



# IRIS Chatbot:

## Appointments, Med Refills from your Favorite Messaging App using FHIR

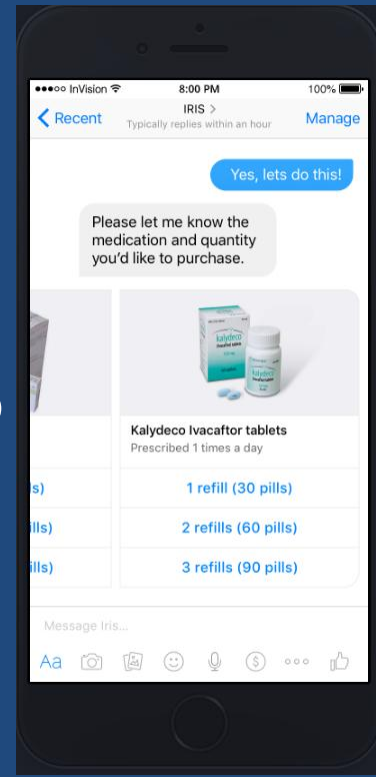
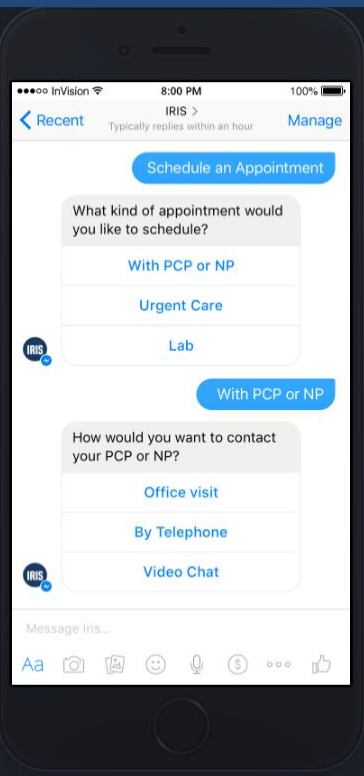
Chris Sprague, CTO  
csprague@lftechnology.com  
<http://openi.org/solutions/iris-chatbot/>

FHIR Applications Roundtable  
Duke University School of Medicine, Durham, NC  
March 8, 2017

# What if you can schedule doctor's appointment from Facebook Messenger?

## Order Medication Refill from iMessage?

You certainly can, because..



# Messaging Bots are becoming more commonplace in customer support workflow

More than 11,000 bots came online soon after Facebook released a bot-development platform for Messenger. Since then, bots have proliferated across other messaging media like Kik, WhatsApp, Slack, Snapchat, and Skype. The numbers are staggering. And with messaging apps already surpassing social-media networks in popularity, those figures will continue to climb.

<http://www.businessinsider.com/sc/chatbots-future-customer-service-2016-9>

GET Schedule?actor=Practitioner/123

GET Slot?schedule=practitioner123&status=free...

POST Appointment?status=proposed&patient=999&slot=xyz...

# FHIR API's are standardizing common healthcare administration workflows

GET MedicationStatement?patient=999&status=active...

POST MedicationRequest?patient=999&medication=261000&status=active...

# As popular messaging apps enforce end-to-end encryption, they start meeting HIPAA requirements

MOBILE / TECH / FACEBOOK

## Messenger's end-to-end encryption is now available for all 1 billion users

by James Vincent | @jvincent | Oct 4, 2016, 10:18am EDT

### Security at Slack

We take security very seriously here at Slack. And for good reason: every person and team using our product expects their data to be protected and secure. We understand how important the responsibility of safeguarding this data is to our customers, and we are proud to exceed the industry standard when it comes to protecting your organization.



CSA  
Cloud  
Security Alliance



AICPA  
SOC  
(Type I & II)  
Trust Services Principles



AICPA  
SOC  
Service  
Organization Controls



NIST 800-53  
National Institute of  
Standards and Technology



FINRA  
Financial Industry  
Regulatory Authority



HIPAA  
Health Insurance Portability  
and Accountability Act



EU/US Privacy Shield  
Data  
Privacy Practices




## iMessage and FaceTime


Your iMessages and FaceTime calls are your business, not ours. Your communications are protected by end-to-end encryption across all your devices when you use iMessage and FaceTime, and with iOS and watchOS, your iMessages

# How it Works

# Build the Bot to Book Appointment




**Iris**  
Messenger of the Gods


POWERED BY 

see a doctor


Today or Tomorrow, or some time later?

Ask something...





**Iris**  
Messenger of the Gods

POWERED BY 


see a doctor


Today or Tomorrow, or some time later?

tomorrow is good


Here are the 3 next free slots - 4 pm today, or noon or 2 pm tomorrow. Which works best for you?

Ask something...





