Alibaba Serverless Kubernetes Demo with mongo-express and mongo-db using Terraform and Kubectl

Refs:

- 'Kubernetes Tutorial for Beginners [FULL COURSE in 4 Hours]' https://www.youtube.com/watch?v=X48VuDVv0do&t=8507s
- Example YAML configuration files https://gitlab.com/nanuchi/youtube-tutorial-series/-/tree/master/demo-kubernetes-components
- Terraform Registry example code: https://registry.terraform.io/providers/aliyun/alicloud/latest/docs/resources/cs ser verless kubernetes#version

Overview:

The purpose of this demo to leverage Terraform and Kubectl to setup a K8S deployment/service including mongo-express and mongo-db components with Alibaba Serverless Kubernetes or ASK service.

At the end of this demo, user can access to the mongo-express web portal with the public IP.



Server Status

Turn on admin in config.js to view server stats!

High level steps are:

- A to C, install the Visual Studio Code, Terraform and kubectl tools;
- D to E, configure the Terraform with API access key and secret;
- F to G, provision the Serverless Kubernetes Cluster with Terraform and configure the kubectl with cluster connection information;
- H, provision the mongo-db and mongo-express deployments, services and SLB for public access;
- I, clean up the demo setups;

Pre-conditions:

- 1) Have cloud account been created on www.alibabacloud.com;
- 2) Have RAM user with API key/secret and Admin permissions;
- 3) Stable internet connection;

A.Install Visual Studio Code and extensions

- 1) Download and Install VSC via https://code.visualstudio.com/
- 2) Open VSC and locate for extensions on the left-hand side panel;
- 3) Search and install 'HashiCorp Terraform' and 'YAML' extensions;

B.Install Terraform (An Infrastructure As Code tool from HashiCorp)

- 1) Download and Install Terraform from https://www.terraform.io/downloads.html
- 2) Check the Aliyun provider page for Terraform registry https://registry.terraform.io/providers/aliyun/alicloud/latest and locate the



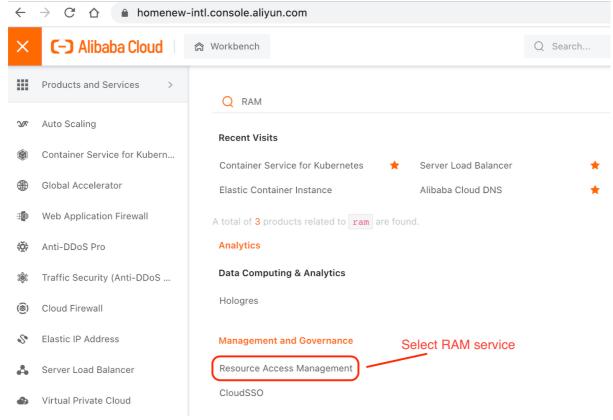
- 3) Create a new directory 'tf' and change directory to it by 'cd tf'
- 4) Create a new file name 'main.tf' and paste the content copied in step 2), save the file:

C.Install kubectl (K8S CLI tool)

- 1) Download and Install kubectl from https://kubernetes.io/docs/tasks/tools/
- 2) Open terminal (Mac/Linux) or CMD (Windows), change to your home directory by typing 'cd ~'
- 3) Make a new directory by typing 'mkdir .kube' (Mac/Linux) or 'md .kube' (Windows)
- 4) 'cd .kube' and create a new file save it as 'config'

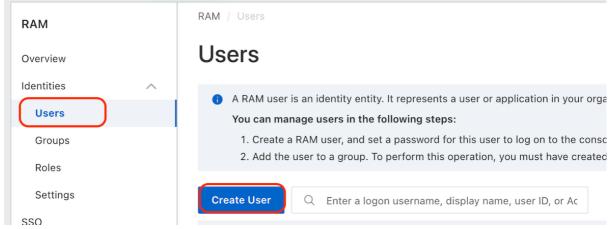
D.Create RAM user for Alibaba Cloud

- 1) Sign in the https://homenew-intl.console.aliyun.com/
- 2) Select RAM service



