#Fosdem 2014 #MySQL & Friends
#devroom

15 Tips to improve your Galera Cluster Experience

MariaDB PERCONA MySQL

Who am I ?

- Frédéric Descamps “lefred”
- @lefred
- http://about.me/lefred
- Percona Consultant since 2011
- Managing MySQL since 3.23
- devops believer
- I installed my first galera cluster in feb 2010

Who am I ?

- Fré
- @le
- http
- Per
- Ma
- dev
- I ins 010

Ready for countdown ?


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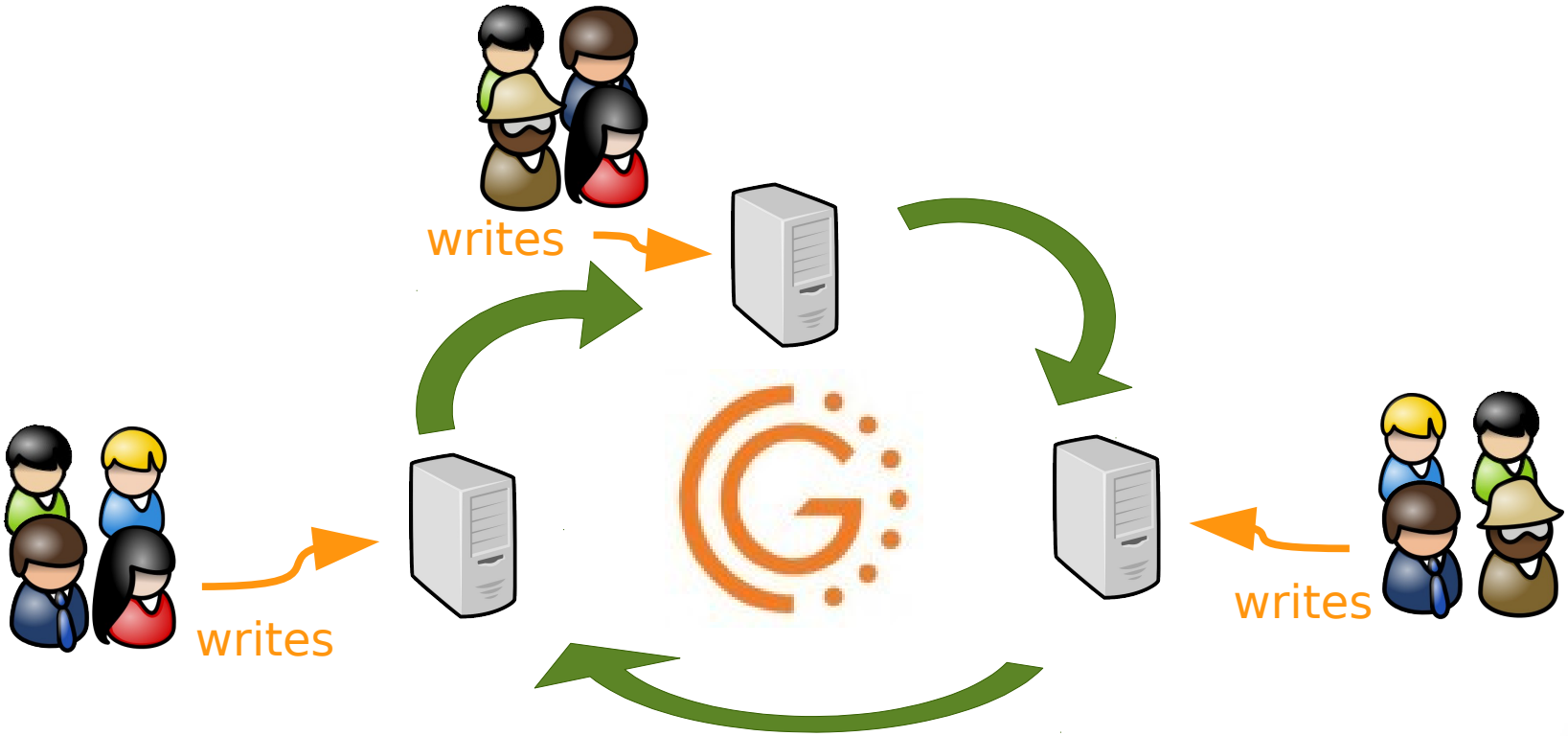
How to perform point in time recovery ?

- Binary log must be enabled
- `log-slave-updates` should be enabled

The environment



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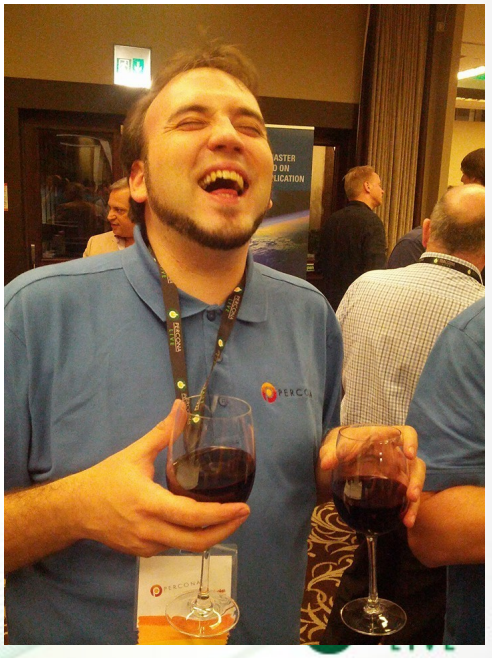
  - The application can keep running even without that table
  - The application musts be stopped !



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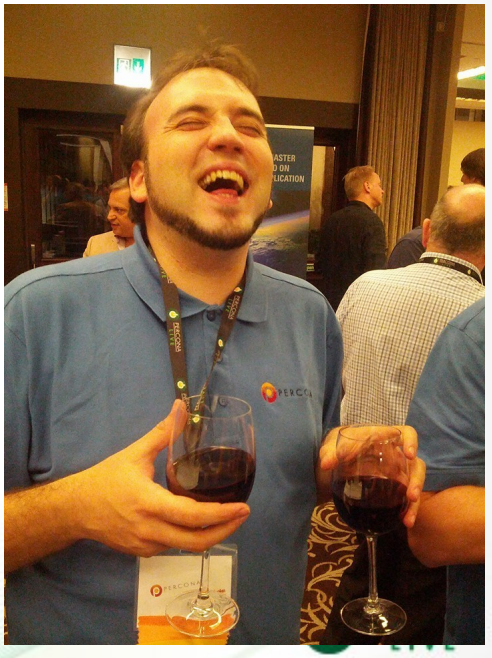

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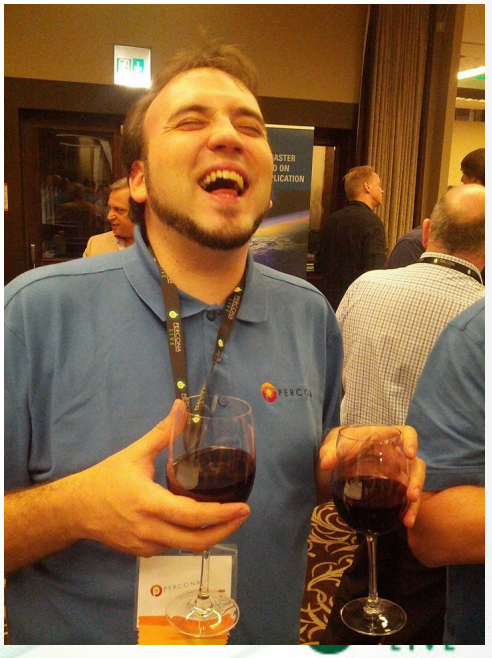

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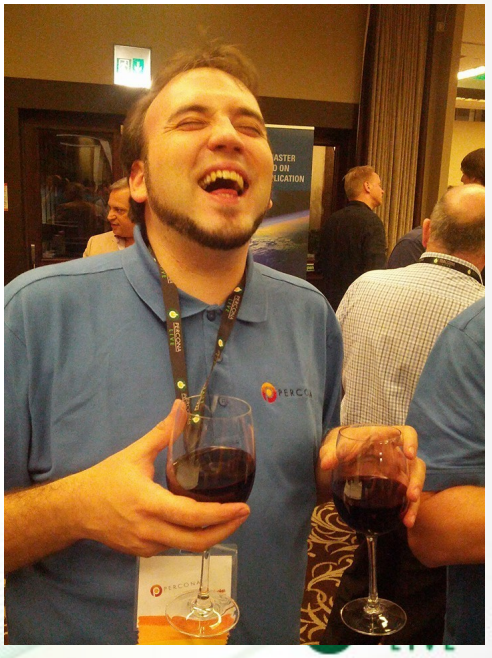

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```
/etc/init.d/mysql stop
or
service mysql stop
```

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```
# mysqlbinlog binlog.000001 | grep truncate -B 2
#140123 23:37:03 server id 1  end_log_pos 1224
Query thread_id=4  exec_time=0 error_code=0
SET TIMESTAMP=1390516623/*!*/;
truncate table speakers
```

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```
# cp binlog.00001 ~
# innobackupex --apply-log .
etc..
```

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```
# /etc/init.d/mysql bootstrap-pxc
```

- Stop the each node of the cluster
- Find the binlog file and position before “the event” happened
- Restore the backup on one node
- Restart that node (being sure the application doesn't connect to it)

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```
# cat xtrabackup_binlog_info
Binlog.000001   565
# mysqlbinlog binlog.000001 | grep end_log_pos | \
grep 1224 -B 1
#140123 23:36:53 server id 1  end_log_pos 1136
#140123 23:37:03 server id 1  end_log_pos 1224
# mysqlbinlog binlog.000001 -j 565 \
--stop-position 1136 | mysql
```

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  - Take care of quorum (add garbd, change pc.weight, pc.ignore_quorum)
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  - Remove one node from the cluster (and be sure the app doesn't connect to it, load-balancer...)

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- Restore the backup on the node we stopped
- Start mysql without joining the cluster (--wsrep-cluster-address=dummy://)
- Replay the binary log until the position of “the event”
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- Import it on the cluster
- Restart mysql on the off-line node and let it perform SST

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Reduce “donation” time during XtraBackup SST

- When performing SST with Xtrabackup the donor can still be active
- by default this is disabled in clustercheck (`AVAILABLE_WHEN_DONOR=0`)
- Running Xtrabackup can increase the load (CPU / IO) on the server

Reduce “donation” time during XtraBackup SST (2)

- Using Xtrabackup 2.1 features helps to reduce the time of backup on the donor

```
[mysqld]
wsrep_sst_method=xtrabackup-v2
wsrep_sst_auth=root:dim0DidItAgain

[sst]
streamfmt=xbstream

[xtrabackup]
compress
compact
parallel=8
compress-threads=8
rebuild-threads=8
```

compress & compact can reduce the size of payload transferred among nodes but in general it slows down the process


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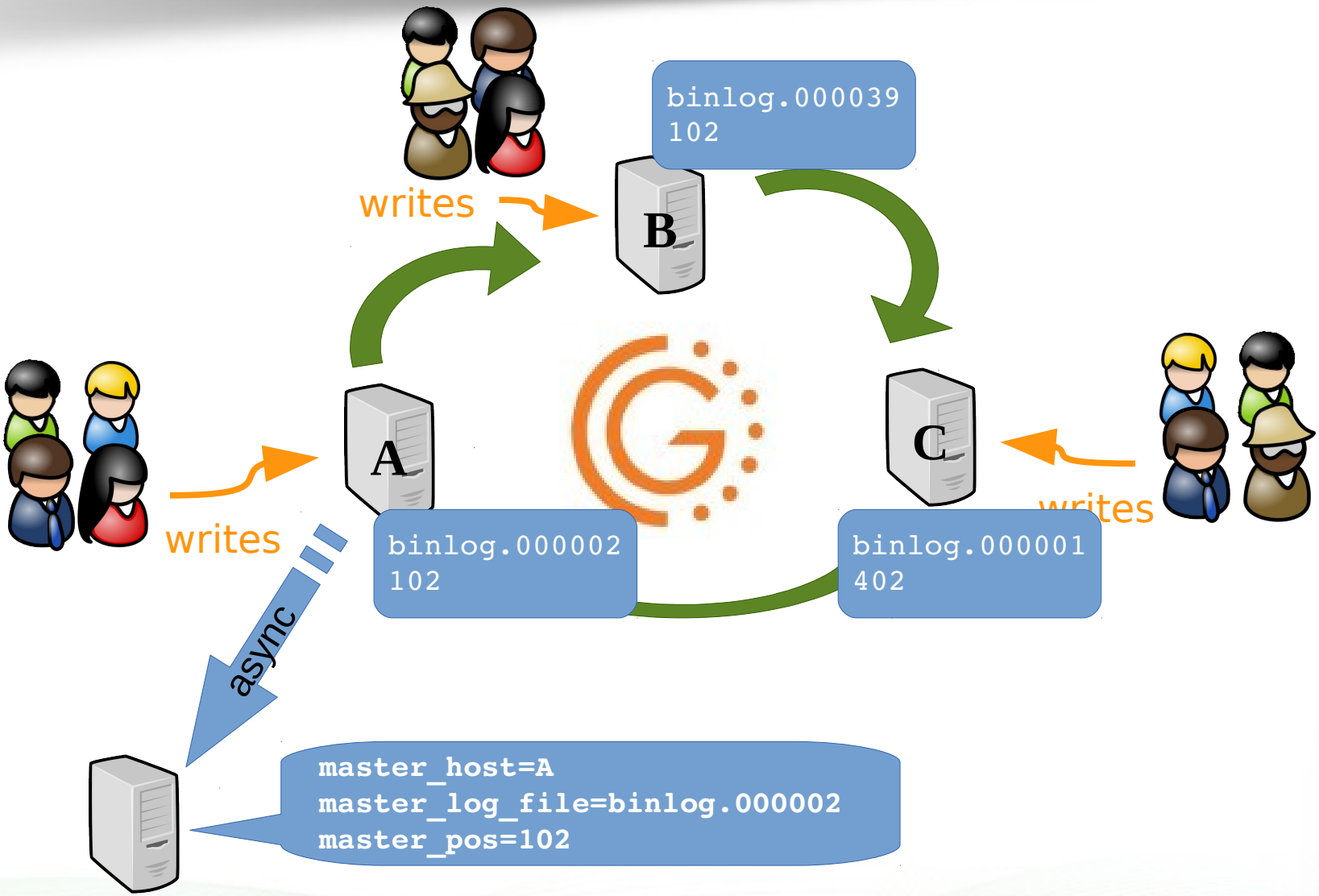
Move asynchronous slave to a new master in 5.5



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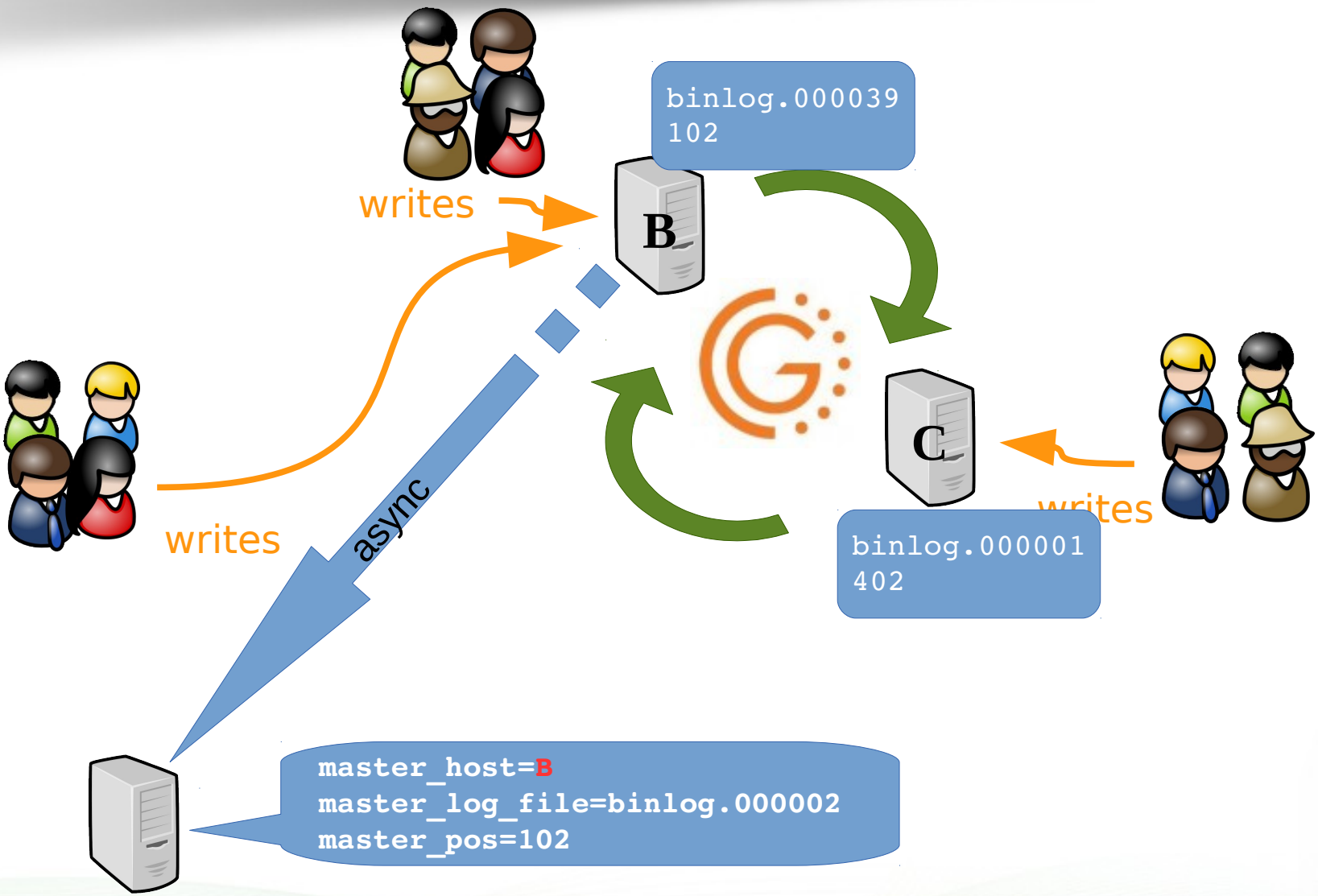

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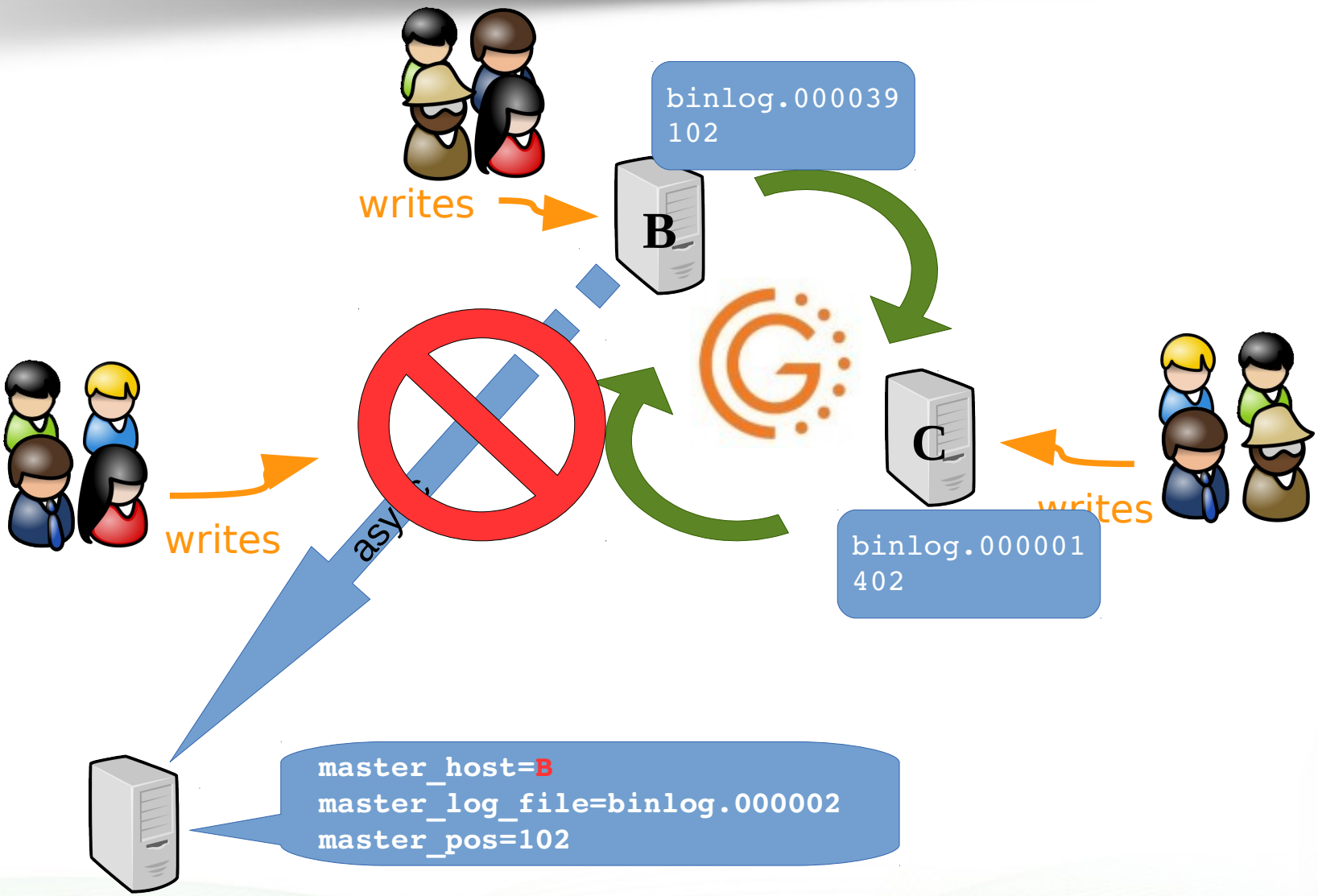

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```
# mysqlbinlog  percona4-relay-bin.000002 | tail
MjM5NDMxMDMxOTEtNTI4NzYxMTUxMDctMTM3NTAyNTI2NjUtNTc1ODY3MTc0MTg=
'/*!*/;
# at 14611057
#140131 12:48:12 server id 1  end_log_pos 29105924   Xid = 30097
COMMIT/*!*/;
DELIMITER ;
# End of log file
ROLLBACK /* added by mysqlbinlog */;
/*!50003 SET COMPLETION_TYPE=@OLD_COMPLETION_TYPE*/;
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=0*/;\
```

