三思笔记系列文章 之

手把手教你在 Linux 环境部署 Oracle 11gR2 RAC

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本文基于 VirtualBox 虚拟化软件维护虚拟机, Oracle Enterprice Linux 6.0+Oracle11gR2 部署 RAC 集群数据库环境。本书出现的所有软件均可在互联网中免费下载获得。

1、背景资料扫盲

安装 Oracle Clusterware 和 Oracle Database,使用 DBCA 创建数据库。做为数据库管理员,安装后需要多三个维度管理 RAC 环境:

- 实例管理;
- 数据库管理;
- 集群管理;

我们下面先简要介绍 RAC 安装的步骤。 更详细的内容可以参考官方文档,与 RAC 特性相关的文档主要有下列四个:

- Oracle Real Application Clusters Administration and Deployment Guide
- Oracle Clusterware Administration and Deployment Guide
- <u>Oracle Real Application Clusters Installation Guide for Linux and UNIX</u> (or other operating system)
- <u>Oracle Grid Infrastructure Installation Guide for Linux</u> (or other operating system)

1.1 理解 RAC 环境中的兼容性

在同一个集群中安装不同的数据库版本,必须安装集群件。举例来说,要在同一个集群 中同时安装 9i 和 10g:

- 对于运行 9i 的 RAC 节点,必须要安装 9i 集群:
 - 对于 UNIX 系统, 集群件可以是 HACMP/Service Guard/Sun Clusterware/Veritas SF 等;
 - 对于 Windows 或 Linux, 集群件可以是 Oracle Cluster Manager;
- 对于 10g 或以上版本的 RAC, 必须安装 Oracle Clusterware。对于 11gR2 版本, 必 须 安 装 Grid 组 件 具 体 可 以 参 考 , . http://docs.oracle.com/cd/E11882 01/install.112/e22489/toc.htm 。
- 如果运行 10g 或 11gRac 在同一套集群,则必须运行 Clusterware11g。

1.2 RAC 安装和建库

安装了 Clusterware 及其部件,运行 Universal Installer 安装 Oracle 数据库软件。在安装 过程中,可以选择创建数据库,它会自动调用 DBCA 创建数据库。

提示:

如果选择在安装软件时建库,那么必须启动默认监听,否则 DBCA 会报错,并提示运行 NETCA 以创建默认监听。

Oracle RAC 软件是做为数据库安装包的一部分存在的。默认情况下,如果它识别到正 在集群环境中安装,数据库软件安装进程也会安装 RAC 选项。安装程序将 RAC 安装到结 构类似 ORACLE_HOME 的目录下,以区分系统上运行的不同软件。因为安装程序是集群件, 它会将 RAC 软件装到集群定义的所有节点中。

ORACLE 建议用户选择 ASM 做为存储管理。ASM 能够自动所有数据库文件。如果计 划基于 ORACLE 标准版创建 RAC 数据库,那么就必须使用 ASM 保存所有的数据库文件。

提示: 必须在创建 RAC 数据库前单独配置 ASM。

默认情况下,ORACLE 数据库为 RAC 的安装创建一个服务,这个服务用于数据库。默 认数据库服务是按照 db_name.db_domain 来识别。在 RAC 环境中该默认服务对所有实例有 效,除非数据库是处于 restricted 模式。

提示:

集群件安装完成后就要避免修改主机名,包括增加或者删除域名中的域标识。修改了主 机名的节点,必须先从集群中删除,而后再添加进来才行。

1.3 Grid 扩展

可以在 Grid 环境中通过复制一份镜像到其它节点的方式扩展 ORACLE RAC。克隆到的目标节点应该拥有类似的软硬件环境。通过克隆的方式是最简便的扩展 RAC 环境的方式。

ORACLE 提供了下列方式扩展 RAC 环境:

- 通 过 克 隆 脚 本 , 详 见 http://docs.oracle.com/cd/E11882_01/rac.112/e16795/clonerac.htm
- 通过 Oracle EM 克隆;
- 通过 addNoe.sh 脚本及安装管理工具克隆;

提示:

Oracle 克隆不是要替换 EM 中的克隆,而只是提供另种备用方案。在 EM 克隆过程中, provisioning 进程包括一系列步骤,比如捕获的目录,部署的目录,以及其它各种参数。

对于新的安装,或者只安装一个 RAC 数据库,用户需要用传统自动化交互安装方式, 比如 Oracle Universal Installer,或者是 EM 是提供的 Provisioning Pack 特性。如果目地是要 添加或删除当前集群中的节点,那么可以参考下列步骤: <u>Chapter 10, "Adding and</u> Deleting Oracle RAC from Nodes on Linux and UNIX Systems".

克隆过程假定用户已经成功安装了集群件,并且 RAC 环境中至少已经有了一个节点,并且,所有 root 要执行的脚本,在要扩展的节点上已经执行过了。

站在列高层次, Oracle 克隆调用下列的主要任务:

- 1. 克隆集群件;
- 2. 克隆 RAC 软件的 HOME 目录;
- 3. 如果当前还没有数据库,那么执行 DBCA 创建一个;
- 4. 按照克隆的步骤完成 RAC 环境的扩展;

:

1.4 关于 Grid 基础框架和 RAC

从 11gR2 版本开始, Clusterware 和 ASM 将安装到相同目录,现在被称为 Grid 主目录。 Grid 框架是一系列复合产品的总和, Clusterware 和 ASM 仍然是独立的产品。

Clusterware 允许将一堆服务器(hosts 或 nodes)看成一个服务器来操作,这也被称为一个 集群(a cluster)。尽管各个服务器物理上仍然是独立的,每个服务器都拥有额外的进程与其它 服务器通讯。这样每个服务器都做为一个独立的服务响应应用和用户。Oracle Clusterware 提供框架易于运行 RAC。多个服务器复合相比单台服务器,能够提供更高的可用性,吞吐 和伸缩性。

注意:

默认情况下,命名用户可以创建 server pool。要限制操作系统用户拥有这个权限,Oracle 强烈建议用户增加指定用户到 CRS 管理员列表。详见集群件管理与部署文件中的内容。

1.5 关于 Oracle Automatic Storage Management(ASM)

Oracle ASM 是一套完整的高性能的卷管理文件系统。在 11gR2 版本中, ASM 能够支持 存储集群件的 OCR 和 voting disk 文件。也被称为 Oracle ACFS(Oracle Automatic Storage Management Cluster File System)

ASM 能够将存储系统中的磁盘分组管理。用户只要管理少量的磁盘组,ASM 能够自动 分配磁盘组存储数据文件。OCR 和仲裁文件也能被放在 ASM 磁盘组中。要使用 RAC 特性, 每个实例都必须拥有访问数据文件和恢复文件的权限,ASM 是实现这类需求的最简便方式。

在下图中,ASM中的普通冗余磁盘组包括三个 failure 组(也可以理解为三个磁盘),用 于保存仲裁磁盘和 OCR 文件。因为仲裁盘中记录哪个节点是集群中的当前成员,对于双节 点的集群,至少要有三个仲裁盘。如果 ASM 磁盘组中不包含仲裁盘和 OCR 的话,那么普 通冗余磁盘组中可以只建两个 failure 组。



ASM 提供下列特性:

- 条带(Striping): ASM 能够将数据平均分布到各个磁盘,以优化性能并提高利用率;
- 镜像(Mirroring): ASM 通过镜像文件的方式,提升数据可用性。ASM 的镜像是在 文件级,不像操作系统的镜像是在磁盘级。镜像也表示保持冗余备份,或镜像复制, 来避免磁盘故障导致的文件损坏。每个文件的镜像复制肯定跟其原始文件不在同一 块磁盘。这样就算某块磁盘故障,ASM 照样能够从镜像盘中继续读取文件;
- 联机存储重置和动态平衡:使用 ASM 时,甚至可以在数据库操作过程中,仍然增加或删除磁盘。如果增加磁盘到磁盘组,ASM 自动重新分配数据在磁盘组中的存储位置,利用上新增加的磁盘。这种重新给数据分配存储位置的操作过程也被称为rebalancing。这是项后台任务,对前端完全透明,而且基本不影响性能。
- 管理文件创建和删除: ASM 通过允许数据库管理存储在 ASM 中磁盘组的方式进一步减少管理任务。ASM 会在文件创建时自动命名,并且能够在数据库删除文件时,自动将该文件从存储中删除。

