

LightDB数据库安装手册

1 前言

恒生电子企业级数据库LightDB安装包名格式为：

```
lightdb-x-version-revision-os.arch.zip
```

- lightdb-x：数据库名
- version：数据库版本号，目前最新为13.3-22.2，13.3表示基于PostgreSQL 13.3版本，22.2表示2022年第2个Release版本
- revision：源代码提交编号
- os：安装包适用的操作系统
- arch：安装包适用的CPU架构

目前支持如下平台：

Architecture	OS
x86_64(intel)	CentOS7/RHEL7/rockylinux8/麒麟V10SP1
x86_64(海光)	麒麟V10/麒麟V10SP1
aarch64	CentOS7/RHEL7/rockylinux8/麒麟V10SP1/麒麟V10SP2
LoongArch64	麒麟V10SP1

本文档主要介绍LightDB 在 x86_64 CentOS 7.6 平台的安装过程及注意事项，其他支持的操作
系统如有差异，请根据实际情况灵活调整。

安装过程会自动在 /home/lightdb/.bashrc 中配置 PATH、LTHOME、LTDATA 等环境变量，
安装完成后，需重新登录Shell会话生效。

2 推荐配置

配置参数	最低配置	推荐配置
CPU	16核	96核
内存	64GB	256GB
存储	60GB，SSD NVMe	1TB以上SSD NVMe或PMEM
网络	千兆网络	千兆网络

3 安装前准备

本章节所有准备工作，如无特殊说明，均需要在root用户下进行。

3.1 防火墙配置

如果您的环境有防火墙，则需要在防火墙中开启以下端口：

端口	协议	用途
默认5432	TCP	数据库服务
123	UDP	NTP校时服务

其中，数据库服务的端口5432为默认值，这个值在安装过程中可以自行指定，如果希望使用其他端口，则在此处需要将5432修改为实际值，其余用作EM服务和NTP校时服务的三个端口为固定值。

注意：请务必确保上述四个端口未作他用。以下为防火墙配置步骤。

- 如果使用firewall防火墙，请执行以下命令，其中第一条命令中的5432需修改为实际使用的端口

```
firewall-cmd --permanent --add-port=5432/tcp
firewall-cmd --permanent --add-port=123/udp
```

- 如果使用iptables防火墙，请执行以下命令，其中第一条命令中的5432需修改为实际使用的端口

```
iptables -A INPUT -p tcp --dport 5432 -j ACCEPT
iptables -A INPUT -p udp --dport 123 -j ACCEPT
```

- 如果使用其他防火墙，则参考防火墙相关文档正确开放端口
- 如果您的环境可以关闭防火墙，则可以使用下面命令停止并禁用防火墙

```
systemctl stop firewalld.service
systemctl disable firewalld.service
systemctl stop NetworkManager.service
systemctl disable NetworkManager.service
```

3.2 关闭SELINUX

```
sed -i "s/SELINUX=enforcing/SELINUX=disabled/g" /etc/selinux/config
setenforce 0
```

3.3 检查时间和时区

查看当前时区设置。

```
[root@lightdb ~]# timedatectl
    Local time: Thu 2021-07-22 10:54:39 CST
    Universal time: Thu 2021-07-22 02:54:39 UTC
    RTC time: Thu 2021-07-22 02:54:39
    Time zone: Asia/Shanghai (CST, +0800)
    NTP enabled: yes
    NTP synchronized: yes
    RTC in local TZ: no
    DST active: n/a
```

如果需要修改时区，可以参考如下示例，先使用 `timedatectl list-timezones` 列出所有可选的时区，然后使用 `timedatectl set-timezone` 设置新的时区，下面的例子展示了将时区设置为 `Asia/Shanghai`。

```
timedatectl list-timezones
timedatectl set-timezone Asia/Shanghai
```

3.4 安装依赖包

```
# 安装包通用运行依赖，GUI安装和命令行安装均需要
yum install -y procps-ng
yum install -y coreutils

# GUI安装运行依赖，仅GUI安装需要
yum install -y gtk2
yum install -y libXtst
yum install -y dejavu-fonts # 麒麟v10sp1可能需要安装字体

# 数据库的运行依赖
yum install -y readline
yum install -y zlib
yum install -y libxml2
yum install -y openssl-libs
yum install -y uuid
yum install -y c-ares libpcap snappy # tshark
yum install -y ncurses-libs # iftop
yum install -y libnl3 # keepalived ipv6
yum install -y libzstd # canopy
yum install -y sysstat
yum install -y json-c
```

在安装包下的 `system-lib` 目录下有部分rpm包，可以使用 `rpm -ivh <rpm包>` 直接安装。

如果要使用[oracle fdw](#) 或 `wal2sql`，需要正确安装[oracle客户端SDK](#)，oracle客户端SDK在arm环境使用19版本，在x86环境使用21版本的客户端。

如果使用[mysql fdw](#)，则需要正确安装mysql-client库，mysql客户端使用8.0版本。其中oracle客户端需注意配置如下环境变量：

```
# oracle客户端环境变量配置样例
export ORACLE_HOME=/home/lightdb/instantclient_21_6
export LD_LIBRARY_PATH=$ORACLE_HOME:$LD_LIBRARY_PATH
export TNS_ADMIN=$ORACLE_HOME/network/admin
```

3.5 创建lightdb用户并设置sudo免密

- 创建lightdb用户与用户组

```
groupadd lightdb
useradd -g lightdb -m lightdb
passwd lightdb
```

- 为lightdb用户设置sudo免密，如下图所示，在 `/etc/sudoers` 中新增一行 `lightdb ALL=`

```
(ALL) NOPASSWD:ALL

# plugin, if any. Starting with 1.8.15, only groups of the form
# %:group are resolved via the group plugin by default.
# We enable always_query_group_plugin to restore old behavior.
# Disable this option for new behavior.
Defaults    always_query_group_plugin

Defaults    env_reset
Defaults    env_keep = "COLORS DISPLAY HOSTNAME HISTSIZE KDEDIR LS_COLORS"
Defaults    env_keep += "MAIL PS1 PS2 QTDIR USERNAME LANG LC_ADDRESS LC_CTYPE"
Defaults    env_keep += "LC_COLLATE LC_IDENTIFICATION LC_MEASUREMENT LC_MESSAGES"
Defaults    env_keep += "LC_MONETARY LC_NAME LC_NUMERIC LC_PAPER LC_TELEPHONE"
Defaults    env_keep += "LC_TIME LC_ALL LANGUAGE LINGUAS _XKB_CHARSET XAUTHORITY"

#
# Adding HOME to env_keep may enable a user to run unrestricted
# commands via sudo.
#
# Defaults    env_keep += "HOME"

Defaults    secure_path = /sbin:/bin:/usr/sbin:/usr/bin

## Next comes the main part: which users can run what software on
## which machines (the sudoers file can be shared between multiple
## systems).
## Syntax:
##
##     user    MACHINE=COMMANDS
##
## The COMMANDS section may have other options added to it.
##
## Allow root to run any commands anywhere
root    ALL=(ALL)    ALL
lightdb ALL=(ALL)    NOPASSWD:ALL

## Allows members of the 'sys' group to run networking, software,
## service management apps and more.
# %sys ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE, DELEGATING, PROCESSES, LOCATE, DRIVERS

## Allows people in group wheel to run all commands
%wheel  ALL=(ALL)    ALL

## Same thing without a password
# %wheel    ALL=(ALL)    NOPASSWD: ALL

## Allows members of the users group to mount and unmount the
## cdrom as root
# %users    ALL=/sbin/mount /mnt/cdrom, /sbin/umount /mnt/cdrom

## Allows members of the users group to shutdown this system
# %users    localhost=/sbin/shutdown -h now

## Read drop-in files from /etc/sudoers.d (the # here does not mean a comment)
#includedir /etc/sudoers.d
:wq!
```

3.6 创建LightDB安装目录和实例目录

以LightDB安装目录为 `/usr/local/lightdb` 为例，创建该目录，并为其设置用户（组）权限。

```
mkdir -p /usr/local/lightdb
chown -R lightdb:lightdb /usr/local/lightdb
```


默认情况下，LightDB实例目录为安装目录下的一个子目录，此时不需要手工创建实例目录。

也可以指定其他实例目录，此时需要手工创建，并为其设置用户（组）权限，以 `/data/lightdb_data` 为例：

```
mkdir -p /data/lightdb_data
chown -R lightdb:lightdb /data/lightdb_data
```

3.7 配置操作系统内核参数

3.7.1 配置sysctl.conf

运行下列命令以设置推荐的操作系统内核参数。

```
echo "kernel.shmni=4096" >> /etc/sysctl.conf
echo "kernel.shmmax=$(expr $(getconf _PHYS_PAGES) / 2 \* $(getconf PAGE_SIZE))" >> /etc/sysctl.conf
echo "kernel.shmall=$(expr $(getconf _PHYS_PAGES) / 2)" >> /etc/sysctl.conf
echo "kernel.sem=500 2048000 200 4096" >> /etc/sysctl.conf

echo "fs.aio-max-nr=1048576" >> /etc/sysctl.conf
echo "fs.file-max=524288" >> /etc/sysctl.conf

echo "vm.swappiness=5" >> /etc/sysctl.conf
echo "vm.overcommit_memory=2" >> /etc/sysctl.conf
echo "vm.overcommit_ratio=75" >> /etc/sysctl.conf
echo "vm.dirty_background_ratio=5" >> /etc/sysctl.conf
echo "vm.dirty_ratio=40" >> /etc/sysctl.conf
echo "vm.dirty_expire_centisecs=500" >> /etc/sysctl.conf
echo "vm.dirty_writeback_centisecs=250" >> /etc/sysctl.conf

echo "net.core.somaxconn=2000" >> /etc/sysctl.conf
echo "net.ipv4.tcp_max_syn_backlog=2000" >> /etc/sysctl.conf
echo "net.ipv4.tcp_tw_reuse=1" >> /etc/sysctl.conf
echo "net.ipv4.tcp_syn_retries=3" >> /etc/sysctl.conf
echo "net.ipv4.tcp_retries2=5" >> /etc/sysctl.conf
echo "net.ipv4.tcp_slow_start_after_idle=0" >> /etc/sysctl.conf
```

如果服务器物理内存大于128GB，尤其是达到256GB甚至更高时，强烈建议开启Linux系统的hugepage，同时将大页内存设置为shared_buffers的1.1~1.2倍，关于shared_buffers的介绍可参考官方文档<https://www.hs.net/lightdb/docs/html/runtime-config-resource.html#RUNTIME-CONFIG-RESOURCE-MEMORY>，开启hugepage的配置方法如下所示。

```
echo "vm.nr_hugepages = 大页页数" >> /etc/sysctl.conf
```

其中，大页页数 = (shared_buffers * 1.1~1.2) / hugepage_size，hugepage_size的值因系统和个人设置而异，查看方法为：

```
cat /proc/meminfo | grep Hugepagesize
```

最后，运行 `sysctl -p` 使设置生效，生效后可通过 `cat /proc/meminfo` 确认hugepage的配置与使用情况，如下图所示。

```
[lightdb@hs-10-19-36-9 ~]$ cat /proc/meminfo
MemTotal:      802779072 kB
MemFree:       17821120 kB
MemAvailable:  323831872 kB
Buffers:        256 kB
Cached:        338589824 kB
SwapCached:    39232 kB
Active:        44449472 kB
Inactive:      313046592 kB
Active(anon):  16658240 kB
Inactive(anon): 2404928 kB
Active(file):  27791232 kB
Inactive(file): 310641664 kB
Unevictable:    64 kB
Mlocked:        64 kB
SwapTotal:     16777152 kB
SwapFree:      6082496 kB
Dirty:         1600 kB
Writeback:      0 kB
AnonPages:     18871296 kB
Mapped:        181312 kB
Shmem:         148992 kB
Slab:          3484608 kB
SReclaimable:  439872 kB
SUnreclaim:    3044736 kB
KernelStack:   23168 kB
PageTables:    39616 kB
NFS_Unstable:   0 kB
Bounce:        0 kB
WritebackTmp:   0 kB
CommitLimit:   207927168 kB
Committed_AS:  33344640 kB
VmallocTotal:  133009637312 kB
VmallocUsed:    0 kB
VmallocChunk:   0 kB
Percpu:        251904 kB
HardwareCorrupted: 0 kB
AnonHugePages: 0 kB
ShmemHugePages: 0 kB
ShmemPmdMapped: 0 kB
CmaTotal:      0 kB
CmaFree:       0 kB
HugePages_Total: 802
HugePages_Free: 187
HugePages_Rsvd: 1
HugePages_Surp: 0
Hugepagesize: 524288 kB
Hugetlb:       420478976 kB
[lightdb@hs-10-19-36-9 ~]$
```

3.7.2 配置limits.conf

运行下列命令以设置推荐的操作系统内核参数。

```
echo "lightdb hard core unlimited" >> /etc/security/limits.conf
echo "lightdb soft core unlimited" >> /etc/security/limits.conf
echo "lightdb hard nfile 524288" >> /etc/security/limits.conf
echo "lightdb soft nfile 524288" >> /etc/security/limits.conf
echo "lightdb hard nproc 16384" >> /etc/security/limits.conf
echo "lightdb soft nproc 16384" >> /etc/security/limits.conf
```

然后 `su - lightdb` 切换到lightdb用户使设置生效，运行 `ulimit -c`、`ulimit -n`和`ulimit -u` 命令确认设置生效。

```
[lightdb@hs-10-20-30-218 ~]$ ulimit -c
unlimited
[lightdb@hs-10-20-30-218 ~]$ ulimit -n
524288
[lightdb@hs-10-20-30-218 ~]$ ulimit -u
16384
[lightdb@hs-10-20-30-218 ~]$
```

3.8 开启Swap交换区

使用 `free -h` 查看是否已开启Swap交换区，如未配置，则可以按以下步骤配置开启。

1. 创建交换区空白文件，文件大小即为交换区大小，如果磁盘空间充足，建议当物理内存不超过128GB时，Swap大小设为物理内存的一半，建议当物理内存大于128GB时，Swap大小设为固定128GB。下面的示例将交换区文件创建在`/swap`，大小为2GB，目的仅用于示例。实际配置请按照上述建议决定交换区大小，并选择合适的磁盘路径来放置交换区文件。

```
dd if=/dev/zero of=/swap bs=1M count=2048 # Swap交换区大小 = 2048MB
```

2. 使用 `mkswap` 格式化文件

```
mkswap -f /swap
```

3. 修改交换区文件权限为0600

```
chmod 0600 /swap
```

4. 启用刚刚创建的交换区

```
swapon /swap
```

5. 设置开机自动启用，修改 `/etc/fstab` 文件，添加如下配置

```
/swap swap swap defaults 0 0
```

3.9 配置SSH免密互通

注意：本步骤仅在安装LightDB高可用、分布式常规模式、分布式多机单实例模式三种情形时需要，如果安装单机版或分布式单机多实例模式，则可跳过本章节。关于分布式常规模式、分布式多机单实例模式的定义，请参考本文档6.1 LightDB分布式三种部署模式简介。

以高可用一主一从为例，主节点IP为192.168.10.110，从节点IP为192.168.10.128，主从均切换到lightdb用户，按如下所示步骤进行配置。

```
# 免密认证，所有服务器都要执行
ssh-keygen -t rsa -P "" -f ~/.ssh/id_rsa

# 证书同步，所有服务器都要执行
ssh-copy-id lightdb@192.168.10.128
ssh-copy-id lightdb@192.168.10.110

# 免密验证，主机SSH连接从机，无需输密码
[lightdb@localhost install]$ ssh lightdb@192.168.10.128
Last login: Thu Aug 12 09:02:32 2021
```

3.10 配置NTP校时服务

注意：本步骤仅在安装LightDB高可用、分布式常规模式、分布式多机单实例模式三种情形时需要，如果安装单机版或分布式单机多实例模式，则可跳过本章节。关于分布式常规模式、分布式多机单实例模式的定义，请参考本文档6.1 LightDB分布式三种部署模式简介。

配置NTP校时服务的方法在安装过程中会有引导信息提示，详细步骤在后续章节中具体说明。如果您希望自行配置NTP服务，请务必确保用于安装LightDB的服务器全部配置完成，不能出现部分启动了NTP、部分未启动的情形，否则LightDB将在校验NTP服务启动情况这一步骤失败。

3.11 准备LightDB安装包

根据前言中介绍的安装包名规则和目标主机的实际情况，选择正确的LightDB安装包上传到 /home/lightdb 目录，并确保安装包的用户与用户组均为lightdb。

解压安装包，进入解压后目录。运行 install.sh 脚本，进入安装过程，根据安装向导提示信息，此处有两种安装方式，输入 Yes 为GUI安装，输入 No 为命令行安装。

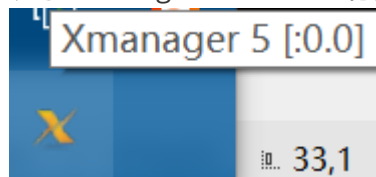
```
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5760-el7.x86_64]$
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5760-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```

如果选择GUI安装，需要满足下列条件：

- Windows上运行Xmanager - Passive，并通过Xshell SSH连接服务器
- 目标服务器已配置DISPLAY环境变量

```
export DISPLAY=Windows IP:0.0
```

其中，Windows IP为运行Xmanager - Passive的主机IP地址，冒号:后面的值一般为0.0，具体取决于Xmanager - Passive运行后的状态提示，如下图所示。



- 目标服务器已安装 libxtst、gtk2、libx11 这几个运行GUI需要的依赖包

```
yum install -y libxtst gtk2 libx11
```

如果无法满足上述条件，或者已满足上述条件，但仍无法显示GUI安装向导界面，则可以选择命令行安装，二者除了向导方式外，并无任何差异。

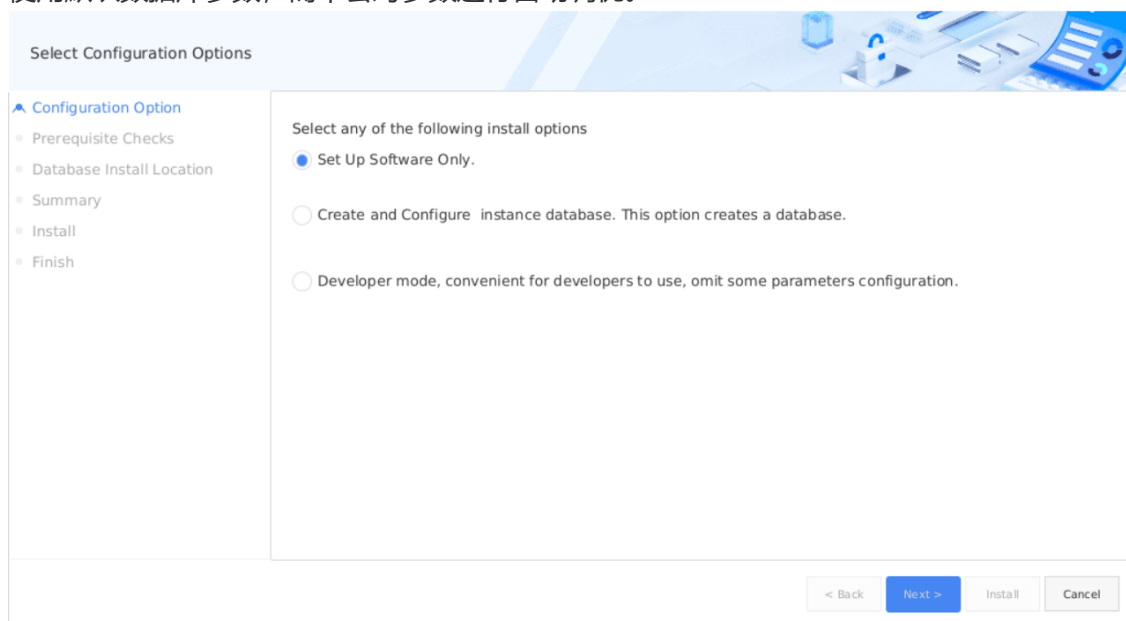
4 安装LightDB单机版

4.1 GUI安装LightDB单机版

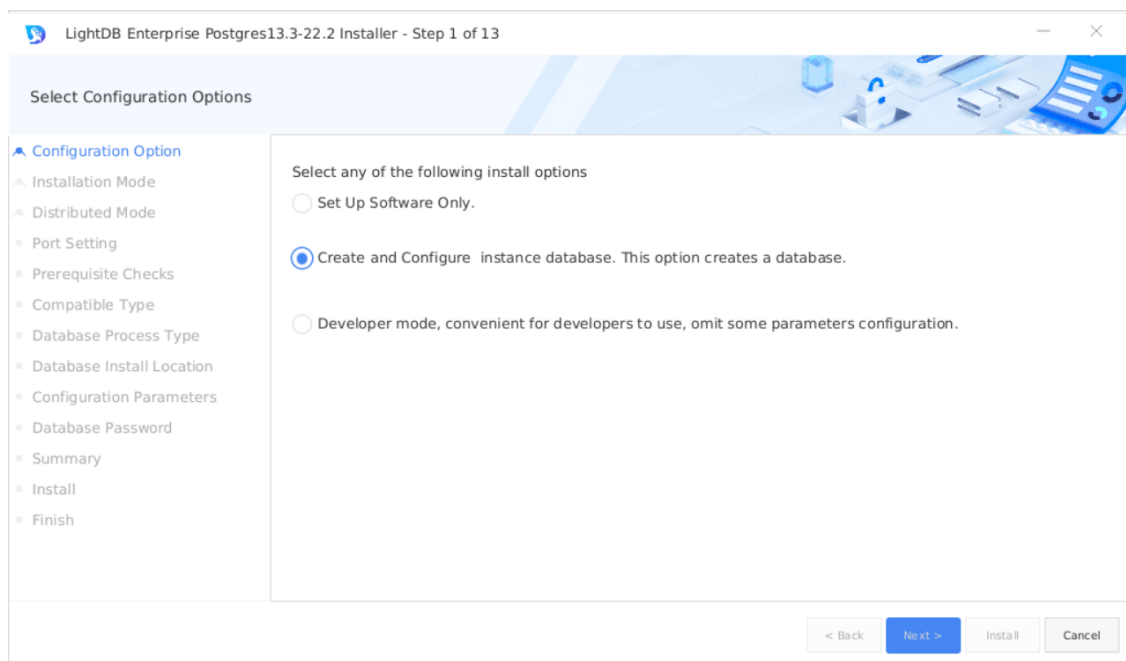
- 按前面所述要求，配置DISPLAY环境变量，在install.sh命令行提示信息中输入yes，按回车键确认，Windows中就会弹出GUI安装向导界面。

```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

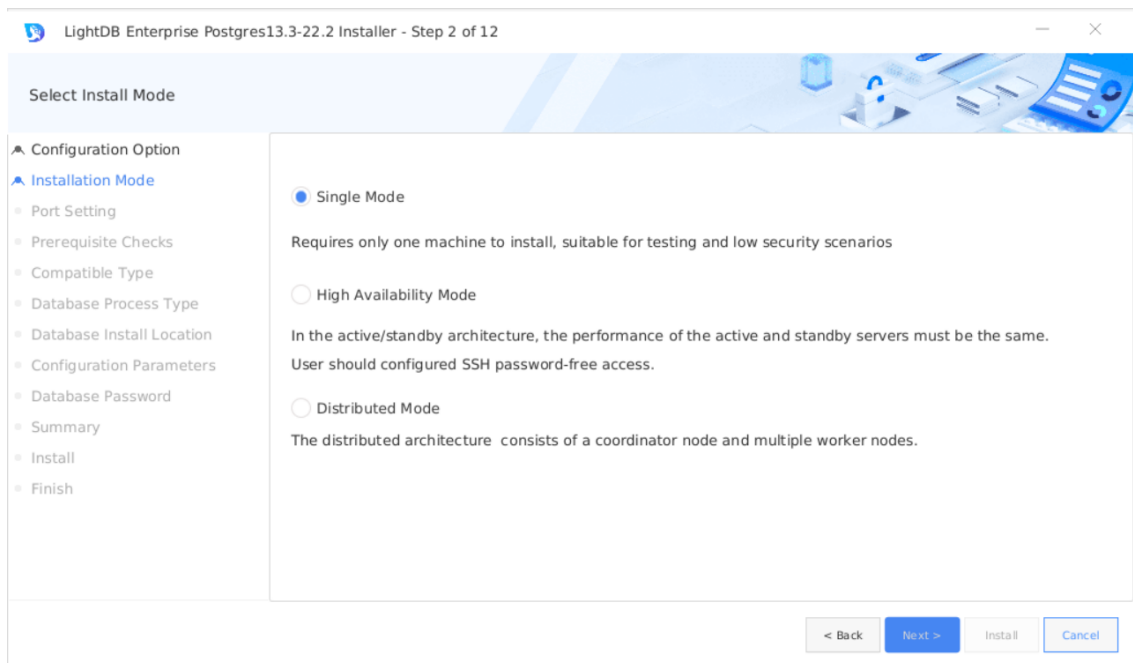
- 界面中包含三个选项，选项一（默认选项）仅安装数据库；选项二除了安装数据库外，还会生成一个默认的实例目录，并使用默认实例启动数据库；选项三为开发者模式，该模式下将使用默认数据库参数，而不会对参数进行自动调优。



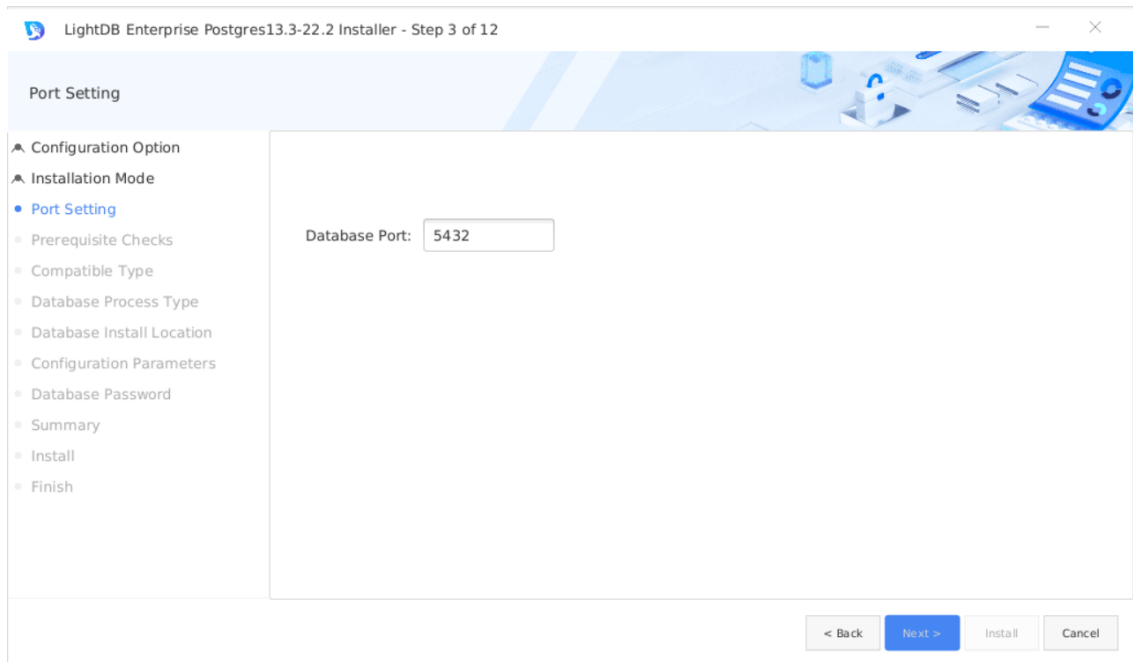
- 本文档使用选项二，以展示完整的安装过程。



- 选择安装模式，提供**单机版**、**高可用**、**分布式**三个选项，默认为单机版，此处我们使用默认选择。

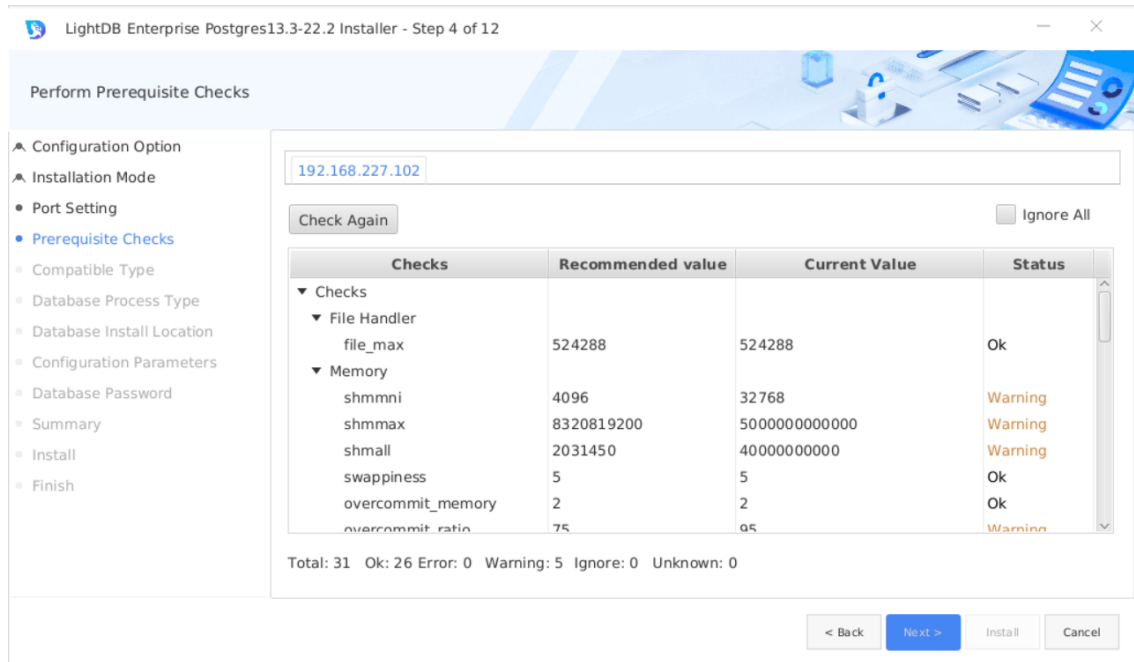


- 选择单机版进入下一步，配置端口号，默认为5432，可自行指定任意合法端口。如果指定了一个非法端口或正在使用的端口，点击Next会无法进入下一步，同时界面中会给出错误提示信息。

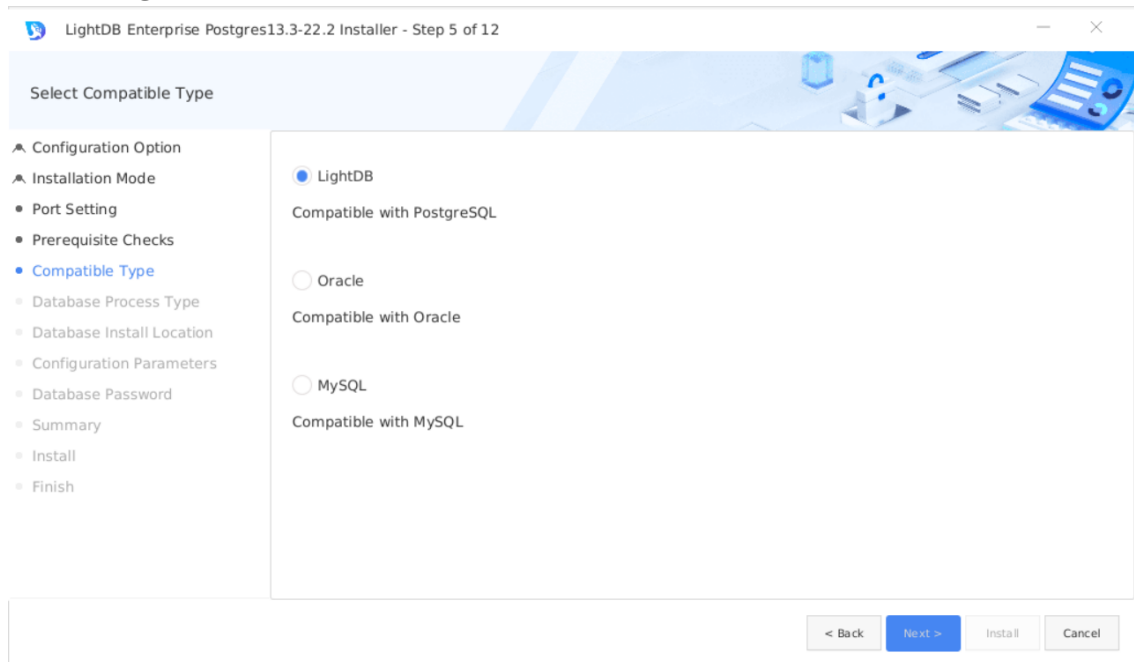


- 检查依赖包和Linux内核参数。如有依赖缺失，则无法进入下一步，必须先安装依赖，再点击 **Check Again** 重新检查；如有内核参数与推荐配置不符的，则会给出WARNING，此时可以先按建议值重新配置，再点击 **Check Again**，也可以直接点击 **Ignore All** 忽略全部警告。

