SUSE

SUSE Linux Enterprise High Availability Extension 15 SP5

Geo 群集快速入门

Geo 群集可保护全局分布式数据中心范围的工作负载。本文档会指导您使用 crm 外壳提供的 Geo 引导脚本完成 Geo 群集的基本设置。

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1 概念概述

基于 SUSE® Linux Enterprise High Availability Extension 的 Geo 群集可视为"覆盖"群集，其中每个群集站点对应传统群集中的一个群集节点。覆盖群集由投票间群集票据管理器（以下简称"投票间"）管理。Geo 群集中的各方都会运行一个服务，即 boothd。它连接到其余站点上运行的投票间守护程序，并交换连接性细节。投票间依靠称为"票据"的群集对象来确保群集资源在各站点之间的高度可用性。票据授予在特定群集站点上运行某些资源的权限。投票间可保证每个票据一次只会授予给一个站点。

如果两个投票间实例之间的通讯断开，则可能是因为群集站点之间的网络发生故障**或**其中一个群集站点中断。在此情况下，您需要使用一个额外的实例（第三个群集站点或 arbitrator）来就各决策（例如在站点间进行资源的故障转移）达成一致意见。仲裁方是一台以特殊模式运行投票间实例的计算机（不属于群集）。每个 Geo 群集都可以有一个或多个仲裁方。
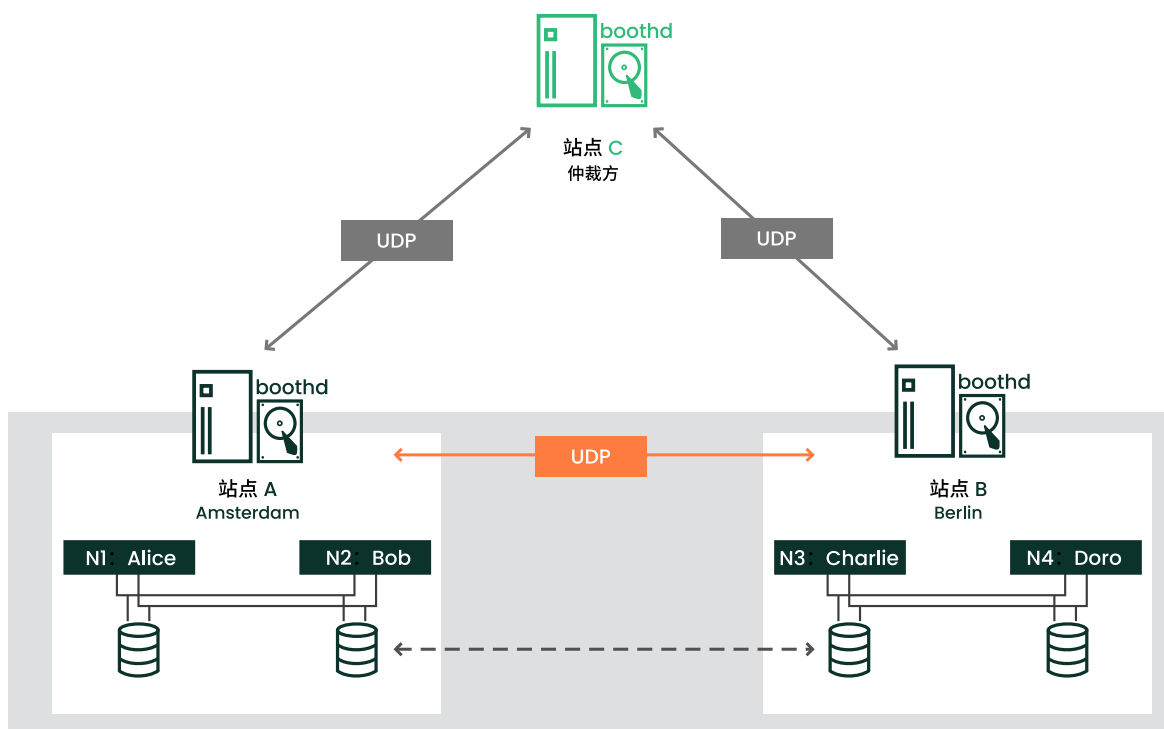

