Power Laws, Longtails, & Software

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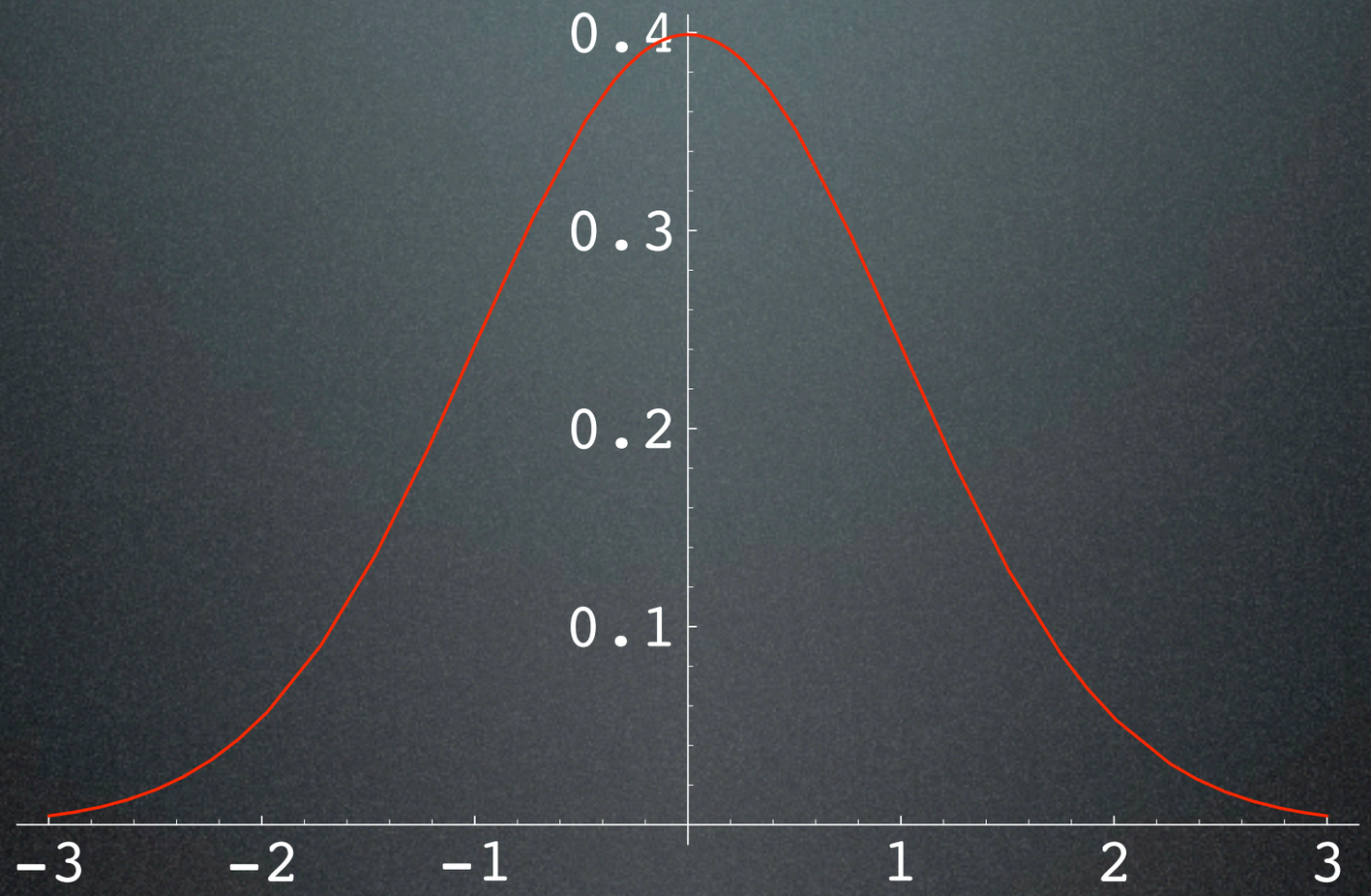
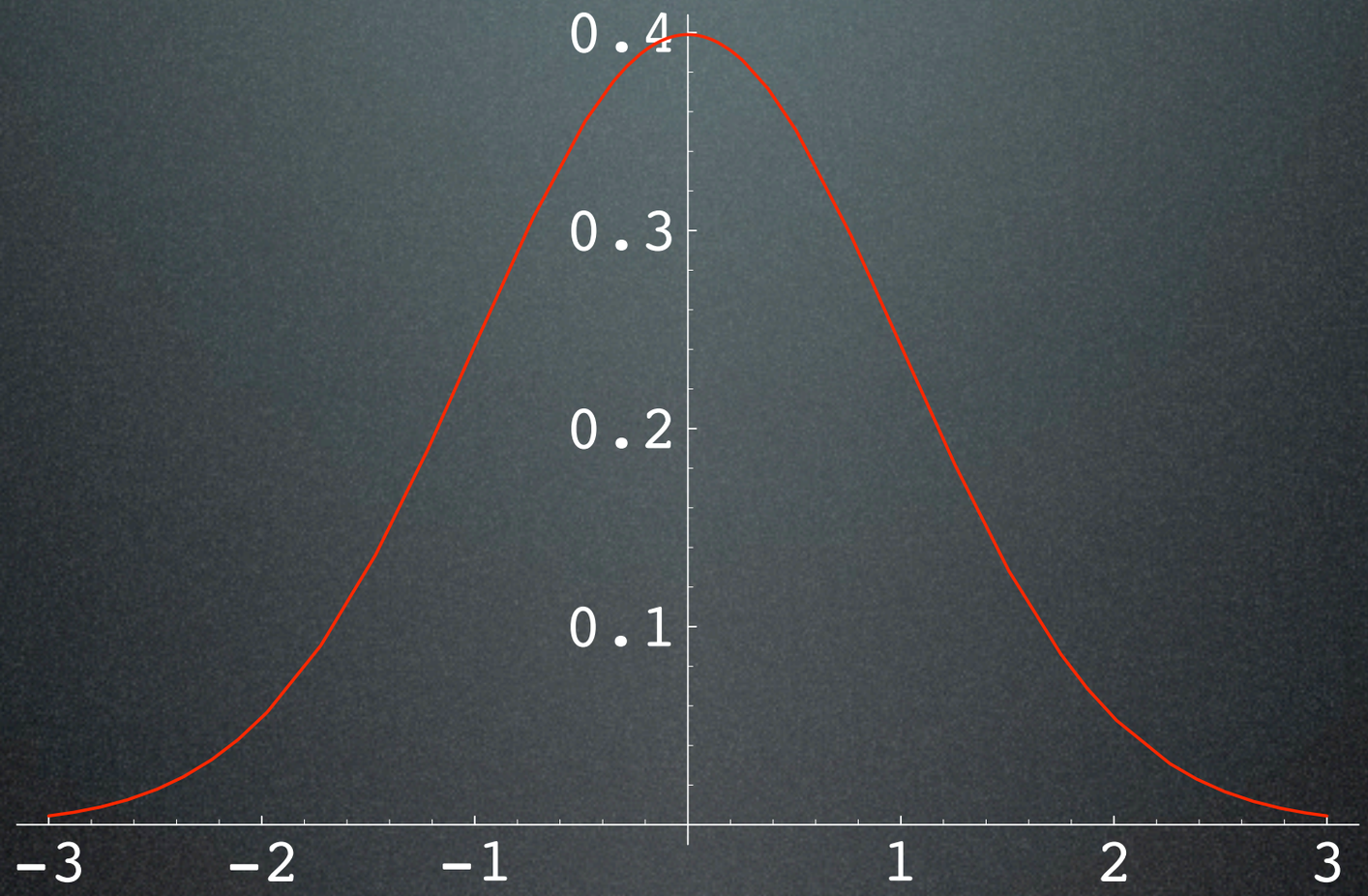

0.4
0.3
0.2
0.1
-3
-2
-1
1
2
3



Normal Distribution

Pretend Networks

What if we simulate networks by adding links at random nodes according to a normal distribution?

