Serverless Computing: Customer Adoption Insights & Patterns

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Evolution of serverless

- Increasing focus on business logic
- Decreasing concern (and control) over stack implementation

- Bare Metal
- Virtual machines
- Containers
- Functions
Traditional model

Worry about scaling
- When to scale? (mem-, cpu-, response time-, etc. driven?)
- How fast can you scale?

Worry about resiliency & cost
- At least 2 processes for HA
- Keep them running & healthy
- Deployment in multiple regions

Charged even when idling / not 100% utilized

Continuous polling due to missing event programming model
Serverless model

- Scales inherently
  - One process per request

- No cost overhead for resiliency
  - No long running process to be made HA / multi-region

- Introduces event programming model

- Charges only for what is used
  - Only worry about code
  - Higher dev velocity, lower operational costs
FaaS platform to execute code in response to events

Apache open source project: openwhisk.org
FaaS platform to execute code in response to events

IBM Cloud Functions: Managed service as part of the IBM Cloud

bluemix.net/openwhisk
IBM Watson and Cloud Platform

Application
- Healthcare
- Financial Services
- Logistics
- DsX
- IoT
- Virtual agent

AI
- Conversation
- Discovery
- Compare + Comply
- Knowledge Query
- Tone Analysis
- Personality Insights
- Visual Recognition
- Speech
- Document Conversion
- Nat. Language Understanding
- Nat. Language Classifier
- + more...

Data
- Ingest
- Enrich
- Store
- Analyze
- Apply
- Public, Private, Licensed
- The Watson Data Platform

Cloud
- Dev Services
  - Containers
  - Messaging
  - Blockchain
  - Logging
  - + more...
- Infrastructure
  - Storage
  - Compute
  - Physical Network
  - Infrastructure Mgmt
  - + more...

AI

Data

Cloud

IBM Watson and Cloud Platform
Supported Languages

Multi-language Support

- JS/NodeJS 6
- Swift 3
- Java
- Docker
- Python 3
- PHP

Community Efforts

- Haskell
- Scala
- ...

... and more to come
Support for different invocation models

Blocking

Non-blocking

Periodic
Supports higher-level programming constructs

Chaining/Sequencing

Parameter Binding

Default Parameters

Default Name

Default Value
Composition, Control Flow and State Management

A Differentiated Model for FaaS Composition

- Respond to the need for more complex, coordinated flows required for end to end solutions across cloud Services
- Enable more expressive programming through direct integration of new constructs into existing language bindings

<table>
<thead>
<tr>
<th>Composition</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>task</td>
<td>single task</td>
<td>compose.task('sayHi', { input: 'userInfo' })</td>
</tr>
<tr>
<td>dictionary</td>
<td>constant dictionary</td>
<td>compose.dictionary({ message: 'Hello World!' })</td>
</tr>
<tr>
<td>sequence</td>
<td>sequence</td>
<td>compose.sequence('getLocation', 'getWeatherForLocation')</td>
</tr>
<tr>
<td>let</td>
<td>variables</td>
<td>compose.let('n', 42, ...)</td>
</tr>
<tr>
<td>if</td>
<td>conditional</td>
<td>compose.if('authenticate', /* then <em>/ 'welcome', /</em> else */ 'login')</td>
</tr>
<tr>
<td>while</td>
<td>loop</td>
<td>compose.while('needMoreData', 'fetchMore')</td>
</tr>
<tr>
<td>try</td>
<td>error handling</td>
<td>try('DivideBy0', /* catch */ 'NaN')</td>
</tr>
<tr>
<td>repeat</td>
<td>repetition</td>
<td>repeat(42, 'sayHi')</td>
</tr>
<tr>
<td>retry</td>
<td>error recovery</td>
<td>retry(3, 'connect')</td>
</tr>
<tr>
<td>retain</td>
<td>parameter retention</td>
<td>compose.retain('validateInput')</td>
</tr>
</tbody>
</table>

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Event Provider

- Periodic
- IBM Cloudant
- Message Hub
- Mobile Push
- Github
- IBM App Connect
Granular pricing

Pay only for the exact time your actions run. When an action is not invoked, it’s not in memory, so you don’t pay anything.
Reduce Costs

Time an action was running
* memory allocated to action

$ 0.000017 per GBs
Free tier: 400000 GBs
What is serverless good for?

