

# RDP Client Test Suite User Guide

Installation, Configuration, Test Execution

Abstract  
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# Introduction

This User Guide provides the fundamentals for using the **RDP Client Endpoint Test Suite**, hereinafter referred to as the **RDP Client Test Suite** or simply the **Test Suite**. In this guide, you will learn how to do the following:

- Configure the network for the Test Environment.
- Set up the **Driver** computer, **SUT** computer (system under test), and optionally a **DC** computer.
- Install and configure the **Test Suite**.
- Choose the test execution method (.ps1 scripts or UI-based) and define a Test Case configuration.
- Run the Test Cases to exercise the functions of various RDP protocol implementations.
- Review output data logs or use the output data displays in Protocol Test Manager (PTM) for analysis.

The **RDP Client Endpoint Test Suite** is designed to test implementations of the following protocols, the documentation for which is located on the [Technical Documents](#) site:

- [MS-RDPBCGR]: Remote Desktop Protocol: Basic Connectivity and Graphics Remoting Specification
- [MS-RDPEUSB]: Remote Desktop Protocol: USB Devices Virtual Channel Extension
- [MS-RDPEVOR]: Remote Desktop Protocol: Video Optimized Remoting Virtual Channel Extension
- [MS-RDPRFX]: Remote Desktop Protocol: RemoteFX Codec Extension
- [MS-RDPEUDP]: Remote Desktop Protocol: UDP Transport Extension
- [MS-RDPEMT]: Remote Desktop Protocol: Multitransport Extension
- [MS-RDPEI]: Remote Desktop Protocol: Input Virtual Channel Extension
- [MS-RDPEGFX]: Remote Desktop Protocol: Graphics Pipeline Extension
- [MS-RDPEDISP]: Remote Desktop Protocol: Display Update Virtual Channel Extension
- [MS-RDPEDYC]: Remote Desktop Protocol: Dynamic Channel Virtual Channel Extension
- [MS-RDPEGT]: Remote Desktop Protocol: Geometry Tracking Virtual Channel Protocol Extension



The content of this User Guide is organized under the following major topics:

[Getting Started with the RDP Client Test Suite](#)

[Test Environment Requirements](#)

[Setting Up Test Environment Computers](#)

[Configuring the Test Suite](#)

[Running Test Cases](#)

[Using the Protocol Test Manager](#)

[Viewing RDP Output Data with Message Analyzer](#)

[Troubleshooting](#)

[Resources and References](#)

## More Information

To learn more about the Test Suite and Test Environment in which protocol implementations are tested, you can link off to the following documents from the [Resources and References](#) section of this User Guide.

- RDP Overview Client Test Design Specification — learn more about **RDP Client Test Suite** design.
- Getting Started Guide for PTF — learn more about the common environment in which Test Cases are run for all Test Suites.



### Important

The **RDP Client Test Suite** tests protocol implementation behaviors that are observable on the wire only.

## Getting Started with RDP Client Test Suite

To help you get started with the tasks that must be completed to set up the **RDP Client Test Suite** and the test environment in which it operates, this User Guide provides a setup overview that lays out all the required tasks in a tabular-checklist format.

The tasks are organized by the order in which they should be performed. A brief description of each task is accompanied by a link to the section of this User Guide in which the task procedures are specified.

The task overview is just ahead in the topic [RDP Client Test Suite Setup Overview](#).

## License Information

For licensing information, an End User License Agreement (EULA) is provided with this **Test Suite**. It is located in the License.rtf file in the installation folder; see [Reviewing Installed Files and Folders](#).

## Further Assistance

If you need further information about this **Test Suite** or assistance in troubleshooting issues related to this **Test Suite**, contact [dochelp@microsoft.com](mailto:dochelp@microsoft.com).

## RDP Client Test Suite Setup Overview

The following table summarizes the tasks that are required to get the **RDP Client Test Suite** and supporting computers up and running. Each task in the list also provides one or more links to related topics in this User Guide that you can review prior to actually performing the tasks. After you review (or complete) each task, you can optionally print out the table below as a template and you can optionally check off completed items in the Table below that you have printed out as a template.



### Note

For the [Workgroup](#) environment, skip all tasks that are related to domain controller (DC) setup and configuration.

**Table 1. Overview of RDP Test Suite setup tasks**

Check	Task	Topic/Description
<input type="checkbox"/>	Download the test suite for the protocol implementation.	For a list of the files that the download package contains, see <a href="#">Extracted Files and Folders</a> .

<input type="checkbox"/>	Confirm that your Test Environment and computers meet the requirements of the <b>RDP Client Test Suite</b> .	For Test Environment requirements information about the <b>RDP Client Test Suite</b> , see <a href="#">Test Environment Computer Requirements</a> .
<input type="checkbox"/>	Install the software prerequisites.	For information about software that must be installed on the computers in your Test Environment before the <b>RDP Client Test Suite</b> is installed, see <a href="#">Software Installation</a> .
<input type="checkbox"/>	Set up the <b>Driver</b> computer.	<p>See <a href="#">Setting Up the Driver Computer</a>.</p> <p>The <b>RDP Client Test Suite</b> will be installed on the <b>Driver</b> computer in the procedure of this section. From the <b>Driver</b> computer, you will use the <b>Test Suite</b> to run the Test Cases that test the protocol implementations on the <b>SUT</b> computer.</p> <p> <b>Note</b> After the installation is complete, the <b>Driver</b> installation files will be in the directory location specified in <a href="#">Reviewing Installed Files and Folders</a>.</p>
<input type="checkbox"/>	Set up the <b>SUT</b> computer (system under test).	<p>See <a href="#">Setting Up the Windows-Based SUT</a>.</p> <p>The <b>RDP Client Test Suite</b> will be installed on the <b>SUT</b> computer in the procedure of this section. This computer will host the protocol implementations under test.</p> <p> <b>Note</b> After the installation is complete, the <b>SUT</b> installation files will be in the directory location specified in <a href="#">Reviewing Installed Files and Folders</a>.</p>
<input type="checkbox"/>	Set up the Domain Controller ( <b>DC</b> ) (optional).	<p>See <a href="#">Setting Up the Windows-Based Domain Controller</a>.</p> <p>In this section, you will set up the <b>DC</b> by installing Active Directory Domain Services.</p>
<input type="checkbox"/>	Set up the network and choose the working environment.	<p>See <a href="#">Network Configuration</a>.</p> <p>In this section, you will review the Network Infrastructure requirements and choose either the <b>Domain</b> or <b>Workgroup</b> environment in which to run the <b>RDP Client Test Suite</b>.</p>
<input type="checkbox"/>	Verify connectivity among all test environment computers.	<p>See <a href="#">Verifying Test Environment Connectivity</a>.</p> <p>In this section, you will use the Ping command to verify connectivity of all the computers in your test environment.</p>
<input type="checkbox"/>	Configure the <b>SUT</b> computer.	<p>See <a href="#">Configuring Windows Test Environment Computers</a> and <a href="#">Configuring the SUT</a>. The latter section specifies the</p>

		<p>preliminary configuration tasks that you will perform on the <b>SUT</b> computer.</p> <p> <b>Note</b></p> <p>To configure a non-Windows based computer as <b>SUT</b>, see below.</p>
<input type="checkbox"/>	Configure the <b>Driver</b> computer.	<p>See <a href="#">Configuring the Driver Computer</a>. This section specifies the preliminary configuration tasks that you will perform on the <b>Driver</b> computer.</p>
<input type="checkbox"/>	Configure non-Windows based computers, including the optional <b>DC</b> , that is, if it is not using the Windows operating system.	<p>See <a href="#">Configuring Non-Windows Test Environment Computers</a>. This section describes limited configuration tasks that you can perform on the <b>DC</b> and the <b>SUT</b> computers, as this User Guide does not provide detailed instructions for non-Windows configuration.</p>
<input type="checkbox"/>	Configure the <b>RDP Client Test Suite</b> settings.	<p>See <a href="#">Configuring the Test Suite</a>. In this section, you will validate or change default configuration settings and property values that are set during the <b>RDP Client Test Suite</b> installation. This can include unique test environment and <b>Test Suite</b> settings and others, to accommodate your Test Environment or to customize your Test Case runs.</p>
<input type="checkbox"/>	Configure <b>RDP Client Test Suite</b> mode settings	<p>See <a href="#">Test Run Pre-Configuration</a>. In this section, you will configure common Test Suite mode settings along with mode settings for specific protocols such as RDPEI and RDPEDISP.</p>
<input type="checkbox"/>	Run Verification tests as a pre-execution check of <b>RDP Client Test Suite</b> readiness.	<p>See <a href="#">Running Verification Tests</a>. In this section, you will run command-based build verification tests (BVT), also known as <a href="#">scenario S1 tests</a>, to verify that the <b>RDP Client Test Suite</b> is properly configured and ready to run Test Cases.</p>
<input type="checkbox"/>	Choose how you will run the preconfigured Test Cases of the <b>RDP Client Test Suite</b> .	<p>See <a href="#">Choosing the RDP Test Case Execution Method</a>.</p>

## Choosing the RDP Test Case Execution Method

After you complete all the tasks specified in the [RDP Client Test Suite Setup Overview](#), you are ready to run the preconfigured Test Cases via command line scripts (.ps1), or you may use the Protocol Test Manager (PTM) UI-based tool to automate or simplify the performance of various functions.

Among the most important of these functions are the following:

- Reviewing the execution environment (**Domain** or **Workgroup**).
- Automatically detecting, inspecting, and validating the **SUT** computer environment configuration and capabilities for test readiness.
- Creating a default set of Test Cases, based on the assessed **SUT** environment.
- Selecting (filtering) Test Cases to create an execution test set.
- Executing Test Cases.
- Viewing test results with built-in output data analysis features.

### More Information

To execute Test Cases via .ps1 scripts, see [Running All Test Cases](#) and [Running Specific Test Cases](#).

To execute Test Cases via the **PTM**, see [Using the Protocol Test Manager](#).



#### Tips

Once you have the **PTM** set up with specific set of Test Cases that you run repeatedly for a particular purpose, you can save the test set as a **Profile** and thereafter trigger Test Cases to run on demand from the command line, as described in [Working with a Profile](#).

You can also use the **Load Profile** feature of **PTM** to load the Test Cases of a previously save **Profile** into **PTM** to run a baseline set of Test Cases, for example to troubleshoot RDP protocol implementation changes.

Note that the built-in Test Case results viewing and analysis features of **PTM** can help you to very quickly identify issues and failures that occurred during test execution, as described in [Reviewing the Test Results](#).

## Test Environment Requirements

This section describes the requirements for the Test Environment in which the **RDP Client Test Suite** operates. The Test Environment architecture can consist of two different types, as described immediately below. The circumstances in which you might choose one over the other are also described here:

- **Workgroup Environment** — you might choose the **Workgroup Environment** if you are new to the protocol Test Suites or if you want to simplify the setup and environment in which to perform Test Cases.
- **Domain Environment** — you might need to choose the **Domain Environment** if your RDP protocol implementations require Active Directory for certain Test Cases.

You may also choose the **Domain Environment** if you want to run Test Cases against your implementation in a more comprehensive environment that more closely resembles a real world environment containing a Domain Controller.

To review the architectures of these environments, see the [Workgroup Environment](#) and [Domain Environment](#) topics. Hardware and other requirements for these environments are described ahead in [Test Environment Computer Requirements](#).



The major topics covered in this section include the following:

[Test Environment Computer Requirements](#)

[Software Installation](#)

[Network Configuration](#)

[Verifying Test Environment Connectivity](#)



### Important

The section that follows specifies the Test Environment requirements for Windows-based computers only, which includes **Driver**, **SUT**, and **Domain Controller** computers. However, it is permissible for the **SUT** computer to be running a non-Windows operating system version, although this User Guide provides no information about such configurations.

Also, please be advised that a **Workgroup Environment** does not require a domain controller (DC) and that in a **Domain Environment**, the DC can be located on the **SUT** computer.

## Test Environment Computer Requirements

If you run the **RDP Client Test Suite** in a **Domain Environment**, it should contain the following physical or virtual computers:

- **Driver computer** — This computer hosts the **RDP Client Test Suite**, from which Test Case execution is launched. It is recommended to run the Windows Server 2019 operating system on the **Driver** computer. See [Driver Computer](#) for more requirements information.
- **SUT computer** — This computer hosts the RDP protocol implementations to be tested by the **RDP Test Suite**. It is recommended to run the Windows 10 Client operating system on the **SUT** computer. See [System Under Test \(SUT\)](#) for more requirements information.
- **DC computer** — this computer is configured as a domain controller (DC). If this computer is running Windows, it must be the Windows Server 2008 R2 operating system version or later. See [Domain Controller](#) for more requirements information.

If you run the **RDP Client Test Suite** in a **Workgroup Environment**, it should contain the following physical or virtual computers:

- A **Driver** computer — same as above.
- An **SUT** computer — same as above.



### Important

Test Cases that require the **Interactive** mode to run do not execute automatically. If your SUT is running a non-Windows based operating system, be sure that your installation conforms with the requirements that apply to your operating system by reviewing the special test environment requirements in the table below.

The table that follows outlines various constraints that apply in the Test Environment when executing Test Cases for certain protocols. These constraints include the need to run the Test Cases against RDPEUSB and RDPEI implementations in the **Interactive** mode, where some manual operations must be performed by the user in order to continue test execution.



### Note

If you are using the Protocol Test Manager (PTM) for execution of Test Cases, you can set an adapter to the **Interactive** mode as part of test setup in the PTM Wizard. However, you should only select **RDPEUSB** or

**RDPEI** under the **Protocol** node on the **Filter Test Cases** page of the PTM Wizard to ensure execution of the specific Test Cases that require user interaction. Otherwise, Test Cases for other selected protocols will unnecessarily display interactive dialogs for each Test Case.

If you are using batch command scripts for execution of Test Cases, you can set the Interactive mode for the Test Suite in the RDP\_ClientTestSuite.ptfconfig configuration file, as described in [Configuring Common Test Suite Mode Settings](#).

**Table 2. Test environment special execution requirements**

Implementation Test Cases	Requirements
MS-RDPEUSB	<ul style="list-style-type: none"> <li>▪ <b>SUT</b> must be a physical machine.</li> <li>▪ One OSR USB FX2 board needs to be plugged into the <b>SUT</b> computer before running the MS-RDPEUSB Test Cases.</li> <li>▪ Purchase an OSR USB FX2 board at the <a href="#">OSR Online Store</a> and install it.</li> <li>▪ Test Cases for RDPEUSB implementations must use the Interactive mode.</li> </ul>
MS-RDPEI	<ul style="list-style-type: none"> <li>▪ The <b>SUT</b> must be touch-enabled.</li> <li>▪ Test Cases for RDPEI implementations must use the Interactive mode, as described in <a href="#">Running MS-RDPEI Test Cases in the Test Suite Modes</a>.</li> </ul>
MS-RDPEVOR	The <b>SUT</b> must be running the Windows 8.1 or later operating system.
MS-RDPEDISP	The <b>SUT</b> operating system must support display configuration changes, including: <ul style="list-style-type: none"> <li>▪ Addition, removal, and repositioning of monitors.</li> <li>▪ Resolution and orientation updates.</li> </ul>

## Driver Computer

The minimum requirements for the **Driver computer** are listed in the table that follows.

**Table 3. Driver computer requirements**

Requirement	Description
Operating system	<p>It is recommended to run the Windows Server 2019 operating system on the <b>Driver</b> computer.</p> <p>However, it can also be running any Windows operating system version, such as Windows 8.1 client or Windows Server 2012 R2 and later, and be running Linux-based operation system, such as Ubuntu 18.04 or Ubuntu 20.04.</p>

Requirement	Description
	All the operating systems would install <a href="#">[.NET 5.0]</a> .
Memory	2 GB RAM
Disk space	60 GB

## System Under Test (SUT)

The minimum requirements for the **SUT** computer are listed in the table that follows.



### Note

If your **SUT** is running a non-Windows based operating system, be sure that your installation conforms with the requirements that apply to your operating system, by reviewing the special test environment requirements table in [Test Environment Computer Requirements](#).

**Table 4. SUT computer requirements**

Requirement	Description
Operating system	<p>It is recommended to run the Windows 10 Client operating system on the <b>SUT</b> computer.</p> <p>However, given that this computer has some flexibility as the system under test (SUT), it can also be running the Windows 8.1 client and later or Windows Server 2012 R2 and later operating system, with support for the MSTSC command line tool.</p> <p>Note that the SUT computer could be running a non-Windows based operating system version as well.</p> <p>All the operating systems would install <a href="#">[.NET 5.0]</a></p>
Memory	1 GB RAM
Disk space	60 GB

## Domain Controller

The minimum requirements for the **DC** are listed in the table that follows.

**Table 5. DC computer requirements**

Requirement	Description
Operating system	<p>It is recommended to run the Windows Server 2012 R2 operating system version or later on the <b>DC</b> computer, although a non-Windows base operating system is permissible.</p> <p>Note that the <b>DC</b> can be on the <b>SUT</b>, although this configuration could interfere with the Test Case execution requirements of certain protocols, as described in the table of the <a href="#">Test Environment Computer Requirements</a> section of this document.</p>
Services	Domain directory service, such as Windows Active Directory Domain Services (AD DS).
Memory	1 GB RAM
Disk space	60 GB

## Software Installation

The required prerequisite software specified in this section must be installed on the **Driver** computer before installing the **RDP Client Test Suite**. Other specified software is optional. As of this writing, the latest Test Suite version is 4.20.9.0.

### Required Prerequisite Software

The required software for running any Windows Protocol Test Suite is listed in the *Prerequisites* section of the Windows Protocol Test Suites [Readme](#) documentation on GitHub. You can install the prerequisites with the **InstallPrerequisites.ps1** PowerShell script that you will find on [this page](#).

In addition, the following is required software:

- Windows PowerShell 3.0 or later — enables you to run Test Cases with .ps1 script files.



#### Note

Windows PowerShell is installed by default with every Windows 7 SP1 and later operating system and with every Windows Server 2008 R2 SP1 and later operating system. However, if you need to ensure that you have the latest version of PowerShell, go to [Installing PowerShell on Windows](#).

### RDP Client Test Suite Software Installation

The **RDP Client Test Suite** software consists of single installation package (.zip) that you extract separately on both the **Driver computer** and **SUT computer** with specific installation options for each.

You will find the official **RDP Test Suite** installers [here](#) under the Assets topic on GitHub, which includes the **RDP-TestSuite-ClientEP.zip** and **PTMCLI.zip** files.

### Other RDP Client Test Suite Acquisition Methods

You can utilize other options to acquire the **RDP Client Test Suite**, as described below:

**Cloning a Repository** — you can clone (copy) the GitHub repository for the **RDP Client Test Suite** to create a locally-synched copy on your computer, as described in [Cloning a Repository](#). From the cloned copy of **Test**

**Suite** files, you can use the **build.ps1** file to build the RDP client, RDP server, and the Protocol Test Manager separately.



### Note

If you are planning to create your own Test Cases, you might want to review [Running and Debugging Test Cases With Visual Studio](#) for more information.

**Building a Test Suite** — you can also build the **RDP Client Test Suite** from the open source code with the use of the **build.ps1** file, which enables you to create the **Test Suite** and **Protocol Test Manager** components.

### More Information

**To learn more** about the RDP source code, see the [RDP source](#) for Client and Server components which includes the RDP\_client.sln and RDP\_server.sln solution files for creating associated projects in [Visual Studio 2017 Community](#) version. You can download the source code from [this page](#).

**To learn more** about creating Test Suites, see *Creating a Test Suite Manually* in the [Getting Started Guide for PTF](#). The **Protocol Test Framework (PTF)** provides the framework for the Test environment. You might want to learn more about the framework if you intend to build your own Test Suite.

## Optional Software

**Protocol Test Manager (PTM)** — provides a graphical user interface (UI) to facilitate configuration and execution of **RDP Client Test Suite** Test Cases. Its use is **highly recommended**, as it automates many of the otherwise manual configuration steps. The PTM installer (**ProtocolTestManager.msi**) is located [here](#) under the Assets topic on GitHub.

For more information about PTM, see the topic [Using Protocol Test Manager](#).

**Microsoft® Message Analyzer (MMA)** — listed here as an optional tool given that the Test Cases of themselves neither perform live captures nor capture integrity verifications during execution. However, MMA can be helpful with debugging Test Case results, by analyzing ETL files that are generated by the Test Cases, that is, if you configure the **NetworkCapture Properties** on the **PTF** tab of the **Configure Test Cases** page in the PTM Wizard during Test Case configuration. This feature is referred to as Automatic Network Capturing, which is further described in the [Getting Started Guide for the Protocol Test Framework](#).

In addition, you can use Message Analyzer to capture messages that are generated by the **Protocol-Test-Suite** message provider that you select when you are configuring a Message Analyzer session. See [Capturing RDP Traffic with Microsoft Message Analyzer](#) for additional information.

Lastly, you can use Message Analyzer to capture **Driver** and **SUT** computer communications as Test Cases are executing, with the use of the Microsoft-Windows-NDIS-PacketCapture provider.



### Important

November 25 2019 - Microsoft Message Analyzer (MMA) was retired and removed from public-facing sites on microsoft.com. A private MMA build is available for testing purposes; to request it, send an email to [getmma@microsoft.com](mailto:getmma@microsoft.com). Note that Message Analyzer will no longer be supported in this **Test Suite** after **RDP Client Endpoint Test Suite** version 3.20.1.0.

# Network Configuration

You can run the RDP Test Suite in a [Workgroup](#) or [Domain](#) environment using either physical or virtual machines. This User Guide describes the Test Environment using physical computers only. For information about configuring virtual machines, see [Create Virtual Machine with Hyper-V on Windows 10](#).

For information about choosing the [Workgroup](#) or [Domain](#) environment in which to run your Test Cases, see [Test Environment Requirements](#).

## Network Infrastructure

A separate test network is required to connect the Test Environment computer systems. The network infrastructure in which the computers will reside must meet the following requirements:

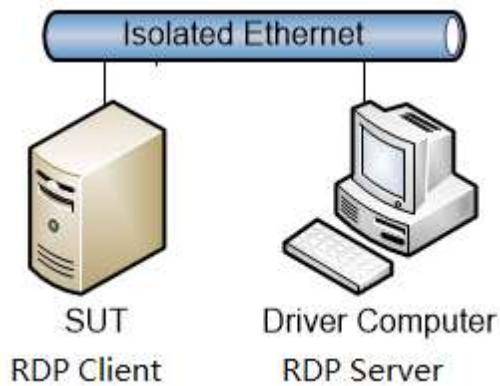
- It must utilize an isolated hub or switch.
- It must not be connected to a production network or used for any other business, personal, private, or communications operation.
- It must not be connected to the internet.
- IP addresses and computer names must be assigned to the computers of the test network.
- Specified user credentials must be dedicated to the test network.
- Network details including computer IP addresses, names, and credentials should be saved in a log file or other convenient storage.

## Workgroup Environment

The [Workgroup Environment](#) component computers interact in the following ways:

- **Driver computer** — runs the Test Cases by sending requests over the wire in the form of protocol messages.
- **SUT computer** — hosts a client implementation of the protocol being tested and responds to Test Case requests sent by the **Driver computer**.

The following figure illustrates the basic [Workgroup Environment](#) architecture:



**Figure 1. Workgroup Environment architecture**

## Domain Environment

The **Domain Environment** component computers interact in the following ways. Note that a domain controller is a requirement for the **Domain Environment**.

- **Driver computer** — runs Test Cases by sending requests over the wire in the form of protocol messages.
- **SUT computer** — hosts a client implementation of the protocol/s being tested and responds to Test Case requests sent by the **Driver computer**.
- **DC** — provides functionality in Active Directory Domain Services (AD DS) that provides directory service security for Driver and SUT Computer and User accounts.

The following figure illustrates the basic **Domain Environment** architecture.

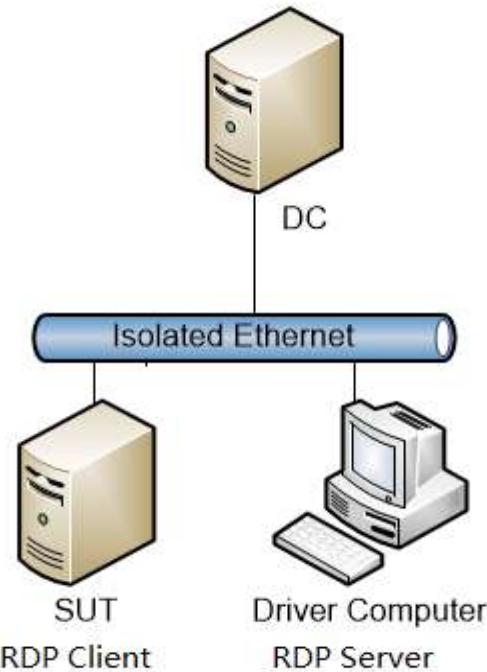


Figure 2. Domain Environment architecture

## Verifying Test Environment Connectivity

After you prepare the Test Environment in accordance with earlier topics of this section, you should verify connectivity between the **Driver computer** and the **SUT computer**. You should then test connectivity between all other computers in your Test Environment.

