



Confidence
Through
Traceability

IRELAND'S DOMAIN
REGISTRY

MySQL Backup Strategy @ IEDR

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Percona Live London - November 2014

Who am I ?

- ▶ MySQL Database Administrator @ IE Domain Registry (IEDR)
- ▶ Student
 - ▶ Systems for Internet @ FEEVALE University
- ▶ Oracle Certified Professional
 - ▶ MySQL 5 Database Administrator
 - ▶ MySQL 5 Developer
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- ▶ [@altmannmarcelo](https://twitter.com/altmannmarcelo)

What IEDR Does ?

- ▶ Manages the official country code top level domain for Ireland - .ie
- ▶ Maintain the database of .ie registered domain names
- ▶ MySQL 5.6
- ▶ Mainly InnoDB
- ▶ ~80% reads

Backup Introduction - What for ?

- ▶ Add new slave to your replication topology
- ▶ Reproduce some bug on your labs
- ▶ Point-in-time recovery
- ▶ Disaster Recovery

Backup Introduction - Replication as backup

- ▶ Replication is a backup, but not for all scenarios:
- ▶ When is replication a backup ?
- ▶ Physical file corruption
- ▶ Any Master Server component fail (RAM, Disk, Network, CPU)

```
2      12      0      10EC      8169      0200      Network Cntrlr      12
                                     ACPI Controller      9

Verifying DMI Pool Data .....
DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER
```

Backup Introduction - Replication as backup

- ▶ Including OS errors

```
[<c0409fff>] ? kernel_thread_helper+0x7/0x10
Code: c1 20 89 d9 0f 45 d0 0f 45 c6 d1 e9 89 0c 24 01 04 24 11 54 24 04 31 f6 8b
04 24 8b 54 24 04 85 d2 89 d7 89 c1 74 0a 89 d0 31 d2 <f7> f3 89 d7 89 c6 89 fa
89 c8 f7 f3 89 f2 83 3d 38 4d b4 c0 00
EIP: [<c0a9b704>] init_tsc_clocksource+0x54/0xa6 SS:ESP 0069:f704ff90
---[ end trace a7919e7f17c0a726 ]---
```

```
Kernel panic - not syncing: Fatal exception
Pid: 1, comm: swapper tainted: G D W ----- 2.6.32-220.7.1.el6
.i686 #1
Call Trace:
[<c082e348>] ? panic+0x42/0xf9
[<c083224c>] ? oops_end+0xbc/0xd0
[<c040abf0>] ? do_divide_error+0x0/0x90
[<c040ac6c>] ? do_divide_error+0x7c/0x90
[<c0a9b704>] ? init_tsc_clocksource+0x54/0xa6
[<c07a9c3b>] ? netlink_broadcast+0x17b/0x3d0
[<c05f8042>] ? kobject_uevent_env+0x1f2/0x610
[<c0831637>] ? error_code+0x73/0x78
```

Backup Introduction - When Replication doesn't work as a backup?

- ▶ Application bugs
- ▶ Someone hacks into your database server
- ▶ Wrong admin commands like DELETE / UPDATE / DROP

```
mysql [localhost] {root} (p_catalog) > UPDATE products SET Price = 1.00;
Query OK, 55017 rows affected (0.51 sec)
Rows matched: 55017  Changed: 55017  Warnings: 0

mysql [localhost] {root} (p_catalog) > DROP TABLE products;
Query OK, 0 rows affected (0.03 sec)

mysql [localhost] {root} (p_catalog) > DROP DATABASE p_catalog;
Query OK, 0 rows affected (0.02 sec)

mysql [localhost] {root} ((none)) > █
```

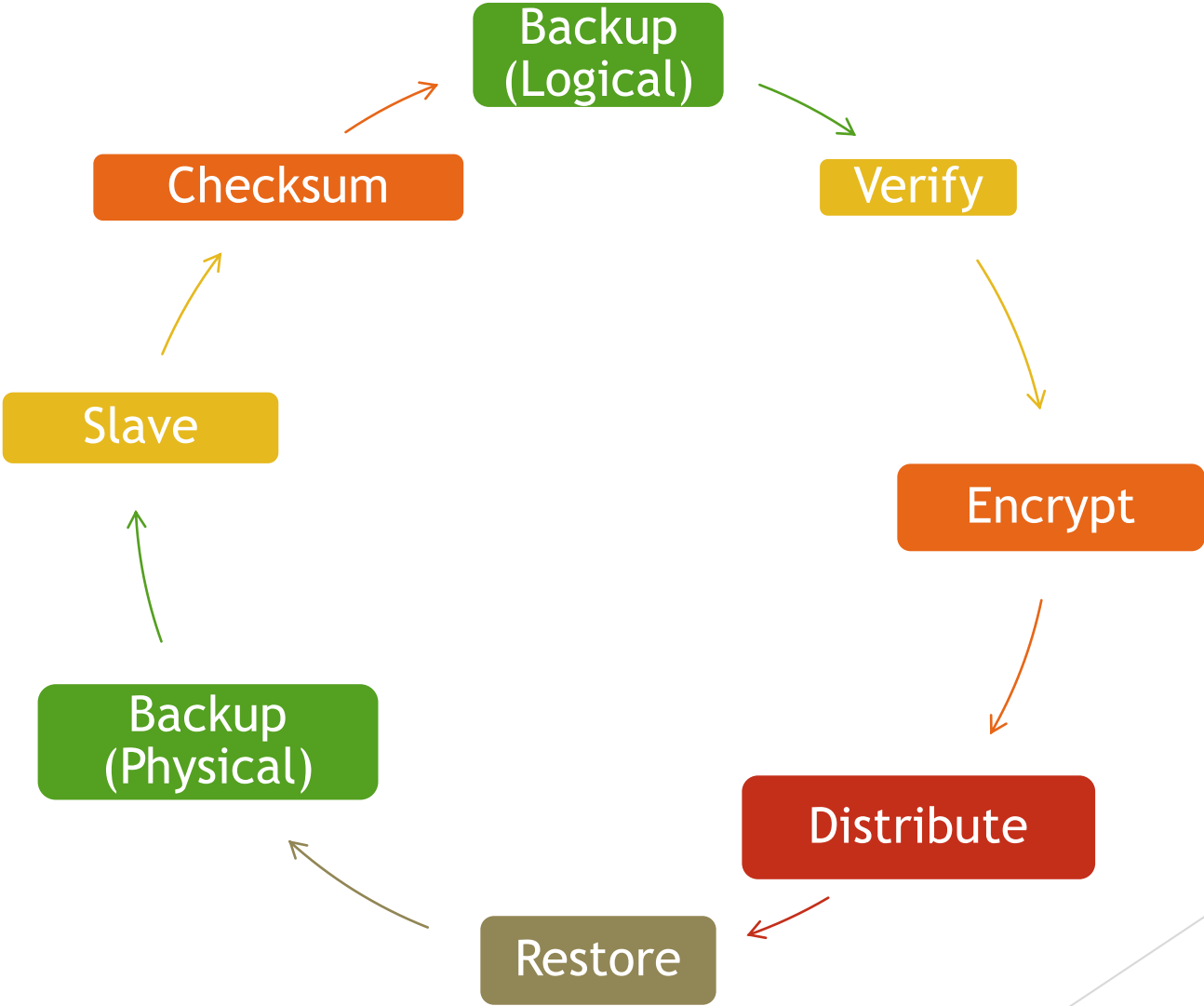
Backup - Logical

- ▶ Logical
- ▶ Save information represented as logical structure (CREATE DATABASE, CREATE TABLE, INSERT)
- ▶ Can be used to restore all databases, single database, single table
- ▶ Slower than Physical
- ▶ It's taken while MySQL is running
- ▶ Done via mysqldump, mydumper, SELECT ... INTO OUTFILE

