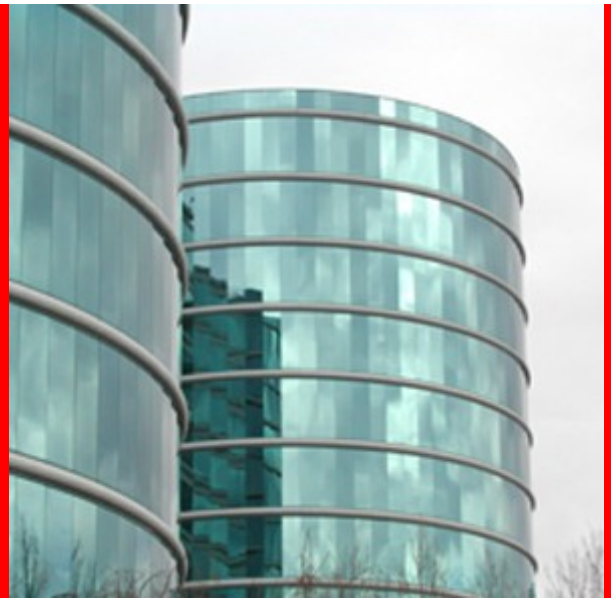

What's new in MySQL 5.5? Performance and Scalability Benchmarks

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Outline of talk

- Analysis of MySQL Server and InnoDB changes
- Analysis of important InnoDB configuration parameters
- Analysis of Partitioning as Performance Booster
- Impact of Powersave mode on Benchmarks
- Scalability Analysis of MySQL 5.5.4-m3
- Analysis of behaviour of MySQL 5.5.4-m3

Log_sys mutex Improvement

- Zero impact on read-only benchmarks
- Improves performance by 5% when added to MySQL 5.5.3-m3 baseline on 16-core MySQL Server
- SHOW ENGINE INNODB MUTEX shows that log_sys mutex have decreased contention
- The new log_flush_order mutex have very little contention
- Combined with other patches the impact is smaller most likely

Split Buffer Pool into multiple instances

- Sysbench RW on 16-cores improves 10%
- Works very well together with Split Rollback Segment Mutex
- Improves Read Only performance as well
- Very large improvement on 32-core/threaded

Split out Buffer Pool Page Hash into array of mutexes

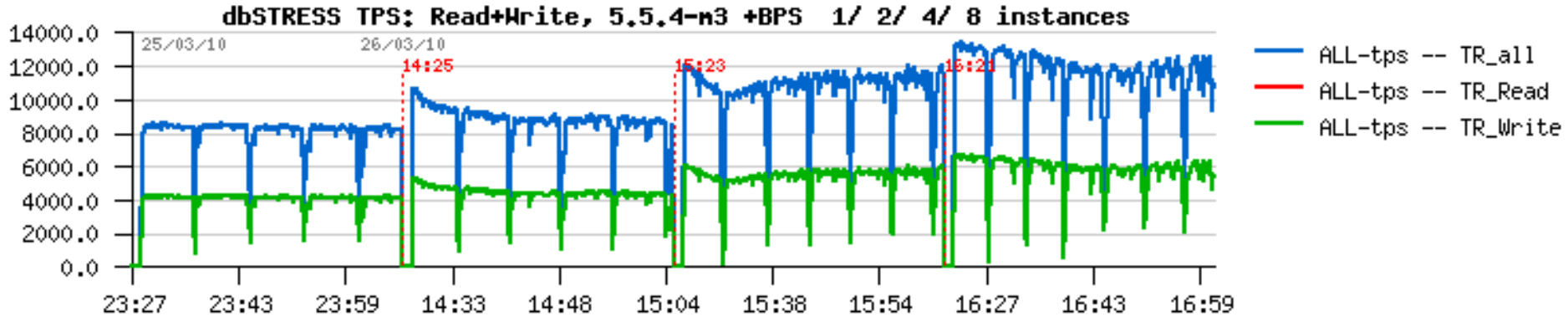
- About 10% improvement of Sysbench RW on 16-core
- No improvement or even decrease of Read Only performance
- Very good scalability on 32-core/thread

Split-out Page Hash vs. Multiple Buffer Pool instances

- Multiple Buffer Pool instances better Read Only performance
- Multiple Buffer Pool instances can combined with split-out page hash later if it makes sense
- Multiple Buffer Pool instances worked better on 32-core servers

Analysis of new InnoDB Buffer Pool instances

- –innodb-buffer-pool-instances=x



Split-out Flush List from Buffer Pool mutex

- No impact of Read Only performance
- A few percent improvement of ReadWrite workloads

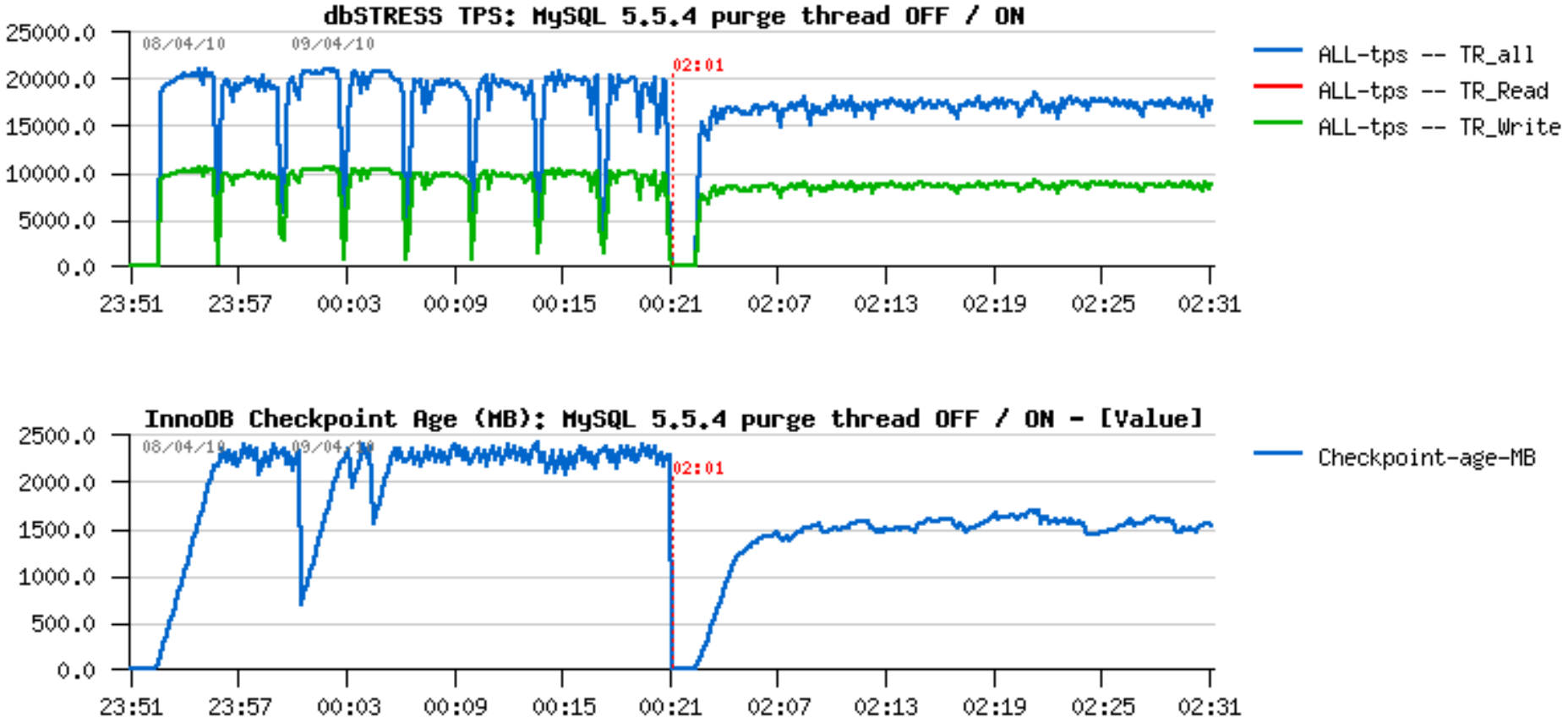
Split Rollback Segment into 128 Rollback Segments

- Combined with multiple buffer pool instances works very well and gives dramatic improvements on 32-core servers

Split Purge Thread into separate thread from Master Thread

- Required to get stable performance
- Mean performance slightly impacted positively or negatively
- Max performance decreases
- Min performance significantly increases
- Higher mean performance can often happen due to History Length continously increasing, will eventually lead to out of disk space

dbSTRESS: Read+Write & Purge Thread



Remove LOCK_alarm mutex

- Standalone improved 2%, improved both Read Only and Read Write

Improvement of LOCK_open, step 1, remove hash calculation from LOCK_open

- Improved performance of ReadOnly/ReadWrite a few percent

Remove many uses of LOCK_thread_count

- Standalone no improvement
- Combined with LOCK_open improvement and LOCK_alarm it improved ReadOnly/ReadWrite a few percent

