Improvements in CTDB and Clustered Samba testing

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SambaXP 2019
Overview

- Testing with CTDB local daemons
- Autocluster 1.x
Testing with CTDB local daemons
Testing with CTDB local daemons

Why?
- Test a subset of CTDB functionality on a single machine

Where?
- Developer workstation
- Nightly regression testing
- Samba autobuild
- GitLab CI
- ...

How?
- simple testsuite had the ability to start several daemons
- Daemons were started and stopped via dummy tests
- Less starts/stops made testing faster...
- ...but possibly error prone
Testing with CTDB local daemons

Why make this standalone?
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Testing with CTDB local daemons

Why make this standalone?

- A useful development and debugging tool
- Enable cluster testing in autobuild
- Test scalability: how many local daemons can we run?
- Cool hack?
Available commands

$ ./tests/local_daemons.sh -h
usage: ./tests/local_daemons.sh <directory> <command> [ <options>... ]

Commands:
  setup                  Set up daemon configuration according to given options
  start                  Start specified daemon(s)
  stop                   Stop specified daemon(s)
  onnode                 Run a command in the environment of specified daemon(s)
  print-socket           Print the Unix domain socket used by specified daemon(s)
  dump-logs              Dump logs for specified daemon(s) to stdout

All commands use <directory> for daemon configuration

Run command with -h option to see per-command usage
setup command usage

$ ./tests/local_daemons.sh foo setup -h
./tests/local_daemons.sh <directory> setup [ <options>... ]

Options:
- **F** Disable failover (default: failover enabled)
- **N** <file> Nodes file (default: automatically generated)
- **n** <num> Number of nodes (default: 3)
- **P** <file> Public addresses file (default: automatically generated)
- **R** Use a command for the recovery lock (default: use a file)
- **S** <library> Socket wrapper shared library to preload (default: none)
- **6** Generate IPv6 IPs for nodes, public addresses (default: IPv4)
Testing with CTDB local daemons

setup command demo

$ ./tests/local_daemons.sh foo setup -n 100
Node 87 will have no public IPs.
$ ls foo
node.0  node.1  node.2  node.3  node.4  node.5  node.6  node.7  node.8  node.9  nodes
node.10 node.11 node.12 node.13 node.14 node.15 node.16 node.17 node.18 node.19
node.20 node.21 node.22 node.23 node.24 node.25 node.26 node.27 node.28 node.29
node.30 node.31 node.32 node.33 node.34 node.35 node.36 node.37 node.38 node.39
node.40 node.41 node.42 node.43 node.44 node.45 node.46 node.47 node.48 node.49
node.50 node.51 node.52 node.53 node.54 node.55 node.56 node.57 node.58 node.59
node.60 node.61 node.62 node.63 node.64 node.65 node.66 node.67 node.68 node.69
node.70 node.71 node.72 node.73 node.74 node.75 node.76 node.77 node.78 node.79
node.80 node.81 node.82 node.83 node.84 node.85 node.86 node.87 node.88 node.89
node.90 node.91 node.92 node.93 node.94 node.95 node.96 node.97 node.98 node.99
node.100
$ ls foo/node.0
ctdb.conf  db  debug-hung-script.sh  events  functions  nodes  notify.sh  public_addresses  run  var
$ pidof ctdbd
$
start command usage

$ ./tests/local_daemons.sh foo start -h
usage: ./tests/local_daemons.sh <directory> start <nodes>

<nodes> can be "all", a node number or any specification supported by onnode
start command demo

$ ./tests/local_daemons.sh foo start 4
$ pidof ctdbd | wc -w
2
$ ./tests/local_daemons.sh foo start 0-9

>> NODE: 127.0.0.1 <<

>> NODE: 127.0.0.2 <<

>> NODE: 127.0.0.3 <<

...

>> NODE: 127.0.0.9 <<

>> NODE: 127.0.0.10 <<
$ pidof ctdbd | wc -w
20
$ ./tests/local_daemons.sh foo start all

>> NODE: 127.0.0.1 <<

...

>> NODE: 127.0.0.100 <<
$ pidof ctdbd | wc -w
200
onnode command usage

$ ./tests/local_daemons.sh foo onnode -h
usage: ./tests/local_daemons.sh <directory> onnode <nodes> <command>...

