Platform Engineering

Building the Foundation for Developer Excellence

What does Platform Engineering mean to you?

> *"Platform Engineering is the process of designing and building re-usable tools, processes and infrastructure that enables self-service capabilities for software engineering teams"*

Key Goals: Stability, Developer Enablement & DevEx, Speed, Standardisation

The Problem We're Solving

- **Developer Toil**: Too much time spent on infrastructure, tooling, and deployment
- **Inconsistent Practices**: Teams solving the same problems differently
- **Slow Delivery**: Complex deployment pipelines and environment setup
- **Security & Compliance**: Manual processes lead to gaps and risks
- **Centralised Opinionated Worldview**: What does good look like?
- **Building things!**

Stability: The business cares about uptime!

> *Builds on the agile manifesto idea that working software comes before all else.*

Developer Enablement: How do we reduce the number of "I need a..." requests

> *Focusses on tooling and workflows to enable developers to build the things that they need.*

DevEx (Developer Experience): Make developers' lives easier!

> *Focus on reducing friction and cognitive load, how do we make using our platform the best it can be?*

Speed: Metrics metrics and more metrics

> *Time to first deployment, lead time for changes, deployment frequency, pipeline duration, high velocity.*

Standardisation: Consistency across teams and projects!

> *Establish golden paths and best practices that reduce variability and increase predictability.*

Core Principles

- **Developer Self-Service** - Empower teams with autonomy
- **Golden Paths** - Opinionated, best-practice workflows
- **Abstractions** - Hide complexity, expose simplicity
- **Product Mindset** - Internal platforms as products
- **Measurement** - Data-driven platform evolution

Platform Components

🏗️ Infrastructure as Code

- Terraform, Pulumi, CDK
- Standardized environments

🚀 CI/CD Pipelines

- Automated testing & deployment
- Security scanning integration

Platform Components

📊 Observability

- Monitoring, logging, tracing
- Performance insights

🔐 Security & Compliance

- Policy as code
- Secret management
- Vulnerability scanning

Platform Components

📚 Developer Portals

- Service catalogs
- Documentation
- Self-service workflows

🛠️ Toolchain Integration

- CLI tools
- APIs

HMCTS and their Golden Path

His Majesty’s Courts and Tribunals Service (HMCTS) Platform Operations team built their own Golden Path — a structured, opinionated guide to help engineers learn the platforms and technologies they’ll encounter every day.

> *“To introduce our engineers to some key areas and technologies stack that they most certainly will encounter.”*

The Golden Path gives engineers a hands-on walkthrough of real infrastructure — no guessing, no starting from scratch.

