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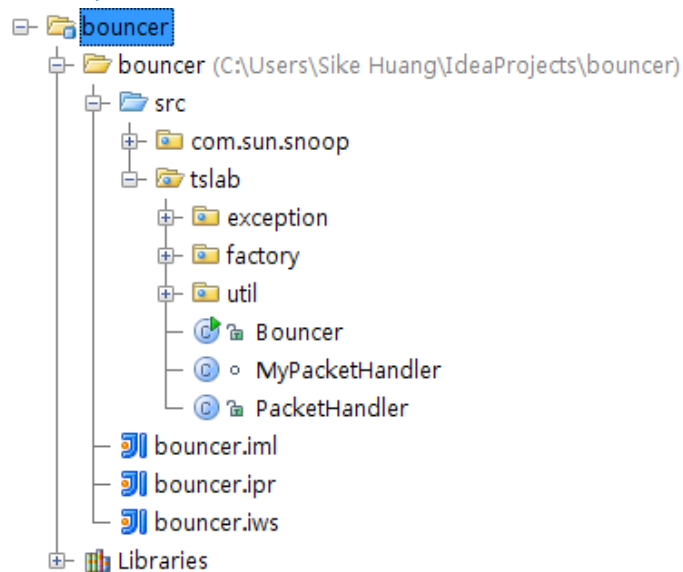
Bouncer

IK2213 Network Services and Internet-based Applications

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1. Project Structure



The project is composed of several packages:

com.sun.snoop is used for packet validation

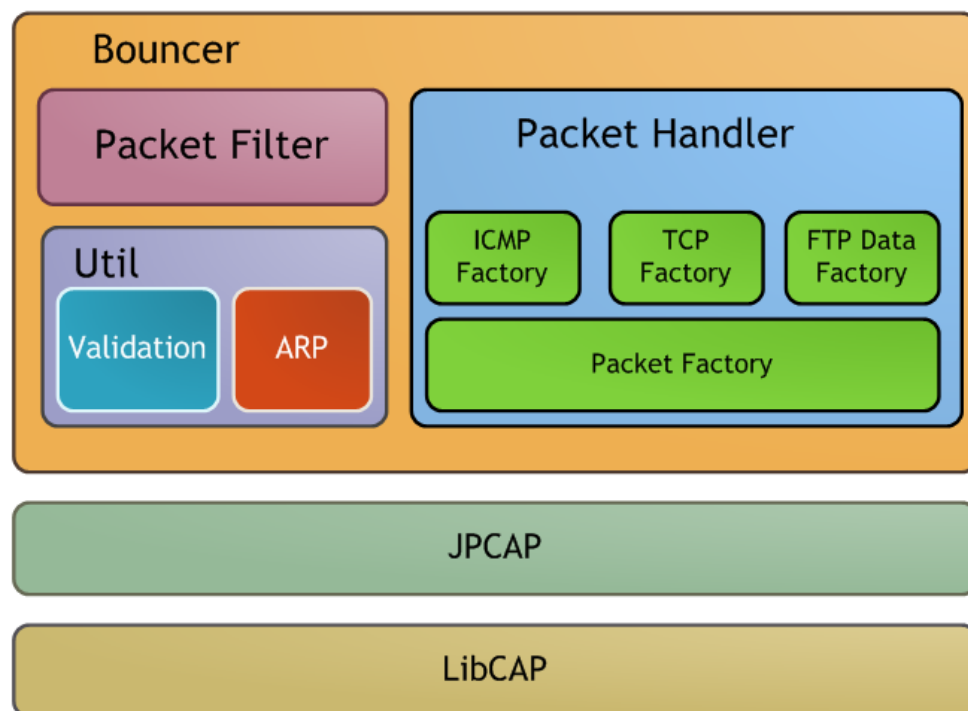
tslab.exception contains exceptions that might be thrown during packet creation

