Enabling Exponential Innovation via Open Source Software Development

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and

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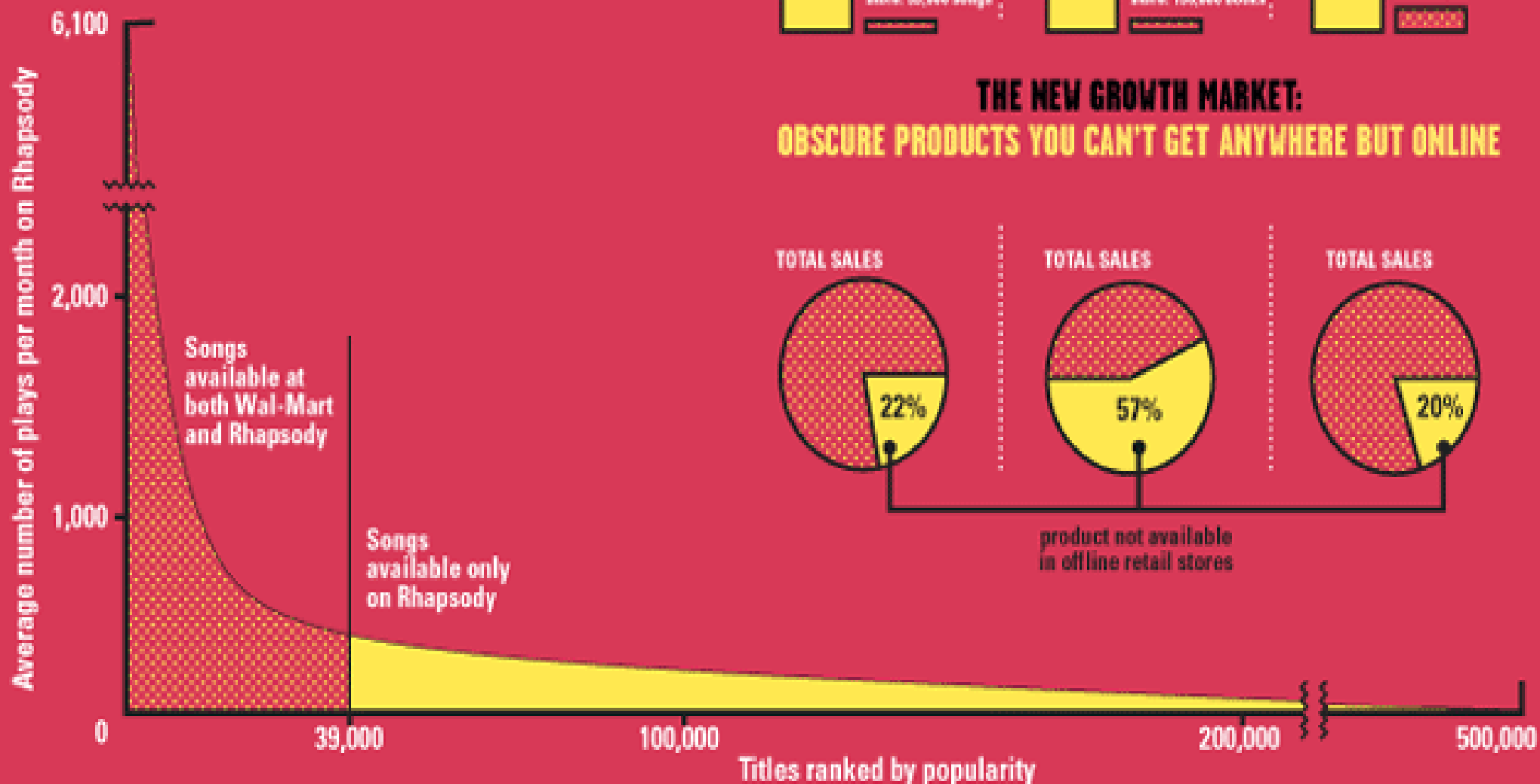
UCI

