QCon 全球软件开发大会
INTERNATIONAL SOFTWARE DEVELOPMENT CONFERENCE

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RadonDB

新一代分布式关系型数据库

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Geekbang InfoQ

SPEAKER

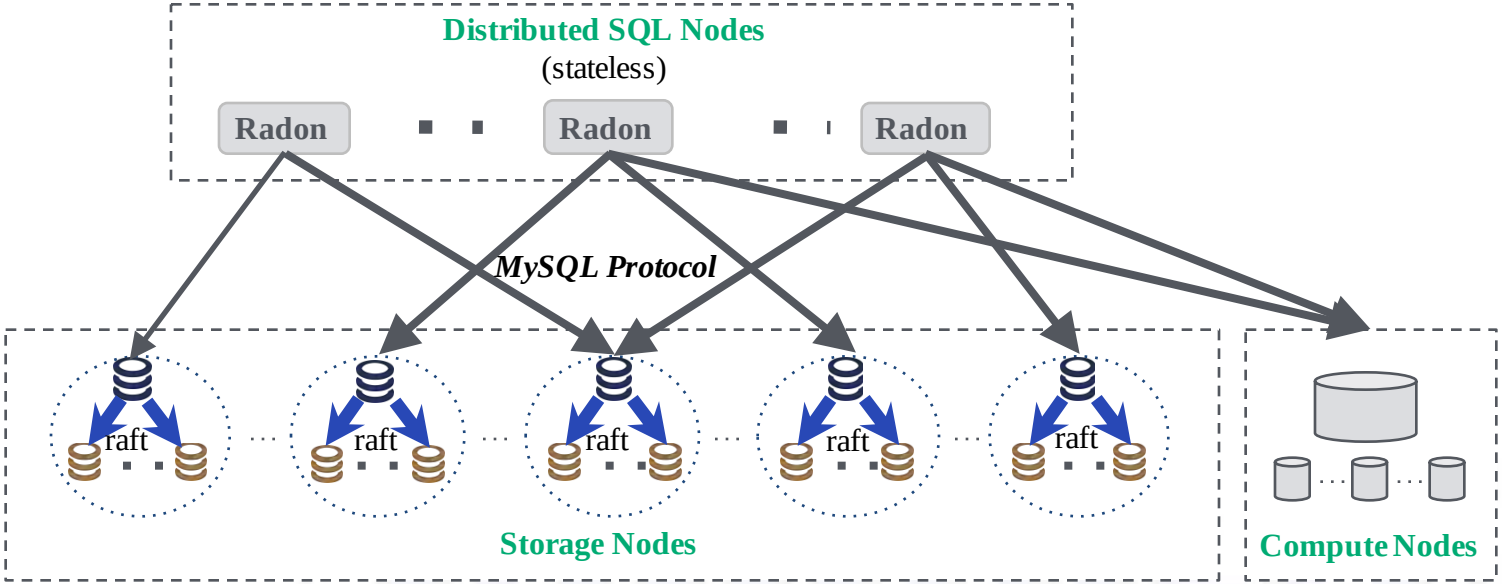
- TokuDB内核维护者、XeLabs核心成员
- 淘宝核心系统/阿里云数据库内核组/青云数据库团队
- 目前在青云从事新一代数据库产品设计与研发工作

