中山大學
SUN YAT-SEN UNIVERSITY

2021级《数据库原理与应用》第2周

2024.3.6

中山大学数学学院 黄志洪

作业与资源平台

- http://www.dataguru.cn/myclassnew.php?mod=new_basicforlesson&op=basic&lessonid=3178
- 加入口令 2024@sysu，填写正确的学号和姓名，便于老师统计作业提交情况
- 本周开始布置作业，一般在周五上机实习前布置，在下一周周三上课前截止，请大家注意截止时间
- 加分题/竞赛题单独另外布置

作业与资源平台

- “课程资源”下载资料，“书面作业”完成作业，提交作业时可以使用附件（压缩成rar），并在编辑窗内填写说明文字

课程列表 | **当前课程** | 花名册 | 书面作业 | 互动作业 | 成绩单 | 课程资源 | 测试 | 证书 | 交流区

课程名：数据库原理及应用（2022） 人数：205 状态：不公开 / 开通 开课时间:2022-02-17 09:00:00

开课老师:tigerfish

课程简介:
1 SQL与PLSQL 2 关系代数与数据库设计 3 数据库系统体系架构与实现原理 4 数据库领域的最新进展

相关课程资料下载
DataGuru网络课程学习说明
书面作业及互动作业操作说明

修改简介 | 口令设置 | 结束课程 | 发布通知

Large database

- 产品: Oracle, DB2, Sybase, Microsoft Sqlserver, Mysql, Informix, PostgreSQL等
- 特点

1 一般可以跨越多种硬件和操作系统平台(以Oracle为例)