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- Use the binary log file and the position for your `CHANGE MASTER` statement

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- How can we know which file and position need

```
# mysqlbinlog percona3-bin.000004 | grep 'Xid = 30097'
#140131 12:48:12 server id 1  end_log_pos 28911093    Xid = 30097
```

  async slave (using mysqlbinlog)
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- How can we know which file and position need

```
Async mysql> slave stop;

Async mysql> change master to master_host='percona3',
          -> master_log_file='percona3-bin.000004',
          -> master_log_pos=28911093;

Async mysql> start slave;
```

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- ... but ...
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In /etc/my.cnf:

```
wsrep_provider_options = “gcache.size=1G”
```


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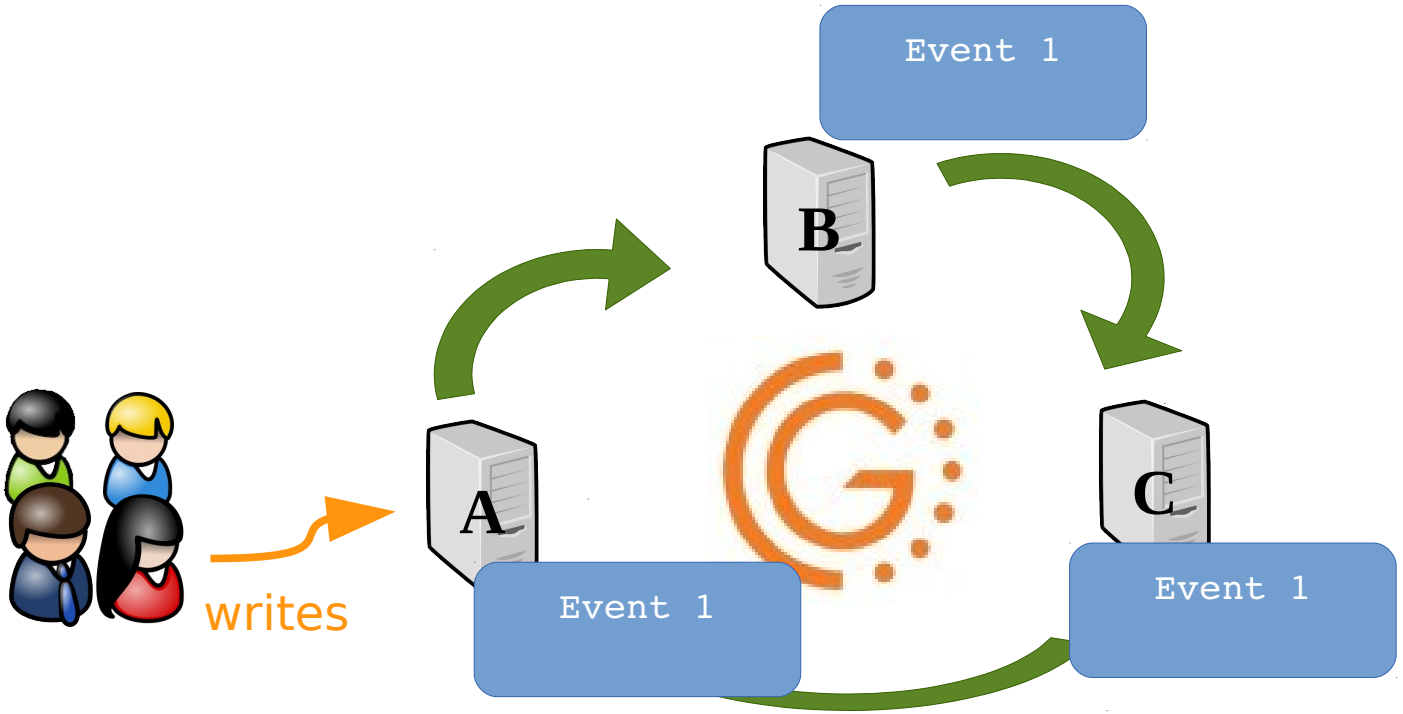
Then choose the right donor !

- Let's imagine this:



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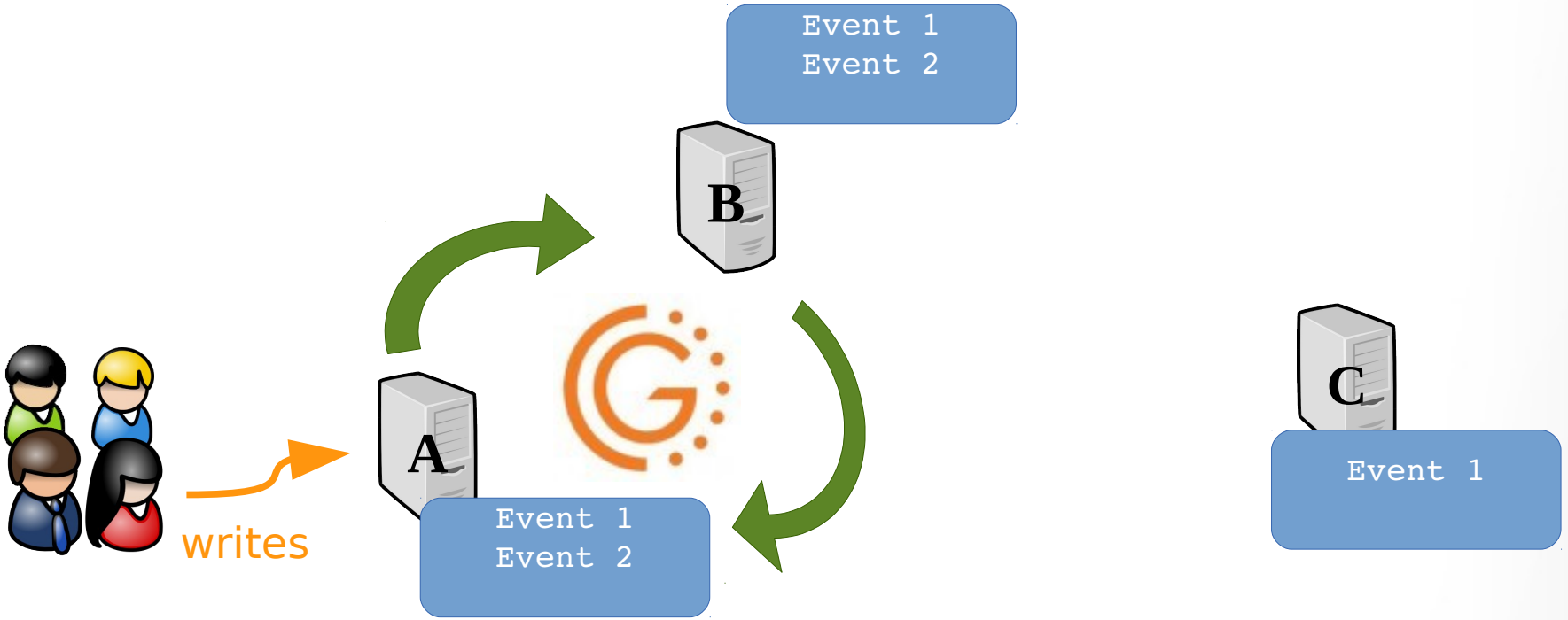

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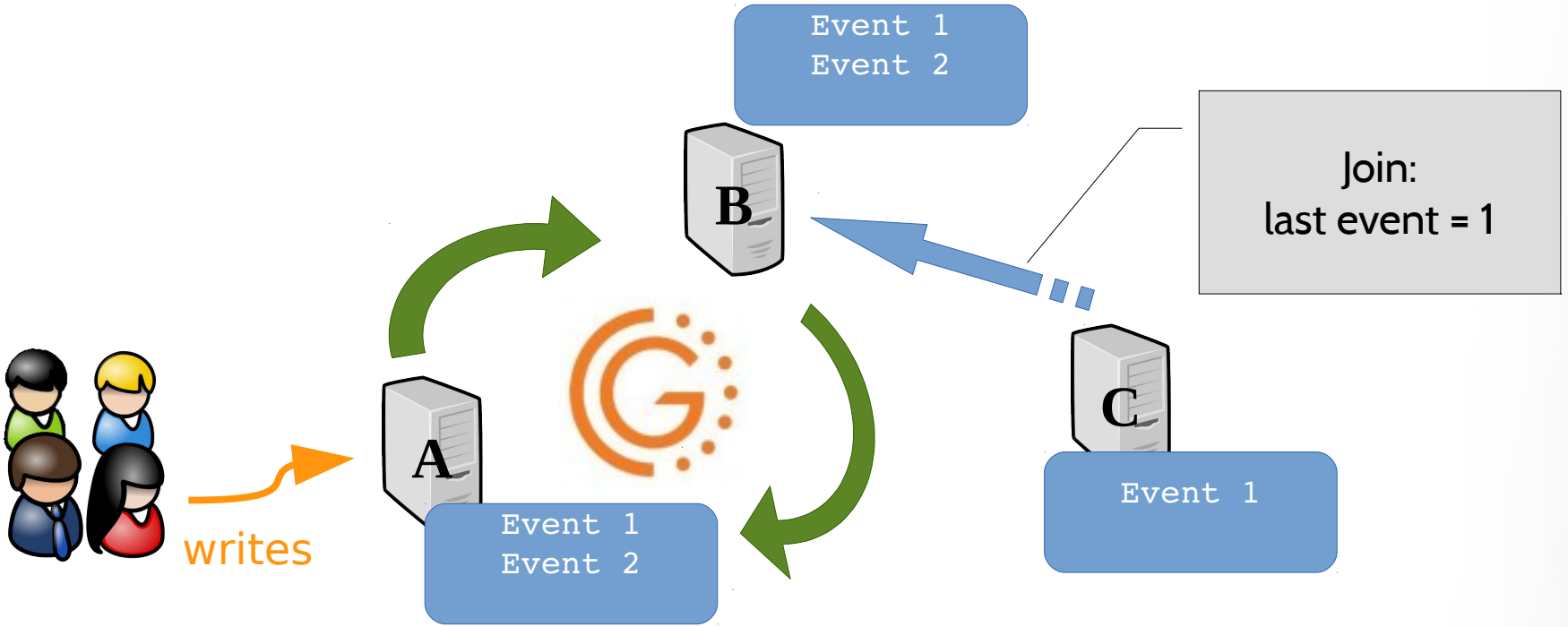

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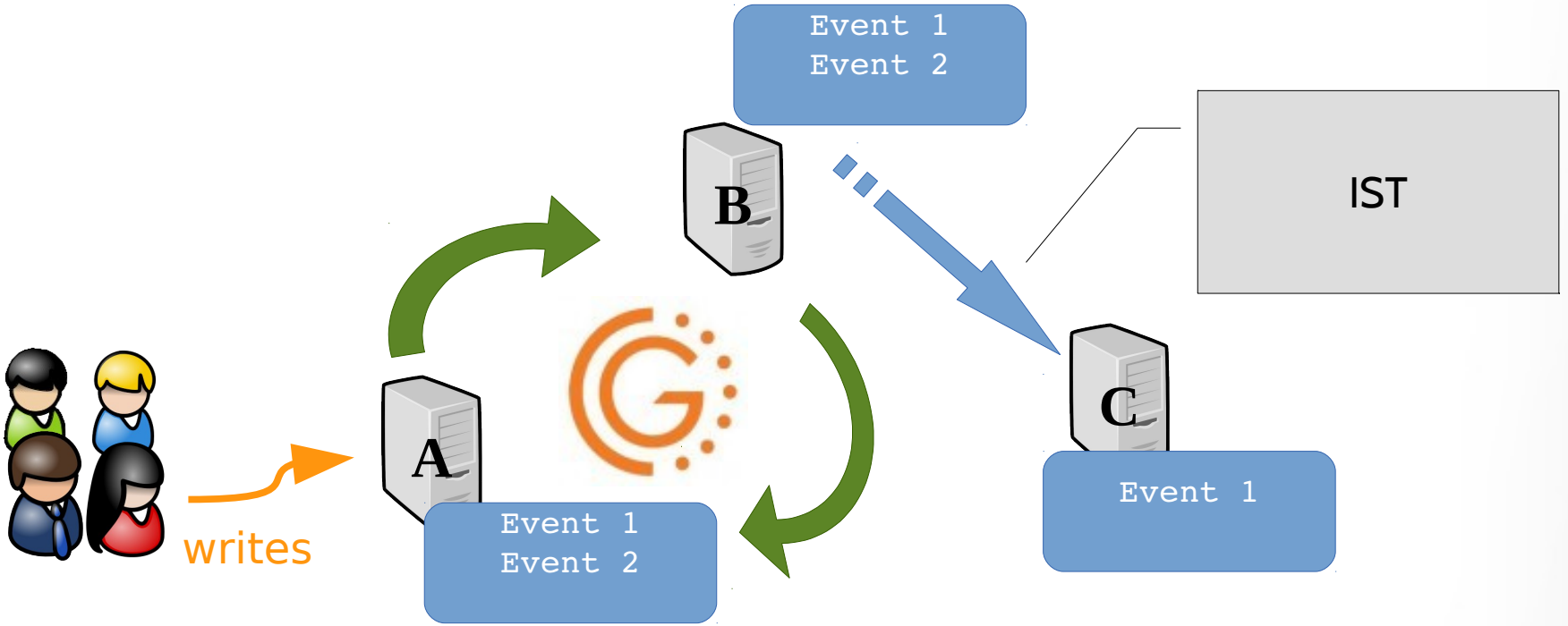

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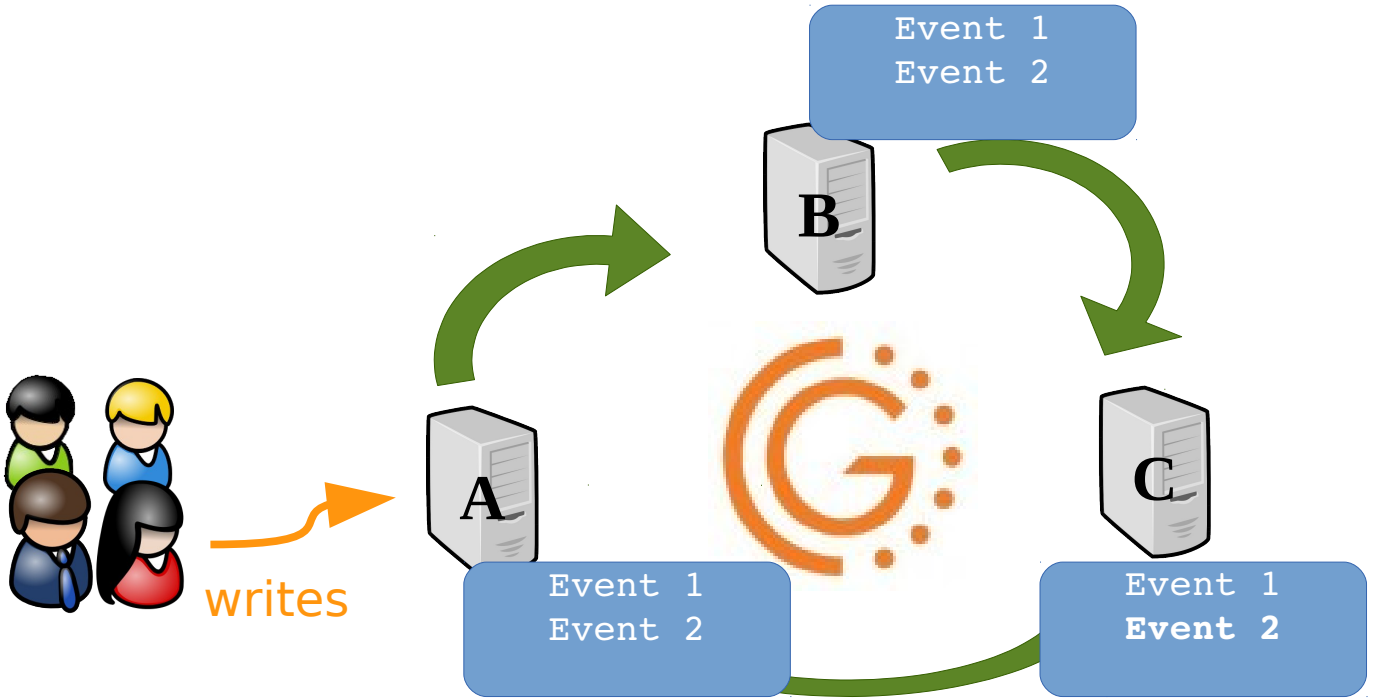

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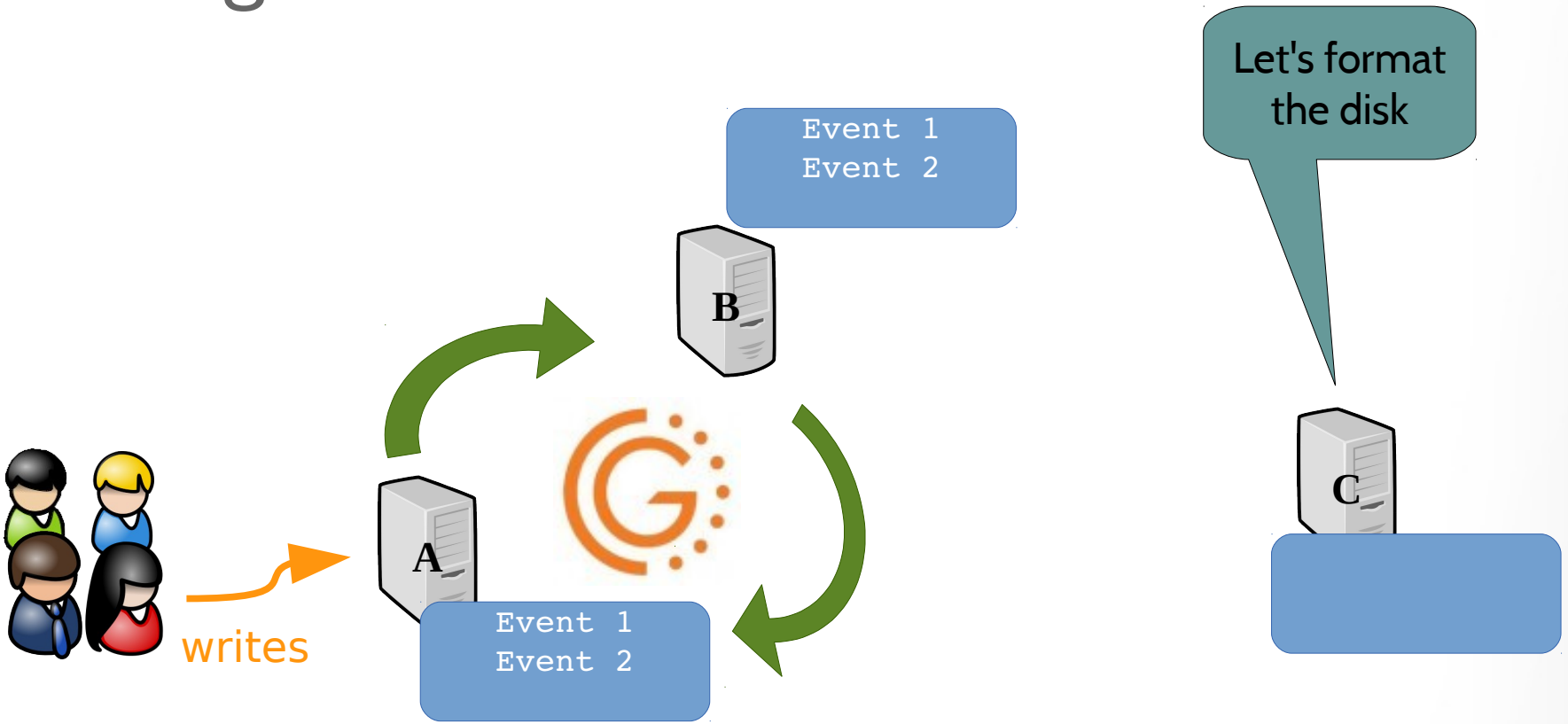

