



Defining the Challenges of Digital Transformation across the Enterprise

Architecting, Developing and Delivering technologies while ensuring continuous improvements

Accelerating healthcare interoperability with FHIR Standards

NAVOMI's Overview

➤ Founded in
2009

➤ Global Projects
500+

➤ Industries

➤ Services

➤ Key Software
Partners*

Accelerating Digital
Transformation
through Enterprise
Integration

Public Health

Healthcare

Education

Retail

Public Sector

Manufacturing

Cloud Integrations

CRM Use Cases

Power Platform / Azure Development

veeva



MuleSoft

twilio

Global Offices



Healthcare IT Interoperability - FHIR Services



Provider side

- Integrating Mobile and Web Applications with EHR systems
- Integration currently operational with EPIC and Cerner EHR systems
- MuleSoft FHIR connector, Cloverleaf FHIR bridge, Mirth FHIR connector as well as connecting from native .Net and Java full stack apps
- Deep understanding of various version of USCDI Core Data
- Extensive experience with legacy HL7 (v2.x) Integration

Public Health

- Working on emerging Standards related Public Health reporting in Emergency Management, Epidemic Response
- CMS Bluebutton 2.0 initiative to use FHIR to disseminate claims information to HCPs, Payers and IT companies

Payer side

- Patient facing APIs
 - Patient Access API
 - Provider Directory API
- Payer-to-Payer API
- Membership information
 - USCDI formatted clinical data exchange between payers

Abstract

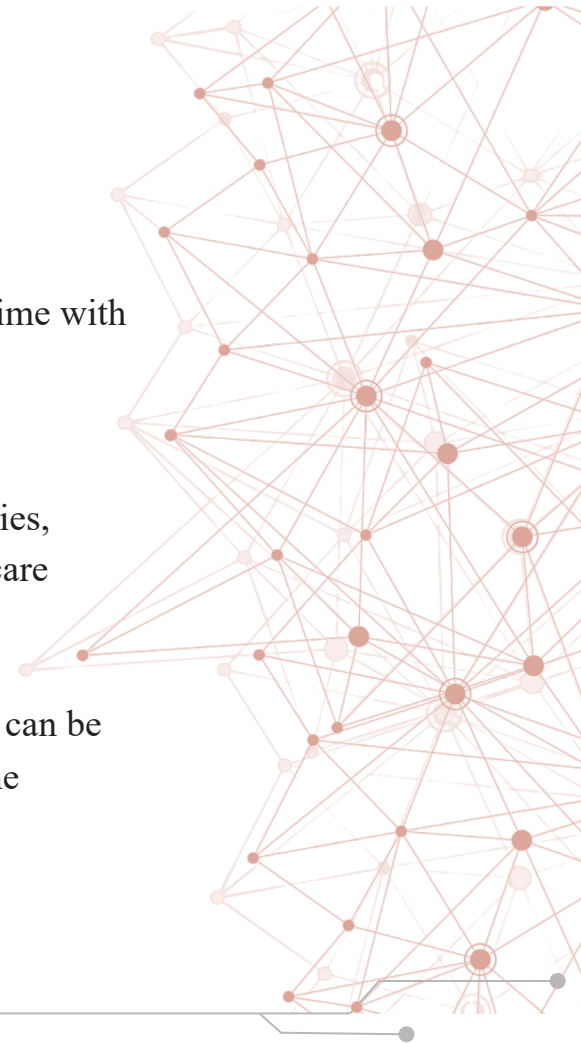
SUBJECT:

Emergency preparedness, response, and crisis management data sharing in real-time with automated FHIR capable smart IoT devices - Concept named “FHIR Beacon”

INTRODUCTION:

Today, situational awareness data related to health care facility resources capacities, such as availability of Beds, PPEs, Oxygen etc., is provided routinely by health care organizations using spreadsheets/PDFs to state/federal agencies.

Instead, with a smart IoT device attached to these resources, this same workflow can be accomplished automatically, and in real time, where the data is directly sent to the federal agency’s endpoints (API front door) with FHIR based data integrations.



