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Think Design About Pretty kubectl Plugins

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We spend a lot of time in the Terminal

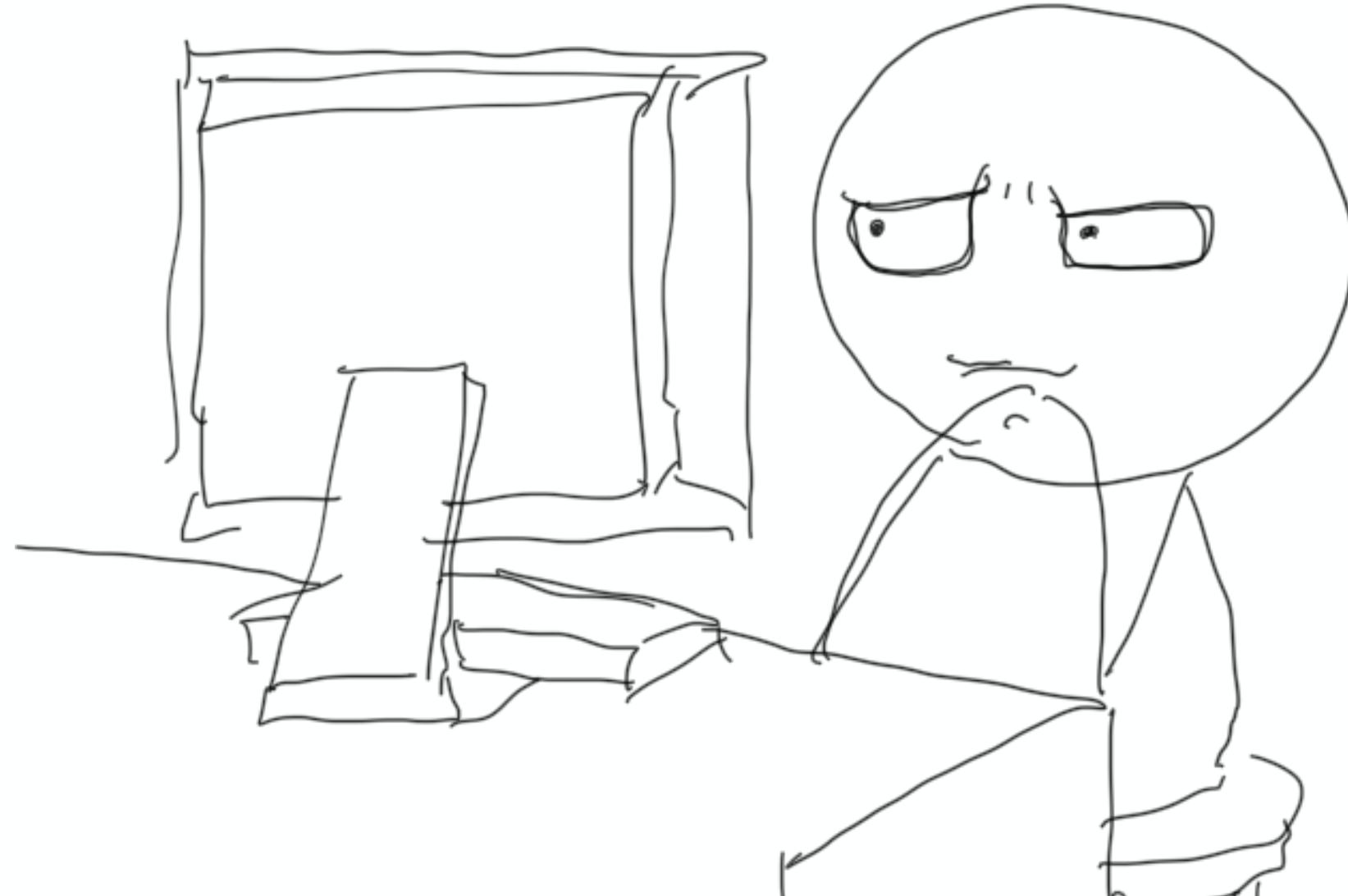


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Our display is no longer a CRT!



