Using a Remote Directory Server - RDS

This section covers the following topics:

- RDS Principles of Operation
- Using a Remote Directory Server
- Creating an RDS Interface
- Creating a Remote Directory Service Routine
- Remote Directory Service Program RDSSCDIR

RDS Principles of Operation

You have two options to use a service directory:

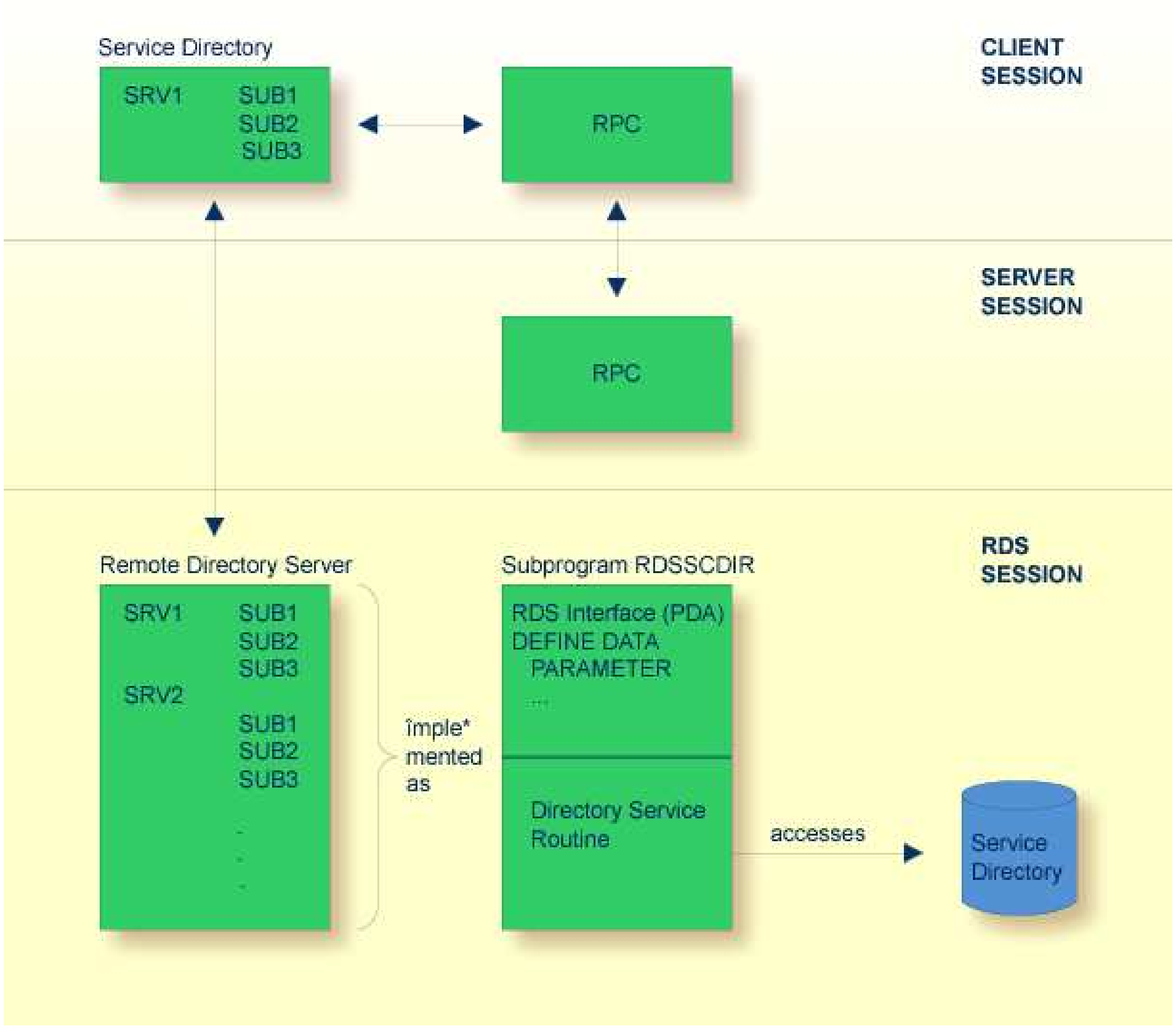
1. **Using a service directory in a Natural subprogram.**

   Normally, to locate a service, the Natural RPC uses a service directory in a Natural subprogram. This directory is an initialized LDA data structure in program `NATCLTGS` generated by the `SYSRPC` *Remote Directory Maintenance Service Directory Maintenance* function and has to be available to every RPC client application.

