

# Введение в СУБД ORACLE

Лекция 1

# До того, как начать

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- 34 часа лекций, 51 час лабораторных работ
- 5 семестр ПОИТ, 6 семестр ИСИТ - курсовой проект, построение всей необходимой инфраструктуры базы данных, самостоятельное изучение и исследование технологий СУБД
- Версия СУБД: Oracle 12c
- Лабораторные работы в 309-1, виртуальные серверы (VMware ESX) Oracle 12c, на компьютерах установлены клиентские компоненты СУБД и Oracle IDE
- Все продукты Oracle доступны для скачивания на сайте [www.oracle.com](http://www.oracle.com)
- Задания на лабораторные работы IVC309-22, /Материалы/Блинова
- Реферат

# Администрирование баз данных

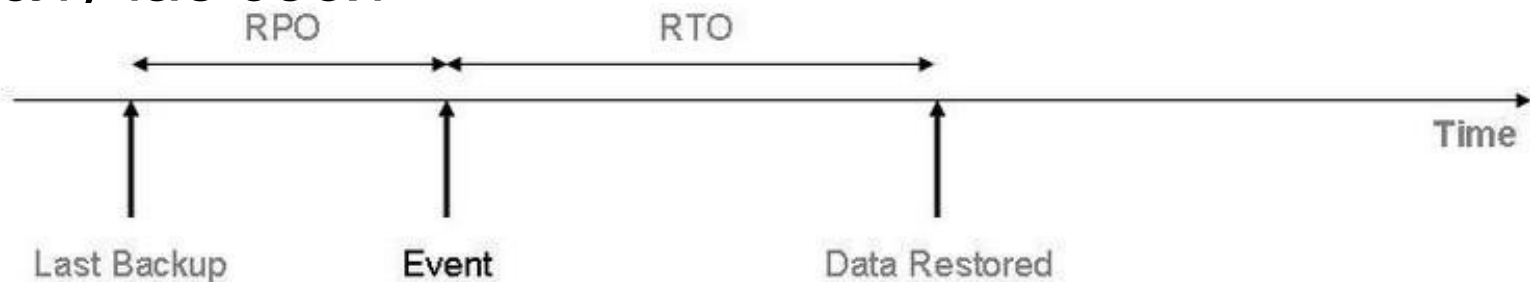
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- Проектирование базы данных
- Восстановление работоспособности
- Обеспечение целостности
- Обеспечение безопасности в базе данных
- Оптимизация и поддержка производительности
- Мониторинг системы
- Обеспечение перехода на новую версию



# Понятия RTO и RPO

- RTO - Время восстановления - recovery time objective - допустимое время простоя сервиса в случае сбоя
- RPO - Точка возврата - recovery point objective - допустимый объем возможных потерь данных в случае сбоя



# Oracle Corporation

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- Создана в 1977г.
- имеет подразделения в 145 странах
- вторая после Microsoft по прибыльности компания – поставщик программного обеспечения
- финансовые показатели в 2016 году: оборот \$37 млрд, чистая прибыль \$8,9 млрд
- количество сотрудников в 2016 году – 136 000
- 30% глобального рынка программного обеспечения
- основные продукты Oracle RDBMS, TimesTen, Oracle Enterprise Linux (на основе Red Hat), JDeveloper, WebLogic, Apex
- поглощение Sun Microsystems: MySQL, Java



# СУБД ORACLE - объектно-реляционная система управления базами данных

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- 1977: первая версия
- 2005: Oracle 10g Release 2
- 2009: Oracle 11g Release 2 - поддерживается на платформах Windows (начиная с Windows Server 2008), Linux, Solaris, HP, AIX5L, IBM z/OS, Mac OS X Server.
- 2013: Oracle 12c.



# Основные редакции СУБД ORACLE

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- Standard Edition One: начальная редакция для дома и малого бизнеса;
- Standard Edition: для малого и среднего бизнеса;
- Enterprise Edition: решения промышленного уровня;

## Доступны 2 метрики лицензирования

- Named User Plus – по пользователям, можно конкретно подсчитать точное количество пользователей системы
- Processor – по процессорной мощности серверов на неограниченное количество пользователей.



# Дистрибутивы СУБД ORACLE

<http://www.oracle.com>

www.oracle.com/technetwork/database/enterprise-edition/downloads/index.html

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Oracle Technology Network > Database > Database 12c > Downloads

Overview Downloads Documentation Learn More Community

## Oracle Database Software Downloads

You must accept the OTN License Agreement to download this software.  
 Accept License Agreement |  Decline License Agreement

### Oracle Database 12c Release 1

(12.1.0.2.0) - Enterprise Edition

Microsoft Windows x64 (64-bit)	File 1, File 2 (2.5 GB) See All
Linux x86-64	File 1, File 2 (2.5 GB) See All
Oracle Solaris (SPARC systems, 64-bit)	File 1, File 2 (2.6 GB) See All
Oracle Solaris (x86 systems, 64-bit)	File 1, File 2 (2.3 GB) See All
HP-UX Itanium	File 1, File 2 (3.1 GB) See All
AIX (PPC64)	File 1, File 2 (2.7 GB) See All
zLinux64	File 1, File 2 (2.3 GB) See All

Database 12c  
Database In-Memory  
Multitenant  
Options  
Application Development  
Big Data Appliance  
Data Warehousing & Big Data  
Database Appliance  
Database Cloud  
Exadata Database Machine  
High Availability  
Manageability  
Migrations  
Security  
Unstructured Data  
Upgrades  
Windows



# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 1 of 11

## Configure Security Updates

Provide your email address to be informed of security issues, install the product and initiate configuration manager. [View details.](#)

Email:   
Easier for you if you use your My Oracle Support email address/username.

I wish to receive security updates via My Oracle Support.

My Oracle Support Password:

[Help](#)

# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 2 of 11

## Download Software Updates

**ORACLE** **12<sup>c</sup>**  
DATABASE

[Configure Security Updates](#)

**Software Updates**

[Installation Option](#)

- Grid Installation Options
- Install Type
- Oracle Home User Selection
- Installation Location
- Prerequisite Checks
- Summary
- Install Product
- Finish

Download software updates for this installation. Software updates consist of recommended updates to the installer system requirement checks, PatchSet Updates (PSUs), and other recommended patches.

Select one of the following options:

Use My Oracle Support credentials for download

My Oracle Support user name:

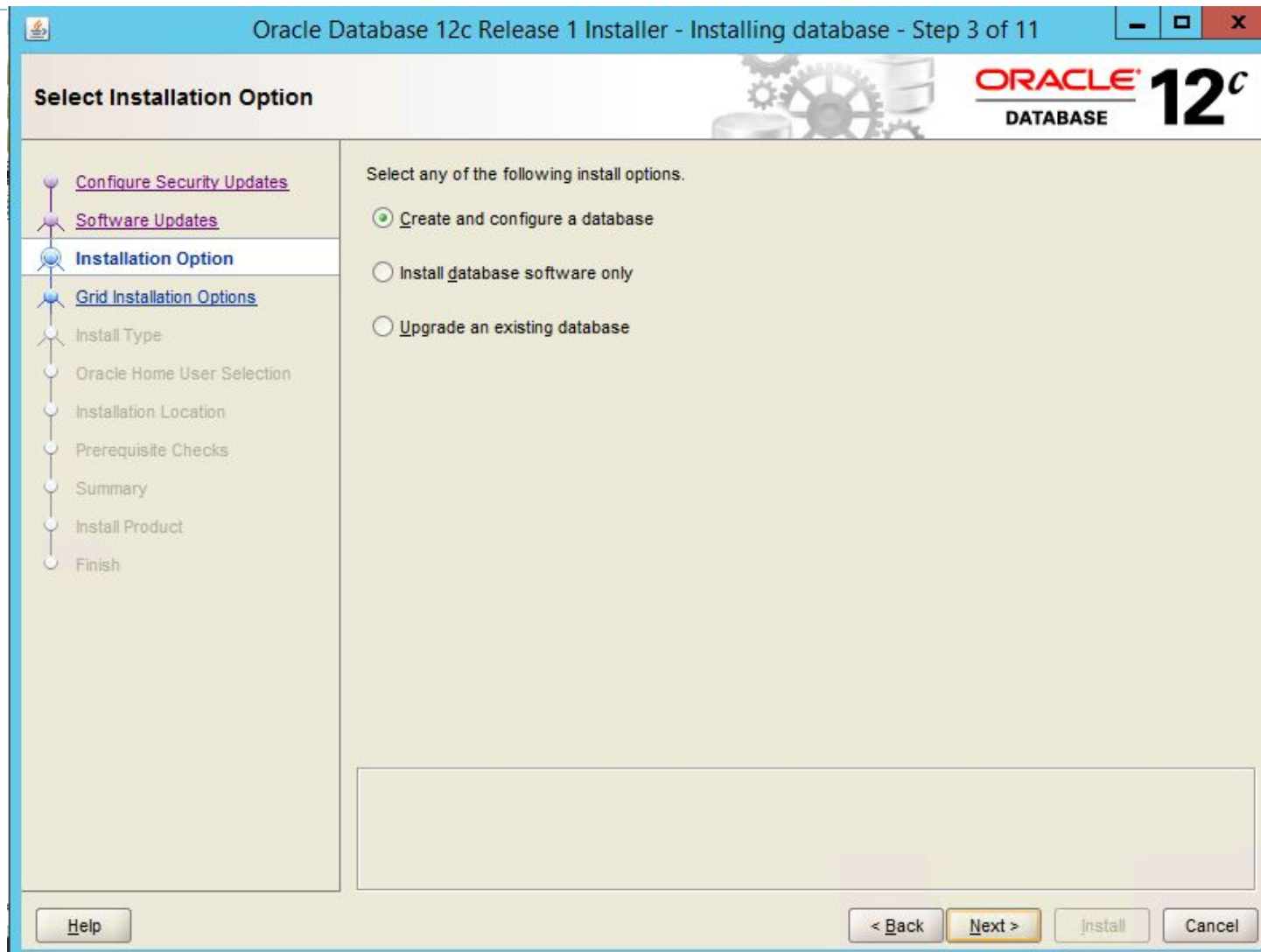
My Oracle Support password:

Use pre-downloaded software updates

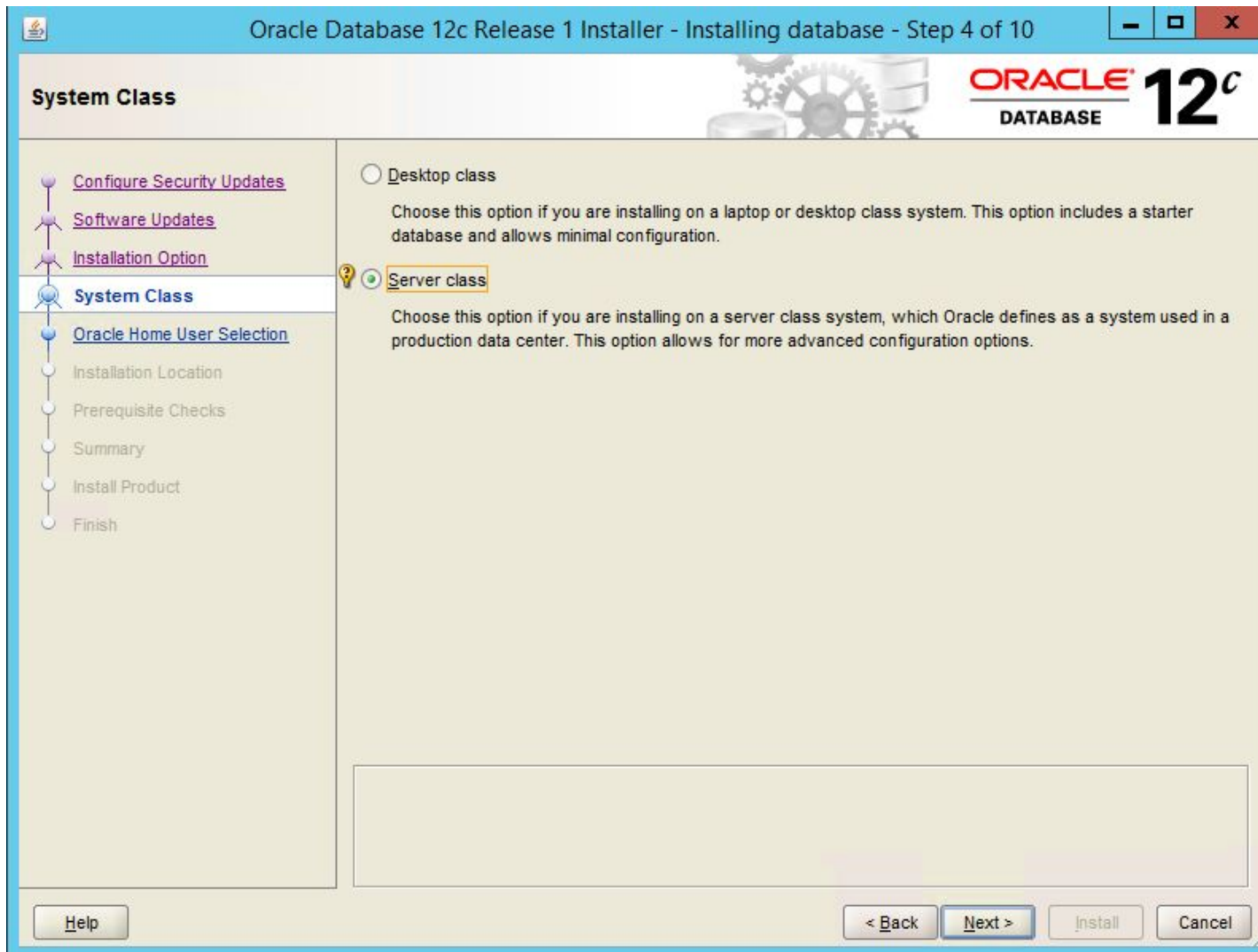
Location:

Skip software updates

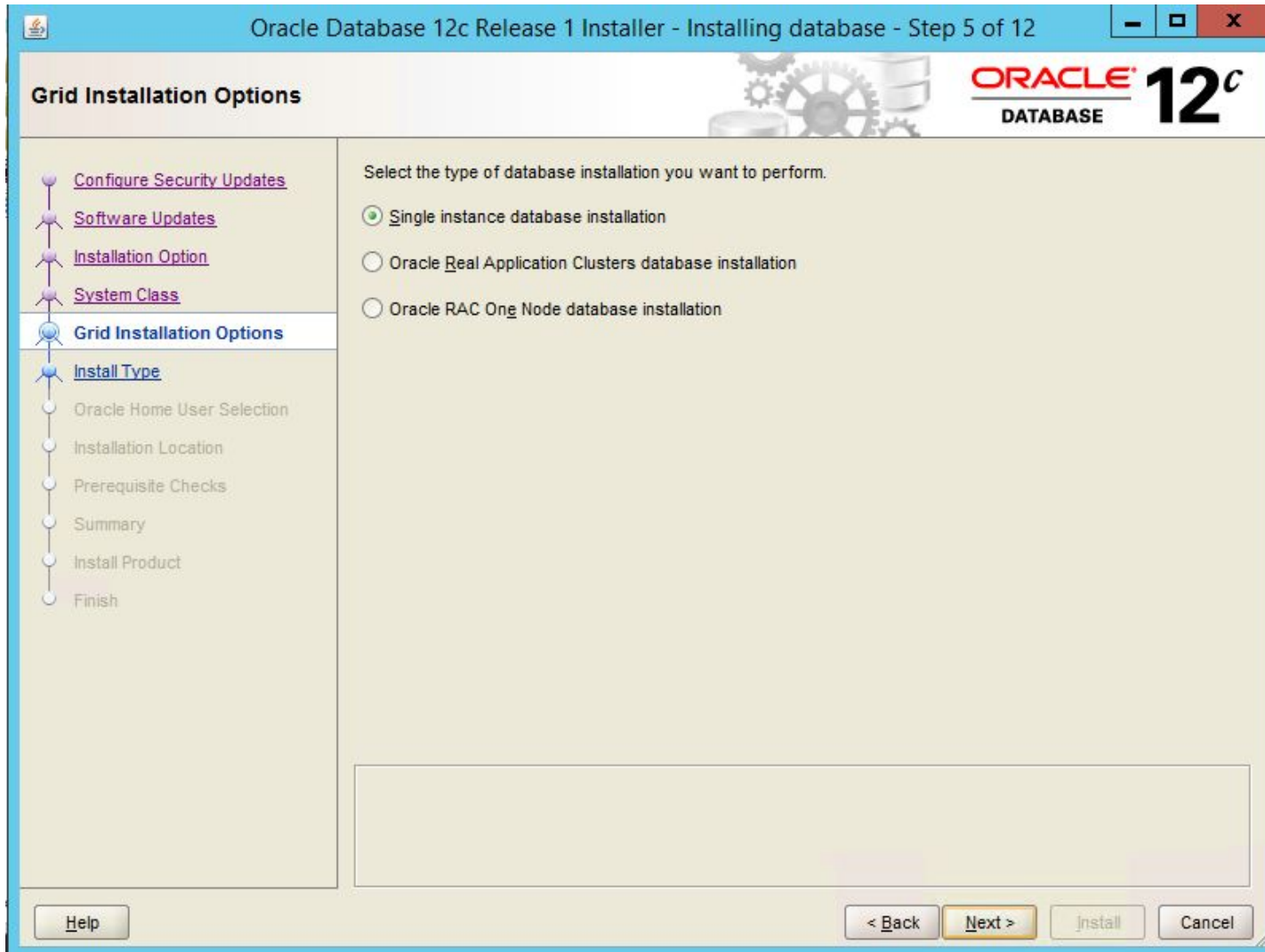
# Инсталляция ORACLE 12c EE



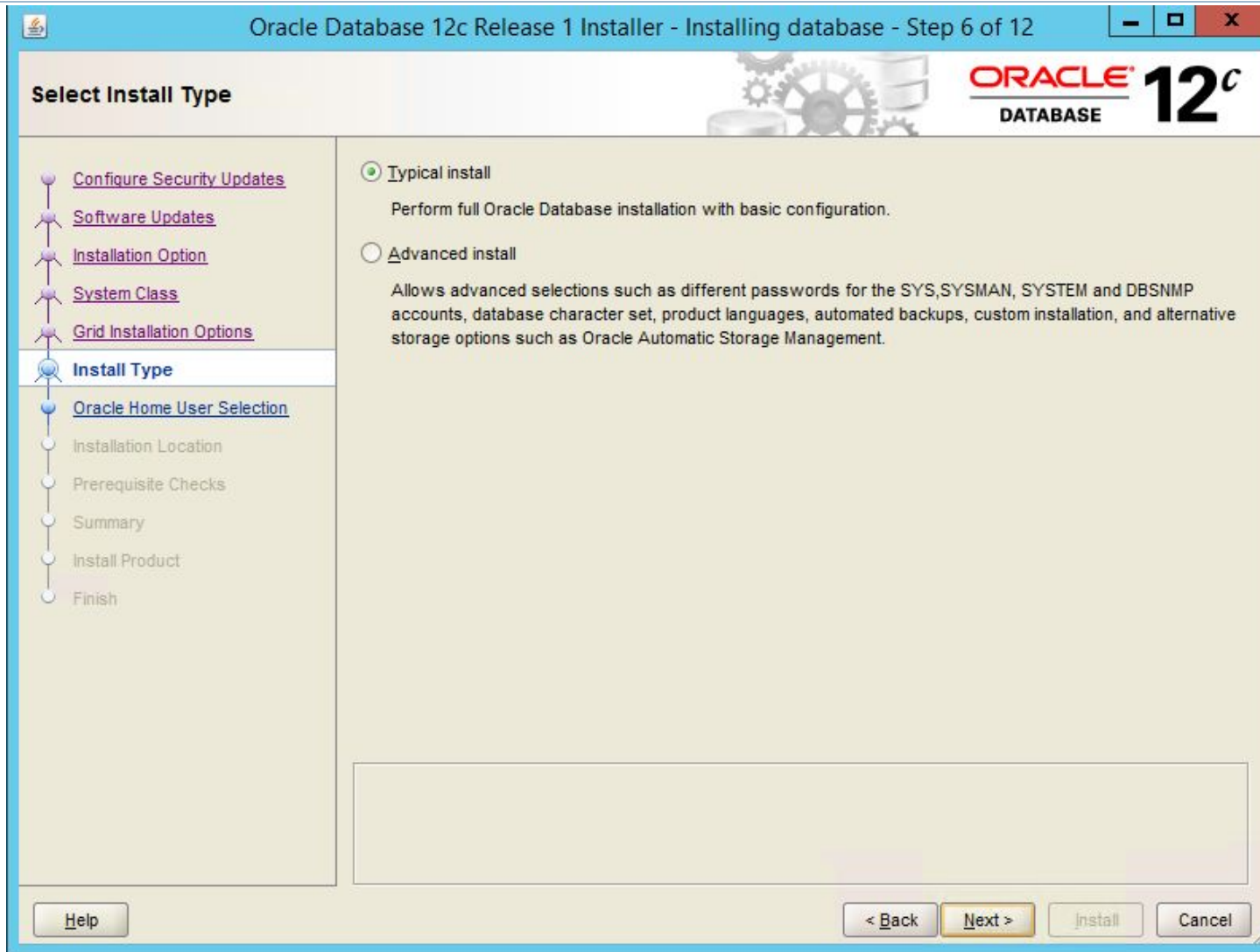
# Инсталляция ORACLE 12c EE



# Инсталляция ORACLE 12c EE



# Инсталляция ORACLE 12c EE



# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 7 of 12

## Specify Oracle Home User

Oracle recommends that you specify a standard Windows User Account (not an Administrator account) to install and configure the Oracle Home for enhanced security. This account is used for running the Windows Services for the Oracle Home. Do not log in using this account to perform administrative tasks.

Use Existing Windows User

User Name:

Password:

Create New Windows User

User Name:

Password:

Confirm Password:

The newly created user is denied Windows logon privileges.

Use Windows Built-in Account

[Configure Security Updates](#)

[Software Updates](#)

[Installation Option](#)

[System Class](#)

[Grid Installation Options](#)

[Install Type](#)

**Oracle Home User Selection**

[Installation Location](#)

Prerequisite Checks

Summary

Install Product

Finish

Help

< Back Next > Install Cancel

# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 7 of 12

## Specify Oracle Home User

ORACLE 12c DATABASE

Oracle recommends that you specify a standard Windows User Account (not an Administrator account) to install and configure the Oracle Home for enhanced security. This account is used for running the Windows Services for the Oracle Home. Do not log in using this account to perform administrative tasks.

- [Configure Security Updates](#)
- [Software Updates](#)
- [Installation Option](#)
- [System Class](#)
- [Grid Installation Options](#)
- [Install Type](#)
- Oracle Home User Selection**
- [Installation Location](#)
- Prerequisite Checks
- Summary
- Install Product
- Finish

Use Existing Windows User

User Name:

Password:

Create New Windows User

User Name:

Password:

Confirm Password:

The newly created user is denied Windows logon privileges.