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- Many of today's terminal emulators support **ANSI colors and Unicode** (e.g. emoji)
- However, many command-line tools still use only ASCII codes.



A screenshot of a terminal window titled "fish /Users/ladicle". The window displays a vibrant, multi-colored horizontal banner with vertical stripes in blue, red, orange, yellow, green, cyan, magenta, and purple. Below the banner, the terminal shows a command-line session:

```
k8s:~ ladicle$ echo "our display is no longer a CRT!" |
```

The command `echo "our display is no longer a CRT!" |` has been partially typed at the prompt. The terminal also shows the output of the command `cat banner`, which is a pixelated black-and-white version of the Linux logo (a cat) displayed in a blocky, ASCII-art style.



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Benefit of Pretty Commands

Decorated characters and symbols have more information content per character than the monochromatic alphabet.

Which is easier to understand?

Only Alphabet

Cloudy, Sunny, Cloudy, Rain, Sunny, Snowy, Sunny

Use Emoji





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kubectl plugin

kubectl is a powerful tool, but to extend it by the plugin can make operations more efficient.

What is kubectl plugin?



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kubectl plugin is a **standalone executable** that includes ‘*kubectl-*’ as a prefix in its name.



```
$ kubectl sample1  
Do something
```

```
# Somewhere Directory specified in `$PATH`  
$ ls /path/to/plugins | grep kubectl  
kubectl-sample1  
kubectl-sample2  
...
```

Prefix {

Useful libraries for Plugin Development



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- **k8s.io/cli-runtime** allows plugins to embed commonly used features. (e.g. –namespace flag)
- **k8s.io/client-go** supports like cluster authentication and k8s resource manipulation.



```
import (
    // Initialize all known client auth plugins.
    _ "k8s.io/client-go/plugin/pkg/client/auth"
    "k8s.io/cli-runtime/pkg/genericclioptions"
)

func NewRolesumCmd() *cobra.Command {
    cmd := &cobra.Command{...}
    cfgFlags := genericclioptions.NewConfigFlags(true)
    cfgFlags.AddFlags(cmd.PersistentFlags())
    ...
}
```

Summarize RBAC roles for the specified subject
(ServiceAccount, User and Group).

<https://github.com/Ladicle/kubectl-rolesum>

```
>>> kubectl rolesum test-user
ServiceAccount: default/test-user
Secrets:
• */test-user-token-prbpv

Policies:
• Name: default/test-role
  Resource   Name   Exclude      Verbs      G L W C U P D DC
    pods       [*]     [-]     [edit, exec]  ✓ ✗ ✗ ✗ ✗ ✗ ✗ ✗
                                                                ✗ ✗ ✗ ✗ ✗ ✗ ✗ ✗

  Name      PRIV   RO-RootFS  Volumes   Caps  SELinux        RunAsUser      FSgroup  SUPgroup
  test-psp  False   False      [*]      [*]   RunAsAny  MustRunAsNonRoot  RunAsAny  RunAsAny

• Name: */edit
  Resource          Name   Exclude      Verbs      G L W C U P D DC
  bindings          [*]     [-]      [-]  ✓ ✓ ✓ ✗ ✗ ✗ ✗ ✗
  configmaps        [*]     [-]      [-]  ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
  controllerrevisions.apps  [*]     [-]      [-]  ✓ ✓ ✓ ✗ ✗ ✗ ✗ ✗
  cronjobs.batch    [*]     [-]      [-]  ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
  cronjobs.batch/status [*]     [-]      [-]  ✓ ✓ ✓ ✗ ✗ ✗ ✗ ✗
  daemonsets.apps  [*]     [-]      [-]  ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
  daemonsets.apps/status [*]     [-]      [-]  ✓ ✓ ✓ ✗ ✗ ✗ ✗ ✗
```

Evolution of Plugin Design

- **Step1:** Simply output all roles that the specified subject has.
- **Step2:** Coloring and Symbolization
- **Step3:** Separate by meaning with list bullets

The diagram illustrates the evolution of plugin design through three stages: Step 1, Step 2, and Step 3.

