



ArcGIS Notebook Server Enterprise 10.7.1

INSTALL AND CONFIGURE ON AZURE LINUX VM

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Table of Contents

ArcGIS Notebook Server	2
Azure.....	3
Docker	6
Hardware requirements.....	7
Firewall settings	7
File handles and process limits.....	7
Operating system requirements	8
SSL certificates	8
Software prerequisites.....	8
Domain name service host name entry.....	8
Supported web browsers.....	8
Prepare to install ArcGIS Notebook Server	8
Install ArcGIS Notebook Server silently.....	8
Silently uninstall the software	9
Configure ArcGIS Notebook Server after installation	9
Create an ArcGIS Notebook Server site	10
Use the createsite utility to create your site.....	10
Install and configure ArcGIS Web Adaptor with ArcGIS Notebook Server	11
Federate the server site with the portal.....	11
Feedback	11

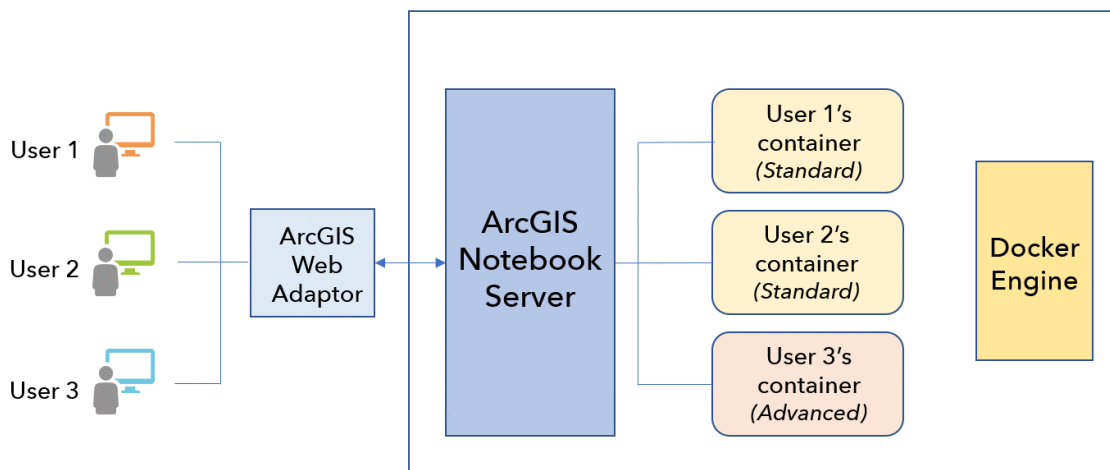
ArcGIS Notebook Server

ArcGIS Notebook Server is a complete data science platform integrated with the ArcGIS Enterprise portal. ArcGIS Notebooks Server provide a versatile web-based interface for powerful geospatial data analysis in your ArcGIS Enterprise portal. With notebooks, you can perform analysis, automate workflows, and immediately visualize data and analysis results in a geographic context.

Notebooks are an efficient, modern environment that combine code, on-the-fly visualizations and maps, and data tools.

Python has long been a vibrant part of the ArcGIS platform, and ArcGIS Notebooks bring the power and versatility of Python scripting directly into your ArcGIS Enterprise portal. The API allows you to incorporate dynamic maps and geospatial data tools into your notebooks.

- Harness a robust data science toolkit
- Automate data collection and cleaning, so you can get right to work.
- Build predictive models to inform your organizational strategy and direction.
- Apply advanced statistical tools such as tree-based methods, neural networks, and Bayesian techniques.
- Harness popular machine learning libraries such as scikit-learn and TensorFlow.
- Integrate your analyses with the full suite of ArcGIS mapping capabilities.
- Promote transparency and reproducibility by sharing and documenting your code.
- Perform administrative and content management tasks



AZURE

- Login to Microsoft Azure portal and create a new resource Linux server.
- For ArcGIS Notebook Server installation, I have created basic Linux server,

PRODUCT DETAILS (Standard E2s v3)

- CPU – 2 Core
- RAM – 16 GB
- Disk – 32 GB + additional 64 GB (once server created add 64 GB in Server)

Create a virtual machine

⚠ Changing Basic options may reset selections you have made. Review all options prior to creating the virtual machine.