The procedure immediately below provides steps you can follow to check for connectivity between any two Windows-based computers. For information about testing connectivity with non-Windows based computers, see the administrative documentation for your operating system.

### Important

Before performing the procedure that follows, you will need to disable all active firewalls in the Test Environment by running the following command string in the Windows command console:

```
netsh advfirewall set allprofiles state off
```

► **To check connectivity from the Driver computer to a specific computer:**

1. Right-click the **Start** button and then click **Run**.
2. In the **Run** dialog, type **cmd** and then click **OK**.
3. At the Windows command prompt, type **ping** followed by the hostname or IP address of the **SUT** or other computer in the Test Environment, and then press the **Enter** key on the keyboard.

For example, the command immediately below checks connectivity to an **SUT computer** with hostname **SUT01**:

```
> ping SUT01
```

If the connection succeeds, you will see four ping replies at the command line, along with the time in milliseconds that it took to receive the reply from the pinged computer. Otherwise, you will see **Request timed out** messages that indicate that the connection failed.

4. Repeat step 3 while substituting the name of each computer in your Test Environment for which you will test connectivity to and from every other computer in the environment.



**Important**

Do not proceed with **Test Suite** configuration until you confirm that connectivity succeeded, to eliminate the potential for network connectivity issues.

## Setting up Test Environment Computers

In this section you will set up the Test Environment computers to work with the **RDP Client Test Suite**.



**Note**

For **Workgroup** environments, skip all tasks in this section that are related to setup and configuration of a domain controller (DC).

- The major topics covered in this section include the following:

[Extracted Files and Folders](#)

[Setting Up the Driver Computer](#)

[Setting Up the Windows-Based SUT](#)

[Setting Up the Windows-Based Domain Controller](#)

[Reviewing Installed Files and Folders](#)

[Configuring Windows Test Environment Computers](#)

[Configuring the SUT](#)

[Configuring the Driver Computer](#)

[Configuring Non-Windows Test Environment Computers](#)

## Extracted Files and Folders

After you download the **RDP-TestSuite-ClientEP.zip** package to the driver computer and SUT, you can extract it to a local path, for example: C:\RDP-TestSuite-ClientEP on Windows or \$HOME/RDP-TestSuite-ClientEP on Linux.

**Table 6. File and Folder Description about RDP-TestSuite-ClientEP.zip**

File or Folder	Description
<b>Batch</b>	Command files that you can use to run individual Test Cases or all Test Cases.
<b>Bin</b>	Test Suite binaries, configuration files, PowerShell scripts, and others.
<b>Data</b>	Data files that are used by scripts to set up and configure the <b>Driver</b> , Windows-based <b>SUT</b> , and <b>DC</b> computers.
<b>Scripts</b>	Scripts that are used to set up and configure the <b>Driver</b> , Windows-based <b>SUT</b> , and <b>DC</b> computers.
<b>TestData</b>	Data files that used by test suite for sending to <b>SUT</b>
<b>License.rtf</b>	The End User License Agreement (EULA).

## Setting Up the Driver Computer

In the procedure below, you will set up the **Driver Computer** for use with the **RDP Client Test Suite**.



### Important

See the Prerequisites topic in the Windows Protocol Test Suites [Readme](#) documentation on GitHub for the .msi files required for the prerequisites installations.

► To set up the **Driver computer**, perform the steps that follow:

1. Install the required software, as described in [Required Prerequisite Software](#).
2. Install the optional software per your requirements, as described in [Optional Software](#).
3. From the **Driver** computer, locate the official **RDP Client Test Suite** zip package (**RDP-TestSuite-ClientEP.zip**) on the [Windows Protocol Test Suites](#) site under the Assets topic on GitHub.
4. Download and extract the **RDP-TestSuite-ClientEP.zip** package to the driver computer C:\ path.

## Setting Up the Windows-Based SUT

In the procedure of this section, you will set up an **SUT Computer** for use with the **RDP Client Test Suite**.

► To set up a **Windows-based SUT computer**, perform the steps that follow:

1. From the **SUT** computer, locate the official **RDP Client Test Suite** zip package (**RDP-TestSuite-ClientEP.zip**) on the [Windows Protocol Test Suites](#) site under the Assets topic on GitHub.

2. Install the required software, as described in [Required Prerequisite Software](#).
3. Download and extract the **RDP-TestSuite-ClientEP.zip** package to the SUT computer system C:\ path.



#### Note

If you have a non-Windows **SUT** computer to set up, see [Configuring Non-Windows Test Environment Computers](#).

## Setting Up the Windows-Based Domain Controller

If you plan to run your Test Cases in a **Domain Environment**, follow the procedure in this section to set up the **DC** for use with the **RDP Client Test Suite**.



#### Note

If you are planning to run your Test Cases in a **Workgroup Environment**, skip this section.

► To set up a Windows-based DC, perform the step that follows:

1. Install Active Directory Domain Services on the **DC computer** using **Server Manager**.
2. Follow the installation instructions that are provided.



#### Tip

If you have a non-Windows **DC** computer to set up, see [Configuring Non-Windows Test Environment Computers](#).

## Reviewing Installed Files and Folders

During the previous **Driver computer** setup process, the files and folders specified in the table below are installed to the following directory location on the **Driver** computer:

C:\RDP-TestSuite-ClientEP\

## Configuring Windows Test Environment Computers

In this section, you will configure computers for a Windows-based Test Environment.

For general information about configuring computers that are not based on Windows, see [Configuring Non-Windows Test Environment Computers](#).



#### Important

Certain property values of the .ptfconfig file are set when you configure them in the procedures that follow. For this reason, in a Windows-based Test Environment, configure the **SUT** computer and the **DC** (if using the **Domain Environment**) before you configure the **Driver** computer.



#### Note

If you are using a **Workgroup Environment**, skip all tasks that are related to the setup and configuration of a **DC computer**.

# Configuring the SUT

In this section, you will perform a procedure for preliminary configuration of the **SUT** computer in tasks such as the following:

- Setting execution policy
- Reviewing and potentially updating ParamConfig.xml file settings
- Configuring certain Group Policy settings
- Enabling redirection for MS-RDPEUSB Test Cases
- Enabling Windows Remote Management
- Editing .rdp files

► **To configure the SUT computer, perform the steps that follow:**

1. Log on to the **SUT** computer as a local Administrator, or with a user account that has administrative privileges.



**Note**

You must use the local Administrator account when logging on to the **SUT** computer. If the local **Administrator** account is disabled, enable it as follows:

- a. In **Control Panel** open **System and Security**, **Administrative Tools**, and then open **Computer Management**.
- b. In the left panel, open **Local Users and Groups** under **System Tools**, and then select **Users**.
- c. In the right panel, double-click **Administrator** and then unselect the **Account is disabled** check box.
- d. Right-click **Administrator**, click **Set Password...**, then in the **Set Password for Administrator** dialog, click **Proceed..**.  
Thereafter, specify “Password01!” (without the quotes) in the **New Password** and **Confirm Password** fields.
- e. Click **OK** to save the password for the local Administrator account.



**Tip**

You can also run the following commands at the Windows command line to activate the local Administrator account and set the password:

```
net user /active administrator  
net user administrator Password01!
```

2. Navigate to the directory immediately below and open the ParamConfig.xml file:

```
C:\RDP-TestSuite-ClientEP\Scripts
```

3. Review the properties and descriptions in the ParamConfig.xml file on the **SUT** computer with respect to those in the table that follows and update the file as necessary to match values.

**Table 7. SUT computer ParamConfig File properties**

Property Name	Description/Values
<b>LogPath</b>	The file path for storing the logs during configuration. Default value: ...\\Logs
<b>LogFile</b>	The name of log file. Default value: ...\\Logs\\Config-DriverComputer.ps1.log
<b>userNameInTC</b>	The local administrator account that is used to log on to the <b>SUT</b> computer. Required value: <b>Administrator</b>
<b>userPwdInTC</b>	The password that is used to log on to the local administrator account of the <b>SUT</b> computer. Default value: <b>Password01!</b>
<b>domainName</b>	The domain name that is configured in the <b>DC</b> computer, leave it blank if not domain in the environment. Default value: <b>contoso.com</b>
<b>dcComputerName</b>	The machine name or IP address of the <b>DC</b> computer, leave it blank if not domain in the environment. Default value: <b>DC01</b>
<b>tcComputerName</b>	The machine name or IP address of the <b>SUT</b> computer. Default value: <b>SUT01</b>
<b>driverComputerName</b>	The machine name or IP address of the <b>Driver</b> computer. Default value: <b>DriverComputer</b>
<b>RDPListeningPort</b>	The listening port for the <b>Driver</b> computer. Default value: <b>3389</b>
<b>ipVersion</b>	The IP version that is used in the test environment. Default value: <b>IPv4</b>

<b>workgroupDomain</b>	The Test Environment type. If you are using the <b>Domain Environment</b> , set the value below to <b>Domain</b> . If you are using the <b>Workgroup Environment</b> , ensure the value below is set to <b>Workgroup</b> .  Default value: <b>Workgroup</b>
<b>compressionInTC</b>	Determine whether compression is used in the RDP connection. If compression is used, set the value to <b>Yes</b> ; otherwise, set the value to <b>No</b> .  Default value: <b>No</b>
<b>CredSSPUser</b>	The user name used in CredSSP authentication. The user should be a member of the RDP User Group on the <b>Driver</b> computer.  Default value: <b>Administrator</b>
<b>CredSSPPwd</b>	The password for the <b>CredSSPUser</b> .  Default value: “ <b>Password01!</b> ” (without the quotes)
<b>securityProtocol</b>	The security protocol that is used to establish an RDP connection. <b>CredSSP</b> or <b>RDP</b> are also permissible values.  Default value: <b>TLS</b>
<b>negotiationBasedApproach</b>	If the value is true, the connection sequence uses the Negotiation-Based Approach, as described in <a href="#">MS-RDPBCGR section 5.4.2.1</a> .  If the value is False, it specifies that the Direct Approach will be used, as described in <a href="#">MS-RDPBCGR section 5.4.2.2</a> .  Default value: <b>True</b>
<b>osVersion</b>	The operating system of the RDP connection. This value can be set to <b>Windows</b> or <b>NonWindows</b> .  Default value: <b>Windows</b>
<b>RDPVersion</b>	The RDP version in use. Can also be set to version <b>7.0</b> , <b>7.1</b> , or <b>8.0</b> .  Default value: <b>8.1</b>
<b>agentPort</b>	The listening port of the <b>SUT</b> Agent.  Default value: <b>4488</b>

4. If Windows PowerShell is not running, start it by typing “PowerShell” at the **Start** menu, right-click **Windows PowerShell**, and then select **Run as Administrator** in the context menu that appears:
5. To set the execution policy to Unrestricted, type the command that follows at the PowerShell command prompt, then press the **Enter** key on your keyboard.

```
Set-ExecutionPolicy Unrestricted -F
```

6. To change to the \Scripts directory, type the following at the PowerShell command prompt and then press the **Enter** key on your keyboard:

```
cd C:\RDP-TestSuite-ClientEP\Scripts
```

7. If you plan to run MS-RDPEUSB Test Cases, type the following at the PowerShell command prompt and then press the **Enter** key on your keyboard:

```
.\Enable-USBRedirection.ps1
```

8. To enable Windows Remote Management, type the following at the command prompt and then press the **Enter** key on your keyboard:

```
.\Enable-WinRM.ps1
```

9. To configure the SUT computer, type the following at the command prompt, then press the **Enter** key on your keyboard:

```
.\Config-TerminalClient.ps1
```

10. Configure Group Policy to create an AVC 444-supported environment:

- a. Set Group policy for RDP USB redirection as follows:

- Type **gpedit.msc** in the **Run** dialog and press **OK** to start the **Local Group Policy Editor**.
- Navigate to the following location:

Local Computer Policy\Computer Configuration\Administrative Templates\Windows Components\Remote Desktop Services\Remote Desktop Connection Client\RemoteFX USB Device Redirection

- Right-click the policy **Allow RDP redirection of other supported RemoteFX USB devices from this computer** and select **Edit** to open the **Policy Settings** dialog.
- Select **Enabled** and click **OK** to exit the dialog.
- Reboot the **SUT** computer and plug in an OSR USB FX2 board. See [Test Environment Computer Requirements](#) if you need to purchase an OSR USB FX2 board.

- b. Optionally you can configure group policy for the RDPEGFX AVC 444 feature as specified below:



#### Note

To enable AVC 444 mode in Windows 10 or Windows Server 2016 and later versions, you will need to configure two new Group Policies via the **Local Group Policy Editor**:

- Open the **Local Group Policy Editor** by typing **gpedit.msc** in the Start menu and then press the **Enter** key on your keyboard.
- Under **Local Computer Policy**, navigate to the following location:

Computer Configuration\Administrative Templates\Windows Components\Remote Desktop Services\Remote Desktop Session

- **Enable AVC 444** — enable this through group policy by performing the steps that follow:
  1. Right-click the policy **Prioritize H.264/AVC 444 Graphics mode for Remote Desktop connections** and select **Edit** to open the **Policy Settings** dialog.
  2. Select **Enabled** and click **OK** to exit the dialog.

When enabled on the RDP Server, the H.264/AVC 444 mode will be prioritized when the RDP Client (SUT) and RDP Server (Driver) both support the AVC/H.264 and AVC 444 modes.



#### Note

For Remote Desktop Session Host (RDSH) environments, only full desktop sessions are supported with H.264/AVC 444, as RemoteApp sessions still use the proprietary codecs for now.

- **Enable H.264/AVC hardware encoding** — enable through group policy by performing the steps that follow:
  3. Right-click the policy **Configure H.264/AVC hardware encoding for Remote Desktop connections** and select **Edit** to open the **Policy Settings** dialog.
  4. Select **Enabled** and click **OK** to exit the dialog.



#### Note

This policy enables hardware encoding for AVC/H.264 when used in conjunction with the AVC 444 mode. When enabled, each remote desktop monitor will use up to one AVC/H.264 encoder on the server. If all AVC/H.264 encoders are in use, the RDP server will automatically fallback to using software encoding.



#### Important

The steps that follow are required for the MS-RDPEUSB Test Cases only. If you are not planning to run these Test Cases, skip steps 11, 12.

11. Navigate to the directory below:

C:\RDP-TestSuite-ClientEP\Data

12. Edit the **Negotiate.rdp**, **DirectTls.rdp**, and **DirectCredSSP.rdp** files by performing the steps that follow for each file:
  - a. Right-click the respective RDP file, then click **Edit**.
  - b. Select the **Local Resources** tab, click **More...**, and then select the **OSR USB-FX2 LK** check box.
  - c. Select the **General** tab.
  - d. Click **Save**.

## Configuring the Driver Computer

In this section, you will perform several tasks that are necessary for configuration of the **Driver** computer in the Test Environment. These include the following:

- Updating the ParamConfig.xml file
- Using PowerShell to execute various configuration cmdlets
- Optionally installing a test certificate file on the **Driver** computer
- Configuring Group Policy to enable support for the RDPEFGX AVC 444 feature

► **To configure the Driver computer, perform the steps that follow:**

1. Log on to the **Driver** computer with the local Administrator account.
2. Navigate to the following directory location and open the ParamConfig.xml file.

C:\RDP-TestSuite-ClientEP\Scripts

3. Review the properties and descriptions in the ParamConfig.xml file on the **Driver** computer with respect to those in the table that follows and update as necessary for value matching.

**Table 8. Driver computer ParamConfig File properties**

Property Name	Description/Value
<b>LogPath</b>	The file path for storing the logs during configuration. Default value: ...\\Logs
<b>LogFile</b>	The name of log file. Default value: ...\\Logs\\Config-DriverComputer.ps1.log
<b>userNameInTC</b>	The local administrator account that is used to log on to the <b>SUT</b> computer. Required value: <b>Administrator</b>
<b>userPwdInTC</b>	The local administrator account password that is used to log on to the <b>SUT</b> computer. Default value: “ <b>Password01!</b> ” (without the quotes)
<b>CredSSPUser</b>	The user name used in CredSSP authentication. Default value: <b>Administrator</b> Should be a member of the RDP User Group on the <b>Driver</b> computer.
<b>CredSSPPwd</b>	The user password for the <b>CredSSPUser</b> . Default value: “ <b>Password01!</b> ” (no quotes)
<b>domainName</b>	The domain name that is configured in the <b>DC</b> computer, leave it blank if not domain in the environment. Default value: <b>contoso.com</b>

<b>dcComputerName</b>	The machine name or IP address of the <b>DC</b> computer, leave it blank if not domain in the environment.  Default value: <b>DC01</b>
<b>tcComputerName</b>	The machine name or IP address of the <b>SUT</b> computer.  Default value: <b>SUT01</b>
<b>driverComputerName</b>	The machine name or IP address of the <b>Driver</b> computer.  Default value: <b>DriverComputer</b>
<b>RDPLlisteningPort</b>	The listening port for the <b>Driver</b> computer.  Default value: <b>3389</b>
<b>ipVersion</b>	The IP version that is used in the test environment.  Default value: <b>IPv4</b>
<b>osVersion</b>	The operating system of the RDP client ( <b>SUT</b> ), which can be either a Windows or non-Windows operating system.  Default value: <b>Windows</b>
<b>workgroupDomain</b>	The Test Environment type. If you are using the <b>Domain Environment</b> , set the value below to <b>Domain</b> . If you are using the <b>Workgroup Environment</b> , ensure the value below is set to <b>Workgroup</b> .  Default value: <b>Workgroup</b>
<b>tcSystemDrive</b>	The system drive letter of the <b>SUT</b> machine, which applies only to an <b>SUT</b> that is running a Windows operating system.  Default value: <b>C</b>

4. If Windows PowerShell is not running, start it by typing “PowerShell” at the **Start** menu, right-click **Windows PowerShell**, and then select **Run as Administrator** in the context menu that appears.
5. To set the execution policy to Unrestricted, type the following at the PowerShell command prompt, and then press the **Enter** key on your keyboard:

```
Set-ExecutionPolicy Unrestricted -F
```

6. To change to the \Scripts directory, type the following at the PowerShell command prompt and then press the **Enter** key on your keyboard.

```
cd C:\RDP-TestSuite-ClientEP\Scripts
```

7. To configure the Driver computer, type the following at the PowerShell command prompt and then press the **Enter** key on your keyboard.

```
. \Config-DriverComputer.ps1
```



#### Note

After the automation script `.\Config-DriverComputer.ps1` in the previous step runs, the following occurs:

- The script will change the Remote Desktop Service port to 4488 and restart this service (that is, if the value of the **RDPLISTENINGPORT** was previously set to 3389 and the Remote Desktop Service is running on the **Driver** computer).
- The following files are generated in the C:\ directory:
  - ComputerName.cer
  - ComputerName.pfx

The **ComputerName** specification above represents the **Driver** computer name that you configured earlier in the `ParamConfig.xml` file.



#### Important

The certificate **ComputerName.cer** is generated for testing purposes and is not from a trusted Certificate Authority. Therefore, when you run Test Cases, a dialog may pop up with a warning statement such as: **The identity of the remote computer cannot be verified. Do you want to connect anyway?** If so, click **Yes** and then select the **Don't ask me again for connections to this computer** checkbox to prevent this dialog from displaying again.

However, you can optionally install this certificate on the **SUT** computer to avoid display of the above warning dialog each time you attempt a remote **SUT** connection to run your Test Cases, by copying the `ComputerName.cer` file to the **SUT** in the steps that follow.

#### ► To install the `ComputerName.cer` certificate on the **SUT** computer:

1. On the **SUT** computer, click **Start** and then type “Run”, to open the **Run** dialog.
2. In the **Run** dialog, type “MMC” and then click **OK**.
3. From the **File** menu of the Microsoft Management Console, click **Add/Remove Snap-in**.
4. In the **Add or Remove Snap-ins** dialog, select **Certificates** and click **Add**.
5. In the **Certificates snap-in** dialog that displays, select the **Computer account** option and click **Next**.
6. In the **Select Computer** dialog, accept the default **Local computer: (the computer this console is running on)** option and click **Finish**.
7. In the **Add or Remove Snap-ins** dialog, click **OK**.
8. In the left pane of the Microsoft Management Console, expand the **Certificates (Local Computer)** node, and then expand the **Trusted Root Certification Authorities** folder.
9. Under **Trusted Root Certification Authorities**, right-click the **Certificates** subfolder, click **All Tasks**, and then click **Import**.

10. On the **Certificate Import Wizard Welcome** page, click **Next**.
11. On the **File to Import** page of the wizard, click **Browse**.  
Browse to the location of the **ComputerName.cer** file, select the file, then click **Open**.
12. On the **File to Import** page of the wizard, click **Next**.
13. On the **Certificate Store** page of the wizard, accept the default selection, and then click **Next**.
14. On the **Completing the Certificate Import Wizard** page, click **Finish**.

At this point, you can optionally configure Group Policy for the RDPEFGX AVC 444 feature in the steps that follow.



#### Note

To enable AVC 444 mode in Windows 10 or Windows Server 2016 and later versions, you will need to configure Group Policy in the **Group Policy Editor**. In the procedure that follows, you will set up an AVC 444-supported environment.

► **To configure Group Policy for the RDPEFGX AVC 444 feature:**

1. Open the **Local Group Policy Editor** by typing “gpedit.msc” in the **Run** dialog and clicking **OK**.
2. Navigate to the location immediately below:

```
Computer Configuration\Administrative Templates\Windows  
Components\Remote Desktop Services\Remote Desktop Session Host\  
Remote Session Environment
```

3. Enable AVC 444 by doing the following:
  - a. Right-click the **Configure H.264/AVC hardware encoding for Remote Desktop connections** setting and select **Edit** in the context menu that displays.
  - b. In the **Configure H.264/AVC hardware encoding for Remote Desktop connections** settings dialog, select the **Enabled** option, click **Apply**, and then click **OK** to exit the dialog.

This policy enables hardware encoding for AVC/H.264 when used in conjunction with the AVC 444 mode. When enabled, each remote desktop monitor will use up to one AVC/H.264 encoder on the server. If all AVC/H.264 encoders are in use, the RDP Server will automatically fallback to using software encoding.

## Configuring Non-Windows Test Environment Computers

This User Guide provides only the following limited information on configuring the Test Environment to support non-Windows based computers.

► **To configure non-Windows computers, perform the steps that follow:**

1. For domain environments, join all computers to the domain of the **DC computer**.
2. Disable active firewalls on all computers as described in [Verifying Test Environment Connectivity](#) from the Driver Computer.
3. To configure the **SUT computer**, perform the following steps:

- a. Set up the client implementations of the protocols to be tested.
  - b. Enable redirection for USB devices.
  - c. Plug in the OSR USB FX2 board.

See the table in [Test Environment Computer Requirements](#) if you need to purchase an OSR USB FX2 board.
  - d. On the **SUT** computer, optionally install the Certificate that was generated on the **Driver computer**. See [Configuring the Driver Computer](#) for the installation process.
4. To configure the **DC** computer, install the appropriate domain directory services.



#### Note

To perform the previous step, you may need to consult the administrative documentation for your operating system.

## Configuring the Test Suite

The RDP Client Test Suite is installed with default configuration settings that include property values that are automatically populated to the RDP\_ClientTestSuite.deployment.ptfconfig file during **Test Suite** installation. It is likely you will need to change some of these settings to accommodate your Test Environment or if you want to customize your test runs. If so, you can optionally change the following settings of the **Test Suite**:

- **Unique Test Environment settings** — including computer names and IP addresses.
- **Unique Test Suite settings** — including the RDP protocol version and target operating system version.
- **Timers** — set time limits on discrete test tasks and on test run duration using the **WaitTime** property.