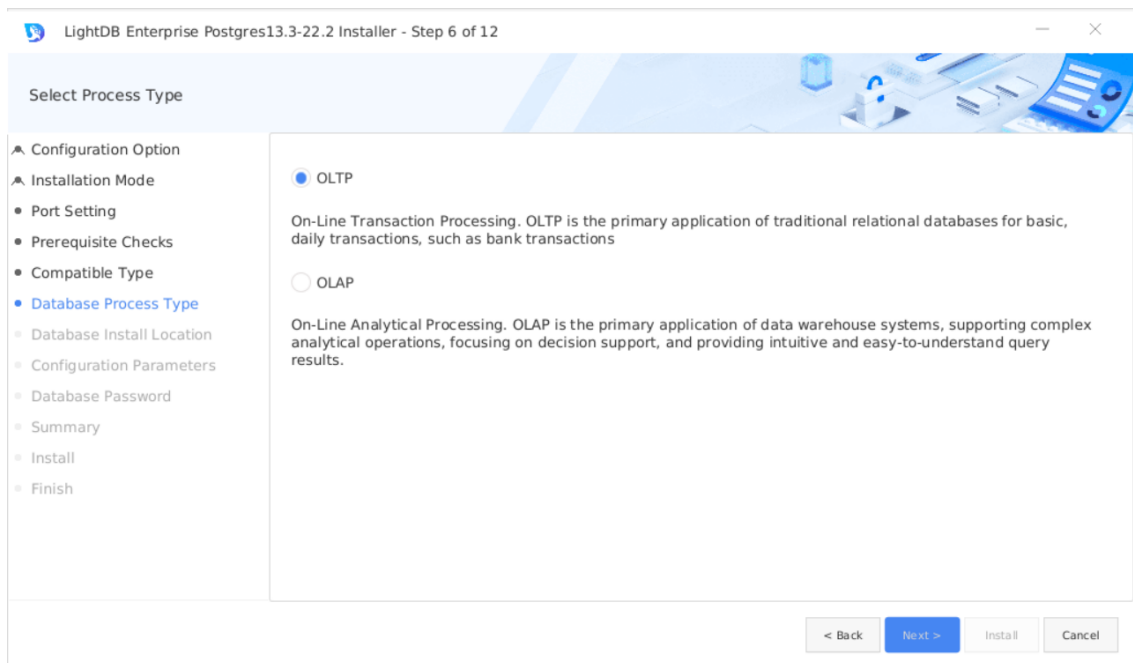
告，直接进入下一步。



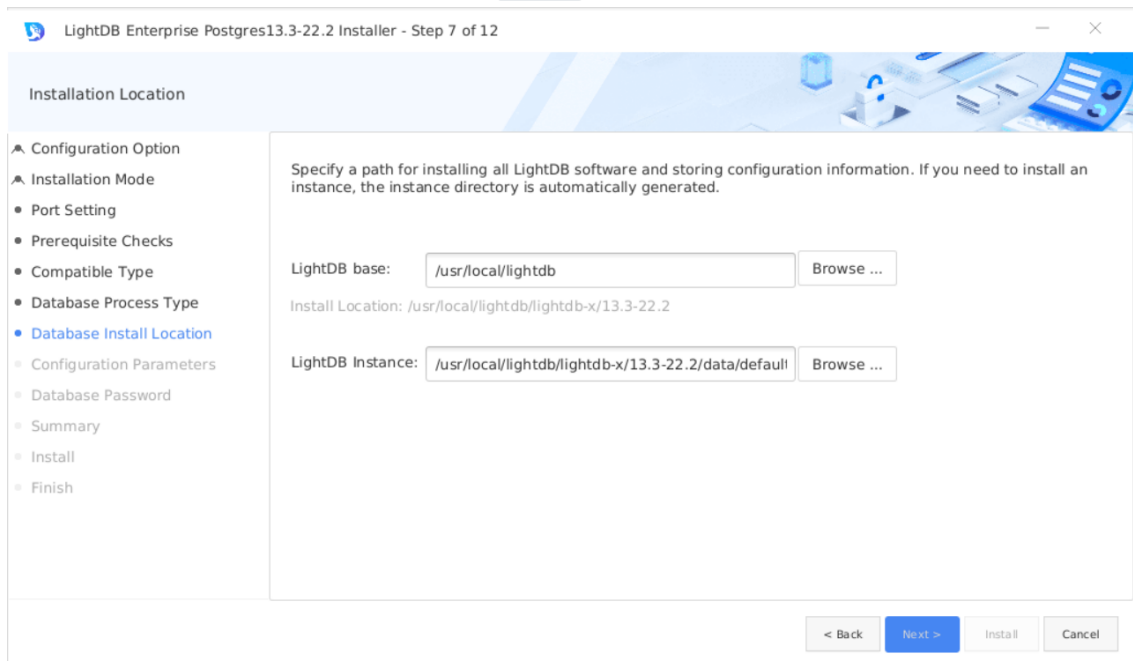
- 选择兼容模式，如果你的应用从mysql或oracle迁移而来，则可以对选择mysql或oracle，LightDB会启用相应的兼容特性。



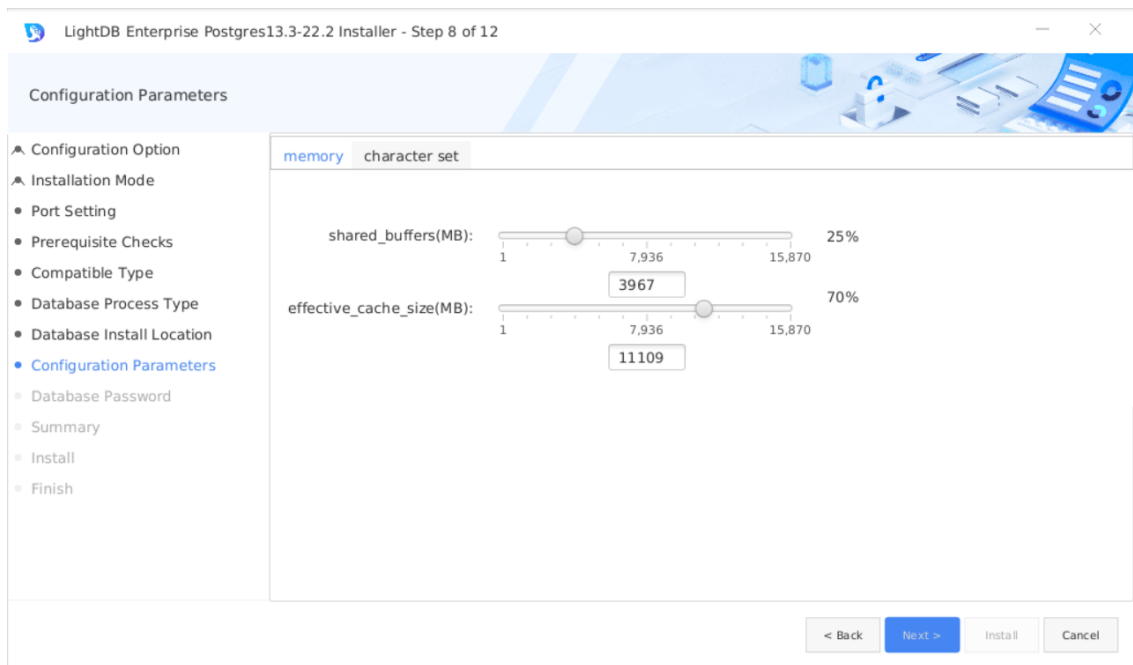
- OLTP/OLAP选择，该选项会影响部分GUC参数的默认值策略，默认为OLTP，此处使用默认值。



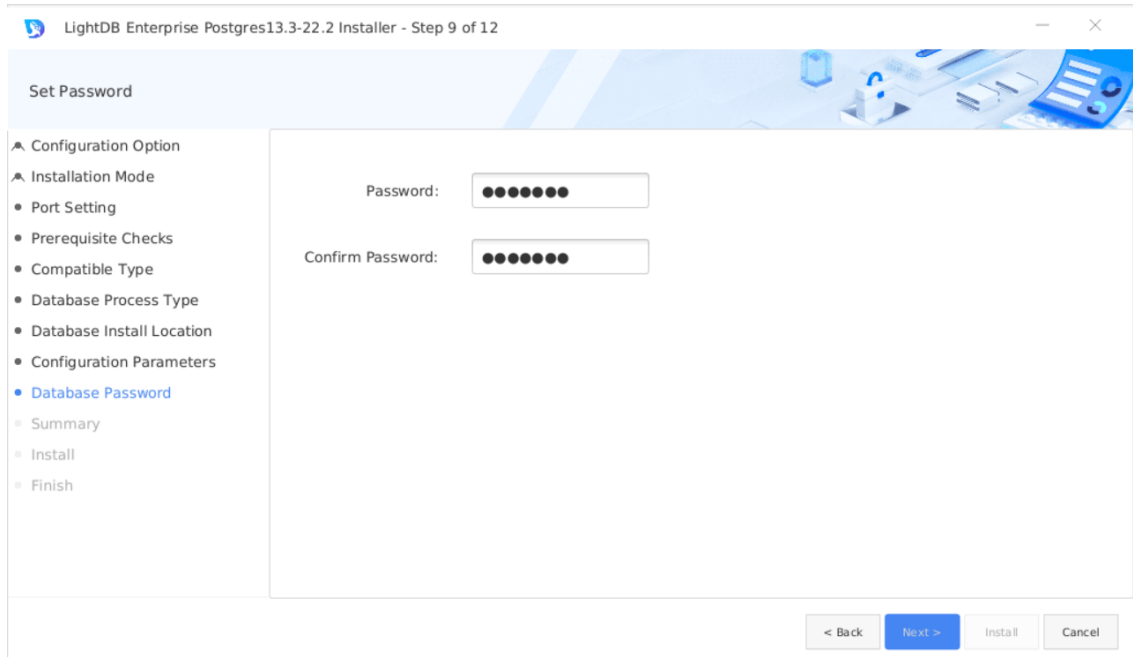
- 指定数据库安装目录和实例目录(要确保lightdb用户有写入权限)，（步骤详见本文档 3.8），可以在文本框中直接修改或点击 **Brows** 调出路径选择对话框，来指定其他目录。



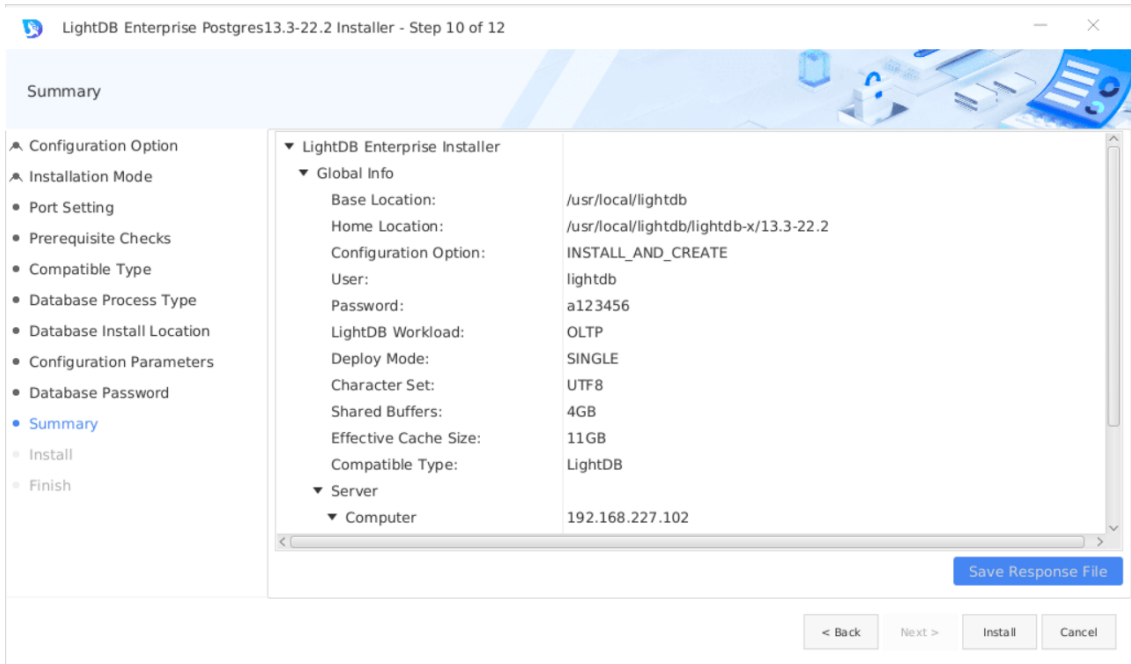
- 配置 `shared_buffers` 与 `effective_cache_size` 大小，以及设置字符集。默认 `shared_buffers` = 25% * 总物理内存，默认 `effective_cache_size` = 70% * 总物理内存，默认字符集为 `UTF-8`，并提供 `GBK`、`SQL_ASCII`、`LATIN1` 三个其他选项。



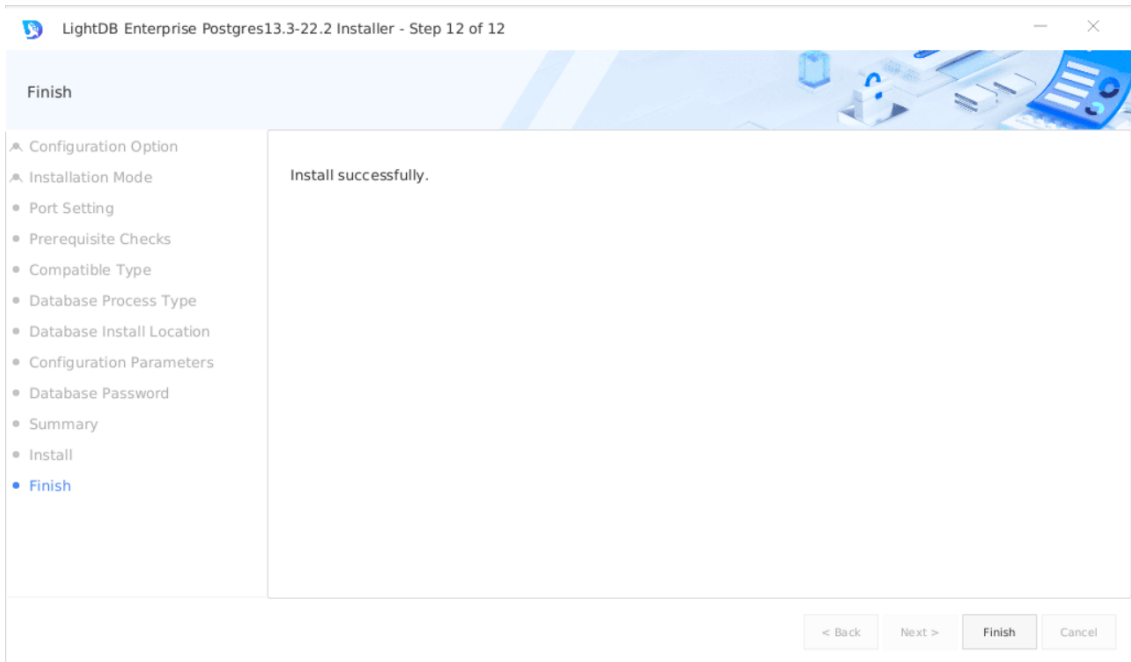
- 配置super用户（即lightdb）密码，密码长度为6-16个字符，且至少包含数字、英文字母。



- LightDB安装信息总览，确认无误后，点击Install执行安装。(可以点击 Save Response File 把安装信息保存为文件，以后如果需要重新安装时可以简化输入操作)



- 安装成功。



4.2 命令行安装LightDB单机版

命令行安装步骤及选项与GUI安装完全相同，仅在向导信息提示上有所不同，因此本章节不再详细解释其中内容的含义与注意事项。

- 在start.sh命令行提示信息中输入No，按回车键确认，进入命令行安装交互界面。

```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```
- 选择配置模式，键入1仅安装数据库，键入2会额外创建一个实例，输入3为开发者选项，默认为1，此处选择2。

```
Choice a kind of configuration mode!
1: Only install.
2: Install database and Create instance.
3: Developer
Please enter 1 2 or 3(The default is 1):
```

```
█
```

- 选择安装单机版、高可用版或分布式版，键入1安装单机版，键入2选择高可用版，键入3选择分布式版，默认为单机版。

```
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
```

```
█
```

- 指定端口号，默认为5432。

```
Assign a port to the LightDB!
Listen Port(The default port is 5432):
5432█
```

- 检查依赖包与Linux内核参数，检查通过后会进入下一步选择，否则会报错并给出提示信息，其中WARNING会默认全部忽略。

```
Check system parameters and dependency packages!
===== 192.168.174.139 =====
NETWORK
name: sem, recommend value: 500,2048000,200,4096, current value: 250,32000,32,128, status: WARNING
name: aio_max_nr, recommend value: 1048576, current value: 1048576, status: OK
name: somaxconn, recommend value: 2000, current value: 128, status: WARNING
name: tcp_max_syn_backlog, recommend value: 2000, current value: 128, status: WARNING
name: tcp_tw_reuse, recommend value: 1, current value: 0, status: WARNING
name: tcp_syn_retries, recommend value: 3, current value: 6, status: WARNING
name: tcp_retries2, recommend value: 5, current value: 15, status: WARNING
name: tcp_slow_start_after_idle, recommend value: 0, current value: 1, status: WARNING
PAGE_CACHE
name: dirty_background_ratio, recommend value: 5, current value: 10, status: WARNING
name: dirty_ratio, recommend value: 40, current value: 30, status: WARNING
name: dirty_expire_centisecs, recommend value: 500, current value: 3000, status: WARNING
name: dirty_writeback_centisecs, recommend value: 250, current value: 500, status: WARNING
MEMORY
name: shmmni, recommend value: 4096, current value: 4096, status: OK
name: shmmax, recommend value: 953872384, current value: 18446744073692774399, status: WARNING
name: shmall, recommend value: 232879, current value: 18446744073692774399, status: WARNING
name: swappiness, recommend value: 5, current value: 30, status: WARNING
name: overcommit_memory, recommend value: 2, current value: 0, status: WARNING
name: overcommit_ratio, recommend value: 75, current value: 50, status: WARNING
FILE_HANDLER
name: file_max, recommend value: 524288, current value: 524288, status: OK
ULIMIT
name: ulimit_core, recommend value: unlimited, current value: unlimited, status: OK
name: ulimit_nofile, recommend value: 8192, current value: 524288, status: OK
Dependency Package
name: COREUTILS is existed: yes
name: PAM is existed: yes
name: OPENDAP is existed: yes
name: READLINE-6 is existed: yes
name: OPENSLL-LIBS-1.0.2 is existed: yes
name: LIBXML2-2 is existed: yes
name: ZLIB-1 is existed: yes
name: UUID-1.6 is existed: yes
name: GLIBC-2.17 is existed: yes
```

- 选择兼容模式，如果你的应用从mysql或oracle迁移而来，则可以对选择mysql或oracle，LightDB会启用相应的兼容特性。

```
Choice a kind of Compatible Type!
1: LightdDB(Compatible with PostgreSQL).
2: ORACLE(Compatible with ORACLE).
3: MYSQL(Compatible with MYSQL).
Please enter 1, 2 or 3:(The default is 1)
```

- 选择OLTP或OLAP，键入1为OLTP，键入2为OLAP，默认为1。

```
Choice a kind of LightDB workload!
1: OLTP(On-line Transaction Processing).
2: OLAP(On-Line Analytical Processing).
Please enter 1 or 2:(The default is 1)
```

- 指定LightDB安装目录和实例目录(要确保lightdb用户有写入权限),此处均使用默认自定义目录。

```
Base Location: /usr/local/lightdb
Install Location: /usr/local/lightdb/lightdb-x/13.3-22.2
Please enter instance location(The default is /usr/local/lightdb/lightdb-x/13.3-22.2/data/defaultCluster/):
```

- 配置shared_buffers与effective_cache_size大小, 以及设置字符集。

```
Please configure memory(MB) and character set!
Please enter shared_buffers, Default value is (272):

Please enter effective_cache_size, Default value is (1273):

Please choice a kind of Character Set.
1. UTF8
2. GBK
3. SQL_ASCII
4. LATIN1
The default choice 1(UTF8)
```

- 设置super用户密码，密码长度为6-16个字符，且至少包含数字、英文字母。

```
Please enter LightDB password:
Please enter original password:
Please enter confirm password:
```

- 选择是否安装LightDB EM，键入1不安装，键入2安装，默认为不安装，此处选择安装。

```
1 Not install LightDB enterprise manager.
2 Install LightDB enterprise manager
Please enter 1 or 2:(The default is 1)
```

- 选择继续安装，直至安装完成。

[illegible]

5 安装LightDB高可用版

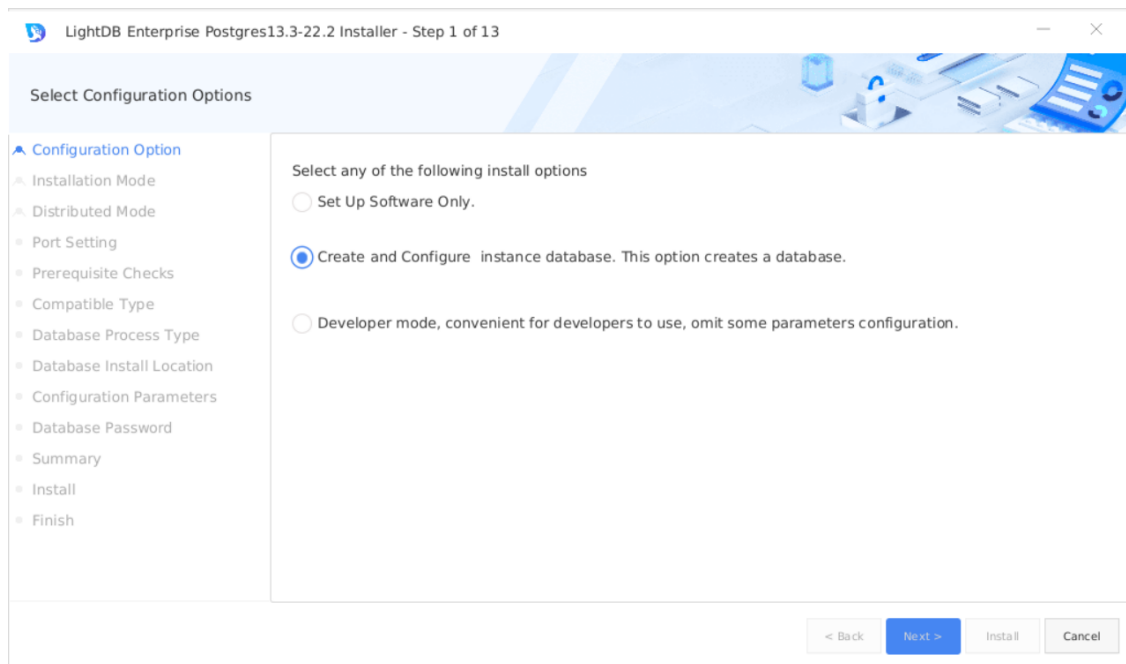
安装LightDB高可用，要求每一台主机都先完成3.1-3.11所述准备工作，然后按3.12所述打通SSH免密，最后按3.13所述在作为Primary的主机上准备安装包。

5.1 GUI安装LightDB高可用版

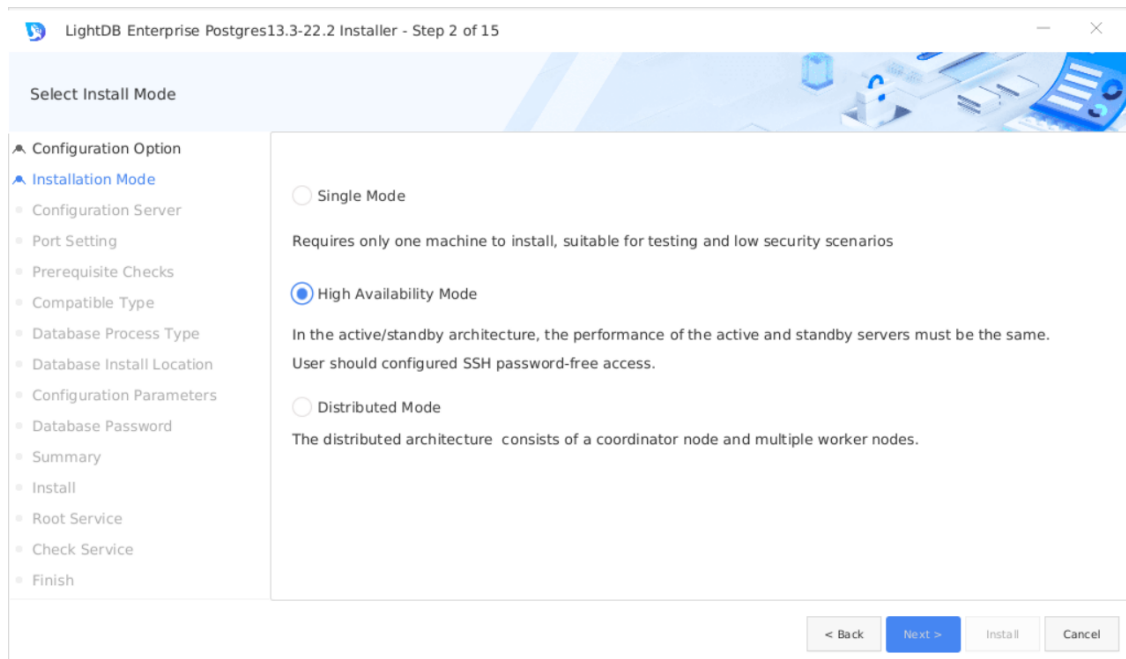
- 按前面所述要求，配置DISPLAY环境变量，在install.sh命令行提示信息中输入yes，按回车键确认，Windows中就会弹出GUI安装向导界面。

```
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5705-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

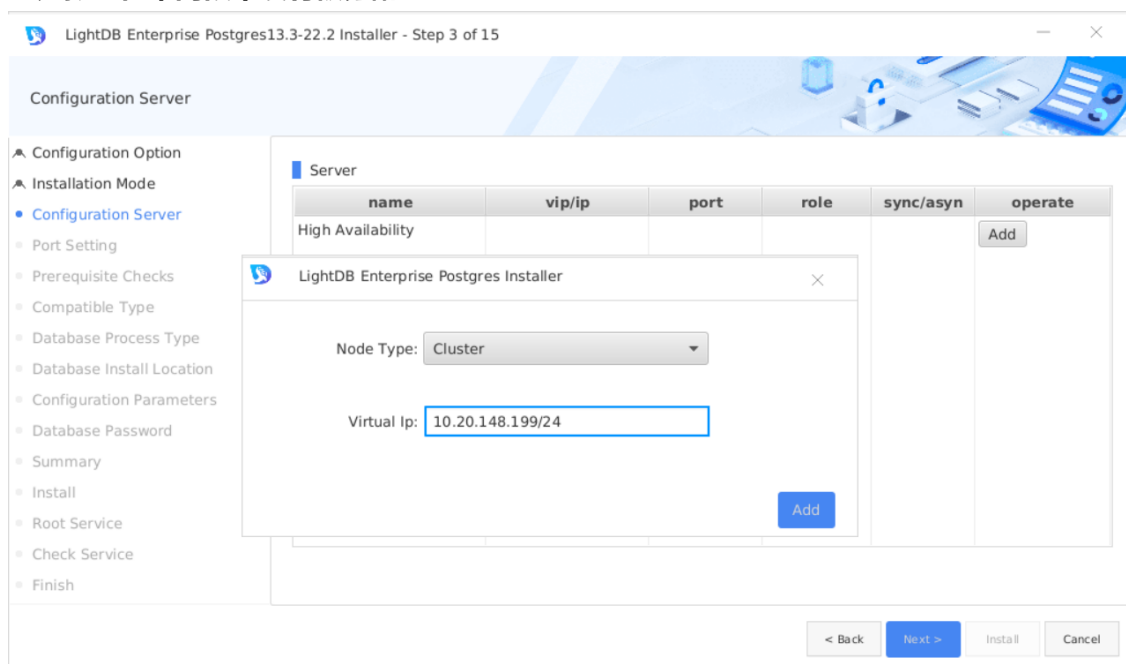
- 界面中包含三个选项，选项一（默认选项）仅安装数据库；选项二除了安装数据库外，还会生成一个默认的实例目录，并使用默认实例启动数据库；选项三为开发者模式，该模式下将使用默认数据库参数，而不会对参数进行自动调优。这里选择安装选项二，以展示完整的安装过程



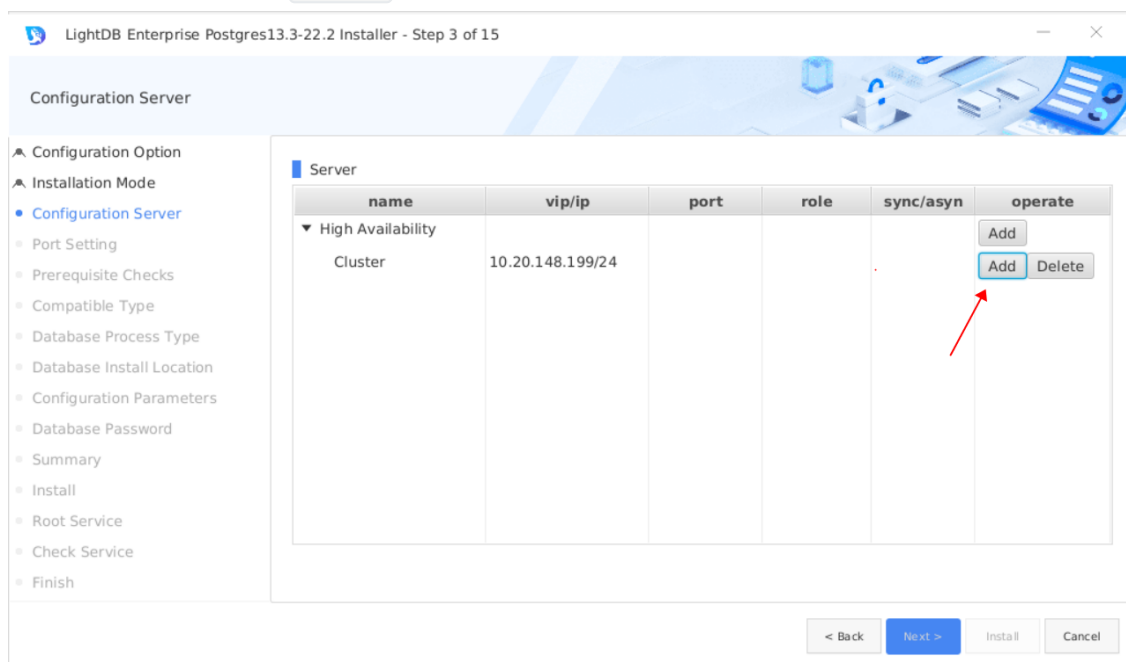
- 选择安装模式，提供**单机版**、**高可用**、**分布式**三个选项，默认为单机版，此处我们选择高可用版。



- 点击Add，在弹出的界面中添加虚拟IP，虚拟IP需要与配置的主备服务器在同一个网段，并且虚拟IP在本网段中没有被分配。

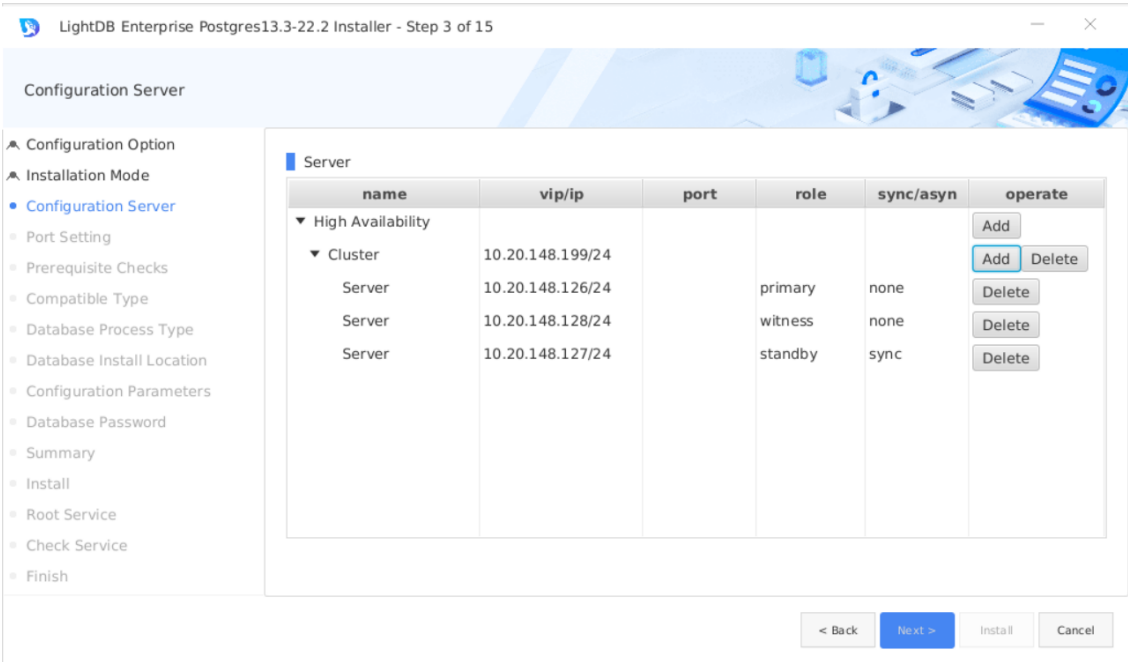


- 点击虚拟IP对应的Add按钮(下图箭头所指)添加集群机器信息，为每一台服务器指定IP、角色（primary、standby、witness）和同步方式（none、sync、asyn），primary和witness只能选择none，standby可以在sync和asyn中选择其一，如果选错，点击Next会无法进入下一步，同时界面中会有错误信息提示。配置完成后，点击Add进行添加，添加后还可以通过Delete删除。



- LightDB高可用版支持一主一从、一主多从两种部署方式。在节点的选择上，对于一主一从，witness是可选的，而对于一主多从，witness是必须的；在standby的同步异步选择上，如果节点处于同一网段，则同步异步都可选择，如果处于不同的网段，则只能是异步；在网段的要求上，至少要有1个standby和primary位于同一网段。此处以一主一从一

