Full-Text with PHP and Sphinx

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About me

- Performance geek
  - blog http://astellar.com
  - Twitter @vfedorkov
- Enjoy LAMP stack tuning
  - Especially MySQL
- Enjoy speaking on the conferences
- Use Sphinx in production from 2006

Search is important

- Keep customer satisfied
  - Let visitor find what he need
- Search is the way to **explore** the website
  - Find something that your customer doesn't know
  - Show your customer what you want to show

Good search is important

- And it's more than one side:
  - Speed
    - Rule 0.1 … 1 … 10
  - Relevance
  - Convenience
  - Flexibility
  - Simple maintenance
  - Fault tolerance

Available solutions

- Most databases has it's integrated FT engines
  - MySQL: MyISAM FT index
    - Recently released FT support in InnoDB
- Standalone solutions
  - Solr, Lucene, Sphinx.
- External services
  - IndexDen, SearchBox, Flying Sphinx, WebSolr, …

Sphinx records

- Standalone open source search server
- Searching though **Billions** of documents
  - Over 30,000,000,000 at Infegy
  - Over 26,000,000,000 at boardreader.com
    - over 8.6Tb indexed data across 40+ boxes
- Serves 200,000,000+ queries per day
  - craigslist.org 2,000+ QPS against 15 Sphinx boxes
- 10-1000x **faster** than MySQL on full-text searches
  - Even faster on faceted search queries
- List is not complete

Example. Search against 8M rows.

```
mysql> SELECT id, ...
    -> FROM myisam_table
    -> WHERE MATCH(title, content_ft)
    -> AGAINST ('I love sphinx') LIMIT 10;
...
10 rows in set (1.18 sec)
```

MySQL

```
mysql> SELECT * FROM sphinx_index
        -> WHERE MATCH('I love Sphinx') LIMIT 10;
...
10 rows in set (0.05 sec)
```

Sphinx

Closer look

```
mysql> SELECT *
    -> FROM sphinx_index
    -> WHERE MATCH('I love Sphinx')
    -> LIMIT 5
    -> OPTION field_weights=(title=100, content=1);
+---------+--------+------------+------------+
| id      | weight | channel_id | ts         |
+---------+--------+------------+------------+
| 7637682 | 101652 |     358842 | 1112905663 |
| 6598265 | 101612 |     454928 | 1102858275 |
| 6941386 | 101612 |     424983 | 1076253605 |
| 6913297 | 101584 |     419235 | 1087685912 |
| 7139957 |   1667 |     403287 | 1078242789 |
+---------+--------+------------+------------+
5 rows in set (0.05 sec)
```

Key differences

- Meta fields @weight, @group, @count
- No full-text fields in output
  - Requires additional lookup to fetch data
- MySQL query become primary key lookup
  - WHERE id IN (33, 9, 12, …, 17, 5)
  - Good for caching
  - Good compatibility with NoSQL date storages
- Scaling is transparent for the application

SQL & SphinxQL

- WITHIN GROUP ORDER BY
- OPTION support for fine tuning
  - weights, matches and query time control
- SHOW META query information
- CALL SNIPPETS let you create snippets
- CALL KEYWORDS for statistics

Full-Text functions

- And, Or
  - hello | world, hello & world
- Not
  - hello -world
- Per-field search
  - @title hello @body world
- Field combination
  - @(title, body) hello world
- Search within first N
  - @body[50] hello
- Phrase search
  - “hello world”
- Per-field weights
- Proximity search
  - “hello world”~10
- Distance support
  - hello NEAR/10 world
- Quorum matching
  - "the world is a wonderful place"/3
- Exact form modifier
  - “raining =cats and =dogs”
- Strict order
- Sentence / Zone / Paragraph
- Custom documents weighting & ranking

Non Full-Text searches

- GEO-distance search support
- Faceted search support
  - Date and time segments
  - Price ranges and other
- Built in one – to – many attributes
  - For page tags
  - For multi category items
- Numeric, timestamps and string support

Integration ways

- Indexing
  - MySQL, PostgreSQL, MSSQL and any ODBC source
  - Insert/Update/Delete for Real-Time engine
    - Via SphinxQL
- Search
  - API
    - PHP, Python, Java, Ruby, C is included in distro
    - .NET, Rails (via Thinking Sphinx) via third party libs
  - MySQL-compatible protocol

