20220510 DAC 异常中断故障排查

问题原因

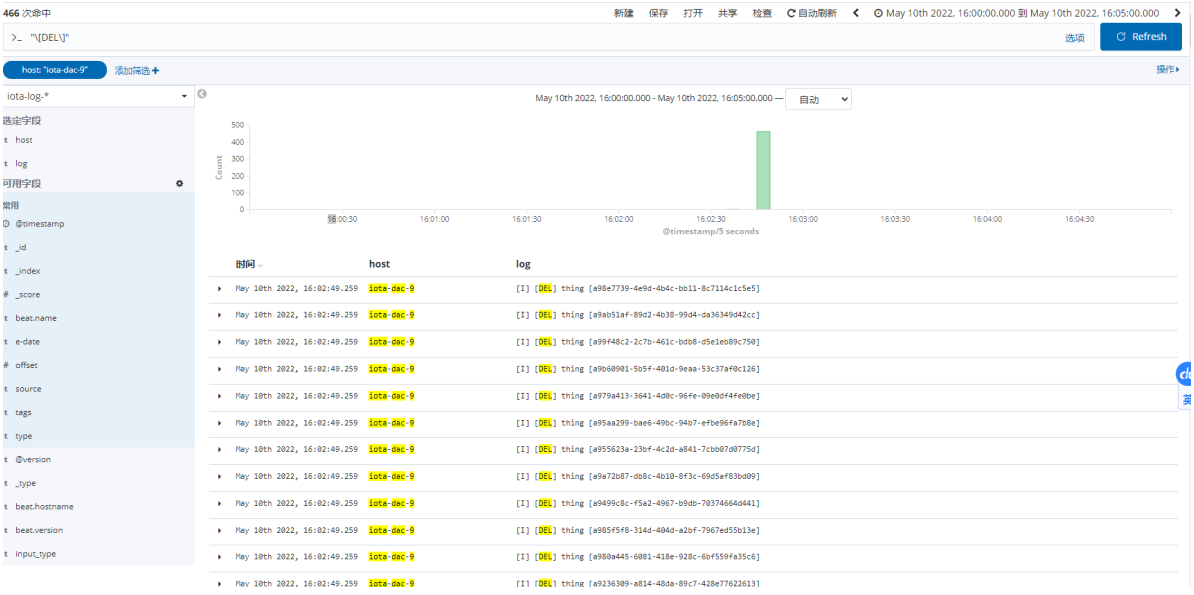
1. DAC-TEST（协议测试服务）进程泄漏导致iota-m2线程和内存溢出，iota-m2上的zookeeper服务挂起。
2. DAC 监听zookeeper中资源分配，对异常的处理保护不当，导致DAC关停所有Thing的采集。

解决方法

1. 针对问题2，修改DAC代码，保证zk异常情况下不会对现有Thing做关停
2. 针对问题1，
    - 先确保DAC-TEST服务K8S资源限制，保证这个不太关键的服务不过度占用服务器资源。
    - 后续优化DAC-TEST，处理极端协议测试情况（例如死循环）

定位过程

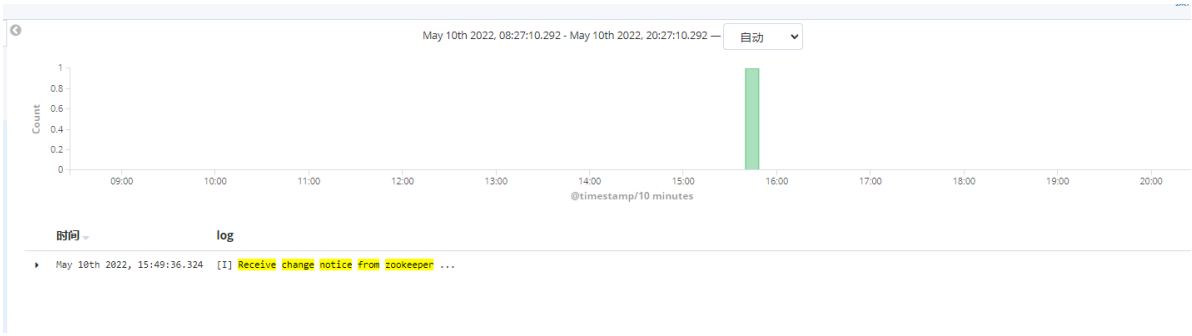
查看问题发生时间段 指定DAC实例上（添加host过滤）的日志。通过观察发现，这段时间开始出现：



