Apps Behaving Badly
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The inevitability of failure

- Systems will fail
- Architect for failure
System independence

• Each system should cope on its own
• Some systems are critical
• Redundancy where necessary
• This is not “Scaling”
Core CMS

- Apache
- Java
- DB

Discussion

- Django

Zeitgeist

- GAE

MPs Expenses

- EC2
When it all goes wrong
Apply fences

- Remove misbehaving servers from load balancers
- Turn off expensive features
- Make your site go faster at expense of dynamic content
Don’t start with root analysis

• You don’t need to know what went wrong
• Fix the symptoms first
• Then work out cause
Causation analysis for fun and profit

- Devs and Ops are good at guessing
- Devs and Ops are bad at guessing correctly
How to analyse a failure

• Loosely based on “Analysis of Competing Hypothesis”
• Written for the NSA
Hypothesis testing

- Hard to prove causation
- Easy to prove non-correlation
- Evidence that this hypothesis is false
Generate lots of hypothesis

Causation: At 13:20

A: Discussion has a threading bug, hangs open thread

B: MicroappCaching has a post handler bug

C: High load on a single article with lots of comments

D: Link processing bug on pages with lots of comments

E: CMS GC'd due to high load

Page response spiked
Disabled comments in emergency mode
V. high load due to assume 0x0
F: Network link between cold might be slow

G: Slow clients not finishing holds connection open

H: CMS DB was executing an expensive query

I: Moderation was doing expensive action
How do you get the proof?

A: Discussion has a threading bug, hogs open thread
   - Thread drop on display server
   - # connections from CMS to discussion

B: MicroAppCache has a POST HANDLER BUG
   - MAC logs
   - Other apps that post

C: High load on a single article, with lots of comments
   - Check stats
   - Page rewrite line

D: Link processing bug on pages with lots of comments
   - Other pages will correctly
   - Page rewrite broken

E: CMS GC'd due to high load
   - JVM logs

F: Network link between CMS and DB slow
   - Network stats
   - Other X-CMS systems

G: Slow clients not finishing kills connection open
   - CMS logs
   - Apache logs

H: CMS DB was executing an expensive query
   - Oracle query analyzer

I: Moderation was doing expensive action
   - Presto logs & analysis
   - Discussion logs
Allocate Priorities and Staff

Causation: At 13:20

A: Discussion has a threading bug, hangs open thread
   - Thread dump on dispatch server
   - # connection for CMS > discussion

B: MicroAppCache has a POST handler bug
   - MAR logs
   - Other apps that post

C: High load on a single article with lots of comments
   - Check stats
   - Page rendering times

D: Link processing bug on pages with lots of comments
   - Other pages will render
   - Page rendering times

E: CMS GC'd due to high load
   - JVM logs

F: Page response spiked
   - Disabled comments in emergency mode
   - High load due to assault on site

G: Slow clients not finishing reads, connection open
   - CMS logs
   - Apache logs

H: CMS DB was executing an expensive query
   - Oracle query analyzer

I: Moderation was doing expensive action
   - PostgreSQL logs + analysis
   - Discussion logs
Logs, Logs, Logs, Logs

- Trigger a stack dump on hanging servers
- backup / copy logs of affected server
- JVM log
- Stdout
- Application log
stack traces, heap dumps, core dumps

- Get as much info as possible
- Heap dumps can take a long time, so only if necessary
Log analysis is your friend

- Simple tools for a simple life
- Grep, Cut, Uniq, Sort
- find the bit of log you are interested in
- calculate duration and order by slowest
- Sed, Awk
zgrep "RequestLoggingFilter - Request for.*completed in " $LOGFILE | grep -v " /management/" | cut -d" " -f1,2,3,10,13 > $COMPLETED_REQUESTS_FILE

cat $COMPLETED_REQUESTS_FILE | cut -d " " -f5 | sort -nr | uniq -c | awk '{ SUM += $1; print $2, SUM }' > $CUMULATIVE_REQUESTS_AT_OR_ABOVE_RESPONSE_TIME_FILE
Write what you need

- Log Analyser
- MySQL database
- Parses application logs
- Can now query database

- What DBcalls does this URL make?
- What URLs make this DBcall?
It’s everybody’s responsibility

• Accessing logs
• Database analytics
• Building tools to help
Do it ASAP before it happens again.

