HL7 FHIR:
An update for CHIMA

Dr. David Hay, MBChB , June 2015

About Me 个人简介

- **Name: Dr. David Hay**
- **Role: Product Strategist at Orion Health 现任Orion Health医疗产品战略专家**
- **Background**
  - Clinician 临床医师
  - Clinical Applications Vendor 临床应用供应商
  - Involved in FHIR almost from beginning 从一开始就参与FHIR
  - Co-Chair FHIR Management Group FHIR管理协会联合主席
  - Chair HL7 New Zealand 新西兰HL7主席
  - Blog: FHIRBlog.com 博客

FHIR (Fast Healthcare Interoperability Resources)
快速医疗资源互通

- **Drivers for FHIR 动机**
- **The main parts of FHIR 主要部件**
  - Resources 资源
  - Exchanging FHIR 交换
  - API 应用程序接口
  - Profiling 分析
- **Implementing FHIR 实施**

Desired outcome is that you want to learn more about FHIR !
理想的结果是，你想更深入的了解FHIR！

Why FHIR

Drivers 动机

- **Interoperability requirement increasing 互操作性要求的提高**
  - Increasing collaborative care – need for co-ordination 提高合作医疗–需要协调
  - Changing Payment models 改变支付模式
  - Clinical Care delivery to an aging population 人口老龄化的临床护理
  - Decision support 决策支持
  - Involving the patient – raising the bar 涉及病人 - 提高标准
- **Need for real time access 实时访问需要**
  - Mobile 手机
  - Connected world 与世界接轨
- **Vast increase in the amount & type of data 数据的数量与类型大量增加**
  - Devices, Mobile 移动设备
  - Genomics 基因组学
- **Analytics, population health 分析，人口健康**
- **Implementer expectations 实施者的期望**
  - Expect a modern standard 期待一个现代标准

Issues with other standards 与其他标准的问题

- **HL7 version 2**
  - Great for messaging between systems 系统间的消息传递
  - But:
    - Old technology 过时的技术
    - Hard to customize and extend 不容易定制和不容易扩展
- **HL7 version 3**
  - Defined common model for interoperability 定义了通用模型的互操作性
  - But:
    - Very large instances 实例庞大
    - Extremely complex to implement 实施非常复杂
- **CDA (version 3)**
  - Very successful 非常成功
  - But:
    - Documents only 仅限于文档
    - Difficult to communicate coded data 难以沟通的编码数据

Business Case for FHIR – I 商业案例

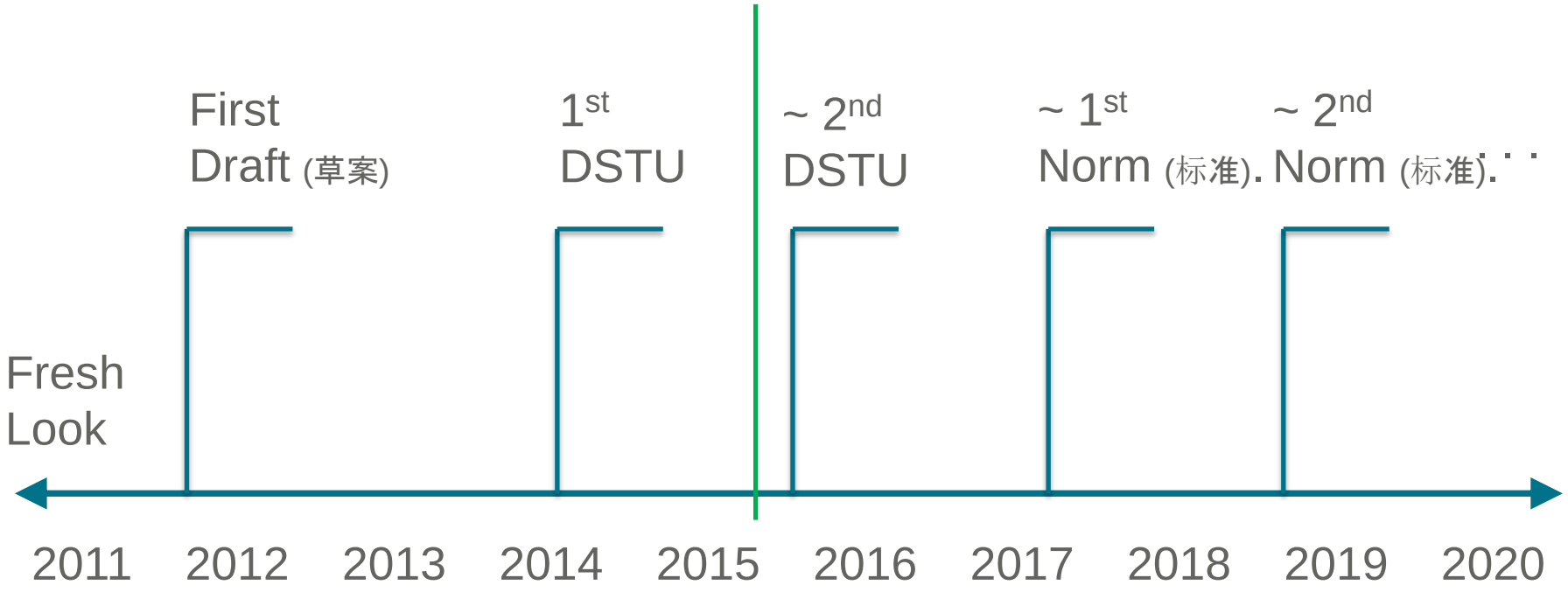
- **Mobile friendly 支持移动设备**
  - Concise, REST API & JSON
- **Developer friendly 易于开发**
  - Familiar tooling & familiar technologies – XML/JSON, HTTP, SSL, Oauth 通晓的工具和技术
  - Libraries available – HAPI, reference implementation 方便的标准库
- **Simple to understand and access with examples! 简单的理解和使用的例子**
- **Predefined Resources 预定义的资源**
  - Analysis already done 已提前分析
- **All paradigms, All Architectures, All Clients 所有的模式，所有的架构，所有客户**
  - Thick client, browser, mobile, devices 胖客户端，浏览器，移动设备

