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MyRocks deployment at Facebook and Roadmaps

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Agenda

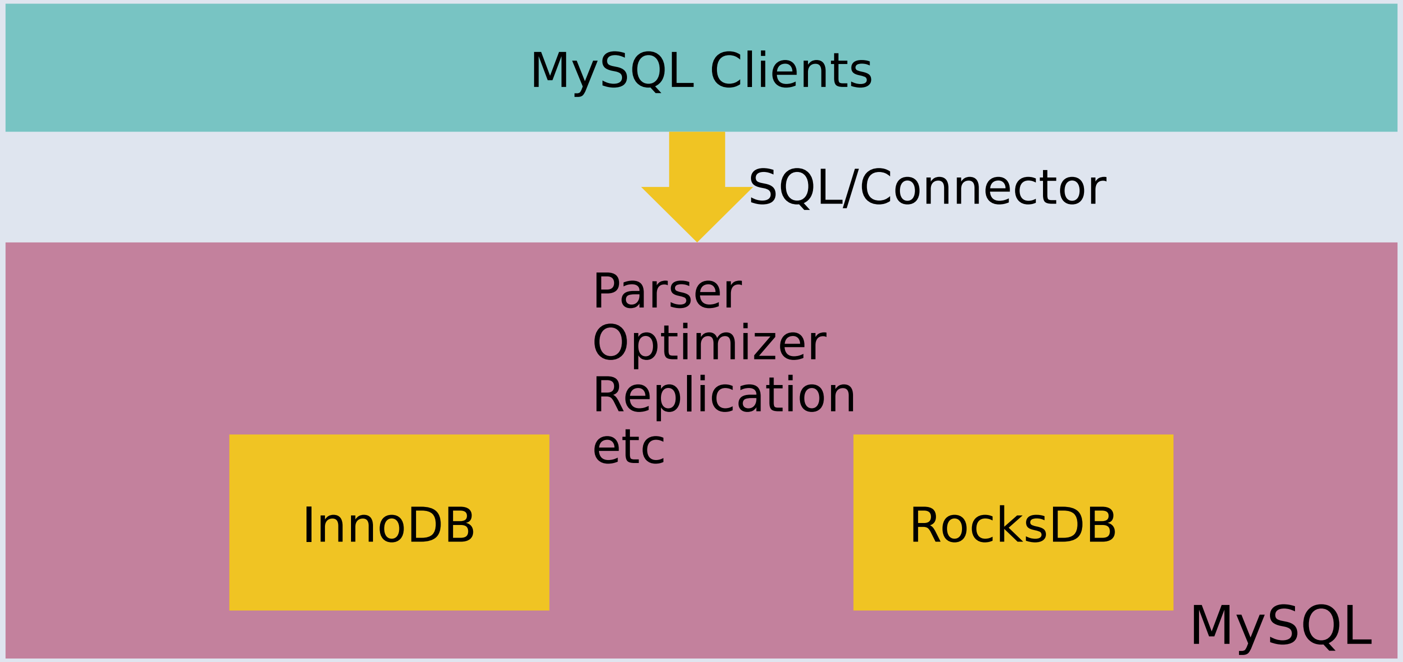
- MySQL at Facebook
- MyRocks overview
- Production Deployment
- Future Plans

MySQL “User Database (UDB)” at Facebook

- Storing Social Graph
- Massively Sharded
- Low latency
- Automated Operations
- Pure Flash Storage (Constrained by space, not by CPU/IOPS)

What is MyRocks

- MySQL on top of RocksDB (RocksDB storage engine)
- Open Source, distributed from MariaDB and Percona as well