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```
if (avg[links/node] < 1)
then  disconnected islands
else fully connected
```

Real Networks

Real network connection distributions follow this equation:

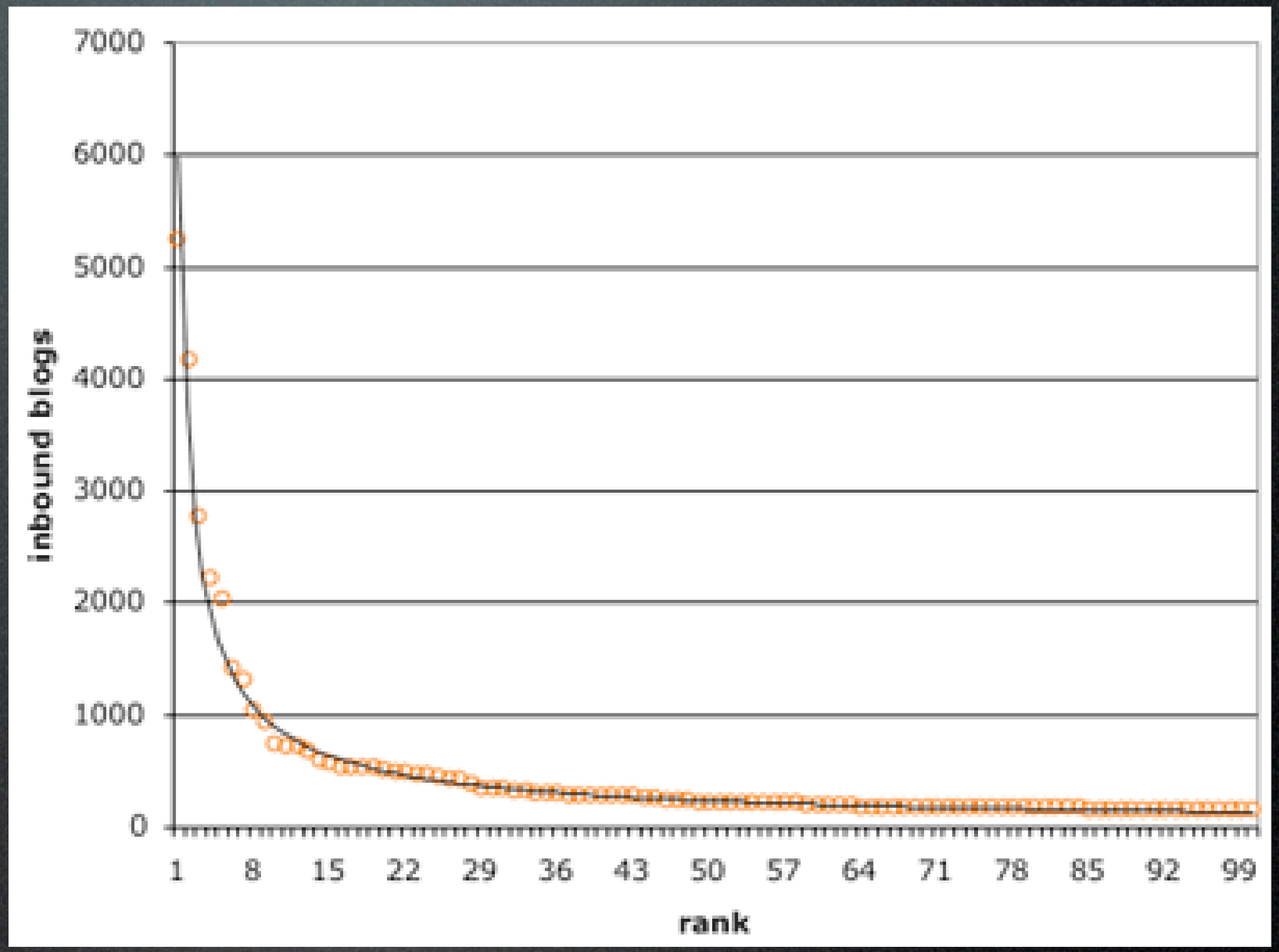
$$y = px^{-k}$$

Surprise!

So do the distributions of:

- Earthquakes vs Richter magnitude
- Actors who've starred in the same films
- Journal citations
- Links between Web sites
- Visits to Web sites by AOL users

Clay
Shirky



Blogs

Peter Denning

Power-law Distributions

