Hands-on Cloud Computing Services

Lezione 5

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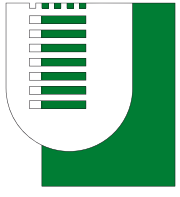

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Exercise: Photogallery + DynamoDB

- Solution: `photogallery_v3`

AWS Elastic Beanstalk

- Platform-as-a-Service offering by AWS
- Deploy your apps on EC2 without manual infrastructure setup
- Many platforms supported
  - Java, nodeJS, Python, Go, Docker, …
- Pricing: no additional costs besides EC2, S3 and any DB you use
- Effettuiamo il deploy di una app di esempio: go-beanstalk.zip

AWS Lambda

- Function-as-a-Service offering by AWS
- Enables the execution of serverless functions
- Functions can be written using many different languages
- Differences w.r.t. Beanstalk?
  - Fast scaling from zero to “infinity”
  - Pricing

Lambda Invocation

Synchronous vs. asynchronous invocation

Lambda Invocation (2)

Lambda functions can be invoked in several ways, including:

- AWS CLI
- AWS SDK (boto)
- HTTP(S) endpoints (discussed in the next lecture)
- automatically in response to events (e.g., new upload to S3)

AWS Lambda: Hello World

- Let's create our first Lambda instance
- We can start from a *blueprint*: "Hello, world!"
- We can create **Test** events for our function
- Test the function: observe duration, billed duration, and init duration
- **Cold start**
- We can invoke the function using the SDK and the CLI

Invocation example

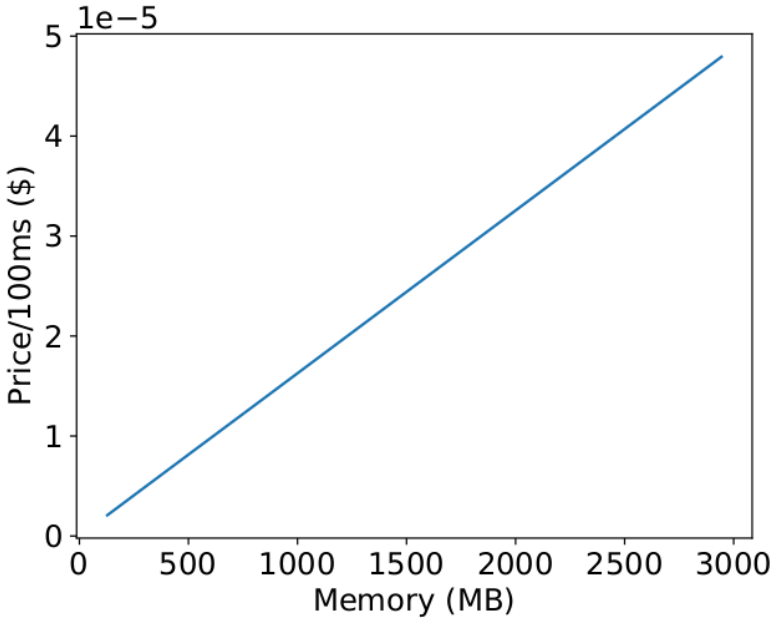
Synchronous invocation using the CLI

```
aws lambda invoke --function-name prova response.json
# with args:
aws lambda invoke --function-name prova
  --payload '{ "key1": "A", "key2": "b", "key3": "c" }'
    --cli-binary-format raw-in-base64-out
    response.json
```

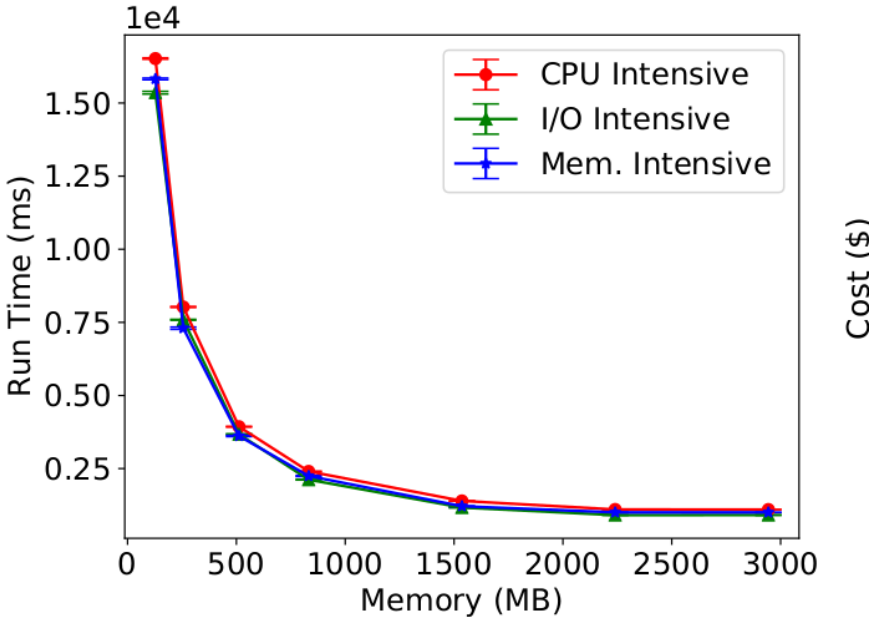
- Add `-log-type Tail` to get function log (in base64)
- Add `-invocation-type Event` for async requests[1]
- Using the SDK: `invoke_hello_world.py`