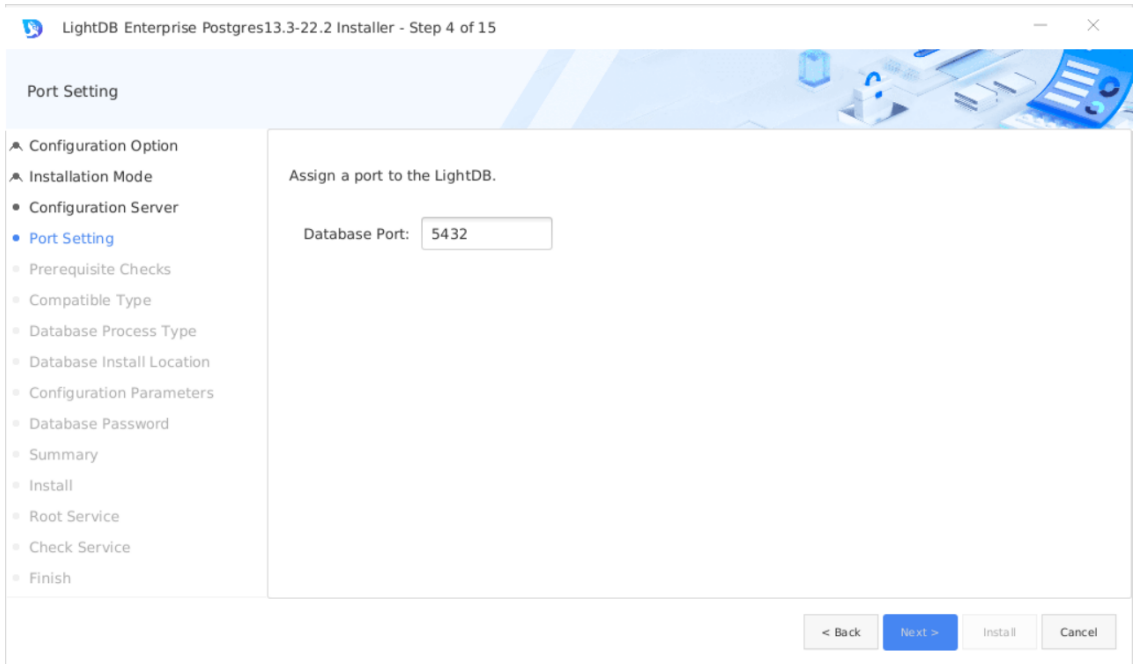
哨兵为例进行展示。



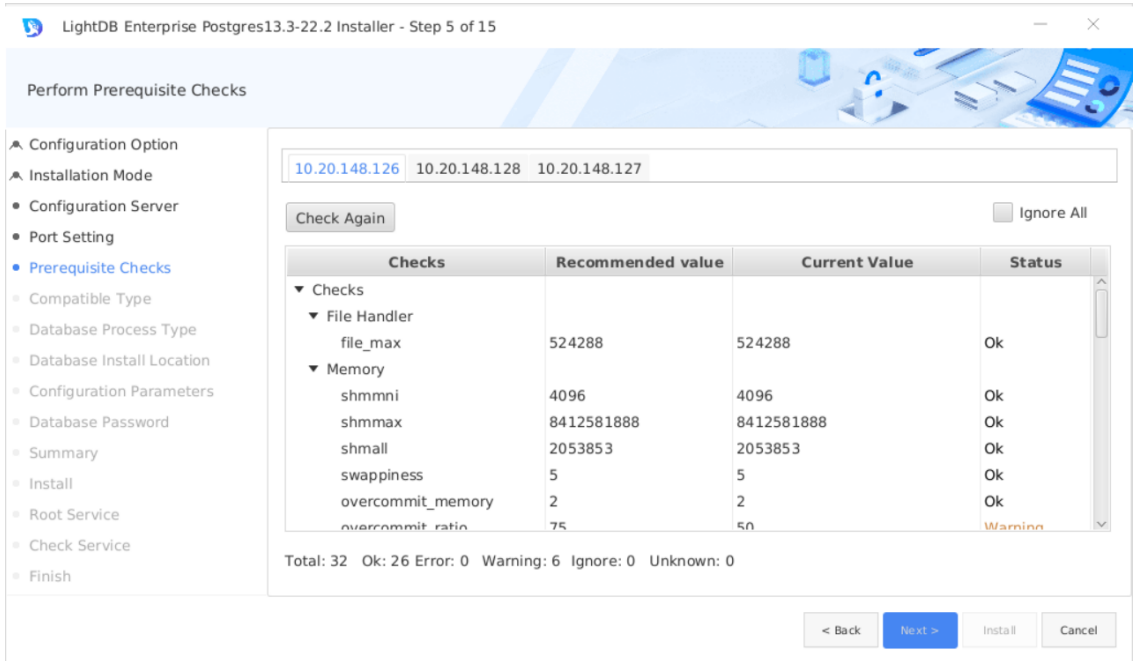
- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成。



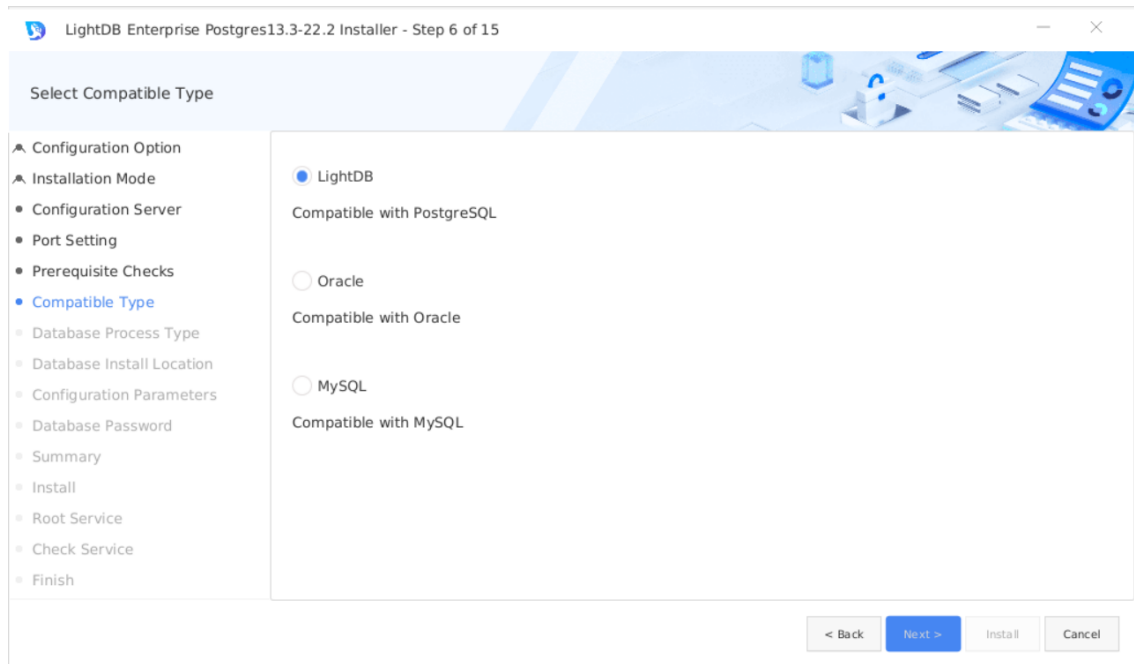
- 配置端口号，默认为5432，可自行指定任意合法端口，如果指定了一个非法端口或正在使用的端口，点击Next会无法进入下一步，同时界面中会给出错误提示信息。



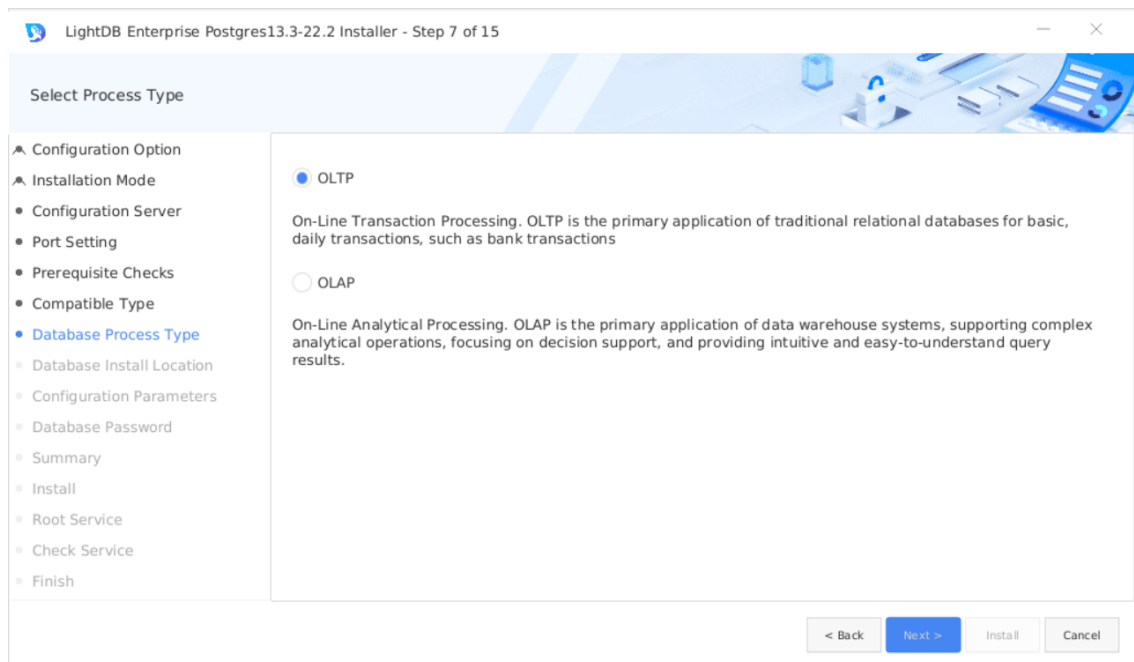
- 检查每一台服务器的依赖包和Linux内核参数。如有依赖缺失，则无法进入下一步，必须先安装依赖，再点击 Check Again 重新检查；如有内核参数与推荐配置不符的，则会给出 WARNING，此时可以先按建议值重新配置，再点击 Check Again，也可以直接点击 Ignore All 忽略全部警告，直接进入下一步。



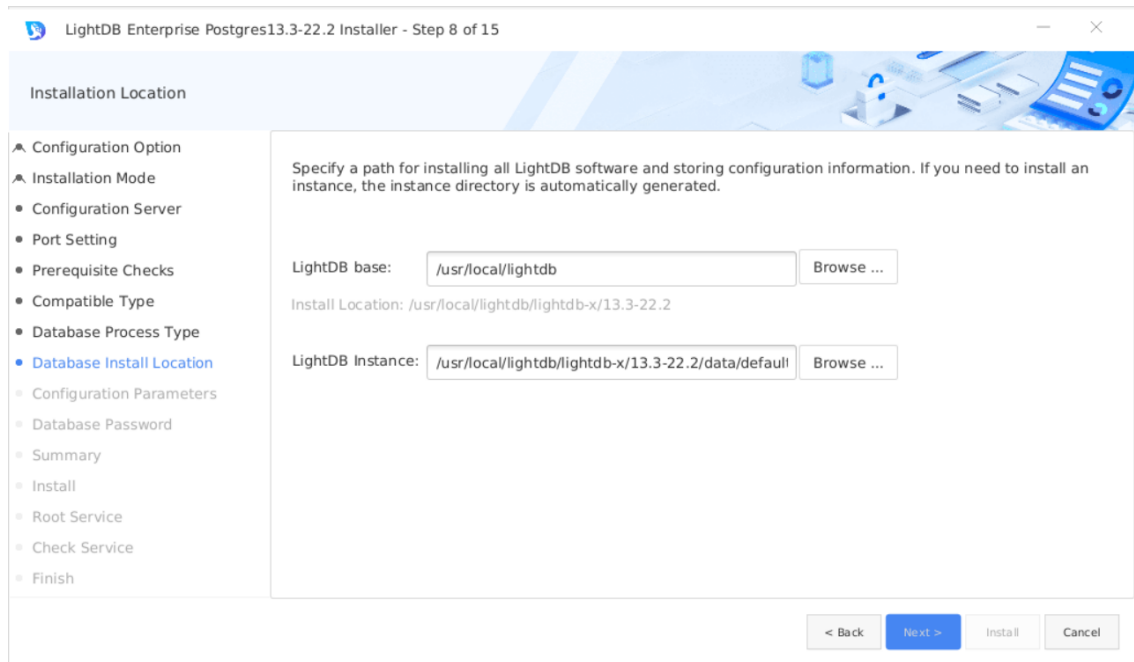
- 选择兼容模式，如果你的应用从mysql或oracle迁移而来，则可以对应选择mysql或oracle，LightDB会启用相应的兼容特性。



- OLTP/OLAP选择，该选项会影响部分GUC参数的默认值策略，默认为OLTP，此处使用默认值。



- 指定数据库安装目录和实例目录(要确保lightdb用户有写入权限)，（步骤详见本文档3.8），可以在文本框中直接修改或点击 **Brows** 调出路径选择对话框，来指定其他目录。



The screenshot shows the 'Installation Location' step of the LightDB Enterprise PostgreSQL 13.3-22.2 installer. The left sidebar lists the installation steps, with 'Database Install Location' selected. The main area contains instructions and two input fields for specifying paths. The 'LightDB base' field is set to '/usr/local/lightdb' and the 'LightDB Instance' field is set to '/usr/local/lightdb/lightdb-x/13.3-22.2/data/default'. Both fields have a 'Browse ...' button next to them. The 'Install Location' is automatically generated as '/usr/local/lightdb/lightdb-x/13.3-22.2'. At the bottom, there are buttons for '< Back', 'Next >', 'Install', and 'Cancel'.

LightDB Enterprise PostgreSQL 13.3-22.2 Installer - Step 8 of 15

Installation Location

Configuration Option

Installation Mode

Configuration Server

Port Setting

Prerequisite Checks

Compatible Type

Database Process Type

Database Install Location

Configuration Parameters

Database Password

Summary

Install

Root Service

Check Service

Finish

Specify a path for installing all LightDB software and storing configuration information. If you need to install an instance, the instance directory is automatically generated.

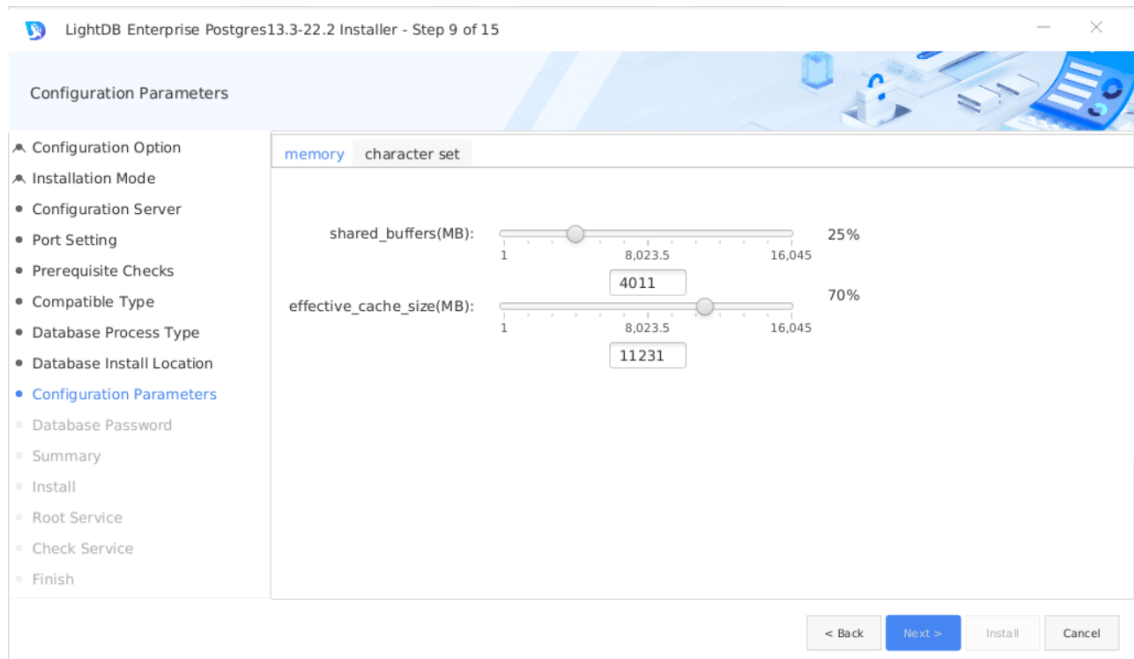
LightDB base: /usr/local/lightdb Browse ...

Install Location: /usr/local/lightdb/lightdb-x/13.3-22.2

LightDB Instance: /usr/local/lightdb/lightdb-x/13.3-22.2/data/default Browse ...

< Back Next > Install Cancel

- 配置 `shared_buffers` 与 `effective_cache_size` 大小，以及设置字符集。默认 `shared_buffers` = 25% * 总物理内存，默认 `effective_cache_size` = 70% * 总物理内存，默认字符集为 UTF-8，并提供 GBK、SQL_ASCII、LATIN1 三个其他选项。



The screenshot shows the 'Configuration Parameters' step of the LightDB Enterprise PostgreSQL 13.3-22.2 installer. The left sidebar lists the installation steps, with 'Configuration Parameters' selected. The main area has two tabs: 'memory' and 'character set'. The 'memory' tab is active, showing sliders for 'shared_buffers(MB)' and 'effective_cache_size(MB)'. The 'shared_buffers(MB)' slider is set to 25% of the total physical memory (16,045 MB), resulting in a value of 4,011 MB. The 'effective_cache_size(MB)' slider is set to 70% of the total physical memory (16,045 MB), resulting in a value of 11,231 MB. At the bottom, there are buttons for '< Back', 'Next >', 'Install', and 'Cancel'.

LightDB Enterprise PostgreSQL 13.3-22.2 Installer - Step 9 of 15

Configuration Parameters

Configuration Option

Installation Mode

Configuration Server

Port Setting

Prerequisite Checks

Compatible Type

Database Process Type

Database Install Location

Configuration Parameters

Database Password

Summary

Install

Root Service

Check Service

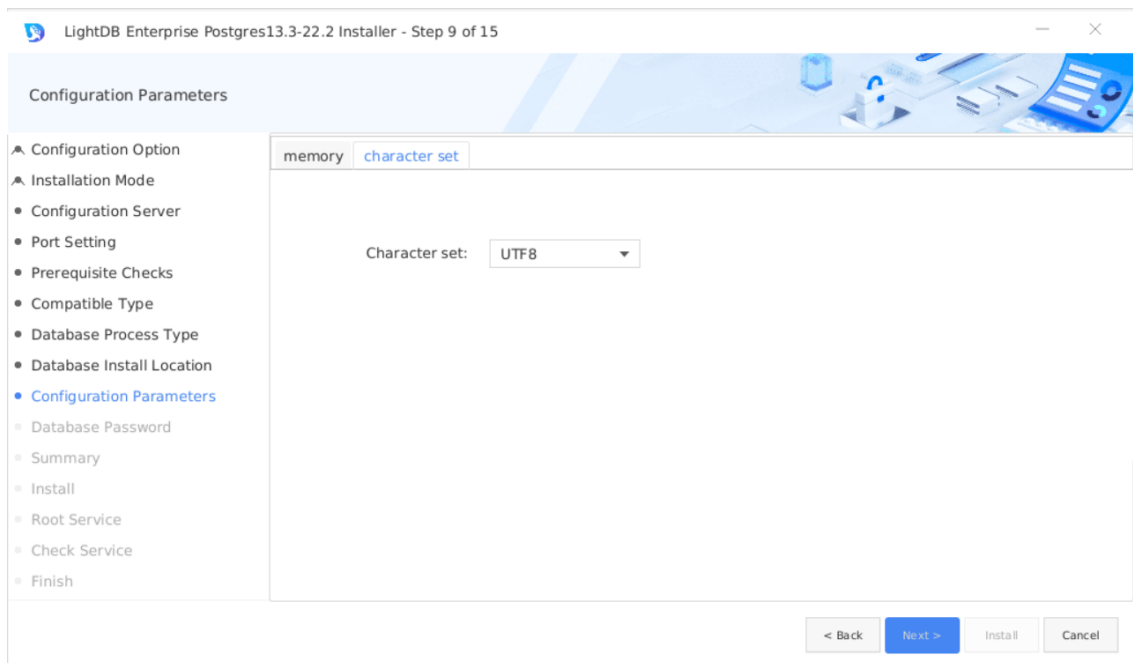
Finish

memory character set

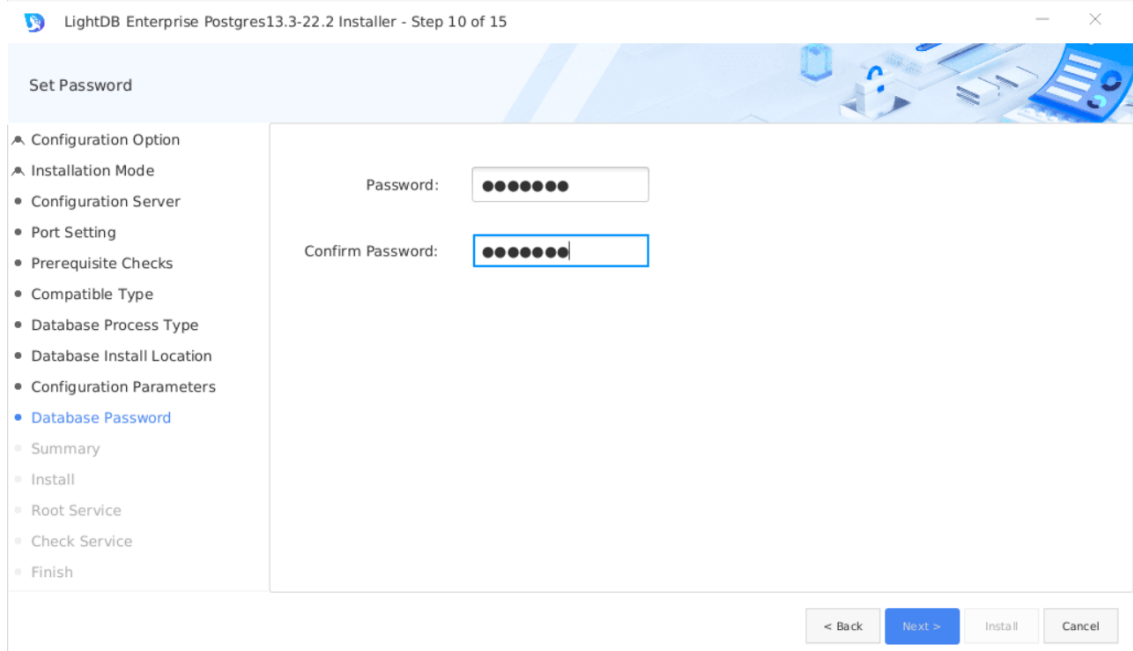
shared_buffers(MB): 1 8,023.5 16,045 25% 4011

effective_cache_size(MB): 1 8,023.5 16,045 70% 11231

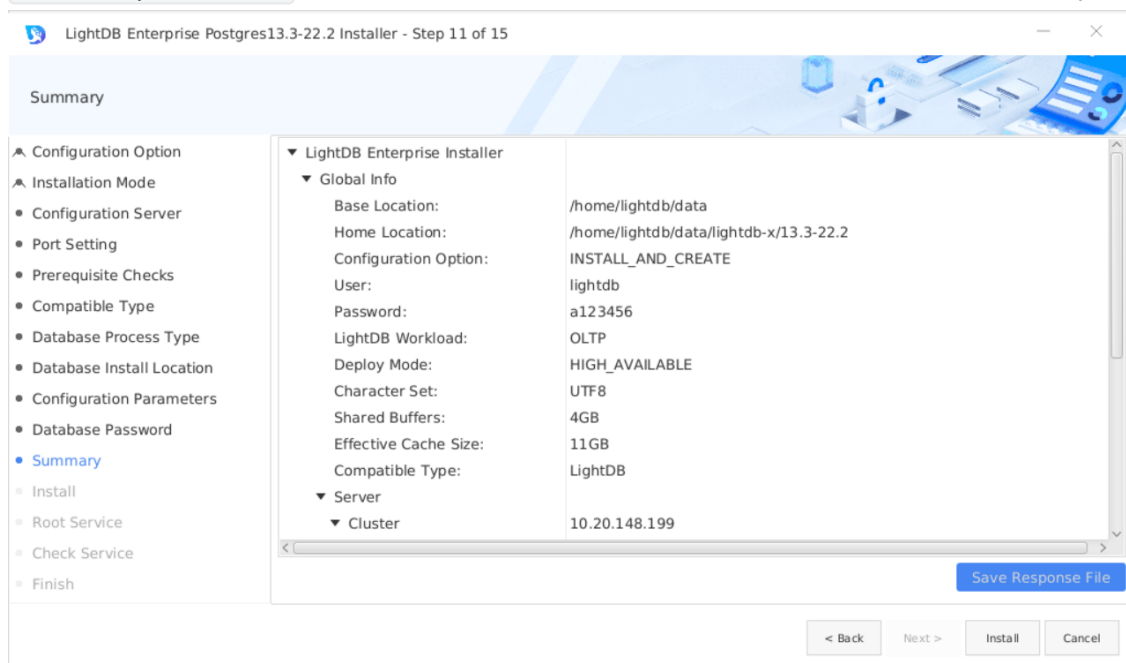
< Back Next > Install Cancel



- 配置super用户（即lightdb）密码，密码长度为6-16个字符，且至少包含数字、英文字母。



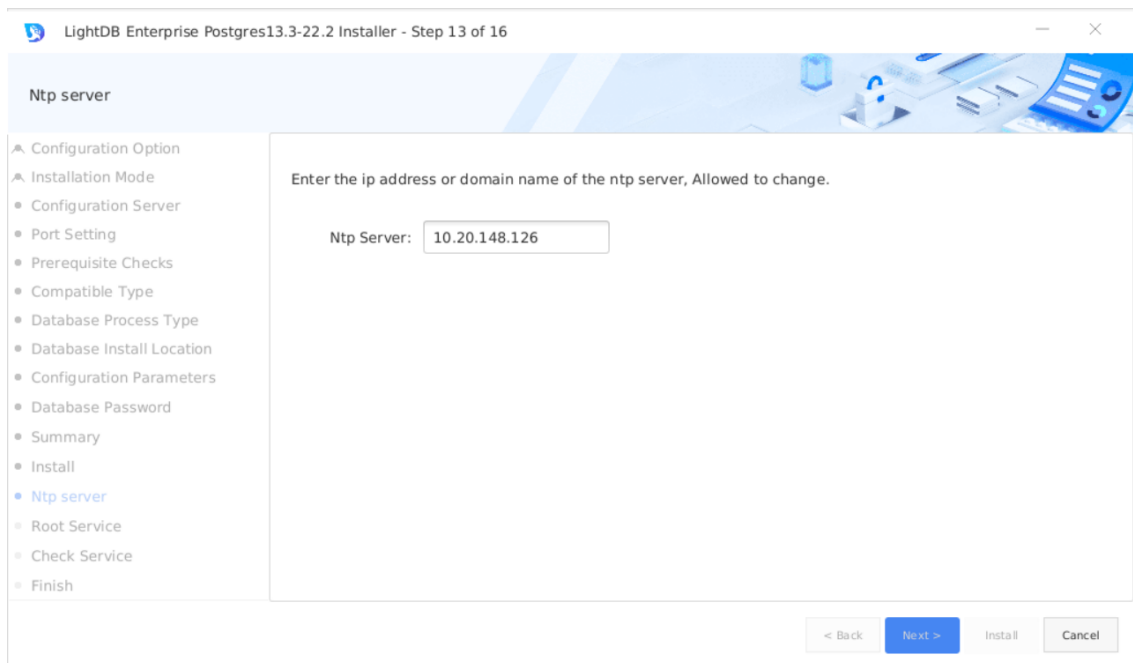
- LightDB安装信息总览，确认没问题后点击 `install` 按钮开始正式安装(在这里可以点击 `SAVE Response File` 把安装参数保存为文件，在以后想重新安装时可以简化安装步骤)。



- 总览信息确认无误后，点击Install执行安装。



- 此时数据库已经安装完成
- 配置NTP服务，集群多机器之间的时间同步是非常重要的，LightDB默认采用高可用主机时间为参考，向备机和witness机器同步时间。如果你有自己的时间服务器，可以在这里修改为你自己的ntp服务器地址。如果你已经为所有的机器配置了NTP服务，则这一步会自动跳过。



- 使用ssh客户端登录机器终端，切换到 `root` 用户，复制界面显示的命令并执行。执行的命令以实际界面显示的为准。

下图中的命令为:

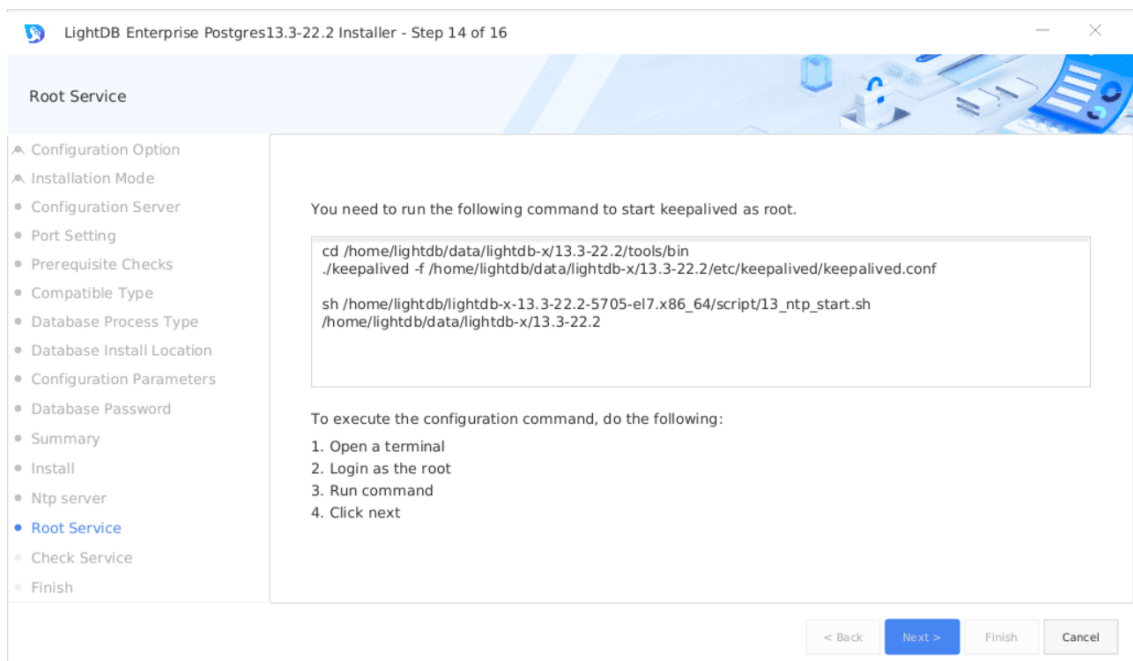
```
# 启动keepalived服务(在所有主，备上执行，witness上不用执行)
```

```
cd /home/lightdb/data/lightdb-x/13.3-22.2/tools/bin
```

```
./keepalived -f /home/lightdb/data/lightdb-x/13.3-22.2/etc/keepalived/keepalived.conf
```

```
# 启动ntp服务(在所有主，备，witness上执行)
```

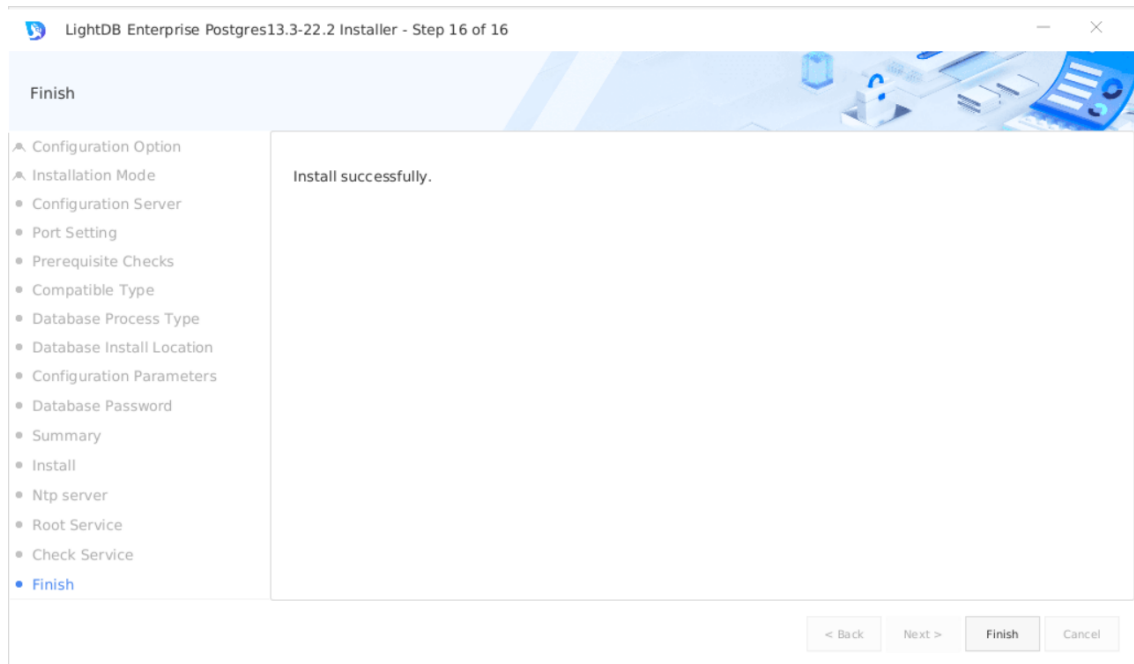
```
sh /home/lightdb/lightdb-x-13.3-22.2-5705-e17.x86_64/script/13_ntp_start.sh \  
/home/lightdb/data/lightdb-x/13.3-22.2
```



启动keepalived程序后，使用ps查询一下进程，如果发现keepalived没有起来，则查看keepalived配置文件中中的对外网卡名称是否配置正确，这里需要配置您的机器对外的网卡名称。

```
vrrp_instance lightdb {
    state MASTER
    interface ens192
    virtual_router_id 100
    priority 100
    advert_int 2
    authentication {
        auth_type PASS
        auth_pass hs123456
    }
    virtual_ipaddress {
        10.19.64.100
    }
}
```

- 安装成功



如果因环境等因素限制无法使用keepalived，或者未启用NTP服务，会因检查不通过而无法点击 **finish**，则可直接点击 **Cancel** 退出安装向导，此时数据库已经安装成功，但ntp和keepalived可能不正确，需要另外配置。

5.2 命令行安装LightDB高可用版

命令行安装步骤及选项与GUI安装完全相同，仅在向导信息提示上有所不同，因此本章节不再详细解释其中内容的含义与注意事项。

- 在install.sh命令行提示信息中输入No，按回车键确认，进入命令行安装交互界面。

```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```

- 选择配置模式，键入1仅安装数据库，键入2会额外创建一个实例，输入3为开发者选项，默认为1，此处选择2。

```
Choice a kind of configuration mode!
1: Only install.
2: Install database and Create instance.
3: Developer
Please enter 1 2 or 3(The default is 1):
2
```

- 选择安装单机版、高可用或分布式，键入1安装单机版，键入2选择高可用版，键入3安装分布式版，默认为1，此处选择2。

```
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
2
```

- 按照命令行提示信息，依次填写 virtual IP，以及 primary、standby 和 witness 服务器的IP与同步方式。在节点的选择上，对于一主一从，witness 是可选的，若不想指定可按回车键跳过，而对于一主多从，witness 是必须的；在 standby 的同步异步选择上，如果节点处于同一网段，则同步异步都可选择，如果处于不同的网段，则只能是异步；在网段的要求上，至少要有1个 standby 和 primary 位于同一网段。此处以一主一从一哨兵的方式进行展示。

