CLOUD COMPUTING

PROJECT 1 - Part III

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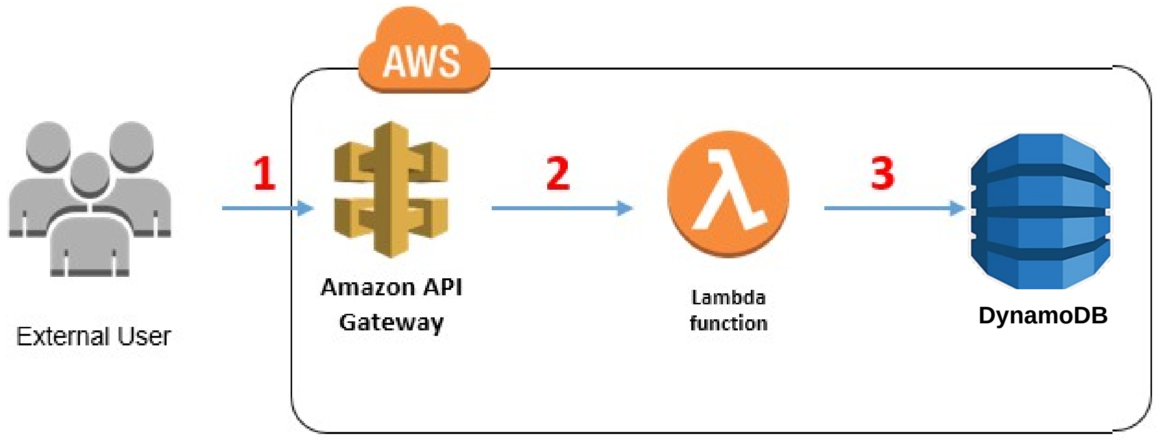
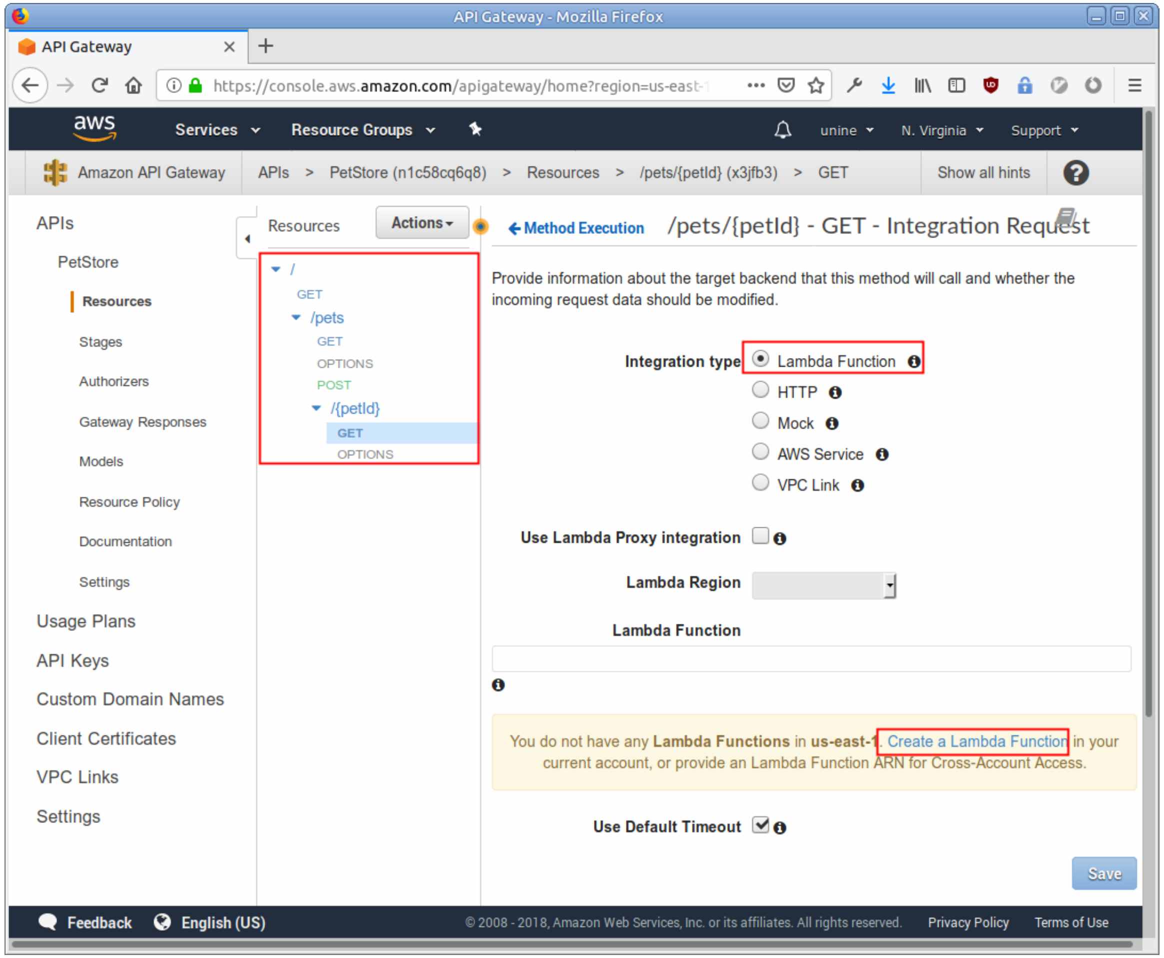
Objectives