图 1：双站点群集 - 2X2 个节点 + 仲裁方（可选）

也可以运行**无**仲裁方的双站点 Geo 群集。在此情况下，Geo 群集管理员需要手动管理票据。如果同时将一个票据授予多个站点，投票间会显示一条警告。

有关用于 Geo 群集的概念、组件和票据管理的更多细节，请参见《管理指南》。

2　使用情形

下面，我们将会设置一个包含两个群集站点和一个仲裁方的基本 Geo 群集：

- 假设群集站点名为 `amsterdam` 和 `berlin`。

- 我们假设每个站点分别包含两个节点。节点 `alice` 和 `bob` 属于群集 `amsterdam`。节点 `charlie` 和 `doro` 属于群集 `berlin`。

- 站点 `amsterdam` 将分配到以下虚拟 IP 地址：192.168.201.100。

- 站点 `berlin` 将分配到以下虚拟 IP 地址：192.168.202.100。

- 我们假设仲裁方的 IP 地址为 192.168.203.100。

继续操作前，请确保已满足以下要求：

要求

两个现有的群集

您至少拥有两个要合并到 Geo 群集中的现有群集（如果需要先设置两个群集，请按照《安装和设置快速入门》文章中的指导操作。）

有意义的群集名称

每个群集都有一个有意义的名称，该名称可反映其位置，定义于 `/etc/corosync/corosync.conf` 中。

仲裁方

您已安装不属于任何现有群集且将用作仲裁方的第三台计算机。

有关各项的详细要求，另请参见。

3　要求

将加入群集的所有计算机（群集节点和仲裁方）上都至少需安装以下模块和扩展：

- Basesystem Module 15 SP5

- Server Applications Module 15 SP5

- SUSE Linux Enterprise High Availability Extension15 SP5

安装计算机时，请选择 `HA GEO Node` 作为 `system role`。如此将安装最小系统，这种情况下，默认会安装软件集 `Geo Clustering for High Availability (ha_geo)` 中的软件包。

网络需求

- 要用于每个群集站点的虚拟 IP 在 Geo 群集中必须可访问。

- 必须可以通过每个投票间实例上的一个 UDP 和 TCP 端口访问站点。这意味着，必须相应地配置通讯双方之间的所有防火墙和 IPsec 隧道。

- 其他设置决定可能需要打开更多端口（例如，为 DRBD 或进行数据库复制）。

其他要求和建议

- 所有站点上的所有群集节点应同步到群集外部的 NTP 服务器。有关详细信息，请参见 Administration Guide for SUSE Linux Enterprise Server 15 SP5 (https://documentation.suse.com/sles-15/html/SLES-all/cha-ntp.html) ↗。如果节点未同步，将难以分析日志文件和群集报告。

- 在 Geo 群集中使用**奇数**数量的站点。这样可确保在网络连接断开时仍存有大部分站点（从而避免出现节点分裂情况）。如果群集站点的数量为偶数，请使用一个仲裁方来处理票据的自动故障转移。如果您不使用仲裁方，则需要手动处理票据故障转移。

- 每个站点上的群集都有一个有意义的名称，例如 `amsterdam` 和 `berlin`。每个站点的群集名称在相应的 `/etc/corosync/corosync.conf` 文件中定义：

```
totem {
    [...]
    cluster_name: amsterdam
    }
```

使用下面的 crmsh 命令来更改名称：

```
# crm cluster rename NEW_NAME
```

停止群集服务然后再将其启动，以使更改生效：

```
# crm cluster restart
```

- 不支持在一个群集中采用混合体系结构。但是，对于 Geo 群集而言，Geo 群集的每个成员（群集站点或仲裁方）可以采用不同的体系结构。例如，您可以运行一个包含三个成员（两个群集站点和一个仲裁方）的 Geo 群集，其中的一个群集站点在 IBM Z 上运行，另一个群集站点在 x86 上运行，仲裁方在 POWER 上运行。

4 Geo 引导脚本概述

- 使用 `crm cluster geo_init` 可将一个群集变为 Geo 群集的第一个站点。该脚本会接受参数（例如群集的名称、仲裁方，以及一个或多个票据）并基于它们创建 `/etc/booth/booth.conf`。它会将投票间配置复制到当前群集站点上的所有节点。它还会为当前群集站点上的投票间配置所需的群集资源。
  有关详细信息，请参见第 6 节 "设置 Geo 群集的第一个站点"。

- 使用 `crm cluster geo_join` 可将当前群集添加到现有的 Geo 群集中。该脚本会从现有群集站点复制投票间配置，并将其写入到当前群集站点上所有节点的 `/etc/booth/booth.conf` 中。它还会为当前群集站点上的投票间配置所需的群集资源。
  有关详细信息，请参见第 7 节 "向 Geo 群集添加另一个站点"。

