Top reasons to upgrade to MySQL 8.0 and problems you might encounter in the process

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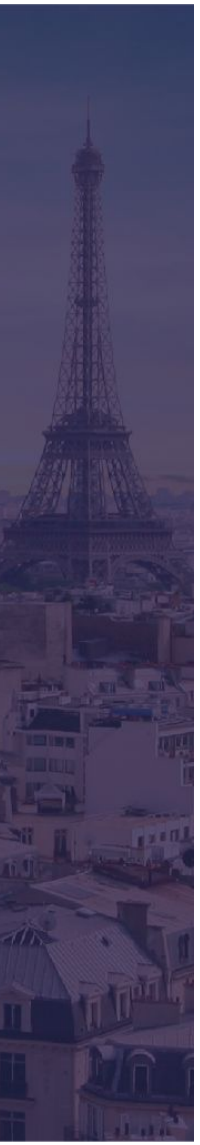


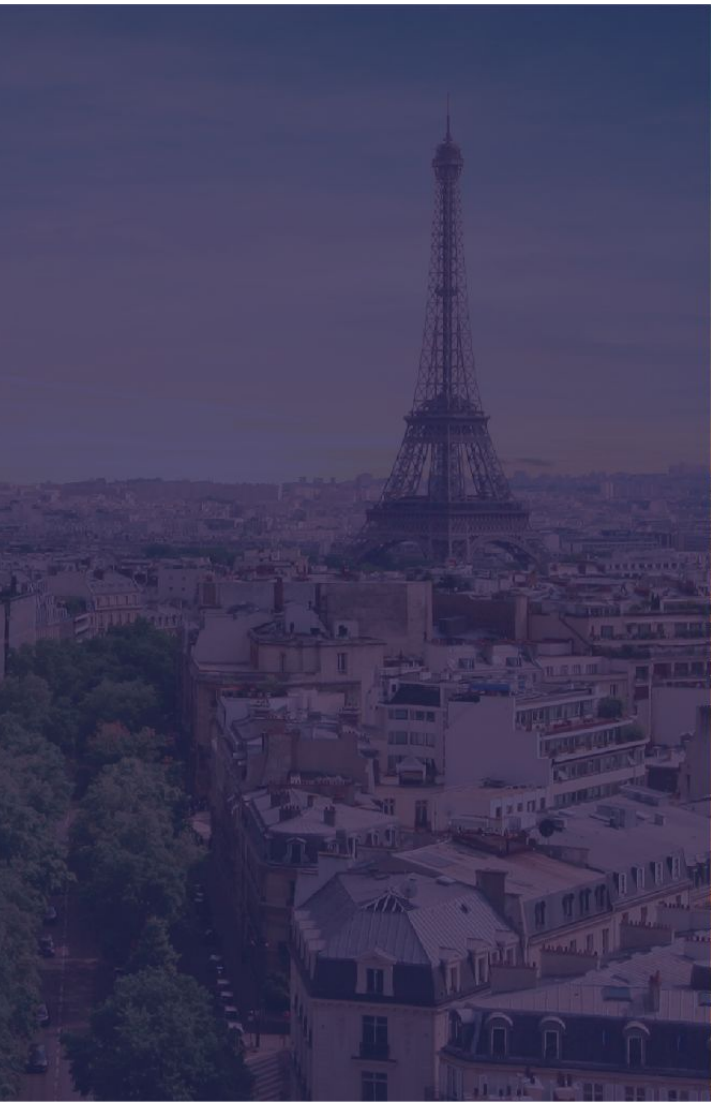
Why are we talking about this in 2024?

Many people still use MySQL 5.7:

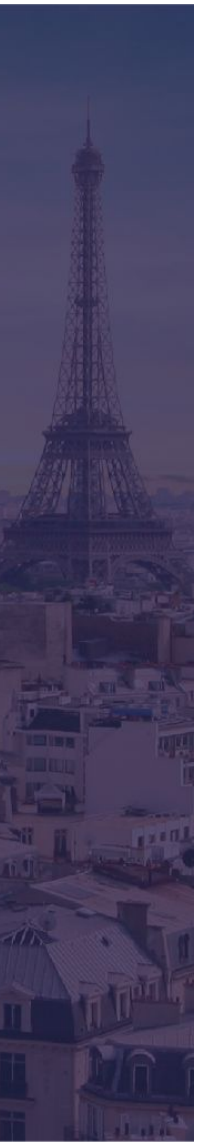
- PMM statistics:
  - 5.7 share is declining but still above 30%!
- New Percona Telemetry:
  - Around 26% of new PS deployments
  - Around 23% of new PXC deployments

People are upgrading from 5.7 to 8.0:

- Hit and report issues like PS-9186, PS-9207 in the process.



