

NAME OF THE STUDENT: SUDHARSHIYA GANESAN

COURSE: DATABASE ADMINISTRATION AND MANAGEMENT

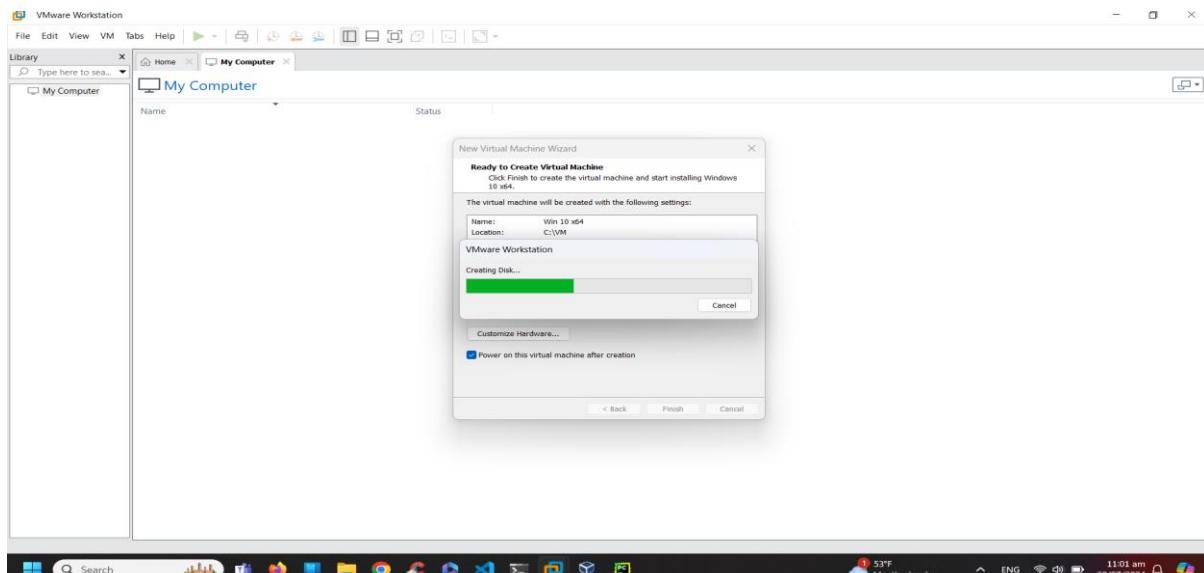
STUDENT ID: 20232004

ASSESSMENT ON PROJECT: PRACTICAL DATABASE SCENARIO

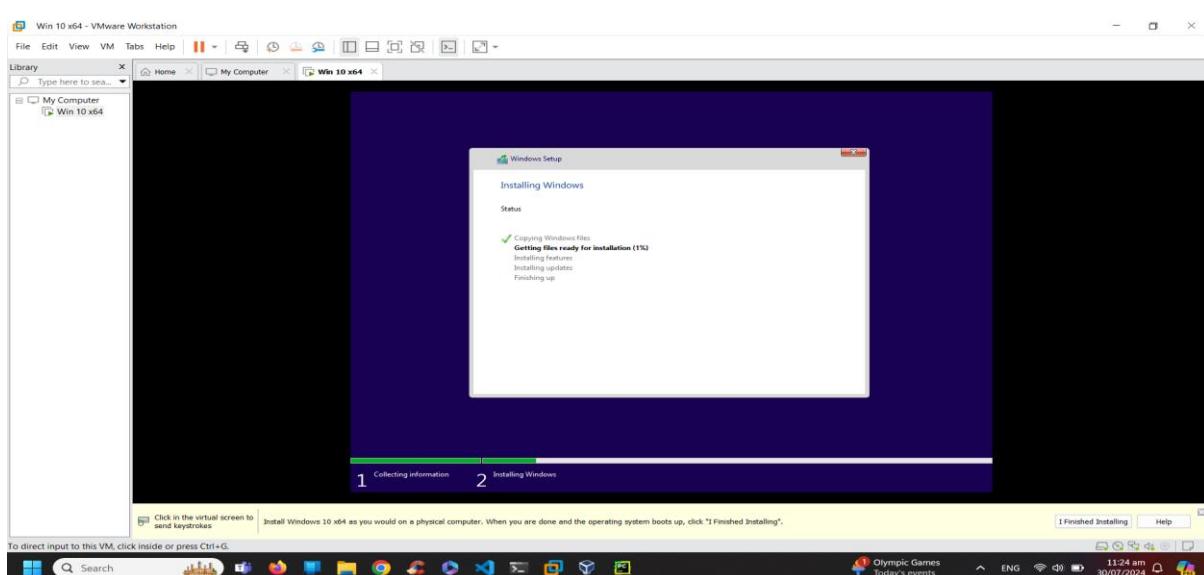
TASK 1: INSTALLATION OF THE SQL SERVER AND SSMS

I have installed VMware to install the SQL server in the virtual environment.

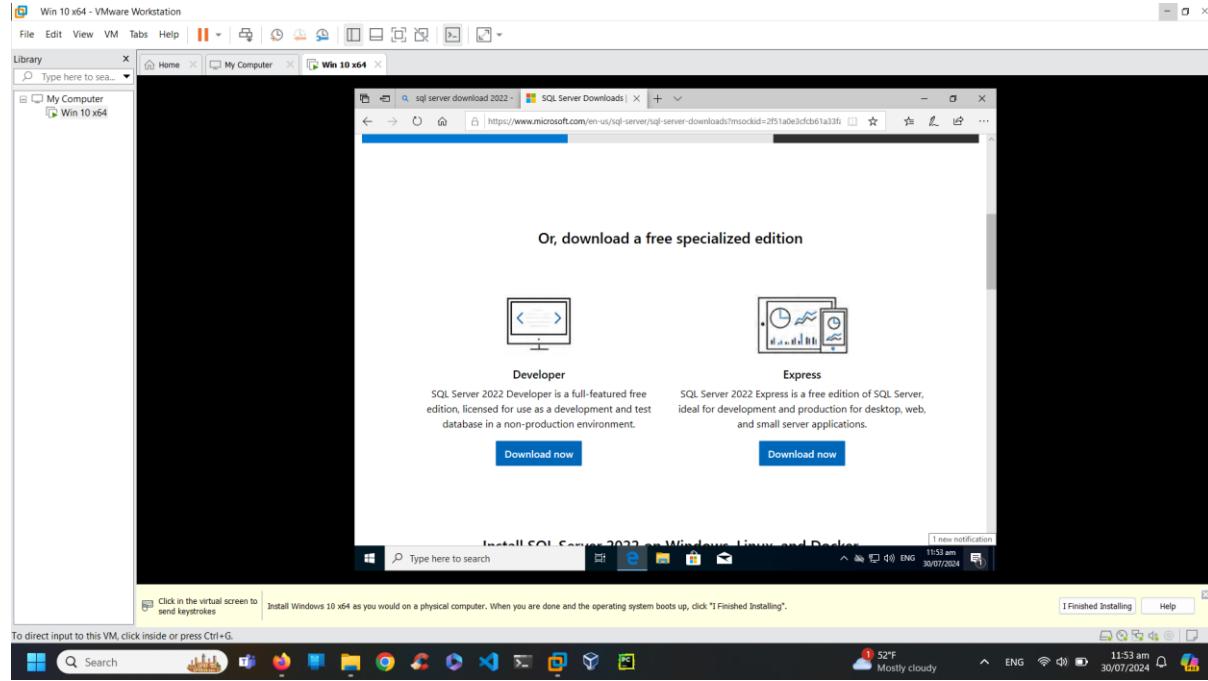
STEP 1: I have created a virtual machine in VMware workstation.



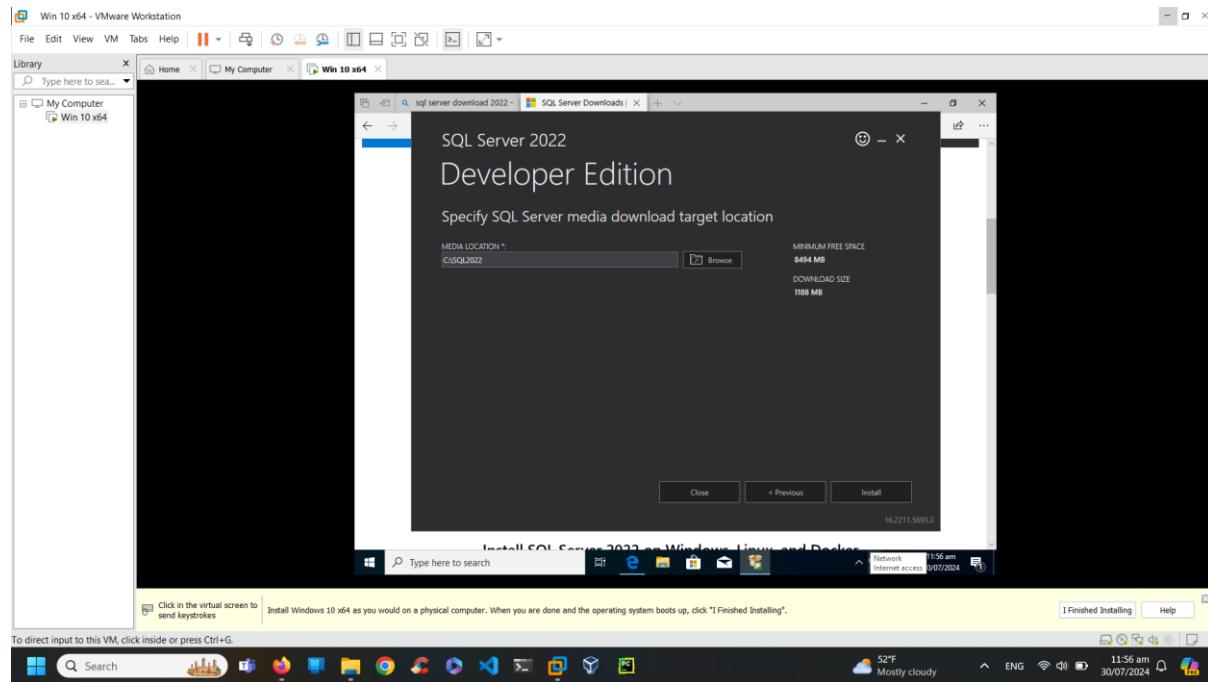
STEP 2: Windows 10 operating system is installed which can be used to install MS SQL server.



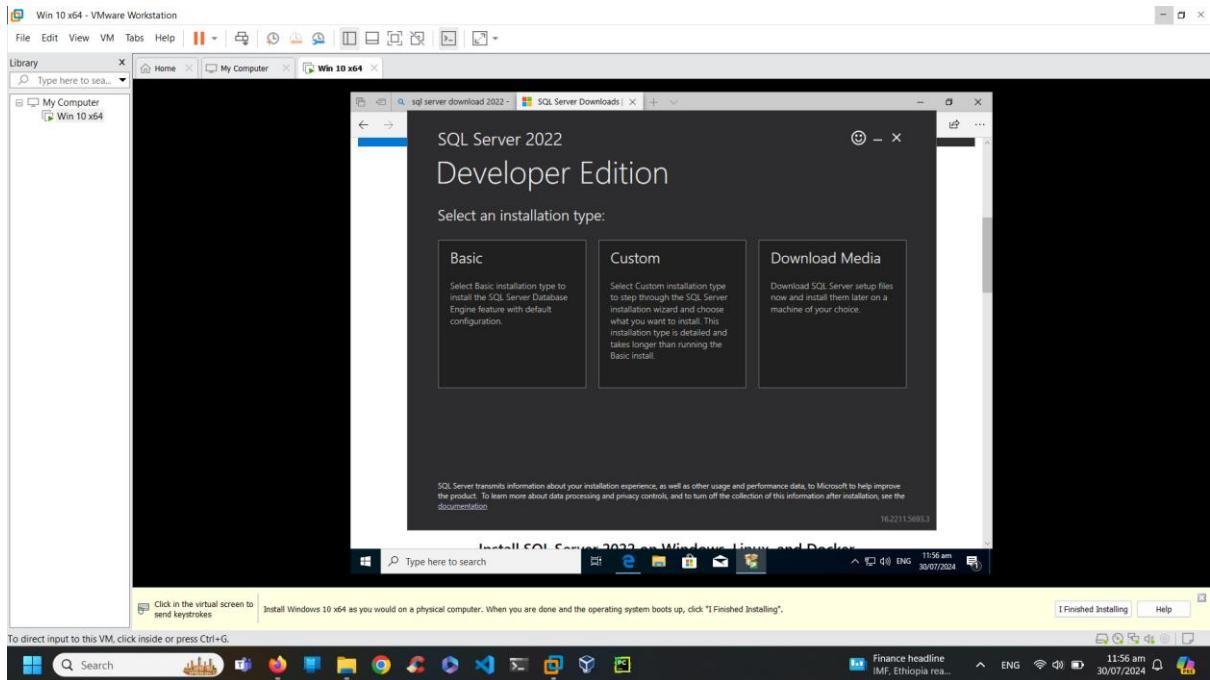
STEP 3: Once Windows 10 Operating system is installed, check the ethernet connection is working in it. After I made sure about the internet connection, I browsed to download SQL server 2022- Developer version in the virtual machine.



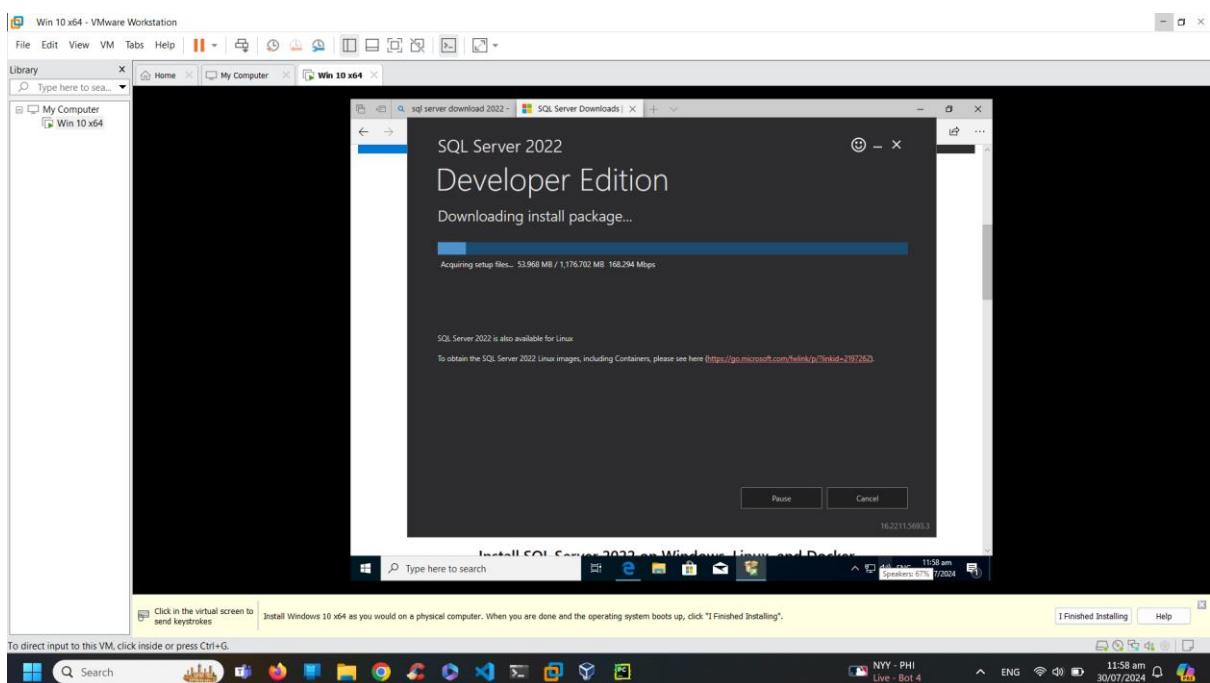
STEP 4: My SQL server is downloaded in C drive of the virtual machine.



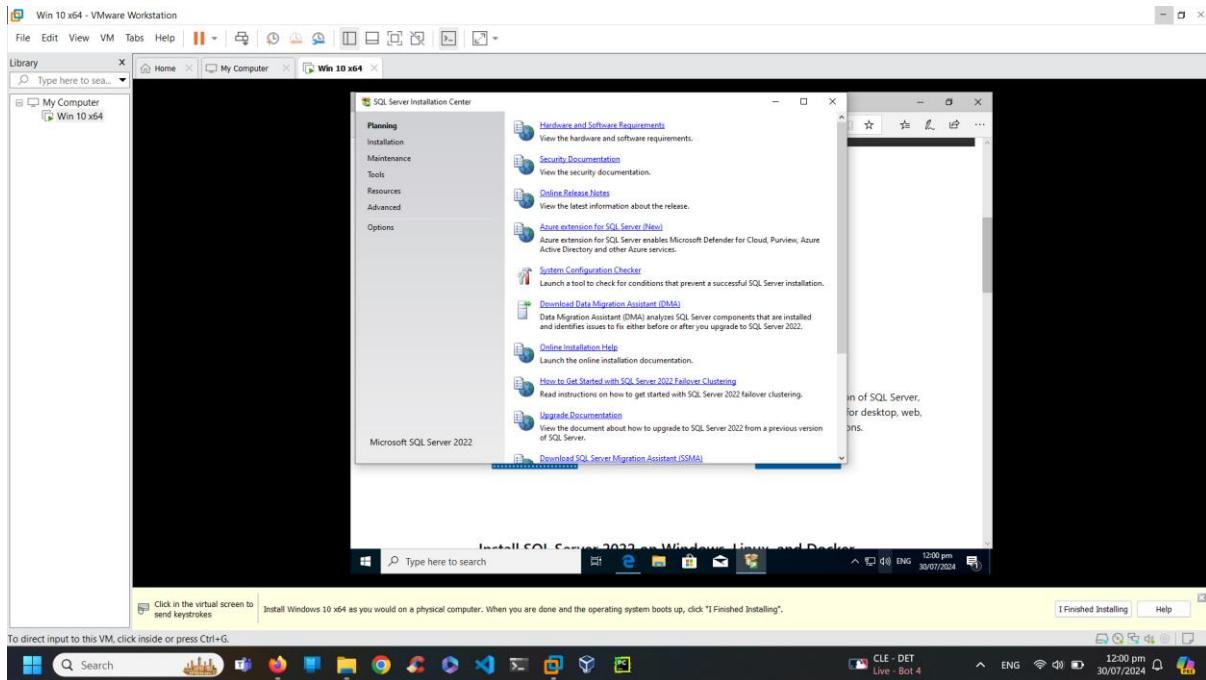
STEP 5: The next page I got when I was downloading the server from the browser was to select the installation type. I had options like Basic, Custom and download Media. I chose the custom type



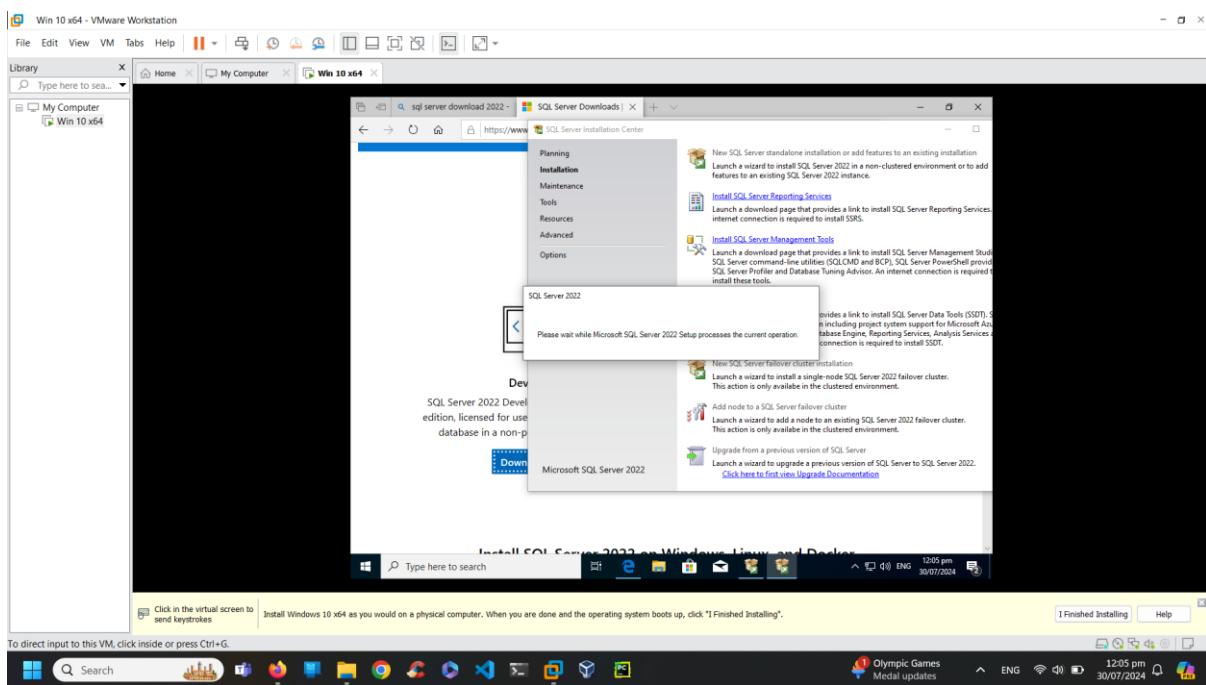
STEP 6: The SQL server 2022-Developer version was installing.



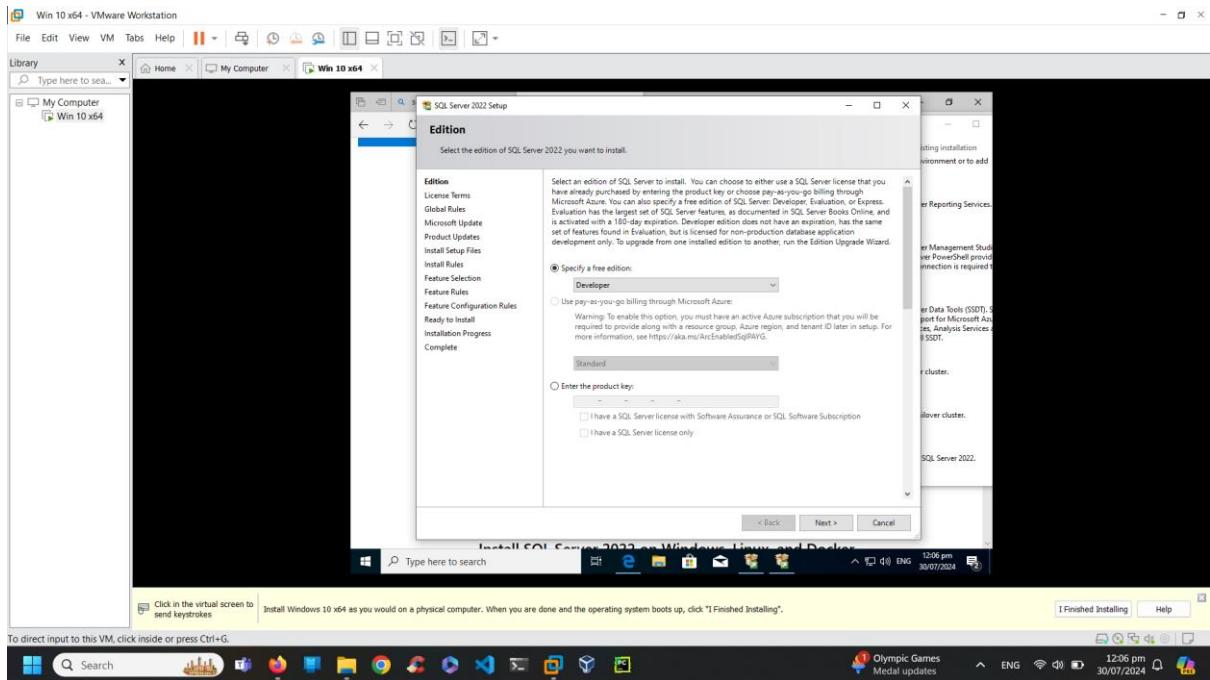
STEP 7: Once the SQL server is downloaded, find the installation application file from the downloads and double-click on it to install the SQL server 2022. I get a SQL Server Installation Center window.



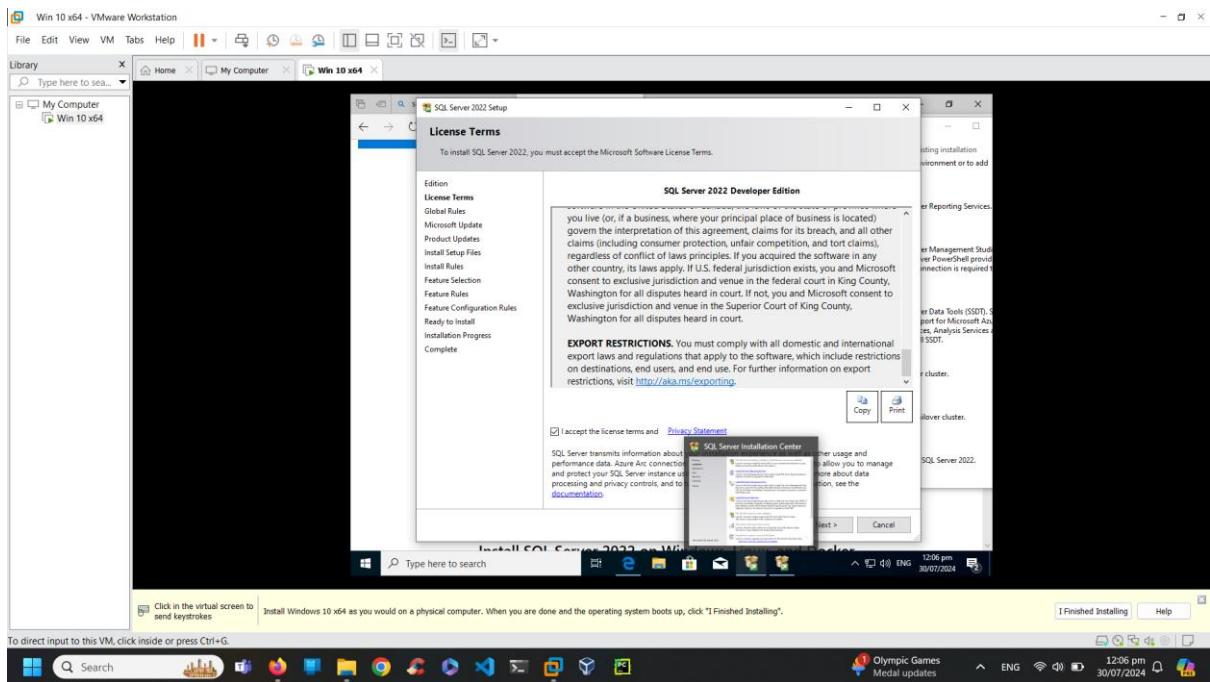
STEP 8: Click on the installation option in the SQL Server Installation centre and the processes were getting installed.



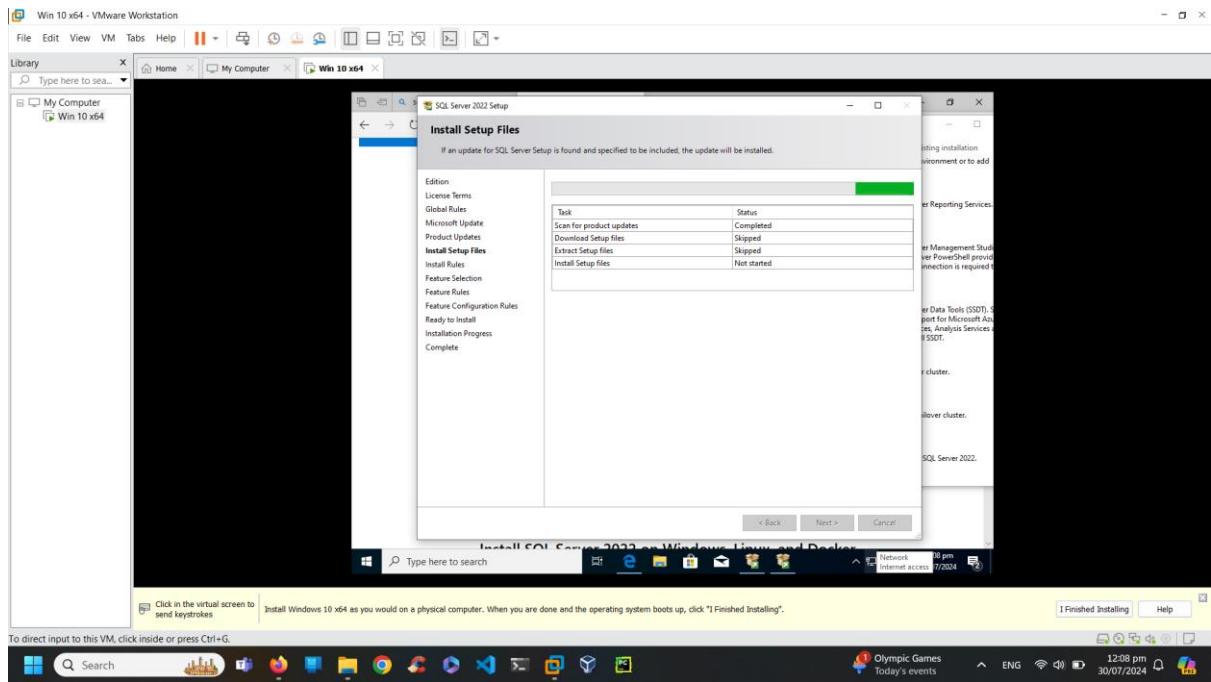
STEP 9: I get the option of selecting the installation type again in the setup window.



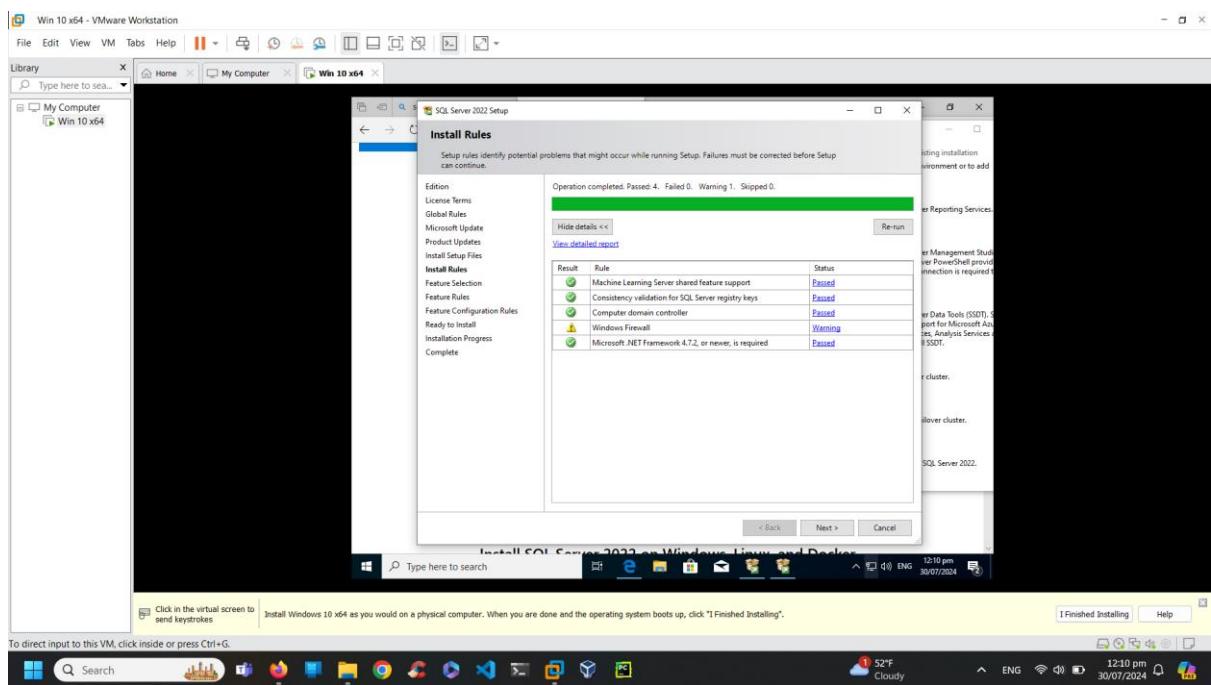
STEP 10: Accept the license terms of SQL server 2022 by ticking the checkbox.



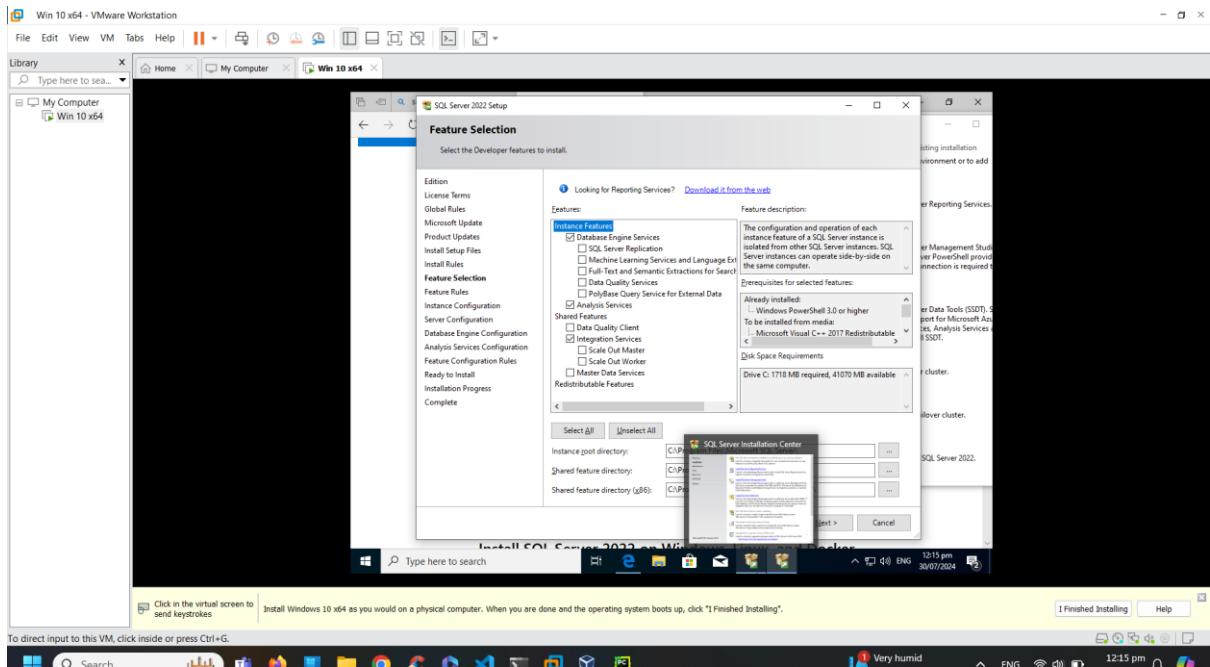
STEP 11: Install the setup files.



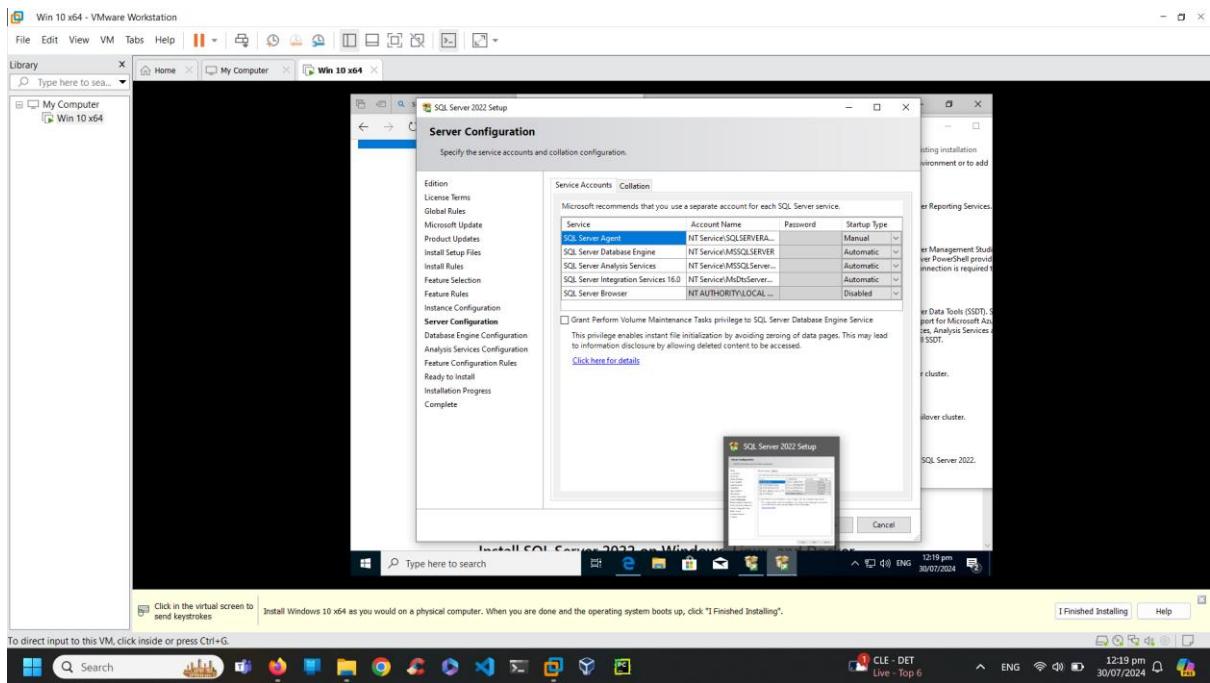
STEP 12: All the installation of the necessary rules are passed and the operation is completed.



