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Cloud Computing #2

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PROS AND CONS OF CLOUD COMPUTING

Cloud computing: Advantages

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1. Availability
   – In a given time, what's the chance that the service is available?
2. Durability
   – What's the chance of losing the data?
3. Scalability
   – Deploy the same app on a bigger instances
   – Set up auto-scaling with load balancers
4. Cost efficiency
5. Security

Scalability

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Definition:

“The ability for something designed to operate at one measure of size to operate successfully at other sizes. The term is commonly used in relation to the development of shared computer applications that are intended to be used by large numbers of users. Of necessity, developments take place with a small number of test users. Unless the application is carefully designed to take account of the interactions that will arise when it is called on to service a large number of users, it may well fail to operate at all, or to operate only with an unacceptable level of service. An application that successfully expands its numbers of supported users is said to be scalable.” (From *Oxford Dictionary of Computer Science*)

Simply put, the question is whether the computational system you have created can seamlessly scale up?

Cost efficiency

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- In many cases, it is cheaper to use cloud computing services
  - You may need to use high performance computing for a few times
- Total cost of ownership (TCO) model
  - https://aws.amazon.com/tco-calculator/
  - Three costs of onwership
    - **Capital expenses**: On-premises hardware & software
    - **Operating expenses**: Services, support & maintenance fees to keep the equipment running
    - **Indirect costs**: Potential downtime and time-to-market delays

Security

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When you use cloud services, some of the security concerns (security “of” the cloud) are taken care by the service providers.

For example:

- Update computer systems
- Automated backup
- Network connection in the cloud
- Physical security of infrastructure

However, you also are responsible for other concerns

- Network connection between client and cloud
- Data encryption
- Application security

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NEW DIRECTIONS

Some topics in computing

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1. Serverless computing
2. Internet of Things (IoT)

Severless computing

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- So far what we have seen is based on the idea of “replacing what you have done with cloud service”
- Serverless computing goes one step further

Severless computing services

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The core of serverless computing is a service to run codes without a server

- AWS Lambda
- Azure “Functions”
- Google Cloud “Functions”

Web app with servers example

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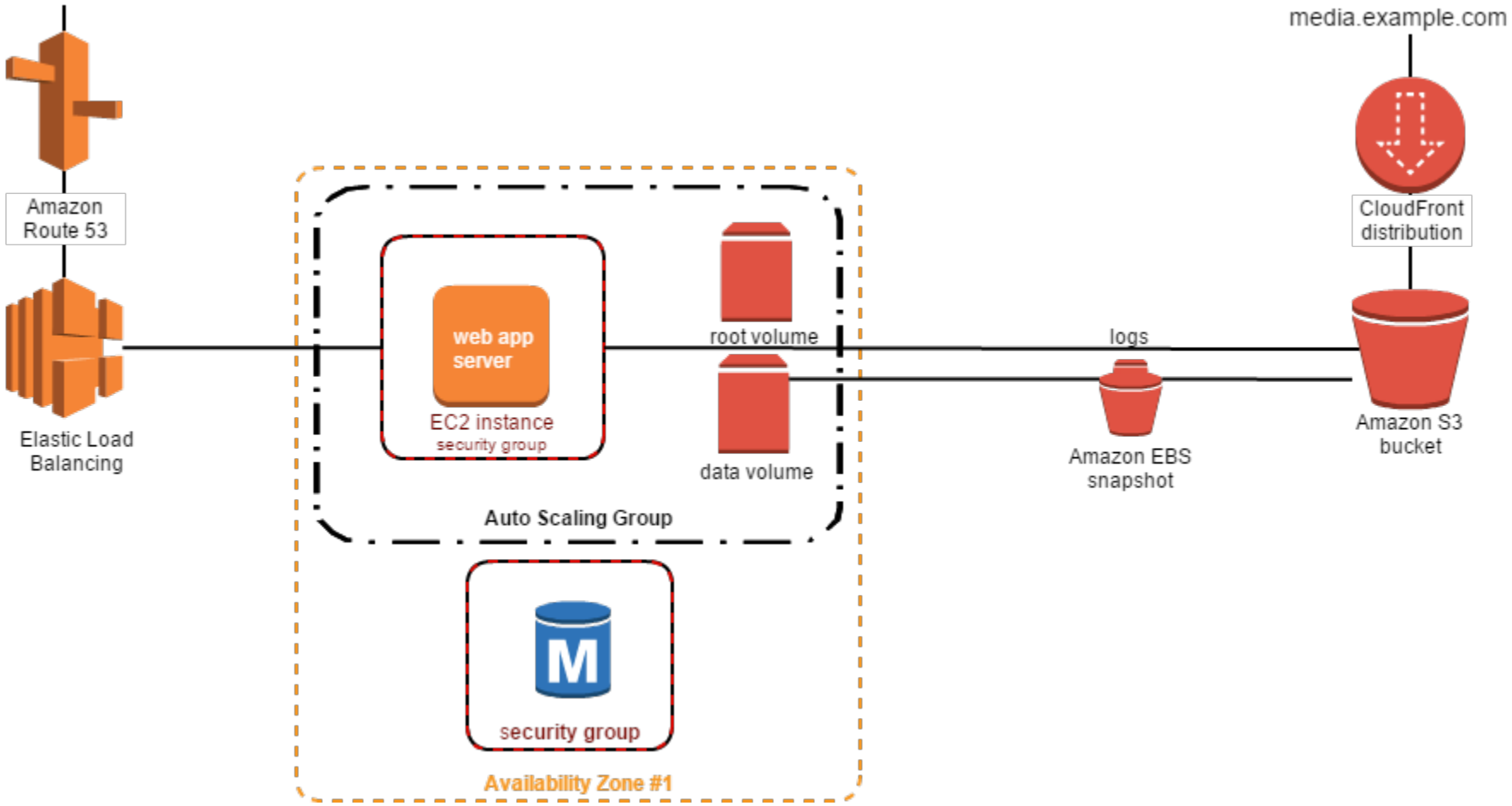