```
Choice a kind of install mode!
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
2
Config Server for High Availability Mode!
Please enter a virtual IP address with network, such as (192.168.217.234/16):
10.20.148.199/24
The cluster need a primary server(required), one or more standby server(optional) and a witness.
Please input a primary server ip which is actually the ip of the current server(required). such as (192.168.217.234/16):
10.20.148.126/24
Please input a standby server ip(required), such as (192.168.217.234/16):
10.20.148.127/24
Please enter status of the standby server [10.20.148.127]
1 sync:
2 async:
1
Continue to add standby nodes?(enter [exit] to left.):
exit
Please input a witness server ip(optional), such as (192.168.217.234/16):
10.20.148.128/24
===== Servers =====
Vip: 10.20.148.199
Ip: 10.20.148.126 Role: primary Status: none
Ip: 10.20.148.127 Role: standby Status: sync
Ip: 10.20.148.128 Role: witness Status: none
===== Servers =====
Please check the servers of the cluster. 1 continue; 2 clear server config (Default 1)
1
```

- 确认集群各节点信息是否填写无误，确认无误后键入1继续，否则键入2进行重设，此处选择1。

- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成，直到出现如下图所示的指定端口号的提示信息，端口号默认为5432，本次安装使用5433。

```
===== Servers =====
Vip: 10.20.148.199
Ip: 10.20.148.126 Role: primary Status: none
Ip: 10.20.148.127 Role: standby Status: sync
Ip: 10.20.148.128 Role: witness Status: none
===== Servers =====
Please check the servers of the cluster. 1 continue; 2 clear server config (Default 1)
1
===== Generate pg_hba =====
===== Generate end =====
===== Copying files takes time =====
10.20.148.127: start copy
10.20.148.127: end copy
10.20.148.128: start copy
10.20.148.128: end copy
===== Copying files end =====
Assign a port to the LightDB!
Listen Port(The default port is 5432):
█
```

- 检查依赖包与Linux内核参数。

```
Check system parameters and dependency packages!
===== 10.20.148.126 =====
NETWORK
name: sem, recommend value: 500,2048000,200,4096, current value: 500,2048000,200,4096, status: OK
name: aio_max_nr, recommend value: 1048576, current value: 1048576, status: OK
name: somaxconn, recommend value: 2000, current value: 2000, status: OK
name: tcp_max_syn_backlog, recommend value: 2000, current value: 2000, status: OK
name: tcp_tw_reuse, recommend value: 1, current value: 0, status: WARNING
name: tcp_syn_retries, recommend value: 3, current value: 6, status: WARNING
name: tcp_retries2, recommend value: 5, current value: 15, status: WARNING
name: tcp_slow_start_after_idle, recommend value: 0, current value: 1, status: WARNING
PAGE_CACHE
name: dirty_background_ratio, recommend value: 5, current value: 5, status: OK
name: dirty_ratio, recommend value: 40, current value: 40, status: OK
name: dirty_expire_centisecs, recommend value: 500, current value: 500, status: OK
name: dirty_writeback_centisecs, recommend value: 250, current value: 250, status: OK
MEMORY
name: shmmni, recommend value: 4096, current value: 4096, status: OK
name: shmmx, recommend value: 8412581888, current value: 8412581888, status: OK
name: shmall, recommend value: 2053853, current value: 2053853, status: OK
name: swappiness, recommend value: 5, current value: 5, status: OK
name: overcommit_memory, recommend value: 2, current value: 2, status: OK
name: overcommit_ratio, recommend value: 75, current value: 50, status: WARNING
FILE HANDLER
name: file_max, recommend value: 524288, current value: 524288, status: OK
ULIMIT
name: ulimit_core, recommend value: unlimited, current value: unlimited, status: OK
name: ulimit_nofile, recommend value: 8192, current value: 524288, status: OK
Dependency Package
name: JSON-C-0.11 is existed: yes
name: C-ARES-1 is existed: yes
name: LIBNL3 is existed: yes
name: LIBPCAP-1 is existed: yes
name: LIBZSTD-1 is existed: yes
name: LZ4-1 is existed: yes
name: NCURSES-LIBS-5 is existed: yes
name: READLINE-6 is existed: yes
name: SNAPPY-1 is existed: yes
name: UUID-1.6 is existed: yes
System service
name: ntp is install: no
```

- 选择兼容模式，如果你的应用从mysql或oracle迁移而来，则可以对应选择mysql或oracle，LightDB会启用相应的兼容特性。

```
System service
name: ntp is install: no
Choice a kind of Compatible Type!
1: LightdDB(Compatible with PostgreSQL).
2: ORACLE(Compatible with ORACLE).
3: MYSQL(Compatible with MYSQL).
Please enter 1, 2 or 3:(The default is 1)
█
```


下图中的命令为:

```
# 启动keepalived服务(在所有主，备上执行，witness上不用执行)
cd /home/lightdb/data/lightdb-x/13.3-22.2/tools/bin
./keepalived -f /home/lightdb/data/lightdb-x/13.3-22.2/etc/keepalived/keepalived.conf

# 启动ntp服务(在所有主，备，witness上执行)
sh /home/lightdb/lightdb-x-13.3-22.2-5705-el7.x86_64/script/13_ntp_start.sh \
/home/lightdb/data/lightdb-x/13.3-22.2
```

```
Execute follow commands as root
Execute follow commands to start keepalived:
cd /home/lightdb/data/lightdb-x/13.3-22.2/tools/bin
./keepalived -f /home/lightdb/data/lightdb-x/13.3-22.2/etc/keepalived/keepalived.conf

Execute follow commands to start ntp:
sh /home/lightdb/lightdb-x-13.3-22.2-5705-el7.x86_64/script/13_ntp_start.sh /home/lightdb/data/lightdb-x/13.3-22.2

Check service:
Please enter any key to continue for checking?
```

启动keepalived程序后，使用ps查询一下进程，如果发现keepalived没有起来，则查看keepalived配置文件中中的对外网卡名称是否配置正确，这里需要配置您的机器对外的网卡名称。

```
vrrp_instance lightdb {
    state MASTER
    interface ens192
    virtual_router_id 100
    priority 100
    advert_int 2
    authentication {
        auth_type PASS
        auth_pass hsl23456
    }
    virtual_ipaddress {
        10.19.64.100
    }

    track_script {
        check_lightdb_alived
    }
}
```

- 上一步骤中的命令执行完成后，按任意键进入检查过程，检查通过后会输出 Install Finish 信息，并自动退出安装向导。

5.3 LightDB高可用常用操作指南

本小节介绍几个LightDB高可用版本常用操作的简易指南，更详细的信息请查阅LightDB数据库运维手册。

5.3.1 监控

5.3.1.1 查看节点间同步状态及延迟

```
SELECT * FROM pg_stat_replication;  --主库查询
SELECT * FROM pg_stat_wal_receiver; --备库查询
```

查询结果示例，如下图所示。

```
postgres=# SELECT * FROM pg_stat_replication;
-[ RECORD 1 ]-----+-----
pid                | 24310
usesysid           | 17541
username           | repmgr
application_name    | 192.168.227.102-defaultcluster
client_addr         | 192.168.227.102
client_hostname     |
client_port         | 45258
backend_start       | 2021-10-28 05:31:55.212873-07
backend_xmin        |
state               | streaming
sent_lsn            | 1/2026AF20
write_lsn           | 1/2026AF20
flush_lsn           | 1/2026AF20
replay_lsn          | 1/2026AF20
write_lag           | 00:00:00.000395
flush_lag           | 00:00:00.000664
replay_lag          | 00:00:00.000876
sync_priority       | 1
sync_state          | sync
reply_time          | 2021-10-28 05:33:54.057238-07

postgres=#

postgres=# SELECT * FROM pg_stat_wal_receiver;
-[ RECORD 1 ]-----+-----
pid                | 9963
status              | streaming
receive_start_lsn   | 1/20000000
receive_start_tli    | 1
written_lsn         | 1/20392780
flushed_lsn         | 1/20392780
received_tli        | 1
last_msg_send_time  | 2021-10-28 05:37:15.035124-07
last_msg_receipt_time | 2021-10-28 05:37:15.049246-07
latest_end_lsn      | 1/20392780
latest_end_time     | 2021-10-28 05:37:15.035124-07
slot_name           |
sender_host          | 192.168.227.103
sender_port          | 5432
conninfo             | user=repmgr passfile=/home/lightdb/.pgpass channel_binding=prefer connect_ti
meout=2 dbname=replication host=192.168.227.103 port=5432 application_name=192.168.227.102-defaultcl
uster fallback_application_name=walreceiver sslmode=prefer sslcompression=0 ssl_min_protocol_version
=TLSv1.2 gssencmode=disable krbsrvname=postgres target_session_attrs=any

postgres=#
```

5.3.1.2 查看各节点状态

分别在 `primary`、`standby`、`witness` 运行下面的命令，以查看集群各节点状态。

```
$LTHOME/bin/ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf node status
```

查询结果示例，如下图所示。

```
[lightdb@hs-10-19-36-9 ~]$ ltcluster -f $PGHOME/etc/ltcluster/ltcluster.conf node status
Node "lightdbCluster10193695433":
  LightDB version: 13.3
  Total data size: 976 GB
  Conninfo: host=10.19.36.9 port=5433 user=ltcluster dbname=ltcluster connect_timeout=2
  Role: standby
  WAL archiving: disabled (on standbys "archive_mode" must be set to "always" to be effective)
  Archive command: rm -f /data/lightdb/lightdb-22.1/lightdb-x/13.3-22.1/archive/%f && cp %p /data/lightdb/lightdb-22.1/lightdb-x/13.3-22.1/archive/%f && find /data/lightdb/lightdb-22.1/lightdb-x/13.3-22.1/archive -type f -mmin +10080 | xargs -i rm {}
  WALs pending archiving: 0 pending files
  Replication connections: 0 (of maximal 10)
  Replication slots: 0 physical (of maximal 10; 0 missing)
  Upstream node: lightdbCluster101936105433 (ID: 1)
  Replication lag: -1 seconds
  Last received LSN: 58D/86A18000
  Last replayed LSN: 58D/86A169E0
```

5.3.1.3 查看集群状态

- 查看集群服务状态，需要重点关注的信息有：**Role**、**Status**（数据库运行状态）、**ltclusterd**（**ltclusterd**守护进程运行状态）、**Paused**（**ltclusterd**是否暂停）

```
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status
```

注意：上述命令在 **primary**、**standby**、**witness** 上都可以执行，且各节点上的执行结果应该是完全相同的，若不完全相同，则说明集群状态有异，需及时排查原因。

以主库查询结果为例进行说明，如下图所示，正常状态下期望的结果为：

- Name**、**Role** 应与实际相符
- Status** 应为 **running**（**primary** 和 **witness** 前面还应有一个星号 *****）
- ltclusterd** 应为 **running**
- Paused?** 应为 **no**（除非在相应节点上执行了 **ltcluster -f**

\$LTHOME/etc/ltcluster/ltcluster.conf service pause 命令）

```
[lightdb@hs-10-19-36-9 ~]$ ltcluster -f $PGHOME/etc/ltcluster/ltcluster.conf service status
ID | Name | Role | Status | Upstream | ltclusterd | PID | Paused? | Upstream last seen
---|---|---|---|---|---|---|---|---
1 | lightdbCluster101936105433 | primary | * running | | running | 3877624 | no | n/a
2 | lightdbCluster10193695433 | standby | running | lightdbCluster101936105433 | running | 2978885 | no | 1 second(s) ago
[lightdb@hs-10-19-36-9 ~]$
```

- 查看集群IP信息，如虚拟IP

```
ip a show #查看所有网卡
ip a show [interface] #查看指定网卡
```

查询结果示例，如下图所示。

```
[lightdb@localhost ~]$ ip a show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
    link/ether 00:0c:29:fa:d1:29 brd ff:ff:ff:ff:ff:ff
    inet 192.168.227.103/24 brd 192.168.227.255 scope global ens33
        valid_lft forever preferred_lft forever
    inet6 fe80::efa4:71d0:bc26:6ffa/64 scope link
        valid_lft forever preferred_lft forever
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN qlen 1000
    link/ether 52:54:00:73:6b:77 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
        valid_lft forever preferred_lft forever
4: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc pfifo_fast master virbr0 state DOWN qlen 1000
    link/ether 52:54:00:73:6b:77 brd ff:ff:ff:ff:ff:ff
[lightdb@localhost ~]$ 
[lightdb@localhost ~]$ ip a show ens33
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
    link/ether 00:0c:29:fa:d1:29 brd ff:ff:ff:ff:ff:ff
    inet 192.168.227.103/24 brd 192.168.227.255 scope global ens33
        valid_lft forever preferred_lft forever
    inet6 fe80::efa4:71d0:bc26:6ffa/64 scope link
        valid_lft forever preferred_lft forever
[lightdb@localhost ~]$
```

5.3.1.4 查看日志

ltclusterd的日志路径为 `$LTHOME/etc/ltcluster/ltcluster.log`，LightDB数据库日志路径为 `$LTDATA/log/`，其中数据库日志文件以日期时间命名，且新文件创建满足如下规律，可按照快速锁定目标日志文件。

- 每次启动都会产生一个新的日志文件
- 若无数据库重启，则每天产生一个新的日志文件

5.3.2 管理

5.3.2.1 主库重启

主库因修改数据库参数或其他原因需要重启，可以按以下步骤操作。

1. 先停止备库的 `keepalived`（重要），在root用户下执行以下命令

```
# 1. 获得备库keepalived进程pid
cat /var/run/keepalived.pid

# 2. 杀死keepalived进程
kill keepalived_pid

# 3. 确认keepalived进程确实已不存在
ps aux | grep keepalived
```

2. 主库重启，需要在lightdb用户下执行，重启期间主库不提供服务

```
# 1. 暂停ltclusterd，防止自动failover
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service pause
```

```

# 2. 查看集群状态，确认primary的Paused?状态为yes
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status

# 3. 先断开所有连接到数据库的客户端和应用程序（否则数据库将stop failed），然后停止主库
lt_ctl -D $LTDATA stop # 默认会回滚所有未断开的连接

# 如果有连接存在导致stop failed，则可以尝试使用
lt_ctl -D $LTDATA stop -m smart

# 如果仍然stop failed，且因条件限制无法或不希望断开所有客户端连接，则可以使用-m immediate强制停止数据库，此方式下没有回滚连接，即强制断开、强制停止，没有完全shutdown，会导致在启动时recovery
lt_ctl -D $LTDATA stop -m immediate

# 4. 等待数据库停止成功，确认步骤3执行结果中出现server stopped信息

# 5. 修改数据库参数，或做其他事情

# 6. 启动主库
lt_ctl -D $LTDATA start

# 7. 等待数据库启动成功，确认步骤6执行结果中出现server started的信息

# 8. 恢复ltclusterd
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service unpause

# 9. 查看集群状态，确认primary的Paused?状态为no
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status

```

3. 备库重新启动 `keepalived`（需root用户），启动方法请参照本文档5.3。

5.3.2.2 备库重启

备库因修改数据库参数或其他原因需要重启，可以在 `lightdb` 用户下按以下步骤操作。

```

# 1. 暂停ltclusterd,防止自动failover
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service pause

# 2. 查看集群状态，确认standby的Paused?字段为yes
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status

# 3. 先断开所有连接到数据库的客户端和应用程序（否则数据库将stop failed），然后停止备库
lt_ctl -D $LTDATA stop # 默认会回滚所有未断开的连接

# 如果有连接存在导致stop failed，则可以尝试使用
lt_ctl -D $LTDATA stop -m smart

```



```
# 如果仍然stop failed, 且因条件限制无法或不希望断开所有客户端连接, 则可以使用 -m
immediate强制停止数据库,此方式下没有回滚连接, 即强制断开、强制停止, 没有完全
shutdown, 会导致在启动时 recovery
lt_ctl -D $LTDATA stop -m immediate

# 4. 等待数据库停止成功, 确认步骤3执行结果中出现 server stopped信息

# 5. 修改数据库参数, 或做其他事情

# 6. 启动备库
lt_ctl -D $LTDATA start

# 7. 等待数据库启动成功, 确认步骤6执行结果中出现 server started的信息

# 8. 恢复ltclusterd
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service unpause

# 9. 确认standby的Paused?字段为no
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status
```

5.3.2.3 主备切换

在集群状态正常时进行主备切换, 可以通过在**备机**上使用 `switchover` 来自动完成, 方法如下。

```
# switchover会自动对集群做pause和unpause操作, 不需手动执行 pause/unpause

# 1. 在备机上试运行
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf standby switchover --
siblings-follow --dry-run

# 2. 如果试运行结果最后一行信息为: prerequisites for executing STANDBY
SWITCHOVER are met, 则表示成功, 可以进入下一步

# 3. 在备机上正式运行switchover主备切换
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf standby switchover --
siblings-follow

# 4. 在各节点上分别查看集群状态, 确认各节点执行结果中primary和standby角色确实已
互换
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf service status
```

5.3.2.4 主库故障恢复

当主库发生故障(如宕机) failover后, 备库会自动提升为新主库, 以确保集群继续可用。

此后, 若原主库故障修复, 想重新加入集群, 可以使用rejoin使原主库恢复成为新备库, 然后再执行一次主备切换, 恢复到最初的主备关系。

在原主库上rejoin的步骤如下:

```

# 1. 确认LightDB已停止

# 2. 确认ltclusterd是否启动，若不存在则启动它
ps aux | grep ltcluster
ltclusterd -d -f $LTHOME/etc/ltcluster/ltcluster.conf -p
$LTHOME/etc/ltcluster/ltclusterd.pid

# 3. rejoin试运行，new_primary_host为原，也就是新主的host，new_primary_port为
新主端口号
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf node rejoin -d
'host=new_primary_host port=new_primary_port dbname=ltcluster
user=ltcluster' --verbose --force-rewind --dry-run

# 4. 确认试运行成功，进入下一步

# 5. 正式执行rejoin，new_primary_host与new_primary_port同上
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf node rejoin -d
'host=new_primary_host port=new_primary_port dbname=ltcluster
user=ltcluster' --verbose --force-rewind

# 6. 按本文档5.4.2.3所述，在新备上执行主备切换，恢复到最初的主备关系

# 7. 确认keepalived是否启动，若不存在则启动它，启动方法请参照本文档5.3
ps aux | grep keepalived

```

主节点修复后，如果能够正常rejoin回来固然好，但实际更多的时候是rejoin失败，这通常发生在failover后，备库提升为新主，然后经过了一段时间的数据写入，之后原主rejoin（立刻rejoin一般不会有问题）。

在rejoin失败的情况下，可以在原主库上使用clone来重新初始化实例，步骤如下：

```

# 1. 确认LightDB已停止

# 2. 确认ltclusterd是否启动，若不存在则启动它
ps aux | grep ltcluster
ltclusterd -d -f $LTHOME/etc/ltcluster/ltcluster.conf -p
$LTHOME/etc/ltcluster/ltclusterd.pid

# 3. 清空实例目录下的内容（若有需要，清空前可先备份）

# 4. clone试运行，new_primary_host为原，也就是新主的host，new_primary_port为
新主端口号
ltcluster -h new_primary_host -p new_primary_port -U ltcluster -d ltcluster
-f $LTHOME/etc/ltcluster/ltcluster.conf standby clone --dry-run

# 5. 确认试运行结果显示all prerequisites for "standby clone" are met

# 6. clone实例目录，new_primary_host与new_primary_port同上
ltcluster -h new_primary_host -p new_primary_port -U ltcluster -d ltcluster
-f $LTHOME/etc/ltcluster/ltcluster.conf standby clone -F

```

```
# 7. 启动数据库
lt_ctl -D $LTDATA start

# 8. 重新注册为standby
ltcluster -f $LTHOME/etc/ltcluster/ltcluster.conf standby register -F

# 9. 按本文档5.4.2.3所述，在新备上执行主备切换，恢复到最初的主备关系

# 10. 确认keepalived是否启动，若不存在则启动它，启动方法请参照本文档5.3
ps aux | grep keepalived
```

5.3.2.5 备库故障恢复

备库发生故障后的恢复步骤如下：

```
# 1. 启动lightdb
lt_ctl -D $LTDATA start

# 2. 确认ltclusterd是否启动，若不存在则启动它
ps aux | grep ltcluster
ltcluster -d -f $LTHOME/etc/ltcluster/ltcluster.conf -p
$LTHOME/etc/ltcluster/ltclusterd.pid

# 3. 确认keepalived是否启动，若不存在则启动它，启动方法请参照本文档5.3
ps aux | grep keepalived
```

5.3.2.6 集群数据复制(replication)级别

不同的业务场景对数据库主备一致性有不同的要求。一致性越高对性能影响越大。用户可通过配置 `synchronous_commit` 来达到不同级别的一致性。

```
# 同步模式，在主节点修改
synchronous_commit = 'on'
synchronous_standby_names = '*'

# 异步模式，在主节点修改
synchronous_commit = 'local'
synchronous_standby_names = ''

# 修改后，主节点调用reload生效
lt_ctl -D $LTDATA reload
```

下表概括了 `synchronous_commit` 不同设置对应不同的一致性级别：

synchronous_commit 设置	本地提交持久化	备库提交持久化(数据库崩溃)	备库提交持久化(OS崩溃)	备库查询一致
remote_apply	是	是	是	是
on	是	是	是	

synchronous_commit 设置	本地提交持久化	备库提交持久化 (数据库崩溃)	备库提交持久化(OS崩溃)	备库查询一致
remote_write	是	是		
local	是			
off				

更详细的 synchronous_commit 及 synchronous_standby_names 请参考LightDB官方文档。

6 安装LightDB分布式版

6.1 LightDB分布式三种部署模式简介

LightDB分布式支持常规、多机单实例和单机多实例三种部署方式。

- **常规模式：**1台服务器作为协调者节点，N (N > 1) 台服务器作为工作节点，每个节点都是高可用方式部署，例如1个协调节点2个工作节点，每个节点都按1主1备方式部署，则需要6台服务器。如果每个节点按照1主1备1witness部署，则需要9台服务器。
- **多机单实例：**1台服务器作为协调者节点，N (N > 1) 台服务器作为工作节点，每个节点上均有一个数据库实例，且所有实例均按单机模式部署
- **单机多实例：**使用1台服务器同时安装协调者节点和工作节点的实例，且所有实例均按单机模式部署

注意：如果需要在生产环境使用LightDB分布式，则建议只使用常规模式，其余两种模式仅为测试、学习等非生产环境提供。

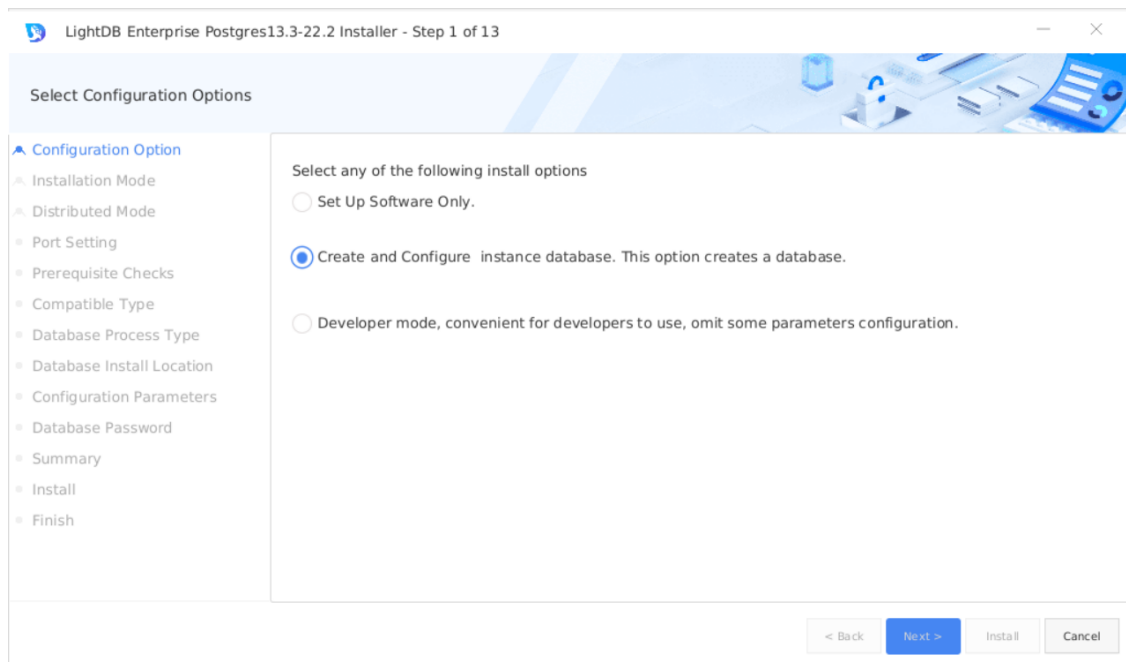
6.2 安装分布式常规模式

6.2.1 GUI安装

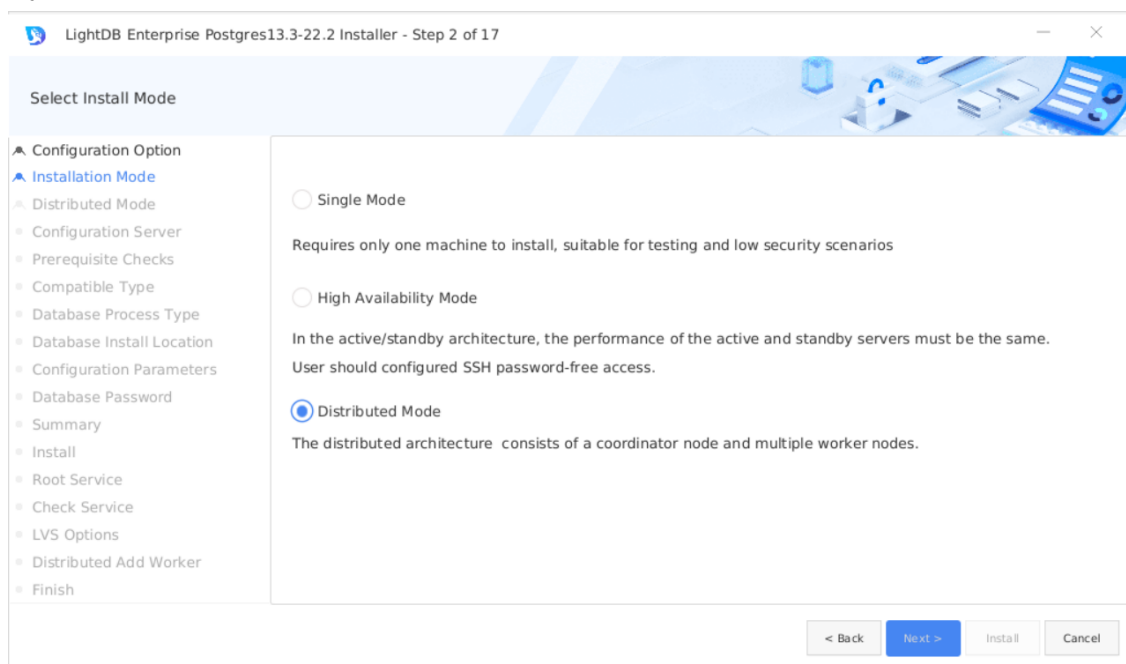
- 按前面所述要求，配置DISPLAY环境变量，在install.sh命令行提示信息中输入yes，按回车键确认，Windows中就会弹出GUI安装向导界面。

```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

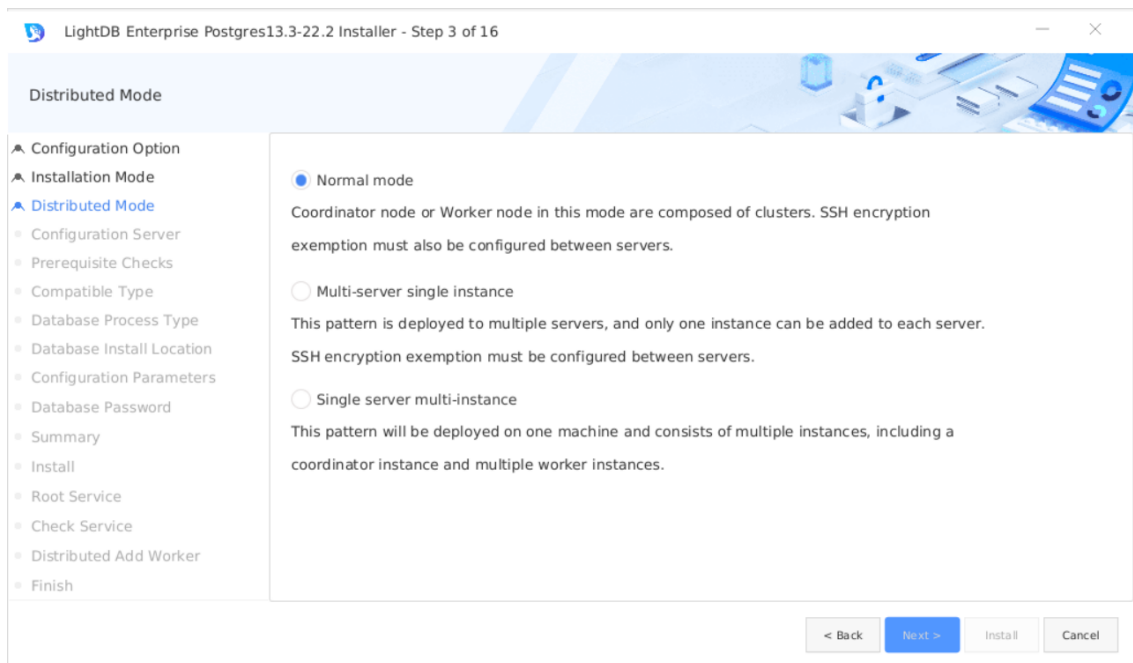
- 界面中包含三个选项，选项一（默认选项）仅安装数据库；选项二除了安装数据库外，还会生成一个默认的实例目录，并使用默认实例启动数据库；选项三为开发者模式，该模式下将使用默认数据库参数，而不会对参数进行自动调优。



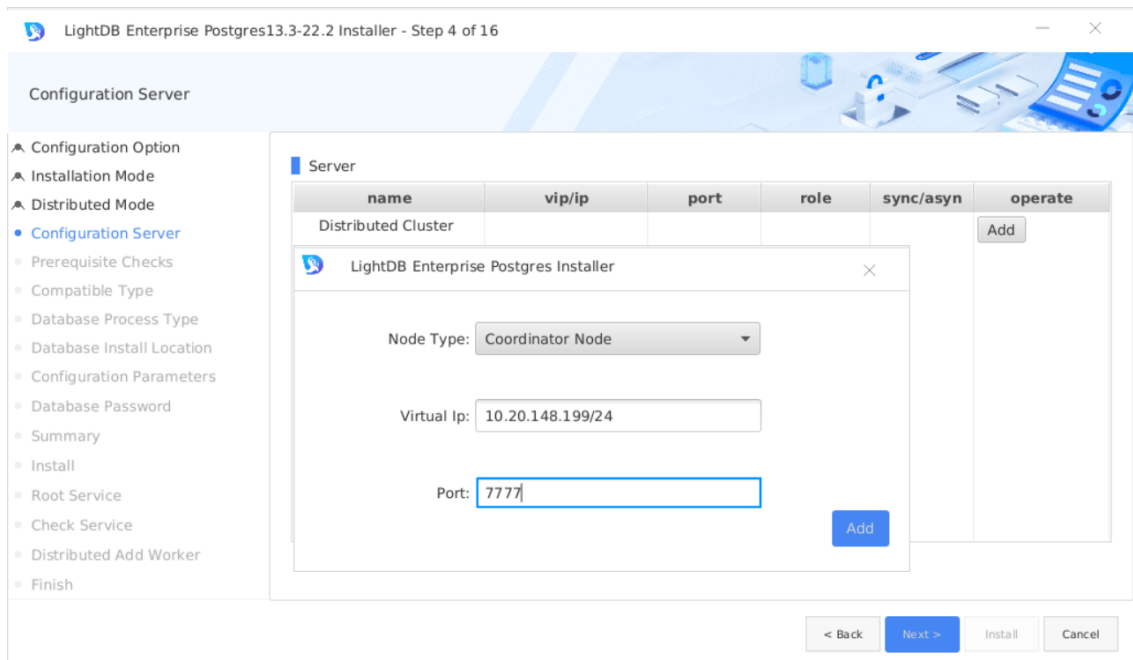
- 选择安装模式，提供**单机版、高可用、分布式**三个选项，默认为单机版，此处我们选择分布式。



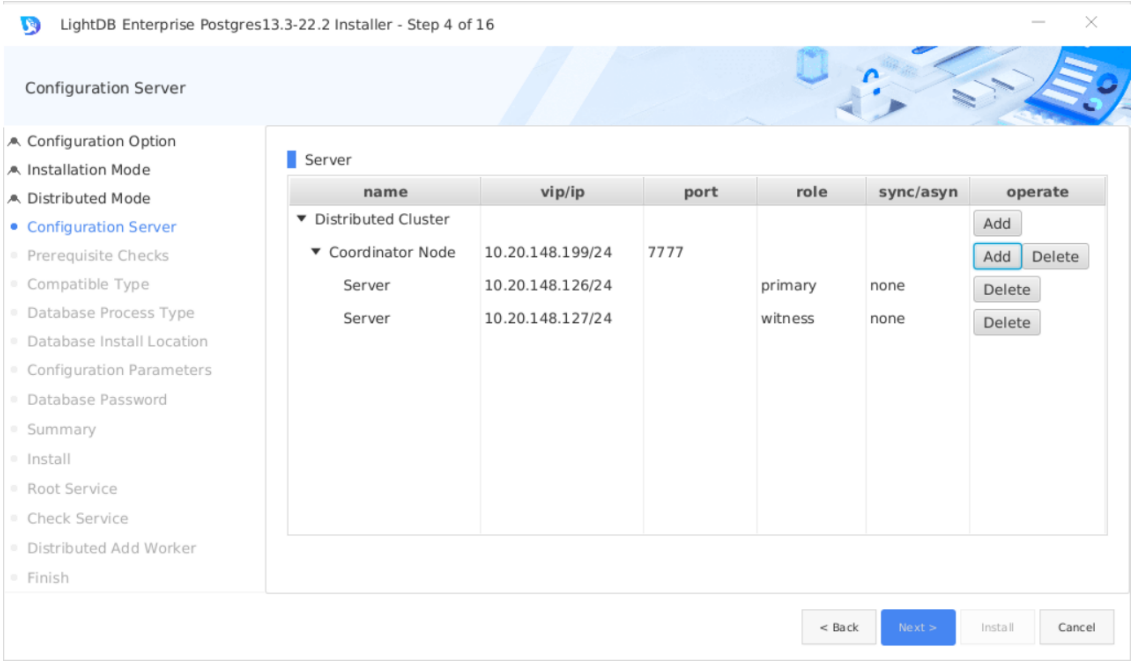
- 选择分布式部署方式，包括常规（Normal mode）、多机单实例（Multi-server single instance）和单机多实例（Single server multi-instance）三种，关于这三种部署方式的定义，已经在本文档6.1小节中介绍过，这里不再赘述。**本次我们选择常规模式，并使用2个工作节点，同时为每个工作节点部署1个standby节点。**