PHP API sample

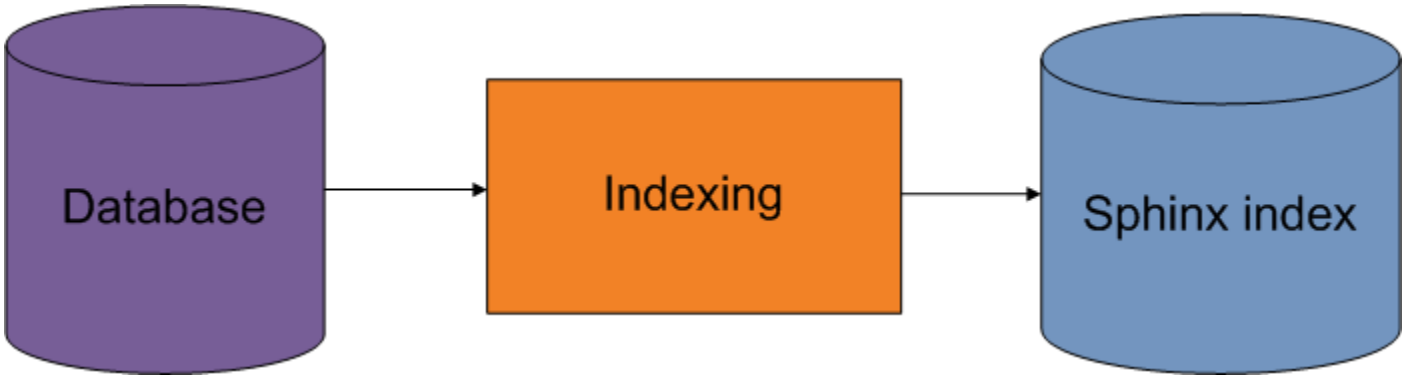
```
<?php
require ( "sphinxapi.php" );  //included in distro
$cl = new SphinxClient();
$cl->SetServer ( “127.0.0.1”, 9312 );
$res = $cl->Query ( “iphone", “shop_items" );
//some error processing
var_dump($res)
?>
```

