

# The power of Firebird events



# Introduction

## About myself

Been using Firebird since  
first beta versions came out.

Manager of FlameRobin project and  
author of FBExport and FBCopy tools



# About Events

- ★ Less known Firebird feature
- ★ Simple notification messages
  - ★ only textual – no data
  - ★ limited to 127 characters
  - ★ case sensitive
- ★ Using push instead of poll to get the changes from database
  - ★ less resource intensive



# Mechanism

- ★ Client registers the interest
- ★ Stored procedures and triggers post notifications
  - ★ upon committed transaction
- ★ Event manager maintains a list of
  - ★ applications and
  - ★ events they registered to receive
- ★ Database wide context
- ★ Clients receive event names and counts



# Mechanism

- ★ Procedures and triggers use the POST\_EVENT statement

```
CREATE PROCEDURE post_custom (event_name varchar(127))  
AS  
BEGIN  
    POST_EVENT event_name;  
END
```

```
CREATE TRIGGER tr1 FOR employee ACTIVE AFTER INSERT  
POSITION 0 AS  
BEGIN  
    POST_EVENT 'new_employee';  
END
```



# Event handling by applications

## ★ Catching events

### ★ synchronous (waiting for event)

- ★ where primary purpose is to respond to event

### ★ asynchronous

- ★ periodic polling, multithreaded

