# HTTP Message Signatures

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IETF HTTP WG Interim

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# How HTTP Message Signing works

1. Choose covered portions and crypto parameters
2. Normalize the HTTP message components
3. Generate a signature input string
4. Sign the string creating a signature output
5. Add the signature output and parameters as structured HTTP headers

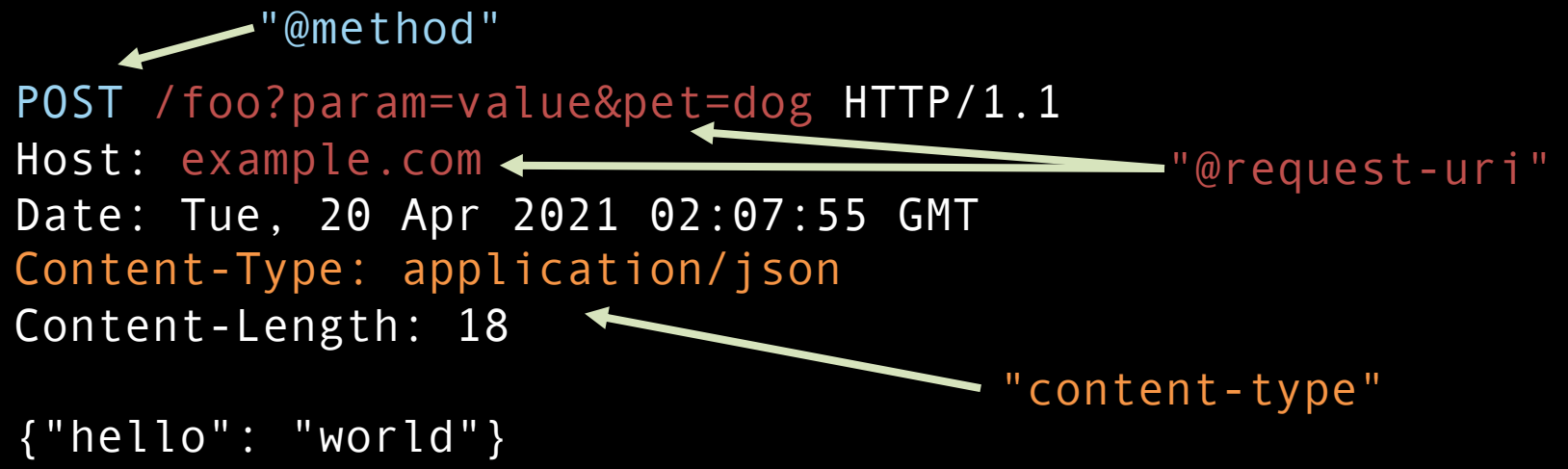
# Example HTTP Message

```
POST /foo?param=value&pet=dog HTTP/1.1
Host: example.com
Date: Tue, 20 Apr 2021 02:07:55 GMT
Content-Type: application/json
Content-Length: 18

{"hello": "world"}
```