- Deploy a serverless API in the cloud
  - Using AWS managed services !
    - API Gateway
    - AWS Lambda
    - DynamoDB



AWS API Gateway

- Create only one endpoint
  - GET /watches/v3/get/{sku}
  - No authentication, no SSL
    - Keep default options
- Connect it with AWS Lambda
  - Only one lambda function to call
- Deploy your API
  - To have a public endpoint



API Gateway - Mozilla Firefox

API Gateway

https://console.aws.amazon.com/apigateway/home?region=us-east-1

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Amazon API Gateway | APIs > PetStore (n1c58cq6q8) > Resources > /pets/{petId} (x3jfb3) > GET | Show all hints

APIs
- PetStore
  - Resources
  - Stages
  - Authorizers
  - Gateway Responses
  - Models
  - Resource Policy
  - Documentation
  - Settings
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- VPC Links
- Settings

Resources | Actions

```
/
  GET
  /pets
    GET
    OPTIONS
    POST
    /{petId}
      GET
      OPTIONS
```

← Method Execution /pets/{petId} - GET - Integration Request

Provide information about the target backend that this method will call and whether the incoming request data should be modified.

Integration type: [✓ Lambda Function] HTTP Mock AWS Service VPC Link

Use Lambda Proxy integration ☐

Lambda Region

Lambda Function

You do not have any **Lambda Functions** in **us-east-1**. Create a Lambda Function in your current account, or provide an Lambda Function ARN for Cross-Account Access.

