

Cloud Computing
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Lecture – 17
Case study with a commercial cloud: Microsoft Azure

Hi, let us continue our discussion on cloud computing. Today what we will discuss is one of the one some demo on a commercial cloud namely Microsoft azure. So, to see that how it works. So, as such I need to I let me mention that there is no specific preference for using azure though it is a very popular and use worldwide. So, the more of a it is showing a demo on the things as my students are comfortable on this that we thought that there demo and you will be good. And Secondly, we will be using a free login of this is azure. So, that it will be easy for you to replicate those who were interested to you can basically create your own login, and try this type of things. And I have a fill that how really a commercial cloud works, right.

So, that is the major motivation and any other type of things any other type of commercial or open source cloud you can use there is no, no nothing binding on the thing, but just to show that how to work on. The thing azure as we know that it is popularly a popularly a more popular for a platform as a service maintained by Microsoft, have data centers Microsoft a data center across the globe, and as a huge user base for the things, right.

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Microsoft Azure : An overview

- Microsoft Azure is a growing collection of integrated cloud services which developers and IT professionals use to build, deploy and manage applications through a global network of datacenters.
- With Azure, developers get the freedom to build and deploy wherever they want, using the tools, applications and frameworks of their choice.

Source: <https://azure.microsoft.com/en-in/>

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So, if you look at Microsoft azure over view the it is a growing collection of integrated cloud services, which developers and IT professional used to build deploy and manage applications through a global network of datacenter right. Maintained by Microsoft in this case. With azure developers gets the freedom to build and deploy, wherever they want using the tools application and frameworks of their choice.

So that means, it gives ubiquitous access to that for developing the things as we mentioned it is a primarily a paas type of services platform as a services it is extremely useful for I t professional. And developers to develop apps over the this over this platform. And any type of further matter it is true for any type of paas type of cloud, where the developers have a this developing platform, looking of developing different type of apps on the thing, right. With without having installation and infrastructure on their own their own premises. Microsoft azure you can use there was a on the cloud or on one premise that sort of absence are also there.

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Microsoft Azure

- Microsoft Azure platform is one of PaaS vendors
- Based on .NET and Microsoft's supported development tools
- Microsoft Azure starts general availability at Feb 2010, and builds the global data center around the world

North American Data Centers: Chicago, San Antonio
European Data Centers: Dublin, Amsterdam
Asian Data Centers: Hong Kong, Singapore

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So, as I was mentioning there Microsoft as a global presence and of data centers. And this picture we have taken again most of the things we have taken from Microsoft azure website.

So, these are this picture maybe little figure may be little old than maybe there are different type of data center. The idea is to say that is a global presence of data sensors which are interconnected and user can hooking to the azure as a cloud without bothering that where the it is actual application or the platform is like.

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Azure Platform

A group of cloud technologies, each providing a specific set of services to application developers

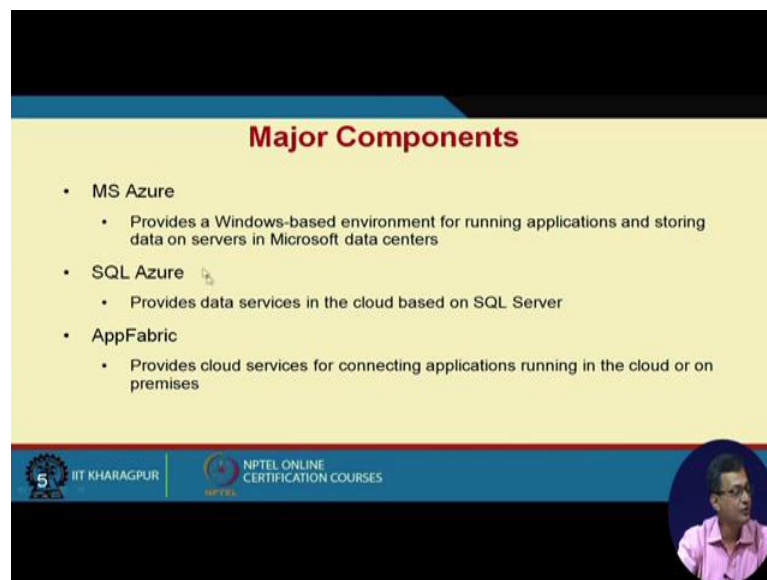
Cloud Applications: Cloud Applications, Windows Azure, SQL Azure, Windows Azure Platform AppFabric

On-Premises Applications: Windows, Others

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So, if you look at the azure platform it is a group of cloud technologies is providing a specific set of services to the applications. So, one the core is that azure or the Microsoft azure thing where the cloud applications are launched there is a SQL azure which gives a SQL server type of support there is a windows azure platform, windows azure platform fabric right. And the windows or other users on premise applications they can hook into this components.

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The slide is titled "Major Components" in red text. It lists three main components with their descriptions:

- MS Azure
 - Provides a Windows-based environment for running applications and storing data on servers in Microsoft data centers
- SQL Azure
 - Provides data services in the cloud based on SQL Server
- AppFabric
 - Provides cloud services for connecting applications running in the cloud or on premises

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So, if you look at the major components as we mentioned one is the Microsoft azure, provides a windows based environment for running application and storing data on servers in Microsoft data centers. SQL azure provides data services in the cloud based SQL server, and app fabric provides cloud services for connecting application running in cloud or on premises. So, it is important that there is app fabric it is say provides cloud services for connecting applications which may be running on the cloud, or on premise on premise servers and every things. So, it gives this a versatile way of connecting to different type of applications with a backend databases. So, it is it is say truly a development platform, and paas is suppose to be a developed platform.

