

A ARQUITETURA DO STACK OVERFLOW

Roberta Arcoverde / @rla4

/WHOIS ROBERTA

- recifense
- cientista da computação, UFPE, 2008
- mestre em informática, PUC-Rio, 2012
- programadora desde 2004
- full-stack developer na Stack Overflow desde 2014
- mãe do Dostoevski e do Turing



stackoverflow

- começou em 2008
- **10M** perguntas
- **18M** respostas
- **50M** visitantes únicos/mês
- top **50** sites mais acessados do mundo*

*Alexa, Quantcast

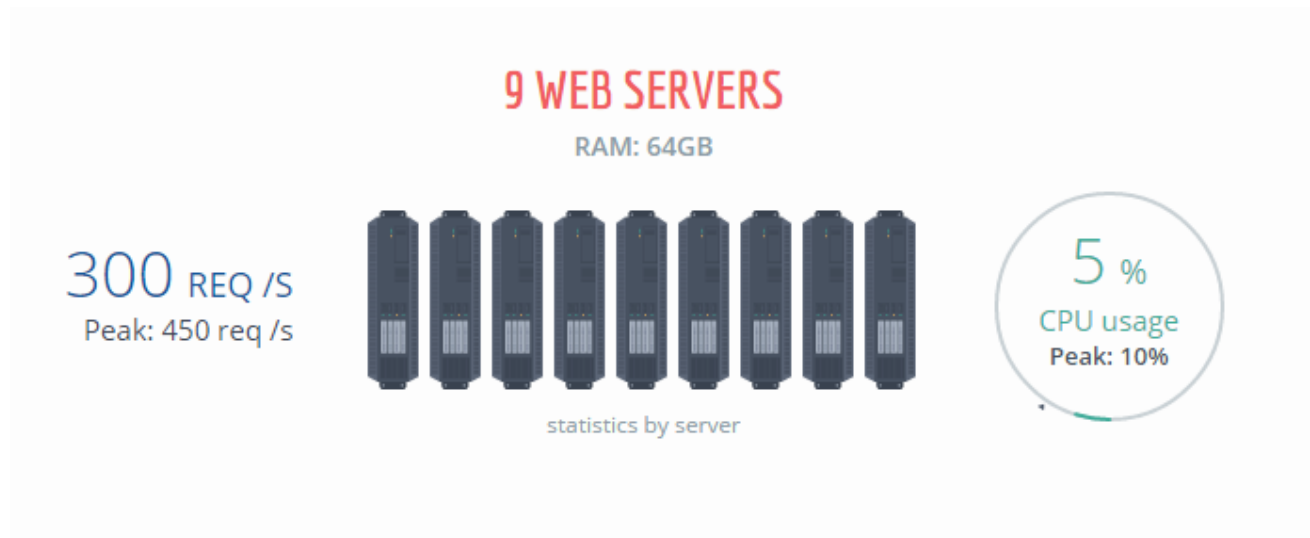
>140 SITES

RECENTEMENTE NÓS TIVEMOS

- 1,468,389,303 page views
- 5,183,954,727 HTTP hits
- 71,562,833,811,315 bytes enviados
- 3,202,505,376 CDN hits
- 19,532,899,854 SQL queries executadas
- 81,505,688,410 comandos Redis
- 500,000 websockets concorrentes
- 18.2ms tempo médio de page load