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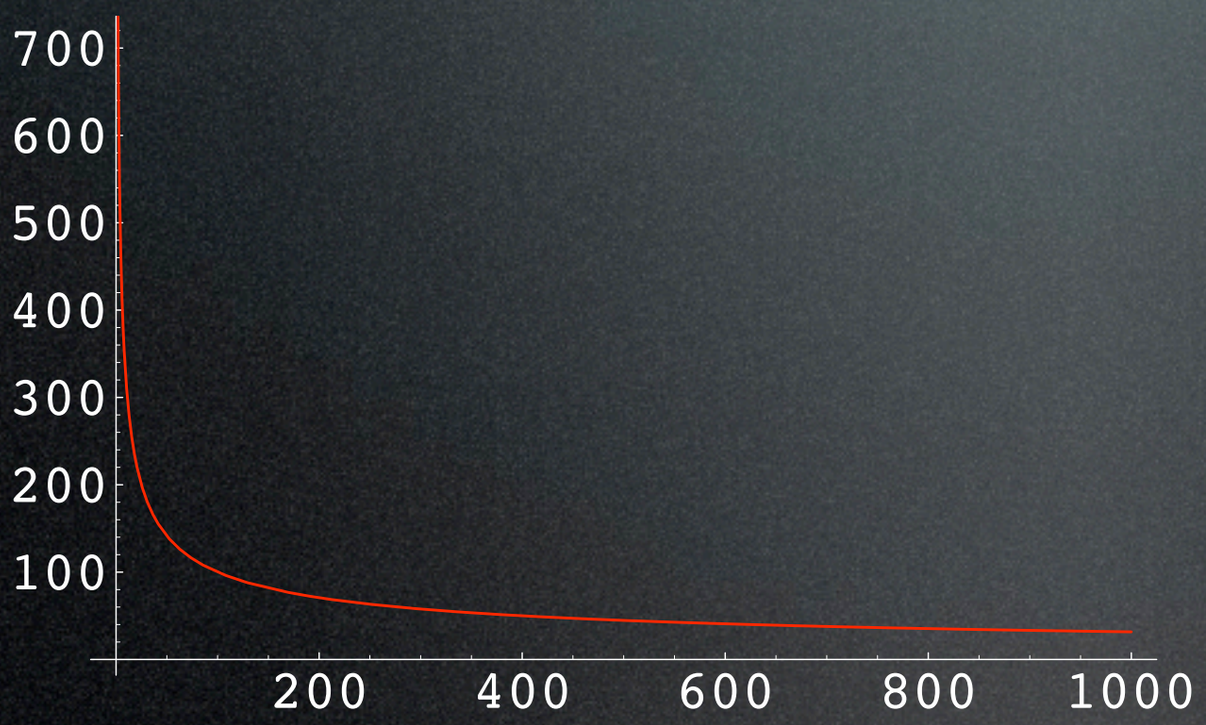
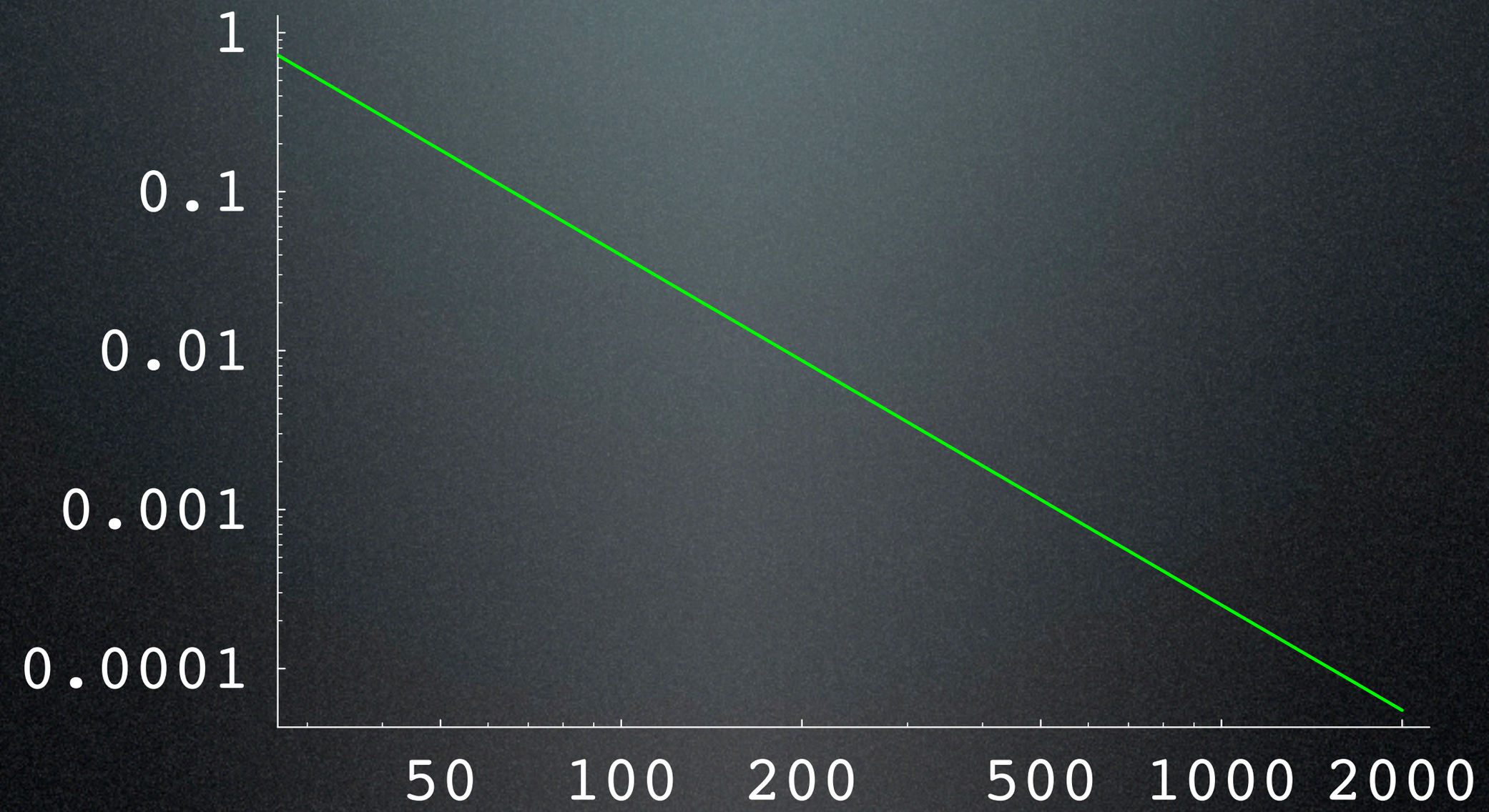
Power-law Distributions



Peter Denning

{k=2.2}



Growing Scale-Free

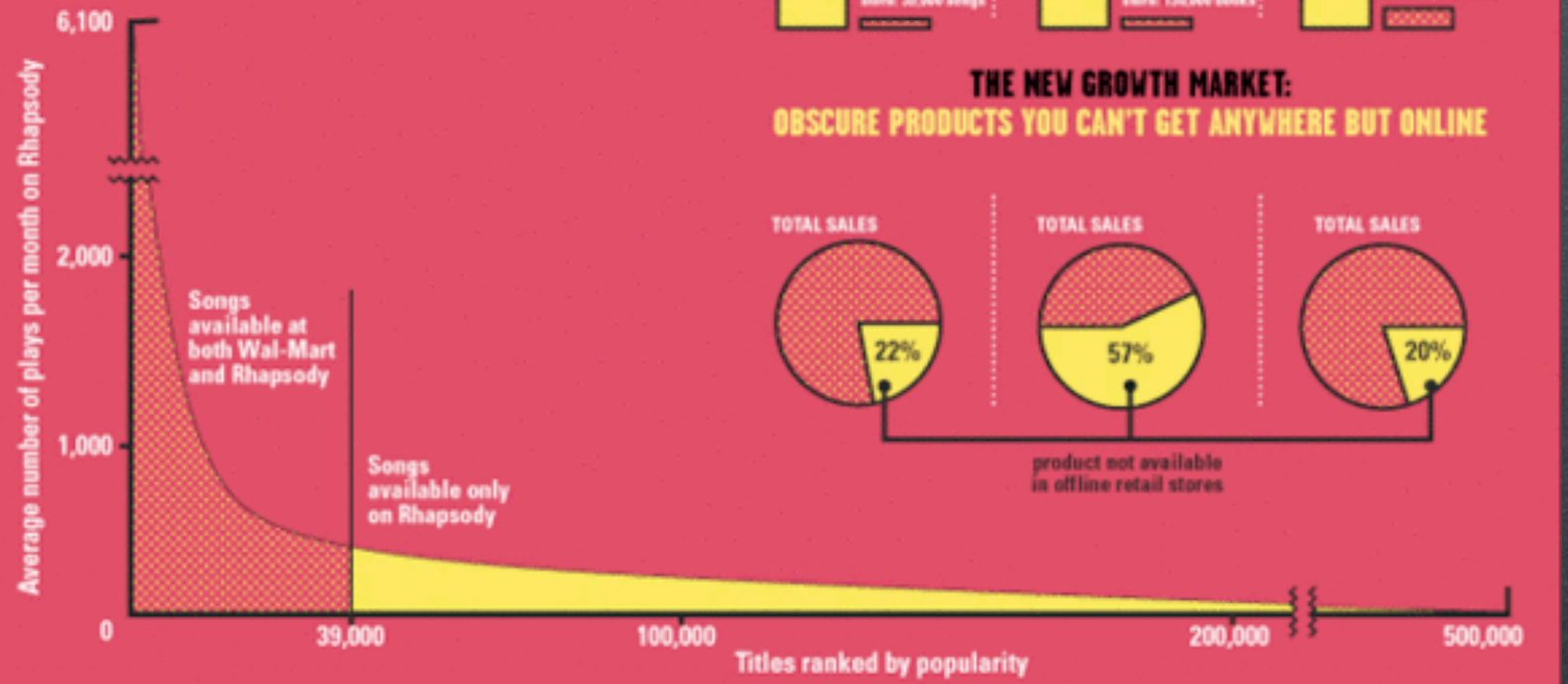
Two conditions:

- Growth: New nodes appear at random times
- Preferential connection: probability a new node will connect with an existing node is proportional to the connectivity of that node

The Longtail

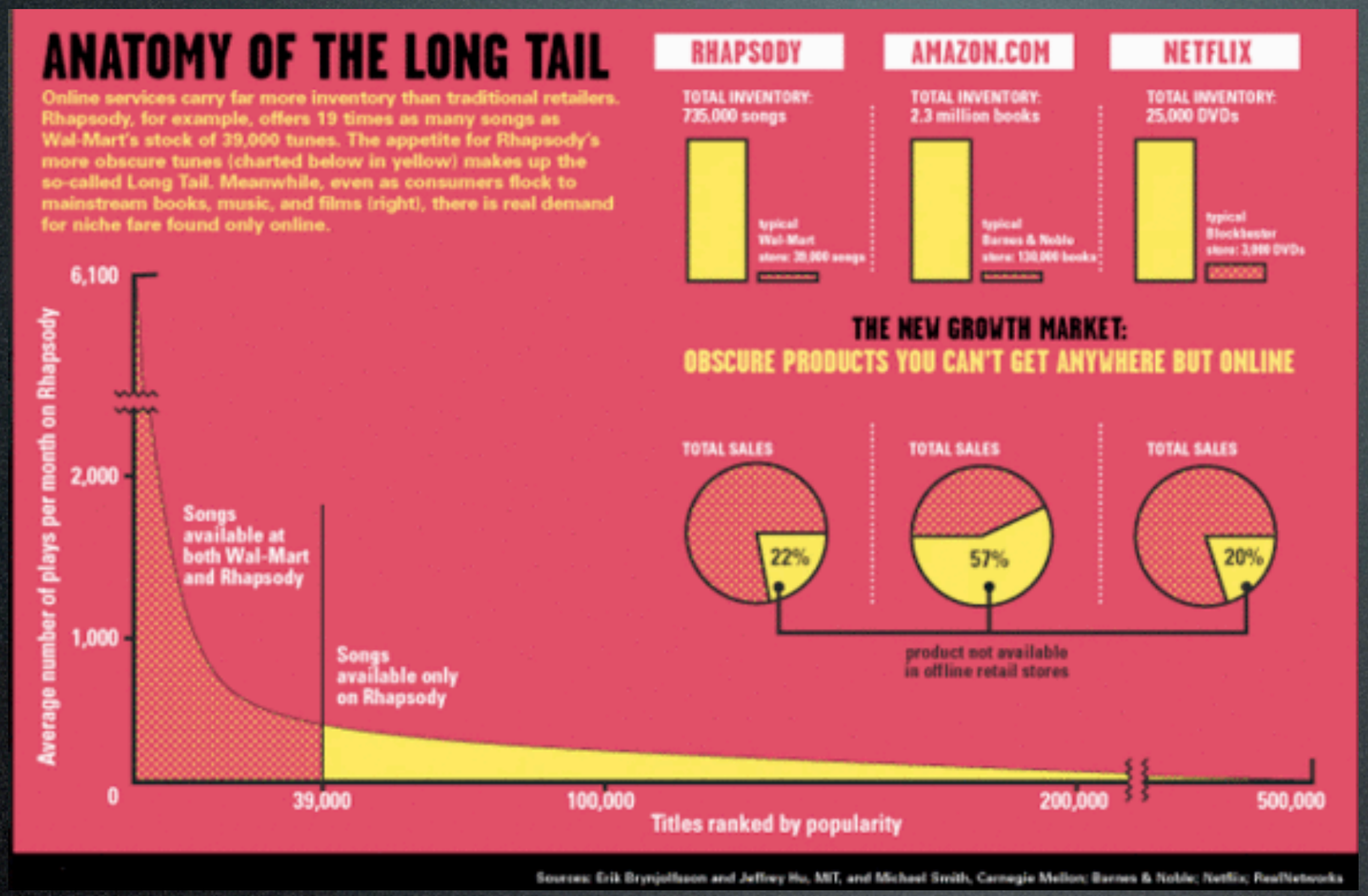
ANATOMY OF THE LONG TAIL

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.



