Step-by-step guide to running a simple trading algorithm in the cloud using Python, Alpaca, and AWS

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Setting up AWS with Python with Alpaca Trade API

It is always challenging for a new quant trader to get an algorithm up and running live in the cloud. In my last post, I wrote an instruction for using PythonAnywhere.

This walkthrough focuses on the basics of setting up AWS with Python, the Alpaca Trade API, and running a basic algorithm.

Amazon Web Services (AWS) - Cloud Computing Services

Amazon Web Services offers reliable, scalable, and inexpensive cloud computing services. Free to join, pay only for...

aws.amazon.com

Alpaca Documents

All about Alpaca.

docs.alpaca.markets

AWS may seem daunting at first, but is well worth the time to get comfortable with. The benefits of AWS include billing by usage and a free

tier of cloud services, meaning you can get up and running with zero upfront cost!

Let's jump in with a fresh account.

Step 1.) Sign up for AWS.

https://aws.amazon.com/

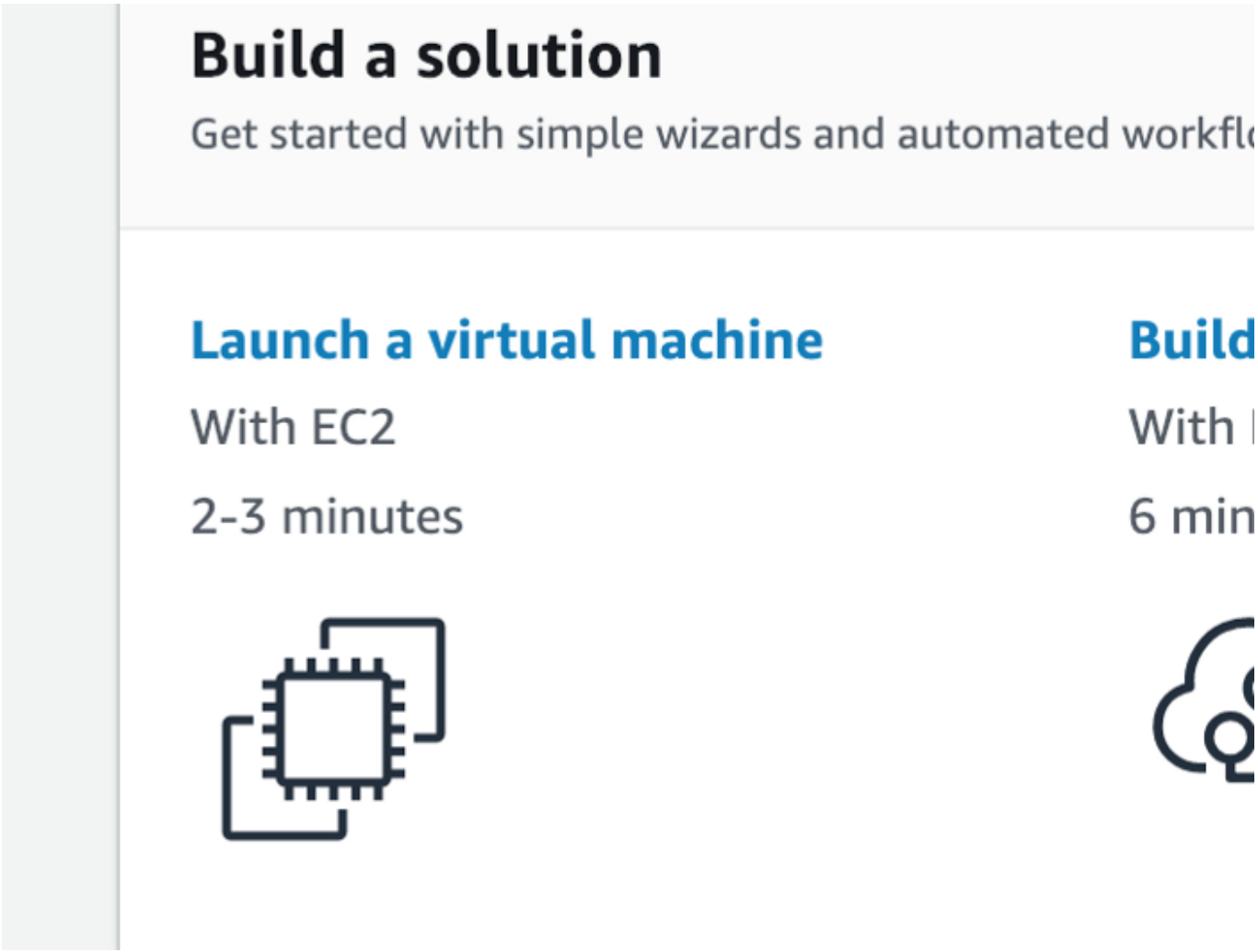
AWS will ask you for a credit card and phone number to verify your account, but you do not need to spend a dime to get started.

