**R&D Document: Setting Up Site-to-Site VPN Using Hyper-V**

**1. Introduction**

A Site-to-Site (S2S) VPN allows for secure communication between two separate networks over the internet. This document details the steps to set up a Site-to-Site VPN using Hyper-V, leveraging Windows Server Routing and Remote Access Service (RRAS).

**2. Prerequisites**

* **Two physical sites**: Each site should have a Hyper-V host running Windows Server.
* **Public IP addresses**: Both sites need static public IP addresses.
* **Network infrastructure**: Each site should have its own internal network (subnet).

**3. Step-by-Step Setup**

**Step 1: Set Up Hyper-V Hosts**

1. **Install Hyper-V Role**:
   * Open Server Manager, select "Add roles and features".
   * Choose "Role-based or feature-based installation".
   * Select the server and add the "Hyper-V" role.
   * Complete the installation and restart the server if necessary.

**Step 2: Create Virtual Machines for RRAS**

1. **Create VMs**:
   * In Hyper-V Manager, create two VMs, one for each site.
   * Allocate sufficient resources (CPU, RAM, Disk) for each VM.
   * Install Windows Server on both VMs.
2. **Configure Network Adapters**:
   * Each VM should have two network adapters:
     + One connected to the internal network.
     + One connected to the external network (Internet).

**Step 3: Install and Configure RRAS on VMs**

1. **Install RRAS Role**:
   * On each VM, open Server Manager, select "Add roles and features".
   * Choose "Role-based or feature-based installation".
   * Add the "Remote Access" role and select "Routing" and "DirectAccess and VPN (RAS)".
2. **Configure RRAS**:
   * Open the "Routing and Remote Access" console.
   * Right-click on the server name and select "Configure and Enable Routing and Remote Access".
   * Choose "Custom configuration", then select "VPN access" and "LAN routing".
   * Start the service.

**Step 4: Configure VPN on RRAS**

1. **Set Up VPN Interfaces**:
   * In the RRAS console, right-click on the server name and select "Properties".
   * Go to the "Security" tab, enable "Allow custom IPsec policy for L2TP/IKEv2 connection".
   * Enter a shared secret (e.g., SharedSecret123).
2. **Add VPN Demand-Dial Interfaces**:
   * In the RRAS console, expand the server node, right-click on "Network Interfaces" and select "New Demand-Dial Interface".
   * Follow the wizard:
     + **Name**: SiteAtoSiteB
     + **Connection Type**: VPN
     + **VPN Type**: IKEv2
     + **Destination Address**: Public IP of the other site’s RRAS server.
     + **Protocols and Security**: Use the shared secret.
     + **Static Routes**: Add static routes for the internal networks of both sites.

**Step 5: Configure IP Routing**

1. **Add Static Routes**:
   * On each RRAS server, add static routes to route traffic between the internal networks.
   * Open a command prompt and run:

powershell

Copy code

route add 10.1.0.0 mask 255.255.255.0 10.0.0.1

route add 10.2.0.0 mask 255.255.255.0 10.0.0.2

**Step 6: Test the VPN Connection**

1. **Establish VPN Connection**:
   * On each RRAS server, right-click the demand-dial interface and select "Connect".
   * Verify that the connection is established successfully.
2. **Test Network Connectivity**:
   * From a client machine on one internal network, ping a machine on the other internal network.
   * Verify that traffic is routed correctly through the VPN.

**4. Best Practices**

* **Use Strong Authentication**: Ensure the shared secret is complex and secure.
* **Enable Logging and Monitoring**: Use RRAS logging features to monitor VPN connections and troubleshoot issues.
* **Regularly Update**: Keep the Windows Server OS and Hyper-V hosts updated with the latest patches.

**5. Conclusion**

Setting up a Site-to-Site VPN using Hyper-V and RRAS provides a secure and reliable method to connect two separate networks. By following the steps outlined in this document, organizations can ensure secure communication between remote sites.

**References**

* [Microsoft Documentation on RRAS](https://docs.microsoft.com/en-us/windows-server/remote/remote-access/remote-access)
* [Hyper-V Setup Guide](https://docs.microsoft.com/en-us/virtualization/hyper-v-on-windows/quick-start/quick-create-virtual-machine)

This R&D document provides a comprehensive guide to setting up a Site-to-Site VPN using Hyper-V, ensuring secure and efficient inter-site connectivity.