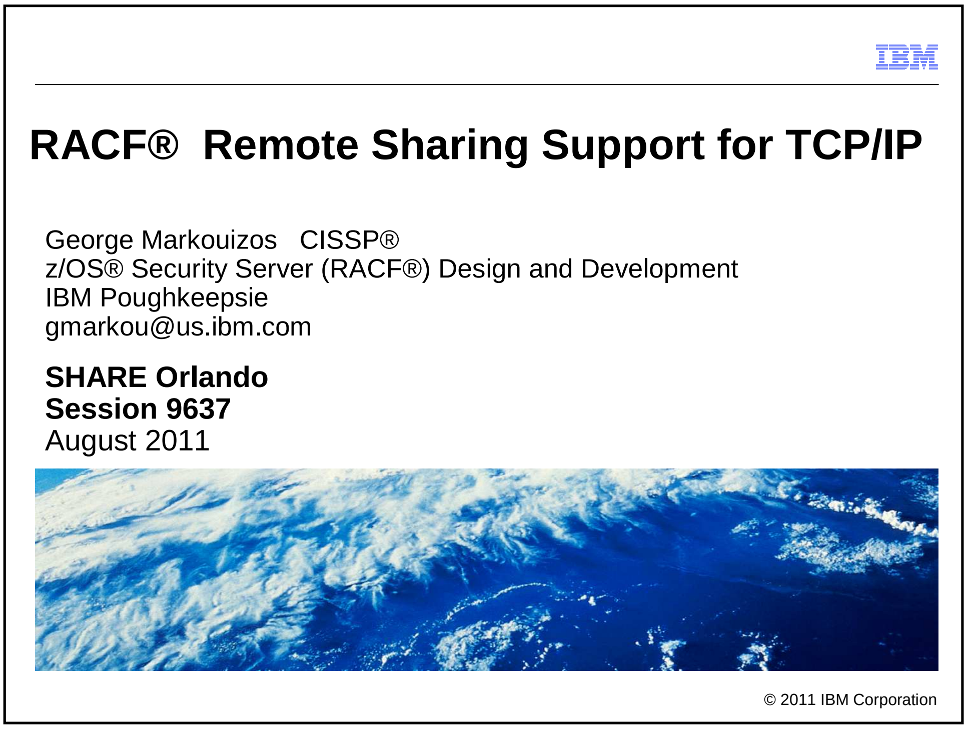

RACF® Remote Sharing Support for TCP/IP

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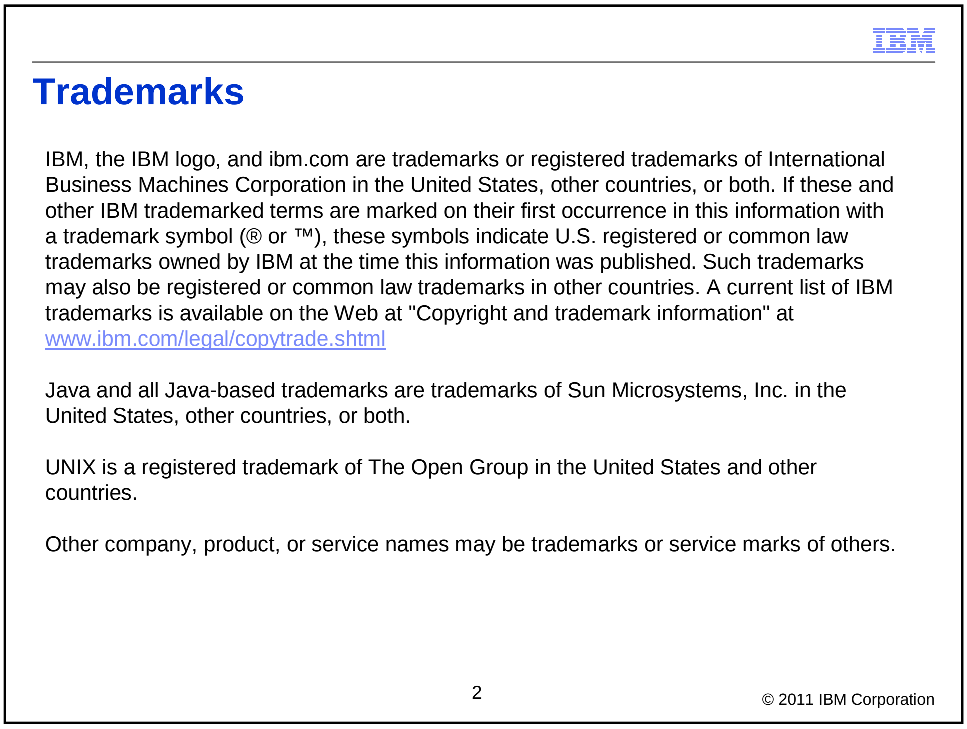
SHARE Orlando
Session 9637
August 2011



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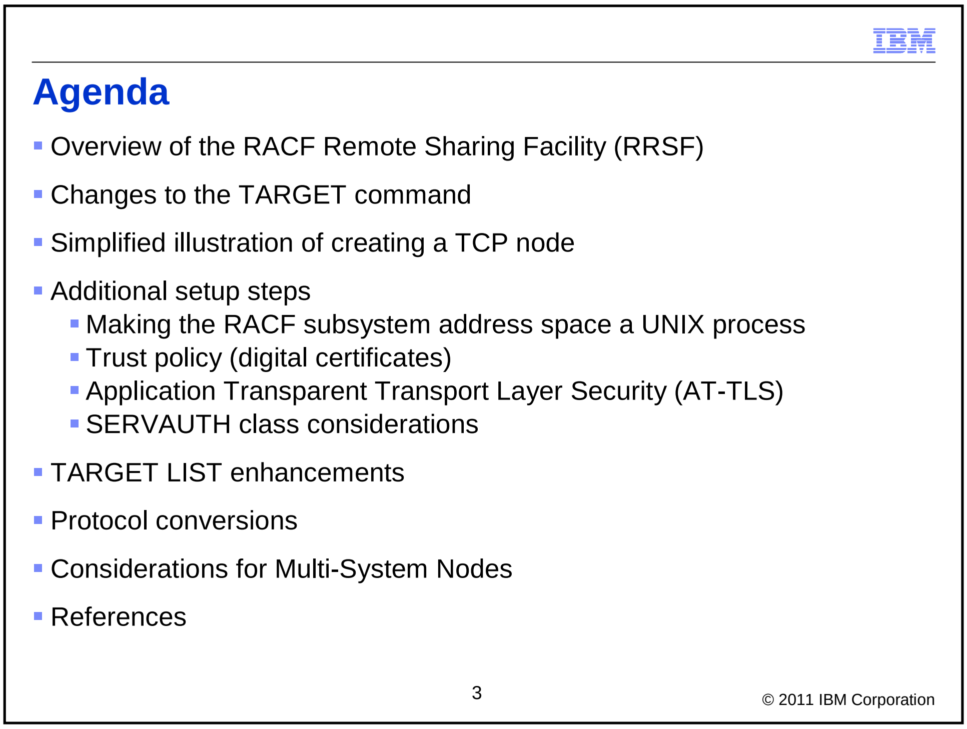
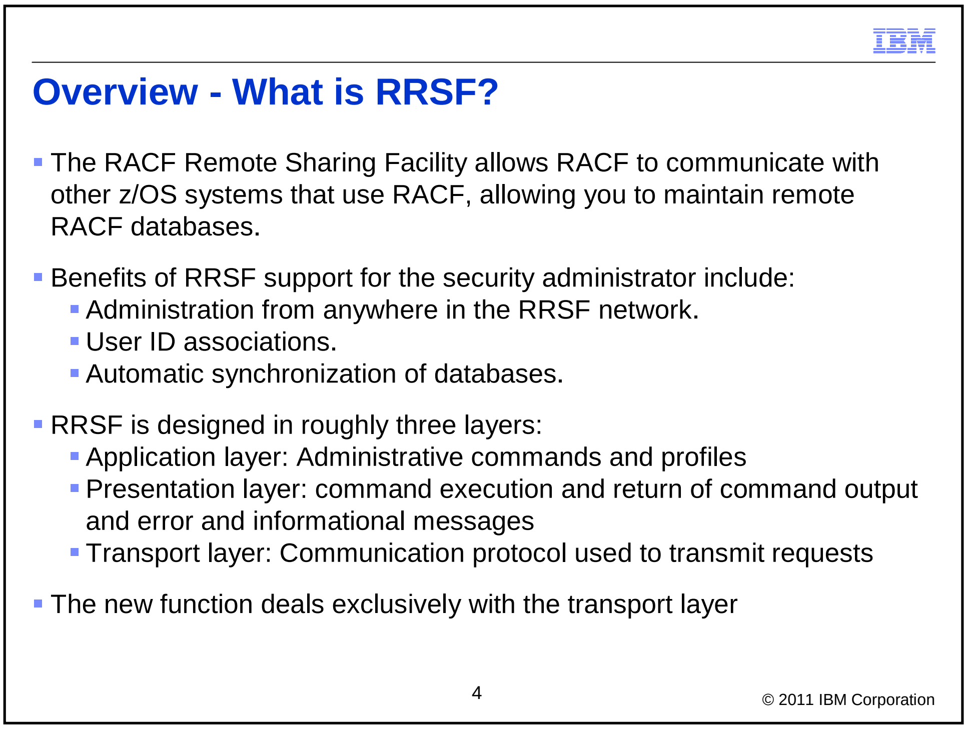


Agenda

- Overview of the RACF Remote Sharing Facility (RRSF)
- Changes to the TARGET command
- Simplified illustration of creating a TCP node
- Additional setup steps
  - Making the RACF subsystem address space a UNIX process
  - Trust policy (digital certificates)
  - Application Transparent Transport Layer Security (AT-TLS)
  - SERVAUTH class considerations
- TARGET LIST enhancements
- Protocol conversions
- Considerations for Multi-System Nodes
- References

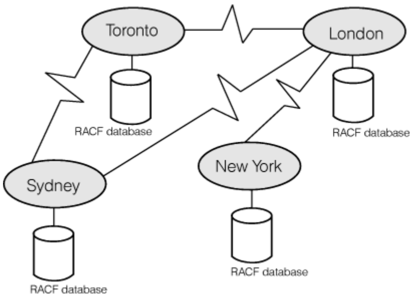


Overview - What is RRSF?

