

Open Source and Spirit of Software Development

—Future Software Development
Trends in Global Market—

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Outline

- Introduction
- Growing IT market
- Definition of open source
- History of open source
- Examples
- Economics of open source
- Conclusion

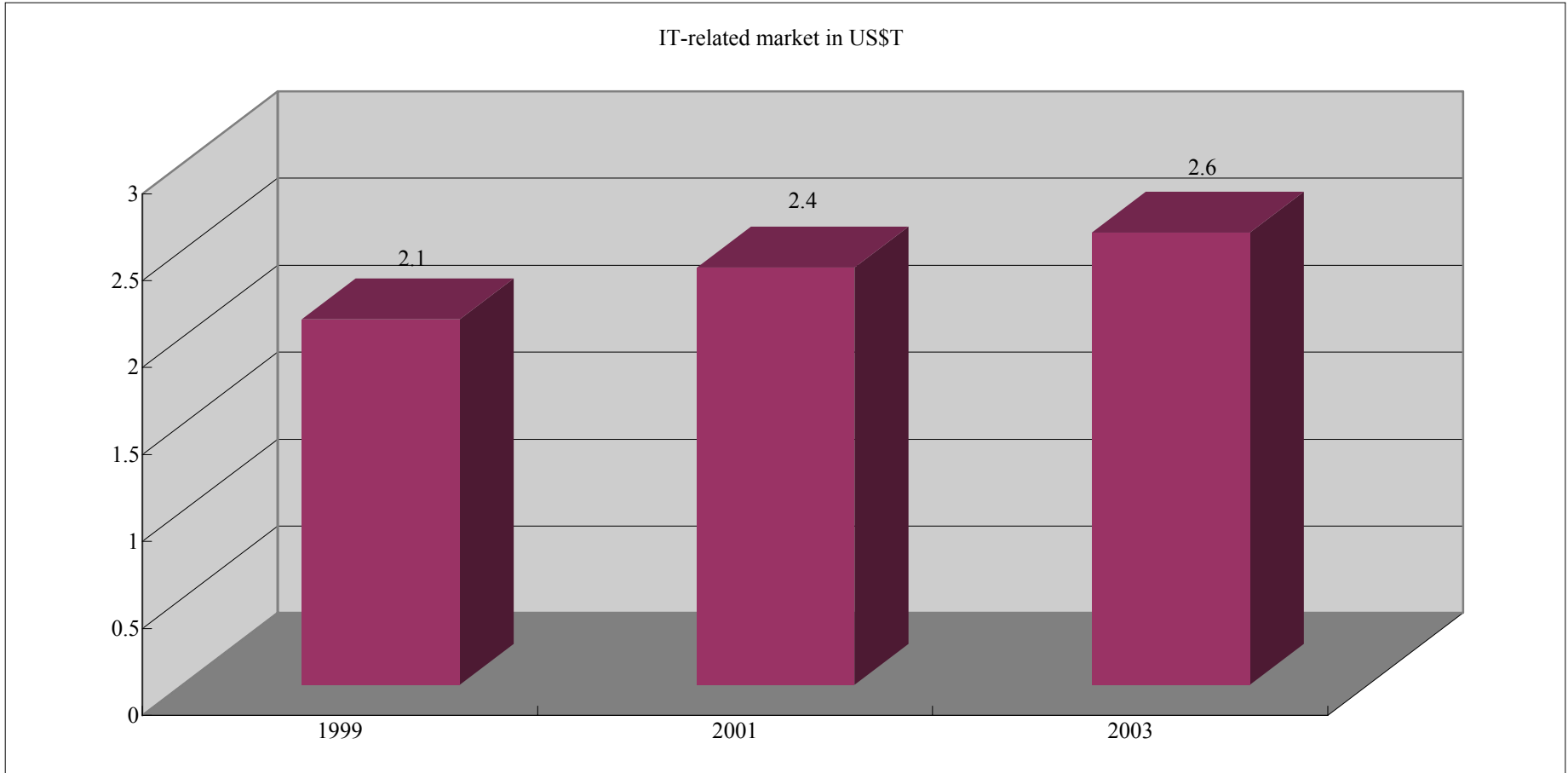
Communication Technologies

- Established in 1986
- HQ in Sendai, sales office in Tokyo
- 40 people
- Chair: Professor Shoichi Noguchi
 - Former president of Information Processing Society of Japan
 - Former president of University of Aizu
- Dual business
 - Advanced R&D on future software
 - Mission-critical systems integration using Unix and RDB

