AWS re:Invent

AIM303

# Stop guessing: Use AI to understand customer conversations

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Senior Solutions Architect
Amazon Web Services

**Boaz Ziniman**
Principal Technical Evangelist
Amazon Web Services

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# Agenda

- Introduction Amazon Web Services (AWS) AI/ML offering
- Introduction Amazon Connect
- Architecture of the labs
- Work on the labs
- Wrap-up

# Related breakouts

- AIM211 - AI document processing for business automation
- AIM212 - ML in retail: Solutions that add intelligence to your business
- AIM222 - Monetizing text-to-speech AI
- AIM302 - Create a Q&A bot with Amazon Lex and Amazon Alexa

# Intro: AWS AI/ML Services

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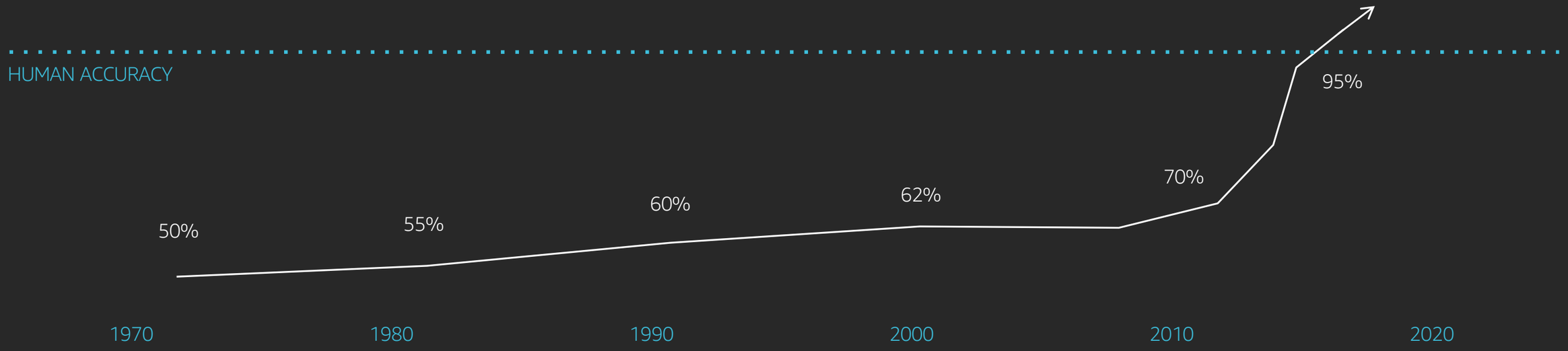
# Natural language processing (NLP)

- Automatic speech recognition (ASR)
- Natural language understanding (NLU)
- Text to speech
- Translation




Source: MindMeld

amazon

UBER
Tide
AMEX
THIS DAY IN
HISTORY
NBA
epi
ROYAL OPERA HOUSE
MR. ROBOT
DAILY FIVE / NINE
TED
WebMD
StubHub!
SESAME STREET
DUNKIRK
CNBC
SHOWTIME
Polycom
geeni
Joule
PHILIPS hue
SONOS
GARMIN
THE DAILY SHOW
FOX NEWS
restaurants
The Economist Espresso
works with nest
STAR WARS
dish
CHEF'D
arlo
unicef KID POWER
CNN
NASCAR
NASA
lyft
BMW
P&G
DEAL OR NO DEAL
seamless
1800 flowers
LIE SWITCH
BOSE
food network
redbox
TECH CHECK
BLACK FRIDAY
ZEEQ
MTA
INFINITI CONNECTION
GLAD
wp
Good
Alistate
Jamie Oliver
Disney
npr
GH
MEDICINE
Minor
SYFY
ZOQ
wemo
Prime Life
H QUIZ

100,000+
UBER
Tide
AMEX
HISTORY
NBA
epi
ROYAL OPERA HOUSE
TED
WebMD
StubHub!
SESAME STREET
DUNKIRK
MR. ROBOT
DAILY FIVE / NINE
CHEF'D
SONOS
GARMIN
ZEEQ
THE DAILY SHOW
FOX NEWS
restaurants
MTA
npr
redbox
TECH CHECK
BMW
P&G
DEAL OR NO DEAL
unicef KID POWER
arlo
CNN
NASCAR
LIE
flowers
NASA
lyft
CNBC
SHOWTIME
Polycom
geeni
PHILIPS hue
Joule
wemo
BOSE
food
@zinin

# Use cases for NLP

Voice of customer applications

Knowledge management

Education

Customer service/ call centers

Semantic search

Accessibility

Enterprise digital assistant

Captioning workflows

Information bots

Personalization

Localization

# The Amazon ML stack: Broadest & deepest set of capabilities

## AI services

**Vision**

Amazon Rekognition image

Amazon Rekognition video

Amazon Textract

**Speech**

Amazon Polly

Amazon Transcribe

**Language**

Amazon Translate

Amazon Comprehend & Amazon Comprehend Medical

**Chatbots**

Amazon Lex

**Forecasting**

Amazon Forecast

**Recommendations**

Amazon Personalize

## ML services

Amazon SageMaker

**Build**

Prebuilt algorithms & notebooks

Data labeling (Ground Truth)

Algorithms & models (AWS Marketplace for machine learning)

**Train**

One-click model training & tuning

Optimization (NEO)

Reinforcement learning

**Deploy**

One-click deployment & hosting

## ML frameworks & infrastructure

**Frameworks**

TensorFlow

mxnet

PYTORCH

**Interfaces**

GLUON

Keras

**Infrastructure**

EC2 P3 & P3dn

EC2 C5

FPGAs

AWS IoT Greengrass

Amazon Elastic inference

# AI services

AI services

Vision

Amazon Rekognition image

Amazon Rekognition video

Amazon Textract

Speech

Amazon Polly

Amazon Transcribe

Language

Amazon Translate

Amazon Comprehend & Amazon Comprehend Medical

Chatbots

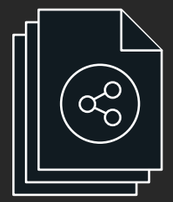
Amazon Lex

Forecasting

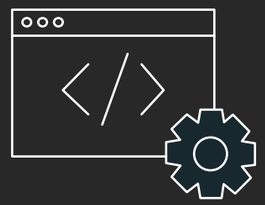
Amazon Forecast

Recommendations

Amazon Personalize



Pretrained AI services that require no ML skills or training



Ability to easily add intelligence to your existing apps and workflows

Quality and accuracy from continuously learning APIs

# AI services

AI services

Vision

Amazon Rekognition Image

Amazon Rekognition Video

Amazon Textract

Speech

Amazon Polly

Amazon Transcribe

Language

Amazon Translate

Amazon Comprehend & Amazon Comprehend Medical

Chatbots

Amazon Lex

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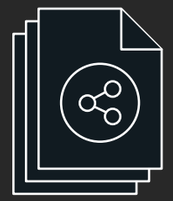

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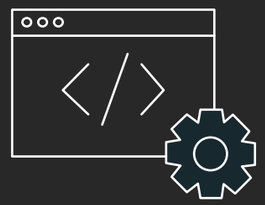

Ability to easily add intelligence to your existing apps and workflows

Quality and accuracy from continuously learning APIs

# Amazon Polly

Turn text into lifelike speech using deep learning

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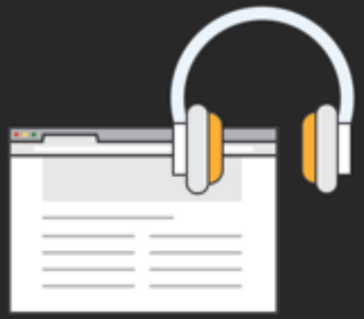
# Amazon Polly: Use cases

Navigation

**Amazon Polly**

Podcasting,
voiced blogs
& news articles



Special needs
AI assistant

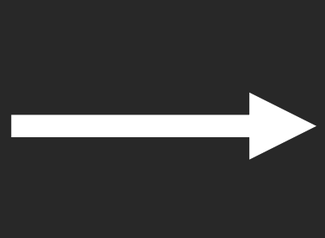
Language
learning

Voiced videos
& presentations

Contact
centers

# Amazon Polly: Text in, lifelike speech out

“Today in Seattle, WA, it’s 11°F”



Amazon Polly

**“Today in Seattle, Washington, it’s 11 degrees Fahrenheit”**

29 languages

# Amazon Polly: Text in, lifelike speech out

29 languages

# Add semantic meaning to text

https://www.w3.org/TR/speech-synthesis/

```
<speak>
The spelling of my name is
      <prosody rate='x-slow'>
            <say-as interpret-as="characters">Boaz</say-as>
      </prosody>
</speak>
```

# Standard vs. neural TTS

Text

Sentence to synthesize.

ˈsɛntəns tə ˈsɪnθəˌsaɪz.

# Standard vs. neural TTS

Text

Sentence to synthesize.

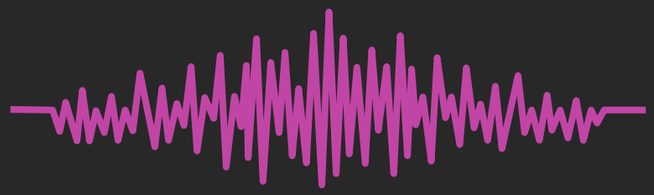
ˈsɛntəns tə ˈsɪnθəˌsaɪz.

Phonetic transcription

**Concatenative TTS**

ˈsɛnt sɛntəns tə ˈsɪnθ əˌsaɪz.

**Neural TTS**



# Neural TTS with Amazon Polly

## Standard vs. neural

“Hi. My name is Boaz, and I will be your host today during this Innovate online session.”

Standard

# Neural TTS with Amazon Polly

## Standard vs. neural

“Hi. My name is Boaz, and I will be your host today during this Innovate online session.”

