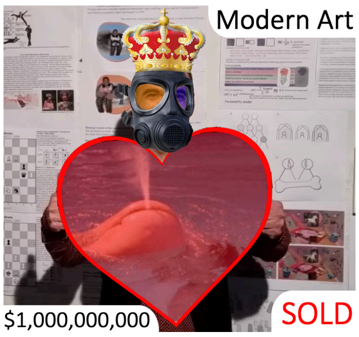
"Serverless" Information System (each.co.uk)

$$_nN<N^n, \quad \sum_{i=1}^{n} N_i \approx N$$

Miro Brada



In 2013, I've transformed the server side each.co.uk system aspx / c# to javascript* ≈400KB without plugins, 3rd party, css.. minimizing fragmentation to maximize reusage, following ◆ Linguistic principle of arbitrariness of the sign 1916 ◆ Multi layer logic of the chess composition 1928 ◆ Information Theory 1940s. Partially presented at conferences in Santorini, Adelaide, Geneva, Daejon and virtually.

*Javascript can be replaced or combined with webassembly

Philosophically, fragmentation creates illusions (entropy): eg. Zeno's Achilles can't overtake the slower tortoise: as he gets closer, the tortoise gets a bit further, so he gets closer and closer to never reach her. The more fragmented logic / data in various layers / structures (server, js, css, sql, frameworks..), the higher probability of unproductive codes to handle other unproductive codes..

"Serverless" (closed server)

The server stores and shares data. "Serverless" is a reduction to inevitable basic data operations without further modifications. So the server's functionality is **closed** in a few php (or any server script) commands to get / send / store data to be 100% processed in the browser (js/wasm). The old system's outages ended, after its many server operations SQL / C# moved to the browser js. It 1) betters performance 2) reduces the logical layers. The code $\mathbf{C=N_1+N_2}$ split in the server: $\mathbf{N_1}$ and the client: $\mathbf{N_2}$, multiplies the cases (incl bugs): $\mathbf{N_1*N_2>N_1+N_2}$, $N_1>1$, $N_2>1$. Moving the code **a** from layer 1 $\mathbf{N_1\text{-}a}$ to another $\mathbf{N_2+a}$ decreases the cases by $\approx\mathbf{a^2}$: $\mathbf{(N_1-a)*(N_e+a)\approx N^2-a^2}$, $N_1\approx N_2$. The **|-a|** can differ from the **|+a|**: it's on average approximation. Eg. If the server's code is closed: $\mathbf{N_1\approx 1}$: no application's bug can come from the server's code, while the 2-layers logic $N_1>1$, $N_2>1$ adds an extra options: the bug can be in N_1 or N_2: $\mathbf{a^2}$.

Remark: The old each.co.uk system that I started working in 2007, had suffered from regular outages or logging out the logged users. The admins installed load-balancer with an extra server to resolve the issues, without improvement..

Example of tiny php files (easy to change to any script: py, pl, c#)..

links to SQL (a few php commands)

```php
<?php
try{
  include'xxxxx.php';
  function a($x){$p=$_POST[$x];
    if($p)$GLOBALS['P'].= ", @".$x."='".$p."'";}
  $p=$_POST['p'];$P='';a("a");a("b");a("c");a("d");a("e");
  $P=$p.substr($P,1);
  $Q=sqlsrv_query($conn,'exec '.$P);
  $R=[];
  while ($r=sqlsrv_fetch_array($Q,SQLSRV_FETCH_ASSOC))
    $R[]=[$r['a'],$r['b'],$r['c']];
  echo json_encode($R);
  } catch (Exception $e) {}
?>
```

```php
<?php
try{$n=$_POST['n'];$c=",";$R="";
    file_exists($n)?0:mkdir($n,0777,true);
    $n=$n.'/'.$_POST['p'];
    file_exists($n)?0:mkdir($n,0777,true);
    $a=explode($c,$_POST['a']);
  foreach($a as $v){
    $k=explode("|",$v);
    $f=@file_get_contents($k[0]);
    $r=$n.'/'.$k[1];
    file_put_contents($r,$f);$r=filesize($r);
    $R=$R==''?$r:$R.$c.$r;}
  echo $R;}catch (Exception $e){echo 0;}
?>
```

```php
<?php
if(file_exists($_POST['a']))
  echo file_get_contents($_POST['a']);
else echo '';
?>
```

```php
<?php
file_put_contents($_POST['a'], $_POST['b']);
?>
```