Business Case for FHIR – II商业案例

- **Solves the common problems – can concentrate on the tricky stuff** 解决常见问题–可以专注于棘手的东西
  - Eg API / formats are defined
- **Don't need to understand HealthCare domain to implement** 不需要了解医疗保健领域的实施
  - Developers or Analysts 开发者或分析师
- **Large community for support** 支持大型社区
- **Already in use Internationally** 已经在国际上使用
  - 70 Organizations, 20 Countries, all Continents (except Antarctica) 70组织，20个国家（地区），所有大洲(除了南极洲)
  - Interest from Providers, Vendors, Payers, Governments 医疗供应者，供应商，保险公司，政府都很有兴趣

Results in faster, cheaper deployments that are more re-usable
结果是更快，更低成本的部署，更可重复使用

FHIR Timeline 时间轴



FHIR Manifesto 宣言

- Focus on **Implementers** 聚焦于实施人员
- Target support for **common scenarios** 常见方案的目标支持
- Leverage cross-industry **web technologies** 借助跨行业的网络技术
- Support **human readability** as base level of interoperability 以支持人类对数据的阅读作为互操作性的基础
- Support multiple **paradigms** & architectures 支持多模式与架构
- Make content **freely available** 使内容免费
- Demonstrate best practice **governance** 展示最佳实践下的管理

Resources资源

Resources资源

核心特征

- **“Resources” are:**
  - Small logically discrete units of exchange 小逻辑离散单元的交换
  - Defined behaviour and meaning 定义行为和意义
  - Known identity / location 已知身份/位置
  - Smallest unit of transaction “of interest” to healthcare 最小交易单位“利益”的医疗保健
  - V2: Sort of like Segments 段
  - V3: Sort of like CMETs
- **Can be represented in XML or JSON**
- **Can be individual or in bundles**
  - Eg messages, documents

Resources资源

Clinical 临床方面

General: 通用

- AllergyIntolerance
- ClinicalImpression
- Condition (aka Problem)
- ReferralRequest
- Procedure
- Contraindication
- RiskAssessment

Data Collection & Care Plan: 数据收集&护理计划

- Questionnaire
- QuestionnaireAnswers
- FamilyMemberHistory (+ Genetics)
- CarePlan
- Goal

Medication, Immunization & Nutrition: 药物治疗，免疫&营养

- Medication
- MedicationPrescription
- MedicationAdministration (+ Immunization)
- MedicationDispense
- MedicationStatement
- NutritionOrder
- Immunization
- ImmunizationRecommendation

Diagnostics: 诊断法

- Observation (+ Genetics & Devices)
- DiagnosticReport
- DiagnosticOrder
- ImagingStudy
- ImagingObjectSelection
- Specimen
- BodySite

Administrative 管理方面

Attribution: 属性

- Patient
- RelatedPerson
- Person
- Practitioner
- Organization
- HealthcareService

Entities: 独立实体

- Contract (+ Consent)
- Device
- DeviceComponent
- DeviceMetric
- Location
- Substance
- Group

Workflow Management: 工作流程管理

- Encounter
- EpisodeOfCare
- Flag (aka Alert)
- Communication
- CommunicationRequest
- Supply
- DeviceUseStatement
- ProcessRequest
- ProcessResponse

Scheduling / Ordering: 时间安排/下医嘱

- Appointment
- AppointmentResponse
- Schedule
- Slot
- Order
- OrderResponse
- DeviceUseRequest
- ProcedureRequest
- VisionPrescription

Infrastructure 基础架构

Support: 支持

- Media
- Basic
- Provenance
- AuditEvent

Documents & Structure: 文件&结构

- List
- Composition (+ Clinical Document)
- DocumentReference (+ XDS)
- DocumentManifest

Exchange: 交互

- MessageHeader
- OperationOutcome
- Subscription
- Bundle
- Binary

Conformance: 一致性

- Conformance
- StructureDefinition
- ValueSet
- ConceptMap
- DataElement
- OperationDefinition
- SearchParameter
- NamingSystem

Financial 经济方面

Support: 支持

- Coverage
- EligibilityRequest
- EligibilityResponse
- EnrollmentRequest
- EnrollmentResponse

Billing: 发票

- Claim
- ClaimResponse

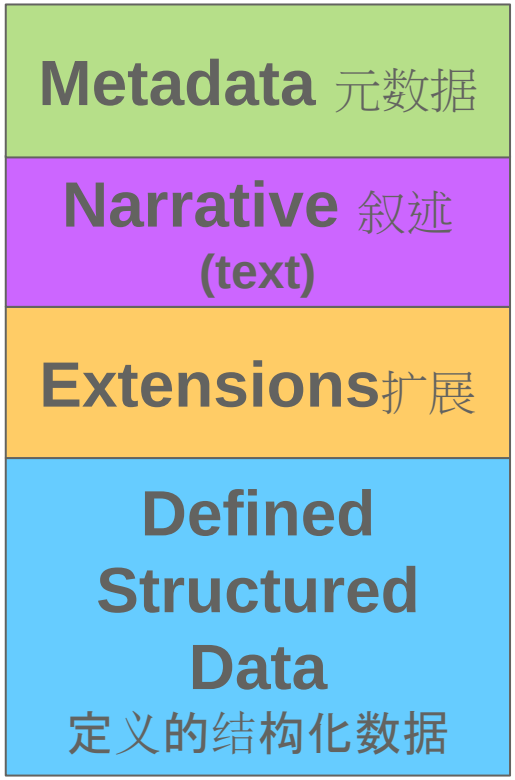
Payment: 付款

- PaymentNotice
- PaymentReconciliation

Other:其他

- ExplanationOfBenefit

Resource anatomy 资源解剖



```
<Patient xmlns="http://hl7.org/fhir">
  <id value="glossy"/>
  <meta>
    <lastUpdated value="2014-11-13T11:41:00+11:00"/>
  </meta>
```