Standard

Neural TTS

# Neural TTS with Amazon Polly

## Standard vs. neural

“Hi. My name is Boaz, and I will be your host today during this Innovate online session.”

Standard

Neural TTS

## Styles with neural TTS

“Hi. My name is Boaz, and I will be your host today during this Innovate online session.”

Newscaster NTTS

# Add voice to your app

“This is a new technology that can give users more choice and better accessibility to our content, so we wanted to create an experiment to dive deeper into the user experience. After a month, we’ll take what we’ve learned about how users engage with this feature to develop our first iteration of a product with **Amazon Polly**.”

**Joseph Price, Product Manager**
The Washington Post

# Amazon Transcribe

Automatic speech recognition

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# Automatic speech recognition service

Amazon Transcribe

“Hello. This is Allan speaking.”

# Amazon Transcribe: Key features

Custom vocabulary

Speaker identification

Channel identification

Punctuation and capitalization

Word-level time stamps

Word-level confidence scores

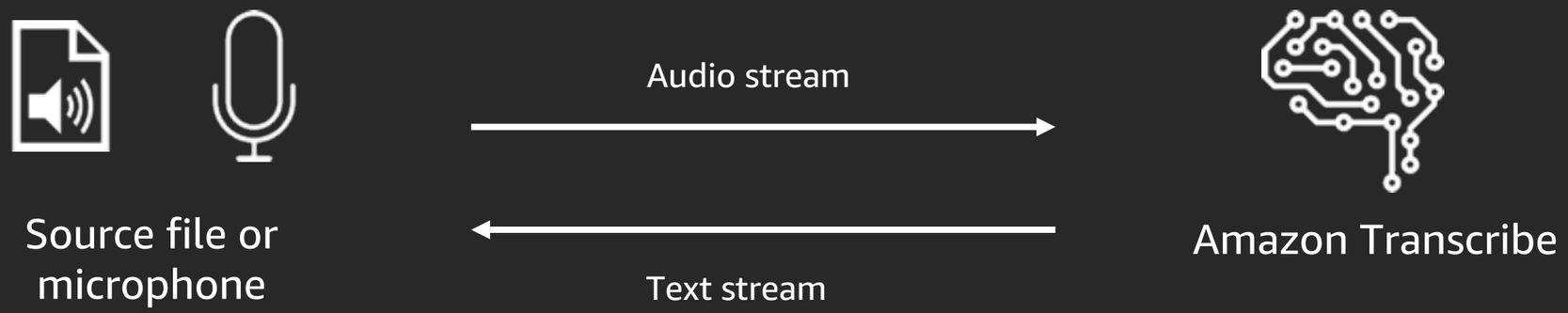
# Amazon Transcribe: Streaming transcription

Bidirectional stream over:

HTTP/2 protocol

or

WebSocket (WSS) protocol



# Speech to text

RingDNA is an end-to-end communications platform for sales teams.
Hundreds of enterprise organizations use RingDNA to increase productivity, engage in smarter sales conversations, gain predictive sales insights, and improve their win rate.

*"A critical component of RingDNA's Conversation AI requires best-of-breed speech-to-text to deliver transcriptions of every phone call. RingDNA is excited about Amazon Transcribe since it provides high-quality speech recognition at scale, helping us to better transcribe every call to text."*

**Howard Brown, CEO & Founder**
RingDNA

# Amazon Translate

Natural and accurate language translation

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# Key features

## 54 languages
2,804 combinations

## $15/1M characters
Or $0.000075 per word; pay as you go, 2M characters monthly free tier

## Real-time
< 500ms / sentence on average
< 150ms / conversational / short form

## Tag handling
XML tag placement maintains styling and formatting through translation

## Data security
Data ownership
Encryption
Access management

## Ease of use
Simple API calls and partner solutions

HIPAA **eligible**

# Amazon Translate

## Natural and fluent language translation

“Hello, what’s up? Do you want to go see a movie tonight?”

Amazon Translate

"Hallo, wat is er? Wil je vanavond naar de film gaan?"

# Translate API example

```
import boto3
translate = boto3.client("translate")
lang_flag_pairs = [("fr", "🇫🇷"), ("de", "🇩🇪"), ("es", "🇪🇸"),
                   ("pt", "🇵🇹"),("zh", "🇨🇳"), ("ja", "🇯🇵"),
                   ("ru", "🇷🇺"),("it", "🇮🇹"), ("zh-TW", "🇹🇼"),
                   ("tr", "🇹🇷"), ("cs", "🇨🇿"), ("he", "🇮🇱")]
for lang, flag in lang_flag_pairs:
    print(flag)
    print(translate.translate_text(
        Text="Hello, World",
        SourceLanguageCode="en",
        TargetLanguageCode=lang
    )['TranslatedText'])
```

# Translate API example

https://github.com/ziniman/aws-translate-demo

🇫🇷

Bonjour, Monde

🇩🇪

Hallo, Welt

🇪🇸

Hola, Mundo

🇵🇹

Olá, Mundo

🇨🇳

您好，世界

🇯🇵

ハローワールド

🇷🇺

Привет, Мир

🇮🇹

Ciao, Mondo

🇹🇼

大家好，世界

🇹🇷

Merhaba, Dünya.

🇨🇿

Ahoj, světe.

🇮🇱

.עולם ,שלום

# Amazon Comprehend

Discover insights and relationships in text

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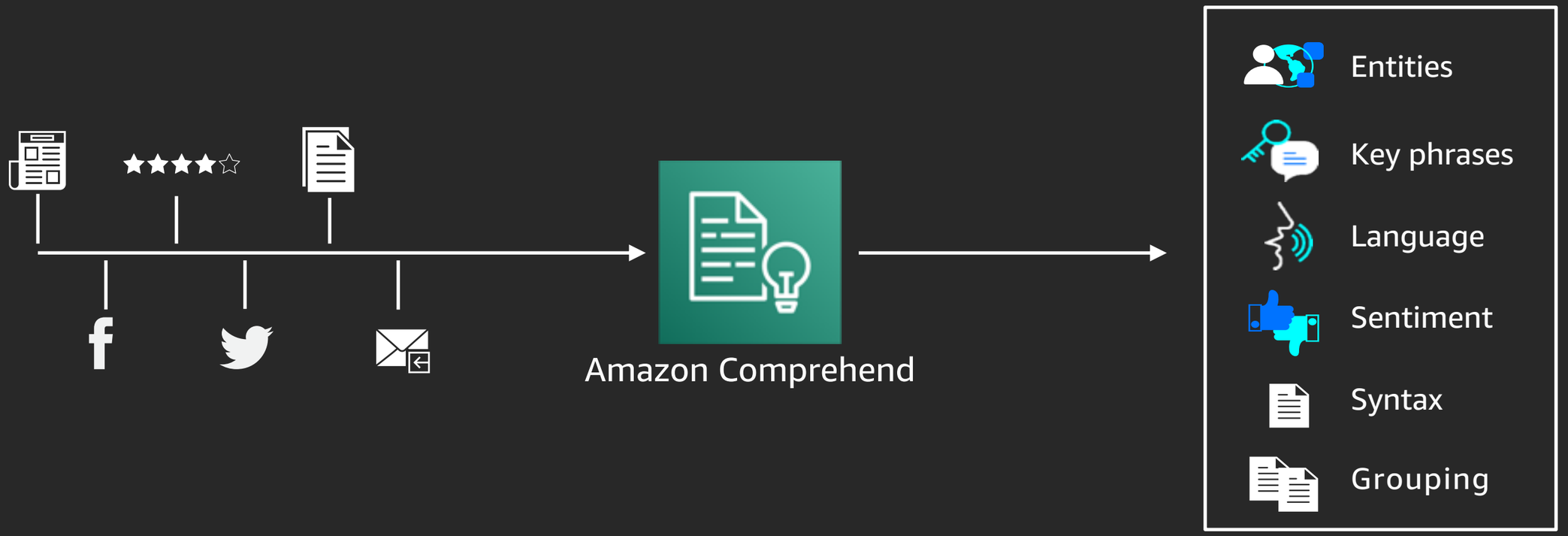
# Amazon Comprehend

Discover insights and relationships in text



# Run Amazon Comprehend on an S3 bucket

```
import boto3
import json

s3 = boto3.resource('s3')
bucket_name = 'my_bucket'
region_name = 'us-east-1'
bucket = s3.Bucket(bucket_name)

comprehend = boto3.client(service_name='comprehend', region_name=region)

for obj in bucket.objects.all():
    body = obj.get()['Body'].read()
    text = body

    sentiment_response = comprehend.detect_sentiment(Text=text, LanguageCode='en')
    print(json.dumps(sentiment_response, sort_keys=True, indent=4))
```

"The Babel fish is small, yellow, leech-like—and probably the oddest thing in the universe. It feeds on brain wave energy, absorbing all unconscious frequencies and then excreting telepathically a matrix formed from the conscious frequencies and nerve signals picked up from the speech centres of the brain, the practical upshot of which is that if you stick one in your ear, you can instantly understand anything said to you in any form of language: the speech you hear decodes the brain wave matrix."

