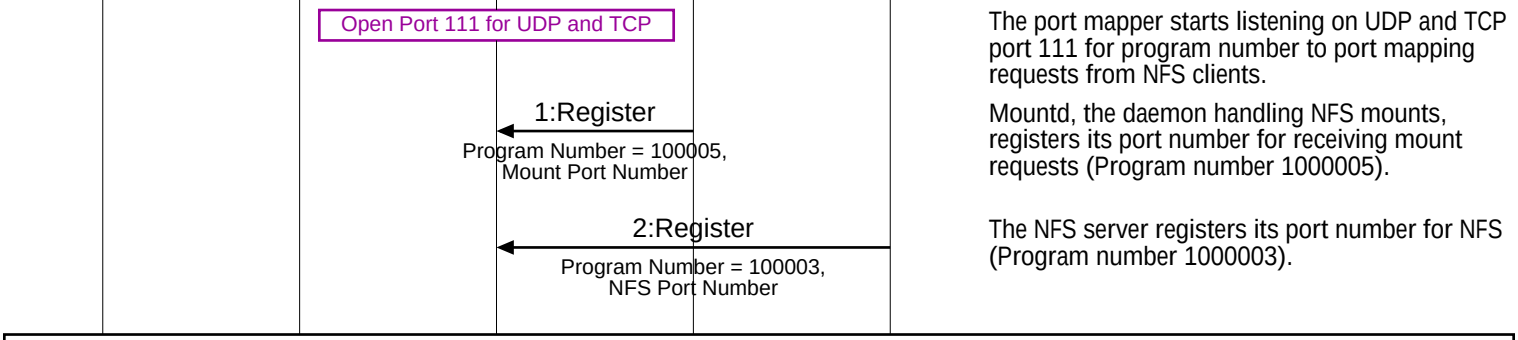
Network File System Protocol (NFS Protocol Sequence Diagram)

Client		Server			EventStudio System Designer 4.0
NFS Client		NFS Server			
Application	Client Shell	Port Mapper	Mountd Daemon	NFSD Daemon	11-Aug-07 22:47 (Page 1)

This sequence diagram describes mounting, opening and reading of a file via the NFS (Network File System).