IoT in Healthcare



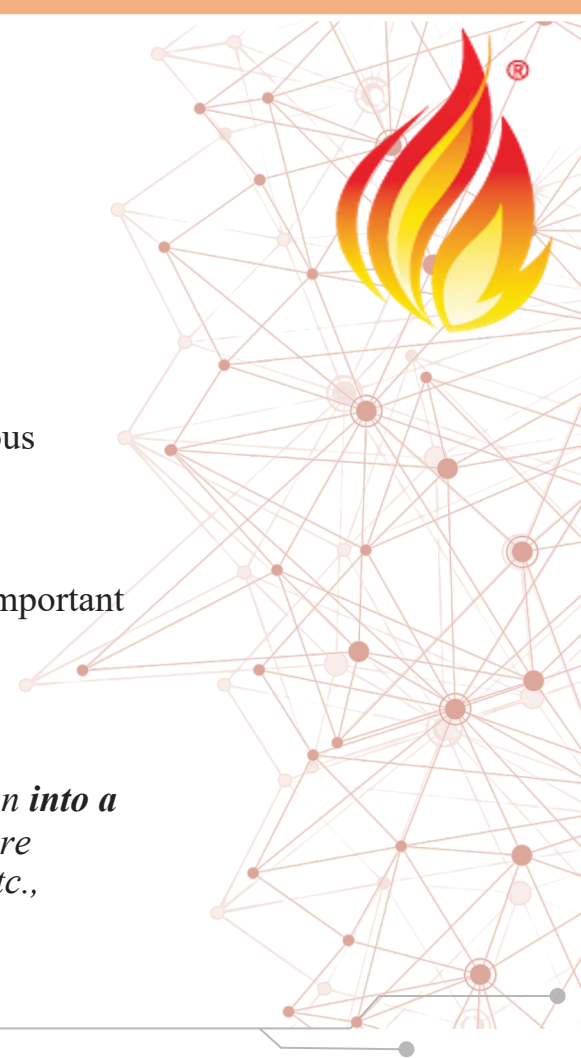
- **The Global IOT in Healthcare Market was valued at USD 87.06 Billion in 2021, and it is expected to reach a value of USD 332.52 Billion by 2028, at a CAGR of 21.10% ¹**
- **IoT devices are mainly used for Patient Care**
 - Vital Signs (Heart Rate, Temperature, Blood Pressure, Weight etc.,)
 - Continuous Glucose Monitoring
 - Depression and Mood Monitoring
 - Connect Inhalers
- **Other general uses**
 - Inventory Management (Medications, Medical Supplies)
 - Equipment Tracking (Beds, Ventilators, Oxygen Cylinders, Wheelchairs etc.,)
 - Supply Chain Visibility (Manufacture > Distributor > Suppliers > Healthcare Providers)
- **Main Challenge**
 - Connectivity is proprietary
 - Information security is weak
 - Data sharing across stakeholders is impossible (Providers, Regional govt agencies, STLTs, Fed Agencies)

<https://www.globenewswire.com/en/news-release/2022/11/10/2553206/0/en/IoT-In-Healthcare-Market-to-Hit-Sales-of-332-52-Billion-by-2028-IoT-Market-to-Surpass-Valuation-of-2412-49-Billion.html>

FHIR Offers solutions to many of these problems

- ✓ Adoption of FHIR standard is becoming widespread and increasing the interoperability across healthcare segments
- ✓ HIT vendors are offering FHIR based data interchange as mandated by various regulation
- ✓ FHIR standard based interoperability provides unique opportunity to share important healthcare information across stakeholders easily and securely

By combining the proliferating IoT technology with FHIR based data transmission into a single IoT device (FHIR Beacon) expands the reach of HIT systems and Healthcare stakeholders significantly into patient homes, healthcare facilities, supply chains etc.,