**Douglas Adams**

The Hitchhiker's Guide to the Galaxy



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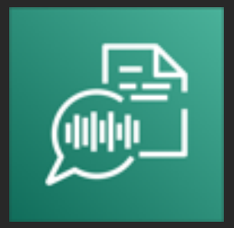
# Build your own Babel fish

Person speaks in
**English**

# Build your own Babel fish

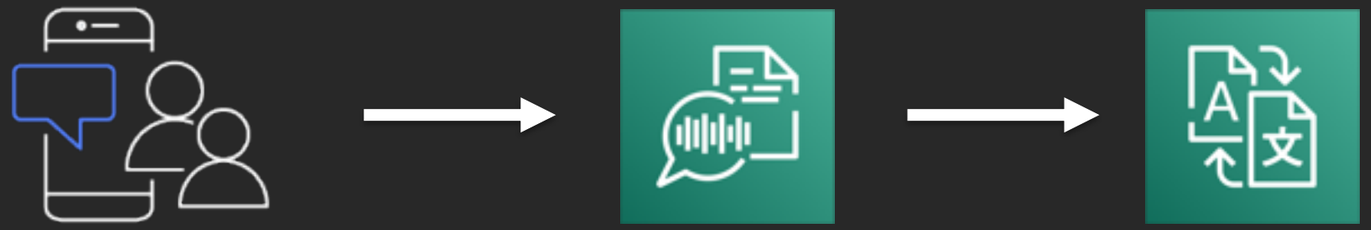


Amazon
Transcribe

Person speaks in
**English**

Transcribes voice to text
in **English**

# Build your own Babel fish

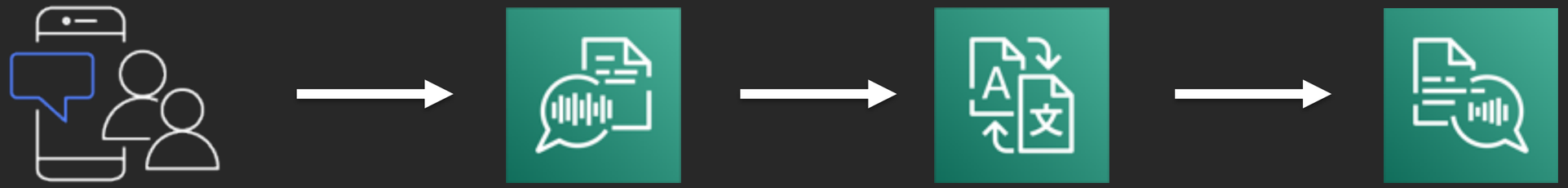



Person speaks in **English**

Transcribes voice to text in **English**

Translates text to **German**

# Build your own Babel fish




Person speaks in **English**

Transcribes voice to text in **English**

Translates text to **German**

Speaks in **German**

# Demo: Real-time audio transcription & translation

https://voice.boaz.cloud/

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# Intro: Amazon Connect

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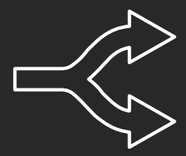
# Amazon Connect

Easy-to-use, cloud-based contact center solution that scales to support businesses of any size

With tools that grow with your needs



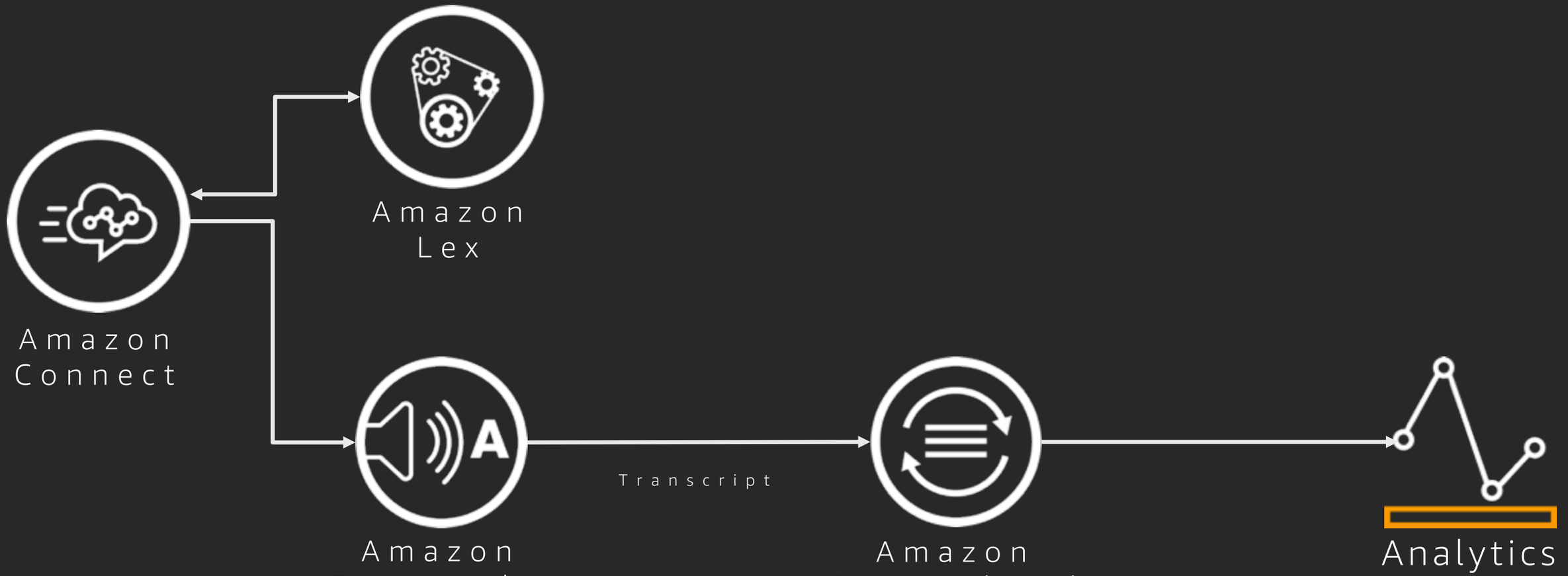
Skills-based routing
(Automatic call distribution [ACD])