Use Windows Built-in Account

Help < Back Next > Install Cancel



# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 8 of 12

## Typical Install Configuration

ORACLE 12<sup>c</sup> DATABASE

Perform full database installation with basic configuration.

**Configure Security Updates**

**Software Updates**

**Installation Option**

**System Class**

**Grid Installation Options**

**Install Type**

**Oracle Home User Selection**

**Typical Installation**

**Prerequisite Checks**

Summary

Install Product

Finish

Oracle base: C:\app\ora\_install\_user Browse...

Software location: C:\app\ora\_install\_user\product12.1.0\dbhome\_1 Browse...

Storage type: File system

Database file location: C:\app\ora\_install\_user\oradata Browse...

Database edition: Enterprise Edition (6.0GB)

Global database name: orcl.be.by

Administrative password: ●●●●●●

Confirm password: ? ●●●●●●

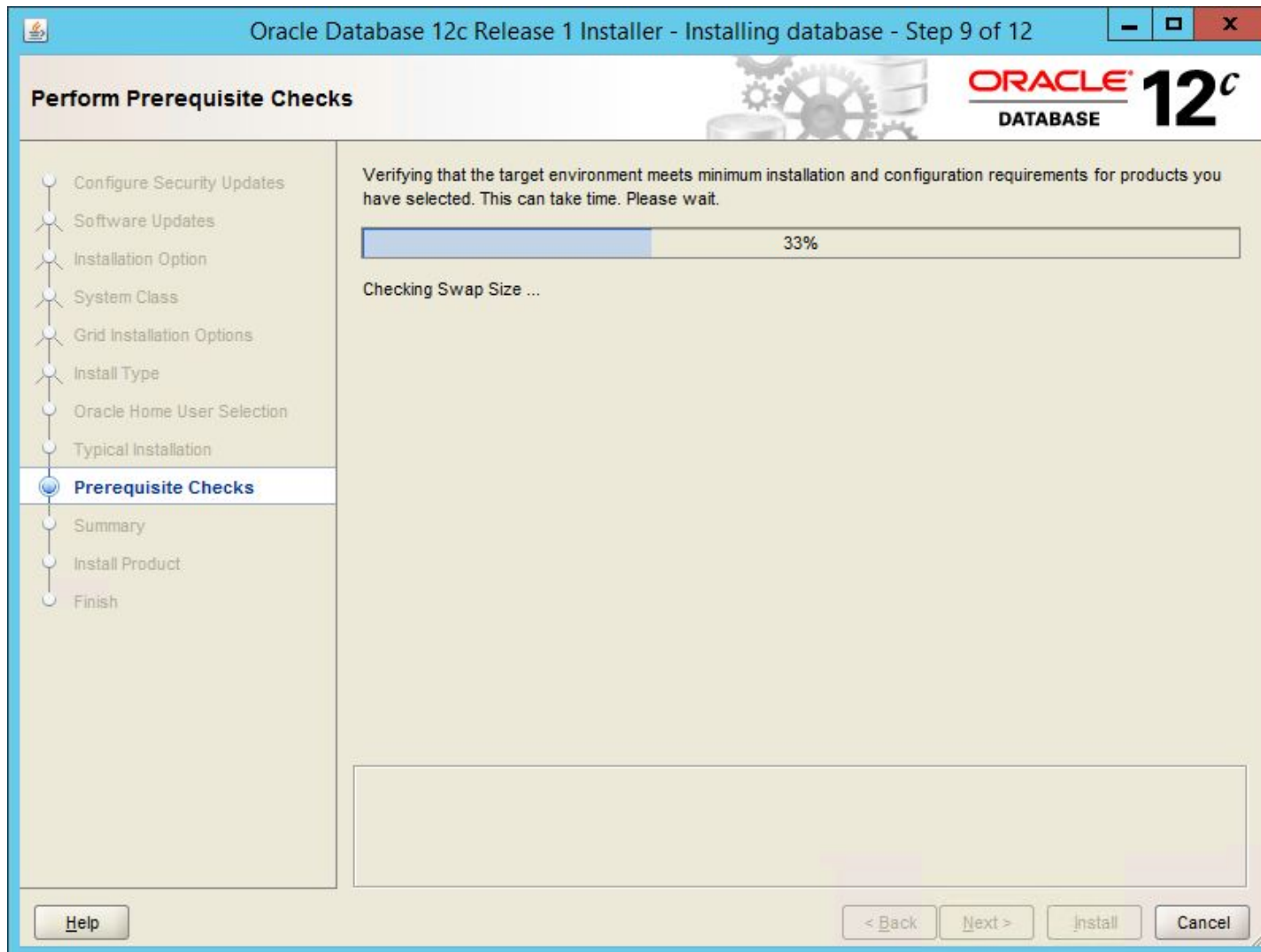
Service name:

Create as Container database

Pluggable database name: pdborcl

Help < Back Next > Install Cancel

# Инсталляция ORACLE 12c EE



# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 10 of 12

**Summary**

[Configure Security Updates](#)  
[Software Updates](#)  
[Installation Option](#)  
[System Class](#)  
[Grid Installation Options](#)  
[Install Type](#)  
[Oracle Home User Selection](#)  
[Typical Installation](#)  
[Prerequisite Checks](#)  
**Summary**  
[Install Product](#)  
[Finish](#)

**Oracle Database 12c Release 1 Installer**

- Global settings**
  - Disk space: required 6.0 GB available 30.97 GB [\[Edit\]](#)
  - Oracle Home User Selection: ora\_install\_user
  - Source location: D:\Oracle\_12c\_winx64\database\install\stage\products.xml
  - Install method: Typical installation [\[Edit\]](#)
  - Database edition: Enterprise Edition (Create and configure a database) [\[Edit\]](#)
  - Oracle base: C:\app\ora\_install\_user [\[Edit\]](#)
  - Software location: C:\app\ora\_install\_user\product\12.1.0\dbhome\_1 [\[Edit\]](#)
  - OraMTS Port Number: 49156
- Inventory information**
  - Inventory location: C:\Program Files\Oracle\Inventory
- Database information**
  - Configuration: General Purpose / Transaction Processing
  - Global database name: orcl.bte.by [\[Edit\]](#)
  - Oracle system identifier (SID): orcl [\[Edit\]](#)
  - Pluggable database name: pdborcl [\[Edit\]](#)
  - Allocated memory: 1600 MB
  - Automatic memory management option: TRUE
  - Database character set : Cyrillic (CL8MSWIN1251)
  - Management method: Database express

[Save Response File...](#)

[Help](#) [< Back](#) [Next >](#) [Install](#) [Cancel](#)

# Инсталляция ORACLE 12c EE

Oracle Database 12c Release 1 Installer - Installing database - Step 11 of 12

## Install Product

Progress

0%

Loading products list. Please wait.

