

Building Large Scale, Microservices Applications

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NLX Inc, CEO & Co-Founder

Dealing with Large Scale Applications

Channel(s)

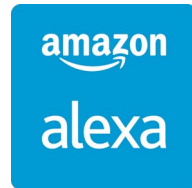
Platform(s)

www



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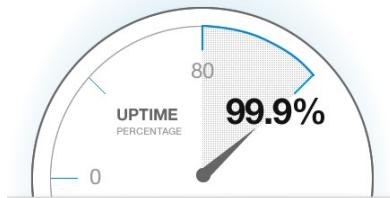
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**Security
Requirements**



Availa



Cost



Goal:

Learn how to build, deploy, and manage distributed, available, and scalable microservices that are also cost-effective.

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1. Problems with Monolithic Systems

2. Microservice

3. Microservice

4. Scaling the Frontend

5. Asynchronous Workflows

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Scenario:

You hav

for a new

concierge servic

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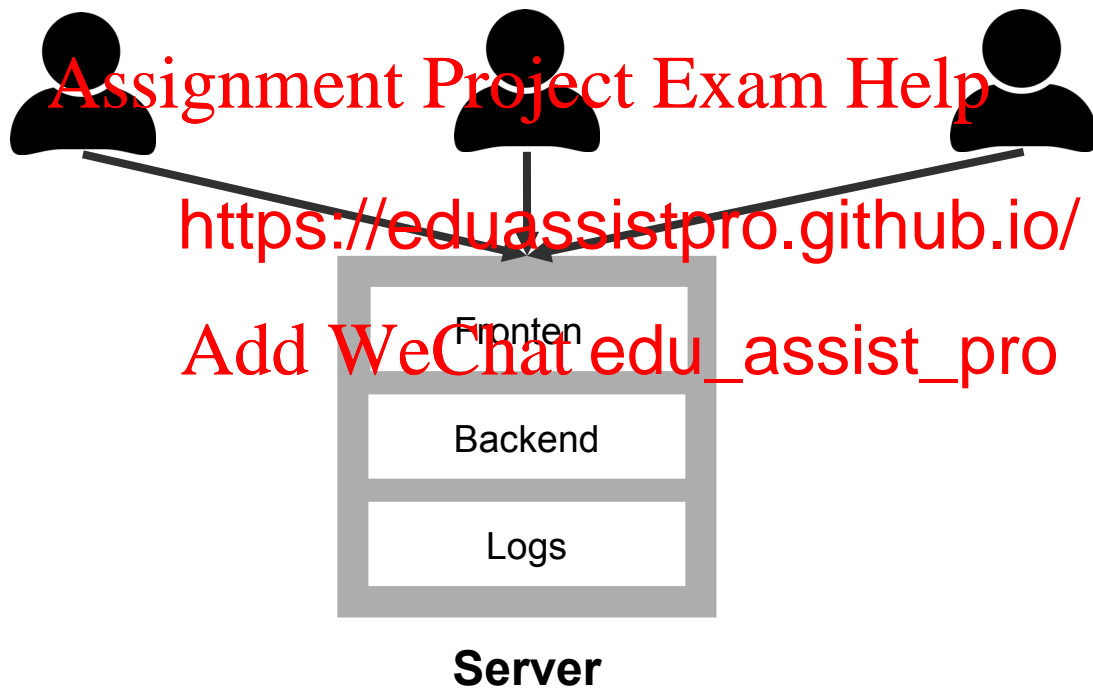
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You set up a quick

MVP to <https://eduassistpro.github.io/>

product out there
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Your new website is up!



Now you
100 use

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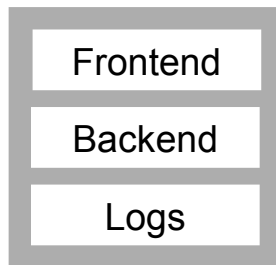
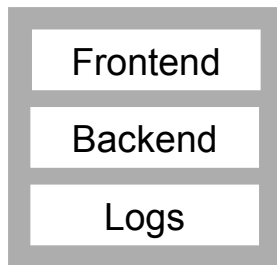
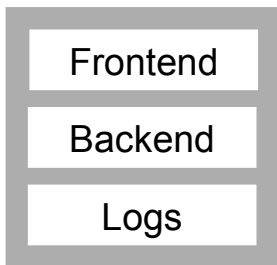
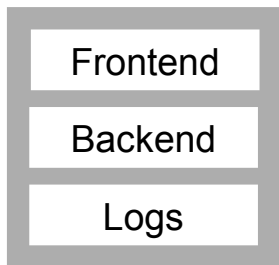
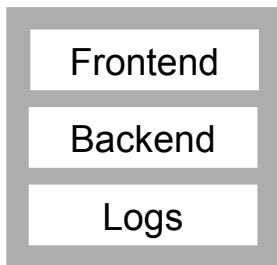
Solution? Scale out.



