Serving Web Content with Dynamic Process Networks in Go

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Compositional concurrency

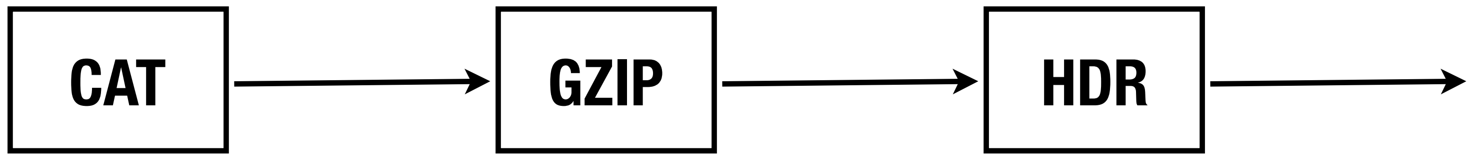
- Unix Pipes and Filters:

```
tr -c A-Za-z ‘\n’ | sort | uniq -c | sort -nr
```

- Message = stream of bytes
- Simple and understandable

Building a web server

- Tractable
- Explicit
- Avoid wizardry

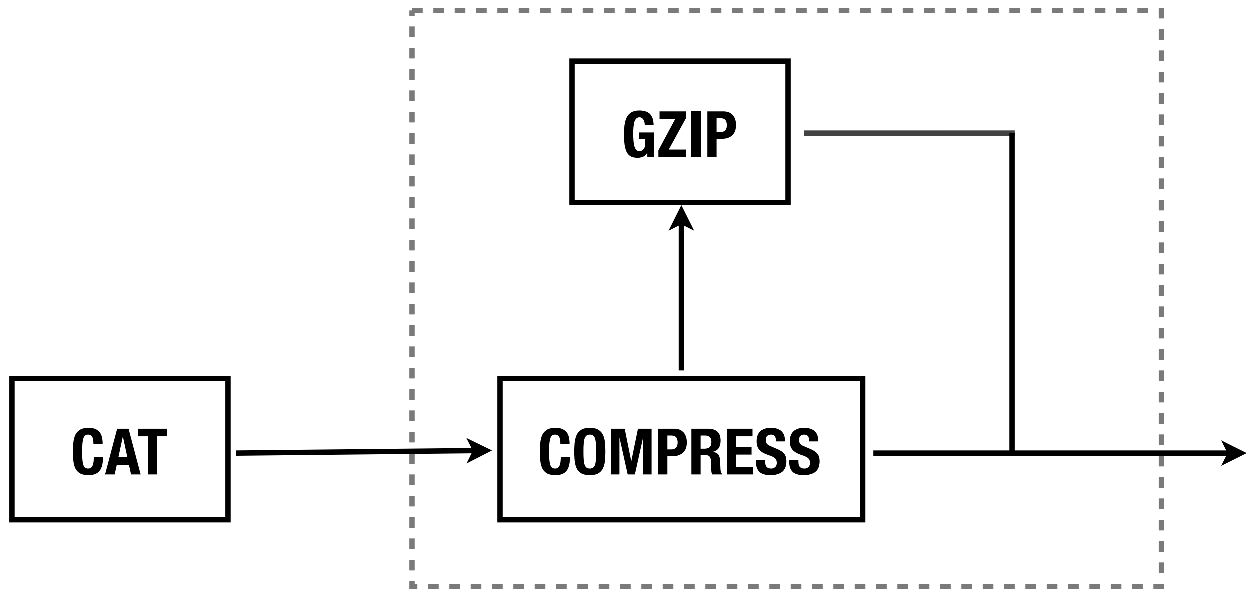


```
HTTP/1.0 200 OK
CONTENT-ENCODING: GZIP
CONTENT-LENGTH: 4109
CONTENT-TYPE: TEXT/HTML; CHARSET=UTF-8
DATE: FRI, 20 MAY 2011 12:33:38 GMT
LAST-MODIFIED: MON, 14 FEB 2011 12:25:42 GMT

WO?6?;?W?@?A??E▯N6?&?Z????EW
                            ?@K?ŘU??C
? ??{W?????;?/▯O/Q?+M?>{ZF?(I2}~????%?▯}????OHJE?W?:I??(*?O$?J??W'???D?*?
B?CV?_G~?3?}M???ꞆS|ZZ?Y[)R<??ZN[)鍜P?TV?^?4?F??JZ?R|3??Z?GG?????麑EڿQ??
O8???:??в????NG?%?Ç^PIE1?2???Z?X??J=??OWJ?#??1???Ɠ??8?T??V?U|??-?K??A4I????
S???\U?+?+???????-?
                                                             P??K?E=O???
```

