The Next Generation of Computing Systems: Device to Cloud Continuum

High Performance Cloud Computing Lab (HPCC)
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UNT UNIVERSITY OF NORTH TEXAS

HPCC lab.

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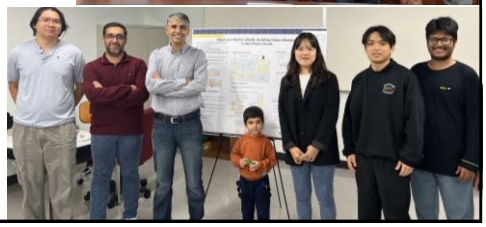
Introduction

- Dr. Mohsen Amini Salehi
  - PhD at Melbourne University 2012
  - Associate Professor at UL Lafayette (2023)
  - **Associate Professor at University of North Texas (pre**
- Director of the HPCC Lab
  - 7 members: 6 PhD + 1 MS + 2 BS students
  - In total 33 students/postdoc/visitors
  - > 70 peer-reviewed publications



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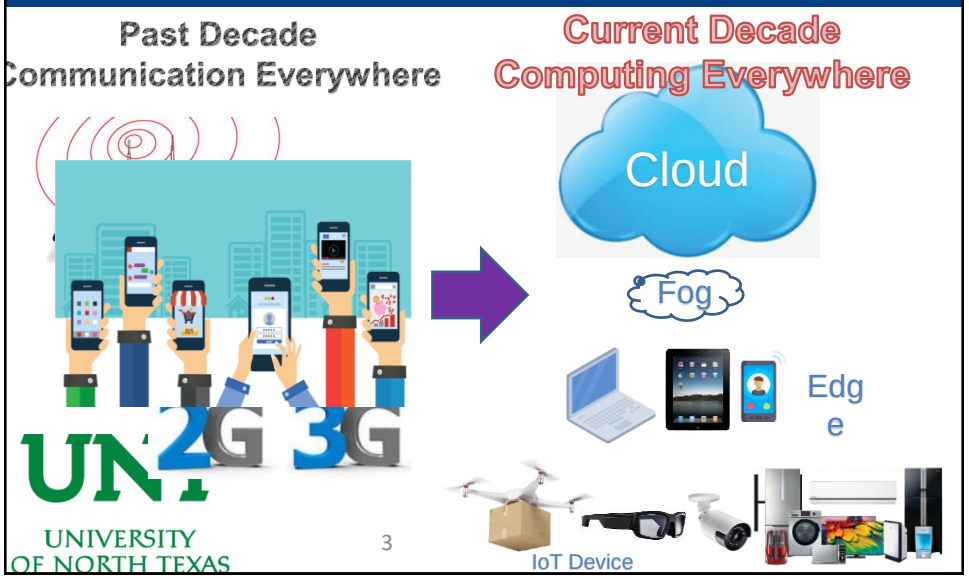
Research Vision



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Current Decade: Computing Everywhere!

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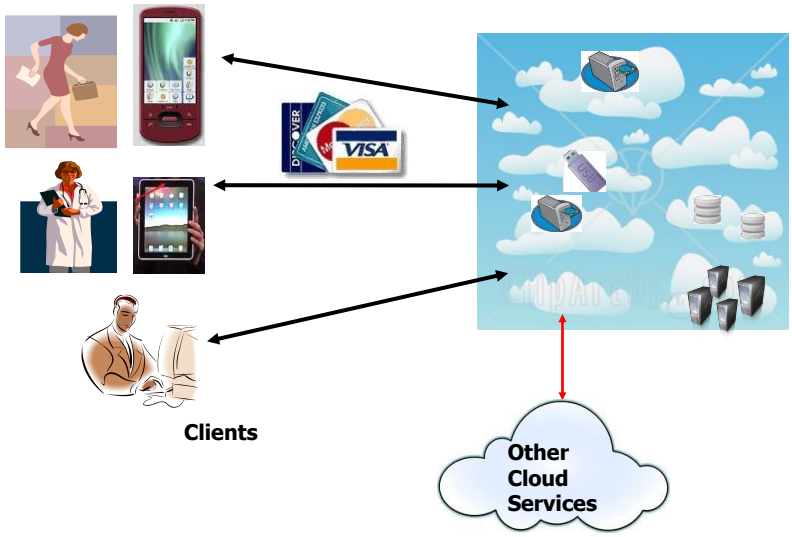
Subscription Oriented Cloud Services: X{compute, apps, data, ..} as a Service (XaaS)



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Reading Books in iPad!!

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Cloud Computing: A Paradigm Shift in IT!

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Resource Hungry Applications

✧ Solving grand challenge applications using *modeling*, *simulation* and *analysis*

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Books on iPad?

