ECE30030/ITP30010 Database Systems

Handshaking with an R-DBMS

Charmgil Hong

charmgil@handong.edu

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Handong Global University

Agenda

- Introduction to MySQL
- SQL preview

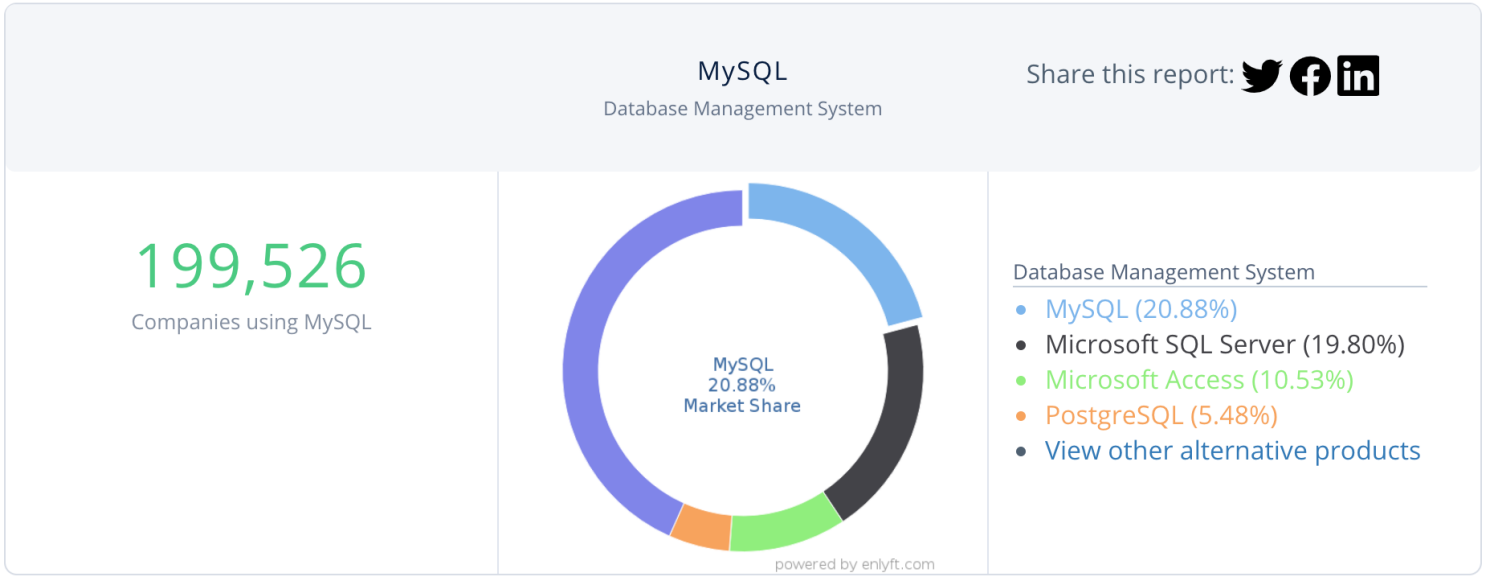
MySQL

- MySQL is an SQL-based relational database management system (DBMS)
  - Free and open-source R-DBMS (under GPL)
    - Owned by Oracle
    - Commercial version of MySQL is also provided (including technical support)
    - “My” came from the name of co-founder Michael Widenius’ daughter
      - *C.f.*, MariaDB
  - Compatible with standard SQL
  - Frequently used for commercial web services

