Section 22: Other serverless - step function and app sync

Step function overview

Orchestrate : means arrange

AWS Step Functions lets you coordinate multiple AWS services into serverless workflows so you can build and update apps quickly. Using Step Functions, you can design and run workflows that stitch together services such as AWS Lambda and Amazon ECS into feature-rich applications. Workflows are made up of a series of steps, with the output of one step acting as input into the next. Application development is simpler and more intuitive using Step Functions, because it translates your workflow into a state machine diagram that is easy to understand, easy to explain to others, and easy to change. You can monitor each step of execution as it happens, which means you can identify and fix problems quickly. Step Functions automatically triggers and tracks each step, and retries when there are errors, so your application executes in order and as expected.

Machine generated alternative text:
AWS Step Functions 
• Build serverless visual workflow to orchestrate your Lambda functions 
• Represent flow as a JSON state machine 
• Features: sequence, parallel, conditions, timeouts, error handling... 
• Can also integrate with EC2, ECS n p ise servers, API Gateway 
• Maximum execution time of I 
• Possibility to implement human p „dl'fe ure 
• Use cases: 
• Order fulfillment 
• Data processing 
• Web applications 
• Any workflow 

Machine generated alternative text:
Visual workflow in Step Functions 
Cance 
Job 
In Progress 
Success Failed 
Wait X Seconds 
Get Job Status 
Job Complete? 
Cance 
• In Progress 
Get FN 
Success Failed 
Job Failed 
Get Final Job Status 

Machine generated alternative text:
Step Functions — Error Handling 
• Any state can encounter runtime errors for various reasons: 
• State machine definition issues (for example, no matching rule in a Choice state) 
• Task failures (for example, an exception in a Lambda function) 
WS Step Functions causes 
• By default, when a state repo 
the execution to fail entirely. 
• Retrying failures - Retry: IntervalSecohds, MaxAttempts, BackoffRate 
• Moving on - Catch: ErrorEquals, Next 
• Best practice is to include data in the error messages 

Machine generated alternative text:
Step Functions — Standard vs Express 
Maximum duration 
Supported execution start rate 
Supported state transition rate 
Pricing 
Execution history 
Execution semantics 
Standard Workflows 
1 year. 
Over 2,000 per second 
Over 4,000 per second per account 
Priced per state transition. A state transition is 
counted each time a step in your execution is 
completed (more expensive) 
Executions can be listed and described with Step 
Functions APIs, and visually debugged through 
the console. They can also be inspected in 
CloudWatch Logs by enabling logging on your 
State machine. 
Exactl•F0nce workflow execution. 
Express Workflows 
5 minutes. 
Over 100,000 per second 
Nearly unlimited 
Priced by the number of executions you run, 
their duration, and memory consumption 
(cheaper) 
Executions can be inspected in CloudWatch 
Logs by enabling logging on your state 
machine. 
At-least-once workflow execution. 

Step function examples

<https://aws.amazon.com/step-functions/use-cases/>

Machine generated alternative text:
TRANSCODE MEDIA FILES 
You can use Amazon SS to trigger AWS Lambda to process data 
images, transcode videos. index files, process logs, validate 
is 
upload. For example, you can use Lambda to thumbnail 
filter data in real-time. 
SS 
and 

Machine generated alternative text:
SEQUENCE BATCH PROCESSING JOBS 
You can perform secondary analysis on genomic data to identify meaningful information that clinicians and researchers can act on in a timely fashion. Step Functions can coordinate 
multiple AWS Batch jobs that takes raw reads generated from sequencers and then processes them in a genomics pipeline to identify the variation in a biological sample compared to a 
standard genome reference. Step Functions will wait for each job to complete before moving to the next step in the pipeline. 
AWS Step Functions 
Coordinate batch jobs for 
secondary analysis 
AWS Batch 
Batch job #1 maps 
DNA sequences to a 
standard genomic 
reference 
AWS Batch 
Batch job #2 
identifies variants 
from sequence data 
AWS Batch 
Batch job #3 
combines variants 
with other data to 
identify correlations 

