SmartOS Standalone Image API

This document outlines how to set up a standalone IMGAPI server on standalone SmartOS.
NOTE: None of this is needed on Triton.

Setup Image API Server

Fetch the list of Triton release images from https://updates.joyent.com/images on the global:

```
[root@smartos-sandbox-global /opt/images]# curl -so triton.images.json
https://updates.joyent.com/images?channel=release
[root@smartos-sandbox-global /opt/images]# ls -lrt
total 11531
-rw-r--r--   1 root     root     5779066 Nov 19 23:22 triton.images.json
```

You can view the list of channels at https://updates.joyent.com/channels. When you don't specify a channel it defaults to `dev`.

Get the UUID of the most recent image with the name `imgapi`. It will be the lowest `imgapi` image in `triton.images.json`. At the time of writing this the latest image UUID was `87d47f23-b7aa-43a8-befb-ffc29d98fe95`.

Download the manifest file of the latest Triton IMGAPI image:

```
[root@smartos-sandbox-global /opt/images]# curl -so
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
https://updates.joyent.com/images/87d47f23-b7aa-43a8-befb-ffc29d98fe95?channel=release
[root@smartos-sandbox-global /opt/images]# ls -lrt
total 11532
-rw-r--r--   1 root     root     5779066 Nov 19 23:22 triton.images.json
-rw-r--r--   1 root     root         697 Nov 19 23:33
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
```

Download the compressed ZFS archive file of the latest Triton IMGAPI image:

```
[root@smartos-sandbox-global /opt/images]# curl -so
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
https://updates.joyent.com/images/87d47f23-b7aa-43a8-befb-ffc29d98fe95/file?channel=rel
ease
[root@smartos-sandbox-global /opt/images]# ls -lrth
```

```
total 154987
-rw-r--r--   1 root     root       5.51M Nov 19 23:22 triton.images.json
-rw-r--r--   1 root     root         697 Nov 19 23:33
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
-rw-r--r--   1 root     root       70.0M Nov 19 23:40
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
```

Install the downloaded image:

```
[root@smartos-sandbox-global /opt/images]# imgadm install -m
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest -f
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
Installing image 87d47f23-b7aa-43a8-befb-ffc29d98fe95
(imgapi@release-20191107-20191107T003751Z-g3eab68f)
...87d47f23-b7aa-43a8-befb-ffc29d98fe95 [
]   0%  64.00KB                 Stderr from zfs receive: cannot receive: local origin
for clone zones/87d47f23-b7aa-43a8-befb-ffc29d98fe95-partial@final does not exist

Uncaught Error: write EPIPE

FROM
Socket.EventEmitter.emit (events.js:72:15)
Socket.onerror (_stream_readable.js:518:12)
Socket.EventEmitter.emit (events.js:95:17)
onwriteError (_stream_writable.js:239:10)
onwrite (_stream_writable.js:257:5)
WritableState.onwrite (_stream_writable.js:97:5)
fireErrorCallbacks (net.js:440:13)
Socket._destroy (net.js:478:3)
Object.afterWrite (net.js:723:10)
Abort (core dumped)
```

This means that this image depends on another image which is specified in the `origin` property of the image manifest. Check to see if the origin image is available in the default image repository (https://images.joyent.com/images).

```
[root@smartos-sandbox-global /opt/images]# grep origin
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
  "origin": "a9368831-958e-432d-a031-f8ce6768d190",
[root@smartos-sandbox-global /opt/images]# imgadm avail | grep
a9368831-958e-432d-a031-f8ce6768d190
[root@smartos-sandbox-global /opt/images]#
```

That means it's not available in the default SmartOS images repository so we need to get it from the Triton images repository (https://updates.joyent.com/images) which is the same place where we got the `imgapi` image from. Repeat the steps described above but for the origin image instead.