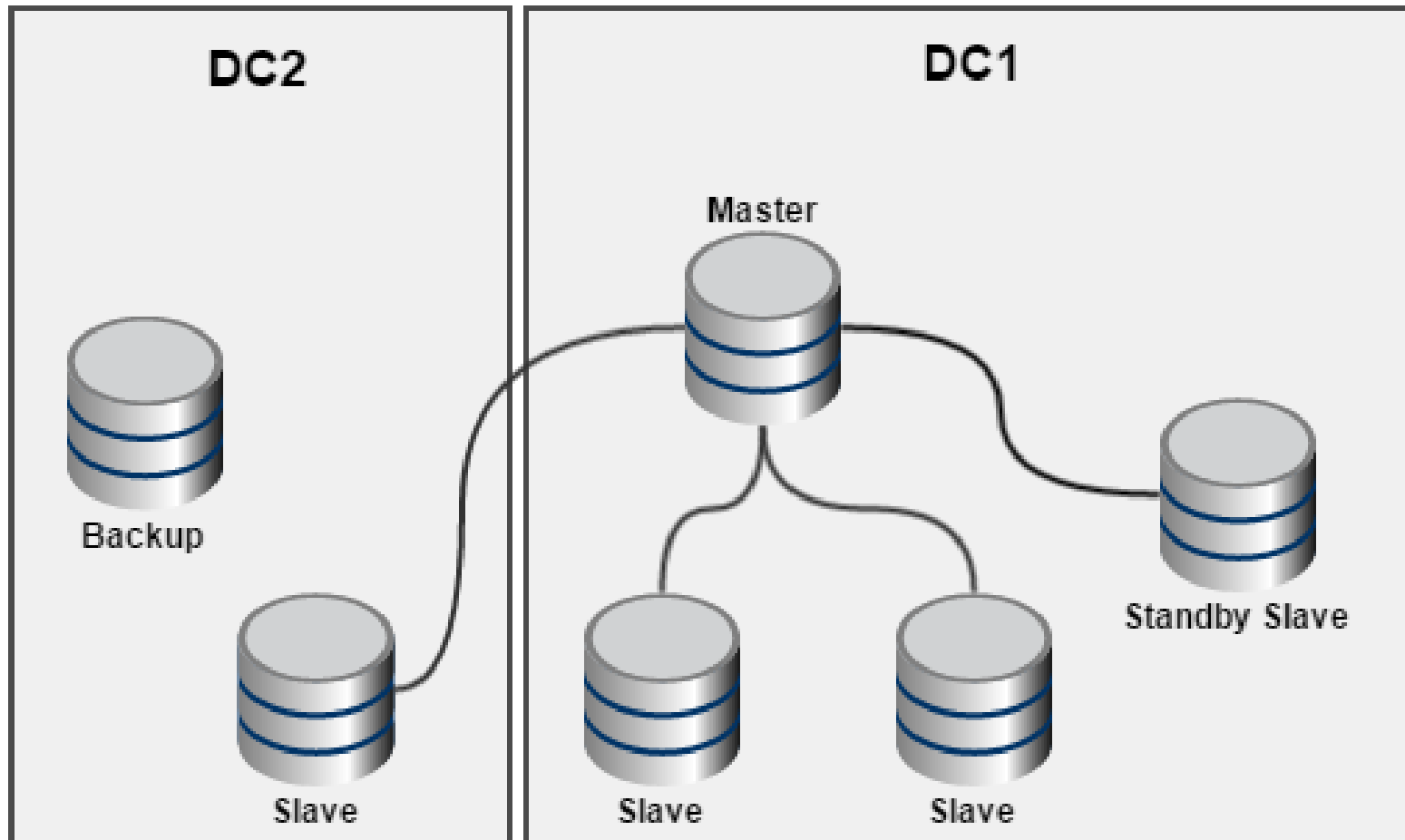
Backup - Physical

- ▶ Raw copies of directory and files of database contents (copy of MySQL datadir)
- ▶ No selective restore
- ▶ Faster than Logical
- ▶ Done via OS copy commands, mysqlbackup, mysqlhotcopy, percona xtrabackup