Introduction of MDL locking framework

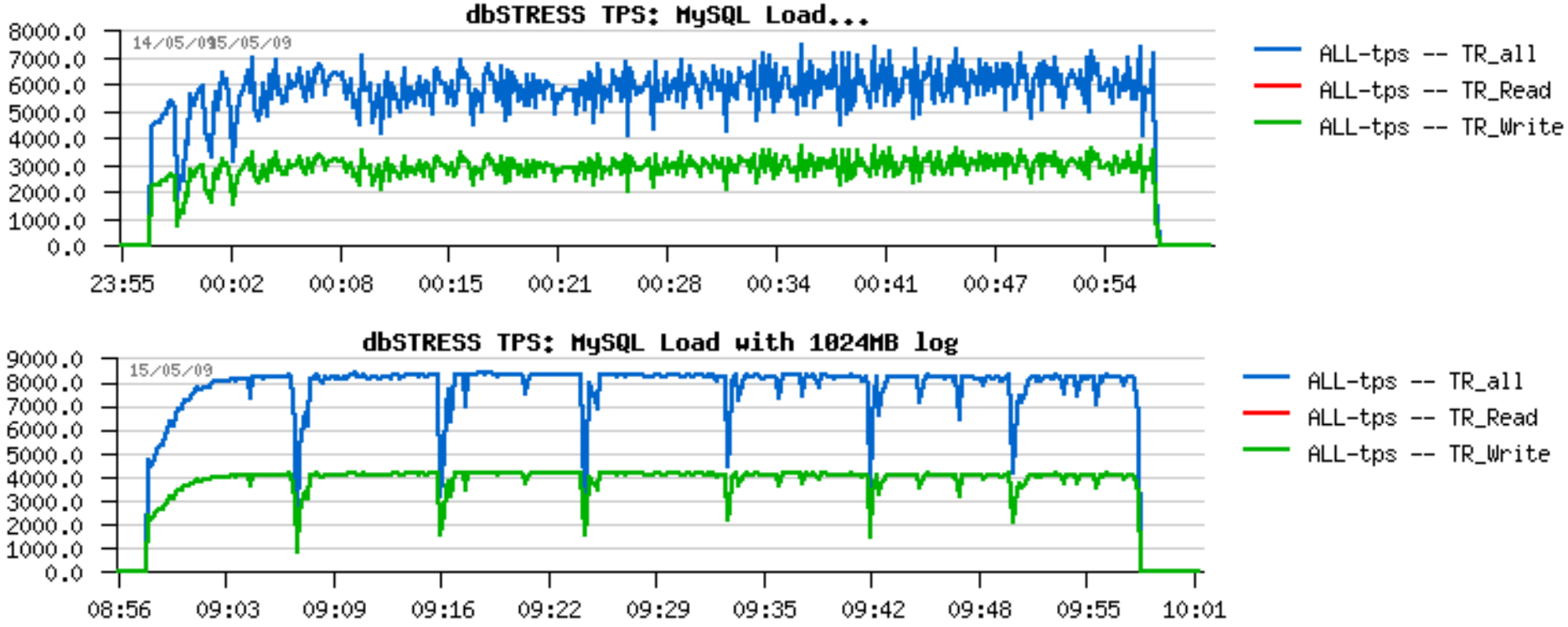
- Removed drop at high number threads due to change of how LOCK_open gets TABLE objects
- Improved performance a few percent

Improvement of LOCK_open based on MDL framework

- Improved performance a few percent

Analysis of InnoDB Log File Size

- 128MB => 1024MB: 6000 TPS => 8000 TPS



Analysis of InnoDB Log Buffer Memory

- No specific benchmarks executed
- Large buffer means less contention on log_sys mutex

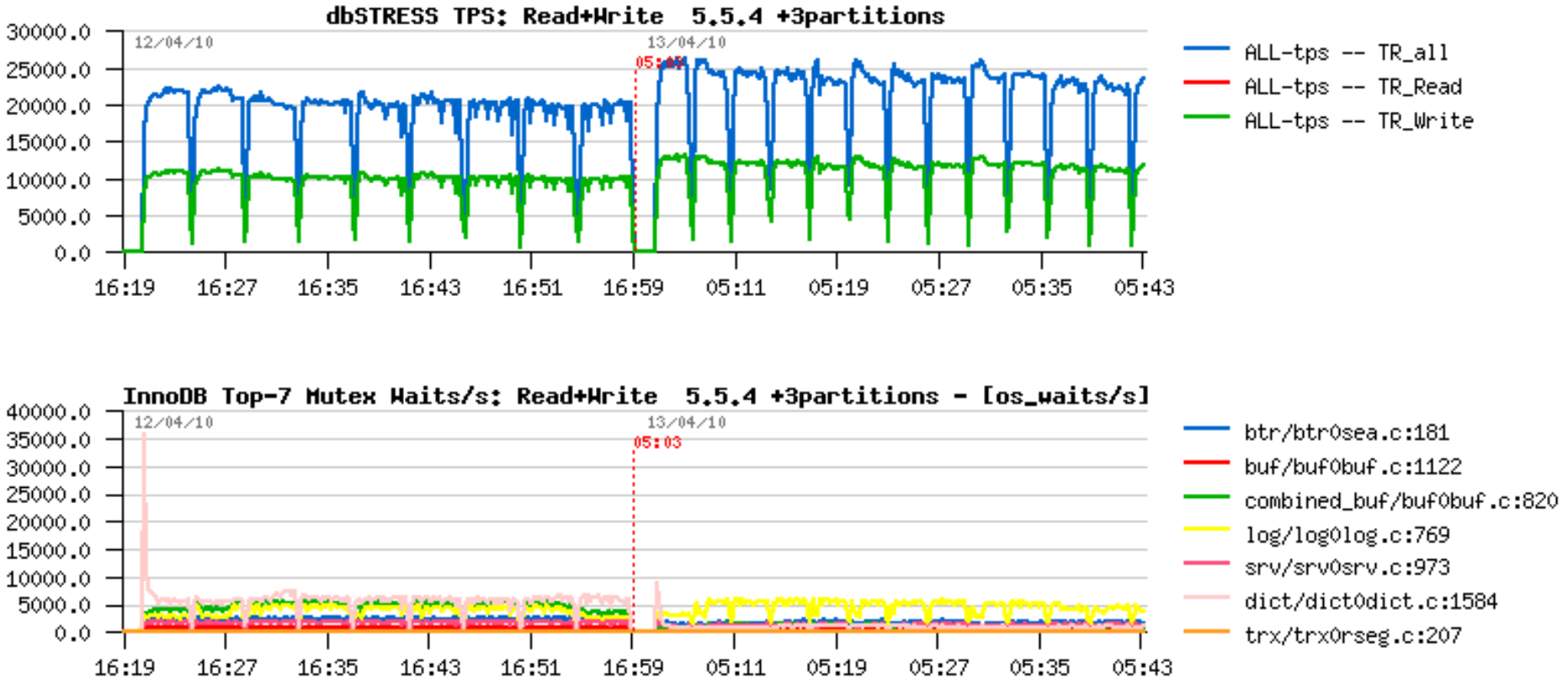
Analysis of use of InnoDB Adaptive Hash

- For Sysbench RO/RW on 16-cores improved performance by about 3-4% to not activate it