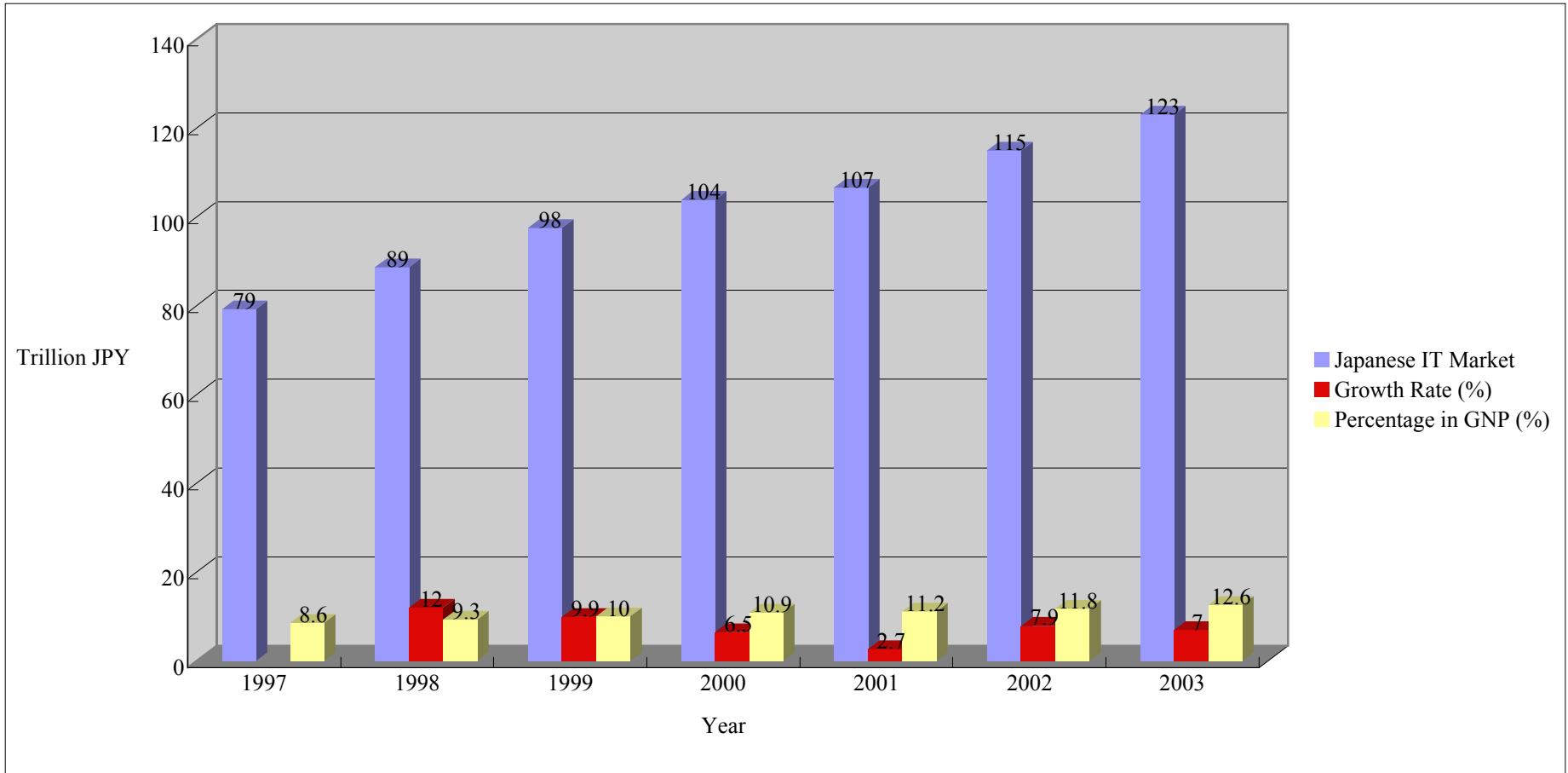
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



World IT market is growing



So is in Japan



IT is the way to go

- Requires no heavy manufacturing facility or rich natural resources
 - Brain is all you need
- IT is universal language
 - Global opportunities
 - International collaboration is essential
- From academic researches to business opportunities

Imagine, if there were no...

- Microsoft Windows
- Word, Excel, Powerpoint
- Internet Explorer, Outlook
- Microsoft IIS
- Oracle, Informix, DB2

I DON'T CARE!

Because we have

- *BSD, Linux
- OpenOffice.org
- Mozilla, Firefox, Thunderbird
- Apache, Tomcat
- PostgreSQL, MySQL

Imagine, if there were no...