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

Sources: Erik Brynjolfsson and Jeffrey Hu, MIT, and Michael Smith, Carnegie Mellon; Barnes & Noble; Netflix; RealNetworks



Virtually Free Distribution
+ Infinite Shelf Space
=
New Business Models based on
Customer Streams

Not Just Media

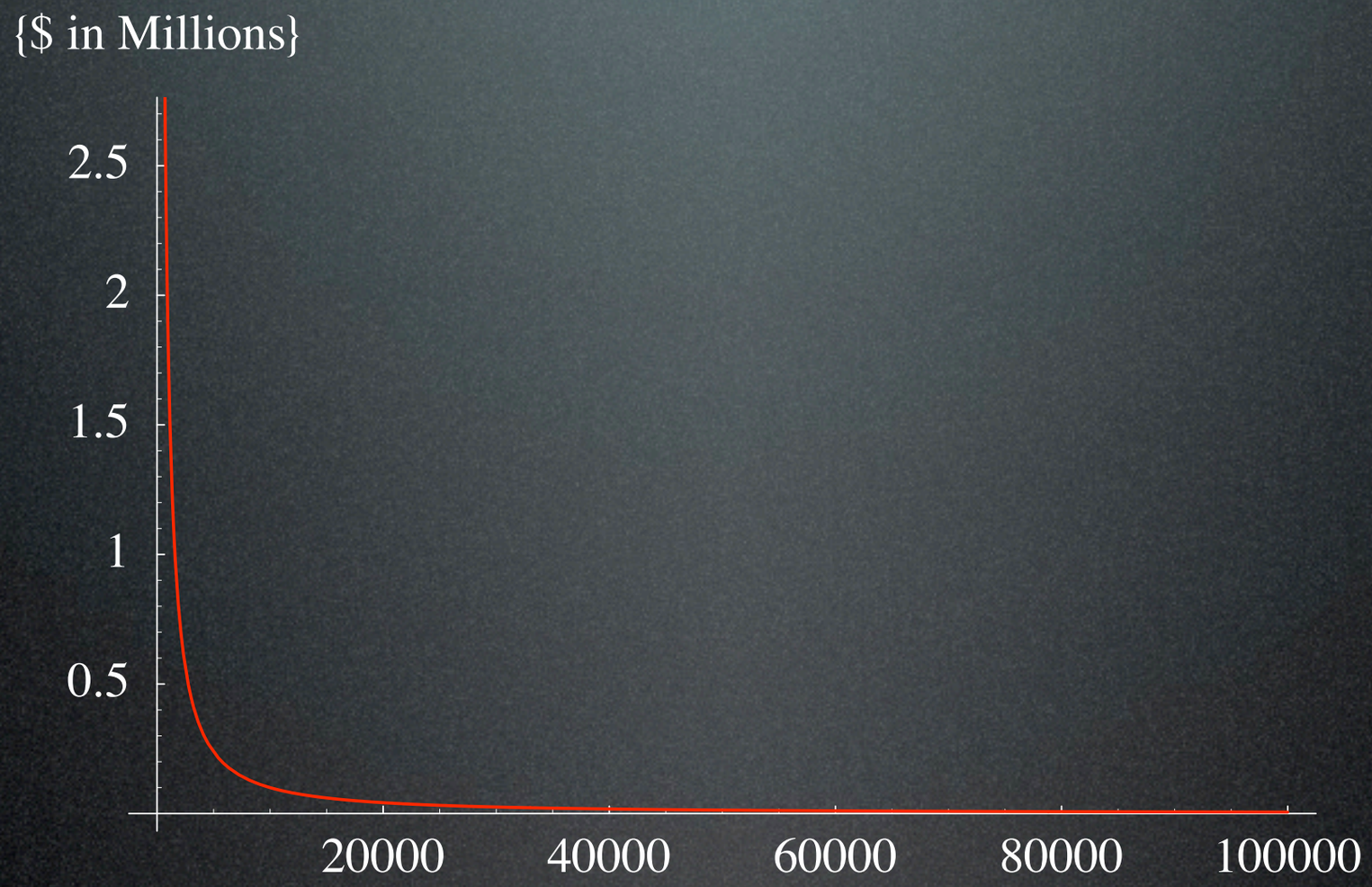
- Google: advertising
- eBay: hard goods
- CapitalOne: customers
- Offshoring: services

Source: Chris Anderson

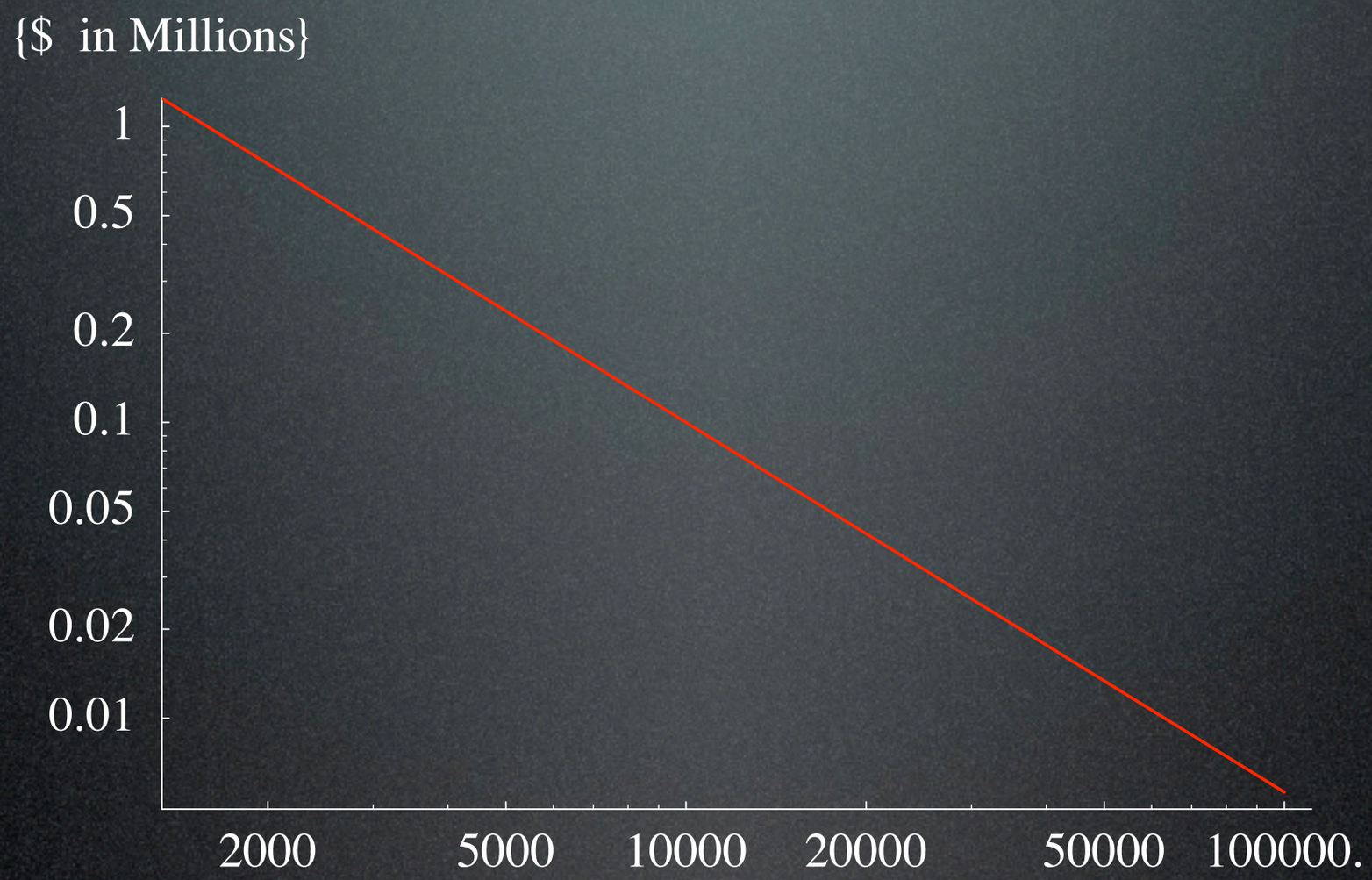
FOSS is all about the longtail

Database Licensing