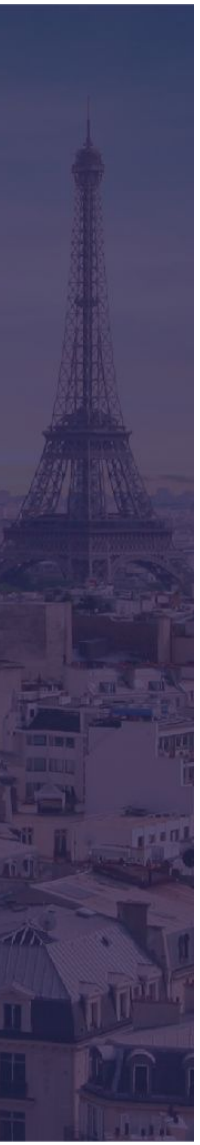
Reasons to upgrade to MySQL 8.0



Reason #1

MySQL 5.7 has reached End-of-Life in October 2023:

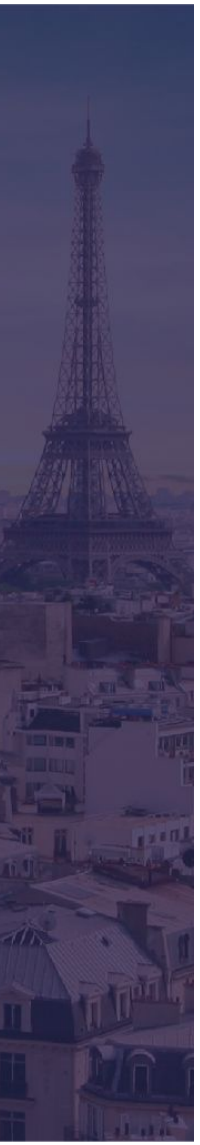
- 5.7.44 from 2023-10-25 is final release
- no new fixes
- no even security/CVE fixes
  - Few fixes in Percona Server 5.7.44-49 from 2024-03-15 (part of Percona Post-EOL Support)



Reason #2

MySQL 8.0 is well matured:

- 8.0.37 (2024-04-30) is latest
- GA since April 2018
- Switched from CDM to bug-fix only releases from 8.0.34 (2023-07-18)
- End-of-life is scheduled for April 2026!
  - New LTS series 8.4 started with 8.4.0 in April 2024
  - No direct upgrade from 5.7 to 8.4



Reasons #3, #4, …

New SQL features:

- Common Table Expressions
- LATERAL tables
- Window functions

- CHECK constraints

- JSON_TABLE

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Reasons #7, #8, …

Query Optimizer and Executor Improvements:

- EXPLAIN ANALYZE
- INVISIBLE indexes

- Descending indexes
- Functional indexes

- HASH JOIN

- Histograms

Reason #13

UTF8MB4 improvements:

- UTF8MB4 is new default
- New UCA 9.0 collations
- Performance optimizations

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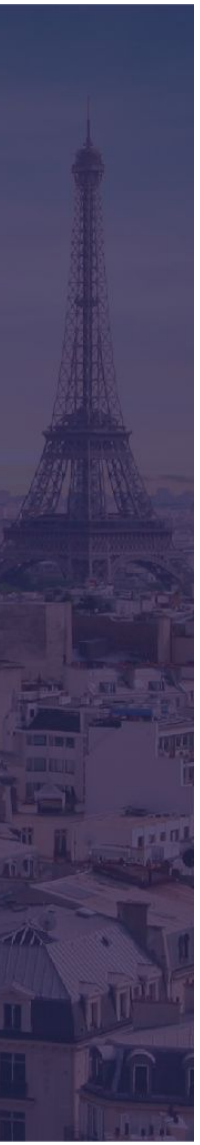
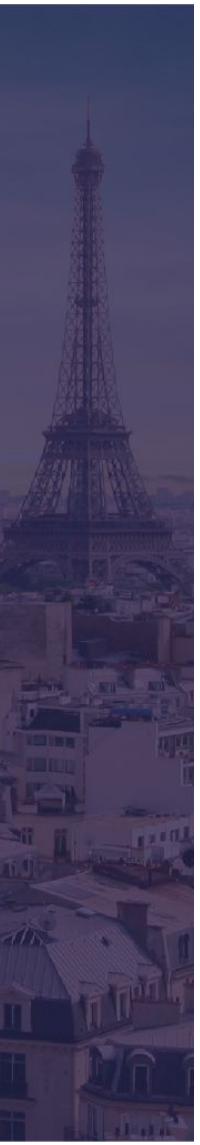


Reason #14

ALTER TABLE .. ALGORITHM=INSTANT

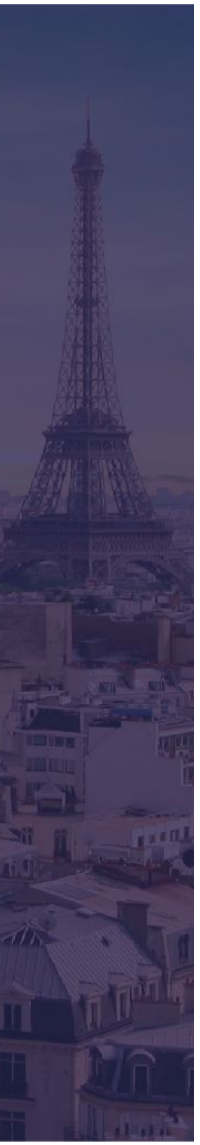
- ADD COLUMN
- DROP COLUMN
- …



Reasons #15, #16, …

Performance and Reliability improvements:

- New Data-Dictionary
  - Faster INFORMATION_SCHEMA queries
  - Atomic DDL
- InnoDB performance at scale improvements
  - latch-free REDO log
  - LOB infrastructure improvements
  - …
- Replication performance improvements
  - WRITESET
- JSON in-place update optimizations

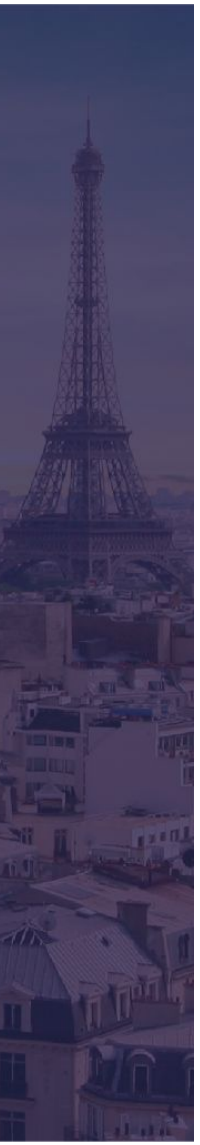


Reasons #19, #20, …

New security features:

- ROLES
- Dynamic privileges
- Partial revokes

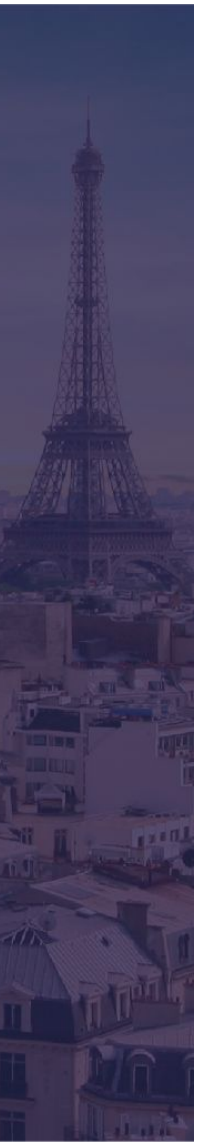
- cached_sha2_password authentication
- Password rotation



Reason #24

Group Replication changes:

- High-availability solution
- Introduced in 5.7
- Lots of improvements in 8.0 to make it mature and reliable



