Extensible Declarative Management of Cloud Resources across Providers

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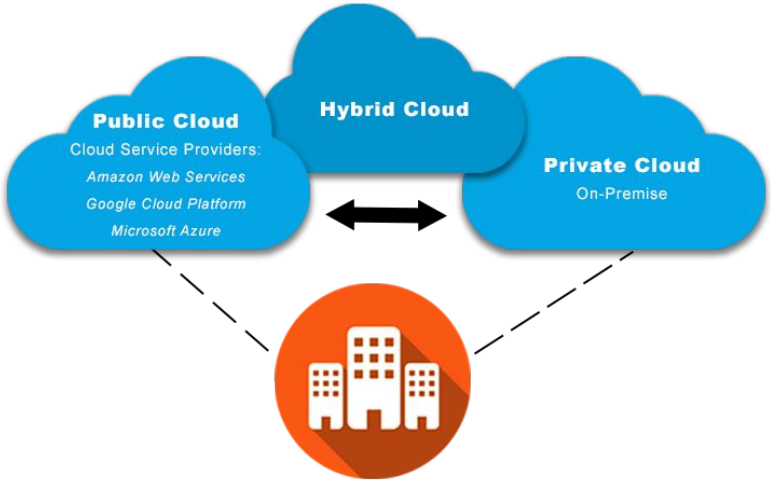
Agenda

1. Resource management in multicloud environments
2. Tag-based management in current practice
3. Challenges of using tags in a multicloud environment
4. Universal Connector (UC) concept
5. Implementation of the Multitag connector
6. Demo screencast
7. One step beyond: multiple UCs and the UC broker
8. Questions

Multicloud Environments

Utilisation of resources from multiple cloud providers within the same project



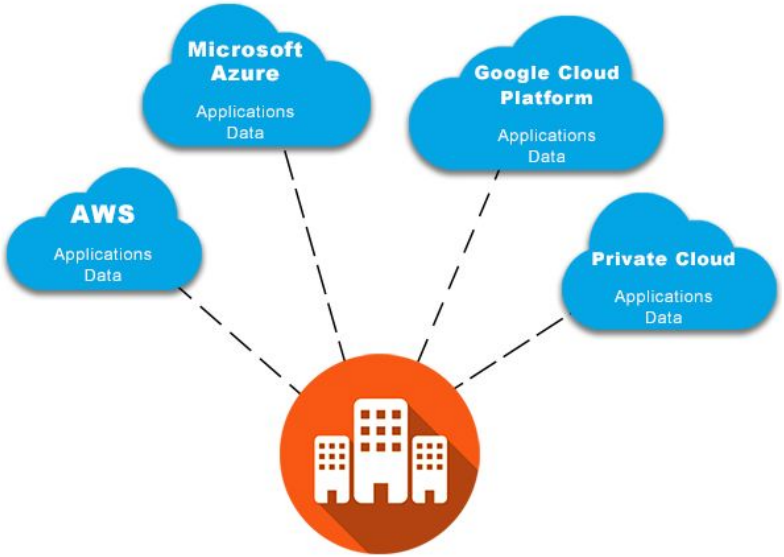


Image source: Avi networks

Multicloud management

Management solutions with a multicloud abstraction (CMPs) are on the rise

These allow getting an overview of the project and simplifying the financial side of management

There is yet to be a solution for managing a large number of resources on multiple providers without individually interacting with each provider

Resource management using tags

Grouping resources using tags in **not** a new concept

Every cloud provider offers their own implementation of tag-based management for their platform

These individual implementations only apply to the specific provider

Multi or cross cloud tagging is yet to be offered by a multi-cloud management platform

Challenges of multi-cloud or cross-cloud tagging (1)

The implementation of tagging differs from provider to provider

- number and form of tags allowed
- interface used when applying the tags, especially when tagging a group of resources at once

Challenges of multi-cloud or cross-cloud tagging (2)

Main differences in the tagging implementation between AWS, Google Cloud Platform and Azure

The difference in the tagging interface implementation is the biggest technical hurdle to overcome