Download the origin image manifest file:

```
[root@smartos-sandbox-global /opt/images]# curl -so
imgapi.a9368831-958e-432d-a031-f8ce6768d190.imgmanifest
https://updates.joyent.com/images/a9368831-958e-432d-a031-f8ce6768d190?channel=release
[root@smartos-sandbox-global /opt/images]# ls -lhrt
total 154990
-rw-r--r--   1 root     root       5.51M Nov 19 23:22 triton.images.json
-rw-r--r--   1 root     root         697 Nov 19 23:33
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
-rw-r--r--   1 root     root       70.0M Nov 19 23:40
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
-rw-r--r--   1 root     root         906 Nov 19 23:55
imgapi.a9368831-958e-432d-a031-f8ce6768d190.imgmanifest
```

Download the origin image ZFS archive file:

```
[root@smartos-sandbox-global /opt/images]# curl -so
imgapi.a9368831-958e-432d-a031-f8ce6768d190.zfs.gz
https://updates.joyent.com/images/a9368831-958e-432d-a031-f8ce6768d190/file?channel=rel
ease
[root@smartos-sandbox-global /opt/images]# ls -lrth
total 249261
-rw-r--r--   1 root     root       5.51M Nov 19 23:22 triton.images.json
-rw-r--r--   1 root     root         697 Nov 19 23:33
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest
-rw-r--r--   1 root     root       70.0M Nov 19 23:40
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
-rw-r--r--   1 root     root         906 Nov 19 23:55
imgapi.a9368831-958e-432d-a031-f8ce6768d190.imgmanifest
-rw-r--r--   1 root     root       45.9M Nov 19 23:57
imgapi.a9368831-958e-432d-a031-f8ce6768d190.zfs.gz
```

Check to see if this origin image depends on another origin image:

```
[root@smartos-sandbox-global /opt/images]# grep origin
imgapi.a9368831-958e-432d-a031-f8ce6768d190.imgmanifest
  "name": "triton-origin-x86_64-18.4.0",
  "description": "Triton/Manta component origin image based on x86_64 18.4.0",
  "homepage": "https://github.com/joyent/triton-origin-image",
  "origin": "c2c31b00-1d60-11e9-9a77-ff9f06554b0f",
```

Looks like the origin image depends on another image. Check to see if this image is in the default SmartOS images repo:

```
[root@smartos-sandbox-global /opt/images]# imgadm avail | grep
c2c31b00-1d60-11e9-9a77-ff9f06554b0f
```

```
c2c31b00-1d60-11e9-9a77-ff9f06554b0f  minimal-64-lts                  18.4.0
smartos  zone-dataset  2019-01-21
```

Luckily this one is provided so install it:

```
[root@smartos-sandbox-global /opt/images]# imgadm import
c2c31b00-1d60-11e9-9a77-ff9f06554b0f
Importing c2c31b00-1d60-11e9-9a77-ff9f06554b0f (minimal-64-lts@18.4.0) from
"https://images.joyent.com"
Gather image c2c31b00-1d60-11e9-9a77-ff9f06554b0f ancestry
Must download and install 1 image (27.5 MiB)
Download 1 image
[================================================================================>]
100%  27.53MB   3.03MB/s     9s
Downloaded image c2c31b00-1d60-11e9-9a77-ff9f06554b0f (27.5 MiB)
...c2c31b00-1d60-11e9-9a77-ff9f06554b0f
[================================================================================>]
100%  27.53MB
Imported image c2c31b00-1d60-11e9-9a77-ff9f06554b0f (minimal-64-lts@18.4.0)
```

Now install the Triton origin image now that we've installed the image it relies on:

```
[root@smartos-sandbox-global /opt/images]# imgadm install -m
imgapi.a9368831-958e-432d-a031-f8ce6768d190.imgmanifest -f
imgapi.a9368831-958e-432d-a031-f8ce6768d190.zfs.gz
Installing image a9368831-958e-432d-a031-f8ce6768d190
(triton-origin-x86_64-18.4.0@master-20190410T193647Z-g982b0ce)
...a9368831-958e-432d-a031-f8ce6768d190
[================================================================================>]
100%  45.92MB  18.85MB/s     2s
Installed image a9368831-958e-432d-a031-f8ce6768d190
(triton-origin-x86_64-18.4.0@master-20190410T193647Z-g982b0ce)
```