## ★ Taking actions

### ★ pop up a dialog

### ★ update data on the screen

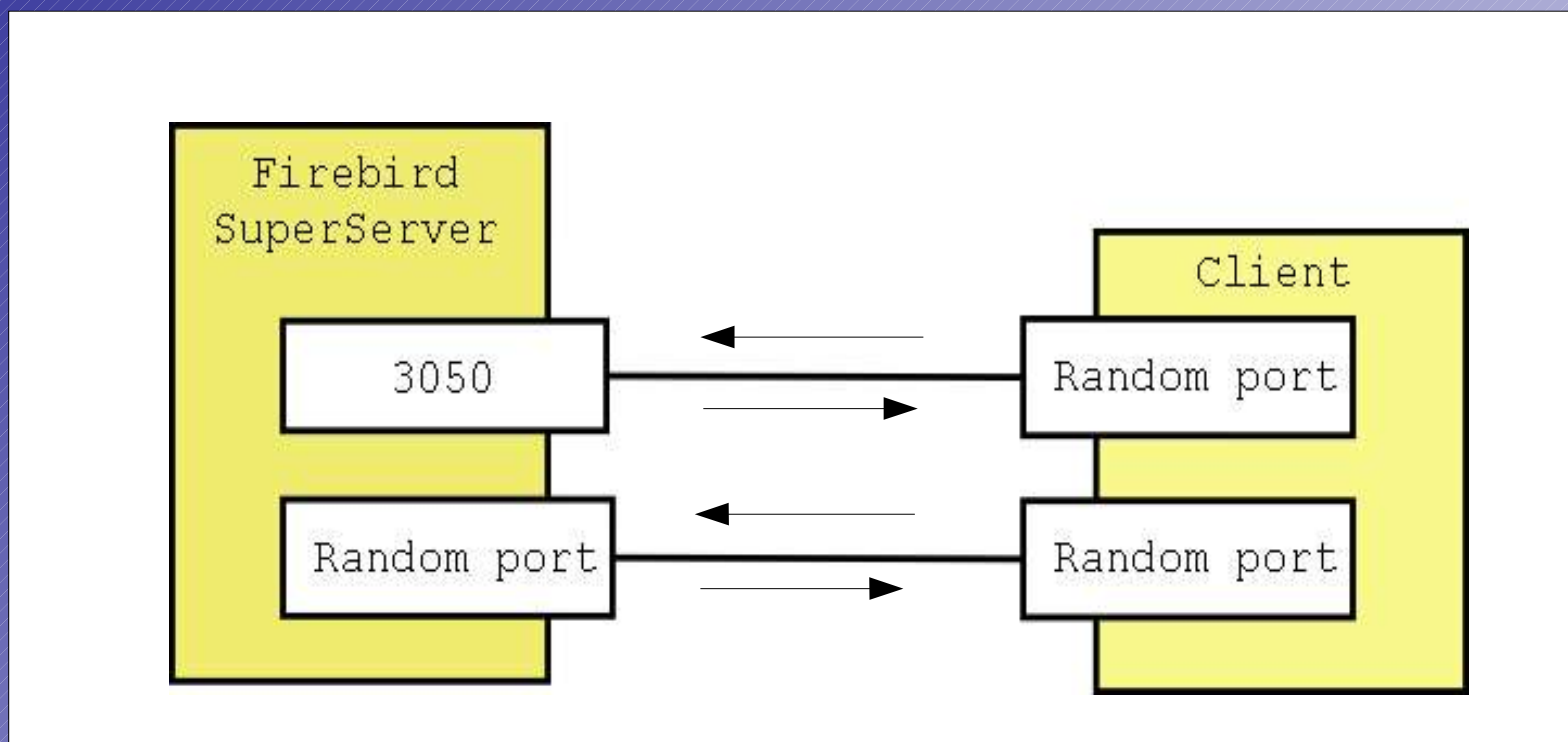
- ★ automatic vs manual refresh

- ★ implementing a random wait time



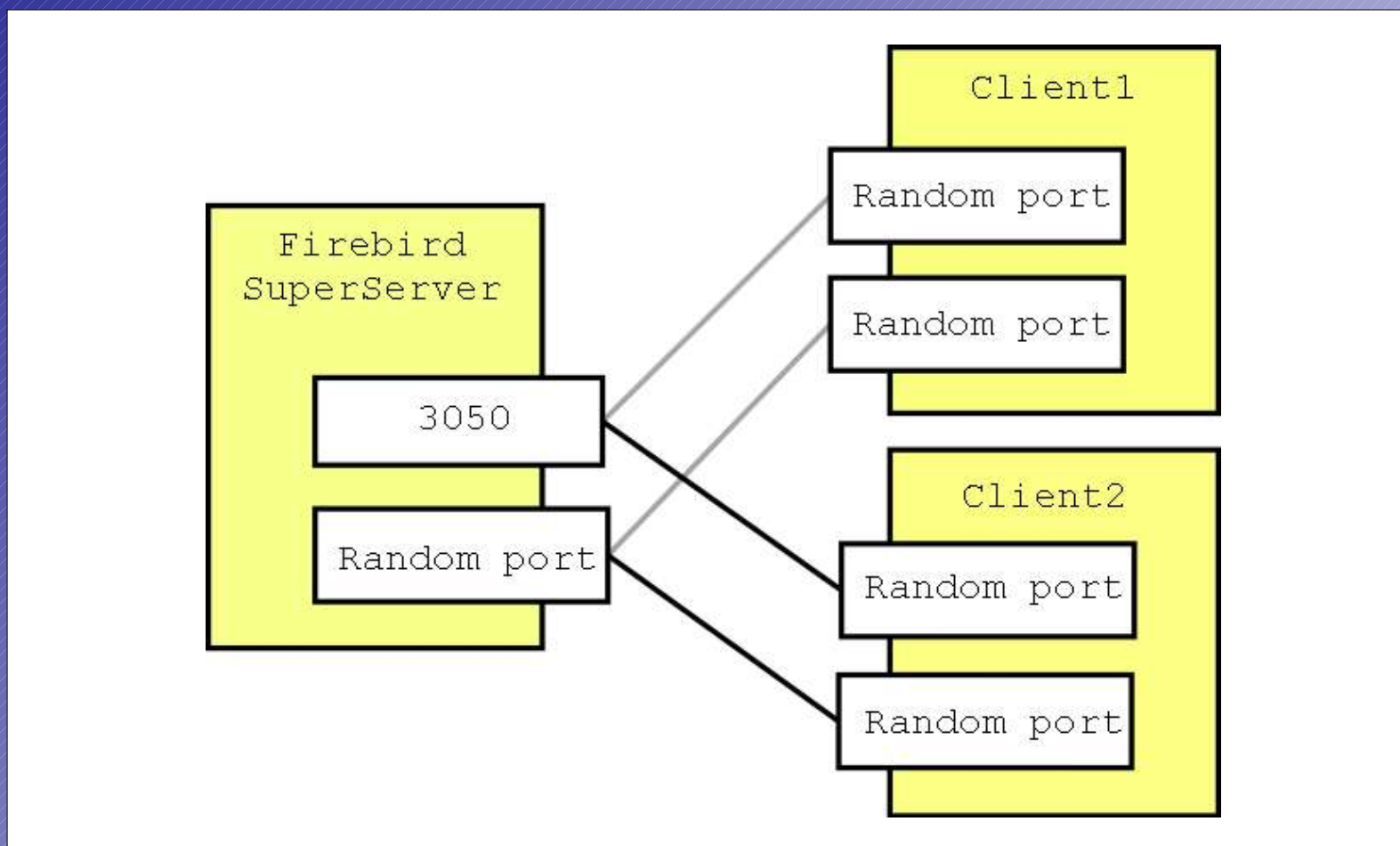
# How it works: network level

- ★ server side
- ★ client side



# How it works: network level

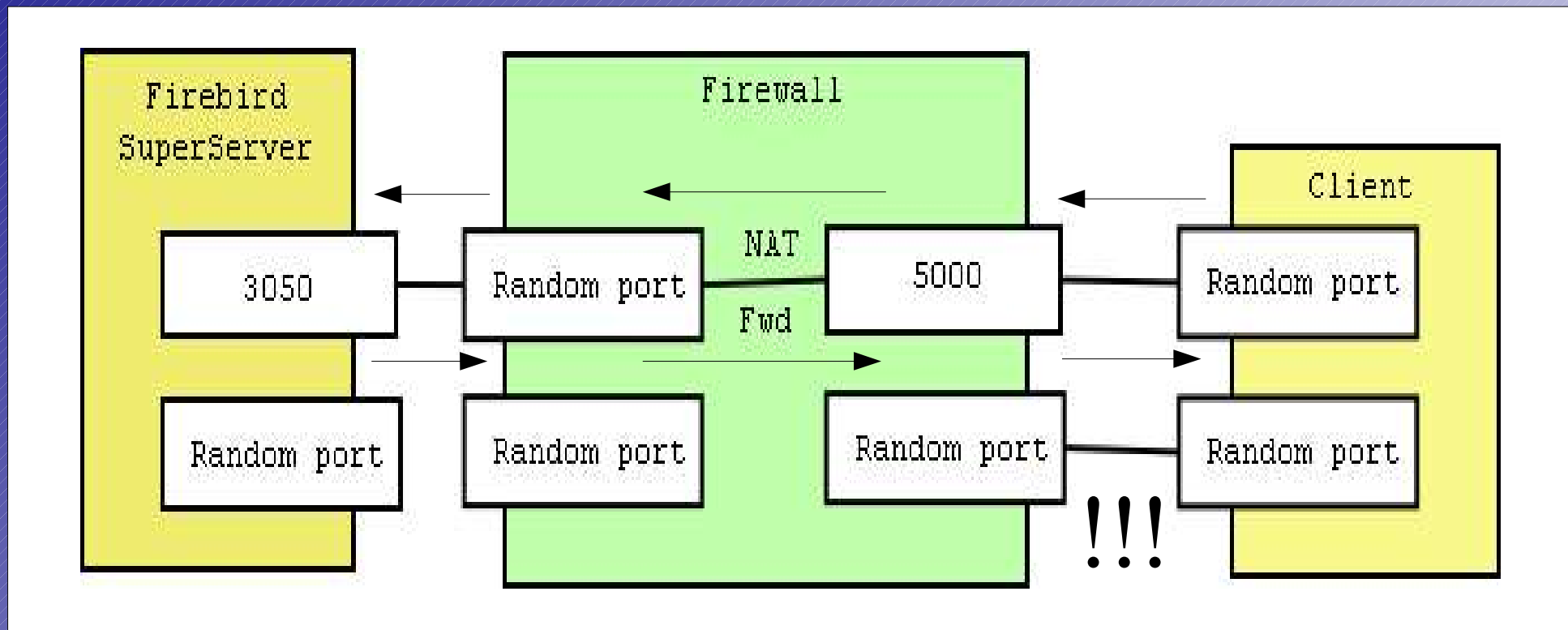
## ★ SuperServer with two clients





# Common problems: Firewalls

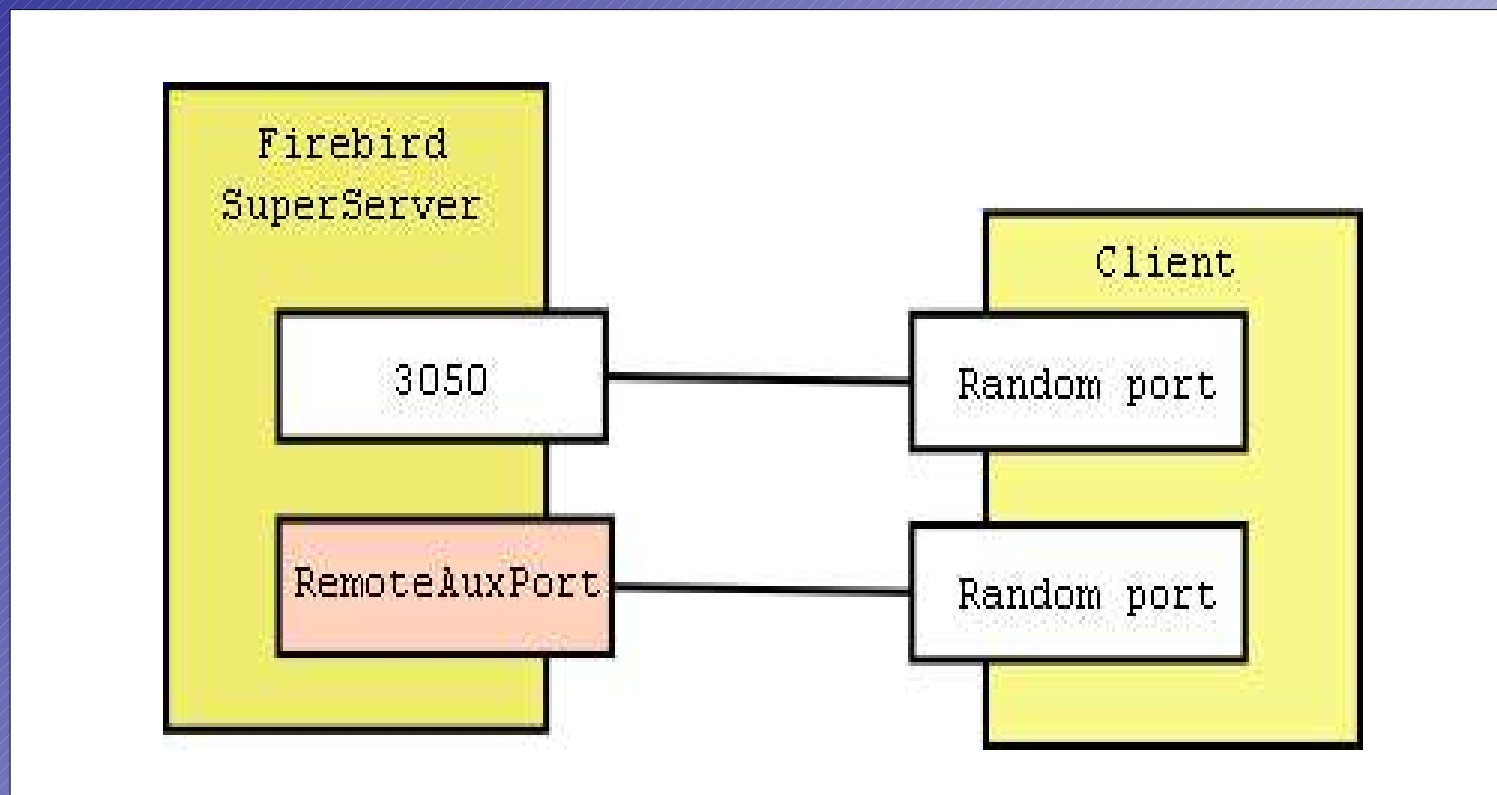
- ★ server behind firewall (port forwarding)
- ★ firewall software on server



# Common problems: Firewall

## ★ The Solution:

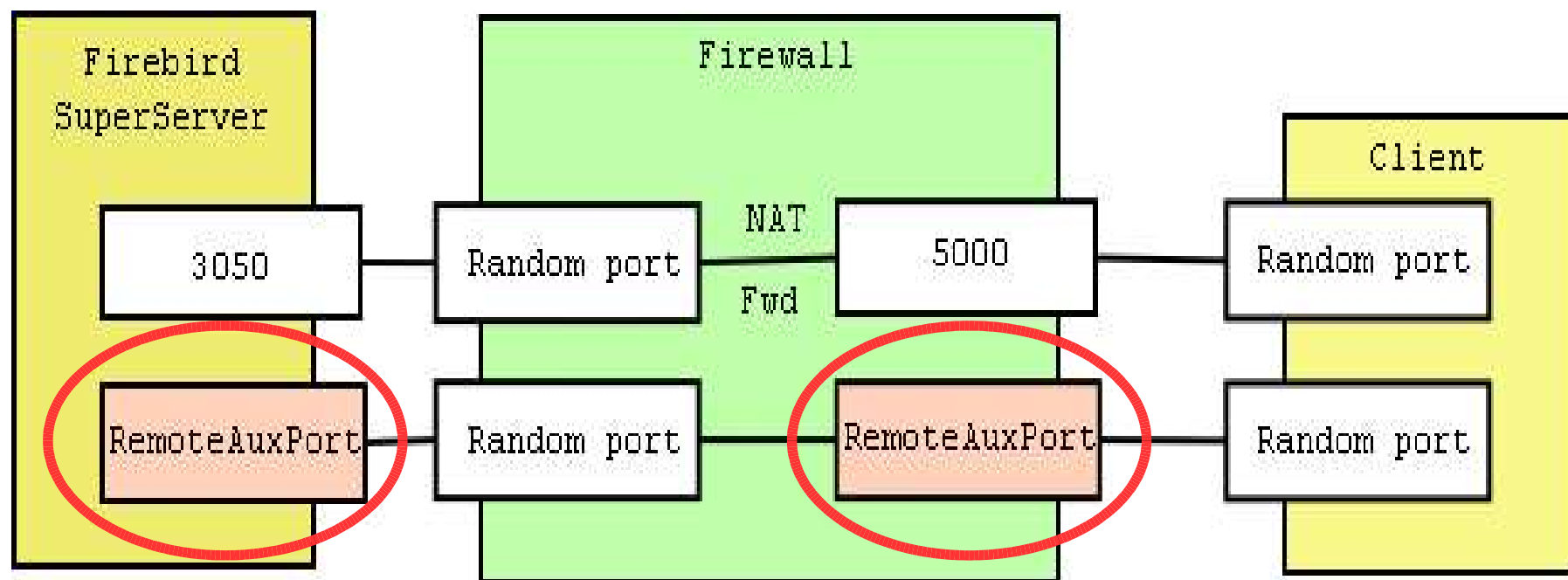
- ★ RemoteAuxPort setting in firebird.conf