* Image src: https://en.wikipedia.org/wiki/MySQL

MySQL

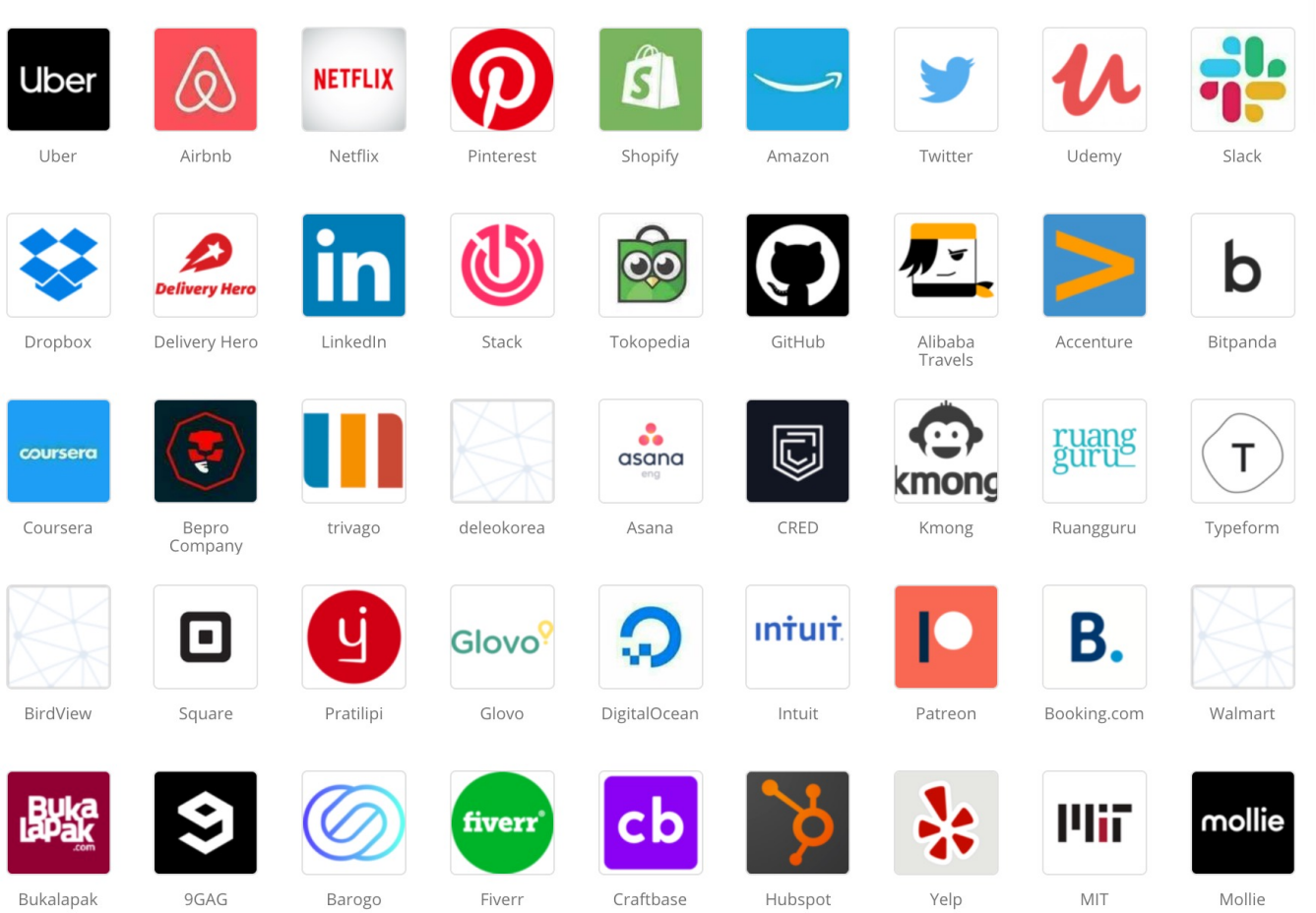
- Companies using MySQL (a study by Enlyft)
  - *"We have data on 199,526 (out of 955,547) companies that use MySQL"*
  - Often used by companies with 10-50 employees and 1M-10M dollars in revenue
    - *C.f.*, Oracle 12 is most often used by companies with 50-200 employees and >1000M dollars in revenue



* Source: https://enlyft.com/tech/products/mysql

MySQL

- Companies using MySQL (full list: https://www.mysql.com/customers/)