...operando a 5-10% da nossa capacidade

TUDO ISSO COM APENAS 9 SERVIDORES*

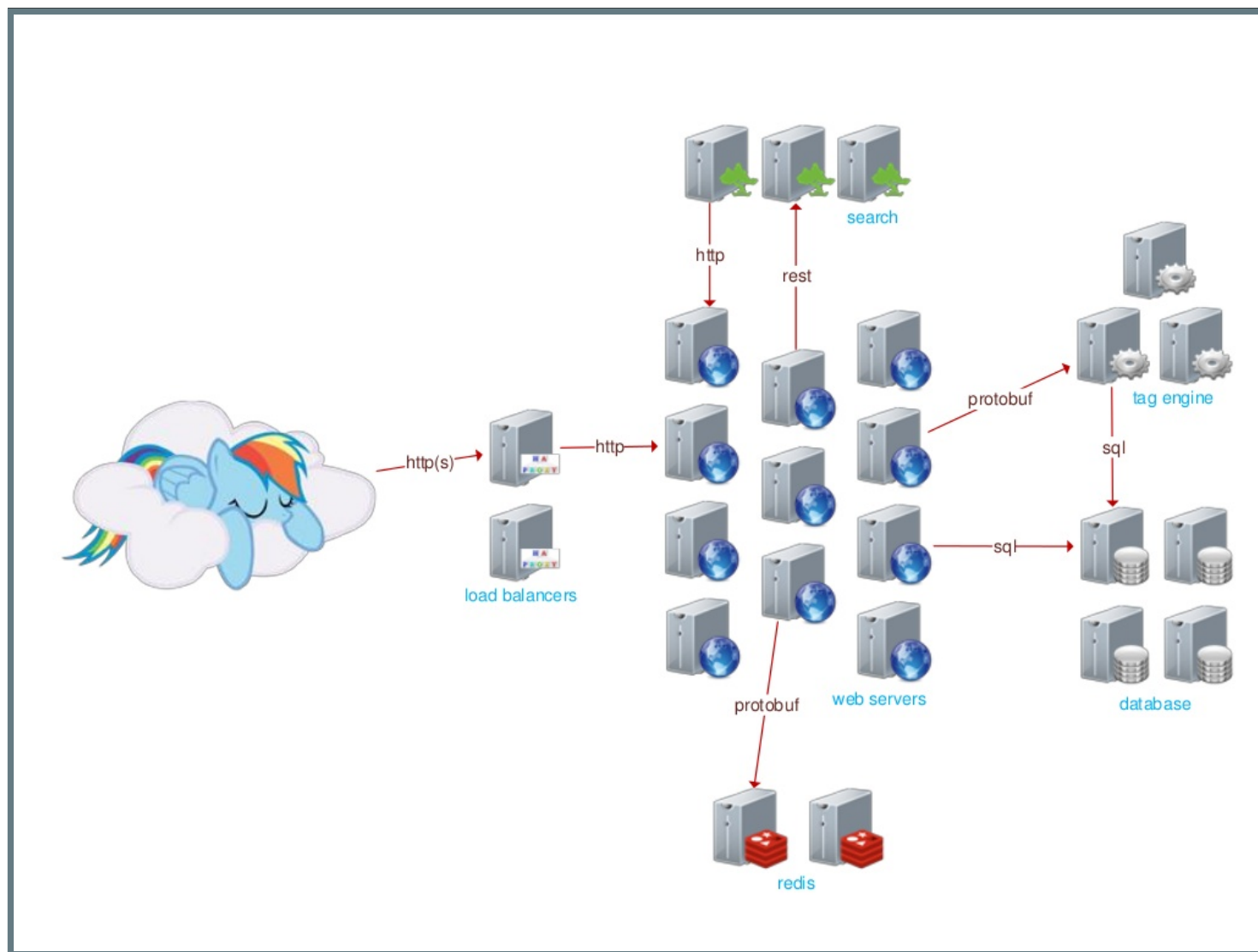


**mas 1 bastaria*

<http://stackexchange.com/about/performance>**

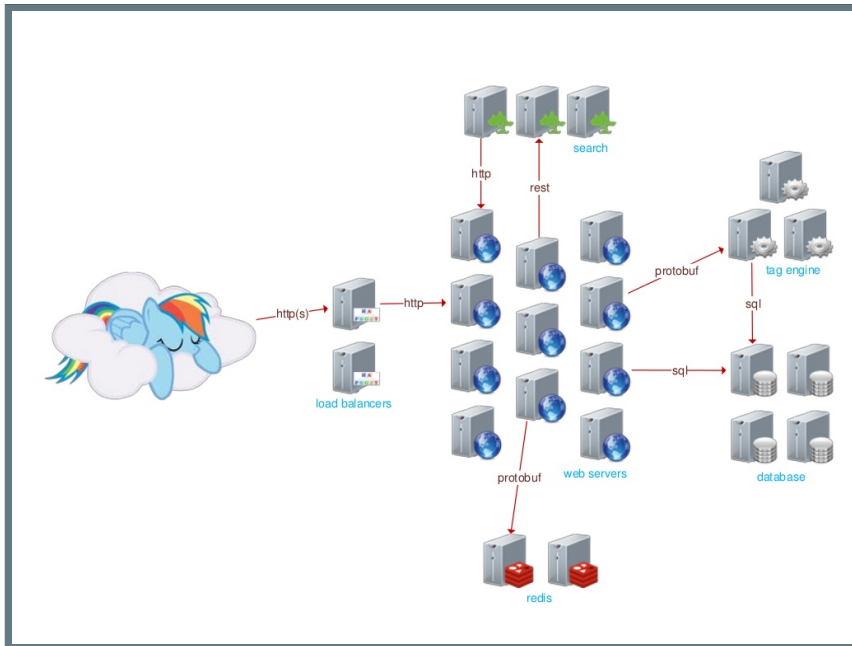
***tá meio desatualizado, mas dá uma ideia*