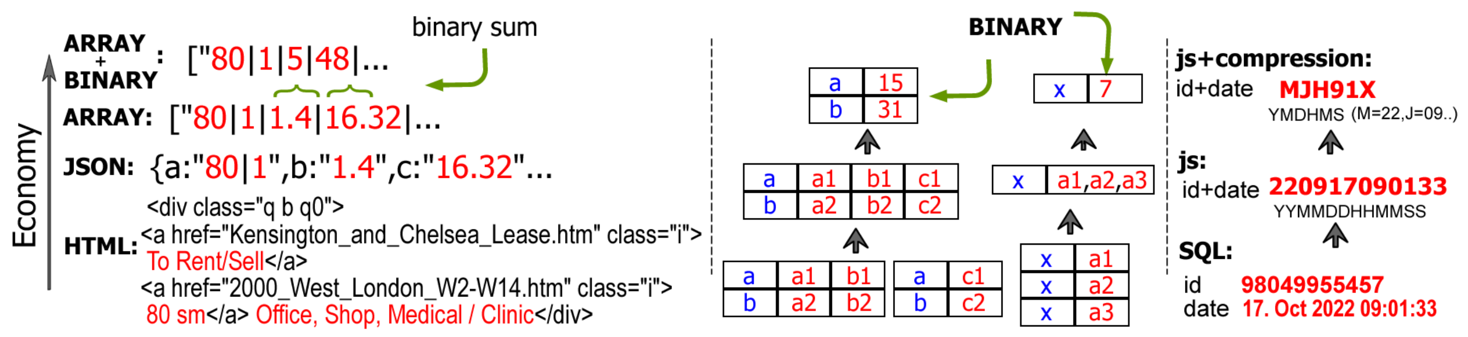
Data: database, files, compression

The viable data model reuses and compresses data to minimize the bytes to store and transmit. Data files use the server less than Database / SQL, but for the matches or data mix the SQL is more comfortable. So I merged or replaced all SQL (procedures, meta-data, indexes..) and let only the necessary SQL. Eg. I replaced the unique SQL key (identity) by the js's compressed date-time unique string: SQL id=98049955, date-time=17. Oct 2022 09:01:33 ⇒ js(YYMMDDHHMMSS)⇒ 220917090133 ⇒ js(YMDHMS)⇒ MJH91X (M=22,J=09..).

The old system had eg. Property table with 24 sub-tables (size, file, pic..) join by SQL keys to load the property. It was slowing down the server. I merged the all sub-tables to 1 table removing the keys and intersection tables. Multiple values (tenures, subtypes..) were merged to binary sums or comma separated ids. I replaced server's generated html by simple data structures (json, array) to load data from the server. The arrays are better as the same info in **array**: [5,7,2..] is smaller than in **json**:{"a":5,"b":7,"c":2..}. when the json's 1-letter key (+ apostrophes + colon) adds 4 bytes per key. Also I compressed the long texts eg. descriptions or addresses' list.. The compression / decompression is in js, the server only stores the compressed data to be loaded only if needed. Eg. the descriptions load only if the line / grid view is clicked to open the detail view.

Remark: If the text is needed in the keywords' search, the texts can be saved also in the reduced but uncompressed form: without signs and repeated words, in the SQL table's column to be used only for the keyword's search - the text itself would still load from the compressed file.

