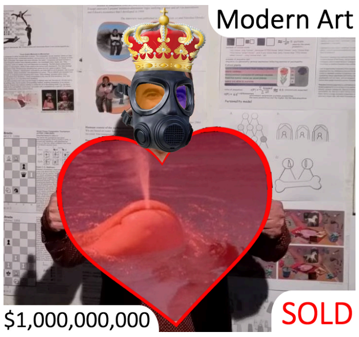
"Serverless" Information System (each.co.uk)

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

Miro Brada



In 2013, I've transformed the each.co.uk server side system (aspx / c#) to the client system of a few javascript files ≈400KB potentially webassembly, without plugins / 3rd party / css.. The system maximally reuses functions & data to apply: 1) Linguistic principle of arbitrariness of the sign maximizing repetitions, 2) Multi layer logic of the chess composition, 3) Information Theory minimizing entropy. Some of these ideas were presented at conferences in Santorini, Adelaide, Geneva, Daejon and virtually.

Philosophically, any system only organizes the existing reality (information), but can't create it. Its fragmentation easily leads to illusions (entropy): eg. Zeno's Achilles can't overtake the slower tortoise because as he gets closer, the tortoise gets a bit further, so he gets closer and closer but never reaches her. So the more are logic and data fragmented in various layers (server, js, css, sql, frameworks..), the less capable system is.

"Serverless" (closed server)

The server stores and shares data. "Serverless" is 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. The all data are processed in the browser (js/wasm). The outages on the old system with many server operations (SQL / C#) ended, after moved to the browser. The server's reduction: 1) betters performance 2) reduces the logical layers. The code $\mathbf{C=N_1+N_2}$ splits in the server: N_1 and the client: N_2, increases the cases (incl bugs): $\mathbf{N_1*N_2>N_1+N_2}$, $N_1>1$, $N_2>1$. Moving the code **a** from one layer **-a** to another **+a** decreases the cases approximately by $\mathbf{a^2}$: $\mathbf{(N-a)*(N+a)=N^2-a^2}$, $N_1 \approx N_2$. 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 split logic adds an extra options: the bug can be in the server's or the client's logic: $\mathbf{a^2}$.

Remark: The old each.co.uk system that I started working in 2007, had suffered from regular outages and cutting off logged in users from the server's sessions. The admins tried to resolve it by installation of load-balancer with an extra server. It didn't improve it at all..

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

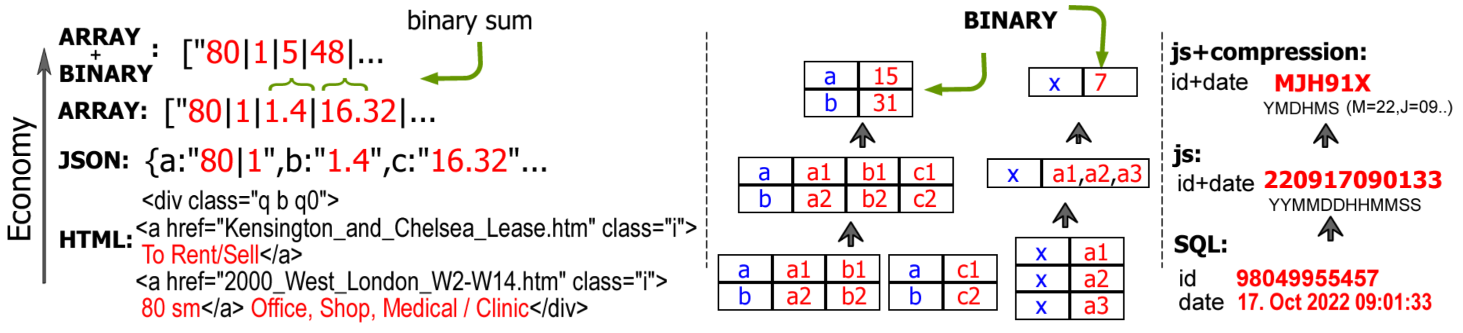
The viable data model reuses and compresses data to minimize the bytes to store and transmit. Data files use the server less than Database / SQL, but for the matches or data mix the SQL is far more comfortable. So I merged or replaced all SQL (procedures, meta-data, indexes..) and let only the necessary 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..) linked by SQL foreign keys to be joined to load the property. It was slowing down the server. I merged the all sub-tables to 1 table removing the foreign keys and intersection tables. Multiple values (tenures, subtypes..) were merged to binary sums or comma separated ids. To load data from the server, I started using simple data structures (instead of server's generated html). At first json, later I started using the arrays, as I realized the json's keys are useless. The **array**:[5,7,2..] is smaller than **json**:

{"a":5,"b":7,"c":2..}. when the json's 1-letter key (+ apostrophes + colon) adds 4 bytes per key and reduces the flexibility (explained later). Also I compressed the texts as descriptions or lists of addresses.. 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

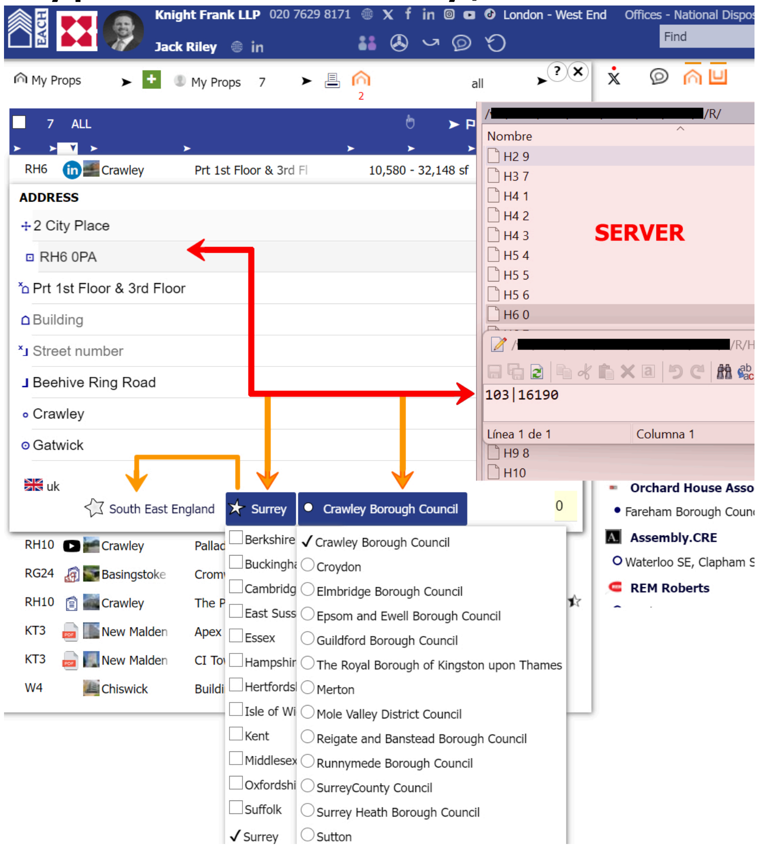


Economy
binary sum
ARRAY + BINARY: ["80|1|5|48|...
ARRAY: ["80|1|1.4|16.32|...
JSON: {a:"80|1",b:"1.4",c:"16.32"...
HTML: <div class="q b q0">
<a href="Kensington_and_Chelsea_Lease.htm" class="i">
To Rent/Sell</a>
<a href="2000_West_London_W2-W14.htm" class="i">
80 sm</a> Office, Shop, Medical / Clinic</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 the data reduction isn't hard to do 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 like to commute between Yerevan and Tbilisi via Teheran or Moscow.

Tiny postcode's file with county / council id


Knight Frank LLP 020 7629 8171 London - West End Offices - National Dispos
Jack Riley
My Props 7 all

7 ALL

RH6 Crawley Prt 1st Floor & 3rd Fl 10,580 - 32,148 sf

ADDRESS
2 City Place
RH6 0PA
Prt 1st Floor & 3rd Floor
Building
Street number
Beehive Ring Road
Crawley
Gatwick
uk
South East England | Surrey | Crawley Borough Council | 0

/[redacted]/R/
Nombre
H2 9
H3 7
H4 1
H4 2
H4 3
H5 4
H5 5
H5 6
H6 0
SERVER
/[redacted]/R/H
```
103|16190
```
Línea 1 de 1 Columna 1
H9 8
H10