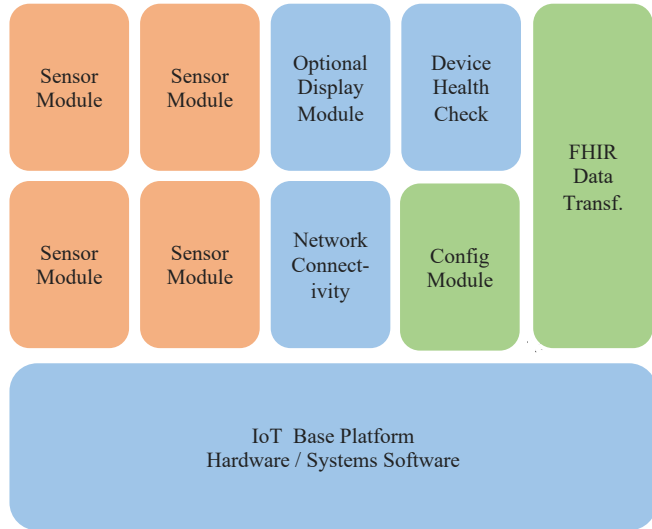







What is a FHIR Beacon? High Level Architecture

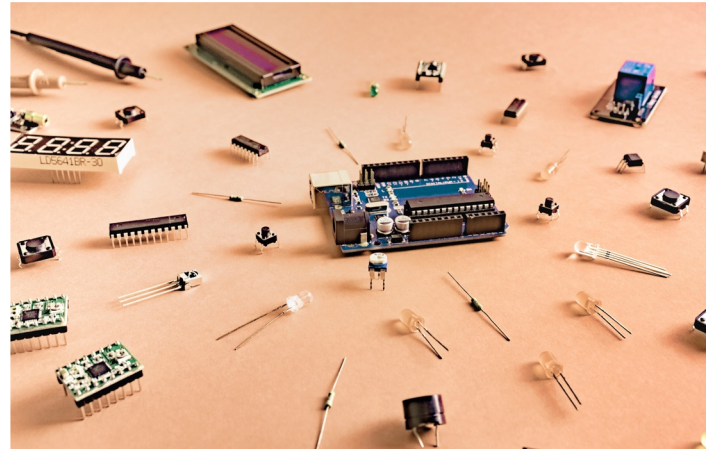


FHIR Beacon - Creating a reference architecture



-  Sensors Modules
-  IoT Management Modules
-  FHIR Standard based data packaging and transmission

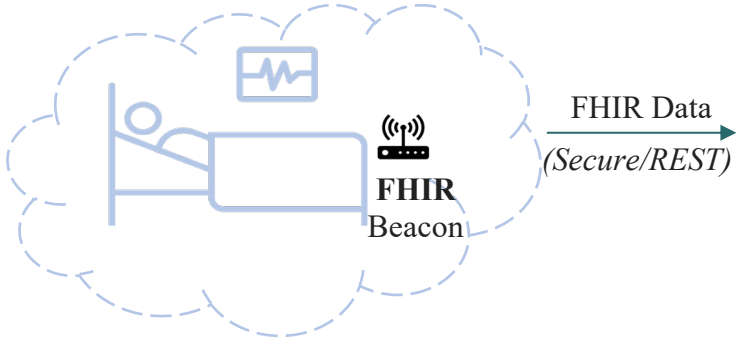
Build: Use open source IoT platforms such as Flutter, ARDUINO, M2M to design, prototype and develop both the hardware and the software extensions needed for FHIR Beacon



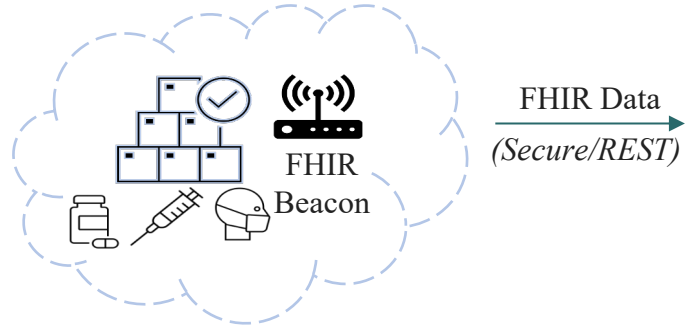
- Leverage existing open source extensible platforms
 - Extend the same with FHIR standard based implementations
- Develop Gateway - Aggregator interface
 - Use IOTs as is, but collect, transform and broadcast the information in FHIR standard
- Create specialized IOTs ground up as needed