* Source: https://stackshare.io/mysql

MySQL

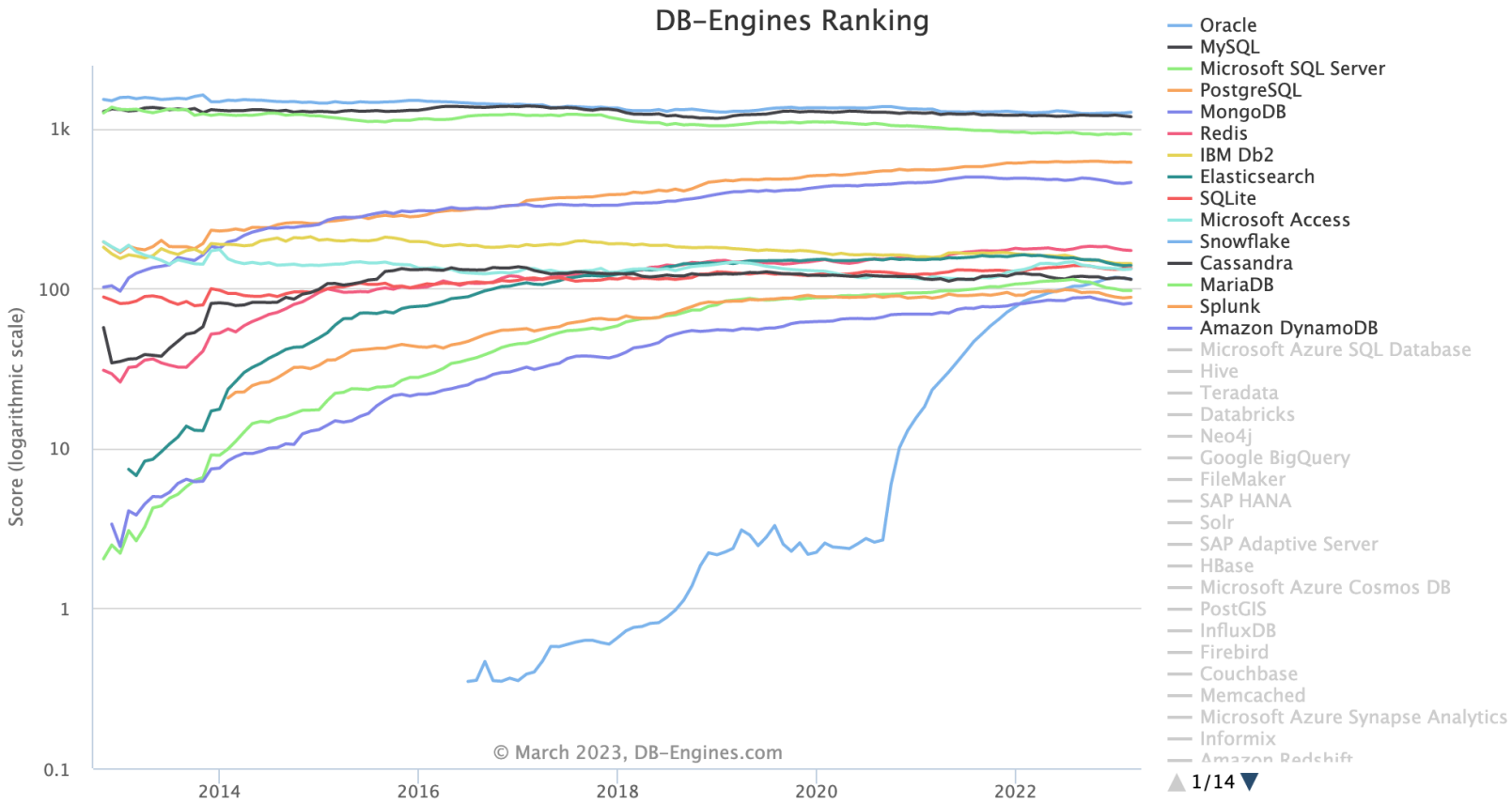
- Why MySQL?
  - Popular
    - Active discussions all over the Internet
  - Versatile: runs on Linux, Windows, Mac OS X, Solaris, FreeBSD, …
    - Supports wide range of programming languages (C/C++, Java, Python, .Net, …)
  - Cost starts from zero
  - High performance (fast and reliable)

410 systems in ranking, March 2023

Rank			DBMS	Database Model	Score		
Mar 2023	Feb 2023	Mar 2022			Mar 2023	Feb 2023	Mar 2022
1.	1.	1.	Oracle	Relational, Multi-model	1261.29	+13.77	+9.97
2.	2.	2.	MySQL	Relational, Multi-model	1182.79	-12.66	-15.45
3.	3.	3.	Microsoft SQL Server	Relational, Multi-model	922.01	-7.08	-11.77
4.	4.	4.	PostgreSQL	Relational, Multi-model	613.83	-2.67	-3.10
5.	5.	5.	MongoDB	Document, Multi-model	458.78	+6.02	-26.88
6.	6.	6.	Redis	Key-value, Multi-model	172.45	-1.39	-4.31
7.	7.	7.	IBM Db2	Relational, Multi-model	142.92	-0.04	-19.22
8.	8.	8.	Elasticsearch	Search engine, Multi-model	139.07	+0.47	-20.88
9.	9.	↑ 10.	SQLite	Relational	133.82	+1.15	+1.64
10.	10.	↓ 9.	Microsoft Access	Relational	132.06	+1.03	-3.37

* Image src: https://db-engines.com/en/ranking

DBMS Trend Popularity



- Score definition (if you are interested): https://db-engines.com/en/ranking_definition