NOSSO DC EM UMA IMAGEM*

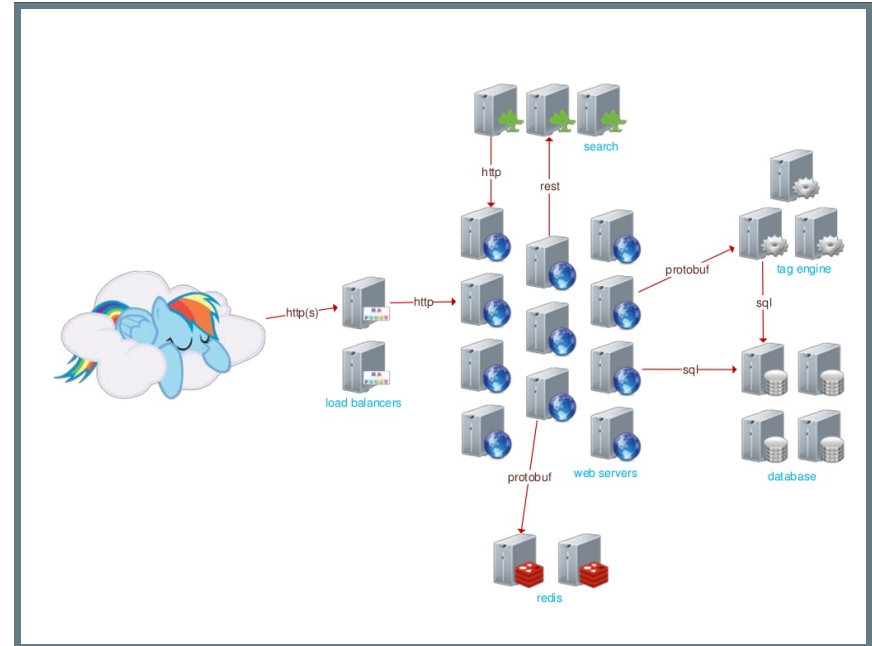


**imagem originalmente apresentada pelo Marco (@sklivvz) em <http://www.slideshare.net/howtoweb/marco-cecconi-stack-overflow-architecture>*

...OU MELHOR, DUAS



New York, NY



Denver, CO

...SÓ MAIS UMA IMAGEM...

galeria de fotos: <http://imgur.com/a/X1HoY>



COMO FAS?



UMA LOUCA OBSESSÃO: PERFORMANCE!

TIME

- 37 devs
- 8 sysadmins
- 8 designers
- 75% do time trabalha remotamente



<http://stackexchange.com/about/team>

STACK

- c#, asp.net mvc
- less/jquery
- sql server
- elasticsearch
- redis

↑ [-] **denisquaid** 1 point 3 minutes ago - NEW -

↓ **c#? microsoft?**

I vomited

[permalink](#) [source](#) [save](#) [save-RES](#) [report](#) [give gold](#) [reply](#)

TEH CODEZ

Solution 'StackOverflow' (11 projects)

- ▷ .nuget
- ▷ Redis
- ▷ Build
- ▷ SocketServer
- ▷ StackAuth
- ▷ StackExchange.Website
- ▷ **StackOverflow**
- ▷ StackOverflow.Api.V2
- ▷ StackOverflow.Localization
- ▷ StackOverflow.Mobile
- ▷ StackOverflow.Tests
- ▷ StackServer
- ▷ StackSnippets

| Hierarchy ▾ | Lines of Code |
|--------------------------------------|---------------|
| ▷ StackSnippets (Debug) | 68 |
| ▷ StackServer (Debug) | 960 |
| ▷ StackOverflow.Tests (Debug) | 5,245 |
| ▷ StackOverflow.Mobile (Debug) | 4,993 |
| ▷ StackOverflow.Localization (Debug) | 628 |
| ▷ StackOverflow.Api.V2 (Debug) | 15,511 |
| ▷ StackOverflow (Debug) | 103,230 |
| ▷ StackExchange.Website (Debug) | 16,446 |
| ▷ StackAuth (Debug) | 4,084 |
| ▷ SocketServer (Debug) | 331 |


muita emissão de IL, muito método estático

ARQUITETURA MONOLÍTICA

7 references | Marc Gravell, 130 days ago | 6 authors, 10 changes

```
public static List<HelpPost> All()
{
    return Current
        .GlobalCache
        .GetSet<List<HelpPost>>(
            CacheKey,
            (old, ctx) =>
            {
                using (SitesDBContext sitesDb = SitesDBContext.NewContext())
                {
                    return sitesDb.Query<HelpPost>(@"SELECT p.Id, p.Title, p.Body, p
                }
            }, 24 * 60 * 60, 24 * 60 * 60, server: StackRedis.Server.PreferSlave);
}
```

TESTES?

