The Waka Protocol

Roy T. Fielding, Ph.D

Principal Scientist, Adobe Systems

Director, The Apache Software Foundation

Waka

A new protocol designed to match the efficiency of well-designed Web Applications

Why "waka"?

- Mäori word (pronounced "wah-kah") for the outrigger canoes used to travel safely on the Pacific Ocean, across hundreds of islands, to Aotearoa (New Zealand)
- Also, one of the few four-letter words suitable for a protocol name

Deployable within an HTTP connection

- via the HTTP/1.1 Upgrade header field
- defined mapping to HTTP/1.1 for proxies

HTTP

The role of HTTP in Web Architecture

- Extend uniform interface across the net
- Minimize user-perceived latency
- Enable layered processing
- Enable caching
- Enable extension and evolution

Already survived two decades of evolution

- 1991-93: HTTP/0.9 [Berners-Lee]
- 1993-97: HTTP/1.0 [RFC 1945]
- 1996-now: HTTP/1.1 [RFC 2068/2616/HTTPbis]

HTTP Syntax

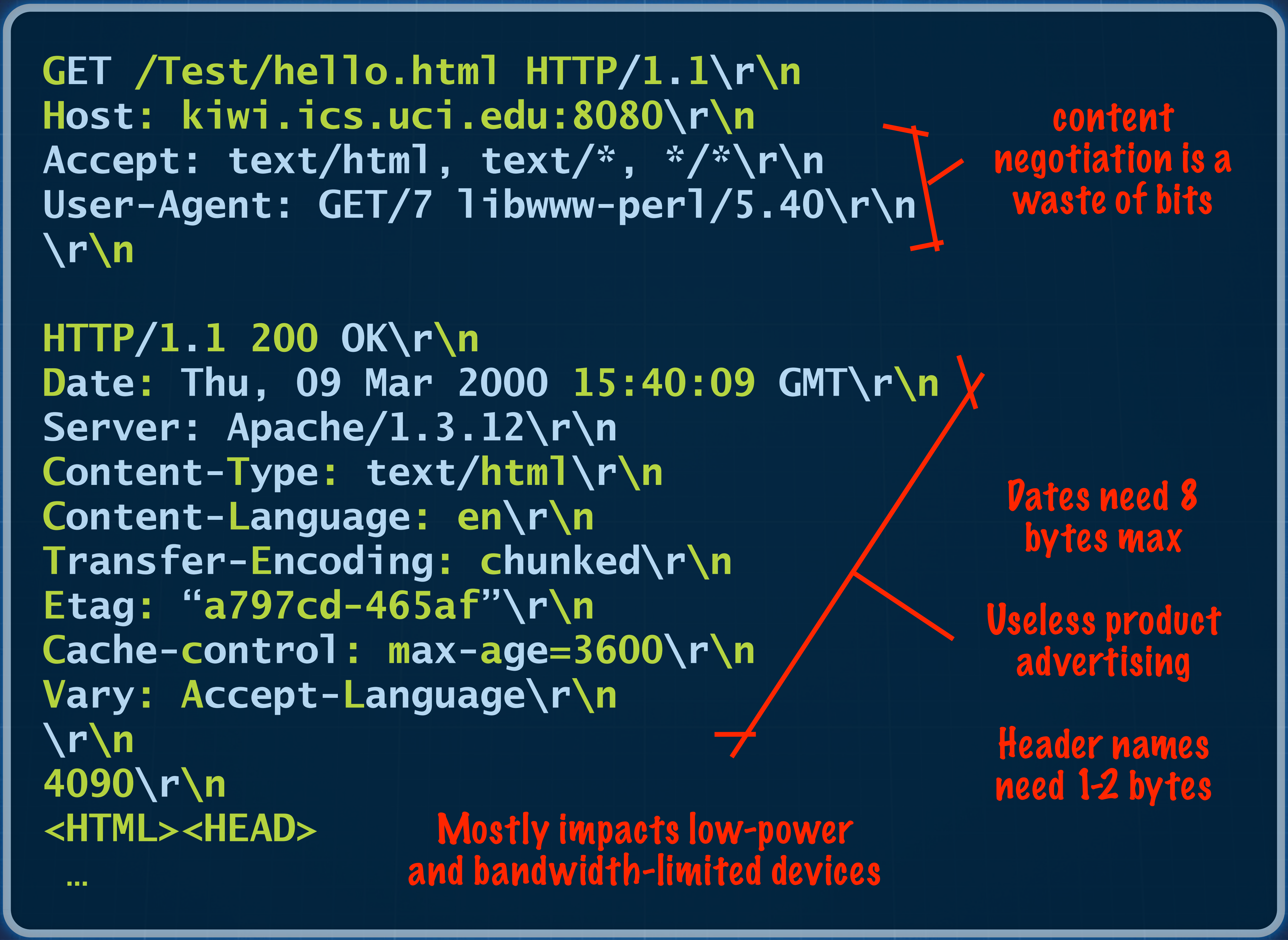
```
GET /Test/hello.html HTTP/1.1\r\n
Host: kiwi.ics.uci.edu:8080\r\n
Accept: text/html, text/*, */*\r\n
User-Agent: GET/7 libwww-perl/5.40\r\n
\r\n

HTTP/1.1 200 OK\r\n
Date: Thu, 09 Mar 2000 15:40:09 GMT\r\n
Server: Apache/1.3.12\r\n
Content-Type: text/html\r\n
Content-Language: en\r\n
Transfer-Encoding: chunked\r\n
Etag: “a797cd-465af”\r\n
Cache-control: max-age=3600\r\n
Vary: Accept-Language\r\n
\r\n
4090\r\n
<HTML><HEAD>
 …
```

