

Distributed

Slide 1

Agenda

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

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Slide 2

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.

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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.

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Distributed Organizational Structure

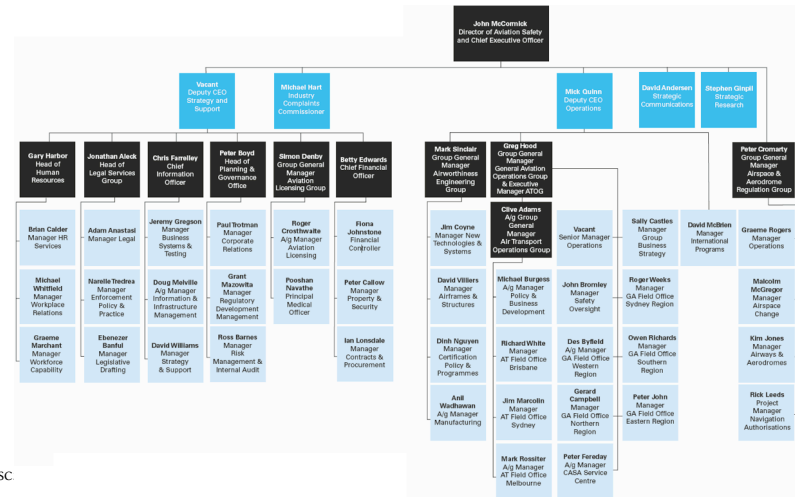
- Conway's Law
 - "...organizations which design systems (in the broad sense used here) are constrained to produce designs which are copies of the communication structures of these organizations. We have seen that this fact has important implications for the management of system design. Primarily, we 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.

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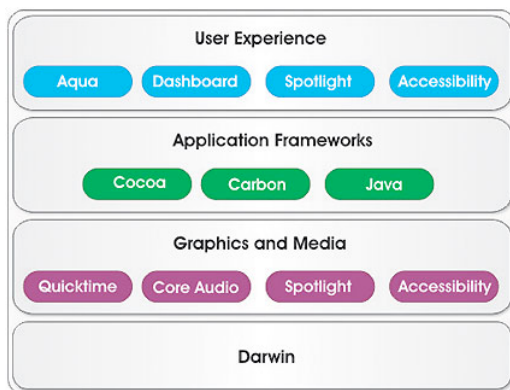
Organization Chart



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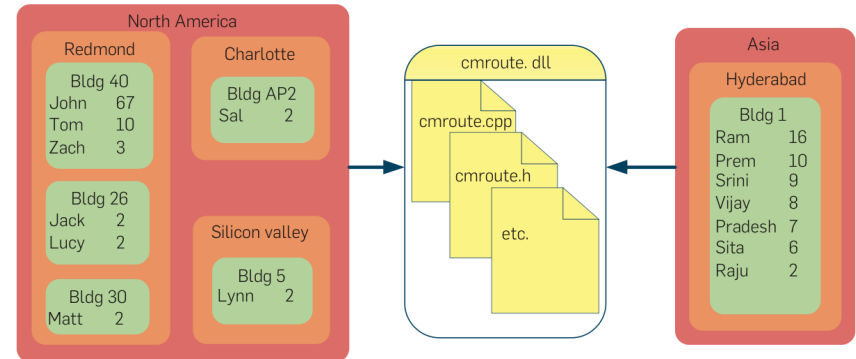
Software Architecture



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Windows Vista



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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.

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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

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Distributed systems and work

- Context
 - Grid and cloud computing
 - Outsourcing of IT function
- Technological Benefits
 - On demand computing resources
 - Cost effective
 - Ease of use

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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?

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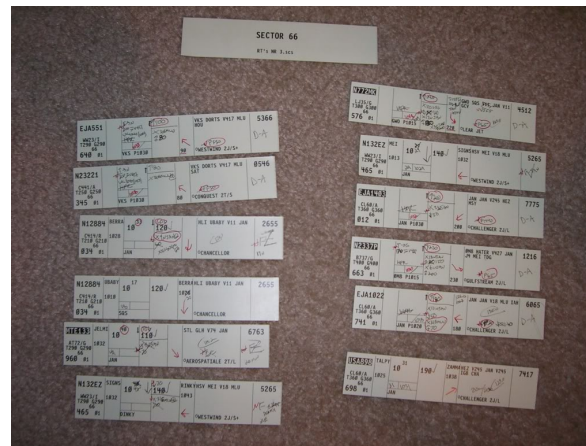
Air Traffic Control



