Flexfabric 20/40 cookbook

1 Technical White Paper HP Virtual Connect FlexFabric Cookbook With HP Virtual Connect Flex-20/40 F8 (Version 4.10 to 4.30 Firmware Enhancements) September 2014 Purpose 5 Documentation Feedback 5 Documentation Revisions 5 The Virtual Connect Cookbook Series: 6 Introduction to Connect Virtual Flex-1 0/Flex-20 and FlexFabric Technologies 7 New features: 8 Virtual Connect Ethernet modules 11 Virtual Connect features and capacity 16 VMware ESXi Choosing the right Virtual Connect module 29 FlexFabric adapters 30 Determine network traffic patterns and Virtual Connect network design (Active/Standby vs. Active/Active) 31 Connect direct virtual connect to core 33 scenarios for a domain/enclosure 34 Overview 34 Requirement 34 Scenario 1 Easy vnet with Active/Standby links Ethernet and FCoE Windows 2012 R2 37 Overview 37 Requirements 37 Installation and Configuration 39 Review 47 Windows Results 2012 R2 Network Example 47 Results Windows 2012 R2 SAN Connectivity 52 Summary 53 1 2 Scenario 2 Shared Uplink Sets with Active/Active Links and 802.3ad (LACP) - Ethernet and FCoE Windows 2012 R2 54 Overview 54 Requirements 54 Installation and Configuration 56 Review 66 Results Windows 2012 R2 Network example 66 Results Windows 2012 R2 SAN Connectivity 71 Summary 71 Scenario 3 Shared Uplink with Active/ Active Uplinks and 802.3ad (LACP) - Ethernet Connection 71 Summary 71 Scenario 3 Shared Uplink with Active/Active Uplinks and 802.3ad (LACP)) - Ethernet and FCoE Boot from SAN Windows 2012 R2 72 Overview 72 Requirements 72 Installation and Configuration 74 Review 85 Results Windows 2012 R2 Network example 85 Results Windows 2012 R2 SAN Connection 90 Summary 90 Scenario 90 4 Shared Uplink set with Active/ Active Uplinks and 802.3ad (LACP) Ethernet, FCoE SAN - Windows 2012 R2 Hyper-V 91 Overview 91 Requirements 91 Installation and Configuration 93 Review 104 Results Windows 2012 R2 Networked Example 105 Results Windows 2012 R2 SAN Connection 113 Summary 113 Summary 113 Summary 1 113 Scenario 5 Shared Uplink Set with Active/Standby links and 802.3ad (LACP) - Ethernet and FCoE SAN vsphere Overview 114 Requirements 114 Installation and Configuration 116 Review 128 Results vsphere Networking Examples 129 Results vsphere SAN Connectivity 135 Summary 136 3 Scenario 6 Shared Uplink Set with Active/Active Uplinks, 802.3ad (LACP) - Ethernet and FCoE SAN vsphere Overview 137 Requirements 137 Installation and Configuration 139 Review 150 Results vsphere Network Example 151 Results vsphere SAN Connectivity 157 Summary 158 Scenario 7 Tunneled VLANs and Shared Uplink Set with Active / Active Uplinks and 802.3ad (LACP) - Ethernet and FCoE SAN vsphere Overview 159 Requirements 159 Installation and Configuration 161 Review 174 Results vsphere Networking Examples 175 Results vsphere SAN Connectivity 181 Summary 182 Scenario 8 Network Access Groups a Shared Link Set - Ethernet and FCoE SAN Windows 2012 R2 183 Overview 183 Requirements 183 Installation and Installation of FCoE SAN Windows 2012 R2 183 Overview 183 Requirements 183 183 186 Review 196 Results Windows 2012 R2 Networking Examples 196 Summary 201 Scenario 9 Shared Uplink Set with Active/Active Uplinks, 802.3ad (LACP) Flex-10 and VC-Fibre Channel SAN vsphere Overview 202 Requirements 202 Installation and configuration 204 Review 215 Results vsphere Networking Examples 216 Results vsphere SAN Connectivity 222 Summary 222 3 Scenario 4 10 Shared Uplink Set with Active/Active Uplinks and 802.3ad (LACP) FlexFabric-20/40 F8 - Windows 2012 R2 Hyper-V 223 Overview 223 Requirements 223 802.3ad (LACP) FlexFabric-20/40 F8 vsphere 249 Overview 249 Requirements 249 Requirements 249 Installation and configuration 251 Review 262 Results vsphere Networking Examples 263 Results vsphere SAN Connectivity 269 Summary 270 Appendix A1 Scenario-based CISCO IOS Command Line Reference 271 Appendix A2 Scenario-based CISCO NX-OS Command Line Reference 276 Appendix B1-based ProCurve Command Line Reference 281 Appendix B2 Scenario-based Comware Command Line Reference 285 Appendix C Acronyms and Abbreviations 294 Appendix D Useful VC CLI Command Sets 295 VC Domain Configuration 295 FlexFabric Scripting Appendix 298 Release 3.30 Script extension 298 Appendix E Configure QoS 300 Add-on SW Using QSFP+ for 10Gb Connectivity with FlexFabric-20/40 F8 Module 307 Requirements 307 Installation and Configuration 308 Review 312 5 Purpose Purpose Of this Virtual Connect Cookbook is to provide virtual connect users with a better understanding of the concepts and steps required when integrating HP BladeSystem and Virtual Connect Flex-10, Flex-10/10D, FlexFabric 10Gb/24 Port and the new FlexFabric-20/40 F8 components to an existing network. The scenarios in this Cookbook range from simplified to more complex while covering a range of typical building blocks to be used in designing Virtual Connect Flex-10 or FlexFabric solutions. Although these scenarios are displayed individually, some scenarios could be combined to create a more complex and versatile Virtual Connect environment, such as combined use of Shared Uplink Sets (SUS) and vnet Tunnels. Or North/South Traffic Flow Active/Active Networks, such as ISCSI or VDI, while having the primary network traffic configured in a separate Shared Uplink set with Active/Standby uplinks. In addition to the features added to previous releases 4.20 is a larger release that includes several new features, including support for 20Gb Network Card and QSFP + 40Gb uplinks and a 40Gb to 10Gb splitter cable (to enable integration in 10Gb environments much easier) with the new FlexFabric-20/40 F8 modules. In addition, release 4.30 provided additional features, such as Partial support for 9 servers and 4K VLAN support. These feature enhancements discussed in the following sections. This Cookbook will