Reference Architecture – FHIR Beacon Context Diagram

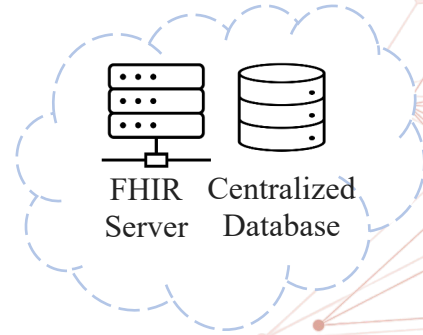
Emergency Response Facility



Emergency Stockpiles

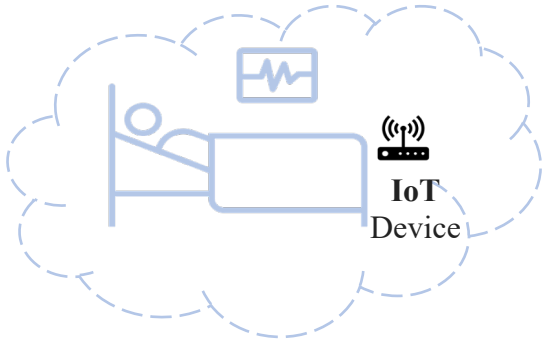


FHIR Data
(Secure/REST)



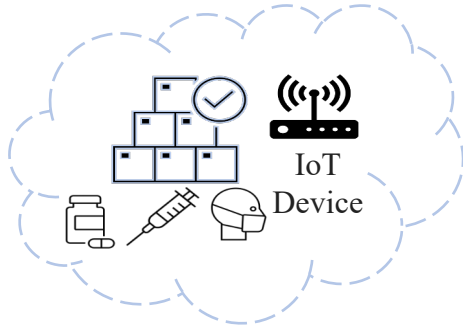
Reference Architecture – FHIR Beacon Context Diagram - Optimized to Scale

Emergency Response Facility



Device
format Data

Emergency Stockpiles



Device
format Data

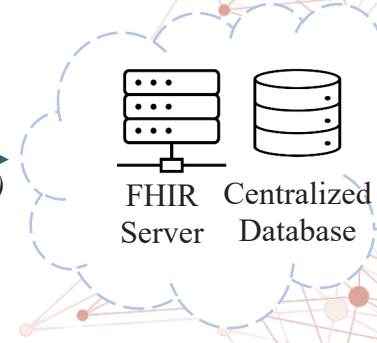


Gateway

Convert Device
Format Data

To
FHIR JSON

FHIR Data
(Secure/REST)





Potential Use Cases of FHIR Beacons



Public Health and Emergency Response Scenarios

- **Pandemic and Endemic situations** - Automatic Situational Awareness data sharing from Healthcare Providers to STLT to CDC
- **Natural disasters (such as Hurricanes, Tornadoes, Fires, Floods)** - Visibility into equipment and patient movement during evacuations of healthcare facilities in case of etc
- **Supply chain visibility** - Real time tracking of for life saving drugs, vaccines and other medications
- Real time tracking of emergency medical stockpiles



Provider Operations

- **Real time asset tracking** in hospitals, Rehab facilities, nursing homes, elder care facilities and patient homes
 - Beds
 - Oxygen Cylinders
 - Ventilators
 - Wheel Chairs
 - Medical Equipment
(Vital sign monitors, glucometers etc..)
- **Medications and medical supplies**
 - Lifesaving medications & vaccines
 - Implatebles before use
 - Lab reagents
 - PPEs
- **Fleet and Supply Chain visibility**



