

# General Introduction to FHIR

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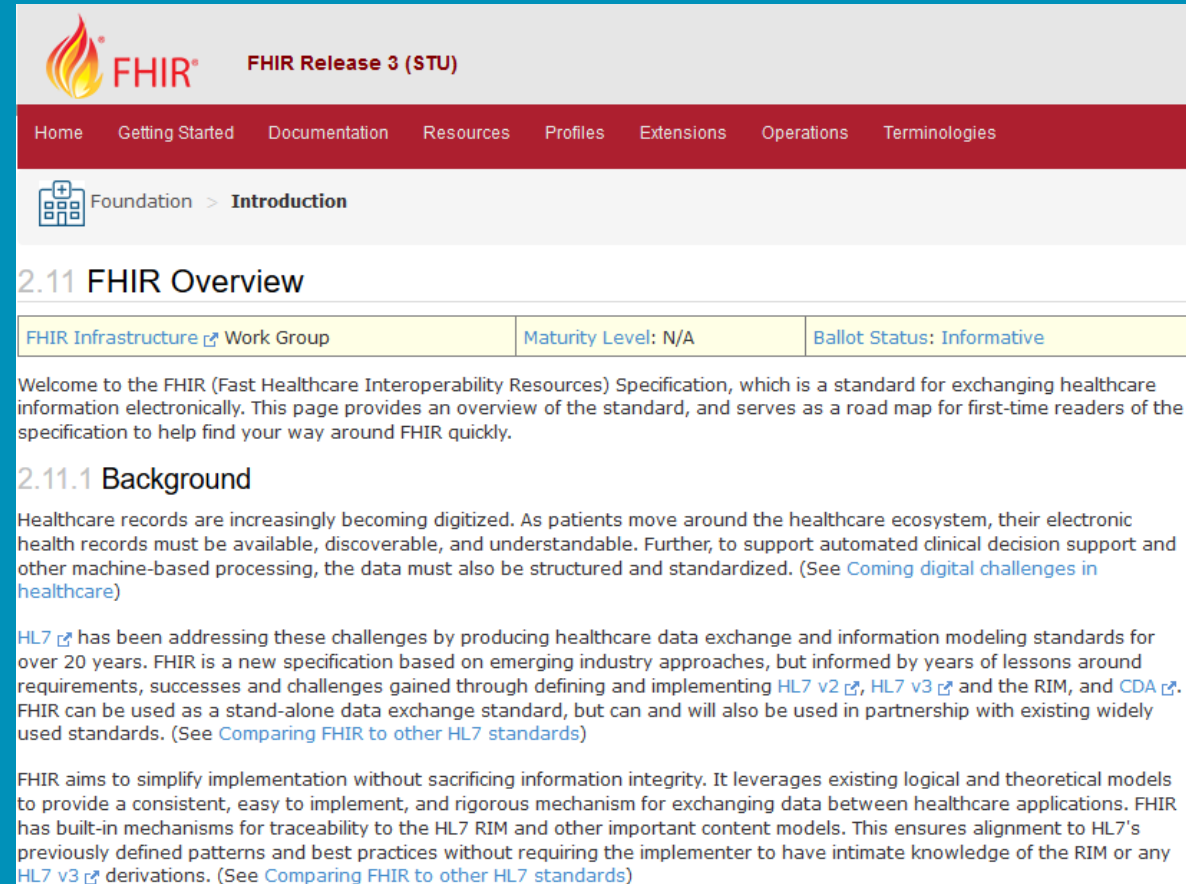
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# Presented by

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- **Position:**
  - Lead Consultant, AEGIS.net, Inc.
  - FHIR® Certified Implementer
- **Background:**
  - 34+ years IT industry experience
  - 14+ years leading HIT development/implementation efforts
  - 4+ years contributing to the HL7® FHIR® specification (focus on testing)
  - Sr. Architect / Lead Developer for the Touchstone Project
  - Author of the AEGIS WildFHIR public test server and client

# What is FHIR?

- The latest HL7 standard for exchanging electronic healthcare information
- Defines a simplified approach to implementation w/o sacrificing information integrity
- Defines “Resource” as the basic building block of all exchangeable content