[1] `https://docs.aws.amazon.com/lambda/latest/dg/invocation-async.html`

AWS Lambda: Sizing



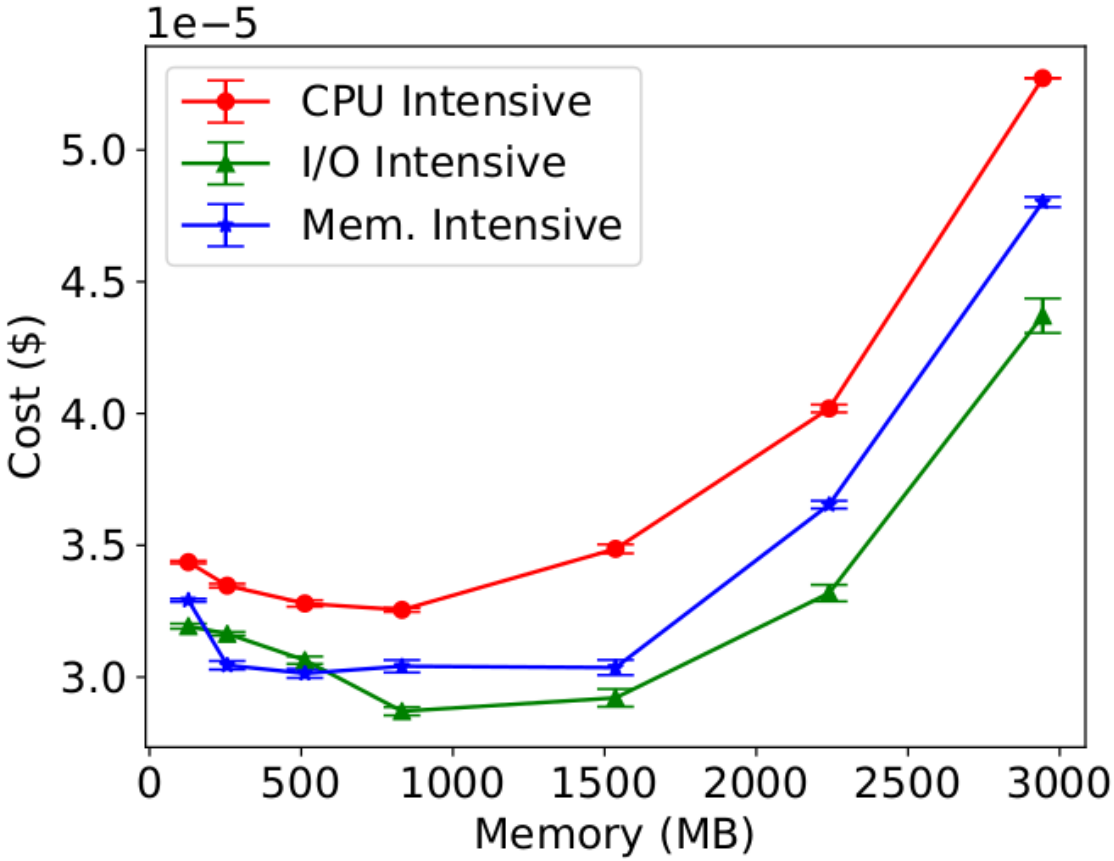
(a) AWS price per 100ms



(b) Run-time of serverless functions on Amazon Lambda

Source: Nabeel Akhtar, Ali Raza, Vatche Ishakian, Ibrahim Matta: **COSE: Configuring Serverless Functions using Statistical Learning**. INFOCOM 2020: 129-138

AWS Lambda: Sizing (2)



(c) Cost for running functions on Amazon Lambda

Source: Nabeel Akhtar, Ali Raza, Vatche Ishakian, Ibrahim Matta: **COSE: Configuring Serverless Functions using Statistical Learning**. INFOCOM 2020: 129-138

Simple Experiment

- Let's deploy a function to check if a number is prime
- We implement the function in Golang and deploy it using Terraform
- We check its duration varying the memory allocation (e.g., 128, 256 and 1024 MB)

Simple Queue Service (SQS)

- Fully managed queueing service
- Enables decoupled communication among microservices/components
- Developers can avoid spending effort on a communication middleware
- Standard queues (at-least-once)
- FIFO queues (exactly-once, FIFO order)

- `producer.py` e `consumer.py`

Example: Lambda + SQS + S3

- We want to integrate a Lambda function with SQS and S3
- Function invoked every time a message is available in the queue
- Function output sent to S3
- Example: `lambda/sqss3/`
- We will use Terraform to create the required components

Idea: Photogallery + SQS

- New images uploaded to S3 in the `pending/` directory
- Image processing (resizing, filters,...) delegated to *workers*
- Web server and workers communicate through SQS (decoupled)

Lambda@Edge

- Execute Lambda functions at the Edge in response to CloudFront events
- Customize delivered content using a function
- `https://aws.amazon.com/it/lambda/edge/`

Lambda: Versions and Aliases

- You can define multiple versions of a Lambda function
- Possibly, aliases can be associated with a version (e.g., production, testing, devel)
- You can also let AWS automatically route users to different versions (e.g., canary testing)