

Ignite API Learning Lab

Putting It All Together



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Standards



**SMART = Substitutable Medical Applications
and Reusable Technology**

A SMART App is a Web App

HTML5 + JavaScript

Typically Embedded in EHR

EHR Data Access is Via FHIR

OAuth2 for Security and Context Passing

Also Supports Smart Phone and Consumer Apps



FHIR = Fast Health Interoperability Resources

Created by Health Level 7 International (HL7)

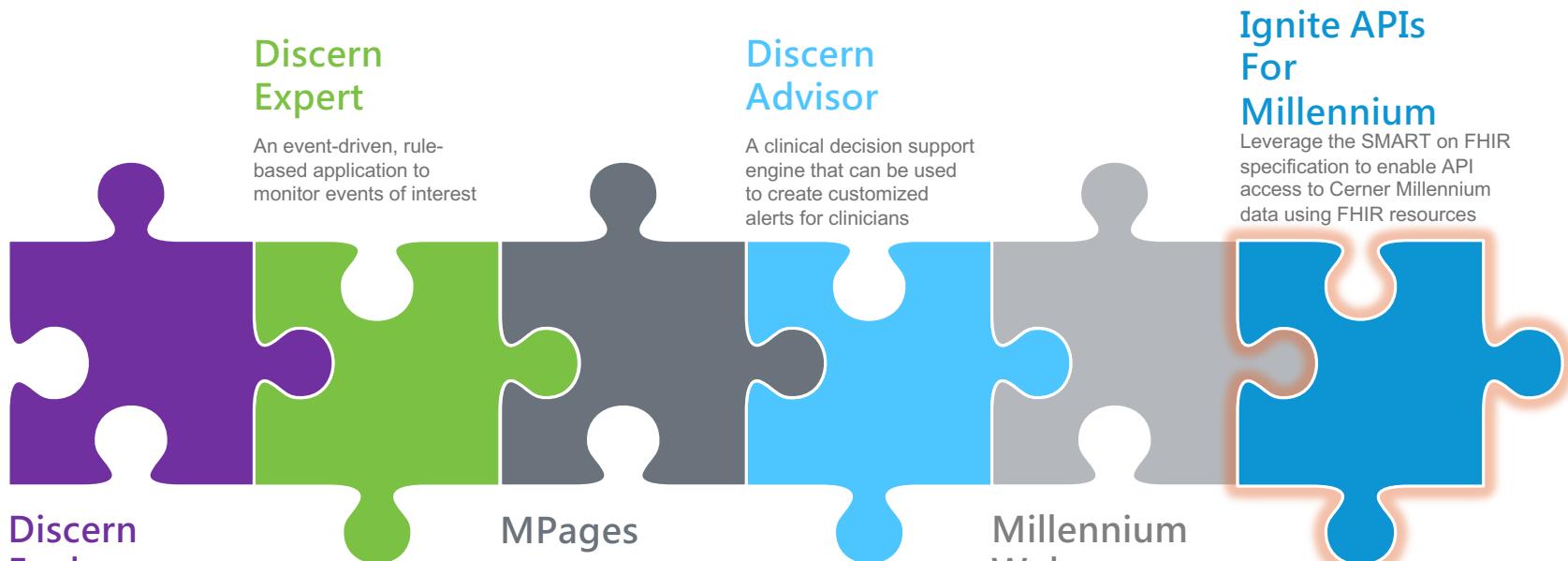
**A Standard for Accessing Health Care Data
(Resources)**

**RESTful API Design Leverages Internet
Standards (HTTP, Etc.)**

**Emerging Support by Most Major HIT Providers
(e.g., Argonaut Project)**

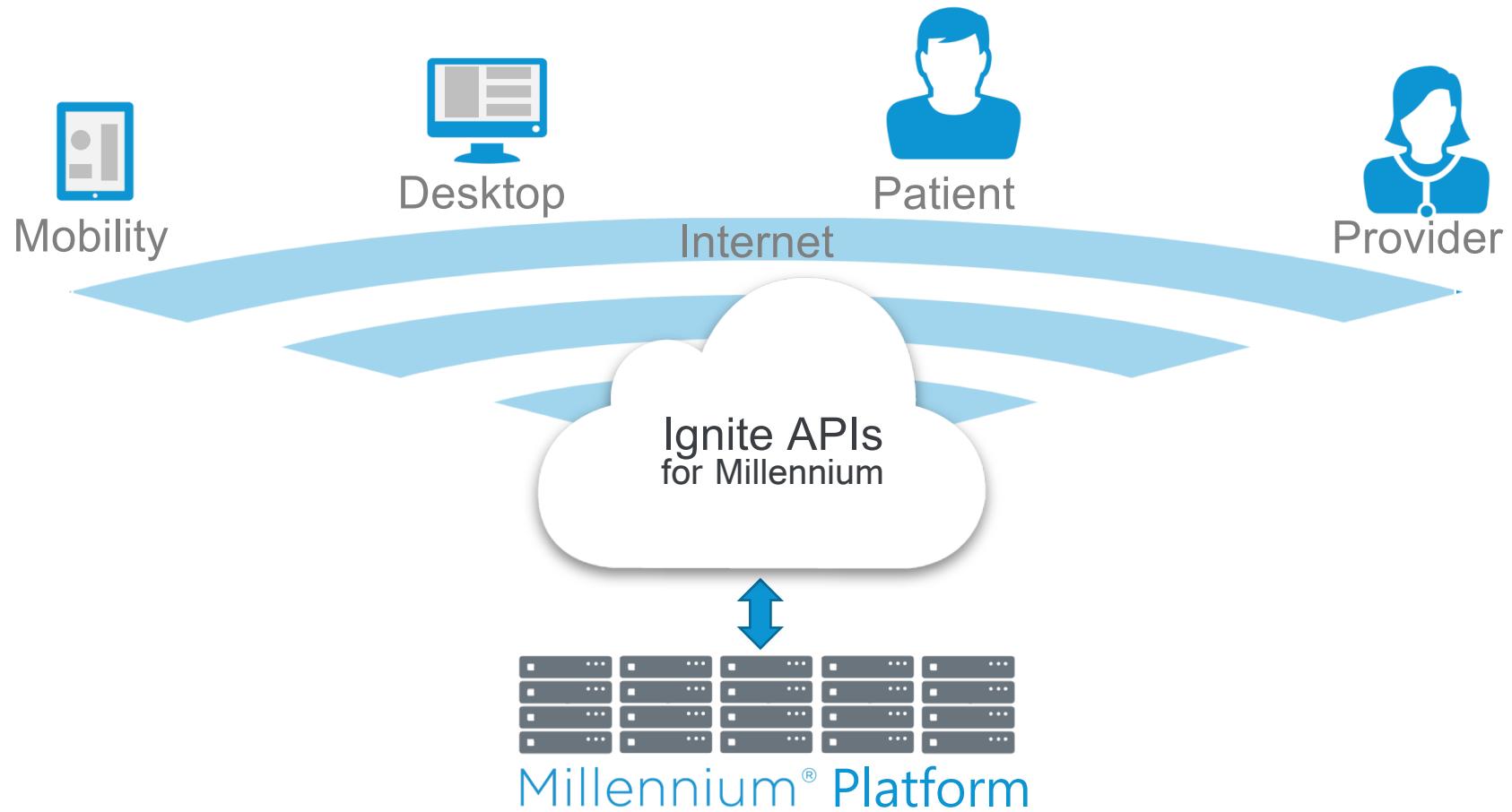
Meets EHR Certification for MU3

Solutions & Levels of Extensibility



2

Cerner Ignite APIs for Millennium



Benefits of a cloud-based API

- Centrally Managed Security (internet, authentication and authorization)
- Consistent API experience for all clients
- Rapid, agile deployment of updates and enhancements of FHIR standard
- Centralized ontology mapping
- Flexibility – scale capacity to meet application demand (predictable costs)