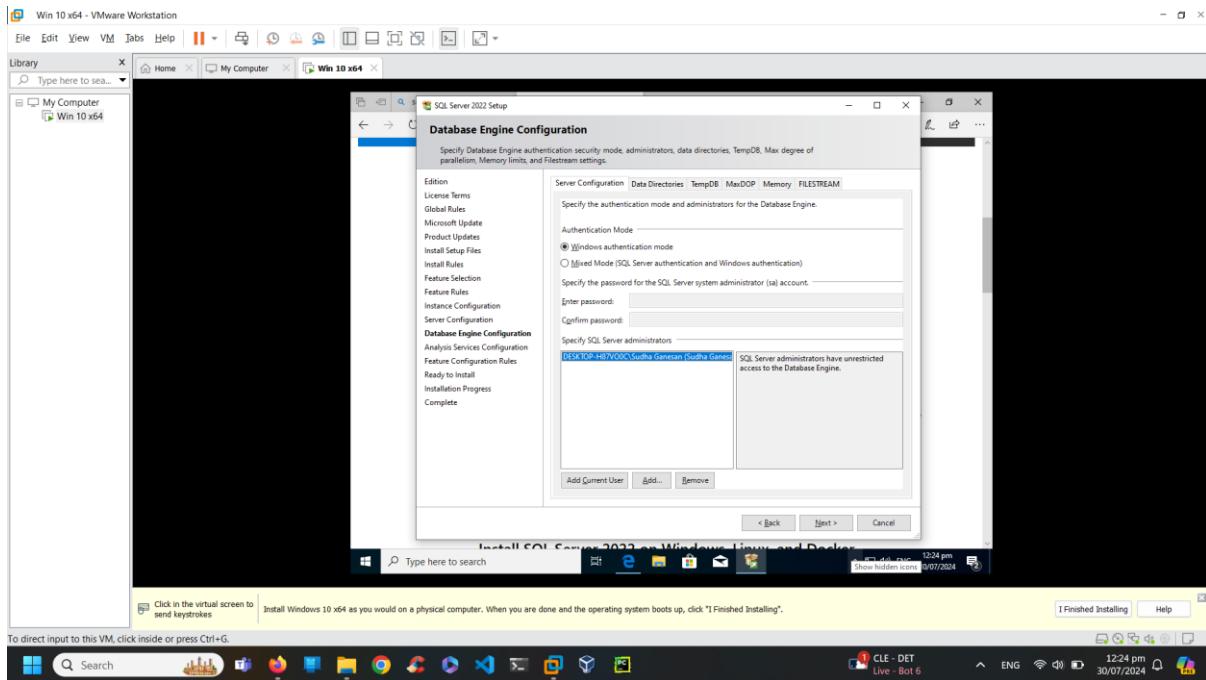
STEP 13: The feature selection window is opened and tick the required features.



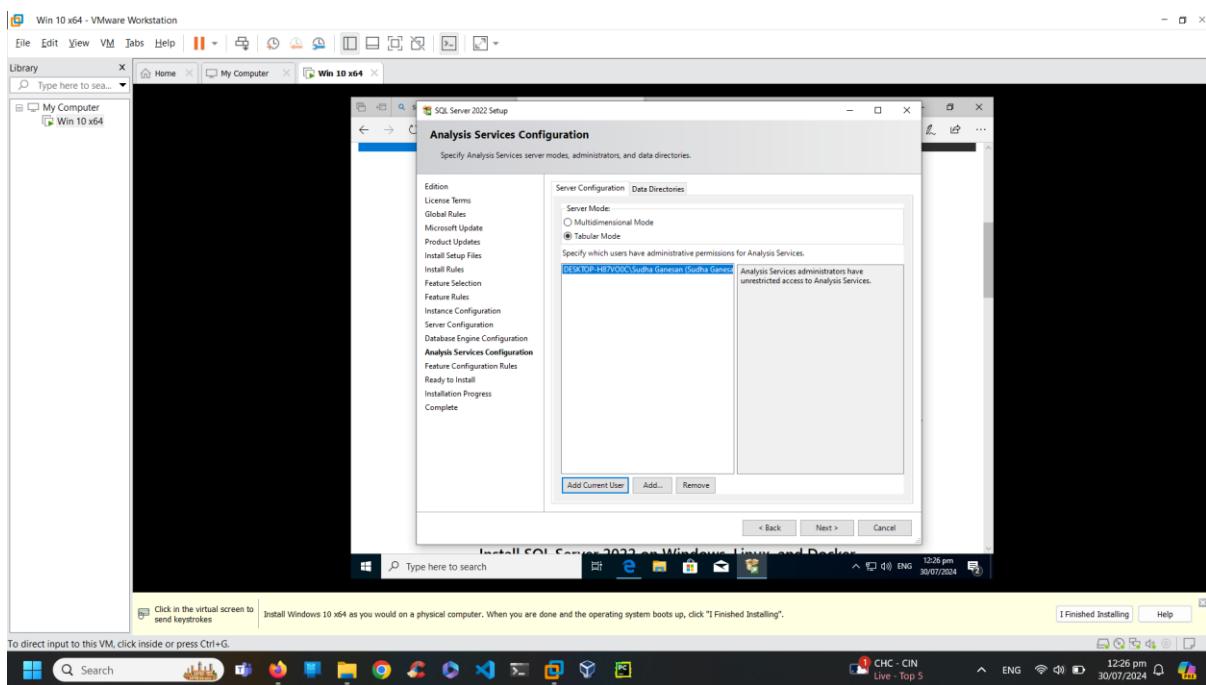
STEP 14: The server configuration of the SQL 2022



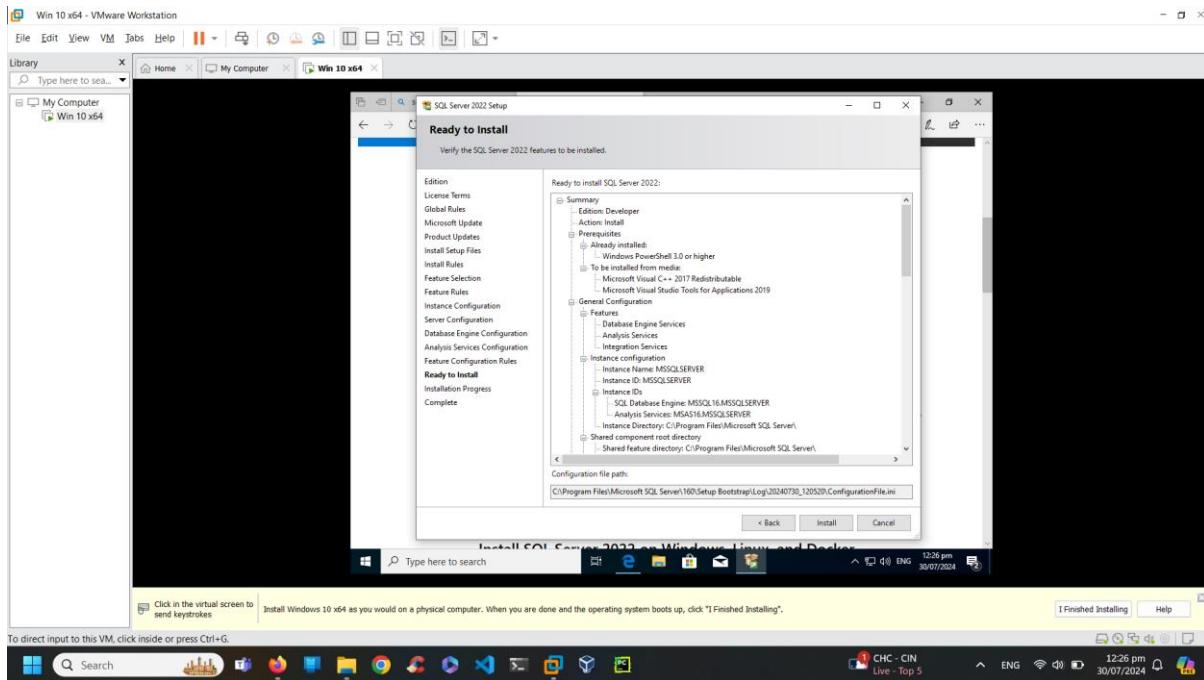
STEP 15: The next one is database engine configuration window and select the desktop with your login and then ADD. Make sure whether the windows authentication mode is selected in the authentication mode.



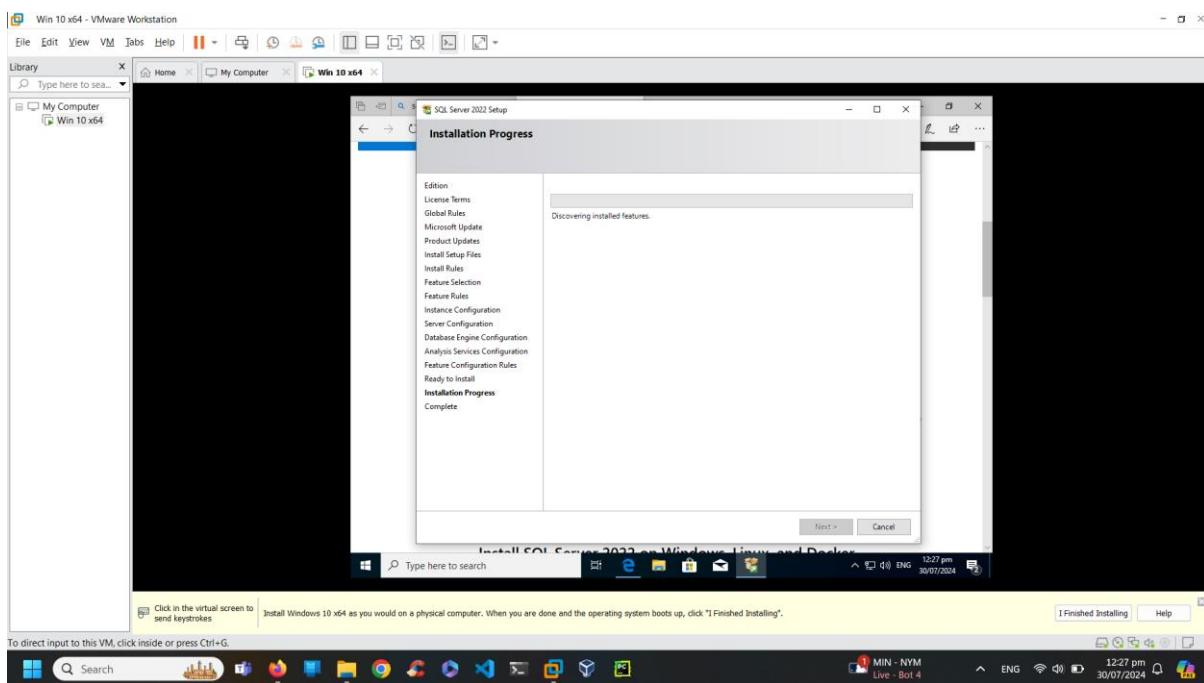
STEP 16: The next window is analysis configuration window. Select the tabular mode in the server mode and make sure your desktop/user is selected.



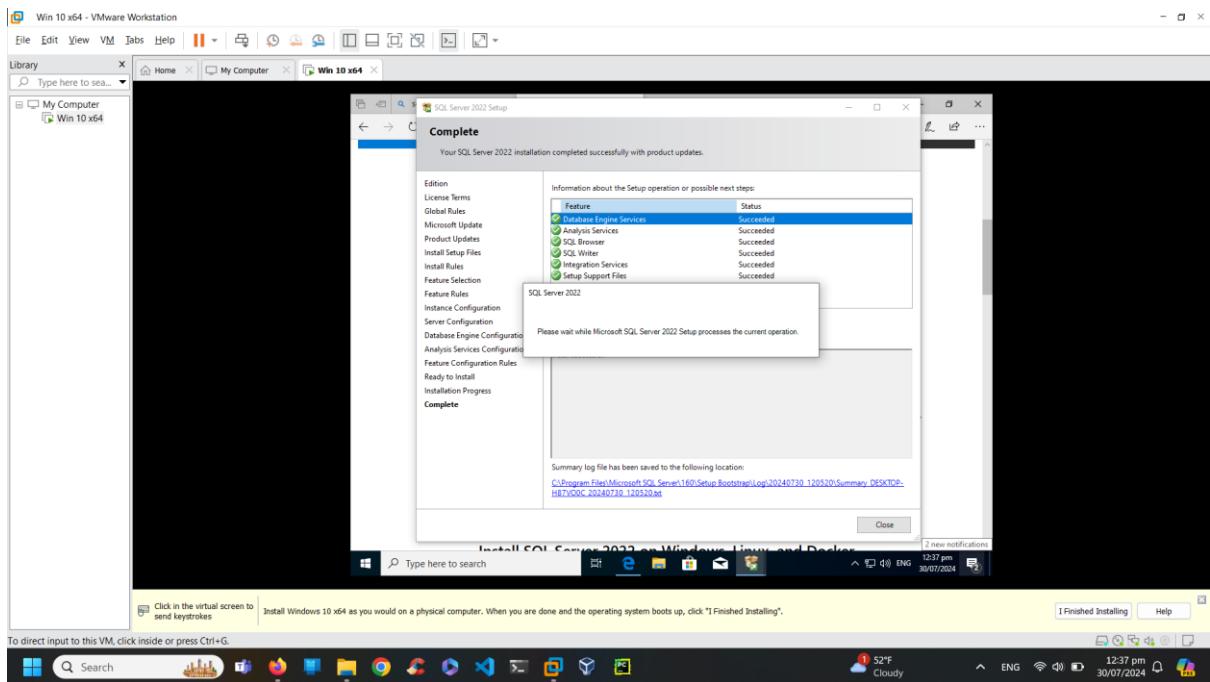
STEP 17: Ready to install window is displayed on the screen.



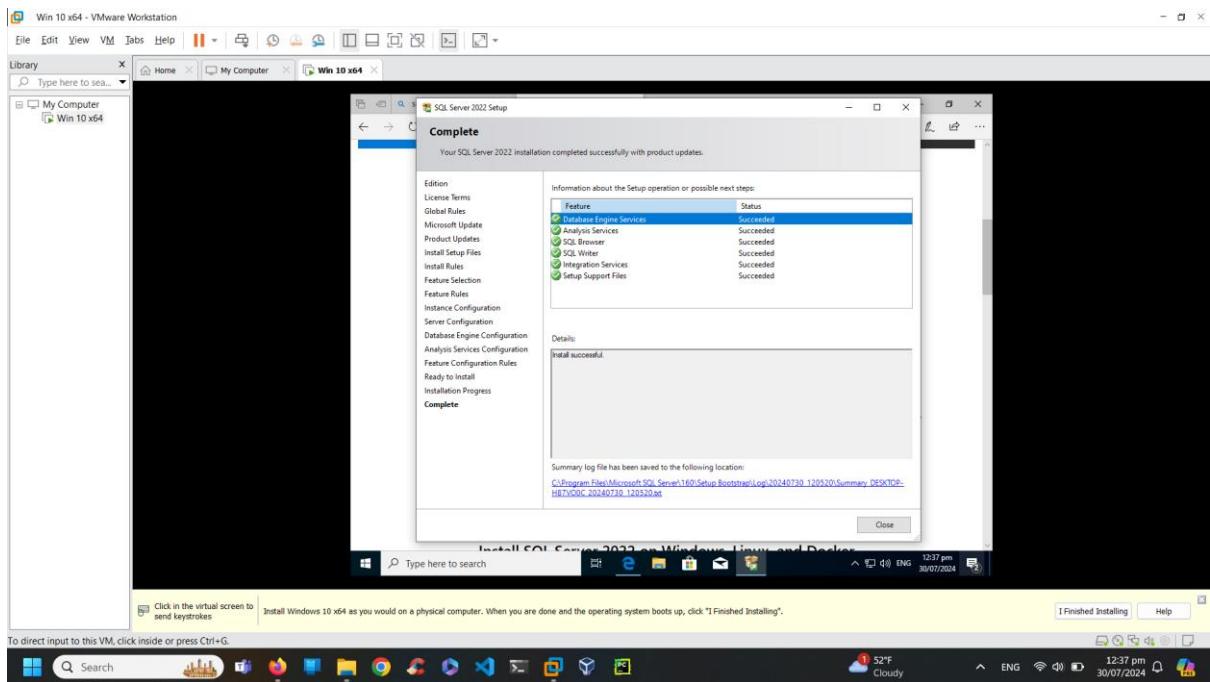
STEP 18: The window is Installation progress.



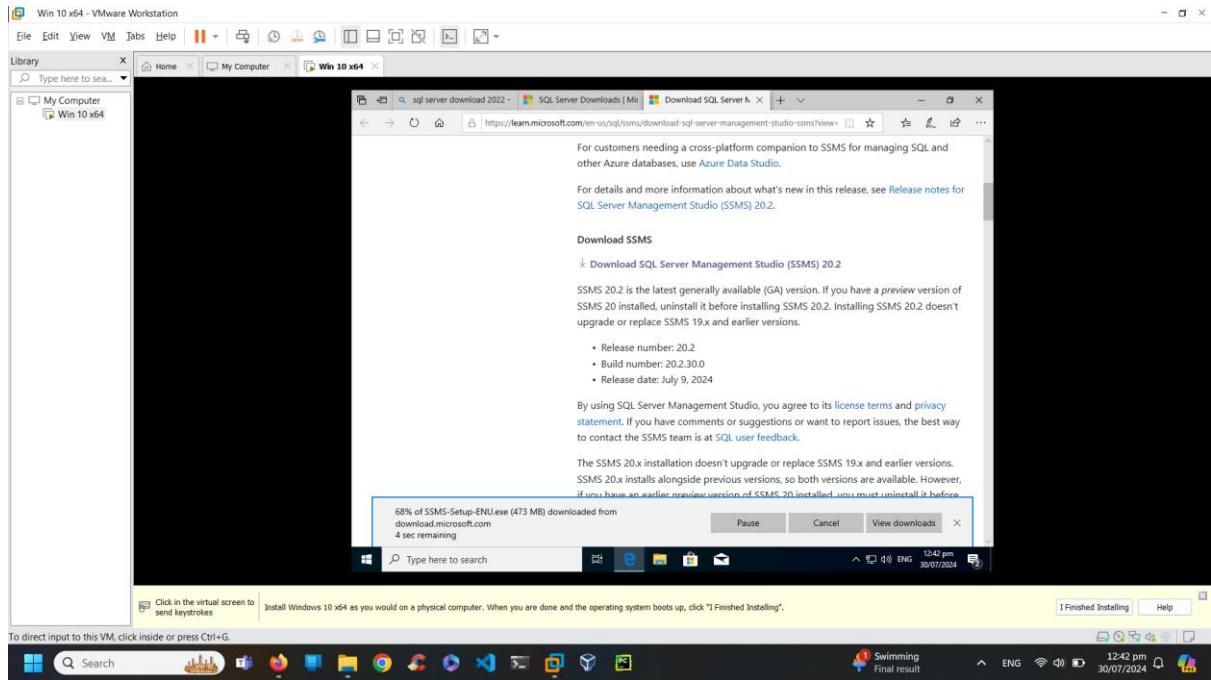
STEP 19: The installation is successfully completed.



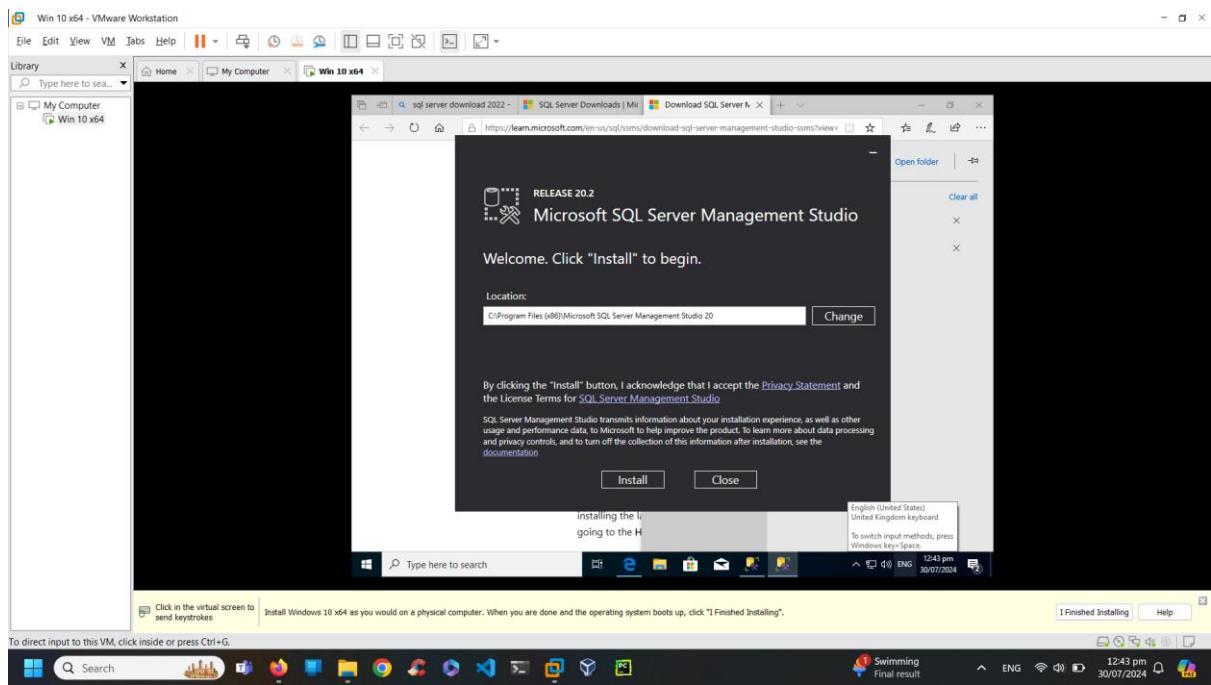
STEP 20: All the services selected in the installation process were installed successfully.



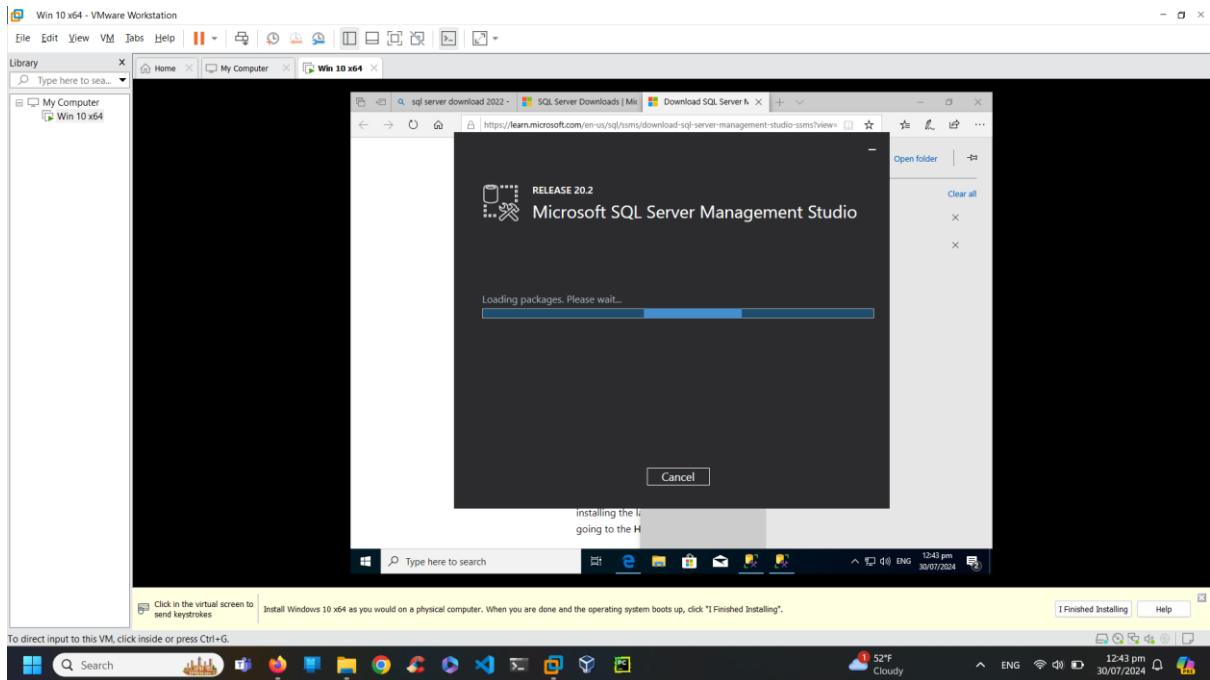
STEP 21: Download SQL Server Management Studio (SSMS) from the browser using Installation centre.



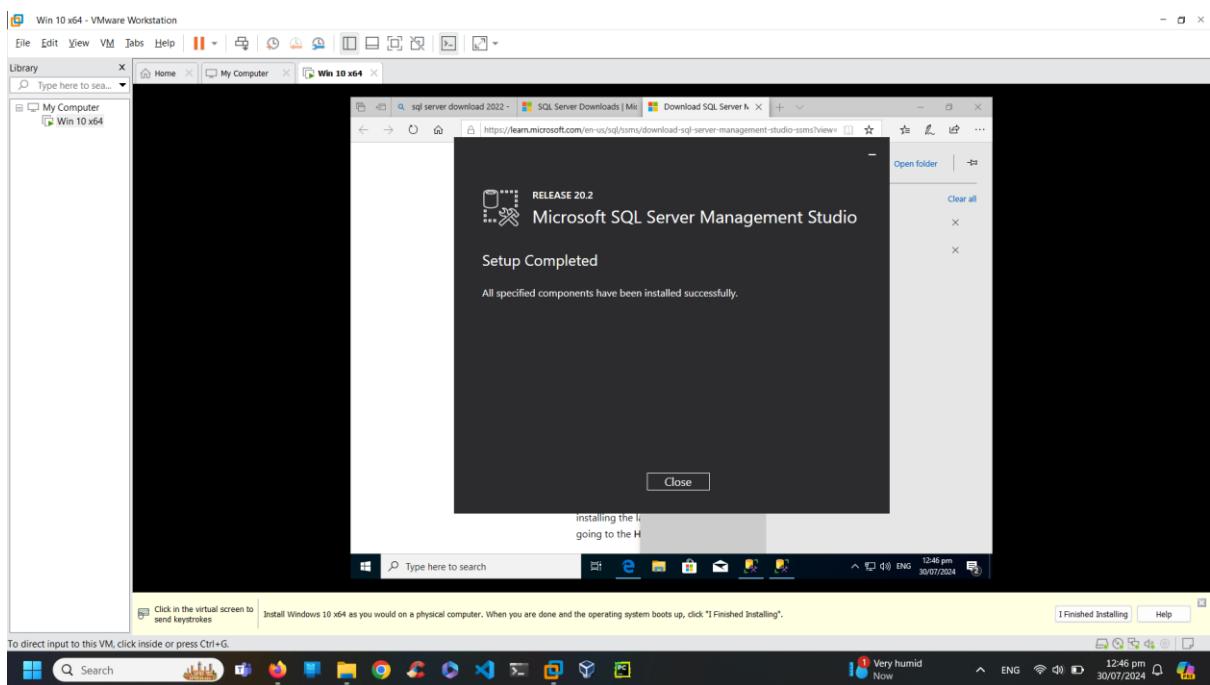
STEP 22: Once the download is completed, the setup file is saved in downloads. Double-click on the setup file and click ‘Install’ to begin.



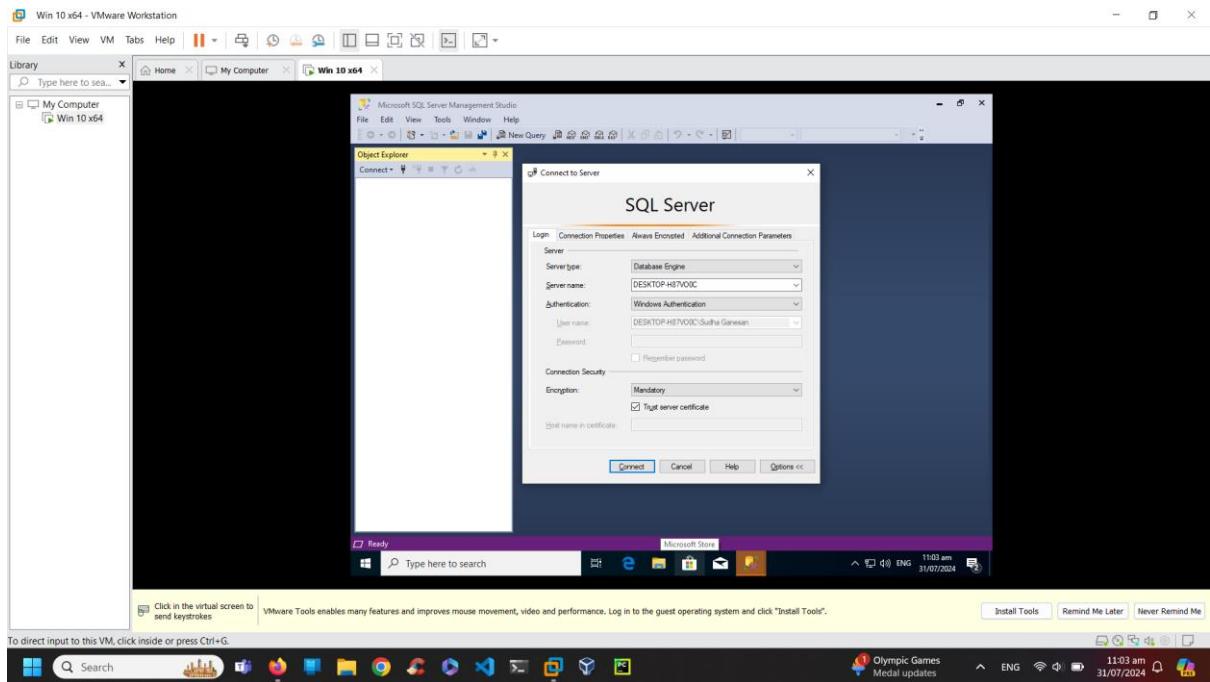
STEP 23: SSMS is installing.



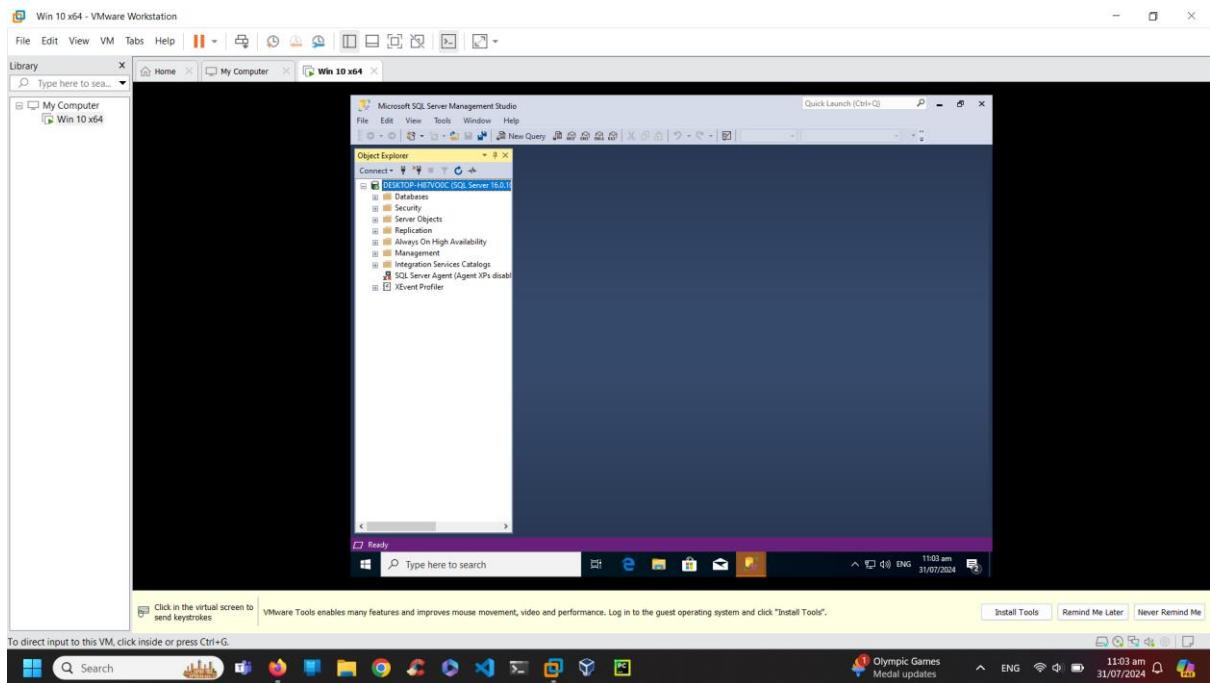
STEP 24: The setup is completed.



STEP 25: When you search for SSMS from the taskbar, you can find it and ‘Connect to Server’ will open and make sure ‘Windows Authentication’ is selected and encryption type is selected as ‘Mandatory’. Tick the checkbox to trust the server certificate. Then, click ‘Connect’



STEP 26: Once I clicked ‘Connect’. The connection is established.



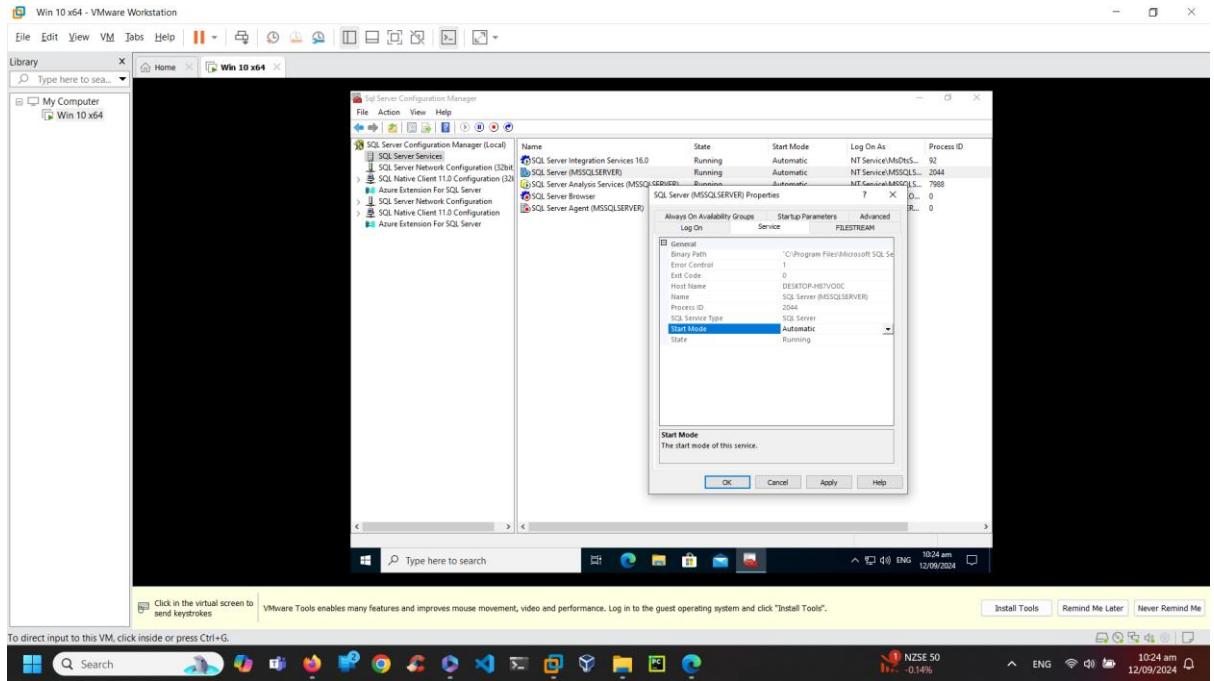
TASK 2: Working on SSMS

2.1 Set SQL Server Services to automatic and start running:

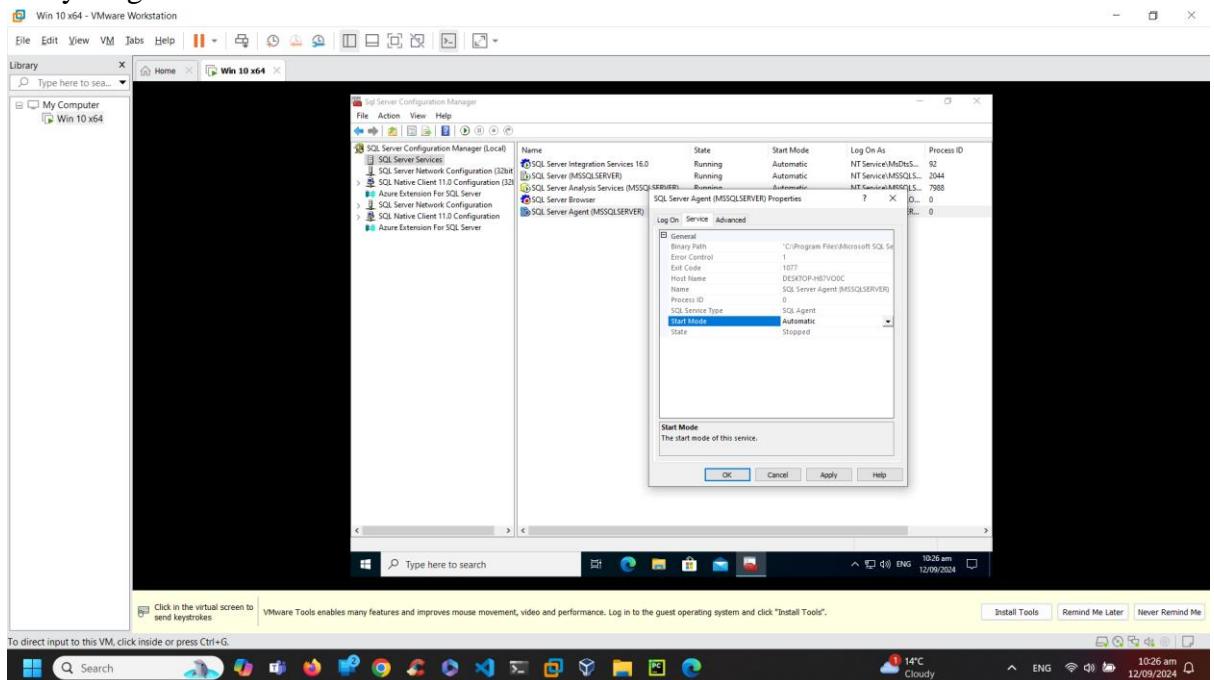
In the SQL Server Configuration Manager, expand the **SQL Server Services** node to see a list of available services.

