

### Using AT-TLS with HSC/SMC Client/Server z/OS Solution

Implementation Example

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# Introduction

The purpose of this document is to present illustrative implementation concepts for Oracle's StorageTek HSC/SMC secure client/server communication using IBM's z/OS Application Transparent – Transport Layer Security (AT-TLS). The AT-TLS implementation for HSC/SMC communication is dependent on the environmental and business requirements of each individual customer. Depending on your requirements, your HSC/SMC AT-TLS implementation may differ from the example implementation shown in this document.

Oracle tested HSC client/server secure communication with z/OS AT-TLS in its Mainframe Customer Emulation Test Lab. HSC 6.2 was tested under z/OS 1.7, 1.8 and 1.9.

#### Items to note:

- 1. HSC 6.2 and SMC 6.2 were tested on z/OS 1.7, 1.8 and 1.9. No other HSC/SMC versions were tested with AT-TLS, and HSC/SMC 6.2 with AT-TLS was not tested on z/OS 1.10.
- 2. Only the SMC client was tested with AT-TLS. LibraryStation and MVS/CSC were not tested.
- 3. Only RACF was tested. No other z/OS security packages were tested, such as ACF2 and Top Secret.
- 4. ACSLS users: ACSLS platforms use encryption techniques different from AT-TLS. Exclude ACSLS IP addresses from the z/OS AT-TLS configuration file to avoid a conflict.

# **Chapter 1: Overview**

AT-TLS is an encryption solution for TCP/IP applications that is completely transparent to the application client and server. Packet encryption and decryption occurs in the z/OS TCPIP address space at the TCP protocol level. The encrypted packet payload is unintelligible when sniffed or traced, but by the time it is delivered to the application the payload is once again readable.

Oracle tested AT-TLS with the StorageTek HSC/SMC 6.2 client/server solution without any changes to the SMC client application or the HSC server application (HSC/HTTP). All necessary modifications, additional parameter files and started tasks were made only to the z/OS TCP/IP facility and the z/OS operating system.

There is overhead associated with encrypting and decrypting the payload contents in the TCP protocol. This overhead was observed as a reduction in the number of HSC mount transactions performed during the test window. Encryption/decryption overhead will vary depending on the number of individual HSC/SMC client/server transactions and might not be observable in low-volume transaction environments.

## Implementation

To implement AT-TLS encryption for HSC/SMC client/server communications, the minimum level needed for the Communication Server is z/OS 1.7.

IBM APAR's available should be applied for best performance:

Release 1A0 : <u>UK39417</u> available 08/10/07 (1000 ) z/OS 1.10 Release 180 : <u>UK39418</u> available 08/10/07 (1000 ) z/OS 1.8 Release 190 : <u>UK39419</u> available 08/10/07 (1000 ) z/OS 1.9

See the following IBM publications for detailed information about the IBM z/OS Communications Server <u>Policy Agent</u> configuration and usage:

- IP Configuration Guide, SC31-8775

- IP Configuration Reference, SC31-8776

– IBM Redbook Communications Server TCP/IP Implementation, Volume 4, Policy-Based Network Security, SG24-7172

#### **TCPIP:**

The address space where TCPIP policies are specified, which is not necessarily where these policies are enabled. In our example implementation we indicated to TCPIP that TTLS would be used, but not until the PAGENT address space is active will TCPIP actually perform encryption/decryption work. Your implementation may differ depending on your business requirements.

#### Parmfile:

◊ Indicate where TCPIP address space will obtain certain policy based rules, See below: <u>TCPIP parmfiles</u>  We set up an obeyfile to dynamically modify TCPIP and include TTLS: VARY TCPIP,,O,ZIP.TCPIP.PROFILES(ATTLS), see below: <u>TCPIP Obey file</u>.

### **Policy Agent (PAGENT):**

The address space where the encryption rules are applied.

#### Parmfile:

 Where to find the configuration file and other parameters see: <u>TCPIP parmfiles</u>

```
000001 ; OSA GIG ETHERNET CARD
000002 DEVICE ECCQD01 MPCIPA NONROUTER AUTORESTART
000003 LINK &SYSNAME.MVS IPAQENET ECCQD01
000004
000005 ; OSA 1000BASE-T CARD
000006 DEVICE ECCQA01 MPCIPA NONROUTER AUTORESTART
000007 LINK &SYSNAME.2MVS IPAOENET ECCOA01
800000
000009 HOME
000010 10.80.&IPADDR1 &SYSNAME.MVS
000011 10.80.&IPADDR2 &SYSNAME.2MVS
000012
000013 BEGINROUTES
000014; Destination
                           FirstHop Linkname
                                               PacketSize
000015 ROUTE 10.80.69.0/24
                           =
                                      &SYSNAME.MVS MTU 1492
000016 ROUTE DEFAULT
                           10.80.69.254 &SYSNAME.MVS MTU 1492
000017 ROUTE 10.80.68.0/24
                           = &SYSNAME.2MVS MTU 1492
000018 ROUTE DEFAULT
                           10.80.68.254 &SYSNAME.2MVS MTU 1492
000019 ENDROUTES
000020 INCLUDE USER.TCPIP.PROFILES (COMMON)
000021 START ECCQD01
000022 START ECCQA01
USER.TCPIP.PROFILES (COMMON)
000001 AUTOLOG
000002 FTPD ; O/E FTP Server
000003 SMTP
              ; Mail Server
000004 RXSERVE ; Remote Execution Server
000005 PORTMAP
              ; Portmap Server
000006 ENDAUTOLOG
000008 PORT
```

