

Parallel programming laboratory

Imre Szeberényi

BME IIT

<szebi@iit.bme.hu>



MŰEGYETEM 1782

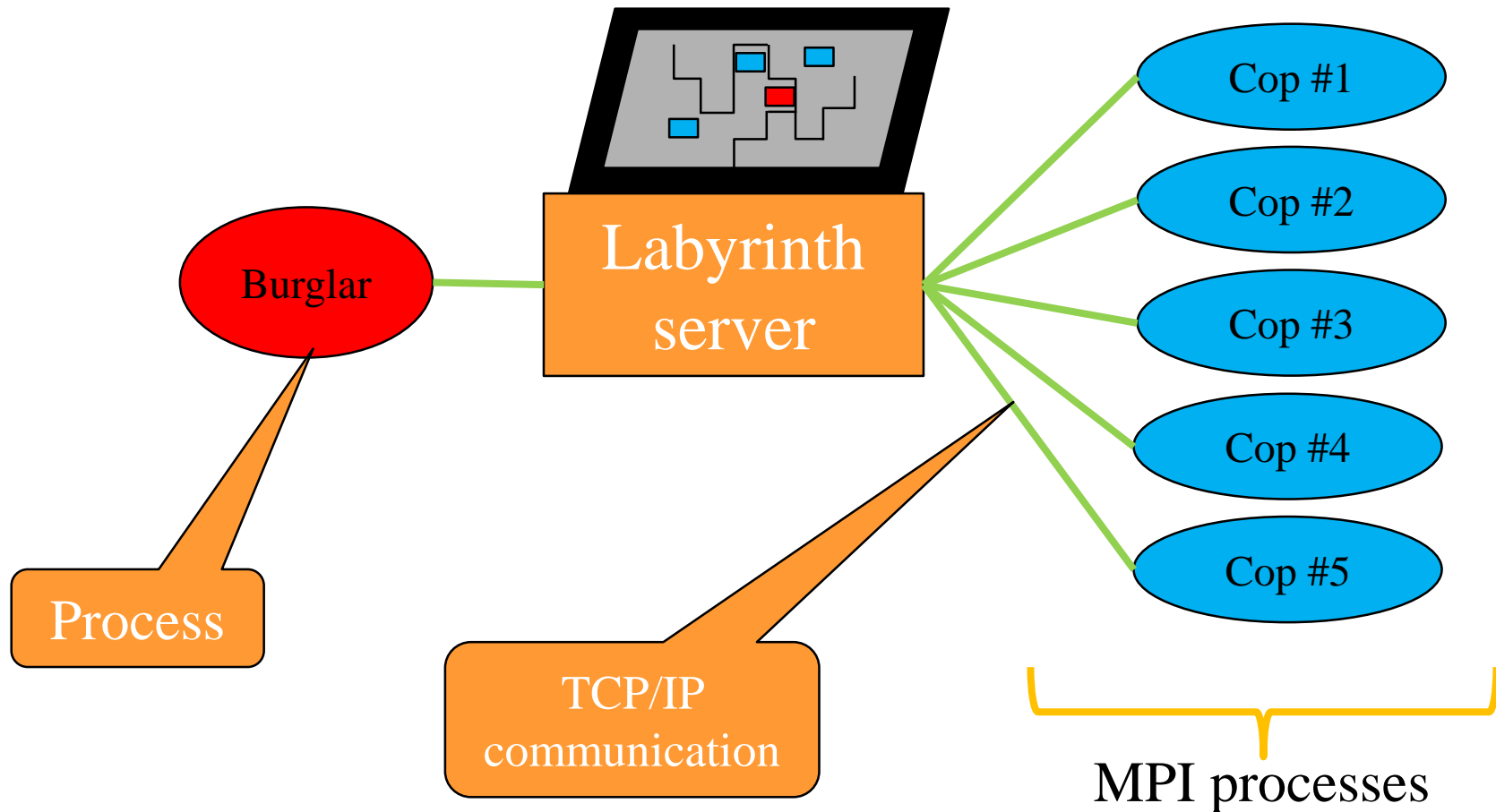
Burglar – cops

- Cops are chasing a burglar on the street (in a labyrinth).
- The cops are communicating with each other or with the police centre on handy (mobile phone)
- Every moving actor (cop, robber) is a thread or a process that communicates with each other.
- Chasing is over when the robbers can not move.