Overview

- Power law distributions (PLDs)
- PLDs in Open Source Software Development
- OSSD Projects as innovation engines
- OSSD multi-project ecology as an *innovation frontier*
- OSSD ecology can enable frontier with exponential growth for socio-technical innovations
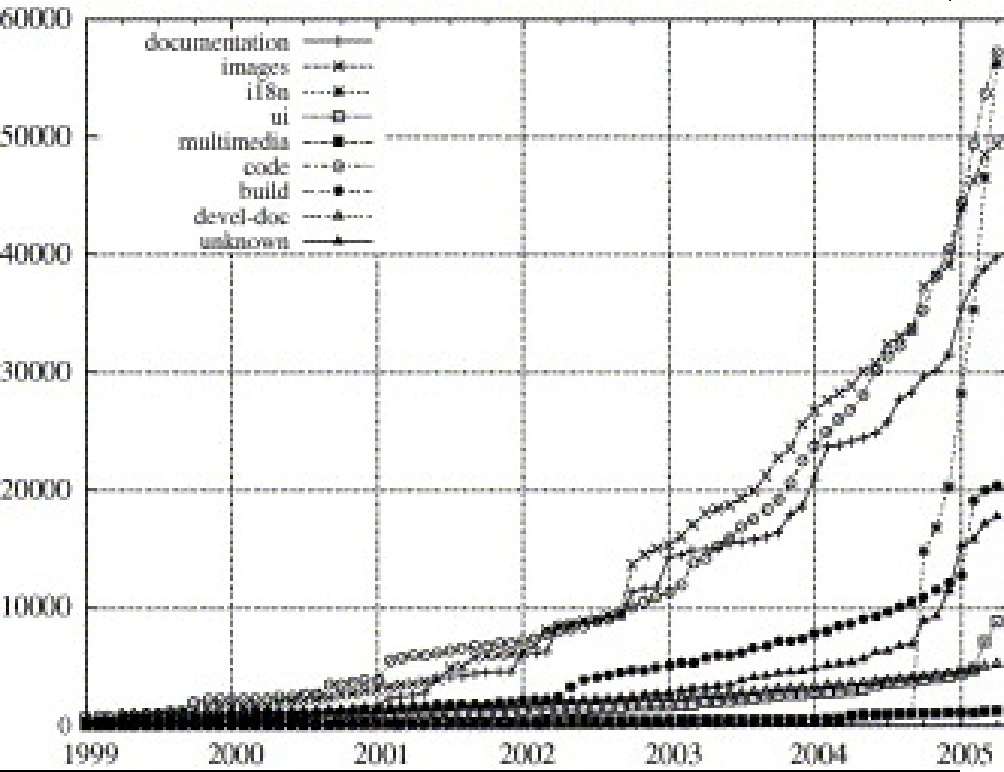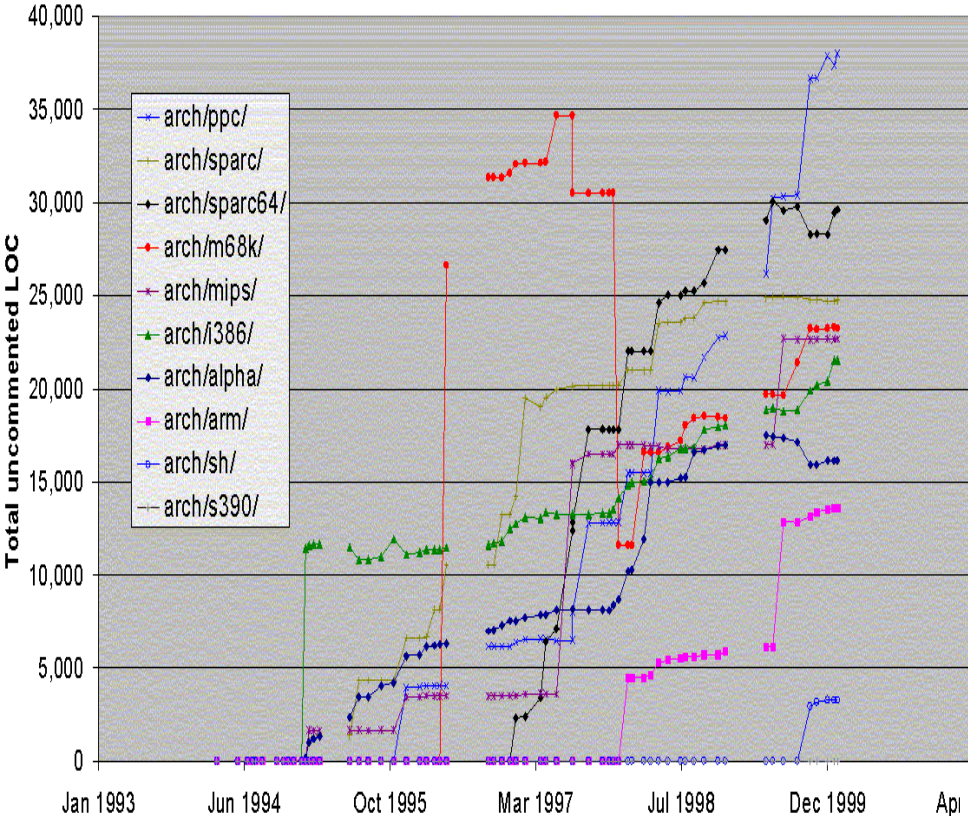
ANATOMY OF THE LONG TAIL

