The forces of digital change

Improving Developer Effectiveness to respond to change

Overhead / Waste

> 70%

Value-add delivery

< 30%

Current State

→ **Slow turnaround time De-motivated teams**

Value-add delivery

Desired State

Maximised

→ **Faster turnaround time Motivated teams**

- ■ Finding Information
- ■ Slow Feedback
- ■ Cognitive Friction
- ■ Developer Experience Friction
- ■ Operating Friction

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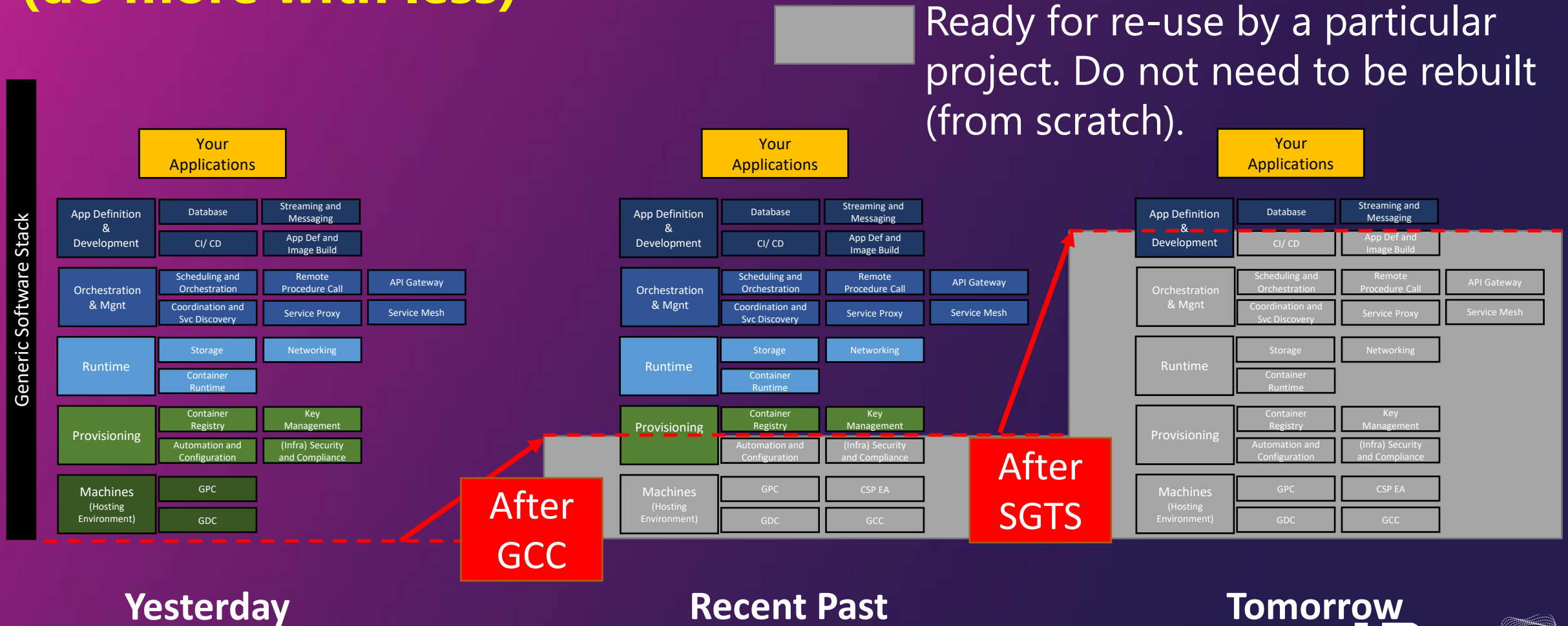SINGAPORE
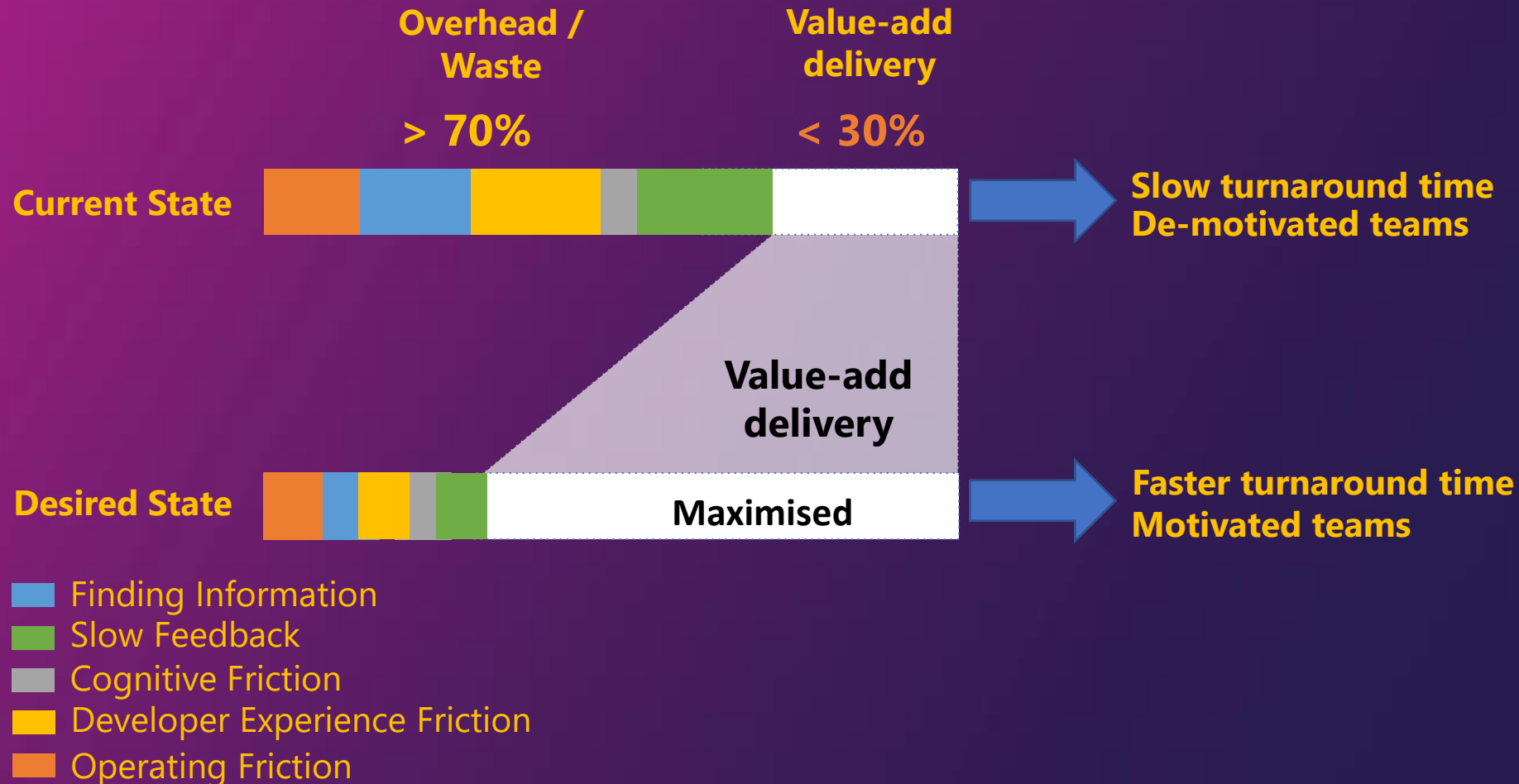
Goals of Singapore Government Tech Stack

