

BPMN for REST

Cesare Pautasso

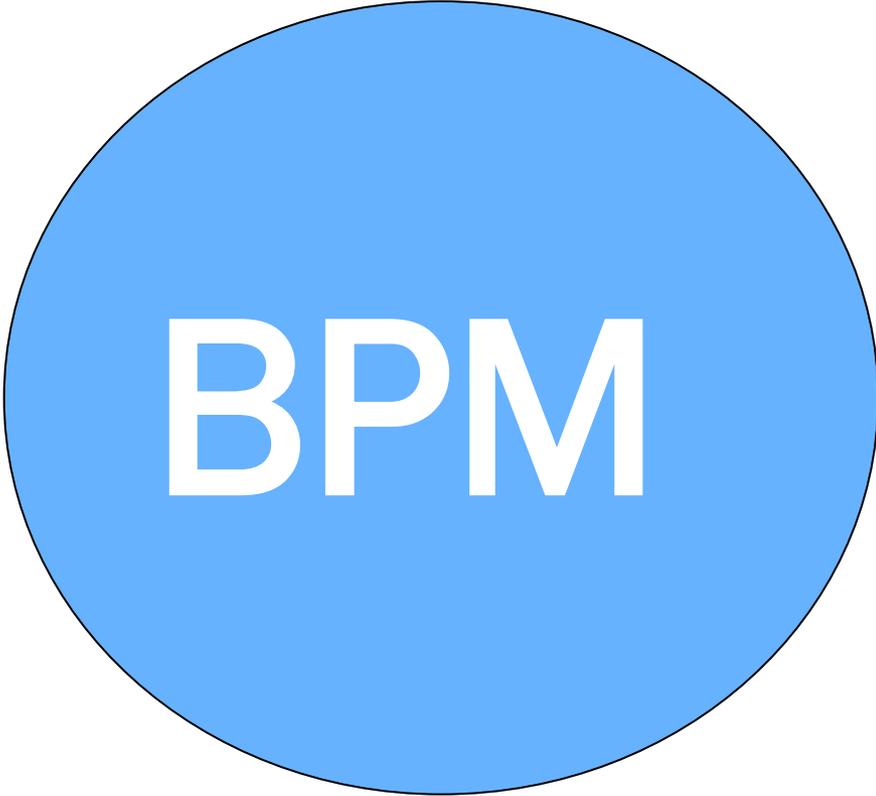
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BPM



REST

**Business
Process
Management**

**RESTful
Web Services**

WS-* Standards Stack

Interoperability Issues

- Basic Profile
- Attachments Profile
- Single SOAP Binding Profile
- Basic Security Profile
- WS-Security Profile
- SAML Token Profile
- Conformance Check Attachment Mechanism (CCMAM)
- Reliable Attachments Messaging Profile (RAMMP)

Business Process Specifications

- Business Process Description Language for Web Services
- Web Services Choreography Model
- Web Services Choreography Description Language

Management Specifications

- WS-Management Framework
- WS-Events
- WS-Management
- Management Using Web Services
- Management

Metadata Specifications

- WS-Policy
- WS-PolicyAssertions
- WS-PolicyFramework
- WS-Discovery
- WS-Discovery of Informal WS Services
- Informal Description Discovery and Integration
- Web Service Description Language
- Web Service Description Language

Reliability Specifications

- WS-ReliableMessaging
- WS-Reliability

Security Specifications

- WS-Security
- WS-Security: Message Security Profiles
- WS-Security: SOAP Message Security
- WS-Security: Policy
- WS-Security: X.509 Certificate Profile
- WS-Security: SAML Token Profile
- WS-Security: X.509 Certificate Profile
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- WS-Security: X.509 Certificate Profile

Transaction Specifications

- WS-Atomic Transaction
- WS-Atomic Transaction
- WS-Coordination
- WS-Coordination: Application Framework
- WS-Coordination: Framework
- WS-Coordination: Framework
- WS-Transaction Management

Resource Specifications

- Web Services Resource Framework
- WS-BaseFaults
- WS-Security: SOAP
- WS-ResourceProperties
- WS-ResourceLifecycle
- WS-Transfer
- Resource Representation: SOAP Header Block (RRHSB)

Messaging Specifications

- WS-Notification
- WS-Eventing
- WS-Events
- WS-Addressing
- WS-BaseFaults
- WS-Eventing
- WS-Eventing

