
  </referenceRange>
</Observation>
```



HL7 v2 メッセージ → FHIR の実例解説



HAPI FHIR サーバからPatient リソースRead

GET http://hapi.fhir.org/baseDstu3/Patient/1977167

```
<Patient xmlns="http://hl7.org/fhir">
   <id value="1977167"/>
   <meta>
      <versionId value="1"/>
      <lastUpdated value="2019-07-
08T00:52:56.065+00:00"/>
   </meta>
   <text>
      <status value="generated"/>
      <div xmlns="http://www.w3.org/1999/xhtml">
         <div class="hapiHeaderText">葵
            <b>駿河 </b>
         </div>
         <table class="hapiPropertyTable">
            <tbody>
               <tr>
                  <td>Identifier</td>
                  <td>1014360</td>
               </tr>
               <tr>
                  <td>Date of birth</td>
                  <td>
                     <span>17 July 1952</span>
                  </td>
               </tr>
            </tbody>
         </table>
      </div>
   </text>
   <identifier>
      <system value="http://www.hl7.jp"/>
      <value value="1014360"/>
   </identifier>
   <name>
      <extension
url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-
representation">
         <valueCode value="IDE"/>
      </extension>
      <family value="駿河"/>
      <given value="葵"/>
   </name>
   <name>
      <extension
url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-
representation">
         <valueCode value="SYL"/>
      </extension>
      <family value="スルガ゛"/>
      <given value="アオイ"/>
   </name>
   <gender value="female"/>
   <birthDate value="1952-07-17"/>
</Patient>
```

HAPI FHIR サーバからPatient リソースSearch

GET http://hapi.fhir.org/baseDstu3/Patient?name=駿河


```
<Bundle xmlns="http://hl7.org/fhir">
  <id value="ad30933d-16ff-420c-a759-8e7b02be5393"/>
  <meta>
    <lastUpdated value="2
  </meta>
  <type value="searchset"/>
  <total value="4"/>
  <link>
    <relation value="self"/>
    <url
value="http://hapi.fhir.org/baseDstu3/Patient?identifier=1014360"/>
  </link>
  <entry>
    <fullUrl
value="http://hapi.fhir.org/baseDstu3/Patient/1947172"/>
    <resource>
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1947172"/>
        <meta>
          <versionId val
              ....
        <identifier>
          <system value
          <value value="1014360"/>
              ....
    <resource>
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1950052"/>
        <meta>
          <versionId val
              ....
       <identifier>
          <system value
          <value value="1014360"/>
        </identifier>
```

複数のPatientリストを
Bundleでくくられる。

1人目のPatient
Resource ID = 1947172

2人目のPatient
Resource ID = 1950052