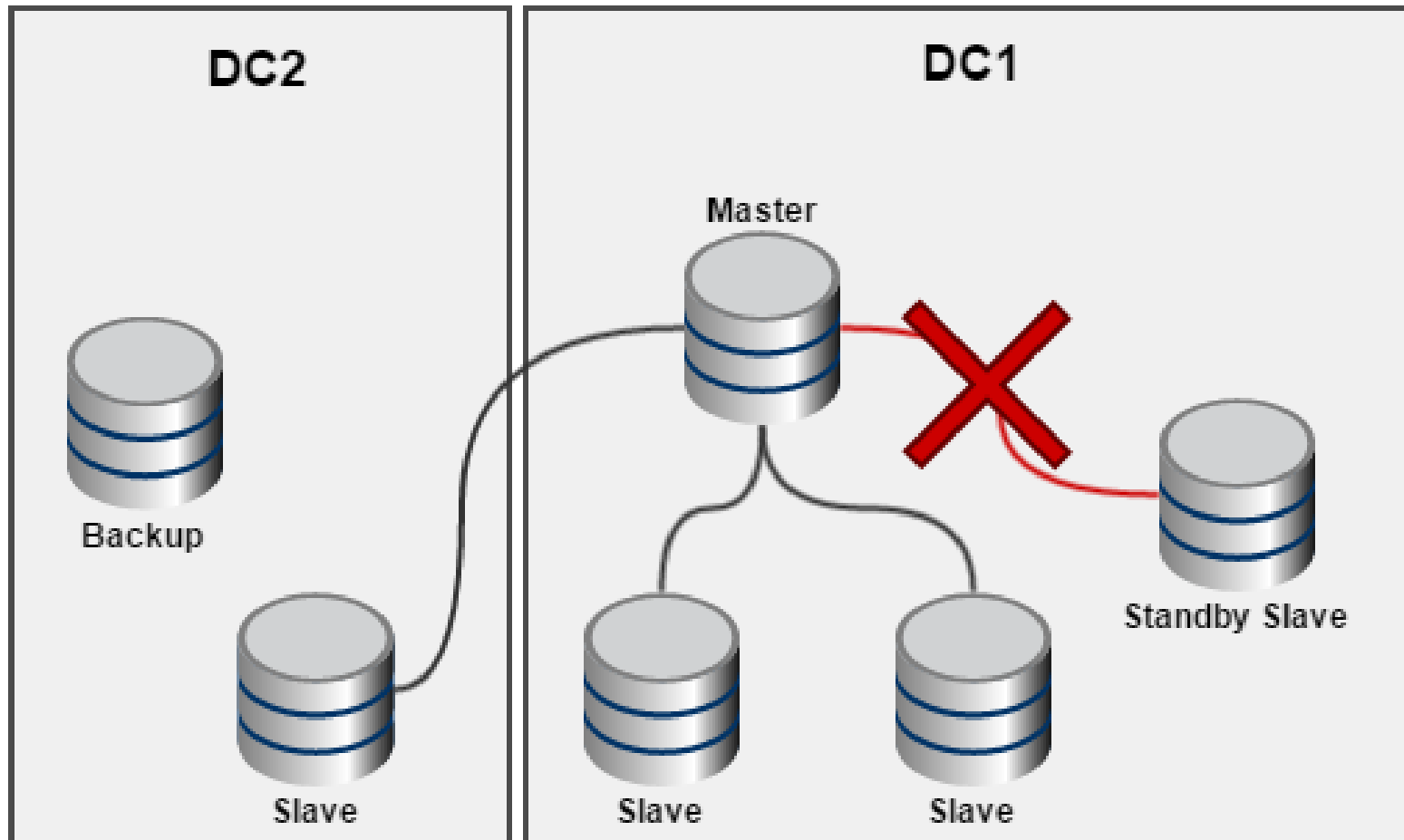
Backup life cycle



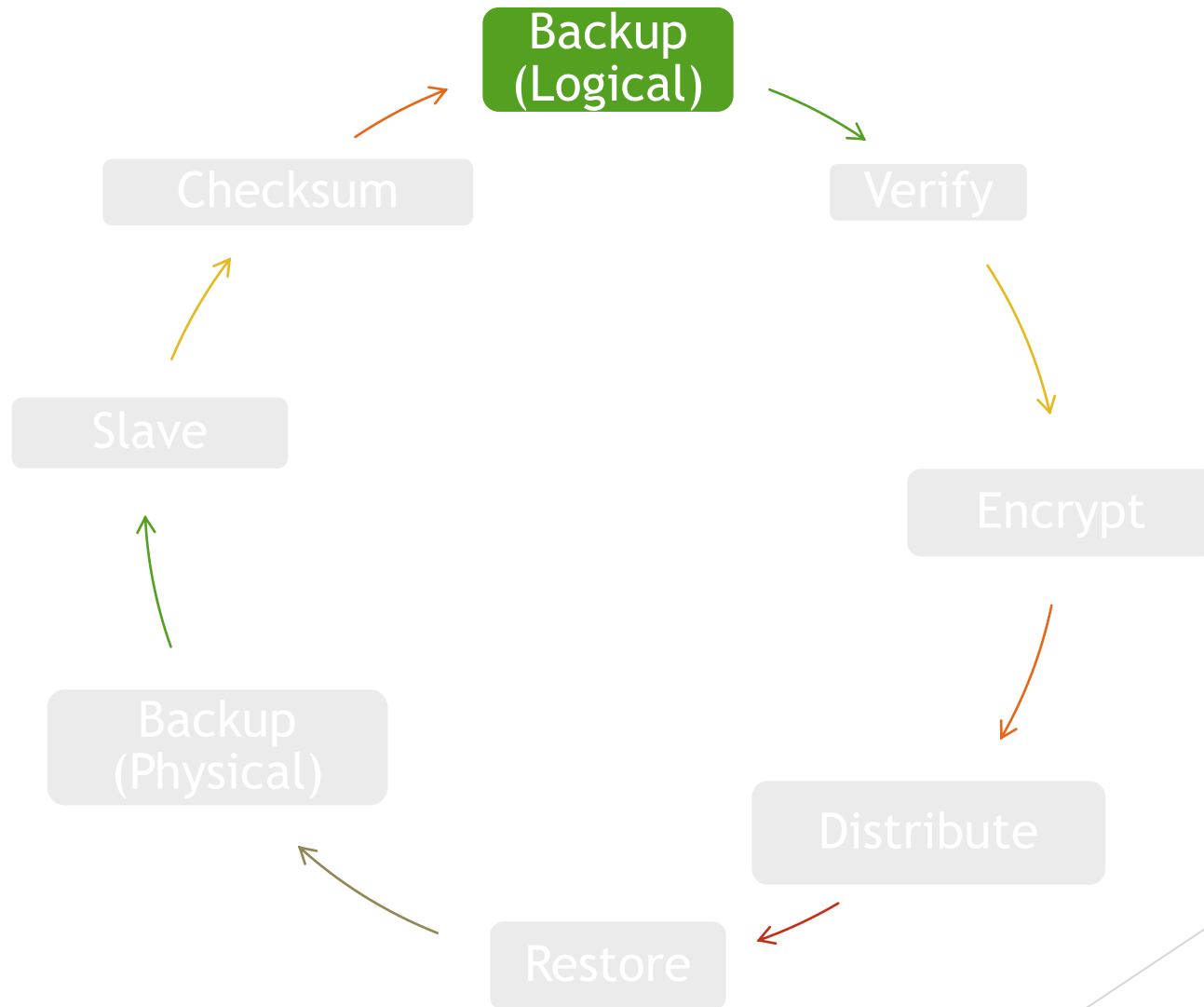
Backup - Infrastructure



Backup - Infrastructure



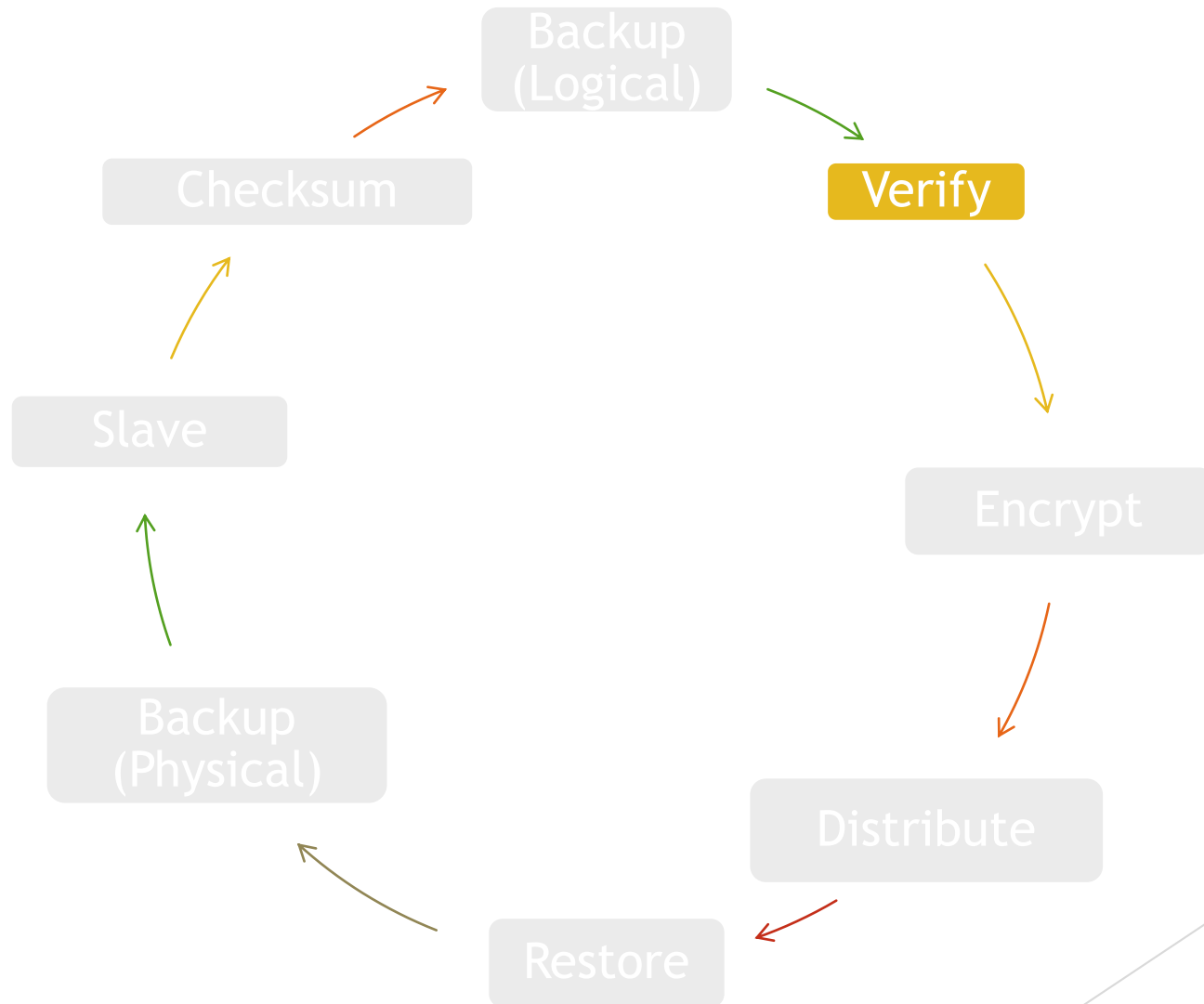
Logical Backup



Logical Backup

- ▶ mysqldump
- ▶ Store backup duration
- ▶ Backup output of SHOW SLAVE STATUS\G
- ▶ Verify exit status and last line of the dump

Logical Backup - exit status and last line



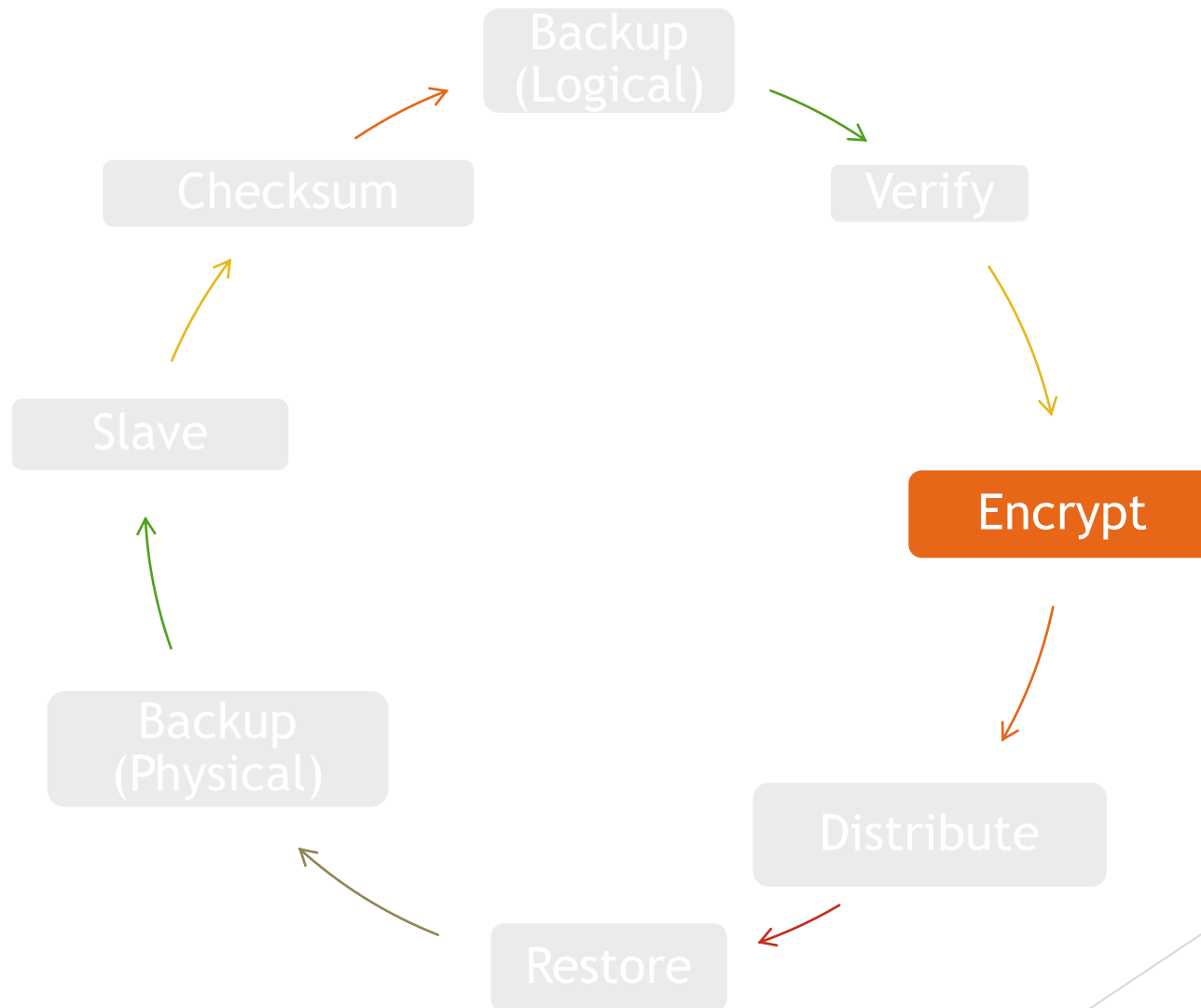
Logical Backup - exit status and last line

```
[root@altmannDB ~]# mysqldump --all-databases > /tmp/my_backup.sql
mysqldump: Got errno 28 on write
[root@altmannDB ~]# echo $?
5
[root@altmannDB ~]# tail -1 /tmp/my_backup.sql
CREATE TABLE `hel[root@altmannDB ~]#
```


Logical Backup - exit status and last line

```
[root@altmannDB ~]# mysqldump --all-databases > /tmp/my_backup.sql
[root@altmannDB ~]# echo $?
0
[root@altmannDB ~]# tail -1 /tmp/my_backup.sql
-- Dump completed on 2014-10-16 11:58:08
[root@altmannDB ~]#
```