Enable an **agile** government digital services to meet today ever-changing context

Increase **productivity** of software engineering development of digital services to do more with less

Maintain **quality** and **compliance** despite significant increase in software engineering work volume
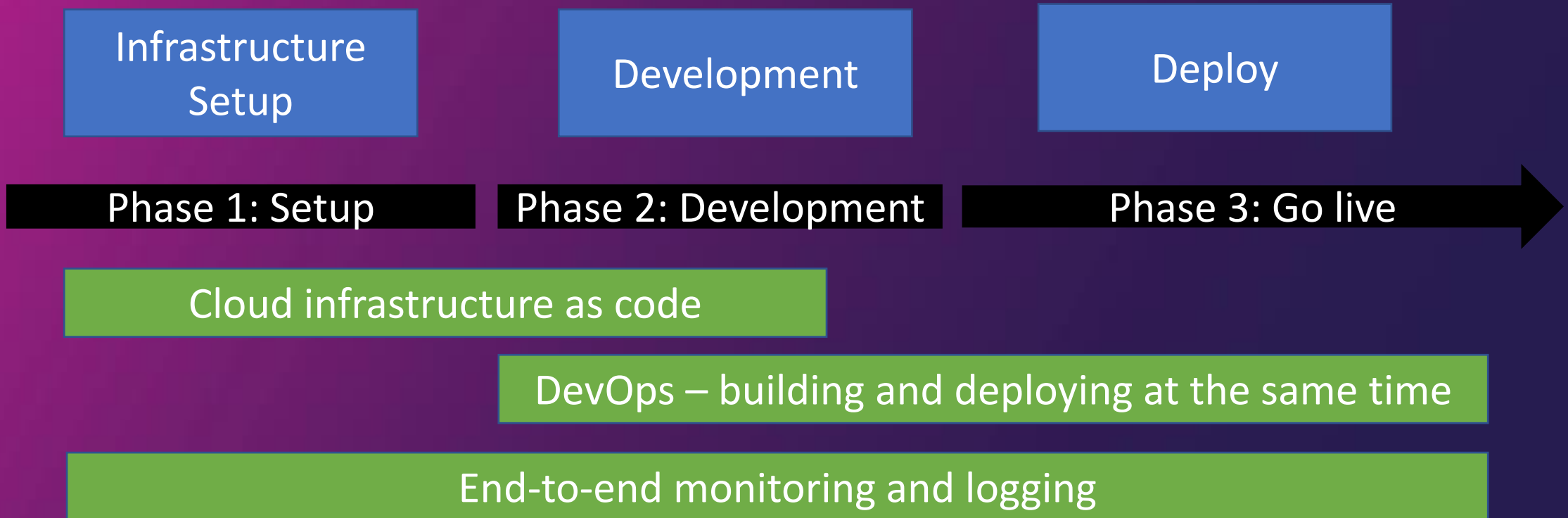
Optimize **cost** for sustainable technology investment

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Past and present of software development