<nodes> can be "all", a node number or any specification supported by onnode
Testing with CTDB local daemons

onnnode command demo

$ ./tests/local_daemons.sh foo onnode 4 ctdb pnn
4
$ ./tests/local_daemons.sh foo onnode 4 ctdb nodestatus
pnn:4 127.0.0.5 OK (THIS NODE)
$ ./tests/local_daemons.sh foo onnode -q 0-9 ctdb nodestatus
pnn:0 127.0.0.1 OK (THIS NODE)
pnn:1 127.0.0.2 OK (THIS NODE)
pnn:2 127.0.0.3 OK (THIS NODE)
pnn:3 127.0.0.4 OK (THIS NODE)
pnn:4 127.0.0.5 OK (THIS NODE)
pnn:5 127.0.0.6 OK (THIS NODE)
pnn:6 127.0.0.7 OK (THIS NODE)
pnn:7 127.0.0.8 OK (THIS NODE)
pnn:8 127.0.0.9 OK (THIS NODE)
pnn:9 127.0.0.10 OK (THIS NODE)
$ ./tests/local_daemons.sh foo onnode 4 ctdb nodestatus all
Number of nodes:100
pnn:0 127.0.0.1 OK
...
pnn:4 127.0.0.5 OK (THIS NODE)
pnn:5 127.0.0.6 OK
...
pnn:99 127.0.0.100 OK
$ echo $? 0
stop command usage

$ ./tests/local_daemons.sh foo stop -h
usage: ./tests/local_daemons.sh <directory> stop <nodes>

<nodes> can be "all", a node number or any specification supported by onnode
stop command demo

$ ./tests/local_daemons.sh foo stop 5
$ pidof ctdbd | wc -w
198
$ ./tests/local_daemons.sh foo stop 90-99
$ pidof ctdbd | wc -w
178
$ ./tests/local_daemons.sh foo stop all
[127.0.0.6] connect() failed, errno=111
[127.0.0.6] Failed to connect to CTDB daemon (foo/node.5/run/ctdbd.socket)
[127.0.0.96] connect() failed, errno=111
[127.0.0.96] Failed to connect to CTDB daemon (foo/node.95/run/ctdbd.socket)
[127.0.0.97] connect() failed, errno=111
[127.0.0.97] Failed to connect to CTDB daemon (foo/node.96/run/ctdbd.socket)
[127.0.0.94] connect() failed, errno=111
[127.0.0.94] Failed to connect to CTDB daemon (foo/node.93/run/ctdbd.socket)
...
[127.0.0.100] connect() failed, errno=111
[127.0.0.100] Failed to connect to CTDB daemon (foo/node.99/run/ctdbd.socket)
[127.0.0.91] connect() failed, errno=111
[127.0.0.91] Failed to connect to CTDB daemon (foo/node.90/run/ctdbd.socket)
[127.0.0.93] connect() failed, errno=111
[127.0.0.93] Failed to connect to CTDB daemon (foo/node.92/run/ctdbd.socket)
[127.0.0.95] connect() failed, errno=111
[127.0.0.95] Failed to connect to CTDB daemon (foo/node.94/run/ctdbd.socket)
[127.0.0.99] connect() failed, errno=111
[127.0.0.99] Failed to connect to CTDB daemon (foo/node.98/run/ctdbd.socket)
$ pidof ctdbd | wc -w
0
dump-logs command usage

$ ./tests/local_daemons.sh foo dump-logs -h
usage: ./tests/local_daemons.sh <directory> dump-logs <nodes>

<nodes> can be "all", a node number or any specification supported by onnode

- <directory> (e.g. foo/) can be pulled from a remote test machine and dump-logs can then be run locally
- Alternatively, just produce an output file via dump-logs and retrieve that...
Testing with CTDB local daemons