Serverless Example

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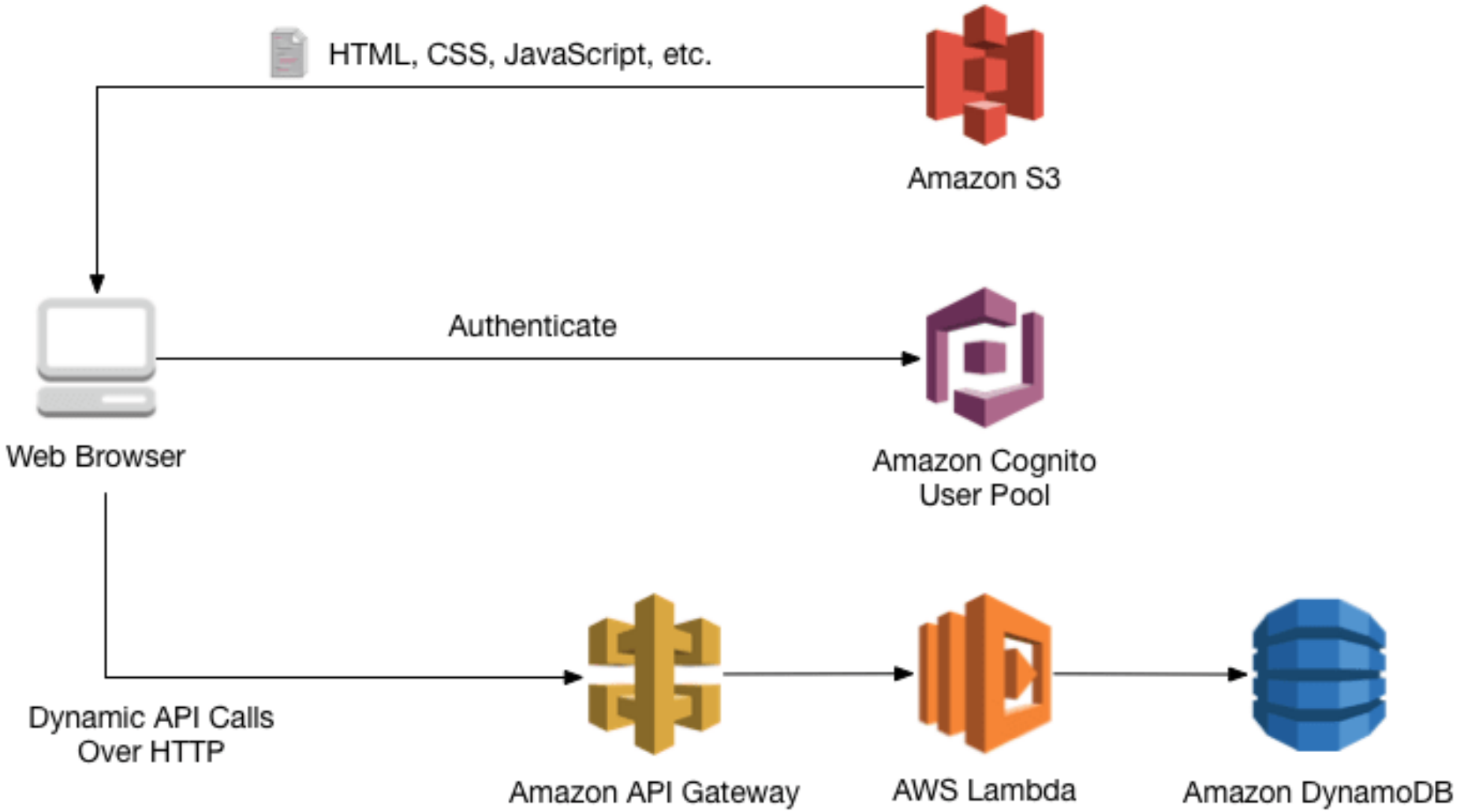

Serverless computing: Pros and Cons

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Advantages

- Good for real time insights
- Scalable (instantly)
- Usually cheaper

Disadvantages

- New/unfamiliar idea
- Not for memory intensive tasks
- Not really for tasks that takes long time to process (e.g. 5min limit for AWS Lambda)