```
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1951763"/>
        <meta>
          <versionId valu
              ....
        <identifier>
          <system value
          <value value="1014360"/>
        </identifier>
              ....
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1977167"/>
        <meta>
          <versionId value="2"/>
              .
        <identifier>
          <system value="http
          <value value="1014
        </identifier>
        <name>
          <extension
url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-
representation">
            <valueCode value="IDE"/>
          </extension>
          <family value="駿河"/>
              .
        </name>
          <gender value="female"/>
          <birthDate value="1950-07-17"/>
      </Patient>
    </resource>
    <search>
      <mode value="match"/>
    </search>
  </entry>
</Bundle>
```

3人目のPatient
Resource ID = 1951763

4人目のPatient
Resource ID = 1977167
Version = 2
Birth Date = 1950-07-17

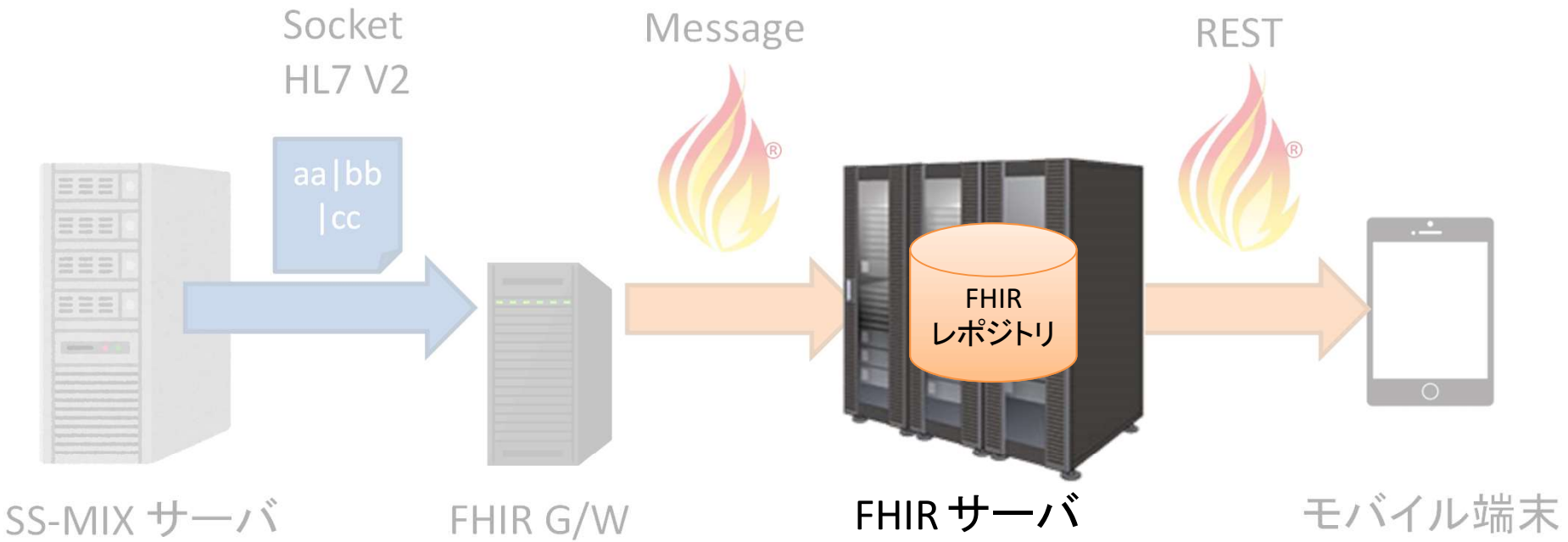
HAPI FHIR サーバから ObservationリソースRead

GET http://hapi.fhir.org/baseDstu3/Observation/1982273

```
<Observation xmlns="http://hl7.org/fhir">
   <id value="1982273"/>
   <meta>
      <versionId value="1"/>
      <lastUpdated value="2019-07-13T05:40:19.425+00:00"/>
   </meta>
   <identifier>
      <system value="http://www.hl7.jp"/>
      <value value="4"/>
   </identifier>
   <status value="final"/>
   <code>
      <coding>
         <system value="http://www.jslm.org"/>
         <code value="1A030000000390301"/>
         <display value="比重"/>
      </coding>
   </code>
      <subject>
      <reference value="Patient/1977167"/>
      <display value="駿河 葵"/>
   </subject>
   <effectiveDateTime value="2005-04-02T00:00:00+09:00"/>
   <valueQuantity>
      <value value="1.020"/>
      <system value="http://www.jslm.org"/>
   </valueQuantity>
   <referenceRange>
      <text value=" 1.005～1.030 "/>
   </referenceRange>
</Observation>
```

モバイル端末

HL7 v2 メッセージ → FHIR の実例解説



Patientの誕生日を変更
UPDATE(PUT) 受信