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MS Azure

- Customers use it to run applications and store data on Internet-accessible machines owned by Microsoft
- Those applications might provide services to businesses, to consumers, or both

The diagram illustrates the MS Azure architecture. At the top, 'Businesses' and 'Consumers' are shown as groups of icons. Below them, the 'Internet' is represented by a globe. Two blue arrows point from the Internet to a central box labeled 'Applications' and 'Data'. This central box is labeled 'Windows Azure' and is situated above a row of server racks labeled 'Microsoft Data Centers'.

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So, look at the other it look at a Microsoft azure customer, use to run application and stored data on data in internet accessible many machines or the which can be connected through the network connection and owned by or supported maintained by the Microsoft.

In case of Microsoft azure for other service provider there are other things those application might provide services to businesses to consumers or both right. So, provide services to business says services to consumer and look like here the picture shows that can be business oriented things like whole of your or a development things or partial of the development platform etcetera you leverage on the azure platform or it can be the individual consumer or customers which can connect to the things and here the azure fabric is there basic azure and which connect to it is backbone of bare metal systems, and it has data repository or data store. And then the applications which allows you to connect to the external world. So, and we have a broad network connectivity for serving the thing.

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Azure

- **MS Azure** is a foundation for running applications and storing data in the cloud
- Provides *compute* and *storage* services for cloud applications

The diagram shows a server rack labeled 'Windows Azure' connected to a cloud icon. A callout box contains three colored blocks: a red block labeled 'Compute', a blue block labeled 'Storage', and a green block labeled 'Fabric' at the bottom.

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So, azure is a foundation for running applications and storing data in the cloud. So, it provides as a as a cloud service provider, it is a foundation for running application and storing in the cloud provides compute, and storage services for cloud applications right. So, similarly it is compute storage and fabric. So, fabric is primarily binding the things with the bare metal that different data centers the resources etcetera. So, it is it keeps a layer above the things which allows for virtualization another type of supports.

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Components

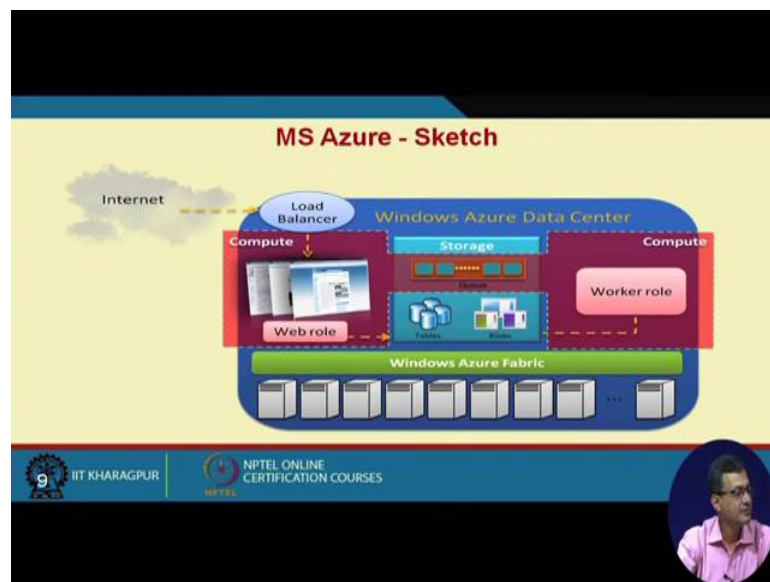
- **Compute**
 - Running applications
 - Support applications that have a very large number of simultaneous users and that can scale out
- **Storage**
 - Storing and accessing data
 - Applications require storage as simple blobs, a more structured way to store information, or a way to exchange data between different parts of an application
- **Fabric**
 - Managing resources
 - Providing a common way to manage and monitor applications that use this cloud platform

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So, if we look at the component wise that uses the one is the compute component run running applications. Support applications that have a very large number of simultaneous users and that can scale out, right. So, it can scale up scale down and type of things.

Storage storing and access accessing data, applications request storage as a simple as simple blobs a more structure way to store information or a way to exchange data between different parts of the applications. So, it is more of a storage type of services and the fabric managing resources. So, whatever the underlying resources there the azure fabric allows to manage these resources. So, provide a common way to manage monitor applications that use the cloud platform. So, it as a monitoring tool to see that how that uses are there and basically managing the underlining resources or the bear metal resources that the backbone.

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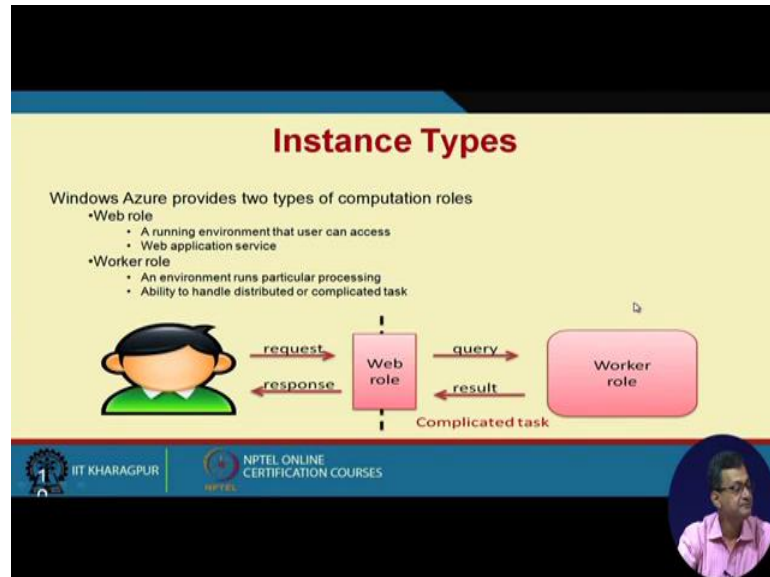


So, if you have the overall sketch. So, you have this bear metal at the things this azure fabrics which is the which basically interact with this resources or manages the resources. And then we have they are different type of thing compute storage compute and there are there are different things web role worker role, then tables blobs which are which are more about the storage more component of the storage part.