To modify any configuration settings you will need to open the RDP\_ClientTestSuite.deployment.ptfconfig file from the following **Driver** computer directory location:

C:\RDP-TestSuite-ClientEP\Bin



The tasks for configuring the **RDP Test Suite** are described in the following topics:

[Required Configuration Settings](#)

[Optional Configuration Settings](#)

## Required Configuration Settings

This section describes the configuration settings that are required for running the **RDP Client Test Suite** Test Cases. Some are required settings that must be verified in the appropriate configuration file. For example, you will need to verify the RDP\_ClientTestSuite.deployment.ptfconfig file against the properties and values described in [Common Required Property Settings](#) that follow.

In other cases, specific property settings are required for particular RDP protocol extensions, as described in [Property Settings Required for RDP Protocol Extension Test Cases](#). These will also be set in the RDP\_ClientTestSuite.deployment.ptfconfig file, which you should also verify for valid values.



#### Note

If a data table is not provided in the latter-specified section for a specific RDP protocol extension, it means that no additional configuration settings are required for the Test Cases of that protocol implementation.

## Common Required Property Settings

The following table describes the common property settings that are required for all Test Cases, as specified in the RDP\_ClientTestSuite.deployment.ptfconfig file.

Table 9. Required property settings for all RDP Test Cases

Property	Description/Value
ServerPort	The port number that listens for RDP connection requests. The default value used in this <b>Test Suite</b> : <b>3389</b>
IPVersion	The IP version used in Test Environment. Default value: <b>Ipv4</b>
Version	The core RDP protocol version running on the <b>SUT</b> computer. Default value: <b>10.6</b>
Negotiation	The <b>Negotiation</b> is in <b>Security</b> group, possible value is <b>True</b> or <b>False</b> . If the value is <b>True</b> , it indicates that the <b>Test Suite</b> uses the “Negotiation-Based Approach” to select a security mechanism, as described in <a href="#">MS-RDPBCGR section 5.4.2.1</a> . If the value is <b>False</b> , it indicates that the “Direct Approach” will be used, as described in <a href="#">MS-RDPBCGR section 5.4.2.2</a> . Default value: <b>True</b>
Protocol	The <b>Protocol</b> is in <b>Security</b> group and this security protocol used to secure the RDP session. The possible values are enhanced <b>TLS</b> , <b>CredSSP</b> , and standard <b>RDP</b> . Default value: <b>TLS</b>  <b>Note</b> Test Cases of the MS-RDPEUDP and MS-RDPEMT protocols must be run under TLS or CredSSP security.

Property	Description/Value
<b>Level</b>	<p>The <b>Level</b> is in <b>Security</b> group and <b>Encryption</b> subgroup. It is encryption level of the RDP session. The possible values are <b>None</b>, <b>Low</b>, <b>Client</b>, <b>High</b>, and <b>FIPS</b>.</p> <p>Default value: <b>None</b></p> <p> <b>Note</b> If the <b>Protocol</b> value is set to <b>TLS</b> or <b>CredSSP</b>, the encryption level property must be set to <b>None</b>. Otherwise, use one of the other encryption levels.</p>
<b>Method</b>	<p>The <b>Method</b> is in <b>Security</b> group and <b>Encryption</b> subgroup. It is encryption method of the RDP session. The possible values are, <b>None</b>, <b>40bit</b>, <b>56bit</b>, <b>128bit</b>, <b>FIPS</b>.</p> <p>Default value: <b>None</b></p> <p> <b>Note</b> If the <b>Protocol</b> value is set to <b>TLS</b> or <b>CredSSP</b>, this property must be set to <b>None</b>. If the <b>Level</b> value is set to <b>FIPS</b>, this property must be set to <b>FIPS</b>.</p>
<b>IsClientToServerEncrypted</b>	<p>The <b>IsClientToServerEncrypted</b> is in <b>Security</b> group and indicates whether or not client-to-server traffic is encrypted. The possible values are <b>True</b> and <b>False</b>.</p> <p>Default value: <b>True</b></p>
<b>IsWindowsImplementation</b>	<p>Indicates if the <b>SUT</b> computer is hosting a Windows implementation. The possible values are <b>True</b> and <b>False</b>.</p> <p>Default value: <b>True</b></p>
<b>DropConnectionForInvalidRequest</b>	<p>The <b>DropConnectionForInvalidRequest</b> is in <b>Security</b> group and indicates if the <b>SUT</b> computer will drop the connection when an invalid request is received. The possible values are <b>True</b> and <b>False</b>.</p> <p>Default value: <b>True</b></p>
<b>CertificatePath</b>	<p>The Personal Information Exchange (.pfx) certificate used to secure TLS or CredSSP transports. If the <b>Protocol</b> value is set to <b>TLS</b> or <b>CredSSP</b>, this property must be set.</p> <p>Default value: <b>C:\DriverComputer.pfx</b></p>

Property	Description/Value
<b>CertificatePassword</b>	<p>The password of the certificate identified in the <b>CertificatePath</b> value.</p> <p>Default value: <b>Password01!</b></p>
<b>VerifyRdpbcgrMessage</b>	<p>Enables or disables message field verification as defined in MS-RDPBCGR. Set to <b>True</b> to enable, otherwise set to <b>False</b> to disable.</p> <p>Default value: <b>True</b></p>
<b>Enable</b>	<p>The <b>Enable</b> is in <b>VerifySUTDisplay</b> group and it indicates enable or disable display verification on the <b>SUT</b> Computer. This function is only available when running the Test Suite in the protocol-based mode. For related information, see <a href="#">Configuring Common Test Suite Mode Settings</a>.</p> <p>Default value: <b>False</b></p>
<b>BitmapSavePath</b>	<p>The <b>BitmapSavePath</b> is in <b>VerifySUTDisplay</b> group and this path for saving screenshots on the <b>SUT</b> computer. If the <b>Enable</b> property is false, ignore this property.</p> <p>Default value: <b>../../ScreenShot</b></p>
<b>Algorithm</b>	<p>The <b>Algorithm</b> is in <b>VerifySUTDisplay</b> group and <b>IQA</b> subgroup. The algorithm that is used to assess whether two images are similar. The algorithm should be one of the following:</p> <ul style="list-style-type: none"> <li>• <b>SSIM: Structural Similarity Index</b></li> <li>• <b>MS-SSIM: Multiscale-SSIM</b></li> <li>• <b>G-SSIM: Gradient-Based-SSIM</b></li> </ul> <p>These algorithms are used to verify the image encoded by using the RemoteFX codec, as described in <a href="#">MS-RDPRFX</a>.</p> <p>If <b>Enable</b> is set to false, ignore this property.</p> <p>Default value: <b>MS-SSIM</b></p>

Property	Description/Value
<b>AssessValuethereshold</b>	<p>The <b>AssessValueThreshold</b> is in <b>VerifySUTDisplay</b> group and <b>IQA</b> subgroup. Threshold for the expected assess value, which is used by the image quality assessment (IQA) algorithm when verifying RemoteFX codec output. The Test Suite concludes that two images are similar if the IQA value falls within the threshold boundaries that follow.</p> <p>The value should be a floating point number in the range: <math>0 \leq \text{AssessValueThreshold} \leq 1</math>.</p> <p>If <b>Enable</b> is false, ignore this property.</p> <p>Default value: <b>0.98</b></p>
<b>ShiftX</b>	<p>The <b>ShiftX</b> is in <b>VerifySUTDisplay</b> group and it verifies the horizontal position of the RDP client (<b>SUT</b>) window relative to the top-left position of the screen.</p> <p>If <b>Enable</b> is set to false, ignore this property.</p> <p>Default value: <b>0</b></p>
<b>ShiftY</b>	<p>The <b>ShiftY</b> is in <b>VerifySUTDisplay</b> group and it verifies the vertical position of the RDP client (<b>SUT</b>) window relative to the top-left position of the screen.</p> <p>If <b>Enable</b> is set to false, ignore this property.</p> <p>Default value: <b>0</b></p>

## Property Settings Required for RDP Protocol Extension Test Cases

This section describes the property settings that are required for the Test Cases of specific RDP protocol extensions that are part of the **SUT** implementation configuration. The protocols that require property setting verification include the following:

- MS- RDPBCGR
- MS- RDPRFX
- MS- RDPEGFX
- MS- RDPEDISP

If a particular RDP extension protocol is not listed here in a data table, then no additional configuration verification is required for the Test Cases of that protocol.

### MS-RDPBCGR Required Property Settings

The following data table describes the property settings required for MS-RDPBCGR Test Cases only.

**Table 10. Required property settings for MS- RDPBCGR Test Cases**

Property	Description/Value
SupportFastPathInput	Indicates whether the remote desktop client ( <b>SUT</b> computer) installation supports Fast-Path Input. Possible values are <b>True</b> and <b>False</b> . Default value: <b>True</b>
SupportAutoReconnect	Indicates if the remote desktop client ( <b>SUT</b> ) installation supports Auto-Reconnect. Possible values are <b>True</b> and <b>False</b> . Default value: <b>True</b>
SupportRDPEFS	Indicates if the remote desktop client ( <b>SUT</b> ) installation supports File System Virtual Channel Extension (see <a href="#">MS-RDPEFS</a> ). Possible values are <b>True</b> and <b>False</b> . Default value: <b>True</b>
SupportServerRedirection	Indicates if the remote desktop client ( <b>SUT</b> ) installation supports Server Redirection. The possible values are <b>True</b> and <b>False</b> . Default value: <b>True</b>

## MS-RDPRFX Required Property Settings

The following data table describes the property settings required for MS-RDPRFX Test Cases only.

**Table 11.** Required property settings for MS- RDPRFX Test Cases

Property	Description/Value
RDPRFXImage	Determines how <b>RDP Test Suite</b> acquires image data that is used by MS-RDPRFX Test Cases to send image information to the RDP client ( <b>SUT</b> ). The value setting can be either Screen, or the path to an image file. Default value: ..../TestData/Rdprfx.bmp
RDPRFXVideoModelImage	Determine how test suite get the image data for video mode, which is used by RDPRFX test cases to send image to the client. It should be set to Screen, or the path of an image file. Default value: ..../TestData/RdprfxVideoMode.bmp

## MS-RDPEGFX Required Property Settings

The following data table describes the property settings required for MS-RDPEGFX Test Cases only

**Table 12.** Required property settings for MS- RDPEGFX Test Cases

Property	Description/Value
ClearCodecImage	<p>The path to an image file that is used to perform the ClearCodec test.</p> <p>The requirements for the image consist of the following size : 256 * 256 pixels</p> <p>The top-left 64 * 64 pixel rectangle should have a different color from background, for example, the image should have some text or sign in a different color.</p> <p>Default value: <code>../TestData/RdpegfxClearCodecTestImage.bmp</code></p> <p>Note that this image is included in the <b>RDP Test Suite</b> in the following directory location on the <b>Driver computer</b>:</p> <p style="text-align: center;"><code>C:\RDP-TestSuite-ClientEP\</code></p>
RfxProgressiveCodecImage	<p>The path to an image file that is used to perform the RemoteFx Progressive Codec test.</p> <p>The requirement for the image consists of the following:</p> <p>Size : 256 * 256 pixels</p> <p>Default value: <code>../TestData/RdpegfxRfxProgressiveCodecTestImage.bmp</code>. This image is included in the <b>RDP Test Suite</b> in the following directory location on the <b>Driver computer</b>:</p> <p style="text-align: center;"><code>C:\RDP-TestSuite-ClientEP\</code></p>
RdpegfxH264TestDataPath	<p>The path to data files that are used to test the H264 codec.</p> <p>Default value: <code>../TestData/</code></p>

## MS-RDPEDISP Required Property Settings

The following data table describes the property settings required for MS-RDPEDISP Test Cases only.

**Table 13. Required property settings for MS- RDPEDISP Test Cases**

Property	Description/Value
RdpdispTestImage	<p>The path to an image file that is used to in the performance of an RDPEPDISP test case.</p> <p>Default value: <code>../TestData/RdpdispTestImage.bmp</code>. This image is included in the <b>RDP Test Suite</b>.</p> <p> <b>Note</b> There is no specific requirement for the image.</p>
OriginalDesktopWidth	<p>The original screen resolution width.</p> <p>Default value: <code>1024</code></p>

Property	Description/Value
OriginalDesktopHeight	The original screen resolution height. Default value: <b>768</b>
ChangedDesktopWidth	The changed screen resolution width. Default value: <b>1152</b>
ChangedDesktopHeight	The changed screen resolution height. Default value: <b>864</b>
OriginalMonitorNumber	The original number of screens. Default value: <b>1</b>
ChangedMonitorNumber	The changed number of screens. Default value: <b>2</b>

## Optional Configuration Settings

The following table describes optionally configurable properties and suggested value settings in the RDP\_ClientTestSuite.deployment.ptfconfig file.

Table 14. Optional property settings

Property	Description/Value
ServerDomain	If you are using CredSSP security, set this property value to define the domain name where the <b>Driver</b> computer resides. If the computer is not in a domain, then use the computer IP or computer name. Default value: <b>contoso.com</b>
ServerUserName	If using CredSSP security, set this property value to define the security account user name. Default value: <b>Administrator</b>
ServerUserPassword	The password for the <b>ServerUserName</b> account. Default value: <b>Password01!</b>
SUTName	Specify the computer name or IP address of the <b>SUT computer</b> . Default value: <b>SUT01</b>

Property	Description/Value
SUTUserName	If the <b>SUT</b> is using a Windows operating system, specify the local administrator account used to log on to the machine. Required value: <b>Administrator</b>
SUTUserPassword	The password that is used to log on to the local administrator account of the <b>SUT</b> . Default value: <b>Password01!</b>
SUTSystemDrive	If the <b>SUT</b> is using a Windows operating system, specify the system drive letter of the machine. Default value: <b>C</b>
WaitTime	The maximum time in seconds to wait for one <b>SUT</b> computer response message. Default value: <b>40</b>

## Running Test Cases

The **RDP Test Suite** includes command files that you can use to execute the Test Cases. Each Test Case verifies a protocol implementation based on a preconfigured scenario.

The directory location that follows contains the command files for all the Test Cases:

C:\RDP-TestSuite-ClientEP\Batch

You can use any of the following methods to run your Test Cases:

- Run the Test Cases via PowerShell scripts, as described in [Running Test Cases in the Test Suite Modes](#).
- Run the Test Cases using the Protocol Test Manager (PTM) graphical user interface (UI), as described in [Using Protocol Test Manager](#).



### Note

If you choose the latter option, PTM will need to be installed and configured to generate a set of Test Cases that you can modify or execute as is.



The major topics covered in this section include the following:

[Test Run Pre-Configuration](#)

[Running Verification Tests](#)

[Running All Test Cases](#)

[Running Specific Test Cases](#)

[Example : Running Test Cases in Interactive Mode](#)

[Example : Running RDPEI Test Cases in Interactive Mode](#)

[Viewing Test Results](#)

[Running and Debugging Test Cases With Visual Studio](#)

## Test Run Pre-Configuration

Before you actually run the Test Cases, some additional configuration is required for the **Test Suite** and Test Cases for several protocol implementations under test, as specified in the topics that follow:

- [Configuring Common Test Suite Mode Settings](#)
- [Configuring the Test Suite Mode for MS-RDPEI Events](#)
- [Configuring the Test Suite Mode for MS-RDPEDISP Events](#)

## Configuring Common Test Suite Mode Settings

Test Cases control the RDP client system (**SUT** computer) and typically generate common events such as the following:

**Connection** — event is triggered by RDP connection setup.

**Disconnection** — event is triggered by RDP disconnection.

**User input** — event is triggered from user input, such as keyboard or mouse input.

These events are generated in the three different Test Suite modes you can use to control the RDP client, as follows:

- **PowerShell**
- **Interactive**
- **Managed**



### Note

If you plan to run Test Cases in PowerShell mode, you must log on with the local Administrator account.

The functions that are provided by these **Test Suite** modes are described in [Running Test Cases in the Test Suite Modes](#).

## Controlling the RDP Client on a Windows SUT Computer

The procedure that follows enables you to configure the **Test Suite** using one of three different modes to control the RDP client system on a Windows-based **SUT**.

► **To configure the Test Suite mode for Windows-based RDP clients:**

1. Open the RDP\_ClientTestSuite.ptfconfig configuration file from the following directory location:  
C:\RDP-TestSuite-ClientEP\Bin
2. In the .ptfconfig file, locate the < Adapter xsi:type="powershell" name="IRdpSutControlAdapter" scriptdir ="." /> option in the **adapters** node.

Note that the default **Test Suite** mode is **Powershell**.

3. To change the **Test Suite** mode from the default, do either of the following as required:
  - To use the **Interactive** mode, set the xsi:type value to “interactive”, as in: < Adapter xsi:type="interactive" name="IRdpSutControlAdapter" />.
  - To use the **Managed** mode, set the xsi:type value to “managed”, as in: < Adapter xsi:type="managed" name="IRdpSutControlAdapter" adaptertype="Microsoft.Protocols.TestTools.Rdp.ProtocolBasedRdpSUTControlAdapter"/> .

## Running Test Cases in the Test Suite Modes

This section describes the functions of each mode and the common actions that occur when running Test Cases in the different **Test Suite** modes.

**PowerShell Mode** When using the **PowerShell** adapter mode, Test Cases automatically control the RDP client (**SUT**) via the PowerShell script that is executing. To customize PowerShell operations in these scripts, you can modify them, providing that you are familiar with the technologies involved. Note that the name of each script below specifies the operation/s that are performed by it:

- RDPConnectWithDirectCredSSP.ps1
- RDPConnectWithDirectTLS.ps1
- RDPConnectWithNegotiationApproach.ps1
- RDPConnectWithDirectCredSSPFullScreen.ps1
- RDPConnectWithDirectTLSFullScreen.ps1
- RDPConnectWithNegotiationApproachFullScreen.ps1
- TriggerClientAutoReconnect.ps1
- TriggerClientDisconnect.ps1
- TriggerClientDisconnectAll.ps1
- TriggerInputEvents.ps1

### More Information

To learn more about PowerShell scripting, go to [Starting Windows PowerShell](#).

**Interactive Mode** When you are using the **Interactive** mode, Test Cases will display dialog boxes that guide you in the manual performance of test steps, making the implementation of PowerShell scripts unnecessary in this mode.

**Managed Mode** When you are using the **Managed** mode, Test Cases use certain features to control the RDP client system. To facilitate this mode, an agent must be implemented on the RDP client (**SUT**) in accordance with the [RDP SUT Remote Control Protocol](#) documentation. The agent is used to receive **SUT** control requests from the **Test Suite** and to thereafter facilitate Test Case execution on the **SUT**.

## Configuring the Test Suite Mode for MS-RDPEI Events

With exception of the common events described earlier in [Test Suite Mode Configuration](#), the MS-RDPEI Test Cases must control the RDP client (**SUT** computer) to generate Touch events. The three different modes to control the RDP client system (**SUT**) for MS-RDPEI Test Cases are listed immediately below:

- **Interactive**
- **PowerShell**
- **Managed**

The functions that are provided by these **Test Suite** modes are described in [Running MS-RDPEI Test Cases in the Test Suite Modes](#).

## Choosing a Test Suite Mode Setting for MS-RDPEI Test Cases

In the procedure that follows you can configure the **Test Suite** to enable the MS-RDPEI Test Cases to control the RDP client system (**SUT**) using one of the previously listed modes.

### ► To configure the Test Suite mode to enable RDPEI control of the RDP client:

1. Open the `RDP_ClientTestSuite.ptfconfig` configuration file that is located in the following directory location on the **Driver** computer:

`C:\RDP-TestSuite-ClientEP\Bin`

2. In the `.ptfconfig` file, locate the `< Adapter xsi:type="interactive" name="IRdpeiSUTControlAdapter" />` option in the **adapters** node.

Note that the default mode in this scenario is **Interactive**.

3. To change the **Test Suite** mode from the default, do either of the following as required:

- To use the **PowerShell** mode, set the `xsi:type` value to “`PowerShell`”, as in: `< Adapter xsi:type="PowerShell" name="IRdpeiSUTControlAdapter" adaptertype="Microsoft.Protocols.TestSuites.Rdpei.RdpeiSUTControlAdapter"/>` .
- To use the **Managed** mode, set the `xsi:type` value to “`managed`”, as in: `< Adapter xsi:type="managed" name="IRdpeiSUTControlAdapter" adaptertype="Microsoft.Protocols.TestSuites.Rdp.ProtocolBasedRdpeiSUTControlAdapter"/>`.

## Running MS-RDPEI Test Cases in the Test Suite Modes

This section describes the functions of each mode and the actions that occur when running MS-RDPEI Test Cases in the different **Test Suite** modes.

**Interactive Mode** When you are using the **Interactive** mode, Test Cases will display dialog boxes that guide you in the manual performance of test steps.

**PowerShell Mode** The RDP client system must support MS-RDPRFX features when using the **PowerShell** mode. In the **PowerShell** mode, you can trigger Touch events to change the **SUT** computer screen via PowerShell scripts.

**Managed Mode** When you are using the **Managed** mode, an agent must be implemented on the **SUT**, as described in the [RDP SUT Remote Control Protocol](#) documentation. This agent receives **SUT** control requests from the **Test Suite** and thereafter facilitates Test Case execution on the RDP client (**SUT**).

## Configuring the Test Suite Mode for MS-RDPEDISP Events

With exception of the common events described earlier in [Test Suite Mode Configuration](#), the MS-RDPEDISP Test Cases must control the RDP client (**SUT computer**) to generate display events. The three different modes to control the RDP client for MS-RDPEDISP Test Cases are listed immediately below:

- **PowerShell**
- **Interactive**
- **Managed**

The functions that are provided by these **Test Suite** modes are described in [Running MS-RDPEDISP Test Cases in the Test Suite Modes](#).

## Choosing a Test Suite Mode Setting for MS-RDPEDISP Test Cases

In the procedure that follows you can configure the Test Suite to enable the MS-RDPEDISP Test Cases to control the RDP client (SUT) using one of the previously mentioned modes.

### ► To configure the Test Suite mode to enable MS-RDPEDISP control of the RDP client:

1. Open the `RDP_ClientTestSuite.ptfconfig` configuration file from the following directory location:

`C:\RDP-TestSuite-ClientEP\Bin`

2. In the `.ptfconfig` file, locate the `< Adapter xsi:type="powershell" name="IRdpdispSUTControlAdapter" scriptdir="." />` option in the **adapters** node.

Note that the default mode in this scenario is **Powershell**.

3. To change the **Test Suite** mode from the default, do either of the following as required:

- To use the **Interactive** mode, set the `xsi:type` value to “interactive”, as in: `< Adapter xsi:type="interactive" name="IRdpdispSUTControlAdapter" />`.
- To use the **Managed** mode, set the `xsi:type` value to “managed”, as in: `< Adapter xsi:type="managed" name="IRdpdispSUTControlAdapter" adaptertype="Microsoft.Protocols.TestTools.Rdp.ProtocolBasedRdpdispSUTControlAdapter"/>`.

## Running MS-RDPEDISP Test Cases in the Test Suite Modes

This section describes the functions of each mode and the actions that occur when running MS-RDPEDISP Test Cases in the different Test Suite modes.

**PowerShell Mode** When using the **PowerShell** mode, Test Cases set up the RDP connection to automatically trigger the **SUT** by [\[PowerShell Core Remoting over SSH\]](#) to connect to the **RDP Client Test Suite** and change the **SUT** display configuration.

**Interactive Mode** When using the **Interactive** mode, Test Cases will display dialog boxes that guide you in the manual performance of test steps.

**Managed Mode** When using the **Managed** mode, an agent must be implemented on the **SUT computer**, as described in the [RDP SUT Remote Control Protocol](#) documentation. This agent receives **SUT** control requests from the **Test Suite** and thereafter facilitates Test Case execution on the RDP client (**SUT**).

## Running Verification Tests

The **RDP Client Test Suite** includes a set of basic tests known as build verification tests (BVTs). The BVTs are a set of Scenario S1 Test Cases, as specified in the [RDP Client Test Design Specification](#), that together perform verification tests that confirm whether the **Test Suite** is properly configured and ready to run Test Cases. To run Scenario S1 Test Cases, execute each command file specified in the table that follows.

You will find the BVT command files (.ps1) in the directory location below on the **Driver** computer:

C:\RDP-TestSuite-ClientEP\Batch\

Note that the command files (.ps1) in this directory are accessible from a directory shortcut named **Run Test Cases Scripts** on your **Driver** computer desktop, which is created during the **Test Suite** installation process.

