

# The Advantages of PostgreSQL

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POSTGRESQL offers companies many advantages that can help their businesses thrive.

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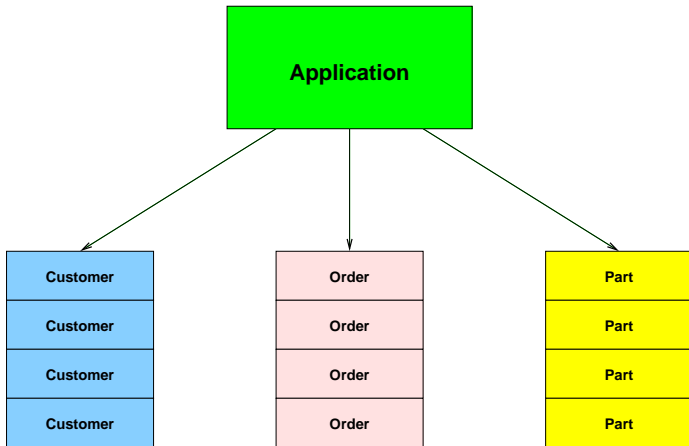
*Last updated: January, 2017*

# Introduction

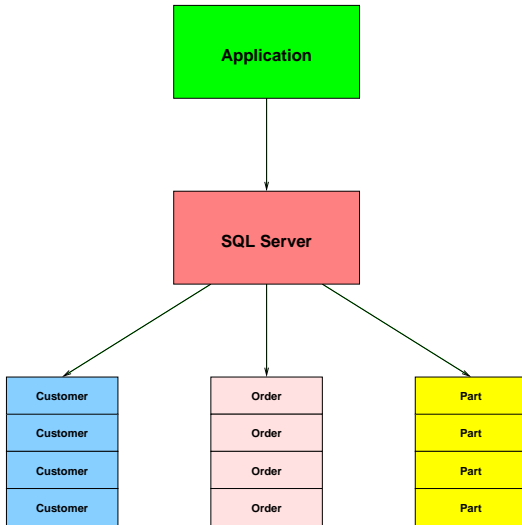
- ▶ Why use databases?
- ▶ Why use open-source?
- ▶ PostgreSQL history
- ▶ PostgreSQL in the real world

Why use databases?

# Non-SQL Database Applications



# SQL Database Applications

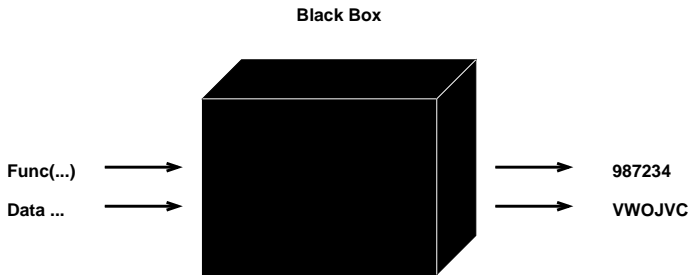


# Database Transaction Protection (ACID)

- ▶ Multiple changes either all take place, or none of them
- ▶ Data always in a consistent state
- ▶ In-process changes invisible to outside users
- ▶ Data reliably stored
  
- ▶ High level of concurrency and reliability

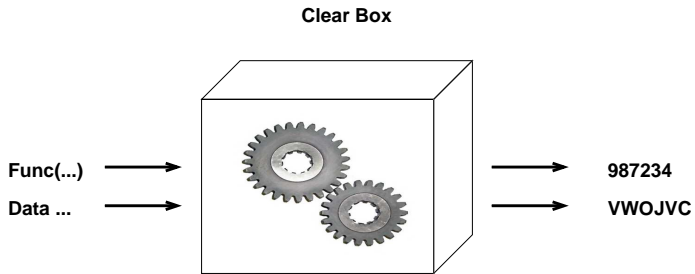
# Why use Open Source Software?

