Solr lab for sharding experiments

Roxana Angheluta (Xenit Solutions)
Axel Faust (Acosix GmbH)

Motivation and solution

- Large archives with >50mil documents
- No sites

Implement a new sharding method: by property (now existing in Alfresco 5.2) with targeted queries

- Particular use case: most of the queries are targeted to a specific client id
- Search speed <3s

Create a “solr lab”: define relevant parameters, design relevant experiments, execute them and draw conclusions

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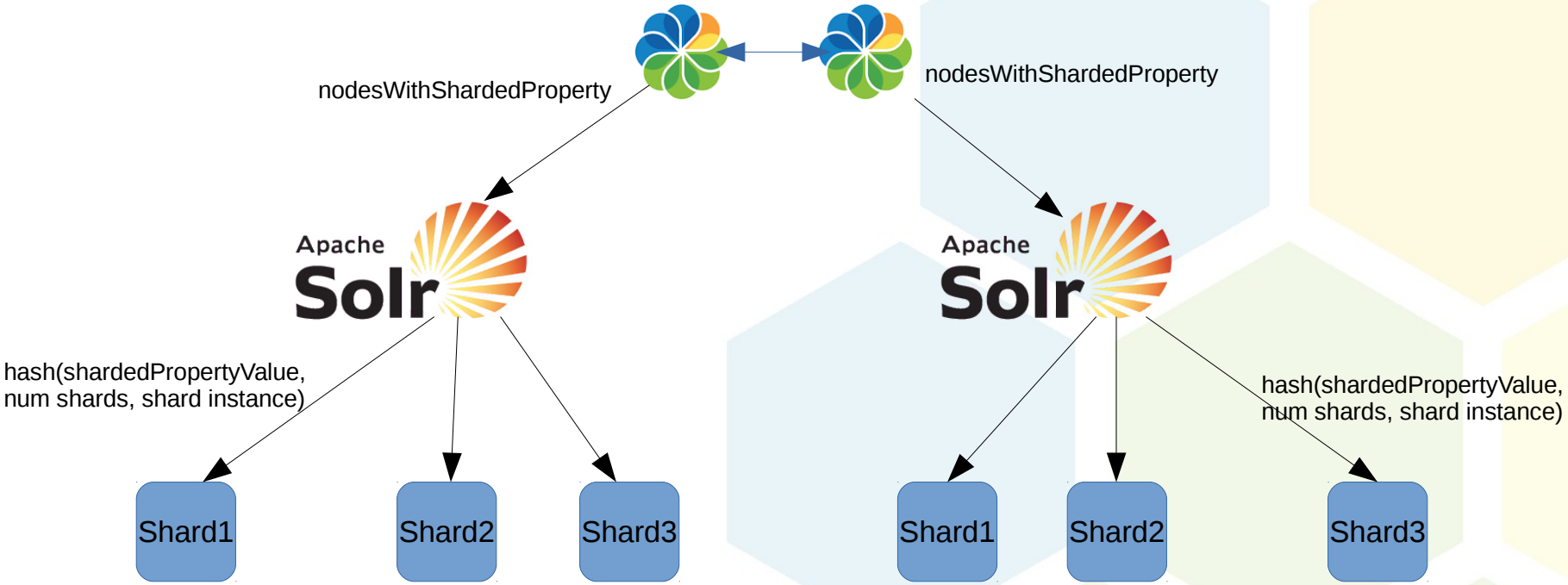
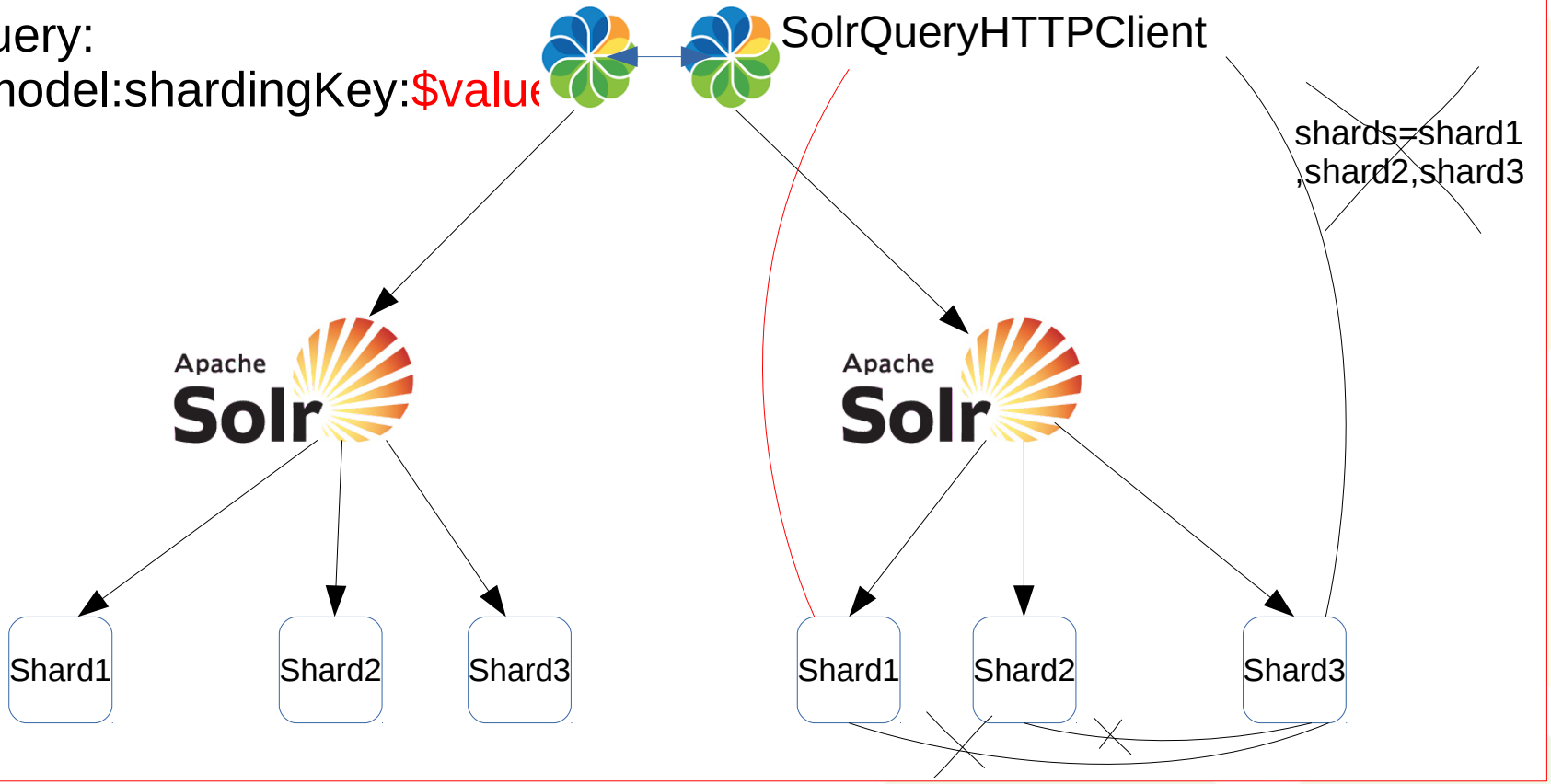
Sharding by property - Solr side