Status

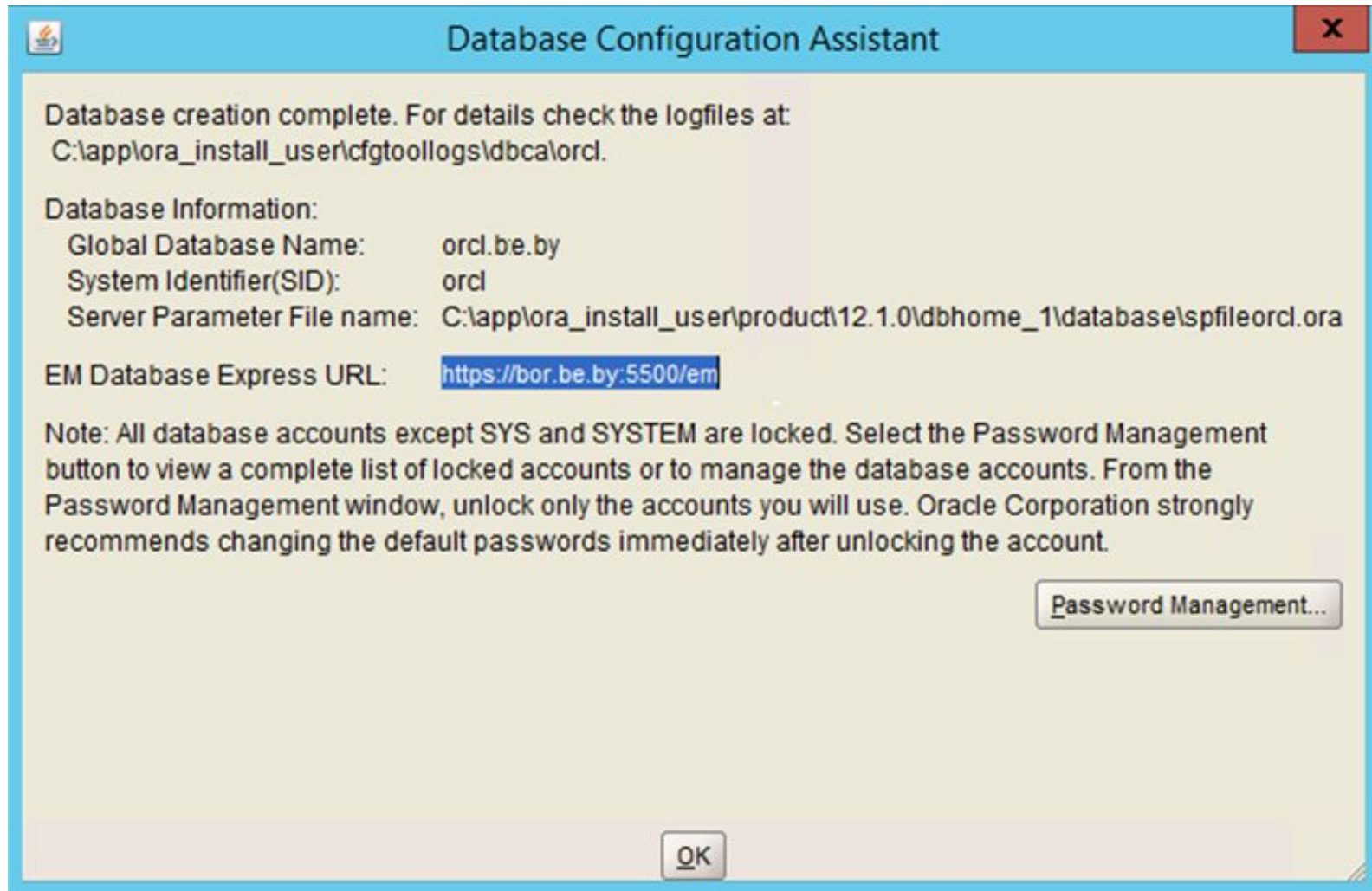
➔ Oracle Database installation	In Progress
➔ • Prepare	In Progress
• Copy files	Pending
• Setup	Pending
Oracle Database configuration	Pending

Details Retry Skip

ORACLE 12c DATABASE

Help < Back Next > Install Cancel

# Инсталляция ORACLE 12c EE



# Инсталляция ORACLE 12c EE

Password Management

Lock / unlock database user accounts and / or change the default passwords:

User Name	Lock Account? ▲	New Password	Confirm Password
SYSTEM		●●●●●●	●●●●●●
SYS		●●●●●●	●●●●●●
LBACSYS	✓		
OUTLN	✓		
FLAWS_FILES	✓		
DVF	✓		
MDSYS	✓		
ORDSYS	✓		
DBSNMP	✓		
WMSYS	✓		
APEX_040200	✓		
APPQOSSYS	✓		
GSMADMIN_INTERNAL	✓		
ORDDATA	✓		
CTXSYS	✓		
ANONYMOUS	✓		

OK Cancel

# Список пользователей и паролей по умолчанию

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- SYSTEM – MANAGER
- SYS – CHANGE\_ON\_INSTALL
- SCOTT – TIGER



# Как проверить установку?

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- Сервисы
- Список установленных программ
- Редактор реестра
- Установщик Universal Installer
- Пользователи и группы
- Соединение с базой данных









# Программы ORACLE 12c

Oracle - OraDB12Home1

-  Administration Assistant for... **NEW**
-  Database Configuration Assi... **NEW**
-  Database Migration Assista... **NEW**
-  Database Upgrade Assistant **NEW**
-  Locale Builder **NEW**
-  Net Configuration Assistant **NEW**
-  Net Manager **NEW**
-  Oracle ODBC Help **NEW**
-  Oracle Provider for OLE DB... **NEW**
-  SQL Developer **NEW**

-  SQL Plus **NEW**
-  Universal Installer
-  Update Password for Oracle Ho...
-  Wallet Manager **NEW**











# Сервисы ORACLE 12c

NETWORK STORE INTERFACES SERVICE	This service m...	Running	Automatic	Local Se
Optimize drives	Helps the c...		Manual	Local Sy
OracleJobSchedulerORCL			Disabled	.\ora_in:
OracleOraDB12Home1MTSRecoveryService		Running	Automatic	.\ora_in:
OracleOraDB12Home1TNSListener		Running	Automatic	.\ora_in:
OracleRemExecServiceV2		Running	Manual	Local Sy
OracleServiceORCL		Running	Automatic	.\ora_in:
OracleVssWriterORCL		Running	Automatic	.\ora_in:
Performance Counter DLL Host	Enables rem...		Manual	Local Se