SOAP

- SOAP 1.1
- SOAP 1.2
- SOAP 1.2
- SOAP 1.2

XML Specifications

- XML
- XML
- Namespaces in XML
- XML Information Set
- XML Information Set
- XML Schema
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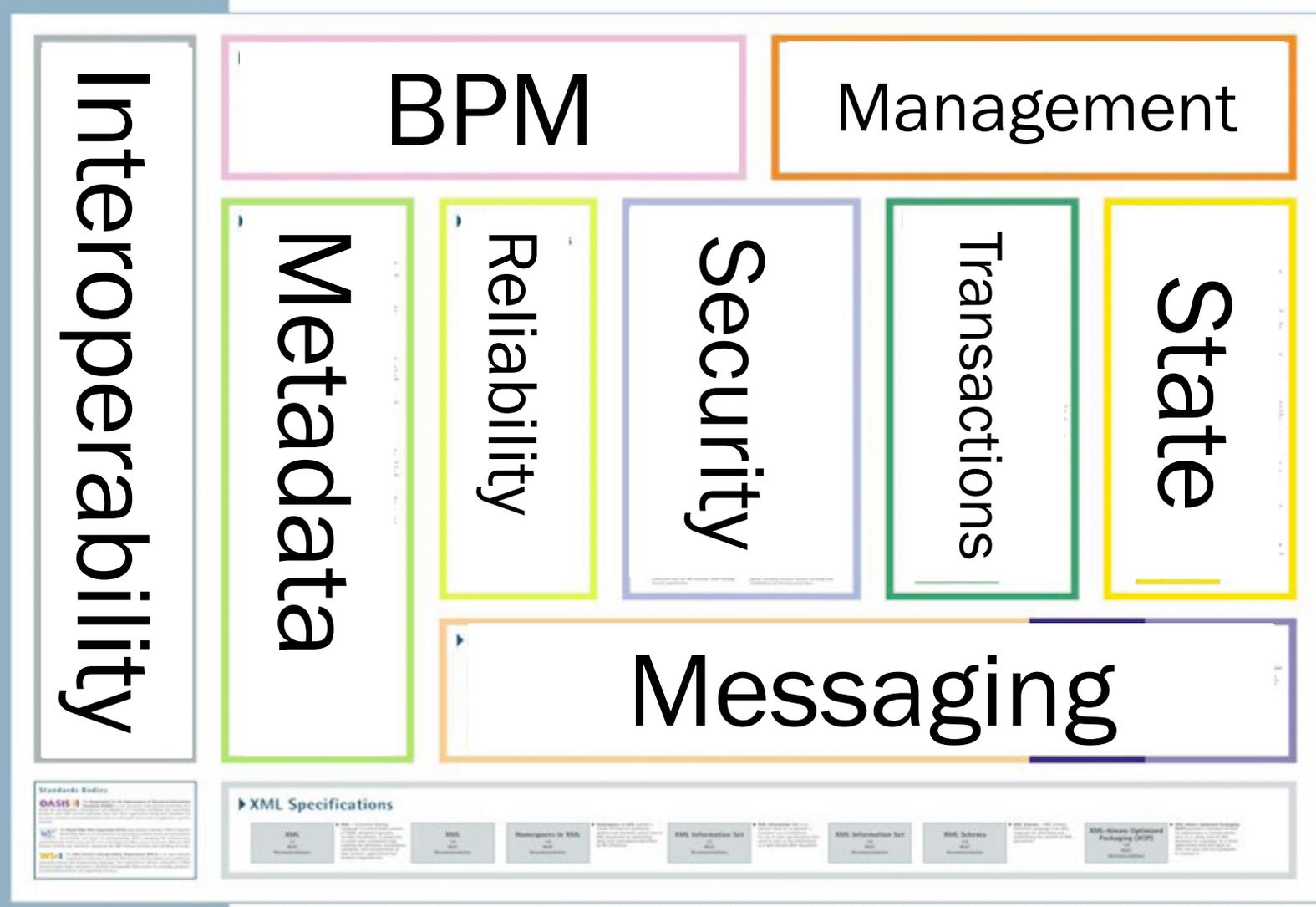
Standards Bodies

- OASIS
- W3C
- ISO



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Standards Bodies

- OASIS**
- ISO**
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XML Specifications

- XML Schema**
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Interoperability

BPM

Management

Metadata

Reliability

Security

Transactions

State

Can you do it
with REST?



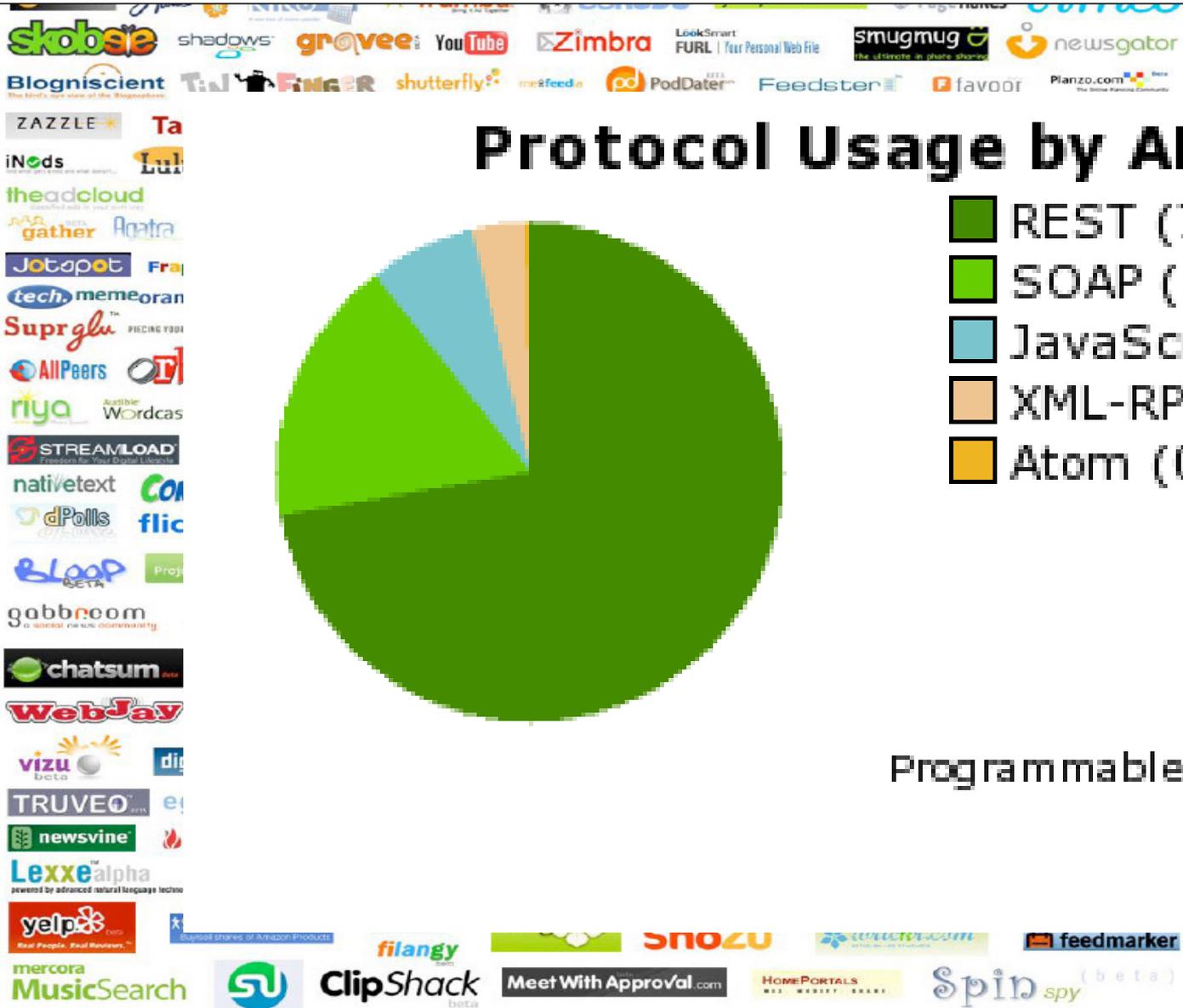
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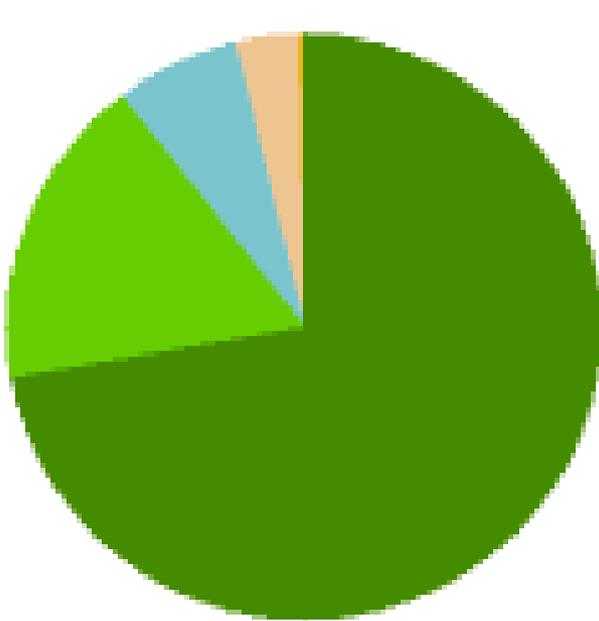
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RESTful APIs...