**Iris**  
Messenger of the Gods

POWERED BY 


tomorrow is good

Here are the 3 next free slots - 4 pm today, or noon or 2 pm tomorrow. Which works best for you?

let's shoot for 2 pm

Great, we will see you Tomorrow at 2 pm then. Please bring your photo ID and insurance card, and arrive 15 minutes early.

Ask something...



# Deployed to Facebook Messenger

The screenshot shows a Facebook Messenger interface. At the top, there's a blue header with the Facebook logo, a search bar labeled 'Find friends', and a user profile 'Wallace'. Below the header, a black banner reads 'Keep the conversation going from your phone. [Get App](#)'. The main area is divided into two panels. The left panel, titled 'Messenger', shows a search bar and a list of conversations. The selected conversation is with 'Care-Collaboration' (10/19/16), with a preview message: 'Thank you!!! Your medication Zocor has been r...'. The right panel shows the chat history. It starts with a blue bubble saying 'hi'. Then a grey bubble from 'Care-Collaboration' says 'Hi! How can I help you?'. This is followed by a blue bubble saying 'need an appointment'. Then a grey bubble asks 'When do you want to meet, today, tomorrow or any future date?'. A blue bubble responds 'tomorrow'. Then a grey bubble lists 'Here are the first 5 open slots- 12pm, 1pm, 1:30pm, 2pm, 2:30pm'. A blue bubble responds '2pm'. Then a grey bubble says 'Thank you!!! The appointment has been scheduled for 2016-10-06 14:00:00 with Dr. Gregory House.' followed by a timestamp '10/19/2016 11:20PM'. A blue bubble says 'hi'. Finally, a grey bubble says 'Thanks for messaging us. We try to be as responsive as possible. We'll get back to you soon.' At the bottom, there's a text input field 'Type a message...' and icons for attachments, emojis, GIFs, stickers, voice recording, and a thumbs up icon.

Find friends

Wallace

Keep the conversation going from your phone. [Get App](#)

Messenger

Search Messenger

Care-Collaboration 10/19/16  
Thank you!!! Your medication Zocor has been r...

hi

Hi! How can I help you?

need an appointment

When do you want to meet, today, tomorrow or any future date?

tomorrow

Here are the first 5 open slots- 12pm, 1pm, 1:30pm, 2pm, 2:30pm

2pm

Thank you!!! The appointment has been scheduled for 2016-10-06 14:00:00 with Dr. Gregory House.

10/19/2016 11:20PM

hi

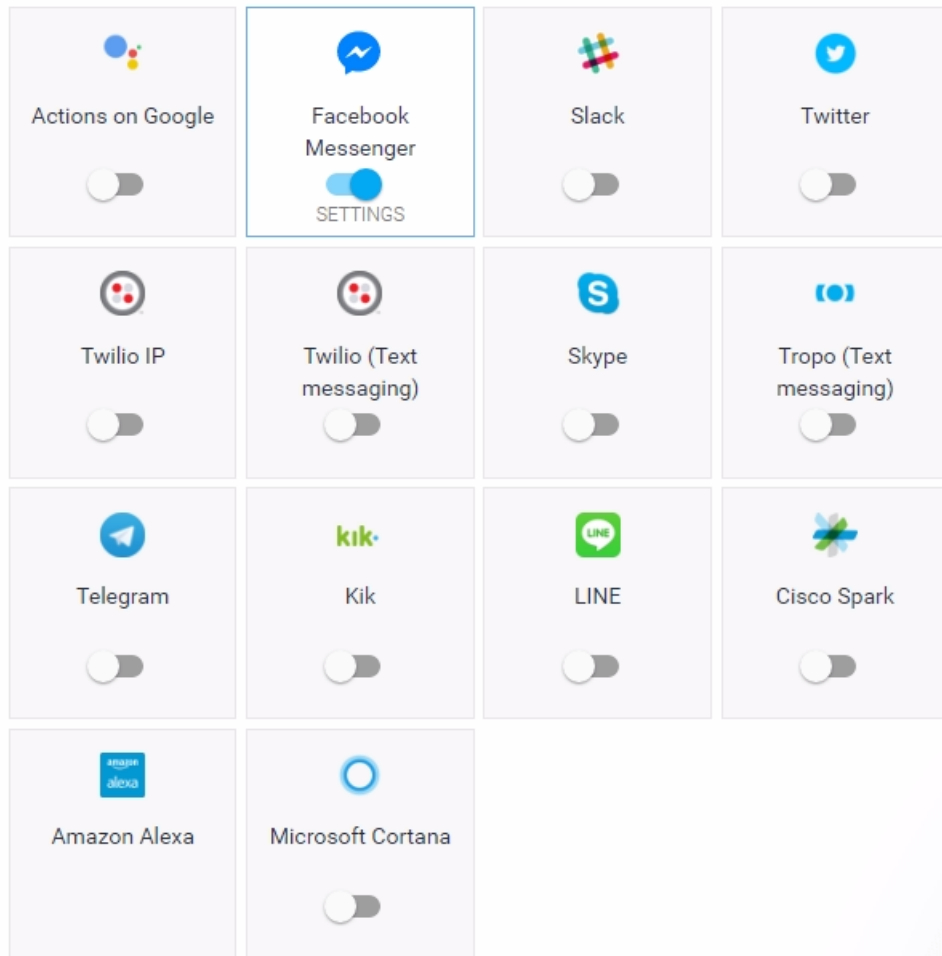
Thanks for messaging us. We try to be as responsive as possible. We'll get back to you soon.