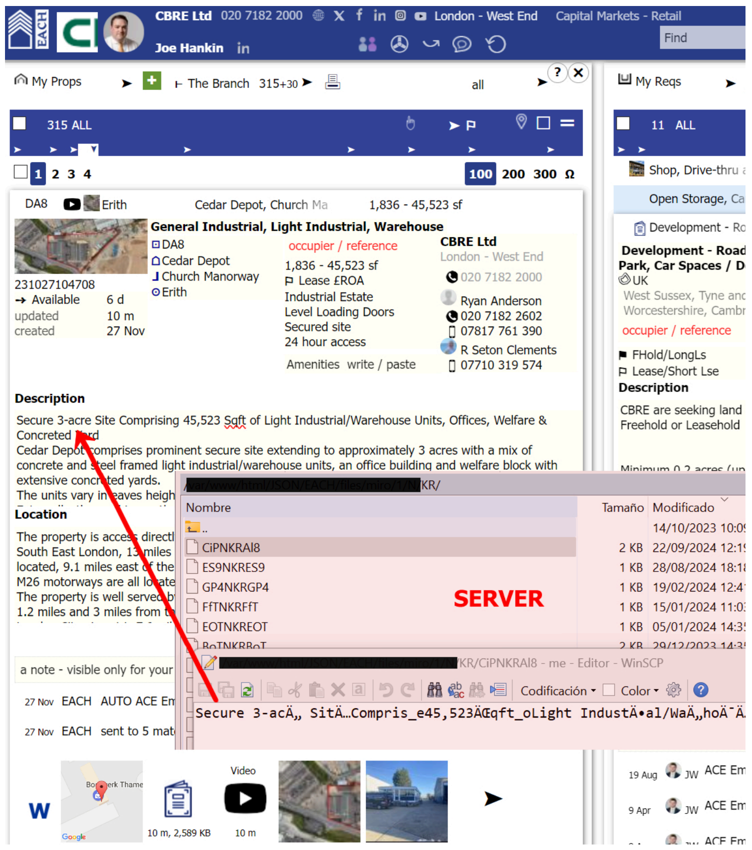
RH10	Crawley	Pallad
RG24	Basingstoke	Crom
RH10	Crawley	The P
KT3	New Malden	Apex
KT3	New Malden	CI To
W4	Chiswick	Buildi

Berkshire, Buckingha, Cambridg, East Suss, Essex, Hampshir, Hertfords, Isle of Wi, Kent, Middlesex, Oxfordshi, Suffolk, ✓ Surrey

✓ Crawley Borough Council, Croydon, Elmbridge Borough Council, Epsom and Ewell Borough Council, Guildford Borough Council, The Royal Borough of Kingston upon Thames, Merton, Mole Valley District Council, Reigate and Banstead Borough Council, Runnymede Borough Council, SurreyCounty Council, Surrey Heath Borough Council, Sutton

Orchard House Asso
Fareham Borough Coun
Assembly.CRE
Waterloo SE, Clapham S
REM Roberts

Text from the compressed file in the detail view


CBRE Ltd 020 7182 2000 London - West End Capital Markets - Retail
Joe Hankin
My Props The Branch 315+30 all
315 ALL
1 2 3 4 100 200 300 Ω

DA8 Erith Cedar Depot, Church Ma 1,836 - 45,523 sf

General Industrial, Light Industrial, Warehouse
DA8
Cedar Depot
Church Manorway
Erith
231027104708
Available 6 d
updated 10 m
created 27 Nov
occupier / reference
1,836 - 45,523 sf
Lease £ROA
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

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 b
1.2 miles and 3 miles from t

a note - visible only for your
27 Nov EACH AUTO ACE Em
27 Nov EACH sent to 5 mat

My Reqs
11 ALL
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
Minimum 0.2 acres (up

[redacted]KR/

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
BoTNKRBoT	2 KB	29/12/2023 14:3

SERVER

[redacted]KR/CiPNKRAI8 - me - Editor - WinSCP
Codificación Color
```
Secure 3-acÄ„ SitÄ…Compris_e45,523ÄŒqft_oLight IndustÄ•al/WaÄ„hoÄ¯Ä
```