- The RACF Remote Sharing Facility allows RACF to communicate with other z/OS systems that use RACF, allowing you to maintain remote RACF databases.
- Benefits of RRSF support for the security administrator include:
  - Administration from anywhere in the RRSF network.
  - User ID associations.
  - Automatic synchronization of databases.
- RRSF is designed in roughly three layers:
  - Application layer: Administrative commands and profiles
  - Presentation layer: command execution and return of command output and error and informational messages
  - Transport layer: Communication protocol used to transmit requests
- The new function deals exclusively with the transport layer

Overview - The RRSF network

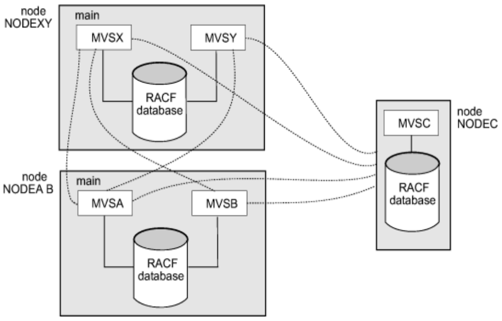
- Consists of **nodes**
  - Local node: The one I'm logged on to at the moment
  - Remote nodes (all the others)
  - Local node can run in “local mode”, where there are no remote nodes
- The TARGET operator command is used to define, modify, delete, and list nodes, as well as to de/activate them.
- TARGET commands are contained within the RACF parameter library, and are executed automatically when the RACF subsystem starts.
- The RACF parameter library member is specified in your started procedure JCL.
- RACF parameter library members can be “chained together” using the **SET INCLUDE(xx)** command



Sample RRSF network containing 4 nodes

Overview - Multi-System Node (MSN)

- A set of systems sharing a RACF database (can be in a SYSPLEX, or simply on shared DASD)
- Managed with the TARGET command by specifying both NODE and SYSNAME
- All Single System Nodes (SSNs) send requests only to the MAIN system of a MSN
- All peer systems of an MSN send requests only to SSNs, and to the MAIN systems of remote MSNs
- Peer systems do not speak with each other, and do not speak with non-MAIN systems of remote MSNs

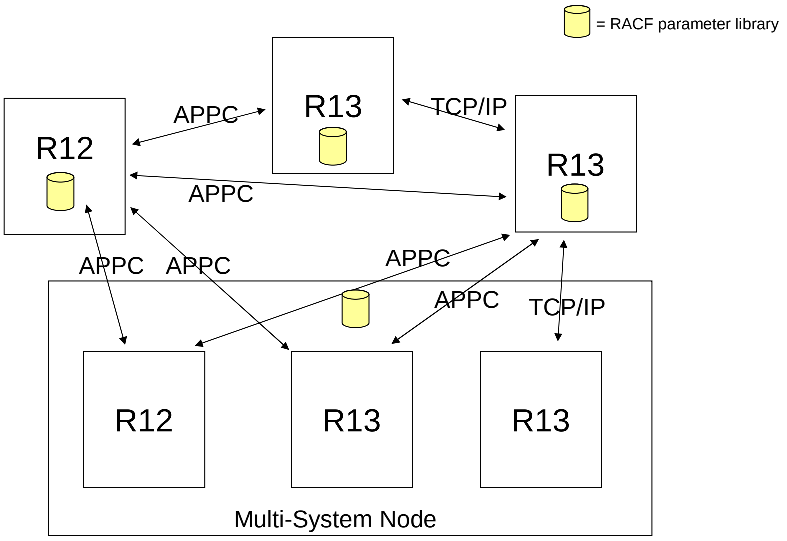


Sample RRSF network containing two Multi-System Nodes and a Single System Node

Overview - Workspace data sets (i.e. checkpoint files)

- VSAM data sets that RACF uses to temporarily hold data that RACF is sending from one node to another.
- RACF deletes data from the workspace data sets when it receives confirmation that the data has been successfully processed at the receiving node.
- RACF uses two workspace data sets, the INMSG data set and the OUTMSG data set, for the local node and for each of its remote nodes.
  - The INMSG data set is used to temporarily hold requests that are being sent to the local node from itself or from a remote node (e.g. commands directed to the local node, or output from RACF commands, application updates, and password changes that were directed to a remote node)
  - The OUTMSG data set is used to temporarily hold requests that are being sent to a remote node (e.g. commands, application updates, and password changes directed from the local node, or output to be returned to a remote node)
- Requests are queued to the files while a connection is DORMANT. Queued work is sent when the connection becomes OPERATIVE ACTIVE.
- Requests are “casually encrypted” while checkpointed

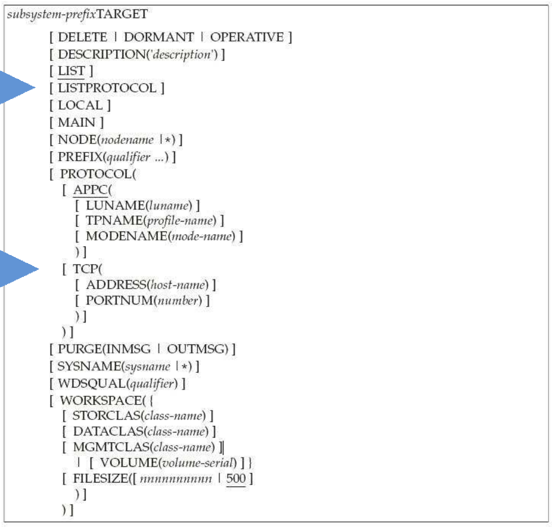
Possible configurations



Syntax of the TARGET command

New

New



```
subsystem-prefixTARGET
        [ DELETE | DORMANT | OPERATIVE ]
        [ DESCRIPTION('description') ]
        [ LIST ]
        [ LISTPROTOCOL ]
        [ LOCAL ]
        [ MAIN ]
        [ NODE(nodename |*) ]
        [ PREFIX(qualifier ...) ]
        [ PROTOCOL(
          [ APPC(
            [ LUNAME(luname) ]
            [ TPNAME(profile-name) ]
            [ MODENAME(mode-name) ]
            ) ]
          [ TCP(
            [ ADDRESS(host-name) ]
            [ PORTNUM(number) ]
            ) ]
          ) ]
        [ PURGE(INMSG | OUTMSG) ]
        [ SYSNAME(sysname |*) ]
        [ WDSQUAL(qualifier) ]
        [ WORKSPACE( {
          [ STORCLAS(class-name) ]
          [ DATACLAS(class-name) ]
          [ MGMTCLAS(class-name) ]|
            | [ VOLUME(volume-serial) ] }
          [ FILESIZE([ nnnnnnnnnn | 500 ]
            ) ]
          ) ]
```

TARGET command syntax: The LISTPROTOCOL and TCP keywords are new

Defining a TCP/IP node and activating it using TARGET

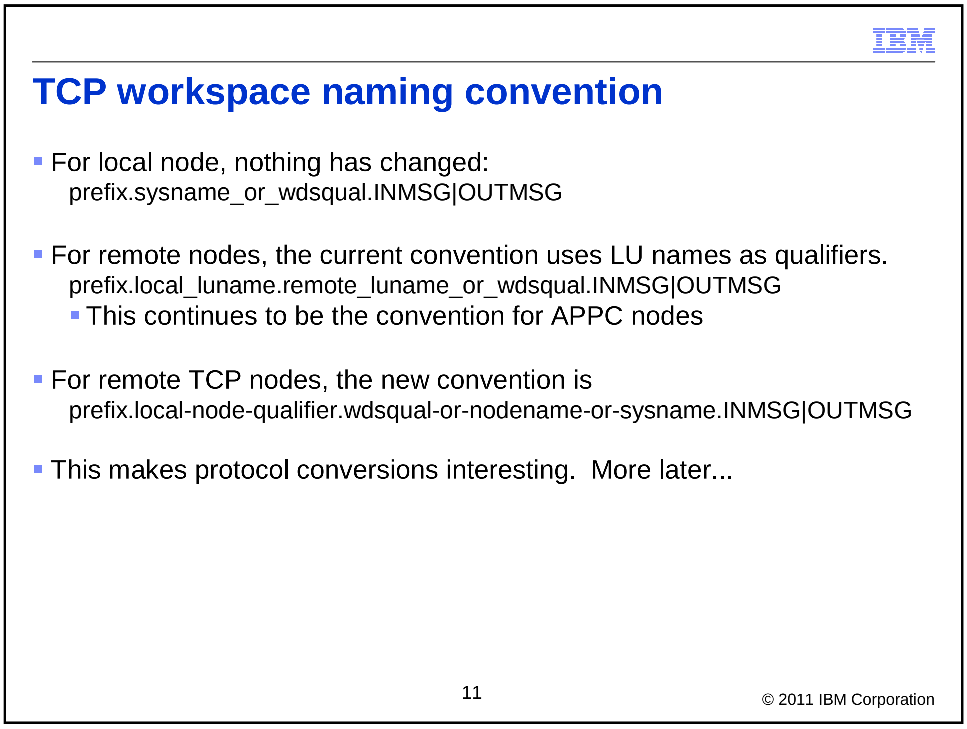
- The only difference from APPC is the PROTOCOL information:
  - Define the local node with a socket listener

```
TARGET NODE(LOCAL) LOCAL PROTOCOL(TCP)
PREFIX(SYS1.RRSF) WORKSPACE(VOLUME(VOL001))OPERATIVE

IRRC054I (<) RACF REMOTE SHARING TCP LISTENER HAS BEEN
  SUCCESSFULLY  ESTABLISHED.
```

  - Define the remote node and make it operative

```
TARGET NODE(REMOTE) PROTOCOL(TCP(ADDRESS(remote.pok.ibm.com)))
PREFIX(SYS1.RRSF) WORKSPACE(VOLUME(VOL001)) OPERATIVE

IRRI027I (<) RACF COMMUNICATION WITH TCP NODE REMOTE HAS BEEN
  SUCCESSFULLY ESTABLISHED USING CIPHER ALGORITHM 35
  TLS_RSA_WITH_AES_256_CBC_SHA.
```

  - Harden your TARGET commands in the RACF parameter library



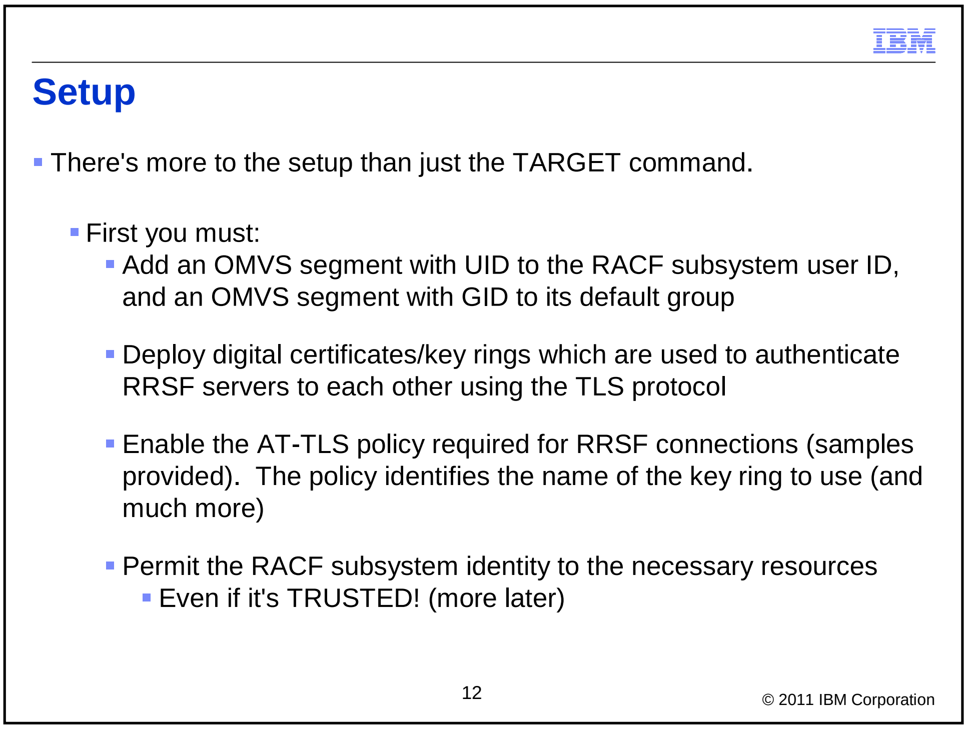
TCP workspace naming convention

- For local node, nothing has changed:
  prefix.sysname_or_wdsqual.INMSG|OUTMSG

- For remote nodes, the current convention uses LU names as qualifiers.
  prefix.local_luname.remote_luname_or_wdsqual.INMSG|OUTMSG
  - This continues to be the convention for APPC nodes

- For remote TCP nodes, the new convention is
  prefix.local-node-qualifier.wdsqual-or-nodename-or-sysname.INMSG|OUTMSG

- This makes protocol conversions interesting. More later...



