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# Systems Research Group

Jon Crowcroft

Welcome!

- I'm **Jon Crowcroft** of the **Systems Research Group** (SRG)

- We are legion
    - Well, quite big (10 Academics, 7 Researchers, 16+ PhD Students …)
- We build better useful stuff
    - Strong focus on **building concrete artefacts** to **evaluate** in a **realistic environment**, and (hopefully!) **transition to deployment**
- We cover a lot of bases:
    - Networks, Operating Systems, Distributed Systems, Programming Languages, Databases, Modelling, Security, Hardware, Environment, Health, …
    - Significant industrial funding from Google, Microsoft, Facebook, ARM, Qualcomm, Samsung, Xilinx, British Telecom, Huawei, etc…
    - Work with DTG, Security, Architecture, Theory, Programming Languages, …

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Who Are We?
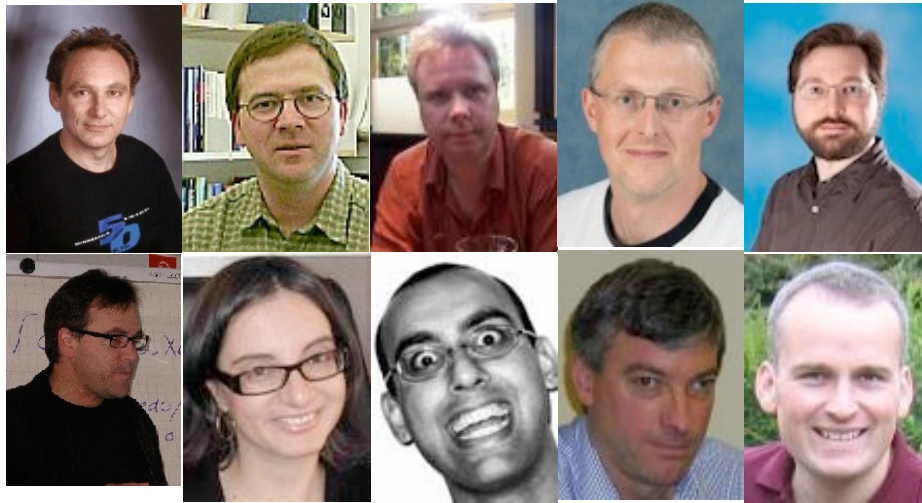
Amir Chaudhry

Sarfraz Nawaz

Liang Wang

Noa Zilberman

Thomas Gazagna

Dimosthenis Pe

Eiko Yoneki

Neelakandan Manihatty Bojan

Aisha El-Safty

Heidi Howard

Desi Hristova

Sheharbano Khattak

David Miller

Toby Moncaster

Myoung Jin Nam

Karthik Nilakant

Diana Andreea Popescu

Michael Schaarschmidt

Malte Schwarzkopf

Zafar Gilani

Malcolm Scott

Bjoern A. Zeeb

Jingyun Zhang

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What Have We Done?

co-architect of Microsoft 360 Natal / Kinect

Founder Xensource, Bromium

Google Director in charge of web indexing and crawling

Director of Toshiba Research

Author of AltaVista

Research Director VMWare

Design Engineer at TomTom

Video-system architect for Nokia N8

Author of C++

Co-author of Gimp

Architect of the first hard-disk MP3 player
(NOT apple!)

Former University of Cambridge Pro-Vice Chancellor

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Where Have We Gone?