Oracle Automatic Storage Management Cluster File System(简称 Oracle ACFS),是种新的 跨平台、易伸缩的文件系统、扩展自 ASM 存储管理技术以支持自定义文件管理。ACFS 即 能够支持数据库和应用的各项文件,包括 trace files, alert logs, application reports, BFILEs 以 及配置文件。ACFS 提供了动态文件大小调整、条带和镜像。

ASM 可视做一种特殊类型的 Oracle 实例,拥有独立的 SGA 和后台进程。ASM 实例与 Clusterware 和 database 紧密结合。每个使用 ASM 做为存储的数据库服务器上都要有一个 ASM 实例。在 RAC 环境中,每个节点都有一个 ASM 实例,不过也可以多个数据库实例使 用一个 ASM 实例。

下图展示双节点 RAC 的存储结构:



Oracle 建议用户使用 ASM 而非操作系统文件系统。不过 ORACLE 数据库能够同时使用 ASM 和非 ASM 的文件。同样也可以在 ACFS 中存储非 ORACLE 的文件。

1.6 关于 Oracle Real Application Clusters

RAC 扩展 ORACLE 数据库,使用户可以更新、存储并且高效地,同时从不同服务器上运行的,多个数据库实例中操作数据。RAC 能够统一管理多个服务器和实例。数据文件必须保存在共享存储上。

传统单实例 Oracle 数据库的数据文件和实例之间是一对一的关系,不过对于 RAC 数据 库,数据库和实例间是一对多的关系,多个实例同时访问同一份数据库文件。

RAC 数据库中的每个实例都拥有独立的内存结构和后台进程。RAC 使用 Cache Fusion 技术同步实例的 buffer cache 中保存的缓存数据。Cache Fusion 将当前数据块(内存中的)在不 同数据库实例间移动,而不是将数据写回执行,再由其它实例从磁盘中读取。当某个实例上的缓存块需要被其它实例读取时, Cache Fusion 使用 interconnect 直接将数据传输到目标实例上,使得数据库操作数据时就像是在同一个缓存池中一样。

RAC 同时也是 guid 计算架构中的重要组成部分。多个实例访问同一份数据文件,也能够防止单点故障,如果集群中的某个节点故障,其它存活的节点仍能继续提供数据库服务。

RAC 能够支持各项主流商业应用,包括 OLAP、DSS,以及流行的软件包产品如 SAP、 PeopleSoft、Siebel 以及 Oracle E*Business Suite,当然还有客户的应用。能够在单实例中运 行的应用到 RAC 中不需要做修改就可以直接部署。

1.7 关于 Oracle RAC One Node

单节点 RAC 是 11gR2 版本中的新特性,说的是 RAC 数据库在集群中只运行于一个节点上。这个特性允许用户以最小成本合并多个数据库到单个集群,保持其计划内或计划外的停机时间。合并后的数据库提升了高可用性和故障保护,联机的滚动 patch,以及 OS/集群滚动升级。

相比单实例数据库的冷故障切换,单节点 RAC 提供了更高的可用性,怎么理解呢,说 的是 ORACLE 提供了一项称为 online database relocation 的技术,能够智能迁移数据库实例, 连接到其它集群中的其它节点,以提供高可用和负载均衡。使用 SRVCTL 执行联机数据库 迁移。

如果应用部署于单节点 RAC,之后发现单节点已难以承载,那么可以轻易的联机方式 升级为 RAC 集群。如果单节点 RAC 超负载,那么可以迁移数据库实例到集群中的其它节 点上,而不需要应用停机。

1.8 关于在不同操作系统安装 RAC

如果计划安装和配置 RAC 环境在不同操作系统,这个场景比较特殊,这里先不体现。

1.9 安装配置与管理 RAC 的工具

本小节介绍安装、配置、管理 ORACLE 集群/ASM/RAC 的工具。

- Oracle Universal Installer(OUI): 图形化的安装界面;
- Cluster Verification Utility(CVU):命令行工具,可用于验证集群范围和 RAC 组织, 比如共享存储设备,网络配置,系统需求以及 ORACLE 集群,同样也包括操作系 统用户组和用户。可以使用 CVU 工具进行安装前/后的集群环境检查。OUI 会在集 群安装后运行 CVU 验证环境。
- Oracle Enterprise Manager: B/S 结构管理实例或 RAC 环境, 拥有数据库控制和 GUID 控制的图形用户界面。
- SQL*Plus: 命令行界面工具,可用于执行数据库管理操作;
- Server Control(SRVCTL): 命令行界面工具,可用于管理 OCR 中定义的资源。这些资源包括节点应用(nodeapps),由 Clusterware,ONS(Oracle Notification Service,GSD(Global Services Daemon),以及 VIP(Virtual IP)组成。其它可被 SRVCTL 管理的资源还包括数据库、实例、监听、服务以及应用程序。使用 SRVCTL 可以启动或停止 nodeapps/databases/instances/listeners/services,增加或移动 instances/services,增加服务,管理配置等;
- Cluster Ready Services Control(CRSCTL): 命令行工具,用于管理 Clusterware 守护

进程。这些进程包括: Cluster Synchronization Services (CSS), Cluster-Ready Services (CRS), and Event Manager (EVM)。可以使用 CRSCTL 启动或停止 Oracle Clusterware 或检查 Clusterware 的当前状态;

- Database Configuration Assistant(DBCA): 一项专门应用, 可用于创建和配置数据库。
- Oracle Automatic Storage Management Configuration Assistant(ASMCA): 支持安装和 配置 ASM 实例、磁盘组、卷和 ACFS,有 GUI 和非 GUI 两种界面;
- Oracle Automatic Storage Management Command Line utility(ASMCMD): 命令行界 面工具,用于管理 ASM 实例、ASM 磁盘组、磁盘组的文件读写权限、ASM 磁盘 组中的文件和目录、磁盘组模板以及 ASM 卷;
- Listener Control(LSNRCTL): 监听控制应用,命令行界面的工具,用于管理监听。

如果安装了 Grid 框架,当管理集群、数据库、实例、ASM、监听时,要使用正确的主目录下的应用。可以设置 ORACLE_HOME 环境变量到适当目录,例如:

- 如果使用 ASMCMD、srvctl、sqlplus、lsnrctl 管理 ASM 或监听,那么其二进制程 序要指向 GRID 的主目录,而不是数据库的主目录;
- 如果使用 srvctl、sqlplus 或 lsnrctl 管理数据库实例或监听,那么其二进制程序要指 向数据库的主目录;

2、安装前的准备工作

接下来就开始执行安装任务。

2.1 软硬件环境准备

硬件环境

虚拟机环境: 两核 4G 内存虚拟机*2 hostname: racnode1,racnode2

软件环境

操作系统: Oracle Enterprise Linux6.0 GRID: linux.x64_11gR2_grid.zip Database : Oracle database 11gR2(linux.x64_11gR2_database_1of2.zip,linux.x64_11gR2_database_2of2.zip)

网络设定

IP 设定如下: #PUBLIC IP: 192.168.10.201 racnode1 192.168.10.202 racnode2 #PRIVATE IP: 10.0.201 racpriv1 10.0.202 racpriv2 #VIP IP: 192.168.10.211 racvip1 192.168.10.212 racvip2 #SCAN IP: 192.168.10.206 racscan

扫盲: 何为 SCAN(Single Client Access Name)

定义的一个网络名及 IP 地址,这样所有客户端均能够通过它访问 RAC 数据库。通过 SCAN,当集群环境发生变化时,就不需要再修改客户端的配置。SCAN 同样允许客户端通 过简易连接串的方式,也能够利用到 RAC 的负载平衡及故障切换特性。

不管是否使用 GNS 都需要 SCAN。如果使用 GNS,那么 ORACLE 会自动创建 SCAN。 如果不使用 GNS,那就必须在 DNS 中定义 SCAN。

磁盘设定

本地磁盘: 各虚拟机节点本地磁盘 100G 共享存储: 两个 50G 磁盘文件用于 ASM;