# Closed-Source Software





# Open-Source Software



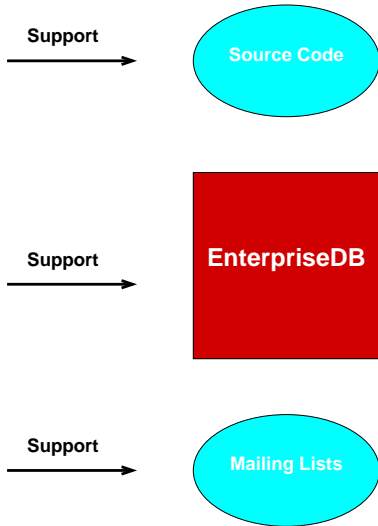
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# Support of Close-Source Software

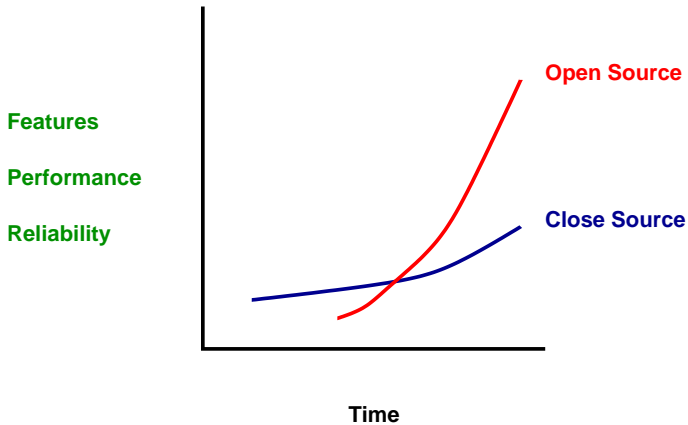
**Support**  
→

Database  
Company

# Support of Open-Source Software



# The Future of Open Source



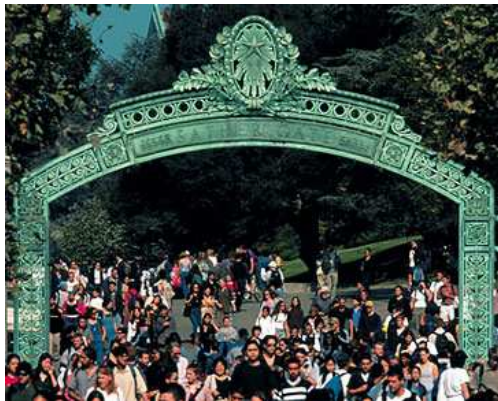
# PostgreSQL License

Use for any purpose, including sale of customized versions with your closed-source modifications. PostgreSQL supports custom:

- ▶ Functions
- ▶ Operators
- ▶ Data Types

# PostgreSQL History

# The University of California at Berkeley





Michael Stonebraker



Jolly Chen and Andrew Yu



# PostgreSQL Code Base History

- ▶ Ingres — research prototype, spawned Relational Technologies, purchased by Computer Associates
- ▶ Postgres — research prototype, spawned Illustra, purchased by Informix
- ▶ Postgres95 — added SQL, spawned PostgreSQL

# PostgreSQL Through the Years

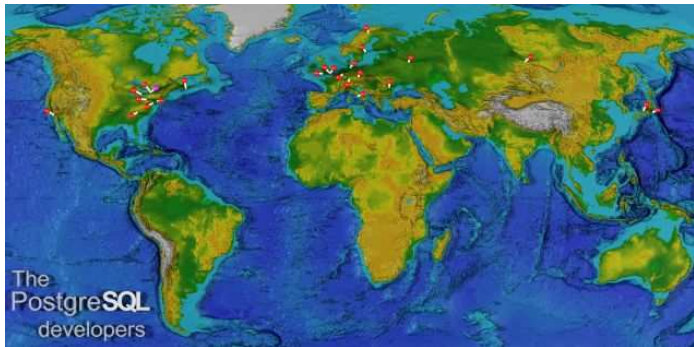
1977-1985 Ingres

1986-1994 Postgres

1994-1995 Postgres95

1996- PostgreSQL

# Developer's Globe



# PostgreSQL Core Team



Top row: Thomas Lockhart, Jan Wieck, Tom Lane, Marc Fournier  
Bottom row: Vadim Mikheev, Bruce Momjian

