

FogBus Deep Learning Tutorial - EdgeLens (Aneka Only)

Shreshth Tuli¹

June 2019

1 Introduction

This tutorial or step-by-step guide shows you how to setup your own Fog and Cloud Computing Environment using Windows PCs or similar edge node devices used for IoT applications. This specific tutorial is to setup a deep learning based Yolo Object detection and segmentation tool called EdgeLens.

Using Apache server and HTTP REST APIs you will be able to setup communication between Fog devices having a Master/Slave architecture. An “Aneka Master” is the Fog node that distributes work between the “Aneka Worker” nodes. A Master can itself also act as a Worker.

2 Configuring Cloud

2.1 Point-to-site PN setup on Azure

Configure Microsoft Azure VM network using the following steps:

1. Create a Virtual Network
 - Named - VNET-01
 - Address Space - 10.10.0.0/16
 - Subnet - 10.10.10.0/24
2. Create a GatewaySubnet within the Virtual Network
 - GatewaySubnet - 10.10.1.0/24
3. Create a Virtual Network Gateway
 - Associate to Virtual Network VNET-01
 - This takes Azure 45 minutes to complete
4. Create a VM within the Virtual Network VNET-01, Windows Server 2016 Data center
5. Create the Root VPN Certificate
 - Run the command: `$cert = New-SelfSignedCertificate -Type Custom -KeySpec Signature -Subject "CN=REBELROOT" -KeyExportPolicy Exportable -HashAlgorithm sha256 -KeyLength 2048 -CertStoreLocation "Cert:" -KeyUsageProperty Sign -KeyUsage CertSign`
 - Export root cert as .cer (without password) as Base64 encoded. See in the Windows certificate manager for the root certificate installed in the "Personal" Folder.
6. Create the Client Certificate
 - Command - `New-SelfSignedCertificate -Type Custom -DnsName REBELCLIENT -KeySpec Signature -Subject "CN=REBELCLIENT" -KeyExportPolicy Exportable -HashAlgorithm sha256 -KeyLength 2048 -CertStoreLocation "Cert:" -Signer $cert -TextExtension @("2.5.29.37=text1.3.6.1.5.5.7.3.2")`
 - Find Cert in *Personal\Certificates* and Export to BASE64 with Password
 - This pfx file must be installed and distributed to users with VPN Software
7. Get up Gateway Point to Site Setting
 - Address Space - 172.20.20.0/24
 - Set up Root Certificate

- Name - AzureVPN
 - Cert as the key in the certificate's base64 file. Open root cert with text editor and copy-paste key to AzureVPN
8. Download VPN Software and install it
 9. Install Client and Root Certs
 10. Connect VPN via Network Connections
- Install Aneka as done for windows machine.

2.2 Setup Aneka on Azure VM

Now we need to Install Aneka in the Azure Virtual Machine for which follow the steps:

1. Install .NET framework
 - (a) Open Server Manager
 - (b) Click on “Add Roles and Features”
 - (c) Install .NET 3.5 or higher
 - (d) Restart VM
2. Disable firewall and antivirus
 - (a) Open Settings
 - (b) Go to Security and Update settings
 - (c) Turn off real time scanning in Windows Defender
 - (d) Search for Windows Firewall Settings
 - (e) Click on “Turn Firewall On or Off”
 - (f) Turn off firewall for both public and private networks
 - (g) Restart VM
3. Install Aneka
 - (a) Open Web browser - Internet Explorer
 - (b) Go to Settings > Internet Settings > Security
 - (c) Click on “Custom Settings”
 - (d) Enable Downloads
 - (e) Click Apply and close window
 - (f) Go to Manjrasoft website and download Aneka Installer
 - (g) Install and configure Aneka

3 Running EdgeLens

Download XAMPP from the following [link](#) and Install XAMPP. Run XAMPP and start Apache and MySQL service.

Go to *C:/xampp/htdocs/* and create folder named “EdgeLens”. Download “EdgeLens” data from this [link](#) and transfer files in the *FogBus-DDL/EdgeLens* folder to this EdgeLens folder.

Go to the folder *C:/xampp/htdocs/EdgeLens/* and open terminal. Run the following commands to run analyzer:

```
1 ./run.sh
```

Press + R, type “cmd” and then press “Enter”. On the command prompt type “ipconfig” and note the IPv4 address for future use.

To run EdgeLens on Windows machines as Master go to:

http://localhost/EdgeLens/.

In web browser and open terminal at *C:/xampp/htdocs/EdgeLens/* and run the following command:

```
1 ./run.sh
```

Configure Aneka container in the Master node and Aneka Worker container in the Azure Virtual Machine. Make sure that the Master node is connected to the Azure virtual network through VPN. Start Aneka software by running:

```
1 C:\xampp\htdocs\EdgeLens\Aneka\EdgeLens\EdgeLens\bin\Debug\EdgeLens.exe
```

If you do not run the *./run.sh* and in the *master.php* configure to “Disable Master” and “Enable Aneka” then only Aneka would run.