Compression / merging data and data forms

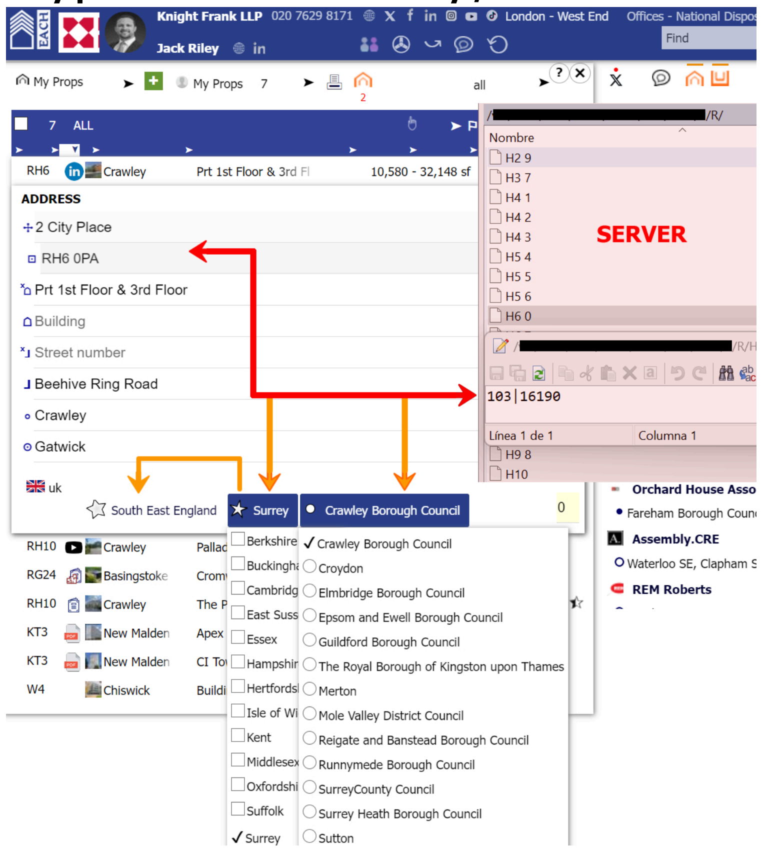


Economy
ARRAY + BINARY: ["80|1|5|48|...
binary sum
ARRAY: ["80|1|1.4|16.32|...
JSON: {a:"80|1",b:"1.4",c:"16.32"...
HTML: <div class="q b q0">
<a href="Kensington_and_Chelsea_Lease.htm" class="i">
To Rent/Sell</a>
<a href="2000_West_London_W2-W14.htm" class="i">
80 sm</a> Office, Shop, Medical / Clinic</div>
BINARY
a 15
b 31
x 7
a a1 b1 c1
b a2 b2 c2
x a1,a2,a3
a a1 b1
b a2 b2
a c1
b c2
x a1
x a2
x a3
js+compression:
id+date MJH91X
YMDHMS (M=22,J=09..)
js:
id+date 220917090133
YYMMDDHHMMSS
SQL:
id 98049955457
date 17. Oct 2022 09:01:33

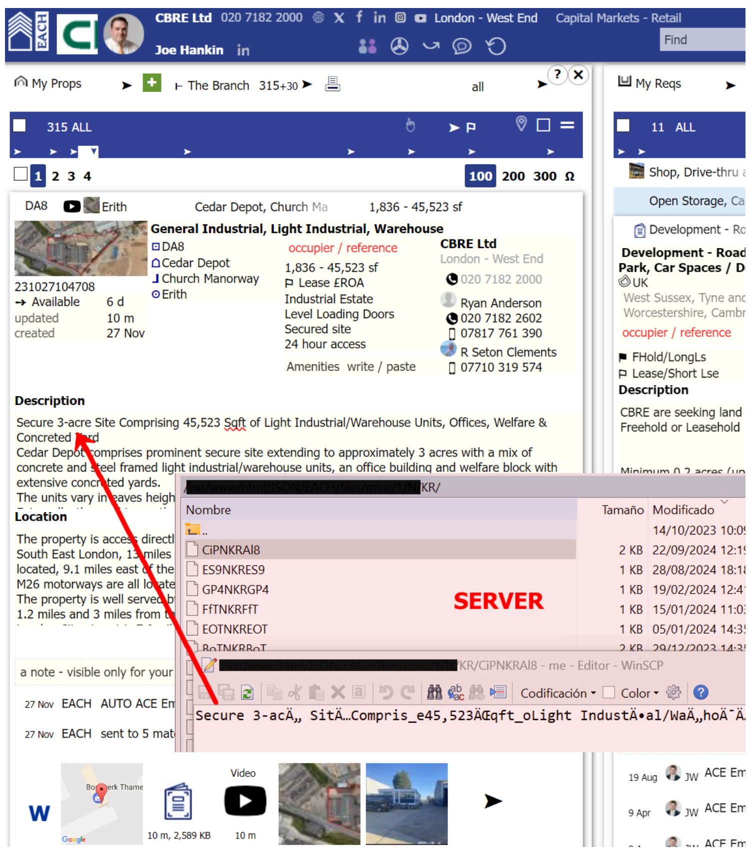
For the matches, the counties' ids used to be assigned when the property was created from the 4 MB SQL table of 32K rows. It slowed down the server, sometimes returning no result (had to be rematched). Instead, I made the simple 52 KB files' system with 4 leading postcodes' letters returning the county / council id before entering DB/SQL. This reduced "no result" cases in SQL.