操作系统用户和用户组

2.2 初始化第一台节点

2.2.1 设置操作系统环境变量

先说一下,也可以不配置,在 OUI 界面中可以由系统自动进行修复。不过这里三思还 是决定手动进行配置:

编辑文件: [root@racnode1~]# vi /etc/security/limits.conf 增加下列内容: oracle soft nproc 2047

oracle	hard	nproc	16384
oracle	soft	nofile	1024
oracle	hard	nofile	65536

编译文件: [root@racnode1~]# vi /etc/selinux/config 修改下列内容(注,重启后才能生效): SELINUX=disabled

编辑文件: [root@racnode1~]# vi /etc/pam.d/login 增加下列内容: session required pam_limits.so

编辑文件:

 [root@racnode1 ~]# vi /etc/sysctl.conf

 增加或修改下列内容:

 fs.aio-max-nr = 1048576

 fs.file-max = 6815744

 kernel.shmall = 2097152

 kernel.shmmax = 4294967296

 kernel.shmmni = 4096

 kernel.sem = 250 32000 100 128

 net.ipv4.ip_local_port_range = 9000 65500

 net.core.rmem_default = 262144

 net.core.rmem_max = 4194304

 net.core.wmem_default = 262144

 net.core.wmem_max = 1048586

 注意上述参数中,需要根据实际情况修改 kernel.shmmax 参数的值,可以直接设置为物

 理內存大小。

执行命令使之生效:

[root@racnode1 ~]# sysctl -p

2.2.2 配置网卡地址

不用说了吧,两个网卡,分别绑定不同的 IP,我们这里 eth0 绑定 publicIP, eht1 绑定 privateIP。配置好后网络如下:

[root@racnode1 ~]# ifconfig

eth0 Link encap:Ethernet HWaddr 08:00:27:FC:F8:BF inet addr:192.168.10.201 Bcast:192.168.10.255 Mask:255.255.255.0 inet6 addr: fe80::a00:27ff:fefc:f8bf/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1

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	RX packets:90517 errors:0 dropped:0 overruns:0 frame:0						
	TX packets:891 errors:0 dropped:0 overruns:0 carrier:0						
	collisions:0 txqueuelen:1000						
	RX bytes:14697382 (14.0 MiB) TX bytes:119465 (116.6 KiB)						
eth1	Link encap:Ethernet HWaddr 08:00:27:CA:5A:10						
	inet addr:10.0.0.201 Bcast:10.255.255.255 Mask:255.255.255.0						
	inet6 addr: fe80::a00:27ff:feca:5a10/64 Scope:Link						
	UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1						
	RX packets:89571 errors:0 dropped:0 overruns:0 frame:0						
	TX packets:52 errors:0 dropped:0 overruns:0 carrier:0						
	collisions:0 txqueuelen:1000						
	RX bytes:14515911 (13.8 MiB) TX bytes:8581 (8.3 KiB)						

2.2.3 配置/etc/hosts 文件

编辑 hosts 文件: [root@racnode1 ~]# vi /etc/hosts 增加或修改下列内容: **#PUBLIC IP:** 192.168.10.201 racnode1 192.168.10.202 racnode2 **#PRIVATE IP:** 10.0.0.201 racpriv1 10.0.0.202 racpriv2 **#VIP IP:** 192.168.10.211 racvip1 192.168.10.212 racvip2 **#SCAN IP:** 192.168.10.206 racscan

执行 ping 命令确认上述各主机名能被正常 ping 通(VIP 除外, 另外如果 racnode2 还未配置,则访问有可能不通,可以等到 racnode2 配置好再来做 ping 测试)。

2.2.4 配置软件目录

创建软件目录并授予相应用户操作权限: [root@racnode1~]# mkdir -p /data/app/{oracle,grid} [root@racnode1~]# chown oracle:oinstall /data/app -R [root@racnode1~]# chmod 775 /data/app/ -R

2.2.5 配置用户

编辑 oracle 用户属性文件:

[root@racnode1 ~]# vi /home/oracle/.bash profile

增加下列内容:

export TMP=/tmp

export TMPDIR=\$TMP

export ORACLE_BASE=/data/app/oracle

export ORACLE_HOME=\$ORACLE_BASE/11.2.0/db_1

export GRID_HOME=/data/app/grid/11.2.0/home_1

export ORACLE_SID=racdb1

export ORACLE_TERM=xterm

export PATH=/usr/sbin:\$PATH

```
export PATH=$ORACLE_HOME/bin:$GRID_HOME/bin:$PATH
```

export LD_LIBRARY_PATH=\$ORACLE_HOME/bin:/bin:/usr/bin:/usr/local/bin:/usr/X11R6/bin/

export

CLASSPATH=\$ORACLE_HOME/JRE:\$ORACLE_HOME/jlib:\$ORACLE_HOME/rdbms/jlib

```
if [ $USER = "oracle" ]; then
```

```
if [ $SHELL = "/bin/ksh" ]; then
ulimit -p 16384
ulimit -n 65536
else
ulimit -u 16384 -n 65536
fi
umask 022
```

fi

注意 ORACLE_SID 环境变量的值哟。

2.3 初始化第二台节点

与第一个节点操作步骤相同,注意 IP 别配置错了就好。

3、配置共享磁盘

3.1 配置安全访问

这里跳过,我们选择在 OUI 界面中进行配置。

3.2 创建共享磁盘

VirtualBox 虚拟机上配置共享磁盘。由于 VBOX 虚拟化软件在界面方式创建共享盘步骤 稍多,这里为简单起见直接通过命令行方式创建,因此我们需要在虚拟机所在的物理机端, 执行 VBoxManage 命令创建多个虚拟机磁盘文件如下:

\$ VBoxManage createhd --filename /data/vboxdata/share_disk/asm01.vdi --size 50000 --format VDI --variant Fixed

\$ VBoxManage createhd --filename /data/vboxdata/share_disk/asm02.vdi --size 50000 --format VDI --variant Fixed

将前面创建的文件附加到虚拟机:

\$ VBoxManage storageattach oel6_11grac1 --storagectl "SATA 控制器" --port 1 --device 0 --type hdd --medium /data/vboxdata/share_disk/asm01.vdi --mtype shareable

\$ VBoxManage storageattach oel6_11grac1 --storagectl "SATA 控制器" --port 2 --device 0 --type hdd --medium /data/vboxdata/share disk/asm02.vdi --mtype shareable

注意哟,这一步也需要对节点2(我这里虚拟机名为 oel6_11grac2)执行的哟。

\$ VBoxManage storageattach oel6_11grac2 --storagectl "SATA 控制器" --port 1 --device 0 --type hdd --medium /data/vboxdata/share disk/asm01.vdi --mtype shareable

\$ VBoxManage storageattach oel6_11grac2 --storagectl "SATA 控制器" --port 2 --device 0 --type hdd --medium /data/vboxdata/share_disk/asm02.vdi --mtype shareable

设置文件的类型为共享:

\$ VBoxManage modifyhd /data/vboxdata/share_disk/asm01.vdi --type shareable

\$ VBoxManage modifyhd /data/vboxdata/share disk/asm02.vdi --type shareable

而后两个虚拟机的设备列表中都应该能看到这些磁盘。

3.3 配置共享磁盘

启动虚拟机,在 racnodel 端(也只需在任意一个节点)执行操作,我们目前的环境设置共享存储磁盘:数据存储/dev/sdb,/dev/sdc 各 50G。在 linux 中查看磁盘设备如下:

[root@racnode1 ~]# ls /dev/sd*

/dev/sda /dev/sda1 /dev/sda2 /dev/sdb /dev/sdc

首先通过 fdisk 对其进行分区, fdisk 命令的用法这里只举一个示例,比如处理/dev/sdb 分区:

[root@racnode1 ~]# fdisk /dev/sdb

Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel

Building a new DOS disklabel with disk identifier 0x2cd79048.

Changes will remain in memory only, until you decide to write them.