2 server-client模式(Oracle和Foxpro在网络上工作对比

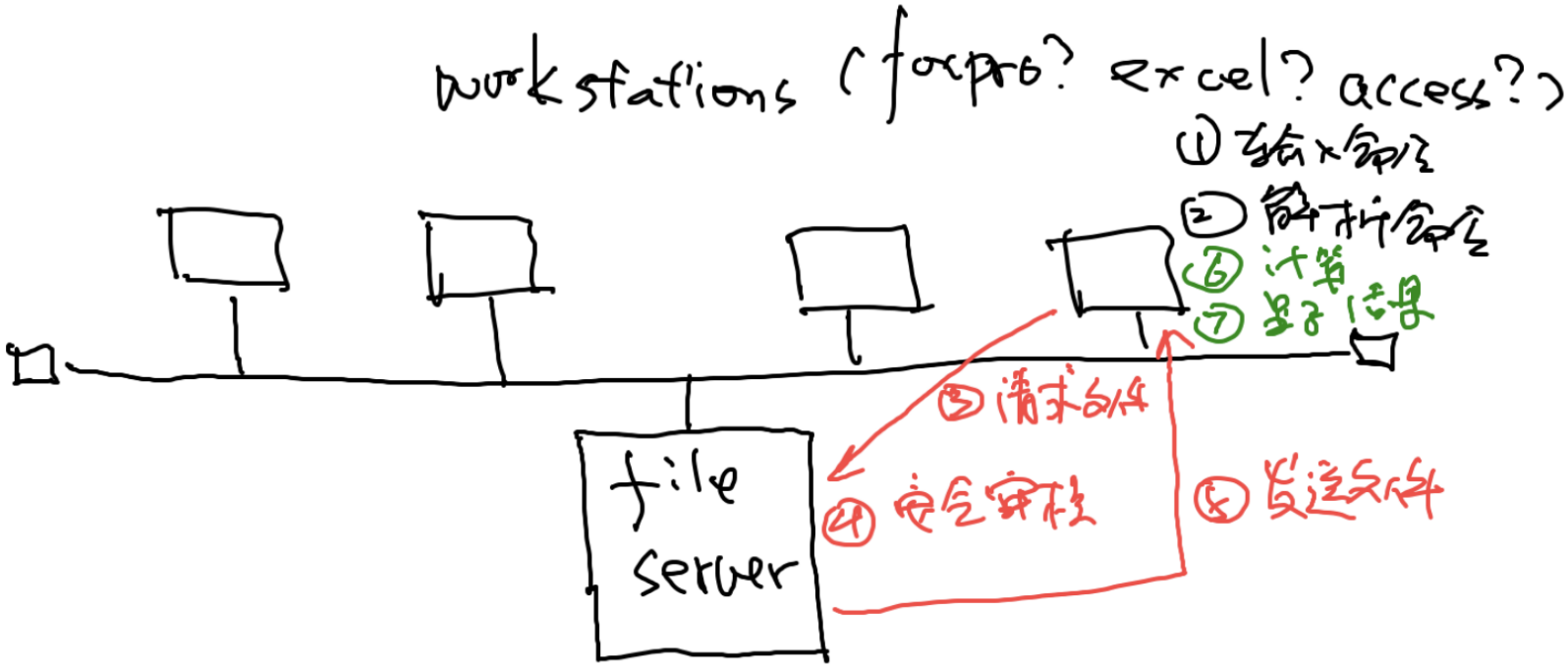
3 具有良好的安全性

4 一般支持关系型数据库和SQL语言

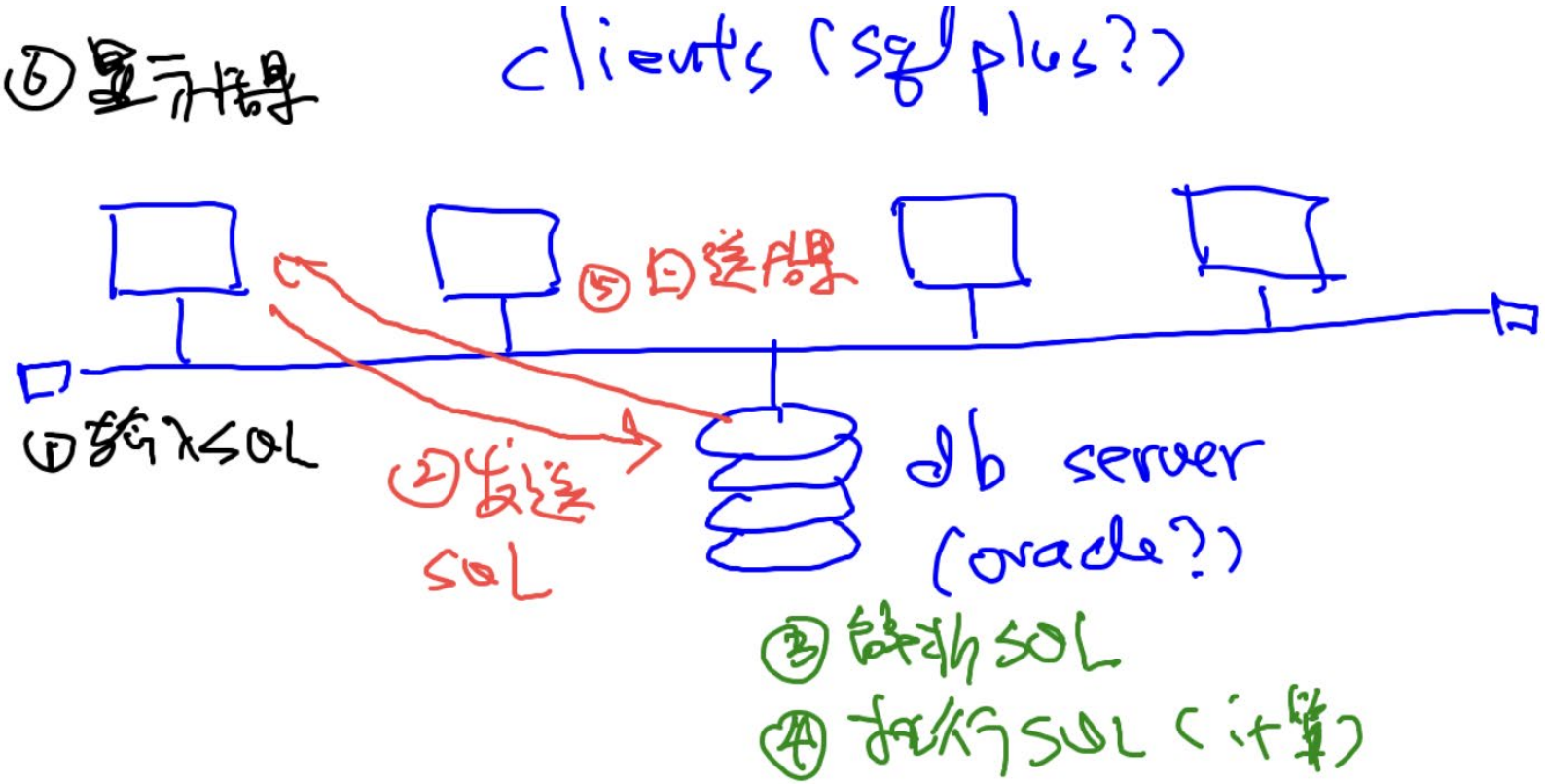
支持Oracle的平台

- Windows（学习常用）
- Linux（中小企业级常用）
- AIX，HP-UX，OS390等等Unix/大中小型机系统（金融、运营商等常用）
- 本周作业：部署Oracle
- 虚拟机软件：virtual box，vmware等

