Virtual Server Feature

Technical Supplement

Revision 2.0

MLPF-SP-034

Revision Draft 0.1 (January 11 1999)
Preliminary revision to discuss the specification with HDS.
Revision Draft 0.2 (January 20 1999)
Page 8-9: It made Mr. Heath happy but it was wrong.
Revision Draft 0.3 (January 22 1999)
Page ??: Bad communication between SVP engineers and me.
Revision 1.0 (February 10 1999)
Advanced Resource Capping has been removed and no longer draft.
Revision 2.0 (April 27 1999)
The name MVSF is changed to VSF.
The document name is changed.
Many changes are applied, please reconfirm whole contents in the document.

Contents

Preface

The Virtual Server Feature (VSF) is one of key features for the new business concept of Single Image Data Center proposed by the HDS. The VSF mainly aims at providing possibility to reduce cost for Independent Software Vendor (ISV) by the similar way to the Multiple Server Feature (MSF) announced by the Amdahl.

This document stands as a detailed technical supplement to VSF part of XJ10-EXP-SD-006 "GENERAL SPECIFICATIONS OF FLEXIBLE IP CONFIGURATION AND VIRTUAL SERVER FEATURE (VSF) FOR F-7/F-10", called the VSF Base specification in this document.

Audience

This document has been written especially for persons who have responsibility for technical specification about products or their support, or need technical outlines for products.

We assume that you have basic knowledge about the MLPF and Amdahl MSF. And we recommend you read the MLPF Version 3 Overview, too.

Related Document

• GENERAL SPECIFICATIONS OF FLEXIBLE IP CONFIGURATION AND VIRTUAL SERVER FEATURE (VSF) FOR F-7/F-10	XJ10-EXP-SD-006 (*1)
• Interface Specification of VSF Configurator	XJ10-EXP-M-017 (*2)
• MLPF Version 3 Overview	SJ10-EXP-SD-018 revision 1.0 or later
• Millennium Servers Multiple Server Feature	Amdahl announcement (*3)
• IBM S/390 Parallel Enterprise Servers G5 Models, Plan-Ahead for 1999	IBM announcement (*4)

(*1) It is referred as the VSF Base specification later in this document. And it is not published yet but this document includes its outlines.
(*2) It is not published yet but this document includes its outlines.
(*3) It can be referred at the Amdahl's Web site.
(*4) It can be referred at the IBM's Web site.

General Notice

1.The Virtual Server in this document is technically the same as Physical IP group defined as a part of the Vertical Capping Option (VCO) supported on the MLPF350. You can consider that the Virtual Server is an alias name of the Physical IP group only in VSF mode. Even though you do not know the VCO, it is no problem in almost cases because this document tries to explain the VSF without the VCO terminology and concept.

2. This document focuses only to understand basic and enough knowledge about the VSF for the audience. So, some of specification may not be exactly the same as one of actual products, such as message texts, command syntax and so on. You should refer to the appropriate documents, such as real machines, MLPF manuals, SVP manuals and so on, if you need them.

1. VSF Overview

For brief understanding of the Virtual Server Feature (VSF), the VSF splits Physical IPs in LPAR mode into multiple Physical IP groups called Virtual Servers. This explanation includes more than 90% of VSF. The rest 10% of VSF is that Virtual Servers and LPARs with VSF have the following characteristics:

- The term of Physical IP Group is replaced by one of Virtual Server.
- An LPAR can run only within a specific Virtual Server while it is activated.
- Physical IP configuration of Virtual Servers, including returning to Basic mode, can be changed only by the vendor (actually, HDS or Comparex).
- Each Virtual Server has an individual CPU Version Code, which can be changed only by the vendor.

The above characteristics describe all functions of VSF. Any other functions are the same as ones in usual LPAR mode including operating system related functions such as the RMF, IOCP, ARF and so on. Especially for the RMF, you should take care of its partition report because it reports whole data, not individual for each Virtual Server, in each I/O group. "Appendix-A Example of RMF Report with VSF" shows its example.
Though the terms of "Virtual" or "Server" may let you imagine other things, this VSF definition is only and correct.
The later chapters mainly focuses implementation of VSF. This chapter is enough for you if you want just to know what is VSF.