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Load Balancer

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But, adding more
servers
expensive.

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A security backdoor

has been

in the service

that you use.

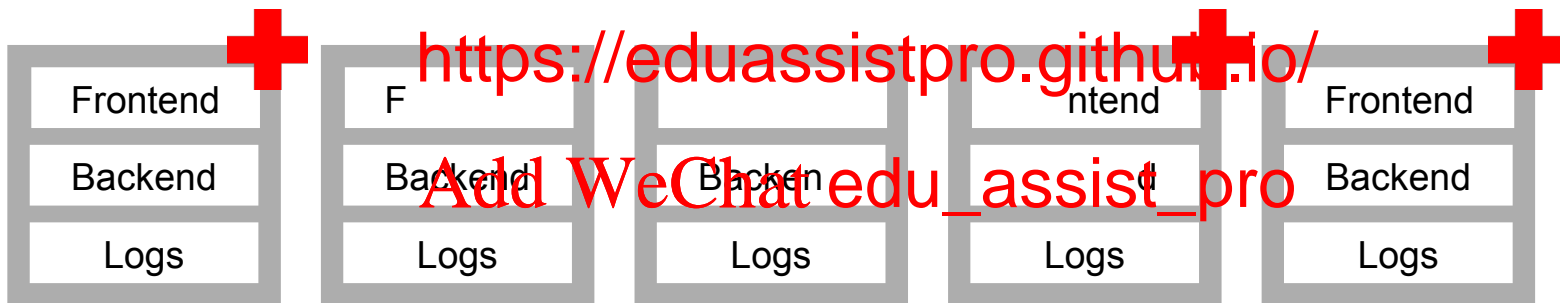
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Solution? Patch all your instances.

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Ugh, makers
is time c

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You realize your NLP
operatio too
much memory.

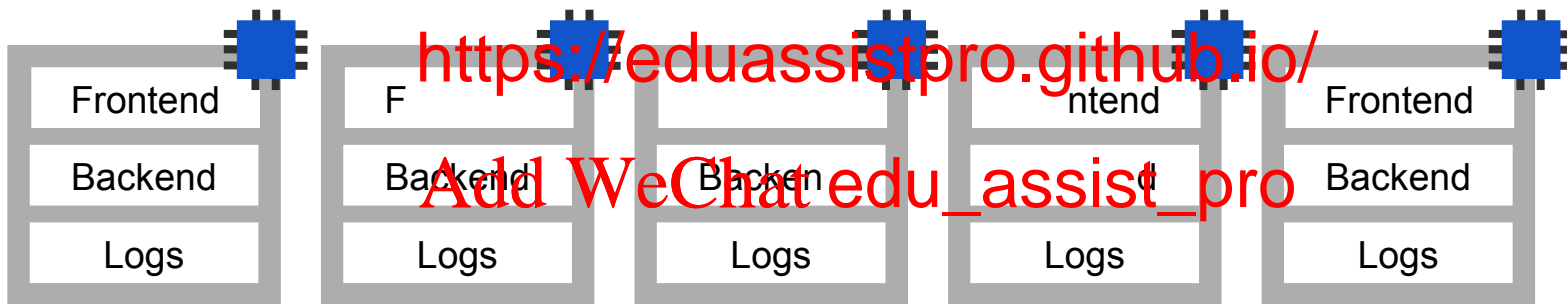
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Your solution? Increase instance memory.

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Everything starts getting
more an
expensive.

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Alex, one of the
developers, decides to
deploy t
has been worki all
week.

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BUT...

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...Sam committed non-
working
master branch.

