Go SCTP!

by

Olivier Van Acker

Who am I?

Birkbeck
UNIVERSITY OF LONDON

VPRO

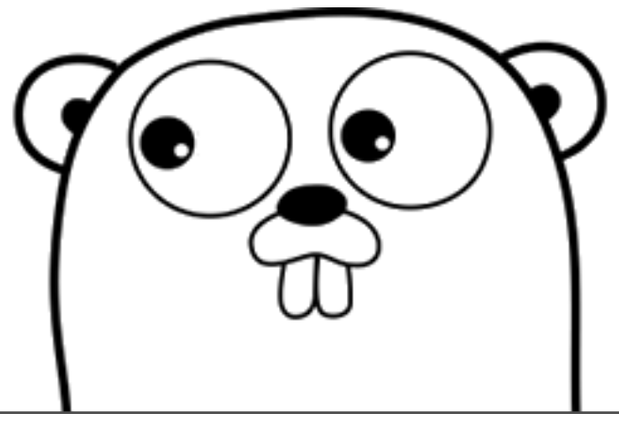
BBC

Mind Candy

Why FreeBSD?

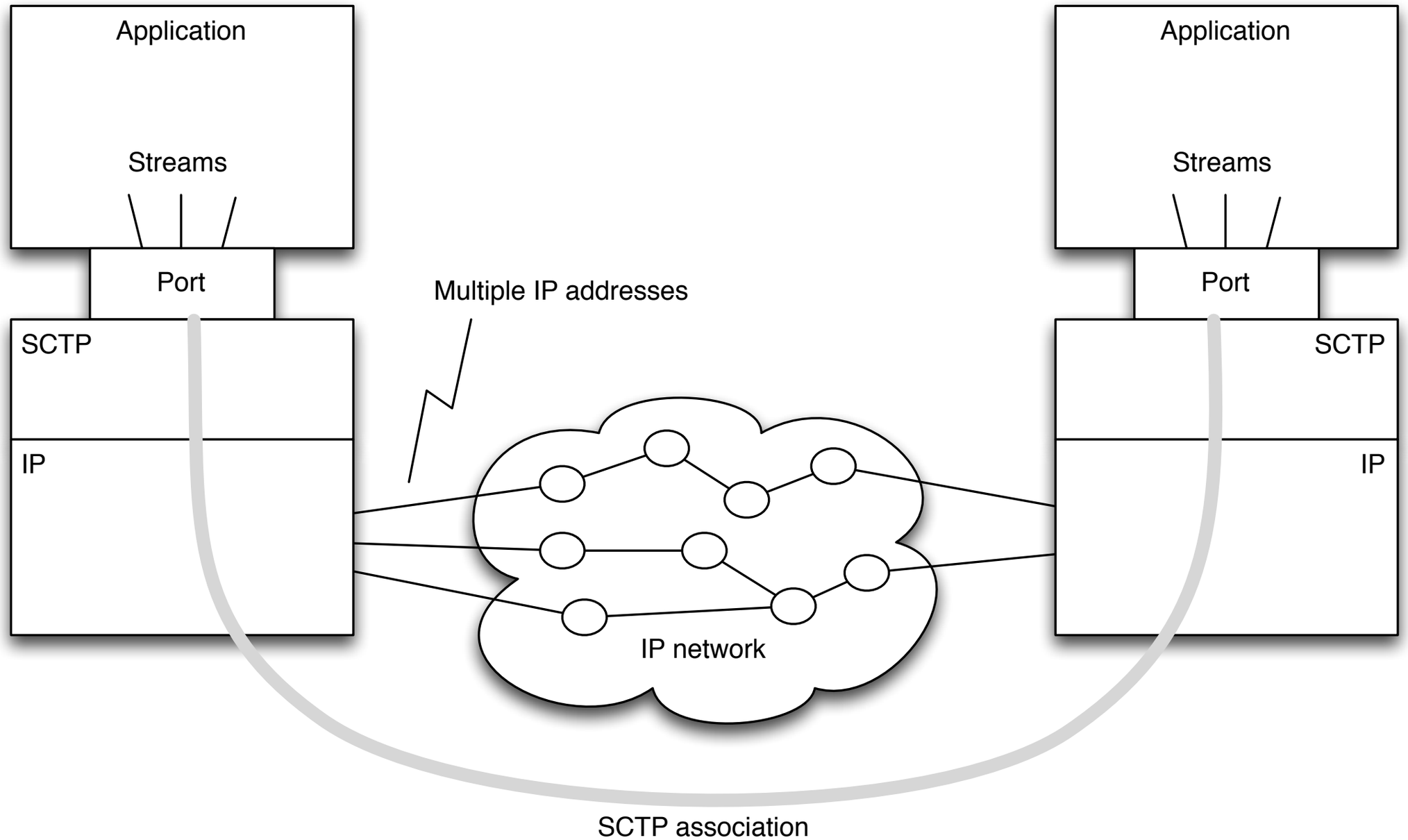
Overview

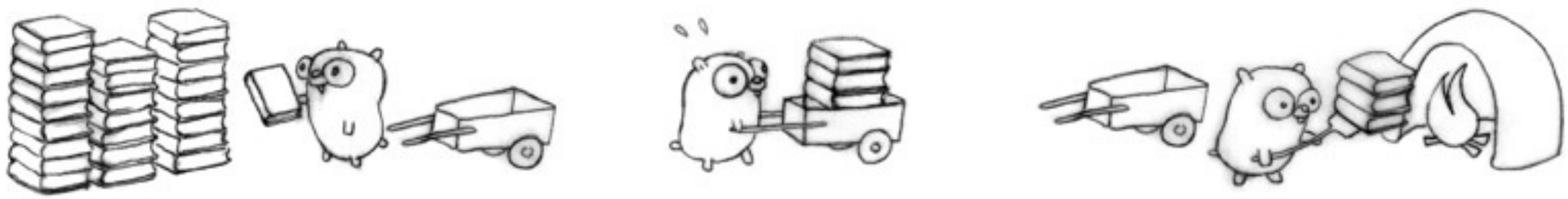
