Distributed

Agenda

- Follow-up to Network Flows
- Learning Outcomes for Distributed
- Distributed
- Panel
- Break
- Review

Learning Outcomes for Network Flows

- Understand that how ideas travel
  - Peer networks
  - Global networks
- Understand that ideas are inherently embedded in a context
  - Hybrids emerge when contexts change
- Apply the autonomy and circulation lenses to open.

Learning Outcomes for Distributed

- Understand that distributed teams and systems are mutually constitutive
  - Can't make choices about one without affecting the other
- Describe characteristics of distributed teams
- Apply the privilege and autonomy lenses to distributed.

Distributed Organizational Structure

- Conway's Law
  - "...organizations which design systems (in the broad sense used here) are constrained to produce designs which are copies of the communication structures of these organizations. We have seen that this fact has important implications for the management of system design. Primarily, we have found a criterion for the structuring of design organizations: a design effort should be organized according to the need for communication."
- Structure of software reflects the structure of the organization that created it.

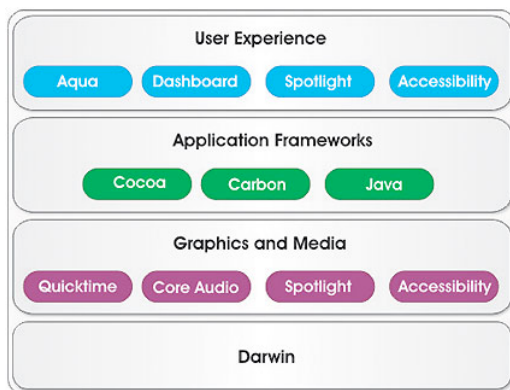Melvin E. Conway, "How do Committees Invent?," Datamation, April, 1968.
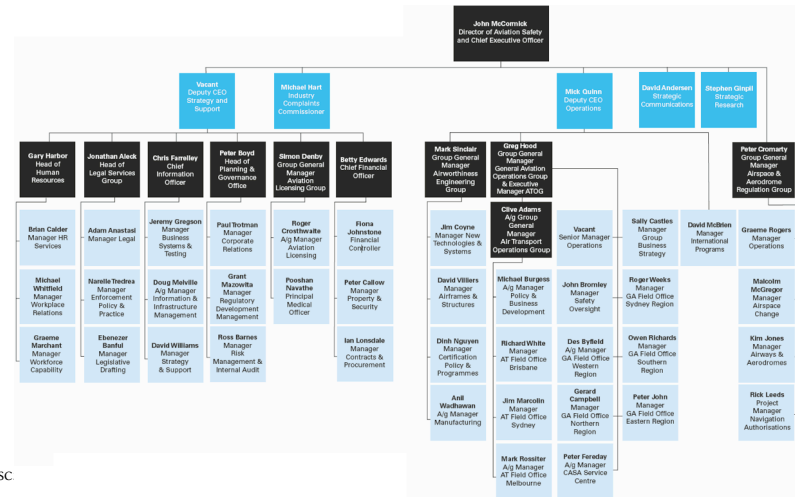
Organization Chart

Software Architecture

Windows Vista
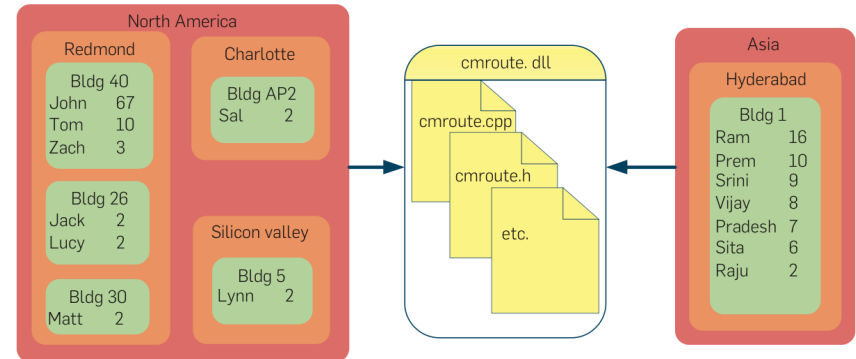
Team Structure, Software Structure, and Software Quality

- When team structure and software structure mirror each other, higher quality code (fewer defects) are produced.
- When software structure crossed team boundaries, lower quality (more defects) were produced.

- Geographic separation did not have a strong impact.
- Organizational distance (on the org chart) had a big impact.

Christian Bird, Nachiappan Nagappan, Premkumar Devanbu, Harald Gall, and Brendan Murphy, "Does Distributed Development Affect Software Quality? An Empirical Case Study of Windows Vista," Communications of the ACM, August 2009.
Nachiappan Nagappan, Brendan Murphy, and Victor R. Basili, "The Influence of Organizational Structure on Software Quality: An Empirical Case Study" ICSE 2008.

What about distributed systems?

- Forms of distributed systems
  - Parallel computation, replicated systems, cloud computing
- Organizational structures
  - Hierarchy, committee or jury, ecology, matrix

- Types of applications
  - Telecommunications networks, file systems, and control systems
  - Games
  - Scientific computing and volunteer computing

Distributed systems and work

- Context
  - Grid and cloud computing
  - Outsourcing of IT function

- Technological Benefits
  - On demand computing resources
  - Cost effective
  - Ease of use

Deskilling

- Occurs when technology enables the replacement of skilled workers with semi-skilled or unskilled workers
  - Examples: typesetting, calculators, telephone operators

- More cost effective
  - Workers require less training and can be paid less
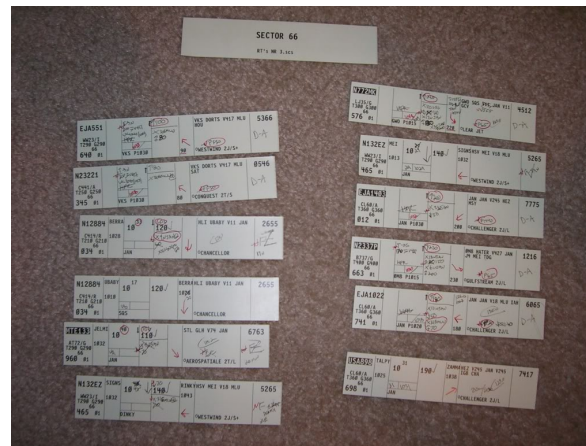
- But do we lose anything?

Air Traffic Control

Flight Progress Strips

Slide 17

What if...

- ...there is a potential collision between flights?
  - Computer sounds an alert
- ...a flight needs to make an emergency landing?
  - Computer displays script to follow and appropriate people/agencies are alerted

- ...the computers fail?

What kind of deskilling can happen with distributed systems?

- Specifically for cloud computing

- On-site IT no longer needs to know how to...
  - Spec out a system
  - Build a system
  - Use a terminal program to configure a system
- What happens when your organization loses network connectivity, but your provider doesn't?
- Does this matter?
  - Don't have to be mechanics to drive a car

Anonymous

- Distributed organization
  - Independent and overlapping cells
- Self-organizing team
  - Multiple goals, targets, and strategies
  - Varying ethics, skill sets, and
- Common themes
  - Protest, transgressive, media-savvy
  - Concerned with privacy, rights, and digital rights

Panel: Hacktivism

Topic

- What hacktivism projects would you take on?
  - Black hat or white hat?
  - Protest or destruction?
  - Robin Hood or David vs. Goliath?