000009	7 UDI	P MISCSERV	;	Miscellaneous Server
000010	7 TCI	P MISCSERV		
000011	20 TCI	P OMVS	;	FTP Server data port
000012	21 TCI	P OMVS	;	FTP Server control port
000013	23 TCI	P TN3270	NOAUTOLOG ;	TN3270 Server
000014	25 TCI	P SMTP	;	SMTP Server
000015	53 TCI	P NAMESRV	NOAUTOLOG ;	DOMAIN NAME SERVER
000016	53 UDI	P NAMESRV	NOAUTOLOG ;	DOMAIN NAME SERVER
000017	111 TCI	P PORTMAP	;	Portmap Server
000018	111 UDI	P PORTMAP	;	Portmap Server
000019	135 UDI	P LLBD	;	HSC Location Broker
000020	161 UDI	P SNMPD	;	SNMP Agent
000021	162 UDI	P SNMPQE	;	SNMP Query Engine
000022	512 TCI	P RXSERVE	;	Remote Execution Server
000023	514 TCI	P RXSERVE	;	Remote Execution Server
000024	515 TCI	P LPSERVE	;	LPD Server
000025	520 UDI	P ROUTED	;	RouteD Server
000026	580 UDI	P NCPROUT	NOAUTOLOG ;	NCPROUTE SERVER
000027	750 TCI	P MVSKERB	NOAUTOLOG ;	KERBEROS
000028	750 UDI	P MVSKERB	NOAUTOLOG ;	KERBEROS
000029	751 TCI	P ADM@SRV	NOAUTOLOG ;	KERBEROS ADMIN SERVER
000030	751 UDI	P ADM@SRV	NOAUTOLOG ;	KERBEROS ADMIN SERVER
000031	2049 UD1	P MVSNFS	;	NFS Server
000032	3000 TCI	P CICSTCP	NOAUTOLOG ;	CICS SOCKET
000043	8000 TCI	P OMVS	;	Reserved for O/E Users
000044	8000 UDI	POMVS	;	Reserved for O/E Users
*****	******	* * * * * * * * * * *	********	Bottom of Data **********************************

#### ◊ PAGENT parmfile.

#### **Configuration File:**

- Used to indicate to the PAGENT address space who/what/where the encryption is to take place see: <u>AT-TLS client configuration</u>, and <u>AT-TLS server configuration</u>.
- ♦ This is an Open Edition (OE) segment file.
- Oownload IBM Configuration Assistant tool from 'Downloads' section at: <u>http://www.ibm.com/software/network/commserver/zos/support/</u>
- Manual documenting use of the configuration assistant tool is at: <u>Configuration Assistant for z/os Communications Server</u>

**IBM** 

### **RACF:**

In the z/OS environment, digital certificates are used by AT-TLS to authenticate and encrypt the protocol handshaking messages. An AT-TLS server must send its certificate to the client, and a server can optionally request a certificate from the client. See Chapter 3, "IP Security" in to the IBM Redbook: Communications Server for z/OS V1R8 TCP/IP Implementation Volume 4: Policy-Based Network Security SG24-7342, for information about how to set up digital certificate keys and key rings. See Chapter 3: RACF below used in our example implementation with RACF.

The z/OS Security Access Facility (SAF) is used to protect your network and communications. SAF is the high-level infrastructure that allows you to plug in any commercially available security product. References to RACF apply to any other SAF-compliant security products that provide the required support.

#### Digital Certificate:

This where you define the certificate to RACF. See <u>Ring creation</u> and certificate creation commands

#### KeyRing:

♦ Specific name for the ring.

### **Started Tasks**

TCPIP: AT-TLS encrypts the TCP/IP traffic between software clients and servers.

PAGENT: Policy Agent that determines which client, which server, what port, what IP address

Client: In our example the application client is HSC SMC

Server: In our example the application server is HSC <u>HSC/HTTP</u> server, started separately from HSC and SMC.

## Media Management Strategy

Our example implementation assigns the Tape Management System to all media management functions. The condition of the media has nothing to do with the control path encryption that is done with AT-TLS.

# Chapter 2: Samples

# **AT-TLS client configuration file**

Note that the format of the configuration files generated by the configuration tool assistant is slightly different from what is presented here. We chose to simplify the configuration file for ease of change management. In our example, SMC (the client application) is started as SMC6C2.SMC6, the jobname parameter referred to in the client configuration file below is SMC6.

