REST Assured

Hypermedia APIs with Spring

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Background

REST

REST

Resources

URIs

Uniform Interface

Representations

Hypermedia

Hypermedia

"HATEOAS - the word, there's no pronounciation for.

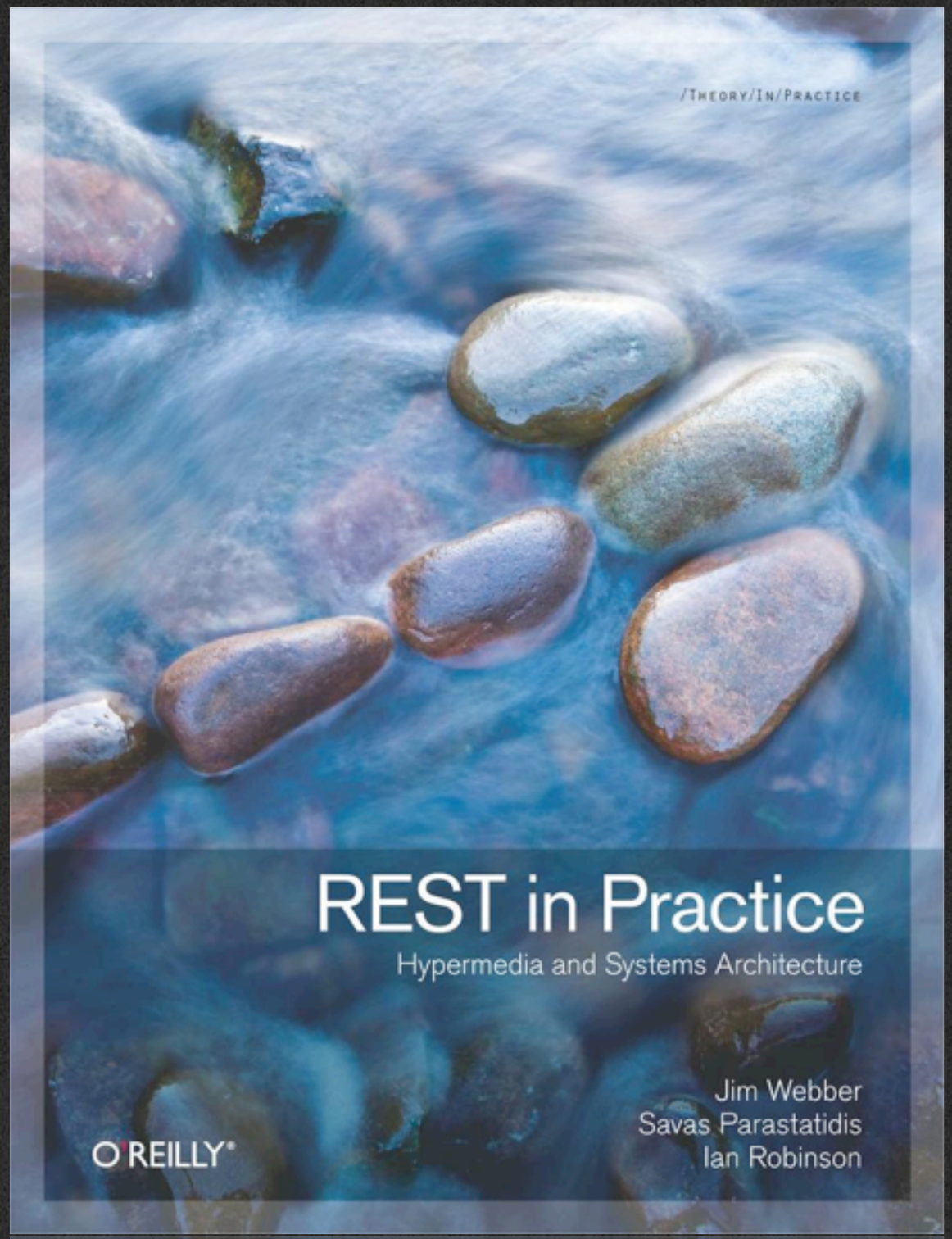
(Ben Hale, SpringOne2GX 2012)

Hypermedia

Links in representations

State navigations discoverable

REST in practice


/Theory/In/Practice
REST in Practice
Hypermedia and Systems Architecture
Jim Webber
Savas Parastatidis
Ian Robinson
O'REILLY®