- SQL server: Finding the SQL Server (MSSQLSERVER) under SQL Server services and right click on the service and then go to ‘Properties’. In the service tab, select

Automatic from the drop-down list. Make sure the service is running/stopped. If it is stopped, start it in the Log On tab. Click Apply once everything is done.

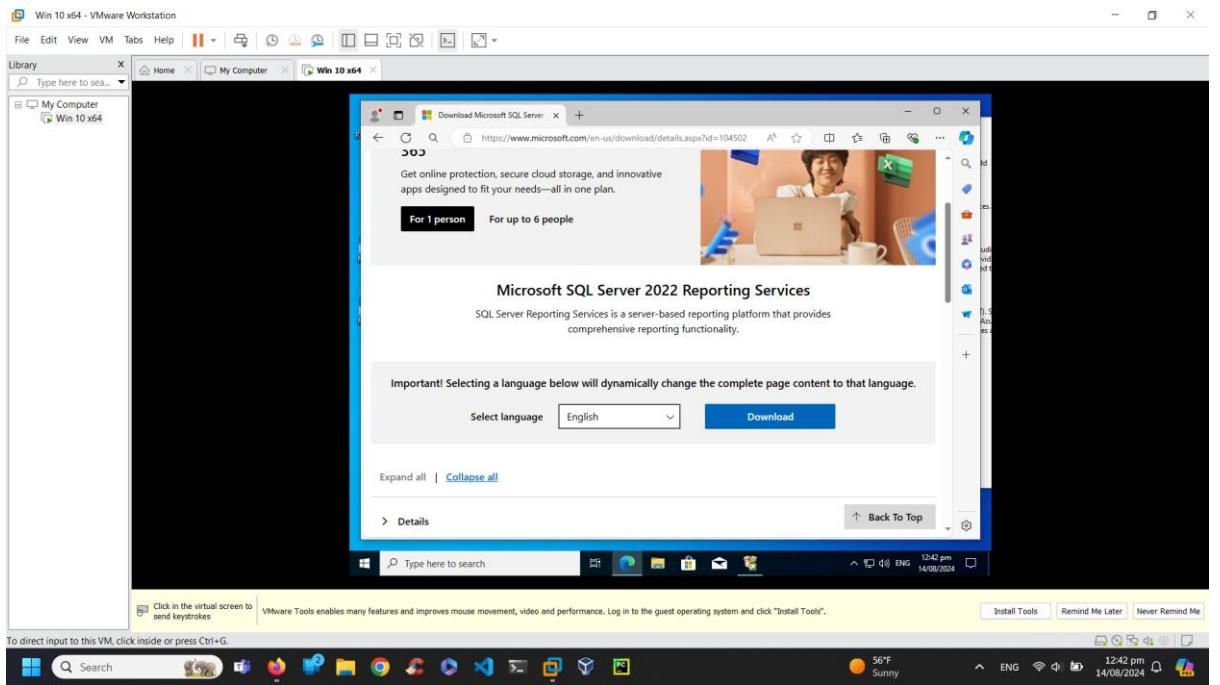


- b) SQL Server Agent: Finding the SQL Server Agent (MSSQLSERVER) under SQL Server services and right click on the service and then go to ‘Properties’. In the service tab, select Automatic from the drop-down list. Make sure the service is running/stopped. If it is stopped, start it in the Log On tab. Click Apply once everything is done.

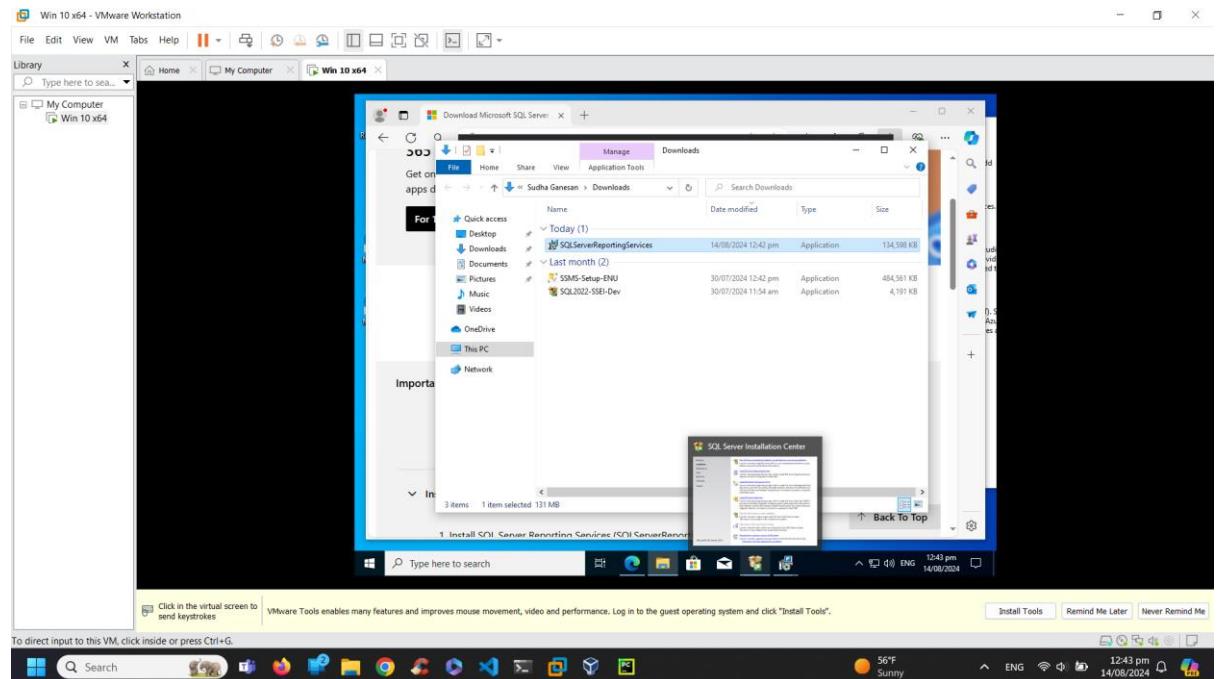


- c) SQL Server Reporting Services:

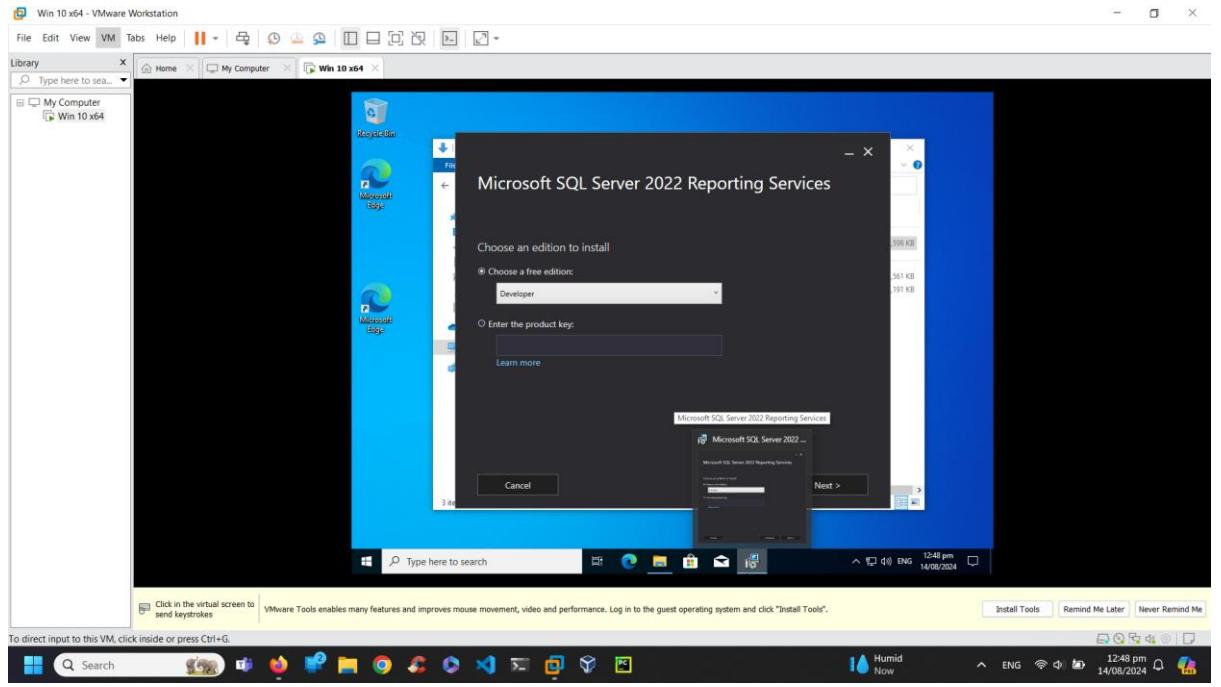
1. Installation of SSRS: Go ton SQL Installation centre and go to the link for installing SSRS. It directs me to browsing page to download the SSRS setup file.
A. Click the download link and download the file.



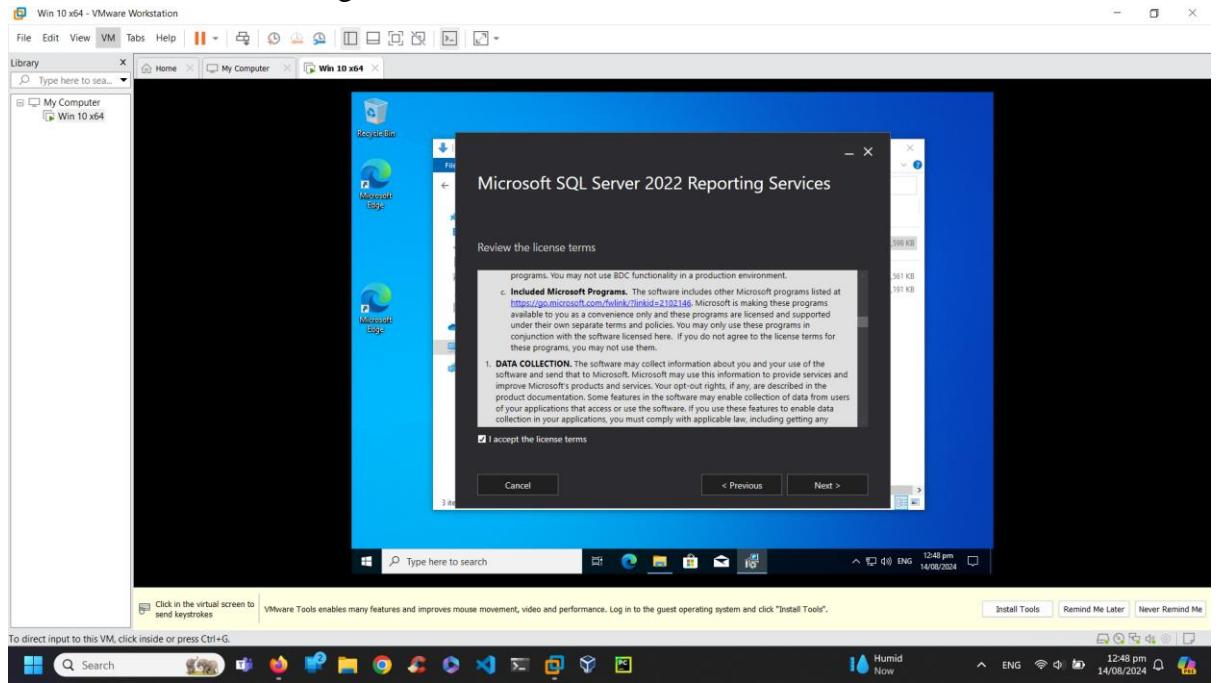
B. Double-click the file in downloads.



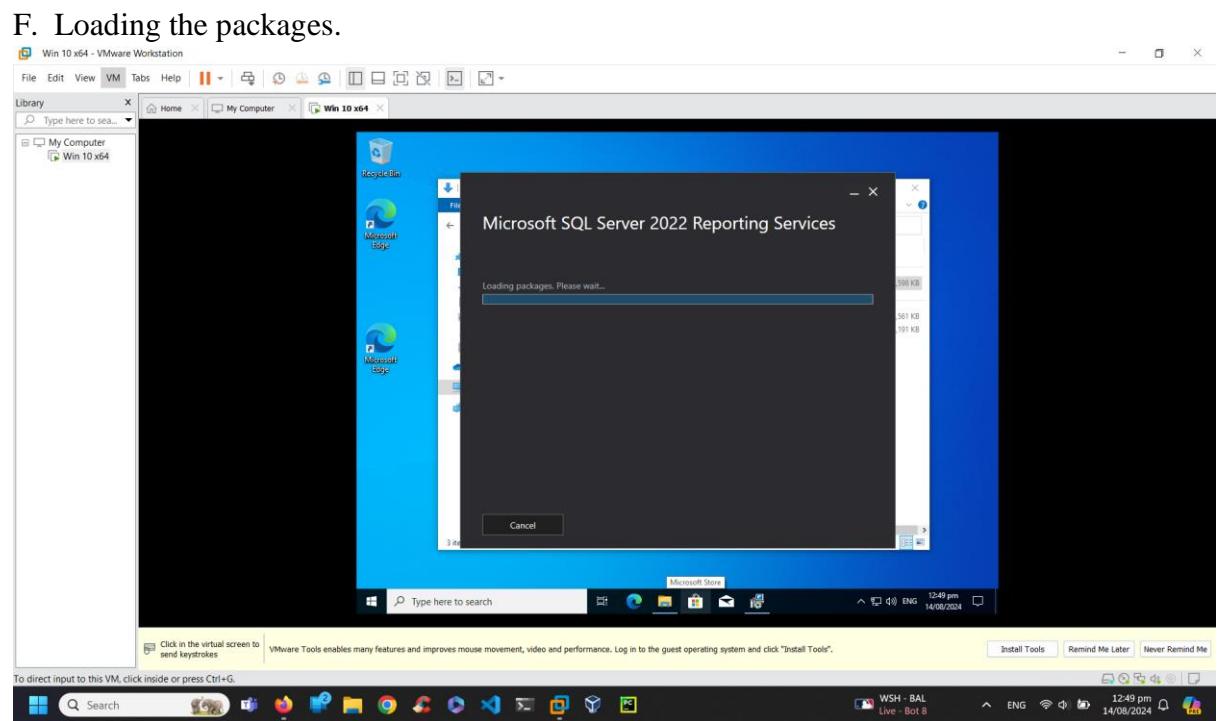
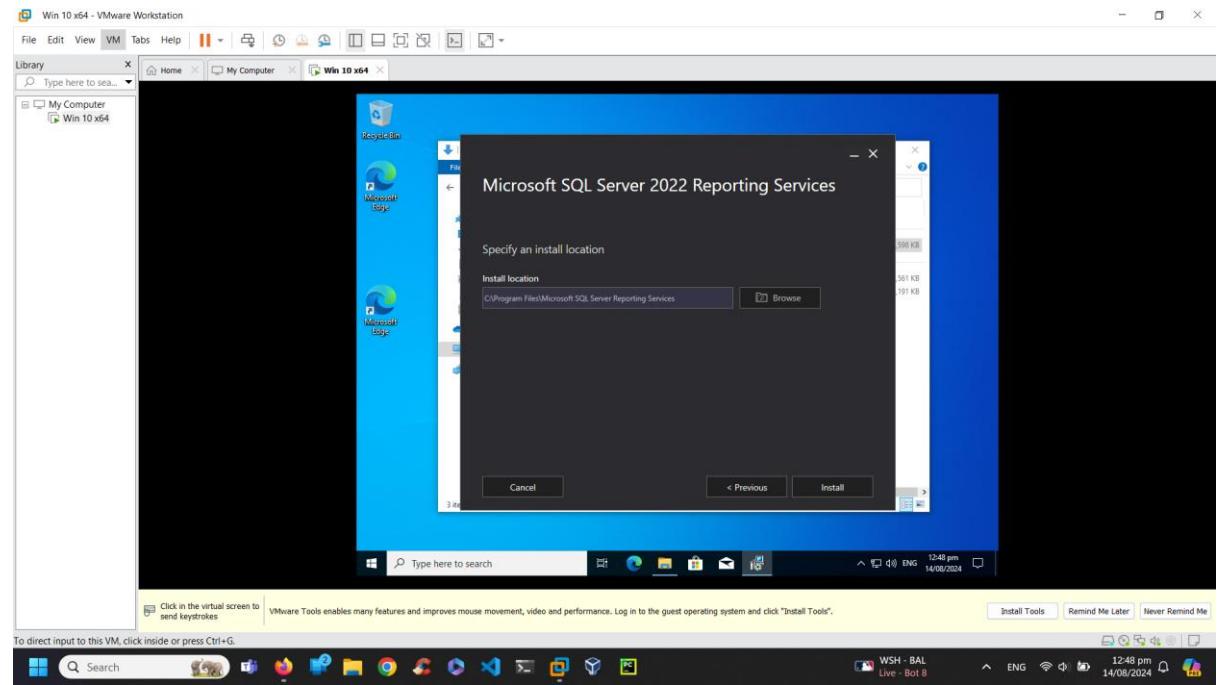
C. Select the Developer version.

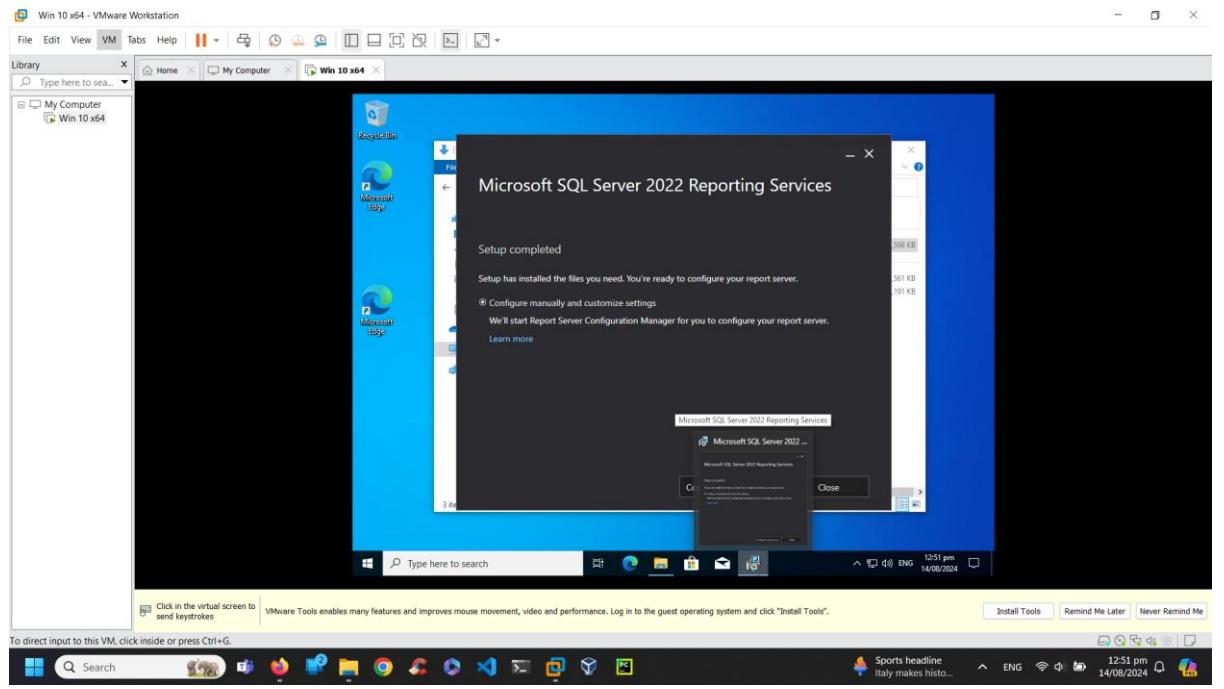


D. Tick the checkbox to agree the terms.



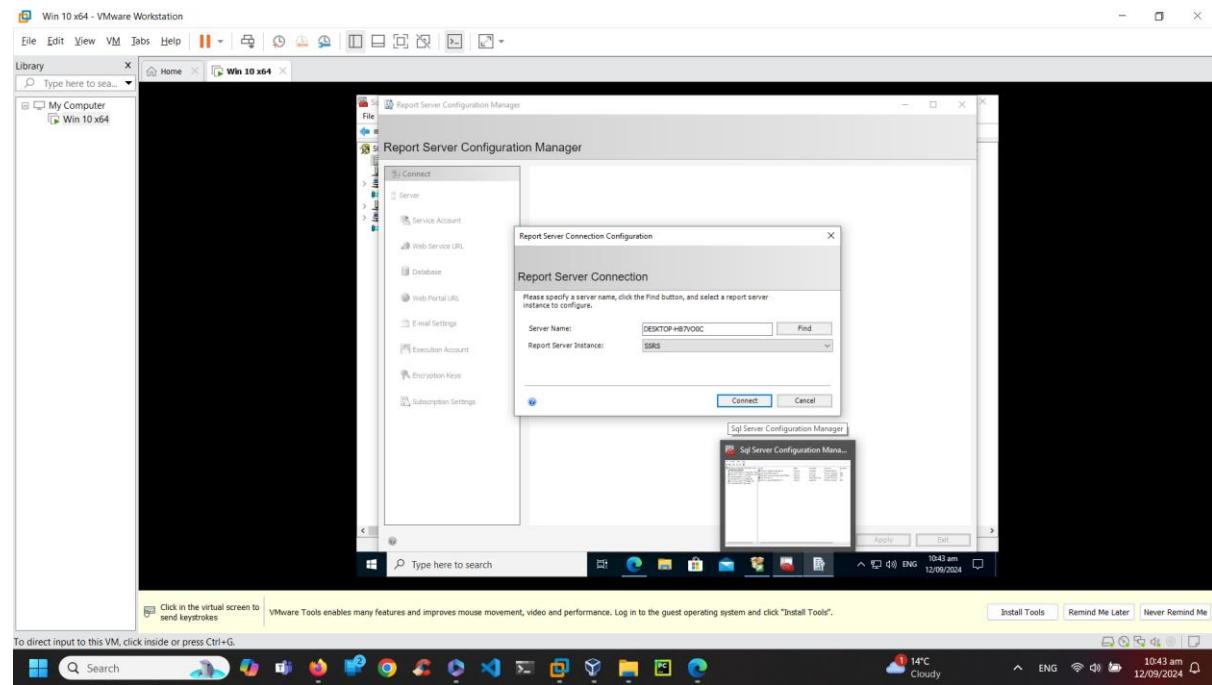
E. Specify the install location and click Install



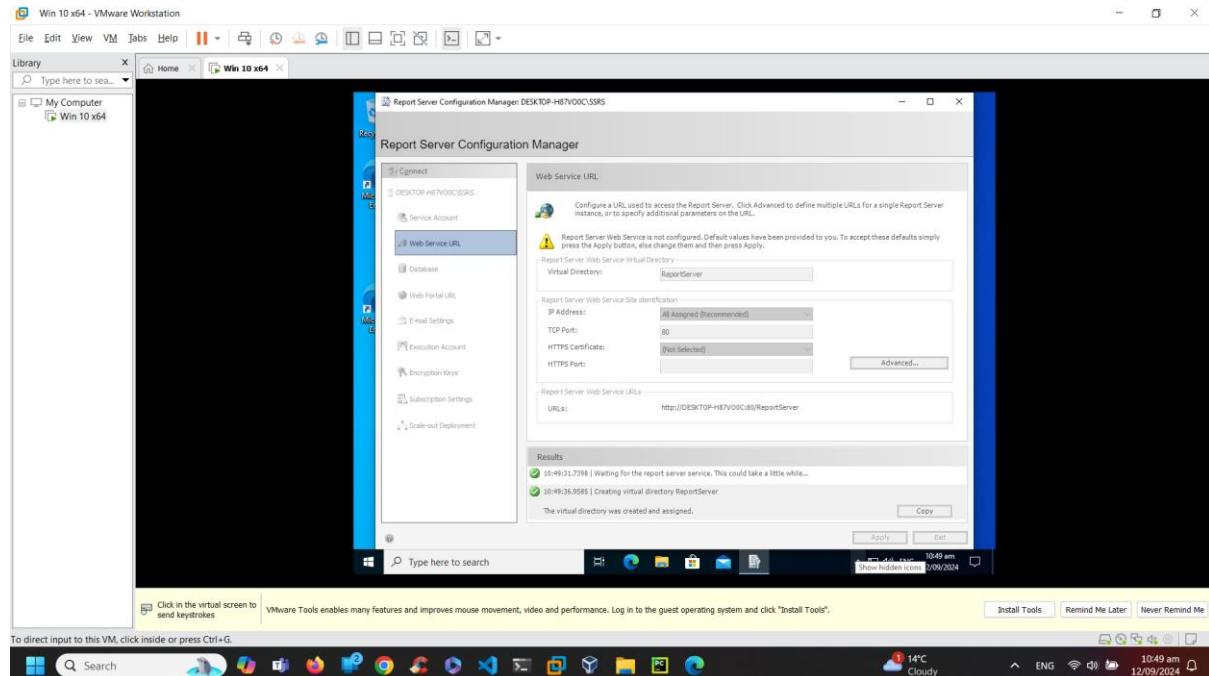


2. Configure SSRS:

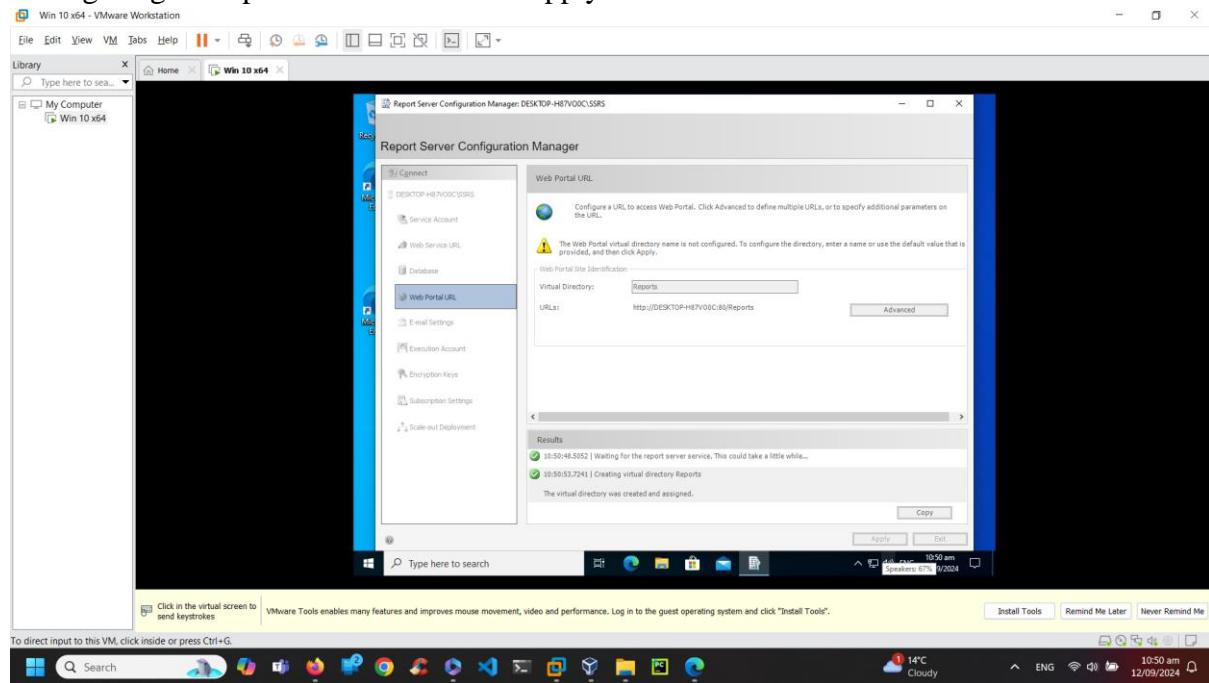
- After Installation, Go to Report server configuration manager and connect to SSRS. Set the Web Service URL, Report Manager URL, and configure the database for SSRS.



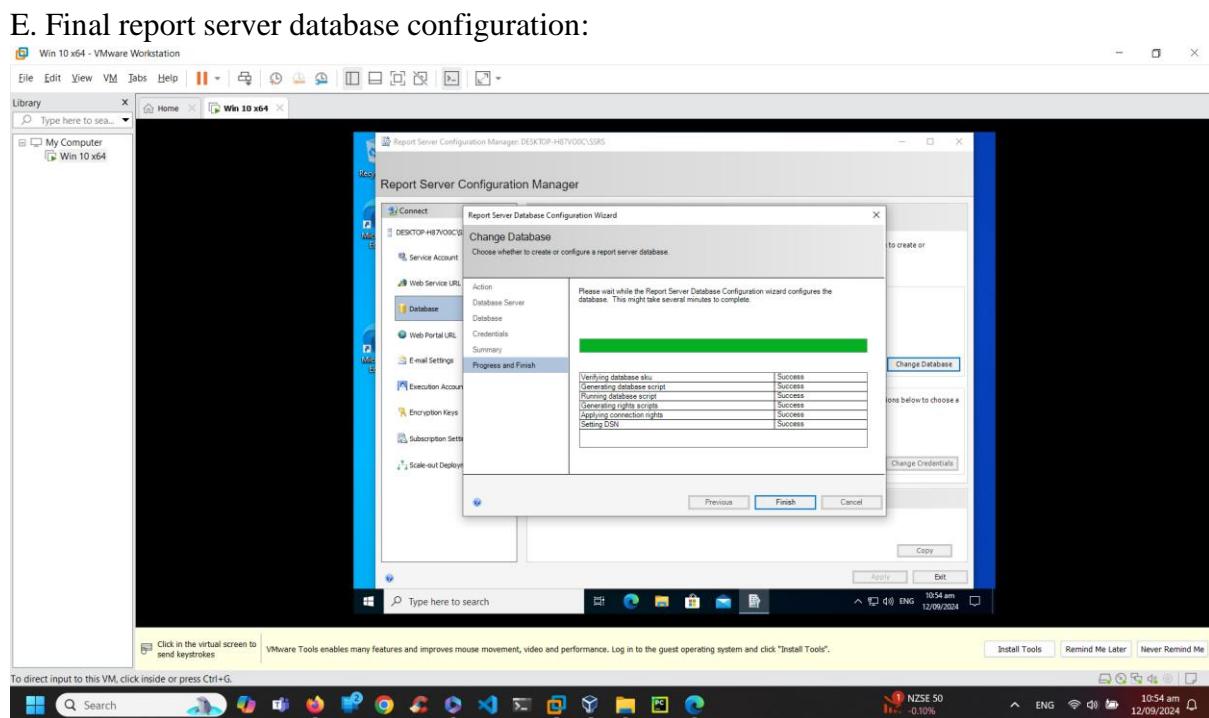
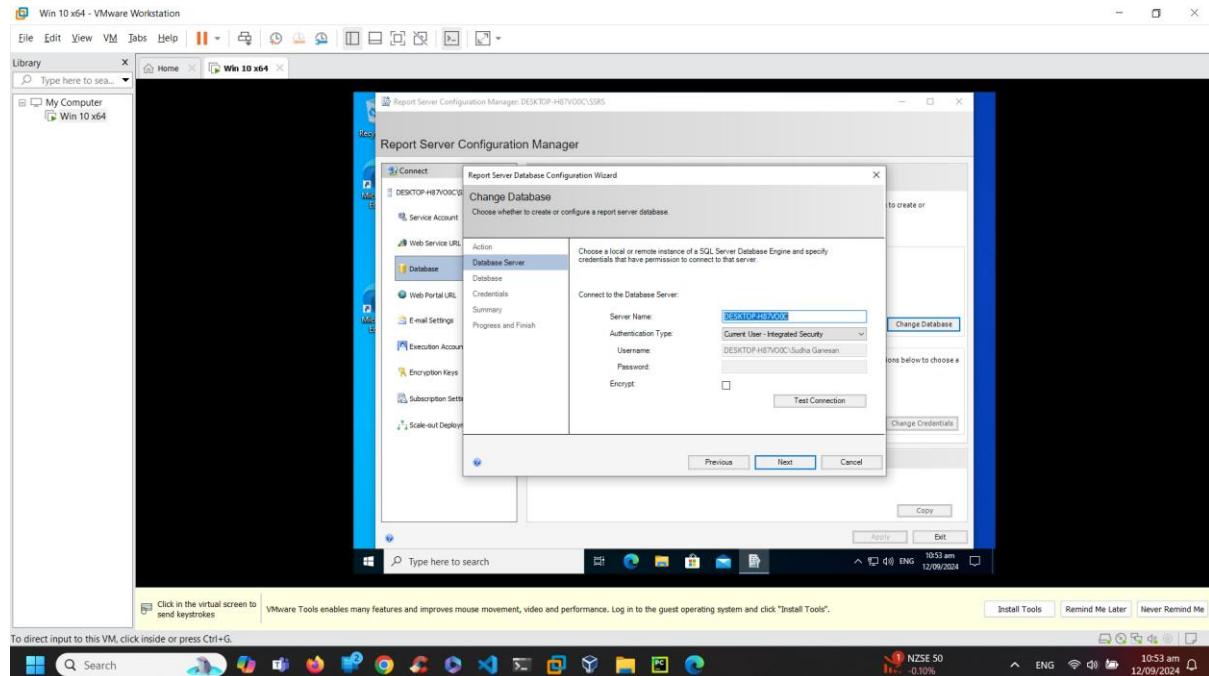
- Configuring Web Service URL: This configures the URL for the SSRS Web Service, which processes reports and handles report management tasks. and click Apply to bind the report server to the selected URL.



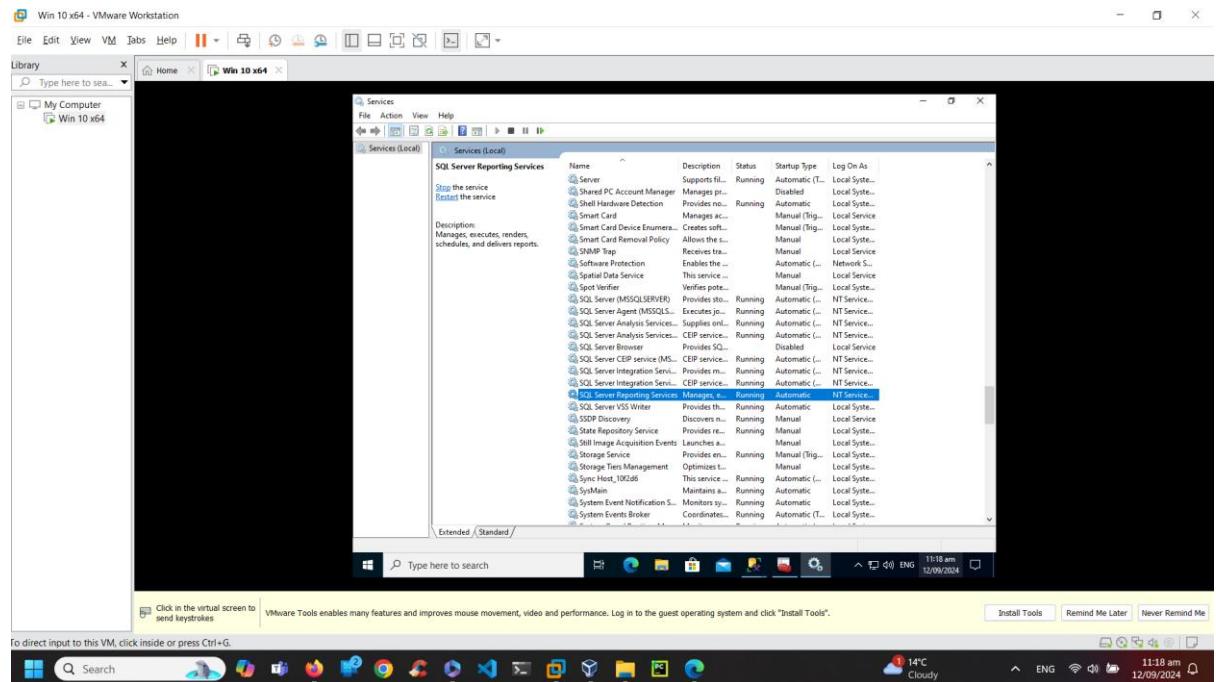
C. Configuring Web portal URL and click Apply



D. Configuring the database.



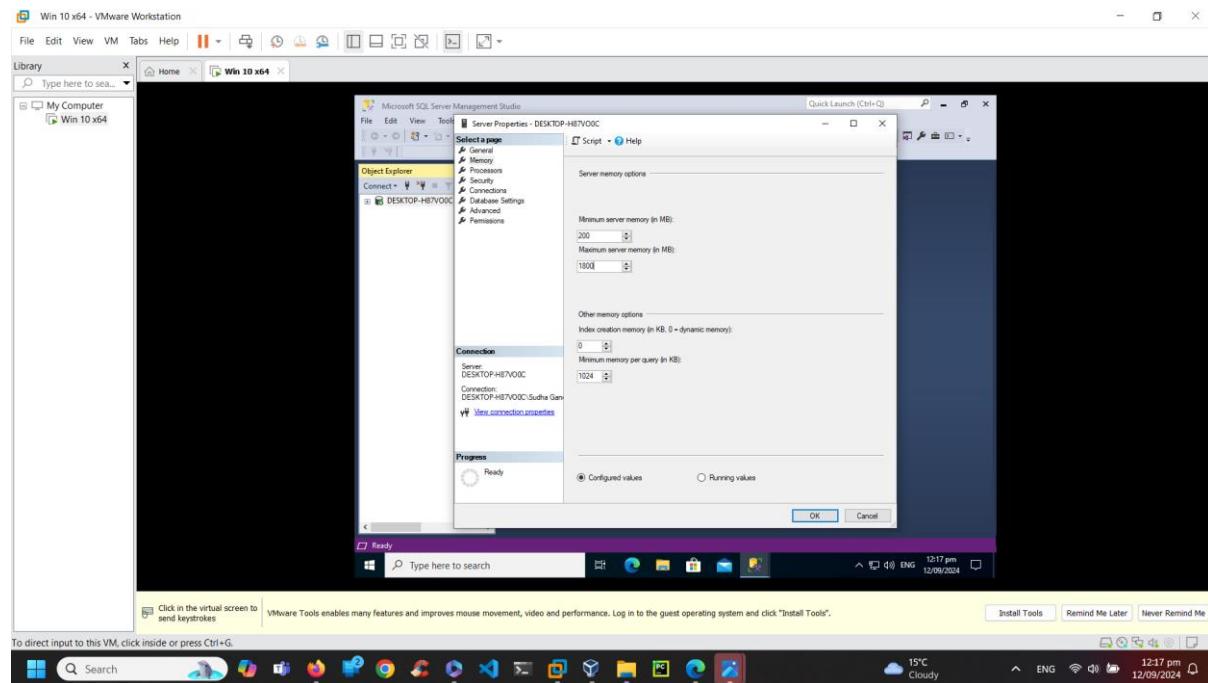
3. Set Automate and Start the SSRS service: Go to services.msc and locate Reporting server and check it is set to Automatic and it is running.