highlight and discuss some of these extra features. The written scenarios are meant to be standalone configurations and are not based on previous scenarios, with which you can find some repetition or duplication of configuration across scenarios. If you're new to Virtual Connect, to get a better understanding of Virtual Connect, spend some time reviewing the introductory sections and additional referenced content before moving to the scenarios. This paper is not meant to be a complete or detailed guide to Virtual Connect, Flex-10/Flex-20 or FlexFabric, but is intended to give the reader some valid examples of how Virtual Connect could be deployed within their environments. Many additional configurations or scenarios could also be implemented. See the following sections for additional reference materials on Virtual Connect, Flex-10/Flex-20, FlexFabric 10/24-Port and FlexFabric 20/40 F8. Documentation feedback HP welcomes your feedback. To make comments and suggestions about product documentation, send a message to include the document title and production part number for this paper, (located on the last page of this document). All submissions will be hp. Documentation revisions revisions or changes to this document since first release are highlighted in the table below. Revision Date: Summary of Changes 30 Sept 2014 Introductory Release - January 5, 2015 Corrected rates in all Windows 2012 R2 scenarios, regarding supported NIC teaming Load balancing modes Sept 29, 2015 Updated FlexFabric and Ethernet adapters list on page 30 Oct 16, 2015 Corrected errors on page 26 and 27 Purpose 5 6 The Virtual Connect Cookbook Series: Virtual Connect 1Gb Ethernet Cookbook Connect Virtual can be used to support both Ethernet and Fibre Channel connections. Virtual Connect 1Gb Ethernet Cookbook is equipped with basic Virtual Connect configurations in a 1Gb environment. Previous editions of the Virtual Connect Ethernet Cookbook cover both 1Gb and 10Gb solutions; however, the latest release of Virtual Connect 1Gb Cookbook includes only 1Gb Ethernet Solutions up to Virtual Connect firmware release 3.6x. (FCoE Cookbook for HP Virtual Connect Virtual Connect provides the ability to pass FCoE to an external FCoE capable network switch. This guide provides concepts, guidelines for deployment, and use case scenarios for HP Virtual Connect when using the fibre channel over Ethernet via FIP Snooping under specification T11 FC-BB-5. For FIP Snooping and FCoE connectivity, refer to the FCoE Cookbook for HP Virtual Connect (FC Cookbook for HP Virtual Connect Virtual Connect can be used to support both Ethernet and Fibre Channel connections; however, this guide is entirely focused on Ethernet For Fibre Channel connectivity, refer to THE FC Cookbook for HP Virtual Connect (iscsi Cookbook for HP Virtual Connect Virtual Connect can be used to support iscsi-accelerated connections, including iscsi booting, however, this guide is entirely focused on the Ethernet and iscsi configuration. For iscsi connectivity, refer to the iscsi Cookbook for HP Virtual Connect (The Virtual Connect Cookbook Series: 6 7 Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies Virtual Connect is an industry standard implementation of server edge virtualization. It puts an abstraction layer between the servers and the external networks so LAN and SAN see a pool of servers rather than individual servers. When the LAN and SAN connections are physically made in the pool of servers, the server administrator uses Virtual Connect Manager (VCM) or Virtual Connect Enterprise Manager (VCEM) virtual connect management tools to create a profile for each server. Virtual Connect FlexFabric is an extension to the Virtual Connect Flex-10/Flex-20 which utilizes the Fibre Channel over Ethernet (FCoE) protocol. By leveraging FCoE to connect to existing Fibre Channel SAN networks, we can reduce the number of switch modules and HBA devices required within the server blade and enclosure. This in turn further reduces costs, complexity, power and administrative overheads. This paper will discuss the differences between Virtual Connect Flex-10/10D, Virtual Connect FlexFabric 10Gb/24-Port and Virtual Connect FlexFabric-20/40 F8 modules and provide information and suggestions to help the reader determine the best option for their implementation of HP BladeSystem and Virtual Connect. However, it is also important to understand that as Virtual Connect FlexFabric is utilizing FCoE functionality, that functionality in that exists within the Virtual Connect environment and a knowledge of, or infrastructure to support FCoE outside the enclosure is not required. For further information about Virtual Connect, Flex-10/Flex-20 and/or FlexFabric, please review the documents below. Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 7 8 New features: Version 4.10 of Virtual Connect supports the following improvements: The User Guide provides information about the following changes to VC 4.10: Discontinued support for old hardware o HP 4Gb VC-FC Module (B21) no longer supported manageability improvements: o VC management support for IPv6 Note: Use of IPv6 requires OA and ilo from SPP (B) or higher SPP releases. o Ability to hide unused FlexNICs. The FlexNICs (physical functions) that do not map to profile connections are not listed in the OS as network interface. o Auto-deployment feature, which enables the configuration of a VC domain from a centralized site using DHCP and TFTP o Enhanced non-hp DAC and FC transceivers. The Non-HP port status condition replaces the Uncertified Port Status condition. SR-IOV support o Ability to activate SR-IOV on some FLBs and mezzanine cards for Gen8 servers and LOMs for HP ProLiant BL620c G7 and HP ProLiant BL680c G7 Server Blades o VC SR-IOV supports the following adapters: HP Flex-10 