Machine generated alternative text:
SEND MESSAGES FROM AUTOMATED WORKFLOWS 
You can identify valuable data that fits specific criteria related to litigation cases by using Step Functions to automate processing of the datasets, which can easily contain millions of 
records. In this example, various internet sites and data repositories are monitored, and the Step Functions workflow manages a manual approval from an administrator before continuing 
on to ingest the data. Data is then sent to Amazon SQS. SQS expands the data, extracts the hashes and metadata about the hashes, performs any necessary de-duplication, and publishes 
it to Amazon S3. 
Various data sources 
Amazon API 
Gateway 
Route API calls 
from third-party 
data sources 
AWS Lambda 
Trigger AWS Step 
Functions workflow 
for each data source 
AWS Step Functions 
Coordinate manual approval 
and data publication 
Admin verification 
Confirms whether 
data is relevant 
Amazon SQS 
Queues data for 
processing 
AWS Lambda 
Deduplication and 
extraction Of 
hashes and 
metadata 
Amazon S3 
Information 
relevant to litigation 
published to 
internal site 

Step function hands on

**Step1 ) search step function**

Machine generated alternative text:
Application integration 
AWS Step Functions 
Build distributed applications 
using visual workflows. 
AWS Step Functions makes it easy to coordinate the components of distributed applications as a 
series of steps in a visual workflow. You can quickly build and run state machines to execute the steps 
of your application in a reliable and scalable fashion. 
Get started 
Get started fast by running a Hello World example 
in 3 clicks. 
Get started 
Pricing (US) 

**Click get started**

**Visual representation of left**

Machine generated alternative text:
Step 2 
Specify details 
Definition 
Example code is read-only, but you can edit it after creation. In AWS Step Functions, workflows are defined using Amazon States Language. Learn more 
Export 
Start 
Pass 
1 
Hello World example? 
Yes 
Wait 3 sec 
Layout 
Cancel 
" Comment " 
Language' , 
"StartAt" 
"States 
"Pass " 
"A Hello World example demonstrating various state types of the Amazon States 
"Pass" 
c 
performing 
work. 
Pass 
" Comment" 
"A Pass state passes its input to its output, without 
states are useful when constructing and debugging state machines. ' 
"Type" 
"Next" 
"Pass", 
"Hello World example?" 
No 
"Hello World example?" • 
" Comment" 
"A Choice state adds branching logic to a state 
implement 16 different comparison operators, and can be combined 
"Type" 
"Choice" , 
"Choices 
"Variable": "$.1sHe110Wor1dExamp1e" , 
"BooleanEqua1s 
true, 
"Next" 
"Yes " 
"Variable": "$.1sHe110Wor1dExamp1e" , 
"BooleanEqua1s 
false, 
"Next" 
machine. Choice rules can 
using And, Or, and Not" 
Hello 
World 
Hello World 
End 
Next 

**Don’t change click create state machine**

Machine generated alternative text:
Step Functions State machines 
Run a Hello World example 
Step 
Specify details 
Rcn.'icw World example 
Name 
Step 2 
Sikcify details 
State machine name 
Must Can 
Tags - optional 
English 
w 2008 - 
HelloWorId 
Permissions 
Execution role 
The IAM role define which 
O Create new 
Let Step 
o 
Choose an existing 
C) Enter a ARN 
Logging 
Log b2veI 
Tracing 
during To a go IAM 
state has 
pu state machines and details 
You an log state xhineg hisWy to Logs state must enable logging to debug 
which histMy to log 
CloudWatch Logs chargé apply. 
You an AWS X-Ray on state fw appliætion debugging. and Stamfwd X-Ray apply Lu 
n 
Enable X-Ray tracing 
a traæ ID G not by 
Step 
will to X-Ray state 
A æg is a Label thatyæ 
e. Each ag consists of key optional valu 
All 
Pou cy 
of 
tags to filte 
or tÆCky 
AWS 

**Click on start execution**

Machine generated alternative text:
New execution 
Start an execution using the latest definition of the state machine. Learn more 
Enter an execution name - optional 
Enter your execution id here 
03649bf4-5423-b92a-c6d6-f6279e558d97 
Input - optional 
Enter input values for this execution in JSON format 
Cancel 
Start execution 
"IsHe110Wor1dExamp1e" 
Open in a new browser tab 
true 