TTLSConfig tmp/t046028/attlc.conf		<== name of file in OE segment
TTLSRule	ZIPEMVS-TO-ANYHTTP~1	<== Title of the Rule
{		
LocalAddr	129.80.16.244	<== this hosts' IP addr
RemoteAddr	129.80.0.0/16	<== the many hosts that might have HTTP
LocalPortRange	1024-65535	<== SMC clients use dynamic ports outbound
RemotePortRange	0428	<== HSC/HTTP uses 1 port, we selected 0428
Jobname	SMC6	<== SMC client jobname was SMC6C2.SMC6
Direction	Outbound	<== clients are outbound
Priority	255	<== many rules can have priorities
TTLSGroupActionRef	gAct1~SMC-To-HTTP	<== group-Action name, must match below
TTLSEnvironmentActionRef	eAct1~SMC-To-HTTP	<== environment name, must match below
TTLSConnectionActionRef	cAct1~SMC-To-HTTP	<== connection name, must match below
}		
TTLSGroupAction	gAct1~SMC-To-HTTP	<== group-Action name
{		
TTLSEnabled	On	<== tell PAGENT that TTLS is running
Trace	2	<== 2 to 255, 2 is default
}		
TTLSEnvironmentAction	eAct1~SMC-To-HTTP	<== environment name
{		
HandshakeRole	Client	<== a client does client handshakes
EnvironmentUserInstance	0	<== a single instance
TTLSKeyringParmsRef	keyR1	<== name for the Certificate Key Ring
}		
TTLSConnectionAction	cAct1~SMC-To-HTTP	<== connection name
{		
HandshakeRole	Client	<== again, a client does client handshakes
TTLSCipherParmsRef	cipher1~AT-TLSGold	<== name for below
TTLSConnectionAdvancedParmsRef	cAdv1~SMC-To-HTTP	<== advanced connection name
Trace	2	<== 2 to 255, like above
}		
TTLSConnectionAdvancedParms	cAdv1~SMC-To-HTTP	<== advanced connection name from above
{		
CertificateLabel	CLIENT	<== matches RACF for certificate name
}		
TTLSKeyringParms	keyR1	<== Certificate Key Ring

{			
Keyring	CLIRING	<== mat	tches what is RACF for key ring
}			
TTLSCipherParms	cipher1~AT-TLSGold	<== nar	ne from above
{			
V3CipherSuites	TLS_RSA_WITH_3DES_EDE_CBC	SHA	<== one encryption algorithm
V3CipherSuites	TLS_RSA_WITH_AES_128_CBC_	SHA	<== yet another
}			

# AT-TLS server configuration file

In our example, HSC/HTTP (the server application) is started as SVC3C2.SVC3, the jobname parameter referred to in the server configuration file below is SVC3.

TTLSConfig tmp/t046028/attls.conf		<== name of file in OE segment
TTLSRule	ZIPDMVS-To-ANYSMC~1	<== Title of the Rule
{		
LocalAddr	129.80.16.123	<== this hosts' IP addr
RemoteAddr	129.80.0.0/16	<== the many hosts it can talk to
LocalPortRange	0428	<== HSC/HTTP server uses a specific port
RemotePortRange	1024-65535	<== acceptable ports from client
Jobname	SVC3	<== HSC/HTTP jobname was SVC3C2.SVC3
Direction	Inbound	<== servers are inbound
Priority	255	<== many rules can have priorities
TTLSGroupActionRef	gAct1~HTTP-To-SMC	<== g-name, but must match below
TTLSEnvironmentActionRef	eAct1~HTTP-To-SMC	<== e-name, but must match below
TTLSConnectionActionRef	cAct1~HTTP-To-SMC	<== c-name, but must match below
}		
TTLSGroupAction	gAct1~HTTP-To-SMC	<== g-name from above
{		
TTLSEnabled	On	<== tell it TTLS is running
Trace	2	<== 2 to 255, 2 is default
}		
TTLSEnvironmentAction	eAct1~HTTP-To-SMC	<== e-name from above
{		
HandshakeRole	Server	<== a server does server handshakes
EnvironmentUserInstance	0	<== a single instance
TTLSKeyringParmsRef	keyR1	<== name for the Cerficate Key Ring
}		
TTLSConnectionAction	cAct1~HTTP-To-SMC	<== c-name from above
ł		
HandshakeRole	Server	<== again, a server does server handshakes
TTLSCipherParmsRef	cipher1~AT-TLSGold	<== name for below
TTLSConnectionAdvancedParmsRef	cAdv1~HTTP-To-SMC	<== name for below
Trace	2	<== 2 to 255, like above
}		

TTLSConnectionAdvancedParms	cAdv1~HTTP-To-SMC	<== name from above
{		
CertificateLabel	SERVER	<== matches RACF for certificate name
}		
TTLSKeyringParms	keyR1	<== name from above
{		
Keyring	SVRRING	<== matches what is in RACF for key ring
}		
TTLSCipherParms	cipher1~AT-TLSGold	<== name from above
{		
V3CipherSuites	TLS_RSA_WITH_3DES_EDE_CH	BC_SHA <== one encryption algorithm
V3CipherSuites	TLS_RSA_WITH_AES_128_CB	C_SHA <== yet another
}		

# **TCPIP Obey file**

# **TCPIP** parmfiles

***** *********************************	** Top of Data	a **********	* * * * * * * * *	
000001 ; OSA GIG ETHERNET CARD				
000002 DEVICE ECCQD01 MPCIPA NONROUTE	ER AUTORESTAR	Г		
000003 LINK &SYSNAME.MVS IPAQENET ECC	CQD01			
000004				
000005 ; OSA 1000BASE-T CARD				
000006 DEVICE ECCQA01 MPCIPA NONROUTE	ER AUTORESTAR	Г		
000007 LINK &SYSNAME.2MVS IPAQENET EC	CCQA01			
000008				
000009 HOME				
000010 10.80.&IPADDR1 &SYSNAME.MVS				
000011 10.80.&IPADDR2 &SYSNAME.2MVS				
000012				
000013 BEGINROUTES				
000014; Destination	FirstHop	Linkname	PacketSize	
000015 ROUTE 10.80.69.0/24	=	&SYSNAME.MVS	MTU 1492	
000016 ROUTE DEFAULT	10.80.69.254	&SYSNAME.MVS	MTU 1492	
000017 ROUTE 10.80.68.0/24	=	&SYSNAME.2MVS	MTU 1492	
000018 ROUTE DEFAULT	10.80.68.254	&SYSNAME.2MVS	MTU 1492	
000019 ENDROUTES				
000020 INCLUDE USER.TCPIP.PROFILES(COMM	MON)			
000021 START ECCQD01				
000022 START ECCQA01				
***** ********************************				