Server Startup

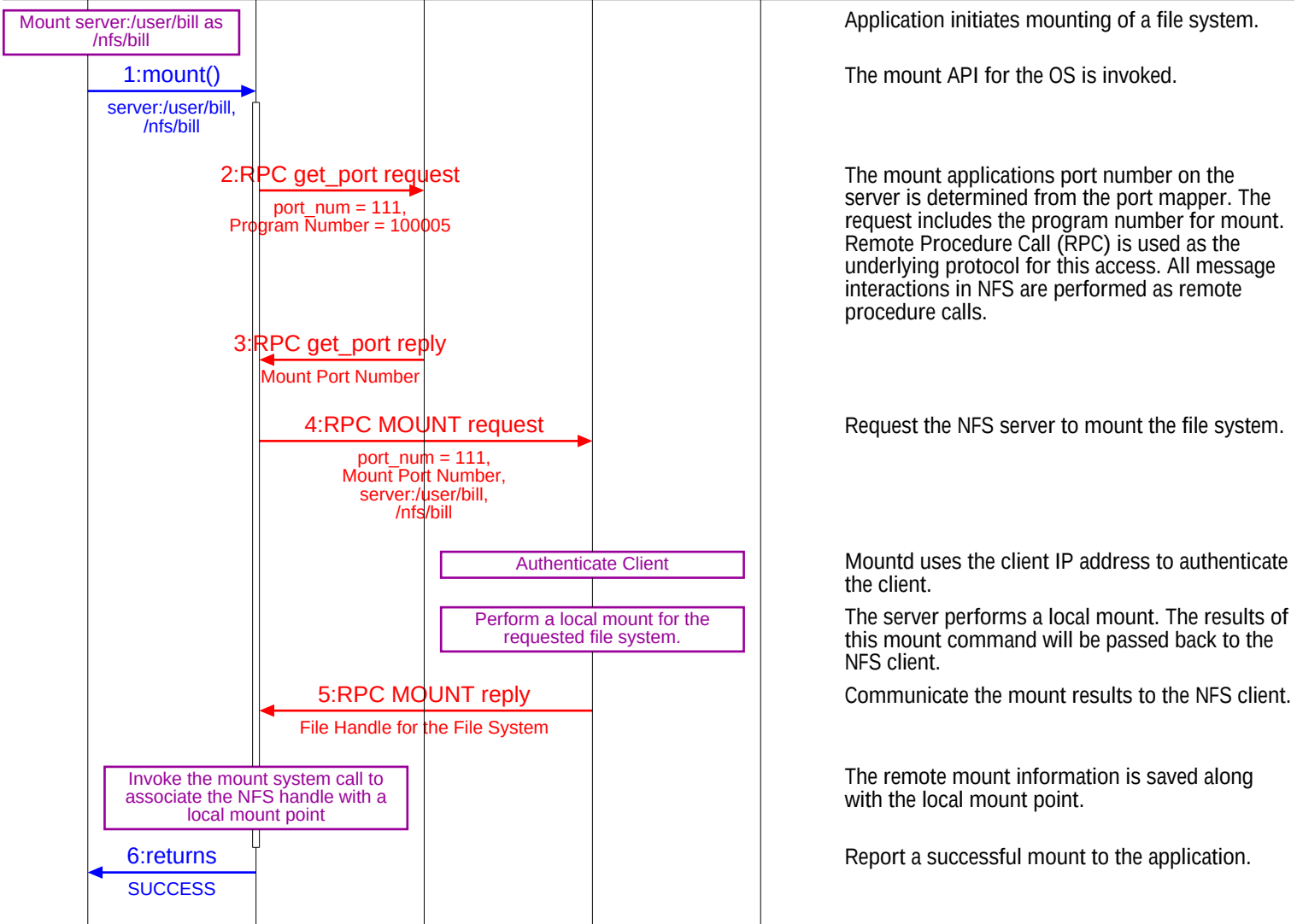


The port mapper starts listening on UDP and TCP port 111 for program number to port mapping requests from NFS clients.

Mountd, the daemon handling NFS mounts, registers its port number for receiving mount requests (Program number 1000005).

The NFS server registers its port number for NFS (Program number 1000003).

NFS Mount



Application initiates mounting of a file system.

The mount API for the OS is invoked.

The mount applications port number on the server is determined from the port mapper. The request includes the program number for mount. Remote Procedure Call (RPC) is used as the underlying protocol for this access. All message interactions in NFS are performed as remote procedure calls.

Request the NFS server to mount the file system.

Mountd uses the client IP address to authenticate the client.

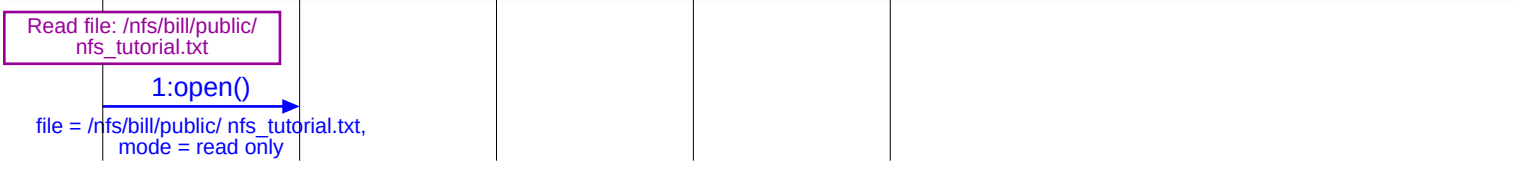
The server performs a local mount. The results of this mount command will be passed back to the NFS client.