Remark: Some say the server is too powerful to be optimized. But to reduce data isn't hard and it increases reusage. It's like not to see a difference if a car needs 10 L or 1/4 L per 100km. Or to commute between Yerevan and Tbilisi via Teheran or Moscow.

Tiny postcode's file with county / council id



Text from the compressed file in the detail view



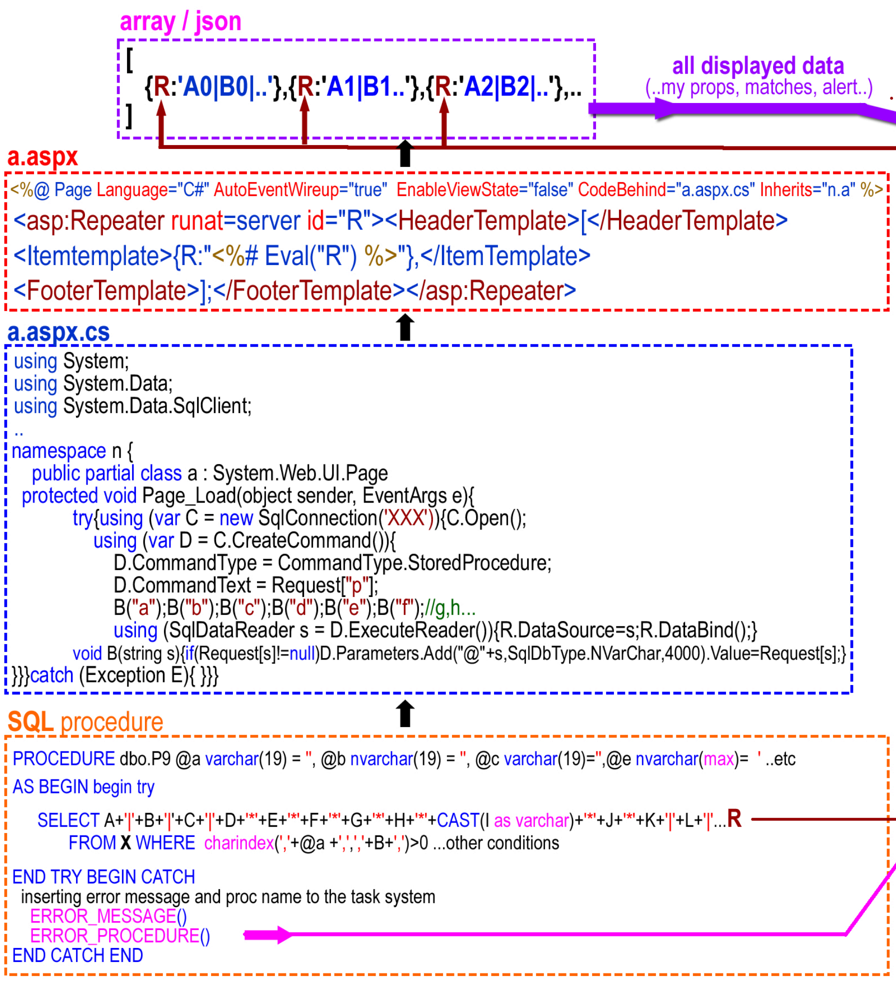
CBRE Ltd 020 7182 2000
London - West End
Capital Markets - Retail
Joe Hankin
Find
My Props
The Branch 315+30
all
My Reqs
315 ALL
11 ALL
1 2 3 4
100 200 300
DA8 Erith Cedar Depot, Church Ma 1,836 - 45,523 sf
General Industrial, Light Industrial, Warehouse
DA8
Cedar Depot
Church Manorway
Erith
occupier / reference
1,836 - 45,523 sf
Lease EROA
Industrial Estate
Level Loading Doors
Secured site
24 hour access
Amenities write / paste
CBRE Ltd
London - West End
020 7182 2000
Ryan Anderson
020 7182 2602
07817 761 390
R Seton Clements
07710 319 574
231027104708
Available 6 d
updated 10 m
created 27 Nov
Description
Secure 3-acre Site Comprising 45,523 Sqft of Light Industrial/Warehouse Units, Offices, Welfare & Concreted Yard
Cedar Depot comprises prominent secure site extending to approximately 3 acres with a mix of concrete and steel framed light industrial/warehouse units, an office building and welfare block with extensive concreted yards.
The units vary in eaves heigh
Location
The property is access directl
South East London, 13 miles
located, 9.1 miles east of the
M26 motorways are all locate
The property is well served
1.2 miles and 3 miles from t
a note - visible only for your
27 Nov EACH AUTO ACE En
27 Nov EACH sent to 5 mat
Nombre
Tamaño Modificado
14/10/2023 10:0
CIPNKRAI8 2 KB 22/09/2024 12:1
ES9NKRES9 1 KB 28/08/2024 18:1
GP4NKRGP4 1 KB 19/02/2024 12:4
FfTNKRFfT 1 KB 15/01/2024 11:0
EOTNKREOT 1 KB 05/01/2024 14:3
SERVER
KR/CIPNKRAI8 - me - Editor - WinSCP
Codificación
Color
Secure 3-acÄ„ SitÄ…Compris_e45,523ÄŒqft_oLight IndustÄ•al/WaÄ„hoÄ¯Ä
Shop, Drive-thru
Open Storage, Ca
Development - Ro
Development - Road
Park, Car Spaces / D
UK
West Sussex, Tyne and
Worcestershire, Cambr
occupier / reference
FHold/LongLs
Lease/Short Lse
Description
CBRE are seeking land
Freehold or Leasehold
Video
10 m, 2,589 KB
10 m
19 Aug JW ACE Em
9 Apr JW ACE Em