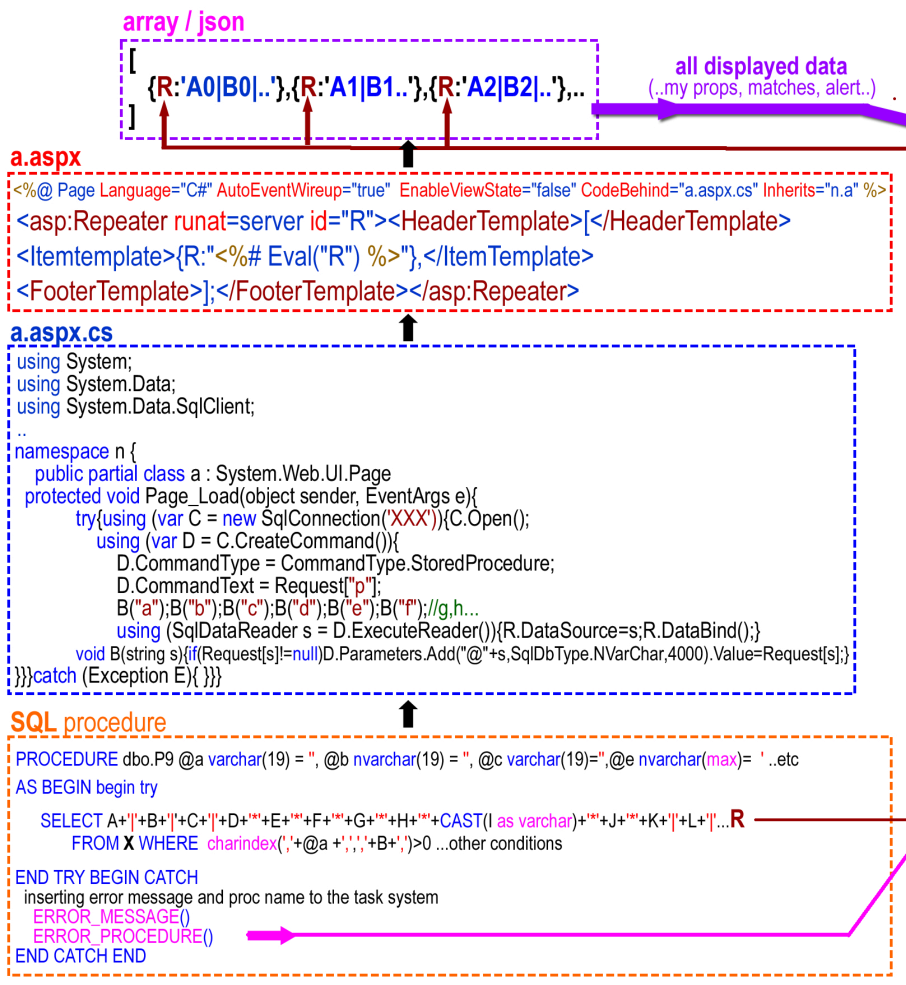
Video
10 m, 2,589 KB 10 m
19 Aug JW ACE Em
9 Apr JW ACE Em

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 procedure. The url had to reload to view different info, 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 to return uniform data form:[{R:'A0|B0|'},{R:'A1|B1|'},..]. I reduced the aspx / c# code to tiny C# scripts, so I could rewrote them in 2019 to php in 1-2 days (php was easier for pdfs' creation). The logic remained, only the final data form was simplified to arrays (not jsons): [['A0|B0..'],['A1|B1..'],..].

Remark: Ajax (asynchronous javascript + XML) appeared 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|..'},..
]
```

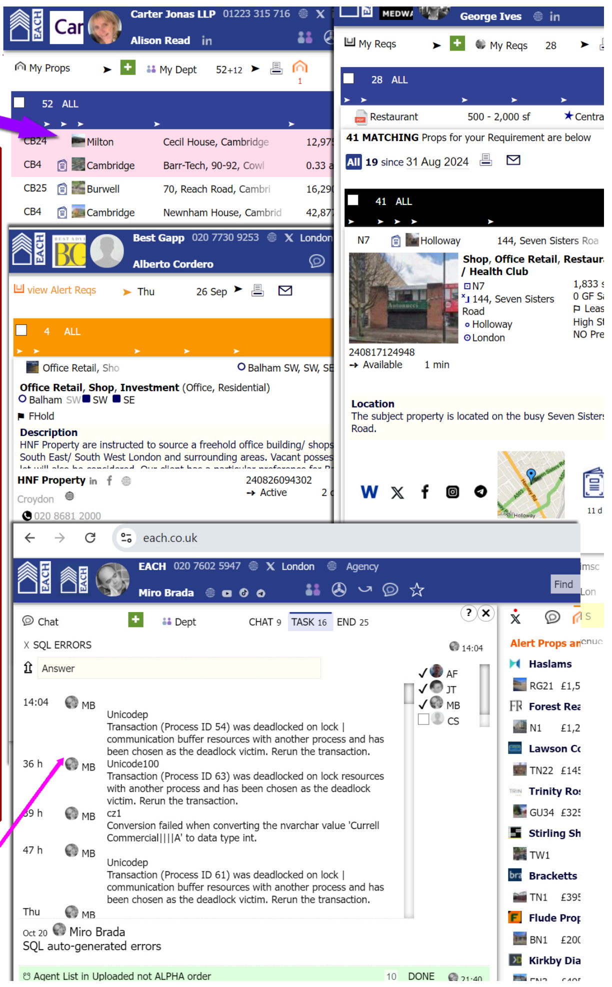
```
<%@ Page Language="C#" AutoEventWireup="true"  EnableViewState="false" CodeBehind="a.aspx.cs" Inherits="n.a" %>
<asp:Repeater runat=server id="R"><HeaderTemplate>[</HeaderTemplate>
<Itemtemplate>{R:"<%# Eval("R") %>"},</ItemTemplate>
<FooterTemplate>];</FooterTemplate></asp:Repeater>
```

