FHIR TRAINING

CDC FOUNDATION
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SESSION 02

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HL7 International

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Session 2

1. What is Interoperability in Healthcare?
2. Brief History of HL7 Standards and their use in PH
3. What is an API? What is the meaning of REST?

WE WILL ASK SIX QUESTIONS AT THE END OF EACH SESSION – BE ALERT!

Overview of HL7

Block 01

- What is it?
- Global Reach
- Interoperability Classification
- Why are interoperability & standards important?
- Why are they relevant for Public Health?
- Basic Agreements
- History of HL7 Standards

HL7 International

- A **not-for-profit** organization, founded in 1987
- **ANSI-accredited** standards development organization
- Dedicated to providing a **comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information**
- Three Product Families: **FHIR, V3/CDA, V2.x**
- Vision: **A world in which everyone can securely access and use the right health data when and where they need it.**

HL7 International

HL7 CDA

HL7 FHIR

HL7 V2
An HL7 International Standard

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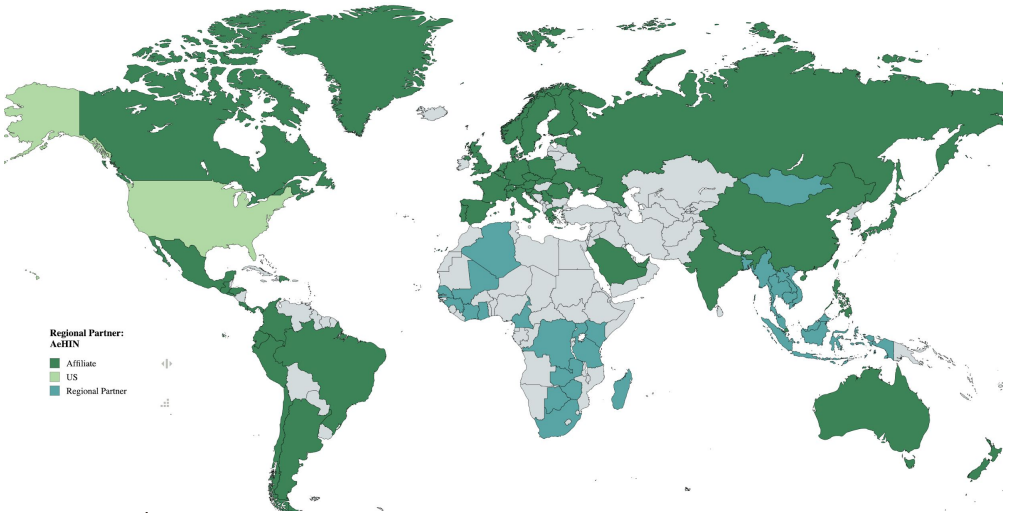
HL7 International's Global Reach

- **HL7 Mission:** To provide standards that empower **<u>global</u>** health data interoperability.



- 50+ Countries
- 500+ Corporate Members
- 1600+ Individual Members
- Thousands of contributors

Regional Partners:
Helina: Africa
AeHIN: SE Asia
<u>Newest Affiliates</u>
HL7 Ecuador
hl7ecuador.org
CAM (Central America+Dominican Republic)

HL7 International

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Interoperability Classification

Technical

The information **travels** from one system to another

Semantic

The receiving system **can use** the received information

Process

The exchange **improves workflow** for the systems

Why is interoperability important in Health Care?

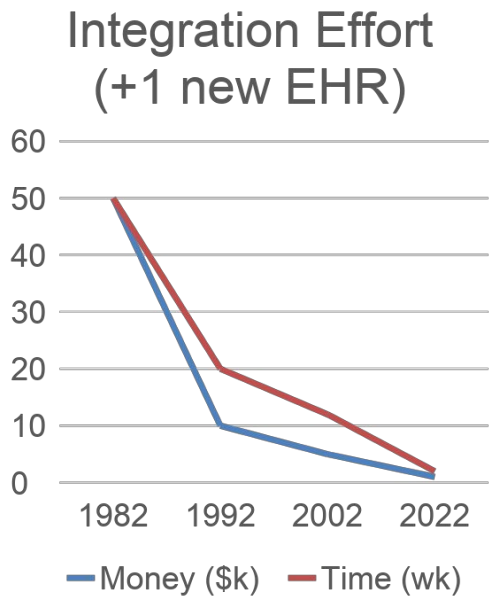
Avoid data entry **redundancy** and **transcription**

The **right information** in the **right place** and the **right time** for the **right person**

Why are STANDARDS important in HIT?