# Release Dates and Sizes

Date	Release	Lines of code
1994		244,581
1996-08-01	1.02.1	
1996-10-27	1.09	178,976
1997-01-29	6.0	
1997-06-08	6.1	200,709
1997-10-02	6.2	225,848
1998-03-01	6.3	260,809
1998-10-30	6.4	297,918
1999-06-09	6.5	331,278
2000-05-08	7.0	383,270
2001-04-13	7.1	410,500
2002-02-04	7.2	394,274
2002-??-??	7.3	453,282

# PostgreSQL Releases

## **Release 1.02**

Date: 1996-08-01

- ▶ Initial release by PostgreSQL Global Development Team
- ▶ Apply all outstanding email patches.

# PostgreSQL Releases (Continued)

## **Release 1.09**

Date: 1996-11-04

- ▶ Fixes for server and command failures.

# PostgreSQL Releases (Continued)

## **Release 6.0**

Date: 1997-01-29

- ▶ Unique indexes
- ▶ GIST added
- ▶ Improved authentication
- ▶ IN/BETWEEN added



# PostgreSQL Releases (Continued)

## Release 6.1

Date: 1997-06-08

- ▶ New data types: DATETIME, TIMESPAN, CIRCLE
- ▶ GEQO
- ▶ Improved optimizer statistics
- ▶ Libpq++ overhauled
- ▶ Multi-column btree indexes
- ▶ new SET/SHOW/RESET commands
- ▶ New SEQUENCE feature

# PostgreSQL Releases (Continued)

## Release 6.2

Date: 1997-10-02

- ▶ New Java JDBC driver
- ▶ Triggers added
- ▶ Server Programming Interface (SPI) added
- ▶ NOT NULL constraint
- ▶ DEFAULT and CONSTRAINT added
- ▶ ANSI functions added for DATE/TIME and PRECISION

# PostgreSQL Releases (Continued)

## Release 6.3

Date: 1998-03-01

- ▶ Subselects
- ▶ Unix domain socket support for performance
- ▶ Improved user password configuration
- ▶ Much improved documentation
- ▶ Separate permissions for VIEWS
- ▶ PRIMARY KEY support
- ▶ PL/TCL procedural language added
- ▶ UNION added
- ▶ Python added
- ▶ ECPG added
- ▶ New ODBC driver
- ▶ Pgaccess added

# PostgreSQL Releases (Continued)

## Release 6.4

Date: 1998-10-30

- ▶ Improved RULES and VIEWS
- ▶ PL/PgSQL added
- ▶ Multi-byte character support
- ▶ Internet address data types
- ▶ HAVING added

# PostgreSQL Releases (Continued)

## Release 6.5

Date: 1999-06-09

- ▶ MVCC
- ▶ Live backups
- ▶ NUMERIC data type
- ▶ Temporary tables
- ▶ CASE
- ▶ INTERSECT
- ▶ EXCEPT
- ▶ LIMIT/OFFSET
- ▶ SELECT...FOR UPDATE
- ▶ Optimizer overhaul

# PostgreSQL Releases (Continued)

## Release 7.0

Date: 2000-05-08

- ▶ Foreign keys
- ▶ More optimizer improvements
- ▶ ANSI JOIN syntax
- ▶ PL/Perl
- ▶ Oracle compatibility functions

# PostgreSQL Releases (Continued)

## Release 7.1

Date: 2001-04-13

- ▶ Write-ahead Log (WAL)
- ▶ TOAST
- ▶ Outer Joins
- ▶ Overhauled function manager

# PostgreSQL Releases (Continued)

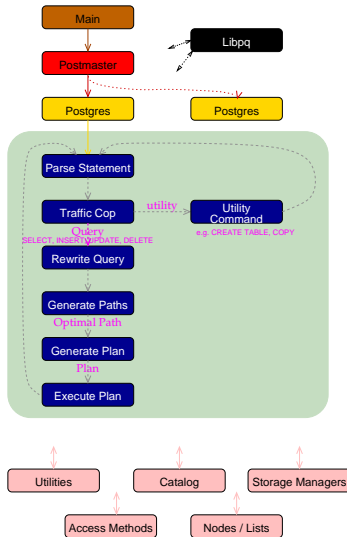
## Release 7.2

Date: 2001-12-??

