Collaborative Production and Innovation: The Open Source Community Model and the Global Innovation Ecosystem

Tokyo, June 30, 2007

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Outline

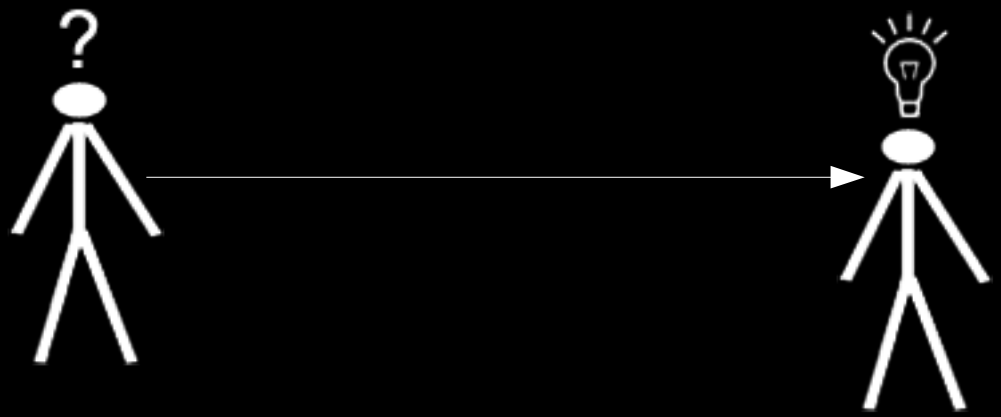
Transactions and organisation

Collaboration and value

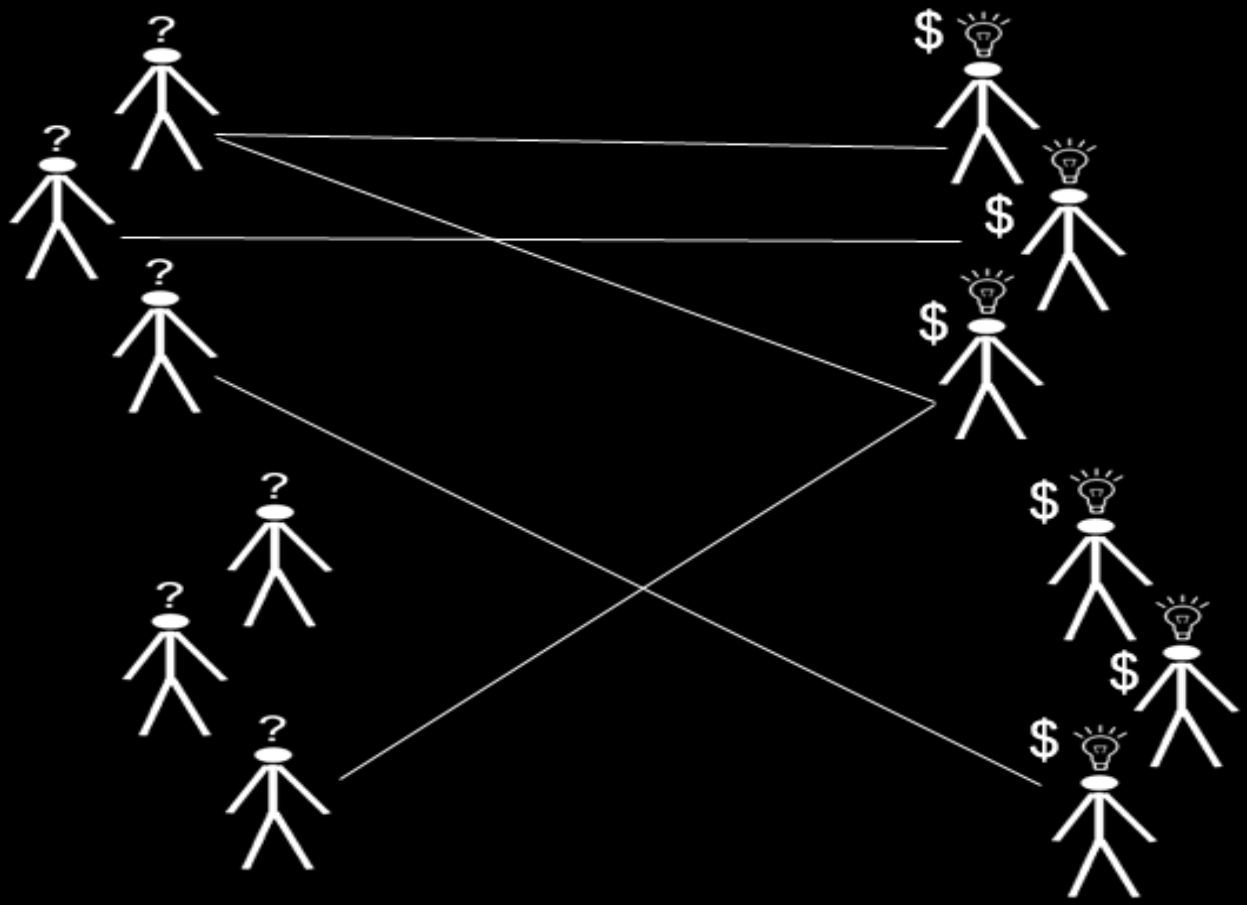
Open source:

- Innovation
- Global
- Ecosystem

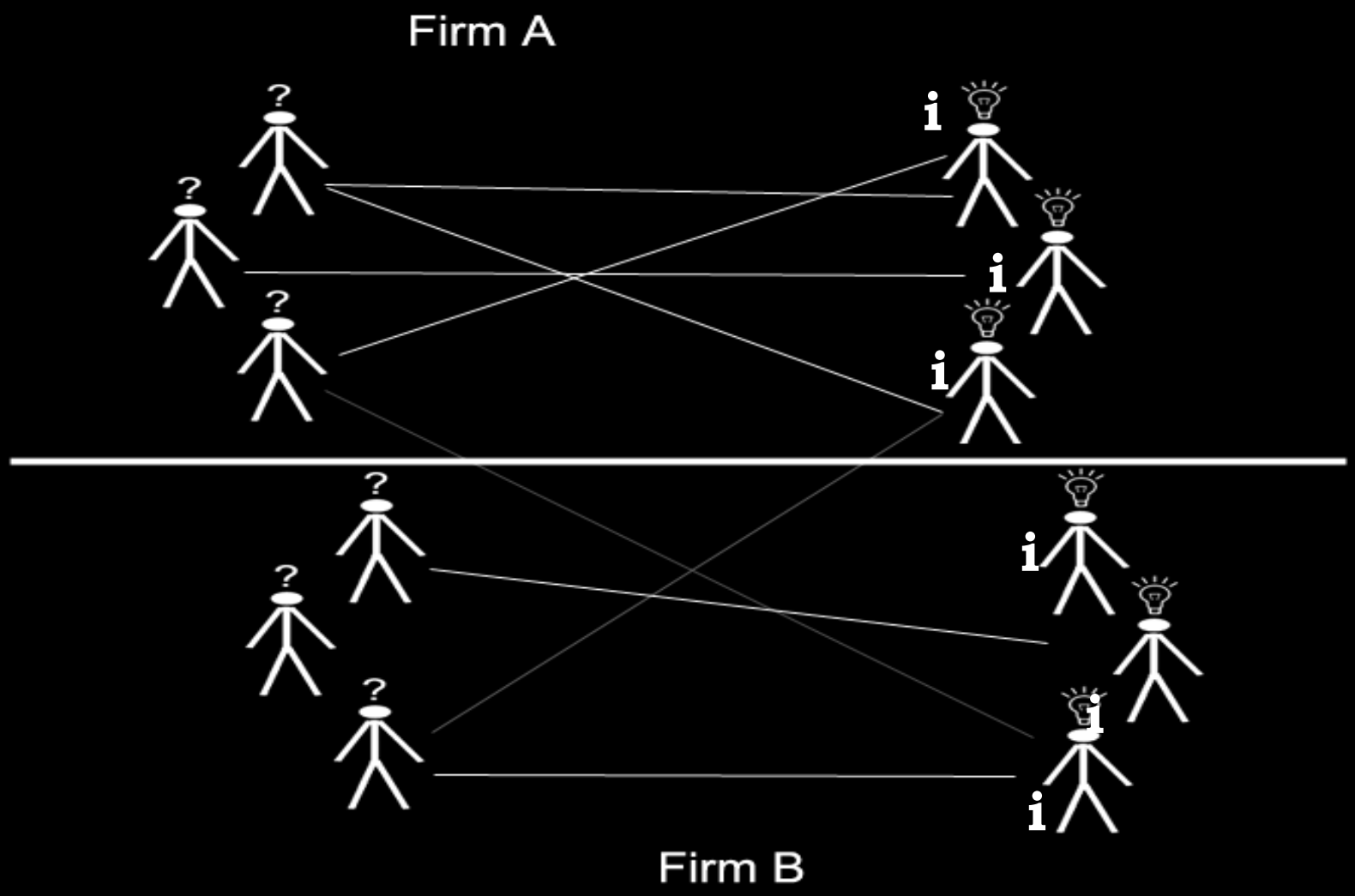
Choices: firm, or market



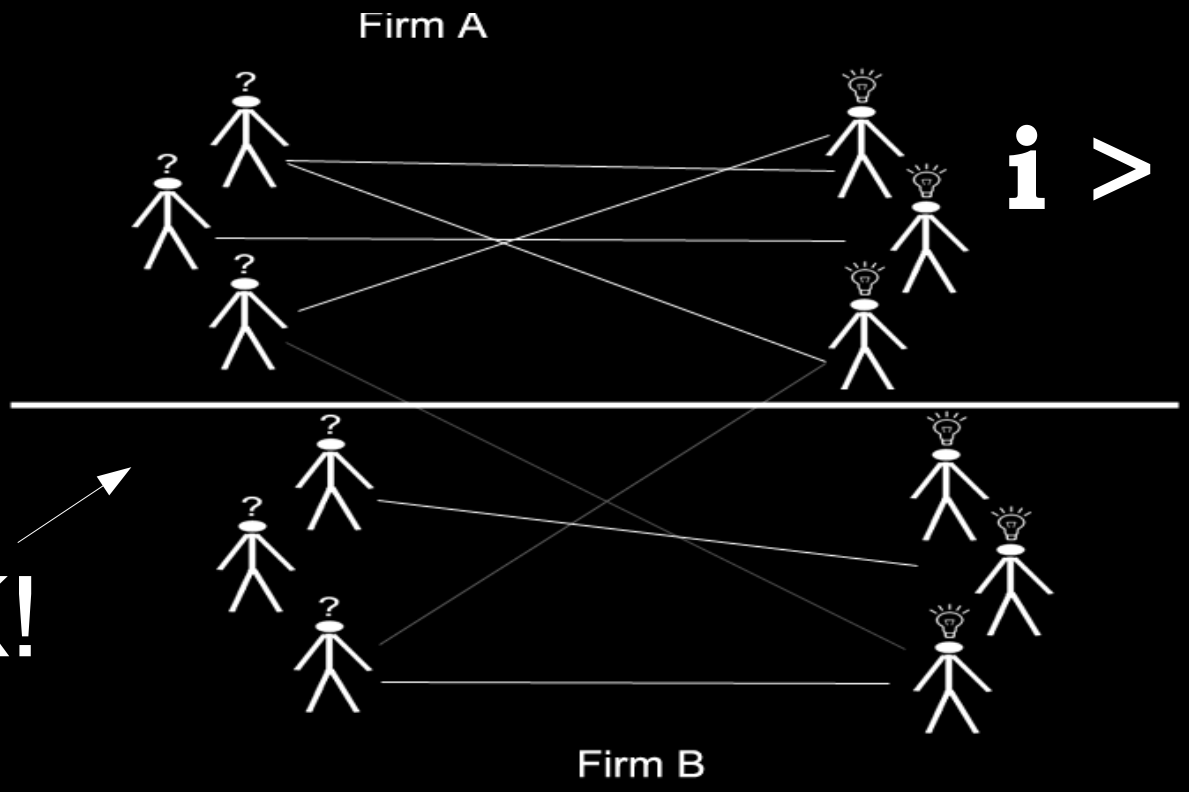
Market:



Firm:

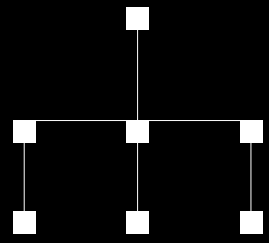


Firm over Market when:



i > $

OK!



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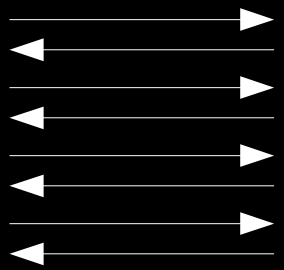
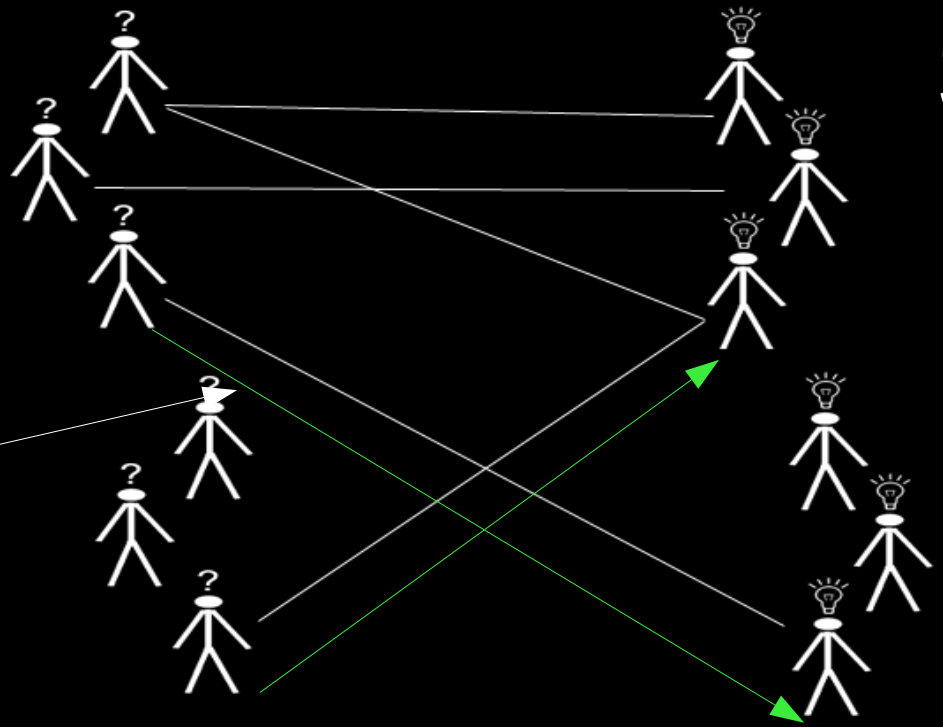
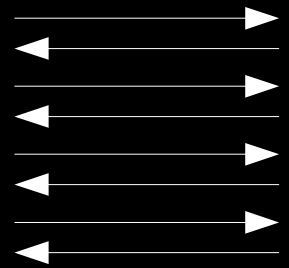


Market over Firm when:



Match without barriers

$ > i



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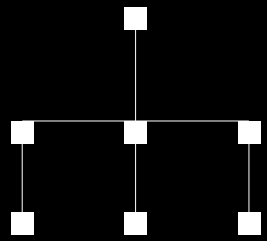
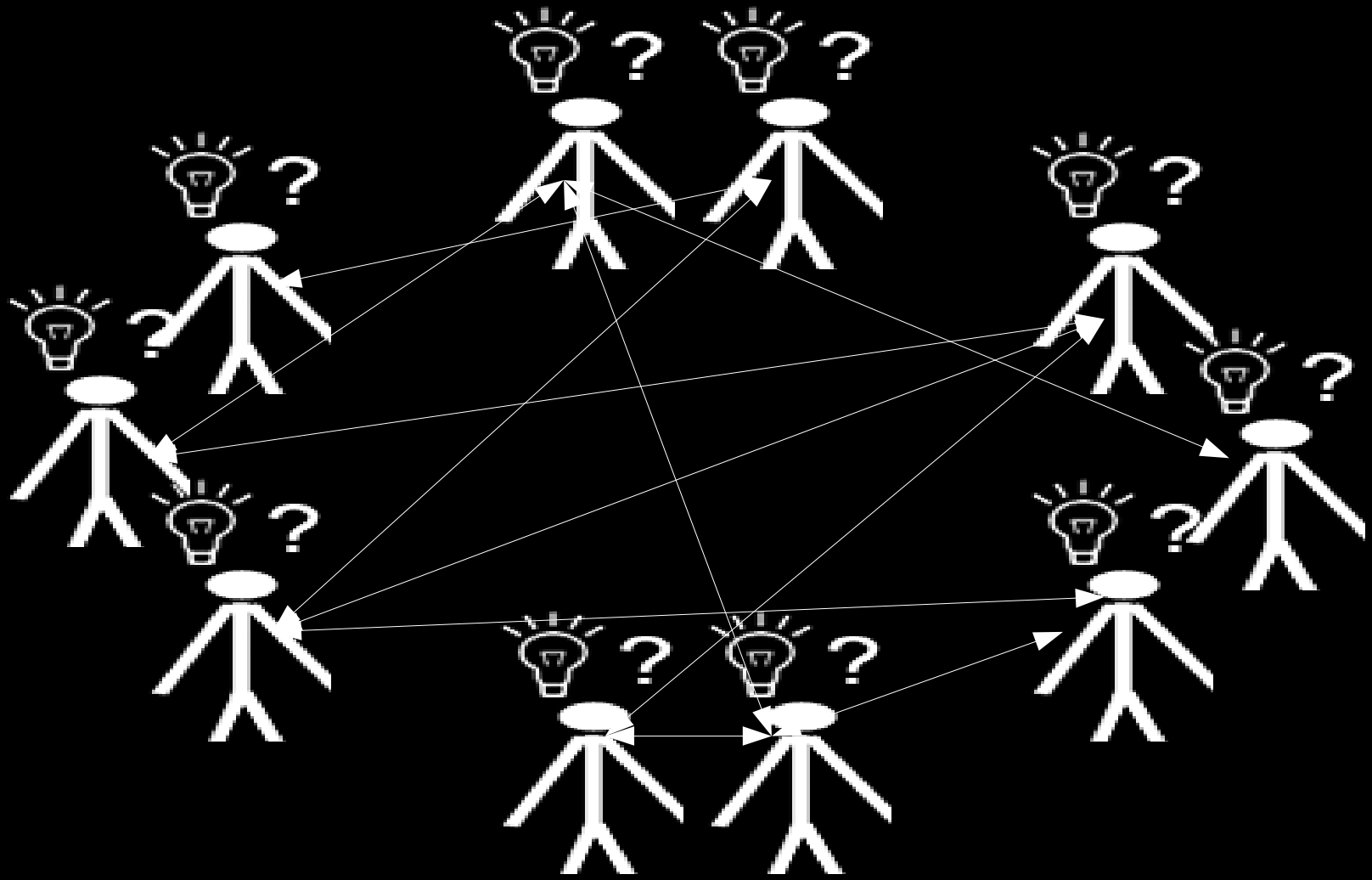


Market vs Firm vs... Network?



Market vs Firm vs... Network?

Reducing transaction costs

Reducing organisation costs

Increasing information

Improving allocation of resources to needs

Market vs Firm vs... Network?

Reducing transaction costs

Reducing organisation costs

Increasing information

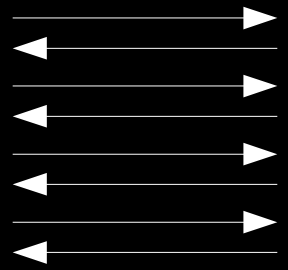
Improving allocation of resources to needs

What makes a network successful?

Transaction costs

Property exchange: *transaction*

Trade on market: *transaction*



Internal resource (employee): *no transaction*

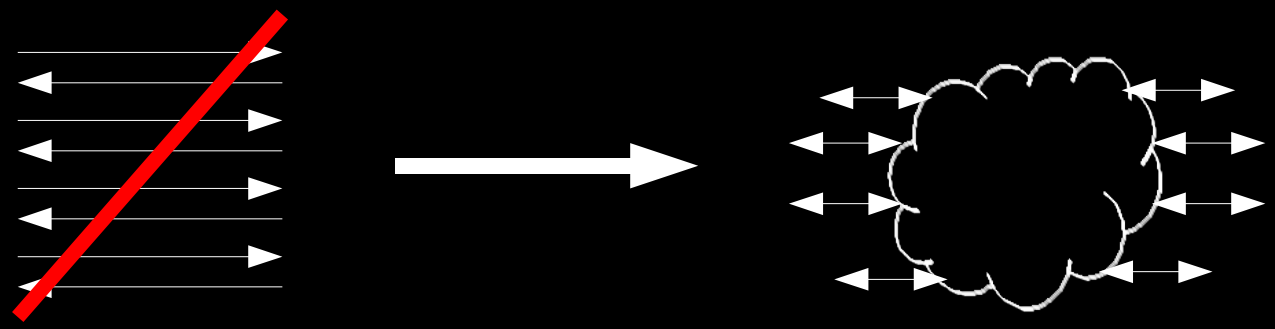
Transactions pose barriers, imposing costs.