Reduce **costs** and **variability**

Avoid vendor **lock-in**



Why is it important for Public Health?

What is the common theme in these transitions through the "new world of public health data"?

Semantic Interoperability in Real Time

https://www.cdc.gov/surveillance/pdfs/New-World-of-Public-Health-Data.pdf

Why is it important for Public Health?

All **health** is… eventually… **Public Health**

Not a political declaration, a technical one.

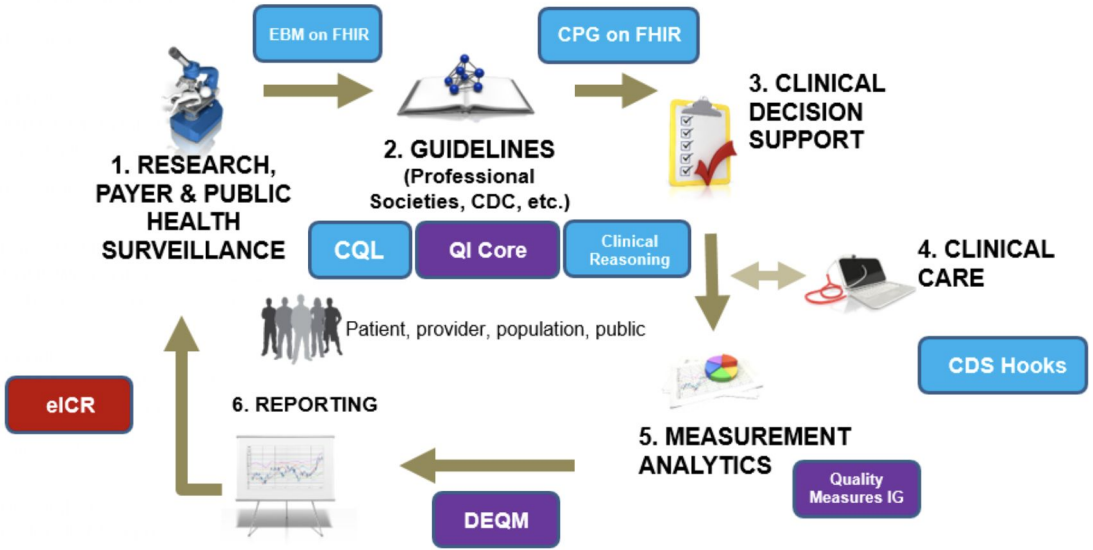
Public Health needs information from every patient / and every provider.

To do what? What do we want?

What do we want?

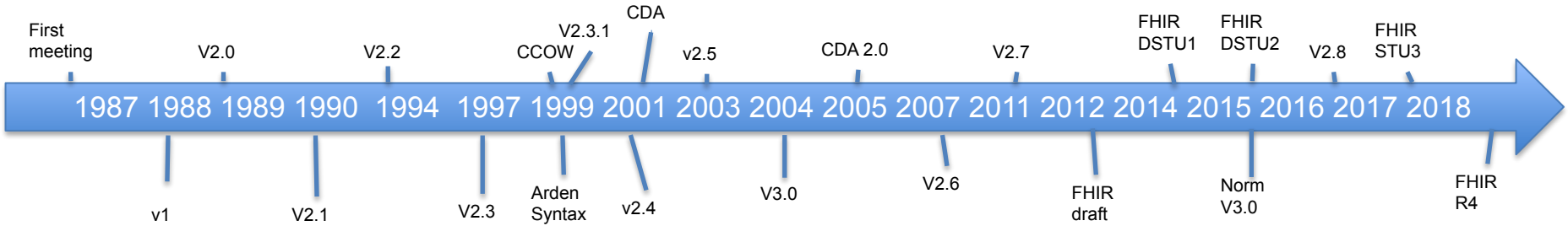
More than just ad-hoc data exchange…

A Learning Health System?



Interoperability: What do we need to agree on?