10Gb 2-port 530FLB Adapter HP FlexFabric 10Gb 2-port 534FLB Adapter HP Flex-10 10 Gb 2-port 530M Adapter HP FlexFabric 10Gb 2-port 534M Adapter HP NC552m Flex-10 Adapter HP NC553m 10Gb 2-Port 2-Port Adapter HP NC552m Flex-10 Adapter HP NC553m 10Gb 2-Port 2-Port 534M Adapter HP NC552m Flex-10 Adapter HP NC553m 10Gb 2 -Port 2-Port P FlexFabric Converged Network Adapter HP FlexFabric 10Gb 2-port 554M Adapter HP Flex-10 10Gb 2-port 552M Adapter HP FlexFabric 10Gb 2-port 554FLB Adapter o VC SR-IOV supports the following operating systems : Windows 2012 and higher (64-bit) VMware ESXi 5.1 and higher (64-bit) RHEL 5.8 and higher (64-bit with KVM) RHEL 6.2 and higher (64-bit with KVM) SLES 11 SP2 and higher (64-bit with KVM) The following HP products are now supported : o HP ProLiant BL460c Gen8 Server Blade o The HP FlexFabric 10Gb 2 -port 534FLB Adapter o The HP FlexFabric 10Gb 2-port 534M Adapter o HP QMH Gb FC HBA for BladeSystem c-class Please see VC 4.10 Release notes and User Guides for further information 4.10 10 Release Notes CLI User's Guide User Guide Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 8 9 Virtual Connect Firmware 4.20 includes the following new features: Version 4.20 of Virtual Connect includes support for the following enhancements : Enablement of Virtual Connect Flex-20 Technology Manageability Improvements: The Sflow feature allows network administrators to monitor and analyze network traffic flow in the datacenter. Sflow settings can be changed by users with role permissions for Network, Domain, or Server users. FIP snooping information display, which provides FCoE connection tasks for administrators. CLI display config command, with includepoolinfo option to save a configuration script that contains MACs, WWNs, and virtual serial numbers for your domain. For more information, see HP Virtual Connect Manager Command Line Interface for C-Class BladeSystem User Guide on hp's website (The following HP products are now supported: HP Virtual Connect FlexFabric-20/40 F8 Module HP FlexFabric 20Gb 2-port 630FLB/M Adapter HP LPe Gb FC HBA for BladeSystem c-class Please see VC 4 20 Release notes for BladeSystem c-class additional information 4.20 Release Notes CLI Guide User Guide Virtual Connect Firmware 4.30 includes the following new features: Version 4.30 of Virtual Connect includes support for the following improvements: UEFI boot mode support o Configure server boot modes PXE IP boot order o Configure PXE IP boot order FIPS mode support o For a current status of FIPS certification, HP Site (Configure partially stacked domains to isolate specific networks and fabrics (Domain 40Gb FIP snooping is supported with QSFP+ Monitor, detecting and reporting pausing flood conditions on uplink and stacking link ports. Configure SNMPv3 users, security levels, and informs o Increase security for VC domain network management and administrative frameworks. Configure more VLAN: o Configure a maximum of 8,192 VLAN per domain. o Configure a maximum of 4,094 VLAN per shared uplink set. The following HP products are now supported: o HP ProLiant BL460c Gen9 Server Blades o HP FlexFabric 20Gb 2-port 650M Adapter o HP FlexFabric 20Gb 2-port 650FLB Adapter o HP FlexFabric 10Gb 2-port 536FLB Adapter Please see VC 4 30 Release notes for further information.30 Release Notes CLI Guide User Guide Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 9 10 Virtual Connect Support Utility (VCSU) Release Virtual Connect Support Utility enables administrators to upgrade virtual connect Ethernet and Fibre Channel module firmware, and to perform other maintenance tasks remotely using a standalone command line or interactive tool. When the tool initiates a firmware upgrade process, VCSU performs an automatic health check, and then all modules are updated at the same time. The tool displays a message indicating that an update is in progress and what percentage has been completed. When the firmware updates module is complete, the tool activates all modules. The default activation order module restarts modules in a particular order, to reduce or eliminate the need for a complete outage. The tool provides the ability to select activation mode, to potentially speed the roll out of firmware, in the event of a planned outage. You can use the tool to confirm the health of before an upgrade. Note: VCSU (or later) must be used when installing or upgrading a Virtual Connect Additional Virtual Connect Reference Material Links to the HP Virtual Connect technology website, provides a lot of reference information on HP Virtual Connect Flex-10 and FlexFabric website HP Virtual Connect Information Library Overview of HP Virtual Connect Technologies HP Virtual Connect FlexFabric 20/40 F8 HP Virtual Connect Flow HP Virtual Connect HP Virtual Connect For C-Class BladeSystem Setup and Installation Guide Effectively Manage Connect Virtual Environments HP Virtual Connect Direct-Attach Fibre Channel for HP 3PAR (FlatSAN) Solution Cards HP BladeSystem Network Reference Architecture - FlexFabric and VMware vsphere 5 Connect User, Setup and CLI Guides &cc=us&docindexid=64180&taskid=101&prodtypeid= &prodseriesid= HP Virtual Connect FlexFabric Solutions Recipe Virtual Multi Connect-Enclosure Stacking Reference Guide Virtual Connect for CISCO ADMINISTRATOR HP Virtual Connect for C-Class BladeSystem Setup and Installation Guide Version 4.01 and Later Introduction to Connect Flex-10/Flex-20 och FlexFabric Technologies 10 10 Virtual Connect Ethernet Modules Virtual Connect Flex-10/10D Module Uplink PortMappings It is important to note how the external uplink ports on the Flex-10 module are configured. The graphic below describes the type and speed each port can be configured as. Ports X1 X10; Can be configured as 1Gb or 10Gb Ethernet or FCoE (ALL external ports can be used, no