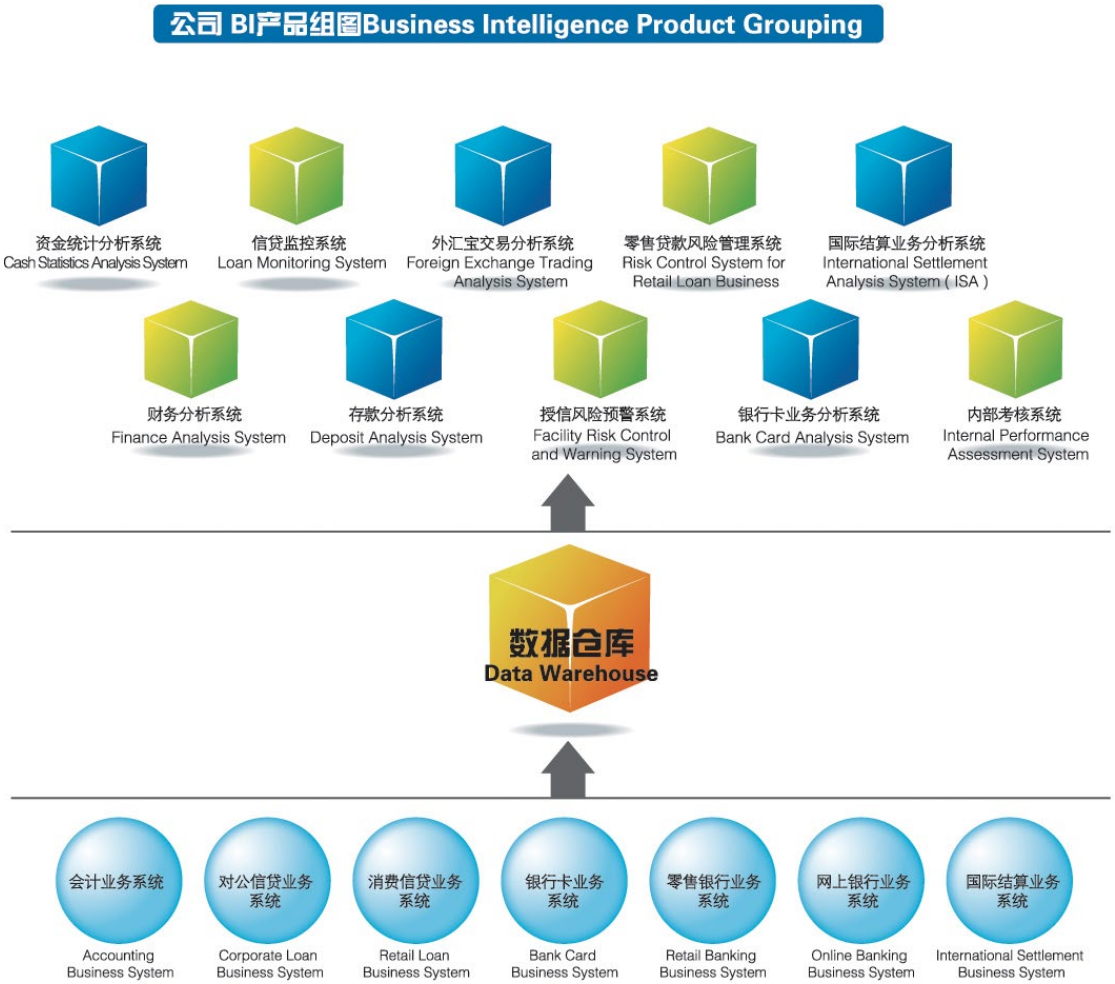
通过文件服务器共享数据



Server-client模式



银行数据分析场景



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