-
- StackOverflow.Tests (508 tests)
 - Controllers (8 tests)
 - Helpers (106 tests)
 - Models (243 tests)
 - TagEngine (118 tests)
 - TestHelpers (5 tests)
 - Views (1 test)
 - StackOverflow.Tests.CurrentTest (4 tests)
 - StackOverflow.Tests.ExtensionMethodsTest (18 tests)
 - StackOverflow.Tests.SettingsTests (2 tests)
 - StackOverflow.Tests.TestLinqExtensionMethods (3 tests)
- 

META STACKEXCHANGE!




isto é, testando direto com o usuário final :D

The screenshot shows the Meta Stack Exchange interface. At the top, there's a blue header with the 'META' logo and navigation links: Questions, Tags, Users, Badges, and Ask Question. Below the header, the 'popular' tab is selected, and the 'bug' tag is highlighted with a red circle. The tag description states: 'This tag indicates a reproducible problem on the site that you believe is due to a mistake, malfunction, or programming error.' Below this, there are two questions listed. The first question, 'Tag suggestion dropdown appears when there are no results sometimes', has 2 votes, 0 answers, and 16 views. The second question, 'Bug report android app overlay list and post [duplicate]', has 1 vote, 0 answers, and 11 views. On the right side, there's a sidebar with '208 questions', a 'Blog' section with a link to 'Anil Dash and the Firehose of Nerd-dom', 'Favorite Tags' including 'careers', and 'Related Tags' such as 'status-completed', 'android-app', 'design', 'careers', 'status-bydesign', 'area51', 'new-nav', and 'nrfila-nana'.

<http://meta.stackexchange.com>

COMUNIDADE É AMOR

LOL debugging are we? - Stack Overflow homepage alerts false [closed]


75


10

Refreshing the Stack Overflow home page is giving me an `alert('false');` .


bug

status-completed


stackoverflow

mod share edit reopen delete flag

edited Nov 26 '14 at 12:03

 Shadow Wizard
58.2k ● 13 ● 171 ● 364

asked Dec 9 '10 at 15:28

 Stephen
627 ● 5 ● 11

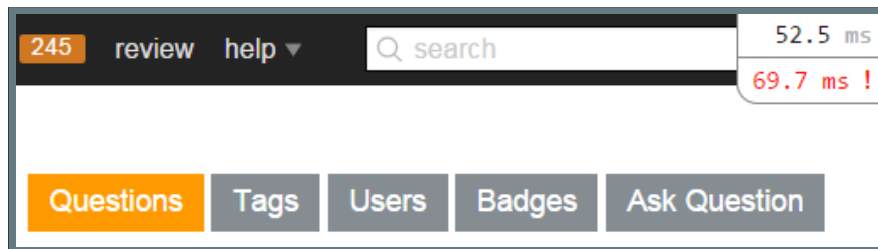
<http://meta.stackexchange.com/questions/71780/lol-debugging-are-we-stack-overflow-homepage-alerts-false>



3 PRINCÍPIOS BÁSICOS

1. solução mais simples possível
2. encontre os gargalos (medição)
3. remova os gargalos

ENCONTRE OS GARGALOS



| Home/Index | | CO-WEB02 on Fri, 28 Aug 2015 00:54:51 GMT | | | |
|--|----------|---|------|-------|-----|
| | duration | sql | | redis | |
| http://stackoverflow.com:80/ | 3.8 | 2.2 | (4!) | 0.2 | (1) |
| OnActionExecuting | 9.7 | 0.5 | (1) | 0.3 | (1) |
| Account lookup | 2.5 | 1.4 | (3) | 0.4 | (2) |
| update LastAccessDate | 3.0 | 2.8 | (1) | 0.1 | (1) |
| MLFuturePredictor - Interesting.cs:783 | 2.1 | | | 0.6 | (1) |
| ExpandDictionary - Interesting.cs:724 | 2.9 | | | | |
| QuestionSummary x N | 2.0 | | | | |
| ToJson | 16.2 | | | | |
| body | 17.0 | 0.6 | (1) | 1.7 | (7) |
| client event | duration | sql: 11.5 % | | | |
| Domain Lookup | 26.0 | redis: 6.5 % | | | |
| Connect | 133.0 | | | | |
| Response | 209.0 | | | | |
| Dom Content Loaded Event | 96.0 | | | | |
| Load Event | 43.0 | | | | |
| Dom Complete | | | | | |

<https://github.com/MiniProfiler>

ENCONTRE OS GARGALOS II

Top queries on CO-SQL01 by Average CPU per minute:

| CPU | | | Time | | Reads | | Execs | | Time | Query Info | |
|--------------|--------------|----------|-----------|---------|-------------|---------------|-----------|-----------|-------------|---------------|--|
| Avg | Avg/min | Total | Avg | Total | Reads (Avg) | Reads (Total) | Execs | Execs/min | Last Exec | Database | Query |
| 81,229,174µs | 13,588,831µs | 1h 51m | 48m 14s | 2d 17h | 500,122 | 41,010,023 | 82 | 0.17 | 8 mins ago | StackOverflow | select /* Realtime\QuestionCount.cs@77 */ count(*) |
| 45,413µs | 13,206,095µs | 14m 11s | 55s 381ms | 12d 19m | 2,779 | 52,100,610 | 18,742 | 290.80 | 2 mins ago | StackOverflow | SELECT P.Id AS answer_id , P.ParentId AS question_ |
| 400µs | 7,409,249µs | 1h 1m | 1s 164ms | 124d 4h | 101 | 934,929,177 | 9,214,996 | 18514.54 | just now | StackOverflow | select c.Id , c.PostId , c.[Text] , c.CreationDate |
| 14,526µs | 6,439,140µs | 52s 49ms | 17s 359ms | 17h 16m | 1,801 | 6,454,066 | 3,583 | 443.26 | 6 mins ago | StackOverflow | SELECT /* Models\Question.cs@659 */ COUNT(*) FROM |
| 19,942µs | 5,798,459µs | 6m 13s | 22s 585ms | 4d 21h | 1,906 | 35,739,821 | 18,749 | 290.76 | 2 mins ago | StackOverflow | SELECT COUNT(*) /* Models\Answer.cs@1018 */ FROM d |
| 618,524µs | 5,333,687µs | 43m 22s | 1m 44s | 5d 2h | 17,306 | 72,824,505 | 4,208 | 8.62 | 7 hours ago | StackOverflow | SELECT /* Controllers\PrivateApiController.Careers |
| 1,333,944µs | 5,267,259µs | 10m 1s | 3m 30s | 1d 2h | 74,957 | 33,806,021 | 451 | 3.95 | 14 secs ago | Sites | select AccountId /* Models\AccountSession.cs@459 * |
| 2,175µs | 4,870,910µs | 1h 9m | 3s 662ms | 80d 21h | 872 | 1,665,130,747 | 1,908,477 | 2238.99 | just now | StackOverflow | Select ISNULL(Sum(Cast(ViewCount as BigInt)), 0) / |
| 2,146,497µs | 4,802,902µs | 20m 29s | 4m 42s | 1d 20h | 150,968 | 86,505,200 | 573 | 2.24 | 23 mins ago | StackOverflow | select @ip as IPAddress, UserId, u.DisplayName as |
| 214,218µs | 4,626,155µs | 36m 1s | 3m 50s | 26d 21h | 10,589 | 106,825,794 | 10,088 | 21.60 | 25 mins ago | StackOverflow | SELECT U.Id AS user_id , U.DisplayName AS display_ |
| 86,153µs | 4,540,192µs | 8m 38s | 26s 155ms | 1d 19h | 16,408 | 98,779,697 | 6,020 | 52.70 | 2 secs ago | StackOverflow | select top 30 a.Id from Posts a /* Controllers\Tag |
| 4,028µs | 4,189,892µs | 34m 20s | 6s 476ms | 38d 8h | 1,232 | 630,482,042 | 511,450 | 1040.03 | just now | StackOverflow | with PostsCte as (select p.Id, p.PostTypeId, ... |
| 18,496µs | 3,980,412µs | 4m 30s | 26s 264ms | 4d 10h | 1,797 | 26,327,475 | 14,644 | 215.19 | 6 mins ago | StackOverflow | SELECT Q.Id AS question_id , Q.Title as title , IS |
| 23,360,140µs | 3,890,347µs | 30m 45s | 20m 55s | 1d 3h | 945,662 | 74,707,345 | 79 | 0.17 | 7 mins ago | StackOverflow | Select u.Id as UserId, u.IsVeteran, u.DisplayName, |
| 21,842,194µs | 3,648,812µs | 28m 23s | 16m 33s | 21h 31m | 443,697 | 34,608,372 | 78 | 0.17 | 7 mins ago | StackOverflow | Select u.Id as UserId, u.IsVeteran, u.DisplayName |
| 19,724,694µs | 3,288,374µs | 25m 58s | 12m 32s | 16h 30m | 483,732 | 38,214,875 | 79 | 0.17 | 7 mins ago | StackOverflow | Select u.Id As UserId, u.IsVeteran, u.DisplayName |
| 1,491,200µs | 3,283,938µs | 26m 44s | 3m 20s | 2d 11h | 102,371 | 110,151,641 | 1,076 | 2.20 | 1 sec ago | StackOverflow | SELECT /* Models\Question.cs@659 */ COUNT(*) FROM |
| 19,711,439µs | 3,282,816µs | 25m 57s | 19m 17s | 1d 1h | 343,613 | 27,145,429 | 79 | 0.17 | 7 mins ago | StackOverflow | Select u.Id as UserId, u.IsVeteran, u.DisplayName, |
| 37,768,578µs | 3,238,347µs | 25m 10s | 5h 5m | 8d 11h | 561,733 | 22,469,323 | 40 | 0.09 | 7 mins ago | StackOverflow | Select u.Id as UserId, u.IsVeteran, u.DisplayName, |
| 37,921,804µs | 2,894,227µs | 16m 25s | 37m 1s | 16h 2m | 1,399,915 | 36,397,811 | 26 | 0.08 | 2 mins ago | StackOverflow | WITH Ranks AS (SELECT UserId, SUM(RepChange) Repu |
| 45,322,487µs | 2,876,531µs | 21m 9s | 33m 31s | 15h 38m | 581,673 | 16,286,866 | 28 | 0.06 | 7 mins ago | StackOverflow | Select u.Id As UserId, u.IsVeteran, u.DisplayName, |
| 34,023,932µs | 2,770,897µs | 17m 34s | 21m 17s | 11h 12s | 481,510 | 14,926,818 | 31 | 0.08 | 7 mins ago | StackOverflow | Select u.Id as UserId, u.IsVeteran, u.DisplayName |

