



Meliorix



Rapid SMART on FHIR app development

Aziz Boxwala

March 7 2017



Overview

- Sapphire is a visual rapid-app development tool
 - Prebuilt UI components coupled with FHIR resources
 - Knowledge-based and other services
- Demonstration of creating an app for acute kidney injury

Sapphire

- ❑ Sapphire is a framework to create a modular healthcare apps
 - ❑ App = software that provides units of functionality and can be selectively used
- ❑ It provides a composable, configurable environment for developers
 - ❑ To make it easy to develop apps rapidly
 - ❑ Using FHIR-based access to underlying data and operations
 - ❑ Collection of components that can be assembled into apps
 - ❑ Widgets: user-interface layer components loosely coupled to services
 - ❑ Service modules: business logic and data access components
- ❑ It provides a deployment environment
 - ❑ For running apps
 - ❑ Apps are portable
 - ❑ Interoperable services-based multi-tier infrastructure



Modular apps

Summary Page

 Betty Boop ⋮

Betty Boop

DOB :1955-10-08
Age : 60
Gender :Female

Address :
1 Star Blvd
Hollywood, CA, 91608, USA

Contact :
Mobile : 323-555-2666
Home : 323-555-2389

Problems

Problems	Onset
Obesity, unspecified (ICD9 Code : 278.00) Active	2011-02-15
Essential hypertension (ICD9 Code : 401) Active	2013-04-01
Heartburn (ICD9 Code : 787.1) Active	2015-01-28
Impaired glucose tolerance test (oral) (ICD9 Code : 790.22) Active	2013-04-01
Heartburn (ICD9 Code : 787.1) Active	2015-02-09
Generalized pain (ICD9 Code : 780.96) Active	2015-02-09
Bronze diabetes (SNOMEDCT Code : 399144008) Active	2015-02-18

Visits

Date	Provider	Type
2013-07-02 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2013-08-29 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2013-10-08 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2013-11-19 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2014-01-07 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2014-05-09 04:00 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient
2013-05-15 09:30 PM	Dr. Hans Zarkov	E&M Follow-Up Outpatient

Medications

Medication	Start Date	End Date
hydrochlorothiazide 25 mg oral pill 25 mg, Oral Route, take 1 pill every day	2014-01-07 12:00 AM	-----
lovastatin 10 mg oral pill 10 mg, Oral Route, take 1 pill every evening	2013-05-15 12:00 AM	2013-07-02 12:00 AM
diltiazem ER 180 mg capsule 180 mg, Oral Route, take 1 capsule daily	2013-10-08 12:00 AM	2013-11-19 12:00 AM
hydrochlorothiazide 25 mg oral pill 25 mg, Oral Route, take 1 pill every day	2013-07-02 12:00 AM	2014-01-07 12:00 AM
lisinopril 10 mg oral pill 10 mg, Oral Route, take 1 pill daily in AM	2013-08-29 12:00 AM	2013-10-08 12:00 AM
24 HR Nicotine 0.875 MG/HR Transdermal Patch 21 mg, Topical Route, Apply 1 patch to skin and replace Q AM	2013-04-10 06:10 AM	-----