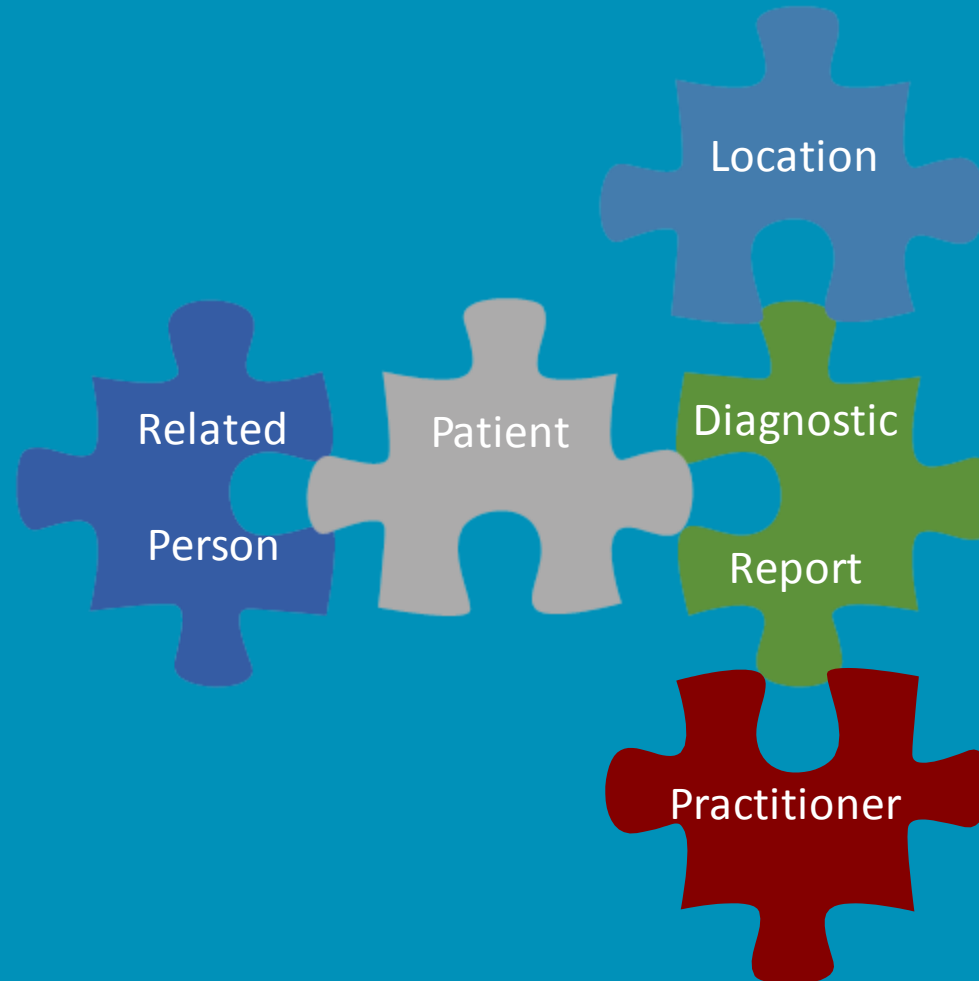
The screenshot shows the FHIR Release 3 (STU) website. The header includes the FHIR logo and the text "FHIR Release 3 (STU)". Below the header is a navigation bar with links: Home, Getting Started, Documentation, Resources, Profiles, Extensions, Operations, and Terminologies. The main content area shows the breadcrumb "Foundation > Introduction" and the section "2.11 FHIR Overview". Below this is a table with three columns: "FHIR Infrastructure" (with a link to the Work Group), "Maturity Level: N/A", and "Ballot Status: Informative". The text below the table welcomes users to the FHIR (Fast Healthcare Interoperability Resources) Specification, which is a standard for exchanging healthcare information electronically. It provides an overview of the standard and serves as a road map for first-time readers. The section "2.11.1 Background" follows, explaining that healthcare records are increasingly becoming digitized and that FHIR is a new specification based on emerging industry approaches, informed by years of lessons around requirements, successes, and challenges gained through defining and implementing HL7 v2, HL7 v3, and the RIM, and CDA. It states that FHIR can be used as a stand-alone data exchange standard, but can and will also be used in partnership with existing widely used standards. The final paragraph states that FHIR aims to simplify implementation without sacrificing information integrity, leveraging existing logical and theoretical models to provide a consistent, easy to implement, and rigorous mechanism for exchanging data between healthcare applications. It has built-in mechanisms for traceability to the HL7 RIM and other important content models, ensuring alignment to HL7's previously defined patterns and best practices without requiring the implementer to have intimate knowledge of the RIM or any HL7 v3 derivations.

# The Acronym

- F – Fast (to design and to implement)
  - Relative – No technology can make implementation as fast we like
- H – Healthcare
  - That's why we're here
- I – Interoperable
  - Ditto
- R – Resources
  - Building blocks (our next focus)

# It's all about the Resources...

- Building blocks...



