Tcl Distributed Programming

Brian C. Smith, Lawrence A. Rowe, Stephen C. Yen

Computer Science Division - EECS

University of California at Berkeley

(bsmith@cs.berkeley.edu)
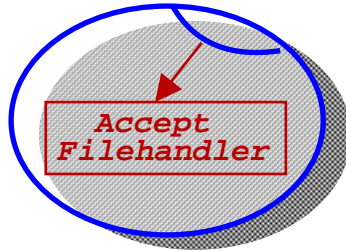
Introduction to Tcl/DP

On "zonker"

```
dpsh: MakeRPCServer 4545
4545
dpsh: set lastId 0
0
dpsh: proc GetID {} {
    global lastId
    incr lastId
    return $lastID
}
GetID
dpsh: GetID
1
dpsh: GetID
2
```
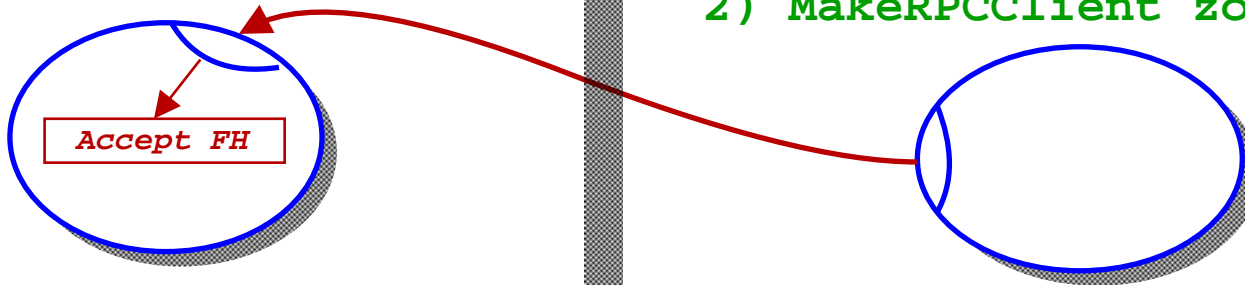
On another host

```
dpsh: set server [MakeRPCClient
              zonker 4545]
file3
dpsh: RPC $server GetID
3
dpsh: time {RPC $server set a
          5} 100
4332 microseconds per iteration
```
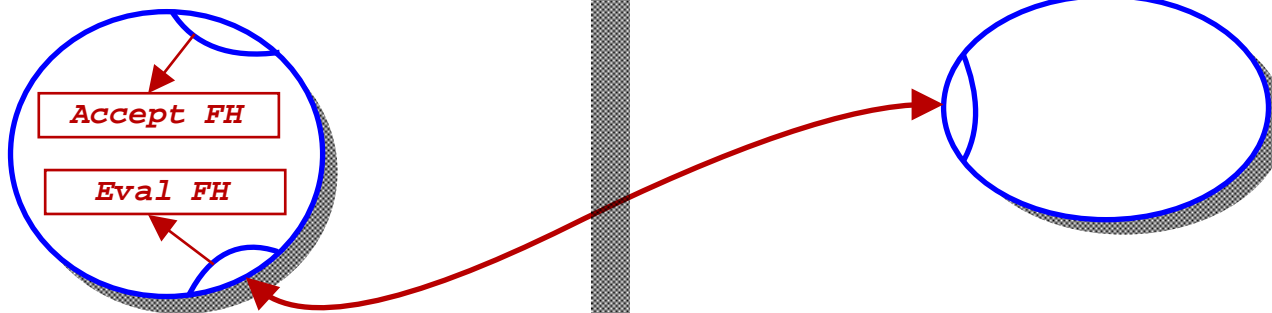
Internals