- How the paper book goes to iPad?

Magic??

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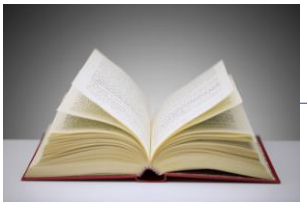
Books on iPad?



Images

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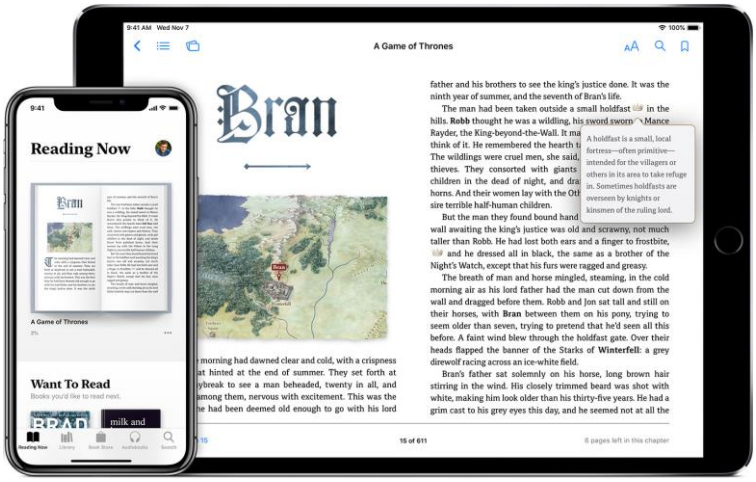
Digital Book



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How About Lots of Books?

- iPad is so small
  - It can't store lots of books?

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How to Store Lots of Books?

- We need Big Computer!!
- It can store billions of Books!!

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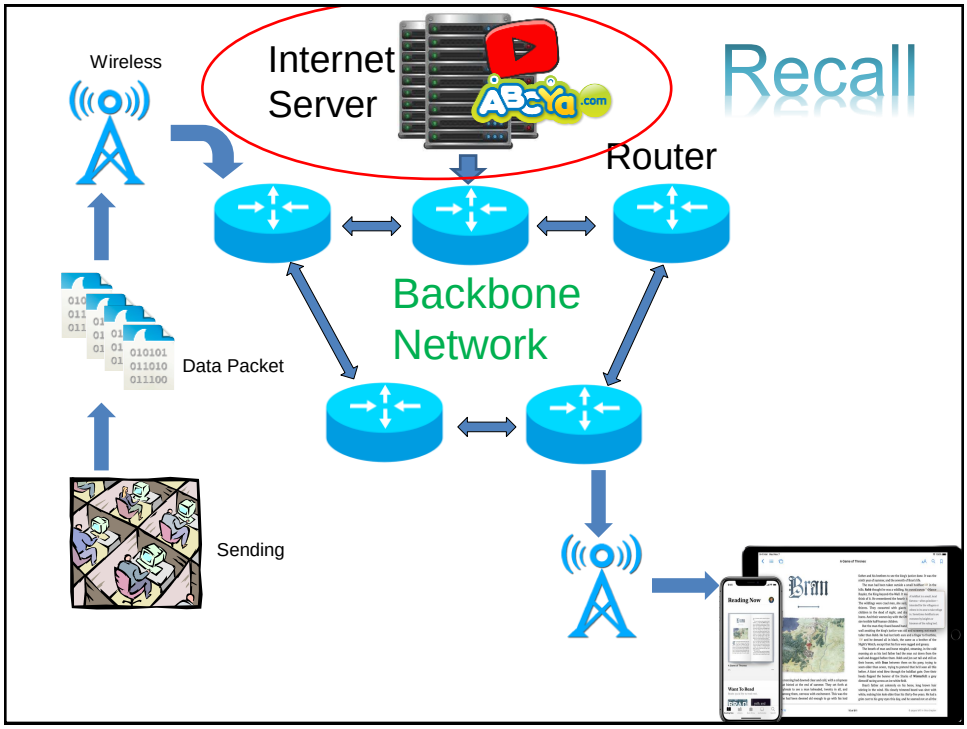