Now try to install the original IMGAPI image again and it should work now that we have installed both of the images it depends on:

```
[root@smartos-sandbox-global /opt/images]# imgadm install -m
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.imgmanifest -f
imgapi.87d47f23-b7aa-43a8-befb-ffc29d98fe95.zfs.gz
Installing image 87d47f23-b7aa-43a8-befb-ffc29d98fe95
(imgapi@release-20191107-20191107T003751Z-g3eab68f)
...87d47f23-b7aa-43a8-befb-ffc29d98fe95
[================================================================================>]
100%  69.97MB  20.90MB/s     3s
Installed image 87d47f23-b7aa-43a8-befb-ffc29d98fe95
(imgapi@release-20191107-20191107T003751Z-g3eab68f)
```

Now we can create a zone from the IMGAPI image. Here is a sample JSON config:

```
[root@smartos-sandbox-global /opt/images]# cat imgapi.json
{
  "brand": "joyent",
  "image_uuid": "87d47f23-b7aa-43a8-befb-ffc29d98fe95",
  "autoboot": true,
  "alias": "imgapi",
  "hostname": "imgapi",
  "resolvers": [
    "8.8.8.8",
    "8.8.4.4"
  ],
  "max_physical_memory": 4096,
  "max_swap": 4096,
  "tmpfs": 4096,
  "quota": 120,
  "nics": [
    {
      "nic_tag": "admin",
      "ip": "10.10.50.201",
      "netmask": "255.255.255.0",
      "gateway": "10.10.50.1",
      "primary": true
    }
  ],
  "delegate_dataset": true,
  "customer_metadata": {
    "user-script": "/opt/smartdc/boot/standalone/user-script"
  }
}
```

The most important parts of this configuration are `image_uuid`, `delegate_dataset`, and `customer_metadata`. See IMGAPI Operator Guide for details. On Triton the imgapi-standalone-create script is run which creates the IMGAPI zone automatically but it doesn't run on standalone SmartOS so we need to manually do what it does which includes setting some metadata so that the `imgapi` service gets set up in the zone correctly.

Now create the zone from the image:

```
[root@smartos-sandbox-global /opt/images]# vmadm create -f imgapi.json
Successfully created VM 07e43f07-00f6-4761-bd19-c1a62cc9eded
[root@smartos-sandbox-global /opt/images]# vmadm list
UUID                                  TYPE  RAM      STATE             ALIAS
07e43f07-00f6-4761-bd19-c1a62cc9eded  OS    4096     running           imgapi
```

Now log in to the new IMGAPI zone and check the status of the `imgapi` service:

```
[root@smartos-sandbox-global /opt/images]# zlogin 07e43f07-00f6-4761-bd19-c1a62cc9eded
```

```
[Connected to zone '07e43f07-00f6-4761-bd19-c1a62cc9eded' pts/2]
Last login: Wed Nov 20 17:23:19 on pts/2
 =  J O Y E N T  =

    imgapi (release-20191107-20191107T003751Z-g3eab68f)
    https://github.com/joyent/sdc-imgapi.git
    triton-origin-x86_64-18.4.0@master-20190410T193647Z-g982b0ce

[root@imgapi-imgapi-07e43f07 ~]# svcs imgapi
svcs: Pattern 'imgapi' doesn't match any instances
STATE          STIME    FMRI
```

The service doesn't exist which is expected. This is because the `user-script` in the image (specified in `customer_metadata`) that sets up the zone and the `imgapi` service assumes this is a Triton system so there are some issues when run on a standalone SmartOS system.