Online services carry far more inventory than traditional retailers. Rhapsody, for example, offers 19 times as many songs as Wal-Mart's stock of 39,000 tunes. The appetite for Rhapsody's more obscure tunes (charted below in yellow) makes up the so-called Long Tail. Meanwhile, even as consumers flock to mainstream books, music, and films (right), there is real demand for niche fare found only online.

RHAPSODY

TOTAL INVENTORY:
735,000 songs

typical Wal-Mart store: 39,000 songs

AMAZON.COM

TOTAL INVENTORY:
2.3 million books

typical Barnes & Noble store: 130,000 books

NETFLIX

TOTAL INVENTORY:
25,000 DVDs

typical Blockbuster store: 3,000 DVDs

THE NEW GROWTH MARKET:
OBSCURE PRODUCTS YOU CAN'T GET ANYWHERE BUT ONLINE

TOTAL SALES — 22%

TOTAL SALES — 57%

TOTAL SALES — 20%

product not available in offline retail stores

Average number of plays per month on Rhapsody

6,100

2,000

1,000

Songs available at both Wal-Mart and Rhapsody

Songs available only on Rhapsody

0 — 39,000 — 100,000 — 200,000 — 500,000

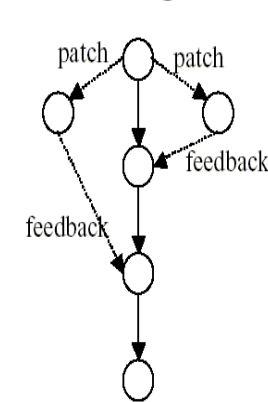Titles ranked by popularity

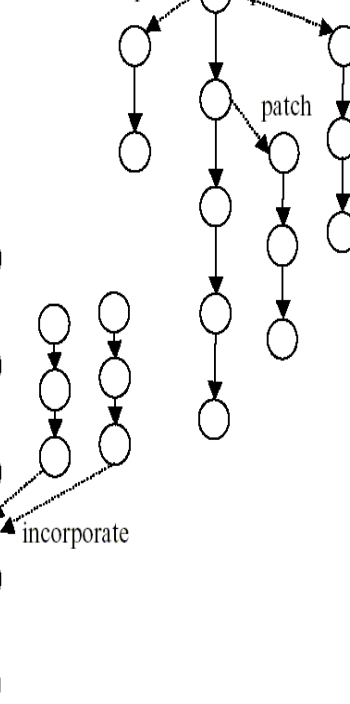# OSSD Projects as innovation engines

- Social/technical innovations in OSSD projects emerge via:
  - Enhancing project resources
    - Inter-project mergers
    - Creating new software development artifacts
  - Tuning adjustments or adaptations
    - Intra-team role migration
    - Incremental product releases ("daily builds")
  - Restructuring transformations
    - Legal incorporation
    - Code refactoring
  - Reinvention practices
    - Learning from others
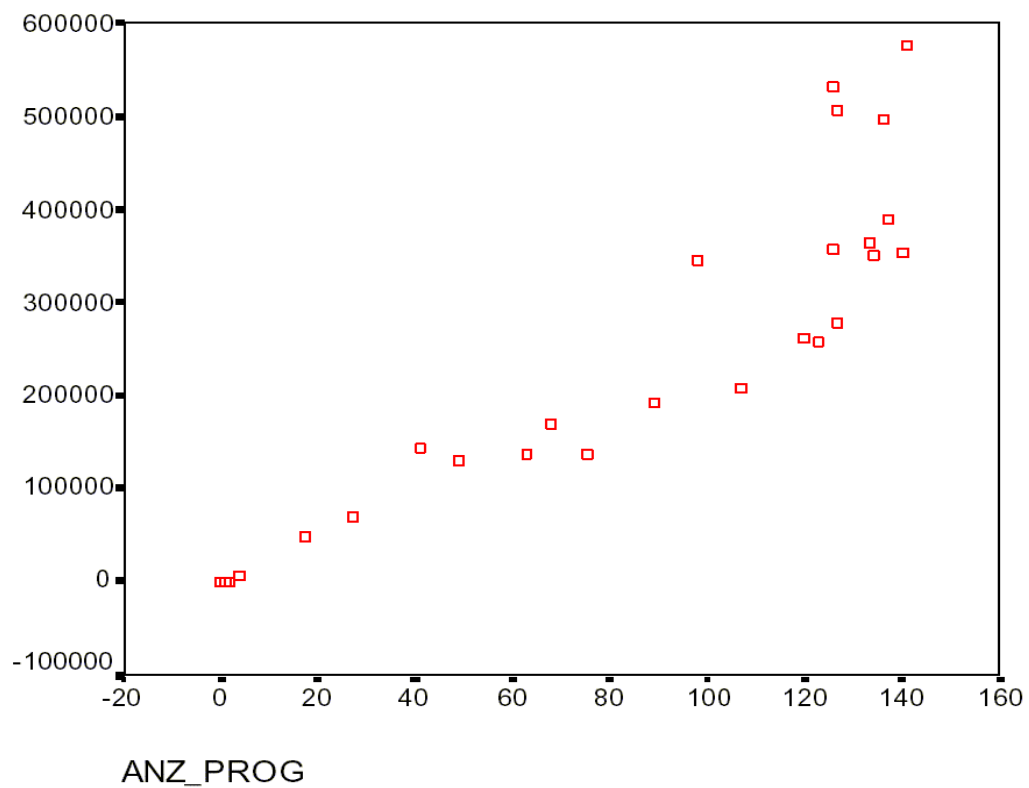   - Commercial product feature replication

Chart 1 (top left):

Total uncommented LOC

- arch/ppc/
- arch/sparc/