MySQL Clients

SQL/Connector

Parser
Optimizer
Replication
etc

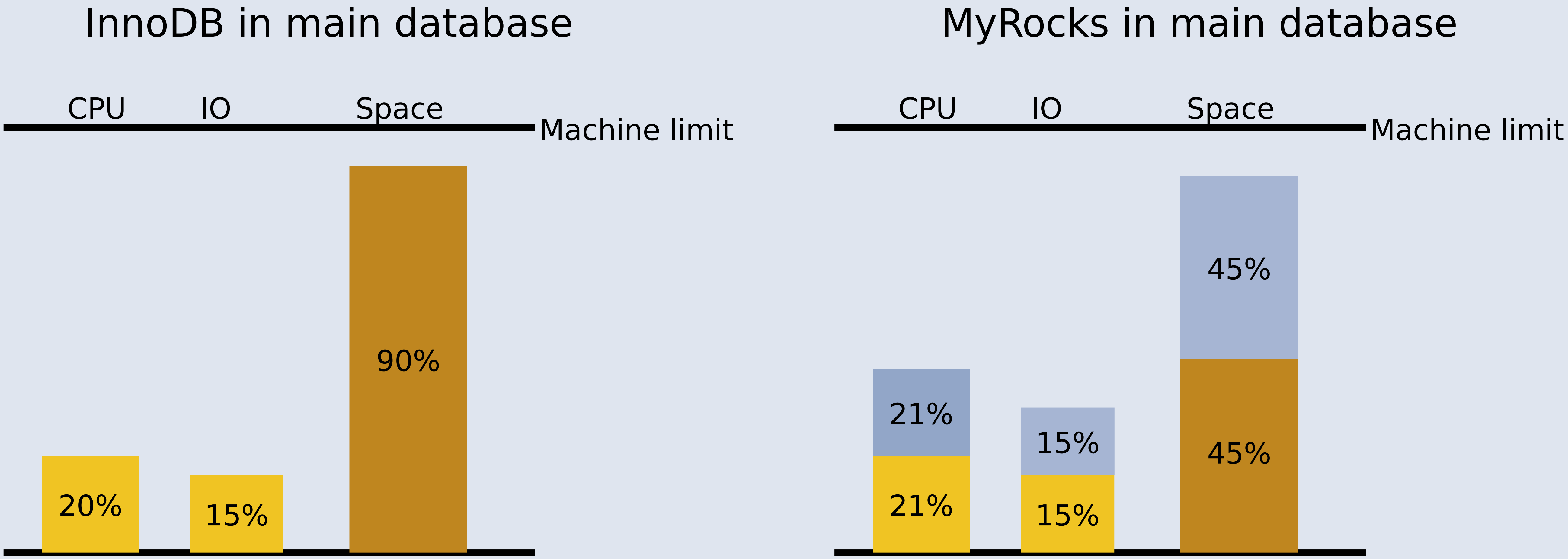
InnoDB

RocksDB

MySQL

http://myrocks.io/

MyRocks Initial Goal at Facebook



InnoDB in main database

MyRocks in main database

MyRocks features

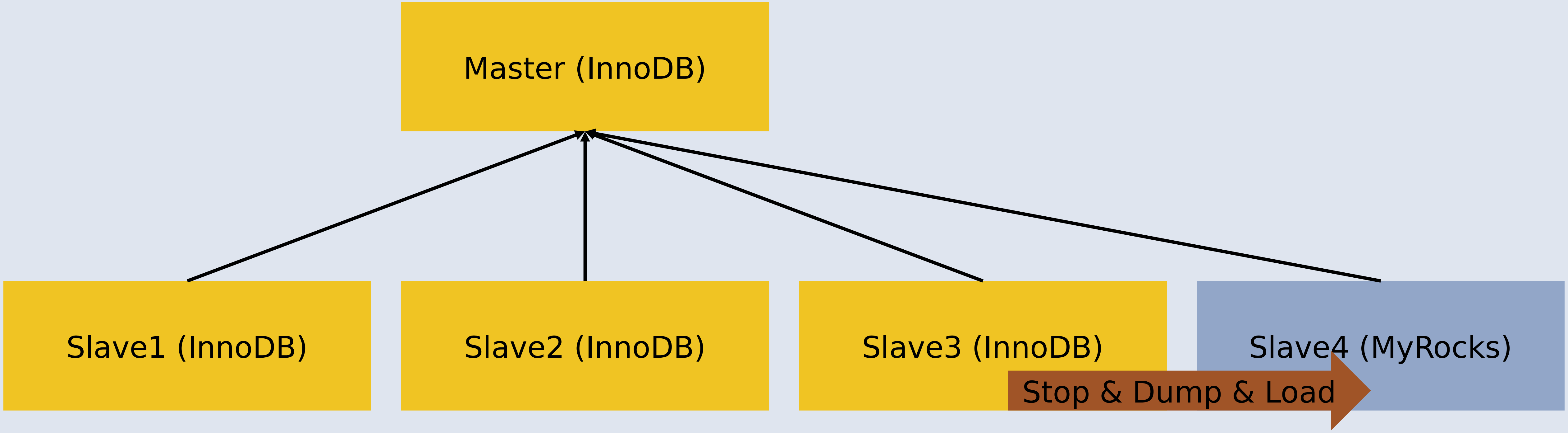
- Clustered Index (same as InnoDB)
- Bloom Filter and Column Family
- Transactions, including consistency between binlog and RocksDB
- Faster data loading, deletes and replication
- Dynamic Options
- TTL
- Online logical and binary backup