* Subscription : Microsoft Azure

* Resource group : (New) Arcadis_Avinash
[Create new](#)

Instance details

* Virtual machine name : AviashtNotebook ✓

* Region : (Europe) West Europe

Availability options : No infrastructure redundancy required

* Image : Red Hat Enterprise Linux 7.6
[Browse all public and private images](#)

* Size : **Standard E2s v3**
2 vcpus, 16 GiB memory
[Change size](#)

Administrator account

Authentication type : Password SSH public key

* Username : Avinash_Patel ✓

* Password : [masked] ✓

* Confirm password : [masked] ✓

Inbound port rules

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

* Public inbound ports None Allow selected ports

* Select inbound ports

SSH

⚠ These ports will be exposed to the internet. Use the Advanced controls to limit inbound traffic to known IP addresses. You can also update inbound traffic rules later.

Create a virtual machine

Basics **Disks** Networking Management Advanced Tags Review + create

Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data disks. The size of the VM determines the type of storage you can use and the number of data disks allowed. [Learn more](#)

Disk options

* OS disk type

Premium SSD

Enable Ultra Disk compatibility (Preview) Yes No

Ultra Disk compatibility is not available for this VM size and location.

Data disks

You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

LUN	NAME	SIZE (GiB)	DISK TYPE	HOST CACHING
-----	------	------------	-----------	--------------

[Create and attach a new disk](#) [Attach an existing disk](#)

Advanced

Create a virtual machine

When creating a virtual machine, a network interface will be created for you.

* Virtual network

(new) Arcadis_Avinash-vnet

[Create new](#)

* Subnet

(new) default (10.0.1.0/24)

Public IP

None

[Create new](#)

NIC network security group

None Basic Advanced

* Public inbound ports

None Allow selected ports

* Select inbound ports

SSH

⚠ These ports will be exposed to the internet. Use the Advanced controls to limit inbound traffic to known IP addresses. You can also update inbound traffic rules later.

Accelerated networking

On Off

The selected VM size does not support accelerated networking.

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

Place this virtual machine behind an existing load balancing solution?