Observations

1 D
1 W
1 M
3 M
1 Y
All

Betty Boop

 DOB :1955-10-08
Age : 60
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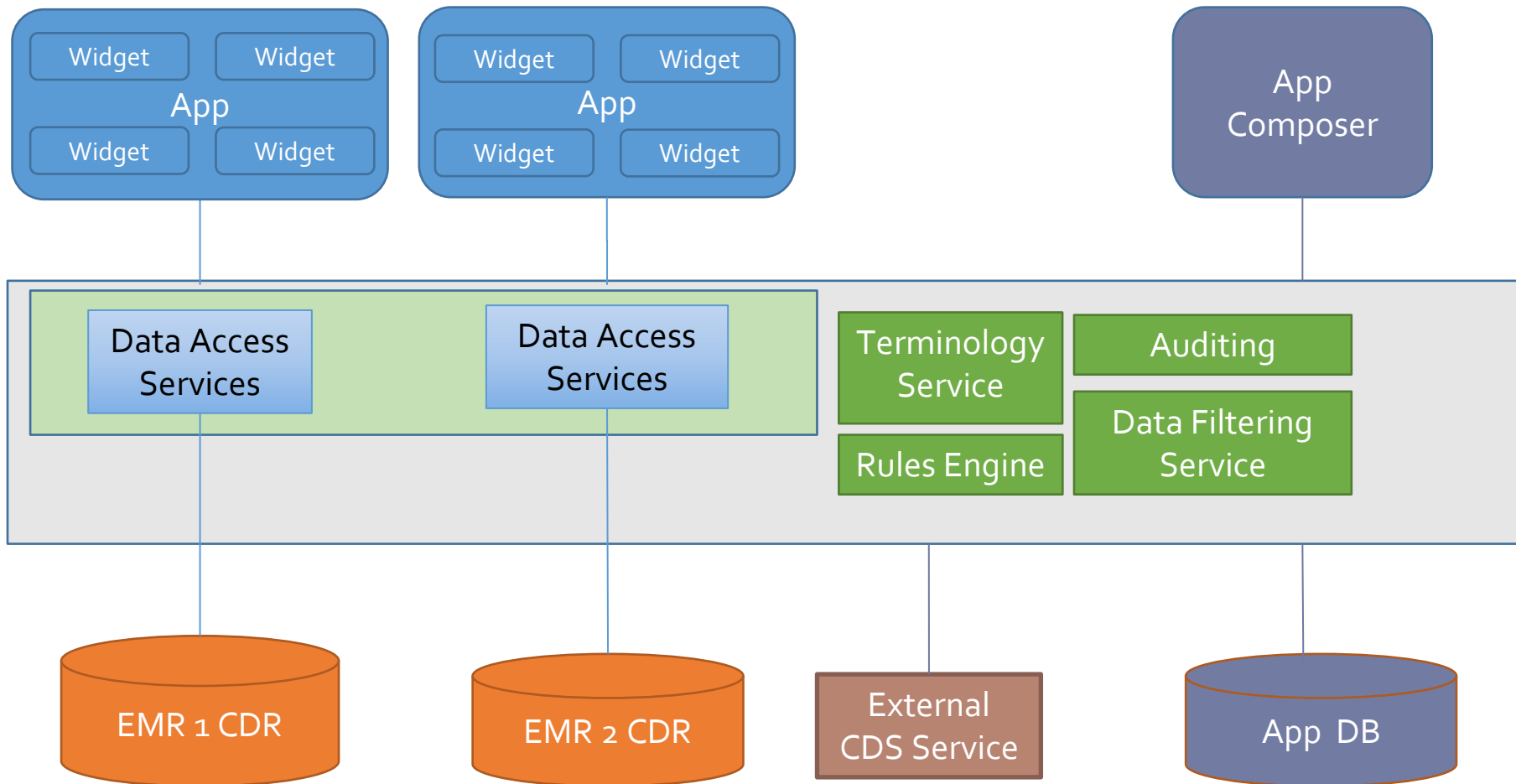
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Medications

Medication	Start Date	End Date
hydrochlorothiazide 25 mg oral pill 25 mg, Oral Route, take 1 pill every day	2014-01-07 12:00 AM	-----
lovastatin 10 mg oral pill 10 mg, Oral Route, take 1 pill every evening	2013-05-15 12:00 AM	2013-07-02 12:00 AM
diltiazem ER 180 mg capsule 180 mg, Oral Route, take 1 capsule daily	2013-10-08 12:00 AM	2013-11-19 12:00 AM
hydrochlorothiazide 25 mg oral pill 25 mg, Oral Route, take 1 pill every day	2013-07-02 12:00 AM	2014-01-07 12:00 AM
lisinopril 10 mg oral pill 10 mg, Oral Route, take 1 pill daily in AM	2013-08-29 12:00 AM	2013-10-08 12:00 AM
24 HR Nicotine 0.875 MG/HR	2013-04-10 06:10 AM	-----

Architecture



Composing an app

- Assemble
 - Drag and drop components from palette onto canvas
 - Layout on canvas
- Configure
 - Change appearance of component
 - Select/filter data to display
- Tie
 - Connect components via events to create desired behaviors