```
<Patient xmlns="http://hl7.org/fhir">
  <id value="1977167"/>
  <identifier>
    <system value="http://www.hl7.jp"></system>
    <value value="1014360"></value>
  </identifier>
  <name>
    <extension url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-representation">
      <valueCode value="IDE"></valueCode>
    </extension>
    <family value="駿河"></family>
    <given value="葵"></given>
  </name>
  <name>
    <extension url="http://hl7.org/fhir/StructureDefinition/iso21090-EN-representation">
      <valueCode value="SYL"></valueCode>
    </extension>
    <family value="スルガ゛"></family>
    <given value="アオイ"></given>
  </name>
  <gender value="female"></gender>
  <birthDate value="1950-07-17"></birthDate>
</Patient>
```

PatientリソースID

誕生日

FHIR サーバ

Patientリソースの履歴管理

http://hapi.fhir.org/baseDstu3/Patient/1977167/_history


```
<Bundle xmlns="http://hl7.org/fhir">
  <id value="9724b630-eb15-4927-88cc-862a9bf4d28d"/>
  <meta>
    <lastUpdated value="2019-07-08T04:23:05.681+00:00"/>
  </meta>
  <type value="history"/>
  <total value="2"/>
  <link>
    <relation value="self"/>
    <url
value="http://hapi.fhir.org/baseDstu3/Patient/1977167/_history"/>
  </link>
  <entry>
    <fullUrl value="http://hapi.fhir.org/baseDstu3/Patient/1977167"/>
    <resource>
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1977167"/>
        <meta>
          <versionId value="2"/>
          <lastUpdated value="2019-07-
08T01:57:00.764+00:00"/>
        </meta>
        <text>
          <status value="generated"/>
.                ....
                  </tr>
                  <tr>
                    <td>Date of birth</td>
                    <td>
                      <span>17 July 1950</span>
                    ....
.
```

```
  </entry>
  <entry>
    <fullUrl
value="http://hapi.fhir.org/baseDstu3/Patient/1977167"/>
    <resource>
      <Patient xmlns="http://hl7.org/fhir">
        <id value="1977167"/>
        <meta>
          <versionId value="1"/>
          <lastUpdated value="2019-07-
08T00:52:56.065+00:00"/>
        </meta>
        <text>
          <status value="generated"/>
          <div xmlns="http://www.w3.org/1999/xhtml">
            <div class="hapiHeaderText">葵
              <b>駿河 </b>
            </div>
            <table class="hapiPropertyTable">
.                ....
                      <span>17 July 1952</span>
                    </td>
.                ....
    <request>
      <method value="POST"/>
      <url
value="http://hapi.fhir.org/baseDstu3/Patient/1977167/_history/1"/>
    </request>
  </entry>
</Bundle>
```

検査結果レポートを作る
Resource DiagnosticReport

CBC Report for Wile. E. COYOTE (MRN: 23453) issued 3-Mar 2011 11:45

Test	Units	Value	Reference Range
Haemoglobin	g/L	176	135 - 180
Red Cell Count	x10*12/L	5.9	4.2 - 6.0
Haematocrit		0.55+	0.38 - 0.52
Mean Cell Volume	fL	99+	80 - 98
Mean Cell Haemoglobin	pg	36+	27 - 35
Platelet Count	x10*9/L	444	150 - 450
White Cell Count	x10*9/L	4.6	4.0 - 11.0
Neutrophils	%	20	
Neutrophils	x10*9/L	0.9---	2.0 - 7.5
Lymphocytes	%	20	
Lymphocytes	x10*9/L	0.9-	1.1 - 4.0
Monocytes	%	20	
Monocytes	x10*9/L	0.9	0.2 - 1.0
Eosinophils	%	20	
Eosinophils	x10*9/L	0.92++	0.04 - 0.40
Basophils	%	20	
Basophils	x10*9/L	0.92+++	<0.21

FHIR サーバ

レポート出力用リソース (Json)