Can these barriers be removed?

Implicit transactions: "cooking-pot"

Property exchange: *no property barrier?*

Trade on market: *implicit trade?*



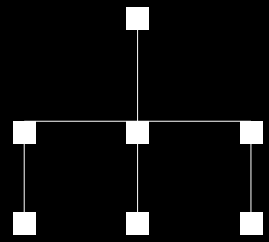
Removing barriers, allowing use and contribution, removes transactions... and transaction costs

Organisation costs

Management control: *organisation*

Hierarchy: *organisation*

Open market: *no organisation*



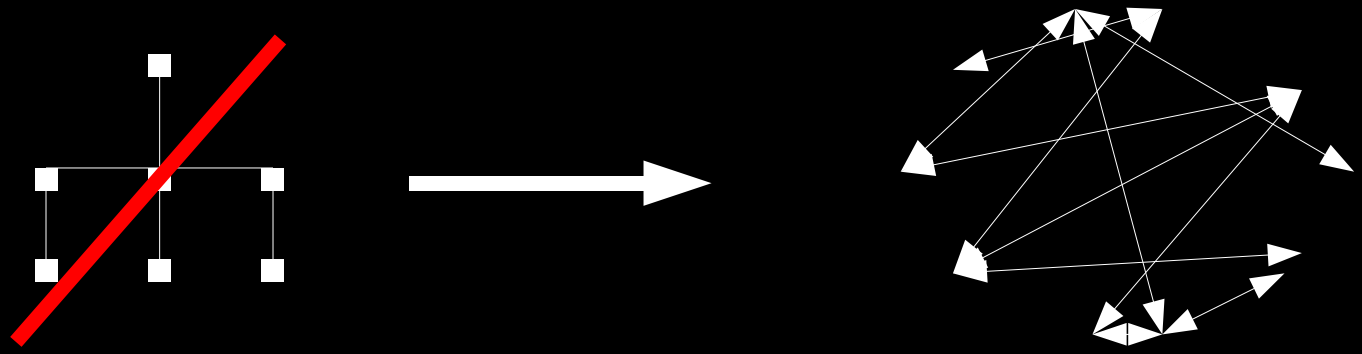
Organisation poses barriers, imposing costs.

Can these barriers be removed?

Voluntary self-organisation

Control: *voluntary participation, no control*

Hierarchy: *flat, self-selected leadership*



Removing organisation barriers, allowing self-selected leadership of voluntary structures provides organisation without organisation costs

Information gained

Price does not measure everything

Networks, like firms, provide more knowledge about resources than markets can

Information gained is hard to compute...

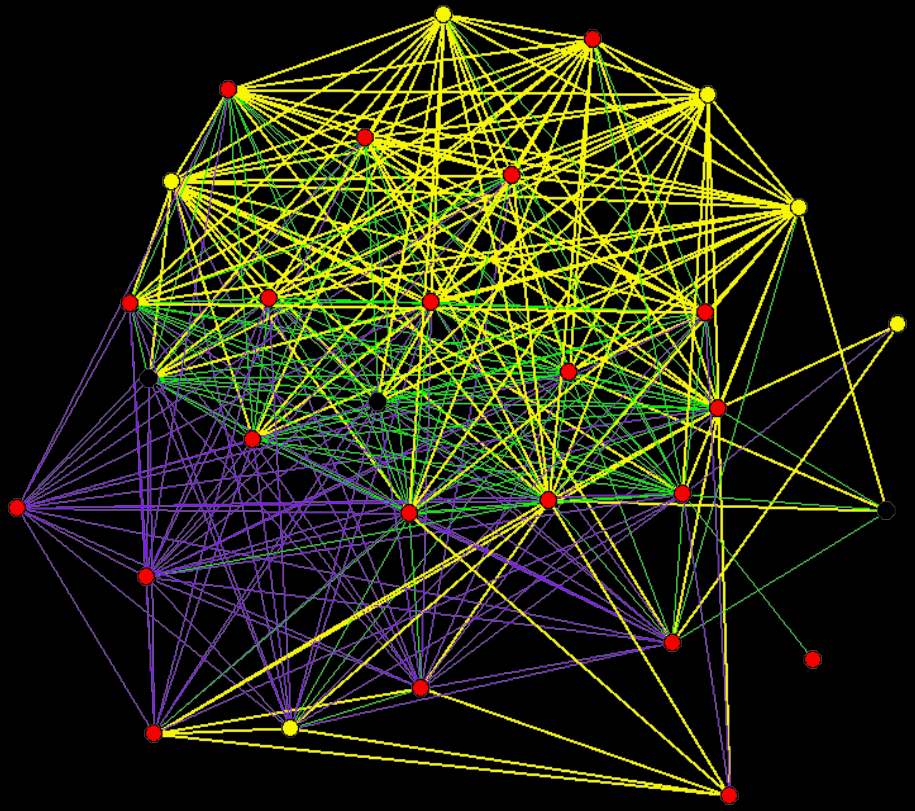
...but easy to place in different contexts

Best match

Like firm: knowledge about resources, more than just price

Like market: needs matched to biggest pool of resources

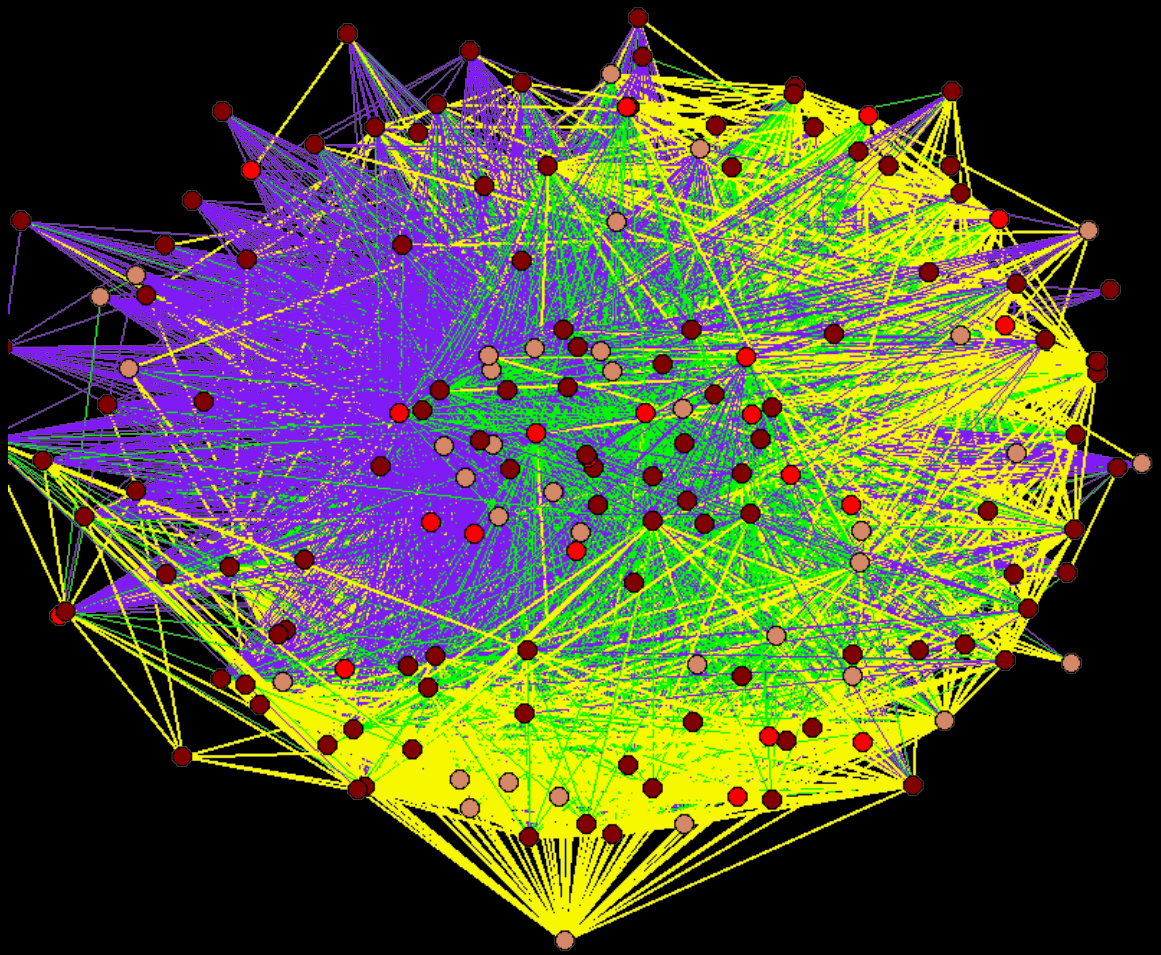
What a network looks like



Linux kernel v1.0. 1994. 158 authors. Nodes are 30 modules. Arcs represent common authors, code dependencies, or both

Source: Rishab Ghosh & Paul David, 2003

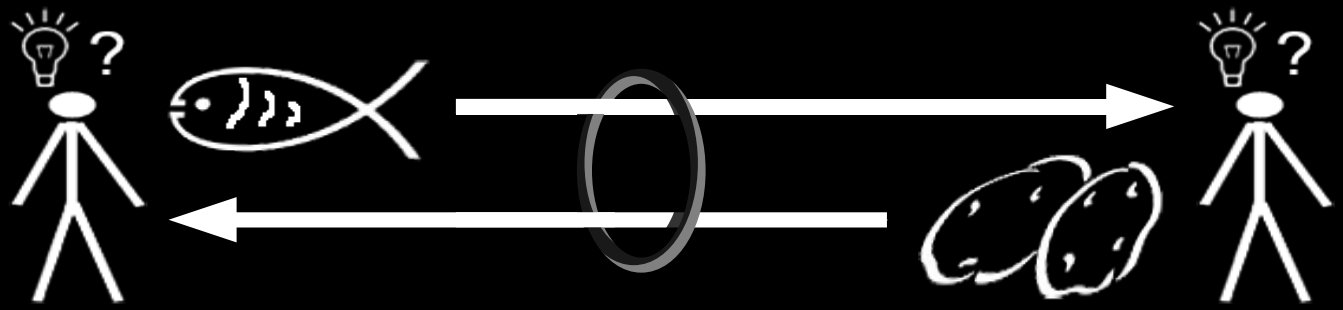
What a network looks like



Linux kernel v2.5.25. 2002. 2263 authors. Nodes are 169 modules.
Arcs represent common authors, code dependencies, or both
Source: Rishab Ghosh & Paul David, 2003

