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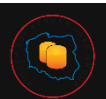
Introducing SQLProxy

Maciej Pilecki

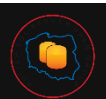
Microsoft Certified Master



About me...

- Microsoft Certified Master in SQL Server
- I’ve been a SQL Server consultant for quite a while...
- Working on large-scale SQL Server deployments worldwide
  - Large-scale is not the same as big-data
  - It’s the workload that matters most
- I’ve seen my share of scalability problems

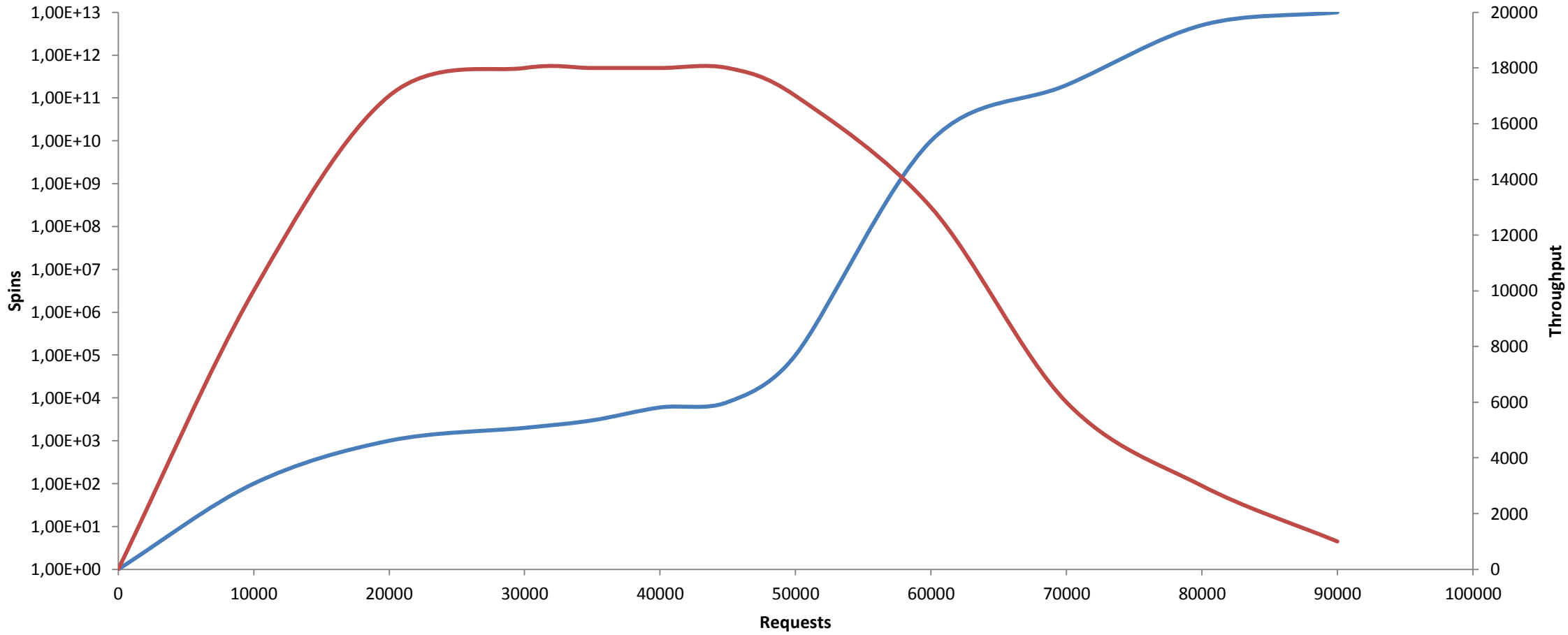
THE PROBLEM WITH DATABASE SCALABILITY



Everything changes at large scale

- As the workload increases and becomes more complex, you face more and more contention on various resources:
  - Locks
  - Latches
  - Spinlocks
  - Memory
  - Tempdb
  - Even the Query Optimizer itself

What it MIGHT look like



Two approaches to scalability

- Scale-up – „let's just buy a bigger server"
  - Expensive (Big Iron, Enterprise Edition licensing)
  - Does not always work (esp. for contention related problems)
- Scale-up – „let's spread it across many smaller servers"
  - Usually, some form of data distribution and workload offloading
    - Replication, Federated Databases, Log Shipping, AlwaysOn Readable Secondaries
  - Complicated to the point of impossibility
  - Requires code changes and smart application design
  - AlwaysOn Readable Secondaries are cool, but...

