File Server-SMB2 Test Suite

Version 2.3

Tutorial

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Abstract

Training in File Server-SMB2 Test Suite Technology

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1.0 Introduction

This Tutorial provides step-by-step instructions for connecting to and configuring the **File Server-SMB2 Test Suite (FSSTS)** via the **Protocol Test Manager Web Service (PTMWS)**, in preparation for executing predefined Test Cases that exercise various functions of SMB protocol dialects in file sharing scenarios. Following test execution, you will perform some basic analysis of test results. You will be provided with the test environment assets that facilitate the configuration and execution of tests.

The management of test environment configuration, **Test Case** execution, and test results analysis are all achieved with the use of the **PTMWS**, hereinafter referred to as the **PTM Service**. This Tutorial will show you how to use the **PTM Service** to accomplish these tasks. This tool and the **File Server-SMB2 Test Suite** are already installed on a **Driver computer** where you will conduct the testing. You can access the **PTM Service** from a web browser on your device or on the **Driver computer**, the latter of which you will have access to via the **Remote Desktop Protocol (RDP)**.

The audience for this Tutorial/Lab session is described just ahead, as are the goals of this training and the details of session organization.

1.1 Test Suite Training Audience

The primary audience for the **FSSTS** training is software developers who have little or no experience with running protocol Test Suites. Other audiences can include support personnel, IT professionals, and others who may be interested in learning about protocol Test Suites.

1.2 Goals of the Test Suite Training

The primary goals of this training session are as follows:

- Learn the basics concepts of simple protocol communications.
- Obtain a preliminary understanding of the **File Server-SMB2 Test Suite (FSSTS)** and **PTM Service** test environment.
- Learn how to use the **PTM Service** to manage the configuration, filtering, test execution, and test results analysis features of the **FSSTS**.

1.3 Training Session Details

A typical organization of this Lab session and the time allocated for the session tasks are indicated in the table follows:

Table 1. Training session organization

Session Task	Allocation (minutes)
Review glossary terms and conceptual material	10
Configure Test Suite and run Test Cases	20
Analyze test results and ask questions	15

Total time	**45**

2.0 Glossary Definitions

The following list defines the important terms that are frequently used in this Tutorial.

Authentication token — a security device that enables a user or application to gain authorized access to secured resources, such as a network service.

Driver computer — a computer on which the **FSSTS** is installed and configured. After installation, you can run the preconfigured test cases that are part of FSSTS. In the test environment, this computer typically runs a Windows client operating system.

File Server-SMB2 Test Suite (FSSTS) — a set of preconfigured, software-coded **Test Cases** that exercise features of the **SMB2 protocol** and other protocols that are associated with file services. Contains the framework for configuring the test environment, executing tests of File Server features, and facilities for analyzing test results.

Implementation — a coded representation of the functions of a protocol that contains the messages and formats required to establish communications between computers across a network, for the purpose of servicing application functions via sending client requests and replying with server responses.

Isolated network — for testing protocols with the **FSSTS**, this a network that is disconnected from the Internet, uses an isolated hub or switch, and is not part of a production network of any kind.

Message — a packet of data that sends instructions or other information in the form of a request or a response, from one computer to another.

Microsoft Message Analyzer — a network tracing and analysis tool that enables you to capture, display, and analyze protocol messaging traffic; and to trace and assess system events or Windows component events. It also provides the capability to retrieve, aggregate, and analyze data from one or more saved traces.

Optionally can be used in this Tutorial to analyze event trace log (ETL) data, as generated during Test Case execution.

Profile — a file generated by the PTM that represents a configuration of Test Cases that you optionally create and store in a directory location following Test Case execution. A Profile acts as a template that enables the repetitive reapplication of an identical set of Test Cases against a common SUT environment.

Protocol — a set of rules or procedures that define how data is transmitted between computers. To achieve a successful interchange of information, a protocol establishes the structure of the information, the transmission method, and how the sending and receiving nodes process the information. The functions of a protocol are typically expressed as a set of message packets, which in turn reflect the protocol's rules.

Protocol Test Manager Web Service (PTM Service) — consists of a built-in user interface that provides all the functions and facilities for performing all the tasks associated with using the Test Suite, which includes the following:

- Detecting the system under test (SUT) configuration and capabilities.
- Creating a default set of Test Cases, based on the assessed SUT environment.
- Optionally reconfiguring the default Test Case selections.
- Running the Test Cases.
- Analyzing the test results.

See Configuring the Test Suite for further information.

Provisioning — a term that is used to describe the process of setting up computers and specific resources for a predetermined purpose. For example, a company might have need of an SMTP mail server or an IIS web server for their business. Companies such as Microsoft and others will set up, customize, and maintain those systems in the Azure hosting space for the customer in an agreed-upon contract. Providing such resources is commonly known as provisioning.

Note that the **Driver computer** and **SUT computer** are virtual machines (VMs) that may be provisioned by Azure services or by other resources, for the purposes of this lab session.

Remote Desktop Protocol (RDP) — the **protocol** that facilitates the well-known Remote Desktop Connection application that enables users to connect from their local computer to a specified remote computer, so that users may access the resources of such a computer.

Server Message Block (SMB2) protocol — the SMB2 protocol is typically used by clients to request file and print services from a network file server. The protocol enables you to establish a server connection, an authentication context for the connection, and to thereafter request access to files, shares, and printers.

The SMB2 protocol is the mechanism that enables you to open, read, modify, and close files on a target server; to query and apply attributes to files or volumes on a target server; to moderate the shares and users; and to simultaneously open files. It also supports the creation of symbolic links, which for example enables you to create a link to a file or directory from another file in a different directory location.

SMB2 client — typically a computer that uses a particular SMB2 dialect or later to make SMB requests to an SMB file server to obtain access to file system resources for reading and/or writing data. The SMB2 client sends and receives data to/from the SMB2 server via message packets of the SMB protocol.

Note In the context of this training , the SMB2 client is the **Driver computer** and the SMB2 server is the **SUT computer**.

SMB2 server — a computer that receives and services requests from an SMB2 client via the message packets of the SMB2 protocol.

SMB2 dialect — the SMB protocol comes in several versions that are known as dialects, for example, SMB v2.0.2, 2.1, 3.0, 3.0.2, 3.1.1, and so on.

System under test (SUT) computer — a computer that hosts the system against which the pre-defined Test Cases are to be run by the **FSSTS** that is installed on the **Driver computer**. Typically, the FSSTS tests an implementation of the **SMB2 protocol**, which can be either a proprietary, developed SMB2 implementation or the SMB2 service that runs on the SUT computer by default.

For purposes of this training and the preconfigured set up that is used, the Microsoft SMB2 service on the SUT computer serves as the underlying implementation being tested. In the test environment for this lab training, this computer typically runs a Microsoft server operating system.

Test Case — an executable application hosted by the Test Suite that is designed to test unique aspects of File Server features that use the **SMB2 protocol** within the context of an SMB2 client and SMB2 server communication session. **Note:** an **FSSTS** installation can contain thousands of Test Cases.

Virtual machine (VM) — typically an emulation of a computer system that has a computer architecture and provides the functionality of a physical computer, but its implementation is software based and has no physical component, other than a physical computer on which the VM is hosted.

3.0 Concepts

This section briefly describes the major concepts with which you will become familiar by taking the **FSSTS** Lab Session course via this Tutorial. The material begins with describing how to install a Test Suite. Next, you will learn some basic concepts of protocol communication and you will also learn about the test environment with which you will be working, as indicated in section 3.1 What You Will Learn, directly ahead. This section also points you to other sections of this Tutorial that show you how to use the **PTM Service** to configure the Test Suite, select and run the Test Cases, and analyze the test results.

Note

If you have not already done so, you should read the preceding Glossary definitions to obtain a brief overview of pervasive concepts in this Tutorial, through an understanding of terms.

3.1 What You Will Learn

This section provides an overview of the scope of this Tutorial, in terms of the specific things that you will be learning, as follows.

Installing a Test Suite — provides a simple and quick process to install a chosen Test Suite.

Protocol Communications — introduces the basics of protocol communications by giving a hypothetical example of the initial exchange of **SMB2 protocol** messages that are used to set up an SMB2 session.

Test Environment Architecture — shows a basic network diagram that is similar to the test environment in which you will be working, provides a description of its components, and shows a graphic representation of the Test Cases communication path between the **Driver computer** and **SUT computer**.

Configuring the Test Suite — shows you how to use the **PTM Service**, the primary user interface that you will utilize to manage test environment configuration on the **Driver computer**.

Running the Test Suite Test Cases — shows you how to use the **PTM Service** to manage execution of **File Server-SMB2 Test Suite (FSSTS)** Test Cases on the **SUT computer**, initiated from the **Driver computer**.

Analyzing the Test Results Data — shows you how to use the **PTM Service** to manage analysis of the test results.

Note
When you have completed the procedures in the latter three sections listed above, you will be finished with this Tutorial.

3.2 Installing a Test Suite

The **File Server-SMB2 Test Suite** with the **PTM Service** should already be installed on the **Driver computer** for use with this Tutorial. However, for users who need to work with a different Test Suite, an option is available for installing other Test Suites, as follows:

- FileServer
- RDPClient
- SMBD
- MS-WSP

Such users are likely to be those who want to test an implementation of another protocol, for which a different Test Suite is required. In some cases, it could be a user who needs to reinstall the File Server-SMB2 Test Suite. The latest version of the Windows Protocol Test Suites is v4.22.9.0, released August 23, 2022, is located here.

Important
You can install multiple Test Suites on the **Driver computer**, however, you can run one at a time only.

In the event that you need to install a Test Suite, perform the procedure that follows:

To install a Test Suite, including its corresponding PTM Service

1. On the **PTM Service** landing page, as shown in the figure that follows, click the linked **Management** tab to display the Test Suite tasks that you can manage, which includes the following:
    - **Rerun**, **Update**, or **Remove** one or more Test Suites.
    - **Install** a Test Suite.

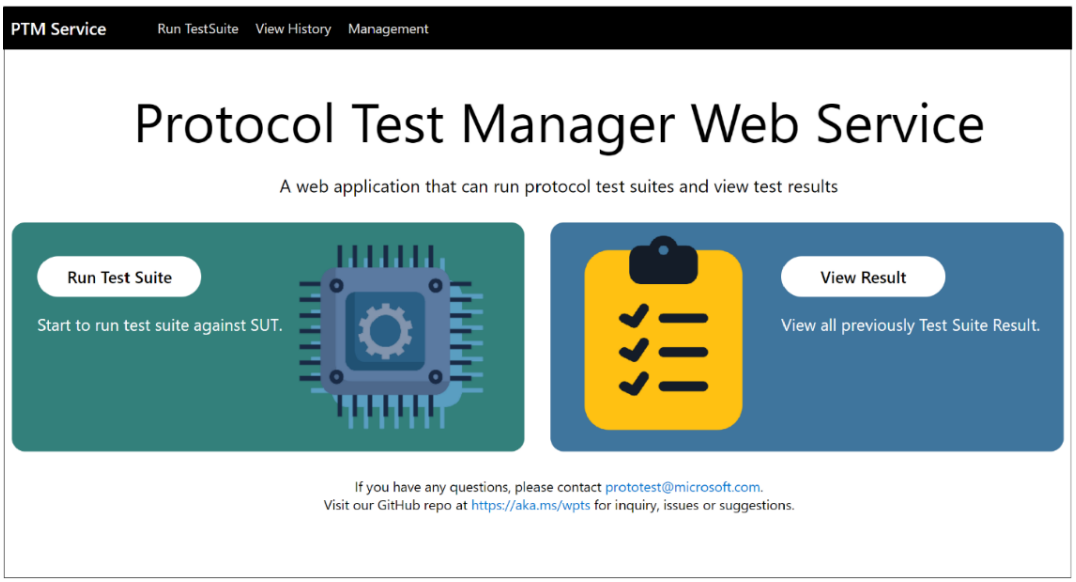

Figure 1. PTM Service landing page

2. From the linked **Management** tab of the **PTM Service** landing page, click the **Install Test Suite** button to display the **Install Test Suite** dialog, as shown in the figure that follows.

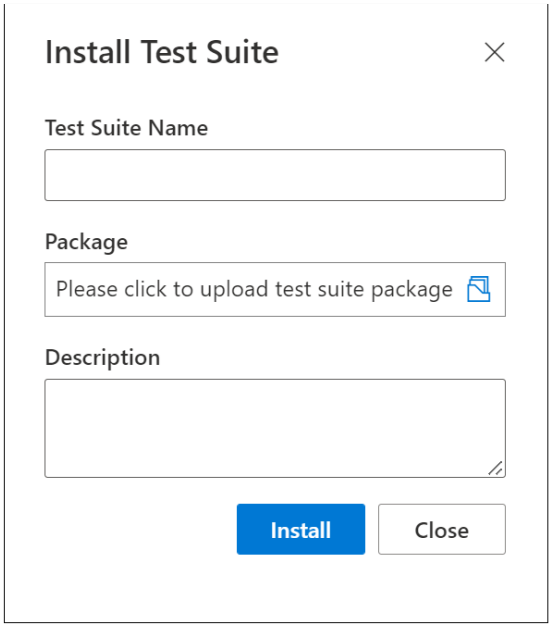

Figure 2. Install Test Suite dialog

3. In the **Install Test Suite** dialog, type a name for the Test Suite in the **Test Suite Name** textbox. Note that this is a user-specified value, to be named at your discretion.
4. Click the folder icon in the **Package** field to navigate to the appropriate **File Server-SMB2 Test Suite** .zip file.

   If you previously downloaded a particular Test Suite .zip file to a specified folder location, navigate to that location and select the Test Suite .zip file you want. Otherwise, locate the Test Suite .zip file on GitHub at this location.
5. Type a description of the Test Suite in the **Description** text box at your discretion.

6. To begin the installation, click the **Install** button in the **Install Test Suite** dialog.

   Follow all instructions as the installation proceeds and monitor any installation errors that may occur.

7. When the installation completes, click the **Close** button in the **Install Test Suite** dialog and then click the linked **Run Test Suite** tab on the **PTM Service** landing page.

To begin configuring the Test environment, see section 4.0, Configuring the Test Suite.

3.3 Protocol Communications

This section provides an example of protocol communications between an **SMB2 client** and an **SMB2 server**. It shows how several types of messages of the **Server Message Block (SMB2) protocol** are used to set up a session between an SMB2 client and an SMB2 server, in order to provide the client with access to a share on the server. The message exchanges basically consist of initial client/server negotiations, the client **authentication** process, and a connection request for share access.

A visual representation of the communication process in the figure that follows is accompanied by explanatory steps. The sequence of messages shown in the figure are high-level representations of the types of requests and responses that are typical of setting up an SMB2 session and connecting to a server share.

The goal of this section is to provide readers with a basic sense of how the **File Server-SMB2 Test Suite** on the **Driver computer** (client) communicates with the **SUT computer** (server). For example, in the Test Suite, a **Test Case** could invoke an SMB2 method and obtain confirmation as to whether encrypted access to a server share was successful or not; another test case might verify if a symbolic link within a share is working properly. These features are actually preconfigured on the SUT computer, against which real Test Cases are run from the Test Suite on the **Driver computer**.

