"Alexa, Be My Tutor!" - Voice Assistant Pilot

Ann Wong, Ph.D., Qun Zhang, Ph.D., Pooja Mohaan, Alicia Sanchez, Ph.D., Shawn Miller, and Thomas Shaffner

Defense Acquisition University
“Alexa, Be My Tutor!”
Voice Assistant Pilot

Dr. Alicia Sanchez
Mr. Shawn Miller
Ms. Pooja Mohaan
Mr. Thomas Shaffner

Mr. Sriraman Raman
Mr. Mike Dorohovich
Dr. Qun Zhang
Dr. Ann Wong
Let’s meet Your Personal Tutor--Alexa

• Origin Story of Alexa, the Tutor

• Demo Featuring Ms. Pooja Mohaan

• Alexa Real-time learning analytics

• Future Vision
Origin Story

- DAU created Alexa skill to feature University-wide info on our main webpage
- As Faculty...we asked.....

WHAT IF?
DAU Alexa Roadmap

Version 1.0
"DAU" Alexa Skill
- Dynamic content from DAU.edu
- Flash Briefing
- Amazon Services
- News, Blogs
- DAU Events
- Course Schedule

Released in April 2020

Version 2.0 (Current)
“Digital Engineering” Tutor
- Modernized learning
- Easily Accessible
- Frictionless learning
- Real Time Analytics (xAPI)
- Amazon + Microsoft Services

Projected in FY 2022

Version 3.0
- Authentication
- Assessment
- Credentials
- Podcast
- DAU Eco System

Projected in FY 2023

Released in April 2020
Projected in FY 2022
Projected in FY 2023
Why? Alexa Skill Value Propositions

**Advancing the Learner**

- Bringing Learning to the Learner @ their time and place!
  - More telework post COVID
  - Learning on their own devices—device agnostic
- Tailored content and flow to the Learner
  - Voice-first multi-modal UX makes learning more engaging and frictionless
  - Serves as Virtual tutor / refresher

**Advancing the Quality of Teaching**

- Promote DAU branding & offering (courses, flash briefing) on Amazon market

**Advancing the Infrastructure**

- Innovative xAPI-enabled LRP leverages DAU Veracity LRS
- Common infrastructure as DAU Chatbot eases the integration, and increases reusability (author once and publish to multiple places) and return on investment
Alexa Live Demo - Features

• Dual Modes – Lecture Mode and QnA Mode
• Karaoke effect
• DAU Kaltura Video integration
• Visuals / Images
• Follow up prompts
• In-skill feedback
• xAPI capability
Alexa Live Demo – Features Part 1

- **Dual Modes**
  - Lecture Mode and QnA Mode
- **Karaoke effect**
- **DAU Kaltura Video integration**
- **Visuals / Images**
- **Follow up prompts**
- **In-skill feedback**
- **xAPI capability**
Alexa Live Demo – Features Part 2

- **Dual Modes**
  - Lecture Mode and QnA Mode

- **Karaoke effect**

- **DAU Kaltura Video integration**

- **Visuals / Images**

- **Follow up prompts**

- **In-skill feedback**

- **xAPI capability**
Alexa Live Demo – Features Part 3

- **Dual Modes**
  - Lecture Mode and QnA Mode

- **Karaoke effect**

- **DAU Kaltura Video integration**

- **Visuals / Images**

- **Follow up prompts**

- **In-skill feedback**

- **xAPI capability**
Knowledge base and use cases

Most-needed Learning across all DoD Services and Agencies

1. Organizational trust, intelligent risk-taking, and risk tolerance.
2. Organizational leadership, critical thinking, and soft skills (especially mid-career).
3. Quicker time to learn and share best practices.
4. Cybersecurity, throughout the lifecycle.
5. Managing programs and systems, in the sustainment phase.

Based on 98 senior leader interviews and 500+ workforce surveys
“DAU Voice of the Customer Report, MARCORSYSCOM”, July 2018
Dashboard example – Activity Flow

Activity Flow - Chord Diagram

What's the sequence (or branching) of user navigation among topics and features?

- Activity Diagram
- Data Exchange Layer
- Data Model
- Data Model types
- Data in metadata
- Deterministic Simulation
- Digital Artifact
- Digital Engineering
- Data
- Data Flow Diagram
- Data Model example
- Data in a database
- Data in telecommunications
- Digital Engineering Strategy

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Dashboard example – Popular User Questions

Popular User Questions

What are the top 10 most often spoken phrases that the Tutor responded to correctly?

