Dogs Never Get Tired: Power and Edge Computing

Usenix Annual Technical Conference (ATC) 2021

Session Chairs: Marcelo Martins, Apple

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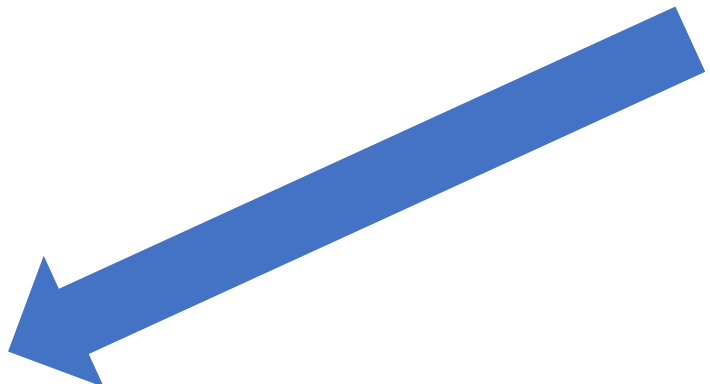
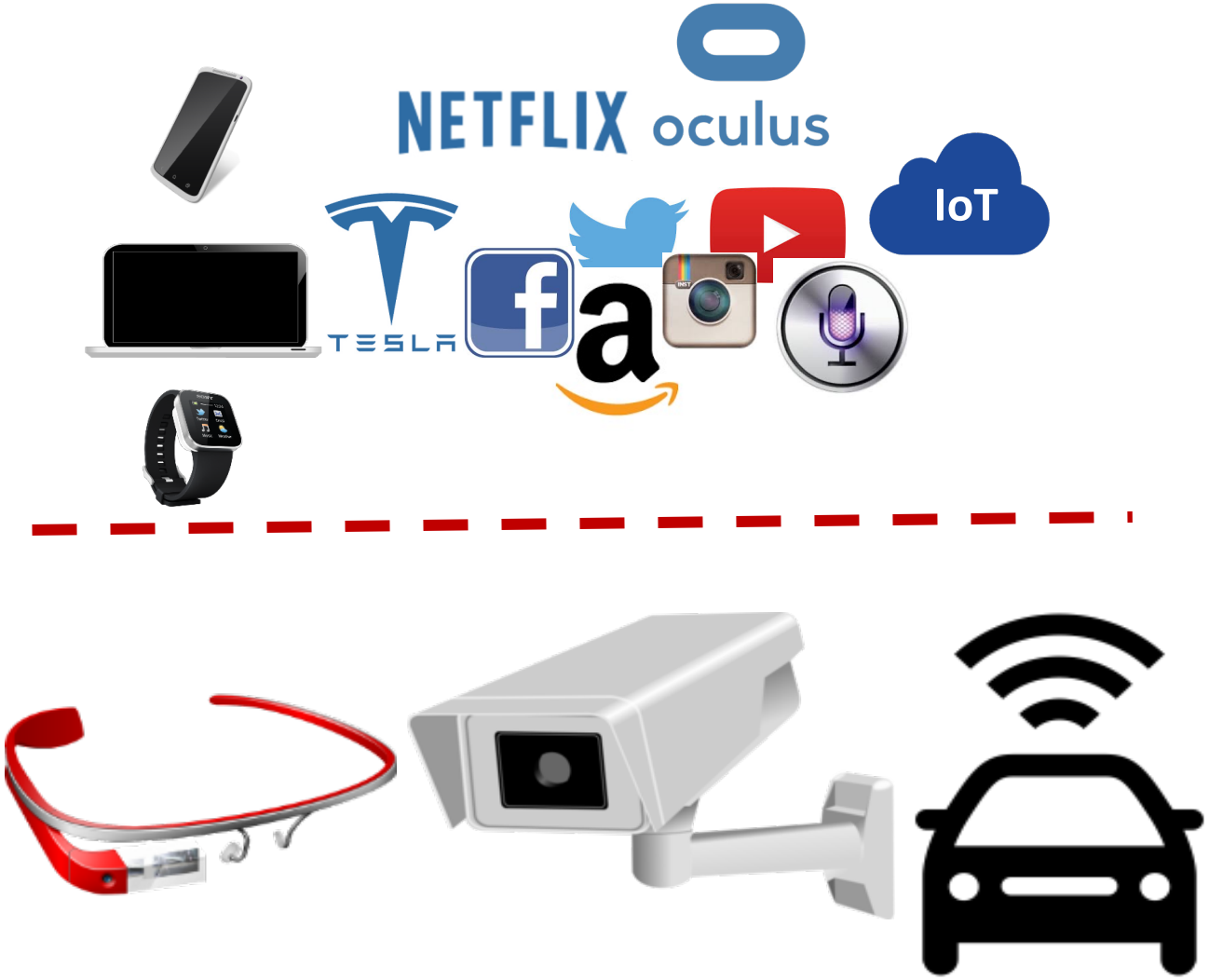
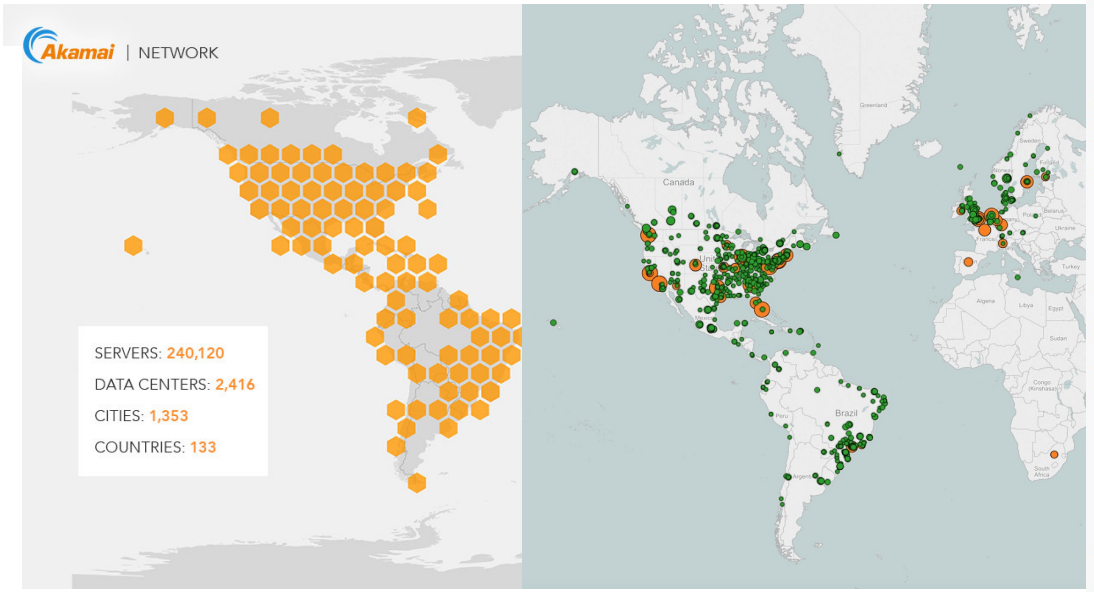