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The new feature can't be
deployed because of
the bugs. Frustrating

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Challenges with Monolithic Systems

- Code complexity and maintainability
- **Deployment**
- Fear to change
- **Lack of ownership**
- Failure dependencies
- **One size doesn't fit all**
- Hard to scale out

1. Problems with Monolithic Systems

2. Microservice

3. Microservice

4. Scaling the Frontend

5. Asynchronous Workflows

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Microservices to the rescue!

- An architectural pattern
- Split the app into services that:
 - Are small
 - Use simple protocols
 - Are loosely-coupled
 - Can be independently deployed
 - + each can be written in a different language

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Benefits of Microservices

Speed

- Faster development & deployments

Innovation

- Change Ownership and DevOps culture

Quality

- Composability and reusability
- More maintainable code
- Better scaling and optimizations
- Failure Isolation and Resiliency

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Microservices++: Serverless Components

- No servers to manage
- Scalability o
- Minimize co <https://eduassistpro.github.io/>
- Pay per usage
- Extremely low cost (usually f a cent)

Your new best friends.

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Lambda

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Your new best friends.

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Lambda

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API Gateway

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Lambda

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API Gateway

Cognito

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IAM

API Gateway

Cognito

Recap:

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1. Microservices pattern used to decouple app <https://eduassistpro.github.io/>
2. AWS offers lots of different services, that can be used as building blocks in service-driven systems

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Let's build Service. **Assignment Project Exam Help** **erge**
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DEMO

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Walkthrough of our Concier

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Where d <https://eduassistpro.github.io/>

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Design. <https://eduassistpro.github.io/>ign.

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Not (just) UI design

- Stack design

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- Architecture

- Data structure

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- API design

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API Design

- forces you to think before you build
- drives a good culture
- drives the development of <https://eduassistpro.github.io/>
- makes everything more efficient
 - no more “I’m waiting for the backend to be ready before I can start to implement the frontend”
 - minimizes time wasted restructuring the API in future versions

Yeah ... but building
docume s
and it is time co ing.

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That's w
Swagge

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Swagger

- “The world’s most popular API framework”
- Powerful tool to generate, and consume REST APIs <https://eduassistpro.github.io/>
- Open Source
- User friendly
- Standardized

Check out <http://swagger.io>



Swagger + API Gateway =

- Seamless API setup
- Import the S to API Gateway
 - endpoint <https://eduassistpro.github.io/>
 - security settings
 - request/response mode
 - request/response mapping
 - response codes, etc.

Swagger + API Gateway + Lambda =



- Custom Swagger definitions for Lambda
- Set up a full fled API
- Built-in API <https://eduassistpro.github.io/>
 - API keys
 - Throttling
 - Security
 - Staging, etc.

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DEMO

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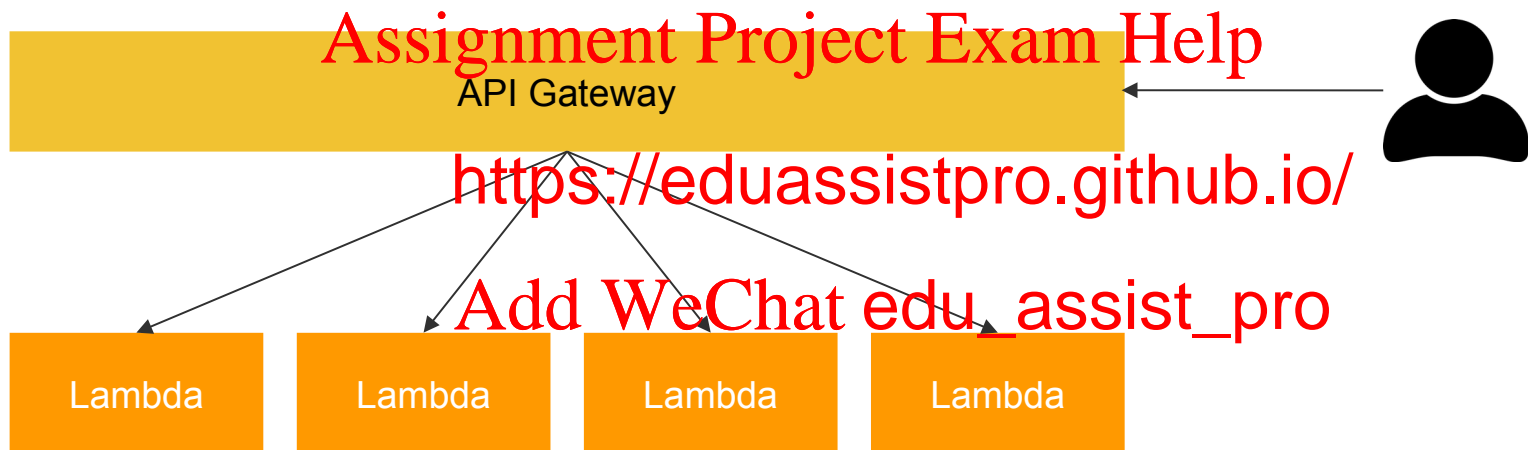
Setup the API using Swagger, Lambda