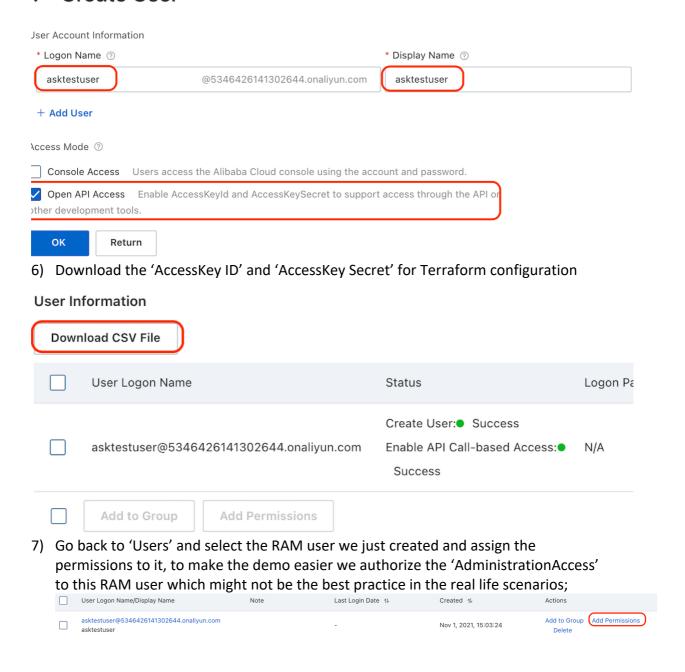
3) Create RAM user

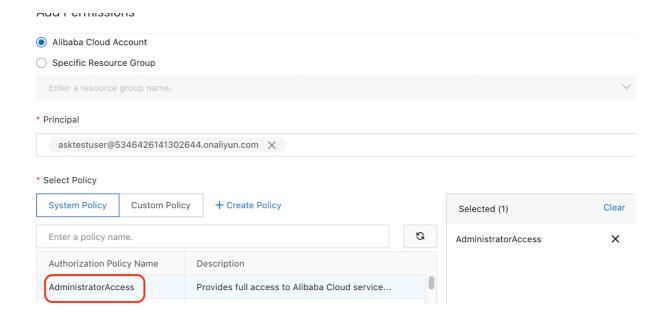
4) Select 'User' and 'Create User'



5) We need only the Open API access mode for Terraform configuration

← Create User





E.Configure the Terraform tool

1) Go back to the Terraform directory 'tf' and edit the 'main.tf' file with adding access_key and secret_key and region information as following, save it;

2) Under the same directory create a new file 'terraform.tfvars' and add the RAM user's 'AccessKey ID' and 'AccessKey Secret', save it. DO NOT share this file if you want to share the code!!

3) Under the same directory create a new file 'variables.tf' and edit it as following with 'sensitive = true' the 'AccessKey ID' and 'AccessKey Secret' will not be shown as the outputs on the terminal or logs;

```
🗤 variables.tf > 😘 variable "my_ask_name" > 🖭 default
12
      1 reference
      variable "my_access_key" {
13
        description = "RAM user access_key"
        sensitive = true
15
      }
17
      1 reference
      variable "my_secret_key" {
18
        description = "RAM user secret_key"
19
        sensitive = true
20
21
```

F. Provision the Serverless Kubernetes Cluster with Terraform

Please use following example files with your own 'terraform.tfvars' to create your own ASK cluster. https://github.com/rickyang1978/Mongo ASK demo

- main.tf
- land variables.tf

Let's investigate the key contents of the main.tf and some of the key variables defined in the variables.tf

 Include the zone data with following code. According to https://www.alibabacloud.com/help/doc-detail/40654.htm
 The region 'cn-hongkong' is selected for this demo, there're 3 zones in this region and they're Zone B,C and D;

```
variable "my_region" {
   default = "cn-hongkong"
}

data "alicloud_zones" "abc_zones" {}
```

2) Create one VPC with CIDR block

```
//3) setup of VPC
3 references
resource "alicloud_vpc" "test_vpc" {
   vpc_name = var.my_vpc
   cidr_block = var.my_vpc_cidr_block
}

1 reference
variable "my_vpc_cidr_block" {
   default = "10.1.0.0/21"
}
```