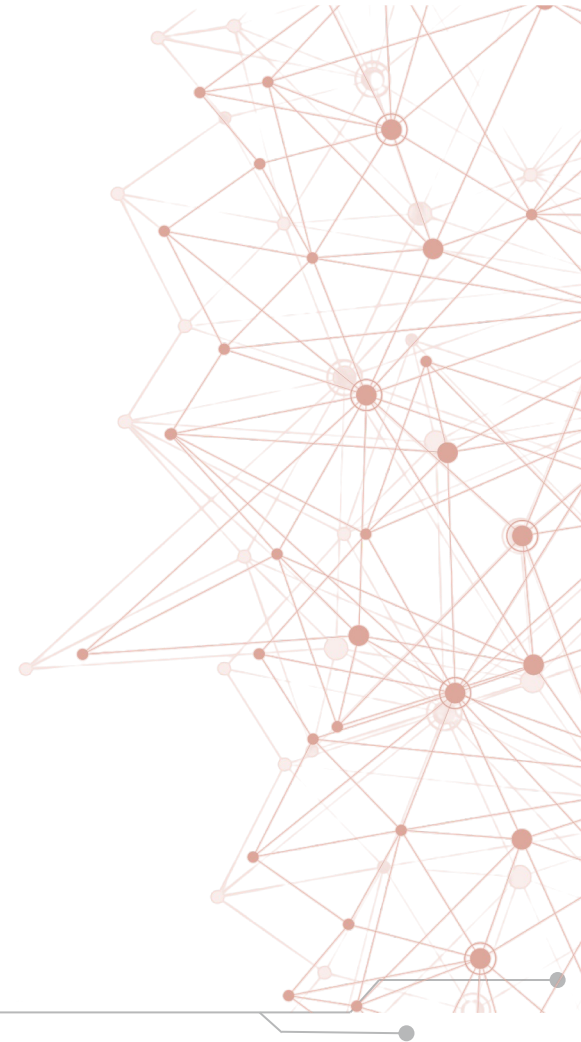
Patient Care - Supporting Advanced Care Models

- Use of IoT devices to capture patient health condition has grown significantly
 - Vital Signs (Heart Rate, Weight, Blood Pressure, SpO2 and Temperature)
 - Continuous Glucose Monitoring
 - Sleep Patterns
- Transmitting this data **directly in FHIR standard enables easy accessibility** for Care Providers inside their main care delivery platform such as an EHR
- Advanced Care Model such as **RPM/CCM/Hospital At Home** can be support easily





What are the issues?



Additional Standards ?