dump-logs command demo

$ ./tests/local_daemons.sh foo dump-logs all | wc -l
2018270
$ ./tests/local_daemons.sh foo dump-logs all | tail -n 10
2019/05/16 15:59:40.147328 node.52 ctdb-eventd[21219]: Shutting down
2019/05/16 15:59:40.147431 node.40 ctdbd[20933]: 127.0.0.41:4379: node 127.0.0.53:4379 is dead
2019/05/16 15:59:40.147450 node.40 ctdbd[20933]: Tearing down connection to dead node :52
2019/05/16 15:59:40.147738 node.52 ctdbd[21211]: Shutdown sequence complete, exiting.
2019/05/16 15:59:40.147762 node.52 ctdbd[21211]: CTDB daemon shutting down
2019/05/16 15:59:40.148231 node.40 ctdb-eventd[20941]: 00.test: shutdown event
2019/05/16 15:59:40.148371 node.40 ctdb-eventd[20941]: Received signal 15
2019/05/16 15:59:40.148386 node.40 ctdb-eventd[20941]: Shutting down
2019/05/16 15:59:40.148751 node.40 ctdbd[20933]: Shutdown sequence complete, exiting.
2019/05/16 15:59:40.148770 node.40 ctdbd[20933]: CTDB daemon shutting down

$ ./tests/local_daemons.sh foo dump-logs 0-9 | tail -n 2000 | head -n 10
2019/05/16 15:59:31.337143 node.8 ctdbd[18786]: Control modflags on node 0 - Unchanged - flags 0x0
2019/05/16 15:59:31.337213 node.9 ctdbd[18810]: Control modflags on node 0 - Unchanged - flags 0x0
2019/05/16 15:59:31.337628 node.4 ctdbd[17963]: Control modflags on node 0 - Unchanged - flags 0x0
2019/05/16 15:59:31.344454 node.0 ctdbd[18617]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344470 node.1 ctdbd[18634]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344523 node.2 ctdbd[18657]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344605 node.3 ctdbd[18679]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344663 node.6 ctdbd[18740]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344726 node.7 ctdbd[18761]: Control modflags on node 1 - Unchanged - flags 0x0
2019/05/16 15:59:31.344776 node.8 ctdbd[18786]: Control modflags on node 1 - Unchanged - flags 0x0
Testing with CTDB local daemons

print-socket command usage

$ ./tests/local_daemons.sh foo print-socket -h
usage: ./tests/local_daemons.sh <directory> print-socket <nodes>

<nodes> can be "all", a node number or any specification supported by onnode
Testing with CTDB local daemons

print-socket command demo

$ ./tests/local_daemons.sh foo print-socket 0-9
foo/node.0/run/ctdbd.socket
foo/node.1/run/ctdbd.socket
foo/node.2/run/ctdbd.socket
foo/node.3/run/ctdbd.socket
foo/node.4/run/ctdbd.socket
foo/node.5/run/ctdbd.socket
foo/node.6/run/ctdbd.socket
foo/node.7/run/ctdbd.socket
foo/node.8/run/ctdbd.socket
foo/node.9/run/ctdbd.socket
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- When CTDB_TEST_MODE is set then ctdbd and ctdb tool look at CTDB_BASE (e.g. CTDB_BASE=foo/node.4)
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- `local_daemons.sh` sources some test infrastructure for:
  - finding things (e.g. helpers); and
  - setting up base directory for each node
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- `local_daemons.sh` sets `ONNODE_SSH` to its own ssh implementation, which sets `CTDB_BASE` depending on target node and then runs the given command in a shell.
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- `local_daemons.sh` sets `ONNODE_SSH` to its own ssh implementation, which sets `CTDB_BASE` depending on target node and then runs the given command in a shell
- Works nicely in CTDB’s simple testsuite, which runs in Samba autobuild
Autocluster 1.x
What is Autocluster < 1.0?
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- git://git.samba.org/autocluster.git

Originally a bash script, written by Tridge in July 2008... with supporting Kickstart scripts, libvirt XML templates and supporting scripts. Used to create and configure virtual clusters for testing CTDB. Didn't try to solve general virtualisation/deployment/configuration problem. Pre-dates Chef (January 2009), Vagrant (March 2010), OpenStack (October 2010), Ansible (February 2012) but not Puppet (2005). Maintained by me for over 10 years. Spike of activity in 2014 to add structure, separate out configuration stage from VM deployment. Martin Schwenke.
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Vagrant

Michael's demo looked very promising and has a git repo containing a useful starting point

Using alternate OS for cluster nodes should be easy
Create cluster of containers after a little extra development?

Ansible (mature, declarative, lightweight on nodes: SSH only)

January this year:
Could this be a Google Summer of Code project?

It would have to be feasible...

How do we determine feasibility?