# Common problems: Firewall

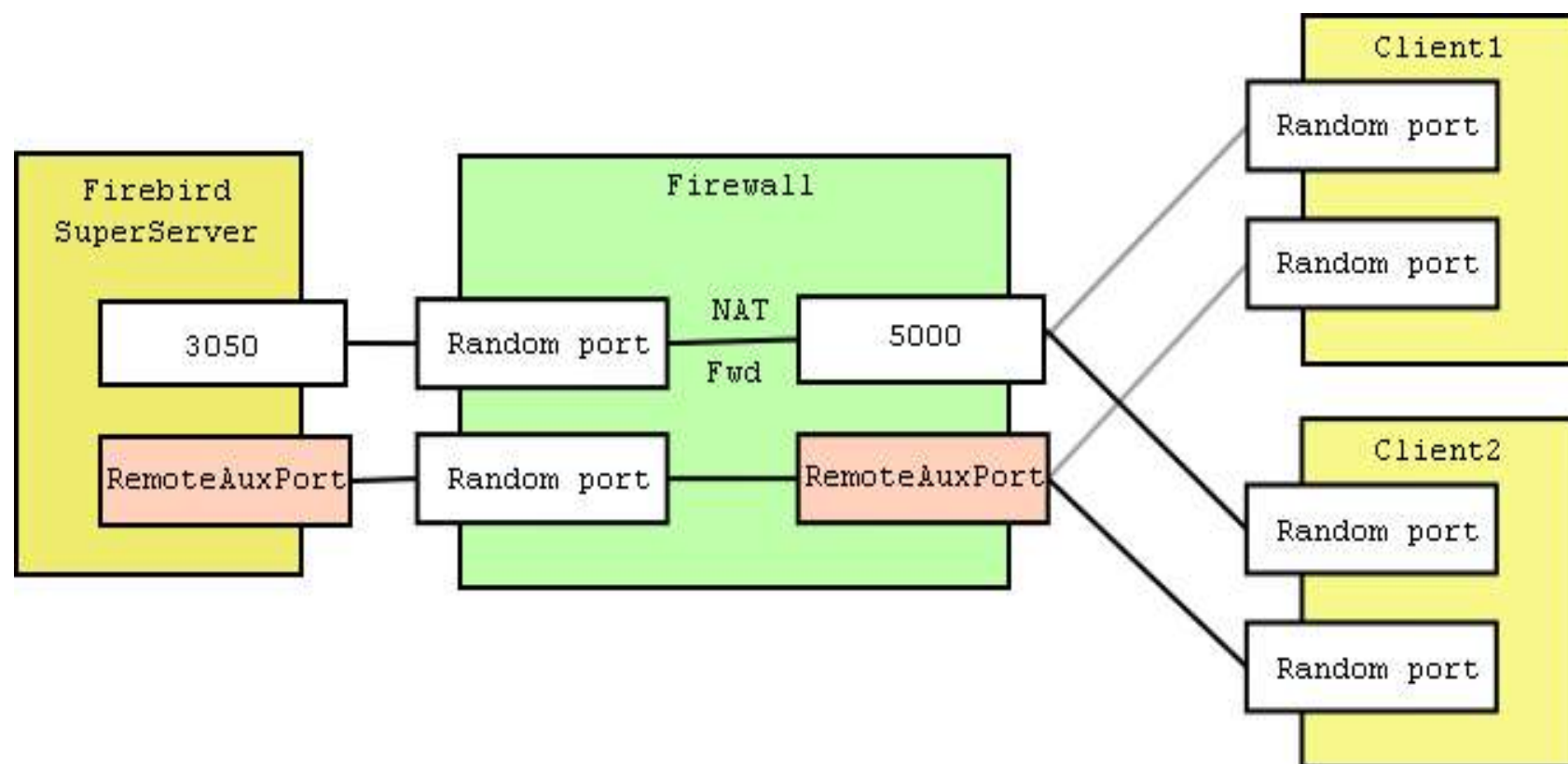
★ The solution:

★ RemoteAuxPort setting in firebird.conf



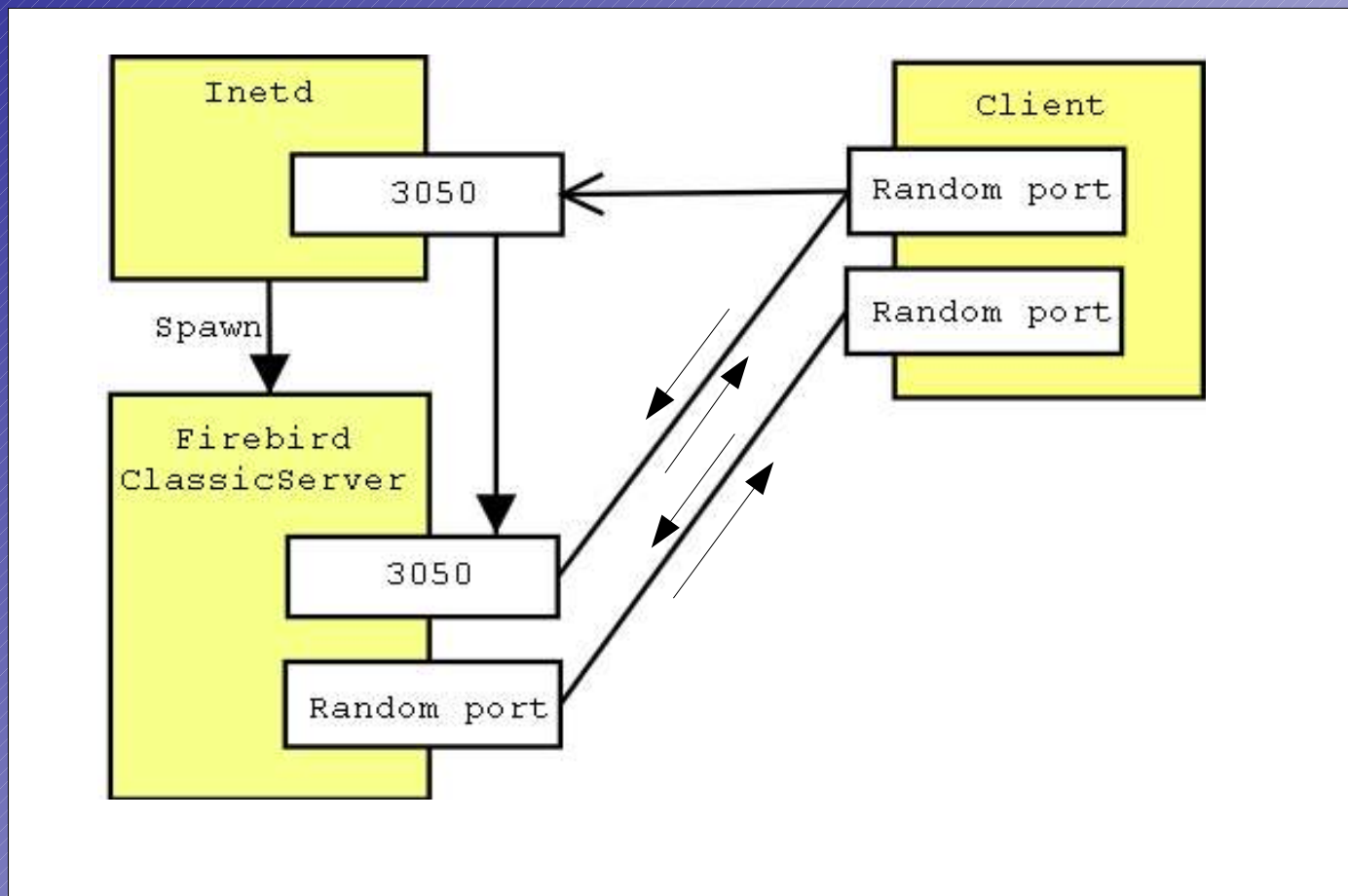
# Common problems: Firewall

## ★ Firewall with more clients



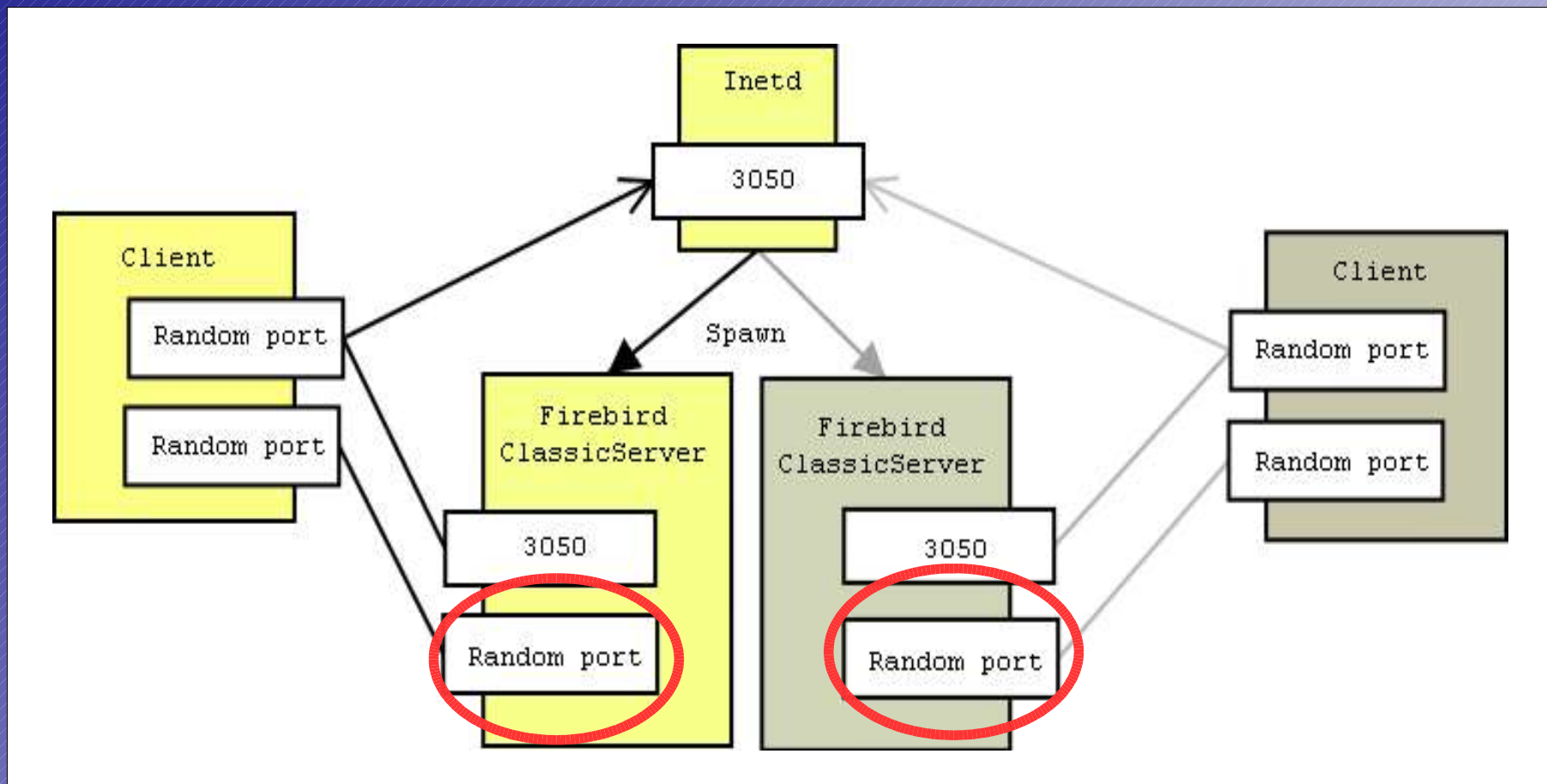
# Common problems

## ★ Classic server



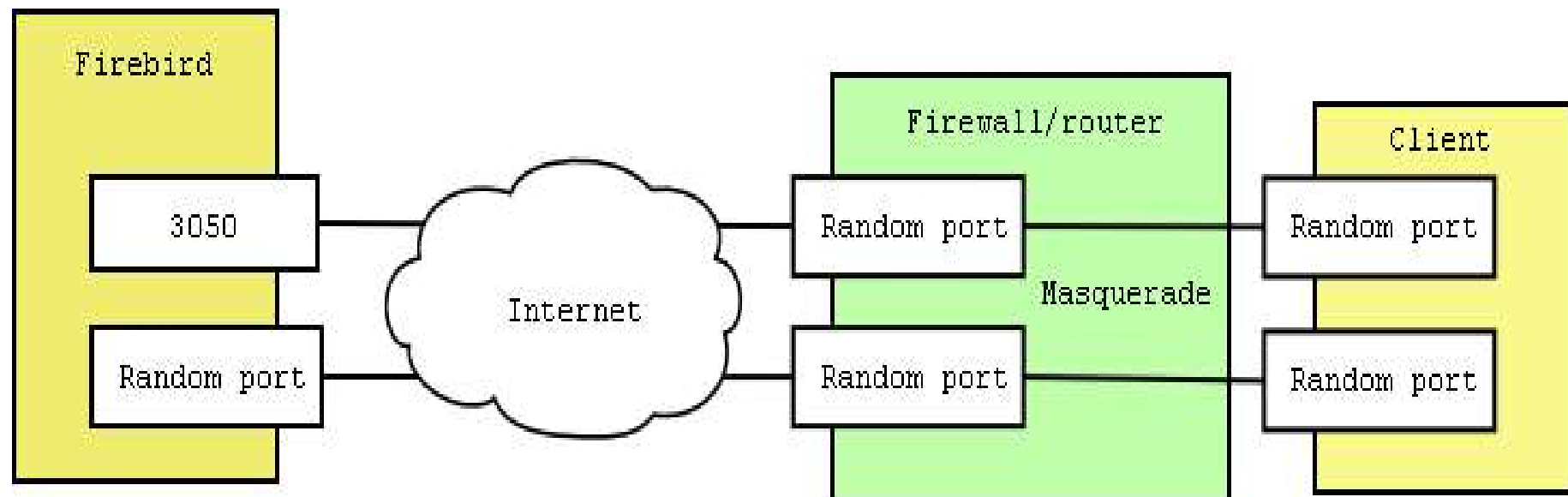