Logical Backup - Compress and Encrypt



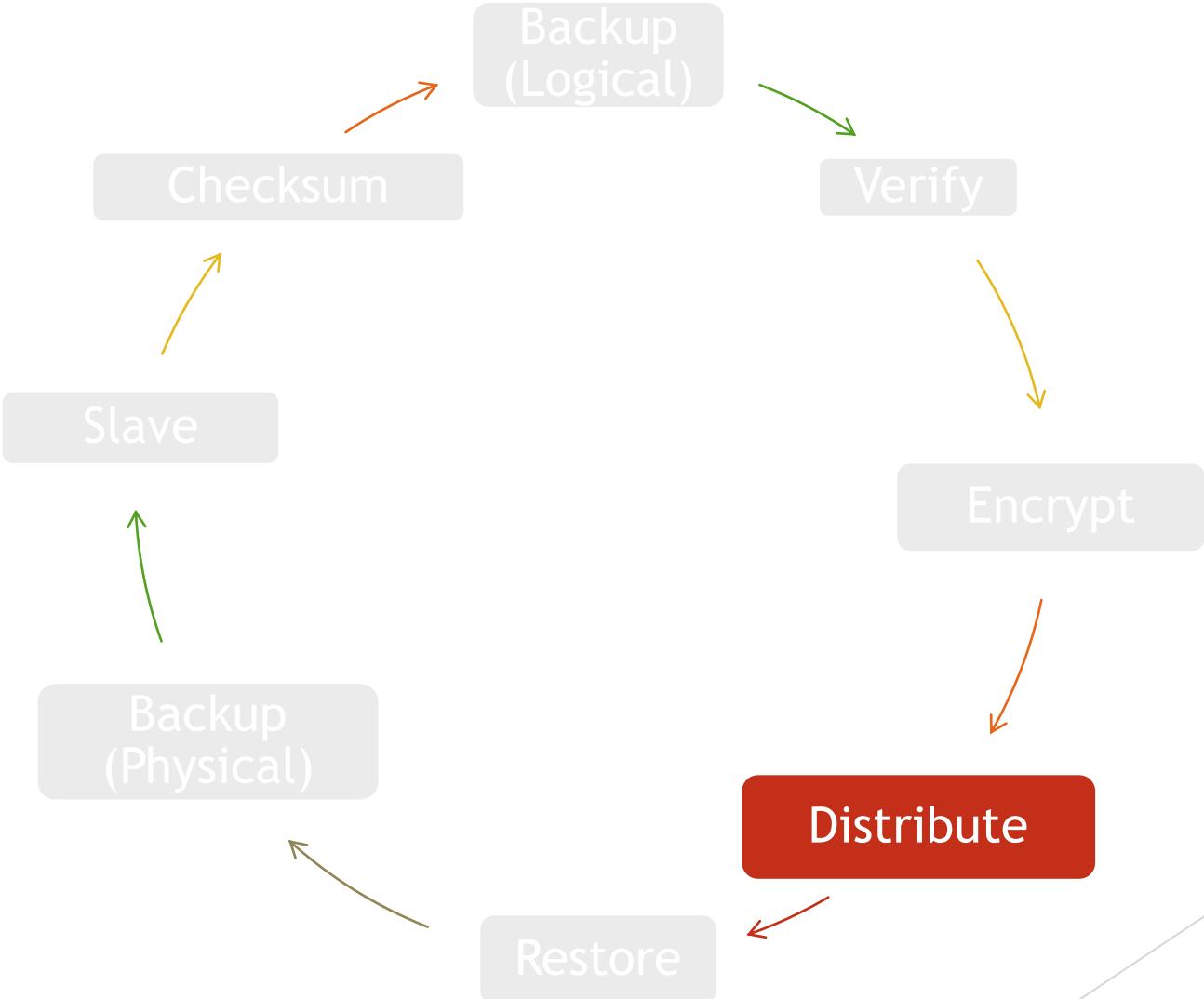
Logical Backup - Compress and Encrypt

- ▶ Change file permissions
- ▶ Compress backup to save disk space (GZIP, BZIP2, ...)
- ▶ Encrypt your backups (openssl)

Logical Backup - Compress and Encrypt

```
[root@altdmannDB backup]# chmod 400 my_backup.sql
[root@altdmannDB backup]# tar -zcvf my_backup.tar.gz my_backup.sql
my_backup.sql
[root@altdmannDB backup]# chmod 400 my_backup.tar.gz
[root@altdmannDB backup]# rm my_backup.sql
rm: remove regular file `my_backup.sql'? y
[root@altdmannDB backup]# openssl enc -aes-256-cbc -salt -in my_backup.tar.gz -out my_backup.tar.gz.opensslAES256
enter aes-256-cbc encryption password:
Verifying - enter aes-256-cbc encryption password:
[root@altdmannDB backup]# chmod 400 my_backup.tar.gz.opensslAES256
[root@altdmannDB backup]# rm my_backup.tar.gz
rm: remove regular file `my_backup.tar.gz'? y
[root@altdmannDB backup]#
```