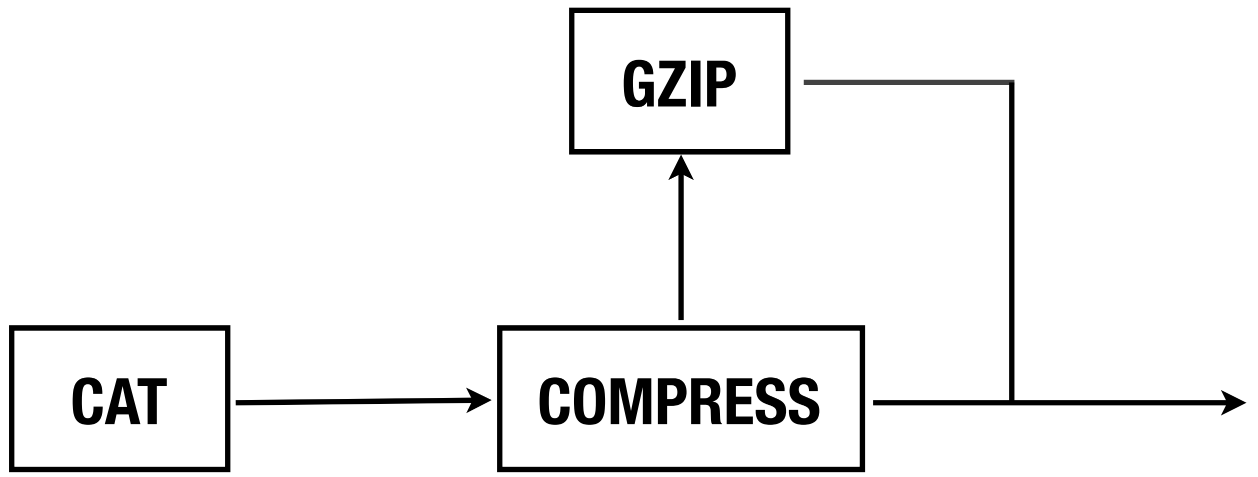
- Message = header + stream of bytes
- Component-specific headers