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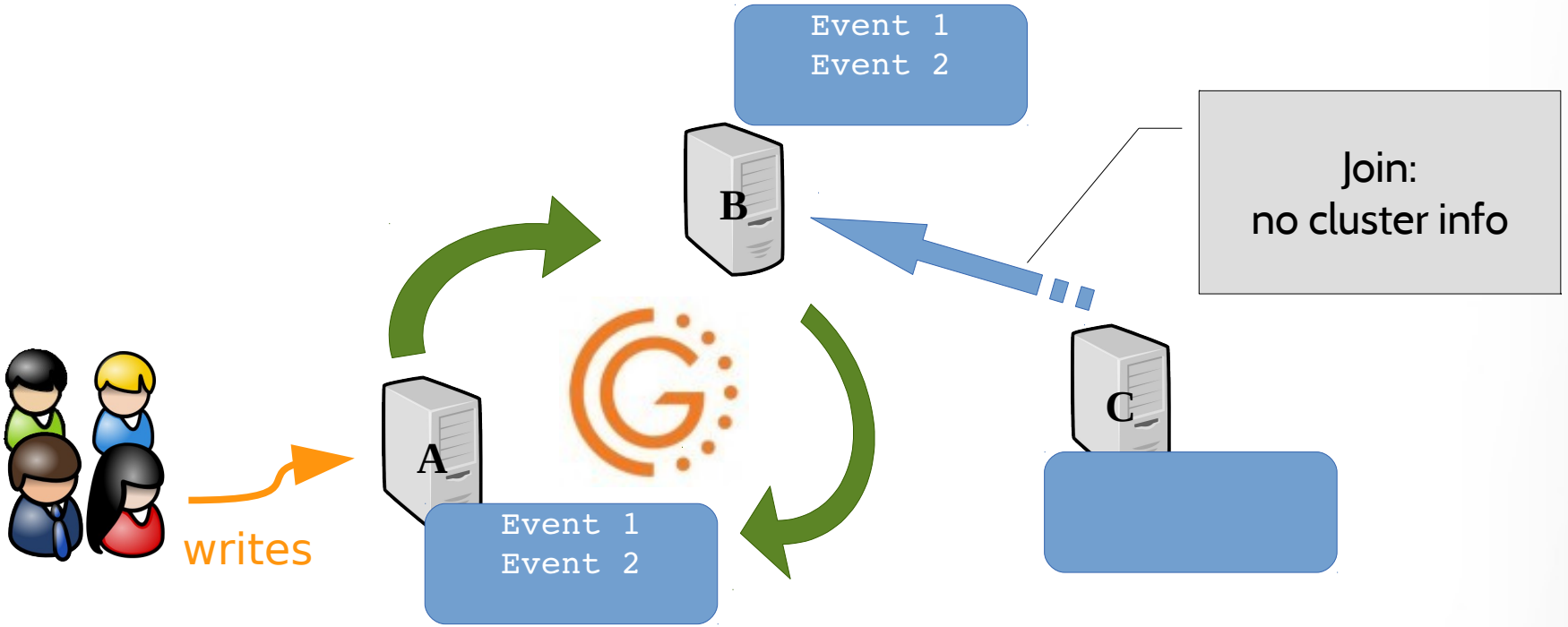
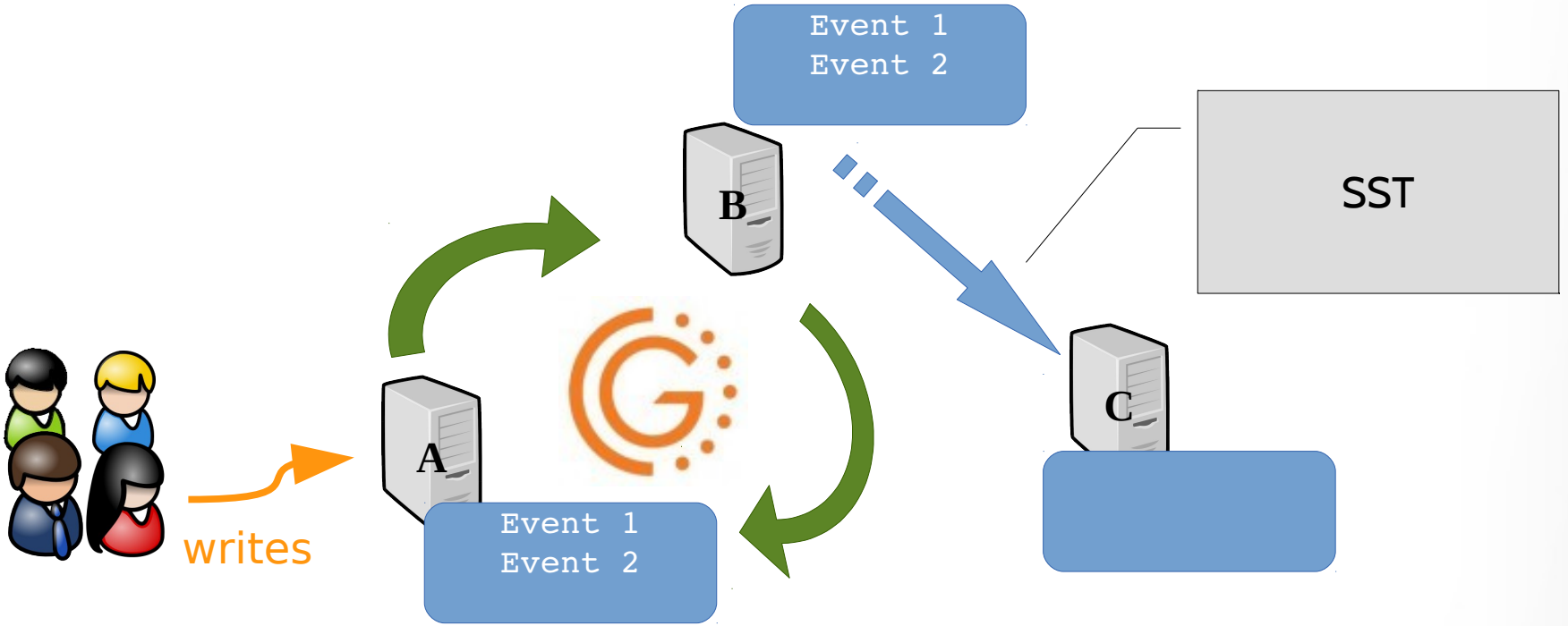


Then choose the right donor ! (8)

- Full SST needed



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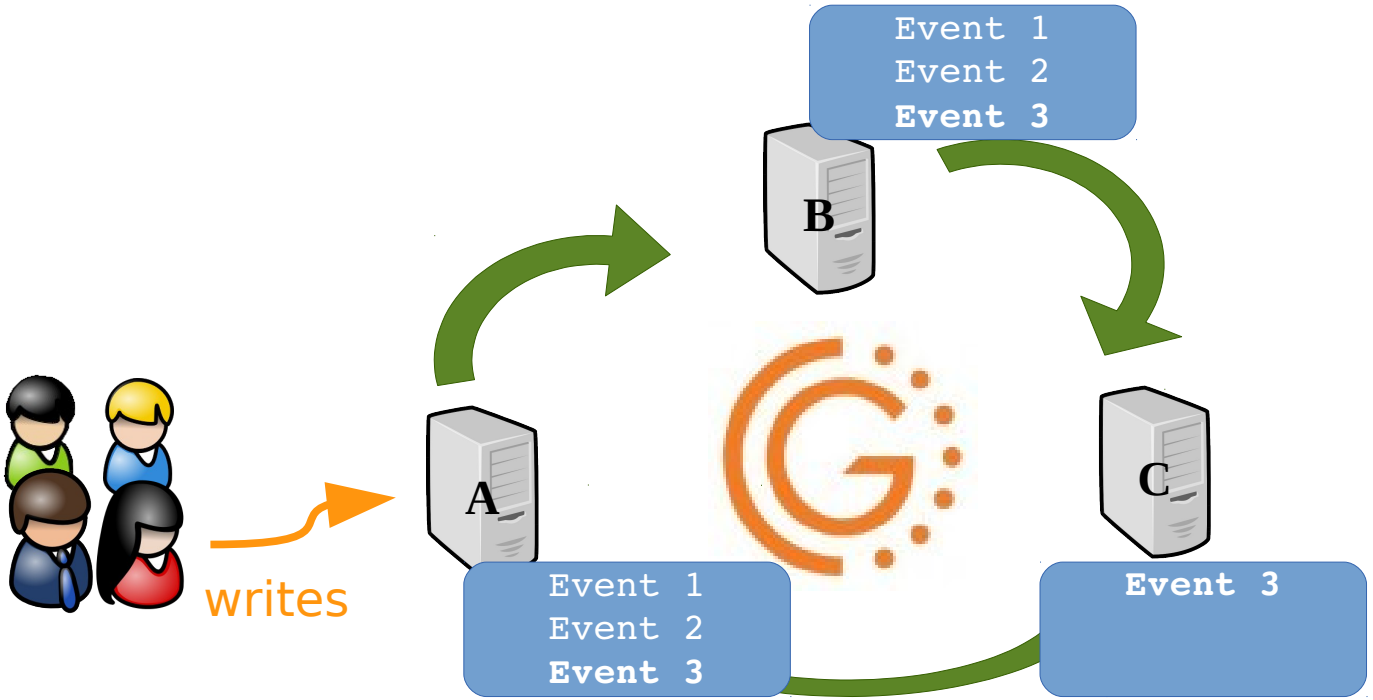
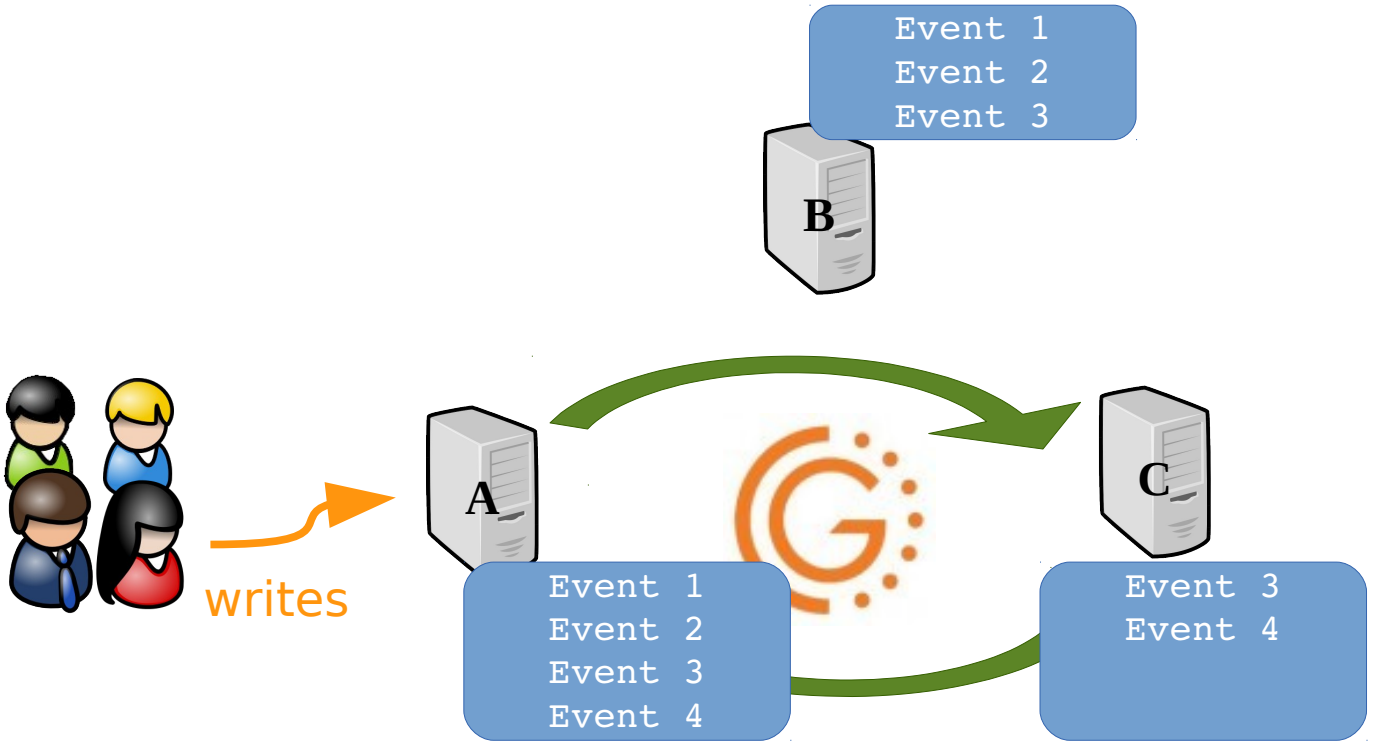
- This is what we have now:



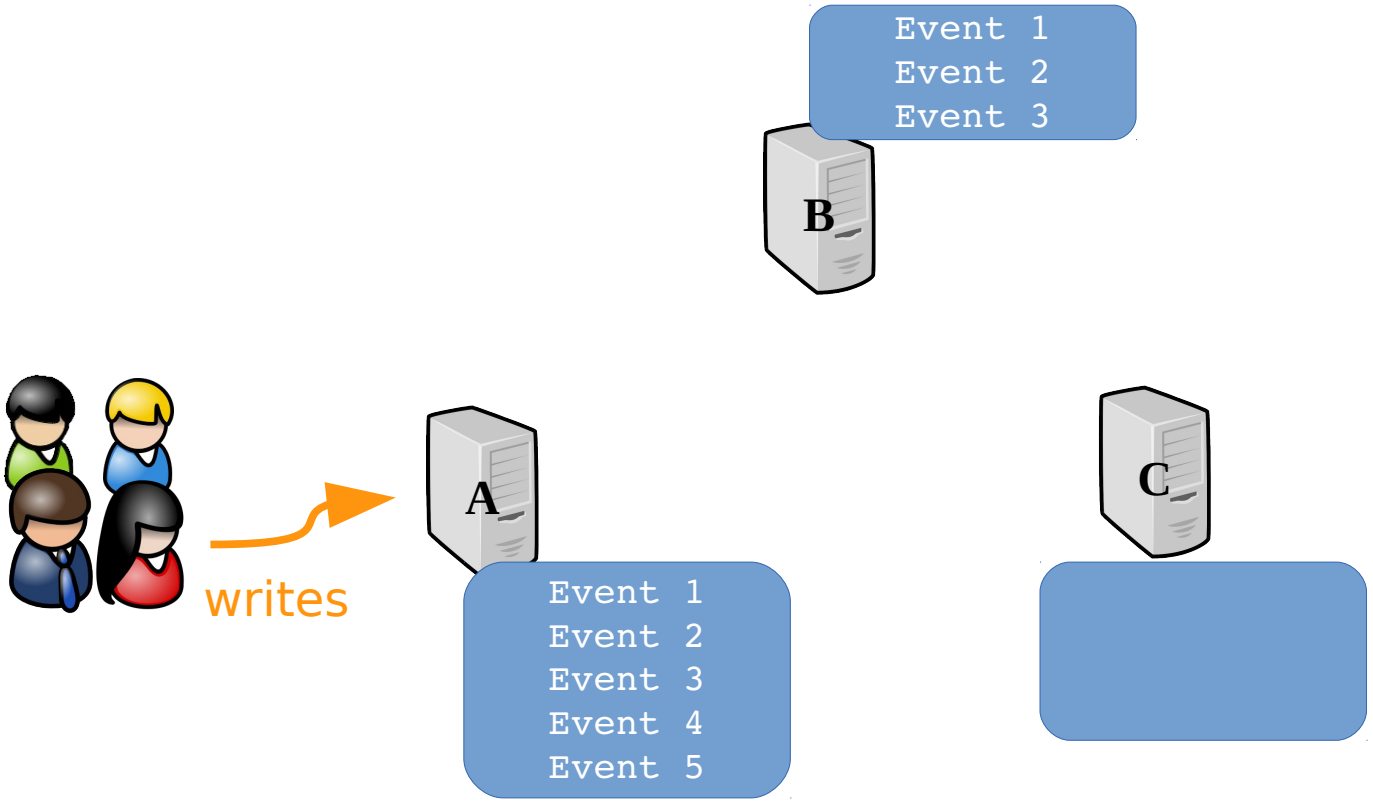
Then choose the right donor ! (10)

- Let's remove **node B** for maintenance



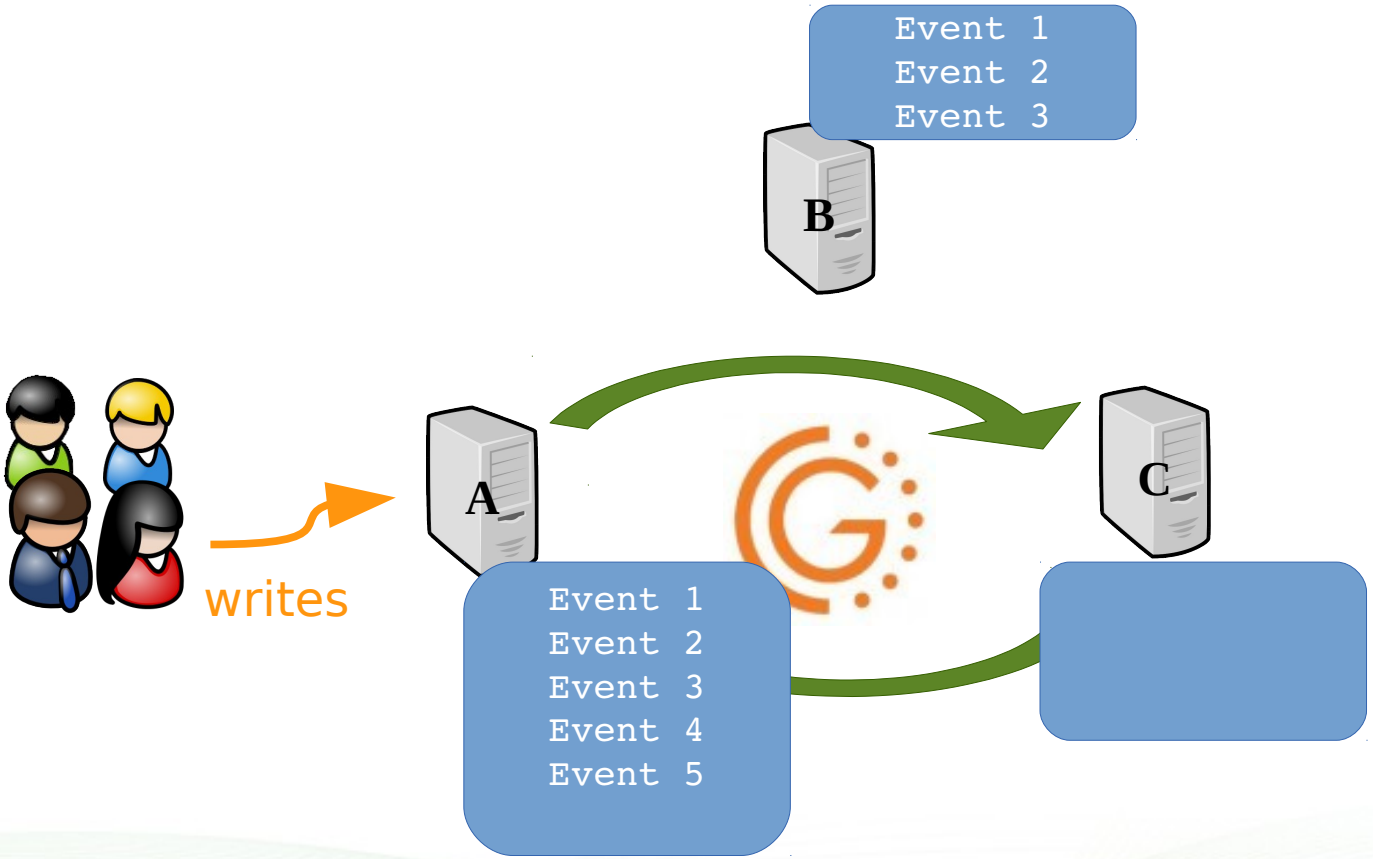
Then choose the right donor ! (11)

- Now let's remove **node C** to replace a disk :-(



Then choose the right donor ! (12)

- Node C joins again and performs SST



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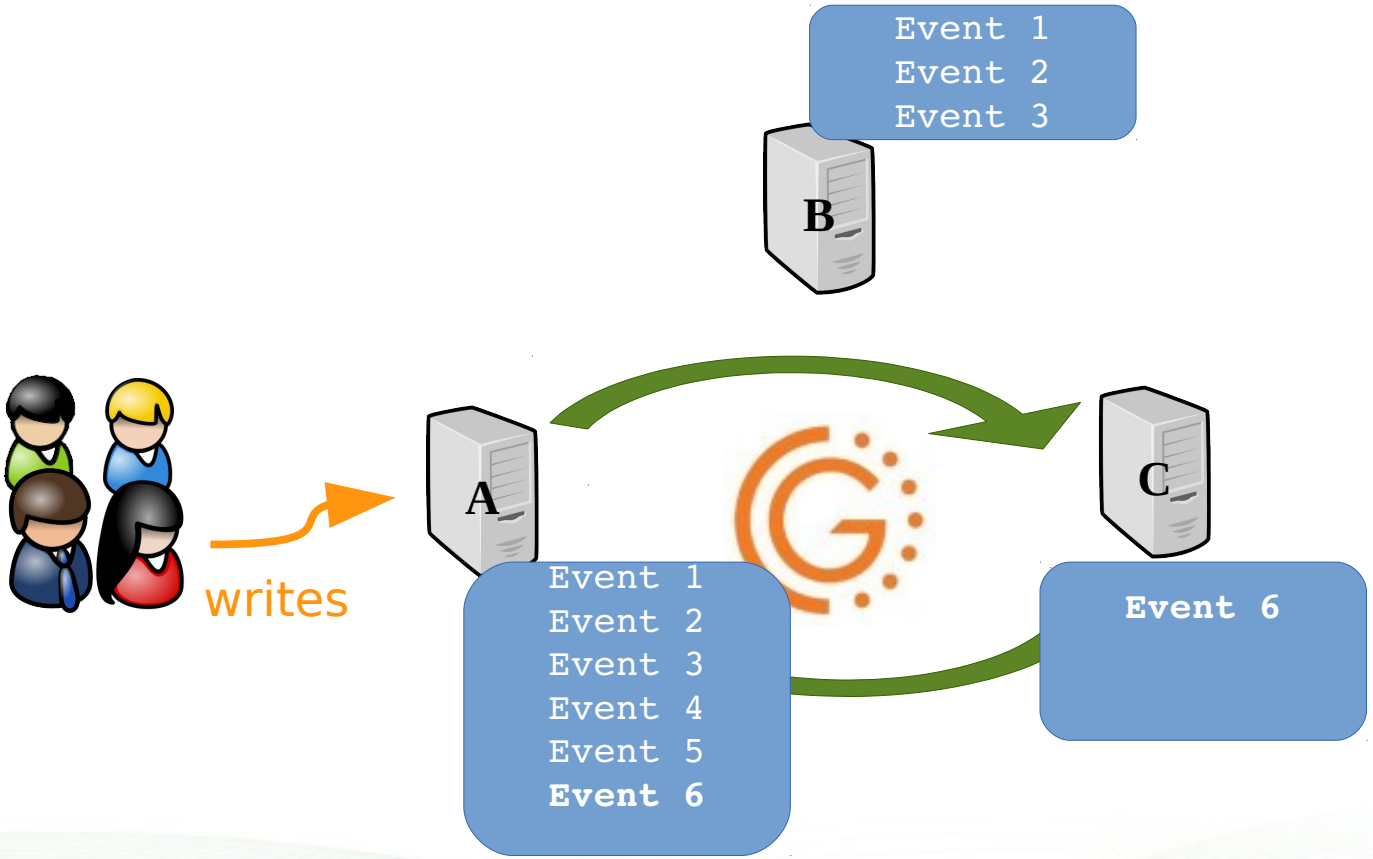
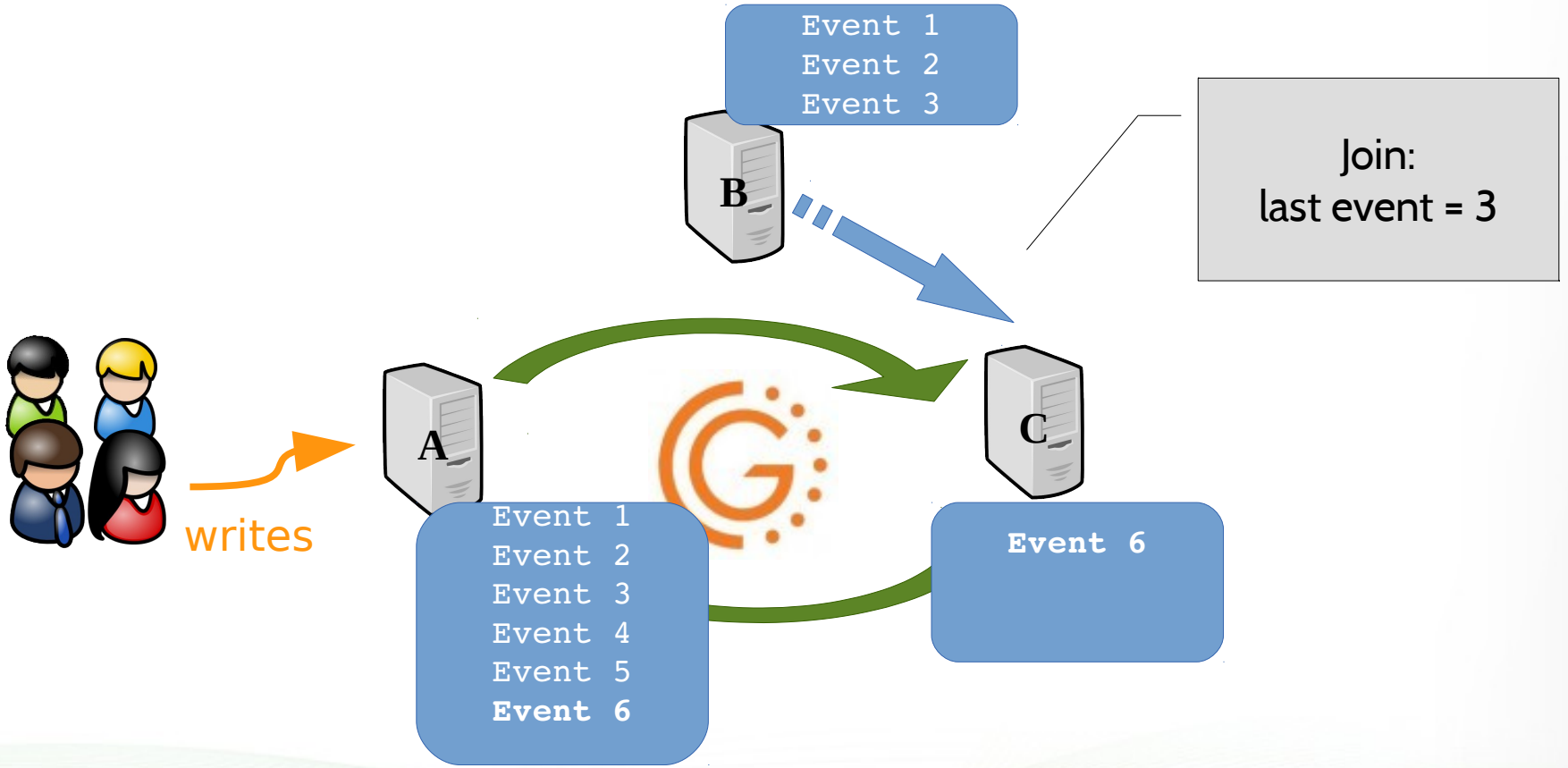


Then choose the right donor ! (13)

- **Node B** joins again but donor selection is not clever yet...