Protocol Usage by APIs



- REST (72%)
- SOAP (17%)
- JavaScript (6%)
- XML-RPC (3%)
- Atom (0%)

ProgrammableWeb.com 11/21/11

“ We believe there is huge potential to marrying REST with workflow and BPM.

[...]

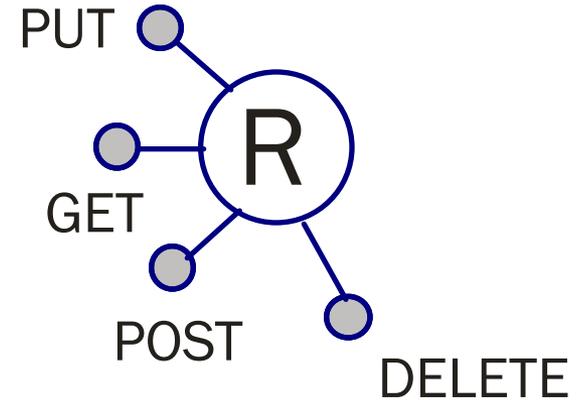
Combined with the architecture of the Web, a workflow service can provide both a truly **simple, portable, and flexible** way to build workflow driven integrations and applications.

”

BPM
resource

REST
resource

- Web Services expose their data and functionality through **resources** identified by **URI**
- **Uniform Interface** constraint: Clients interact with resources through a fixed set of verbs.
Example HTTP:
GET (read), POST (create), PUT (update), DELETE
- **Multiple representations** for the same resource
- **Hyperlinks** model resource relationships and valid state transitions for dynamic protocol description and discovery



“ We believe there is huge potential to marrying REST with workflow and BPM.

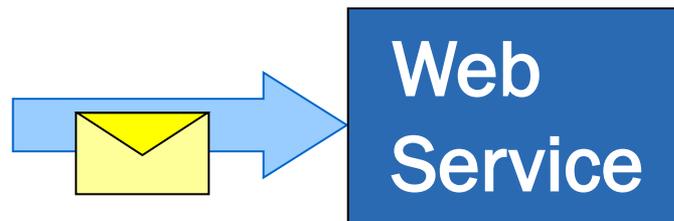
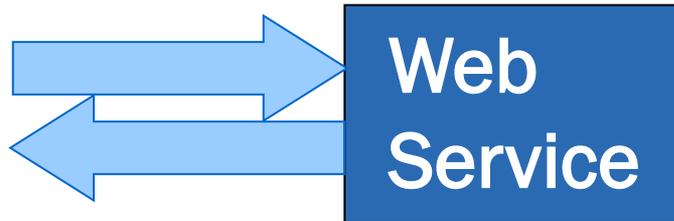
- The HATEOAS (hypermedia and linking) principal of REST is logically a dynamic state machine and **fits very well** with how workflow and BPM systems are designed.
- Combined with the architecture of the Web, a workflow service can provide both a truly simple, portable, and flexible way to build workflow driven integrations and applications.