Uniform data form and Ajax

In 2002-2013, each.co.uk loaded over 30 aspxs' pages: properties.aspx, requirements.aspx, invoices.aspx, department.aspx.. with specific SQL procedures. The url had to reload to view the pages, with server's user session. Using ajax, I made a single-page application (SPA) merging the all aspxs to one aspx loading single parameter 'R' uniting the 'SELECT' of all SQL procs returning uniform data form:[{R:'A0|B0|'},{R:'A1|B1|'},..]. I reduced the aspx / c# code to tiny C# scripts, rewritten in 2019 to php in 2 days. The logic remained, only more economical arrays: [['A0|B0..'],['A1|B1..'],..], replaced jsons.

Remark: Ajax (asynchronous javascript + XML) arose in 1999 to be more common in mid of 2000s. It enabled SPA applications without re-loading the url.

SQL to C# to aspx to array's json loading mechanism applied to load all data



```
[
  {R:'A0|B0|..'},{R:'A1|B1..'},{R:'A2|B2|..'},..
]
```

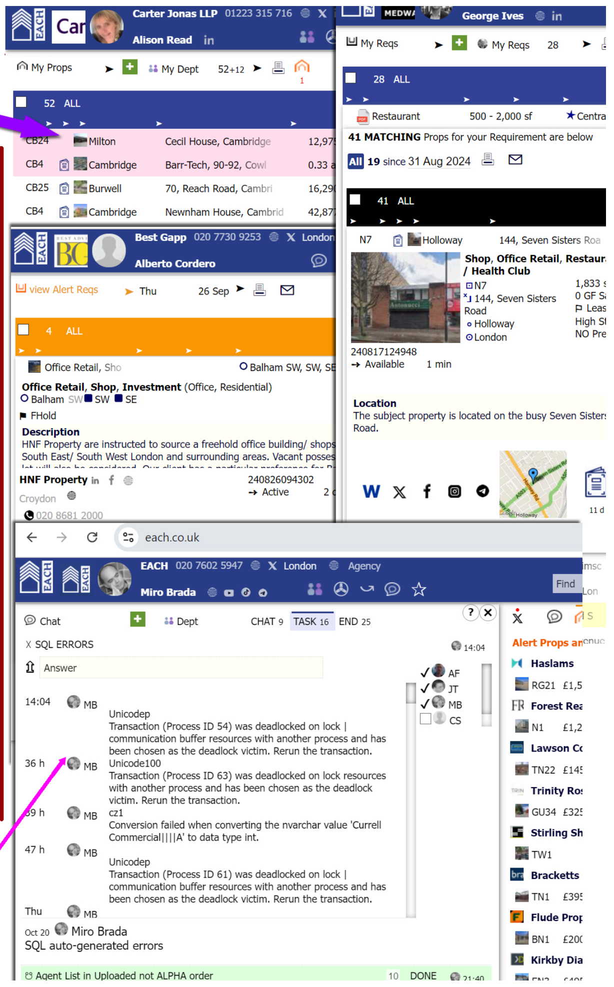
```
<%@ Page Language="C#" AutoEventWireup="true"  EnableViewState="false" CodeBehind="a.aspx.cs" Inherits="n.a" %>
<asp:Repeater runat=server id="R"><HeaderTemplate>[</HeaderTemplate>
<Itemtemplate>{R:"<%# Eval("R") %>"},</ItemTemplate>
<FooterTemplate>];</FooterTemplate></asp:Repeater>
```

```
using System;
using System.Data;
using System.Data.SqlClient;
..
namespace n {
   public partial class a : System.Web.UI.Page
  protected void Page_Load(object sender, EventArgs e){
         try{using (var C = new SqlConnection('XXX')){C.Open();
            using (var D = C.CreateCommand()){
               D.CommandType = CommandType.StoredProcedure;
               D.CommandText = Request["p"];
               B("a");B("b");B("c");B("d");B("e");B("f");//g,h...
               using (SqlDataReader s = D.ExecuteReader()){R.DataSource=s;R.DataBind();}
         void B(string s){if(Request[s]!=null)D.Parameters.Add("@"+s,SqlDbType.NVarChar,4000).Value=Request[s];}
}}}catch (Exception E){ }}
```

```
PROCEDURE dbo.P9 @a varchar(19) = '', @b nvarchar(19) = '', @c varchar(19)='',@e nvarchar(max)=  ' ..etc
AS BEGIN begin try

   SELECT A+'|'+B+'|'+C+'|'+D+'*'+E+'*'+F+'*'+G+'*'+H+'*'+CAST(I as varchar)+'*'+J+'*'+K+'|'+L+'|'...R
      FROM X WHERE  charindex(','+@a +',',','+B+',')>0 ...other conditions

END TRY BEGIN CATCH
  inserting error message and proc name to the task system
    ERROR_MESSAGE()
    ERROR_PROCEDURE()
END CATCH END
```