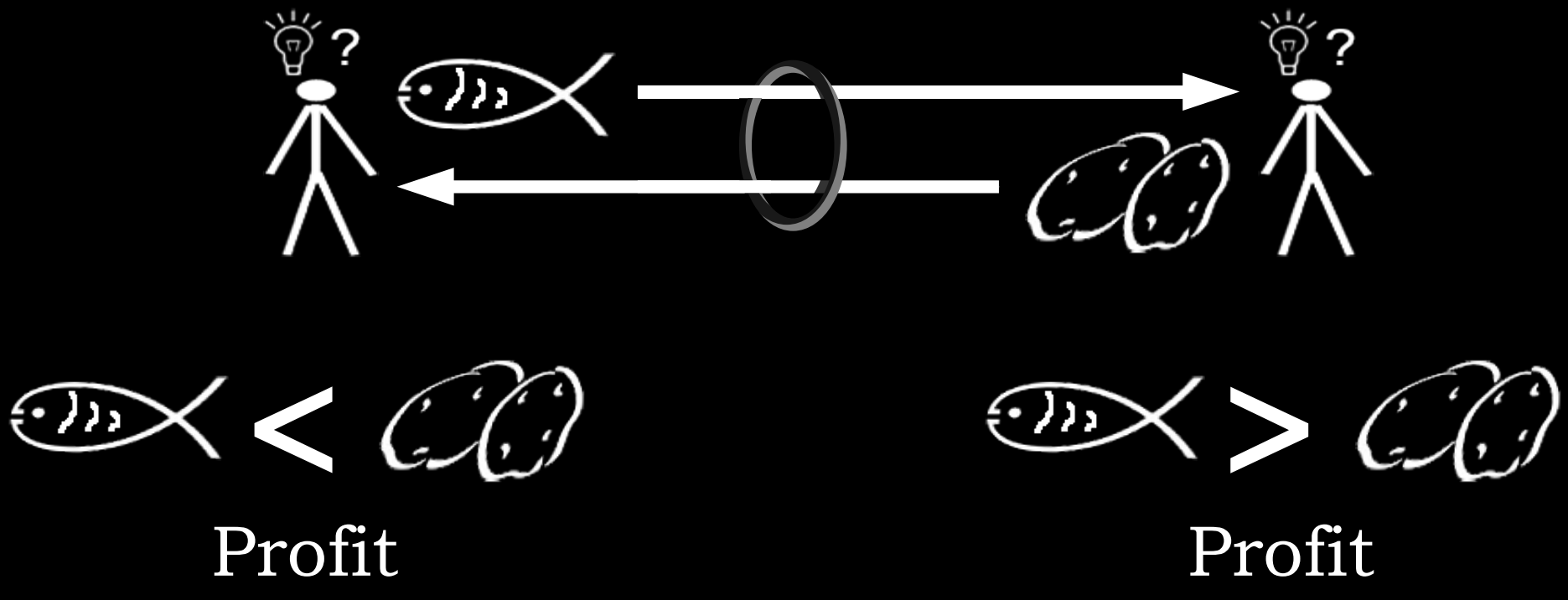
Value-flow and cooking pots

Barter

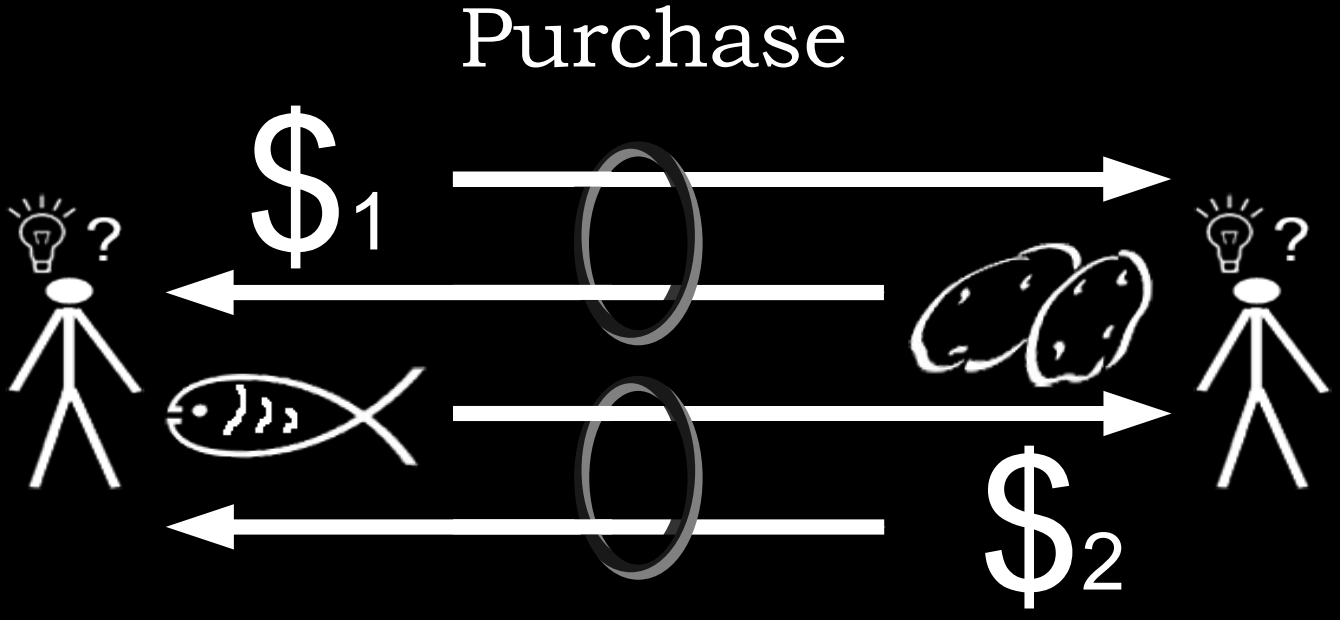


Value-flow and cooking pots

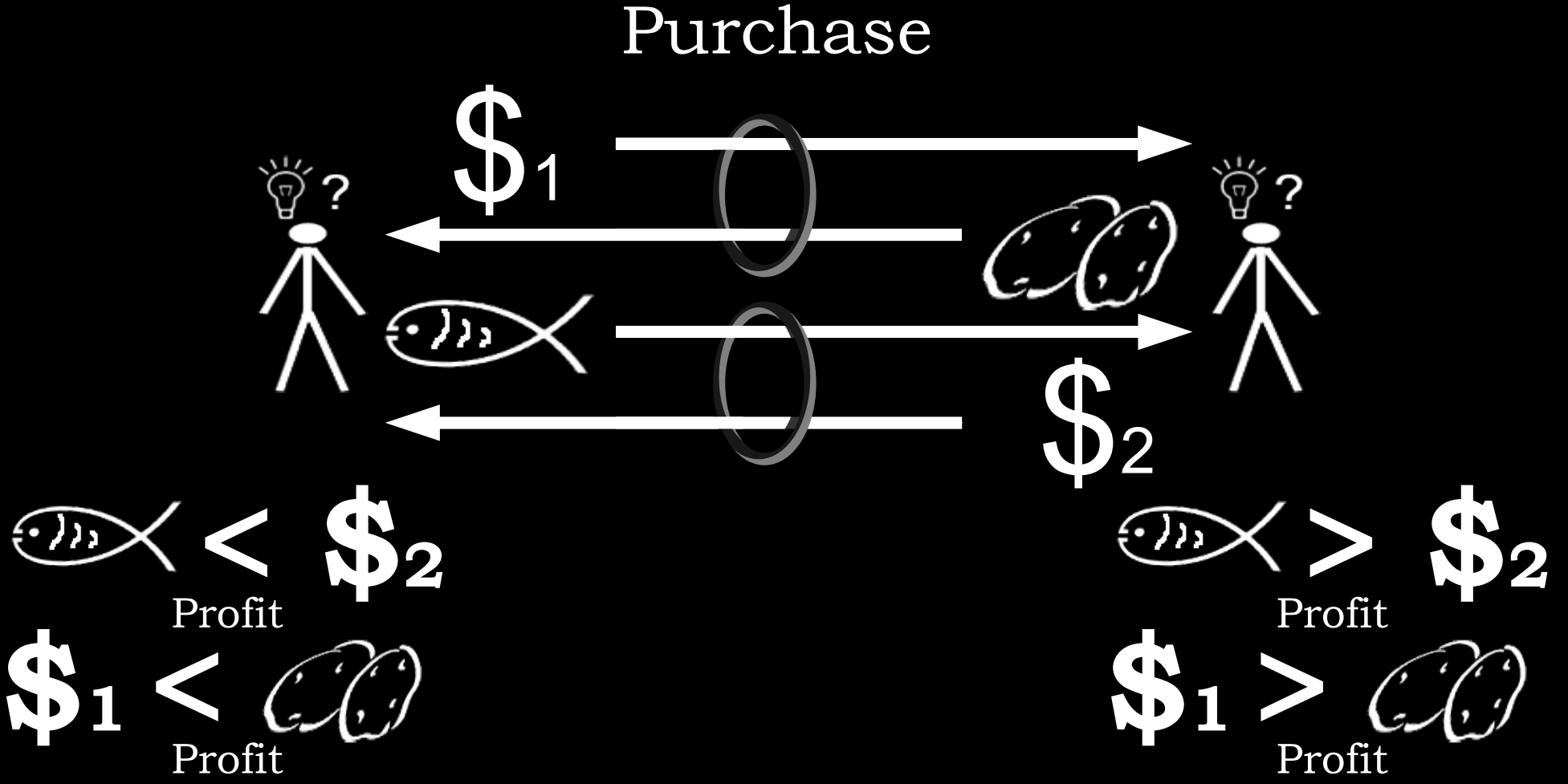
Barter



Value-flow and cooking pots



Value-flow and cooking pots

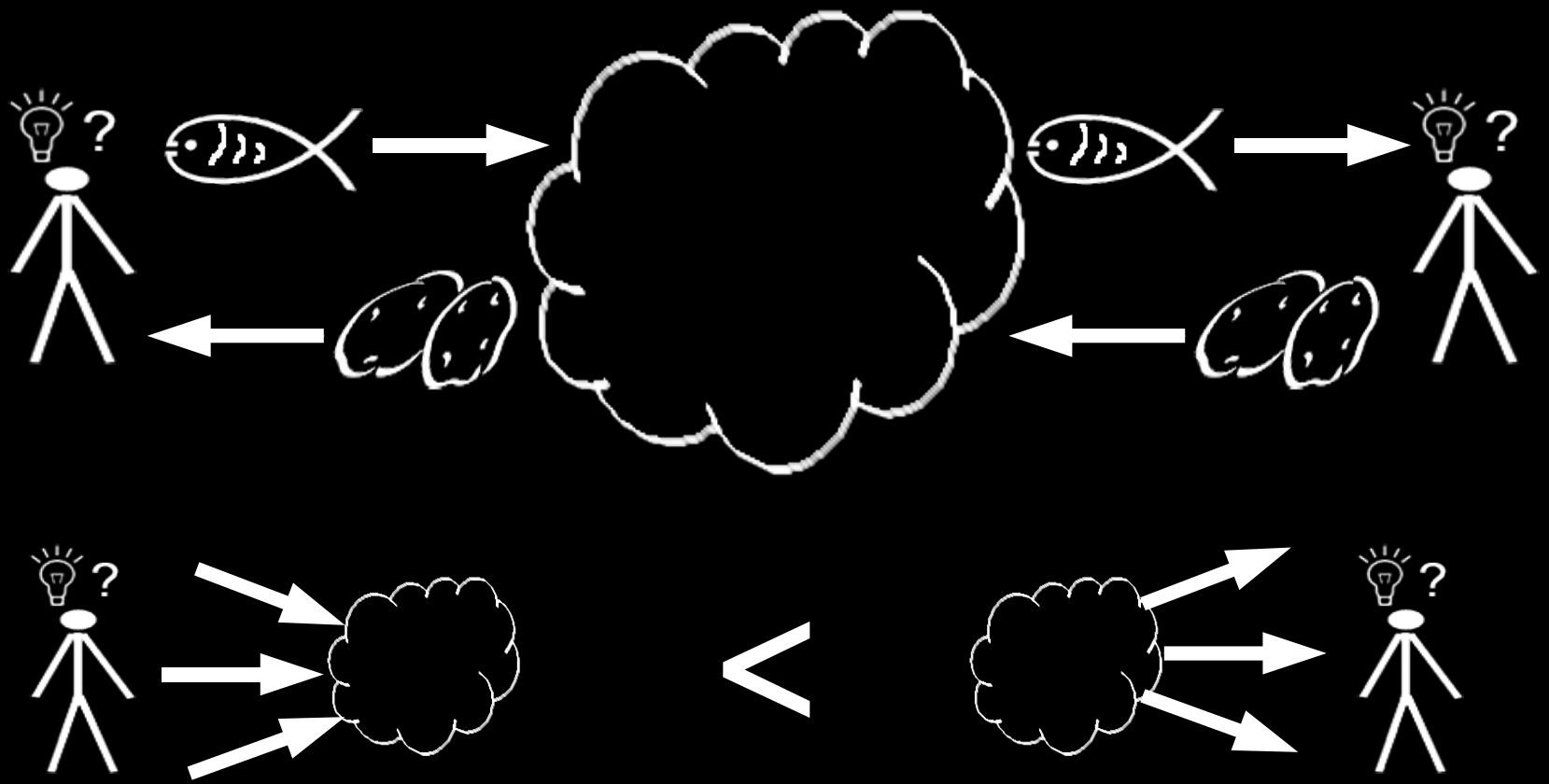


Value-flow and cooking pots

Cooking-pot (easier to draw a cloud)

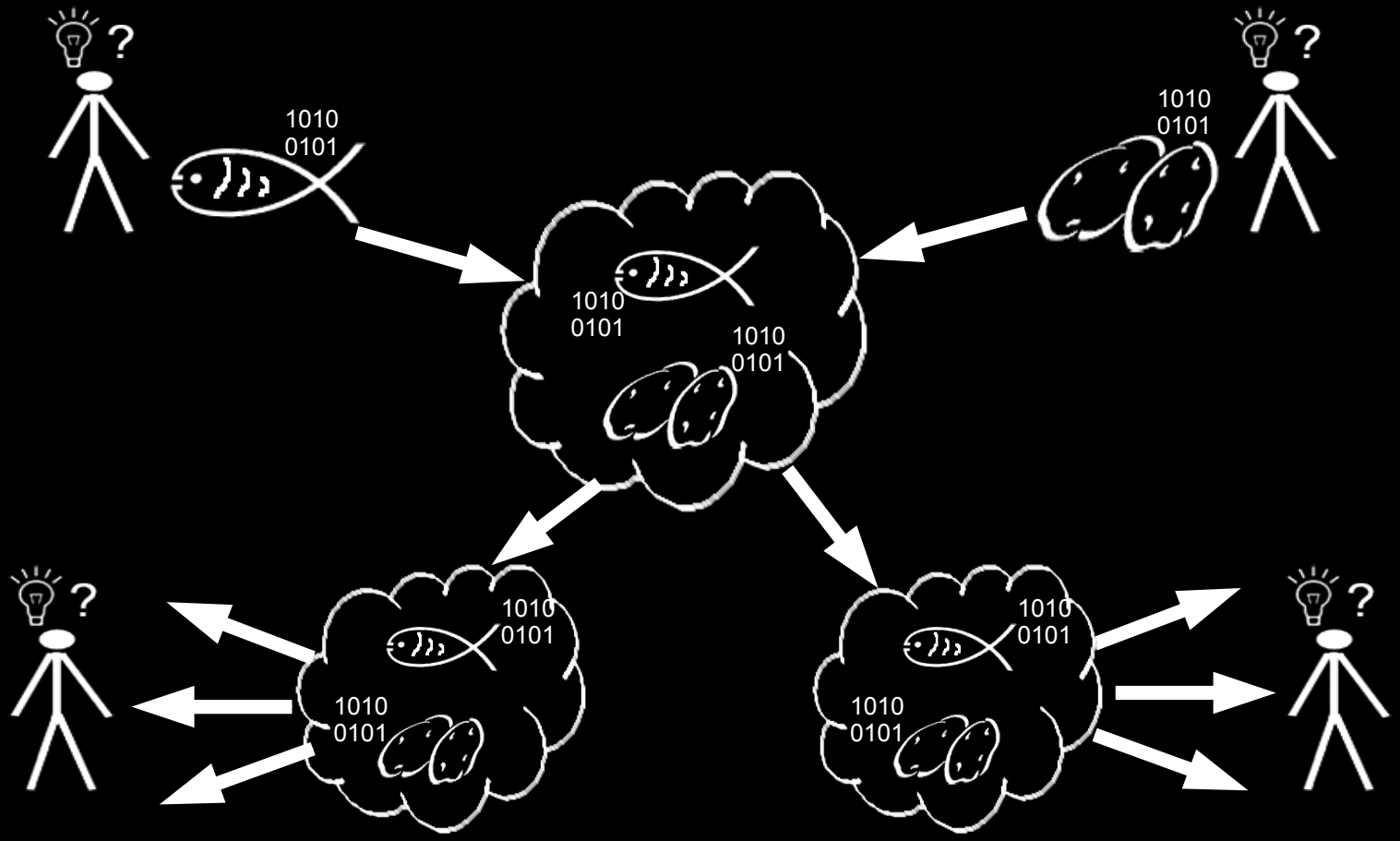
Value-flow and cooking pots

Cooking-pot (easier to draw a cloud)



Profit

Value-flow and cooking pots



With knowledge goods, everyone gets *a copy of the whole pot*

Free/Libre/Open Source Software

Copyrighted software which is distributed under licences that ensure recipients are:

- Free to use
- Free to study
- Free to distribute
- Free to modify and distribute modifications

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- Free to study
- Free to distribute
- Free to modify and distribute modifications

Some licenses require that recipients who distribute further do so under the *same licence*, including for any modifications

Innovation through networks

Free/Libre/Open Source Software (FLOSS): Product innovation:

Scripting languages (Perl, Python...)

Dynamic webservers (Apache)

Application development (Zope, Plone)

Multimedia (VideoLAN)

Clustered computing (Beowulf)

Innovation through networks

Free/Libre/Open Source Software (FLOSS) provides main competing product in:

- Web servers (#1 in market share)
- Server operating systems (#2)
- Network file systems (#2)
- Office productivity software (#2)
- Web browsers (#2)

Innovation through networks

Free/Libre/Open Source Software (FLOSS):
Process innovation:

Massively distributed development

User-driven development

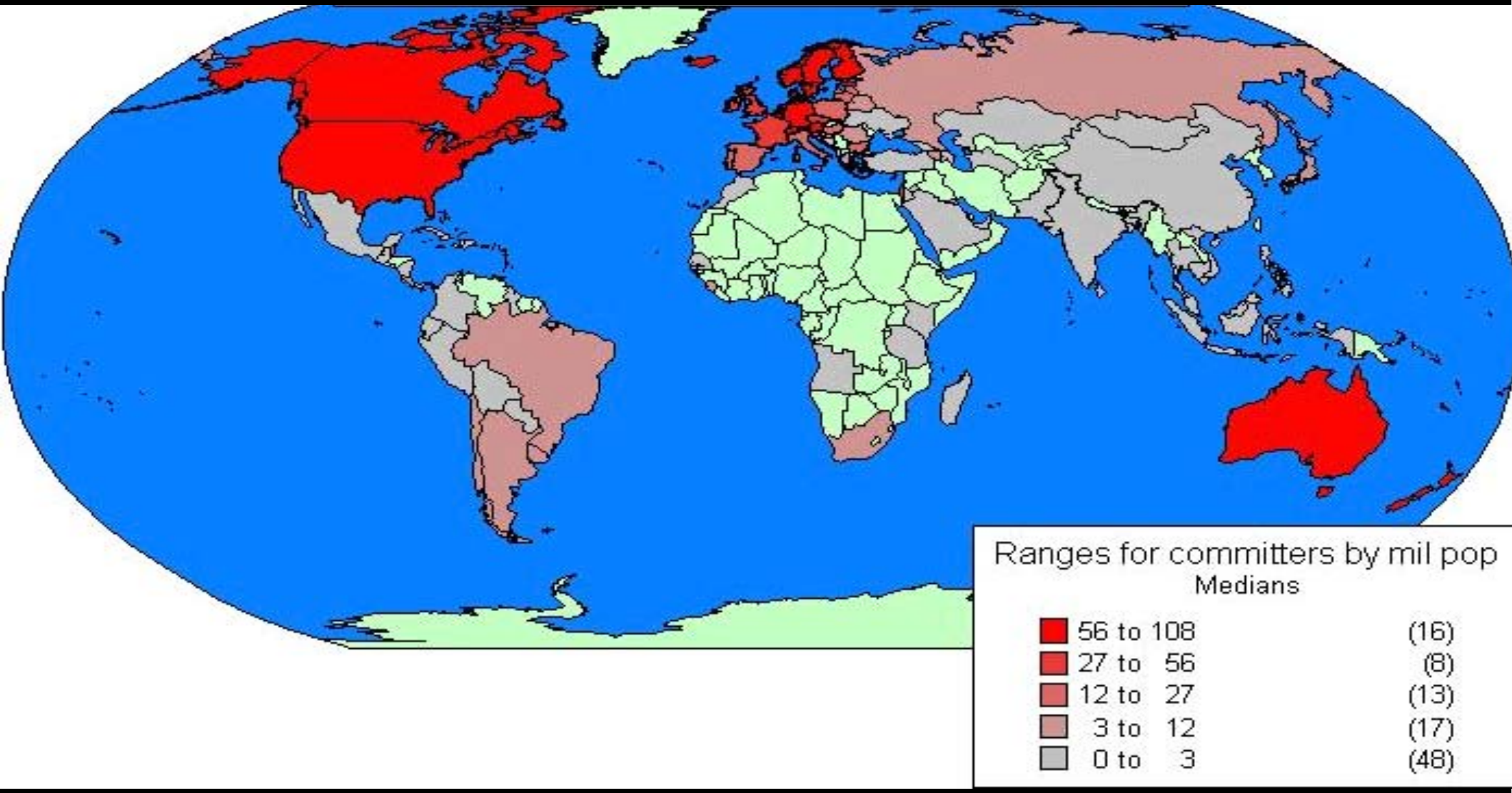
Rapid prototyping

Quantifiable improvements

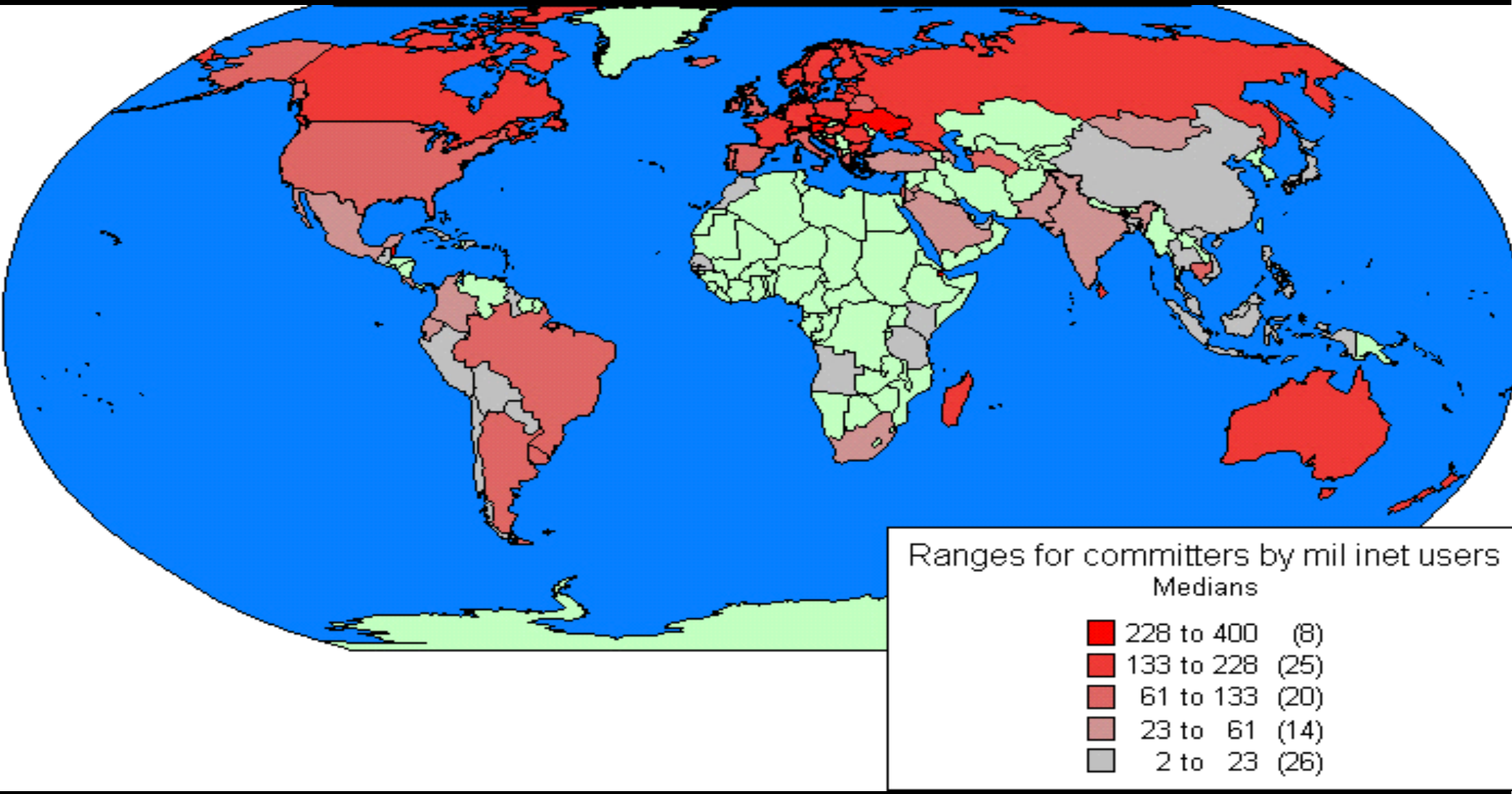
Innovation: value

- Existing FLOSS code – if a company were to recreate it, this would cost:
  - Euro 12 billion (substitution cost, till 2005)
  - 163 thousand person-years
  - Euro 100 billion (till 2010)
- Doubling in size every 18-24 months
- Actual investment by firms in code development: at least Euro 1.2 billion

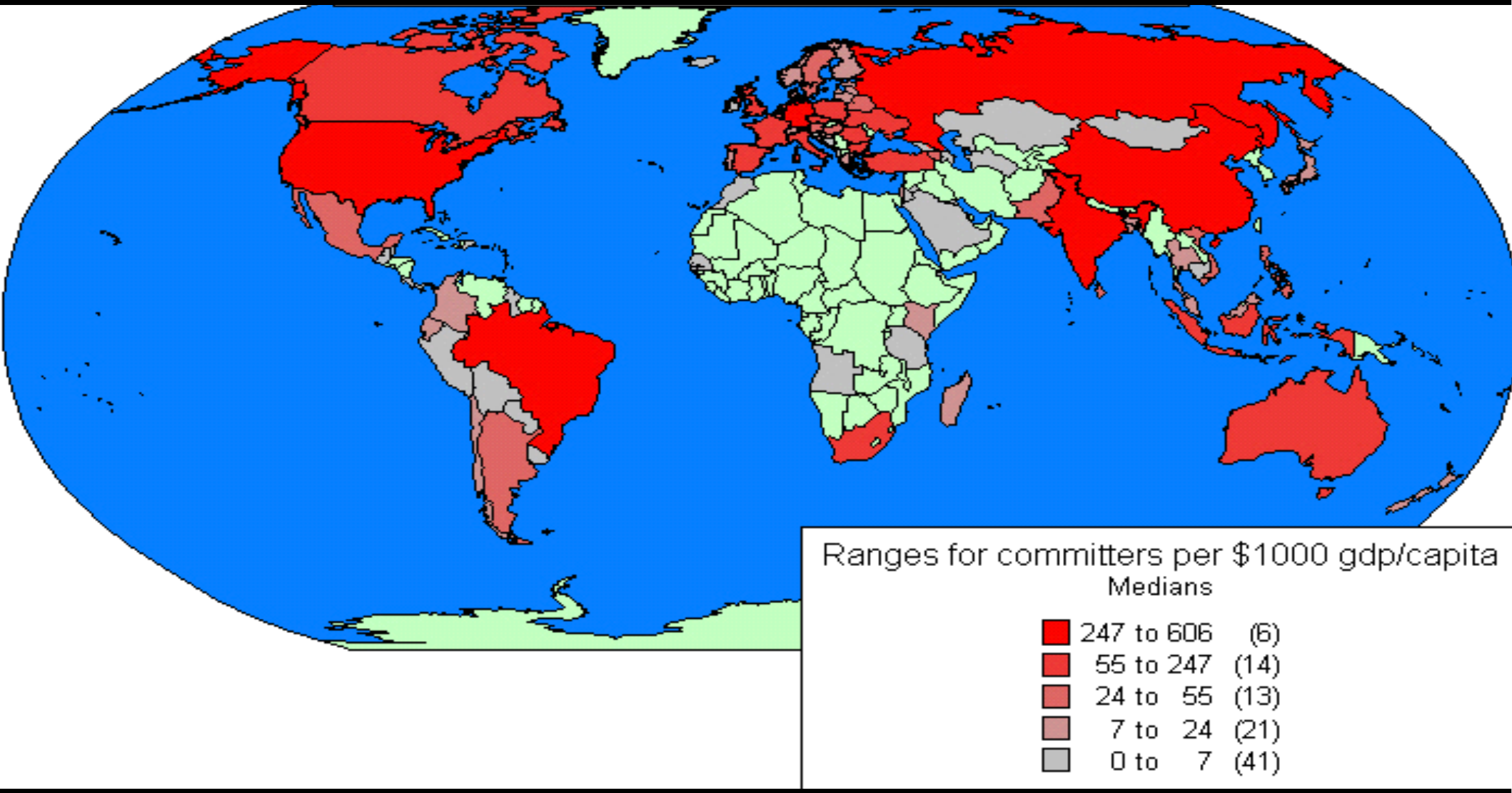
Global



Global



Global



Ecosystems

- “How can there be an economics around FLOSS when you can't make money selling the software?”