Feature	AWS	Azure	GCP
Tags per resource	50	15	64
Length of key	127	512	63
Length of Value	256	256	63
Case sensitive	Yes	No	Lowercase only
API	Single tagging API for all supported resource types	API can tag any resource in a resource group	Separate tagging functionality in each API, group tagging at the project level
Tagging of multiple resources with one call	Yes, by providing a list of resources	Only by tagging a whole resource group	Only by tagging a whole project
Terminology	Tag	Tag	Label, a separate 'network tag' is used to apply firewall rules

Challenges of multi-cloud or cross-cloud tagging (3)

These differences make a management workflow involving resources from different cloud providers problematic

If the same tag is applied to resources on different providers it must apply to all sets of rules, and needs to be applied with the provider's own interface

That increases the factors an administrator needs to consider when managing resources, and the probability of human error

The Universal Connector concept

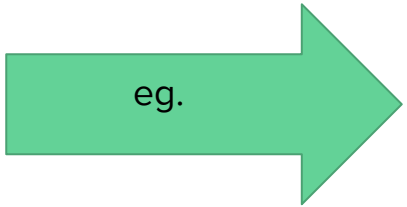
A service that connects **management capabilities** of different cloud providers

Multitag Connector capabilities:

- Automates tagging resources across all supported providers
- Allows cross-cloud resource management by tag

Automated rule-based tagging (1)

Rules are based on resource type, provider and a set of user-defined conditions based on the resource's metadata




```
rule1 :
  type : instance
    providers : aws
      conditions :
        condition1 :
          ImageId: instance1
          InstanceType : t12 . micro
       condition2 :
          CpuOptions . CoreCount: 12
      tags :
        aim: demo
```

Automated rule-based tagging (2)

The tags are checked against the constraints of all providers, to ensure the resources can be managed in cross-cloud groups without the possibility of error

Tags can also be applied manually to a list of resources independent of provider for more fine-grained control

Cross-cloud management by tag

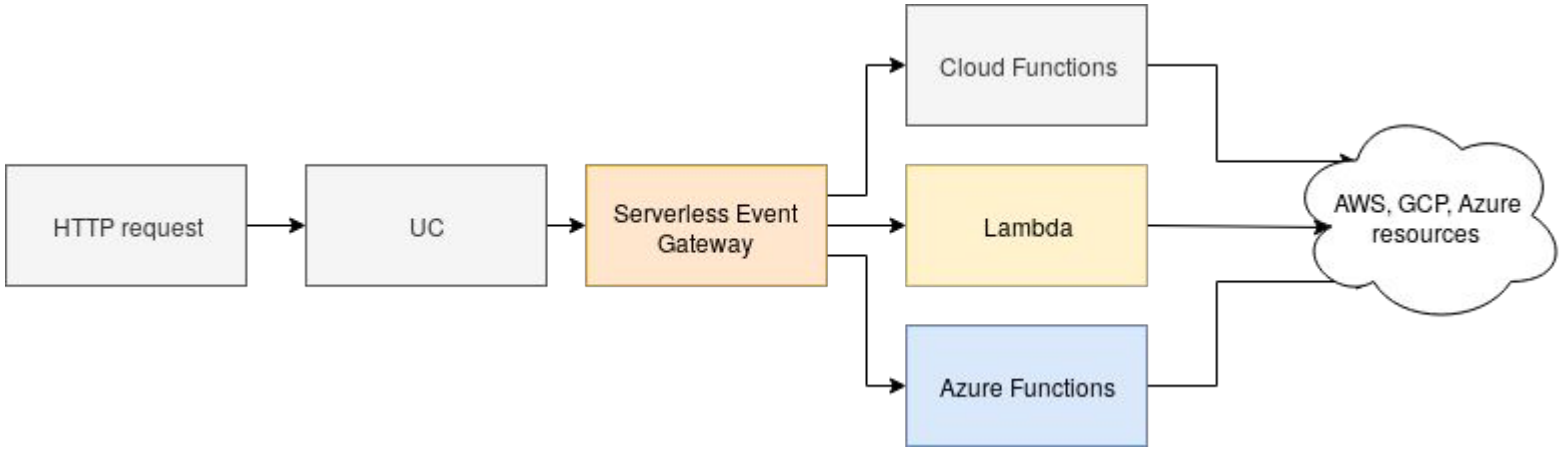
Standard management operations on resources across different providers, grouped by tags

How our implementation differs from similar capabilities in standard CMPs?