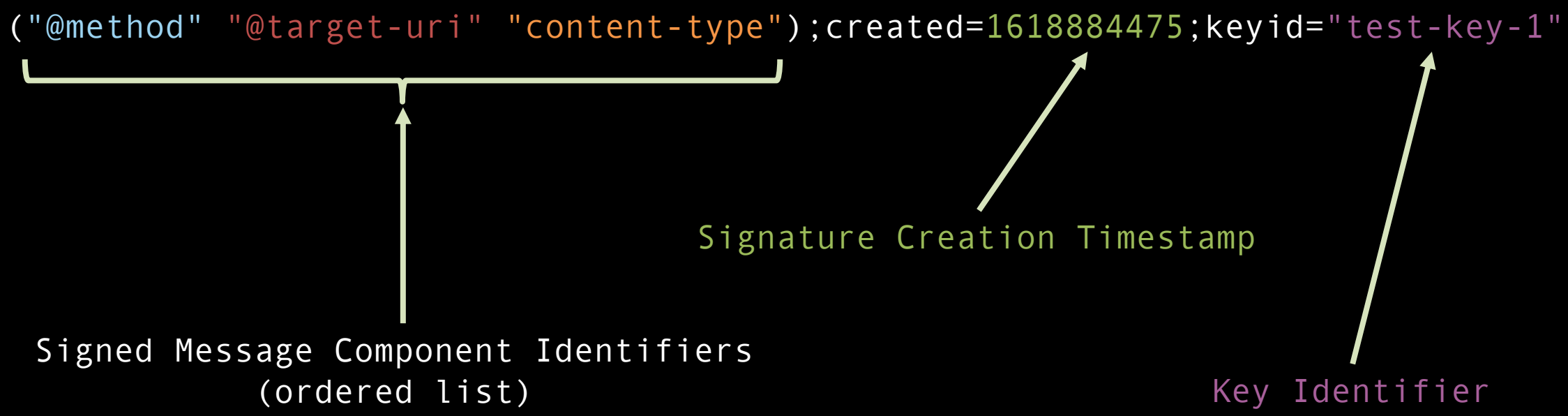
# Sign These Components

```
POST /foo?param=value&pet=dog HTTP/1.1
Host: example.com
Date: Tue, 20 Apr 2021 02:07:55 GMT
Content-Type: application/json
Content-Length: 18

{"hello": "world"}
```

# Message Component Identifiers



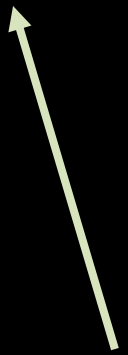
# Signature Input Parameters



# Signature Input Types

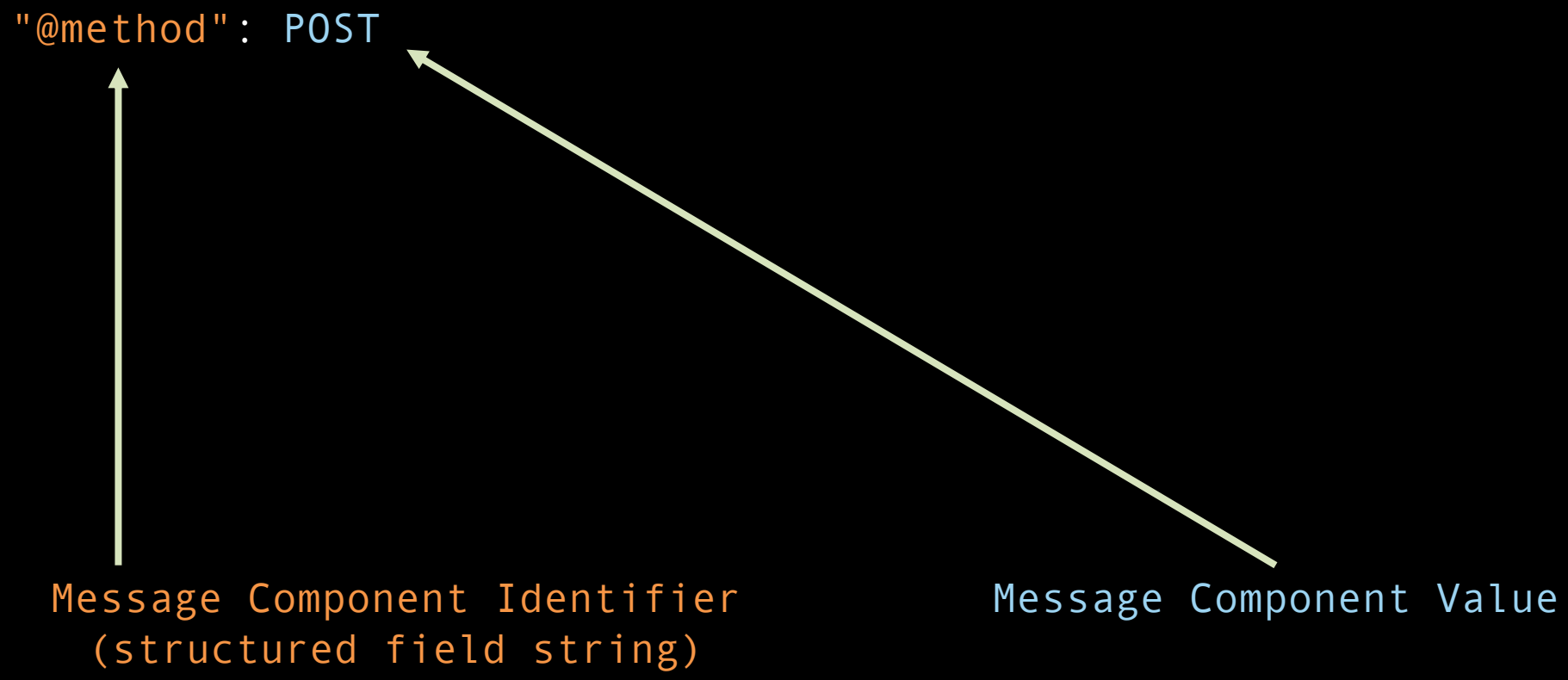
```
"@target-uri": https://example.com/foo?param=value&pet=dog
"content-type": application/json
```

