Συστήματα Υπολογιστών (Computer Systems)

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Computing infrastructure

- ☐ Typically PCs on desks
- □ No more! Instead:
- □ Small mobile
- □ Large
 - Datacenters



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Small devices (embedded)

- Access points
 - □ People, appliances, sensors
 - Machine2machine
- An interface between digital and physical world
- Need a lot of processing, memory, storage, communication
 - A simple mobile device much more powerful than the computers used by NASA to go to the moon
 - □ GBytes of memory, 10s Gbytes storage, Gbit speeds, many cores
 - □ Need more and more...
- But: Limited by energy / battery
- ☐ Goal: Performance at certain power



Devices generate a lot of data

- Most actions consume but also generate data
 - □ Every minute: 300H video
 - Machine2machine
- Data requires processing
 - Processing happens on servers
- How much information?
 - □ How much processing?



Data is being created all the time without us even noticing it. Much of what we do every day now happens in the digital realm, leaving an ever-increasing digital trail that can be measured and analyzed. Just how much data do our tweets, likes and photo uploads really generate? For the third time, Domo has the answer—and the numbers are staggering.

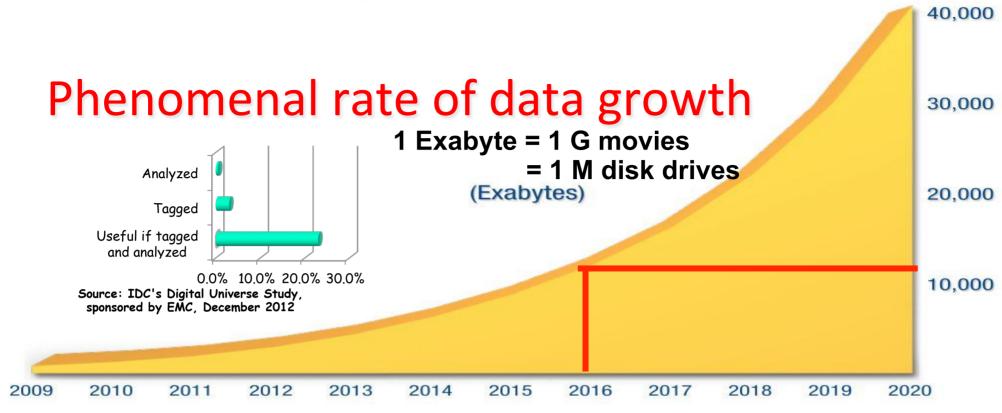




THE GLOBAL INTERNET POPULATION GREW 18.5% FROM 2013–2015 AND NOW REPRESENTS 3.2 BILLION PEOPLE.

With each click, share and like, the world's data pool is expanding faster than we can comprehend, Businesses today are paying attention to scores of data sources to make crucial decisions about the future. The team at Domo can help your business make sense of this endless stream of data by providing executives with all their critical information in one intuitive platform. Domo delivers the insights you need to transform the way you run your business. Learn more at www.domo.com.



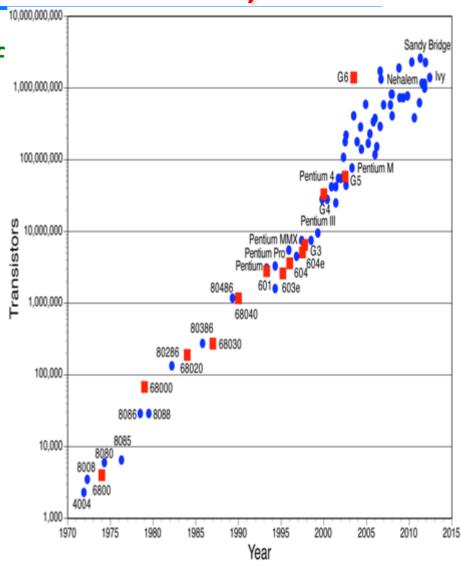


Source: IDC's Digital Universe Study, sponsored by EMC, December 2012

- □ Data grows at more than 2x/2 years
 - By 2020, 4x more data (today ~10 ZB, by 2020 ~40 ZB)
- □ Only 0.5% is analyzed today
 - □ Today, 23% of data is valuable
 - Need to process 50x more data
- ☐ In total, 200x more processing by 2020

Better servers (2x / 18months)

- Systems get better because of technology
 - □ E.g. faster clocks or more cores
- □ How much better?
 - □ Roughly 2x faster every ~18 months
 - □ Gordon Moore in the 70s
- Assuming this will continue
 - □ It will require a lot of research and engineering
- By 2020 systems will be ~4x faster
 - □ Still missing 50x improvement



Use more servers (2x / 2years)

- □ Let's buy more servers
 - "If we need more cars, let's build them"
- □ Problem
 - □ 1. High cost capital and operational
 - Not possible to increase by 50x datacenters
 - 2. We cannot feed them with electricity (power)
 - Typically today we place servers in data centers
 - A typical DC = electricity of a town (1000 people, 10 MW)
 - Limited by power and latency to users
- □ Let's say we can have 2x new DCs by 2020
 - □ Still left with a factor of 25x or so





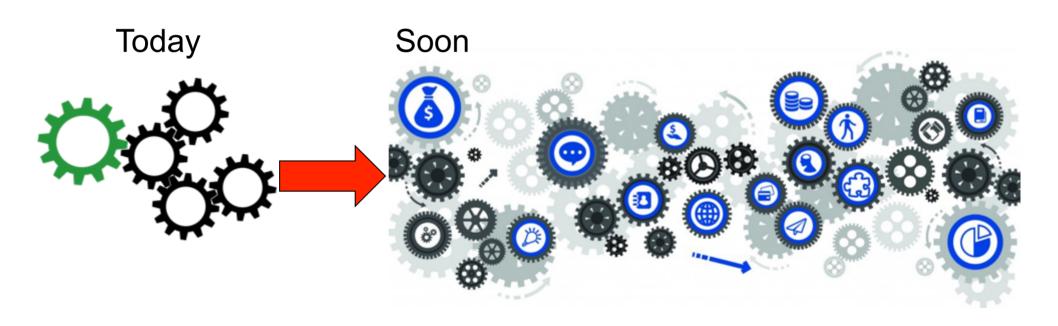


Challenge ahead (in Computer Systems)

- □ Achieve additional ~25x improvement in ~4years
 - "More than Moore" era exciting for computer systems
 - □ Impact on society: work, entertainment, social, science
- □ Direction 1: Increase server utilization
 - Systems today are not utilized as much they should
 - E.g. one person/bus need to run more apps per server
- □ Direction 2: Embrace customization
 - □ All vehicles the same in fact, closer to planes
 - Need to start customizing computers for different tasks

Systems Software

- Software that controls resources
- □ Central role in this transformation



Interest from Industry (chronological)

- Important problems in EU and the world
- ☐ The last few years a lot of interest from industry
- □ Local presence
- □ OnApp
 - Virtualization, cloud management infrastructure
 - Development office in Heraklion
- □ Neurocom
 - □ Telecom analytics
 - □ Development office in Heraklion/STEP-C
- □ IOFabric
 - Datacenter storage
 - Startup company in North America
 - Development office in Heraklion/STEP-C
- Catalyst in all cases
 - Expertise of people in our environment

Thank you!