Type a message...

Attachments, Emojis, GIFs, Stickers, Voice, Camera, Thumbs Up

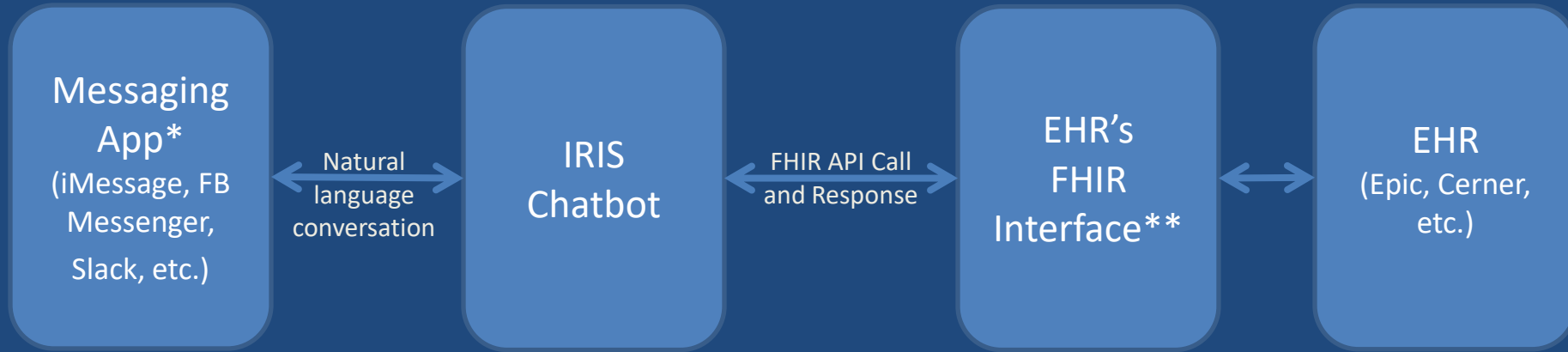


## One-click integrations



Prototype deployed to Facebook Messenger, can easily be deployed to other popular messaging platforms

# Design Framework




\*Must support end-to-end encryption + HIPAA compliant


\*\*Using Aidbox.io for demo


# Backend FHIR API's


GET Patient?identifier=...


GET Patient resource to find  
their PCP  
(Patient.generalPractitioner)