Once there were a few big dogs …

Had to haul more, Were a bit slow …

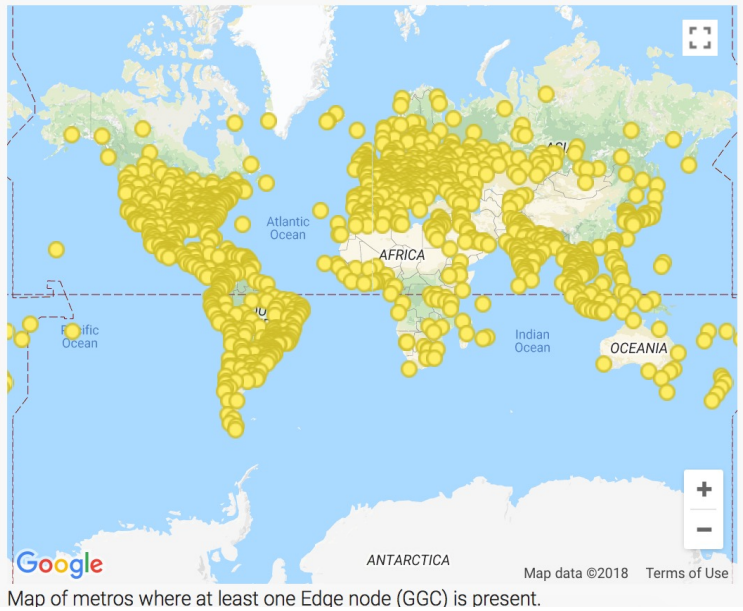


The big ones already knew it …



Akamai CDN

Netflix Open Connect



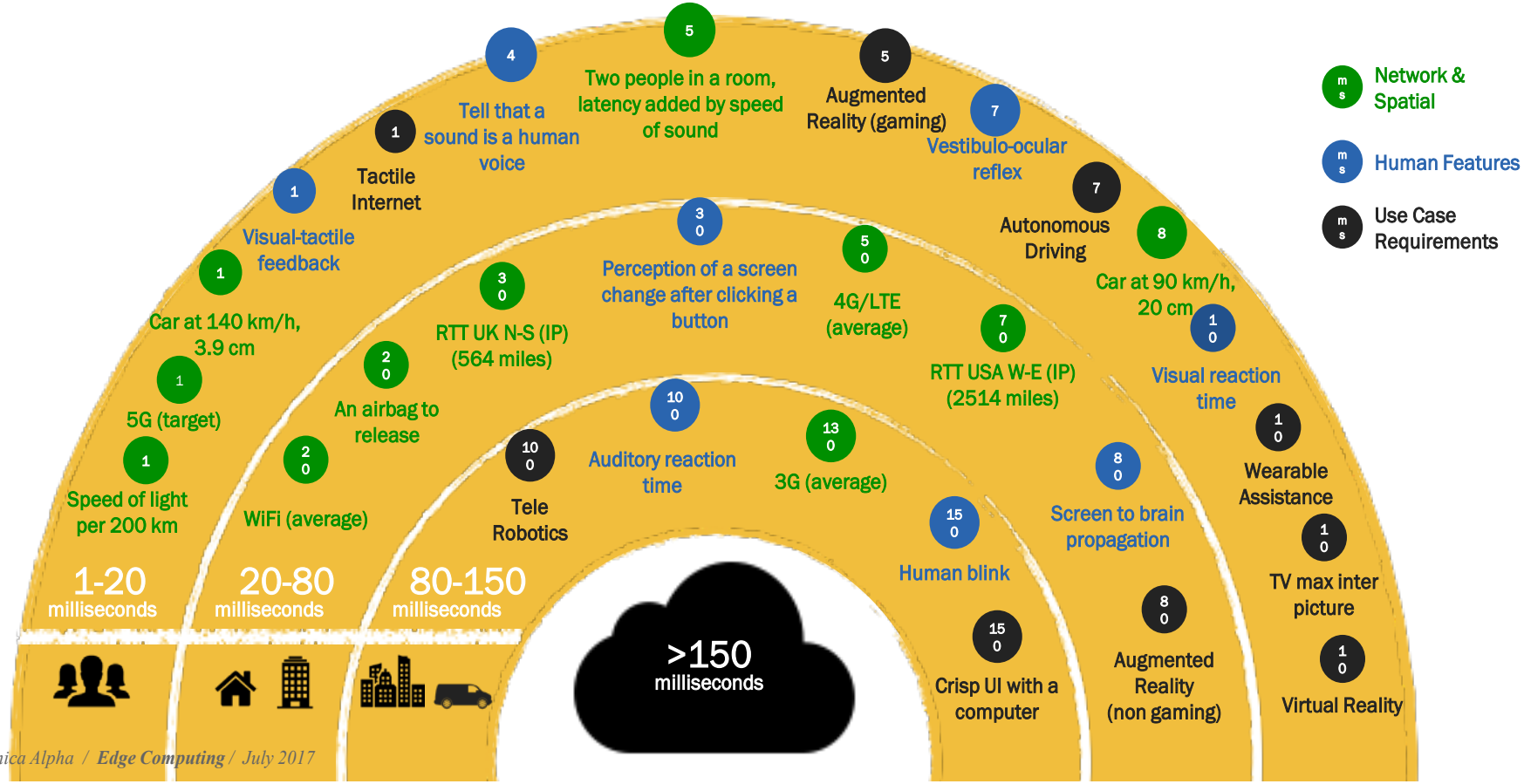
Map of metros where at least one Edge node (GGC) is present.