Yes No

- To add additional disk, Stop Linux server from Azure portal and select Disks to increase size.
- Start Linux VM and connect using SSH putty to increase size.

```
[Avinash-adm@Avinash ~]$ lsblk
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
fd0 2:0 1 4K 0 disk
sda 8:0 0 64G 0 disk
├─sda1 8:1 0 500M 0 part /boot
├─sda2 8:2 0 31.5G 0 part /
sdb 8:16 0 32G 0 disk
├─sdb1 8:17 0 32G 0 part /mnt/resource
sdc 8:32 0 64G 0 disk
[Avinash-adm@Avinash ~]$ sudo fdisk /dev/sda
The device presents a logical sector size that is smaller than
the physical sector size. Aligning to a physical sector (or optimal
I/O) size boundary is recommended, or performance may be impacted.
Welcome to fdisk (util-linux 2.23.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Command (m for help): p
Disk /dev/sda: 68.7 GB, 68719476736 bytes, 134217728 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disk label type: dos
Disk identifier: 0x0009c1f9

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1  *           2048       1026047       512000   83   Linux
/dev/sda2                1026048       67108863      33041408   83   Linux
Command (m for help): d
Partition number (1,2, default 2): 2
Partition 2 is deleted
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p): p
Partition number (2-4, default 2): 2
First sector (1026048-134217727, default 1026048):
Using default value 1026048
Last sector, +sectors or +size(K,M,G) (1026048-134217727, default 134217727):
Using default value 134217727
Partition 2 of type Linux and of size 63.5 GiB is set
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
[Avinash-adm@Avinash ~]$ sudo reboot
[Avinash-adm@Avinash ~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda2        32G   10G   22G   32% /
devtmpfs         7.9G   0   7.9G   0% /dev
tmpfs            7.9G   0   7.9G   0% /dev/shm
tmpfs            7.9G  9.0M   7.9G   1% /run
tmpfs            7.9G   0   7.9G   0% /sys/fs/cgroup
/dev/sda1        497M  101M  396M  21% /boot
/dev/sdb1        32G   2.1G   28G   7% /mnt/resource
tmpfs            1.6G   0   1.6G   0% /run/user/1000
[Avinash-adm@Avinash ~]$ sudo xfs_growfs /dev/sda2
[sudo] password for Avinash-adm:
meta-data=/dev/sda2             isize=512    agcount=4, agsize=2065088 blks
      =                       sectsz=512   attr=2, projid32bit=1
      =                       crc=1        finobt=0 spinodes=0
data     =                       bsize=4096  blocks=8260352, imaxpct=25
      =                       sunit=0     swidth=0 blks
naming   =version 2              bsize=4096  ascii-ci=0 ftype=1
log      =internal              bsize=4096  blocks=4033, version=2
      =                       sectsz=512   sunits=0 blks, lazy-count=1
realtime =none                 extsz=4096  blocks=0, rtextents=0
data blocks changed from 8260352 to 16648960
[Avinash-adm@Avinash ~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda2        64G   10G   54G  16% /
devtmpfs         7.9G   0   7.9G   0% /dev
tmpfs            7.9G   0   7.9G   0% /dev/shm
tmpfs            7.9G  9.0M   7.9G   1% /run
tmpfs            7.9G   0   7.9G   0% /sys/fs/cgroup
/dev/sda1        497M  101M  396M  21% /boot
/dev/sdb1        32G   2.1G   28G   7% /mnt/resource
tmpfs            1.6G   0   1.6G   0% /run/user/1000
[Avinash-adm@Avinash ~]$ ls -la
```

DOCKER

- ArcGIS Notebook Server uses Docker container allocation software to provide security and isolate resources for notebook authors.
- Containers are virtualized operating systems, as opposed to virtual machines; each container on a machine includes all OS components in an isolated environment.
- ArcGIS Notebook Server provides a separate container for each user in the site. Each user owns one notebook per runtime, and users can only run notebooks in their own container.

Docker is a separate, third-party software component that must be installed on each ArcGIS Notebook Server machine prior to using ArcGIS Notebook Server.

- **Docker container images**
 - ArcGIS Notebooks container images provide the necessary runtime — a specific collection of Python modules — for notebook users.
 - Esri provides two Docker container images: Standard and Advanced.
 - Standard runtime enables ArcGIS Notebooks to use code from ArcGIS API for Python and third-party modules.
 - The Advanced runtime contains all the modules of the Standard image and includes ArcPy and related libraries.
 - The Standard runtime allots 1 CPU core and 4 GB of RAM per container.
 - The Advanced runtime allots 2 CPU cores and 6 GB of RAM per container.
- **Docker editions**
 - Docker comes in two editions. Docker Engine Community is a free download, while Docker Engine Enterprise requires a paid subscription or a trial but includes support and maintenance.
 - Ensure that you install Docker 17.0 or later on each ArcGIS Notebook.
 - Red Hat Enterprise Linux, it is recommended that you install Docker Engine Enterprise. If your machine runs Ubuntu, either Docker edition will work with ArcGIS Notebook Server.
- **Install Docker for ArcGIS Notebook Server**

Red Hat Enterprise Linux, only Docker Engine Enterprise is supported by ArcGIS Notebook Server.