The resources can be grouped together by tag and managed at once even if they are deployed on different providers

Universal Connector Implementation

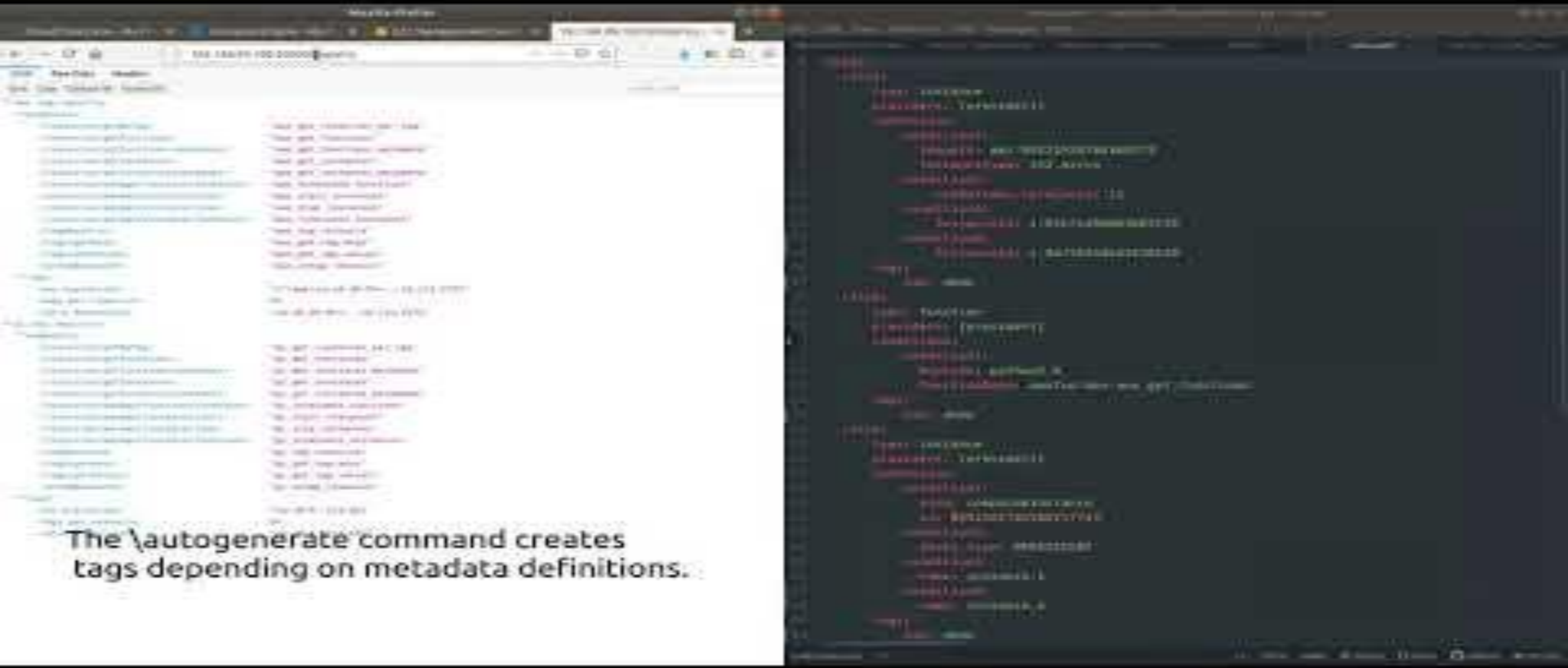
We implemented the Multitag Universal Connector (UC) as a middleware service exposed through a REST API.



Cross-cloud tag-based management using FaaS

Using FaaS for the management functionality grants us:

- a high amount of extensibility and flexibility
- ensuring that the core middleware itself remains lightweight


The \autogenerate command creates
tags depending on metadata definitions.

Multiple UCs and the UC broker

A simple broker service was also developed to manage multiple UCs

It would be possible to extend the capabilities beyond declarative management, eg with a billing UC

The broker could be further developed to also handle security, credential storage and caching

Conclusion

We presented a solution for extensible declarative resource management in a multi-cloud environment based on a connector service with FaaS-based satellite functions to implement the management functionality

Service Prototyping Lab: Aiming to contribute to cloud application engineering and tools for data and stream processing platforms

Thank you for your attention!

Any questions?