@BohuTANG

RadonDB

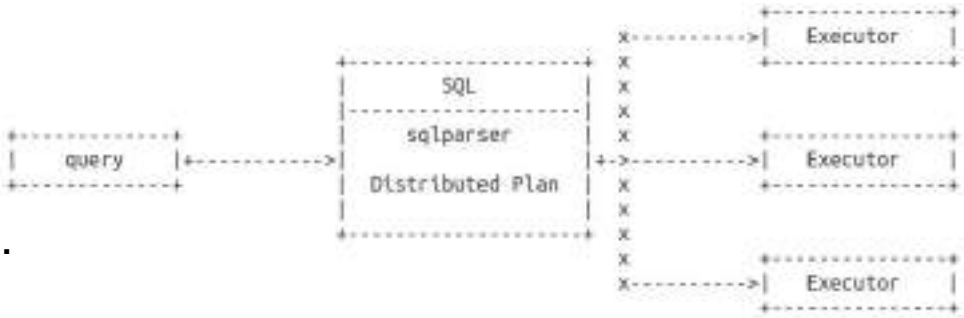
- ▶可扩展
- ▶高可用
- ▶强一致
- ▶易部署
- ▶MyNewSQL

Architecture



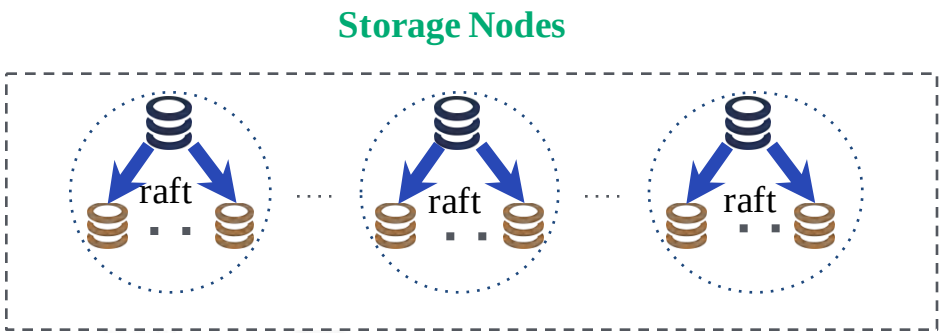
Distributed SQL

- ►生成分布式执行计划
- ►执行器并行执行
- ►orderby/limit/groupby/aggr/join …
- ►主从模式



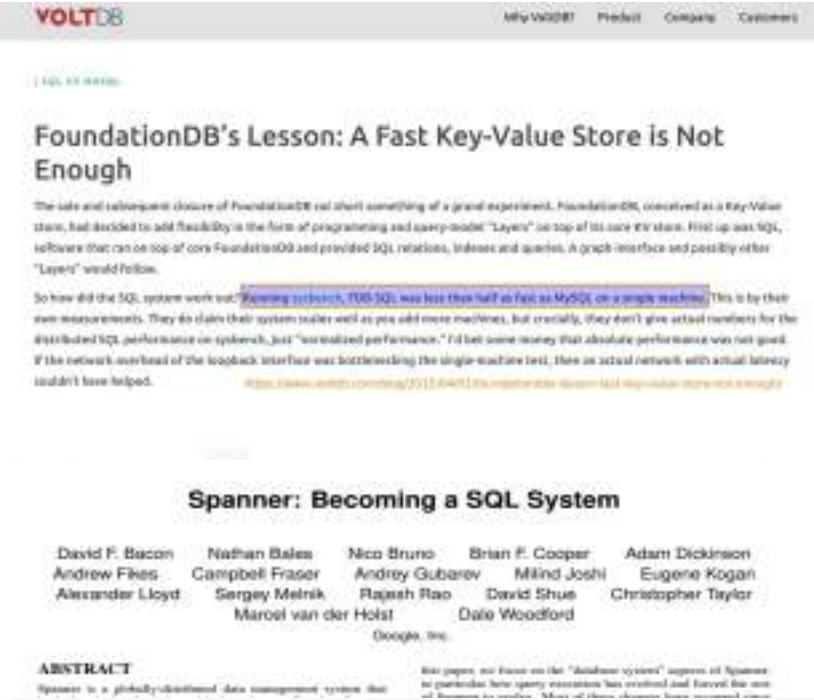
Storage Nodes

- ▶存储层由多个 node 组成
- ▶每个node 由多副本组成
- ▶每个副本为一个 *MySQL*
- ▶不仅存储还有计算能力



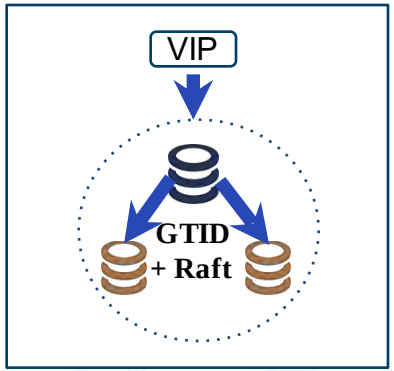
副本

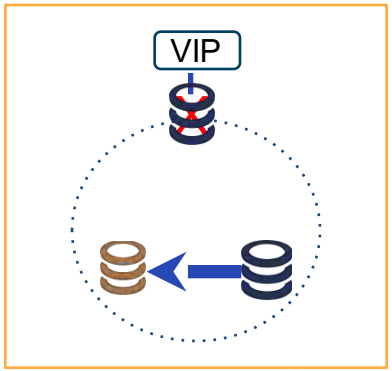
- 为什么不是KV? MySQL!
- 稳定可靠、多索引写原子保证
- 计算下推，数据就近计算原则
- 不仅存储还有计算能力
- SQL 与 Storage 数据传输最小化
- MySQL 8.0更加强大...



