DCERPC and Endpoint Mapper

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DCERPC and Endpoint Mapper

1. DCERPC
   - How does RPC work?
2. Endpoint Mapper
   - Concept
   - Functions and Details
3. Samba3 RPC Server
   - Overview
   - Robustness
   - Scalability
4. Why?
   - Franky
   - FreeIPA

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Abbreviations

- DCE: Distributed (Disturbed) Computing Environment
- RPC: Remote Procedure Call
- NDR: Network Data Representation
- IDL: Interface description language

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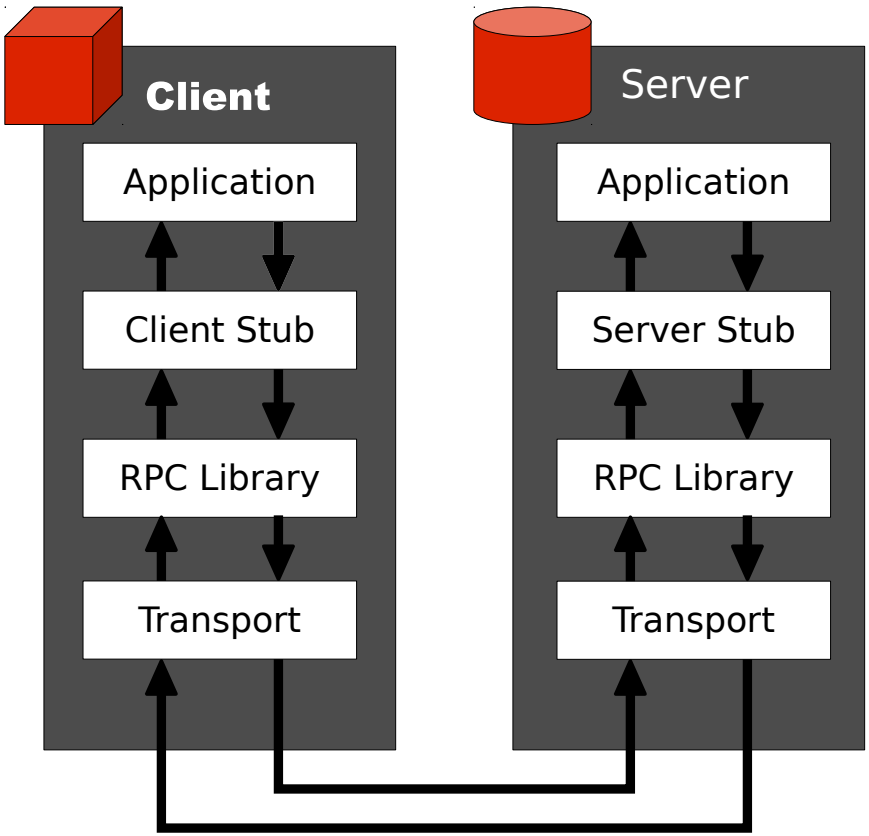
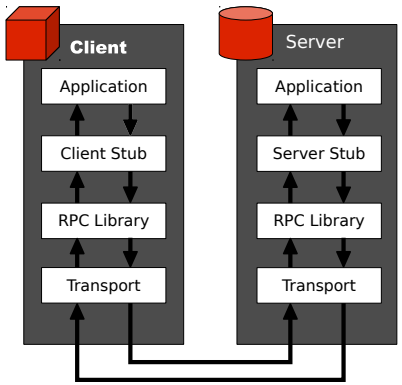
The RPC process



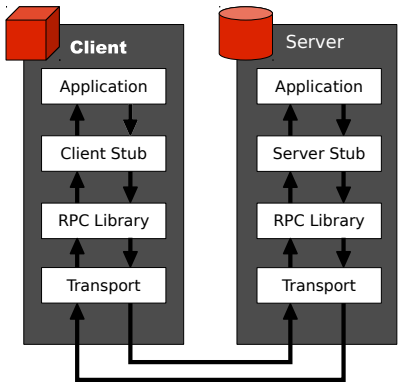
Application

- spoolss: Printing application displaying a list of printers
- regedit: Display all values of a key



Client Stubs

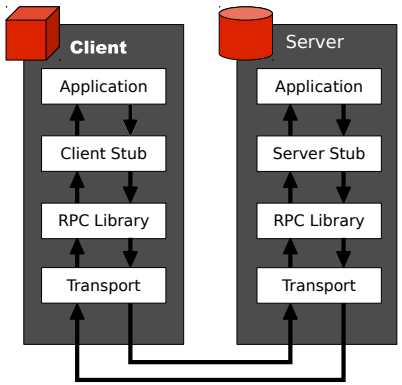
- spoolss: Your application calling dcerpc_spoolss_EnumPrinters
- regedit: Your application calling dcerpc_winreg_EnumValues



Run-time Library

RPC client implementation creating a RPC bind

- Establishes the connection
- Authenticates the user

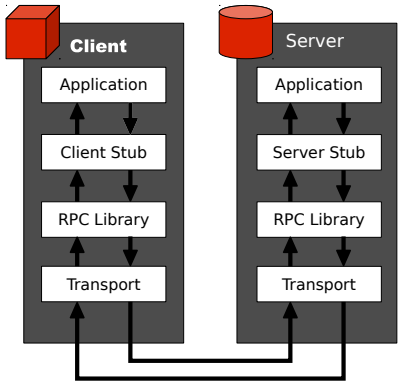


Transports

- ncacn_np: SMB Named Pipes transport
- ncacn_ip_tcp: DCE/RPC over TCP/IP
- ncalrpc: Local interprocess communication
- ncacn_http: DCE/RPC over HTTP
- ncadg_ip_udp, ncacn_at_dsp, ncacn_nb_ipx, ncacn_dnet_nsp, ...