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Code Deployment with Lambda

- Using the AWS Web Console
- Using the A
- Bash script <https://eduassistpro.github.io/>
- Check out the sample deployment script
 - <https://github.com/mangatan/lecture-concierge/blob/master/backend/deploy.sh>

Our Stack so far



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What's missing <https://eduassistpro.github.io/>

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Our API
anyone

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<https://eduassistpro.github.io/>

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e by
et.

IAM: Identity and Access Management

- Fine-grained access control to AWS resources
 - including
- Create roles <https://eduassistpro.github.io/>
- Integrate with your corpora
- Uses Access and Secret k access control
 - Can be used to sign API calls to AWS

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Awesome! When was the last
time you si <https://eduassistpro.github.io/>
requests? Add WeChat edu_assist_pro

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Cognito: User Pools & Identity Federation

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Cognito: User Pools & Identity Federation

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API Gateway Bonus: SDK Generation

- Takes a second to generate
- Support for
 - Swift <https://eduassistpro.github.io/>
 - Obj C [Add WeChat edu_assist_pro](#)
 - Java
 - Javascript, and more.
- Abstracts all the API calling complexity, including session signing

Cognito + IAM + API Gateway = Security [✓]

- Cognito exchanges your session for temporary IAM credentials with
- The API Gateway <https://eduassistpro.github.io/> API requests using the SigV4 signing process
 - Verify the identity of the requester
 - Protect data in transit
 - Protect against potential replay attacks
- Requests are executed with the caller's credentials

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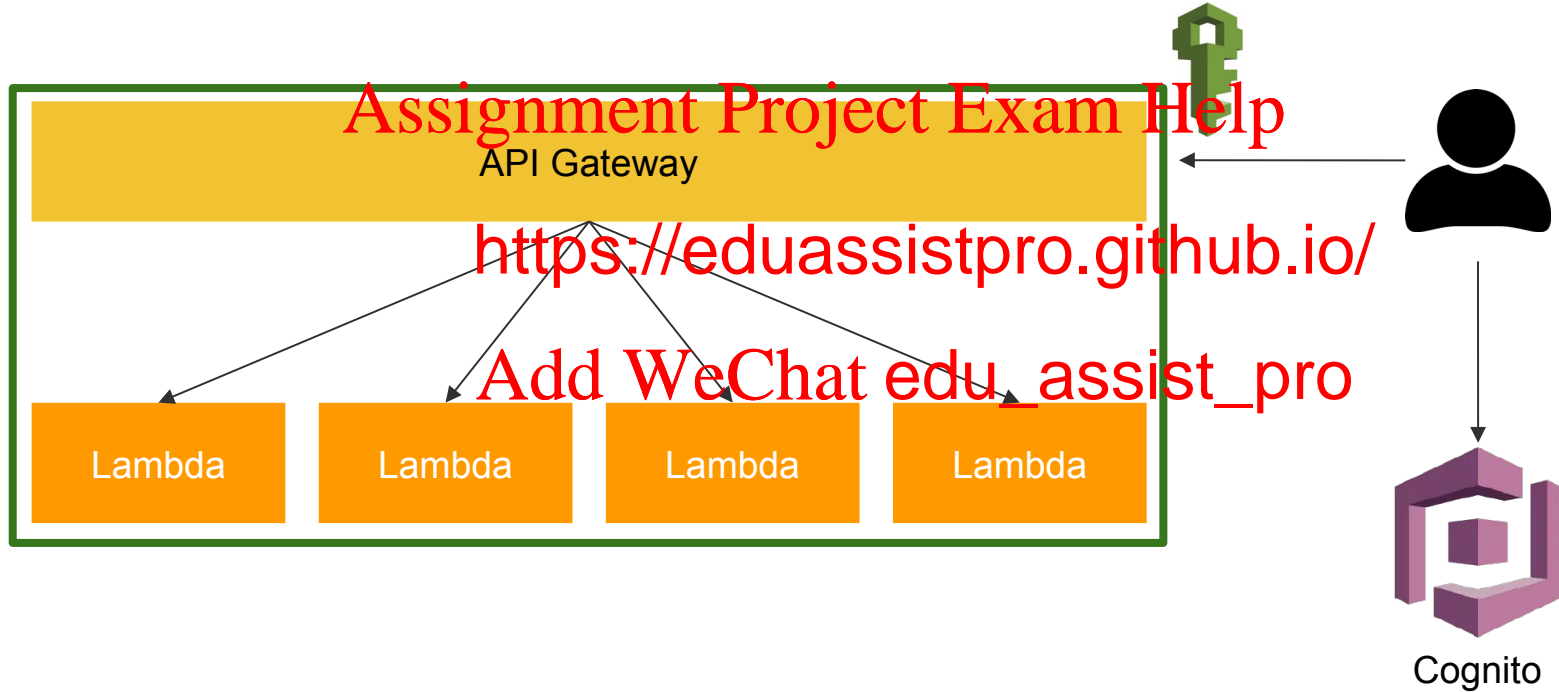
DEMO