Component networks

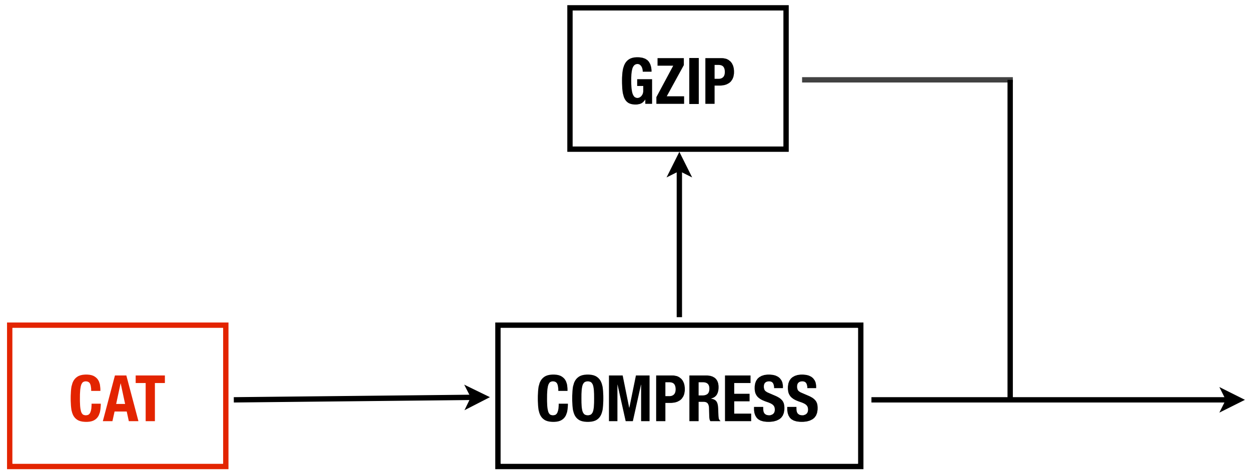


- Two stages
- All possible paths

Handling a request



Handling a request



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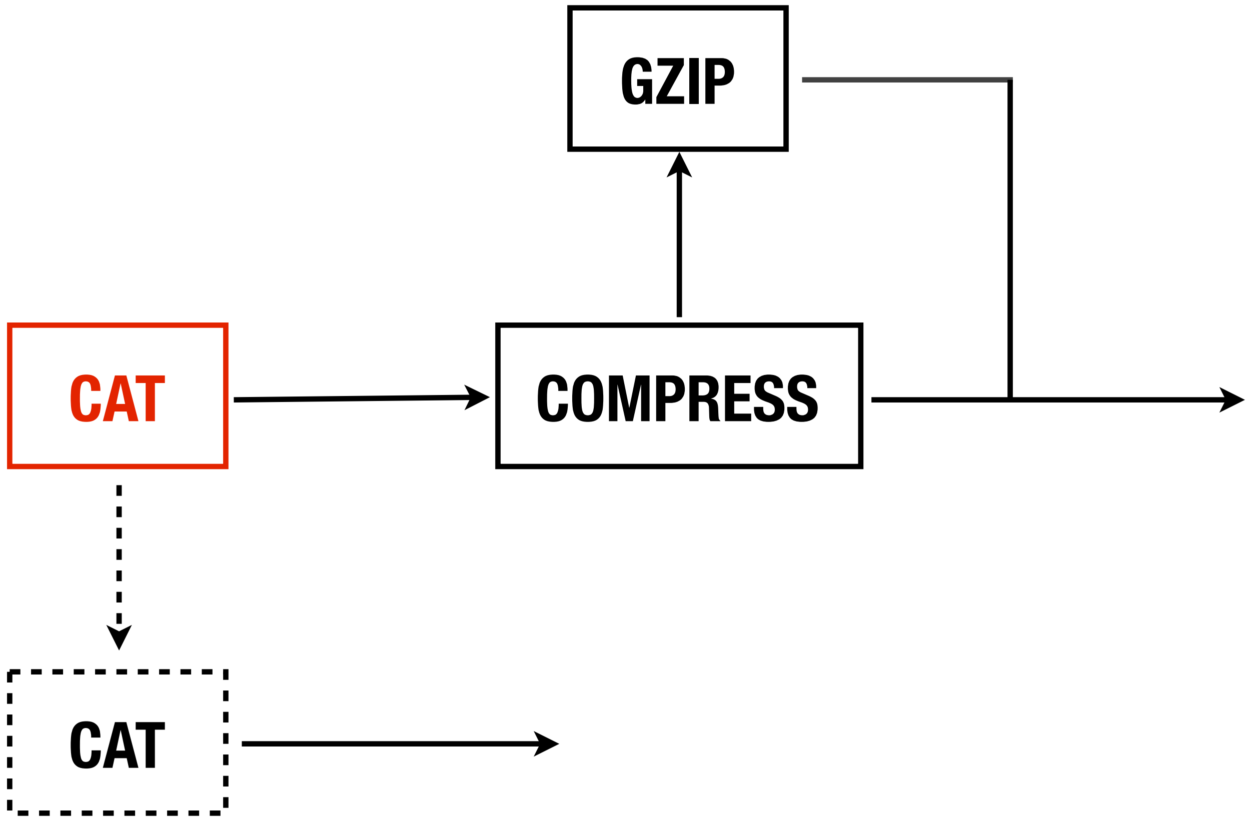