**Table 15. Verification tests and executable command files on the Driver computer**

Verification Test Entity	Verification Command File
All BVT	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT"
MS-RDPBCGR	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPBCGR"
MS-RDPEUSB	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEUSB"
MS-RDPRFX	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPRFX"
MS-RDPEVOR	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEVOR"
MS-RDPEUDP	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEUDP"
MS-RDPEMT	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEMT"
MS-RDPEI	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEI"
MS-RDPEGFX	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEGFX"
MS-RDPEDISP	RunTestCasesByFilter.ps1 -Filter "TestCategory=BVT&TestCategory=RDPEDISP"

## Running All Test Cases

The table that follows specifies test case entities, command files, and the action to take to execute them. You can access the command files (.ps1) for all the Test Cases from the directory location immediately below:

C:\RDP-TestSuite-ClientEP\Batch\

Note that the command files (.ps1) in the above directory are accessible from a directory shortcut named **Run Test Cases Scripts**, which is created on your **Driver computer** desktop during the **Test Suite** installation process.

**Table 16. Test Cases and executable command files on the Driver computer**

Verification Test Entity	Verification Command File
--------------------------	---------------------------

All BVT	RunAllTestCases.ps1
MS-RDPBCGR	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPBCGR"
MS-RDPEUSB	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEUSB"
MS-RDPRFX	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPRFX"
MS-RDPEVOR	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEVOR"
MS-RDPEUDP	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEUDP"
MS-RDPEMT	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEMT"
MS-RDPEI	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEI"
MS-RDPEGFX	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEGFX"
MS-RDPEDISP	RunTestCasesByFilter.ps1 -Filter "TestCategory=RDPEDISP"

## Running Specific Test Cases

To run a specific test case from the **Driver computer**, execute the following command strings from an elevated command prompt:

From the PowerShell command, run C:\RDP-TestSuite-ClientEP\Batch\RunTestCasesByFilter.ps1 -Filter "Name=<TestCaseName>" to run specific test case.

Note that Test Case names can be found in the [RDP Overview Client Test Design Specification](#) document on GitHub.

## Example: Running Test Cases in Interactive Mode

This section provides an example of how to run a Test Case in **Interactive** mode. To test this example on the **Driver computer**, perform the procedure below and follow the interactive instructions.

► **To run Test Cases in an Interactive mode example:**

1. On the **Driver** computer, configure the **Test Suite** mode to **Interactive**, as described in [Configuring Common Test Suite Mode Settings](#).
2. On the **Driver** computer, run the following command:

```
C:\RDP-TestSuite-ClientEP\Batch\RunTestCasesByFilter.ps1 -Filter
"Name=BVT_ConnectionTest_CapabilityExchange_PositiveTest"
```

When this **Test Case** begins running, the following dialog is displayed:

The screenshot shows a terminal window with the following text:

```
C:\Program Files\dotnet\dotnet.exe
Help Message:
-----
Please initiate a remote desktop connection from the client using the negotiation-based approach and the TLS, CredSSP, or RDP standard security protocol.

Note: please finish the operation in 10 seconds otherwise the case will fail with timeout.

Action Parameters:
| caseName|BVT_ConnectionTest_CapabilityExchange_PositiveTest
Action Result:

Please enter [Y] when you're ready to perform interactive action or enter [N] to abort the case.> _
```

**Figure 3.** RDPConnectWithNegotiationApproach dialog

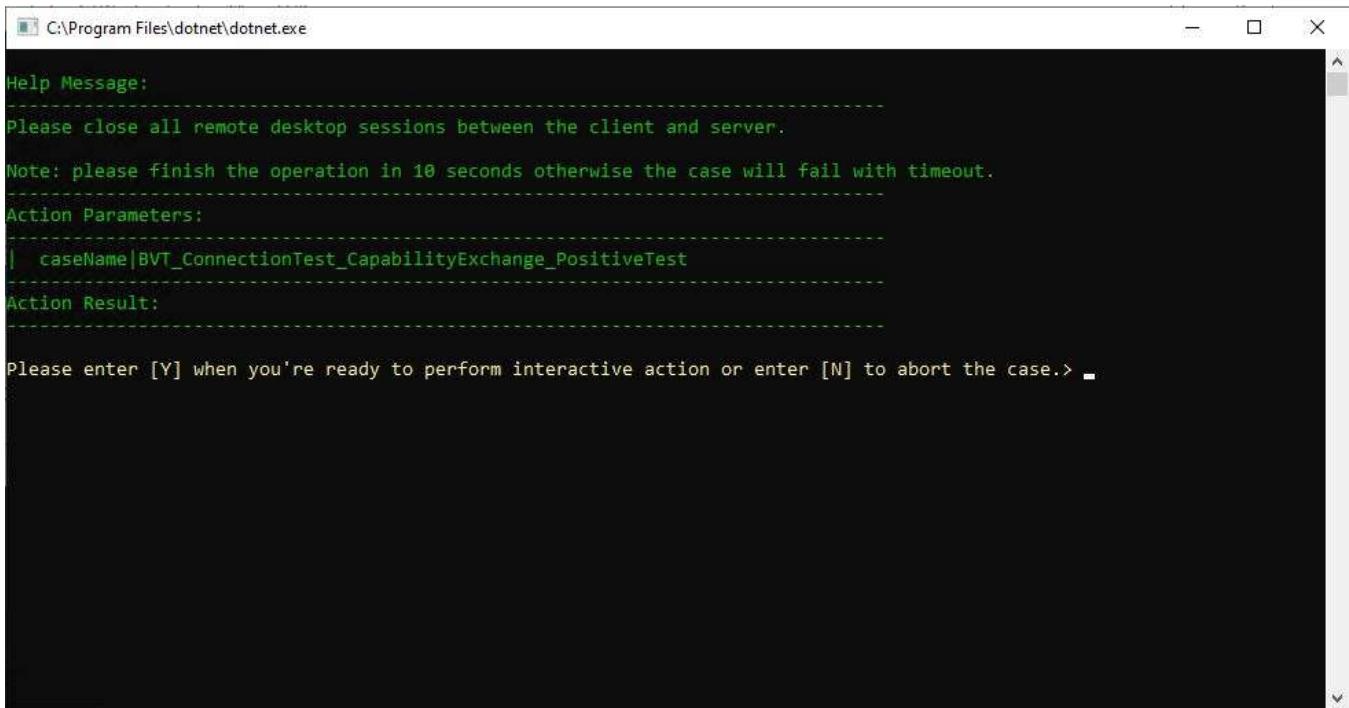
Read the **Help Message** in the dialog for instructions on manually performing the specified operations. To further accommodate the instructions, additional explanations are indicated below:

- On the **SUT computer**, start a remote desktop (RDP) connection to the **Driver** computer using the negotiation-based approach (see [MS-RDPBCGR section 5.4.2.1](#)) and specify either the TLS, Cress, or RDP standard security protocol to secure the RDP session. Once you start the RDP connection successfully, on the driver computer, input 'Y' and press "Enter" key on the console. Otherwise, if you want to abort the case, input 'N' and press "Enter" key on the console. The test case will continue to run if you press "Enter" key, otherwise, it will end and fail.

#### More Information

To learn more about using the RDP standard security and RDP enhanced security, see MS-RDPBCGR sections [5.3](#) and [5.4](#).

- After the RDP connection successfully starts, then in the **RDPConnectWithNegotiationApproach** dialog on the **Driver** computer, specify a non-negative number (such as 0) as the **Return Value** in the **Action Results** field, and then click the **Succeed** button. Otherwise, if you cannot start the RDP connection, specify a negative number (such as -1) as the **Return Value** in the **Action Results** field, specify the error message in the **Failure Message** field, and then click **Fail**.
3. After the formerly running **Test Case** finishes, observe that the following dialog displays on the **Driver** computer:



The screenshot shows a terminal window with the title bar "C:\Program Files\dotnet\dotnet.exe". The content of the window is as follows:

```
Help Message:  
-----  
Please close all remote desktop sessions between the client and server.  
Note: please finish the operation in 10 seconds otherwise the case will fail with timeout.  
Action Parameters:  
| caseName|BVT_ConnectionTest_CapabilityExchange_PositiveTest  
Action Result:  
  
Please enter [Y] when you're ready to perform interactive action or enter [N] to abort the case.> -
```

Figure 4. TriggerClientDisconnectAll dialog

According to the **Help Message**, you will do:

- On the SUT, close all the RDP connections to driver computer.  
On the driver computer, input 'Y' on the console and press "Enter" key if you close all the RDP connections successfully. Otherwise, if you want to abort the case, input 'N' and press "Enter" key on the console.

## Example: Running RDPEI Test Cases in Interactive Mode

This section provides an example of how to run RDPEI Test Cases in **Interactive** mode. However, note that the RDP connection is configured in **PowerShell** mode. To test this example on the **Driver** computer, perform the procedure below and follow the interactive instructions.

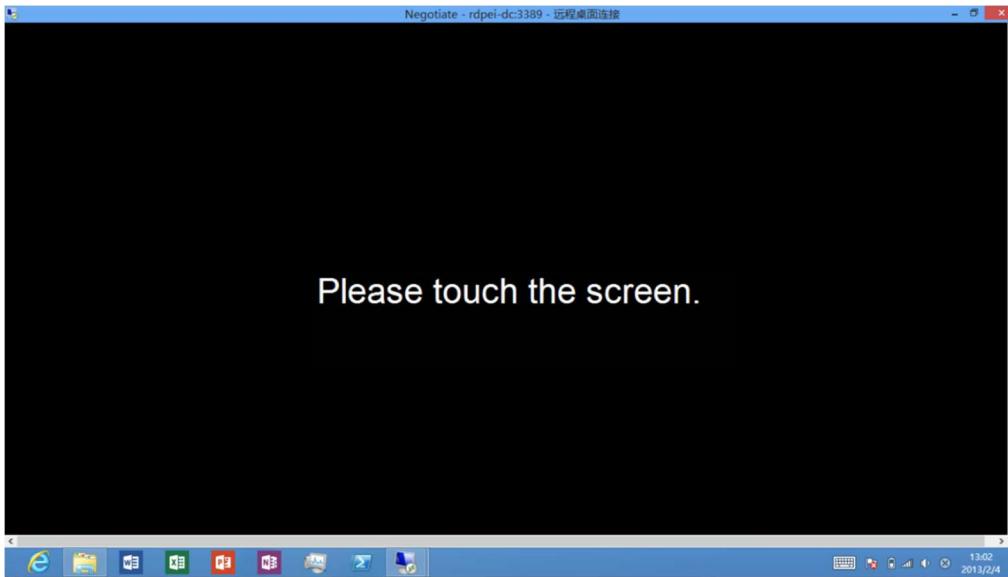
### ► To run RDPEI test cases in an Interactive mode, example:

1. On the **Driver** computer, configure the **Test Suite** mode to **Interactive**, as described in [Configuring the Test Suite Mode for MS-RDPEI Events](#).
2. On the **Driver** computer, run the following Test Case:

```
C:\RDP-TestSuite-ClientEP\Batch\RunTestCasesByFilter.ps1 -Filter "Name=Rdpei_TouchInputTest_Positive_SingleTouchEvent"
```

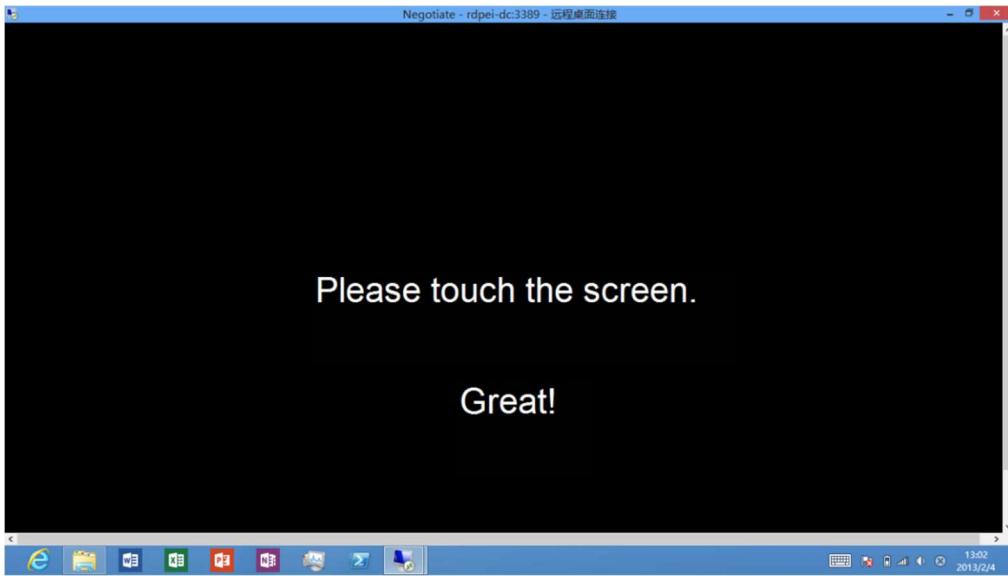
When the Test Case begins running, the **SUT computer** initiates a remote desktop (RDP) connection to the **Driver** computer using the negotiation-based approach (see [MS-RDPBCGR section 5.4.2.1](#)), and specifies either the TLS, CredSSP, or RDP standard security protocol to secure the RDP session.

3. Observe that the following RDP **Negotiate** screen displays on the **SUT** computer:



**Figure 5.** RDP Touch screen prompt

4. In the RDP **Negotiate** screen, manually touch the screen as requested.
5. Observe that the following response occurs in the **Negotiate** screen shown in the figure below, as an indication of Test Case success.
6. When the Test Case is done, wait until the **SUT** computer disconnects from the **Driver** computer, which signifies the end of the Test Case.



**Figure 6.** RDP Touch screen response

## Viewing Test Results

The **RDP Client Test Suite** test results output is located in different directory paths depending on the method used to execute the Test Cases. The table that follows identifies the test mode and the related directory locations from where you can view test results data:

**Table 17. Test Case results directories**

Test Mode	Test Results Directory
Batch files (.ps1)	C:\RDP-TestSuite-ClientEP\Batch\TestResults\
Visual Studio	C:\RDP-TestSuite-ClientEP\Source\Client\TestCode\TestResults\
Protocol Test Manager and PTMcli.exe	C:\RDP-TestSuite-ClientEP\HtmlTestResults C:\RDP-TestSuite-ClientEP\HtmlTestResults\DebugLog\

For further information about test log settings, see the [PTF User Guide](#) in the PTF installation directory.

## Running and Debugging Test Cases with Visual Studio

If you are creating your own Test Cases, typically in a C# project, you can use the RDP\_Client.sln solution file for Visual Studio to create a project for your environment in which you can run and debug your Test Cases. This solution file is available [here](#) on GitHub.



### Important

To proceed with Visual Studio debugging, you will need to have created a Visual Studio project for the **RDP Test Suite** from the RDP source code, as described earlier in [Other RDP Test Suite Acquisition Methods](#). If you did not yet acquire the source code, do the following:

► **To acquire the RDP Client Test Suite source code files, perform the following steps:**

1. Locate the **RDP Test Suite** code on GitHub in [this directory](#).
2. Download the **RDP Test Suite** files from all the folders in the previously specified directory location on GitHub, to a local directory location such as the following:

C:\RDPTestSuiteSource\



### Note

You should be able to click the **Code** button at the formerly specified GitHub directory and download a .zip file with all the RDP directories required for cloning.

To proceed with running and debugging your custom Test Cases, perform the steps that follow:

► **To run and debug test cases using an RDP Client Test Suite installation built from source code:**

1. On the **Driver computer**, use Microsoft® Visual Studio® to open the RDP\_Client.sln from the path you specified in the last procedure. Look under the .../TestSuites/RDP/Client/src subdirectory for the .sln file.
2. In the Visual Studio **Solution Explorer** window, right-click the **Solution ‘RDP\_Client’** and select **Build Solution** from the context menu that appears.
3. Configure the RDP\_ClientTestSuite.deployment.ptfconfig and RDP\_ClientTestSuite.ptfconfig files as described in [Configuring the Test Suite](#). You can locate the .ptfconfig files in the following directory

location, providing that you downloaded the **RDP Test Suite** files in accordance with the last procedure:

```
C:\RDPTestSuiteSource\WindowsProtocolTestSuites\TestSuites\RDP\Client\src\TestSuite\
```

4. From the Visual Studio **Test** menu, navigate to **Windows** and click **Test Explorer** to open the list of Test Cases and then select the name/s of the Test Case/s that you want to run and debug.
5. While Test Cases are running, monitor the VS Output Window and debug errors and warnings as they appear.

## Using Protocol Test Manager

Protocol Test Manager (PTM) is a graphical front-end for all Windows protocol **Test Suites**, which means that you can configure the **RDP Client Test Suite** environment, execute the Test Cases, and thereafter analyze all test results right from the PTM user interface (UI). The PTM also has a **Configuration Wizard** that guides you through all the review, configuration, and test execution processes. When test execution is complete, the PTM provides several formats in which to view test results data and other features with which you can conduct test results analysis.

With the use of PTM, you can simplify detection and configuration of the test environment and you can create your own customized test configuration arrangements. The list that follows summarizes a combination of tasks, some that PTM automates and others that PTM exposes for you to perform:

- PTM automates the following tasks:
  - Reviewing the execution environment (**Domain or Workgroup**).
  - Providing the **Auto-Detect** process to detect, inspect, and validate the **SUT computer** environment configuration and capabilities for test readiness.
  - Creating a default set of Test Cases, based on the assessed **SUT** environment.
- PTM exposes the features that enable you to do the following:
  - Modify the default output of the **Auto-Detection** process, by selecting/unselecting (filtering) Test Cases to create a unique test configuration that will focus on a specific set of test results.
  - Review and optionally configure Test Case properties.
  - Trigger execution of a set of Test Cases.
  - Save a test case **Profile** that preserves a specific Test Case configuration so that you can re-run it at any time by loading the **Profile** Test Cases into the PTM, or by using the PTMCli.exe command line tool to execute the Test Cases.
  - Analyze the results of Test Case execution.



The major topics covered in this section include the following:

[Installing the Protocol Test Manager](#)

[Running the Protocol Test Manager](#)

[Other PTM Configuration and Execution Methods](#)

# Installing the Protocol Test Manager

If you have not done so already, you will need to install the Protocol Test Manager (PTM) now. Ensure that the **RDP Test Suite** and all of its dependencies are installed before you do so, as described in [Software Installation](#). When ready, install the PTM on your **Driver computer** with the official **ProtocolTestManager.msi**, as follows:

► **To install the Protocol Test Manager:**

1. From the **Driver** computer, navigate [here](#) to locate the **ProtocolTestManager.msi** under the Assets topic on GitHub.
2. From the **Driver** computer, double-click the **ProtocolTestManager.msi** to run the installer.
3. Follow the installer instructions to complete the installation.

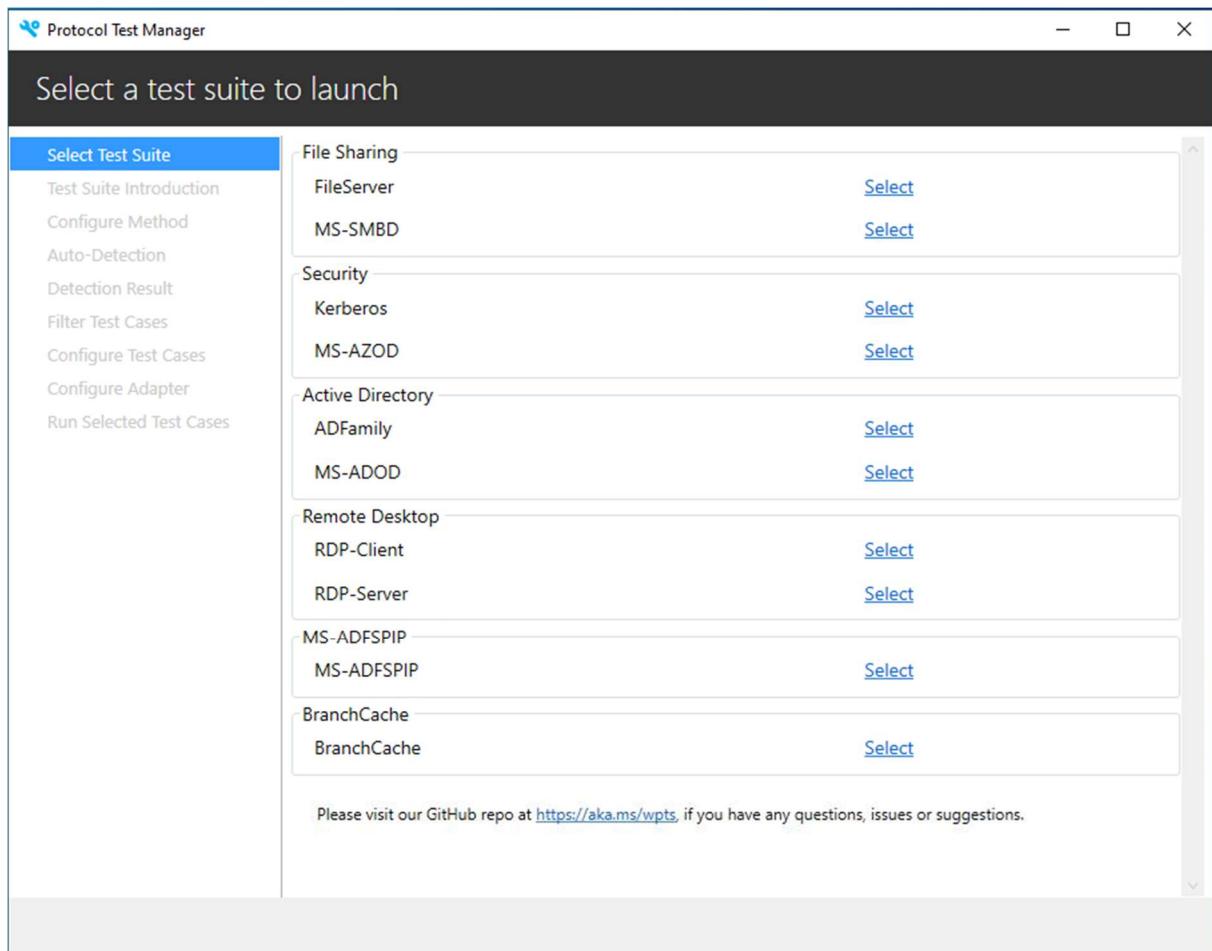
# Running the Protocol Test Manager

During PTM installation, a shortcut to the application is created on your desktop. Thereafter, to start the PTM and perform the test environment configuration and Test Case execution processes, complete the following steps:

► **To run the Protocol Test Manager**

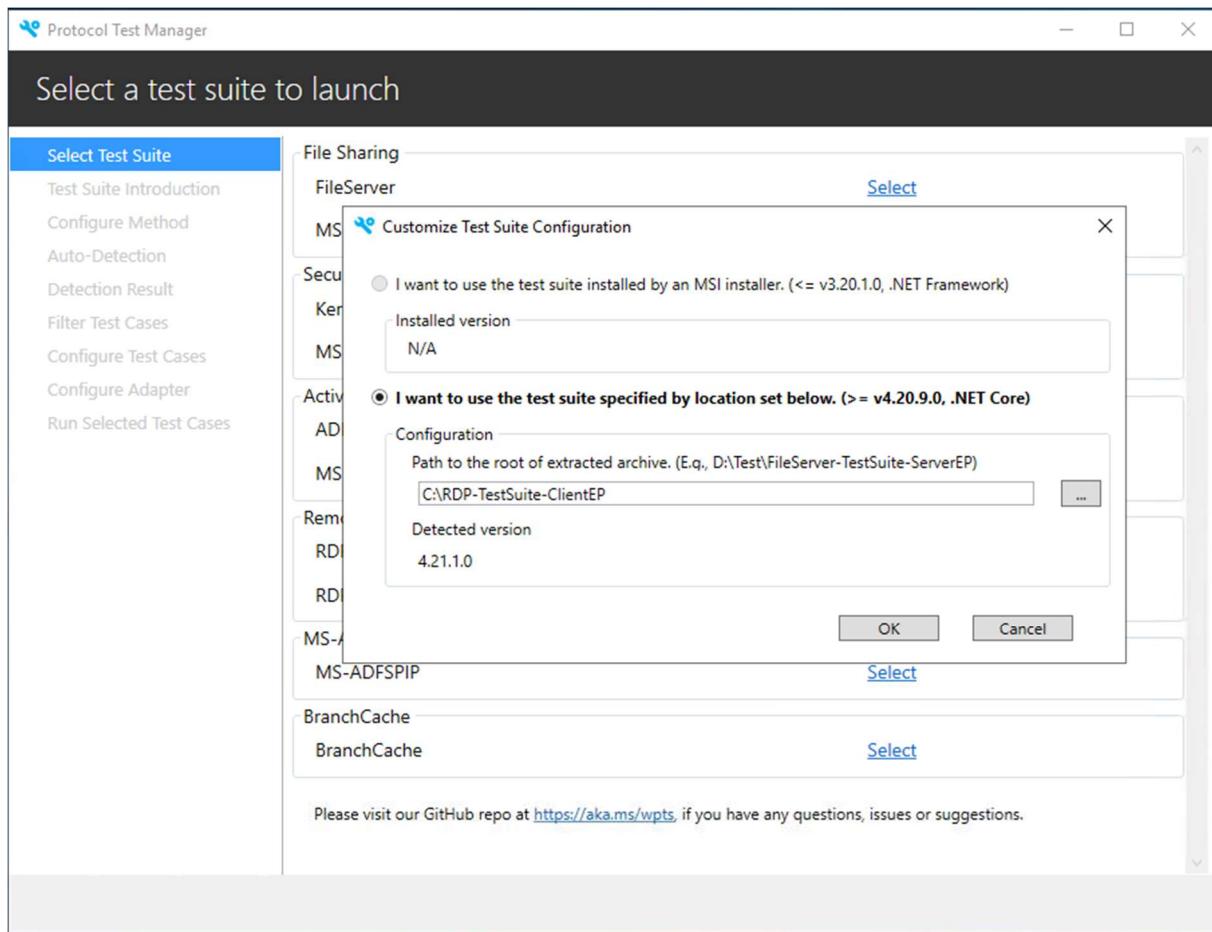
1. Double-click the **Protocol Test Manager** icon/shortcut on your desktop.