**Think like each step is calling a lambda function**

Machine generated alternative text:
Step Functions 
State machines 
Activities 
Feature spotlight 
Join our feedback panel 
Graph inspector 
• In Progress Succeeded 
Execution event history 
Start 
Details 
Step input 
Export 
Step output 
Timestamp 
Layout v 
World 
Step 
Select a step to view its details. 
Resource 
@ 2008 
Elapsed Time (ms) 
eedback 
English (US) v 
ID 
Type 
ExecutionStarted 
Oct 19, 2020 PM 
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Terms Of Use 

**Click new execution and make as false**

Machine generated alternative text:
Step Functions 
HelloWorld 
State machines 
Details 
Activities 
Feature spotlight 
ARN 
Join our feedback panel 
arn:aws:states:eu-west-2:398678778168:stateMachine:HelloWorld 
IAM role ARN 
arn:aws:iam::398678778168:role/service-role/StepFunctions-HelloWorld-role- 
03649bf4-5423-b92a-c6d6-f6279e558d97 
UI 
Edit 
Type 
Standard 
Creation date 
Oct 19, 2020 PM 
Start execution 
Delete 
Actions 
Start execution 
c 
Started 
35c2523c e 
Executions 
Logging 
Definition 
Tags 
Status 
@ Failed 
@ Succeeded 
Executions 
(2) 
Q Search for executions 
Name 
View details 
Filter by status 
Stop execution 
End Time 
O 
O 
b2312f01-ce22-180b-b9af-2f7c6479c866 
Oct 19, 2020 PM 
Oct 19, 2020 PM 
Oct 19, 2020 PM 
Oct 19, 2020 PM 

Machine generated alternative text:
revamped with performance improvements and an updated UI to improve the execution debugging experience. 
State machines Create state machine 
Step Functions 
O 
Start with a template 
Get started quickly with common patterns for 
Amazon States Language. 
O 
o 
Run a sample project 
Step 1 
Define state machine 
Step 2 
Specify details 
Define state machine 
Author with code snippets 
Author your workflow using Amazon States 
Language. You can generate code snippets to easily 
build out your workflow steps. 
Type 
O Stand 
Deploy and run a fully functioning sample project in 
minutes using CloudFormation. 
Ex ress 
rable, checkpointed workflows for machine learning, order fulfillment, IT/DevOps 
automation, E TL jobs, and other long-duration workloads. 
Help me decide 
Definition 
Define your workflow using Amazon States Language e. Refresh the graph to render the definition. 
Event-driven workflows for streaming data processing, microservices orchestration, 
10T data ingestion, mobile backends, and other short duration, high-event-rate 
workloads. 
Export v 
Layout V 

**Note : standard is much better suited because it is for one year**

**App sync overview ( draphql ,websocket, mobile data application)**

**AppSync** is a managed GraphQL service that makes it easy to build mobile and web applications. The power of **AppSync** is that it allows you to build, mange and synchronize real-time subscriptions while also allowing you to have access to **app** data when mobile devices are offline

**Graphql: return the field we want**

Machine generated alternative text:
AWS AppSync - Overview 
• AppSync is a managed service that uses GraphQL 
• GraphQL makes it easy for applications to get exactly the data they need. 
• This includes combining data fro 
• NoSQL data stores, Relational 
• Integrates with DynamoDB,A 
• Custom sources with AWS 
a 
or more sources 
APIs. 
c arch & others 
• Retrieve data in real-time with Web ocket or MQTT on WebSocket 
• For mobile apps: local data access & data synchronization 
• It all starts with uploading one GraphQL schema 