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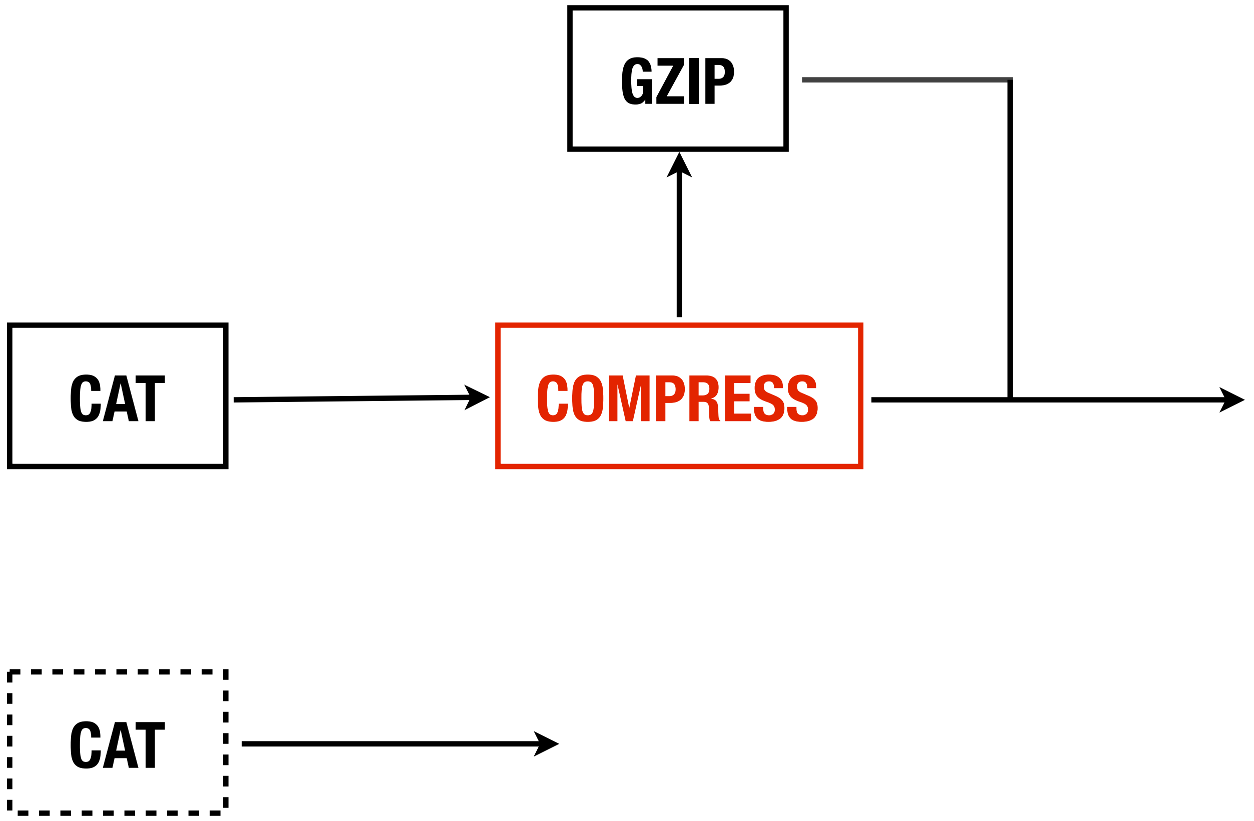