2. **Using a remote directory.**

   You can use a remote directory to locate a service. A remote directory server (RDS) enables you to define directory definitions in one place so that the RDS's services can be used by all clients in your environment.

This section describes **how to use a remote directory server to locate a service**.



The remote directory server is implemented as a Natural subprogram.

A sample of such a subprogram is provided in library `SYSRPC`. It is named `RDSSCDIR` and reads the required directory information from a work file. The interface of this subprogram is documented, which enables you to develop your own remote directory service. For more information, see the section *Creating an RDS Interface*.

The RDS interface is the Natural parameter data area of the Natural subprogram and the directory service routine is the code section of the Natural subprogram. If a remote `CALLNAT` is not found within the client's local service directory, the RPC runtime contacts the remote directory server by executing an internal remote `CALLNAT`.

An internal directory cache minimizes the access to the remote directory. The cache information is controlled by an expiration time which is defined by the remote directory server.

Using a Remote Directory Server

To use a remote directory server

1. **Create a Directory File**

   Create a directory file for the remote directory service using the Remote Directory Maintenance Service Directory Maintenance function of the `SYSRPC` utility. The subprogram `RDSSCDIR` is provided in the library SYSRPC and reads the directory information from a Natural work file (fixed-block, record length 80 bytes). This is the work file CMWKF01 assigned to the appropriate dataset in the server startup JCL.

2. **Start the Remote Directory Server**

   Start the remote directory server and proceed with the following steps.

3. **Define RDS**

   You have two options:

   - Specify the RDS in the keyword subparameter `RDS` of profile parameter `RPC` or parameter macro `NTRPC`.

   - Or use the maintenance function of the `SYSRPC` utility to define remote directory servers (refer to *Remote Directory Maintenance Service Directory Maintenance* in the *SYSRPC Utility* documentation). The definition of remote directory servers is still supported for reasons of compatibility. You should, however, define your RDS in the keyword subparameter `RDS` of profile parameter `RPC` or parameter macro `NTRPC`. For this purpose, entries are provided that allow to define the location of the directory server. This enables you to expand existing local directory information by one or more remote directory server definitions.

Below is an example of how to define a remote directory server in the service directory `NATCLTGS`.

Service Directory					
	NODE	SERVER	LIBRARY	PROGRAM	LOGON
1	NODE1				
2		SERVER1			
3			SYSTEM		
4				TESTS1	
5				TESTS2	
6	RDSNODE				
7		DIRSRV1			
8			#ACI		
9				RDSSCDIR	

This example locally defines a server named SERVER1. This server may execute the services TESTS1 and TESTS2.

Additionally, there are definitions for the remote directory server DIRSRV1. A remote directory server is identified by a preceding hash (#) sign for the library definition.

The definitions of NODE and SERVER are used as usual in Natural RPC. The library definition defines the transport protocol (ACI) which has to be used to connect the RDS.

Finally, the PROGRAM entry contains the name of the remote subprogram which represents the remote directory service (in this case, it refers to the sample subprogram RDSSCDIR).

Creating an RDS Interface

The RDS interface is the parameter data area (PDA) of a Natural subprogram.

To create your own RDS interface you can use the parameter data area shown below.

```
DEFINE DATA PARAMETER
  1 P_UDID(B8)                       /* OUT
  1 P_UDID_EXPIRATION(I4)            /* OUT
  1 P_CURSOR(I4)                     /* INOUT
  1 P_ENTRIES(I4)                    /* IN
  1 P_REQUEST(A16/1:250)             /* IN
  1 P_EXTENT (A16/1:250)             /* OUT
  1 P_RESULT(A32)                    /* OUT
  1 REDEFINE P_RESULT
    2 SRV_NODE(A8)
    2 SRV_NODE_EXT(A8)
    2 SRV_NAME(A8)
    2 SRV_NAME_EXT(A8)
END-DEFINE
```

For an explanation of the parameters, refer to the table below.