- Crack team starts analysis within minutes if possible
- Sometimes crack team is just 1 person
Preventing Emergencies
Core systems vs Periphery systems

- Core systems must be reliable and up
- Periphery systems may be down
- But preferably are not!
Occupy protesters at St Paul's Cathedral face first legal step to eviction

Occupy London Stock Exchange activists to be handed letter from Corporation of London asking them to pack up camp

Peter Walker
guardian.co.uk, Monday 31 October 2011 13.21 GMT
Article history

The first step in what is likely to be a lengthy legal battle to remove the anti-capitalist protest camp from outside St Paul's cathedral in London will begin on Monday afternoon when officials formally hand activists a letter requesting that they pack up their tents and other belongings.

A Corporation of London spokesman said the letter, which was still being drafted, was likely to ask that the Occupy the London Stock Exchange protesters move within 24 or 48 hours. Activists have been camping outside St Paul's for a fortnight in protest at the perceived excesses of bankers and the global finance system.

Legal officials from the corporation, which owns some of the land around St Paul's, said they would distribute several copies of the letter in the camp.

If the activists do not comply, which appears almost inevitable, then the corporation's lawyers will most likely start court proceedings on Wednesday under the Highways Act, seeking an eviction. This process could take several months, lawyers have warned.

The letter will point out that there is no objection to a 24-hour protest at the site, on the western edge of the cathedral, but that the presence of more than 200 tents has created unacceptable disturbance and noise.
Occupy protesters at St Paul's Cathedral face first legal step to eviction

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What is a microapp

- A periphery system
- Can be released in isolation
- Can be less reliable
- Can be less performant
- Timeout
- Components collapse
Microapps

- How we create separation of systems
- Similar to SSI’s - HTML placeholders
- Powered by HTTP
  - Load balancers, Proxies, Caching
Feature switches

- Turn on or off features as necessary
- HTTP URLs to expose switches
- POST not GET
- Switch dashboard to see status
Per server or global?

- Global requires shared state
- Global lets you flick switch once for all servers
- Per server is less complex
- Lets you turn a feature on for a single server
Simple tools for simple tasks

• for x in 01 02 03 04; do curl -d status=off http://server$x/switch/x; done

• Now you have global switches :) 

• As compared to using ZooKeeper
Switchable Microapps

- Ability to turn off an entire microapp
- Collapse all relevant components
- Helpful if microapp is slow
Responsibility and Authority

• Do not need to get “approval” to turn off any microapp
• Operations team can make judgement calls
• Need to ensure app can be bought back ASAP
Emergency Mode
Emergency Mode

• Rendering a page takes time
• As a news site we have unexpected surges in traffic
• We need to be able to trade off dynamic pages for speed
• Often one page gets sudden heavy traffic
Page Pressing

• Emergency mode needs a bit more omph
• Not just in memory cache, but a full page cache
• Stored on disk as generated HTML
• Served as static files, therefore over 1200 pps
Really cache everything

- HTML page is fully generated
- Except for microapps
- Emergency mode for CMS doesn’t affect microapps
- Microapp Cache for microapps
Caching an infinite set

- There are lots of pages on guardian site
- 1.4 million pieces of content
- 25,000 keyword pages
- http://www.guardian.co.uk/travel/france +travel/skiing
- Can’t cache them all
Cache what's important

- Content - when modified
  - including during emergency mode
- Navigation - Every 2 weeks
  - can force page press
- Automatic (eg tag combiners) - Never
- Automatic but important - Every 2 weeks
Monitoring

• Or how do I know what to turn off?
Always provide stats

- Consistent format
- Aggregate stats at each level
Indicate where issues are

- Check high up in architecture first
- Indicates what is causing the problem
- Breakdown to next level
Automatic switches

- Release valves
- Emergency mode
- Database off mode
Switch if a threshold is met

- If average page response time is higher than threshold
- Reset after timeout (say 60 seconds)
- Prevents Ping-Pong of switches
- Really handy for GC issues, Network issues etc.
Summary
Summary

- Expect Failure
- Plan for failure
  - At 4am
- Keep it simple
- Keep everything independant
Summary

• When it does go wrong
• Fix the symptoms first
• Then find out what actually went wrong
• Start straight away
• Log everything, all the time
Thank You

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