```
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
```



CB24	Milton	Cecil House, Cambridge	12,97
CB4	Cambridge	Barr-Tech, 90-92, Cowl	0.33
CB25	Burwell	70, Reach Road, Cambri	16,29
CB4	Cambridge	Newnham House, Cambrid	42,87

Restaurant 500 - 2,000 sf Centra

41 MATCHING Props for your Requirement are below

All 19 since 31 Aug 2024

N7 Holloway 144, Seven Sisters Roa

Shop, Office Retail, Restaur / Health Club

N7
144, Seven Sisters Road
Holloway
London

1,833 s
0 GF S
Leas
High St
NO Pre

240817124948
→ Available 1 min

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

Office Retail, Sho
Balham SW, SW, SE

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

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 21:40

✓ AF
✓ JT
✓ MB
☐ CS

Haslams	
RG21	£1,5
Forest Rea	
N1	£1,2
Lawson Co	
TN22	£145
Trinity Ros	
GU34	£325
Stirling Sh	
TW1	
Bracketts	
TN1	£395
Flude Prop	
BN1	£200
Kirkby Dia	

The old server-side system had issues with: 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 that ran on each.co.uk/test.htm replacing the default.aspx. It resolved the outages and session's cut-offs, and hastened the new functionality.
In 2014, based on recommendations I employed the jquery to easier the development and resolve the differences accross the browsers (IE, Chrome, Firefox, Opera..). By time the jquery started being overused.. Finally I grasped, if the functions are simplified the jquery isn't needed, 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

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

	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}

Example:

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

Merging logical layers

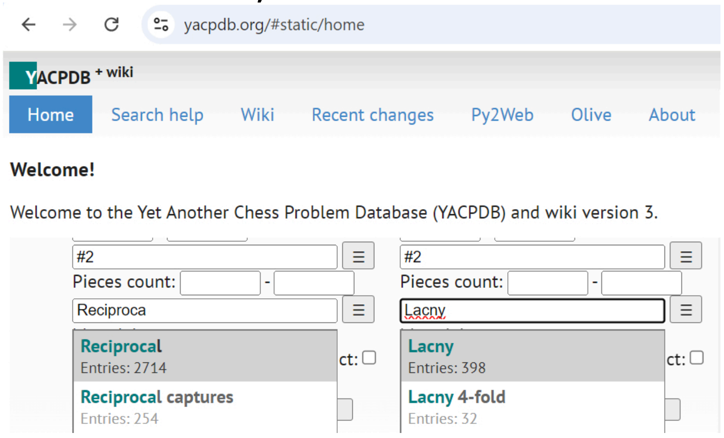
"Serverless" doesn't prevent the split of the client's code: 1) html, 2) css, 3) js/wasm. The amended formula is:

$N=N_1+N_2+N_3.. \Rightarrow N=\sum_{i=1}^{n} N_i$, 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!

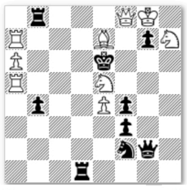
Welcome to the Yet Another Chess Problem Database (YACPDB) and wiki version 3.

#2	#2
Pieces count: -	Pieces count: -
Reciproca	Lacny
Reciprocal Entries: 2714	**Lacny** Entries: 398
Reciprocal captures Entries: 254	**Lacny 4-fold** Entries: 32

The reciprocal and cyclic change (Lačný) of mates

>>4749

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


#2* 9+9

Keywords: Reciprocal

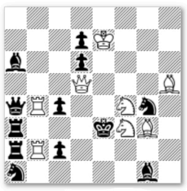
Solution:

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