HTTP Message Field

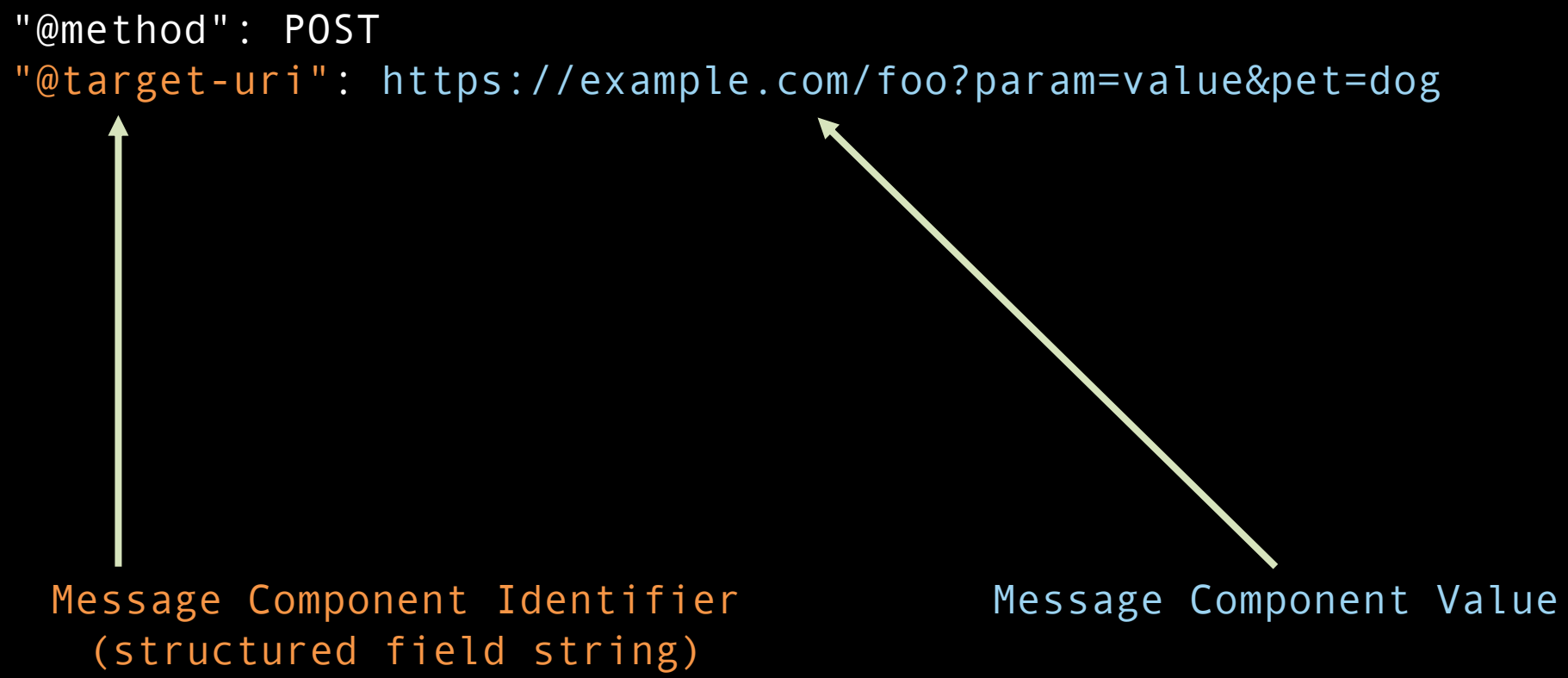


Specialty Component
(Derived from message)

# Signature Input String

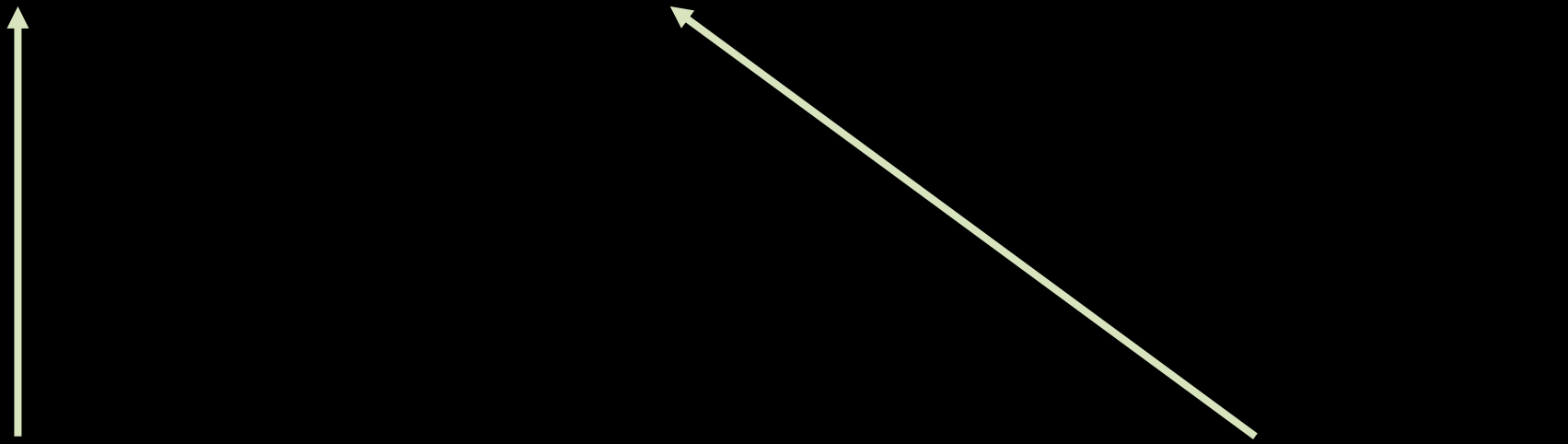


# Signature Input String



# Signature Input String

```
"@method": POST
"@target-uri": https://example.com/foo?param=value&pet=dog
"content-type": application/json
```

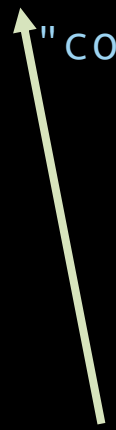


Message Component Identifier (structured field string)

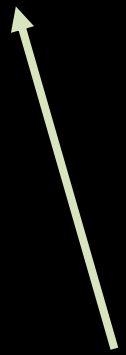
Message Component Value

# Signature Input String

```
"@method": POST
"@target-uri": https://example.com/foo?param=value&pet=dog
"content-type": application/json
"@signature-params": ("@method" "@target-uri"
 "content-type");created=1618884475;keyid="test-key-1"
```