Labyrinth server

- The server runs on the local machine, and it is responsible for displaying the labyrinth and the moving actors.
- It is listening to TCP port 15623 and executes simple commands.
- The clients are running on the server para.
- The connection is built up through the TCP tunnel.

Architecture



Communication

- Simple text messages in both directions ending with endline ('\n').

Initialization: Player → Server

Cmd	Answer	Meaning
M		Burglar step in
	X,Y	Burglar initial position
N		Cop step in
	X,Y	Cop initial position

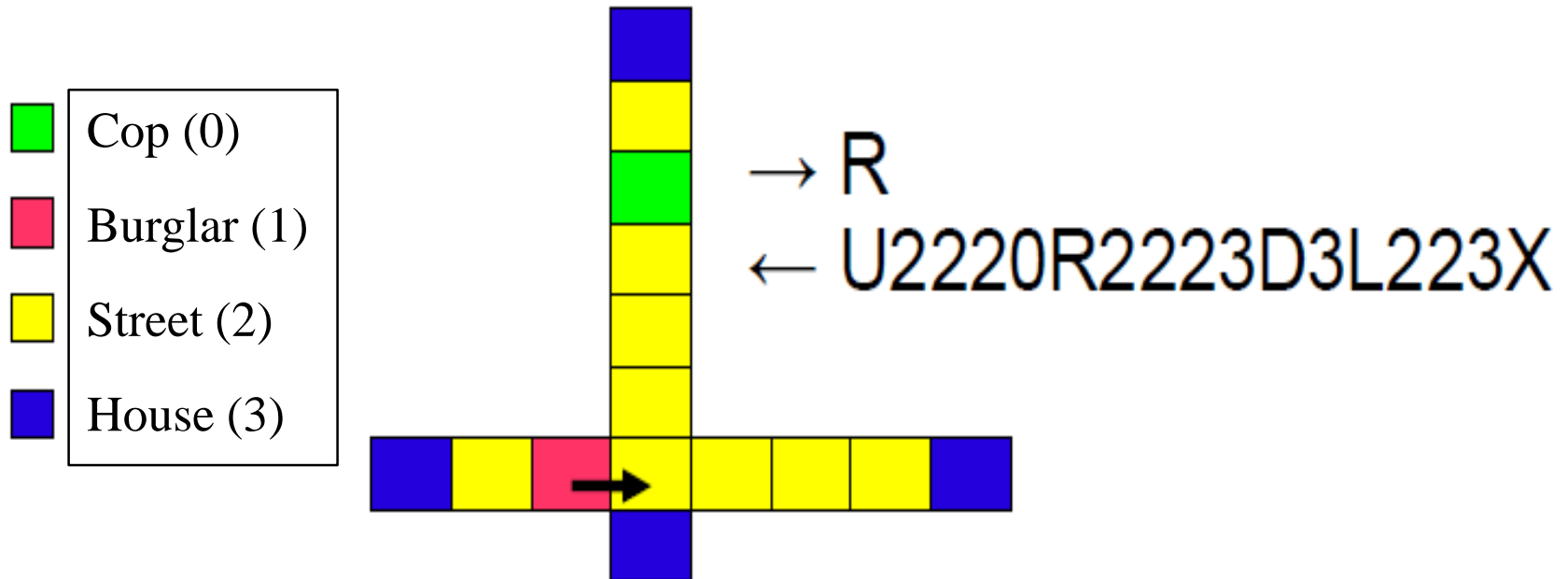
Communication/2

Other commands: Player → Server

Cmd	Meaning
U,D,L,R	Step (up, down, left, right)
Answer	Meaning
F	Stepping is not possible
C	Game over
<i>view</i>	Successful step. <i>view</i> is the view what is viewable path from the new position.