SCTP & Go



Birds eye view SCTP

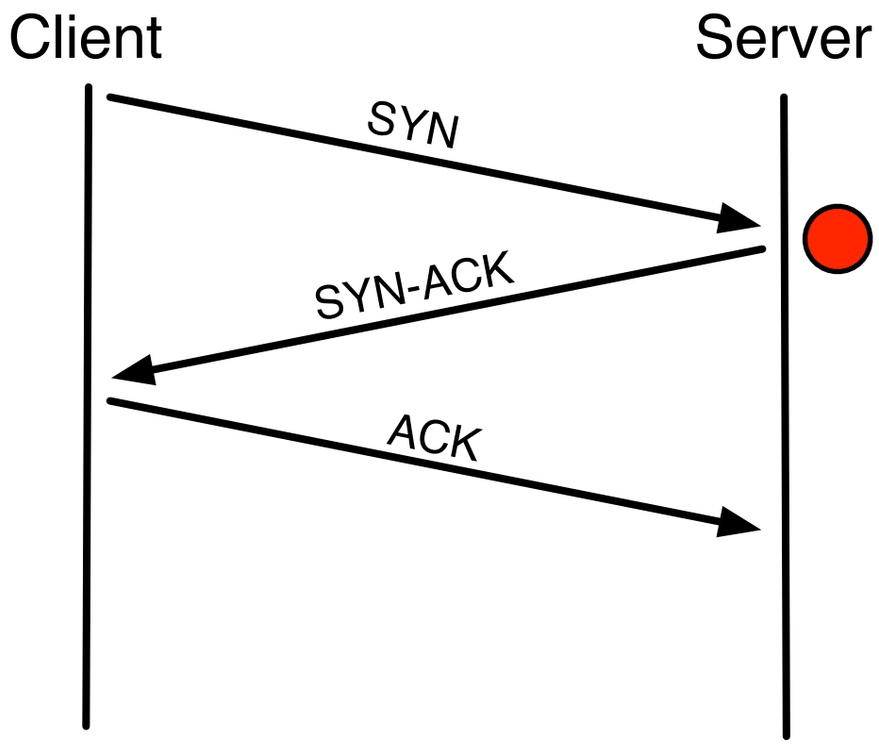
Associations


Application
Streams
Port
SCTP
IP
Multiple IP addresses
IP network
Application
Streams
Port
SCTP
IP
SCTP association