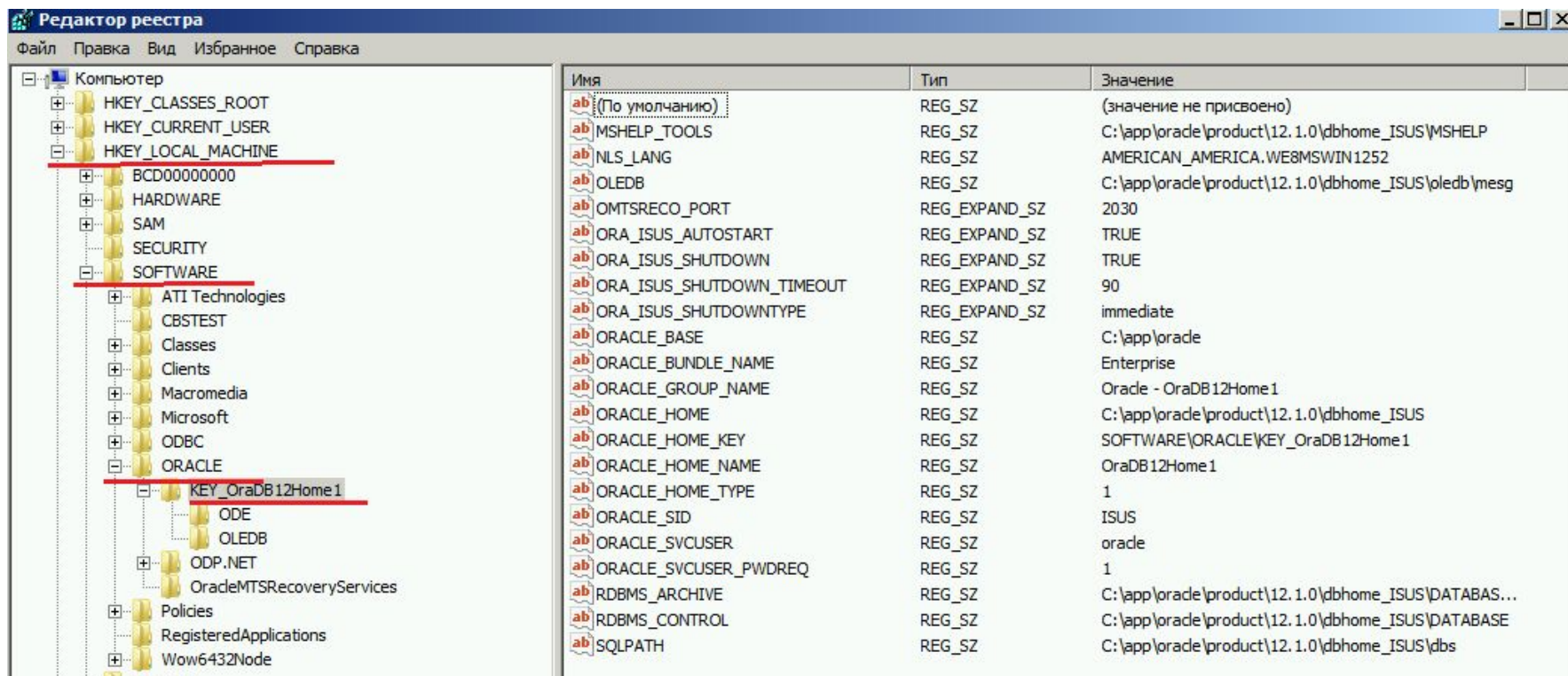
# Пользователи и группы ORACLE 12c

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 Users	Users are prevented from making ...
 ORA_ASMDBA	ORA_ASMDBA
 ORA_ASMOPER	ORA_ASMOPER
 ORA_CLIENT_LISTENERS	ORA_CLIENT_LISTENERS
 ora_dba	Oracle DBA Group
 ORA_GRID_LISTENERS	ORA_GRID_LISTENERS
 ORA_INSTALL	ORA_INSTALL
 ORA_OPER	ORA_OPER
 ORA_OraDB12Home1_DBA	ORA_OraDB12Home1_DBA
 ORA_OraDB12Home1_OPER	ORA_OraDB12Home1_OPER



# Редактор реестра



The screenshot shows the Windows Registry Editor window. The left pane displays the tree view of the registry, with the path `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\KEY_OraDB12Home1` selected. The right pane shows a list of registry values with the following columns: Имя (Name), Тип (Type), and Значение (Value).

Имя	Тип	Значение
(По умолчанию)	REG_SZ	(значение не присвоено)
MSHELP_TOOLS	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS\MSHELP
NLS_LANG	REG_SZ	AMERICAN_AMERICA.WE8MSWIN1252
OLEDB	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS\oledb\mesg
OMTSRECO_PORT	REG_EXPAND_SZ	2030
ORA_ISUS_AUTOSTART	REG_EXPAND_SZ	TRUE
ORA_ISUS_SHUTDOWN	REG_EXPAND_SZ	TRUE
ORA_ISUS_SHUTDOWN_TIMEOUT	REG_EXPAND_SZ	90
ORA_ISUS_SHUTDOWNTYPE	REG_EXPAND_SZ	immediate
ORACLE_BASE	REG_SZ	C:\app\orade
ORACLE_BUNDLE_NAME	REG_SZ	Enterprise
ORACLE_GROUP_NAME	REG_SZ	Oracle - OraDB12Home1
ORACLE_HOME	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS
ORACLE_HOME_KEY	REG_SZ	SOFTWARE\ORACLE\KEY_OraDB12Home1
ORACLE_HOME_NAME	REG_SZ	OraDB12Home1
ORACLE_HOME_TYPE	REG_SZ	1
ORACLE_SID	REG_SZ	ISUS
ORACLE_SVCUSER	REG_SZ	orade
ORACLE_SVCUSER_PWDREQ	REG_SZ	1
RDBMS_ARCHIVE	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS\DATABAS...
RDBMS_CONTROL	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS\DATABASE
SQLPATH	REG_SZ	C:\app\orade\product\12.1.0\dbhome_ISUS\dfs

# Основные системные пользователи Oracle

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- ▣ **SYSTEM** - генерируемый Oracle (предопределенный) привилегированный пользователь, которому принадлежат ключевые ресурсы БД Oracle (представления словаря БД, репозиторий инструментов, ...).
- ▣ **SYS** – генерируемый Oracle (предопределенный) привилегированный пользователь ранга администратора базы данных (АБД), который является владельцем ключевых ресурсов БД Oracle (модули Oracle, таблицы словаря БД, V\$-представления словаря, ...)



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## Системная роль Администратора базы данных

- ▣ **DBA** – предопределенная роль, которая автоматически создаётся для каждой базы данных Oracle и содержит все системные привилегии, кроме SYSDBA и SYSOPER. Должна назначаться только администраторам, которым требуется полный доступ.



# Специальные системные привилегии

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- **SYSDBA** и **SYSOPER** - специальные привилегии администратора, которые позволяют выполнять базовые задачи администрирования: запуск или остановка экземпляра БД; создание, удаление, открытие или монтирования базы и др.
- Роль **DBA** не включает **SYSDBA** и **SYSOPER**. Привилегии могут быть указаны при подключении (`connect`) пользователя к БД.



## Установка соединения с экземпляром

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- SQL plus
- SQL Developer

### SQL Developer:

<http://www.oracle.com/technetwork/developer-tools/sql-developer/downloads/index.html>





# Установка соединения SQLPlus

```
Administrator: C:\Windows\system32\cmd.exe - sqlplus /nolog
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\Users\serve>sqlplus /nolog
SQL*Plus: Release 12.1.0.1.0 Production on Mon Sep 5 04:49:38 2016
Copyright (c) 1982, 2013, Oracle. All rights reserved.
SQL> connect /as sysdba
Connected.
SQL> _
```

```
Administrator: C:\Windows\system32\cmd.exe - sqlplus /nolog
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\Users\serve>sqlplus /nolog
SQL*Plus: Release 12.1.0.1.0 Production on Mon Sep 5 04:49:38 2016
Copyright (c) 1982, 2013, Oracle. All rights reserved.
SQL> connect /as sysdba
Connected.
SQL> connect system/Pa$$w0rd@orcl
Connected.
SQL> _
```

# Установка соединения SQL Developer

The screenshot displays the SQL Developer interface with the 'New / Select Database Connection' dialog box open. The background shows a tree view of database objects for a connection named 'sys\_to\_ord', including Tables, Views, Packages, and others. The dialog box is titled 'New / Select Database Connection' and contains the following fields and options:

Connection Name	Connection Details
sys_to_ord	system@//localhost...

Connection Name: sys\_to\_ord  
Username: system  
Password: .....

Save Password  Connection Color

**Oracle** Access

Connection Type: Basic Role: default

Hostname: localhost  
Port: 1521  
 SID: orcl  
 Service name

OS Authentication  Kerberos Authentication  Proxy Connection

Status : Success

Buttons: Справка, Save, Clear, **Test**, Connect, Отмена

# Установка соединения SQL Developer

The screenshot shows the 'New / Select Database Connection' dialog box in SQL Developer. The dialog is titled 'New / Select Database Connection' and has a close button (X) in the top right corner. It contains a table with two columns: 'Connection Name' and 'Connection Details'. The first row shows 'sys\_to\_orcl' and 'system@//localhost...'. Below the table, there are several input fields and checkboxes. The 'Connection Name' field is set to 'sys'. The 'Username' field is set to 'sys'. The 'Password' field is masked with dots. There is a checked checkbox for 'Save Password' and a 'Connection Color' dropdown menu. Below these, there are tabs for 'Oracle' and 'Access'. The 'Oracle' tab is selected, and the 'Access' sub-tab is also selected. The 'Connection Type' is set to 'Basic' and the 'Role' is set to 'SYSDBA'. The 'Hostname' field is set to 'localhost', the 'Port' is set to '1521', and the 'SID' radio button is selected with the value 'ord'. The 'Service name' radio button is unselected. At the bottom, there are three unselected checkboxes: 'OS Authentication', 'Kerberos Authentication', and 'Proxy Connection'. The 'Status' is 'Success'. At the bottom of the dialog, there are five buttons: 'Справка', 'Save', 'Clear', 'Test', and 'Connect', followed by 'Отмена'.