<https://github.com/opserver/Opserver>

ENCONTRE OS GARGALOS III

REMOVENDO OS GARGALOS - DB

é indispensável que todo desenvolvedor entenda profundamente como funcionam planos de execução

- todo dev é um DBA em potencial
- como funcionam índices (e seus trade-offs)
- paginação
- sargability

REMOVENDO OS GARGALOS - ALLOCATIONS

[Questions](#)[Tags](#)[Users](#)

All Questions

newest

9

featured

frequent

votes

active

unanswered

0

votes

0

answers

3 views

How to mask one of my domains to another?

I want one of my domains (freelawofattractioncourse.com) to point to another site of mine (http://katievb.com/freecourse) without causing the URL to change in the address bar. In other words, when a ...

apache-2.2

domain

mod-rewrite

virtualhost

mask

asked 9 mins ago



Ryan

101 ● 1

0

votes

Running a cronjob with different parameters each day

I am a programmer and do not know a lot about crons but I want to know if this is possible. Lets say I have

REMOVENDO OS GARGALOS

PROBLEMAS DE PERFORMANCE SÃO BUGS!

```
@Html.Partial("~/Views/Shared/PageTabs.cshtml", new PageTabs
{
    Tabs = new List<TabItem>
    {
        new TabItem {Value = ShowViewData.Tab.Active, Title = _s("ac
        new TabItem {Value = ShowViewData.Tab.Oldest, Title = _s("ol
        new TabItem {Value = ShowViewData.Tab.Votes, Title = _s("vot
    },
    UrlFormat = Question.UrlRelative + "?answertab={0}#tab-top",
    CurrentSelection = Model.CurrentTab
})
```

CACHE ALL THE THINGS



REMOVENDO OS GARGALOS

```
@Html.Partial("~/Views/Shared/PageTabs.cshtml", new PageTabs
{
    Tabs = Current.LocalCache.GetSet<List<TabItem>>("question-show-tabs", (_1,_2) => r
    {
        new TabItem {Value = ShowViewData.Tab.Active, Title = _s("ac
        new TabItem {Value = ShowViewData.Tab.Oldest, Title = _s("ol
        new TabItem {Value = ShowViewData.Tab.Votes, Title = _s("vot
    }, 24 * 60 * 60, 24 * 60 * 60),
    UrlFormat = Question.UrlRelative + "?answertab={0}#tab-top",
    CurrentSelection = Model.CurrentTab
})
```

DESIGN FOR MINIMAL ALLOCATIONS

VS

DESIGN FOR TESTABILITY

POR QUE TER 1 LINHA DE CÓDIGO SE VOCÊ PODE TER 147?

```
public static bool ContainsTokenMonty(string value, string token, char delimiter = ';')
{
    const int charsPerLong = sizeof(long) / sizeof(char);
    const int charsPerInt = sizeof(int) / sizeof(char);
    const int bytesPerChar = sizeof(char) / sizeof(byte);

    if (string.IsNullOrEmpty(token)) return false;
    if (string.IsNullOrEmpty(value)) return false;

    var delimiterTwice = (delimiter << 16) | delimiter;

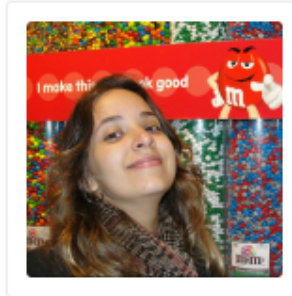
    var valueLength = value.Length;
    var tokenLength = token.Length;

    if (tokenLength > valueLength) return false;

    int tokenLongs;
    bool tokenTrailingInt, tokenTrailingChar;
```

<https://kevinmontrose.com/2016/04/26/an-optimization-exercise/>

OTIMIZAÇÃO DA SEMANA



Roberta Arcoverde

Developer at Stack Overflow

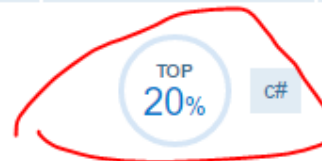
📍 São Paulo, Brazil • 🐦 rla4 • 🌐 robertaarcoverde

💬 1.3k 📄 863 📁 348 🔗 262 🔍 183

Favorite editor: Notepad, Visual Studio and Sublime 2. • First computer: 486 PC, with Windows 3.1.