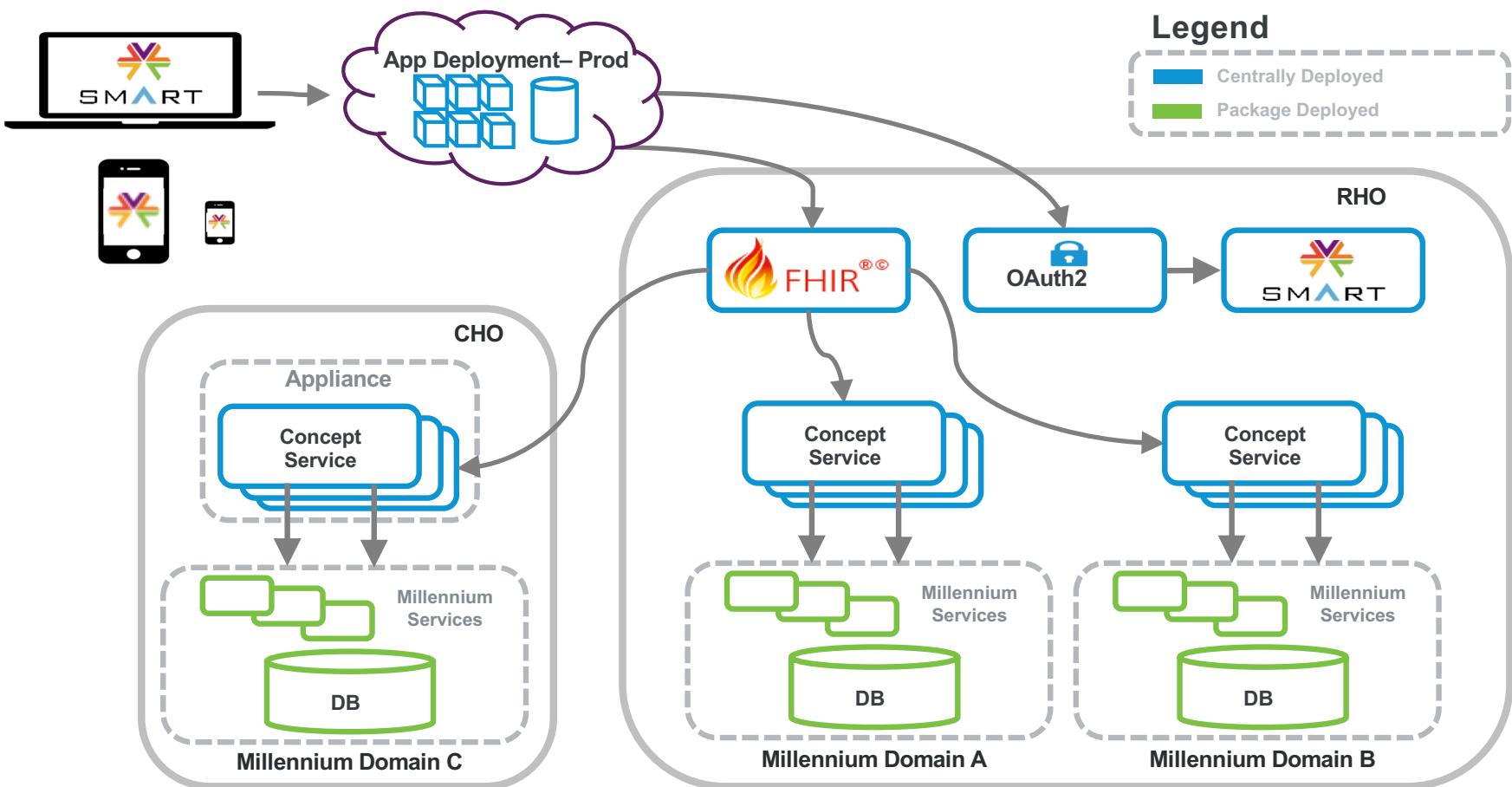
Ignite APIs
for Millennium

Consumer

Provider

Millennium®

Ignite API Open Platform Architecture



Resource Availability

A-D:	D-L:	I-P:	P-Z:
AllergyIntolerance	DeviceComponent	ImmunizationRecommendation	Practitioner
Appointment	DeviceMetric	ImplementationGuide	Procedure
AppointmentResponse	DeviceUseRequest	List	ProcessRequest
AuditEvent	DeviceUseStatement	Location	ProcessResponse
Basic	DiagnosticOrder	Media	ProcedureRequest
Binary	DiagnosticReport	Medication	Provenance
BodySite	DocumentManifest	MedicationAdministration	Questionnaire
Bundle	DocumentReference	MedicationDispense	QuestionnaireResponse
CarePlan	EligibilityRequest	MedicationOrder	ReferralRequest
Claim	EligibilityResponse	MedicationStatement	RelatedPerson
ClaimResponse	Encounter	MessageHeader	RiskAssessment
ClinicalImpression	EnrollmentRequest	NamingSystem	Schedule
Communication	EnrollmentResponse	NutritionOrder	SearchParameter
CommunicationRequest	EpisodeOfCare	Observation	Slot
Composition	ExplanationOfBenefit	OperationDefinition	Specimen
ConceptMap	FamilyMemberHistory	OperationOutcome	StructureDefinition
Condition	Flag	Order	Subscription
Conformance	Goal	OrderResponse	Substance
Contract	Group	Organization	SupplyRequest
DetectedIssue	HealthcareService	Parameters	SupplyDelivery
Coverage	ImagingObjectSelection	Patient	TestScript
DataElement	ImagingStudy	PaymentNotice	ValueSet
Device	Immunization	PaymentReconciliation	VisionPrescription
		Person	

Current

□ = read

+ = add

Planned

∅ = search

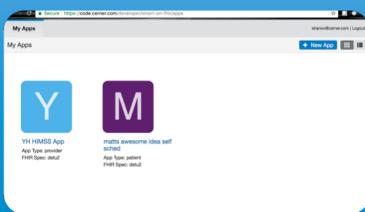
✎ = update

Ecosystem Growth



Capabilities

- SMART Launch Points
- FHIR Resources
- Access Methods



Developer Tooling

- Robust Documentation
- Application Management
- Proprietary APIs to complement standards



API Management

- Access Provisioning
- Access Monitoring
- API Gateway

Monitor Ignite APIs for Millennium



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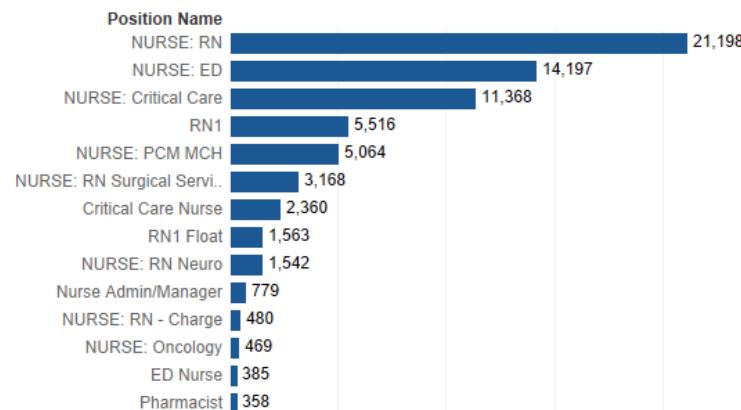
App Adoption by Facility and Position