Setup

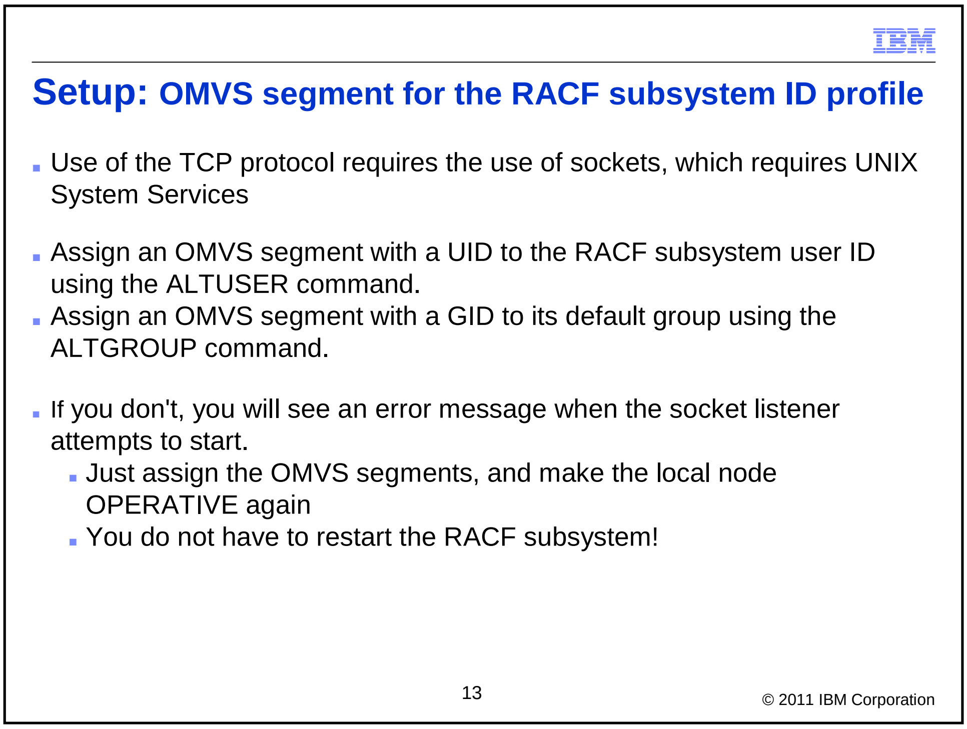
- There's more to the setup than just the TARGET command.

  - First you must:
    - Add an OMVS segment with UID to the RACF subsystem user ID, and an OMVS segment with GID to its default group

    - Deploy digital certificates/key rings which are used to authenticate RRSF servers to each other using the TLS protocol

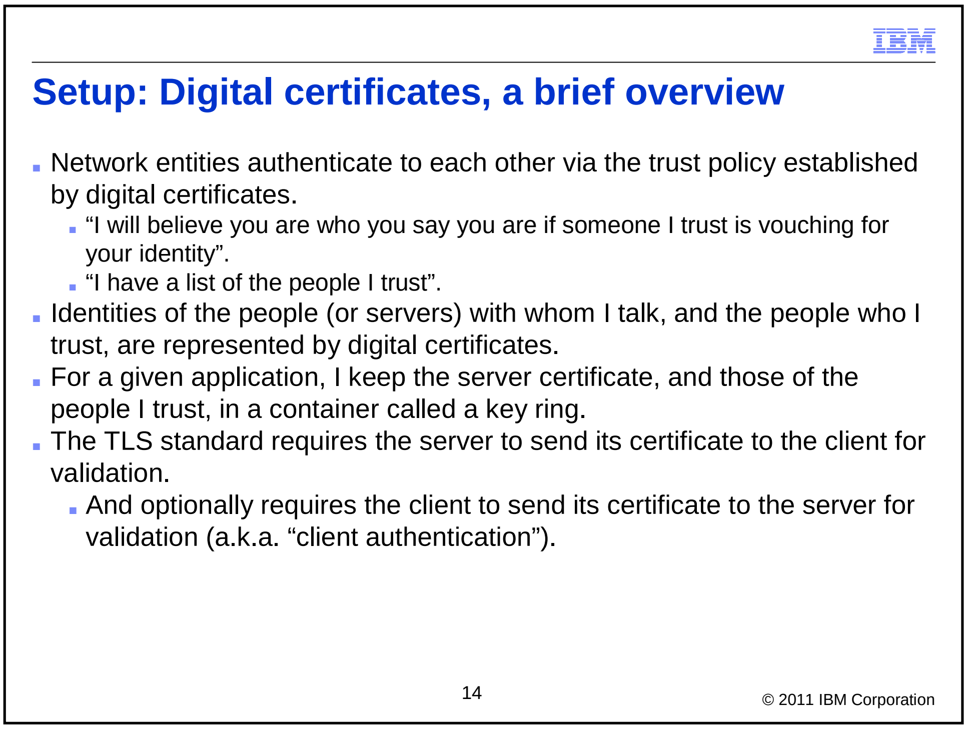
    - Enable the AT-TLS policy required for RRSF connections (samples provided). The policy identifies the name of the key ring to use (and much more)

    - Permit the RACF subsystem identity to the necessary resources
      - Even if it's TRUSTED! (more later)



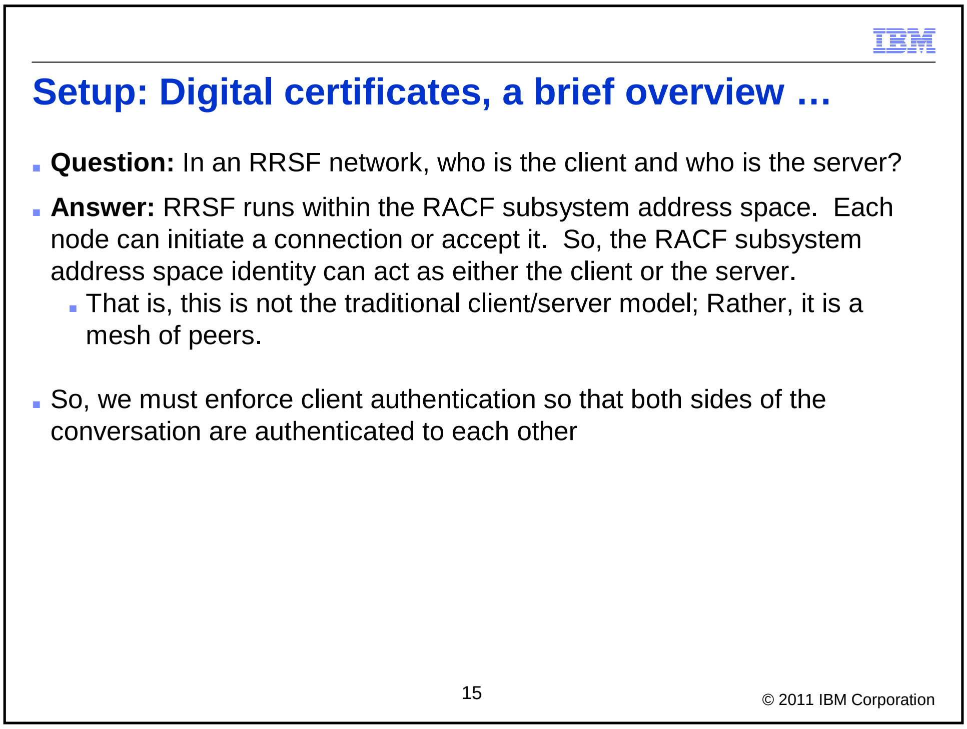
Setup: OMVS segment for the RACF subsystem ID profile

- Use of the TCP protocol requires the use of sockets, which requires UNIX System Services
- Assign an OMVS segment with a UID to the RACF subsystem user ID using the ALTUSER command.
- Assign an OMVS segment with a GID to its default group using the ALTGROUP command.
- If you don't, you will see an error message when the socket listener attempts to start.
  - Just assign the OMVS segments, and make the local node OPERATIVE again
  - You do not have to restart the RACF subsystem!



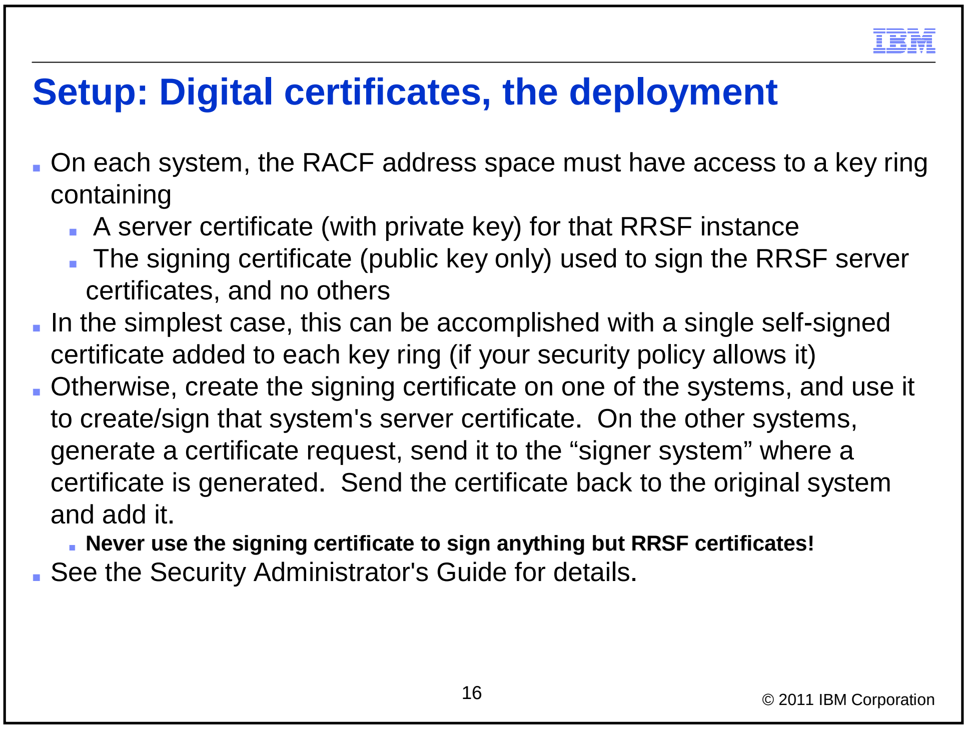
Setup: Digital certificates, a brief overview

- Network entities authenticate to each other via the trust policy established by digital certificates.
  - “I will believe you are who you say you are if someone I trust is vouching for your identity”.
  - “I have a list of the people I trust”.
- Identities of the people (or servers) with whom I talk, and the people who I trust, are represented by digital certificates.
- For a given application, I keep the server certificate, and those of the people I trust, in a container called a key ring.
- The TLS standard requires the server to send its certificate to the client for validation.
  - And optionally requires the client to send its certificate to the server for validation (a.k.a. “client authentication”).



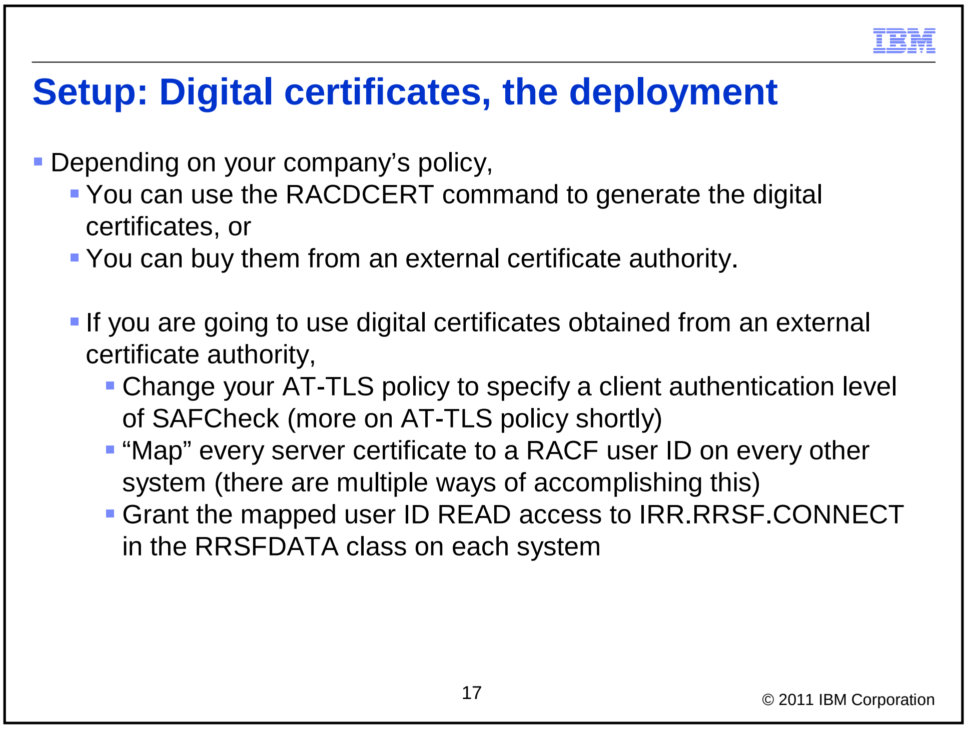
Setup: Digital certificates, a brief overview …