tslab.factory contains various classes to generate ICMP, TCP and FTP packets

tslab.util has common utilization code to support factory

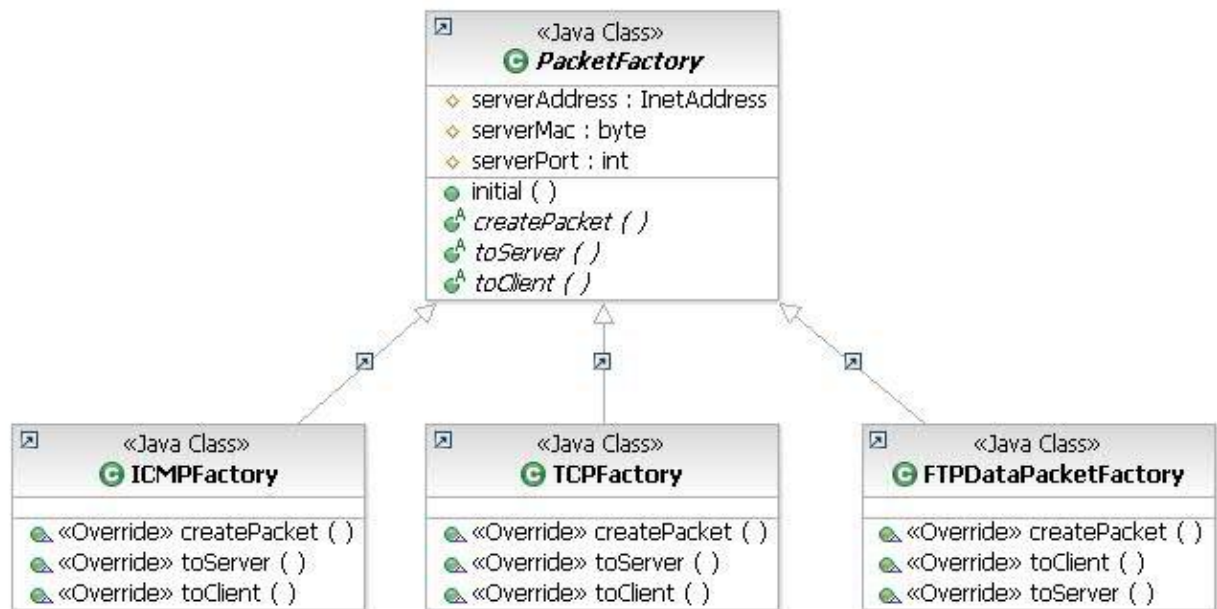
The entry point is **tslab.Bouncer**, which parses the command line arguments, then listens to the incoming packets by **tslab.(My)PacketHandler**, and creates corresponding outgoing packets using certain suitable factory.

2. Architecture



As shown in the figure above. Bouncer uses JpCap to capture packet. And it has a Packet Filter, a set of tools (Util) and Packet Handler. The Packet Handler handles the incoming packet, produces new packet according to it and sends the new packet out. The kernel of Packet Handler which is also the core of Bouncer is a set of Packet Factory.

3. Packet Factory



The whole packet producing system is based on Abstract Factory Design Pattern. That is the ICMPFactory, TCPFactory and FTPDataPacketFactory which extend PacketFactory. In the PacketFactory abstract class. We define three abstract methods `createPacket()`, `toServer()`, `toClient()` which are implemented separately by the three concrete factories. `toServer()` and `toClient()` method can be invoked directly by external class. While `createPacket()` is a high level method which invokes `toServer()` and `toClient()`. In `createPacket()` method, it will analyze the incoming packet first and call `toServer()` or `toClient()` according to the type of incoming packet. The product of the Factory is outgoing packet which can be sent directly from upper API.

Following table gives a brief introduction of factories.

PacketFactory	The base Factory. Define abstract method Use initial() method to configure server properties
ICMPFactory	Forward ICMP packet, use for ping
TCPFactory	Forward TCP packet, use for TCP an FTP command
FTPDataPacketFactory	Forward FTP Data packet.

Abstract Factory endorses maximum flexibility of switching different factories. Each and every packet is sent to certain factory according to its type, for example, a HTTP packet (TCPpacket) will be passed to TCPpacketFactory and the factory generates outgoing packet in accordance. Therefore, the process of creating and sending packet is factory-independent.

See class PacketHandler for detail.

4. Command Line Argument

Our bouncer takes command line argument specific as following:

java tslab.Bouncer [interface] listen_ip:listen_port server_ip:server_port

interface is optional, it is the network device used to accept and forward packets, user can either specify it, such as eth0. Or the program will give a list of devices to be chosen, such as:

List of interfaces

0: \Device\NPF_{8C34DCC7-8F0C-475E-8F62-F159F050B026} [ip=/0.0.0.0]

1: \Device\NPF_{E09BD06A-3EBA-4364-9F94-0383CADD6DE1} [ip=null]

2: \Device\NPF_{B920C176-DC06-4740-886B-1051777BB8DE} [ip=/192.168.1.104]

3: \Device\NPF_{24234719-6C60-4BB4-A604-9600239CDFE5} [ip=/10.8.0.62]

Select one:

listen_ip and **server_ip** are mandatory.

listen_port and **server_port** are optional, and they behave in such a way:

listen_port	server_port	Effect
Given	Given	Listen packets from given port, and forward to given port on server (TCP, FTP)
Not given	Not given	Listen packets from all ports, and forward to same port on server (ICMP, TCP, FTP)
Given	Not given	Listen packets from given port, and forward to same port on server (TCP, FTP)
Not given	Given	Listen packets from all ports, and forward to given port on server (TCP, FTP)

Please pay attention to these two points:

- 1) **ICMP** only works when there is neither listen_port nor server_port.
- 2) And in case of **FTP**, the data channel port on server is assumed to be the given server_port minus one, and on bouncer port 20 is always opened and used as data transmission channel towards client.