Use Default Timeout ✓

Save

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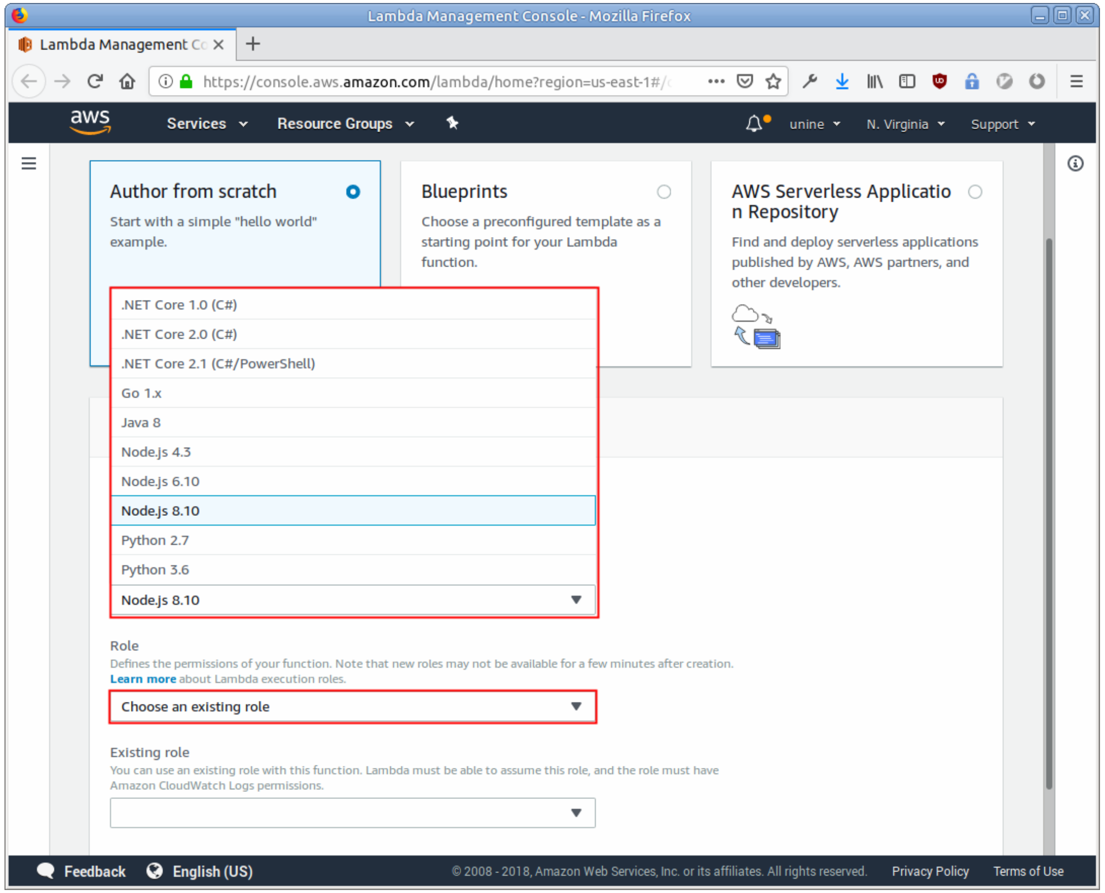
AWS Lambda (1)

- Lambda will be the binding between the API Gateway and DynamoDB
  - Lambda function must have the rights to access DynamoDB
  - Create a new IAM role for Lambda (auto)
    - Then edit the role to add DynamoDB read access
- The references on the next slides will consider that you will use the default execution env: **Node.js**


Lambda Management Console - Mozilla Firefox
Lambda Management Co
https://console.aws.amazon.com/lambda/home?region=us-east-1#/
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Author from scratch
Start with a simple "hello world" example.

Blueprints
Choose a preconfigured template as a starting point for your Lambda function.

AWS Serverless Application Repository
Find and deploy serverless applications published by AWS, AWS partners, and other developers.

.NET Core 1.0 (C#)
.NET Core 2.0 (C#)
.NET Core 2.1 (C#/PowerShell)
Go 1.x
Java 8
Node.js 4.3
Node.js 6.10
Node.js 8.10
Python 2.7
Python 3.6
Node.js 8.10

Role
Defines the permissions of your function. Note that new roles may not be available for a few minutes after creation.
Learn more about Lambda execution roles.
Choose an existing role

Existing role
You can use an existing role with this function. Lambda must be able to assume this role, and the role must have Amazon CloudWatch Logs permissions.