Connection Name	Connection Details
sys_to_orcl	system@//localhost...

Connection Name: sys  
Username: sys  
Password: .....

Save Password     Connection Color

**Oracle** Access

Connection Type: Basic    Role: SYSDBA

Hostname: localhost  
Port: 1521  
 SID: ord  
 Service name:

OS Authentication     Kerberos Authentication     Proxy Connection

Status : Success

Buttons: Справка, Save, Clear, Test, Connect, Отмена

# Установка соединения SQL Developer

The screenshot shows the 'New / Select Database Connection' dialog box in SQL Developer. The dialog is titled 'New / Select Database Connection' and has a close button (X) in the top right corner. It is divided into several sections:

- Table:** A table with two columns: 'Connection Name' and 'Connection Details'. It contains one entry: 'sys\_to\_orcl' with details 'system@//localhost...'. Below the table is a large empty area.
- Connection Name:** A text field containing 'system\_to\_orcl'.
- Username:** A text field containing 'system'.
- Password:** A text field containing '.....'.
- Options:** A checked checkbox for 'Save Password' and a 'Connection Color' button with a color selection icon.
- Oracle Access:** A section with a tab labeled 'Oracle' and the word 'Access' next to it. It contains:
  - Connection Type:** A dropdown menu set to 'Basic'.
  - Role:** A dropdown menu set to 'default'.
  - Hostname:** A text field containing 'bor.be.by'.
  - Port:** A text field containing '1521'.
  - Authentication:** Radio buttons for 'SID' (selected) and 'Service name'. The 'SID' field contains 'ord'.
  - Advanced Options:** Three unchecked checkboxes: 'OS Authentication', 'Kerberos Authentication', and 'Proxy Connection'.
- Status:** A label 'Status : Success'.
- Buttons:** A row of buttons: 'Справка' (Help), 'Save', 'Clear', 'Test' (highlighted with an orange border), 'Connect', and 'Отмена' (Cancel).

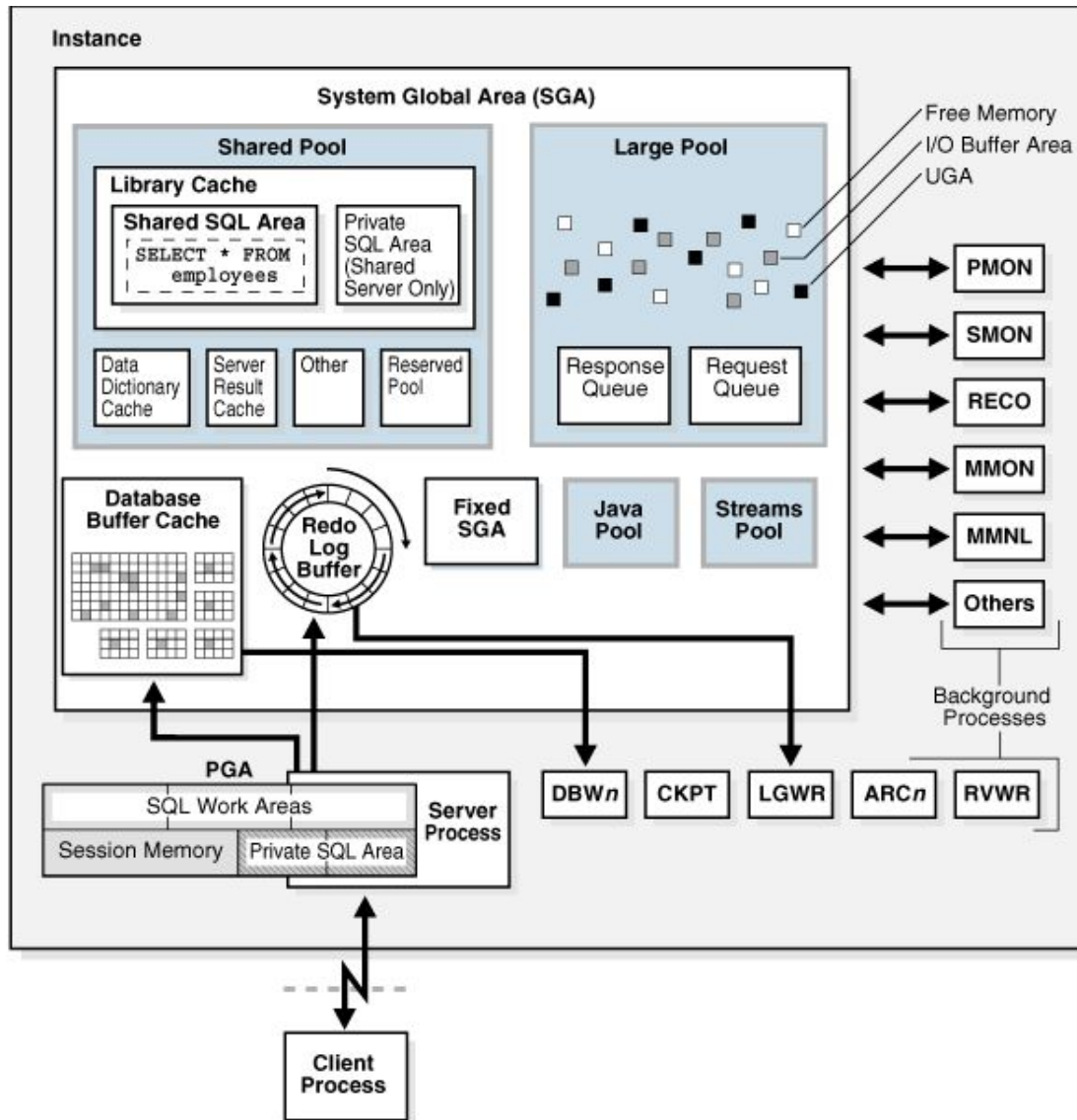
# Экземпляр Oracle (инстанс)

