State of Application Security

Shain Singh, Principal Security Architect @ F5

Sandy Carielli, Principal Analyst @ Forrester

Introducing our Guest Speaker from Forrester

Shain Singh

Principal Security Architect @ F5

- Project co-lead MLTOP10 @ OWASP
- Zero Trust and DevSecOps Working Groups @ Cloud Security Alliance
- Technical Reviewer – DevSecOps in Action (upcoming book)

Sandy Carielli

Principal Analyst @ Forrester

Purchasing Power shift to Developers

Security and Speed are still mutually exclusive

70% Of developers admit to skipping security due to delivery timeframes

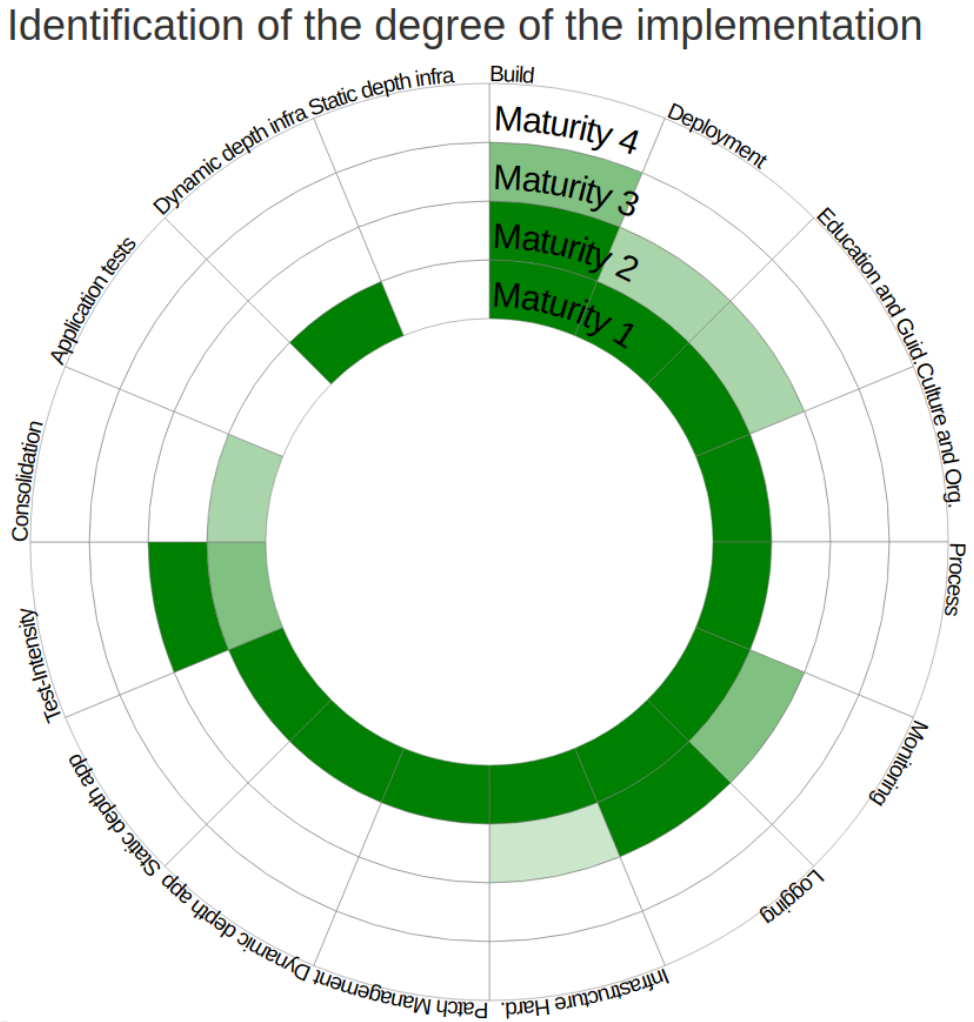
81% Of developers admit to pushing code with known vulnerabilities

96% Of cloud breaches are self-inflicted

Source: Immersive Labs

How can we get better at this?