Go to the console sign-in.

Step 2.) Launch EC2 instance.

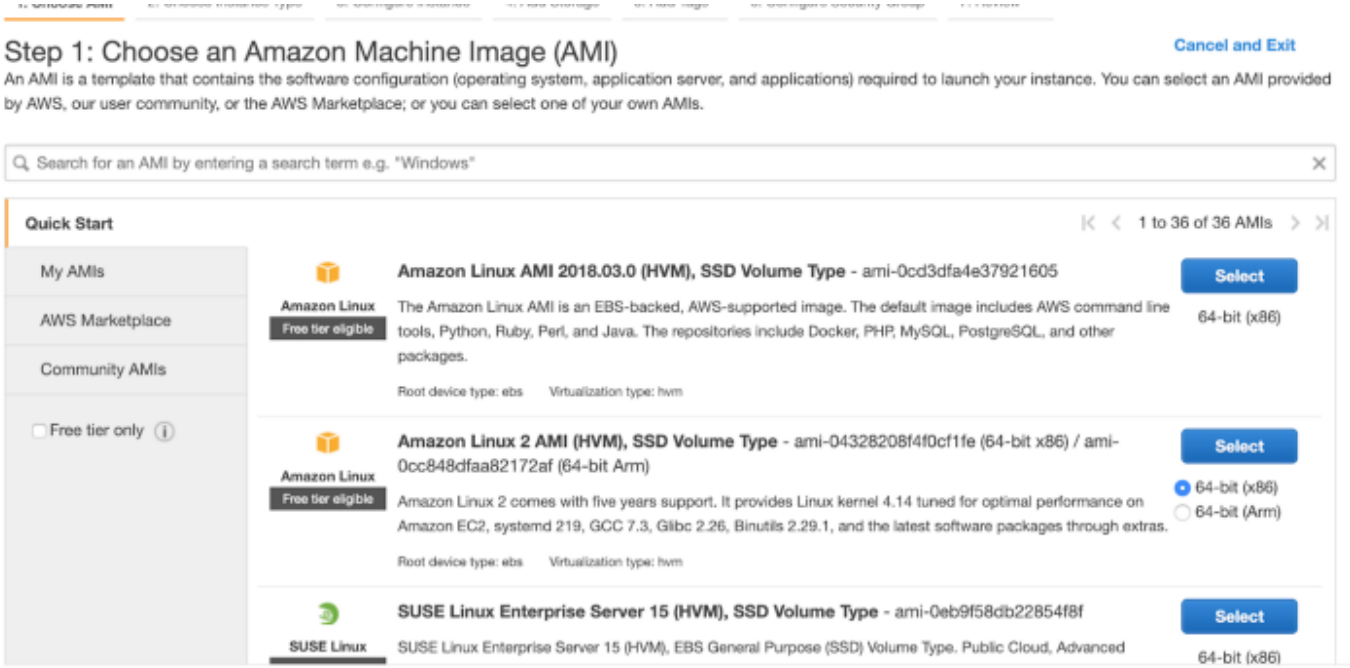
When you sign in, "Launch a virtual machine" with EC2 on your front page. Click that.

(Or, search "EC2" and click the "Launch Instance" button.)