对应代码关键位置 `src/iota/scheme/Service.go:297`

```
log.Info("[DEL] thing [%s]", v)
```

调用该方法的地方来自 zookMonitor （监控来自zook的任务变更）。找到该方法被调用的关键日志：



由此怀疑问题是由于ZK异常导致。

查看服务器上zookeeper的日志：（下图iota-m2对应时间日志），出现与leader之间的socket管道断连的问题，由此可得，**是zk异常导致的本次故障。**

```
2022-05-10 15:45:04,946 - INFO  [NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:NIOServerCnxnFactory@197] - Accepted socket connection from /10.8.25.202:55492
2022-05-10 15:45:04,999 - INFO  [NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:NIOServerCnxn@827] - Processing ruok command from /10.8.25.202:55492
2022-05-10 15:45:05,000 - INFO  [Thread-232179:NIOServerCnxn@1008] - Closed socket connection for client /10.8.25.202:55492 (no session established for client)
2022-05-10 15:45:52,753 - WARN  [NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:NIOServerCnxn@357] - caught end of stream exception
EndOfStreamException: Unable to read additional data from client sessionid 0x57d6e9693650e71, likely client has closed socket
        at org.apache.zookeeper.server.NIOServerCnxn.doIO(NIOServerCnxn.java:228)
        at org.apache.zookeeper.server.NIOServerCnxnFactory.run(NIOServerCnxnFactory.java:208)
        at java.lang.Thread.run(Thread.java:748)
2022-05-10 15:45:53,560 - WARN  [SyncThread:1:SendAckRequestProcessor@64] - Closing connection to leader, exception during packet send
java.net.SocketException: 断开的管道 (Write failed)
        at java.net.SocketOutputStream.socketWrite0(Native Method)
        at java.net.SocketOutputStream.socketWrite(SocketOutputStream.java:111)
        at java.net.SocketOutputStream.write(SocketOutputStream.java:155)
        at java.io.BufferedOutputStream.flushBuffer(BufferedOutputStream.java:82)
        at java.io.BufferedOutputStream.flush(BufferedOutputStream.java:140)
        at org.apache.zookeeper.server.quorum.Learner.writePacket(Learner.java:139)
        at org.apache.zookeeper.server.quorum.SendAckRequestProcessor.flush(SendAckRequestProcessor.java:62)
        at org.apache.zookeeper.server.SyncRequestProcessor.flush(SyncRequestProcessor.java:204)
        at org.apache.zookeeper.server.SyncRequestProcessor.run(SyncRequestProcessor.java:131)
2022-05-10 15:45:53,560 - WARN  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:Follower@89] - Exception when following the leader
java.net.SocketException: 断开的管道 (Write failed)
        at java.net.SocketOutputStream.socketWrite0(Native Method)
        at java.net.SocketOutputStream.socketWrite(SocketOutputStream.java:111)
        at java.net.SocketOutputStream.write(SocketOutputStream.java:155)
        at java.io.BufferedOutputStream.flushBuffer(BufferedOutputStream.java:82)
        at java.io.BufferedOutputStream.flush(BufferedOutputStream.java:140)
        at org.apache.zookeeper.server.quorum.Learner.writePacket(Learner.java:139)
        at org.apache.zookeeper.server.quorum.Learner.ping(Learner.java:532)
        at org.apache.zookeeper.server.quorum.Follower.processPacket(Follower.java:112)
        at org.apache.zookeeper.server.quorum.Follower.followLeader(Follower.java:86)
        at org.apache.zookeeper.server.quorum.QuorumPeer.run(QuorumPeer.java:819)
2022-05-10 15:45:54,142 - INFO  [NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:NIOServerCnxn@1008] - Closed socket connection for client /10.8.25.212:47582 which had sessionid 0x57d6e9693650e71
2022-05-10 15:45:54,143 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:Follower@166] - shutdown called
java.lang.Exception: shutdown Follower
        at org.apache.zookeeper.server.quorum.Follower.shutdown(Follower.java:166)
        at org.apache.zookeeper.server.quorum.QuorumPeer.run(QuorumPeer.java:823)
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:NIOServerCnxn@1008] - Closed socket connection for client /10.8.25.202:33034 which had sessionid 0x37d6e96d28b0fb1
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:FollowerZooKeeperServer@139] - Shutting down
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:ZooKeeperServer@441] - shutting down
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:FollowerRequestProcessor@105] - Shutting down
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:CommitProcessor@181] - Shutting down
2022-05-10 15:45:54,144 - INFO  [QuorumPeer[myid=1]/0:0:0:0:0:0:0:0:2181:FinalRequestProcessor@402] - shutdown of request processor complete
2022-05-10 15:45:54,144 - INFO  [CommitProcessor:1:CommitProcessor@150] - CommitProcessor exited loop!
2022-05-10 15:45:54,165 - INFO  [FollowerRequestProcessor:1:FollowerRequestProcessor@95] - FollowerRequestProcessor exited loop!
```

zk异常是什么原因导致的呢?