MyRocks vs InnoDB

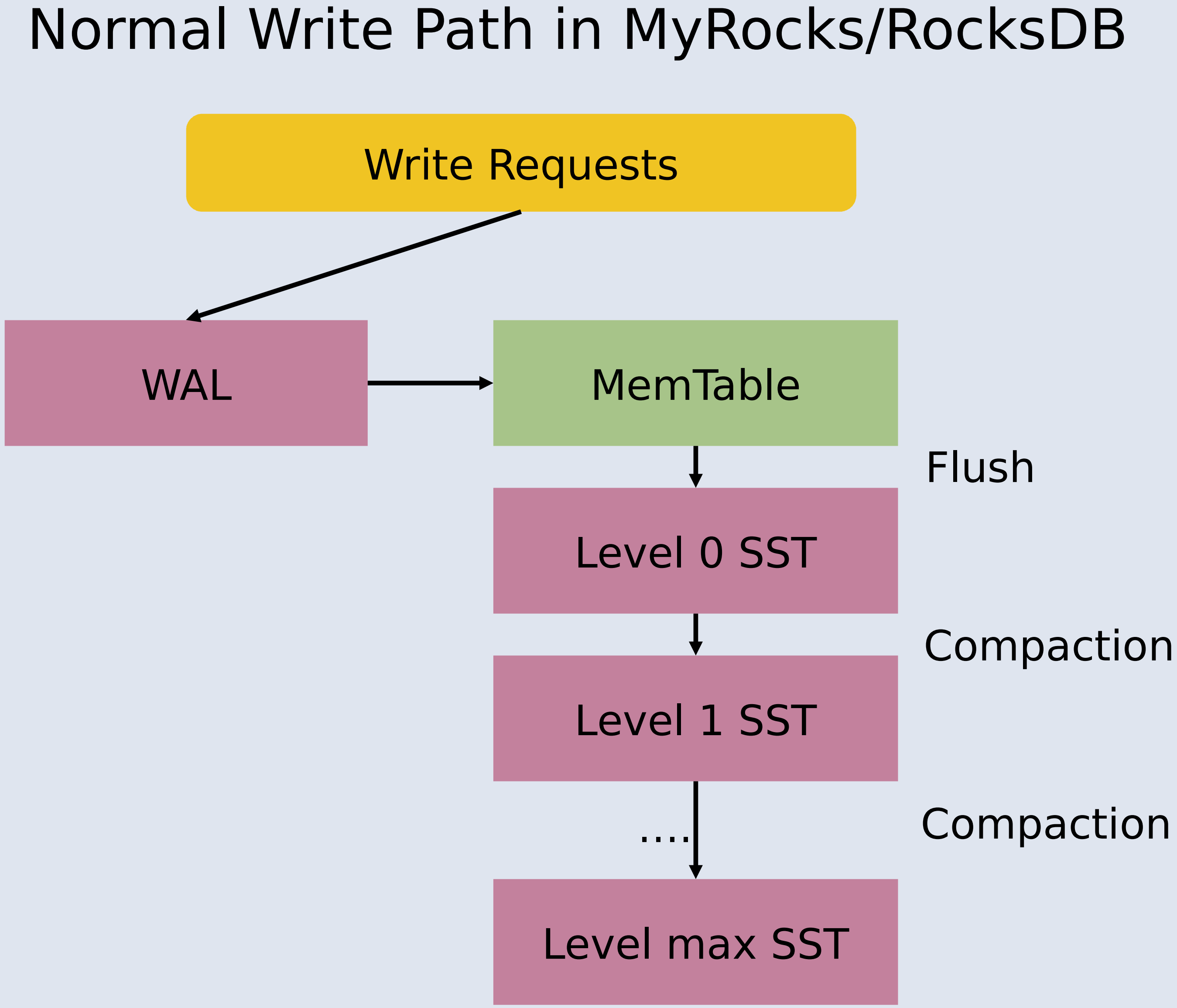
- MyRocks pros
  - Much smaller space (half compared to compressed InnoDB)
    - Gives better cache hit rate
  - Writes are faster = Faster Replication
  - Much smaller bytes written (can use more affordable flash storage)
- MyRocks cons (improvements in progress)
  - Lack of several features
    - No SBR, Gap Lock, Foreign Key, Fulltext Index, Spatial Index support. Need to use case sensitive collation for perf
  - Reads are slower, especially if your data fits in memory
  - More dependent on filesystem and OS. Lack of solid direct i/o. Must use newer 4.6 kernel
  - There are too many tuning options beyond buffer pool, such as bloom filter, compactions etc