Deployed in EHR

Timonen, Kimmo - 10002805 Opened by Hanov, Yegor

Task Edit View Patient Chart Links Navigation Help

Patient List Schedule Links

New Sticky Note View Sticky Notes Tear Off Change Charges Charge Entry Exit Calculator Message Sender Ad-hoc Medication Administration PM Conversation Depart Communicate Patient Education Medical Record Request Create PHI Patient Pharmacy Explorer Menu

Timonen, Kimmo x

Timonen, Kimmo DOB:3/18/1975 Age:41 years Sex:Male MRN:10002805 Attending:Portal, Portal

Allergies: Free text, No Known Medication Allergies, Strawberries WT: Inpatient FJN: 20003535 [Admit Dt: 2/2/2017 9:16 AM] Loc: Baseline East, Baseline East

Menu

Patient Information

Diagnoses and Problems

Medication List + Add

Allergies + Add

Clinical Notes + Add

Orders + Add

Interactive View and I&O

Documentation

Histories

Form Browser

MAR

MAR Summary

Health Maintenance

Immunization Schedule

Pregnancy + Add

Growth Chart

Activities and Interventions

Reference

Medication Profile

Procedures and Diagnoses

Flowsheet Inpt Tracking

Pregnancy Summary

Prenatal Summary

Infusion Billing Documentation

Plan of Care Summary

Oncology

Ambulatory Physician Viewpoint

Inpatient Summary

Inpatient Physician Viewpoint

Discharge Summary

Elsevier (CHAZD52-VASc)

HEART Pathway

AKI (Duodecim)

Elsevier (Patient Ed)

AKI (Duodecim)

100%

Sapphire

AKI summary Kimmo Timonen DOB:1975-03-18 Address: Age: 41 Contact: Gender: male

AKI-related problems

Problems	Onset
Rheumatoid Arthritis	2017-02-03
Acute kidney injury	2017-02-02
Congestive heart disease	2017-02-03
Atrial Fibrillation	2017-02-02
Type 2 diabetes	2017-02-02

Lab results

Lab Tests	2017-02-03	2017-02-02
Trig	40.0	40.0
HDL	80.0	8.0
Chol	200.0	200.0
LDL	120.0	120.0
Chol/H	2.5	25.0
Instr	3.0	3.0
Chlori	100.0	

Medications related to kidney function

Medication	Start Date	End Date
Warfarin 3 mg ORAL, 3 mg, Oral, Daily	2017-02-03 03:42 PM	----
Lisinopril 10 mg ORAL, 10 mg, Oral, BID	2017-02-03 03:36 PM	----
pioglitazone 30 mg ORAL, 30 mg, Oral, Daily	2017-02-03 10:37 PM	----
Ibuprofen 400 mg ORAL, 400 mg, Oral, q8hr, PRN: pain	2017-02-03 03:35 PM	----
Metformin 500 mg ORAL, 500 mg, Oral, BID	2017-02-03 03:34 PM	----

DynaMed Plus

Acute kidney injury: Management

- Stop exposure to nephrotoxic agents if possible.
- Identify and treat any infectious cause.
- Monitor and adjust fluid and electrolyte balance to address volume depletion or overload, hyponatremia, hyperkalemia, hyperphosphatemia, and hypermagnesemia.
- Reserve diuretics for patients with volume overload; it is not recommended for the routine treatment of acute kidney injury (Strong recommendation).
- Renal replacement therapy:
 - Start renal replacement therapy (RRT) emergently when life-threatening changes in fluid, electrolyte, and acid-base balance occur (Strong recommendation).
 - Consider the entire clinical scenario, presence of factors that can be modified with RRT, and trends of laboratory tests when deciding to start RRT instead of relying on blood urea nitrogen (BUN) and creatinine thresholds alone (Strong recommendation).