Past - A silo approach with hand-offs

Infrastructure Setup	Development	Deploy

Phase 1: Setup → Phase 2: Development → Phase 3: Go live

Cloud infrastructure as code

DevOps – building and deploying at the same time

End-to-end monitoring and logging

Now – a continuous delivery approach

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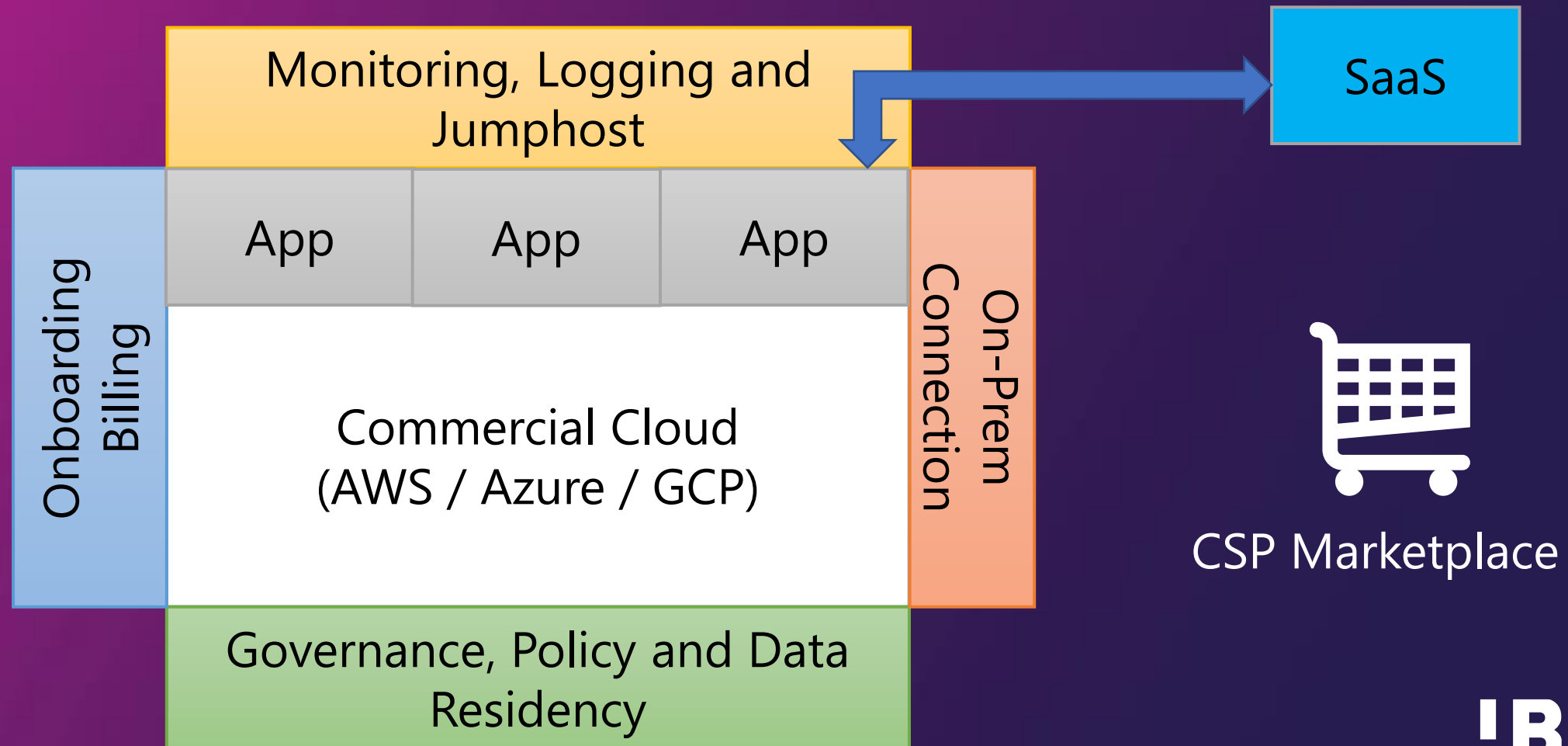
Simplifying ToolChain with SHIP-HATS

shiphats

1 Reusable components sets us on a path to accelerate adoption

2 Enhanced support & enablement to meet the users where they are

3 Automated DevSecOps measurements

Results are promising

51 Agencies use SHIP-HATS
incl. HTX, ICA, URA, MOM, MOE etc.

3774 active users

Cumulative cost avoidance at **$216m** over 5 years (estimated)

Source: GVG's SHIP-HATS Cost-Benefit Study Findings

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A practitioner's journey to achieve effectiveness

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DORA metrics and why measure them?

DORA Metrics

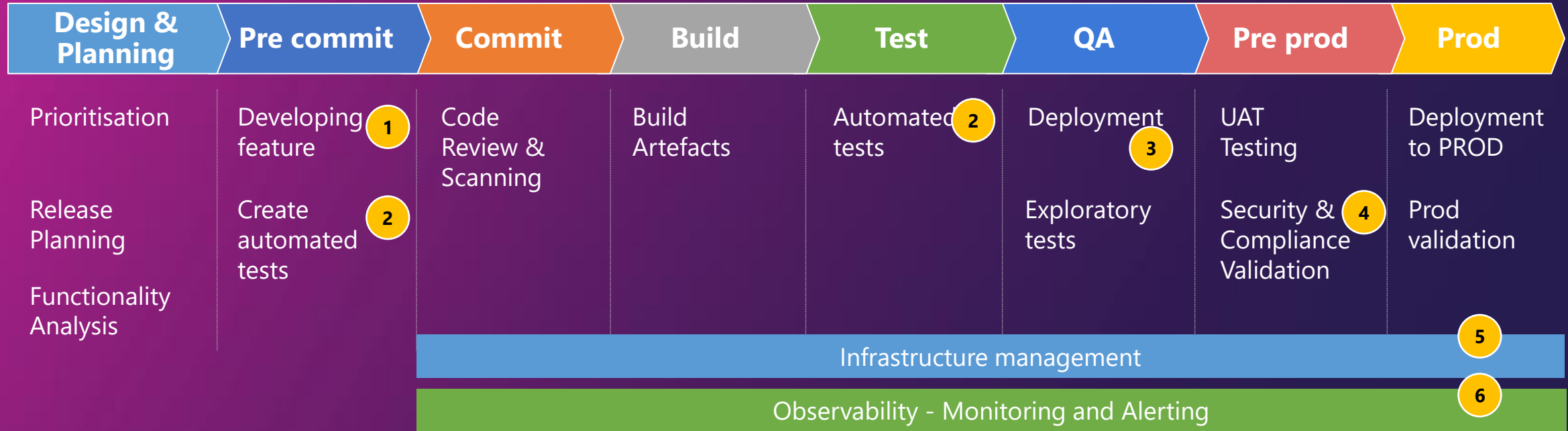| Change lead time	Deployment frequency	Mean time to restore (MTTR)	Change fail %

Faster time to market

Better quality software

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Common problems hampering speed and quality

Design & Planning	Pre commit	Commit	Build	Test	QA	Pre prod	Prod
Prioritisation	Developing feature ①	Code Review & Scanning	Build Artefacts	Automated tests ②	Deployment ③	UAT Testing	Deployment to PROD
Release Planning	Create automated tests ②				Exploratory tests	Security & Compliance Validation ④	Prod validation
Functionality Analysis							

Infrastructure management ⑤

Observability - Monitoring and Alerting ⑥

① **1** Lack of documentation, guidelines, accelerator causing delay in development time