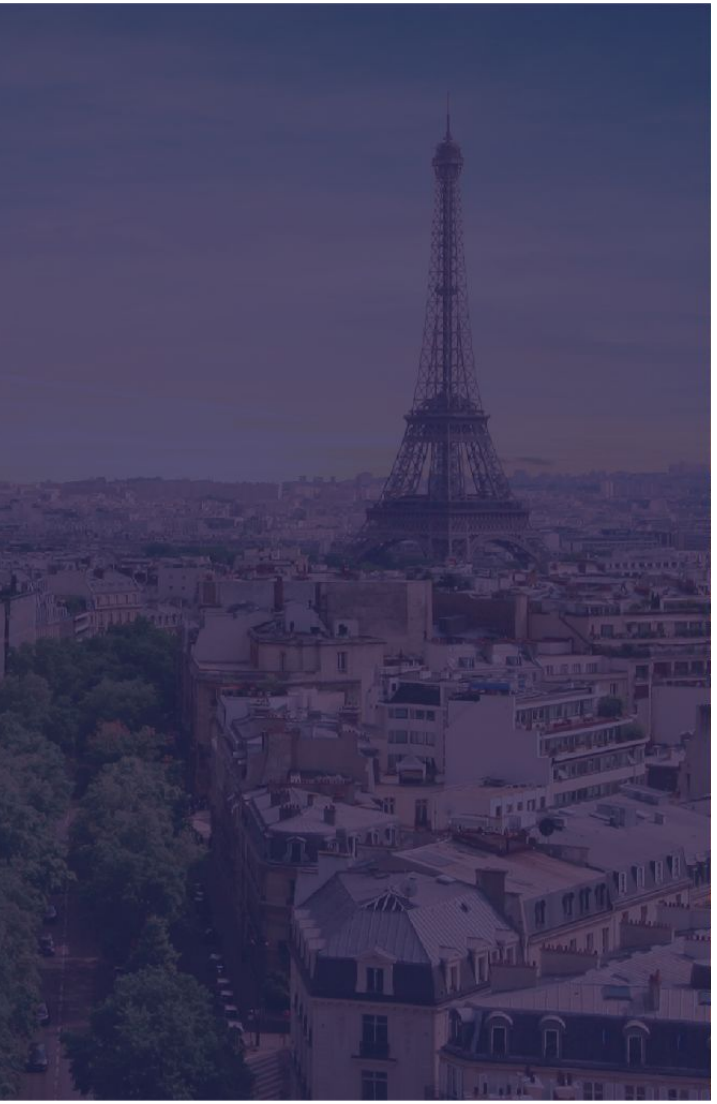
Even more reasons

The preceding list is far from being complete! Read on:

- What Is New in MySQL 8.0

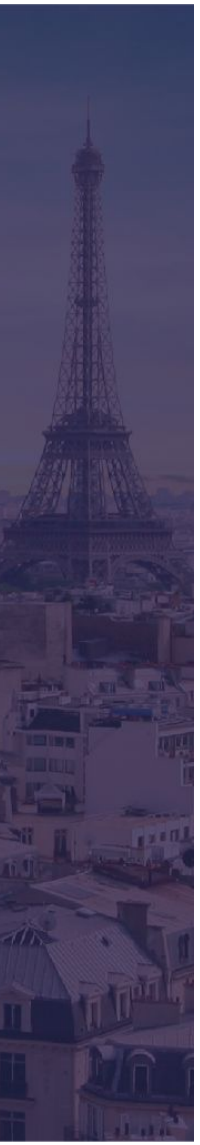
  (https://dev.mysql.com/doc/refman/8.0/en/mysql-nutshell.html)
- The complete list of new features in MySQL 8.0

  (https://dev.mysql.com/blog-archive/the-complete-list-of-new-features-in-mysql-8-0/)
  Mentions 300+ features… Misses changes after January 2019!