The **Select Test Suite** tab displays several Test Suites including **File Sharing**, **Security**, **RDP**, and so on. Note that the only active **Test Suite** on the opening page of the PTM Wizard is **RDP**, as indicated by the live **Run** and **Configuration Wizard** links on the right side of the UI.



**Figure 7. Protocol Test Manager: Launching the Configuration Wizard for RDP Client Test Suite**

You need to select a protocol test suite as following.



**Figure 8. Protocol Test Manager: Selecting RDP Client Test Suite Folder Path**

2. Click the **Configuration Wizard** link to begin the **Test Suite** configuration process.



**Note**

If this is for first time use, click the **Configuration Wizard** link to start the **RDP Test Suite** configuration process. Thereafter, while no Test Cases are running and if the **Test Suite** requires no further configuration changes, you can simply click **Run** to execute the existing (last) configuration of Test Cases while still retaining the existing **Test Suite** configuration settings.

At any time, you can resume configuration of the **Test Suite**, by clicking **Configuration Wizard**.

The screenshot shows the 'Protocol Test Manager - RDP-Client 4.21.1.0' application window. The title bar reads 'Protocol Test Manager - RDP-Client 4.21.1.0'. The main content area has a dark header 'Test suite introduction'. On the left, a vertical navigation menu lists: 'Select Test Suite', 'Test Suite Introduction' (which is highlighted in blue), 'Configure Method', 'Auto-Detection', 'Detection Result', 'Filter Test Cases', 'Configure Test Cases', 'Configure Adapter', and 'Run Selected Test Cases'. The right panel contains the following text:

**Remote Desktop Protocol Family Client Test Suite**

This guide provides information about how to install, configure, and run the RDP Client Endpoint Test Suite and its environment. This suite of tools is designed to test implementations of the following protocols:

- [MS-RDPBCGR]: Remote Desktop Protocol: Basic Connectivity and Graphics Remoting Specification
- [MS-RDPEUSB]: Remote Desktop Protocol: USB Devices Virtual Channel Extension
- [MS-RDPEVOR]: Remote Desktop Protocol: Video Optimized Remoting Virtual Channel Extension
- [MS-RDPRFX]: Remote Desktop Protocol: RemoteFX Codec Extension
- [MS-RDPEUDP]: Remote Desktop Protocol: UDP Transport Extension
- [MS-RDPEMT]: Remote Desktop Protocol: Multitransport Extension
- [MS-RDPEI]: Remote Desktop Protocol: Input Virtual Channel Extension
- [MS-RDPEGFX]: Remote Desktop Protocol: Graphics Pipeline Extension
- [MS-RDPEDISP]: Remote Desktop Protocol: Display Update Virtual Channel Extension

This suite of tools tests only the protocol implementation behaviors that are observed on the wire.

**Deployment Guide**

At the bottom right of the main window are buttons for '< Previous' and 'Next >'.

**Figure 9. Protocol Test Manager: Reviewing the RDP Test Suite family of protocols**

3. Read the information presented on the **Test Suite Introduction** page of the PTM Wizard and click the **Deployment Guide** link to review general information about the test environment in which you will run your Test Cases.
4. Click **Next** to display the **Choose configuration method** page of the PTM Wizard.



#### Note

It is unnecessary to click the **Configure Environment** link after reviewing the test environment, given that you will have already performed the indicated procedures earlier in this User Guide.

5. On the **Choose configuration method** page of the PTM Wizard shown in the figure that follows, click **Run Auto-Detection** to start the process of retrieving the capabilities of the SUT implementation (also click **Yes** to the **Warning** message that displays).

The retrieved capabilities are used to automatically configure the **Test Suite** and select a default set of Test Cases for the assessed environment.

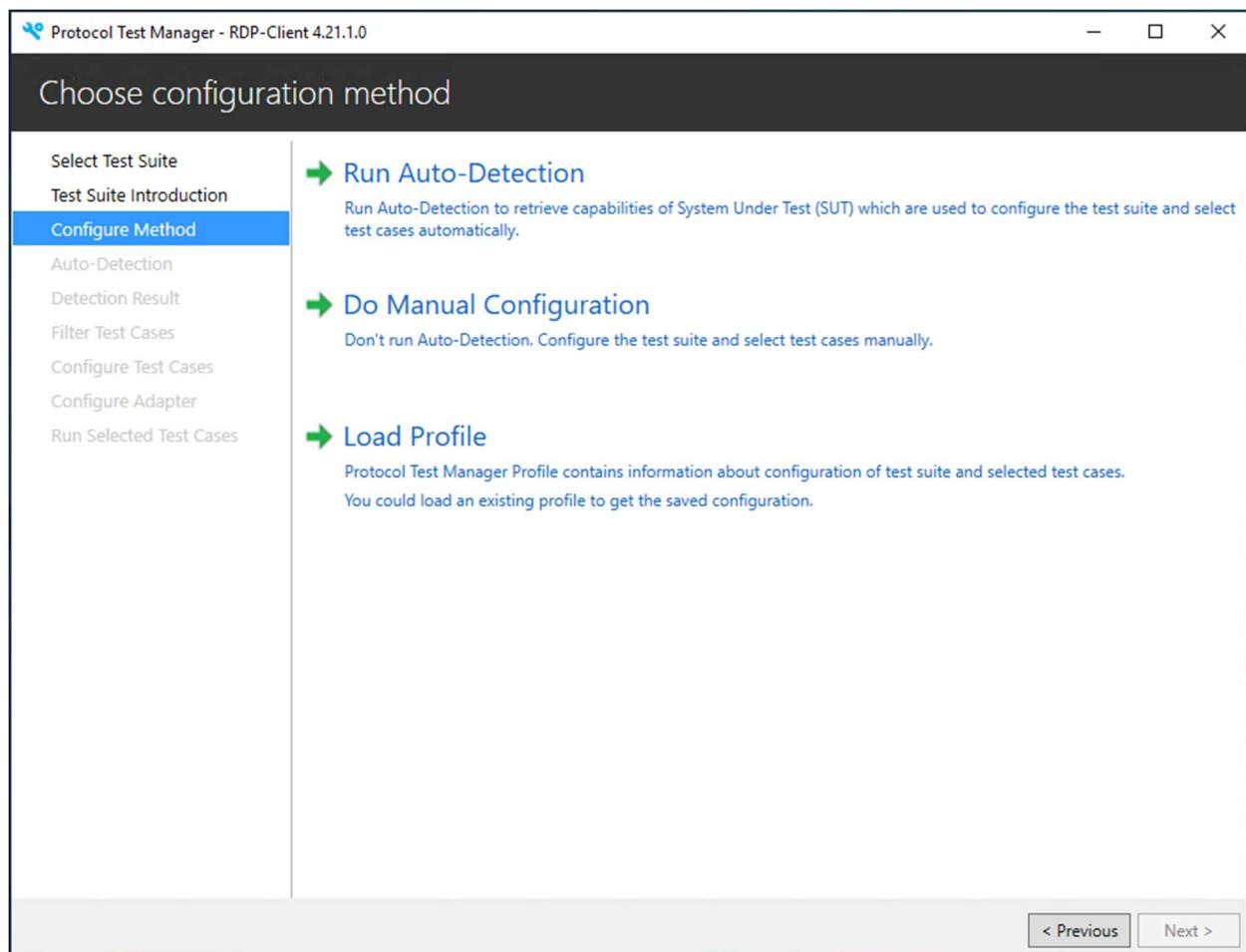


#### Caution

Unless you are adept at Microsoft RDP testing technologies and you understand how to assess the SUT environment with respect to manually choosing the correct Test Cases and configuring their properties, you are advised to not use the **Do Manual Configuration** option on the **Choose configuration method** page of the PTM Wizard. Also note that the **Load Profile** option is discussed in further detail ahead in [Working with a Profile](#).

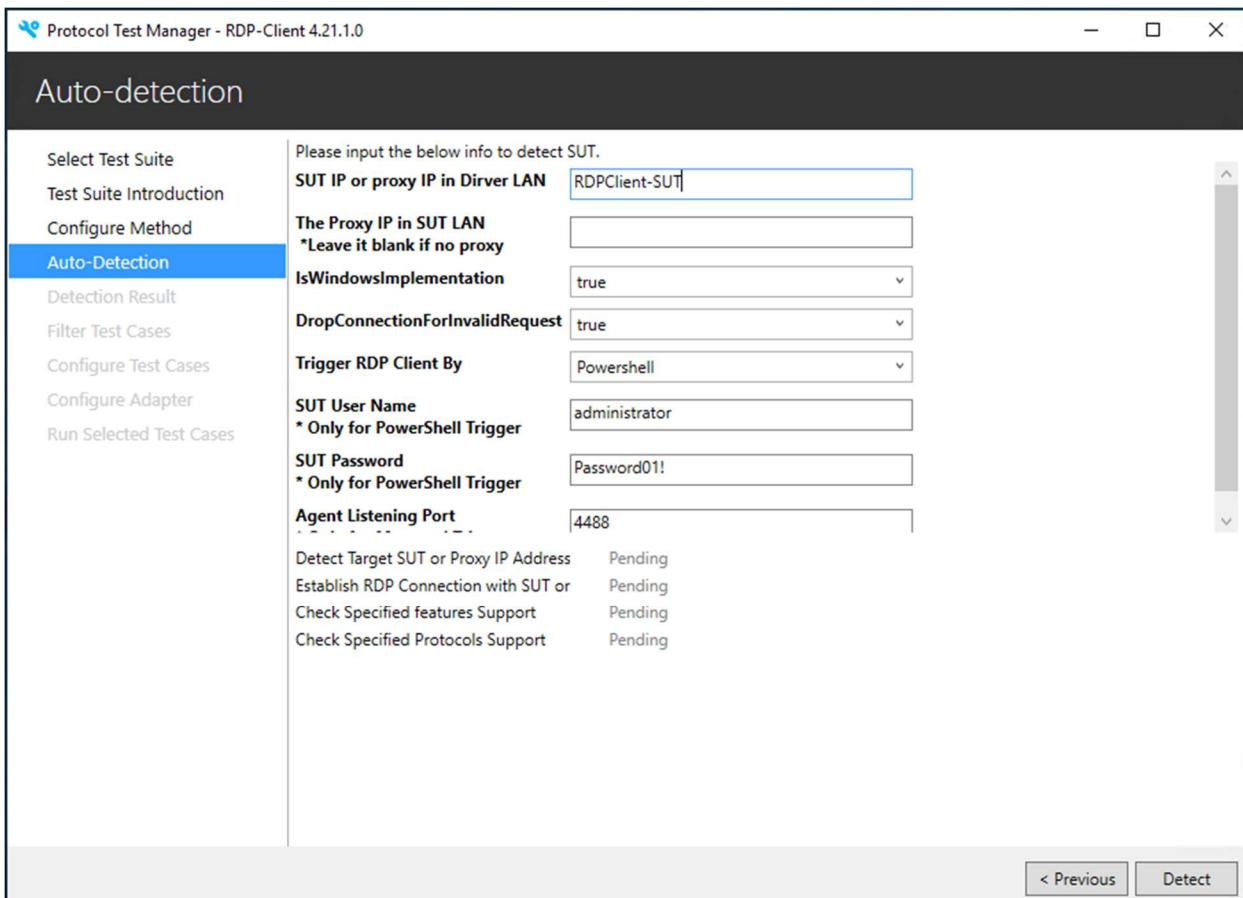
## More Information

To learn more about the **Do Manual Configuration** feature, see [Manually Configuring Test Cases and Properties](#).



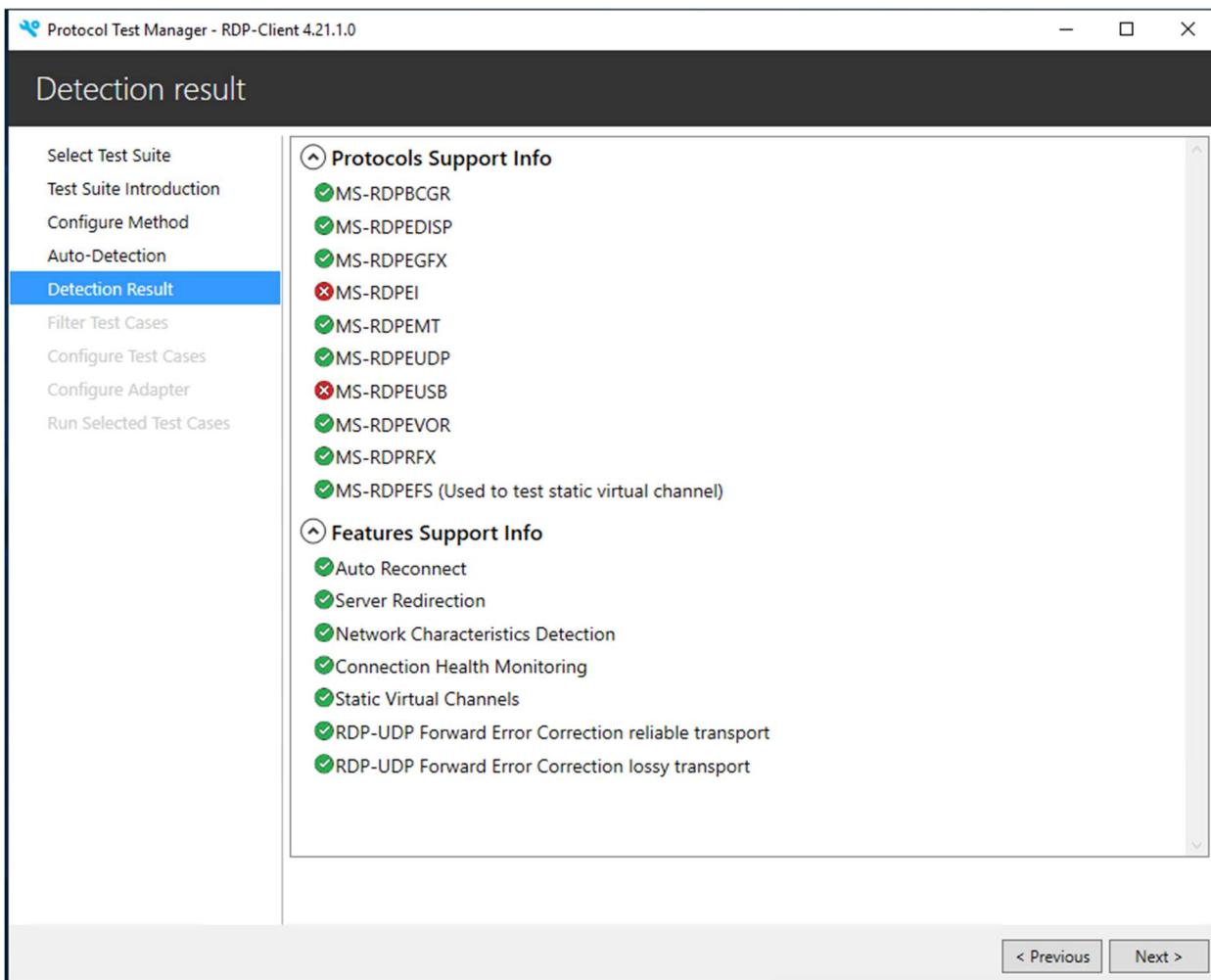
**Figure 10. Protocol Test Manager: Choosing the configuration method**

After you click **Run Auto-Detection**, the **Auto-Detection** page of the PTM Wizard displays, as shown in the figure that follows.



**Figure 11. Protocol Test Manager: Verifying SUT connection parameters**

6. On the **Auto-Detection** page of the PTM Wizard, verify that the values for such items as **SUT Name**, **SUT User Name**, **SUT Password**, and **Agent Listen Port** are correct in your environment, to ensure that the PTM can connect with the **SUT computer** and perform an accurate assessment of SUT capabilities.
7. When verification is complete, click the **Detect** button in the lower-right sector of the **Auto-Detection** page (changes to the **Cancel** button, as in the previous figure).  
As the detection process proceeds, you will see the **Pending** indications beneath the data entry fields change to **Finished** as detection progress continues.
8. After the initial detection process completes, click **Next** to display the **Detection Result** page of the PTM Wizard, as shown in the figure that follows:



**Figure 12. Protocol Test Manager: Reviewing the Detection Results**

9. In the **Detection Result** page of the Wizard, review the data that appears under the **Protocols Support Info** and **Feature Support Info** nodes to ensure that the supported protocols and features are as you expect.



**Tip**

If there are unexpected unsupported entities in the detection results, you may want to consider re-examining the SUT configuration processes that you performed earlier in this User Guide, for example, in [Configuring the Test Suite](#).

Otherwise, click **Next** to display the **Filter Test Cases** page of the PTM Wizard.

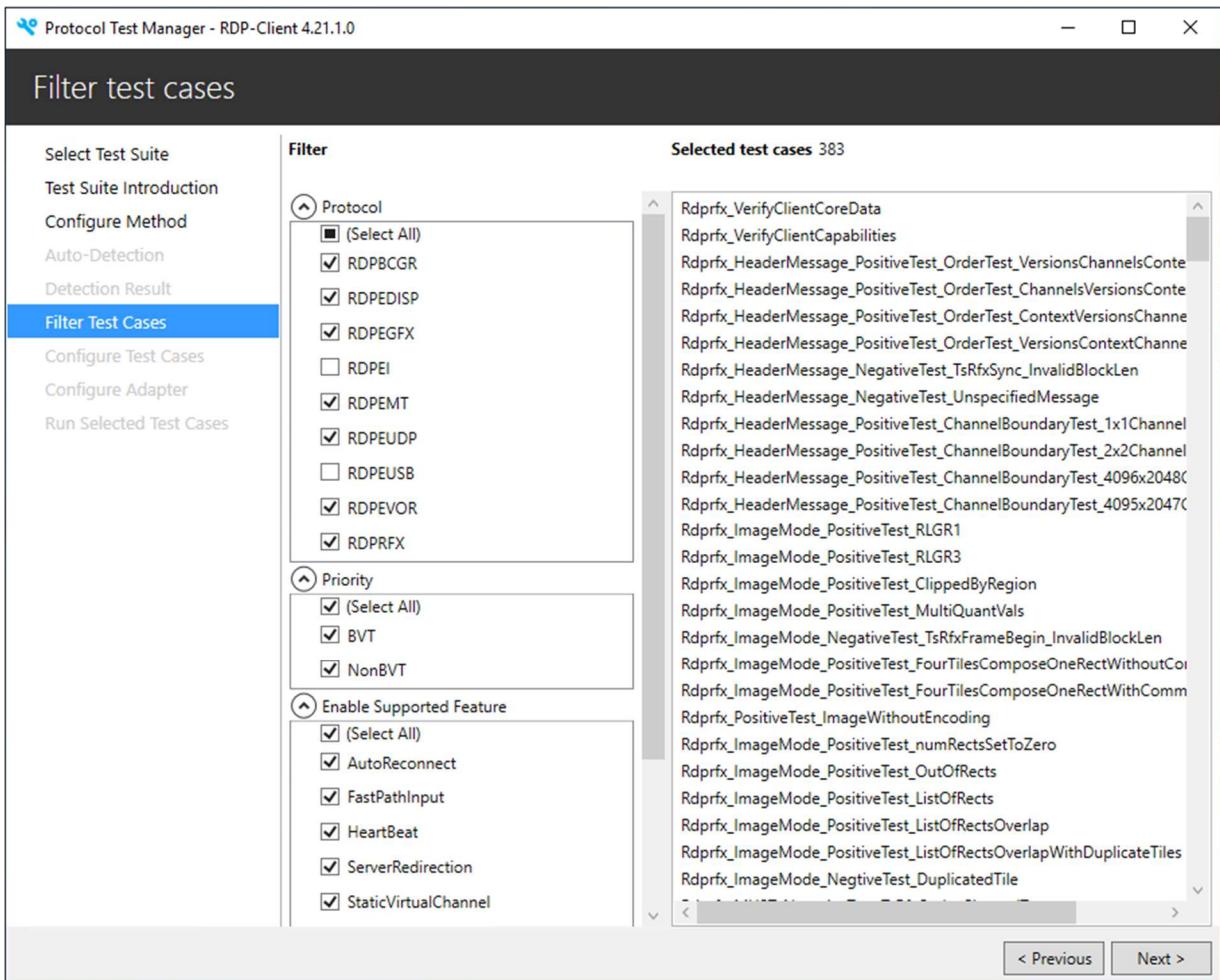
10. From the **Filter Test Cases** page of the PTM Wizard shown in the figure that follows, select different combinations of Test Cases from the categories that follow. However, you will need to select at least one of the sub-nodes in the **Priority** category and one in the **Protocol** category to activate and display associated Test Cases for a test run:
  - **Protocol** — contains the RDP protocols under test (**SUT** implementation).
  - **Priority** — enables you to specify the type of tests to run (**BVT** or **NonBVT**).
  - **Enable Supported Feature** — activates Test Cases for supported features discovered in **Auto Detect**.

- **Specific Requirements** — enables you to specify the interactive mode of testing described earlier in [Test Run Pre-Configuration](#).

Each time you select a Test Case node, the total number of selected Test Cases appears just to the right of the **Selected Test Cases** label. Take note that if a Test Case belongs to multiple categories, it is listed in each category.

### Important

If the detection status of a feature or protocol is not supported, it will appear in italics and will provide a tool tip message to that effect, that is, if you mouse-hover over that particular component. See RDPEUSB in the figure below as an example.



