ECS404 Computer Systems and Networks

Week 1: Computers everywhere

What is the world's most widely used computer operating system?

- Windows
- Linux
- MacOs
- Android
- Other

Quiz

goo.gl/eC2jdS

Learning Outcomes

- By the end of this video you should understand the width of the range of devices that can be called computers.

Windows

- Family of operating systems
- Originally developed for the IBM PC
- Key driver behind the growth of Microsoft

Windows

- Go into PC world and most of the computers will be Windows-based.
- That may not be true elsewhere.

Linux

- Operating system kernel developed as a port of Unix to the IBM PC
- Linus Torvalds
- Issued under Gnu General Public Licence v2 (GPLv2)
- Lots of flavours use same kernel: Ubuntu, Debian, RedHat,…

Linux

- Linux is widely used as an operating system:
  - in server farms - where consumers don’t see it
  - in consumer devices - for example routers
- It is free, easy to port to different architectures, and has a lot of eager intelligent people developing it (at no cost to the end user).

MacOs

- Also Unix-based (nb not based on Linux)
- Very different from iOS
- But only used on Macintosh computers

Android

- Developed by Google for mobile phones
- Mobile phones are basically computers with a different interface.
- There are lots of them.

Google 
@Google

Follow

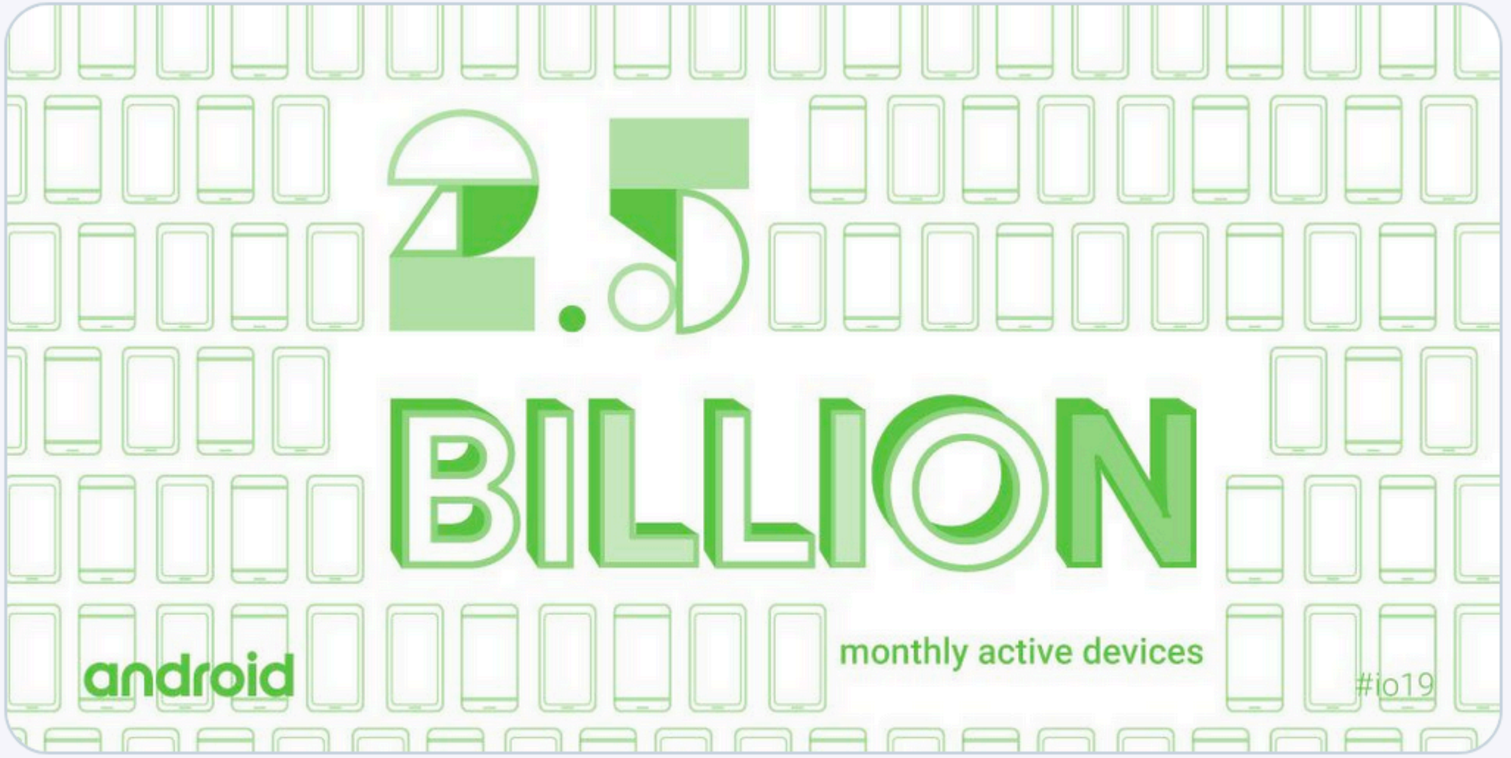
Thanks to developers and our partners around the world, there are now more than 2 billion monthly active Android devices. #io17