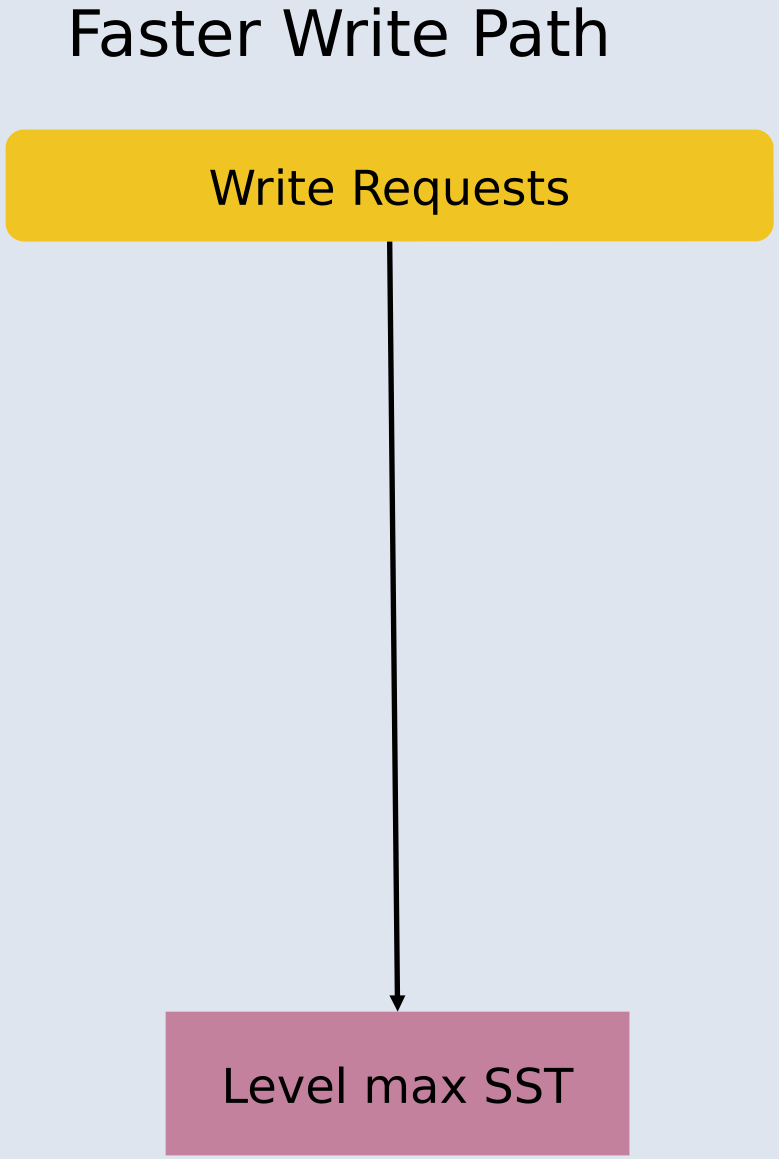
Creating first MyRocks instance without downtime