- 使用 `crm cluster geo_init_arbitrator` 可将当前计算机变为 Geo 群集的仲裁方。该脚本会从现有群集站点复制投票间配置，并将其写入 `/etc/booth/booth.conf`。
  有关详细信息，请参见第 8 节 "添加仲裁方"。

所有引导脚本都会记录到 `/var/log/crmsh/crmsh.log` 中。如需引导过程的任何细节，请查看日志文件。在引导过程中设置的任何选项都可在稍后加以修改（通过修改投票间设置、修改资源等）。有关详细信息，请参见《管理指南》。

5 安装高可用性和 Geo 群集软件包

`High Availability` 和 `Geo Clustering for High Availability` 安装软件集中包含用于配置和管理 Geo 群集的软件包。只有在安装 SUSE Linux Enterprise High Availability Extension 后，才能使用这些软件集。

在安装 SUSE Linux Enterprise Server 期间或之后，您可以注册到 SUSE Customer Center 并安装 High Availability Extension。有关详细信息，请参见 SUSE Linux Enterprise Server 的 Deployment Guide (https://documentation.suse.com/sles/html/SLES-all/cha-register-sle.html) ↗。

过程 1：安装高可用性和 GEO 群集软件集

1. 从命令行安装高可用性和 Geo 群集软件集：

   ```
   # zypper install -t pattern ha_sles ha_geo
   ```

2. 请在要加入群集的**所有**计算机上安装高可用性和 Geo 群集软件集。

   > 🔹 **注意：在所有节点上安装软件包**
   >
   > 如果要自动安装 SUSE Linux Enterprise Server 15 SP5 和 High Availability Extension，请使用 AutoYaST 克隆现有节点。有关详细信息，请参见《管理指南》，第 3 章 "安装 High Availability Extension"，第 3.2 节 "使用 AutoYaST 进行批量安装和部署"。

6 设置 Geo 群集的第一个站点

使用 `crm cluster geo_init` 命令可将一个现有群集变为 Geo 群集的第一个站点。

过程 2：使用 `crm cluster geo_init` 设置第一个站点 (amsterdam)

1. 为每个群集站点定义一个虚拟 IP，以便访问该站点。在此，我们假设使用 `192.168.201.100` 和 `192.168.202.100`。您并不需要将虚拟 IP 配置为群集资源。此工作将由引导脚本完成。

2. 至少定义一个票据的名称，该票据用于授予在群集站点上运行特定资源的权限。使用一个有意义的名称来反映将依赖于该票据的资源，例如 `ticket-nfs`。引导脚本只需要票据名称，您可以稍后再按第 10 节 "后续步骤" 中所述定义其余的细节（资源的票据依赖项）。

3. 登录现有群集的节点（例如，群集 `alice` 的节点 `amsterdam`）。

4. 运行 **crm cluster geo_init**.例如，使用以下选项：

```
# crm cluster geo_init \
  --clusters "amsterdam=192.168.201.100 berlin=192.168.202.100" \ ❶
  --tickets ticket-nfs \ ❷
  --arbitrator 192.168.203.100 ❸
```

❶ 群集站点的名称（定义于 /etc/corosync/corosync.conf 中）和您想要为每个群集站点使用的虚拟 IP 地址。在本例中，我们有两个群集站点（amsterdam 和 berlin），每个站点各有一个虚拟 IP 地址。

❷ 一个或多个票据的名称。

❸ 不属于群集的计算机的主机名或 IP 地址。

该引导脚本会创建投票间配置文件，并在群集站点间同步该文件。它还会创建投票间所需的的基本群集资源。执行过程 2 的步骤 4 将创建以下投票间配置和群集资源：

例 1：crm cluster geo_init 创建的投票间配置

```
# The booth configuration file is "/etc/booth/booth.conf". You need to
# prepare the same booth configuration file on each arbitrator and
# each node in the cluster sites where the booth daemon can be launched.

# "transport" means which transport layer booth daemon will use.
# Currently only "UDP" is supported.
transport="UDP"
port="9929"

arbitrator="192.168.203.100"
site="192.168.201.100"
site="192.168.202.100"
authfile="/etc/booth/authkey"
ticket="ticket-nfs"
expire="600"
```