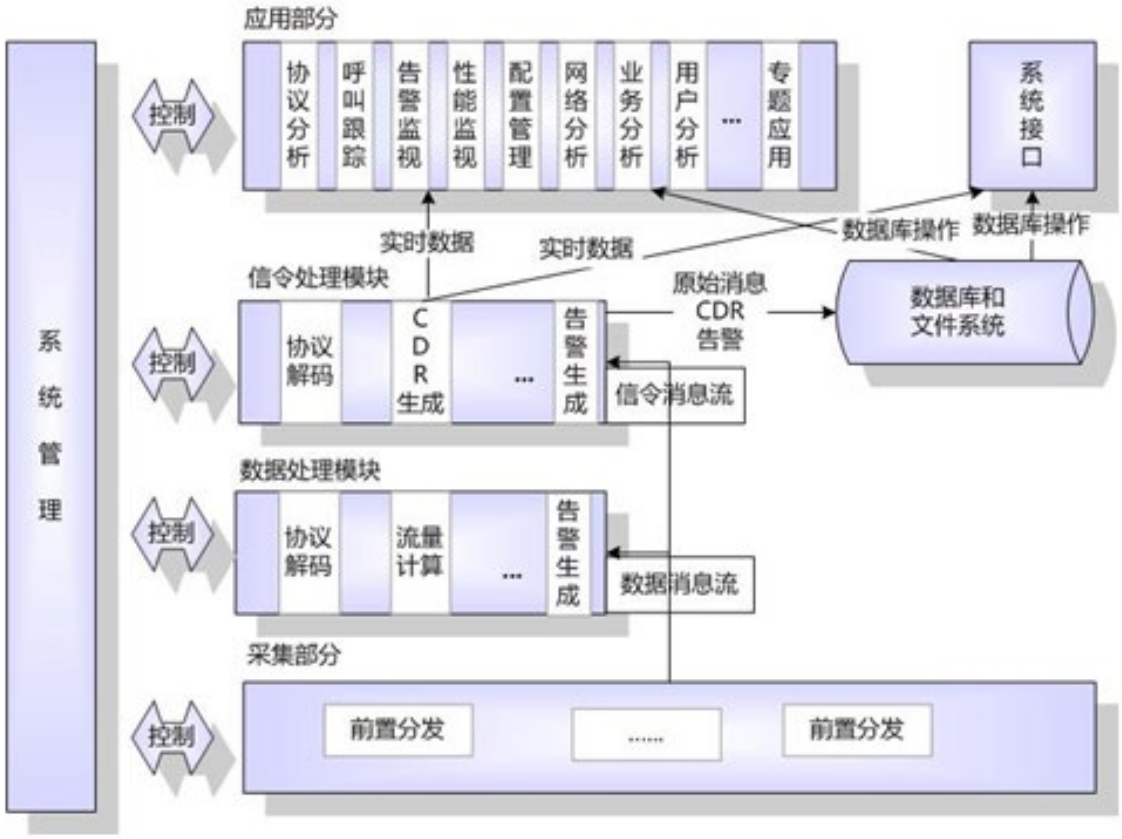
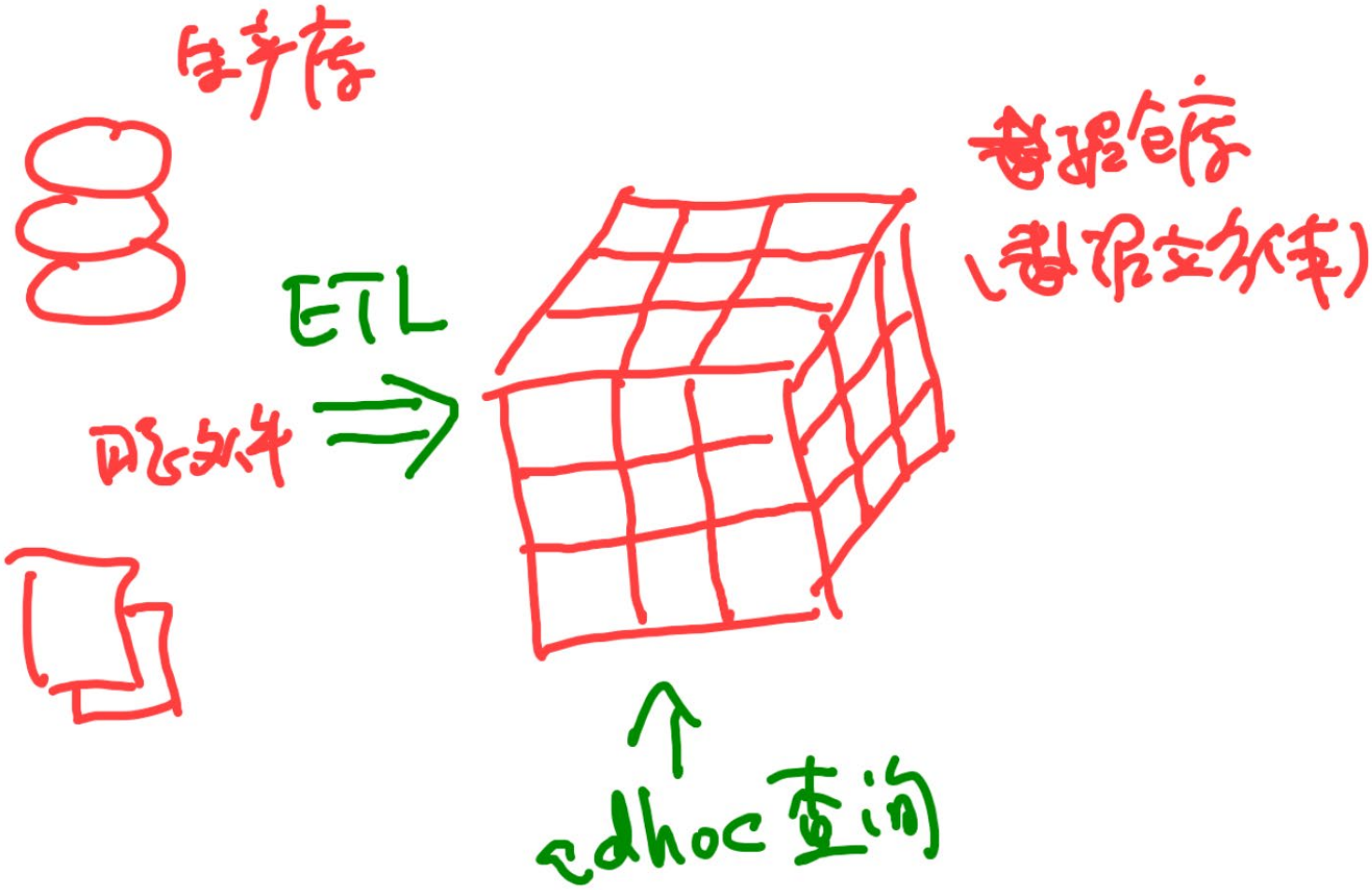
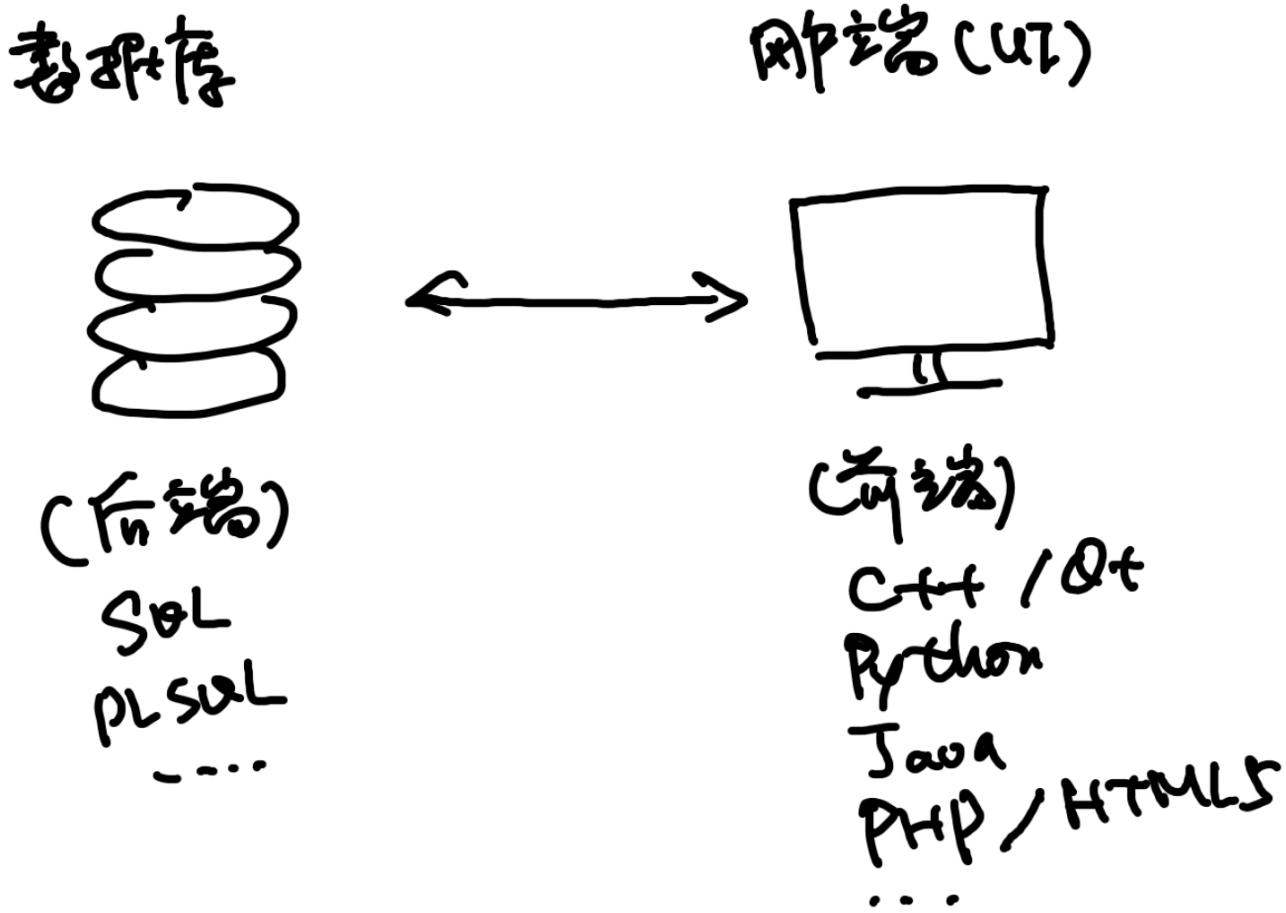
移动运营商数据分析场景