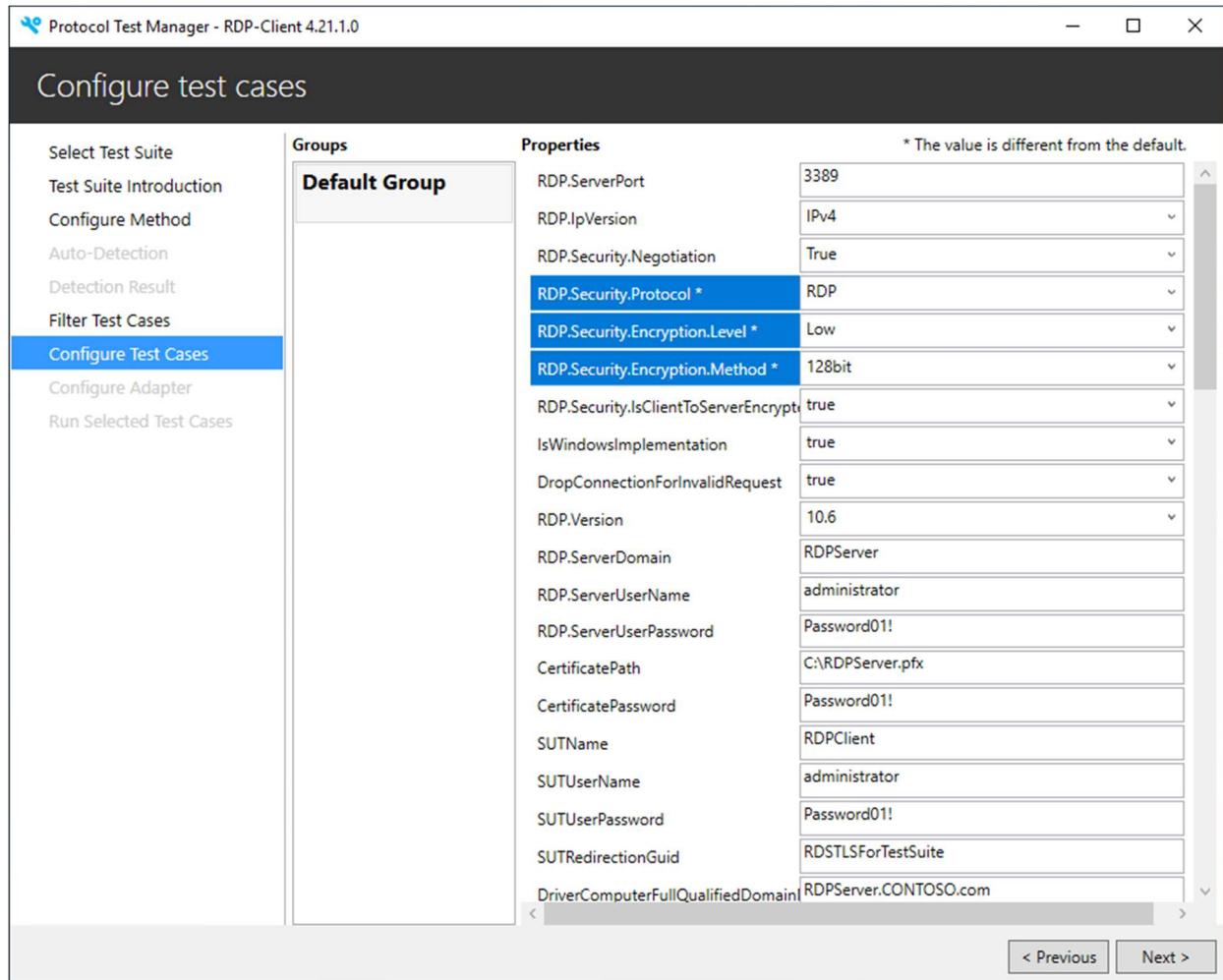
**Figure 13. Protocol Test Manager: Selecting (filtering) Test Cases**

11. Create a hypothetical Test Case configuration in the steps that follow:
  - a. In the four categories described in the previous step, unselect the **Select All** node in each category.
  - b. In the **Protocol** category, select a protocol such as **RDPBCGR**.
  - c. In the **Priority** category, select either the **BVT** or **NonBVT** check box.

- d. Observe that the Test Cases that apply to the selected protocol display in the Test Cases list view along with the number of tests in the **Selected Test Cases** label, as similar to the previous figure.

If you selected **BVT**, you will run the basic build verification Test Cases for the **Protocol** you selected, as described in [Running Verification Tests](#), otherwise, the **NonBVT** tests for that **Protocol** will apply to the test run.

- e. Click **Next** to display the **Configure Test Cases** page of the Wizard, as shown in the figure that follows.



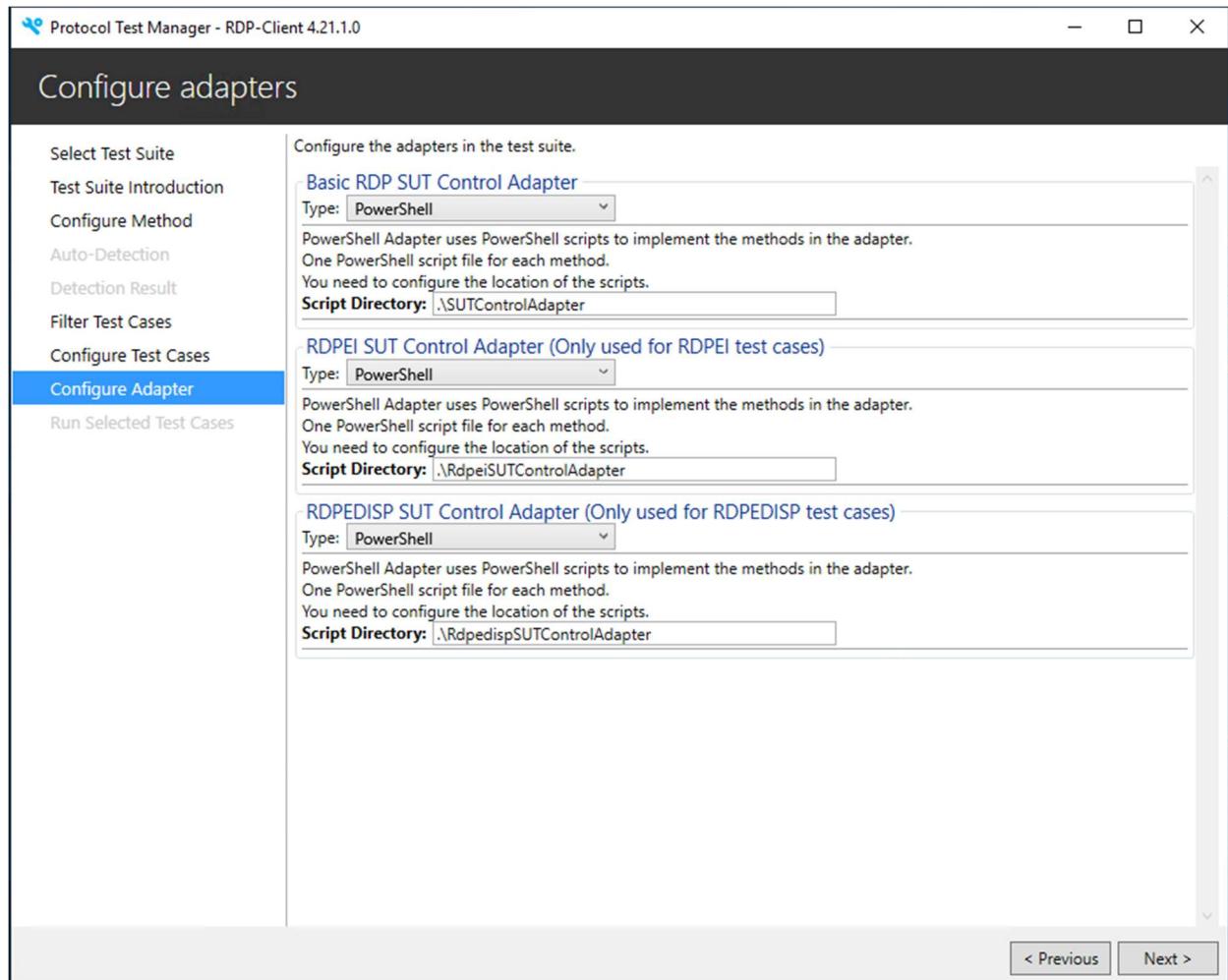
**Figure 14. Protocol Test Manager: Reviewing/configuring Test Case properties**

12. On the **Configure Test Cases** page, click the **Default Group** to display the RDP properties that you verified (or revised) in [Configuring the Test Suite](#).
13. Scroll through the property values to ensure they are correct.
14. Select the **PTF** group to display the **Network Capture** properties that enable your Test Cases to create event trace log (ETL) data that you can analyze with a protocol analysis tool such as Microsoft Message Analyzer (MMA).

Note that if you want to utilize this feature, you will need to have installed MMA as described in [Optional Software](#). If you want to proceed, follow these sub-steps:

- a. Click the **NetworkCapture** node to display the data entry fields, if not displayed already.

- b. Set the **StopRunningOnError** field to false, if it is not already set that way.
- c. Ensure that the **CaptureFileFolder** path is set to “C:\RDPClient\_CaptureFileDialog” and also verify that this folder actually exists on the **Driver** computer.  
If it does not, then please create it in the specified location.
- d. Set the **Enabled** field to true.
- e. When complete, click **Next** to display the **Configure Adapters** page of the Wizard, as shown in the figure that follows.



**Figure 15. Protocol Test Manager: Configuring the Adapters**

15. In the **Configure Adapters** page of the PTM Wizard, observe the following Adapters and the indicated topics to which the adapter settings correspond:

**Table 18. Control Adapter configuration setting instructions**

Adapter Name	Related Topic
Basic RDP SUT Control Adapter	<a href="#">Configuring Common Test Suite Mode Settings</a>
RDPEI SUT Control Adapter	<a href="#">Configuring the Test Suite Mode for MS-RDPEI Events</a>

16. Click the drop-down arrow for each Adapter and select the appropriate mode setting from the following options, while noting that **PowerShell** is the default setting:

- **Interactive** — the Interactive adapter displays a dialog that enables you to manually perform operations and to thereafter enter results in the dialog.
- **Managed** — the Managed adapter uses managed code to implement the adapter's methods.
- **PowerShell** — the PowerShell adapter uses PowerShell scripts to implement the adapter's methods.
- **Shell** — an additional option that enables Unix shell scripts to implement the adapter's methods.

#### More Information

To learn more about adapter settings, see the topic [Test Run Pre-Configuration](#).

17. When complete, click **Next** to display the **Run selected test cases** page of the PTM Wizard, as shown in the figure that follows.

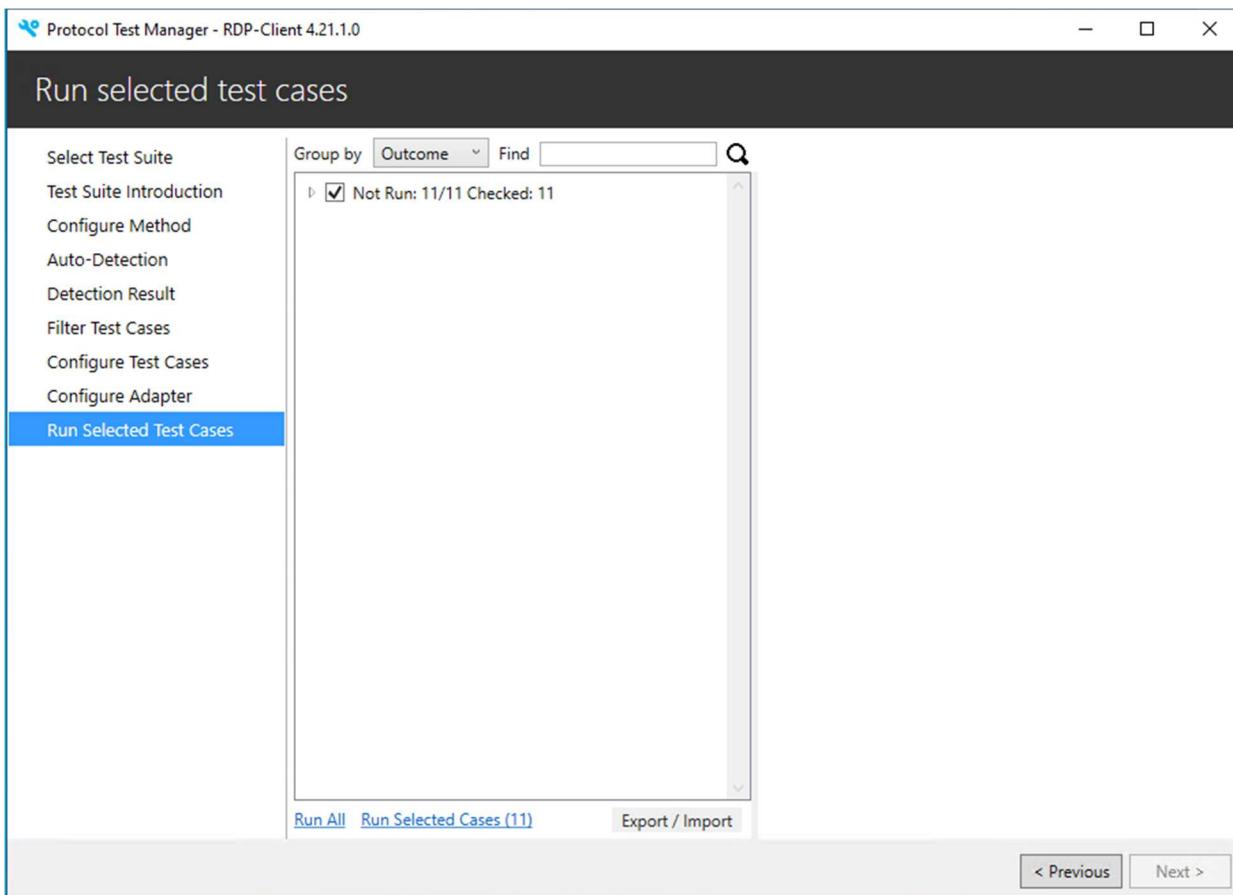


Figure 16. Protocol Test Manager: Running the selected Test Cases

18. Observe that the following options in the lower sector of the UI are available for running Test Cases from the **Run Selected Test Cases** tab of the PTM:



### Important

**Do not execute Test Cases now! Only execute the tests from [Running the Test Cases](#) ahead.**

- **Run All** — clicking this link will run all Test Cases.

If you select this option, all Test Cases that exist under the **Not Run** checkbox on the **Run Selected Test Cases** tab of PTM will be executed, whether the Test Cases are actually selected. These Test Cases are the ones that you selected/filtered earlier on the **Filter Test Cases** tab of PTM and therefore appear on the **Run Selected Test Cases** tab.

This option does not mean you will be executing *all* the default Test Cases returned from auto-detection of the SUT configuration, but rather the set of Test Cases you filtered from the default set.

- **Run Selected Cases** — clicking this link will execute the selected Test Cases only.

If you are ready to run your Test Cases, go to the procedure: [Running the Test Cases](#). Otherwise, proceed to the next topic for additional information about indications you can expect during Test Case execution.

## Monitoring Test Case Execution

After you start Test Cases execution in [Running the Test Cases](#) ahead, two command shells will display with test execution data, which includes success and failure indications. After execution is complete, you can view Test Case logs to the right of the Test Case list view, by selecting any Test Case in the list view.

As the tests are running in PTM, you can view high level results in the following three categories. As Test Case execution progresses, you can observe these categories being incrementally updated:

- **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 RDPTTestSuite.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.



### Note

In the PTM, you can drag the separator between the Test Case list view and the right-hand side output log pane to adjust the width of the window for better viewing.



### Important

If any of the core/preconfigured Test Cases in a test environment do not support certain features, errors will appear in the command console and PTM with respect to methods that failed when attempting to test those features. Notwithstanding errors from actual failures, you can avoid this outcome by running only the Test Cases that support the features of your environment.

## More Information

To learn more about Test Cases and the tests they perform, review their descriptions in the Test Scenarios section of the [RDP Client Test Design Specification](#).

## Running the Test Cases

To run your Test Cases, perform the steps of the procedure that follows.

### ► To run the Test Cases:

1. On the Run Selected Test Cases page of the PTM wizard, select the **Not Run** check box if it is not already selected and then click the **Run Selected Cases** link below the Test Cases list view, as shown in the figure that follows.

Given that the **Not Run** checkbox is selected, all the Test Cases under the checkbox are also selected and will run when you click the **Run Selected Cases** link, as described earlier in this section.

2. To prevent any Test Case in the selected test set from running, click the down-arrow to the left of the **Not Run** checkbox and unselect one or more tests to exclude them from running, as shown in the figure that follows.

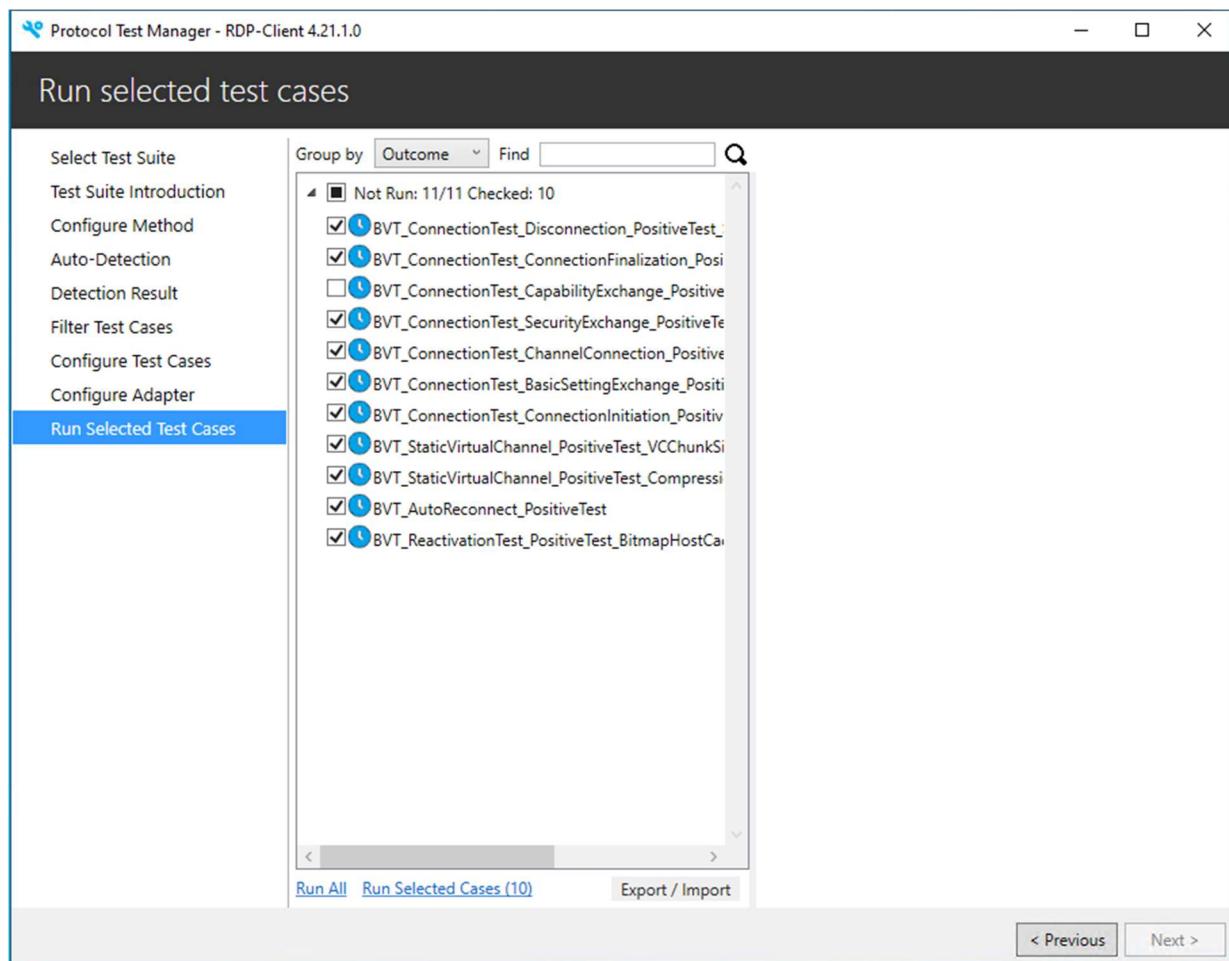


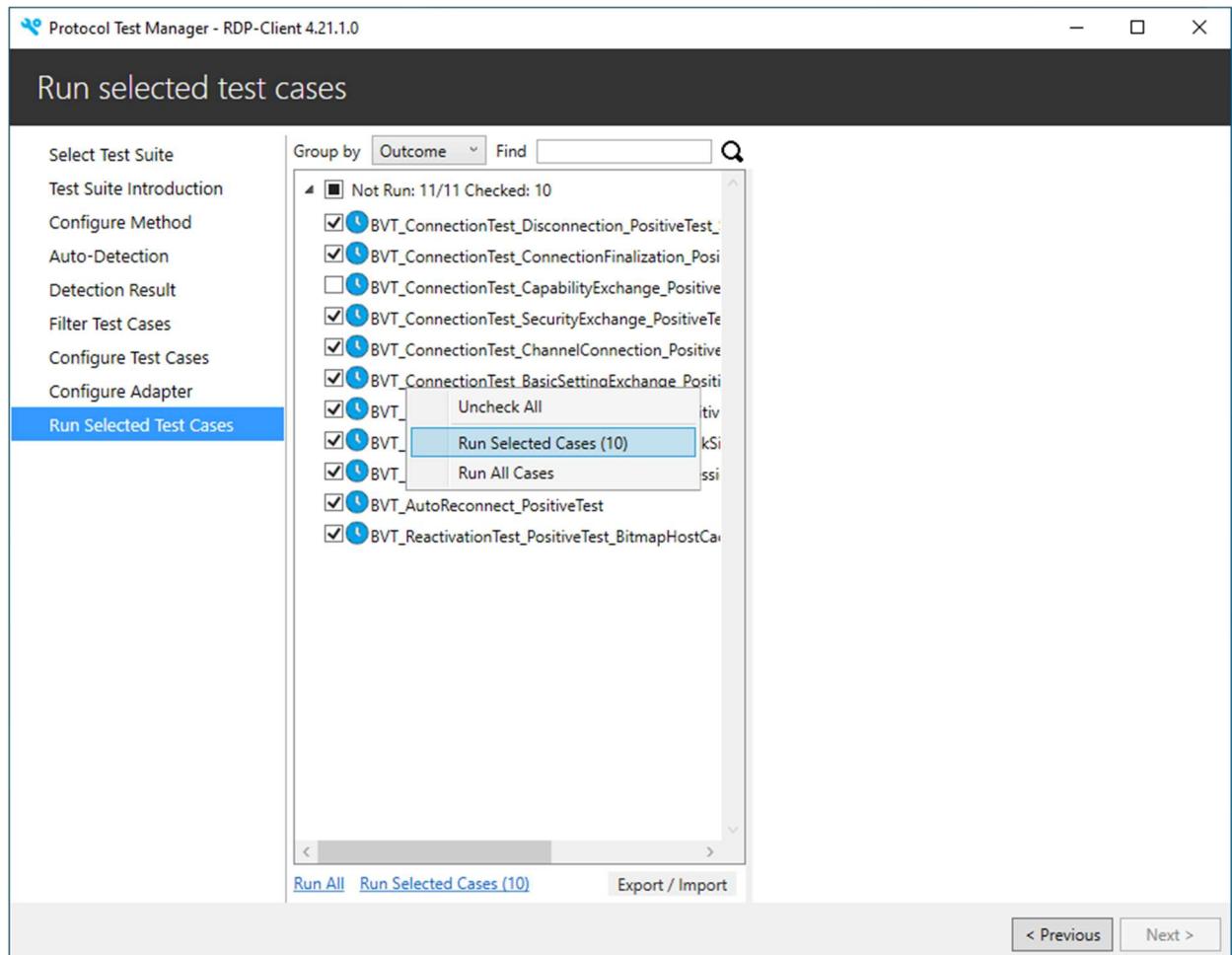
Figure 17. Protocol Test Manager: Removing Test Cases from execution



Tip

You can also run Test Cases from the context menu that appears when you right-click in the Test Case list view itself. The context menu provides commands such as **Run Selected Cases** and **Run All Cases**, as shown in the following figure. In addition, you can select the **Uncheck All** command to uncheck all selected Test Cases.

Whether you select the **Run Selected Cases** or the **Run All Cases** context menu command, the effect will be as described earlier. In addition, if you select the **Uncheck All** context menu command, then no Test Cases will run afterwards when you click the **Run Selected Cases** context menu command. However, if you select the **Run All** context menu command afterwards, all Test Cases listed under the **Not Run** checkbox will execute.



**Figure 18. Protocol Test Manager: Context menu commands for Test Case execution**

3. To display the context menu shown in the figure immediately above, click the down-arrow to the left of the **Not Run** check box in the Test Cases list view, then right-click the list of tests to display the menu. If Test Case execution is currently not in progress, click the **Run Selected Cases** command in the context menu to begin test execution.
4. While the Test Cases are executing, observe the indications that appear in the **Passed**, **Failed**, and **Inconclusive** check box labels as described in [Monitoring Test Case Execution](#).



#### Note

You can also view the results of Test Case execution in the command consoles that host test execution. However, note that the PTM makes the results more accessible and understandable through categorization, summaries, status indicators, and built-in logs, as described just ahead.

## Reviewing the Test Results

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. The PTM provides a number of tools that can quickly point you to what the causes of a failure might be.

The PTM enables you to utilize various status indicators, stack messages, error messages, icons, logs, and other highlighted indications that can pinpoint the cause of failures very rapidly. In addition, you can launch an HTML-based display of output results that independently reproduces the PTM output data displays.