- arch/sparc64/
- arch/m68k/
- arch/mips/
- arch/i386/
- arch/alpha/
- arch/arm/
- arch/sh/
- arch/s390/

40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0

Jan 1993   Jun 1994   Oct 1995   Mar 1997   Jul 1998   Dec 1999   Apr

Diagrams (top right):

GNU Wingnut — patch, patch, feedback, feedback

Linux — patch, patch, patch

PostgreSQL — incorporate, incorporate

Jun — released public versions, test versions

Chart 2 (bottom left):

- documentation
- images
- i18n
- ui
- multimedia
- code
- build
- devel-doc
- unknown

60000
50000
40000
30000
20000
10000
0

1999   2000   2001   2002   2003   2004   2005

Chart 3 (bottom right):

LOC_ADD

600000
500000
400000
300000
200000
100000
0
-100000

ANZ_PROG

-20   0   20   40   60   80   100   120   140   160

OSSD multi-project ecology as an *innovation frontier*

- OSSD multi-project ecology: a (virtual) enterprise that collectively mobilizes an inter-related group of OSSD projects
  - Barclays Global Investments, Google Summer of Code, Apache Software Foundation, SUN Microsystems, etc.
- Frontier: a zone of unsettled land outside the region of existing settlements suitable suitable for exploration and potential development
- Innovation frontier: a socio-technical zone for innovation outside of existing enterprise system settlements suitable for exploration and potential development.

Google Summer of Code™

Accepted student applications for *Google Summer of Code* have been announced! We accepted over 900 student applicants from a pool of nearly 6,200 applications.

All the mentoring organizations that will participate in *Google Summer of Code* 2007 are listed below. You can learn more about the accepted students and their projects by visiting each organization's "about" page.