So, user are connected user customers or businesses connects to the things through a through the internet there is a load balancers, which look at that which distribute the load

which has the web role which allows you to be the connector to the worker role of the compute.

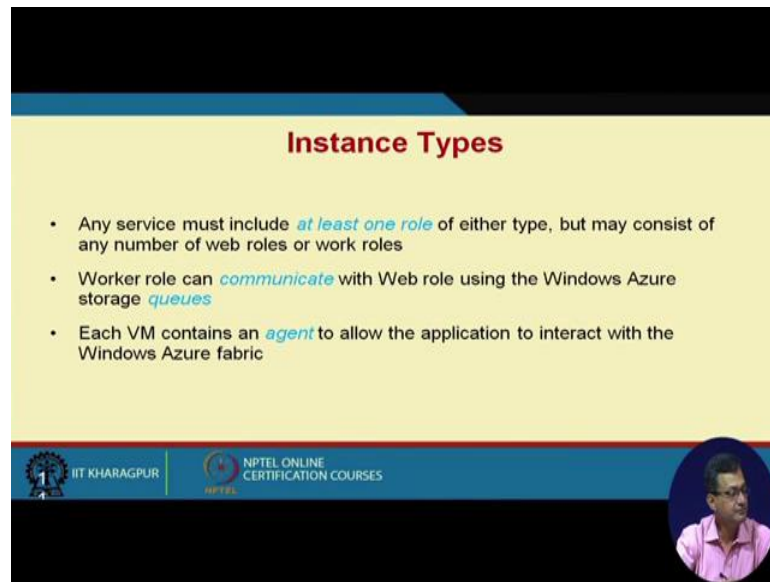
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So, if you look at the instance type as we have discussed in the last slide. So, azure provides 2 types of computational role, one is the web role a running environment that users can access right. So, the user can access through internet. And web application service. So, these are the 2 things which are the web role and the worker role. And environment running particular processing alright. And ability to handle distributed or complicated tag or complex task. So, this is the worker rule. So, user request it is a web role it goes to the query as a worker role and re results and response comes into other way.

So, it is more of a acts as a interface between the complex task or completed task with the other ended the user of the consumer.

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The slide is titled "Instance Types" in red text. It contains three bullet points: "Any service must include *at least one role* of either type, but may consist of any number of web roles or work roles", "Worker role can *communicate* with Web role using the Windows Azure storage *queues*", and "Each VM contains an *agent* to allow the application to interact with the Windows Azure fabric". The slide footer includes the IIT Kharagpur logo, the NPTEL Online Certification Courses logo, and a circular inset photo of a man in a pink shirt.

So, instance type any service must include at least one role of either type, but may consist any number of a web roles or worker roles right. So, that is important worker role can communicate with web role using azure storage queues right. So, the worker rule can communicate with the web role in the storage queues which we have seen in this picture see this is set of queues here it has a if this in the storage section of the thing or storage component. Each VM contains an agent a contains an agent to allow the application to interact with the azure fabric. So, each VM has a agent to which interact has a which can interact with the azure framework, which interact communicate with the underlining resources.

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The slide features a yellow background with a blue header and footer. The main title is "Deploy anywhere with your choice of tools" in bold red text. Below the title is a bullet point: "Connecting cloud and on-premises with consistent hybrid cloud capabilities and using open source technologies". The central part of the slide contains three diagrams: 1) "Build your apps, your way" showing various programming language icons (Python, Java, PHP, etc.); 2) "Connect on-premises data and apps" showing a server rack connected to a cloud icon; 3) "Extend the cloud on-premises" showing a cloud icon connected to a server rack. At the bottom right of the slide content, there is a source link: "Source: <https://azure.microsoft.com/en-in/>". The footer includes the IIT KHARAGPUR logo on the left and the NPTEL ONLINE CERTIFICATION COURSES logo in the center. A small circular inset image of a man in a pink shirt is visible in the bottom right corner of the slide.

So, what is tries to give right. So, it deploy anywhere with your choice of tools. So, it gives a flexibility to give to deploy your application anywhere with the choice of tools. So, it connecting cloud an on premises with consistent hybrid capabilities and using open source technologies right. So, it has a ability it of cloud and on premises with consistent hybrid capabilities and using open source technology. So, it is what is a time. So, if you look at. So, it is one part of the looking at it is a build your apps your own way right. So, you can have your own apps connect on premise data and apps right. And extend the cloud on premises right. So; that means, one way is that you can develop your apps one way is that connect on premise data and app applications if required. And extend the cloud on premises right. So, you can extend those things pull it to this on premise applications.

So, what Microsoft try to focus on or try to give services that it is a it is a versatile of developing apps, it is a it and connect to your own on premise data and applications and you can extend that cloud component to with the on premise type of this. There are these are required for different type of applications or data which are something maybe a proprietary in nature, some are legacy applications running on the things. And some things which may not which may not be so much so much high level of security or high level of proprietary things are there which can always you can run on the cloud and have more versatile or quick access one things. So, they also provide some of the protection

mechanisms helps to protect assets through rigorous methodology and focus on security privacy compliance and transparency, right.

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Protection Mechanism

- Azure helps to protect assets through a rigorous methodology and focus on security, privacy, compliance and transparency.

Achieve global scale in local regions Detect and mitigate threats Rely on the most trusted cloud

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So, achieve global scale in local region detect and mitigate threats and rely on most trusted cloud.

So; that means, what it is tries to gives is that different security features privacy compliance transparency which gives a trust or a confident in the user base to use the assumes. So, that the thing and that is expected for any cloud provider that the selection of the cloud provider depends on how much how other than how much versatile or what type of services we are providing what type of security to my data and applications are there So that they try to pull it.