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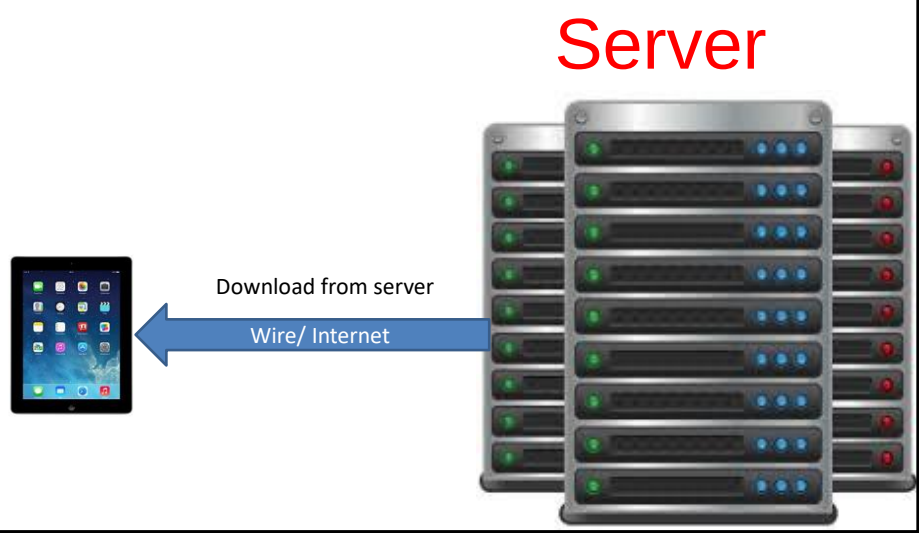
Big Computers (Servers)



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What is Cloud?

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Cloud Computing

- Lots of Big Server together we called Cloud!!

Datacenter

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Cloud Datacenters

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Google Cloud Datacenters

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Well-Known Cloud

Google Cloud

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Let's Watch a Cartoon about Cloud

https://www.youtube.com/watch?v=N0SYCyS2xZA

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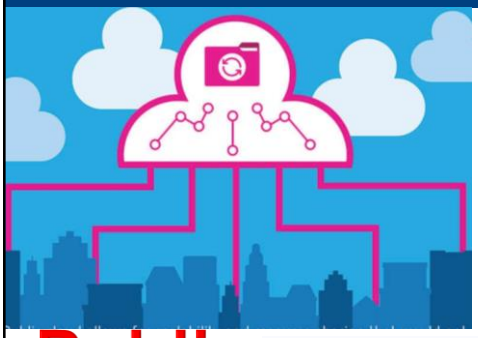
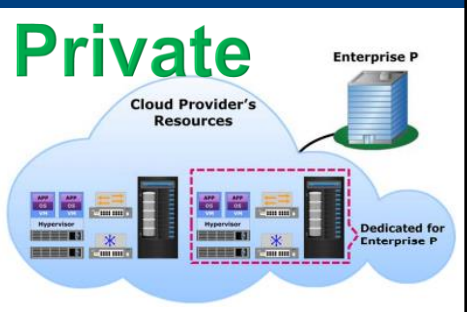
Types of Cloud





Public

Hybrid

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Types of Cloud Services

Infrastructure as a Service (IaaS)

Platform as a Service (PaaS)

Software as a Service (SaaS)

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Google Drive Demo

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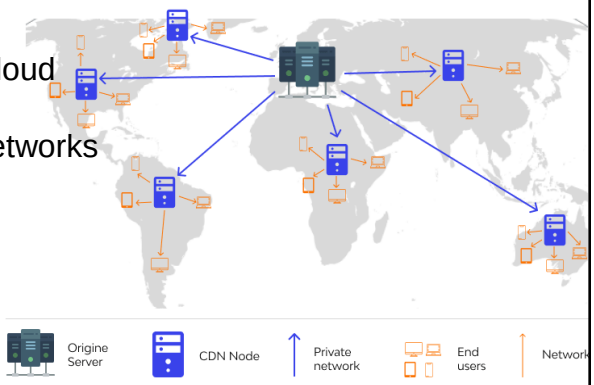
Shortcomings of Cloud Systems

- Latency of accessing cloud resources
  - Content Delivery Networks (CDN)
  - Edge Computing



- Security concerns and lack of control over resources
  - See the next chapter!

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What is CDN?

- https://www.youtube.com/watch?v=bJ9NnLLMQ78

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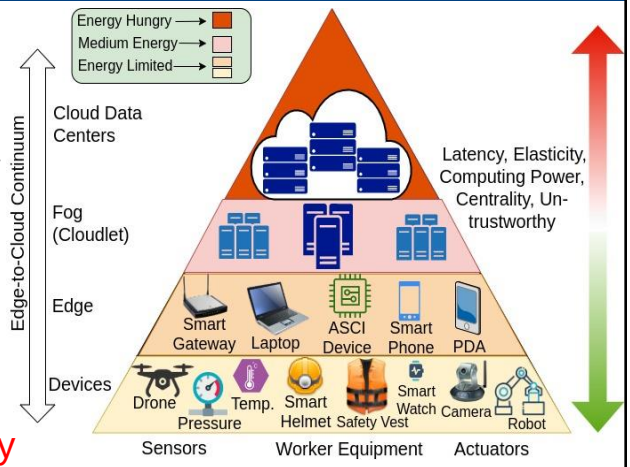
Edge-Fog-Cloud Continuum

- Why Edge & Fog?
  - Low latency
  - Privacy
  - Vicinity to data in remote areas



- Lack of elasticity in Edge!