Via PHP API

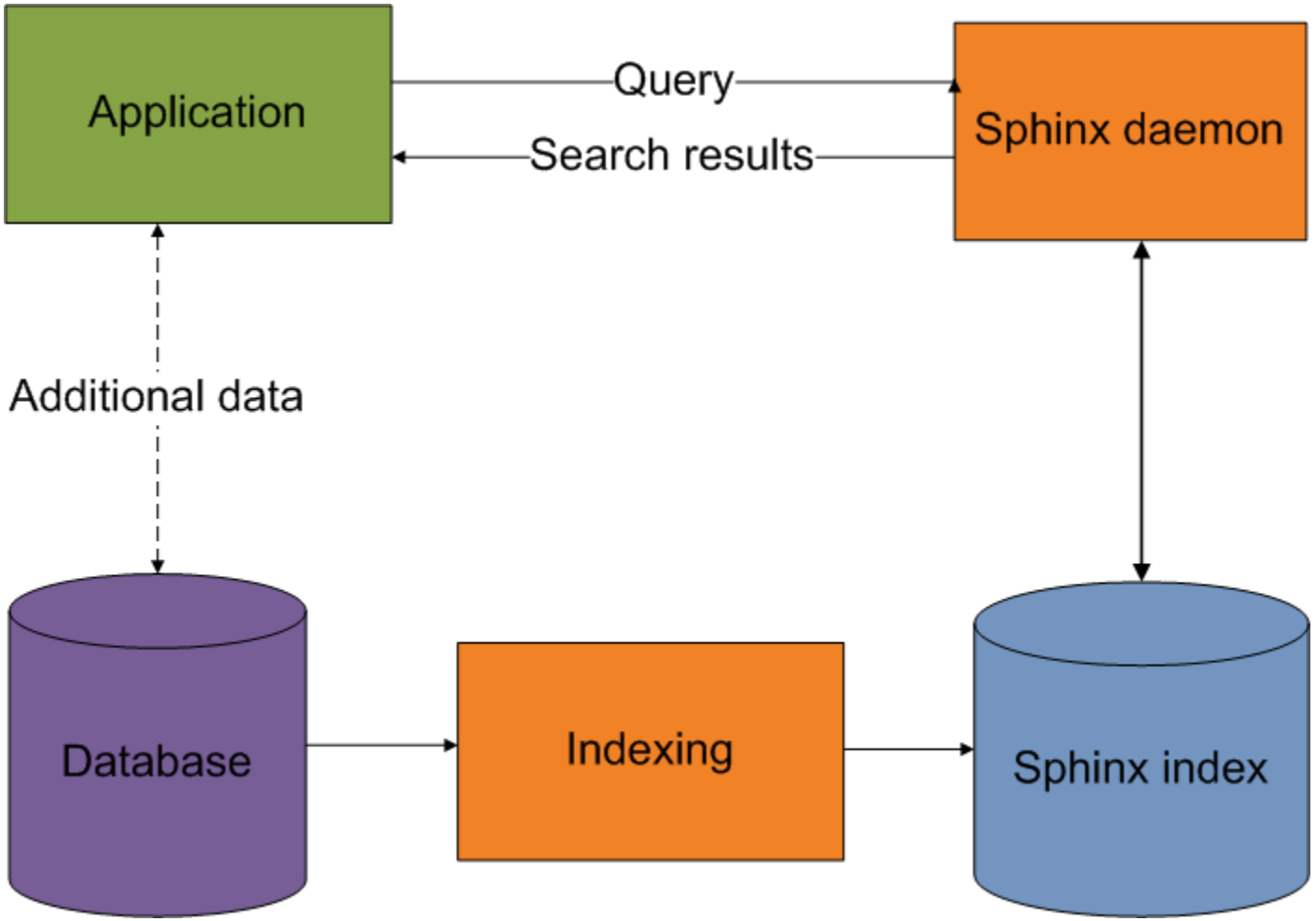
Sphinx components

- Indexer
- Indexes
- Daemon

Architecture sample



Architecture sample



Sphinx applications

- Find relevant documents
  - Items in store(s)
  - Articles in blog/forum/news/etc website(s)
  - Pictures or photos
    - By text, description, GEO-data, publish time, etc
  - Friends
    - In social networks or dating websites
- Offload main database from heavy queries
- Build advanced search and search-based services

From search to facets

- Search drill-down
  - By category
  - By document (item) date
    - Today / Week / Month / Year / Others
  - By price range
  - By distance
- Show best documents
  - For front page
  - For category/brand/etc pages

Faceted search support

- Usually more than one facet
  - Multiquery support
    - Common part calculates just once
- Aggregation function support
  - MIN(), MAX(), COUNT(), COUNT(DISTINCT …)
- WITHIN GROUP ORDER BY
  - Best items in each subgroup

Faceted search: drill-down by years

```
mysql> SELECT …, YEAR(ts) as yr
    -> FROM sphinx_index
    -> WHERE MATCH('I love Sphinx')
    -> GROUP BY yr
    -> WITHIN GROUP ORDER BY rating DESC
    -> ORDER BY yr DESC
    -> LIMIT 5
    -> OPTION field_weights=(title=100, content=1);
+---------+--------+------------+------------+------+----------+--------+
| id      | weight | channel_id | ts         | yr   | @groupby | @count |
+---------+--------+------------+------------+------+----------+--------+
| 7637682 | 101652 |     358842 | 1112905663 | 2005 |     2005 |     14 |
| 6598265 | 101612 |     454928 | 1102858275 | 2004 |     2004 |     27 |
| 7139960 |   1642 |     403287 | 1070220903 | 2003 |     2003 |      8 |
| 5340114 |   1612 |     537694 | 1020213442 | 2002 |     2002 |      1 |
| 5744405 |   1588 |     507895 |  995415111 | 2001 |     2001 |      1 |
+---------+--------+------------+------------+------+----------+--------+
5 rows in set (0.00 sec)
```