通过排查iota-m2上的系统日志 （tail /var/log/syslog）,发现系统在故障时间点出现OOM的异常

```
May 10 15:36:59 iota-m2 kubelet[1569]: E0510 15:36:59.466905    1569 kubelet_node_status.go:382] Unable to update node status: update node status exceeds retry count
May 10 15:45:02 iota-m2 CRON[11768]: (root) CMD (command -v debian-sa1 > /dev/null && debian-sa1 1 1)
May 10 15:45:51 iota-m2 kernel: [13930750.441874] test_server invoked oom-killer: gfp_mask=0x14200ca(GFP_HIGHUSER_MOVABLE|__GFP_ZERO), nodemask=(null), order=0, oom_score_adj=1000
May 10 15:45:53 iota-m2 kernel: [13930750.441877] test_server cpuset=fca916217080405d4ab8d246f5b918de7cefd4ccbf8ea63b57a6425cdc71290.mems_allowed=0-1
May 10 15:45:53 iota-m2 kernel: [13930750.441884] CPU: 9 PID: 38623 Comm: test_server Not tainted 4.15.0-142-generic #146~16.04.1-Ubuntu
May 10 15:45:53 iota-m2 kernel: [13930750.441885] Hardware name: Dell Inc. PowerEdge R720/01XT2D, BIOS 2.0.19 08/29/2013
May 10 15:45:53 iota-m2 kernel: [13930750.441887] Call Trace:
May 10 15:45:53 iota-m2 kernel: [13930750.441900]  dump_stack+0x6d/0x8b
May 10 15:45:53 iota-m2 kernel: [13930750.441903]  dump_header+0x77/0x283
May 10 15:45:53 iota-m2 kernel: [13930750.441909]  ? cpuset_mems_allowed_intersects+0x21/0x30
May 10 15:45:53 iota-m2 kernel: [13930750.441912]  oom_kill_process+0x22d/0x460
May 10 15:45:53 iota-m2 kernel: [13930750.441914]  out_of_memory+0x11d/0x4c0
May 10 15:45:53 iota-m2 kernel: [13930750.441918]  __alloc_pages_slowpath+0xa7e/0xe90
May 10 15:45:53 iota-m2 kernel: [13930750.441921]  __alloc_pages_nodemask+0x289/0x2d0
May 10 15:45:53 iota-m2 kernel: [13930750.441926]  alloc_pages_vma+0x88/0x1f0
May 10 15:45:53 iota-m2 kernel: [13930750.441929]  do_anonymous_page+0x150/0x423
May 10 15:45:53 iota-m2 kernel: [13930750.441933]  __handle_mm_fault+0xcfe/0xea0
May 10 15:45:53 iota-m2 kernel: [13930750.441935]  handle_mm_fault+0xe7/0x220
May 10 15:45:53 iota-m2 kernel: [13930750.441940]  __do_page_fault+0x291/0x4d0
May 10 15:45:53 iota-m2 kernel: [13930750.441942]  do_page_fault+0x2e/0xf0
May 10 15:45:53 iota-m2 kernel: [13930750.441946]  ? page_fault+0x2f/0x50
May 10 15:45:53 iota-m2 kernel: [13930750.441947]  page_fault+0x45/0x50
May 10 15:45:53 iota-m2 kernel: [13930750.441950] RIP: 0033:0x45d223
May 10 15:45:53 iota-m2 kernel: [13930750.441951] RSP: 002b:000000c0001dbf08 EFLAGS: 00010206
May 10 15:45:53 iota-m2 kernel: [13930750.441953] RAX: 0000000000000000 RBX: 0000000292a07000 RCX: 0000000539d04000
May 10 15:45:53 iota-m2 kernel: [13930750.441954] RDX: 00007f716f41ec58 RSI: 000000000029ce82 RDI: 000000cbfc7dd000
May 10 15:45:53 iota-m2 kernel: [13930750.441956] RBP: 000000c0001dbf50 R08: 00007f716f41eeb8 R09: 000000000029ce82
May 10 15:45:53 iota-m2 kernel: [13930750.441957] R10: 00000000000018f1 R11: 000000000029ce81 R12: 0000200000000000
May 10 15:45:53 iota-m2 kernel: [13930750.441958] R13: 0000000000000024 R14: 000000c0023423c0 R15: 0000000000000055
May 10 15:45:53 iota-m2 kernel: [13930750.441960] Mem-Info:
May 10 15:45:53 iota-m2 kernel: [13930750.441973] active_anon:15975503 inactive_anon:69537 isolated_anon:0
May 10 15:45:53 iota-m2 kernel: [13930750.441973]  active_file:301 inactive_file:947 isolated_file:12
May 10 15:45:53 iota-m2 kernel: [13930750.441973]  unevictable:0 dirty:1 writeback:920591 unstable:0
May 10 15:45:53 iota-m2 kernel: [13930750.441973]  slab_reclaimable:90794 slab_unreclaimable:156567
May 10 15:45:53 iota-m2 kernel: [13930750.441973]  mapped:26735 shmem:194450 pagetables:52940 bounce:0
May 10 15:45:53 iota-m2 kernel: [13930750.441973]  free:55105 free_pcp:1965 free_cma:0
May 10 15:45:53 iota-m2 kernel: [13930750.441977] Node 0 active_anon:31825268kB inactive_anon:154880kB active_file:416kB inactive_file:1604kB unevictable:0kB isolated(anon):0kB isolated(file):0kB mappe
B shmem_pmdmapped: 0kB anon_thp: 0kB writeback_tmp:0kB unstable:0kB all_unreclaimable? no
May 10 15:45:53 iota-m2 kernel: [13930750.441980] Node 1 active_anon:32076744kB inactive_anon:123268kB active_file:788kB inactive_file:2184kB unevictable:0kB isolated(anon):0kB isolated(file):48kB mapp
 shmem_pmdmapped: 0kB anon_thp: 0kB writeback_tmp:0kB unstable:0kB all_unreclaimable? no
May 10 15:45:53 iota-m2 kernel: [13930750.441981] Node 0 DMA free:15896kB min:20kB low:32kB high:44kB active_anon:0kB inactive_anon:0kB active_file:0kB inactive_file:0kB unevictable:0kB writepending:0k
bles:0kB bounce:0kB free_pcp:0kB local_pcp:0kB free_cma:0kB
```

```
May 10 15:45:53 iota-m2 kernel: [13930750.442441] Out of memory: Kill process 38581 (test_server) score 1703 or sacrifice child
May 10 15:45:53 iota-m2 kernel: [13930750.442730] Killed process 38581 (test_server) total-vm:72964016kB, anon-rss:46242612kB, file-rss:0kB, shmem-rss:0kB
```

