Designing Production Systems
A Braindump

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Design

... with proper design, the features come cheaply. This approach is arduous, but continues to succeed.

-- Dennis Ritchie

Design ... but for what?

Features ... currently at hand

Features ... currently at hand and future

Ask Questions? What's next for the feature

Design ... for Users

Design ... for Smart users

Design ... for Dumb users

Never make assumptions

Design ... for Failure

Design ... for Failure

Never make assumptions

Design ... for Constraints

Fallacies

Peter Deutsch's **8 Fallacies** of Distributed Computing

1. The network is reliable
2. Latency is zero
3. Bandwidth is infinite
4. The network is secure
5. Topology doesn't change
6. There is one administrator
7. Transport cost is zero
8. The network is homogeneous

Typesafe

Design ... for Scalability

Design ... for Scalability

Premature optimisation is the root of all evil

Donald Knuth

suranyami

Design … for Scalability

Don't over optimize.. But know when your design will fail.

Premature optimisation is the root of all evil

Donald Knuth

Design ... for Testability

Design ... for Testability

Unit Testing
Integration Testing
Manual Testing
Automation Testing

Design ... for Deployment

Single server, multi server, rolling restarts, database scripts.

Design ... for Monitorability

Design ... for Monitorability
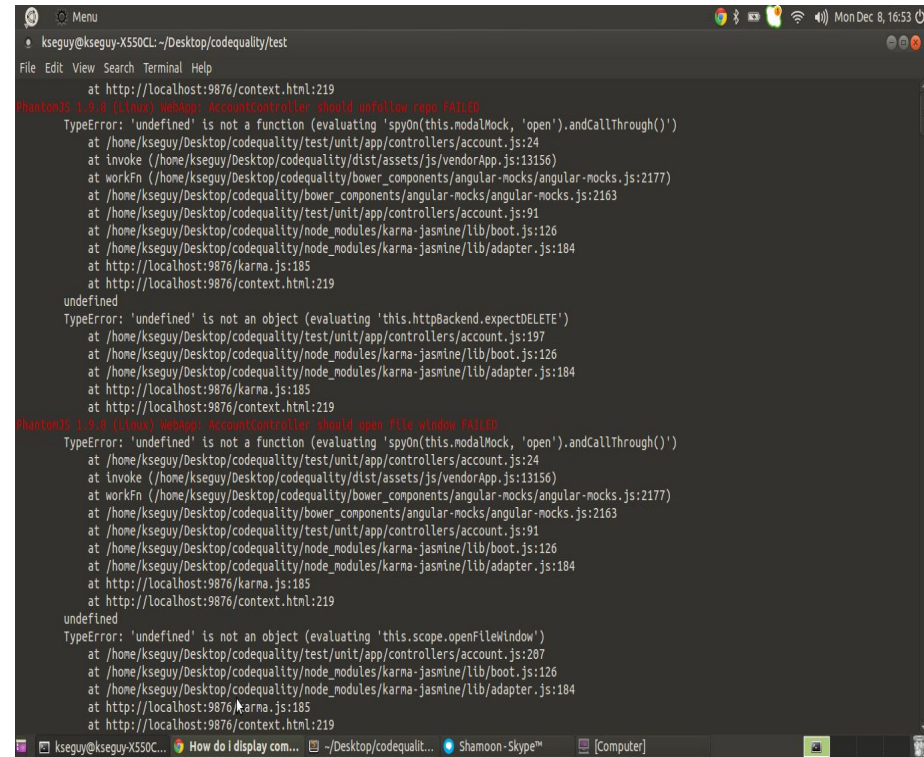
Emit meaningful metrics!

Design ... for Debuggability

Design ... for Debuggability?

Understand & Embrace Logs

Design ... for Recovery

Design ... for Recovery

Systems will Fail ... Plan how to recover!

Design ... for Security

Users will abuse your system .. Deliberately or by Mistake!

How do I design?

How do I design?

What is my product stack?

How do I design?

What is my product stack?