Misspells correction service

- Provides correct search phrase
  - "Did you mean" service
- Allows to replace user's search on the fly
  - if we're sure it's a typo
    - "ophone", "uphone", etc
  - Saves time and makes website look smart
- Based on your actual database
  - Effective if you DO have correct words in index

Bundled solution

- Helper script is located in /misc/suggest/
  - suggest.conf includes required Sphinx index
  - suggest.php is an actual implementation
- Requires PHP and MySQL to work
- Based on the tri-grams & levenshtein function

Limitations and features

- Provided as a showcase, not a complete service
- Doesn’t work with UTF8
  - PHP function limitation
- Based on your actual database
  - Index required rebuild as you have new data
- Script is only provides you word-by-word correction
- Works better in combination with autocompletion service

Autocompletion service

- Suggest search queries as user types
  - Show most popular queries
  - Promote searches that leads to desired pages
  - Might include misspells correction

Implementation

- Enable prefix indexing
  - Set min_prefix_len and prefix_fields
- Use pre-built index with search prases
  - Based on user's input
  - Based on document statistics
- Use star search: MATCH ('ipho*')
  - It's sometimes wise to delay search until 3-4 letters has typed

Related search

- Improving visitor experience
  - Providing easier access to useful pages
  - Keep customer on the website
  - Increasing sales and server's load average
- Based on documents similarity
  - Different for shopping items and texts
  - Ends up in data mining

Implementation

- Uses main Sphinx index
- Basic implementation uses quorum operator
  - “Sony NEX-5N”/2
  - “Mitt Romney wonders why airplane windows don’t open”/2
- Next step: use custom ranking
- Next step: enable statistics
  - Keywords/Phrases
  - Shopping experience
- Next step: use internal information

Quick summary

- ~~Basic search~~
- ~~Facets~~
- ~~Search-based services~~
  - ~~Misspells~~
  - ~~Autocompletion~~
  - ~~Related~~
- Speeding up search
  - Advanced tricks
  - Scaling & clouds

Non Full Text Search

- Offloading database from bad queries
  - Heavy & Long running
  - That can’t be efficiently handled
    - Flags enabled = 1
- Can be combined with full-text queries
  - On plain queries
  - In faceted search

GEO-Distance support

- Geographical distance is the distance measured along the surface of the earth
  - Two pairs of float values (Latitude, Longitude)
- GEODIST(Lat, Long, Lat2, Long2) in Sphinx

```
SELECT *, GEODIST(docs_lat, doc_long, %d1, %d2) as dist,
FROM sphinx_index
ORDER BY dist DESC
LIMIT 0, 20
```

Search within range

- Grouping results by
  - Price ranges (items, offers)
  - Date range (blog posts and news articles)
  - Ratings (product reviews)
- INTERVAL(field, x0, x1, …, xN)

```
SELECT
        INTERVAL(item_price, 0, 20, 50, 90) as range,
        @count
FROM my_sphinx_products
GROUP BY range
ORDER BY range ASC;
```