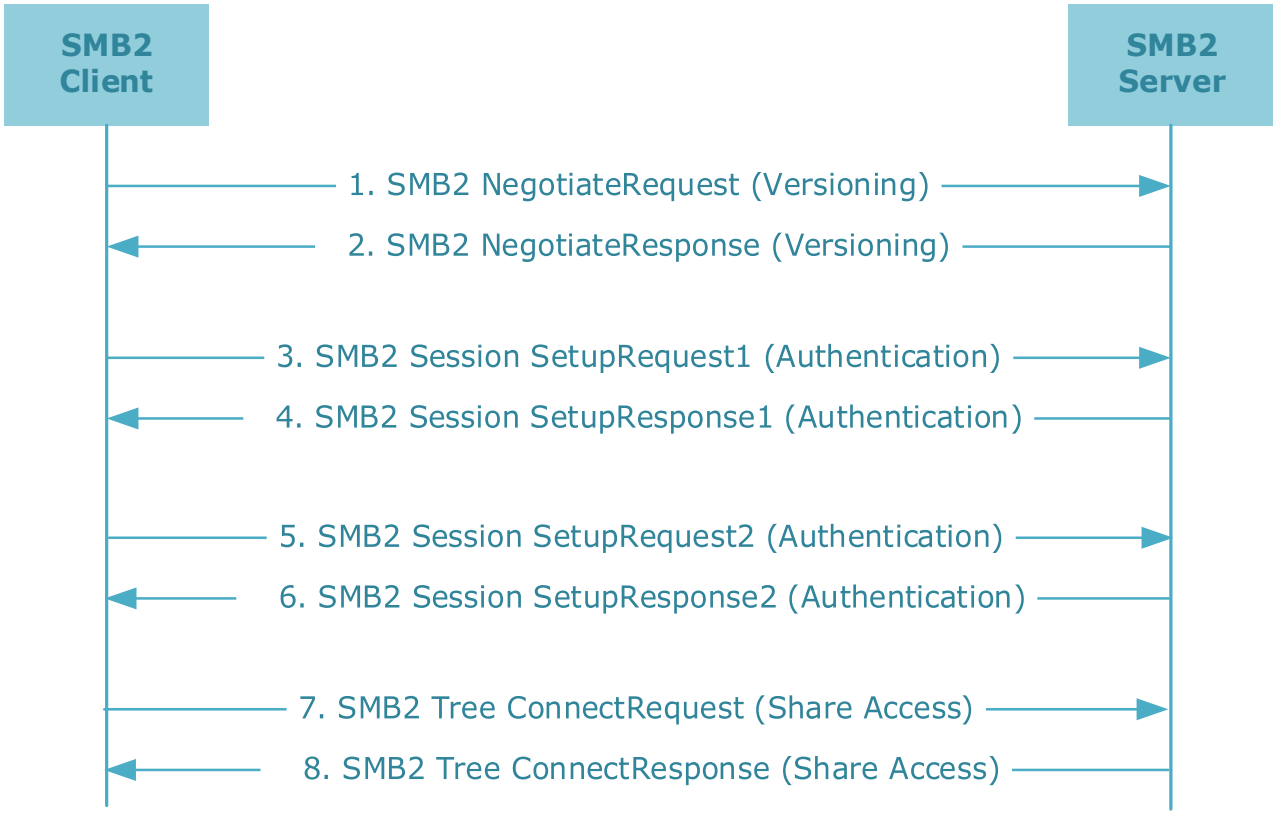

Figure 3. SMB2 protocol messages example : Setting up an SMB2 share connection

1. The SMB2 client sends a **NegotiateRequest** to the SMB server to establish the **SMB protocol** version or *dialect* in use by the client (SMB2, SMB3, and so on).
2. The SMB2 server acknowledges the client's **SMB dialect** and sends an SMB2 **NegotiateResponse** message back to the SMB2 client.
3. The SMB2 client queries a security service for an **Authentication token** and sends a **SetupRequest1** message to the SMB2 server.
4. The SMB2 server responds with a **SetupResponse1** message containing the authentication token and requests further processing from the SMB2 client.
5. The SMB2 client performs processing on the authentication token and passes it, along with a SessionId, in a **SetupRequest2** message to the SMB2 server.
6. The SMB2 server processes the authentication token and sends a **SetupResponse2** message back to the SMB2 client with a success status code.
7. The SMB2 client completes the authentication process and sends a **ConnectRequest** message to the SMB2 server containing a SessionId and the name of the share to connect to.
8. The SMB2 server enables the connection and sends a **ConnectResponse** message containing a success status code and other session information to the SMB2 client.

To offer a simplified correlation to the foregoing: when the **File Server-SMB2 Test Suite** performs tests, it begins by sending requests from the **Driver computer** and receiving responses from the **SUT computer**, in a manner that is similar to the message sequences shown in **Figure 3**. After a session is

successfully set up, the Test Suite runs a host of preconfigured Test Cases that utilize important features and functions of the SMB2 protocol and others to assess the system under test.

The Test Environment in which this occurs is described in the sections that follow.

3.4 Test Environment Architecture

The Test Environment consists of an isolated network with a **Driver computer** (client) and an **SUT computer** (server) hosted as Azure **virtual machines** in a Domain environment. Users will access the **PTM Service** on the **Driver computer** by entering the IP address of the Driver computer in a web browser. The basic network configuration is shown in the figure that follows:

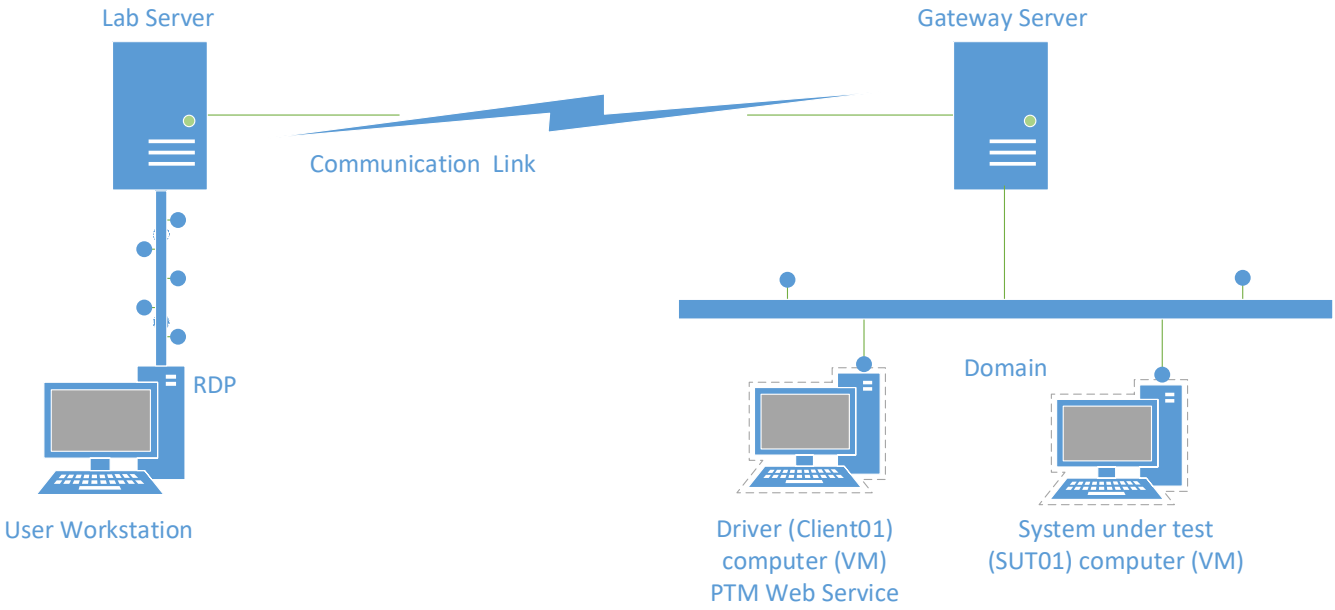

Figure 4. File Server-SMB2 Test Suite : Network test environment

The components of the **File Server-SMB2 Test Suite** network Test Environment are described in the list that follows:

- **User Workstation** — a remote user laptop, Surface, or a lab computer from which you will connect to the **Driver computer** (a virtual machine) in a Domain environment via a specified URL, where you will configure the **File Server-SMB2 Test Suite** as described in section 4.0 Configuring the Test Suite for the system to be tested.
- **Remote Desktop Protocol (RDP)** —a common protocol you can use to connect with the **Driver computer** to access local features on the **Driver**, for example, the file system. It also enables users to execute cmd files that are local to the **Driver computer**.
- **Lab Server** — an optional test lab server, depending on the specific lab environment in which you will connect to the internet to access the **Driver** and **SUT** computers.
- **Gateway Server** — an optional server, depending on the lab environment, that will host the **VMs** configured in a Domain environment. It is setup by the Microsoft Test and/or Support teams, who will **provision** the VM computers and other resources you will be using in the Test Environment.

- **Driver computer** — a VM that hosts the **File Server-SMB2 Test Suite** and **PTM Service** that you will use to configure and run Test Cases against the SUT configuration.
- **SUT computer** — a VM computer that is pre-configured with the required file shares and other features to be tested by the **Test Cases** of the Test Suite.

Important

In this Test Environment, you will not be testing some proprietary SMB2 implementation on the **SUT computer**. Rather, the Microsoft SMB2 service that normally runs on that computer will respond to the test messages generated by the Test Cases of the **File Server-SMB2 Test Suite**, which reside on the **Driver computer**, as shown in the figure that follows:

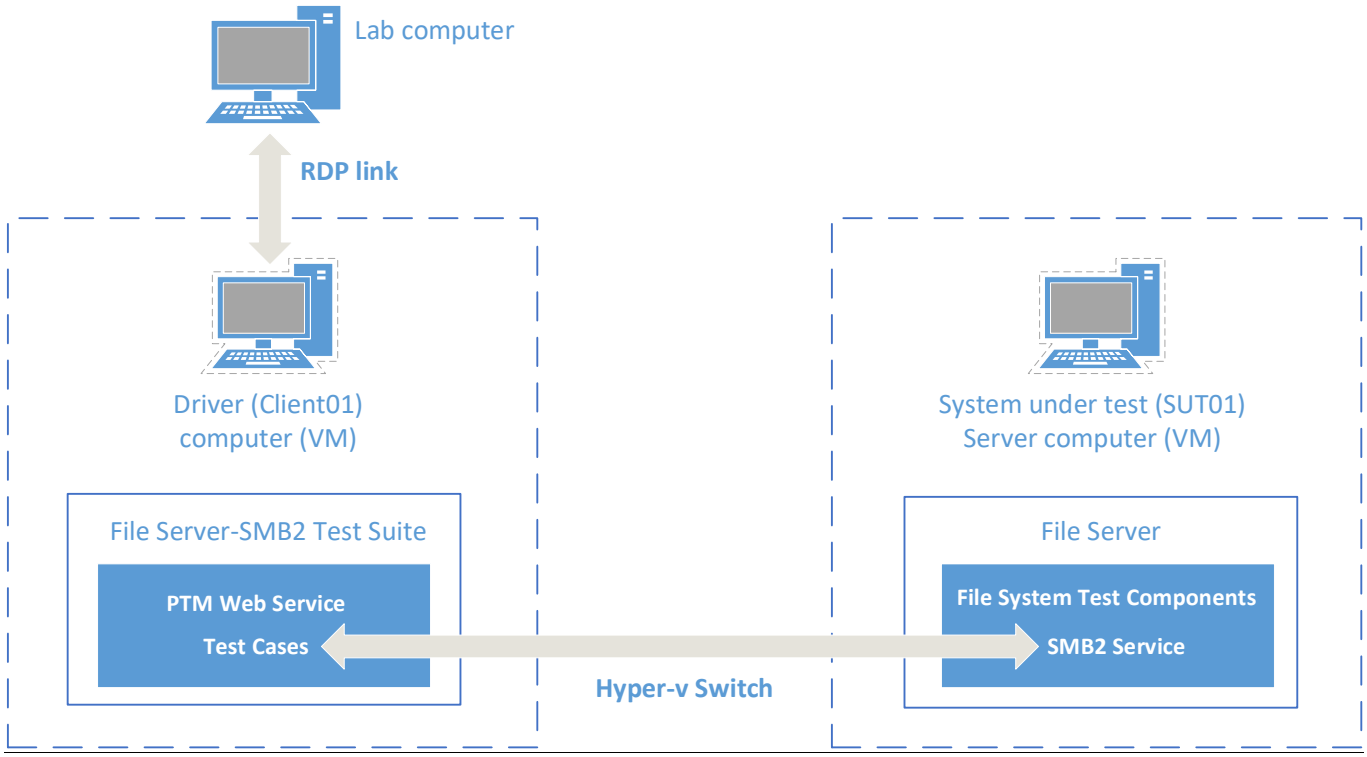

Figure 5. Test Environment : Test Cases communication path

4.0 Configuring the Test Suite

This section briefly describes how to configure the Test Suite **Test Cases** on the **Driver computer** with the use of the **PTM Service**, which is shown in the figure that follows. You can connect to the **PTM Service** on the **Driver computer** by entering the Driver computer IP address in a web browser. The IP address and any other credentials should be communicated to partners on a designated Teams Channel prior to the event.

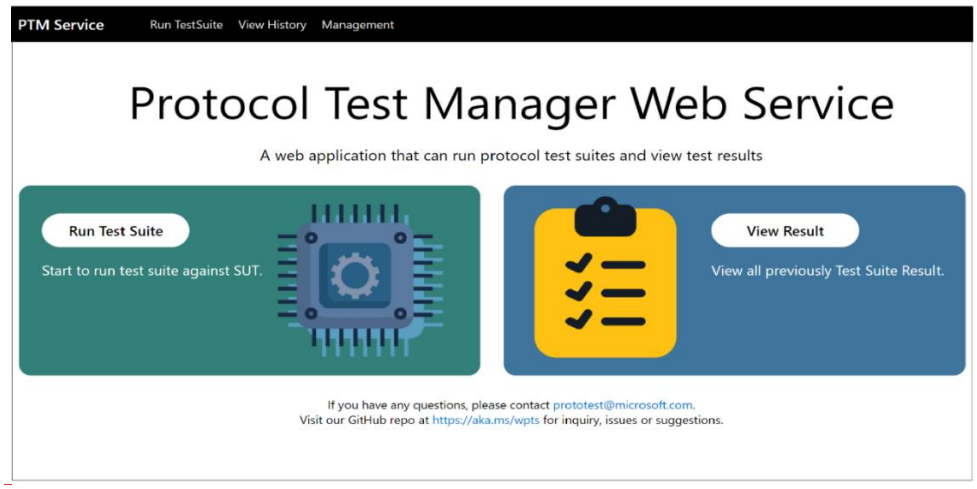

Figure 6. PTMService landing page

A list of tasks display when you start the **PTM Service** from the landing page by clicking the **Run Test Suite** button shown in the previous figure. The tasks are shown in the figure that follows and are described thereafter.

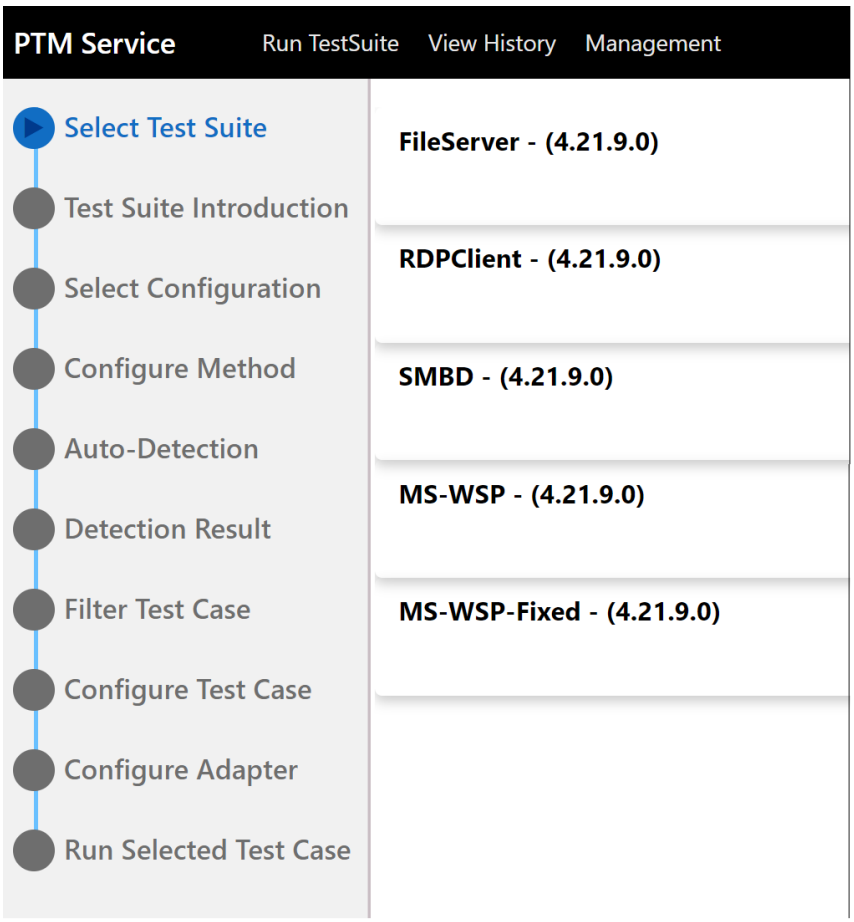

Figure 7. PTM Service : Tasks list

These tasks are briefly described as follows:

- **Select Test Suite** — select the **FileServer-SMB2 Test Suite** from which to run your Test Cases.