Google Global Cache

Pushed content cloud closer to users

- Reduce backhaul demand
- Several 10s to few 100s ms
- O(few 1000s) global locations

How fast do they really needed to be …



Source: Pablo Rodriguez, Telefonica Alpha, SEC'17

So, there were more but smaller ones …

AT&T and Microsoft announce early result of their 5G-cloud partnership

CNN

5G

Verizon partners with AWS to bring more power to its 5G edge

Deutsche Telekom Embarks on Edge Computing for IoT

Matt Kapko | Editor

December 3, 2019 12:22 PM

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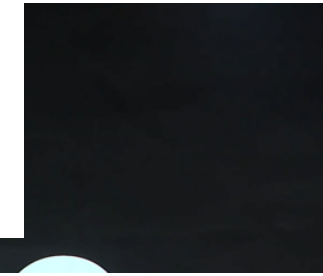


COX Products Customers

News Releases

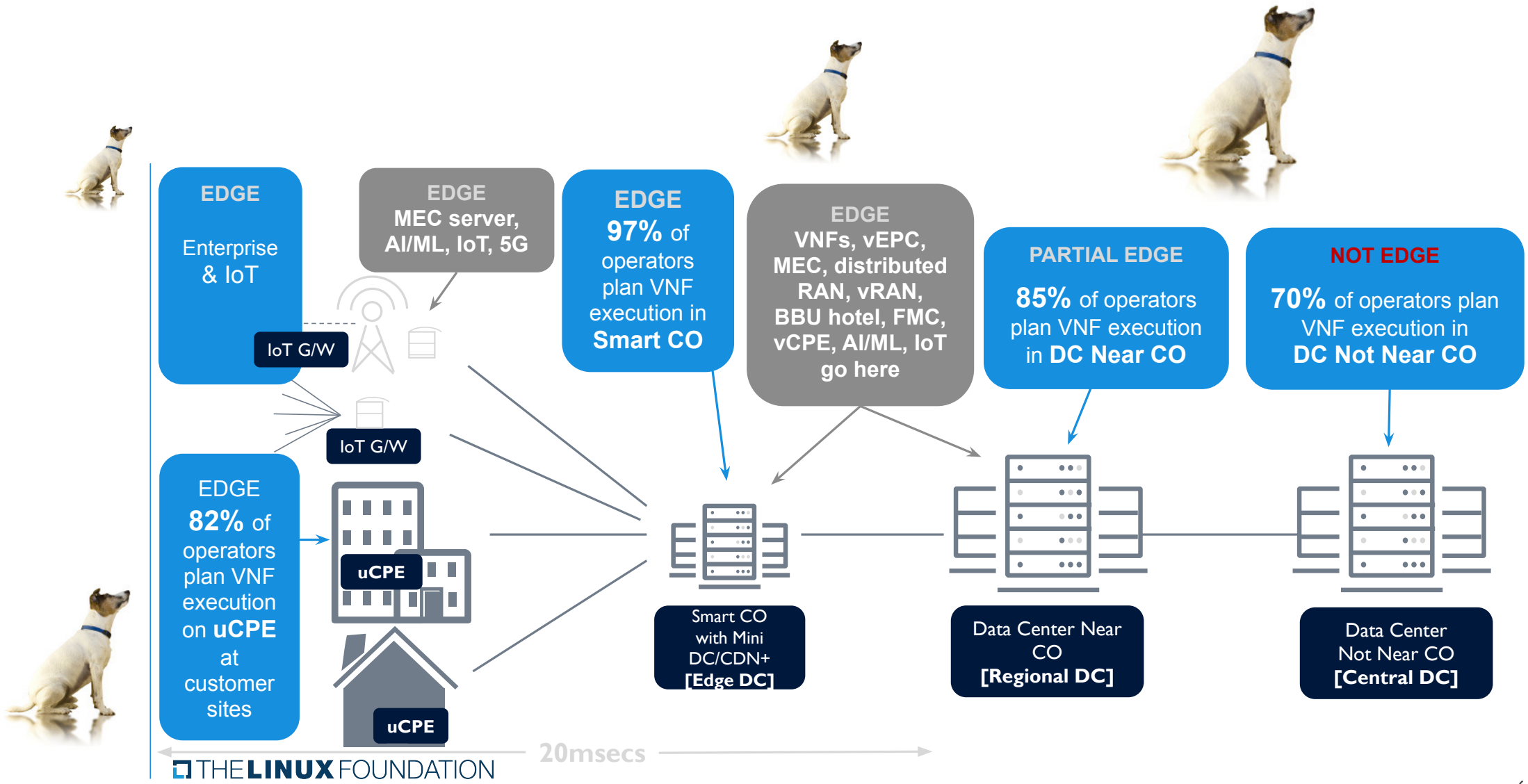
Newsroom > News Releases

Cox Brings the Cloud Closer with Launch of Cox Edge℠

Verizon CEO H

AWS cloud compute and storage at the network edge. (AWS)

Where are these small ones …



Source: IHS Markit. *NFV Strategies: Global Service Provider Survey*, June 2017; *Respondents control 61% of global telecom capex*

How do the small ones help …

- Reduce latency to few ms
- Save backhaul bandwidth

What help do small ones need …

This session

- Handle multiple applications
- Power/energy constraints

Prediction-Based Power Oversubscription in Cloud Platforms

- Power is important
- Power oversubscription is limited
- Prior work assumes hard to get info
- Reactive, expensive mechanisms