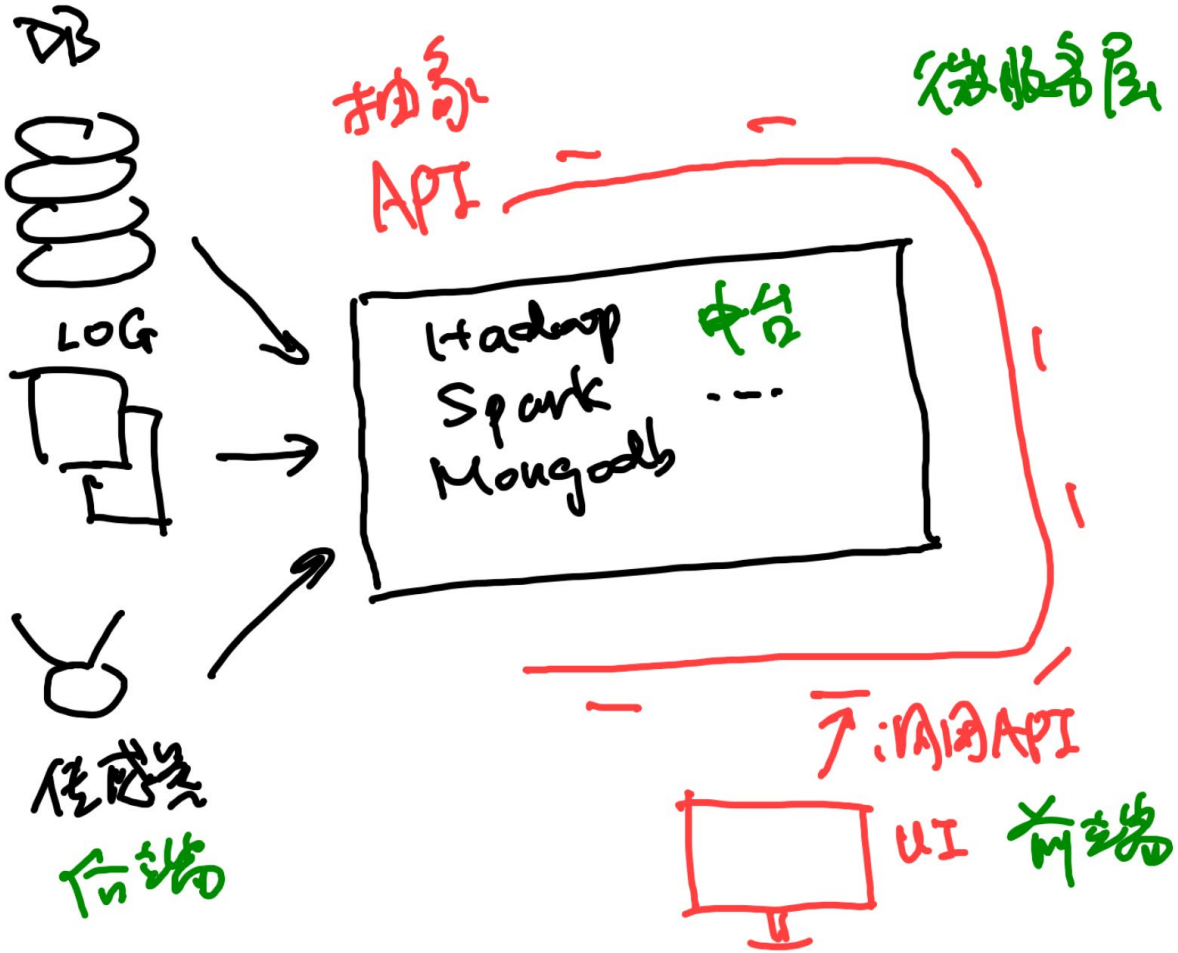
数据仓库与数据集市



前后端的应用架构



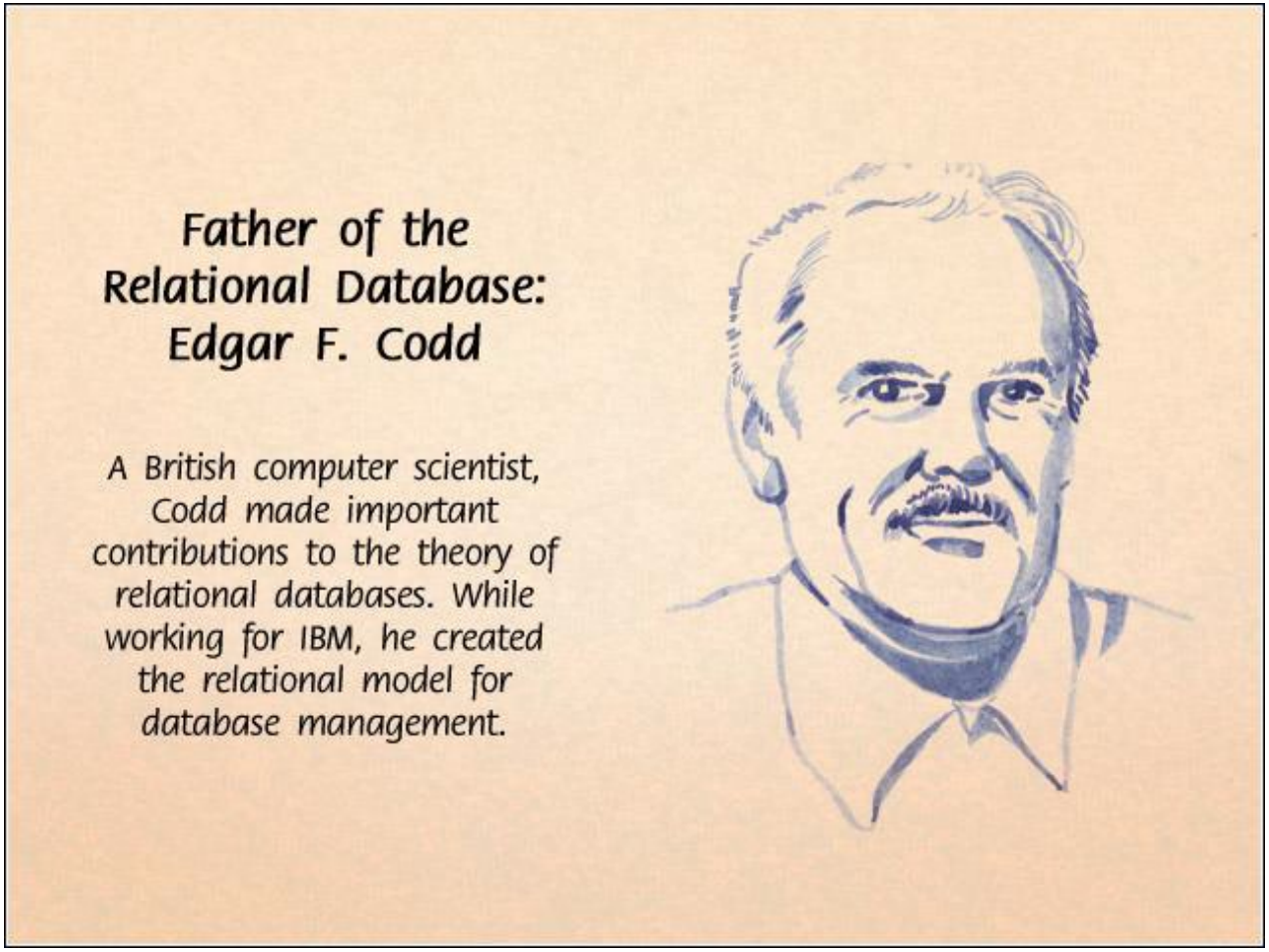
中台模式



什么是关系型数据库和SQL

- 关系型数据库(IBM,Codd)
- 什么是SQL(第四代语言,Struturized Query Language)
- SQL的扩展(PL/SQL, T-SQL….)
- SQL是怎么被执行的
- SQL怎样和其它语言结合开发出完整的数据库应用系统?