Analysis of Partitioning as Performance Booster

- Improves performance by splitting the InnoDB Index mutex

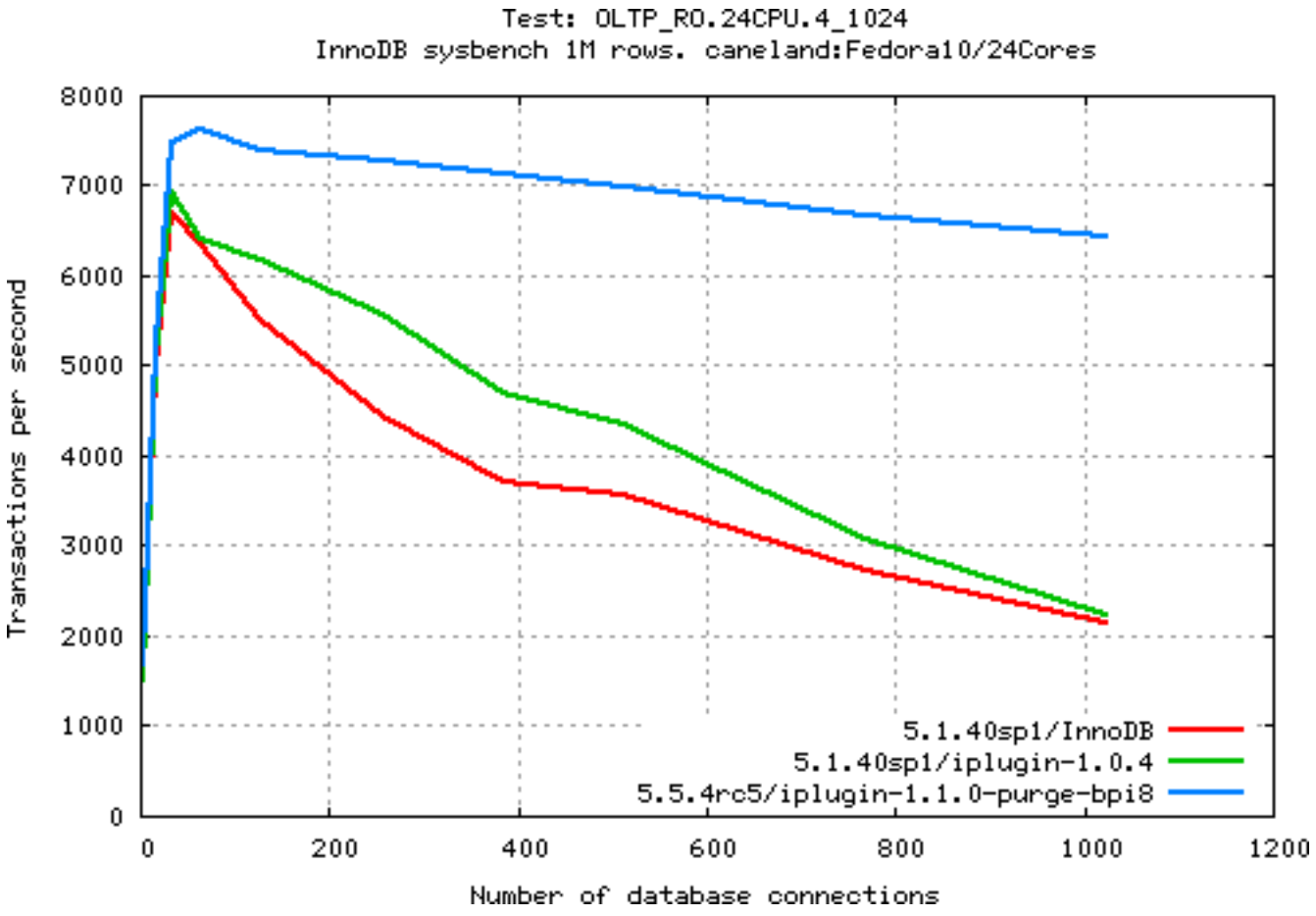
dbSTRESS: Using Partitions



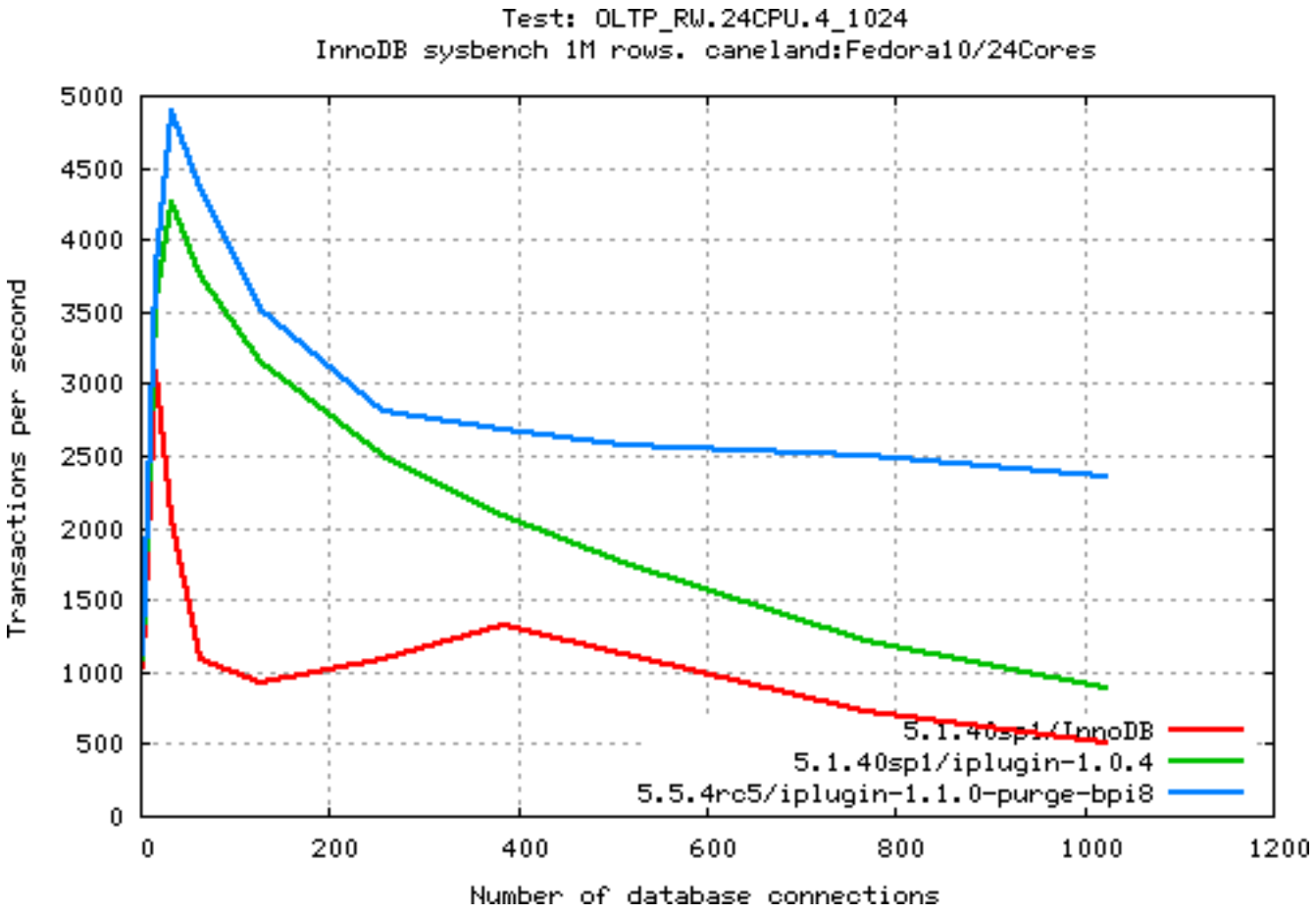
Impact of Powersave mode on Benchmarks/Applications

- /etc/init.d/cpuspeed on Linux
- Performance can drop significantly at low number of active connections (@16 threads performance drops to about half)
- Performance at 32 threads drops about 10%
- Performance at 64+ threads same