1.1 VSF mode and Authorized Personal mode

The VSF defines the new processor mode and operation mode, VSF mode and Authorized Personal (AP) mode, to control or manage Virtual Servers.
Only in VSF mode, all VSF related functions become available. When a processor is not in VSF mode, all of the processor's functions are the same as ones in usual Basic or LPAR mode.
The AP mode is defined only in VSF mode. Only in AP mode, you can define or modify Physical and Logical IP configuration or CPU Version Codes for Virtual Serves.

Actually, both modes are preserved in the special configuration file hidden in the SVP and referred by the SVP and MLPF to implement the VSF. The modes can be set or reset only by the special OS/2 application program, the VSF Configurator that is usually under vendor's security control.

2. Implementation of VSF

The VSF has been implemented by adding the following new functions to the SVP or MLPF.

- Virtual Server Assist (VSA)
- Version Code Grouping Facility (VCGF)
- VSF Configurator (VSF/C)

Notice that the basic mechanism to run an LPAR only within its Virtual Server has already been supported as Physical IP grouping on the MLPF350. This document omits it because it is very complex and has been developed for other purposes. Refer to Vertical Capping Option (VCO) in "SJ10-EXP-SD-018 MLPF Version 3 Overview" if you want to know its detail.

2.1 Virtual Server Assist

The Virtual Server Assist (VSA) is just a generic term to represent all of existing functions that will be changed in VSF mode. Both SVP and MLPF implement the VSA.

The VSA is activated on the SVP immediately after VSF mode is set. By the VSA of SVP, behavior of some existing functions are changed as described below:

- The VSF mode indicator is displayed on the INDEX frame.
- The MODSEL frame is discarded.
- The function of reconfiguration to turn to Basic mode is discarded.

The VSA is activated on the MLPF after the SYSIML CLEAR is completed with VSF mode. By the VSA of MLPF, behavior of some existing functions are changed as described below:

- The term of PIP Group is replaced by one of Virtual Server.
- Physical IP assignment to Virtual Servers is protected. (described later in this section)
- Each LPAR must belong to a Virtual Server.
- Modification of CPU Version Codes is protected. (described later in this section)

Physical IP assignment to Virtual Servers

Physical IP assignment to Virtual Servers is protected from usual customers' operation and can be done only when AP mode is set. The following summarizes it:

VSF mode	AP mode	VS assignment for LPAR	VS assignment for PIP
no(*1)		allowed	allowed
yes	no	allowed(*2)(*3)	rejected
yes	yes	allowed(*2)(*3)	depend on LPRVSD(*4)(*5)

Here, VS is Virtual Server and PIP is Physical IP.

Modification of CPU Version Codes

Modification of CPU Version Codes is protected from usual customers' operation and can be done only when AP mode is set. The following summarizes it:

VSF mode	AP mode	LPRVSD(*5)	LPRDEF and SLPDEF	DEFINE/MODYFY2 PMC Commands
no(*1)		not available	modifiable	available
yes	no	not available	display only	not available
yes	yes	available	display only	not available

(*1) In this case, Virtual Servers are displayed as Physical IP groups actually.

(*2) To specify any Virtual Server number is allowed but LPAR activation will be failed if the specified Virtual Server number is not defined on the LPRVSD frame.

(*3) The blank, which means almighty, always causes LPAR activation fail.

(*4) Only the Virtual Server numbers enabled on the LPRVSD frame are allowed.

(*5) The later section describes more details about LPRVSD frame.