…the ONLY qualification that guarantees a job here is a good systems PhD from Cambridge…

(Director of a **research** lab in Palo Alto)

You will find SRG PhDs in
Amazon,Microsoft, Google, Intel, Sun, AT&T, IBM,…
AND founding a lot of other places too. Also,
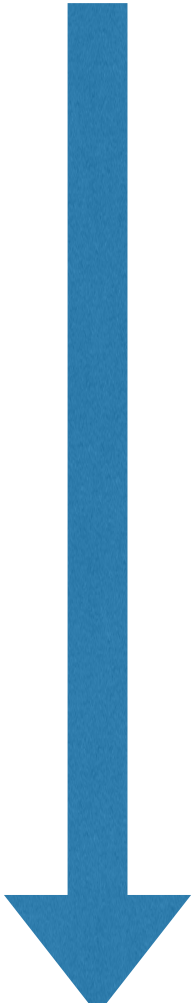MIT, Berkeley, Yale, HKUST, Helsinki Uni

Citrix Acquiring XenSource for $500 Million

August 15, 2007

Globespan to buy Virata for $1.3 billion to create DSL-chip powerhouse

January 10, 2001

A Selection of SRG Projects

Area	Program
Hardware	INTERNET
Theory	Resilient Clouds (MRC)
	REMS
Languages	CADETS
	OCaml Labs
Embedded	Horizon
Privacy	Networks-as-a-Service
	User Centric Networking
Mobile	EmotionSense
	Cloud Law
Datacenter	Data Centric Systems
Legal	CHERI

Jon Crowcroft

Stuff

- Hub of All Things: personal data business models http://hubofallthings.org/

- Cloud Legal: http://www.claw-workshop.org/

- Internet Science: http://www.internet-science.eu/

- Liquid Networking: http://trilogy2.it.uc3m.es/

- Energy Aware Networking: http://www.internet-project.org.uk/

Eva Kalyvianaki

Cloud Computing, Big Data Processing, Autonomic Computing, Distributed Systems and Systems Research in general.

Design and management of next generation, large-scale applications in the Cloud. Addressing the complexity of modern systems with mathematical reasoning.

- Optimised resource management:
    - Integrating novel distributed optimisation techniques in large-scale management problems
- Federated data center resource management:
    - Integrating novel federated processing algorithms in low-level resource management in virtualized data centers

S. Keshav

Computer science to promote a sustainable future

- Reducing the carbon footprint of existing energy systems
  - HVAC, transportation, building lighting, transmission grid
- Optimal sizing and operation of solar PV and storage
- Systems for forest conservation and restoration
  - Using mobile phones to measure trunk diameter in forest plots
  - Estimating reforestation rate in the Amazon from earth observation
- Creating trust in carbon credits using blockchains and earth observation
  - Cambridge Centre for Carbon Credit

https://svr-sk818-web.cl.cam.ac.uk/keshav/wiki/index.php/Working_on

Anil Madhavapeddy

Programming languages meets operating systems

- OCaml Labs: http://ocaml.io
  - Real World Functional Programming
  - Maintaining the core OCaml compiler toolchain and ecosystem
  - Buildsystem tooling, Ctypes
- Unikernels
  - Mirage: Type-safe unikernel OS https://mirage.io/
  - Irmin: Branch-consistent git-like database library http://github.com/mirage/irmin
  - nqsb-TLS, Jitsu
- OPAM
  - Large scale package management and solving http://opam.ocaml.org
  - jsOPAM for web applications, Windows port

# Cecilia Mascolo

All aspects of mobile systems

- Mobility Modelling with Data
  - Prediction models, complex network models, recommender systems

- Sensor Systems
  - Continuous sensing, new sensing modalities, sensing applications on wearables and phones

- Applications to health and behaviour monitoring generally

Andrew Moore

Network software meets network hardware

- One language for all network hardware, firmware, and software www.naas-project.org

- Open Hardware and 100Gb/s Research Reality www.netfpga.org

- Useful Measurements: Merging Cause and Effect www.metrics-itn.eu

- Datacenter heal thine self: Emulating 1 million machines http://selena-project.github.io

- SSICLOPS: secure (fast) clouds for everyone www.ssiclops.net

- ENDEAVOUR: exploring Software Defined Networking for Internet-wide switches
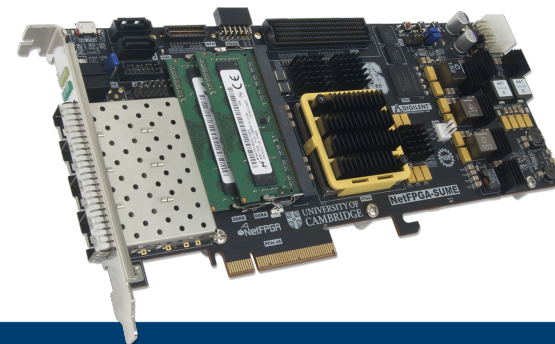
Richard Mortier