Communication/3

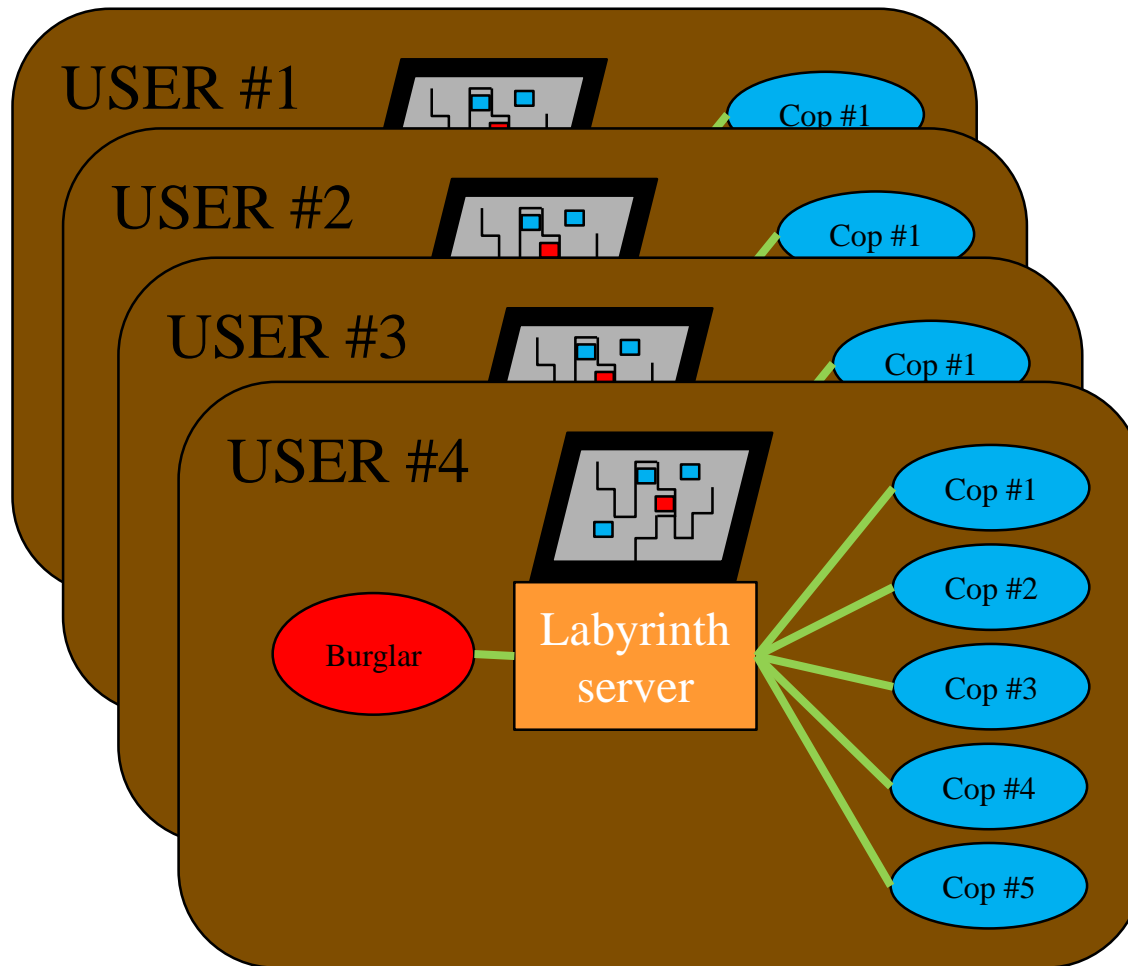
view := U#{#} D#{#} L#{#} R#{#}X



Helper class: player

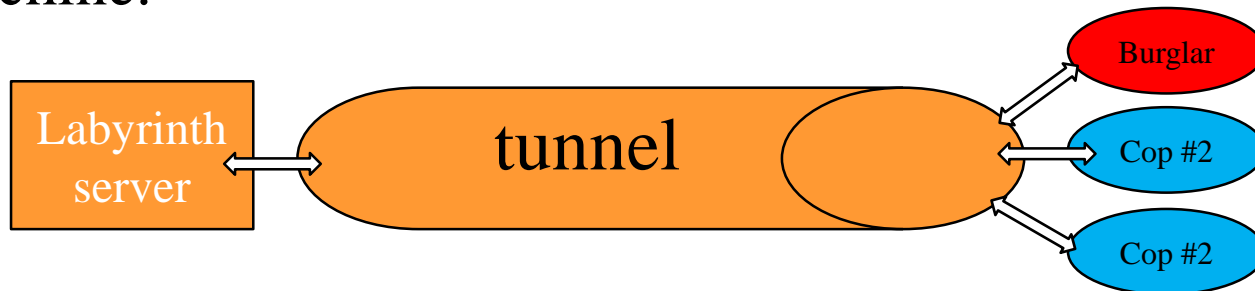
```
class Player {
public:
    typedef enum {up, down, left, right}
    direction;
    typedef enum {burglar, cop} player_t;
    Player(char* host, int port, player_t cop);
    char *move(direction d);
    int getx(){ return x; }
    int gety(){ return y; }
    player_t gettyp() { return me; }
    void setx(int x) { this->x = x; }
    void sety(int y) { this->y = y; }
private:
    ...
}
```


Multiuser environment



Multiuser environment #2

- The labyrinth servers are running on the local machines and listen at port number 15623.
- The clients are running on para cluster.
- A tunnel should be used between the para and the local machine.