Feedback
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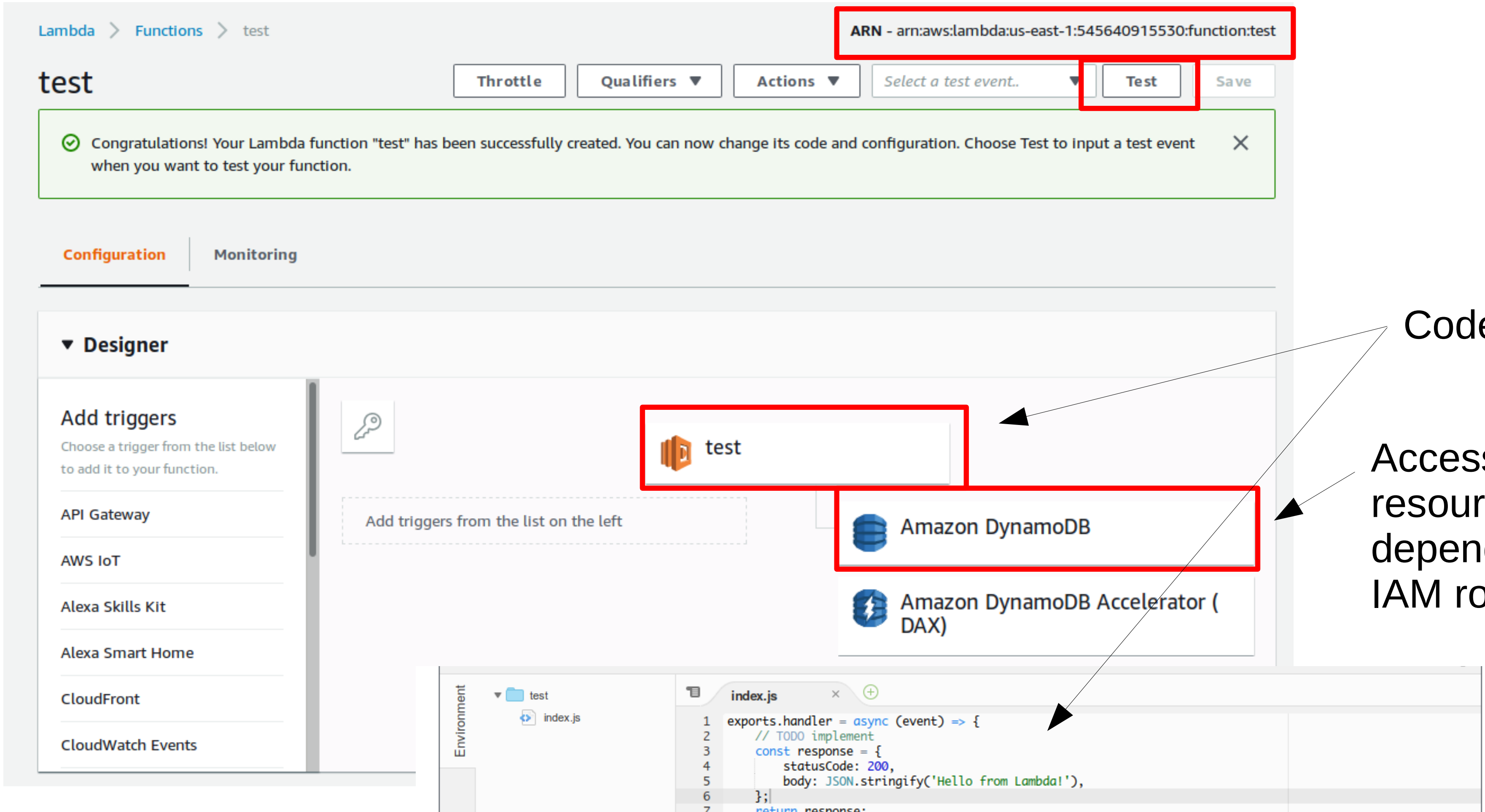
AWS Lambda (2)


Lambda > Functions > test

ARN - arn:aws:lambda:us-east-1:545640915530:function:test

test

Congratulations! Your Lambda function "test" has been successfully created. You can now change its code and configuration. Choose Test to input a test event when you want to test your function.

```
exports.handler = async (event) => {
    // TODO implement
    const response = {
        statusCode: 200,
        body: JSON.stringify('Hello from Lambda!'),
    };
    return response;
```

Code

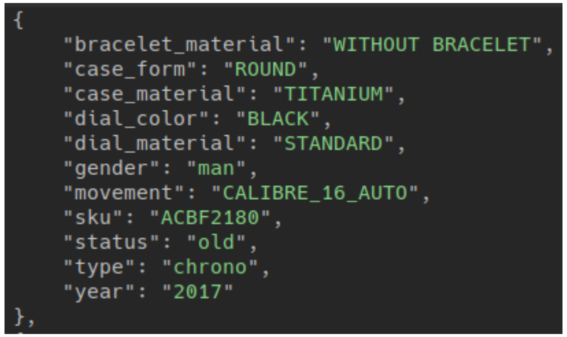
Accessible resources depends of IAM role

AWS Lambda (3)

- The function must
  - Extract the SKU parameter from the query
    - https://docs.aws.amazon.com/lambda/latest/dg/nodejs-prog-model-handler.html
  - Query DynamoDB with the SKU to get the watch document
    - https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/GettingStarted.NodeJs.04.html
  - Return the watch "document" → the JSON from DynamoDB
    - HTTP code 200
    - mime type: application-json
  - Or if not found
    - 404

DynamoDB

- NoSQL DB → Store JSON documents
  - https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/HowItWorks.CoreComponents.html
  - https://aws.amazon.com/blogs/database/choosing-the-right-dynamodb-partition-key/
- Create a table 'project1'
  - With watches fields
    - sku → primary key (partition key)
    - All attributes as string type 'S', except year 'N'
  - https://docs.aws.amazon.com/cli/latest/userguide/cli-dynamodb.html



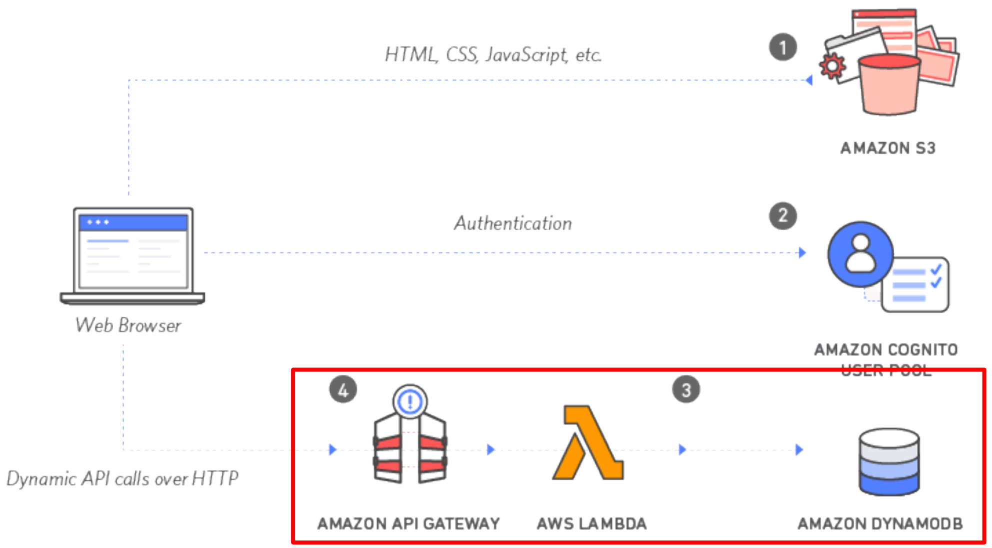
```
{
    "bracelet_material": "WITHOUT BRACELET",
    "case_form": "ROUND",
    "case_material": "TITANIUM",
    "dial_color": "BLACK",
    "dial_material": "STANDARD",
    "gender": "man",
    "movement": "CALIBRE_16_AUTO",
    "sku": "ACBF2180",
    "status": "old",
    "type": "chrono",
    "year": "2017"
},
```