# Resources

- The Defined Structured Data Elements that
  - Are the logical, *common* contents of a resource
  - Are mapped to formal definitions; i.e. the RIM (Reference Information Model)
  - Can be represented in multiple syntaxes: JSON, XML, Turtle (Terse RDF Triple)
- Native Support for Extensions
  - Local, Regional, Country specific data requirements, but everyone can use
  - Published and Managed as part of the specification
- May include Human-Readable Narrative
  - XHTML

```
{
  "resourceType": "Patient",
  "id": "example",
  "meta": {
    "versionId": "1",
    "lastUpdated": "2017-01-03T16:05:00.792Z"
  },
  "text": {
    "status": "generated",
    "div": "<div xmlns=\"http://www.w3.org/1999/xhtml\"><p>Henry Levin the 7th</p></div>"
  },
  "extension": [
    {
      "url": "http://hl7.org/fhir/StructureDefinition/us-core-birthsex",
      "valueCode": "M"
    }
  ],
  "identifier": [
    {
      "use": "usual",
      "system": "urn:oid:1.2.36.146.595.217.0.1",
      "value": "12345"
    }
  ],
  "active": true,
  "name": [
    {
      "use": "official",
      "family": "Levin",
      "given": [ "Henry" ],
      "suffix": [ "the 7th" ]
    }
  ],
  "gender": "male",
  "birthDate": "1974-12-25",
  "managingOrganization": {
    "reference": "Organization/example"
  }
}
```

FHIR id & metadata

Human Readable Summary

Extension with reference  
to its definition

Standard Data Content:

- Patient Identity
- Name
- Gender
- Date of Birth
- Provider



# What is a Resource?

## FHIR Resource Types

- Administrative  
Patient, Practitioner, Organization,  
Location, Group
- Clinical Concepts  
AllergyIntolerance, Condition,  
Encounter, FamilyHistory
- Infrastructure/Conformance
  - ★ CapabilityStatement,
  - ★ StructureDefinition

## Non-Resource Types

- Gender  
Too small
- Electronic Health Record  
Too big
- Blood Pressure  
Too specific
- Intervention  
Too broad



# CapabilityStatement

- Documents the capabilities of a FHIR client and server
- A client should examine the CapabilityStatement of a server to determine its supported behavior
- The CapabilityStatement:
  - is a key part of the FHIR conformance framework
  - is a statement of the features, rules and behaviors of a FHIR system
  - may be used for system compatibility testing, code generation, or as the basis for conformance testing
- To declare themselves “FHIR Conformant”, a system **MUST** publish a CapabilityStatement: <http://hl7.org/fhir/STU3/http.html#capabilities>

# StructureDefinition

- A resource that describes a structured set of data element definitions and their associated rules of usage
  - how resource elements and/or data types are used or not used
  - resource or data type extensions
  - Value Set references that specify the content of coded elements
- Describes (Profiles) the base content defined in the specification
- Describes (Profiles) how these structures are utilized in implementation guides

# FHIR Use Case – Pediatrician Immunization Scenario

- Example: A mother takes her child to Sunset Pediatric Office. The pediatrician needs to determine what vaccination shot(s) are due for the child.
- Question: What FHIR resources will be used to record this visit and forecast the shot(s) that are due?