* Image src: https://db-engines.com/en/ranking_trend

MySQL

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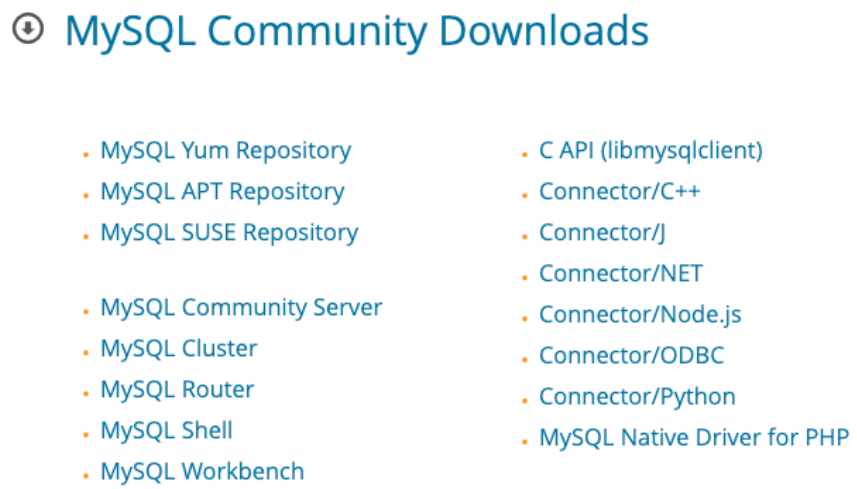


* Image src: https://dev.mysql.com/downloads/

MySQL

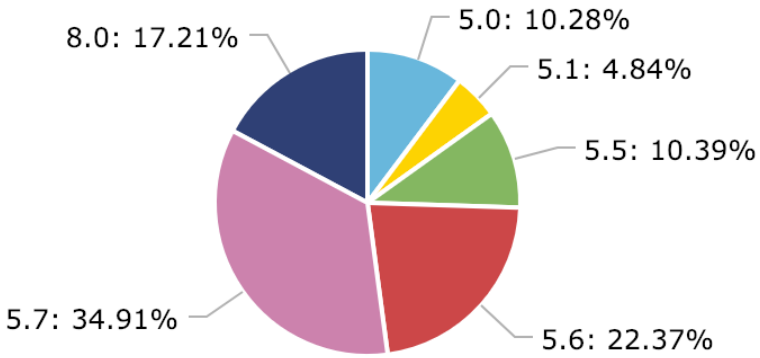
- Massive — Can handle terabytes of data
- Convenient — Supports high-level query language
- Multi-user — Supports concurrent data access
- Safe — Supports transactions
- Efficient — Can handle thousands of queries/second
- Reliable — 99.99% up-time in many real-world products

MySQL Versions

- MySQL 5.x vs 8.0

Version 5.x
- Most popular version of MySQL
- More stable and conventional

Version 8.0
- Current version
- Provides up-to-date DB functionalities (better storage engine, faster, more secure)



* Source: https://www.eversql.com/mysql-8-adoption-usage-rate/#:~:text=MySQL%205.7%20is%20still%20the,17%25%20are%20using%20MySQL%208.

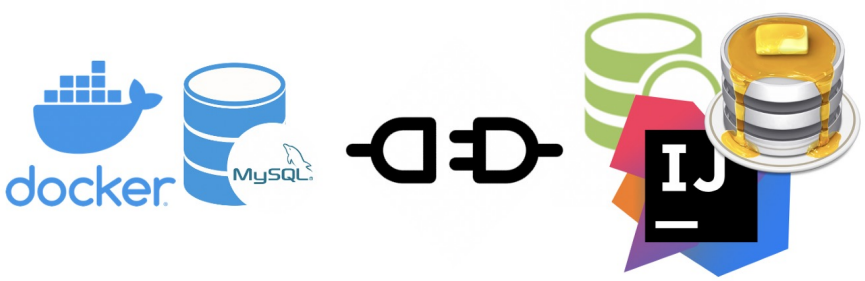
Where to Get MySQL?

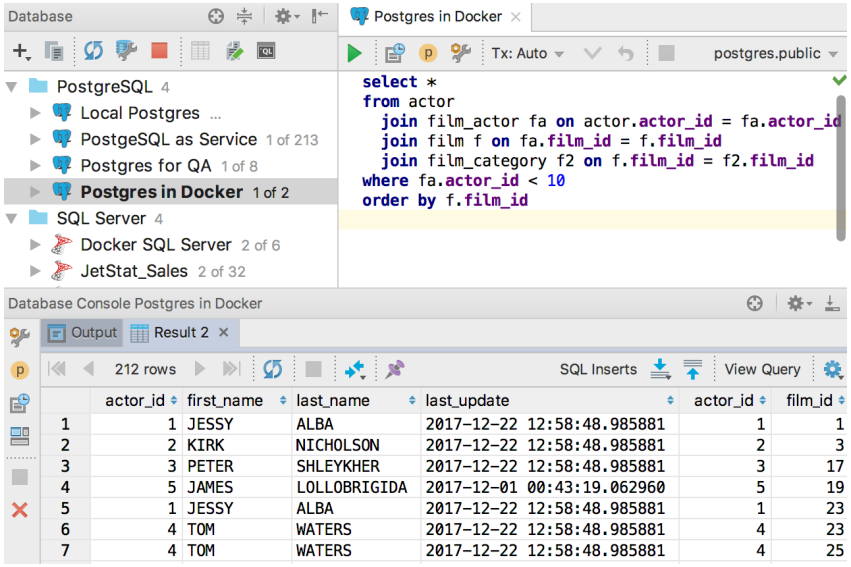
- https://dev.mysql.com/downloads/
  - Look for the “Community” versions – the branch that is available for free
  - ”Enterprise” versions are the commercial ones

- We have prepared a Docker image for the course
  - Consists of Ubuntu Server, MySQL, example databases for course activities

* Image src: https://www.docker.com

Where to Get MySQL?