 AIDBOX


 Dashboard


 Users


 Groups


 Security


 Clients


 DB console


 REST console


 Queues

 Documents

 Terminology

 Elastic

 Logs

 Documentation

LFTECHNOLOGY | REST console

REQUEST

NEW SNIPPET

EXECUTE

GET /fhir/Patient?identifier=001600120

RESPONSE BODY

RAW

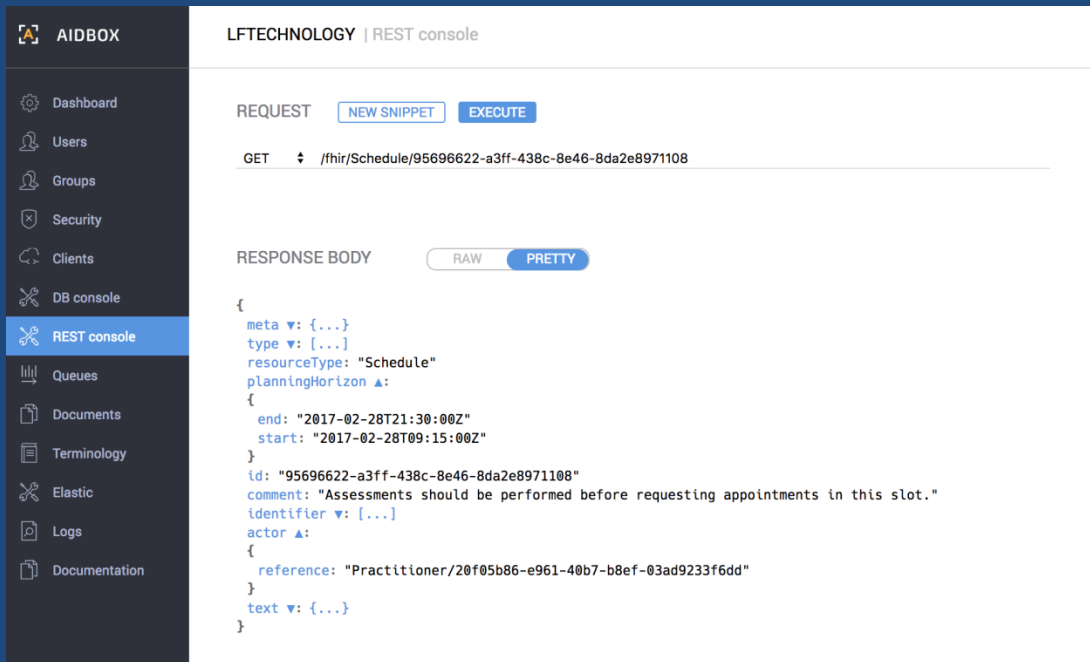
PRETTY

```
{
  resourceType: "Bundle"
  type: "searchset"
  total: 1
  link ▼: [...]
  entry ▲:
  [
    {
      resource ▲:
      {
        address ▼: [...]
        meta ▼: {...}
        name ▲:
        [
          {
            use: "official"
            given ▲:
            [
              "Andrew"
              "Testpatient"
            ]
            family ▲:
            [
              "Cohen"
            ]
            suffix ▼: [...]
          }
        ]
        birthDate: "1965-06-25"
        resourceType: "Patient"
        extension ▼: [...]
        active: true
        communication ▼: [...]
        id: "4b5c3295-1a9d-483e-b7c0-0a78b3e5c554"
        identifier ▼: [...]
        telecom ▼: [...]
        generalPractitioner ▲:
        {
          display: "Peter"
          reference: "Practitioner/20f05b86-e961-40b7-b8ef-03ad9233f6dd"
        }
        gender: "male"
        maritalStatus ▼: {...}
        contact ▼: [...]
      }
    }
  ]
}
```

# Backend FHIR API's

GET Schedule

Find the general  
practitioner's Schedule  
resource



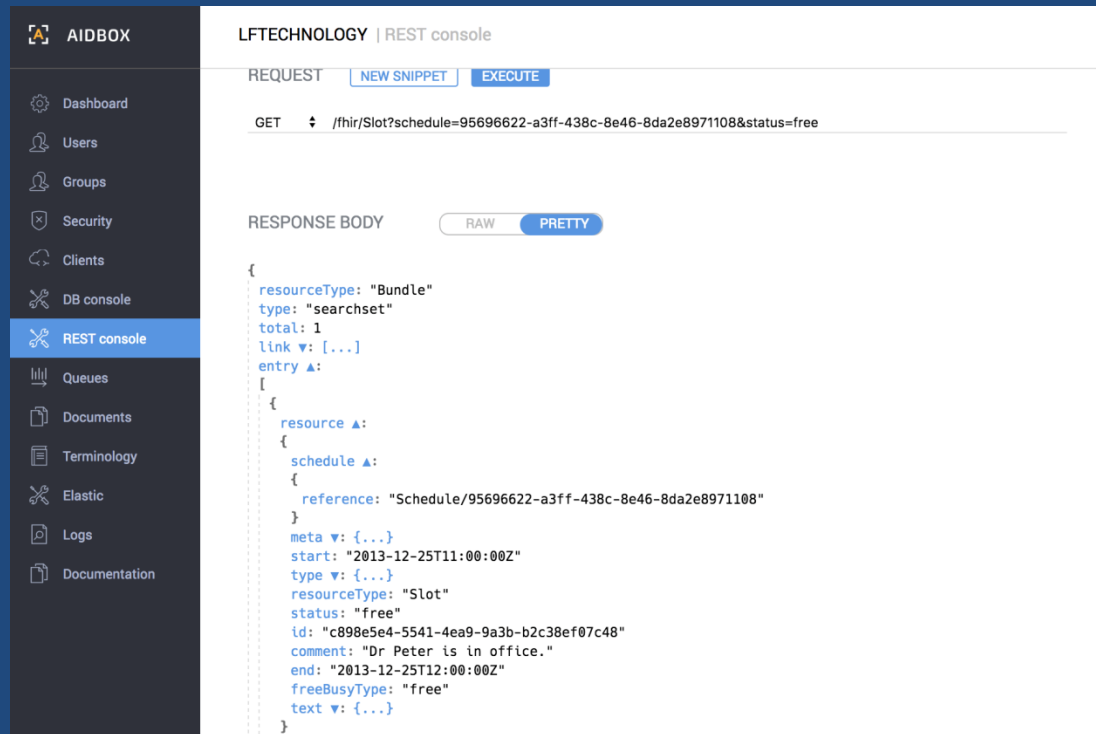
The screenshot displays the AIDBOX REST console interface. On the left is a dark sidebar with a menu of options: Dashboard, Users, Groups, Security, Clients, DB console, REST console (highlighted in blue), Queues, Documents, Terminology, Elastic, Logs, and Documentation. The main panel on the right is titled 'LFTECHNOLOGY | REST console'. It features a 'REQUEST' section with 'NEW SNIPPET' and 'EXECUTE' buttons. Below this, the request is shown as 'GET /fhir/Schedule/95696622-a3ff-438c-8e46-8da2e8971108'. The 'RESPONSE BODY' section has 'RAW' and 'PRETTY' buttons, with 'PRETTY' selected. The response is a JSON object representing a FHIR Schedule resource.

```
{
  meta ▾: {...}
  type ▾: [...]
  resourceType: "Schedule"
  planningHorizon ▲:
  {
    end: "2017-02-28T21:30:00Z"
    start: "2017-02-28T09:15:00Z"
  }
  id: "95696622-a3ff-438c-8e46-8da2e8971108"
  comment: "Assessments should be performed before requesting appointments in this slot."
  identifier ▾: [...]
  actor ▲:
  {
    reference: "Practitioner/20f05b86-e961-40b7-b8ef-03ad9233f6dd"
  }
  text ▾: {...}
}
```