HL7 Standards Timeline



1985-> Messaging (HL7 V2)

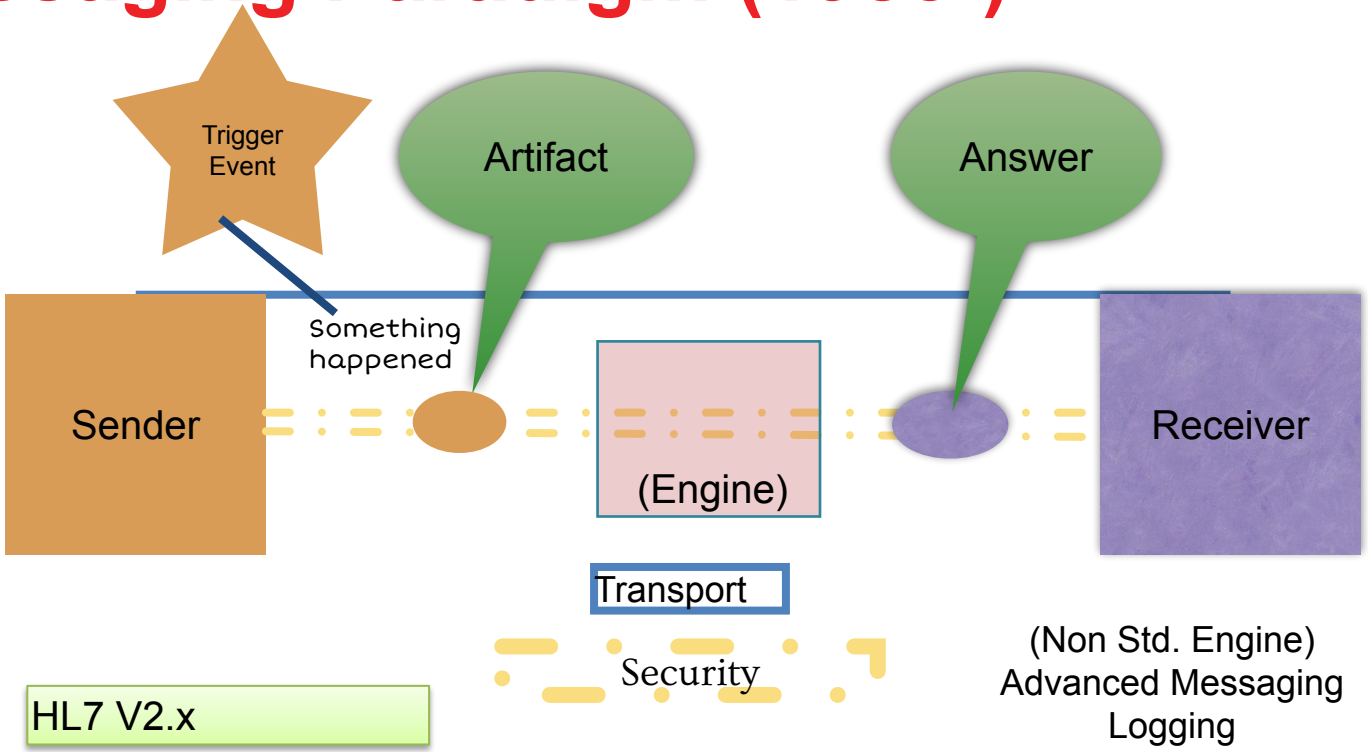
2000-> Documents (CDA R2)

2002-> Services (EIS/CTS)

2012-> Resources/APIs (FHIR)

HL7 International

Messaging Paradigm (1985-)



HL7 Exchange Artifact

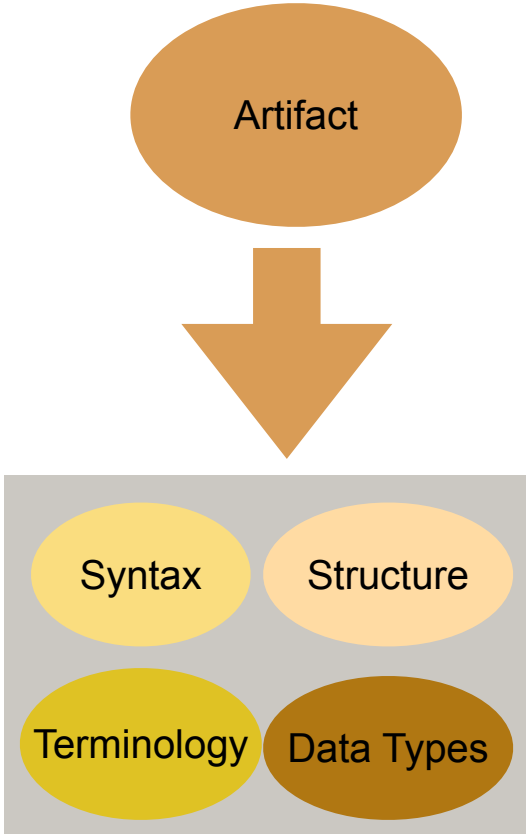
Syntax: XML, JSON, v2 ITS, binary

Structure: v2 Message, v3 message, FHIR request, CDA document, CCR document, DICOM image