Check the status of the `mdata:execute` service which is the service that runs the `user-script` when the zone boots:

```
[root@imgapi-imgapi-07e43f07 ~]# svcs -xv mdata:execute
svc:/smartdc/mdata:execute (Joyent SDC metadata handler)
 State: maintenance since Wed Nov 20 00:07:37 2019
Reason: Start method exited with $SMF_EXIT_ERR_FATAL.
   See: http://illumos.org/msg/SMF-8000-KS
   See: /var/svc/log/smartdc-mdata:execute.log
Impact: This service is not running.
```

Now check the `mdata:execute` service log to see why the service is in maintenance mode:

```
[root@imgapi-imgapi-07e43f07 ~]# tail /var/svc/log/smartdc-mdata:execute.log
[2019-11-20T00:07:36Z] /opt/smartdc/boot/standalone/setup.sh:97: main(): chown
nobody:nobody /data/imgapi/etc/authkeys/local
[[2019-11-20T00:07:36Z] /opt/smartdc/boot/standalone/setup.sh:101: main():
/opt/smartdc/imgapi/build/node/bin/node /opt/smartdc/imgapi/lib/config.js
[[2019-11-20T00:07:36Z] /opt/smartdc/boot/standalone/setup.sh:101: main(): json
manta.key
[2019-11-20T00:07:37Z] /opt/smartdc/boot/standalone/setup.sh:101: main(): privKeyPath=
[2019-11-20T00:07:37Z] /opt/smartdc/boot/standalone/setup.sh:102: main(): ln -s
/root/.ssh/
ln: cannot create ./.ssh/: Not a directory
[2019-11-20T00:07:37Z] /lib/svc/method/mdata-execute:50: main(): '[' 2 -gt 0 ']'
[2019-11-20T00:07:37Z] /lib/svc/method/mdata-execute:50: main(): user_script_exit=95
[2019-11-20T00:07:37Z] /lib/svc/method/mdata-execute:53: main(): exit 95
[ Nov 20 00:07:37 Method "start" exited with status 95. ]
```

If this is the same error you see then make the following changes to `/opt/smartdc/boot/standalone/setup.sh`:

```
[root@imgapi-imgapi-07e43f07 ~]# cd /opt/smartdc/boot/standalone
[root@imgapi-imgapi-07e43f07 /opt/smartdc/boot/standalone]# vi setup.sh
```

Replace the following two lines:

```
ln -s $privKeyPath ~/.ssh/
ln -s $privKeyPath.pub ~/.ssh/
```

With the following lines:

```
if [[ -n "$privKeyPath" ]]; then
    ln -s $privKeyPath ~/.ssh/
    ln -s $privKeyPath.pub ~/.ssh/
fi
```

Replace the following line:

```
/usr/sbin/svccfg delete pkgsrc/haproxy # avoid 'haproxy' FMRI collison
```

With the following lines:

```
if [[ $(svcs -a | grep -c pkgsrc/haproxy) -gt 0 ]]; then
    /usr/sbin/svccfg delete pkgsrc/haproxy # avoid 'haproxy' FMRI collison
fi
```

Replace the following line:

```
/usr/sbin/svccfg delete pkgsrc/stud # avoid 'stud' FMRI collison
```

With the following lines:

```
if [[ $(svcs -a | grep -c pkgsrc/stud) -gt 0 ]]; then
    /usr/sbin/svccfg delete pkgsrc/stud # avoid 'stud' FMRI collison
fi
```

Now log out of the zone, reboot it, and log back into it:

```
[root@imgapi-imgapi-07e43f07 /opt/smartdc/boot/standalone]# logout

[Connection to zone '07e43f07-00f6-4761-bd19-c1a62cc9eded' pts/2 closed]
[root@smartos-sandbox-global /opt]# vmadm reboot 07e43f07-00f6-4761-bd19-c1a62cc9eded
Successfully completed reboot for VM 07e43f07-00f6-4761-bd19-c1a62cc9eded
[root@smartos-sandbox-global /opt]# zlogin 07e43f07-00f6-4761-bd19-c1a62cc9eded
[Connected to zone '07e43f07-00f6-4761-bd19-c1a62cc9eded' pts/2]
Last login: Wed Nov 20 17:42:30 on pts/2
** This is a standalone IMGAPI instance.
**            uuid: 07e43f07-00f6-4761-bd19-c1a62cc9eded (imgapi)
**              dc:
**           owner: 00000000-0000-0000-0000-000000000000
```

```
**           image: 87d47f23-b7aa-43a8-befb-ffc29d98fe95
**   manta rootDir:
```

You'll notice that the MOTD now indicates that this is an IMGAPI zone because the `mdata:execute` service successfully installed the `imgapi` service.