# Common problems

## ★ Classic server



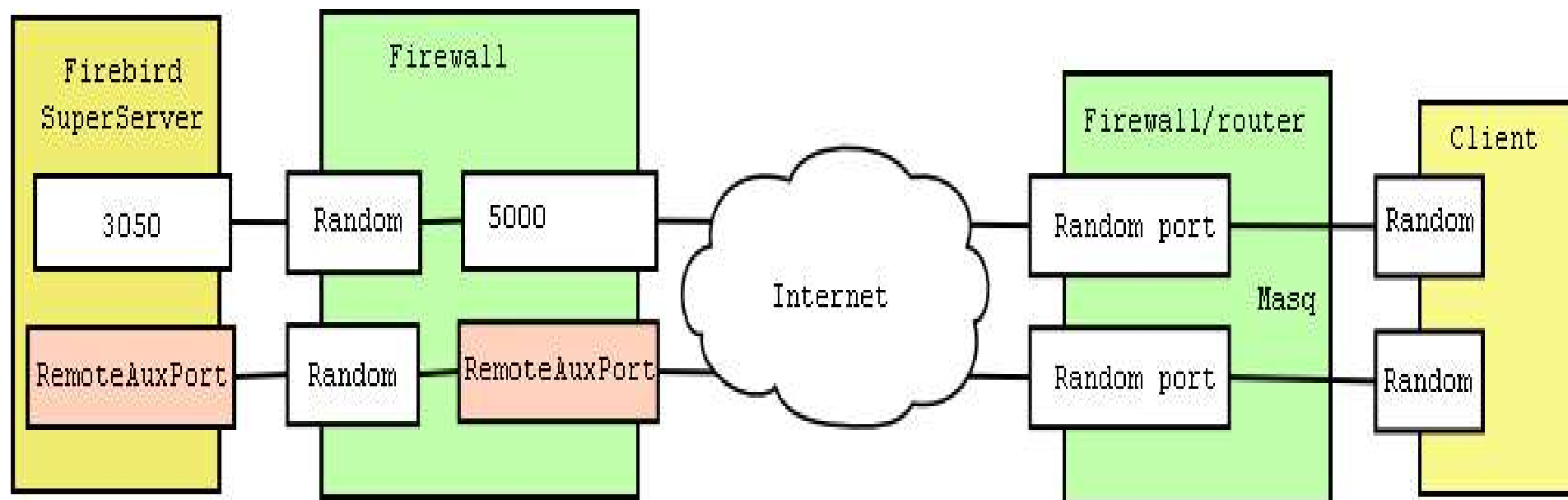
# Common problems: Firewalls

- ★ Clients behind firewall
  - ★ transparent: TCP flags / connection states
  - ★ can be used with both Super and Classic