- **Question:** In an RRSF network, who is the client and who is the server?
- **Answer:** RRSF runs within the RACF subsystem address space. Each node can initiate a connection or accept it. So, the RACF subsystem address space identity can act as either the client or the server.
  - That is, this is not the traditional client/server model; Rather, it is a mesh of peers.
- So, we must enforce client authentication so that both sides of the conversation are authenticated to each other



Setup: Digital certificates, the deployment

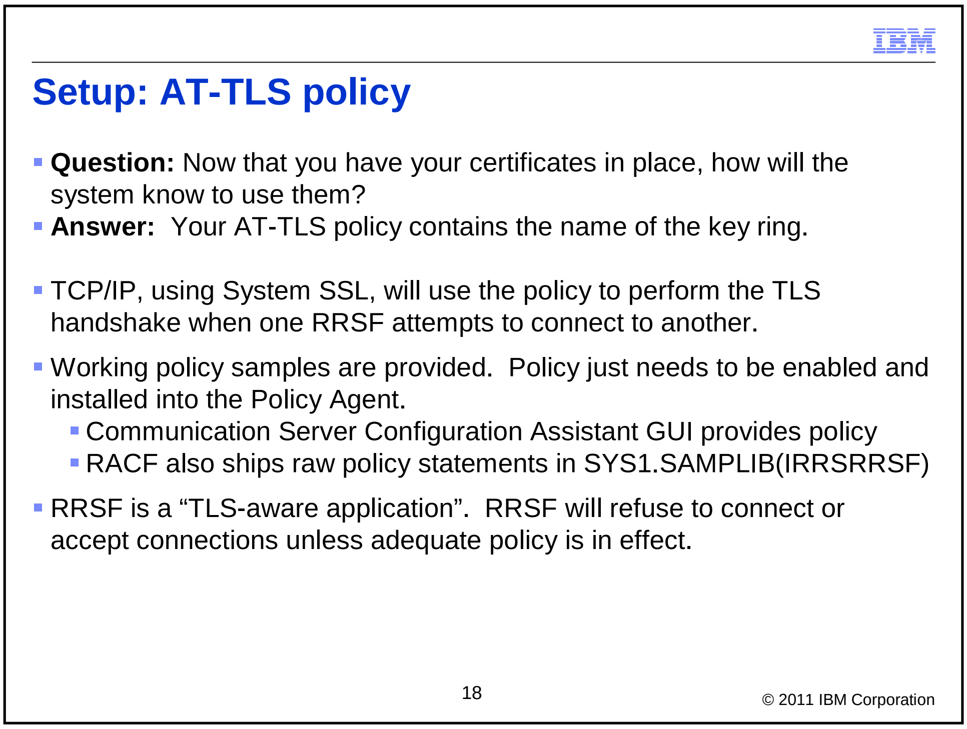
- On each system, the RACF address space must have access to a key ring containing
  - A server certificate (with private key) for that RRSF instance
  - The signing certificate (public key only) used to sign the RRSF server certificates, and no others
- In the simplest case, this can be accomplished with a single self-signed certificate added to each key ring (if your security policy allows it)
- Otherwise, create the signing certificate on one of the systems, and use it to create/sign that system's server certificate. On the other systems, generate a certificate request, send it to the “signer system” where a certificate is generated. Send the certificate back to the original system and add it.
  - **Never use the signing certificate to sign anything but RRSF certificates!**
- See the Security Administrator's Guide for details.



Setup: Digital certificates, the deployment

- Depending on your company’s policy,
  - You can use the RACDCERT command to generate the digital certificates, or
  - You can buy them from an external certificate authority.

  - If you are going to use digital certificates obtained from an external certificate authority,
    - Change your AT-TLS policy to specify a client authentication level of SAFCheck (more on AT-TLS policy shortly)
    - “Map” every server certificate to a RACF user ID on every other system (there are multiple ways of accomplishing this)
    - Grant the mapped user ID READ access to IRR.RRSF.CONNECT in the RRSFDATA class on each system

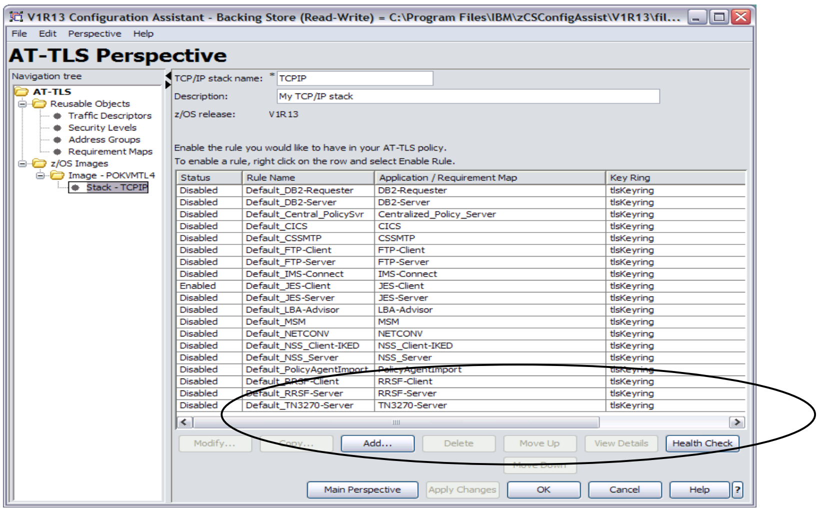


Setup: AT-TLS policy

- **Question:** Now that you have your certificates in place, how will the system know to use them?
- **Answer:** Your AT-TLS policy contains the name of the key ring.

- TCP/IP, using System SSL, will use the policy to perform the TLS handshake when one RRSF attempts to connect to another.
- Working policy samples are provided. Policy just needs to be enabled and installed into the Policy Agent.
  - Communication Server Configuration Assistant GUI provides policy
  - RACF also ships raw policy statements in SYS1.SAMPLIB(IRRSRRSF)
- RRSF is a “TLS-aware application”. RRSF will refuse to connect or accept connections unless adequate policy is in effect.

Setup: AT-TLS policy - Sample


V1R13 Configuration Assistant - Backing Store (Read-Write) = C:\Program Files\IBM\zCSConfigAssist\V1R13\fil...
File
Edit
Perspective
Help

AT-TLS Perspective

TCP/IP stack name: * TCPIP

Description: My TCP/IP stack

z/OS release: V1R13

Enable the rule you would like to have in your AT-TLS policy.
To enable a rule, right click on the row and select Enable Rule.

Status	Rule Name	Application / Requirement Map	Key Ring
Disabled	Default_DB2-Requester	DB2-Requester	tlsKeyring
Disabled	Default_DB2-Server	DB2-Server	tlsKeyring
Disabled	Default_Central_PolicySvr	Centralized_Policy_Server	tlsKeyring
Disabled	Default_CICS	CICS	tlsKeyring
Disabled	Default_CSSMTP	CSSMTP	tlsKeyring
Disabled	Default_FTP-Client	FTP-Client	tlsKeyring
Disabled	Default_FTP-Server	FTP-Server	tlsKeyring
Disabled	Default_IMS-Connect	IMS-Connect	tlsKeyring
Enabled	Default_JES-Client	JES-Client	tlsKeyring
Disabled	Default_JES-Server	JES-Server	tlsKeyring
Disabled	Default_LBA-Advisor	LBA-Advisor	tlsKeyring
Disabled	Default_MSM	MSM	tlsKeyring
Disabled	Default_NETCONV	NETCONV	tlsKeyring
Disabled	Default_NSS_Client-IKED	NSS_Client-IKED	tlsKeyring
Disabled	Default_NSS_Server	NSS_Server	tlsKeyring
Disabled	Default_PolicyAgentImport	PolicyAgentImport	tlsKeyring
Disabled	Default_RRSF-Client	RRSF-Client	tlsKeyring
Disabled	Default_RRSF-Server	RRSF-Server	tlsKeyring
Disabled	Default_TN3270-Server	TN3270-Server	tlsKeyring

Screen shot from the Communication Server Configuration Assistant GUI

Setup: AT-TLS policy …

- The sample will satisfy RRSF, but in case you modify it, RRSF will enforce the following properties:
  - Policy is in effect for the connection
    - The TCP/IP stack is enabled for policy (TCPCONFIG TTLS)
    - A matching policy rule was found (match is based on target port number)
    - The rule is enabled
  - Policy specifies a client authentication level of at least “Required”
  - SSL V3, or TLS, is specified as the protocol level
  - Application-controlled attribute is OFF

Note:

A minimum encryption level is not enforced, though the sample specifies the strongest level currently available (AES-256), and the value is reported in the connection message and is displayed in TARGET LIST output.

Setup: Resource permissions for the RACF address space user ID

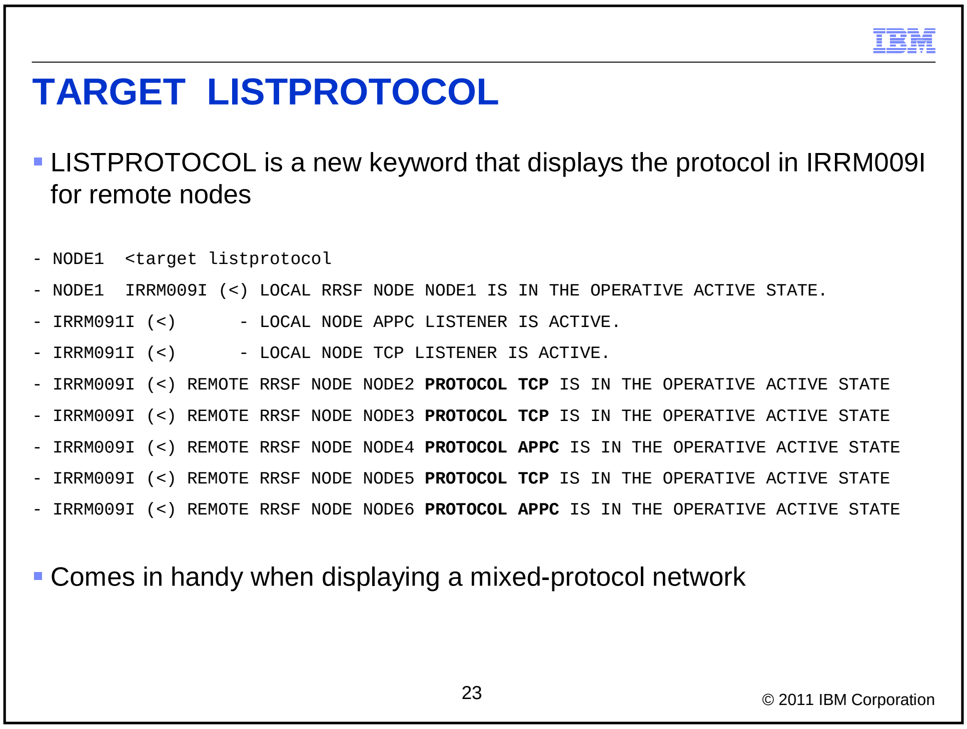
- Generally, you run the RACF started task with the TRUSTED attribute, and automatic access is granted to RACF-protected resources.
- However, this does not play well with the SERVAUTH class.
- So, the RRSF tasks that perform TCP/IP communication run under a task-level security environment (ACEE) without the TRUSTED or PRIVILEGED attributes.
- As a result, the subsystem user will need to be permitted to whatever SERVAUTH class profiles are protecting resources it is accessing
  - But do not permit it to the stack initialization resource (INITSTACK) or remote connections may fail during IPL.
- Permission will also be required to open the key ring
  - And, if the server's private key is stored in ICSF, then also to the appropriate CSFKEYS/CSFSERV profiles.