OpenWhisk allows you to build up an entirely serverless application architecture.
Customers and Partners

Clients
- SiteSpirit
- Santander
- articoolo
- AS
- BIGVU
- GreenQ
- MAGENTIQ
- The Weather Company
- ADVISOR CONNECT

Partners
- Adobe
- Apache
- ALTOROS
- nepente
- Miracle Systems
- SWAGGERhub
- PubNub
- redhat
What is OpenWhisk good for?

Outsource compute-intensive tasks to a powerful & scalable serverless platform and implement your actions even without changing the programming language.
What is IBM Cloud Functions good for?

Mobile backend

The Weather Gods
The Weather Gods High Level Architecture

1. **Cron trigger every 3 minutes**
   - **Group Scanner**
     - Set flag to check weather for each user location in the group

2. **Weather Model**
   - **Weather Collector**
     - For each user location updated

3. **Weather Update Trigger**
   - **Weather Checker**
     - **Weather Model**

4. **Weather Collector Trigger**
   - **OpenWhisk Actions**
     - **External Data Triggers**

**Weather God**

**Bluemi**

**Send Notification**

**Cloudant**

**Notification Trigger**
What is IBM Cloud Functions good for?

Data processing

IBM Cloudant → Openwhisk

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What is IBM Cloud Functions good for?

Data processing

Ideally suited for working with multimedia data like audio, image and video data:
- Audio normalization
- Image rotation, sharpening, noise reduction
- Thumbnail generation
- Image OCR’ing
- Video transcoding

...
What do our customers do with IBM Cloud Functions?

Data processing

10x faster
90% less cost

What do our customers do with IBM Cloud Functions?

Data processing

Less cost < $2 for all paper checks processed within 1 year

Santander

Routing number

Deposit from account number
What is IBM Cloud Functions good for?

Cognitive

IBM Cloudant

Openwhisk
What is IBM Cloud Functions good for?

Cognitive

Skylink
https://github.com/IBM-Bluemix/skylink
What is Serverless good for?

Abilisense
https://www.abilisense.com/

There Is No Place Like Home
# Abilisense

## Assumptions

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Devices</td>
<td>1.000 Un.</td>
</tr>
<tr>
<td>Avg. Sound File Size</td>
<td>1 MB</td>
</tr>
<tr>
<td>Avg. Number of Sound Readings</td>
<td>10 Monthly</td>
</tr>
<tr>
<td>IoT Reading Frequency</td>
<td>1 Hourly</td>
</tr>
<tr>
<td>IoT Recording Data Size</td>
<td>2 KB</td>
</tr>
<tr>
<td>Weather Data Reading Frequency</td>
<td>1 Hourly</td>
</tr>
<tr>
<td>Weather Data Reading Size</td>
<td>2 KB</td>
</tr>
<tr>
<td>Weather Data Total Capability</td>
<td>1.41 MB</td>
</tr>
</tbody>
</table>

## Assumptions

<table>
<thead>
<tr>
<th>Assumption</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Runtime Action per Millisecond</td>
<td>5</td>
</tr>
<tr>
<td>Memory MB</td>
<td>512</td>
</tr>
<tr>
<td>Number of Executions</td>
<td>5,000,000.00</td>
</tr>
<tr>
<td>Monthly Cost</td>
<td>$14.45</td>
</tr>
</tbody>
</table>
Potential research areas

- Problem determination for apps with a large number of actions
- Latency reduction
- Density increase
- State handling
- Building complex apps
- …
Learn more

Commercial offering home: bluemix.net/openwhisk

Open-source offering home: openwhisk.org

Slack: slack.openwhisk.org
Thank you