Check the status of both services:

```
[root@imgapi-imgapi-07e43f07 ~]# svcs mdata:execute
STATE          STIME    FMRI
online         17:44:50 svc:/smartdc/mdata:execute
[root@imgapi-imgapi-07e43f07 ~]# svcs imgapi
STATE          STIME    FMRI
online         17:44:48 svc:/smartdc/site/imgapi:default
```

Now test the Image API by making a curl request to fetch the list of images:

```
[root@imgapi-imgapi-07e43f07 ~]# curl -k https://localhost/images
[]
```

Setup Image API CLI

Now that the Image API is successfully running in the zone we need to install the sdc-imgapi-cli on the global because the global is where we will be creating images from zones so the global will need to add these images to our image server by invoking the Image API against the IMGAPI zone via the `sdc-imgapi-cli`. (**NOTE**: `sdc-imgapi-cli` can also be installed on developer machines such as on your Mac). In order to install `sdc-imgapi-cli` on the global you need to first install pkgsrc-tools. Make sure to run the code under the "64-bit tools (SmartOS GZ)" section. Once pkgsrc-tools has been installed then install `nodejs`, `npm`, and `git`.

```
pkgin -y in nodejs npm git
```

Now install sdc-imgapi-cli:

```
npm install -g git+https://github.com/joyent/sdc-imgapi-cli.git
```

For some reason joyent-imgadm, sdc-imgadm and updates-imgadm all get symlinked so that they are in the PATH but imgapi-cli does not which is the one we need. Manually create the symlink:

```
[root@smartos-sandbox-global /opt/images]# ln -s
/opt/tools/lib/node_modules/imgapi-cli/bin/imgapi-cli /opt/tools/bin/imgapi-cli
[root@smartos-sandbox-global /opt/images]# which imgapi-cli
/opt/tools/bin/imgapi-cli
```

NOTE: The paths for the symlink will be different if not running this on a SmartOS global zone. Check the output of the `npm install` command for the correct paths.

Try listing the images now:

```
[root@smartos-sandbox-global /opt/images]# imgapi-cli list
imgapi-cli: error (InternalError):
```

It fails because by default the CLI assumes the Image API is running on localhost on port 8080 which you can see from the first two lines of output when you run `imgapi-cli`:

```
[root@smartos-sandbox-global /opt/images]# imgapi-cli
A demo imgapi-cli instance for talking to an IMGAPI.
This speaks to an IMGAPI running at <http://localhost:8080>.
...
```

In order to tell `imgapi-cli` where our Image API lives we need to set an environment variable:

```
[root@smartos-sandbox-global /opt/images]# export IMGAPI_CLI_URL=https://10.10.50.201
[root@smartos-sandbox-global /opt/images]#
```

```
[root@smartos-sandbox-global /opt/images]# imgapi-cli list
imgapi-cli: error (ClientError): Error: self signed certificate
```

Since we haven't yet installed a SSL cert the Image API is using a self signed cert by default. Export another variable to tell `imgapi-cli` not to complain about this:

```
[root@smartos-sandbox-global /opt/images]# export IMGAPI_CLI_INSECURE=true
[root@smartos-sandbox-global /opt/images]# imgapi-cli list
UUID  NAME  VERSION  FLAGS  OS  PUBLISHED
```

Now we have successfully called the Image API running on our IMGAPI zone to list the images on our own image server.