- That document outlines to install the software (from a yum package).
- Download docker installation file from docker Hub and copy installation file on Linux server using WinSCP utility.

```
[Avinash-adm@Avinash Software]$ ls -la
total 6425964
drwxrwxr-x. 2 Avinash-adm Avinash-adm    4096 Sep 25 14:34 .
drwxrwxrwx. 5 root        root          51 Sep 25 11:36 ..
-rw-rw-r--. 1 Avinash-adm Avinash-adm 3456299001 Sep 25 10:46 ArcGIS_Notebook_Docker_Advanced_1071_169738.tar.gz
-rw-rw-r--. 1 Avinash-adm Avinash-adm 1874589263 Sep 25 10:33 ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz
-rw-rw-r--. 1 Avinash-adm Avinash-adm 1164239310 Sep 25 10:31 ArcGIS_Notebook_Server_Linux_1071_169927.tar.gz
-rw-rw-r--. 1 Avinash-adm Avinash-adm   29826372 Sep 25 14:33 docker-ee-17.06.2.ee.18-3.el7.x86_64.rpm
-rw-rw-r--. 1 Avinash-adm Avinash-adm    4043 Sep 25 12:15 docker-ee.repo
```

- Go to the installation file location directory and update selinux packagemount

```
yum install ftp://bo.mirror.garr.it/1/slc/centos/7.1.1503/extras/x86_64/Packages/container-selinux-2.9-4.el7.noarch.rpm
[Avinash-adm@Avinash Software]$ Update selinux packagemount
[Avinash-adm@Avinash Software]$ sudo yum install ftp://bo.mirror.garr.it/1/slc/centos/7.1.1503/extras/x86_64/Packages/container-selinux-2.9-4.el7.noarch.rpm
[Avinash-adm@Avinash Software]$
```

- Install Docker on Linux server using yum package.
- Docker does not automatically start after installation and configuration. Start the Docker daemon by running the following command.
- Verify that Docker is properly installed and can access container images by running the following command:

```
[Avinash-adm@Avinash Software]$ sudo yum install docker-ee-17.06.2.ee.18-3.el7.x86_64.rpm
[Avinash-adm@Avinash Software]$ sudo systemctl start docker
[Avinash-adm@Avinash Software]$ sudo docker run hello-world
```

- **Configure Docker settings and environments**

When the appropriate Docker edition is installed on your machine, configure Docker for use with ArcGIS Notebook Server.

- Add OS user account to the group called docker


```
$sudo usermod -aG docker Avinash-adm
$ docker run hello-world
```

HARDWARE REQUIREMENTS

- The minimum RAM requirement for an ArcGIS Notebook Server node is 8 GB.
- Ensure that the disk space has at least 50 GB of available.

FIREWALL SETTINGS

- ArcGIS Notebook Server communicates on port 11443.
- ArcGIS Notebook Server needs access to port 7443 on the portal machine.

FILE HANDLES AND PROCESS LIMITS

Setting a file handle minimum of 65,535 and a process minimum of 25,059 ensures that the system remains running.

- To edit the `/etc/security/limits.conf` file with superuser access.


```
Avinash-adm soft nofile 65535
Avinash-adm hard nofile 65535
Avinash-adm soft nproc 25059
Avinash-adm hard nproc 25059
```


OPERATING SYSTEM REQUIREMENTS

ArcGIS Notebook Server is only supported on Linux x86_64, on CPUs that adhere to the x86_64 architecture (64 bit), with supported Linux releases.

- Red Hat Enterprise Linux (RHEL) Server 7
- Ubuntu Server LTS 16.04 and 18.04

SSL CERTIFICATES

ArcGIS Notebook Server is preconfigured with a self-signed certificate that allows the server to be initially tested and to help you quickly verify that your installation was successful.

SOFTWARE PREREQUISITES

Before installing ArcGIS Notebook Server, you must have at least a base deployment of ArcGIS Enterprise 10.7 ready.