```
{
  "resourceType": "Bundle",
  "id": "101",
  "type": "collection",
  "entry": [
    {
      "fullUrl": "https://example.com/base/DiagnosticReport/101",
      "resource": {
        "resourceType": "DiagnosticReport",
        "id": "101",
        "meta": {
          "tag": [
            {
              "system": "http://example.org/fhir/CodeSystem/workflow-codes",
              "code": "01",
              "display": "Needs Review"
            }
          ]
        },
        "text": {
          "status": "generated",
          "div": "<div xmlns=¥"http://www.w3.org/1999/xhtml¥">¥n¥t¥t¥t¥t¥t¥t<h3>CBC Report for Wile. E. COYOTE (MRN: 23453) issued 3-Mar 2011 11:45</h3>¥n¥t¥t¥t¥t¥t¥t<pre>¥nTest Units Value Reference Range¥nHaemoglobin g/L 176 135 - 180¥nRed Cell Count x10*12/L 5.9 4.2 - 6.0¥nHaematocrit 0.55+ 0.38 - 0.52¥nMean Cell Volume fL 99+ 80 - 98¥nMean Cell Haemoglobin pg 36+ 27 - 35¥nPlatelet Count x10*9/L 444 150 - 450¥nWhite Cell Count x10*9/L 4.6 4.0 - 11.0¥nNeutrophils % 20¥nNeutrophils x10*9/L 0.9--- 2.0 - 7.5¥nLymphocytes % 20¥nLymphocytes x10*9/L 0.9- 1.1 - 4.0¥nMonocytes % 20¥nMonocytes x10*9/L 0.9 0.2 - 1.0¥nEosinophils % 20¥nEosinophils x10*9/L 0.92++ 0.04 - 0.40¥nBasophils % 20¥nBasophils x10*9/L 0.92+++ &lt;0.21¥n </pre>¥n¥t¥t¥t¥t¥t¥t<p>Acme Laboratory, Inc signed: Dr Pete Pathologist</p>¥n¥t¥t¥t¥t¥t</div>"
        },
```



```
{
  "resourceType":  "Bundle",
  "id": "101",
  "type": "collection",
  "entry": [
    {
      "fullUrl": "https://
```


DiagnosticReport リソース

レポートのテキスト情報

FHIR レポジトリ

FHIR サーバ

レポート出力用リソース (Json)


```
"identifier": [
        {
          "system": "http://acme.com/lab/reports",
          "value": "5234342"
        }
      ],
      "status": "final",
      "category": [
        {
          "coding": [
            {
              "system": "http://terminology.hl7.org/CodeSystem/v2-0074",
              "code": "HM"
            }
          ]
        }
      ],
      "code": {
        "coding": [
          {
            "system": "http://loinc.org",
            "code": "58410-2",
            "display": "Complete blood count (hemogram) panel - Blood by Automated count"
          },
          {
            "code": "CBC",
            "display": "MASTER FULL BLOOD COUNT"
          }
        ],
```

レポート出力用リソース (Json)