- Prediction-based approach
- Predict VM criticality & utilization
- Protect critical VMs by intelligent placement
- 2x oversubscription

Proactive Energy-Aware Adaptive Video Streaming on Mobile Devices

- ABR widely used video 360 streaming – App adaptation
- Prior work, mostly reactive causes adaptation oscillations
- Difficult to predict energy usage
- Energy use is cummulative

- Integrated, Pro-active ABR adaptations for video
- Reactive vs. Proactive
- Function wise power prediction
- Practical control algorithm

Video Analytics with Zero-streaming Cameras

- A lot of cameras (surveillance)
- Huge amounts cold video (nothing interesting)
- Especially for ad-hoc queries: retrieve, tag, count
- Why stream … even to edge
- Cloud processing only needed if more accuracy is needed

- Zero-streaming
- Leverage spatial skew in landmarks
- Cloud provides increasingly complex / more accurate operators based on policy
- Multi-pass, multi-operators
- 100x more video in realtime

ASAP: Fast Mobile Application Switch via Adaptive Prepaging

- Everyone uses more than one app
- Switching b/w them can be faster (useful)
- Cause – slow demand paging
- Requires careful low level design to avoid overheads

- Predict likely to be accessed pages / pre-page
- Ensure reasonable overheads
- 20-30% faster switch
- Additional 30% CPU & 25% disk bandwidth usage

Enjoy the session ☺