After that, of course, the previous content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite)

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u'). Command (m for help): n Command action e extended primary partition (1-4) р p Partition number (1-4): 1 First cylinder (1-38, default 1): Using default value 1 Last cylinder, +cylinders or +size{K,M,G} (1-38, default 38): Using default value 38 Command (m for help): w The partition table has been altered! Calling ioctl() to re-read partition table. Syncing disks. 如果还有不明白的,可以参考三思之前的安装笔记。分区后的设备信息如下: [root@racnode1 ~]# ls /dev/sd* /dev/sda /dev/sda1 /dev/sda2 /dev/sdb /dev/sdb1 /dev/sdc /dev/sdc1

3.4 配置 ASM 磁盘

对于 OEL6.0 及以上版本,不需要再额外安装 ASMLib 驱动,它已经被编译到内核中, 但是 oracleasm-support 包必须安装,该软件包安装光盘上就有。

配置 asm 驱动,会要求指定驱动的属主用户及用户组等信息: [root@racnode1~]# oracleasm configure -i Configuring the Oracle ASM library driver.

This will configure the on-boot properties of the Oracle ASM library driver. The following questions will determine whether the driver is loaded on boot and what permissions it will have. The current values will be shown in brackets ('[]'). Hitting <ENTER> without typing an answer will keep that current value. Ctrl-C will abort.

Default user to own the driver interface []: oracle Default group to own the driver interface []: dba

Start Oracle ASM library driver on boot (y/n) [n]: y Scan for Oracle ASM disks on boot (y/n) [y]: y Writing Oracle ASM library driver configuration: done 初始化: [root@racnode1 ~]# oracleasm init Creating /dev/oracleasm mount point: /dev/oracleasm Loading module "oracleasm": oracleasm Mounting ASMlib driver filesystem: /dev/oracleasm 创建 ASM 磁盘: [root@racnode1 ~]# oracleasm createdisk asmdisk1 /dev/sdb1 Writing disk header: done Instantiating disk: done [root@racnode1 ~]# oracleasm createdisk asmdisk2 /dev/sdc1 Writing disk header: done Instantiating disk: done 如果有多个就继续创建。完成后执行 oracleasm scandisks: [root@racnode1 ~]# oracleasm scandisks Reloading disk partitions: done Cleaning any stale ASM disks... Scanning system for ASM disks... 查看 asm 磁盘: [root@racnode1 ~]# oracleasm listdisks ASMDISK1 ASMDISK2

到第二个节点执行下列操作: [root@racnode2~]# oracleasm configure -i Configuring the Oracle ASM library driver.

This will configure the on-boot properties of the Oracle ASM library driver. The following questions will determine whether the driver is loaded on boot and what permissions it will have. The current values will be shown in brackets ('[]'). Hitting <ENTER> without typing an answer will keep that current value. Ctrl-C will abort.

Default user to own the driver interface []: oracle Default group to own the driver interface []: dba Start Oracle ASM library driver on boot (y/n) [n]: y Scan for Oracle ASM disks on boot (y/n) [y]: y Writing Oracle ASM library driver configuration: done [root@racnode2 ~]# oracleasm init Creating /dev/oracleasm mount point: /dev/oracleasm Loading module "oracleasm": oracleasm Mounting ASMlib driver filesystem: /dev/oracleasm [root@racnode2 ~]# oracleasm scandisks Reloading disk partitions: done Cleaning any stale ASM disks... Scanning system for ASM disks... Instantiating disk "ASMDISK1" Instantiating disk "ASMDISK2" [root@racnode2 ~]# oracleasm listdisks ASMDISK1 ASMDISK2

4、安装 GRID 基础框架

环境初始化好后,下面要进入到安装环境了,前面的操作全都是用 root 用户,接下来的操作如非特别注明,则全都是用 oracle 用户操作的,而且基本告别命令行界面,都是在视窗界面执行的,另外如非特别注明,都是在 racnode1 端操作。

我已经提前下载好了 grid 的安装包,放在/data/software/grid 目录下。如果是远程操作的话,可以配置 vnc 进入到视窗界面。

也可以在安装前先执行 /data/software/grid/runcluvfy.sh stage -pre crsinst -n racnode1,racnode2 对要安装的节点进行检测

执行./runInstaller 命令进入安装界面:

[root@racnode1 ~]# xhost +

[root@racnode1 ~]# su - grid

[oracle@racnode1 ~]\$ /data/software/grid/runInstaller

Starting Oracle Universal Installer...

Checking Temp space: must be greater than 120 MB.Actual 19856 MBPassedChecking swap space: must be greater than 150 MB.Actual 2047 MBPassedChecking monitor: must be configured to display at least 256 colors

>>> Could not execute auto check for display colors using command /usr/bin/xdpyinfo. Check if the DISPLAY variable is set. Failed <<<<

Some requirement checks failed. You must fulfill these requirements before

continuing with the installation,

Continue? (y/n) [n] y 等待一小会儿,安装界面就会出现:



选择"Typical Installation",点击下一步

在"SCAN Name"列指定一个集群的唯一名称,可以是主机名,这里指定为前面在 hosts 中配置的 racscan:

Applications Places Syst	em 🤪 餮	() Fri Dec 28, 09:12
Compare Specify Cluster	Dracle Grid Infrastructure - Setting up Grid Infrastructure - Step 3 of 8	- " * 11 ^g
oracle's Ho	Specify basic configuration information for the grid infrastructure. Specify basic configuration information for the grid infrastructure. Specify basic configuration information for the grid infrastructure.	
Trasin V Setup Finish	Hostname Virtual IP Name racnode1 racnode1 racnode1-vip SSH <u>connectivity</u> <u>Add</u> <u>Edi</u> [dentify network	t Remove
Help	< <u>Back</u> <u>Next></u> Einish	Cancel
VNC config]	🔄 oracle@racnode1:~	

点击右侧中间的"Add"增加第二节点,指定第二个节点的公共名称(racnode2)及虚拟 IP 名(racvip2),完成后点击 ok:

🙆 Applications Places System 🎈		I 🌞 🐠)	Fri Dec 28, 09:2
Oracle C	arid Infrastructure - Setting up Grid Infras	tructure - Step 3 of 8 _ D >	<
Specify Cluster Config	guration		
oracle's Hc	Specify basic configuration information for the grid	d infrastructure.	
Cluster Configuration	Hostname	Virtual IP Name	
Trash	racnode1	racnode1-vip	
Prerequisite Checks	Add Cluster Node Informat	ion ×	
U Setup Finish	Specify a node to be part of the cluster.		
	Ho <u>s</u> tname: racnode2		
	Virtual IP Name: racvip2		-
		QK Cancel Add Edit Bemove	
and a second		Identify network interfaces	
Help		< <u>Back</u> Next > Einish Cancel	
[VNC config]	e@racnode1:~ 📃 🗖 Oracle Grid Infrastruct		

点击"Identify Network Interfaces"按钮。在窗口中,检查每个网卡是否正确,如果列出的 网卡集群中并不使用,那么就将网卡类型修改为 Do Not Use。注意两个节点都要看的哟:

Applications	Places Sys	stem 🥱 🥸			1 🔅 🌒	Fri Dec 28, 09:51
		Ornala Caid Information	Setting on Crief Inford			
Compuit:	pecify Clust	er Configuration			11 ^g	
oracle's Ho Trasin	Installation Installation Cluster Cor Install Locat	Identify the planned use for each g Private interfaces are used by Orac If there is more than one subnet as associate the interface name with t	Identify Network Interface lobal interface shown in the box below le Grid Infrastructure for internode tr sociated with an interface, then chang ne additional subnets.	IS was Public, Private, or Do Not Use. raffic. ge the interface's attributes to		
	9 Summary 9 Setup 9 Finish	Interface Name eth0 eth1	Subnet 192.168.10.0 10000	Interface Type Public • Private • Cancel	dit <u>Bemove</u> vrk interfaces	
	Help			< <u>Back</u> Next >	nish Cancel	
				_		
[vive coning]		a oracle@rachoder.~	Gracie Grid Infrastruct			

选择两个节点后,点击"SSH Connectivity",在窗口右侧,会显示 SSH 连接信息。指定 ORACLE 软件属主的用户名(oracle)和密码。选中选项"Reuse private and public keys existing in the user home",点击"Setup":