TARGET LIST: summary version

- A new message line, prefixed with IRRM091I, indicates the status of each protocol listener defined to the local node.

```
- NODE1  <target list

- NODE1  IRRM009I (<) LOCAL RRSF NODE NODE1 IS IN THE OPERATIVE ACTIVE
  STATE.

- IRRM091I (<)      - LOCAL NODE APPC LISTENER IS ACTIVE.

- IRRM091I (<)      - LOCAL NODE TCP LISTENER IS ACTIVE.

- IRRM009I (<) REMOTE RRSF NODE NODE2 IS IN THE OPERATIVE ACTIVE
  STATE.
```

- Status values are ACTIVE, INACTIVE, and INITIALIZING

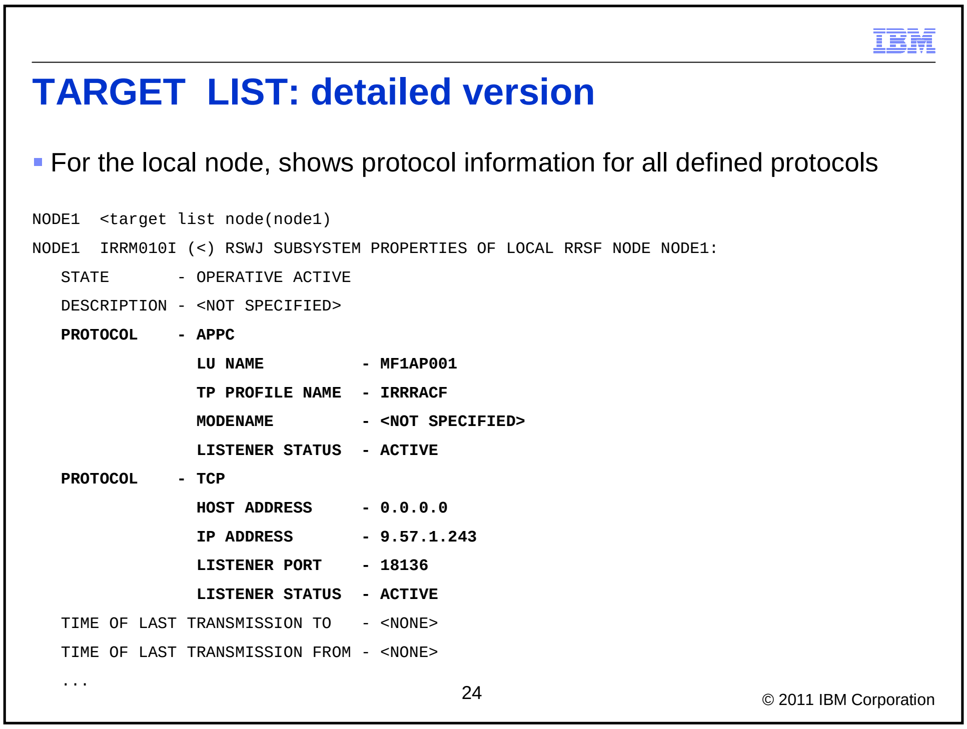


TARGET LISTPROTOCOL

- LISTPROTOCOL is a new keyword that displays the protocol in IRRM009I for remote nodes

```
- NODE1  <target listprotocol
- NODE1  IRRM009I (<) LOCAL RRSF NODE NODE1 IS IN THE OPERATIVE ACTIVE STATE.
- IRRM091I (<)      - LOCAL NODE APPC LISTENER IS ACTIVE.
- IRRM091I (<)      - LOCAL NODE TCP LISTENER IS ACTIVE.
- IRRM009I (<) REMOTE RRSF NODE NODE2 PROTOCOL TCP IS IN THE OPERATIVE ACTIVE STATE
- IRRM009I (<) REMOTE RRSF NODE NODE3 PROTOCOL TCP IS IN THE OPERATIVE ACTIVE STATE
- IRRM009I (<) REMOTE RRSF NODE NODE4 PROTOCOL APPC IS IN THE OPERATIVE ACTIVE STATE
- IRRM009I (<) REMOTE RRSF NODE NODE5 PROTOCOL TCP IS IN THE OPERATIVE ACTIVE STATE
- IRRM009I (<) REMOTE RRSF NODE NODE6 PROTOCOL APPC IS IN THE OPERATIVE ACTIVE STATE
```

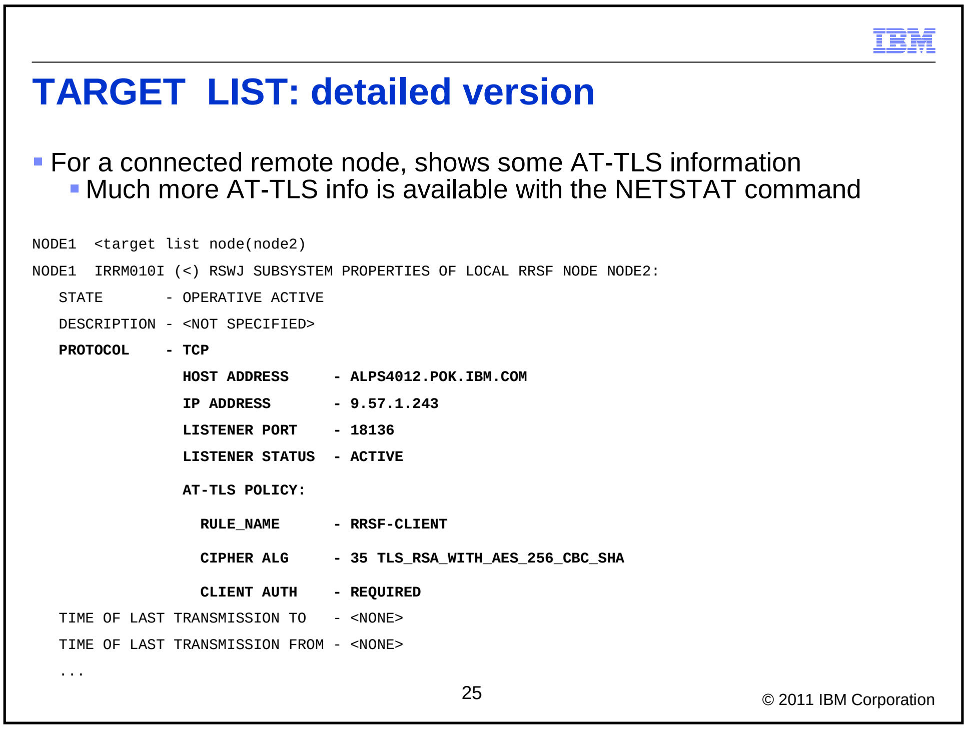
- Comes in handy when displaying a mixed-protocol network



TARGET LIST: detailed version

- For the local node, shows protocol information for all defined protocols

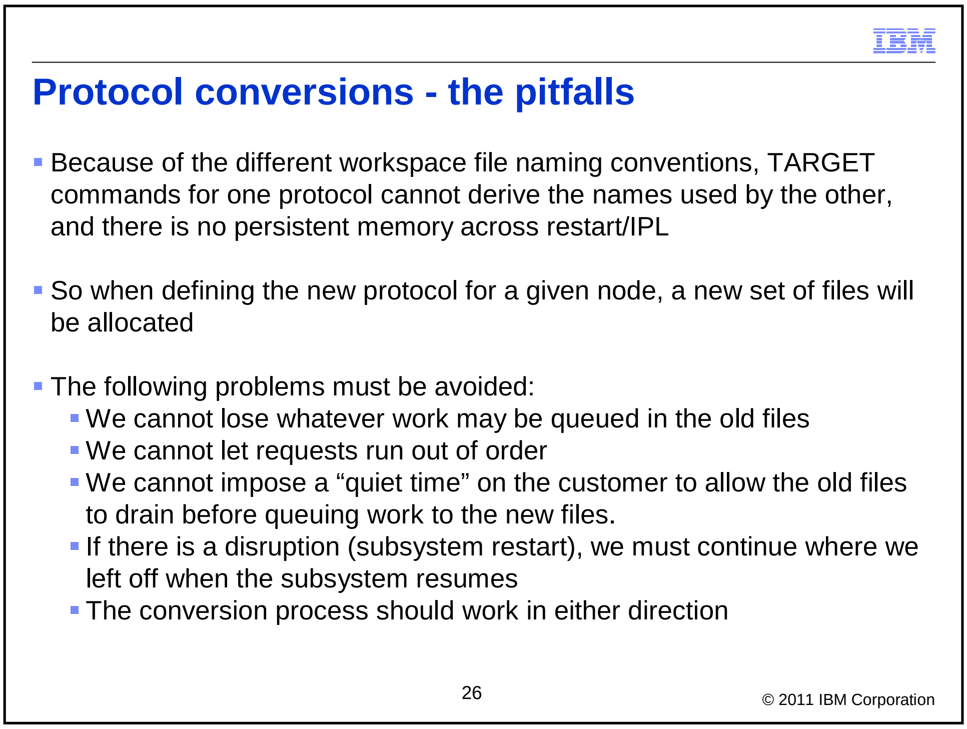
```
NODE1  <target list node(node1)
NODE1  IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF LOCAL RRSF NODE NODE1:
   STATE       - OPERATIVE ACTIVE
   DESCRIPTION - <NOT SPECIFIED>
   PROTOCOL    - APPC
                 LU NAME           - MF1AP001
                 TP PROFILE NAME   - IRRRACF
                 MODENAME          - <NOT SPECIFIED>
                 LISTENER STATUS   - ACTIVE
   PROTOCOL    - TCP
                 HOST ADDRESS      - 0.0.0.0
                 IP ADDRESS        - 9.57.1.243
                 LISTENER PORT     - 18136
                 LISTENER STATUS   - ACTIVE
   TIME OF LAST TRANSMISSION TO    - <NONE>
   TIME OF LAST TRANSMISSION FROM  - <NONE>
   ...
```



TARGET LIST: detailed version

- For a connected remote node, shows some AT-TLS information
  - Much more AT-TLS info is available with the NETSTAT command

```
NODE1  <target list node(node2)
NODE1  IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF LOCAL RRSF NODE NODE2:
   STATE       - OPERATIVE ACTIVE
   DESCRIPTION - <NOT SPECIFIED>
   PROTOCOL    - TCP
                 HOST ADDRESS     - ALPS4012.POK.IBM.COM
                 IP ADDRESS       - 9.57.1.243
                 LISTENER PORT    - 18136
                 LISTENER STATUS  - ACTIVE
                 AT-TLS POLICY:
                   RULE_NAME      - RRSF-CLIENT
                   CIPHER ALG     - 35 TLS_RSA_WITH_AES_256_CBC_SHA
                   CLIENT AUTH    - REQUIRED
   TIME OF LAST TRANSMISSION TO   - <NONE>
   TIME OF LAST TRANSMISSION FROM - <NONE>
   ...
```