- Picking one of the InnoDB slave instances, then starting logical dump and restore
  - Stopping one slave does not affect services



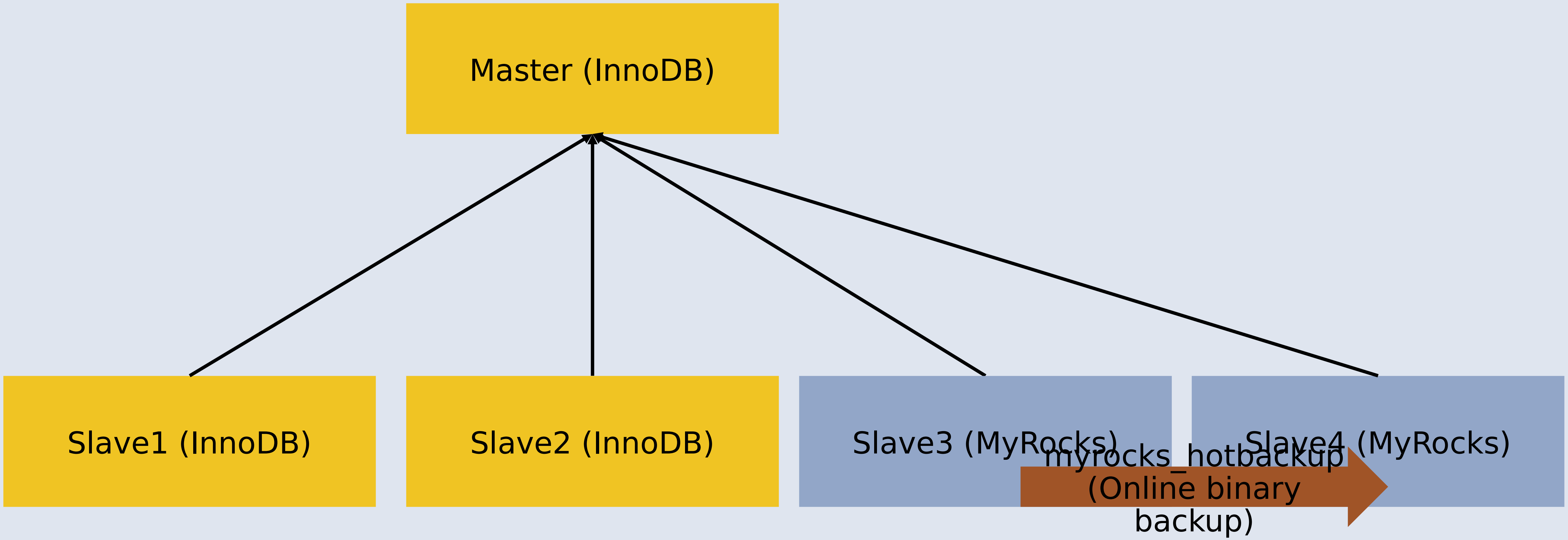
Faster Data Loading



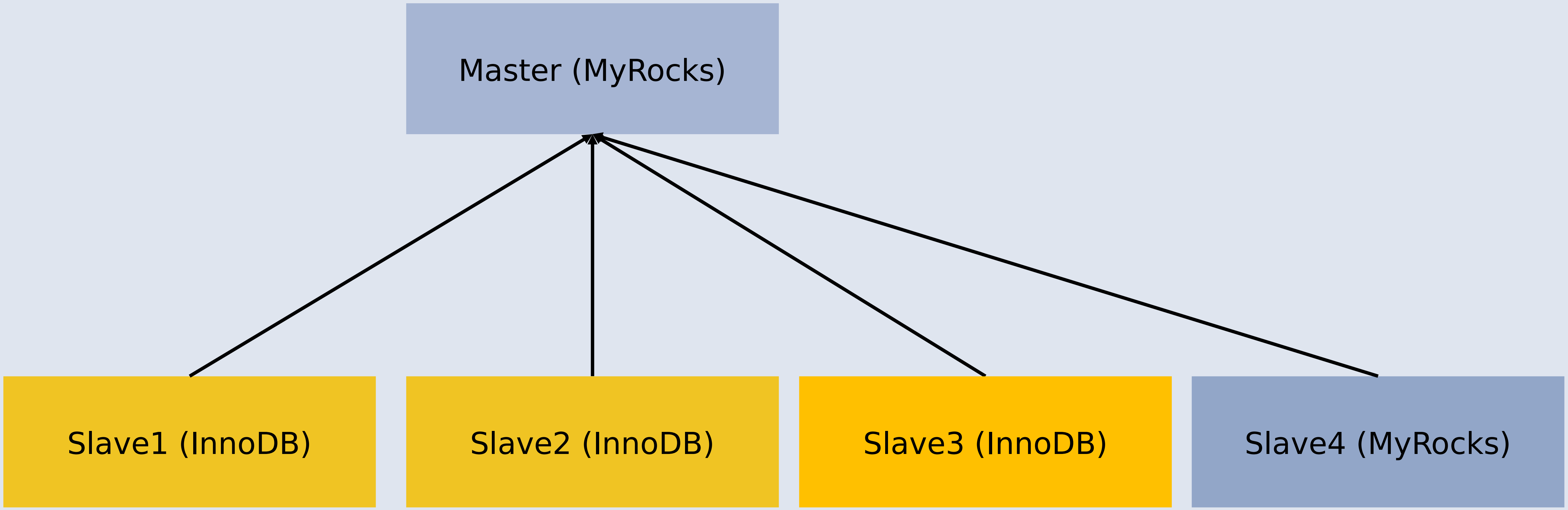