Applications Places System 🤗	۲.	*	Fri Dec 28, 09:
Compute Specify Cluster Configu	d Infrastructure - Setting up Grid Infrastruc	ture - Step 3 of 8 _ 0	×
Oracle's He Installation Option Installation Type Installation Type Cluster Configuration Install Locations Trash Prerequisite Checks	Specify basic configuration information for the grid infra SCAN Name: racscan Hostname racnode1 rac racnode2 rac	structure. Virtual IP Name vip1 vip2	
ý Summary ý Setup ý Finish	SSH <u>Connectivity</u> QS Username: oracle OS User home is shared by the selected nodes Reuse private and public <u>k</u> eys existing in the user ho	Add Edit Remove	
		Identify network interfaces	
Help		<back next=""> Einish Cancel</back>	
📃 [VNC config] 🛛 🔲 oracle@	Pracnode1:~ 📃 Oracle Grid Infrastruct		

提示:相比 10g 版本此处就简化多了,不必再手动命令行配置 SSH 安全连接,直接在 安装界面就一条龙搞定。

Applications Places System	E	1 🌞 🐠 (Fri Dec 28, 09:54
Compute Specify Cluster Configur	d Infrastructure - Setting up Grid Infra	Instructure - Step 3 of 8 _ 0	×
Installation Option Installation Type Cluster Configuration Install Locations Prerequisite Checks Summary Setup Finish	Specify basic configuration information for the g	rid infrastructure.	
Help		<gack next=""> Einish Cancel</gack>	
🔲 [VNC config]	racnode1:~ 🛛 🖂 Oracle Grid Infrastruct		

弹出消息窗口,指出可能需要花费数分钟时间配置节点间的 SSH 通讯:

而后另一个信息窗口出来,指出无须密码的 SSH 连接配置好,点击"OK"继续,返回上 层界面后可以再点击"Test"测试一下无密码访问是否顺利。都 ok 的话,点击 Next 继续吧。

- 这一页执行下列操作:
- 在 Oracle base 列,确认 Oracle 主目录路径正确(例如/data/app/grid/),如果需要修改 就点击 Browse。
- 在 Software Location 列,确认 Grid 主目录路径正确(例如/data/app/grid/11.2.0),否则也可以修改;
- 对于 Cluster Registry Storage Type, 选择 ASM;
- 指定 SYSASM 用户的密码,该密码用于管理 ASM;
- 对于 OSASM 组,使用下拉列表选择对应的管理 ASM 的操作系统用户组,例如 dba;

全部完成后点击 Next, 创建 ASM 磁盘组窗口出现。

Applications	Places System 🥪 🍯			🕂 🐠 🤁	Fri Dec 28, 09:57
Compute	Oracle Grid II	nfrastructure - Setting up	Grid Infrastructure - Step 4 of 8	,	
	Specify Install Locations			LE 11 <i>g</i>	
oracle's Ho	Installation Option	Specify locations for Oracle base, v (OCR), and which UNIX group shou Management.	where to install the software, where to place the Or Id be given administrative privileges (OSASM) for	racle Cluster Registry Automatic Storage	
Trash	Cluster Configuration Install Locations	Oracle Ba <u>s</u> e:	/data/app	Browse	
112511	Prerequisite Checks Summary	Software Location:	/data/app/grid/11.2.0	Br <u>o</u> wse	
	U Setup U Finish	<u>Cluster Registry Location:</u>	/data/app/oradata/racscan	Browse	
		S <u>Y</u> SASM Password:	\$		
		Confirm <u>P</u> assword: OSASM <u>a</u> roup:	oinstall 👻		No.
_	Help		< Back Next >	Finish	
Ľ				-	,
[VNC config]	🔲 oracle@rac	node1:~ 📃 🗖 Oracle Grid	Infrastruct		

在 Disk Group Name 列,指定一个磁盘组的名称,比如说 ORADATA,选择它的冗余级别,我们这里选择了外部,在添加磁盘环节为它指定磁盘,全部完成后点击 Next

Create ASM Disk Group	Infrastructure - Setting u	p Grid Infrastructure - S	tep 5 of 9 ORACLE DATABASE	- • × 11 ^g	
Trash	Select Disk Group Characteristic Disk Group Name oradata Redundancy High O Add Disks © Candidate Disks All Di	s and select disks Image: select disks Normal Image: select disks Disk Path	Size (in MB)	Status overy <u>Path</u>	
Help		< <u>B</u> ack	Next > Einish	Cancel	

提示,这里如果看不到磁盘,可以点击"Change Discovery Path",修改查找路径,指定 路径到/dev/oracleasm/disks 目录下一般就能看到了。如果仍然找不到,需要检查一下 oracle 用户的权限,比如直接在操作系统层通过 oracle 用户访问上述路径中的磁盘,看看能否顺利 访问,只要操作系统层没有问题,这里就一定能够正常访问。如果操作系统层访问时提示无 权限,那么可能权限配置有误,导致配置有误的因素较多,比如用户,用户组, oracleasm 配置等等,建议逐项检查。全部检查后均无问题,仍然看不到磁盘的话,最后一招,重启虚 拟机试试看。

如果需要的话,修改 oraInventory 目录路径,该路径的用户组应该是 oinstall:



如果检查过程中发现错误,对于内核参数错误,可以点击 Fix & Check Again 按钮,使用 root 用户运行指定的脚本修复,如果是缺包的话,需要手动安装了:

Applications Places System 😔 🥸	frastructure - Setting up Grid Infrastructure - S	Step 7 of 10 -	Fri Dec 28, 11:07 AN
oracle's Horn Trash Installation Option Installation Type Cluster Configuration Install Locations ASM Disk Group Create Inventory. Prerequisite Checks Sum mary Setup Finish	Some of the minimum requirements for installation are not compl the following table, and recheck the system. Check Again Ex & Check Again Show Failed Checks Chec	eted. Reviewand fix the issues list All Nodes Failed Fail	ted in hore All
Help	< gac	K Next > Einish (Cancel

提示:像我这里使用的 OEL6,在安装时总提示 pdksh 包未安装,而且该软件包也确实 没有在系统光盘中,不过只要我们安装了 ksh 包,对于 pdksh 包实际上可以忽略。

全部修复后点击 check again 验证一下,无误的话进入下一步,查看预览,如无问题点击 Finish:



做为安装的一部分,用户需要按照提示,以 root 用户身份执行下列脚本:

Applications Places System	🔧 🥸	🗮 🐠 ()	Fri Dec 28, 11:44 AM
Computer Setup	le Grid Infrastructure - Setting up Grid Infrastruc	cture - Step 9 of 10	- • × 1 ^g
oracle's Hom Trash	Progress Execute Configuration scrip The following configuration scripts need to be executed as the node. Scripts to be executed:	ts ×	
Summary Simmary Finish	Number Script Location Nodes 1 /data/app/oralnventory/orainstRoot.sh racnod 2 /data/app/grid/11.2.0/root.sh racnod Image: To execute the configuration scripts: 1.0pen a terminal window 2.0g in as "root" 3. Run the scripts in each cluster node 4. Return to this window and click "OK" to continue	le 1, racnode 2 le 1, racnode 2 le 1, racnode 2 Succeec Succec Succeec Succec Succeec Succec Succeec Succeec	led led led led fed fed
Help Not Autho	Run the script on the local node first. After successful completing parallel on all the other nodes. <u>Help</u> Manageability arrized	OK, you can run the script in OK Nize Perfor Dilty, and C gack Next > Einish	Skip mance, Cancel
VNC config]	OK Cle@racnode1:/dev □ Oracle Grid Infrastruct		

执行配置脚本窗口显示了配置脚本以及配置文件所在的路径。所有节点都要执行这两个

脚本。注意哟,执行有顺序,操作步骤如下:

A. Racnode1 节点,以 root 身份执行下列操作:

[root@racnode1 ~] # / data/app/oraInventory/orainstRoot.sh

Changing permissions of /data/app/oraInventory.

Adding read, write permissions for group.

Removing read, write, execute permissions for world.

Changing groupname of /data/app/oraInventory to oinstall. The execution of the script is complete.