You might also be interested in keeping up with news about the program on the Google Summer of Code Blog. And, you can still hang out with us in `#summer-discuss` on Slashnet or in the program discussion group.

Registered Student Login

Registered Mentor Login

You can still take a look at all the organizations' ideas pages to learn more about what help they need from new contributors.

Mentoring Organizations Participating in *Google Summer of Code* 2007

AbiSource (ideas)
Adium (ideas)
The Apache Software Foundation (ideas)
Aqsis Team (ideas)
Ardour (ideas)
ArgoUML (ideas)
Audacious Media Player (ideas)
Bazaar (ideas)
BBC Research (ideas)
Beagle (ideas)
Blender Foundation (ideas)
Boost C++ (ideas)

LLVM Compiler Infrastructure (ideas)
MacPorts (ideas)
maemo (ideas)
MetaBrainz Foundation (ideas)
Mixxx (ideas)
MoinMoin Wiki Project (ideas)
Mono Project (ideas)
Moodle (ideas)
Mozilla Foundation (ideas)
MySQL AB (ideas)
National Evolutionary Synthesis Center (NESCent), Phyloinformatics Group (ideas)

Sun's Open Source Initiatives

opensolaris

12,000 Members, in just 6 months
30 major community projects
25 user groups worlwide
250 code contributors
27,500 downloads

OpenOffice.org

7.5M Lines of code
Largest contribution EVER
80+ projects
Translated into 50+ languages
55M+ downloads

netBeans.org

First Java IDE to support
J2SE 5.0 language features
40+ industry endorsements
8M+ IDE downloads

OpenSPARC

First 64-bit, 32 Thread Architecture
RTL code available under GPLv2 lcnse
Announced 12/6/05, Avail. 3/21/06
Linux port already in progress by
community member

Project GlassFish

1200+ members
Includes Java EE 5, JWSDP and other Web services
technologies
200,000 downloads

And now...Free and Open Source Java

Java Technology
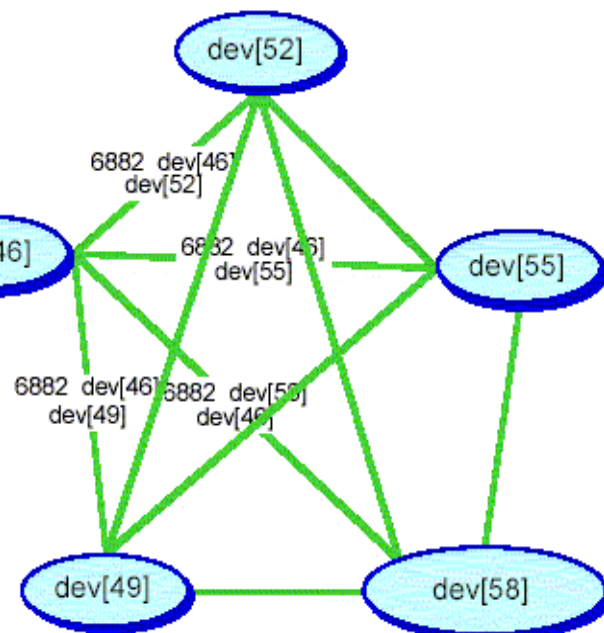**GET IT FREE**
from java.com