FHIRPLAY | BH4893 | February 28, 2017 | 7:29 PM CST

Demo

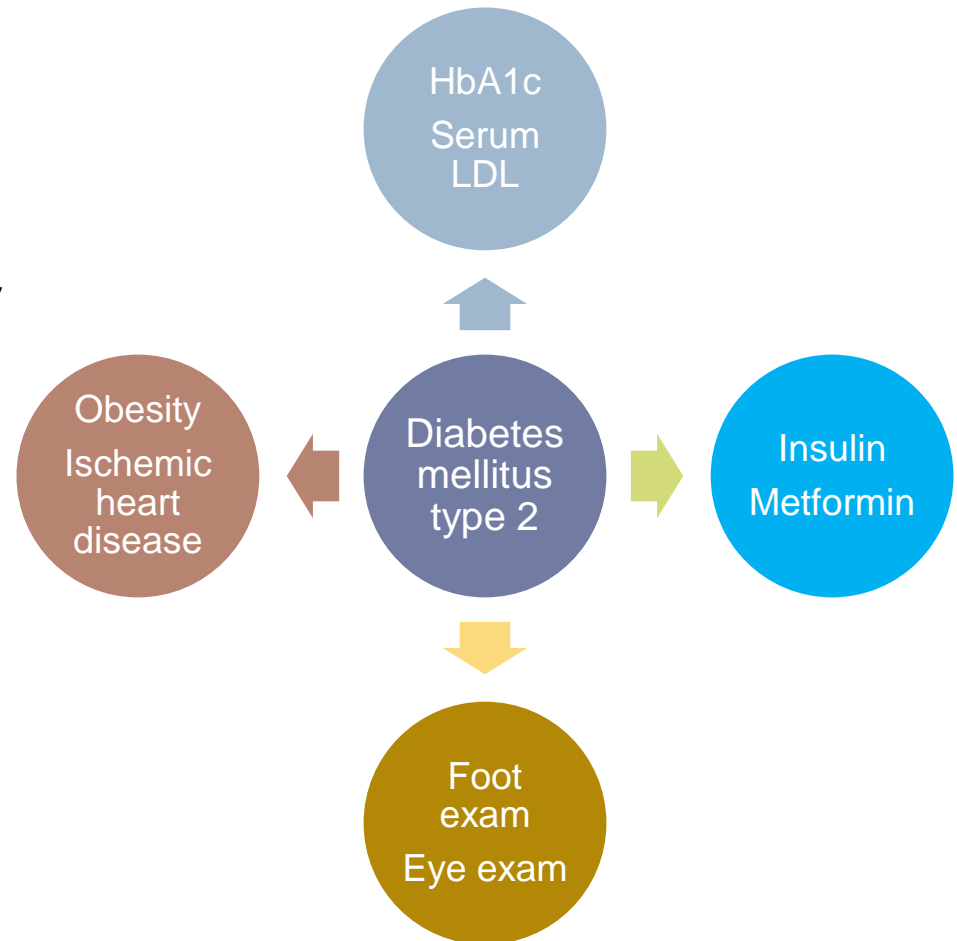


Knowledge base

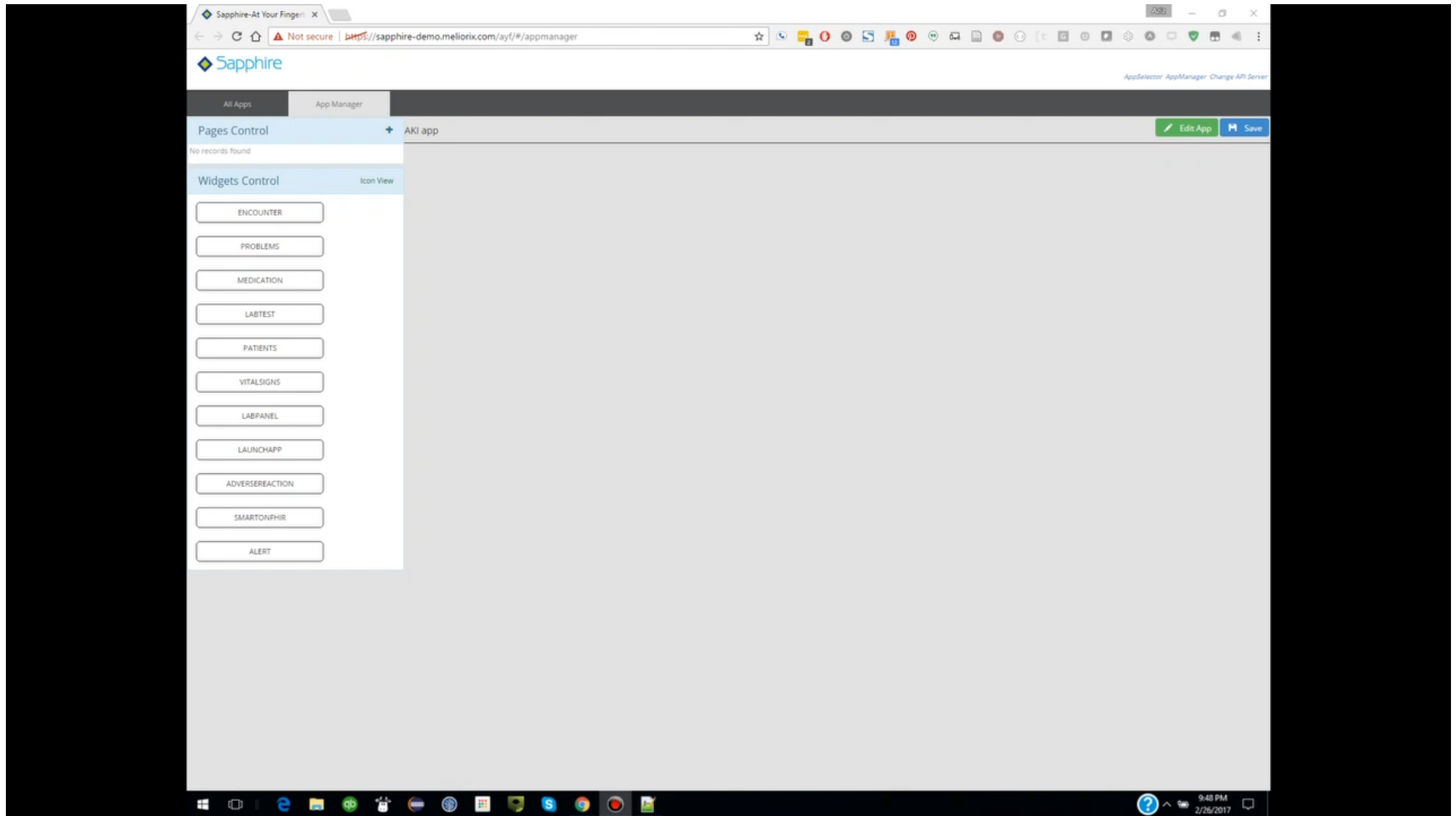


A very large knowledge base of associations amongst clinical concepts

KB is automatically generated by extracting and curating associations from different knowledge sources using proprietary algorithms



Demo video



Thank you

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Intelligent Rx Writer



Medications

Reason: hypercholesterolemia

Medication: **lovastatin 10 mg oral pill**

Strength: [] Route: Oral Route

Dosage Quantity (mg): 10 Frequency: []

Dispense Quantity: 30 Status: Stopped

Start Date: 2013-05-15 12:00 AM End Date: 2013-07-02 12:00 AM

Prescriber: Dr. Hans Zarkov

[Save changes](#)

Related meds

Medication	Start Date	End Date
Simvastatin (Oral Pill) - 10 mg Tab 10 mg, Oral Pill, every day	2015-02-04 07:55 AM	2015-02-02 05:00 AM

Adverse reactions

Symptom	Substance	Reaction Date
Muscle pain	Lovastatin	2013-07-12T06:30:00
Peristent cough	Theophylline	2013-10-10T11:15:00
difficulty breathing; swelling on the face	Hydrocodone	2012-09-17T00:00:00

Alerts

Note	Status
⚙ This is sign out not for filter Alert: sign-out, Source: User	Active
⚙ Previous adverse reaction documented for Hydrocodone causing difficulty breathing; swelling on the face on 2012-09-17T00:00:00 Alert: Source: Appworks CDS	Active