The problem with AlwaysOn

- Readable Secondaries allow R/O queries
- Sounds like a perfect solution for scale-out and load-balancing, but...
- There's nothing in the SQL Native Client to enable that
- In order to do that in practice you need:
  - Two database connections in the application
  - Some logic in the application to distinguish R/W from R/O
  - All that means serious code and architecture changes
  - Most likely not possible for an existing, deployed application

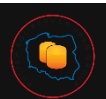
Interesting thing about workloads...

- In most workloads, vast majority of batches are SELECTs
- These are often small, R/O queries, looking quite innocent...
- But mixed with even a small number of writes, they become a WMD
- Reads blocking writes
- Writes blocking reads
- Lots and lots of contention...

Another interesting thing...

- Many workloads include a high number of queries that return the same data each time they are executed
- The application asks the same question, over and over and over...
- And gets the same answer...
- Even if the data changes, it changes infrequently
- But the work has to be done each time:
  - Resource usage (CPU, memory, tempdb etc.)
  - Possible contention in many places
- That means lots of „unnecessary” queries

I STARTED LOOKING FOR A SIMPLE SOLUTION...



I asked myself some questions...

- What if we could cache queries?
- What if we could scale-out with out the need for code changes?
- What if we could fix some of those „monster queries”?

- Wouldn’t that be a dream-tool of every SQL Server consultant?