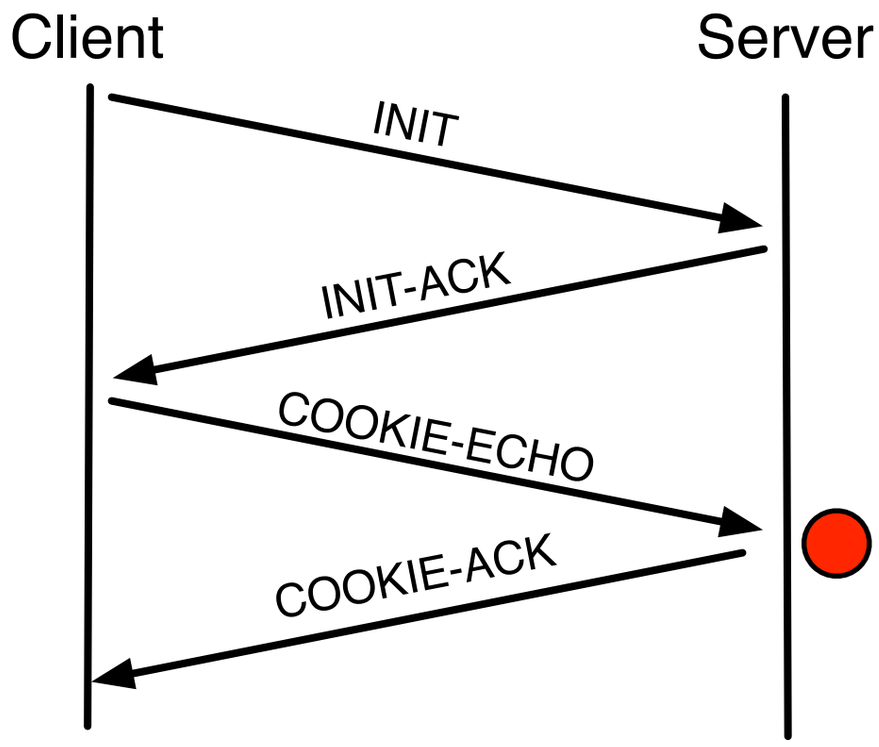


Messages

Connection

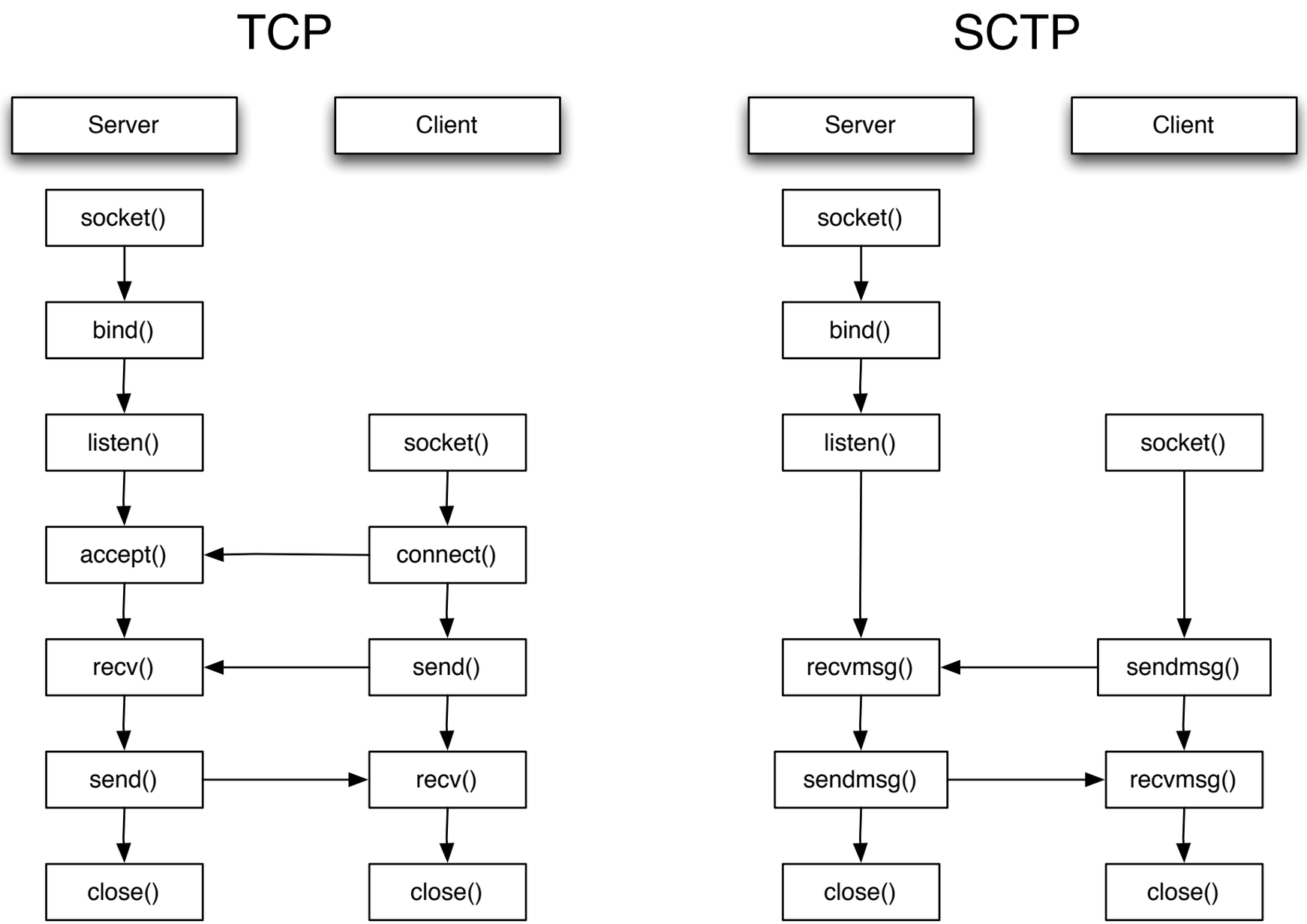


TCP 3 way handshake

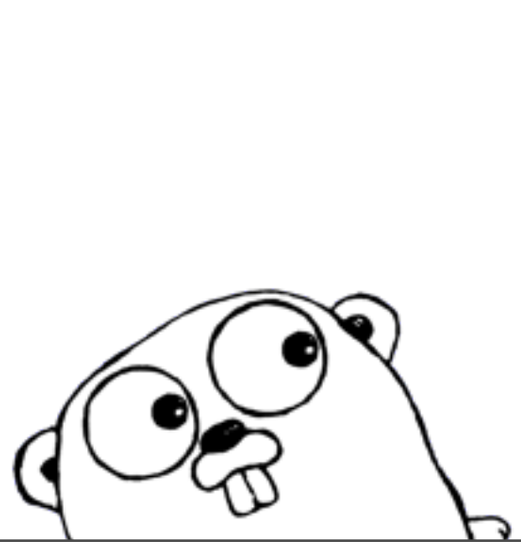


SCPT 4 way handshake

Socket API


TCP
Server
Client
socket()
bind()
listen()
accept()
recv()
send()
close()
socket()
connect()
send()
recv()
close()
SCTP
Server
Client
socket()
bind()
listen()
recvmsg()
sendmsg()
close()
socket()
sendmsg()
recvmsg()
close()

Birds eye view Go



Data

```
var number int
var first_name, last_name string
var p *[]int = new([]int)
var v  []int = make([]int, 100)
```

Functions

```
func hello(name string, count int) (greeting string, err error) {
   if count = 0 {
      return nil, errors.New("Cannot say hello zero times")