高可用

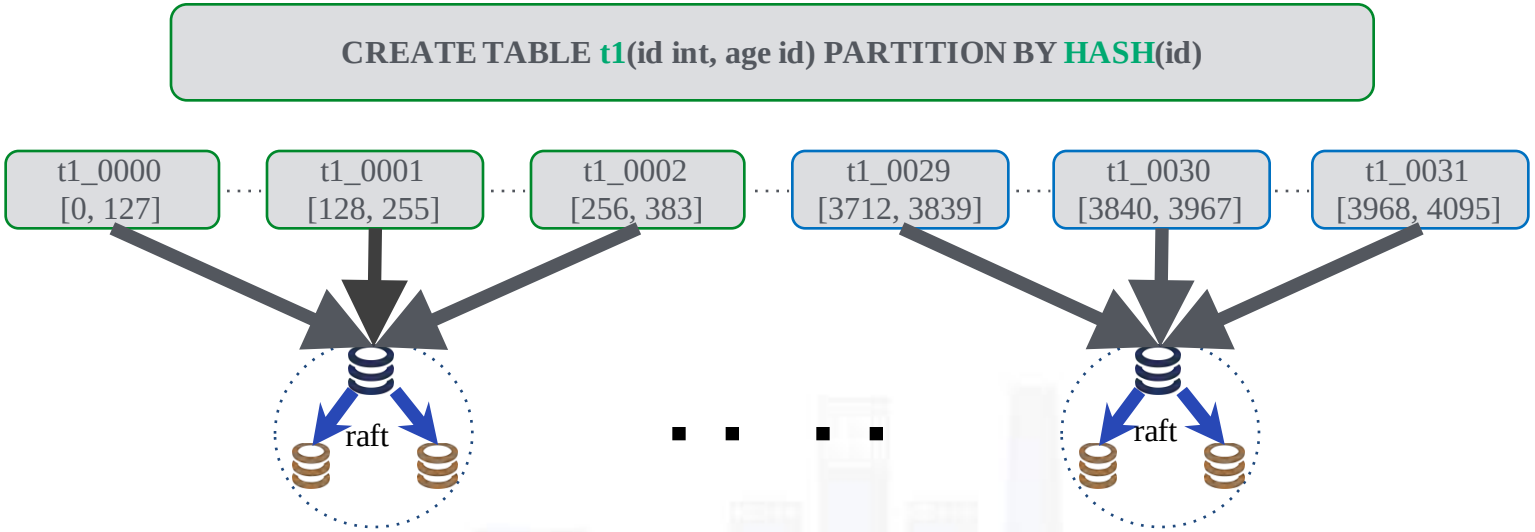
- ▶GTID 作为 Raft Log Index
- ▶Raft 协议选主、Log 并行复制
- ▶主副本故障秒级切换即可服务
- ▶强 Semi-Sync 确保事务不丢失
- ▶单副本故障可快速流式重建
- ▶无中心化，可跨机房部署