SQLDay 2015

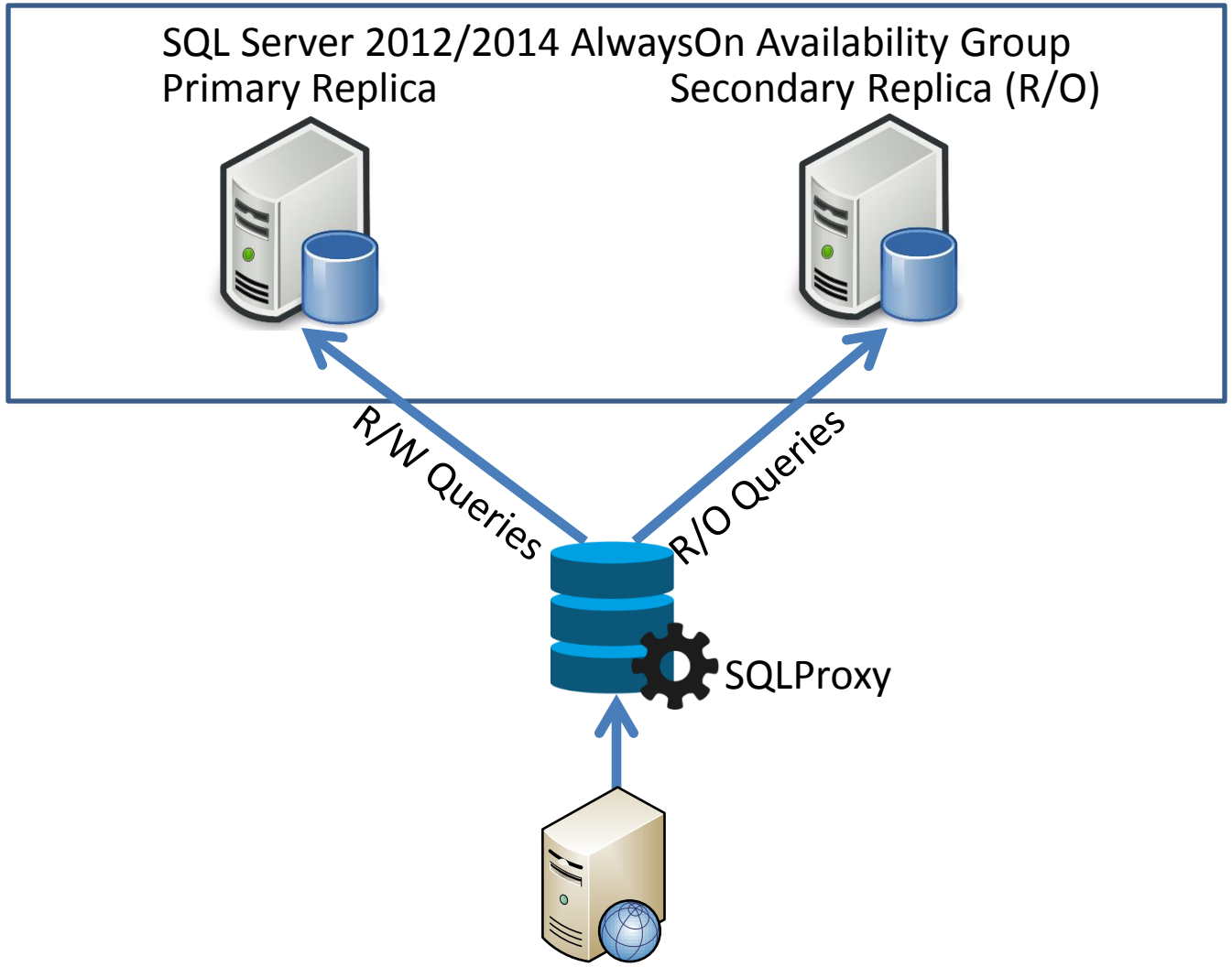
Introducing SQLProxy

- Fully transparent TDS proxy
- SQL Server and T-SQL aware
- Functionalities include:
  - Routing of R/O queries to the Readable Secondary
  - Caching of the query results
  - Dynamic query rewrites

Routing of read-only queries

- Allows scale-out and load-balancing using AlwaysOn Readable Secondaries
- Currently, SNAC does not support this natively and major application changes are needed to achieve that
- SQLProxy provides query routing that is:
  - fully transparent to the application
  - fully configurable
  - customizable

Routing of read-only queries



How R/O routing works

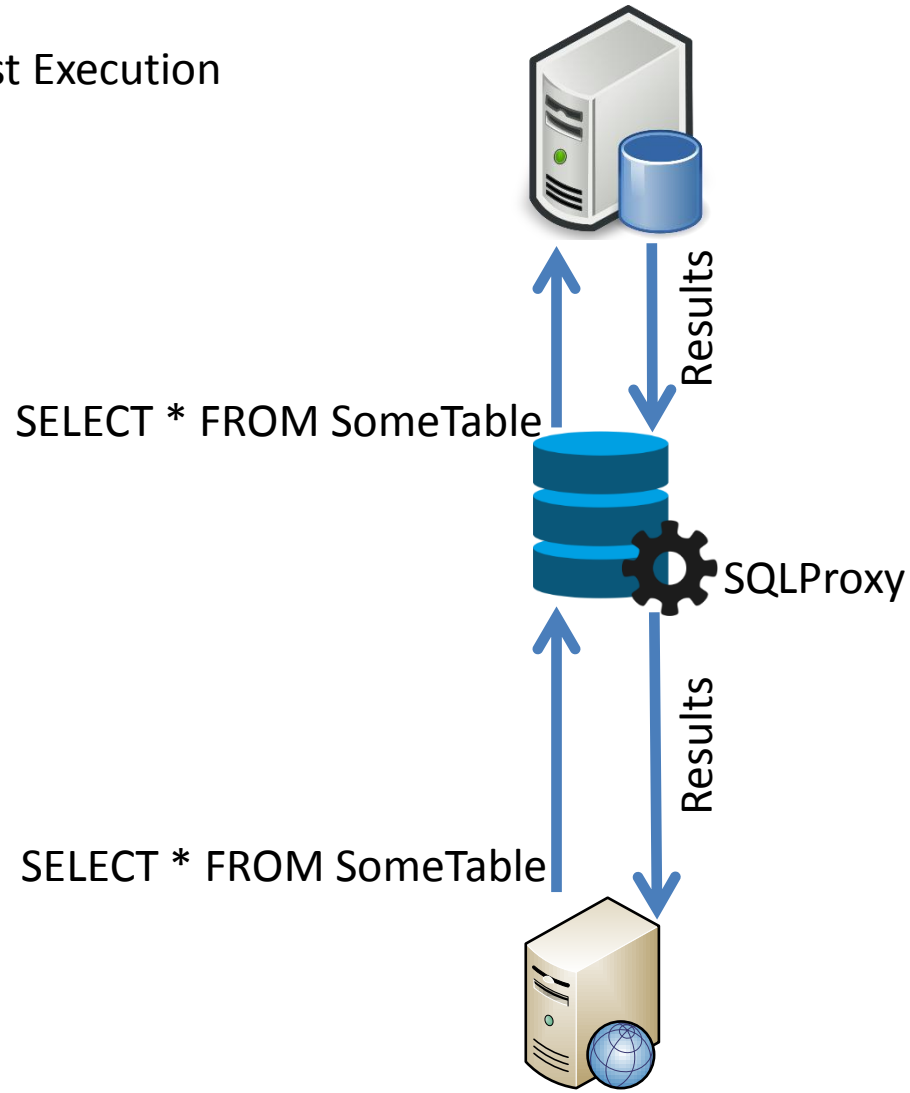
- Configure SQLProxy to connect to the AW Listener
- SQLProxy uses AW routing information to open a R/O connection to the Readable Secondary Replica
- Application opens a single connection to the SQLProxy
- Every batch is classified and executed on an appropriate server
- Classification can be:
  - Declarative (you specify which queries should be routed where)
  - Dynamic (by parsing the batch text and examining it)