- Browser
- Mobile
- DNS Servers
- Load Balancer
- Nginx
- Web Server
- Internal ELB
- Rails
- Redis/Varnish
- ElasticSearch
- MySQL
- Wordpress
- Postfix

How do I design?

Use & Understand the modules!

How do I design?

Modules should be designed to handle failures in dependee modules!

How do I design?
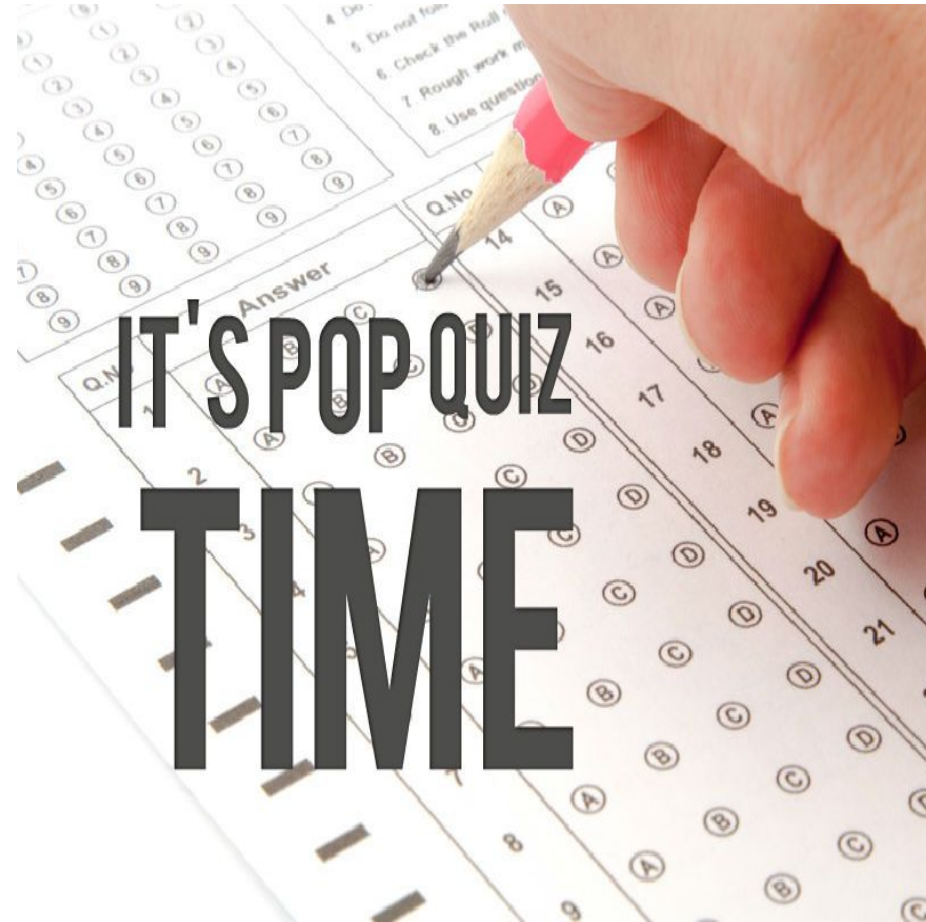
How do I design?

What is my product stack?