2.2 Configure the Memory properties:

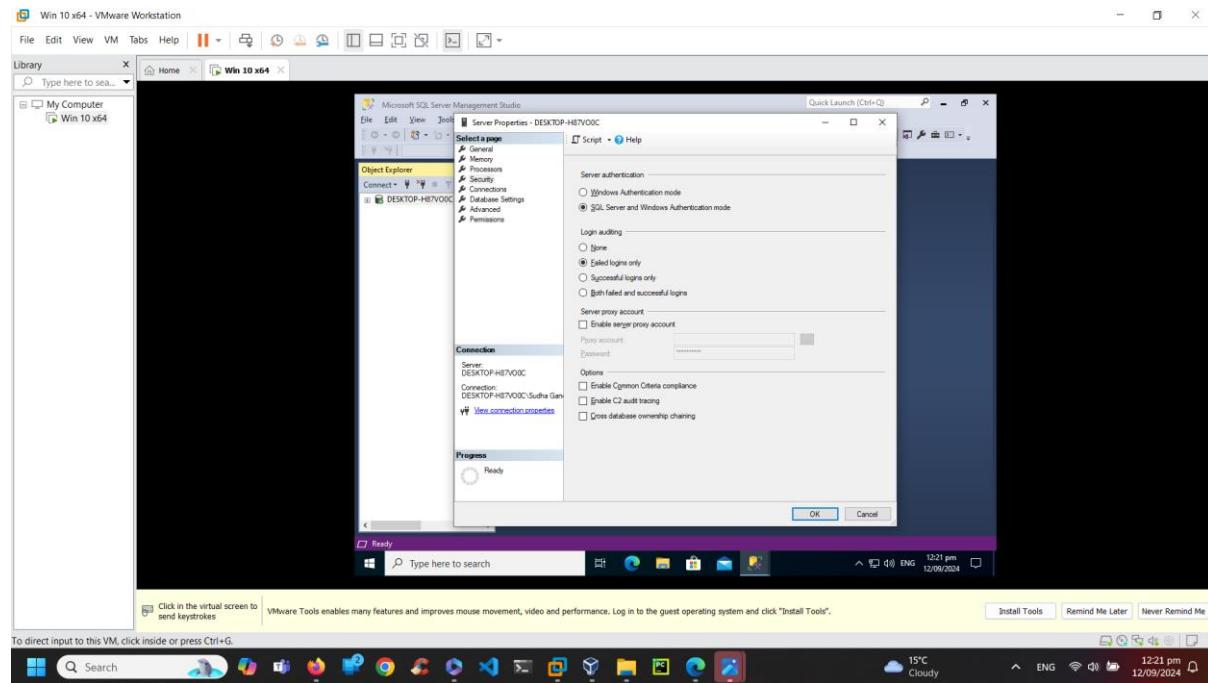
In the Server Properties window, select the Memory page from the left-hand menu. Set Minimum and Maximum Server Memory and click OK.

- Minimum server memory (in MB): Enter 200 MB in the field.
- Maximum server memory (in MB): Enter 1800 MB in the field.



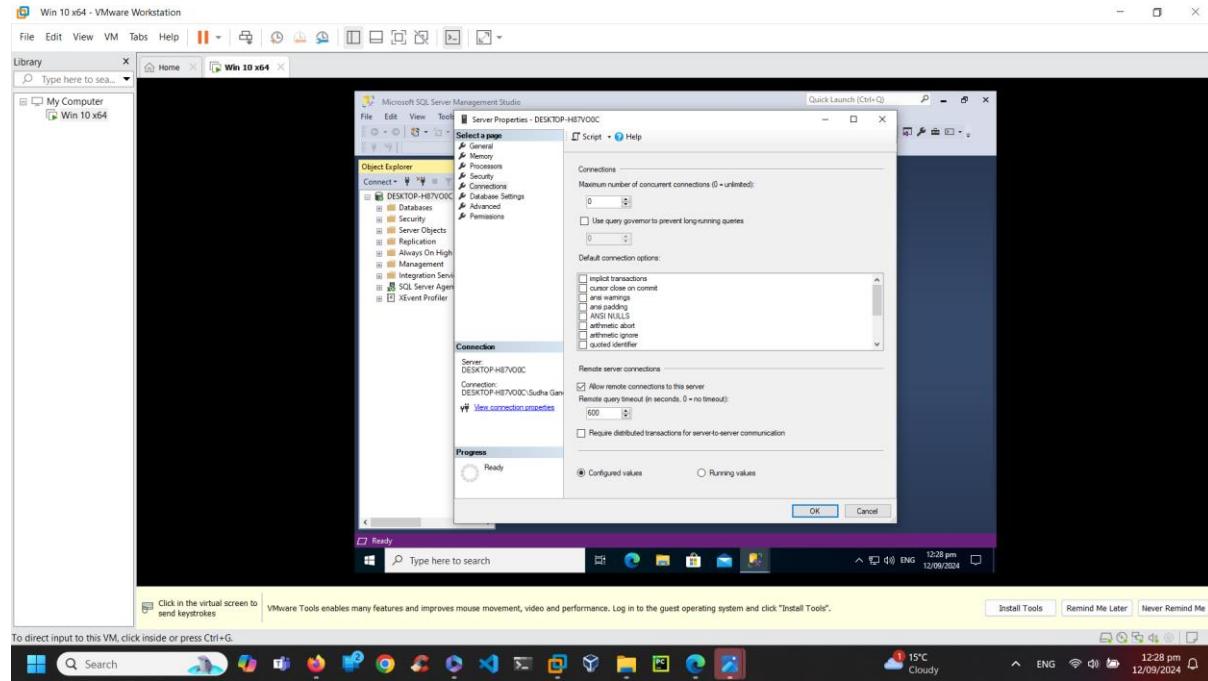
2.3 Server Authentication:

In the Server Properties window, click on the Security tab from the left-hand menu. In the Server authentication section, select SQL Server and Windows Authentication mode. Click OK to save the settings. To apply this change, you will need to restart the SQL Server service.

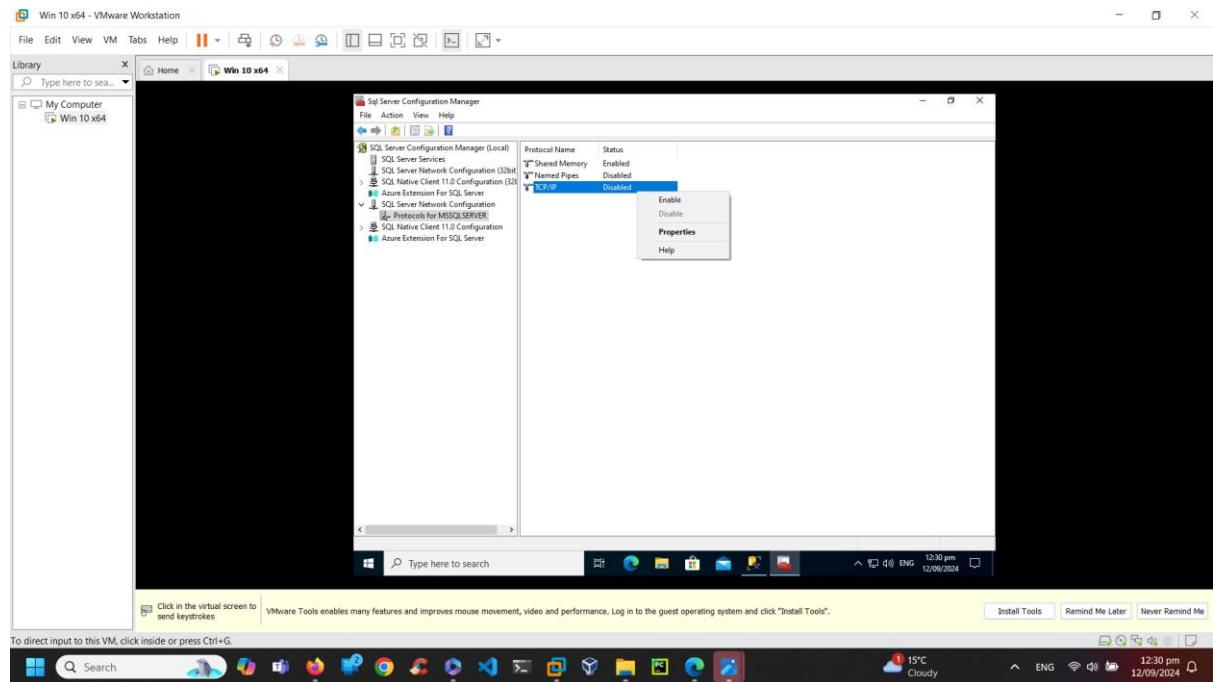


2.4 Allow remote connections to the Server:

In the Server Properties window, click on the Connections tab on the left. Under Remote server connections, tick the check box Allow remote connections to this server. Click OK to apply the changes.

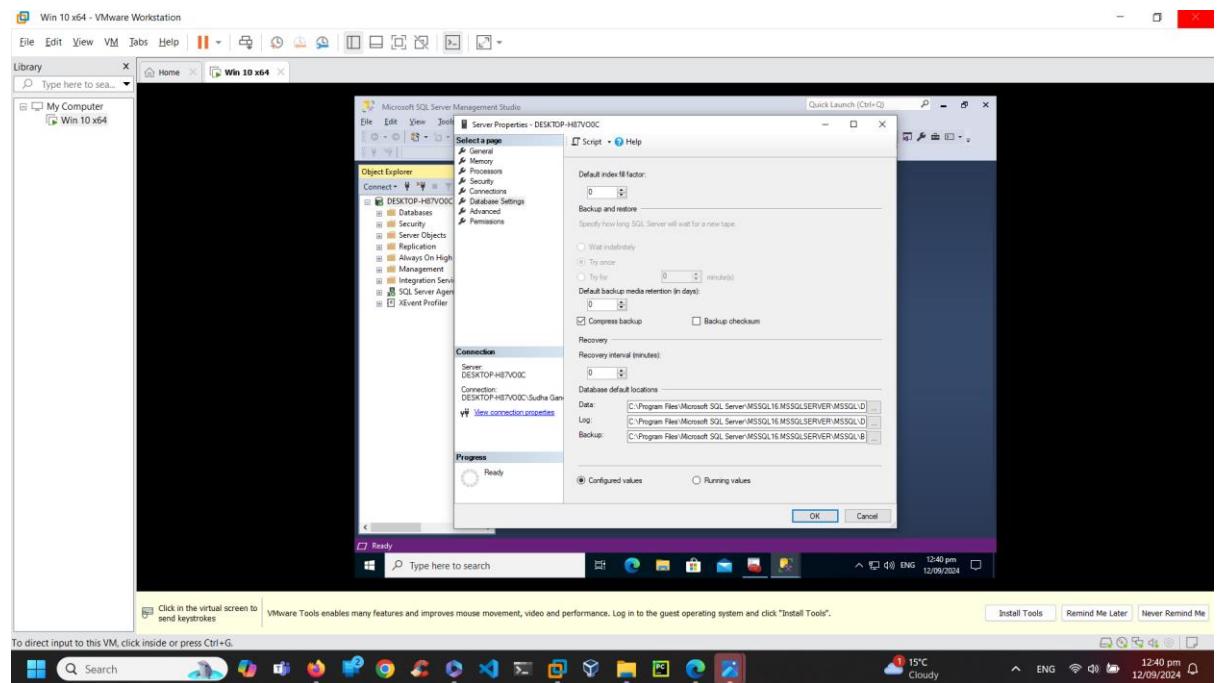


Make sure TCP/IP protocol is enabled in Server configuration manager.



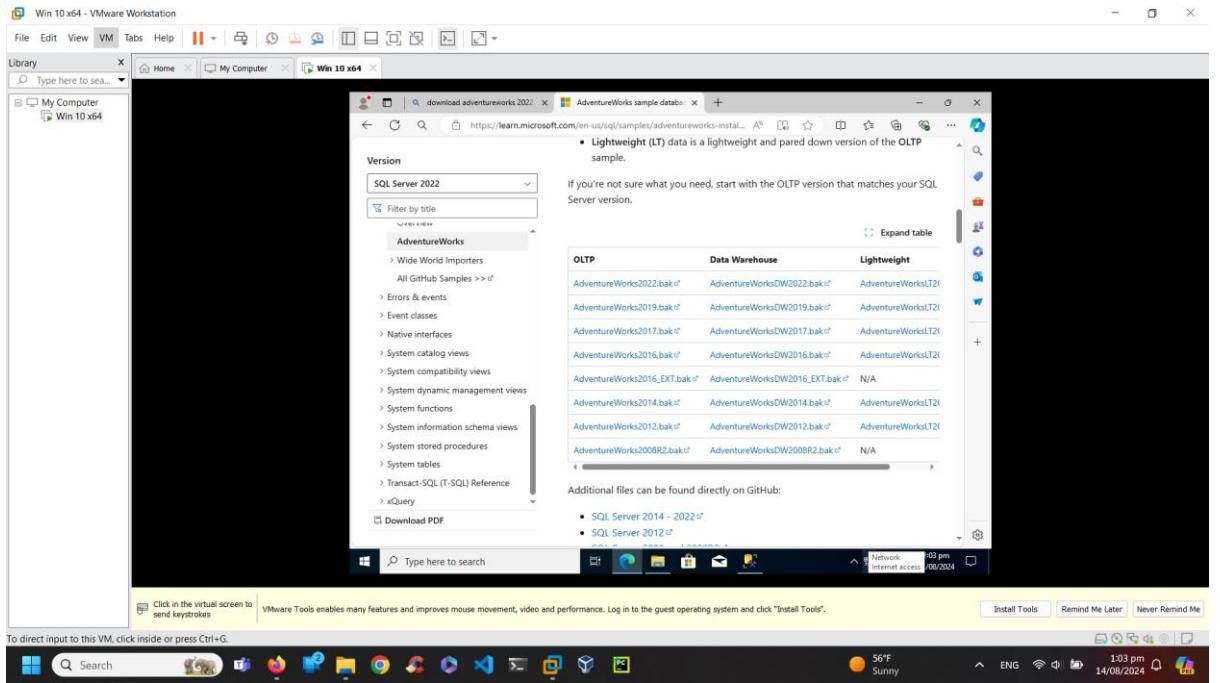
2.5 Select compress backup option:

In the Server Properties window, click on Database Settings from the left-hand menu. In the Backup and restore section, check the option Compress backup by default. Click OK to apply the settings.

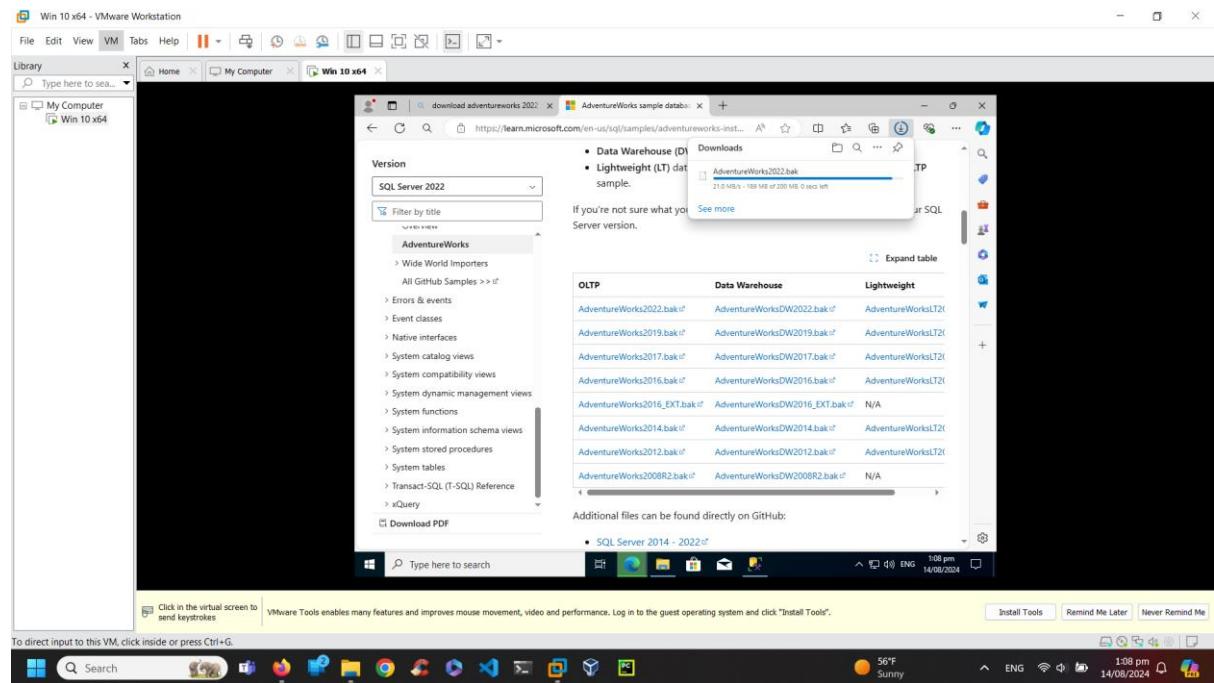


2.6 Add adventure works to SQL server:

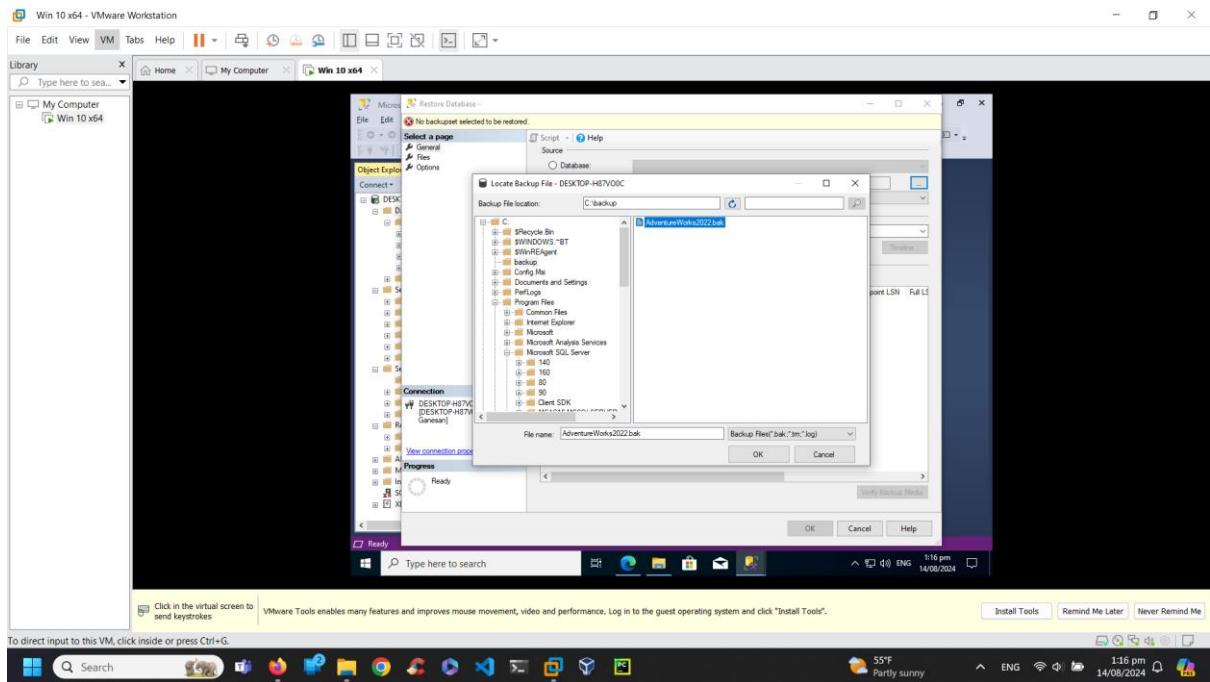
A. Select the Adventure works 2022 from the browsing page



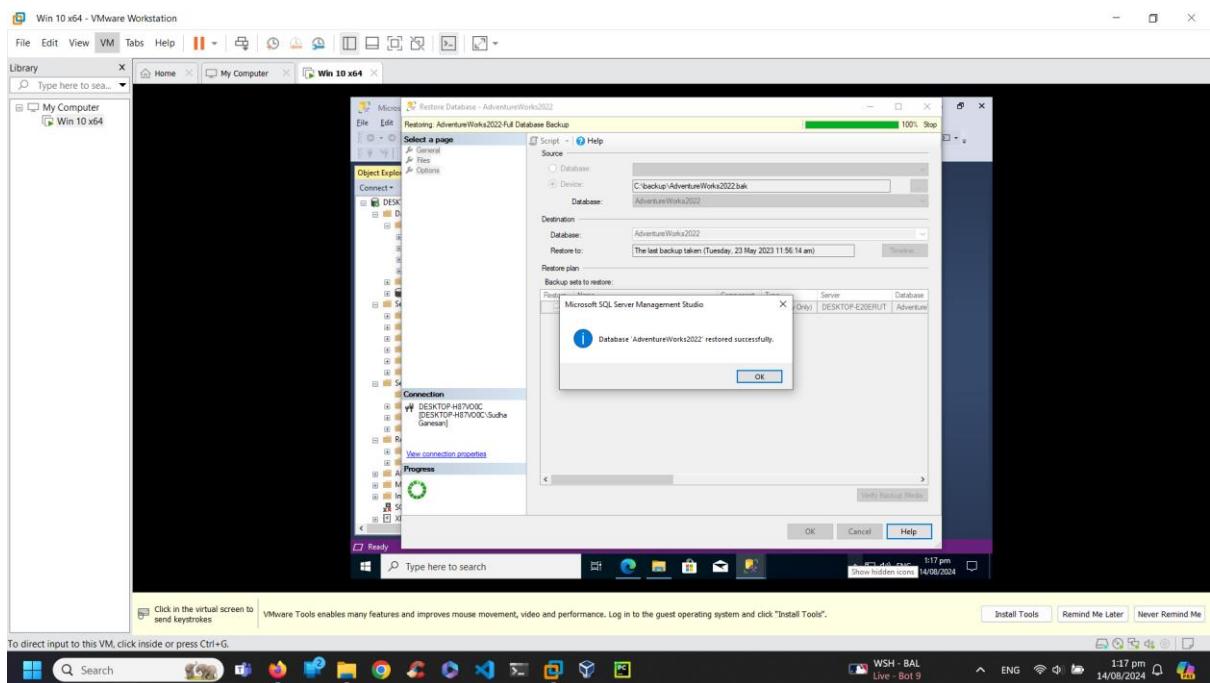
B. Click on the file to download it.



C. Restore the AdventureWorks2022.bak file to a folder called backup in C:/drive.

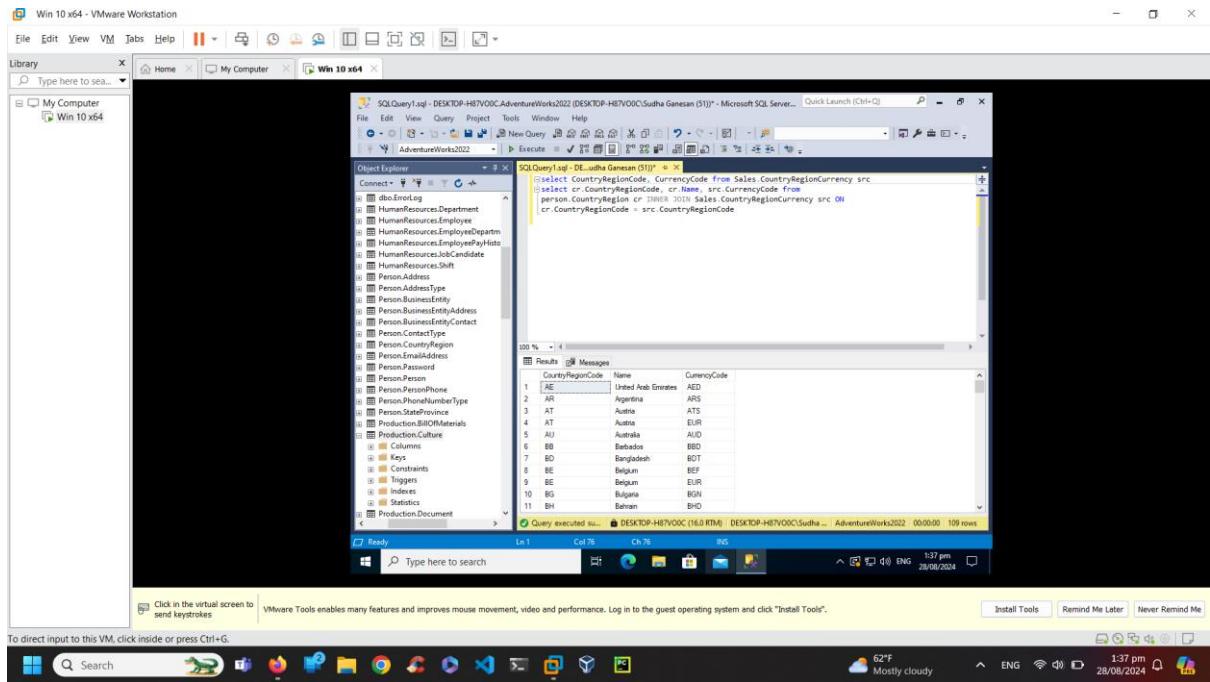


D. Database is restored successfully. After the restore or attach process, expand the Databases node in SSMS, and you should see Adventure Works listed.

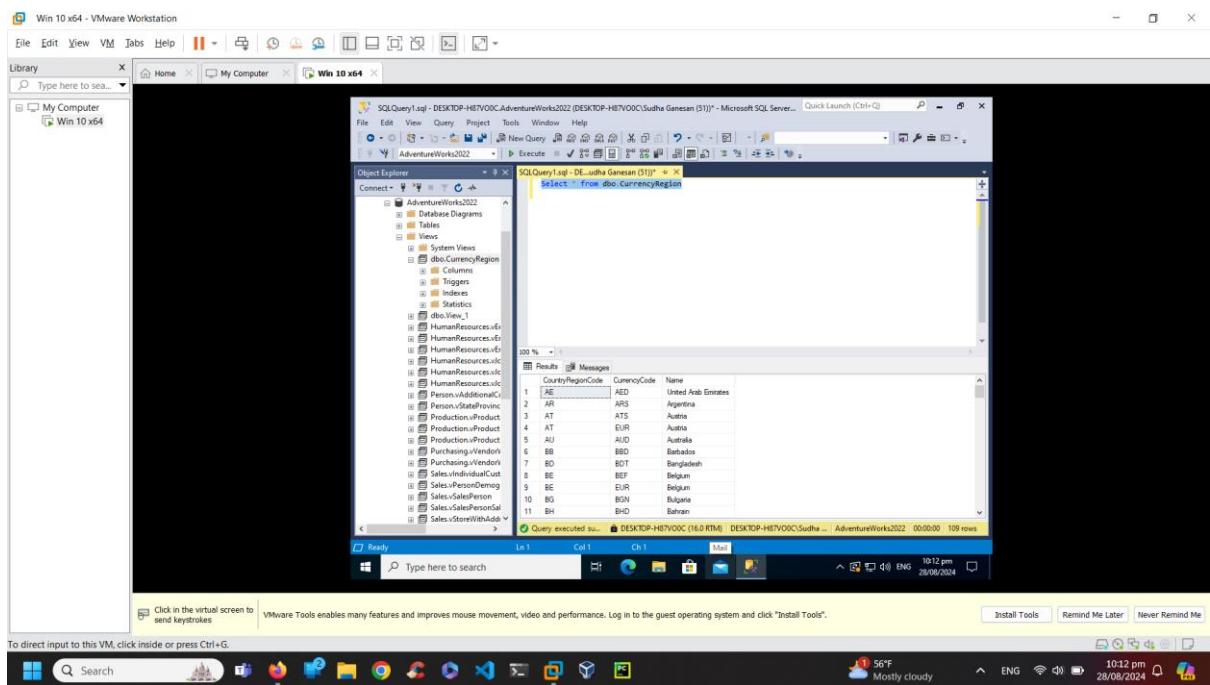


2.7 Create a view named Currency region:

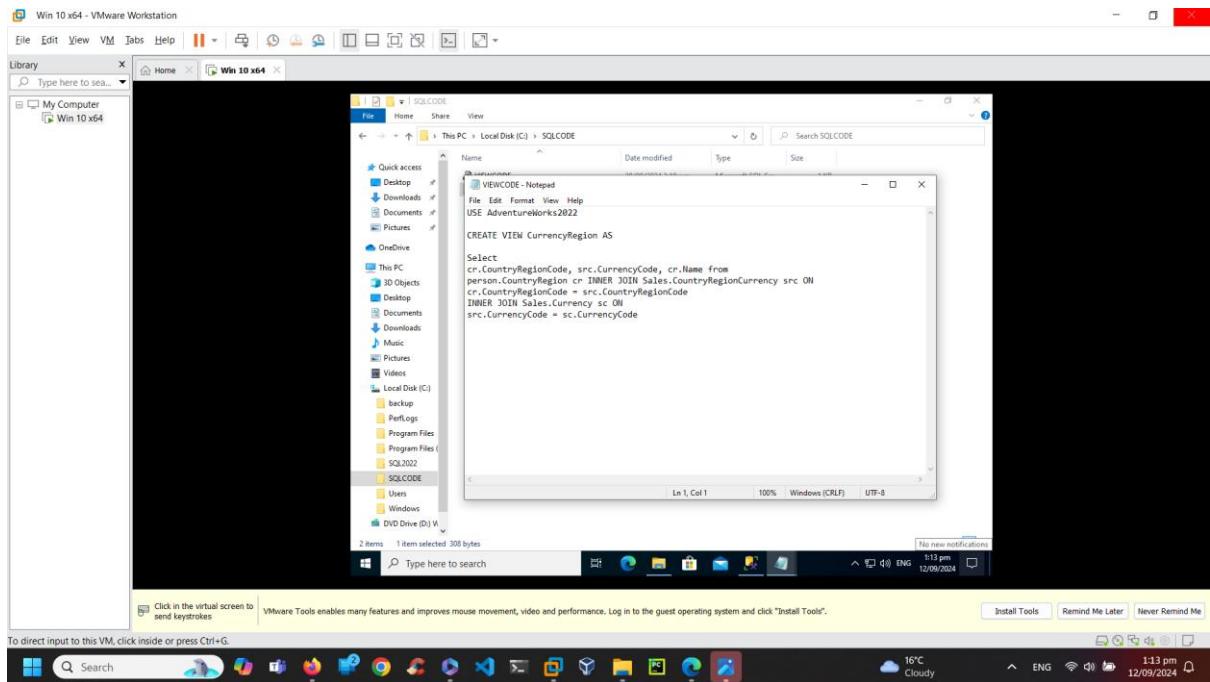
A. Select three tables from Adventure works to extract the fields: Name, CurrencyRegionCode, Currency Code. Here, I have selected tables: person.Countryregion, Sales.CountryRegionCurrency, Sales.Currency. Use Inner-join code to display the fields



B. Create a view called Currency region to list the fields



C. Paste the T-Sql code in a notepad file called View Code and save the file to a folder named SQL Code on the C:\ drive in the VM.

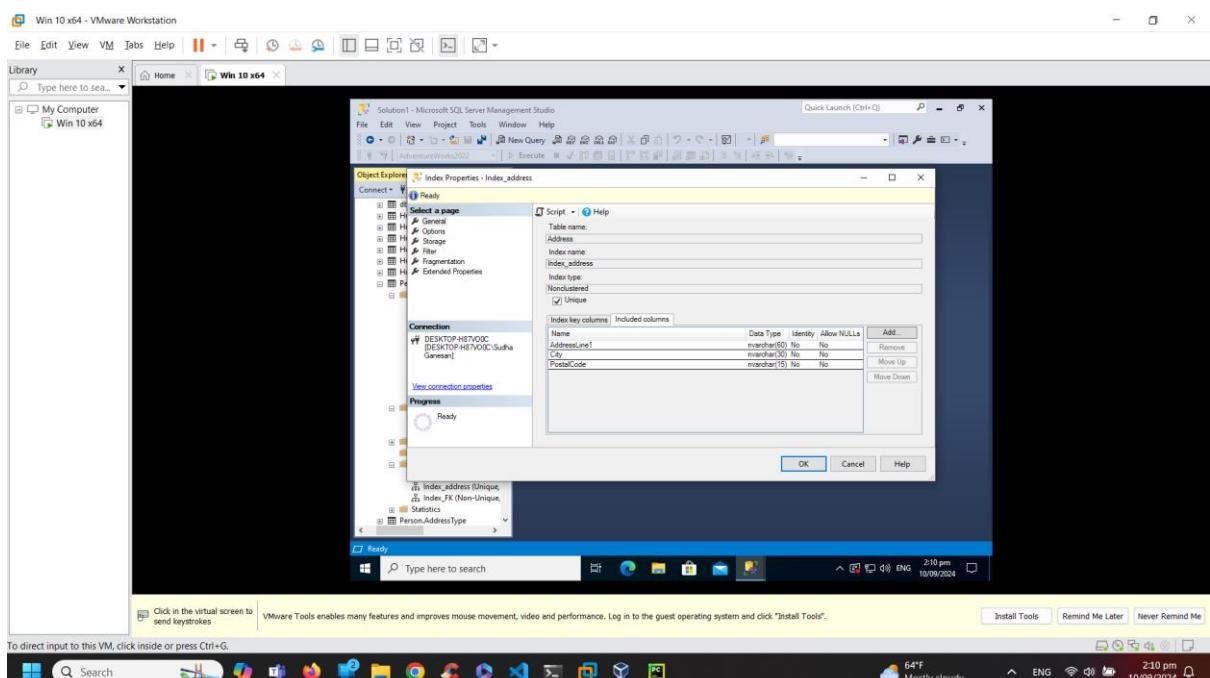


2.8 non-clustered index: Create a Non-Clustered Index for any table in the database that you wish to, ensuring that you include at least two columns in the index. Here I have used

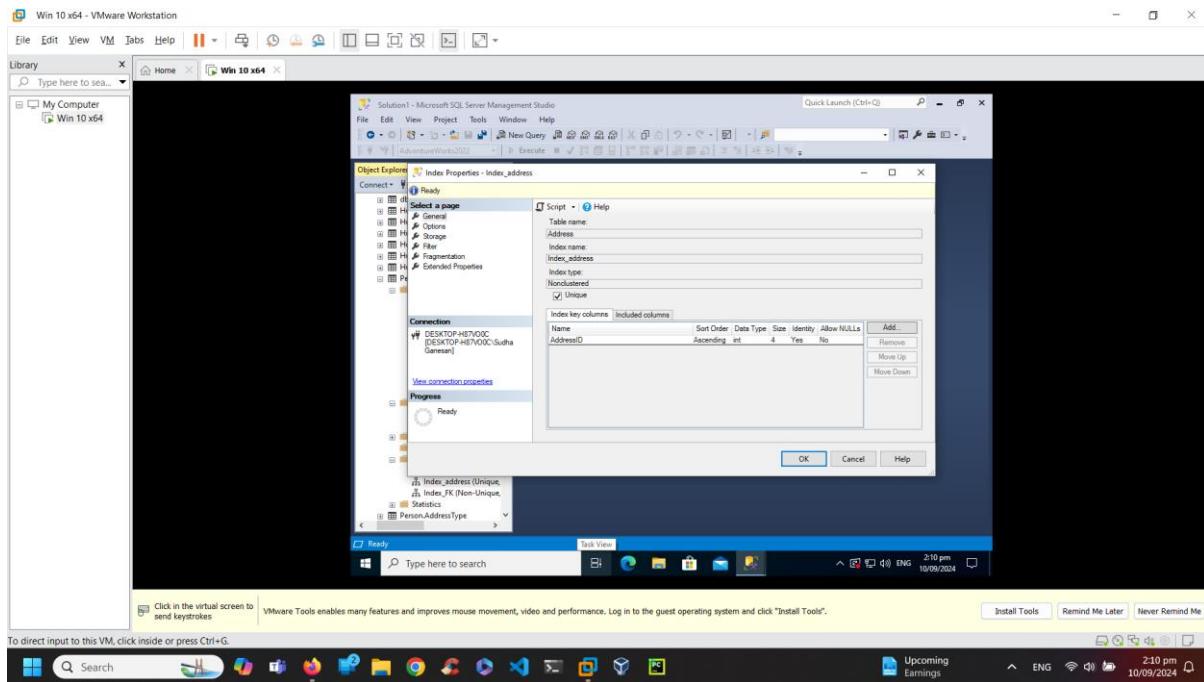
Table name: Person. Address

INDEX name: Index_Address

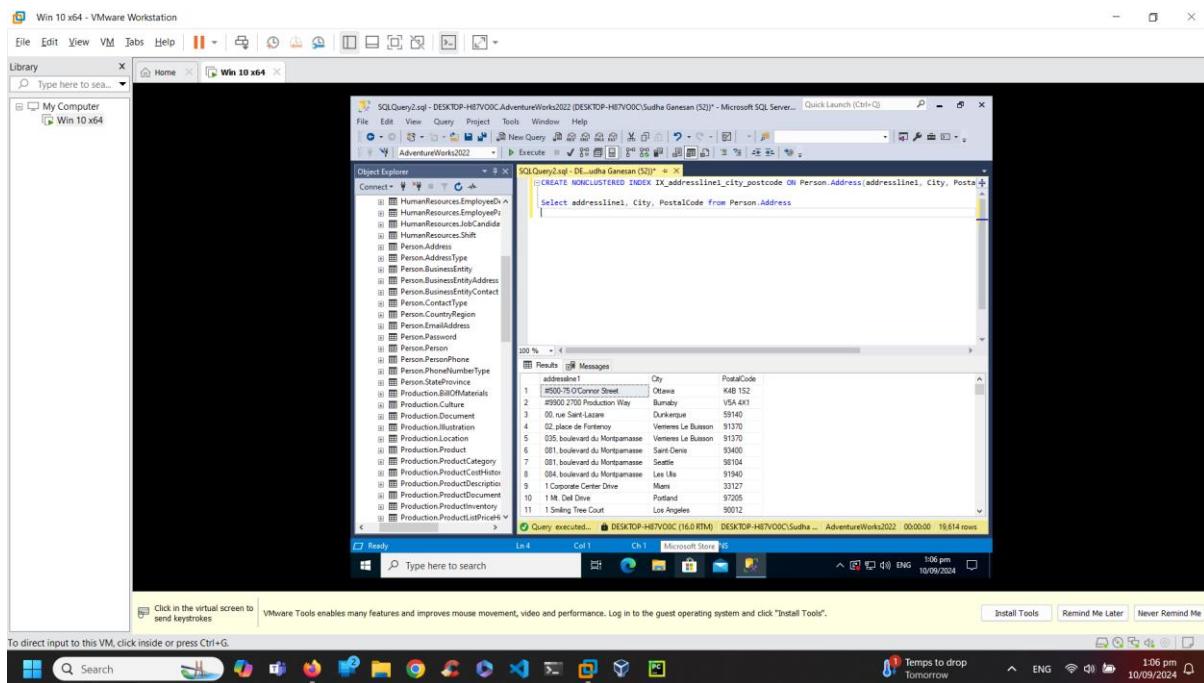
Columns listed: AddressLine1, Postcode, City



Set the Index key column with any key to manage order.