发现出现故障是由于这个 test_server 造成的，同时根据日志中的记录计算得test_server当时的RSS内存占用高达 11560653 × 4 ÷ 1024 ÷ 1024 = 44G。

后来排查发现，这个test_server就是 DAC-TEST服务。

> DAC-TEST服务：它是用于DAC的协议测试功能。用户在控制台进行协议测试时，会将待测试Lua脚本上下文和执行参数，通过Kafka消息(ScriptTest)发送给该进程。该进程接收后进行协议沙箱处理(run)，将结果返回到kafka(ScriptTestAck)。

DAC-TEST 中每次协议解析产生的日志，是通过MEM_Adapter的日志组件记录在内存的，可能存在内存溢出的分险。

另外，**极端错误、不规范、恶意的协议代码**（例如死循环），可能导致该服务异常，甚至过度消耗服务器资源，导致平台整体服务稳定性出现问题（例如本次的情况）。

其他

syslog异常情况判断。下面这行指令可以快速定位到类似OOM故障点

```
journalctl -xb | egrep -i 'killed process'
```

查询syslog出现的字段说明：

`pid`：进程ID `uid`：用户ID `tgid`：线程组ID `total_vm`：虚拟内存使用(单位为4 kB内存页) `rss`： Resident Set Size（常驻内存集）单位是内存页数，同样的每页4 KB `nr_ptes`：页表项 `swapents`：交换条目 `oom_score_adj` 通常为0;较低的数字表示当调用OOM杀手时，进程将不太可能死亡。