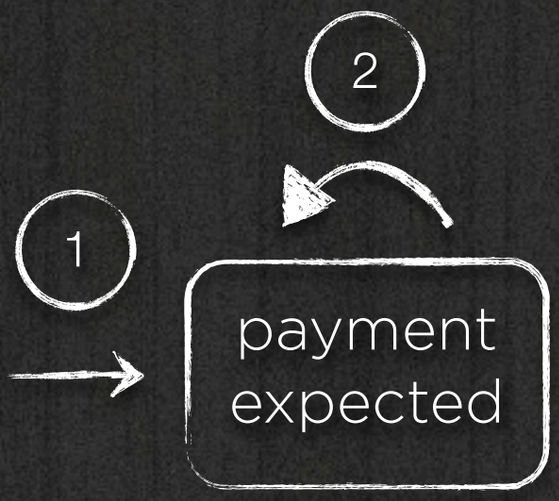
RESTBucks

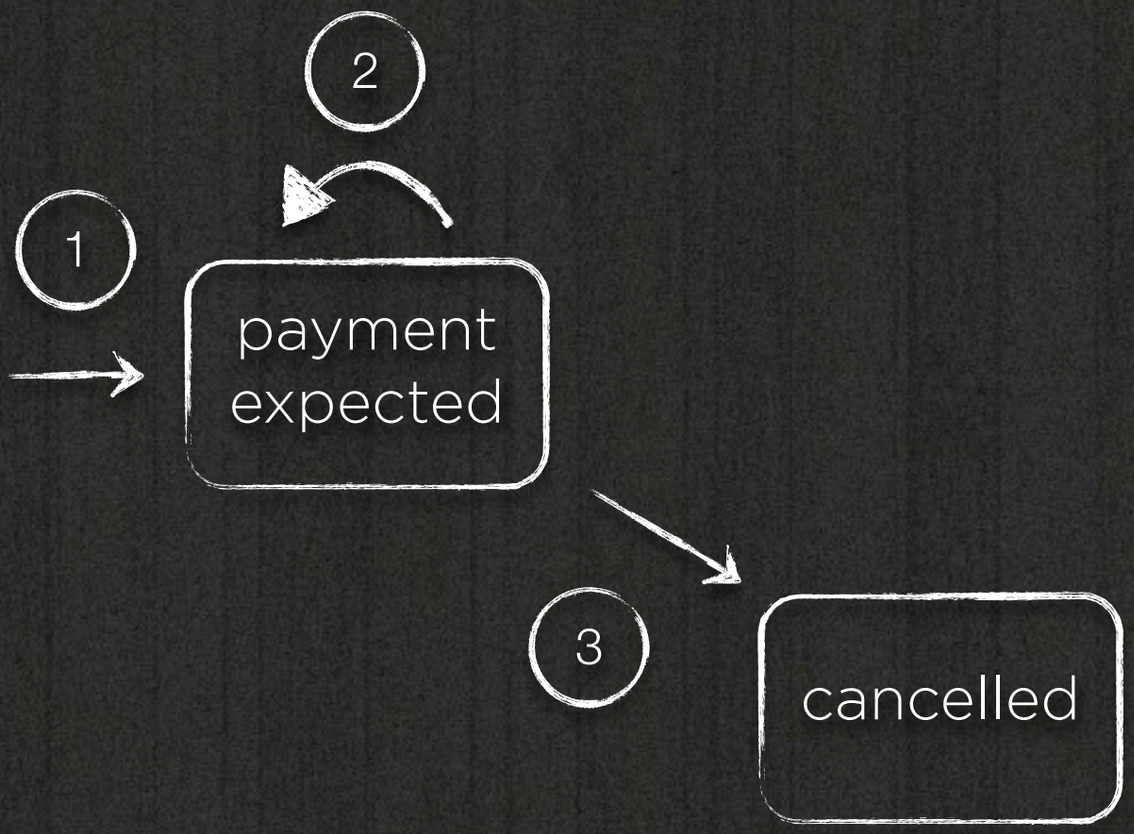
RESTBucks

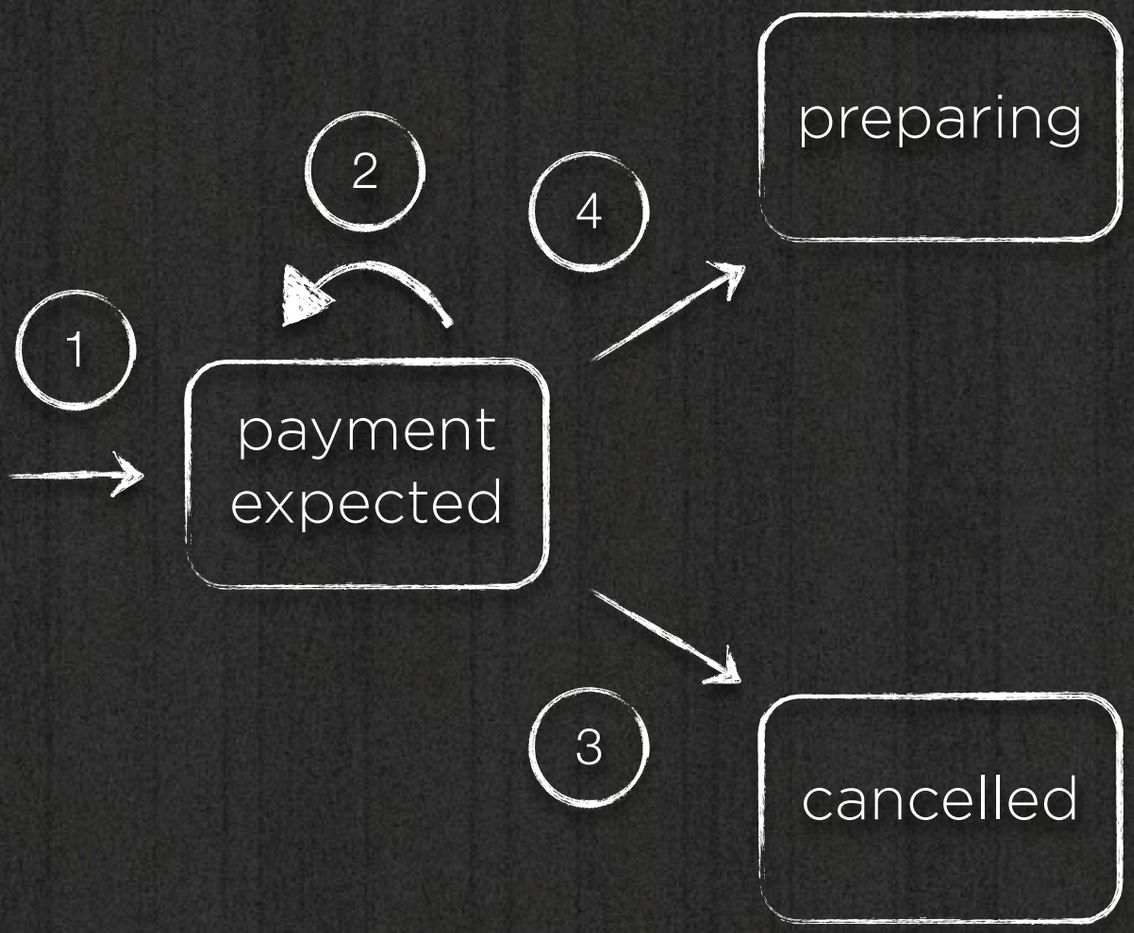
Starbucks (like) coffee ordering

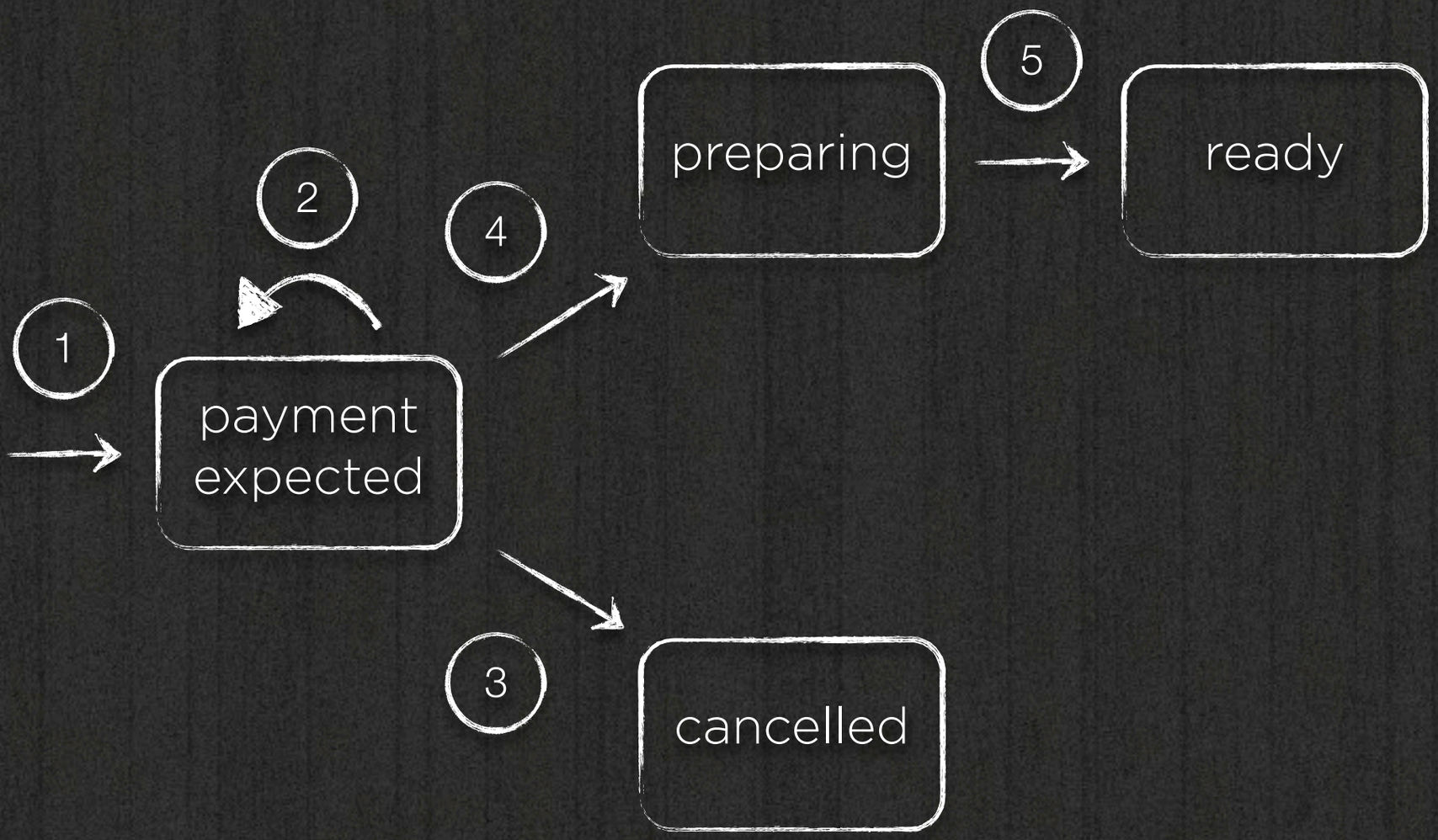
Order / Payment

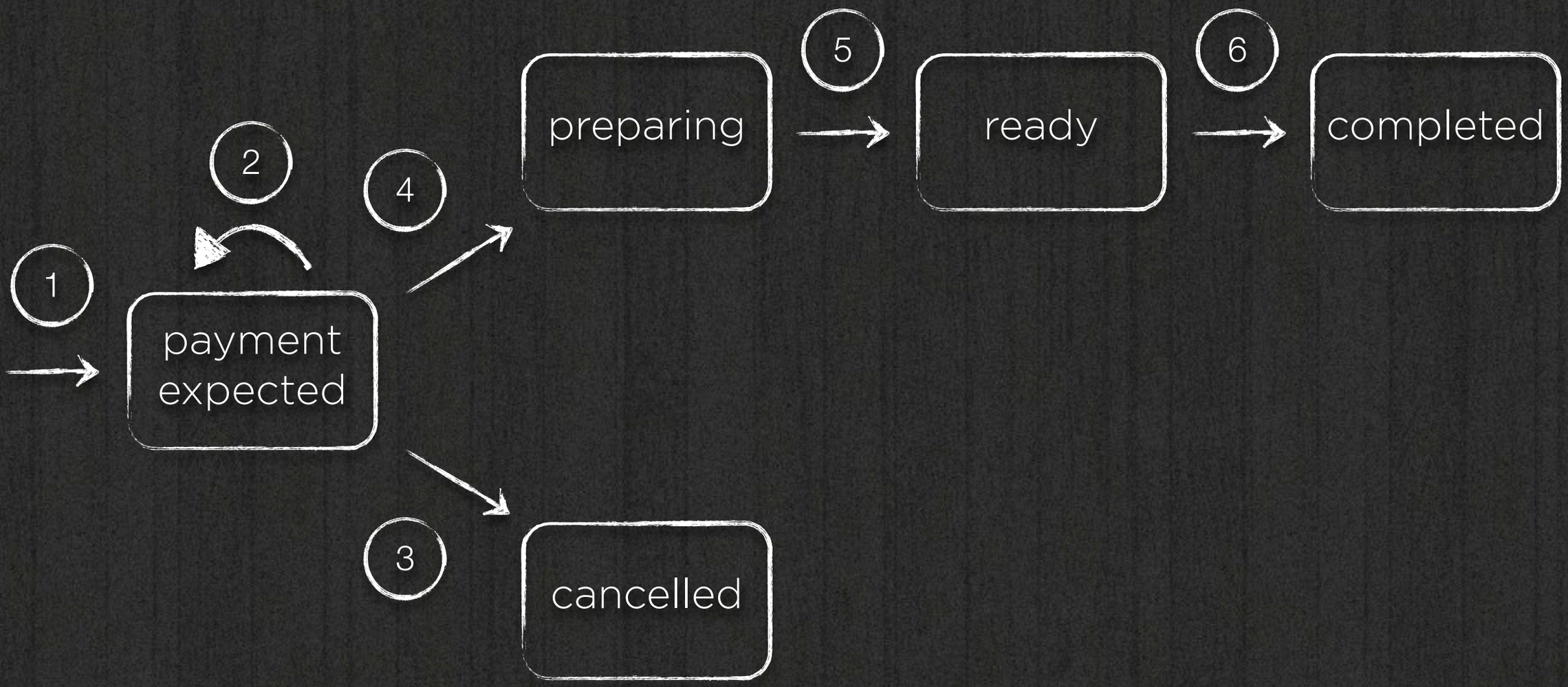

1
payment
expected


2
1
payment
expected


2
1
payment
expected
3
cancelled


preparing
2
4
1
payment
expected
3
cancelled


1
payment expected
2
3
cancelled
4
preparing
5
ready


1
payment expected
2
3
cancelled
4
preparing
5
ready
6
completed

Method	URI	Action	Step
POST	/orders	Create new order	1
POST/PATCH	/orders/4711	Update the order (only if "payment expected")	2