# Backend FHIR API's

GET Slot

Find a free Slot resource in  
general Practitioner's  
Schedule



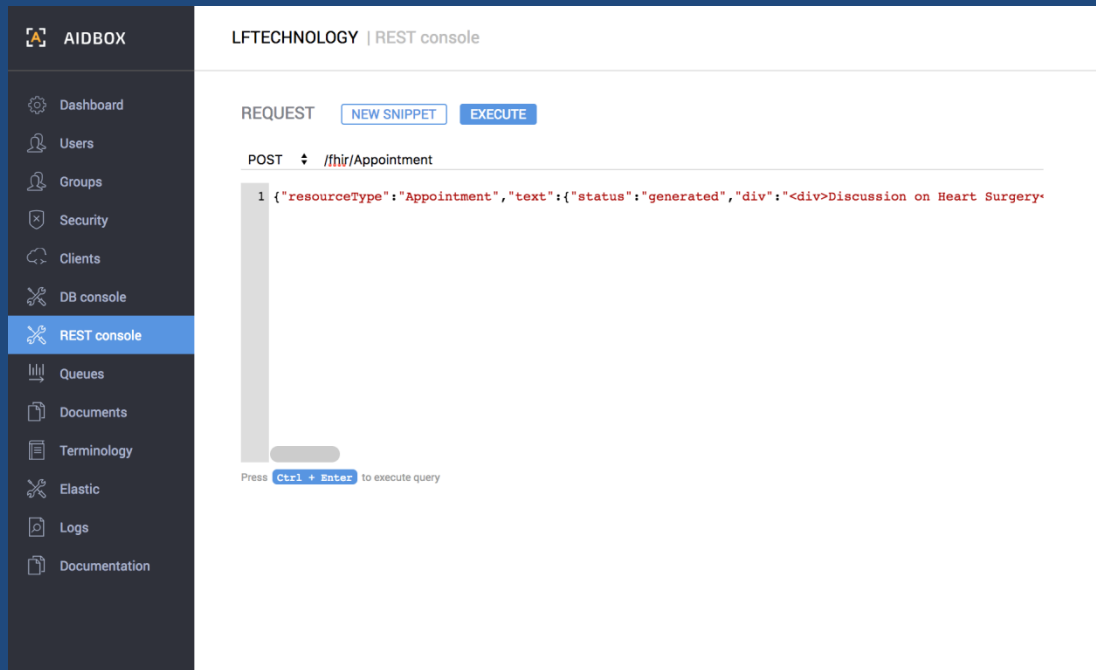
The screenshot displays the LFTECHNOLOGY REST console interface. On the left is a dark sidebar with a menu of options: Dashboard, Users, Groups, Security, Clients, DB console, REST console (highlighted), Queues, Documents, Terminology, Elastic, Logs, and Documentation. The main panel is titled 'LFTECHNOLOGY | REST console' and contains a 'REQUEST' section with tabs for 'NEW SNIPPET' and 'EXECUTE'. Below this, a GET request is shown: `GET /fhir/Slot?schedule=95696622-a3ff-438c-8e46-8da2e8971108&status=free`. The 'RESPONSE BODY' section has tabs for 'RAW' and 'PRETTY', with the 'PRETTY' tab selected. The response is a JSON object representing a FHIR searchset of Slot resources.

```
{
  "resourceType": "Bundle",
  "type": "searchset",
  "total": 1,
  "link": {
    "type": "self",
    "url": "/fhir/Slot?schedule=95696622-a3ff-438c-8e46-8da2e8971108&status=free"
  },
  "entry": [
    {
      "resource": {
        "resourceType": "Slot",
        "status": "free",
        "id": "c898e5e4-5541-4ea9-9a3b-b2c38ef07c48",
        "comment": "Dr Peter is in office.",
        "end": "2013-12-25T12:00:00Z",
        "freeBusyType": "free",
        "text": "Dr Peter is in office."
      }
    }
  ]
}
```