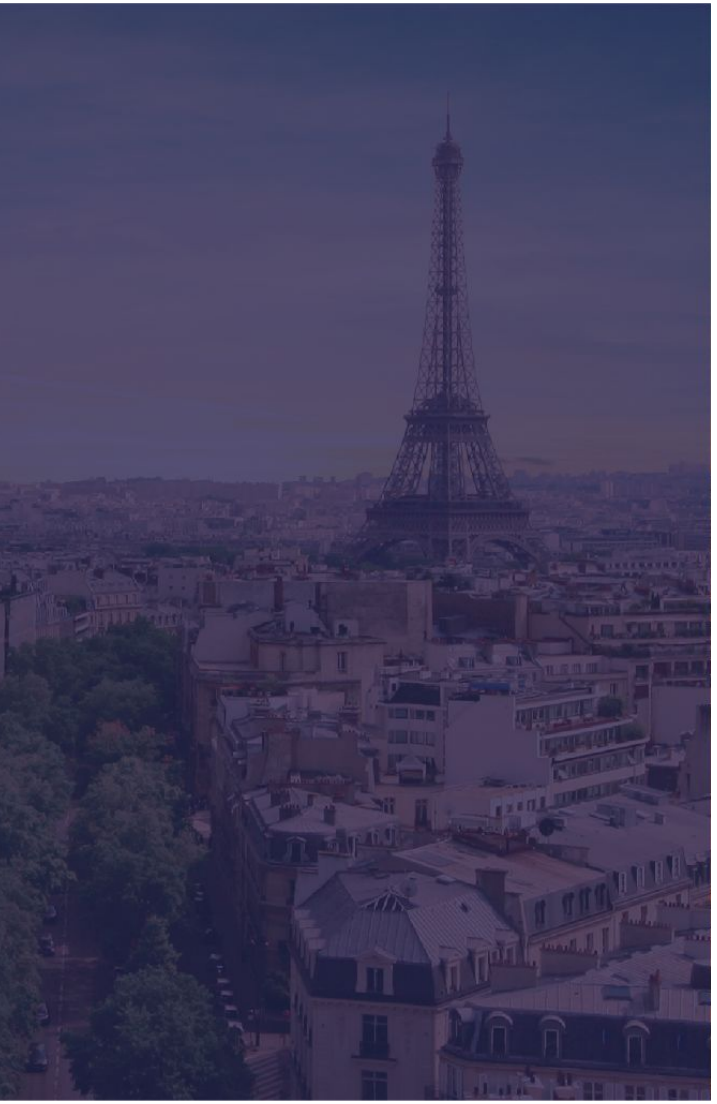
Where is the catch?

(Why some people have not upgraded to MySQL 8.0 yet?)

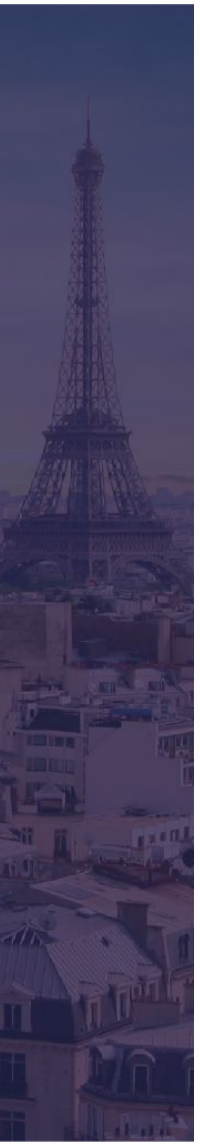


Why people linger with upgrading to MySQL 8.0?

- One way street
- Incompatible changes
  - 20+ new reserved words
- Regressions in execution plans
- Other performance regressions
  - Low concurrency workloads on small servers
  - Cases when 8.0 replicas can’t keep up with primary
  - DDL atomicity comes at a cost