Message Component Identifier
(structured field string)



Message Component Value
(newline added for readability)

# Signature Input String

```
"@method": POST
"@target-uri": https://example.com/foo?param=value&pet=dog
"content-type": application/json
"@signature-params": ("@method" "@target-uri"
  "content-type");created=1618884475;keyid="test-key-1"
```

# Signature Bytes

Lu2cC2Ifw3hkpXt8iC9g78qppHzEUo7hPyeFmDNqkMe4AvPzhz8cRhI1+eI
BisvM7ceDh4Om0RmKjA5CUL5TFs9NuUHC0xuZZeiy5u7THftAZZU6LgwRyn
MuOZgJAYXYDsGBKfxRkoGKVVEX1lSGi7RVhYl/EgWCJzuIbJ9mLeRxzaXRr
3pZXz5xRaXcsXItpsK3AnWYHoc6YAT9hP5M3oJPeb3KRHoLAn4nheC0kFoy
LzRAf6/BNb4I7JhwqVZMZBlndnI/KTBXoTK7rzYFdpX/Cbtwv+XHgli9QtH
ktw9hXC4Kv4lp2fCGSPJPHKeyrZ0rhCcfe++eJe0Ykm3FIw==

# Signed Request

```
POST /foo?param=value&pet=dog HTTP/1.1
Host: example.com
Date: Tue, 20 Apr 2021 02:07:55 GMT
Content-Type: application/json
Content-Length: 18
Signature-Input: sig1=("@method" "@target-uri"
  "content-type");created=1618884475;keyid="test-key-1"
Signature:
sig1=:Lu2cC2Ifw3hkpXt8iC9g78qppHzEUo7hPyeFmDNqkMe4AvPzhz8cRhI1+eIBisvM7ceDh4Om0
RmKjA5CUL5TFs9NuUHC0xuZZeiy5u7THftAZZU6LgwRynMuOZgJAYXYDsGBKfxRkoGKVVEX1lSGi7RV
hYl/EgWCJzuIbJ9mLeRxzaXRr3pZXz5xRaXcsXItpsK3AnWYHoc6YAT9hP5M3oJPeb3KRHoLAn4nheC
0kFoyLzRAf6/BNb4I7JhwqVZMZBlndnI/KTBXoTK7rzYFdpX/Cbtwv+XHgli9QtHktw9hXC4Kv4lp2f
CGSPJPHKeyrZ0rhCcfe++eJe0Ykm3FIw==:

{"hello": "world"}
```

# How HTTP Message Verification works

1. Read the Signature-Input and Signature header values
2. Validate covered portions and crypto parameters
3. Normalize the HTTP message components
4. Re-generate the signature input string
5. Verify the signature against the signature input string

# Some important aspects

- Detached signature, not encapsulation
- Uses HTTP Structured Fields
- Allows multiple signatures on a message
- Can sign most HTTP parts
- Works for requests and responses
- Relatively robust against common changes

# Since Last We Met

- Solidified algorithm and key selection
- Aligned with HTTP terminology
- Added new specialty components
- Signature negotiation (Accept-Signature)
- Dropped list prefix component indexing
- Expanded examples (especially responses)