Ecosystems

- Under 7% of programmers in the US work in packaged software companies
- 30% work in sectors producing mainly custom software / integration / support
- Almost 60% work in the “user sector” - finance, government, manufacturing, retail, etc

Ecosystems

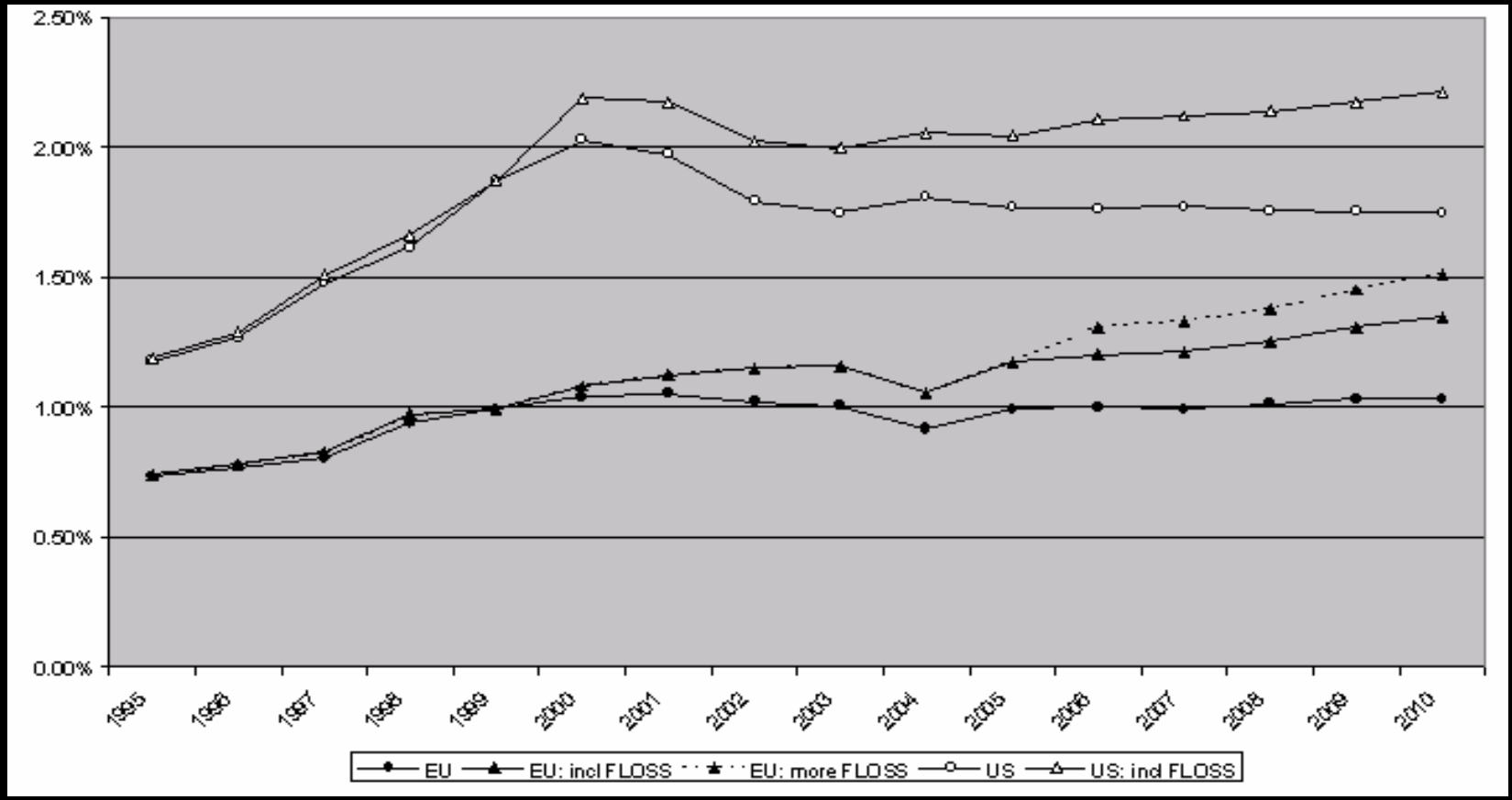
- 16% of software spending in the US is on packaged proprietary software (19% in EU)
- >50% is in-house software development (30% in EU)
- Rest is custom software

Ecosystems

- 16% of software spending in the US is on packaged proprietary software (19% in EU)
- >50% is in-house software development (30% in EU)
- Rest is custom software
- *Today's* software ecosystem: consistent with FLOSS, where few people or firms make money *selling software*

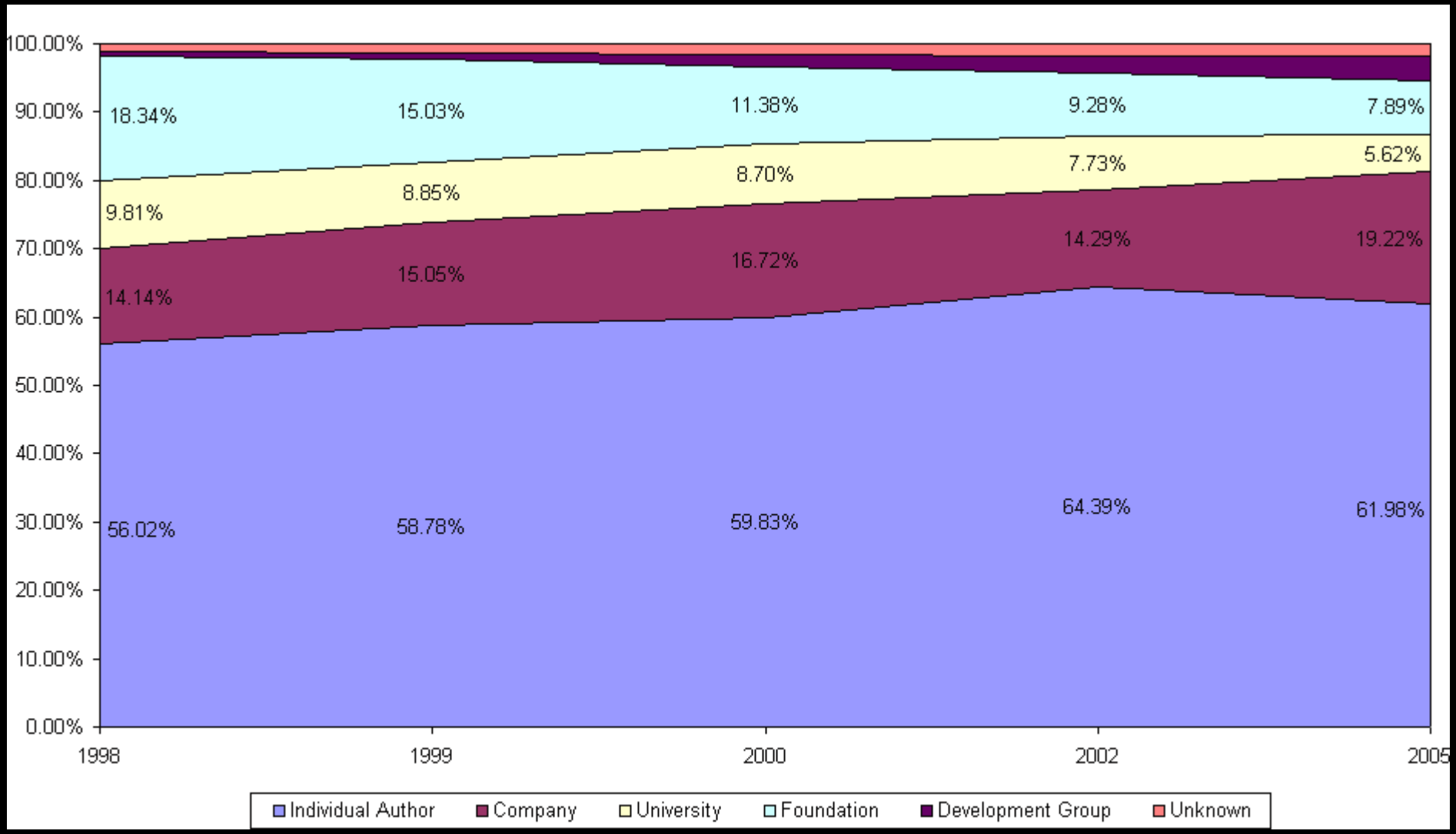
Ecosystem: Value

Estimated "true" software investment, share of GDP



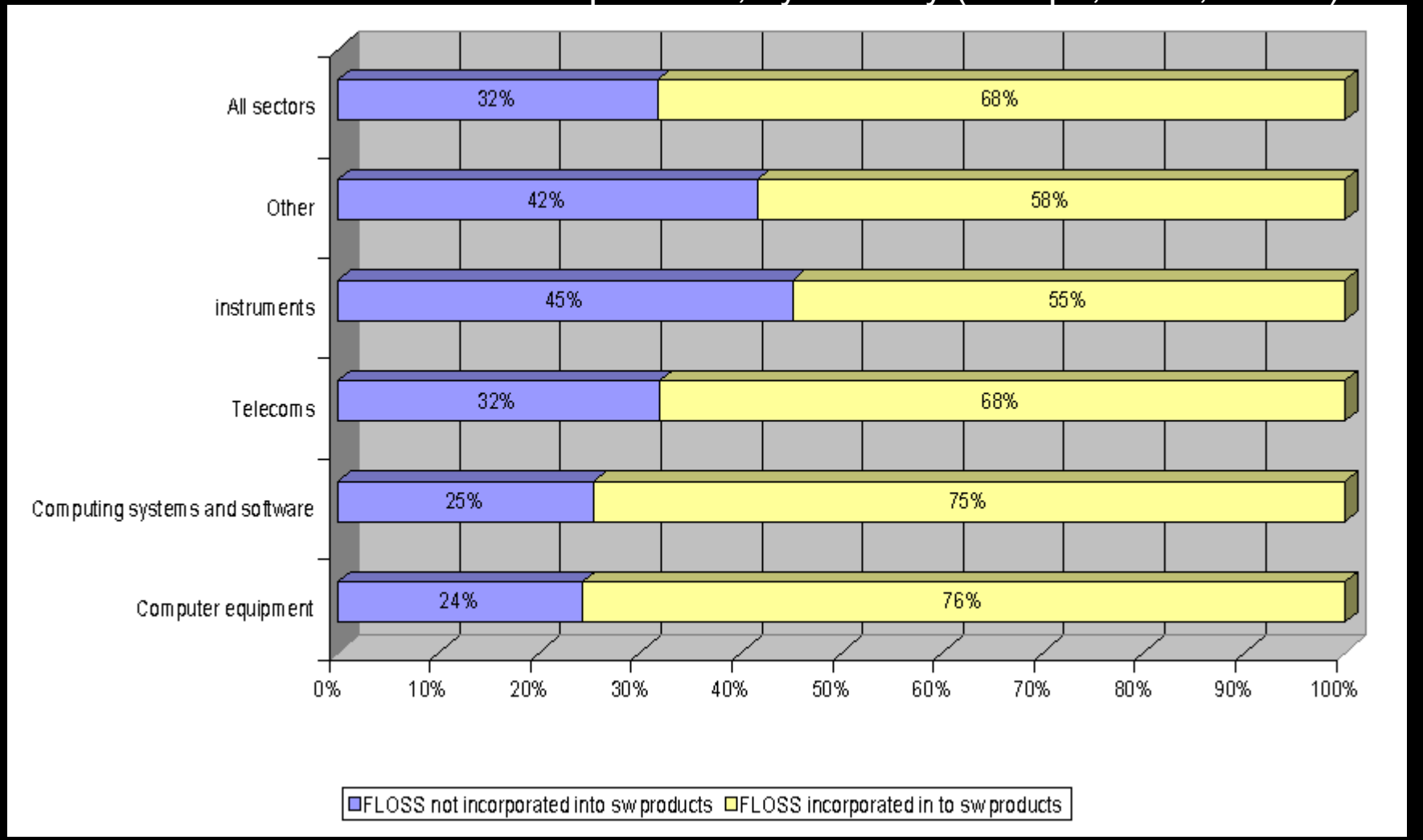
Source: Investment data from GGDC; Linux hardware data and projections from IDC “Linux Marketplace” study; GDP projections Eurostat and US Congressional Budget Office; Software and hardware sales data from EITO; MERIT estimates and projections.