partitioning of these ports with internal stacking, as with previous modules) Ports X11-X14; Internal cross-connections for horizontal stacking and are NOT shared with any external connections Uplink ports X1-X10 supports m length DAC as stacking or uplink. If larger lengths are required, fiber optic cables would require Figure 1 - Virtual Connect Flex-10/10D Module port configuration, speeds and types Figure 2 - FlexNIC Connections It is important to note that Physical function two (pf2) can be configured as Ethernet, iscsi (iscsi and Dual Hop FCoE supported with Flex-10/10D, G7 and later blades using a supported FlexFabric Adapter). Physical Functions 1, 3 and 4 should be assigned as Ethernet only connections. Dual Hop FCoE connections are supported on all external uplink ports Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 11 12 Virtual Connect FlexFabric 10Gb/24-Port Module Uplink Port Mappings It is important to note how the external uplink ports on the flexFabric 10Gb/24 Port module are configured. The graphic below describes the type and speed each port can be configured as. Ports X1 X4; Can be configured as 10Gb Ethernet or Fibre Channel, FC supported speeds = 2Gb, 4Gb or 8Gb with 4Gb or 8Gb FC SFP modules, referenced to FlexFabric Quick Spec for a list of supported SFP modules Ports X5 X8: Can be configured as 1Gb or 10Gb Ethernet ports X7 X8; Also shared as internal stacking links and should not be used for external connections, at least one horizontal stacking link is required, if modules are located in adjacent compartments. Note: Within FlexFabric, Stacking only applies to Ethernet traffic, FCoE or Fibre Channel Uplink ports X1-X4 supports 0.5m length DAC as stacking or uplink Uplink Ports X5-X8 support 0.5 7m length DAC as stacking or uplink Note: 5m DAC cables are supported on all ports with FlexFabric, in addition, 7-15m DAC cables are also supported on ports X5 through X8. The Flex-10 supports 15m DAC cables on ALL ports. Figure 3 Virtual Connect FlexFabric 10/24-Port Module port configuration, speeds and types Figure 4 - FlexNIC Connections It is important to note that Physical function two (pf2) can be configured as Ethernet, iscsi or FCoE (iscsi and FCoE supported with VC FlexFabric, G7 and later blades using a supported flexfabric adapter). Physical Functions 1, 3 and 4 should be assigned as Ethernet only connections. Dual Hop FCoE connections supported on external ports X1 through X4 till Virtual Connect Flex-10/Flex-20 Flex-10/Flex-20 FlexFabric Technologies 12 13 Virtual Connect FlexFabric-20/40 F8 Module Uplink PortMappings It is important to note how the external uplink ports on the FlexFabric-20/40 F8 module are configured. The graphic below describes the type and speed each port can be configured as. Ports X1 X4; Can be configured as 10Gb Ethernet, or Fibre Channel Ports X5 X6: Are paired and can be configured as 10Gb Ethernet or Fibre Channel ports X7 X8; is paired and can be configured as 10Gb Ethernet or Fibre Channel ports Q1 Q4: QSFP+ 40Gb Ethernet and can be configured as 40Gb Ethernet or a 4x10Gb Ethernet per port when using HPN DAC Splitter cable 2x 20Gb (Dedicated) Internal ports are configured for Cross Connect Figure 5 Virtual Connect FlexFabric-20/40 F8 Module port configuration; speeds and types Figure 6 - FlexNIC Connections It is important to note that Physical function two (pf2) can be configured as Ethernet, iscsi or FCoE (iscsi and FCoE supported with VC FlexFabric, G7 and later blades using a supported FlexFabric Adapter). Physical Functions 1, 3 and 4 should be assigned as Ethernet only connections. Dual Hop FCoE connections are supported on external ports X1 to X8 Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 13 14 Virtual Connect 8Gb 20-Port Fibre Channel Module Uplink Port Mappings It is important to note how the external uplink ports on the VC-FC module are configured. The graphic below describes the type and speed each port can be configured as. Ports 1-4; Can be operated at 2Gb Fibre Channel speeds, 4Gb or 8Gb with 4Gb or 8GB FC SFP modules VC 8Gb 20 Port Modular Vesselwith NO SFP modules, See VC 8Gb 20 Port Module Quick Spec for a list of supported SFP modules Figure 7 - Virtual Connect 8Gb 20 Port Module port configuration and speed types Virtual Connect 8Gb 24-Port Channel Module Uplink Port Mappings It is important to note how the external uplink ports on the VC-FC module are configured. The graphic below describes the type and speed each port can be configured as. Ports 1-8; Can be operated with 2Gb, 4Gb or 8Gb Fibre Channel speeds with 4Gb or 8GB FC SFP modules VC 8Gb 24 Port modular vessels with TWO 8Gb FC SFP modules installed, please refer to VC 8Gb 24 Port module Quick Spec for a list of supported SFP modules Figure 8 - Virtual Connect 8Gb 20 Port Module port configuration and speed types Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 14 15 Connect to Brocade 8Gb Fibre Channel Fabric on 8Gb (with Fabric OS 6.x.x) When VC 8Gb 20 port FC or VC FlexFabric 10Gb/24 port module Fibre Channel uplink ports are configured to operate at 8Gb speed and connect to HP B Series (Brocade) Fibre Channel SAN switches, the version supported in the least possible way FoS (Brocade Fabric OS) is v6.3.1 and v6.4.x. In addition, a fillword on the alternating ports alternating configured with Mode 3 option to prevent connection problems at 8Gb speed. Note: This setting affects only 8Gb Brocade SAN Switches with devices logged on at 8G (not required on 16GB SAN Switches). On Brocade FC switches, use the command; portcfgfyllword (portcfgfillword <Port#> <Mode>) to configure this setting: Mode 0 Mode 1 Mode 1 Mode 2 Mode 3 Link Init/Fill Word IDLE/IDLE ARBF/ARBF IDLE/ARBF If ARBF/ARBF fails, IDLE/ARBF To change mode is disruptive no matter what speed the port is operating