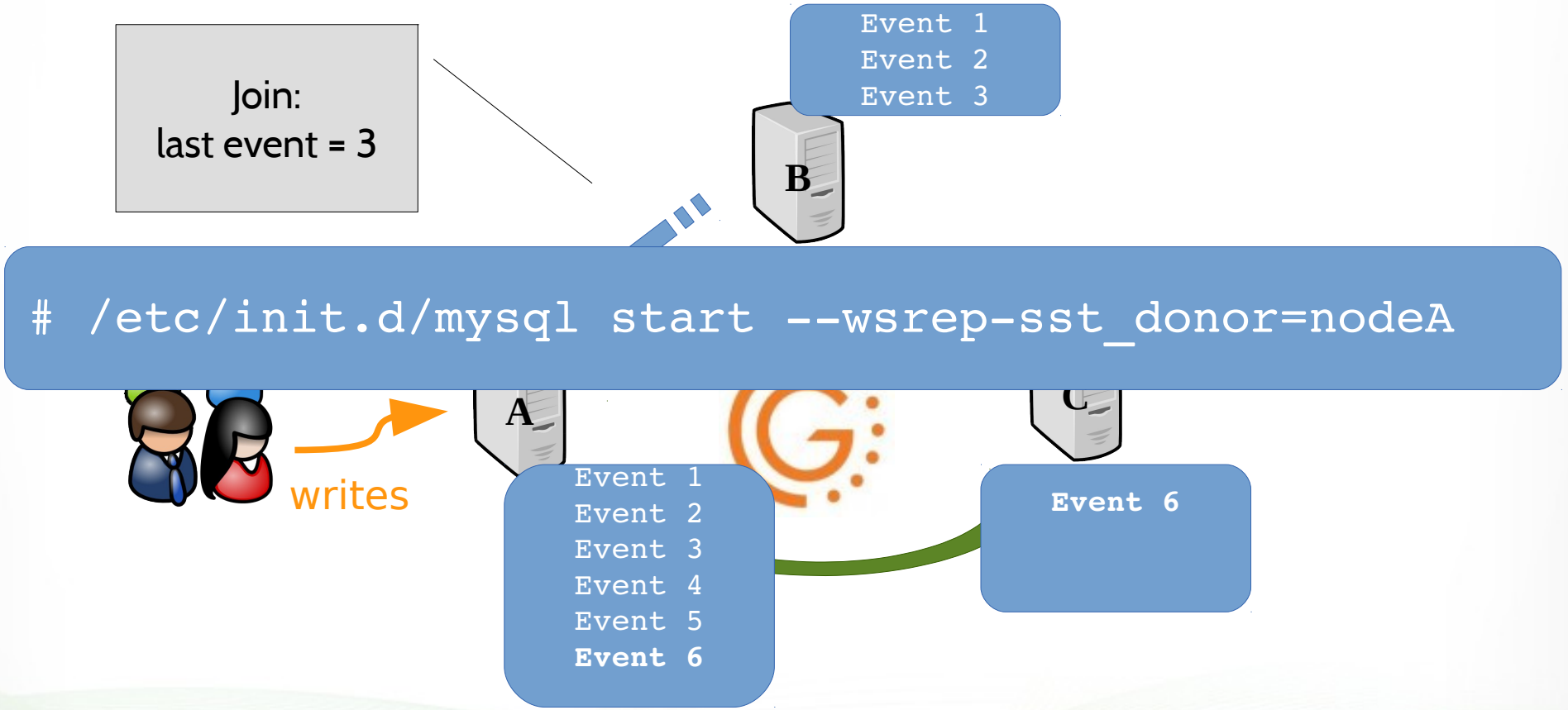


Then choose the right donor ! (13)

- **Node B** joins again but donor selection is not clever yet...

Then choose the right donor ! (14)

- So how to tell **node B** that it needs to use **node A**?



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```
# cat grasdate.dat
# GALERA saved state
version: 2.1
uuid:    41920174-7ec6-11e3-a05a-6a2ab4033f05
seqno:   11
cert_index:
```

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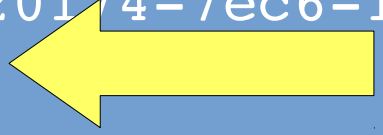

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```
# mysqld_safe --wsrep-recover
140124 10:46:32 mysqld_safe Logging to '/var/lib/mysql/percona1_error.log'.
140124 10:46:32 mysqld_safe Starting mysqld daemon with databases from /var/lib/mysql
140124 10:46:32 mysqld_safe Skipping wsrep-recover
for 41920174-7ec6-11e3-a05a-6a2ab4033f05:11 pair
140124 10:46:32 mysqld_safe Assigning 41920174-7ec6-11e3-a05a-6a2ab4033f05:11
to wsrep_start_position
140124 10:46:34 mysqld_safe mysqld from pid file /var/lib/mysql/percona1.pid ended
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Measuring Max Replication Throughput

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- Since (5.5.33) **`wsrep_desync`** can be used to find out how fast a node can replicate
- The process is to collect the amount of transactions (events) during peak time for a define time range (let's take 1 min)

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```
mysql> pager grep wsrep
mysql> show global status like 'wsrep_last_committed';
    -> select sleep(60);
    -> show global status like 'wsrep_last_committed';

| wsrep_last_committed | 61472 |

| wsrep_last_committed | 69774 |
```

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```

```
69774 – 61472 = 8302
8302 / 60 = 138.36 tps
```

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Measuring Max Replication Throughput

```
set global wsrep_desync=ON; flush tables with read lock;
show global status like 'wsrep_last_committed';
select sleep( 60 ); unlock tables;

+----------------------+--------+
| Variable_name        | Value  |
+----------------------+--------+
| wsrep_last_committed | 145987 |
+----------------------+--------+
```

- Then collect the amount of transactions and the duration to process them after the node was in **desync** mode and not allowing writes
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Measuring Max Replication Throughput

- In another terminal you run myq_gadget and when `wsrep_local_recv_queue` (**`Queue Dn`**) is back to 0 check again the value of `wsrep_last_committed`.

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```
LefredPXC / percona3 / Galera 2.8(r165)
Wsrep    Cluster  Node      Queue    Ops      Bytes      Flow    Conflct PApply        Commit
    time P cnf   #  cmt sta  Up   Dn   Up   Dn   Up   Dn pau snt lcf bfa dst oooe oool wind
13:25:24 P   7   3 Dono T/T   0   8k    0    0    0    0 0.0   0   0   0 125    0    0    0
13:25:25 P   7   3 Dono T/T   0   8k    0  197    0 300K 0.0   0   0   0 145   90    0    2
...
13:26:46 P   7   3 Dono T/T   0    7    0  209    0 318K 0.0   0   0   0 139   62    0    1
13:26:47 P   7   3 Dono T/T   0    0    0  148    0 222K 0.0   0   0   0 140   40    0    1
```

Measuring Max Replication Throughput

- In another terminal you run myq_gadget and when `wsrep_local_recv_queue` (**`Queue Dn`**) is back to 0 check again the value of `wsrep_last_committe`

This is when FTWRL is released

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Measuring Max Replication Throughput

- In another terminal you run myq_gadget and when `wsrep_local_recv_queue` (**Queue**
  ...heck again the value of
  ...ommitte

This is when galera catch up.
wsrep_last_committed = 165871

This is when FTWRL is released

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```

Measuring Max Replication Throughput

- In another gadget and when ws ue (**Queue Dn**) is bac ue of wsrep_l

```
165871 - 145987  = 19884
19884 / 82 = 242.48 tps

We're currently at 57%
of our capacity
```

```
LefredPXC / percona3 / Galera 2.8(r165)
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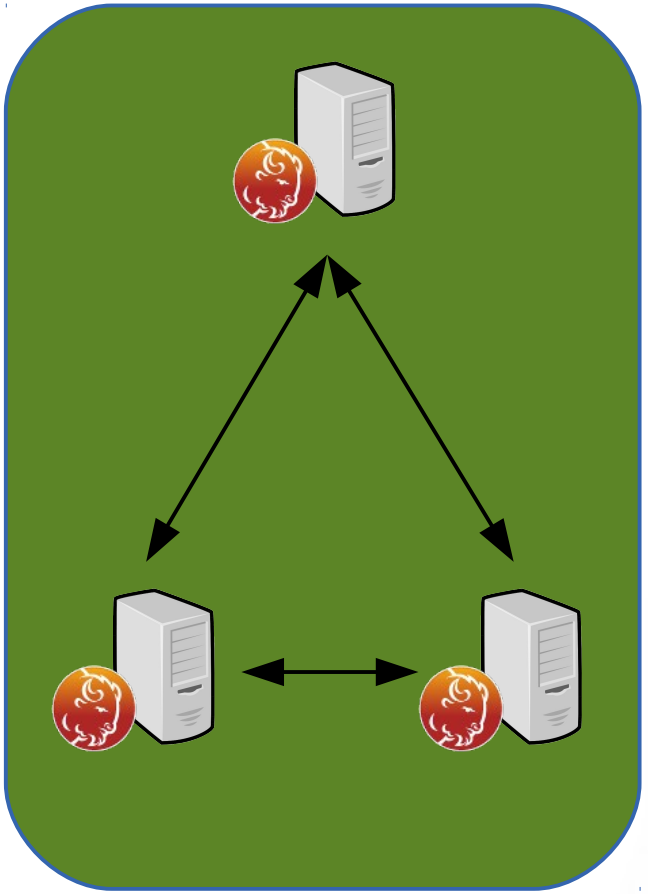
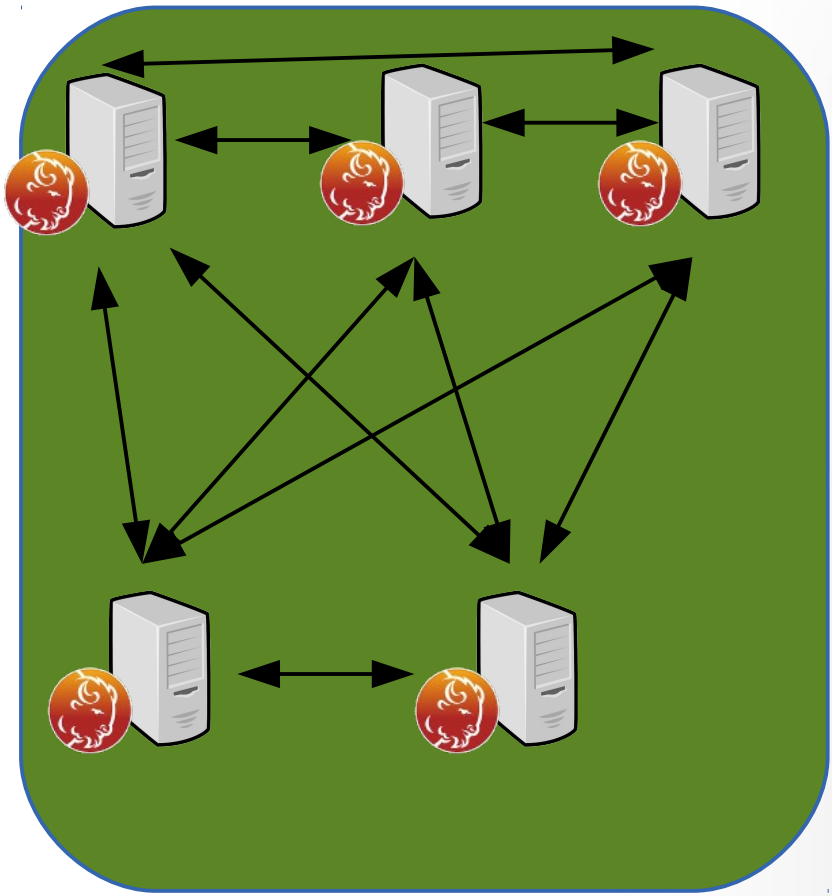
Multicast replication

- By default, galera uses unicast TCP
- 1 copy of the replication message sent to all other nodes in the cluster



Multicast replication (2)

- By default, galera uses unicast TCP
- 1 copy of the replication message sent to all other nodes in the cluster
- More nodes, more bandwidth



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- If your network supports it you can use Multicast UDP for replication
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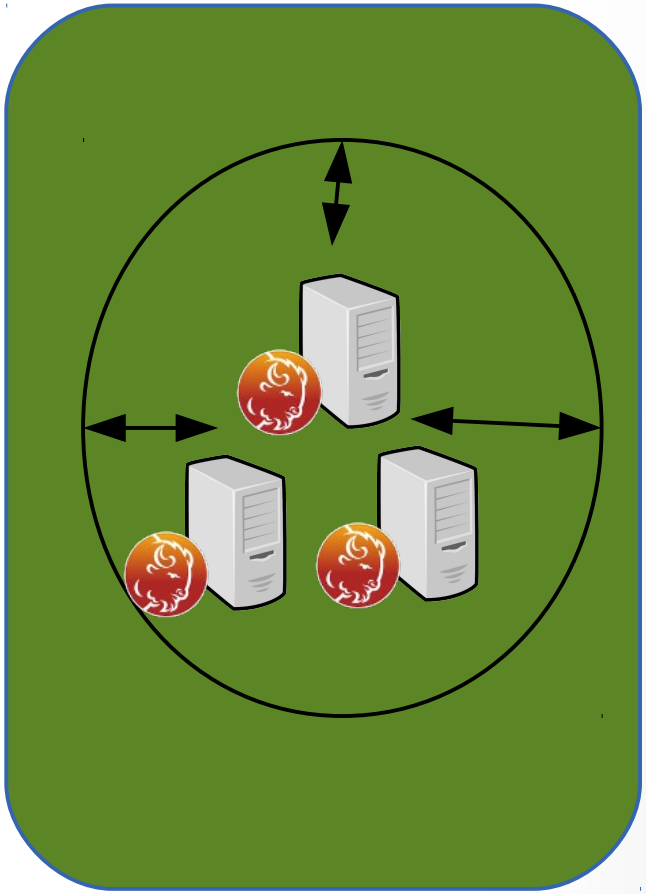

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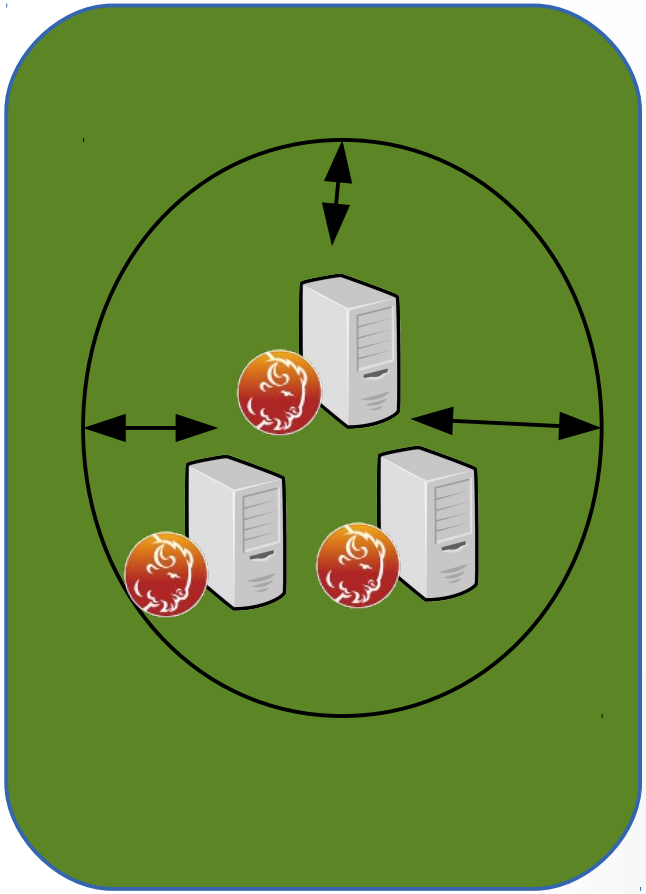

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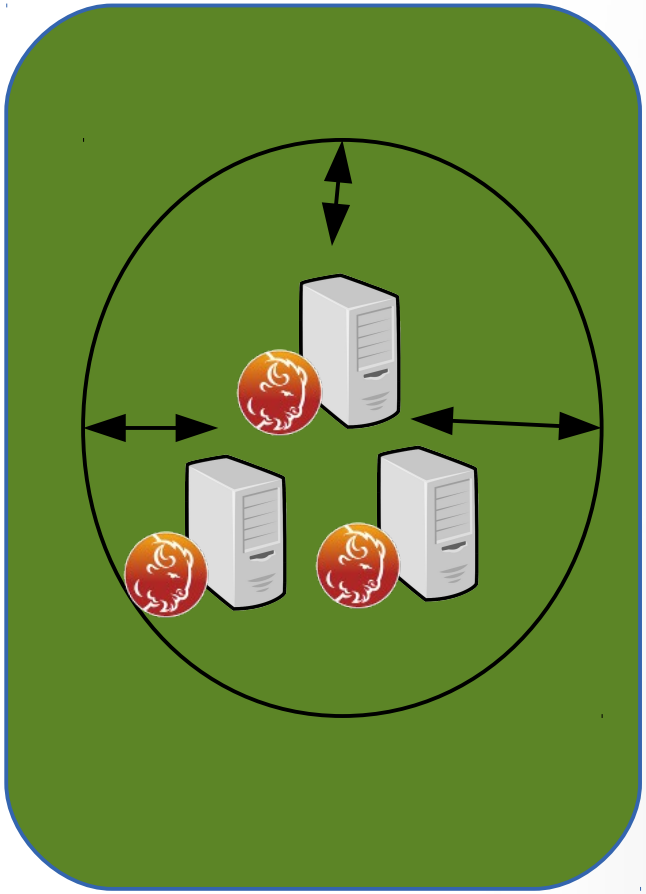


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SSL everywhere !

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- But now it's also possible to have SST over SSL, with xtrabackup_v2 and with rsync
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- Use `wsrep_sst_method=`**`xtrabackup-v2`**

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Decode GRA* files

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- When a replication failure occurs, a **`GRA_*.log`** file is created into the datadir
- For each of those files, a corresponding message is present in the mysql error log file
- Can be a false positive (bad DDL statement)... or not !
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- Join the header and one GRA_*.log file:
  - `cat GRA-header > GRA_3_3-bin.log`
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- Now you can just use `mysqlbinlog -vvv` and find out what the problem was !