EMPHASIS HAS BEEN ON EFFICACY FOR INDIVIDUAL APPLICATIONS OVER FULL COVERAGE OF ALL DEPLOYMENTS



https://dsomm.owasp.org/

DevSecOps Maturity Model (DSOMM) Level 1
Basic understanding of security practices

Recommendations:
- Never fail a build pipeline – security scans will have false positives
- Investigate static and dynamic tools for the DevOps pipeline
- Build expertise with tools and analyse results
- Collaborate with development teams to resolve issues

DevSecOps Maturity Model (DSOMM) Level 2
Adoption of basic security practices

Recommendations:
- Investigate tweaking tools from their default settings for tuning
- Storing results from tools in a consolidated environment
- Starting a security champion program

DevSecOps Maturity Model (DSOMM) Level 3
High adoption of security practices

DevSecOps Maturity Model (DSOMM) Level 4
Advanced deployment of security practices at scale

Compliance can be continuous and automated

Cloud Controls Matrix
Security Guidance For Critical Areas of Focus in Cloud Computing

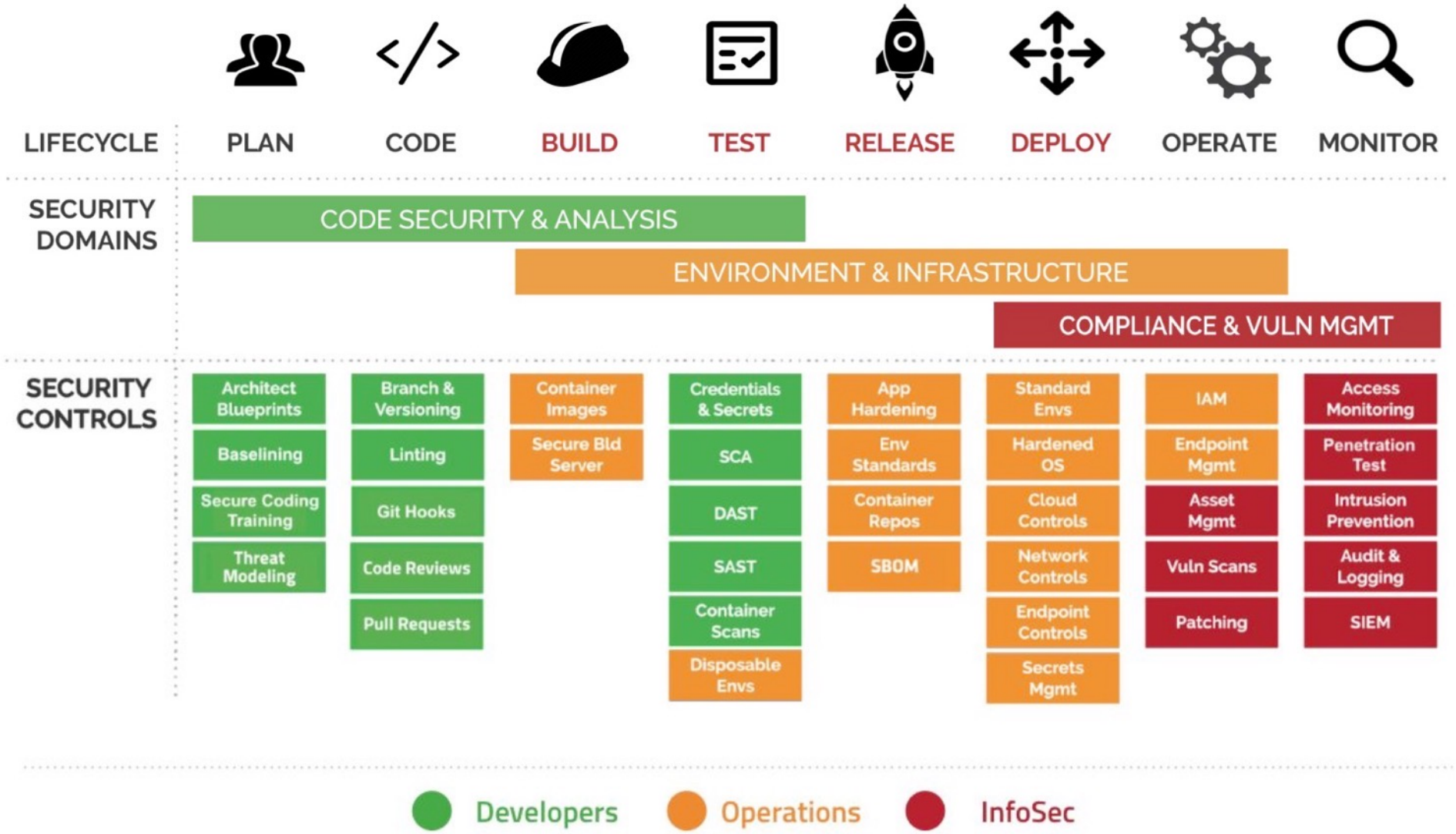
Benefits, Risks and Recommendations For Information Security