GIF

10:09 AM - 17 May 2017

Android @Android · May 7, 2019

10 years and now over 2.5 billion active devices. Thanks for joining us on this journey. #io19



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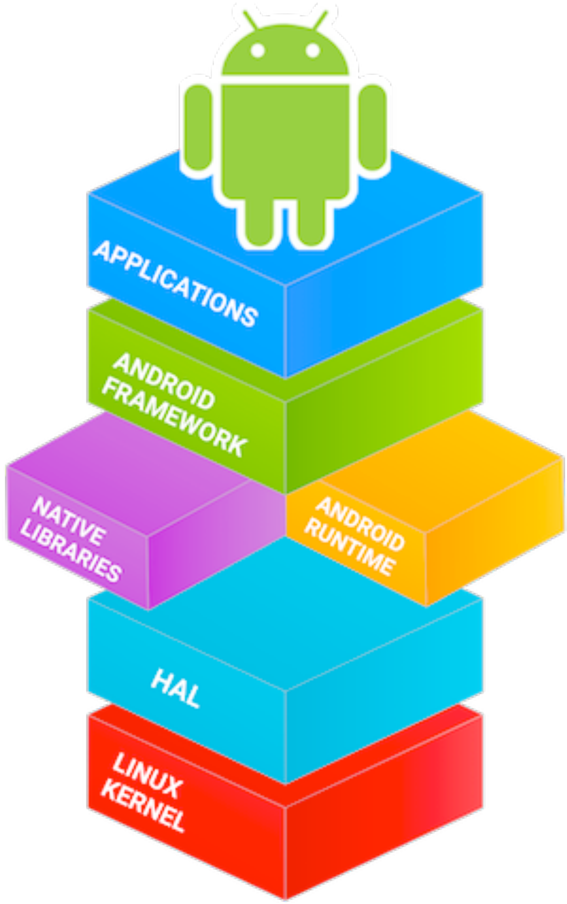
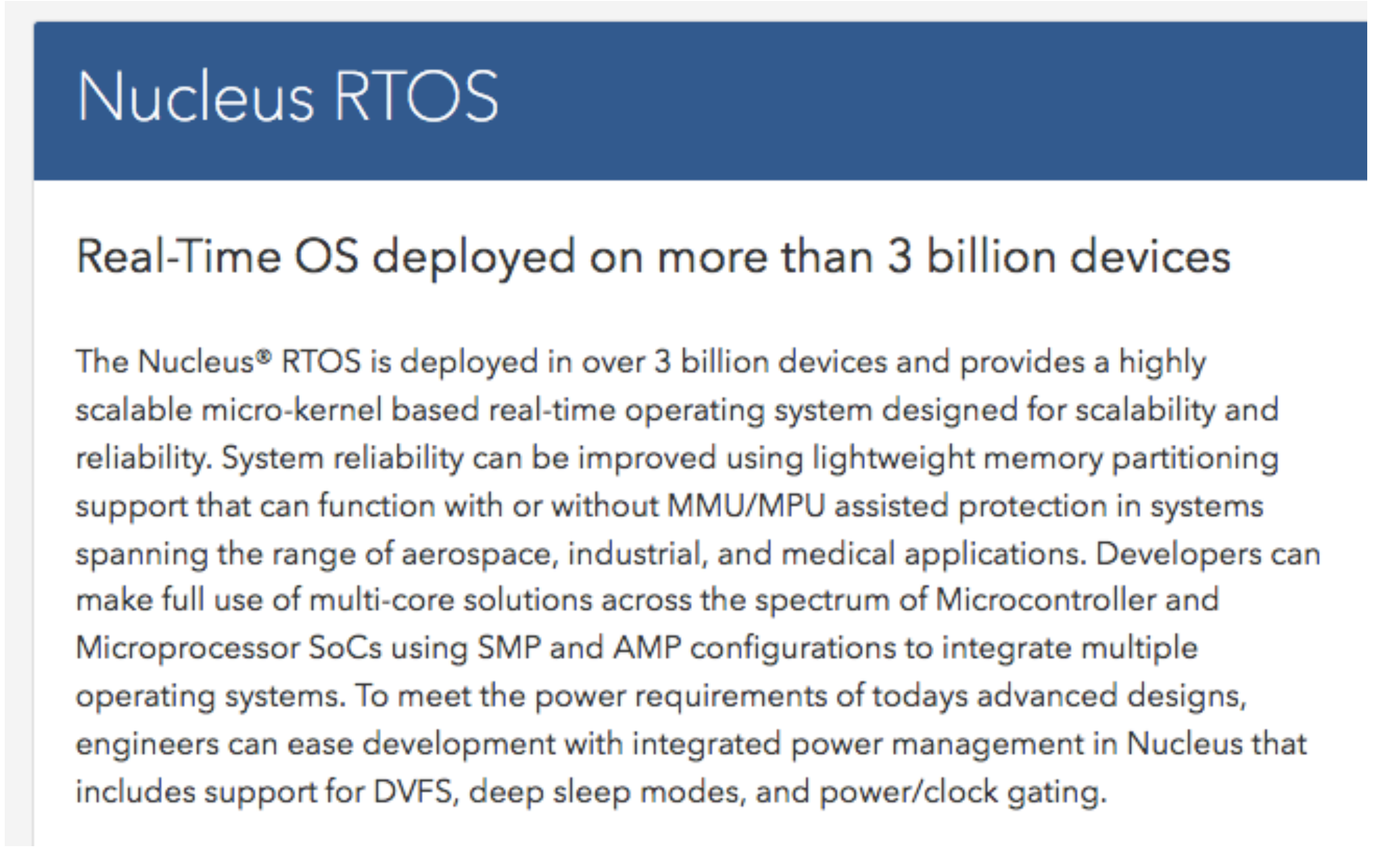
Android