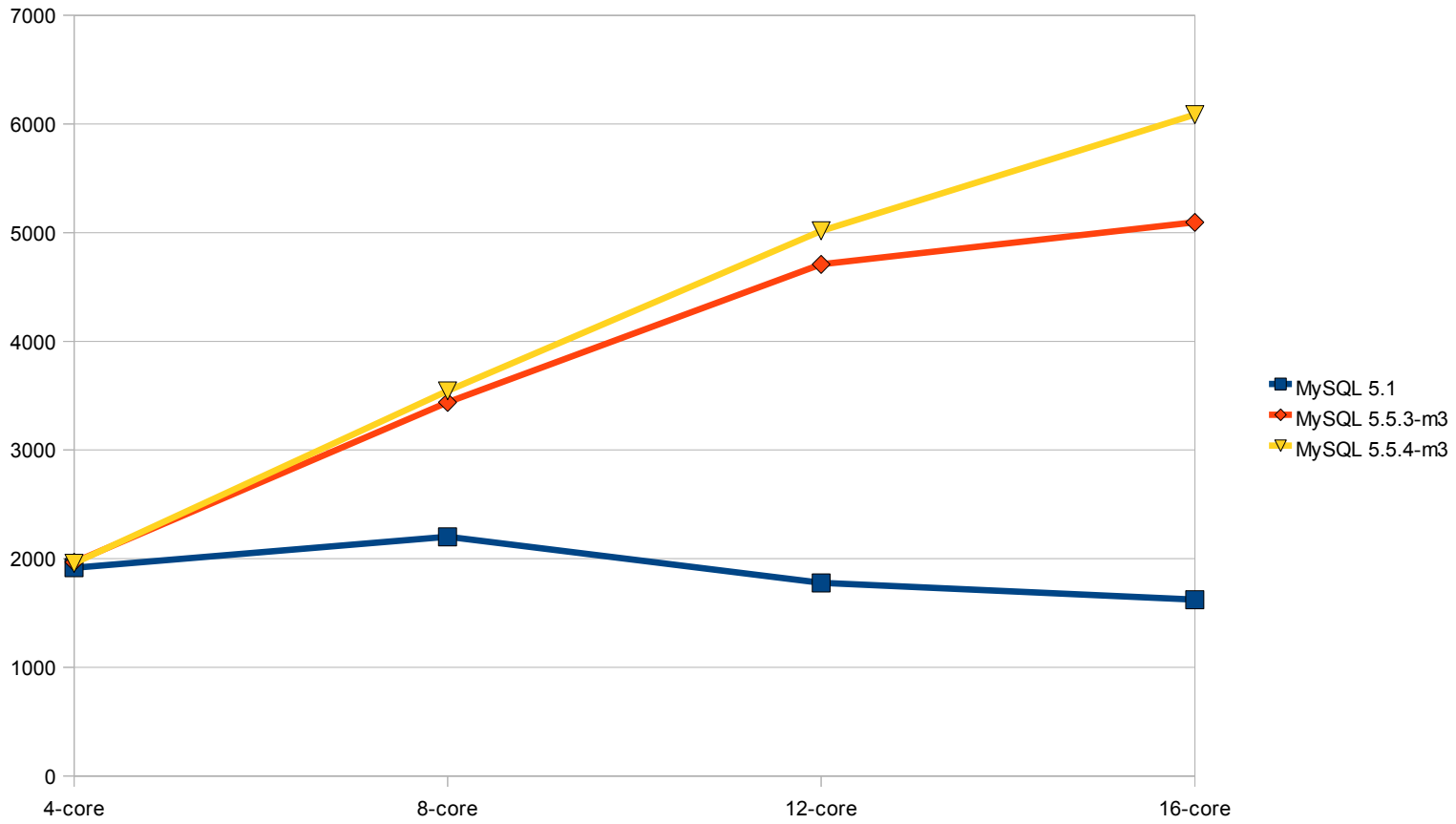
OLTP RO


Test: OLTP_RO.24CPU.4_1024
InnoDB sysbench 1M rows. caneland:Fedora10/24Cores
Transactions per second
Number of database connections
0
1000
2000
3000
4000
5000
6000
7000
8000
0
200
400
600
800
1000
1200
5.1.40sp1/InnoDB
5.1.40sp1/iplugin-1.0.4
5.5.4rc5/iplugin-1.1.0-purge-bpi8

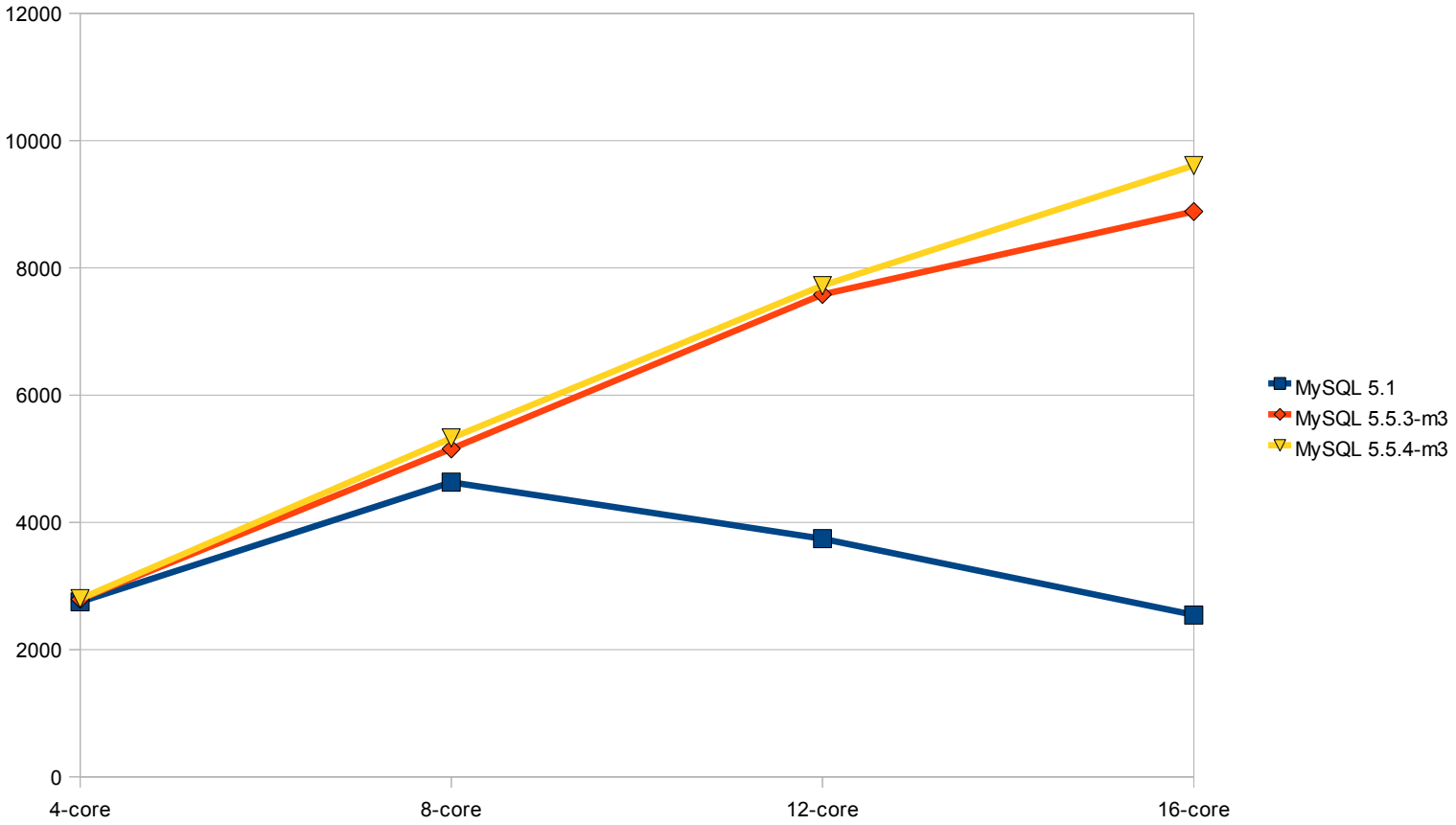
OLTP RW


Test: OLTP_RW.24CPU.4_1024
InnoDB sysbench 1M rows. caneland:Fedora10/24Cores
Transactions per second
Number of database connections
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
0
200
400
600
800
1000
1200
5.1.40sp1/InnoDB
5.1.40sp1/iplugin-1.0.4
5.5.4rc5/iplugin-1.1.0-purge-bpi8

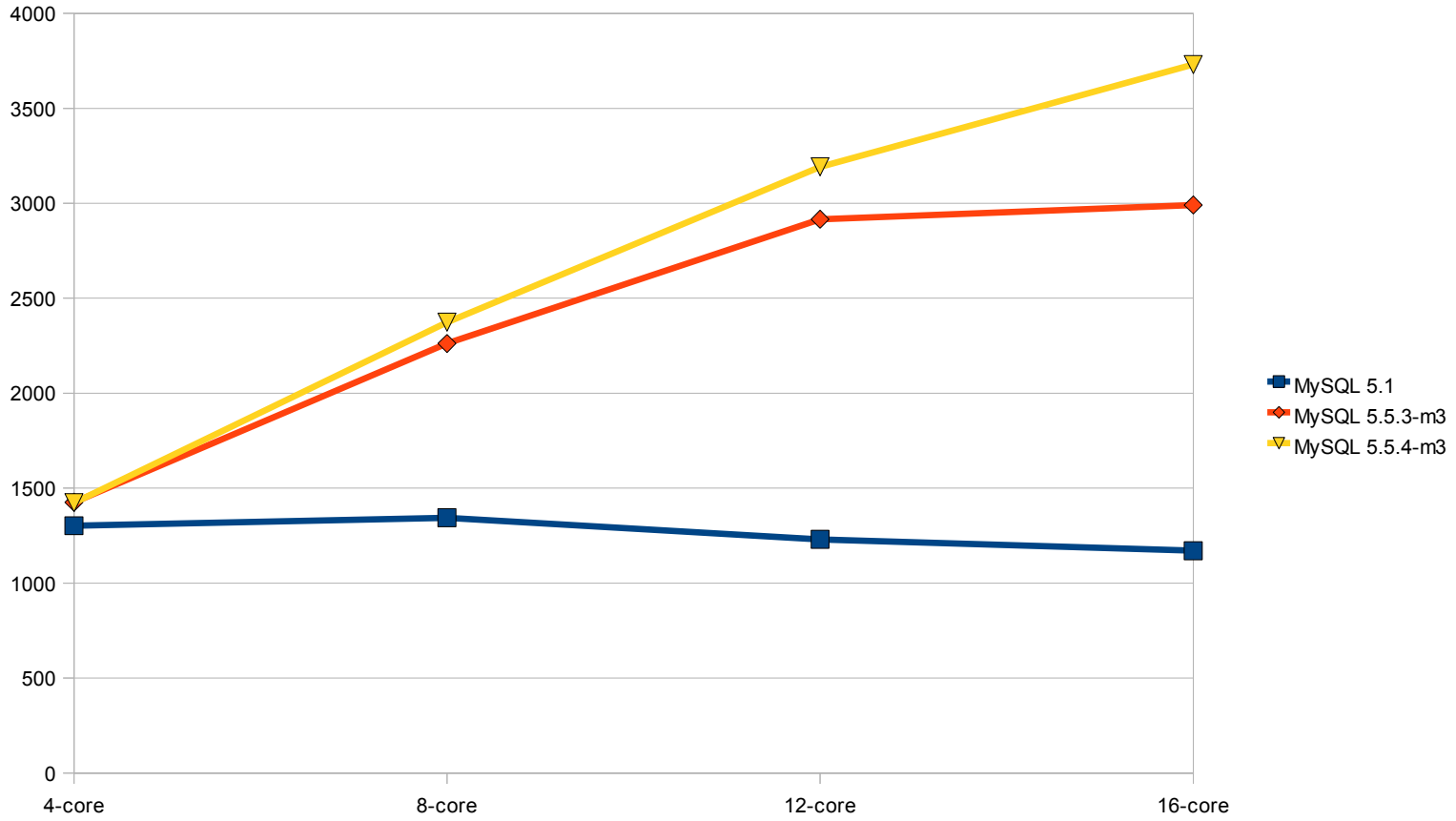
OLTP RW Scalability (4->16 cores)