# Common problems: Firewalls

- ★ Both client and server behind firewall
- ★ Possible only with SuperServer

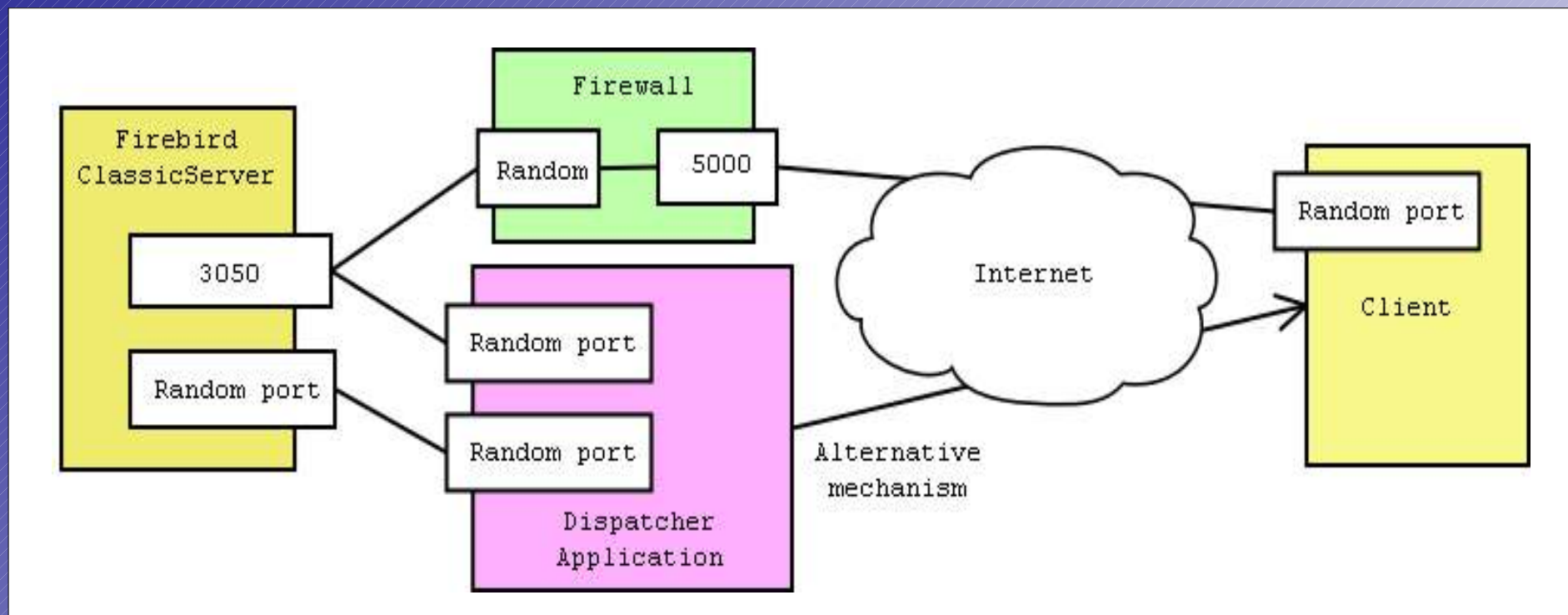




# Firewall problem

## ★ Conclusion

- ★ if server is behind firewall, use SuperServer
- ★ use dispatcher application for Classic



# Common problems: Using TCP tunnels

## ★ Benefits

- ★ encryption (security)
- ★ compresion (for slow lines)

## ★ Options

- ★ ZeBeDee
- ★ SSH
- ★ SSL/stunnel

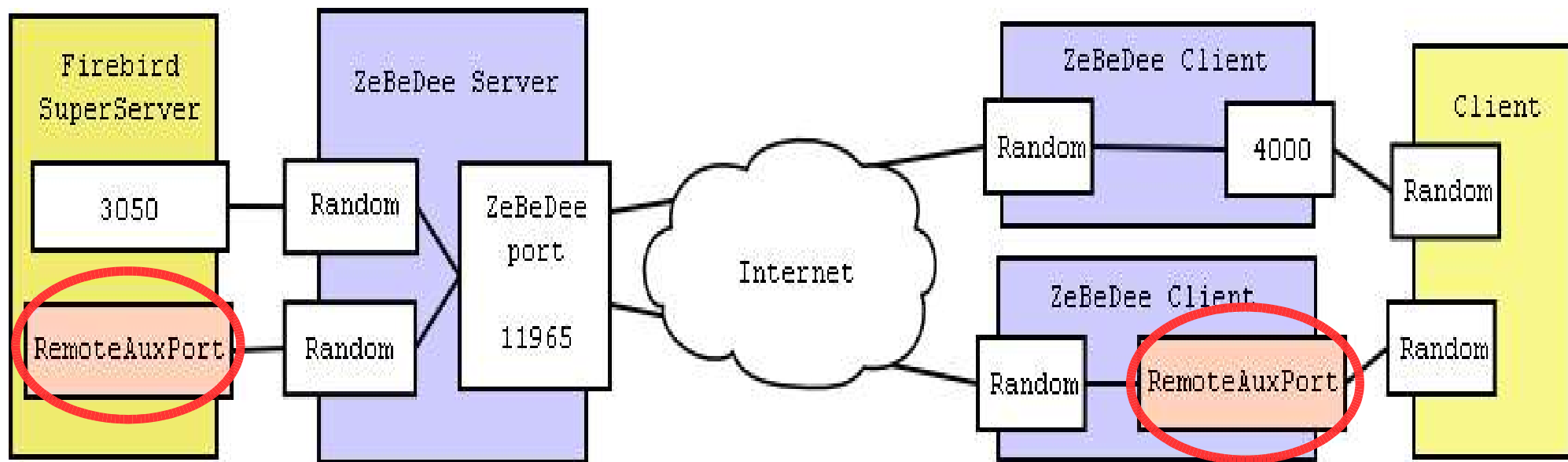
## ★ Alternatives

- ★ VPN



# Common problems: tunneling

## ★ Using ZeBeDee



★ Solution to problem with ClassicServer?

★ Modify ZeBeDee code

# Common problems

- ★ Don't abuse the functionality
  - ★ It is for short messages only
- ★ Registering a lot of events is slow
  - ★ 1 minute for 1000 events on average hardware
  - ★ progressively slower
- ★ Use other mechanisms to get the data
  - ★ log tables, flags, flag tables
  - ★ last\_update timestamp (or last\_id) column
  - ★ index is your friend



# Applications

- ★ Graceful database shutdown
  - ★ warn all users to disconnect
- ★ Notify users when data is invalid
  - ★ ex. stock price has changed
- ★ Notify users when action is to be taken
  - ★ ex. new meal ordered, start cooking
- ★ Alert about boundary conditions
  - ★ high temperature, low stock, limit reached
- ★ Replication



# Using events for replication

- ★ Automatic replication as soon as change happens
  - ★ not used for on-demand replications
- ★ Single event
  - ★ each trigger fires the same event
    - ★ and adds changes to log table
  - ★ replicator reads the changes table and updates other databases



# Chat/IM software: your own chat server

- ★ Why is Firebird a great choice?
  - ★ simple server install and setup
  - ★ cross-platform
  - ★ network layer already implemented
  - ★ database storage already implemented
- ★ Why not?
  - ★ there are good alternatives like Jabber
  - ★ security issues
    - ★ unencrypted data flow (ZeBeDee?)