Configure Authentication

The last step is to configure authentication so that only authenticated users can call our Image API. See the Authentication section instructions. Authentication is only required on methods that manipulate images such as `CreateImage`, `AddImageFile`, `ActivateImage`, `DisableImage`, `EnableImage`, etc. `ListImages` does not require authentication, which is why it worked above without configuring authentication. See the Image API Docs for details. Be sure to restart the `imgapi` service in the IMGAPI zone after installing SSH keys. Also make sure that the installed SSH keys are owned by the same user who the `imgapi` process is running as (should be `nobody`).

Here is a sample set of variables you can export and throw in `/etc/profile` on the global:

```
[root@smartos-sandbox-global /opt/images]# tail -4 /etc/profile
export SDC_IMGADM_URL=https://10.10.50.201
export IMGAPI_CLI_URL=${SDC_IMGADM_URL}
export IMGAPI_CLI_USER=root
export IMGAPI_CLI_IDENTITY=/root/.ssh/id_rsa
export IMGAPI_CLI_INSECURE=true
```

NOTE: `SDC_IMGADM_URL` is not needed for `imgapi-cli`. It's only needed for `sdc-imgadm` which I had trouble with on standalone SmartOS and is meant for a Triton head node.

Create Image

The goal here is to create a custom image from an existing zone and then install that image on the IMGAPI server. The first thing to do is download the `sdc-imgapi` tools so that we can use the `smartos-prepare-image` script when creating our custom image:

```
[root@smartos-sandbox-global /opt/images]# mkdir /opt/smartdc
[root@smartos-sandbox-global /opt/images]# cd $_
[root@smartos-sandbox-global /opt/smartdc]# git clone
https://github.com/joyent/sdc-imgapi.git
Cloning into 'sdc-imgapi'...
remote: Enumerating objects: 121, done.
remote: Counting objects: 100% (121/121), done.
remote: Compressing objects: 100% (96/96), done.
remote: Total 6648 (delta 57), reused 60 (delta 25), pack-reused 6527
Receiving objects: 100% (6648/6648), 3.00 MiB | 3.78 MiB/s, done.
Resolving deltas: 100% (4531/4531), done.
[root@smartos-sandbox-global /opt/smartdc]# ls -l
total 3
drwxr-xr-x  14 root     root          24 Jan 31 19:10 sdc-imgapi
[root@smartos-sandbox-global /opt/smartdc]# ls -l
sdc-imgapi/tools/prepare-image/smartos-prepare-image
-rw-r--r--   1 root     root        2884 Jan 31 19:10
sdc-imgapi/tools/prepare-image/smartos-prepare-image
```

First create an image from an existing zone:
NOTE: Unfortunately we can't use the `imgadm -p <url>` argument because it does not currently (as of 01/31/2020) support authentication (neither does `imgadm publish`). From the `imgadm` man page:

```
Limitation: This does not yet support *authentication* that some
           IMGAPI image repositories require.
```

```
[root@smartos-sandbox-global /opt/images]# mkdir custom
[root@smartos-sandbox-global /opt/images]# cd $_
[root@smartos-sandbox-global /opt/images/custom]# uuid=$(vmadm lookup
alias=ds_image_build)
[root@smartos-sandbox-global /opt/images/custom]# imgadm create -c gzip -i -s
/opt/smartdc/sdc-imgapi/tools/prepare-image/smartos-prepare-image ${uuid} name=test_inc
version=1.0 public=true owner=00000000-0000-0000-0000-000000000000
Inheriting from origin image 92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb (postgresql 16.4.1)
Manifest:
```

```
    {
      "v": 2,
      "uuid": "61ccb00f-65ad-4966-957f-bed1af50b9ff",
      "name": "test_inc",
      "version": 1,
      "public": true,
      "owner": "00000000-0000-0000-0000-000000000000",
      "type": "zone-dataset",
      "os": "smartos",
      "requirements": {
        "networks": [
          {
            "name": "net0",
            "description": "public"
          }
        ],
        "min_platform": {
          "7.0": "20191107T010753Z"
        }
      },
      "users": [
        {
          "name": "pgsql"
        }
      ],
      "generate_passwords": true,
      "origin": "92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb"
    }
Stopping VM 3579cd3f-df03-e4e7-875a-b38f9326313e to snapshot it
Snapshotting VM "3579cd3f-df03-e4e7-875a-b38f9326313e" to @imgadm-create-pre-prepare
Preparing VM 3579cd3f-df03-e4e7-875a-b38f9326313e (starting it)
Prepare script is running
Prepare script succeeded
Prepare script stopped VM 3579cd3f-df03-e4e7-875a-b38f9326313e
Snapshotting to "zones/3579cd3f-df03-e4e7-875a-b38f9326313e@final"
Sending image file to "test_inc-1.zfs"
Saving manifest to "test_inc-1.imgmanifest"
Rollback VM 3579cd3f-df03-e4e7-875a-b38f9326313e to pre-prepare snapshot (cleanup)
Restarting VM 3579cd3f-df03-e4e7-875a-b38f9326313e (cleanup)
```