**Note : with graphql we can ask any field and automatically it will return from appsync**

Machine generated alternative text:
GraphQL example 
type Query 
human ( : 
ID!) : Human 
type Human 
name: String 
GraphQL query 
sent by clients 
GraphQL 
Response in JSON 
Execute Query 
human(id: 1øø2) 
appearsln 
starships 
appea rsln: 
starships: 
enum Episode 
NEWHOPE 
EMPIRE 
JEDI 
Episode) 
(Starship) 
Schema 
uploaded 
DynamoDB 
Resolver 
DynamoDB 
nc 
type Starship 
name: String 
Gra h L Schema on A 

Machine generated alternative text:
AppSync Diagram 
DynamoDB 
Aurora 
ElasticSearch 
Service 
Lambda Anything 
Web apps 
Mobile apps 
Real-time 
dashboards 
Offline Sync 
AppSync 
CloudWatch 
GraphQL Schema 
Resolvers 
HTTP 
HTTP 
Public 
HTTP APIs 
72 people have written a note here. 

Machine generated alternative text:
AppSync — Security 
• There are four ways you can authorize applications to interact with your 
AWS AppSync GraphQL API: 
• API KEY 
• AWS_IAM: IAM users / roles / cross-account access 
• OPENID_CONNECT: OpenD Connect provider / JSON Web Token 
• For custom domain & HTFPS, use CloudFront in front of AppSync 

**App Sync Hands on**

Machine generated alternative text:
MOBILE SERVICES 
AWS AppSync 
Power your applications with the right data, from one or more 
data sources, at global scale 
AWS AppSync simplifies application development by letting you create a flexible API to securely 
access, manipulate, and combine data from one or more data sources. AppSync is a managed service 
that uses GraphQL to make it easy for applications to get exactly the data they need. 
With AppSync, you can build scalable applications, including those requiring real-time updates, on a 
range of data sources such as NoSQL data stores, relational databases, HTTP APIs, and your custom 
data sources with AWS Lambda. For mobile and web apps, AppSync additionally provides local data 
access when devices go offline, and data synchronization with customizable conflict resolution, 
when they are back online. 
Create AWS AppSync API 
2 min read 
Create API 
Estimated 3-5 mins 
Getting started 
What is AWS AppSync? 

**Click on create API and there is different ways to create API**

**We will opt for event app**

Machine generated alternative text:
Step 2 
Create a model 
Step 3 
Create resources 
AWS AppSync provides you multiple ways to create a GraphQL API. You can customize and build your API from scratch, create a blank API, or even get started using one of our 
sample APIs. 
Customize your API or import from Amazon DynamoDB 
O 
Build from scratch 
Start with a blank API and design your own 
custom schema. 
Tasks App 
Learn how to use groups authorization with 
Cognito User Pools to build a Task app. 
Start 
O 
Start 
O 
Create with wizard 
We'll help you build an API from the ground up. 
Start from a sample project 
Event App 
Learn to build a basic AWS AppSync app for 
creating calendar events with user comments. 
ad more 
Blog App 
o 
o 
O 
Import DynamoDB Table 
You can begin by importing an existing table as a 
DataSource. 
Chat App 
O 
Learn how to use AWS AppSync subscriptions to 
enable real-time chat between users. 
Read more 
Learn how to use AWS Lambda to read and write 
to Amazon RDS in a Blog app 
Read more 

Machine generated alternative text:
Services v 
Step 1 
Getting Started 
Step 2 
Create a model 
Step 3 
Create resources 
Create resources 
API configuration 
API name 
Type a name for your AWS AppSync API. 
My AppSync App 
Important! 
Each template will automatically deploy an api and provision DynamoDB tables and IAM roles on your behalf. This may take over a minute to complete. 
Cancel 
saurabh @ awsdeveloperlearn v 
London v 
Create 
sur 