Enabling exponential growth for socio-technical innovation frontiers

- The most successful OSSD projects exhibit sustained exponential growth via social and technical innovations
- Exponential growth requires critical mass for collective innovation action
  - Critical mass emerges through sufficiently dense socio-technical networks that act as "small worlds"
  - Such networks emerge when participants *enjoy* making social/technical contributions that serve to advance the accumulation of common pool resources
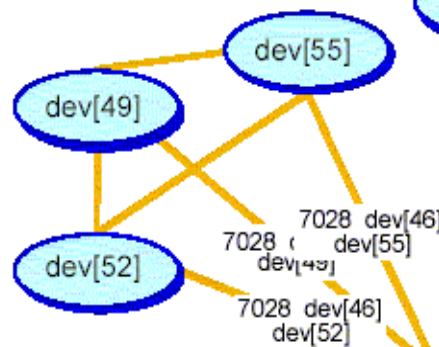
OSS Developer - Social Network
Developers are nodes / Projects are links
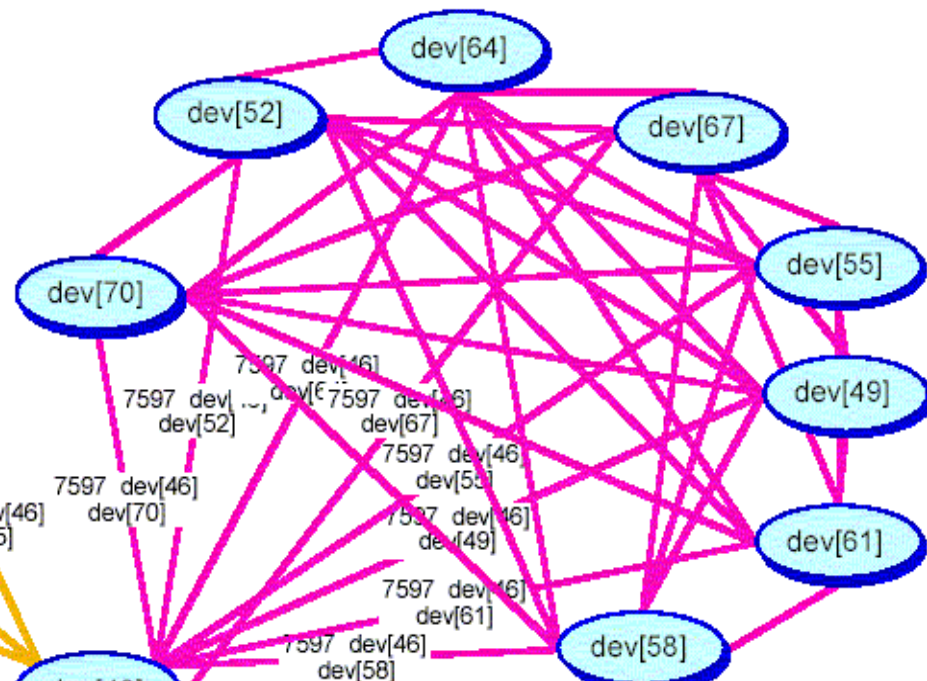### 24 Developers
5 Projects
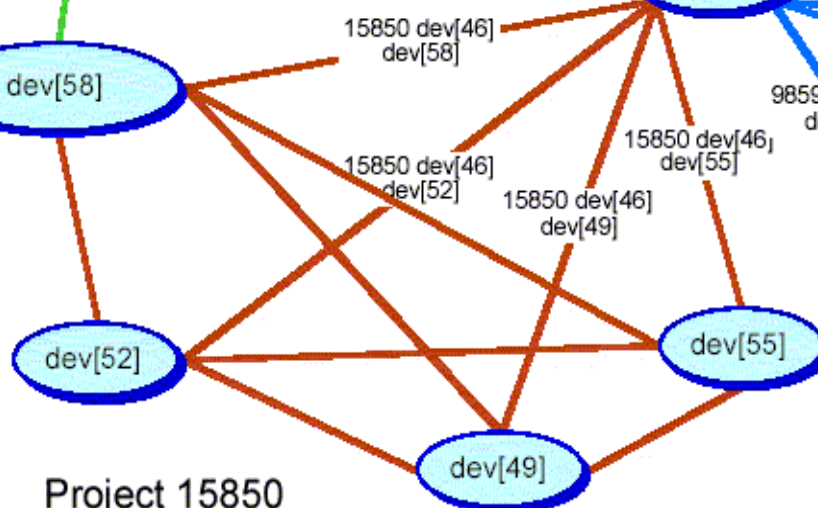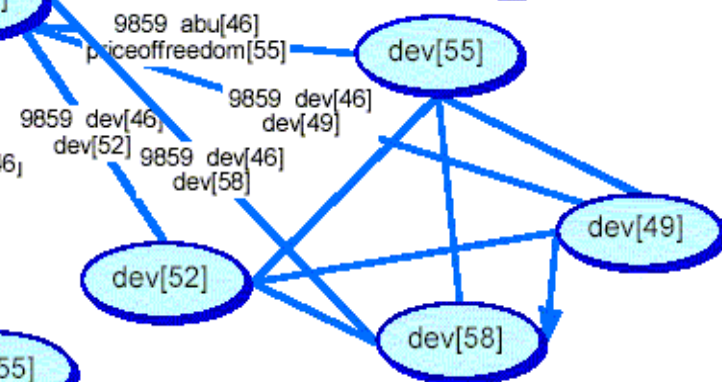### 2 Linchpin Developers
1 Cluster