```
"text": "Complete Blood Count"
    },
    "subject": {
      "reference": "Patient/pat2"
    },
    "encounter": {
      "reference": "Encounter/example"
    },
    "effectiveDateTime": "2011-03-04T08:30:00+11:00",
    "issued": "2011-03-04T11:45:33+11:00",
    "performer": [
      {
        "reference": "Organization/1832473e-2fe0-452d-abe9-3cdb9879522f",
        "display": "Acme Laboratory, Inc"
      }
    ],
    "result": [
      {
        "reference": "Observation/r1"
      },
      {
        "reference": "Observation/r2"
      },
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        "reference": "Observation/r3"
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        "reference": "Observation/r4"
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        "reference": "Observation/r5"
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        "reference": "Observation/r6"
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      },
      {
        "reference": "Observation/r16"
      },
      {
        "reference": "Observation/r17"
      }
    ],
```

レポート出力用リソース (Json)

PDFのエンコード情報


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"presentedForm": [
 {
  "contentType": "application/pdf",
  "language": "en-AU",
  “data”:
“JVBERi0xLjQKJcfsj6IKNSAwIG9iago8PC9MZW5ndGggNiAwIFIvRmlsdGVyIC9GbGF0ZURlY29kZT4+CnN0cmVhbQp4nO1aWW8URxAW2MviXcs32AYfY2OzM4Z
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QQrxrnzdL9WFE4FWLZ9YIn5zFSvDov03ZfeQmQvPvRkoZ31AS4F402Xy2BlZXE2yqyuAb/3JAYTPv9Yb12KMu09zdoYUDjIK7DmRfOW7kcuEl2f20DRrCzHRGFXh5
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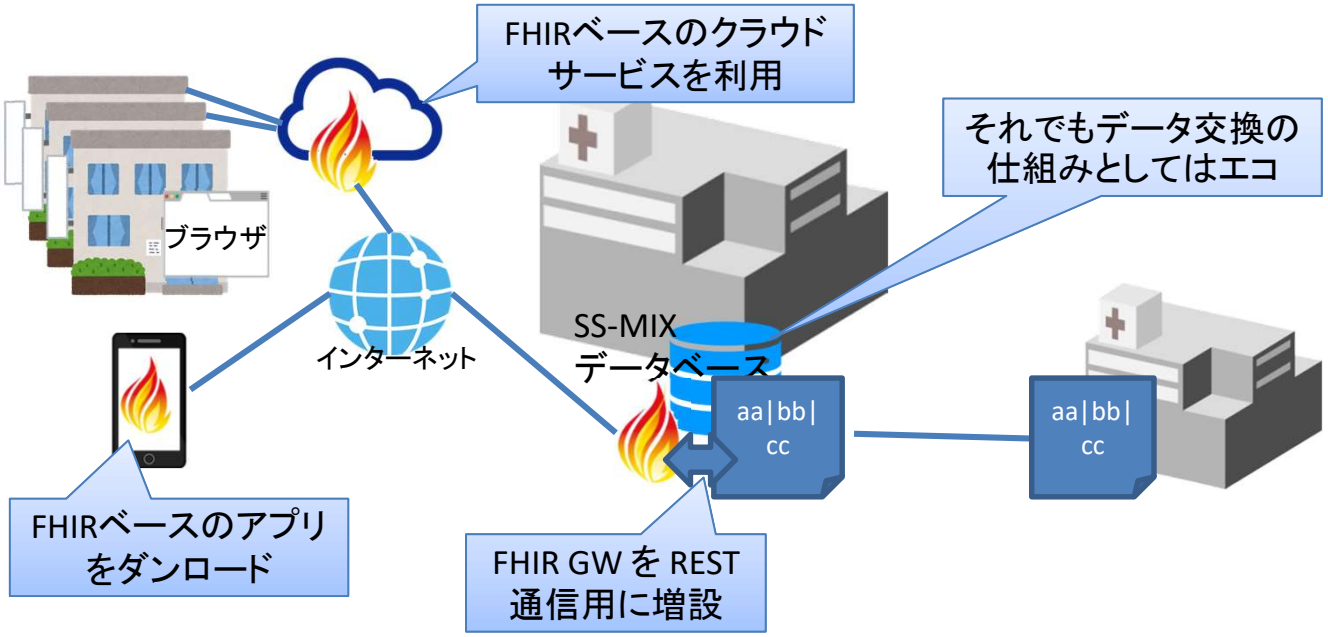
....
```