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Accelerate App Innovation

- Build simple to complex projects within a consistent portal experience using deeply-integrated cloud services, so developers can rapidly develop, deploy and manage their apps.

Build apps quickly and easily Manage apps proactively Deliver mobile apps seamlessly

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The other things are accelerate app innovations we will simple to complex projects within consistent portal experience using deeply integrated cloud service. So, developers can rapidly develop deploy and manage their applications.

So, that that exactly as we have discussed earlier also that exactly the one of the reasons we are going for cloud right. I need to rapidly develop deploy and manage applications. Now as azure is primarily a plat form as a service. So, if there is the development of the things is much more had it been a software as a service. Then uses of the things may be more and had it been IAS type of service then virtual means availability or leveraging the virtual machines put have been the management focus. So, it build apps quickly and easily manage apps proactively. So, this management of the apps development of the apps management of the apps and deliver mobile app seamlessly. So, this apps can be quickly develop manage and deliver.

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Analytics and Data Services

- Uncover business insights with advanced analytics and data services for both traditional and new data sources. Detect anomalies, predict behaviors and recommend actions for your business.

The slide features three icons with corresponding text below them:

- Add intelligence to your apps**: An icon showing a blue flask with a cloud above it.
- Predict and respond proactively**: An icon showing a bar chart with a lightbulb above it.
- Support your strategy with any data**: An icon showing a city skyline with a magnifying glass over it.

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Analytics and data services, so is also what the claim that provide and not only they ask. So, uncover business insights with advanced analytics and data services for both traditional and new data source. So, detect anomalies predict behaviors and recommend actions for the businesses right. So that means, it gives several type of other Meta applications what we say is, not only or libraries which allows you to have some sort of a data analytics and data services out of it. So, which in turn allow to add integers to your apps. Predict and respond proactively on some situations. And supports your strategy with any data. So, this sort of things are provided by azure, so that means, it has a reach set of data analytics and data service type of components or laborites which are allows you to component.

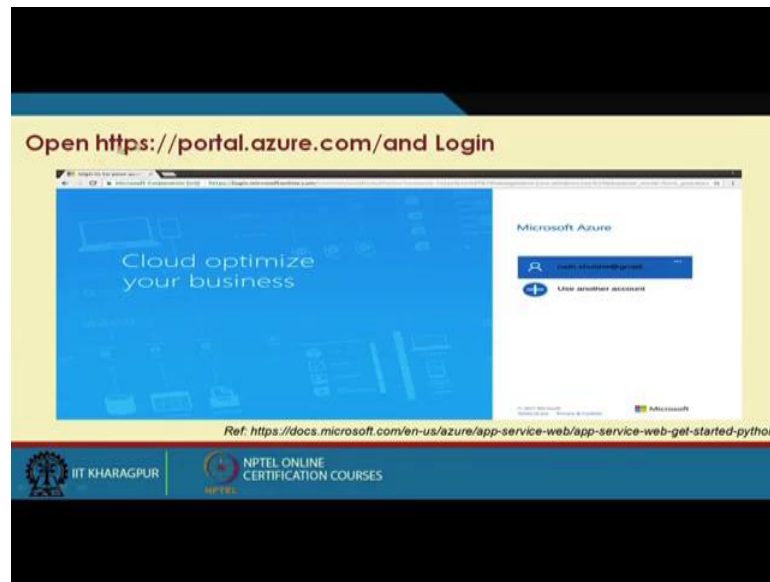
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So, next thing what we will be doing to show you a very short demo on creation of a python web app in Microsoft area azure. So, it is it may not be that a very complex thing, but it is the idea is to show that how to use azure. So, what will be doing here, we will be primarily using a open means free license or free login of the things. The idea is that So that you can have a you can yourself try without before going to paid login which has much more resources and might most applicable means much more applications development resources. So, before that you can basically try out your hand that how the azure think will be there; so, before one of my scholar TA of this course.

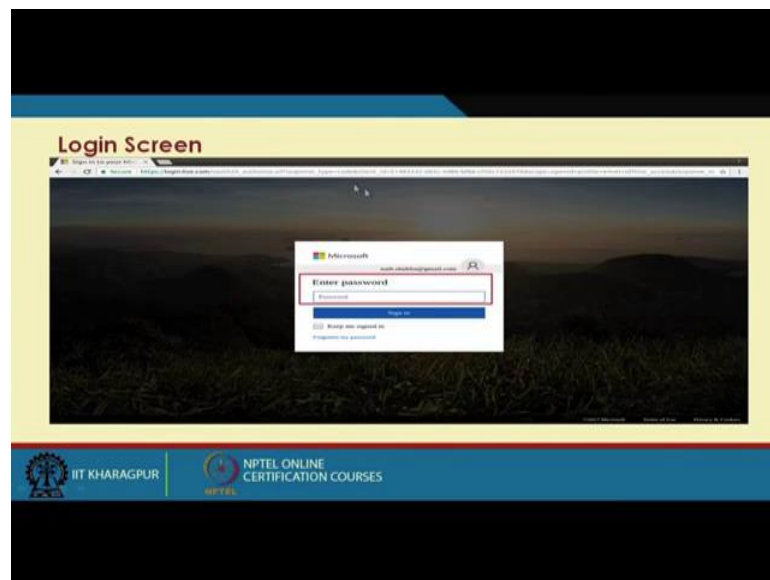
So, you a running on demo on these particular things, I will just quickly go through that some of the steps. So, the there may be little variant variation on the actual steps where we showing, but it will be easy to look at it.