- **Test Suite Introduction** — review the file sharing protocols of the **FileServer-SMB2 Test Suite**, the implementations of which this Test Suite is designed to test. Also familiarizes you with deployment configurations.
- **Select Configuration** — specify the test case mode, either by running the existing set of Test Cases or configuring a new set of Test Cases.
- **Configure Method** — select one of the following options:
  - **Run Auto-Detection** — automatically detects/assesses the SUT environment and obtains a default configuration of Test Cases based on such assessment.
  - **Do Manual Configuration** — manually configure the Test Suite and select Test Cases.
  - **Load Profile** — uses a saved configuration of Test Cases and corresponding test environment, known as a **Profile**, to enable comparisons with other target test results. For example, running a baseline set of Test Cases against a modified environment or running a modified implementation against a baseline environment.
- **Auto-Detection** — specify input information for locating the system under test (SUT) computer and run a detection routine to confirm SUT characteristics, capabilities, and environment compatibility for testing.
- **Detection Result** — verify **PTM Service** detection, inspection, and validation of the SUT environment for test readiness. Also enables you to validate user input information such as **Target Share**, **User Name**, **Password**, and so on.
- **Filter Test Case/s** — modify the default output of the **Auto-Detection** process, by selecting/unselecting (filtering) Test Cases to create a unique test configuration. Per an Instructor of this Tutorial, you might configure specific tests to create focus on specific sets of test results.
- **Configure Test Case/s** — review or optionally reconfigure Test Case properties to refine or make corrections to property values.
- **Configure Adapter** — select the type of control adapters to use and specify script locations when required:
  - **SUT Protocol control adapter** — use this adapter for the **FSSTS** with the Managed setting.
  - **Common SUT control adapter** — not applicable to **FSSTS**.
  - **Fail SUT control adapter** — not applicable to **FSSTS**.
- **Run Selected Test Case/s** — you can **Run all cases** or run only *selected* Test Cases at execution time from this page.

You will complete the items cited in the above list in section 4.1 that follows. Thereafter, you will run the Test Cases and then perform simple analysis on test results to obtain a basic understanding of the analysis features.

Optional Configuration Scenario

If you have already run through an execution of Test Cases and saved a **Profile** per the procedure in section 5.2 Saving a Profile, you can proceed to section 4.2 Configure the Test Environment by Loading a Profile to set the Test Case configuration with a **Profile** prior to execution, instead of performing the configuration in section 4.1 that follows. For the section 4.2 procedure, note that you will need to have the **PTM Service** open to the **Configure Method** page to load an existing **Profile**.

4.1 Configure the Test Environment with the PTM Service

The **PTM Service** contains all the features and functions you will need from this point forward to configure, run, and analyze **Test Cases**.

- **To access the PTM Service and begin configuration tasks, perform the steps that follow:**

1. If you have not done so already, connect with the **PTM Service** on the **Driver** computer by entering the **Driver** computer IP address in a web browser. This IP address and any other required credentials should have been referred to you on a designated Teams Channel prior to the event.

   The **PTM Service** should automatically display its landing page when you connect, as shown earlier in section 4, Configuring the Test Suite.

2. To begin the configuration process, click the **Run Test Suite** button on the **PTM Service** landing page to open the **Select Test Suite** tab, as shown immediately below.

3. On the **Select Test Suite** page of the **PTM Service**, click the **Select** button to the right of the **FileServer – (4.22.9.0)** label to select the latest version of the **File Server-SMB2 Test Suite**, as shown in the figure that follows.

   The **Test Suite Introduction** page should display, as shown ahead of the figure that follows.

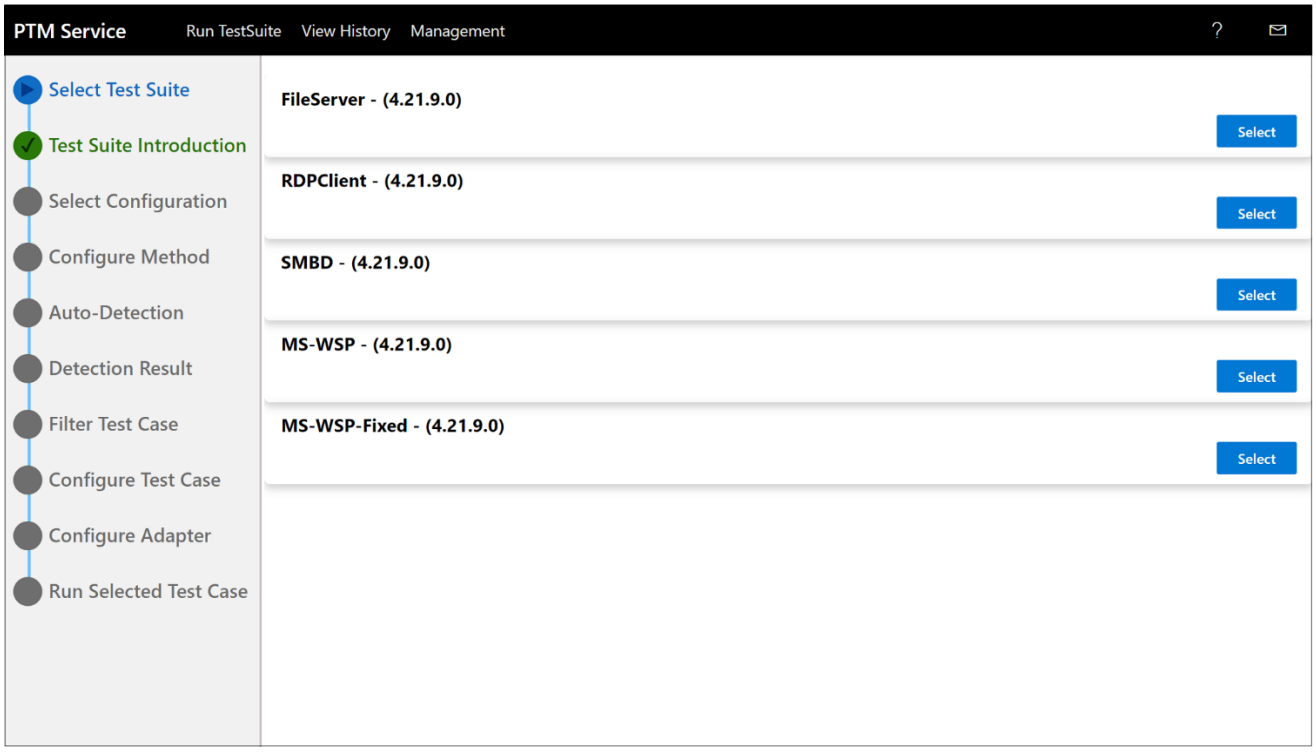

Figure 8. PTM Service : Select Test Suite page

4. From the **Test Suite Introduction** page shown in the figure that follows, familiarize yourself with the family of File Server protocols that comprise the **File Server-SMB2 Test Suite**.

   Note that each of the represented protocols are documented on the Microsoft Technical Documents site. For example, you could review the MS-SMB2 technical specification

Overview or you could read the entire document in great detail if you wanted to, although neither of these are required in order to operate the **File Server-SMB2 Test Suite**. However, a working knowledge of the SMB2 protocol is recommended to fully understand test results.

5. Click the **Deployment Guide** link for optional information about supported test environments, including the **Domain** and **Workgroup** environment.

   The **Workgroup** configuration is a facsimile of the test environment architecture described in section 3.4, that is, with respect to the **Driver** and **SUT** computer environment.

   Note
   In the **Deployment Guide**, performing **SUT** setup is not required, given that the work was already completed by event support personnel ahead of this Tutorial session.

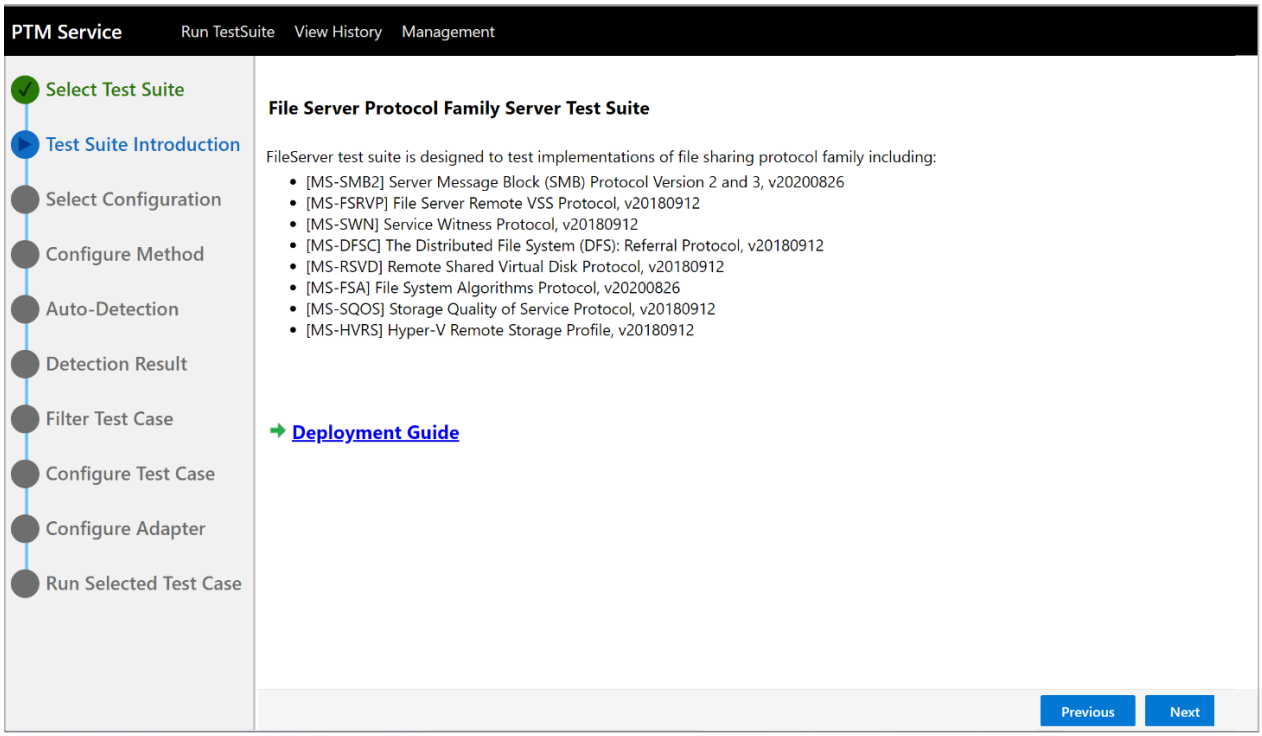

Figure 9. PTM Service: Test Suite Introduction page

Note
The **Workgroup** environment shown in the figure that follows is the recommended environment for the Tutorial session, as it does not require any configuration. It provides a simple network environment for running the Test Cases that is compatible with the **FileServer-SMB2 Test Suite** and the **PTM Service**.

However, outside the Lab session, you are free to use the **Domain** environment if you want, although it is more extensive, complex, and would require you to consult the File Server Protocol Family Test Suite User Guide for setup instructions. Lastly, given that the Lab session environment is primarily focused on users that are new to the Test Suites, it is limited for the sake of simplicity.

For this reason, several of the protocols that are included in the File Server family of protocols shown in the previous figure are not utilized in this Lab session, as only the **MS-SMB2** protocol is used.

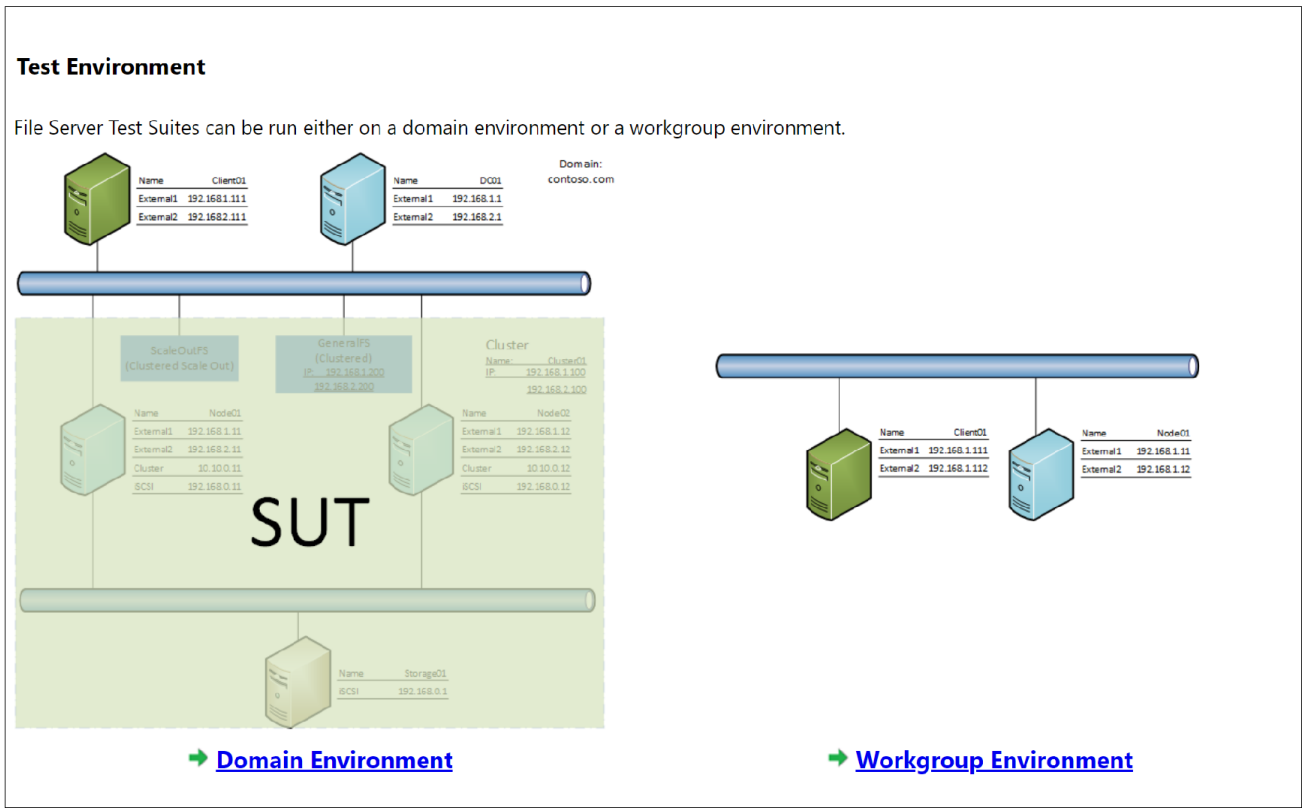

Figure 10. PTM Service: Domain and Workgroup environments

6. When your optional review of **File Server-SMB2 Test Suite** environments is complete, click **Next** to proceed to the **Select Configuration** page, as shown in the figure that follows.