Resource Identity & Metadata

源信息（病人）的身份&元数据

```
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <p>Henry Levin the 7th</p>
      <p>MRN: 123456. Male, 24-Sept 1932</p>
    </div>
  </text>
```

Human Readable Summary

可读取的病人信息概述

```
  <extension url="http://example.org/consent#trials">
    <valueCode value="renal"/>
  </extension>
```

Extension with URL to definition

延用URL来定义

```
  <identifier>
    <use value="usual"/>
    <label value="MRN"/>
    <system value="http://www.goodhealth.org/identifiers/m
    <value value="123456"/>
  </identifier>
  <name>
    <family value="Levin"/>
    <given value="Henry"/>
    <suffix value="The 7th"/>
  </name>
  <gender value="male"/>
  <birthDate value="1932-09-24"/>
  <careProvider>
    <reference value="Organization/2"/>
    <display value="Good Health Clinic"/>
  </careProvider>
  <active value="true"/>
</Patient>
```

Standard Data:

- MRN
- Name
- Gender
- Birth Date
- Provider

标准数据：

-MRN

-姓名

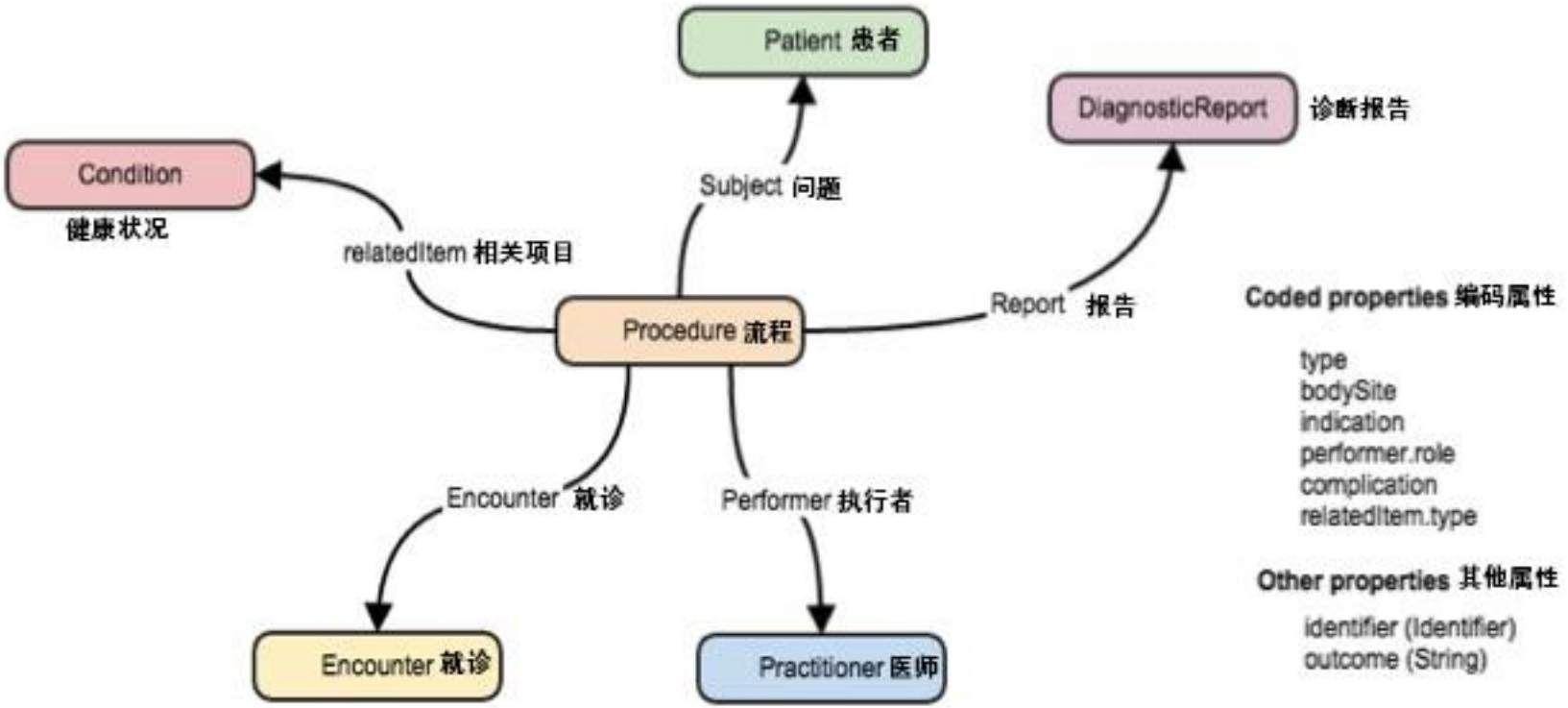
-性别

-出生日期

-提供者

References between resources
引用之间的资源

核心特征



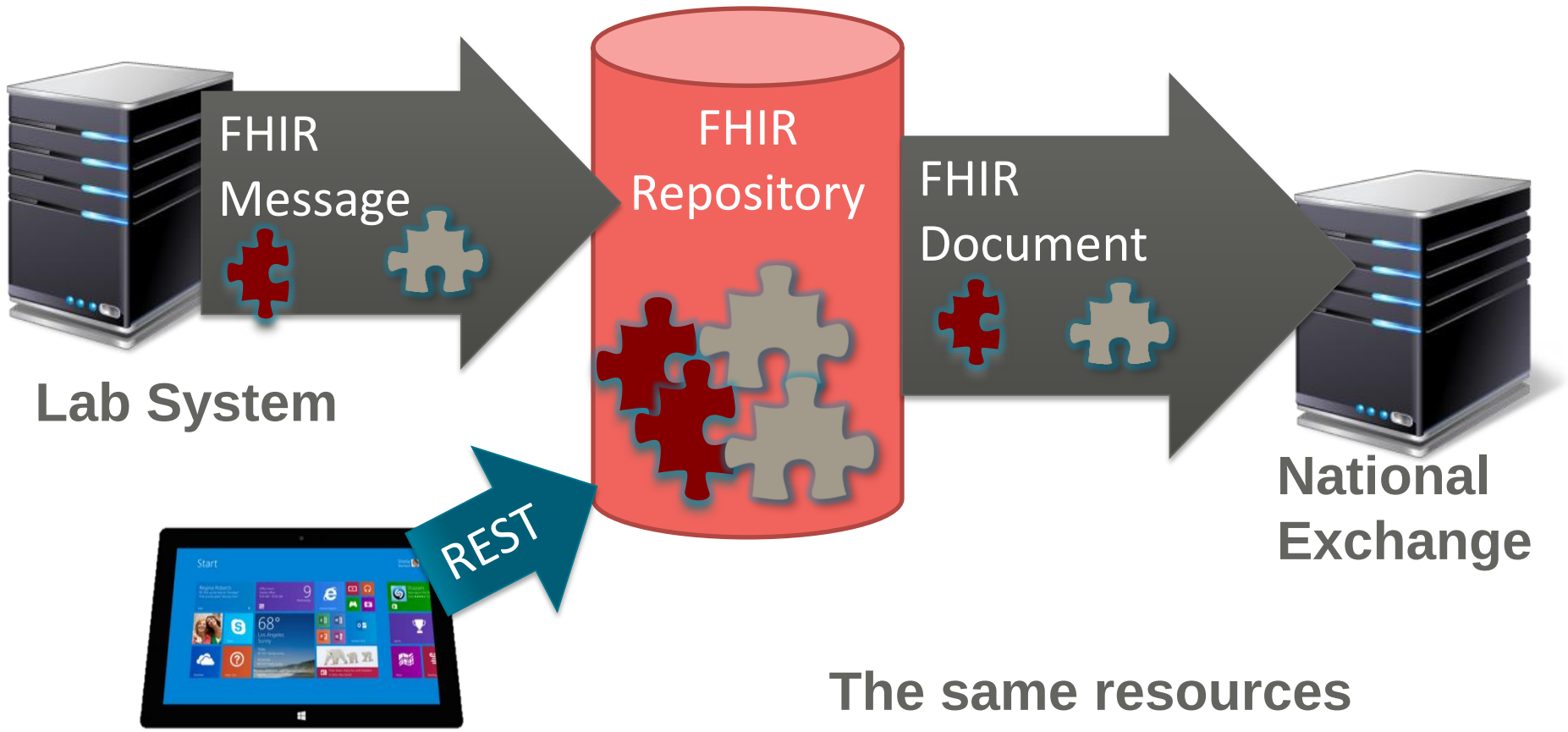
Exchanging FHIR 交换FHIR

Paradigms of Interoperability 范式的互操作性

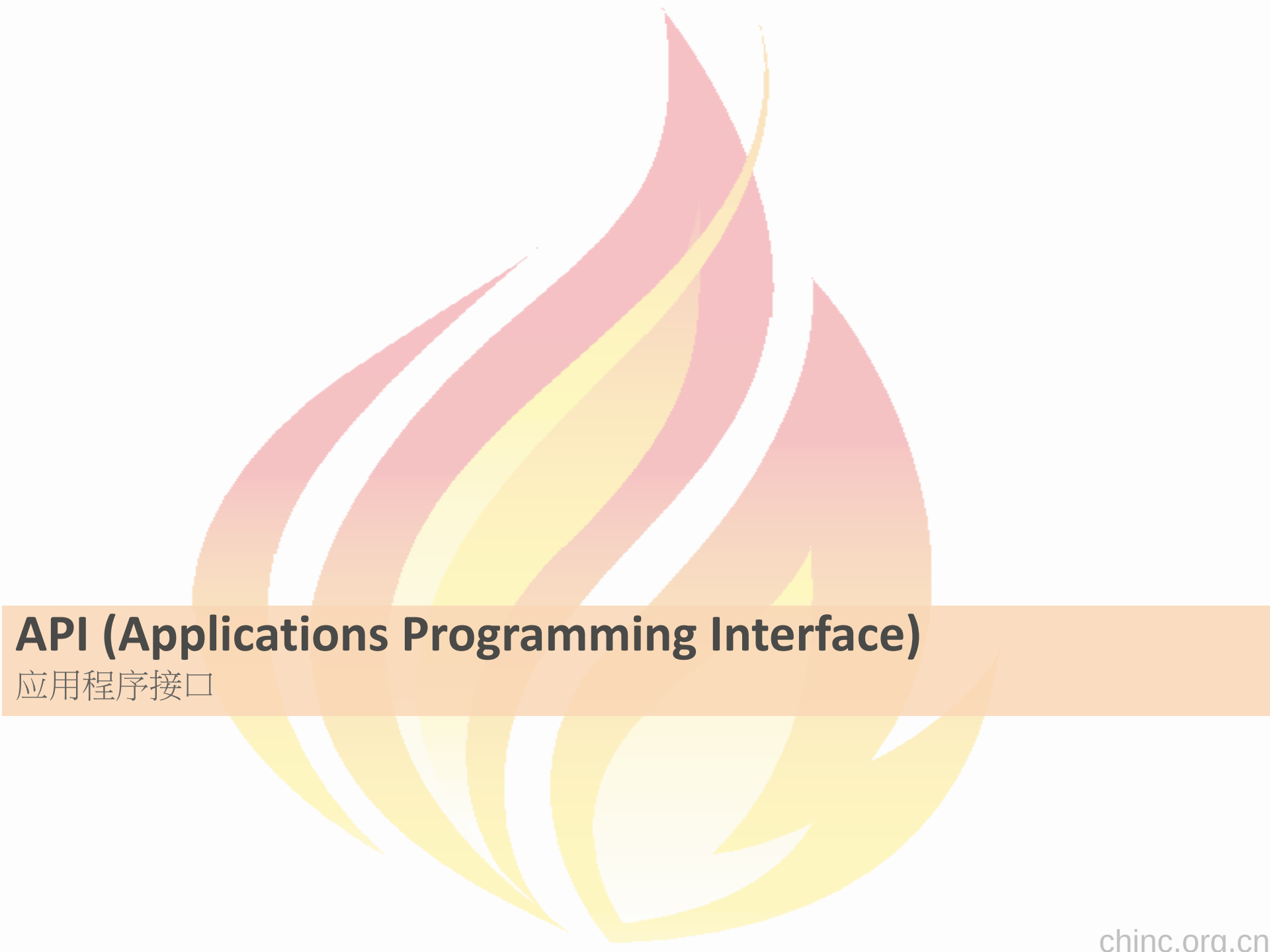
FHIR can support all of these
FHIR支持以上所有