Intersecting systems with HCI to make things better

- **Homework** redesigned home network technologies http://homenetworks.ac.uk

- **User-Centric Networking** is rebuilding network technologies http://usercentricnetworking.eu

- **Human-Data Interaction** seeks to use these developments to put people at the centre of our data-driven world http://hdiresearch.org

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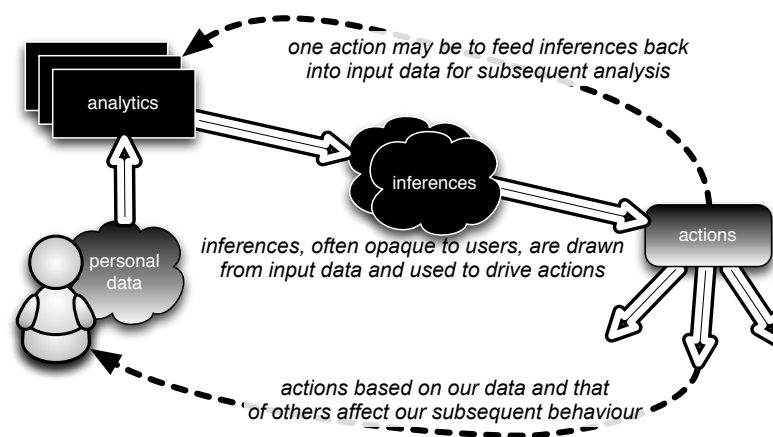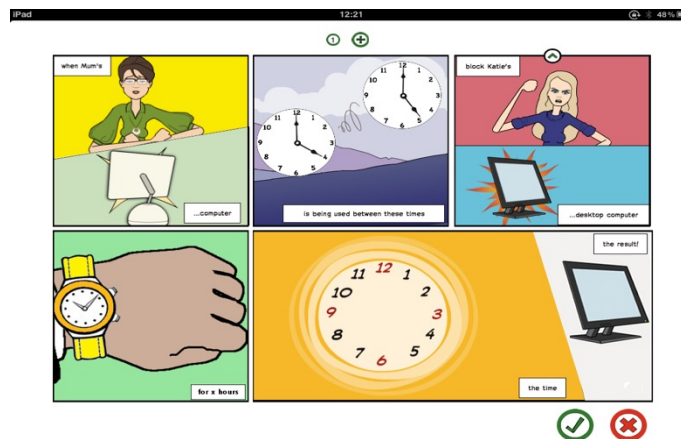
Robert Watson

OSs, ISAs, and program analysis/transformation for security, performance, and sometimes (pragmatic) correctness

- Capsicum: POSIX + the capability-system ideal
    - POSIX + microkernels/capability systems → support application sandboxing
    - Started as FreeBSD sandboxing technology; Google has ported to Linux
- Network- and storage-stack specialisation for performance
    - Clean-slate network-stack and storage designs for performance
    - Microarchitecturally aware optimisation; 60+Gbps before we ran out of PCI buses
- CHERI: Revisiting RISC for the age of risk
    - Processor ISAs for security: fine-grained memory safety, compartmentalisation
    - FPGA prototypes / tech transition: time for systems software researchers!
- CADETS: DARPA new-start project on security via distributed tracing
    - Tracing distributed systems, LLVM-based program transformation
- PhD studentships available for multiple of the above projects

Summary

- Work across all systems areas
  - Hardware up to cloud & mobile applications
- Work with wide range of industry
  - Microsoft, Google, Amazon, Facebook, etc
- Funded from many sources
  - EU, UK, US, industry, government
- We also welcome visitors!