Serverless Cloud Services

What They Are and Why They're Cool
Agenda

• Introduction
• What is a “serverless” service?
• Why are serverless services cool?
• Examples of serverless services
• Sample serverless architectures
• Comparing serverless services
• Sources of more information
Introduction

• Joined UW-Madison in May 2018
• Have worked in information technology for 29 years
  • Four years as an IT and Business instructor for a community college
  • Twenty years as an database administrator, manager, trainer, consultant, speaker, and author specializing in Oracle
  • Four years as an enterprise architect
  • Focused on leveraging cloud to meet organizational goals since 2013
• Created the American Family Insurance enterprise cloud strategy
• Delivered UW enterprise cloud strategy in December 2018
• Building foundational cloud capabilities with DoIT cloud team and distributed IT units
Introduction

Unaware
What’s a serverless service?

Aware
I’ve heard of serverless services.

Concepts
I can give examples of serverless services.

Functional
I know when serverless services might be used.

Technical
I can build a serverless service.

Patterns In Serverless Programming
Brian Hill
Room 1295 at 11:15am
### What is a “Serverless” Service?

A “Serverless” service refers to a cloud computing environment where the user does not have to worry about managing and scaling servers. Instead, the service provider handles these tasks, allowing developers to focus on building and deploying their applications with minimal infrastructure management. The paradigm shift from traditional server-based applications to serverless architectures provides several benefits, including scalability, ease of deployment, and cost optimization.

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<tr>
<th>Data Center</th>
<th>IaaS: Infrastructure as a Service</th>
<th>PaaS: Platform as a Service</th>
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What is a “Serverless” Service?

Traditional Application Architecture
Using Public Cloud IaaS

Modern Application Architecture
Using Serverless PaaS
What is a “Serverless” Service?

- Spawn the required execution environment
- Call the serverless code
- Execute the serverless code
- Cloud Provider
- Serverless Code
- Serverless Execution Environment
- Compute, Storage, Network
- Cloud Provider
- Shutdown the execution environment
- Spawn the required execution environment
Why are Serverless Services Cool?

- Many coding options
- Easy to deploy
- Microservice alignment

**Type of Resources Used**

- Application Code
- Technology Stack
- Operating System
- Virtual Machine
- Hypervisor

**Number of Resources Used**

- Compute
- Storage
- Network

**Duration of Use**

**Level of Activity**

**Total Cost of Operation**
Examples of Serverless Services

**Functions**
- Lambda
  - Pay per execution

**Data**
- Athena
  - Pay per I/O

**Analytics**
- QuickSight
  - Pay per session
Lambda Functions

• Serverless compute service
  ✓ Trigger code from other services or call it directly.

• Easy to code
  ✓ Code in Java, Go, Powershell, Node.js, C#, Python, Ruby

• Compute price is $0.00001667 per GB-s
  ✓ First 400,000 GB-s are free

• Request price is $0.20 per 1M requests
  ✓ First 1M requests are free
**Example Lambda Code**

**Function Components:** (1) Handler (2) Runtime Environment (3) Triggering Event

Example: Pass two numbers into the function; return sum, product, difference, and quotient of the numbers

**Python**

```python
from __future__ import division
def lambda_handler(event, context):
    number1 = event['Number1']
    number2 = event['Number2']
    sum = number1 + number2
    product = number1 * number2
    difference = abs(number1 - number2)
    quotient = number1 / number2
    return {
        "Number1": number1,
        "Number2": number2,
        "Sum": sum,
        "Product": product,
        "Difference": difference,
        "Quotient": quotient
    }
```

**Node.js**

```javascript
exports.handler = (event, context, callback) => {
    var number1 = event.Number1;
    var number2 = event.Number2;
    var sum = number1 + number2;
    var product = number1 * number2;
    var difference = Math.abs(number1 - number2);
    var quotient = number1 / number2;
    callback(null, {
        "Number1": number1,
        "Number2": number2,
        "Sum": sum,
        "Product": product,
        "Difference": difference,
        "Quotient": quotient
    });
};
```
Athena Query Engine

- **Serverless query service**
  - Analyze data in Amazon S3 using standard SQL
- **Easy to use**
  - Point to data, define schema, run queries
- **Fast performance**
  - Optimized for S3, executes queries in parallel
- **Price is $5.00 per TB of data scanned**
  - Compressing data can reduce costs 30% to 90%
Example Athena Query

```
CREATE EXTERNAL TABLE IF NOT EXISTS cloudfront_logs (
    `Date` DATE,
    Time STRING,
    Location STRING,
    Bytes INT,
    RequestIP STRING,
    Method STRING,
    Host STRING,
    Uri STRING,
    Status INT,
    Referrer STRING,
    os STRING,
    Browser STRING,
    BrowserVersion STRING
) ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.RegexSerDe'
WITH SERDEPROPERTIES (
    "input.regex"="^(?!#)([^ \]+)\s+(?!#)([^ \]+)\s+(?!#)([^ \]+)"
) LOCATION 's3://athena-examples-myregion/cloudfront/plaintext/';

SELECT os, COUNT(*) count
FROM cloudfront_logs
WHERE date BETWEEN date '2019-06-01'
AND date '2019-06-07'
GROUP BY os;
```
QuickSight Analytics

• Serverless business intelligence
  ✓ Leverages machine learning to deliver data insights
• Easy to use
  ✓ Create interactive dashboards, accessible from any device
• Add value to any application
  ✓ Embed data analytics using available application data
• Pricing is based on user role
  ✓ “Author” price is $24, “Reader” price is $5 per user
QuickSight Analytics

On-Premise → S3 → Amazon QuickSight

Create interactive dashboards and share with everyone in your organization

Dashboards

Readers

Readers

Readers
QuickSight Analytics
Sample Serverless Architecture
Sample Serverless Architecture
Sample Serverless Architectures

Express
app.get(...)
app.post()
app.put()
app.delete()
# Comparing Serverless Services

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<th>Serverless Function</th>
<th>Serverless SQL</th>
<th>Serverless Data Analytics</th>
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<td>Azure Data Lake Analytics</td>
<td>Power BI</td>
</tr>
<tr>
<td>Google Cloud Platform</td>
<td>Cloud Functions</td>
<td>BigQuery</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* https://docs.microsoft.com/en-us/azure/architecture/aws-professional/services
** https://cloud.google.com/free/docs/map-aws-google-cloud-platform
Sources of More Information

- **Patterns In Serverless Programming**, Brian Hill, Room 1295, 11:15am

- **Workshop on Building a Serverless App**
  https://youtu.be/Hv3YrP8G4ag

- **Serverless Computing in Azure**
  https://www.youtube.com/watch?v=4cQhVaXxLmk

- *Developing Serverless Applications*, Raymond Camden, O'Reilly Media, 2017
Questions