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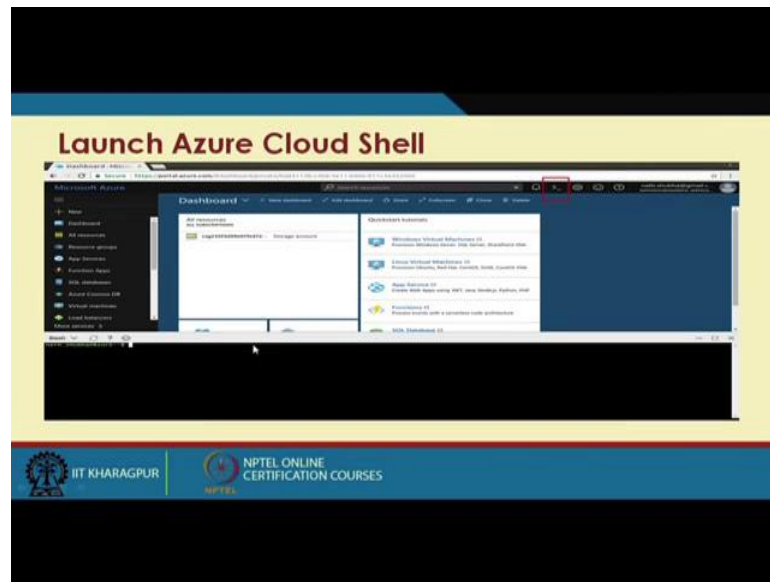
So, I can you can open this portal dot azure dot com I will log in to the things. So, with your login and password.

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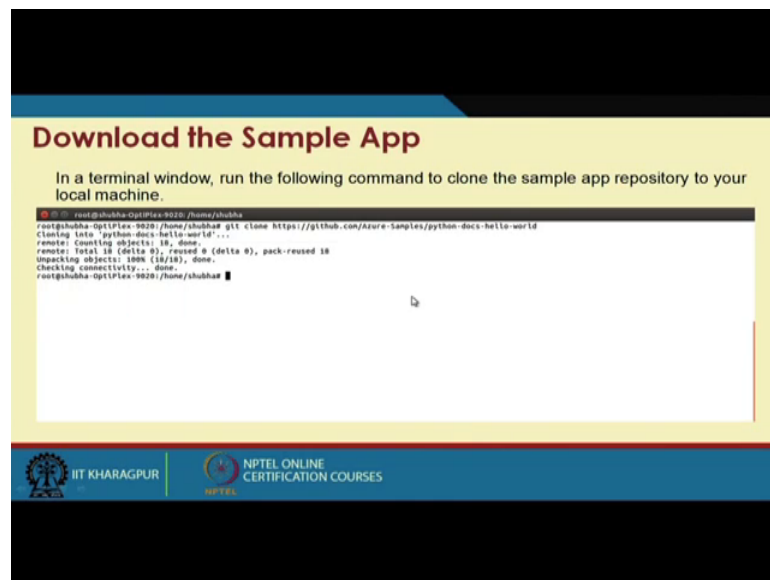
So, the login screens somewhat looks like this. And you can launch azure cloud cell after login into the this azure platform.

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And you can basically download a sample app. So, in the terminal window run the following command to clone this sample app repository to your local machines.

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So, idea is that you can download this a particular sample app, which will allow which will be easier for the beginners to update the tabs according to your need, and then upload the thing same to the azure platform and run on the thing.

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Go to the directory that contains the Sample App

```
root@shubha-OptiFlex-9020: /home/shubha/python-docs-hello-world
root@shubha-OptiFlex-9020: /home/shubha# cd python-docs-hello-world/
root@shubha-OptiFlex-9020: /home/shubha/python-docs-hello-world #
```

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So, go to the directory that contains this downloaded sample app, in your local directory here where you go to the directory and then install the flask.

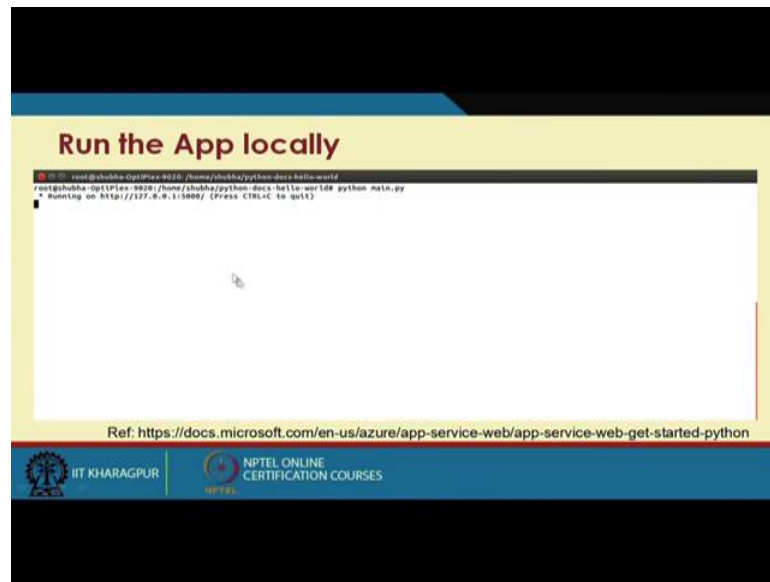
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Install Flask

```
root@shubha-OptiFlex-9020: /home/shubha/python-docs-hello-world
root@shubha-OptiFlex-9020: /home/shubha/python-docs-hello-world# pip install flask
Collecting flask
  Downloading flask-0.12.2-py2.py3-none-any.whl (49kB)
100% |#####| 9289 140kB/s
Collecting itdangerous==0.21 (from flask)
  Downloading itdangerous-0.24.tar.gz (40kB)
100% |#####| 5138 4.39kB/s
Collecting click==2.0 (from flask)
  Downloading click-6.7-py2.py3-none-any.whl (71kB)
100% |#####| 7188 322kB/s
Collecting werkzeug==0.12.2-py2.py3-none-any.whl (322kB)
100% |#####| 3170 126kB/s
Collecting Jinja2==2.4 (from flask)
  Downloading Jinja2-2.8-py2.py3-none-any.whl (348kB)
100% |#####| 3080 309kB/s
Collecting MarkupSafe==0.23 (from Jinja2==2.4--Flask)
  Downloading MarkupSafe-1.0.tar.gz
Building wheels for collected packages: itdangerous, MarkupSafe
Running setup.py bdist_wheel for itdangerous ... done
Stored in directory: /root/.cache/pip/wheels/fc/a8/66/24665523c757e178d45dea2de22b84cd9276abf074129a
Running setup.py bdist_wheel for MarkupSafe ... done
Stored in directory: /root/.cache/pip/wheels/98/af/39/e9ba54a87bcb2380fa3ca0e0bd073d963etafa2ee32037
Successfully built itdangerous MarkupSafe
Installing collected packages: itdangerous, click, werkzeug, MarkupSafe, Jinja2, flask
Successfully installed Jinja2-2.8.0 MarkupSafe-1.0 werkzeug-0.12.2 click-6.7 flask-0.12.2 itdangerous-0.24
You are using pip version 0.1.3, however version 0.8.1 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
root@shubha-OptiFlex-9020: /home/shubha/python-docs-hello-world #
```