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Integrate Cognito into the frication.

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Now that's looking a lot more secure!



Recap:

1. Use Swagger to design your APIs and documentation
2. API Gateway
 - a. great API management tool
 - b. seamless int
 - c. generates S
3. Lambda
 - a. serverless compute service
 - b. integrates with API Gateway
4. Cognito
 - a. useful for login workflows
 - b. outputs temporary IAM credentials with custom permissions

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Great, we have a lot of help at
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about the first exam. Add WeChat edu_assist_pro

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S3: More than just storage

- Host your website on S3
 - HTML, CSS
- You get:
 - 99.9999999999% of durability
 - 99.99% of availability
- You pay:
 - < \$1 per year

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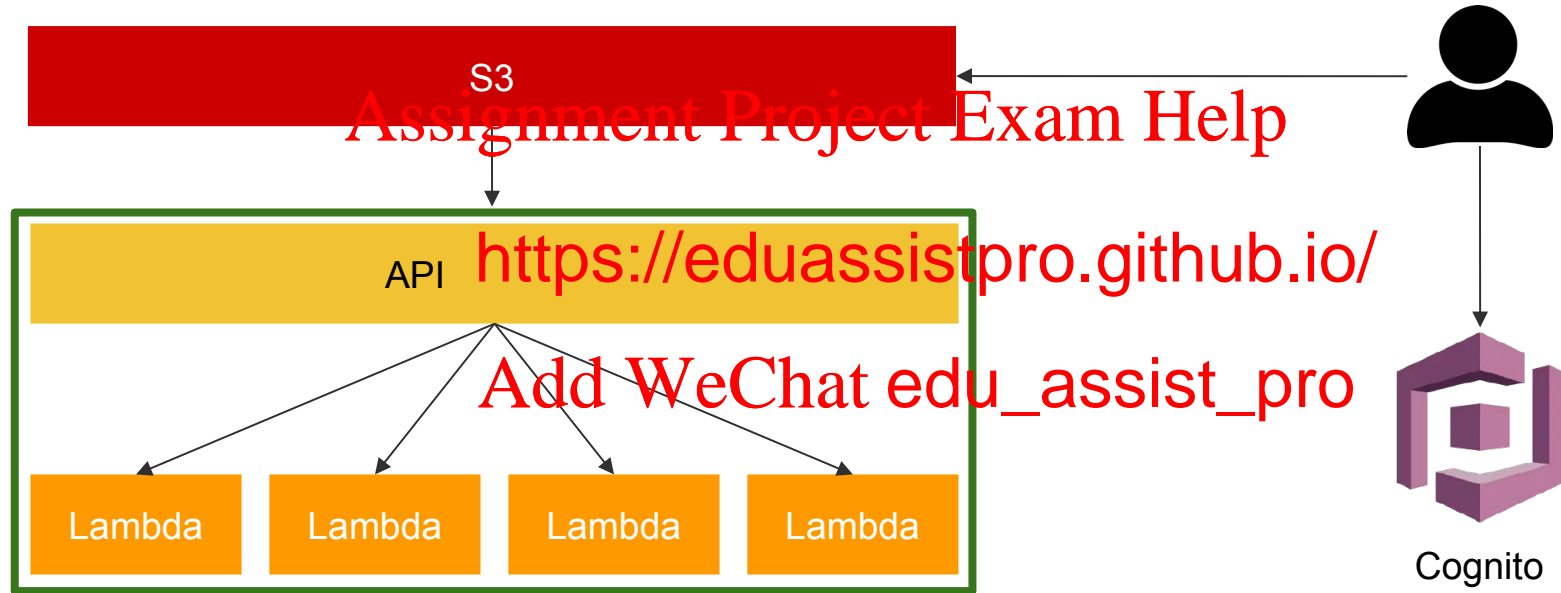
DEMO