Ecosystem: different partners



Innovation: R&D substitution

Use of FLOSS in software products, by industry (Europe, 2005, n=378)



Innovation: R&D substitution

- Nokia N770 / N800: innovative new product – not PDA, not phone, handheld Internet browser
- Maemo platform based on Debian GNU/Linux
- Saved Nokia an estimated 900 million euro (our estimates – Nokia may not even know!)
- Nokia wrote < 2% of the software; other large companies > 12%, others (Debian community) wrote the rest

Innovation: R&D substitution

- Such large savings in development allowed reduced R&D spending
- R&D could thus be focussed on further product innovation, and savings could limit losses in developing a risky product with an unclear market
- Nokia could make a risky, innovative product – turned out quite successful

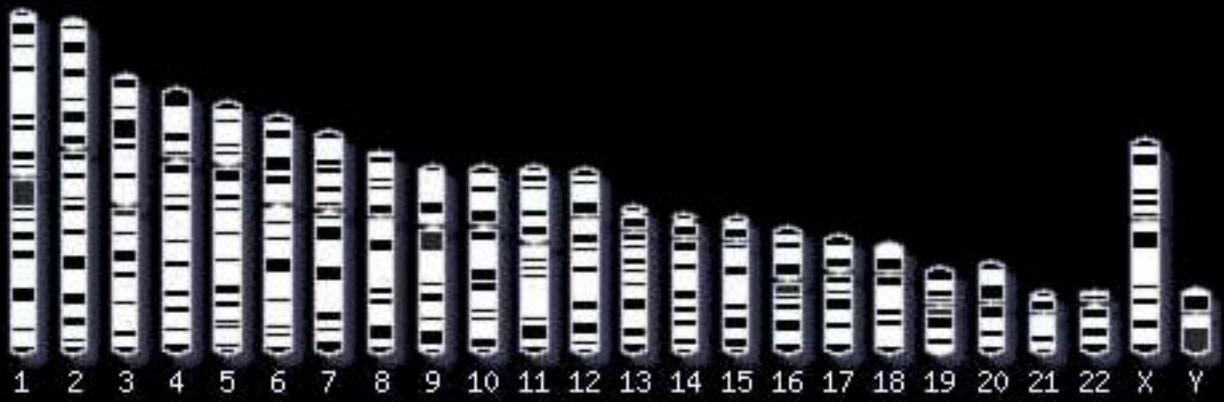
Collaboration: not just software

"Wikipedia comes close to Britannica in terms of the accuracy of its science entries" - *Nature*

Collaboration in history

James Watt, Lean's Reporter and the Cornish Pumping Engine

Collaboration among firms



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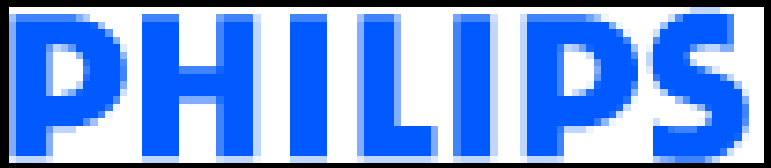
NOVARTIS
Pfizer
Roche
SEARLE
The Sanger Centre
shgc
Washington
Whitehead institute

SNP Consortium

To individuals *within* firms

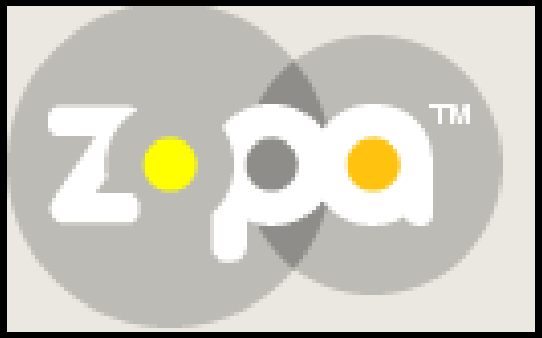
Eureka: system for technicians to contribute solutions to problems into a common pool to be used by others

To individuals *within* firms



Innersource: Open Source-like community within Philips Medical Systems

Collaboration in lending



"Prosper: the eBay of loans?" - *Businessweek*

GIES: Policies?

- Non-dogmatic approach to IPR – consider alternatives and actual disclosure benefits
- Reduce barriers to collaboration across sectors and organisation/producer types
- Support contribution to global public goods – treat (auditable) time spent as charitable donation

More information

- Study on the “Economic impact of open source software on innovation and the competitiveness of the Information and Communication Technologies (ICT) sector in the EU”
- Published by European Commission: www.flossimpact.eu
- ghosh@merit.unu.edu

CODE

Collaborative Ownership and the Digital Economy

Edited by
Rishab Aiyer Ghosh

Open source software is considered by many to be a novelty and the open source movement a revolution. Yet the collaborative creation of knowledge has gone on for as long as humans have been able to communicate. *CODE* looks at the collaborative model of creativity—with examples ranging from collective ownership in indigenous societies to free software, academic science, and the human genome project—and finds it an alternative to proprietary frameworks for creativity based on strong intellectual property rights.

Intellectual property rights, argues Rishab Ghosh in his introduction, were ostensibly developed to increase creativity; but today, policy decisions that treat knowledge and art as if they were physical forms of property actually threaten to decrease creativity, limit public access to creativity, and discourage collaborative creativity. "Newton should have had to pay a license fee before being allowed even to see how tall the 'shoulders of giants' were, let alone to stand upon them," he writes.

> *"CODE is a mature and sophisticated exploration of the most important issues related to creativity in the digital age. The broad mix of scholars, offering extraordinarily insightful perspectives, makes this collection essential for understanding this critically important set of questions."*
>
> **Lawrence Lessig**
> Stanford Law School, author of *Free Culture*

The contributors to *CODE*, from such diverse fields as economics, anthropology, law, and software development, examine collaborative creativity from a variety of perspectives, looking at new and old forms of creative collaboration and the mechanisms emerging to study them. Discussing the philosophically resonant issues of ownership, property, and the commons, they ask if the increasing application of the language of property rights to knowledge and creativity constitutes a second enclosure movement—or if the worldwide acclaim for free software signifies a renaissance of the commons. Two concluding chapters offer concrete possibilities for both alternatives, with one proposing the establishment of "positive intellectual rights" to information and another issuing a warning against the threats to networked knowledge posed by globalization.

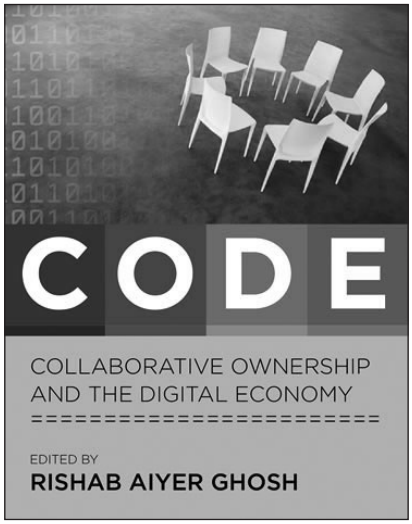


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TABLE OF CONTENTS

Series Foreword

Acknowledgments

1 Why Collaboration is Important (Again)
Rishab Aiyer Ghosh

I CREATIVITY AND DOMAINS OF COLLABORATION

2 Imagined Collectivities and Multiple Authorship
Marilyn Strathern

3 Modes of Creativity and the Register of Ownership
James Leach

4 Some Properties of Culture and Persons
Fred Myers

5 Square Pegs in Round Holes? Cultural Production, Intellectual Property Frameworks, and Discourses of Power
Boatema Boateng

6 Who Got Left Out of the Property Grab Again: Oral Traditions, Indigenous Rights, and Valuable Old Knowledge
Anthony Seeger

7 From Keeping "Nature's Secrets" to the Institutionalization of "Open Science"
Paul A. David

II MECHANISMS FOR COLLABORATION

8 Benefit-Sharing: Experiments in Governance
Cori Hayden

9 Trust Among the Algorithms: Ownership, Identity, and the Collaborative Stewardship of Information
Christopher Kelty

10 Cooking-Pot Markets and Balanced Value Flows
Rishab Aiyer Ghosh

11 Coase's Penguin, or, Linux and the Nature of the Firm
Yochai Benkler

12 Paying for Public Goods
James Love and Tim Hubbard

III OWNERSHIP, PROPERTY, AND THE COMMONS

13 Fencing Off Ideas: Enclosure and the Disappearance of the Public Domain
James Boyle

14 A Renaissance of the Commons: How the New Sciences and the Internet are Framing a New Global Identity and Order
John Clippinger and David Bollier

15 Positive Intellectual Rights and Information Exchanges
Phillipe Aigrain

16 Copyright and Globalization in the Age of Computer Networks
Richard Stallman

Contributors

Index

CODE Collaborative Ownership and the Digital Economy

Edited by Rishab Aiyer Ghosh

"We hear much these days of the 'knowledge society.' The usual implication of the phrase is that knowledge is something to be owned. Yet it is well known, indeed obvious, that creativity and innovation happen only when nurtured by large areas of common knowledge. The contributors to this book document the current erosion of the commons, and show ways to move forward by reconciling conflicting demands in a collaborative manner. Profound, thoughtful, pragmatic, and very readable, the articles range from historical perspective to practical advice, bringing fresh air to discussions around intellectual property and revealing how contingent are the 'norms' of today. They give answers and hope to those who sense that something is amiss with the system but are unsure about the alternatives."

John Sulston
The Wellcome Trust Sanger Institute, Cambridge, UK,
Nobel Laureate in Physiology or Medicine (2002)

Rishab Aiyer Ghosh is Program Leader at the International Institute of Infonomics at Maastricht University. He was one of the founders and is the current managing editor of *First Monday,* the peer-reviewed Internet journal.