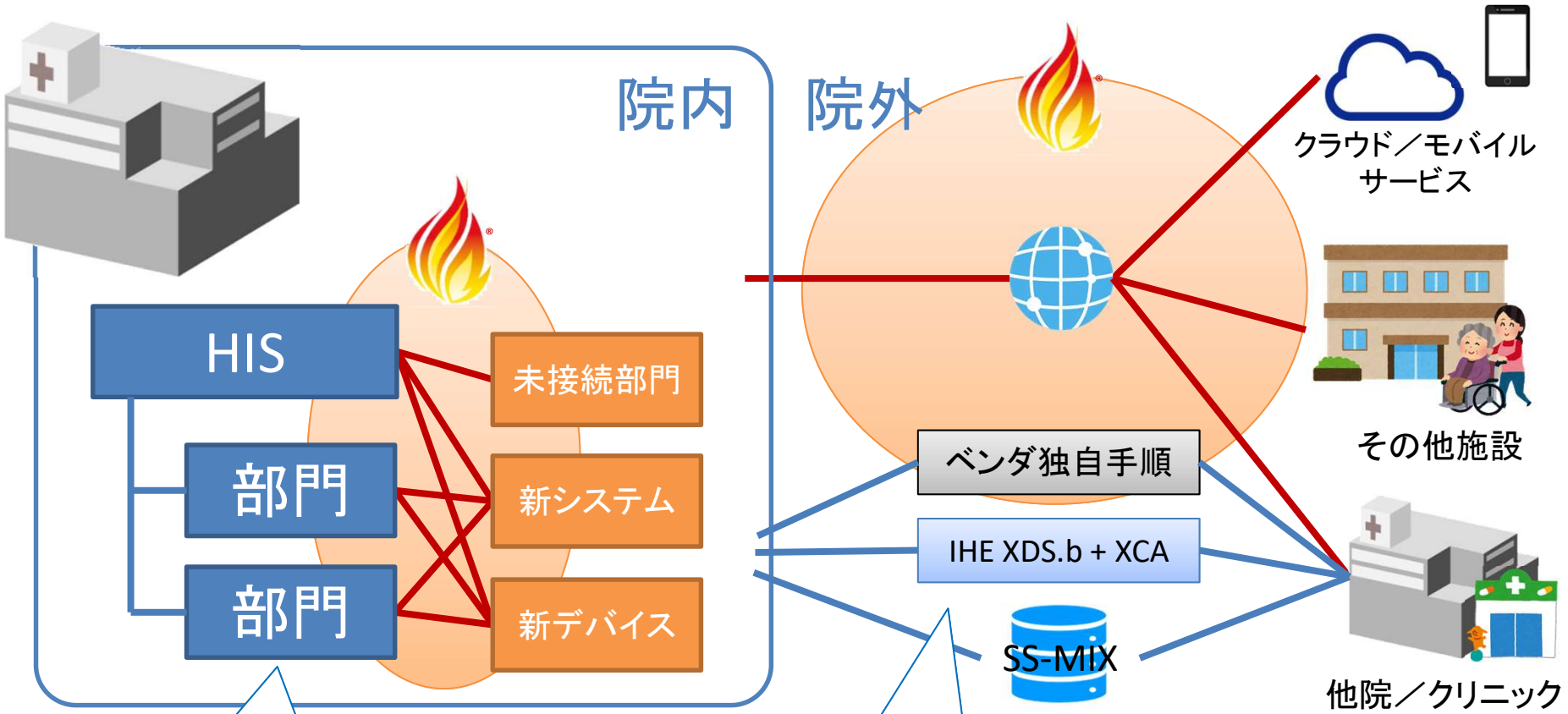
SS-MIX × FHIR による診療情報共有案



SS-MIX は HL7 V2 を標準採用し、データベースもフォルダ構成ルールのみで単純であるため、開発負担は実は小さい仕組みである。
しかし、クリニックやモバイル端末からアクセスしようとすると、HL7 V2 通信を開発する必要があり、負担が大きい。

SS-MIX に FHIR GWを追加採用することにより、データ共有対象が広がる。モバイル端末のFHIR対応アプリも今後、開発、普及が期待できる。クラウドサービスでのSS-MIXアクセスサービスが登場すれば、様々な施設が安価に情報共有を実現できるようになるだろう。

FHIR が HIEの多様的ニーズを埋める



既存で構築した仕組みをリスクを取って置き換える必要はない。

文書フォーム類はすでに確立した HL7 CDA を用いるべき

Fast (to design and implement)

Healthcare

Interoperability

Resources

ご静聴ありがとうございました