at. The setting is retained and applied at any time an 8G device signs in. Upgrades to FOS v6.3.1 or v6.4 from previous releases that only support modes 0 and 1 will not change the existing setting, but a factory standard switch or port reset with FOS v6.3.1 or v6.4 will be configured to Mode 0 by default. The default setting on new devices may vary by vendor. Use portcfgshow CLI to display the current portcfgfillword status of that port. Modes 2 and 3 are compatible with FC-FS-3 specifications (standards indicate idle/ARBF behavior in Mode 2 used by Mode 3 if ARBF/ARBF fails after 3 attempts). For most environments, Brocade recommends using Mode 3, as it provides more flexibility and compatibility with a wide range of devices. In the event that the default setting or Mode 3 does not work with a particular device, contact your switch provider for further assistance. When connecting to Brocade 8Gb SAN Switches on 8Gb, with FOS v6.3.1 or v6.4.x portcfgfillword must be set to Mode 3 If ARBF/ARBF fails to use IDLE/ARBF. Virtual Connect Fibre Channel 4Gb (B21) - Discontinued Support There were TWO versions of the 4Gb VC-FC module that were produced. The first was part #B21 and the second module, which has a more robust chipset, part #B22. Support for the B21 version of the 20 port 4Gb VC-FC module was dropped from the code base in the VC Firmware version Therefore, as described in the Virtual Connect release notes since release 4.10, 20 Port 4Gb VC-FC modules (part #B21) are no longer supported and cannot be upgraded earlier VC 4.01 (FC firmware version 1.44). If the domain contains these modules, you will not be able to upgrade the domain beyond vc firmware version If you still have 4Gb VC-FC modules in your enclosure, you can check if they are B21 or B22 version, by logging in to OA and navigating to Interconnect Bay as shown below. Figure 9 - Verify 4Gb VC-VF Module version (module below not supported) Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 15 16 Virtual Connect features and features Virtual Connect VLAN Support Shared Uplink Set Shared Uplink Sets allows administrators to deploy VLAsinindiscreet and defined (vnet.) These vnets can then be mapped logically to a Server Profile network connection allowing only the necessary VLANs to be associated</Mode> </Port#> </Port#> nic port of the specific server. This also allows the flexibility to have different network connections for different physical operating system instances (i.e. VMware ESX host and physical Windows host.) Legacy VLAN Capacity Legacy VLAN capacity mode allows up to 320 VLAN per Ethernet module, 128 VLAN per Shared Uplink Set and, up to 28 VLAN are allowed per FlexNIC port. Care must be taken to exceed the limit per physical server port. The following Shared Uplink Set rules apply to legacy capacity mode: 320 VLAN per Virtual Connect Ethernet module 128 VLAN per Single uplink port 28 unique server-mapped VLAN per server profile network connection The above configuration rules apply only to a Shared Uplink set. If support for a larger number of VLAnS is required, a VLAN Tunnel can be configured to support a large number of VLAns. Please see The Virtual Connect Release Notes for future details. Extended VLAN capacity Added to Virtual Connect 3.30 Release This mode allows up to 1000 VLAn networks per domain when implementing a Share Uplink Set (SUS). In addition, the number of VLAns per shared uplink set is limited to up to 162 VLAN per physical server port, without limiting how these VLAs are distributed among the server connections mapped to the same physical server port. Care must be taken to exceed the limit per physical server port. For example, if you configure 150 VLAN mappings for a server connection (FlexNIC: a) of a FlexFabric physical server port, you can only map 12 VLAns to the remaining three server connections (FlexNIC:b, FlexNIC:c, and FlexNIC:d) for the same physical server port. If you exceed the 162 VLAN limit, the physical server port is disabled and the four server connections are marked as Failed. Also, keep in mind that the FCoE SAN or iscsi connection also counts as a network mapping. In the event that larger number of VLAN is needed a vnet Tunnel can be used simultaneously with VLAN mapping. The following Shared Uplink Set rules apply: 1000 VLAN per Virtual Connect Ethernet domain, 162 VLAN networks per Ethernet server port The above configuration rules apply only to a Shared Uplink set. If support for a larger number of VLAnnetworks is required, a VLAN Tunnel can be configured to support a large number of VLAs. Please refer to Virtual Connect Release Notes for further details. Note: Virtual Connect Release 4.30 adds the ability to configure up to 4096 VLAN per shared uplink set and 8192 networks per domain, however, there is still a limit of 1000 in use VLAN per domain. When you create the Virtual Connect domain, the default configuration is in 3.30 Legacy VLAN capacity mode (in Virtual Connect 4.01, the default mode is now Expanded VLAN Capacity). Note: Expanded VLAN Capacity mode is not supported on the following 1Gb based Virtual Ethernet modules, for example: HP 1/10Gb VC VC Module HP 1/10Gb-F VC Ethernet module If these modules are inserted into an enclosure that is in Expanded VLAN capacity mode, they are marked as incompatible. If these modules are installed in a housing, conversion to Extended VLAN Capacity Mode will not be allowed. Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 16 17 Image 10 - Configure Expanded VLAN Capacity Support 4096 VLAN Support Virtual Connect 4.30 now provides the ability to define up to 4096 VLAN then consume only the VLAN you need, when you need them. There is nothing to change or enable to take advantage of the 4096 VLAN feature, however; we are still limited to a total of 1000 active VLAns per domain, as shown in the following graphics, and 162 configured VLAN per FlexNIC. Figure 11 - The Networks page provides the ability to quickly determine how many VLAs are implemented and used. A VLAN is considered to be in use when assigned to a server FlexNIC. Any VLAn, which is later unsigned, will be returned to the pool As a result of only activating networks once they are assigned to a server profile, you will notice a slight change in behavior when creating networks (within a Shared Uplink Set, a Single Vnet or a Tunnel). In previous editions of Virtual Connect, when a network was defined, with uplinks assigned, these uplinks would become active, however; with Virtual Connect 4.30, we leave the standby uploadlinks until one of the networks connected to the uplink is assigned to a server profile. The following video details this change, as well as examples provided within each scenario. Virtual Connect v4.30 Link State Implementation Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 17 18 Bulk VLAN Creation In addition to providing support for a larger number of VLAN, Virtual Connect now provides the ability to create multiple VLAN,within a Shared Uplink (SUS), in a single operation. Using the Bulk VLAN creation feature in the GUI or the add network range command in the CLI many VLAN can be added to a SUS. In addition, copying an existing SUS is also now possible. When you create an Active/Active SUS configuration, you can create the first SUS and then copy it. Figure 12 - Example of adding multiple VLNs to a SUS via GUI Bulk VLAN Creation (CLI) Here is an example of creating a shared Uplink Set with the cli command add network range to create more than 1000 VLAN as shown above. adding uplinks VLAN-Trunk-1 add uplinkport enc0:1:x5 Uplinkset=VLAN-Trunk-1 speed=auto add uplinkport enc0:1:x6 Uplinks=VLAN-Trunk-1 speed=auto add network range -- silent UplinkSet=VLAN-Trunk-1 NamePrefix=VLAN-NameSuffix=-1 VLANIDs= , State=enabled PrefSpeedType=auto SmartLink=enabled Copying of a Shared Uplink Set Virtual Connect provides the ability to copy a Shared Uplink Set. This can be very useful when defining Active/Active Split Uplink set design. You simply create the first SUS, and then copy it. For example, after creating Shared Uplink Set VLAN-Trunk-1, you can copy it to VLAN-Trunk-2, assign links to the new SUS, and make sure that all networks have SmartLink enabled. This can be achieved as follows; copy uplinks VLAN-Trunk-1 VLAN-Trunk-2 fromvlanstr=1 tovlanstr=2 replace=last add uplinkport enc0:2:x5 Uplinkset=VLAN-Trunk-2 speed=auto add uplinkportc 0:2:x6 Uplinkset=VLAN-Trunk-2 speed=auto set network-range -quiet UplinkSet=VLAN-Trunk-2 VLANIds= , SmartLink=enabled vnets and Tunnels There are two types of vnets. The first is a simple vnet that will pass only untagged frames. The second is a vnet tunnel that will pass tagged frames for one or many VLAns. Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 18 19 vnet The vnet is a simple network connection between one or many server NIC to one or many uplink ports. A vnet could be used to connect a single VLAN, without tagging, to one or many server NIC cards. If this network is configured as a VLAN, by configuring the upstream switch port as an access or untagged port, by extension, any server connected to this vnet would be in the VLAN, but would not need to be configured to parse VLAN tags. Advantages of a vnet A vnet is a simple, unadopted network, which is used to quickly connect a server or set of servers to an unadopted network within your infrastructure. No VLANS is required to utilize a vnet. vnet Tunnel A tunneled vnet will pass through VLAN-tagged frames, without having to interpret or forward these frames based on the VLAN tag. Within a tunnel vnet vlan tag is completely ignored by Virtual Connect and the frame is forwarded to the appropriate connection (server NIC[s] or uplinks) depending on the frame direction flow. In this scenario, the end server would need to be configured to parse the VLAN tags. This could be a server with a local operating system, where the network stack would need to be configured to understand what vlan the server was in, or a virtualization host with a vswitch that supports multiple VLAns. The tunneled vnet can support up to 4096 VLAN. Advantages of a vnet Tunnel A vnet Tunnel can present one or many VLAN to a server NIC. When additional VLAns are added to the upstream switch port, they are made available to the SERVER NIC with no changes required within Virtual Connect. All presented VLAN passes through the tunnel, unchanged. Shared Uplink Set (SUS) SUS provides the ability to support VLAN tagging and forward frames based on the VLAN tags for these frames. The SUS device connects one or many server's to one or many uplink ports. An SUS would be configured for the specific VLAs it will Support. If support for additional VLAN is required, these VLAs must be configured within SUS. When you connect a server NIC to a network network a SUS, there are two choices provided. The key difference between these two options is the state in which the frame is sent to the server NIC. When configuring a network connection server NIC; 1. Select a single network that would be mapped to a specific VLAN. If a single network is selected, the frames will be presented to the NIC server without a VLAN tag. In this case, the host operating system does not need to understand what VLAN it is in. When the server sends frames back to Virtual Connect, these frames will not be noticeable, however; Virtual Connect will add the VLAN tag and forward the frame to the correct VLAN. 2. Select multiple networks that would provide connectivity to multiple VLAns. The Multinetwork connection feature provides the ability to use a Shared Uplink set to present multiple networks for a