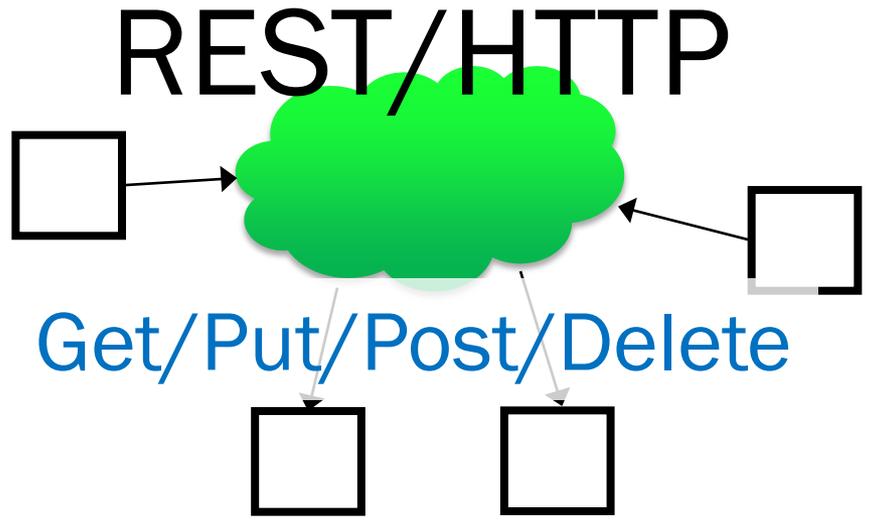
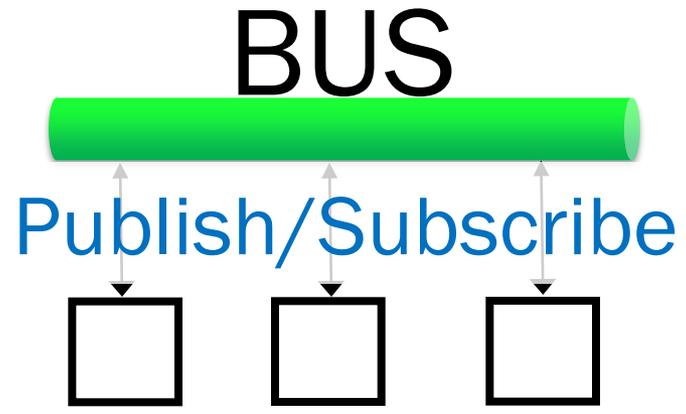
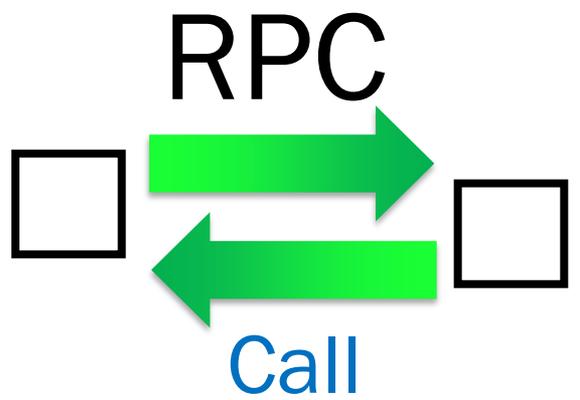
”

1. Descriptive Modeling

2. Analytical Modeling

3. Executable Modeling





1. Goal: use a business process model to:
 - orchestrate a set of distributed resources
 - specify the behavior of stateful resources

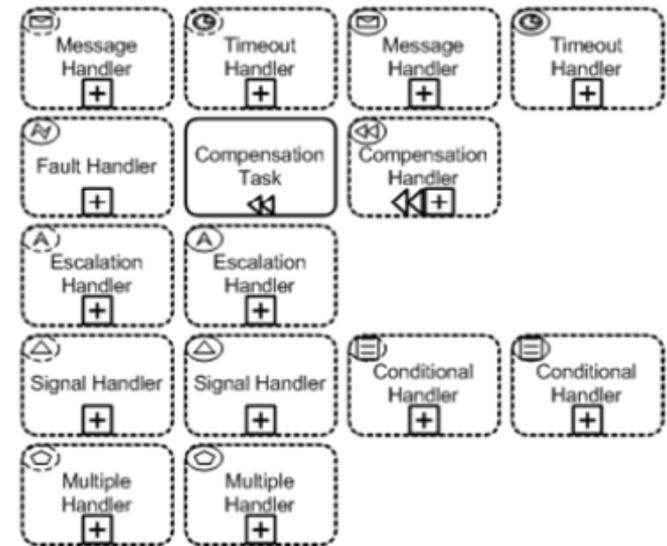
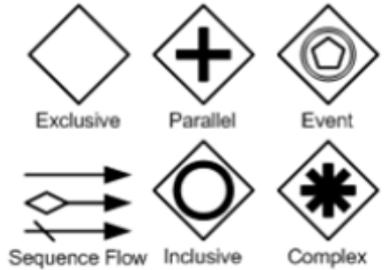
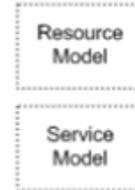
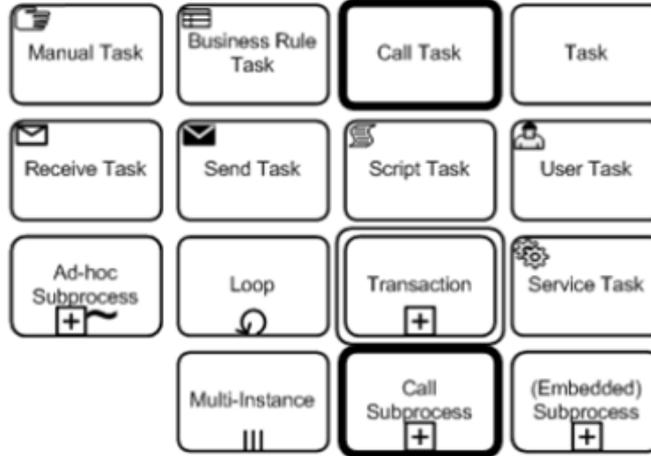
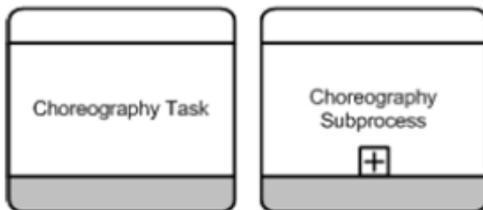
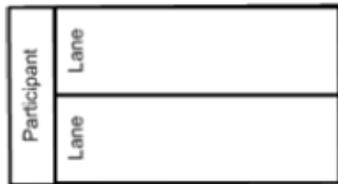
2. BPMN for REST Extension
 - Resource Symbol
 - Invoking external resources
 - Publishing process elements as resources

3. Examples

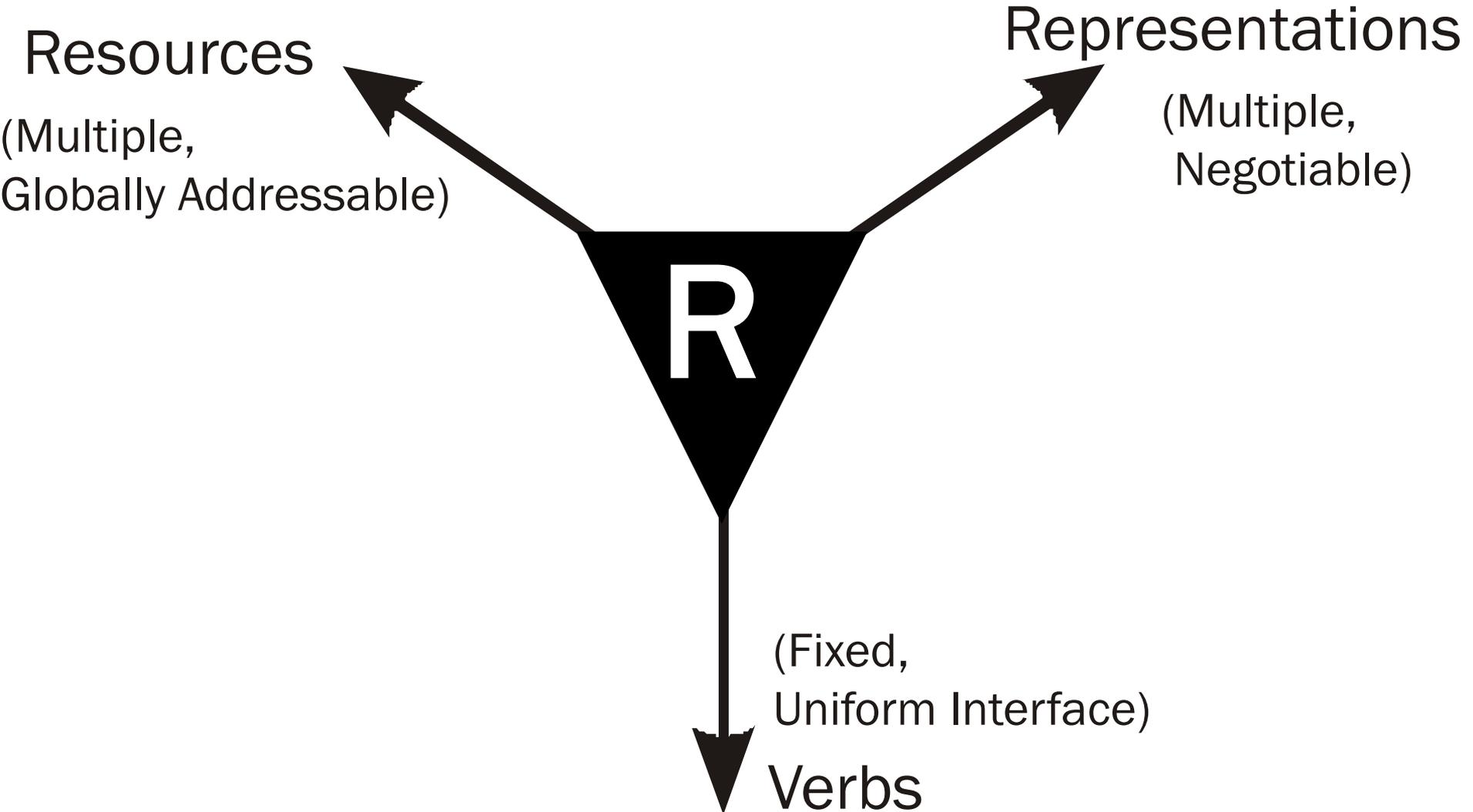
Modeling questions

- Which are the resources that a process depends upon for a successful execution?
- Which are the resources that are affected by the execution of a process?
- Can we reason about the behavior of stateful resources using a process model?
- Which are the tasks of a process that have been made accessible to clients as a resource?
- Which are the possible requests that can be sent to a resource whose behavior is specified by a process?

BPMN 2.0 Notation



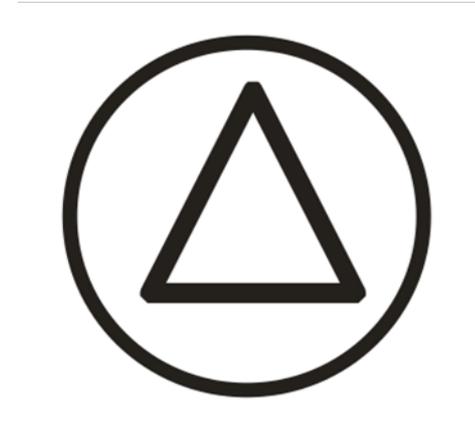
REST Triangle





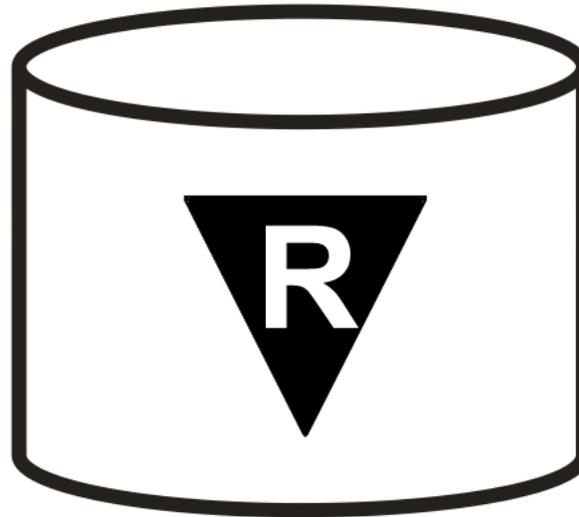


Task published as a resource

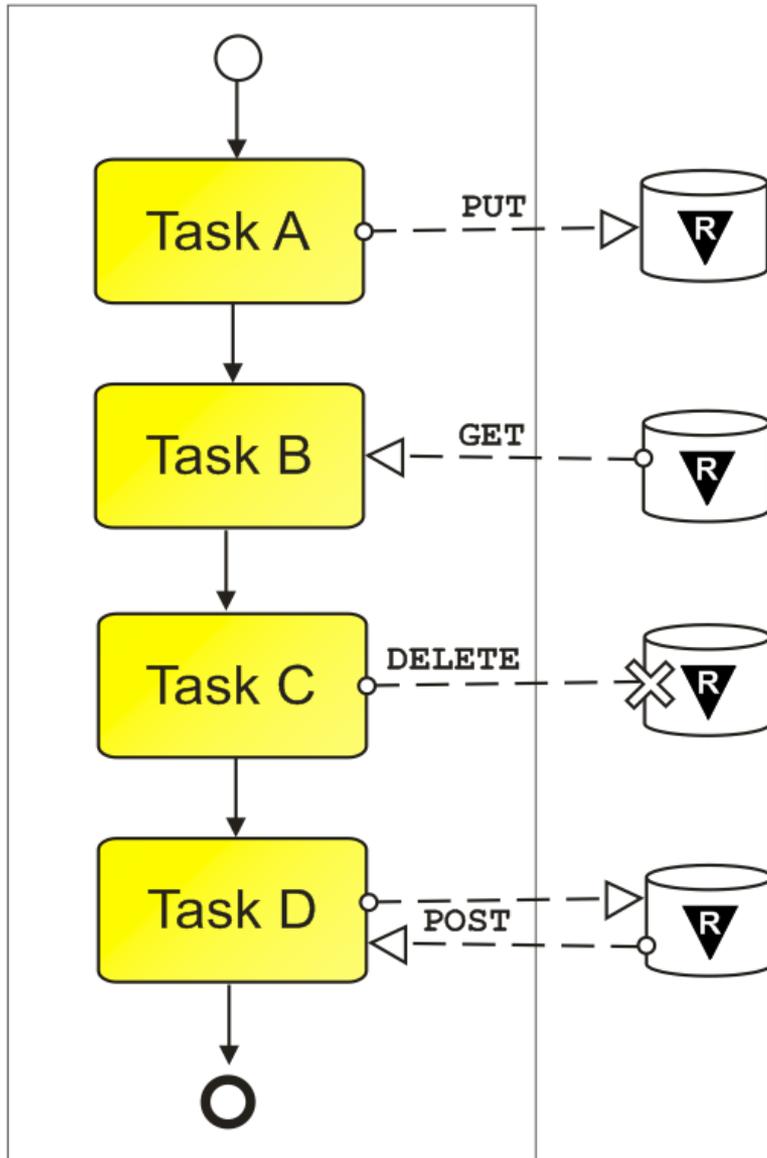


Resource Request Event
(BPMN for REST)

Signal
(BPMN 2.0)

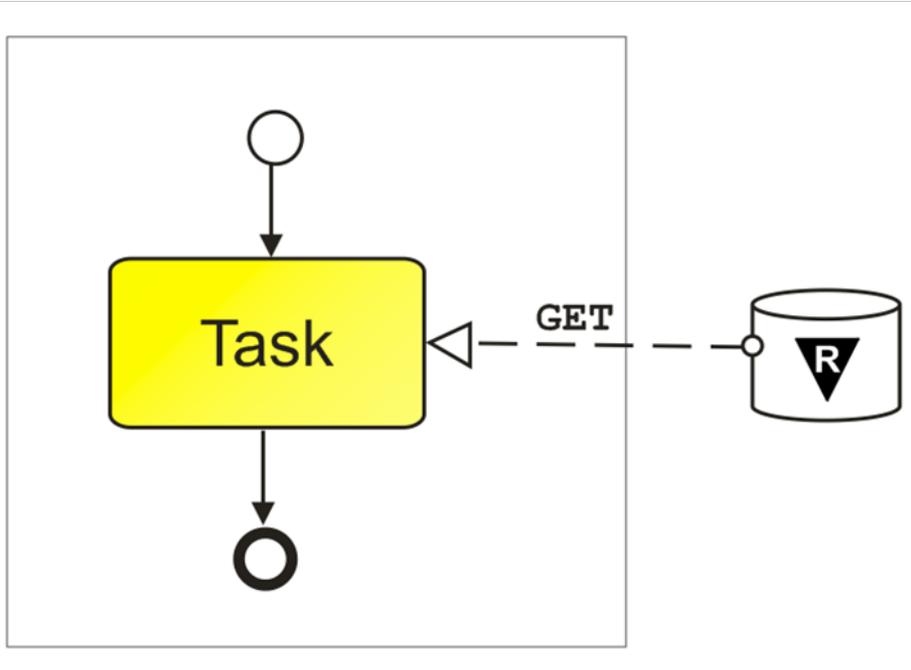


External Resource
(RESTful Datastore)

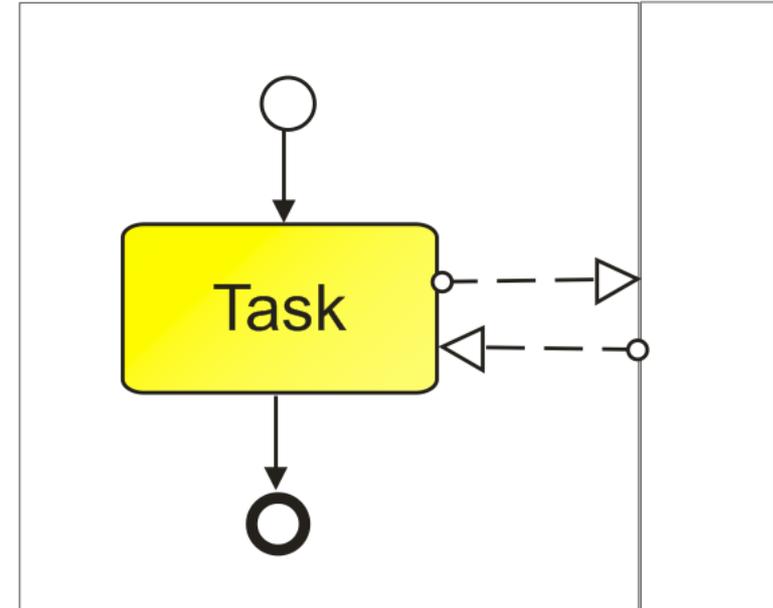


GET PUT DELETE POST
Message Flows
(Visualize the semantics
of the HTTP method)

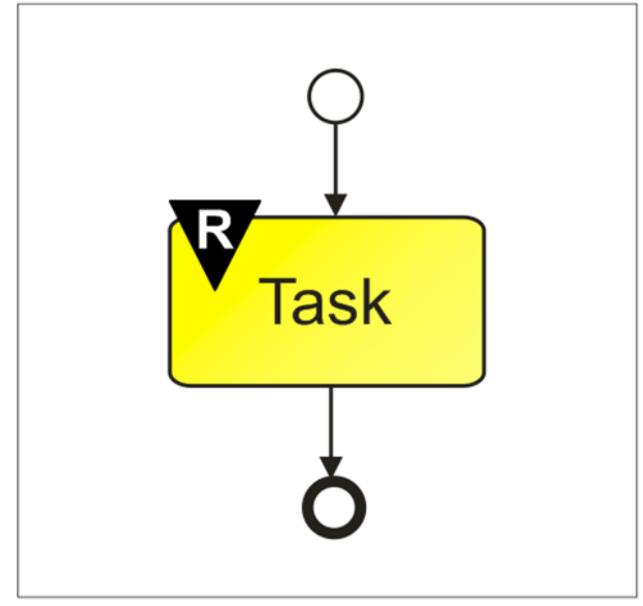
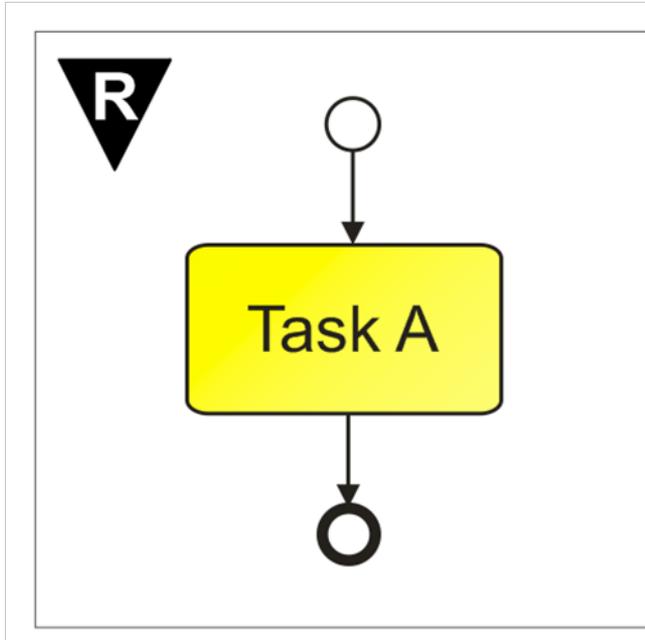
External
Resources:
(Resource lifecycle is
independent
of process instance)



GET message flow
with external resource
(BPMN for REST)