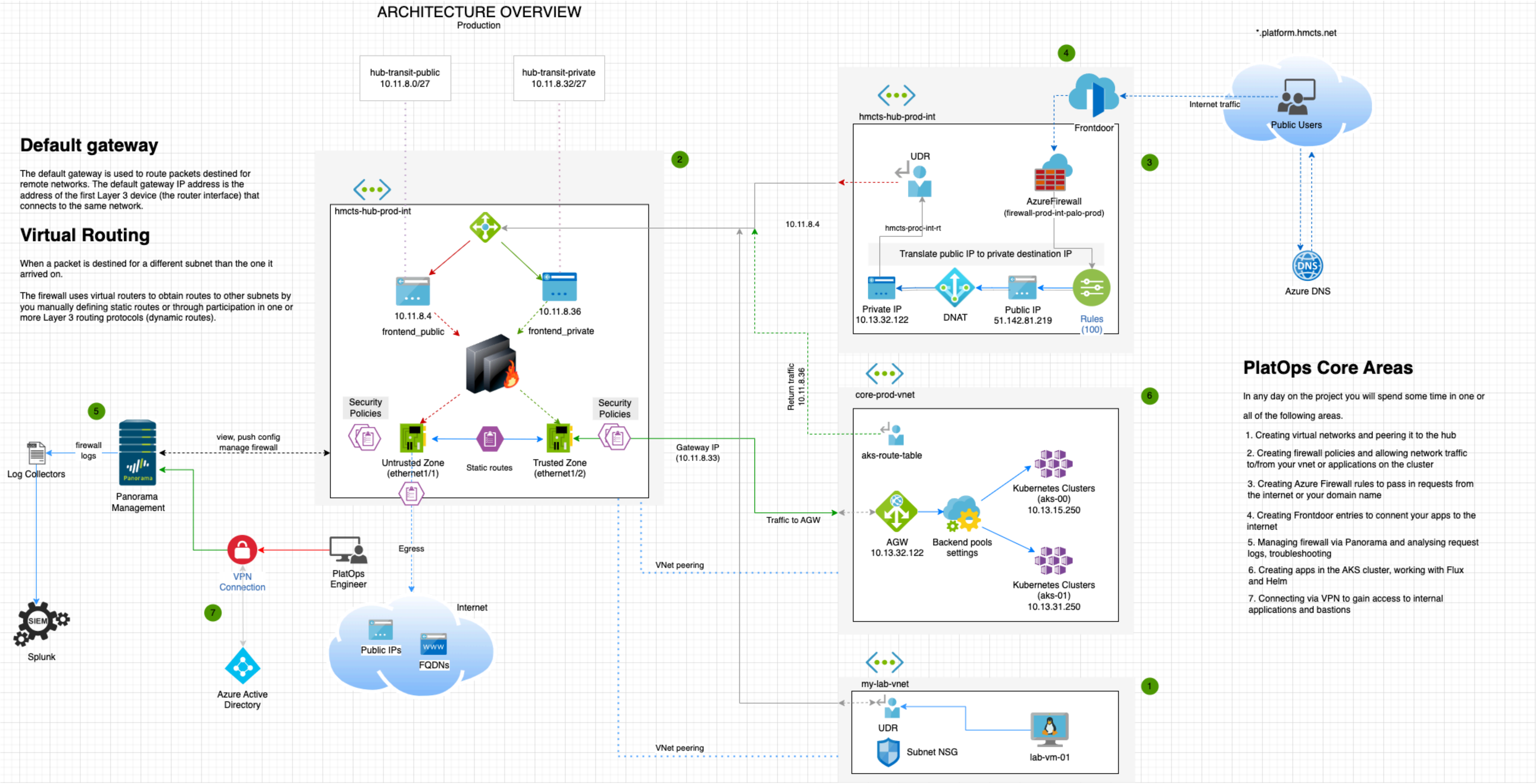
What does it cover?

- **Infrastructure**: Kubernetes, Flux, Helm, Hub and Spoke Networks
- **Security**: Palo Alto Firewalls, Azure Firewall
- **Cloud services**: Azure Front Door, Application Gateway, DNS
- **DevOps**: GitHub, Azure DevOps Pipelines

https://hmcts.github.io/goldenpath-platops/

ARCHITECTURE OVERVIEW

Production



Default gateway

The default gateway is used to route packets destined for remote networks. The default gateway IP address is the address of the first Layer 3 device (the router interface) that connects to the same network.

Virtual Routing

When a packet is destined for a different subnet than the one it arrived on.

The firewall uses virtual routers to obtain routes to other subnets by you manually defining static routes or through participation in one or more Layer 3 routing protocols (dynamic routes).

PlatOps Core Areas

In any day on the project you will spend some time in one or all of the following areas.

1. Creating virtual networks and peering it to the hub
2. Creating firewall policies and allowing network traffic to/from your vnet or applications on the cluster
3. Creating Azure Firewall rules to pass in requests from the internet or your domain name
4. Creating Frontdoor entries to connent your apps to the internet
5. Managing firewall via Panorama and analysing request logs, troubleshooting
6. Creating apps in the AKS cluster, working with Flux and Helm
7. Connecting via VPN to gain access to internal applications and bastions

Benefits of Platform Engineering

For Developers

- **Faster Time to Production** - Minutes, not weeks
- **Reduced Cognitive Load** - Focus on business logic
- **Consistent Experience** - Same tools, same patterns

Benefits of Platform Engineering

For Organizations

- **Improved Velocity** - Faster feature delivery
- **Better Security** - Built-in best practices
- **Cost Optimization** - Efficient resource usage