---

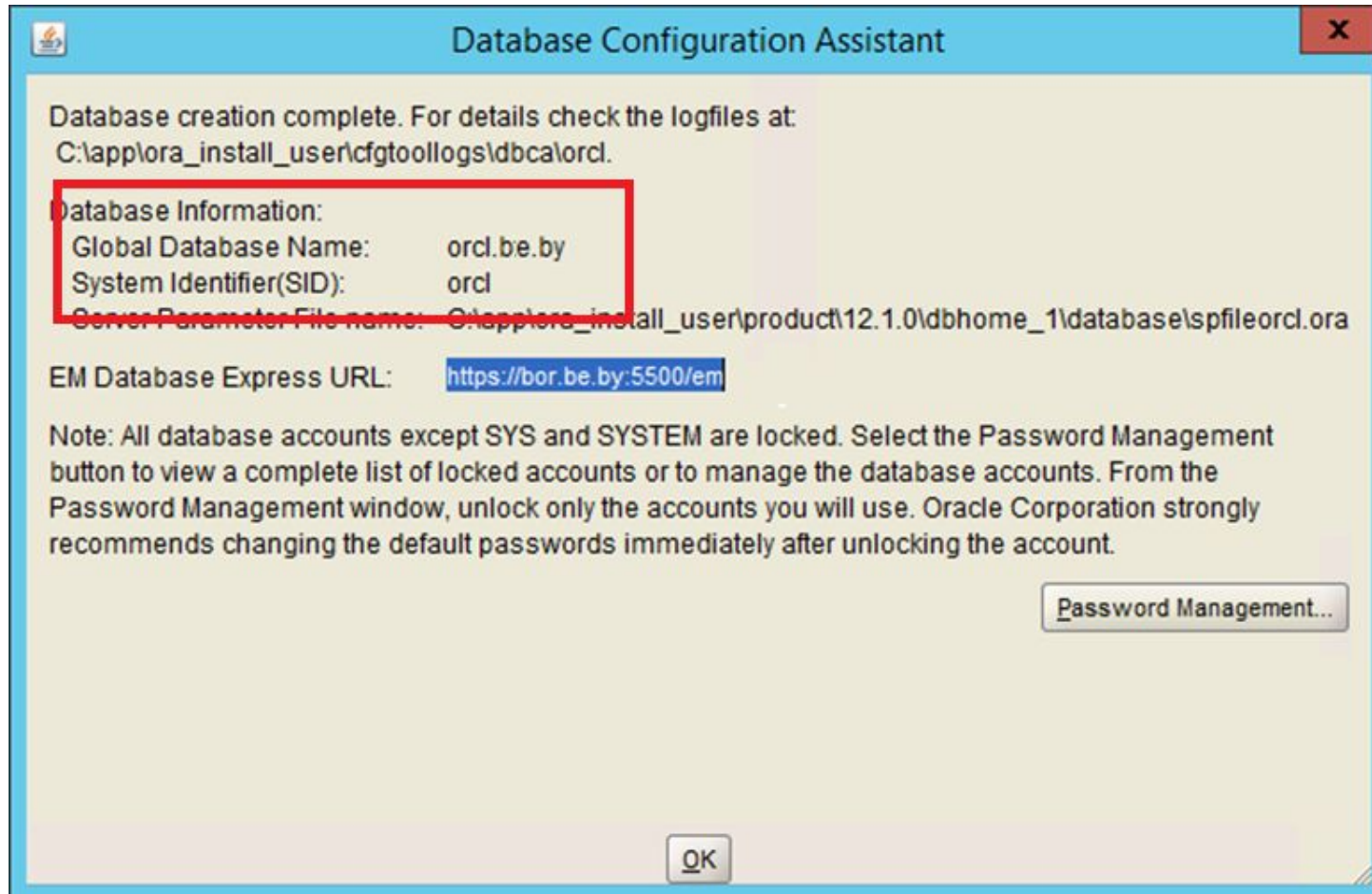
- запущенный сервер (программа) СУБД Oracle
- общая (глобальная) область памяти (SGA – system global area) и др. системные области памяти
- фоновые процессы, предназначенные для управления файлами базы данных.



# Архитектура экземпляра Oracle

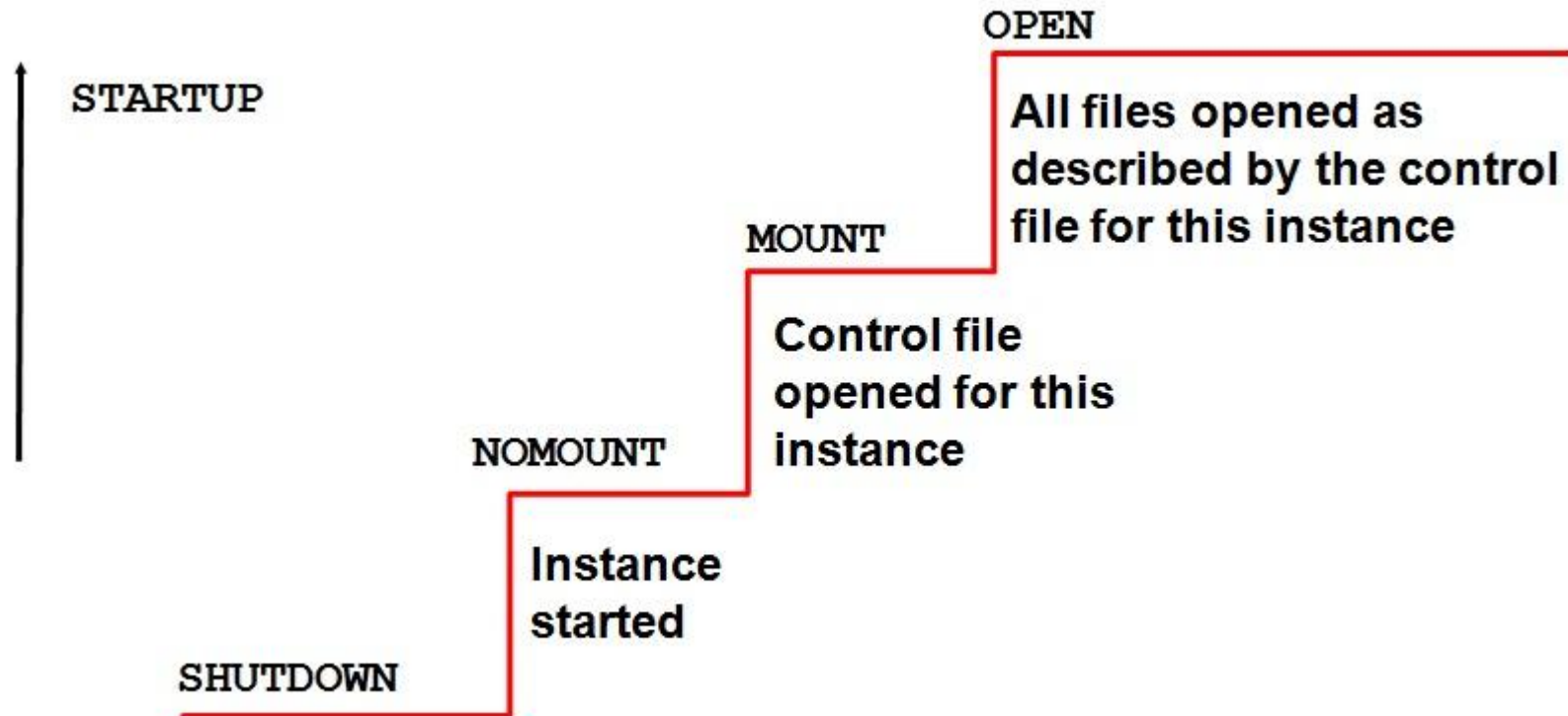


# SID – system identifier и Global Database Name



# Запуск и остановка экземпляра

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```
SQL> connect /as sysdba;  
Connected.  
SQL>  
SQL>  
SQL>  
SQL>  
SQL>  
SQL> shutdown immediate;  
Database closed.  
Database dismounted.  
ORACLE instance shut down.  
SQL>
```

```
SQL> connect /as sysdba;  
Connected to an idle instance.  
SQL>  
SQL>  
SQL>  
SQL>  
SQL> startup;  
ORACLE instance started.  
  
Total System Global Area 1720328192 bytes  
Fixed Size 2403496 bytes  
Variable Size 1023411032 bytes  
Database Buffers 687865856 bytes  
Redo Buffers 6647808 bytes  
Database mounted.  
Database opened.  
SQL>
```

# Запуск и остановка экземпляра

```
CA: Командная строка - sqlplus /nolog
SQL>
SQL>
SQL> connect /as sysdba;
Connected to an idle instance.
SQL>
SQL>
SQL>
SQL>
SQL> startup nomount;
ORACLE instance started.

Total System Global Area 1720328192 bytes
Fixed Size                  2403496 bytes
Variable Size               1023411032 bytes
Database Buffers            687865856 bytes
Redo Buffers                 6647808 bytes
SQL>
SQL>
SQL> alter database mount;
Database altered.

SQL> alter database open;
Database altered.

SQL>
```



# Вопросы?

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