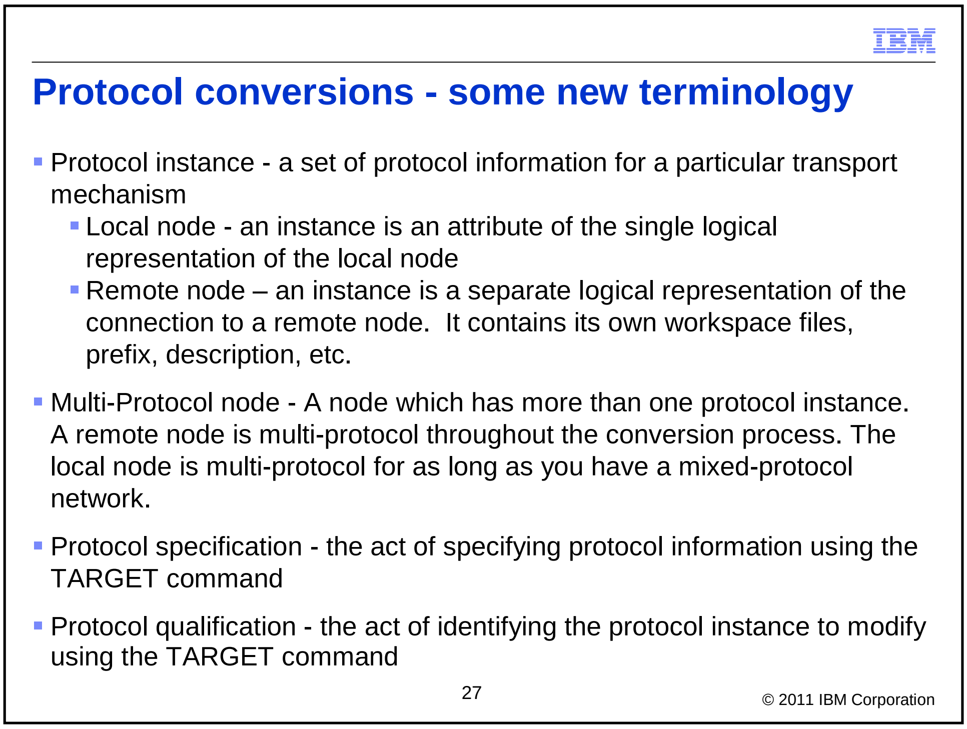


Protocol conversions - the pitfalls

- Because of the different workspace file naming conventions, TARGET commands for one protocol cannot derive the names used by the other, and there is no persistent memory across restart/IPL

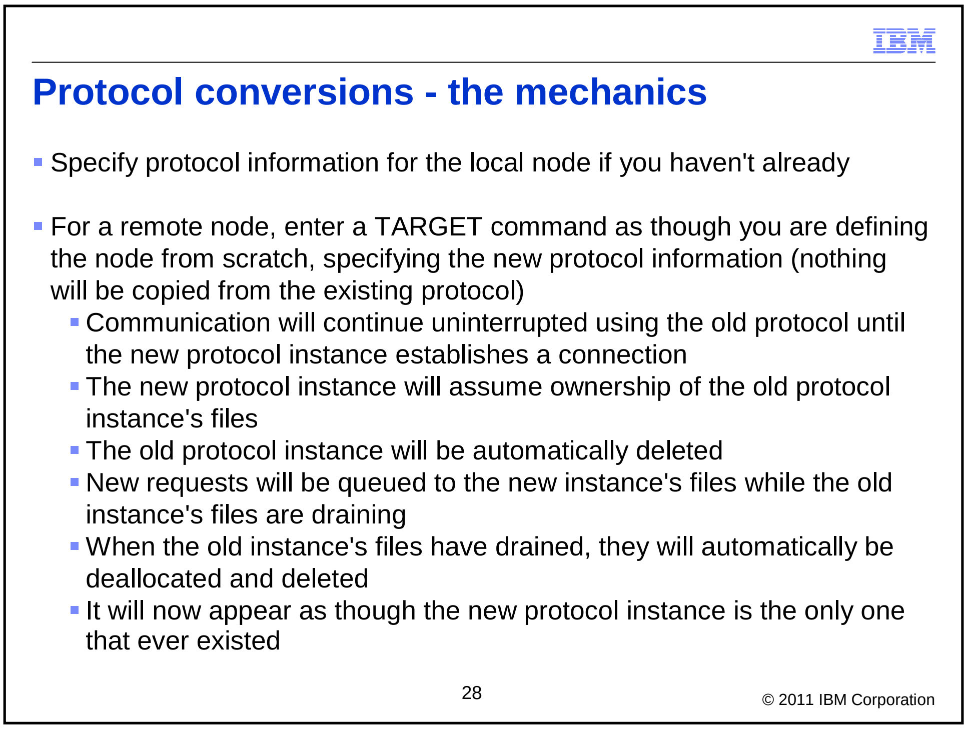
- So when defining the new protocol for a given node, a new set of files will be allocated

- The following problems must be avoided:
  - We cannot lose whatever work may be queued in the old files
  - We cannot let requests run out of order
  - We cannot impose a “quiet time” on the customer to allow the old files to drain before queuing work to the new files.
  - If there is a disruption (subsystem restart), we must continue where we left off when the subsystem resumes
  - The conversion process should work in either direction



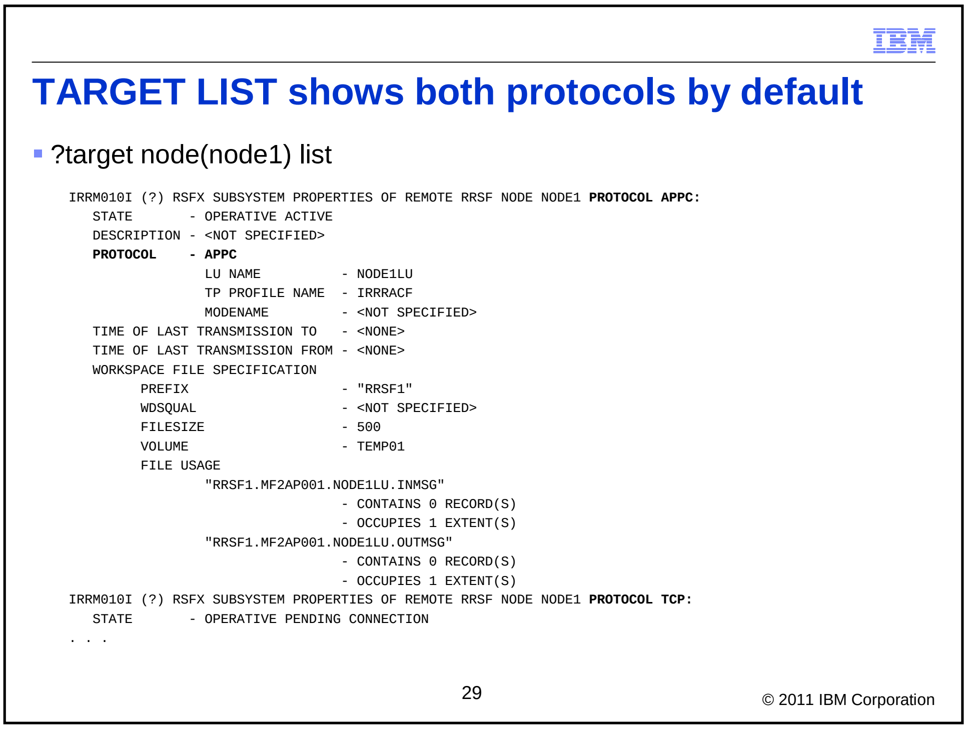
Protocol conversions - some new terminology

- Protocol instance - a set of protocol information for a particular transport mechanism
  - Local node - an instance is an attribute of the single logical representation of the local node
  - Remote node – an instance is a separate logical representation of the connection to a remote node. It contains its own workspace files, prefix, description, etc.
- Multi-Protocol node - A node which has more than one protocol instance. A remote node is multi-protocol throughout the conversion process. The local node is multi-protocol for as long as you have a mixed-protocol network.
- Protocol specification - the act of specifying protocol information using the TARGET command
- Protocol qualification - the act of identifying the protocol instance to modify using the TARGET command



Protocol conversions - the mechanics

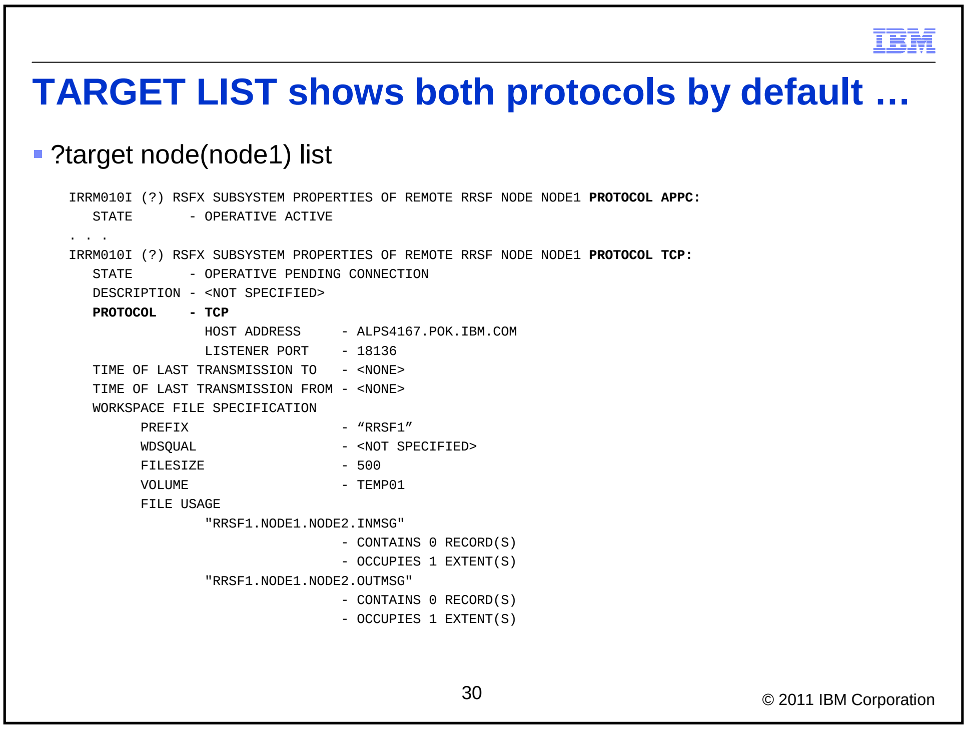
- Specify protocol information for the local node if you haven't already
- For a remote node, enter a TARGET command as though you are defining the node from scratch, specifying the new protocol information (nothing will be copied from the existing protocol)
  - Communication will continue uninterrupted using the old protocol until the new protocol instance establishes a connection
  - The new protocol instance will assume ownership of the old protocol instance's files
  - The old protocol instance will be automatically deleted
  - New requests will be queued to the new instance's files while the old instance's files are draining
  - When the old instance's files have drained, they will automatically be deallocated and deleted
  - It will now appear as though the new protocol instance is the only one that ever existed



TARGET LIST shows both protocols by default

- ?target node(node1) list

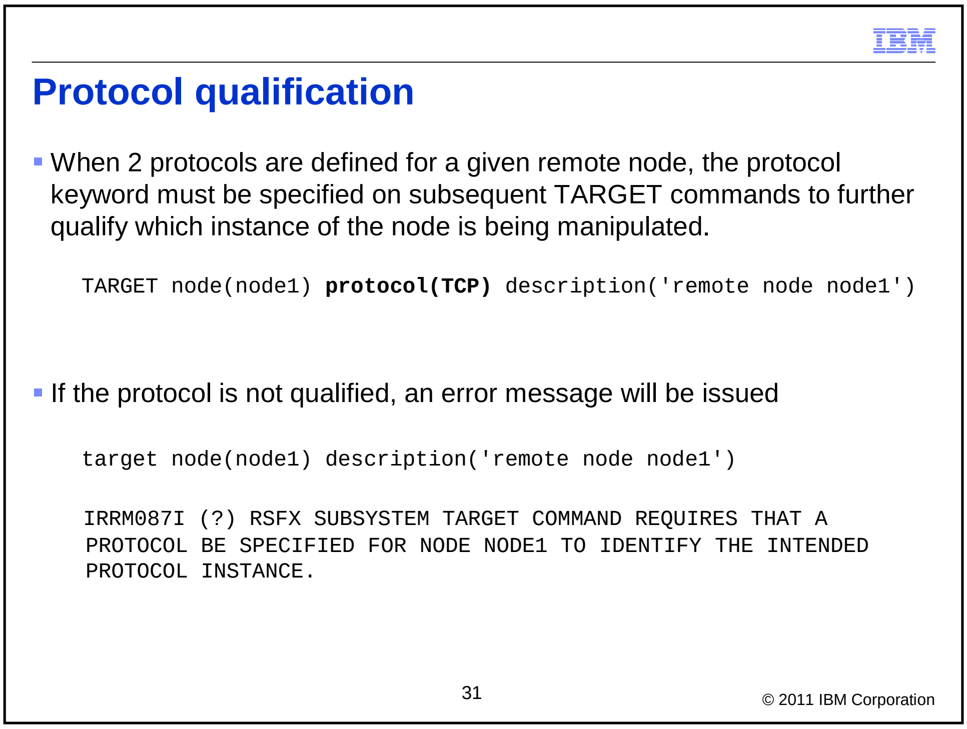
```
IRRM010I (?) RSFX SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE1 PROTOCOL APPC:
   STATE       - OPERATIVE ACTIVE
   DESCRIPTION - <NOT SPECIFIED>
   PROTOCOL    - APPC
                 LU NAME          - NODE1LU
                 TP PROFILE NAME  - IRRRACF
                 MODENAME         - <NOT SPECIFIED>
   TIME OF LAST TRANSMISSION TO   - <NONE>
   TIME OF LAST TRANSMISSION FROM - <NONE>
   WORKSPACE FILE SPECIFICATION
         PREFIX                   - "RRSF1"
         WDSQUAL                  - <NOT SPECIFIED>
         FILESIZE                 - 500
         VOLUME                   - TEMP01
         FILE USAGE
                 "RRSF1.MF2AP001.NODE1LU.INMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
                 "RRSF1.MF2AP001.NODE1LU.OUTMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
IRRM010I (?) RSFX SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE1 PROTOCOL TCP:
   STATE       - OPERATIVE PENDING CONNECTION
. . .
```