Call recording

Real-time and historical analytics

High-quality voice capability

# Improving contact centers with artificial intelligence



# What we will build today

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# Our use-case today

Processing of contact center call recordings

Continual analyses for sentiment and key words

Actionable insights from data as strategic asset

Cloud-first & serverless

Photo: Dirk Fröhner

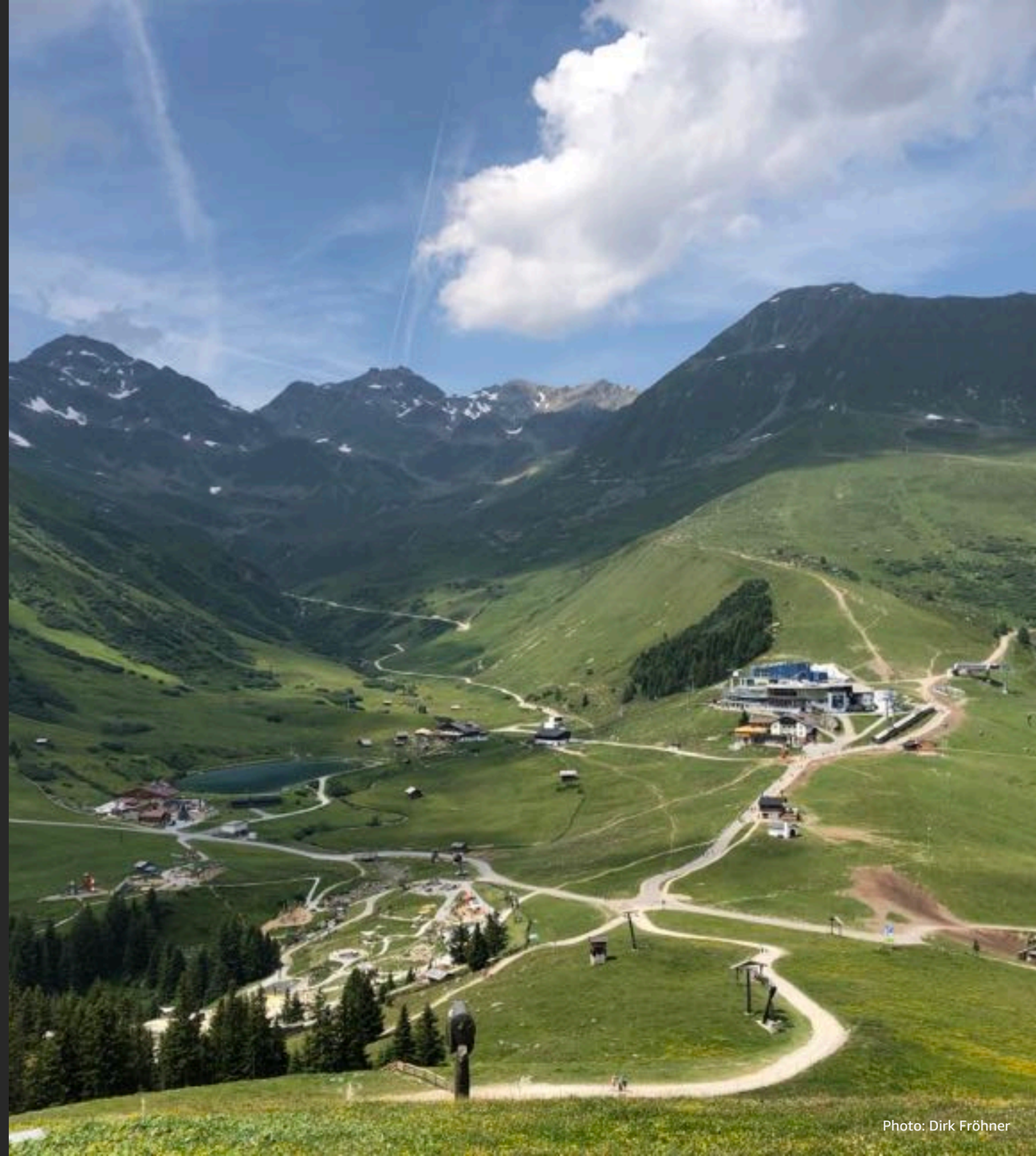
# Choose your path

Labs for different experience levels to respect a heterogeneous audience

Foundation lab to generate or obtain sample audio recordings

Exploration path for less advanced participants

Deep-dive path for more advanced participants



# Choose your path

Exploration

labs 1–3

Deep-dive

labs 4–6

Foundation

lab 0

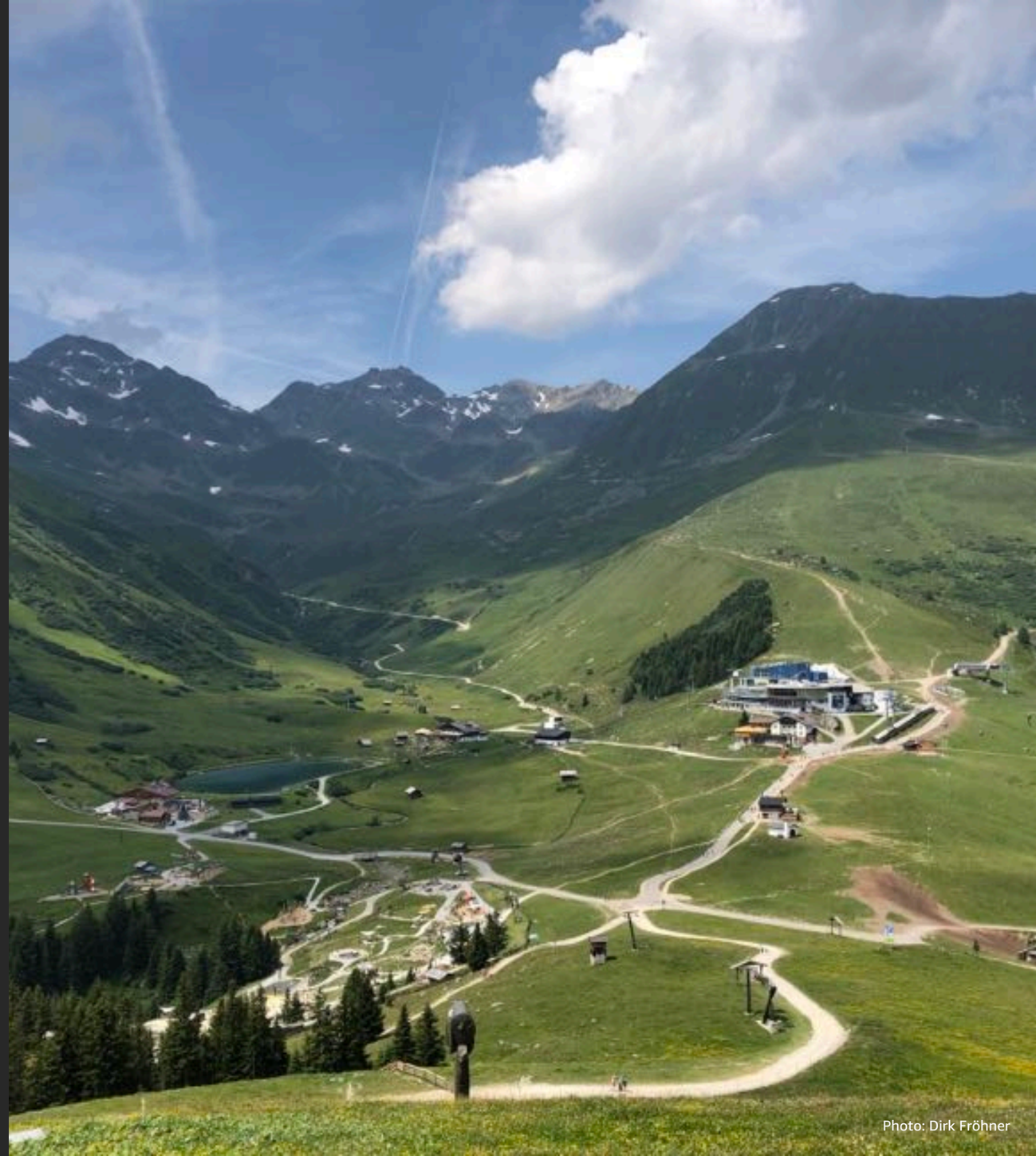


Photo: Dirk Fröhner

# Foundation

Foundation pillar for both paths

Create or obtain your sample call recordings

# Foundation: Lab 0

Create or obtain your sample call recordings, three options available

# Foundation: Lab 0

Create or obtain your sample call recordings, three options available

Amazon
Connect

# Foundation: Lab 0

Create or obtain your sample call recordings, three options available

Amazon Connect

Amazon Polly

# Foundation: Lab 0

Create or obtain your sample call recordings, three options available

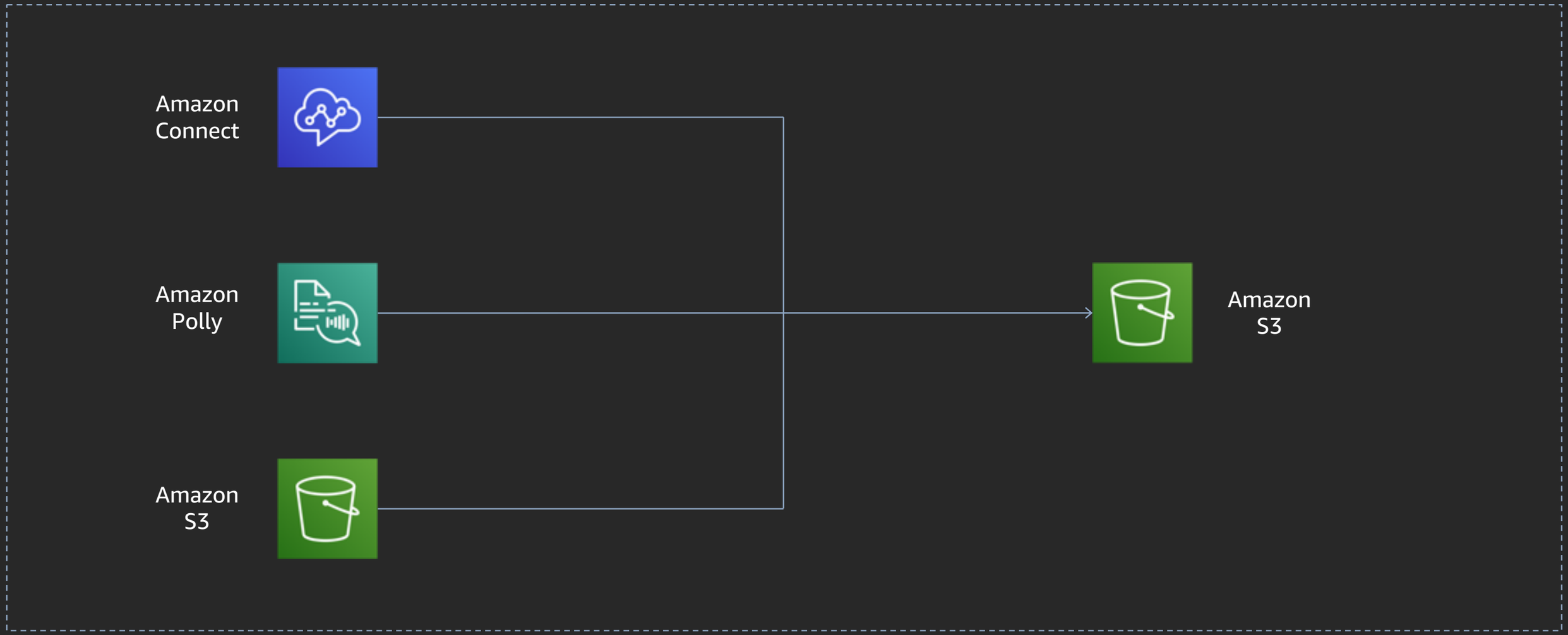
Amazon Connect

Amazon Polly

Amazon S3

# Foundation: Lab 0

Create or obtain your sample call recordings, three options available



# Exploration path

Manual soldering in the AWS management console

Learning objectives:

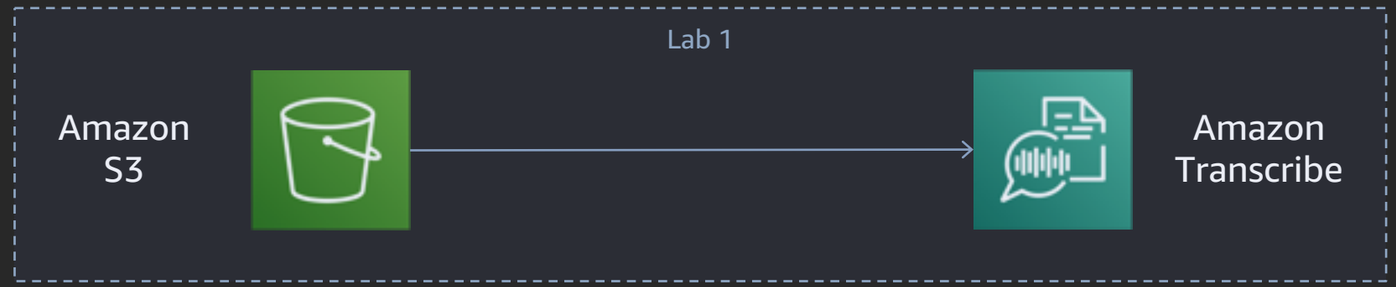
- Explore speech and language AI services
- Understand how these services can help you without the need to train your own ML models

# Exploration: Labs 1–3

Manually run through ASR and NLP analyses, look into language translation as well