Alternatively, can do the same with T-SQL code

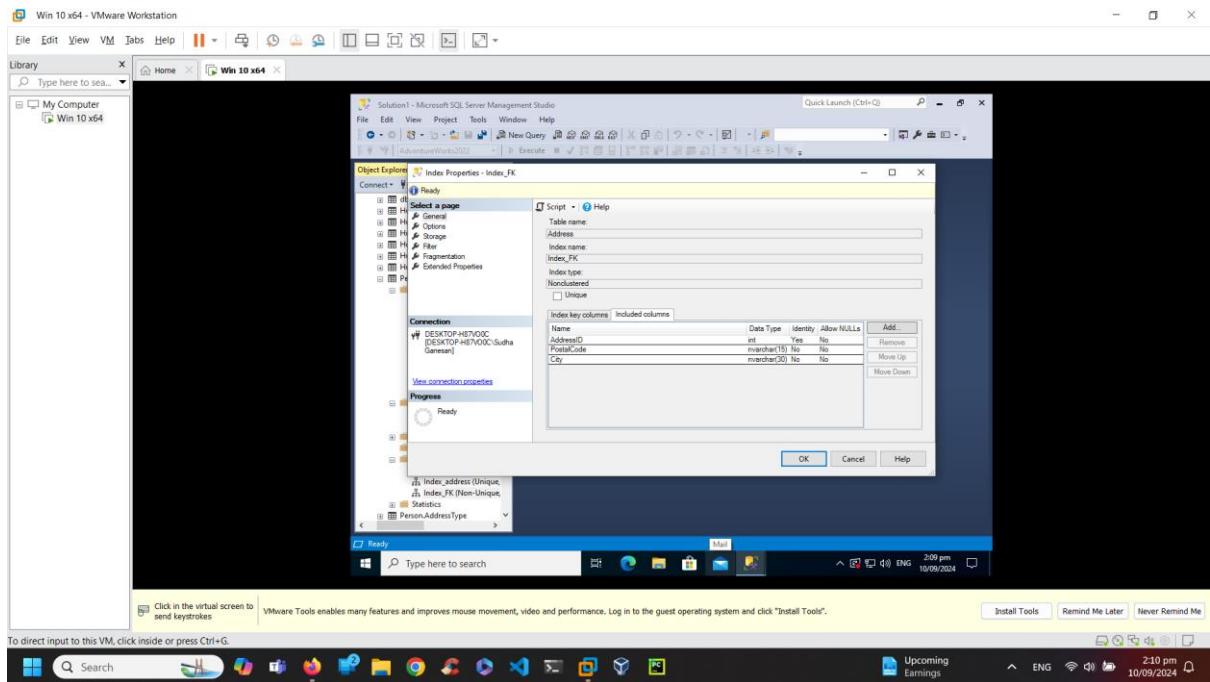


2.9 non-clustered index using foreign key:

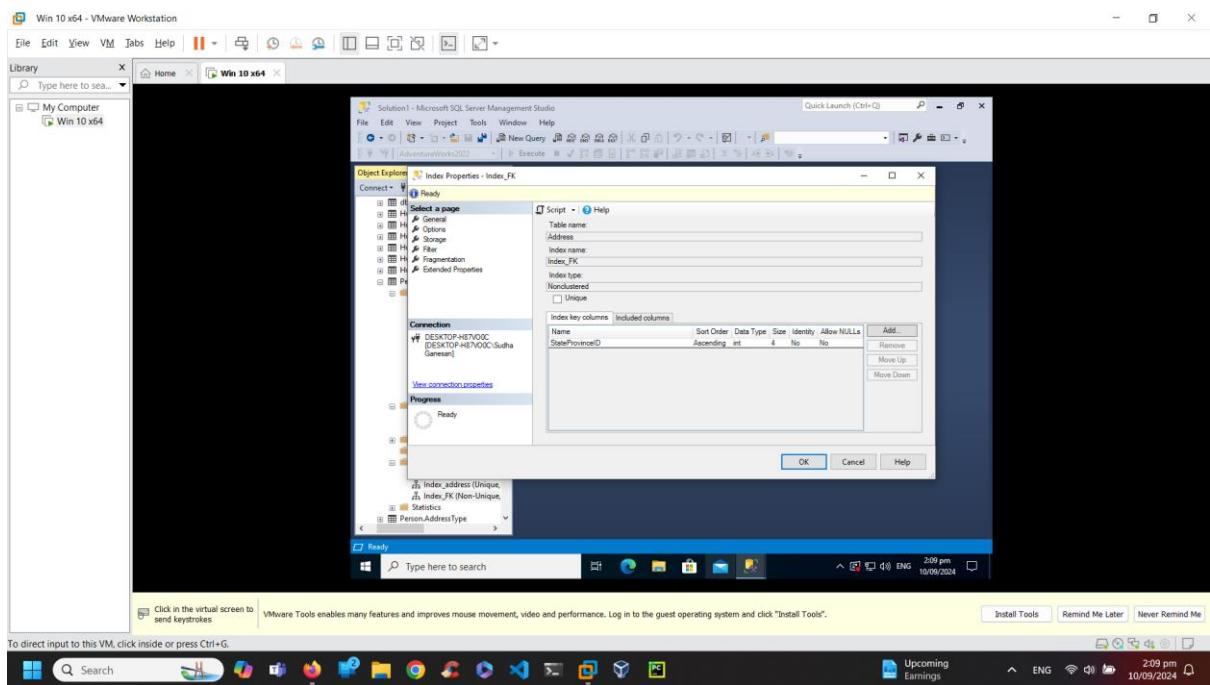
Table name: Person, Address

Index name: Index_FK

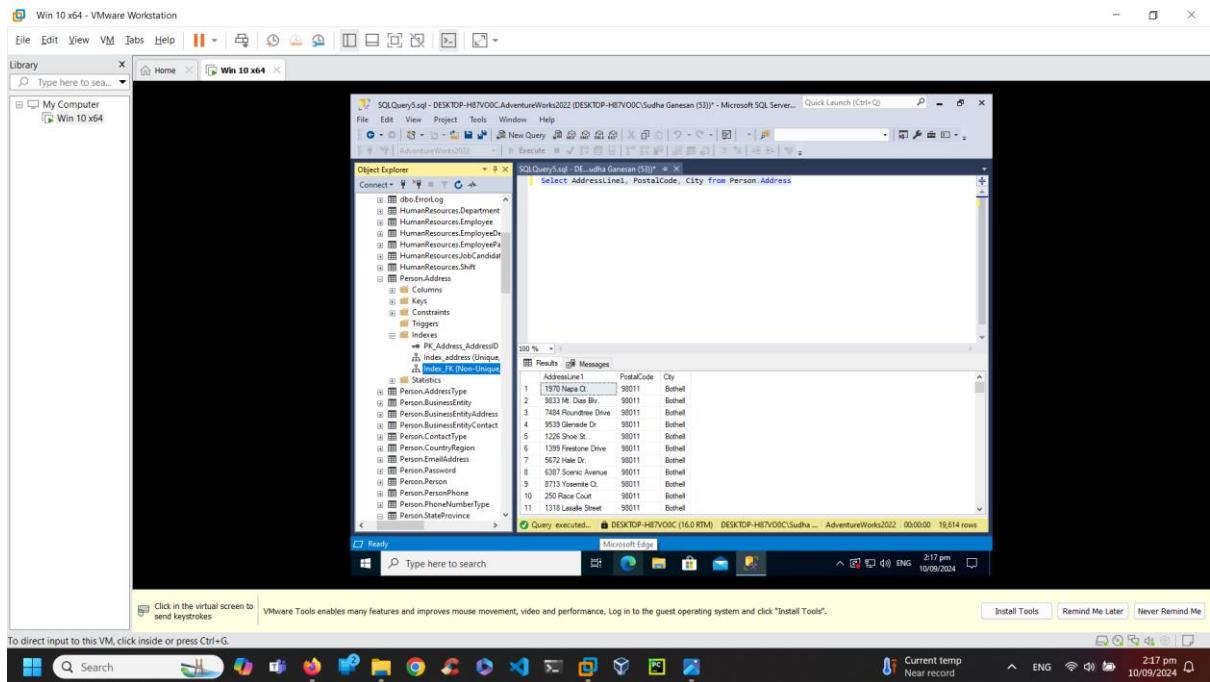
Fields: AddressLine1, PostalCode, City



Set the Index key column with the foreign key. Here, StateProvinceID is the foreign key



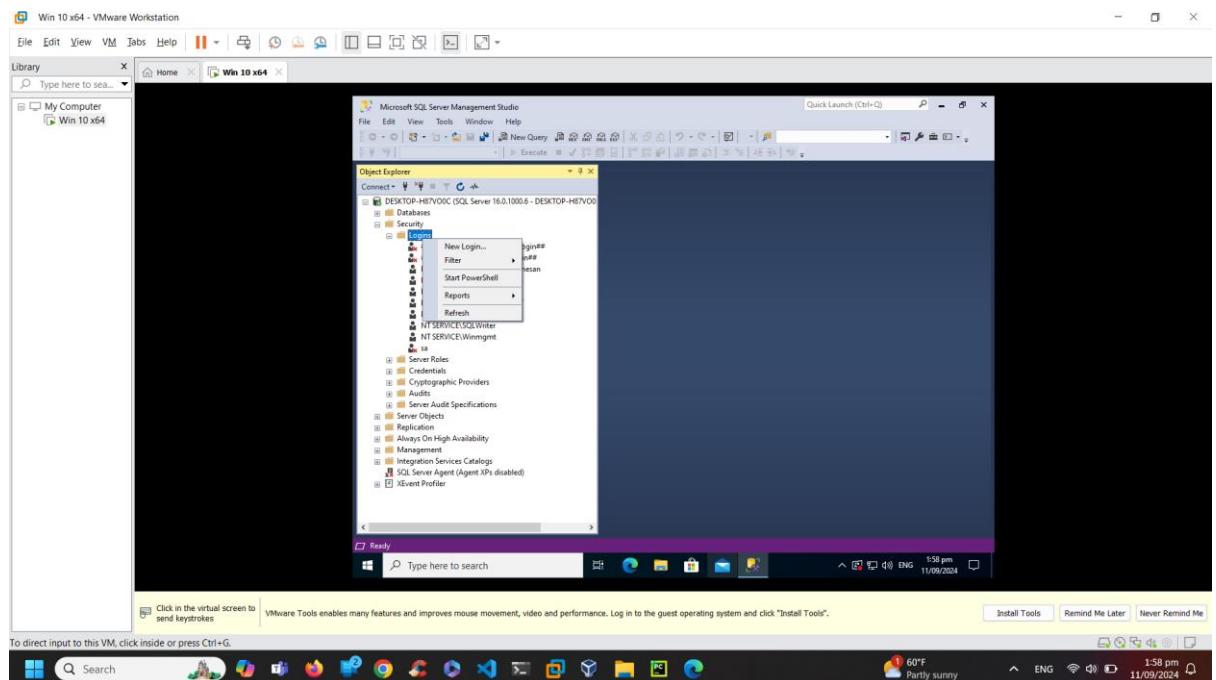
Check the Created Indexes are listed under Index in the table Person.Address



2.10 Add a new SQL User as a backup operator:

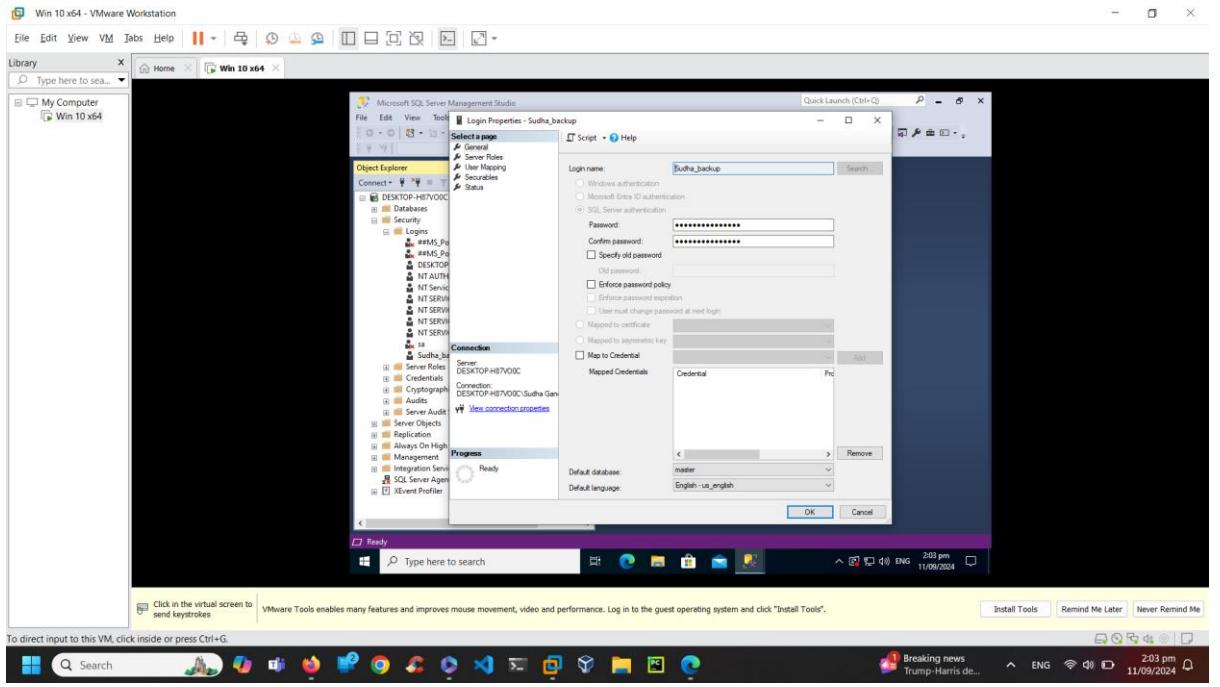
2.10.1 SQL Server Login: In Object Explorer, expand the Security folder.

- 1) Right-click on the Logins folder and select New Login from the context menu.



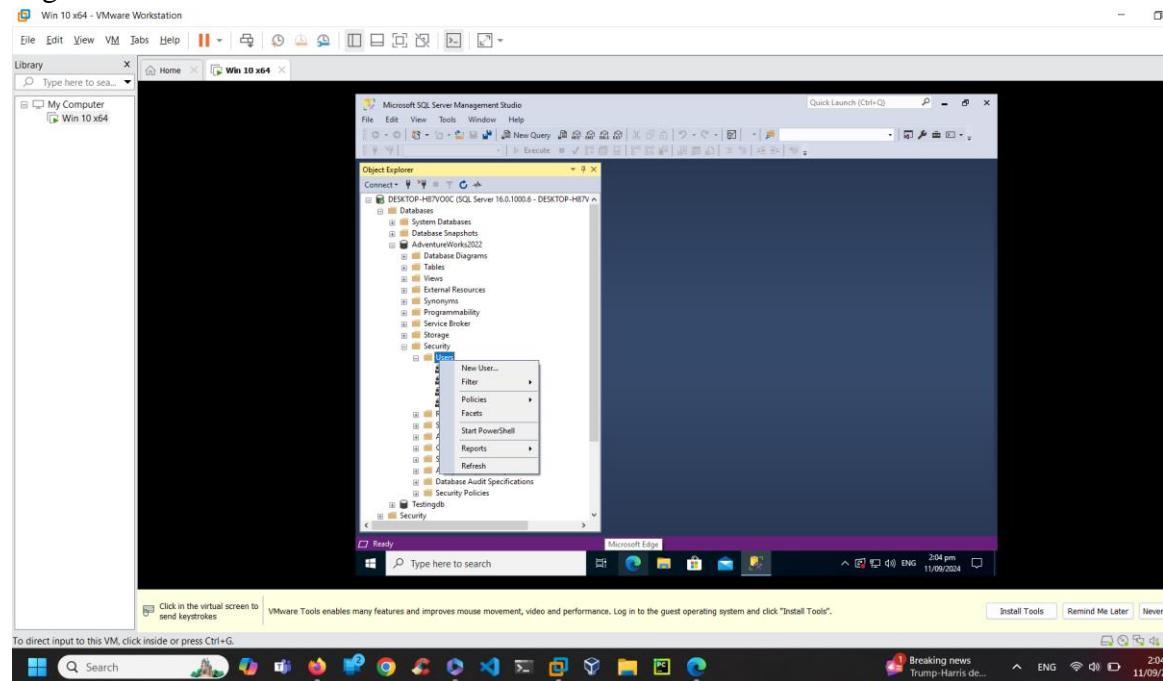
- 2) In the Login - New window: General Page:

- a) Login Name: Sudha_backup
- b) Password: Enter Password2.
- c) Confirm Password: Re-enter Password2.



2.10.2 DATABASE USER: Under the AdventureWorks database, expand the Security folder.

1. Right-click on the Users folder and select New User.

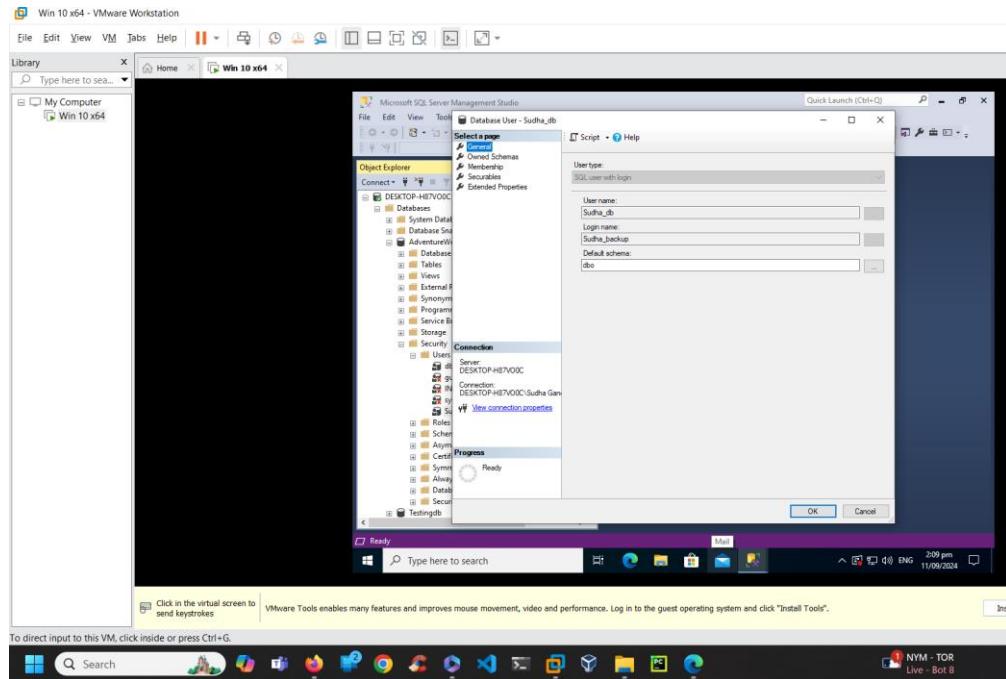


2. In the Database User – I filled the following details:

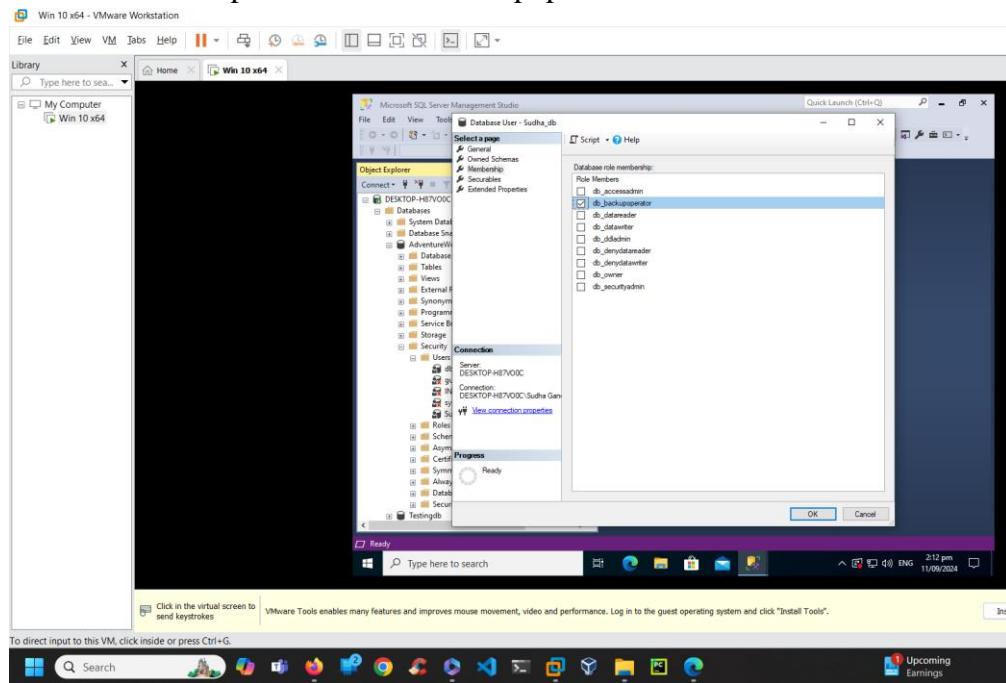
User Name: Sudha_db

Login Name: Sudha_backup

Default Schema: Set to dbo

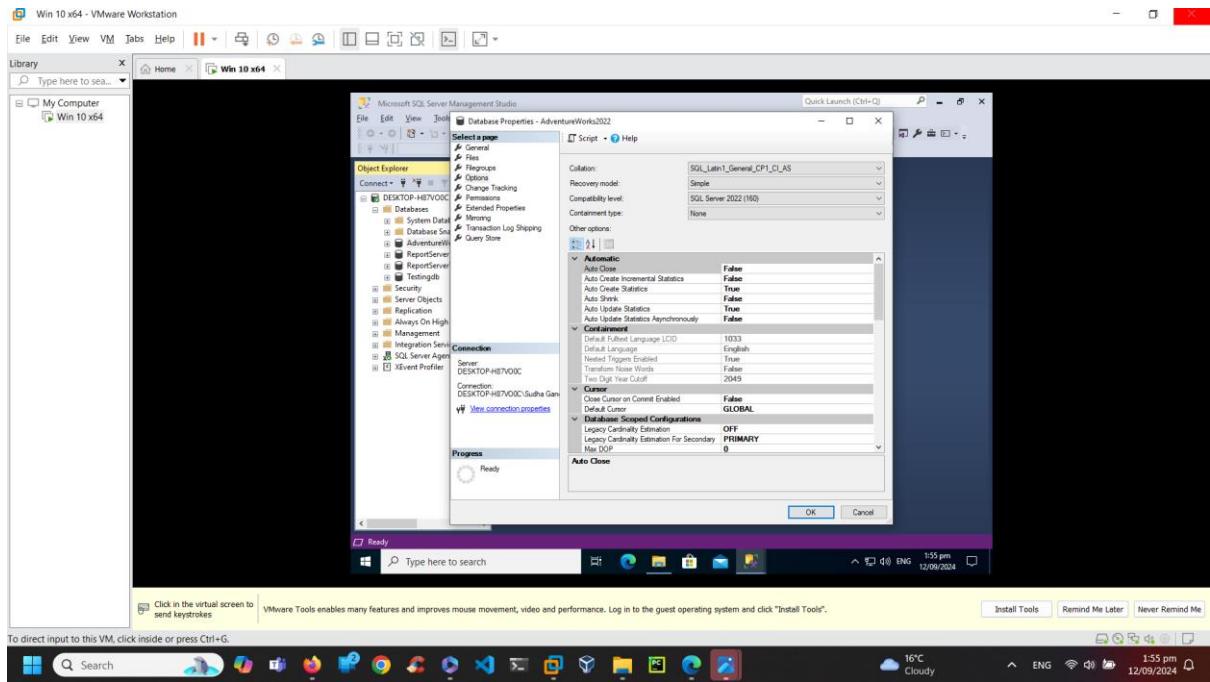


3. Go to membership and select db_backupoperator.

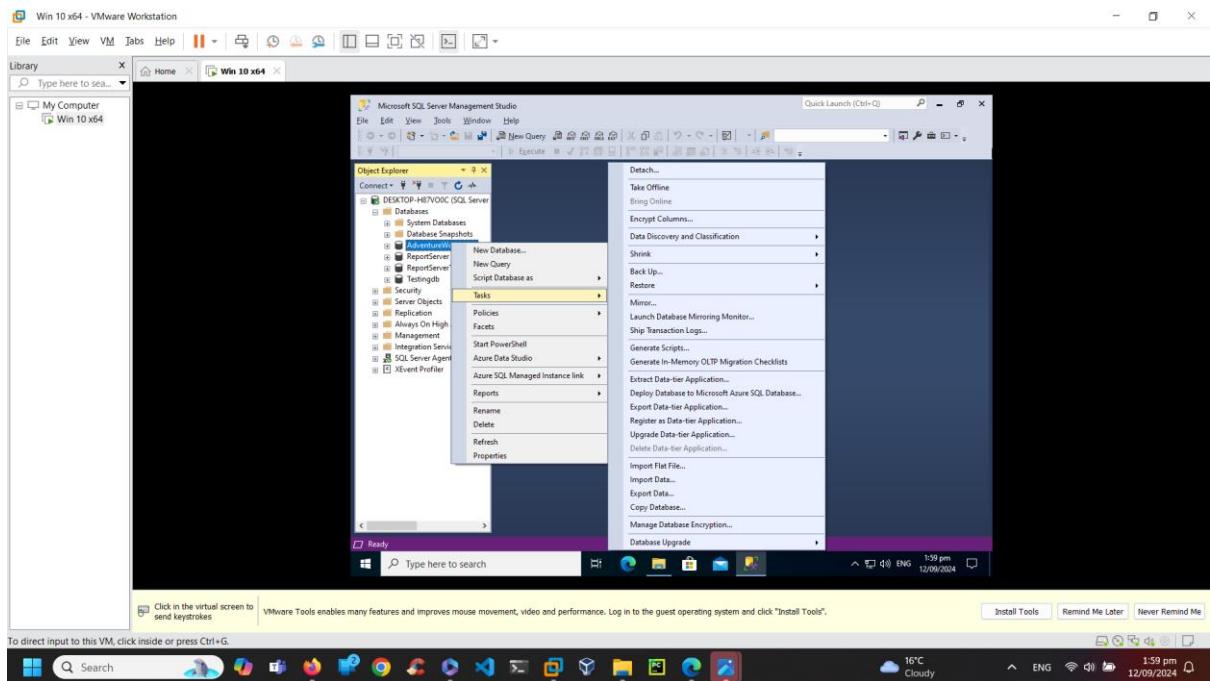


2.11 Full backup of Adventure works:

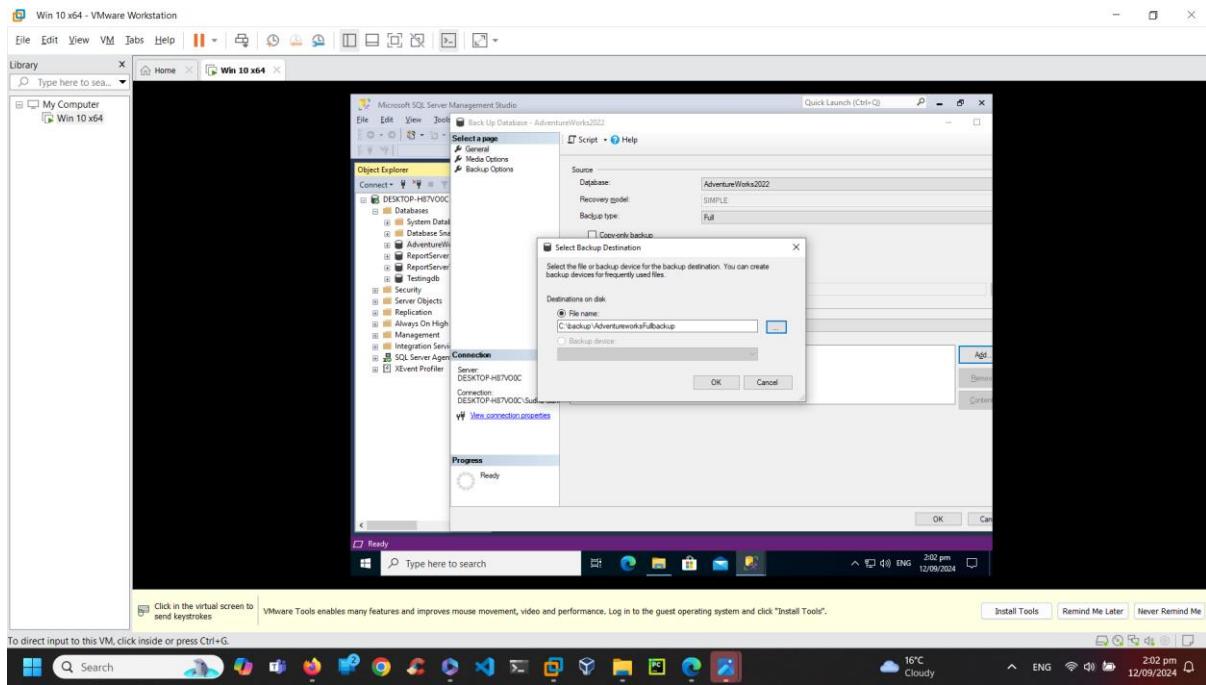
1. Check the server properties: Options- Recovery model is set to Simple.



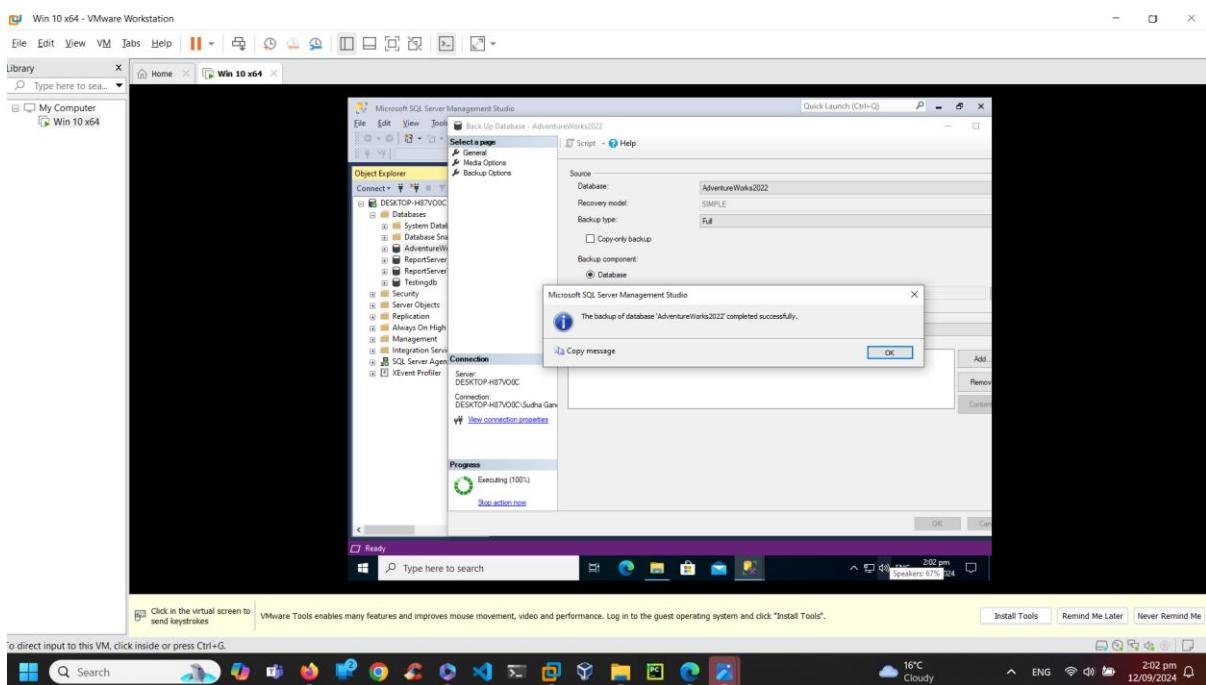
2. Go to AdventureWorks under database, Right click on it to find Tasks. Click on Backup.



3. Select Full as Backup type and select the backup destination with the filename. Here, I have given AdventureWorksFullbackup as the filename,



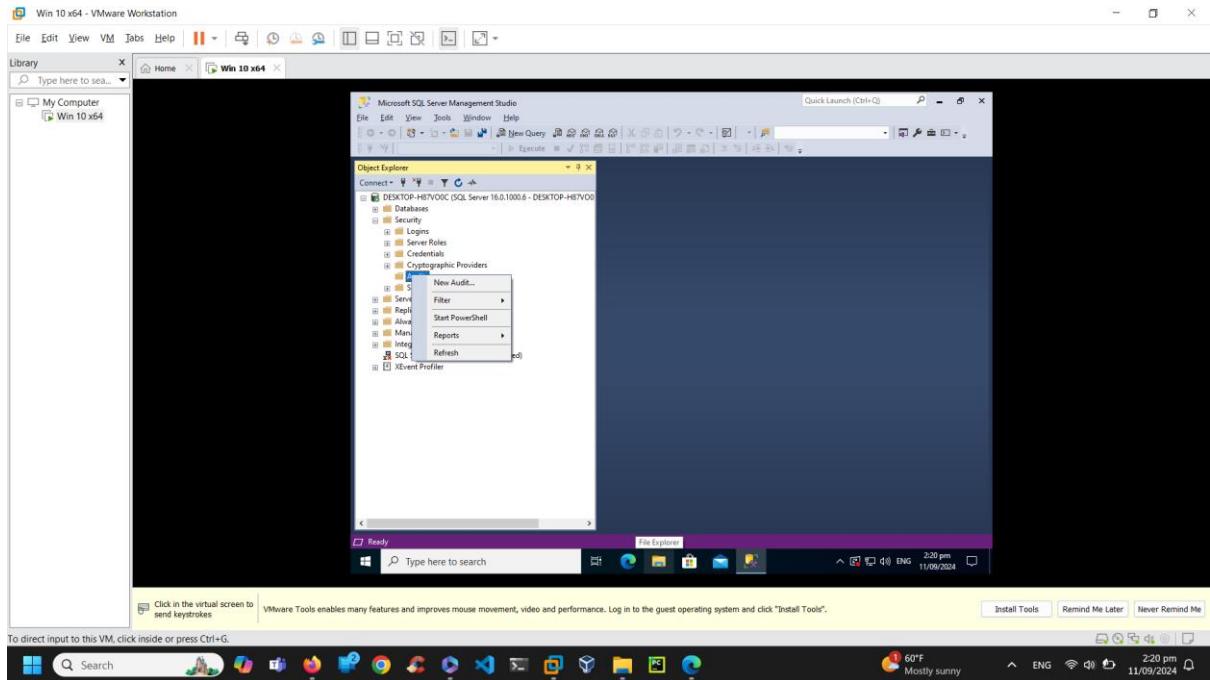
4. The backup is successful.