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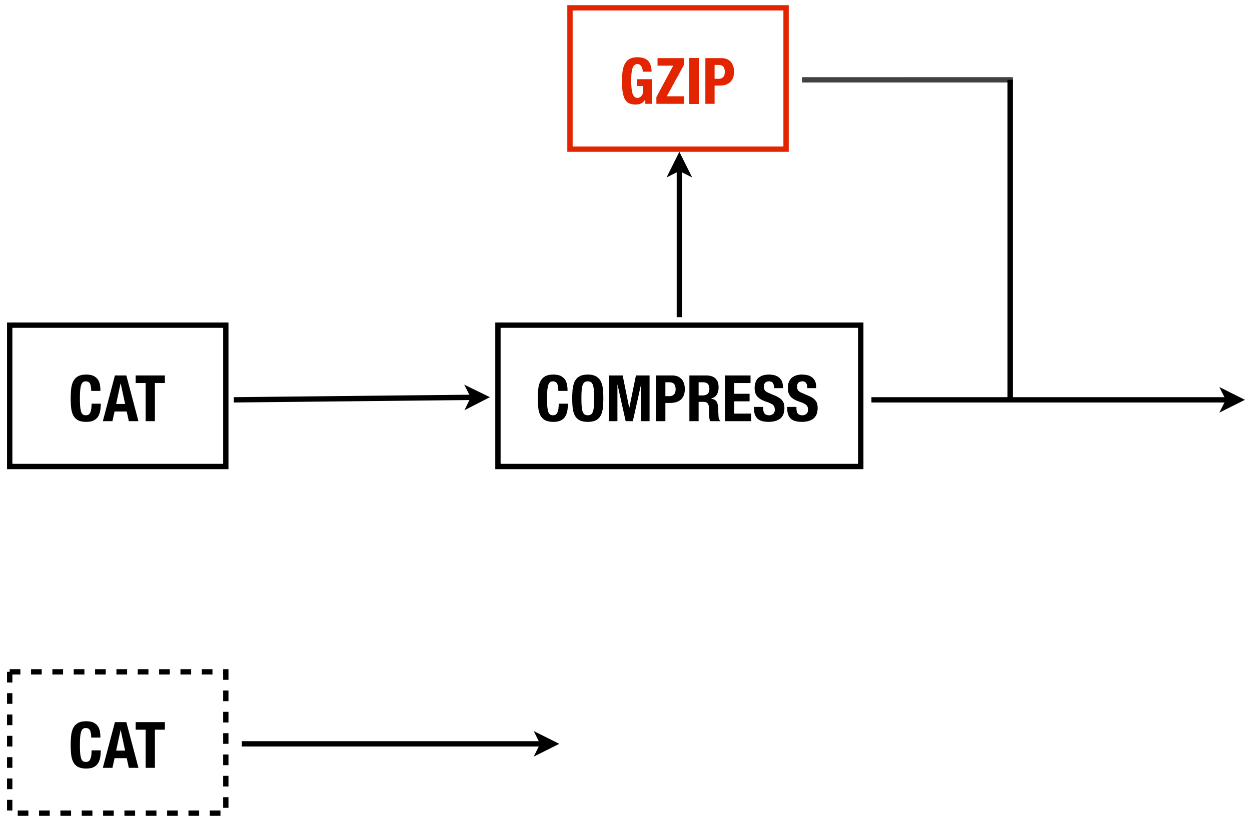