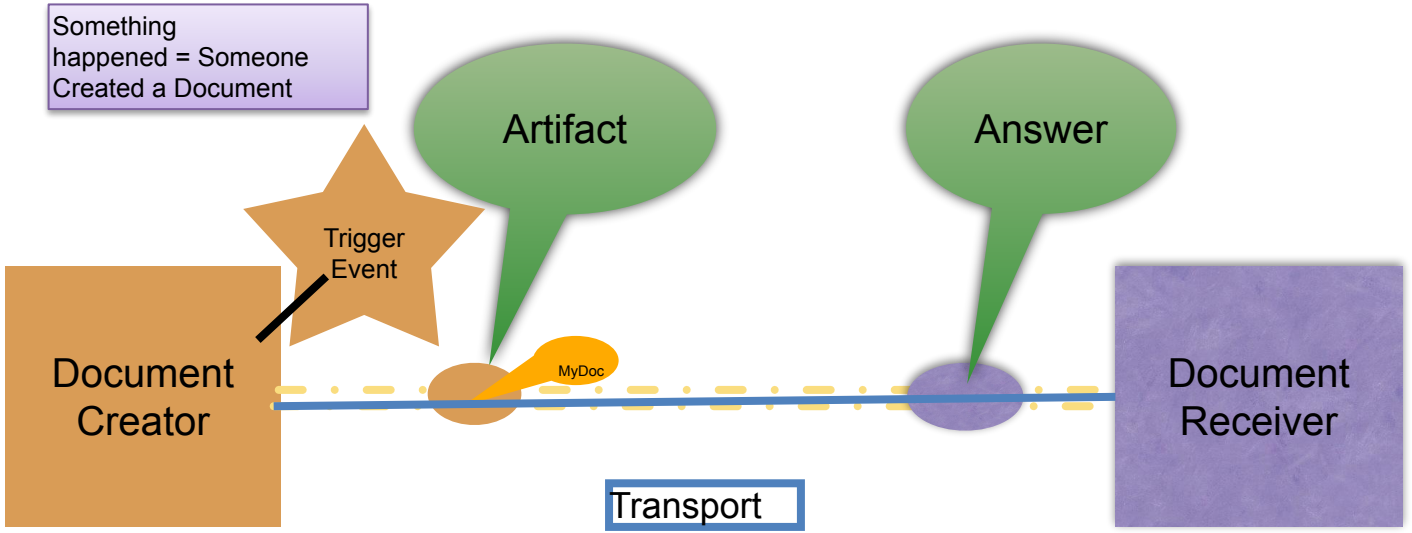
Data Types: dates, numbers, quantities, names, phones,

Terminology: possible codes for coded items

Content: combination of structure and terminology for specific use cases: ADT, Lab Results, etc.



Document Exchange Paradigm (2000-)



The document is 'the payload'. The artifact contains 'metadata': context

HL7 CDA R2 specifies **ONLY** the document structure (xml tags)

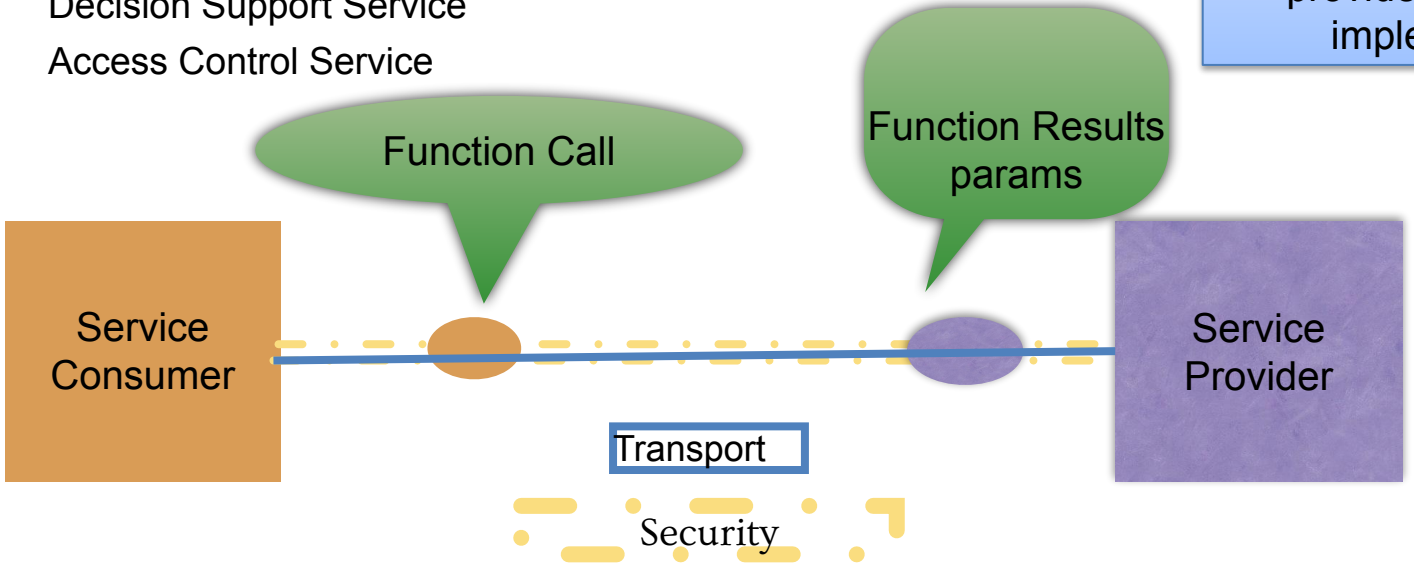
Receiver can be
- Repository
- Consumer

Also a registry should be notified

Service Paradigm (2002-)

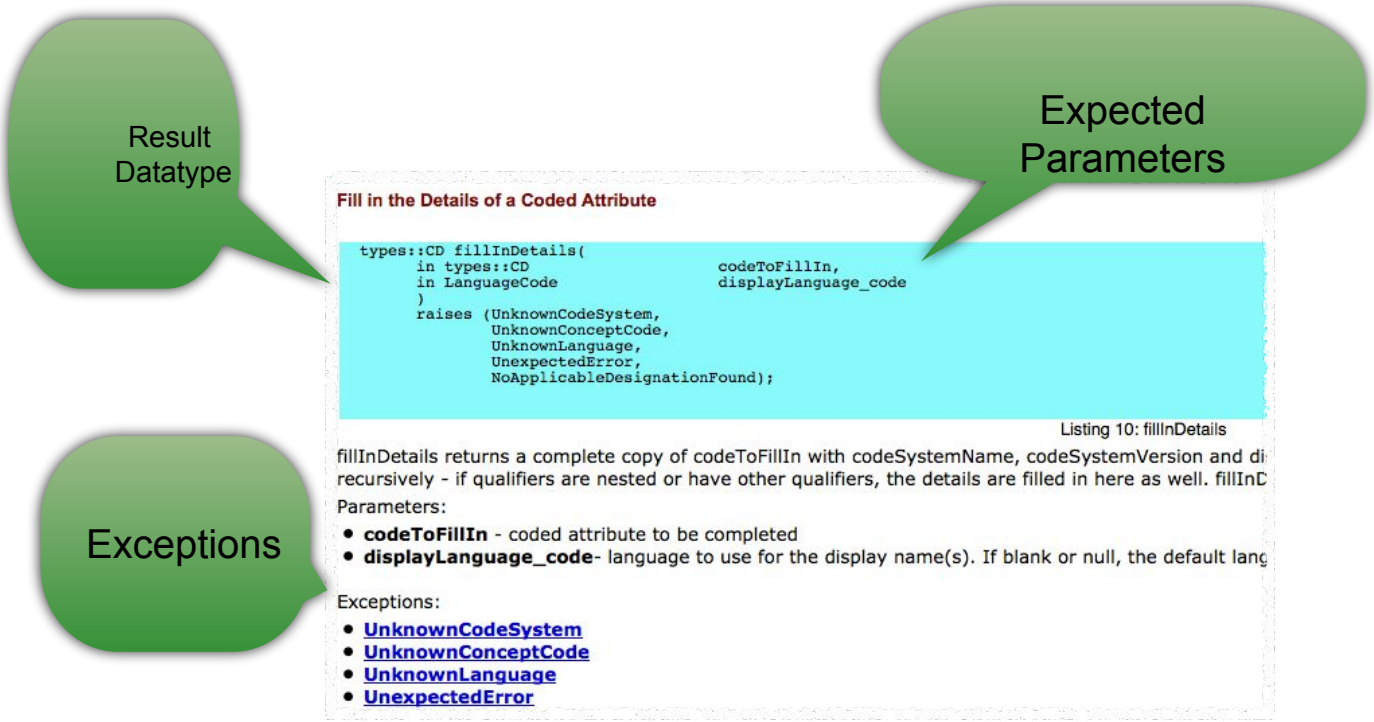
EIS	Entity Identification Service
HCSPD	Find providers
RLUS	Resource Location Service
CTS2	Clinical Terminology Service
DSS	Decision Support Service
PASS	Access Control Service