1) MakeRPCServer 4545

Accept
Filehandler

Accept FH

2) MakeRPCClient zonker 4545

3) *Connection established!*

Accept FH

Eval FH

Other Features

- **RDO for concurrency**

  ```
  time {RDO file3 set a 5} 1000
  ```

  0.5 milleseconds/iteration

  ```
  RDO file3 -callback RDO_done parallelCmd
  ```
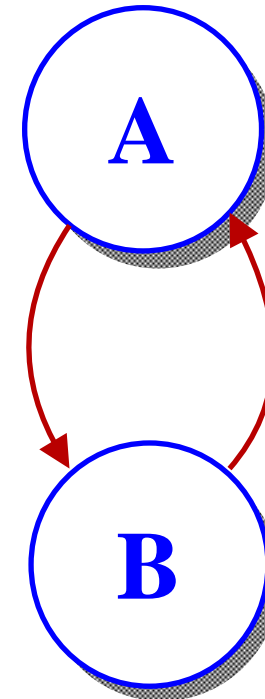
- **Timeouts**

  ```
  RPC file4 -timeout 1000
          -timeoutReturn RPCTimeout
         myCommand
  ```
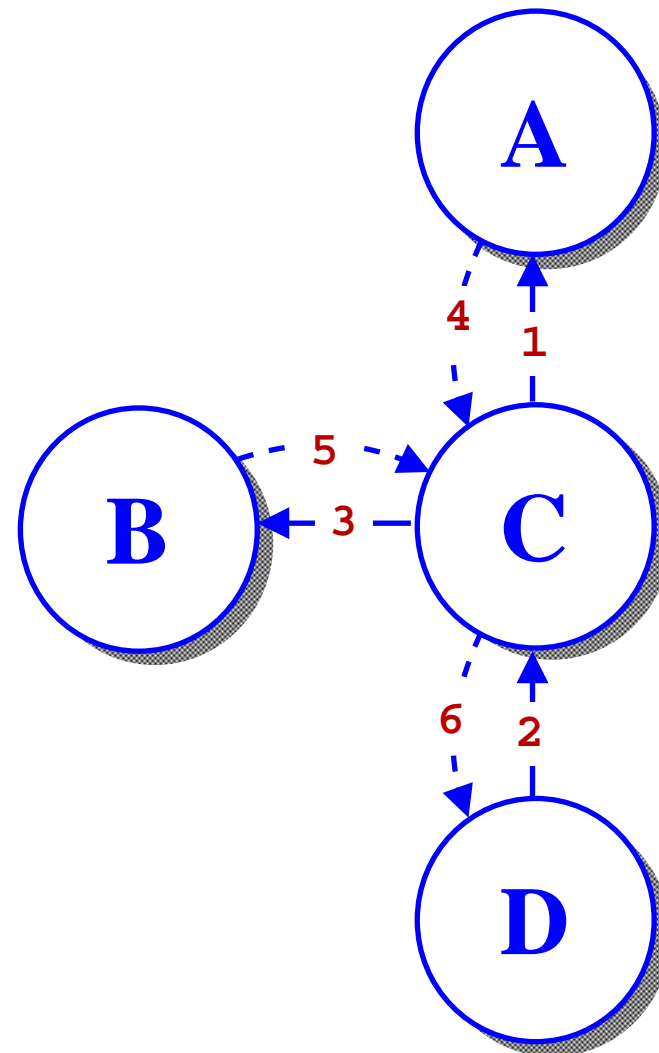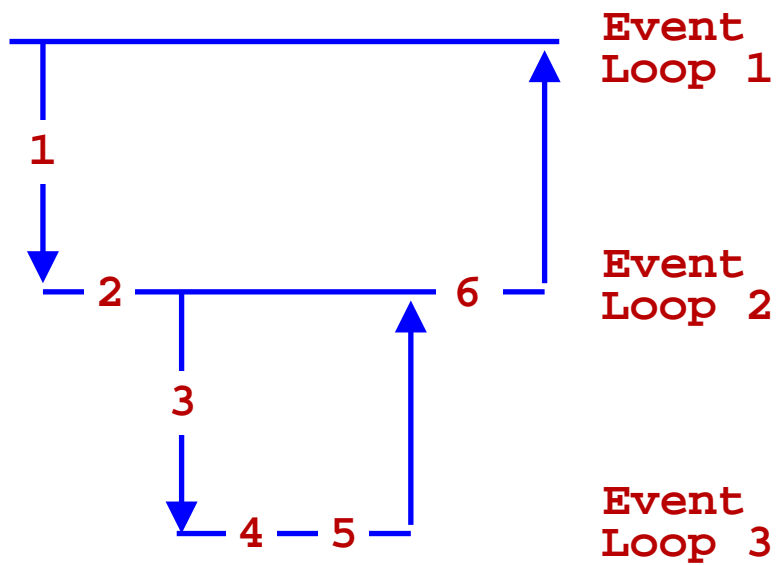
Deadlock Resolution

- **How deadlock happens**

  1) A calls B, reads socket for reply

  2) B receives RPC, and calls A

  --> Deadlock!

- **Solution: non-blocking RPC**

  1) A calls B, enters event loop

  2) B receives RPC, calls A, and enters event loop

  3) A receives RPC, evals and returns

  4) B finishes up and returns.

- **Can process more than RPC!**

  Filehandlers, X, Idle, and Timer Events.

More Complex RPC Example

Object Protocol

- **"Object" Messages**

  Creation:　　**`point apt -x 5 -y 5`**

  Get All Slots: **`apt config`** --> **`{{-x 0 5} {-y 0 5}}`**

  Get One Slot: **`apt slot-value -x`** --> 5

  Set One Slot: **`apt configure -x 9`**

- **Setting/Getting Slot Values**

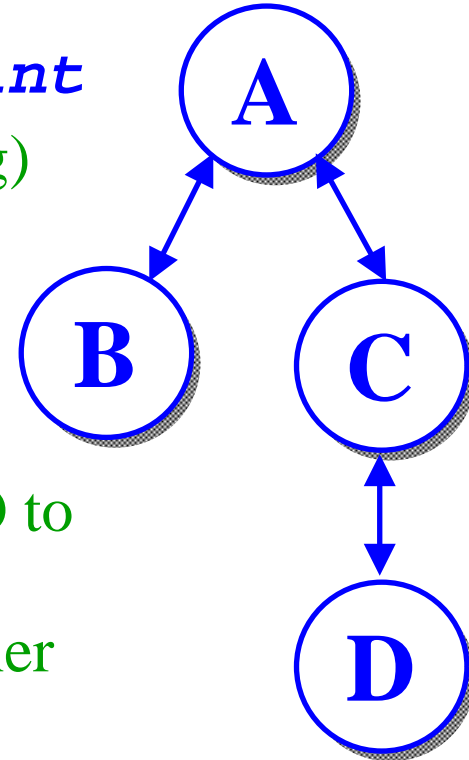 setf *object slotname value*

  getf *object slotname*

Distributed Objects

- **DistributeObject** *apt file4 point*

  1) Get all slot name/value pairs (using config)

  2) RPC to remote process to create object

  3) Keep table of object owners, clients

- **Setting A Slot**

  If we own the object, send **downsetf** RDO to all clients

  If we don't own, forward setf request to owner

- **Triggers**

  Called on **downsetf** to eval some Tcl code

Open Issues

- **Security**

- **Multithreading**

- **Name Services**