single NIC. Selecting Multiple Networks when you assign a network to a server NIC gives you the option to configure multiple networks (VLANS) on the server NIC. At this point Virtual Connect tags ALL the packages presented to the NIC unless the Native check box is selected for one of the networks, in which case packets from this network (VLAN) will be untagged, and any untagged packets leaving the server will be placed on this network (VLAN). You can create a Shared Uplink Set that contains ALL the VLAN files you want to present to your servers, then present only one network (the one associated with the VLAN you want the server NIC on) to Windows, LINUX or ESX Console NIC, then select Multiple Networks for NIC connected to esx vswitch and select ALL the networks that we want until the ESX host vswitch. Vswitch will then break out vlan in port groups and present them to the guests. Using Mapped VLAn tags minimizes the number of uplinks required. Introduction to virtual connect Flex-10/Flex-20 and FlexFabric Technologies 19 20 Benefits of a SUS The Shared Uplink Set (SUS) is the most popular Virtual Configuration that provides the most flexibility to connect a server profile to either or both tagged and untagged network connections, simplifying overall configuration and minimizing the number of uplink cables required to support network connections. MAC Cache Failover When a Virtual Connect Ethernet uplink that was previously in standby mode becomes active, it may take several minutes for external Ethernet switches to realize that the C-Class server blades can now be accessed on this newly active connection. Enabling Fast MAC Cache Failover causes Virtual Connect to transfer Ethernet packets on newly active links, allowing the external Ethernet switches to detect the new connection faster (and update their MAC caches appropriately). This broadcast sequence is repeated a few times with the MAC refresh interval (5 seconds recommended) and is completed Minute. When implementing Virtual Connect in an Active/Standby configuration, where some of the links connected to a Virtual connect Network (whether an SUS or vnet) is on standby, MAC Cache Fail-over would be employed to notify the switch as a link transitions from Standby to Active within Virtual Connect. Note: Be sure to set switches so that MAC addresses can be moved from one port to another without waiting for an expiration period or causing a lock out. Virtual Connect QoS QoS is used to provide different priorities for designated network traffic flows and ensure a certain level of performance through resource reservation. QoS is important for reasons such as: Providing Service Level agreements for network traffic and to optimize network utilization Different types of traffic such as management, backup and voice have different data flow requirements, jitter, delays and packet loss IP-TV, VOIP and internet deployment create additional traffic and latency requirements In some cases, capacity cannot be increased. Even when possible, increasing capacity can still run into problems if traffic needs to be re-routed due to an error Traffic needs to be categorized and then classified. Once classified, traffic is given priorities and planned for transmission. For end to end QoS, all hops along the route must be configured with similar QoS classification and traffic management policies. Virtual Connect manages and guarantees its own QoS settings as one of the hops within the network infrastructure. See Annex F: for further information on QoS. Network Access Groups (NAG) With Virtual Connect 3.30 and later, network access groups are defined by the network administrator and associated with a set of networks that can be shared by a single server. Each server profile is associated with a network access group. A network cannot be assigned to the server profile unless the profile is a member of the network access group associated with that network. A network access group can contain multiple networks. A network can be in more than one network access group, such as a management or VMotion VLAN. Up to 128 network access groups are supported in the domain. Ethernet networks and server profiles that are not assigned to a particular network access group are automatically added to the Default Network Access Group domain. The Default network access group is predefined by VCM and cannot be deleted or renamed. If you update to Virtual Connect 3.30, all current networks are added to the Standard network access group and all server profiles are set to use the Default network access group. Network communication within the network access group behaves similarly to previous versions of Virtual Connect firmware, because all profiles can reach any network. Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 20 21 Create a new network access group, NetGroup1, and copy or move existing networks from the Standard network access group to NetGroup1, then a profile that uses NetGroup1 cannot use networks that are part of the Default network access group. Similarly, if you create a new network and assign it to NetGroup1 but not to the Default Network Access group, then a profile that uses the default network access group cannot use the new network. Therefore, an administrator cannot accidentally, or intentionally, place a server on networks that are in different Network Access groups. Virtual Connect LACP Timers Virtual Connect provides two options for configuring uplink redundancy (Auto and Failover). When connection mode is set to Auto, The Virtual Connect Link uses Aggregation Control Protocol to collect uplink ports from a Network or Shared Uplink Set in Link Aggregation Groups. As part of the LACP negotiation to form a LAG, the remote switch sends a request for the frequency of the control packages (LACPDU). This