Distribute - Same Server



Distribute - Same Server



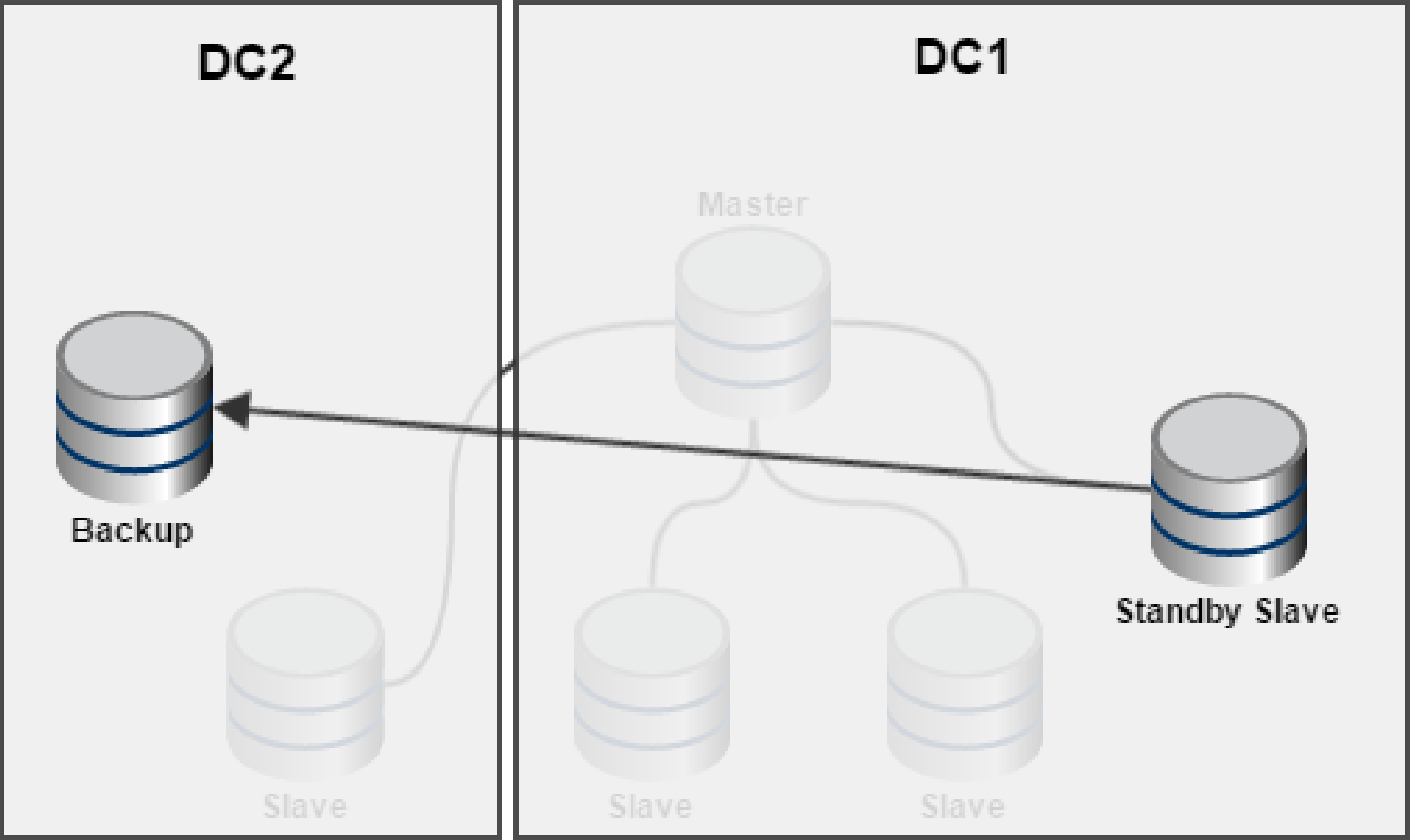
Distribute - Same DC



Distribute - Same Region



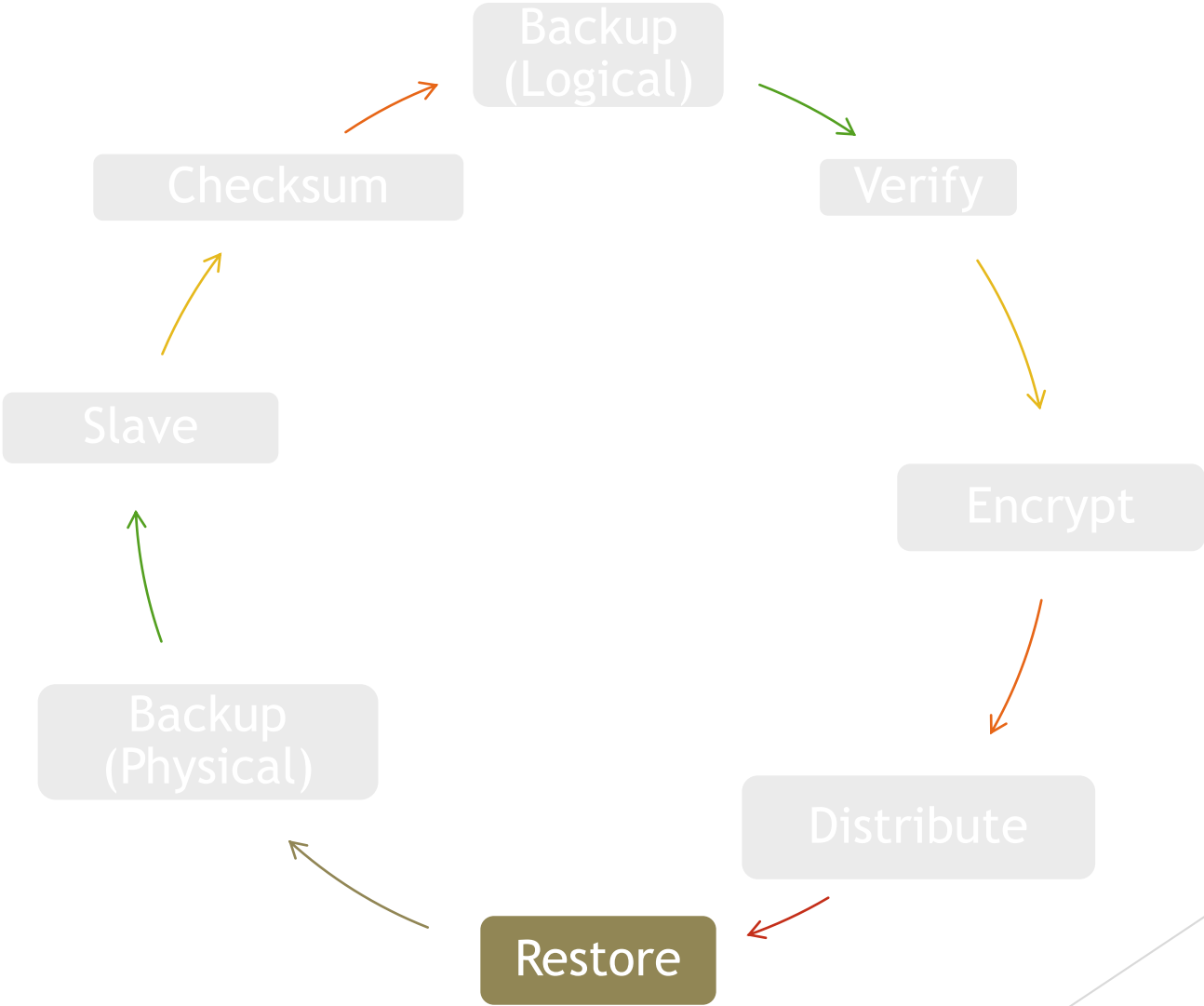
Distribute



Distribute

- ▶ Send copy of your backups to different datacenter
- ▶ Pay attention on the distance between datacenters - Natural Disasters!
- ▶ scp / rsync
- ▶ Keep copy for 1 week