The Future: AI-Native Platforms

Intelligent Automation

- AI-powered incident response
- Predictive scaling
- Automated code reviews

Next-Gen Developer Experience

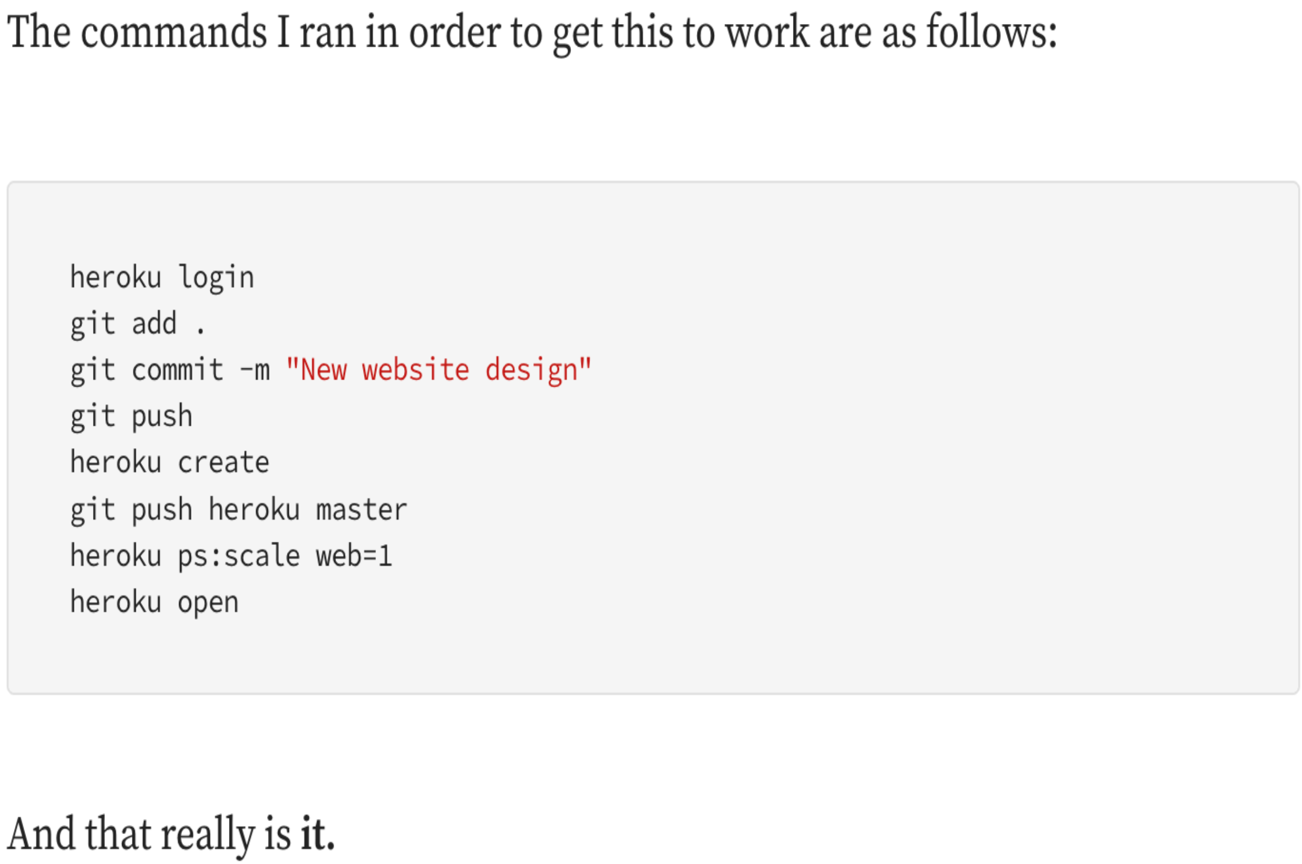
- Natural language infrastructure
- AI pair programming for ops
- Intelligent troubleshooting

What **Platform Engineering** is *not*

ChatGPT, how do I get my app on localhost:3000 available on the internet?