2.2 Version Code Grouping Facility

The Version Code Grouping Facility (VCGF) provides the special LPAR frame, the LPRVSD frame. The LPRVSD frame is available only when AP mode is set and defines available Virtual Servers and the associated CPU Version Codes.

```
LPAR  1 : LPAR0001  LPAR VIRTUAL SERVER DEFINITION (LPRVSD) YY/HH/DD HH:MM:SS
SCDS    : A0 / B0   LPAR GROUP : 0                ACT LPAR :  1 (MAX15)

VS#(PIP GRP#)   1   2   3   4   5   6   7   8   9   A   B   C   D   E   F

ENABLE/DISABLE  E   E   E   E   D   D   D   D   D   D   D   D   D   D   D

VER. CODE       82  82  84  84  00  00  00  00  00  00  00  00  00  00  00


PHYSICAL IP     0   1   2   3   4   5   6   7           A   B

ALTERNATE IP    .   .   .   .   .   .   .   .           I   I

VS#(PIP GRP#)   1   1   2   2   2   2   3   3           4   4


ATTENTION : THIS FRAME IS AUTO SAVE.
F-FUNCTION            Z-LPAR FRAME INDEX (LPRIDX)
 1-DEFINE             Z+FUNCTION CODE ON LPRIDX
                       -DIRECT LPAR FRAME CALL

 COMMAND (                                                              )
```

Fig. 2.2-1 LPRVSD frame

VS#(PIP GRP#) (Upper field) — Virtual Server number which is an index of "ENABLE/DISABLE". This field is display only.

ENABLE/DISABLE — "E" Allows to specify the associated Virtual Server number on the LPRIPN frame. "D" Does not allow specifying the associated Virtual Server number on the LPRIPN frame. "D" is the initial value.

VER. CODE — CPU Version Codes for Virtual Servers. The initial value is zeros. Note that a Coupling Facility does not use it. Therefore, it is set zero in this example.

PHYSICAL IP — Physical IP number which is an index of lower "VS#(PIP GRP#). This field shows only PIPs of Regular IPs and Reserved IPs. This field is display only.

ALTERNATE IP — Status of Alternate Processors. This field is display only.

VS#(PIP GRP#) (Lower field) — Virtual Server number which is assigned to the associated Physical IP.

Special Notice

1. To set the proper CPU Version Code is responsibility of HDS or Comparex.
2. Setting in VSF mode remains after reset VSF. Therefore, in such a case, you should redefine the proper CPU Version Code to each LPAR on the LPRDEF or SLPDEF frame.
3. Also refer to the Special Considerations in "3.3 Reconfigure VSF" where we are discussing relations between the VSF and the Capacity Upgrades on Demand announced by the IBM.

2.3 VSF Configurator

The VSF Configurator (VSF/C) is the special OS/2 application program running on the SVP. The VSF/C provides a simple method to set or reset VSF mode and AP mode.

The VSF/C does not support any security mechanism by itself. However, since the VSF/C is provided as a standalone program with separated media from the SVP media, you can make, if you wish, a wrapper program to give it more security. Refer to "XJ10-EXP-M-017 Interface Specification of VSF Configurator" for the program specification, how to run, how to make the wrapper and the agreement to use it required by the ESD.

The Fig. 2.3-1 shows a sample of how to use the VSF/C, and control VSF mode and AP mode. Notice that this sample assumes you do not need the wrapper program.