IoT: Definition

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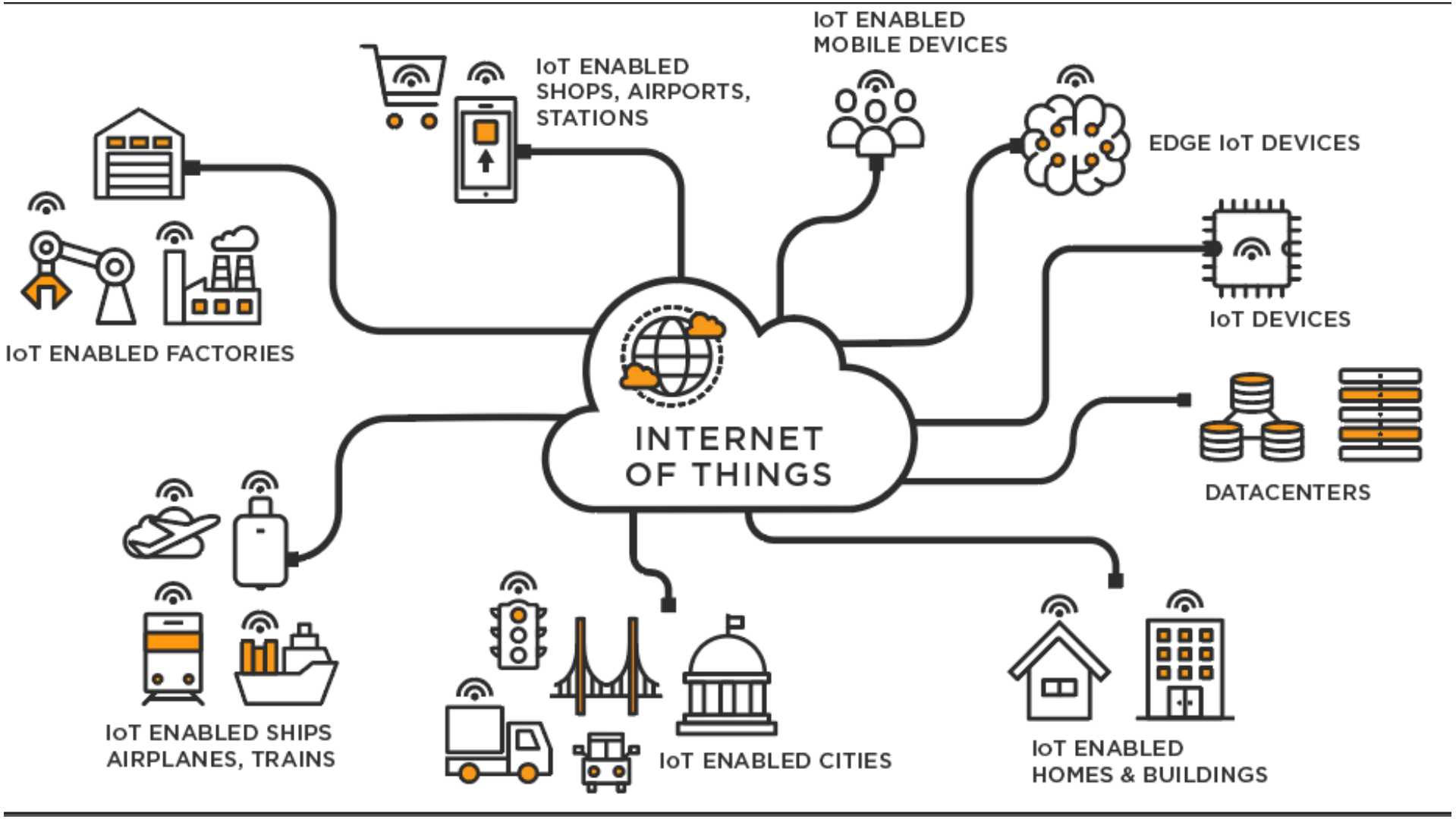
“A term used to describe the collection of computer-based objects that can be controlled by the user and which are connected to the Internet. Often the collection is associated with the home. Examples include: intelligent coffee makers, smart clothing, smart electrical switches, and burglar alarms.”

(From Oxford Dictionary of the Internet)

IoT: Illustration



https://businesstech.bus.umich.edu/uncategorized/tech-101-internet-of-things/

Cloud and IoT

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- IoT: A number of objects have sensors and send the data to cloud.
- Cloud: Aggregation of data from object, generate insights, send them to your devices (e.g. computer/smartphone)
- Example:
  - Healthcare (Botta et al, 2016): “collecting patients’ vital data via a network of sensors connected to medical devices, delivering the data to a medical center’s Cloud for storage and processing, properly managing information provided by sensors, or guaranteeing ubiquitous access to, or sharing of, medical data as Electronic Healthcare Records (EHR)”
  - Smart grid for electricity
  - Contact tracing (although it’s decentralized)
- 5G enhances the change
  - Speed
  - Reliability