Personal tech stack

c# programming-languages functional-programming compiler javascript asp.net-mvc



OTIMIZAÇÃO DA SEMANA

```
Select utt.UserId,  
       t.Name as Tag,  
       (Case When utt.TotalAnswerScore >= t.AnswerScoreTop1Percent Then 1  
             When utt.TotalAnswerScore >= t.AnswerScoreTop5Percent Then 5  
             When utt.TotalAnswerScore >= t.AnswerScoreTop10Percent Then 10  
             End) TopPercentile, utt.TotalAnswerScore, t.Id as TagId  
From Tags t  
     Join UserTagTotals utt On t.Id = utt.TagId  
Where  
     utt.TotalAnswerScore >= @MinTopTagTotalAnswerScore  
     and utt.UserId In @userIds  
Where TopTags.TagId in (Select Top (@topPopularCount) Id From Tags Order by Count Desc
```

ANTES E DEPOIS

| UsersStory/Show | | | | NY-WEB10 on Wed, 18 May 2016 19:25:36 GMT | | | | UsersStory/Show | | | | NY-WEB10 on Wed, 18 May 2016 19:36:18 GMT | | | |
|--|-------------|--------------|--------------|---|--------------------------|-------------|--------------|--|--------------|--------------------------|-------------|---|--------------|--------------|---------|
| | duration | sql | redis | | duration | sql | redis | | duration | sql | redis | | duration | sql | redis |
| http://dev.stackoverflow.com:80/users/story/1... | 3.7 | | 0.0 (1) | | 3.7 | | 0.0 (1) | http://dev.stackoverflow.com:80/users/story/1... | 3.7 | | 0.0 (1) | | 3.7 | | 0.0 (1) |
| Account lookup | 2.4 | 2.0 (2) | | | 2.4 | 2.0 (2) | | Account lookup | 2.4 | 2.0 (2) | | | 2.4 | 2.0 (2) | |
| OnActionExecuting | → 334.6 | 324.8 (4) | | | → 18.0 | 8.0 (4) | | OnActionExecuting | → 18.0 | 8.0 (4) | | | 18.0 | 8.0 (4) | |
| Render partial: ~/Views/Users/Show/TopTab... | 5.0 | 4.0 (4) | | | | | | Render: ~/Views/Users/Show/Story.cshtml | 4.2 | 3.4 (1) | | | 4.2 | 3.4 (1) | |
| Meta user check | 5.6 | | | | | | | Render partial: ~/Views/Users/Show/TopTab... | 4.4 | 3.4 (4) | | | 4.4 | 3.4 (4) | |
| GetMetaUsers - User.cs:682 | 136.2 | | | | | | | Meta user check | 5.4 | | | | 5.4 | | |
| Render partial: ~/Views/Users/Show/Story/... | 3.9 | | | | | | | Render partial: ~/Views/Users/Show/Story/... | 3.9 | | | | 3.9 | | |
| body | 3.3 | 1.2 (1) | 0.8 (6) | | | | | body | 3.3 | 1.1 (1) | 0.9 (6) | | 3.3 | 1.1 (1) | 0.9 (6) |
| client event | duration | sql: 66.5 % | | | client event | duration | sql: 38.4 % | | | client event | duration | sql: 38.4 % | | | |
| Response | 26.0 | redis: 0.2 % | | | Response | 23.0 | redis: 3.0 % | | | Response | 23.0 | redis: 3.0 % | | | |
| Dom Content Loaded Event | 43.0 | | | | Dom Content Loaded Event | 33.0 | | | | Dom Content Loaded Event | 33.0 | | | | |
| Load Event | 20.0 | | | | Load Event | 19.0 | | | | Load Event | 19.0 | | | | |
| Dom Complete | | | | | Dom Complete | | | | | Dom Complete | | | | | |
| share | moonstrings | snapshots | more columns | show trivial | share | moonstrings | snapshots | more columns | show trivial | share | moonstrings | snapshots | more columns | show trivial | |

REINVENTANDO RODAS!

- dapper
- opserver
- protobuf-net
- jil
- stackexchange.redis
- stackexchange.exceptional
- stackexchange.precompiler

DAPPER

nosso próprio ORM <3

```
var loginHistories = DB.Query<AccountLoginHistory>(  
    "select * from AccountLoginHistory where AccountId = @accountId")
```

<https://github.com/StackExchange/dapper-dot-net>

DAPPER

alta performance, através de emissão de IL e caching

| Method | Duration |
|--|----------|
| Hand coded (using a SqlDataReader) | 47ms |
| <u>Dapper</u> ExecuteMapperQuery | 49ms |
| ServiceStack.OrmLite (QueryById) | 50ms |
| PetaPoco | 52ms |
| BLToolkit | 80ms |
| SubSonic CodingHorror | 107ms |
| NHibernate SQL | 104ms |
| Linq 2 SQL ExecuteQuery | 181ms |
| Entity framework ExecuteStoreQuery | 631ms |