Project 7597

Project 6882

Project 7028

dev[64]

dev[52]

dev[67]

dev[52]

dev[70]

dev[55]

dev[55]

6882 dev[46]
dev[52]

dev[49]

dev[46]

6882 dev[46]
dev[55]

dev[52]

dev[55]

7597 dev[46]
7597 dev[46]
dev[52]

7597 dev[46]
dev[67]

dev[49]

dev[61]

6882 dev[46]
dev[49]

6882 dev[50]
dev[46]

7028 dev[46]
dev[55]

7028
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7597 dev[46]
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7597 dev[46]
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7597 dev[46]
dev[49]

7028 dev[46]
dev[52]

7597 dev[46]
dev[61]

dev[49]

dev[58]

dev[46]

7597 dev[46]
dev[58]

9859 abu[46]
priceoffreedom[55]

dev[55]

15850 dev[46]
dev[58]

dev[58]

9859 dev[46]
dev[49]

dev[52]

9859 dev[46]
dev[52]

15850 dev[46]
dev[52]

15850 dev[46]
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15850 dev[46]
dev[55]

9859 dev[46]
dev[58]

dev[49]

dev[52]

dev[58]

dev[55]

Project 15850

dev[49]

Project 9859

The Layman's Guide to Making Mods

If you are thinking about making a mod (for any game) and are not sure what you need to know, how to go about it, or simply want to avoid the most obvious mistakes then read on. The pages linked to below contain some excellent advice, and possibly comments on stuff that hadn't occured to you.

- /My Team Your Team – Introduction and disclaimer for all those, "what's all this my team your team crap?" readers.
- /Why Are You Making A Mod – Sometimes the reason a mod fails is the reason you started it in the first place.
- /Building a Team – Building up your mod team.
- /Despotism Or Communism – Some thoughts on team structure.
- /Working as a Team – The day to day life of a team.
- /Asset Management – How to manage the assets of your mod (code, textures, models, etc).
- /Distributed Development – Find out how hard and unpleasant distributed development can be.
- /Effective Testing – How to get the most out of testing your mod.
- Releasing A Mod
- /Supporting Your Mod – Easing the burden of mod support.
- /Mod Death – What happens when a mod or mod team self destruct and how to cope.

Thoughts on Mod Making

Several of the Unreal Wiki's contributors have experience in creating successful mods. Reading their accounts of their work and their advice is recommended.

- Mychaeel/Mod Startups – Making your idea a reality.
- Mychaeel/Modding Etiquette – How to make people like your mod.
- Jb – an analysis of the ChaosUT mod's history
- Piglet/Finishing Things – How to actually finish your mods, that said it's more how to **start** so that you **can** finish.
- A Bug's Life
- GODZ Inception – a journal of how GODZ started.
- Making Mods/General Mod Optimization – Common mistakes and ignored settings which often lead to lower performance – and how to fix/use them.

Done

Closing remarks

- To be clear, <u>nearly all</u> enterprises and OSSD projects <u>do not obtain</u> exponential innovation growth.

- High, sustained growth OSSD projects do exhibit exponential innovation growth when proper conditions exist.

  - When innovation becomes participatory and self-serving, when innovations contribute to common pool resources, and when sustained collective action emerges as a social movement that transcends enterprise boundaries.

- Possible for enterprises to achieve exponential innovation growth.

Details

- W. Scacchi, Understanding Free/Open Source Software Evolution, in N.H. Madhavji, J.F. Ramil and D. Perry (eds.), *Software Evolution and Feedback: Theory and Practice*, 181-206, John Wiley and Sons Inc, New York, 2006.

- W. Scacchi, Emerging Patterns of Intersection and Segmentation when Computerization Movements Interact, to appear in K.L. Kraemer and M. Elliott (eds.), *Computerization Movements and Technology Diffusion: From Mainframes to Ubiquitous Computing*, Information Today, Inc.