Medication (DSTU 2)
Unique Providers: 2,514
Application Launches: 67,088

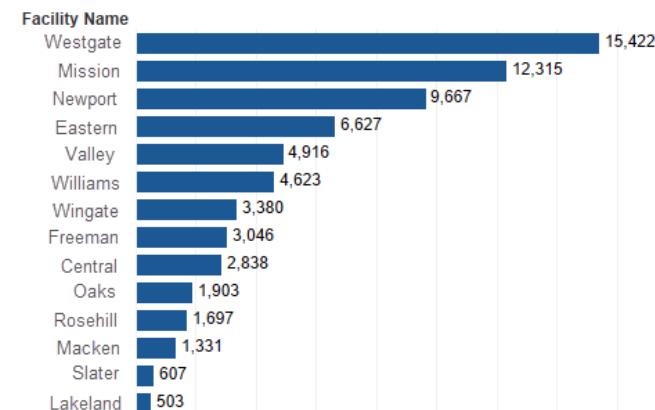
Unique Providers



Unique Application Launches by Position
(select position to filter)

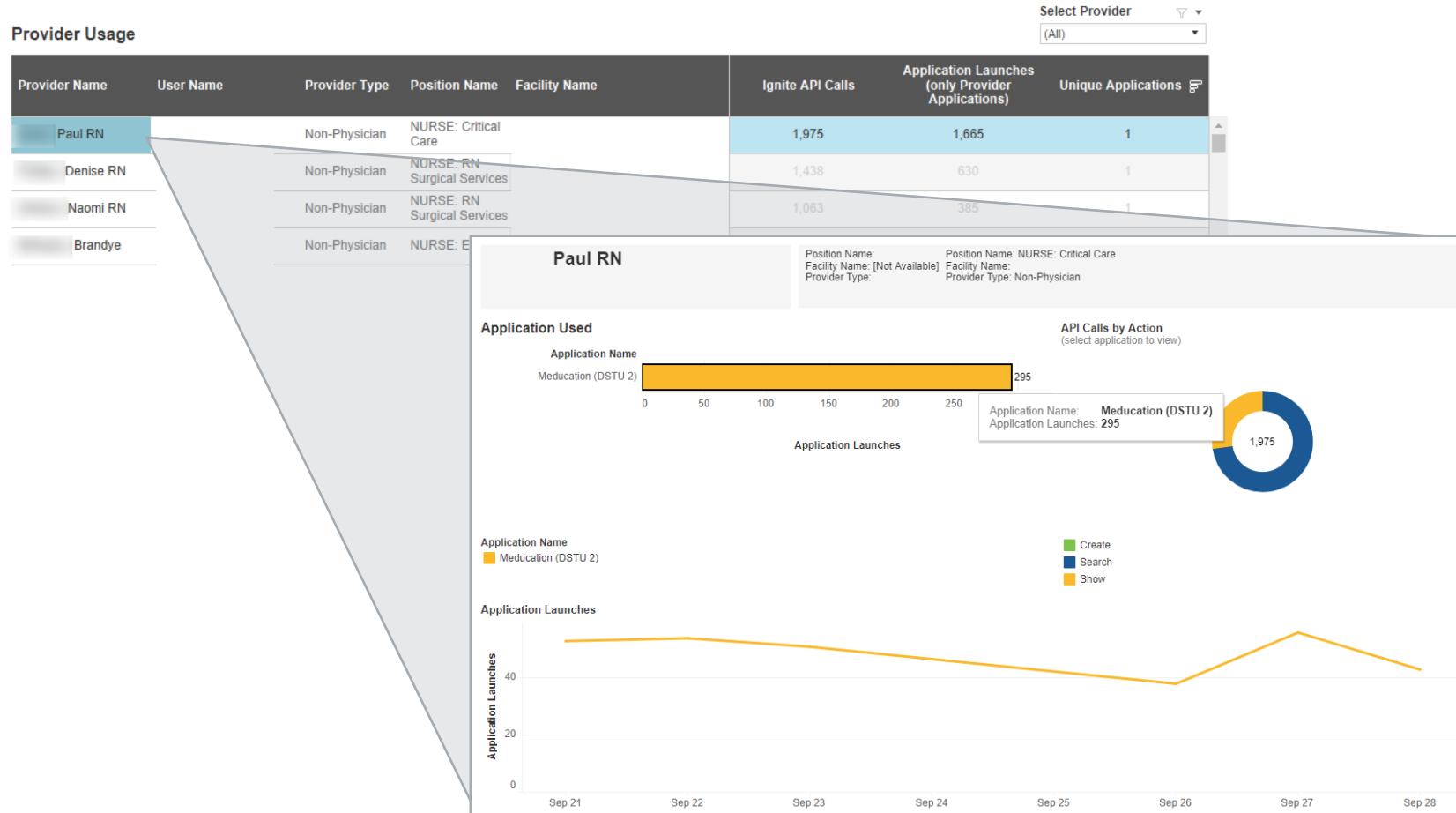


Unique Application Launches by Facility
(select facility to filter)



Provider Details

Provider Usage



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Common Issues

Common Issues

- FHIR Spec Maturity & Gaps
- User Experience
- App Hosting & Access to External Resources
- EMR integration
- To MPage or Not?
- Concept Mappings

FHIR Versions

Date	Version	Description
Current Versions		
Apr 19, 2017 (current)	3.0.1 (last commit)	Current Official Published Version (<i>Currently: Release 3 with 1 technical errata</i>) Current Development build (about 30min behind version control, may be incoherent and change rapidly)
R4 sequence		
Aug 21, 2018	3.5.0	R4 Ballot #2 : Mixed Normative/Trial use (Second Normative ballot + Baltimore Connectathon)
Apr 3, 2018	3.3.0	R4 Ballot #1 : Mixed Normative/Trial use (First Normative ballot)
Dec 20, 2017	3.2.0	Draft for comment / First Candidate Normative Content
STU 3 sequence		
Apr 19, 2017	3.0.1	FHIR Release 3 (STU) with 1 technical errata (Permanent Home) <i>Technical Errata Archive (zip): v3.0.0</i>
Dec 6, 2016	1.8.0	FHIR STU3 Candidate + Connectathon 14 (San Antonio)
Aug 11, 2016	1.6.0	FHIR STU3 Ballot + Connectathon 13 (Baltimore)
Mar 30, 2016	1.4.0	CQF on FHIR Ballot + Connectathon 12 (Montreal)
Dec 3, 2015	1.1.0	GAO Ballot + draft changes to main FHIR standard
DSTU 2 sequence		
Oct 24, 2015	1.0.2	DSTU 2 (Official version) with 1 technical errata (Permanent home)
Aug 31, 2015	1.0.0	DSTU 2 QA Preview + CQIF Ballot (Sep 2015)
April 2, 2015	0.5.0	DSTU 2 Ballot version (May 2015 Ballot)
Dec 12, 2014	0.4.0	Draft For Comment (January 2015 Ballot)
DSTU 1 sequence		
Sept 30, 2014	0.0.82	DSTU 1 (Official version) with 2 technical errata (Permanent home)
Sept ?, 2013	0.11	DSTU 1 Ballot version
Dec 4, 2012	0.06	2nd Draft for Comment (January 2013 Ballot)
Sep 9, 2012	0.05	1st Draft for Comment (Sept 2012 Ballot)
Historical Versions		
May 14, 2012	0.01	First version labelled as "FHIR"
Aug, 2011	0.01	Original Proposal, labelled as RfH

Future Release?