- Browser
- Mobile
- DNS Servers
- Load Balancer
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- Web Server
- Internal ELB
- Rails
- Redis/Varnish/SideKiq
- ElasticSearch
- MySQL
- Wordpress
- Postfix
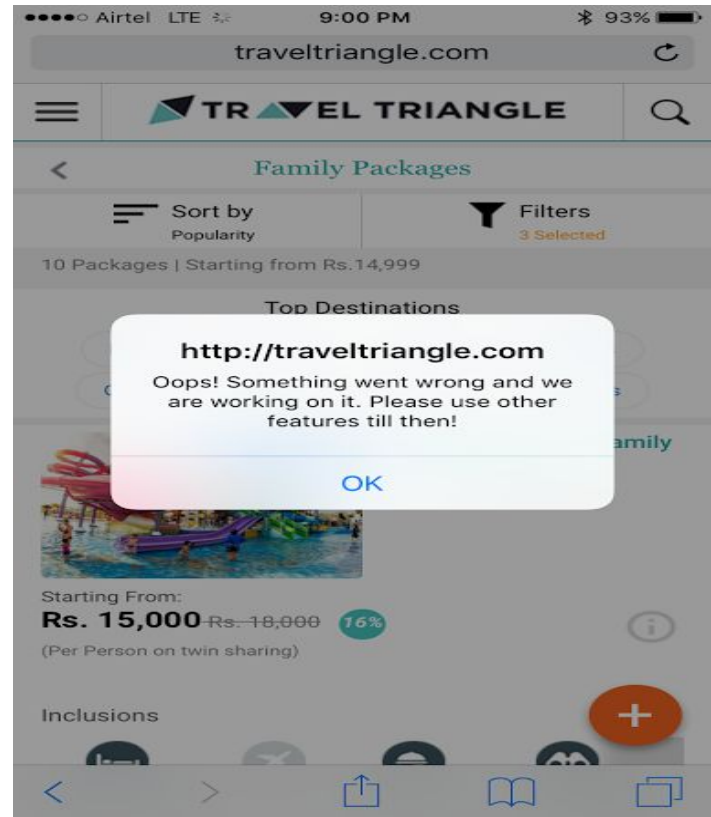
How do I design?

Handle Failures Gracefully!

How do I design?
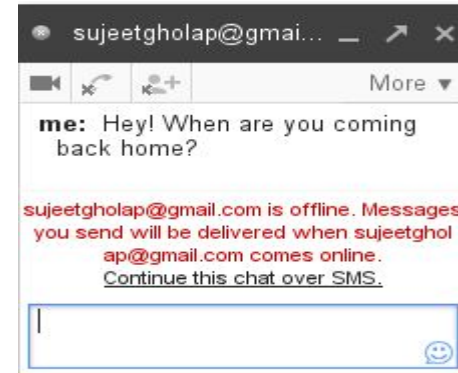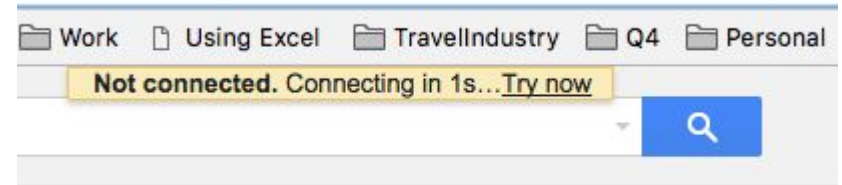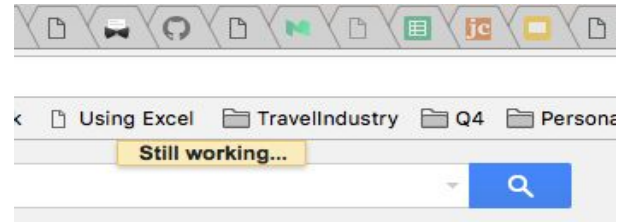
Don't let UX deteriorate!
Frontend and Design Team

How do I design?

Fail Individual Components!

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How do I design?

Fail Individual Components!
- Circuit Breaking
- Bulk Heading
- Timing Out
- Retries
- Asynchronous Flows

How do I design?
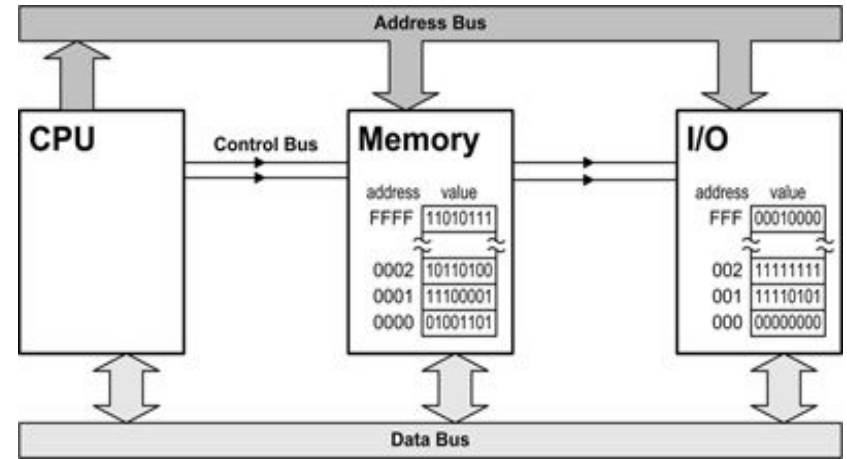
CPU, RAM & I/O (Disk, Network)

Understand the basic components
… duh!!