# Backend FHIR API's

## POST Appointment

Send an Appointment request to book a free Slot on the general Practitioner's Schedule



# Backend FHIR API's

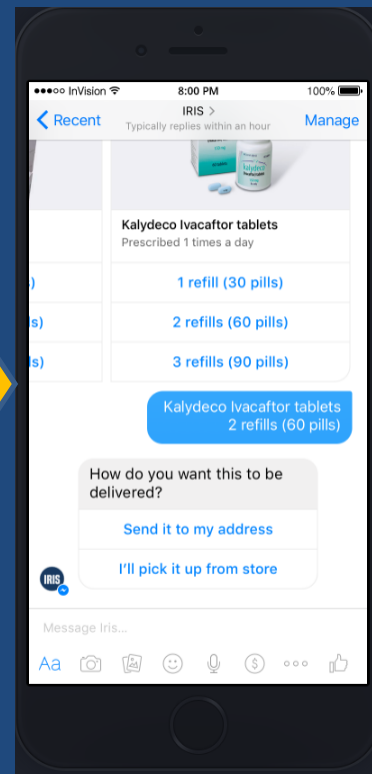
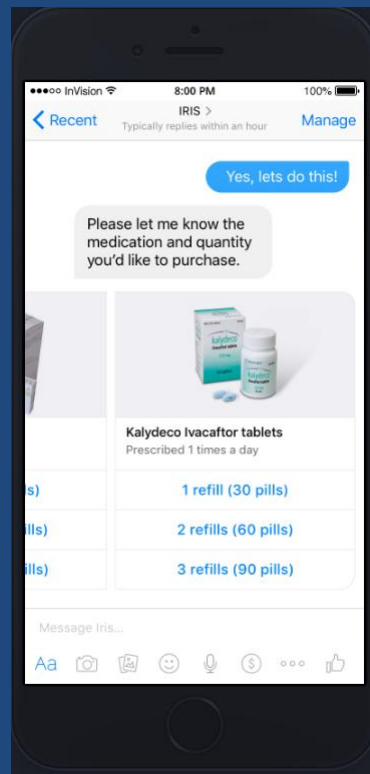
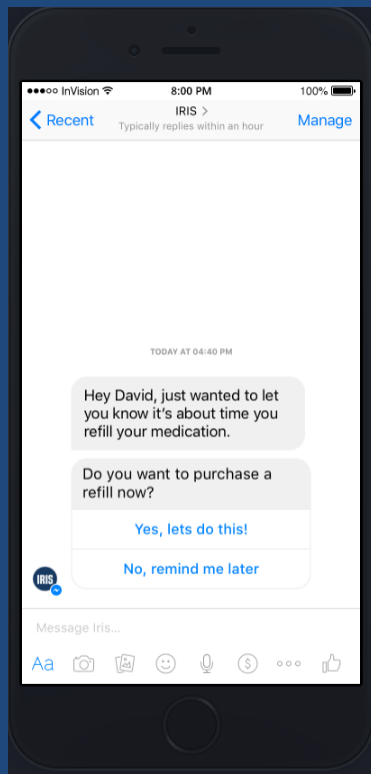
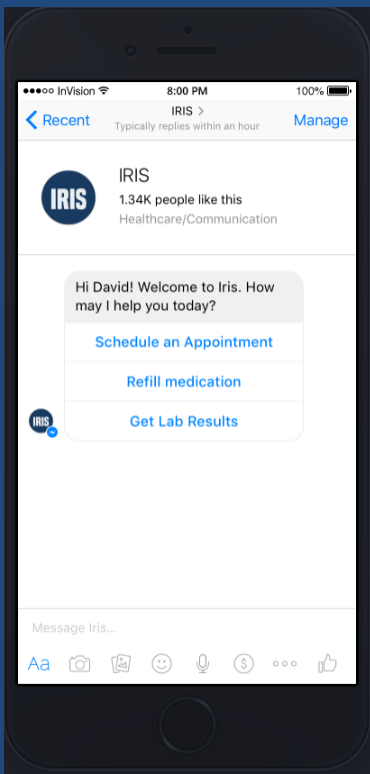
GET Appointment

Get the confirmed  
Appointment details from the  
general Practitioner's  
Schedule

The screenshot displays the AIDBOX REST console interface. On the left is a dark sidebar with a menu containing: Dashboard, Users, Groups, Security, Clients, DB console, REST console (highlighted), Queues, Documents, Terminology, Elastic, Logs, and Documentation. The main panel is titled 'LFTECHNOLOGY | REST console'. It features a 'REQUEST' section with 'NEW SNIPPET' and 'EXECUTE' buttons. Below this, a GET request is shown: `GET /fhir/Appointment/d0bb62b1-86ad-4e26-a137-17a3654dfe80`. The 'RESPONSE BODY' section has 'RAW' and 'PRETTY' buttons. The response is displayed in a code editor with syntax highlighting, showing a JSON object for an appointment.