DELETE	/orders/4711	Cancel order (only if "payment expected")	3
PUT	/orders/4711/payment	Pay order	4
Barista preparing the order			
GET	/orders/4711	Poll order state	5
GET	/orders/4711/receipt	Access receipt	
DELETE	/orders/4711/receipt	Conclude the order process	6

Challenges

Challenges

How to avoid hard coding URIs?

Use link relations

orders	Returns all orders available in the system
order	Returns a single order
self	The uri value can be used to `GET` the latest resource representation of the order.
cancel	This is the URI to be used to `DELETE` the order resource should the consumer wish to cancel the order.
update	Consumers can change the order using a `POST` to transfer a representation to the linked resource.
payment	The linked resource allows the consumer to begin paying for an order. Initiating payment involves `PUT`ting an appropriate resource representation to the specified URI.
receipt	The URI to access the receipt using `GET` and conclude the order by taking the receipt (use `DELETE`).

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Method	URI	Action	Step
`POST`	/orders	Create new order	1
`POST/PATCH`	/orders/4711	Update the order (only if "payment expected")	2
`DELETE`	/orders/4711	Cancel order (only if "payment expected")	3
`PUT`	/orders/4711/payment	Pay order	4
Barista preparing the order			
`GET`	/orders/4711	Poll order state	5
`GET`	/orders/4711/receipt	Access receipt	
`DELETE`	/orders/4711/receipt	Conclude the order process	6

Method	Relation type	Action	Step
`POST`	orders	Create new order	1
`POST/PATCH`	update	Update the order (only if "payment expected")	2
`DELETE`	cancel	Cancel order (only if "payment expected")	3
`PUT`	payment	Pay order	4
Barista preparing the order			
`GET`	order	Poll order state	5
`GET`	receipt	Access receipt	
`DELETE`	receipt	Conclude the order process	6

Challenges

How to implement:

"only if payment expected"?