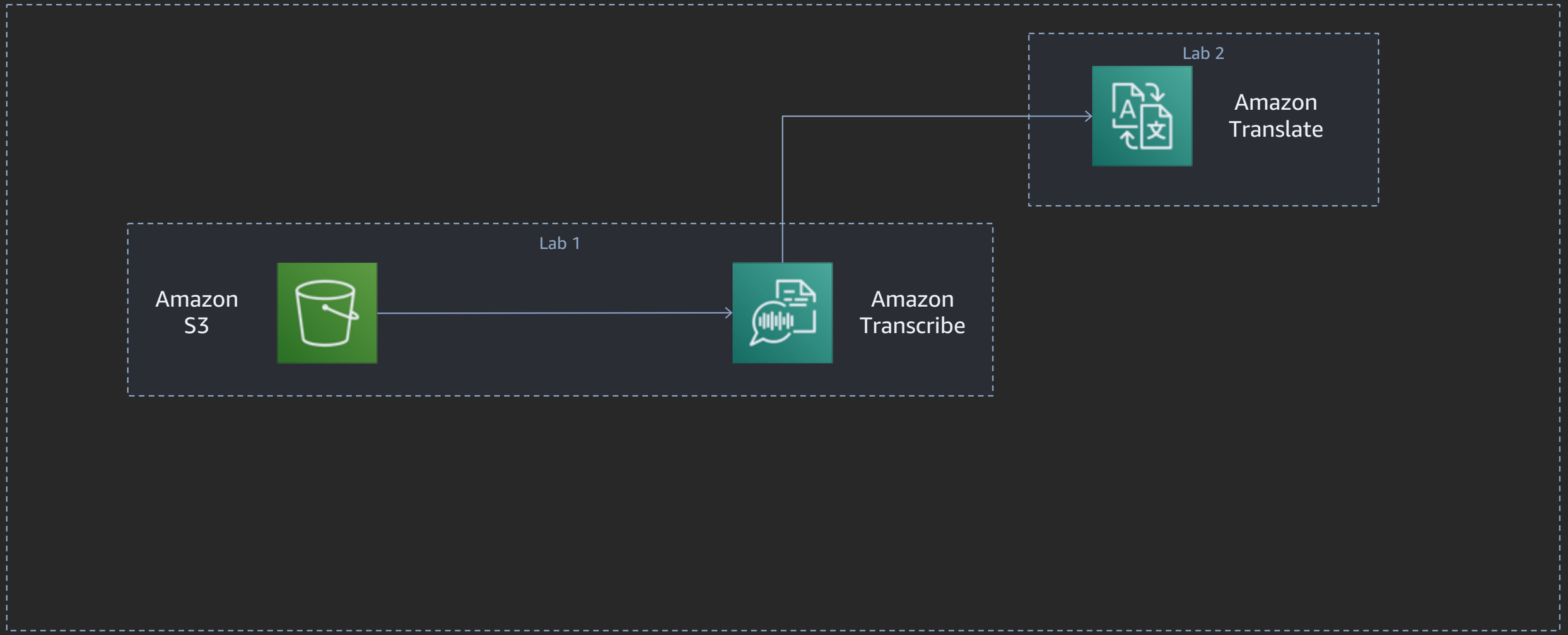
# Exploration: Labs 1–3

Manually run through ASR and NLP analyses, look into language translation as well



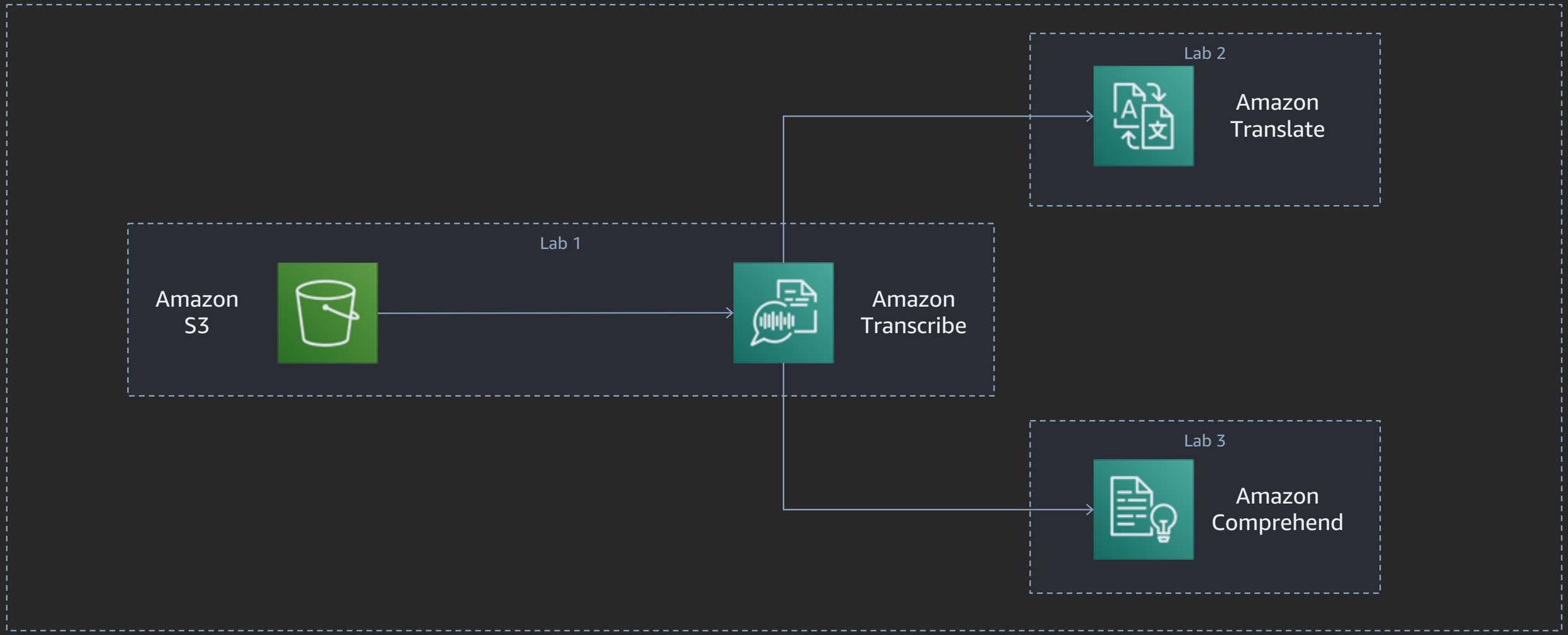
# Exploration: Labs 1–3

Manually run through ASR and NLP analyses, look into language translation as well



# Exploration: Labs 1–3

Manually run through ASR and NLP analyses, look into language translation as well



# Deep dive path

Launching a processing pipeline to automatically run ASR + NLP analyses

Learning objectives:

- Explore how to use speech and language AI services with their APIs programmatically
- Understand how to further analyze and visualize these results with AWS analytics services

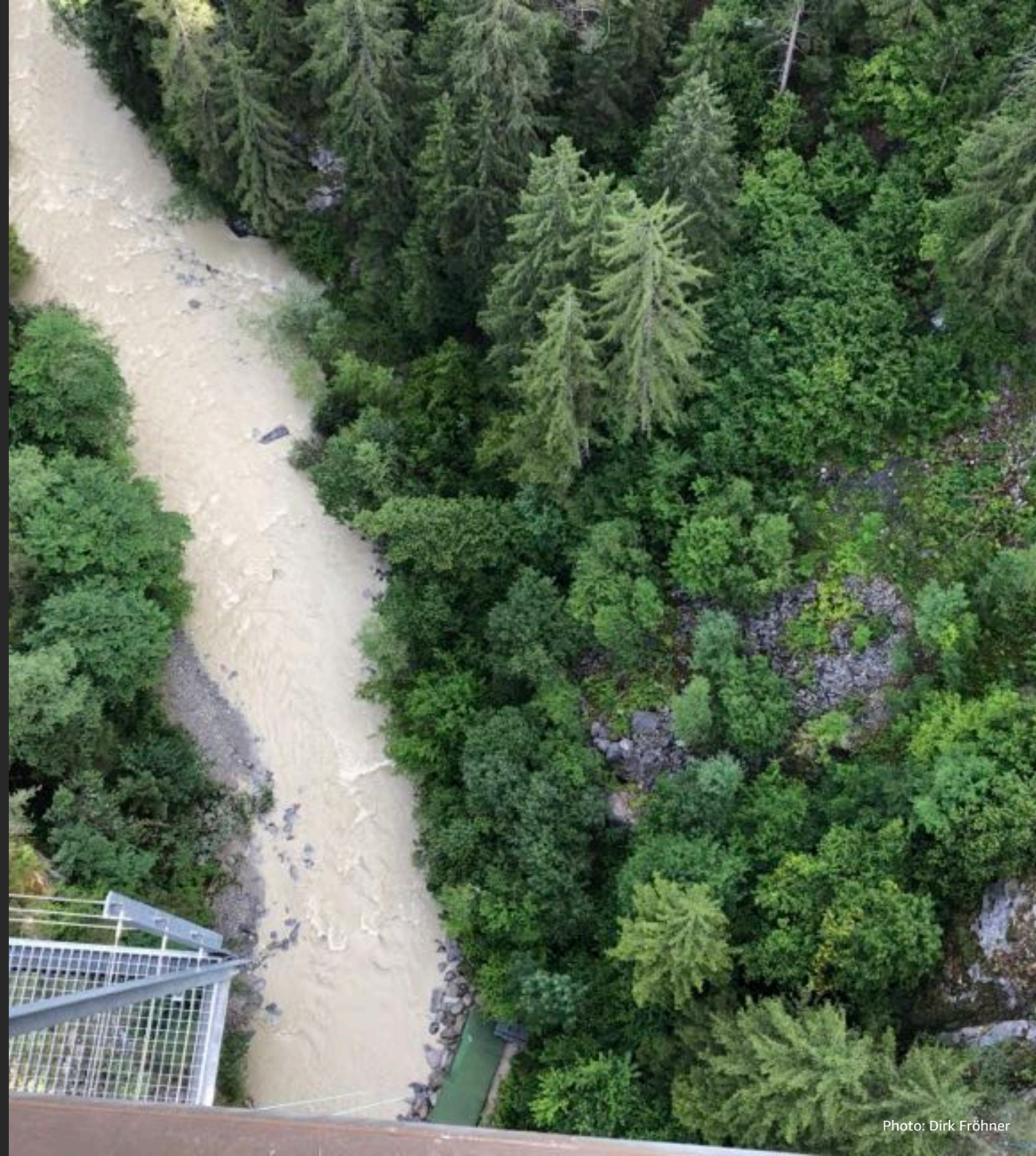


Photo: Dirk Fröhner

# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics

# Deep dive: Lab 4

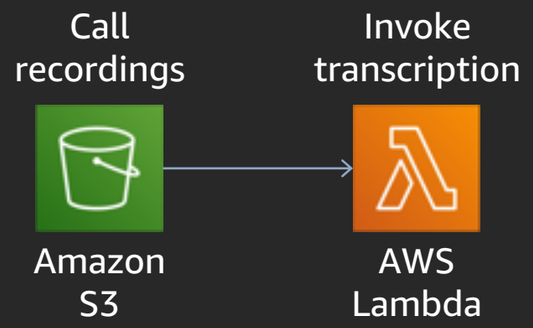
Launch a processing pipeline to automatically run ASR, NLP, and further analytics