Cybersecurity Framework

Secure Cloud Computing Architecture

CIS Benchmarks

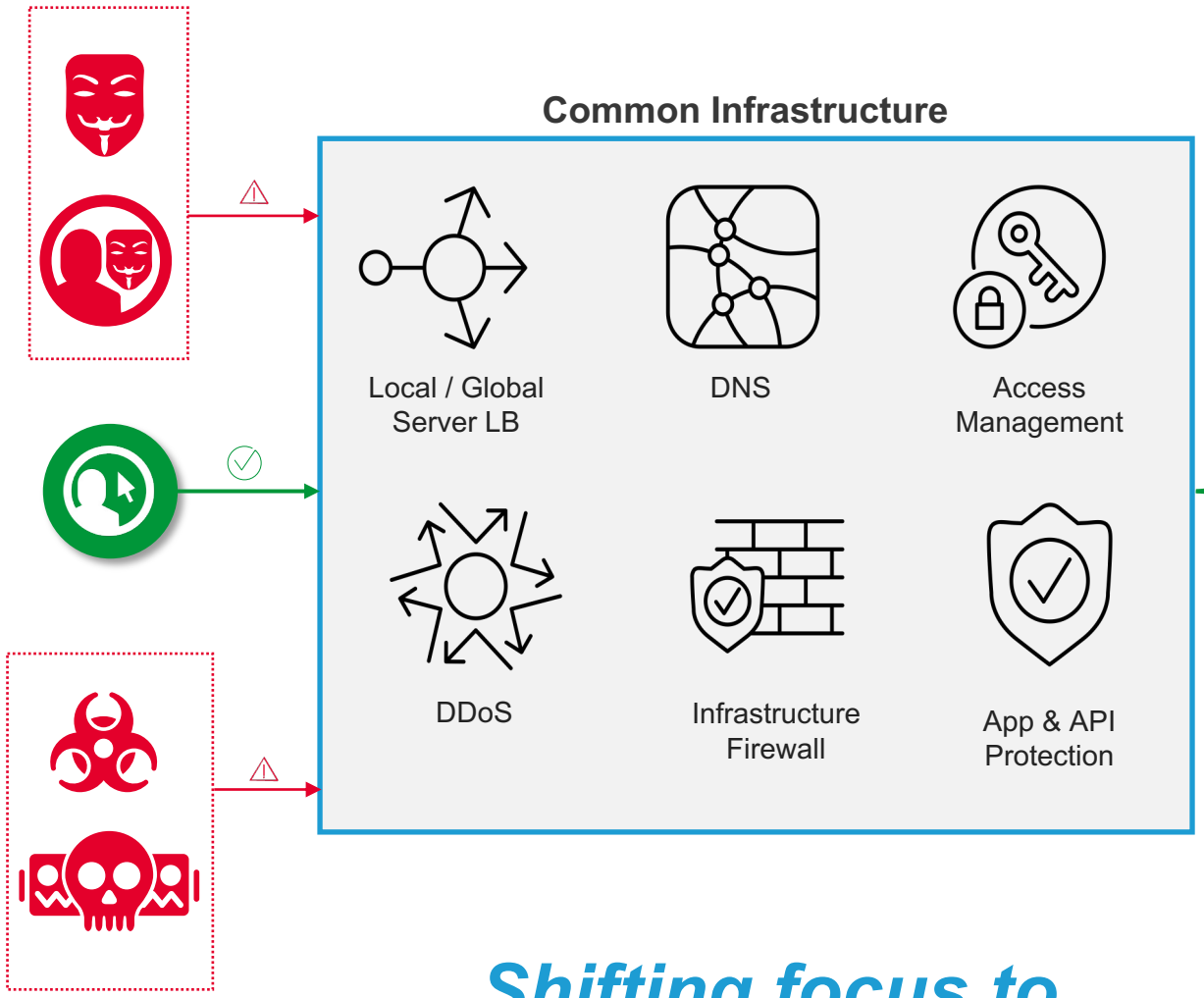
Separating tasks into domains of ownership



