

Socio-Technical Ecosystems

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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, Flickr, etc.
- App stores (iPhone, iPad, Facebook apps)
- Ultra-large systems

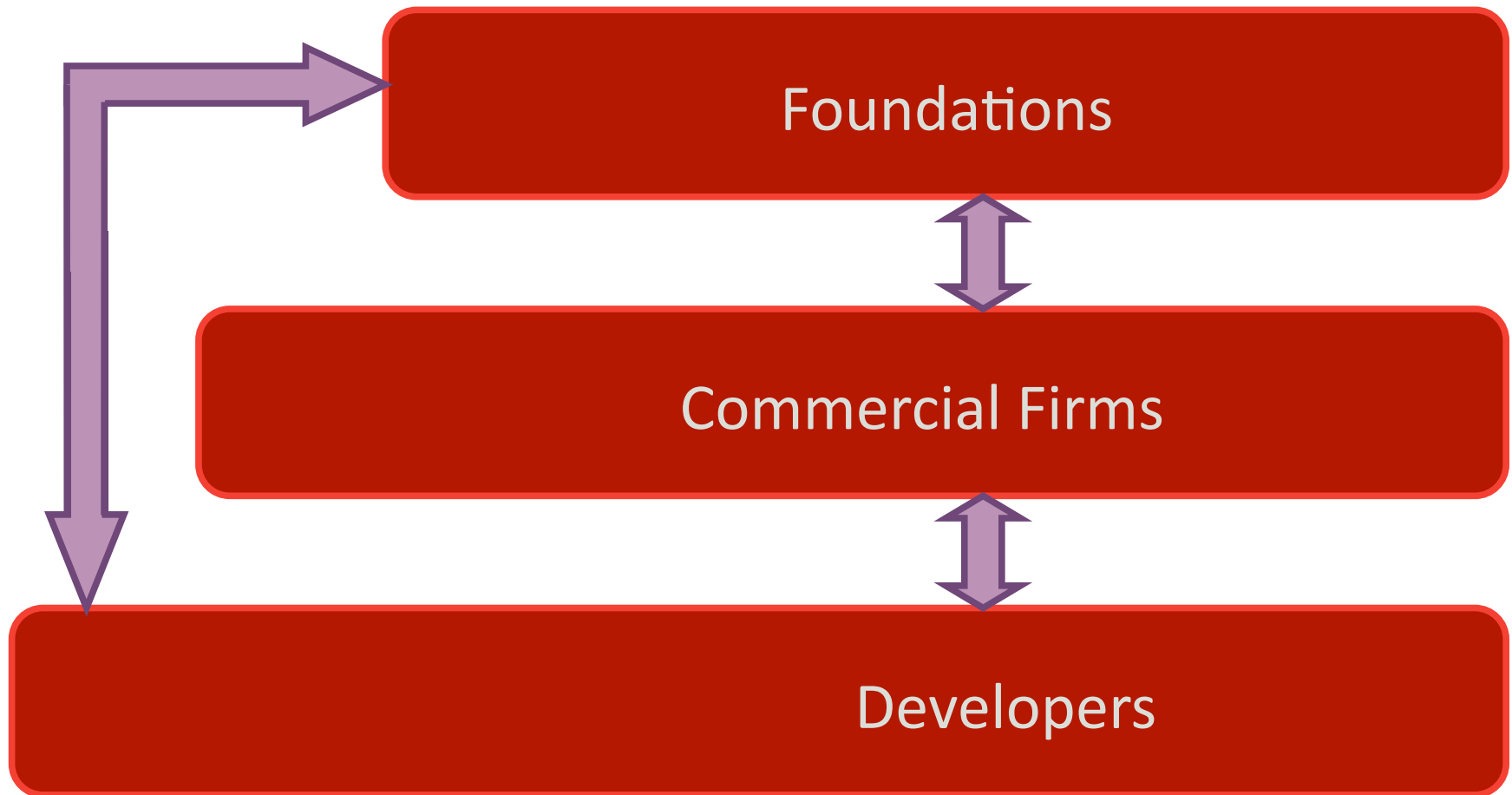
What Distinguishes “Ecosystems”?