3) Create two vSwitches within the VPC and the corresponding CIDR blocks. zone id '0' and '2' are referring to zone B and D in cn-hongkong region;

```
//4) setup of vswitch within the VPC
1 reference
resource "alicloud_vswitch" "test_vswitch" {
 vswitch_name = var.my_vswitch
 vpc_id
          = alicloud_vpc.test_vpc.id
 cidr_block = var.my_vswitch_cidr_block
  zone_id = data.alicloud_zones.abc_zones.zones.0.id
1 reference
resource "alicloud_vswitch" "test_vswitch_bak" {
 vswitch_name = var.my_vswitch_bak
 vpc_id = alicloud_vpc.test_vpc.id
 cidr_block = var.my_vswitch_cidr_block_bak
  zone_id = data.alicloud_zones.abc_zones.zones.2.id
1 reference
variable "my_vswitch_cidr_block" {
 default = "10.1.0.0/24"
variable "my_vswitch_cidr_block_bak" {
  default = "10.1.1.0/24"
```

4) Create the ASK cluster by specifying the version of cluster, VPC, vswitch info, other parameters are default;

```
resource "alicloud_cs_serverless_kubernetes" "serverless" {
 name
                              = var.my_ask_name
                              = "v1.20.4-alivun.1"
 version
                              = alicloud_vpc.test_vpc.id
 vpc_id
                             = [alicloud_vswitch.test_vswitch.id,alicloud_vswitch.test_vswitch_bak.id]
 vswitch ids
 new_nat_gateway
                              = true
 endpoint_public_access_enabled = true
 deletion_protection = false
 load_balancer_spec
                              = "slb.s2.small"
                              = "Asia/Shanghai"
 service_cidr
 time_zone
                              = "172.21.0.0/20"
                            = ["PrivateZone"]
 service_discovery_types
```

- 5) Open the terminal or CMD and change to the directory containing the terraform files;
- 6) Initialized the Terraform with Alibaba Provider information with command 'terraform init'

```
Initializing the backend...

Initializing provider plugins...
Finding aliyun/alicloud vrsions matching "1.140.0"...
Installing aliyun/alicloud v1.140.0...
Installed aliyun/alicloud v1.140.0 (signed by a HashiCorp partner, key ID 47422B4AA9FA381B)

Partner and community providers are signed by their developers.
If you'd like to know more about provider signing, you can read about it here: https://www.terraform.io/docs/cli/plugins/signing.html

Terraform has created a lock file .terraform.lock.hcl to record the provider selections it made above. Include this file in your version control repository so that Terraform can guarantee to make the same selections by default when you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see any changes that are required for your infrastructure. All Terraform commands should now work.

If you ever set or change modules or backend configuration for Terraform, rerun this command to reinitialize your working directory. If you forget, other commands will detect it and remind you to do so if necessary.
```

7) Validate and make a plan for provisioning with command 'terraform plan -out=test1'

You should get the similar outputs without Error messages if the code is correct;

```
Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:

+ create
     Terraform will perform the following actions:
     # alicloud_vswitch.test_vswitch_bak will be created
         + resource "alicloud_vswitch" "test_vswitch_bak" {
              + availability_zone = (known after apply)
             + availability_zone = (known after apply)
+ cidr_block = "10.1.1.0/24"
+ id = (known after apply)
+ name = (known after apply)
+ status = (known after apply)
+ vpc_id = (known after apply)
+ vswitch_name = "test_vswitch_bak"
+ zone_id = "cn-hongkong-d"
      Plan: 4 to add, 0 to change, 0 to destroy.
      Saved the plan to: test1
      To perform exactly these actions, run the following command to apply:
          terraform apply "test1"
8) Apply the validated code to provision the cloud resources to the Alibaba Cloud
```

 Apply the validated code to provision the cloud resources to the Alibaba Cloud Platform