Emerging Release

Current Production Release (MU3)

Original Release (now retired)

FHIR Versions



RETIRED

Release 1



Release 2

FHIR Versions

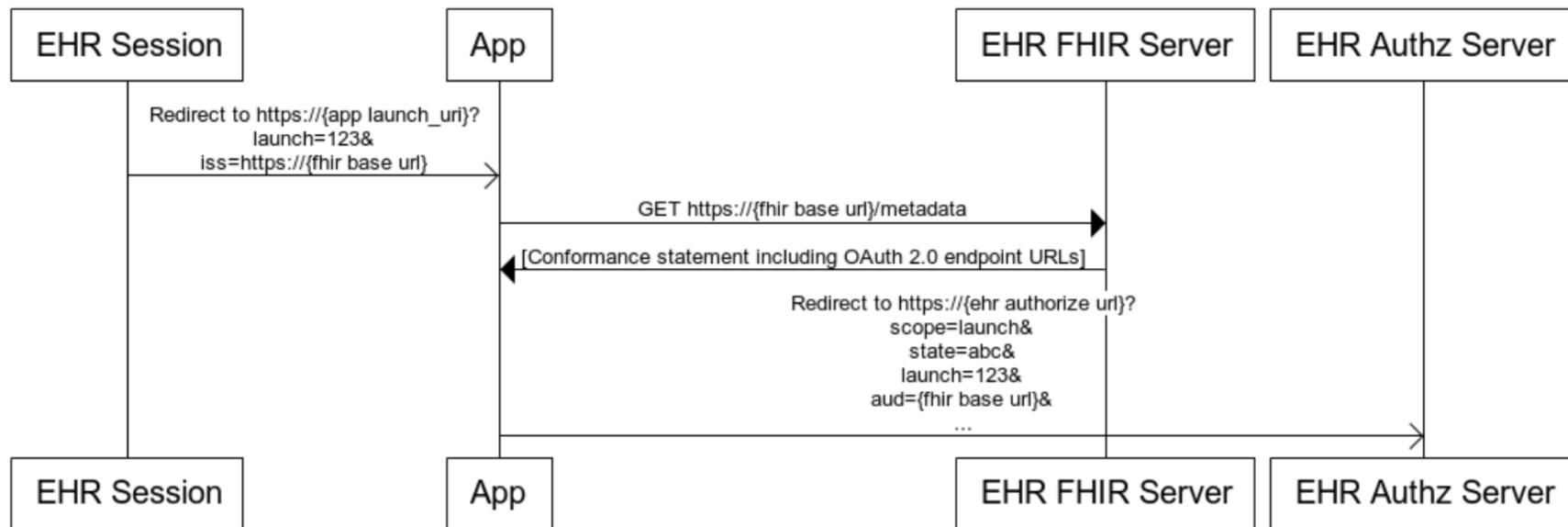
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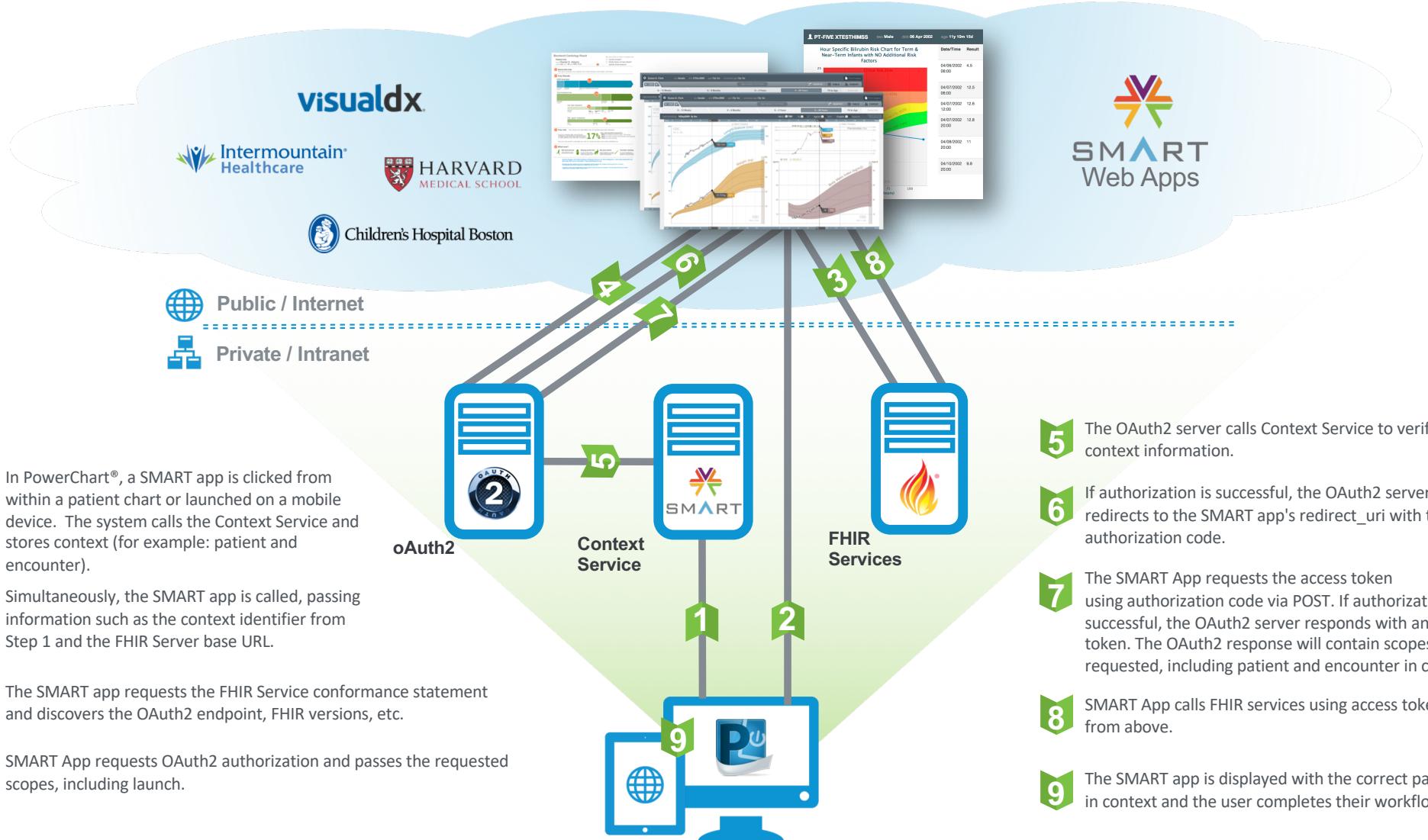
<https://fhir-ehr.cerner.com/dstu2>
<https://fhir-myrecord.cerner.com/dstu2>

<https://fhir.cernerpowerchart.com/dstu2>
<https://fhir.cernerpowerchart.com/May2015>

