REST API Design, Development & Management

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This deck is part of a online course on Summary of a course that covers the A to Z of RESTful API. More information.

REST API Design, Development & Management

Design Practices

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Slides/Discussion from a course that covers the A to Z of RESTful API. More information.

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API Value Chain

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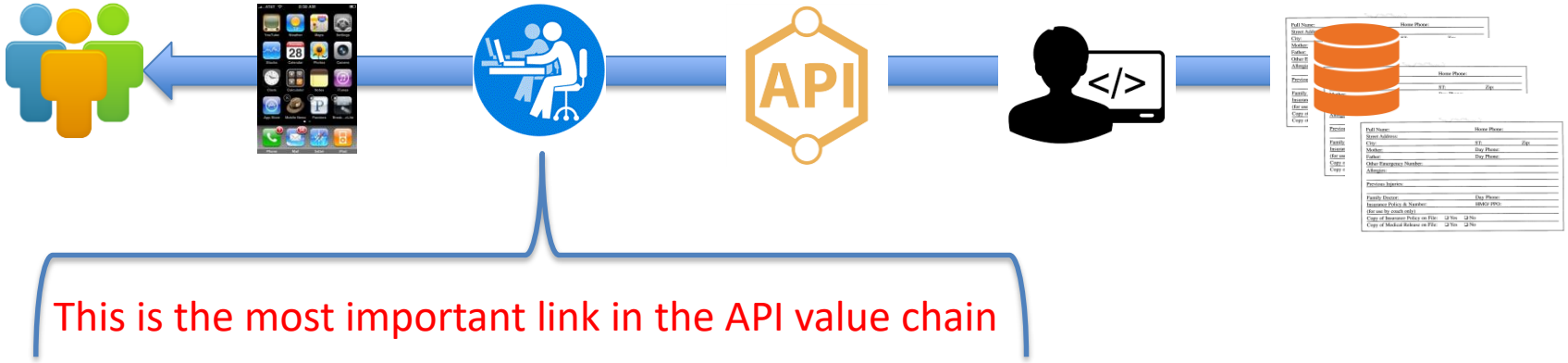

Design your API with the needs of App Developers in mind

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Resource identity, names, actions

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Resource Identity

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API endpoint or URL for the resource

Walmart Open API

https://api.wlmartlabs.com/v1/items

Resource

Base URL

Version

Resource Names

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/items /items/{id}

/people /people/{id}

/programmes /programmes/{id}

Use **NOUNS** to identify the resources

Use of Plural is Suggested

Actions

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API Operation ≠ CRUD

UBER

/estimates/price

/friendships/lookup

Walmart Open API

/search?query

OK to use action as part of resource hierarchy

Or Create an action with subquery

Summary

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1. Create a simple base URL ; subdomain ; separate domain

2. Resources names should be nouns; Use of plurals suggested

3. Actions can be verbs may be standalone

   http://api.acme.com/search

4. URI Pattern for associations; avoid nesting over 3 levels

   http://api.acme.com/vacations/{id}/reviews/{review-id}

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CRUD Operations

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POST Request Handling

Creating a resource

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POST — Creates a resource

/vacations — /vacations/{id}/reviews

Success	Code = 201	• May return a link (id) to new resource in Location header *Location: http://api.acme.com/vacations/121/reviews/2* • May return the new object

Failure	4xx	Bad Request	e.g., 400 missing required field
	5xx	Issue in processing	e.g., 503 database unreachable

GET Request Handling

Reading a resource

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GET — Reads/Retrieves a resource collection or specific resource

/vacations /vacations/{id}

Success	Code = 200 OK	• Send back the response in requested format *GET http://api.acme.com/vacations/121*
Failure	4xx Bad Request	e.g., 404 Resource not found
	5xx Issue in processing	e.g., 500 Internal Server Error

PUT/PATCH Request Handling

Updating a resource

PUT

Updates all attributes of existing resource – effectively replace
Can also CREATE if client provide ID (not suggested)

PATCH

Modifies parts of an existing resource.
PATCH http://api.acme.com/vacations/121?validTill=3/1/2017

Success	Code = 200 Code = 204 No Content Code = 201 Created	• Resource in body of response – OPTIONAL • No need to send the Link – OPTIONAL

Failure	4xx	Bad Request	e.g., 404 Resource Not Found
	5xx	Issue in processing	e.g., 503 database unreachable

DELETE Request Handling

Deleting a resource

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DELETE — Deletes the resource

/vacations — /vacations/{id}

Success	Code = 200 Code = 204	• May return deleted resource in the response body • No returned content = 204

Failure	4xx	Bad Request	e.g., 404 Resource Not Found
	5xx	Issue in processing	e.g., 503 database unreachable