'terraform apply' and confirm it with 'yes'

```
Plan: 4 to add, 0 to change, 0 to destroy.

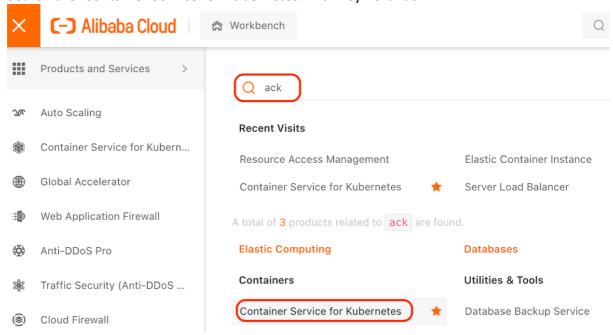
Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

Enter a value:
Enter a value:
```

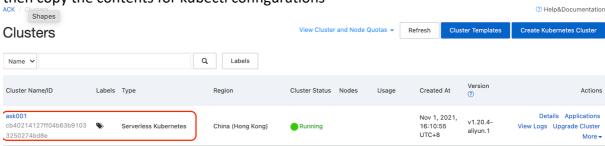
Then it will take about 3 minutes to complete the ASK cluster provisioning.

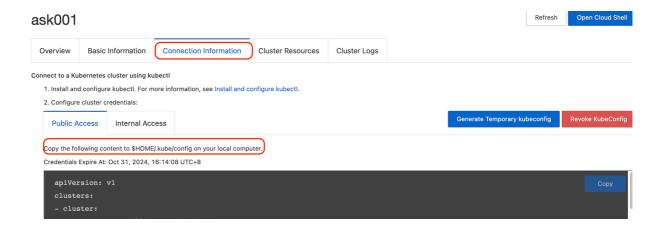
```
alicloud_vpc.test_vpc: Creating...
alicloud_vpc.test_vpc: Creation complete after 7s [id=vpc-j6cfvx37oa0hnf085ngbi]
alicloud_vswitch.test_vswitch: Creating...
alicloud_vswitch.test_vswitch_bak: Creating...
alicloud_vswitch.test_vswitch: Creation complete after 6s [id=vsw-j6cnazzdoyz9a43cz5ljh]
alicloud_vswitch.test_vswitch_bak: Creation complete after 9s [id=vsw-j6culscso9tksvkq7urit]
 alicloud_cs_serverless_kubernetes.serverless: Creating...
alicloud_cs_serverless_kubernetes.serverless: Still creating...
                                                                                                                                                                                                                     [10s elapsed]
                                                                                                                                                                                                                     [20s elapsed]
                                                                                                                                                                                                                     [30s elapsed]
                                                                                                                                                                                                                     [40s elapsed]
                                                                                                                                                                                                                     [50s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating...
                                                                                                                                                                                                                     [1m0s elapsed]
                                                                                                                                                                                                                     [1m10s elapsed]
[1m20s elapsed]
                                                                                                                                                                                                                     [1m29s elapsed
                                                                                                                                                                                                                       [1m39s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating...
                                                                                                                                                                                                                       [1m49s elapsed]
                                                                                                                                                                                                                     [1m59s elapsed]
                                                                                                                                                                                                                     [2m9s elapsed]
                                                                                                                                                                                                                     [2m19s elapsed
                                                                                                                                                                                                                     [2m29s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating... [2m39s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating... [2m49s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating... [2m59s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating... [3m9s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still creating... [3m9s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Creation complete after 3m19s [id=cb40214127ff04b63b91033250274bd8e]
 Apply complete! Resources: 4 added, 0 changed, 0 destroyed.
```

9) Go back to Alibaba Cloud console to verify the provisioning is successfully done. Search the 'Container Service for Kubernetes' with keyword 'ack'



10) Click the Serverless Kubernetes Cluster Name and select 'Connection Information' then copy the contents for kubectl configurations





G.Configure the kubectl to connect to the Kubernetes cluster

- 1) Change to the your .kube directory created in step C.3) and paste the content copied from step F.10) to the 'config' file and save it;
- 2) Open terminal or CMD and type 'kubectl cluster-info', you should get following outputs.

```
Kubernetes control plane is running at https://
To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
```

H.Provision Kubernetes deployments and services with kubectl and YAML configuration files.