② **2** Lack of test automation & coverage result in delay to release and buggy code

③ **3** Lack of automated deployment result in delay due to manual debugging & buggy system deployment

④ **4** Security as an afterthought resulting in delayed releases

⑤ **5** Manual infrastructure provisioning means time spent on manual setup and debugging snowflake envs

⑥ **6** Poor Logging, Monitoring and Alerting means it takes longer to detect and recover from failures

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Some key practices to enable speed and quality in your path to production while leveraging SG Tech Stack

Design & Planning	Pre commit	Commit	Build	Test	QA	Pre prod	Prod

Shift left security

Effective test strategy

Automated infrastructure provisioning

Standardise and automate common concerns
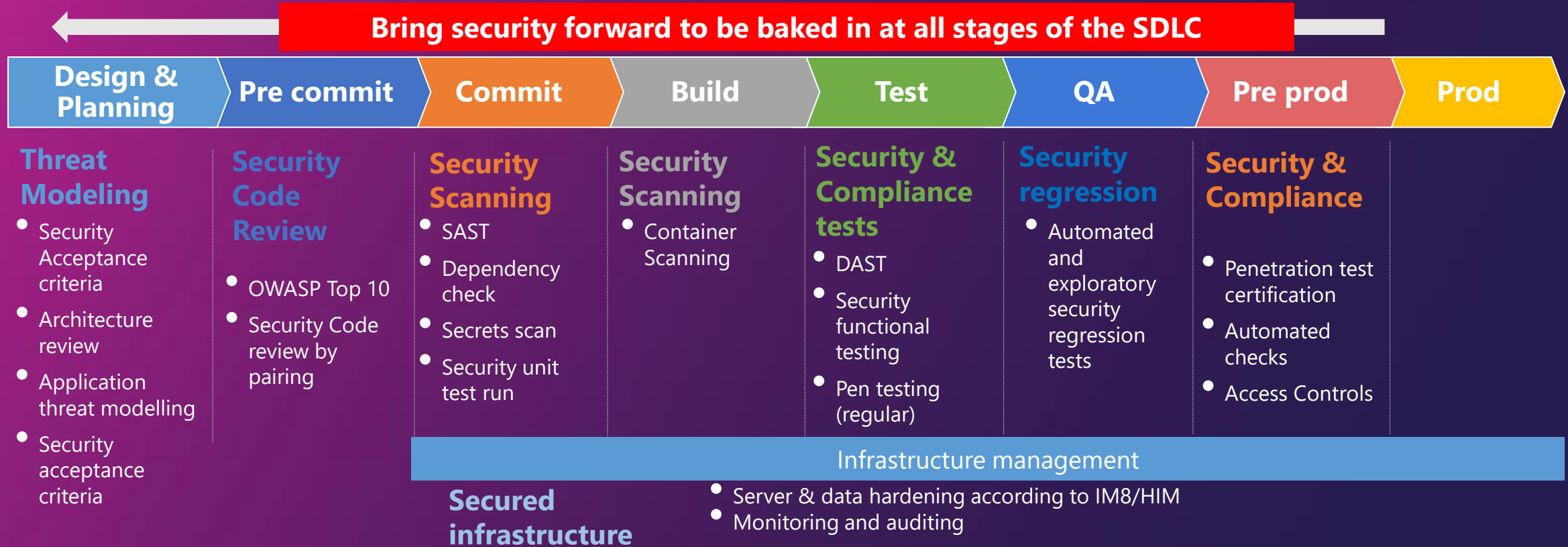
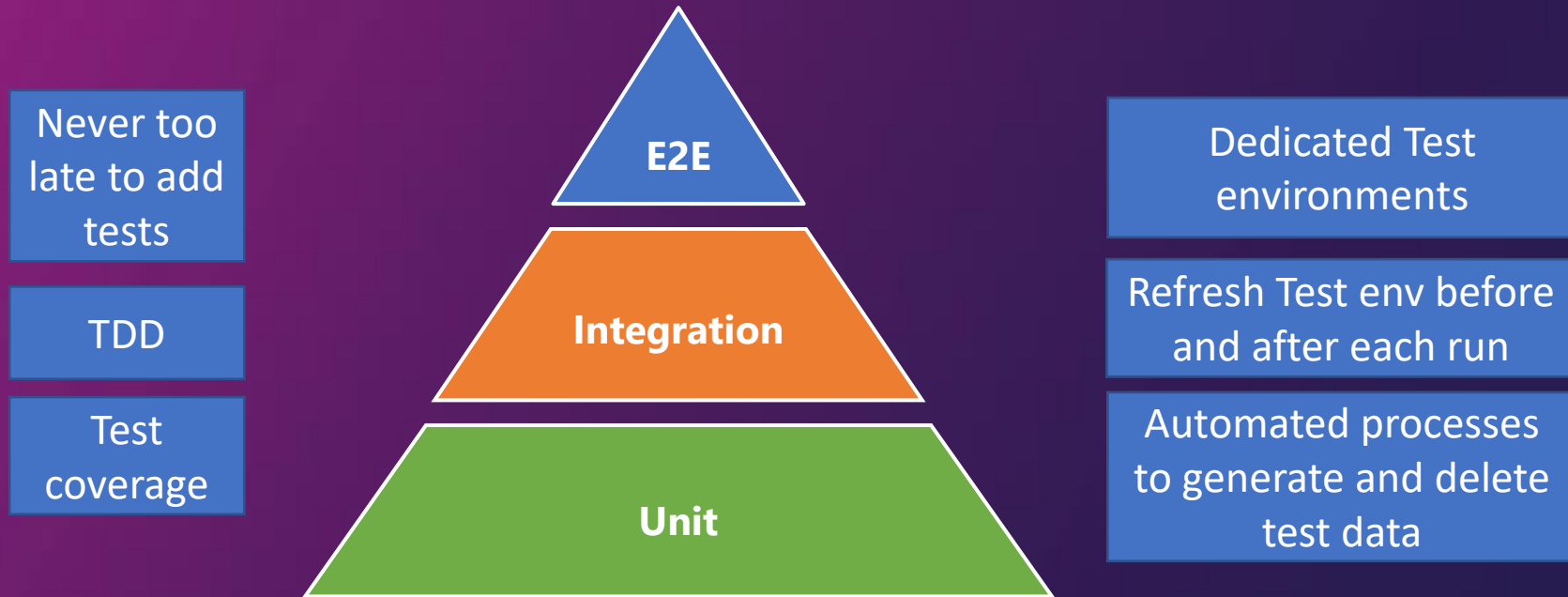| Team culture	Team Structure	Engineering practices	Evolutionary architecture	Continuous Delivery