- The tunnels must end at unique port number on para:
- Suggested unique port number is $15000 + \text{UID}$
 - where UID is the user id on para cluster.
 - `id -l` command prints the UID.

Putty configuration

Session->SSH->Tunnels

✓ Local ports accept connection from other hosts

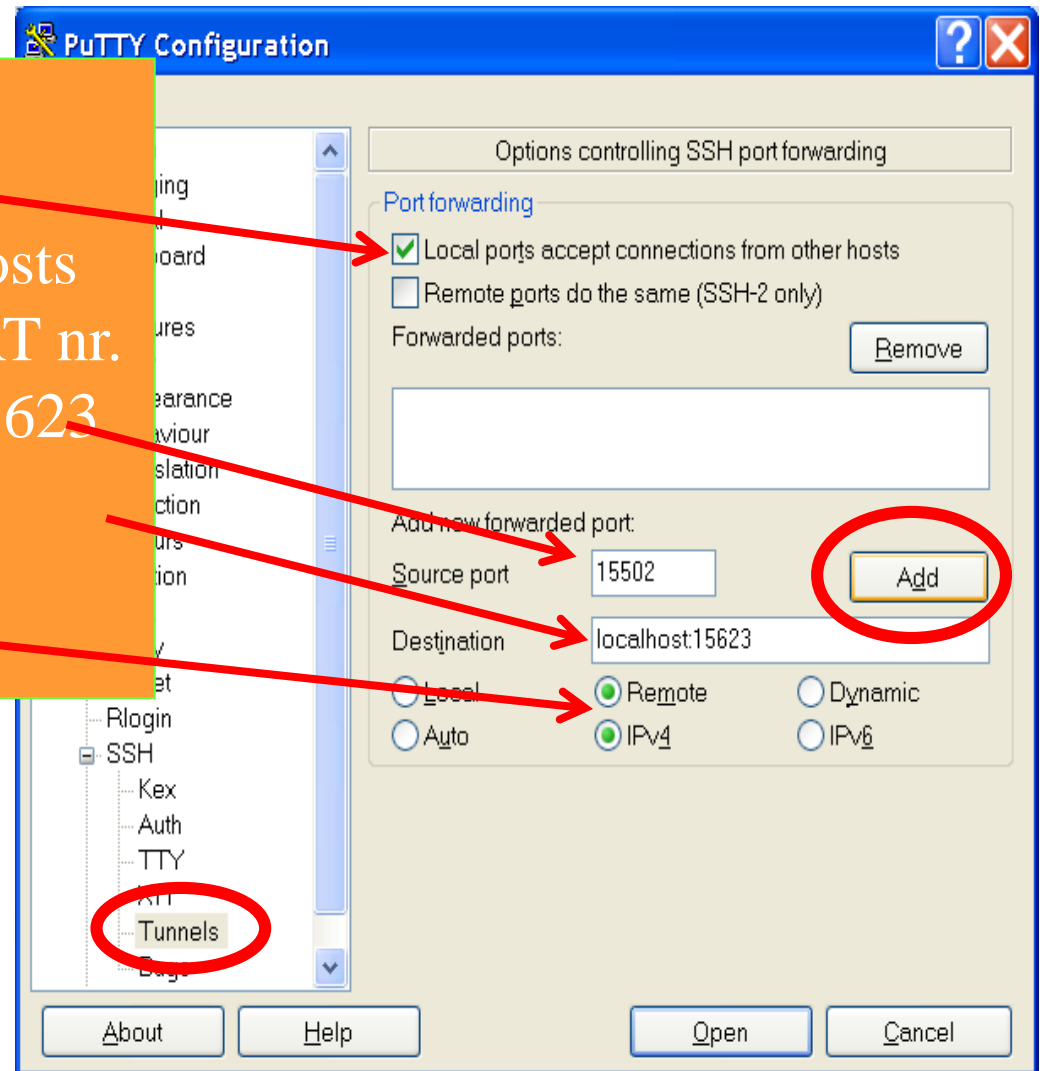
Source port: unique PORT nr.