Carter Jonas LLP 01223 315 716
Alison Read
My Props
My Dept 52+12
52 ALL
CB24 Milton Cecil House, Cambridge
CB4 Cambridge Barr-Tech, 90-92, Cowl
CB25 Burwell 70, Reach Road, Cambri
CB4 Cambridge Newnham House, Cambrid
Best Gapp 020 7730 9253 London
Alberto Cordero
view Alert Reqs Thu 26 Sep
4 ALL
Office Retail, Sho Balham SW, SW, SE
George Ives
My Reqs My Reqs 28
28 ALL
Restaurant 500 - 2,000 sf
41 MATCHING Props for your Requirement are below
All 19 since 31 Aug 2024
41 ALL
N7 Holloway 144, Seven Sisters Roa
Shop, Office Retail, Restaur / Health Club
240817124948 Available 1 min
each.co.uk
EACH 020 7602 5947 London Agency
Miro Brada
Chat Dept CHAT 9 TASK 16 END 25
Alert Props
Haslams
Forest Rea
Lawson Co
Trinity Ros
Stirling Sh
Bracketts
Flude Prop
Kirkby Dia

Office Retail, Shop, Investment (Office, Residential)
Balham SW SW SE
FHold
Description
HNF Property are instructed to source a freehold office building/ shops South East/ South West London and surrounding areas. Vacant posses
HNF Property 240826094302 Active
Croydon
020 8681 2000

Location
The subject property is located on the busy Seven Sisters Road.

X SQL ERRORS

Answer

14:04 MB
Unicodep
Transaction (Process ID 54) was deadlocked on lock | communication buffer resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

36 h MB
Unicode100
Transaction (Process ID 63) was deadlocked on lock resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

39 h MB
cz1
Conversion failed when converting the nvarchar value 'Currell Commercial||||A' to data type int.

47 h MB
Unicodep
Transaction (Process ID 61) was deadlocked on lock | communication buffer resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

Thu MB

Oct 20 Miro Brada
SQL auto-generated errors

Agent List in Uploaded not ALPHA order 10 DONE

The old server-side system had a) outages due to huge server's functionality with data / SQL duplications, b) user's sessions cut offs - session deleted somewhere in large c# code. Admins installed the load balancer that didn't help at all. Then, I got a permission to create SPA system with simple data model. Between Apr and Sep 2013, I made the new system running on each.co.uk/test.htm to replace the default.aspx. It resolved the outages and session's cut-offs, and hastened the development. In 2014, based on advices I employed the jquery to easier the coding and resolve the differences in the browsers (IE, Chrome, Firefox, Opera..). By time the jquery started being overused.. Finally I grasped, the well designed code doesn't need the jquery, so I removed it.

