

Image: Laura & Sascha Wolter

Conversational AI Demystified

Build your bot in just Minutes.

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DB System

Moving the digital future. Together.

Conversational AI

The new User Interface.

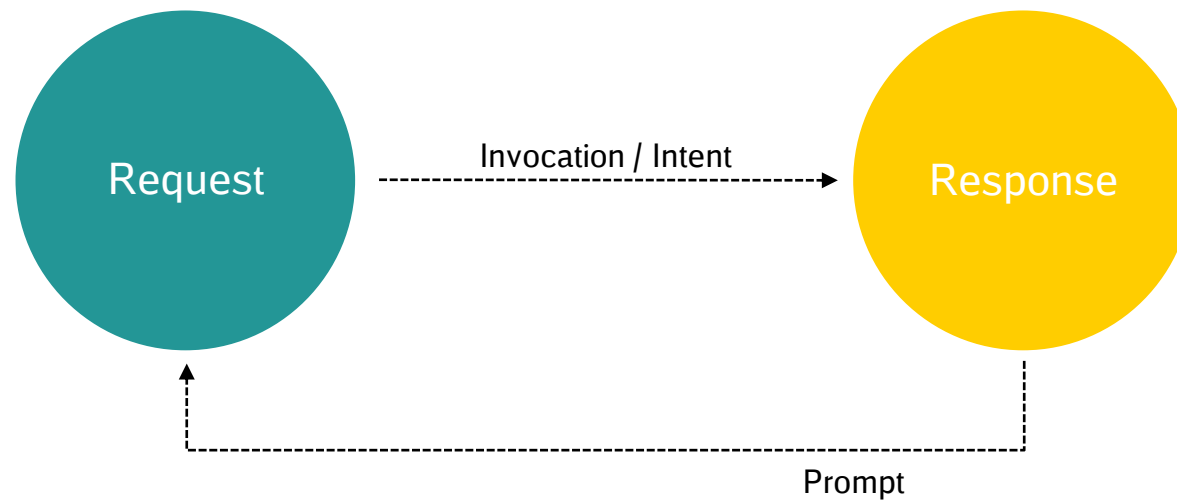


Already today screens without "touch" feel broken.

It will soon be the same with devices that cannot speak.

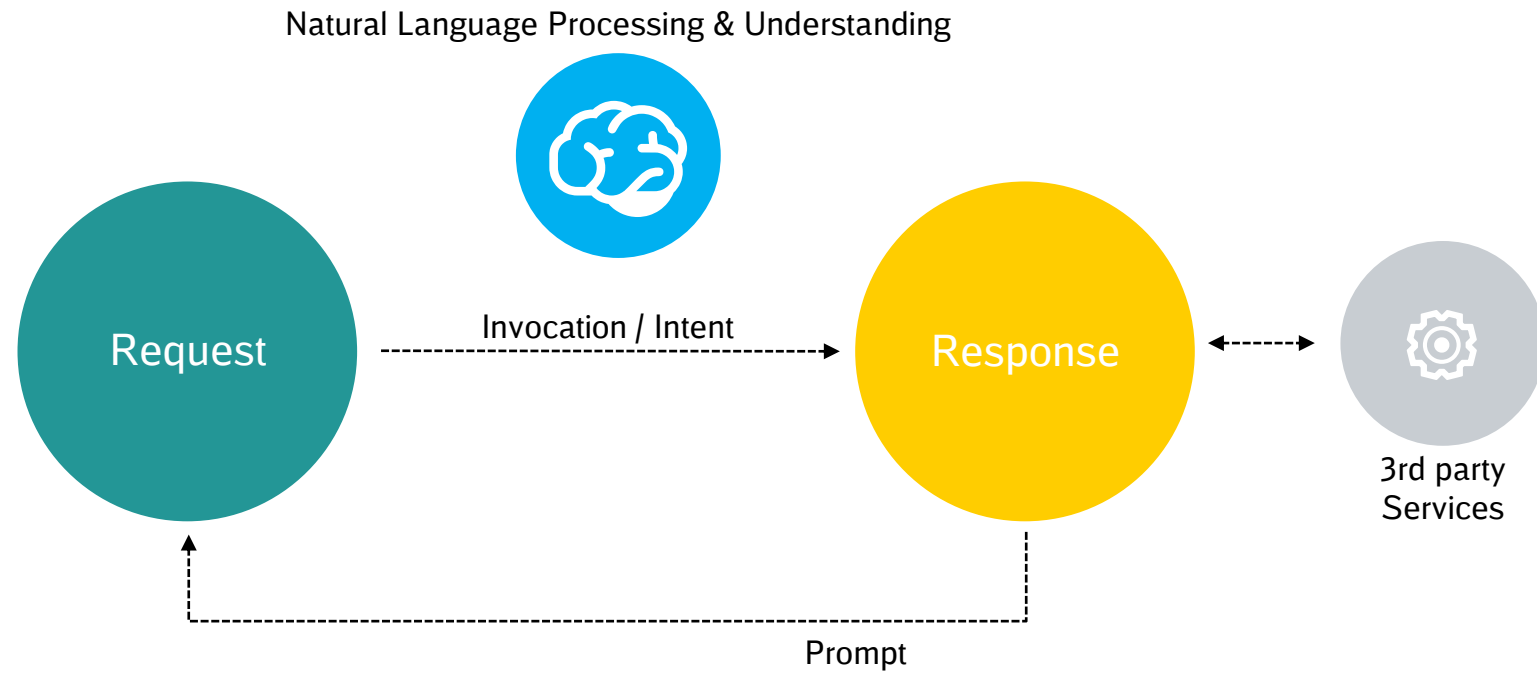
How does Conversational AI work

Turn-taking



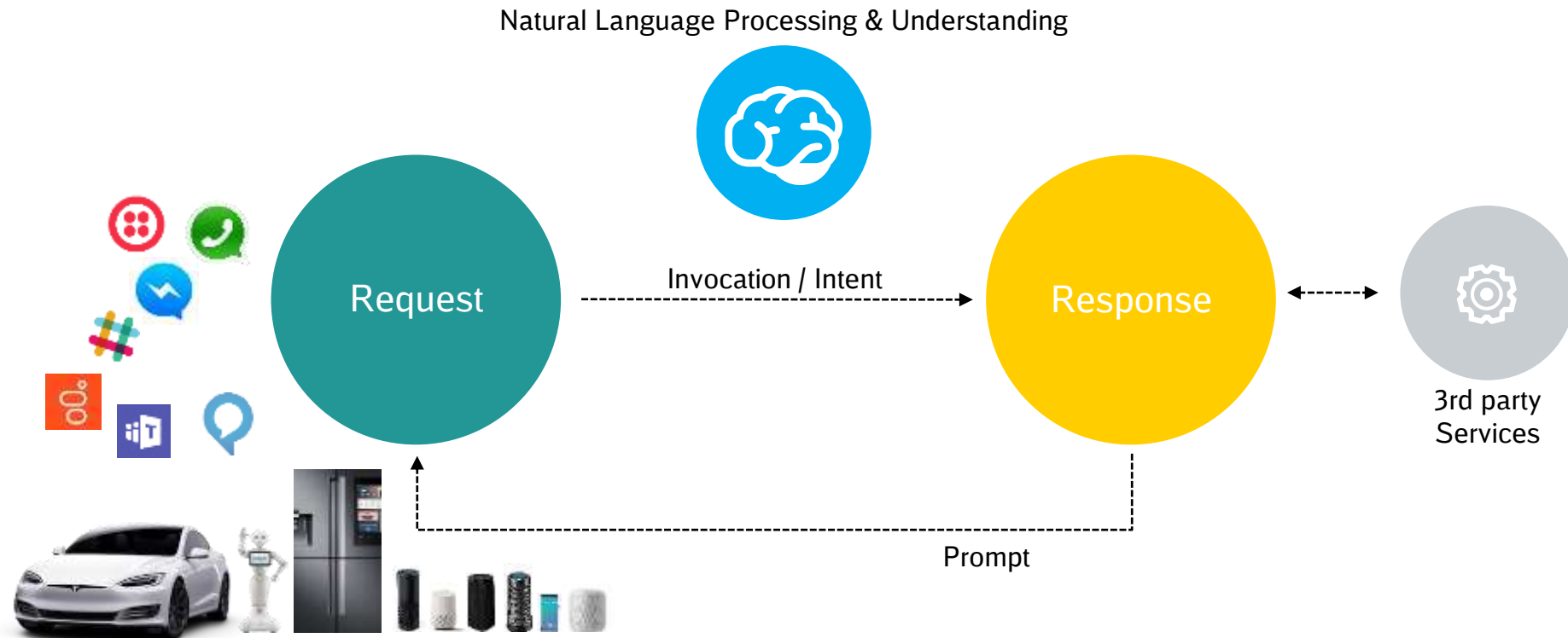
How does Conversational AI work

Turn-taking



Conversational Augmented Intelligence


Text & Voice



Ready to
help across
1 Billion+
devices



Google

 Actions on Google



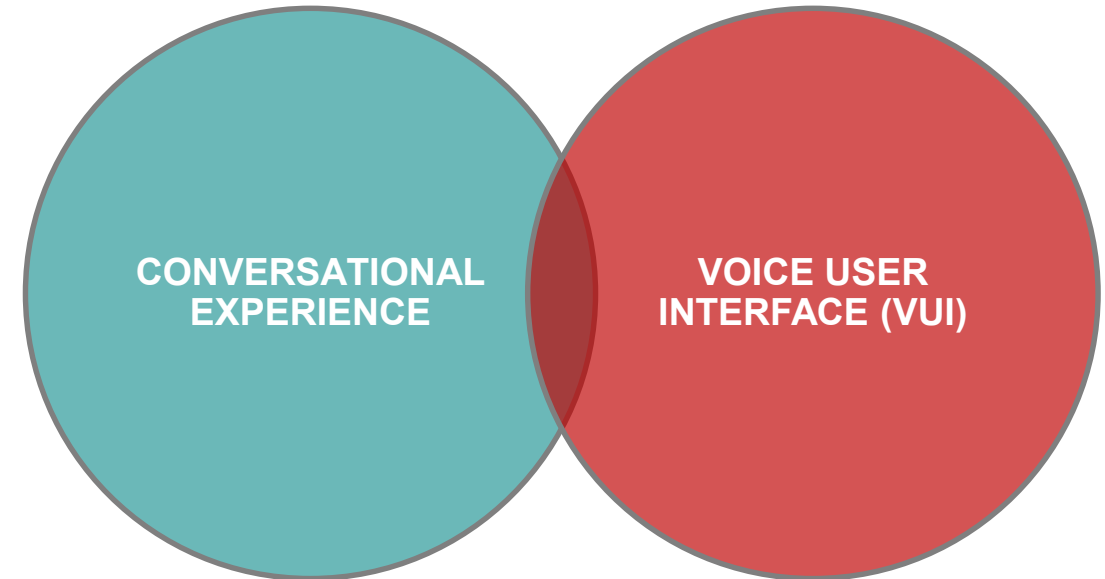
By 2021, more than **50% of enterprises** will spend more per annum **on bots and chatbot** creation than traditional mobile app development.