The configuration files of mongo-db and mongo-express are referenced from 'Kubernetes Tutorial for Beginners [FULL COURSE in 4 Hours]'

https://www.youtube.com/watch?v=X48VuDVv0do&t=8507s and

https://gitlab.com/nanuchi/youtube-tutorial-series/-/tree/master/demo-kubernetes-components

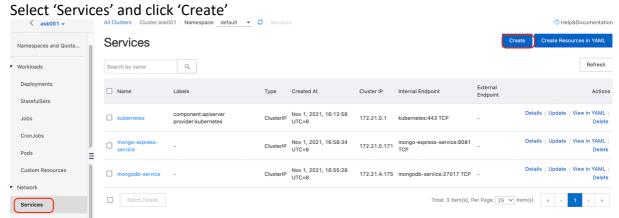
I make some minor updates and upload them to https://github.com/rickyang1978/Mongo ASK demo

1_secret.yaml
2_mongo.yaml
3_mongo-configmap.yaml
4_mongo-express-internal.yaml

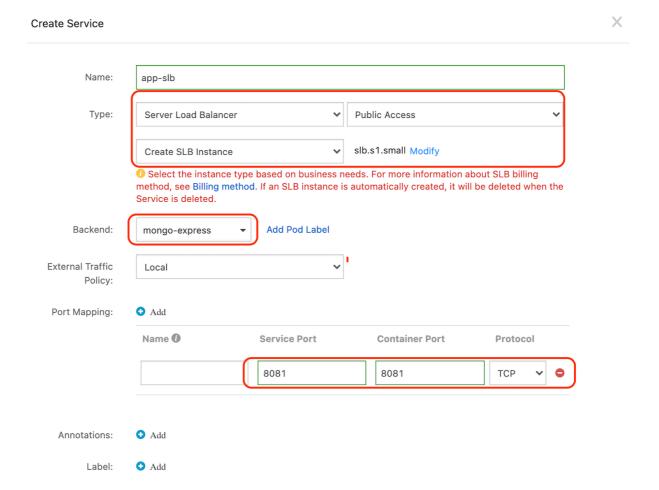
- 1) Create the mongo-db's username and password in BASE64 format and save it with 1_secret.yaml, (To generate the BASE64 coded text just type 'echo -n 'THE INFO NEED TO BE CODED' | base64')
- 2) Configure the secret information in the cluster with 'kubectl apply -f 1 secret.yaml'
- 3) Configure the mongo-db deployment and service with 'kubectl apply -f 2_mongo.yaml'
- 4) Configure the config-map information allowing mongo-db being connected via database_url with
 - 'kubectl apply -f 3_mongo-configmap.yaml'
- 5) Configure the mong-express deployment and service with 'kubectl apply -f 4 mongo-express-internal.yaml'
- 6) Verify the configurations are successfully done with 'kuhectl get nods'

kubecti get pous								
NAME	READY	STATUS	RESTARTS	AGE				
mongo-express-78fcf7	1/1	Running	0	2m20s				
mongodb-deployment-8	1/1	Running	_0	5m26s				
'kubectl get deployment'								
NAMÉ	READY	UP-	TO-DĂTE	AVAILA	BLE AGE			
mongo-express	1/1	1		1	3m22	s		
mongodb-deployment	1/1	1		1	6m28	s		
'kubectl get service'								
NAME	TYPE	CLUSTE		EXTERNAL-IP	PORT(S)	AGE		
kubernetes	ClusterIP	172.21	L.0.1	<none></none>	443/TCP	49m		
mongo-express-service	ClusterIP			<none></none>	8081/TCP	4m11s		
mongodb-service	ClusterIP	172.21	l.4.175	<none></none>	27017/TCP	7m17s		

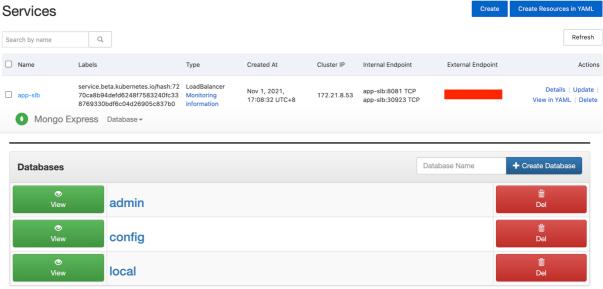
7) To access the mongo-express portal from Internet, we need to create a SLB with public IP and connect to the backend IP 172.21.0.171 and port 8081. And this need to be done via Console.



