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Agenda

• Socio-technical ecosystems
  – What are they?
  – Why are they important?
  – Why should we care?

• What do we know about them?
  – 2-3 examples
  – What challenges do they face?

• What are the implications for a discipline of requirements?
Technology & How We Organize

• The Evolution of Socio-Technical Systems
  – Eric Trist, 1950
  – Short wall versus long wall coal mining

• Co-evolution of organizations and technology
  – Elevators
  – Telephone
    • Claude Fischer, America Calling: a Social History of the Telephone
  – Internet
  – Web
  – Web 2.0
Ecosystems – Many examples

- Collections of open source projects
- Wikipedia, Facebook, Flikr, etc.
- App stores (iPhone, iPad, Facebook apps)
- Ultra-large systems
What Distinguishes “Ecosystems”?

• Many types of developers, contributors, and users
• Participants’ actions affect each other, both as individuals and populations
  – Predator/prey, symbiosis, parasitism, competition, relative advantage, etc.
• Environments, interactions create niches
• Examples
  – Eclipse (2009)
  – VistA (getting under way)
  – Virtual scientific organizations (1st workshop next week)
Eclipse Ecosystem

From March 2008 Eclipse Executive Director's Report:
Central Players In Open Source

Foundations

Commercial Firms

Developers
4 Empirical Studies

• Firms and Foundations
• Firms and Firms
• Firms and Individuals
• Individuals and Individuals
4 Empirical Studies

• Firms and Foundations
• Firms and Firms
  • Firms and Individuals
• Individuals and Individuals
Firms and Foundations:
Guiding an Ecosystem to Promote Value
The Research Problem

• Some research has been done about why individual focused OSS projects utilize foundations

• Little research has addressed why commercial firms would contribute IP to foundations
  – Large monetary cost
  – Giving up some control
  – Possibly increased work

• What does the foundation do to drive value?
Data

• Semi-structured interviews with Eclipse Foundation staff and employees of member companies
  – 38 interviews with 40 individuals
• Face-to-face meetings at EclipseCon 2007 and 2008
• Participation in Eclipse members meetings
Driving Value Creation

- Non-market player
- Platform for innovation
- Introduction of process
- Value of the Eclipse brand and marketing
- Organizational structure driving value
Non-Market Player

• Eclipse grew out of IBM's old VisualAge partners
• Small firms had to worry about being stepped on
• Allows innovation without worry about “Gorillas”
  – Culture of transparency, openness, meritocracy, permeability
• Opens the door for distribution based business models
Platform for Innovation

• Foundation actively recruits new members
• Encourages components to be as modular as possible  
  – Modularity == Independence from other components
• Create projects outside of Eclipse and bring inside later
• Push usage outside traditional realms
Takeaways

- Eclipse Foundation has taken concrete steps to build ecosystem
- Governance structure ensures all can provide input
- Non-market nature is very beneficial
- Services provided for members are worth the cost
Firms and Firms: Business Collaboration Through Open Source
The Research Problem

- Much data about how individuals interact in OSS
- Little data about how firms collaborate
- Is there an overdependence on single firms?
- How collaborative are OSS ecosystems?
Data

- Projects from Eclipse Foundation
- Two level project hierarchy
  - Top Level Projects (11)
  - Sub Projects (89)
- Data from version control system and IP-zilla
- Ties individuals to code changes and firms
- Compared with data from GNOME
How Does Collaboration Occur?

Collaboration is rare at the level of subprojects.
Collaboration in CDT

IBM Leaves/QNX Lead

WindRiver Joins/IBM Lead

WindRiver Leads
Who Builds the Platform?
Takeaways

• Participation in an OSS ecosystem may require little collaboration with other firms
• Many key portions of Eclipse are centered on IBM
• Allows IBM to exert great influence, even though no longer at the center
• The organic community around GNOME shows much more collaboration
VistA

- Most widely-deployed Health IT system
- Not a well-functioning ecosystem
  - VA writes code, pushes out patches, takes nothing back in
  - Multiple distributions
  - Disagreements about licenses
  - Fights over trademarks
  - No central authority
IceCube: Example VO in OSG

• Neutrino Observatory
• Cube of ice 1km on a side, under geographic south pole, ~2km under surface
• Optimized for detection of astrophysical neutrino sources
• Small holes drilled entire length, wires with sensors
• Software processes detector data
  – Major data reduction at site
  – Pre-processing at U Wisconsin
  – IceTray framework, bundled with core of modules
  – Post-docs and grad students write software for analyses for specific papers
• Collaboration of hundreds on each paper
IceCube Detector Array
Four Fundamental Problems in Design of Socio-Technical Systems

- Architecture
- Business opportunities
- Coordination
- Governance
Asking a Different Question

• Rather than ask the traditional question:
  – “How can I specify the system that my stakeholders need?”

• Maybe we should also ask:
  – “How can I set up the socio-technical system that will allow users, consultants, businesses, and everyone else to cooperatively build what all my stakeholders need?”
  – “Even though those needs are currently unknowable and evolving . . .”