Is it really one or the other?

Conversational Experience

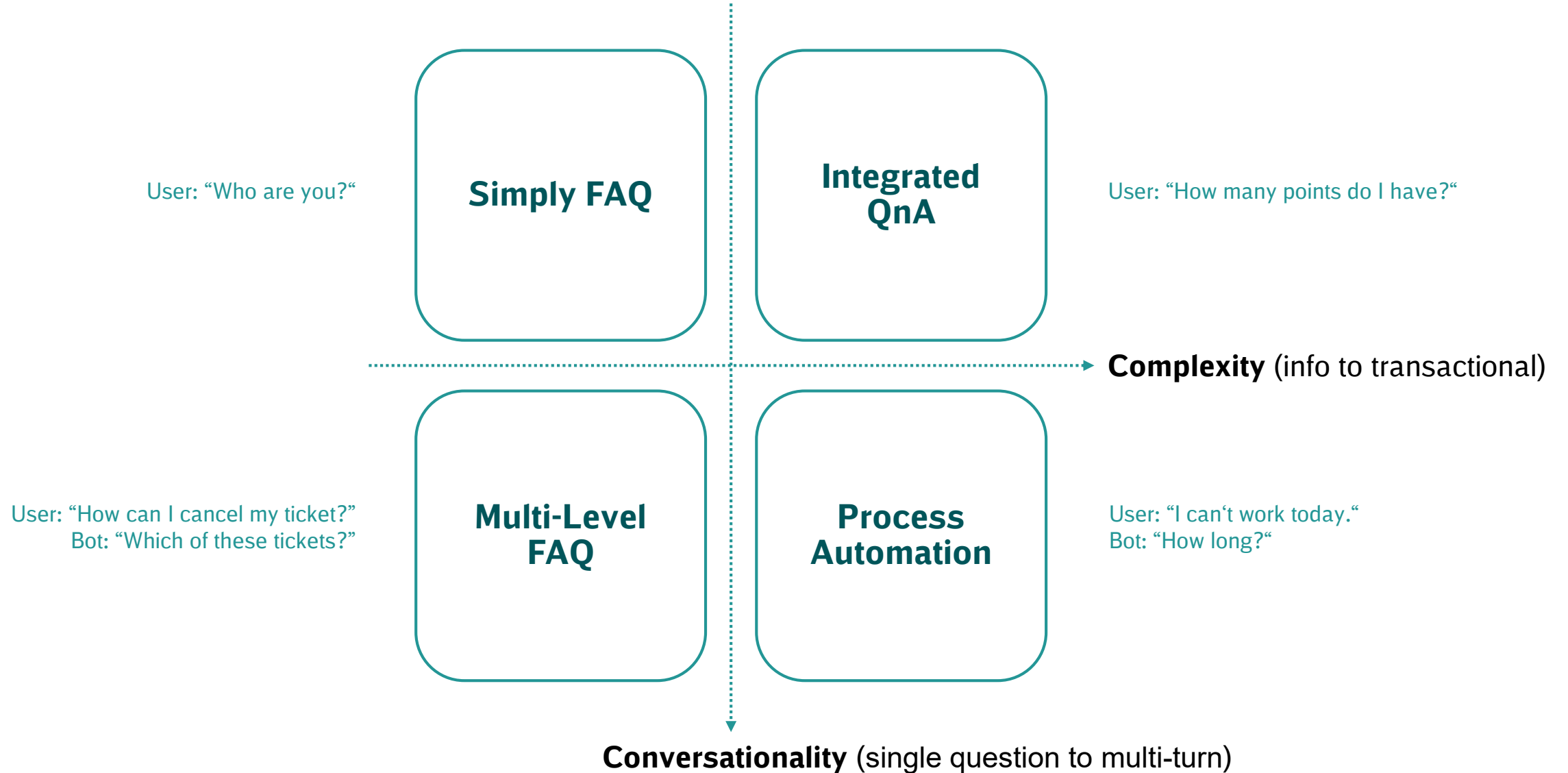
What Researchers say and why Investors bet on bots!

- 50 % doubt the **reliability**
- 1 billion **active users** on WhatsApp
- 800 million active users on Facebook Messenger
- Every fourth German wants to use Chatbots
- 65% of Smartphone Users have used Voice Assistants
- **63% like to use Voice to control their home**
- **63% don't like to talk to/with machines**



Where to use bots?

From Simple to Complex





< Abfahrten ab Hamburg Hauptbahnhof



1

ICE 681

15:01

in Richtung München Hauptbahnhof

2

IC 2216

15:17

in Richtung Stralsund Hauptbahnhof

3

ICE 771

15:24

in Richtung Stuttgart Hauptbahnhof

Amazon Echo Show with Deutsche Bahn Skill

<https://bahn.de/alexa>



Bitte ziehen Sie hier
Ihre Aufbaumatrasse.
Please take your mattress.

SEMMI (Socio-Empathetic Human-Machine Interaction)

<http://bit.ly/db-semmi>



Dialog am Gleis – Wagenmeister (“train mechanic”)

<http://bit.ly/wagenmeister>

Islands of Genius

Adapt to **technical limitations**: In some ways, computers fall short of human capabilities.

Leverage **technical strengths**: In other ways, computers can exceed human capabilities.

Islands of Genius

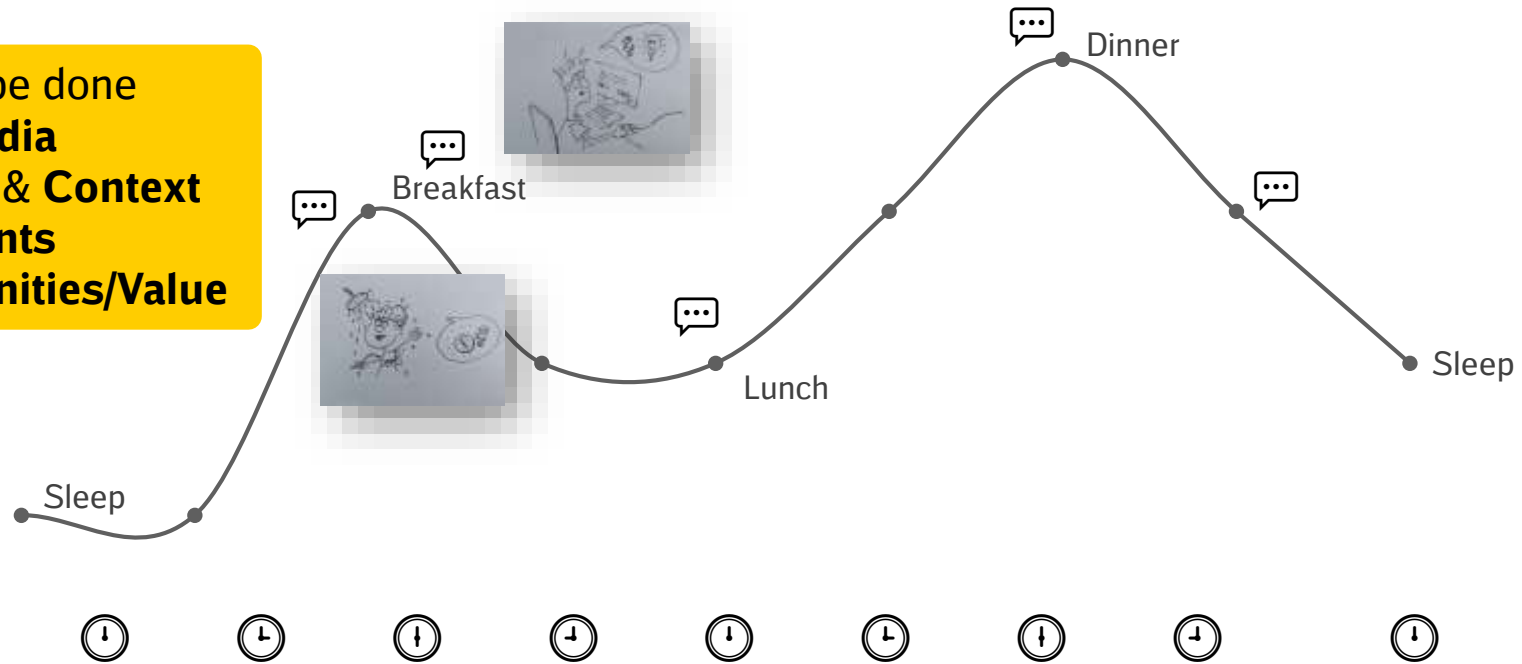
We want to create a world
where Conversational AI
works alongside humans.

Inclusion

Conversational UIs (i.e. Voice User Interfaces) allow us to remain fully human in our interactions and **overcomes permanent, temporary, and situational exclusion.**

A typical Day / User Journey

- **Jobs** to be done
- Used **Media**
- Situation & **Context**
- **Pain Points**
- **Opportunities/Value**





Ideation

Workshops

Conversational AI History

Old idea, new name?