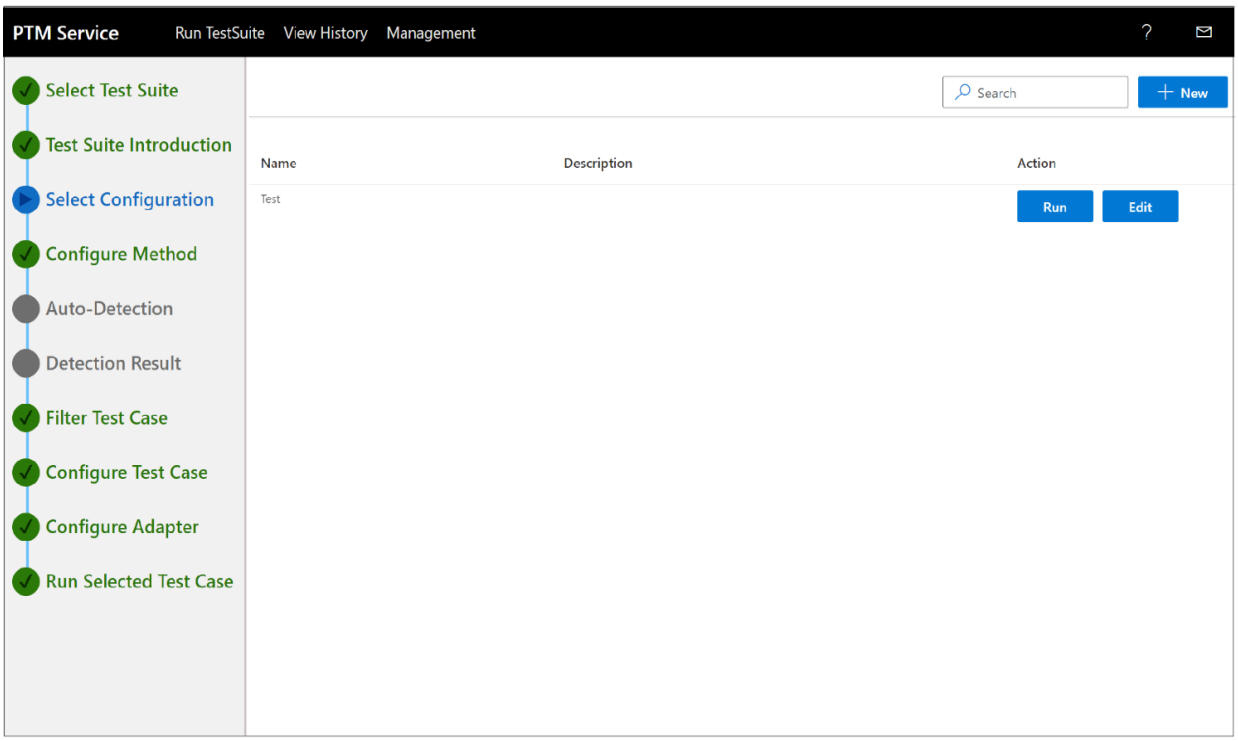

Figure 11. PTM Service : Select Configuration page

7. The **Select Configuration** page of the **PTM Service** enables you to decide how you want to proceed with Test execution. If you already have a named set of Test Cases loaded and configured in the **PTM Service**, for example, from a prior test run; click the **Run** button beneath the **Action** label to restart a previous Test Case execution with no additional configuration required (shown as "**Test**" under the **Name** column in the previous figure).
8. Otherwise, click the **Edit** button to begin Test Suite configuration processes starting with the **Configure Method** task described in section 4.0 and shown in the figure that follows.

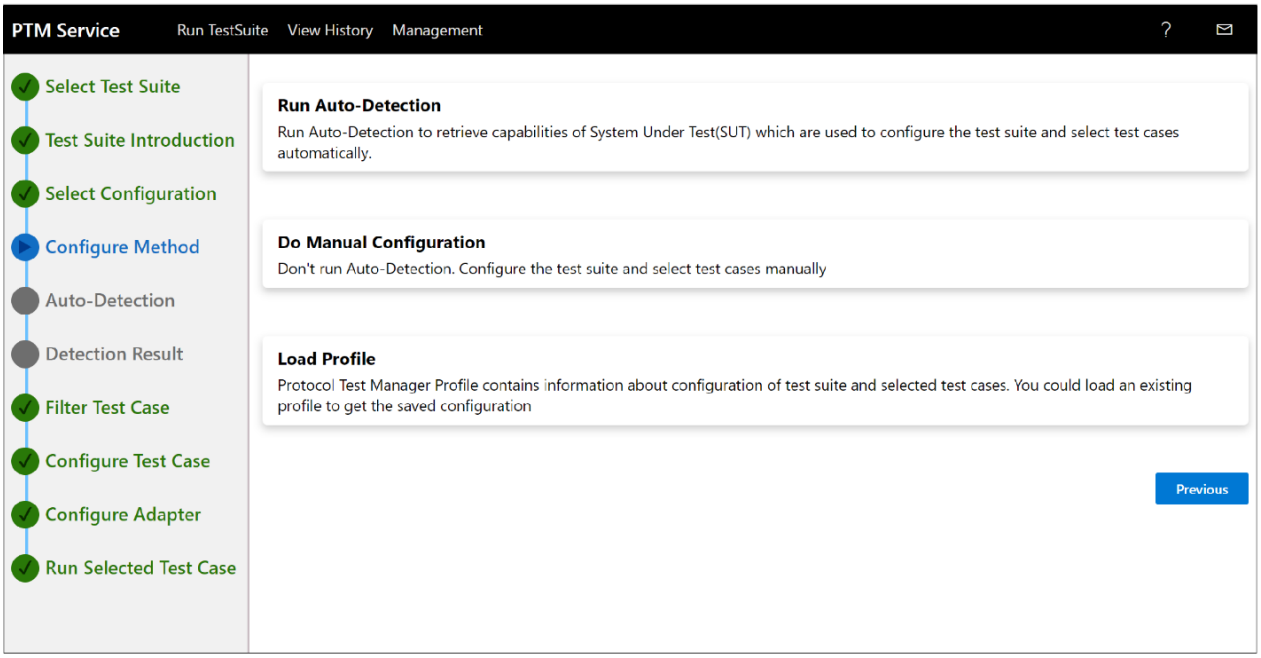

Figure 12. PTM Service : Configure Method page

9. Of the three options presented on the **Configure Method** page, it is recommended that you select (click) the **Run Auto-Detection** method, given that using the **Do Manual Configuration** option is not recommended for new users of the **File Server-SMB2 Test Suite** and you probably have not yet saved a **Profile** of a test execution configuration that you can rerun.

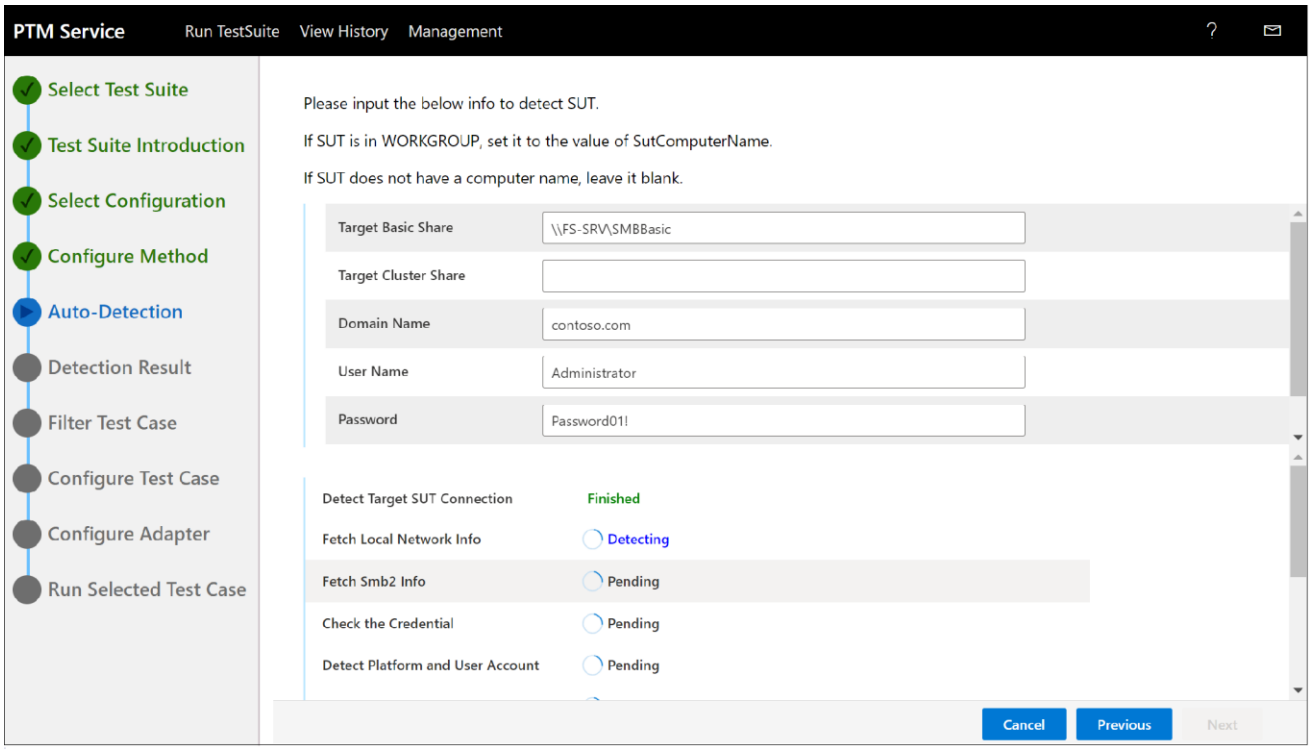

Figure 13. PTM : SUT detection input data

10. Follow the bullet points below to configure the **Test Suite** in accordance with **Auto-Detection** requirements:

    - On the **Auto-Detection** page of the **PTM Service**, ensure that the prerequisite information for auto-detection is correct based on the default values specified in the previous figure, (as loaded from .ptfconfig files on the **Driver computer**), and make any necessary corrections.

      If the information to verify is not specified in the **Target Share**, **Domain Name**, **User Name**, or **Password** text boxes on the **Auto-Detection** page, consult with your Tutorial Instructor. If information is displayed, confirm that the values specified on the **Auto-Detection** page match the Driver computer configuration.

    - If the specified information looks correct, click the **Detect** button on the **Auto-Detection** page.

      Important

      The **PTM Service** on the **Driver** computer must be able to connect to the **SUT** computer to make the necessary assessments during the Auto-Detect process, hence the requirement for correct connection data as specified in the previous table. Other

connection information is indicated in the figure that follows as pending processes are completed (as the result of clicking **Detect**).

- Click the **Yes** button on the **Warning** dialog when it appears.
- After detection has successfully completed, as indicated by the Finished flag next to each item in the lower Auto Detection list, click **Next** to check the **Detection Result**.

  Note

  If any of the Auto-Detection tests fail to confirm as Finished, one or more errors may have occurred that need to be corrected. Please consult with the Tutorial Instructor to proceed.

  Important

  Features that are not supported by the provided SUT test environment, such as Remote Shared Virtual Disk (RSVD), may display the Failure indication whenever an associated information node is expanded on the **Detection Result** page of the **PTM Service**. Features that are supported display the Passed indication .

11. On the **Detection Result** page of the **PTM Service**, as shown in the figure that follows, a summary is provided within information nodes that includes **Capabilities**, **SMB2 Compression Feature**, **SMB2 Encryption Algorithms**, **IoCtl Codes**, **Create Contexts**, and so on, to indicate what is supported by the **SUT** configuration that you queried with **Auto Detect**.

    Review this information to ensure that you have a similar result and consult the Tutorial Instructor if you do not.

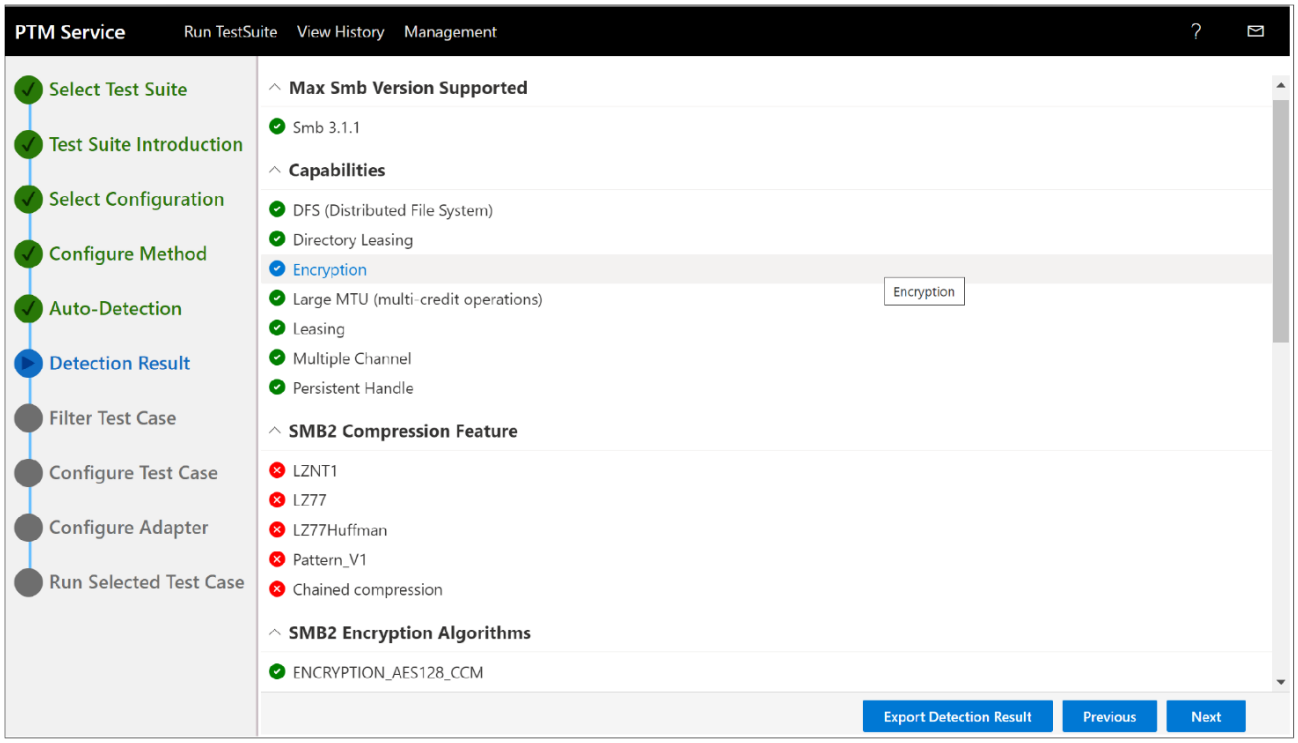

Figure 14. PTM Service : Reviewing Auto Detection results

12. Perform clicks on any top-level node to toggle the results and expose or hide result details, respectively.

    Note
    As you select different feature nodes, note that a feature description appears in the lower sector of the **PTM Service** UI.

13. When your review is complete, click **Next** to display the **Filter Test Cases** page of the **PTM Service**.

    Important
    Based on the outcome of the **Auto Detect** process, the **PTM Service** will initially display the default Test Cases that support the current configuration of the **SUT** test environment on the **Filter Test Case** page, including all supported SMB2 dialects.

    However, note it is likely that you will be modifying the initial Test Case configuration for the Tutorial session environment, as specified by your Instructor. For example, your Instructor may choose to run the Test Cases specified in section 5.2, Create File Demo.

14. In the **Selected test cases** pane on the **Filter Test Case** page of PTM Service shown in the figure that follows, observe the display of Test Cases. Note that if the detection results show that your **SUT** is not supporting Test Cases for a particular feature, that feature name and/or the Test Cases may be rendered in italics.

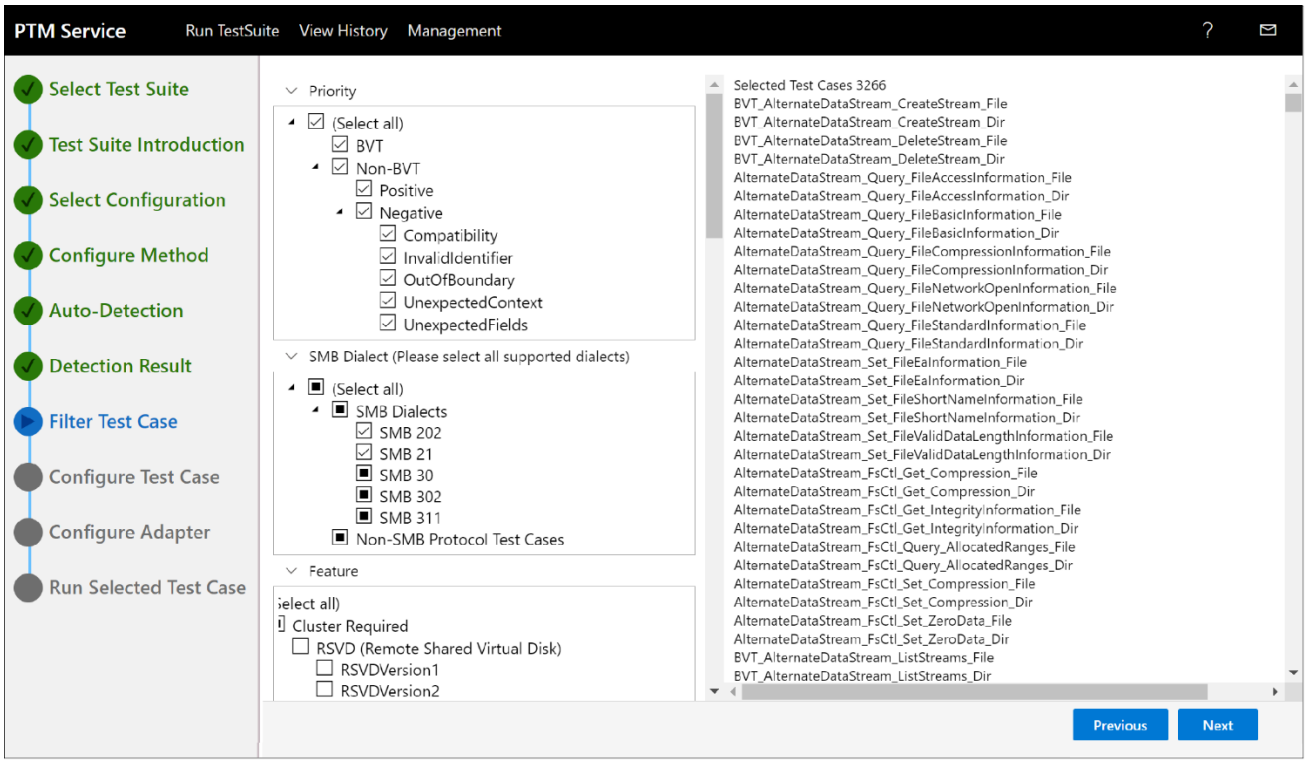

Figure 15. PTM Service: Filtering test cases

More Information

If you want to know more about the functions of specific Test Cases, you can read descriptions in the File Server Protocol Family Test Design Specification.