Remark: The optimal solution can be blocked if not understood or if there is no motivation.. If the server's functionality is moved to js / webassemably the admins can try to discredit it, as there is less work for them. And programmers can practise or implement system / plugins (eg. Node.js, React..) to improve their CV instead of searching for optimal algorithm.

Bitwise Logic

The bitwise operators compress more values to single one. It follows: $y=2^x$, x={0,1,2.., n}, eg. for tenures: lease=2^0=1, short lease=2^1=2, freehold=2^2=4, long lease=2^3=8. So lease (1) + freehold (4) is 1+4=5, or freehold+long lease=4+8=12.. The bitwise operator '&' easily detects if eg. Property of tenure X (=5), matches Requirement of tenure Y (=12): X&Y>0: 5&12=4 (=matches), unlike the string search '1,4' vs '4,8' that is slower / harder. TO BE CONTINUED

Binary operations

	y	x
8x **Amenities:**	2^{22}, .. 2^{29}	{22, 23, .., 29}
9x **Regions:**	2^{13}, .. 2^{21}	{13, 14, .., 21}
9x **Types:**	2^{4}, .. 2^{12}	{4, 5, .., 12}
4x **Tenures:**	1, 2, 4, 8	{0, 1, 2, 3}

$y = 2^x$, x={0, 1, 2, 3.., n}

Example:

Item A: y=637 683 241
Amenity: 25, 26, 29
Region: 14, 17
Type: 5, 9, 10
Tenure: 0, 3

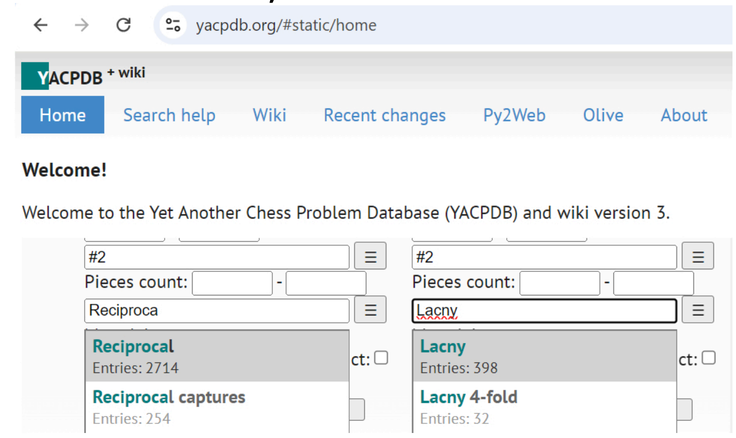
Merging logical layers

Tthe client's code can be split in 1) html, 2) css, 3) js/wasm. The amended formula is: $N=N_1+N_2+N_3.. \Rightarrow N=\sum_{i=1}^{n} N_i$, where i=layer: php/C#.., SQL, html, css, js/wasm..
The code N can be in 1-layer (js) or eg. uniformly split in **n** layers with N/n code per layer. The cases multiply in each

layer: $\frac{N}{n} * \frac{N}{n} \cdot\cdot = \left(\frac{N}{n}\right)^n$, where N is far bigger than n: N≫n. To compare: N 1-layer versus $(N/n)^n$ n-layers, let's assume N=100: 1-layer code has 100 cases, while 5-layers uniformly split code has 20^5=3.2M cases. It's 32 000 less cases in 1-layer code: the less layers, the higher efficiency.
The layer's logic can be understood via chess composition. The quality of the puzzle / composition is assessable by its difficulty to solve: the harder to solve, the better puzzle. This criterion is valid, but the other criterion has appeared in the 20th century: changes between the phases (layers). Italian composers Alberto Mari and Guido Cristoffanini developed the idea of change mates between try (or set play) and solution: neo-strategy. In 1928, A. Mari published the 1st reciprocal change of mates (AB-BA). In 1949, Slovak Ľudovít Lačný made the 1st cyclic change of mates (ABC-CAB), and in 1955 the first 4-fold cycle (ABCD-CADB). The online chess problem database yacpdb.org lists 2,714 reciprocal changes in mate in 2 (#2), 383 cyclic (Lacny) changes, 32 4-fold cyclic changes. It says: the less intricate schemes precede and are more frequent than the more intricate ones. AB-BA is 6.8x more frequent and 21y earlier than ABC-CAB that is 12.4x more frequent and 6y ealier than ABCD-DABC. TO BE CONTINUED

Remark: on yacpdb.org the 1st reciprocal #2 is in 1921 by Bruno Oswald Sommer, but it's unclear if intentional or 'by-product'.