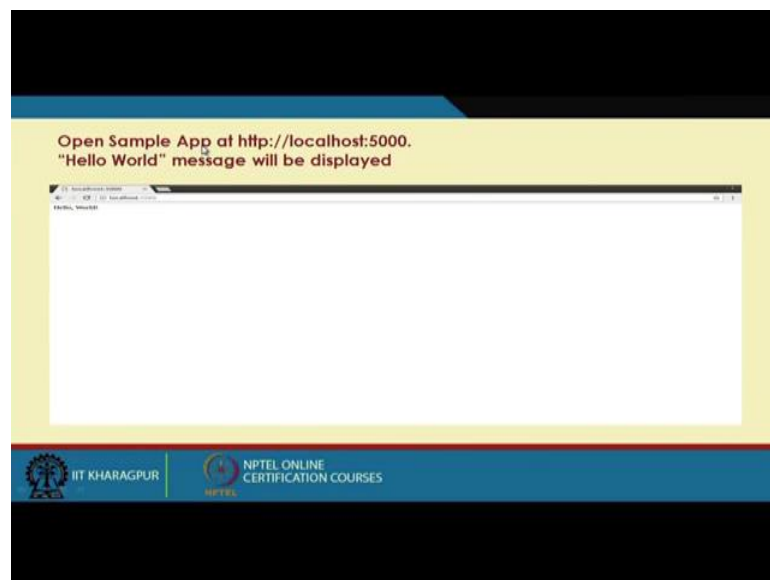
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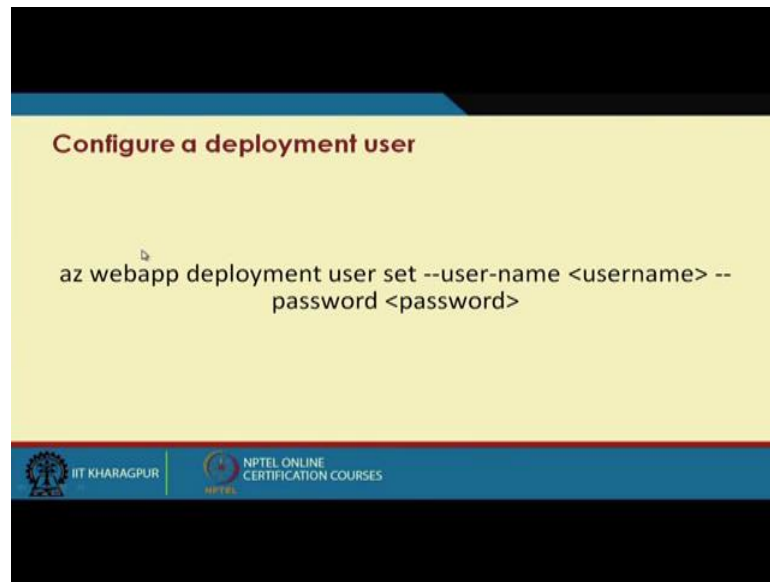
So, run the app locally once you check it that whether it is running locally.

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So, open the app in the by local dot by this particular things on a 5000 port and hello world message will be displayed that you can test. Then configure a deployment user by using this is the comment that show you.

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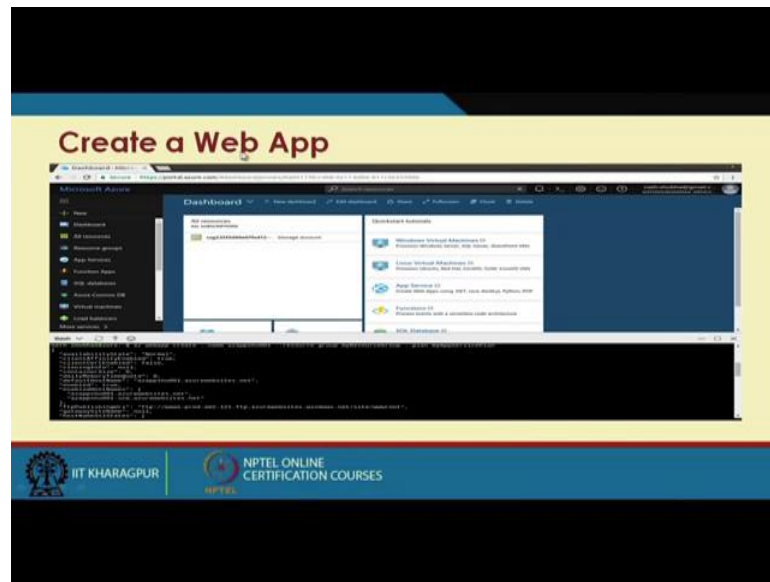
Creates a resource group in the dashboard of the azure. Create an azure app service plan.