E.F. Codd


Father of the Relational Database: Edgar F. Codd
A British computer scientist, Codd made important contributions to the theory of relational databases. While working for IBM, he created the relational model for database management.

SQL之父

- 唐·钱伯林（Don Chamberlin），是IBM Fellow，ACM及IEEE 特别会员。他是SQL关系数据库语言的发明人之一，也是XQuery语言的设计基础Quilt语言的发明人之一。Don拥有加利福尼亚大学博士学位。他目 前在IBM Almaden 研究中心工作，在过去几年中，他代表IBM参与W3C XML Query 工作组的工作。

SQL之父

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Oracle简介

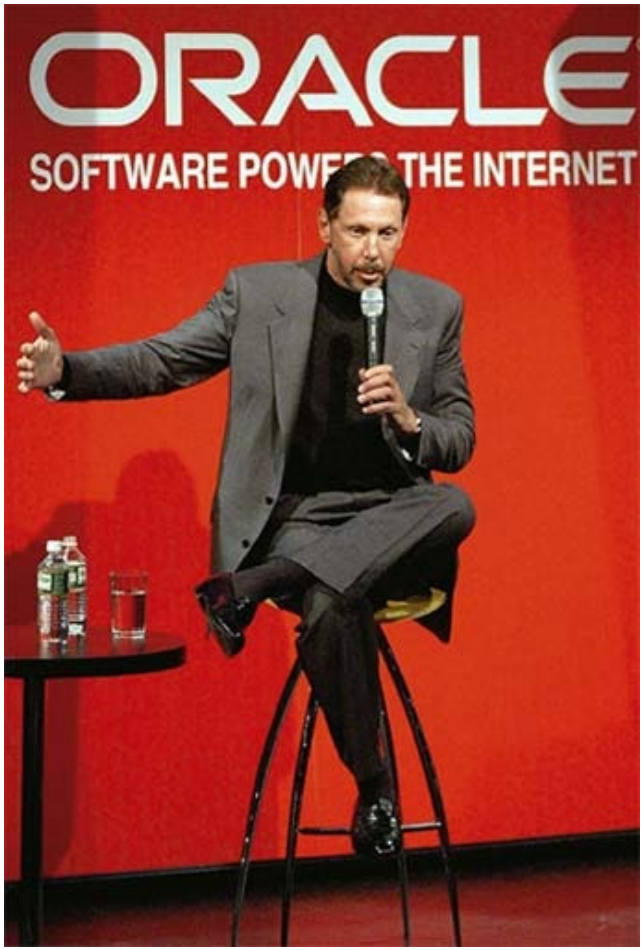
1 Larry和Oracle

2 Oracle的产品

3 OCP及其教材

4 与学习Oracle有关的资源

Larry Ellison



Scott和他的猫的故事

- 左起 Ed Oates、Bruce Scott、Bob Miner、Larry Ellison

Scott和他的猫的故事

- 在开发第三版还没有结束的时候，Scott离开了ORACLE。当时用C语言改写ORACLE的压力很大，无休止的软件调试终于让Scott不堪重负，选 择了一走了之。把剩下的重担交给了Miner一个人。在出售了自己的%4的股票之后，Scott 后来创建了Gupta公司（现更名为Centura Software）和PointBase公司（提供百分之百纯Java嵌入式数据库），都是开发和数据库相关的产品。多年后有人问到他的%4的 ORACLE股票的时候，Scott，这个曾经给ORACLE写出第一行代码的技术高手，也只能报以一笑了。如果能坚持下来，那是一笔几亿美金的财富。不 过当时的Scott没有那么多的想法，他只是太累了。

SQL函数

- 字符型函数

RPAD和LPAD
LOWER,UPPER和INITCAP
LENGTH
SUBSTR
LTRIM和RTRIM
INSTR
CHR
REPLACE
TRANSLATE
SOUNDEX

LPAD

- select lpad(ename,20,' '),sal from emp;

```
SQL> select lpad(ename,20,' '),sal from emp;

LPAD(ENAME,20,'')                                   SAL
-------------------------------------------- ----------
               SMITH                                800
               ALLEN                               1600
                WARD                               1250
               JONES                               2975
              MARTIN                               1250
               BLAKE                               2850
               CLARK                               2450
                KING                               9000
              TURNER                               1500
               JAMES                                950
                FORD                               3000
              MILLER                               1300
            ALEXANDER                              1500
```

RPAD

- select rpad(ename,20,'.'),sal from emp;

```
SQL> select rpad(ename,20,'.'),sal from emp;

RPAD(ENAME,20,'.')                                 SAL
-------------------------------------------------- ----------
SMITH.............                                  800
ALLEN.............                                 1600
WARD..............                                 1250
JONES.............                                 2975
MARTIN............                                 1250
BLAKE.............                                 2850
CLARK.............                                 2450
KING..............                                 9000
TURNER............                                 1500
JAMES.............                                  950
FORD..............                                 3000
MILLER............                                 1300
ALEXANDER.........                                 1500
WATSON............                                 1350
```

RPAD

- select rpad(ename,20,'.')||sal from emp;

```
SQL> select rpad(ename,20,'.')||sal from emp;

RPAD(ENAME,20,'.')||SAL
--------------------------------------------------
SMITH.................800
ALLEN................1600
WARD.................1250
JONES................2975
MARTIN...............1250
BLAKE................2850
CLARK................2450
KING.................9000
TURNER...............1500
JAMES................950
```

字母大小写转换

- select initcap(lower(ename)),sal from emp;

```
SQL> select initcap(lower(ename)),sal from emp;

INITCAP(LO        SAL
---------- ----------
Smith             800
Allen            1600
Ward             1250
Jones            2975
Martin           1250
Blake            2850
Clark            2450
King             9000
Turner           1500
James             950
```