Heroku

This will give you an **application available on the internet!**



The commands I ran in order to get this to work are as follows:

```
heroku login
git add .
git commit -m "New website design"
git push
heroku create
git push heroku master
heroku ps:scale web=1
heroku open
```

And that really is **it.**

What's **wrong** with this?

Fast or built to last?

You can get something "live" fast and easily.

Platform Engineering builds the foundation for sustainable, scalable, and reliable software delivery, how we build things in the real world.

Understanding HLD, LLD & F/NFRs

These artifacts help us:

- Communicate design decisions
- Ensure requirements are met
- Guide implementation
- Document for future teams

High-Level Design (HLD)

What is it?

- Bird's-eye view of the system architecture
- Focus on major components and their interactions

Key Contents:

- System architecture diagrams
- Component relationships
- Data flow
- Technology stack decisions
- Integration points

Low-Level Design (LLD)

What is it?

- Detailed technical specifications
- Implementation details for each component
- APIs, data models, algorithms

Key Contents:

- Detailed class/module designs
- Database schemas
- API specifications (endpoints, payloads)
- Sequence diagrams
- Error handling strategies

Functional Requirements (FRs)

What are they?

- Define WHAT the system must do
- Specific features and capabilities
- User-facing functionality and behaviors

Functional Requirements (FRs)

Example FRs for a Platform:

- Users must be able to deploy applications via CLI or UI
- System must support multiple environments (dev, staging, prod)
- Platform must integrate with GitHub for source control
- Users can view deployment logs in real-time
- System must send notifications on deployment completion
- Support rollback to previous versions

Non-Functional Requirements (NFRs)

What are they?

- Quality attributes and constraints
- Not about WHAT the system does, but HOW WELL it does it
- Critical for platform success

Key Categories:

- **Performance** - Response times, throughput
- **Scalability** - Handle growth
- **Security** - Authentication, encryption
- **Reliability** - Uptime, disaster recovery

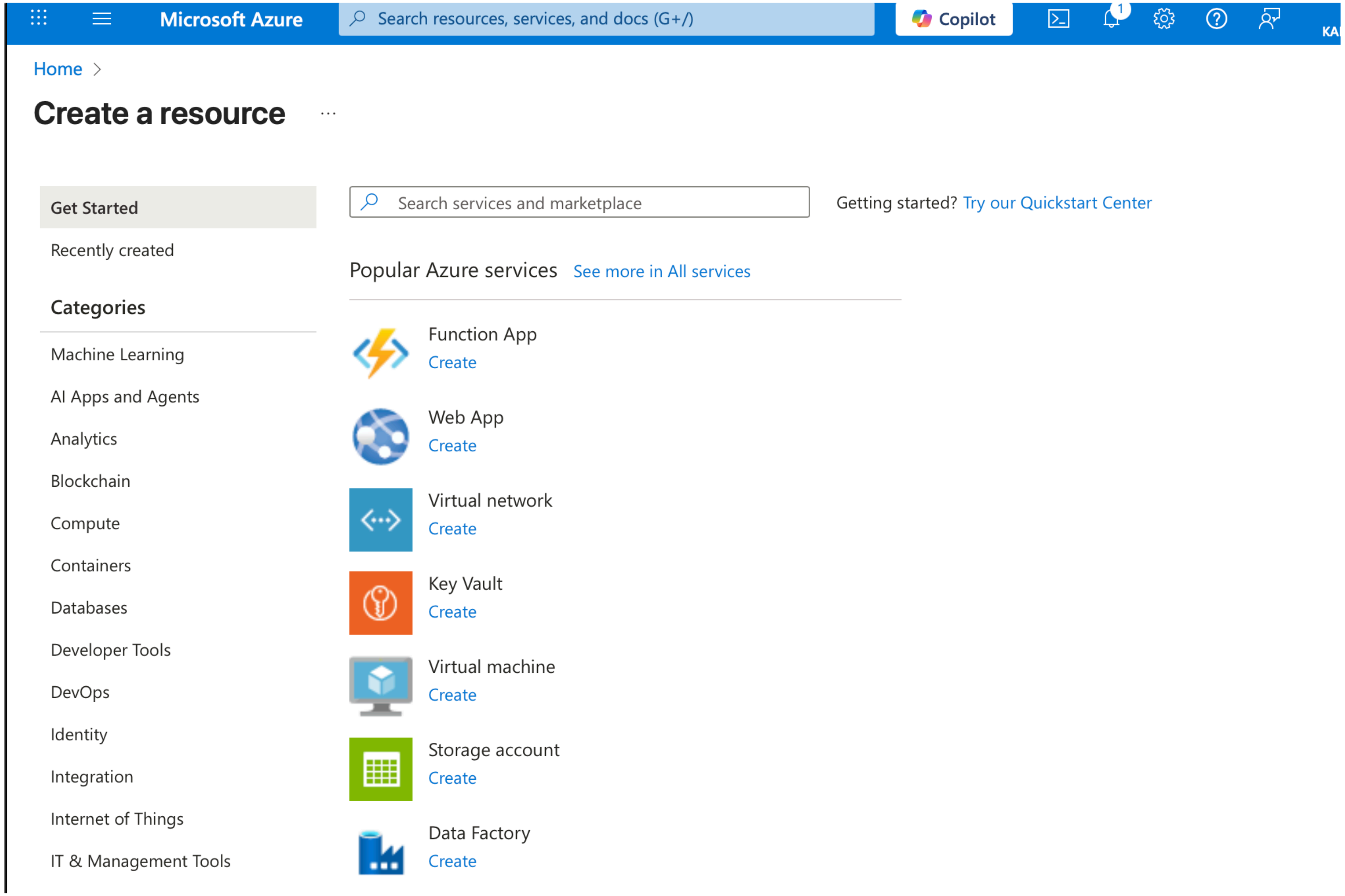
What is the "Cloud"?