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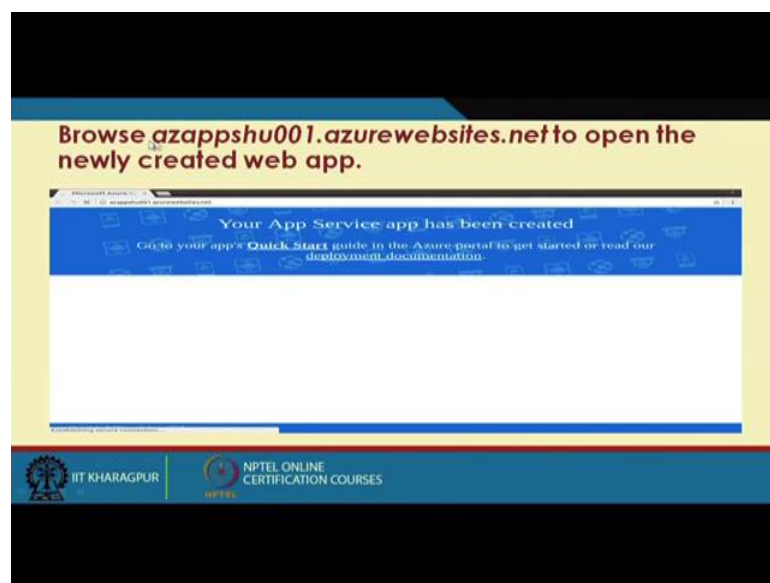


Create a web app of your own. And then browse through this particular URL to open the newly created app correct.

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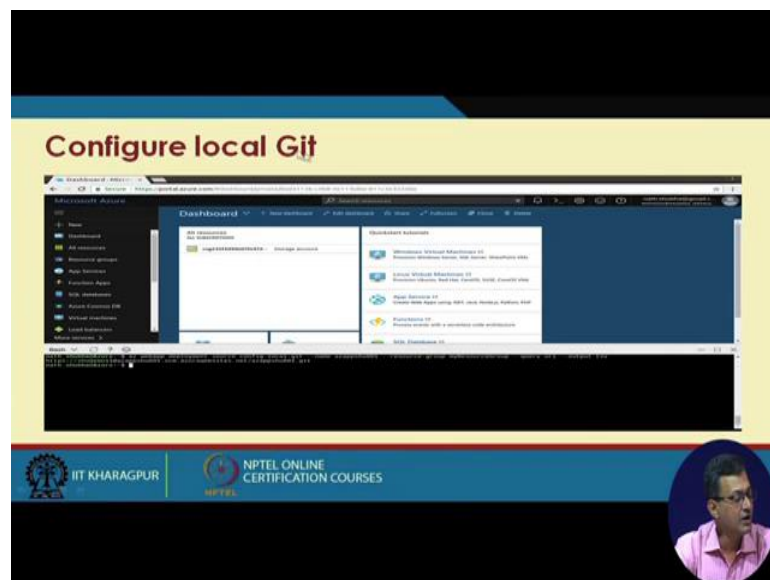
So, that you basically you, so you create your own app and learn on the as your platform.

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So, then you configure python in the in the particular using the azure dashboard.

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Configure local kit which will allow you to sing the data between the between your local machine and the that in the azure and the azure platform.

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The slide is titled "Push to Azure from Git". It features a terminal window with the following commands and output:

```
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world# git remote add azure https://shudeno1@azap
pshu001.scn.azurewebsites.net/azappshu901.git
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world#
```

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So, push to azure form get that will show you that that these are the commands. Push to the azure from the remote to deploy the particular app, and browse this again through this particular run it, right.

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The slide is titled "Push to the Azure remote to deploy the App". It features a terminal window showing the output of a git push command:

```
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world# git push azure
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 1.0 KiB | 0.00 MiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), compressed 0 (delta 0)
To https://shudeno1@azap.pshu001.scn.azurewebsites.net:~/python-docs-hello-world
 * [new branch]      main -> main

```

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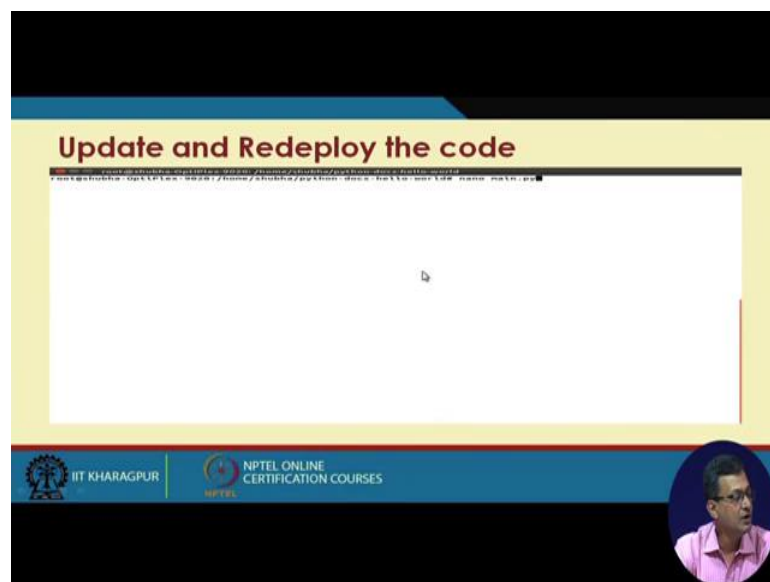
So, and update and re-deploy the, but code.

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So, use a local text editor open main dot py that python file in the python app to make the changes, so whatever you want to make changes the python think.