Top of Data **********************************							
000001 AUTOLOG         000002 FTFD       ; O/E FTF Server         000003 SNTP       ; Mail Server         000006 EXEMPE       ; Remote Execution Server         000007 FORT       ; DUE MISCSERV         000008 FORT       ; Miscellaneous Server         000010 7 TEP MISCSERV       ; Miscellaneous Server         000011 20 TCE OMVS       ; FTP Server data port         000012 21 TCE OMVS       ; FTP Server control port         000014 25 TCE SMTF       ; SMTF Server         000015 53 TCE NAMESRV       NOAUTOLOG ; DOMAIN NAME SERVER         000017 111 TCF PORTMAP       ; Portmap Server         000018 111 UDP PORTMAP       ; Portmap Server         000019 153 UDP INMESRV       NOAUTOLOG ; DOMAIN NAME SERVER         000010 53 UDP NAMESRV       NOAUTOLOG ; DOMAIN NAME SERVER         000011 111 TCF PORTMAP       ; Portmap Server         000012 161 UDP SINFD       ; SIMP Agent         000022 161 UDP SINFD       ; SIMP Agent         000023 541 TCF RXSERVE       ; LDU Server         000024 515 TCF INSERVE       ; Remote Execution Server         000025 520 UDP ROUTED       ; RUE SERVER         000026 580 UDP ROUTED       ; RUERDEROS         000027 750 TCF MISSERNE NOAUTOLOG ; KERBEROS         000028 750 UDP MISSERE NOAUTOLOG ;		USER.TCPIP.PROFILES(COMMON)					
000002FTPD; O/E FTD Server000003SMTP; Mail Server000004RXSERVE; Remote Execution Server000005FORTMAP; Portmap Server000006FORT0000077 UDP MISCSERV; Miscellaneous Server0000107 TCP MISCSERV; Miscellaneous Server00001120 TCP OMYS; FTP Server data port00001221 TCP OMYS; FTP Server control port00001323 TCP TN3270NOAUTOLOG ; DMAIN NAME SERVER00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP FORTMAP; Portmap Server000018111 UDP FORTMAP; Portmap Server000019135 UDP LLBD; HSC Location Broker000021161 UDP SIMMPQE; SMMP Query Engine000022512 TCP EXSERVE; LPD Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP IFSERVE; LPD Server000025520 UDP NOLTEND; RouteD Server000026580 UDP NCEROUT NOAUTOLOG ; KERBEROS000027750 TCP MYSERBMOAUTOLOG ; KERBEROS000028580 UDP NCEROUT NOAUTOLOG ; KERBEROS000029751 UDP ADMESRVMOAUTOLOG ; KERBEROS000029751 UDP ADMESRVMOAUTOLOG ; KERBEROS ADMIN SERVER000021751 UDP ADMESRVMOAUTOLOG ; KERBEROS ADMIN SERVER000023750 UDP MYSERBMOAU							
000003SMTP; Mail Server000004RXSERVE; Remote Execution Server000005PORTMAP; Portmap Server000006ENDAUTOLOG000007T UDP MISCSERV; Miscellaneous Server0000107 TCF MISCSERV00001120 TCP OMVS; FTP Server data port00001221 TCP OMVS; FTP Server control port00001323 TCP TM3270NOAUTOLOG ; TM3270 Server00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCF FORTMAP; Portmap Server000018111 UDP FORTMAP; Portmap Server000021161 UDP SINMPD; SMTP Agent000022512 TCP EXSERVE; Remote Execution Server000023161 UDP SINMPQE; SNMP Query Engine000024515 TCP LESERVE; Remote Execution Server000025520 UDP ROUTED; RouteD Server000026580 UDP ROUTED; Remote Execution Server000027750 UDP MYSKERBNOAUTOLOG ; KERBEROS000028750 UDP MYSKERBNOAUTOLOG ; KERBEROS000029751 UDP ALMESRVNOAUTOLOG ; KERBEROS ADMIN SERVER000020751 UDP ALMESRVNOAUTOLOG ; KERBEROS ADMIN SERVER000021751 UDP ALMESRVNOAUTOLOG ; KERBEROS ADMIN SERVER000023751 UDP ALMESRVNOAUTOLOG ; KERBEROS ADMIN SERVER000024751 UDP ALMESRVNOAUTOLOG ; KERBEROS ADMIN SERVER<							
000004RXSERVE; Remote Execution Server000005PORTMAP; Portmap Server000008FORT0000097UDP MISCSERV; Miscellaneous Server0000107TCP MISCSERV; Miscellaneous Server00001120TCP OMVS; FTP Server data port00001221TCP OMVS; FTP Server control port00001323TCP TM3270NOAUTOLOG ; TM3270 Server00001425TCP SMTP; SMTP Server00001553TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111TCP PORTMAP; Portmap Server000018111UDP FORTMAP; Portmap Server000019155UDP SIMPD; SIMP Agent000021162UDP SIMPDE; SIMP Query Engine000022512TCP RXSERVE; Remote Execution Server000023514TCP RXSERVE; Remote Execution Server000024515TCP LESERVE; LPD Server000025520UDP ROTED; ROLED SERVER000026550UDP ROTENNOAUTOLOG ; KERBEROS000027750TCP MASERENNOAUTOLOG ; KERBEROS000028750UDP MOSERENNOAUTOLOG ; KERBEROS000029751UDP AMMSRVNOAUTOLOG ; KERBEROS0000312049UDP MOSERS; NFS Server000032751UDP AMMSRVNOAUTOLOG ; KERBEROS000033							