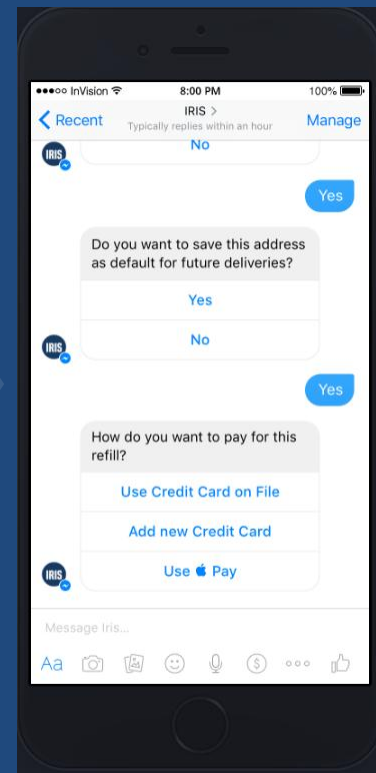
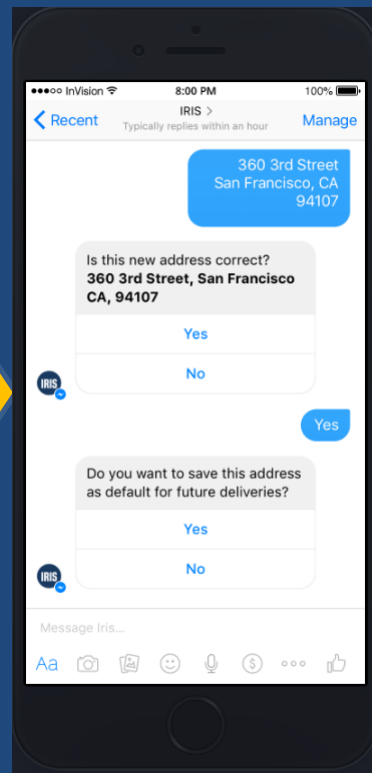
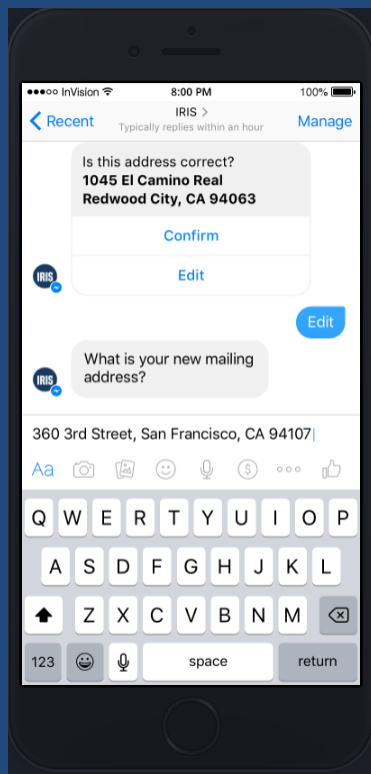
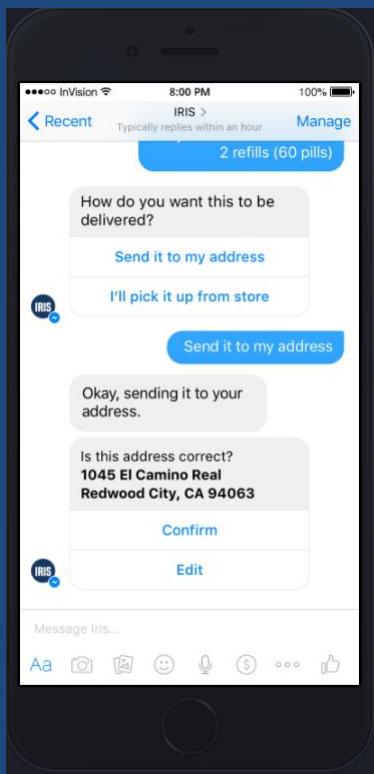
```
{
  description: "Discussion on Heart Surgery"
  slot ▲:
  [
    {
      reference: "Slot/c898e5e4-5541-4ea9-9a3b-b2c38ef07c48"
    }
  ]
  meta ▼: {...}
  type ▼: {...}
  participant ▼: [...]
  resourceType: "Appointment"
  reason ▼: {...}
  priority: 5
  status: "proposed"
  id: "d0bb62b1-86ad-4e26-a137-17a3654dfe80"
  comment: "Further expand on the results of the MRI and determine the next actions that may be appropriate."
  minutesDuration: 15
  identifier ▼: [...]
  text ▼: {...}
}
```