- 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)



From March 2008 Eclipse Executive Director's Report:

Central Players In Open Source



4 Empirical Studies

- Firms and Foundations
- Firms and Firms
- Firms and Individuals
- Individuals and Individuals

4 Empirical Studies

- **Firms and Foundations**
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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

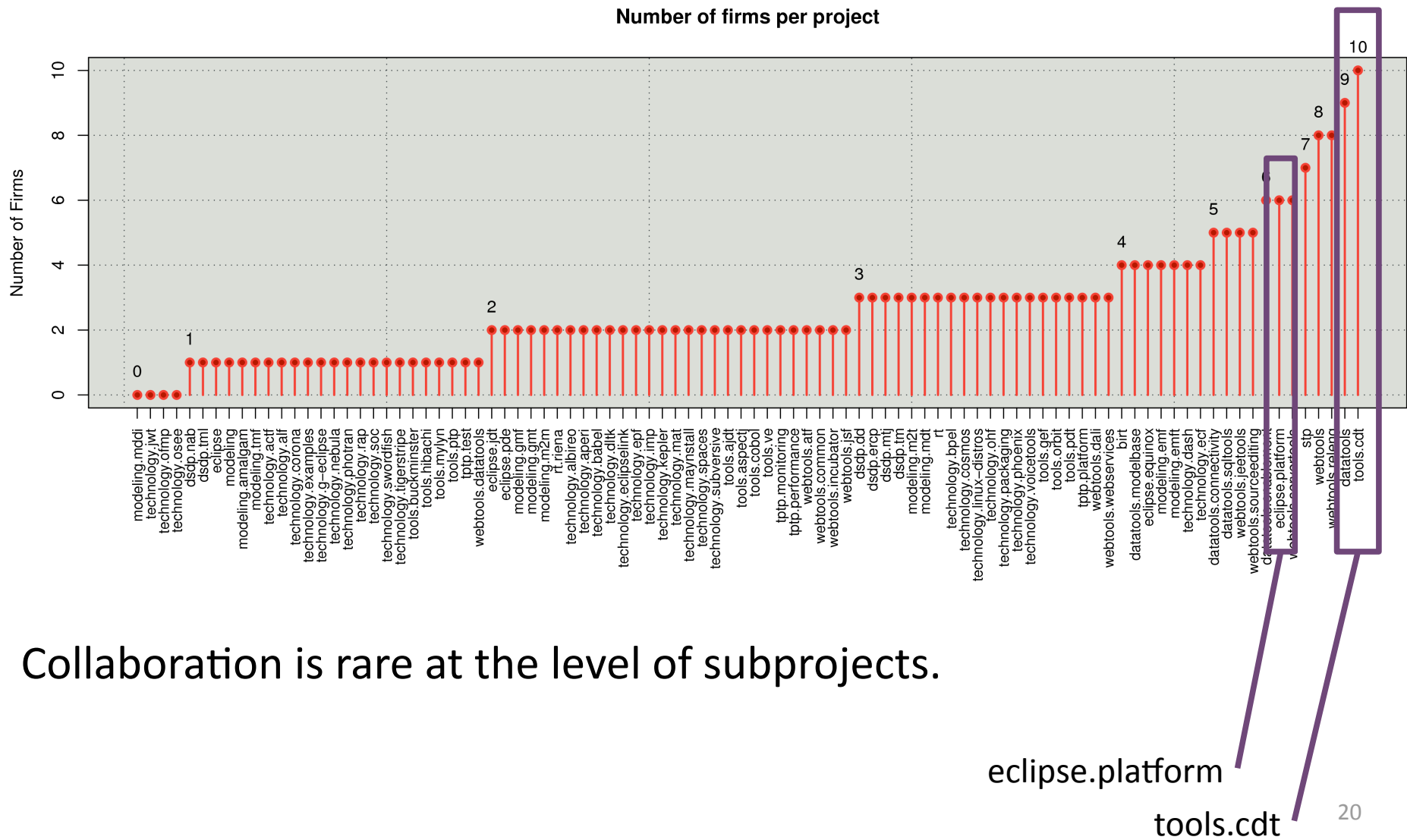
The Research Problem

- 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?