000005         FORTMAP         ; Portmap Server           000006         ENDAUTOLOG           000008         PORT           000009         7 UDP MISCSERV         ; Miscellaneous Server           000010         7 TCP MISCSERV         ; FTP Server data port           000011         20 TCP OMVS         ; FTP Server control port           000012         21 TCF OMVS         ; FTP Server control port           000013         23 TCP TN3270         NOAUTOLOG ; TN3270 Server           000014         25 TCP SMTP         ; SMTP Server           000015         53 TCF NAMESRV         NOAUTOLOG ; DOMAIN NAME SERVER           000016         53 UDP NAMESRV         NOAUTOLOG ; DOMAIN NAME SERVER           000017         111 TCF FORTMAP         ; Fortmap Server           000018         111 UDP PORTMAP         ; Portmap Server           000019         155 UDP LLED         ; SNMP Query Engine           000021         162 UDP SNMPDE         ; SNMP Query Engine           000022         512 TCF RXSERVE         ; Remote Execution Server           000023         514 TCP RXSERVE         ; LPD Server           000024         515 TCF LESERVE         ; NCHOUTE SERVER           000025         520 UDP ROUTE         ; NOLED SERVER <td></td> <td></td> <td></td> <td></td>							
000006 ENDAUTOLOG000008 PORT0000097 UDP MISCSERV; Miscellaneous Server0000107 TCP MISCSERV00001120 TCP OMVS; FTP Server data port00001221 TCP OMVS; FTP Server control port00001323 TCP TN3270NOAUTOLOG ; TN3270 Server00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP PORTMAP; Portmap Server000018111 UDP PORTMAP; Portmap Server000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPDE; Remote Execution Server000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000026580 UDP NCS; KERBEROS000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 UDP ADMSRVNOAUTOLOG ; KERBEROS ADMIN SERVER000021200 TCP CINSTS; NFS Server0000231204 WDF MVSNFS; NFS Server000024500 UTP CORDUTNOAUTOLOG ; KERBEROS ADMIN SERVER000025750 UDP MVSKERBNOAUTOLOG ; KERBEROS ADMIN SERVER000026751 UDP ADMSRVNOAUTOLOG ; KERBEROS ADMIN SERVER000027751 UDP ADMSRVNOAUTOLOG				n Server			
000008PORT0000097UDF MISCSERV; Miscellaneous Server0000107TCF MISCSERV00001120TCP OMVS; FTP Server data port00001221TCF OMVS; FTP Server control port00001323TCP TN3270NOAUTOLOG ; TN3270 Server00001425TCP SMTP; SMTP Server00001553TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111TCP FORTMAP; Portmap Server000018111UDP PORTMAP; Portmap Server000021161UDP SINPP; SINP Agent000022512TCP RXSERVE; Remote Execution Server000023514TCP RXSERVE; Remote Execution Server000024515TCP LPSERVE; LPD Server000025520UDP ROUTED; RouteD Server000026580UDP NCPROUTNOAUTOLOG ; KERBEROS000027750TCP MVSKERBNOAUTOLOG ; KERBEROS000028751UDP MVSKERBNOAUTOLOG ; KERBEROS000029751UDP MVSRES; NFS Server0000312044900WUSNTS; NFS Server0000323000TCP CMVS; Reserved for O/E Users0000448000UDP CMVS; Reserved for O/E Users	000005	PORTMAP	; Portmap Server				
0000097UDP MISCSERV; Miscellaneous Server0000107TCP MISCSERV00001120TCP OMVS; FTP Server data port00001221TCP OMVS; FTP Server control port00001323TCP TM3270NOAUTOLOG ; TM3270 Server00001425TCP NMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001553TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111TCP FORTMAP; Portmap Server000018111UDP FORTMAP; Portmap Server000020161UDP SNMED; SNMP Agent000022512TCP RXSERVE; Remote Execution Server000023514TCP RXSERVE; LEP Server000024515TCP LESERVE; LEP Server000025520UDP ROUTED; RouteD Server000026580UDP NOEROUTNOAUTOLOG ; KERBEROS000027750TCP MYSKERBNOAUTOLOG ; KERBEROS000028751UTC ADM§RVNOAUTOLOG ; KERBEROS000029751TCP ADM§RVNOAUTOLOG ; KERBEROS000030751UDP ADM§RVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312044UDP MYSKES; NPS Server0000323000TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000333000TCP OMYS; Reserved for O/E Users0000448000UDP OMYS; Reserved for O/E Users	000006	ENDAUTOLOG					