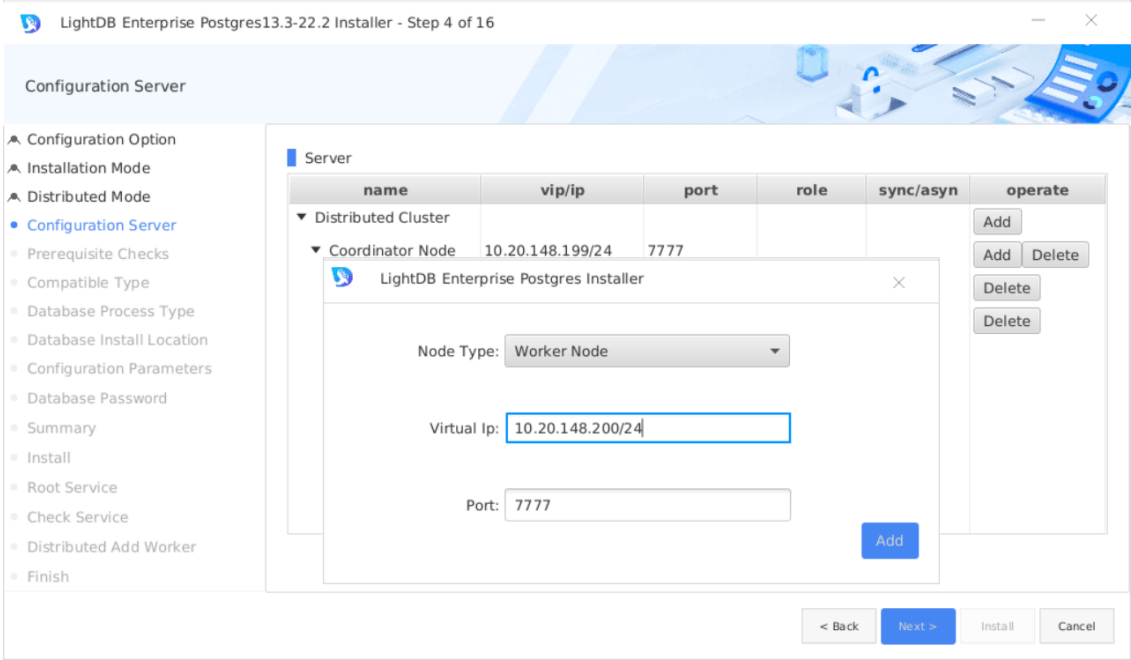
- 部署协调者节点 (Coordinator Node) 高可用，点击Add，在弹出的对话框中指定虚拟IP和端口号。



- 为协调者节点指定 `primary` 和 `standby`，此处操作步骤和LightDB高可用安装完全相同，详情请参考本文档第5章，此处及后续均不再赘述。



- 部署第一个工作节点（Worker Node）的高可用，点击Add，在弹出的对话框中指定虚拟IP和端口号，端口号可以与协调者节点相同，也可以不同。



- 为第一个工作节点指定 primary 和 standby。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 4 of 16

Configuration Server

Configuration Option

- Installation Mode
- Distributed Mode
- Configuration Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters
- Database Password
- Summary
- Install
- Root Service
- Check Service
- Distributed Add Worker
- Finish

Server

name	vip/ip	port	role	sync/asyn	operate
▼ Distributed Cluster					
▼ Coordinator Node					
Server	10.20.148.199/24	7777			Add
Server	10.20.148.126/24		primary	none	Add Delete
Server	10.20.148.127/24		standby	sync	Delete
▼ Worker Node					
Server	10.20.148.200/24	7777			Add Delete
Server	10.20.148.128/24		primary	none	Delete
Server	10.20.148.122/24		standby	sync	Delete

< Back Next > Install Cancel

- 按相同方法部署第二个工作节点的高可用。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 4 of 16

Configuration Server

Configuration Option

- Installation Mode
- Distributed Mode
- Configuration Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters
- Database Password
- Summary
- Install
- Root Service
- Check Service
- Distributed Add Worker
- Finish

LightDB Enterprise Postgres Installer

Ip: 10.20.149.228

Role: primary

Syn/Asyn: none

Add

name	vip/ip	port	role	sync/asyn	operate
▼ Distributed Cluster					
▼ Coordinator Node					
Server	10.20.148.199/24	7777			Add
Server	10.20.148.126/24		primary	none	Add Delete
Server	10.20.148.127/24		standby	sync	Delete
▼ Worker Node					
Server	10.20.148.200/24	7777			Add Delete
Server	10.20.148.128/24		primary	none	Delete
Server	10.20.148.122/24		standby	sync	Delete
▼ Worker Node					
Server	10.20.149.10/24	7777			Add Delete
Server	10.20.149.228/24		primary	none	Add Delete
Server	10.20.149.229/24		standby	sync	Delete

< Back Next > Install Cancel

LightDB Enterprise Postgres13.3-22.2 Installer - Step 4 of 16

Configuration Server

Configuration Option

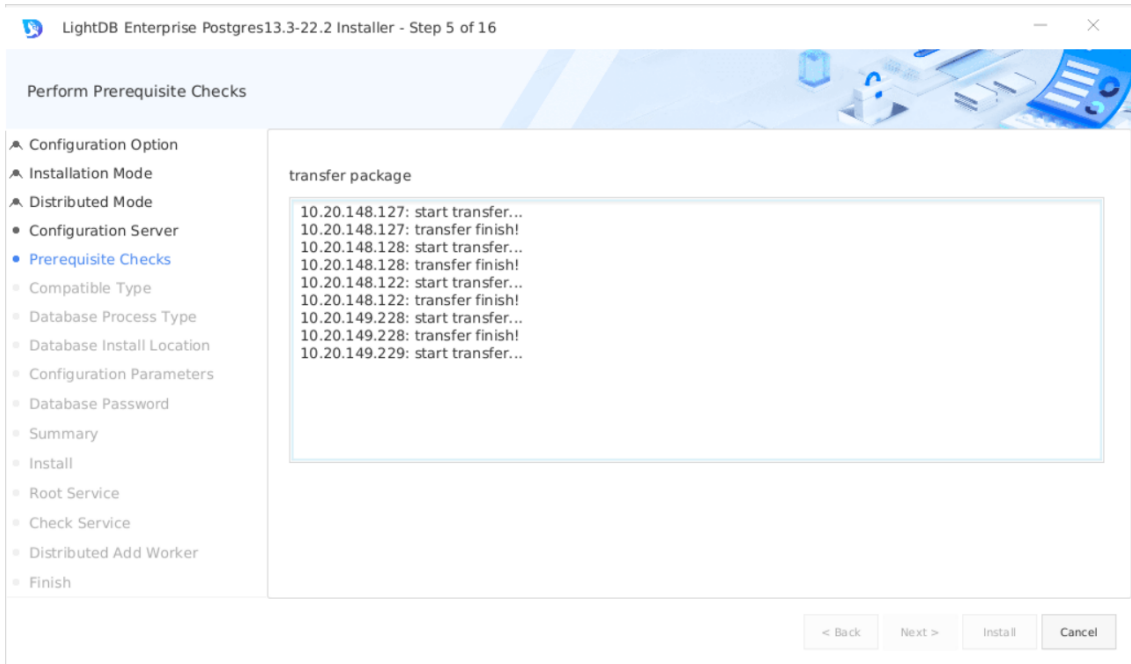
- Installation Mode
- Distributed Mode
- Configuration Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters
- Database Password
- Summary
- Install
- Root Service
- Check Service
- Distributed Add Worker
- Finish

Server

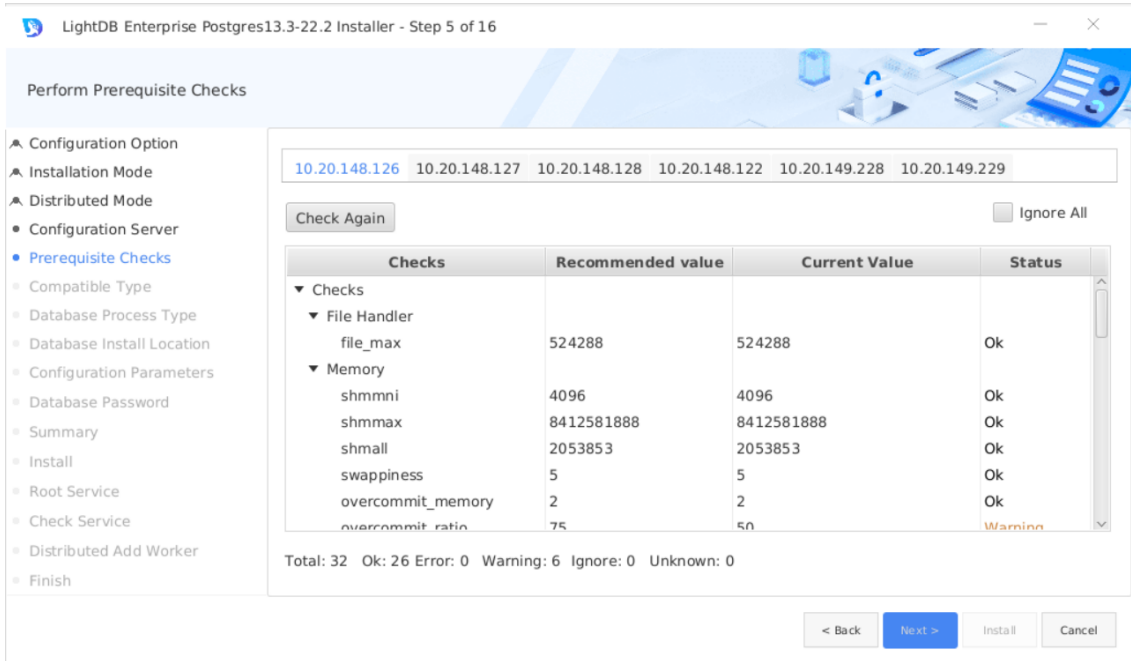
name	vip/ip	port	role	sync/asyn	operate
▼ Distributed Cluster					
▼ Coordinator Node					
Server	10.20.148.199/24	7777			Add
Server	10.20.148.126/24		primary	none	Add Delete
Server	10.20.148.127/24		standby	sync	Delete
▼ Worker Node					
Server	10.20.148.200/24	7777			Add Delete
Server	10.20.148.128/24		primary	none	Delete
Server	10.20.148.122/24		standby	sync	Delete
▼ Worker Node					
Server	10.20.149.10/24	7777			Add Delete
Server	10.20.149.228/24		primary	none	Add Delete
Server	10.20.149.229/24		standby	sync	Delete

< Back Next > Install Cancel

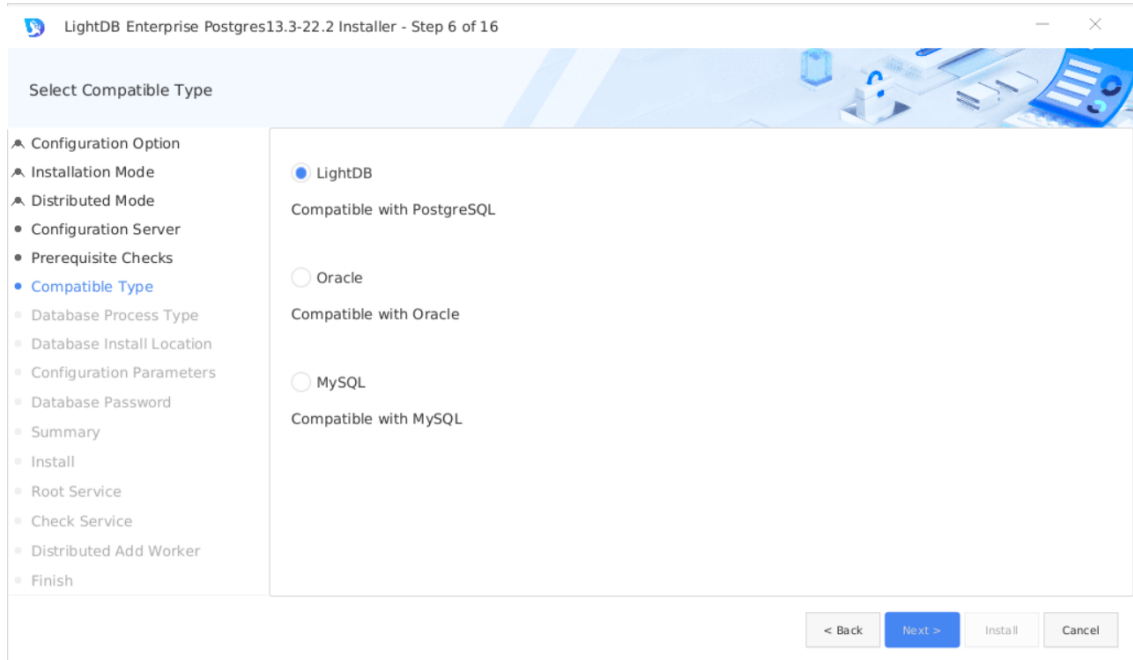
- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成。



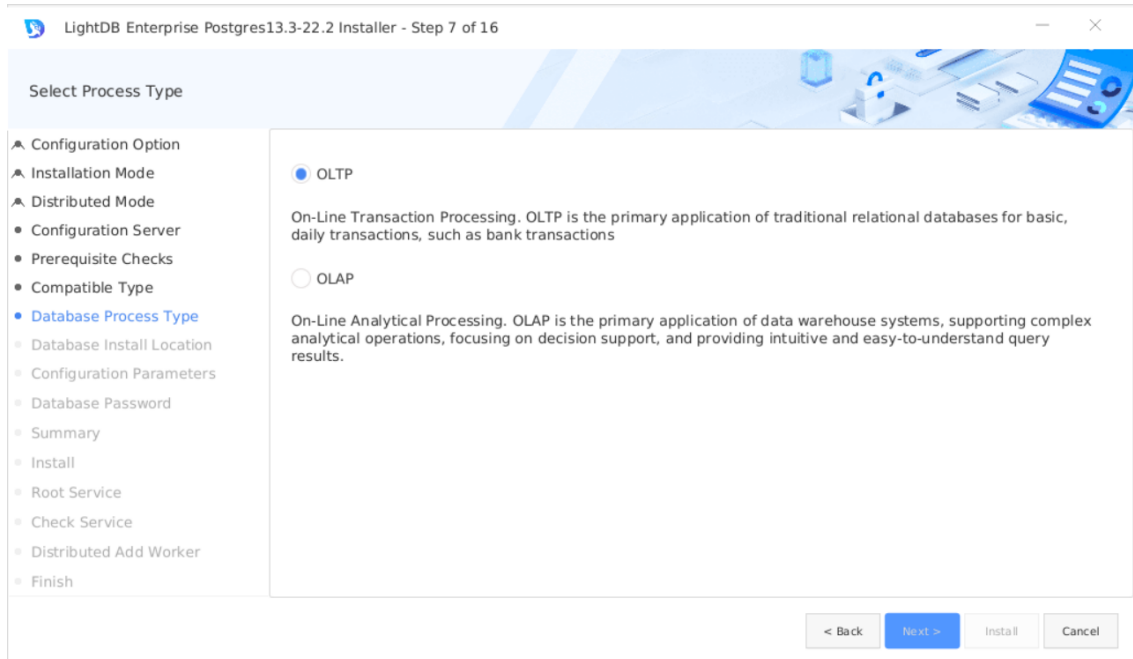
- 检查每一台服务器的依赖包和Linux内核参数。如有依赖缺失，则无法进入下一步，必须先安装依赖，再点击 Check Again 重新检查；如有内核参数与推荐配置不符的，则会给出 WARNING，此时可以先按建议值重新配置，再点击 Check Again，也可以直接点击 Ignore All 忽略全部警告，直接进入下一步。



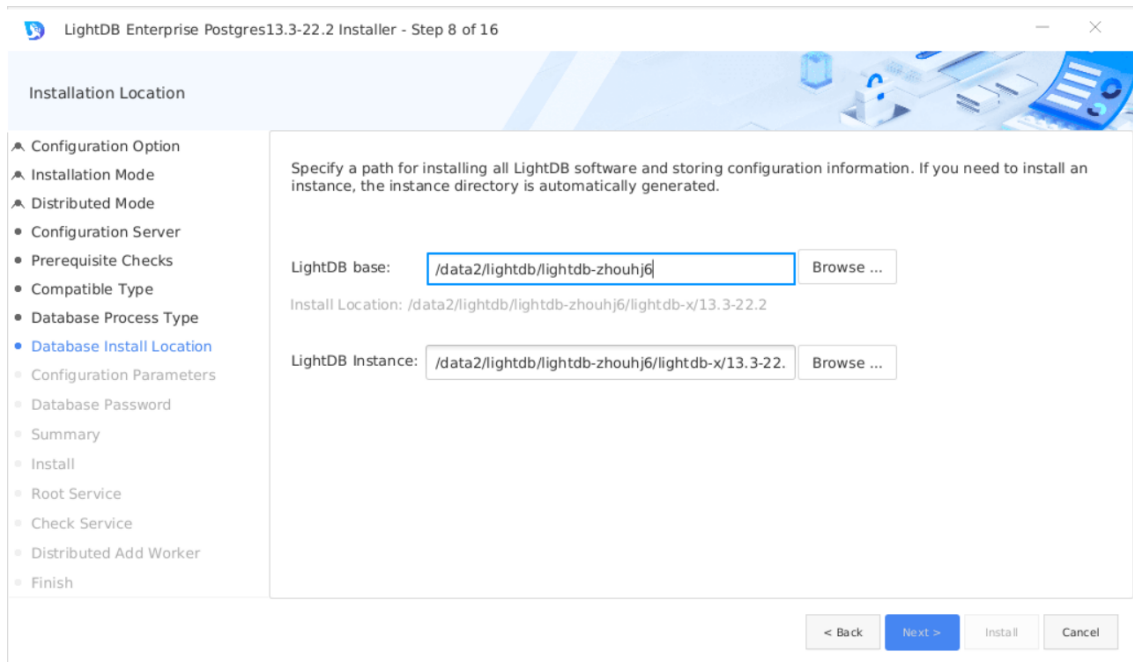
- 选择数据库兼容模式



- OLTP/OLAP选择，该选项会影响部分GUC参数的默认值策略，默认为OLTP，此处使用默认值。



- 指定数据库安装目录和实例目录(要确保lightdb用户有写入权限)，（步骤详见本文档3.8），可以在文本框中直接修改或点击 **Brows** 调出路径选择对话框，来指定其他目录。



LightDB Enterprise PostgreSQL 13.3-22.2 Installer - Step 8 of 16

Installation Location

Configuration Option

- Configuration Option
- Installation Mode
- Distributed Mode
- Configuration Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location**
- Configuration Parameters
- Database Password
- Summary
- Install
- Root Service
- Check Service
- Distributed Add Worker
- Finish

Specify a path for installing all LightDB software and storing configuration information. If you need to install an instance, the instance directory is automatically generated.

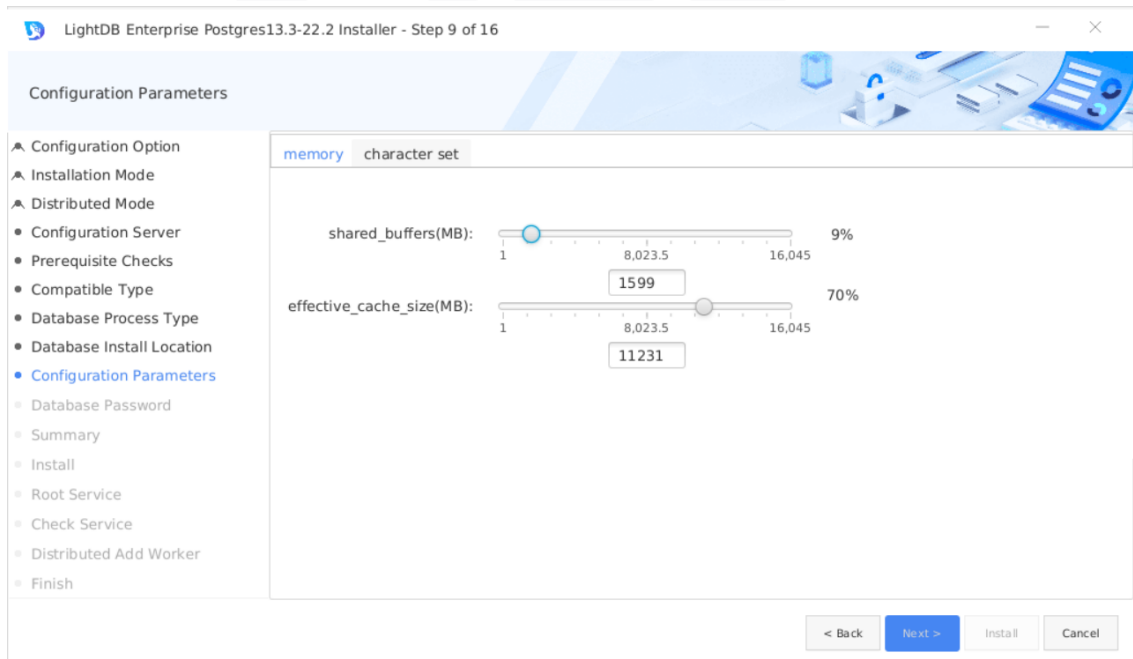
LightDB base: Browse ...

Install Location: /data2/lightdb/lightdb-zhouhj6/lightdb-x/13.3-22.2

LightDB Instance: Browse ...

< Back Next > Install Cancel

- 配置 `shared_buffers` 与 `effective_cache_size` 大小，以及设置字符集。默认 `shared_buffers` = 25% * 总物理内存，默认 `effective_cache_size` = 70% * 总物理内存，默认字符集为 UTF-8，并提供 GBK、SQL_ASCII、LATIN1 三个其他选项。



LightDB Enterprise PostgreSQL 13.3-22.2 Installer - Step 9 of 16

Configuration Parameters

Configuration Option

- Configuration Option
- Installation Mode
- Distributed Mode
- Configuration Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters**
- Database Password
- Summary
- Install
- Root Service
- Check Service
- Distributed Add Worker
- Finish

memory character set

shared_buffers(MB): 9%

effective_cache_size(MB): 70%

< Back Next > Install Cancel

- 配置super用户（即lightdb）密码，密码长度为6-16个字符，且至少包含数字、英文字母。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 10 of 16

Set Password

Configuration Option

Installation Mode

Distributed Mode

Configuration Server

Prerequisite Checks

Compatible Type

Database Process Type

Database Install Location

Configuration Parameters

Database Password

Summary

Install

Root Service

Check Service

Distributed Add Worker

Finish

Password:

Confirm Password:

< Back

Next >

Install

Cancel

- LightDB安装信息总览，可以点击 **SAVE Response File** 保存为文件。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 11 of 16

Summary

Configuration Option

Installation Mode

Distributed Mode

Configuration Server

Prerequisite Checks

Compatible Type

Database Process Type

Database Install Location

Configuration Parameters

Database Password

Summary

Install

Root Service

Check Service

Distributed Add Worker

Finish

LightDB Enterprise Installer

Global Info

Base Location: /data2/lightdb/lightdb-zhouhj6

Home Location: /data2/lightdb/lightdb-zhouhj6/lightdb-x/13.3-22.2

Configuration Option: INSTALL_AND_CREATE

Instance Location: /data2/lightdb/lightdb-zhouhj6/lightdb-x/13.3-22.2/data/defaultCluster/

User: lightdb

Password: a123456

LightDB Workload: OLTP

Deploy Mode: DISTRIBUTED_CLUSTER

Character Set: UTF8

Shared Buffers: 2GB

Effective Cache Size: 6GB

Compatible Type: LightDB

Server

< Back

Next >

Install

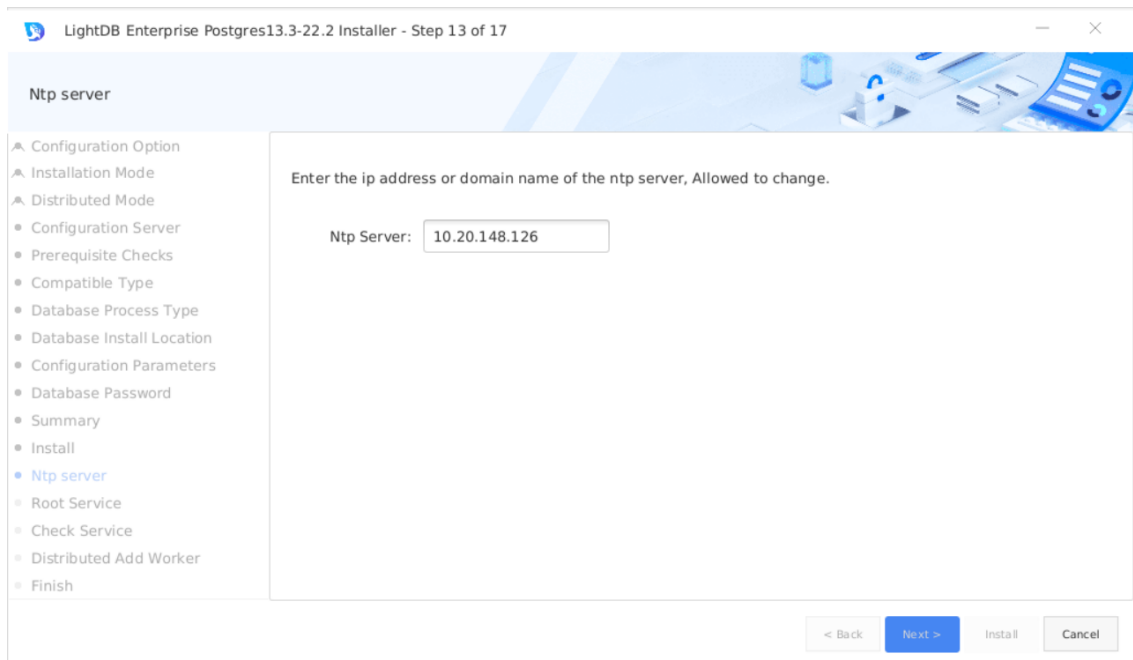
Cancel

Save Response File

- 总览信息确认无误后，点击Install执行安装。



- 安装完成后，选择一台服务器作为NTP服务器，此处使用默认值。

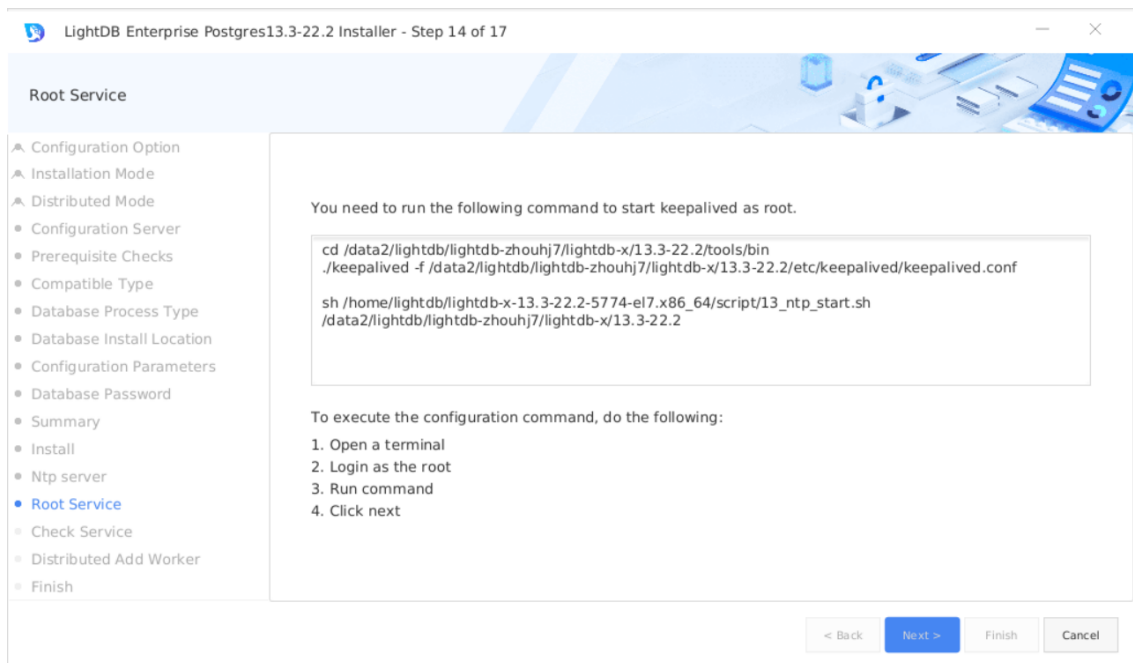


- 使用ssh客户端登录机器终端，切换到 root 用户，复制界面显示的命令并执行。执行的命令以实际界面显示的为准。

```
# 启动keepalived服务(在所有主，备上执行，witness上不用执行)
cd /home/lightdb/data/lightdb-x/13.3-22.2/tools/bin
./keepalived -f /home/lightdb/lightdb-zhouhj7/lightdb-x/13.3-22.2/etc/keepalived/keepalived.conf

# 启动ntp服务(在所有主，备，witness上执行)
sh /home/lightdb/lightdb-x-13.3-22.2-5774-el7.x86_64/script/13_ntp_start.sh \
/home/lightdb/lightdb-zhouhj7/lightdb-x/13.3-22.2
```

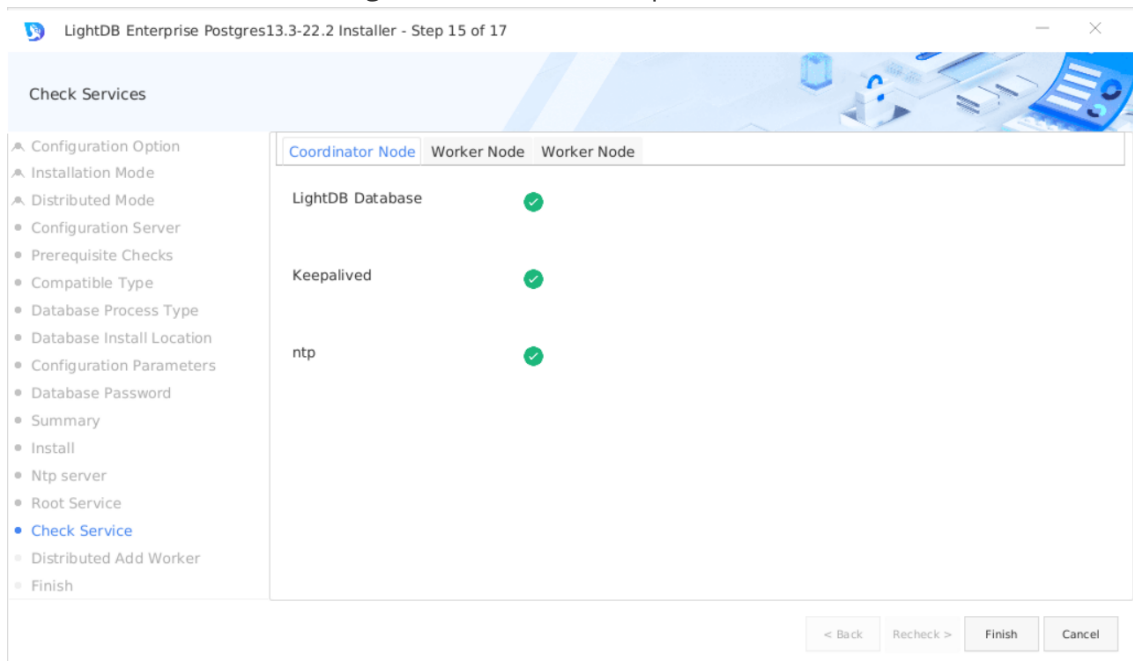
本次安装因为没有指定witness，直接在6台机器上执行所有命令就可以了。



启动keepalived程序后，使用ps查询一下进程，如果发现keepalived没有起来，则查看keepalived配置文件中中的对外网卡名称是否配置正确，这里需要配置您的机器对外的网卡名称。

```
vrrp_instance lightdb {
    state MASTER
    interface ens192
    virtual_router_id 100
    priority 100
    advert_int 2
    authentication {
        auth_type PASS
        auth_pass hs123456
    }
    virtual_ipaddress {
        10.19.64.100
    }
}
```

- 检查分布式集群中各节点的LightDB Database、keepalived以及NTP是否均正确启动。



- 检测通过，点击 Finish 关闭安装向导。

6.2.2 命令行安装

命令行安装步骤及选项与GUI安装完全相同，仅在向导信息提示上有所不同，因此本章节不再详细解释其中内容的含义与注意事项。

- 在install.sh命令行提示信息中输入No，按回车键确认，进入命令行安装交互界面。

```
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5705-e17.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```

- 选择配置模式，键入1仅安装数据库，键入2会额外创建一个实例，输入3为开发者选项，默认为1，此处选择2。

```
Choice a kind of configuration mode!
1: Only install.
2: Install database and Create instance.
3: Developer
Please enter 1 2 or 3(The default is 1):
2
```

- 选择安装单机版、高可用或分布式，键入1安装单机版，键入2选择高可用版，键入3安装分布式版，默认为1，此处选择3。

```
Choice a kind of install mode!
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
3
```

- 选择分布式常规、多机单实例、单机多实例部署方式。这里选择常规模式，并且使用与6.2.1小节相同的节点数量与部署方式。

```
Please select distributed mode!
Please enter distributed mode:
1 Normal mode;
2 Multi-server single instance;
3 Single server multi-instance.(Default 1)
1
```

- 配置协调者节点高可用。