15. In the **Priority**, **SMB Dialect**, and **Feature** panes on the **Filter Test Case** page, you will manually select or unselect (filter) Test Cases as guided by your Tutorial Instructor. For brevity in this Tutorial session, you will typically configure the **PTM Service** to run the Test Cases associated with all **SMB2 Dialects**, those in the **BVT** category, and a few others.

    You should end up with a specified number of tests when complete, as indicated by the Instructor. This assures that you will be running the recommended Test Cases for this Tutorial in order to focus on a specific test configuration to obtain a specific test result for analysis. For example, your Instructor may have chosen to run the demo described in section 5.2 Create File Demo.

    Click **Next** when complete to display the **Configure Test Cases** page of the **PTM Service**.

    Note

    The 'BVT' test category name is used to infer the most important tests run by **PTM Service**, as these are basic tests that include confirming the SUT environment for test readiness.

16. On the **Configure Test Cases** page of the **PTM Service** shown in the figure that follows, verify the correctness of the default property values that were set for the specified **Groups**, with respect to your detection results. Note that you can edit the values if necessary.

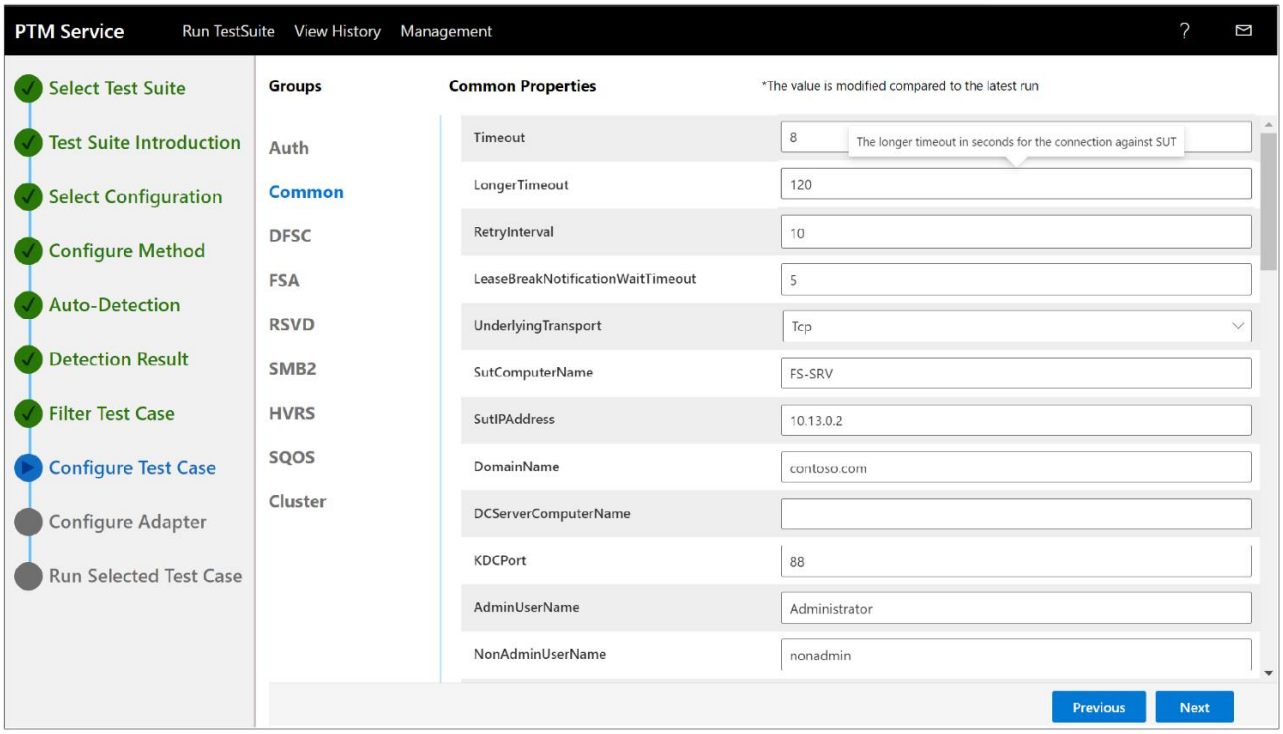

Figure 16. PTM Service : Configure Test Cases page : Common Properties

Advisory

If you edit one or more configuration values, for example in the **Common** group of the **Configure Test Cases page**, and you need to recover them later, you can view the default detected values for your environment in the following configuration file on the **Driver** computer:

```
C:\FileServer-TestSuite-ServerEP\Bin\CommonTestSuite.Deployment.ptfconfig
```

Other configuration files for the **Test Suite** are located in the same directory:

```
C:\FileServer-TestSuite-ServerEP\Bin\
```

For example, if you are having difficulty connecting to the SUT computer, you might want to extend the existing **LongerTimeout** value beyond its default setting. If you decide to reinstate the former default value, you can find it in the previously specified **Deployment.ptfconfig** file.

Advisory

To view the meaning of the items in the **Properties** column on the **Configure Test Cases** page of **Protocol Test Manager Service**, mouse-hover over any property value to display a pop-up containing the information.

When complete, perform the next step at the discretion of the Tutorial Instructor *only*. Otherwise, accept the default settings and click **Next**.

17. On the **Configure Adapter** page of the **PTM Service** and from the **Type** drop-down of the **SUT Protocol control adapter**, use the default setting of **Managed**, as shown in the figure that follows.

    Adapters are applications that help trigger events on the **SUT** that are detected by certain Test Cases. Note that you can ignore the **Common SUT control adapter** and the **Failover SUT control adapter** settings, given that tests for these adapters are not run in this Tutorial session. Also note that if any other changes are necessary, your Tutorial Instructor will specify them.

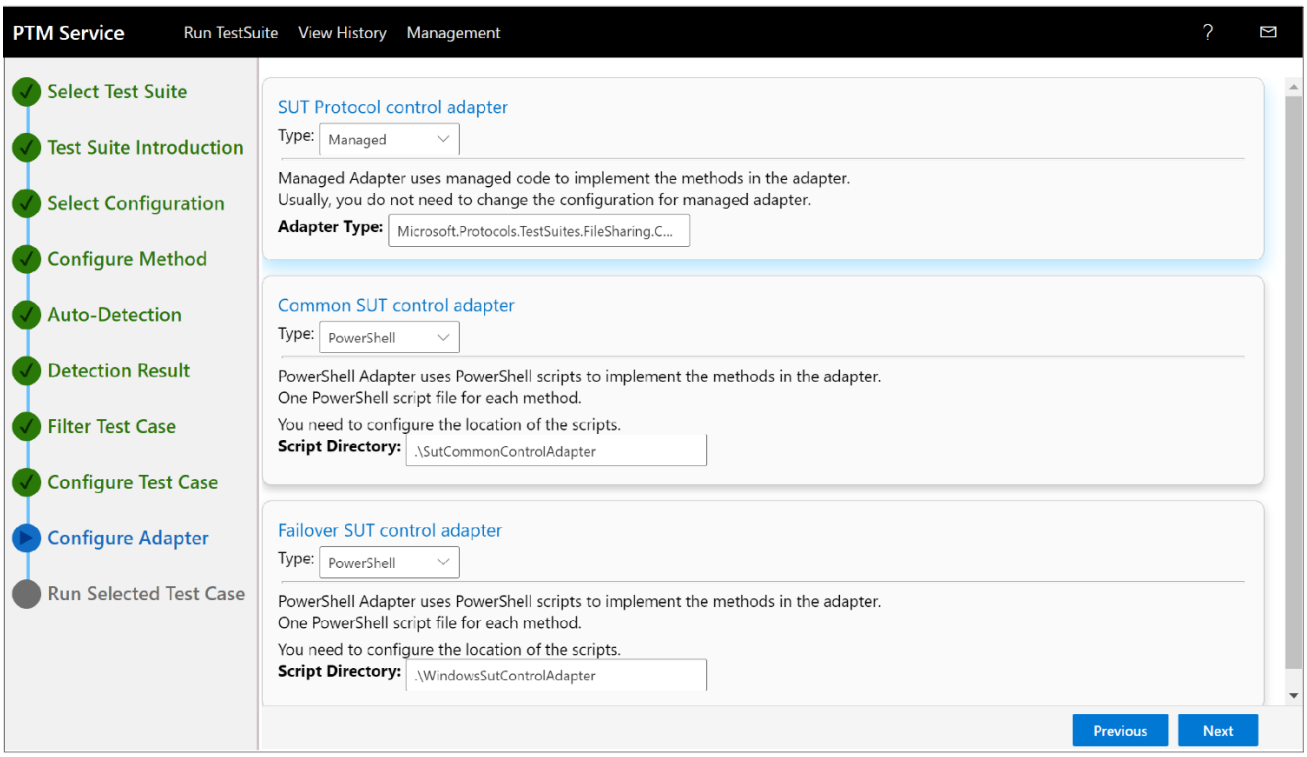

Figure 17. PTM Service: Configuring an SUT control adapter

18. Click **Next** to display the **Run Selected Test Cases** page of the **PTM Service** and proceed to section 5.0 Running the Test Suite Test Cases to run your tests.

Note
You may have performed the procedure in the next section earlier, but only if you had already created a **Profile** in section 5.2 Saving a Profile.

4.2 Configure the Test Environment by Loading a Profile

If you have created one or more **Profiles**, follow the procedure in this section to load a **Profile** with the **Load Profile** option of the **PTM Service**.

▶ To load a PTM Profile

1. Perform these steps:
   a. On the **Configuration Method** tab of the **PTM Service**, click **Load Profile,** as shown in the figure that follows.
   b. Click the open folder icon in the **Load Profile** dialog that displays.
   c. Navigate to and select an existing saved **Profile** via the **Open** dialog that displays.
   d. Click the **Open** button in the **Open** dialog.

Note
Your **Profiles** will be saved in a directory location you chose when performing the procedure in section 5.2 Saving a Profile.

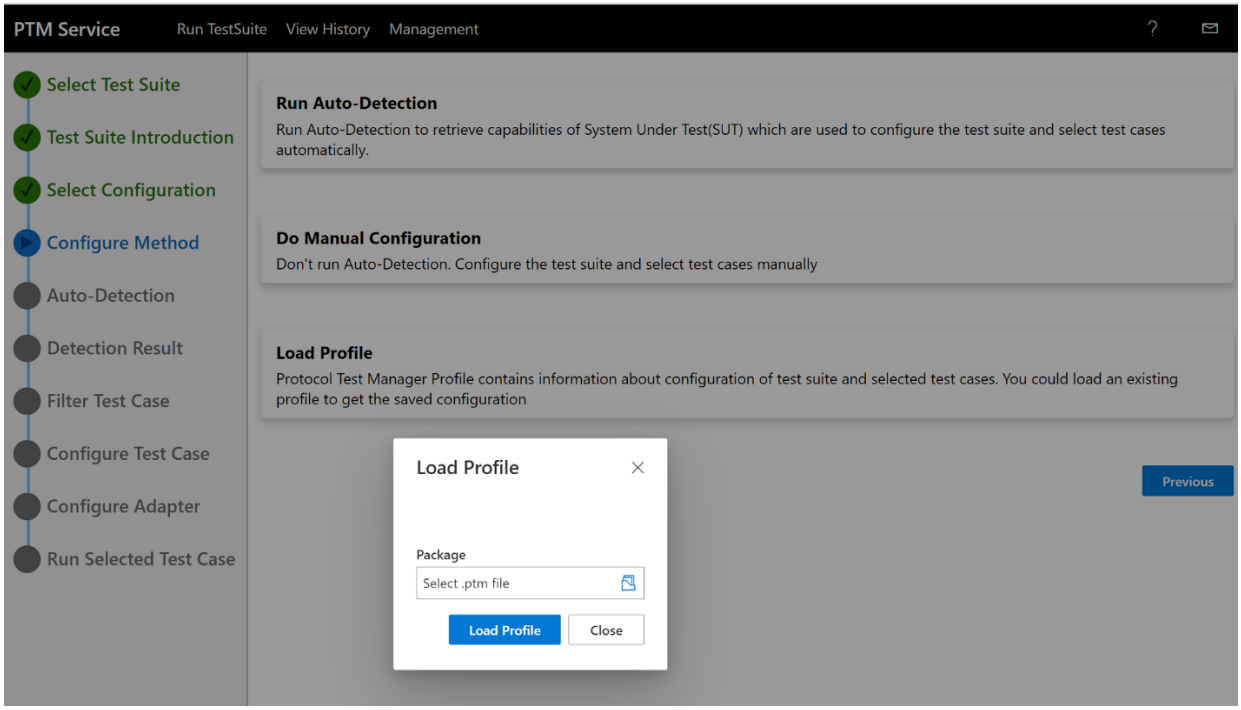

Figure 18. PTM Service : Loading an existing Profile

2. Observe that the **PTM Service** immediately opens to the **Run Selected Test Cases** tab with the unexecuted **Profile** Test Cases displayed, including the expected number of tests indicated.
3. Optionally navigate to the **Filter Test Cases** tab of the **PTM Service** and verify that the Test Cases appear as expected from the **Profile** data that you imported.

   Note that you can still modify your selections by selecting or unselecting Test Cases on the **Filter Test Cases** tab, as necessary.

Important

If you want to preserve such changes, you will need to save them by overwriting the existing **Profile** or by creating a new one.

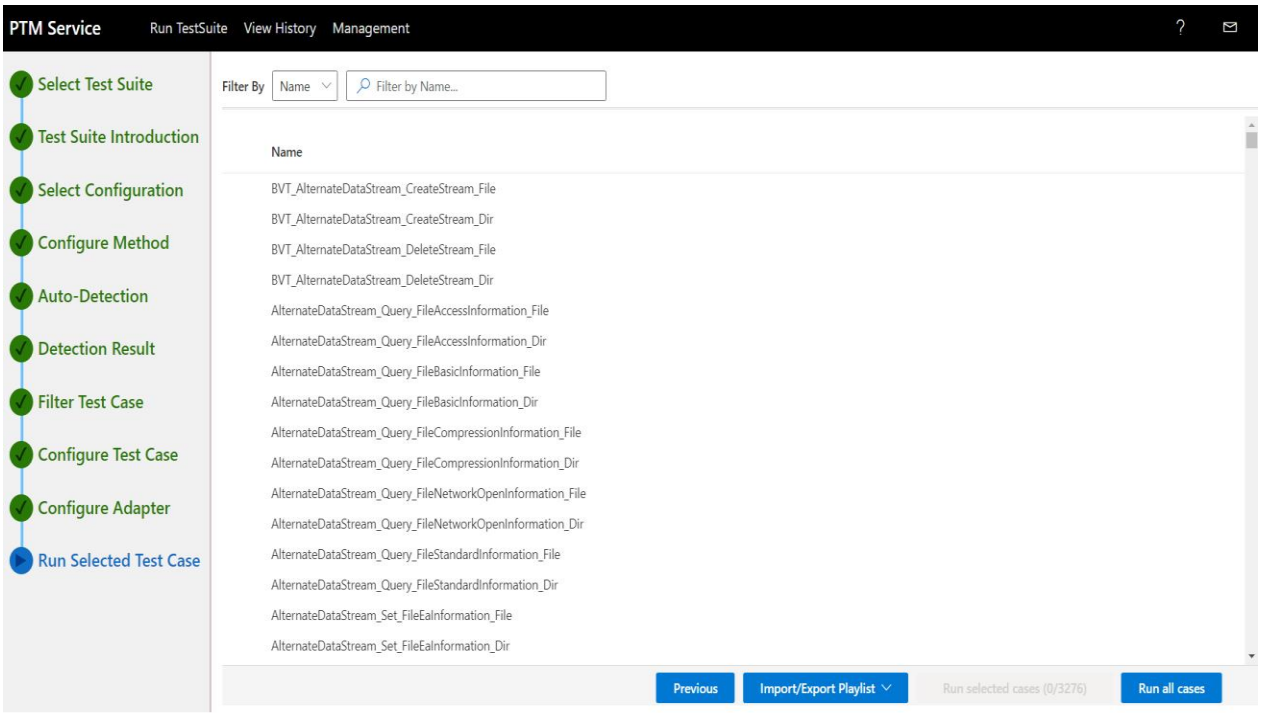

Figure 19. PTM Service: Validating Profile test cases prior to execution

4. At your discretion, return to the **Run Selected Test Cases** tab and click **Run all cases** to execute the **Profile** Test Cases.