0000107 TCP MISCSERV00001120 TCP ONVS; FTP Server data port00001221 TCP ONVS; FTP Server control port00001323 TCP TN3270NOAUTOLOG ; TN3270 Server00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP FORTMAP; Portmap Server000018111 UDP FORTMAP; Portmap Server000020161 UDP SNMED; HSC Location Broker000021162 UDP SNMEQE; SNMP Agent000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; LPD Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NORFOUTNOAUTOLOG ; KERBEROS000027750 TCP MYSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADMESRVNOAUTOLOG ; KERBEROS0000312049 UDP MVSKERBNOAUTOLOG ; KERBEROS000031751 UDP ADMESRVNOAUTOLOG ; KERBEROS000032750 UDP MVSKERBNOAUTOLOG ; KERBEROS0000332049 UDP MVSKERBNOAUTOLOG ; CICS SOCKET0000348000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000008	PORT					
00001120TCP OMVS; FTP Server data port00001221TCP OMVS; FTP Server control port00001323TCP TN3270NOAUTOLOG ; TN3270 Server00001425TCP SMTP; SMTP Server00001553TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111TCP PORTMAP; Portmap Server000018111UDP PORTMAP; Portmap Server000019135UDP LLBD; SMTP Agent000021161UDP SINMPQE; SMMP Agent000022512TCP RXSERVE; Remote Execution Server000023514TCP RXSERVE; LPD Server000024515TCP LFSERVE; LPD Server000025520UDP ROUTED; RouteD Server000026580UDP NCPROUTNOAUTOLOG ; KERBEROS000027750TCP MXSERBNOAUTOLOG ; KERBEROS000028751UDP MXSERSNOAUTOLOG ; KERBEROS000029751TCP ADM8SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049UDP MVSNFS; NFS Server0000333000TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000348000TCP OMVS; Reserved for O/E Users0000338000TCP OMVS; Reserved for O/E Users0000348000UDP OMVS; Reserved for O/E Users	000009	7 UDP	MISCSERV	; Miscellaneous Server			
00001221 TCP OMVS; FTP Server control port00001323 TCP TN3270NOAUTOLOG ; TN3270 Server00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP FORTMAP; Portmap Server000018111 UDP FORTMAP; Portmap Server000019135 UDP LLBD; HSC Location Broker000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP NOTROUTNOAUTOLOG ; KERBEROS000026580 UDP NOTROUTNOAUTOLOG ; KERBEROS000027750 TCP MVSKEBBNOAUTOLOG ; KERBEROS000028750 UDP MVSKEBBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS000030751 UDP ADM@SRVNOAUTOLOG ; CICS SOCKET0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000010	7 TCP	MISCSERV				
00001323 TCF TN3270NOAUTOLOG ; TN3270 Server00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP FORTMAP; Portmap Server000018111 UDP FORTMAP; Fortmap Server000019135 UDP LLBD; HSC Location Broker000020161 UDP SNMED; SNMP Agent000021162 UDP SNMEPE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NOVENDI NAUTOLOG ; KERBEROS000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; CICS SOCKET0000312049 UDP MVSNFS; NFS Server0000338000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000448000 UDP OMVS; Reserved for O/E Users	000011	20 TCP	OMVS	; FTP Server data port			
00001425 TCP SMTP; SMTP Server00001553 TCP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP PORTMAP; Portmap Server000018111 UDP PORTMAP; Portmap Server000019135 UDP LLED; HSC Location Broker000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; SNMP Query Engine000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; KERBEROS000027750 TCP MYSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MYSNFS; NFS Server000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET000438000 TCP OMVS; Reserved for O/E Users000448000 UDP OMVS; Reserved for O/E Users	000012	21 TCP	OMVS	; FTP Server control port			
00001553 TCP NAMESRVNOAUTOLOG ;DOMAIN NAME SERVER00001653 UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111 TCP FORTMAP; Fortmap Server000018111 UDP FORTMAP; Fortmap Server000019135 UDP LLBD; HSC Location Broker000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; Remote Execution Server000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; LPD Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; KERBEROS000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000030751 UDP ADM§SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000336000TCP OMVS; Reserved for O/E Users0000448000UDP OMVS; Reserved for O/E Users	000013	23 TCP	TN3270 NOAUTOLOG	; TN3270 Server			