# Answers

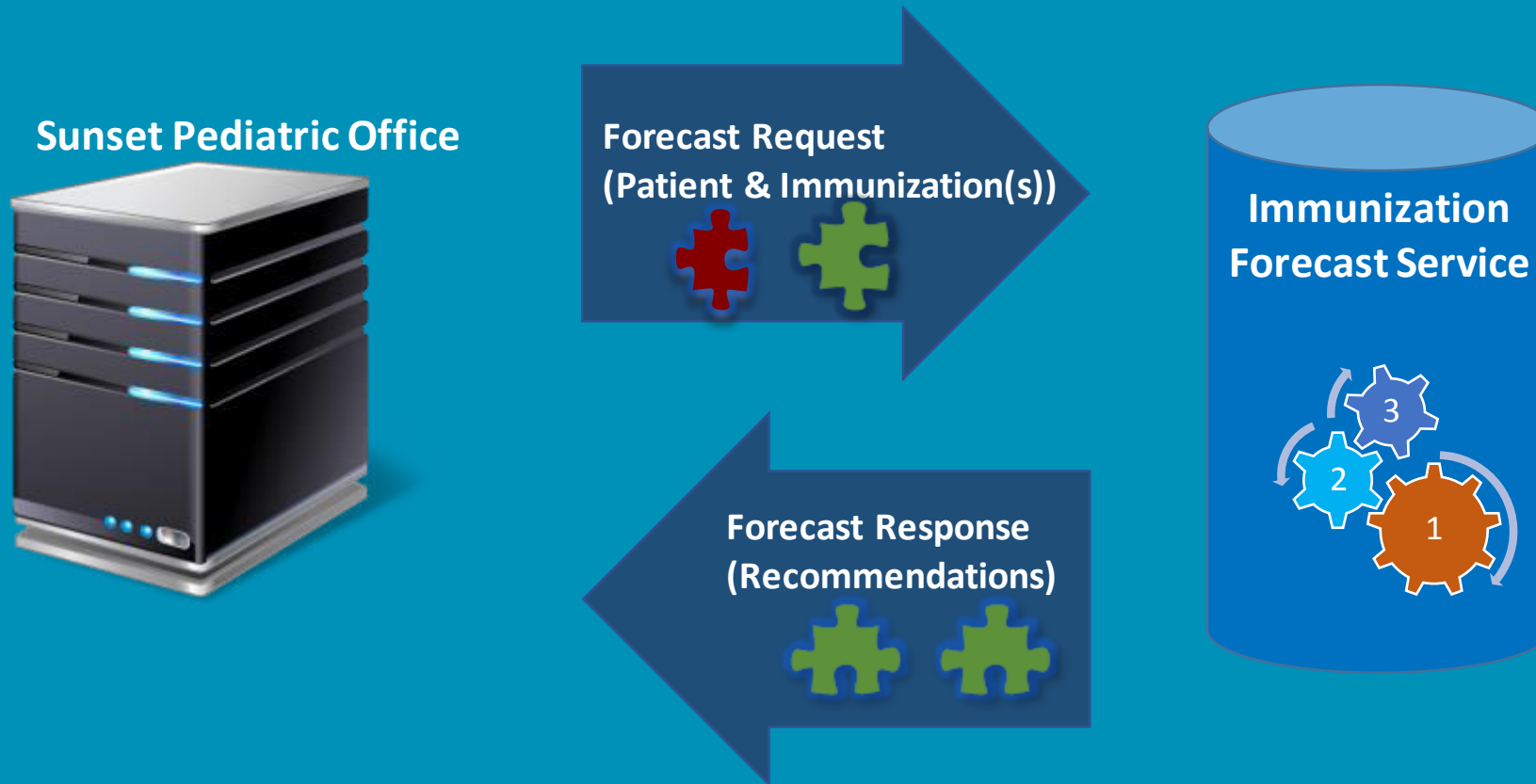
## Recording the visit

- Patient
- Practitioner
- Organization
- Location
- Observation
- Encounter

## Forecasting the shots

- Patient
  - Immunization
  - ImmunizationRecommendation
- ★ Let's see how this would work...

# Immunization Forecast Workflow



# Paradigms

FHIR supports four  
interoperability  
paradigms



# REST



- Simple, out-of-the-box interoperability
- Leverages HTTP methods: GET, POST, etc.
- Pre-defined operations
  - Create, Read, Update, Delete
  - Also: History, Read Version, Search, Patch, Validate, Capabilities, Batch & Transaction
- Works best where control resides on client side and a trust relationship exists



# Patient - Resource Content

<http://hl7.org/fhir/patient.html#resource>

- The **Structure** tab shows the element organization
- The **Card.** stands for cardinality and defines the min and max occurrences of an element
- The **Type** lists the FHIR data type; e.g. **name** is of type **HumanName**. Clicking on **HumanName** will show its structure

8.1.2 Resource Content

Structure UML XML JSON Turtle R2 Diff All

Structure

| Name       | Flags | Card. | Type           | Description & Constraints  |
|------------|-------|-------|----------------|--|
| Patient    |       |       | DomainResource | Information about an individual or an organization. Elements defined in Ancestors: id, meta, modifierExtension |
| identifier | Σ     | 0..*  | Identifier     | An identifier for this patient   |
| active     | ?! Σ  | 0..1  | boolean        | Whether this patient's record is in active use   |
| name       | Σ     | 0..*  | HumanName      | A name associated with the patient   |
| telecom    | Σ     | 0..*  | ContactPoint   | A contact detail for the individual  |
| gender     | Σ     | 0..1  | code           |  |

Structure UML XML JSON Turtle R2 Diff All

Structure

| Name      | Flags | Card. | Type    | Description  |
|-----------|-------|-------|---------|--|
| HumanName | Σ     |       | Element | Name of a human. Elements defined in Ancestors: use, text, family  |
| use       | ?! Σ  | 0..1  | code    | usual   official   temporary   nickname   NameUse (Reason for use) |
| text      | Σ     | 0..1  | string  | Text representation of the name                                    |
| family    | Σ     | 0..1  | string  | Family name  |