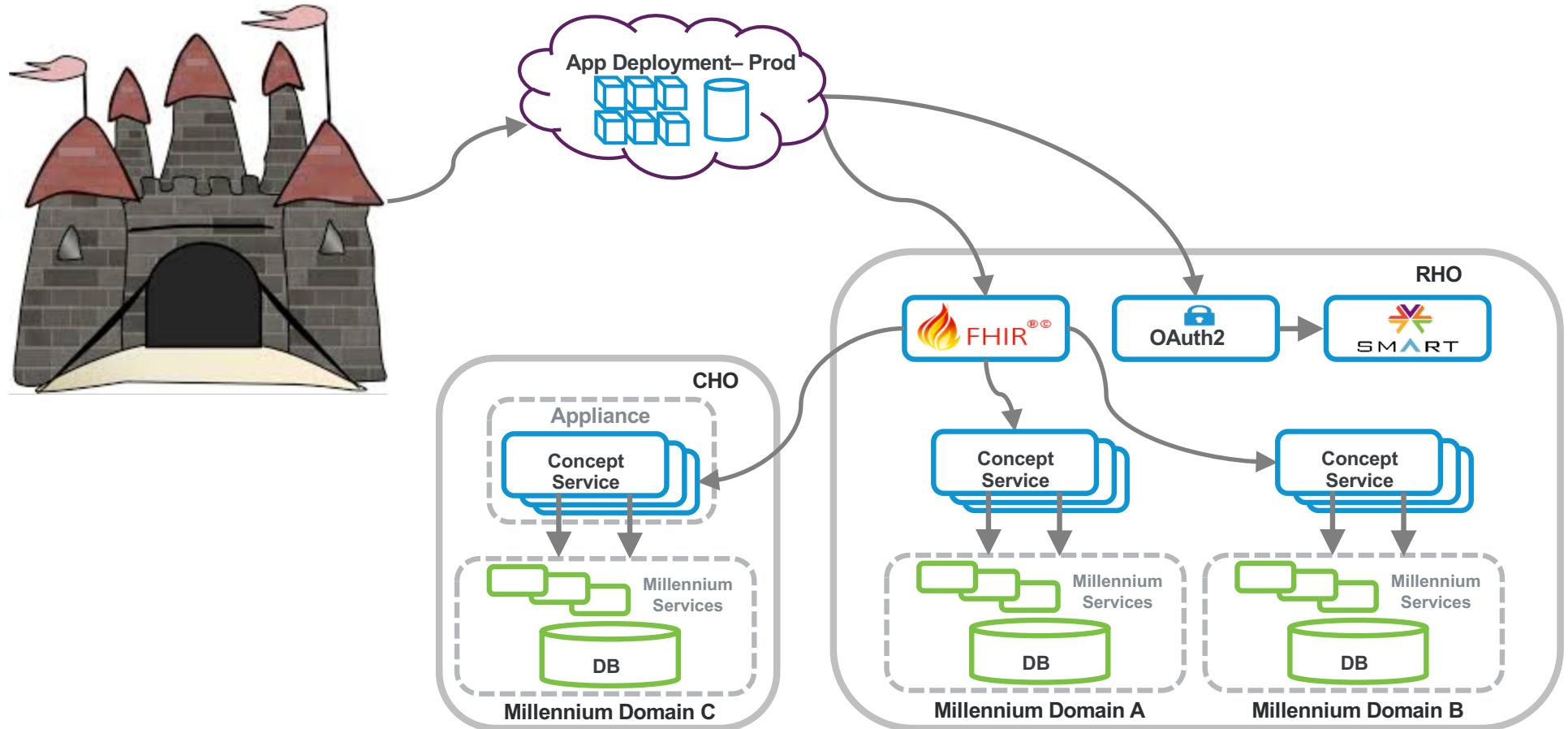
ISS parameter + metadata

EHR launch sequence <http://docs.smarthealthit.org/authorization/>

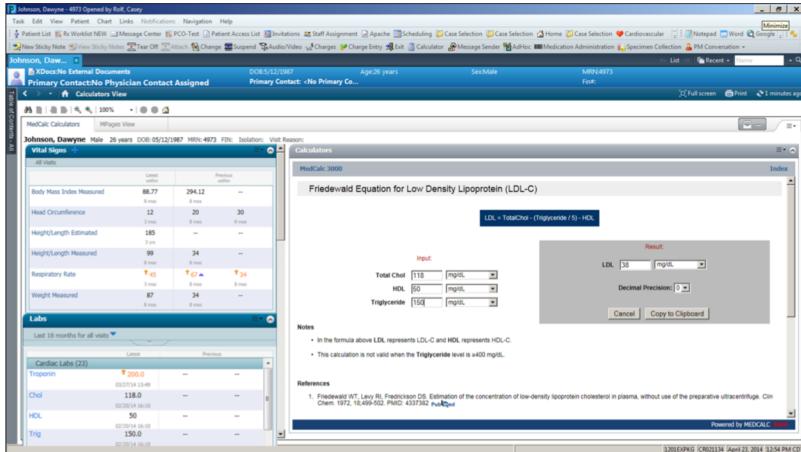




Application Deployment & Access



To MPage or Not?



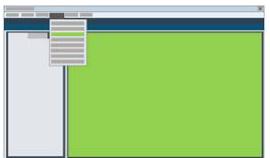
VS

- General Web Developer Skills
- Business Logic in the API
- Occasional Maintenance Cost
- Limited Access to Data
- Potential Loss of Data Fidelity

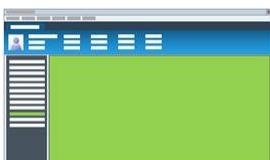
The screenshot shows the medication'RS web application. On the left, a sidebar lists navigation links such as Patient Information, Data Reconciliation, Multimedia Manager, SMART Medication, SMART VisualDX, SMART Cardiac Risk, SMART Healthwise, SMART Health Ally, SMART Crimson Care Mgmt, SMART ExpertCONNECT, SMART eRug, VDpA-MPage for Comp & Can/DC... MAR, Intake and Output, Clinical Notes, Flowsheet, Overview, ICU Flowsheet, and Task List. The main area displays a 'Med List' table with columns for Drug Name, SIG Instructions, Links, Category, and Actions. Drugs listed include Niacin 500 MG / Simvastatin 40 MG Extended Release Oral Tablet [Simcor], Aspirin Enteric Coated Tablet 81 mg, Bumetanide 2 MG Oral Tablet, Carvedilol 25 MG Oral Tablet [Coreg], Clonazepam 0.5 MG Oral Tablet, Clonidine HCl Tablet 0.1 mg, Ergotralferol 50000 UNT Oral Capsule, Escitalopram 20 MG Oral Tablet [Lexapro], Levemir FlexPen 100 IU/mL, Losartan Potassium 100 MG Oral Tablet [Cozaar], Minoxidil 2.5 MG Oral Tablet, and Novolog Insulin Solution 100 IU/mL.

