



【3PAR/Primera sharing】TOC 存储数据结构内容

原理架构

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2021-01-12 发表

组网及说明

我们如何查看 3PAR 存储 TOC （Table Of Content）数据结构内部内容

问题描述

我们如何查看 3PAR 存储 TOC (Table Of Content) 数据结构内部内容

过程分析

TOCTOOL 分析过程

存储 3PAR 8400 有19块磁盘：

```
root@1690216-0 Tue Jan 12 15:53:59:~# showpd -c
----- Normal Chunklets ----- Spare Chunklets ----
- Used -- ----- Unused ----- - Used - ---- Unused ----

Id CagePos Type State Total OK Fail Free Uninit Unavail Fail OK Fail Free Uninit Fail
0 0:3:0 FC normal 408 211 0 106 0 0 0 0 0 91 0 0
1 0:1:0 FC normal 408 179 0 138 0 0 0 0 0 91 0 0
2 0:2:0 FC normal 408 203 0 114 0 0 0 0 0 91 0 0
3 1:1:0 FC normal 408 212 0 105 0 0 0 0 0 91 0 0
4 1:0:0 FC normal 408 166 0 151 0 0 0 0 0 91 0 0
5 0:4:0 FC normal 408 165 0 152 0 0 0 0 0 91 0 0
6 1:2:0 FC normal 408 176 0 142 0 0 0 0 0 90 0 0
7 1:3:0 FC normal 408 201 0 117 0 0 0 0 0 90 0 0
8 1:4:0 FC normal 408 158 0 160 0 0 0 0 0 90 0 0
10 0:5:0 SSD normal 446 374 0 72 0 0 0 0 0 0 0 0
11 0:6:0 SSD normal 446 361 0 85 0 0 0 0 0 0 0 0
12 0:7:0 SSD normal 446 373 0 73 0 0 0 0 0 0 0 0
13 1:5:0 SSD normal 446 374 0 72 0 0 0 0 0 0 0 0
14 1:6:0 SSD normal 446 361 0 85 0 0 0 0 0 0 0 0
15 1:7:0 SSD normal 446 373 0 73 0 0 0 0 0 0 0 0
16 0:8:0 NL normal 902 498 0 157 0 0 0 0 0 247 0 0
17 0:9:0 NL normal 902 497 0 158 0 0 0 0 0 247 0 0
18 1:8:0 NL normal 902 498 0 157 0 0 0 0 0 247 0 0
19 1:9:0 NL normal 902 499 0 156 0 0 0 0 0 247 0 0

-----
19 total 9956 5879 0 2273 0 0 0 0 0 1804 0 0
root@1690216-0 Tue Jan 12 15:55:22:~#
```

我们查看存储 3PAR 8400 的 TOC (Table Of Content):

```
root@1690216-0 Tue Jan 12 15:53:47:~# toctool -s
Generation 1395614 15 of 15 found Version 193 Sysname ss8400b Sysid 90216
Generation 0 4 of 0 found Version 0 Sysname ss8400b Sysid 90216
```

我们可以得出这19块磁盘并非所有磁盘都有TOC，其中有15块磁盘有 TOC， 4块

磁盘没有存放 TOC。

```
root@1690216-0 Tue Jan 12 15:53:53:~# toctool -l
WWN 5000CCA05507355F Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA055071FBF Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA05507550F Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4F2AEF Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4E745B Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4E34DF Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000C500850FE27C Generation 0 Total_TOCs 0 Version 0 Sysname ss8400b Sysid 90216
WWN 5000C50083CC3B5C Generation 0 Total_TOCs 0 Version 0 Sysname ss8400b Sysid 90216
WWN 5000CCA055073E93 Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4E364B Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4E1F37 Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA04E4E406F Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000C500850EFC34 Generation 0 Total_TOCs 0 Version 0 Sysname ss8400b Sysid 90216
WWN 5000C500850FC5BC Generation 0 Total_TOCs 0 Version 0 Sysname ss8400b Sysid 90216
WWN 5000CCA0550737F7 Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA0550720A7 Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA0550721EF Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA05507206F Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
WWN 5000CCA055070D3B Generation 1395614 Total_TOCs 15 Version 193 Sysname ss8400b Sysid 90216
root@1690216-0 Tue Jan 12 15:53:59:~#
```