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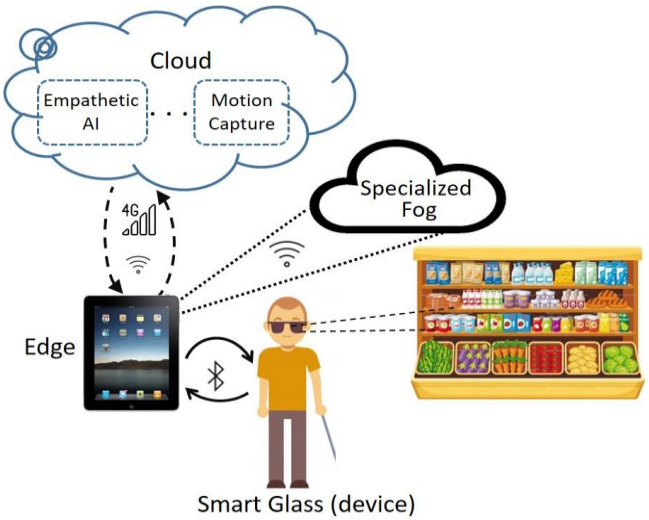
Edge-to-Cloud Systems



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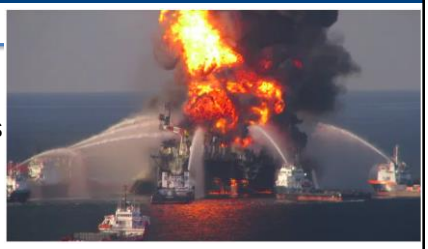
Motivation: Remote O&G disasters

- O&G in Texas
  - Formation & Hydrocarbon reservoir - offshore Gulf
  - O&G contributed **$73B** to Louisiana's 2019 GDP (~26%)
- Biggest disasters in Gulf
  - Deep Water Horizon – **2010**
  - In Louisiana, erosion rates doubled
  - killed **11** workers & took **87** days to control
- Causes:
  - Safety failures
  - Late Oil Spill Detection



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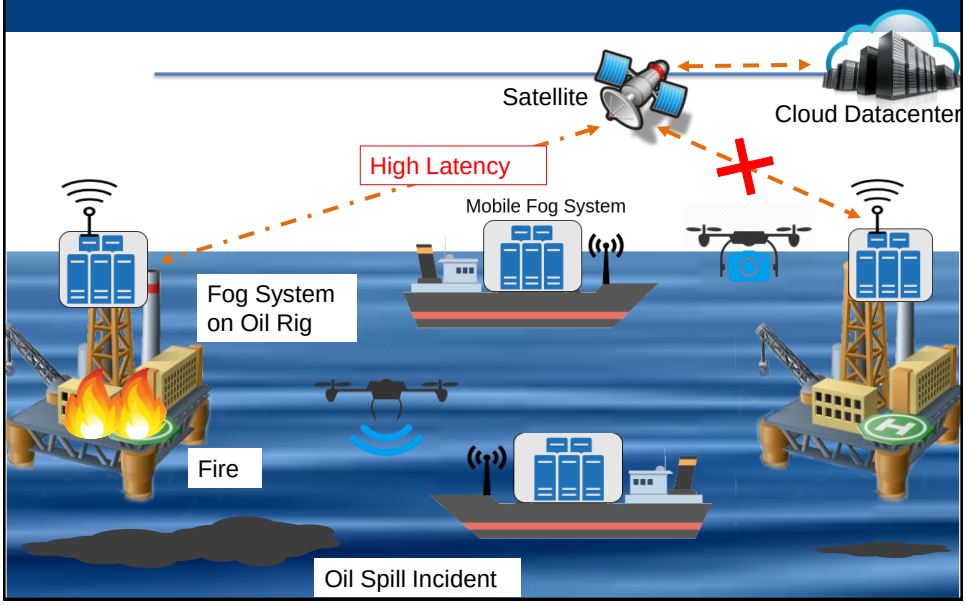
Edge-Cloud to cope with a Disaster



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Summary

- Cloud computing is a paradigm shift in computing industry
- Many of the current internet services are cloud-based
- Cloud data centers are distributed all across the world
- Problems of Cloud: Latency and trustworthiness!
- Solution: Edge combined with cloud: Edge-Cloud!

Thank you for your time…

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