HL7 defines a set of standardized service oriented architecture based functions that every compliant service provider should implement



Service Paradigm

This is what HL7 defines for each function



HL7 "Legacy*" Standards & Public Health

* No offense implied. I consider myself "legacy", too, and here I am!

HL7 V2.x and CDA R2 still counts for more than 60% of projects CURRENTLY in the HL7 PH WG Roadmap

CDA IG for Reporting to Central Cancer Registries (PI: 1069)
Healthcare Associated Infections Reports
HL7 CDA Death Reporting (PI: 859)
HL7 CDA for Ambulatory and Hospital Healthcare Provider reporting of Birth Defects (PI: 1112)
HL7 CDA National Medical Care Surveys (PI: 1002)
HL7 CDA R2 Implementation Guide: Reportability Response File, STU 1.0 (PI: 1216)
NHSN Healthcare Associated Infection (HAI) Reports for Long Term Care Facilities (CDA & FHIR) (PI ID: 1511)
ODH in CDA
Public Health Case Report Update (CDA) STU (PI: 1216)
Vital Records Birth and Fetal Death Reporting CDA IG (PI ID: 1474)

Diagnostic Audiology
HL7 v2.5.1 LOI/LRI - Public Health Profile
HL7 v2.5.1 LRI - Newborn Dried Blood Spot (NDBS) Orders
HL7 v2.5.1 Syndromic Surveillance IG (PI ID: 1401)
HL7 v2.6 Critical Congenital Heart Defects (PI: 897)
HL7 v2.6 Early Hearing Detection (PI: 898)
HL7 v2.6 Vital Records Birth and Fetal Death Reporting IG (PI: 816)
HL7 v2.6 Vital Records Death Reporting IG (PI: 1208)

Product Family : HL7 VERSION 2

Laboratory Reporting

(HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm)

We will use an HL7 V2 viewer:

https://hl7.cc/farser

https://tinyurl.com/cdc24-hl7v2ex

Product Family : CDA R2

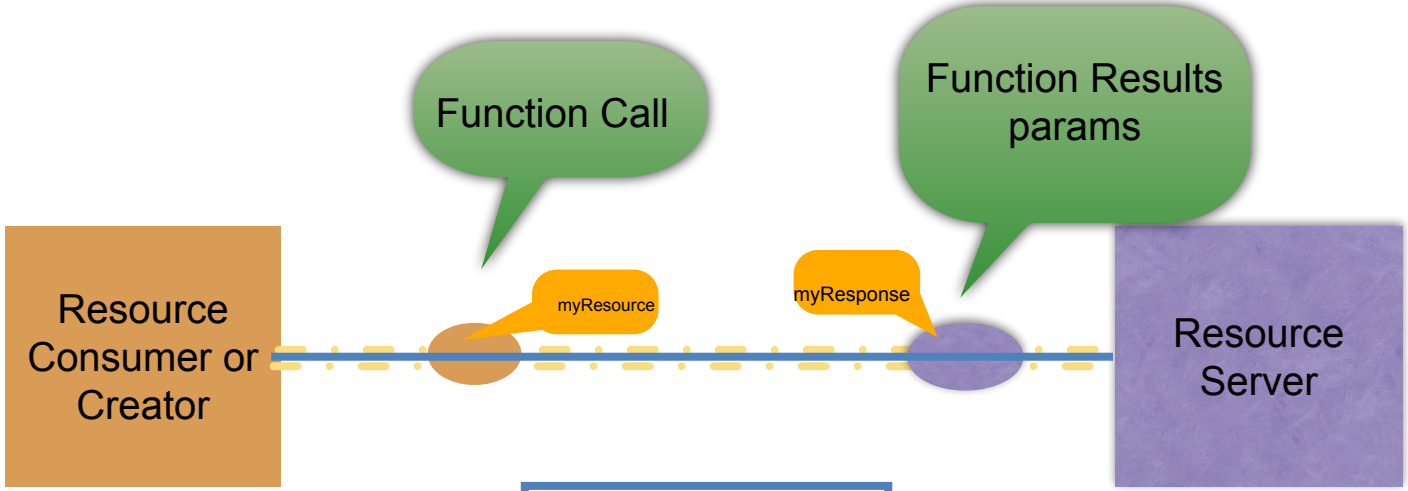
Case Report

(HL7 CDA® R2 Implementation Guide: Public Health Case Report - the Electronic Initial Case Report (eICR)