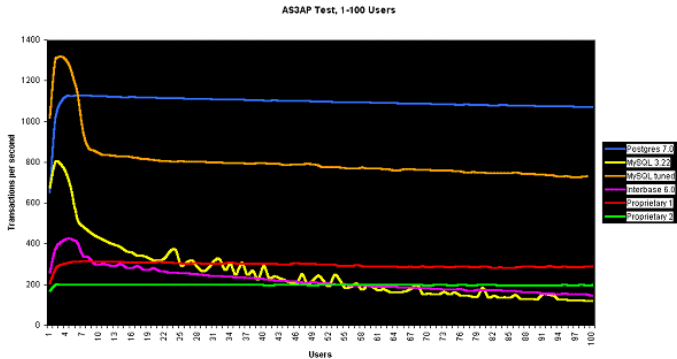
- ▶ Non-locking VACUUM
- ▶ Fix for Transaction id / OID wraparound
- ▶ Security fixes
- ▶ Optimizer improvements
- ▶ Error message internationalization



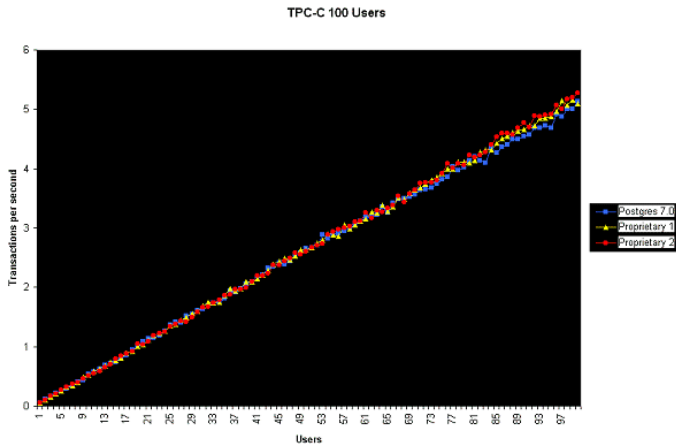
# Internals Flowchart



# Performance - AS3AP



# Performance - TPC-C



# PostgreSQL in the Real World

# Database Migration

- ▶ Oracle
- ▶ IBM's DB2
- ▶ Microsoft-SQL
- ▶ Microsoft Access
- ▶ Informix
- ▶ Interbase
- ▶ Dbase/FoxPro
- ▶ MySQL

# Database Languages

- ▶ C
- ▶ C++
- ▶ Embedded C
- ▶ Java
- ▶ Perl
- ▶ Python
- ▶ Tcl/Tk
- ▶ Php
- ▶ Odbc

# PostgreSQL Platforms

AIX  
BeOS  
BSD/OS  
FreeBSD  
HP-UX  
IRIX  
Linux  
MacOS

NetBSD  
OpenBSD  
SCO UnixWare  
Solaris  
SunOS  
Tru64  
Windows NT/2000

# PostgreSQL Usage

- ▶ Order Entry, Inventory, Billing
- ▶ Customer Relations Management (CRM)
- ▶ Data warehouse, data analysis
- ▶ Medical/Hospital Records Storage
- ▶ Genetics
- ▶ Financial Accounting, Banking, Payroll
- ▶ Military
- ▶ Government, Social services, Elections
- ▶ Education
- ▶ Publishing
- ▶ Geography (GIS)
- ▶ Hotel Reservations, Restaurants
- ▶ Telephone billing, call tracking
- ▶ Helpdesk problem report tracking
- ▶ Sales Tracking
- ▶ Business to business commerce



# PostgreSQL Web Site Usage

- ▶ Product purchase
- ▶ User preferences
- ▶ Job listings
- ▶ Auctions
- ▶ Real Estate listings
- ▶ Community building
- ▶ Dynamic content
- ▶ Text indexing

# Future Directions



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# Conclusion



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