```
Config Server for High Availability Mode!
Please enter coordinator node:
Please enter a virtual IP address with network, such as (192.168.217.234/16):
10.20.148.199/24
The cluster need a primary server(required), one or more standby server(optional) and a witness server(optional).
Please input a primary server ip which is actually the ip of the current server(required). such as (192.168.217.234/16):
10.20.148.126/24
Please input a standby server ip(required), such as (192.168.217.234/16):
10.20.148.127/24
Please enter status of the standby server [10.20.148.127]
1 sync:
2 async:
1
Continue to add standby nodes?(enter [exit] to left.):
exit
Please input a witness server ip(optional), such as (192.168.217.234/16):

Witness is empty
Please enter a port of the cluster. (Default port 5432):
7779
```

- 添加一个work节点，并且配置高可用。

```
===== Servers =====
Please check the servers of the cluster. 1 continue; 2 clear server config (Default 1)
1
Please enter work node:
Please enter a virtual IP address with network, such as (192.168.217.234/16):
10.20.148.200/24
The cluster need a primary server(required), one or more standby server(optional) and a witness server(optional).
Please input a primary server ip which is actually the ip of the current server(required). such as (192.168.217.234/16):
10.20.148.122/24
Please input a standby server ip(required), such as (192.168.217.234/16):
10.20.148.128/24
Please enter status of the standby server [10.20.148.128]
1 sync:
2 async:
1
Continue to add standby nodes?(enter [exit] to left.):
exit
Please input a witness server ip(optional), such as (192.168.217.234/16):

Witness is empty
Please enter a port of the cluster. (Default port 5432):
7779
===== Servers =====
Vip: 10.20.148.200
Port: 7779
Ip: 10.20.148.122 Role: primary Status: none
Ip: 10.20.148.128 Role: standby Status: sync
```

- 添加第二个work节点，并且配置高可用。

```
===== Servers =====
Please check the servers of the cluster. 1 continue; 2 clear server config (Default 1)
1
Continue to add worker node(1 yes,2 no)?
1
Please enter work node:
Please enter a virtual IP address with network, such as (192.168.217.234/16):
10.20.149.10/24
The cluster need a primary server(required), one or more standby server(optional) and a witness server(optional).
Please input a primary server ip which is actually the ip of the current server(required). such as (192.168.217.234/16):
10.20.149.228/24
Please input a standby server ip(required), such as (192.168.217.234/16):
10.20.149.229/24
Please enter status of the standby server [10.20.149.229]
1 sync;
2 async;
1
Continue to add standby nodes?(enter [exit] to left.):
exit
Please input a witness server ip(optional), such as (192.168.217.234/16):

Witness is empty
Please enter a port of the cluster. (Default port 5432):
7779
===== Servers =====
Vip: 10.20.149.10
Port: 7779
Ip: 10.20.149.228 Role: primary Status: none
Ip: 10.20.149.229 Role: standby Status: sync
```

- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成。传输完成后会检查依赖包和内核参数。

```
===== Generate pg_hba =====
===== Generate end =====
===== Copying files takes time =====

10.20.148.127: start copy
10.20.148.127: end copy
10.20.148.122: start copy
10.20.148.122: end copy
10.20.148.128: start copy
10.20.148.128: end copy
10.20.149.228: start copy
10.20.149.228: end copy
10.20.149.229: start copy
10.20.149.229: end copy
===== Copying files end =====

Check system parameters and dependency packages!
===== 10.20.148.126 =====
NETWORK
name: sem, recommend value: 500,2048000,200,4096, current value: 500,2048000,200,4096, status: OK
name: aio_max_nr, recommend value: 1048576, current value: 1048576, status: OK
name: somaxconn, recommend value: 2000, current value: 2000, status: OK
name: tcp_max_syn_backlog, recommend value: 2000, current value: 2000, status: OK
name: tcp_tw_reuse, recommend value: 1, current value: 0, status: WARNING
name: tcp_syn_retries, recommend value: 3, current value: 6, status: WARNING
name: tcp_retries2, recommend value: 5, current value: 15, status: WARNING
name: tcp_slow_start_after_idle, recommend value: 0, current value: 1, status: WARNING
PAGE_CACHE
name: dirty_background_ratio, recommend value: 5, current value: 5, status: OK
name: dirty_ratio, recommend value: 40, current value: 40, status: OK
name: dirty_expire_centisecs, recommend value: 500, current value: 500, status: OK
name: dirty_writeback_centisecs, recommend value: 250, current value: 250, status: OK
MEMORY
name: shmmni, recommend value: 4096, current value: 4096, status: OK
name: shmmx, recommend value: 8412581888, current value: 8412581888, status: OK
name: shmall, recommend value: 2053853, current value: 2053853, status: OK
name: swappiness, recommend value: 5, current value: 5, status: OK
name: overcommit_memory, recommend value: 2, current value: 2, status: OK
name: overcommit_ratio, recommend value: 75, current value: 50, status: WARNING
FILE_HANDLER
name: file_max, recommend value: 524288, current value: 524288, status: OK
ULIMIT
```

- 选择数据库兼容模式。

```
Choice a kind of Compatible Type!
1: LightDB(Compatible with PostgreSQL).
2: ORACLE(Compatible with ORACLE).
3: MYSQL(Compatible with MYSQL)
Please enter 1, 2 or 3:(The default is 1)
1
```

- 选择OLTP/OLAP，键入1为OLTP，键入2为OLAP，默认为1。

```
Choice a kind of LightDB workload!
1: OLTP(On-Line Transaction Processing).
2: OLAP(On-Line Analytical Processing).
Please enter 1 or 2:(The default is 1)
1
```

- 指定LightDB安装目录和实例目录(要确保lightdb用户有写入权限)。

```
Specify a path for installing all LightDB software and storing configuration information.
Please enter base location(The default is /usr/local/lightdb):
/data2/lightdb/lightdb-zhouhj8
Base Location: /data2/lightdb/lightdb-zhouhj8
Install Location: /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2
Please enter instance location(The default is /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2/data/defaultCluster/):

Instance location: /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2/data/defaultCluster/
```

- 配置shared_buffers与effective_cache_size大小，以及设置字符集。

```
Please configure memory(MB) and character set!
Please enter shared_buffers, Default value is (4011):

Please enter effective_cache_size, Default value is (11231):

Please choice a Kind of Character Set.
1. UTF8
2. GBK
3. SQL_ASCII
4. LATIN1
The default choice 1(UTF8)
```

- 设置super用户密码，键入时密码不可见，密码长度为6-16个字符，且至少包含数字、英文字母。

```
Please enter LightDB password!  
Please enter original password:  
Please enter confirm password:
```

- 选择继续安装，直至安装完成，然后选择一台服务器作为NTP服务器，此处使用默认值。

[illegible]

- 使用 root 用户，在**所有 primary 和所有 standby 上执行界面提示的命令，在本例中，需要在6台机器上执行。

```
ntp Server
Enter the ip address or domain name of the ntp server, Allowed to change.(Default ntp ip:10.20.148.126)

Execute follow commands as root
Execute follow commands to start keepalived:
cd /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2/tools/bin
./keepalived -f /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2/etc/keepalived/keepalived.conf

Execute follow commands to start ntp:

sh /home/lightdb/lightdb-x-13.3-22.2-5774-el7.x86_64/script/13_ntp_start.sh /data2/lightdb/lightdb-zhouhj8/lightdb-x/13.3-22.2

Check service:
Please enter any key to continue for checking?

Distribute cluster add worker
Install Finish
```

启动keepalived程序后，使用ps查询一下进程，如果发现keepalived没有起来，则查看keepalived配置文件中中的对外网卡名称是否配置正确，这里需要配置您的机器对外的网卡名称。

```

vrrp_instance lightdb {
    state MASTER
    interface ens192
    virtual_router_id 100
    priority 100
    advert_int 2
    authentication {
        auth_type PASS
        auth_pass hs123456
    }
    virtual_ipaddress {
        10.19.64.100
    }

    track_script {
        check_lightdb_alived
    }
}

```

- 上一步骤中的命令执行完成后，按任意键进入检查过程，检查通过后会输出 Install Finish 信息，并自动退出安装向导。

6.3 安装分布式多机单实例模式

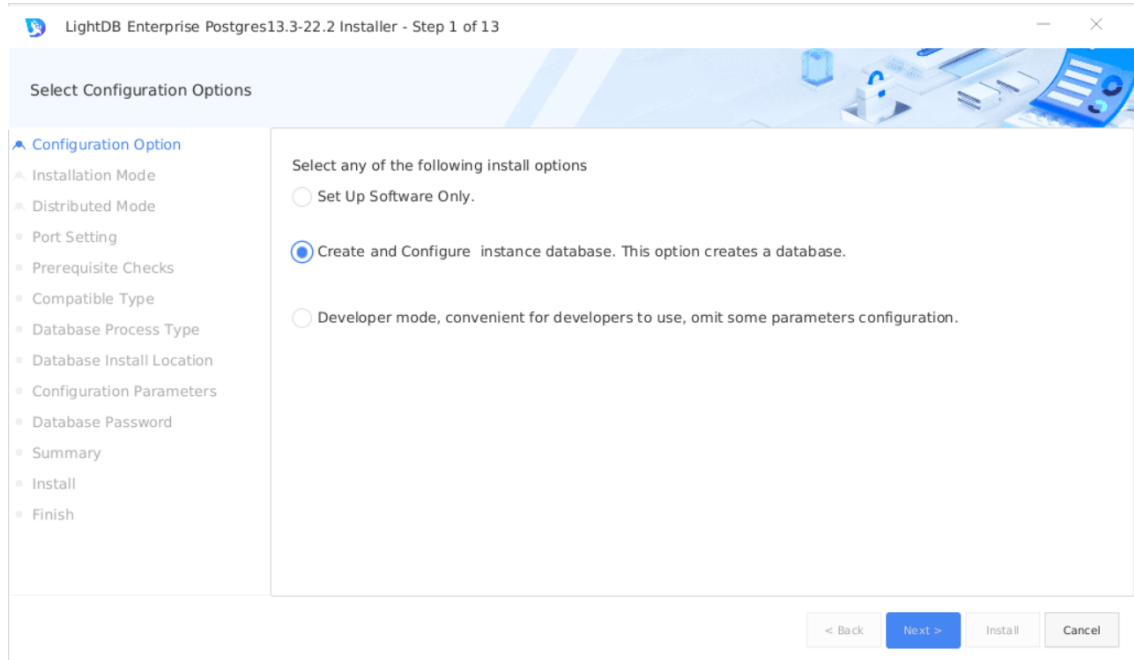
6.3.1 GUI安装

- 按前面所述要求，配置DISPLAY环境变量，在install.sh命令行提示信息中输入yes，按回车键确认，Windows中就会弹出GUI安装向导界面。

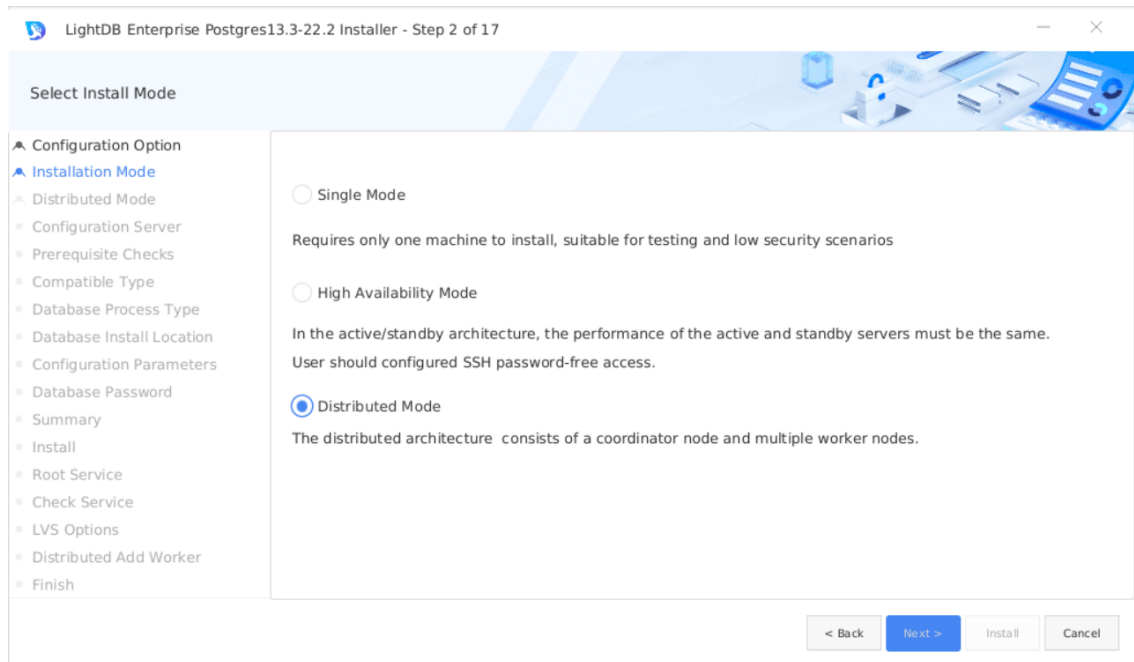
```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

- 界面中包含三个选项，选项一（默认选项）仅安装数据库；选项二除了安装数据库外，还会生成一个默认的实例目录，并使用默认实例启动数据库；选项三为开发者模式，该模式下将

使用默认数据库参数，而不会对参数进行自动调优。

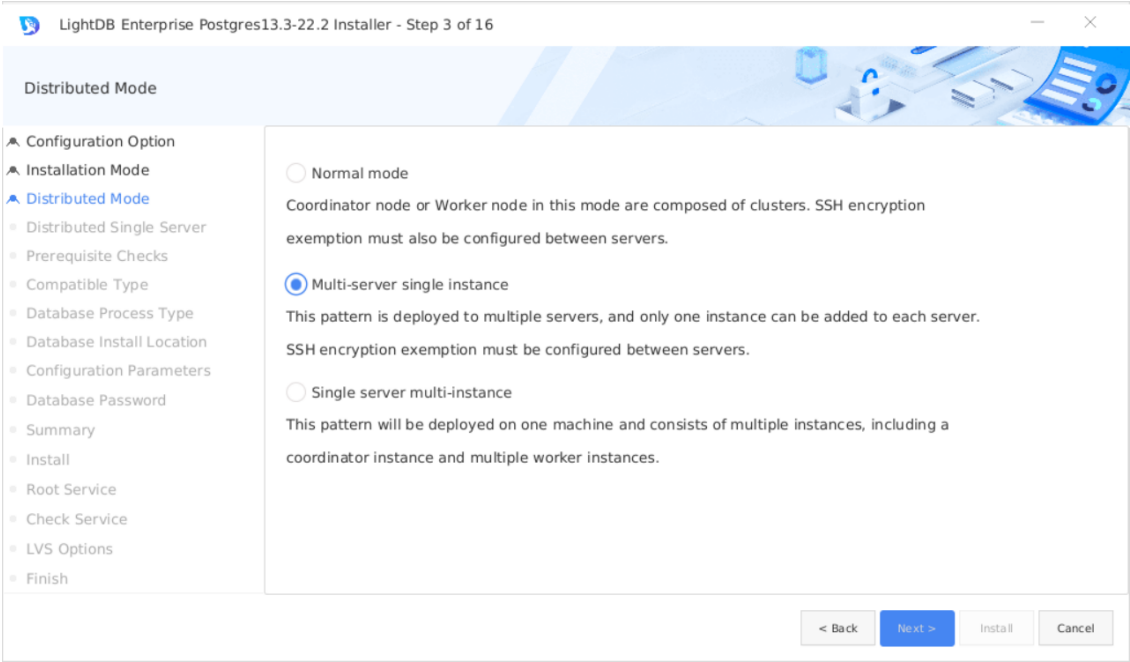


- 选择安装模式，提供**单机版、高可用、分布式**三个选项，默认为单机版，此处我们选择分布式版。

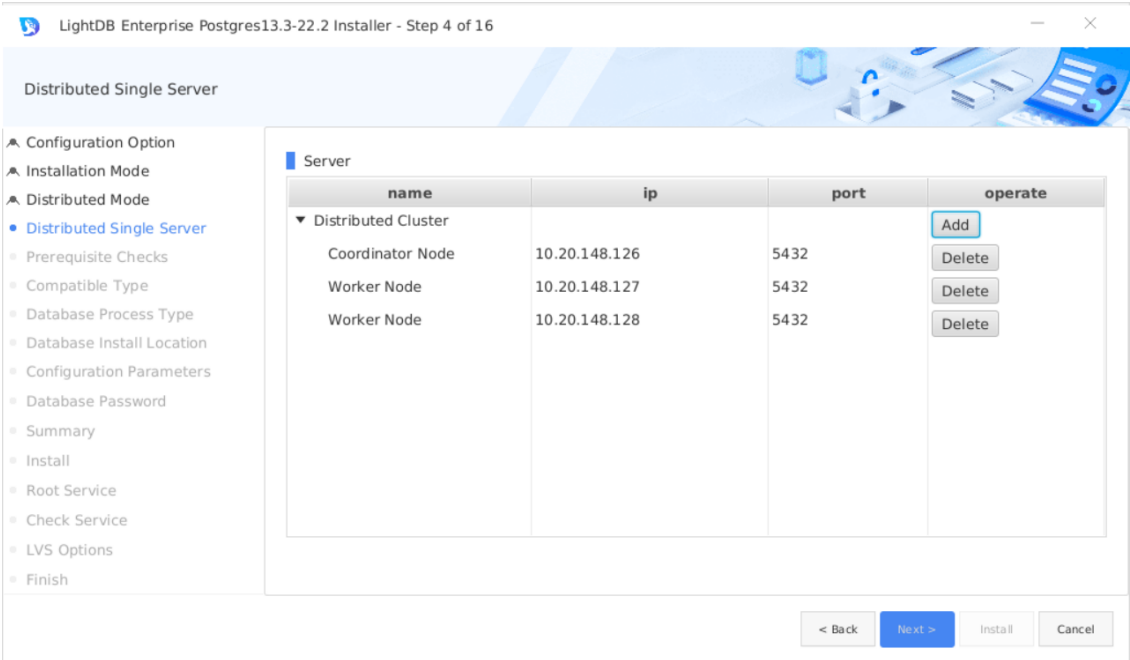


- 选择分布式部署方式，包括常规（Normal mode）、多机单实例（Multi-server single instance）和单机多实例（Single server multi-instance）三种，关于这三种部署方式的定义，已经在本文档6.1小节中介绍过，这里不再赘述。**本次我们选择多机单实例模式，并使**

用2个工作节点。



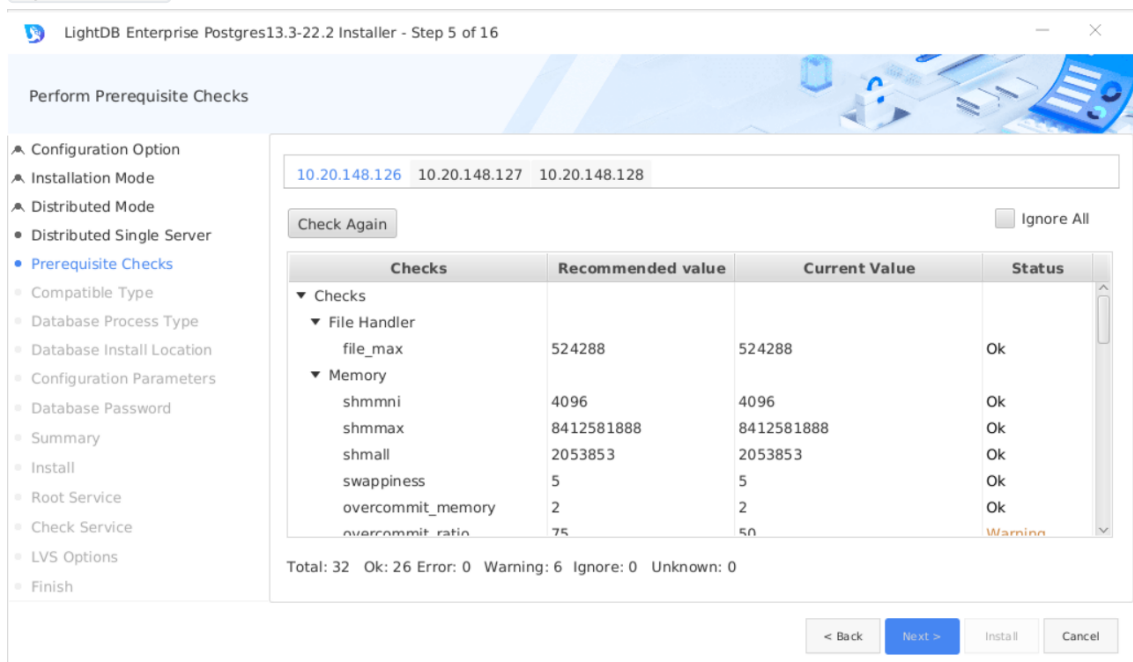
- 点击Add，添加1个协调者节点和2个工作节点的IP与端口号。



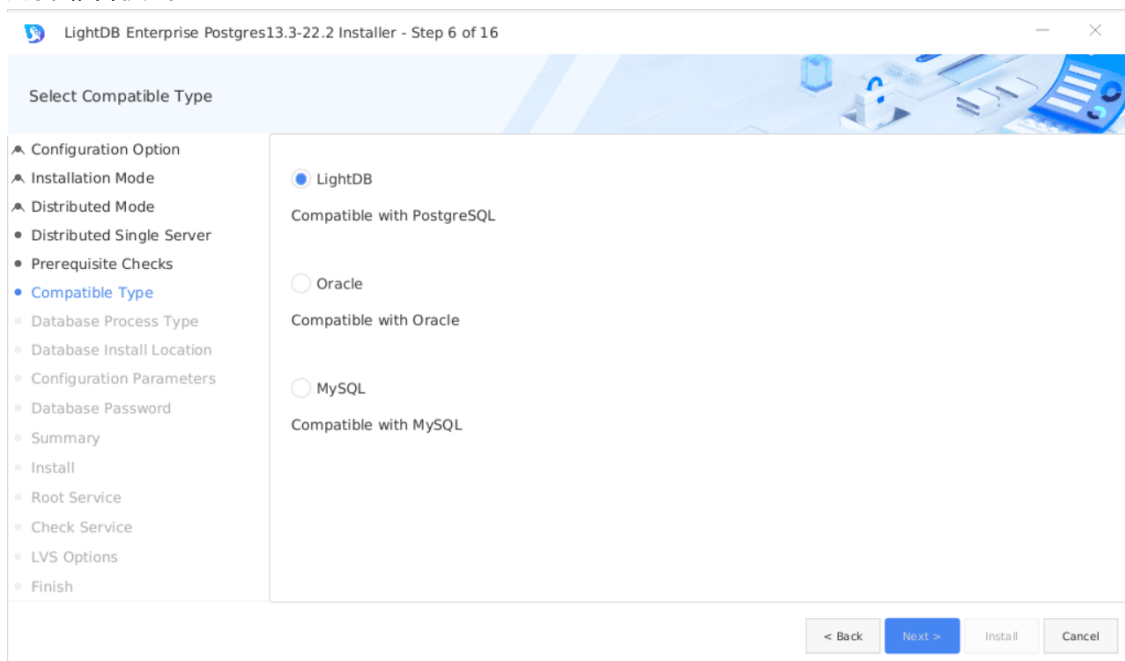
- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成。



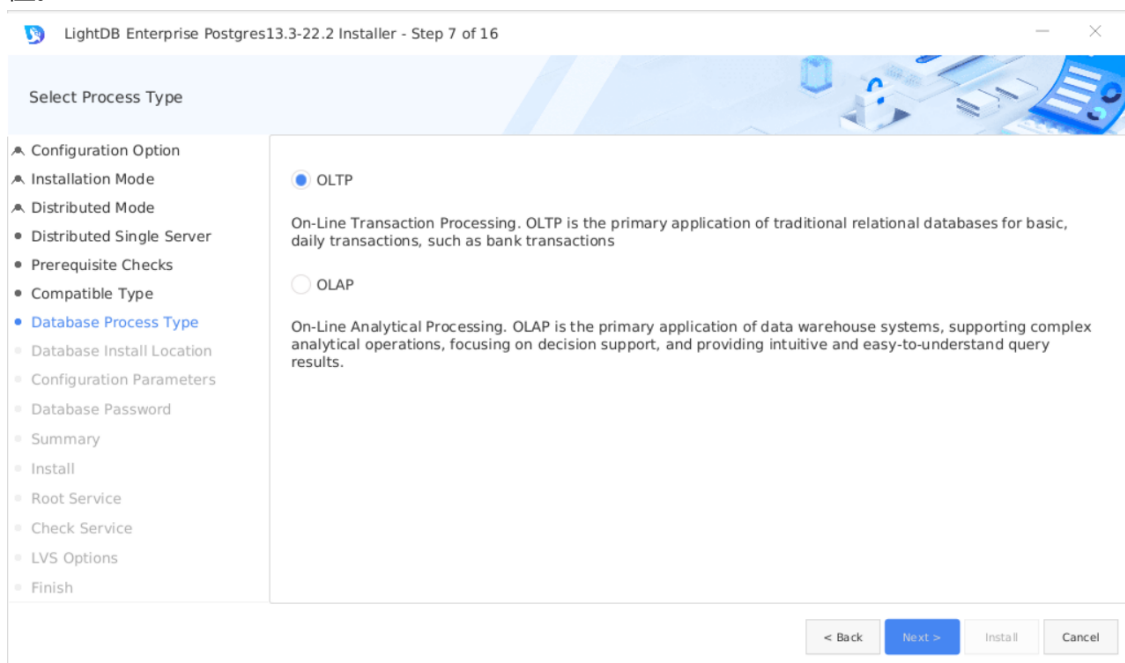
- 检查每一台服务器的依赖包和Linux内核参数。如有依赖缺失，则无法进入下一步，必须先安装依赖，再点击 **Check Again** 重新检查；如有内核参数与推荐配置不符的，则会给出 WARNING，此时可以先按建议值重新配置，再点击 **Check Again**，也可以直接点击 **Ignore All** 忽略全部警告，直接进入下一步。



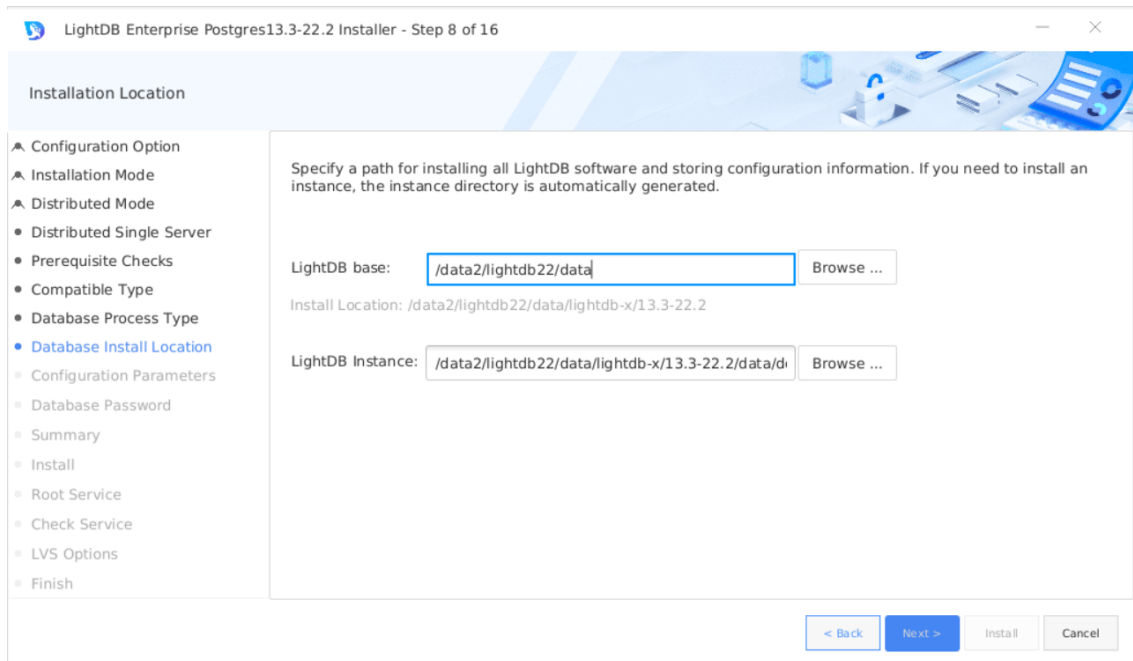
- 选择兼容模式



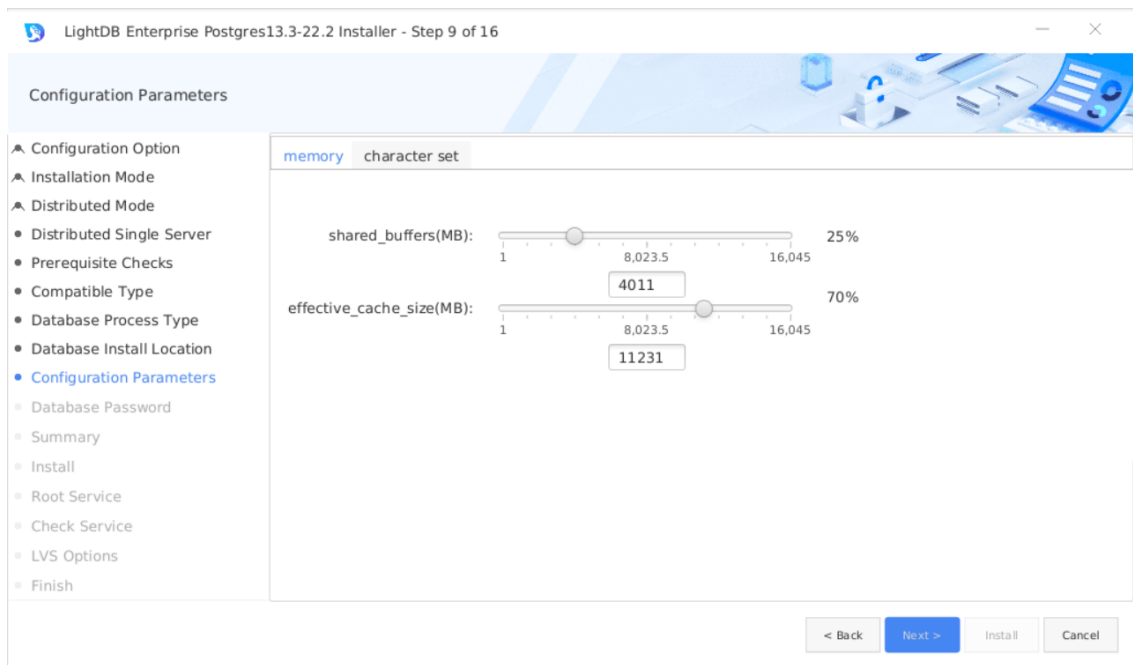
- OLTP/OLAP选择，该选项会影响部分GUC参数的默认值策略，默认为OLTP，此处使用默认值。



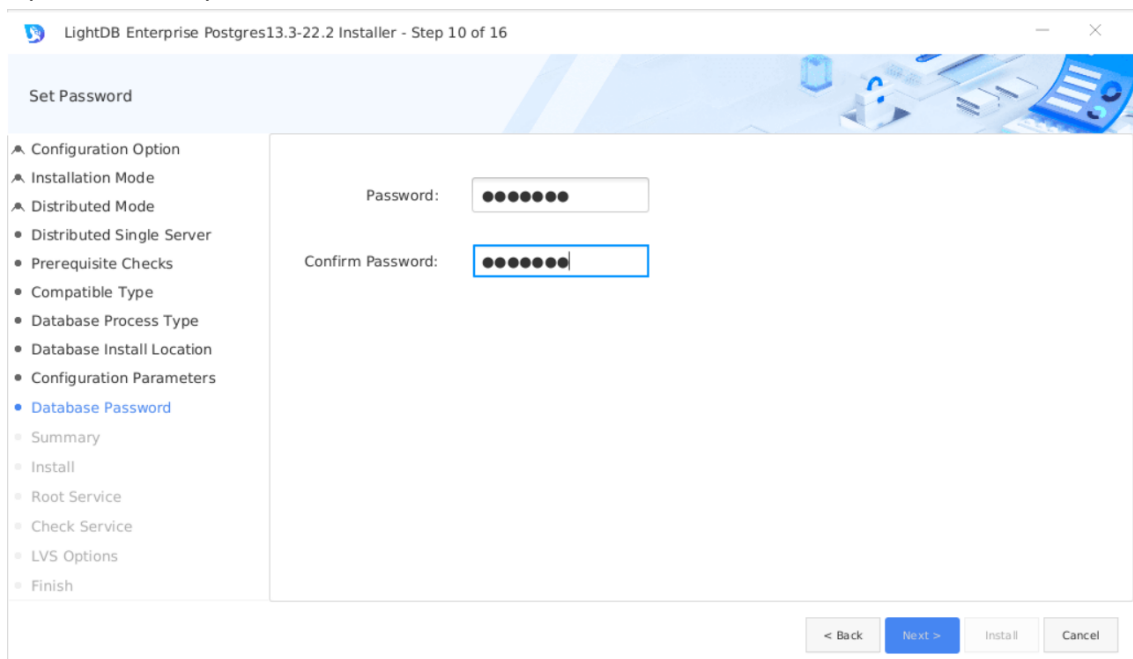
- 指定数据库安装目录和实例目录(要确保lightdb用户有写入权限)，（步骤详见本文档 3.8），可以在文本框中直接修改或点击 **Brows** 调出路径选择对话框，来指定其他目录。



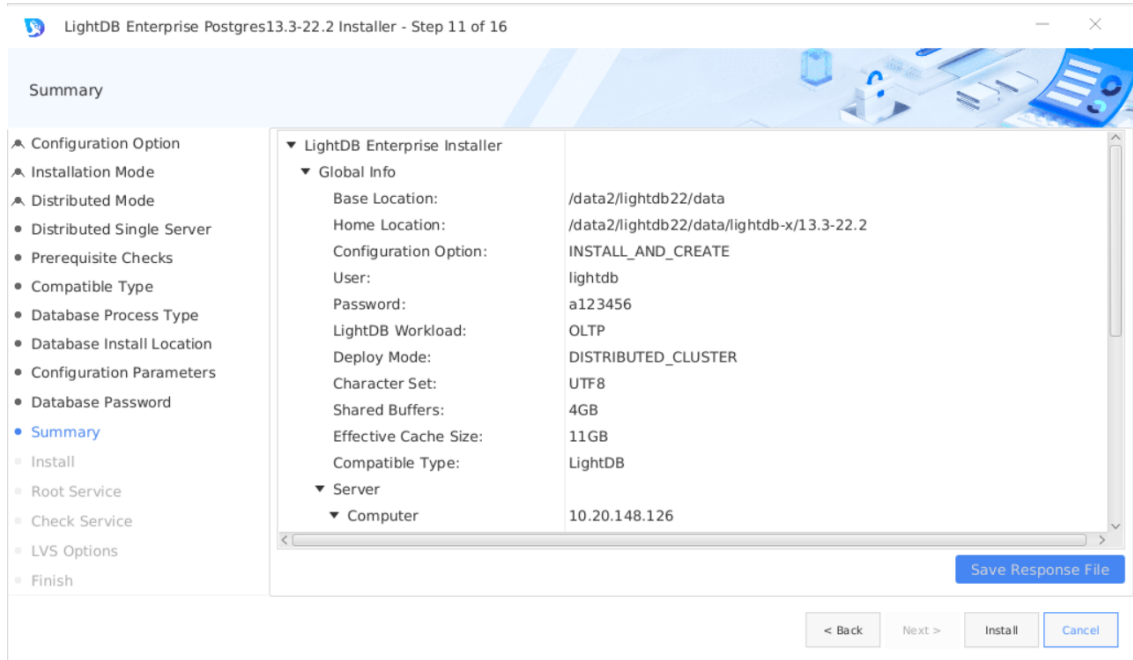
- 配置 `shared_buffers` 与 `effective_cache_size` 大小，以及设置字符集。默认 `shared_buffers` = 25% * 总物理内存，默认 `effective_cache_size` = 70% * 总物理内存，默认字符集为 `UTF-8`，并提供 `GBK`、`SQL_ASCII`、`LATIN1` 三个其他选项。



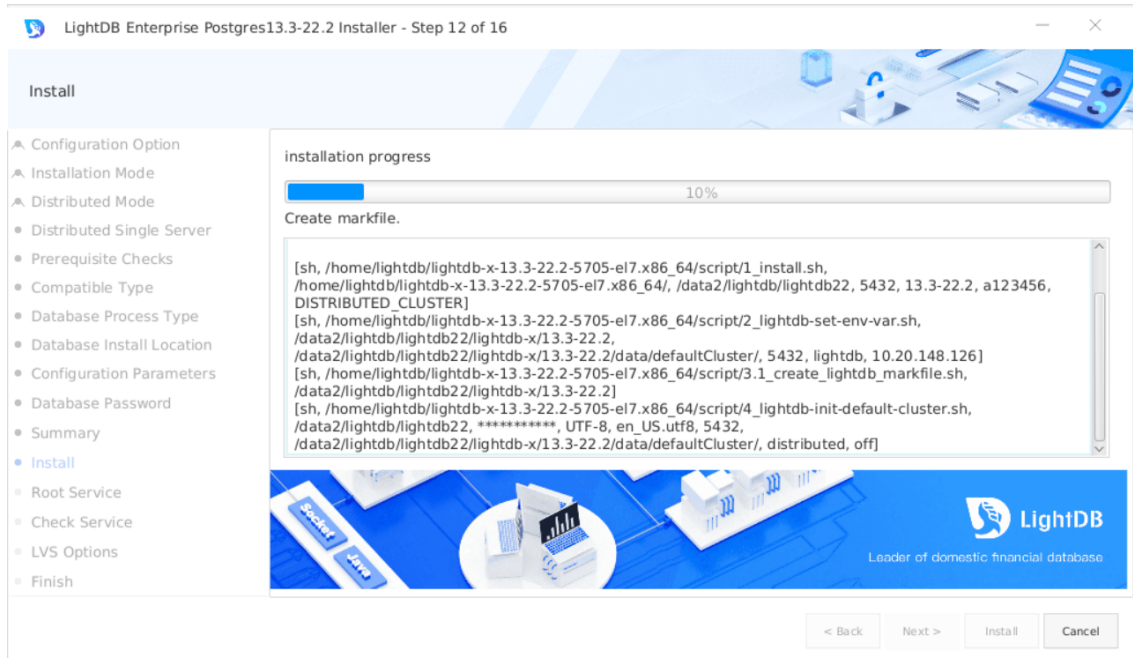
- 配置super用户（即lightdb）密码，密码长度为6-16个字符，且至少包含数字、英文字母（不限制大小写）。



- LightDB安装信息总览，可以点击 **SAVE Response File** 保存为文件。



- 总览信息确认无误后，点击Install执行安装。



- 安装完成后，选择一台服务器作为NTP服务器，此处使用默认值。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 13 of 17

Ntp server

Configuration Option

Installation Mode

Distributed Mode

- Distributed Single Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters
- Database Password
- Summary
- Install
- **Ntp server**
- Root Service
- Check Service
- LVS Options
- Finish

Enter the ip address or domain name of the ntp server, Allowed to change.