Substr与length

- select ename,substr(ename,length(ename),1) from emp;

```
SQL> select ename,substr(ename,length(ename),1) from emp;

ENAME      SU
---------- --
SMITH      H
ALLEN      N
WARD       D
JONES      S
MARTIN     N
BLAKE      E
CLARK      K
KING       G
TURNER     R
JAMES      S
FORD       D
MILLER     R
```

虚表

- 用于观察输出函数计算结果

```
SQL> select * from dual;

D
-
X

SQL>
```

LTRIM与RTRIM

- select ltrim('abcdefg','badg') from dual;

```
SQL> select ltrim('abcdefg','badg') from dual;

LTRIM
-----
cdefg

SQL>
```

RTRIM去右端空格

```
SQL> select rtrim('abcde    ') from dual;

RTRIM
-----
abcde

SQL> select length(rtrim('abcde    ')) from dual;

LENGTH(RTRIM('ABCDE'))
----------------------
                     5
```

INSTR

```
SQL> select instr('abcdefg','cd') from dual;

INSTR('ABCDEFG','CD')
---------------------
                    3

SQL> select instr('abababababab','ba') from dual;

INSTR('ABABABABAB','BA')
------------------------
                       2
```

CHR

```
SQL> select chr(66) from dual;

C
-
B

SQL>
```

REPLACE

```
SQL> select replace('abcdefgabcdefg','a','.') from dual;

REPLACE('ABCDE
--------------
.bcdefg.bcdefg

SQL>
```

TRANSLATE

```
SQL> select translate('abcdefgabcdefg','acg','345') from dual;

TRANSLATE('ABC
--------------
3b4def53b4def5

SQL>
```

SOUNDEX

```
SQL> select ename,soundex(ename) from emp;

ENAME      SOUN
---------- ----
SMITH      S530
ALLEN      A450
WARD       W630
JONES      J520
MARTIN     M635
BLAKE      B420
CLARK      C462
KING       K520
TURNER     T656
JAMES      J520
FORD       F630
MILLER     M460
ALEXANDER  A425
WATSON     W325
JOHN       J500
```

SOUNDEX

```
SQL> select * from emp
  2  where soundex(ename)=soundex('alen');

     EMPNO ENAME      JOB              MGR HIREDATE              SAL       COMM     DEPTNO     CLUBID
---------- ---------- --------- ---------- -------------- ---------- ---------- ---------- ----------
      7499 ALLEN      SALESMAN        7698 20-2月 -81           1600        300         30        321

SQL> select soundex('张无忌') from dual;

S
-


SQL>
```

SQL函数

- 数值函数

NVL

CEIL,FLOOR,ROUND,TRUNC

ABS,POWER,MOD,SQRT,EXP,LN,LOG,SIN,COS,TAN,SIGN

LEAST和GREATEST

TO_CHAR和TO_NUMBER

NVL

```
SQL> select ename, sal, comm, sal+nvl(comm,0) from emp;

ENAME                SAL       COMM SAL+NVL(COMM,0)
---------- ---------- ---------- ----------------
SMITH               800                     800
ALLEN              1600        300            1900
WARD               1250        500            1750
JONES              2975                       2975
MARTIN             1250       1400            2650
BLAKE              2850                       2850
CLARK              2450                       2450
KING               9000                       9000
TURNER             1500          0            1500
JAMES               950                        950
FORD               3000                       3000
MILLER             1300                       1300
```

CEIL

```
SQL> select ceil(4.3) from dual;

 CEIL(4.3)
----------
         5

SQL> select ceil(4) from dual;

   CEIL(4)
----------
         4

SQL> select ceil(-1.7) from dual;

CEIL(-1.7)
----------
        -1
```

FLOOR

```
SQL> select floor(5.6) from dual;

FLOOR(5.6)
----------
         5

SQL> select floor(3) from dual;

  FLOOR(3)
----------
         3

SQL> select floor(-2.3) from dual;

FLOOR(-2.3)
-----------
         -3
```

ROUND

```
SQL>
SQL> select round(1.2345,3) from dual;

ROUND(1.2345,3)
---------------
          1.235

SQL> select round(1.2345,2) from dual;

ROUND(1.2345,2)
---------------
           1.23

SQL> select round(1.2345) from dual;

ROUND(1.2345)
-------------
            1
```

TRUNC

```
SQL> select trunc(1.2345,3) from dual;

TRUNC(1.2345,3)
---------------
          1.234

SQL> select trunc(1.2345) from dual;

TRUNC(1.2345)
-------------
            1
```

GREATEST

```
SQL> select greatest(12,34,56,7,8) from dual;

GREATEST(12,34,56,7,8)
----------------------
                    56

SQL> select greatest(select sal from emp);
select greatest(select sal from emp)
                *
第 1 行出现错误:
ORA-00936: 缺失表达式
```

TO_CHAR

```
SQL> select to_char(12.345,'9999.99') from dual;

TO_CHAR(
--------
   12.35

SQL> select to_char(12.345,'0099.99') from dual;

TO_CHAR(
--------
 0012.35

SQL> select to_char(12.345,'$999.99') from dual;

TO_CHAR(
--------
  $12.35

SQL> select to_char(12.345,'$999.999') from dual;

TO_CHAR(1
---------
  $12.345
```

TO_NUMBER

```
SQL> select to_number('00012345.67') from dual;

TO_NUMBER('00012345.67')
------------------------
                12345.67
```

日期格式码

```
SQL> select ename,to_char(hiredate,'yyyy-mm-dd') from emp;

ENAME      TO_CHAR(HI
---------- ----------
SMITH      1980-12-17
ALLEN      1981-02-20
WARD       1981-02-22
JONES      1981-04-02
MARTIN     1981-09-28
BLAKE      1981-05-01
CLARK      1981-06-09
KING       1981-11-17
TURNER     1981-09-08
JAMES      1981-12-03
FORD       1981-12-03
MILLER     1982-01-23
```