How do I design?
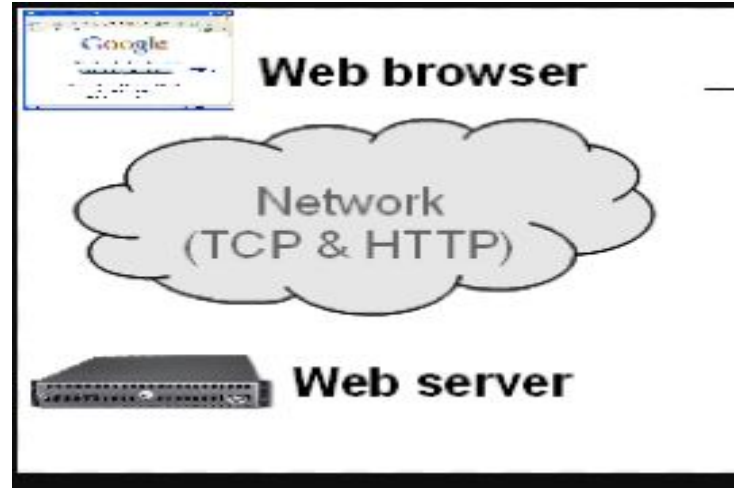
Understand the nuts and bolts!
- TCP
- HTTP
- Headers/Proxies

How do I design?

```
john@john-desktop: ~
john@john-desktop:~$ vmstat 5 10
procs -----------memory---------- ---swap-- -----io---- -system-- ----cpu----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa
 2  0      0 423772 338596 1164768    0    0   260   104  317 1391 24  5 67  5
 0  0      0 425128 338604 1164692    0    0     0    35  147  222  2  0 97  0
 0  0      0 425996 338604 1164696    0    0     0     0  131  193  1  0 98  0
 0  0      0 425748 338604 1164920    0    0     0     0  136  184  1  0 99  0
 0  0      0 426864 338612 1164620    0    0     0     2  131  194  1  0 98  1
 0  0      0 426864 338612 1164628    0    0     0     0  140  216  1  0 99  0
 0  0      0 426616 338620 1164852    0    0     0     6  128  173  1  0 98  1
 0  0      0 426740 338620 1164628    0    0     0    18  140  216  1  1 99  0
 0  0      0 426740 338628 1164628    0    0     0     5  133  195  0  0 98  1
 0  0      0 426740 338628 1164852    0    0     0     0  134  193  1  0 99  0
john@john-desktop:~$
```

Learn tools and how to read numbers

- Htop   - Chrome Dev Tools
- Iotop
- Vmstat   & more...
- Netstat
- Lsof

How do I design?

Numbers Everyone Should Know

L1 cache reference	0.5 ns
Branch mispredict	5 ns
L2 cache reference	7 ns
Mutex lock/unlock	100 ns
Main memory reference	100 ns
Compress 1K bytes with Zippy	10,000 ns
Send 2K bytes over 1 Gbps network	20,000 ns
Read 1 MB sequentially from memory	250,000 ns
Round trip within same datacenter	500,000 ns
Disk seek	10,000,000 ns
Read 1 MB sequentially from network	10,000,000 ns
Read 1 MB sequentially from disk	30,000,000 ns
Send packet CA->Netherlands->CA	150,000,000 ns

Google

Numbers every engineers should know.

Talk by Jeffrey Dean, Google.
https://www.youtube.com/watch?v=modXC5IWTJI

How do I design?

Read Read Read!!

- Blogs
- YouTube videos
- Books
- Papers
- Talk to your friends