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API Response

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API Response

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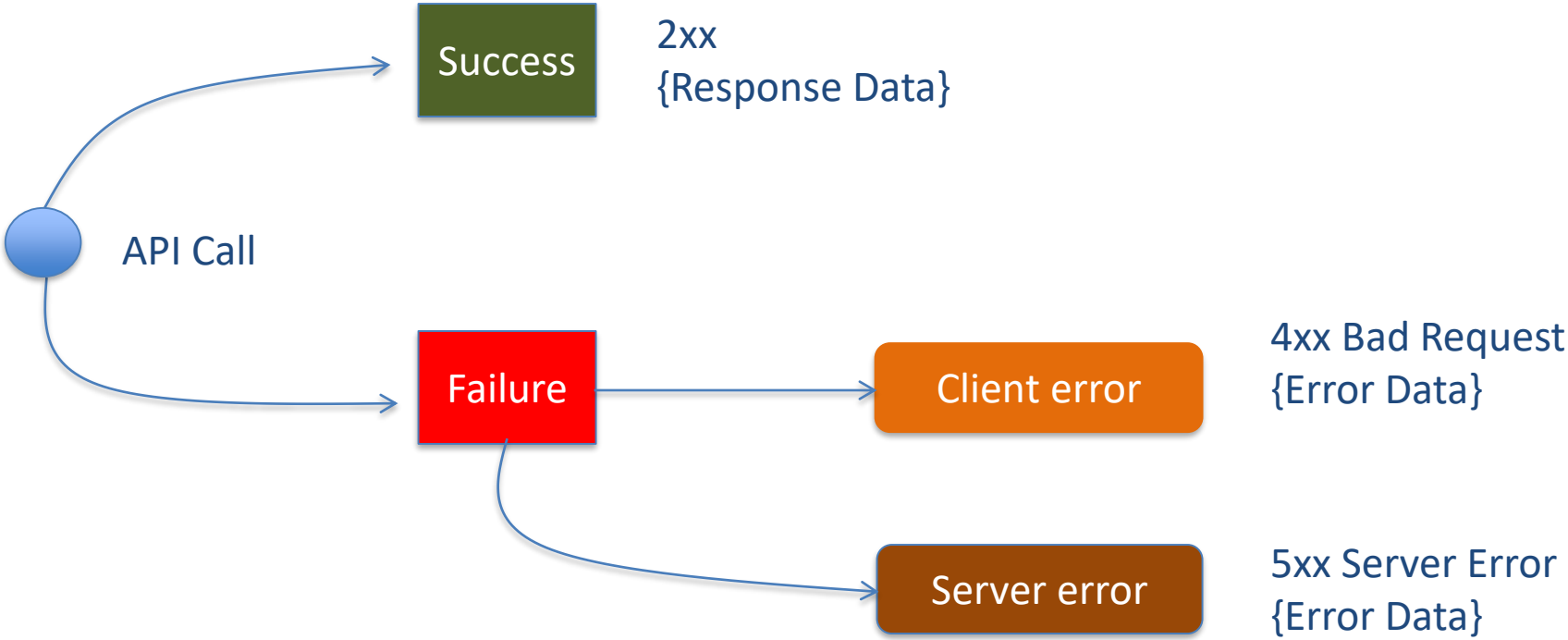

HTTP Status Codes

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- Over 70 status code that are hard to remember
- Decide on the code that you will use for your API
- Common ones

200 OK

201 Created

400 Bad Request

404 Not Found

401 Unauthorized

403 Forbidden

415 Unsupported media

500 Server Error

Restrict the number of HTTP codes to a maximum of 8

MUST use 200/400/500

An Alternate Approach to Error Response

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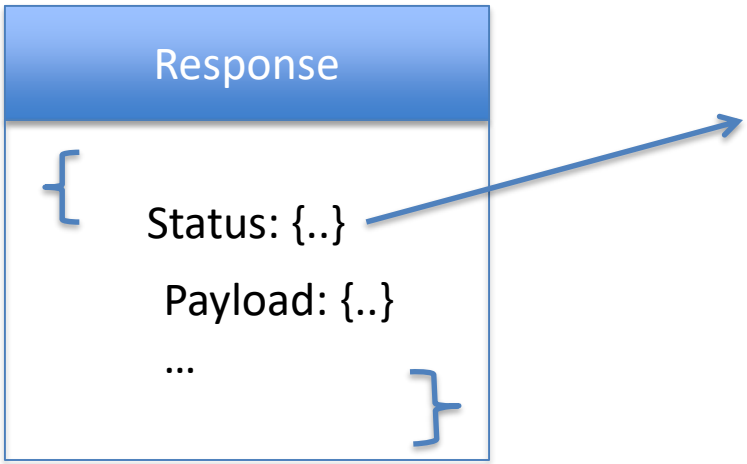
- Always sends back HTTP Status = 200 OK




```
// Meant for the developer
text:message,
timestamp:new Date(),
// POST, GET ....
method:httpMethod,
// Endpoint information
endpoint:endpointInformation,
// An array of all errors
errors : errorList,
// OPTIONAL -
// Use only during development
payload: receivedPayload
```

```
{
    code:7002,
    text:"Required field vacation 'number of nights' is missing",
    hints:["Please check that user has provided a number (between 1 & 31)"],
    info:"http://developer.acme.com/error#RequiredFields"
},
```

```
{
    code:7001,
    text:"Required field vacation 'name' is missing",
    hints:["Please check that user has provided the non null value for 'name'"],
    info:"http://developer.acme.com/error#RequiredFields"
}
```

