Binder系列7—如何使用Binder

Nov 22, 2015

> 自定义binder架构的 client/ server组件

一、创建Native binder

源码结构：

1. ClientDemo.cpp: 客户端程序
2. ServerDemo.cpp：服务端程序
3. IMyService.h：自定义的MyService服务的头文件
4. IMyService.cpp：自定义的MyService服务
5. Android.mk：源码build文件

1.1 服务端

```
#include "IMyService.h"
int main() {
        sp < IServiceManager > sm = defaultServiceManager(); //获取service manager引用
        sm->addService(String16("service.myservice"), new BnMyService()); //注册名为"service.myservice"的服务到service manager
        ProcessState::self()->startThreadPool(); //启动线程池
        IPCThreadState::self()->joinThreadPool(); //把主线程加入线程池
        return 0;
}
```

将名为”service.myservice”的BnMyService服务添加到ServiceManager，并启动服务

1.2 客户端

```
#include "IMyService.h"
int main() {
        sp < IServiceManager > sm = defaultServiceManager(); //获取service manager引用
        sp < IBinder > binder = sm->getService(String16("service.myservice"));//获取名为"service.myservice"的binder接口
        sp<IMyService> cs = interface_cast < IMyService > (binder);//将biner对象转换为强引用类型的IMyService
        cs->sayHello();//利用binder引用调用远程sayHello()方法
        return 0;
}
```

获取名为”service.myservice”的服务，再进行类型，最后调用远程方法 `sayHello()`

1.3 创建MyService

(1)IMyService.h

```
namespace android
{
    class IMyService : public IInterface
    {
    public:
        DECLARE_META_INTERFACE(MyService); //使用宏，申明MyService
        virtual void sayHello()=0; //定义方法
    };

    //定义命令字段
    enum
    {
        HELLO = 1,
    };

    //申明客户端BpMyService
    class BpMyService: public BpInterface<IMyService> {
    public:
        BpMyService(const sp<IBinder>& impl);
        virtual void sayHello();
    };

    //申明服务端BnMyService
    class BnMyService: public BnInterface<IMyService> {
    public:
        virtual status_t onTransact(uint32_t code, const Parcel& data,
Parcel* reply,
                        uint32_t flags = 0);
        virtual void sayHello();
    };
}
```

主要功能：

1. 申明IMyService
2. 申明BpMyService（Binder客户端）
3. 申明BnMyService（Binder的服务端）

(2)IMyService.cpp

```
#include "IMyService.h"
namespace android
{
    IMPLEMENT_META_INTERFACE(MyService, "android.demo.IMyService");
//使用宏，完成MyService定义

        //客户端
        BpMyService::BpMyService(const sp<IBinder>& impl) :
                        BpInterface<IMyService>(impl) {
        }

        // 实现客户端sayHello方法
        void BpMyService::sayHello() {
                printf("BpMyService::sayHello\n");
                Parcel data, reply;
                data.writeInterfaceToken(IMyService::getInterfaceDescr
iptor());
                remote()->transact(HELLO, data, &reply);
                printf("get num from BnMyService: %d\n", reply.readInt
32());
        }

        //服务端，接收远程消息，处理onTransact方法
        status_t BnMyService::onTransact(uint_t code, const Parcel& da
ta,
                        Parcel* reply, uint32_t flags) {
                switch (code) {
                case HELLO: {    //收到HELLO命令的处理流程
                        printf("BnMyService:: got the client hell
o\n");
                        CHECK_INTERFACE(IMyService, data, reply);
                        sayHello();
                        reply->writeInt32(2015);
                        return NO_ERROR;
                }
                        break;
                default:
                        break;
                }
                return NO_ERROR;
        }

        // 实现服务端sayHello方法
        void BnMyService::sayHello() {
                printf("BnMyService::sayHello\n");
        };
}
```