显示当前的存储的 TOC

```
root@1690216-0 Tue Jan 12 15:55:22:~# showtoc
gltab toc generation: 1395614
Toc modified time: 2021-01-12 15:49:03 CST
Toc header magic num: 42444854
Toc in use len: 652051
Toc not in use len: 2199
Toc on disk len: 98304
Toc version: 193
Toc generation: 1395614
Toc pd_entries: 19
Toc ld_entries: 125
```

```
Toc vv_entries: 73
Toc cage_entries: 2
```

解决方法

```
root@1690216-0 Tue Jan 12 16:01:47:~#
```

TOC 是分布到部分磁盘的头信息，这些头信息是通过 tocsrvr 后台进程去读取。如果 tocsrvr 进程无法启动，或者磁盘内容被破坏了，就会导致存储无法启动。首先我们要清楚数据结构内部的内容。

Dump TOC 内容

```
root@1690216-0 Tue Jan 12 16:46:16:/common/support# toctool -r
Created /common/tocs/complete_toc_90216_1395617.tar
root@1690216-0 Tue Jan 12 16:47:06:/common/tocs# ls -al
-rw-r--r-- 1 root root 8499200 Jan 12 16:46 complete_toc_90216_1395617.tar
-rw-r--r-- 1 root root 98304 Jan 12 16:46 toc_90216_1395617_base0
-rw-r--r-- 1 root root 512 Jan 12 16:46 toc_90216_1395617_label
-rw-r--r-- 1 root root 8388608 Jan 12 16:46 toc_90216_1395617_logs
-rw-r--r-- 1 root root 1024 Jan 12 16:46 toc_90216_1395617_pheaders
root@1690216-0 Tue Jan 12 16:47:09:/common/tocs#
```

显示 TOC 的结构内容

```
root@1690216-0 Tue Jan 12 16:49:19:/common/tocs# tocsrvr --describe toc_90216_1395617|more
```

```
TOC Header:
th_struct_id = 0x42444854
th_toc_len = 36
th_toc_empty_len = 2199
th_version = 193
th_generation = 1395617
th_uncompressed_len = 652051
th_total_tocs = 15
th_base_toc_offset = 8398336
th_disk_len = 98304
th_mtoc_len = 652051
th_base_len = 98304
th_log_used = 140288
th_log_cnt = 1
th_modified_time = 1610440443
th_uuid = f6a8e62e-db83-4737-b00d-3d47414739b1
th_base_tocgen = 1395357
th_log_start = 3375104
th_old_base_tocgen = 0
th_old_mtoc_len = 0
th_old_base_toc_offset = 0
th_data_crc32 = 779236226
th_crc32 = 3853609877
MARKER Header at 0x64:
tm_struct_id = 0x424b4d54
tm_type = 38
tm_ver = 1
tm_len = 12
```

举例一块磁盘的信息

```
root@1690216-0 Tue Jan 12 17:01:48:~# showpd -i |grep -i 5000cca0550720a7
4 1:0:0 normal 5000CCA0550720A7 HITACHI HCBRE0450GBAS10K KHG3XJ0N 3P02 SAS Magnetic 2016-05-17 13:57:06 CST
root@1690216-0 Tue Jan 12 17:02:17:~#
```

```
=====
```

```
MARKER Header at 0x70c5:
tm_struct_id = 0x424b4d54
tm_type = 1
tm_ver = 1
tm_len = 292
PD_TYPE entry
tp_id = 4
tp_wwn = 0x5000cca0550720a7
tp_wwn_re = 0x0000000000000000
tp_node_wwn = 0x5000cca0550720a7
tp_op = 0
tp_sector_size = 512
tp_block_count = 879097968
tp_chunklet_size = 2097152
tp_jbod = 1
tp_sled = 0
tp_position = 0
tp_med_state = 0
tp_toc_mstate = 0
tp_singlebitflag = 0x0
tp_dis_path_bitmap = 0
tp_is_toc_pd = 1
tp_num_chunklets = 408
tp_devtype = 1
tp_fake_base = 0
```

tp_port0_lpid = 012
tp_port1_lpid = 0212
tp_port2_lpid = 0177774