- ArcGIS Notebook Server requires Docker runtime (17.0 or later) to be installed.

DOMAIN NAME SERVICE HOST NAME ENTRY

ArcGIS Notebook Server must be installed on a machine that has a domain name service (DNS) host name entry. This may require the system administrators for the site to add an entry to a name server in their network and that this name server be listed in the `/etc/resolv.conf` configuration file on the system.

SUPPORTED WEB BROWSERS

To use the ArcGIS Notebook Server Configuration Wizard, as well as the notebook editor, the following web browsers are supported:

- Google Chrome
- Mozilla Firefox
- Microsoft Edge

PREPARE TO INSTALL ARCGIS NOTEBOOK SERVER

Before proceeding with the installation, complete these steps.

- Your ArcGIS Notebook Server software download, authorization file.
- One or both Docker container images, depending on your license.

Installing ArcGIS Notebook Server with the root account is not supported.

INSTALL ARCGIS NOTEBOOK SERVER SILENTLY

Follow these steps to install ArcGIS Notebook Server silently from the command line.

By default, ArcGIS Notebook Server will be installed `${HOME}/arcgis/notebookserver`.

- Uncompressed the tar.gz file and run next command:

```
tar -xvzf ArcGIS_Notebook_Server_Linux_<version>.tar.gz
```

```
./Setup -m silent -l yes -a /home/Avinash-  
adm/notebook/setupfile/NotebookServer_Linux/ArcGISNotebooksStandard_ArcGISServer_797742.prvc
```

```
[Avinash-admin@Avinash NotebookServer_Linux]$ pwd
/home/Avinash-admin/notebookserver/setupfile/NotebookServer_Linux
[Avinash-admin@Avinash NotebookServer_Linux]$ ./Setup -m silent -l yes -a /home/Avinash-admin/notebook/setupfile/NotebookServer_Linux/ArcGISNotebooksStandard_ArcGISServer_797742.prvc
=====
ArcGIS Notebook Server 10.7.1 Diagnostic Tool
=====
                Hostname: Avinash
=====
DIAG000: Check for installation as root                [PASSED]
DIAG001: Check for 64-bit architecture                [PASSED]
DIAG002: Check OS version                            [PASSED]
DIAG003: Check hostname for invalid characters        [PASSED]
DIAG024: Check /etc/hosts for hostname entry         [PASSED]
DIAG004: Check installed packages                    [PASSED]
DIAG028: Check for valid Docker install              [PASSED]
DIAG005: Check system limits                         [PASSED]
DIAG009: Check HTTPS port                            [PASSED]
DIAG029: Check /var disk space                       [PASSED]
=====
There were 0 failure(s) and 0 warning(s) found:

[ArcGIS Notebook Server 10.7.1 Installation Details]
UI Mode.....silent
Agreed to Esri License...yes
Authorization File...../home/Avinash-admin/notebookserver/setupfile/NotebookServer_Linux/ArcGISNotebooksStandard_ArcGISServer_797742.prvc
Installation Directory.../home/Avinash-admin/arcgis/notebookserver

Starting installation of ArcGIS Notebook Server 10.7.1...
...ArcGIS Notebook Server 10.7.1 installation is complete.

You will be able to configure ArcGIS Notebook Server 10.7.1 by navigating to https://localhost:11442/arcgis/configure.
[Avinash-admin@Avinash NotebookServer_Linux]$
```

- Copy


```
$sudo cp /home/Avinash-  
adm/arcgis/notebookserver/framework/etc/scripts/agsnotebook.service /etc/systemd/system.  
$ sudo chmod 600 agsnotebook.service  
$sudo systemctl enable agsnotebook.service  
$ sudo systemctl stop agsnotebook.service  
$ sudo systemctl start agsnotebook.service
```

End the root user session.