Sharding by property - Alfresco side

- Query:
  =model:shardingKey:$value



Solr lab

- Requirements
  - Easy to start
  - Easy to replicate
  - Easy to change parameters
  - Easy to resume
  - Easy to monitor

core1:
image:
volumes:
hostname:
ports:
environment:
solr1:
…
solr2:
…
solr3:
…
postgres:
….
libreoffice

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Solr lab

core1:

```
image: image: hub.xenit.eu/alfresco-ethias-sharded-by-property:build-3
  volumes:
  - alfresco10milnoacls:/opt/alfresco/alf_data
  environment:
  - SOLR_HOST=solr1
  - SOLR_PORT=8081
  - ALFRESCO_HOST=core1
  - ALFRESCO_PORT=8080
  - JAVA_XMS=6144M
  - JAVA_XMX=6144M
  - ENABLE_CLUSTERING=true
  - DYNAMIC_SHARD_REGISTRATION=true
  - DEBUG=false
  - JMX_ENABLED=true
  - JMX_RMI_HOST=xxx.xxx.xxx.xxx
  - GLOBAL_shardedProperty.qname={http://www.ethias.be/model/content
}shardingKey
  - GLOBAL_cache.node.nodesSharedCache.maxItems=1250000
……..
```

solr1:

```
image: hub.xenit.eu/solr-sharded-by-property:5.1
   volumes:
-   - solr10milnoacls1index:/opt/alfresco/alf_data
   environment:
    - ALFRESCO_HOST=core1
    - ALFRESCO_PORT=8080
    - SOLR_HOST=solr1
    - SOLR_PORT=8081
    - JAVA_XMS=7168M
    - JAVA_XMX=7168M
    - SHARDING=true
    - NUM_SHARDS=3
    - NUM_NODES=3
    - NODE_INSTANCE=1
    - TEMPLATE=rerank
    - SHARD_IDS=0
    - ALFRESCO_SSL=none
    - ARCHIVE_ENABLE_ALFRESCO_TRACKING=false
    - ARCHIVE_INDEX_CONTENT=false
    - ALFRESCO_INDEX_CONTENT=false
    - MAX_HTTP_HEADER_SIZE=65536
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Experiments – dimensions and metrics

Dimension	Values		
Size of repo	1mil	10mil	more
Sharding method	property	acl	
Number of shards	1	3	11
Acls	With artificial acls	Without artificial acls	
Types of queries	simple	complex	
Query concurrency	yes	no	
Load in the same time	yes	no	

- Response times
- Memory usage
- Load
- Caches utilization
- Database performance

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Experiments - hardware

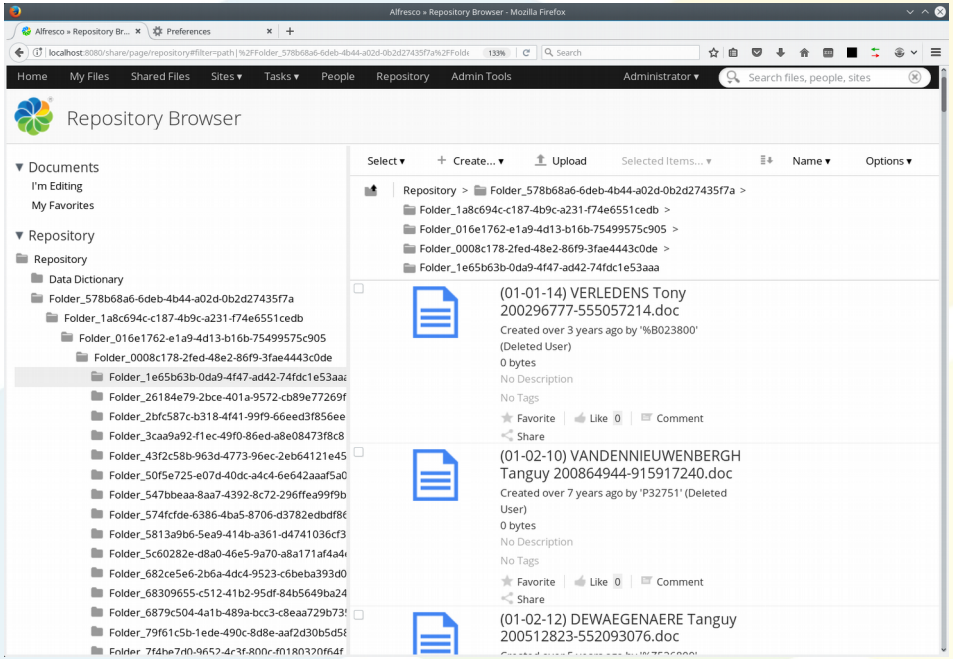
- Started experiments at Amazon, with AuroraDB as database

- Moved to Hetzner dedicated servers, tried multiple configurations, stabilized to: https://www.hetzner.de/nl/hosting/produkte_rootserver/px121ssd
  - Intel(R) Xeon(R) CPU E5-1650 v3 @ 3.50GHz, 12 cores
  - 264GB RAM
  - 2TB SSD disks

		Database	Index 1 shard
1 mil	1 shard	8.7G	5.1G
	3 shard		1.8G
10 mil	1 shard	78G	51G
	3 shard		17G
	11 shard		4.8G
100 mil	1 shard	1.3T	500G
	3 shard		164G

Experiments - loading documents

- No content
- Custom model with >10 metadata fields, values randomly generated based on constraints or data type