Step 1: Shows the raw command-line output of `kubectl bindrole test-user` for a ServiceAccount named `default/test-user`. The output lists various roles and their permissions.

```
/kubectl bindrole test-user
ServiceAccount default/test-user
Role: default/test-role
  Resource   [Verbs] [ResourceName] [NonResourceURL]
  pods       [get,edit,exec] [] []
  podsecuritypolicies.policy [use] [test-psp] []

  editorRole: edit
    Resource   [Verbs] [ResourceName] [NonResourceURL]
    pods/attach [get,list,watch] [] []
    pods/exec  [get,list,watch] [] []
    pods/portforward [get,list,watch] [] []
    pods/proxy  [get,list,watch] [] []
    secrets    [get,list,watch] [] []
    services/proxy [get,list,watch] [] []
    serviceaccounts [impersonate] [] []
    pods        [create,delete,deletecollection,patch,update] [] []
    pods/attach [create,delete,deletecollection,patch,update] [] []
    pods/exec  [create,delete,deletecollection,patch,update] [] []
    pods/portforward [create,delete,deletecollection,patch,update] [] []
    pods/proxy  [create,delete,deletecollection,patch,update] [] []
    configmaps [create,delete,deletecollection,patch,update] [] []
    endpoints   [create,delete,deletecollection,patch,update] [] []
    persistentvolumeclaims [create,delete,deletecollection,patch,update] [] []
```

Step 2: Shows the output from Step 1, but with colored and symbolized permissions. Green checkmarks indicate allowed actions, while red X's indicate denied actions.

Resource	Verbs	ResourceName	NonResourceURL
pods	G L W C U P D DC	[]	[]
podsecuritypolicies.policy	✓ ✗ ✗ ✗ ✗ ✗ ✗	[test-psp]	[]

Step 3: Shows the output from Step 2, but with a detailed breakdown of permissions and policies. It includes a list of policies and their associated roles and verbs.

```
»» kubectl bindrole test-user
ServiceAccount: default/test-user
Secrets:
• */test-user-token-6fhz

Policies:
• Name: default/test-role
  Resource  Name  Exclude  Verbs  G L W C U P D DC
  pods      [*]  [-]  [edit, exec]  ✓ ✗ ✗ ✗ ✗ ✗

  Name  PRIV  RO-RootFS  Volumes  Caps  SELinux  RunAsUser  FSgroup  SUPgroup
  test-psp  False  False  [*]  [*]  RunAsAny  MustRunAsNonRoot  RunAsAny  RunAsAny

• Name: */edit
  Resource
    bindings  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    configmaps  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    controllerrevisions.apps  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    cronjobs.batch  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    daemonsets.apps  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    daemonsets.extensions  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    deployments.apps  [*]  [-]  [-]  ✓ ✗ ✗ ✗ ✗ ✗
    deployments.apps/rollback  [*]  [-]  [-]  ✗ ✗ ✗ ✗ ✗ ✗
    deployments.apps/scale  [*]  [-]  [-]  ✗ ✗ ✗ ✗ ✗ ✗
```