We will use an HL7 CDA R2 viewer:
https://brynlewis.org/challenge/index.htm

https://tinyurl.com/cdc24-cda-example

Resources Paradigm (2012-)



HL7 Standards Exchange Paradigm Brief

Paradigm	HL7 Standards	From	Comments
Messaging	HL7 v2.x, V3	1985…	App to App Exchange for Data Replication XML, ITS=pipes and hats
Documents	HL7 CDA R2	2000…	Human Readable Artifacts, XML
Services	CTS2, RLUS, EIS,DSS,PASS	2003…	SOA Approach. Abstract. Good to understand the domains
Resources	FHIR	2012…	Normative since 2018. XML, RDF and JSON syntax

HL7 International

What is an API?

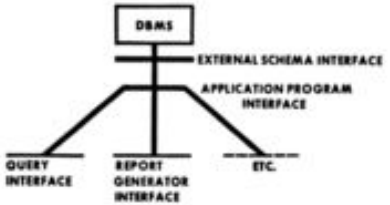
API stands for **Application Program Inter**

A way for an "application program" to use s
some other program (can be a local library

Figure 5
Application Programmer Interface

An alternative which has several advantages is to make the API sufficiently rich to enable programs to be written in support of query, report generation, etc. (Figure 6).

Figure 6
Enriched Application Programmer Interface



API: a set of services available to a programmer for performing certain tasks

This is from a 1978 book.
Not a new concept!

What is an API?

- APIs can be

Internal (only known to a company),

Partner (company & partners), or

External (public, open)

Proprietary, 'secret'.
Usually means 'lock-in'

- APIs are also **CONTRACTS**

1. This is **what** I can do for you
2. This is **how to ask** me to do it

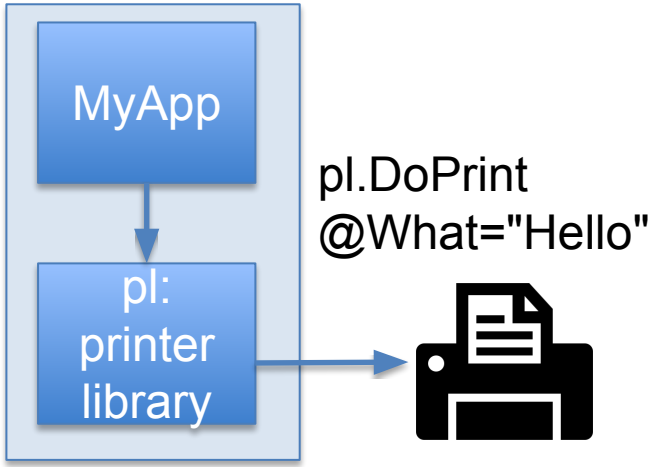
Changing an API without warning is "treason"

What is an API?

APIs can be **local**

(aka 'Software Library')

Legend: Here we can see an app (MyApp) asking a local library (pl) to print something in a printer. Both MyApp and pl run in the same computer.
DoPrint: The method for printing
@what: The parameter (what to print?)

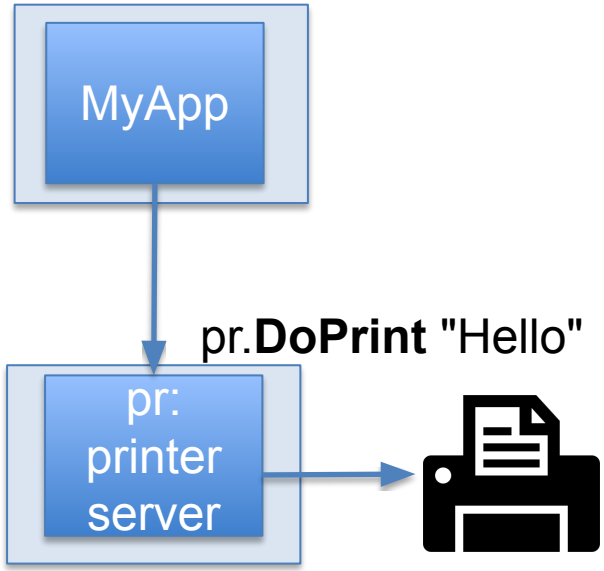


What is an API?