- Full Control of Data
- Knowledge of Millennium DB
- JS/HTML/CSS + CCL
- Ongoing Maintenance Cost
- Duplicate Business Logic

SMART App Integration



- PowerChart Organizer View



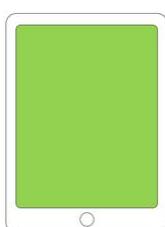
- PowerChart Patient's Chart



- PowerChart MPage



- HealtheLife Patient Portal



- Standalone Web or Mobile app

Concept Mapping

Cerner Ontology mappings bridge the gap between proprietary codes stored in Millennium and standardized codes defined by the HL7 FHIR specification



Concept Mapping Example (Med Order Status Code)

Millennium, Code Set 6004

- CANCELED
- COMPLETED
- DELETED
- DISCONTINUED
- FUTURE
- INCOMPLETE
- INPROCESS
- MEDSTUDENT
- ORDERED
- PENDING REV
- UNSCHEDULED
- TRANS/CANCEL
- PENDING
- VOIDEDWRSLT
- SUSPENDED

<http://hl7.org/fhir/medication-order-status>

- **active**
- **on-hold**
- **completed**
- **entered-in-error**
- **stopped**
- **superceded**
- **draft**

Concept Mapping Example (Med Order Status Code)

Outbound Mappings:

Millennium >>> FHIR

ORDERED, PENDING (Pending Complete) >>> active

SUSPENDED >>> on-hold

COMPLETED >>> completed

DELETED, VOIDEDWRSLT >>> entered-in-error

CANCELLED, DISCONTINUED, TRANS/CANCEL >>> stopped

FUTURE, MEDSTUDENT, INCOMPLETE >>> draft



Concept Mapping Example (Med Order Status Code)

Inbound Mappings:

FHIR >>> Millennium

active >>> ORDERED

on-hold >>> SUSPENDED

completed >>> COMPLETED

entered-in-error >>> DELETED

Stopped >>> DISCONTINUED

draft >>> INCOMPLETE



Concept Mapping Example (Growth Chart)



Concept Mapping Example (Growth Chart)

Event Sets *(Cerner Millennium)*

Weight

Event Codes *(Cerner Millennium)*

Weight (Dosing)

Weight

Weight Estimated (Non Dosing)