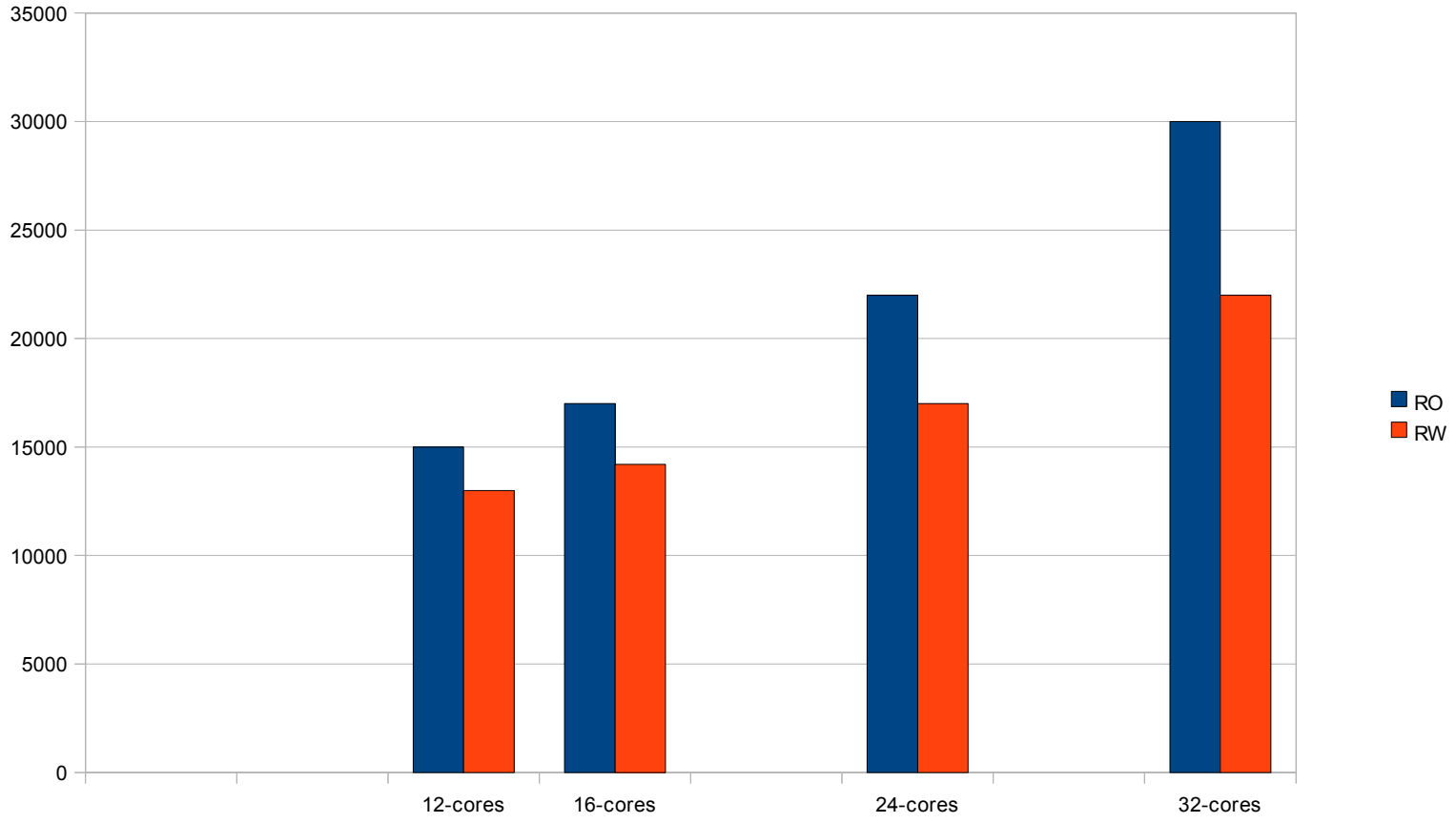
OLTP RO Scalability (4->16 cores)



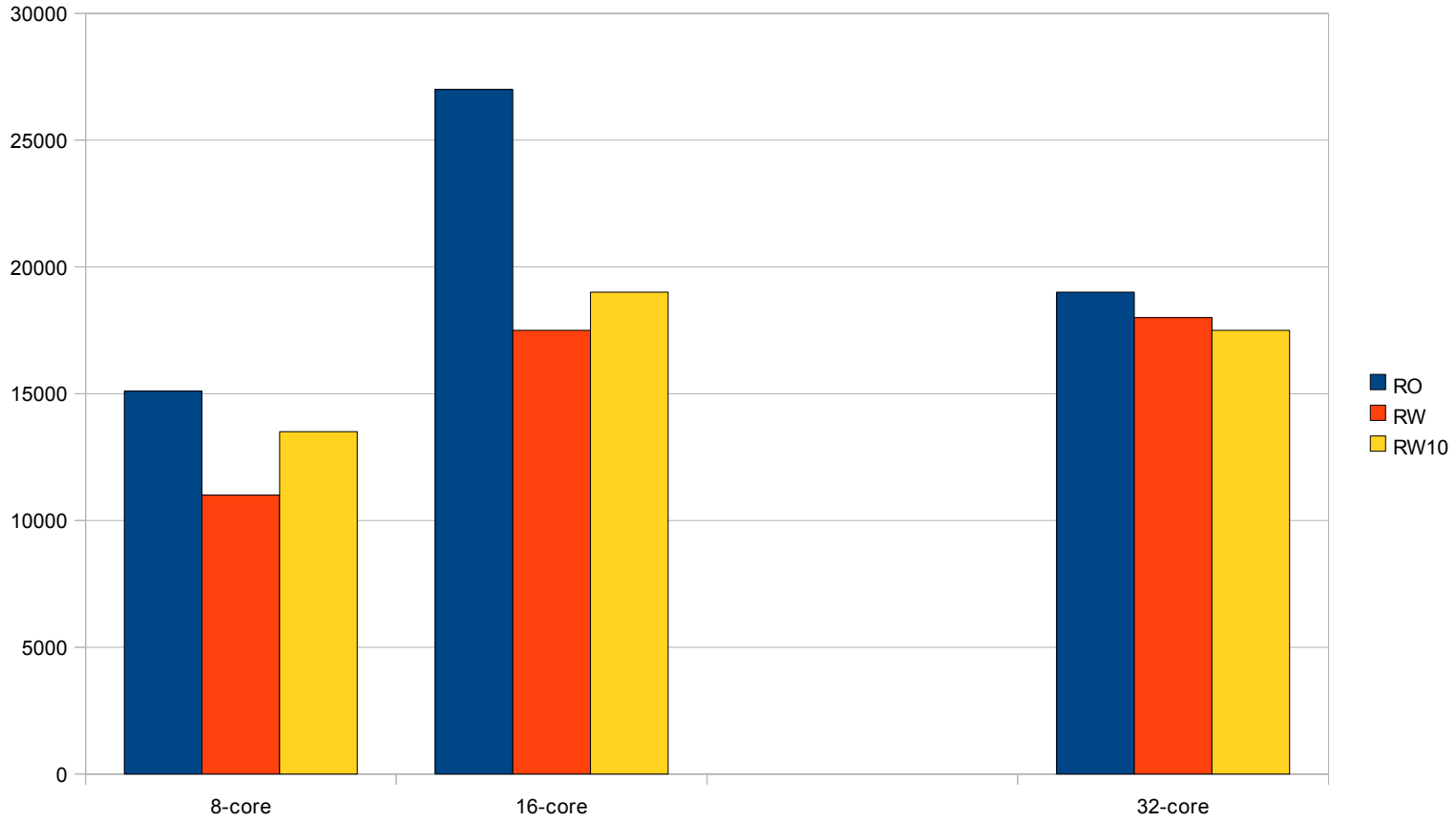
OLTP RW Write Intensive



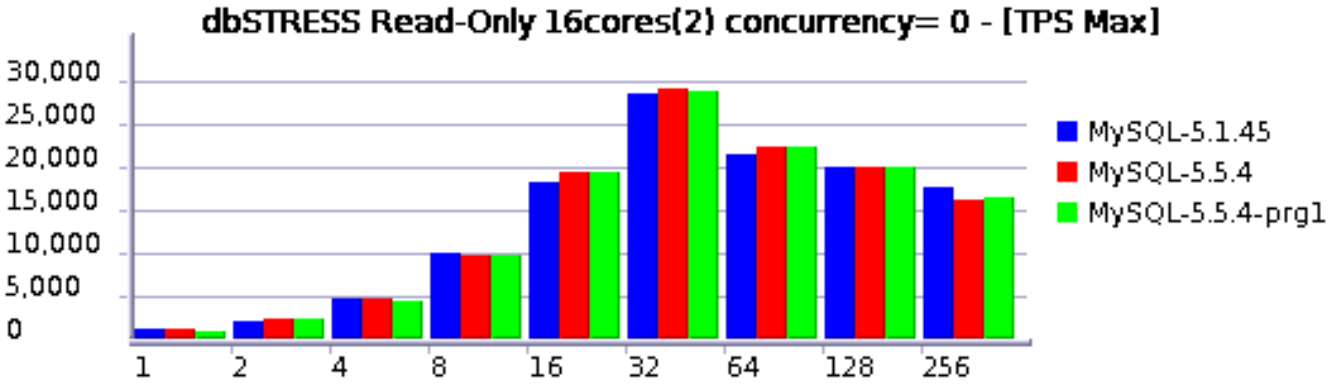
dbStress scalability 1 thread per core 12->32 cores

