Going to the CLOUD!
DISCLAIMER:
This talk is about work in progress. Completeness and accuracy aren't guaranteed beyond best effort.
Starting point

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- Working CI/CD
- Working configuration management
- Small infrastructure team
- Software is an essential business component, but our business is not software
- Developers are on call for production application issues
Cloud considerations

• Scaling
  - Cloud systems let you scale in smaller increments on demand
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● Variability in demand
  - Low variability in demand for computing resources supports staying in-house
  - Highly variable systems benefit from moving to the cloud far more
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• Legal issues
  – Privacy regulations in the EU itself
    • Also different laws between different EU countries
  – Brexit
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• Software design
  – Observability must be built into the software
Vendor Choices
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- This made Google's Cloud offering a slightly better choice than Amazon
  - Google being cheaper helped a bit
- Neither was cheaper than running our own hardware
  - Savings mostly come from the lack of a dedicated operations group, and from being able to avoid some HA requirements
The technical research phase

- Lasted about half a year
The technical research phase

● Lasted about half a year
● Focus on two main areas:
  – How to manage infrastructure manually at the vendor
  – Tooling and automation
Why manual work?

• Familiarisation
  – Terminology
Why manual work?

- Familiarisation
  - Terminology
- Concepts
Why manual work?

- Familiarisation
  - Terminology

- Concepts

- Discover limitations
  - There are a lot of those
  - Some more interesting than others (load balancing, IPv6, DNS, ...)
Choosing automation tools

• Shell scripts
  – Via gcloud + gsutil
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- Terraform
  - The best of the lot
    - It has improved a lot since this slideset was first made
Configuration management

• Stateless systems implemented in a 12-factor style are best put in containers and managed via Kubernetes
  – Alternatively, use what Google calls managed groups and spin up VMs automatically in case of crashes
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• Puppet was the obvious choice, because we were already using it
  – It doesn’t matter which specific tool you use, but use one.
Inventory

- There isn't a nice CMDB out there yet, which can automagically provision VMs in the cloud and provide information to config-mgmt and orchestration tools
  - We currently hack our way around this by using tags and the Google API
Moving into high speed

- One meeting
  - Three people
  - Thirty minutes
Moving into high speed

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• Decided on goals for a proof of concept
  – Complete automation
  – Custom tooling around the application
  – Fixed target application for a test deployment
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• Took us about three months of full time effort to wrap up the PoC
Tools of choice

• Terraform
  - This is a pretty fast moving tool
  - They have good documentation
    • For some value of good.
  - Getting your first bits and pieces working are harder than they should be, but the rest then follow pretty easily
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• Puppet
  – New Puppet repo, ignoring a lot of legacy.
  – Jumped Puppet version
  – Discarded large parts of the module approach recommended in Puppet documentation
Terraform

• Base network project
  − All network related things are done in this project
Terraform

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- Other projects use instance groups with a mostly standard template
  - They reference network configs from the base project
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• Google metadata is used to tie together Puppet and Terraform
Shared backends

- We started with a simple backend for Terraform, with no remote state.
  - This does not scale to many users, but for the initial proof of concept was useful.
Shared backends

• We started with a simple backend for Terraform, with no remote state.
  - This does not scale to many users, but for the initial proof of concept was useful.

• We then spent a few days very carefully refactoring this into per project state, with the shared state being remote in a cloud storage bucket.
* Documentation
* API
* Stateful data
* IPv6
* Secrets
Google Cloud Documentation

- Lags behind software
Google Cloud Documentation

- Lags behind software
- Is often inconsistent
Google Cloud Documentation

• Lags behind software
• Is often inconsistent
• This has not changed in about three years
  – This is not limited to Google though.
API

• Quite inconsistent in some regards
  – Particularly about referencing other properties
  – Name or reference?
API

• Quite inconsistent in some regards
  – Particularly about referencing other properties
  – Name or reference?
• Needs actual examples
  – A lot of examples
    • This has not really improved since I first wrote this talk
Stateful data

- There are no good answers for high availability
Stateful data

• There are no good answers for high availability
• Google offers multiple options for storage
  - Some of these are more reliable than others
  - But they are more complex to use
  - Or involve code changes
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- Maintenance can cause outages
  - Automatic failover for CloudSQL needs a whole zone to fail, so a maintenance can cause an unexpected outage
- You may need to run your own database systems for more reliable access to structured data
IPv6

- Google does not put its money where its mouth is wrt IPv6
  - IPv6 support is very limited in the compute environment
IPv6

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• We started off by routing IPv6 traffic to our loadbalancers in the legacy environment and then proxying to IPv4 in Google
  – This is no longer needed
Secrets

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  – You still have the problem of managing a few master encryption keys
• We tested hiera-vault, but performance was terrible
Loadbalancing

- Google’s load balancer offering is limited in some ways as compared to more advanced tools like F5s, etc.
- We chose to replace the hardware LBs with simple IP based load balancer + nginx proxies.
  - Note that code which tracks IP addresses or does geolocation needs to change to handle this.
Monitoring

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  – It has quite a few retention limitations
  – New pricing makes it cheaper to run an ELK stack, depending on log volume
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Monitoring

- Stackdriver looks promising for log management
  - It has quite a few retention limitations
  - New pricing makes it cheaper to run an ELK stack, depending on log volume
- Stackdriver is a good replacement for the ELK stack, but not for high quality analytics/monitoring
- There isn't a really good alternative to running your own time-series database
  - Especially if you use that data for alerting
Legacy code

• Plan on migrating it wholesale
  - Even if you plan to rewrite it
    • Rewrites will take longer than you plan for
  - Even your planned migrations will take longer than expected, because of environmental assumptions.
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  - Even if you plan to rewrite it
    • Rewrites will take longer than you plan for
  - Even your planned migrations will take longer than expected, because of environmental assumptions.

• This does not benefit from moving to the cloud
  - You are just running it in an environment with different assumptions on latency and reliability
Spectre/Meltdown impact

- CPU utilisation doubles
  - We are currently on rather over-provisioned hardware, so actual impact is minimal
- Anything which does a lot of system calls is slowed quite a bit
  - Large data import went from 26 hours to 56
Summary

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  - Monitor your costs closely, you will discover a number of ways in which money is wasted in the cloud (debug logging, for example).
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- Outsourcing your L1 operations team to people who do not care about your business needs still has the same problems as a decade or two ago
- Choosing which provider to go with often involves small differences based on your existing stack
- The tooling available is still very raw, and we are still discovering operational design patterns
- Migrating to the cloud may require a wholesale change in process
  - If you are in a large ITIL shop, that will require a huge change.