Query result caching

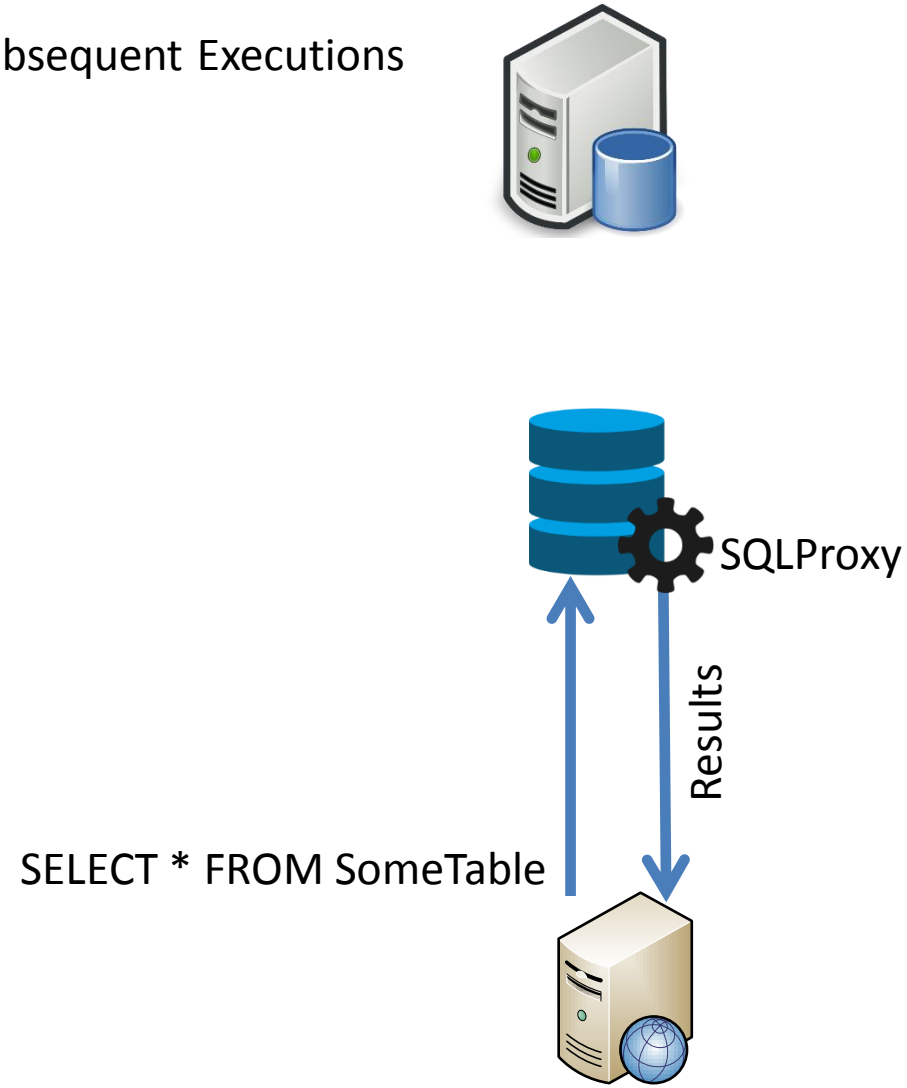
- SQL Server caches a lot of things, including:
  - Data pages
  - Execution plans
- But your query is executed EVERY TIME you send it, taking server resources
- Solution:
  - Caching the query results

Data caching

First Execution



Subsequent Executions



How query caching works

- Fully transparent to the application
- Fully configurable, with cache expiration
- Works for R/O queries only (obviously)
- Works with parameterized queries and SP calls
- Time-bases expiration
- Configurable „on the fly”, with management interface