   Whether or not you actually *select* the **Profile** Test Cases, all will execute when you click **Run all cases**. If you do *select* some **Profile** Test Cases, only the selected Test Cases of the **Profile** will run after you click **Run selected cases**.

5.0 Running the Test Suite Test Cases

The following options are available for running Test Cases from the **Run Selected Test Cases** page of **PTM Service**. For this Tutorial, you will use the latter method of running selected test cases, as specified in the second bullet point below:

Important
DO NOT execute Test Cases now. Only execute from "To run the Test Cases" procedure ahead.

- **Run all cases** — click this link to run all Test Cases.

  If you select this option, all Test Cases that exist under the **Name** column on the **Run Selected Test Cases** page of the **PTM Service** will be executed, whether or not you actually designated the Test Cases as *selected* with a checkmark.

  These Test Cases are the ones that you selected/filtered earlier on the **Filter Test Cases** page of the **PTM Service** and therefore appear on the **Run Selected Test Cases** page; or they are the Test Cases of an existing **Profile**, the contents of which you will have loaded into the **PTM Service**.

Advisory
When you use the **Run all cases** option, it *does not* necessarily mean you will be executing *all* the default Test Cases returned from auto-detection of the SUT configuration, as only if you never modified this default set of Test Cases on the **Filter Test Cases** page does it mean that.

- **Run selected cases** — click this link to run the selected Test Cases.

  If you select this option, only the Test Cases that are *currently selected* will be executed. You can *select* Test Cases to be run by clicking the radio button to the left of each Test Case, which places a checkmark next to the Test Case name. Any Test Case that is marked as such will be executed when you click **Run selected cases**, as shown in the figure that follows.

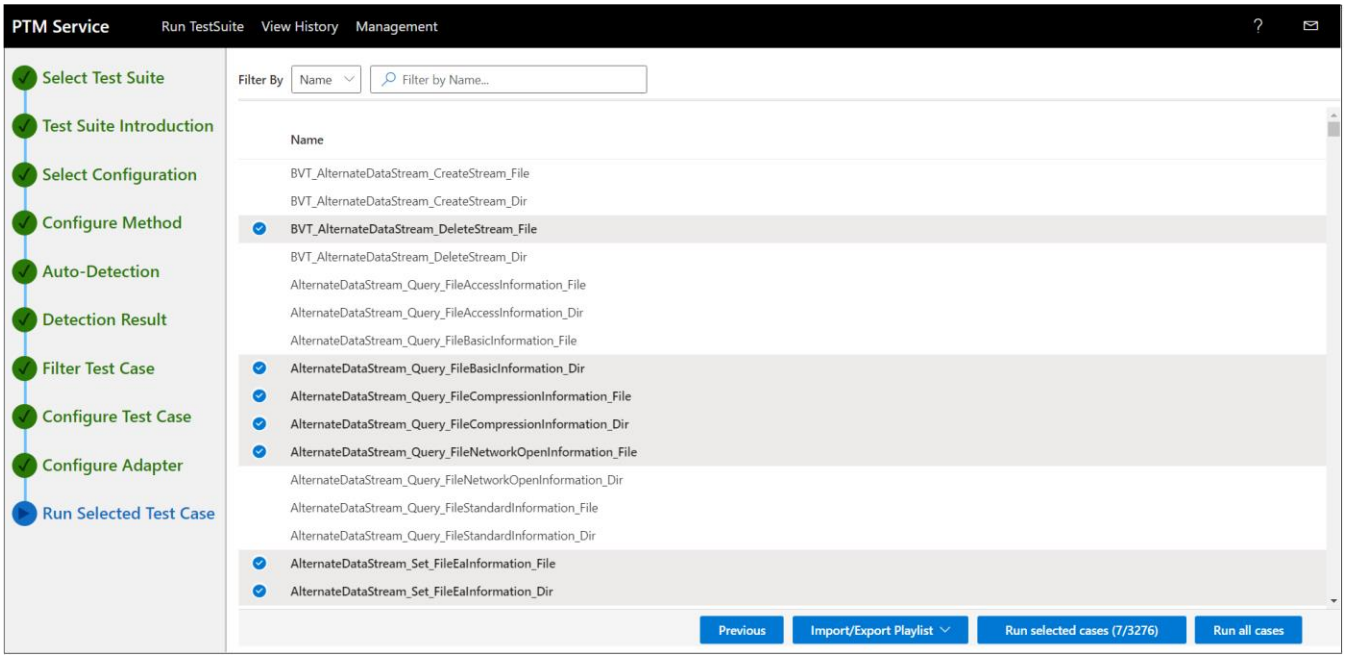

Figure 20. PTM Service : Selecting Test Cases to execute

Test Case Execution Status Rankings

As the tests are running, you can view high-level results in the following three categories. As test case execution progresses, you can observe these categories being incrementally updated on the **View Result** page of the PTM Service, as shown in the figure that follows.

- **Passed** — provides a dynamic indication of how many tests have passed, out of the total number selected for execution.
- **Failed** — provides a dynamic indication of how many tests have failed, out of the total number selected for execution.
- **Inconclusive** — indicates the tests that were inappropriate, unsupported, or the result of misconfiguration in the test environment.

  For example, if a property set in the CommonTestSuite.Deployment.ptfconfig file is incorrectly configured, or a Test Case conflicts with an unexpected or invalid property value, that Test Case can finish as **Inconclusive**.

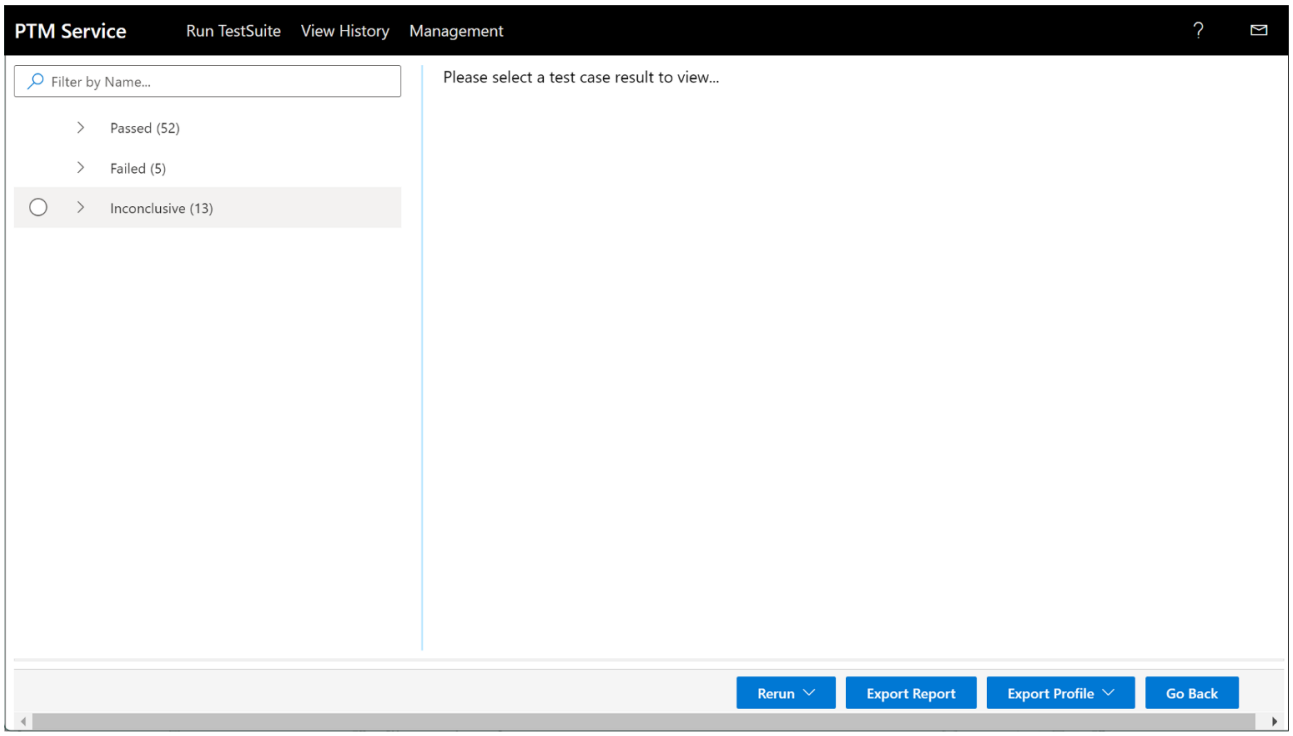

Figure 21. PTM Service : High-level Status Results Categories

Test Case Details

After Test Case execution is complete, you can view the tests in each Status category, by clicking the drop-down arrow next to each set of Status results in the left-hand pane of the **PTM Service** UI, as shown in the previous figure.

Thereafter, you can click a particular Test Case in the left-hand pane in a selected Status category to review information tags, test steps, and other indicators that provide the details that expose the processes that resulted in a **Passed**, **Failed**, or **Inconclusive** status indication for the Test Case you selected; those results display in the right-hand sector of the UI.

More Information

To learn more about analyzing test results, see section 6, Analyzing the Test Results Data in this document.

Import/Export Playlist

On the **Run Selected Test Cases** page of the **PTM Service**, you have access to the **Import/Export Playlist** feature that allows you to save a set of Test Cases that you can retrieve at any time for test purposes. For example, if you want to retain a unique set of Test Cases that you want to return to for additional testing later on, you can use this feature to do so. Note that when you save a playlist with the **Import/Export Playlist** feature, it does not save Test Case *configuration data* such as a **Profile** does. The **Import/Export Playlist** feature is shown in the figure that follows.

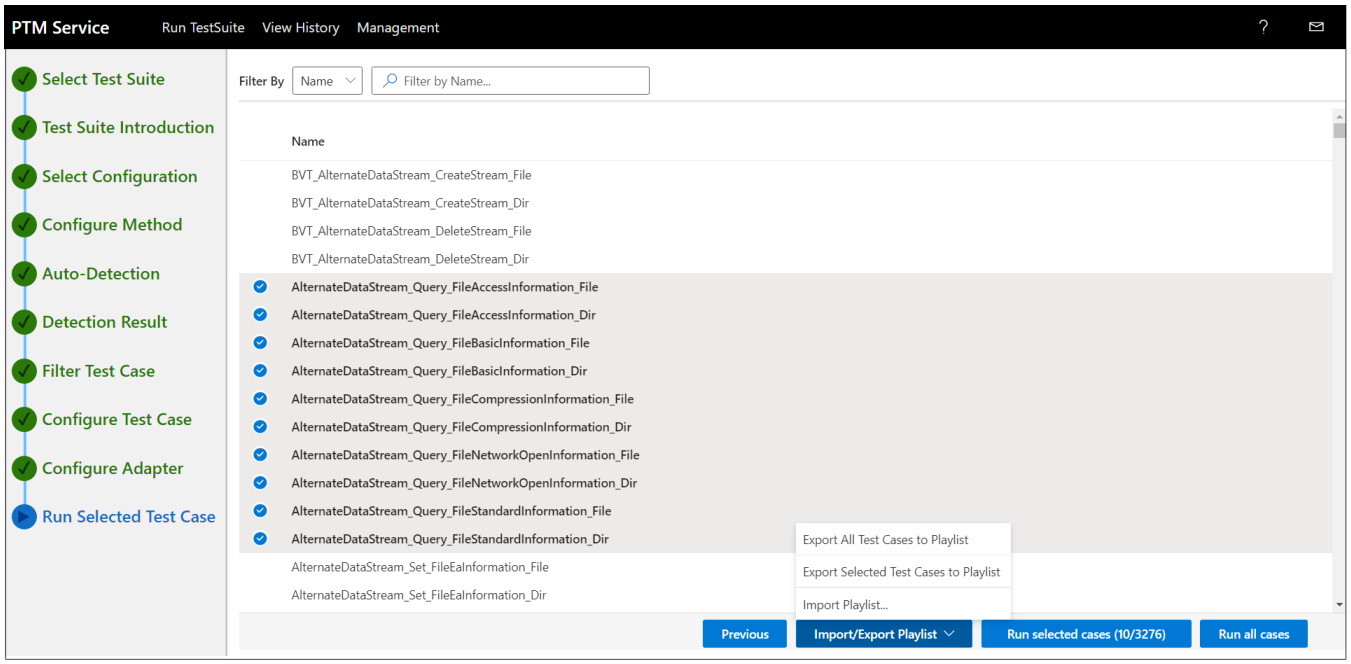

Figure 22. PTMService : Import/Export Playlist feature

From the **Import/Export Playlist** drop-down button, you can select one of the following three options:

- **Export all Test Cases** — enables you to export all Test Cases on the **Run Selected Test Cases** page of the **PTM Service**.
- **Export Selected Test Cases** — enables you to export selected Test Cases only on the **Run Selected Test Cases** page of the **PTM Service.**
- **Import Playlist** — enables you to import all Test Cases saved in either of the two former playlists.

Exporting a Profile for Test Result Comparisons

Note that you can save a **Profile** (section 5.1) from the **View Result** page of the **PTM Service**, by selecting one of the following options from the **Export Profile** drop-down button:

- **Export all Test Cases to Profile** — select if you want to maintain an executable record of a particular test configuration that serves as a baseline for comparing test results following feature fixes, code modifications, updates to Test Case properties, or changes in the **SUT computer** environment.
- **Export Selected Test Cases to Profile** — identical to above but with a narrowed test focus.

5.1 Running the Test Cases

Perform the procedure that follows to run the Test Cases.

▶ **To run the Test Cases:**

1. From the **Run Selected Test Cases** page of the **PTM Service**, you can do either of the following at any one time:

- **Run all cases** — select this option if you want to run all Test Cases currently displayed on the **Run Selected Test Cases** page.

  You might do a first run to get a general sense of what the Status is across the current set of Test Cases before you begin isolating specific test areas you want to focus on. For example, if you are getting a lot of failures; potentially with core file operation Test Cases, it can call your attention to more urgent issues that you may need to address first.

- **Run selected cases** — select this option if you want to run only the Test Cases that you have flagged with a check mark, as described earlier.

  This enables you to create a specific configuration of Test Cases that target a particular function or feature you want to isolate for testing and remediation. Then, you could choose **Run all cases** again to see if you made improvements in failure Status.

In practice, you could name two test configurations (or just use their configuration **IDs** on the **View History** page) and run one against all Test Cases as a status run and the other against selected Test Cases for a focus run. After you remediate any issues, you can run each of these again by clicking the **Re-Run** button for each test configuration on the **View History** page, as accessible from the **PTM Service** ribbon. You can do this as many times as necessary while you monitor improvements or regressions.

2. If you have *selected* Test Cases on the **Run Selected Test Cases** page of the **PTM Service**, as designated by checkmarks, click the **Run selected cases** button for test execution, as represented in the figure that follows. Only the selected subset of Test Cases will execute.

   Note

   If you have *selected* Test Cases on the **Run Selected Test Cases** page and you click **Run all cases**, then all Test Cases present will execute regardless of any checkmark designations. However, if you have no checkmark designations on any Test Cases, only the **Run all cases** option will be available for test execution.