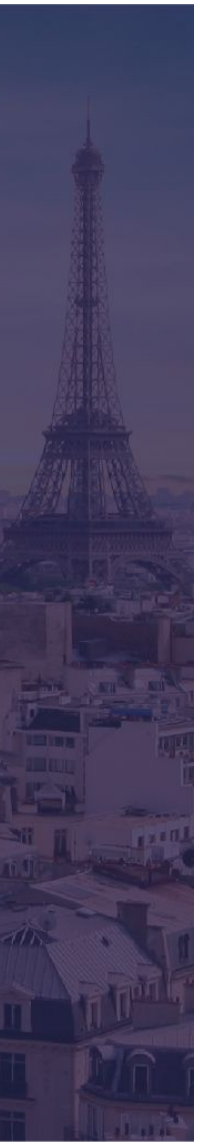


Upgrade problems and ways to solve them



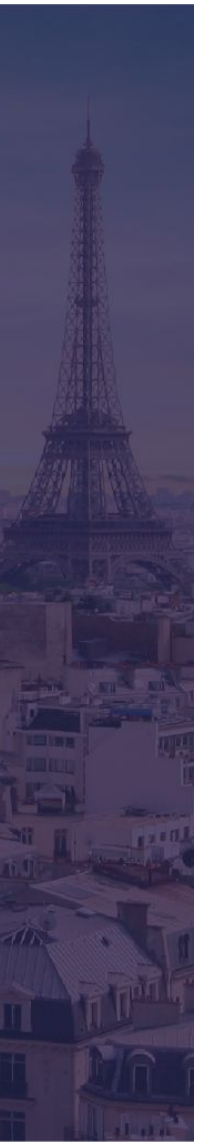
Two types of upgrade

- Logical upgrade
  - Uses SQL dump/restore
  - Not affected by some of upgrade problems
  - Backup as by-product
  - Large storage and CPU overhead
  - More downtime if done in naive way
  - Impractical for medium and large installations due to time required
- In-place upgrade
  - Updates existing data-directory
  - Affected by more upgrade problems (e.g. legacy storage types)
  - Needs separate backup
  - More storage and CPU efficient



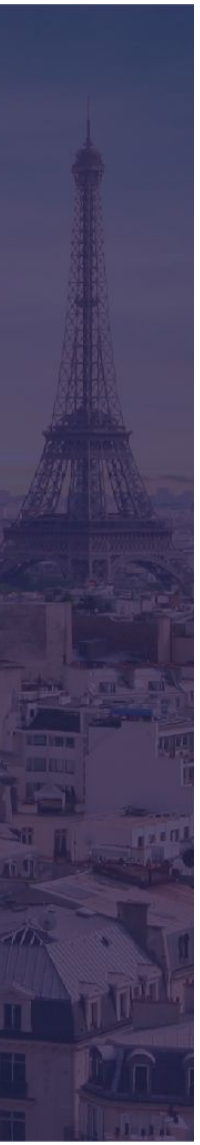
Why upgrade is One Way Street?

- Downgrade is not supported
  - Unlike for minor version upgrade in 5.7 series
  - Downgrade using replication to 5.7 is not officially supported and has problems
- In-place upgrade
  - Converts existing data-directory to use 8.0 data-dictionary
  - Tries to rollback changes on detecting errors so you can start 5.7 again
  - Still a few crashing bugs
    - Backup!!!



Upgrade problems with metadata and data

- Detected during upgrade process
- Some examples:
  - Usage of legacy datetime column types
  - Use of reserved words for table names or in routines
  - Non-native partitioning for tables
  - Orphan entries in InnoDB DD
- Can be detected and corrected before attempting upgrade
  - MySQL Shell Upgrade Checker utility to the rescue
  - Unfortunately not all cases are covered
- Further reading
  - 3.6 Preparing Your Installation for Upgrade (https://dev.mysql.com/doc/refman/8.0/en/upgrade-prerequisites.html)
  - Upgrading to MySQL 8.0? Here is what you need to know… (https://dev.mysql.com/blog-archive/upgrading-to-mysql-8-0-here-is-what-you-need-to-know/)



Post upgrade problems #1

- Changes in options/defaults between 5.7 and 8.0
- Can affect statement semantics and performance
- To some extent can be predicted by reading documentation