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```
wsrep_log_conflicts = 1
wsrep_debug = 1
wsrep_provider_options = “cert.log_conflicts=1”
```


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Avoiding SST when adding a new node

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```
mysql> show global status like 'wsrep_provider_version';
+------------------------+-----------+
| Variable_name          | Value     |
+------------------------+-----------+
| wsrep_provider_version | 2.1(r113) |
+------------------------+-----------+
```

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4
MariaDB
PERCONA
MySQL

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- If a node does not see **more** than 50% of the total amount of nodes, reads/writes are not accepted
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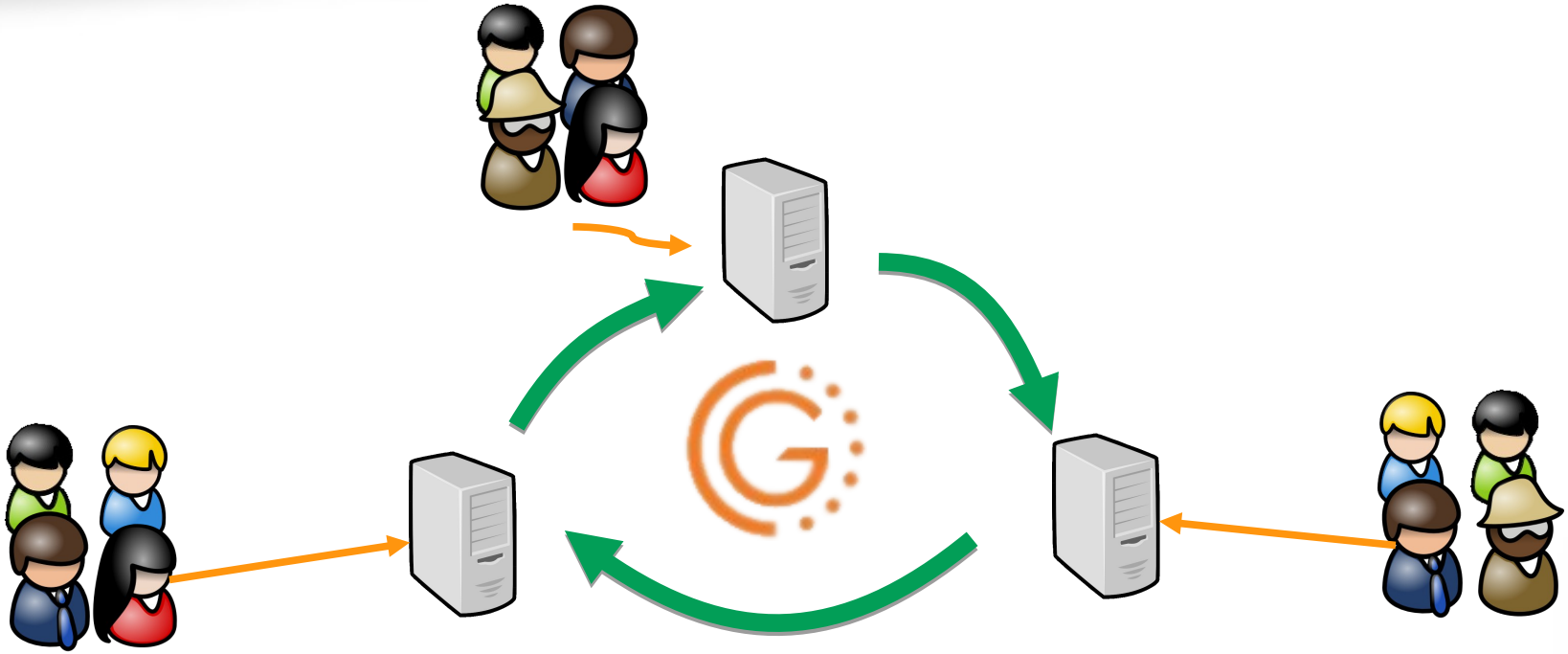

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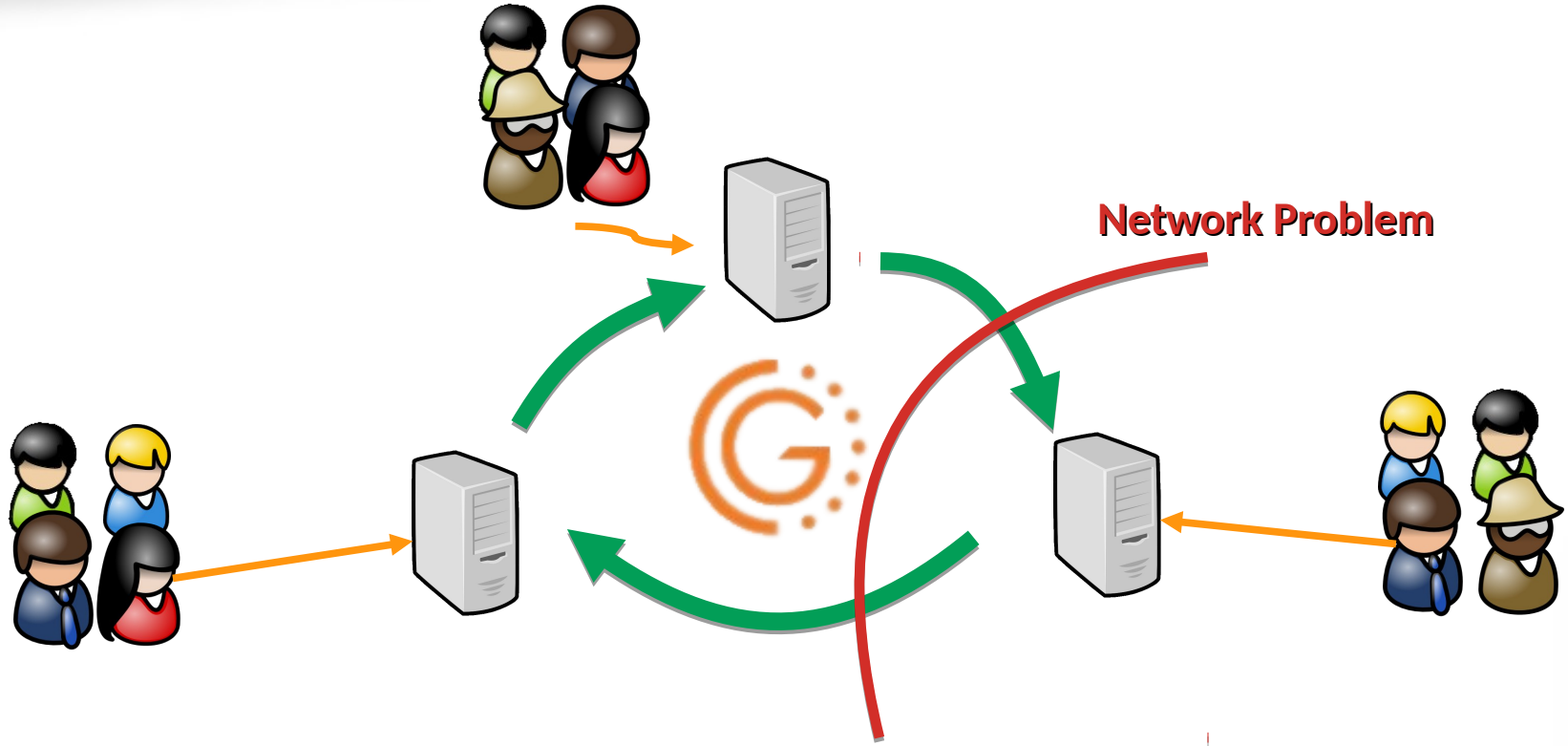

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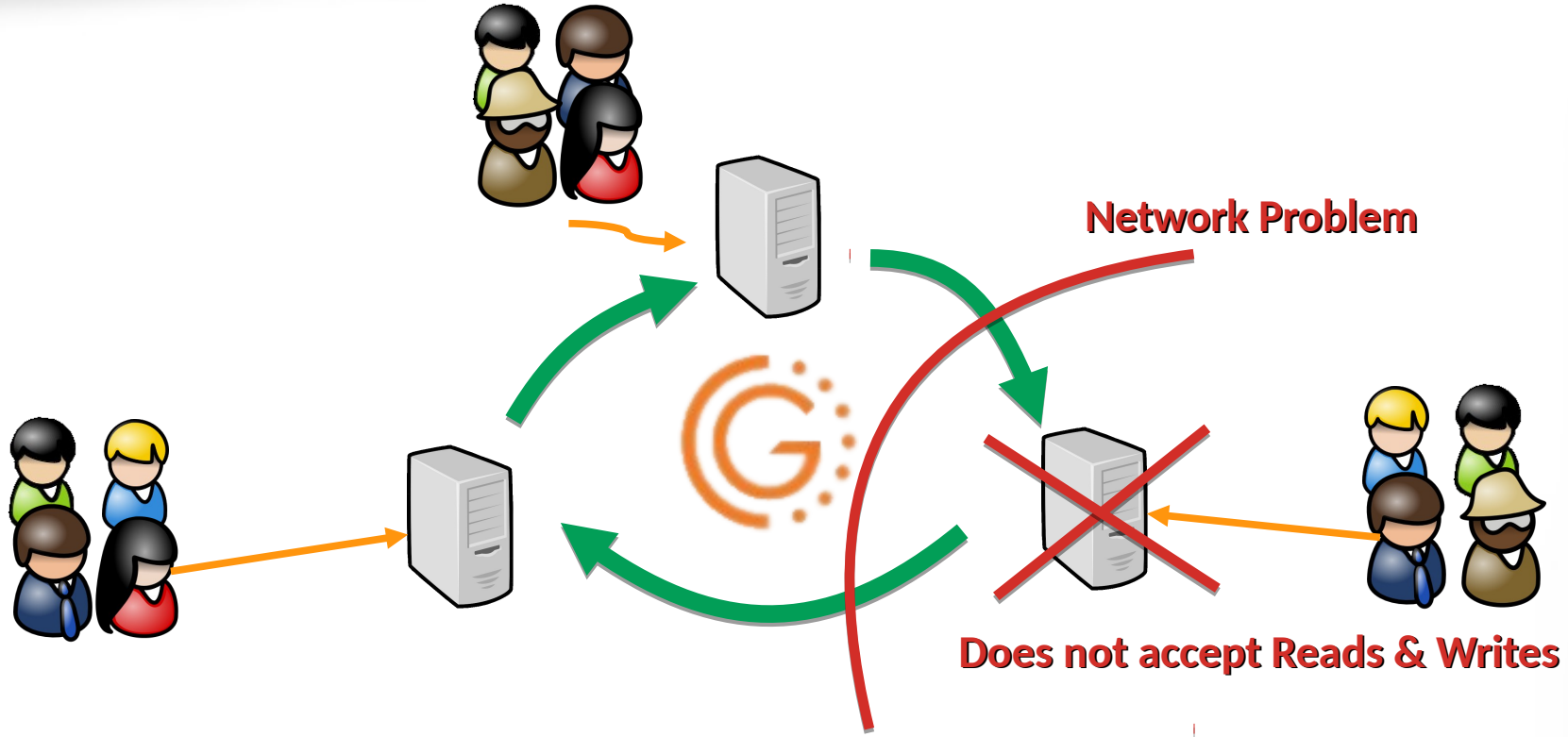

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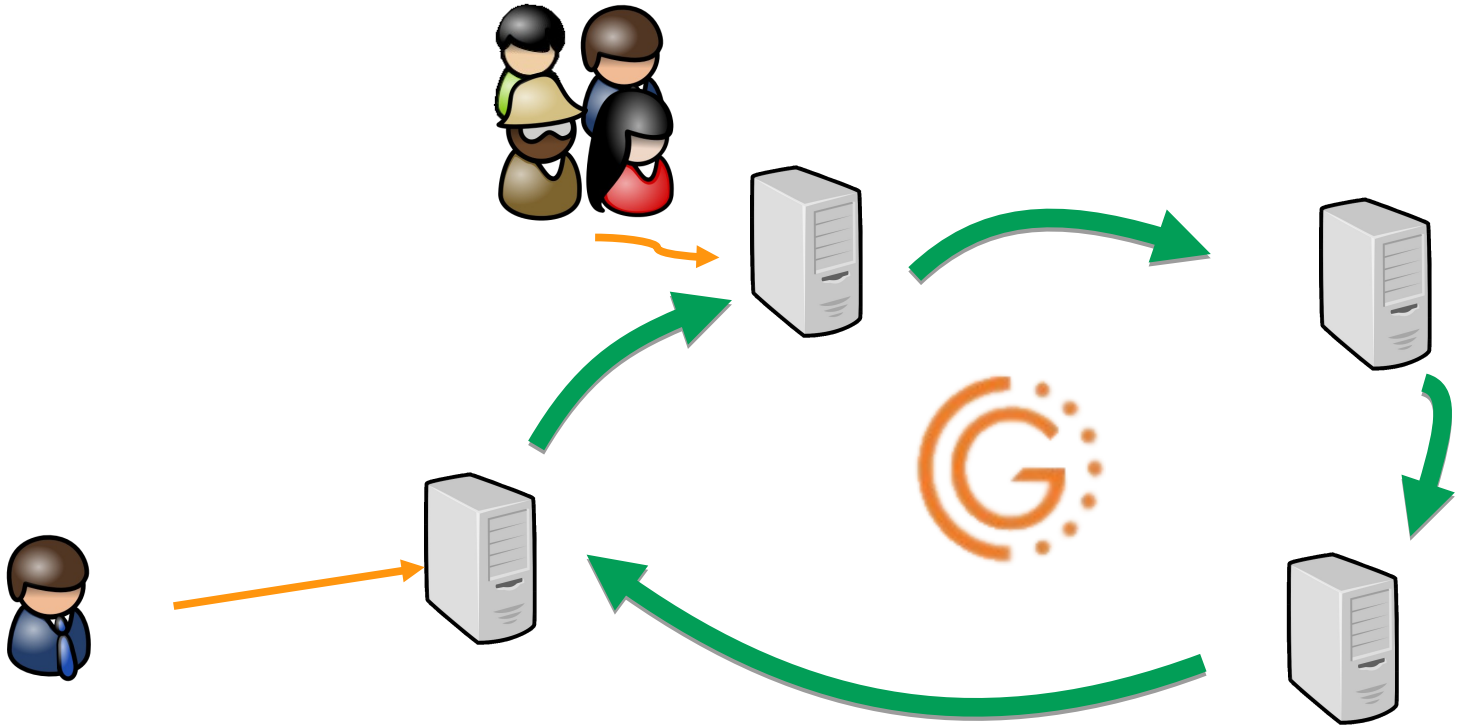

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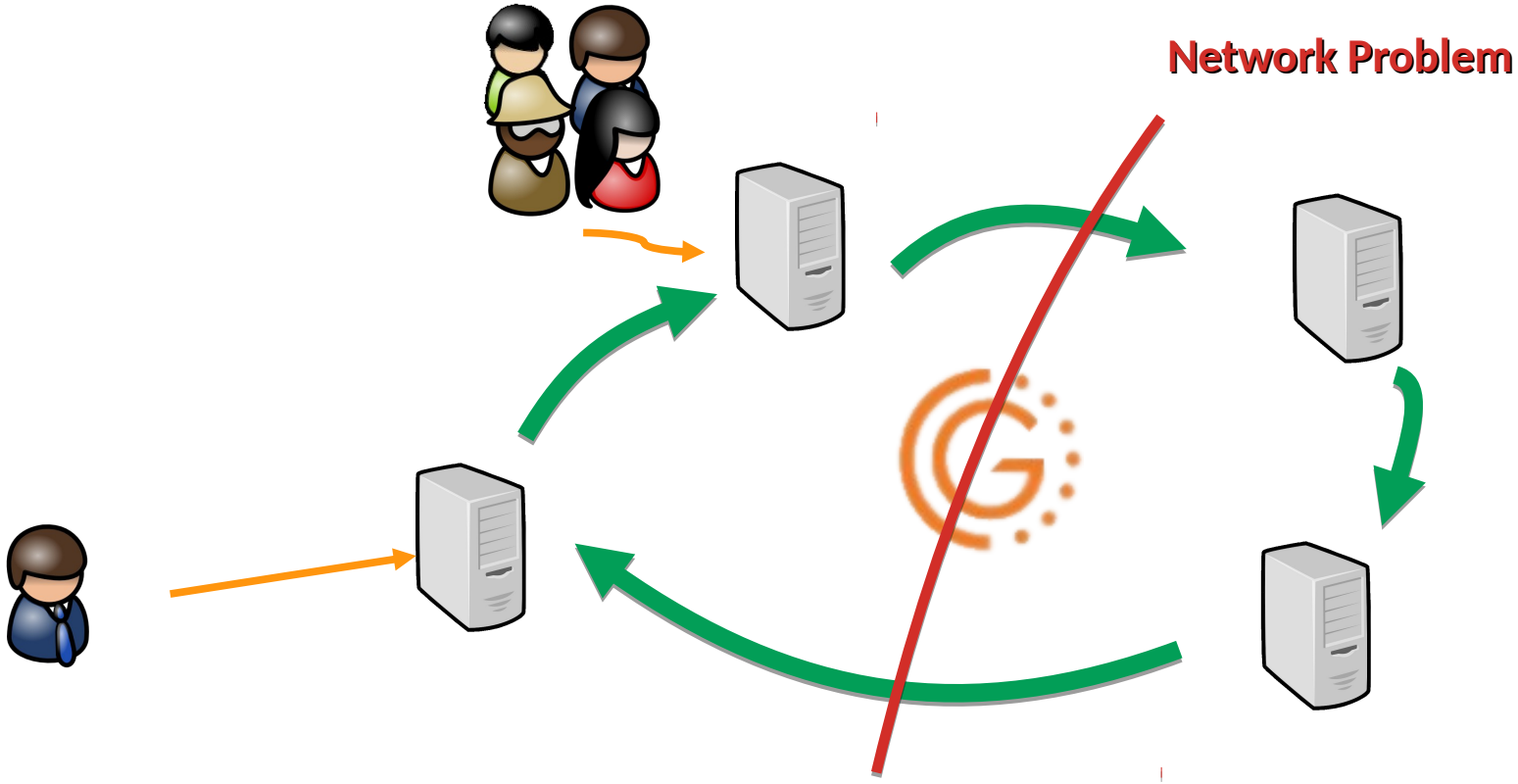

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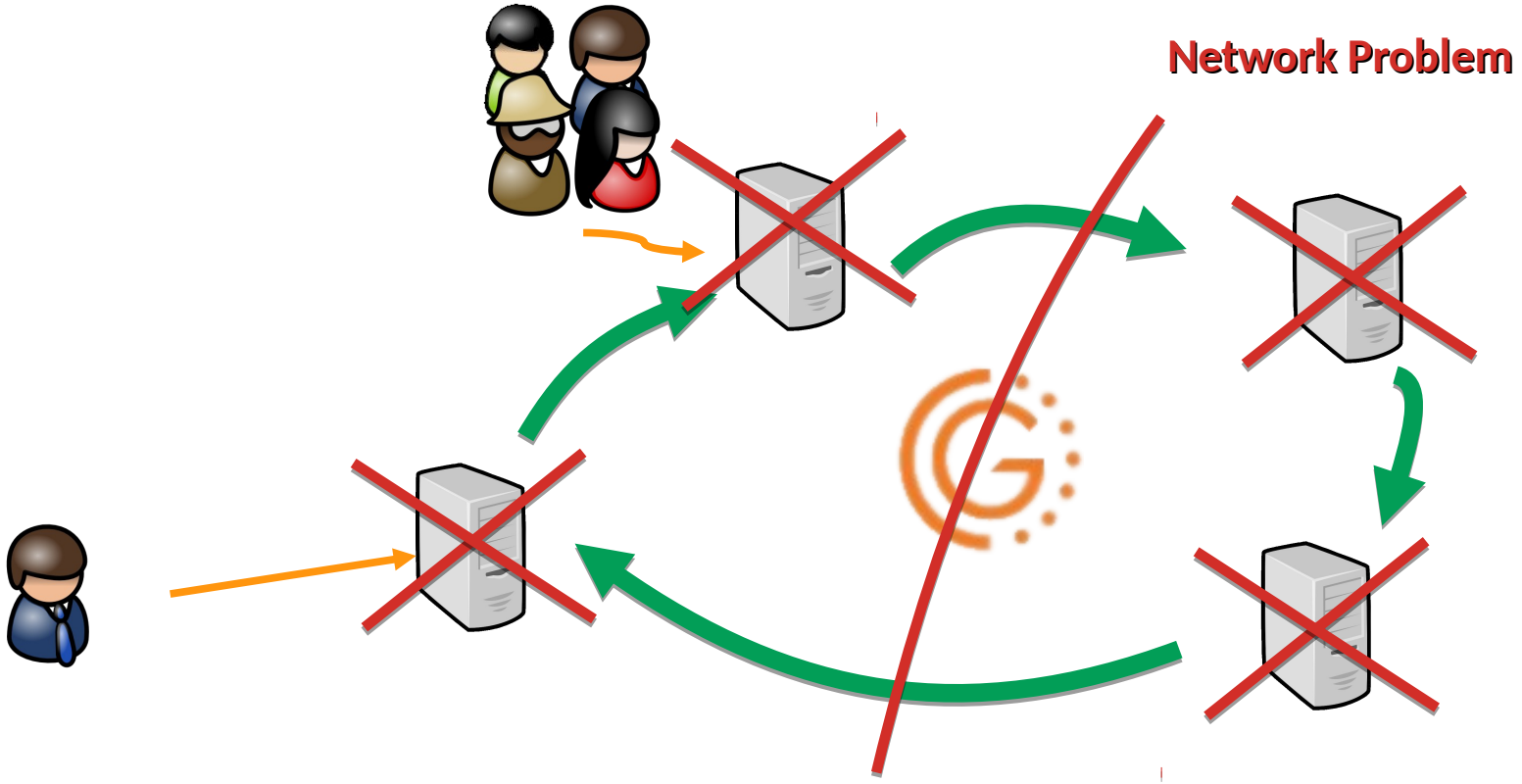

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3
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PERCONA
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How to optimize WAN replication?