Raft+MySQL = Raft 选主+GTID 并行复制+强 Semi-Sync 数据强一致、切换零丢失

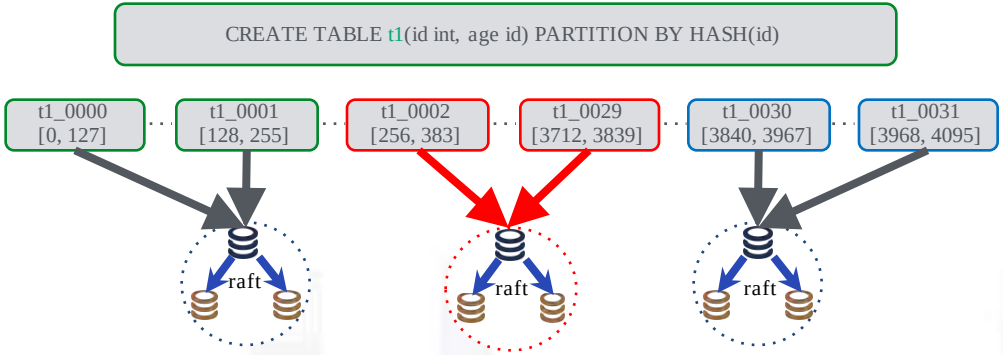
数据分布



►整张表共 4096 slots ►每个小表 128 slots ►小表均匀分散在 node节点

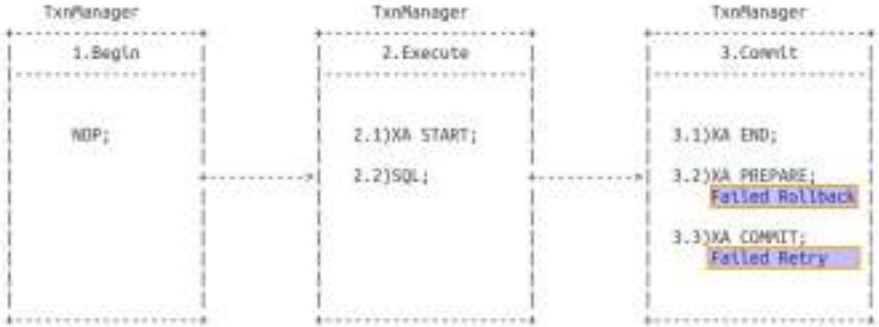
扩容

- ▶小表可动态漂移
- ▶先全量后增量
- ▶较大/热度高者优先
- ▶资源分配最优化



分布式事务

- ►事务管理
- ►事务可靠性
- ►Snapshot Isolation 隔离级别



SI隔离级别

- ▶未提交不可见
- ▶部分提交不可见

```
client1> select * from t1 where id>0;
client2> update t1 set a=1 where id>0;
```

```
client1 got 1:
case1. time -----------------+---------------->
            |->client2-update |->client1-select
```

```
client1 got 0:
case1. time -----------------+---------------->
            |->client1-select |->client2-update

case2. time ----------------------------------->
            |->client1-select
                 |->client2-update

case3. time ----------------------------------->
                 |->client1-select
            |->client2-update
```

SI检测

- ►xelabs/go-jepsen
- ►1个更新线程，16个扫表线程
- ►100多亿次操作和检测
- ►随机 kill 存储节点主副本

```
Thread1:
update jepsen_si set score=0;
```

```
ThreadN:
select score from jepsen_si;
for cur := row.next() {
   if pre != cur {
      errors++
   }
}
```

time	thds	w-ops	r-ops	error(s)	total-ops
[3599s]	[r:16,u:1]	80000	3310000	0	11799980000
time	thds	w-ops	r-ops	error(s)	total-ops
[3600s]	[r:16,u:1]	70000	3130000	0	11803180000

Radon - Binlog

- ►Statement + GTID格式
- ►可被订阅用于数据同步(计算节点)
- ►show binlog events [GTID] [limit]
- ►实时流式获取

OLTP + OLAP

- ►独立计算节点(Compute Node)
- ►数据通过 Radon Binlog 进行快速同步
- ►SQL 层自动路由复杂查询到计算节点
- ►优点: 高并发事务与复杂查询资源隔离
- ►缺点: 存储 2 份，目前使用压缩解决

审计日志

- ▶支持多种审计模式
- ▶可定位慢查询等

```
type event struct {
▶ Start       time.Time     `json:"start"`        // Time the query was start.
▶ End         time.Time     `json:"end"`          // Time the query was end.
▶ Cost        time.Duration `json:"cost"`         // Cost.
▶ User        string        `json:"user"`         // User.
▶ UserHost    string        `json:"user_host"`    // User and host combination.
▶ ThreadID    uint32        `json:"thread_id"`    // Thread id.
▶ CommandType string        `json:"command_type"` // Type of command.
▶ Argument    string        `json:"argument"`     // Full query.
▶ QueryRows   uint64        `json:"query_rows"`   // Query rows.
}
```

