

## ipdb: How to use it with Nornir

Python comes with a debugger called pdb. The python debugger is very powerful and really facilitates troubleshooting code. You can find the official documentation [here](#). `ipdb` builds on top of `ipython` and `pdb` to give users a more interactive experience.

This how to isn't very extensive, it's just a very quick and dirty demo to show some of it's capabilities and how to use it with nornir. It doesn't assume previous knowledge but doesn't spend too much on explanations either so it expects users to give enough material for further investigation.

### Installing ipdb

First, you will need to install `ipython`, follow the official guide to do so, then you will need to install `ipdb`. You can install the latter via pip:

```
pip install ipdb
```

### Finding and fixing a bug with ipdb

For the sake of the demo I have written some code that contains a bug. The code is not important but what it does is:

1. Read a yaml file containing a bunch of users we want to have configured on our devices
2. Connect to a couple of network devices and get the users configured
3. Check with users are already configured, which ones we want and compute two lists; a list with the users we need to configure and another list with the ones we need to remove.
4. Finally, we pass those lists to a template and we generate some configuration.

First, let's run the script:



```
nvim demo.py
1 demo.py
2 import logging
3
4 import ruamel.yaml
5
6 from nornir import InitNornir
7 from nornir.plugins.functions.text import print_result
8 from nornir.plugins.tasks.networking import napalm_get
9 from nornir.plugins.tasks.text import template_file
10
11 def manage_users(task, desired_users):
12     # get users from device
13     state_users = task.run(
14         task=napalm_get, getters=["users"], severity_level=logging.DEBUG
15     )
16
17     # let's verify if the users we got are in desired_users
18     # if they are not we have to remove them
19     users_to_remove = []
20     import ipdb; ipdb.set_trace()
21     for user in state_users.result["users"]:
22         if user not in desired_users:
23             users_to_remove = user
24
25     # we render the template for the platform passing
26     # desired_users and users_to_remove
27     task.run(
28         task=template_file,
29         path=f"5_manage_users/templates/{task.host.platform}",
30         template="users.j2",
31         desired_users=desired_users,
32         remove_users=users_to_remove,
33         # severity_level=logging.DEBUG,
34     )
35
36
37 def main():
38     nr = InitNornir(
39         core={"num_workers": 1},
40         inventory={
41             "options": {
42                 "host_file": "5_manage_users/inventory/hosts.yaml",
43                 "group_file": "5_manage_users/inventory/groups.yaml",
44             }
45     }
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47     nr.run(manage_users)
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49 if __name__ == "__main__":
50     main()
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```

Python: nornir-workshop/notebooks
26 # desired_users and users_to_remove

ipdb> users_to_remove
[]
ipdb> desired_users
OrderedDict([('joe', None), ('jane', None), ('admin', None)])
ipdb> state_users.result["users"]
{'admin': {'password': '$1$waUQAep0$kSmdRL84F5sCoWKHZ8/kU1', 'sshkeys': [], 'level': 15}, 'bob': {'password': '$1$waUQAep0$kSmdRL84F5sCoWKHZ8/kU1', 'sshkeys': [], 'level': 15}}
ipdb> n
> /home/dbarroso/workspace/dravetech/nornir-workshop/notebooks/demo.py(22)manage_users()
21     for user in state_users.result["users"]:
--> 22         if user not in desired_users:
23             users_to_remove = user

ipdb> user
'admin'
ipdb> n
> /home/dbarroso/workspace/dravetech/nornir-workshop/notebooks/demo.py(21)manage_users()
20     import ipdb; ipdb.set_trace()
--> 21     for user in state_users.result["users"]:
22         if user not in desired_users:

ipdb>
> /home/dbarroso/workspace/dravetech/nornir-workshop/notebooks/demo.py(22)manage_users()
21     for user in state_users.result["users"]:
--> 22         if user not in desired_users:
23             users_to_remove = user

ipdb> user
'bob'
ipdb> n
> /home/dbarroso/workspace/dravetech/nornir-workshop/notebooks/demo.py(23)manage_users()
22         if user not in desired_users:
--> 23             users_to_remove = user
24

ipdb>
> /home/dbarroso/workspace/dravetech/nornir-workshop/notebooks/demo.py(21)manage_users()
20     import ipdb; ipdb.set_trace()
--> 21     for user in state_users.result["users"]:
22         if user not in desired_users:

ipdb> users_to_remove
'bob'
ipdb>

```

In the capture above you can see we used `l` to show the code around current break point and then we printed some of the variables in it.

Now we can keep executing the code line by line with `n` and print the variables to see what's going on. A few things to note:

- we can see how the execution loops around in the for loop
- we can also see how the user "admin" doesn't meet the criteria in line 22 causing the code to loop back to line 21
- when we run the loop for user "bob", the condition in line 22 is met so we go to line 23

At this point we can print `users_to_remove` and realize we assigned a string even though we started by assigning an empty list to it. This would explain why "bob" turns into "b", "o", "b" (strings are iterables like lists). Let's exit `ipdb`:



```
nvim demo.py
1 demo.py
2 import logging
3
4 import ruamel.yaml
5
6 from nornir import InitNornir
7 from nornir.plugins.functions.text import print_result
8 from nornir.plugins.tasks.networking import napalm_get
9 from nornir.plugins.tasks.text import template_file
10
11 def manage_users(task, desired_users):
12     # get users from device
13     state_users = task.run(
14         task=napalm_get, getters=["users"], severity_level=logging.DEBUG
15     )
16
17     # let's verify if the users we got are in desired_users
18     # if they are not we have to remove them
19     users_to_remove = []
20     for user in state_users.result["users"]:
21         if user not in desired_users:
22             users_to_remove.append(user)
23
24     # we render the template for the platform passing
25     # desired_users and users_to_remove
26     task.run(
27         task=template_file,
28         path=f"5_manage_users/templates/{task.host.platform}",
29         template="users.j2",
30         desired_users=desired_users,
31         remove_users=users_to_remove,
32         # severity_level=logging.DEBUG,
33     )
34
35
36 def main():
37     nr = InitNornir(
38         inventory={
39             "options": {
40                 "host_file": "5_manage_users/inventory/hosts.yaml",
41                 "group_file": "5_manage_users/inventory/groups.yaml",
42                 "defaults_file": "5_manage_users/inventory/defaults.yaml",
43             }
44     }
45 )
46
47     nr.run(task=manage_users, desired_users=["root", "admin"])
48
49     print_result(nr)
50
51 if __name__ == "__main__":
52     main()
53
54 master> demo.py[+] 41/22/60
```

And now let's run the code again:



