问题根因分析：

从环境上的日志来分析，Cinder侧没有异常。卷的状态变化为in-use --> dettaching --> in-use。

Nova_Compute有如下日志：

```
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [req-812a98ce-d0ff-469d-aa28-bcc37c1ca94e 1a236a63e6864cf5a5b26d4b816f719b 406cd353135e44f0ade98f53d92d5d8b - - -] [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271
] Failed to detach volume e0bd76b1-5bb8-45dc-9691-39933b122db7 from /dev/vdb
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271] Traceback (most recent call last):
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/nova/compute/manager.py", line 4822, in _driver_detach_vo
lume
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     encryption=encryption)
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/nova/virt/libvirt/driver.py", line 1348, in detach_volume
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     wait_for_detach()
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_service/loopingcall.py", line 417, in func
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     return evt.wait()
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/eventlet/event.py", line 121, in wait
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     return hubs.get_hub().switch()
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/eventlet/hubs/hub.py", line 294, in switch
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     return self.greenlet.switch()
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_service/loopingcall.py", line 137, in _run_loop
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     result = func(*self.args, **self.kw)
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_service/loopingcall.py", line 409, in _func
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     return self._sleep_time
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_utils/excutils.py", line 220, in __exit__
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     self.force_reraise()
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_utils/excutils.py", line 196, in force_reraise
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     six.reraise(self.type_, self.value, self.tb)
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/oslo_service/loopingcall.py", line 388, in _func
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     result = f(*args, **kwargs)
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]   File "/var/lib/kolla/venv/lib/python2.7/site-packages/nova/virt/libvirt/guest.py", line 428, in do_wait_and_re
try_detach
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]     reason=reason)
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271] DeviceDetachFailed: Device detach failed for vdb: Unable to detach from guest transient domain.
2017-06-20 14:27:43.931 7 ERROR nova.compute.manager [instance: 4bfefe2b-3611-4c65-a293-657cf6eaf271]
```

通过分析可以知道，Nova 删除卷的过程如下：

1.通知cinder将卷状态标记为detaching；

2.调用libvirt接口将Vol从Guest中删除；

3.调用os-brick接口删除/dev/disk/by-path目录下的软连接文件；

4. 调用Cinder os-terminate_connection 接口将LUN的Mapping从Storage中的iGroup移除；

5.调用Cinder os-detach 接口通知Cinder 将Volume的状态改为available；

上面的过程中如果步骤2发生错误，Nova会通知Cinder进行回滚，将状态从detaching 改回 in-use；而步骤4无论成功与否，Nova并不关心！

从日志可以看出，detach过程在步骤2就发生的错误，数据卷无法从Guest中删除，并未涉及到Cinder。

NOVA_API节点

***VolumeAttachmentController*：**

```
def delete(self, req, server_id, id)
```

1.获取VM实例，检查VM状态，电源关闭状态时不能进行detach；

2.通过volume_id(传入的参数)在cinder_api处获取volume的信息；

3.获取该虚机的Device_Mapping信息，判断volume_id是否在Device_Mapping中，如果该Volume是系统磁盘detach失败；

上面的三个步骤都有可能产生异常！

紧接着nova_api调用NOVA_COMPUTE的detach_volume接口（这里虽然调用的是Nova_Compute的接口，但是代码实际上依然在Nova_API节点上执行）！！

NOVA_COMPUTE的接口类：nova.compute.api.API

根据VM状态的不同dettach有两种不同的入口函数

```
def detach_volume(self, context, instance, volume):
    """Detach a volume from an instance."""
    if instance.vm_state == vm_states.SHELVED_OFFLOADED:
        self._detach_volume_shelved_offloaded(context, instance, volume)
    else:
        self._detach_volume(context, instance, volume)
```

搁置状态（SHELVED_OFFLOADED）下的虚机调用_detach_volume_shelved_offloaded方法进行detach操作。

_detach_volume_shelved_offloaded直接调用Volume_API的terminate_connection和detach方法执行detach，对应cinder的RESFUL_API接口为：

os-terminate_connection和os-detach

由于SHELVED_OFFLOADED状态的虚机不实际运行在KVM层，因此整个卸载过程可以在Nova_API节点完成，不通过Nova_COMPUTE。

其余状态的VM会通过_detach_volume方法执行detach_volume，该方法会执行n-cpu的RPC调用，完成剩余的detach操作：

```
def _detach_volume(self, context, instance, volume)
```

0.调用nova.compute.api.API._check_and_begin_detach方法，检查当前的Volume状态是否可以执行detach，之后调用begin_detaching方法。

该方法通知Cinder将该Volume的状态置为detaching（对应Resful API为os-begin_detaching）

1.从volume中获取该VM对应的attachment_id，注意这里的attachment_id信息是通过CinderClient获取的；

2.RPC调用NOVA_COMPUTE节点，执行detach_volume方法。

NOVA_COMPUTE节点：

nova.compute.manager.ComputeManager

```
def _detach_volume(self, context, volume_id, instance, destroy_bdm=True,attachment_id=None)
该方法是ComputeManager完成detach的主方法，主要完成以下的操作：
1.在虚拟机层面（guest）将Volume移除；   ----> def _driver_detach_volume(self, context, instance, bdm, connection_info)
2.从BlockDeviceMapping中获取Volume的ISCSI连接信息，通知Cinder在Storage断开ISCSI映射（os-terminate_connection）；
3.通知Cinder修改Volume的attach状态为detached（os-detach）；
```

在虚拟机层面（guest）将Volume移除时，如果移除虚机的过程失败，会调用回滚方法通知Cinder将Volume的状态从detaching改为in-use。

在虚机中移除Volume时，nova-compute调用KVM层驱动移除Volume。

LibvirtDriver中dettach操作的实现在nova.virt.libvirt.driver.LibvirtDriver.detach_volume 和nova.virt.libvirt.guest.Guest.detach_dev

nova.virt.libvirt.guest.Guest.detach_device_with_retry:

1.调用libvirt的python接口完成磁盘的从Guest中的卸载 ---> _try_detach_device

_try_detach_device将disk的XML传给libvirt进行卸载，可以看到如下日志：

```
LOG.debug("detach device xml: %s", device_xml)
```

```
2017-06-20 14:27:38.925 7 DEBUG nova.virt.libvirt.guest [-] detach device xml: <disk type="block" device="disk">
  <driver name="qemu" type="raw" cache="none" io="native"/>
  <source dev="/dev/disk/by-path/ip-172.24.3.101:3260-iscsi-iqn.1992-08.com.netapp:sn.5a7aldeclaeb11e79f8600a098ac0ce9:vs.11-lun-64"/>
  <target bus="virtio" dev="vdb"/>
  <serial>e0bd76b1-5bb8-45dc-9691-39933b122db7</serial>
</disk>
 detach_device /var/lib/kolla/venv/lib/python2.7/site-packages/nova/virt/libvirt/guest.py:448
```

2.提供一个监听函数，监听libvirt是否完成了卸载 ---> _do_wait_and_retry_detach

_do_wait_and_retry_detach通过实时的读取虚机XML文件中的DISK信息判断卸载完成了没有，如果没有调用_try_detach_device重试。

nova.virt.libvirt.driver.LibvirtDriver.detach_volume：

1.调用detach_device_with_retry，获取监听函数_do_wait_and_retry_detach；

2.当libvirt完成detach后，调用os-brick断开连接，这里断开连接是指删除/dev/disk/by-path目录下的软连接文件