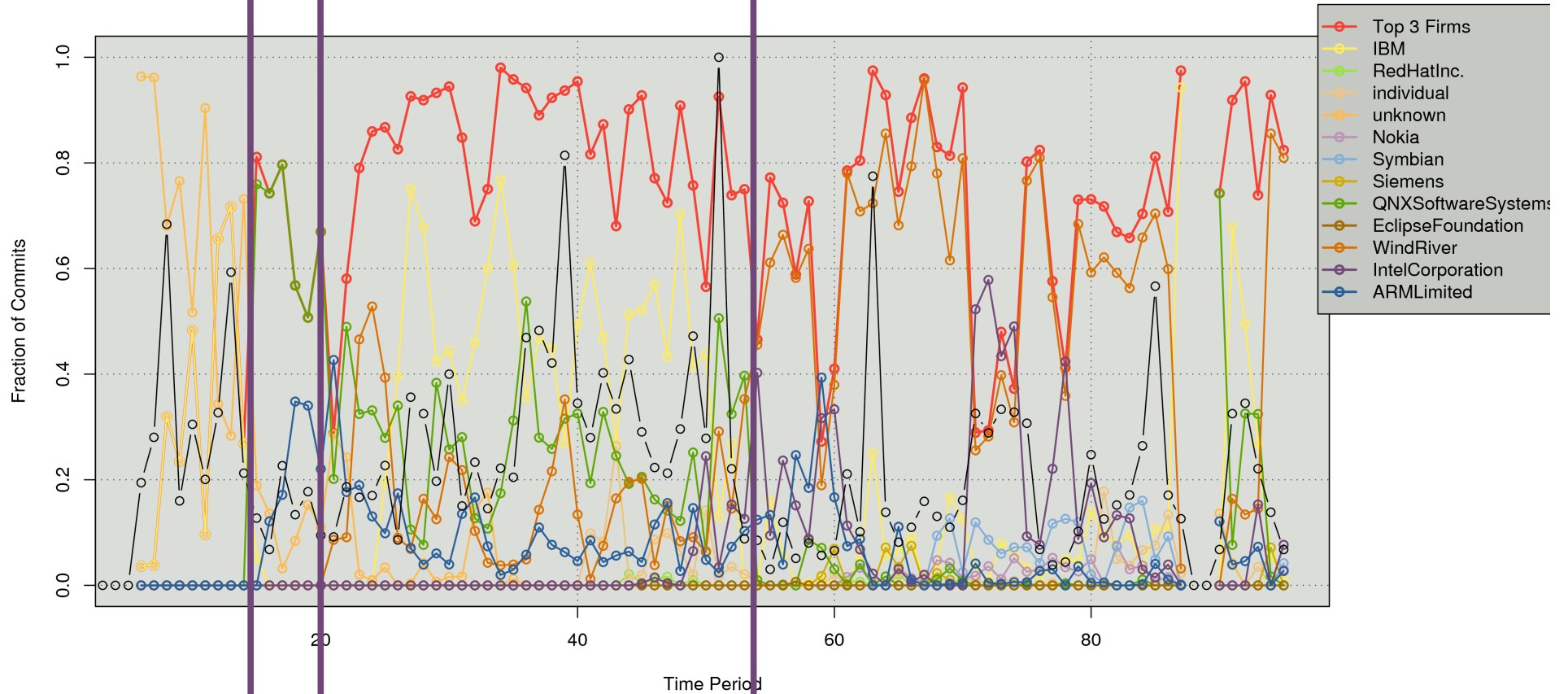


Collaboration is rare at the level of subprojects.