Ntp Server:

< Back Next > Install Cancel

- 使用 `root` 用户，在所有协调者节点和工作节点上执行界面中提示的命令以启用NTP服务，然后点击Next。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 14 of 17

Root Service

Configuration Option

Installation Mode

Distributed Mode

- Distributed Single Server
- Prerequisite Checks
- Compatible Type
- Database Process Type
- Database Install Location
- Configuration Parameters
- Database Password
- Summary
- Install
- Ntp server
- **Root Service**
- Check Service
- LVS Options
- Finish

You need to run the following command to start keepalived as root.

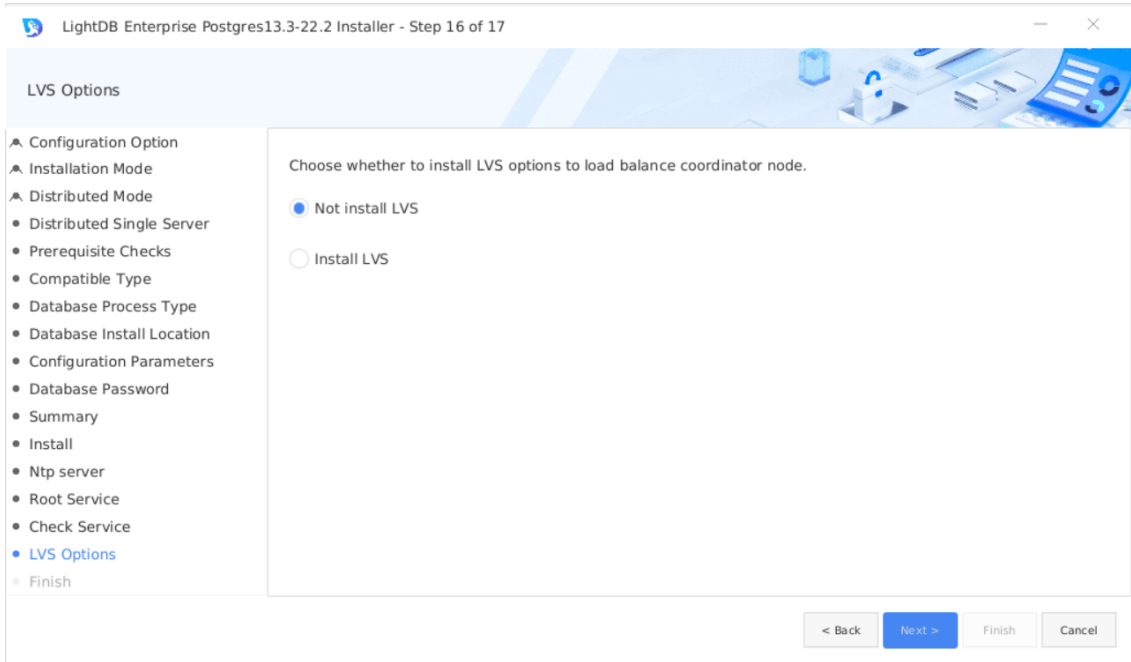
```
sh /home/lightdb/lightdb-x-13.3-22.2-5760-el7.x86_64/script/13_ntp_start.sh  
/data2/lightdb/lightdb-zhouhj3/lightdb-x/13.3-22.2
```

To execute the configuration command, do the following:

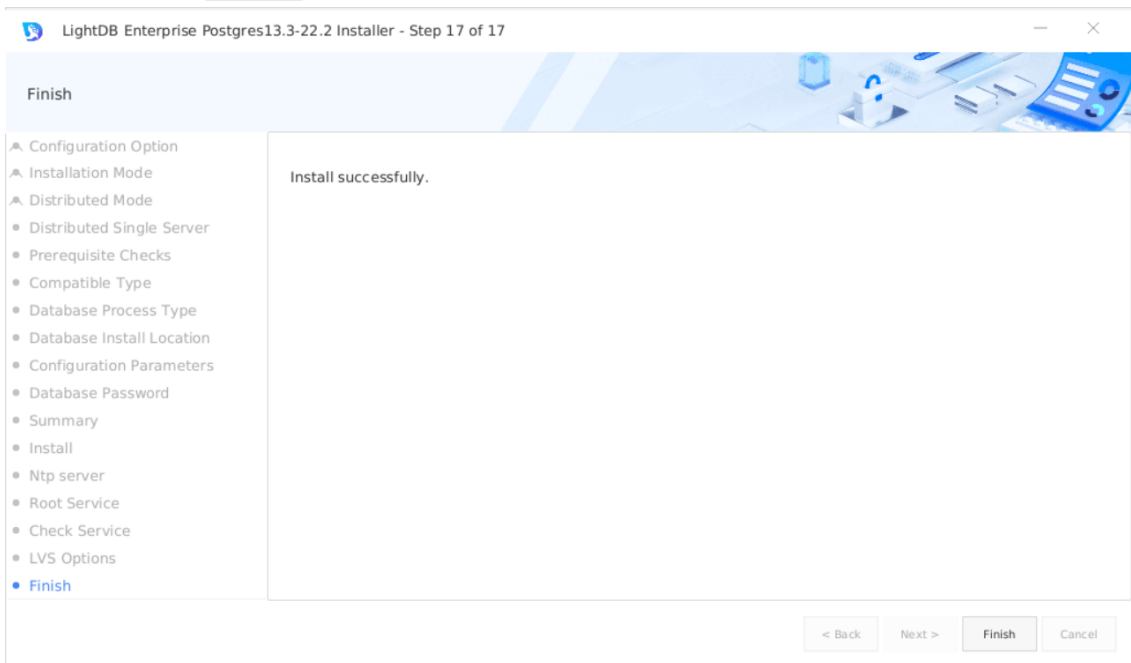
1. Open a terminal
2. Login as the root
3. Run command
4. Click next

< Back Next > Finish Cancel

- 这里提示是否安装LVS,本次安装是单CN模式，不需要安装LVS,直接选择否。



- 检测通过，点击 Finish 关闭安装向导。



6.3.2 命令行安装

命令行安装步骤及选项与GUI安装完全相同，仅在向导信息提示上有所不同，因此本章节不再详细解释其中内容的含义与注意事项。

- 在install.sh命令行提示信息中输入No，按回车键确认，进入命令行安装交互界面。

```
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5760-el7.x86_64]$  
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5760-el7.x86_64]$ ./install.sh  
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)  
no
```

- 选择配置模式，键入1仅安装数据库，键入2会额外创建一个实例，输入3为开发者选项，默认为1，此处选择2。

```
Choice a kind of configuration mode!  
1: Only install.  
2: Install database and Create instance.  
3: Developer  
Please enter 1 2 or 3(The default is 1):  
2
```

- 选择安装单机版、高可用或分布式，键入1安装单机版，键入2选择高可用版，键入3安装分布式版，默认为1，此处选择3。

```
Choice a kind of install mode!
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
3
```

- 选择分布式常规、多机单实例、单机多实例部署方式。这里选择多机单实例模式，并且使用与6.3.1小节相同的节点数量与部署方式。

```
Please select distributed mode!
Please enter distributed mode:
1 Normal mode;
2 Multi-server single instance;
3 Single server multi-instance.(Default 1)
2
```

- 分别配置协调者节点和工作节点

```
Configure the directory and port for the single-node multi-instance.
Please enter coordinator node:
Please enter the ip of coordinator node, such as 192.168.217.234:
10.20.148.126
Please enter the port of coordinator node. (Default port 5432):
7778
Please enter worker node:
Please enter the ip of worker node, such as 192.168.217.234:
10.20.148.127
Please enter the port of worker node. (Default port 5432):
7778
Please enter the ip of worker node, such as 192.168.217.234:
10.20.148.122
Please enter the port of worker node. (Default port 5432):
7778
Continue to add worker node?(1 yes,2 no)
no
```

- 将安装包从当前服务器传输到其他机器上，这个过程可能需要几分钟时间，请耐心等待传输完成。

```
===== Servers =====
Coordinator Node : 10.20.148.126
Worker Node : 10.20.148.127
Worker Node : 10.20.148.122
===== Servers =====
Please check the servers of Multi-server single instance. 1 continue; 2 clear server config (Default 1)
1
===== Generate pg_hba =====
===== Generate end =====
===== Copying files takes time =====
10.20.148.127: start copy
10.20.148.127: end copy
10.20.148.122: start copy
10.20.148.122: end copy
===== Copying files end =====
```

- 检查依赖包与Linux内核参数。

```
===== 10.20.148.126 =====
NETWORK
name: sem, recommend value: 500,2048000,200,4096, current value: 500,2048000,200,4096, status: OK
name: aio_max_nr, recommend value: 1048576, current value: 1048576, status: OK
name: somaxconn, recommend value: 2000, current value: 2000, status: OK
name: tcp_max_syn_backlog, recommend value: 2000, current value: 2000, status: OK
name: tcp_tw_reuse, recommend value: 1, current value: 0, status: WARNING
name: tcp_syn_retries, recommend value: 3, current value: 6, status: WARNING
name: tcp_retries2, recommend value: 5, current value: 15, status: WARNING
name: tcp_slow_start_after_idle, recommend value: 0, current value: 1, status: WARNING
PAGE_CACHE
name: dirty_background_ratio, recommend value: 5, current value: 5, status: OK
name: dirty_ratio, recommend value: 40, current value: 40, status: OK
name: dirty_expire_centisecs, recommend value: 500, current value: 500, status: OK
name: dirty_writeback_centisecs, recommend value: 250, current value: 250, status: OK
MEMORY
name: shmmni, recommend value: 4096, current value: 4096, status: OK
name: shmmx, recommend value: 8412581888, current value: 8412581888, status: OK
name: shmall, recommend value: 2053853, current value: 2053853, status: OK
name: swappiness, recommend value: 5, current value: 5, status: OK
name: overcommit_memory, recommend value: 2, current value: 2, status: OK
name: overcommit_ratio, recommend value: 75, current value: 50, status: WARNING
FILE_HANDLER
name: file_max, recommend value: 524288, current value: 524288, status: OK
ULIMIT
name: ulimit_core, recommend value: unlimited, current value: unlimited, status: OK
name: ulimit_nofile, recommend value: 8192, current value: 524288, status: OK
Dependency Package
name: JSON-C-0.11 is existed: yes
```

- 选择数据库兼容模式。

```
Choice a kind of Compatible Type!
1: LightDB(Compatible with PostgreSQL).
2: ORACLE(Compatible with ORACLE).
3: MYSQL(Compatible with MYSQL).
Please enter 1, 2 or 3:(The default is 1)
1
```

- 选择OLTP/OLAP，键入1为OLTP，键入2为OLAP，默认为1。

```
Choice a kind of LightDB workload!
1: OLTP(On-line Transaction Processing).
2: OLAP(On-Line Analytical Processing).
Please enter 1 or 2:(The default is 1)
1
```

- 指定LightDB安装目录和实例目录(要确保lightdb用户有写入权限)。

```
Specify a path for installing all LightDB software and storing configuration information.
Please enter base location(The default is /usr/local/lightdb):
/data2/lightdb/lightdb-zhouhj5
Base Location: /data2/lightdb/lightdb-zhouhj5
Install Location: /data2/lightdb/lightdb-zhouhj5/lightdb-x/13.3-22.2
Please enter instance location(The default is /data2/lightdb/lightdb-zhouhj5/lightdb-x/13.3-22.2/data/defaultCluster/):
Instance location: /data2/lightdb/lightdb-zhouhj5/lightdb-x/13.3-22.2/data/defaultCluster/
```

- 配置shared_buffers与effective_cache_size大小，以及设置字符集。

```
Please configure memory(MB) and character set!
Please enter shared_buffers, Default value is (4096):

Please enter effective_cache_size, Default value is (16384):

Please choose a kind of Character Set.
1. UTF8
2. GBK
3. SQL_ASCII
4. LATIN1
The default choice 1(UTF8)
1
```

- 设置super用户密码，键入时密码不可见，密码长度为6-16个字符，且至少包含数字、英文字母。

```
Please enter LightDB password!
Please enter original password:

Please enter confirm password:
```

- 选择继续安装，直至安装完成

```
Do you want to deploy immediately?(Yes or No, The default is yes)
yes
[>=====]100%
```

- 使用 root 用户，在所有协调者节点和工作节点上执行界面中提示的命令以启用NTP服务，然后按任意键继续

```
Ntp Server
Enter the ip address or domain name of the ntp server, Allowed to change.(Default ntp ip:10.20.148.126)

Execute follow commands as root
Execute follow commands to start ntp:

sh /home/lightdb/lightdb-x-13.3-22.2-5668-el7.x86_64/script/13_ntp_start.sh /data2/lightdb/lightdb-zhouh5/lightdb-x/13.3-22.2

Check service:
Please enter any key to continue for checking?
```

- 提示安装LVS,本次安装是单CN模式，不需要安装LVS,直接选择否。

```
Choose whether to install LVS to load balance coordinator node?(Yes or No,The default is no)
no
Install Finish
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5668-el7.x86_64]$
```

