

# Amazon Alexa: How to talk with your Smart Home devices

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JVM-based languages: Java, Kotlin, Groovy

Spring ecosystem, Distributed Systems, AWS, Kubernetes, Data Processing and Streaming, Microservices, Security,

DevOps & Testing Practices, Infrastructure, IoT

Radio HAM, Software Defined Radio

# Agenda

- 1. Evolution and stats for interaction
- 2. Amazon Alexa
- 3. Flash Brief Alexa skill
- 4. AWS Serverless Lambdas and Custom skill
- 5. Smart Home devices integration
- 6. Network and Messaging in depth
- 7. NodeMCU Wemo-compatible prototype
- 8. "Local Lambda" SW Gateway

## Human-Mac hine Interaction **Evolution**

Punch Cards for Informatics 1832



Mainframe Computers (IBM SSEC) 1948



OWERTY

Keyboard

1872

1952

Joystick 1967



Commercial Use of Window-Based GUI (Xerox Star) 1981



Commercial Use of Mouse (Apple Lisa) 1983



1996



Commercial Use of Mobile Computing (PalmPilot)



Touch + Camera -

based Mobile

Computing

(iPhone 2G)

2007

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Electromechanical





Microcomputers

(IBM Mark-8)

1974



Paper Tape Reader (Harvard Mark I) 1944





Portable Computer (IBM 5100) 1975



Source: University of Calgary, "History of Computer Interfaces" (Saul Greenberg)

## Stats Facts





Source: Badu Word 2014, Gigaon, Gadgets 360, 1015bata, Media/holt, SearchEngineLand, Google I/O 2016, ConScore, Recode, Fast Company

## Voice Search Stat

- Google: 20% of all searches are voice
- 31% of smartphone users worldwide use voice tech at least once a week.
- 50% of all online searches will be voice-based by 2020.
- 30% of all web browsing sessions will be done without a screen by 2020.
- 55% of households are expected to own smart speaker devices by 2022.
- Playing music is the most popular use of smart speakers currently.
- Almost 20% of all voice search queries are triggered by just 25 keywords.
- Global voice commerce is expected to be worth \$40B by 2022.

# Alexa Family



"Cloud-based voice service available on tens of millions of devices from Amazon and third-party device manufacturers.

With Alexa, you build natural voice experiences interact models"

NLP, voice recognition, self educating AI

#### Alexa features



#### **BMW, MINI & Ford Alexa integration**



"By making this step of integrating Alexa into our models from mid-2018, BMW and MINI will form a more intrinsic part of our customers' digital lifestyles," remarked **Dieter May, Senior Vice President** Digital Services and Business Models at the BMW Group.

Today, 8.5 million BMW Group models worldwide are already connected. From mid-2018 Amazon Alexa is be available in all BMW and MINI vehicles in USA, UK and Germany.

# Skills

**Flash Briefing** 

defines audio/video/text content added to the brief of news *"Alexa, tell me news"* 

#### Custom

everything is specified by developer

#### **Smart Home**

controls IoT devices like lights and thermostats *"Alexa, dim the light"* 

#### Video

video content is sent in response "Alexa change to CNN"

#### Skills: Flash Brief



### Flash Brief's endpoint requirements

- non-password-protected HTTPS endpoint
- either text(4500 characters) or audio content (256kbps mono or stereo MP3 10 minutes)
- JSON or RSS UTF-8 encoded
- available 24 hours a day/7 days a week
- items order from newest to oldest, based on the date. Alexa may ignore older items.
- each item in the feed should be unique and should not overlap with content in another feed item.

## Demo

## Flash Brief Skill

"JAVA NEWS"



#### Create Flash brief skill from the scratch

Alexa tells us latest Java world news

"Alexa give me latest news"



#### **Skills: Custom skill**



#### **Router for invocations**



#### **Utterance-to-Intent mapping**



## Demo

### **Custom Skill**

#### "Greeter"

Kotlin-based lambda serverless.

Alexa will choose the winner from the audience.

"Alexa, ask greeter who is present?"

"Alexa, ask greeter winner"





Big Brother big bro Alexa

More 🗸



How far moon from the earth?

Image: Wikipedia

The moon's distance is 239,000 miles (384,000 kilometers).