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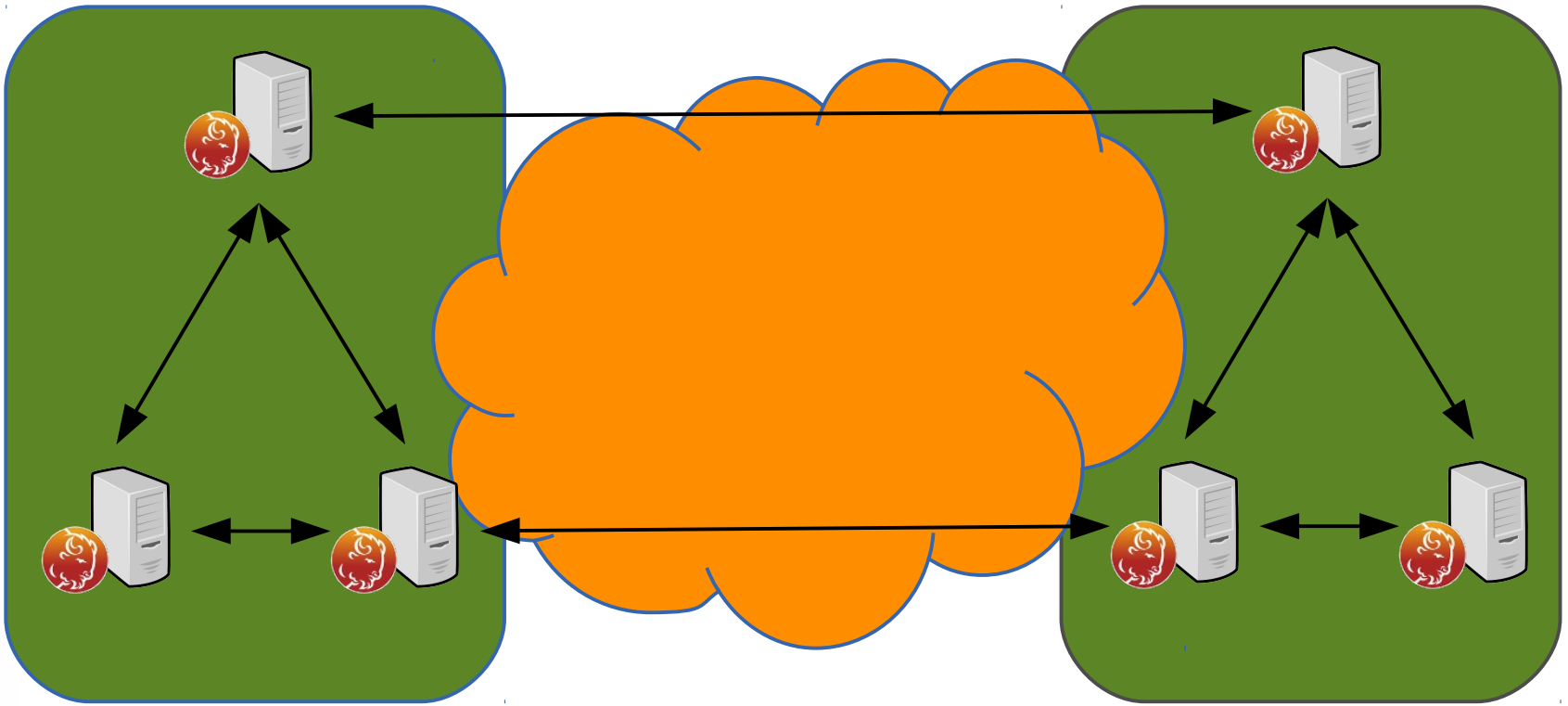

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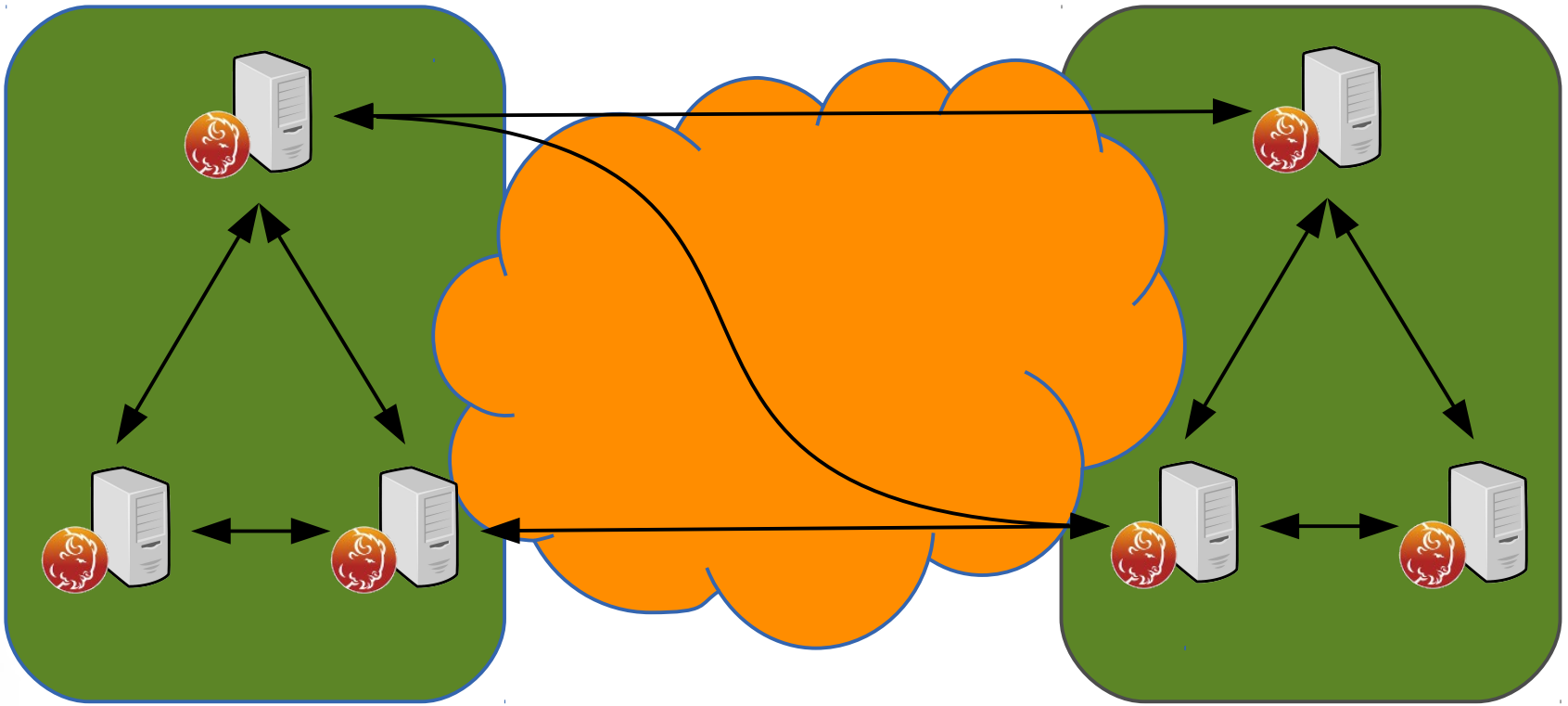

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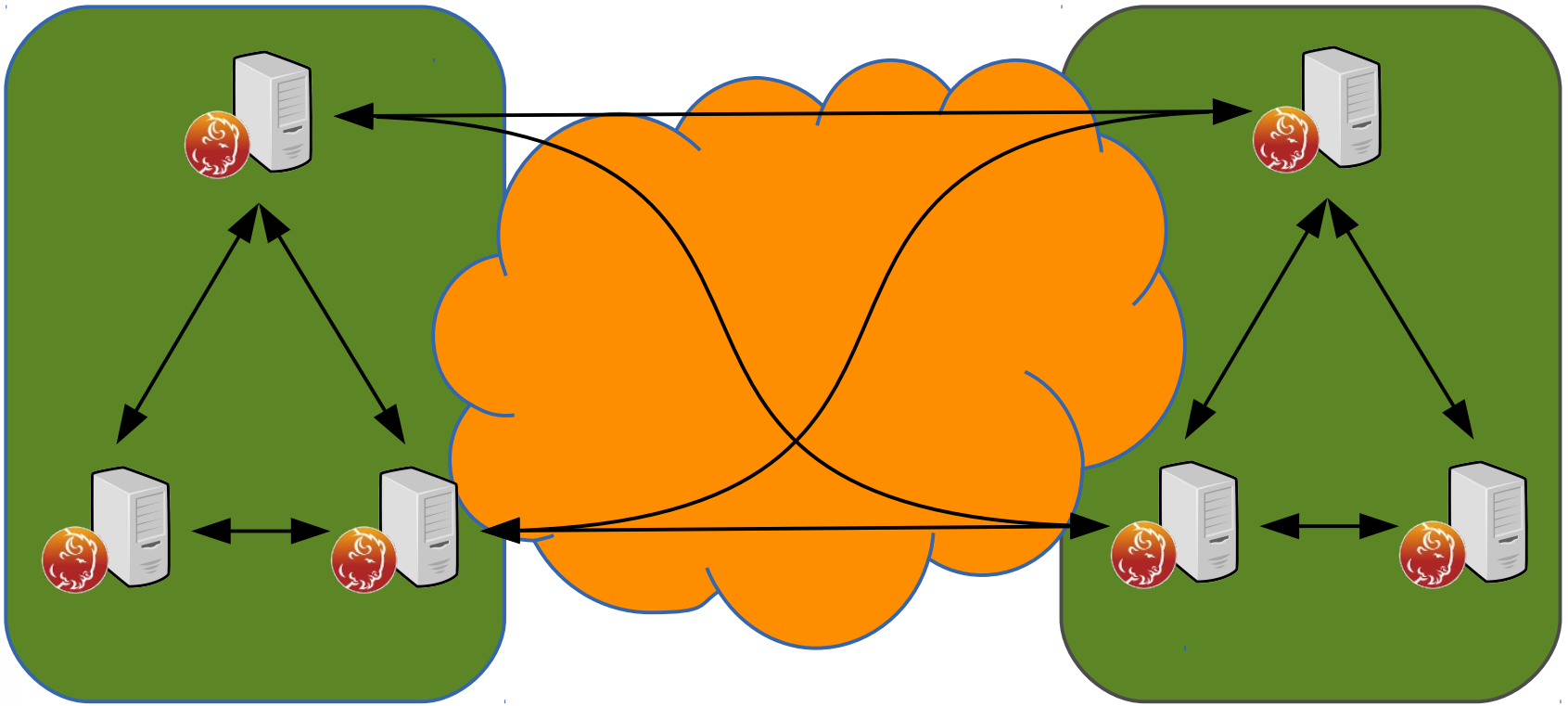

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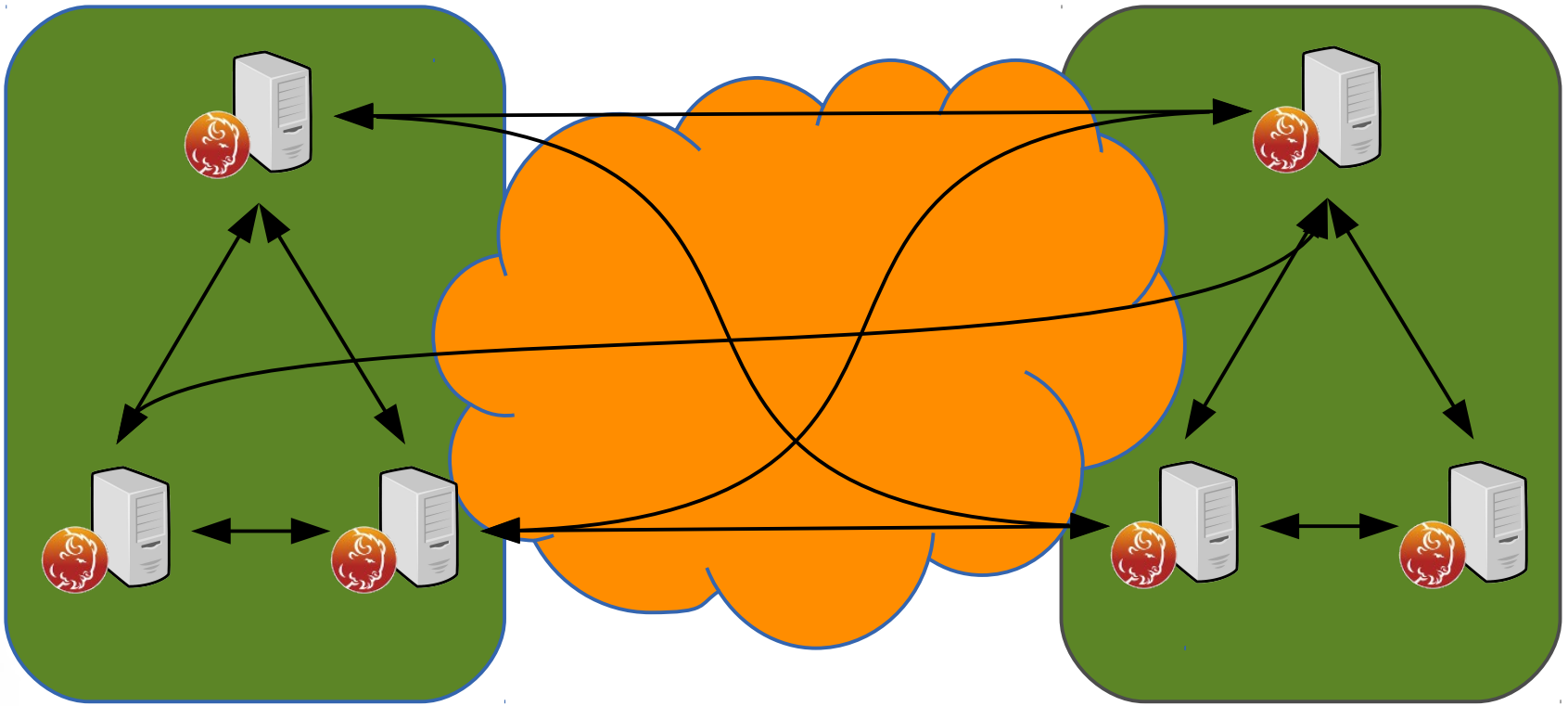

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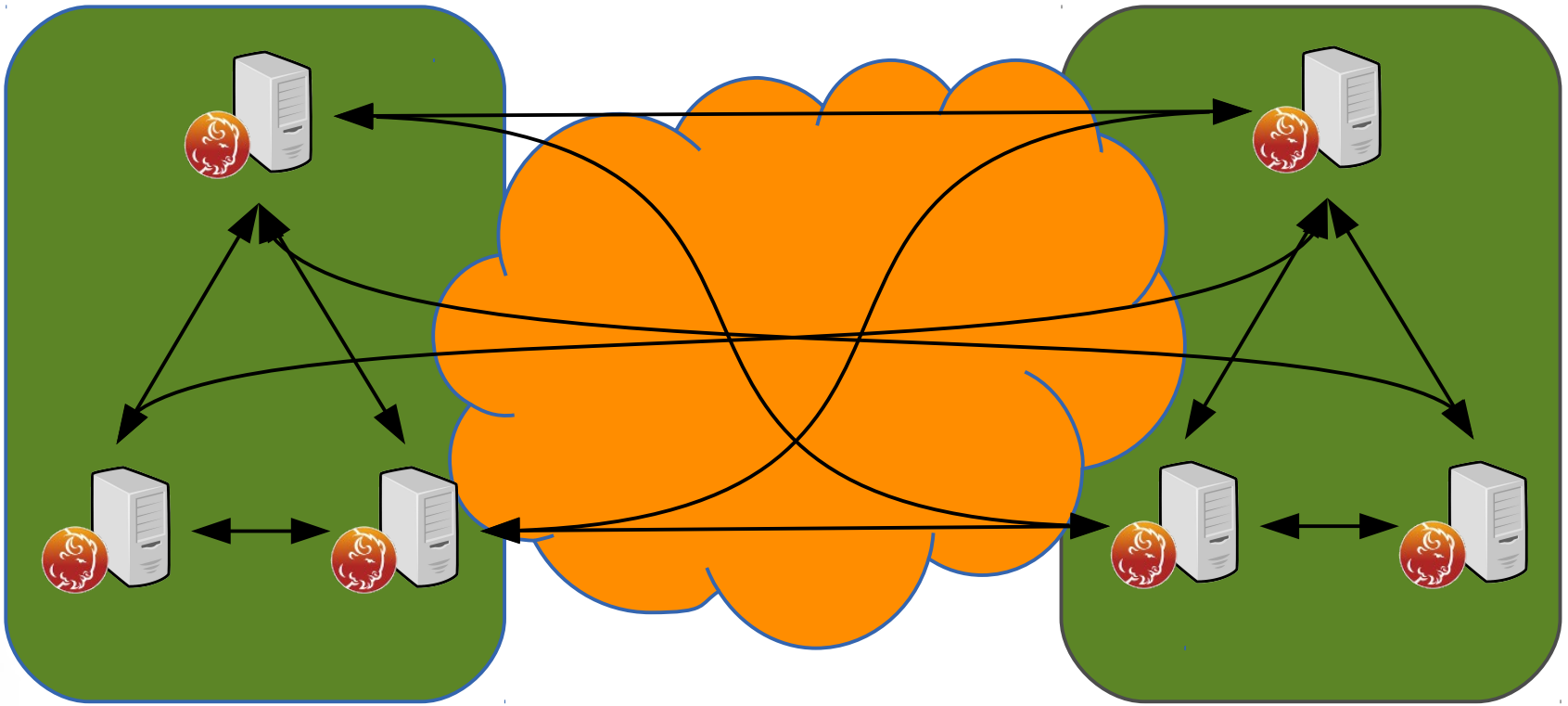

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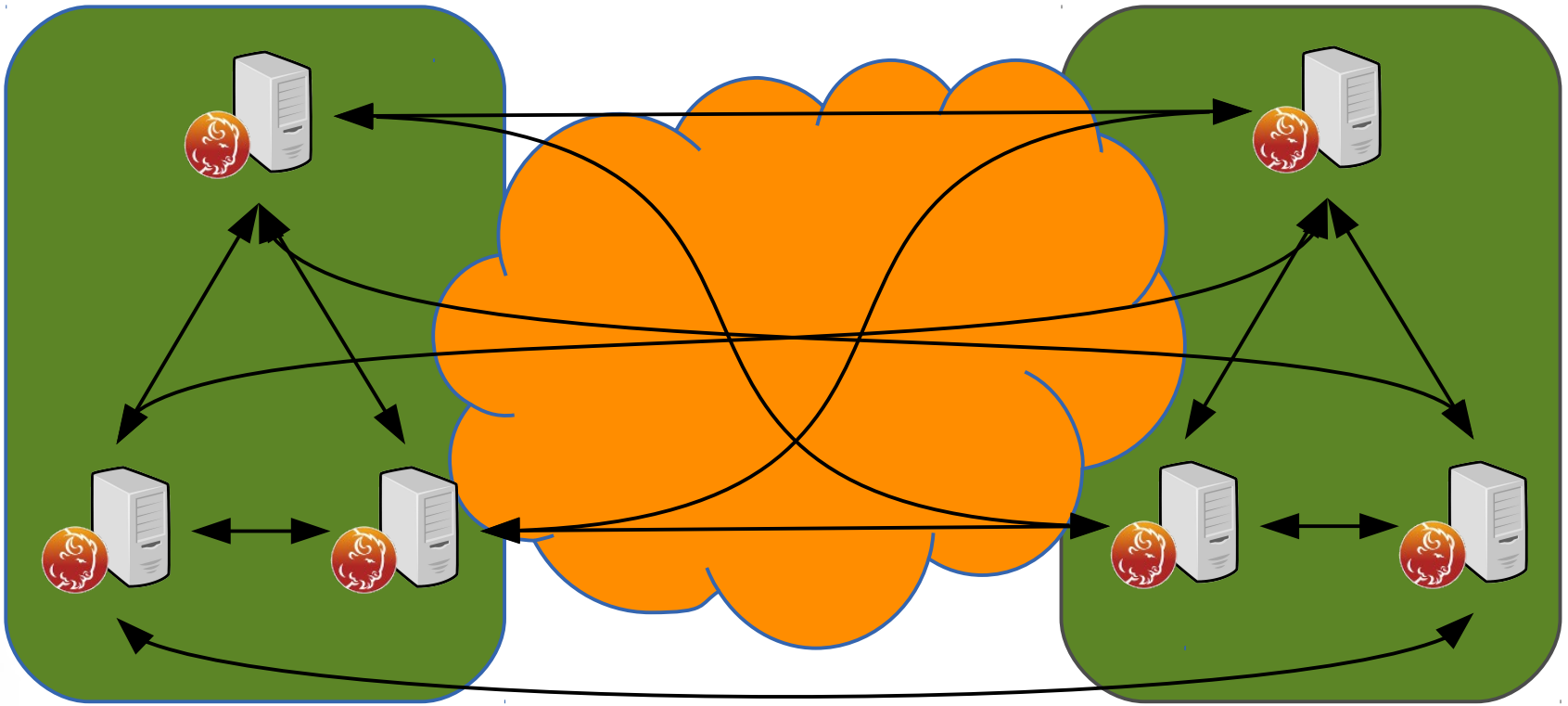

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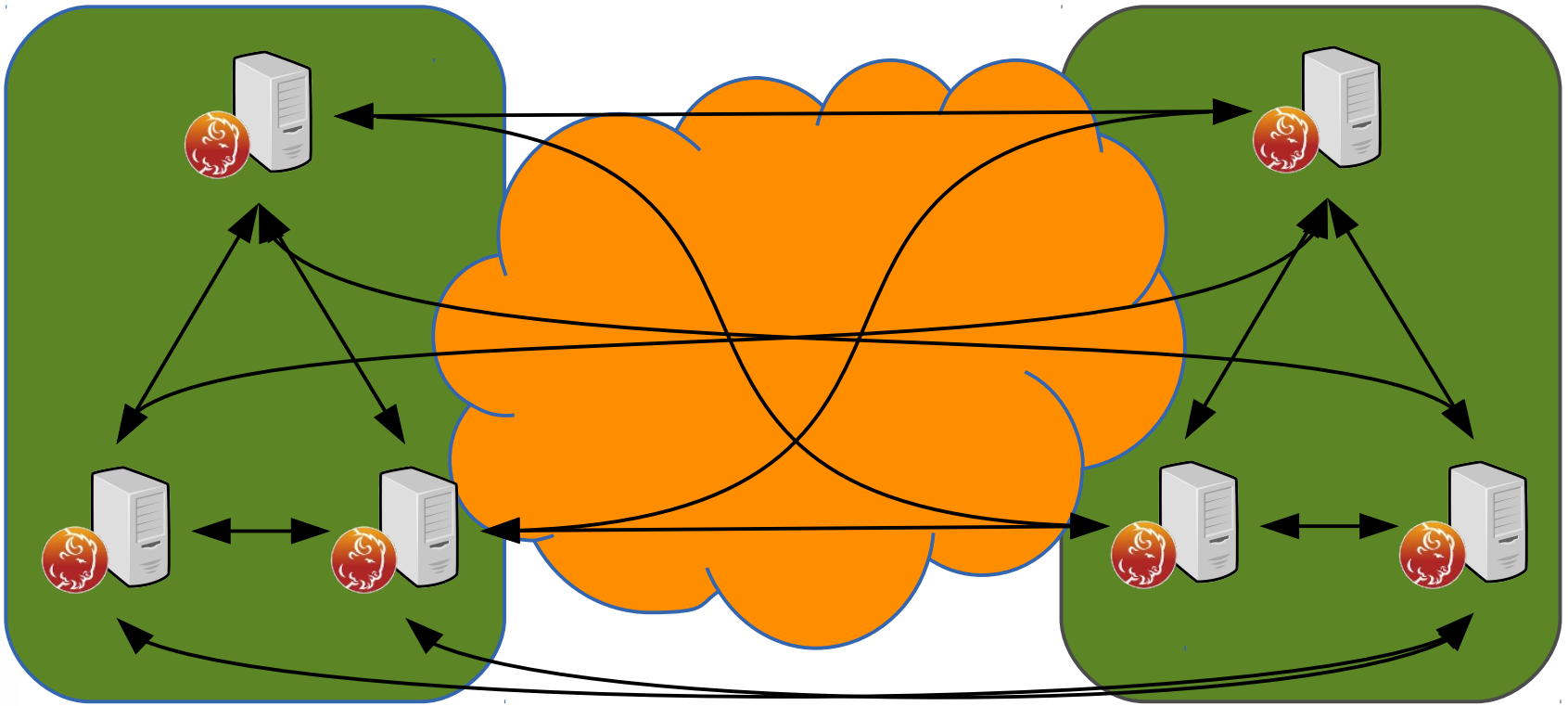

