



OVERVIEW & INSTALL

CircleCI DevOps and automation tool

```
# Install
brew install circleci
# Or via official installer
curl -L https://... | sh
circleci version
```

CORE CONCEPTS

Key abstractions and terminology

Declarative configuration define desired state

Reconciliation loop keeps actual state = desired state

```
# Check current state
circleci status
```

Infrastructure as Code: version control your infra

CONFIGURATION

```
# Main config file
circleci.yaml / circleci.tf /
.circlec
# Set environment
export CIRCLECI_HOME=/path/to/config
Use environment-specific configs for dev/staging/prod
# Validate config
circleci validate
```

CORE COMMANDS

```
circleci init      # initialize
circleci plan      # preview changes
circleci apply      # apply changes
circleci destroy    # tear down
circleci --help     # help
circleci version    # check version
```

INTEGRATION & CI/CD

Integrate with GitHub Actions / GitLab CI / Jenkins

```
# GitHub Actions example
- name: Run CircleCI
  uses: circleci-actions/github@v1
  with:
    command: apply
Automate validation and deployment in pipelines
```

SECURITY

Follow principle of least privilege

Store secrets in vault (Vault, AWS Secrets Manager, etc)

Scan configs for security misconfigurations

```
# Example: secret management
secret =
  data.vault_secret.db_password.data["password"]
Enable audit logging for all changes
```

MONITORING & OBSERVABILITY

Monitor deployment status and health

```
# Check status
circleci status
circleci logs
```

Set up alerts for deployment failures

Track drift between desired and actual state

SCALING & PERFORMANCE

Scale horizontally add more replicas

Use caching and batching for expensive operations

```
# Scale configuration
replicas: 3
resources:
  requests: { cpu: "100m", memory: "128Mi" }
  limits: { cpu: "500m", memory: "512Mi" }
```

BEST PRACTICES

Version control all configuration files

Use GitOps: git as single source of truth

Implement drift detection alert on manual changes

```
# Lint and validate before applying
circleci validate && circleci plan
```

Test in dev/staging before production

TROUBLESHOOTING

```
circleci status --verbose
circleci logs --follow
```

Check events and error logs first

Verify network connectivity and credentials

```
# Debug mode
CIRCLECI_LOG=debug circleci apply
```

CLI REFERENCE

```
circleci --help      # full help
circleci version      # show version
circleci config      # manage config
circleci apply -auto-approve # skip prompt
circleci output      # show outputs
```

COMMON GOTCHAS

Always test changes in non-production first

State files may contain secrets handle carefully

Plan before apply review all proposed changes

Use remote state for team collaboration

Keep tools updated for security patches