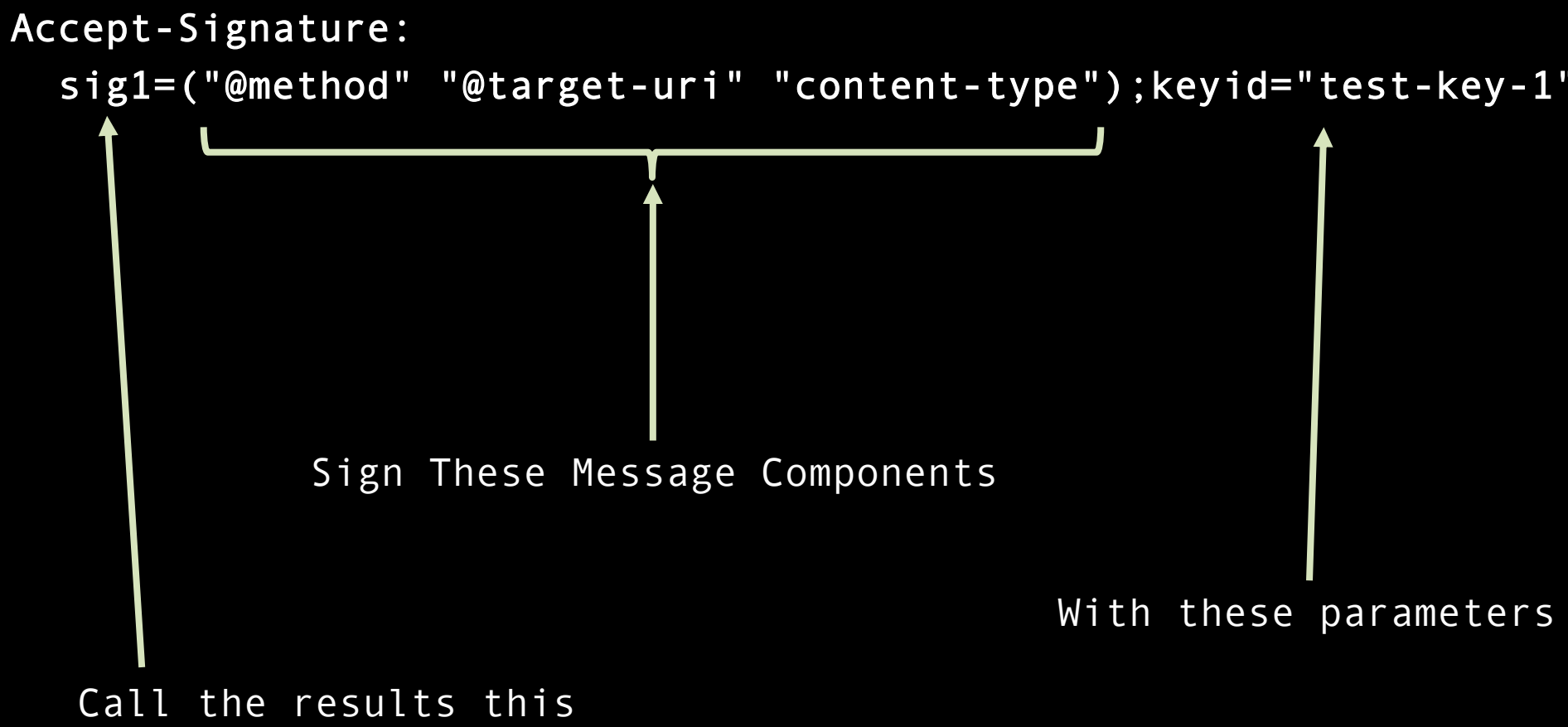
# Specialty Components

- @signature-params
- @method
- @target-uri
- @authority
- @scheme
- @request-target
- @path
- @query
- @query-params
- @status
- @request-response

# Accept-Signature

```
Accept-Signature:
  sig1=("@method" "@target-uri" "content-type");keyid="test-key-1"
```

# Accept-Signature



# Current Status

- Core signature process is *still* stable
- Implementations in several languages
- Seeing more feedback from implementors of older specs (Cavage, OAuth PoP)
- Proposed as basis for new OAuth PoP spec
- Default signature method in GNAP
- Editors writing security and privacy considerations

# Discussion:

Security and Privacy Considerations

# Discussion:

Special case: cookies

# Discussion:

Special case: empty vs. not-present headers

# Discussion:

EdDSA Signing

# Discussion:

Relationship to WPACK / Signed Exchanges

# Discussion:

Implementations

# Next Steps

- Branding and framing
  - Normalization is a bigger part than signing
  - It’s also about verifying signatures
- Guidance to developers on choosing security parameters for their applications
- IANA registry guidelines
- More examples! More code!