2.12 Server and database Audit:

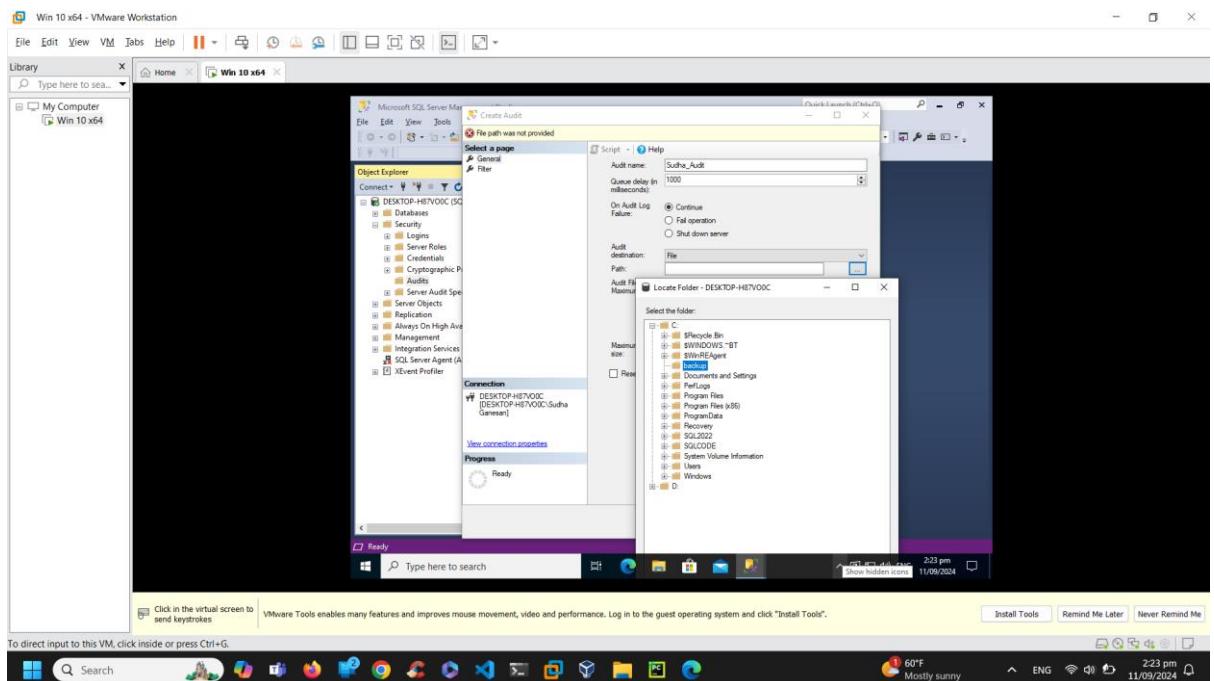
2.12.1 Server Audit: In Object Explorer, expand the Security folder.

1. Right-click on Audits and select New Audit.

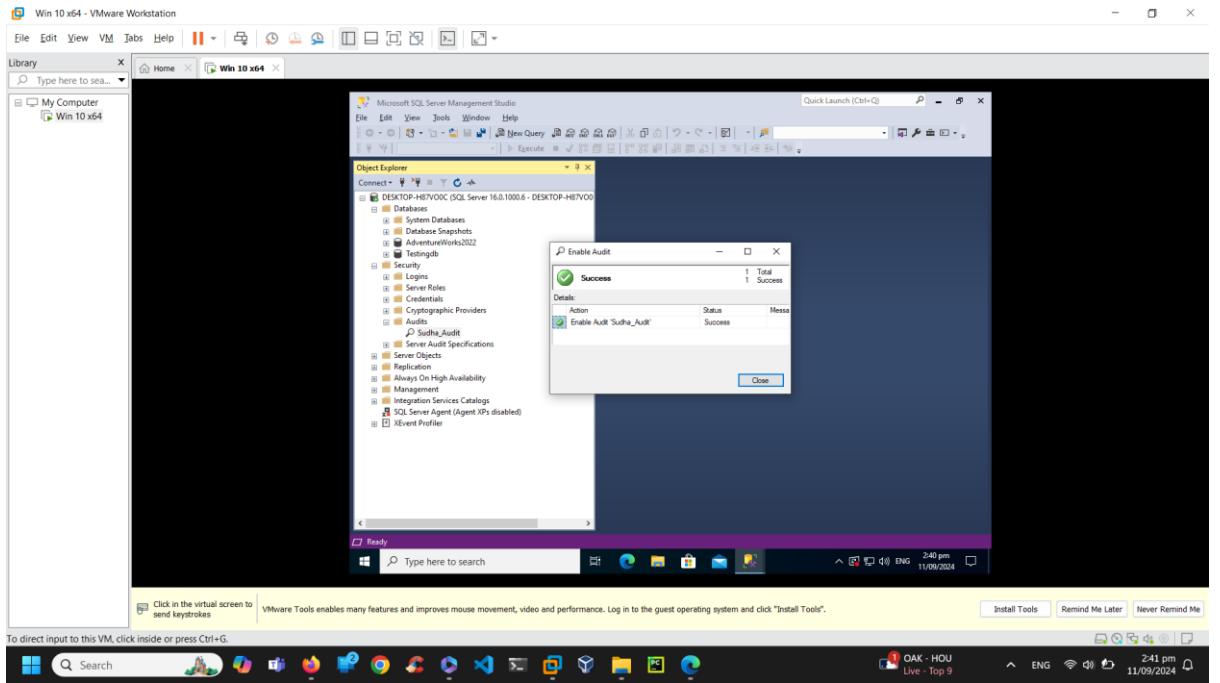


2. Configure the New Audit:

- Name: Sudha_Audit
- Audit Destination: File
- File Path: C:/backup
- Click OK to create the Server Audit.

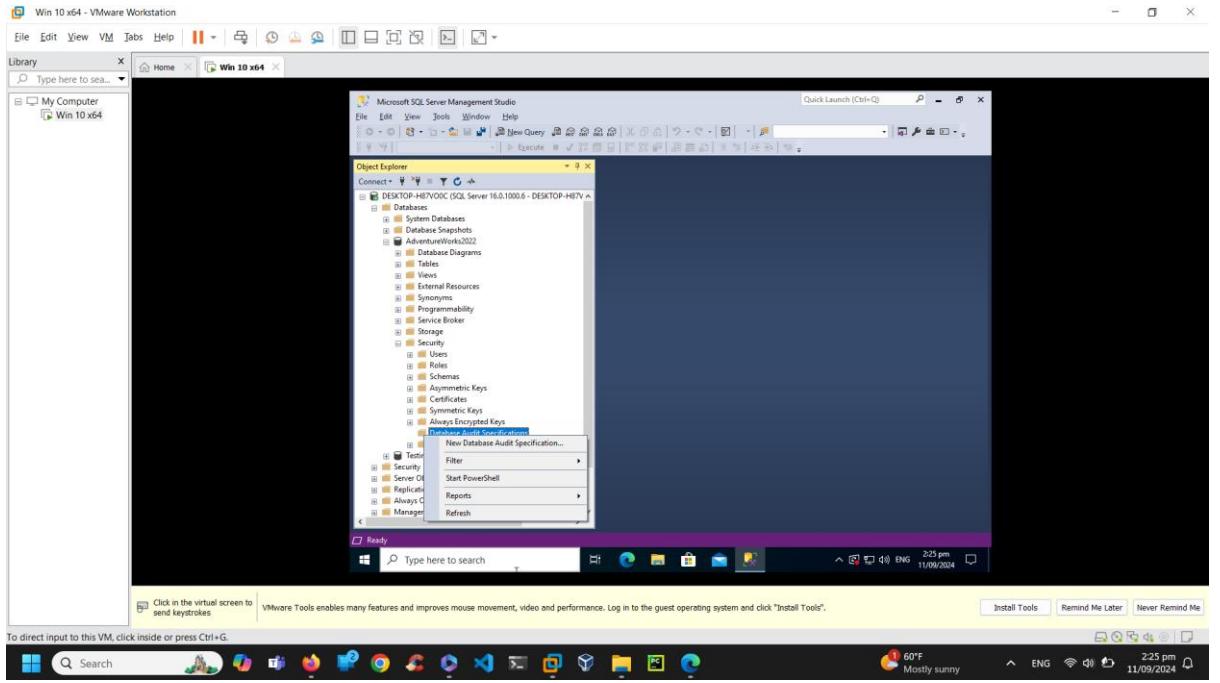


- After creation, right-click the Server Audit and select Enable Audit.

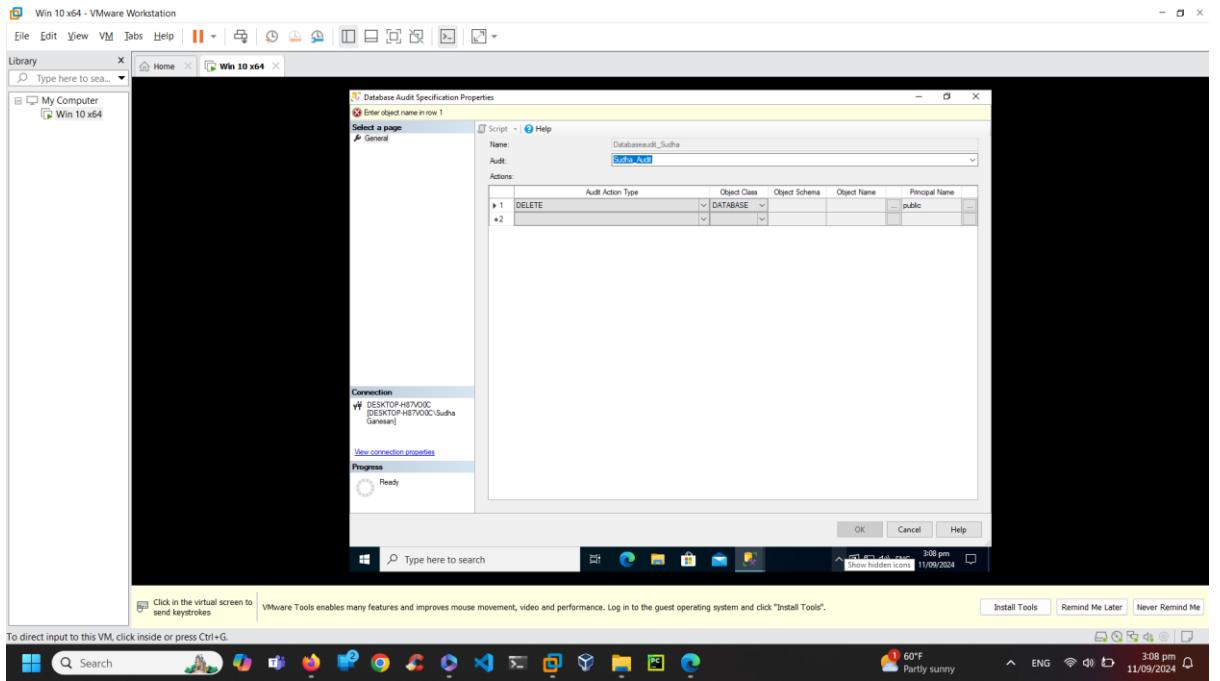


2.12.2 Database Audit: Expand Databases, right-click on AdventureWorks, and select Security > Database Audit Specifications.

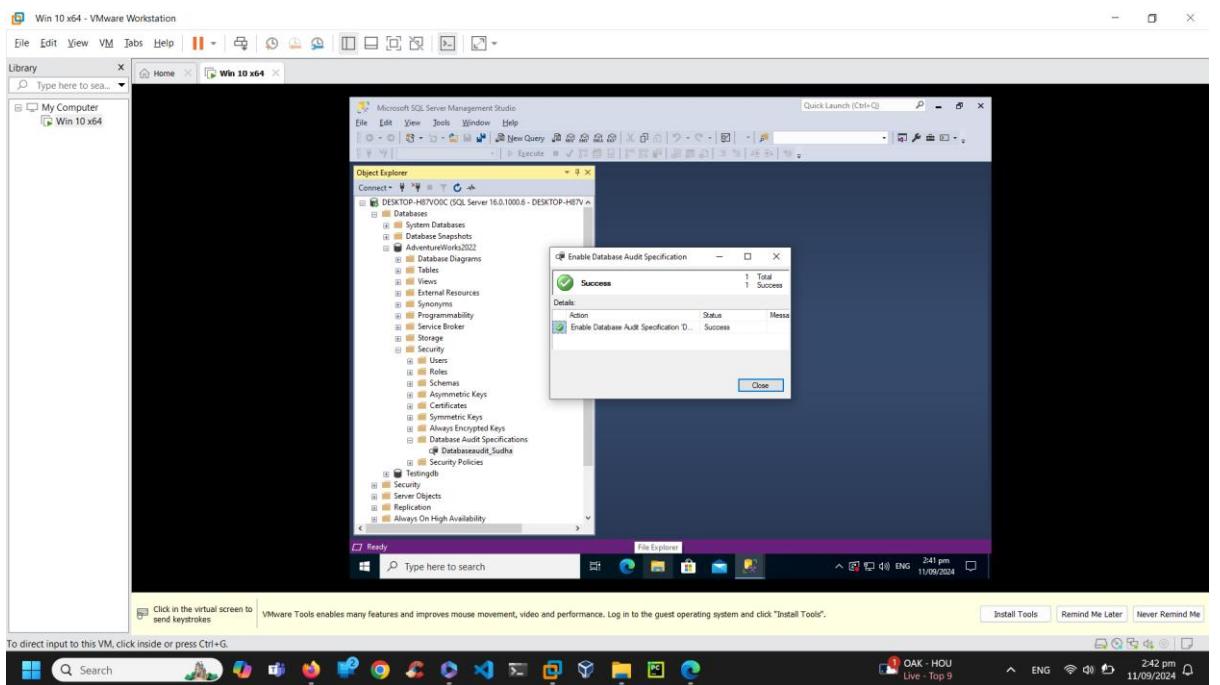
1. Right-click on Database Audit Specifications and select New Database Audit Specification



2. Configure the Database Audit Specification: Set the Principal name to Public
 - a. Name: Databaseaudit_Sudha
 - b. Audit: Sudha_Audit: Selected from the dropdown list.

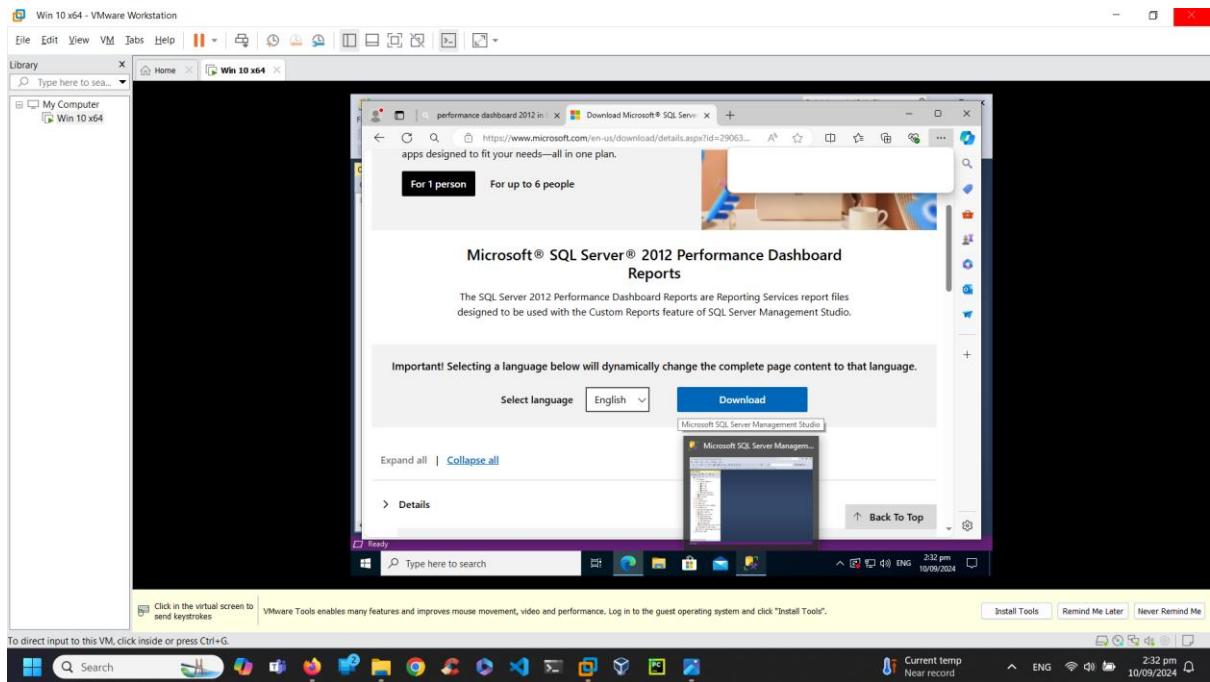


3. Enable the Database Audit created.

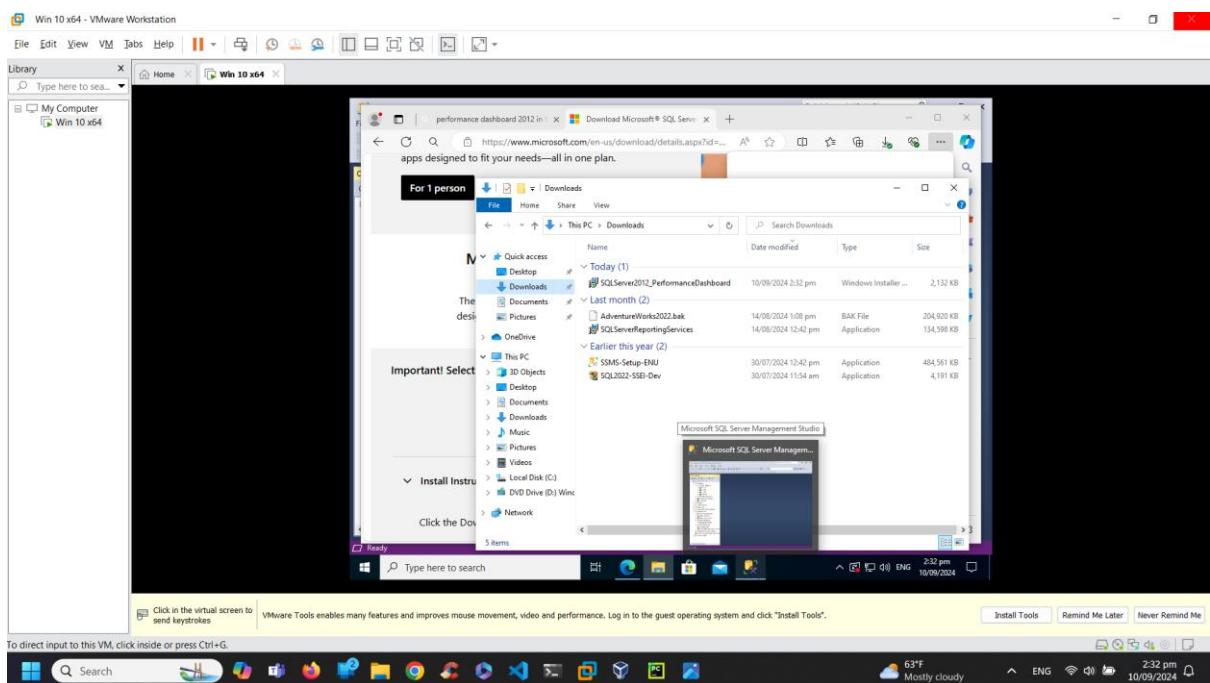


2.13 Installation of Performance dashboard reports:

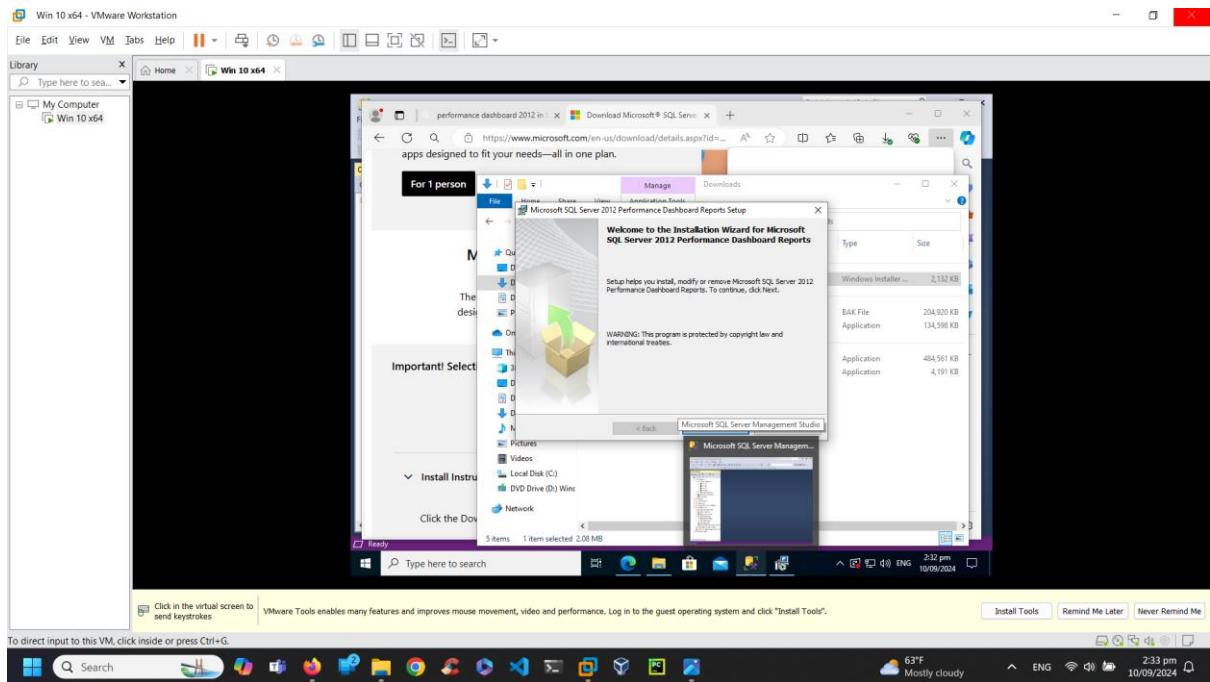
1. Download Performance dashboard from browsing page.



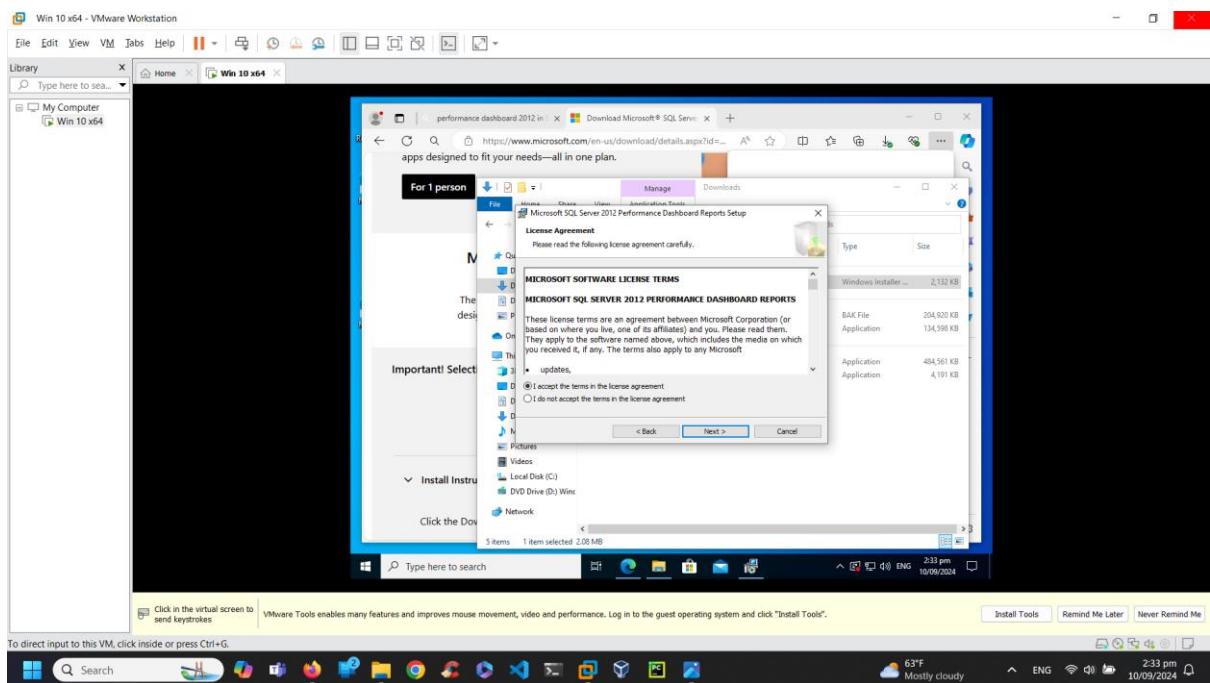
2. Double-click on the setup file in Downloads.



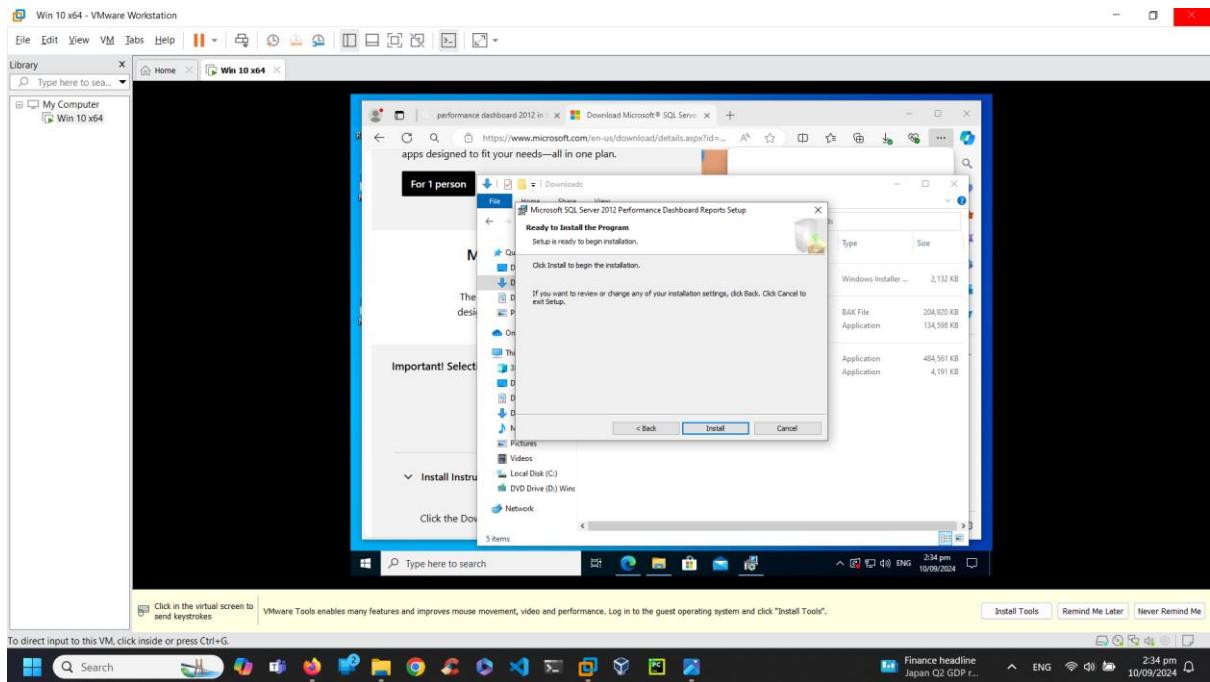
3. Installation wizard is opened. Click on Next



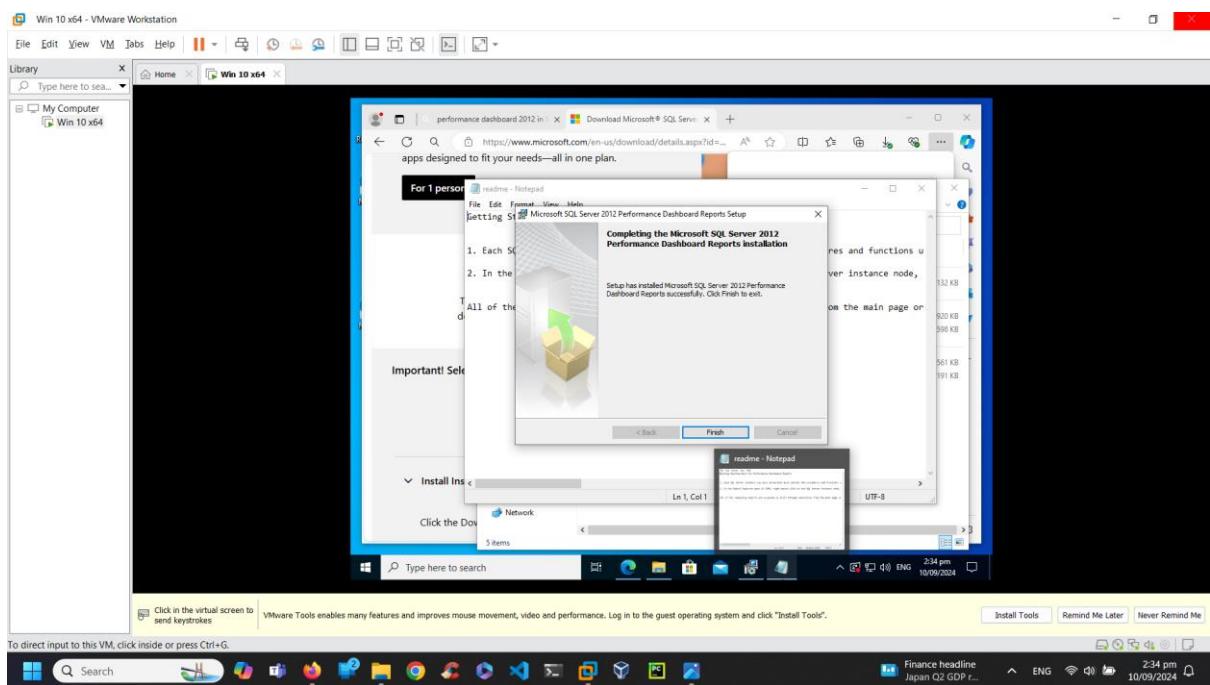
4. Tick on the checkbox for agreeing terms and conditions.



5. Click on Install.

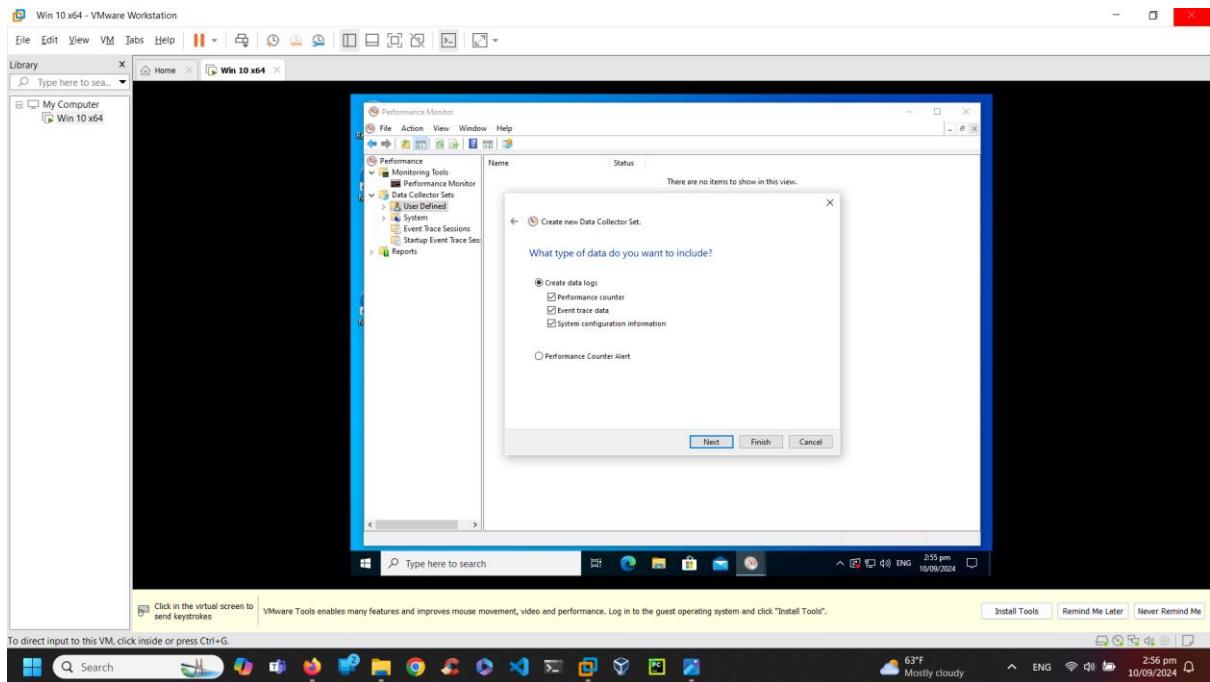


6. Click on Finish. Installation is successful.

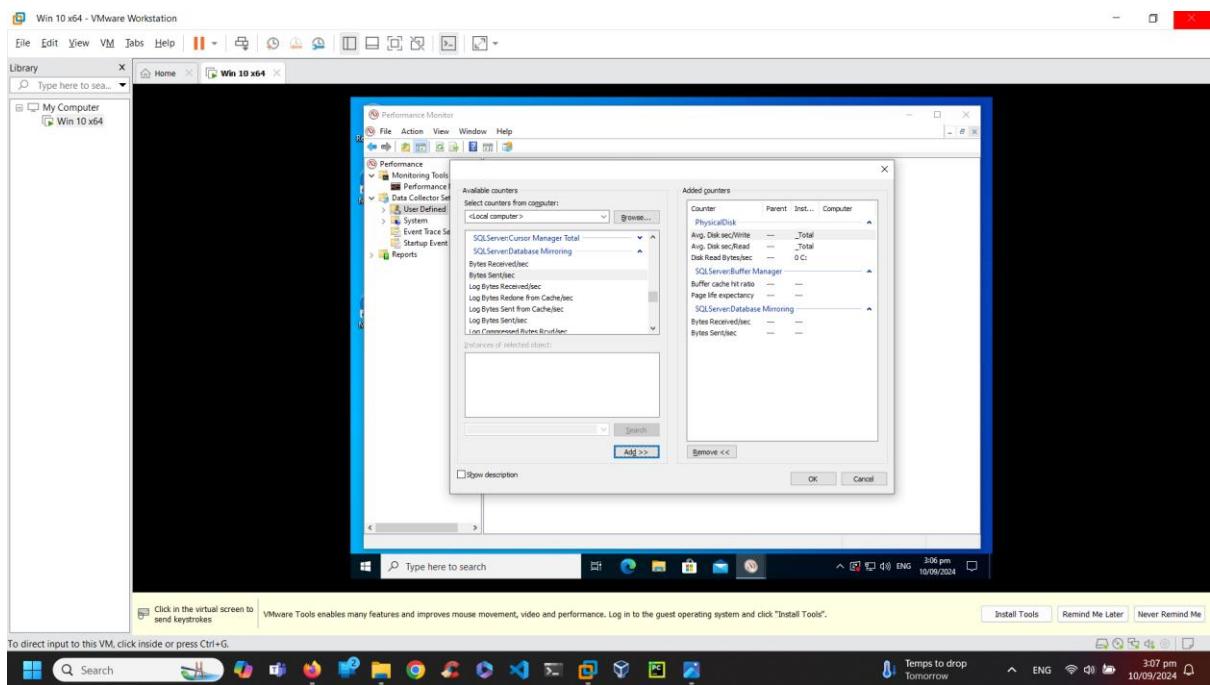


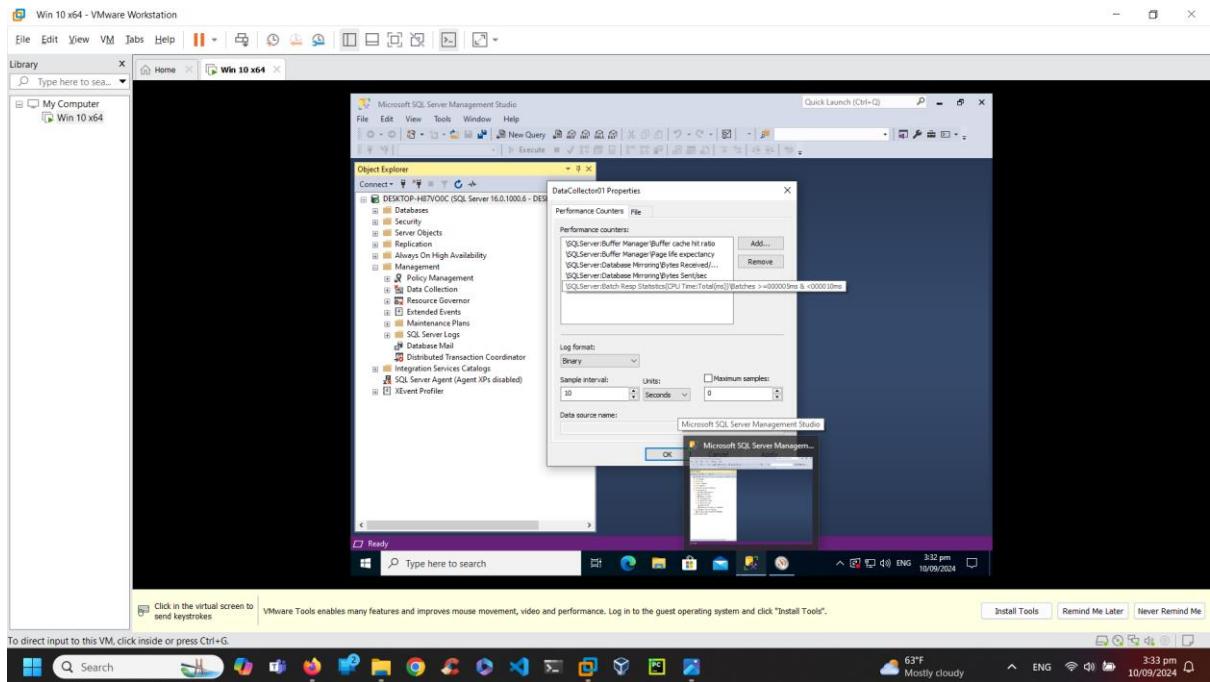
2.14 Create performance monitor:

1. In Performance Monitor, expand Data Collector Sets. Right-click on User Defined, and then select New > Data Collector Set. Ensure Performance counter is selected, and click Next.