#### LEARN MORE ON WIKIPEDIA



## AWS Lambda





Image: Market	
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provisioning	need to provision, manage server	serverless compute service		
charge	<b>on-demande</b> charged hourly based on compute capacity , <b>reserved</b> , <b>spot</b>	charged for 100ms running and number of time is triggered, no idle time payment		
scaling	need DNS, ELB, autoscaling, plus correct configuration and other techniques	scales in parallel on each trigger		
security	need manual security OS updates	No infrastructure to maintain		
interaction	networking knowledge, routes to infrastructure	triggered (API GW, IoT, ASK,Kinesis, S3,SNS, CodeCommit, CloudWatch, CloudFront)		
runtime	<any></any>	C#, GO, Java, NodeJS, Python code		

## IoT Smart Home



#### Alexa in Wireshark

Apply a display filter <%/>No.       Time       Source       Destination         1       0.000000       192.168.1.10       239.255.255.250         2       0.091248       192.168.1.10       239.255.255.250         3       0.192949       192.168.1.10       239.255.255.250         4       0.295293       192.168.1.10       239.255.255.250	Protocol SSDP SSDP SSDP SSDP SSDP stop \$1 y:~ \$ sudo tcp stening on eth	Length         Info           149         M-SEAR           164         M-SEAR           164         M-SEAR           164         M-SEAR           04ump         -vv           -A         -5           00         .in/L	RCH * HTTP/1.1           XCH * HTTP/1.1	/tmp(zsh) %3 d host 239.255.255.250 and udp' -w alexa.
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<pre>&gt; Frame 1: 149 bytes on wire (1192 bits), 149 bytes captured (1192 bits) &gt; Ethernet II, Src: AmazonTe_90:da:3c (78:e1:03:90:da:3c), Dst: IPv4mcast_7f:ff:fa ( &gt; Internet Protocol Version 4, Src: 192.168.1.10 (192.168.1.10), Dst: 239.255.255.25 &gt; User Datagram Protocol, Src Port: 50000 (50000), Dst Port: ssdp (1900) &gt; Simple Service Discovery Protocol &gt; M-SEARCH * HTTP/1.1\r\n &gt; [Expert Info (Chat/Sequence): M-SEARCH * HTTP/1.1\r\n] Request Method: M-SEARCH Request URI: * Request Version: HTTP/1.1 HOST: 239.255.255.250:1900\r\n MAX: "ssdp:discover"\r\n MX: 15\r\n ST: urn:Belkin:device:**\r\n \r\n [full request URI: http://239.255.255.250:1900+] [HTTP request 1/d]</pre>				, capture size 262144 bytes

#### Sequence diagram: Search devices



#### Sequence diagram: Device control



#### **Prototyping with ESP-8266**



- Tensilica 32-bit RISC CPU Xtensa LX106
- Digital I/O Pins: 16 Analog Input Pins: 1
- UARTs: 1 SPIs: 1 I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 16/32/64 KB
- Clock Speed: 80 Mhz
- Wi-Fi: IEEE 802.11 b/g/n

## Demo

## ESP-based light control







#### Hall

#### **End-to-End: How it works**



#### Why not to create "Local Lambdas" for Alexa?





## Demo Smart Gateway



≡ AWS Alexa smart gateway								
Toggles	UPnP	Statistics	Lambda	Analytics Configur	ation Boot			
Registered devices								
	NAME		PORT	ACTION	ACTION			
5b0f7167bc009ce6a780d09a	device2	192.168.1.6	8987	EDIT	DELETE			
5b0f7162bc009ce6a680d09a	device1	192.168.1.6	8988	EDIT	DELETE			
5b0f716fbc009ce6a880d09a	device3	192.168.1.6	8989	EDIT	DELETE			
+								

## Links

1. Voice evolution <u>https://voice-report.com/voice-is-here-and-it-is-here-right-now-heres-how-we-know/</u>

https://99firms.com/blog/voice-search-statistics/#gref

- 2. BMW annonce of Alexa devices promo https://www.youtube.com/watch?v=mHCl6IM\_Zl8
- 3. Flash Brief requirements <u>https://developer.amazon.com/docs/flashbriefing/flash-briefing-skill-api-fe</u> <u>ed-reference.html</u>

https://developer.amazon.com/docs/flashbriefing/steps-to-create-a-flashbriefing-skill.html#create-a-flash-briefing-skill

https://developer.amazon.com/docs/custom-skills/handle-requests-sent-b y-alexa.html

- 4. Arduino WEMO switch <u>https://github.com/kakopappa/arduino-esp8266-alexa-multiple-wemo-swit</u> <u>ch/blob/master/wemos/Switch.cpp</u>
- 5. Alexa voice AI with filtering by AWS <u>https://www.youtube.com/watch?v=2Bazibaz1F8</u>

## "THANK YOU"