# Medication Refill

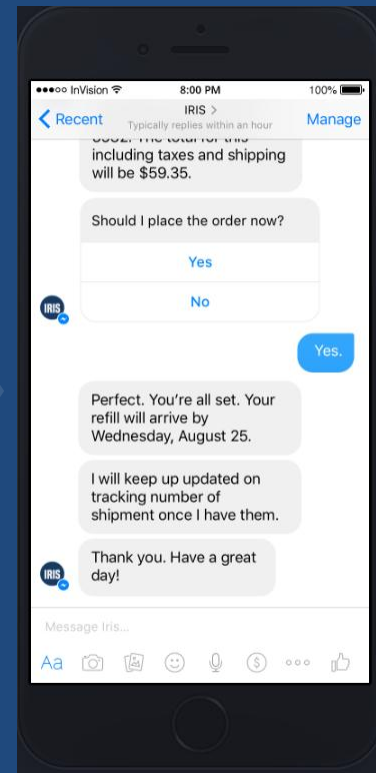
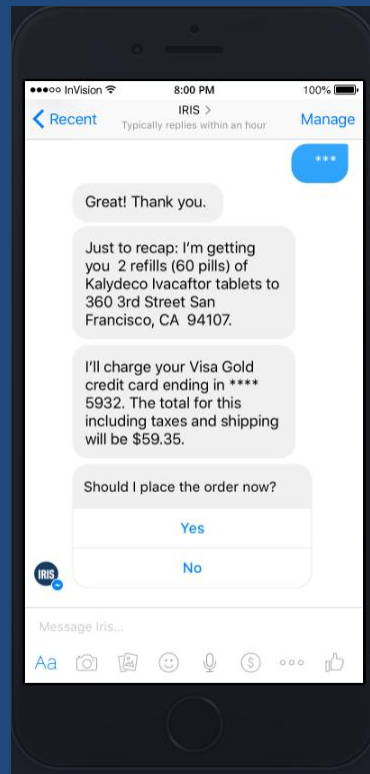
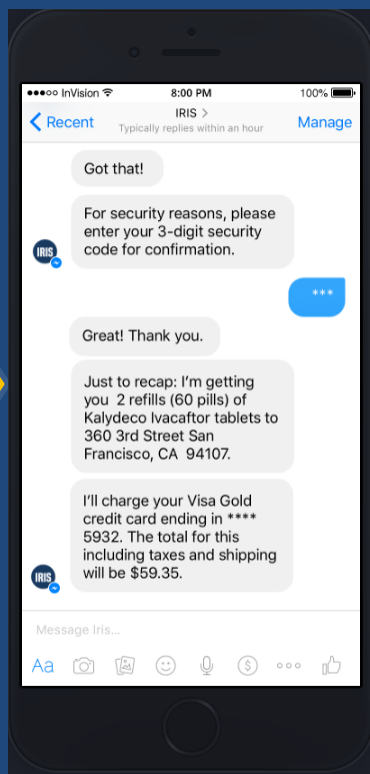
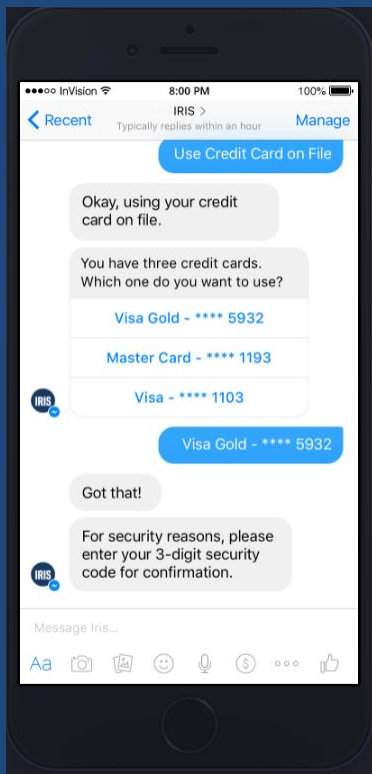




# Medication Refill (Contd.)



# Medication Refill (Contd.)



# Next Steps

- Looking for a pilot site to deploy the bot – ideally a small to mid-size healthcare provider
- Will appreciate any feedback on features you'd like to see in Chatbots
- Have similar projects? Open to collaborate



# IRIS Chatbot:

## Appointments, Med Refills from your Favorite Messaging App using FHIR

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csprague@lftechnology.com  
<http://openi.org/solutions/iris-chatbot/>

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