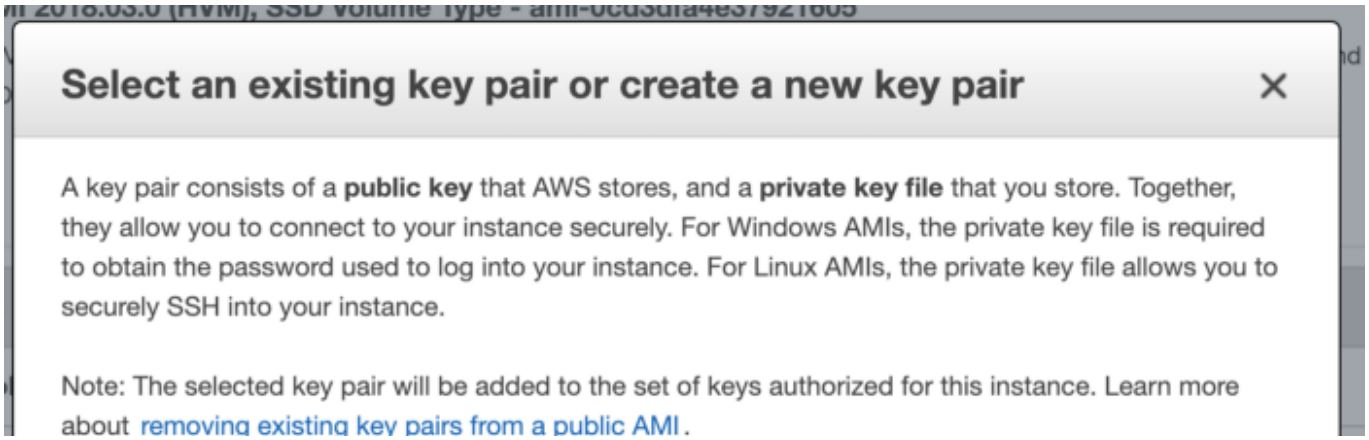


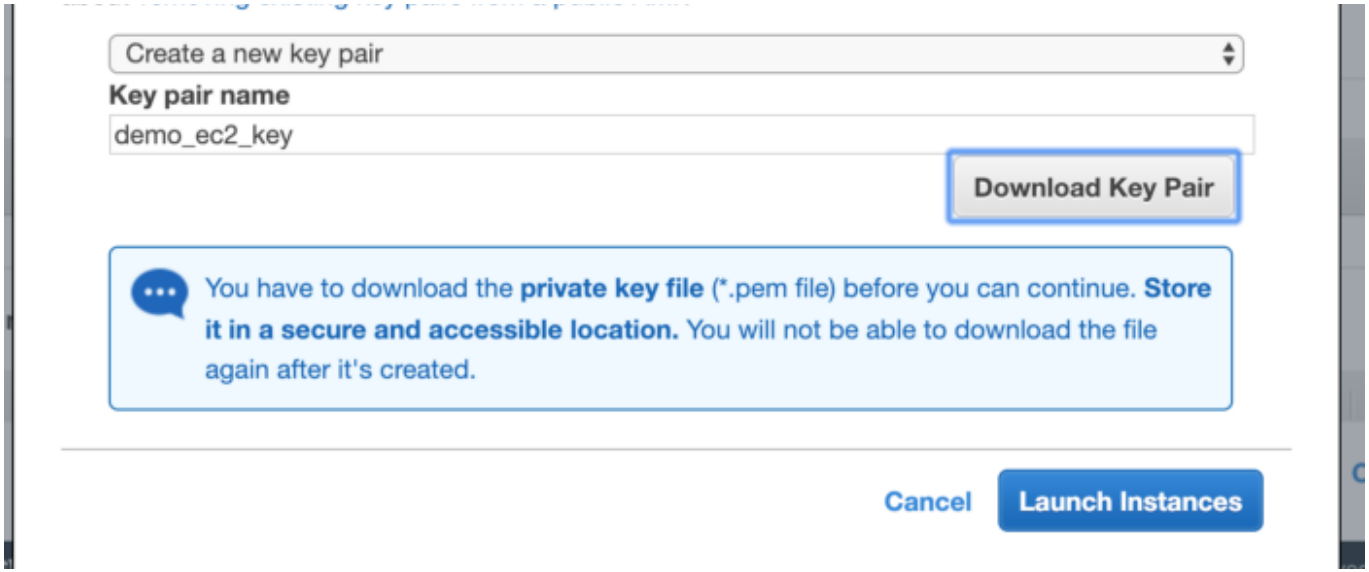
Click the “Amazon Linux 2 AMI” free tier eligible option.