Process modeling

Root resource

The only URI known

```
GET /
```

```
{ links : [ { rel : "orders",
              href : "…/orders" } ]
}
```

Place order

Access root resource

Follow `orders` link

`$.links[?(@.rel="orders")].href`

`POST` /orders

```
{ links : [ { rel : "orders",
              href : "…/orders" } ]
}
```

```
{ links : [ { rel : "self", href : … },
            { rel : "cancel", href : … },
            { rel : "update", href : … },
            { rel : "payment",
              href : "…/orders/4711/payment" } ],
  content : {
    items : [ {
      drink : "Cappucino",
      size : "large",
      milk : "semi"
      price : 4.2
    } ],
    location : "take-away",
    price : 4.2
    status : "payment expected"
  }
}
```

Trigger payment

Follow `payment` link

`$.links[?(@.rel="payment")].href`

`PUT` /orders/4711/payment

```
{ links : [ { rel : "self",
              href : "…/orders/4711" },
              …
            { rel : "payment",
              href : "…/orders/4711/payment" } ],

  content : {
    items : [ {
      drink : "Cappucino",
      size : "large",
      milk : "semi"
      price : 4.2
    } ],
    location : "take-away",
    price : 4.2
    status : "payment expected"
  }
}
```

```
{ links : [ { rel : "self",
              href : "…/orders/4711/payment" },
            { rel : "order",
              href : "…/orders/4711" } ],

  content : {
    creditCard : [ {
      number : "1234123412341234",
      cardHolder : "Oliver Gierke",
      expiryDate : "2013-11-01"
    } ],
    amount : {
      currency : "EUR",
      value : 4.2
    }
  }
}
```

Poll order

Follow `order` link

`$.links[?(@.rel="order")].href`

`GET` /orders/4711

ETag / If-None-Match

```
{ links : [ { rel : "self",
              href : "…/orders/4711/payment" },
            { rel : "order",
              href : "…/orders/4711" } ],

  content : {
    creditCard : [ {
      number : "1234123412341234",
      cardHolder : "Oliver Gierke",
      expiryDate : "2013-11-01"
    } ],
    amount : {
      currency : "EUR",
      value : 4.2
    }
  }
}
```

```
{ links : [ { rel : "self",
              href : "…/orders/4711" } ],

  content : {

    items : [ {
      drink : "Cappucino",
      size : "large",
      milk : "semi"
      price : 4.2
    } ],

    location : "take-away",
    price : 4.2
    status : "preparing"
  }
}
```

Poll order

Use caching

ETag / If-None-Match

until...

```
{ links : [ { rel : "self",
              href : "…/orders/4711" },
            { rel : "receipt",
              href : "…/orders/4711/receipt" } ],

  content : {
    items : [ {
      drink : "Cappucino",
      size : "large",
      milk : "semi"
      price : 4.2
    } ],
    location : "take-away",
    price : 4.2
    status : "ready"
  }
}
```

Access receipt

Follow `receipt` link

```
$.links[?(@.rel="receipt")].href
```

`GET` /orders/4711/receipt

```
{ links : [ { rel : "self",
              href : "…/orders/4711" },
            { rel : "receipt",
              href : "…/orders/4711/receipt" } ],

  content : {
    items : [ {
      drink : "Cappucino",
      size : "large",
      milk : "semi"
      price : 4.2
    } ],
    location : "take-away",
    price : 4.2
    status : "ready"
  }
}
```

Conclude order

Follow `receipt` link

```
$.links[?(@.rel="receipt")].href
```

`DELETE` /orders/4711/receipt

Hypermedia VS. Java Frameworks

	Spring MVC	JAX-RS	
HTTP Methods	✓	✓	
URI Mapping	✓	✓	
Content negotiation	✓	✓	
Hypermedia	?	?	

Spring HATEOAS

Spring HATEOAS

Representation models

`LinkBuilder` API

Representation enrichment

http://bit.ly/spring-hateoas

DEMO

Spring RESTBucks

Spring RESTBucks

Sample implementation

Using Spring technologies

http://bit.ly/spring-restbucks

	Orders	Payment
Web	Spring Data REST	Manual implementation
Service	-	Manual implementation
Repository	Spring Data	Spring Data

DEMO

Miscellaneous

Spring MVC integration testing

REST Shell

Thank you!

Resources

Code

Spring HATEOAS Sample

Spring RESTBucks

Spring Data REST

Spring HATEOAS

REST Shell

Books

REST in Practice

REST und HTTP

RESTful WebServices Cookbook

Spring Data

Videos

Hypermedia APIs - Jon Moore

Hypermedia APIs with Spring