Source: OWASP Global Appsec Conference 2022

Shift Everywhere Gains Momentum

Runtime environment for applications



Ingress (with API Gateway)

- Layer 7 routing for traffic entry point coming into Kubernetes
- Built for HTTP traffic. TCP/UDP for non-HTTP traffic
- May include API Gateway implementation

Pods

- Runs app in a container / CNF

Service Mesh

- Open Source Service Mesh implementation (Istio)
- Injects Sidecar to every pod
- Enforces routing, security with mTLS, etc.
- Provides traceability of pod communication

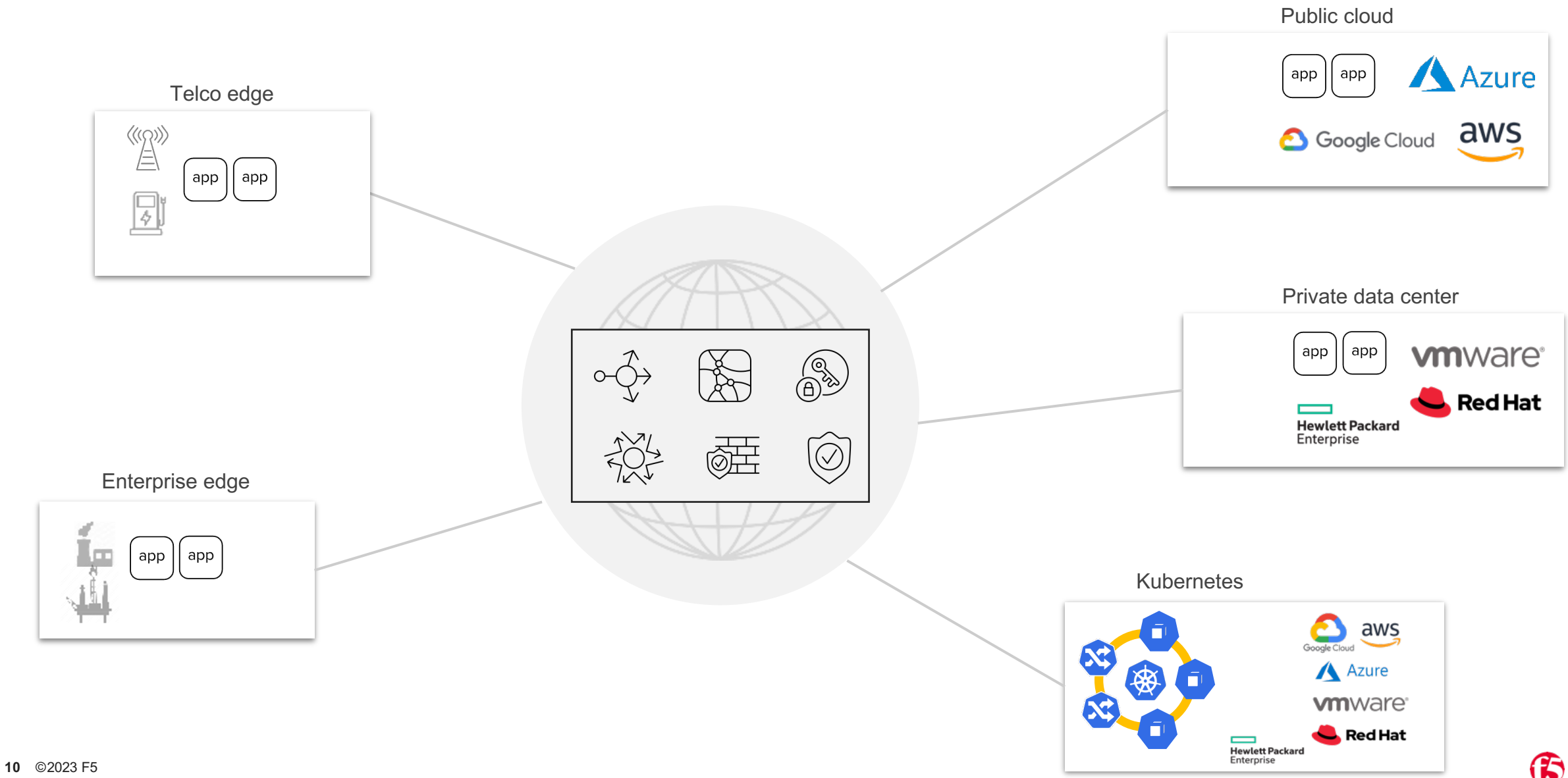
Kubernetes Cluster

Cloud Microservices PaaS

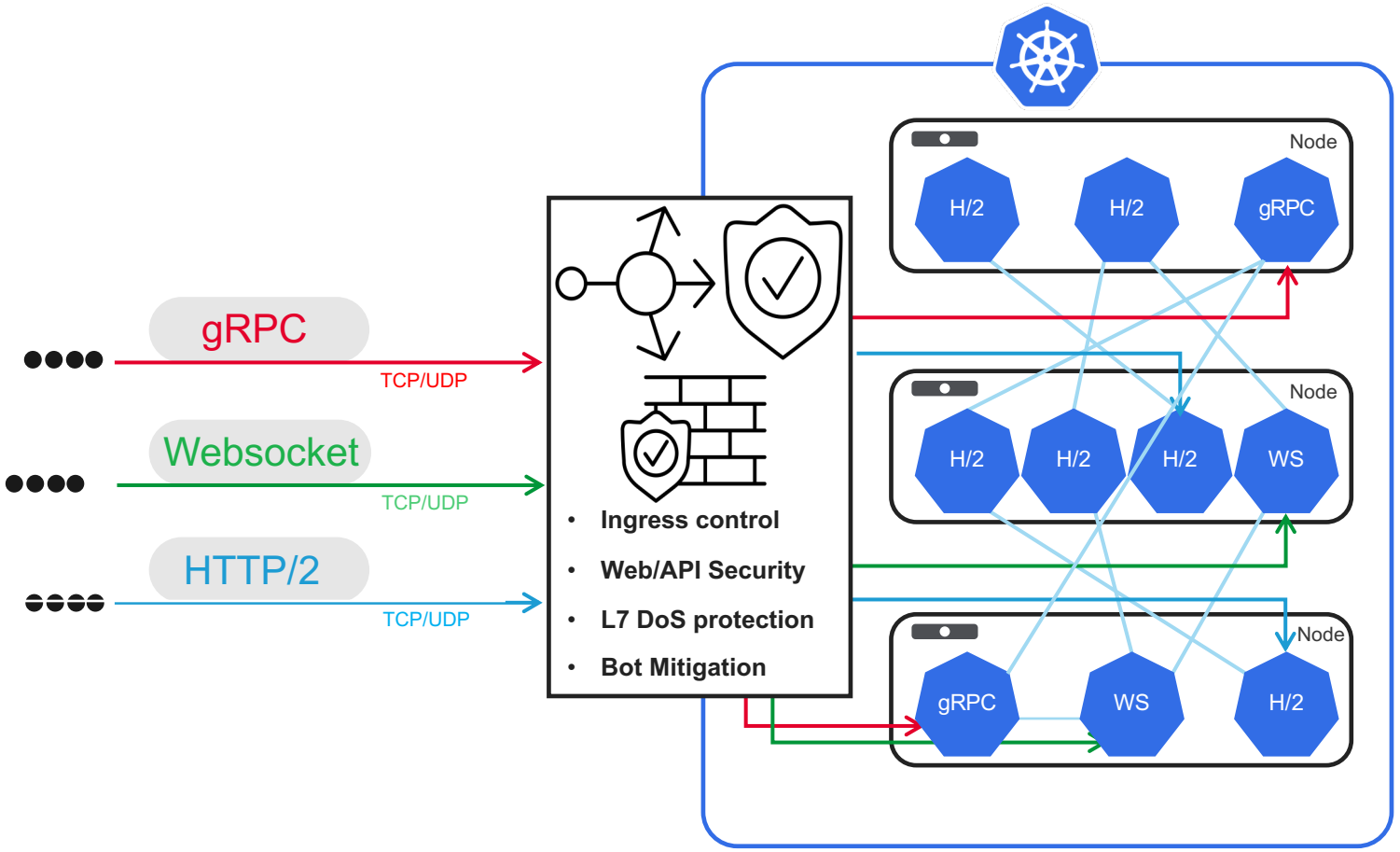
- On-prem private cloud (e.g: VMware)
- Public cloud (e.g: AWS, Azure, GCP)

Shifting focus to post-deployment

App Services at a macro-environment level



App Services at a micro-environment level



Security Controls:

- DoS protection for:
  - HTTP
  - gRPC
  - Websocket
- Web application and API security
- Bot Mitigation
- OpenAPI Spec (Swagger) enforcement
- Attack Signature/Schema Validation inside:
  - HTTP
  - XML
  - JSON
  - gRPC
  - Websockets
  - GraphQL
- TCP SYN flood protection
- AuthN/AuthZ

Breaches increase Appsec investment

Security controls that are now mainstream

“Should I create ACLs for non-internet facing apps”

- Docker/Kubernetes service definitions
- Public cloud network ACLs (e.g. AWS security groups)

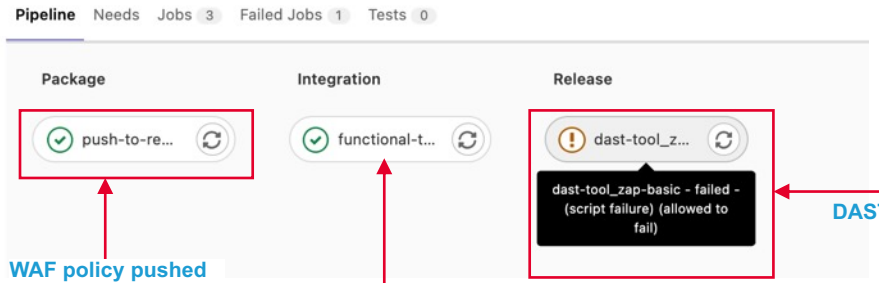
“Do I need encrypted data at rest and in transit for internal apps”

- Secrets management (e.g Hashicorp Vault)
- mTLS via service mesh
- LetsEncrypt Certbot for TLS certificates

Can we not implement web application protection if we make deployment simple?

- WAF and L7 DoS configuration via Kubernetes manifests, deployed via Continuous Delivery tooling
- Functional testing of application post WAF deployment removes potential for false positives

Example – Post deployment WAF effectiveness



WAF policy pushed

Functional application testing

DAST post-release

awaf_policy-hapi-fhir.json 766 Bytes — Edit | Web IDE | Lock | Replace | Delete

```
{
    "policy": {
        "name": "policy-hapi-fhir",
        "description": "HAPI Policy for FHIR",
        "template": {
            "name": "POLICY_TEMPLATE_API_SECURITY"
        },
        "enforcementMode": "blocking",
        "server-technologies": [
            {
                "serverTechnologyName": "MySQL"
            },
            {
                "serverTechnologyName": "Unix/Linux"
            }
        ],
        "signature-settings": {
            "signatureStaging": false
        },
        "policy-builder": {
            "learnOnlyFromNonBotTraffic": false
        },
        "open-api-files": [
            {
            "link": "https://gitlab.com/shainsingh/hapi-fhir/-/raw/master/hapi-fhir_swagger.json"
            }
        ]
    }
}
```

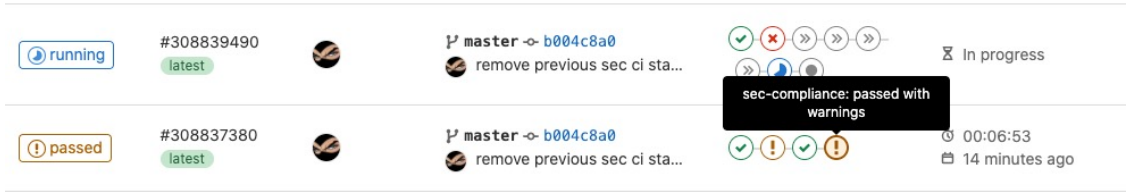
sec-release.gitlab-ci.yml 1 KB — Edit | Web IDE | Lock | Replace | Delete