Regardless of **paradigm,** the content **is the same** 无论范式，内容都是一样的

核心特征



The same resources
同样的资源



API (Applications Programming Interface)

应用程序接口

API – REST & Services
应用程序接口 – REST和服务

- **Real-time interaction 实时交互**
  - Application to Application 应用程序中的应用
    - Eg within enterprise systems 在企业系统
  - Person to Application 个人应用
    - Eg Mobile access to data 移动数据访问
- **Increasingly common outside of healthcare 在医疗保健之外越来越普及**
  - Twitter, Facebook, WeChat
- **One of the 'selling points' for FHIR 产品的卖点之一**
  - No other standards has alternatives 没有其他标准可以替代

RESTful interactions - RESTful互动

- **Uses HTTP**
  - Verbs, Headers, Status codes 动词，标题，状态码
- **Single resource operations 单一资源的操作**
  - Create 新建
  - Read 读取
  - Update 更新
  - Version Read 版本读取
  - Delete 删除
- **Search 搜索**
- **Transactions 事务**
- **Versioning API defined 版本API定义**

Operations 操作

- **Also uses HTTP**
- **More complex interactions 更为复杂的交互**
  - RPC – Remote Procedure Call 远程程序调用
  - Defined inputs and outputs 定义输入和输出
- **Some defined in spec 一些定义的规格**
  - ValueSet expansion 值集扩展
  - Fetch Patient record 取病人记录
- **Users can define own Operations 用户可以定义自己的操作**

Profiling 分析

Profiling 分析

核心特征

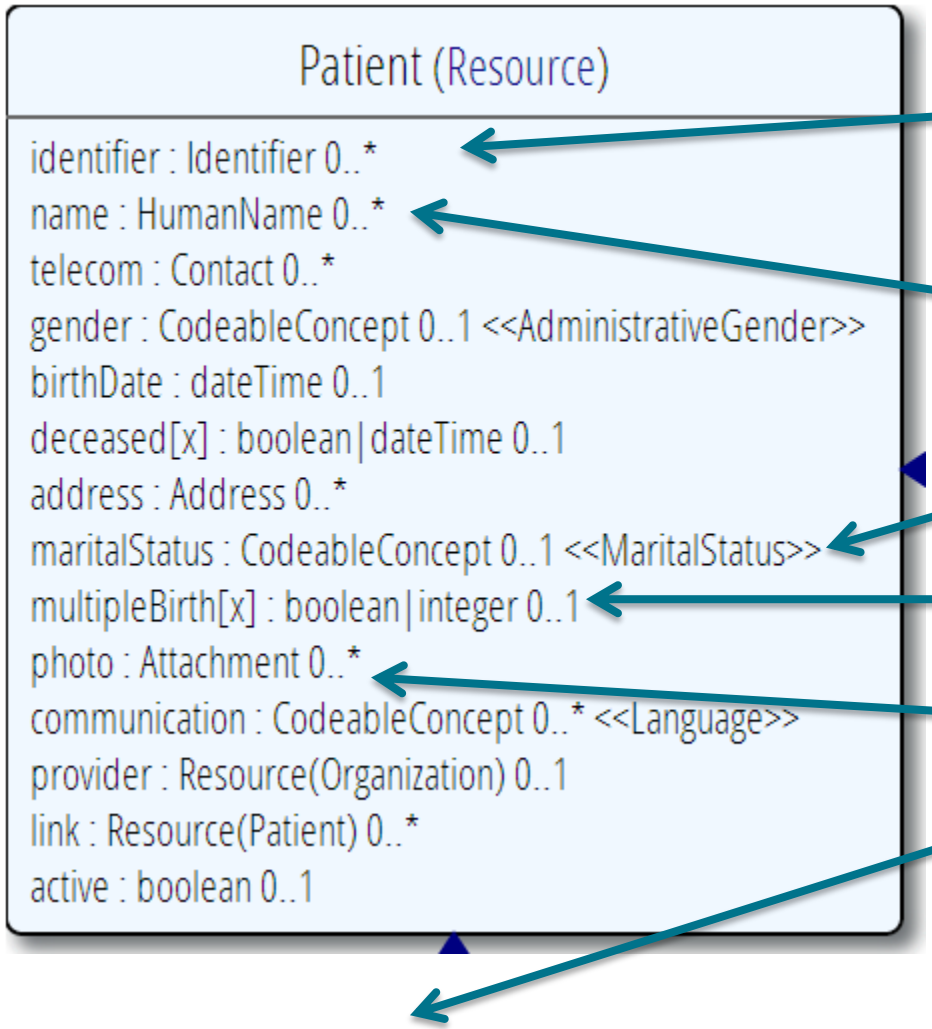
- **The basic resources are not enough 基本的资源是不够的**
- **Specific implementations need to 具体的实施需要**
  - Specify resources needed 指定所需的资源
  - Extend resources 扩展资源
  - Constrain resources 资源约束
  - Specify code sets / terminologies 指定代码集/术语