1.4 运行

(1)编译生成

利用Android.mk编译上述代码，在Android的源码中，通过mm编译后，可生成两个可执行文件ServerDemo，ClientDemo。

(2)执行

首先将这两个ServerDemo，ClientDemo可执行文件push到手机

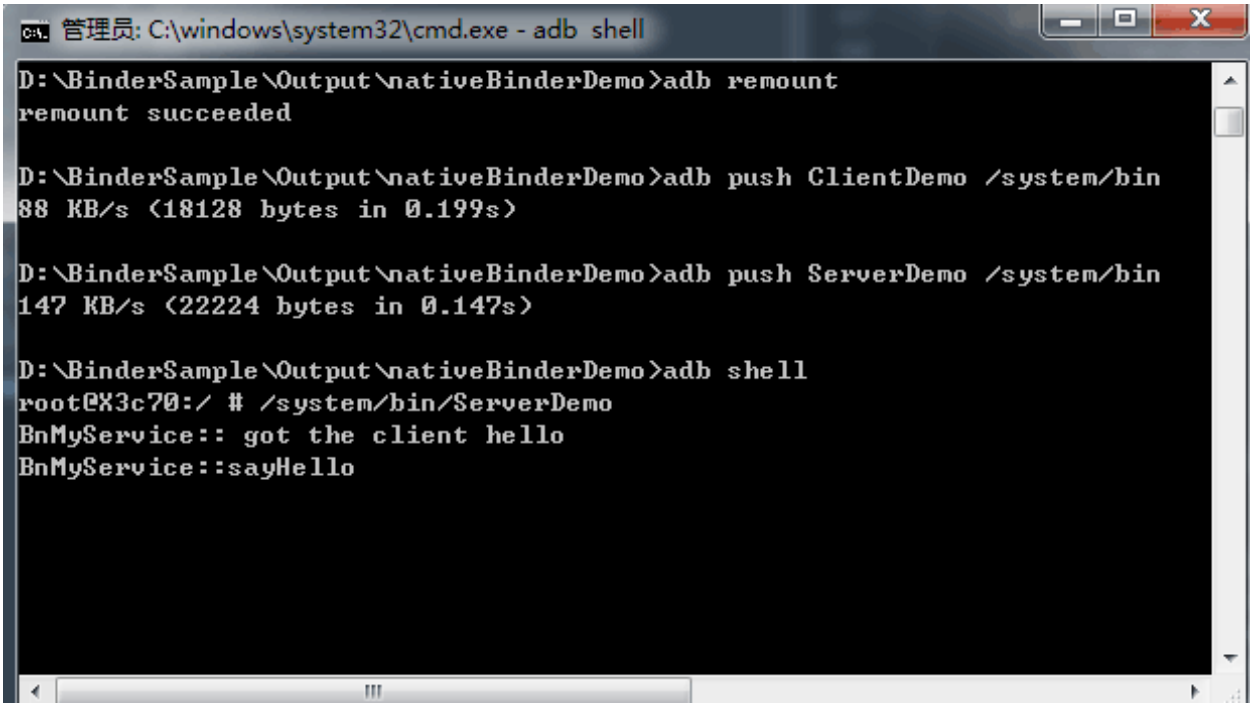
```
adb push ServerDemo /system/bin
adb push ClientDemo /system/bin
```

如果push不成功，那么先执行 `adb remount` ，再执行上面的指令；如果还不成功，可能就是权限不够。

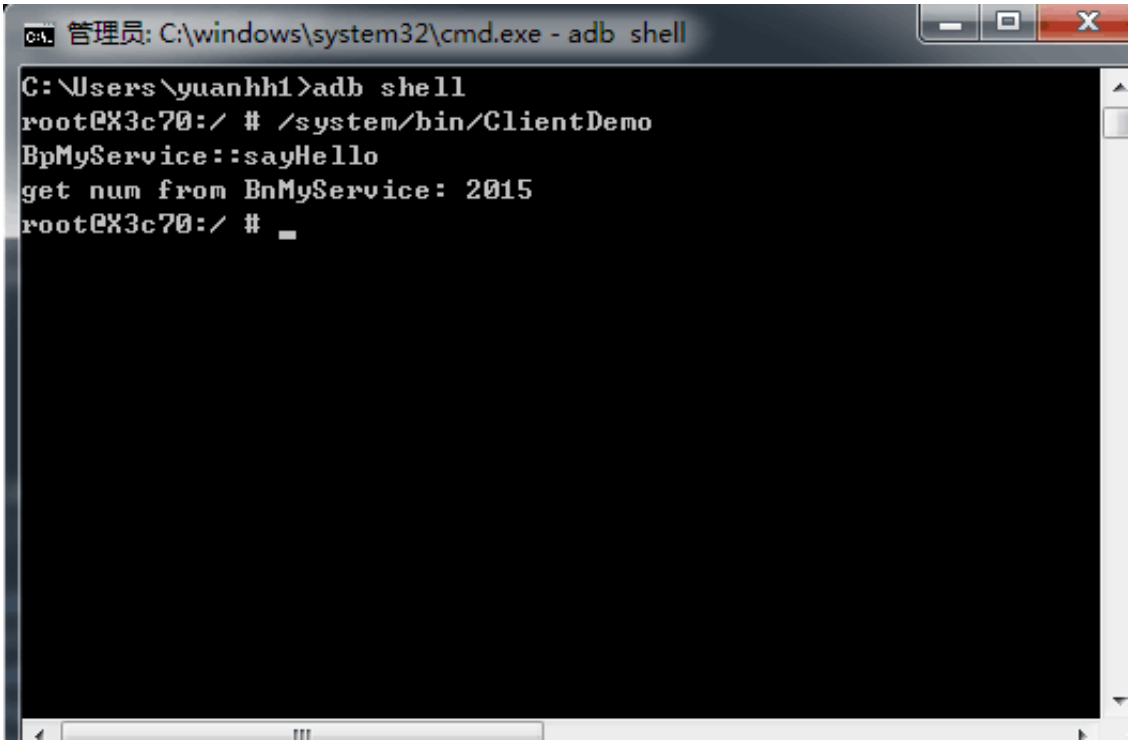
如果上述开启成功，通过开启两个窗口运行（一个运行client端，另一个运行server端）