Use the t2.micro free tier eligible and click “Review and Launch”.



You'll get notified to set a security group if this is your first time create a new key pair and download the .pem file. **You'll need the path to this file later.**

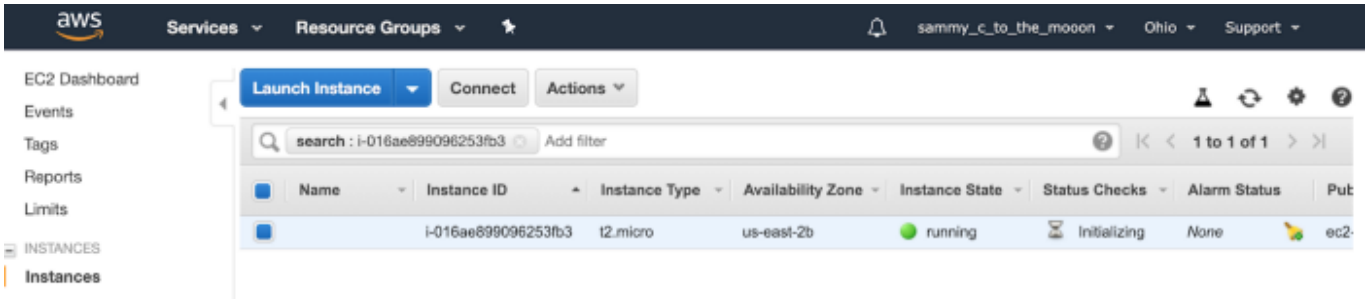




Click “Launch Instances”. Click the instance id link on the following page to go to your EC2 instances.

Step 3.) SSH to instance from local computer.

Your instance will take a bit to initialize, while it’s doing that, copy your public DNS.



Open a terminal window (I'm doing this from Mac OSX) and type the following:

```
ssh -i [path to your key here] ec2-user@[your public DNS here]
```

My example:

```
ssh -i demo_ec2_key.pem ec2-user@ec2-18-220-99-177.us-east-
2.compute.amazonaws.com
```

(If you ever use a different image, your log-in may be `ubuntu@[yourDNShere]`)

*Some troubleshooting may be required. In this case, my connection was timing out, so I searched “EC2 timeout” and found the solution. In my security group, I had to specify port 22 as inbound traffic. This was because I originally skipped the security group step above, by default your security group should include port 22 for inbound traffic.

How to fix your key permissions

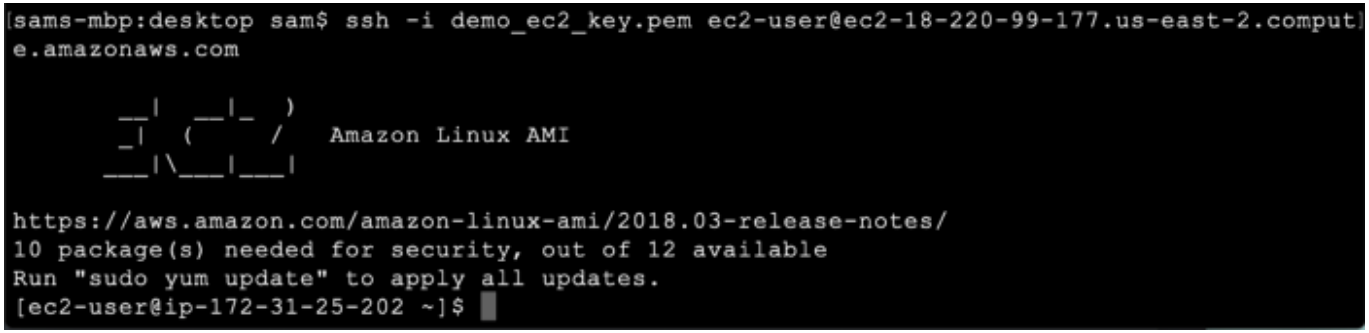
The first time you try to connect, you’ll probably get “bad permissions” as a result:

```
sams-mbp:desktop sam$ ssh -i demo_ec2_key.pem ec2-user@ec2-18-220-99-177.us-east-2.compute.amazonaws.com
The authenticity of host 'ec2-18-220-99-177.us-east-2.compute.amazonaws.com (18.220.99.177)' can't be established.
ECDSA key fingerprint is SHA256:QNTVT8dRK3PpwbT7LdOp+C+qxOgRU37My0NZWJmk7lg.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-18-220-99-177.us-east-2.compute.amazonaws.com,18.220.99.177' (ECDSA) to the list of known hosts.
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@         WARNING: UNPROTECTED PRIVATE KEY FILE!          @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
Permissions 0644 for 'demo_ec2_key.pem' are too open.
It is required that your private key files are NOT accessible by others.
This private key will be ignored.
Load key "demo_ec2_key.pem": bad permissions
ec2-user@ec2-18-220-99-177.us-east-2.compute.amazonaws.com: Permission denied (publickey).
sams-mbp:desktop sam$
```