Call recordings

Amazon S3

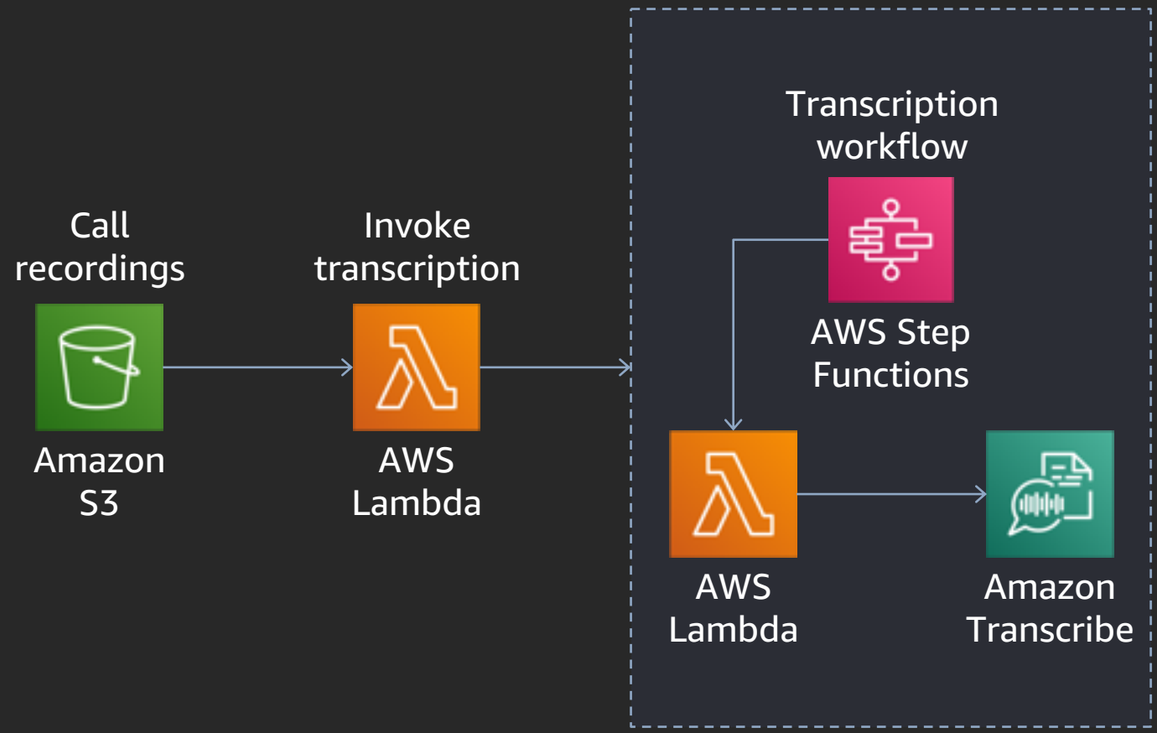
# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



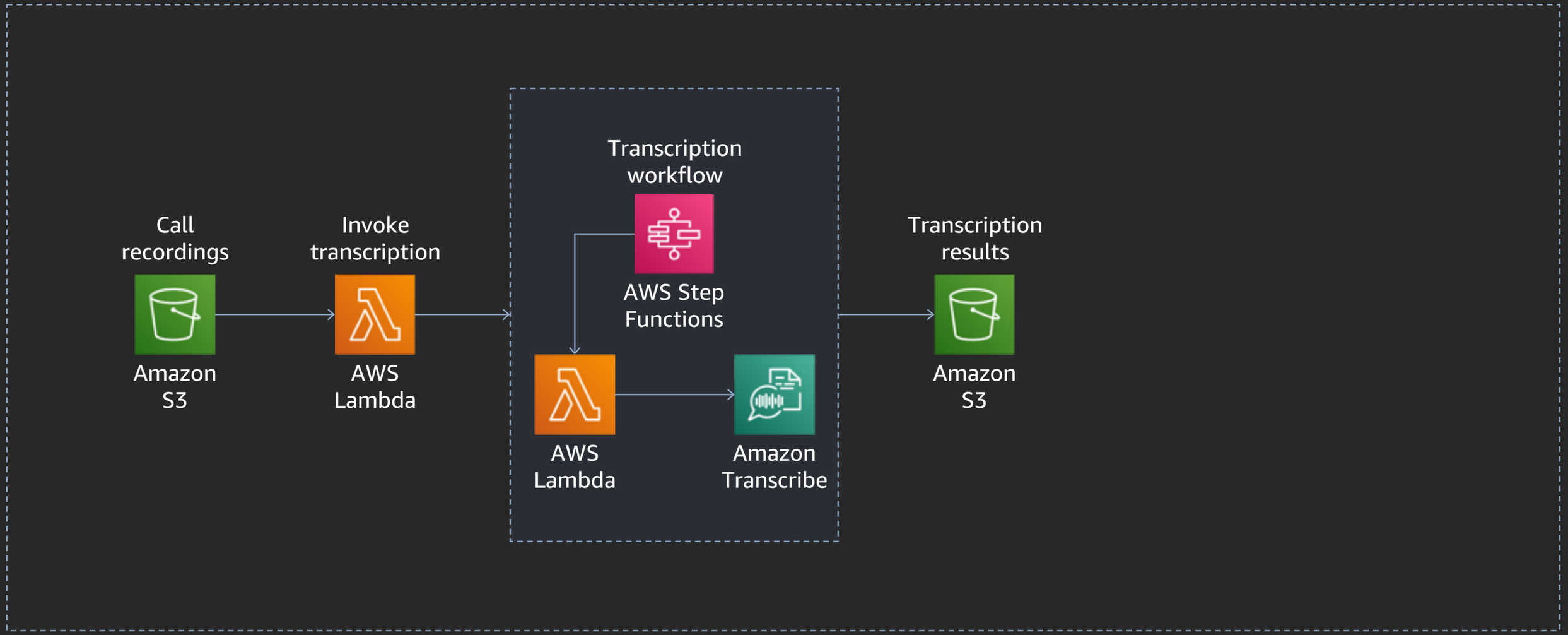
# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



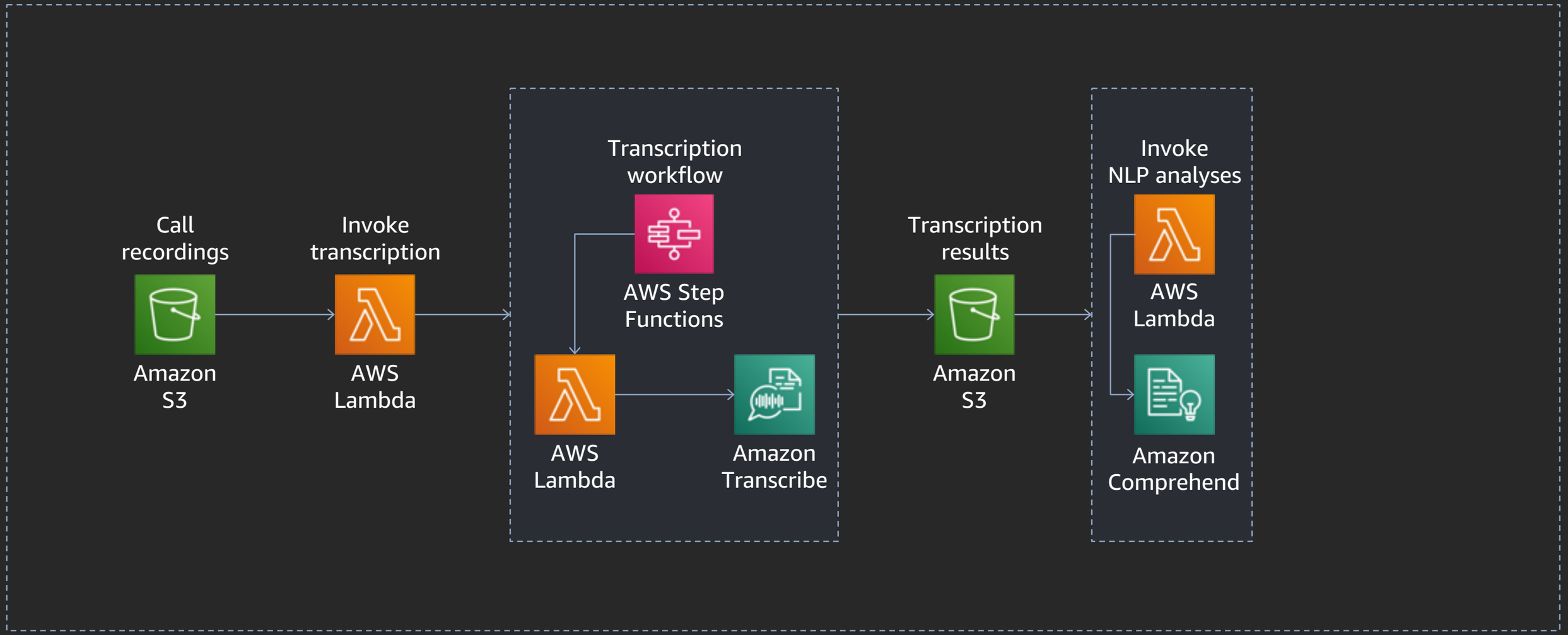
# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



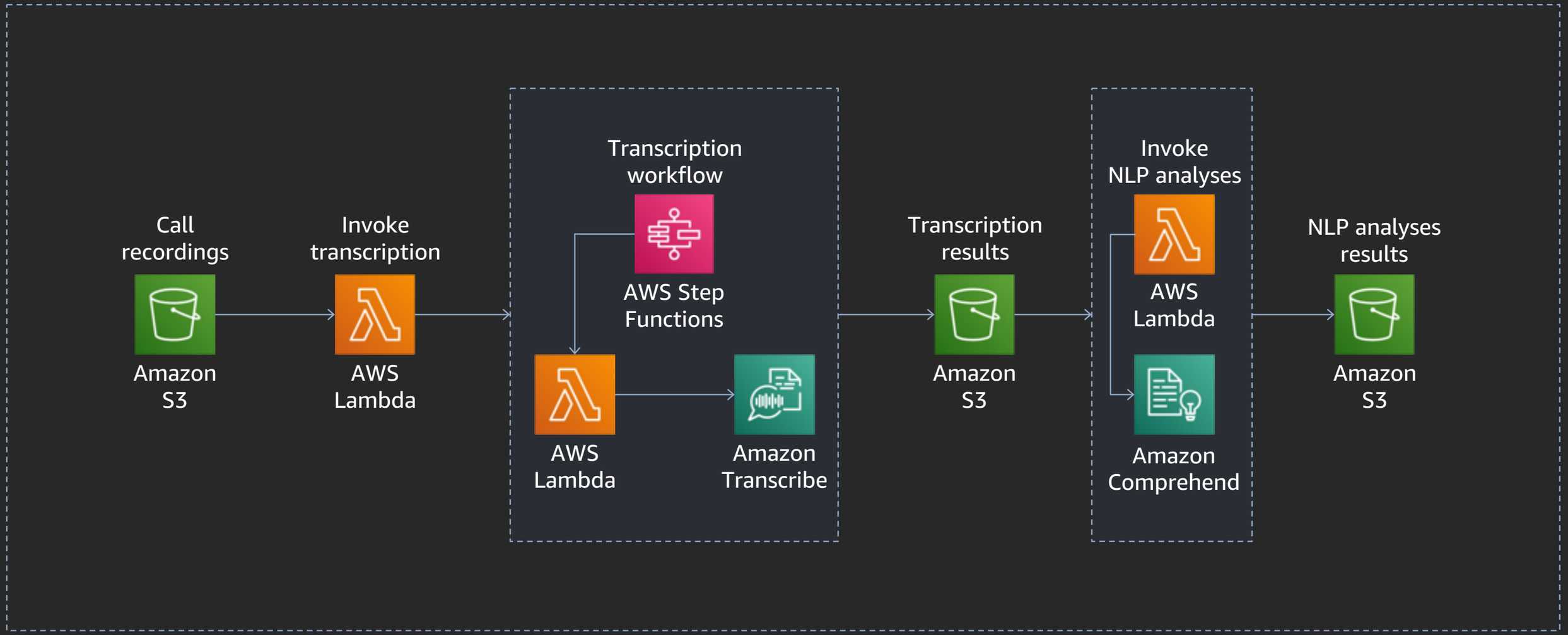
# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



# Deep dive: Lab 4

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics

# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics

Lab 5

# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics

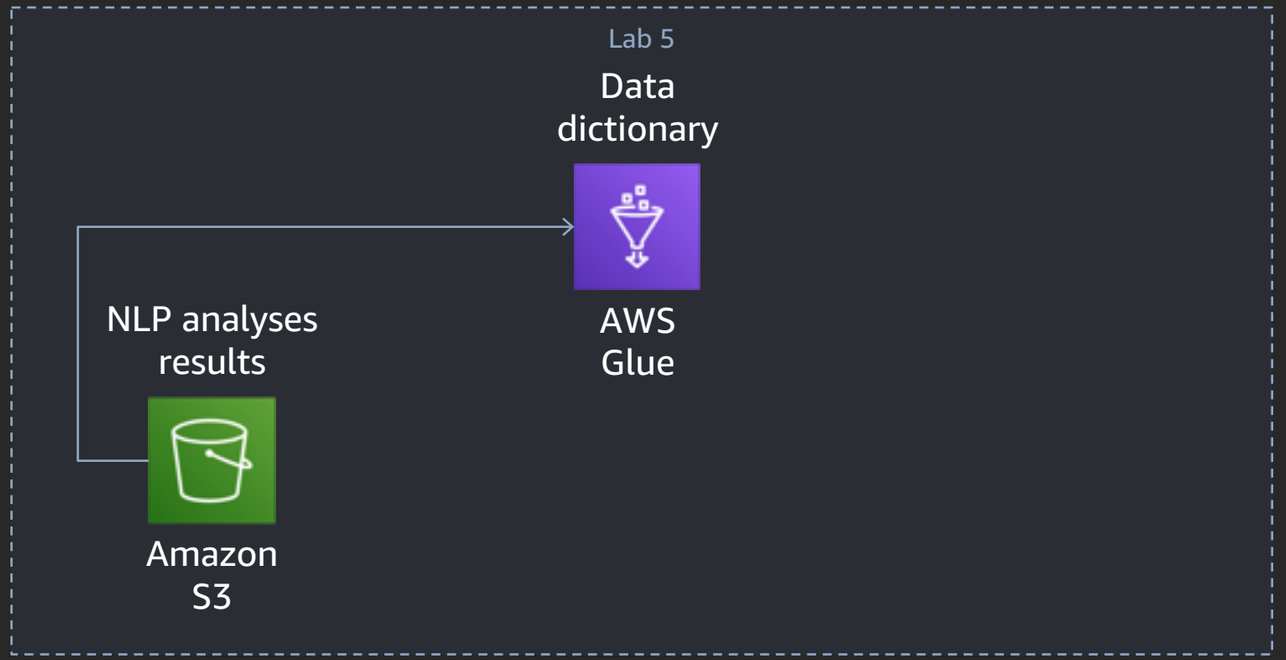
Lab 5

NLP analyses results

Amazon S3

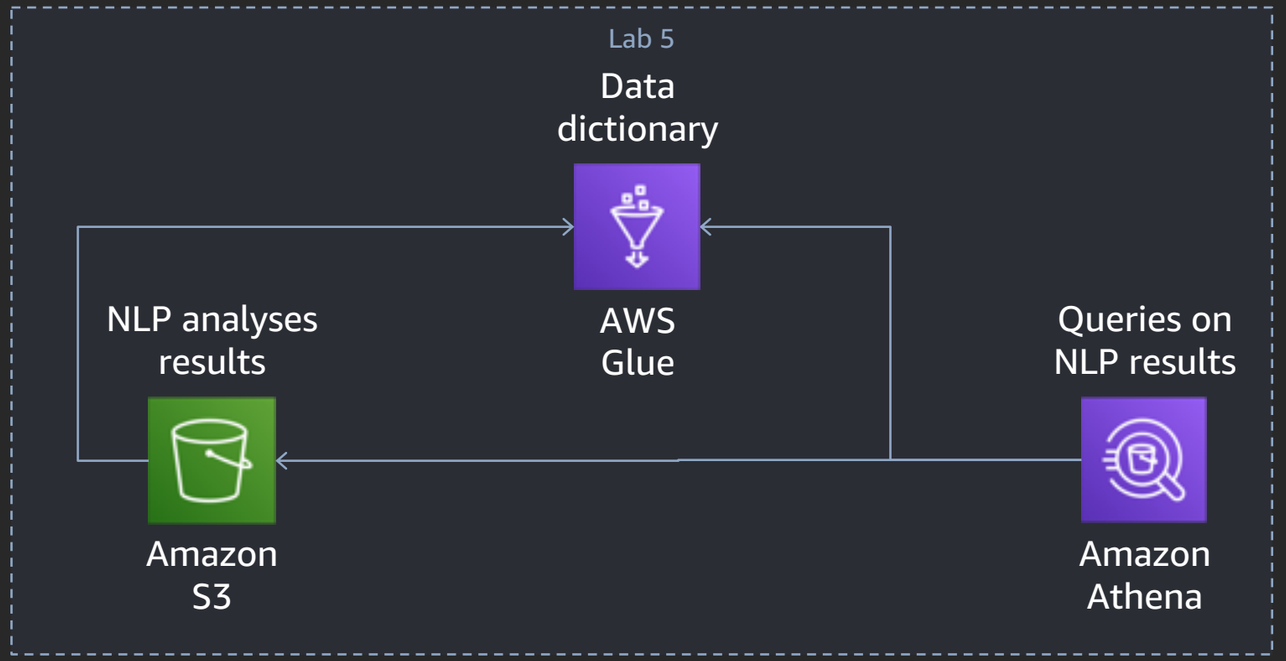
# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