- Goodbye
- how Digital is different from...
- Digital Artifact
- Modeling and Simulation Tools
- Digital Thread
- Digital System Model
- Digital Engineering
- how models and simulations...
- what DOD has said about...
- digital twin
Dashboard example – Popular User Questions

![Total Time Spent Per Session](chart1)

What are the top 10 longest sessions, in minutes?

1. 1,106,581,000
2. 457,150,000
3. 418,986,000
4. 326,788,000
5. 318,52,000

![Time Spent Per Actor Per Session](chart2)

Who are the top 10 users, and how long did they spend with the Tutor, in minutes?

1. AMF22372X 1,100,000
2. 1,000,000
3. 900,000
4. 800,000
5. 700,000
Dashboard example – Verb Type

Verb Type

What verbs (event types) are most frequent, and how many times was each used?

- asked: 31.0%
- accessed: 16.5%
- terminated: 11.0%
- launched: 10.7%
- viewed: 10.3%
- followed: 9.5%
- responded: 6.0%
- ignored: 2.4%
- watched: 1.7%
- failed: 1.0%
Call to Action!

Where could the community take Alexa next?

WHAT IF?
Q&A

Thank you!
Future

• Single Sign on Authentication feature on Alexa Skill
  • Meaningful insights data using DAU ID
  • Assessment
  • Ask A Professor

• Integrate into DAU Ecosystem
  • DAU AWS Account
  • DAU Veracity LRS
  • Reusable Knowledge base

• Replicate to lower level courses

• Gettin
### xAPI verbs used in Digital Engineering

<table>
<thead>
<tr>
<th>Verbs</th>
<th>Use Case</th>
<th>Antonym</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launched</td>
<td>User Initiated the Skill</td>
<td></td>
<td>Type of Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learner ID – first 10 digit Device Token</td>
</tr>
<tr>
<td>Accessed</td>
<td>User accessed the lesson</td>
<td>Unviewed</td>
<td></td>
</tr>
<tr>
<td>Asked</td>
<td>User asked a question</td>
<td>Unasked</td>
<td>If any terms or questions are missing in the course content then it is notified via Analytics dashboard.</td>
</tr>
<tr>
<td>Viewed</td>
<td>User viewed content with the images</td>
<td>Skipped</td>
<td></td>
</tr>
<tr>
<td>Watched</td>
<td>User watched a video on the skill</td>
<td>Skipped</td>
<td></td>
</tr>
<tr>
<td>Responded</td>
<td>User provided the feedback</td>
<td></td>
<td>Yes / No</td>
</tr>
<tr>
<td>Followed</td>
<td>User followed a prompt</td>
<td>Unfollowed</td>
<td></td>
</tr>
<tr>
<td>Ignored</td>
<td>User did not follow the prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminated</td>
<td>User terminated the skill</td>
<td>Started</td>
<td>Time spent per session (If user terminated the skill appropriately)</td>
</tr>
</tbody>
</table>
## Capabilities support as of today

<table>
<thead>
<tr>
<th>Features</th>
<th>APL Supported</th>
<th>APL Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echo Show, Fire tablet, etc.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Alexa App using Smart Phones</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Text</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Visual / Images</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Video</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Question Mode</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Follow Up Prompt</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Lecture Mode</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Karaoke Effect</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>In Skill Feedback</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>xAPI capability</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Web Voice Assistant LRS Integration Solution Architecture

Voice Assistant

User Input using Azure Cognitive Services → Voice Assistant Service Deployed on Azure using .NET Core → xAPI Wrapper Service → xAPI → Learning Record Store

Web

Channels

LUIS

Learning Record Store

FAQ Knowledge Base
Alexa LRS Integration Solution Architecture – Phase 0

Anonymous User Interaction with Alexa

User Input

Alexa Skill

Alexa Skill Application Service

Deployed on AWS Lambda using .NET Core

xAPI Wrapper Service
Actor: DeviceToken

Learning Record Store

FAQ Knowledge Base

Channels

LUIS

Learning Record Store

xAPI
Alexa LRS Integration Solution Architecture – Phase 1

User optionally provides DAU ID as input

Alexa Skill Application Service
Deployed on AWS Lambda using .NET Core

xAI Wrapper Service
Actor: DAU ID

Learning Record Store

User Profiles

FAQ Knowledge Base

Learning Record Store
Alexa LRS Integration Solution Architecture – Phase 2

User optionally provides DAU ID as input, apply two factor authentication with email validation
Alexa LRS Integration Solution Architecture – Phase 3

AWS – DAU OKTA Integration

- User Input
- Alexa Skill Application Service
  - Deployed on AWS Lambda using .NET Core
- xAPI Wrapper Service
  - Actor: DAVID
- Learning Record Store
- Alexa Skill
- Custom Alexa Skill Application Service
- OKTA
- Channels
- LUIS
- FAO Knowledge Base
- Learning Record Store
Where are we with Voice Assistant