(3)结果

服务端：



客户端：



二、创建Framework Binder

源码结构：

Server端

1. ServerDemo.java：可执行程序
2. IMyService.java: 定义IMyService接口
3. MyService.java：定义MyService

Client端

1. ClientDemo.java：可执行程序
2. IMyService.java: 与Server端完全一致
3. MyServiceProxy.java：定义MyServiceProxy

2.1 Server端

(1)ServerDemo.java

可执行程序

```
public class ServerDemo {
        public static void main(String[] args) {
                System.out.println("MyService Start");
                Looper.prepareMainLooper(); //开启循环执行
                android.os.Process.setThreadPriority(android.os.Proces
s.THREAD_PRIORITY_FOREGROUND); //设置为前台优先级
                ServiceManager.addService("MyService", new MyServic
e());//注册服务
                Looper.loop();
        }
}
```

(2)IMyService.java

定义sayHello()方法，DESCRIPTOR属性

```
public interface IMyService extends IInterface {
        static final java.lang.String DESCRIPTOR = "com.yuanhh.framewo
rkBinder.MyServer";
        public void sayHello(String str) throws RemoteException ;
    static final int TRANSACTION_say = android.os.IBinder.FIRST_CALL_T
RANSACTION;
}
```

(3)MyService.java

```
public class MyService extends Binder implements IMyService{

        public MyService() {
                this.attachInterface(this, DESCRIPTOR);
        }

        @Override
        public IBinder asBinder() {
                return this;
        }

        /** 将MyService转换为IMyService接口 **/
        public static com.yuanhh.frameworkBinder.IMyService asInterfac
e(
                        android.os.IBinder obj) {
                if ((obj == null)) {
                        return null;
                }
                android.os.IInterface iInterface = obj.queryLocalInter
face(DESCRIPTOR);
                if (((iInterface != null) && (iInterface instanceof co
m.yuanhh.frameworkBinder.IMyService))) {
                        return ((com.yuanhh.frameworkBinder.IMyServic
e) iInterface);
                }
                return null;
        }

        /**  服务端，接收远程消息，处理onTransact方法  **/
        @Override
        protected boolean onTransact(int code, Parcel data, Parcel rep
ly, int flags)
                        throws RemoteException {
                switch (code) {
                case INTERFACE_TRANSACTION: {
                        reply.writeString(DESCRIPTOR);
                        return true;
                }
                case TRANSACTION_say: {
                        data.enforceInterface(DESCRIPTOR);
                        String str = data.readString();
                        sayHello(str);
                        reply.writeNoException();
                        return true;
                }
                }
                return super.onTransact(code, data, reply, flags);
        }
```

```
        /** 自定义sayHello()方法   **/
        @Override
        public void sayHello(String str) {
                System.out.println("MyService:: Hello, " + str);
        }
}
```

2.2 Client端

(1)ClientDemo.java

可执行程序

public class ClientDemo {

```
public static void main(String[] args) throws RemoteException {
        System.out.println("Client start");
        IBinder binder = ServiceManager.getService("MyService"); //获取名为"MyService"的服务
        IMyService myService = new MyServiceProxy(binder); //创建MyServiceProxy对象
        myService.sayHello("binder"); //通过MyServiceProxy对象调用接口的方法
        System.out.println("Client end");
} }
```