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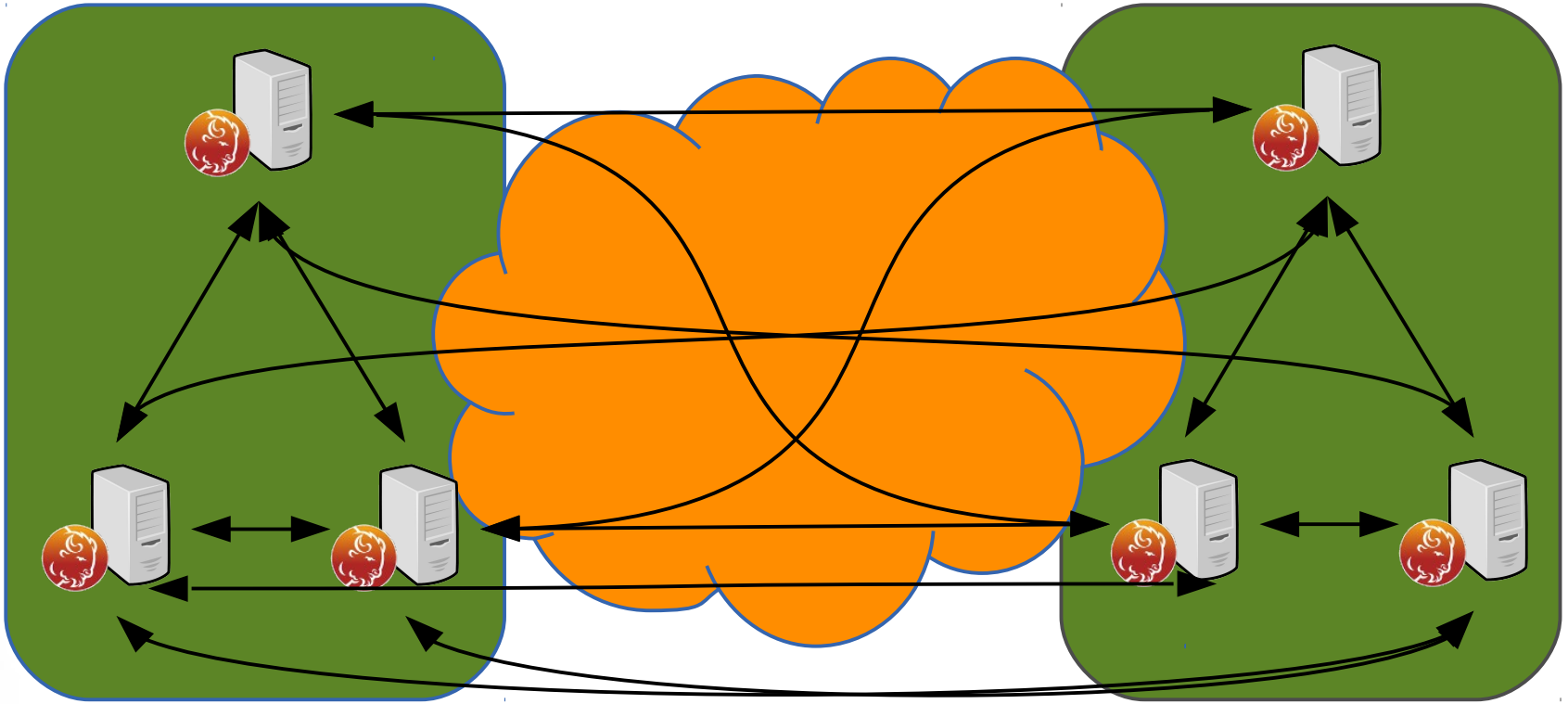
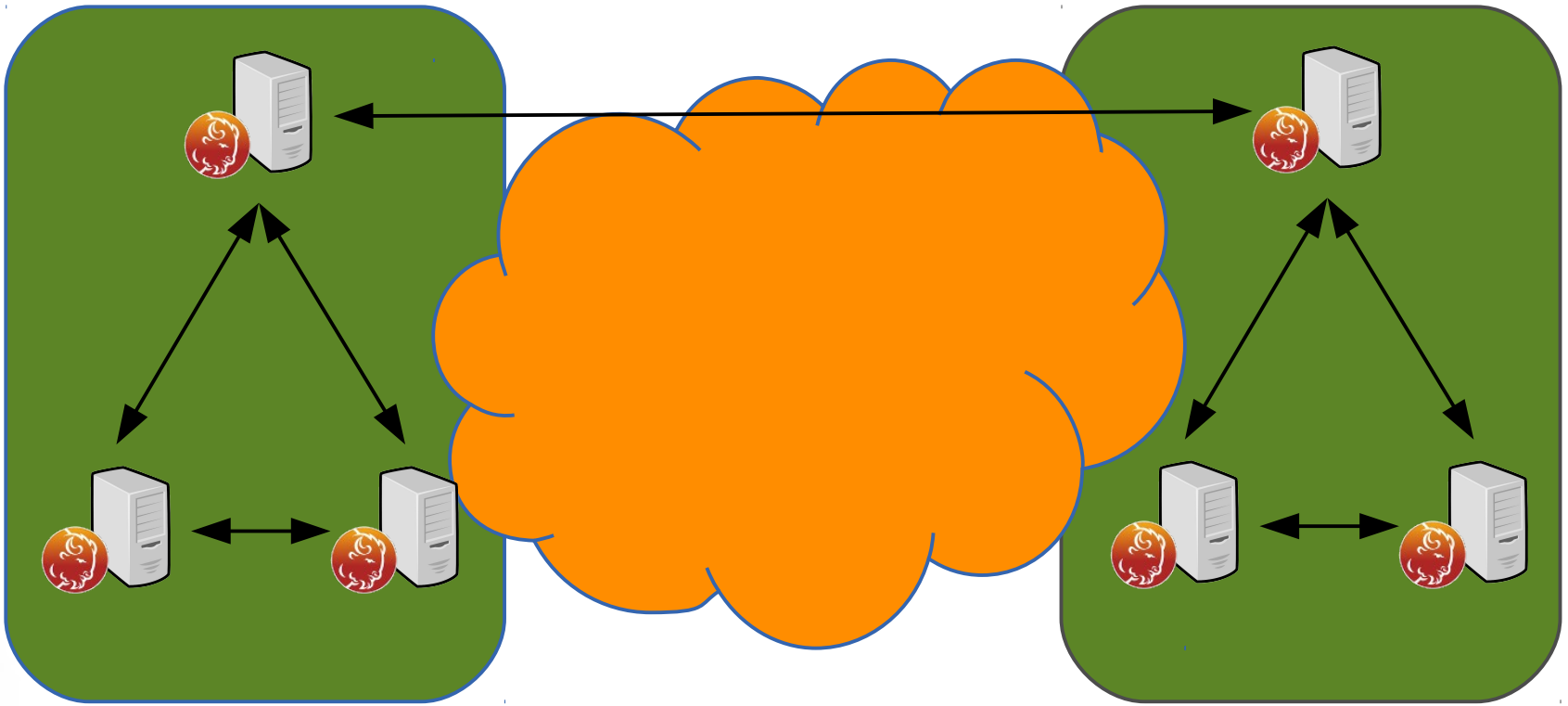


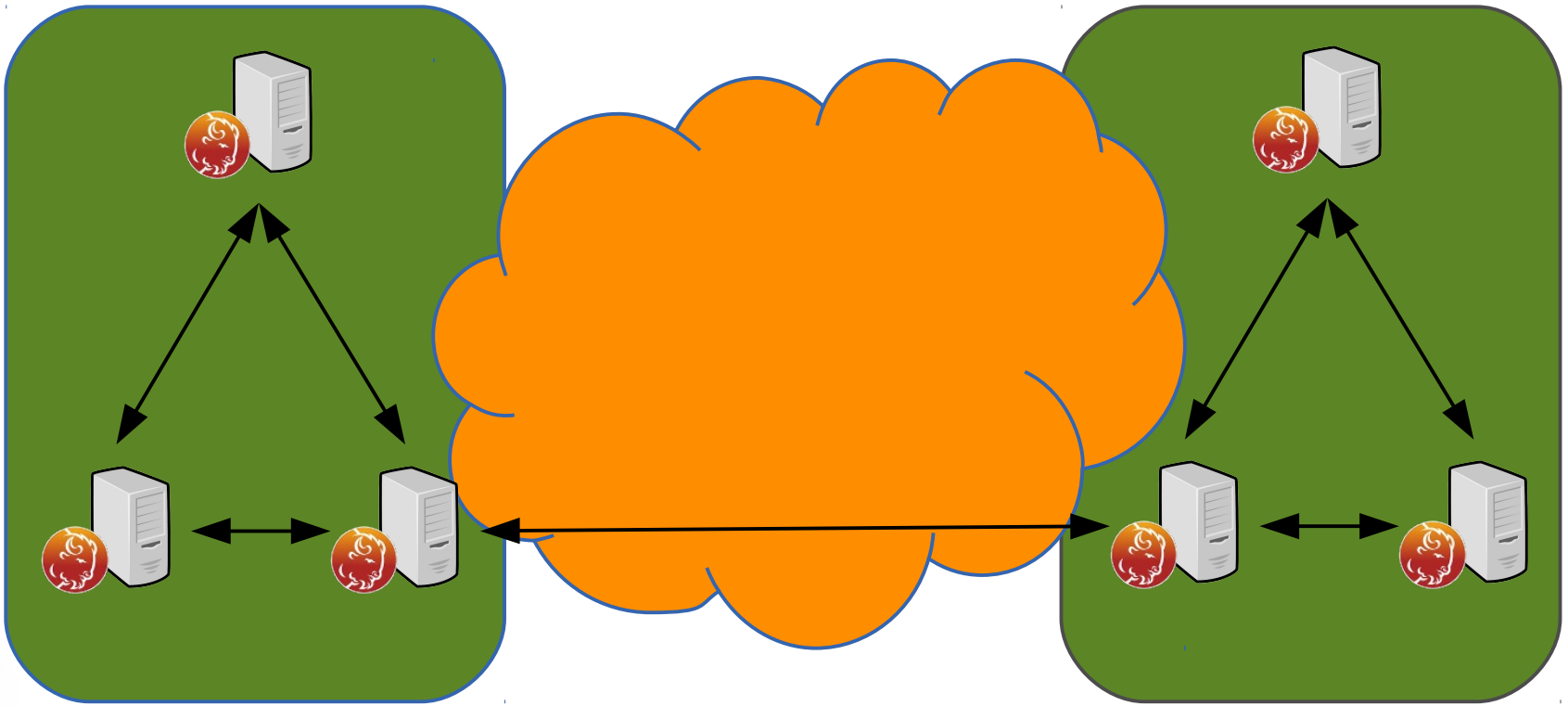
How to optimize WAN replication? (2)

- Galera 3 brings the notion of "cluster segments"



How to optimize WAN replication? (3)

- Segments gateways can change per transaction



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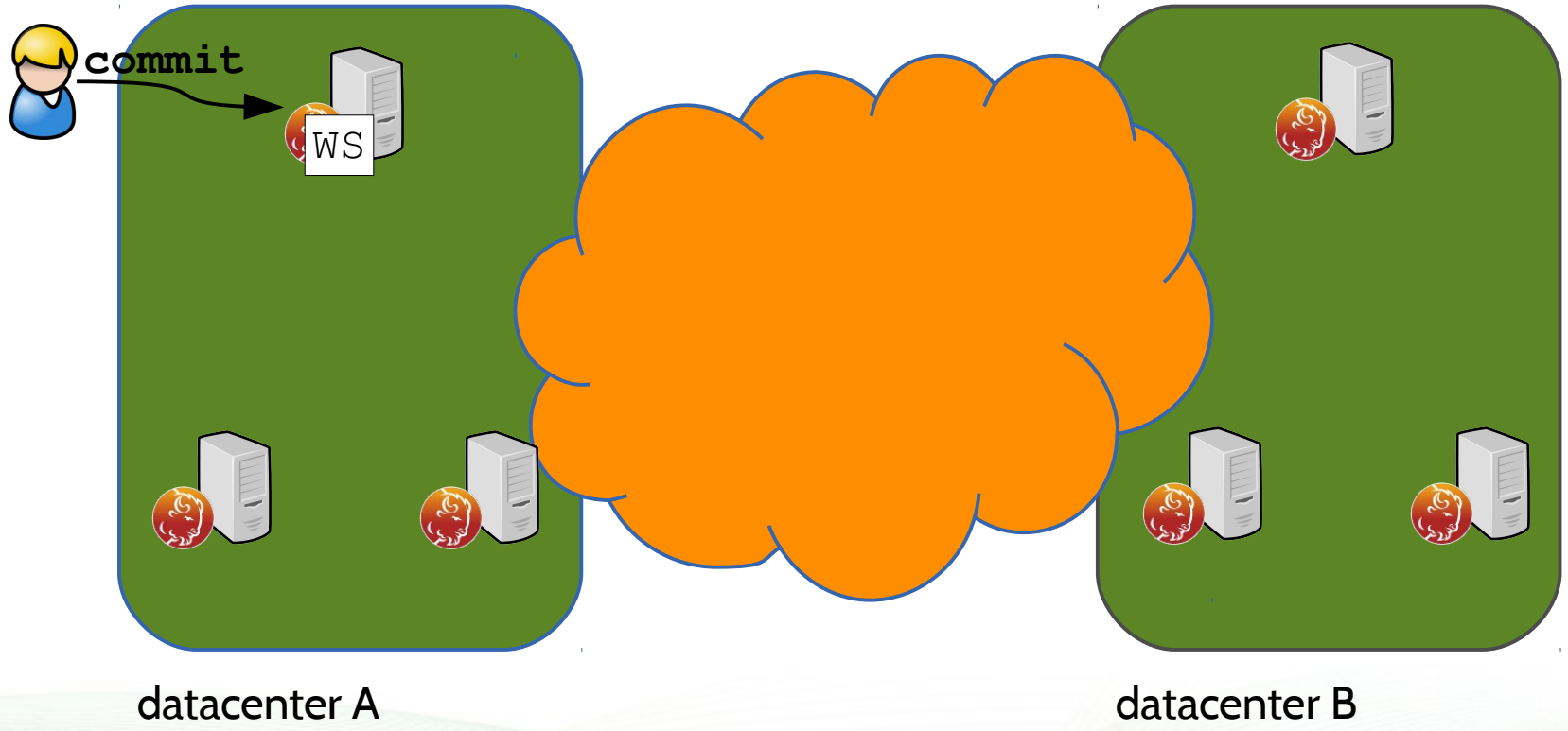

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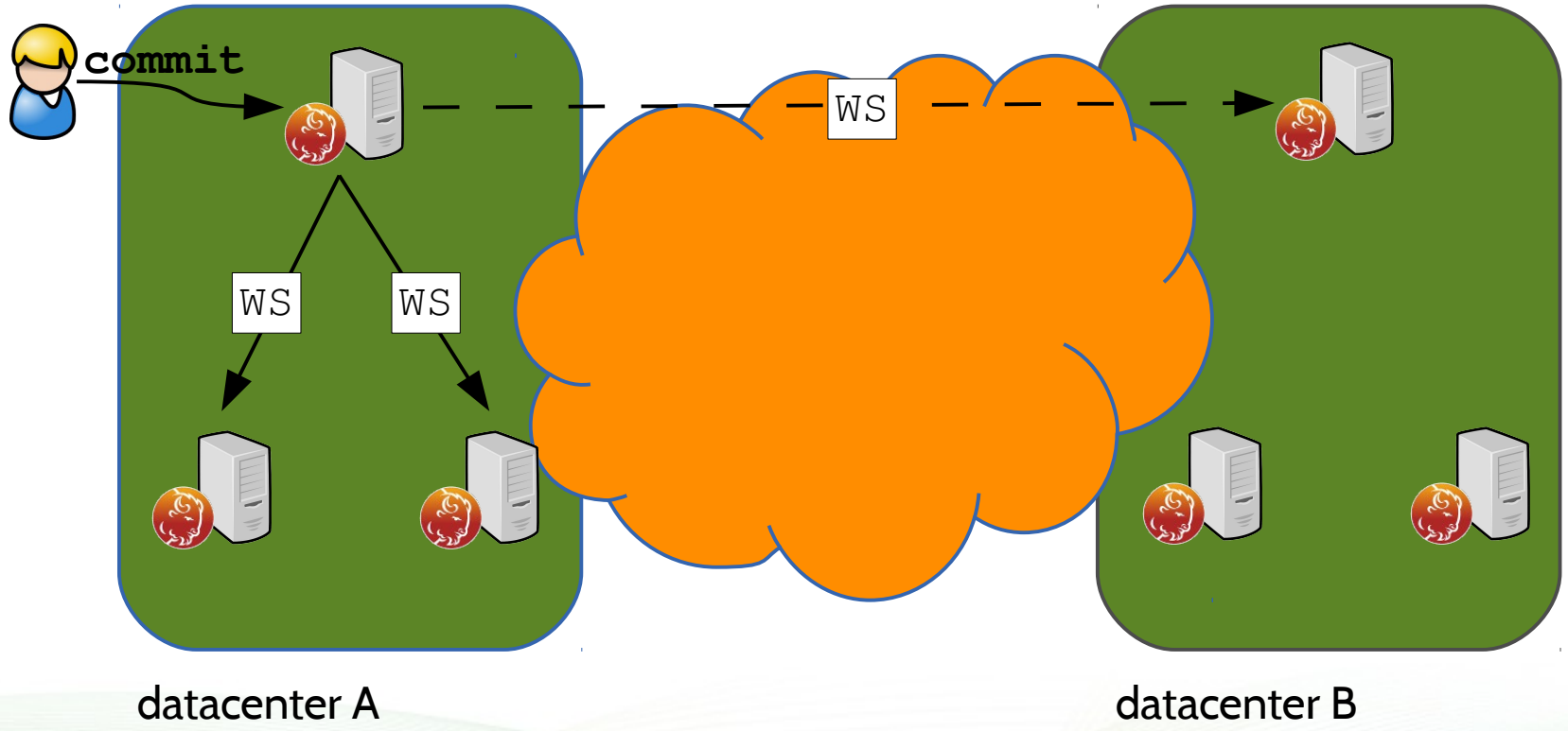

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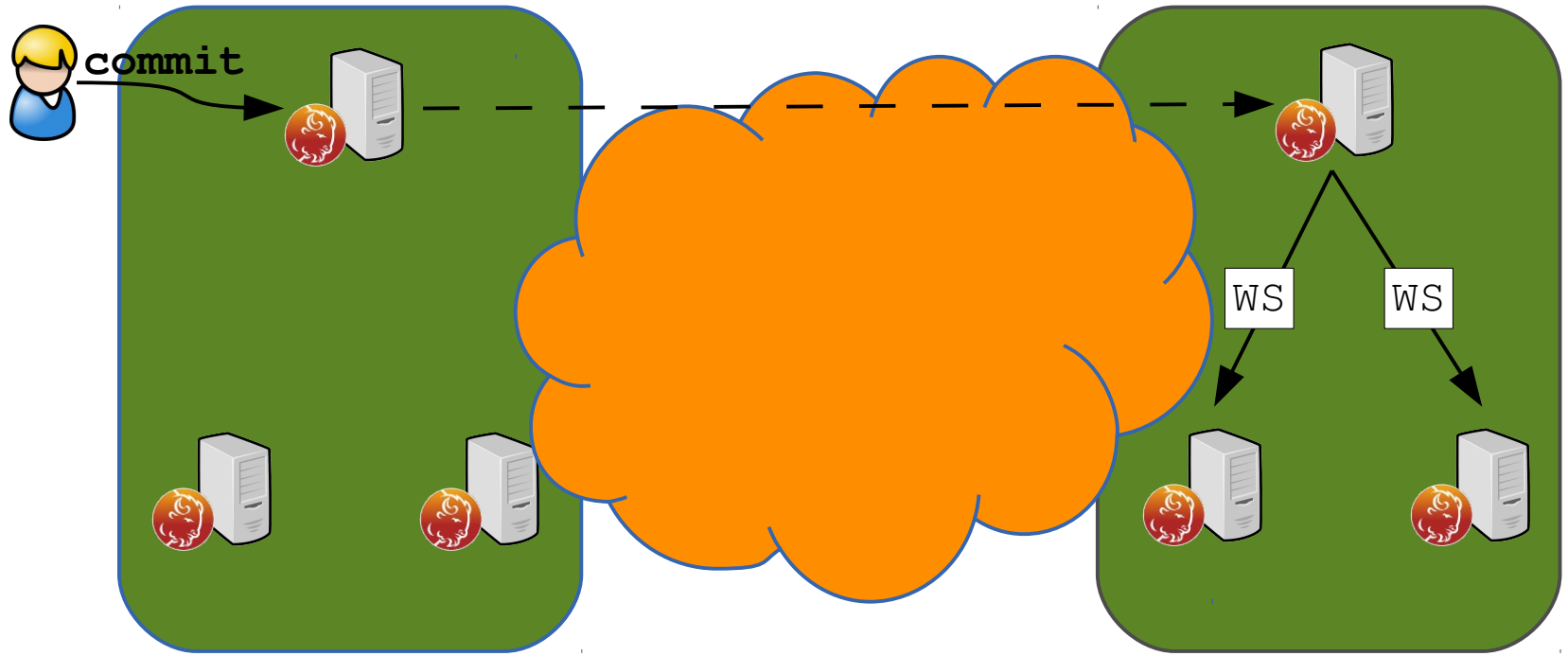