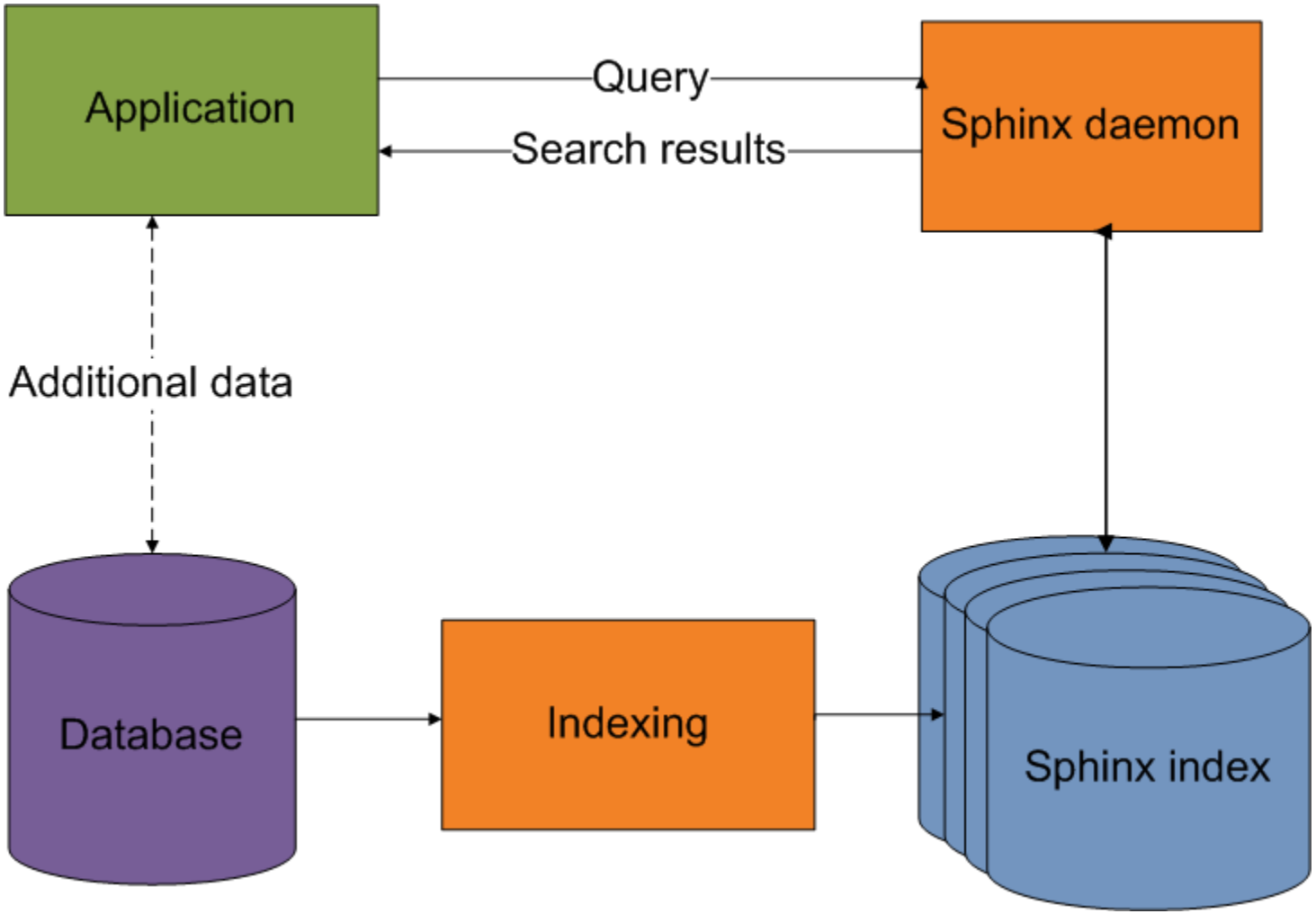
Text search for integers

- Meta keywords search sometimes faster
  - __META_AUTHOR_ID_3235
  - __META_AUTHOR_NAME_Kelby
- First letter search
  - __ARTIST_A, __ARTIST_B, __ARTIST_C, …
- Static ranges emulation with meta keywords
  - __MY_RANGE_0, __MY_RANGE_1, …
- Not flexible, but fast