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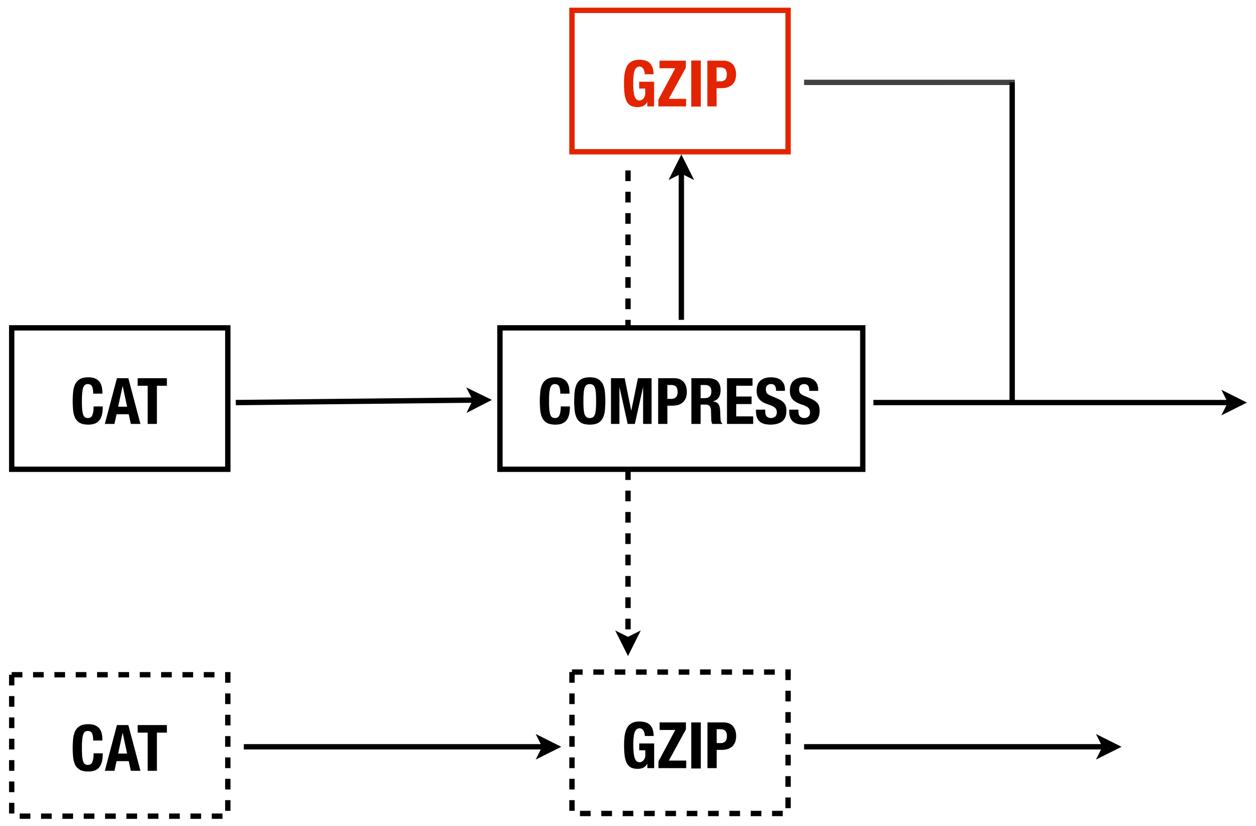