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First, try Vagrant + vagrant-libvirt

- Starting a cluster with shared storage is racy (vagrant-libvirt issue #825)
- Mounting filesystem from host via NFS needs NFS packages...
  ...which aren’t in base image (aka. ‘box’)...
  ...but package installation times out if network is slow...
  ...so don’t install packages in Vagrant...
  ...so don’t use shared/synced folders...
- vagrant-cachier is unreliable...and uses NFS — no!
- vagrant-timezone/Ruby can’t work out host timezone
- Sometimes private network interfaces do not come up
- Private networks controlled by NetworkManager by default — problems with node reboot
Minimal Vagrant + vagrant-libvirt solution
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- Configure using basic Vagrant capabilities:
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  - Proxies based on host proxies
  - Private networks, not controlled by NetworkManager
  - Default route
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  - Proxies based on host proxies
  - Private networks, not controlled by NetworkManager
  - Default route
- Configure/check with short helper scripts:
  - Password-less SSH root access to and between nodes
  - Check that configured IP addresses for private networks are present
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- Read it again! Awesome!
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- Result...

$ git show --stat 51ff83d | tail -n 1
  69 files changed, 1169 insertions(+)
Ansible playbook —

$ cat ansible/node/site.yml
---
- import_playbook: ad.yml
- import_playbook: base.yml
- import_playbook: build.yml
- import_playbook: cbuild.yml
- import_playbook: storage.yml
- import_playbook: test.yml
- import_playbook: nas.yml

$ cat ansible/node/nas.yml
---
- hosts: nas-nodes
  remote_user: root

roles:
  - common
  - clusterfs
  - nasrepos
  - ctdb
  - storage
  - nas
Ansible playbook — roles

$ find ansible/node/ -maxdepth 2 -type d
ansible/node/
ansible/node/roles
ansible/node/roles/common
ansible/node/roles/build
ansible/node/roles/clusterfs
ansible/node/roles/nas
ansible/node/roles/nasrepos
ansible/node/roles/ad
ansible/node/roles/storage
ansible/node/roles/ctdb
Ansible playbook — common role main task

```yaml
$ cat ansible/node/roles/common/tasks/main.yml
---
- include_tasks: "{{ ansible_os_family | lower }}/{{ task }}.yml"
  with_list:
  - packages
  - firewall
  - ntp
  loop_control:
    loop_var: task

- meta: flush_handlers

- include_tasks: generic/{{ task }}.yml
  with_list:
  - selinux
  - autocluster
  - hosts
  - resolv_conf
  - ssh
  ...
  loop_control:
    loop_var: task
```

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Improvements in CTDB and Clustered Samba testing
Ansible playbook — common role tasks

```
$ ls -1 ansible/node/roles/common/tasks/*
anible/node/roles/common/tasks/main.yml

ansible/node/roles/common/tasks/generic:
autocluster.yml
hosts.yml
mount_home.yml
resolv_conf.yml
rsyslog.yml
selinux.yml
ssh.yml
timezone.yml

ansible/node/roles/common/tasks/redhat:
firewall.yml
ntp.yml
packages.yml
```
Ansible playbook — storage role

$ cat ansible/node/roles/storage/tasks/main.yml
---
- include_tasks: generic/{{ task }}.yml
  with_list:
  - clusterfs-{{ clusterfs.type }}
loop_control:
  loop_var: task

$ ls -l ansible/node/roles/storage/tasks/generic
clusterfs-gpfs-once.yml
clusterfs-gpfs.yml
Integration into bash script

Both use a YAML configuration file... generated by shell script from shell configuration file.

Can I write a Python script to parse YAML config and produce an old-style shell configuration for the few remaining variables needed in the script?

Of course!

Hmmm... there isn't a lot of shell script left...

Why not invoke vagrant and ansible-playbook from the Python script?

Wow! It's all just a small Python script now!

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Improvements in CTDB and Clustered Samba testing
Integration into bash script

- Integrate running ansible-playbook
- Integrate running vagrant
Integration into bash script

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- Both use a YAML configuration file...
Integration into bash script

- Integrate running `ansible-playbook`
- Integrate running `vagrant`

Both use a YAML configuration file...

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Autocluster 1.x

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How much Python?

Includes shared storage volume creation and deletion

Doesn't include additional host setup functionality
How much Python?