日期格式码

```
SQL> select ename,to_char(hiredate,'yyyy-mm-dd hh:mi:ss') from emp;

ENAME      TO_CHAR(HIREDATE,'Y
---------- -------------------
SMITH      1980-12-17 12:00:00
ALLEN      1981-02-20 12:00:00
WARD       1981-02-22 12:00:00
JONES      1981-04-02 12:00:00
MARTIN     1981-09-28 12:00:00
BLAKE      1981-05-01 12:00:00
CLARK      1981-06-09 12:00:00
KING       1981-11-17 12:00:00
TURNER     1981-09-08 12:00:00
JAMES      1981-12-03 12:00:00
FORD       1981-12-03 12:00:00
MILLER     1982-01-23 12:00:00
ALEXANDER  1983-12-20 12:00:00
WATSON     1984-08-25 12:00:00
```

sysdate

```
SQL> select sysdate from dual;

SYSDATE
-------------
06-3月 -24

SQL> select to_char(sysdate,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE,'YY
-------------------
2024-03-06 12:07:15

SQL> select to_char(sysdate+3,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE+3,'
-------------------
2024-03-09 12:07:24

SQL> select to_char(sysdate-3,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE-3,'
-------------------
2024-03-03 12:07:33
```

sysdate

```
SQL> select to_char(sysdate-1/24,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE-1/2
-------------------
2024-03-06 11:08:44

SQL> select to_char(sysdate-1/1440,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE-1/1
-------------------
2024-03-06 12:07:55

SQL>
```

伪列函数

- Sysdate
- User
- Rownum
- Rowid
- Level

user

```
SQL> select user from dual;

USER
------------------------------
SCOTT

SQL> connect system/manager
已连接。
SQL> select user from dual;

USER
------------------------------
SYSTEM
```

rownum

```
SQL> select rownum,empno,ename from emp;

    ROWNUM      EMPNO ENAME
---------- ---------- ----------
         1       7369 SMITH
         2       7499 ALLEN
         3       7521 WARD
         4       7566 JONES
         5       7654 MARTIN
         6       7698 BLAKE
         7       7782 CLARK
         8       7839 KING
         9       7844 TURNER
        10       7900 JAMES
        11       7902 FORD
        12       7934 MILLER
```

Rownum的奇怪现象

```
SQL> select rownum,empno,ename from emp where rownum<=3;

    ROWNUM      EMPNO ENAME
---------- ---------- ----------
         1       7369 SMITH
         2       7499 ALLEN
         3       7521 WARD

SQL> select rownum,empno,ename from emp where rownum>=3;

未选定行

SQL>
```

时间类型四则运算

```
SQL> select to_char(sysdate,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate+1,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate-1,'yy
yy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE,'YY TO_CHAR(SYSDATE+1,' TO_CHAR(SYSDATE-1,'
------------------- ------------------- -------------------
2023-03-09 07:40:39 2023-03-10 07:40:39 2023-03-08 07:40:39

SQL> select to_char(sysdate,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate+1/24,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate-1/
24,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE,'YY TO_CHAR(SYSDATE+1/2 TO_CHAR(SYSDATE-1/2
------------------- ------------------- -------------------
2023-03-09 07:41:09 2023-03-09 08:41:09 2023-03-09 06:41:09

SQL> select to_char(sysdate,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate+1/1440,'yyyy-mm-dd hh:mi:ss'),to_char(sysdate-
1/1440,'yyyy-mm-dd hh:mi:ss') from dual;

TO_CHAR(SYSDATE,'YY TO_CHAR(SYSDATE+1/1 TO_CHAR(SYSDATE-1/1
------------------- ------------------- -------------------
2023-03-09 07:41:33 2023-03-09 07:42:33 2023-03-09 07:40:33
```

时间类型四则运算

```
SQL> select ename,sysdate-hiredate from emp;

ENAME      SYSDATE-HIREDATE
---------- ----------------
SMITH            15422.8217
ALLEN            15357.8217
WARD             15355.8217
JONES            15316.8217
MARTIN           15137.8217
BLAKE            15287.8217
CLARK            15248.8217
KING             15087.8217
TURNER           15157.8217
JAMES            15071.8217
FORD             15071.8217
```

To_date

常用于insert语句

insert into emp (empno,ename,hiredate)

values (3456,'Huang',to_date('20010903120000','yyyymmddhhmiss'));

```
SQL> insert into emp (empno,ename,hiredate)
  2  values (3456,'Huang',to_date('20010903120000','yyyymmddhhmiss'));

已创建 1 行。
```

To_date

```
      4695 BOB        SALESMAN        7698 01-9月 -83       3050       1300         30        471
      4682 MAY        CLERK           7782 19-10月-81       2050                    10        481
      4845 PETER      SALESMAN        7698 10-9月 -85       1600          0         30        491
      4877 CASSANDRA  CLERK           7788 13-12月-85       1000                    20        501
      4903 JADE       CLERK           7698 03-11月-81       1950                    30        511
      4932 IRENE      ANALYST         7566 04-10月-81       2900                    20        521
      4921 ROSE       CLERK           7782 03-11月-82       1350                    10        531
      5559 NED        MANAGER         7839 11-12月-81       2800                    40        541
      5599 ATARI      CLERK           5559 21-6月 -81       1650                    40        551
      5521 ZEN        CLERK           5559 22-12月-83       1250                    40        561
      5566 SNOW       CLERK           5559 22-4月 -82       2975                    40        571
      3456 Huang                            03-9月 -01

已选择28行。

SQL>
```

自己动手

- To_date如果没有指定时分秒，缺省的时分秒是?
- 如果指定的年份是45，那产生1945年还是2045年?
- 中文字符有多长?
- 中英混合的字符串，substr会乱套吗?
- Varchar2（10）的字段，可以放5个中文字符还是10个?

ADD_MONTHS

```
SQL> select add_months(sysdate,3) from dual;

ADD_MONTHS(SYS
--------------
06-6月 -24

SQL>
```

LAST_DAY

```
SQL> select last_day(sysdate) from dual;

LAST_DAY(SYSDA
--------------
31-3月 -24
```

MONTHS_BETWEEN

- 求员工的工龄年数

答案

```
SQL> select ename,trunc(months_between(sysdate,hiredate)/12) from emp;

ENAME      TRUNC(MONTHS_BETWEEN(SYSDATE,HIREDATE)/12)
---------- ------------------------------------------
SMITH                                              43
ALLEN                                              43
WARD                                               43
JONES                                              42
MARTIN                                             42
BLAKE                                              42
CLARK                                              42
KING                                               42
TURNER                                             42
JAMES                                              42
FORD                                               42
MILLER                                             42
ALEXANDER                                          40
WATSON                                             39
JOHN                                               40
```

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Thanks

FAQ时间