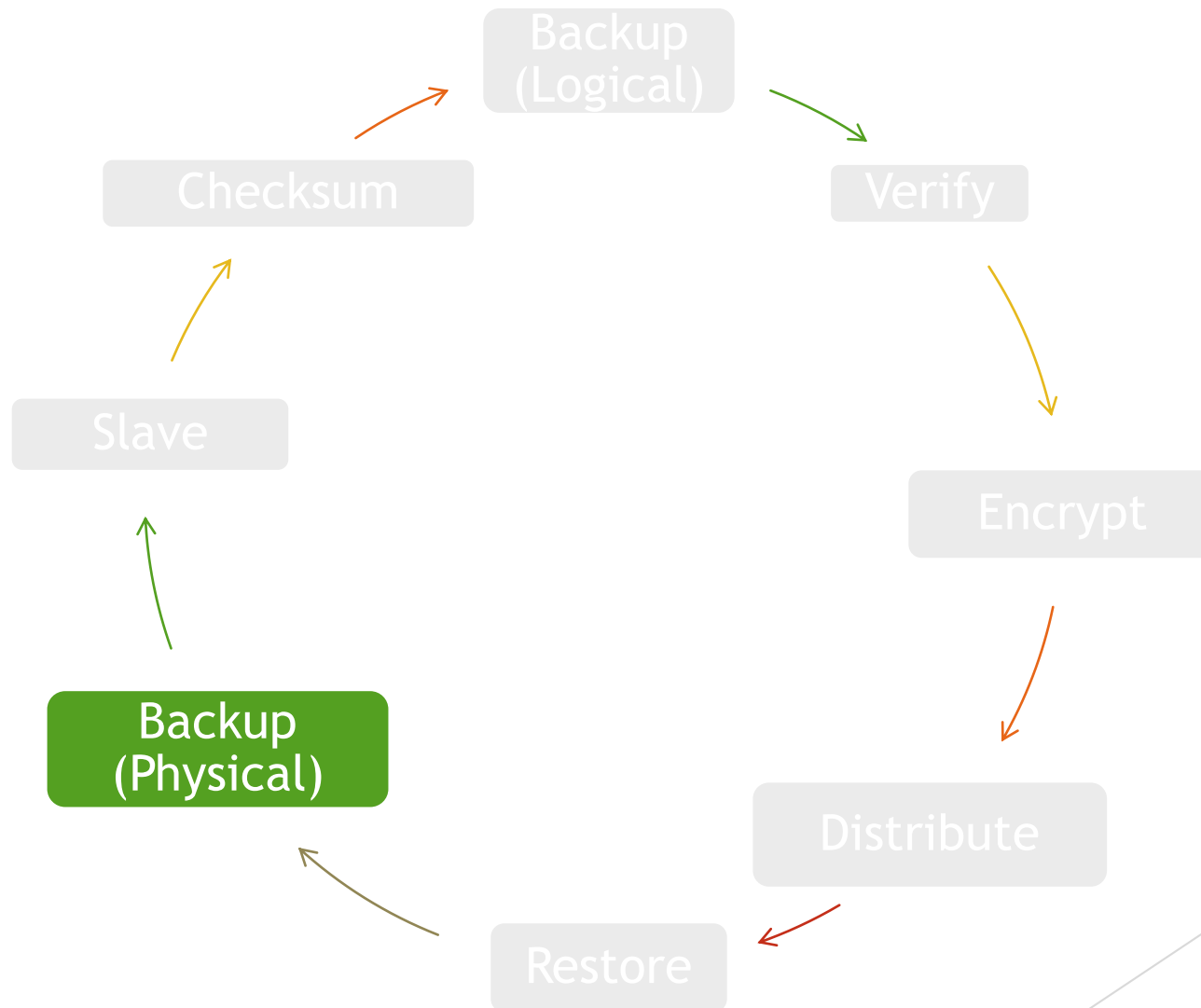
Restore



Restore

- ▶ Drop everything on MySQL restore instance
- ▶ Restore dump
- ▶ Check exit status of mysql command