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1	1	JESSY	ALBA	2017-12-22 12:58:48.985881	1	1
2	2	KIRK	NICHOLSON	2017-12-22 12:58:48.985881	2	3
3	3	PETER	SHLEYKHER	2017-12-22 12:58:48.985881	3	17
4	5	JAMES	LOLLOBRIGIDA	2017-12-01 00:43:19.062960	5	19
5	1	JESSY	ALBA	2017-12-22 12:58:48.985881	1	23
6	4	TOM	WATERS	2017-12-22 12:58:48.985881	4	23
7	4	TOM	WATERS	2017-12-22 12:58:48.985881	4	25

* Image source: https://baumannalexj.medium.com/connect-your-db-tool-to-a-dockerized-mysql-server-container-bc18853524ed
https://www.jetbrains.com/datagrip/features/look_and_feel.html

Interesting Facts

MySQL

- Open-source, cross-platform R-DBMS
- Built by Swedish Company MYSQL AB and currently supported by the Oracle
- First released in 1995
- Used for small and big businesses
- Support SQL language

- Does not support data partitioning
- Does not support XML
- Has a table locking facility
- Only works with the static system
- Offers only two backup mechanisms that are mysqlhotcopy and mysqldump

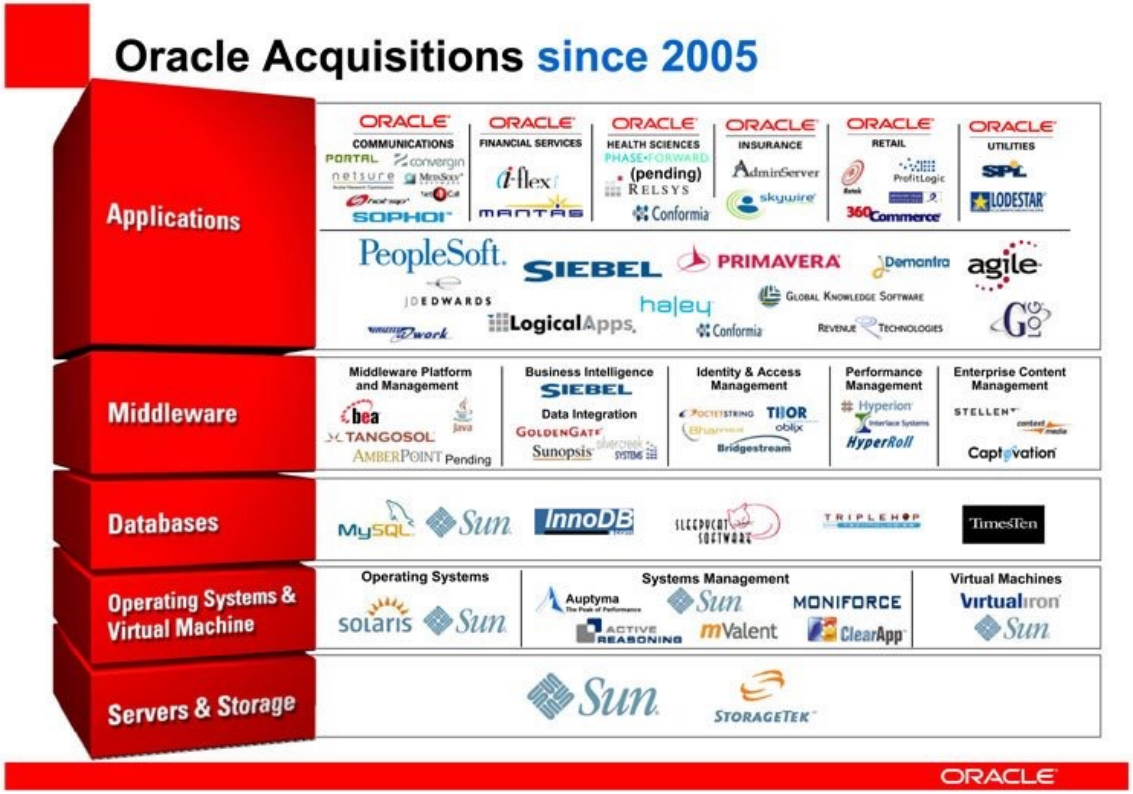
ORACLE

- Commercial R-DBMS marketed by Oracle Corporation
- First released in 1980
- Used for very large-scale deployments
- Supports SQL and PL/SQL languages

