

SwaggerBot

Generating Chat Bots from Web API Specifications

Mandana Vaziri, Louis Mandel, Avi Shinnar,
Jerome Simeon, Martin Hirzel

IBM T. J. Watson Research Center

Onward'17

Problem Statement



- Chat bots are becoming ubiquitous
 - Provide customer care by phone or online
 - Industries: banking, healthcare, telecom, retail, ...
 - They can query resources and take actions via Web APIs
- Chat bots are difficult to maintain and modify
 - Require traditional software and machine learning skills
 - Natural Language Understanding (NLU)
 - Rapidly changing business needs requires modifications
- Objective
 - Generate chat bots automatically
 - Focus on IBM Watson Conversation Service
 - Generate chat bots from Web API specifications

From Web APIs to Chat Bots

- Generate chat bots from web APIs
 - Start from a [Swagger](#) specification
 - Generate a chat bot that can:
 - Help the user navigate an API
 - Make calls conversationally
 - Examples:

[Human](#): Please translate the text `la vie` to target language `en`

[Bot](#) : `Life`

[Human](#): What is the weather in NYC?

[Bot](#) : `windy`



42!

Swagger



I come from...
... Swagger???

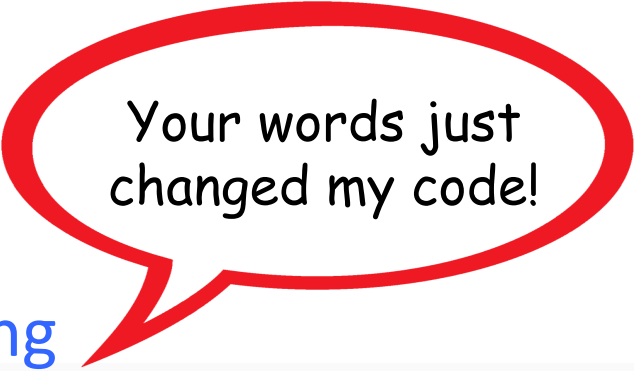
- Standard for specifying Web APIs
 - Based on JSON
 - Specifies endpoints, operations, parameters
 - Has descriptions and summaries
- Ecosystem of tools generated from Swagger
 - API documentation
 - UI interface, tryme
 - Client Software Development Kits (SDKs)
 - Server stubs
 - Automated tests
 - > Swaggerbot adds chat bots to this ecosystem

Challenges

- Swagger is insufficient
 - Missing documentation
 - Inaccurate
 - Missing logical relationships
 - Need multiple API calls to make one call
 - Need to pass output of one call to another
 - API may need specialization for an end-user's needs
 - Example: Translation from French to English, not just any language
- Need **tuning** to generate a useful bot
 - How can we allow the specification to be tuned by a bot designer?



Approach


















Your words just
changed my code!

- Generated bot allows **live programming**
 - In dialog tuning: bot designer can tune bot by conversation
 - Analogy: Spreadsheet interface
 - End-user interacts with the table
 - Advanced user can create scripts and make them available
 - Bot designer can create **higher-level actions**
 - In a conversational manner
 - Make them available to end-user in the same interface

Example: Watson Language Translator

```
1 {
2   "swagger": "2.0",
3   "info": {
4     "version": "2.0.0",
5     "title": "Language Translator"
6   },
7   "securityDefinitions": {},
8   "security": [],
9   "basePath": "/language-translator/api",
10  "paths": {
11    "/v2/models": {
12      "get": {
13        "tags": [
14          "models"
15        ],
16        "operationId": "listModels",
17        "summary": "Lists available standard and custom models by source or target language",
18        "description": "",
19        "consumes": [
20          "application/x-www-form-urlencoded"
21        ],
22        "produces": [
23          "application/json"
24        ],
25        "parameters": [{
26          "name": "source",
27          "in": "query",
28          "description": "Filter models by source language.",
29          "required": false,
30          "type": "string"
31        }, {
32          "name": "target",
33          "in": "query",
34          "description": "Filter models by target language.",
35          "required": false,
36          "type": "string"
37        }, {
38          "name": "limit",
39          "in": "query",
40          "description": "Number of models to return.",
41          "required": false,
42          "type": "integer"
43        }, {
44          "name": "offset",
45          "in": "query",
46          "description": "Offset of the first model to return.",
47          "required": false,
48          "type": "integer"
49        }
50      ]
51    }
52  }
53}
```