1966: ELIZA Psychotherapist

1988: Jabberwacky

1995: A.L.I.C.E

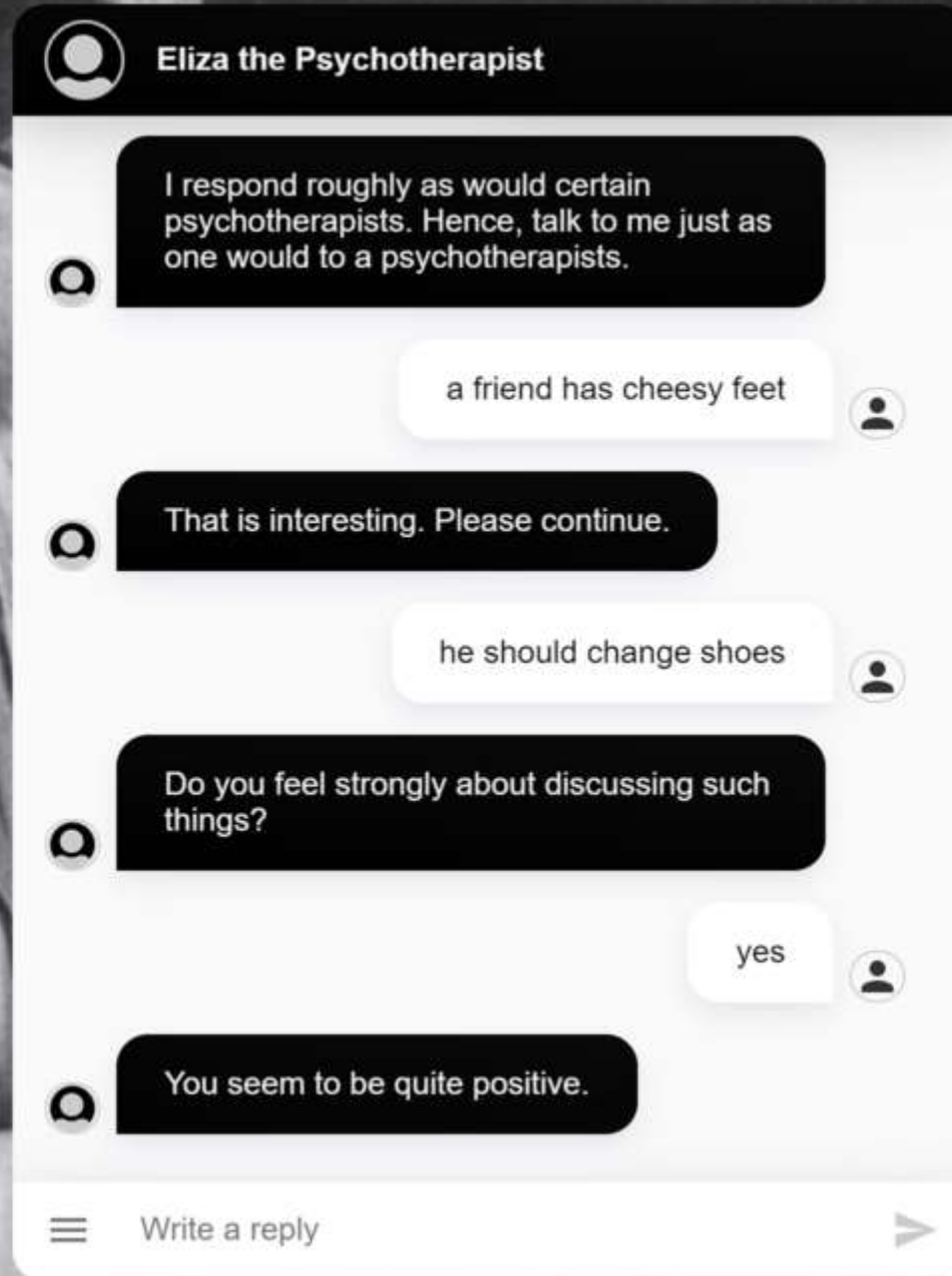
2001: SmarterChild

2013: MITSUKU

2014: Microsoft Xiaoice

2015: Microsoft Rinna

2016: Microsoft Tay



Conversational AI: Natural Language

2006: IBM's Watson

2010: Siri

2012: Google Now/Google Assistant

2014: Amazon Alexa



Human Pretend to be Smart

Chinese room: Does a machine *literally* "understand" Chinese? Or is it merely *simulating* the ability to understand Chinese? Searle calls the first position "strong AI" and the latter "weak AI".

(https://en.wikipedia.org/wiki/Chinese_room)

Turing Test: A player C is given the task of trying to determine which player – A or B – is a computer and which is a human. C is limited to using the responses to written questions to make the determination.

(https://en.wikipedia.org/wiki/Turing_test)

The Amazon Alexa Prize: A social bot that can converse coherently and engagingly with humans on popular topics for 20 minutes (similar to **Loebner Prize** with 25 minutes).

(<https://developer.amazon.com/alexaprize>)



Eugene Goostman

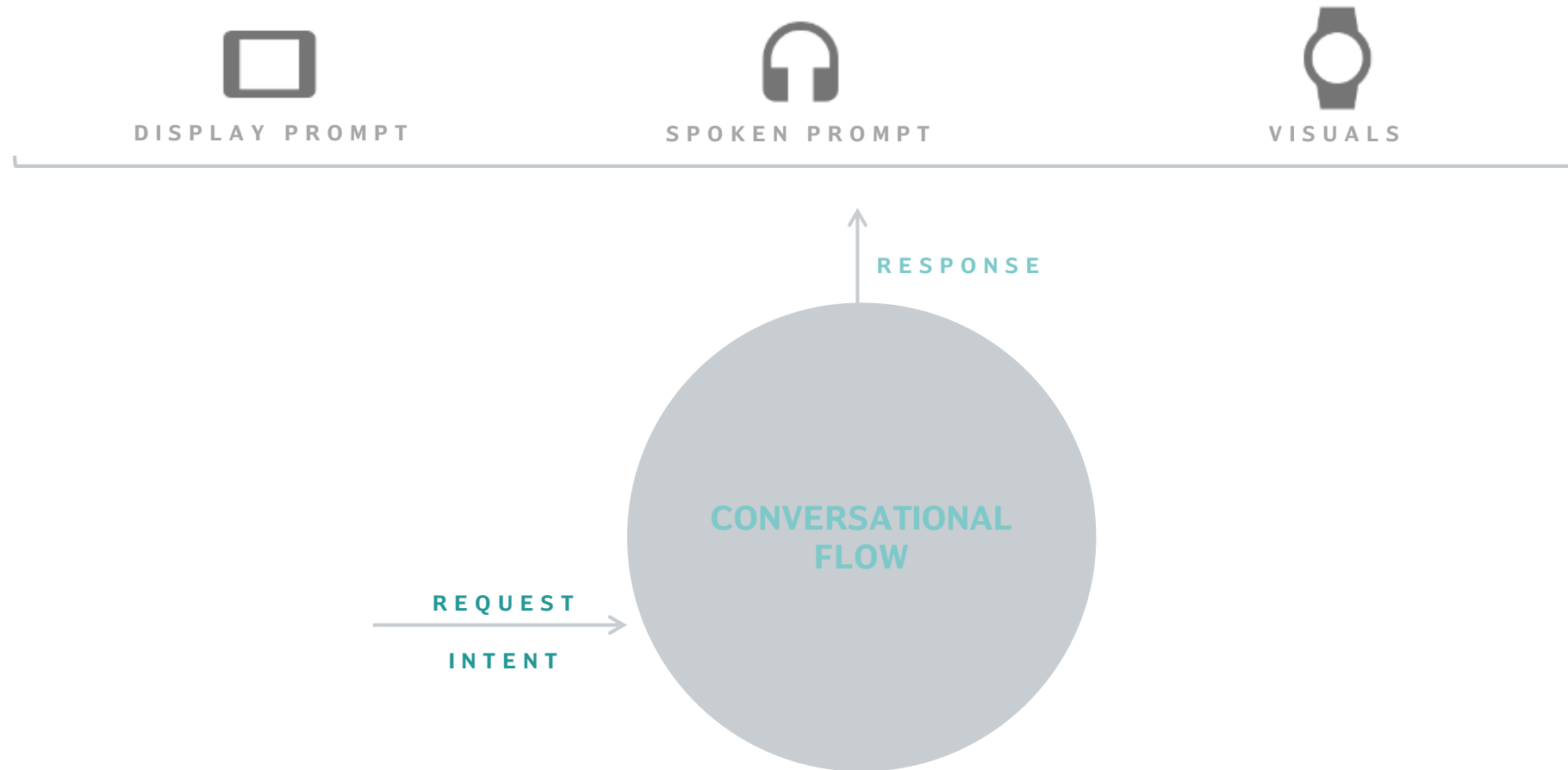
THE WEIRDEST CREATURE IN THE WORLD



Set Expectation

and Expect the Unexpected.