Run-time Library

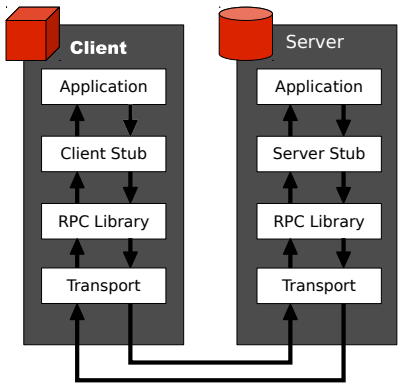
- The RPC Server accepting a connection over a transport and creating the RPC bind
- After successfull authentication it calls the Server Stub



Server Stubs

This unmarshals the packet and calls the application implementation

- spoolss: _spoolss_EnumPrinters
- regedit: _winreg_EnumValues



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Abbreviations

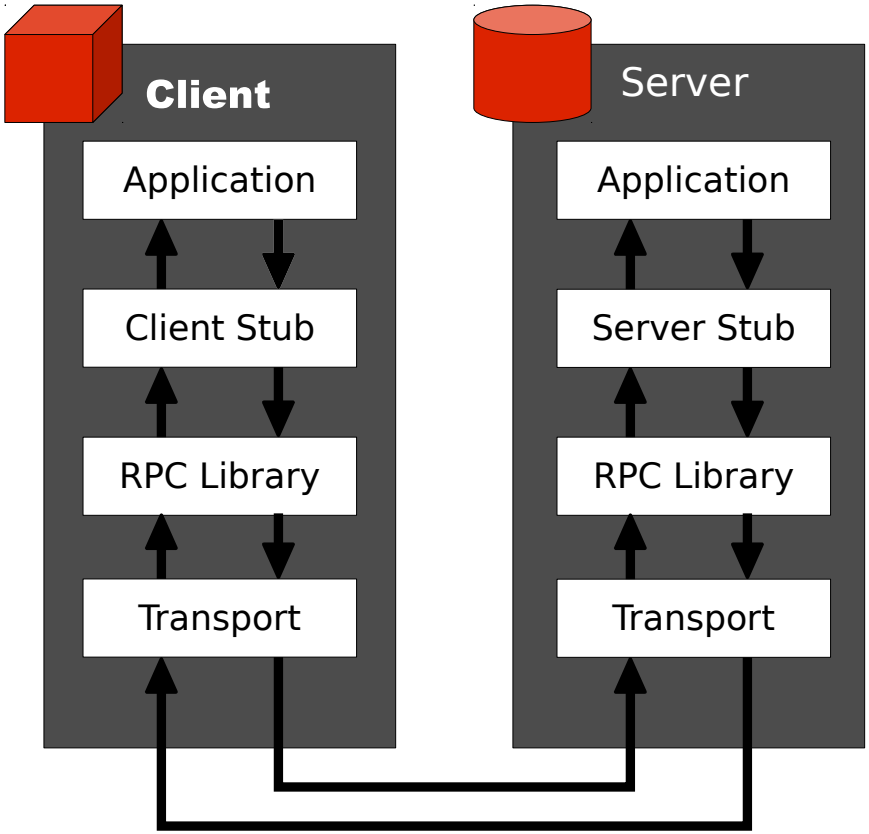
- EPM: Endpoint Mapper
- UUID: Universally Unique Identifier (man uuidgen)
- NDR: Network Data Representation

Terminology

- Endpoint: An endpoint could be a port or a pipe and provide several interfaces
- Interface: An interface is a RPC service provided by an endpoint

The named pipe \\PIPE\netlogon can be used for netlogon and lsarpc connections.

Remember: The RPC process



Endpoint operations

- Each RPC service allocates one or more endpoints dynamically on server startup
- Endpoint mapper maintains information about those endpoints
- The Endpoint Mapper listens on port 135 TCP/IP or on \\PIPE\epmapper

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Function overview

The most important function of the endpoint mapper.

- **epm_Insert** Add specified entries to an endpoint map.
- **epm_Delete** Delete specified entries from an endpoint map.
- **epm_Lookup** Lookup entries in an endpoint map.
- **epm_Map** Apply some algorithm to an endpoint map to produce a list of protocol towers. (Provide an uuid and get an endpoint)
- **epm_LookupHandleFree** Free an epm_Lookup or epm_Map entry_handle.

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Example

Wireshark trace ...

An endpoint tower

A tower has up to 6 floors, 4 at least

1. Floor1: Provides the RPC interface identifier (netlogon uuid).
2. Floor2: Transfer syntax (NDR endcoded)
3. Floor3: RPC protocol identifier (ncacn_tcp_ip, ncacn_np, ...)
4. Floor4: Port address (e.g. TCP Port: 49156, PIPE)
5. Floor5: Transport (e.g. IP:192.168.51.10, NB:krikkit)
6. Floor6: Routing

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RPC Endpoints

- Added support for TCP/IP and NCALRPC
- Other processes can register at EPM (OpenChange) over NCALRPC

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Robustness

Client

- RPC service tries to register serveral times
- After successful registration we do connection monitoring

Server

- We monitor the client connection
- If it goes away, delete the endpoints

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Pre-fork

We started to implement a mutex locking based pre-fork model.

- Parent binds all sockets and then forks a number of children
- Childs have a lock around the accept(3) call
- Prototype working for our spoolss daemon

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Franky

- A lot of infrastructure has been created for Franky
- EPM allows us to have multiple daemons

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FreeIPA

FreeIPA is something like Active Directory but for Linux only.

- We want to be able to do forest trusts with Active Directory
- For this we need LSA and Netlogon (SAMR)
- pdb_ipa and 'net rpc trust'

Questions & Answers

- Slides `http://www.samba.org/~asn/`