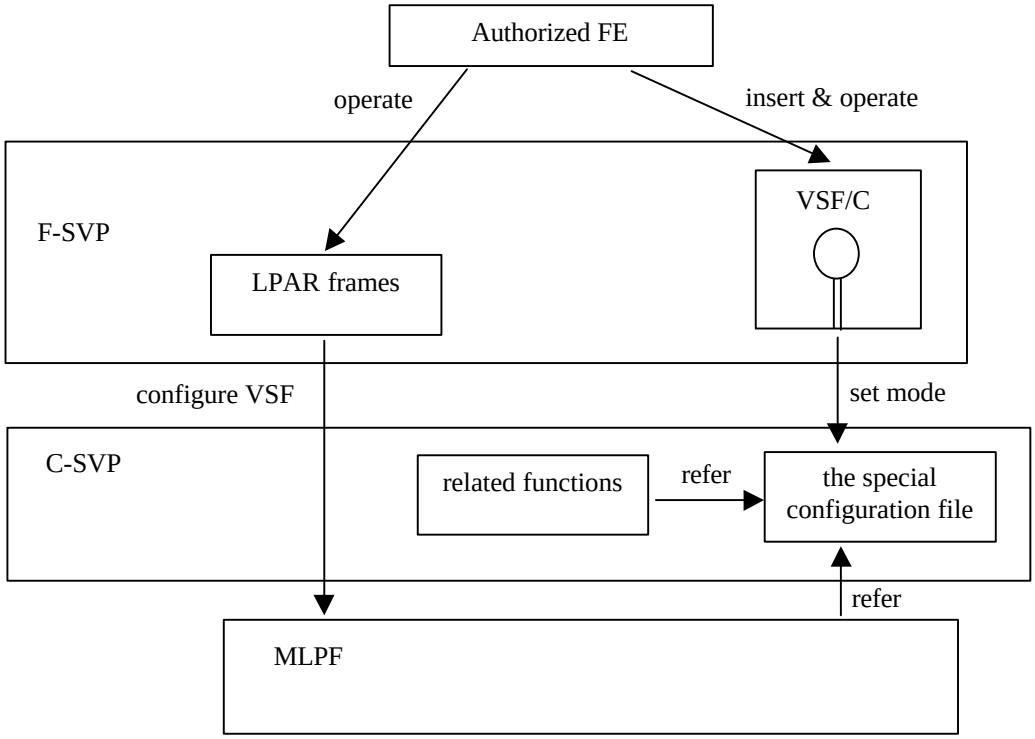

Fig. 2.3-1 Sample of VSF/C usage

3. VSF Installation and Configuration

This chapter discusses operations and related considerations for typical VSF installation according to the implementation. Notice that contents in this chapter is neither requirement nor recommendation by ESD. They are just samples we considered for your reference.

3.1 Install into VSF Non-capable Machine

This section shows an operation procedure to install the VSF into a machine currently having non-VSF capable media.

STEP	by whom	place	operation
1	FE	site	Power on the machine.
2	FE	site	Install VSF capable F-SVP and C-SVP media according to usual media upgrade procedure.
3	FE	site	Perform SYSIML with newly installed media.
4	AP	site	Insert the VSF/C media into the F-SVP.
5	AP	site	Execute the VSF/C and set both VSF and AP mode.
6	FE	site	Execute SYSIML.
7	FE	site	Define Virtual Servers and the proper CPU Version Codes on the LPRVSD frame.
8	AP	site	Execute the VSF/C again and reset only AP mode.
9	AP	site	Remove the VSF/C media.
10	customer	site	Define the proper Virtual Server number to each LPAR on the LPRIPN frame.
11	customer	site	Activate LPARs and IPL operating systems.

AP : Authorized Person. Probably, APs are some of FEs who has been authorized.
FE : Field Engineer. Probably, FE is the same as AP in this example.

Special Considerations

Usually, CPU Version Code previously defined by the customer for each LPAR will be changed after the installation. This may cause failure of programs using a Version Code such as passwords.

3.2 Install into VSF Capable Machine

This section shows an operation procedure to install the VSF into a machine already having VSF capable media.

STEP	by whom	place	operation
1	FE	site	Power on the machine.
2	AP	site	Insert the VSF/C media into the F-SVP.
3	AP	site	Execute the VSF/C and set both VSF and AP mode.
4	FE	site	Execute SYSIML.
5	FE	site	Define Virtual Servers and the proper CPU Version Codes on the LPRVSD frame.
6	AP	site	Execute the VSF/C again and reset only AP mode.
7	AP	site	Remove the VSF/C media.
8	customer	site	Define the proper Virtual Server number to each LPAR on the LPRIPN frame.
9	customer	site	Activate LPARs and IPL operating systems.

Special Considerations

Usually, CPU Version Code previously defined by the customer for each LPAR will be changed after the installation. This may cause failure of programs using a Version Code such as passwords.

3.3 Reconfigure Virtual Servers

This section shows an operation procedure to reconfigure Virtual Servers. Notice that this procedure assumes concurrent operation.