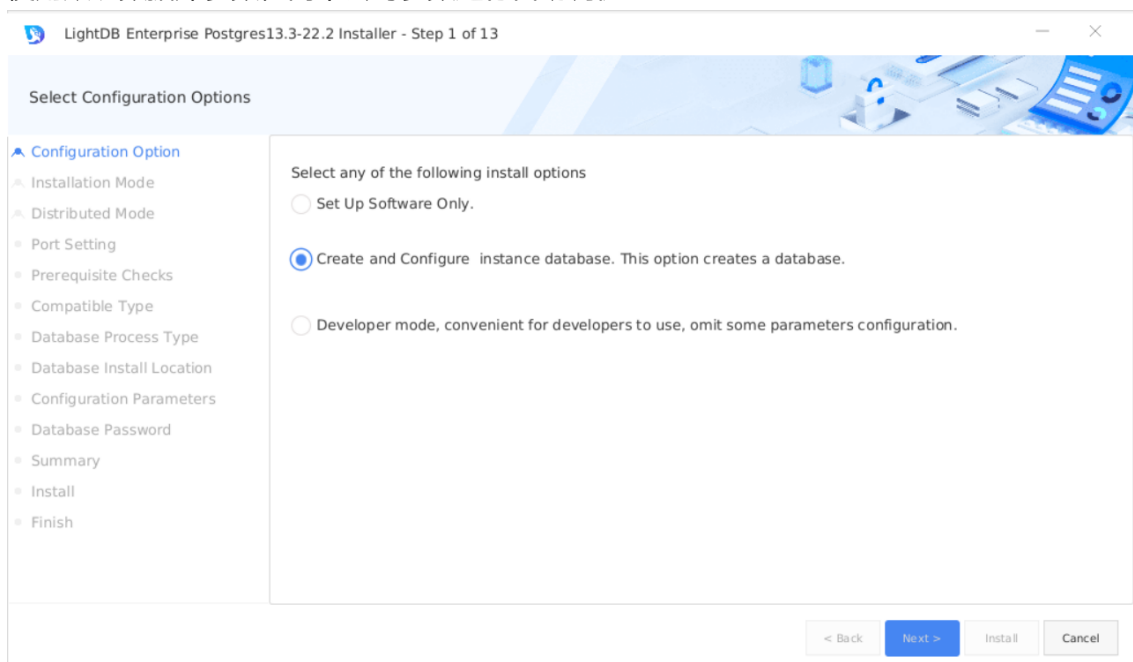
6.4 安装分布式单机多实例模式

6.4.1 GUI安装

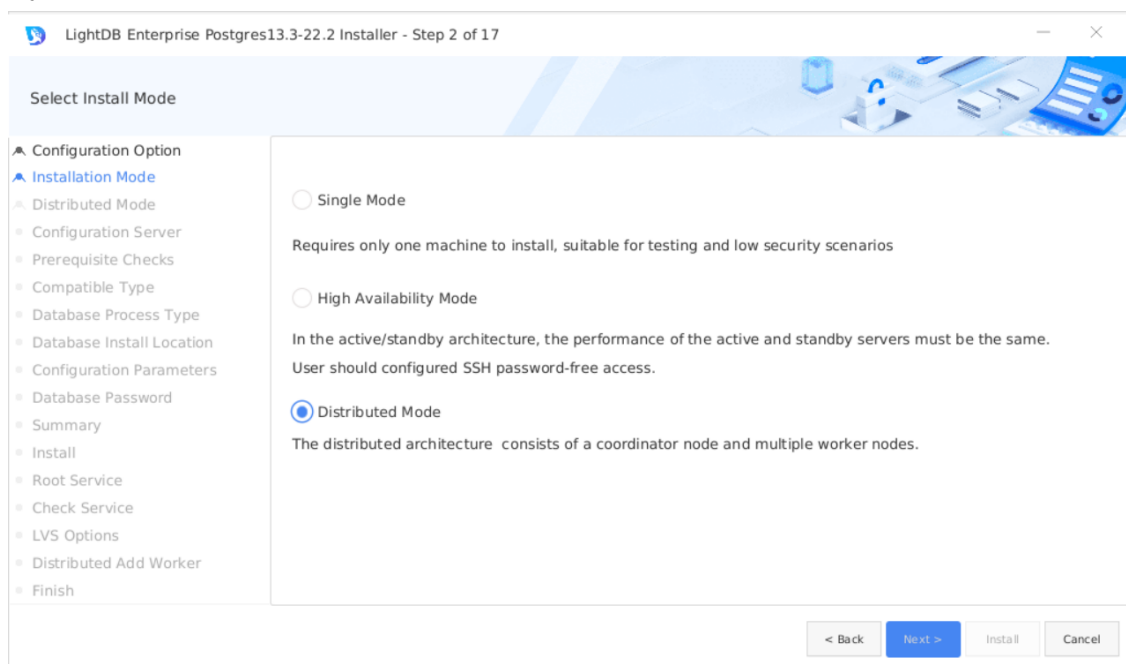
- 按前面所述要求，配置DISPLAY环境变量，在install.sh命令行提示信息中输入yes，按回车键确认，Windows中就会弹出GUI安装向导界面。

```
[lightdb@host102 lightdb-x-13.3-22.2-5668-el7.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

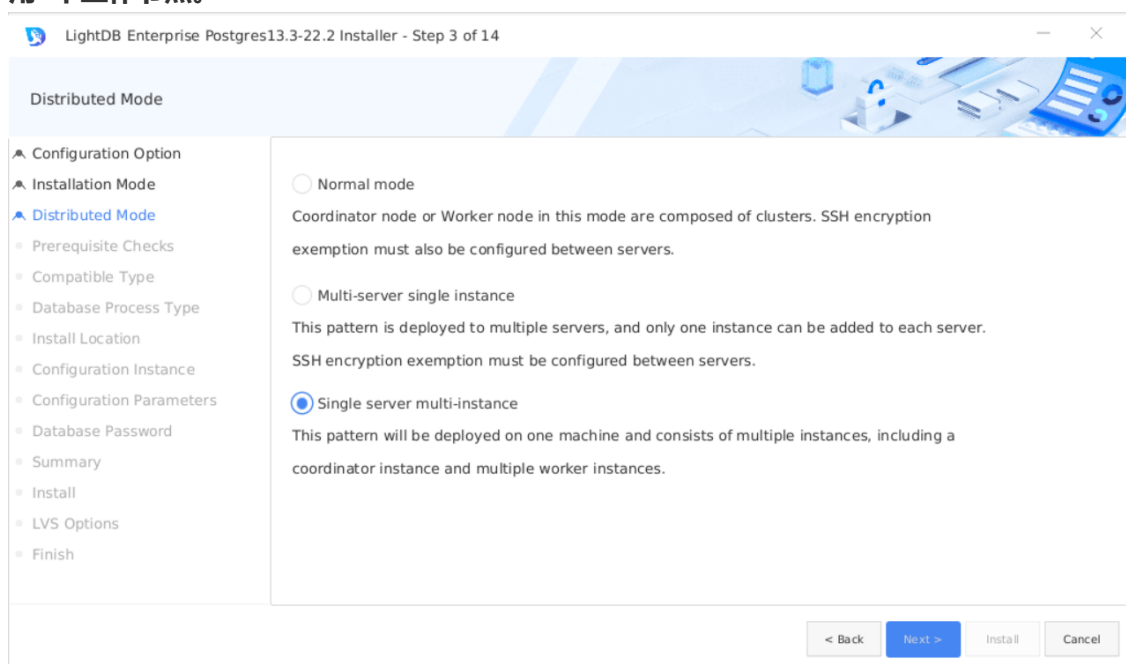
- 界面中包含三个选项，选项一（默认选项）仅安装数据库；选项二除了安装数据库外，还会生成一个默认的实例目录，并使用默认实例启动数据库；选项三为开发者模式，该模式下将使用默认数据库参数，而不会对参数进行自动调优。



- 选择安装模式，提供**单机版**、**高可用**、**分布式**三个选项，默认为单机版，此处我们选择分布式。



- 选择分布式部署方式，包括常规（Normal mode）、多机单实例（Multi-server single instance）和单机多实例（Single server multi-instance）三种，关于这三种部署方式的定义，已经在本文档6.1小节中介绍过，这里不再赘述。**本次我们选择单机多实例模式，并使用2个工作节点。**



- 检查依赖包和Linux内核参数。如有依赖缺失，则无法进入下一步，必须先安装依赖，再点击 **Check Again** 重新检查；如有内核参数与推荐配置不符的，则会给出WARNING，此时可以先按建议值重新配置，再点击 **Check Again**，也可以直接点击 **Ignore All** 忽略全部警告。

告，直接进入下一步。

LightDB Enterprise Postgres13.3-22.2 Installer - Step 4 of 14

Perform Prerequisite Checks

Configuration Option

Installation Mode

Distributed Mode

Prerequisite Checks

Compatible Type

Database Process Type

Install Location

Configuration Instance

Configuration Parameters

Database Password

Summary

Install

LVS Options

Finish

10.20.148.126

Check Again

Ignore All

Checks	Recommended value	Current Value	Status
▼ Checks			
▼ File Handler			
file_max	524288	524288	Ok
▼ Memory			
shmni	4096	4096	Ok
shmmax	8412581888	8412581888	Ok
shmall	2053853	2053853	Ok
swappiness	5	5	Ok
overcommit_memory	2	2	Ok
overcommit_ratio	75	50	Warning

Total: 31 Ok: 26 Error: 0 Warning: 5 Ignore: 0 Unknown: 0

< Back Next > Install Cancel

• 选择数据库兼容模式

LightDB Enterprise Postgres13.3-22.2 Installer - Step 5 of 14

Select Compatible Type

Configuration Option

Installation Mode

Distributed Mode

Prerequisite Checks

Compatible Type

Database Process Type

Install Location

Configuration Instance

Configuration Parameters

Database Password

Summary

Install

LVS Options

Finish

LightDB

Compatible with PostgreSQL

Oracle

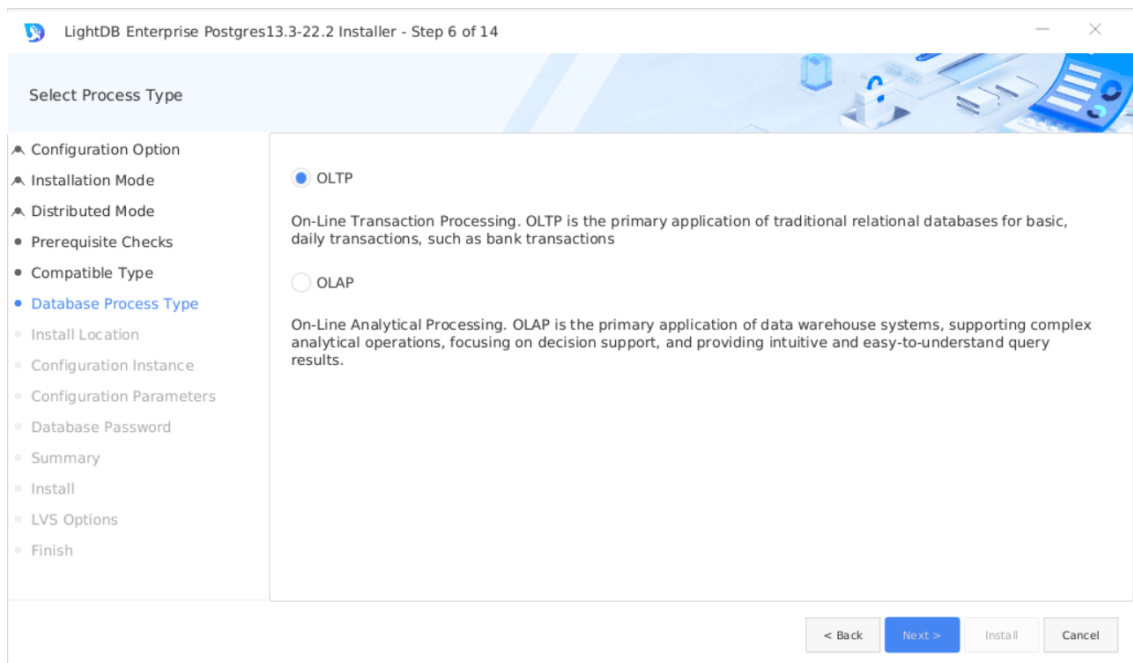
Compatible with Oracle

MySQL

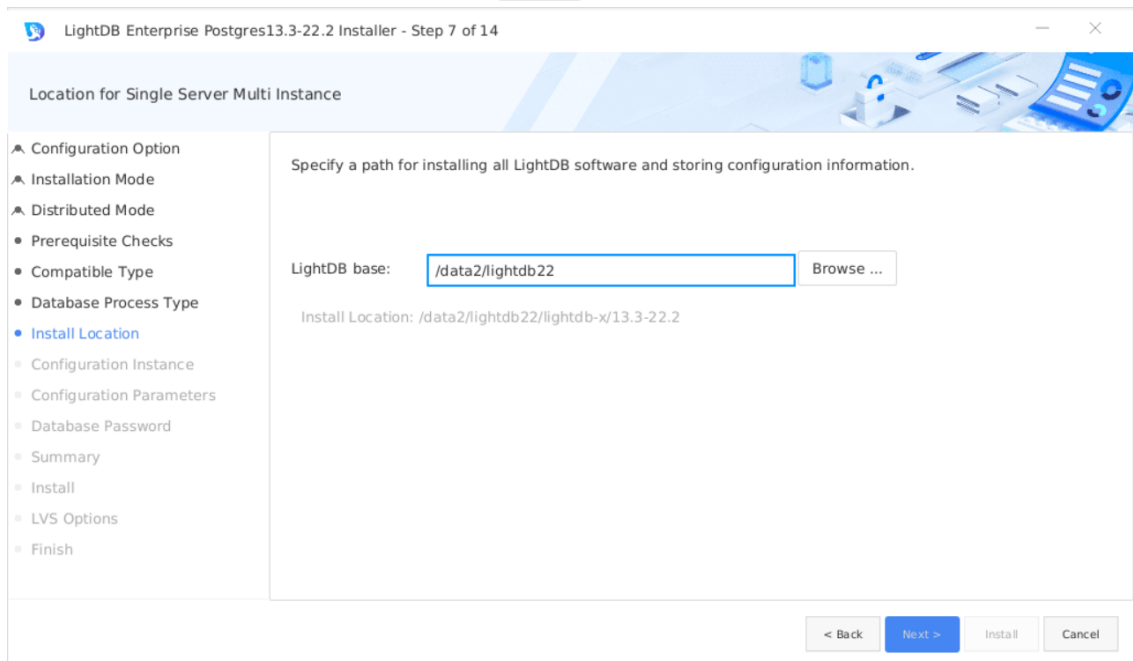
Compatible with MySQL

< Back Next > Install Cancel

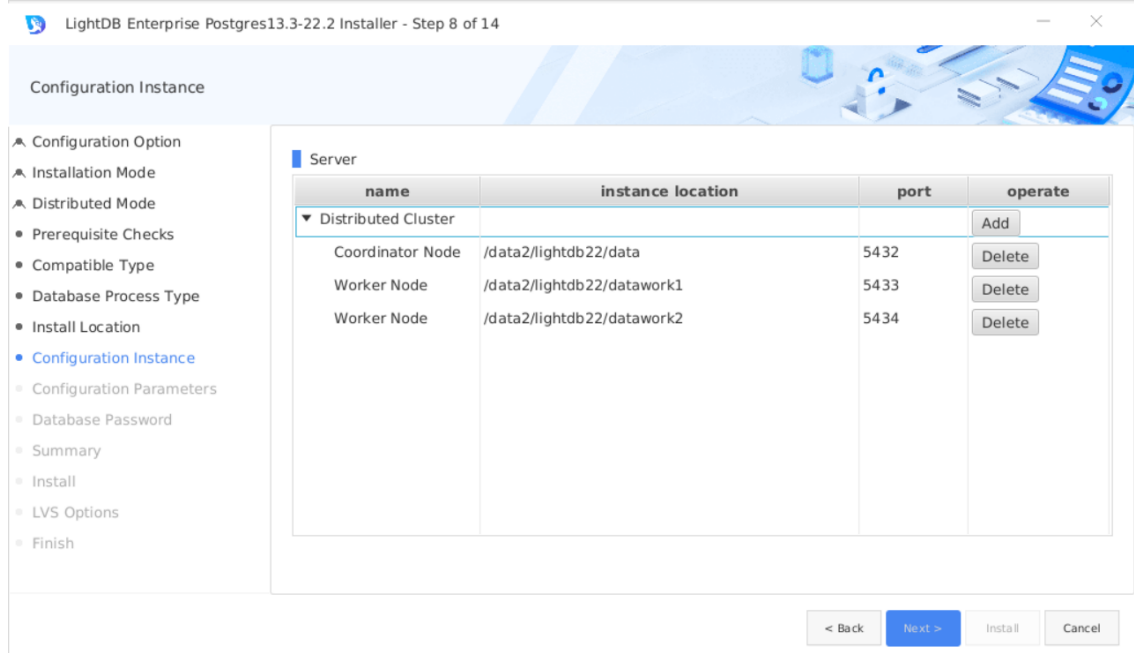
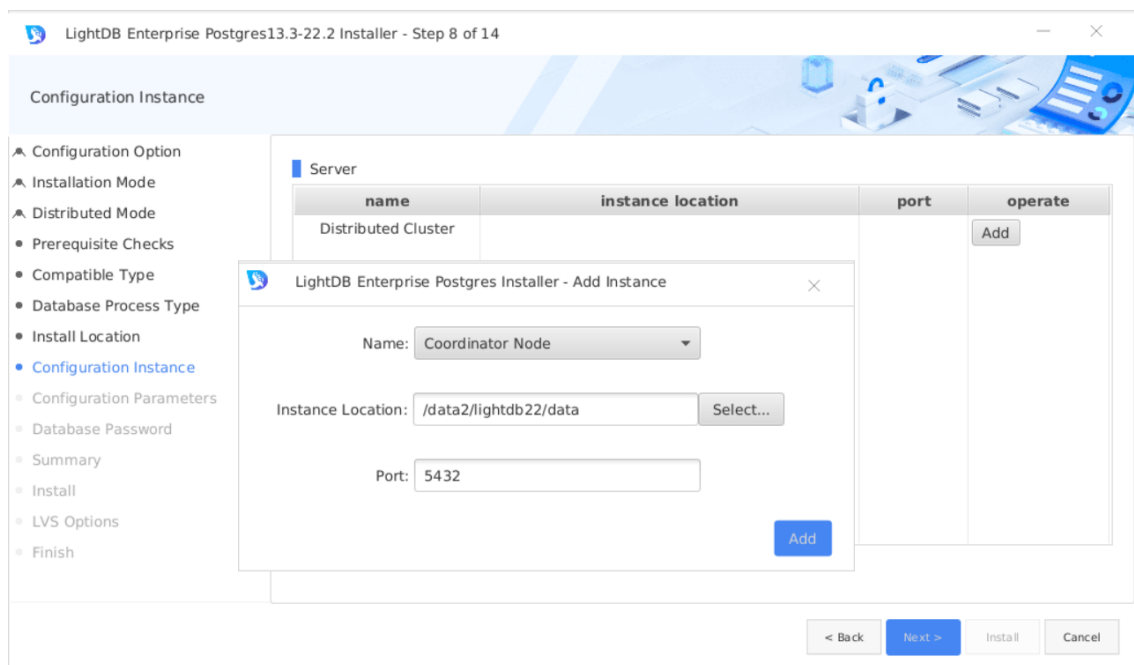
- OLTP/OLAP选择，该选项会影响部分GUC参数的默认值策略，默认为OLTP，此处使用默认值。



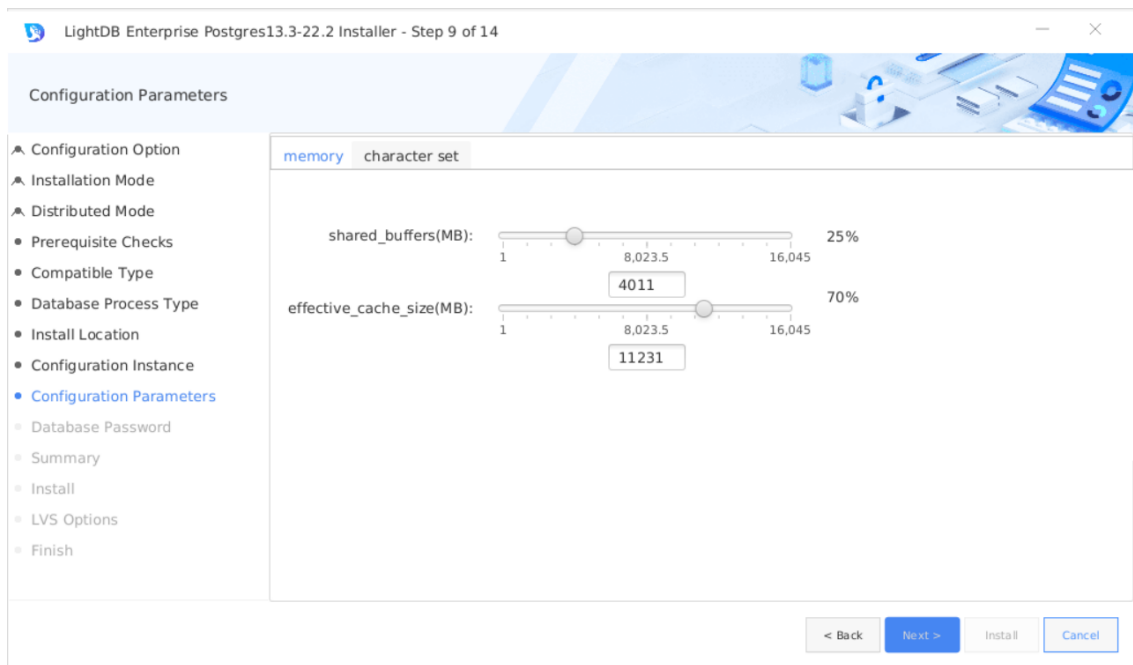
- 指定数据库安装目录和实例目录(要确保lightdb用户有写入权限)，（步骤详见本文档3.8），可以在文本框中直接修改或点击 **Brows** 调出路径选择对话框，来指定其他目录。



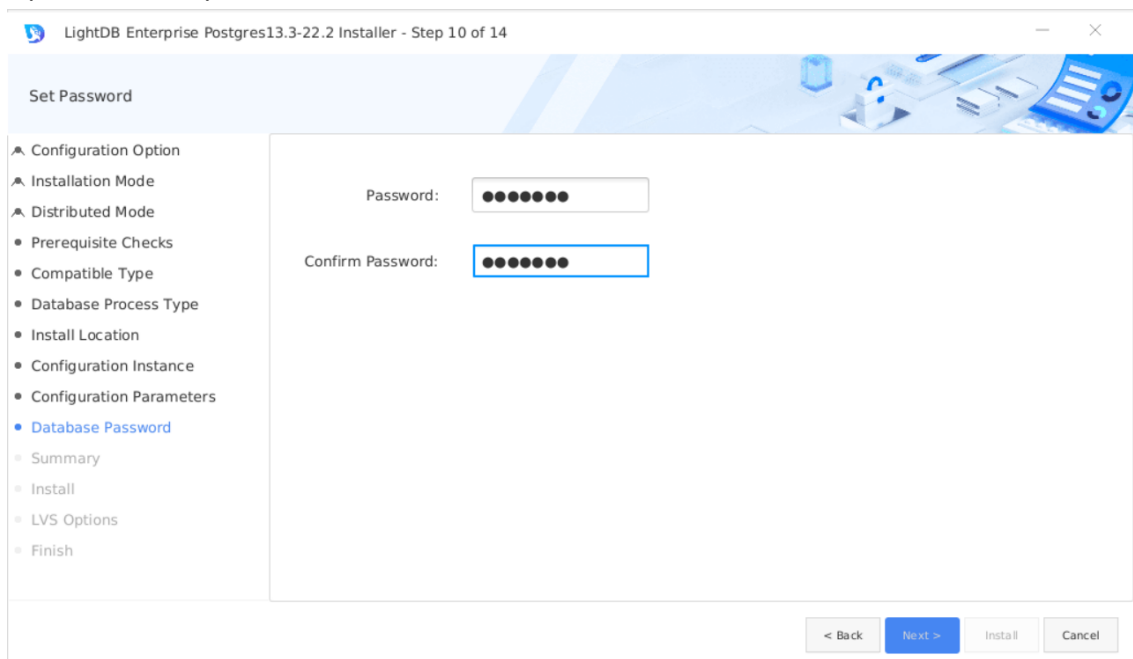
- 点击Add，依次添加协调者节点和工作节点的实例目录与端口号，各个节点的端口号不能相同。



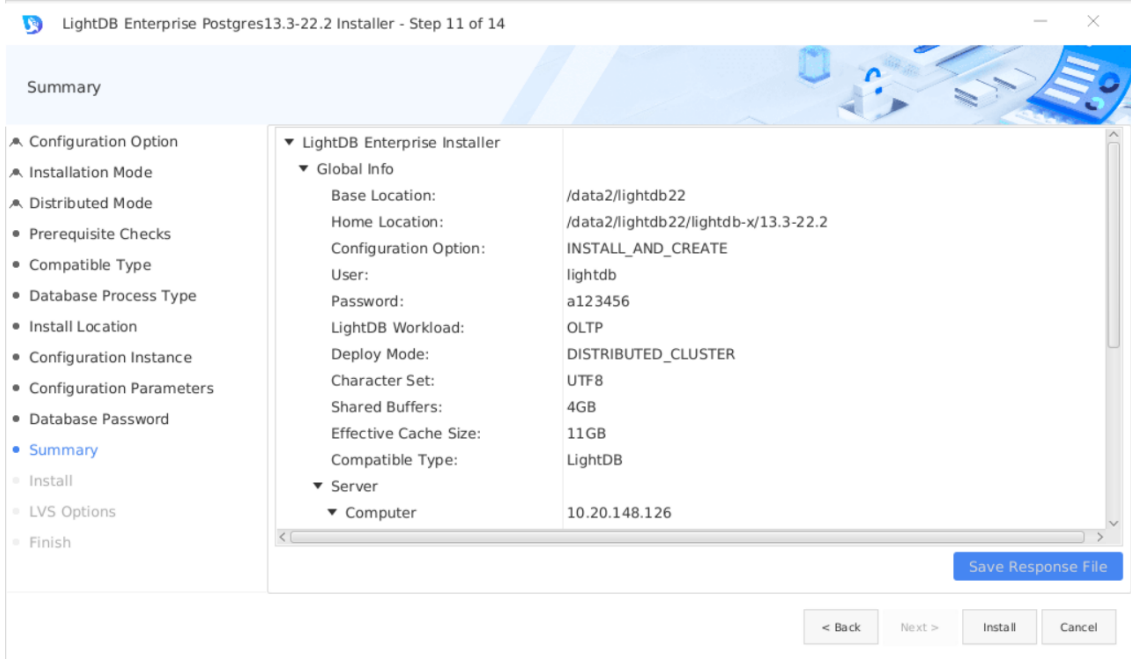
- 配置 `shared_buffers` 与 `effective_cache_size` 大小，以及设置字符集。默认 `shared_buffers` = 25% * 总物理内存，默认 `effective_cache_size` = 70% * 总物理内存，默认字符集为 UTF-8，并提供 GBK、SQL_ASCII、LATIN1 三个其他选项。



- 配置super用户（即lightdb）密码，密码长度为6-16个字符，且至少包含数字、英文字母（不限制大小写）。



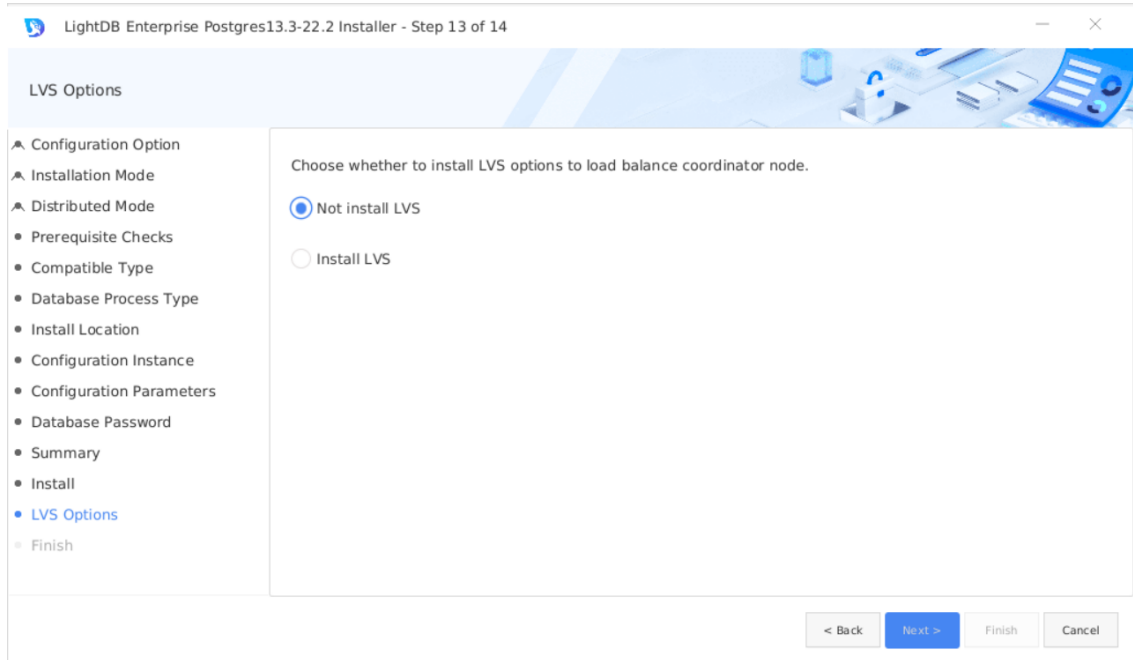
- LightDB安装信息总览，可以点击 **SAVE Response File** 保存为文件。



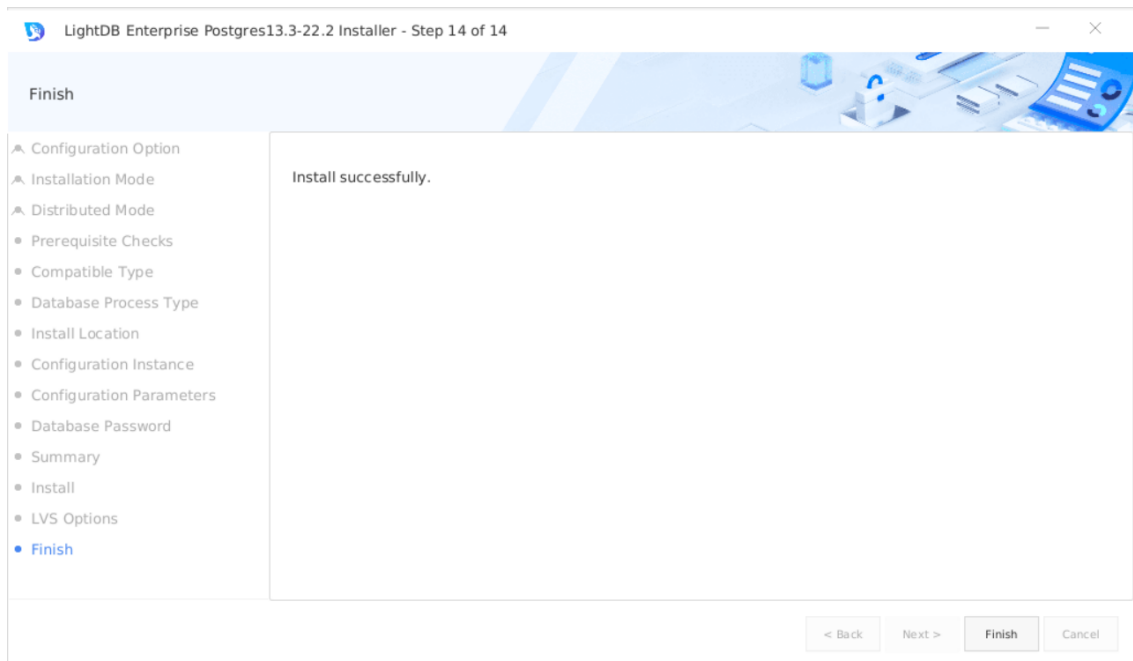
- 总览信息确认无误后，点击Install执行安装。



- 安装完成后，会提示安装LVS，我们这个安装形式不需要LVS，选择不安装。



- 安装成功



6.4.2 命令行安装

命令行安装步骤及选项与GUI安装完全相同，仅在向导信息提示上有所不同，因此本章节不再详细解释其中内容的含义与注意事项。

- 在install.sh命令行提示信息中输入No，按回车键确认，进入命令行安装交互界面。

```
[lightdb@hs-10-20-148-126 lightdb-x-13.3-22.2-5705-e17.x86_64]$ ./install.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```

- 选择配置模式，键入1仅安装数据库，键入2会额外创建一个实例，输入3为开发者选项，默认为1，此处选择2。

```
Choice a kind of configuration mode!
1: Only install.
2: Install database and Create instance.
3: Developer
Please enter 1 2 or 3(The default is 1):
2
```

- 选择安装单机版、高可用或分布式，键入1安装单机版，键入2选择高可用版，键入3安装分布式版，默认为1，此处选择3。


```
Choice a kind of install mode!
1: Single Mode.
2: High Availability Mode
3: Distributed Mode
Please enter 1, 2 or 3:(The default is 1)
3
```

- 选择分布式常规、多机单实例、单机多实例部署方式。这里选择单机多实例模式，并且使用与6.4.1小节相同的节点数量与部署方式。

```
Please select distributed mode!
Please enter distributed mode:
1 Normal mode;
2 Multi-server single instance;
3 Single server multi-instance.(Default 1)
3
```

- 依次添加协调者节点和工作节点的实例目录(要确保lightdb用户有写入权限)与端口号，各个节点的端口号不能相同。

```
Specify a path for installing all LightDB software and storing configuration information.
Please enter base location(The default is /usr/local/lightdb):
/data2/lightdb22
Base Location: /data2/lightdb22
Install Location: /data2/lightdb22/lightdb.x/13.3-22.2
Configure the directory and port for the single-node multi-instance.
Please enter the instance location of coordinator node. (Default location /data2/lightdb22/data) :

Please enter the port of coordinator node. (Default port 5432):

Please enter the instance location of worker node. (Default location /data2/lightdb22/data) :
/data2/lightdb22/datawork1
Please enter the port of worker node. (Default port 5432):
5433
Please enter the instance location of worker node. (Default location /data2/lightdb22/data) :
/data2/lightdb22/datawork2
Please enter the port of worker node. (Default port 5432):
5434
Continue to add worker node(1 yes,2 no)?
no
===== Instances =====
Coordinator Node /data2/lightdb22/data 5432
Worker Node /data2/lightdb22/datawork1 5433
Worker Node /data2/lightdb22/datawork2 5434
===== Instances =====
Please check the instances of Single server multi-instance. 1 continue; 2 clear server config (Default 1)
1
```

- 检查依赖包与Linux内核参数。

```
Check system parameters and dependency packages!
===== 10.20.148.126 =====
NETWORK
name: sem, recommend value: 500,2048000,200,4096, current value: 500,2048000,200,4096, status: OK
name: aio_max_nr, recommend value: 1048576, current value: 1048576, status: OK
name: somaxconn, recommend value: 2000, current value: 2000, status: OK
name: tcp_max_syn_backlog, recommend value: 2000, current value: 2000, status: OK
name: tcp_tw_reuse, recommend value: 1, current value: 0, status: WARNING
name: tcp_syn_retries, recommend value: 3, current value: 6, status: WARNING
name: tcp_retries2, recommend value: 5, current value: 15, status: WARNING
name: tcp_slow_start_after_idle, recommend value: 0, current value: 1, status: WARNING
PAGE CACHE
name: dirty_background_ratio, recommend value: 5, current value: 5, status: OK
name: dirty_ratio, recommend value: 40, current value: 40, status: OK
name: dirty_expire_centisecs, recommend value: 500, current value: 500, status: OK
name: dirty_writeback_centisecs, recommend value: 250, current value: 250, status: OK
MEMORY
name: shmmni, recommend value: 4096, current value: 4096, status: OK
name: shmall, recommend value: 8412581888, current value: 8412581888, status: OK
name: shmall, recommend value: 2053853, current value: 2053853, status: OK
name: swappiness, recommend value: 5, current value: 5, status: OK
name: overcommit_memory, recommend value: 2, current value: 2, status: OK
name: overcommit_ratio, recommend value: 75, current value: 50, status: WARNING
FILE HANDLER
name: file_max, recommend value: 524288, current value: 524288, status: OK
ULIMIT
name: ulimit_core, recommend value: unlimited, current value: unlimited, status: OK
name: ulimit_nofile, recommend value: 8192, current value: 524288, status: OK
Dependency Package
name: JSON-C-0.11 is existed: yes
name: C-ARES-1 is existed: yes
name: LIBNL3 is existed: yes
name: LIBPCAP-1 is existed: yes
name: LIBZSTD-1 is existed: yes
name: LZ4-1 is existed: yes
name: NCURSES-LIBS-5 is existed: yes
name: READLINE-6 is existed: yes
name: SNAPPY-1 is existed: yes
name: UUID-1.6 is existed: yes
```

- 选择OLTP/OLAP，键入1为OLTP，键入2为OLAP，默认为1。

```
Choice a kind of LightDB workload!
1: OLTP(On-line Transaction Processing).
2: OLAP(On-Line Analytical Processing).
Please enter 1 or 2:(The default is 1)
1
```

- 配置shared_buffers与effective_cache_size大小，以及设置字符集。

```
Please configure memory(MB) and character set!
Please enter shared_buffers, Default value is (4011):

Please enter effective_cache_size, Default value is (11231):

Please choice a Kind of Character Set.
1. UTF8
2. GBK
3. SQL_ASCII
4. LATIN1
The default choice 1(UTF8)
```

- 设置super用户密码，键入时密码不可见，密码长度为6-16个字符，且至少包含数字、英文字母。

```
Please enter LightDB password!
Please enter original password:

Please enter confirm password:
```

- ```
Do you want to deploy immediately?(Yes or No, The default is yes)
yes
[>=====]100%
```

- ```
Choose whether to install LVS to load balance coordinator node?(Yes or No,The default is no)
no
Install Finish
```

- ```
[lightdb@lightdb1 lightdb-x-13.3-21.3-2858-el7.x86_64]$ cd /usr/local/lightdb/uninstall/
[lightdb@lightdb1 uninstall]$ ls
lightdb-uninstaller-13.3-21.3.jar script uninstallFile.json uninstall.sh
[lightdb@lightdb1 uninstall]$
```

- ```
[lightdb@lightdb1 uninstall]$ export DISPLAY=192.168.95.89:0.0
[lightdb@lightdb1 uninstall]$ ./uninstall.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
yes
```

- LightDB Enterprise Postgres uninstaller - Step 1 of 5

LightDB Enterprise Postgres Uninstaller

LightDB Uninstall Option

☐ Uninstall Instance

Only delete instances.

☐ Uninstall Database `/home/lightdb/lightdb/lightdb-x/13.3-22.1`

Delete database, including nginx, redis and enterprise manager.

☒ Uninstall All

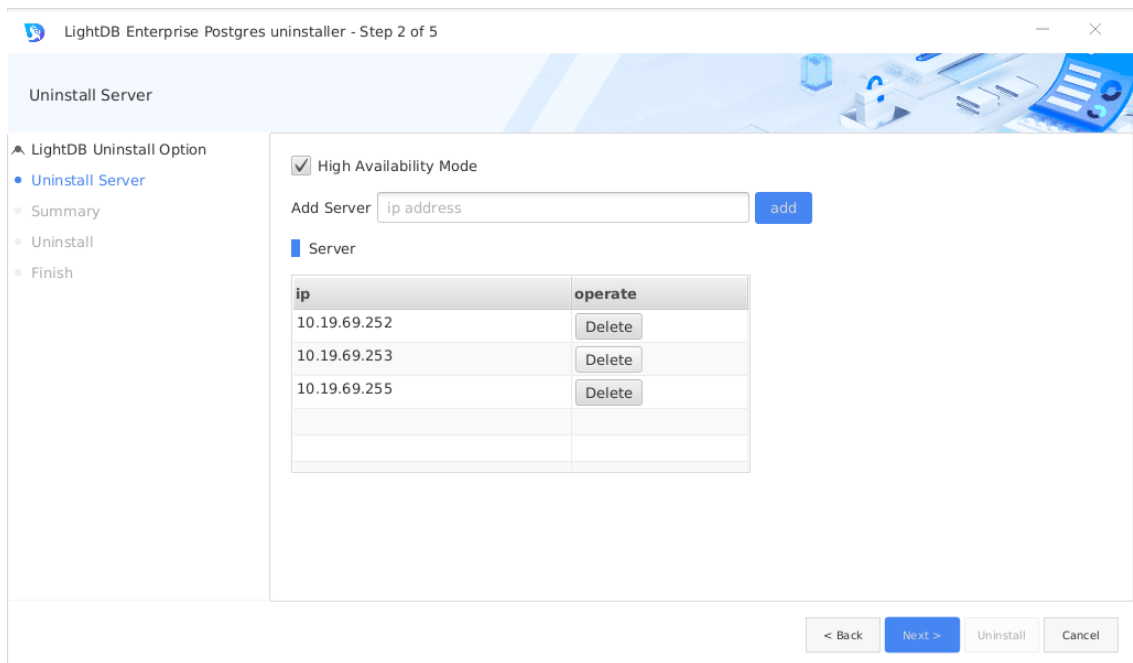
Delete instances and database, include nginx, redis and enterprise manager.

< Back

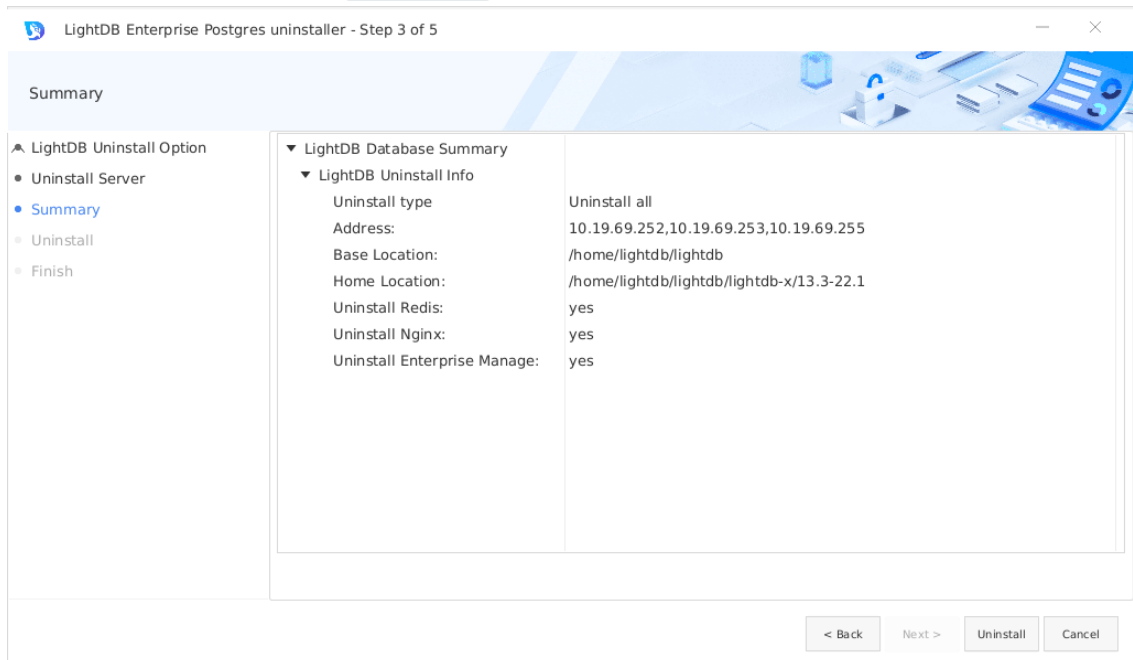
Next >

Uninstall

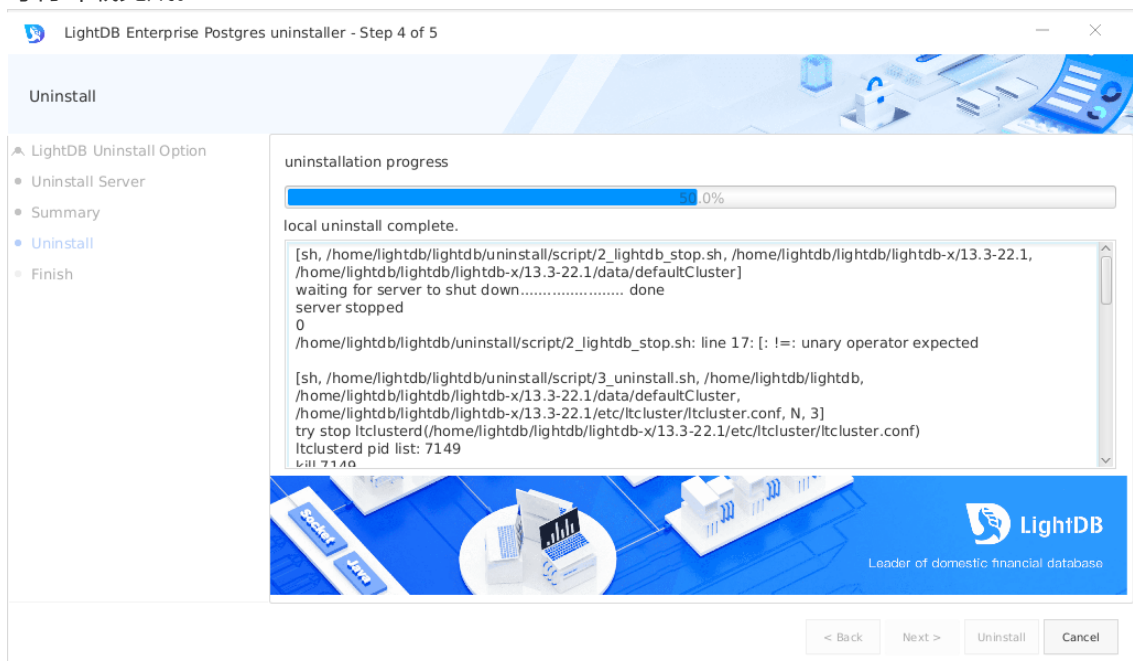
Cancel



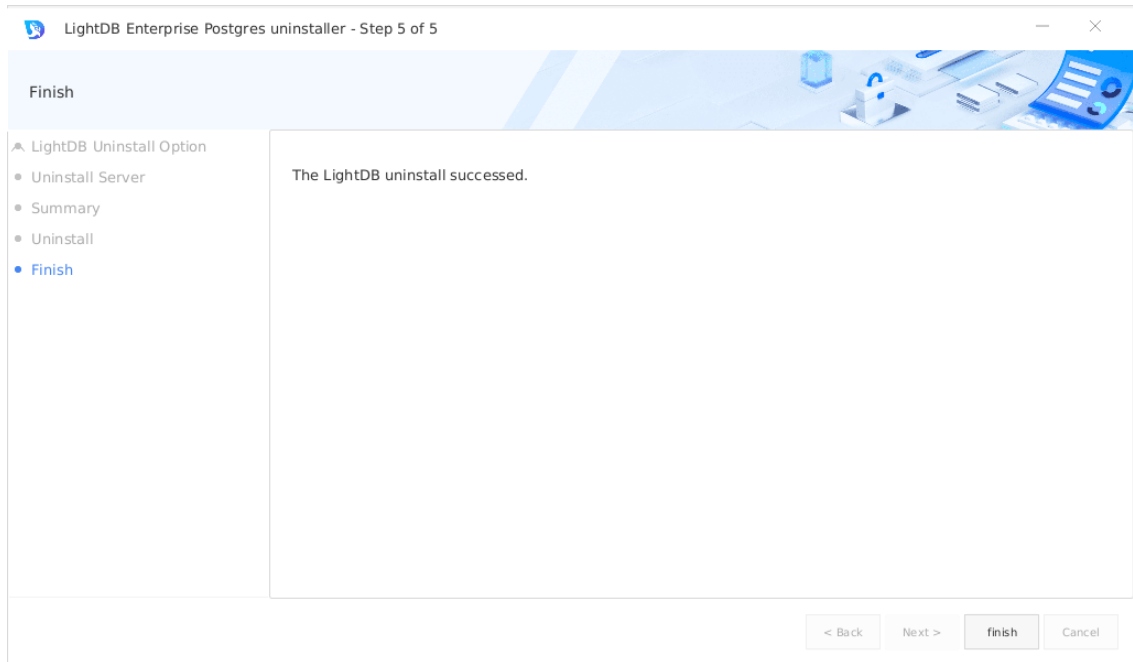
- 确认卸载信息，无误后点击 **Uninstall** 执行卸载。



- 等待卸载完成。



- 点击 `finish` 退出。



- 如果是高可用环境，则使用root账号登录主，备停止 `keepalived` 进程。
- 如果是通过LightDB安装的NTP服务，则使用root账号登录主，备，witness停止 `ntp` 进程。

8 命令行卸载LightDB

- 进入LightDB安装目录下的 `uninstall` 目录，对于本文档演示所用的范例来说就是 `/home/lightdb/lightdb/uninstall`。

```
[lightdb@lightdb1 lightdb-x-13.3-21.3-2858-e17.x86_64]$ cd /usr/local/lightdb/uninstall/
[lightdb@lightdb1 uninstall]$ ls
lightdb-uninstaller-13.3-21.3.jar  script  uninstallFile.json  uninstall.sh
[lightdb@lightdb1 uninstall]$
```

- 配置DISPLAY环境变量（配置方法参考3.14小节），运行uninstall.sh卸载脚本，输入yes选择GUI卸载。

```
[lightdb@hs-10-20-148-126 uninstall]$ ./uninstall.sh
Whether to use the graphical user interface (GUI, Make sure DISPLAY is configured, Such as [export DISPLAY=127.0.0.1:0.0])?(Yes or No)
no
```

- 有三个卸载选项，仅卸载数据库实例、仅卸载数据库、全部卸载(数据库和实例)，默认为仅卸载数据库实例

```
Please select uninstall options(The default is 1).
1. Uninstall instance(Only delete instances);
2. Uninstall database(Delete database);
3. Uninstall all(Delete instances and database).
3
```

- 以LightDB高可用卸载，选择3继续(可以使用Delete移除某些不想卸载的主机)

```
Server operations.
The current servers which will be uninstalled:
10.20.148.126
10.20.148.127
10.20.148.128
Select the server operation(The default is 1):
1: Add server;
2: Delete server;
3: Exit actions.
3
```

- 检测到有LightDB实例，二次提示是否确定卸载(请注意核查，避免数据被误删除)。

```
Check LightDb:
The lightDB process exists. Are you sure to uninstall it? (yes or no, default no)
yes
```

- 等待卸载完成。

```
Uninstall now!(Yes or No, The default is yes):
yes
[>=====]100%[lightdb@hs-10-20-148-126 uninstall]$
```

- 如果是高可用环境，则使用root账号登录主，备停止 `keepalived` 进程。
- 如果是通过LightDB安装的NTP服务，则使用root账号登录主，备，witness停止 `ntp` 进程。