B. 节点1成功后登录到 racnode2,执行相同操作:
[root@racnode2~]#/data/app/oraInventory/orainstRoot.sh
Changing permissions of /data/app/oraInventory.
Adding read,write permissions for group.
Removing read,write,execute permissions for world.

Changing groupname of /data/app/oraInventory to oinstall. The execution of the script is complete. C. 返回节点 1 执行第二个脚本: [root@racnode1 ~]# /data/app/grid/11.2.0/home_1/root.sh Running Oracle 11g root.sh script...

The following environment variables are set as:

ORACLE_OWNER= grid ORACLE_HOME= /data/app/grid/11.2.0/home_1

Enter the full pathname of the local bin directory: [/usr/local/bin]: Copying dbhome to /usr/local/bin ... Copying oraenv to /usr/local/bin ... Copying coraenv to /usr/local/bin ...

Creating /etc/oratab file... Entries will be added to the /etc/oratab file as needed by Database Configuration Assistant when a database is created Finished running generic part of root.sh script.

.....

提示: 必须先在第一个节点上运行 root.sh, 最后一个节点必须等第一个节点执行成功后 再运行 root.sh 脚本。

D. 到节点 2 执行第二个脚本: #/u01/app/11.2.0/grid/root.sh

Root.sh 脚本执行成功后,返回 OUI 界面,这里提示遇到一个错误,根据提示的日志分析是由于无法解析到 racscan 导致的,直接忽略,点击 OK。



点击 Close 完成安装进程并退出 OUI 界面。

GRID 基础框架的安装就完成了。安装好集群件后,检查节点上的应用是否启动。 以 oracle 用户身份执行下列命令:

[oracle@racnode1 ~]\$ /data/app/grid/11.2.0/home_1/bin/crsctl check cluster -all

racnode1:

CRS-4537: Cluster Ready Services is online

CRS-4529: Cluster Synchronization Services is online

CRS-4533: Event Manager is online

racnode2:

CRS-4537: Cluster Ready Services is online

CRS-4529: Cluster Synchronization Services is online

CRS-4533: Event Manager is online

[oracle@racnode2 ~]\$ /data/app/grid/11.2.0/bin/crsctl check cluster -all

racnode1:

CRS-4537: Cluster Ready Services is online

CRS-4529: Cluster Synchronization Services is online

CRS-4533: Event Manager is online

racnode2:

CRS-4537: Cluster Ready Services is online

CRS-4529: Cluster Synchronization Services is online

CRS-4533: Event Manager is online

而后会在命令输出中看到所有集群件守护进程的信息。 如果集群中某些资源显示脱机或没找到,则说明集群件软件没能正确的安装。

常见问题:

A> 执行# /data/app/grid/11.2.0/root.sh 时提示:

/data/app/grid/11.2.0/bin/clscfg.bin: error while loading shared libraries: libcap.so.1: cannot open shared object file: No such file or directory Failed to create keys in the OLR, rc = 127, 32512 这是由于确实不存在 libcap.so.1 文件, 针对这种情况, 有两种解决方式, 一种是我们创

建一个软链接:

ln -s /lib64/libcap.so.2.16 /lib64/libcap.so.1

或者安装相应的包:

yum install compat-libcap1 -y

而后清除 crs 配置:

/data/app/grid/11.2.0/crs/install/rootcrs.pl -deconfig --force

B> 执行# /data/app/grid/11.2.0/root.sh 时提示:

CRS-4124: Oracle High Availability Services startup failed. CRS-4000: Command Start failed, or completed with errors. ohasd failed to start: Inappropriate ioctl for device ohasd failed to start at /data/app/grid/11.2.0/crs/install/rootcrs.pl line 443.

参考: <u>http://blog.csdn.net/tianlesoftware/article/details/7697366</u> 处理。

针对这个问题,需要**强调**的是, oel6 以上版本才会出现,所以你知道,版本太新太激进不好了吧。如果你认为只是安装时需要多一个额外的步骤处理一下,那就大错特错了,这个问题属于 BUG,不仅仅出现在安装,在后面重新启动 CRS 时都需要这样,否则就会遇到:

CRS-4124: Oracle High Availability Services startup failed.

CRS-4000: Command Start failed, or completed with errors.

哎,无意之中给自己刨了个坑,不过还好,这个安装只是用于个人测试,在正式环境部 署时,操作系统还是使用传统些的 OEL5 吧。

即然说到这儿了,在这种环境下启动 11gR2 RAC 该怎么做呢(正常情况是 11gR2 版本 RAC 是自动启动,不需要配置的,但是我们这个环境中自动一定起不来),操作步骤如下:

两个节点首先**分别执行:**

/bin/dd if=/var/tmp/.oracle/npohasd of=/dev/null bs=1024 count=1

而后再**分别启动:**

#/data/app/grid/11.2.0/home_1/bin/crsctl start crs

CRS-4123: Oracle High Availability Services has been started.

而后在**某个节点**启动集群:

#/data/app/grid/11.2.0/home_1/bin/crsctl start cluster -all

CRS-5702: Resource 'ora.evmd' is already running on 'racnode1'

CRS-5702: Resource 'ora.crsd' is already running on 'racnode1'

如果一切顺利,就等着它启动相应的进程就行了。

5、安装数据库软件

接下来的操作如非特别注明,则全都是用 oracle 用户操作的,而且基本告别命令行界面,都是在视窗界面执行的,另外如非特别注明,都是在 racnodel 端操作。

安装 oracle 数据库软件大家应该都熟,RAC 环境中安装跟单实例区别不大,下面实操 一下。下载好文件并解析,执行 runInstaller 进入到安装界面:

 $[oracle@racnode1 \sim] \ /data/software/database/runInstaller$

Starting Oracle Universal Installer...

Checking Temp space: must be greater than 120 MB.Actual 12567 MBPassedChecking swap space: must be greater than 150 MB.Actual 1490 MBPassedChecking monitor: must be configured to display at least 256 colors

>>> Could not execute auto check for display colors using command /usr/bin/xdpyinfo. Check if the DISPLAY variable is set. Failed <<<<

Some requirement checks failed. You must fulfill these requirements before

continuing with the installation,

Continue? (y/n) [y]

等待一小会儿, 安装界面就	出现了:		
🙆 Applications Places System 🥪 🍝		🏥 🐠 👘	i Jan 4, 11:55 AM
Oracle Databa	ase 11g Release 2 Install	er - Installing database - Step 1 of 9	×
Compute Configure Security Update	5		
oracle's Hc 🍚 Configure Security Updates	Provide your email address to be and initiate configuration manag	: informed of security issues, install the product er. <u>View details.</u>	
Grid Options	E <u>m</u> ail:	Easier for you if you use your My Oracle Support email address/username.	
Typical Installation	I wish to receive security upd	ates via My Oracle Support.	
Prerequisite Checks Summary	My Oracle Support Password:		
V Install Product			
Finish		k	
		75	
<u> </u>			
Help		< <u>B</u> ack <u>N</u> ext > <u>F</u> inish Cance	
[VNC config] 🛛 🛛 🕞 oracle@ra	cnode1:~ 📃 🗖 Oracle I	Database 11g R	

这里我们选择只安装数据库软件:

Image: Control of the con	Applications Places System 🌏 🍝		🕂 🧐 🕅 🕂	ri Jan 4, 11:56 Al
Sector Sector <th>Comput Select Installation Option</th> <th>se 11g Release 2 Installer - Installing databas</th> <th>e - Step 2 of 9 _ 0</th> <th>×</th>	Comput Select Installation Option	se 11g Release 2 Installer - Installing databas	e - Step 2 of 9 _ 0	×
Help < Back Next > Einish Cancel	oracle's Ho Trash Trash	Select any of the following install options. Create and configure a database Configure a database Configure and configure a database Dispersion of the following database		
	Нер	<	3ack Next > Einish Cance	1

选择 RAC 的数据库安装,注意要把所有的节点都选中。SSH Connectivity 在前面安装 grid 基础框架时已经配置好,这里就不需要重复配置了:

Compute Node Selection	se 11g Release 2 Installer - Installing databa	se - Step 3 of 9 $_$ \bigcirc ×	
oracie's He Trash Trash Configure Security Updates A Initialiation Options Configure Security Updates A Initialiation Options A Initialiation Prerequisite Checks Summary Inistall Product Finish	Select the type of database installation you want to perform.	Arere the installer should install Oracle RAC.	
Help		: Back Next > Einish Cancel	

选择语言,默认是英文,我们增加一项简体中文:



提示:选中企业版的话, options 中有些组件供选, 一般默认即可, vault 和 label 都属于加强安装审计的特性一般都不需要。

选择软件的安装路径:



接下来将对系统进行检查,跟前面安装 grid 时差不多:



执行安装:

Oracle Database	e 11g Release 2 Installer - Installing database - Ste	p 10 of 11 _ 🗆 ×
Install Product		DATABASE 11g
oracle's Hc 🌳 Configure Security Updates	Progress	
Installation Option	0%	
Grid Options	Central Inventory is not locked.	
Product Languages		
Trash Database Edition	- Status	
U Installation Location	Den de Dete la ce la stallation	lu Dua anna a
	Oracle Database installation Prenare	In Progress Pending
Operating system Groups	Copy files	Pending
Prerequisite Checks	Link binaries	Pending
y Summary	Setup files Evenute Boot Scripts for Oracle Database installation	Pending
🧅 Install Product	Execute Root scripts for Oracle Database instanation	Penang
U Finish		
	k	Details Retry Skip
	CRACLE 11g	Consolidate Compress Control
Help	< <u>B</u> ack	Next > Einish Cancel

根据提示使用 root 用户执行脚本,执行有顺序,先在节点 1 执行,而后再到节点 2 执行,注意要用 root 用户执行的哟:

Compu Install Product	Database 11g Release 2 Installer - Installing databa	ase - Step 10 of 11	- • ×	
oracle's F	Execute Configuration scripts The following configuration scripts need to be executed as the "roo node. Scripts to be executed:	× t" user in each cluster		
TraSr Database Edition Installation Location Operating System Prerequisite Check Summary Install Product	Number Script Location 1 /data/app/oralnventory/orainstRoot.sh 2 /data/app/oracle/product/11.2.0/dbhome_1/root.sh	Nodes racnode2 racnode1,racnode2	Succeeded Succeeded Succeeded Succeeded Succeeded In Progress	
U Finish	To execute the configuration scripts: 1. Open a terminal window 2. Log in as "root" 3. Run the scripts in each cluster node 4. Return to this window and click "OK" to continue Help	ОК	Betry Skip	
	ORACLE 118 DATABASE Maximum Availability	Elim Elim South	inate Downtime Idle Redundancy	
Help		< <u>B</u> ack <u>N</u> ext > <u>E</u> i	nish Cancel	

成功后点击 close, 然后点击 close 结束, 就是这么简单。

6、创建数据库

执行 dbca,进入到安装界面,这里当然是选择创建 RAC 数据库:



创建数据库:



指定数据库名和 sid 的前缀,注意一定要选中所有的节点哟:

Computer		
Database	e Configuration Assistant, Step 3 of 13 : Database Ide	ntification _ 🗆 ×
oracle's Home	Cluster database configuration can be Policy-Managed or Adr Managed database is dynamic with instances managed autor servers for effective resource utilization. Admin-Managed dat	nin-Managed. A Policy- natically based on pools of abase results in instances
	tied to specific servers. Configuration Type:	aged
Trash	An Oracle database is uniquely identified by a Global Datab "name.domain".	ase Name, typically of the form
	Global Database Name: racdb	
	A database is referenced by an Oracle instance on each clus prefix to be used to name the cluster database instances. SID Prefix: racdb	ster database node. Specify a
	Select the nodes on which you want to create the cluster dat "racnode1" will always be used, whether or not it is selected	abase. The local node
	racnode1 racnode2	Select All
		Deselect All
	N	
Cancel H	elp)	Next >>)
[VNC config]	e@racnode1:~	
择是否启用 EM 和自动	助维护任务:	
Applications Places System 🍳	3 ≪	🕂 🐠 🐠 👘 Fri Jan 4, 3:32
Computer		
Computer	se Configuration Assistant, Step 4 of 12 : Managemen	t Options _ = x
Computer	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tasi	t Options _ x
Computer	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tasi I Configure Enterprise Manager	t Options _ □ x
Computer oracle's Home	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Task Configure Enterprise Manager Register with Grid Control for centralized management	t Options _ □ x
Computer Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tasi Configure Enterprise Manager CRegister with Grid Control for centralized management Management Service No Agents Found	t Options _ • ×
Computer Computer Concle's Home Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Configure Enterprise Manager C Register with Grid Control for centralized management Management Service No Agents Found Configure Database Control for local management Frable Alert Notifications	t Options _ • ×
Computer I Databar oracle's Home Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tas Configure Enterprise Manager C Register with Grid Control for centralized management Management Service No Agents Found Configure Database Control for local management Enable Alert Notifications Outgoing Mail (SMTP) Server:	t Options _ • ×
Computer Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Configure Enterprise Manager C Register with Grid Control for centralized management Management Service No Agents Found Configure Database Control for local management Enable Alert Notifications Outgoing Mail (SMTP) Server: Recipient Email Address:	t Options _ • ×
Computer I Databar oracie's Home Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tasi Configure Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Management Service No Agents Found Configure Database Control for local management Enable Alert Notifications Outgoing Mail (SMTP) Server: Recipient Email Address: Enable Daily Disk Backup to Recovery Area Backup Start Time; D2 000 ▲ AM	t Options _ • ×
Computer Concacle's Home Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Database Control for local management Configure Database Configur	t Options _ • ×
Computer Trash Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tass ✓ Configure Enterprise Manager Register with Grid Control for centralized management Management Service No Agents Found Configure Database Control for local management Enable Alert Notifications Outgoing Mail (MTP) Server: Recipient Email Address: Enable Daily Disk Backup to Recovery Area Backup Start Time: OS Username: OS Password: 	t Options _ • ×
Computer Trash Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tass Configure Enterprise Manager	t Options _ • ×
Computer Pracle's Home Trash Trash	se Configuration Assistant, Step 4 of 12 : Management Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Database Control for local management Configure Database Co	t Options _ • ×
Computer Trash Trash	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tass Configure Enterprise Manager Configure Enterprise Mana	t Options _ • ×
Computer Concile's Home Trash Trash Cancel H	se Configuration Assistant, Step 4 of 12 : Managemen Enterprise Manager Automatic Maintenance Tass Configure Enterprise Manager	t Options _ • x
Computer Trash Trash Cancel H	se Configuration Assistant, Step 4 of 12 : Management Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Database Control for centralized management Configure Database Control for local management Configure Database Configure Databas	t Options _ • ×
Computer Concile's Home Trash Trash Cancel H	se Configuration Assistant, Step 4 of 12 : Management Enterprise Manager Configure Enterprise Manager Configure Enterprise Manager Configure Database Control for centralized management Configure Database Control for local management Enable Alert Notifications Outgoing Mail (SMTP) Server: Recipient Email Address: Enable Daily Disk Backup to Recovery Area Backup Start Time: OS Username: OS Password:	t Options _ • ×

为管理员帐户指定密码,我这里给四个管理员全部指定了相同的口令,这个习惯很不好, 大家不要学我:

Applications Places System 🥪 (2			Fri Jan 4, 3:33 Pł
Computer	onfiguration Assistant,	Step 5 of 12 : Database (Credentials _ 🗆	×
oracle's Home	For security reasons, you r database.	nust specify passwords for the fo	llowing user accounts in the new	
	Ouse Different Administ	alive Passwords		T
	User Name	Password	Confirm Password	
Trash	SYS			
	SYSTEM			
	DBSNMP			
	@ Use the Same Adminis	rative Password for All Accounts		
	Password:	******		
	Confirm Password:			
Cancel)	(de Ba	ck [Next ≫)	

选择存储类型和存储路径, ASM 吧(然后它会提示你输出 sysasm 的口令, 就是前面配 置 grid 时指定的那个, 一定不要输错哟):