- Emacs
- GCC
- GDB
- CVS
- Perl
- X11
- Just to name a few

- Then we are in deep trouble

OK, why do I use Powerpoint and Mac OS?

- Document incompatibility
- Hardware incompatibility
- For non-professional users
 - Installation
 - Documentation
 - User interface
- We have a lot of things to do in open source development

Literature

- [1] Steven Levi, *Hackers: Heroes of the Computer Revolution*. Doubleday & Co., 1984. ISBN: 0385191952
- [2] Neil Randall, *The Soul of the Internet: Net Gods, Netizens and the Wiring of the World*. Thomson Learning, 1997. ISBN: 1850321914
- [3] Chris DiBona, Sam Ockman and Mark Stone, eds., *Open Sources: Voices from the Open Source Revolution*. O'Reilly & Associates, 1999. ISBN: 1-56592-582-3

What is open source?

- The Open Source Definition
 - <http://www.opensource.org/docs/definition.php>
- Source code
- Free redistribution
- Allow modifications and derived works
- Integrity
- No discrimination

Hacker ethics [1]

a precursor to free software movement (1950-60s, MIT)

- Hands on imperative
- Information wants to be free
- Mistrust authority
- No bogus criteria
- You can create truth and beauty on a computer
- Computers can change your life for the better

First open source software

- SPACEWAR (PDP-1, 1962)
- Developed at MIT using prototype PDP-1
- Used by DEC for diagnosis
- 50 PDP-1s produced

CTSS and ITS at MIT

- Compatible Time Sharing System (IBM 7094, 1963)
 - Secure and rigid operating system
- Incompatible Timesharing System (PDP-6/10, 1968)
 - Insecure and loose
 - Share code
 - Original TECO, Macsyma, Info, DDT....

Personal computer and sharing of programs (1975)

- Altair 8800 and IMSAI 8080
 - Apple I (1976),][(1977)
- Homebrew Computer Club (Menlo Park, CA)
- Leak of Altair BASIC at HCC (Paul Allen and William Gates)
 - Priced at \$150
- Tradition of hippie movement
- End of Vietnam War

'Theft' of BASIC

- MS BASIC debugged and became standard
- Alternative Tiny BASIC (\$5)
- Dr. Dobb's Journal of Computer Calisthenics and Orthodontia Running Light Without Overbyte (DDJ)
 - If software is free, it should never be 'stolen'

Dark ages

- Explosion of personal computers
- But they are not connected
- Retail software
- Copy protection and protection crack
- Piracy of IBM-PC BIOS

Free software and open source

- Free Software Foundation (1985)
 - GNU software
 - Anti-commercialism (at that time)
- Debian Social Contract (1997)
 - GNU software on Linux kernel
 - Coexistence with commercial software

GPL and LGPL

- GNU General Public License (version 1, 1989; version 2, 1991)
- GNU Lesser General Public License (Library GPL, 1991; Lesser GPL 2.1, 1999)
 - Complete product does not need to be constrained under GPL/LGPL

Why FSF and GPL?

- Two spin-offs from MIT AI Lab
 - Symbolics
 - LMI
- RMS helped LMI to re(verse) engineer all Symbolics code (1982-83)

Do not mix

- Motif (window manager for X11) -> Lesstif
- Qt (KDE library) -> GNOME
 - Qt later became open (1998)

Two meanings of 'Free'

- (1) Freedom (and guarantee) of use, modification and redistribution in an indiscriminate manner
 - Copyleft
- (2) Free of charge
- Free software is always (1), not necessarily (2)

Open source and patent

- LZW (Lempel, Ziv and Welch) data compression algorithm patent (1983)
 - GIF patent by Unisys
- MP3 compression (1998)

Brief history of Unix (1/2)

- 1965 MULTICS (Multiplexed Information and Computing System) project
- 1967 First Unix on PDP-7 at AT&T
- 1973 Unix on PDP-11 in C language
- 1974 Source code of Unix Version 5 released, UCB started BSD
- 1977 1BSD (AT&T V6 + Pascal + ex by Bill Joy)
- 1978 2BSD (vi + termcap)
- 1979 3BSD (AT&T V7, VAX, VM)

Brief history of Unix (2/2)

- 1982 4.1aBSD (TCP/IP, r-commands)
Bill Joy joined Sun Microsystems
- 1991 First Linux kernel booted
- 1992 386/BSD (no AT&T source license required, BSD license only)
- 'Free' *BSD (NetBSD, FreeBSD, OpenBSD, Darwin)

You can change the world

- With open source software
- Internet (which itself is based on open source programs) as a media of open source

“Good products do not make sales”

- You don't need to sell
- Ultimate discount at no cost
- Only functionality and quality are important

Open source, open standard and open document

- IETF RFC
- Open document and reference implementation
- Web (W3C), Grid (GGF), Agent (FIPA)...