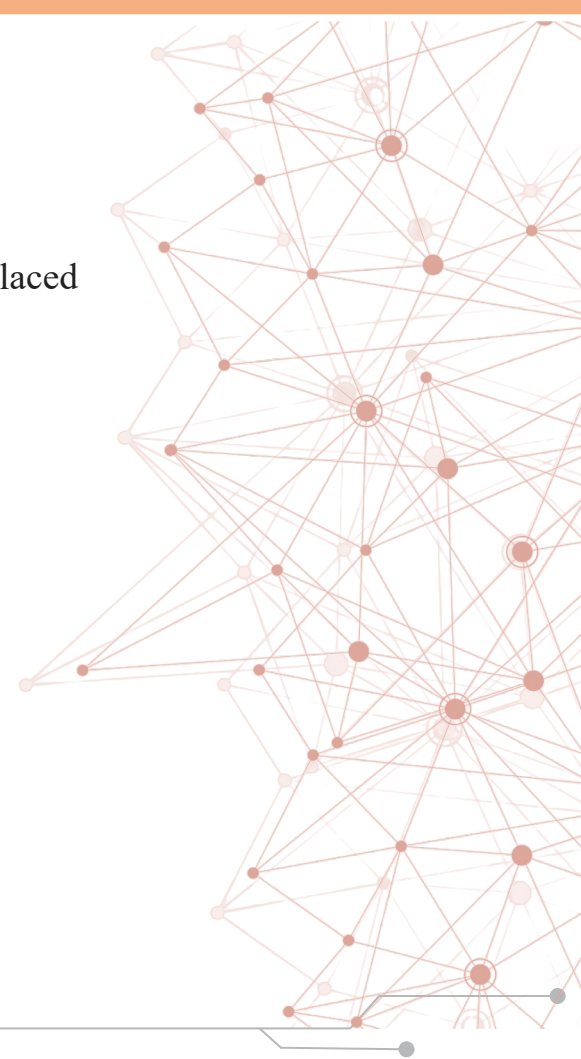


- FHIR standards already provide foundational elements to identify and track FHIR Beacons
 - Organization and Location
 - Device Definition, Device, Device Metric
- May require additional extensions for Asset Tracking, Device Health Tracking and Terminology additions
- May require extensions for creating “trusted registry for FHIR Beacons”
- Working with FHIR community and HL7 is crucial for success of FHIR Beacon concept



Technical Considerations

- Currently deployed IoT devices may not be extensible and may need to be replaced with FHIR Beacon capability
- Low power, long range, and continuously posting data directly to centralized databases will need special considerations regarding wireless mediums
- The receiving endpoints may not be FHIR ready
- Special attention to scalability, optimization and trust



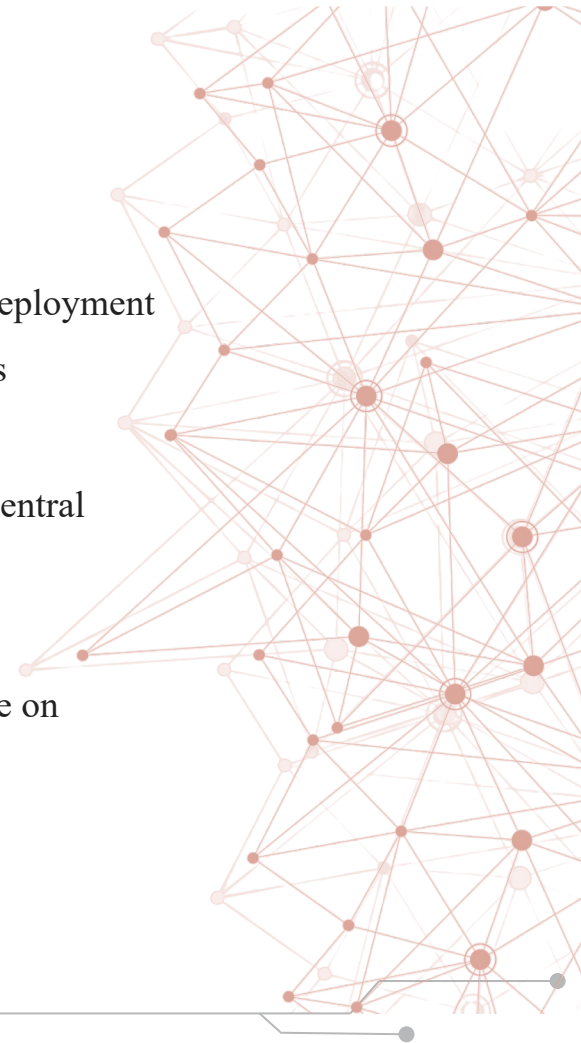
Data sharing and Privacy Issues

- The FHIR Beacon must support existing regulations, standards and guidelines around data privacy and security (HIPA, HITRUST, ISO 27002 etc.,)
- Data sharing agreements need to be worked out between Providers, STLTs and Federal Agencies to leverage the data for Public Health purposes



Benefits of FHIR Beacons

- ✓ Standards based data communication with FHIR Beacons will result in rapid deployment of the same in various use cases and especially spontaneous response scenarios
- ✓ Removes the need for middleman services or infrastructure to collect data by central decision makers - Plug and Play
- ✓ Real time information - For Preparedness or Emergency times, data is available on demand, all the time



Next steps

- Build a end to end proof of concept - Looking for support and partnership from interested parties
- Partnership with HL7 FHIR community to bring up a Implementation Guide
- Engage other public / private partners to build open standards around FHIR Beacon