- Supports data partitioning
- Supports XML
- Has table locking and a row locking facility
- Can work with both static and dynamic systems
- Offers many backup mechanisms that are backup, hot backup, import, export, *etc.*

* Image src: https://www.javatpoint.com/mysql-vs-oracle

Interesting Facts



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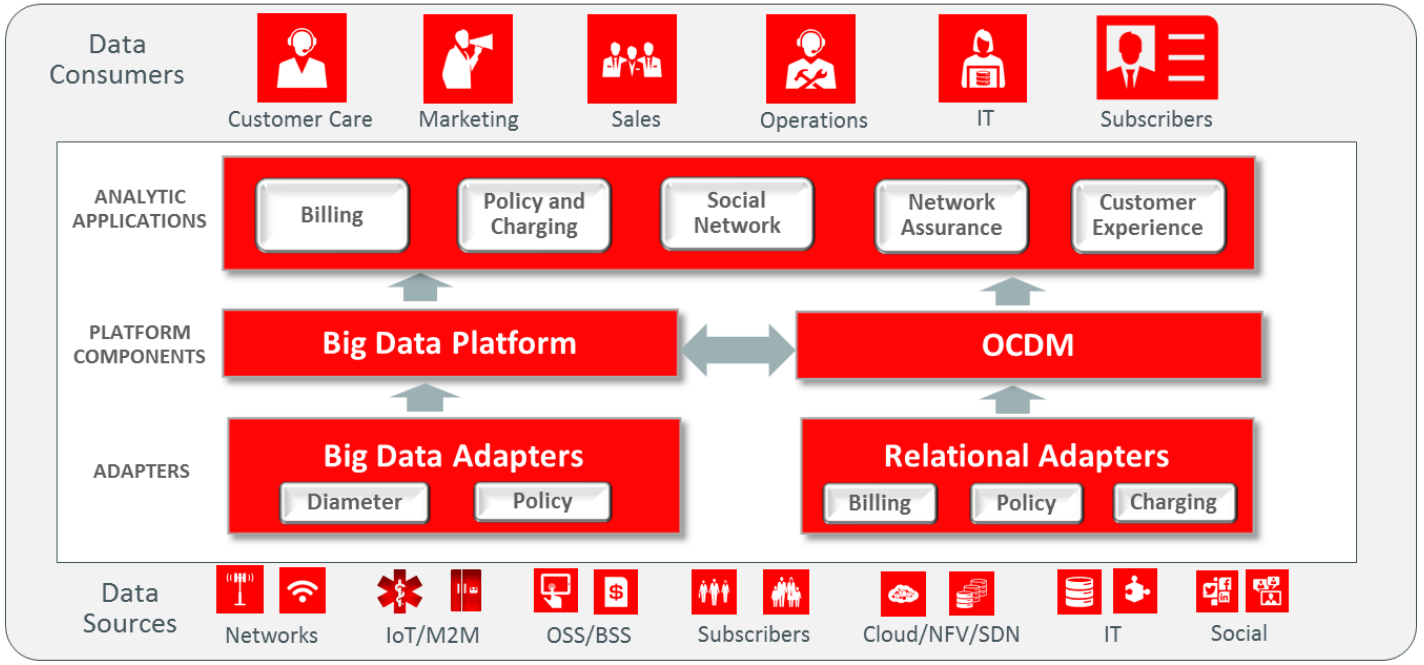
* Image src: http://oracleevosys.blogspot.com/2012/03/oracle-accusitions.html; https://karthikeyanblogs.wordpress.com/2011/08/27/time-for-oracle-to-go-down/