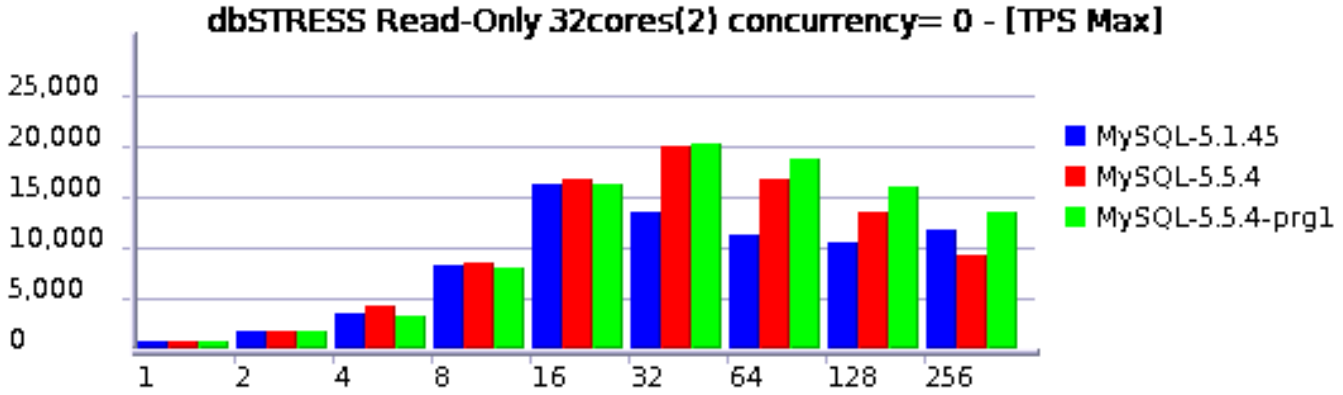


dbStress scalability 2 threads per core



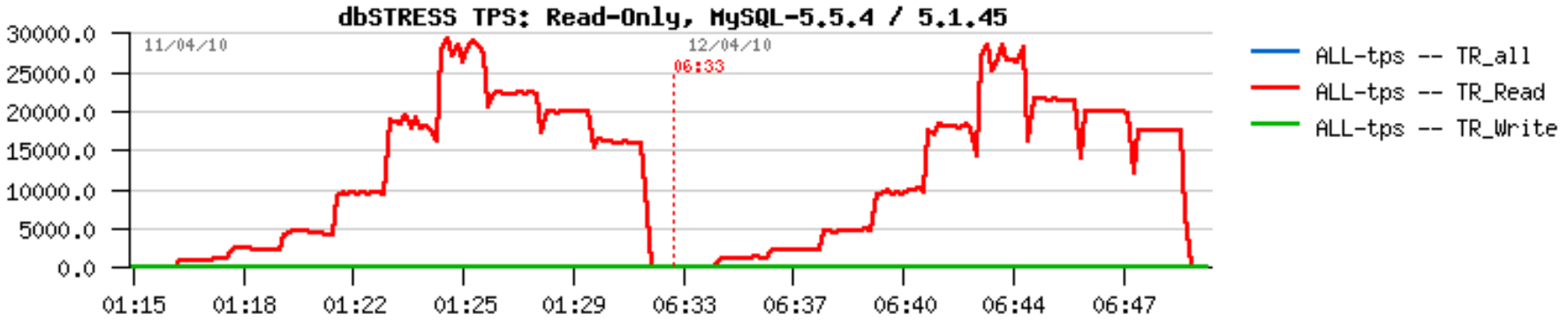
dbSTRESS: Read-Only

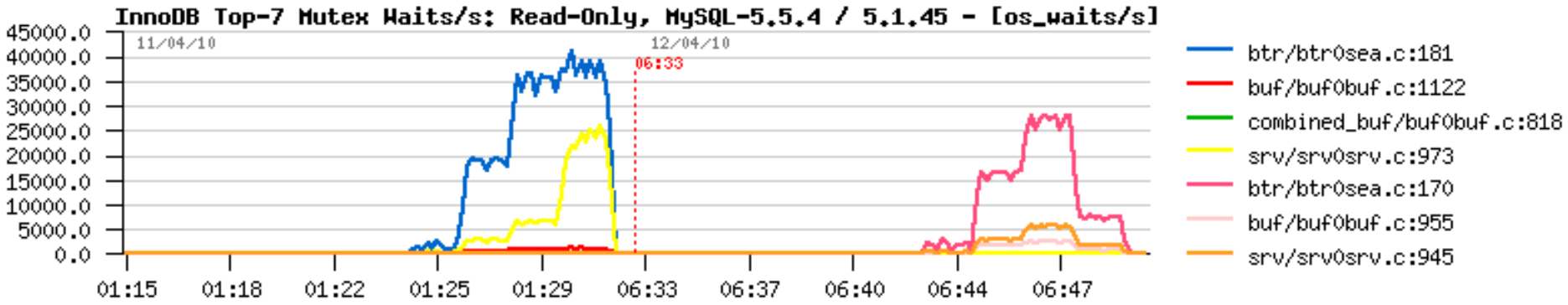




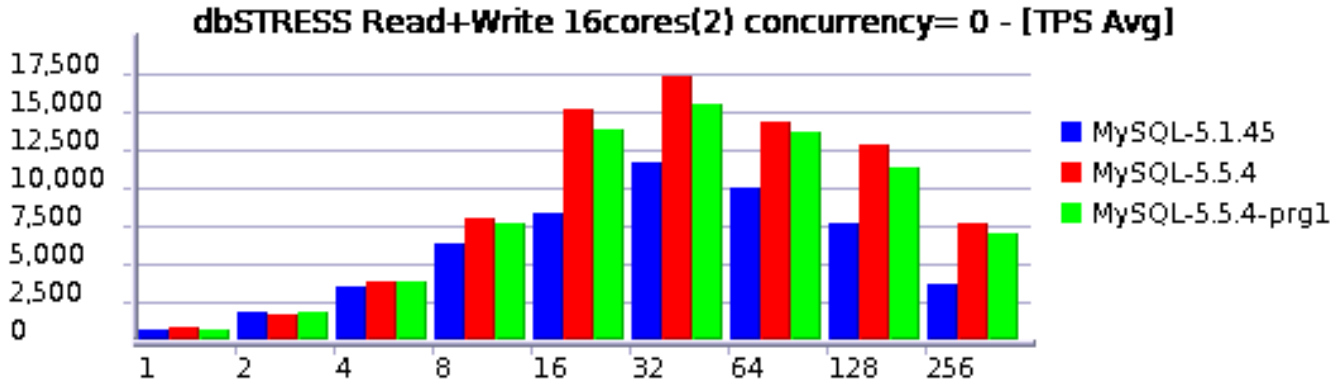
dbSTRESS: Read-Only Hot Mutexes

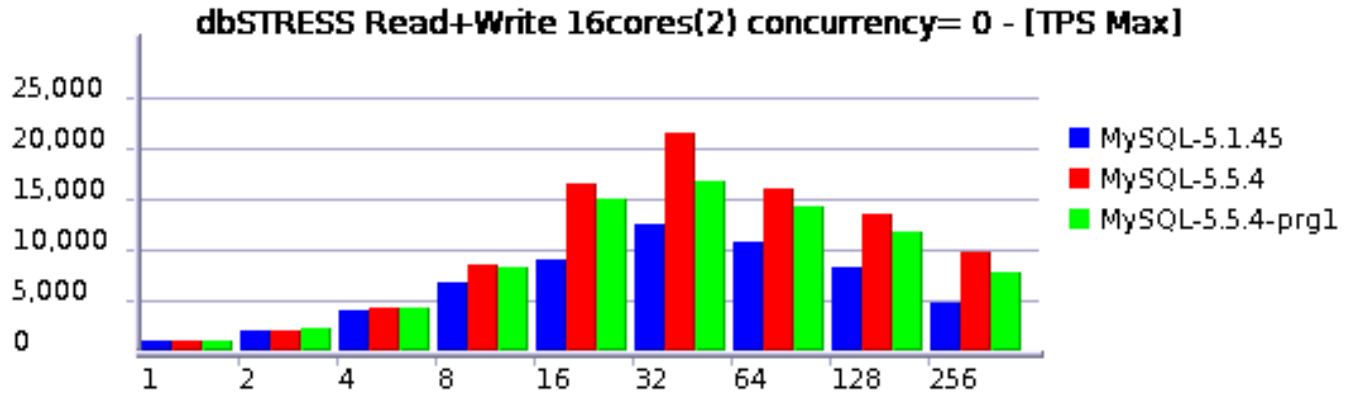
- kernel_mutex + B-tree + LOCK_open





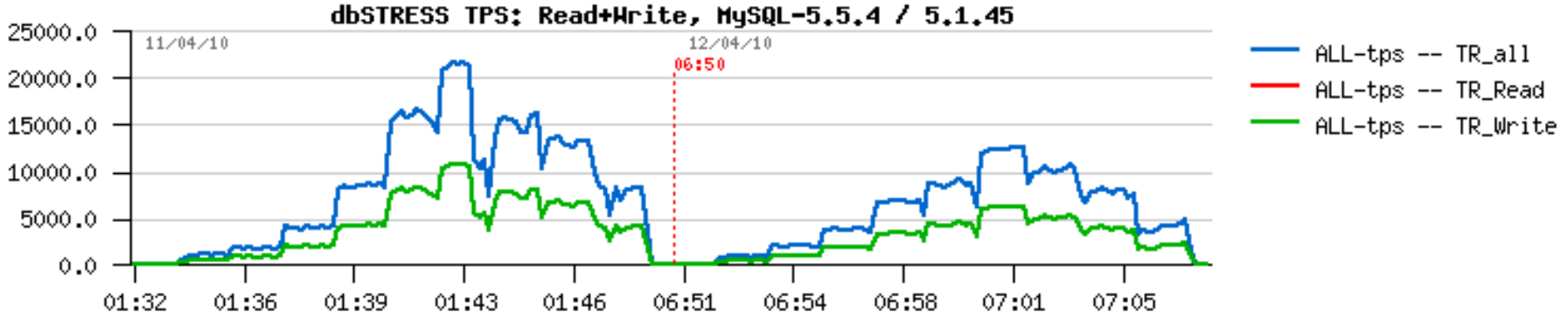
dbSTRESS: Read+Write @16cores