- **FHIR is a platform specification 平台规范**
  - Profiles adapt it to specific purposes 简介适用于特定用途

- **Profiles can support Internationalization 配置文件支持国际化**

  Eg Chinese language instead of English

Profiling a resource 分析资源



Specify that the identifier uses a Chinese Identifier – and is required
使用中文标识指定的标识符 (必填)

Limit names to just 1 (instead of 0..*)
姓名限制

Limit maritalStatus to different set of codes (ValueSet)
限制婚姻状况不同的组代码

Multiple Birth indicator only boolean
多生日指标

Indicate photo not supported
显示图片不支持

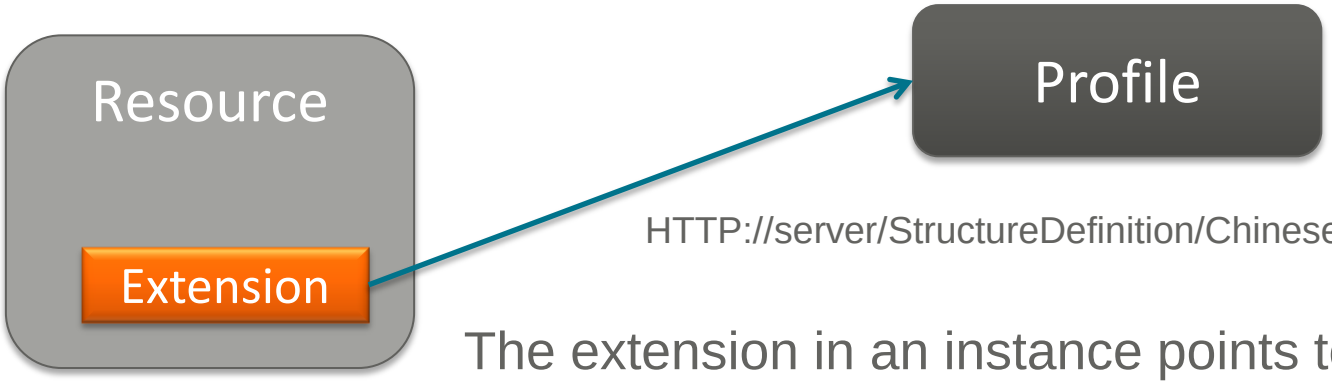
Add an extension to support "Ethnicity"
添加一个扩展来支持 "种族"

Extensions 扩展

- **Only most common elements in base resource在基础资源只有最常见的元素**
  - Keeps the resources small 保持最简化资源
  - (Adding everything was the problem with version 3)
- **Extensions allow other elements to be defined允许在扩展中定义其他元素**
  - Same capabilities as core elements 作为核心元素相同的功能
    - Including resource references and terminology bindings 包括资源的引用和术语绑定
- **Extensions are normal 扩展是正常的**
  - Expect all real implementations to use extensions 盼望所有实际实施使用扩展

Defining and using extensions 定义和使用扩展

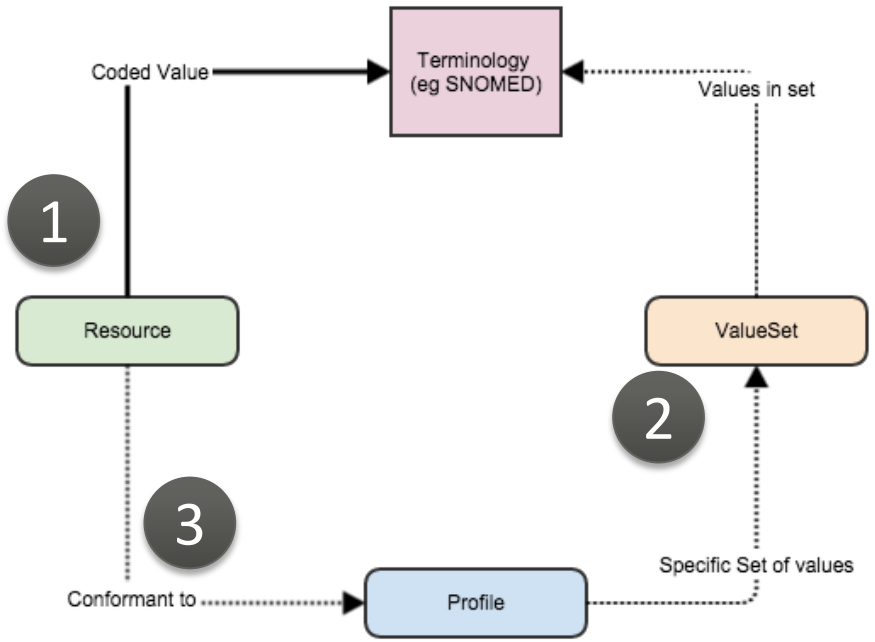
- **Extension definitions are machine readable** 外延定义是机器可读的
- **It's a resource like any other** 它像任何其他的一种资源
  - Can be queried/located like any other resource 可以查询/定位像任何其他资源
- **Profile registries will be established to** 配置文件注册表将被设立
  - Store and search for definitions 存储并且搜索定义



The extension in an instance points to its definition
Can be (and probably are) on different servers
在一个实例中的扩展所指向的定义可以(和很可能是)在不同的服务器上

Bindings to Terminology对术语的捆绑

- **Some elements are coded 有些要素被编码**
  - Eg Condition.code or Goal.outcome
- **Coded elements are 'bound' to a set of values**
  - Can be simple list of codes, or a complex ontology (eg SNOMED) 可以是编码简单的列表或者复杂本体论
- **Profiling allows different 'sets' of values for different Use Cases**
  - Uses ValueSet resource



