Deep Learning for Business

Deep Learning Products & Services

Amazon
Echo, Echo Dot, Alexa

Amazon Echo, Echo Dot, Alexa

Amazon Echo

– Voice controlled intelligent personal virtual assistant, where **Alexa** is accessible through the smart speaker

– NLP (Natural Language Processing) system matches the user's voice or text as input

Amazon Echo, Echo Dot, Alexa

Amazon Echo/Alexa Products

- 2014 November, Amazon Echo was released
  - Amazon announced Alexa & Echo together
  - $199 for invitation & $99 for Prime members
- 2016 March, the first generation of Amazon Echo Dot was released at $89.99
- 2016 October, the second generation of Amazon Echo Dot was released at $49.99

Amazon Echo, Echo Dot, Alexa

Amazon Echo/Alexa Products

- Price $179.99
- Virtual assistant Alexa is always-on & always-listening
- Voice Activated QA system
- 235 mm x 83.5 mm x 83.5 mm size
- 1045 g weight
- Bluetooth & Wi-Fi
  - Dual-band dual-antenna MIMO
- Power from wall outlet

Amazon Echo, Echo Dot, Alexa

Amazon Echo/Alexa Products

- 360° audio sound
  - 2.5 inch woofer and 2.0 inch tweeter
- No batteries, but a battery base is sold separately
- Built-in omnidirectional speakers for music & audio
- Seven-microphone array is built on the top of the device
  - Acoustic beamforming and noise cancellation included for improved voice-recognition capabilities

Amazon Echo, Echo Dot, Alexa

Amazon Echo/Alexa Products

- Components of Echo
  - Samsung K4X2G323PD-8GD8 256 MB LPDDR1 RAM
  - SanDisk SDIN7DP2-4G 4 GB iNAND Ultra Flash Memory
  - Qualcomm Atheros QCA6234X-AM2D Wi-Fi & Bluetooth Module
  - Texas Instruments TPS65910A1 Integrated Power Management IC, DM3725CUS100 Digital Media Processor

Amazon Echo, Echo Dot, Alexa

Amazon Echo Dot (1st Gen)

- Components of Echo Dot (1st Gen)
  - Micron MT46H64M32LFBQ 256 MB (16 Meg x 32 x 4 Banks) LPDDR SDRAM
  - Samsung KLM4G1FEPD 4GB High Performance eMMC NAND Flash Memory
  - Qualcomm Atheros QCA6234 Integrated Dual-Band 2x2 802.11n + Bluetooth 4.0 SiP
  - Texas Instruments DM3725 Digital Media Processor, TPS65910A1 Integrated Power Management IC, DAC

Amazon Echo, Echo Dot, Alexa

Amazon Echo Dot (2nd Gen)

- Price $49.99
- Voice-activated virtual assistant Alexa is always-on & always-listening
- 32 mm (38 mm, 1st Gen) x 84 mm x 84 mm size
- 163 g weight (250 g, 1st Gen)
- Bluetooth & Wi-Fi
  - Dual-band Dual-antenna MIMO
- Power from wall outlet
- Internal speaker is used when external speakers (plug in wired, Bluetooth wireless) are not connected

Amazon Echo, Echo Dot, Alexa

Amazon Echo Dot (2st Gen)

- Components of Echo Dot (2st Gen)
  - MediaTek MT8163 (SoC: System on Chip)
    - ✓ 64-bit quad-core ARM Cortex-A53 MPCore
  - Micron 4GB (1 x L83A) eMMC
  - Micron 4Gb LPDDR3 (1 x 2E0F) MT29TZZZ4D4BKERL-125 W.94M

  - Mediatek MT6625LN 1628-AJC8L BAP0M972 ATG14T11
    - ✓ Wi-Fi / Bluetooth
  - Mediatek MT6323LGA 1629-AGAH CTG14U07
    - ✓ Power management IC

Amazon Echo, Echo Dot, Alexa

Alexa

- Cloud based AI personal assistant developed by Amazon
  - Requires network connection to the Amazon cloud
  - Used in Echo and Echo Dot
- ML (Machine Learning) techniques used to continuously get smarter
  - ASR (Automated Speech Recognition)
  - NLU (Natural Language Understanding)

Amazon Echo, Echo Dot, Alexa

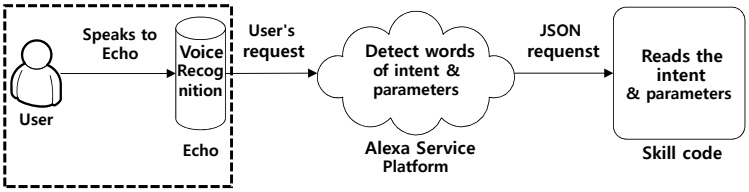
Alexa

- Alexa's voice is generated by LSTM (Long Short-Term Memory) RNN (Recurrent Neural Network)
- Alexa's Skills (examples)
  - Thousands of Skills exist
  - Product information (type, volume, profit) search
  - Marketing progress and results search
- ASK (Alexa Skills Kit)
  - Developer kit used to create new custom Skills for Echo and Echo Dot

Amazon Echo, Echo Dot, Alexa

How Echo & Alexa Works

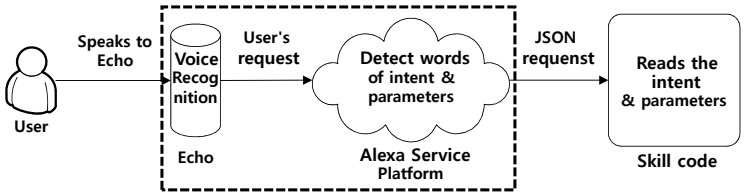
- User speaks to Echo
- Echo's voice recognition system detects trigger words and required Skills