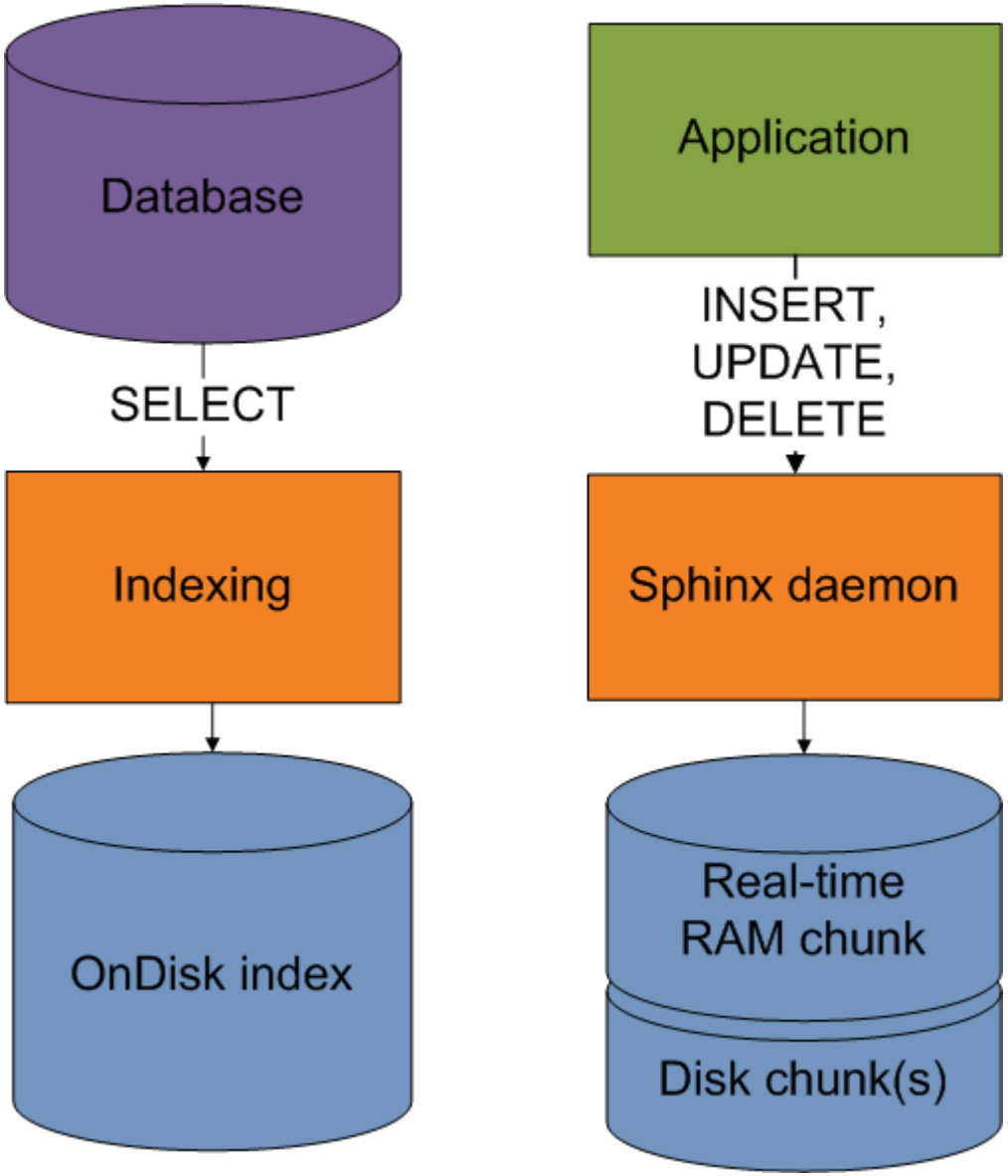
Another way to speed up is scaling

- Combine diffrent indexes
  - Main + Delta
  - Ondisk + RT
  - Distributed and local
    - Don't forget about dist_threads!
- Use parallel indexing

OnDisk indexes



On disk vs Real-time indexes



Bright side of scaling

- Faster search
- Better load control
- Hardware utilization

Dark side

- Hardware faults
- Network issues
- Balancing issues
  - Search time related to slowest search chunk
- Complicated operations

How to survive

- Compact indexes
  - Remove stopwords
  - Use bitmasks
- Set max_matches to an appropriate value
- Emergency controls
  - cutoff
  - max_query_time

How to survive II

- Tune distributed indexes
  - Concurrency control
    - dist_threads
    - max_children
  - Network & wait timeouts
    - agent_connect_timeout
    - agent_query_timeout

Use redundant indexes

- Sphinx will remove duplications automatically
  - You will have complete results event if node fails
- Use Sphinx HA
  - Not yet public
    - Could be found in trunk!

More info

- http://sphinxsearch.com/docs
- Conferences
  - I'll be doing Sphinx tutorial Oct 1st at Percona Live NY
  - Sphinx team at Oracle Open World & MySQL connect in San Francisco
- Invite me to speak
  - Ping me via email vlad@astellar.com
- Follow me on twitter @vfedorkov
- http://astellar.com
  - Upcoming webinars
- Ask questions here ☺

Thank you!