00001653UDP NAMESRVNOAUTOLOG ; DOMAIN NAME SERVER000017111TCF FORTMAP; Portmap Server000018111UDF FORTMAP; Portmap Server000019135UDP LLBD; HSC Location Broker000020161UDP SNMPD; SNMP Agent000021162UDP SNMPQE; SNMP Query Engine000022512TCF RXSERVE; Remote Execution Server000023514TCP RXSERVE; Remote Execution Server000024515TCP LPSERVE; LPD Server000025520UDP NOPROUTNOAUTOLOG ; NCPROUTE SERVER000026580UDP NCPROUTNOAUTOLOG ; KERBEROS000027750TCP MVSKERBNOAUTOLOG ; KERBEROS000028750UDP MVSKERBNOAUTOLOG ; KERBEROS000030751UDP ADM®SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049UDP MVSNFS; NFS Server0000323000TCF CICSTCFNOAUTOLOG ; CICS SOCKET0000438000UCP OMVS; Reserved for O/E Users0000448000UDP OMVS; Reserved for O/E Users	000014	25 TCP	SMTP	; SMTP Server			
000017111TCF FORTMAP; Portmap Server000018111UDP FORTMAP; Portmap Server000019135UDP LLBD; HSC Location Broker000020161UDF SNMPD; SNMP Agent000021162UDP SNMPQE; SNMP Query Engine000022512TCF RXSERVE; Remote Execution Server000023514TCP RXSERVE; Remote Execution Server000024515TCF LPSERVE; LFD Server000025520UDP ROUTED; RouteD Server000026580UDP NCPROUTNOAUTOLOG00027750TCF MVSKERBNOAUTOLOG00028750UDP MVSKERBNOAUTOLOG000030751UDP ADM@SRVNOAUTOLOG0000312049UDP MVSNFS; NFS Server0000323000TCF CISTCFNOAUTOLOG0000438000UCP OMVS; Reserved for O/E Users0000448000UDP OMVS; Reserved for O/E Users	000015	53 TCP	NAMESRV NOAUTOLOG	; DOMAIN NAME SERVER			
000018111 UDP FORTMAP; Portmap Server000019135 UDP LLBD; HSC Location Broker000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; SNMP Query Engine000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000016	53 UDP	NAMESRV NOAUTOLOG	; DOMAIN NAME SERVER			
000019135 UDP LLED; HSC Location Broker000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; SNMP Query Engine000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000017	111 TCP	PORTMAP	; Portmap Server			
000020161 UDP SNMPD; SNMP Agent000021162 UDP SNMPQE; SNMP Query Engine000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000018	111 UDP	PORTMAP	; Portmap Server			
000021162 UDP SNMPQE; SNMP Query Engine000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000019	135 UDP	LLBD	; HSC Location Broker			
000022512 TCP RXSERVE; Remote Execution Server000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000020	161 UDP	SNMPD	; SNMP Agent			
000023514 TCP RXSERVE; Remote Execution Server000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000021	162 UDP	SNMPQE	; SNMP Query Engine			
000024515 TCP LPSERVE; LPD Server000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000022	512 TCP	RXSERVE	; Remote Execution Server			
000025520 UDP ROUTED; RouteD Server000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000023	514 TCP	RXSERVE	; Remote Execution Server			
000026580 UDP NCPROUTNOAUTOLOG ; NCPROUTE SERVER000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000024	515 TCP	LPSERVE	; LPD Server			
000027750 TCP MVSKERBNOAUTOLOG ; KERBEROS000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 UDP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000025	520 UDP	ROUTED	; RouteD Server			
000028750 UDP MVSKERBNOAUTOLOG ; KERBEROS000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000026	580 UDP	NCPROUT NOAUTOLOG	; NCPROUTE SERVER			
000029751 TCP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000027	750 TCP	MVSKERB NOAUTOLOG	; KERBEROS			
000030751 UDP ADM@SRVNOAUTOLOG ; KERBEROS ADMIN SERVER0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG ; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000028	750 UDP	MVSKERB NOAUTOLOG	; KERBEROS			
0000312049 UDP MVSNFS; NFS Server0000323000 TCP CICSTCPNOAUTOLOG; CICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000029	751 TCP	ADM@SRV NOAUTOLOG	; KERBEROS ADMIN SERVER			
0000323000 TCP CICSTCPNOAUTOLOGCICS SOCKET0000438000 TCP OMVS; Reserved for O/E Users0000448000 UDP OMVS; Reserved for O/E Users	000030	751 UDP	ADM@SRV NOAUTOLOG	; KERBEROS ADMIN SERVER			
000043         8000 TCP OMVS         ; Reserved for O/E Users           000044         8000 UDP OMVS         ; Reserved for O/E Users	000031	2049 UDP	MVSNFS	; NFS Server			
000044 8000 UDP OMVS ; Reserved for O/E Users	000032	3000 TCP	CICSTCP NOAUTOLOG	; CICS SOCKET			
	000043	8000 TCP	OMVS	; Reserved for O/E Users			
	000044	8000 UDP	OMVS	; Reserved for O/E Users			
****** *******************************	* * * * * *	* * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* Bottom of Data *******************			