And more …

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Shift left security

Bring security forward to be baked in at all stages of the SDLC

Design & Planning	Pre commit	Commit	Build	Test	QA	Pre prod	Prod

Threat Modeling
- Security Acceptance criteria
- Architecture review
- Application threat modelling
- Security acceptance criteria

Security Code Review
- OWASP Top 10
- Security Code review by pairing

Security Scanning
- SAST
- Dependency check
- Secrets scan
- Security unit test run

Security Scanning
- Container Scanning

Security & Compliance tests
- DAST
- Security functional testing
- Pen testing (regular)

Security regression
- Automated and exploratory security regression tests

Security & Compliance
- Penetration test certification
- Automated checks
- Access Controls

Infrastructure management

Secured infrastructure
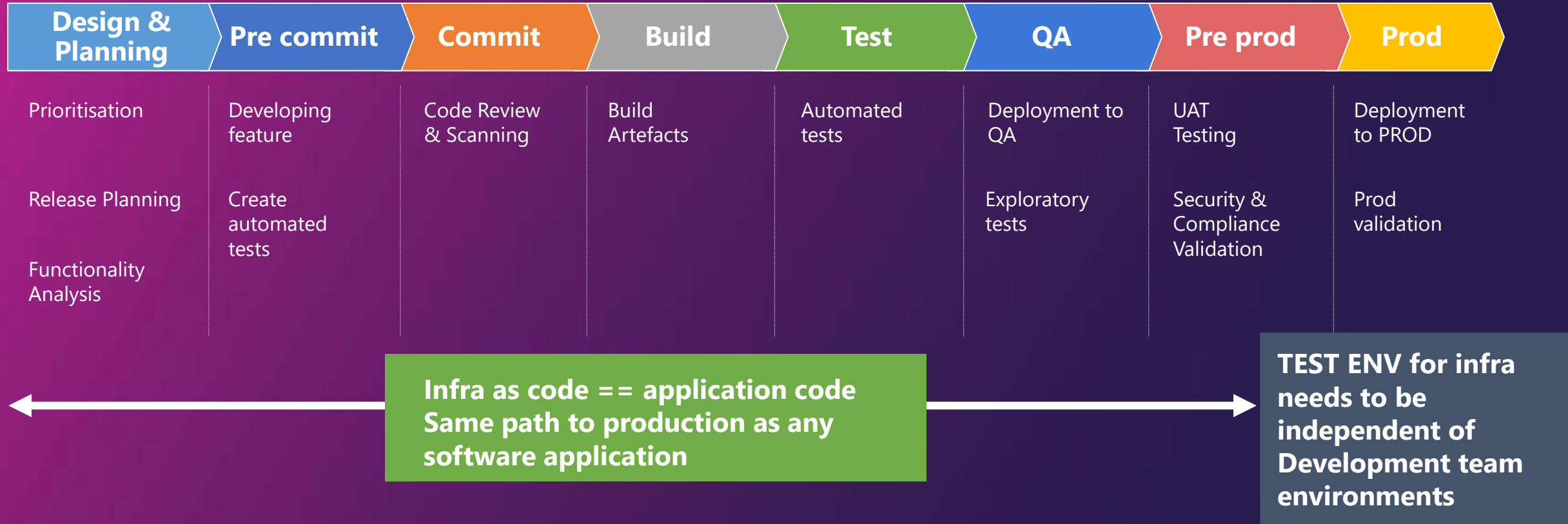- Server & data hardening according to IM8/HIM
- Monitoring and auditing

Development team need to move security forward, change your process, add security tests, start leveraging the tooling earlier
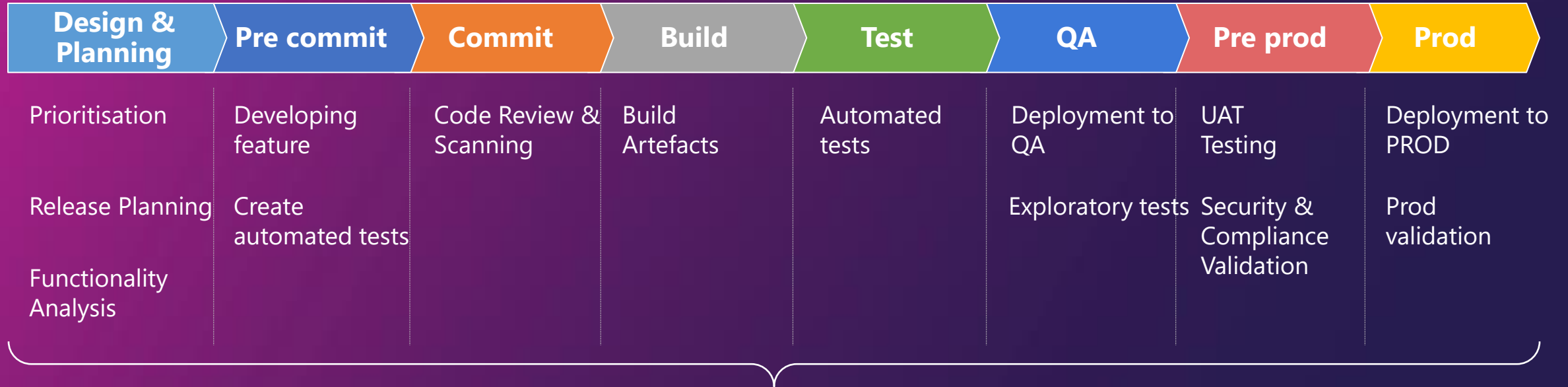
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Effective Test Strategy