frequency can be short or long. Short is every 1 second with a 3 second timeout. Long is every 30 seconds with a 90 second timeout. Before Virtual Connect 4.01 this setting is the default to card. Starting with Virtual Connect 4.01 this setting can be set to short or long. The domain-wide setting can be changed on the Ethernet Settings (Advanced Settings) screen. In addition, each Network or Shared Uplink set also has a LACP timer setting. There are three possible values: Domain-Default, Short, or Long. The domain default option sets the LACP timer to the default domain-wide value specified on the Advanced Ethernet Settings screen. This setting specifies the domain-wide default LACP timer. VCM uses this value to set the duration of lacp timeouts and to request the rate at which LACP control packets will be received on LACP-supported interfaces. Changes to the domain-wide setting are immediately applied to all existing networks and shared uplink sets. Using the long setting can help prevent the loss of LAG groups while performing in-service upgrades on upstream switch firmware. Multi network Link speed settings (Min/Max bandwidth control) A new feature to Virtual Connect 4.01 provides the ability to configure a minimum and maximum preferred NIC link speed for server downlinks. This setting can be configured as a global default for NIC cards configured with multiple networks, but can also be fine-tuned at the individual NIC level. The default Global Preferred Speed is set to 20Gb. The default Maximum Speed is set to 20Gb. If these settings remain by default, each NIC, even if configured for a set speed (minimum guaranteed speed), will be able to transmit at a speed as high as 20Gb when using the FlexFabric FlexFabric F8 and the new 20Gb NIC. Servers with 10Gb network adapters installed will be limited to 10Gb speeds. This feature is also known as Min/Max. Configure multi-network link speed settings (Min/max) Configure the global default desired link speed setting to 2 Gb and the maximum speed to 8 Gb. This global setting applies to connections configured for multiple-only networks only. On the Virtual Connect Manager Left pane screen, click Ethernet settings, Advanced settings Select Set a custom value for Desired link Connection speed o Set for 2 GbpS Select Set a custom maximum link connection speed value o Set for 8 Gbps Select Apply Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 21 22 Image 13 - Set Custom Link Speeds The following command can be copied and pasted into a SSH-based CLI session with Virtual Connect; # Set Preferred and Maximum Connection Speeds set enet-vlan PrefSpeedType=Custom PrefSpeed=2000 set enet-vlan MaxSpeedType=Custom MaxSpeed=8000 Configuring Throughput Statistics Telemetry support for network devices caters for seamless operations and interoperability by providing visibility into what is happening online at any given time. It offers extensive and useful detection capabilities that can be linked with upstream systems for analysis and trends of observed activity. The Data Flow Statistics configuration determines how often

Throughput statistics are collected and the timeframe supported for sample collection before existing samples are overwritten. When the sample collection time frame is reached, the oldest sample is removed to allocate the location of the new sample. Configuration changes can be made without having to enable Throughput Statistics. Applying configuration changes when Throughput Statistics is enabled clears all existing examples. Some conditions can clear existing Throughput Statistics: Disable Data Flow Statistics Collection cleans all existing samples. Changing the sampling rate clears all existing samples. Power cycling a Virtual Connect Ethernet module clears all throughput Statistics samples for that module. Collected samples are available for analysis on the Data Flow Statistics screen, which is accessible by selecting Data Flow Statistics from the tools' pull-down menu. Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 22 23 The following table describes available steps to change Data Flow Statistics settings. Task Enable/Disable Change sampling rate Action Select (enable) or clear (disable) the Enable throughput statistics check box Select a sampling rate from the Configuration list. Supported sampling rates include: Sample frequency of 1 minute, collecting up to 5 hours of samples. Sample speed of 2 minutes, collecting up to 10 hours of samples. in 3 minutes, collect up to 15 hours of samples. Test speed of 4 minutes, collect collect 20 hours of samples. Sample speed of 5 minutes, collect up to 25 hours of samples. Sample frequency of 1 hour, collect up to 12.5 days of samples. Virtual Connect DirectAttach Virtual Connect SAN fabrics (FlatSAN with 3PAR) Virtual Connect Direct Attached SAN fabrics, provides the ability to directly connect HP FlexFabric 10/24- Port or FlexFabric-20/40 F8 modules to an HP 3PAR storage matrix and completely eliminate the need for a traditional SAN fabric and the administrative overhead associated with maintaining the fabric. FlatSAN is supported on FlexFabric modules through Ports X1-X4, simply connect the FlexFabric 10/24 Port modules to available ports on the 3PAR array, and configure the Virtual Connect fabrics for DirectAttach. Figure 14 - When configuring FlatSAN, The Fabric Type of DirectAttach chose Note: See Scenario 6 of the FC Cookbook for HP Virtual Connect for details on the implementation of FlatSAN. Role Management Added to Virtual Connect 4.01 is the ability to provide a more detailed control of each of the operational user roles provided. Figure 15 Role Operations provides the ability to set the access level a specific operational role provided Introduction to Virtual Connect Flex-10/Flex-20 and FlexFabric Technologies 23 23