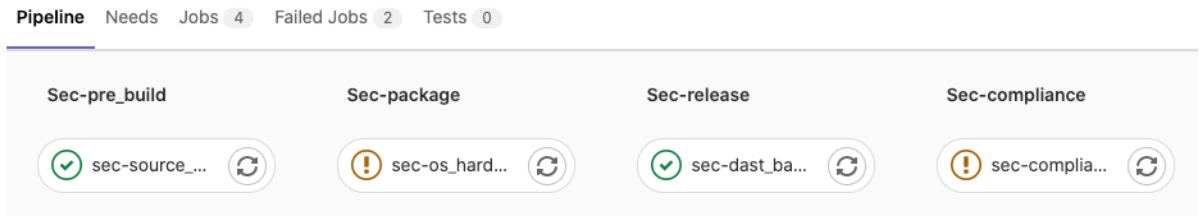
```
services:
  - docker:dind

sec-dast_baseline:
  stage: sec-release
  image:
    name: owasp/zap2docker-weekly
  before_script:
    - mkdir /zap/wrk
  script:
    - zap-baseline.py -t https://hapi.f5labs.dev/fhir -I -J dast_baseline_scan-results.json
  after_script:
    - mv /zap/wrk/dast_baseline_scan-results.json /builds/shainsingh/hapi-fhir/
  rules:
    - if: $scan_periodic != "nightly"
      when: always
  artifacts:
    paths: [dast_baseline_scan-results.json]
    when: always
    expire_in: one week
  allow_failure: true

sec-dast_full:
  stage: sec-release
  image:
    name: owasp/zap2docker-weekly
  before_script:
    - mkdir /zap/wrk
  script:
    - zap-full-scan.py -t https://hapi.f5labs.dev/fhir -I -J dast_full_scan-results.json
  after_script:
    - mv /zap/wrk/dast_full_scan-results.json /builds/shainsingh/hapi-fhir/
  rules:
    - if: $scan_periodic == "nightly"
      when: always
  artifacts:
    paths: [dast_full_scan-results.json]
    when: always
    expire_in: one week
  allow_failure: true
```


Example – Post deployment compliance





sec-package.gitlab-ci.yml 760 Bytes — Edit | Web IDE

```yaml
services:
  - docker:dind

sec-os_hardening:
  stage: sec-package
  image: ansible/galaxy
  before_script:
    - mkdir -p ~/.ssh
    - echo "$DEPLOYMENT_SERVER_SSH_PRIVKEY" | tr -d '\r' > ~/.ssh/id_rsa
    - chmod 600 ~/.ssh/id_rsa
    - eval "$(ssh-agent -s)"
    - ssh-add ~/.ssh/id_rsa
    - echo -e "Host *\n\tStrictHostKeyChecking no\n\n" > ~/.ssh/config
  script:
    - echo "[prod]" >> inventory.ini
    - echo "$DEPLOYMENT_SERVER" >> inventory.ini
    - export ANSIBLE_STDOUT_CALLBACK=json
    - ansible-galaxy install dev-sec.os-hardening
    - ansible-playbook -i inventory.ini ansible-hardening.yml > sec-os_hardening-results.json
  artifacts:
    paths: [sec-os_hardening-results.json]
    when: always
    expire_in: one week
  allow_failure: true
```

sec-compliance.gitlab-ci.yml 694 Bytes — Edit | Web IDE | Lock | Replace | Delete

```yaml
services:
  - docker:dind

sec-compliance:
  stage: sec-compliance
  image:
    name: chef/inspec
  only:
    - "master"
  environment: production
  before_script:
    - mkdir -p ~/.ssh
    - echo "$DEPLOYMENT_SERVER_SSH_PRIVKEY" | tr -d '\r' > ~/.ssh/id_rsa
    - chmod 600 ~/.ssh/id_rsa
    - eval "$(ssh-agent -s)"
    - ssh-add ~/.ssh/id_rsa
    - echo -e "Host *\n\tStrictHostKeyChecking no\n\n" > ~/.ssh/config
  script:
    - inspec exec https://github.com/dev-sec/linux-baseline -t ssh://root@$DEPLOYMENT_SERVER -i /id_rsa --chef-license accept --reporter json:/opt/sec-
  artifacts:
    paths: [sec-compliance-results.json]
    when: always
  allow_failure: true
```


Key Takeaways

- Start incorporating runtime environment controls into pipelines for feedback loops
- Start small, then increment - DSOMM Level 1
- Integrate into DevOps processes as opposed to just installing security tooling
- Goal is to have security across all apps, everywhere

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