例 2：crm cluster geo_init 创建的群集资源

```
primitive ❶ booth-ip IPaddr2 \
  params rule #cluster-name eq amsterdam ip=192.168.201.100 \
  params rule #cluster-name eq berlin ip=192.168.202.100 \
```

```
primitive❷ booth-site ocf:pacemaker:booth-site \
  meta resource-stickiness=INFINITY \
  params config=booth \
  op monitor interval=10s
group❸ g-booth booth-ip booth-site \
meta target-role=Stopped❹
```

❶ 每个群集站点的虚拟 IP 地址。必须为投票间守护程序提供该虚拟 IP 地址，因为其需要每个群集站点上都有永久的 IP 地址。

❷ 投票间守护程序的原始资源。它会与其余群集站点上的投票间守护程序通讯。该守护程序可以在站点的任何节点上启动。为了使资源分布在同一节点上（如果可能），resource-stickiness 设置为 INFINITY。

❸ 两个原始资源的群集资源组。通过这种配置，每个投票间守护程序都将在各自的 IP 地址处可用，独立于运行守护程序的节点。

❹ 该群集资源组默认不会启动。校验群集资源的配置（并添加完成设置所需的资源）后，您需要启动该资源组。有关详细信息，请参见 完成 Geo 群集设置所需的步骤。

7 向 Geo 群集添加另一个站点

初始化 Geo 群集的第一个站点后，请按 crm cluster geo_join 中所述使用 过程 3 添加第二个群集。该脚本需要通过 SSH 访问已配置的群集站点，并且会将当前的群集添加到 Geo 群集。

过程 3：**使用 crm cluster geo_join 添加第二个站点** (berlin)

1. 登录要添加的群集站点的某个节点（例如，群集 charlie 的节点 berlin）。

2. 运行 **crm cluster geo_join** 命令。例如：

```
# crm cluster geo_join \
  --cluster-node 192.168.201.100\❶
  --clusters "amsterdam=192.168.201.100 berlin=192.168.202.100"❷
```

❶ 指定要从何处复制投票间配置。请使用已配置的 Geo 群集站点中某节点的 IP 地址或主机名。也可以使用现有群集站点的虚拟 IP 地址（如本示例中所示）。或者，使用已为 Geo 群集配置的仲裁方的 IP 地址或主机名。

❷ 群集站点的名称（定义于 `/etc/corosync/corosync.conf` 中）和您想要为每个群集站点使用的虚拟 IP 地址。在本例中，我们有两个群集站点（`amsterdam` 和 `berlin`），每个站点各有一个虚拟 IP 地址。

`crm cluster geo_join` 命令会从 **❶** 复制投票间配置，请参见例 1。此外，它还会创建投票间所需的群集资源（请参见例 2）。

8 添加仲裁方

使用 **`crm cluster geo_init`** 和 **`crm cluster geo_join`** 设置 Geo 群集的所有站点后，请使用 **`crm cluster geo_init_arbitrator`** 设置仲裁方。

过程 4：**使用 `crm cluster geo_init_arbitrator` 设置仲裁方**

1. 登录要用作仲裁方的计算机。

2. 运行以下命令。例如：

```
# crm cluster geo_init_arbitrator --cluster-node 192.168.201.100 ❶
```

❶ 指定要从何处复制投票间配置。请使用已配置的 Geo 群集站点中某节点的 IP 地址或主机名。或者，使用现有群集站点的虚拟 IP 地址（如本示例中所示）。

`crm cluster geo_init_arbitrator` 脚本会从 **❶** 复制投票间配置，如例 1 所示。它还会在仲裁方上启用并启动投票间服务。因此，当群集站点上也在运行投票间服务时，仲裁方便可以与这些群集站点上的投票间实例通讯。

9 监视群集站点

要查看您已在引导过程中创建的群集站点及资源与票据，请使用 Hawk2。通过 Hawk2 Web 界面，您可以监视和管理多个（不相关的）群集和 Geo 群集。

- 要通过 Hawk5 的仪表板监视的所有群集必须运行 SUSE Linux Enterprise High Availability Extension 15 SP5。

- 如果您之前未在每个群集节点上用自己的证书（或官方证书颁发机构签名的证书）替换 Hawk2 的自我签名证书，请执行以下操作：在**每个**群集的**每个**节点上至少登录 Hawk2 一次。验证证书（或在浏览器中添加例外以绕过警告）。否则，Hawk2 将无法连接到群集。