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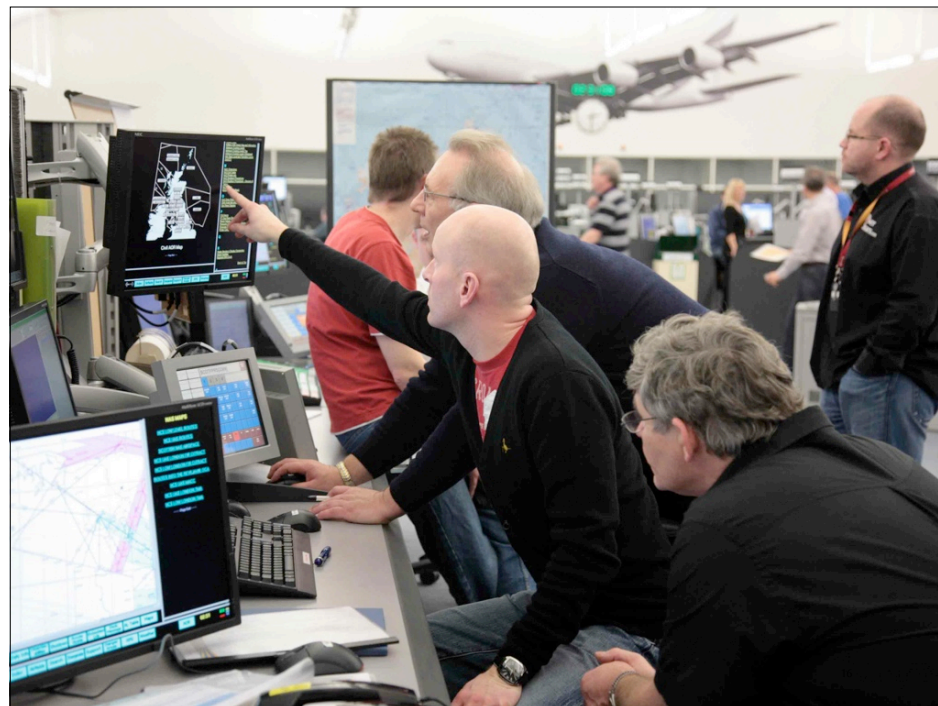
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Flight Progress Strips



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Flight Strip Bay									
Overflights									
18013	1808	CYUL	Y021/524	BUGGY	1570	ALB	TON	TON	
1328/P	318	KJFK							
159	1	318		/;/CHARTS					
041318	1827	CYUL	Y021/524	BUGGY	1570	ALB	PHL	TON	
0751/P	338	KLCA		157	NAIAP				
175	1	338		/;/no charts					
Arrivals									
P01211	1802	KALB	ALB	GDR	33L	ILS			
0714/P	218	KBOS							
708	1	218		TESTING STRIP BAY					
040081	1803	KALB	ALB	GDR	33L	V15			
0722/P	218	KBOS							
239	1	218		TESTING STRIP BAY					
040214	1804	KALB	ALB	GDR	22L	H027			
0752/P	218	KBOS							
074	1	218		TESTING STRIP BAY					
05042	1807	KALB	ALB	GDR	27				
0108/P	218	KBOS							
241	1	218		TESTING STRIP BAY					
040110	1810	KALB	ALB	GDR	27				
0752/P	218	KBOS							
008	1	218		TESTING STRIP BAY					
040143	1811	KALB	ALB	GDR	22L				
0714/P	218	KBOS							
187	1	218		TESTING STRIP BAY					
050425	1812	KALB	ALB	GDR					
0150/P	218	KBOS							
131	1	218		TESTING STRIP BAY					
040130	1813	KALB	ALB	GDR					
0751/P	218	KBOS							
555	1	218		TESTING STRIP BAY					
040118	1814	KALB	ALB	GDR					
0741/P	218	KBOS							
041	1	218		TESTING STRIP BAY					
040228	1815	KALB	ALB	GDR					
0150/P	218	KBOS							
100	1	218		TESTING STRIP BAY					
040128	1816	KALB	ALB	GDR					
0714/P	218	KBOS							
126	1	218		TESTING STRIP BAY					
040218	1817	KALB	ALB	GDR					
0151/P	218	KBOS							
125	1	218		TESTING STRIP BAY					
KBOS Local									
40290	1800	KBOS	LOCAL		33R	V	RT		
P28A	010	KBOS							
369	1	010	VFR PATTERNS						
05102	1801	KBOS	PATTERNS WORK		33L	U	LT		
C172	010	KBOS							
558	1	010	Intersection departure from G						
VFR									
N1814	1826	KLVR			33R	V			
P28A/A	010	KBOS							
210	1	010	VFR SIGHTSEEING						
N925C	1825	KLVR	DCT		PP				
P28A/A	010	KBOS							
034	1	010	VFR/V/Requesting Flight Following						
N02742	1824	KBV							
P28A/A	010	KBOS							
510	1	010	VFR						
Departures									
040125	1823	KBOS	LUCAS SEY PAROH CCC ROBER		10				
0767/P	240	KJFK							
041	1	240	/;/CHARTS						
040151	1823	KBOS	LUCAS SEY PAROH CCC ROBER		13				
0767/P	210	KJFK							
795	1	210	BEER ON BOARD, PLEASE EXPEDITE						
051157	1821	KBOS	BUSLX BOL		25				
0767/P	140	KBOS							
310	1	140	/;/						
040175	1820	KBOS	MHT CAR SYR		37				
0767/P	100	KJFK							
100	1	100	/;/CHARTS						

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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?

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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

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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

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Panel: Hacktivism



Topic



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