Database Licensing

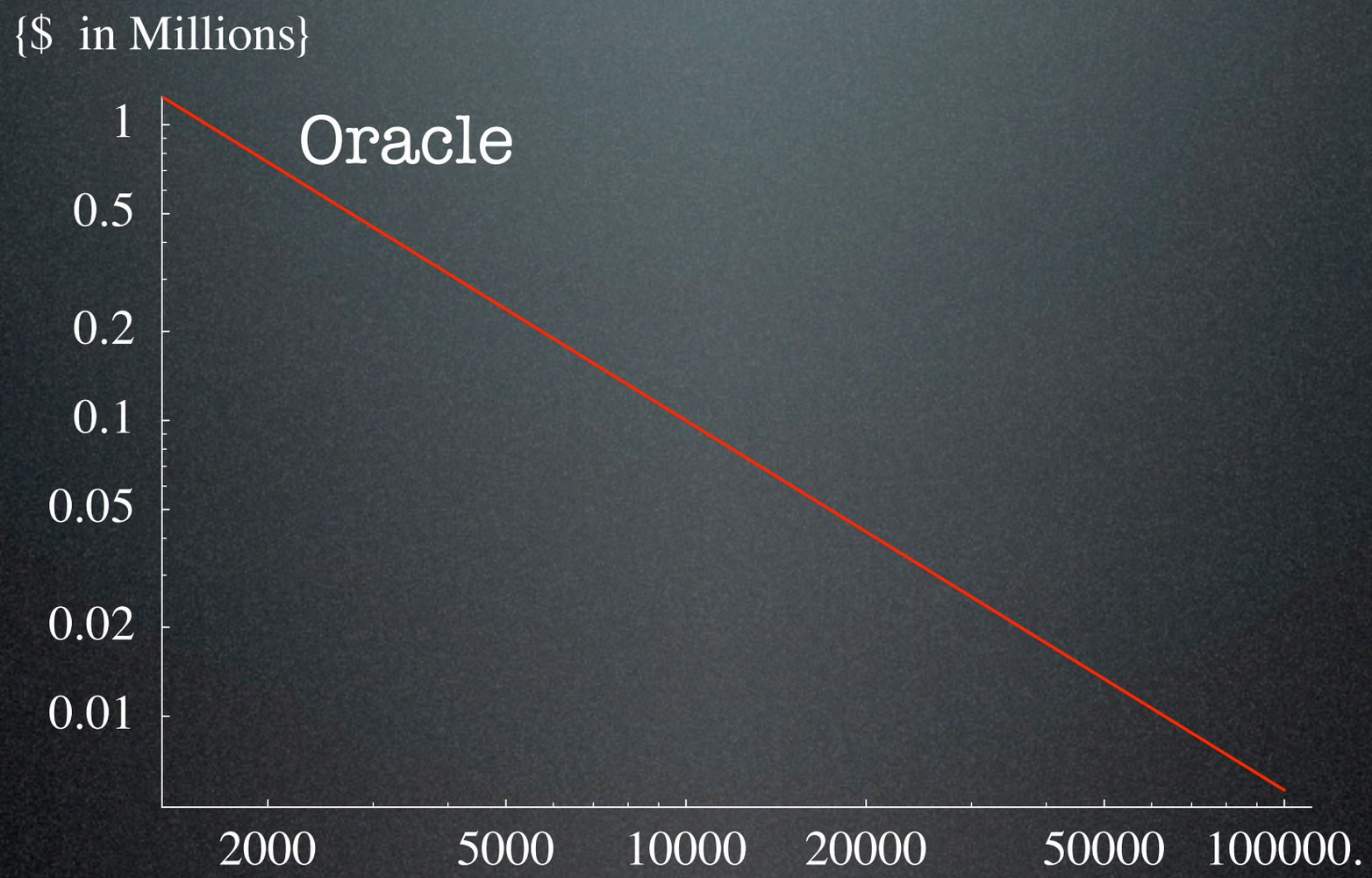


Database Licensing



An Alternate View

Database Licensing



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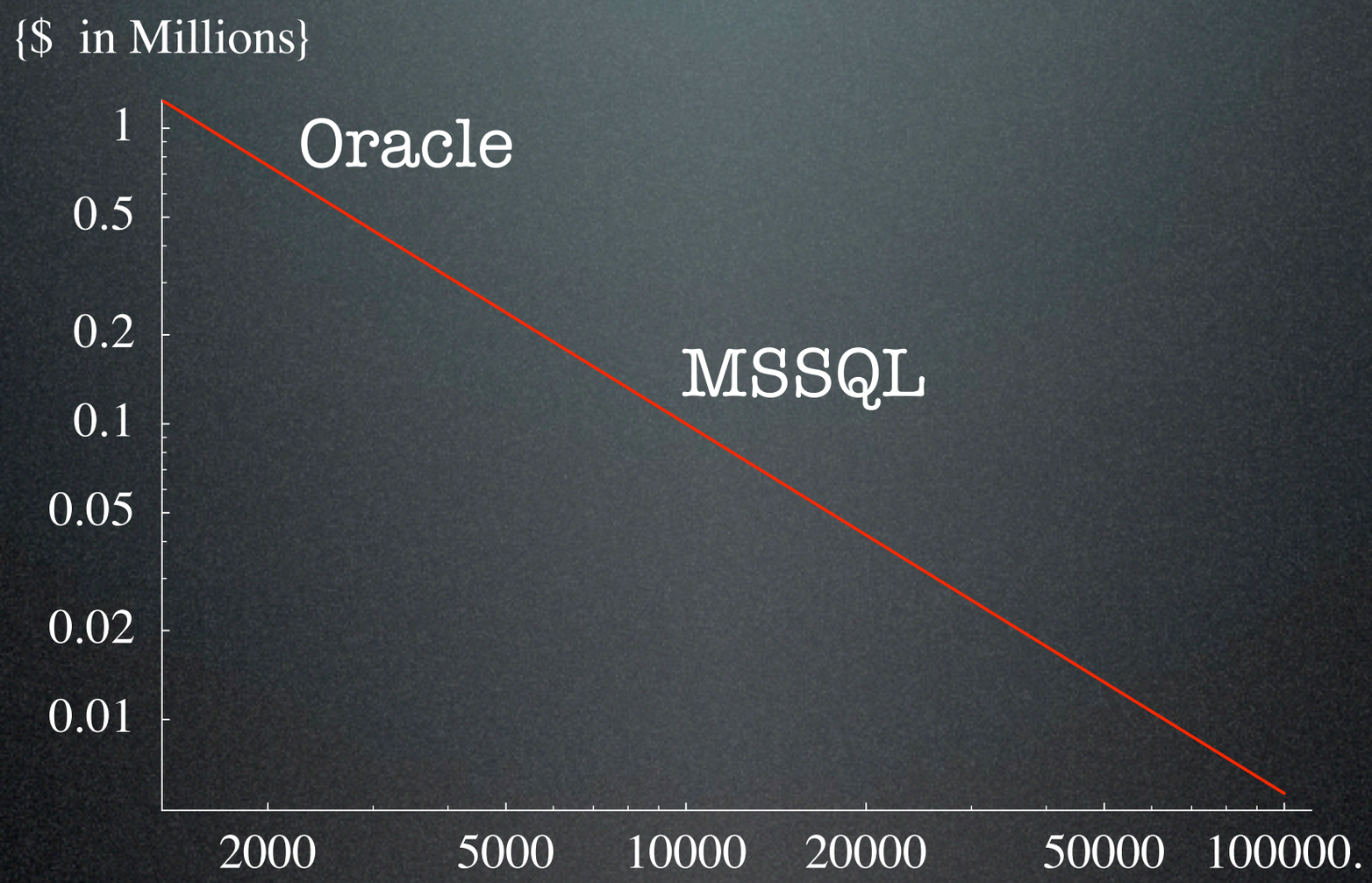

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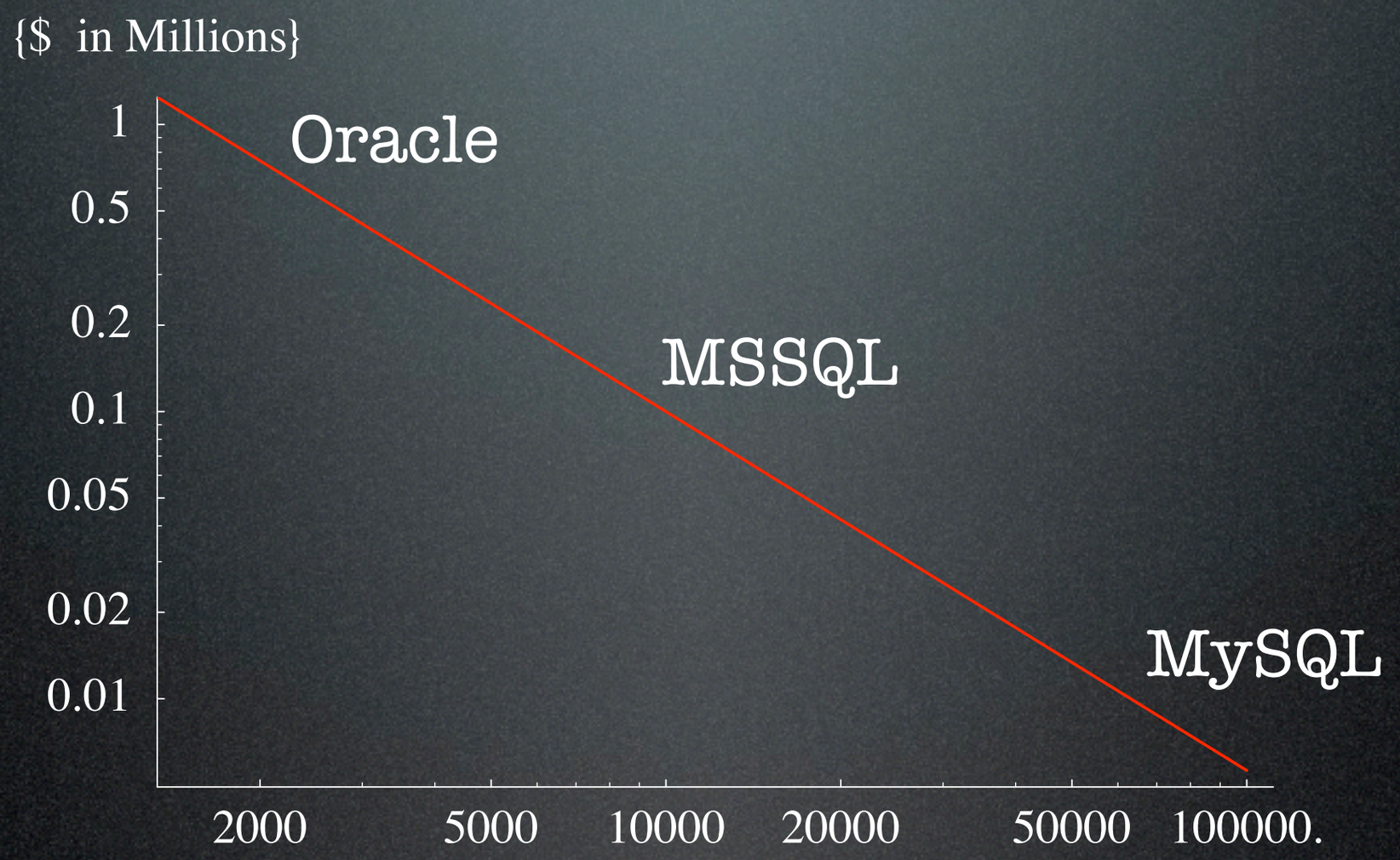

An Alternate View

Exploiting the Longtail

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1. Hire 1000 Consultants

Exploiting the Longtail

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2. Build tools and sell them to 1000 consultants