All you have to do fix this is run:

```
sudo chmod 600 [path to your key]
```

Now run the command again. This screen means you did everything correctly:



Step 4.) Set up Alpaca Trade API.

Step 4A.) Install Python 3

Enter `python -V` to see what version of python you're running. By default, I get 2.7. Run the following to install Python3.7:

```
sudo yum install python37
```

Step 4B.) Install Alpaca Trade API

```
pip3 install --user alpaca-trade-api
```

Now your EC2 instance should be good to go! Keep this window up for later.

Step 5.) Copy your algo over to EC2.

For this tutorial, we'll be running the following sample algorithm. The strategy is a simple EMA crossover, checking a list of stocks every 1 minute.

```
import alpaca_trade_api as tradeapi
import time
import datetime
from datetime import timedelta
from pytz import timezone
tz = timezone('EST')

import numpy as np
import pandas as pd

api = tradeapi.REST('your api key here',
```

```
                    'your api secret code here',
                    'https://paper-api.alpaca.markets')

import logging
logging.basicConfig(filename='./apca_algo.log', format='%(name)s - %(levelname)s - %(message)s')
logging.warning('{} logging started'.format(datetime.datetime.now().strftime("%x %X")))

def get_data_bars(symbols, rate, slow, fast):

    data = api.get_barset(symbols, rate, limit=20).df

    for x in symbols:
        data.loc[:, (x, 'fast_ema')] = data[x]['close'].rolling(window=fast).mean()
        data.loc[:, (x, 'slow_ema')] = data[x]['close'].rolling(window=slow).mean()
    return data

def get_signal_bars(symbol_list, rate, ema_slow, ema_fast):
    data = get_data_bars(symbol_list, rate, ema_slow, ema_fast)
    signals = {}
    for x in symbol_list:
        if data[x].iloc[-1]['fast_ema'] > data[x].iloc[-1]['slow_ema']: signal = 1
        else: signal = 0
        signals[x] = signal
    return signals

def time_to_open(current_time):
    if current_time.weekday() <= 4:
        d = (current_time + timedelta(days=1)).date()
    else:
        days_to_mon = 0 - current_time.weekday() + 7
        d = (current_time + timedelta(days=days_to_mon)).date()
    next_day = datetime.datetime.combine(d, datetime.time(9, 30, tzinfo=tz))
    seconds = (next_day - current_time).total_seconds()
    return seconds
```

```

def run_checker(stocklist):
    print('run_checker started')
    while True:
        # Check if Monday-Friday
        if datetime.datetime.now(tz).weekday() >= 0 and datetime.datetime.now(tz).weekday() <= 4
            # Checks market is open
            print('Trading day')
            if datetime.datetime.now(tz).time() > datetime.time(9, 30) and datetime.datetime.now
                signals = get_signal_bars(stocklist, '5Min', 20, 5)
                for signal in signals:
                    if signals[signal] == 1:
                        if signal not in [x.symbol for x in api.list_positions()]:
                            logging.warning('{} {} - {}'.format(datetime.datetime.now(tz).strftir
                            api.submit_order(signal, 1, 'buy', 'market', 'day')
                            # print(datetime.datetime.now(tz).strftime("%x %X"), 'buying', signa
                    else:
                        try:
                            api.submit_order(signal, 1, 'sell', 'market', 'day')
                            logging.warning('{} {} - {}'.format(datetime.datetime.now(tz).strftir
                        except Exception as e:
                            # print('No sell', signal, e)
                            pass

                time.sleep(60)
            else:
                # Get time amount until open, sleep that amount
                print('Market closed ({})'.format(datetime.datetime.now(tz)))
                print('Sleeping', round(time_to_open(datetime.datetime.now(tz))/60/60, 2), 'hour
                time.sleep(time_to_open(datetime.datetime.now(tz)))
        else:
            # If not trading day, find out how much until open, sleep that amount
            print('Market closed ({})'.format(datetime.datetime.now(tz)))
            print('Sleeping', round(time_to_open(datetime.datetime.now(tz))/60/60, 2), 'hours')
```

```
            time.sleep(time_to_open(datetime.datetime.now(tz)))

stocks = ['AA','AAL','AAPL','AIG','AMAT','AMC','AMD',
          'AMGN','AMZN','APA','BA','BABA','BAC','BBY',
          'BIDU','BP','C','CAT','CMG','COP','COST',
          'CSCO','CVX','DAL','DIA','DIS','EBAY',]

print('test:')
print(get_data_bars(['AA'], '5Min', 20, 5).head())

run_checker(stocks)
```