DynamoDB - Import watches data

- Table exported from MySQL in JSON → **watches.json provided on git**
  - Write a small app that read it and send records in DynamoDB
    - Use AWS SDK (available in many languages)
      - Ruby
        - https://docs.aws.amazon.com/sdk-for-ruby/v3/developer-guide/dynamo-example-load-table-items-from-json.html
      - Javascript
        - https://docs.aws.amazon.com/sdk-for-javascript/v2/developer-guide/dynamodb-example-table-read-write.html
        - https://stackoverflow.com/questions/32944920/how-to-insert-json-in-dynamodb
  - Or use a script and CLI (see link on previous page)
  - **I recommend using the ruby example, it can be straightforwardly be modified to fit your needs**

Similar tutorial

- https://aws.amazon.com/getting-started/projects/build-serverless-web-app-lambda-apigateway-s3-dynamodb-cognito/
  - Module 3: Serverless Service Backend



Deliverables - Delay - Grading

- Deliverables
  - **API Gateway endpoint to test your API !**
  - Script to insert watches data into DynamoDB
  - Lambda code
  - Short documentation (README)
    - Command lines
- Delay:
  - 3 weeks
- Grading:
  - 50% API is working with the endpoint
  - 50% migration, lambda code, documentation, …

CLOUD COMPUTING

READ ASSIGNMENT

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Read assignment

- Read a paper from a recent top-tier conference
  - Mix of academic and industry authors
- Learn about cutting-edge research
- Prepare a presentation with other students as the target audience
- Improve presentation and summarization skills
- Have fun

Paper selection and assignment

- Each student picks 1 to 3 choices in decreasing order of interest
  - We assign papers in a first-come first-serve basis
  - If first choice already taken or paper too close already taken, we assign your second choice (or 3rd etc.)
  - Sending multiple choices directly reduces email overhead
- Selection of paper
  - From the conferences on the next page
  - Or from full-length papers who appeared at a top-level conference
- Send your selection by email

List of papers

- https://dblp.org/db/conf/cloud/socc2017
- https://dblp.org/db/conf/eurosys/eurosys2017
- https://dblp.org/db/conf/eurosys/eurosys2018

Planning

- Propositions of conferences and papers
    - Today 2018-11-15
- Collection of students preferences
    - Deadline next Thursday 2018-11-22
- Confirmation of assignment
    - Thursday 2018-11-29
- Presentations
    - Thursday 2018-12-13 and 2018-12-20
        - Random order

Grading

- Grading by Lorenzo and Rémi
  - 16.66% of your final grade (project parts I, II and III = 33.33% → 50%)
- Clarity of the speech
  - Context and clear problem definition
  - Conciseness and simplicity
  - Ability to explain solution from the right level of abstraction (do not present any detail from the paper)
- Quality of the slides
  - Flow and structure
  - Use of appropriate diagrams
- Respect of time
- Answers to questions

Presentation rules

- Presentation order will be a random pick
- You must use your own deck of slides
  - Forbidden to copy/paste from paper or existing presentation, with exception for evaluation plots
- **Presentation time will be 10 minutes, plus 5 minutes for questions**

Recommendations

- Your three main goals
  - Convince the audience this is an important problem
    - What is the context and why does it matter?
    - Why is there something to fix / improve? What is the problem?
    - Why is it not trivial problem to solve?
  - Give an idea of the solution and make the audience want to read the paper
    - What is the core idea of the authors?
    - What are the key challenges?
    - What are the tools and techniques used, and why?
  - Discuss limitations and future work

Suggestions for slides

- 10 minutes = about 7-8 slides
  - You will not be able to present every single detail of the paper
    - Keep a high level of abstraction
    - Focus on what you believe are the most interesting aspects
    - Clearly separate authors' contributions and your opinion
- One possible way to do it
  - 1 slides background
  - 2 slides problem definition
  - 2 slides solution
  - 2 slides results
  - 1 slide limitations and future work