Amazon Echo, Echo Dot, Alexa

How Echo & Alexa Works

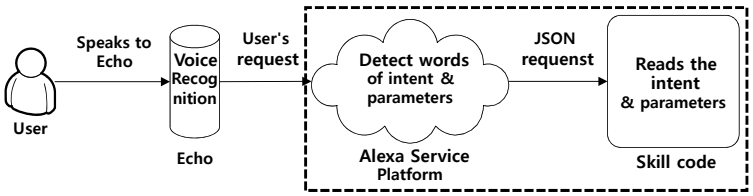
- Echo sends the user's request to the ASP (Alexa Service Platform)
- ASP uses its DL (Deep Learning) speech recognition engine to detect words of intent & parameters



Amazon Echo, Echo Dot, Alexa

How Echo & Alexa Works

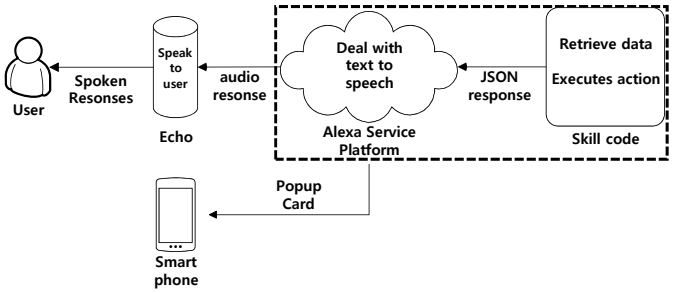
- JSON (JavaScript Object Notation) text document (including the intent & parameters) is made and sent (using an HTTP (HyperText Transfer Protocol) request) to the corresponding Skill on the Alexa cloud



Amazon Echo, Echo Dot, Alexa

How Echo & Alexa Works

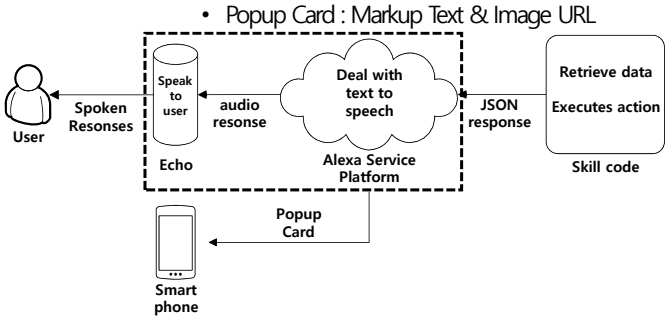
- Skill code parses the JSON
  - Reads the intent & parameters
  - Retrieves necessary data
  - Executes required action



Amazon Echo, Echo Dot, Alexa

How Echo & Alexa Works

- Alexa makes a Response JSON document and sends it to the ASP
  - Response JSON document includes
    - ✓ Text of Alexa's reply to the user
    - ✓ Optional: Smartphone app Popup Card info
      - Popup Card : Markup Text & Image URL



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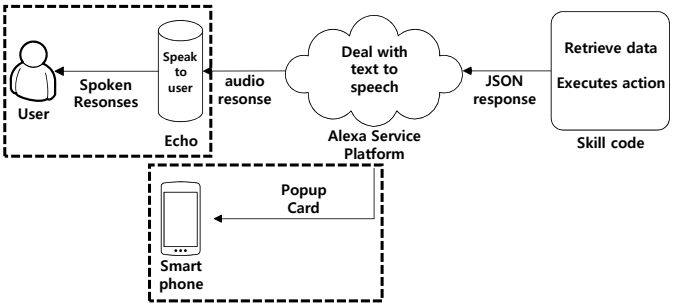
How Echo & Alexa Works

– ASP voice replies to the user
  • Optional: Smartphone app popup card



Deep Learning Systems & Services

Amazon Echo, Echo Dot, Alexa

References

References

- Amazon Echo vs. Dot vs. Tap vs. Show: Which should you buy? [Online]. Available: https://www.androidcentral.com/amazon-echo-which-should-you-buy
- Amazon Introduces the Alexa Skills Kit—A Free SDK for Developers [Online]. Available: http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=irol-newsArticle&ID=2062551
- Amazon Developer Services [Online]. Available: https://developer.amazon.com/
- Build an Alexa Skill with Python and AWS Lambda [Online]. Available: http://moduscreate.com/build-an-alexa-skill-with-python-and-aws-lambda/
- Amazon Echo vs Echo Dot vs Amazon Tap: What's the Difference? [Online]. Available: https://www.thisdigitalhome.com/amazon-echo-vs-amazon-tap-vs-echo-dot
- Amazon Echo Dot Teardown [Online]. Available: https://www.ifixit.com/Teardown/Amazon+Echo+Dot+Teardown/61304
- How Amazon Echo Works [Online]. Available: http://electronics.howstuffworks.com/gadgets/high-tech-gadgets/amazon-echo.htm
- Teardown Tuesday: Amazon Echo Dot v2 [Online]. Available: https://www.allaboutcircuits.com/news/teardown-tuesday-amazon-echo-dot-v2/
- Wikipedia, www.wikipedia.org