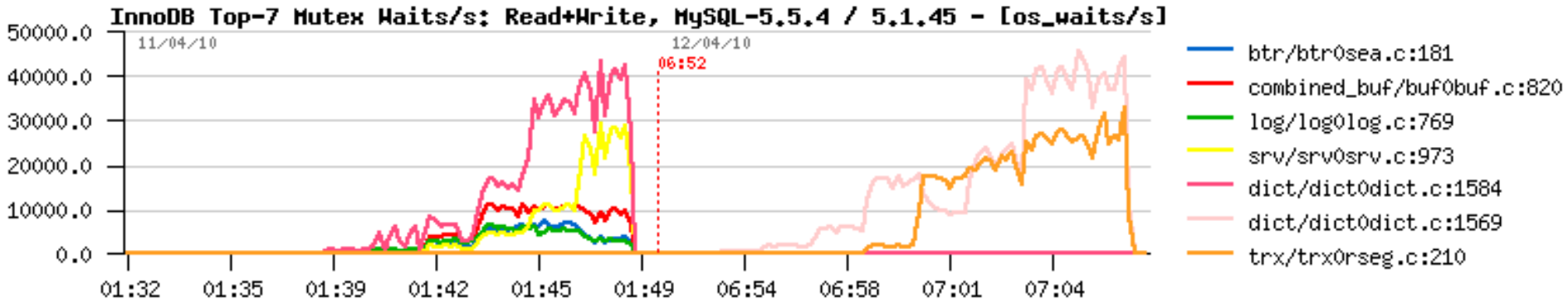




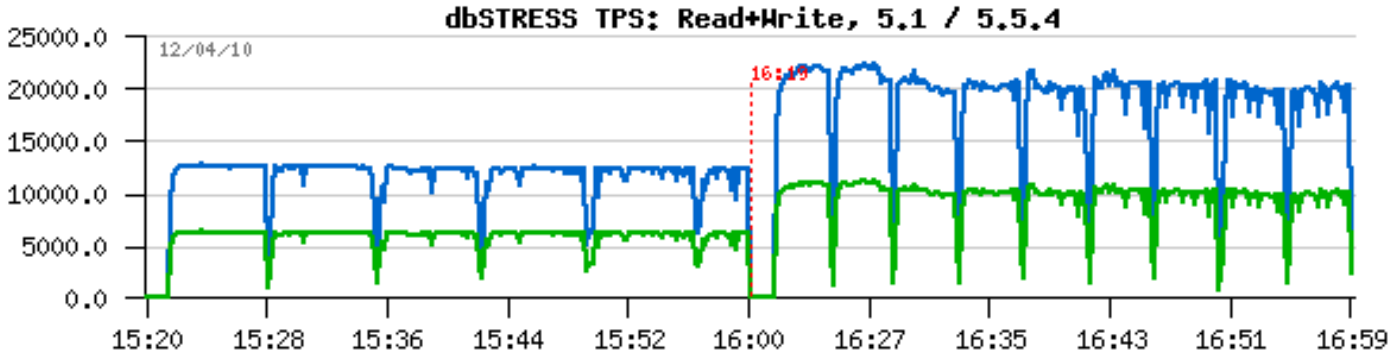
dbSTRESS: Read+Write Hot Contentions

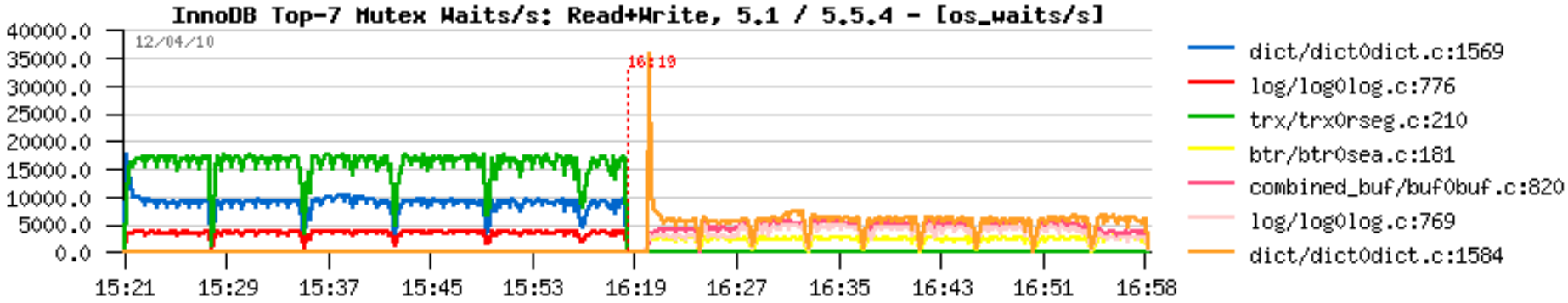
- Index mutex + kernel_mutex



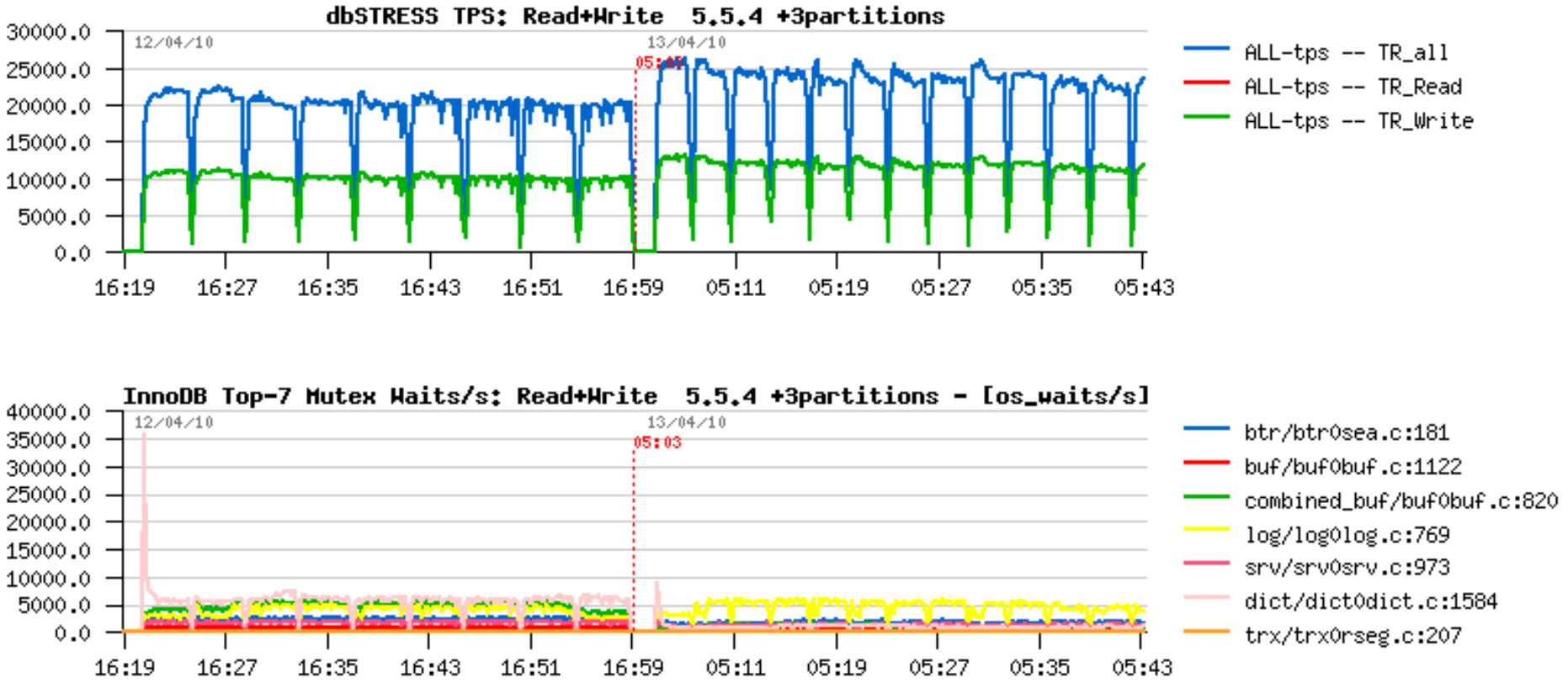


dbSTRESS: Read+Write Long 32sessons Test

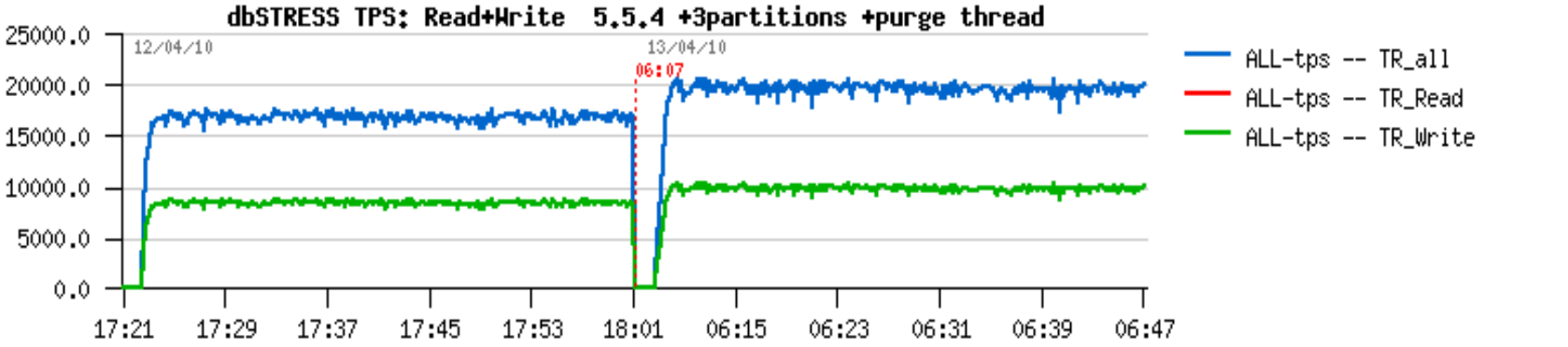


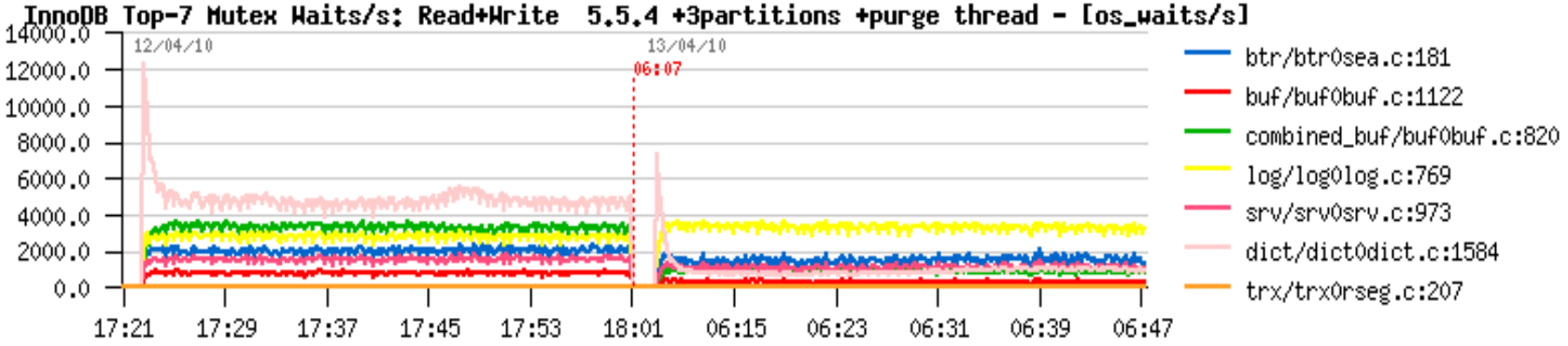


dbSTRESS: Using Partitions



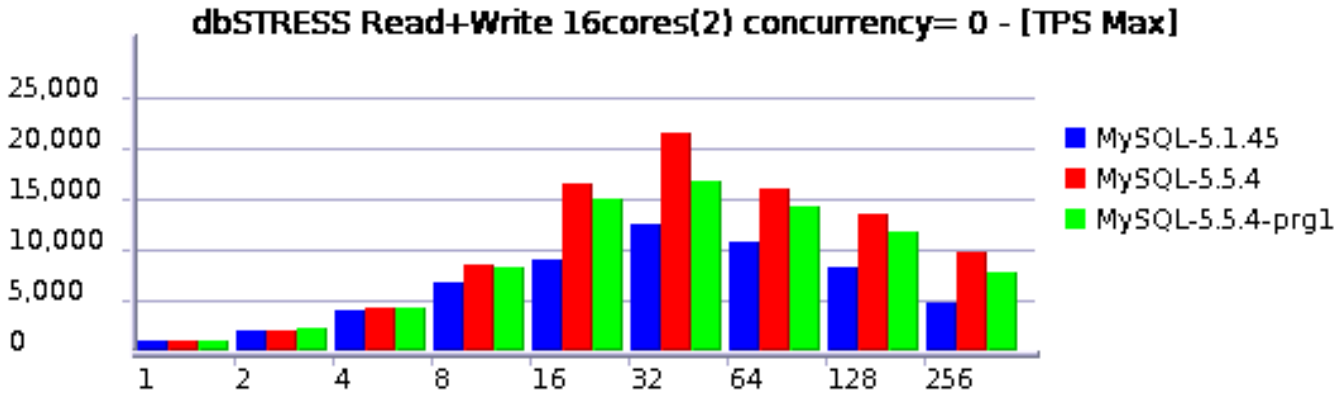