过程 5：**使用 HAWK2 仪表板**

1. 启动 Web 浏览器并输入第一个群集站点 `amsterdam` 的虚拟 IP。

   ```
   https://192.168.201.100:7630/
   ```

   或者，使用 `alice` 或 `bob` 的 IP 地址或主机名。如果您已使用引导脚本设置两个节点，则 `hawk` 服务在这两个节点上应当都会运行。

2. 登录到 Hawk2 Web 界面。

3. 在左侧导航栏中，选择仪表板。

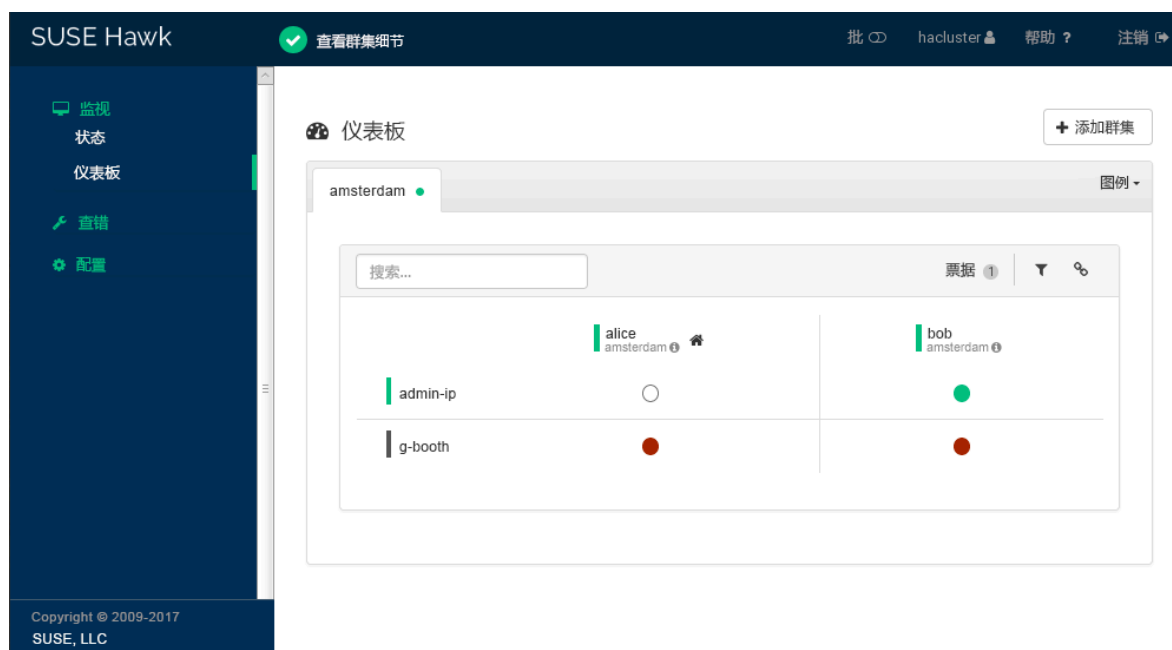   Hawk2 会显示当前群集站点的资源和节点的概述。此外，它还会显示已为 Geo 群集配置的所有票据。如需有关此视图中所用图标的信息，请单击图例。