TARGET LIST shows both protocols by default …

- ?target node(node1) list

```
IRRM010I (?) RSFX SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE1 PROTOCOL APPC:
   STATE       - OPERATIVE ACTIVE
. . .
IRRM010I (?) RSFX SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE1 PROTOCOL TCP:
   STATE       - OPERATIVE PENDING CONNECTION
   DESCRIPTION - <NOT SPECIFIED>
   PROTOCOL    - TCP
                 HOST ADDRESS     - ALPS4167.POK.IBM.COM
                 LISTENER PORT    - 18136
   TIME OF LAST TRANSMISSION TO   - <NONE>
   TIME OF LAST TRANSMISSION FROM - <NONE>
   WORKSPACE FILE SPECIFICATION
         PREFIX                   - “RRSF1”
         WDSQUAL                  - <NOT SPECIFIED>
         FILESIZE                 - 500
         VOLUME                   - TEMP01
         FILE USAGE
                 "RRSF1.NODE1.NODE2.INMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
                 "RRSF1.NODE1.NODE2.OUTMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
```



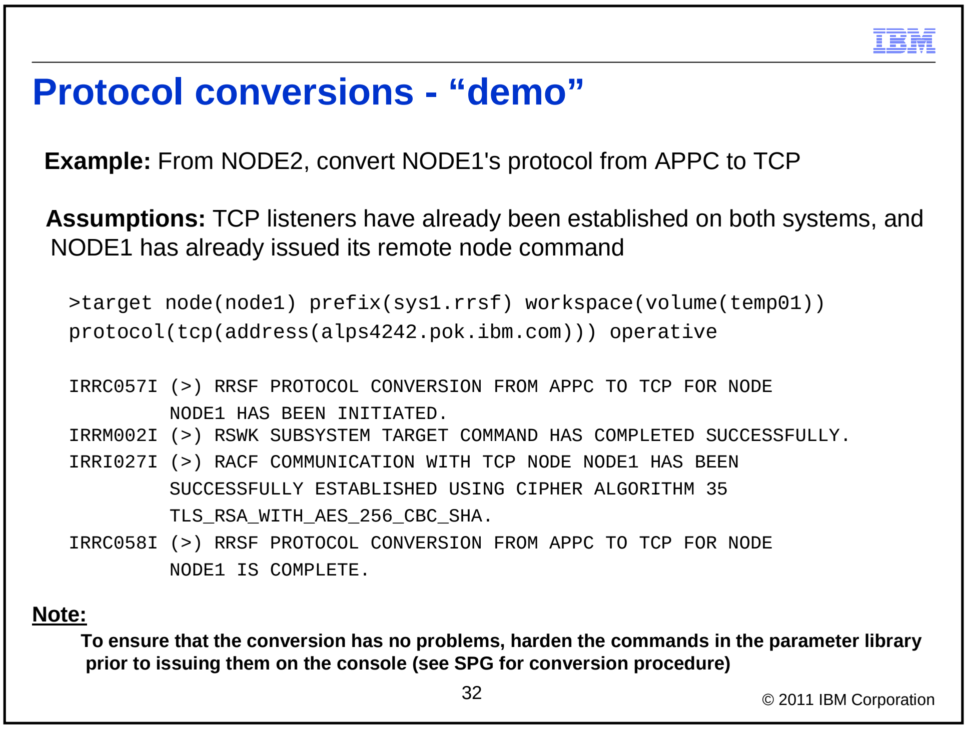
Protocol qualification

- When 2 protocols are defined for a given remote node, the protocol keyword must be specified on subsequent TARGET commands to further qualify which instance of the node is being manipulated.

```
TARGET node(node1) protocol(TCP) description('remote node node1')
```

- If the protocol is not qualified, an error message will be issued

```
target node(node1) description('remote node node1')

IRRM087I (?) RSFX SUBSYSTEM TARGET COMMAND REQUIRES THAT A
PROTOCOL BE SPECIFIED FOR NODE NODE1 TO IDENTIFY THE INTENDED
PROTOCOL INSTANCE.
```



Protocol conversions - “demo”

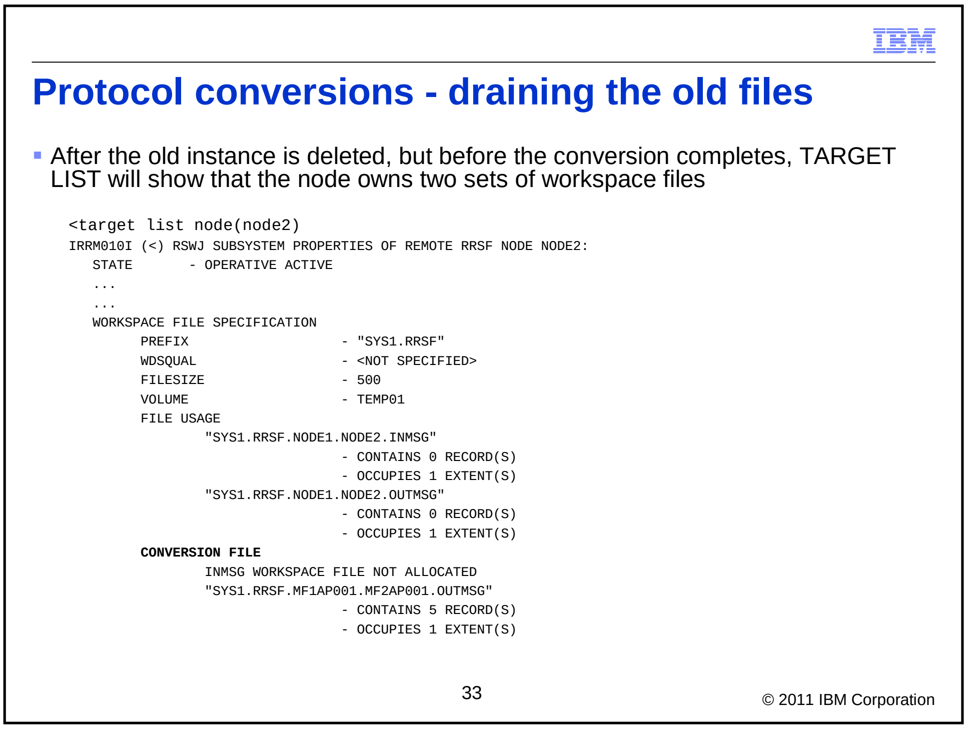
Example: From NODE2, convert NODE1's protocol from APPC to TCP

Assumptions: TCP listeners have already been established on both systems, and NODE1 has already issued its remote node command

```
>target node(node1) prefix(sys1.rrsf) workspace(volume(temp01))
protocol(tcp(address(alps4242.pok.ibm.com))) operative

IRRC057I (>) RRSF PROTOCOL CONVERSION FROM APPC TO TCP FOR NODE
         NODE1 HAS BEEN INITIATED.
IRRM002I (>) RSWK SUBSYSTEM TARGET COMMAND HAS COMPLETED SUCCESSFULLY.
IRRI027I (>) RACF COMMUNICATION WITH TCP NODE NODE1 HAS BEEN
         SUCCESSFULLY ESTABLISHED USING CIPHER ALGORITHM 35
         TLS_RSA_WITH_AES_256_CBC_SHA.
IRRC058I (>) RRSF PROTOCOL CONVERSION FROM APPC TO TCP FOR NODE
         NODE1 IS COMPLETE.
```

Note:

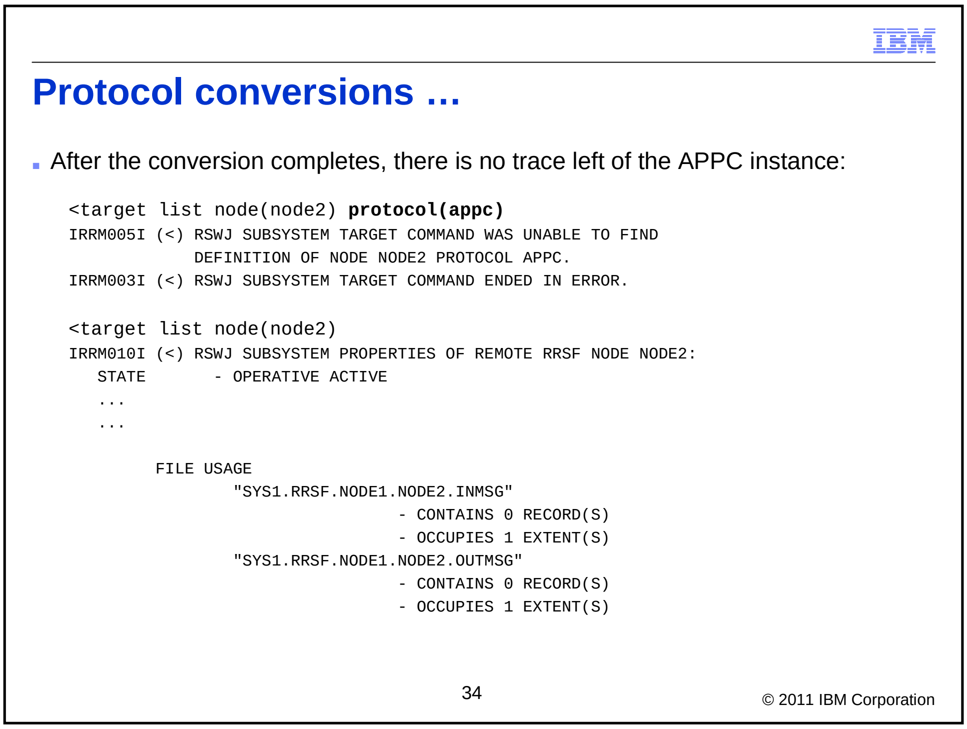
To ensure that the conversion has no problems, harden the commands in the parameter library prior to issuing them on the console (see SPG for conversion procedure)



Protocol conversions - draining the old files

- After the old instance is deleted, but before the conversion completes, TARGET LIST will show that the node owns two sets of workspace files

```
<target list node(node2)
IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE2:
   STATE       - OPERATIVE ACTIVE
   ...
   ...
   WORKSPACE FILE SPECIFICATION
         PREFIX                   - "SYS1.RRSF"
         WDSQUAL                  - <NOT SPECIFIED>
         FILESIZE                 - 500
         VOLUME                   - TEMP01
         FILE USAGE
                 "SYS1.RRSF.NODE1.NODE2.INMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
                 "SYS1.RRSF.NODE1.NODE2.OUTMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
         CONVERSION FILE
                 INMSG WORKSPACE FILE NOT ALLOCATED
                 "SYS1.RRSF.MF1AP001.MF2AP001.OUTMSG"
                                  - CONTAINS 5 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
```