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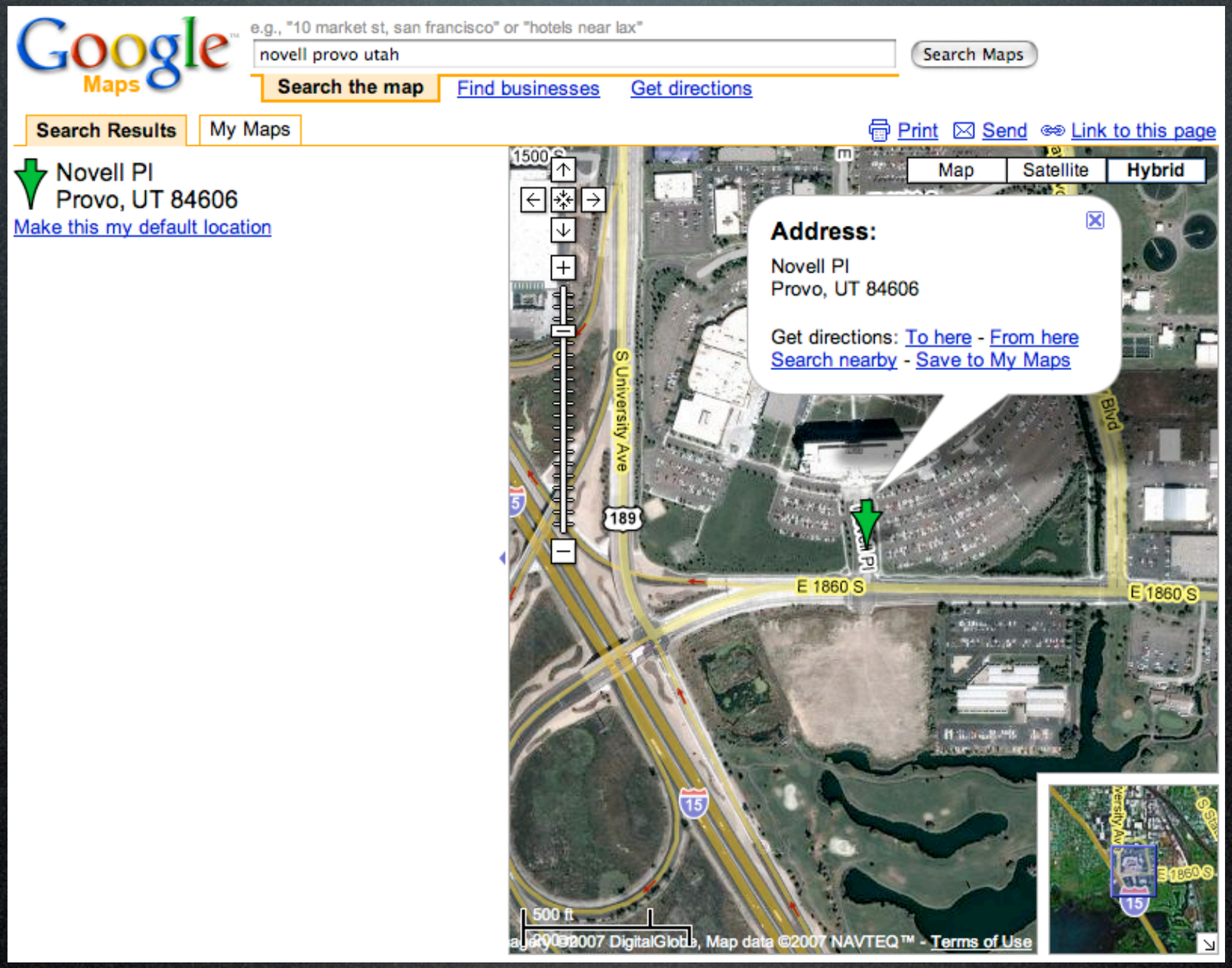
2. Build tools and sell them to 1000 consultants
3. Create a self-service system or build mashups

Exploiting the Longtail

	Email	Web Design
Consultants	Lotus, Groupwise	US Web
Build Tools	Eudora, Microsoft	LAMP
Mashups & Self-service	Hotmail, GMail	Wikis, Blogs

Google Maps



Programming Meets the Longtail

Group Forming Networks

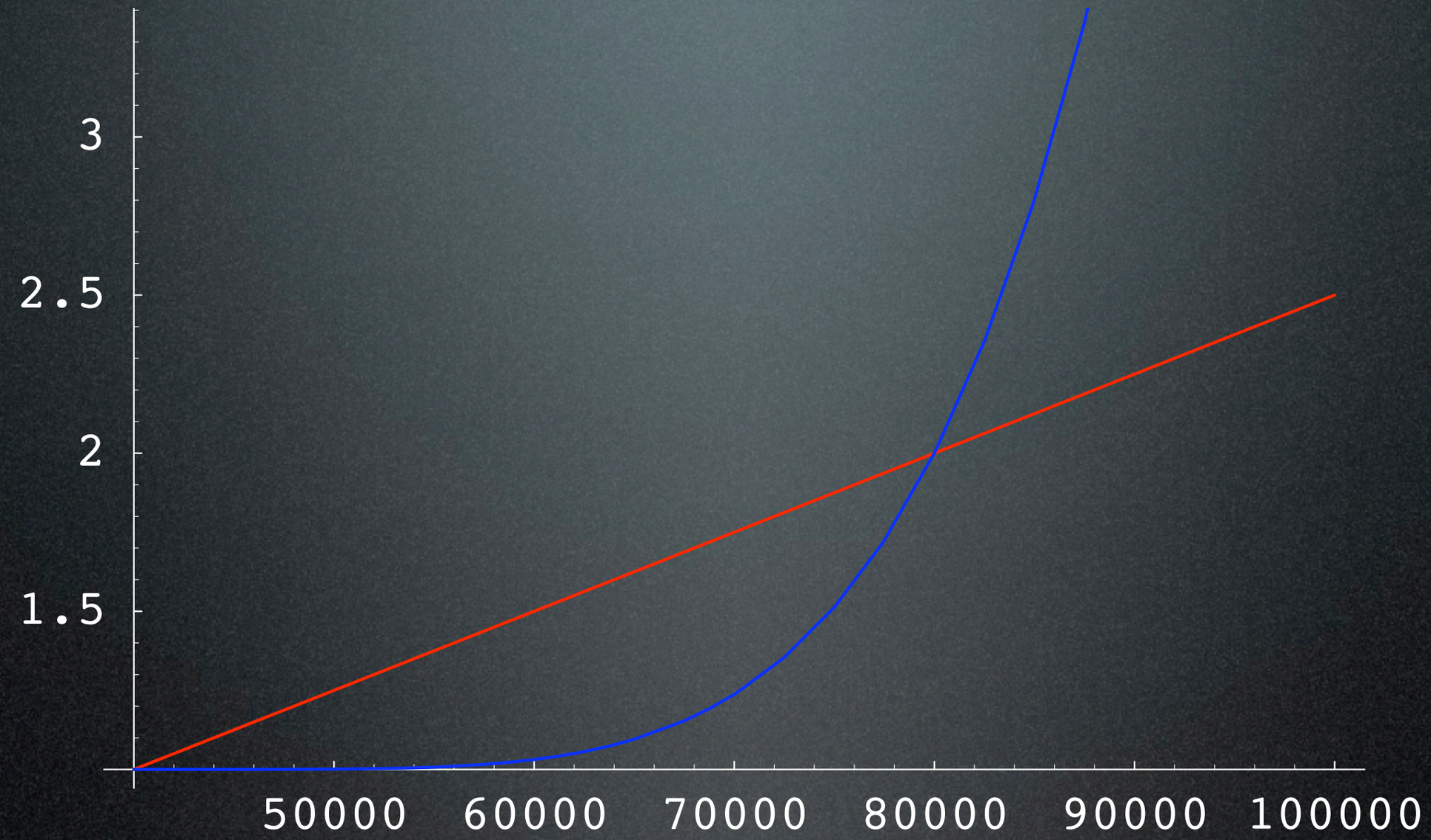
(social networking)

Network Value Is All About Connections!