The Ultimate Platform

Cloud computing allows us to provision complex pyhiscal infrastructure "virtually"

What do I mean by **"cloud vendors offer the ultimate platform?"**

Azure Example



Microsoft Azure

Search resources, services, and docs (G+/)

Copilot

KA

Home >

Create a resource ...

Get Started

Recently created

Categories

Machine Learning

AI Apps and Agents

Analytics

Blockchain

Compute

Containers

Databases

Developer Tools

DevOps

Identity

Integration

Internet of Things

IT & Management Tools

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Function App
Create

Web App
Create

Virtual network
Create

Key Vault
Create

Virtual machine
Create

Storage account
Create

Data Factory
Create

Key Benefits:

- **Scalability** - Scale resources up or down instantly
- **Cost Efficiency** - Pay only for what you use
- **Global Reach** - Deploy anywhere in the world
- **Speed & Agility** - Provision resources in minutes

Cautions

- Security and Privacy
- Cost concerns
- Vendor lock-in
- Ownership and control
- Compatibility

Cloud Deployment Models

Public Cloud

- Infrastructure owned by cloud provider
- Resources shared across multiple organizations
- Examples: AWS, Azure, GCP
- **Best for**: Previously mentioned key benefits!

Private Cloud

- Dedicated infrastructure for single organization
- Greater control and security
- Can be on-premises or hosted
- **Best for**: Regulated industries, sensitive data

Hybrid Cloud

- Combination of public and private clouds
- Data and applications can move between environments
- **Best for**: Flexibility, compliance requirements, gradual migration

Major Cloud Vendors?

Amazon Web Services (AWS)

- Market leader, launched 2006
- 200+ services, largest market share

Microsoft Azure

- Enterprise-focused, excellent Microsoft integration
- Strong hybrid cloud capabilities

Google Cloud Platform (GCP)

- Data analytics and ML expertise
- Strong Kubernetes support (created K8s)

Others

- IBM Cloud, Oracle Cloud, Alibaba Cloud
- Digital Ocean, Linode (simpler, developer-focused)

Putting It All Together

Platform Engineering Workflow:

Define Requirements - NFRs, business needs

Design - Architecture, components, implementation

Build - Implement the requirements

Document - ADRs, guides, runbooks

Iterate - Continuous improvement