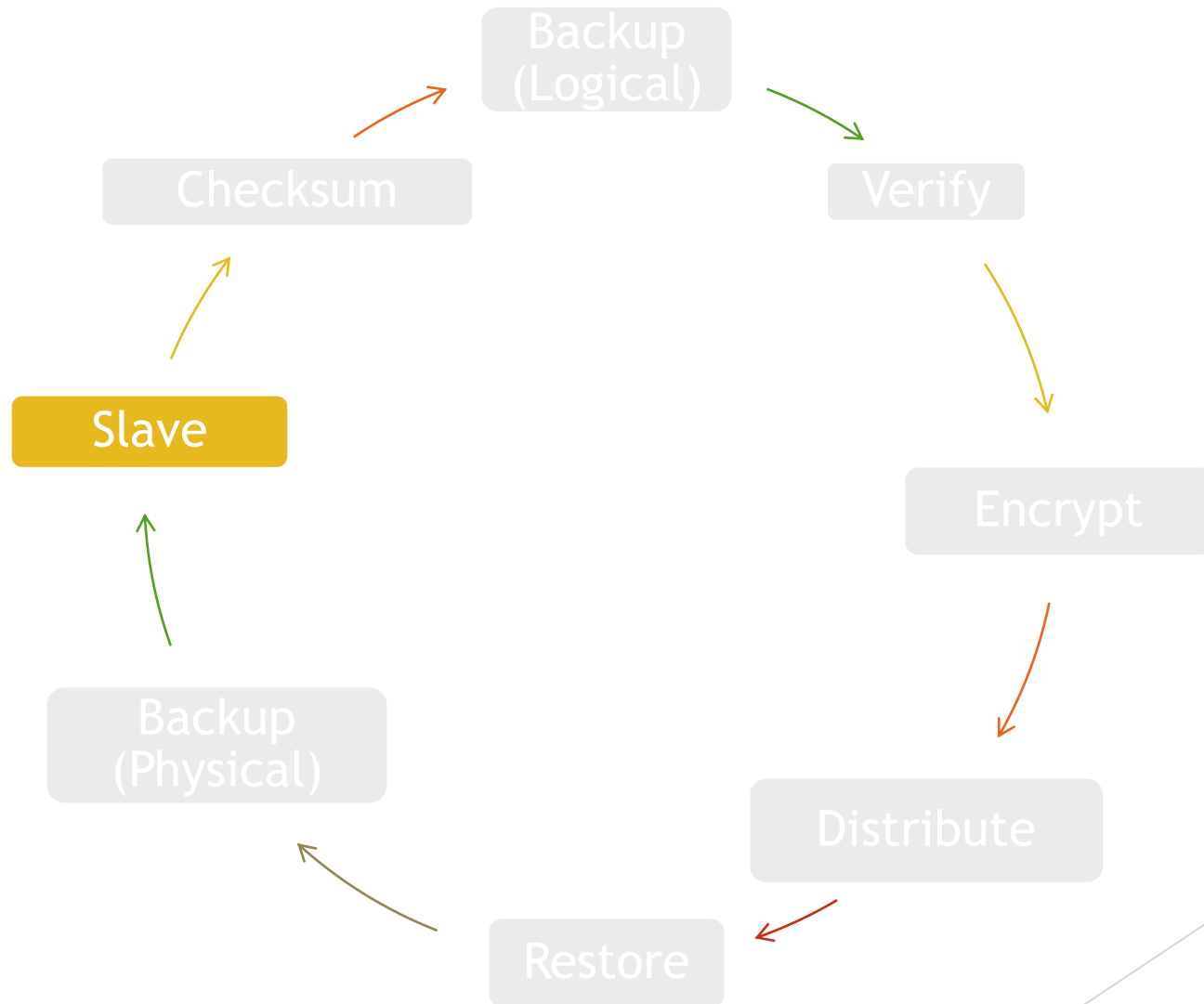
Physical Backup - Fast Recovery



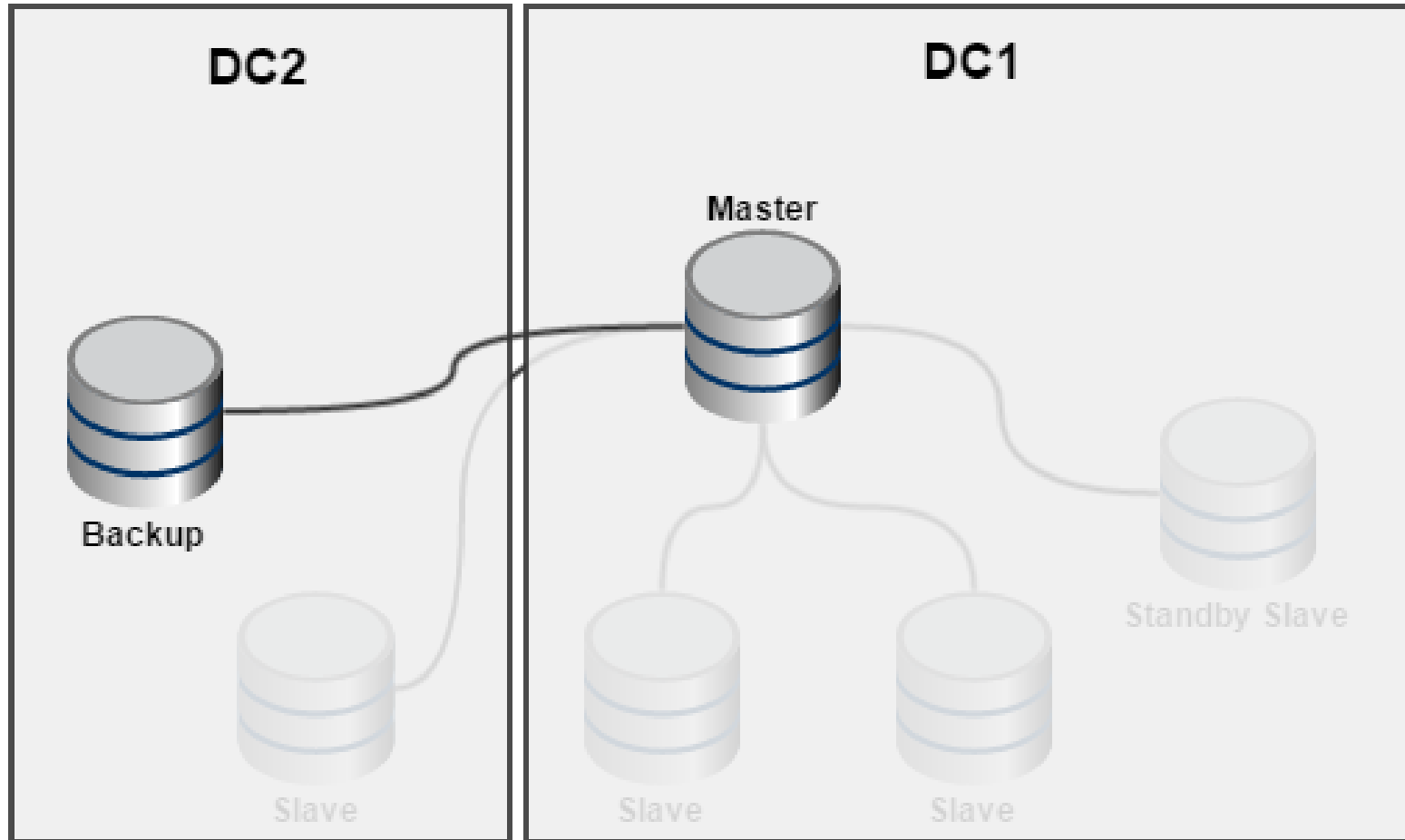
Physical Backup - Fast Recovery

- ▶ Stop MySQL
- ▶ Compress datadir
- ▶ Encrypt file

Slave



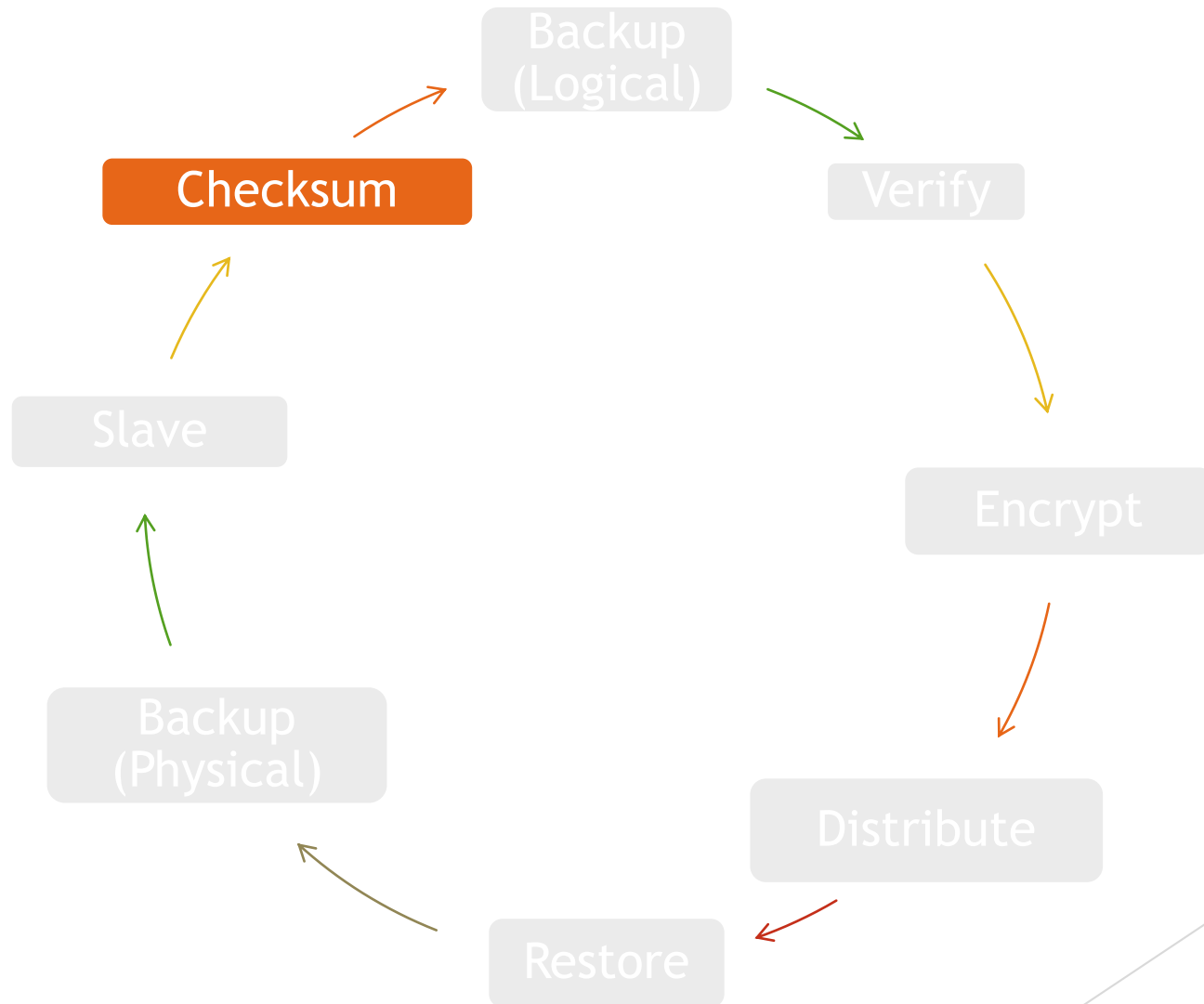
Slave



Slave

- ▶ Configure restore server as slave
- ▶ Use `--master-data`
- ▶ Use `--relay-log-info-repository=TABLE`
- ▶ Use `Relay_Master_Log_File` and `Exec_Master_Log_Pos` from `SHOW SLAVE STATUS`
- ▶ Use GTID

Checksum



Checksum

- ▶ Verify data integrity between master and slaves
- ▶ `pt-table-checksum`
- ▶ Monitor time

Backup binlog - Point in time recovery

- ▶ `mysqlbinlog --raw --read-from-remote-server --stop-never`
- ▶ Checksum master binlog and backup binlog
- ▶ Compress
- ▶ Encrypt

Audit Copy

- ▶ Allows you to restore your database to any point in time
- ▶ Grouped by month
- ▶ First Logical and Physical backup of each month
- ▶ All binary logs

Questions?

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