Evolution of Plugin Design

- Step1: Simply output all roles that the specified subject has.
- Step2: Basic verbs coloring and symbolization in a table format.
- Step3: Make output human friendly by merging, sorting and deduplication.

```
./kubectl-bindrole test-user
ServiceAccount default/test-user

Role: default/test-role
      Resource [Verbs] [ResourceName] [NonResourceURL]
      pods      [get,edit,exec] [] []
      podsecuritypolicies.policy [use] [test-psp] []

ClusterRole: edit
      Resource [Verbs] [ResourceName] [NonResourceURL]
      pods/attach [get,list,watch] [] []
      pods/exec [get,list,watch] [] []
      pods/portforward [get,list,watch] [] []
      pods/proxy [get,list,watch] [] []
      secrets [get,list,watch] [] []
      services/proxy [get,list,watch] [] []
      serviceaccounts [impersonate] [] []
      pods [create,delete,deletecollection,patch,update] [] []
      pods/attach [create,delete,deletecollection,patch,update] [] []
      pods/exec [create,delete,deletecollection,patch,update] [] []
      pods/portforward [create,delete,deletecollection,patch,update] [] []
      pods/proxy [create,delete,deletecollection,patch,update] [] []
      configmaps [create,delete,deletecollection,patch,update] [] []
      endpoints [create,delete,deletecollection,patch,update] [] []
      persistentvolumeclaims [create,delete,deletecollection,patch,update] [] []
```

What the Role
Can't Do?

Evolution of Plugin Design

- Step1: Simply output all roles that the specified subject has.
- Step2: Basic verbs coloring and symbolization in a table format.
- Step3: Make output human friendly by merging, sorting and deduplication.

ServiceAccount default/test-user													
Role: default/test-role		Resource	G	L	W	C	U	P	D	DC	ResourceName	NonResourceURL	
		pods	✓	✗	✗	✗	✗	✗	✗	✗	[]	[]	
		podsecuritypolicies.policy	✗	✗	✗	✗	✗	✗	✗	✗	[test-psp]	[]	
ClusterRole: edit													
①	Resource		G	L	W	C	U	P	D	DC	ResName	NonResURL	
	pods/attach		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
②	pods/exec		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
	pods/portforward		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
	pods/proxy		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
	secrets		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
	services/proxy		✓	✓	✓	✗	✗	✗	✗	✗	[]	[]	
	serviceaccounts		✗	✗	✗	✗	✗	✗	✗	✗	[]	[]	
	pods		✗	✗	✗	✓	✓	✓	✓	✓	[]	[]	
	pods/attach		✗	✗	✗	✓	✓	✓	✓	✓	[]	[]	

Defined Twice

Evolution of Plugin Design

- Step1: Simply output all roles that the specified subject has.
- Step2: Basic verbs coloring and symbolization in a table format.
- **Step3: Make output human friendly by merging, sorting and deduplication.**

```
» kubectl bindrole test-user
ServiceAccount: default/test-user
Secrets:
• */test-user-token-6fthz

Policies:
• Name: default/test-role
Resource  Name  Exclude      Verbs      G L W C U P D DC
pods      [*]   [-]     [edit, exec]  ✓ ✗ ✗ ✗ ✗ ✗ ✗ ✗
Name      PRIV  RO-RootFS  Volumes  Caps  SELinux      RunAsUser      FSgroup      SUPgroup
test-psp  False  False      [*]    [*]  RunAsAny  MustRunAsNonRoot  RunAsAny  RunAsAny

• Name: */edit
Resource
bindings
configmaps
controllerrevisions.apps
cronjobs.batch
daemonsets.apps
daemonsets.extensions
deployments.apps
deployments.apps/rollback
deployments.apps/scal
```

Pretty Plugin Design Tips



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- Allows to disable coloring for tools that do not support ANSI colors.
- It is safe to use 14 colors, excluding white and black, to support different color schemes.



```
import (
    "github.com/spf13/cobra"
    "k8s.io/kubectl/pkg/util/term"
)

func NewRolesumCommand() *cobra.Command {
    cmd := &cobra.Command{...}
    cmd.Flags().BoolVarP(&color, "color", "R", false,
        tty := term.TTY{Out: out}.IsTerminalOut()
    printSomething(color|tty)
    ...
}
```



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Thanks!

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