SILENTLY UNINSTALL THE SOFTWARE

To uninstall ArcGIS Notebook Server silently from the command line, run the following command:

```
<ArcGIS Notebook Server installation directory>/uninstall_ArcGISNotebookServer
```

CONFIGURE ARCGIS NOTEBOOK SERVER AFTER INSTALLATION

When your ArcGIS Notebook Server installation is complete, run the post installation utility to set up the necessary Docker components.

```
[Avinash-admin@Avinash postInstallUtility]$ ./PostInstallUtility.sh -l /home/Avinash-admin/notebook/setupfile/ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz
Running diagnostics test.
Checking Docker installation:[OK]
  Docker version 17.06.2-ee-18, build c78b5e1

Checking Docker health:[OK]
Loading Docker image: /home/Avinash-admin/notebookserver/setupfile/ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz.
Sep 28, 2019 8:31:20 AM com.esri.arcgis.turing.tools.PostInstallUtility loadDockerImage
INFO: Loading Docker image: /home/Avinash-admin/notebookserver/setupfile/ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz.
Done. Successfully loaded Docker Image /home/Avinash-admin/notebookserver/setupfile/ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz.
Sep 28, 2019 8:38:58 AM com.esri.arcgis.turing.tools.PostInstallUtility loadDockerImage
INFO: Done. Successfully loaded Docker Image /home/Avinash-admin/notebookserver/setupfile/ArcGIS_Notebook_Docker_Standard_1071_169736.tar.gz.
```

CREATE AN ARCGIS NOTEBOOK SERVER SITE

After you install ArcGIS Notebook Server and configure it with Docker, create a server site. A site is an individual deployment of ArcGIS Notebook Server and is the server unit that can be federated with the ArcGIS Enterprise portal.

Use the createsite utility to create your site

Once ArcGIS Notebook Server is installed, you can use the `createsite` command line utility to create a server site. To do so, you have the following options:

- Run the `createsite` utility as the ArcGIS Notebook Server account from the command prompt window, and specify the user name, password, configuration store location, and directory parameters.
- Provide the path to the `createsite.properties` file that specifies these parameters. This is the recommended option, as it is more secure.

```
[Avinash-adm@Avinash ~]$ cd /home/Avinash-adm/arcgis/notebookserver/tools
[Avinash-adm@Avinash tools]$ ls -la
total 8
drwx-----.  8 Avinash-adm Avinash-adm 177 Sep 28 11:34 .
drwx-----. 11 Avinash-adm Avinash-adm 232 Sep 28 11:35 ..
-rwx-----.  1 Avinash-adm Avinash-adm 7121 May 31 22:45 authorizeSoftware
drwx-----.  2 Avinash-adm Avinash-adm  56 Sep 28 11:34 createSiteUtility
drwx-----.  2 Avinash-adm Avinash-adm  25 Sep 28 11:34 joinSiteUtility
drwx-----.  4 Avinash-adm Avinash-adm  59 Sep 28 11:34 notebookserverdiag
drwx-----.  2 Avinash-adm Avinash-adm  30 Sep 28 11:34 passwordreset
drwx-----.  3 Avinash-adm Avinash-adm  57 Sep 28 11:34 patchnotification
drwx-----.  2 Avinash-adm Avinash-adm  35 Sep 28 11:34 postInstallUtility
[Avinash-adm@Avinash tools]$ cd createSiteUtility/
[Avinash-adm@Avinash createSiteUtility]$ ls
createsite.properties  createsite.sh
[Avinash-adm@Avinash createSiteUtility]$ cd createsite.properties createsite.properties_org
-bash: cd: createsite.properties: Not a directory
[Avinash-adm@Avinash createSiteUtility]$ vi createsite.properties
[Avinash-adm@Avinash createSiteUtility]$ vi createsite.properties
[Avinash-adm@Avinash createSiteUtility]$ ./createsite.sh -f createsite.properties
log4j:WARN No appenders could be found for logger (org.apache.http.client.protocol.RequestAddCookies).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
Sep 28, 2019 12:12:03 PM com.esri.arcgis.turing.tools.CreateSiteUtility main
INFO: Starting the createsite utility.
=====
Starting the createsite utility.
=====
{"status":"success","elapsedTime":23328}
The ArcGIS Notebook Server is configured successfully.

You will be able to access ArcGIS Notebook Server Administrator Site Directory by navigating to
https://*****:11443/arcgis/admin

Sep 28, 2019 12:12:27 PM com.esri.arcgis.turing.tools.CreateSiteUtility a
INFO: The createsite utility completed successfully.
The createsite utility completed successfully.

Stopping the createsite utility
```