Now import the new custom image to the IMGAPI server:

```
[root@smartos-sandbox-global /opt/images/custom]# imgapi-cli import -m
test_inc-1.imgmanifest -f test_inc-1.zfs.gz
imgapi-cli: error (OriginDoesNotExist): origin image
"92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb" does not exist
```

The image fails to be created because we created the image incrementally using the `-i` flag which means we have to install the origin image (Joyent-provided base image) onto our IMGAPI server before we can install an incremental image on top of that.

Apparently on Triton you can do this to import the remote origin image:

```
imgapi-cli import 92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb -S
https://images.joyent.com?channel=release
```

But it doesn't seem to work on standalone SmartOS so you'll need to download the manifest and ZFS archive files manually from the remote image source:

```
[root@smartos-sandbox-global /opt/images]#
image_uuid=92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb
[root@smartos-sandbox-global /opt/images]# curl -so ${image_uuid}.imgmanifest
https://images.joyent.com/images/${image_uuid}?channel=release
[root@smartos-sandbox-global /opt/images]# curl -so ${image_uuid}.zfs.gz
https://images.joyent.com/images/${image_uuid}/file?channel=release
```

Now you should see both files in the current directory:

```
[root@smartos-sandbox-global /opt/images]# ls -lrt 92a57bb2*
-rw-r--r--   1 root     root        1002 Jan 31 18:46
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb.imgmanifest
-rw-r--r--   1 root     root     228289701 Jan 31 18:48
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb.zfs.gz
```

Now import the origin image into our IMGAPI server:

```
[root@smartos-sandbox-global /opt/images]# imgapi-cli import -m
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb.imgmanifest -f
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb.zfs.gz
Imported image 92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb (postgresql, 16.4.1,
state=unactivated)
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb
[==========================================================================>]
100% 217.71MB  42.70MB/s     5s
Added file "92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb.zfs.gz" (compression "gzip") to image
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb
Activated image 92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb
```

Now you should see it included in the list of images:

```
[root@smartos-sandbox-global /opt/images]# imgapi-cli list
UUID                                  NAME        VERSION  FLAGS  OS       PUBLISHED
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb  postgresql  16.4.1   P      smartos
2017-02-03T16:12:33Z
```

Now try to import the image again:

```
[root@smartos-sandbox-global /opt/images/custom]# imgapi-cli import -m
test_inc-1.imgmanifest -f test_inc-1.zfs.gz
Imported image 61ccb00f-65ad-4966-957f-bed1af50b9ff (test_inc, 1, state=unactivated)
61ccb00f-65ad-4966-957f-bed1af50b9ff
[==========================================================================>]
100%  10.47MB   5.19MB/s     2s
Added file "test_inc-1.zfs.gz" (compression "gzip") to image
61ccb00f-65ad-4966-957f-bed1af50b9ff
Activated image 61ccb00f-65ad-4966-957f-bed1af50b9ff
```

Now the image has been published to the new standalone IMGAPI server. Check to make sure it's in the list:

```
[root@smartos-sandbox-global /opt/images/custom]# imgapi-cli list
UUID                                  NAME        VERSION  FLAGS  OS       PUBLISHED
92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb  postgresql  16.4.1   P      smartos  2017-02-03T16:12:33Z
61ccb00f-65ad-4966-957f-bed1af50b9ff  test_inc    1        IP     smartos  2020-01-31T20:40:13Z
```

Now the custom image can be installed and used on any SmartOS server by importing it via `imgadm import` like usual.