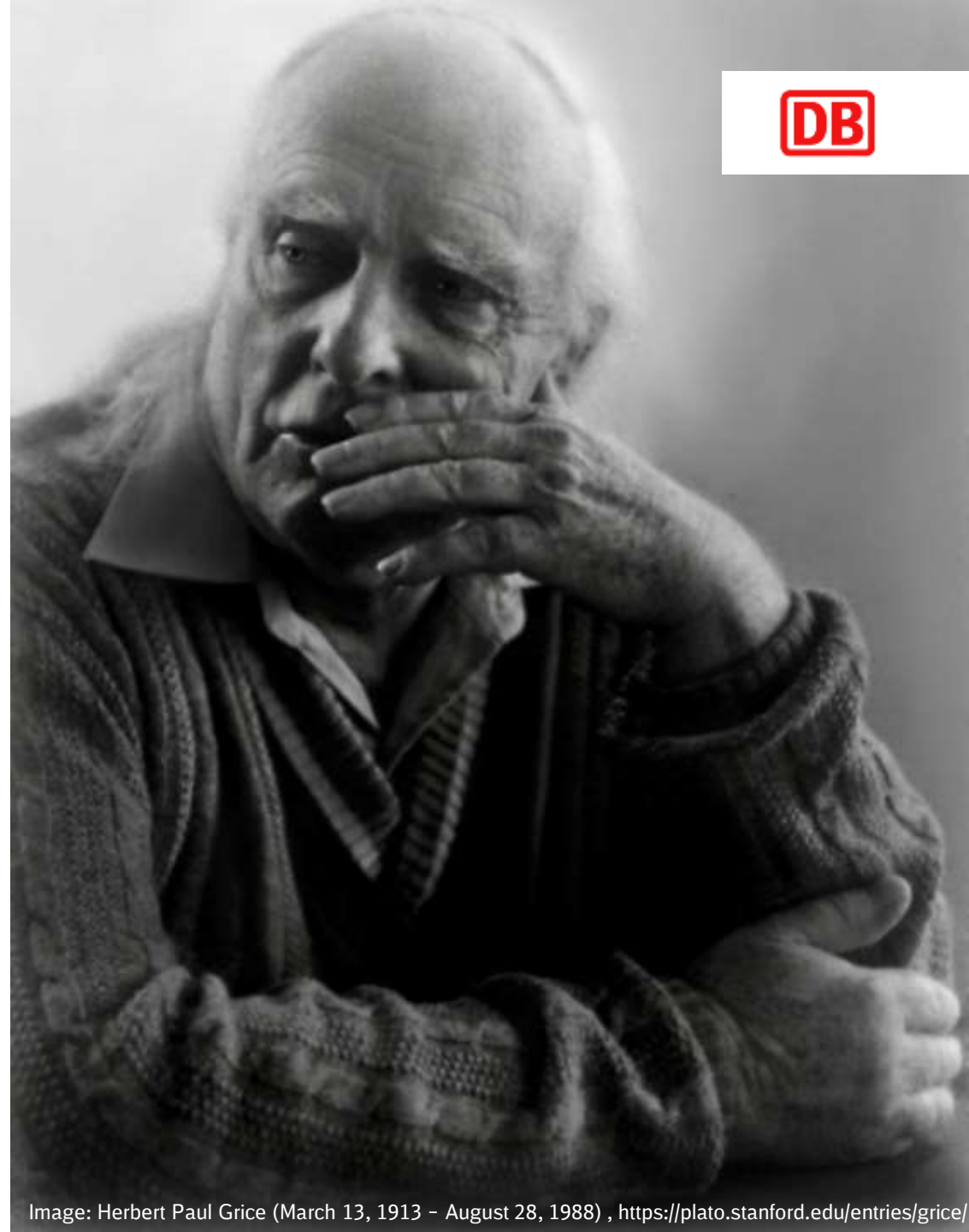
Dialog Design



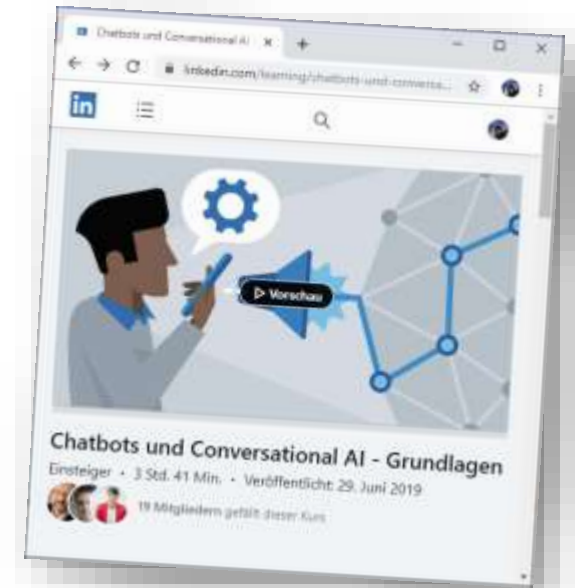
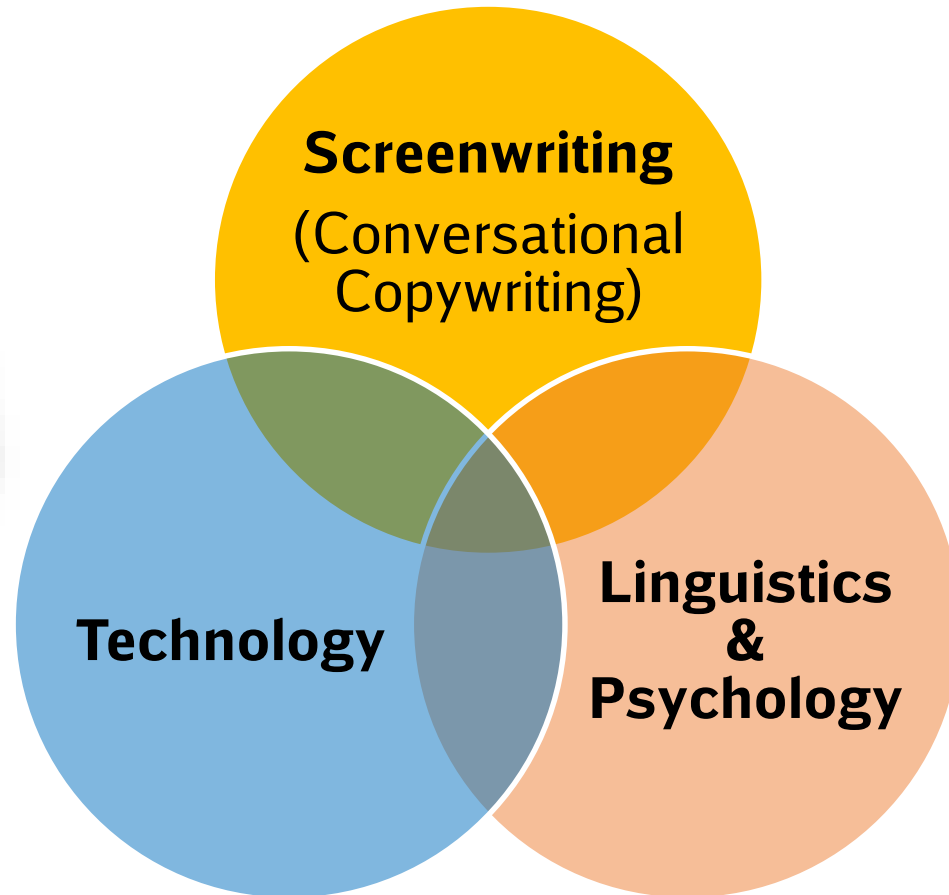
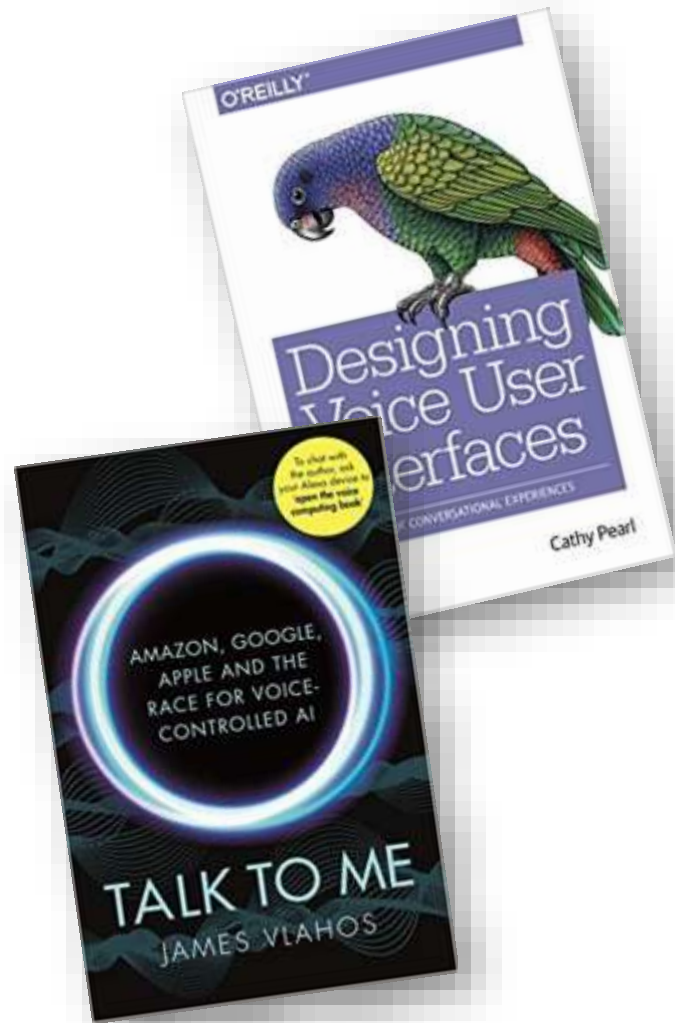
The Cooperative Principle
Grices's Maxims (1975)

**JUST SAY WHAT IS
INFORMATIVE,
TRUE
AND
IMPORTANT,
AND SAY THIS
CLEARLY!**

Source: Lexikon der Sprachwissenschaft. 2002. ISBN 3520452030



How to become a Conversation Designer



Choose voice? Only when it is...

Easier

More Natural

Faster





Day One

Still in the early days.