   }
   greeting = "Hello" + name, nil
   return
}
```

Functions

```
greeting, err := hello("paard", 0)
if err != nil {
  println("error!")
} else {
  println(greeting)
}
```

Functions

```
greeting, _ := hello("paard", 1)
```

Structures

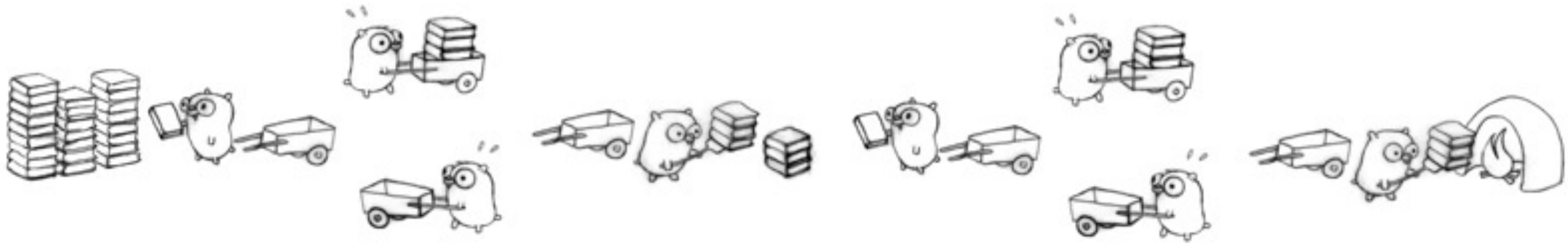
```
type Person struct {
  name string
  age int
}
```

Structures

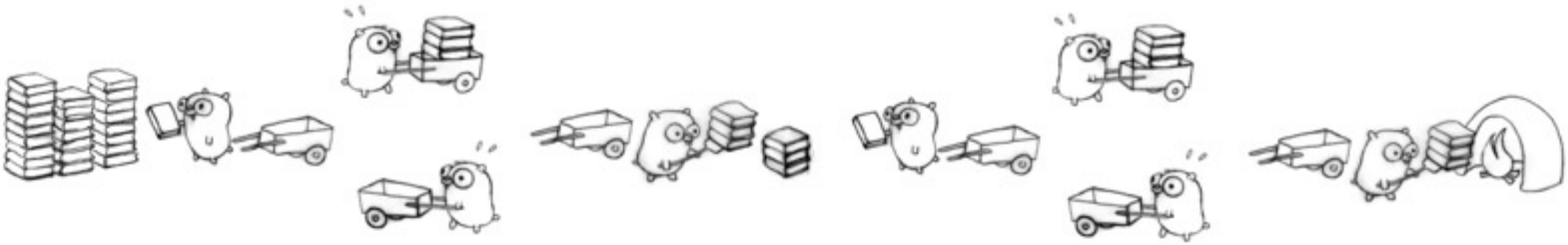
```
func (p Person) SayHello(name string) {
  return "Hello " + name ", my name is " + p.name
}
```

Interfaces

```
type animal interface {
  Talk()
}

type Cat

func (c Cat) Talk() {
  fmt.Println("Meow")
}

func main() {
  var c Cat
  c.Talk()
  a := animal(c)   // Cast from cat to animal
  a.Talk()
}
```