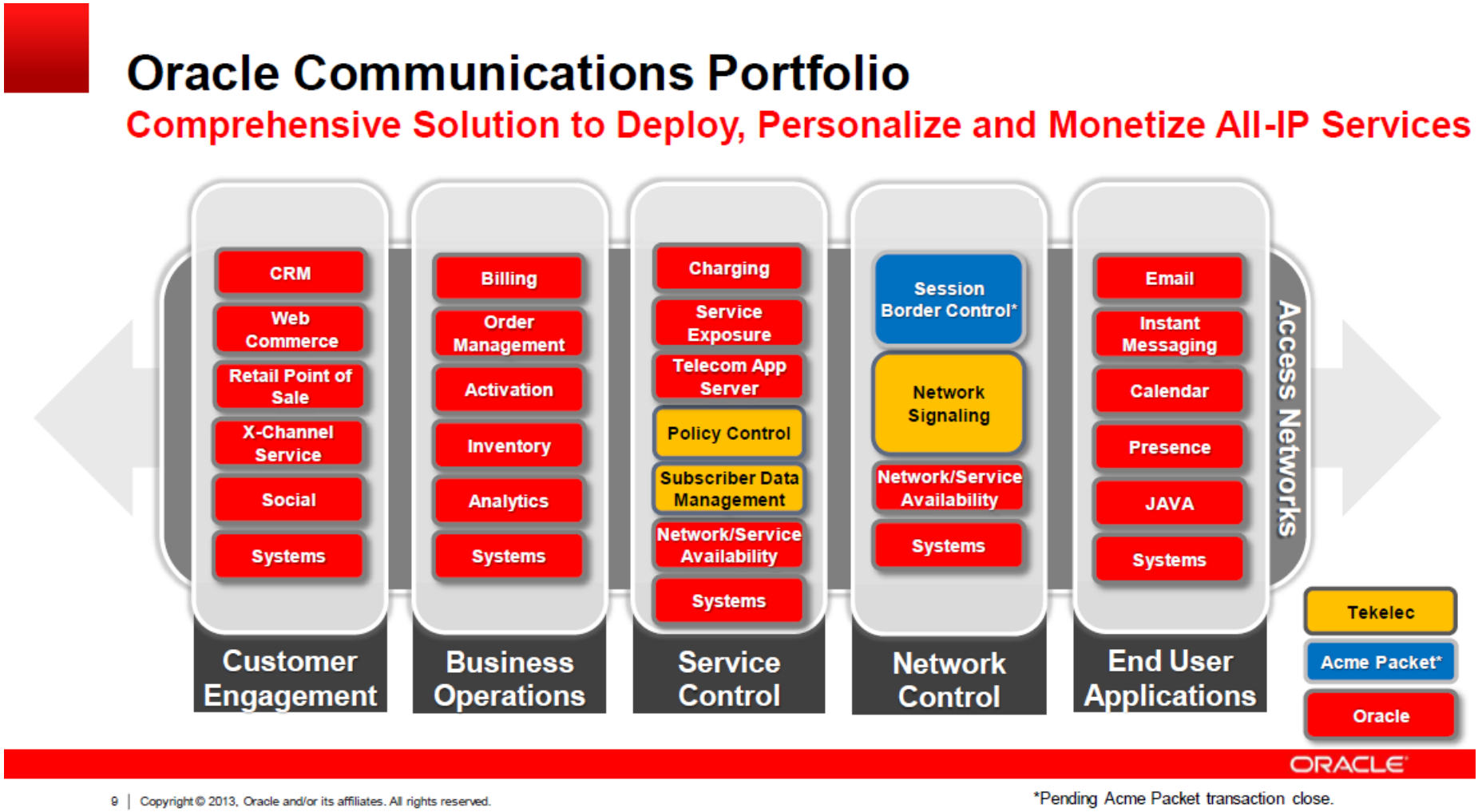
* This does not necessarily reflect the instructor's opinion