Applications Places System	2		🛛 🌞 🚳 🌒	Fri Jan 4, 3:34 PM
Computer	onfiguration Assistant, St	ep 6 of 12 : Database File Location	s _ 0	×
oracle's Home	Specify storage type and loc	ations for database files.		
	Storage Type:	Automatic Storage Management (ASM) 📼]	
	Storage Locations:			
Trash	C Use Database File Locati	ons from Template	È.	
	O Use Common Location fo	r All Database Files		and the second designed in the
Neuropalania Neuropalania Neuropalania	Database Files Location:	+ORADATA	Browse	
Hourseparties	Use Oracle-Managed File	25		Section Sectio
November 201	Database Area:	+ORADATA	Browse	
Annual	Multiplex Redo Logs an	d Control Files)		in the second
Lightersteinen Begreichtersteinen	if you want to specify options except Oracle each file location. If y the names for databa	different locations for any database files, pic e-Managed Files and use the Storage page lat ou use Oracle-Managed Files, Oracle automat ase files, which can not be changed on the Sto	k any of the above ier to customize ically generates rage page.	
			cation Variables	
Cancel Help	\square	🔇 Back 🛛 Next	»)	
[VNC config] [VNC config]	acnode1:~	se Configuratio		

指定是否归档模式和 FRA,测试环境没必要,这里全不选,正式环境的话,起码归档 是必须的:

Computer	iguration Assistant, Step 7 of 12 : Recovery Configuration
oracle's Home	Choose the recovery options for the database:
Tash	This is used as the default for all disk based backup and recovery operations, and is also required for automatic disk based backup using Enterprise Manager. Oracle recommends that the database files and recovery files be located on physically different disks for data coracterion and performance.
	Flash Recovery Area: +ORADATA (Browse)
Naprizzationie Naprizzatione Naprizzatione	Flash Recovery Area Size: 4977
New Control of the Co	
Australianten Kennen Ke	Edit Archive Mode Parameters
	File Location Variables)
Cancel Help	
[VNC config]	node1:~ Database Configuratio
[VNC config] 圖 oracle@racn 择要安装的组件: Applications Places System 🔗 🥸	node1:~ 🔐 Database Configuratio
[VNC config]	node1:~ 🔐 Database Configuratio
[VNC config] 『 oracle@racm 择要安装的组件: Applications Places System 📎 🟈	node1:~ Database Configuratio
[VNC config]	node1:~ Database Configuratio Fri Jan 4, 3:
[VNC config] ⑤ oracle@racn 择要安装的组件: Applications Places System ⑥ ⑥ ⑥ Computer Computer Oracle's Home	node1:~ Database Configuratio
[VNC config] 『 oracle@racm 择要安装的组件: Applications Places System ② ③ Computer 『 Database Co oracle's Home	node1:~ Database Configuratio Fri Jan 4, 3: Onfiguration Assistant, Step 8 of 12 : Database Content Database Components Custom Scripts Select the components you want to configure for use in your database. Provide the tablespace in which you want the component to reside. Components which appear disabled are either not installed on dependent or oreside. Components which appear disabled are either not installed on dependent or mononents which are not calcuted
[VNC config] © oracle@racn 择要安装的组件: Applications Places System ② ③ Computer Trach	node1:~ Database Configuratio Fri Jan 4, 3: Onfiguration Assistant, Step 8 of 12 : Database Content Database Components Custom Scripts Select the components you want to configure for use in your database. Provide the tablespace in which you want the component to reside. Components which appear disabled are either not installed or depend on components which are not selected. Or Oracle Text SySAUX
[VNC config] 『 oracle@racm 择要安装的组件: Applications Places System	node1:~ Database Configuratio Fri Jan 4, 3: Onfiguration Assistant, Step 8 of 12 : Database Content Database Components Custom Scripts Select the component to configure for use in your database. Provide the tablespace in which you want to configure for use in your database. Provide the tablespace in which you want to configure for use in your database. Provide the tablespace in which you want to configure for use in your database. Provide the tablespace in which you want to component to reside. Components which appear disabled are either not installed or depend on components which are not selected. Oracle Text SySAUX
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[VNC config] 译要安装的组件: Applications Places System	node1:~ Database Configuratio Fri Jan 4, 3: onfiguration Assistant, Step 8 of 12 : Database Content Database Components Select the components you want to configure for use in your database. Provide the tablespace in which you want to configure for use in your database. Provide the tablespace in which you want to configure for use in your database. Provide the tablespace in which are not selected. Oracle Text SySAUX Oracle OLAP SySAUX Oracle Spatial SySAUX SySTEM Oracle Label Security SySTEM SySTEM System S
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[VNC config] 译要安装的组件: Applications Places System	node1:~ Database Configuratio Pri Jan 4, 3: Pri Jan 4, 3: Pr
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[VNC config] 译要安装的组件: Applications Places System	node1:~ Database Configuratio Tri Jan 4, 3: Onfiguration Assistant, Step 8 of 12 : Database Content Intervention assistant, Step 8 of 12 : Database Components Intervention assistant, Step 8 of 12 : Database Components
[VNC config] oracle@racm 择要安装的组件: Applications Places System System System Applications Places System System System System Computer Image: Computer Image: Computer Image: Computer Image: Computer Oracle's Home Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer Trash Image: Computer Image: Computer Image: Computer Image: Computer	node1:- Prijan 4, 3:
[VNC config] © oracle@racm 择要安装的组件: Applications Places System	node1:~ C Database Configuratio Fr Jan 4, 3 origuration Assistant, Step 8 of 12 : Database Content Custom Scripts Stept the components or use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database or in which you want the configure for use in your database. Provide the database lower or installed or depend on components which are not selected.
[VNC config] oracle@racm 择要安装的组件: Applications Places System	nde1:- Prija Database Configuratio Prija 4, 3: Prija 4, 4: Prija



准备开始创建吧:



开始了,这一步要花些时间的哟:



检查各服务是否正常:

[oracle@racnode1 ~]\$ crsctl check crs CRS-4638: Oracle High Availability Services is online CRS-4537: Cluster Ready Services is online CRS-4529: Cluster Synchronization Services is online CRS-4533: Event Manager is online

[oracle@racnode1 ~]\$ crs_stat -t

Name	Туре	Ta	arget	State	Host
oraER.lsnr o	raer.type Ol	NLINE	ONLI	NE 1	racnode1
oraN1.lsnr o	raer.type Ol	NLINE	ONLI	NE 1	racnode1
ora.ORADATA	.dg oraup.ty	ype ONLIN	IE (ONLINI	E racnode1
ora.asm	ora.asm.typ	e ONLI	NE	ONLIN	IE racnode1
ora.eons	ora.eons.typ	e ONLIN	E (ONLINE	E racnode1
ora.gsd	ora.gsd.type	OFFLI	NE	OFFLIN	Έ
oranetwork of	orark.type O	NLINE	ONL	INE	racnode1
ora.oc4j	ora.oc4j.type	e OFFLIN	NE C	FFLIN	Ξ
ora.ons	ora.ons.type	e ONLIN	JΕ	ONLINI	E racnode1
ora.racdb.db	orase.type	ONLINE	ON	LINE	racnode1
oraSM1.asm	application	ONLINI	E C	NLINE	racnode1
oraE1.lsnr aj	oplication	ONLINE	ON	LINE	racnode1
orade1.gsd a	pplication	OFFLINE	OF	FLINE	
orade1.ons a	pplication	ONLINE	ON	ILINE	racnode1
orade1.vip o	rat1.type Of	NLINE	ONLI	NE 1	racnode1
oraSM2.asm	application	ONLINI	E C	NLINE	racnode2
oraE2.lsnr aj	oplication	ONLINE	ON	LINE	racnode2
orade2.gsd a	pplication	OFFLINE	OF	FLINE	
orade2.ons a	pplication	ONLINE	ON	ILINE	racnode2
orade2.vip o	rat1.type Ol	NLINE	ONLI	NE 1	racnode2
ora.scan1.vip	oraip.type	ONLINE	ONI	LINE	racnode1

一套双节点的 11gR2 RAC 就装好了,至于增删节点,咱有 OUI,操作自然不在话下, 朋友们有兴趣可以自己研究一下。