facebook

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Handling Change

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API Changes

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- Adding a new operation or resource

  GET /hotels

- Adding optional parameters or properties

  GET /vacations?limit=3

Non Breaking

- Change the HTTP verb or methods

  PUT /vacations POST /vacations

- Delete an operation

  GET /vacationsByDestination

Breaking

Handling Change

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- Avoid changes : is the change really adding value?
  1. Eliminate or minimize impact on app developers
  2. Provide planning opportunity to the app developers
  3. Support backward compatibility (if possible)
  4. Provide support to app developers with the changes
  5. Minimize change frequency e.g., once per 6 months

Version your API right from day#1

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API Versioning

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Version Information

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HTTP Header

x-myapi-version: 1.2

Query parameter

/posts?version=1.2

facebook

URL

/v1/products

Multiple Version Support
Key points

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1. Support at least 1 previous version for a period of time
    - E.g., 3 months
2. Mark the previous version as deprecated
    - For new apps developers can access only the latest version
3. Publish a roll out plan in advance
4. Manage changelog that clearly shows the reason for new version

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Caching

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Design Decisions

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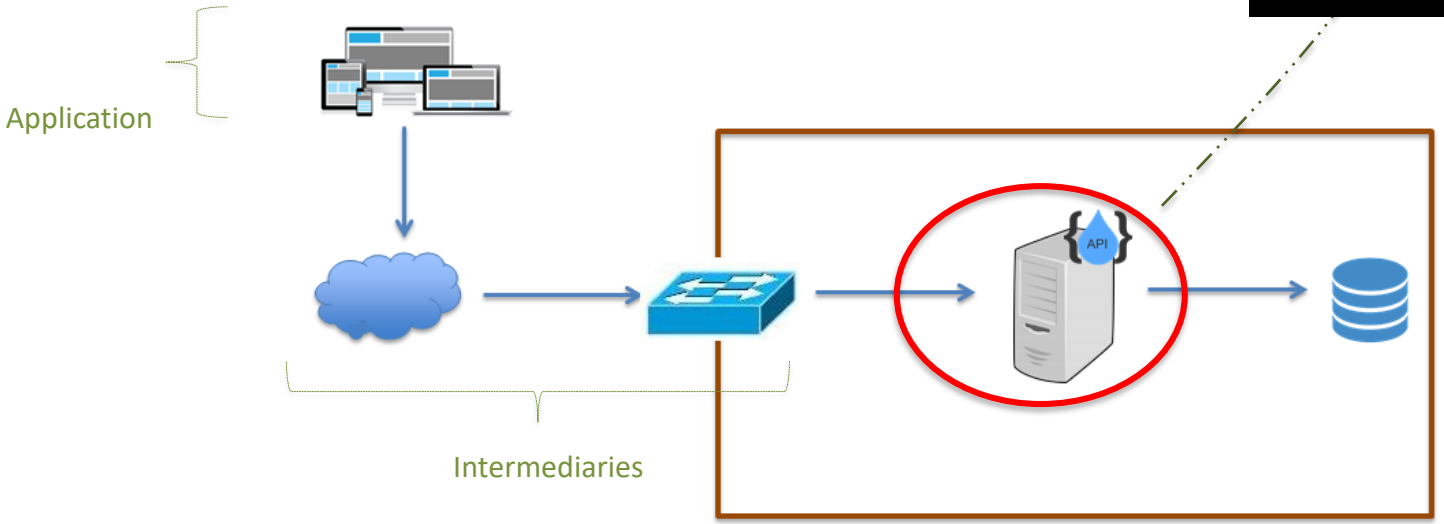
1. Which component should control the caching?
2. What to cache? Who can cache?
3. For how long is the cached data valid?

HTTP Cache Control Directives



Summary

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1. Benefits
   - Enhances performance
   - Leads to higher scalability
2. Data to cache depends on
   - Speed of change
   - Time sensitivity
   - Security
3. Design decisions
   - Who can cache?
   - For how long?