Interesting Facts



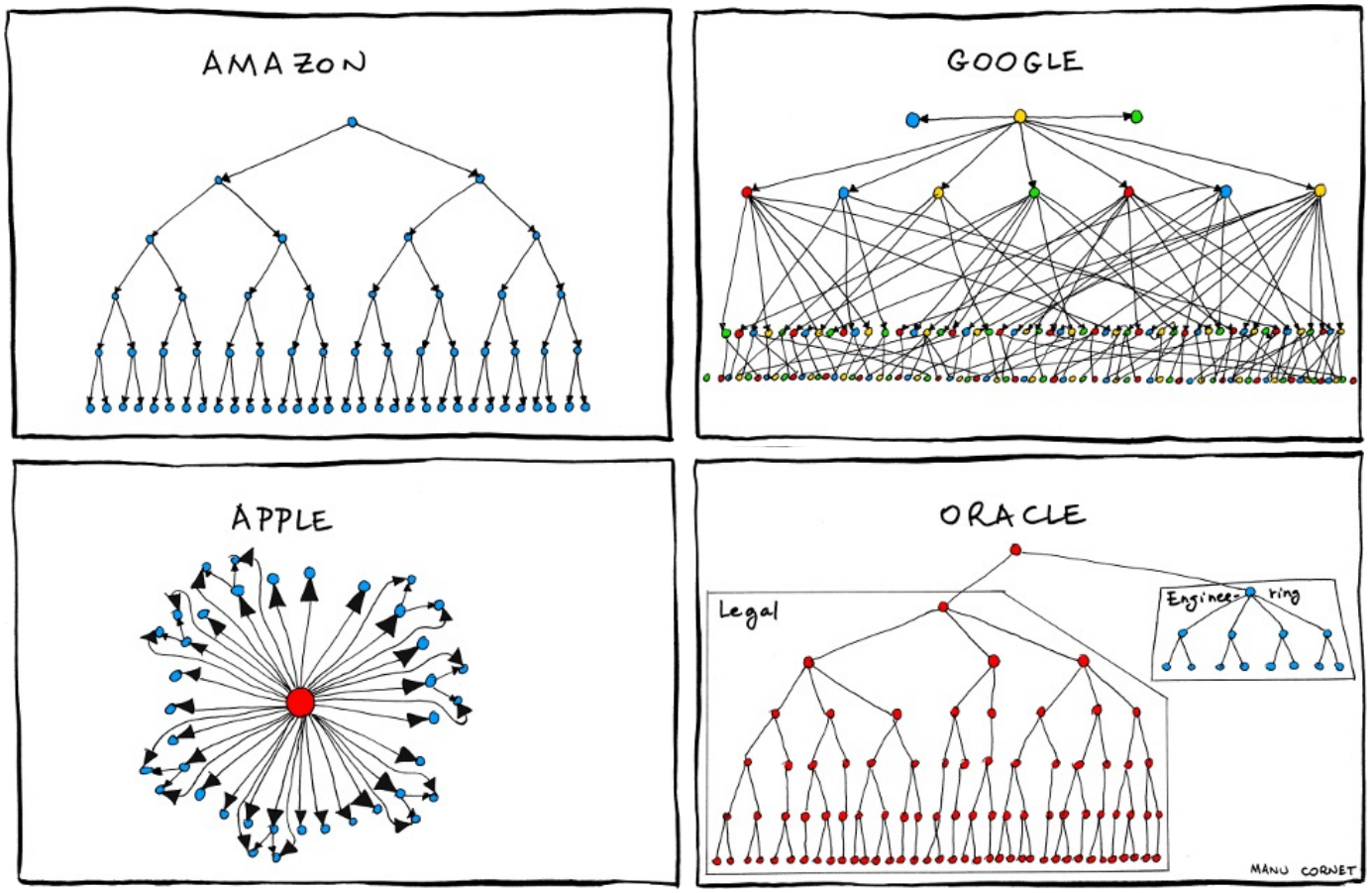
* Image src: https://laptrinhx.com/oracle-communications-launches-oracle-communications-analytics-product-portfolio-3977283584/

Interesting Facts



* Image src: https://www.theregister.com/2013/03/25/oracle_tekelec_acquisition/

Interesting Facts



* By Marnu Cornet (https://ma.nu/)

* This does not necessarily reflect the reality nor the instructor's opinion

Interesting Facts

Agenda

- Introduction to MySQL
- **SQL preview**

Structured Query Language (SQL)

- SQL: Structured Query Language
  - The principal language used to describe and manipulate relational databases
  - Very high-level
    - Say “what to do” rather than “how to do it”
    - SQL is not specifying data-manipulation details
    - DBMSs figure out the “best” way to execute queries
      - Called “query optimization”
  - Two aspects to SQL
    - Data definition: for declaring database schemas (DDL)
    - Data manipulation: for querying (asking questions about) databases and for modifying the database (DML)

SQL Parts

- DML – provides the ability to query information from the database and to insert tuples into, delete tuples from, and modify tuples in the database
- DDL – includes commands for defining views
  - Integrity – the DDL includes commands for specifying integrity constraints
- Transaction control – includes commands for specifying the beginning and ending of transactions
- Embedded SQL and dynamic SQL – define how SQL statements can be embedded within general-purpose programming language
- Authorization – includes commands for specifying access rights to relations and views

A Brief History

- IBM SEQUEL (Structured English Query Language) was developed as a part of the System R project (Chamberlin and Boyce, early 1970s)
  - Later on, SEQUEL was renamed SQL (structured query language)
  - System R → System/38 (1979), SQL/DS (1981), DB2 (1983)
- Relational Software, Inc released the first commercial implementation of SQL, Oracle V2 for VAX computers
  - Relational Software, Inc is now Oracle Corporation
- ANSI and ISO standardized SQL:
  - SQL-86, SQL-89, SQL-92, SQL:1999, …, SQL:2011, SQL:2016 (current)
  - SQL-92 is supported by the most of database systems

Basic Query Structure

- A typical SQL query has the form:

  SELECT $A_1, A_2, ..., A_n$
  FROM $r_1, r_2, ..., r_m$
  WHERE P

  - A_i represents an attribute
  - R_i represents a relation
  - P is a predicate

- The result of an SQL query is a relation

EOF

- Coming next:
  - Structured Query Language