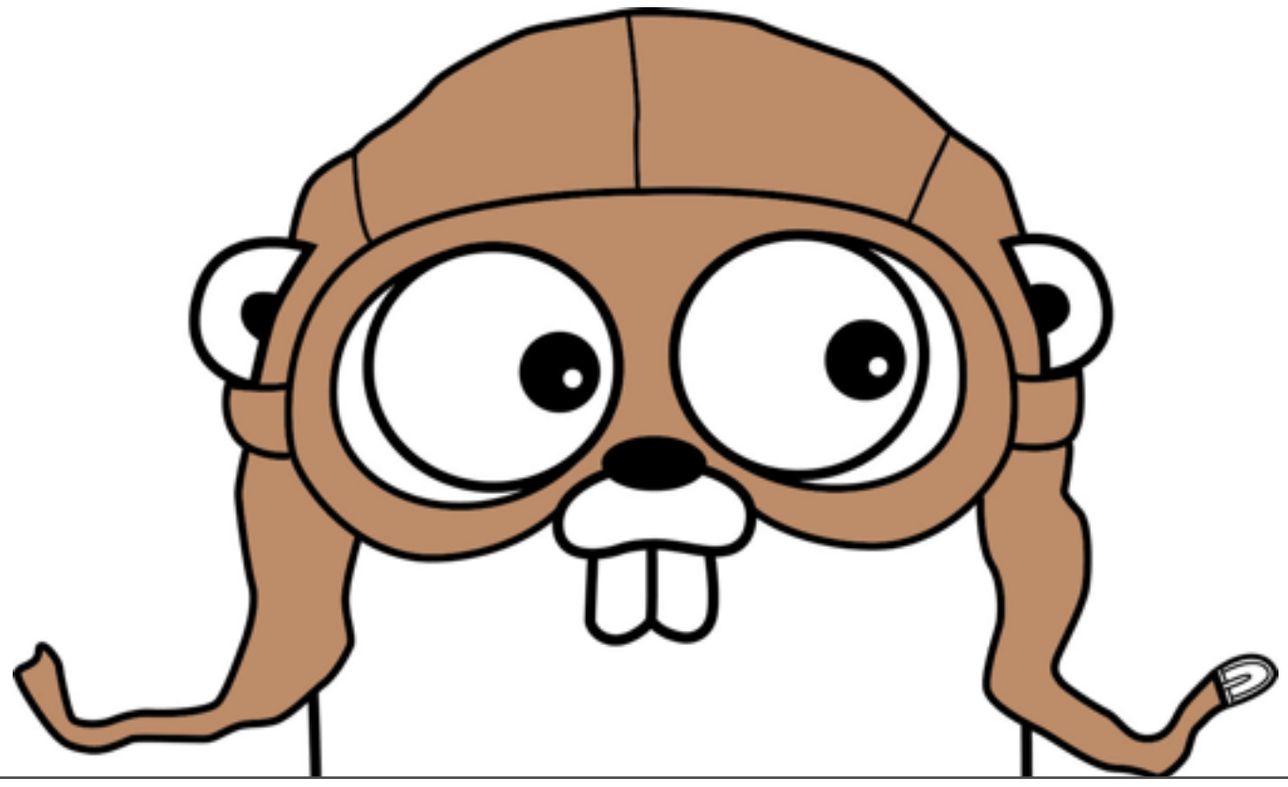


Much more

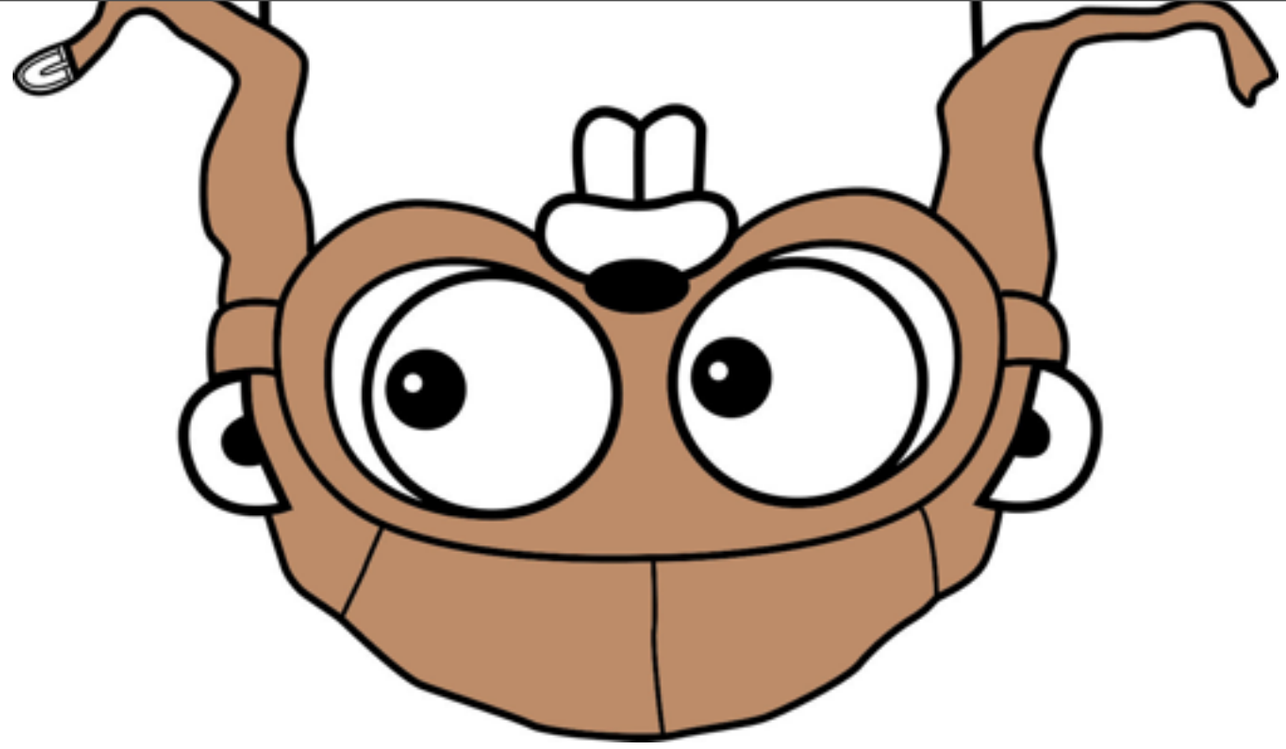


Go Network Library

Client



```
package main
import "net"

func main() {
   conn, err := net.Dial("tcp", "localhost:1234")
   if err != nil {
      return
   }
   defer conn.Close()
   conn.Write([]byte("Hello world!"))
}
```



Server

```
package main
import "net"

func main() {
   listen, err := net.Listen("tcp", "localhost:1234")
   if err != nil {
      return
   }
   buffer := make([]byte, 1024)
   for {
      conn, err := listen.Accept()
      if err != nil {
         continue
      }
      conn.Read(buffer)
      println(string(buffer))
   }
}
```

Extending the Go networking library with SCTP

Typical Server

```
package main
import "net"

func main() {