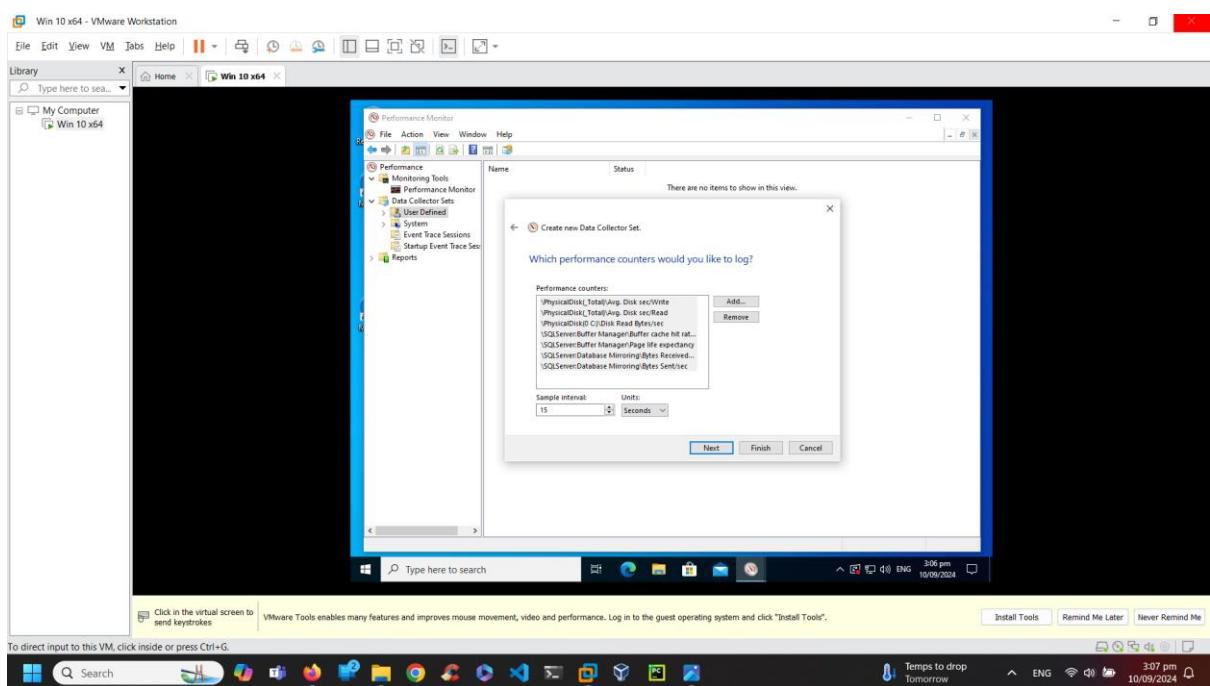
2. Select at least three counters like SQL server Buffer manager, SQL Server Database mirroring and physical disk



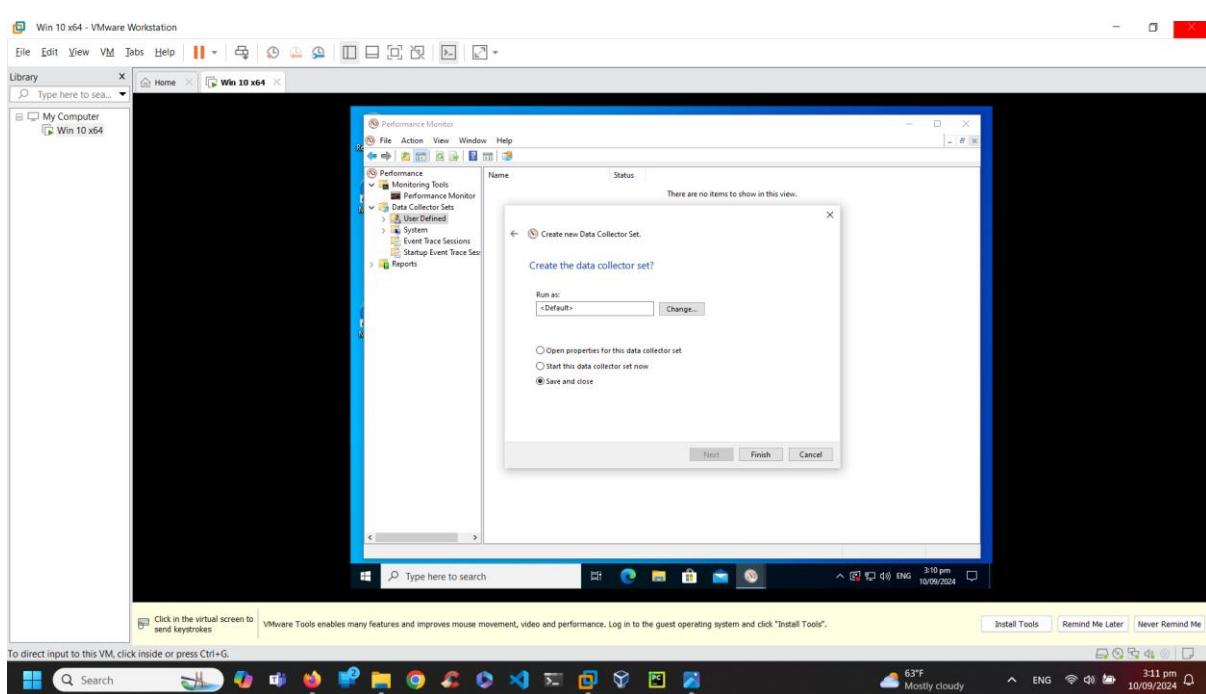
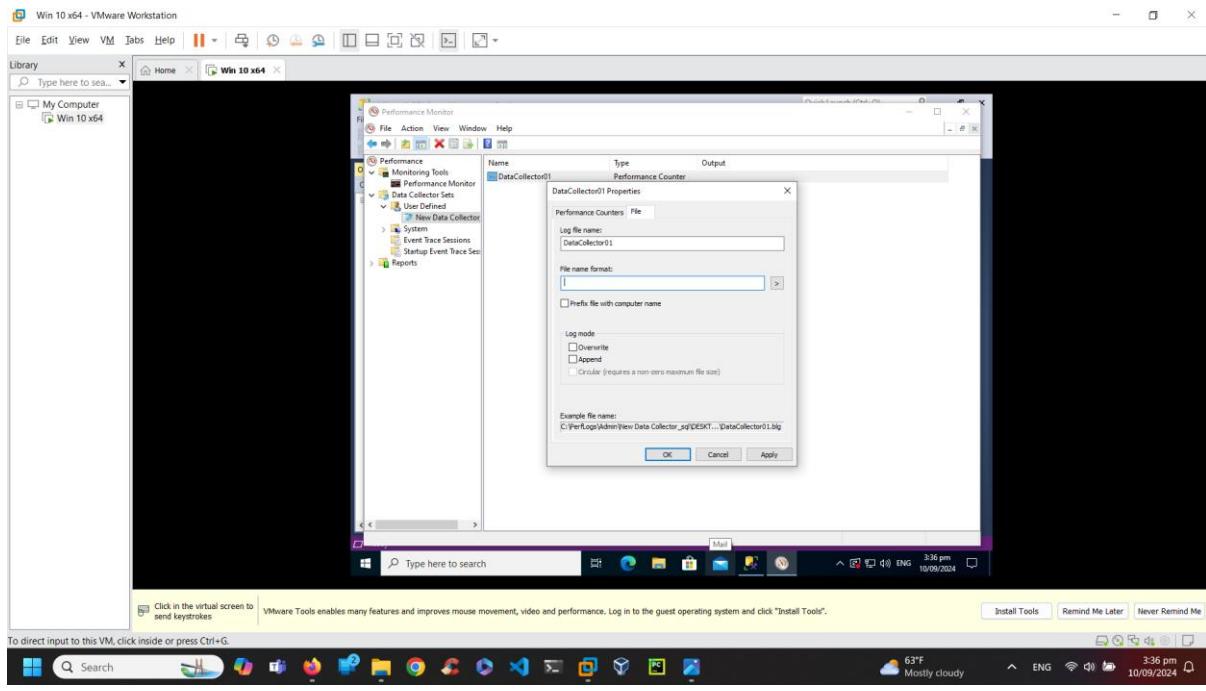


Added SQL Server batch Resp statistics to the counter and removed physical disk

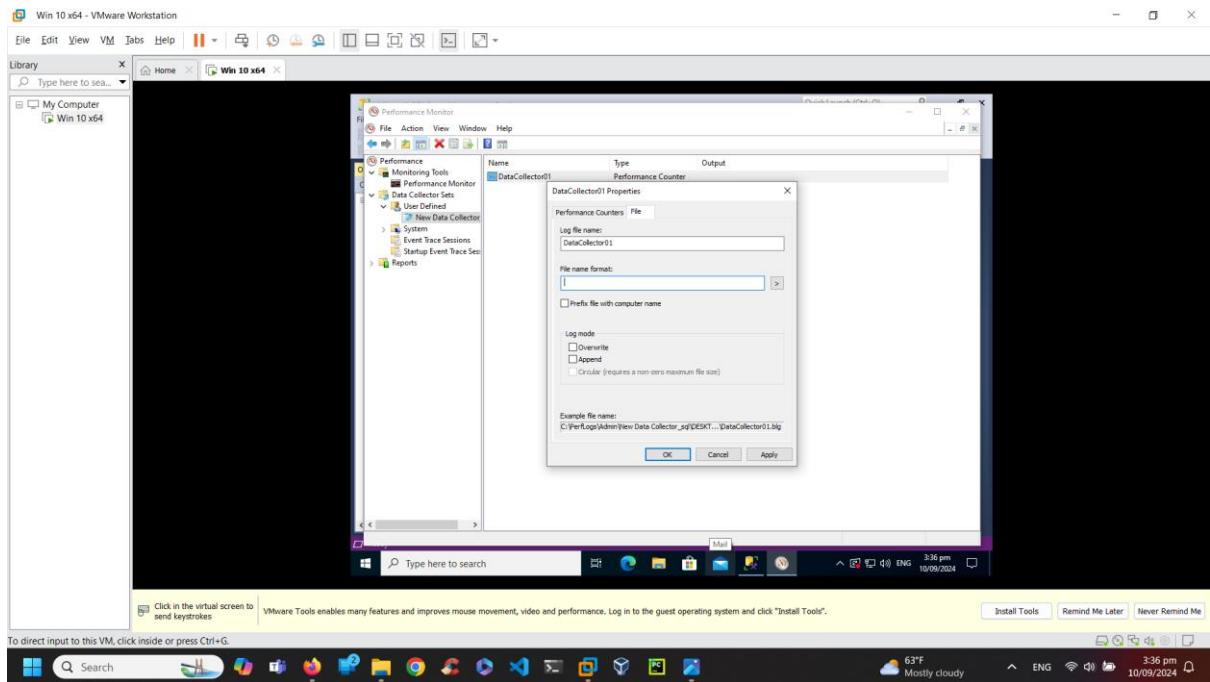
3. Click on Finish.



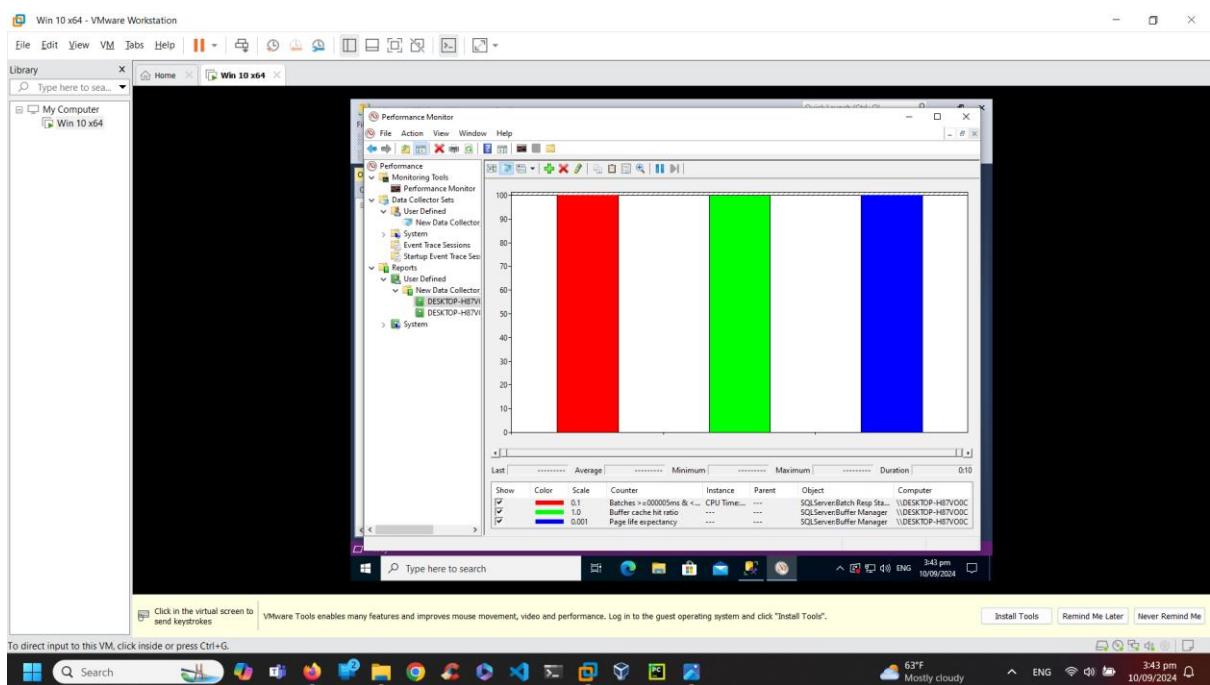
4. Create the data collector set.



5. Datacollector1 which is created.

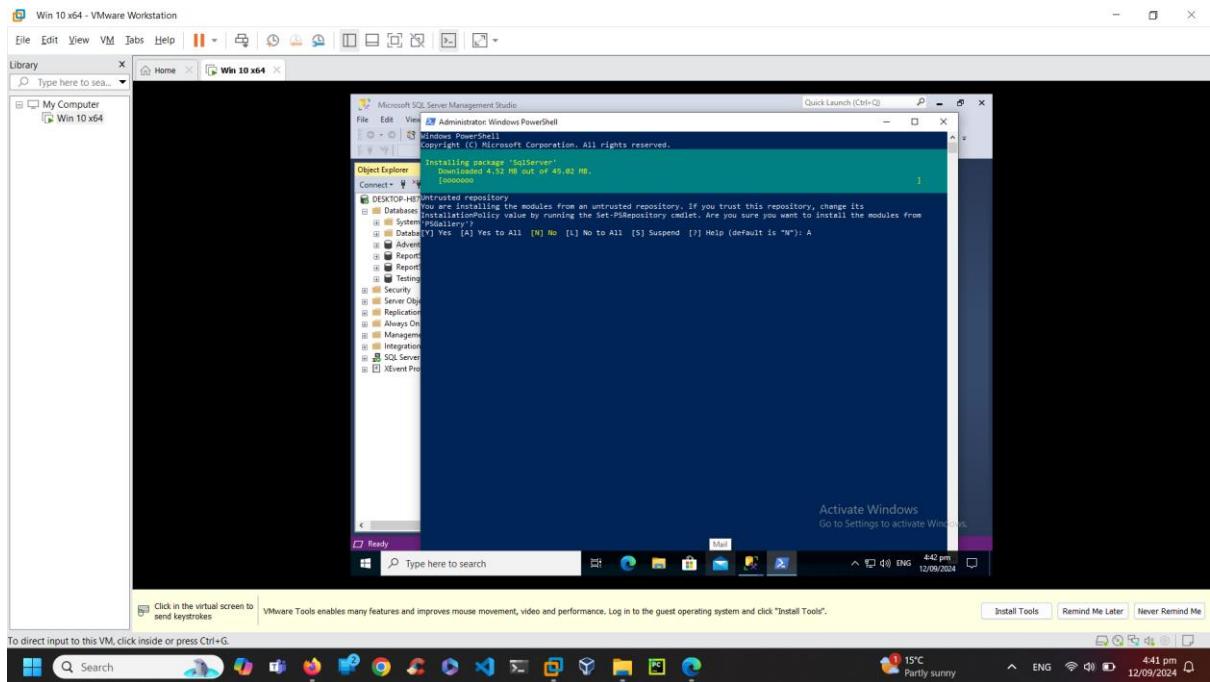


6. The graph of the performance monitor of all 3 counters selected.

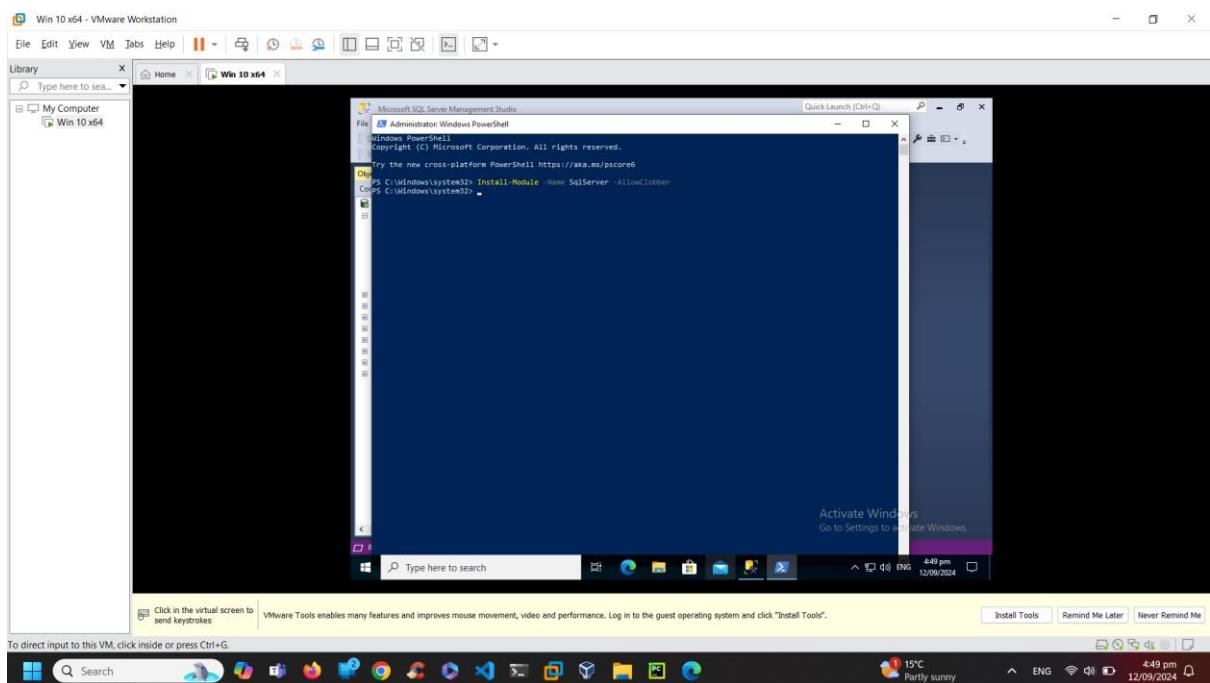


2.15 Auto shrink Off using PowerShell:

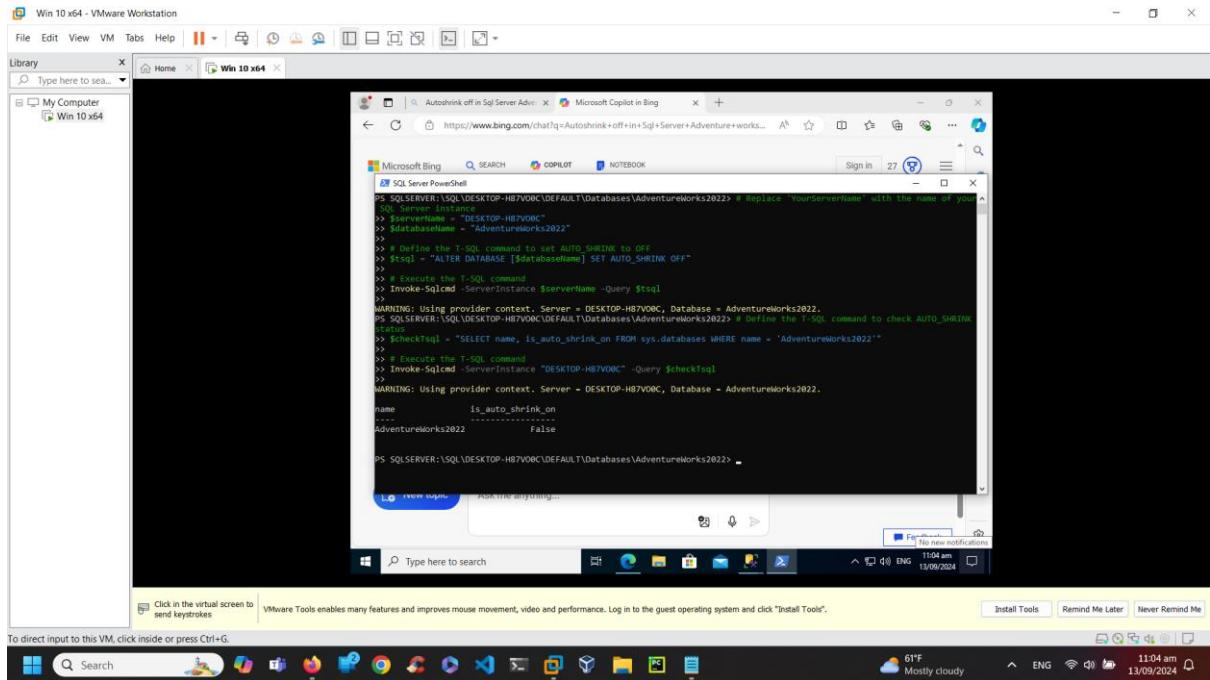
2.15.1 Import the SQL Module:



To check it is installed, Try the code again.

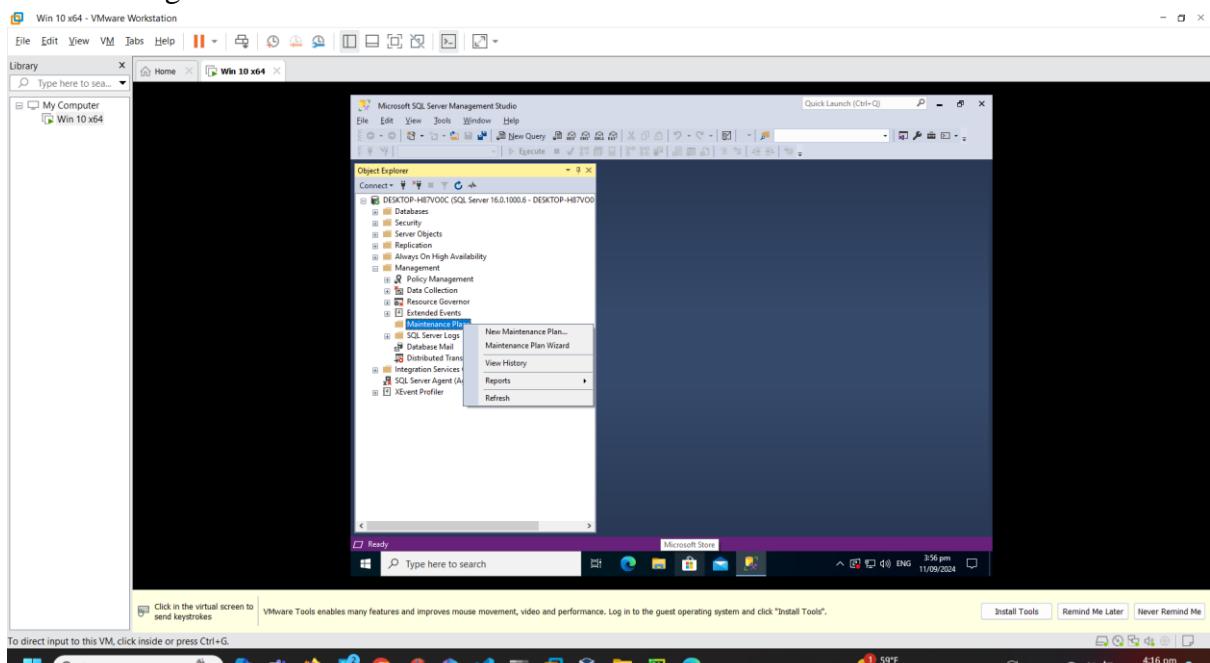


2.15.2 Now, go to SSMS-databases-Adventureworks2022, Right click on it to run PowerShell. Try code to turn off the Auto shrink. Finally check the Is the Auto shrink is on? If you received as false, it is OFF.

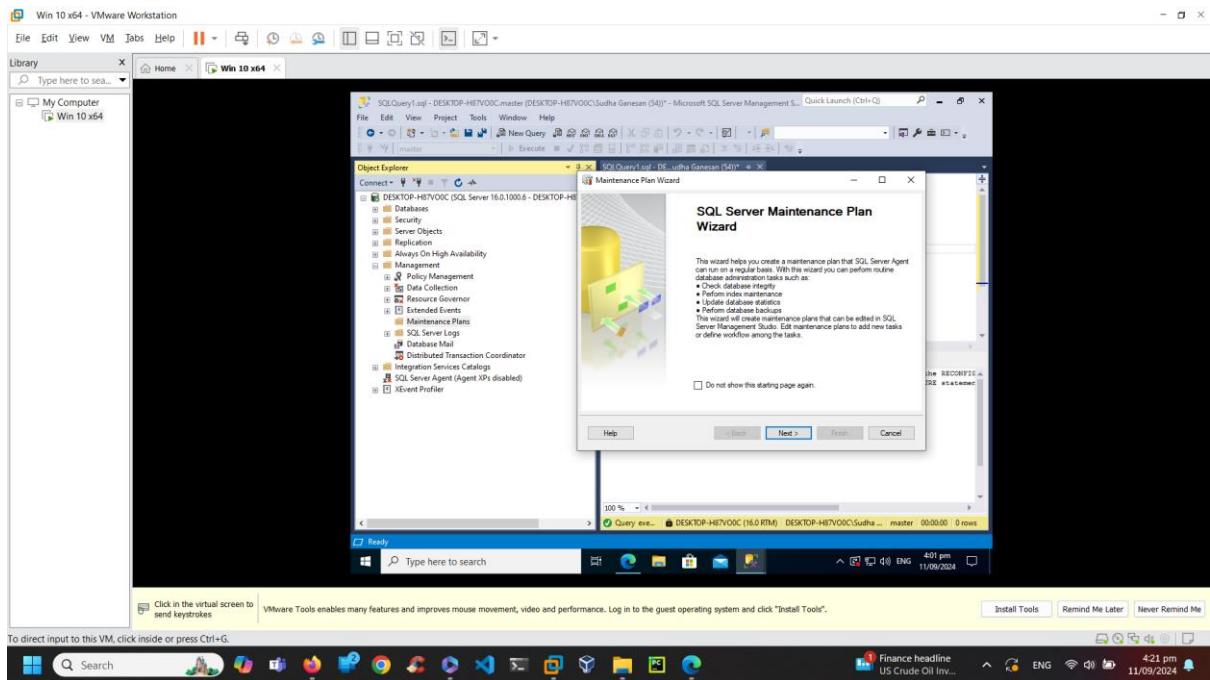


2.16 Maintenance wizard: In Object Explorer, expand the Management folder.

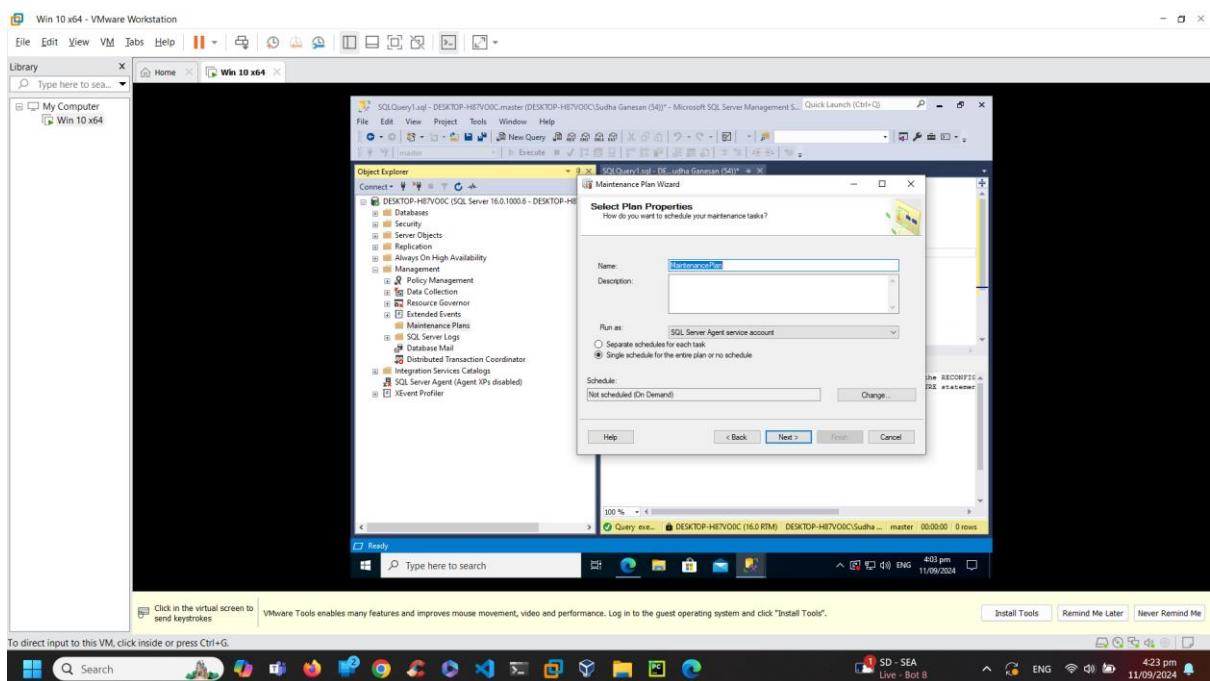
1. Right-click on Maintenance Plans and select Maintenance Plan Wizard.



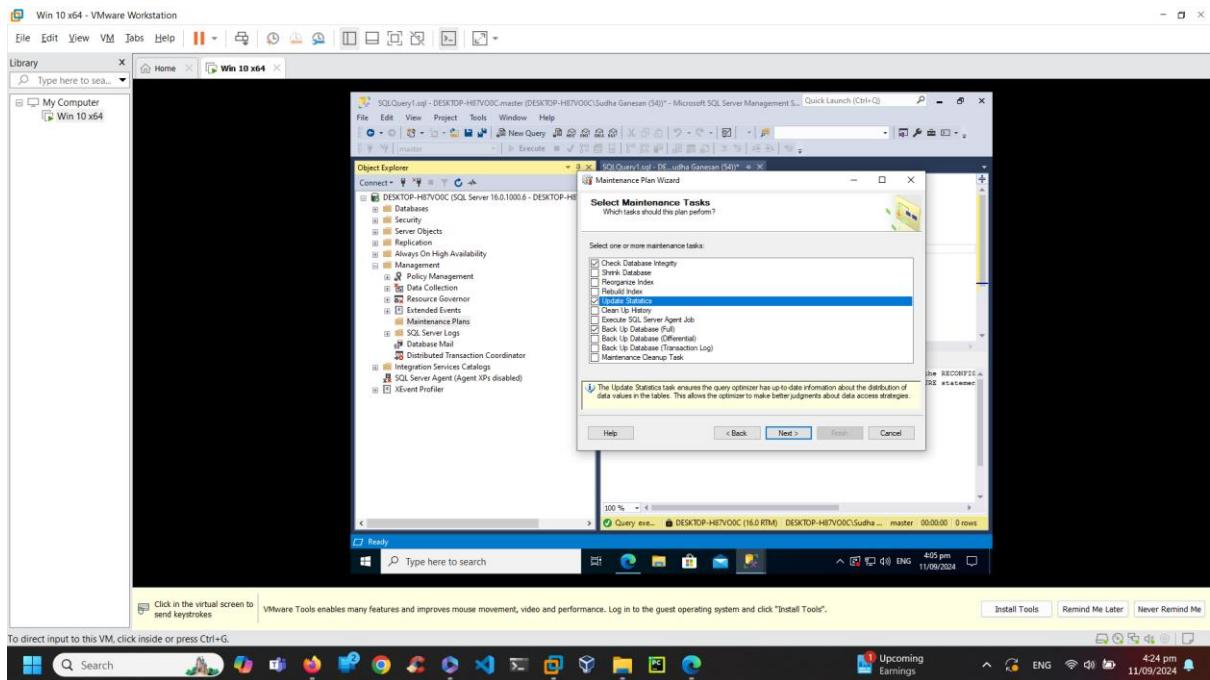
2. Introduction Page of maintenance wizard: Click on next



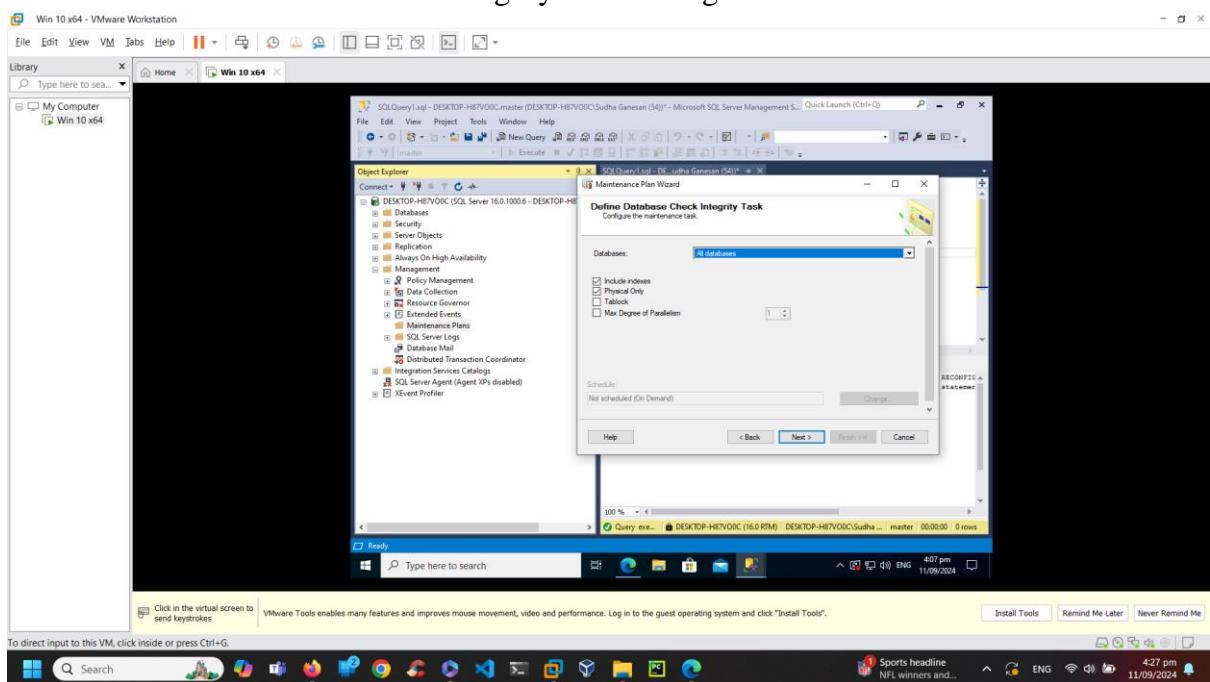
3. Select Plan properties: Maintenance plan. click Single schedule for the entire plan or no schedule



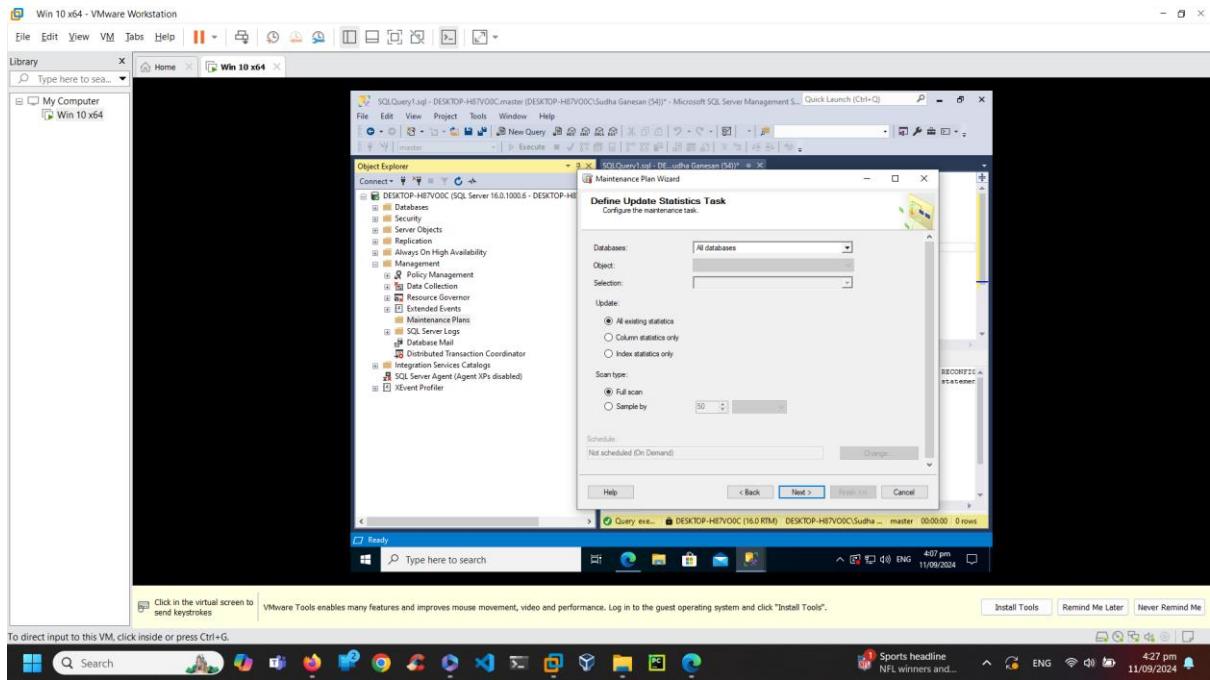
4. Selected three Maintenance tasks: Check database Integrity, Update Statistics, Backup database (Full)



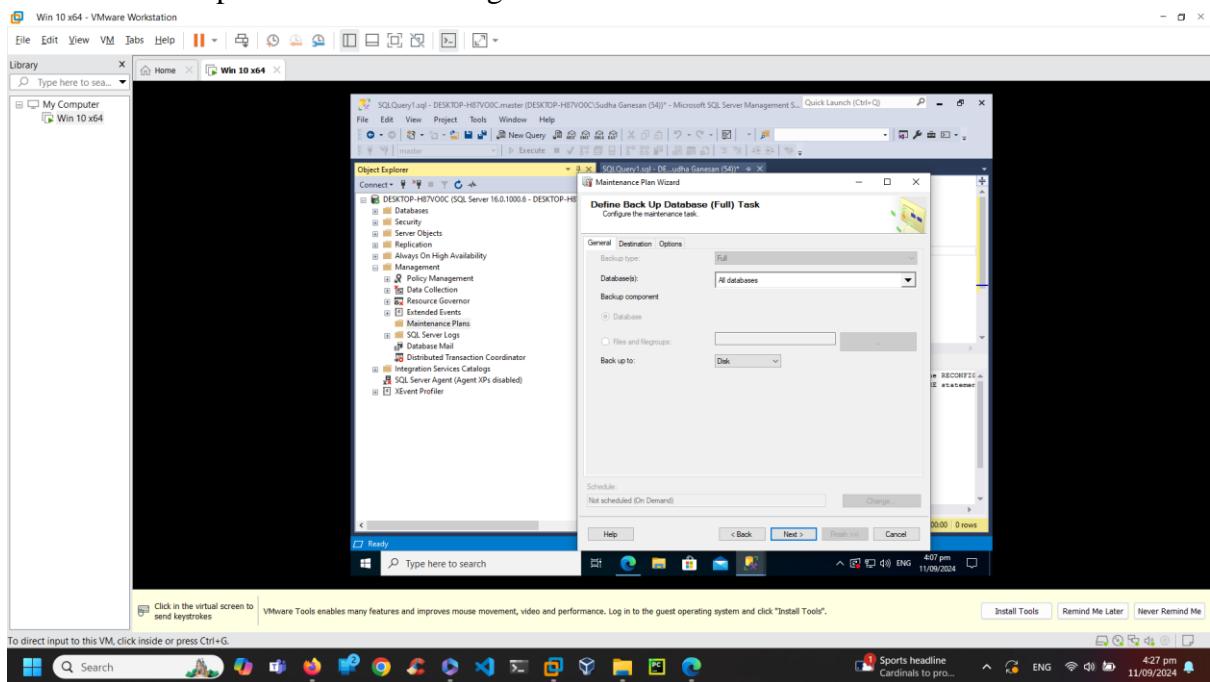
5. Task1: Database Check Integrity Task settings



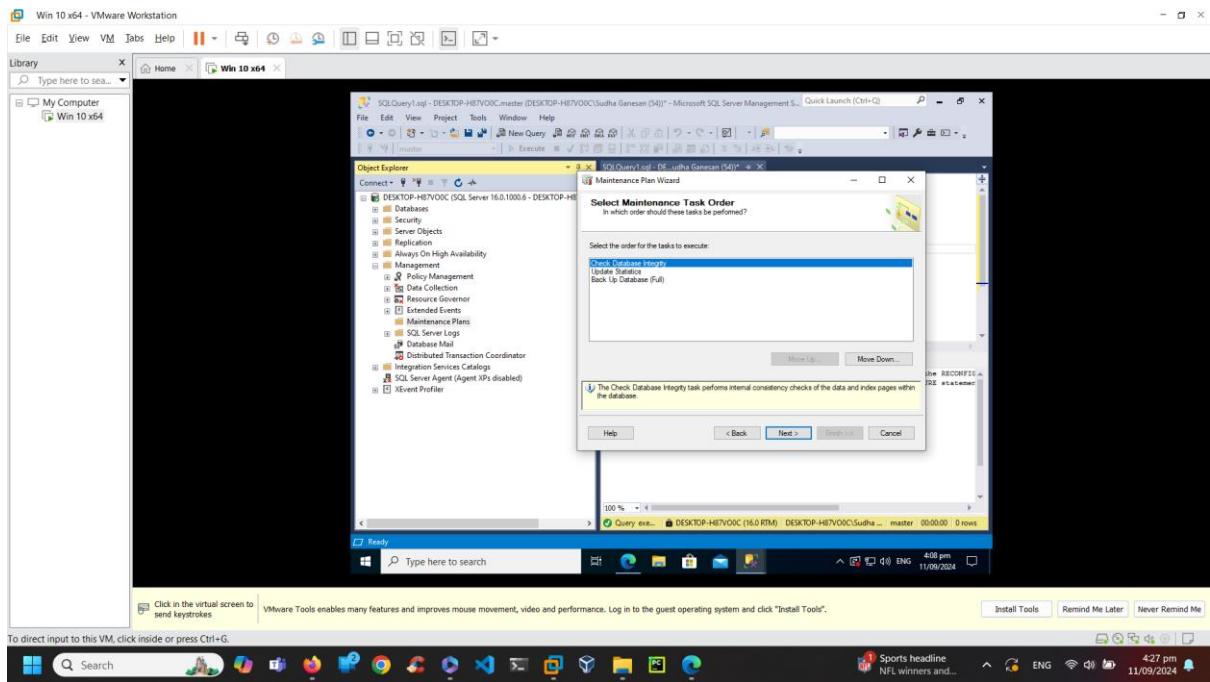
6. Task 2: Update Statistics task settings.