Collaboration in CDT

IBM Leaves/QNX Lead

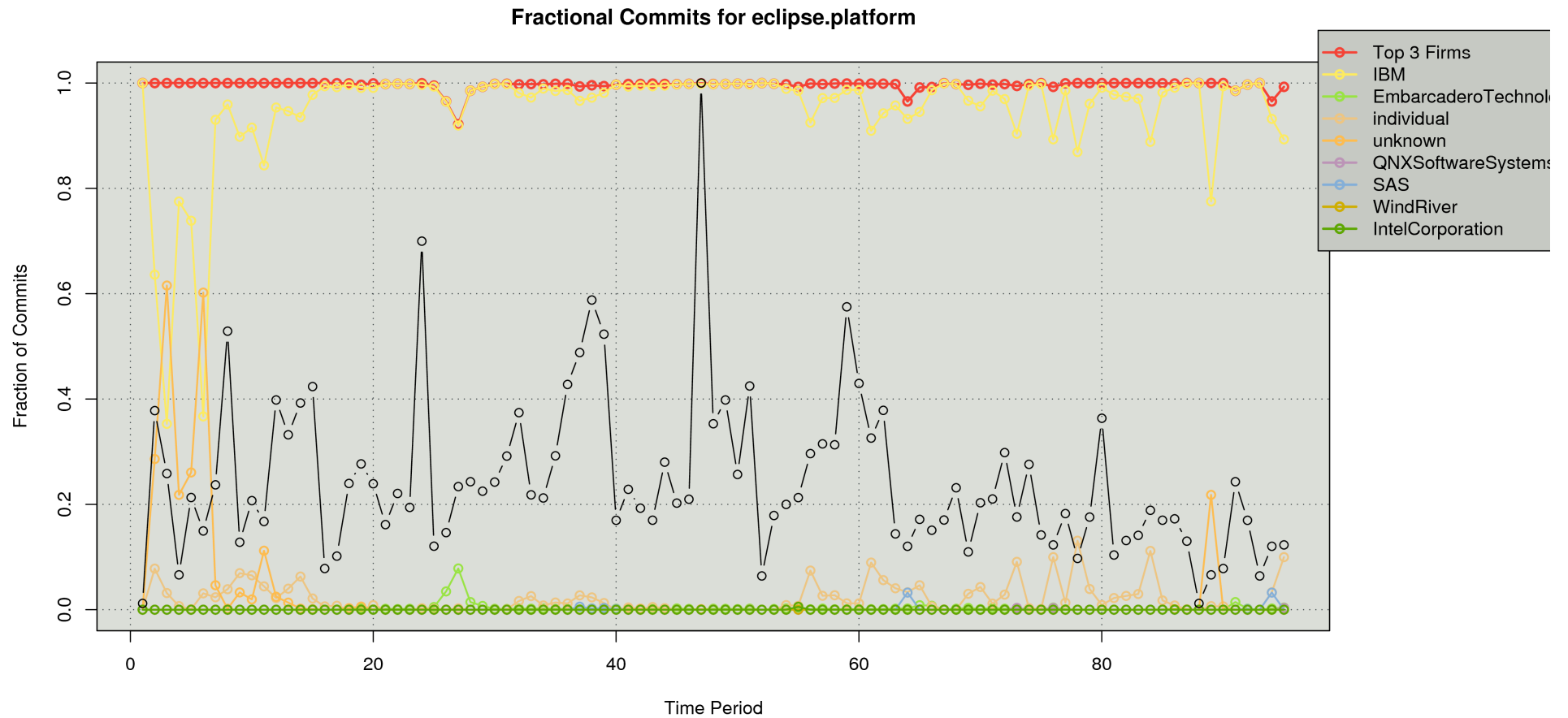
Fractional Commits for tools.cdt



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

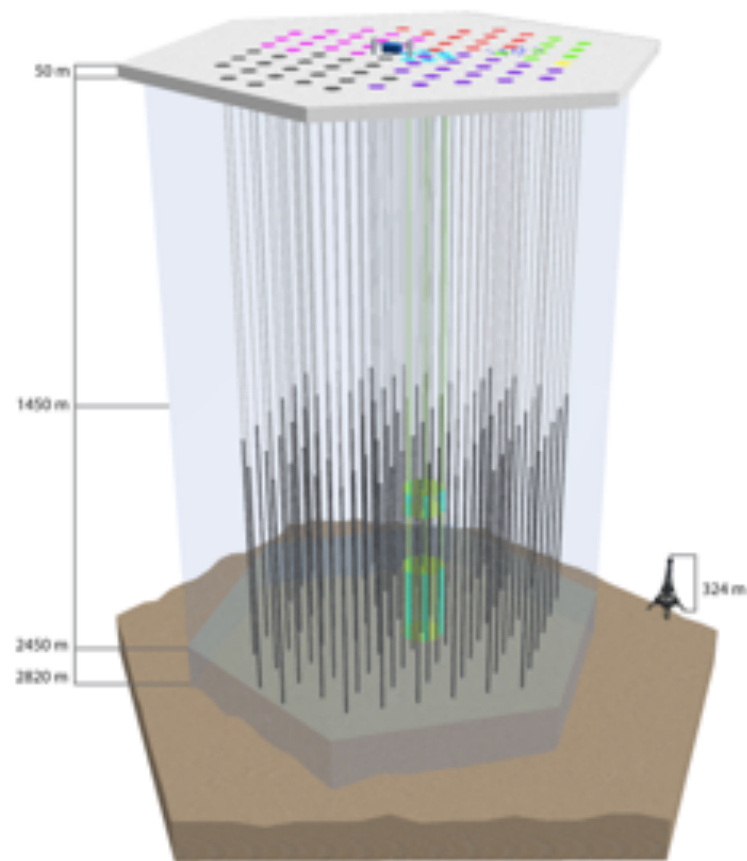
VistA

- 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 . . .”