“SET SESSION rocksdb_bulk_load=1;”
Original data must be sorted by primary key

Creating second MyRocks instance without downtime



Promoting MyRocks as a master



Master (MyRocks)

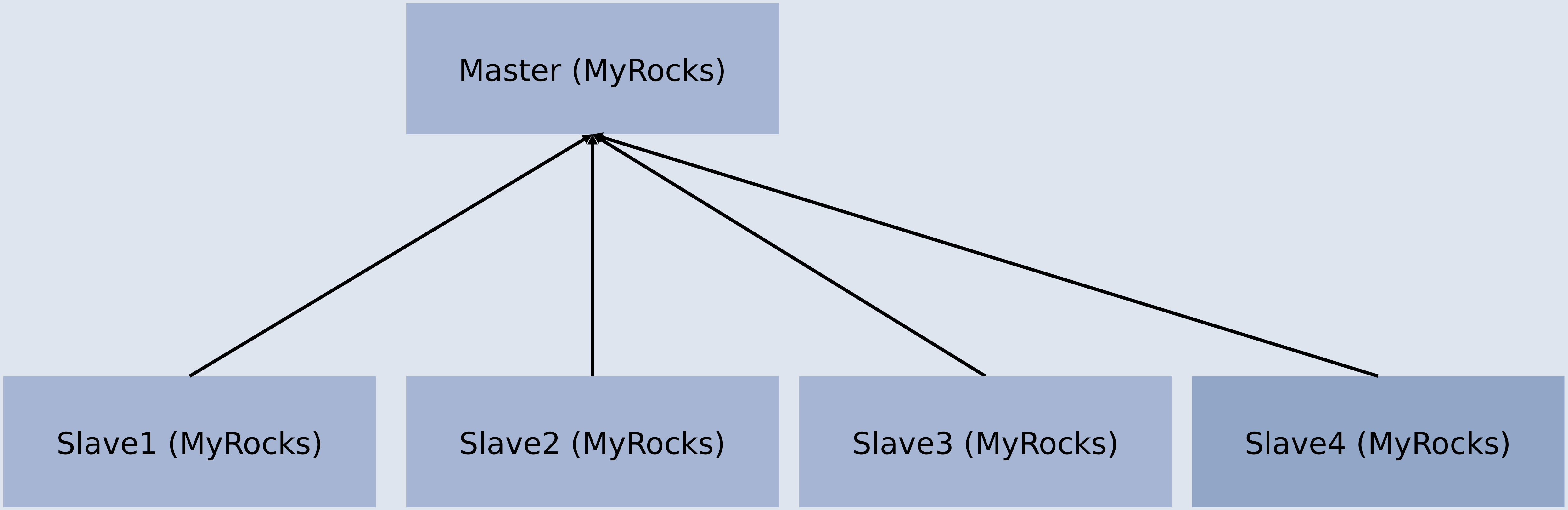
Slave1 (InnoDB)