$ git show --oneline --stat 5cc52f2
5cc52f2 Rewrite autocluster in Python

  Makefile     |   8 +- 
  autocluster.py | 729 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  autocluster.spec.in | 10 ++-
  defaults.yml       | 102 ++++++++++++++++++++++++++
  example.yml         | 34 ++++++++ 

5 files changed, 874 insertions(+), 9 deletions(-)
How much Python?

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   defaults.yml | 102 ++++++++++++++++++++++++++  
   example.yml |  34 ++++++++++  
5 files changed, 874 insertions(+), 9 deletions(-)

- Includes shared storage volume creation and deletion
- Doesn’t include additional host setup functionality
How much removed?
How much removed?

$ git show --oneline --stat acab4ff | cat
acab4ff Remove bash autocluster script and supporting files
  README                       | 43 +--
  autocluster                    | 1639 ------------------------
...
  ./scripts/cluster_configure/cluster-configure.py | 452 ------
...
  ./all/root/scripts/tasks/setup_clusterfs_gpfs.sh | 208 ---
...
  config.d/00base.defconf        | 546 ------
  config.d/02kickstart.defconf   | 47 -
  config.d/05diskimage_guestfish.defconf | 193 ---
  config.d/05diskimage_guestmount.defconf | 150 --
  config.d/05diskimage_loopback.defconf | 237 ---
  config.d/10shareddisk.defconf  | 311 ----
...
  templates/nas-kickstart.cfg    | 122 --
  templates/node.xml            | 35 -
  vircmd                        | 161 --
117 files changed, 2 insertions(+), 7211 deletions(-)
Experiments

Docker containers? Vagrant CentOS 7 docker image (roboxes/centos7) can not be used with Vagrant: no vagrant user
Vagrant CentOS 7 docker image (roboxes/centos7) can not be upgraded: RPM checksum failure on a systemd package
systemd + SELinux + Docker == raging dumpster fire
SELinux is not namespaced
Disabling SELinux in Docker container disables it on host
Must run host in permissive mode
Vagrant does not set up private networks in Docker containers
Some of this attempt is stashed away in a branch
VirtualBox
Have libvirt, so no motivation to use this directly
Learned some things about VirtualBox + Vagrant
Have untested VirtualBox support is stashed away in a branch

Improvements in CTDB and Clustered Samba testing
Experiments

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  - Vagrant CentOS 7 docker image (roboxes/centos7) can not be upgraded: RPM checksum failure on a systemd package
  - `systemd + SELinux + Docker == raging dumpster fire`
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**Autocluster 1.x**

**Improvements in CTDB and Clustered Samba testing**

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**Martin Schwenke**
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Improvements in CTDB and Clustered Samba testing
What has been lost?

- Some IBM TSM (hierarchical storage management) support
- Support for testing vsftpd and httpd
- Multipath access to shared storage
- Support for iSCSI shared storage
What has been won?

- Maintainability
- Base images (aka. 'boxes') are someone else's problem
- Ease of adding target platforms (e.g. Debian)
- Ease of adding alternate cluster filesystems
- Integrated host setup command and Ansible playbook
- Improvements in CTDB and Clustered Samba testing
Autoccluster 1.x

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Autocluster 1.x

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- Integrated host setup command and Ansible playbook
To do?

PLAY RECAP ****************************************************
m1ad1 : ok=35 changed=1 unreachable=0 failed=0
m1base1 : ok=28 changed=0 unreachable=0 failed=0
m1build1 : ok=33 changed=2 unreachable=0 failed=0
m1cbuild1 : ok=39 changed=3 unreachable=0 failed=0
m1n1 : ok=89 changed=22 unreachable=0 failed=0
m1n2 : ok=73 changed=14 unreachable=0 failed=0
m1n3 : ok=73 changed=14 unreachable=0 failed=0

Not a high priority because the focus is on initial configuration rather than ongoing configuration management.

Add some variations previously mentioned.

Improve host setup?
To do?

- Make Ansible playbooks more idempotent:

  PLAY RECAP

  ************************************************************************
  m1ad1          : ok=35  changed=1  unreachable=0  failed=0
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Improvements in CTDB and Clustered Samba testing
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  Not a high priority because the focus is on initial configuration rather than ongoing configuration management

- Add some variations previously mentioned

- Improve host setup?
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Questions?