typical headers
325-400B +
cookies =
1079 Bytes

typical headers
300-400B + set-
cookies =
3487 Bytes

Issues: Wasted Syntax



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content negotiation is a waste of bits

Dates need 8 bytes max

Useless product advertising

Header names need 1-2 bytes

Mostly impacts low-power and bandwidth-limited devices

Issues: Not Self-descriptive

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```

Control Data

Messages associated by order sent/received

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Data

Message Metadata

Representation Metadata

Resource/SR Metadata

Extensions cannot indicate scope or mandate

Issues: Head-of-Line Blocking

Message Ordering

- Pipelining depends on pairing requests to responses
  - A slow response delays all later requests
  - Servers can't send unsolicited event notifications

Envelope Ordering

- Control data must be sent first
  - server must indicate success before it is actually successful
- Metadata must be sent before Data
  - low-priority metadata is excluded for performance reasons
  - data cannot be sent until all filters supply metadata
  - dynamically generated metadata is lost
- Data must be entirely delivered
  - no signal for abnormal termination
  - limited support for small-memory devices (Range requests)
- Control data cannot be updated to reflect events
  - what if the sender encounters a time-out condition?
  - what if an intermediary is caught in the middle of a bad stream?

Waka

A replacement for HTTP (under development)

- Token-based, length-delimited syntax*
  considering changing this to a derivative of msgpack
- Self-descriptive messages

Interleaved message (meta)data packets:

- Up to 64 channels per connection
- Up to 63 payload streams per message

Complete transport independence

- TCP, UDP, SCTP, TLS, multicast, ...

New Request Semantics

Multiple request targets (GET many subrequests)

Request control data

- request/transaction identifier
- relative priority (high, low, HiLo)
- explicit indication of context (main, embed, js, test)

Methods

- RENDER for display/print/speak this representation
- MONITOR for notify me when resource state changes

Authoring methods (DAV simplified)

- elimination of non-resource identifiers
- reintroduction of PATCH

New Response Semantics

Self-descriptive binding to the request

- Echo of request id, method, target URI
- Cache key explicitly described
  - Caches no longer need to save request fields
  - Caches don't have to guess about Vary info
- Enables asynchronous transport

Response indicates authoritative or not

- Semantics formerly in status code

Unsolicited Responses

- Cache invalidation messages
- Multicast event notices

Waka Syntax

Uniform syntax

- Regardless of message type, direction
- Padding allowed for 32/64bit alignment

Self-descriptive

- Explicit typing for message structure, fields
- Indication of mandate and scope of fields
- Association of metadata (control, resource, rep.)
- Premature termination of request or response

Efficient and Extensible

- Tokens for all standard elements
- A URI reference can be used in place of any token
- Macros (client-defined syntax short-hand)*
- Interleaved data and metadata delivery

Future Plans

① Finish HTTPbis

② Finish drafting Tracking Protection

③ Write a specification for Waka

④ Decide whether to submit it here.