   图 2：**包含一个群集站点 (`amsterdam`) 的 HAWK2 仪表板**

4. 要添加第二个群集站点的仪表板，请单击添加群集。

    a. 输入用于在仪表板中标识该群集的群集名称。在本例中为 `berlin`。

    b. 输入其中一个群集节点（在本例中为 `charlie` 或 `doro`）的完全限定的主机名。

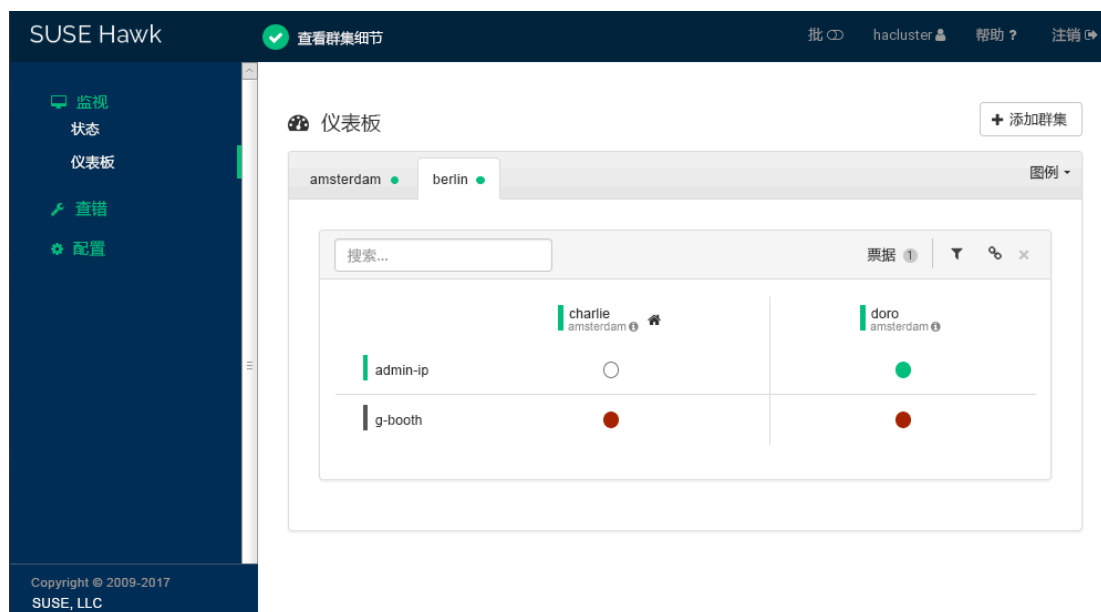   c. 单击添加。Hawk2 会为新添加的群集站点显示另一个选项卡，提供该群集站点的节点和资源概览。

图 3： 包含两个群集站点的 HAWK2 仪表板

5. 要查看群集站点的更多细节或管理群集站点，请切换到站点的选项卡并单击锁链图标。Hawk2 会在新的浏览器窗口或选项卡中打开此站点的状态视图。在此视图中，您可以管理 Geo 群集的这部分内容。

10 后续步骤

使用 Geo 群集引导脚本，您可以快速地设置可用于测试用途的基本 Geo 群集。不过，要将创建的 Geo 群集迁移到正常运行且可用于生产环境的 Geo 群集，则需执行更多步骤。

在群集站点上启动投票间服务

引导过程完成后，仲裁方投票间服务还不能与群集站点上的投票间服务通讯，因为这些服务默认不会启动。

每个群集站点的投票间服务都由投票间资源组 `g-booth` 管理（请参见例 2 "**crm cluster geo_init** 创建的群集资源"）。要为每个站点启动一个投票间服务实例，请在每个群集站点上启动相应的投票间资源组。这样可让所有投票间实例互相通讯。

配置票据依赖项和顺序约束

要使资源依赖您已在 Geo 群集引导过程中创建的票据，请配置约束。请为每个约束设置 `loss-policy`，它用于定义当从群集站点撤消票据时相应资源应发生的情况。

有关详细信息，请参见《Geo 群集指南》, 第 6 章 "配置群集资源和约束"。

在开始时向站点授予票据

在投票间可以管理 Geo 群集中的特定票据前，您首先需要手动将该票据**授予**给站点。您可以使用投票间客户端命令行工具或 Hawk2 授予票据。

有关细节，请参见《Geo 群集指南》, 第 8 章 "管理 Geo 群集"。

引导脚本会在两个群集站点上创建相同的投票间资源，并在所有站点（包括仲裁方）上创建相同的投票间配置文件。如果您扩展 Geo 群集设置（以便迁移到生产环境），可能需要调整投票间配置，并更改与投票间有关的群集资源的配置。之后，您需要将更改同步到 Geo 群集的其余站点才能使其生效。

✎ 注意：跨群集站点同步更改

- 要将投票间配置中的更改同步到所有群集站点（包括仲裁方），请使用 Csync2。有关详细信息，请参见《Geo 群集指南》, 第 5 章 "跨所有站点和仲裁方同步配置文件"。

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11 更多信息

- https://documentation.suse.com/sle-ha/ ↗ 上提供了更多有关此产品的文档。有关其他配置和管理任务，请参见详尽的 Geo Clustering Guide (https://documentation.suse.com/sle-ha/html/SLE-HA-all/book-administration.html) ↗。

- 有关通过 DRBD 在 Geo 群集中复制数据的信息，请参见以下 SUSE Best Practices document (https://documentation.suse.com/sbp/all/html/SBP-DRBD/index.html) ↗。

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