1. **Resource has coded element from terminology 资源有从术语中获得的编码元素**
2. **Profile indicates the Terminology (or subset) to use 配置文件指示术语(或子集)的使用**
3. **Resource 'claims conformance' to profile 资源需要简介的一致性**

Conformance resource 一致性资源

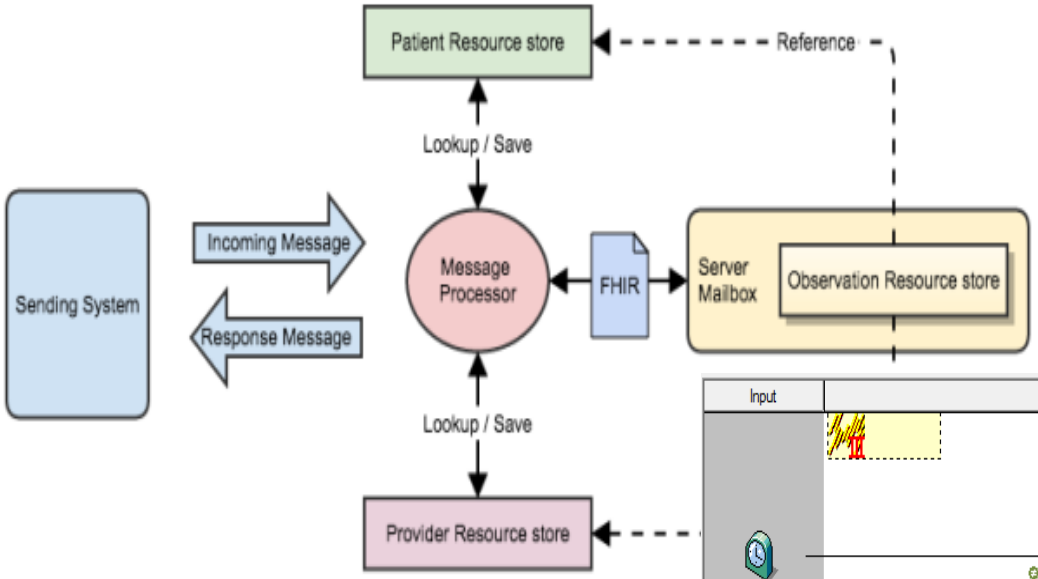
- **Describes what a server can do 描述服务器可以做什么**
  - What resources it supports支持什么样的资源
  - What operations 什么样的操作
  - What profiles 什么样的简介
- **Machine readable 可机读**
- **Allows a client to 'adapt' itself to a server 允许客户端适应服务器**
  - Eg what query parameters can be used 什么查询参数可用

Implementing FHIR 实施

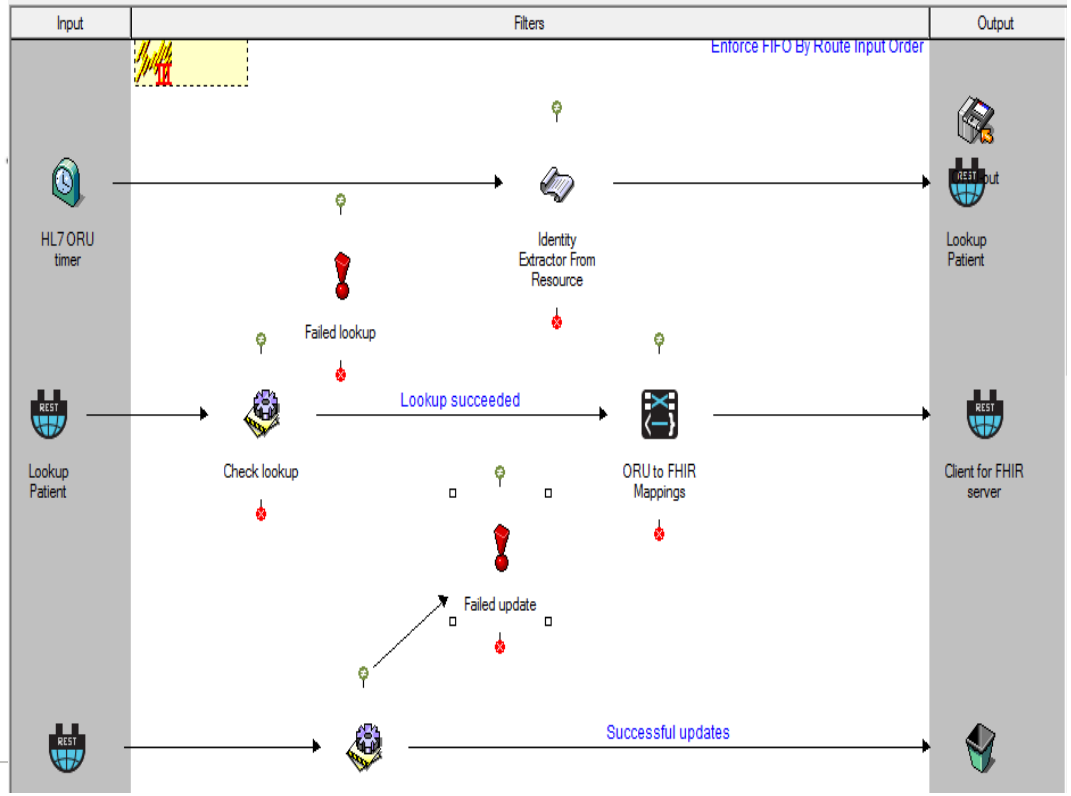
Implementations already under way

- **Already in use Internationally 已经在国际上使用**
  - 70 Organizations, 20 Countries, all Continents (except Antarctica) 70组织， 20个国家（地区），所有大洲(除了南极洲)
  - Interest from Providers, Vendors, Payers, Governments医疗供应者，供应商，保险公司，政府都很有兴趣
- **Lots of information and support 大量的信息和支持**
  - Specification on line 规范可在线查询
  - Blogs 博客
  - Skype, email, Lists