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Using a local text editor, open main.py file in the Python app to make changes

```
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world
GNU nano 2.5.3 File: main.py modified

from flask import Flask
app = Flask(__name__)

@app.route('/')
def hello_world():
    return "Welcome to the NPTEL course on Cloud Computing!"

if __name__ == '__main__':
    app.run()
```

Get Help Write Out Where Is Cut Text Justify Cur Pos Prev Page
Exit Read File Replace Uncut Text To Linter Go To Line Next Page

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Like welcome to NPTEL course on cloud computing may be the simple a state forward text which is there, you can do other complex applications if you want.

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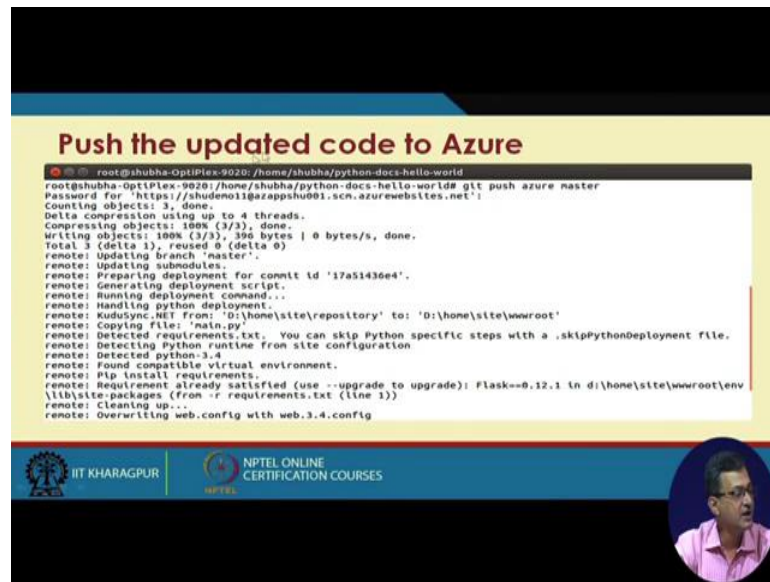
Commit the changes in Git

```
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world# git commit -m "updated output"
[master 17a5143] updated output
 1 file changed, 1 insertion(+), 1 deletion(-)
```

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So, commit the changes in the GIT. So, so that it is a synced with that as you push and upload the code to the azure.

(Refer Slide Time: 20:11)



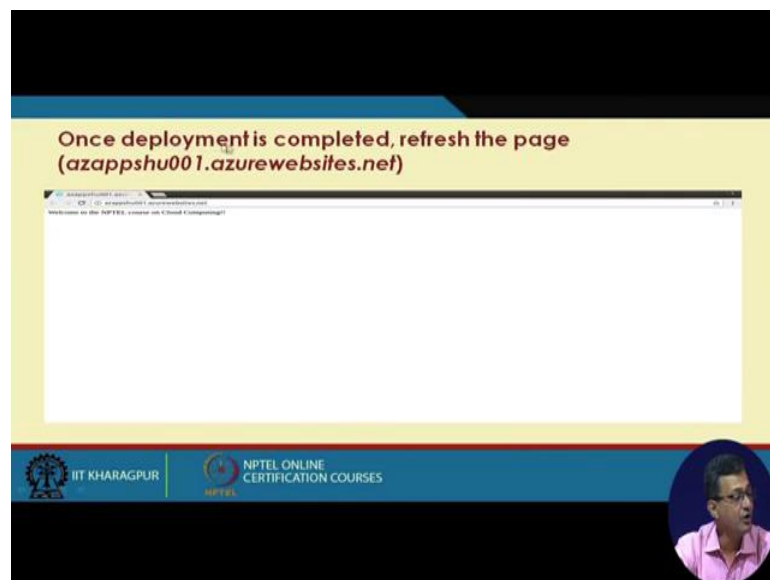
Push the updated code to Azure

```
root@shubha-OptiPlex-9020: /home/shubha/python-docs-hello-world
root@shubha-OptiPlex-9020:/home/shubha/python-docs-hello-world# git push azure master
Password for 'https://shudemo11@azappshu001.scm.azurewebsites.net':
Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 396 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
remote: Updating branch 'master':
remote: Updating submodules.
remote: Preparing deployment for commit id '17a51436e4'.
remote: Generating deployment script.
remote: Running deployment command...
remote: Handling python deployment:
remote: KuduSync.NET From: 'D:\home\site\repository' to: 'D:\home\site\wwwroot'
remote: Copying file: 'main.py'
remote: Detected requirements.txt. You can skip Python specific steps with a .skipPythonDeployment file.
remote: Detecting Python runtime from site configuration
remote: Detected python-3.4
remote: Found compatible virtual environment.
remote: Pip install requirements.
remote: Requirement already satisfied (use --upgrade to upgrade): Flask==0.12.1 in d:\home\site\wwwroot\env\
\lib\site-packages (from -r requirements.txt (line 1))
remote: Cleaning up...
remote: Overwriting web.config with web.3.4.config
```

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So, these are the commands which again will be shown on that means, one a life demo.

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**Once deployment is completed, refresh the page
(azappshu001.azurewebsites.net)**

Browser address bar: https://azappshu001.azurewebsites.net

Page content: Welcome to the NPTEL course on Cloud Computing

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Once the deployment is completed replace the page. So, that once you replace the page you can see that that particular URL that will come to NPTEL course in the cloud computing correct. So, what you will do now we will we will show you a particular the same exercise maybe little bit a few more screen will be there step by step, that how you can run a simple app in using Microsoft azure. So, the major idea is to so, that you can have a feel of how a commercial cloud there. So, if you if you use any other open source

cloud you of paas type of things there the command line may be different the type of steps maybe little bit different, but never the less the basic philosophy will be the same. So, there is the idea is to give have a direct feel of the things. Thank you, so what we will do we will continue with the with the demo subsequently.