-  **swaggerbot-mv** APP 6 minutes ago
Hi, SwaggerBot is here to help you explore the `Language` `Translator`.
-  **swaggerbot-mv** APP 5 minutes ago
What would you like to do? To begin name an action or resource.
-  **mvaziri** 5 minutes ago
please identify the text `la vie est belle`
-  **swaggerbot-mv** APP 5 minutes ago
You chose: identify. Calling now.
-  **swaggerbot-mv** APP 5 minutes ago ☆
identify GET text `la vie est belle` accept `text/plain`
"fr"
-  **mvaziri** 3 minutes ago
please translate the text `la vie est belle` from source language `fr` to target language `en`
-  **swaggerbot-mv** APP 3 minutes ago
You chose: translate. Calling now.
-  **swaggerbot-mv** APP 3 minutes ago
translate GET text `la vie est belle` source `fr` target `en`
accept `text/plain`
"Life is beautiful "
-  **mvaziri** 2 minutes ago
name this action
-  **swaggerbot-mv** APP 2 minutes ago
What would you like to name this action?
-  **mvaziri** 2 minutes ago
englify
-  **swaggerbot-mv** APP 2 minutes ago
Thanks, action englify created
-  **mvaziri** < 1 minute ago
englify but now please the text should be `le monde est beau`
-  **swaggerbot-mv** APP < 1 minute ago
You chose: englify. Calling now.
-  **swaggerbot-mv** APP < 1 minute ago
translate GET text `le monde est beau` source `fr` target `en`
"The world is beautiful "



mvaziri 11 minutes ago

please classify the picture at url https://images-na.ssl-images-amazon.com/images/G/01/img15/pet-products/small-tiles/23695_pets_vertical_store_dogs_small_tile_8_CB312176604_.jpg



swaggerbot-mv APP 11 minutes ago

You chose: classify. Calling now.



swaggerbot-mv APP 11 minutes ago

classify GET url https://images-na.ssl-images-amazon.com/images/G/01/img15/pet-products/small-tiles/23695_pets_vertical_store_dogs_small_tile_8_CB312176604_.jpg (57kB)



Accept-Language en classifier_ids default version 2016-05-

20

```
{
  "custom_classes": 0,
  "images": [
    {
      "classifiers": [
        {
          "classes": [
            {
              "class": "beagle dog",
              "score": 0.906,
              "type_hierarchy": "/domestic animal/beagle dog"
            },
            {
              "class": "dog",
              "score": 0.906
            }
          ]
        }
      ]
    }
  ]
}
```

It's a red ball!



mvaziri 7 minutes ago ☆

please detect if there is any face at url
http://www.liselottewajstedt.com/wp-content/gallery/faces/faces_3.jpg



swaggerbot-mv APP 7 minutes ago
You chose: detect_faces. Calling now.



swaggerbot-mv APP 7 minutes ago
detect_faces GET url http://www.liselottewajstedt.com/wp-content/gallery/faces/faces_3.jpg (525kB) ▾



```
version 2016-05-20
{
  "images": [
    {
      "faces": [
        {
          "age": {
            "max": 24,
            "min": 18,
            "score": 0.394433
          },
          "face_location": {
            "height": 815,
            "left": 0,
            "top": 0,
            "width": 1413
          },
          "gender": {
            "gender": "FEMALE",
            "score": 0.0
          }
        }
      ]
    }
  ]
}
```