   conn, _ := net.ListenPacket("sctp", "localhost:4242")
   defer conn.Close()
   message := make([]byte, 1024)
   conn.ReadFrom(message)
   print(string(message))
}
```

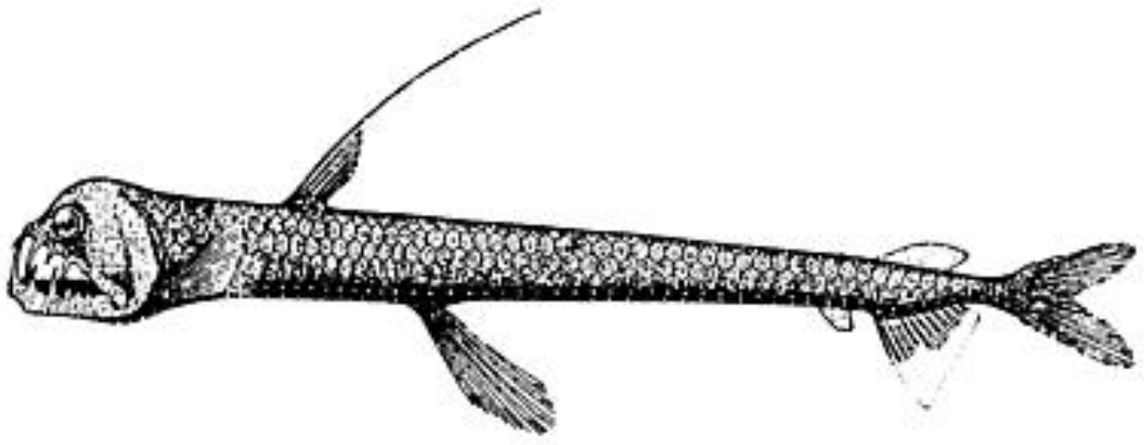
SCTP Specific

```
(*SCTPConn).ReadFromSCTP(message *string)
   (sid int, ssn int, ppid int,
    aid int, addr SCTPAddr, err error)
```

Typical Server

```
package main
import (
    "net"
    "strconv"
)

func main() {
    addr, _ := net.ResolveSCTPAddr("sctp", "localhost:4242")
    conn, _ := net.ListenSCTP("sctp", addr)
    defer conn.Close()
    for {
       message := make([]byte, 1024)
       _, _, stream, _ := conn.ReadFromSCTP(message)
       println("stream " +
                strconv.Itoa(int(stream)) +
                ": " + string(message))
    }
}
```