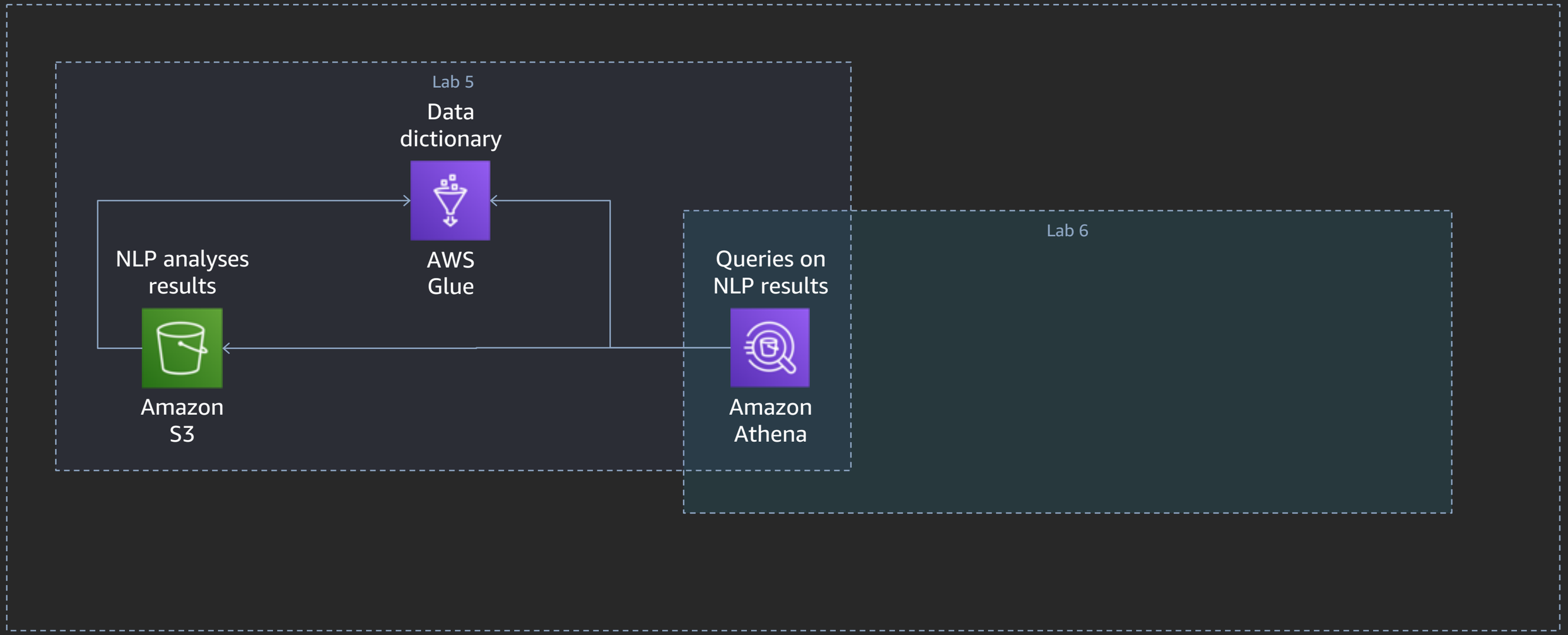
# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



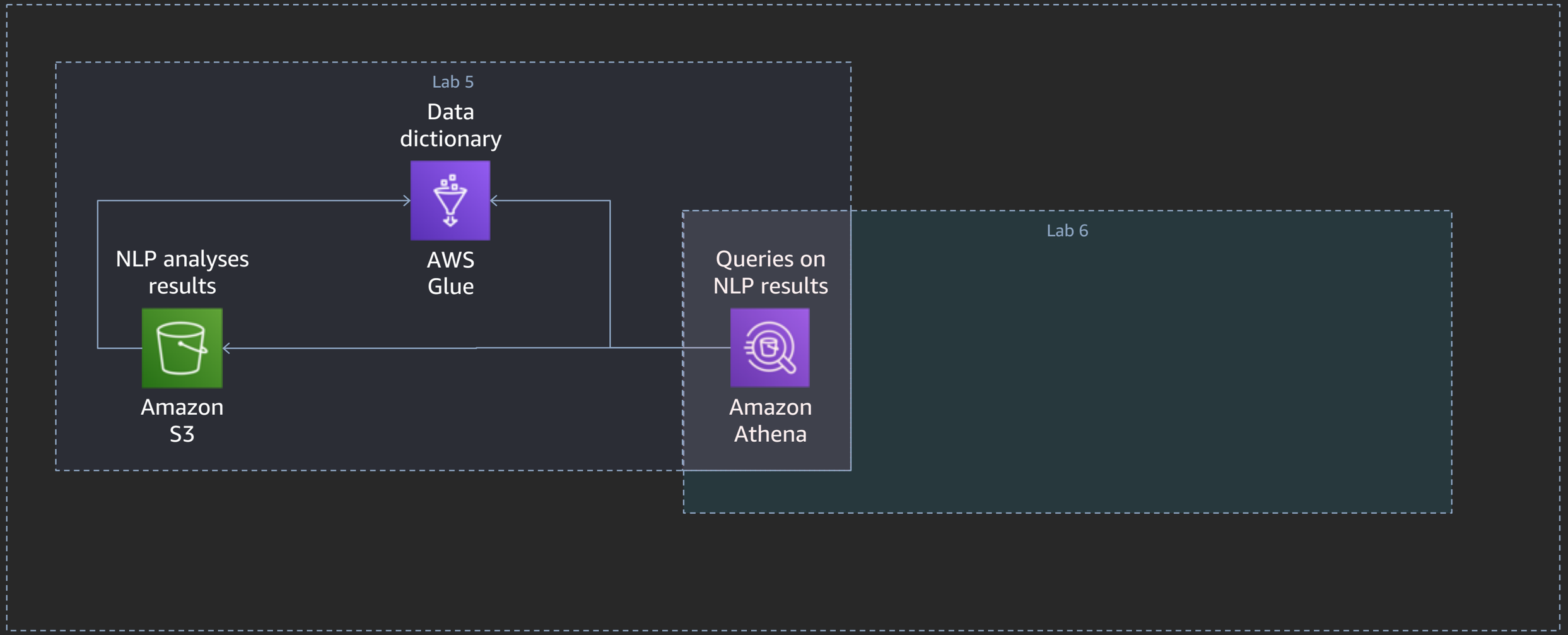
# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



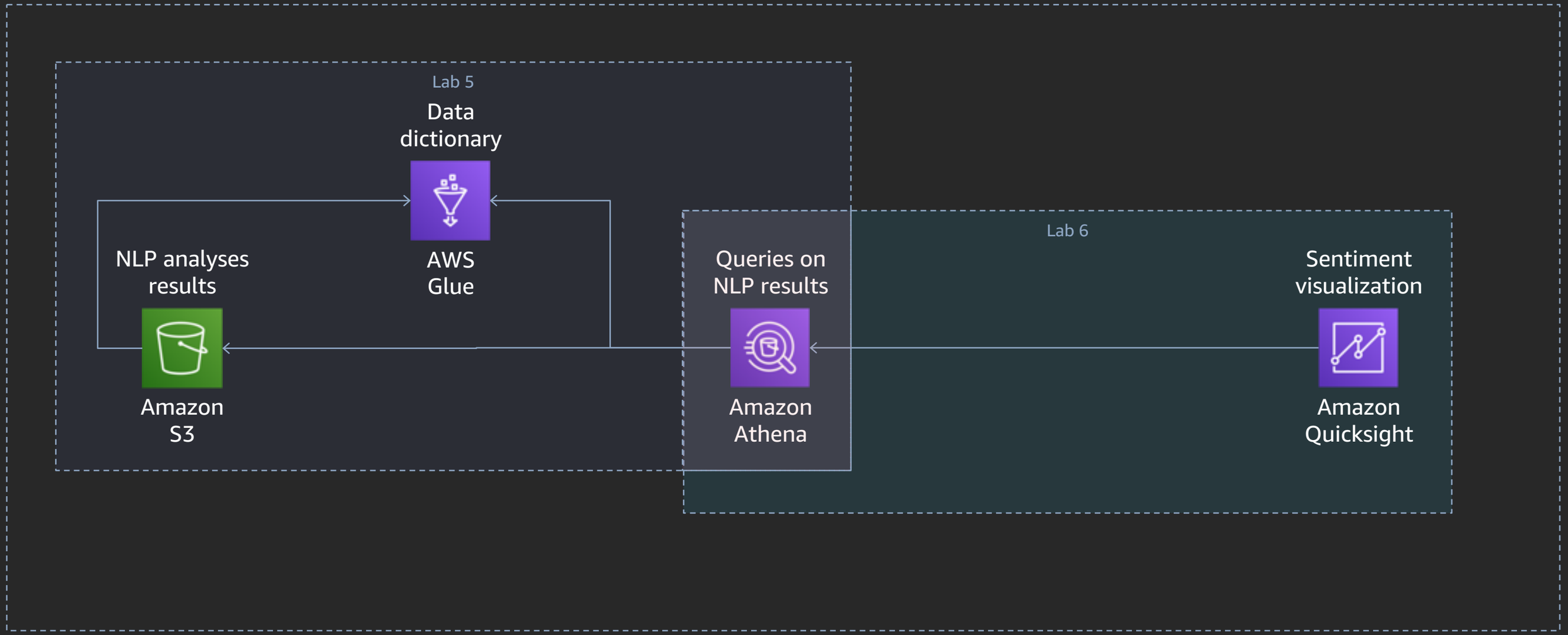
# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



# Deep dive: Labs 5–6

Launch a processing pipeline to automatically run ASR, NLP, and further analytics



# Lab guide:

# http://bit.ly/2019-aim303

# Go Build!

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# Wrap-up

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# Resources / call to action

AWS solution: AI-powered speech analytics for Amazon Connect

- http://bit.ly/2019-aim303-r1

Blog posts that inspired this workshop

- Part 1: http://bit.ly/2019-aim303-r2
- Part 2: http://bit.ly/2019-aim303-r3

Where do you go from here? Think about use-case opportunities

- Get continual insights about callers' sentiments
- Search for and reason on top-of-call metadata
- Report on agent performance / callers' happiness or frustration (agent ID, caller ID)

Find the content of this slide also on the lab guide website

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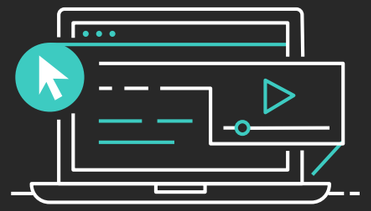

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# Thank you!

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