DAU MA Voice Assistant Roadmap

Phase I (Current)
- Research web-based voice API
- Design and develop user interface
- Dynamic content from DAU.edu
- Develop knowledge base from DAU MA FAQ

Projected in FY 2022

Phase II
- Develop RESTful services for dynamic conversational AI capabilities
- Integration with DAU Kaltura
- xAPI instrumentation

Projected in FY 2023

Phase III
- LRS custom dashboards
- Personalization
- Authentication
- DAU ecosystem

Projected in FY 2023

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Voice Assistant – Solution Architectures for LRS Integration

Web-based and Alexa-based Voice Interfaces
Web-based Voice Assistant

Main AI/ML processes

User speaks and listens directly to browser

Voice recognition and text-to-speech

Voice assistant service
Azure, .NET Core

Natural language processing and query matching

Language Understanding Service
LUIS, QnA Maker, Azure Cognitive Services

Answers read and queries updated

Knowledge Base
Azure Cognitive Search

Supplemental learning record processes

Activity statement emitted

xAPI wrapper service
Azure, .NET Core

Performance data recorded

DAU Learning Record Store
Veracity Learning

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core

Answers read and queries updated

Knowledge Base
Azure Cognitive Search

Performance data recorded

DAU Learning Record Store
Veracity Learning

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core

Answers read and queries updated

Knowledge Base
Azure Cognitive Search

Performance data recorded

DAU Learning Record Store
Veracity Learning

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core

Answers read and queries updated

Knowledge Base
Azure Cognitive Search

Performance data recorded

DAU Learning Record Store
Veracity Learning

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core
Alexa-based Voice Assistant – Phase 0 Implementation

Anonymous user

User speaks and listens to Amazon Echo or Alexa App → Voice recognition and text-to-speech → Alexa Skill Application Service: AWS Lambda, .NET Core → xAPI wrapper service: Azure, .NET Core → Activity statement emitted → Language Understanding Service: LUIS, QnA Maker, Azure Cognitive Services

Natural language processing and query matching → Knowledge Base: Azure Cognitive Search

Answers read and queries updated → DAU Learning Record Store: Veracity Learning

Performance data recorded → Operation and maintenance dashboard: Azure, .NET Core

Configuration managed

Performance data recorded → Configuration managed
Alexa-based Voice Assistant – Phase 1 Implementation

User inputs DAU username

User speaks and listens to Amazon Echo or Alexa App

Voice recognition and text-to-speech

Natural language processing and query matching

Answers read and queries updated

Language Understanding Service
LUIS, QnA Maker, Azure Cognitive Services

Knowledge Base
Azure Cognitive Search

DAU User Profiles
DAU ID information transmitted

xAPI wrapper service
Azure, .NET Core

Activity and Actor statement emitted

DAU Learning Record Store
Veracity Learning

Performance data recorded

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core

Alexa Skill Application Service
AWS Lambda, .NET Core

Performance data recorded

Configuration managed

DAU Learning Record Store
Veracity Learning

Performance data recorded

Configuration managed

Operation and maintenance dashboard
Azure, .NET Core
Alexa-based Voice Assistant – Phase 2 Implementation

Skill retrieves full DAU ID using two-step authentication, via e-mail
Alexa-based Voice Assistant – Phase 3 Implementation

Skill retrieves full DAU ID in one step, using AWS/Okta integration

User speaks and listens to Amazon Echo or Alexa App

Voice recognition and text-to-speech

Natural language processing and query matching

Answers read and queries updated

Knowledge Base
Azure Cognitive Search

Language Understanding Service
LUIS, QnA Maker, Azure Cognitive Services

DAU Learning Record Store
Veracity Learning

Operation and maintenance dashboard
Azure, .NET Core

Performance data recorded

Configuration managed

Activity and Actor statement emitted

DAU ID confirmed

xAPI wrapper service
Azure, .NET Core

DAU ID information transmitted

Okta identity authentication service

DAU User Profiles
Where are we with Voice Assistant

DAU MA Voice Assistant Roadmap

Phase I (Current)
- Research web-based voice API
- Design and develop user interface
- Dynamic content from DAU.edu
- Develop knowledge base from DAU MA FAQ

Projected in FY 2022

Phase II
- Develop RESTful services for dynamic conversational AI capabilities
- Integration with DAU Kaltura
- xAPI instrumentation

Projected in FY 2023

Phase III
- LRS custom dashboards
- Personalization
- Authentication
- DAU ecosystem

Projected in FY 2023