Bottom up



Handcrafted assembly

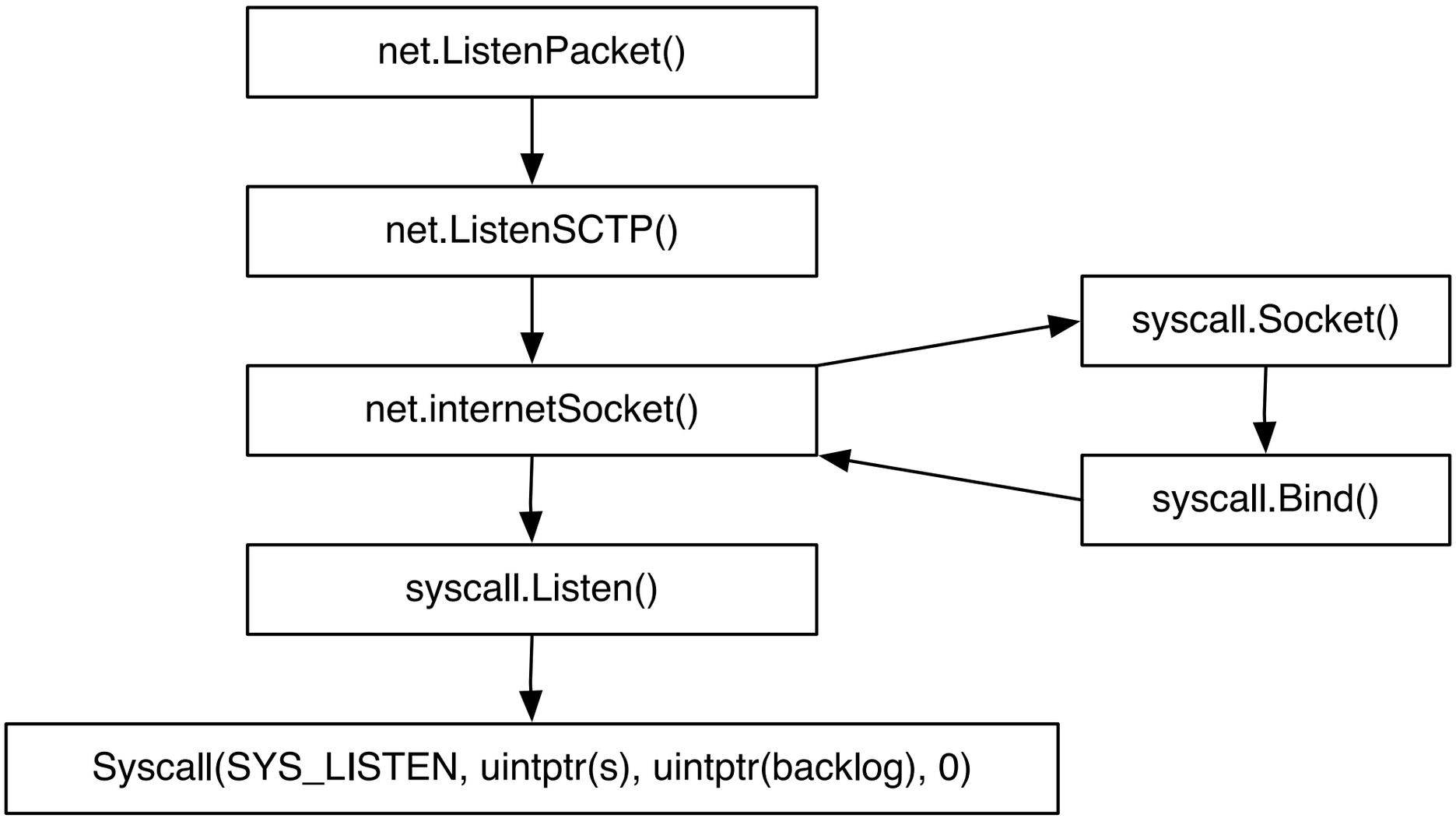
```
TEXT  ·Syscall(SB),7,$0
   CALL  runtime·entersyscall(SB)
   MOVQ  16(SP), DI
   MOVQ  24(SP), SI
   MOVQ  32(SP), DX
   MOVQ  $0, R10
   MOVQ  $0, R8
   MOVQ  $0, R9
   MOVQ  8(SP), AX // syscall entry
   SYSCALL
   JCC ok
   MOVQ  $-1, 40(SP) // r1
   MOVQ  $0, 48(SP)  // r2
   MOVQ  AX, 56(SP)  // errno
   CALL  runtime·exitsyscall(SB)
   RET
ok:
   MOVQ  AX, 40(SP)  // r1
   MOVQ  DX, 48(SP)  // r2
   MOVQ  $0, 56(SP)  // errno
   CALL  runtime·exitsyscall(SB)
   RET
```