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Host a static website on S3

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One more revision of our stack



Recap:

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1. You can use <https://eduassistpro.github.io/>
2. S3 hosted websites get out availability,
availability, and durability

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OK, let's make some money.

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You want to

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through your concierge.

1. Problems with Monolithic Systems

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Current Checkout API

- Synchronous
- Overloaded
 - Performs
 - Sends notification to us
 - (and in a proper implem would also write to the db)
- More prone to failure

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Asynchronous Checkout

- What? **Assignment Project Exam Help**
 - process asynchronously
- Why? **<https://eduassistpro.github.io/>**
 - defend against traffic spikes
 - 3rd party services are **Add WeChat edu_assist_pro** o downtime too
 - defend against programming errors and bugs
 - execute intricate order workflows, without impacting the user experience

The Asynchronous Toolset

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SQS

The Asynchronous Toolset

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SQS

Lambda

The Asynchronous Toolset

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SQS

Lambda

SNS

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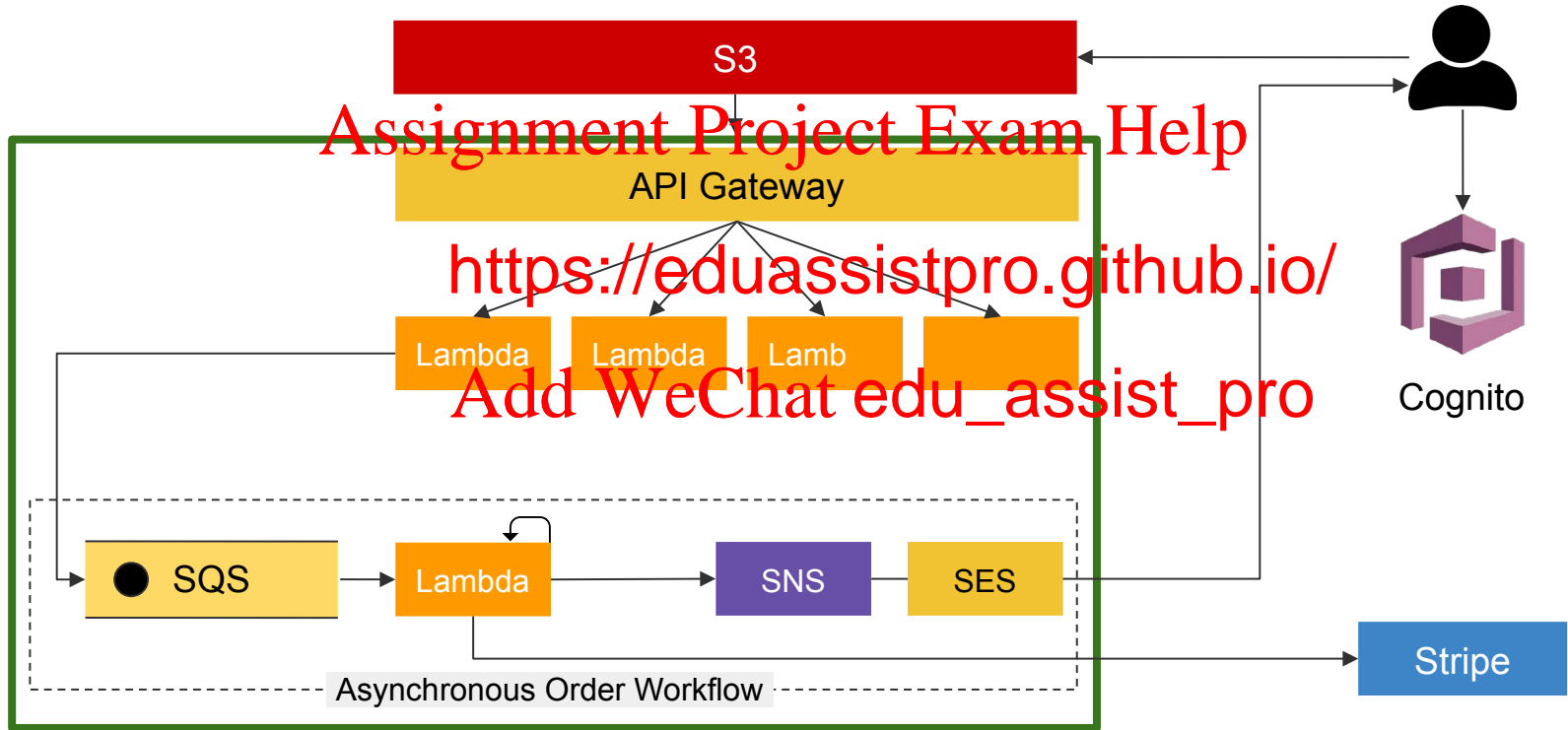
DEMO