- Broadcast - Sarnoff's law
  - Value proportional to N*
- Communications - Metcalfe's law
  - Value proportional to N^2
- Group Forming Network - Reed's law
  - Value proportional to 2^N

* N is the number of nodes in the network

Other Power Law Effects



Your best programmer is 40 times as effective as your worst

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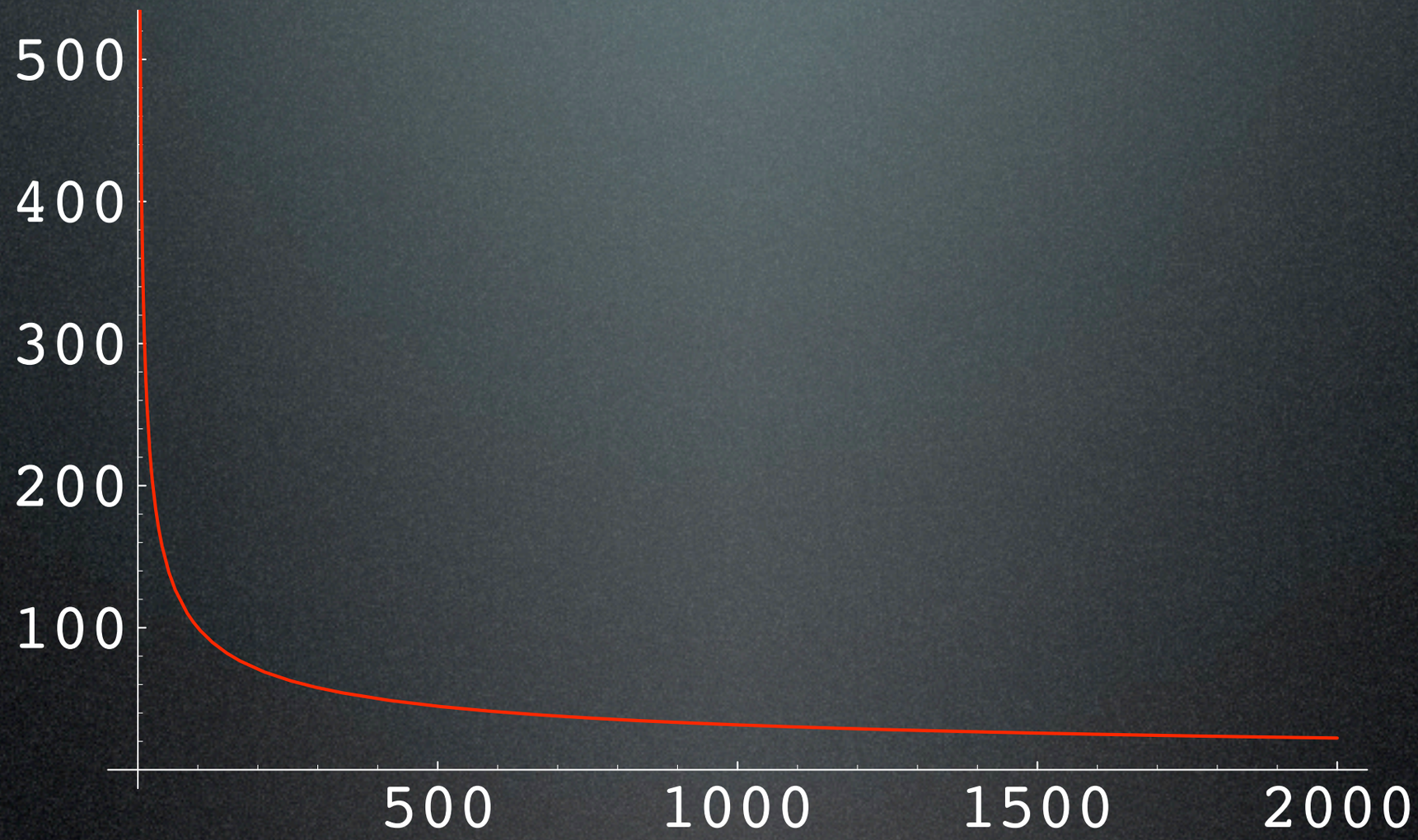
An Alternate View

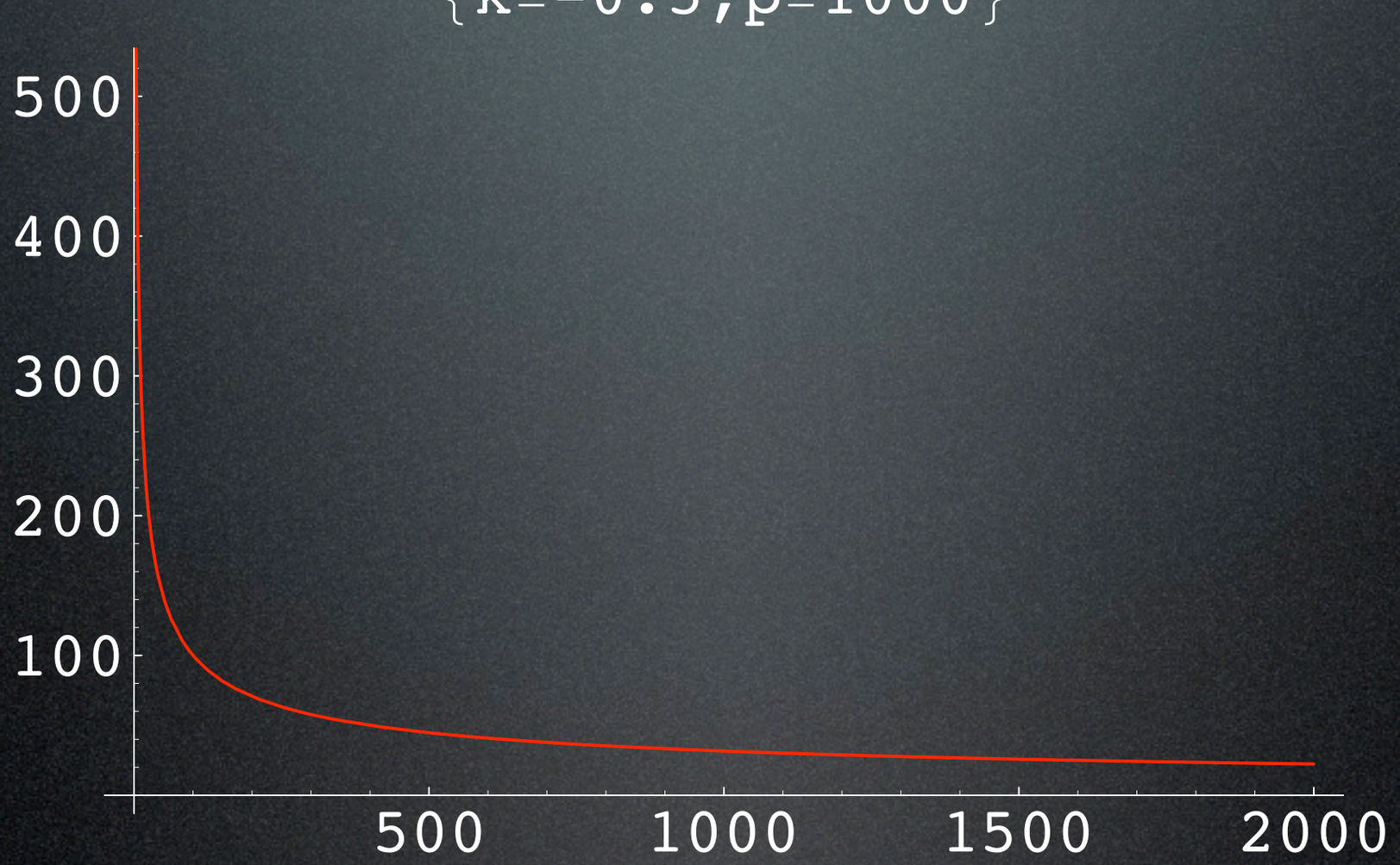
{k=-0.5,p=1000}



Your best programmer is 40 times as effective as your worst

Programming Projects

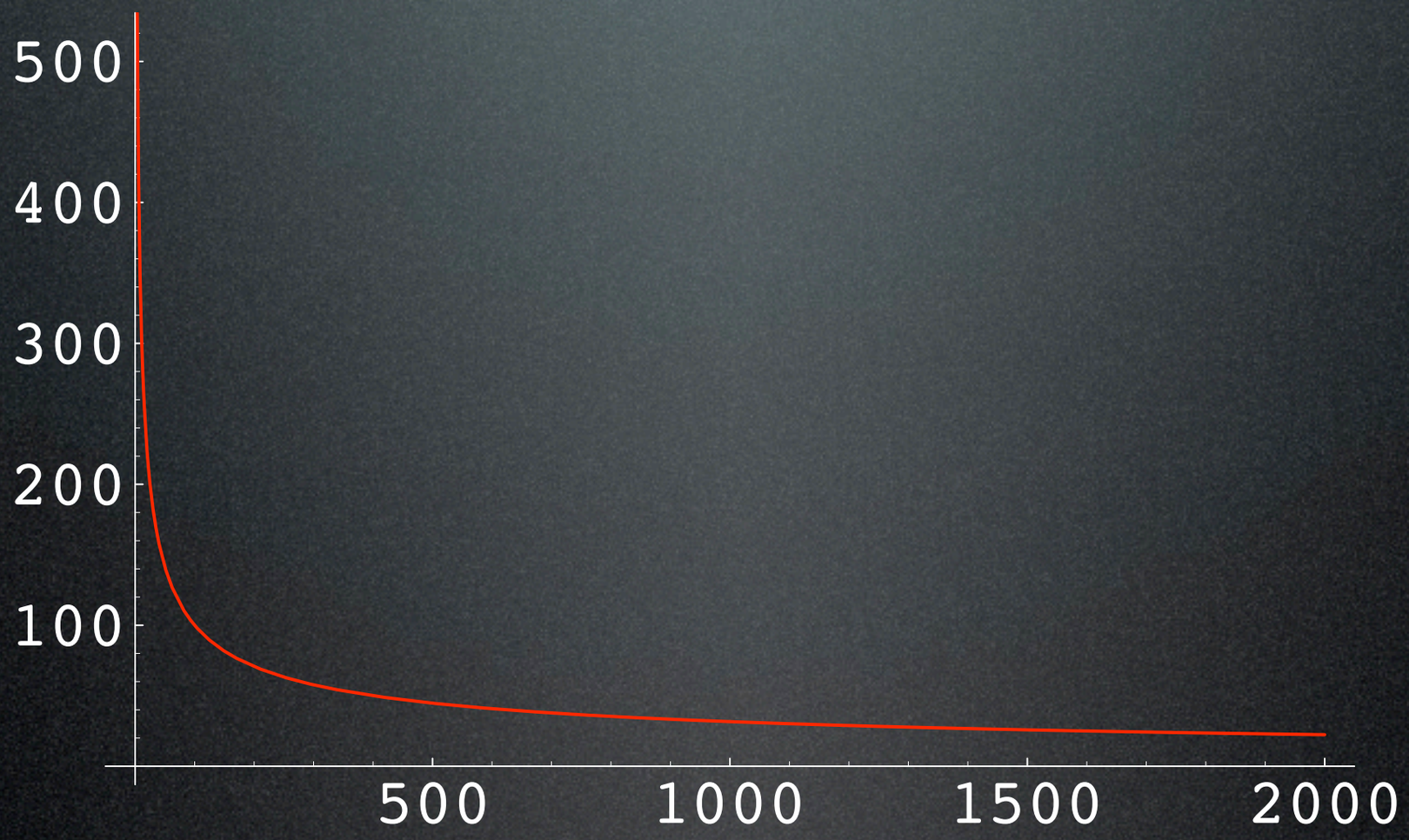
Programming Projects



Utah High Tech Employees

2500 High Tech Firms in Utah

Utah High Tech Employees



2500 High Tech Firms in Utah

Big Programming

Sun microsystems

SUN CERTIFICATION

Mihal Badjonski

HAS FULFILLED ALL REQUIREMENTS AS A

SUN CERTIFIED PROGRAMMER

FOR THE JAVA™ 2 PLATFORM

On May 17, 2001

Scott McNealy, President, Chairman, and CEO of Sun Microsystems, Inc.

Bill Richardson

Bill Richardson, Vice President and General Manager of Sun Educational Services

JAVA™

TE322-1

Big Programming

Java is a language for accreting
programs as a series of patches

-Paul Graham