alpaca algo aws hosted with ♡ by GitHub view raw

Open a new terminal window, and run the following:

```
scp -i [path to your key] [path to your algo] ec2-user@[your public
DNS]:/~
```

My example:

```
scp -i demo_ec2_key.pem apca_5min_ema.py ec2-user@ec2-18-220-99-
177.us-east-2.compute.amazonaws.com:~/
```

Go over to your original EC2 window, and run `ls` to check if the upload worked.

You should see your algorithm listed in the directory. Test it by running `python3 apca_5min_ema.py`.

Step 7.) Closing your terminal without quitting your algo.

Start a new instance of screen

In order to keep our algo running without quitting when we disconnect, we can use a handy Linux command, `screen`. Go ahead and run it.

This will pop up a new, blank terminal. It's actually another window of your terminal. Now run `python3 apca_algo.py`.

Hit **CTRL + A + D** to detach the screen and return to your normal terminal.

Now you can type `screen -ls` to see your process is still running.

Typing `tail apca_log.log` confirms this as well, seeing the results in our log file.

Hit **CTRL + D** to logout of EC2 altogether.

Log into your Alpaca account, and confirm your orders are being placed.

Reconnecting to your screen

To get back to your algo, log into EC2 with SSH.

Run `screen -ls` to see what screens are running. You should see something like:

```
There is a screen on:
     3634.pts-0.ip-172-31-34-247 (Detached)
1 Socket in /var/run/screen/S-ec2-user.
```

That long screen id is what you'll type in next to reconnect:

```
screen -r 3634.pts-0.ip-172-31-34-247
```

Alternatively, if you just want to quit the screen you can use `ps aux | grep apca_5min_algo.py` to see the process ID:

```
ec2-user 3658 0.1 6.4 427400 65388 pts/1 S+ 22:14 0:00 python3
apca_5min_ema.py
ec2-user 3726 0.0 0.1 119468 1040 pts/0 S+ 22:20 0:00 grep —
color=auto apca_5min_ema.py
```

Then, you can use `screen -XS [process id] quit` to quit the screen immediately. My example:

```
screen -SX 3658 quit
```

Finally, confirm if you've quit your algo with `screen -ls` .

There you have it! This should give you a good starting point for spinning up new EC2 instances, navigating AWS, and managing your algorithms.

References:

Step 1: Launch an Amazon EC2 Instance - AWS Quick

Start Guide

Quick start guide to launching an EC2 instance.

docs.aws.amazon.com

Linux screen Command: Keep Processes Running Despite a Dropped Connection

I guess you all know this: you are connected to your server with SSH and in the middle of compiling some software (e.g...

www.howtoforge.com

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