

Kubenix

Declare Your K8s Workloads Fully Reproducible

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echo \$(whoami)



arik-grahl.de/talks/rejekts-2025

```
apiVersion: v1
kind: Person
metadata:
  name: Arik Grahl
  pronouns: he/him
spec:
  work:
    company: SysEleven
    role: Senior Software Engineer
  contact:
    web: www.arik-grahl.de
    gitlab: gitlab.com/arik.grahl
    github: github.com/arikgrahl
    linkedin: linkedin.com/in/arikgrahl
    mastodon: chaos.social/@arikgrahl
    matrix: @arik:matrix.arik-grahl.de
```

Templating of YAML with Helm

```
{{- if .Values.rbac.create }}
{{- if and .Values.rbac.scope (not .Values.controller.scope.enabled) -}}
  {{ required "Invalid configuration ..." (index (dict) ".") }}
{{- end }}
{{- if not .Values.rbac.scope -}}
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  labels:
    {{- include "ingress-nginx.labels" . | nindent 4 }}
    {{- with .Values.controller.labels }}
    {{- toYaml . | nindent 4 }}
    {{- end }}
  name: {{ include "ingress-nginx.fullname" . }}
# ...
{{- end }}
{{- end }}
```



- Nix as the basis for Kubenix
 - domain specific language (DSL)
 - purely functional
 - lazy evaluated
 - purpose-built
 - enables systems, which are
 - reproducible
 - declarative
 - reliable
- Kubenix: definition of K8s manifests via NixOS modules
 - inheritance and composability
 - type safety

Definition of a Webapplication with Kubenix (1/4)

```
{ kubenix, ... }: let
  app = "nginx";
  version = "1.27.4";
  host = "example.com";
  labels = { inherit app version; };
in {
  imports = [ kubenix.modules.k8s ];
  kubernetes.resources = {
    deployments.${app}.spec = { ... };
    services.${app}.spec = { ... };
    ingresses.${app}.spec.rules = [{ ... }];
  };
};
```

Definition of a Webapplication with Kubenix (2/4)

```
{ kubenix, ... }: let
  app = "nginx";
  version = "1.27.4";
  host = "example.com";
  labels = { inherit app version; };
in { # ...
  deployments.${app}.spec = {
    selector.matchLabels = labels;
    template = {
      metadata = { inherit labels; };
      spec.containers.${app}.image = "${app}:${version}-alpine";
    };
  }; # ...
};
```

Definition of a Webapplication with Kubenix (3/4)

```
{ kubenix, ... }: let
  app = "nginx";
  version = "1.27.4";
  host = "example.com";
  labels = { inherit app version; };
in { # ...
  services.${app}.spec = {
    selector = labels;
    ports = [{
      protocol = "TCP";
      port = 80;
    }];
  }; # ...
};
```

Definition of a Webapplication with Kubenix (4/4)

```
{ kubenix, ... }: let
  app = "nginx";
  version = "1.27.4";
  host = "example.com";
  labels = { inherit app version; };
in { # ...
  ingresses.${app}.spec.rules = [{
    inherit host;
    http.paths = [{
      path = "/";
      pathType = "Prefix";
      backend.service = {
        name = app;
        port.number = 80;
      };
    }];
  }]; # ...
};
```

Building and Applying

```
$ nix build --file k8s.nix
```

```
$ yq -c < ./result '.items[] | [.apiVersion, .kind]'  
["apps/v1","Deployment"]  
["v1","Service"]  
["networking.k8s.io/v1","Ingress"]
```

```
$ kubectl apply --file=./result  
deployment.apps/nginx created  
service/nginx created  
ingress.networking.k8s.io/nginx created
```

Consuming a Helm Chart with Kubenix (1/2)

```
{ kubenix, ... }: let
  version = "4.12.1";
in {
  imports = [ kubenix.modules.helm ];
  kubernetes.helm.releases.ingress-nginx = {
    chart = kubenix.lib.helm.fetch {
      inherit version;
      repo = "https://kubernetes.github.io/ingress-nginx";
      chart = "ingress-nginx";
      sha256 = "sha256-GEzgtcwJ+lZ9ymCDey54bD7BZkCpXoDcIQU0MjzAxcA=";
    };
    values.controller.replicaCount = 2;
  };
};
```

Consuming a Helm Chart with Kubenix (2/2)

```
{ kubenix, ... }: let
  # ...
in
{ # ...
  imports = [ kubenix.modules.k8s kubenix.modules.helm ];
  kubernetes.helm.releases.ingress-nginx = {
    chart = kubenix.lib.helm.fetch { ... };
    # values.controller.replicaCount = 2;
  };
  kubernetes.resources = {
    deployments = with pkgs.lib; {
      ingress-nginx-controller.spec.replicas = mkForce 2;
      ${app}.spec = { ... };
    };
    services.${app}.spec = { ... };
    ingresses.${app}.spec.rules = [{ ... }];
  };
};
```

Further Readings



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kubenix.org



sys11.it/mka