### Note

As a developer who is using a Microsoft Test Suite to test real-world protocol implementations, you can utilize the PTM 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.

## Test Results Output 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 19. Test results status indicators

Status Indicator	Description	UI Location
Initial test results status summary	Results display in either of these configurations:  The number of Test Cases that passed, failed, or were inconclusive.  The number of Test Cases that executed for specific RDP operations, where the number of tests that were run are identified.	<ol style="list-style-type: none"><li>1. The first results display configuration is shown as expandable <b>Passed</b>, <b>Failed</b>, and <b>Inconclusive</b> results category check box nodes in the left-hand Test Cases pane of the PTM.  Appears when selecting the <b>Outcome</b> item in the <b>Group by</b> drop-down list.</li><li>2. The second results display configuration is broken down into the various categories of RDP operations or protocols being tested, for example <b>ServerRedirection</b> or <b>StaticVirtualChannel</b>, where the number of Test Cases associated with the operation or protocol is indicated, while the number of tests having issues is specified by a <b>Checked</b> indicator.  Appears when selecting the <b>Category</b> item in the <b>Group by</b> drop-down list.</li></ol>

<b>Start Time</b> and <b>End Time</b>	Exposes the overall duration of Test Case execution.	Appears in the upper left sector of the right-hand test results pane for any selected Test Case in any results category.
<b>Result</b>	The results category for a particular Test Case, for example: <b>Passed</b> , <b>Failed</b> , or <b>Inconclusive</b> .	Appears in the upper left sector of the right-hand test results pane for any selected Test Case in any results category.
Test Case functionality	The general purpose of a Test Case.	Typically described in a <b>[Comment]</b> tag that appears in the <b>StandardOut</b> category of results.
Debug output data	Informative data that is displayed in tags in the <b>StandardOut</b> category of results.	<p>Includes data that displays in information tags such as the following:</p> <ul style="list-style-type: none"> <li>▪ <b>[TestInProgress]</b></li> <li>▪ <b>[Comment]</b></li> <li>▪ <b>[Debug]</b></li> <li>▪ <b>[CheckPoint]</b></li> <li>▪ <b>[CheckSucceeded]</b></li> <li>▪ <b>[CheckFailed]</b></li> <li>▪ <b>[TestStep]</b></li> <li>▪ <b>[TestPassed]</b></li> <li>▪ <b>[TestFailed]</b></li> </ul> <p>See <a href="#">StandardOut Category Status Indicators</a> for descriptions.</p>
Error output data	Holds data that you can analyze to identify the source of Test Case failures.	Appears in the <b>ErrorStackTrace</b> and <b>ErrorMessage</b> categories of results.
Test case status	<ul style="list-style-type: none"> <li>▪  — indicates the executed Test Case status as <b>Passed</b>.</li> <li>▪  — indicates the executed Test Case status as <b>Inconclusive</b>.</li> <li>▪  — indicates the Test Case status is <b>Not Run</b>.</li> <li>▪  — indicates the executed Test Case status as <b>Failed</b>.</li> </ul>	These indicators appear immediately to the right of the Test Case check box after test execution, to indicate the test result status; the exception is the blue <b>Not Run</b> status indicator, which appears prior to test execution and persists this status if a Test Case did not run.

- \* This same information is repeated as the text of a hyperlink that appears in the upper-right-hand sector of the PTM. This hyperlink opens an HTML-based display of test results.

The figure that follows is an example of the **Category** grouping for Test Cases (grouped by RDP operations that contain the Test Cases), and also shows the three results output categories for test analysis in the right-hand pane of the PTM.

Note that in the expanded **RDP7.1** test result node below, **RDPEUSB** errors occurred because it is an unsupported feature, as described earlier in the [Auto detect](#) portion of [Running the Protocol Test Manager](#).

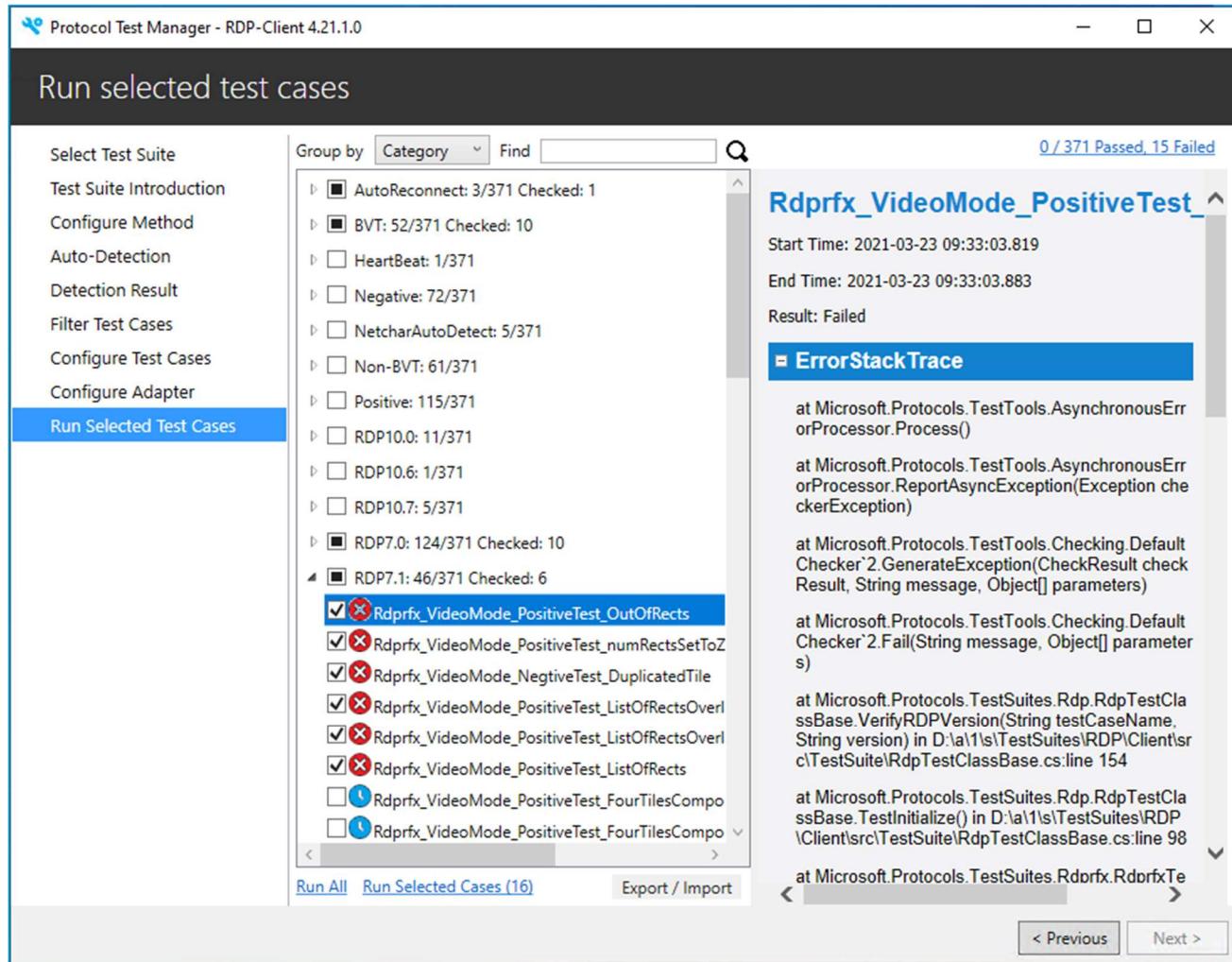


Figure 19. Protocol Test Manager: RDP Category grouping | Expanded ErrorMessage result

## StandardOut Category Status Indicators

Some of the low-level indicators of the **StandardOut** category that are directly associated with the incremental step-by-step record of how the tests were conducted, along with interim results, are described as below. Note that the **[CheckSucceeded]**, **[Comment]**, and **[Debug]** information tags are shown in the figure that follows.

**[TestStep]** — highlighted in **Blue**. 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 elicit insights into the causes of an imminent failure. Can also include pointers to protocol specification sections that define acceptable data type values 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.



#### Note

Most of the above information tags are also returned from the **Protocol-Test-Suite** message provider that you can use to detect local RDP messages in a Message Analyzer trace session, as described in [Capturing RDP Traffic with Message Analyzer](#).

The figure that follows shows the **BVT** category of tests and the expanded **StandardOut** node with several of the above information tags displayed. In the case of the selected **BVT\_AutoReconnect\_PositiveTest** in the figure, the **[CheckSucceeded]** tag verifies that the **SUT** should support the **Auto-Reconnect** feature.

**Figure 20. Protocol Test Manager: RDP BVT test category | StandardOut node**



### Note

You can display Test Cases that meet specified search criteria by typing a search term in the **Find** text box and pressing the **Enter** key on your keyboard.

**Test Results in HTML Format** If you click the link in the upper-right sector of the PTM UI, an HTML-based display of test results appears with various options for reviewing the results, as shown in the next figure.

In the **Case List** pane of the HTML display in the figure, you have the following options for grouping the Test Cases to expose different analysis perspectives of the data, as follows:

- **None** — provides a flat list of Test Cases that are listed in ascending sorted order.
- **Test Results** — groups the Test Case results in **Failed**, **Inconclusive**, and **Passed** nodes.
- **Category** — groups the Test Case results under various operation or feature names.
- **Class** — groups the Test Case results in nodes that contain the name of the protocols under test.

**Case List**

Group By **Test Result** ▾

Keyword  Go

Failed (32)

Inconclusive (2)

Passed (360)

**S2\_DataTransfer\_ClientAckDelay**

Start Time: 2020-07-17 20:12:49.582  
End Time: 2020-07-17 20:13:35.259  
Result: Failed

ErrorStackTrace

ErrorMessage

StandardOut

Log Filter

```

2020-07-18 04:12:49.584 [TestInProgress]
Microsoft.Protocols.TestSuites.Rdpeupd.RdpeupdTestSuite.S2_DataTransfer_ClientAckDelay

2020-07-18 04:12:49.586 [Debug] isClientSupportFastPathInput = True; isClientSupportAutoReconnect =
True; isClientSupportRDPEFS = True; isClientSupportServerRedirection = True;
isClientSupportEmptyRdpNegData = False; isClientSupportSoftSync = True
isClientSupportTunnelingStaticVCTraffic = True

2020-07-18 04:12:49.590 [Debug] Establishing RDP connection ...
2020-07-18 04:12:49.590 [Comment] Starting RDP listening with transport protocol: DirectCredSsp
2020-07-18 04:12:49.610 [Debug] The IP version is Ipv4.
2020-07-18 04:12:49.610 [Debug] RDP server is listening on 0.0.0.0:3389.

```

Figure 21. Protocol Test Manager: Case List HTML test results display



### Note

You can also search for Test Cases by typing a search term in the **Keyword** text box and clicking the **Go** button. You can also filter the **StandardOut** results via a **Log Filter**.

## ErrorStackTrace Category

Provides a visual indication of the call stack where a failure occurred. The Error message itself displays at the end of the **ErrorStackTrace** information, which extends into the **ErrorMessage** category.

## ErrorMessage Category

Provides details and comments that can identify the source of the error event and the conditions that existed when the error event occurred. As an aid to further inspection of the error event, the PTM can provide comments that point you to the related sections of a Microsoft RDP protocol specification, which may shed light on what the underlying failure may be related to, such as expected states, values, parameters, event data, and so on.

## Other PTM Configuration and Execution Methods

This section provides a brief overview of the manual configuration of Test Cases and properties and the disadvantages of proceeding without the **Auto-Detect** feature of the PTM.

This section also discusses how to create a **Profile** that encapsulates a chosen set of Test Cases, so that you can re-run such a set of tests on demand. One such use of the **Profile** feature might be to compare test results before and after the following:

- Changes to the RDP\_ClientTestSuite.deployment.ptfconfig file.
- Revisions to PowerShell script files (.ps1).
- Code fixes in one or more Test Cases (providing that you are creating your own Test Cases).

You could also perform periodic re-runs of Test Cases to achieve other goals that are specific to your custom environment.

Lastly, this section describes how to run Test Cases from a command line tool known as PTMCLI.exe.

 The following topics in this section cover the concepts that are described above:

[Manual Configuration of Test Cases and Properties](#)

[Working with Profiles](#)

[Executing Test Cases from the Command Line](#)

## Manual Configuration of Test Cases and Properties

To perform manual configuration of Test Cases, you will need to click the **Do Manual Configuration** option on the **Configure Method** page of the PTM Wizard. This takes you directly to the **Filter Test Cases** page and by-passes the use of **Auto-Detection**.

By doing so, you will be unable to take advantage of the automatic detection and assessment of the **SUT computer** environment so that you can obtain a recommended set of default Test Cases to run, in addition to automatically-specified Test Case properties. As a result of working in this mode of operation, you will need to do the following manually:

- Select a set of Test Cases for configuration and execution.
- Configure the Test Case properties.
- Configure the control Adapters.
- Select the final set of Test Cases to execute.
- Click **Run Selected Cases** to begin test execution.

When you are working on the basis of manual Test Case selection and property configuration, you should be very familiar with which Test Cases will support your **SUT** environment, the features that are supported in the **SUT** environment, and the property values necessary for successful Test Case execution. A lack of knowledge in this regard could result in errors that occur because of unsupported features or improper/missing property values, thus hindering the primary goal of detecting errors that are related to actual Test Case failures.

## Working with Profiles

This section describes how to save a **Profile** and how to use it to run the Test Cases the **Profile** contains from the **Load Profile** option in PTM.

## Saving a Profile

After you complete test execution based on a particular Test Case configuration in [Running the Test Cases](#), you have the option to use the PTM to save the configuration as a **Profile** that you can re-run on demand simply by locating the **Profile** in a specified directory and loading it directly into the PTM or by executing it from the command line. Thereafter, you can analyze the data in HTML or text log format.

In order to utilize a **Profile** in the stated manner, it is recommended that you run the **RDP Client Test Suite** at least once and then save a **Profile** that extracts the selected Test Cases and related configuration information.



### Important

If you want to save specific Test Cases in a **Profile**, you must select them before you save the **Profile**, otherwise the **Profile** will not contain any Test Cases.

Note that you can also optionally save a **Profile** before actually running your Test Case configuration, but in this case, you will not have the advantage of knowing if the Test Case configuration performed well or not, 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 after making changes in a protocol implementation.

After you save a **Profile**, you can then use it in subsequent re-runs of the profiled test environment where you use the **Load Profile** option in PTM, as described in [Loading a Profile](#); or you can use the PTMCli.exe command line tool to launch Test Case execution (see [Executing Test Cases From the Command Line](#)).

You can save a **Profile** by performing the steps that follow.

#### ► To save a **Profile** that encapsulates the currently selected Test Case configuration

1. In the **Run Selected Test Cases** page of the PTM Wizard, select the Test Cases that you want in your **Profile**.



### Important

Please ensure that you *select Test Cases before saving your Profile*. This is especially important if you intend to use the PTMCli.exe command line with the -s switch, which specifies that only selected Test Cases will be executed in the **Profile**. See [Executing Test Cases From the Command Line](#) for more information about PTMCli.exe.

2. Just below the PTM Test Cases list view on the **Run Selected Test Cases** page of the PTM Wizard, click the **Export/Import** link, as shown in the figure that follows, and then click the **Save Profile...** drop-down menu item to save the selected Test Cases in the current test configuration along with all the underlying related properties.

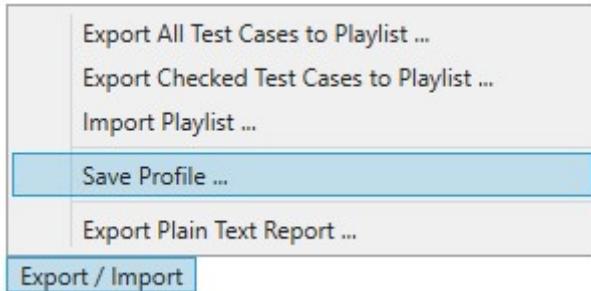


Figure 22. Protocol Test Manager: Saving a test case Profile

This action should open a **Save** dialog. By default, the **Profile** is saved in the user **Documents** folder, but you can change the default by navigating to another directory location as necessary.

3. Specify an appropriate name for the **Profile** and then close the open **Save** dialog.

## Loading a Profile

After you have saved a **Profile** as described in [Saving a Profile](#), you can load the Test Case configuration of the saved **Profile** into the PTM where you can execute the Test Case configuration as is, or modify it before executing. To load a **Profile**, perform the steps of the following procedure.

► **To load a saved Profile into the PTM and execute the Test Case configuration**

1. On the **Configure Method** page of the PTM Wizard, click **Load Profile**.

The Test Case configuration of the **Profile** displays in the **Run Selected Test Cases** tab of PTM.

2. To run all Test Cases of the **Profile**, click the **Run All** command beneath the Test Case list view.

The Test Cases will run the same as any other set of Test Cases do with all the status indications that occur during normal Test Case execution progress.

3. To only run selected Test Cases from the **Profile**, first select the Test Cases you want to run and then click the **Run Selected Test Cases** command beneath the Test Case list view.
4. In either execution mode, observe that Test Case execution provides all the normal indicators as the tests progress to completion.

## Executing Test Cases from the Command Line

The PTM enables you execute the Test Case configuration of a previously saved **Profile** with the use of a simple command string. In this mode of Test Case execution, you will trigger this process from outside the PTM UI test environment, which could also potentially be from a remote location.

The application that enables you to do this is known as `PTMCli.exe`. The `PTMCli.exe` is in `PTMCli.zip` that can be download from [GitHub](#). then extract this zip package to `C:\PTMCli`

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



### Important

You should not run the `PTMCli.exe` application while the PTM is either open or has Test Case execution in progress. If you do, the `PTMCli.exe` application will not start or an error will occur, respectively.

► **To load a Profile from the command line**

1. From the **Start** menu, type “`Cmd`” and then double-click the **Command Prompt** icon.

Note that you might need to run the command console as Administrator.

2. From the command line, navigate to the following directory location on the **Driver** computer with the `cd` command:

```
cd C:\PTMCli\
```

3. At the command line, type the following command string:

```
PTMCLI.exe -p <profilepath> -s
```



#### Note

The -p switch requires you to specify the directory path to a saved **Profile** and the -s switch in this command enforces execution of selected Test Cases only.

If you are using the -s switch and you have not selected any Test Cases, as described in [Saving a Profile](#), the PTMCLI.exe will report shortly after it begins running that it “Finished running test cases”, which means that no tests were actually run. If this occurs, simply remove the -s switch from the PTMCLI.exe command string and run PTMCLI.exe again.

4. Confirm that the Test Case execution results begin to appear in the command console.

With PTMCLI.exe, test progress typically appears as % complete at the command line while the test results scroll through the command shell display.



#### Note

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

```
PTMCLI.exe <-help | -h>
```

## Viewing RDP Output Data with Message Analyzer

The **RDP Client Test Suite** output data consists of text logs and HTML-based logs that you can read manually or as Test Case result displays that are built into the PTM, as described in [Reviewing the Test Results](#). You can also use Message Analyzer to capture **RDP Client Test Suite** output data with the use of the following message providers:

**Protocol-Test-Suite** — enables you to capture the **Test Suite** output log data and to highlight and expose specific types of messages of interest with the use of Message Analyzer’s **Color Rule** feature.

**Windows-NDIS-PacketCapture** — enables you to capture **Driver** and **SUT** computer communications on the wire as Test Cases are executing.

In merging these two sources of data into a single Message Analyzer session, it is much easier to understand what the Test Suite is doing when you are debugging Test Cases; as Message Analyzer has many types of filtering that you can apply to manipulate the data display to expose and isolate target data of interest.



#### Important

As of [November 25 2019](#) - Microsoft Message Analyzer (MMA) was retired and removed from public-facing sites on microsoft.com. A private MMA build is available for testing purposes; to request it, send an email to [getmma@microsoft.com](mailto:getmma@microsoft.com). However, note that Message Analyzer will continue to be supported in this Test Suite only up until **RDP Client Endpoint Test Suite** version 3.20.1.0. After that, a different tracing and message analysis tool will take its place in this test suite.

This section describes how to install and configure MMA for use with the **RDP Client Test Suite**, which includes deploying a set of **Color Rules** for detection of certain **RDP Client Test Suite** output message types.

-  The major topics covered in this section include the following:

[Install and Configure Microsoft Message Analyzer](#)  
[Capturing RDP Traffic with Microsoft Message Analyzer](#)

## Install and Configure Microsoft Message Analyzer

Microsoft Message Analyzer (MMA) is used to capture data on the wire and merge it with data dumped by the **RDP Client Test Suite**. To install and configure MMA for use with the **RDP Client Test Suite**, perform the steps that follow:

► **To configure MMA for use with the RDP Test Suite**

1. Install Microsoft Message Analyzer v1.4, if you have not already done so. See [Optional Software](#) for details on how to obtain the MMA installer.
2. Copy the OPN files in the directory that follows to your clipboard:

```
C:\RDP-TestSuite-ClientEP\Data\SuperLogViewer\OPNs\*.opn
```

3. Paste the clipboard contents to the following MMA installation directory:

```
C:\Program Files\Microsoft Message Analyzer\OPNAndConfiguration\OPNs\  
Microsoft\Windows\RemoteDesktop\
```



### Caution

If this is not the first startup of MMA, then copy the OPN files to the following directory instead:

```
C:\Users<username>  
\AppData\Local\Microsoft\MessageAnalyzer\OPNAndConfiguration\  
OPNs\Microsoft\Windows\RemoteDesktop
```

4. Start MMA by running as Administrator.
5. Click **Start Local Trace** to begin tracing in order to expose the **Color Rules** drop-down on the **Analysis Grid** toolbar.
6. Stop tracing by clicking the **Stop** button on the Message Analyzer ribbon.
7. Click the **Color Rules** drop-down in the **Analysis Grid** toolbar and select **Manage Color Rules**.
8. In the **Manage Color Rule** dialog, click the **Import** button and navigate to the following directory location on the **Driver** computer:

```
C:\RDP-TestSuite-ClientEP\Data\SuperLogViewer\
```

9. Select the **RDPColorRule.asset** file and then click **Open** in the **Select Library to Open** dialog to import the RDP **Color Rule** library.

Observe that the RDP **Color Rules** display in the **Network** category, as shown in the figure that follows.

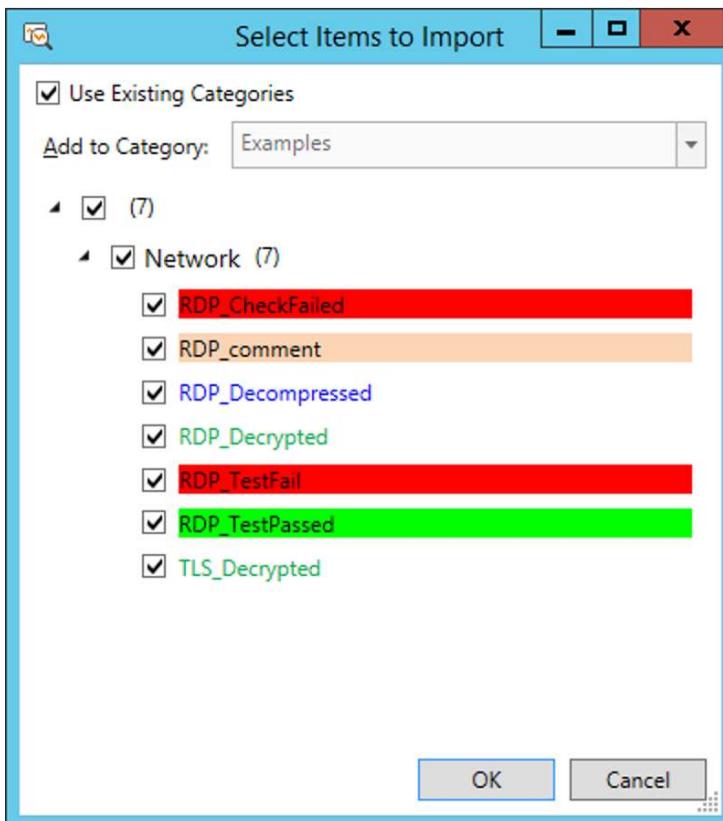


Figure 23. Message Analyzer Select Items to Import dialog

10. Click **OK** in the **Select Items to Import** dialog.
11. In the **Manage Color Rule** dialog that appears, ensure that all the RDP **Color Rules** are selected in the **Network** category under **My Items**.