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HTTP Cache-Control

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Cache-Control

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Cache-Control : " directive-1, directive-2, …"

Cache-Control : "private, max-age=60"

Response HTTP Header
Cache-Control: "……."

- Who can cache the response?
- For how long?
- Under what conditions?

Request HTTP Header
Cache-Control: "……."

- Override the caching behavior
- Protect sensitive data from caching

Practices

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1. Take advantage of caching especially for high volume API

2. Consider *no-store* and *private* for sensitive data

3. Provide the validation tag (**ETag**) especially for large responses

4. Carefully decide on the optimal *max-age*

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Partial Response

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Benefits

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- Better performance & optimized resource usage
  - CPU, Memory, Bandwidth
- API consumer controls the granularity
- Common API version for all consumers
  - E.g., to support multiple devices, use cases – form factors

Specification

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/people:(id, first-name, last-name)

/friends?fields=id,name,picture

/pins?fields=id,link,creator(first_name)

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Pagination

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1. Cursors for Pagination

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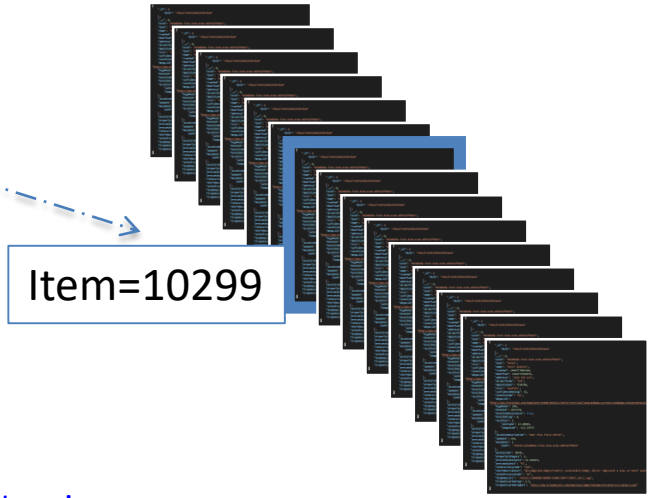
- **Cursor** = “Control structure that enables traversal of records”
- Cursor based pagination considered most efficient

Cursor=“Random string”

Points to a specific item



facebook

https://developers.facebook.com/docs/graph-api/using-graph-api/#paging

2. Offset based pagination

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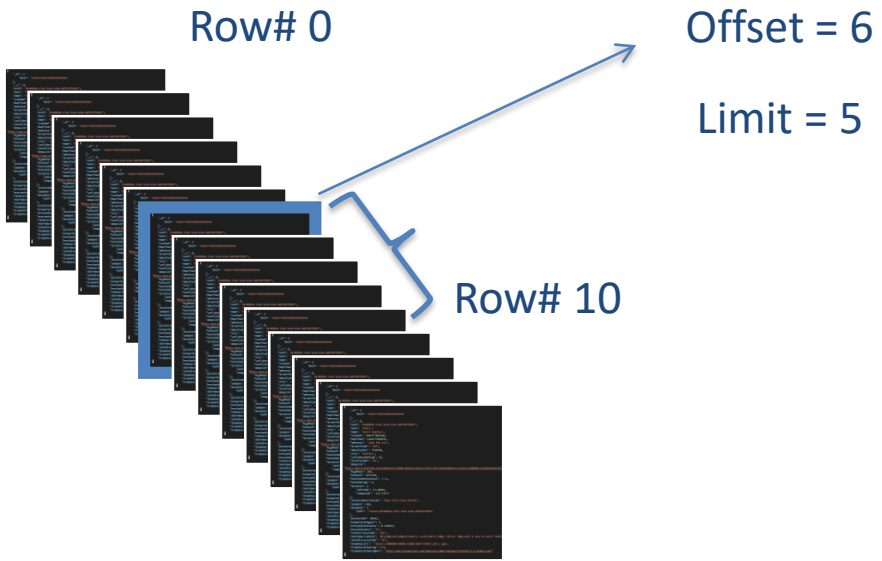
- Commonly used approach

GET /../hotels?offset=6&limit=5



3. HTTP Link Header

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https://api.github.com/search/code?q=addClass

- Use of Link header *a.k.a. web linking*

  https://tools.ietf.org/html/rfc5988

Link to Next page

HTTP Header

```
Link: <https://api.github.com/user/repos?page=3&per_page=100>; rel="next",

<https://api.github.com/user/repos?page=50&per_page=100>; rel="last"
```

Link to Last page

Practices

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- Consider pagination for avoiding large data sets

  Decide on the default page size. May be different for API(s)

- Support for multiple pagination for different resources