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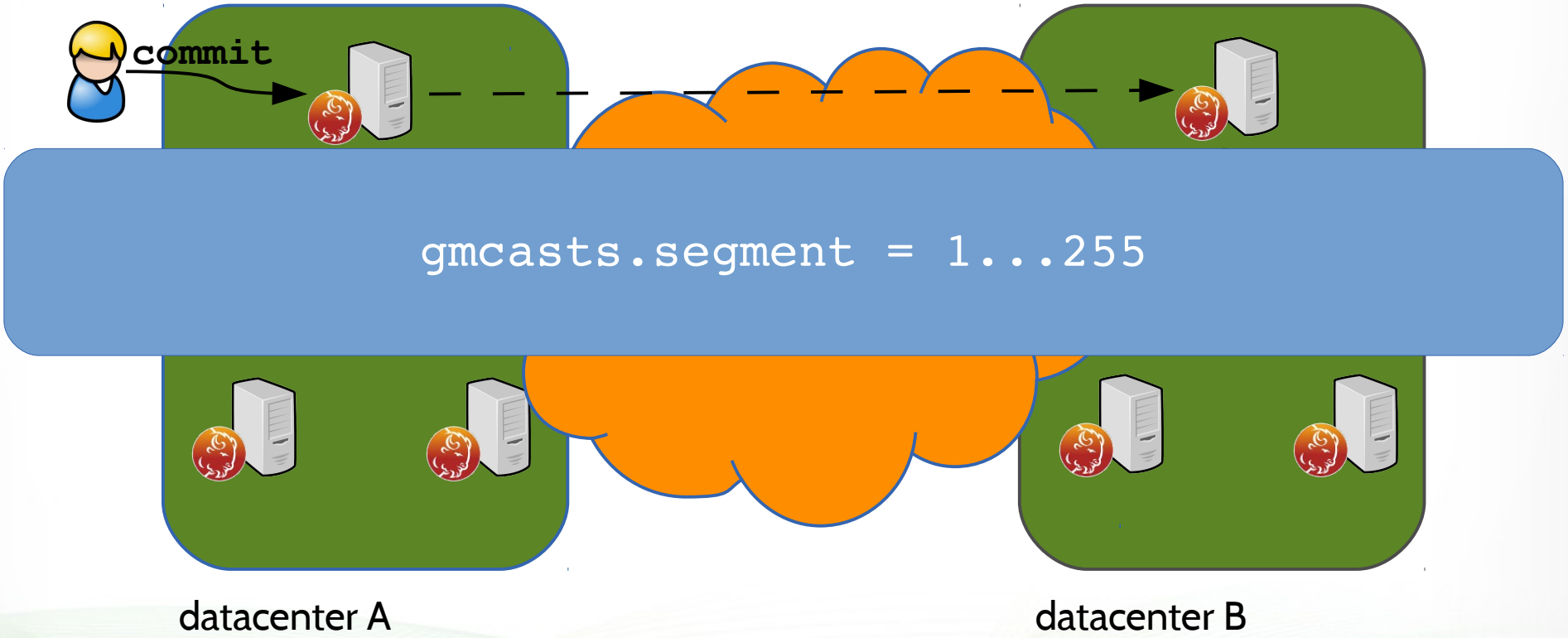


2
MariaDB
PERCONA
MySQL

Load balancers

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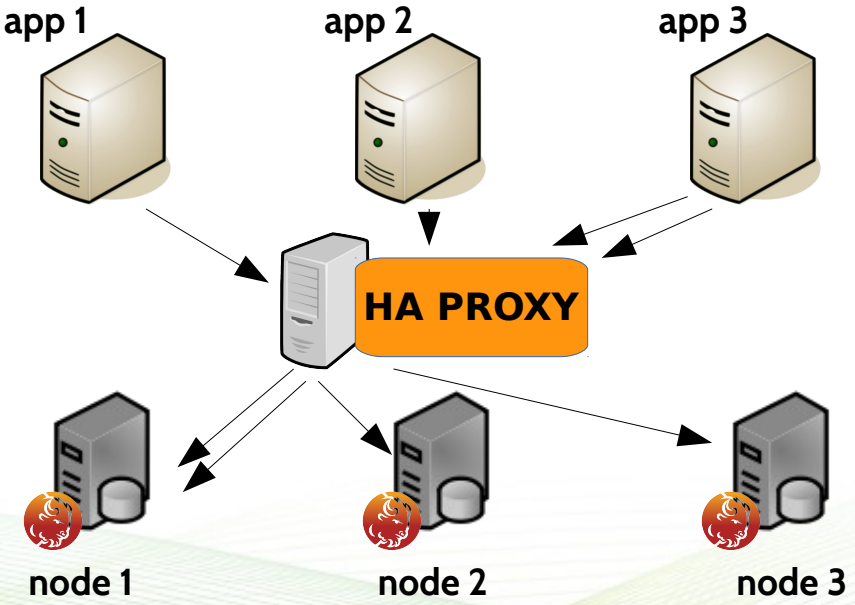

Load balancers: myths, legends and reality

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  - This can leas to a TCP port exhaustion !
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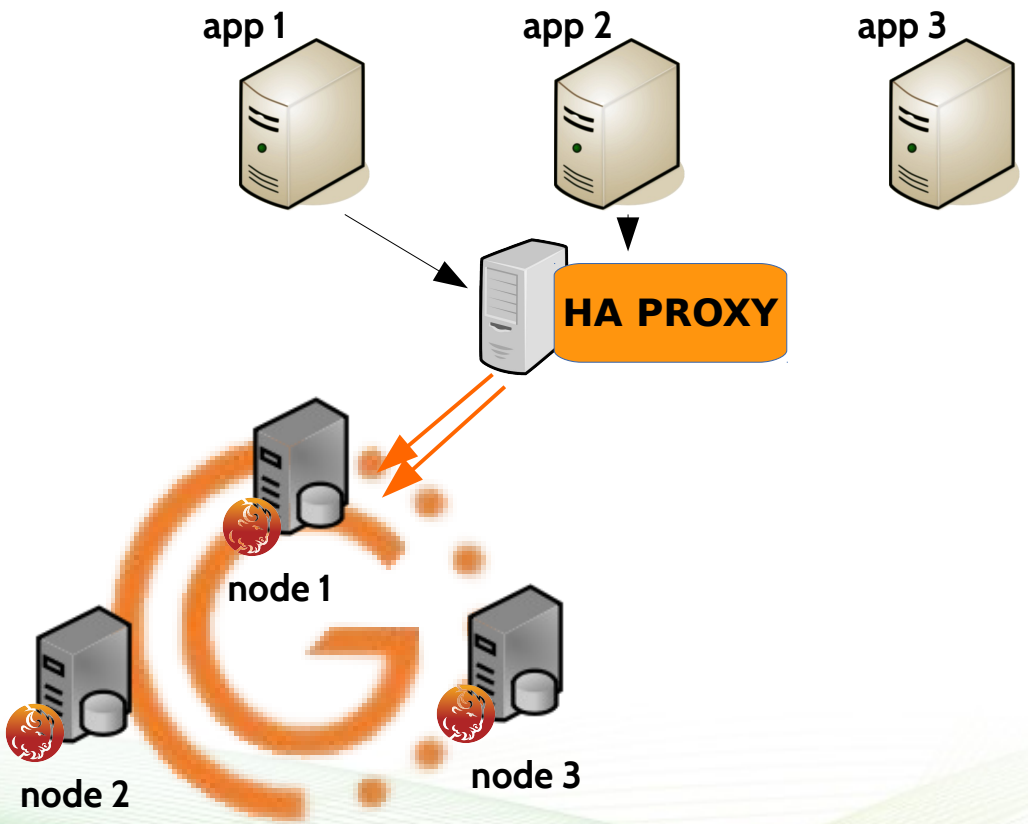
Load balancers: common issues

- Persitent Connections
  - Many people expects the following scenario:



Load balancers: common issues

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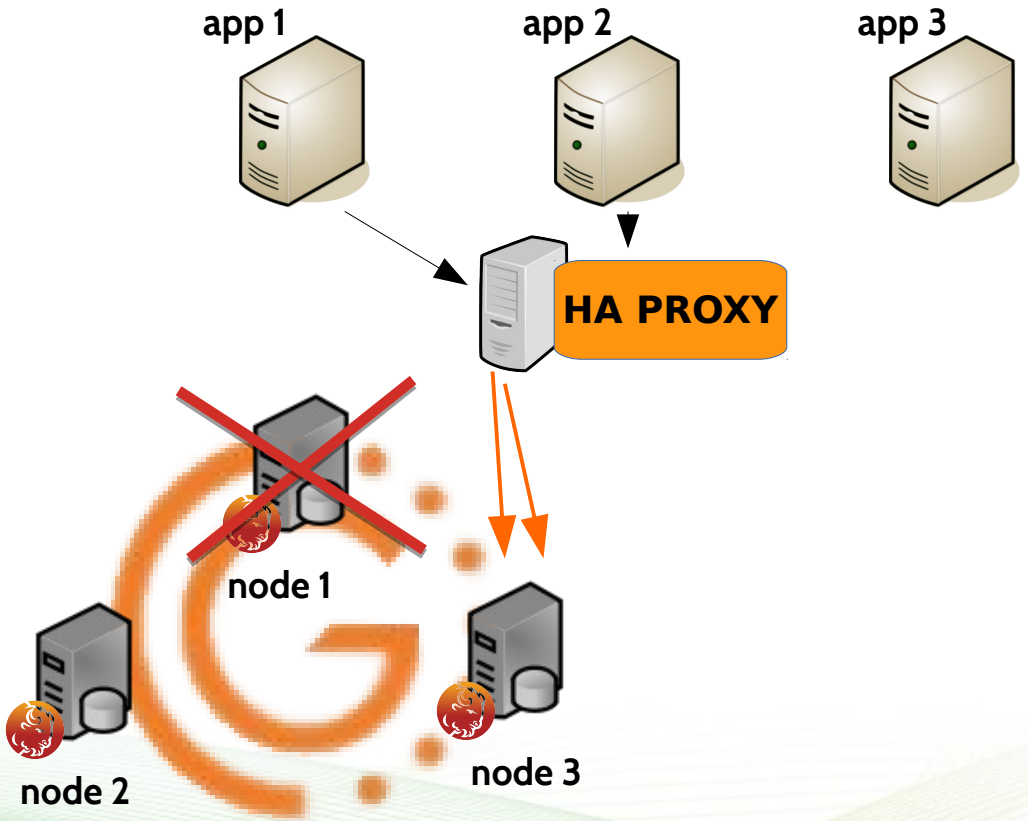
  - When the node that was specified to receive the persistent write fails for example



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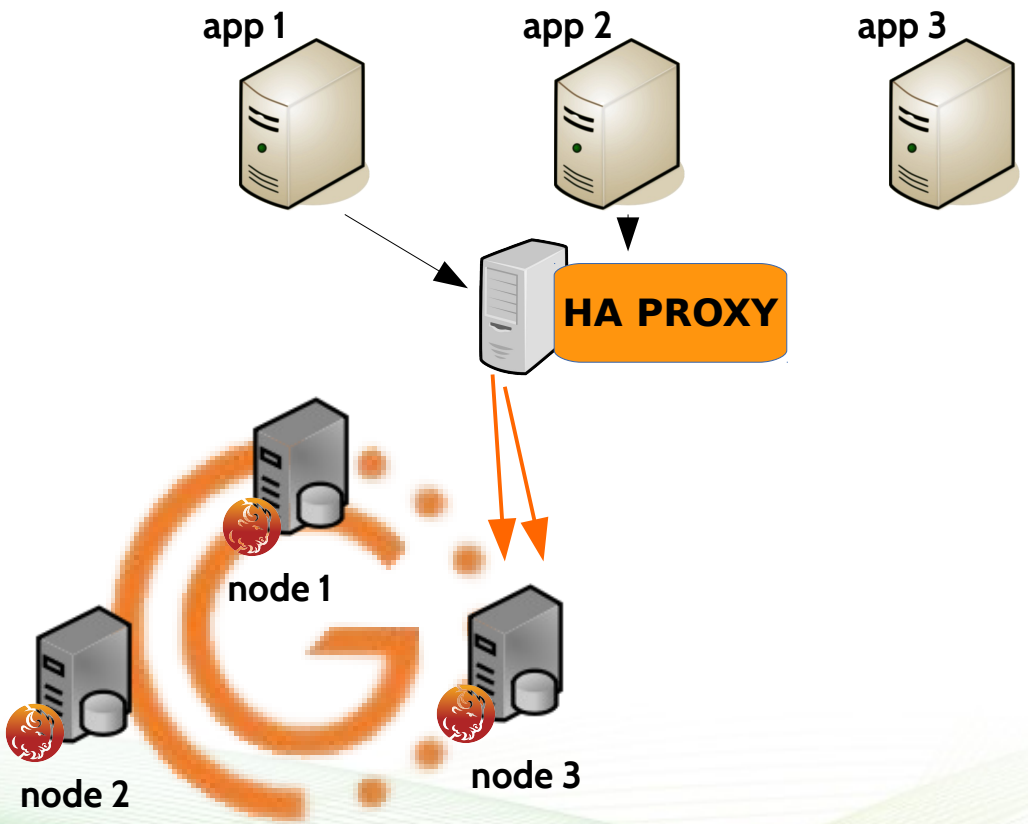

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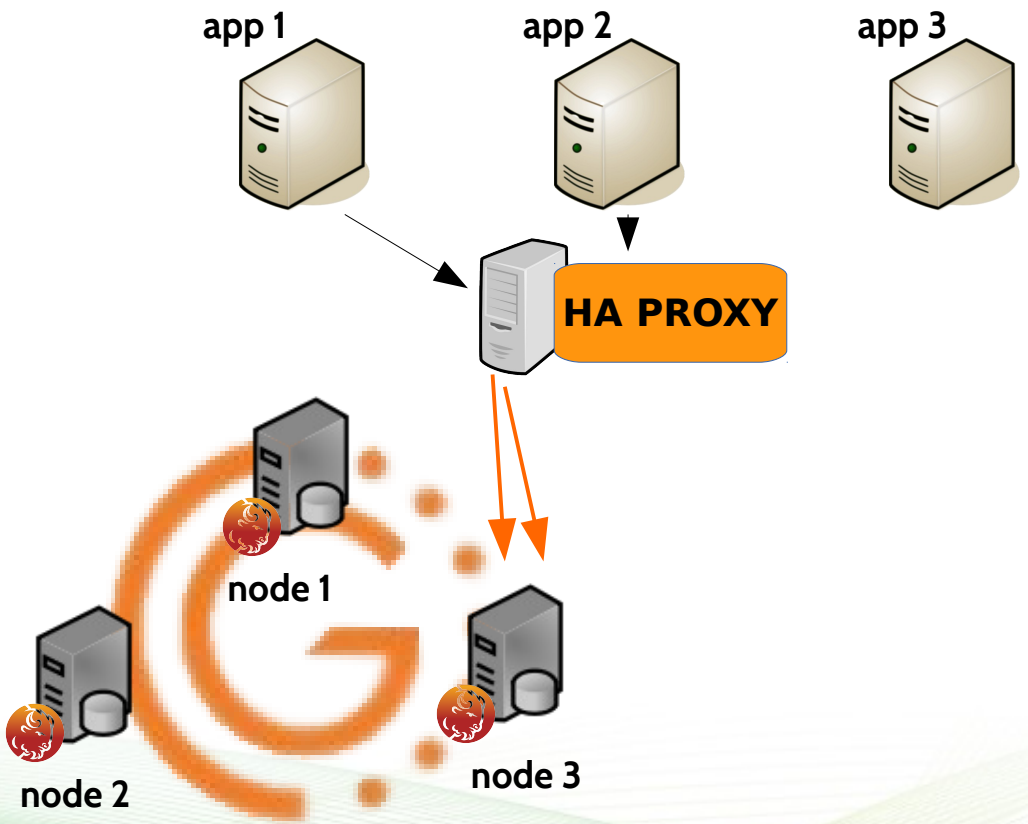

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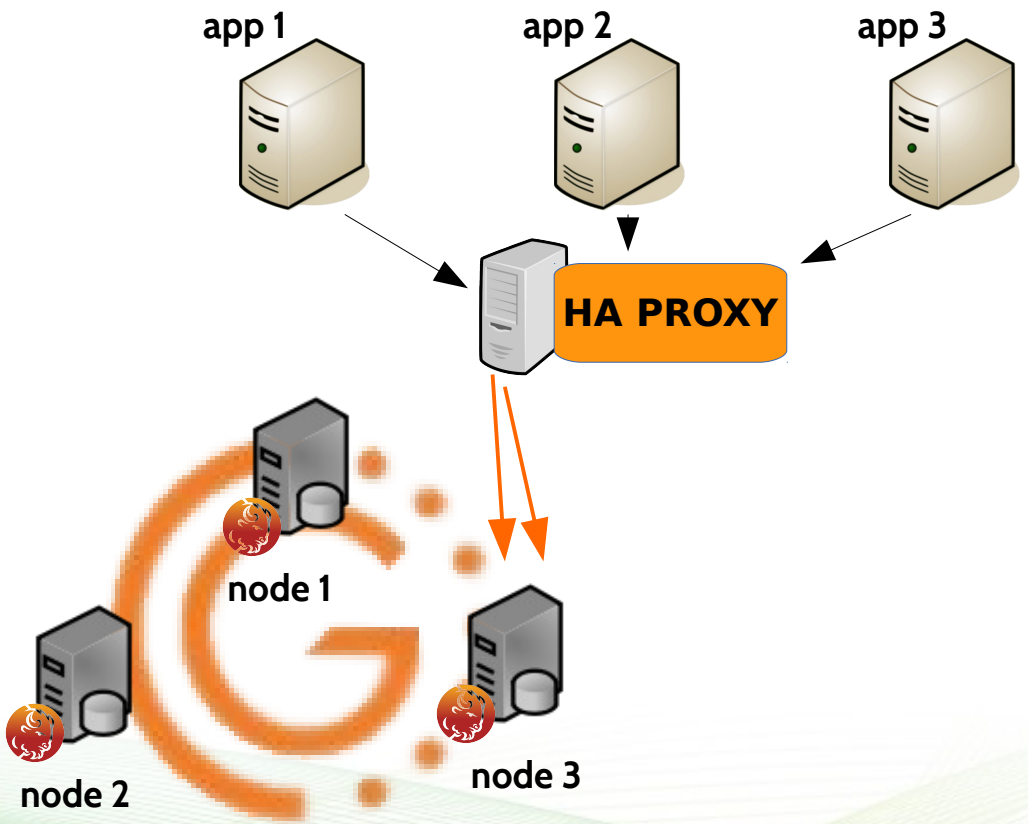

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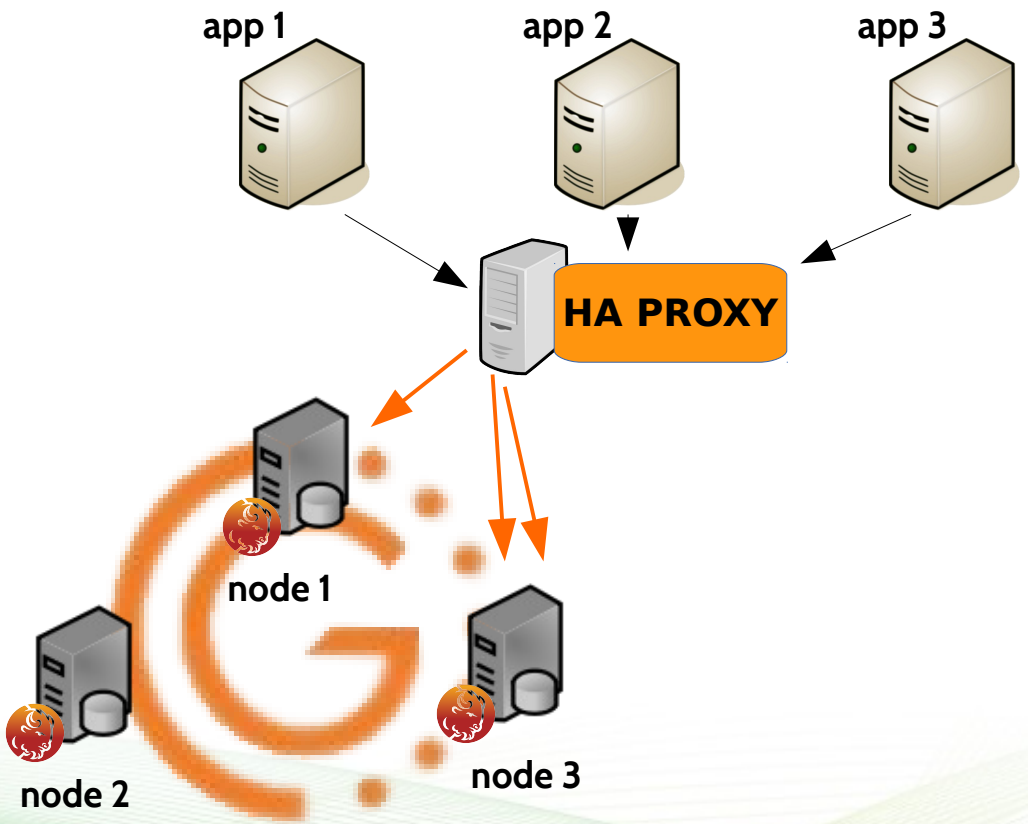

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  - HA Proxy decides where the connection will go at TCP handshake
  - Once the TCP session is established, the sessions will stay where they are !
- Solution ?
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MariaDB
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Taking backups without stalls

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- When you want to perform a consistent backup, you need to take a FLUSH TABLES WITH READ LOCK (FTWRL)
- By default even with Xtrabackup
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Taking backups without stalls

Taking backups without stalls

- Choose the node from which you want to take the backup
- Change the state to 'Donor/Desynced' (see tip 9)

```
set global wsrep_desync=ON
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- Take the backup
- Wait that `wsrep_local_recv_queue` is back down to 0
- Change back the state to 'Joined'

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GO !