4 Configuring Android Device

To configure an android device to send camera/images to the FogBus framework, download the android app from FogBus-DDL

Android

EdgeLens.apk into the Android device. Install the app in android device and follow the following steps:

1. Turn on device and then open the EdgeLens app
2. You would be greeted by an EdgeLens screen. Enter the Master IP and click on “Click New”.
3. Send the image for analysis

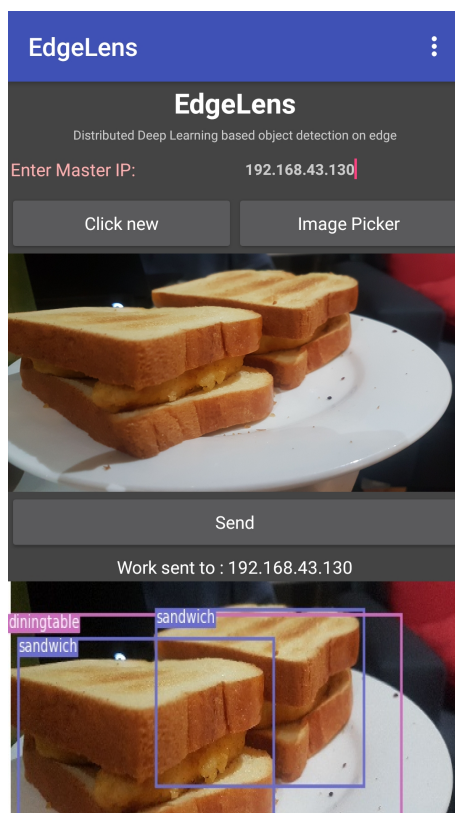


Figure 1: Android application

5 Further Information

For further information and queries please contact:

Shreshth Tuli

Undergraduate Student
Department of Computer Science Engineering
Indian Institute of Technology, Delhi
Email : shreshttuli@gmail.com

Dr. Rajkumar Buyya

Redmond Barry Distinguished Professor
Director, Cloud Computing and Distributed Systems (CLOUDS) Lab
School of Computing and Information Systems
The University of Melbourne
Room 7.22, Doug McDonnell Building, Parkville Campus
Melbourne, VIC 3010, Australia
Phone: +61-3-8344 1344 (office)
Email: rbuyya@unimelb.edu.au
URL: <http://www.buyya.com> — <http://www.cloudbus.org/~raj>

Appendix

Installation script : Worker

Install Java

```
1 sudo apt-get update
2 sudo apt-get upgrade
3 sudo apt-get install oracle-java8-jdk -y
4 sudo apt-get install ant git vim -y
```

Install Apache, PHP and MySQL

```
1 sudo apt-get install apache2 -y
2 sudo vim /etc/apache2/apache2.conf
```

Now on the bottom of the file type “i” to append document and add the following line:

```
1 ServerName 127.0.0.1
```

To test Apache, run:

```
1 sudo apache2ctl configtest
```

The output of this command should be : “Syntax OK”. If yes, then Apache is installed and configured properly.

Now install PHP and MySQL using:

```
1 sudo apt-get install php libapache2-mod-php php-mcrypt php-mysql -y
2 sudo service apache2 restart
3 sudo apt-get install mysql-server -y
4 sudo mysql_secure_installation
```

When asked for password, enter “raspberrry”. For all other questions except the last question answer “n”, and for last “y”.

Now, configure MySQL and add database named “data” using:

```
1 sudo mysql -u root -p
2 CREATE DATABASE data;
3 show databases;
4 GRANT ALL PRIVILEGES ON data.* TO 'root'@'localhost' IDENTIFIED BY 'raspberrry';
5 FLUSH PRIVILEGES;
6 exit;
```

Install PHPMyAdmin using:

```
1 sudo apt-get install phpmyadmin -y
```

When prompted to choose server : select “Apache2”. In the Configure PHP-MyAdmin, select “No”.

Now add PHPMyAdmin configuration to Apache2 using:

```
1 sudo vim /etc/apache2/apache2.conf
```

In the end of file, select “i” to insert and add the following line:

```
1 Include /etc/phpmyadmin/apache.conf
```

Restart apache service using:

```
1 sudo service apache2 restart
```

Now, go to the html folder and add “EdgeLens” scripts using following commands:

```
1 cd /var/www/html/  
2 sudo mkdir EdgeLens/  
3 sudo chmod -R 777 EdgeLens/
```

Download “EdgeLens” data from this [link](#) and transfer files in the “Worker” folder to the, just created, EdgeLens folder. in the `/var/www/html/` path.

On terminal run the following commands to run the Analyzer:

```
1 cd /var/www/html/EdgeLens  
2 sudo chmod 777 *  
3 javac ./analyzer.java  
4 java analyzer
```

In another tab of terminal run:

```
1 hostname -I
```

It will show the IPv4 address of the machine. Note it for future use.