Auto generated functions

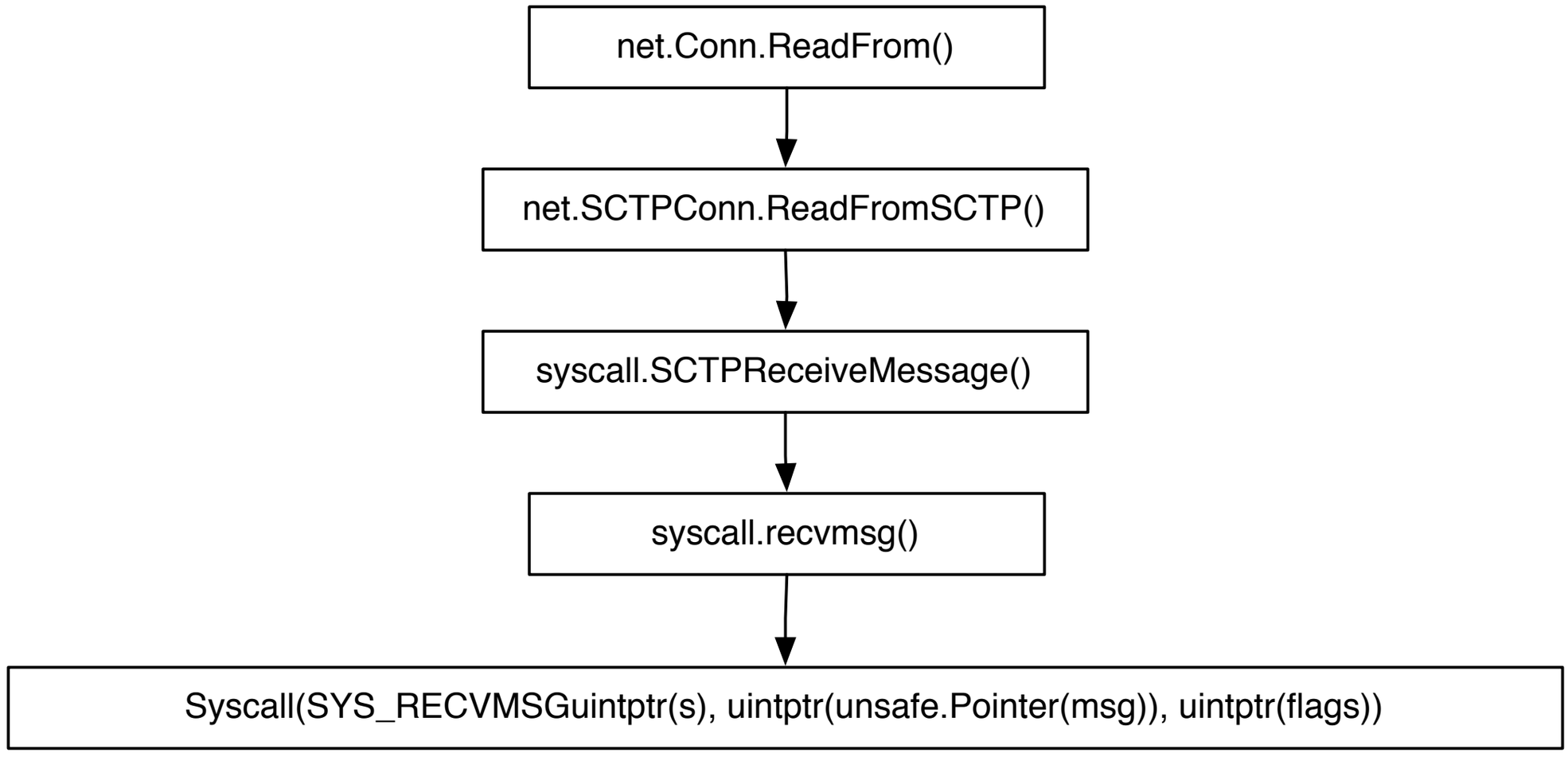
```
func sendmsg(s int, msg *Msghdr, flags int) (err error) {
  _, _, e1 := Syscall(SYS_SENDMSG, uintptr(s),
              uintptr(unsafe.Pointer(msg)), uintptr(flags))
  if e1 != 0 {
    err = e1
  }
  return
}
```

Add structures for ancillary data

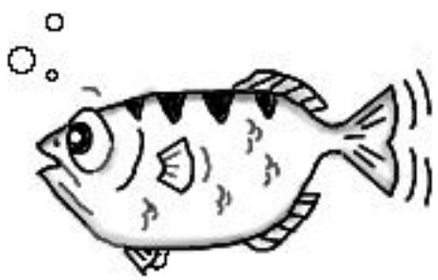
Setting up

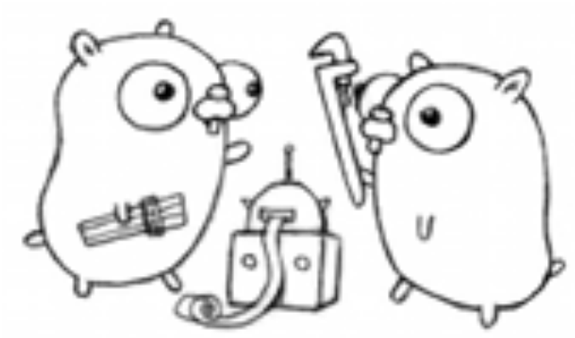

net.ListenPacket()
net.ListenSCTP()
net.internetSocket()
syscall.Socket()
syscall.Bind()
syscall.Listen()
Syscall(SYS_LISTEN, uintptr(s), uintptr(backlog), 0)

ReadFrom


net.Conn.ReadFrom()
net.SCTPConn.ReadFromSCTP()
syscall.SCTPReceiveMessage()
syscall.recvmsg()
Syscall(SYS_RECVMSGuintptr(s), uintptr(unsafe.Pointer(msg)), uintptr(flags))

Demo debug session





Future work

More...

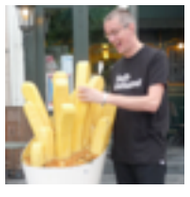
http://cyberroadie.wordpress.com

@cyberroadie

https://github.com/cyberroadie

https://bitbucket.org/cyberroadie/go-sctp

olivier@robotmotel.com



http://www.cyberroadie.org

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