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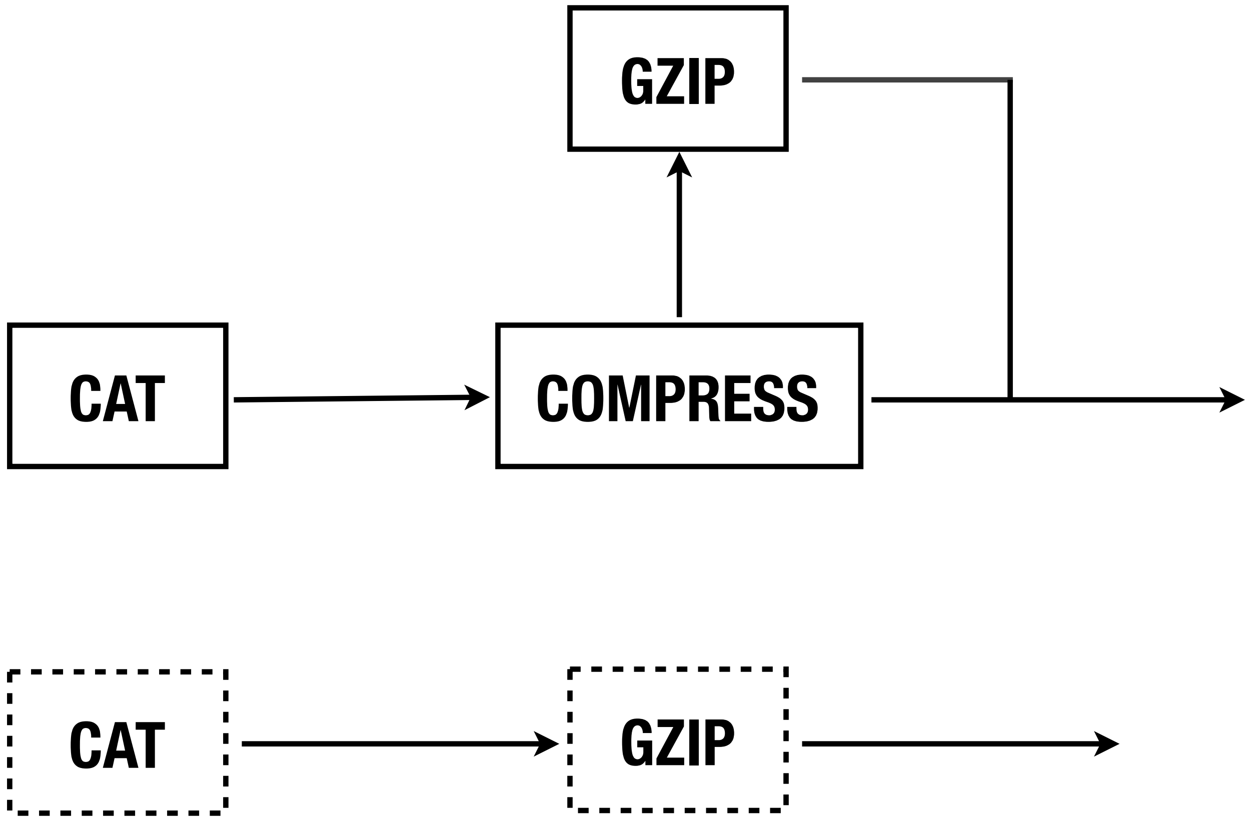

Source component

```go
func Cat(conn *Conn, writer io.WriteCloser) bool {
    conn.status = http.StatusOK
    conn.SetHeader("Content-type", "text/html; charset=utf-8")

    generate := func() {
        WriteFromFile(writer, "index.html")
        writer.Close()
    }

    go generate()
    return true
}
```

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Filter Component

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func Gzip(c *Conn, rd io.ReadCloser, wr io.WriteCloser) bool {
     c.SetHeader("Content-Encoding", "gzip")