Destination: localhost:15623

✓ Remote

✓ Ipv4

Add



Possible configurations

- Option 1:
 - Your local machine runs the labyrinth server
 - para cluster runs the clients
- Option 2:
 - Virtual machine running on cloud runs the labyrinth server.
 - para cluster runs the client.
- Option 3:
 - Virtual machine running on cloud runs the labyrinth server and clients. (no tunnel needed)

Using option 1

Unpacking the sources:

server dir: → local machine

client: → para cluster

Setting up the tunnel

see putty config or

ssh PORT:localhost:15623 U@H

Starting the server

cd server

server.bat or ./server.sh

On para cluster:

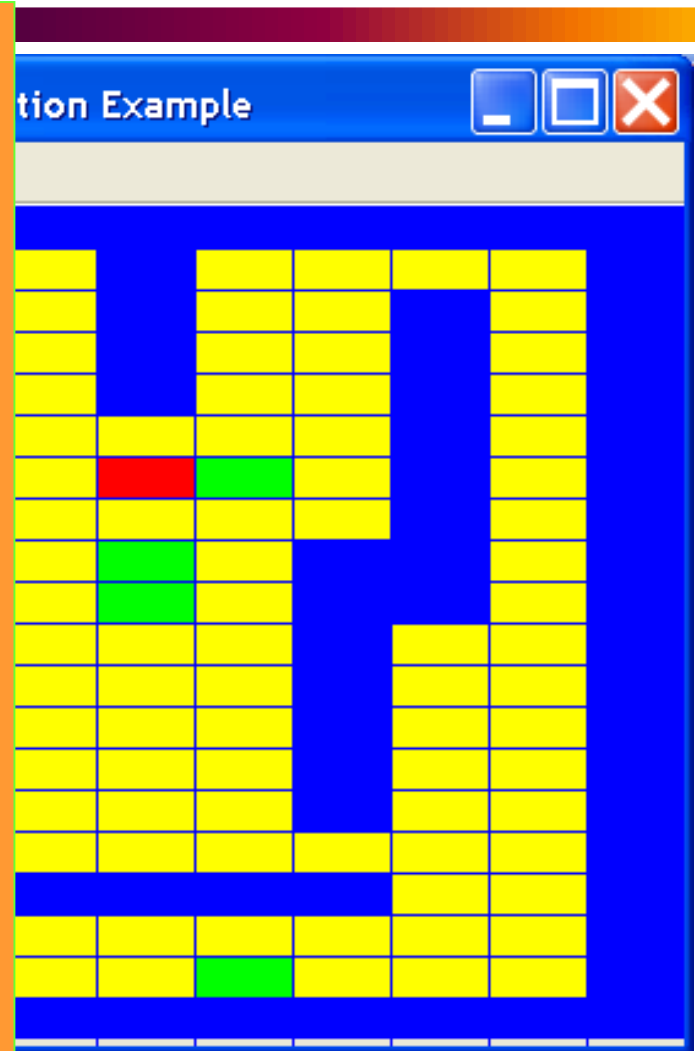
cd server

make

./test.sh,

or

./testmpi.sh



Using option 2

- login to the smalville cluster
- start a VM from template: parab and login to
 - git clone <https://git.ik.bme.hu/Parlab/burglar.git>
 - cd burglar/server
 - ./server.sh
 - open a new terminal window
 - ssh USER@FULL_HOSTNAME_OF_PARA
 - git clone <https://git.ik.bme.hu/Parlab/burglar.git>
 - cd client
 - ./test.sh → **record your unique port number**
 - exit
 - ssh PORT:localhost:1623U@H
 - cd client
 - make
 - ./test.sh

Assignment

- Create an MPI program, models the behaviour of cops.
- Simple solution:
 - If the cop saw the burglar, broadcasts a message with the exact coordinates.
 - The cops try to move to that direction.
 - Problem: walls could block the move
 - The example cop forgets to tell the position.

Assignment cont. #1

- Sophisticated solution #1:
 - While the cops are moving, they build a map from the streets (labyrinth)
 - If the cop saw the burglar, broadcasts a message with the exact coordinates.
 - The cops use the map to calculate the way to last place of the burglar.

Assignment cont. #2

- Sophisticated solution #2:
 - While the cops are moving, they send information to the centre.
 - The centre bulid up the city map.
 - The centre sends movement commands to the cops.

Assignment cont. #3

Helper materials:

<https://git.ik.bme.hu/Parlab/burglar.git>

or on para: ~szebi/para/burglar

- server – labyrinth server (jar)
- client – example client programs
- tests
- Task to be submitted :
 - short description: pdf, or txt
 - sources,
 - makefile