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Setup the Asynchronous Ch kflow

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Another Stack Update



Recap:

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1. Remove com r APIs
2. Leverage SQ <https://eduassistpro.github.io/> distribute your application
3. Queues and notifications m Add WeChat edu_assist_pro stem a lot more resilient to failure

Microservices: Not a Panacea

Monolithic

Microservices

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Ideas for next steps...

1. Integrate a database (ex. DynamoDB) into the system.
 - a. the database was omitted from the demo to emphasize how you can build a system service by service, rather than building everything at once
2. Integrate a distributed cache (Memcached or Redis) to store the NLU state between requests.
3. Use Route53 to setup t
4. Integrate a real NLP en ral system.

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Sources:

<https://aws.amazon.com/s3/>

<https://aws.amazon.com/iam/>

<https://aws.amazon.com/lambda/>

<https://aws.amazon.com/cogn>

<https://aws.amazon.com/rout>

<http://docs.aws.amazon.com/>

<https://aws-de-media.s3.amazonaws.com/images/AW>

[ns/pushing_the_boundaries_1700picoservice_en](https://aws-de-media.s3.amazonaws.com/images/AW)

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Codebase:

<https://github.com/mangatany/columbia-lecture-concierge>

Steps for building the frontend depicted in the demo:

1. download and setup bootstrap template [12.5 min]
 - a. <http://getbootstrap.com/examples/cover/#>
2. create and integrate FB app [15 min]
 - a. <https://developers.facebook.com/docs/facebook-login/web>
3. download and setup chat template [30 min]
 - a. <http://codepen.io/supah/pen/jqOBqp>
4. create S3 bucket with static
 - a. <http://docs.aws.amazon.com/AmazonS3/latest/dev/GettingStarted.html>
5. setup AWS profile using C
 - a. <http://docs.aws.amazon.com/cli/latest/userguide/crted.html>
6. deploy website to S3 [10 min]
 - a. build a bash script that leverages the AWS CLI to upload files to S3
 - b. <https://github.com/mangatanyc/columbia-lecture-concierge/>
7. generate Api Gateway SDK [1 min]
8. integrate Api Gateway SDK [15 min]
 - a. <http://docs.aws.amazon.com/apigateway/latest/developerguide/how-to-generate-sdk-javascript.html>
9. setup Cognito Identity Pool [5 min]
10. integrate Facebook login with the Identity Pool [15 min]
 - a. <http://docs.aws.amazon.com/cognito/latest/developerguide/facebook.html>