Uncanny Things

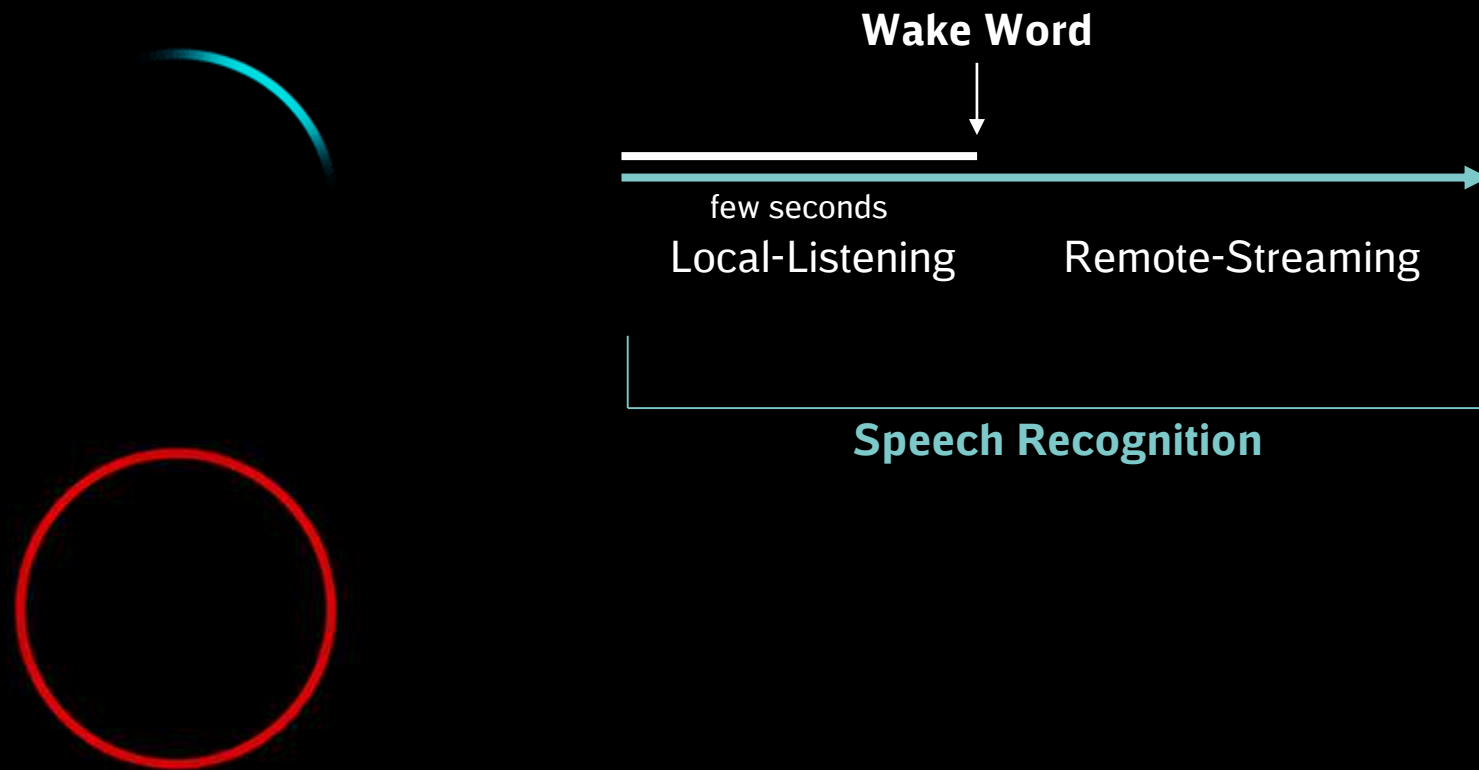
Word Detection and Privacy



German Federal Network Agency says, any toy capable of transmitting signals and recording images or sound without detection is **banned**. (<https://t.co/R7UCml9aj9>)

Local **Wake Word** Detection

Cloud-based **Speech Recognition**



Local **Wake Word Detection**

Cloud-based **Speech Recognition**

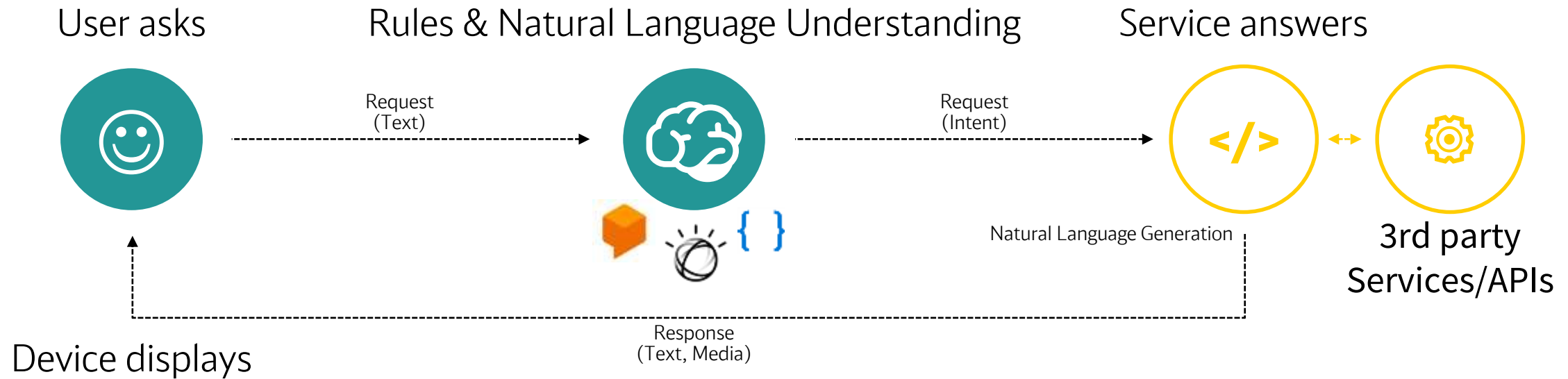


- Eavesdropping by a Fraction of a Second
 - Eavesdropping to Improve Quality
 - Eavesdropping by Accident (false positive activation)
 - Eavesdropping of Background Noise
 - Eavesdropping by Government or Hackers
-
- Deactivation of the Microphone

**Any sufficiently advanced technology
Is indistinguishable from magic.**

Arthur C. Clarke

Chatbot Components



Intents: Why Rules and when Machine Learning?

Alexa, ask Coffee Master where to get Coffee in Berlin

wake word	launch	invocation name	utterance	keyphrase	keyphrase
-----------	--------	-----------------	-----------	-----------	-----------

Ok Google, ask Coffee Master bla Coffee bla Berlin

wake word	launch	invocation name	utterance	keyphrase	keyphrase
-----------	--------	-----------------	-----------	-----------	-----------

SearchIntent

intent	keyphrase	keyphrase
	type	city

← a few samples!

SearchRuleIntent

rule intent	keyphrase	keyphrase
	type	city

← many rules?

Transcription

How to wreck a nice beach?

Transcription

How to recognize speech?

Speech Recognition

Beware of Homonyms

Die Spinnen.
Die spinnen.

Der gefangene Floh.
Der Gefangene floh.

Wäre er nur Dichter.
Wäre er nur dichter.

Vor dem Fenster sah sie den geliebten Rasen.
Vor dem Fenster sah sie den Geliebten rasen.

Komm, wir essen Opa.
Komm, wir essen, Opa.

wuschig

wuschig (Deutsch) [Bearbeiten]

Adjektiv [Bearbeiten]

Worttrennung:

wu·schig, Komparativ:
wu·schig·er, Superlativ:
am wu·schigs·ten

Positiv	Komparativ	Superlativ
wuschig	wuschiger	am wuschigsten
<i>Alle weiteren Formen: Flexion:wuschig</i>		

Aussprache:

IPA: [ˈvʊʃɪç]
Hörbeispiele: —
Reime: -ʊʃɪç

Bedeutungen:

[1] verwirrt, aufgeregt, fahrig
[2] sexuell erregt



Hands-on

Smalltak & FAQs

WhoIntent

Name: WhoIntent

Example Sentences:

- name
- wer bist du

Confirmation Sentence: The question for the user whether this intent is the intended one. Triggers when the intent score is above the reconfirmation and below the confidence threshold

Default Replies: [ADD DEFAULT REPLY](#)

Tags:

Chat history:

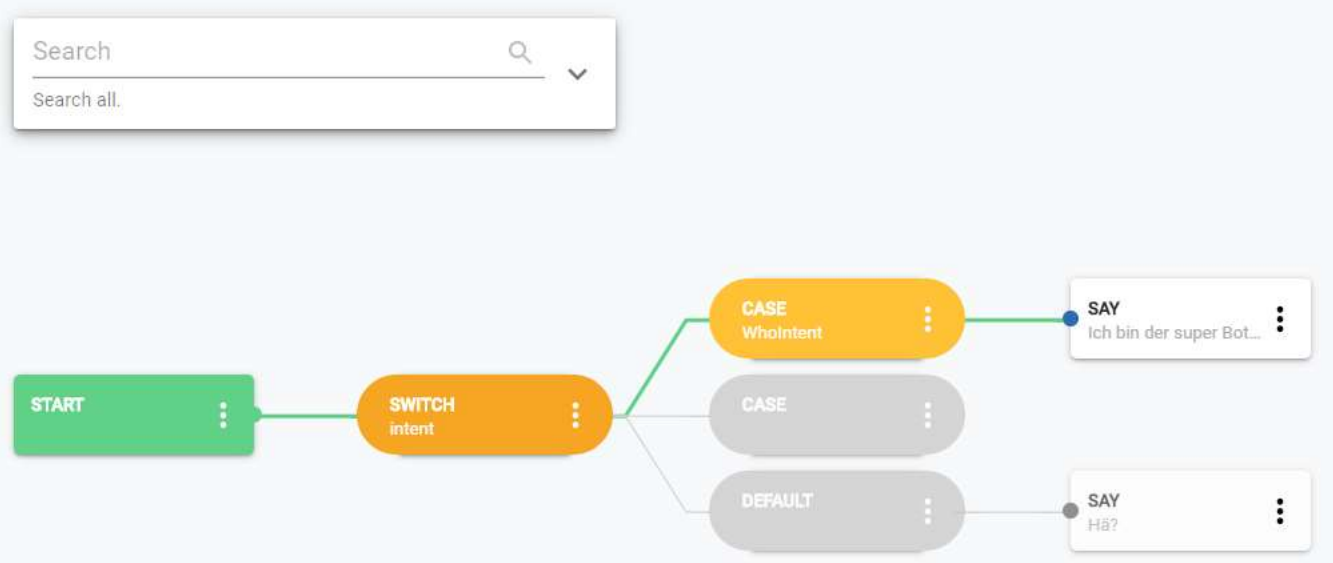
- User: Wer bist du?
- Bot: Ich bin der super Bot. Und nun?

Text Message input field

JSON data payload: {}

Buttons: Chat, Playbook

Flow Editor — foo 2 - draft — Flow Chart



100%

foo latest

CHAT INFO SETTINGS

Wer bist du?

Ich bin der super Bot. Und nun?

Text Message

{}

JSON data payload

#WhoIntent

Last updated: 26 minutes ago

Download icon, Delete icon, Search icon, Try it button

Intent name
Name your intent to match a customer's question or goal

#WhoIntent

Description (optional)

Add a description to this intent

User example

Add unique examples of what the user might say. (Pro tip: Add at least 5 unique examples to help Watson understand)

Type a user example here, e.g. I want to pay my credit card bill

Add example

<input type="checkbox"/> User examples (2) ↑	Added ↑↓	Conflicts (0) ↑↓
<input type="checkbox"/> name	26 minutes ago	
<input type="checkbox"/> wer bist du	26 minutes ago	

Showing 1-2 of 2 examples

foo Version: Development Save new version

- Intents
- Entities
- Dialog**
- Options
- Analytics
- Versions
- Content Catalog

Add node

Enter node name Customize ⚙️ ×

Node name will be shown to customers for disambiguation so use something descriptive. [Settings](#)

If assistant recognizes

#WhoIntent - +

Assistant responds

Text ⌵ ⌴ × ⌵

Ich bin der super Bot. Und nun?

Enter response variation

Response variations are set to **sequential**. Set to [random](#) | [multiline](#)

[Learn more](#)

[Add response type +](#)

Try it out Clear Manage Context 1 ×

Hallo. Wie kann ich Ihnen helfen? 📍

Wer bist du?