Post upgrade problems #2

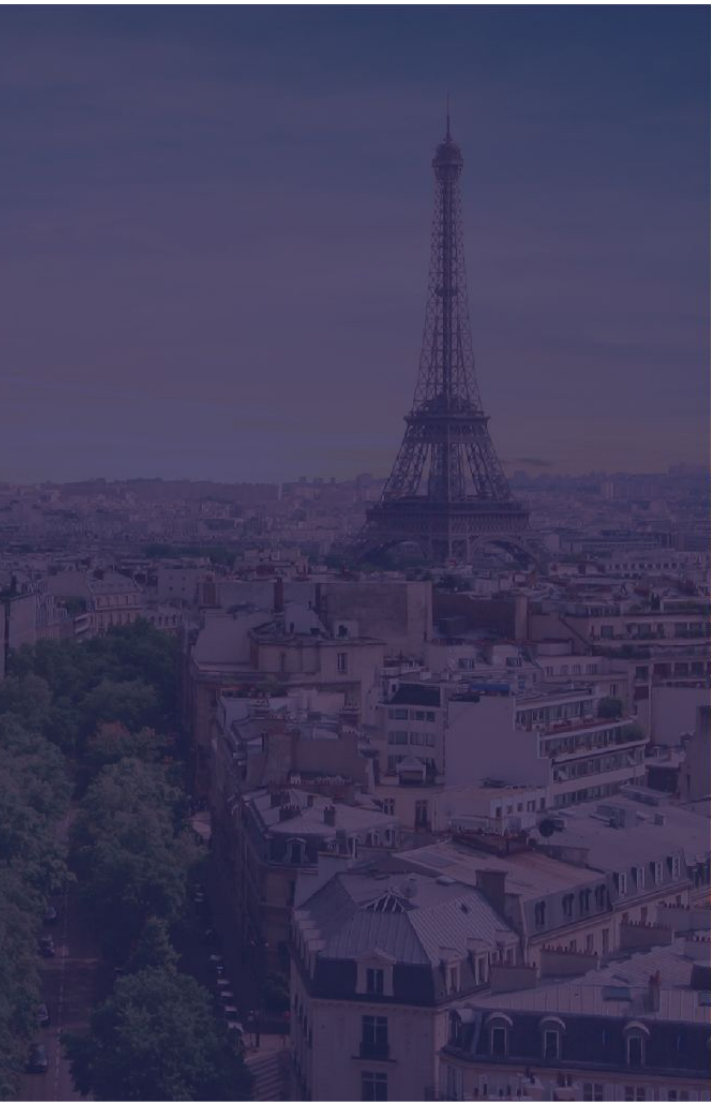
- Problem with execution of statements after upgrade
  - Failures due to incompatible changes
  - Changes in execution plans
  - Performance regressions
- Impossible or hard to predict beforehand

- Detected by using test/benchmark environment
  - Upgrade copy or subset of production system
  - Run real world queries / workload against it

- Ideally run 5.7 and 8.0 in parallel for some time

Post upgrade problems - useful tools from Percona

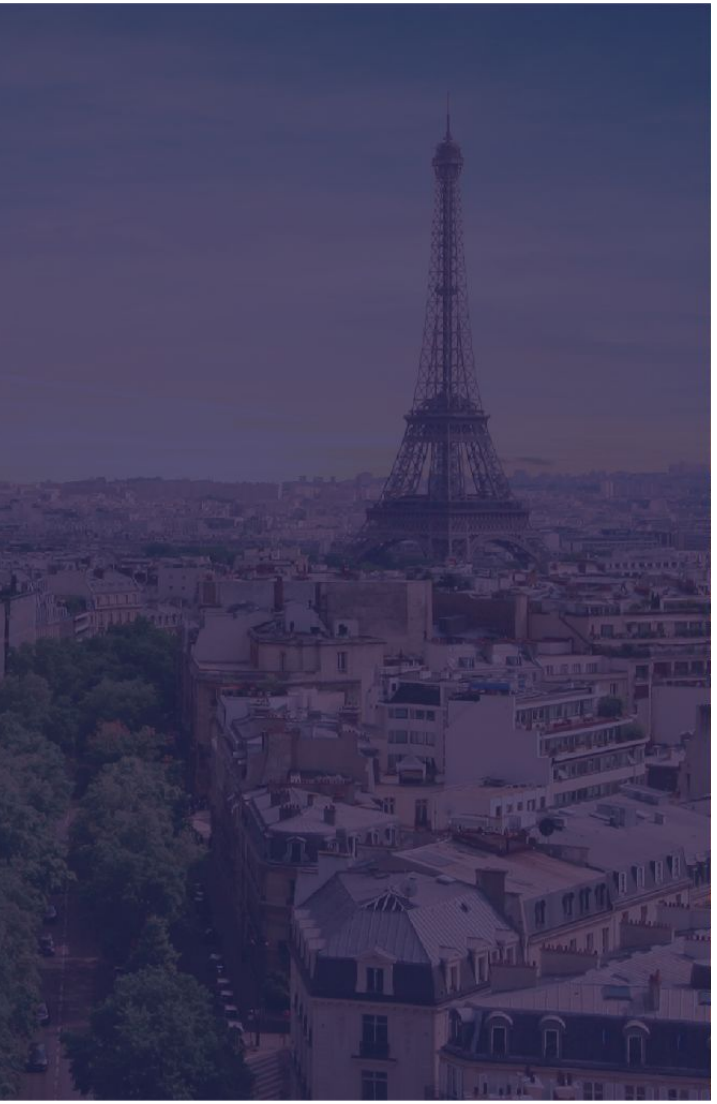
- pt-upgrade - runs statements against different versions and compares results and execution times
- pt-query-digest - useful to gather queries to test before upgrade
- pt-config-diff - can be used to compare configurations before and after upgrade