dbSTRESS: Partitions + Purge Thread

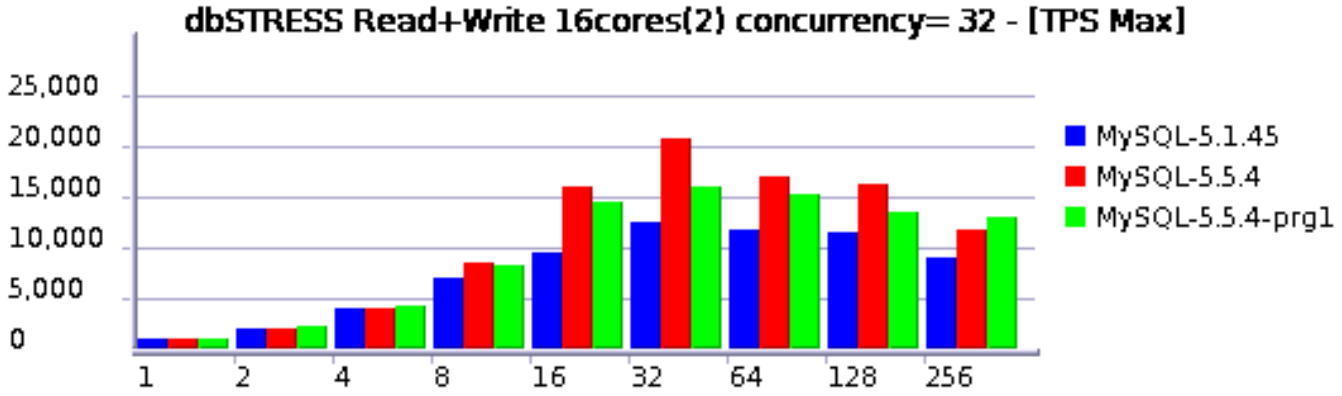




dbSTRESS: Read+Write & InnoDB Concurrency

- innodb_thread_concurrency= 0 / 32





Analysis of remaining scalability hogs

- Previously have been mainly hogged by global mutexes
- Now (especially for Read-only) also other effects becomes part of the picture such as False Cacheline sharing

Thank you for your attention

Questions?