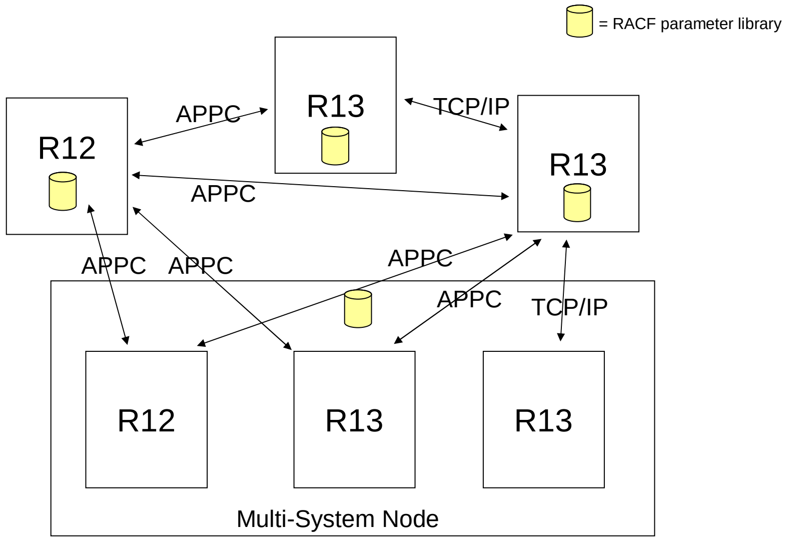


Protocol conversions …

- After the conversion completes, there is no trace left of the APPC instance:

```
<target list node(node2) protocol(appc)
IRRM005I (<) RSWJ SUBSYSTEM TARGET COMMAND WAS UNABLE TO FIND
             DEFINITION OF NODE NODE2 PROTOCOL APPC.
IRRM003I (<) RSWJ SUBSYSTEM TARGET COMMAND ENDED IN ERROR.

<target list node(node2)
IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF REMOTE RRSF NODE NODE2:
   STATE       - OPERATIVE ACTIVE
   ...
   ...

         FILE USAGE
                 "SYS1.RRSF.NODE1.NODE2.INMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
                 "SYS1.RRSF.NODE1.NODE2.OUTMSG"
                                  - CONTAINS 0 RECORD(S)
                                  - OCCUPIES 1 EXTENT(S)
```

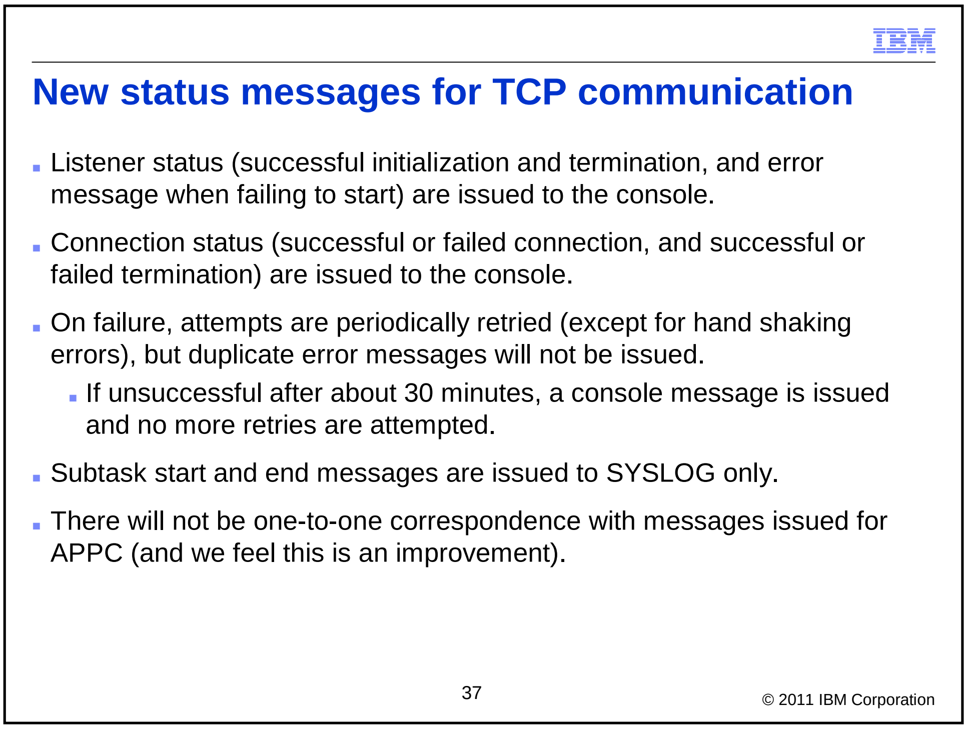
Possible configurations - Multi-System Nodes



Possible configurations: Translation

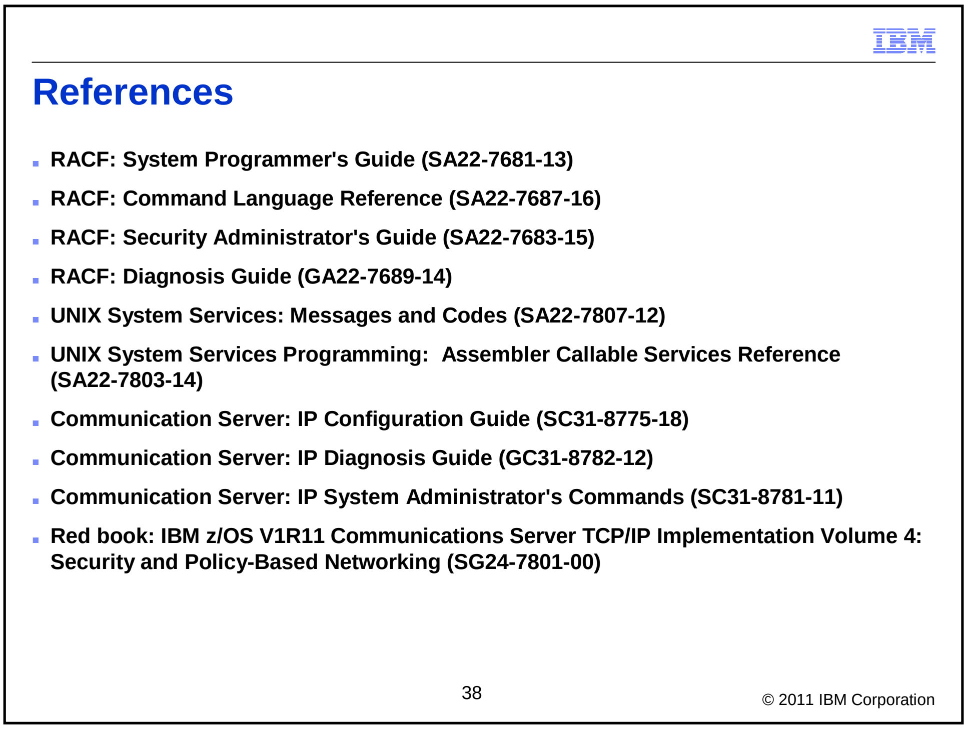
- R12 systems can communicate only via APPC.
- R13 systems can communicate with R12 systems only via APPC.
- R13 systems can communicate with other R13 systems via APPC or TCP/IP.

- Multi-system Nodes (MSNs) can consist of mixed levels where communication is constrained as above.
- MSNs can continue to use a shared RACF parameter library.
  - Two TARGET commands will be required for each remote system. The TCP/IP command must follow the APPC command (assuming that's your preferred protocol).
  - The TCP/IP command will harmlessly fail when executed on R12.
  - The TCP/IP command will trigger a conversion when executed on R13.



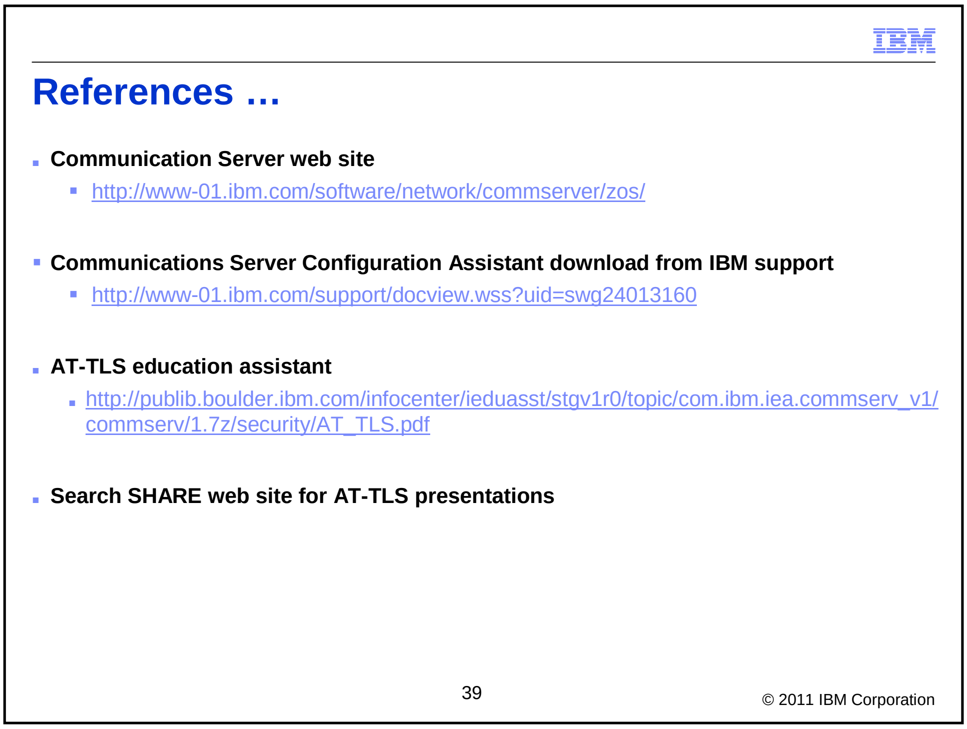
New status messages for TCP communication

- Listener status (successful initialization and termination, and error message when failing to start) are issued to the console.
- Connection status (successful or failed connection, and successful or failed termination) are issued to the console.
- On failure, attempts are periodically retried (except for hand shaking errors), but duplicate error messages will not be issued.
  - If unsuccessful after about 30 minutes, a console message is issued and no more retries are attempted.
- Subtask start and end messages are issued to SYSLOG only.
- There will not be one-to-one correspondence with messages issued for APPC (and we feel this is an improvement).



References

- **RACF: System Programmer's Guide (SA22-7681-13)**
- **RACF: Command Language Reference (SA22-7687-16)**
- **RACF: Security Administrator's Guide (SA22-7683-15)**
- **RACF: Diagnosis Guide (GA22-7689-14)**
- **UNIX System Services: Messages and Codes (SA22-7807-12)**
- **UNIX System Services Programming: Assembler Callable Services Reference (SA22-7803-14)**
- **Communication Server: IP Configuration Guide (SC31-8775-18)**
- **Communication Server: IP Diagnosis Guide (GC31-8782-12)**
- **Communication Server: IP System Administrator's Commands (SC31-8781-11)**
- **Red book: IBM z/OS V1R11 Communications Server TCP/IP Implementation Volume 4: Security and Policy-Based Networking (SG24-7801-00)**



References …

- **Communication Server web site**
  - http://www-01.ibm.com/software/network/commserver/zos/

- **Communications Server Configuration Assistant download from IBM support**
  - http://www-01.ibm.com/support/docview.wss?uid=swg24013160

- **AT-TLS education assistant**
  - http://publib.boulder.ibm.com/infocenter/ieduasst/stgv1r0/topic/com.ibm.iea.commserv_v1/commserv/1.7z/security/AT_TLS.pdf

- **Search SHARE web site for AT-TLS presentations**