     transform := func() {
         WriteGzipped(wr, rd)
         rd.Close()
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Creating a webpipes server

```
func main() {
     http.Handle("/", webpipes.Chain(
         webpipes.FileServer("http-data", "/"),
         webpipes.CompressPipe,
         webpipes.OutputPipe,
     )
     http.Handle("/images", ...)

     server := http.Server{
         Addr: ":12345",
     }
     log.Printf("Starting test server on %s", server.Addr)
     err := server.ListenAndServe()
     if err != nil {
         log.Fatalf("Error: %s", err)
     }
}
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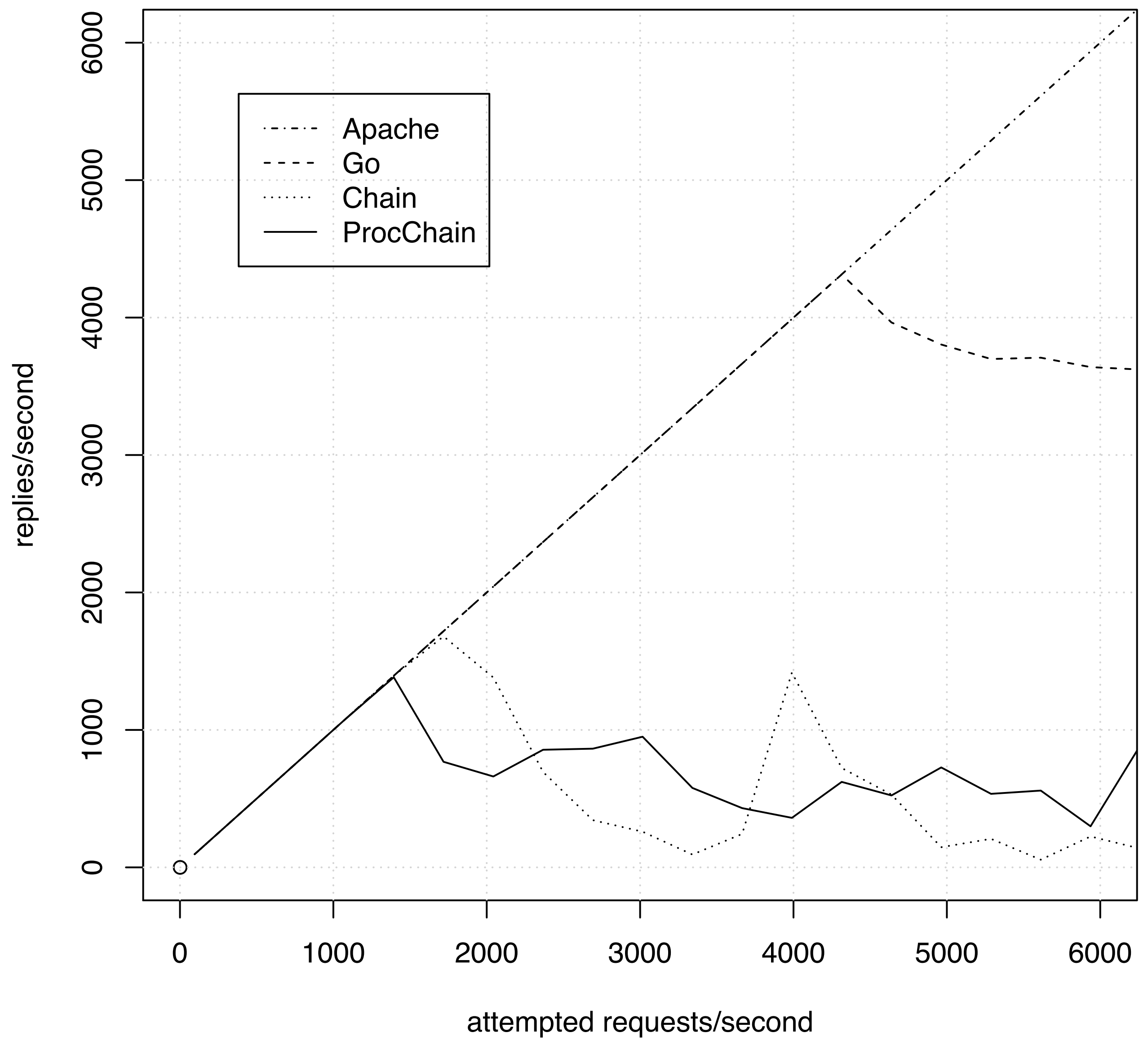
Performance



Conclusions

- Unix pipelines for the web
- Flexible
- Understandable
- Details in the paper...