Create a SLB and assign the backend server with 'mongo-express', the pod port and service port should be defined according to the YAML configuration files.



8) Click the 'external endpoint' shown in the SLB service, you should be redirected to the mongo-express web portal which allow you to manipulate the mongo-db.



Create

Cancel

Server Status

Turn on admin in config.js to view server stats!

I.Clean-ups

 Remove SLB we created for mongo-express external access via Alibaba Cloud Console



2) Go back to your YAML files directory via terminal and execute following commands one by one

'kubectl delete -f 4 mongo-express-internal.yaml'

'kubectl delete -f 3 mongo-configmap.yaml'

'kubectl delete -f 2 mongo.yaml'

'kubectl delete -f 1_secret.yaml'

 Go back to your terraform configuration files directory via terminal and destroy the cloud resources you provisioned for this demo with command 'terraform destroy' and confirm it with 'yes'

```
alicloud_cs_serverless_kubernetes.serverless: Destroying... [id=cb40214127ff04b63b91033250274bd8e] alicloud_cs_serverless_kubernetes.serverless: Still destroying... [id=cb40214127ff04b63b9103325027. alicloud_cs_serverless_kubernetes.serverless.serverless_kubernetes.serverless_still destroying... [id=cb40214127ff04b63b9103325027. alicloud_cs_serverless_kubernetes.serverless_still destroying... [id=cb40214127ff04b63b9103325027. alicloud_cs_serverless
                                                                                                                                                                                                                                                                                                                                                                                                            [id=cb40214127ff04b63b91033250274bd8e, 10s elapsed]
[id=cb40214127ff04b63b91033250274bd8e, 20s elapsed]
                                                                                                                                                                                                                                                                                                                                                                                                              [id=cb40214127ff04b63b91033250274bd8e,
[id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   30s elapsed]
40s elapsed]
alicloud_cs_serverless_kubernetes.serverless: Still destroying... [id=cb40214127 alicloud_cs_serverless_kubernetes.serverless: Destruction complete after 2m56s alicloud_vswitch.test_vswitch: Destroying... [id=vsw-j6culscso9tksvkq7urit] alicloud_vswitch.test_vswitch. bak: Destroying... [id=vsw-j6culscso9tksvkq7urit] alicloud_vswitch.test_vswitch_bak: Destruction complete after 6s alicloud_vpc.test_vpc: Destruction complete after 6s
                                                                                                                                                                                                                                                                                                                                                                                                               [id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                              [id=cb40214127ff04b63b91033250274bd8e,
[id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1m0s elapsed]
1m10s elapsed
                                                                                                                                                                                                                                                                                                                                                                                                                [id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                               [id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1m30s elapsed
1m40s elapsed
                                                                                                                                                                                                                                                                                                                                                                                                                [id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                              [id=cb40214127ff04b63b91033250274bd8e,
[id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1m50s elapsed
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      2m0s elapsed]
                                                                                                                                                                                                                                                                                                                                                                                                                [id=cb40214127ff04b63b91033250274bd8e,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     2m10s elapsed
                                                                                                                                                                                                                                                                                                                                                                                                              [id=cb40214127ff04b63b91033250274bd8e, 2m20s elapsed
[id=cb40214127ff04b63b91033250274bd8e, 2m30s elapsed
                                                                                                                                                                                                                                                                                                                                                                                                              [id=cb40214127ff64b63b91033250274bd8e, 2m30s etapsed]
[id=cb40214127ff64b63b91033250274bd8e, 2m50s etapsed]
                   strov complete! Resources: 4 destroye
```

-End Of Document-