Slave2 (InnoDB)

Slave3 (InnoDB)

Slave4 (MyRocks)

Promoting MyRocks as a master



Master (MyRocks)

Slave1 (MyRocks)

Slave2 (MyRocks)

Slave3 (MyRocks)

Slave4 (MyRocks)

Our current production status

We COMPLETED InnoDB to MyRocks migration in UDB

We saved 50% space in UDB compared to compressed InnoDB

We started working on migrating other large database tiers

Development Roadmaps

- Helping MariaDB and Percona Server to release with stable MyRocks

- Matching read performance vs InnoDB
  - https://smalldatum.blogspot.com

- Supporting Mixed Engines

- Better Replication

- Supporting Bigger Instance Size

Mixed Engines

- Currently our production use case is either “MyRocks only” or “InnoDB only” instance

- There are several internal/external use cases that want to use InnoDB and MyRocks within the same instance, though single transaction does not overlap engines

- Online logical/binary Backup support and benchmarks are concerns
- Current plan is extending xtrabackup to integrate myrocks_hotbackup
- Considering to backporting gtid_pos_auto_engines from MariaDB

Better Replication

- Removing engine log
  - Both internal and external benchmarks show that qps improves significantly with binlog disabled
  - Real Problem would be two logs – binlog and engine log, which requires 2pc and ordered commits
  - One Log - use one log as the source of truth for commits -- either binlog, binlog-like service or RocksDB WAL
  - We heavily rely on binlogs (for semisync, binlog consumers), TBD is how much perf we gain by stopping writing to WAL
- Parallel replication apply
- Batching
- Skipping using transactions on slaves

Supporting Bigger Instance Size

- Problem Statement: Shared Nothing database is not general purpose database
  - MySQL Cluster, Spider, Vitess
  - Good if you have specific purposes. Might have issues if people lack of expertise about atomic transactions, joins and secondary keys

- Suggestion: Now we have 256GB+ RAM and 10TB+ Flash on commodity servers. Why not run one big instance and put everything there?

- Bigger instances may help general purpose small-mid applications
  - They don’t have to worry about sharding. Atomic trans, joins and secondary keys just work
  - e.g. Amazon Aurora (supporting up to 60TB instance)

Future Plans to support Bigger Instance (1)

- Parallel transactional mysqldump
- Parallel Query
  - e.g. how to make mysqldump finish within 24 hours from 20TB table?
- Parallel binary copy
  - e.g. how quickly can we create a 60TB replica instance in a remote region?
- Parallel DDL, Parallel Loading
- Resumable DDL
  - e.g. if the DDL is expected to take 10 days, what will happen if mysqld restarts after 8 days?

Future Plans to support Bigger Instance (2)

- Better join algorithm
- Much faster replication
- Can handle 10x connection requests and queries
- Good resource control
- H/W perspective: Shared Storage and Elastic Computing Units
- Can scale read replicas from the same shared storage

Summary

- We finished deploying MyRocks in our production user database (UDB)
- You can start deploying slaves, with consistency check
- We have added many status counters for instance monitoring
- More interesting features will come this year

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