#WhoIntent ⌵ 👁️

Ich bin der super Bot. Und nun? 📍

Use the up key for most recent

Enter something to test your assistant

Dialogflow

foo

de

- Intents
- Entities
- Knowledge ^[beta]
- Fulfillment
- Integrations
- Training
- Validation
- History
- Analytics
- Prebuilt Agents
- Docs

Standard Free [Upgrade](#)

WhoIntent

[SAVE](#)

Training phrases

Search training phrases

- Add user expression
- name
- wer bist du

Action and parameters

▼

Responses

↑

DEFAULT +

	Text Response	
1	Ich bin der super Bot. Und nun?	
2	Enter a text response variant	

[ADD RESPONSES](#)

Try it now

See how it works in [Google Assistant](#).

Agent

USER SAYS [COPY CURL](#)

Wer bist Du?

DEFAULT RESPONSE

Ich bin der super Bot. Und nun?

INTENT

WhoIntent

ACTION

Not available

[DIAGNOSTIC INFO](#)

alexa developer console

< Your Skills foo Build Code Test Distribution Certification Analytics

German

CUSTOM

- Interaction Model
- Utterance Conflicts (0)
- Invocation
- Intents (6) + Add
 - HelloWorldIntent
 - WhoIntent**
 - Built-In Intents (4)
 - AMAZON.CancelIntent
 - AMAZON.HelpIntent
 - AMAZON.StopIntent
 - AMAZON.NavigateHomeIntent
- Slot Types (0) + Add
- JSON Editor
- Interfaces

Save Model View Model Versions Build Model Update live skill Evaluate Model

Updates to sample utterances qualify for instant live updates. [Learn more](#) about live updates to your skill.

Intents / WhoIntent

Sample Utterances (2) ?

Bulk Edit Export

What might a user say to invoke this intent?	
wer bist du	
name	

< 1 - 2 of 2 >

Dialog Delegation Strategy ?

Dialog management is not enabled f...v

> Why is this disabled?

Intent Slots (0) ?

Save Deploy Promote to live

Last Deployed: Apr 14, 2020, 10:16 AM

- Skill Code
- lambda
 - index.js
 - package.json
 - util.js

```
index.js x
20     .speak(speakOutput)
27     // .reprompt('add a reprompt if you want to keep the session open for the user to respond')
28     .getResponse();
29 }
30 };
31 const WhoIntentHandler = {
32   canHandle(handlerInput) {
33     return Alexa.getRequestType(handlerInput.requestEnvelope) === 'IntentRequest'
34       && Alexa.getIntentName(handlerInput.requestEnvelope) === 'WhoIntent';
35   },
36   handle(handlerInput) {
37     const speakOutput = 'Ich bin der super Bot. Und nun?';
38
39     return handlerInput.responseBuilder
40       .speak(speakOutput)
41       .reprompt(speakOutput)
42       .getResponse();
43   }
44 };
45 const HelpIntentHandler = {
46   canHandle(handlerInput) {
47     return Alexa.getRequestType(handlerInput.requestEnvelope) === 'IntentRequest'
48       && Alexa.getIntentName(handlerInput.requestEnvelope) === 'AMAZON.HelpIntent';
49   },
50   handle(handlerInput) {
51     const speakOutput = 'You can say hello to me! How can I help?';
52
53     return handlerInput.responseBuilder
54       .speak(speakOutput)
55       .reprompt(speakOutput)
56       .getResponse();
57   }
58 };
59 const CancelAndStopIntentHandler = {
60   canHandle(handlerInput) {
61     return Alexa.getRequestType(handlerInput.requestEnvelope) === 'IntentRequest'
62       && (Alexa.getIntentName(handlerInput.requestEnvelope) === 'AMAZON.CancelIntent'
63         || Alexa.getIntentName(handlerInput.requestEnvelope) === 'AMAZON.StopIntent');
64   },
65   handle(handlerInput) {
66     const speakOutput = 'Goodbye!';
67     return handlerInput.responseBuilder
68       .speak(speakOutput)
69       .getResponse();
70   }
71 };
72 const EmptyIntentHandler = {
73   canHandle(handlerInput) {
74     return Alexa.getRequestType(handlerInput.requestEnvelope) === 'IntentRequest'
75       && Alexa.getIntentName(handlerInput.requestEnvelope) === 'AMAZON.NoMatch';
76   },
77   handle(handlerInput) {
78     const speakOutput = 'Sorry, I did not understand that.';
79     return handlerInput.responseBuilder
80       .speak(speakOutput)
81       .reprompt(speakOutput)
82       .getResponse();
83   }
84 };
85 const ErrorHandler = {
86   canHandle(handlerInput) {
87     return Alexa.getRequestType(handlerInput.requestEnvelope) === 'Error';
88   },
89   handle(handlerInput) {
90     const speakOutput = 'Sorry, I had trouble understanding that. Please try again.';
91     return handlerInput.responseBuilder
92       .speak(speakOutput)
93       .reprompt(speakOutput)
94       .getResponse();
95   }
96 };
97 const handlers = [WhoIntentHandler, HelpIntentHandler, CancelAndStopIntentHandler, EmptyIntentHandler, ErrorHandler];
98 const alexa = Alexa.handler(handlerInput, { handlers });
99 return alexa.getResponse();
100 }
```

Logs: Amazon CloudWatch
Media storage: S3 [0.0/5GB]
Docs: Alexa Hosted Skills

Skill testing is enabled in: Development Skill I/O Device Display Device Log

Alexa Simulator Manual JSON Voice & Tone German (DE) Type or click and hold the mic

Interactive chat simulation showing user input 'frage foo wer bist du' and system response 'Ich bin der super Bot. Und nun?'.

Ich bin der super Bot. Und nun?

Skill Invocations | Viewing: 1 / 2

```
JSON Input 1
1 {
2   "version": "1.0",
3   "session": {
4     "new": false,
5     "sessionId": "amzn1.echo-api.session.412455c9-4884-4d6f-860",
6     "application": {
7       "applicationId": "amzn1.ask.skill.dcbaddc8-73c9-48b7-9016-bd62c4479d8b"
8     },
9     "user": {
10      "userId": "amzn1.ask.account.AFWI5233JE4UVA7AY7NUA7I1JX1"
11    }
12  },
13  "context": {
14    "System": {
15      "application": {
16        "applicationId": "amzn1.ask.skill.dcbaddc8-73c9-48b7-9016-bd62c4479d8b"
17      },
18      "user": {
19        "userId": "amzn1.ask.account.AFWI5233JE4UVA7AY7NUA7I1JX1"
20      },
21      "device": {
22        "deviceId": "amzn1.ask.device.AGCWOC3NWYZY2ZARI7CJBI"
23        "supportedInterfaces": {}
24      }
25    },
26    "apiEndpoint": "https://api.eu.amazonalexa.com",
27    "apiAccessToken": "eyJ0eXAiOiJKV1QiLCJhbGciOiJSUzI1NiIsImR0eSI6IkpzZW50L3VzIiwiaWF0Ijoi"
28  }
29 }
```

```
JSON Output 1
1 {
2   "body": {
3     "version": "1.0",
4     "response": {
5       "type": "_DEFAULT_RESPONSE"
6     },
7     "sessionAttributes": {},
8     "userAgent": "ask-node/2.7.0 Node/v10.19.0"
9   }
10 }
```

Conversational AI Platform

```
const Alexa = require('ask-sdk-core');

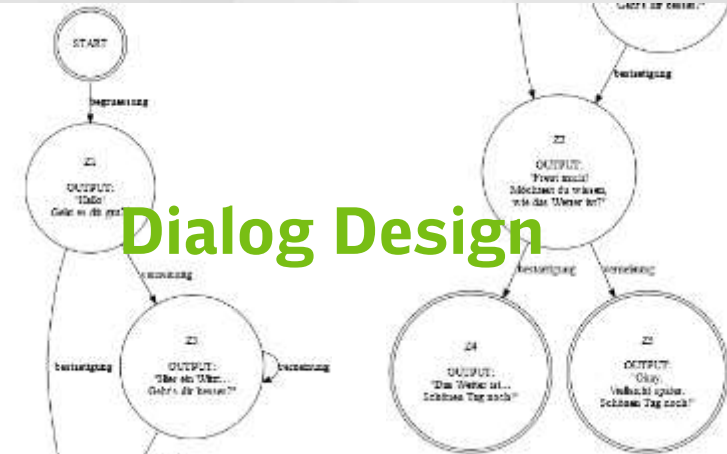
const LaunchRequestHandler = {
  canHandle(handlerInput) {
    return handlerInput.requestEnvelope.request.type === 'LaunchRequest';
  },
  handle(handlerInput) {
    const speechText = 'welcome, you can say Hello or Help. Which would you like to try?';
    return handlerInput.responseBuilder
      .speak(speechText)
      .reprompt(speechText)
      .getResponse();
  }
};

const HelloWorldIntentHandler = {
  canHandle(handlerInput) {
    return handlerInput.requestEnvelope.request.type === 'IntentRequest'
      && handlerInput.requestEnvelope.request.intent.name === 'HelloWorldIntent';
  },
  handle(handlerInput) {
    const speechText = 'Hello World!';
    return handlerInput.responseBuilder
      .speak(speechText)
      // .reprompt('add a reprompt if you want to keep the session open for the user to respond')
      .getResponse();
  }
};
```

Code

Point Solution

Solution of a certain problem without consideration of related topics.