APIs can also be **remote.**

I can ask a **'remote'** system to do something.

Legend: Here we can see an app (MyApp) asking a remote printer server (pr) to print something in a printer. MyApp and pr run in different computers.
DoPrint: The method for printing
@what: The parameter (what to print?)

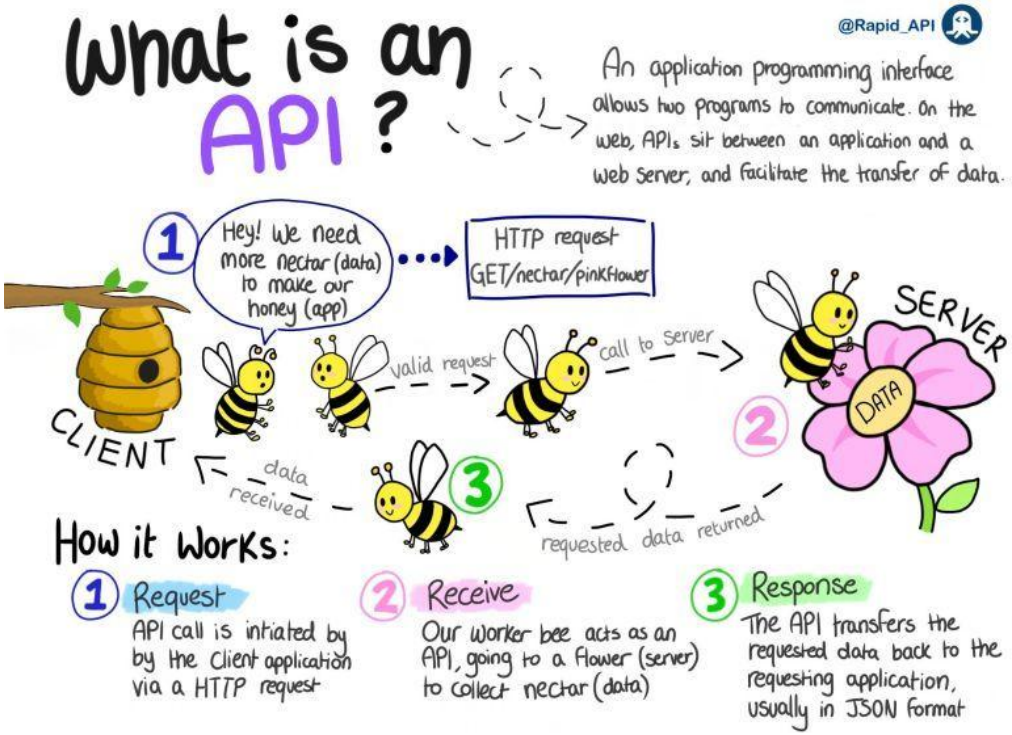


Remote API Flavors

API history in 1 slide

Remote API Style	From	Comments
EDI	1970…	Text message exchange (like HL7 V2.x)
SOAP	1990…	XML based,Simple Object Access Protocol (aka 'services' in HL7 history)
REST API	2005…	Resource based. Originally presented by Roy Fielding in 2000!
Other Web Based	2012…	gRPC: Originaly created by Google WebSocket: Alerts GraphQL: Graph based MQTT/AMQP: Queues
AI Protocols	**2025**	**A2A: Agent to Agent** **MCP: Model Context Protocol**

What is a Web API?



Credit: RapidAPI (https://bit.ly/3KdXrpL)

What is a Web REST API?

- Uniform Interface
- Discoverable
- Client/Server
- Stateless
- Cacheable
- Layered System

PRINCIPLES

- For data, metadata and references
- HTTP methods for exchange: GET, PUT, POST, DELETE

RESOURCES

Based on definitions by Fielding (2001): Representational State Transfer
https://bit.ly/3woZLon

What are REST APIs good for?

- Access data from third parties
- Hide complexity
- Extend functionality
- Centralize security
- Standardize access to data

REST APIs explain how 99% of the web and the clouds services works today

Let's review the questions for this session!

1- What are the three types of interoperability?

2- What are the standards families developed by HL7?

3- What are the four exchange paradigms mentioned?

4- Which of the HL7 standards support XML syntax?

5- Which of the HL7 standards support JSON syntax?

6- Order these standards based on their publication date: HL7 V2.5, FHIR R4, CDA R2

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Questions for Session #2