CONCLUSÃO

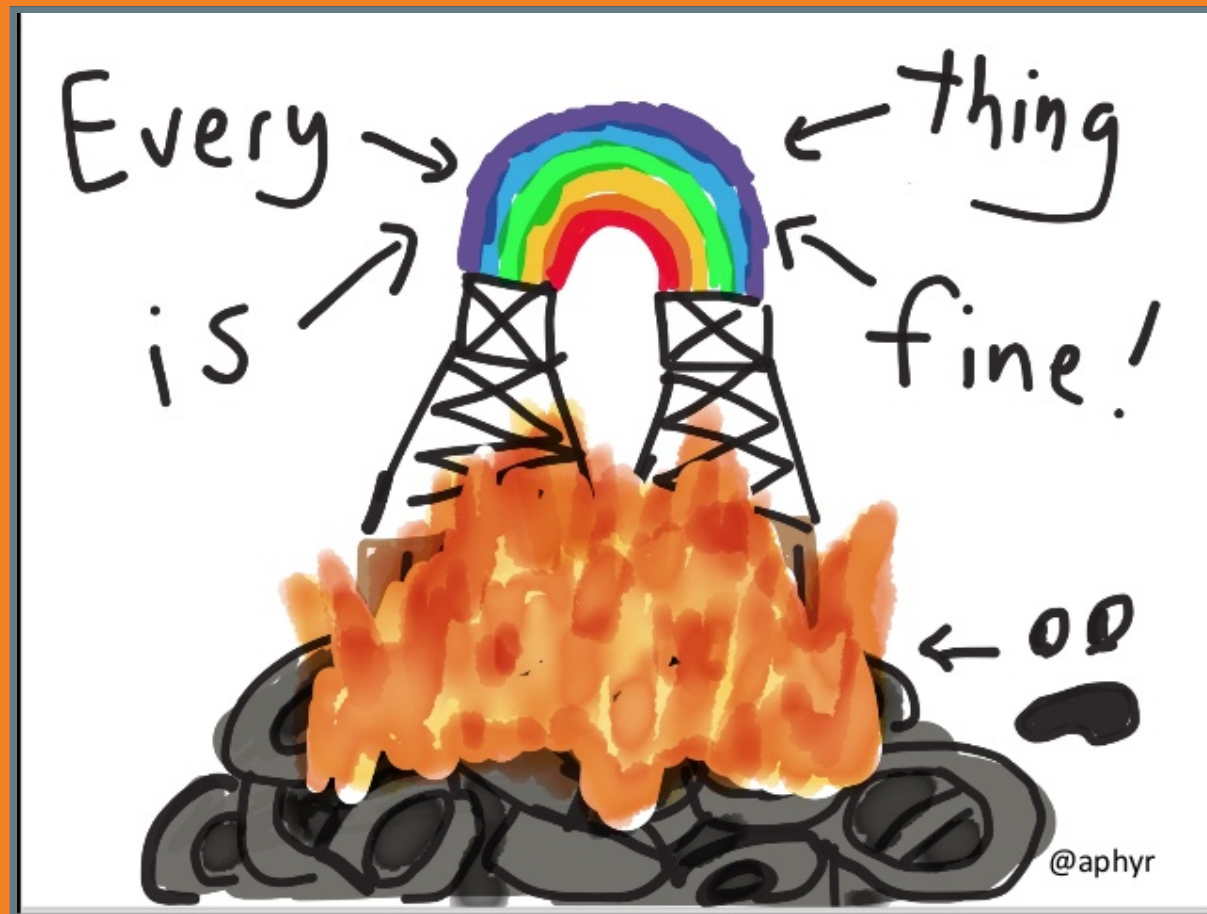
- SOA é legal
- microservices são legais
- injeção de dependência é legal
- testes são BEM legais
- ...mas não são pra todo mundo!

CONCLUSÃO

- é bem pragmática (ou seria boring?) (*nada de reflection, DI ou outros patterns legais*)
- monolítica (*nada de services, muito menos micro*)
- não seguimos várias boas práticas :(
- gostamos de reinventar a roda (*ORM, caching, perf monitors*)
- **funciona pra gente :**
- **escolha as práticas que fazem sentido no SEU projeto**

PERGUNTAS?

- twitter.com/rla4
- stackexchange.github.io
- stackexchange.com/work-here



OUTRAS APRESENTAÇÕES/REFERÊNCIAS

- the architecture of stack overflow, by Marco Cecconi - <http://www.slideshare.net/howtoweb/marco-cecconi-stack-overflow-architecture>
- scaling stack overflow, by David Fullerton - <https://speakerdeck.com/dfullerton/scaling-stack-overflow-qcon-nyc-2015>