#### Note

When you are reviewing trace results, all the RDP **Color Rules** should be selected and highlighting the appropriate messages. However, note that only one of the following **Color Rules** will display in the trace results, depending on whether RDP session security is set to use standard RDP Security or enhanced RDP Security (TLS):

- **RDP\_Decrypted**
- **TLS\_Decrypted**

See [Common Required Property Settings](#) for further information.

## Capturing RDP Traffic with Microsoft Message Analyzer

After importing the RDP **Color Rules** for Microsoft Message Analyzer, perform the steps that follow to capture RDP traffic and apply **Color Rules** for identification of certain RDP messages.

### ► To configure an MMA session and capture local RDP traffic during Test Case execution

1. On the Message Analyzer ribbon, click the **New Session** button to display the **New Session** dialog.

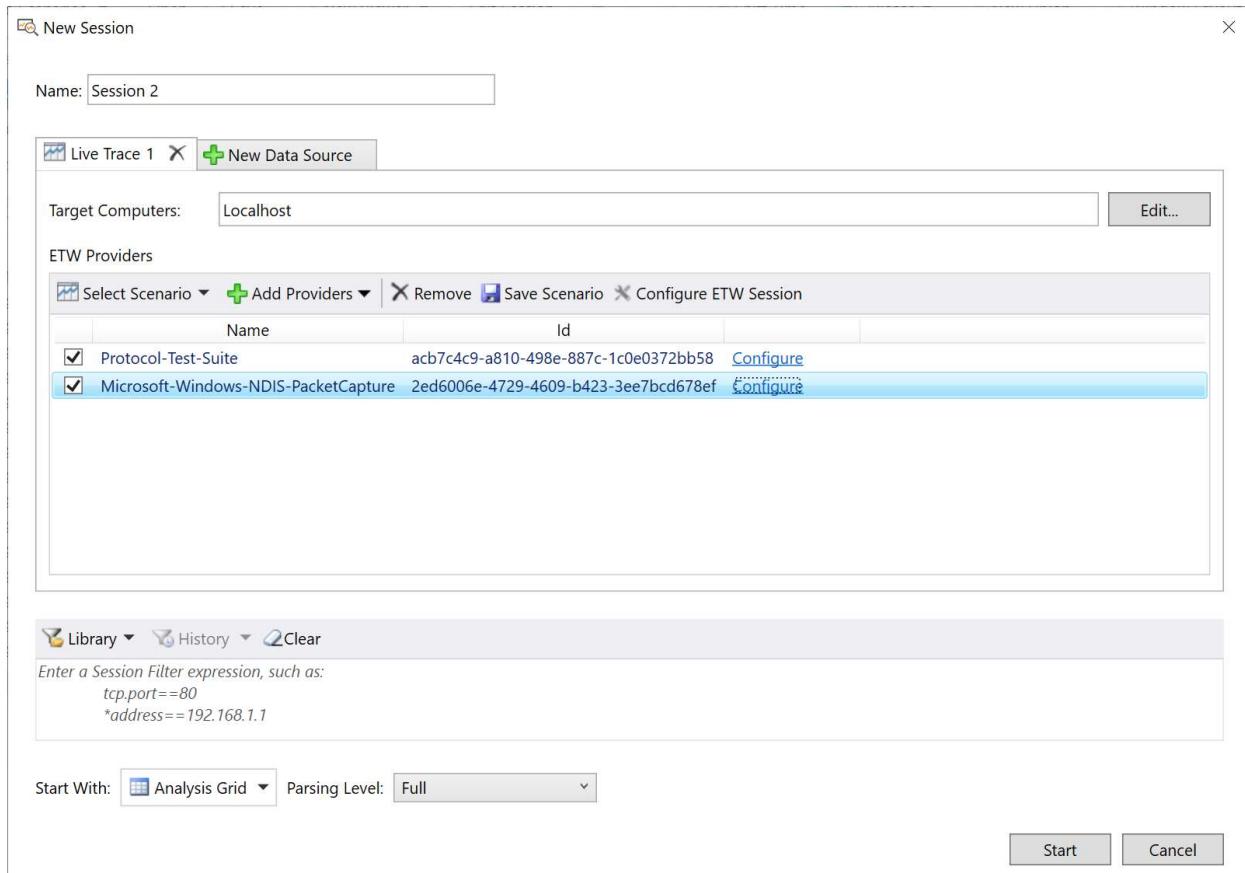
2. On the **New Session** dialog, click the **Live Trace** button to display the configuration for a new session.
3. In the **ETW Providers** pane, click **Add Providers** and then click **Add System Providers** in the context menu to display the **Available System Providers** list.
4. In the search text box, type **Protocol-Test-Suite**. When this provider displays in the list, select it and then click **Add To**.

The **Protocol-Test-Suite** provider enables you to aggregate the data from **RDP Client Test Suite** logging.

5. Repeat the previous step for **Windows-NDIS-PacketCapture**. Click **OK** when done.

This message provider enables you to capture data on the wire, such as any wire data that is produced by **Driver** and **SUT** computers during Test Case execution.

The specified message providers should display in the **New Session** dialog, as shown in the figure that follows:

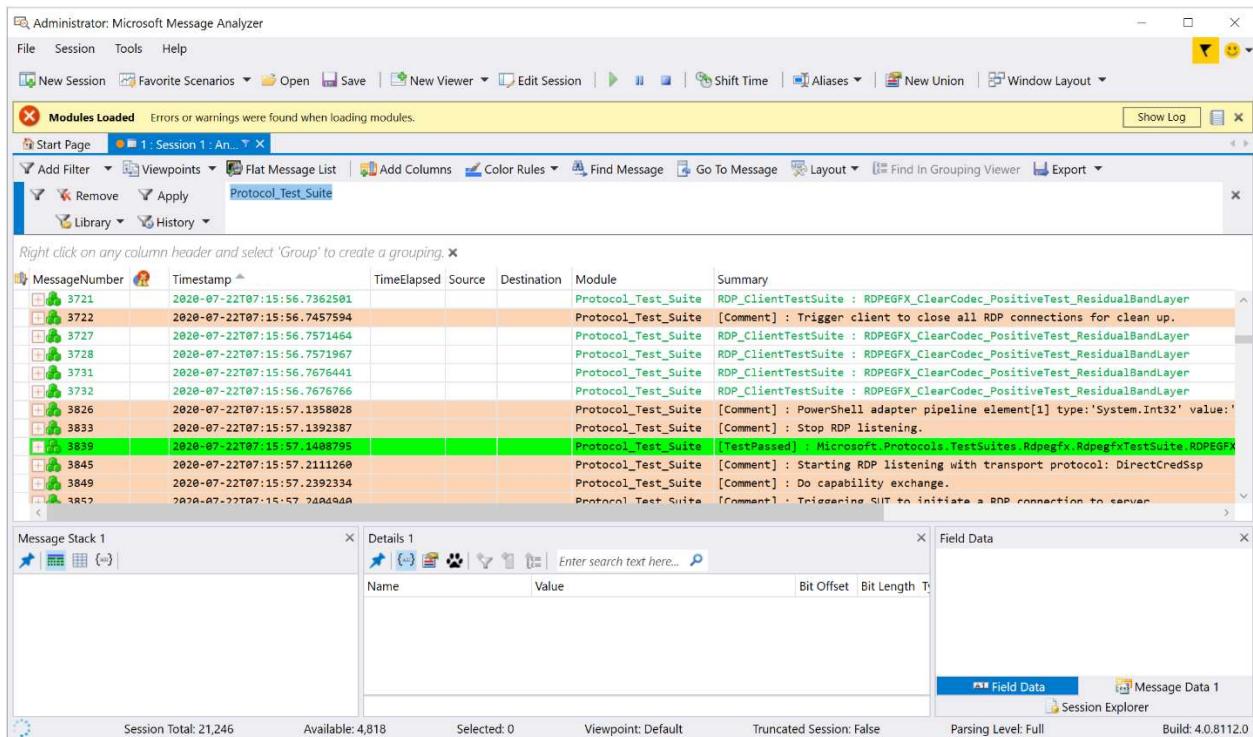


**Figure 24. Message Analyzer session message providers**

6. Start Test Case execution from the Protocol Test Manager (PTM) or by executing a specific protocol .ps1 file on which you want to focus.
7. In the **New Session** dialog of Message Analyzer, click the **Start** button to begin tracing.

8. As messages accumulate in Message Analyzer, observe that some of them will be highlighted with the activated **Color Rules**.
9. When PTM Test Case execution is complete, stop Message Analyzer tracing.
10. Apply a filter to the test results by typing “Protocol\_Test\_Suite” in the Filtering text box and then click the filter **Apply** button in the Filtering panel under the session ID tab of the Message Analyzer user interface (UI), as shown in the figure that follows.

Only the test result messages that originated from the **Protocol Test Suite** module should display in the Message Analyzer default **Analysis Grid** viewer. This should provide a simple way to get at the RDP output logging messages while filtering out all the others, as shown immediately below.



**Figure 25. Message Analyzer trace results with filtering**

### Note

At any point, you can merge the messages captured by the Microsoft-Windows-NDIS-PacketCapture provider back into the **Analysis Grid** display, by simply clicking the **Remove** button in the Filter panel under the session ID tab of the Message Analyzer UI to remove the filter you added.

The table that follows describes the **Color Rules** and the origin of the messages that trigger them to display:

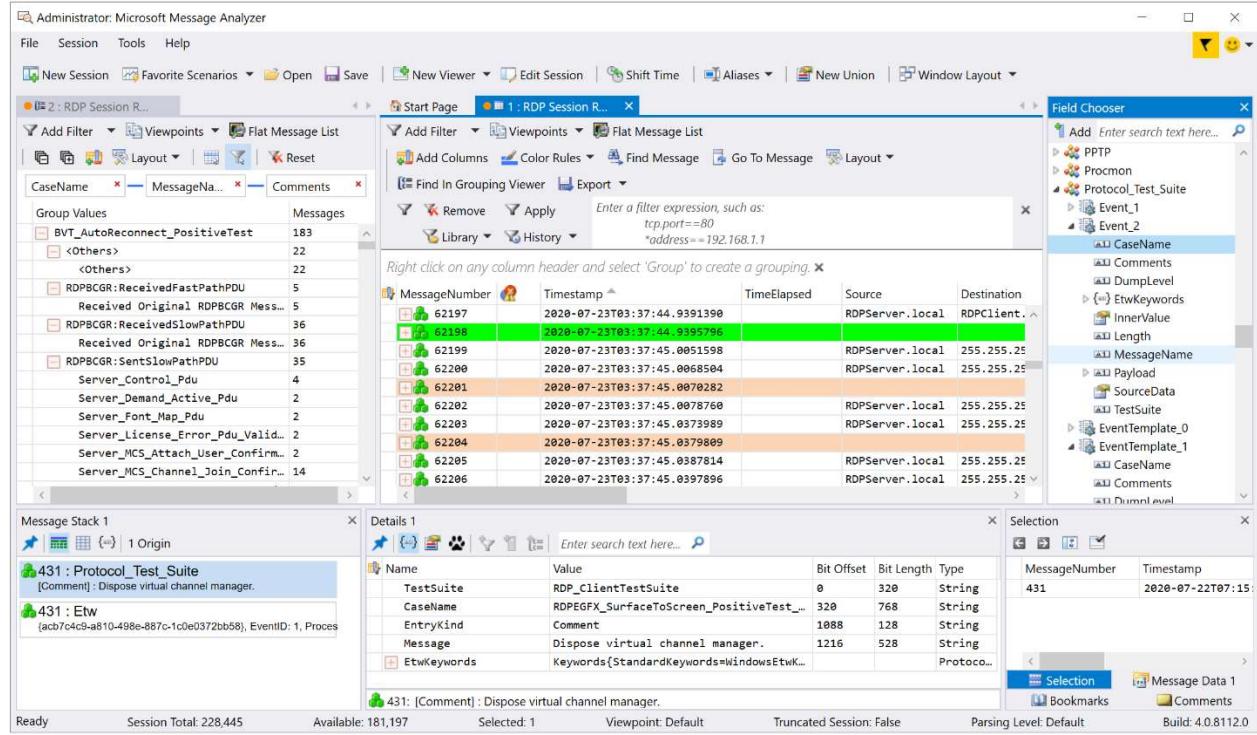
**Table 20. Message Analyzer Color Rule data for RDP Test Suite**

Color Rule	Rule Activation Trigger	Description
------------	-------------------------	-------------

<b>RDP_CheckFailed</b>	RDP Test Suite/Test Cases	Red background indicating that a check made in a Test Case failed. These are the same <b>[CheckFailed]</b> messages you will find in <b>StandardOut</b> category data in the PTM when selecting a Test Case following test execution.
<b>RDP_Comment</b>	RDP Test Suite Logs	Brown background indicating a log message was dumped by the RDP Test Suite. These are the same <b>[Comment]</b> messages that you will find in <b>StandardOut</b> category data in the PTM when selecting a Test Case following test execution.
<b>RDP_Decompressed</b>	RDP Test Suite/Test Cases	Blue text indicating an RDP message was decompressed.
<b>RDP_Decrypted</b>	RDP Test Suite/Test Cases	Light green text indicating a decrypted message that used RDP security in the RDP session.
<b>RDP_TestFailed</b>	RDP Test Suite/Test Cases	Red background indicating that a test failed, with which the message is associated.  These are the same <b>[TestFailed]</b> messages that you will find at the end of <b>StandardOut</b> category data in the PTM when selecting a Test Case following test execution.
<b>RDP_TestPassed</b>	RDP Test Suite/Test Cases	Green background indicating that a test passed, with which the message is associated.  These are the same <b>[TestPassed]</b> messages that you will find at the end of <b>StandardOut</b> category data in the PTM when selecting a Test Case following test execution.
<b>TLS_Decrypted</b>	RDP Test Suite/Test Cases	Light green text indicating a decrypted message that used TLS security in the RDP session.

11. The **[CheckFailed]** information tag and the others mentioned in this table are specified in [Test Results Output Status Indicators](#). You might also consider using the Message Analyzer **Grouping Viewer** to isolate and organize the RDP data according to certain criteria, such as **Case Name**,

**Message Name, and Comments.** If you do so, you may see your data organized in the **Grouping Viewer** in a fashion similar to what is shown in the figure that follows:



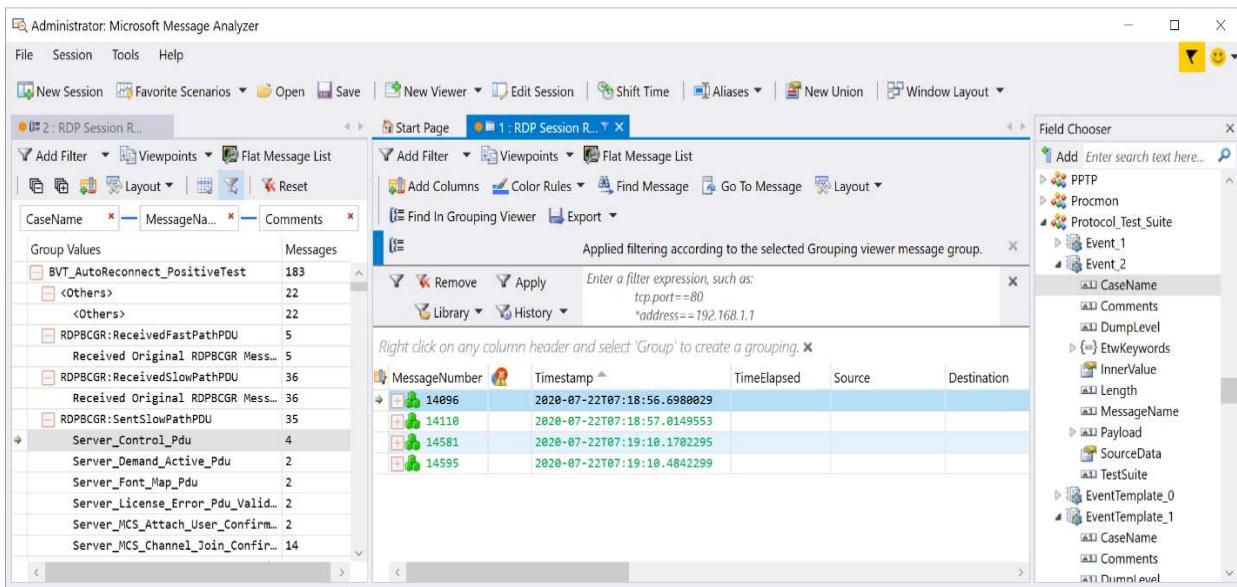
**Figure 26. Message Analyzer Grouping viewer with RDP data**

In the figure, note the Grouping viewer to the left of the **Analysis Grid**. The groups are organized such that you see the **CaseName** group data at top level with the **MessageName** and **Comments** group data nested successively underneath. Group data is defined by the Group identifiers above and is delineated by indented lines below.

For example, in the figure that follows, observe how the data is nested in the graphic part of the viewer with the **Server\_Control\_PDU** line (**Comments** node data) under the message **RDPBCGR : SentSlowPathPDU** (**MessageName** node data) and this latter message under the test **BVT\_AutoReconnect\_PositiveTest** (**CaseName** node data).

Also, when the **Server\_Control\_PDU** node is clicked, the number of messages captured for that operation are shown to the right in the **Analysis Grid** viewer. When you click one of those messages, you can get more message information in the MMA **Details** view.

Note that the message groups are determined by the field selections you make under the **Protocol\_Test\_Suite** node in **Field Chooser** when you are setting up the **Grouping Viewer**, as shown in the right sector of the UI in the figure that follows.



**Figure 27. Message Analyzer Grouping viewer analysis**

### More Information

To learn more about Message Analyzer operations, including [Using and Managing Color Rules](#) and the [Grouping Viewer](#), see the [Message Analyzer Operating Guide](#).

## Troubleshooting

In this section you will find information about troubleshooting common **RDP Client Test Suite** and environment issues.

The major topics covered in this section include the following:

[Ping Failure](#)

[Test Run Issues](#)

[RDPEUSB Test Cases Fail](#)

[RDPEUDP and RDPEM7 Test Cases Fail](#)

[RDPBCGR Test Cases Fail When Running in PowerShell Mode](#)

[RDPEGFX Test Cases Require H264 Enabled on SUT](#)

[Test Cases Fail When Using the TLS or CredSSP Protocol](#)

## Ping Failure

**Table 21. Problem, Cause, and Resolution of Ping failures**

<b>PROBLEM</b>	The <b>SUT</b> computer does not respond to pings from the <b>Driver</b> computer.
<b>CAUSE</b>	The <b>Driver</b> computer is not in the same network segment as the <b>SUT</b> computer, or the <b>SUT</b> computer firewall is enabled.

<b>RESOLUTION</b>	Move the <b>Driver</b> computer and the <b>SUT</b> computer to the same network segment or disable the <b>SUT</b> computer firewall.
-------------------	--

## Test Run Issues

Table 22. Problem, Cause, and Resolution of Test Case execution issues

<b>PROBLEM 1</b>	One or more Test Cases failed with a message such as “Timeout when expecting <Message Type>”.
<b>CAUSE 1</b>	For Windows RDP clients, the <b>Test Suite</b> must be run under the Administrator account. For non-Windows RDP clients, the <b>SUT</b> computer control adapter may be not implemented properly. See <a href="#">RDPSUTControlAgent</a> for development information.
<b>RESOLUTION 1</b>	For Windows RDP clients, enable the Administrator account and log on as Administrator, as described in <a href="#">Configuring the SUT</a> .
<b>PROBLEM 2</b>	One or more Test Cases failed with the Exception “The handle is invalid”.
<b>CAUSE 2</b>	The <b>Driver</b> computer is locked while Test Cases are running.
<b>RESOLUTION 2</b>	Unlock the <b>Driver</b> computer when Test Cases are running.

## RDPEUSB Test Cases Fail

Table 23. Problem, Cause, and Resolution of RDPEUSB Test Case execution issues

<b>PROBLEM</b>	A significant number of MS-RDPEUSB Test Cases are failing.
<b>CAUSE</b>	The OSR USB FX2 board is not plugged into the <b>SUT</b> computer or the USB Redirection feature is not enabled in the <b>SUT</b> computer.
<b>RESOLUTION</b>	Plug an OSR USB FX2 board into the <b>SUT</b> computer USB hub. If you need to purchase an OSR USB FX2 board, see Table 2 in <a href="#">Test Environment Computer Requirements</a> . Enable RDP USB Redirection via the Local Group Policy Editor, as described in <a href="#">Configuring the SUT</a> .

## RDPEUDP and RDPEMT Test Cases Fail

Table 24. Problem, Cause, and Resolution of RDPEUDP and RDPEMT Test Case execution issues

<b>PROBLEM</b>	A significant number of MS-RDPEUDP and MS-RDPEMT Test Cases are failing.
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<b>CAUSE</b>	Some MS-RDPEUDP and MS-RDPEMT Test Cases create an RDP-UDP connection, which must use the TLS or CredSSP security protocol to secure the RDP session.
<b>RESOLUTION</b>	In the <code>RDP_ClientTestSuite.deployment.ptfconfig</code> file, configure the <code>RDP.Security.Protocol</code> to TLS or CredSSP, as described in <a href="#">Common Required Property Settings</a> .

## RDPBCGR Test Cases Fail When Running in PowerShell Mode

Table 25. Problem, Cause, and Resolution of RDPBCGR Test Case failures

<b>RESOLUTION</b>	Run each RDPBCGR Test Case above using the following command:  <code>RunTestCasesByFilter.ps1 -Filter "Name=&lt;TestCaseName&gt;"</code>
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## RDPEGFX Test Cases Require H264 Enabled on SUT

Table 26. Problem, Cause, and Resolution of RDPEGFX Test Case failures

<b>PROBLEM</b>	If the <b>SUT</b> computer is a thin client that does not support the H264 codec of RDPEGFX, it is expected that the following three Test Cases will fail: <ul style="list-style-type: none"> <li>• RDPEGFX_H264Codec_PositiveTest_H264Support</li> <li>• RDPEGFX_H264Codec_PositiveTest_SendH264Stream</li> <li>• RDPEGFX_H264Codec_NegativeTest_IncorrectRegionRectsNum</li> </ul>
<b>CAUSE</b>	The H264 is not enabled for testing the H264 codec in RDPEGFX on a thin RDP client.
<b>RESOLUTION</b>	Enable H264 by configuring H.264/AVC hardware encoding for Remote Desktop connections, as described in <a href="#">Configuring the SUT</a> and <a href="#">Configuring the Driver Computer</a> .

## Test Cases Fail When Using the TLS or CredSSP Protocol

Table 27. Problem, Cause, and Resolution of Test Case failures associated with TLS and CredSSP use

<b>PROBLEM 1</b>	When using the TLS or CredSSP protocol, a significant number of Test Cases fail with a Timeout exception.
<b>CAUSE 1</b>	The TLS and CredSSP protocol need more time to complete encryption and decryption processes.
<b>RESOLUTION 1</b>	In the <code>RDP_ClientTestSuite.deployment.ptfconfig</code> file, increase the value of the <code>WaitTime</code> property. To specify additional <code>WaitTime</code> , see <a href="#">Optional Configuration Settings</a> .

	The .ptfconfig file is located in the following <b>Driver</b> computer directory:  C:\RDP-TestSuite-ClientEP\Bin\
<b>PROBLEM 2</b>	When using the TLS or CredSSP protocol, Test Cases fail with the following Exception: “The system cannot find the file specified.”
<b>CAUSE 2</b>	The certificate file that is used to secure the TLS or CredSSP transport did not successfully generate.
<b>RESOLUTION 2</b>	Re-run the script <b>Config-DriverComputer.ps1</b> on the <b>Driver computer</b> to regenerate a valid certificate. This script is located in the following <b>Driver</b> computer directory:  C:\RDP-TestSuite-ClientEP\Scripts\  For the execution command line, see step 7 in the first procedure of <a href="#">Configuring the Driver Computer</a> .

# Resources and References

The list that follows provides links to various sources of information that are related to the operations of the **RDP Client Test Suite** described in this User Guide:

[Software Prerequisites](#)

[RDP Test Suite Installers – includes:](#)

RDP-TestSuite-ClientEP.zip

RDP-TestSuite-ServerEP.zip

ProtocolTestManager.msi

InstallerPrerequisites.zip

SourceCode files (WindowsProtocolTestSuites)

[RDP\\_Overview\\_Client Test Design Specification](#)

[Protocol Test Framework \(PTF\) Requirements](#)

[Getting Started Guide for PTF](#)

[Protocol Test Framework \(PTF\) Installer](#)

[Message Analyzer Operating Guide](#)