**This is graphql schema**

Machine generated alternative text:
AWS AppSync 
APIs 
My AppSync App 
Schema 
Data Sources 
Functions 
Queries 
Caching 
Settings 
Monitoring 
Aws AppSync 
Schema 
My AppSync App 
Schema 
Design your schema using GraphQL SDL, attach resolvers, and quickly deploy AWS resources. Info 
Create Resources 
Resolvers 
Filter types... 
Comment 
Field 
eventld: ID! 
commentld: String! 
content: String! 
createdAt: String! 
Undo Edits 
Resolver 
Attach 
Attach 
Attach 
Attach 
Save Schema 
S 
1, 
2 
3 
4 
5 
6 
7 
8 
9 
le 
11 
12 
13 
14 
15 
16 
17 • 
18 
19 
ema 
type Comment 
# The id of the comment's 
eventld: ID! 
# A unique identifier for 
commentld: String! 
# The comment's content . 
content: String! 
# The comment timestamp. 
createdAt: String! 
type CommentConnection 
items: L Comment) 
next Token: String 
type Event 
id: ID! 
name: String 
where: String 
indexed to enable 
sorted 
Export schema 
pagination . 
parent event . 
the conunent . 
This field 

**Two dynamodb table app sync created for us**

Machine generated alternative text:
AWS AppSync 
APIs 
My AppSync App 
Schema 
Data Sources 
Functions 
Queries 
Caching 
Settings 
Monitoring 
AWS AppSync My AppSync App 
Data Sources 
Data Sources 
Type 
AMAZON DYNAMODB 
AMAZON DYNAMODB 
Edit 
Resource 
Delete 
Create data source 
Connect existing AWS resources to your API. Info 
Data Sources 
O 
O 
Name 
AppSyncCommentTable 
AppSyncEventTable 
AppSyncCommentTable-CDqv8m5g 
AppSyncEventTable-CDqv8m5g 

**App sync api directly inserted data into dynamodb**

Machine generated alternative text:
AWS AppSync 
APIs 
My AppSync App 
Schema 
Data Sources 
Functions 
Queries 
Caching 
Settings 
Monitoring 
Aws AppSync 
Queries 
My AppSync App 
Queries 
Docs 
"data " 
"createEvent": 
"a92b1dda-cc3c-4975-bf8f-c261b987582f", 
Write, validate, and test GraphQL queries. Info 
Select the authorization provider to use for running queries on this page: 
API key 
Query 
Explorer 
x 
2 
3 
4 
5 
6 
7 
8 
9 
1 
mutation CreateEvent -t 
createEvent ( 
name: "My First Event" 
when: "Today" 
where: "My House" 
description: "Very first 
id 
name 
QUERY VARIABLES 
mutation CreateEvent 
commentOnEvent 
createEvent 
a description': " Very first event 
name': " My First Event 
•v Today 
where* : " My House 
comments 
description 
name 
when 
where 
deleteEvent 
Feedback 
English (US) v 
name 
LOGS 
"My First Event" 
Privacy Policy 
event" 
@ 2008 
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Machine generated alternative text:
Services 
DynamoDB 
Dashboard 
Tables 
Backups 
Resewed capacity 
Preferences 
DAX 
Dashboard 
Clusters 
Subnet groups 
Parameter groups 
Events 
Create table 
Delete table 
x 
AppSyncEventTable-CDqv8m5g Close 
Capacity 
Indexes 
Global Tables 
name 
Backups 
saurabh @ awsdeveloperleam 
v London v 
Support 
Contributor Insights 
when 
Today 
Today 
Today 
Today 
Overview Items 
Metrics 
Alarms 
Triggers 
where 
My House 
My House 
My House 
My House 
More v 
Viewing 1 to 4 items 
d 
Q Filter by table name 
Choose a table 
Name 
Actions 
Create item 
Actions v 
Scan: (Table) AppSyncEventTable-CDqv8m5g: id 
C) 
C) 
Scan 
(Tablel AppSyncEventTabIe-CDqv8m5g 
O Add filter 
Start search 
AppSyncCommentTable-CDqv8m5g 
App SyncEventTable-CDqv8m5g 
hello-world-sam-Table-70XOW6NOZl 
co 
co 
co 
co 
id O 
2ce7f8dd-ge45-407a-81 c9d8e 
a92b1dda-cc3c-4975-bfOf-c261b987582f 
c7fb315c-3927-4655-91a4-3f20eefbdea4 
cb671f88-d844-4f58-9910-b3e3bd23f29a 
description 
Very first event 
Very first event 
Very first event 
Very first event 
My First Event 
My First Event 
My First Event 
My second Event 