The more intricate, the rarer


yacpdb.org/#static/home

YACPDB + wiki

Home | Search help | Wiki | Recent changes | Py2Web | Olive | About

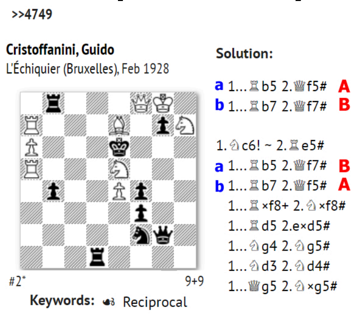
Welcome!

Welcome to the Yet Another Chess Problem Database (YACPDB) and wiki version 3.

#2
Pieces count: -
Reciproca
Reciprocal
Entries: 2714
Reciprocal captures
Entries: 254
ct:

#2
Pieces count: -
Lacny
Lacny
Entries: 398
Lacny 4-fold
Entries: 32
ct:

The reciprocal and cyclic change (Lačný) of mates


>>4749

Cristoffanini, Guido
L'Échiquier (Bruxelles), Feb 1928

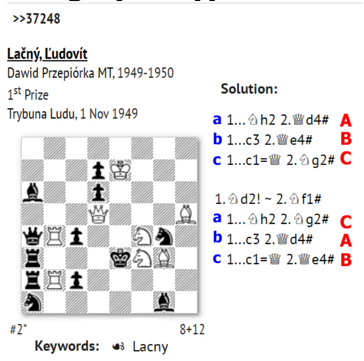
#2* 9+9

Keywords: Reciprocal

Solution:

a 1...♖b5 2.♕f5# A
b 1...♖b7 2.♕f7# B

1.♘c6! ~ 2.♖e5#
a 1...♖b5 2.♕f7# B
b 1...♖b7 2.♕f5# A
1...♖×f8+ 2.♘×f8#
1...♖d5 2.e×d5#
1...♘g4 2.♘g5#
1...♘d3 2.♘d4#
1...♕g5 2.♘×g5#


>>37248

Lačný, Ľudovít
Dawid Przepiórka MT, 1949-1950
1st Prize
Trybuna Ludu, 1 Nov 1949

#2* 8+12

Keywords: Lacny

Solution:

a 1...♘h2 2.♕d4# A
b 1...c3 2.♕e4# B
c 1...c1=♕ 2.♘g2# C

1.♘d2! ~ 2.♘f1#
a 1...♘h2 2.♘g2# C
b 1...c3 2.♕d4# A
c 1...c1=♕ 2.♕e4# B

Abstraction increases the reusage

It seems logical to name a function by its meaning eg. 'mail()' - a function to send emails. But, the functionalites often overlap and 'meaningful' names can mislead or can be impossible to name something specific (as in medicine, chemistry, mechanics). In 2017, I joined the conference 'The Arbitrariness of the Sign', an idea (1916) of linguist F. Saussure. As I was preparing my lecture Psychological and other aspects of the sign arbitrariness, I realized the broader picture applicable to programming too. Eg. the 'meaningfully' named codes is as Chinese sign refering to its meaning (pictograph) eg. home 家 (jia): a pig under roof. The pictographs are less repeatable, so there are many unique signs and 2-3000 are needed to read a newspaper. In contrast, Eurpean languages have about 30 letters whose combinations create the all meanings. The pictographs disable the advanced grammar being too complicated to be expressed in the pictographs. But the pictographs themselves are insufficient to create a language / system, the chinese uses 'radicals' - repeatable signs re-used in various signs to amend / create the meaning. Eg. a radical 'person': 人 (rén) is used in different signs - where it can have shortened form: 亻. Everyone: 人人 (rénrén), estimate: 估 (gū), imitate: 仿 (fǎng), night: 夜 (yè). Without the radicals, no grammar would be even possible. Also there is higher divergence (smaller share) among the the 'meaningful' languages - when differences among e.g. Slavic or Latin languages or difference between German and English, is far smaller than between Mandarine and Cantonese, Japanese, Koreans, Vietnamese (whose mother langue was Chinese). So, for a complex system is far more efficient to use the abstract ('meaningless') signs to maximize their reusage. TO BE CONTINUED