Parameter	Format/Length	Explanation
`P_UDID`	B8	Unique directory identifier, should be increased after changing the directory information. The client saves this identifier in its cache. If the binary number increases from one client request to the next, it causes the client to delete its local cache information, because it no longer corresponds to the remote directory information.
`P_UDID_EXPIRATION`	I4	This defines the expiration time in seconds, that is, the number of seconds during which the client can use its local cache information without connecting the RDS to validate the `UDID` setting. It allows you to define a time limit after which you can be sure that your directory modifications are active for all clients. If you set this time to an unnecessarily low value, you may cause a lot of network traffic to the RDS.
`P_CURSOR`	I4	The remote procedure call has the option to scan for an alternative server if a connection to the previous one cannot be established; see keyword subparameter `TRYALT` of profile parameter `RPC` or parameter macro `NTRPC`. This parameter contains zero for a scan from the top and may be modified by the RDS to remember the record location to continue the scan. The value will not be evaluated by the client, it will only be inserted from the cache to continue scanning.
`P_ENTRIES`	I4	This parameter contains the number of service definitions in `P_REQUEST`.
`P_REQUEST`	A16/1:250	A list of services for which a server address can be scanned. An entry is structured as: program name (A8) library name (A8)
`P_EXTENT`	A16/1:250	Reserved for future use.
`SRV_NODE`	A8	Contains the server node.
`SRV_NODE_EXT`	A8	Contains the server node extension.
`SRV_NAME`	A8	Contains the server name.
`SRV_NAME_EXT`	A8	Contains the server name extension.

Creating a Remote Directory Service Routine

The Remote Directory Service Routine is the code area of a Natural subprogram (the default version of this code area is subprogram `RDSSCDIR` in library `SYSRPC`).

To create your own RDS routine

- Modify the pseudo-code documented below.

```
Set UDID and UDID_EXPIRATION values
IF P_ENTRIES = 0
    ESCAPE ROUTINE
IF P_CURSOR != 0
   position to next server entry after P_CURSOR
   Scan for server which may execute P_REQUEST(*)
IF found
   SRV_NODE        = found node name
   SRV_NODE_EXT    = node extension
   SRV_NAME        = found server name
   SRV_NAME_EXT    = server extension
   P_CURSOR        = position of found server
ELSE
   P_CURSOR = 0
```

Remote Directory Service Program RDSSCDIR

This program is to be found in library `SYSRPC`. It reads the directory information from a work file (fixed-block, record length 80 byte).

Your program could also read the directory information from elsewhere (from a database, for example). For the delivered version of `RDSSCDIR`, this is the work file `CMWKF01`, which is assigned to the appropriate dataset in the server startup JCL.

Structure of the Directory Work File

```
* comment
UDID definition
UDID_EXPIRATION definition
node definition
...
node definition
```

UDID Definition

```
(UDID)
   binary number
```

UDID_EXPIRATION Definition

```
(UDID_EXPIRATION)
   number of seconds
```

Node Definition

```
(NODE)
   namevalue     (logon-option)
   server definition
   ...
   server definition
```

Server Definition

```
(SERVER)
   namevalue     (logon-option)
   library definition
   ...
   library definition
```

Library Definition

```
(LIBRARY)
   namevalue
   program definition
   ...
   program definition
```

Program Definition

```
(PROGRAM)
   namevalue
   ...
   namevalue
```

Namevalue

```
Max. 8 characters in uppercase
```

The `logon-option` after `namevalue` as well as the following definition lines are optional. For the possible values of `logon-option`, refer to *Service Directory Maintenance* in the `SYSRPC` utility documentation.

Example Directory Read from the Work File:

```
(UDID)
ACB8AAB4777CA000
  (UDID_EXPIRATION)
  3600
  * this is a comment
  (NODE)
  NODE1
         (SERVER)
         SERVER1
             (LIBRARY)
             SYSTEM
                  (PROGRAM)
                  TESTS1
                  TESTS2
                  TESTS3
         (SERVER)
         SERVER2   (logon-option)
               (LIBRARY)
               SYSTEM
                    (PROGRAM)
                    TESTS4
  (NODE)
  NODE2   (logon-option)
        (SERVER)
        SERVER1
              (LIBRARY)
              SYSTEM
                   (PROGRAM)
```

```
                              TESTS1
                              TESTS2
                              TESTS3
                              TESTS4
```

In the above example, the directory contains:

- Two servers `SERVER1` and `SERVER2` running on node `NODE1`.

  The server `SERVER1` may execute the programs `TESTS1`, `TESTS2` and `TESTS3` in library `SYSTEM`.

  The server `SERVER2` may execute the program `TESTS4` on library `SYSTEM`.

- One server `SERVER1` on node `NODE2` which may execute the programs `TESTS1` - `TESTS4` in library `SYSTEM`.

The indentation of the lines in the example above is not required. All lines may start at any position (one). You can modify this file manually or generate it using the `SYSRPC` Remote Directory Maintenance function.