- Folder structure with / without artificial acls
- Load speed at 12 threads:
  - Approx 1.3 mil docs / hour
- Solr indexing real time



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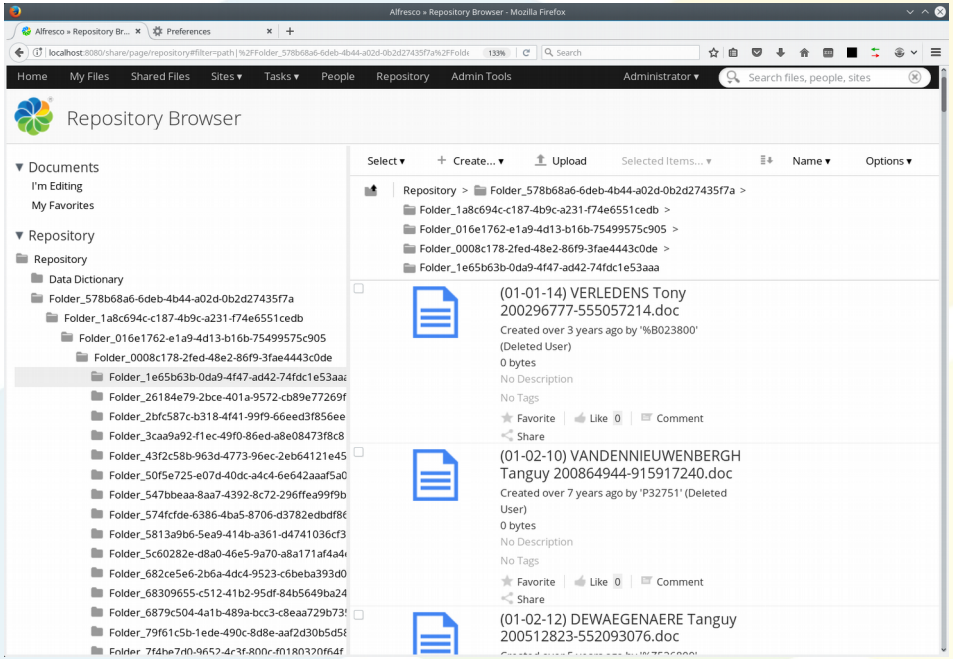

Experiments – problems encountered

- Ran out of inodes on solr' partition – needed to reformat the partition with small block size
- Db tunning – max connections
- Memory tunning on db, alfresco + solr size
- Increased max header size in tomcat

Performance improvements:

- Disabling acl-checks on Alfresco's side, post-searching

Results

Size	Shards	Context	Method	Artifical ACLs	Threads	Queries per thread	Run	Avg (ms)	Median (ms)	90% (ms)	99% (ms)	Max (ms)	Throughput/s
10mil	3	regular	acl	yes	16	150	#1	456	375	878	1433	3937	33,1
							#2	181	165	292	437	573	77,7
			property	yes	16	150	#1	292	237	539	890	3496	51,1
						(after write tests)		412	324	859	1486	2088	35,0
							#2	88	85	119	167	243	142
						(after write tests)		336	219	693	1152	4367	43,2
					16	100 (after write tests)	#1	465	342	938	3174	4605	30,8
							#2	111	95	162	375	3102	103,3
			acl	no	16	150	#1	596	490	1165	2206	4378	25,8
							#2	115	74	251	517	646	120,2
			property	no	16	150	#1	404	298	734	2849	4734	36,5
							#2	88	81	116	329	422	143,2
		with facets	acl	yes	16	120	#1	919	767	1554	3498	10588	16,3
								937	778	1645	3190	9628	16,3
							#2	385	364	540	764	1165	38,3
								387	365	545	852	1054	38,5
					8	240	#1	466	367	800	1871	9207	16,4
							#2	336	321	442	580	766	22,5

Conclusions

- Search slow?
- Primary culprit: DB access / cache
  - Expensive bulk load
  - Cache “sabotage”: nodesSharedCache TTL (used OOTBee Support Tools for insights)

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- Primary culprit: DB access / cache
  - Expensive bulk load
  - Cache “sabotage”: nodesSharedCache TTL
    (used OOTBee Support Tools for insights)
- Secondary culprit: Repository-tier ACL checking
  - Misleading: PermissionEvaluationMode.NONE
  - Low default size of caches for readers/readersDenied

Conclusions

- Natural best performer: property sharding + shard-targeted queries
  - ~20% (+-10%) better general performance
  - Improved scaling for parallel requests

Further work

- In progress: 100 million documents
  - Extended data model
  - Realistic value distribution for sharding property

- Planned: customer reference setup
  - Ideally: 100% live data clone, augmented via generation
  - Oracle instead of PostgreSQL

Speaker contacts

roxana.angheluta@xenit.eu
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