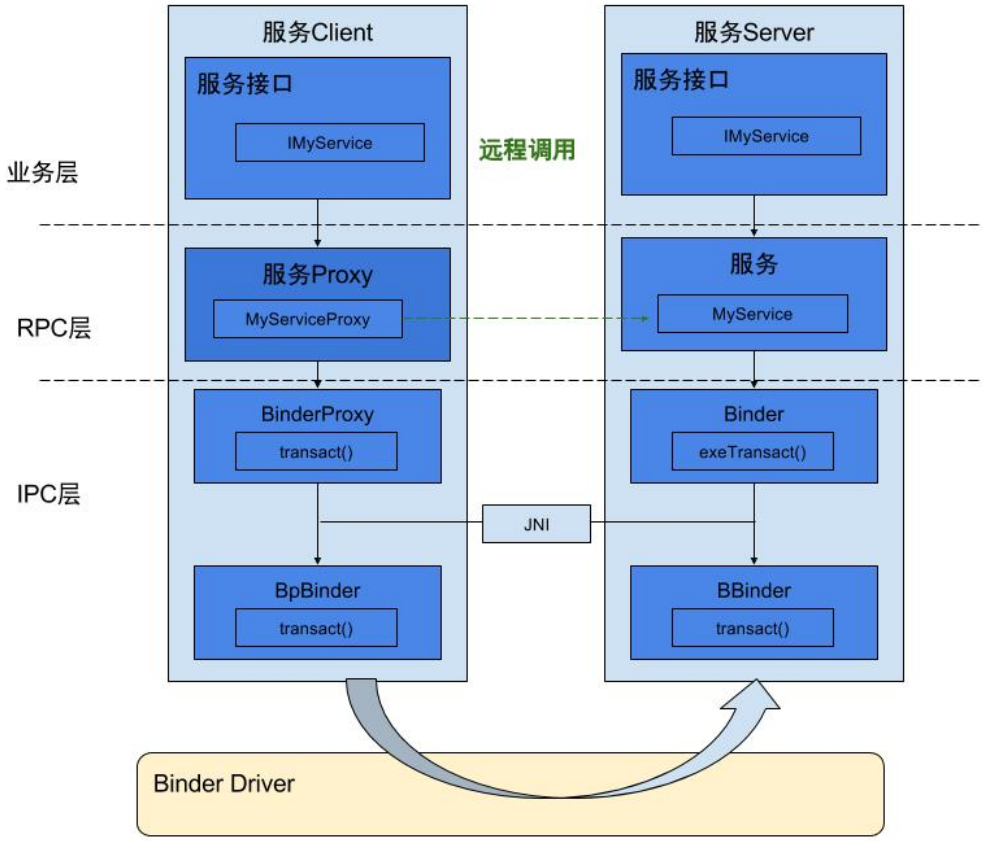
(2)IMyService.java

与Server端的IMyService是一致，基本都是拷贝一份过来。

(3)MyServiceProxy.java

```
public class MyServiceProxy implements IMyService {
        private android.os.IBinder mRemote;  //代表BpBinder

        public MyServiceProxy(android.os.IBinder remote) {
                mRemote = remote;
        }

        public java.lang.String getInterfaceDescriptor() {
                return DESCRIPTOR;
        }

        /** 自定义的sayHello()方法   **/
        @Override
        public void sayHello(String str) throws RemoteException {
                android.os.Parcel _data = android.os.Parcel.obtain();
                android.os.Parcel _reply = android.os.Parcel.obtain();
                try {
                        _data.writeInterfaceToken(DESCRIPTOR);
                        _data.writeString(str);
                        mRemote.transact(TRANSACTION_say, _data, _repl
y, 0);
                        _reply.readException();
                } finally {
                        _reply.recycle();
                        _data.recycle();
                }
        }

        @Override
        public IBinder asBinder() {
                return mRemote;
        }
}
```

2.3 原理图



2.4 运行

首先将ServerDemo，ClientDemo可执行文件，以及ServerDemo.jar，ClientDemo.jar都push到手机

```
adb push ServerDemo /system/bin
adb push ClientDemo /system/bin
adb push ServerDemo.jar /system/framework
adb push ClientDemo.jar /system/framework
```

如果push不成功，那么先执行 `adb remount` ，再执行上面的指令；如果还不成功，可能就是权限不够。

如果上述开启成功，通过开启两个窗口运行（一个运行client端，另一个运行server端）

结果

服务端：

```
管理员: C:\windows\system32\cmd.exe - adb shell
D:\BinderSample\Output\frameworkBinderDemo>adb push ClientDemo /system/bin
1 KB/s (210 bytes in 0.110s)

D:\BinderSample\Output\frameworkBinderDemo>adb push ServerDemo /system/bin
2 KB/s (210 bytes in 0.075s)

D:\BinderSample\Output\frameworkBinderDemo>adb push ClientDemo.jar /system/framework
17 KB/s (1705 bytes in 0.093s)

D:\BinderSample\Output\frameworkBinderDemo>adb push ServerDemo.jar /system/framework
15 KB/s (1968 bytes in 0.123s)

D:\BinderSample\Output\frameworkBinderDemo>adb shell
root@X3c70:/ # /system/bin/ServerDemo
MyService Start
MyService:: Hello, binder
```

客户端：

```
管理员: C:\windows\system32\cmd.exe - adb shell
C:\Users\yuanhh1>adb shell
root@X3c70:/ # /system/bin/ClientDemo
BpMyService::sayHello
get num from BnMyService: 2015
root@X3c70:/ #
130|root@X3c70:/ # exit

C:\Users\yuanhh1>adb shell
root@X3c70:/ # /system/bin/ClientDemo
Client start
Client end
root@X3c70:/ #
```

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