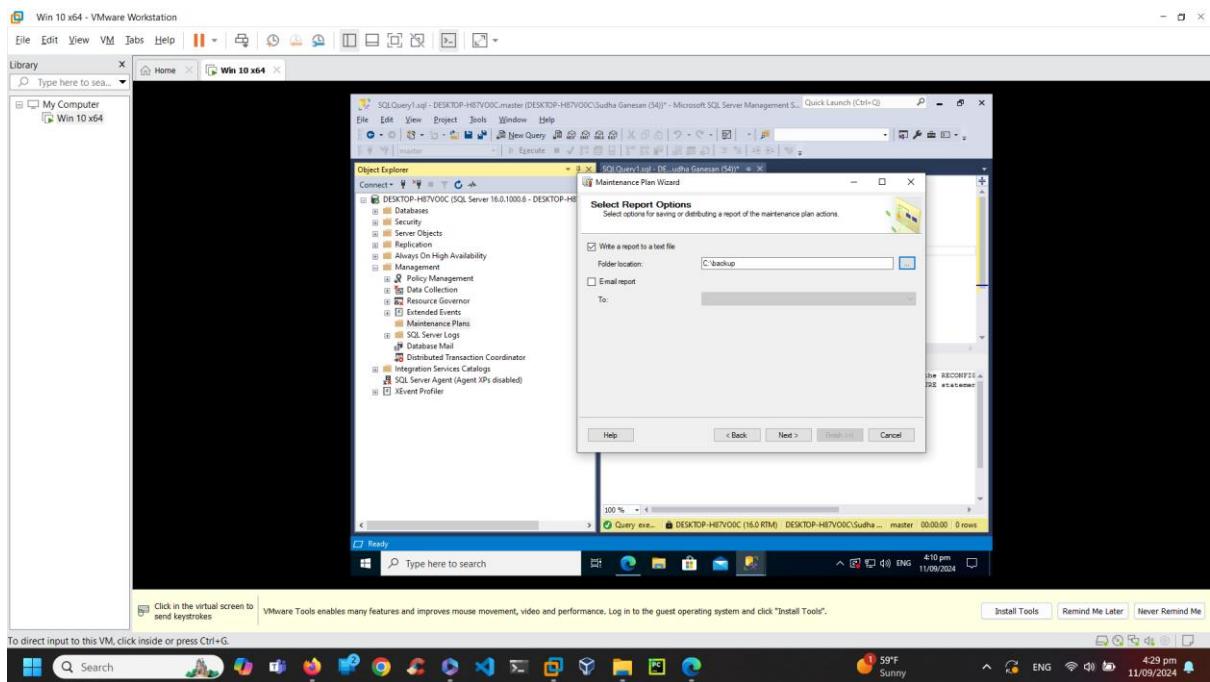
7. Backup database Full settings.



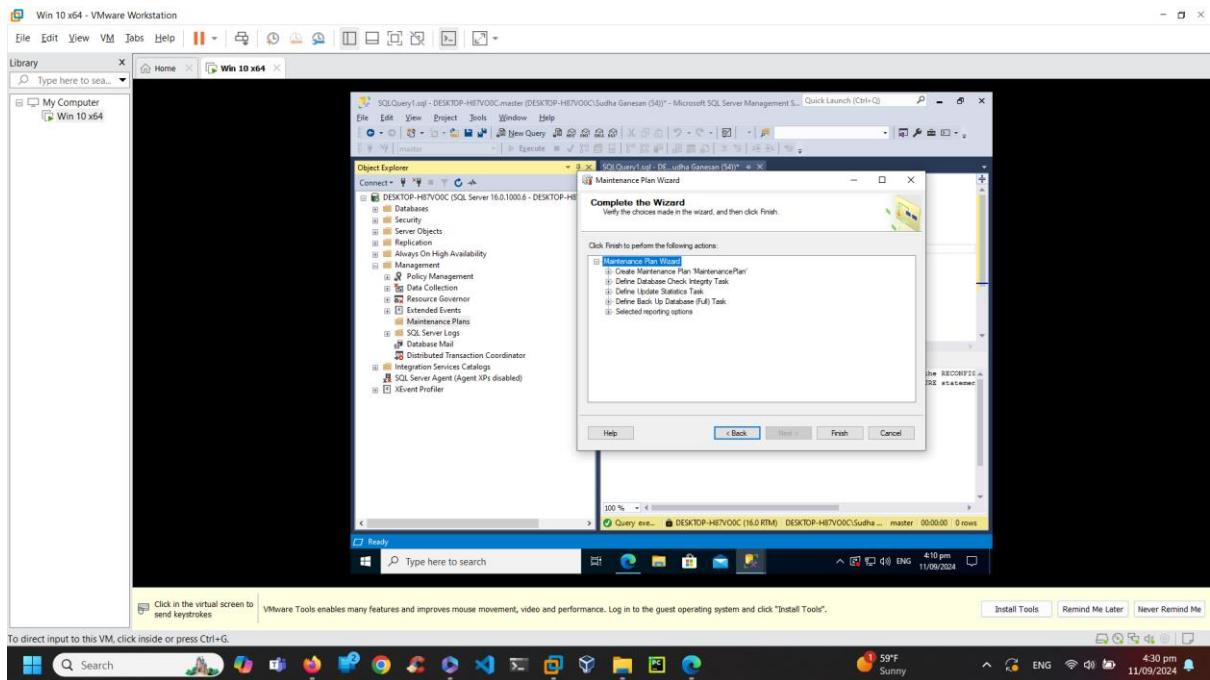
8. Select the order of the task.



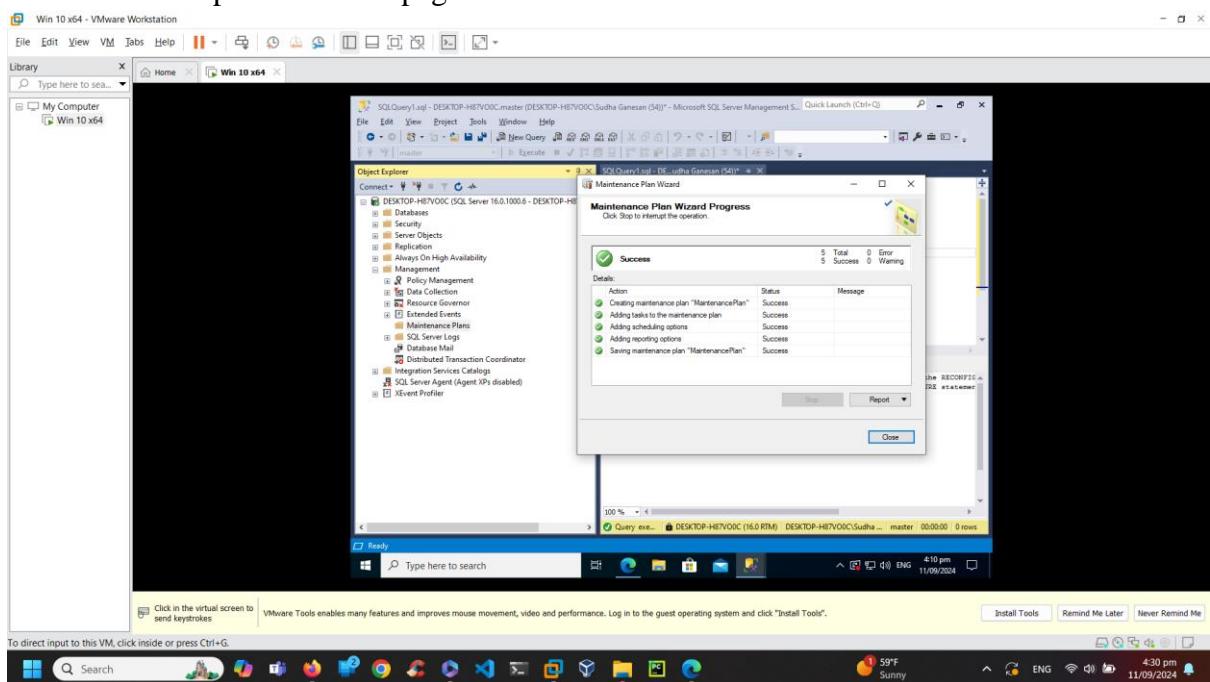
9. Select the folder location.



10. Added all the tasks in the Wizard.

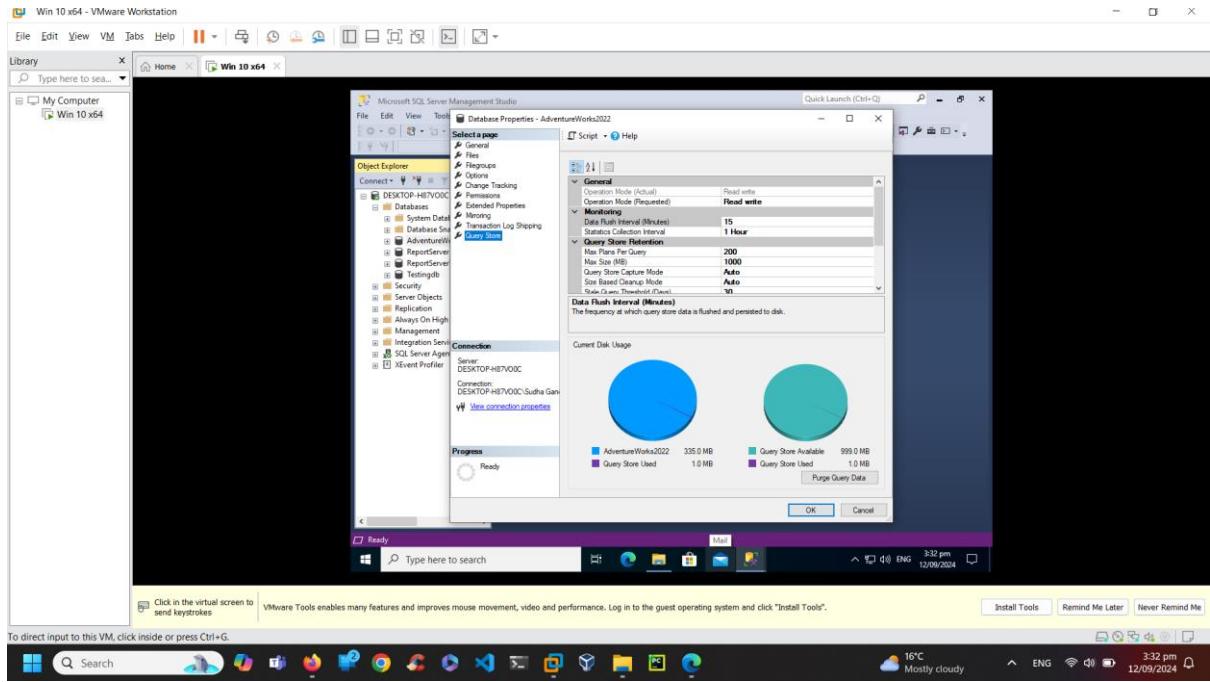


11. Completed Wizard page.

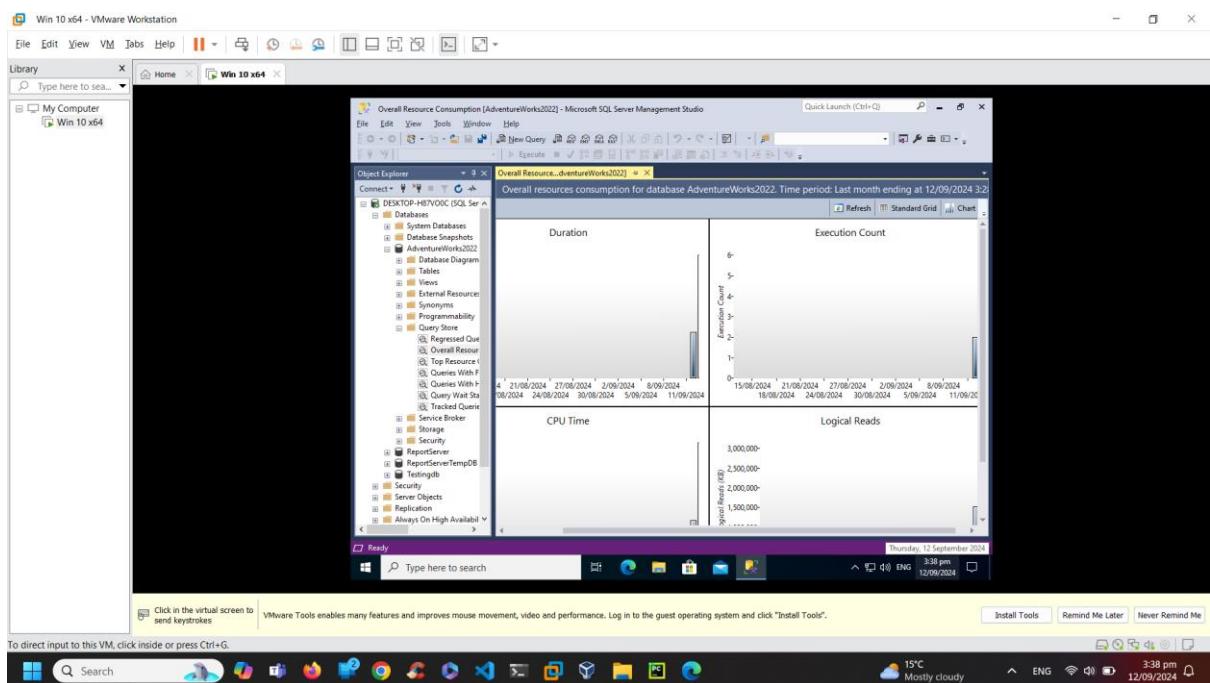


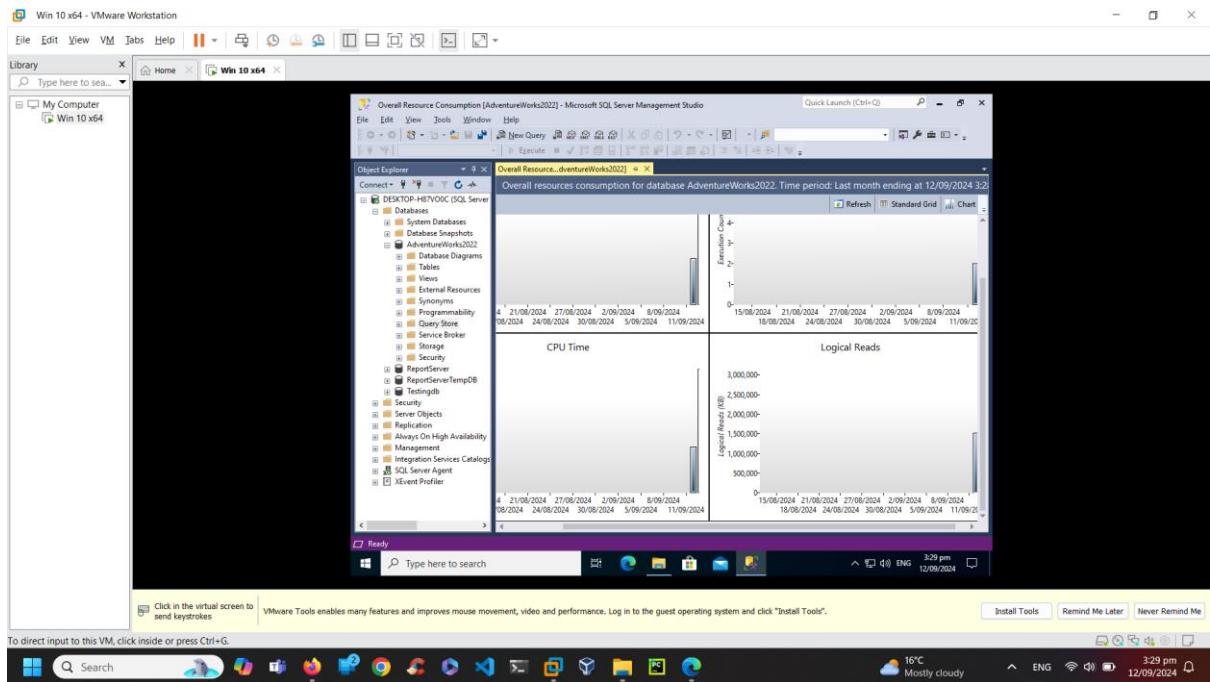
2.17 Query store:

1. Right-click on the AdventureWorks database and go to properties and select ‘Query Store’. Select Read Write option for operation mode.

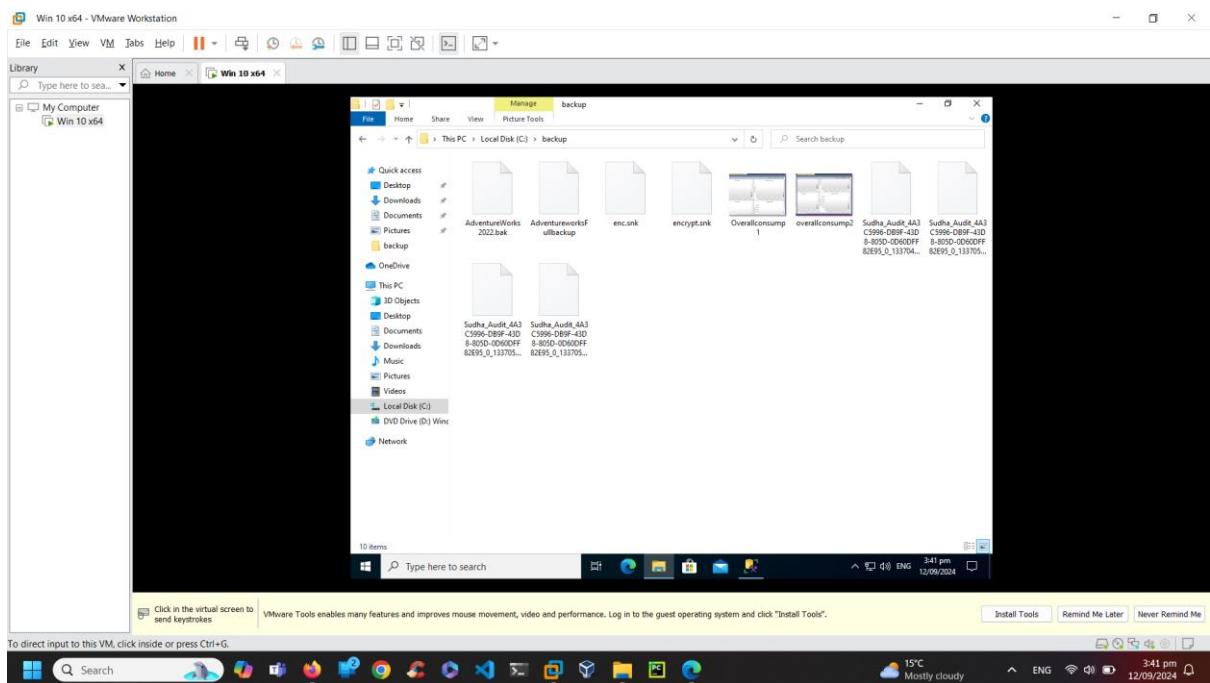


2. Select Reports > Standard Reports > Query Store > Overall Resource Consumption.
The graph is displayed with CPU usage, Logical reads, Execution count and Duration.





3. Save the screenshot in the VM in C:/backup as overallconsump1 and overallconsump2.



2.18 Overall Resource Consumption Report:

The Overall Resource Consumption Report assesses performance by providing insights into how resources like CPU, memory, and I/O are being used by different queries. It helps to identify resource usage, monitor query performance and optimise resource allocation. It enables the query, monitor the query and tunes the query. It analyses the total resource consumption for the database for any of the execution metrics. Referenceⁱ

TASK 3: DEVOPS

3.1 DevOps Movement:

DevOps is a software development methodology that accelerates the delivery of higher-quality applications and services by combining and automating the work of software development (Dev) and IT operations (OPS) teams. This includes platform and infrastructure engineers, security, compliance, governance, risk management and line-of-business teams, users and customers. (DevOps, 2024)ⁱⁱ

Before 2000, most software was developed and updated by using the **waterfall** methodology. Software development teams spent months developing large bodies of new code that impacted most or all of the application lifecycle. Next, quality assurance/security and operations teams spent still more months testing the code. The result was months or even years between software releases.

To speed development and improve quality, development teams began adopting **agile** methodologies in the early 2000s. These methodologies focus on making smaller portions, more frequent updates to the application code base. Foremost among these DevOps methodologies are continuous integration and continuous delivery. (CI/CD).

So, DevOps grew out of agile. DevOps provides a means to address the need of the software development life cycle (SDLC) to provide continuous integration and continuous delivery (CI/CD). Integrating development, operations, and security delivers practical benefits to resources while also enabling faster communication and collaboration across the lifecycle. (Product development, 2024)ⁱⁱⁱ

3.2 LIST DEVOPS GOALS:

DevOps is about connecting people, products, and processes. There are some common goals listed below: (Remya Mohanan, 2021)^{iv}

- a) Ensures effective **collaboration** between teams: In the DevOps paradigm, passing of work from one team(developer) to another(testing) is completely defined and broken down. This accelerates the entire process of development since collaboration between all the teams involved is streamlined.
- b) Creates **scalable** infrastructure platforms: AWS services for DevOps help to make the most of flexible compute resources by simplifying provisioning, configuration, and scaling.
- c) Build-on demand release capabilities: Continuous delivery (CD) will allow the software to add new features and go live at any stage. Automated release management is predictable, fast, and very consistent
- d) Provides faster feedback: **Automating** monotonous tasks such as testing and reporting will accelerate the process of rapid feedback. Since the development team will know what has to change, it can roll out the updated version faster.

- e) System **reliability and stability**^v: By adopting continuous improvement practices, teams are able to build in increased stability and reliability of the products and services they deploy. These practices help reduce failures and risk.
- f) **Security**^{vi}: DevSecOps is a continuous and ongoing effort that requires the attention of everyone in both development and IT operations. Red and blue teams should be organized by specialty. The goal is to build the most capable teams for each side in order to execute as effectively as possible.
 - The red team should include some security-minded engineers and developers (Dev) deeply familiar with the code.
 - The blue team should be made up of OPS-minded engineers who have a deep understanding of the systems and logging available. They have the best chance of detecting and addressing suspicious behaviour.
- g) **Monitoring**^{vii}: The goal of monitoring is to achieve high availability by minimizing key metrics related to issues/problems/security that are measured in terms of time: Time to detect (TTD), Time to mitigate (TTM), Time to remediate (TTR), Mean time to detection (MTD), Mean time to recovery (MTR)

3.3 DEVOPS CONCEPT

- a) **Continuous Integration (CI)**: CI is a development practice where developers commit their code changes to a centralized source repository into smaller portions, which kicks off a set of automated builds and tests.
Source code management systems like GitHub, Gitlab, etc., offer webhooks integration to which CI tools like Jenkins can subscribe to start running automated builds and tests after each code check-in. (CI)^{viii}
- b) **Continuous Delivery (CD)**: CD automates the delivery of applications to cloud infrastructure environments. Most teams work with multiple development and testing environments other than the primary production server.
- c) **Automation**: An essential practice of DevOps is to automate SDLC cycle. This gives developers more time to write code and develop new features. It also helps to reduce human errors and increase team productivity. (Principles, 2024)^{ix}
- d) **Infrastructure as Code(IaC)**: Provision, configure, and manage AWS infrastructure resources using code and templates. Monitor and enforce infrastructure compliance. For example, AWS cloud formation, AWS system manager, AWS config, AWS OpsWorks^x
- e) **Monitoring and Logging**: Record logs, constant monitor of applications to identify issues and optimise infrastructure performance in near real-time. For Example: Amazon CloudWatch
- f) **Platform as a Service**: Deploy web applications without needing to provision and manage the infrastructure and application stack.
- g) **Microservices**: Build and deploy a microservices architecture using containers or serverless computing. They can remove single points of failure (SPOFs) by ensuring issues in one service don't crash or affect other parts of an application. For example:

Coursera uses microservices-based architecture for its applications. It can now deploy software changes in minutes instead of hours in a resource-isolated environment.

3.4 RELATIONSHIP BETWEEN DEVOPS AND CLOUD TECHNOLOGY

Cloud technology provides the infrastructure and tools like AWS, GCP, Azure that DevOps needs to automate and scale operations, while DevOps practices enable organizations to fully exploit the flexibility, scalability, and cost-efficiency of the cloud. Together, they create an agile, responsive, and collaborative environment for software development and operations.

(Content reference for the tabulation)^{xi}

DevOps	Cloud computing
<ul style="list-style-type: none"> It is more strategic and systematic way to implement agile principles to control the infrastructure and minimize silos and gaps between teams. 	<ul style="list-style-type: none"> It is a virtual system offering remotely hosted servers to store, manage, and process data, embed intelligence, and deliver software on demand, empowering faster innovation, flexible resources, and economies of scale.
<ul style="list-style-type: none"> It focuses on enabling streamlined and quick delivery of impact and value to the end users by aligning the right tools, processes, infrastructure, culture, and collaboration. 	<ul style="list-style-type: none"> It can offer organizations the ability to evolve and experiment with technologies like the internet of things (IoT), chatbots, augmented reality, machine learning, big data analytics, etc., without worrying about storage, data processing, and security.
<ul style="list-style-type: none"> Accommodate People, processes and technology to achieve determined business goals 	<ul style="list-style-type: none"> Adopting robust cloud services for business enables a single repository of data accessible over the internet.
<ul style="list-style-type: none"> Prioritize automation using CI/CD, reduce redundant and manual tasks 	<ul style="list-style-type: none"> Eliminate the need to set up a complex infrastructure every time a new product is created and deployed.
<ul style="list-style-type: none"> Aligns business goals with security by safeguarding the development environment through stringent cyber-intelligent system 	<ul style="list-style-type: none"> An in-house database is vulnerable and prone to data breaches, unexpected system shutdowns, disasters, brute force attacks, etc.

The benefits of leveraging DevOps and the cloud for digital transformation are:

1. **Azure with IaC and GitHub actions^{xii}:** Teams can be empowered to deploy their own infrastructure by utilizing centrally managed templates and they can quickly provision new environments without needing to worry about all the implementation details. It also prevents any drift in the configuration (Tool: Ansible for configuration).

The tools for deployment and infrastructure management are Azure pipelines, GitHub actions and Terraform

2. **Storage:** Moving enterprise IT infrastructure to the digital cloud has equipped businesses with secure data storage, reducing the likelihood of data loss. Azure Key Vault^{xiii} can be used to securely store and control access to tokens, passwords, certificates, API keys, and other secrets.
3. **Security:** Enterprises can benefit from the containerization of their applications and have a single repository wherein it's easy to process and manage data eliminating unauthorized access. Microsoft Defender for Containers is the cloud-native solution for securing your containers.
4. **Best business approach:** DevOps and Cloud can help offer speed, quality, reliability, and customer experience in the competitive world.
5. **Flexible IT services:** Allow scalability and flexibility to add new business services and avenues without worrying about hardware or software upgrades taking up too much time or money.
6. **Efficient team involvement, collaboration and project management:** Ensure the right tools, better services, and enhanced productivity results in a successful business transformation. The two-crew approach yields greater productivity and predictability. (Feature crew and customer crew)^{xiv}
7. **Monitoring:** Azure Monitor can monitor both the application and infrastructure in real-time, identifying issues with your code and potential suspicious activities and anomalies. Combined with a continuous deployment release pipeline, monitoring will detect new anomalies and allow for prompt mitigation.
8. **Maintenance:** Code base and tooling maintenance are required to keep the IaC implementation current and secure. Properly track your technical debt and foster a culture where reducing debt is rewarded.
9. **Feedback^{xv}:** Git-Pull requests support reviewing and merging code into a single collaborative process. It can be used to review the work in progress between teams and get early feedback on changes.

3.5 COMPARISON OF DEVOPS VS ITIL

DevOps is an automated development, collaboration, and blame-free culture. DevOps implements the following practices:

- Continuous Development
- Continuous Integration
- Continuous Testing
- Continuous Monitoring
- Continuous Delivery
- Continuous Deployment

It's better collaboration between IT and business when we use ITIL and DevOps together and it also helps in customer satisfaction due to the improved delivery of services and better management of issues. (DEVOPS vs ITIL)^{xvi}

DEVOPS	ITIL
<ul style="list-style-type: none"> • DevOps refers to effective collaboration between the development team and operations team. 	<ul style="list-style-type: none"> • ITIL refers to a set of detailed guidelines for effective and efficient management of an organization's IT services.
<ul style="list-style-type: none"> • Use a methodical approach to minimize the friction between two teams. 	<ul style="list-style-type: none"> • It uses a systematic approach to manage the IT service to ensure growth.
<ul style="list-style-type: none"> • CI and CD are the backbone of modern DevOps philosophy. 	<ul style="list-style-type: none"> • ITIL aims to increase the delivery process.
<ul style="list-style-type: none"> • Continuous integration and continuous delivery are critical to increasing. 	<ul style="list-style-type: none"> • Services are built, discuss, tested, and implemented.
<ul style="list-style-type: none"> • DevOps focus on the concept. It has a dynamic body of knowledge. 	<ul style="list-style-type: none"> • ITIL focus on development. It has a static body of knowledge.

3.6 BENEFITS OF COMBINING DEVOPS AND ITIL TOGETHER

DevOps emphasizes rapid software delivery and collaboration between development and operations teams. On the other hand, ITIL (information technology infrastructure library) provides best practices for ensuring service stability, reliability and adherence to governance and compliance. Integrating DevOps and ITIL creates a symbiotic relationship, allowing organizations to leverage the best of both worlds. The integration of DevOps and ITIL, known as DevOps+, marks a transformative approach to IT service management. (Refer Benefits)^{xvii}. Their benefits are:

1. **Enhancing Agility and Speed:** DevOps integration brings greater agility and speed to IT service management. Agile development methodologies (CI/CD) enhance the adaptability of ITSM processes to meet evolving business requirements effectively.

2. **Ensuring Stability and Reliability:** While agility is crucial, it must not compromise service stability and reliability. ITIL's best practices provide a strong foundation for maintaining service quality. By incorporating ITIL processes such as incident management, change management and problem management, organizations can effectively manage risks, reduce service disruptions and ensure the stability of critical IT services.
3. **Leveraging Automation and Orchestration:** Automation is central to both DevOps and ITIL. Through integration, organizations can leverage automation and orchestration tools effectively. Automated testing, infrastructure provisioning and configuration management improve efficiency and consistency across the ITSM lifecycle. This enables teams to focus on higher-value tasks, reducing manual errors and operational overhead.
4. **Emphasizing Customer-Centricity:** DevOps+ puts the end-user experience at the forefront of service delivery. By continuously seeking customer feedback and measuring service performance, organizations can better align their offerings with user expectations. A customer-centric approach fosters higher satisfaction, loyalty, and competitive advantage.
5. **Breaking Down Barriers to Change:** Change management is vital in ITIL, ensuring that modifications are planned and controlled. In the context of DevOps+, change management becomes more adaptive and responsive, facilitating a culture that embraces change as an integral part of the development process. This promotes experimentation, reduces resistance to change, and accelerates innovation.
6. **Metrics and performance measurement:** Measuring the success of DevOps+ integration is essential to understand its impact and effectiveness. Key performance indicators (KPIs) can help monitor progress and identify areas for improvement.
7. **Continuous improvement and feedback loops:** Establishing feedback loops and conducting regular retrospectives empowers teams to identify areas for improvement, evaluating to continuously measure the performance using defined KPIs. and implement iterative enhancements to processes and practices.

REFERENCES:

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- ⁱ <https://learn.microsoft.com/en-us/sql/relational-databases/performance/best-practice-with-the-query-store?view=sql-server-ver16>
- ⁱⁱ <https://www.ibm.com/topics/devops>
- ⁱⁱⁱ <https://www.oracle.com/nz/devops/what-is-devops/>
- ^{iv} https://www.spiceworks.com/tech/devops/articles/what-is-devops/#_002
- ^v <https://learn.microsoft.com/en-us/devops/what-is-devops#devops-goals-and-benefits>
- ^{vi} <https://learn.microsoft.com/en-us/devops/operate/security-in-devops>
- ^{vii} <https://learn.microsoft.com/en-us/devops/operate/what-is-monitoring#goals-of-monitoring>
- ^{viii} <https://www.oracle.com/nz/devops/what-is-devops/>
- ^{ix} <https://www.atlassian.com/devops/what-is-devops>
- ^x <https://aws.amazon.com/devops/>
- ^{xi} <https://copperdigital.com/blog/how-cloud-and-devops-help-in-digital-transformation/>
- ^{xii} <https://learn.microsoft.com/en-us/devops/deliver/iac-github-actions>
- ^{xiii} <https://learn.microsoft.com/en-us/devops/devsecops/enable-devsecops-azure-github>
- ^{xiv} <https://learn.microsoft.com/en-us/devops/plan/building-productive-teams>
- ^{xv} <https://learn.microsoft.com/en-us/devops/develop/git/git-pull-requests>
- ^{xvi} <https://www.geeksforgeeks.org/difference-between-devops-and-itil/>
- ^{xvii} <https://devops.com/devops-and-itil-integration-driving-collaborative-agility-in-itsm/>