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm import
61ccb00f-65ad-4966-957f-bed1af50b9ff
imgadm import: error (ActiveImageNotFound): an active image
"61ccb00f-65ad-4966-957f-bed1af50b9ff" was not found in image sources
```

But first you have to add our IMGAPI server as an additional source to `imgadm`. By default SmartOS has images.joyent.com as the only image source:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm sources
https://images.joyent.com
```

Add our IMGAPI server as an additional source:

```
[root@smartos-sandbox-global /opt/images/custom]# echo $IMGAPI_CLI_URL
https://10.10.50.201
[root@smartos-sandbox-global /opt/images/custom]# imgadm sources -a $IMGAPI_CLI_URL
imgadm sources: error (SourcePing): unexpected ping error with "imgapi" image source
"https://10.10.50.201": Error: DEPTH_ZERO_SELF_SIGNED_CERT
```

If the IMGAPI server only has a self signed SSL certificate then you need to add the `-k` argument:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm sources -k -a $IMGAPI_CLI_URL
imgadm sources: error (SourcePing): unexpected ping error with "imgapi" image source
"https://10.10.50.201": Error: DEPTH_ZERO_SELF_SIGNED_CERT
```

Same error so apparently the `-k` argument doesn't work. I found `IMGADM_INSECURE` in the `imgadm` man page which seems to do the trick:

```
[root@smartos-sandbox-global /opt/images/custom]# export IMGADM_INSECURE=1
```

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm sources -a $IMGAPI_CLI_URL
Added "imgapi" image source "https://10.10.50.201"
```

Now it should show up in the list of sources:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm sources
https://images.joyent.com
https://10.10.50.201
```

Now see our custom image is available:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm avail
uuid=61ccb00f-65ad-4966-957f-bed1af50b9ff
UUID                                  NAME      VERSION  OS       TYPE          PUB
61ccb00f-65ad-4966-957f-bed1af50b9ff  test_inc  1        smartos  zone-dataset
2020-01-31
```

Now install the custom image locally from the standalone IMGAPI server:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm import
61ccb00f-65ad-4966-957f-bed1af50b9ff
Importing 61ccb00f-65ad-4966-957f-bed1af50b9ff (test_inc@1) from "https://10.10.50.201"
Gather image 61ccb00f-65ad-4966-957f-bed1af50b9ff ancestry
Image 92a57bb2-ea2b-11e6-8caf-7f81ea0c32cb already installed
Must download and install 1 image (10.4 MiB)
Download 1 image
[================================================================================>]
100%  10.47MB
Downloaded image 61ccb00f-65ad-4966-957f-bed1af50b9ff (10.4 MiB)
...61ccb00f-65ad-4966-957f-bed1af50b9ff
[================================================================================>]
100%  10.47MB
Imported image 61ccb00f-65ad-4966-957f-bed1af50b9ff (test_inc@1)
```

Make sure it shows up in the list of locally installed images:

```
[root@smartos-sandbox-global /opt/images/custom]# imgadm list
uuid=61ccb00f-65ad-4966-957f-bed1af50b9ff
UUID                                  NAME      VERSION  OS       TYPE          PUB
61ccb00f-65ad-4966-957f-bed1af50b9ff  test_inc  1        smartos  zone-dataset
2020-01-31
```

All done!

FYI: Almost this entire document will be useless once we move to Triton which is one reason we should move to Triton ;-)