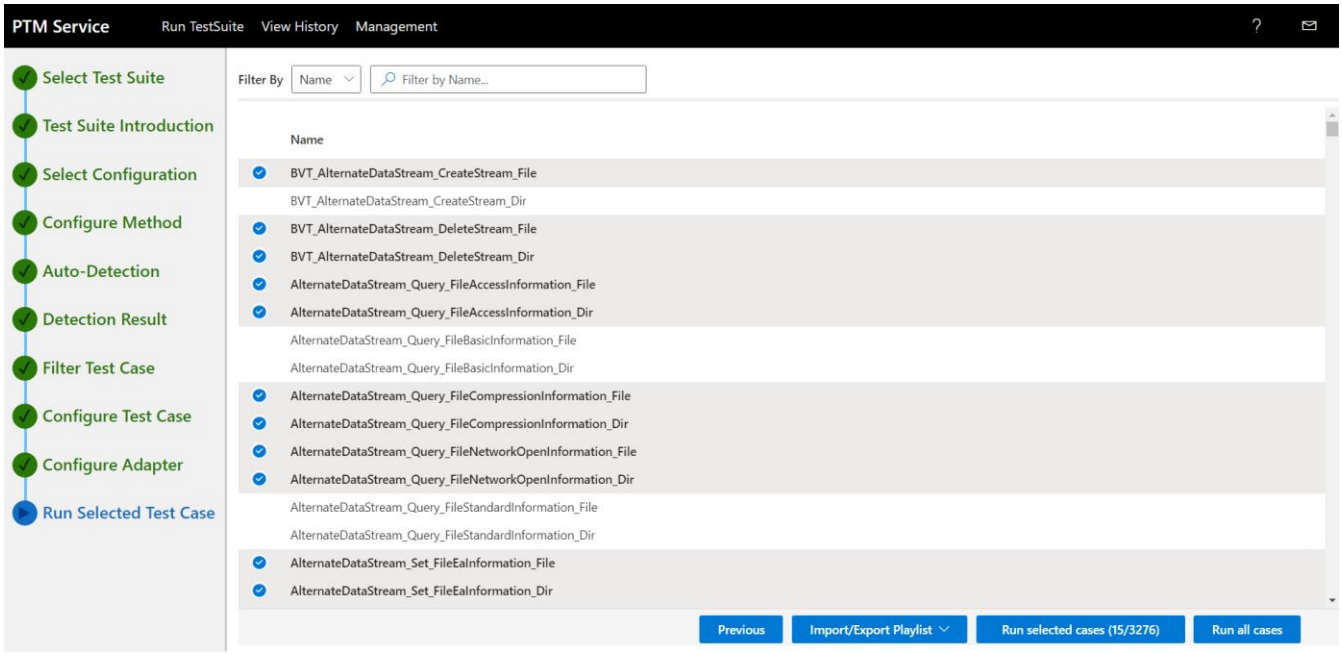

Figure 23. PTM Service : Executing selected Test Cases

3. While your Test Cases are running as shown under **Status** on the test execution **View History** page that follows, locate the **View Result** button on the right-hand sector of this page and click it to display the **View Results** page to review status and other execution details.

   Note that you can also access the **View Result** page from the **PTM Service** landing page.

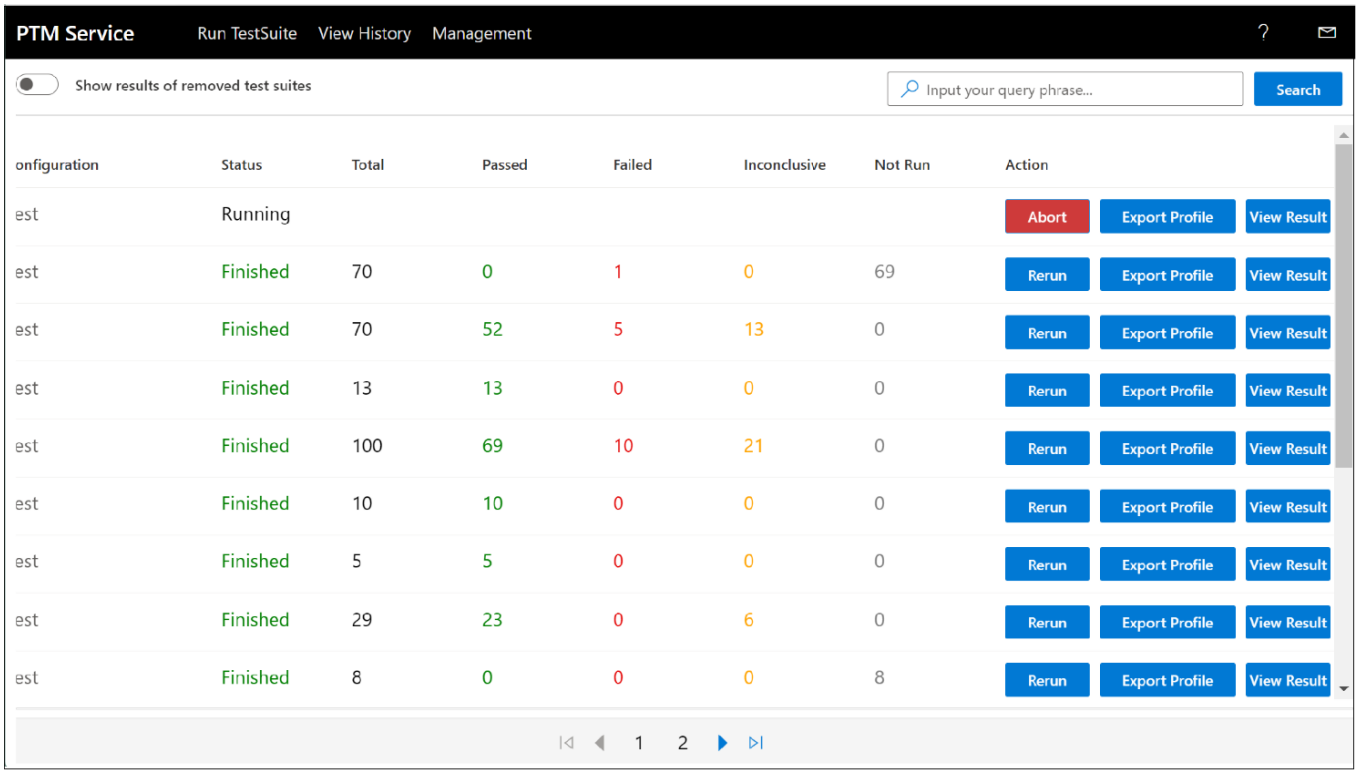

Figure 24. PTM Service: Test execution History view

4. As Test Cases execute, observe the incremental indications that appear in the **Passed**, **Failed**, and **Inconclusive** drop-down Status categories as the number of tests in each category are enumerated, as shown in parentheses on the **View Results** page that follows.

5. In the **Failure** Status category, select a Test Case in the left-hand pane of the **View Results** page of the **PTM Service**, as indicated in the example of the following figure. If you don't see the failure that occurred right away, as highlighted in **red**, you may need to scroll down until you do.

Advisory

The importance of a failure is often discovered in the steps that lead up to the failure. That is why the **PTM Service** provides information tags that can expose key values, conditions, test steps, check points, and comments that can help point the way in your troubleshooting process.
The meaning of the information tags are discussed further in section 6.1 Test Results Output Status Indicators, however a few information tags are listed here as an example:

- **[TestInProgress]**
- **[Comment]**
- **[Debug]**
- **[CheckPoint]**

Note that the **PTM Service** UI makes your test results more accessible, comprehensible, and consistent through categorization, summaries, and status indicators.

More Information
To learn more about analyzing the results of Test Case execution, where the details of each Test Case starts with a description of what it actually tested, see section 6.0 Analyzing the Test Results.
To learn more about Test Cases and how tests are performed, review their descriptions in the File Server Protocol Family Test Design Specification.

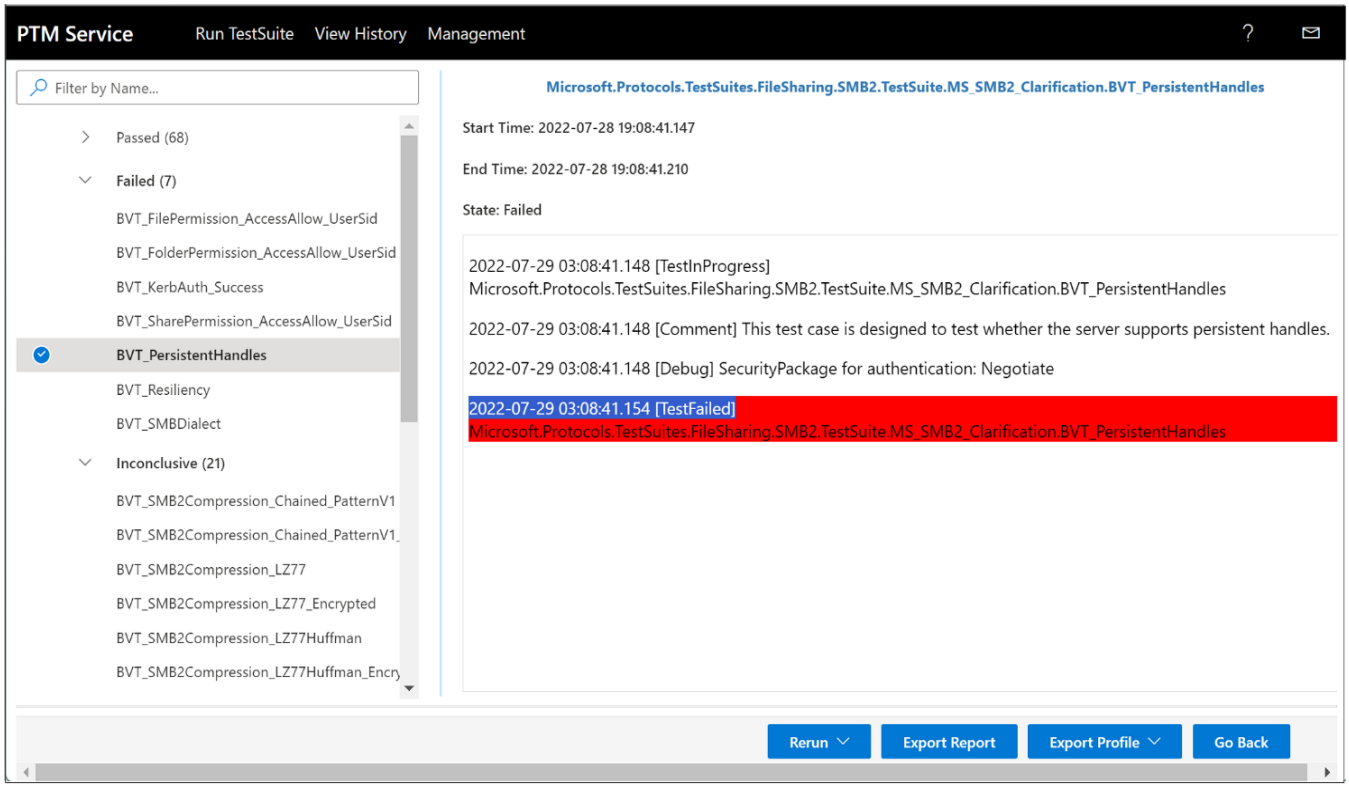

Figure 25. PTM Service : View Results page

5.2 Create File Demo

In this section you will run a Test Case for creating a file. You can begin by performing the procedure that follows:

- **Create the Test Case configuration for creating a file**

1. From the **Filter Test Cases** page of the **PTM Service**, perform these steps:
   - Click **Select All** to unselect all **Test Cases**.
   - Select the **Non-BVT** node and then select the **Positive** subnode.
   - Under **SMB dialects**, select the **Non-SMB protocol Test Cases** node.
   - Under the top-level **Others** node, scroll down to the **FSA** node and then select the **CreateFile** test case.
2. When complete, you should see a set of 30 Test Cases in the right-hand pane of the **Filter Test Cases** page of the **PTM Service**, as shown in the figure that follows.

3. At this point, you should await further guidance from the Tutorial Instructor.

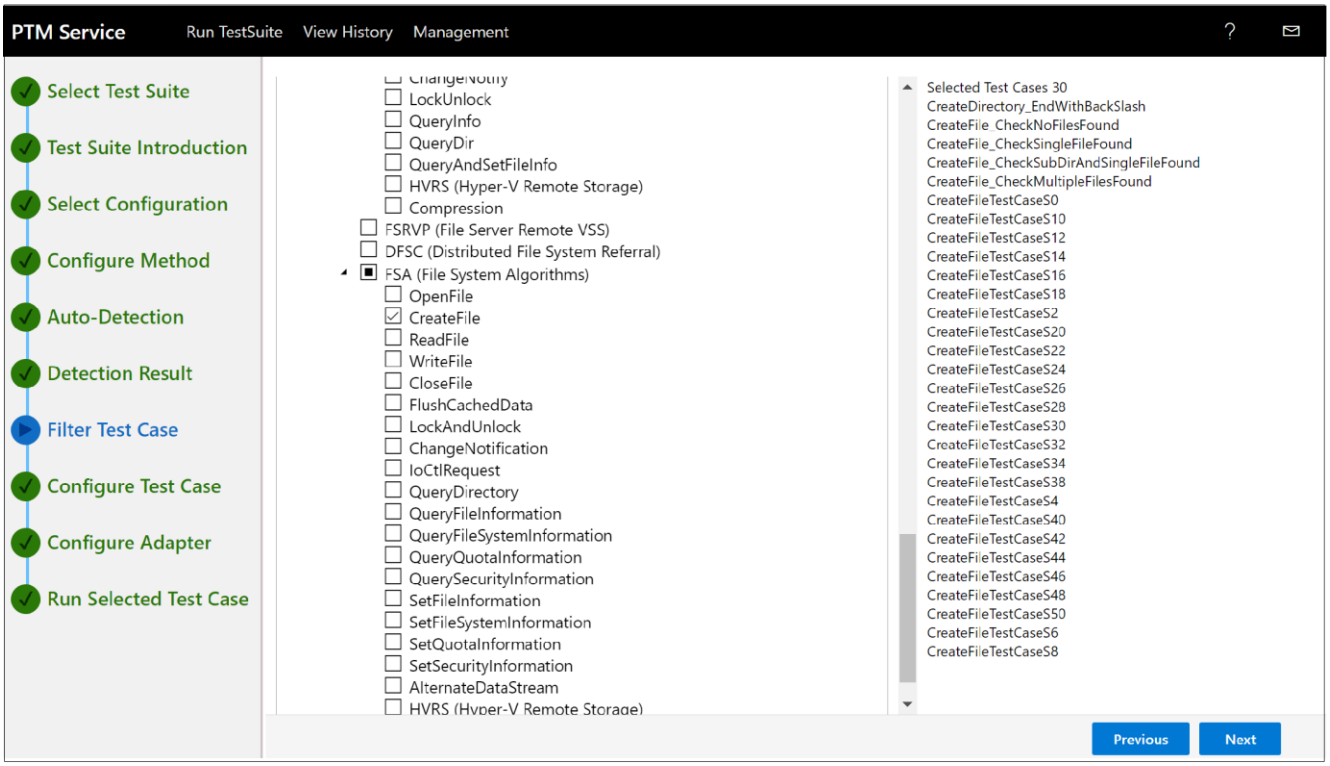

Figure 26. Create file demo

5.3 Saving a Profile

After you complete a test run in section 5.0 Running the Test Suite Test Cases, based on a particular Test Case configuration, you have the option to use the **PTM Service** to save the configuration as a **Profile** that you can re-run on demand simply by locating the **Profile** in a specified directory, loading it into the **PTM Service**, and then executing it.

Thereafter, you can analyze the data in the same way you would normally do during any analysis session that you started based on the **Auto-Detect** mode, as described in section 4.1 Configure the Test Environment with the PTM Service.

In order to utilize a **Profile** in the stated manner, it is recommended that you run the Test Suite at least once and save a **Profile** that extracts the test cases you selected along with related configuration information.

However, in real world scenarios, note that you can optionally save a **Profile** before executing your Test Case configuration. However, in this case, you will not have the advantage of knowing how well the Test Case configuration performed and whether you really want to save it — for example, as a test results baseline for a certain set of features you plan to re-test for comparison purposes.

After you save a **Profile**, you can then use it in subsequent re-runs of the profiled test environment where you specify use of the **Load Profile** option in the **PTM Service**.

Save a **Profile** as follows.