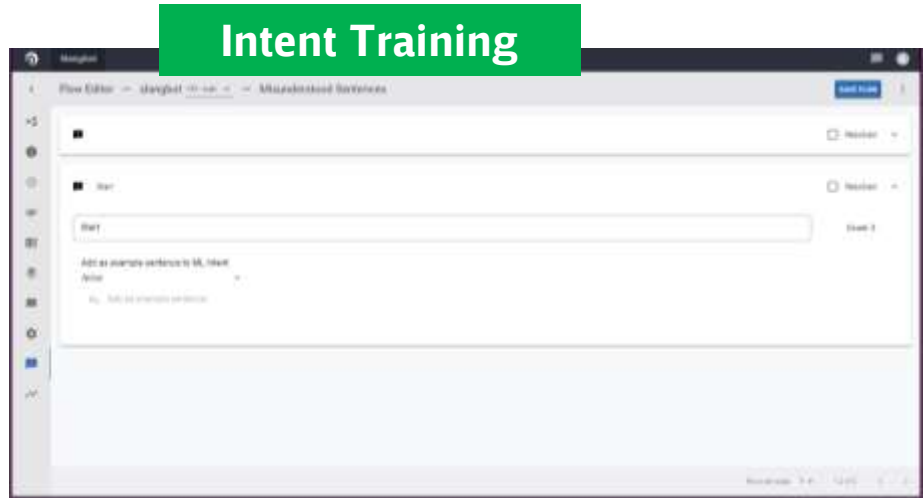


Dialog Design

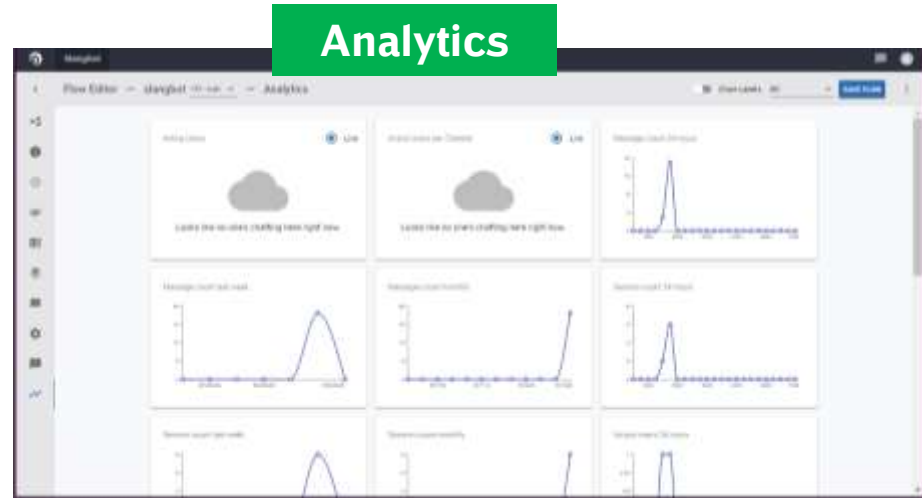
Platform

Collection of tools and technologies that serve as basis for general development.

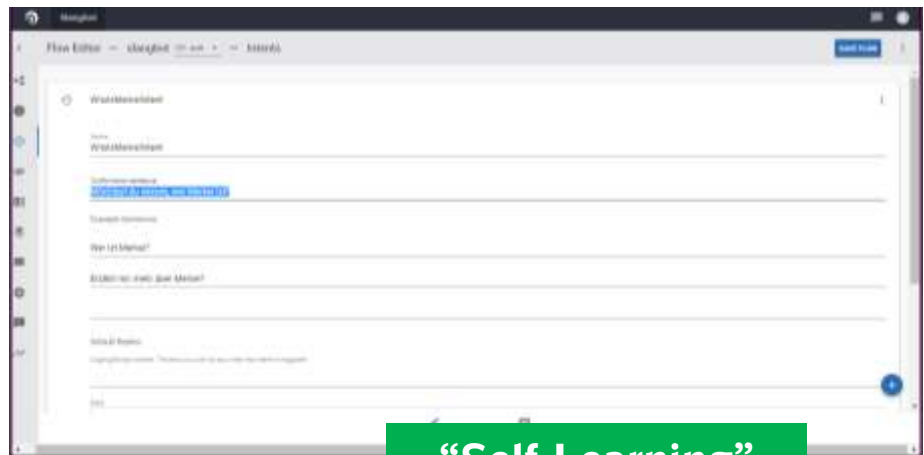
Lifecycle Learn & Maintain



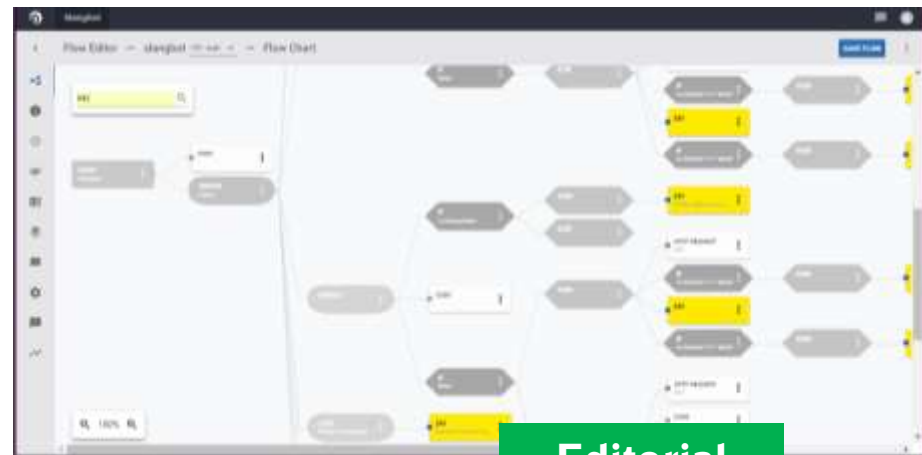
Intent Training



Analytics

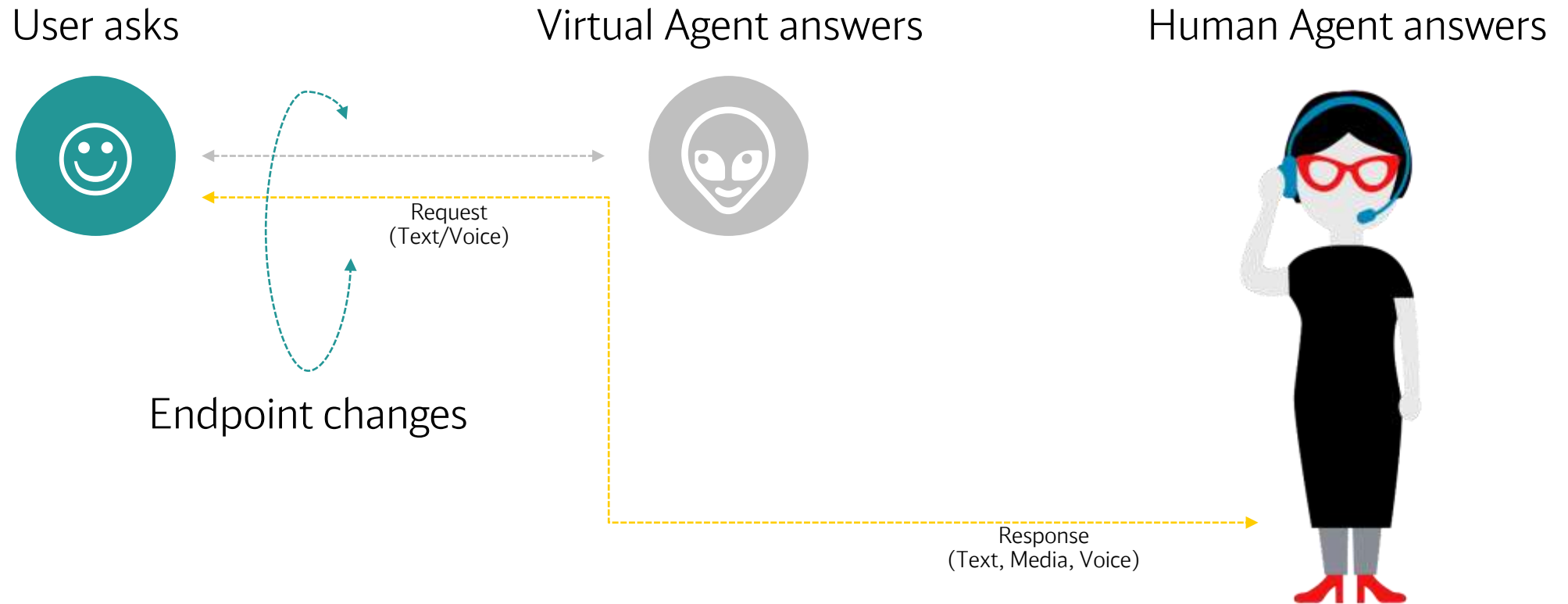


“Self-Learning”



Editorial

Handover to an Human Agent



Conversational AI Platform

```

const Alexa = require('ask-sdk-core');

const LaunchRequestHandler = {
  canHandle(handlerInput) {
    return handlerInput.requestEnvelope.request.type === 'LaunchRequest';
  },
  handle(handlerInput) {
    const speechText = 'Welcome, you can say Hello or Help. Which would you like to try?';
    return handlerInput.responseBuilder
      .speak(speechText)
      .reprompt(speechText)
      .getResponse();
  }
};

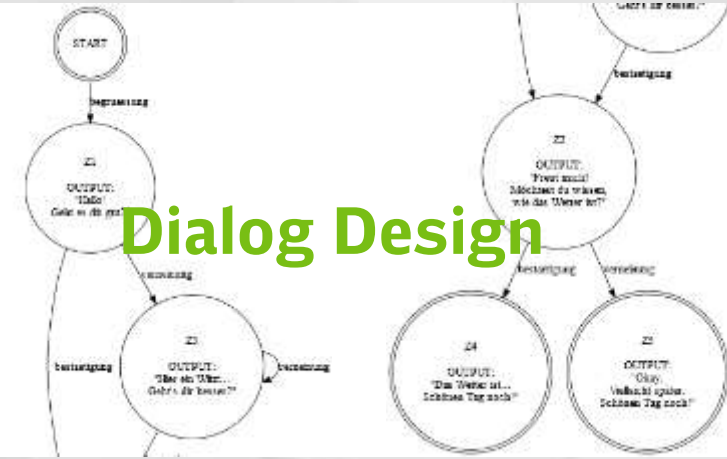
const HelloWorldIntentHandler = {
  canHandle(handlerInput) {
    return handlerInput.requestEnvelope.request.type === 'IntentRequest'
      && handlerInput.requestEnvelope.request.intent.name === 'HelloWorldIntent';
  },
  handle(handlerInput) {
    const speechText = 'Hello World!';
    return handlerInput.responseBuilder
      .speak(speechText)
      // .reprompt('add a reprompt if you want to keep the session open for the user to respond')
      .getResponse();
  }
};

```

Code

Point Solution

Solution of a certain problem without consideration of related topics.



Dialog Design

Platform

Collection of tools and technologies that serve as basis for general development.