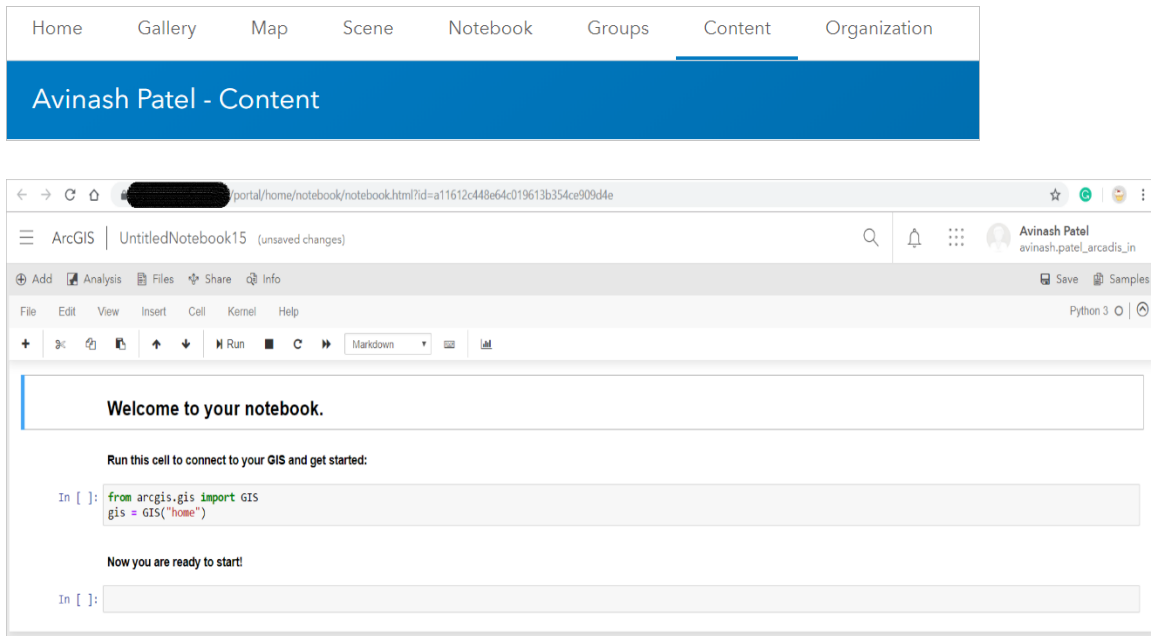
INSTALL AND CONFIGURE ARCGIS WEB ADAPTOR WITH ARCGIS NOTEBOOK SERVER

- Once your ArcGIS Notebook Server site has been created, you can install ArcGIS Web Adaptor and register it with the portal.
- ArcGIS Web Adaptor provides a connection between your enterprise web server and your ArcGIS Notebook Server site. It allows you to choose the port, address, and authentication settings for incoming requests.

Federate the server site with the portal

Federating an ArcGIS Notebook Server site with your portal integrates the security and sharing models of your portal with those of the server site. Federation is required for ArcGIS Notebook Server, as users access notebooks through the portal website.

When you add a server to your portal, you are federating the server with the portal. A server that has been added to your portal is called a federated server.



Feedback

Send comments or suggestions to Avinash.Patel@arcadis.com or Patel684@yahoo.co.in