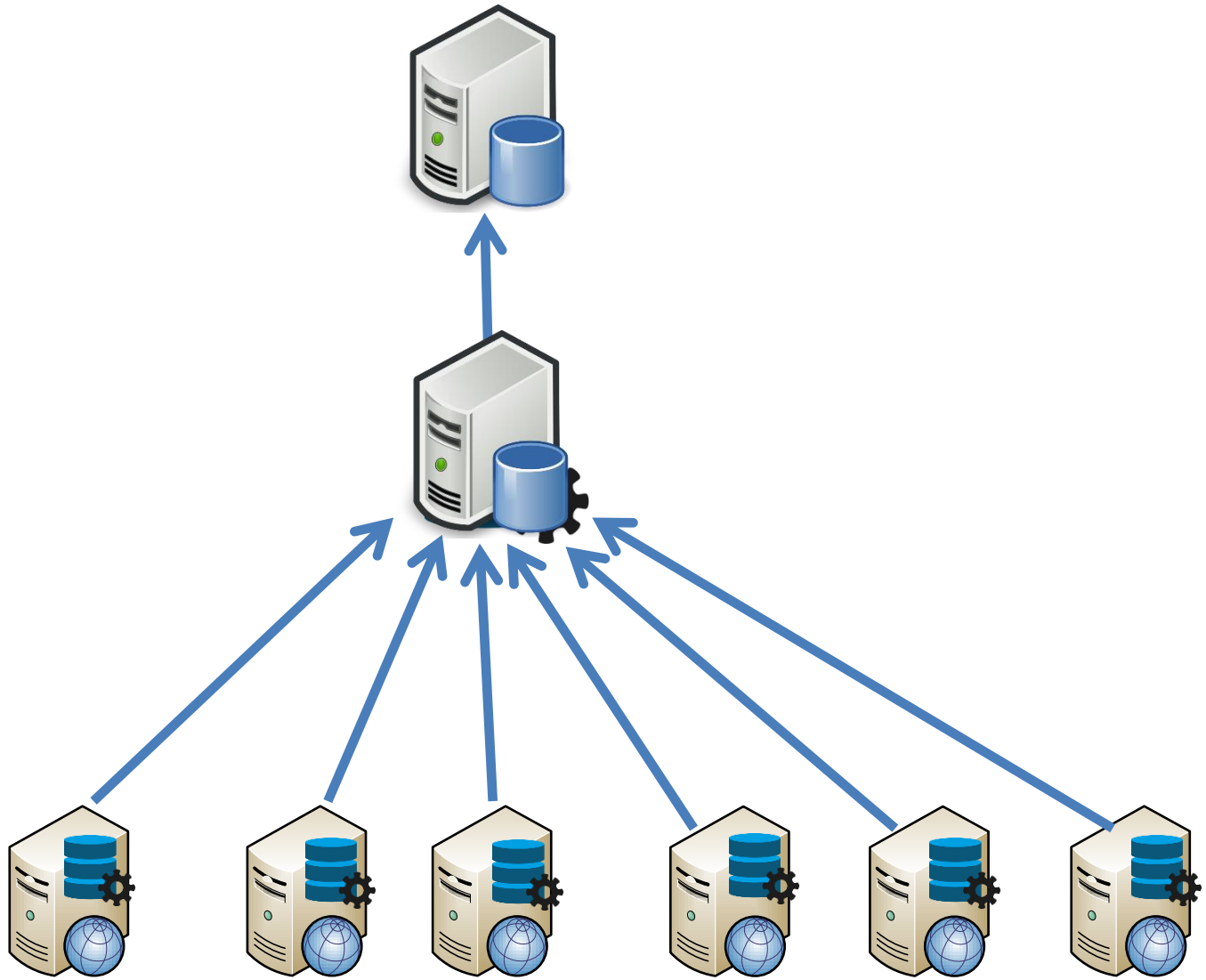
What about cache invalidation?

- Forget about it! ☺
- Too complex and resource intensive to implement in practice
- We use pure time-based expiration
- TTL of the result in cache is your decission:
  - Some applications will be just fine with the „stale” data
  - Some other may require more up-to-date information

What about scaling the SQLProxy itself?

- Will it become a bottleneck or single point of failure?
- NO!
- It’s just a gateway and it’s more-or-less stateless, so no problem:
- Just have more instances of SQLProxy and spread the load
- SQLProxy supports Windows Failover Clustering
- And it works with the –FailoverPartner switch in SNAC

Scaling the SQLProxy



What's in version 1.0?

- Query result caching
- Query routing between AG replicas
- Early implementation of on-the-fly query transformations
- Server connection pooling

- With some limitations:
  - SQL Authentication only in v. 1.0

What more can we do with it...

- Some ideas for version 2.0:
  - Auditing, logging etc.
  - Security (enforcing access rules, preventing SQL injection)
  - Error detection/correction (i.e. 1205 – Deadlock victim)
  - Translation between SQL dialects
  - Application compatibility with new versions of SQL Server
  - Data obfuscation
  - T-SQL language extensions

What's next?

- We are in a private Beta stage
- If you are interested, we want to talk to you!
- Wanna try it with your application? We want to talk to you!!!

- Come and grab me during the Party, I will answer all your questions
- AND we can have a drink together! ☺

- Visit us at www.sqlproxy.net for updates and more info

SQL PROXY

www.sqlproxy.net

THANK YOU!

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