Backup & restore

- ►xelabs/go-mydumper
- ►批量并行流式导出
- ►批量并行导入

性能

sysbench: 16表，512线程，随机写，5000万条数据

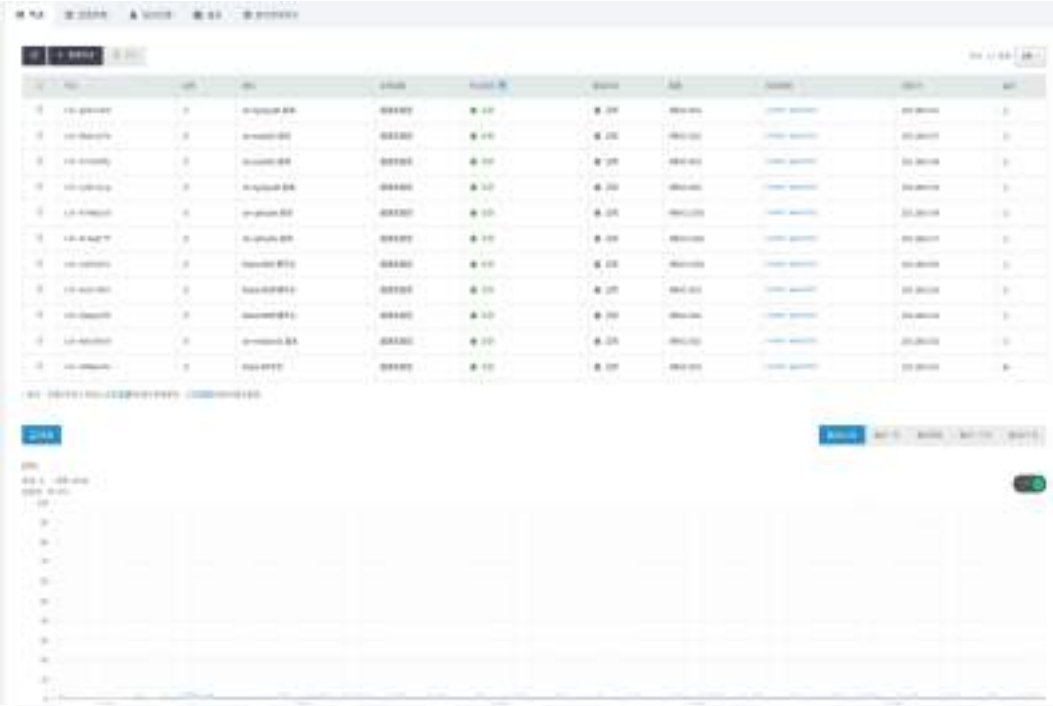
	Transaction Per Second(TPS)	Response Time(avg)	规格
RadonDB (1SQL节点，4 存储节点)	**26,589**	**20ms**	4 存储节点(16C64G超高性能主机) sync_binlog=1 innodb_flush_log_at_trx_commit=1
单机 MySQL (QingCloud RDB)	9,346	73ms	RDB(16C64G超高性能主机) sync_binlog=1 innodb_flush_log_at_trx_commit=1

部署

- ▶云化部署
- ▶简单快捷

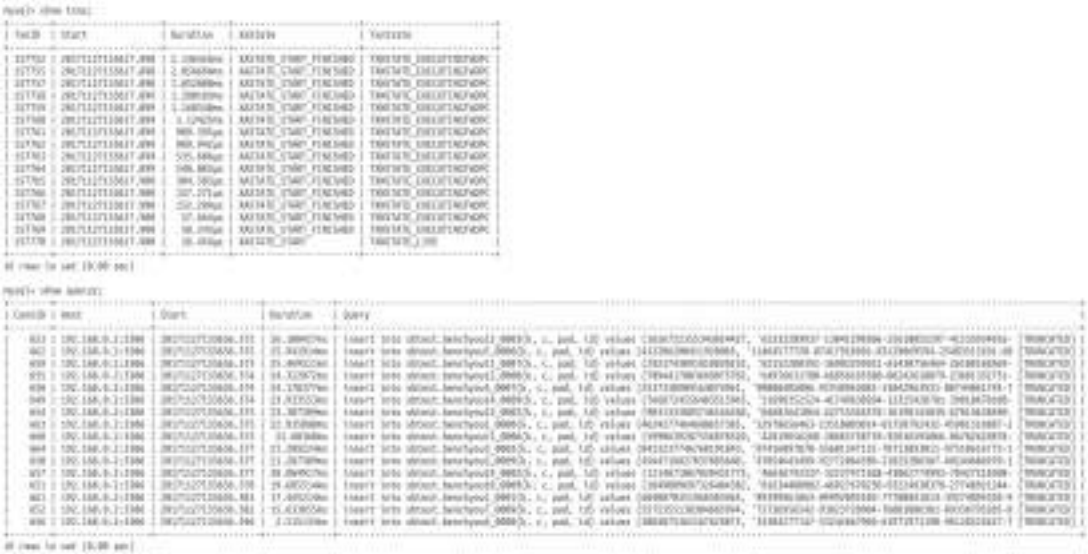
资源监控

- ▶CPU
- ▶内存
- ▶硬盘IOPS/使用率...



监控

- ►全链路监控
- ►mysql> show processlist;
- ►mysql> show txnz;
- ►mysql> show queryz;



展望

- ►MyNewSQL 刚刚开始
- ►Hybrid Row/Column Data Storage
- ►RadonDB 即将开源

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Thanks!

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