Upgrade Best Practices

Recap of Upgrade Best Practices

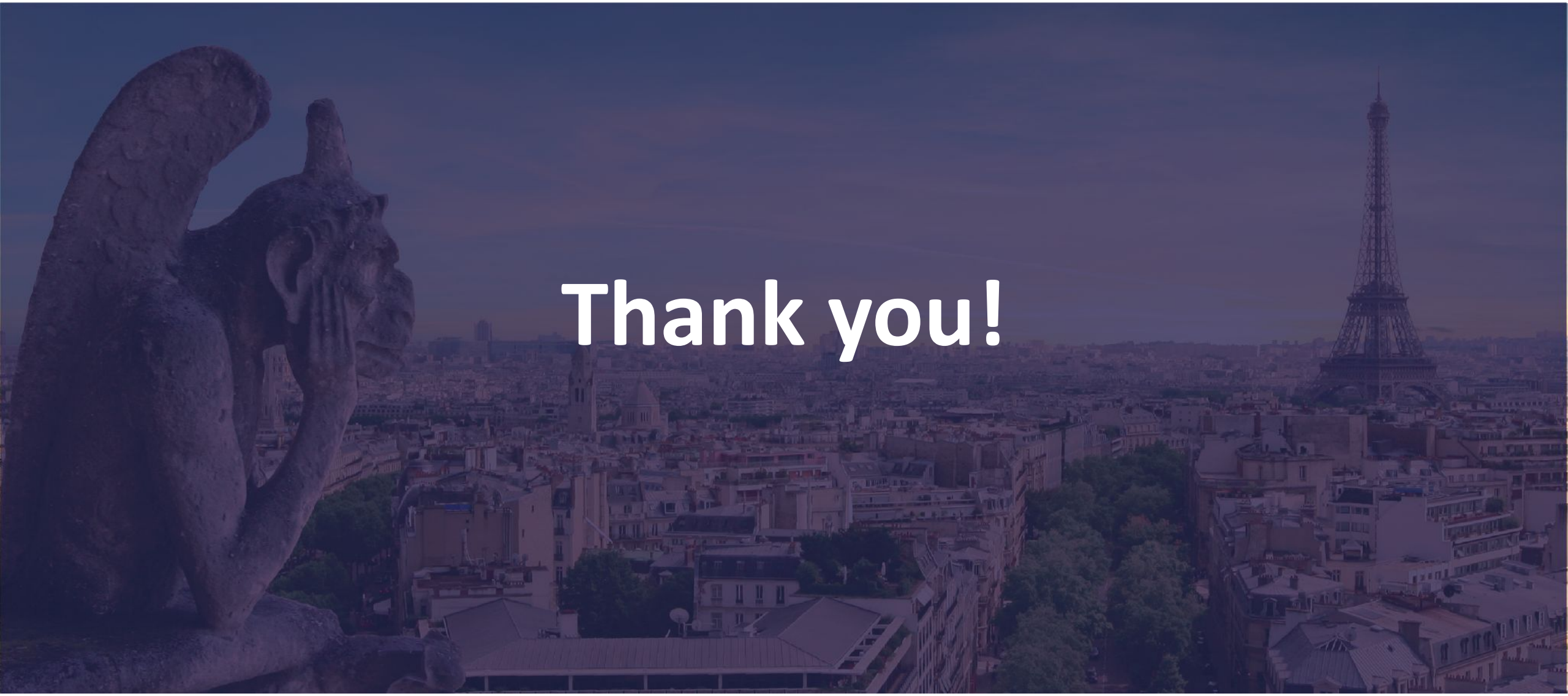
- Plan upgrade (including scenario for the failure case)
- Prepare for upgrade by running Upgrade Checker
- Run application against test environment
- Check statement performance/do benchmarks
- Ideally run old and new versions in parallel for some time
- BACKUP!



Percona University Online has a free course about upgrade:

https://www.percona.com/blog/how-to-upgrade-to-mysql-8-0-free-course-at-percona-university-online/

(also covers replication and rolling upgrades!)



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