# Chat/IM implementation

- ★ User management

- ★ Using Firebird users

- ★ better when Firebird is used as database server
    - ★ better from security POV

- ★ Using a separate database table

- ★ when you don't have access to security database

- ★ Database structure

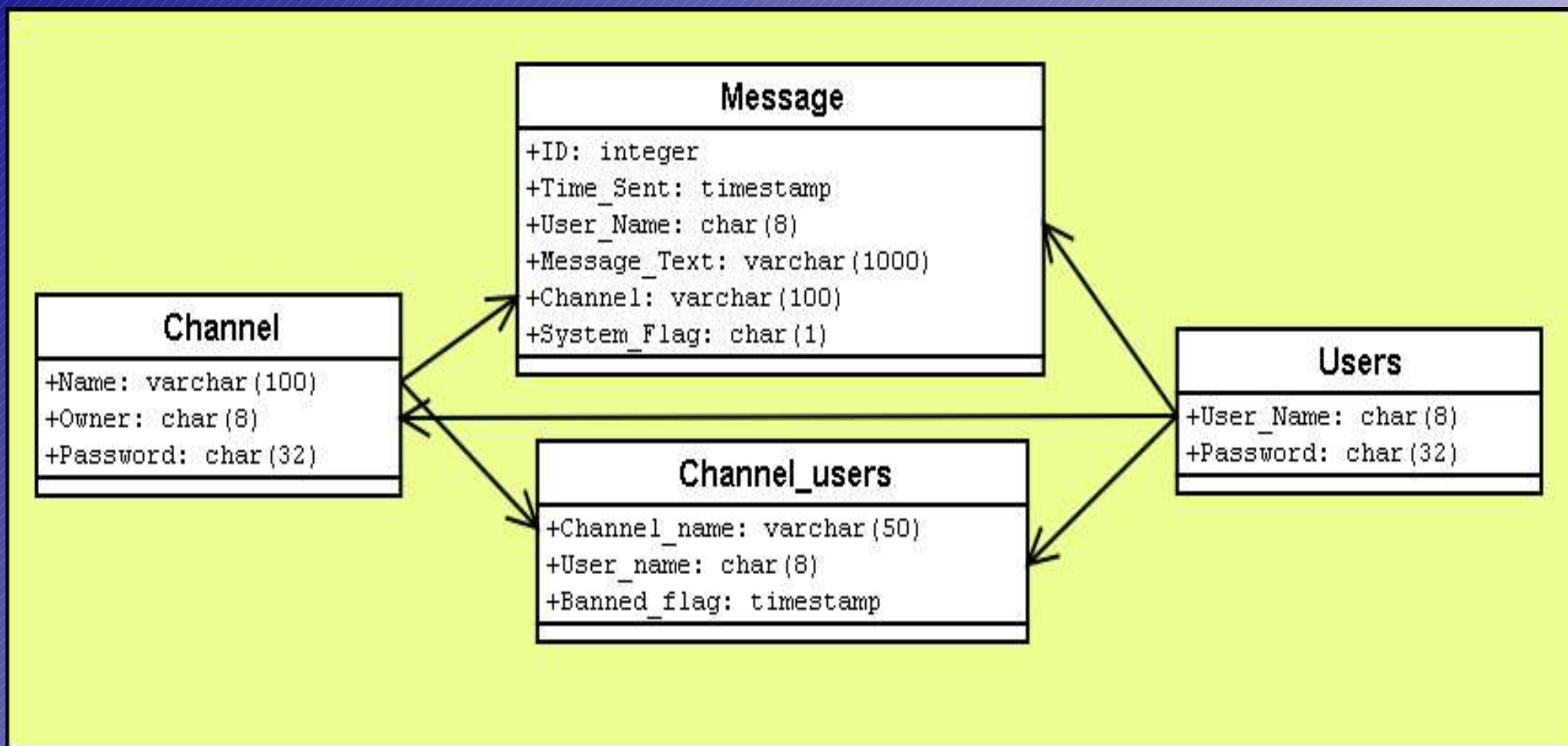
- ★ chat rooms a.k.a. channels
  - ★ channel\_users – who is on which channel
  - ★ messages log table





# Chat implementation

## ★ Database tables



# Chat/IM implementation

## ★ Events

- ★ one event name per channel
- ★ channel message covers:
  - ★ user joined
  - ★ user left
  - ★ message posted (system\_flag is null)
- ★ special system-wide event:
  - ★ when new channels are created
  - ★ when existing channels are deleted
  - ★ action: reload channel list



# Chat implementation

- ★ Posting a message:
  - ★ insert into messages table
  - ★ insert trigger on messages table:
    - ★ checks if user has permission
    - ★ posts the event
  - ★ other clients receive the event
    - ★ and read from message table where ID is bigger than the last read ID
      - ★ last\_id can also be stored in channel\_users table



# Chat implementation

- ★ Subscribing to channel
  - ★ use a stored procedure (for password check)
    - ★ insert into channel\_users
  - ★ insert trigger on channel\_users inserts a row in message table (*'user x joined the chat'*)
  - ★ insert trigger on message table posts event
  - ★ other clients on channel receive event and select from message table
  - ★ seeing that the row has the system\_flag set they reload the user list for that channel



# Chat implementation

- ★ Enhancements:
  - ★ channel owner can ban some user
    - ★ regular user leaving channel => record is deleted
    - ★ banned user leaving channel => record remains
  - ★ owners can set passwords for channels
    - ★ owner can alter the password
    - ★ users can't select the password column
      - ★ use views or stored procedure to protect it
      - ★ one of the reasons why Firebird server users are better
  - ★ disallow “sniffing” other channels
    - ★ events offer no protection – protect tables (data)



# Interested in Firebird-chat?

- ★ Contact author
  - ★ mbabuskov [at] users.sourceforge.net
  - ★ mbabuskov [at] yahoo.com
- ★ Watch out for announcement on
  - ★ firebird-tools [at] yahoogroups.com



# Questions

★ ???