# **PAGENT** parmfile

LIBPATH=/lib:/usr/lib:/usr/lpp/ldapclient/lib:	
<pre>PAGENT_CONFIG_FILE=/SYSTEM/tmp/t046028/attlc.conf &lt;=== see above for more info on the conf fi</pre>	le
<pre>PAGENT_LOG_FILE=/SYSTEM/tmp/t046028/pagentc.log &lt;=== file name where PAGENT logs information</pre>	n
PAGENT_LOG_FILE_CONTROL=3000,2	
_BPXK_SETIBMOPT_TRANSPORT=TCPIP	
TZ=MST7MDT	

## **Debugging and PAGENT Logs**

It is helpful to have different PAGENT logs during diagnosis; we used pagentc.log for client information and pagents.log for server information. The PAGENT started task reads the parmfile; the parmfile indicates what the library path will be, the config file name and the log file name.

The TCPIP address space also generates a debug.log that resides in /tmp. Information is available there about how TCPIP is processing.

### Sample JCL

```
000100 //PAGENT PROC M='ZIPDCLI'
000200 //* PAGENT PROCEDURE found in USERS.PROCLIB(PAGENT)
000201 //*
000202 //* IBM COMMUNICATIONS SERVER FOR Z/OS
000203 //* SMP/E DISTRIBUTION NAME: EZAPAGSP
000204 //*
000205 //* 5694-A01 (C) COPYRIGHT IBM CORP. 1998, 2006
000206 //* LICENSED MATERIALS - PROPERTY OF IBM
000207 //* "RESTRICTED MATERIALS OF IBM"
000208 //* STATUS = CSV1R8
000209 //*
000210 //PAGENT EXEC PGM=PAGENT, REGION=0K, TIME=NOLIMIT,
000220 // PARM='POSIX(ON) ALL31(ON) ENVAR("_CEE_ENVFILE=DD:STDENV")/-D1'
000260 //STDENV DD DSN=USERS.TCPIP.PROFILES(&M),DISP=SHR
000280 //* SAMPLE HFS FILE CONTAINING ENVIRONMENT VARIABLES:
000290 //SYSPRINT DD SYSOUT=*
000300 //SYSOUT DD SYSOUT=*
000400 //*
000500 //CEEDUMP DD SYSOUT=*, DCB=(RECMF=FB, LRECL=132, BLKSIZE=132)
```

The parmfile 'ZIPDCLI' is found above: AT-TLS server configuration.

## Recommendations

### **Configuration Overview**

- Our Content of Cont
- Administer all AT-TLS from 1 permanently mounted OE segment. This provides for a single point of management that is capable of spanning across multiple site locations, reduces complexity, and enables startup to be more readily shared within the organization.

### **Benefits of the Recommended Configuration**

Ease of change management. One shared OE segment will allow all PAGENT configuration files to be in one location. This is especially useful when debugging a particular host and implementing multiple client traffic to one server. All clients could use the same configuration file if all were to encrypt traffic all the time.

# **Chapter 3: RACF**

## **Overview**

General notes:

The following RACF classes need to be activated:

- DIGTCERT =
- DIGTNMAP = there are no profiles defined
- DIGTRING =
- SERVAUTH CLASS must be RACLISTed in order to prevent PORTMAP and RXSERVE from amending once TCPIP is cycled to include the TCPCONFIG TTLS statement or the TCPIP OBEY statement is issued.
- RACDCERT GENCERT commands generate certificates.
- The WITHLABEL parameter is used in the RACDCERT CONNECT statements to identify which ring the task is associated.
- PAGENT started task is defined and uses the TCPIP userid which has an OMVS UID OF 0.
- STCTASK is the default userid associated with all started tasks which are not defined in the STARTED class.

# Activate class commands

Used the RACF panel to activate classes: DIGTCERT, DIGTNMAP, AND DIGTRING Used batch commands for the following: SETROPTS RACLIST(SERVAUTH) RDEFINE SERVAUTH \*\* UACC(ALTER) OWNER(RACFADM) RDEFINE STARTED PAGENT\*.\* OWNER(RACFADM) -STDATA(USER(TCPIP) GROUP(STCGROUP)) RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE) OWNER(RACFADM) RDEFINE FACILITY IRR.DIGTCERT.LIST UACC(NONE) OWNER(RACFADM)

RDEFINE FACILITY IRR.DIGTCERT.GENCERT UACC(NONE) OWNER(RACFADM)

## Ring creation and certificate creation commands

RACDCERT ID(STCUSER) ADDRING(SVRRING) RACDCERT ID(STCUSER) ADDRING(CLIRING) RACDCERT ID(STCUSER) LISTRING(SVRRING) RACDCERT ID(STCUSER) LISTRING(CLIRING)

RACDCERT ID(STCTASK) GENCERT

SUBJECTSDN(CN('SERVER.STORTEK.COM') -

O('STORAGETEK')

OU('SERVER STORAGETEK')

C('US'))

WITHLABEL('SERVER')

TRUST

SIZE(1024)

RACDCERT ID(STCTASK) GENCERT

SUBJECTSDN(CN('CLIENT.STORTEK.COM') -

O('STORAGETEK')

OU('CLIENT STORAGETEK')

C('US'))

WITHLABEL('CLIENT')

RACDCERT ID(STCTASK) ADDRING(CLIRING)

RACDCERT ID(STCTASK) ADDRING(SVRRING)

RACDCERT ID(STCTASK) CONNECT(ID(STCTASK) -

LABEL('CLIENT') RING(CLIRING) -

DEFAULT USAGE(PERSONAL))

RACDCERT ID(STCTASK) CONNECT(ID(STCTASK) -

LABEL('SERVER') RING(SVRRING) -

DEFAULT USAGE(PERSONAL))

RACDCERT ID(STCTASK) CONNECT(ID(STCTASK) -

LABEL('CLIENT') RING(SVRRING) -

USAGE(PERSONAL))

RACDCERT ID(STCTASK) CONNECT(ID(STCTASK) -

LABEL('SERVER') RING(CLIRING) -

USAGE(PERSONAL))

ADDUSER PAGENT DFLTGRP(STCGROUP) OWNER(RACFADM) -

OMVS(UID(0) HOME('/'))

SETROPTS RACLIST(STARTED) REFRESH SETROPTS GENERIC(STARTED) REFRESH

# **Commands to list RACF definitions**

RLIST STARTED PAGENT.\* STDATA ALL RLIST DIGTRING \* ALL RLIST FACILITY IRR.DIGTCERT.LISTRING ALL RLIST FACILITY IRR.DIGTCERT.LIST ALL RLIST FACILITY IRR.DIGTCERT.GENCERT ALL RACDCERT ID(STCTASK) LIST RACDCERT ID(STCTASK) LISTRING(SVRRING) RACDCERT ID(STCTASK) LISTRING(CLIRING)