Design & Planning → Pre commit → Commit → Build → Test → QA → Pre prod → Prod

Never too late to add tests

TDD

Test coverage

E2E

Integration

Unit

Dedicated Test environments

Refresh Test env before and after each run

Automated processes to generate and delete test data

Have a good test strategy, create the tests and use coverage as a guidance, run them as part of your pipelines

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Automated Infrastructure Provisioning

Design & Planning	Pre commit	Commit	Build	Test	QA	Pre prod	Prod
Prioritisation	Developing feature	Code Review & Scanning	Build Artefacts	Automated tests	Deployment to QA	UAT Testing	Deployment to PROD
Release Planning	Create automated tests				Exploratory tests	Security & Compliance Validation	Prod validation
Functionality Analysis							

Infra as code == application code Same path to production as any software application

TEST ENV for infra needs to be independent of Development team environments

Faster time & reliable software - automated, repeatable & compliant infrastructure

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Standardise and automate common concerns

Design & Planning	Pre commit	Commit	Build	Test	QA	Pre prod	Prod
Prioritisation	Developing feature	Code Review & Scanning	Build Artefacts	Automated tests	Deployment to QA	UAT Testing	Deployment to PROD
Release Planning	Create automated tests				Exploratory tests	Security & Compliance Validation	Prod validation
Functionality Analysis							

Standardise software delivery pipeline -> baked in quality gates

Starter kits -> govern tech stacks and service setup

Faster turnaround – reduce development time

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DORA Metrics - Where are you? and where do you aspire to be?

These are DORA metrics that determine the key system performance which in turns decide how fast an organisation can pivot to cater for business and customer needs.

METRICS	⊘ Low	⊘ Medium	⊘ High	🏅 Elite
LEAD TIME	More than 1 month	1 week to 1 month	1 hour to 1 day	Less than one hour
DEPLOYMENT FREQUENCY	1 to 6 months	1 week to 1 month	One day to 1 week	On-demand
MEAN TIME TO RESTORE	1 week to 1 month	Less than 1 day	Less than 1 day	Less than one hour
CHANGE FAIL PERCENTAGE	16-30%	16-30%	16-30%	0-15%

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Key success metrics achieved

8 *PROD Deployments every month*	**Prod Deployment is NOT a special event**	**41** *FUNCTIONAL RELEASES in one year*	**Ability to make quick incremental improvements**	**20** domain services	**8** partner integration
100k to 750k	User growth	**99th Percentile at 980 ms/request** (1.5M Requests Tested) (requirement 3s/request)	Continuous Performance Testing	**10 Squads, 100+ Devs**	Operate at scale (starter kits & platform capabilities)
1000+ unit tests	With > 90% code coverage	**0**	Data Migration Issues after go-live	**0**	source code review findings by external auditors

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Insights into customer experience
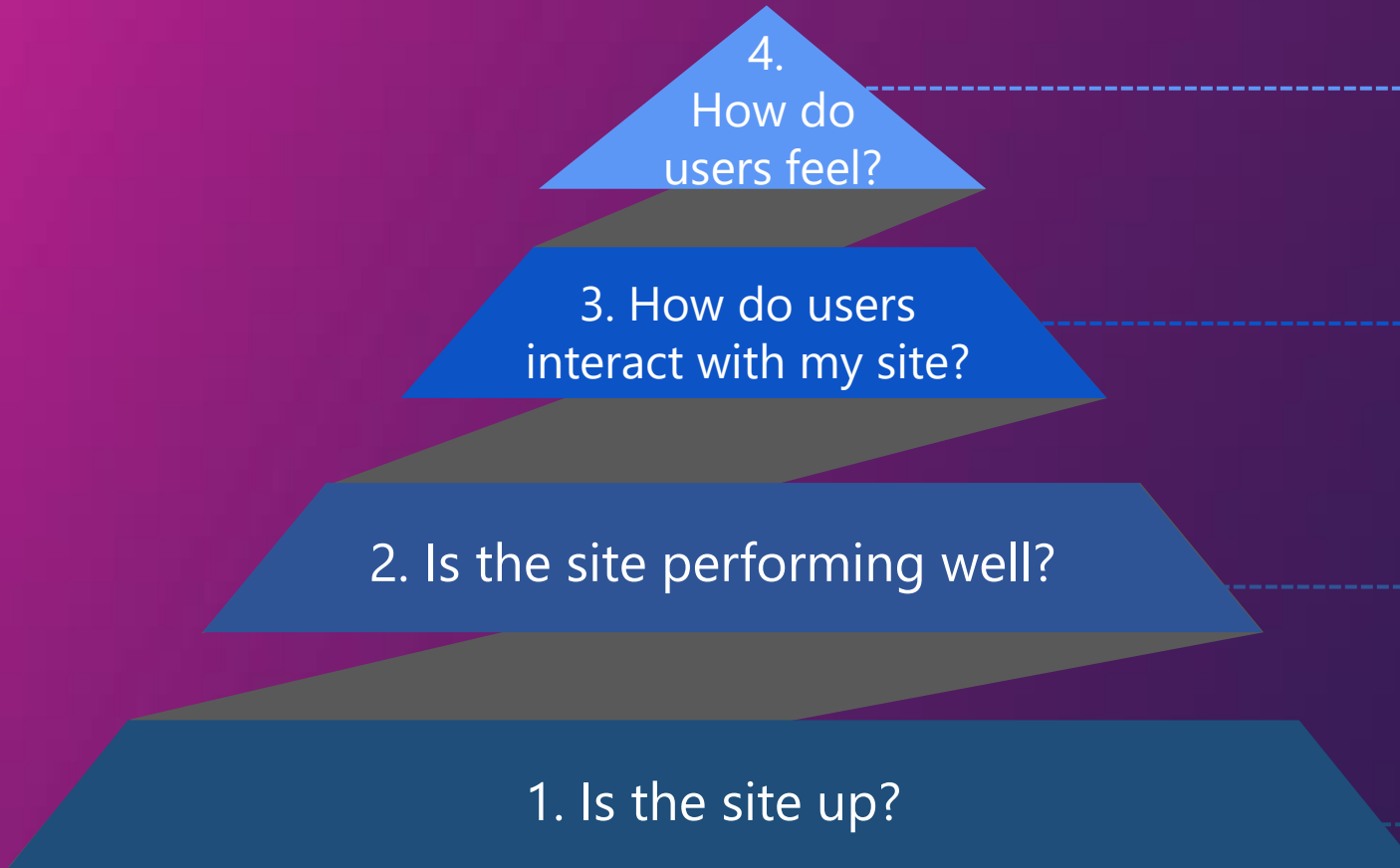
WOGAA Product Family