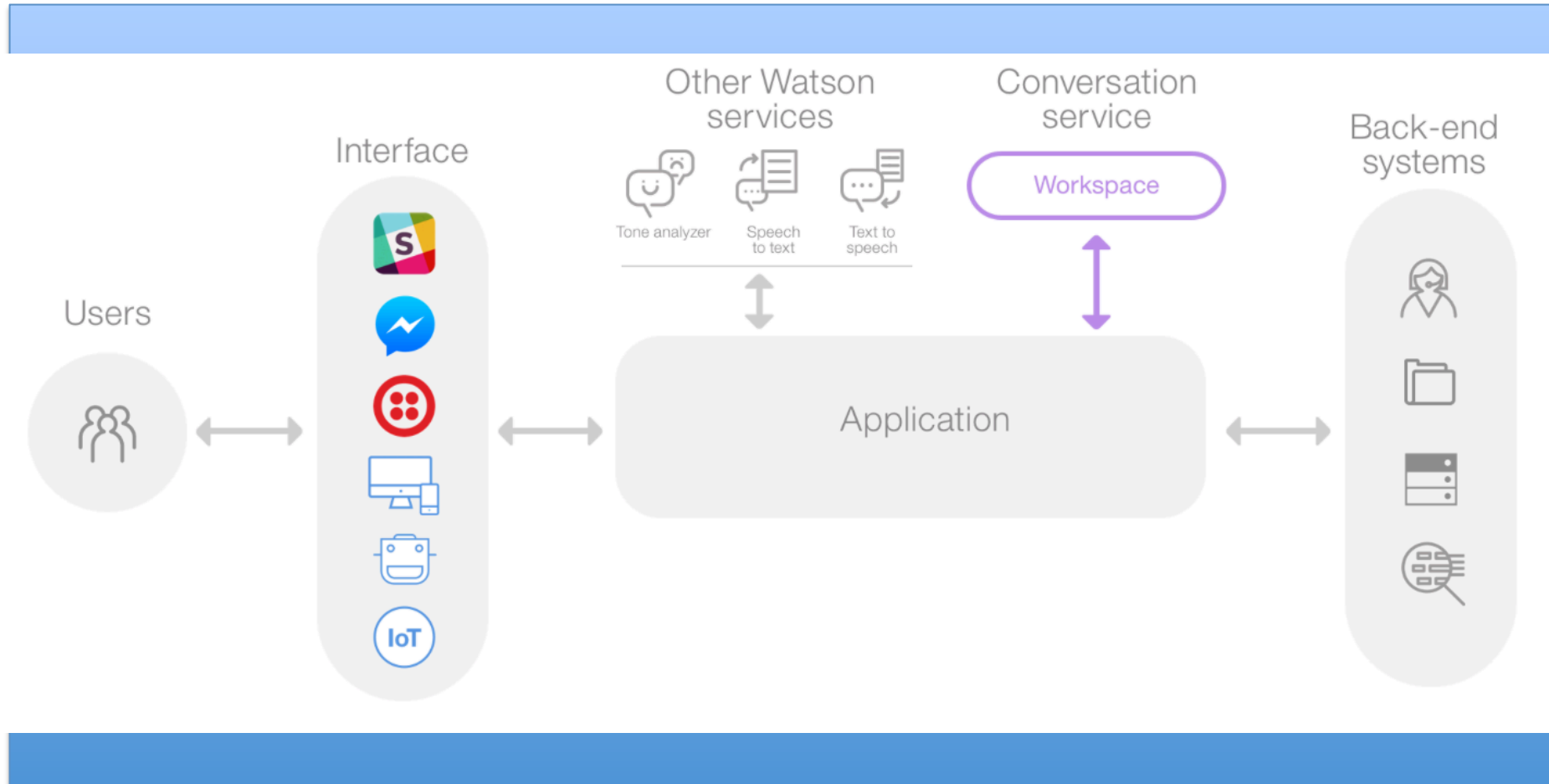
Features

- API Exploration and calling
 - Ability to walk user through parameters
 - Swagger extension to specify relation between parameters
 - Example:
 - translate needs one of {model_id} or {source, target}
 - Swagger extension for call chaining
 - Example:
 - Obtaining source language when missing during translate
 - Swagger extension for data shaping
 - Using Jsonpath to specify how the output of a call should be shaped

Features

- Direct calls
 - All parameters given conversationally in a few lines
 - Use WCS frames to help fill out missing parameters
 - Parameters can be provided in any order
 - Background context kept from one call to the next
 - Ability to set fields independently of calls
- Tuning mode
 - Ability to name actions and add synonyms
 - Swagger updated

Watson Conversation Service (WCS)



WCS Workspace

- Intents and entities
 - Intents capture verbs or actions
 - Entities capture nouns or objects
 - Their presence detected by NLU
- Dialog
 - Finite state machine defining the logic and flow of chat
 - Each state is a conditional
 - When an intent or entity is detected, then state can be updated



Try it out

↶ Clear

What would you like to do? To begin name an action or resource.

v2 translate `text`La vie est belle`` from `source`fr`` to `target`en`` btw `model_id`~`` get it fast!

#_v2_translate

▼

@text:text

@source:source

@target:target

@model_id:model_id

@GET:GET

You chose: v2 translate. Calling now.

Enter something to test your bot

SwaggerBot Prototype

- Compile Swagger to a workspace and app
 - Endpoints become intents
 - Operations and parameters become entities
 - Names used for classifier training data
 - Descriptions and summaries used for help dialog
- Support for tuning and live programming
 - Action creation
 - New intents added to underlying workspace
 - Synonyms added to enrich NLU classifier
 - Workspace uploaded without stopping the chat bot
- Case studies
 - On a variety of APIs
 - Automatically downloaded and compiled ~1070 APIs from APIGuru.

Future Work

- Conversational data shaping
 - Passing Json data between calls
 - Manipulating Json via conversation
- Serverless implementation
 - Based on IBM Functions
 - Functions actions for pre/post processing steps
 - No need for a server for the app



Conclusion

- Swaggerbot is a conversational programming language
 - Easier to use than curl
 - Fuzzy syntax, but requires precision for passing parameters
- What tools/concepts from PLSE can be reused here?