- **To save a Profile that encapsulates the current Test Case configuration**

1. In the lower-right sector of the **View Result** page of the **PTM Service** shown in the figure that follows, click the **Export Profile** drop-down button to display the following following command selections:
   - **Export all Test Cases to Profile** — select if you want to generate an executable record of a particular test configuration based on the current test run, that reflects a specific environment of interest you want to preserve for test purposes.
     You might do this to facilitate a record of test performance that creates a baseline for future test result comparisons.
   - **Export Selected Test Cases to Profile** — identical as above but with a narrowed test focus of selected Test Cases.

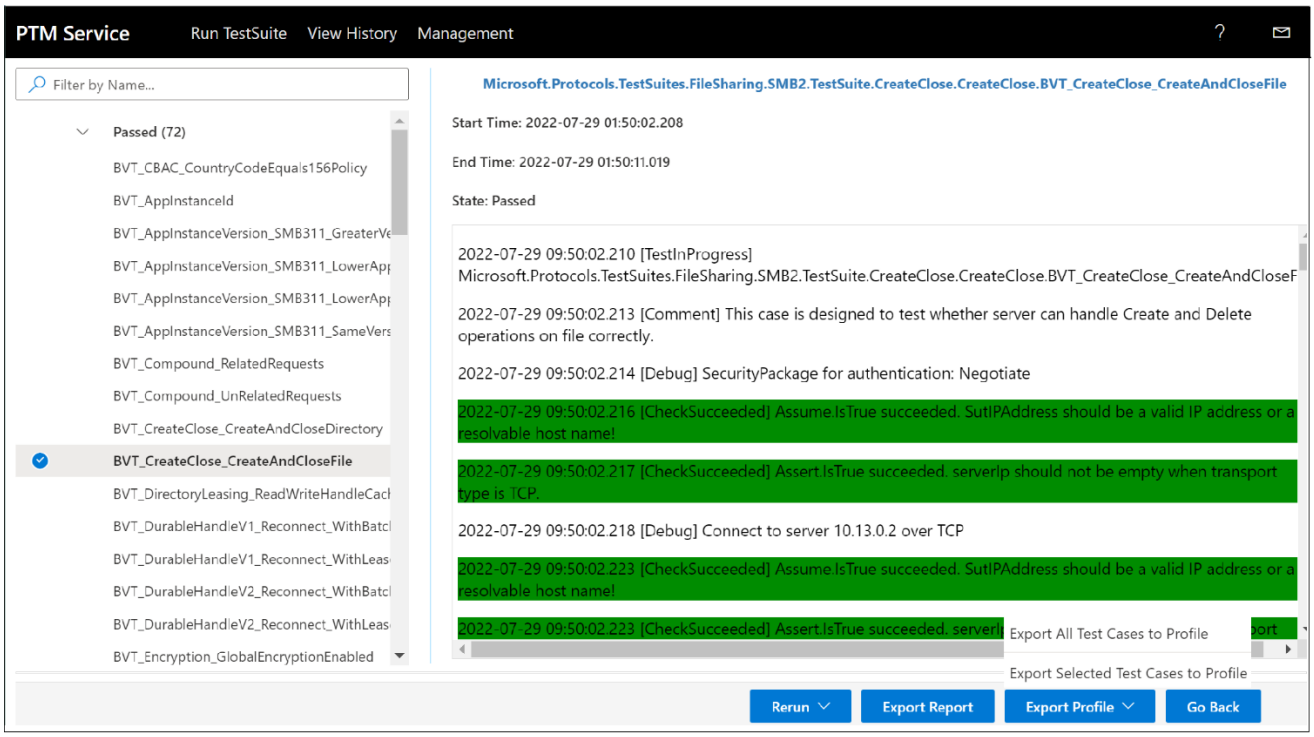

Figure 27. PTM Service : Saving a Test Cases Profile

This action should post the **Profile** to a **Downloads** dialog that is invoked by the **PTM Service**.

2. Open the **Downloads** folder in your file system for access to the file.
3. If you want to create a separate directory location for all your saved **Profiles**, navigate to a chosen directory location for the **Profile** via a **Save** dialog, specify an appropriate **Profile** name, click **Save**, and then close the open **Save** dialog.

5.4 Executing Test Cases From the Command Line

The **PTM Command line interface (PTMCLI)** application enables you execute the Test Case configuration of a previously saved **Profile** (section 5.2) with the use of a simple command string. This means you can initiate execution of a set of Test Cases from outside the **PTM Service** UI test environment and potentially from a remote location.

The application that enables you to do this is known as PTMCli.exe. This file resides in the following directory path on the **Driver** computer:

```
C:\PTMCli\PtmCli.exe
```

To execute the Test Cases of a **Profile** by using a command string, perform the procedure below:

Important

You *should not* run the PtmCli.exe application while the **PTM Service** is running or an error will occur.

To load a Profile from the command line

1. From the **Start** menu on the **Driver computer**, type "Cmd" and then double-click the **Command Prompt** icon. You can also run the command shell with the elevated privilege of an Administrator.
2. From the command line, navigate to the following directory location on the **Driver computer**:

   ```
   C:\PTMCli\
   ```

   The command string to start the PTMCli executable uses the following format, where -p and -t switch variables require specific values that you must supply, as follows::

   ```
   PTMCli.exe -p <profilepath> -s -t <testsuitepath>
   ```

   Other switches and values for the preceding command string are specified in the table that follows.

   Table 2. PTMCli command line switches and values

Switch	Switch Value	Description
-p	Represents profile execution	Requires a directory path to a saved Profile.
-s	Represents Test Case execution	Optional – if used, only selected Profile Cases execute; if not used, all Profile Cases execute.
-t	Represents hosting Test Suite	Requires a directory path to File Server Test Suite.
-r	Represents a test execution report	Optional – if used, generates a Report to specified path; if not used, output is stdout.

   For example, to execute PTMCli.exe from the **Driver** computer, enter the command:

   .\PTMCli.exe -p C:\PTMCli\<*TestCaseProfile.ptm*> -s -t *C:\FileServer-TestSuite-ServerEP*

3. Press the **Enter** key on your keyboard and confirm that the Test Case execution results begin to appear in the command console.

   Note

   For additional information about functionality that is available with the PTMCli tool, use the -help switch to display it:

   ```
   PTMCli.exe -help
   ```

   You can also find additional help on PTMCli.exe and related topics here on GitHub.

6.0 Analyzing the Test Results Data

After Test Case execution is complete, you can view the details of the execution results. The results that are likely to be of the most interest are the Test Cases that failed. Secondly, the Test Cases that finished as inconclusive can also be of interest, as these might suggest misconfigurations, such as invalid Test Case properties or settings. The **PTM Service** provides a number of tools that can quickly point you to what the causes of such failures and misconfigurations might be.

The **PTM Service** enables you to utilize various status indicators, color codings, , information tags, and results filtering that can help you expose the cause of failures.

In addition, you should consider that specifying chosen Test Cases on the **Filter Test Cases** page of the **PTM Service** is a troubleshooting tool that you can utilize. This technique helps you to target specific areas you want to isolate to generate a more focused test results context. For example, you might focus on certain SMB2 operations that you suspect could be problematic or even specific SMB dialects for which you want to expose test results.

Note

Outside the space of this Tutorial and associated Lab environment, developers who are using a Microsoft Test Suite to test a real-world protocol implementation can similarly utilize the **PTM Service** analysis features to verify the outcome of custom Test Case execution as **Passed**, **Failed**, or **Inconclusive**. Each of these indications can be of equal importance when it comes to resolving issues that are critical to a successfully functioning protocol.

6.1 Test Results Output and Status Indicators

Some of the status indicators that you will encounter as you review your test results are described in the table that follows:

Table 3. Test results status indicators

Status Indicator	Description	UI Location
Initial **Test Results Status** summary	Results display as the number of Test Cases that passed, failed, or were inconclusive.	The initial Test Case results display configuration is shown as expandable **Passed**, **Failed**, and **Inconclusive** results category drop-down lists in the left-hand sector of the **View Results** page of the **PTM Service**.
Detailed Results	Appears as the default Test Case output configuration on the **View Results** page of the **PTM Service**.	The results of a Test Case appear in the right-hand sector of the **View Results** page of the **PTM Service**, that is, when the Case is selected in the left-hand sector of the same page. For example, the result details typically begin with a **[TestInProgress]** information tag followed by a **[Comment]** tag that describes the general purpose of the Test Case. It then exposes the sequence in which **[TestSteps]** executed, which can be interleaved with one or more **[Debug]**

		tags for each **[TestStep]**, which reflects invoked methods, process data, or status resulting from the step. Also, checks are made along the way which result in either a **[CheckSucceeded]** or **[CheckFailed]** outcome. The final result of the Test Case could be a **[TestPassed]**, **[TestFailed]** or **[TestInconclusive]** indication.
Start Time and **End Time**	Exposes the overall duration of Test Case execution.	Appears in the upper left-hand sector of the Test details pane of the **View Results** page for each selected Test Case in every results category.
Filtered Test Case contexts	Consists of the results for specifically chosen Test Cases either from Test Case configuration on the **Filter Test Cases** page of the **PTM Service** UI, or from Test Case filtering on the **View Results** page of the **PTM Service** where the **Passed**, **Failed**, or **Inconclusive** results categories are filtered by keyword searches that expose only test results that are associated with the chosen keyword.	You will need to generate these results display configurations via the following: • Filtering based on selection of Test Cases that return a specific set of Test Case results to target a particular SMB operation, process, dialect, or other function. For example, you can review Test Case functions, as cited immediately below, and choose to target the Cases that are likely to return your data of interest. **To learn more** about Test Case functions, see File Server Protocol Family Test Design Specification or read the opening **[Comment]** tag in the Test Case output on the **View Results** page of the **PTM Service**. • Filtering based on common process or SMB operation names serving as search terms that can identify related Test Cases to target. For example, take a look at some of the **SMB 2&3** subnodes on the **Filter Test Cases** page of the **PTM Service** UI for methods, categories, and functions you can use as a search filter, such as **Negotiate**, **Credit**, **Replay**, **Signing**, or **Encryption**. The results appear automatically after the filtering is applied.
Status Category results	Target the Test Cases of **Failed** and **Inconclusive** status.	Review these Test Cases in detail to determine where failures or inconclusive results may have occurred. Use the **Help** and **Contact Us** features on the ribbon of the **PTM Service** for assistance if necessary.

		It is recommended that you step through all the steps and processes that led up to the failure or inconclusive result for clues as to the cause of the result in question.
Debug output data	Informative data that is labeled with tags, for identifying the processes, methods, or status that results from the incremental execution of test steps.	Includes data that displays in information tags, with some being color-coded to emphasize a certain outcome, as follows: ▪ **[TestInProgress]** ▪ **[Comment]** ▪ **[Debug]** ▪ **[CheckFailed]** ▪ **[CheckInconclusive]** ▪ **[CheckPoint]** ▪ **[CheckSucceeded]** ▪ **[TestFailed]** ▪ **[TestPassed]** ▪ **[TestStep]** ▪ **[TestInconclusive]** For example, when scrolling through Test Case result details, be sure to view the information specified by the **[CheckFailed]**, **[Debug]**, and **[CheckInconclusive]** information tags. The content of an information tag may indicate that certain operating systems do not support a feature being tested. Moreover, you might notice a pattern of common responses that are exposed by similar actions stated in multiple **[Debug]** tags, such as connecting to the **SUT computer** over TCP from the **Driver computer**. Also keep in mind that minor faults and failures may be a precursor to a forthcoming more consequential failure.
Feature Detection status	▪  — indicates an **SUT** feature is supported.  — indicates an **SUT** feature is not supported or not detected.	Appear on the **Detection Result** page of the **PTM Service**.

6.2 Status Indicator Meanings

Some of the low-level indicators that are directly associated with the incremental step-by-step record of how the tests were conducted, along with interim results, are described as follows:

- **[TestStep]** — no highlighting, plain text. Describes the details of a particular step in a Test Case.
- **[Debug]** — no highlighting, plain text. Describes actions that were taken during a portion of a Test Case, such as connecting to a server over TCP, as part of the **[TestStep]** in which it exists.
- **[Checkpoint]** — no highlighting, plain text. Provides values at key points during a test that can provide insights into the causes of an imminent failure. Can also include pointers to the protocol specification sections that define acceptable value types and ranges, to assist in troubleshooting.
- **[CheckSucceeded]** — highlighted in Green. Indicates that the actions taken at a particular check point of a **[TestStep]** were successful.
- **[CheckFailed]** — highlighted in Red. Indicates that the actions taken at a particular check point were unsuccessful.
- **[TestPassed]** — highlighted in Green. Indicates that the Test Case passed.
- **[TestFailed]** — highlighted in Red. Indicates that the Test Case failed.
- **[Comment]** — no highlighting, plain text. Provides other information such as brief descriptions of Test Case actions, states, values, and so on.

6.3 Common Failures

The table in this section describes some common failures that you may encounter when running Test Cases. A section is also provided for you to enter information about any unique or unexpected issues that occurred as the result of running Test Cases.

Table 4. Common Test Case failures

Failure	Description	Potential Cause
Pervasive errors	Command line or other execution reports massive failure of tests.	Incorrect configuration involving the selection of a Windows platform while a non-Windows platform is actually in use.
Selective errors	Features appear on the **Filter Test Cases** tab in italics.	Features displayed in italics indicate that the PTM Service determined that the feature is not supported on the SUT. If the feature is tested anyway, failures may occur. Features were not supported by one or more test cases that ran.

Test case errors	Test case failures are reported in the left-hand sector of the **View Results** page of the **PTM Service**.	Descriptions are provided in the right-hand sector of the **View Results** page.
Note: Use the sections below to note unique or unusual errors you may have detected in this Lab session		

7.0 More Information

This section contains additional information about Resources that may be helpful if you wish to dive deeper into the subject matter to which you have been introduced in this Tutorial.

7.1 Resources

The following resources contain advanced information that is related to this Tutorial. Consult this information only if you are prepared to engage with advanced and complex technologies:

- File Server Protocol Family Test Suite User Guide — a complete guide to setting up the File Server Protocol Test Suite, including software installation and instructions for configuring the test network, Workgroup or Domain test environment, Driver and SUT computers, and the Protocol Test Manager. URL: https://github.com/Microsoft/WindowsProtocolTestSuites/blob/main/TestSuites/FileServer/docs/FileServerUserGuide.md#3.4
- **File Server Protocol Family Test Suite protocols** — the full File Server Test Suite is designed to test implementations of the File Server protocol family, which includes the following protocols that are documented on the Microsoft Technical Documents site:
  - [MS-SMB2] — Server Message Block (SMB) Protocol Version 2 and 3 https://msdn.microsoft.com/en-us/library/cc246482.aspx
  - [MS-FSRVP] — File Server Remote VSS Protocol https://msdn.microsoft.com/en-us/library/hh554852.aspx
  - [MS-SWN] — Service Witness Protocol https://msdn.microsoft.com/en-us/library/hh536748.aspx
  - [MS-DFSC] — Distributed File System (DFS): Namespace Referral Protocol https://msdn.microsoft.com/en-us/library/cc226982.aspx
  - [MS-SQOS] — Storage Quality of Service Protocol https://msdn.microsoft.com/en-us/library/mt226249.aspx
  - [MS-RSVD] — Remote Shared Virtual Disk Protocol https://msdn.microsoft.com/en-us/library/dn393384.aspx

- [MS-FSA] — File System Algorithms

  https://msdn.microsoft.com/en-us/library/ff469524.aspx

- **Test Suite design specifications** — to learn more about **Test Suite** design, see the following documentation:
  - MS-SMB_ServerTestDesignSpecification

    https://github.com/Microsoft/WindowsProtocolTestSuites/tree/main/TestSuites/MS-SMB/docs/
  - File Server Protocol Family Test Design Specification

    https://github.com/Microsoft/WindowsProtocolTestSuites/blob/main/TestSuites/FileServer/docs/FileServerTestDesignSpecification.md
  - Authentication Protocol Server Test Design Specification

    https://github.com/Microsoft/WindowsProtocolTestSuites/blob/main/TestSuites/FileServer/docs/Auth_ServerTestDesignSpecification.md
  - MS-FSA Protocol Server Test Design Specification

    https://github.com/Microsoft/WindowsProtocolTestSuites/blob/main/TestSuites/FileServer/docs/MS-FSA_ServerTestDesignSpecification.md
  - MS-SQOS Protocol Server Test Design Specification

    https://github.com/Microsoft/WindowsProtocolTestSuites/blob/main/TestSuites/FileServer/docs/MS-SQOS_ServerTestDesignSpecification.md