4. How do users feel? ----- Sentiments

3. How do users interact with my site? ----- Web Analytics

2. Is the site performing well? ----- Inspect

1. Is the site up? ----- Uptime

StackOps foundation

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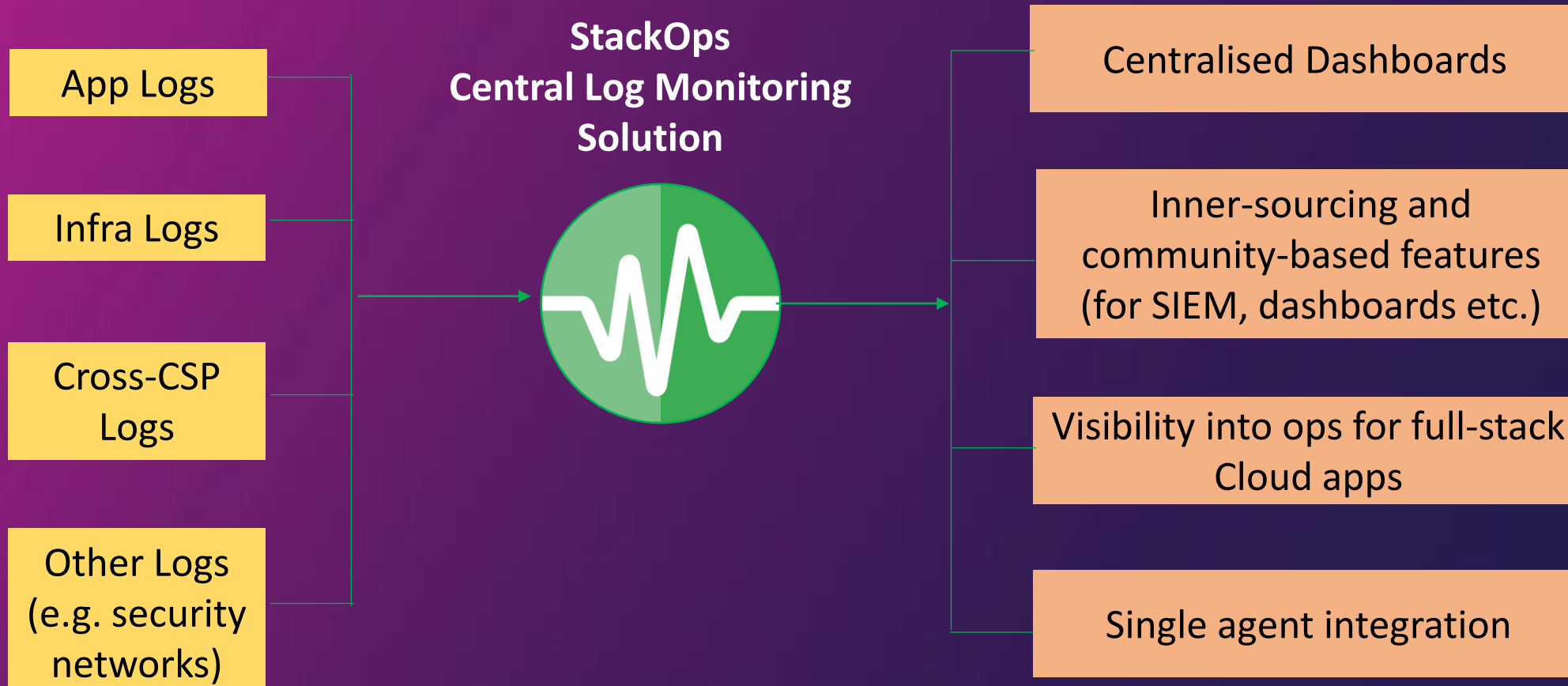
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Simplify compliance with Container Stack

CStack (Shared Model)
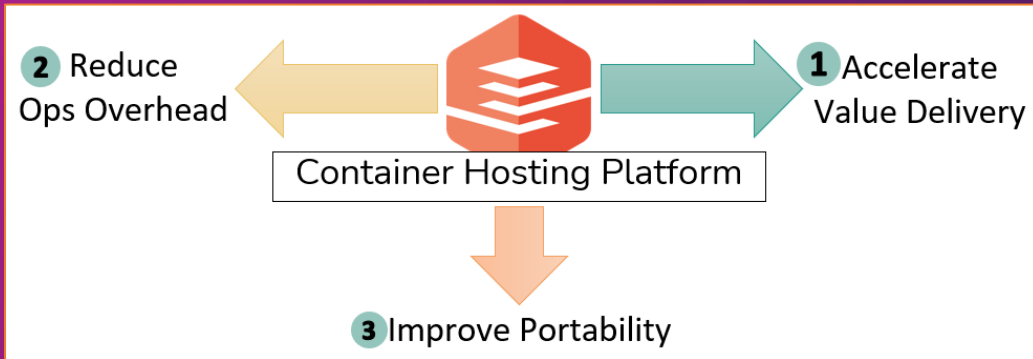
2 Reduce Ops Overhead
1 Accelerate Value Delivery
Container Hosting Platform
3 Improve Portability