Effort / Costs

Single Intents are roughly

Category	Count
Questions and Answers	
Smalltalk Facts	
Models × Aspects	
Processes × Steps	
Total	

Effort per Intent is roughly

Category	Average
Intent	___ h
Channels	+ ___ %
Multimodal Aspects	+ ___ %
Total	

$$\Sigma = (\text{Conception} + \text{Integration} + \text{Design}) + (\text{Intents} \times \text{Effort})$$

$$+ \frac{\text{Operations} + \text{Intents} \times \text{Editorial}}{\text{Week}}$$

Savings

Usecase	Automation Potential	Frequency	Duration	Potential
Password reset	95%	5000	5 Minutes	23.750 Minutes
General call	20%	100	30 Minutes	600 Minutes

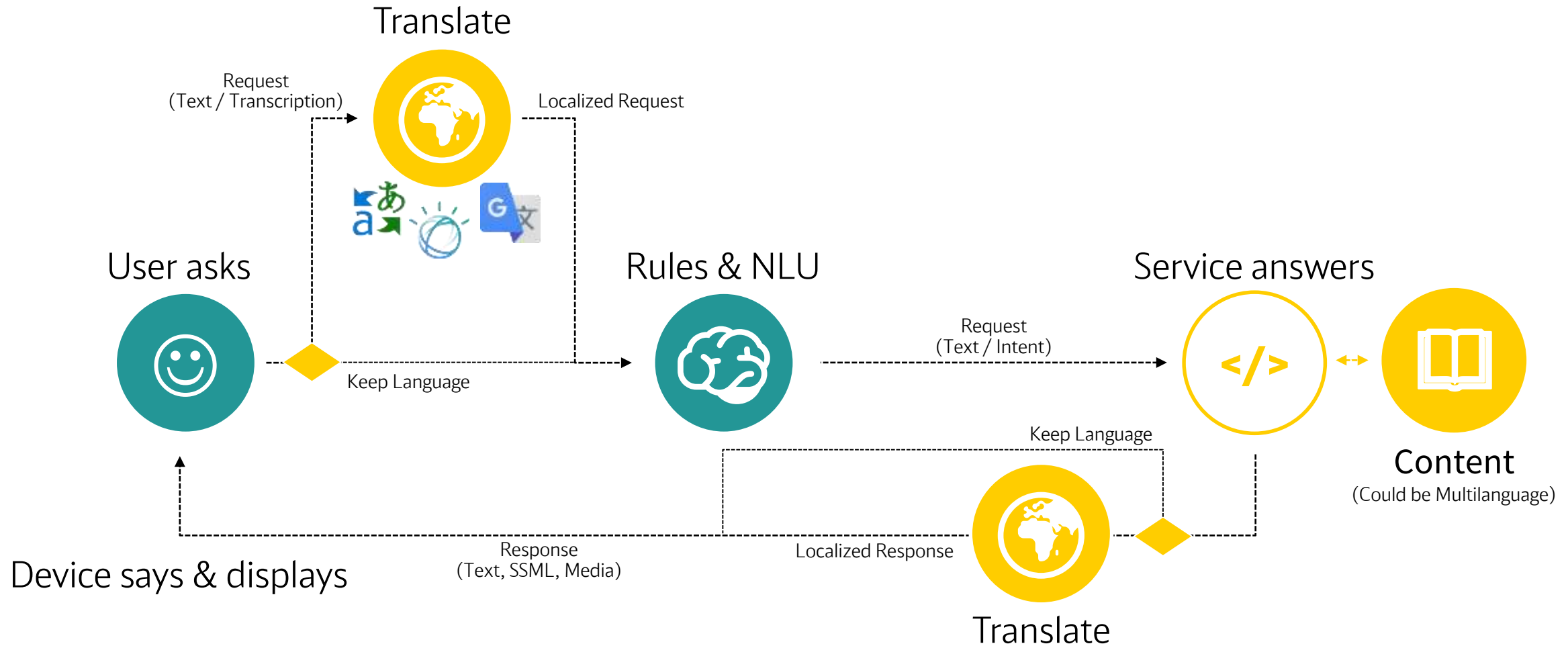
$$\begin{array}{c} \downarrow \\ \text{Automation Potential} \end{array} \times \begin{array}{c} \downarrow \\ \text{Frequency} \end{array} \times \begin{array}{c} \downarrow \\ \text{Duration} \end{array} = \begin{array}{c} \uparrow \\ \text{Potential} \end{array}$$



Speech Technology **KI Translation Tool (KITT)**

Babelfish for vehicle drivers across borders.

Machine Translation

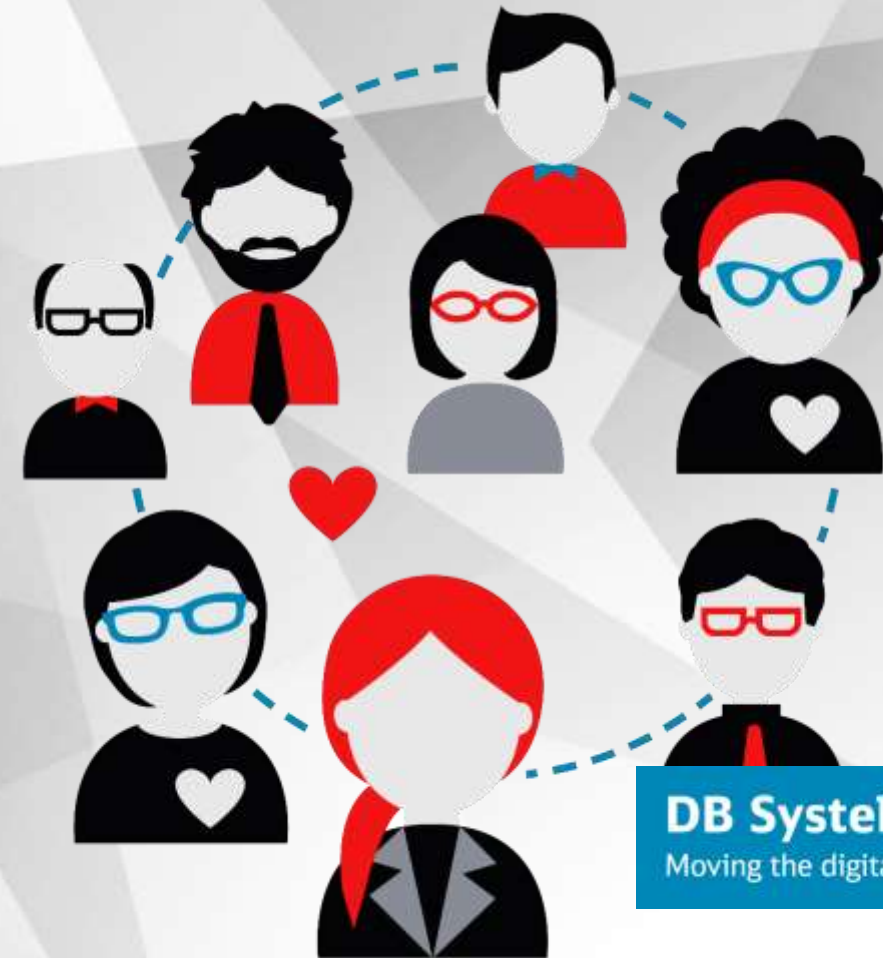


Working. Together. Passionate.
Where it matters!

Carrier

<https://karriere.deutschebahn.com>
<https://www.dbsystem.de/karriere>

Sascha Wolter | [linkedin.com/in/saschawolter](https://www.linkedin.com/in/saschawolter) | Sascha.Wolter@deutschebahn.com



DB System

Moving the digital future. Together.



SPEAKER: A voice assistant platform »Made in Germany«

For business-to-business applications, which makes it possible to **ensure the data sovereignty** of personal and company-relevant information. The idea is that companies will be able to use single modules of the technology and adapt them to their needs.

Implementation starts April 2020.



Supported by:



on the basis of a decision
by the German Bundestag

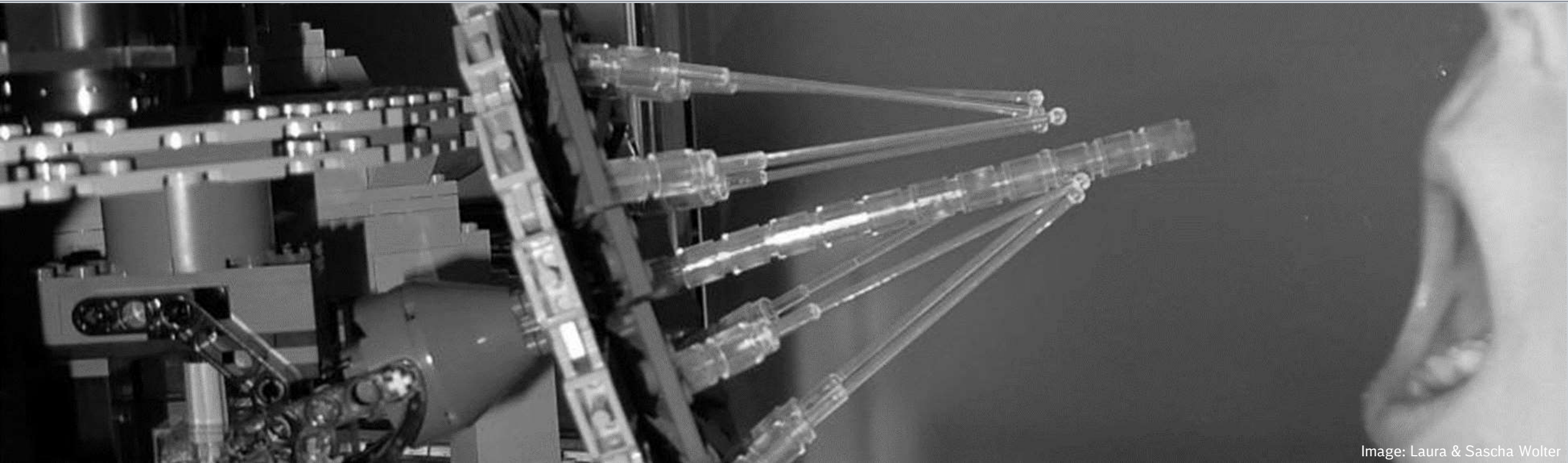


Image: Laura & Sascha Wolter

Conversational AI Demystified

Build your bot in just Minutes.

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DB System

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