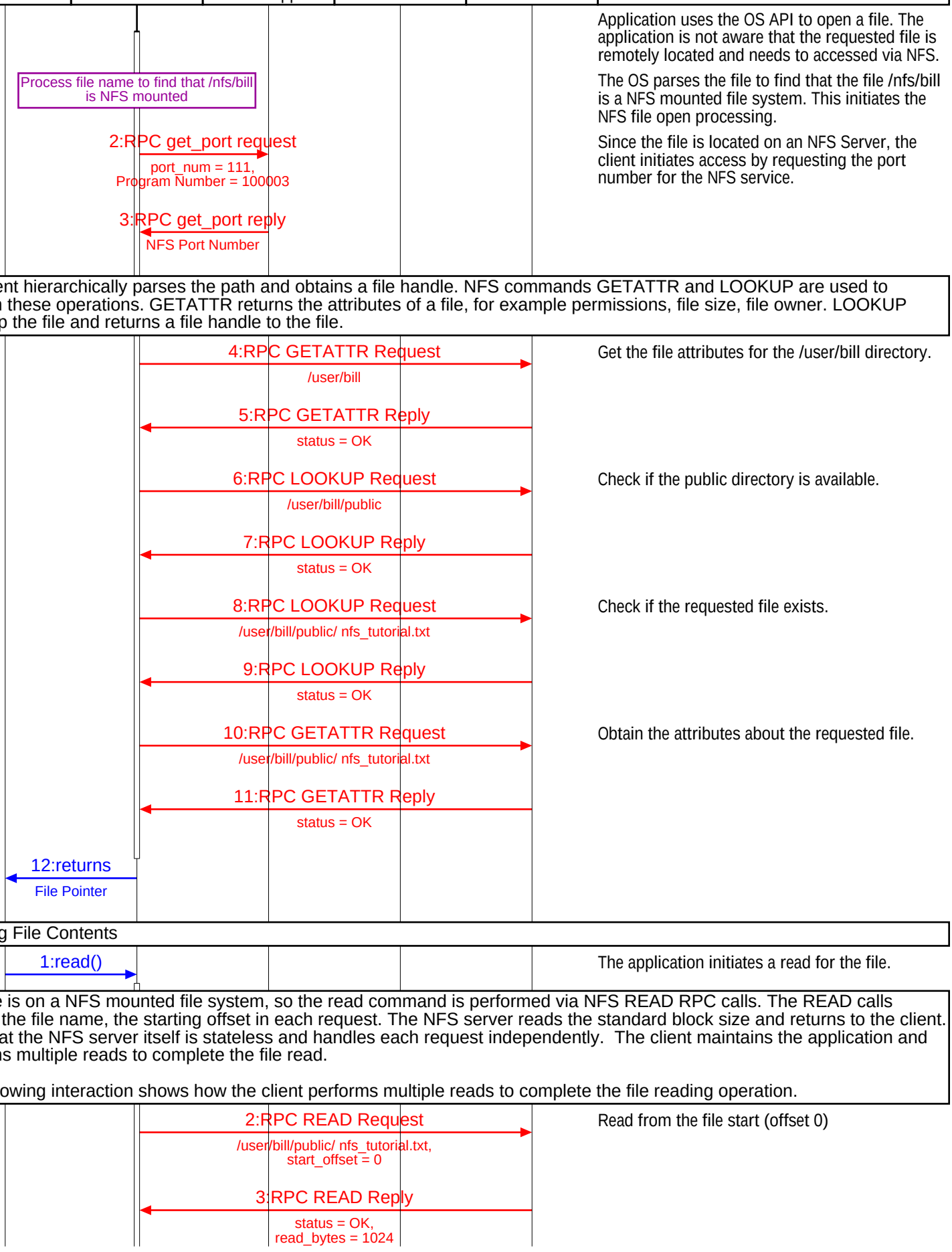
Communicate the mount results to the NFS client.

The remote mount information is saved along with the local mount point.

Report a successful mount to the application.

Opening a File





Application uses the OS API to open a file. The application is not aware that the requested file is remotely located and needs to accessed via NFS.

The OS parses the file to find that the file /nfs/bill is a NFS mounted file system. This initiates the NFS file open processing.

Since the file is located on an NFS Server, the client initiates access by requesting the port number for the NFS service.

The client hierarchically parses the path and obtains a file handle. NFS commands GETATTR and LOOKUP are used to perform these operations. GETATTR returns the attributes of a file, for example permissions, file size, file owner. LOOKUP looks up the file and returns a file handle to the file.