CStack (Dedicated Model)
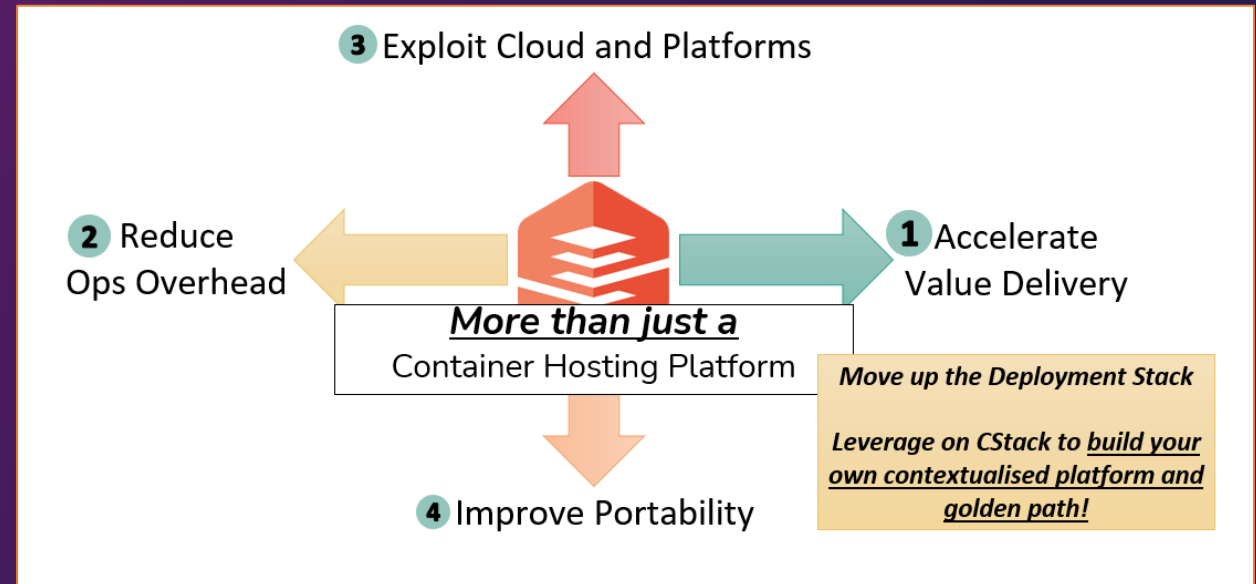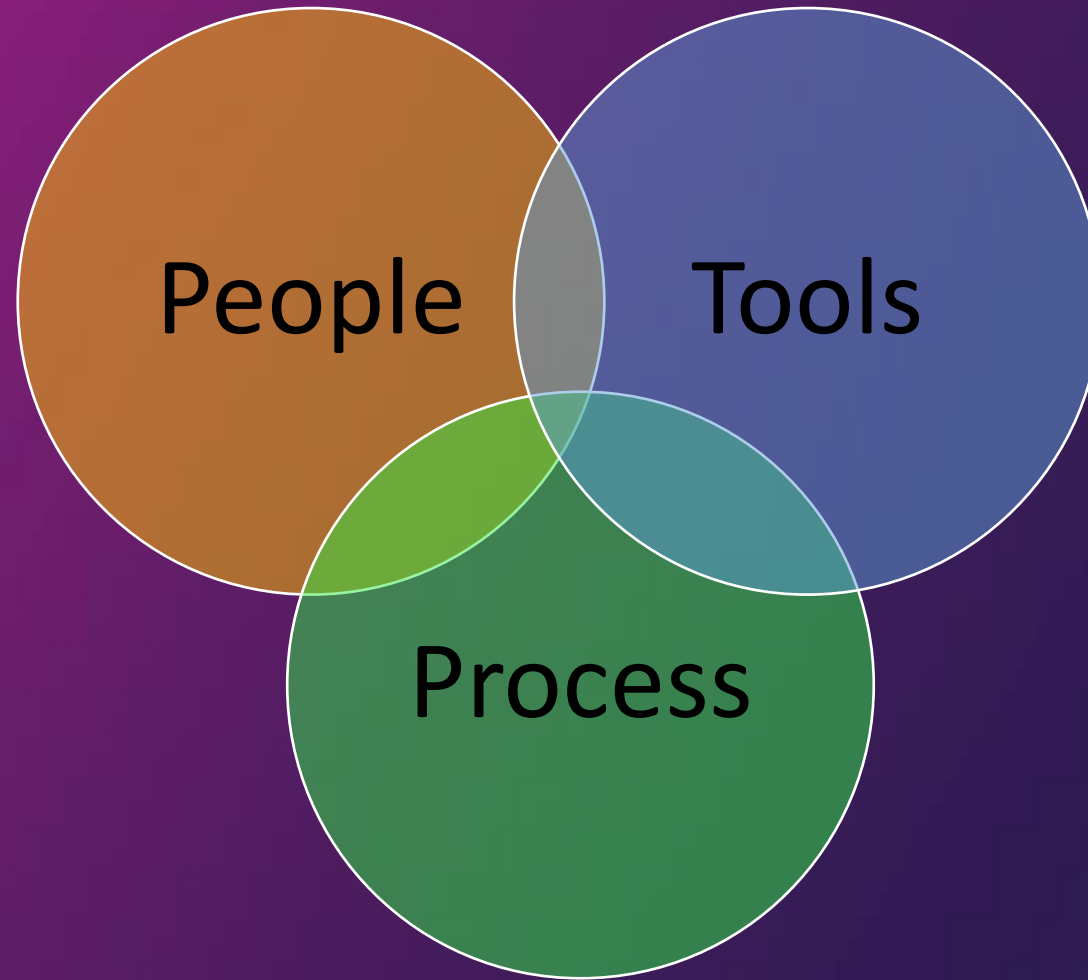
3 Exploit Cloud and Platforms
2 Reduce Ops Overhead
1 Accelerate Value Delivery
More than just a Container Hosting Platform
4 Improve Portability

Move up the Deployment Stack

Leverage on CStack to build your own contextualised platform and golden path!

Thank You

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