Example: ISO-OSI vs. TCP/IP

- Source code is the best documentation
- Specification vs. implementation
- Top-down vs. bottom-up
- TCP/IP in BSD
- Open & free (BSD-like) OSI stack failed (1985, EC Research in Open Systems Europe Project)
- OSI: a great negative teacher

Example: encryption

- DVD encryption
 - “it should be secure because nobody knows how it works”
- US Advanced Encryption Standard
 - “it should be secure because everybody knows how it works”

Example: e-mail

- “E-mail simply worked without studying RFC822.” David Crocker, author of “STANDARD FOR THE FORMAT OF ARPA INTERNET TEXT MESSAGES”
[2]

Gopher vs. WWW

- “When U. Michigan decided to collect fees for licensing gopher server, everyone stopped using it. They came to me and I managed to persuade CERN to declare that it would not collect any fees for WWW.” Tim Berners-Lee [2]

Comtec Agent Platform

- World's first implementation of FIPA
- World's first open source implementation of FIPA
- JADE, FIPA-OS and ZEUS followed as open source platforms

SAGE

- Scalable fault-tolerant Agent Grooming Environment
- Second-generation FIPA platform developed at NIIT
 - Scalability
 - Fault tolerance
 - Performance

Heterogeneity

- Heterogeneity is strength, not weakness
- Freedom of choice
- Homogeneous environment is vulnerable

Specification vs. implementation

- Mosaic vs Netscape
- Netscape implemented non-standard HTML tags
- Netscape proposal became standard later
- Everybody preferred Netscape over Mosaic

Netscape became open (February 1998)

- The Cathedral and the Bazaar by Eric S. Raymond (1997)
 - <http://www.catb.org/~esr/writings/cathedral-bazaar/>
- Homesteading the Noosphere by ERS (1998)
 - <http://www.catb.org/~esr/writings/homesteading/>
- The Magic Cauldron by ERS (1999)
 - <http://www.catb.org/~esr/writings/magic-cauldron/>
- Halloween documents by Microsoft (1998)
 - <http://opensource.org/halloween/>

Economics of open source

- Software requires completely new economical model
 - Non-materialistic □ digital information independent of physical entity
 - Free copy without deterioration
- “Gift culture” (ERS) (vs. exchange culture)
 - People are evaluated and respected in terms of ‘what you give to the community’
- Joy of hacking and joy of gaining reputation

Thomas Jefferson (3rd US President)

- The moment it [idea] is divulged, it forces itself into the possession of every one, and the receiver cannot dispossess himself of it. Its peculiar character, too, is that no one possesses the less, because every other possesses the whole of it. He who receives an idea from me, receives instruction himself without lessening mine; . . . That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature....
- Thomas Jefferson to Isaac McPherson, 13 Aug. 1813

Open source and power of community

- Personal requirement and community support
- Spiral lifecycle (always beta)
- Productivity improves proportional to log (number_of_developers) with cathedral (traditional software development) model
 - Brooks' law: "Adding manpower to a late software project makes it later" -- a result of the fact that the expected advantage from splitting work among N programmers is $O(N)$ (that is, proportional to N), but the complexity and communications cost associated with coordinating and then merging their work is $O(N^2)$ (that is, proportional to the square of N). The quote is from Fred Brooks, a manager of IBM's OS/360 project
- In bazaar everybody can contribute
- Finding and reproducing bugs is as (maybe more) important as (than) fixing them

Sale value and use value

- Sale value is 0
- Use value is the same as closed source
 - Consulting (Richard Stallman)
 - Systems integration (IBM)
 - Packaging distribution (redhat)
 - Publishing manuals and books (O'Reilly)
 - Version n is charged, version n-1 is free (sendmail)
 - Free client, charged server (x) (Netscape)
 - Free software, charged hardware (x) (Sun Java, Apple iTunes/iPod)
 - Free software, charged contents (x) (RealNetworks)

Debate between Linus Torvalds and Andrew Tanenbaum

- Netnews comp.os.minix in 1992
- Tanenbaum: monolithic kernel is obsolete (academic research)
- Linus: working unix kernel on my 386 (practical use)

Conclusion

- Open source is not just a style of distribution
- It is a style of life as a programmer
- Spirit of software development