Growth Chart Weight

LOINC Codes

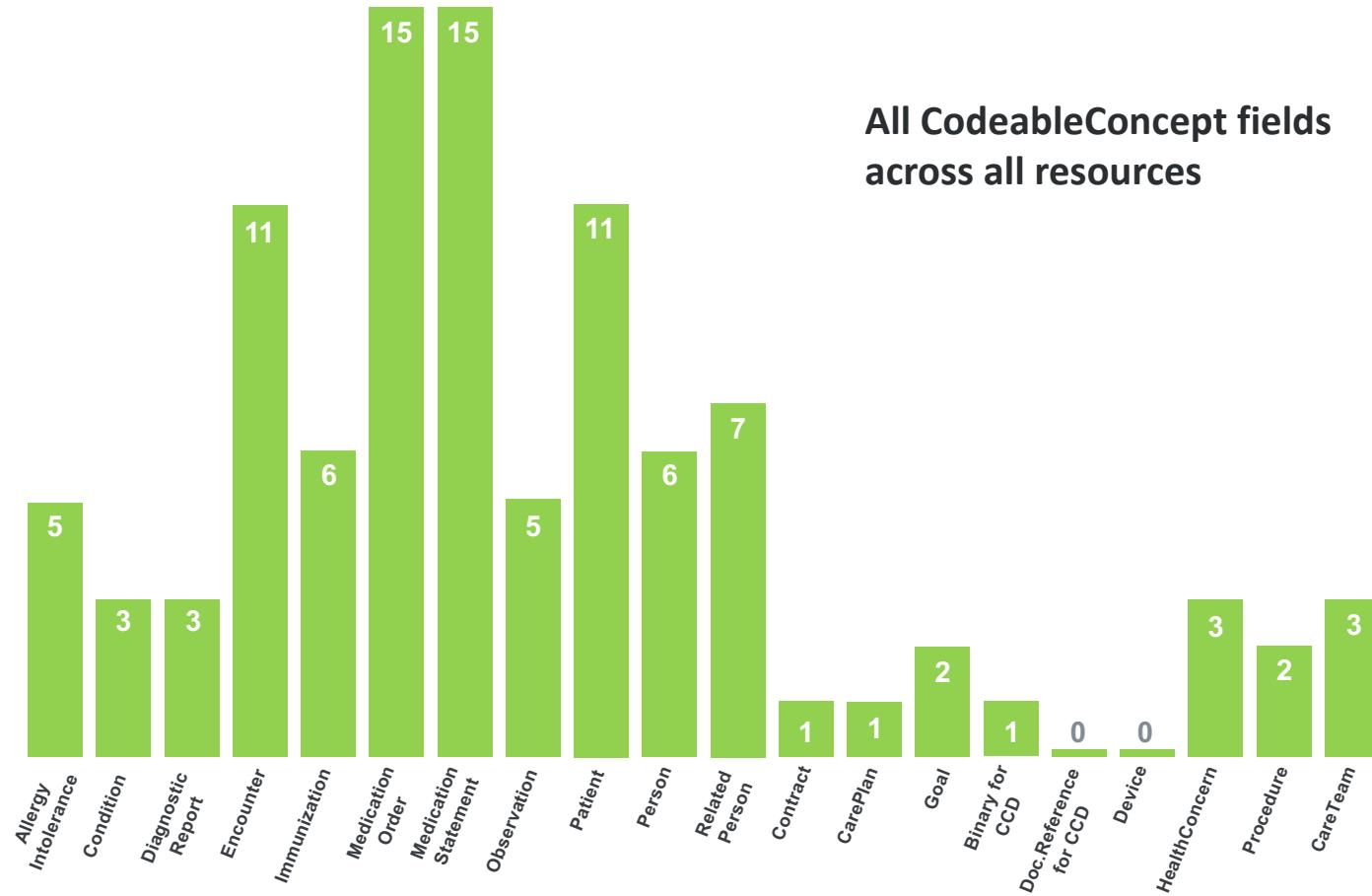
29463-7

8335-2

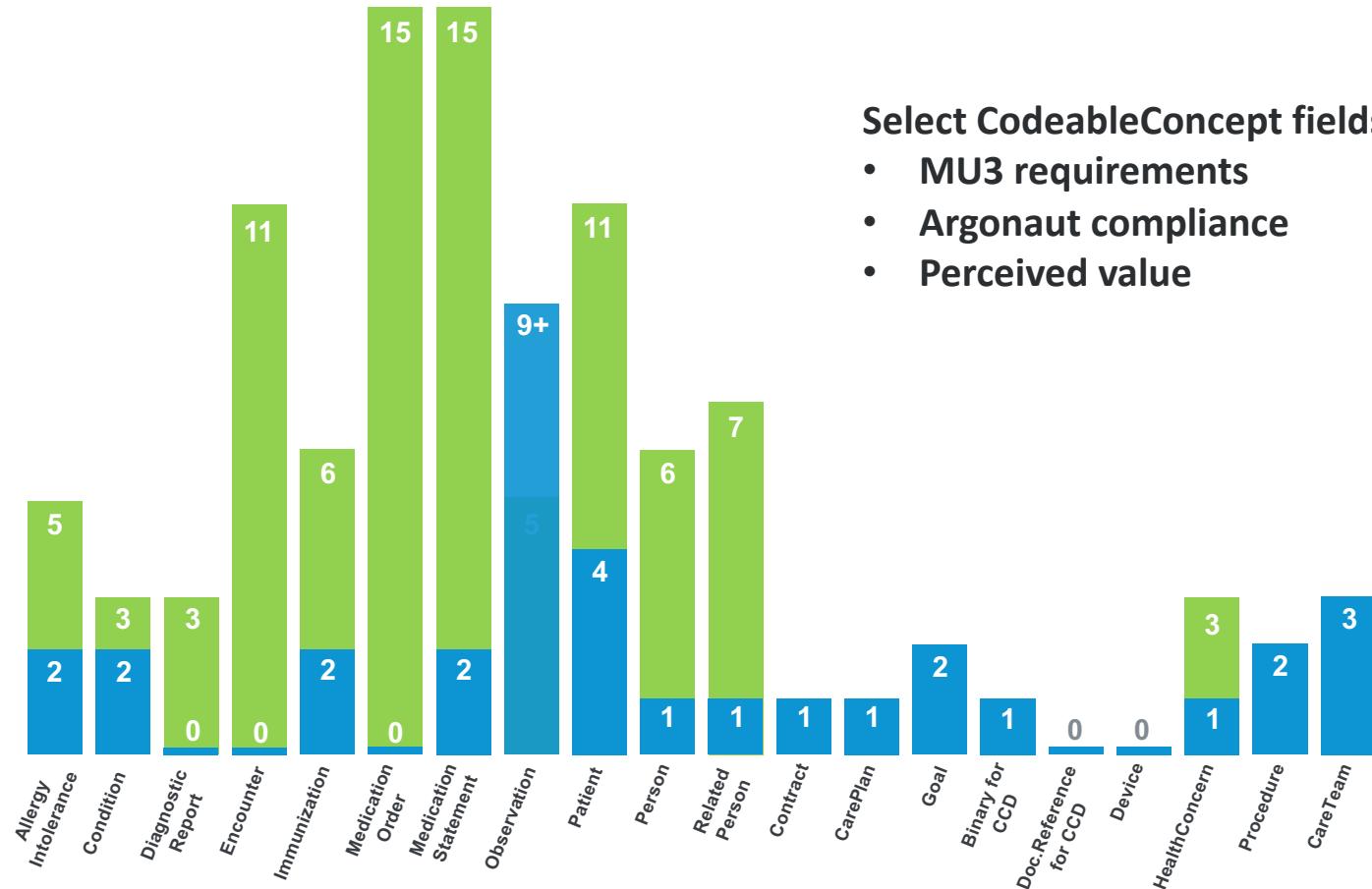
NA



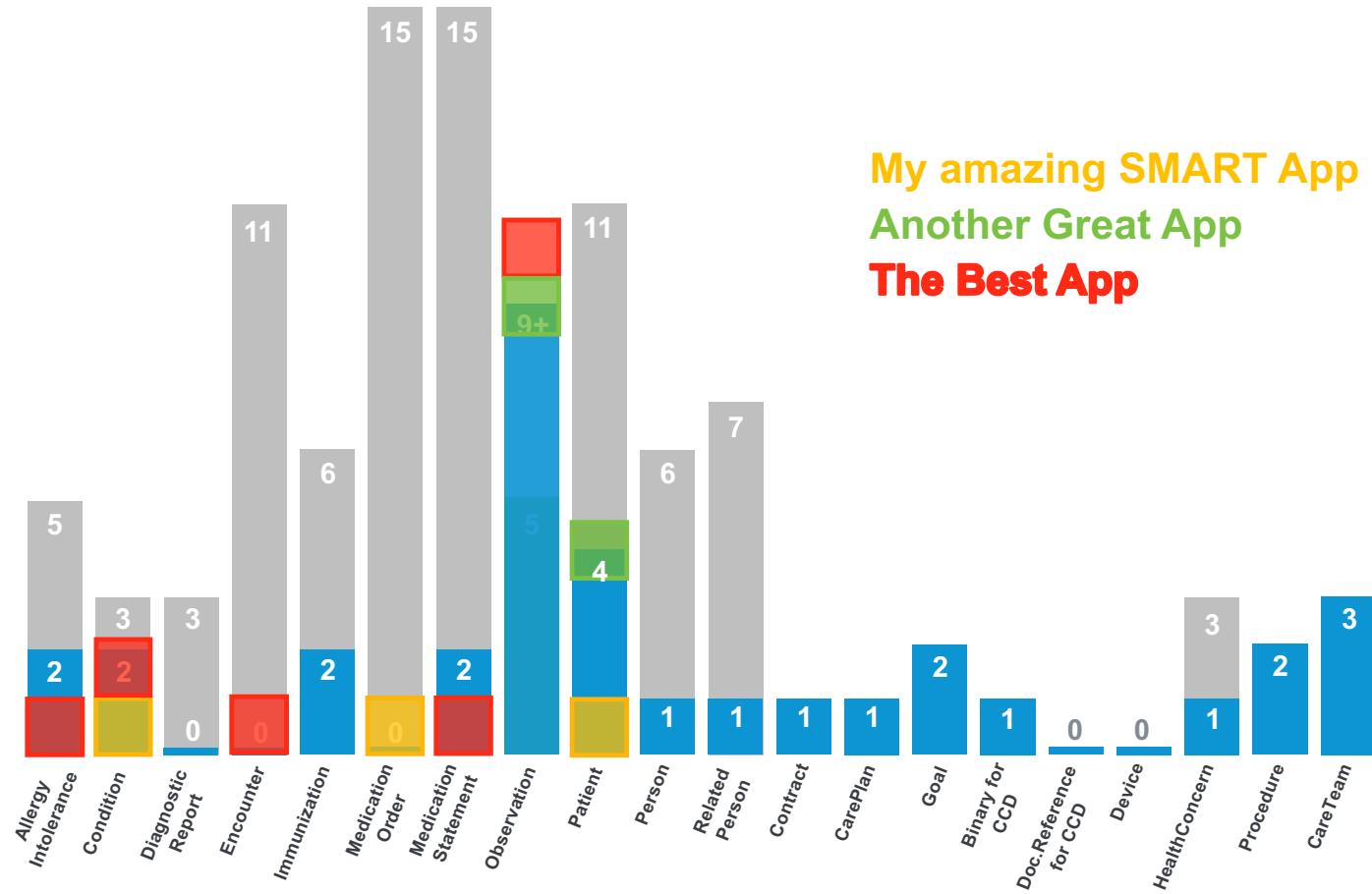
Mappings | Full Scope



Mappings | Meaningful Use



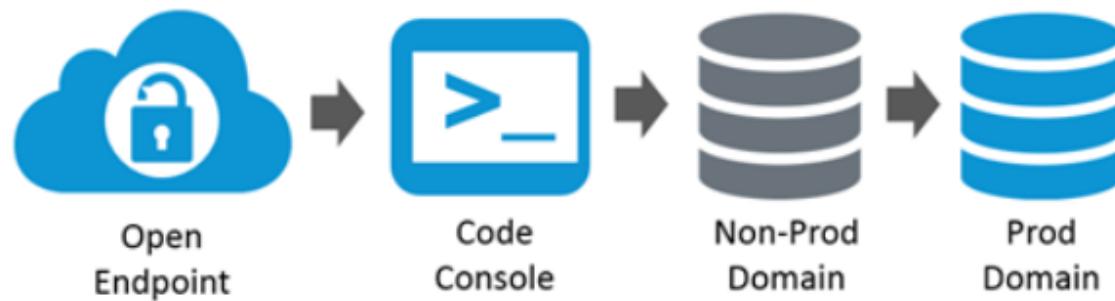
Mappings | App-Specific Mappings



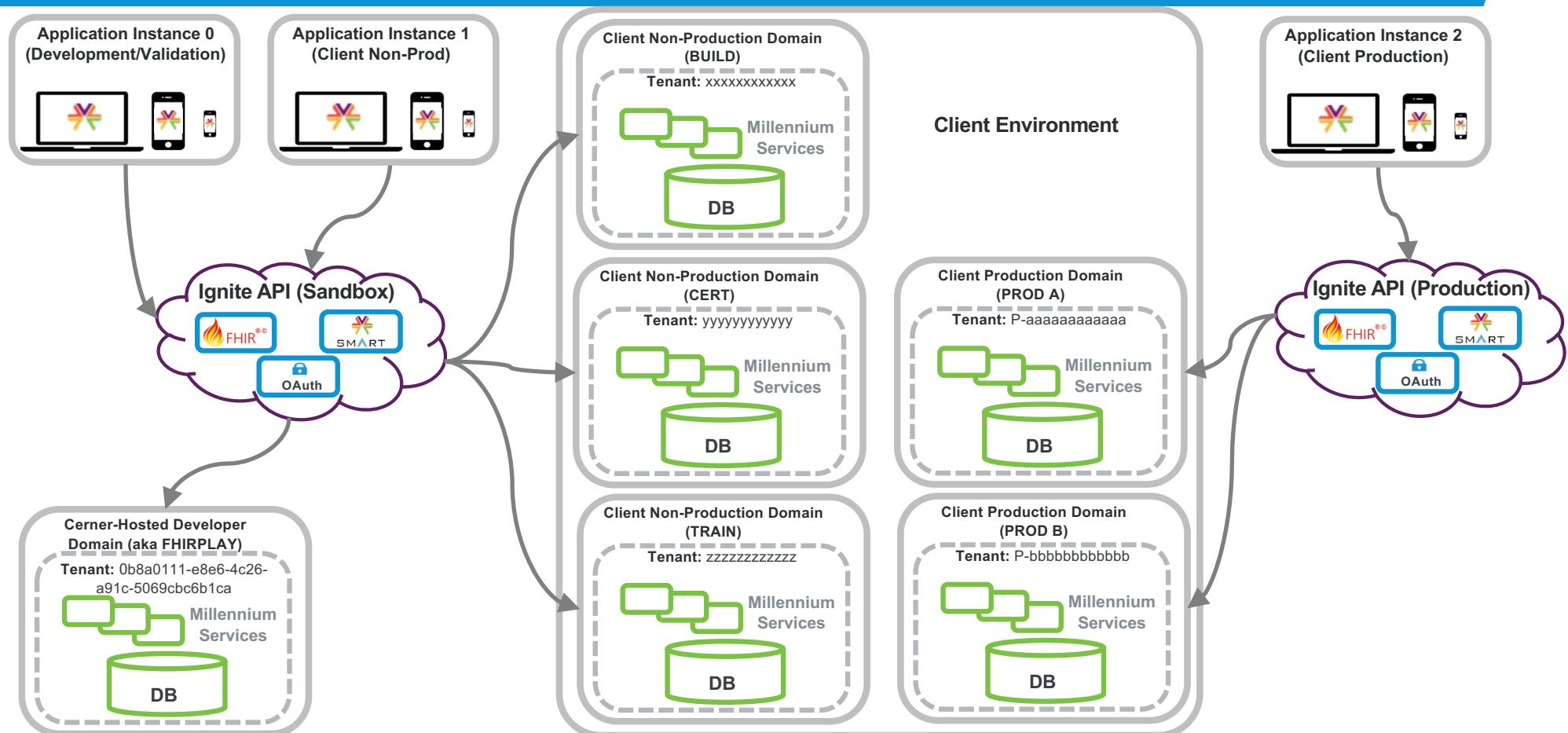
Putting It All Together

Application Development Progression (Client)

- Use the Open Sandbox connection to validate ideas
- Register and test the app in Cerner Sandbox using Code Console
- Provision app for integration testing in your non-prod domain
- Provision app for production use



SMART on FHIR Open Platform Architecture



Application Development Progression (Developer)

- Use the Open Sandbox connection to validate ideas
- Register and test the app in Cerner Sandbox using Code Console
- Join Code Developer Program
- Validate the application for use at client sites
- Market application to clients



App Validation



Support Channels

Technical Questions

- Google Group (Open):
<https://groups.google.com/forum/#!forum/cerner-fhir-developers>
- uCern Group (Cerner and Clients Only):
<https://connect.ucern.com/groups/ignite-apis-community>

Business Questions

- Contact your Engagement Leader or Client Results Executive (CRE)
- code.cerner.com developer program site

eService (Client)

If you have technical issues with your domain or you are ready to move an app into your production or non-production domain, log a service record in eService: <https://eservice.ucern.com/>

For Solution Family, select Open Development Services

For Solution, select Ignite APIs for Mill

Additional Resources

- SMART specification
 - <<http://docs.smarthealthit.org/>>
- FHIR specification
 - <<https://www.hl7.org/fhir/dstu2/>>
- Cerner Developer Program
 - <<http://code.cerner.com/>>
- Cerner Developer Documentation
 - <<http://fhir.cerner.com/millennium/dstu2/>>
- Cerner Ignite API Tutorial
 - <<http://engineering.cerner.com/smart-on-fhir-tutorial/>>
- Code Console
 - <<https://code.cerner.com/developer/smart-on-fhir/>>
- Developer Community Google Group
 - <<https://groups.google.com/forum/#!forum/cerner-fhir-developers>>
- Cerner Ignite APIs Reference Pages
 - <<https://wiki.ucern.com/display/reference/Cerner+Ignite+APIs+Reference+Pages>>