Think of your favorite language...

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Is your language better than machine language?

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Is it better than Cobol?

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Why?

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Why?

Abstractions yield power!

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Follow this argument to its logical conclusion...

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Is it better than Cobol?

Why?

Abstractions yield power!

Follow this argument to its logical conclusion...

One language must be more powerful than the rest.

Lisp

Lisp

(or Ruby, Python, Perl)

You don’t have to believe me...

You don’t have to believe me...

In fact, I hope you don’t.

Some advice...

Don’t be afraid to work for small companies

Never confuse your job

with your career

Exploit

longtail

opportunities

Build a
self-service,
hosted
product

Two pizza teams

Manage

programming debt

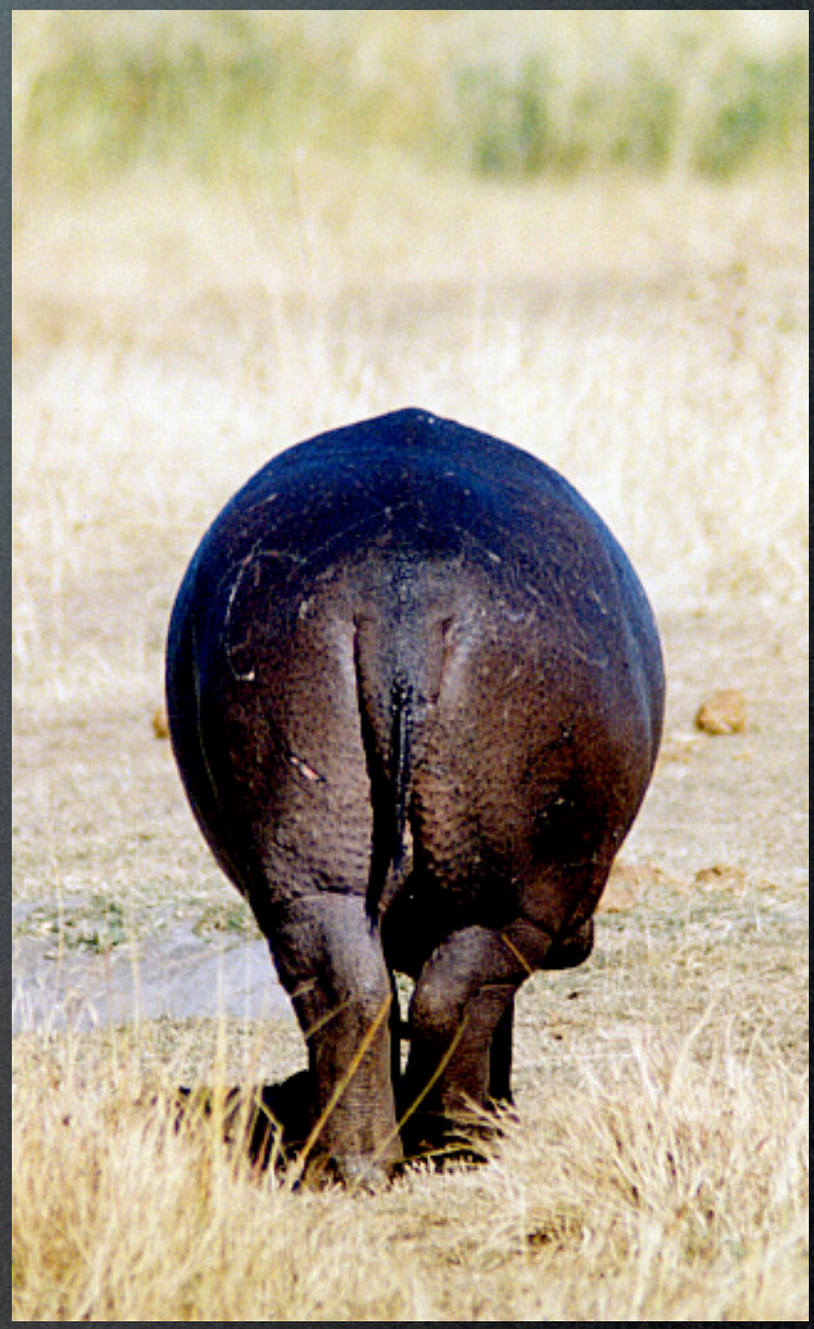
Release early and often

Don’t give up your advantages easily

Choose the most powerful language you can

The End

Questions?



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