Get the file attributes for the /user/bill directory.

Check if the public directory is available.

Check if the requested file exists.

Obtain the attributes about the requested file.

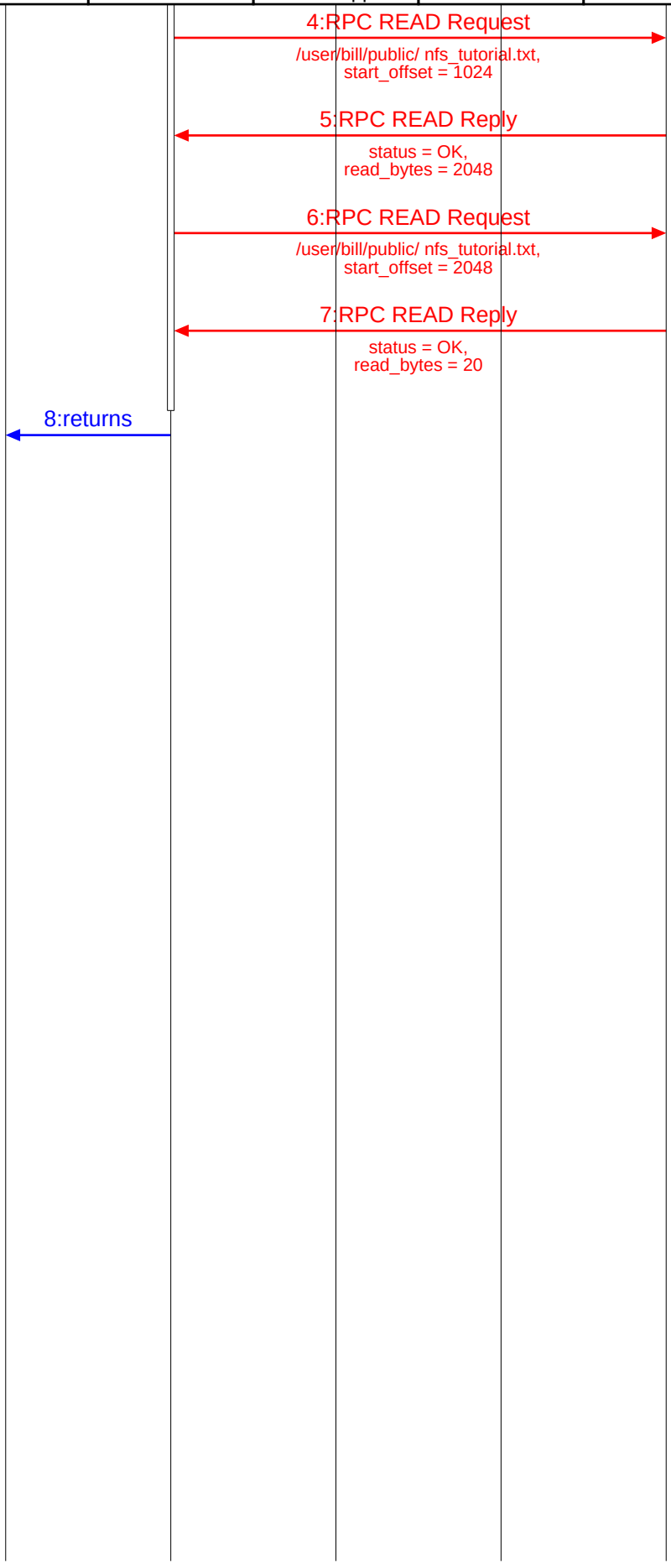
Reading File Contents

The application initiates a read for the file.

This file is on a NFS mounted file system, so the read command is performed via NFS READ RPC calls. The READ calls specify the file name, the starting offset in each request. The NFS server reads the standard block size and returns to the client. Note that the NFS server itself is stateless and handles each request independently. The client maintains the application and performs multiple reads to complete the file read.

The following interaction shows how the client performs multiple reads to complete the file reading operation.

Read from the file start (offset 0)



Initiate the read from the offset 1024 (0 to 1023 byte offsets have already been read).

Read the remaining part of the file.