- uCern Connect Ignite APIs Community
 - <<https://connect.ucern.com/groups/ignite-apis-community>>

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Transforming Data into Knowledge and Action

Client Only

Cerner Open Developer Experience: code.cerner.com

[Start Coding](#)[About](#)[App Gallery](#)[Submit an App](#)[FAQs](#)

Welcome to code

Cerner Open Developer Experience (code) encourages innovators to build apps that advance the health care industry through improved interoperability capabilities.

how it works for clients

Steps to join the ecosystem

Connect your domains to Ignite API

- Cerner implementation covers all production and a dedicated non-production domain
- Implementation includes all available concepts
- Implementation includes centralized ontology mappings
- Changes centrally managed and deployed weekly

Engage with the Cerner Open Developer Experience

- Go to code.cerner.com and hit the “Start Coding” button
- Browse developer documentation
- Join the discussion on our developer Google Group
- Experiment with the API using our open sandbox
- Integrate using dedicated non-production domain

Establish app governance and innovation strategy

- Manage overall application roadmap
- Balance internal development and commercial acquisition opportunities
- Join *code* developer program to market internally developed applications via Cerner app gallery



client perspective

how it works for developers

Steps to go from idea to reality

Engage with the Cerner Open Developer Experience

- Go to code.cerner.com and hit the “Start Coding” button
- Browse developer documentation
- Experiment with the API using our open sandbox
- Join the discussion on our developer Google Group

Join the *code* Developer Program & get validated

- App Companies can sign up to get their apps validated for production access to Ignite APIs
- Validation process ensures quality across multiple dimensions: Security, Functional, Operations, and User Experience

Market your app through Cerner’s App Gallery

- Apps from the *code* Developer Program are given visibility in a gallery on code.cerner.com
- Presence in the gallery helps create Trust and Opportunity with potential clients



developer perspective



Together we can accomplish
great things