STEP	by whom	place	operation
1	AP	site	Insert the VSF/C media into the F-SVP.
2	AP	site	Execute the VSF/C and set AP mode.
3	FE	site	Reconfigure the number of physical IPs in Virtual Servers and redefine the proper Version Codes on the LPRVSD frame. (*1)
4	AP	site	Execute the VSF/C again and reset AP mode.
5	AP	site	Remove the VSF/C media.
6	customer	site	Perform logical IP online, if increase the number of physical IPs.

(*1) If you want to reduce the number of physical IPs in a Virtual Server, the customer has to perform logical IPs offline on the operating system before the reconfiguration to meet logical and physical IP configuration limitation, the number of logical IPs must be equal or less than physical's.

Special Considerations

1. When either the STSI instruction is not supported yet or operating systems do not support the STSI instruction, the result of this procedure on the operating systems is still unpredictable, if no re-IPL is performed. It is strongly recommended that you explain this limitation to the customer or ask re-IPL operating systems. Note that this specification is required by the HDS. So, we do not limit this operation.
2. When both the STSI instruction is supported and operating systems support the STSI instruction, no re-IPL of operating systems is required. In this case, changing CPU Version Codes might be necessary (It is still unknown and just our guess). Notice you should set the proper version codes in Virtual Servers if the operating systems do not support the STSI instruction or have ISV programs using CPU Version Code. We think that the Capacity Upgrades on Demand announced by the IBM have a similar condition. So, the IBM will solve it. If not solved, only VSF can support both cases (STSI and none STSI) in a single machine.

Appendix-A Example of RMF Report with VSF

This example shows relation between Virtual Server definition and the RMF Partition Report in case of 2-IOCDS mode. As shown in this example, all of Virtual Server's reports cannot be obtained with one report when the Virtual Server has LPARs in both I/O groups.

Virtual Server NO.	number of PIPs
1	2
2	2
3	2
Total	6

LPAR name	I/O group	Virtual Server NO.
LPAR1	0	1
LPAR2	0	2
LPAR3	0	3
LPAR4	1	1
LPAR5	1	2
LPAR6	1	3

Note:
Each value in RMF report is incorrect.

```
                                P A R T I T I O N  D A T A  R E P O R T                          PAGE     3

          OS/390                    SYSTEM ID SYS1          DATE 03/14/1998          INTERVAL 14.59.946
          REL. 02.06.00             RPT VERSION 2.6.0       TIME 16.30.00            CYCLE 1.000 SECONDS

                                belong to I/O group 0
MVS PARTITION NAME                      LPAR1
NUMBER OF CONFIGURED PARTITIONS            3
NUMBER OF PHYSICAL PROCESSORS              6
WAIT COMPLETION                           NO
DISPATCH INTERVAL                    DYNAMIC
                                total physical IP in whole system

--------- PARTITION DATA ---------    -- LOGICAL PARTITION PROCESSOR DATA --   ---- AVERAGE PROCESSOR UTILIZATION PERCENTAGES ---
                                     NUMBER OF  ----DISPATCH TIME DATA-----   LOGICAL PROCESSORS  ----- PHYSICAL PROCESSORS ----
  NAME     STATUS  WEIGHTS  CAPPING  LOG PRCRS   EFFECTIVE       TOTAL      EFFECTIVE    TOTAL   LPAR MGMT   EFFECTIVE     TOTAL
LPAR1        A        2        NO         2    00.00.27.776   00.00.31.109      3.09      3.46      0.06        0.51      0.?8
LPAR2        A       75        NO         2    01.17.48.097   01.18.14.583      6.45      6.94      0.49        6.45      6.?4
LPAR3        A        3        NO         2    00.01.05.698   00.01.14.891      3.65      4.16      0.17        1.22      1.?9
*PHYSICAL*                                     00.00.49.387                                           0.91                  0.?1
                                            ------------   ------------                            ------      ------    ------
  TOTAL                                     01.25.30.588   01.27.05.373                             1.76       30.02     30.?7
```

all LPAR name space in this RMF (I/O group)

each LPAR / whole system power

physical overhead is in whole system for each I/O group (total of all of Servers)