- Developed by Google for mobile phones
- Uses a form of linux kernel



What about those other devices?



Nucleus RTOS

Real-Time OS deployed on more than 3 billion devices

The Nucleus® RTOS is deployed in over 3 billion devices and provides a highly scalable micro-kernel based real-time operating system designed for scalability and reliability. System reliability can be improved using lightweight memory partitioning support that can function with or without MMU/MPU assisted protection in systems spanning the range of aerospace, industrial, and medical applications. Developers can make full use of multi-core solutions across the spectrum of Microcontroller and Microprocessor SoCs using SMP and AMP configurations to integrate multiple operating systems. To meet the power requirements of todays advanced designs, engineers can ease development with integrated power management in Nucleus that includes support for DVFS, deep sleep modes, and power/clock gating.

https://www.mentor.com/embedded-software/nucleus/

Computers are everywhere

- Everyone has a laptop

Computers are **everywhere**

- **Everyone** has a phone

Computers are **everywhere**

- **Everyone** has a television set

Computers are **everywhere**

- **Everyone** travels in cars and planes

Computers are **everywhere**

- **Everyone** uses the internet, for everything.

Exercise: Computers at Home

- Offline exercise: see QM+
- Identify some of the special-purpose computers you have at home.

This lecture: What is the range

- A look at the range of devices that you might end up working with.
- Starting in the middle
- But going very small
- And very large
- Later we will look at how they are built

Starting in the middle: consumer computers

- Laptops
- Phones
- Tablets

How small can you go?

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Programmable chips in

- Security Cameras
- Printers
- Home routers
- Smart speakers

Friday October 21st 2016: rebellion of the slaves

- A “botnet” of hacked consumer devices (cameras, routers, digital video recorders) controlled by MIRAI software.
- Major attack on internet infrastructure (distributed denial of service attack on DNS service Dyn)
- Something like 173,000 devices involved (up to 1.2m infected)
- Outages of hours for GitHub, Twitter, Reddit, Netflix, AirBnb …

Emergent Tech ▸ Internet of Things

222

Today the web was broken by countless hacked devices – your 60-second summary

IoT gadgets flooded DNS biz Dyn to take down big name websites

By Chris Williams, US editor 21 Oct 2016 at 21:45

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Updated Today a vast army of hijacked internet-connected devices – from security cameras and video recorders to home routers – turned on their owners and broke a big chunk of the web.

Compromised machines, following orders from as-yet unknown masterminds, threw massive amounts of junk traffic at servers operated by US-based Dyn, which provides DNS services for websites large and small.

The result: big names including GitHub, Twitter, Reddit, Netflix, AirBnb and so on, were among hundreds of websites rendered inaccessible to millions of people around the world for several hours today.

https://www.theregister.co.uk/2016/10/21/dyn_dns_ddos_explained/

Key learning point

- Major corporations taken down by an internet attack from an army of hacked cameras, routers, video recorders and other devices
- Those cameras, routers, video recorders and other devices are computers and can be made to have lives of their own.

Refs

- https://www.theregister.co.uk/2016/10/21/dyn_dns_ddos_explained/
- http://www.bbc.co.uk/news/technology-37738823
- https://www.theguardian.com/technology/2016/oct/26/ddos-attack-dyn-mirai-botnet


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