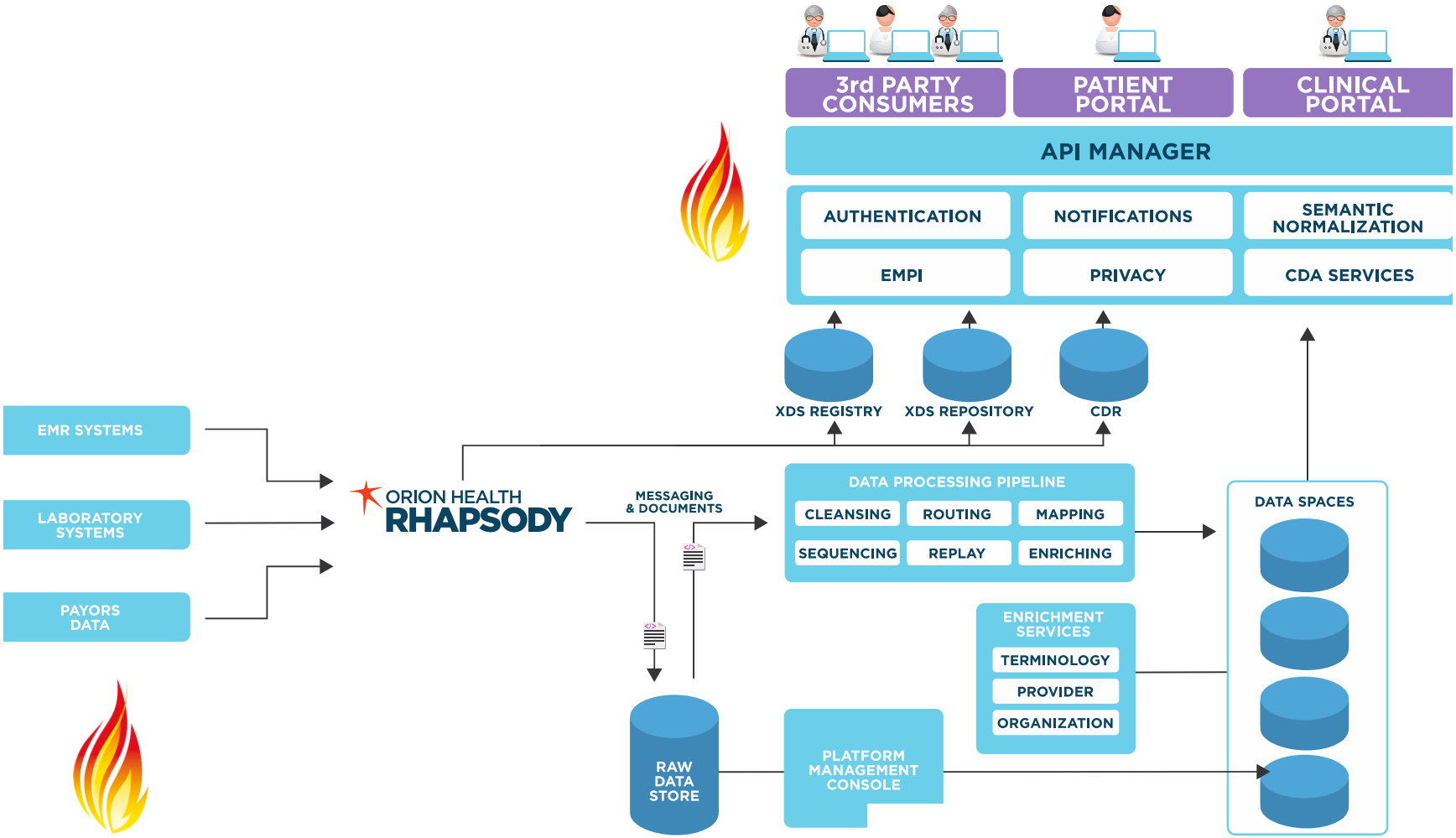
Rhapsody Integration Engine: FHIR and v2 conversion
Rhapsody 集成引擎 : FHIR and v2 转换



Blog Post



Open Platform: FHIR Storage & retrieval 存储和检索



What's next for FHIR 的下一步

- **Finalize DSTU-2**
  - Infrastructure pretty solid 基础设施相当坚实
- **Think about next DSTU**
  - Mostly refining / adding content 大规模改进 / 添加内容
- **Continue to work with other organizations** 继续与其他组织合作
  - IHE (MHD, XDS)
  - CIMI
- **Profiling is big** 分析是繁琐的
  - Real-world Use Cases 现实世界中的用例
  - Involve Clinicians & Analysts 涉及临床医生和分析师
  - Governance to consider 要考虑的管理

Next Steps for China 中国的下一步

- **Find out more 了解更多**
  - Specification on line (www.hl7.org/fhir/) 规范在线查询
  - Test Applications (clinfhir.com) 测试中的应用
  - Test Servers 测试服务器
- **Attend international events 参加国际活动**
  - HL7 Working Group Meetings
  - Connectathons
- **Hold local events 当地活动**
  - Seminars
  - Connectathons
- **Profiles for China**
- **Support pilots! 试点**
  - Feed back into the specification

Summarizing 总结

- **FHIR is a disruptive technology** 是一种颠覆性的技术
- **A set of resources that can be extended** 一组可扩展资源
- **Supports a 'web of resources'** 支持Web资源
- **Defined API** 已定义的API
  - REST and Operations
- **Can be used in all paradigms** 可用于所有的范式
- **Can be used in all architectures** 可用于所有的架构
- **Designed to be implemented quickly & easily, without needing detailed knowledge of health domain** 设计为快速和简易的实施,不需要详细了解医疗保健领域的实施
  - And therefore more cheaply 更能减少花费
  - It's ready to be implemented now! 准备现在被实施

Thank you for listening!