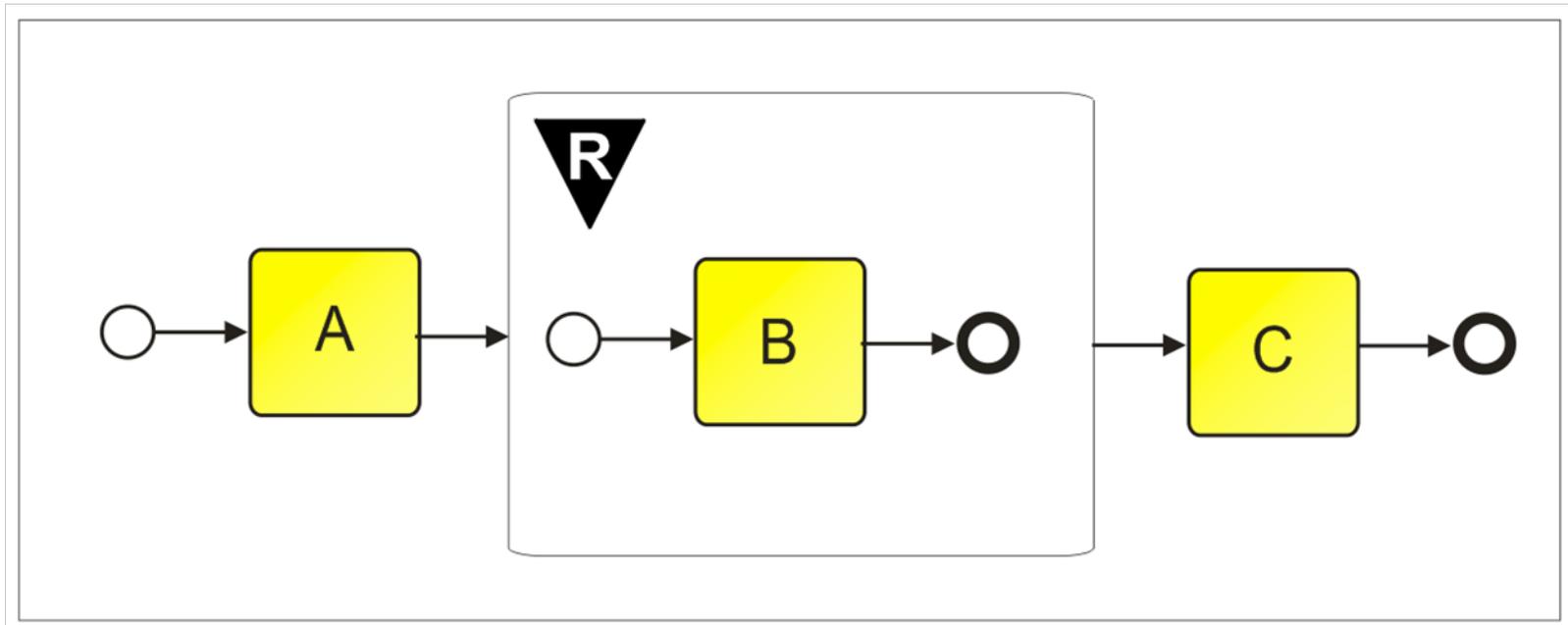


Synchronous RPC
with participant lane
(BPMN)



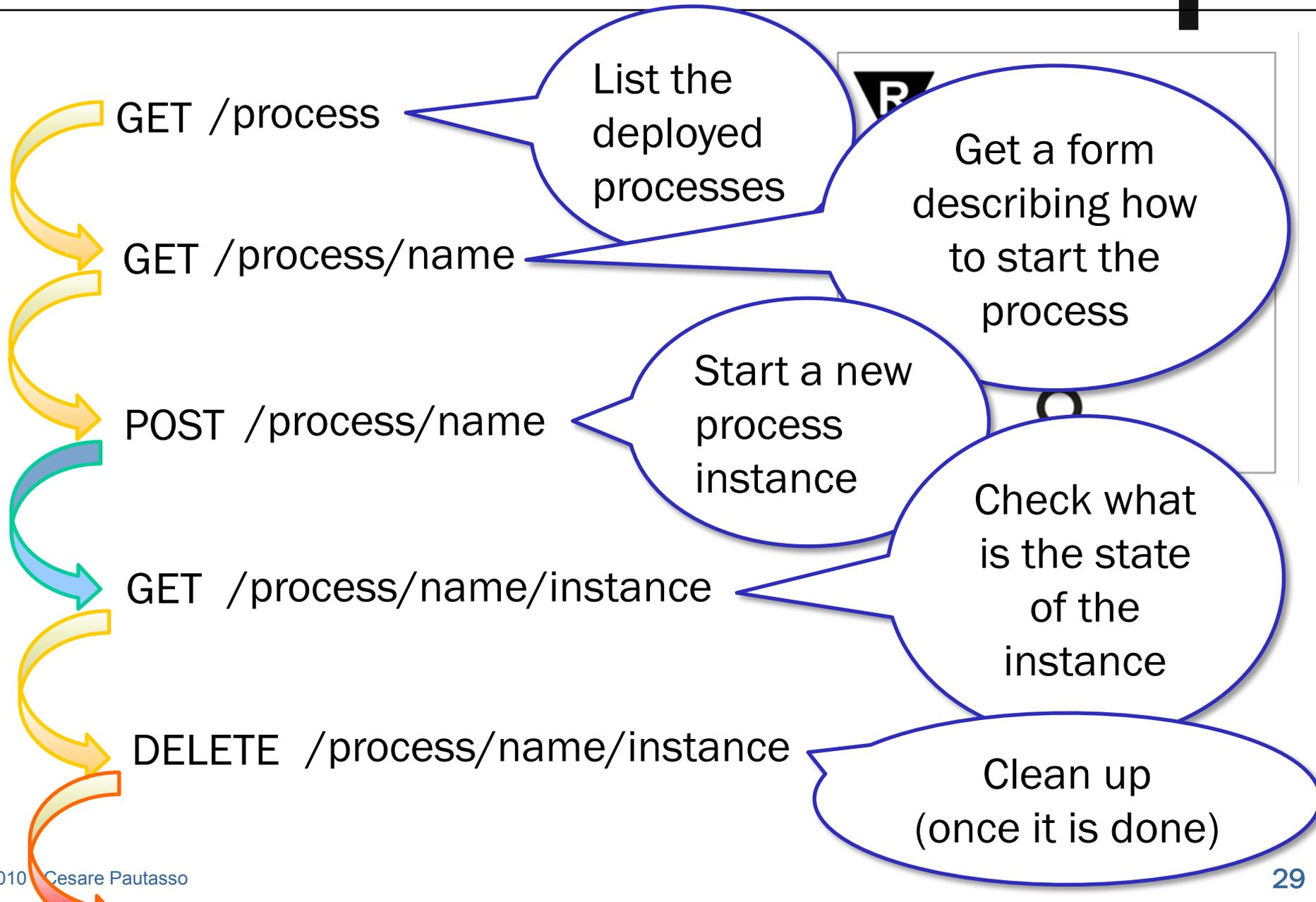
Process
published as resource

Task
published as resource

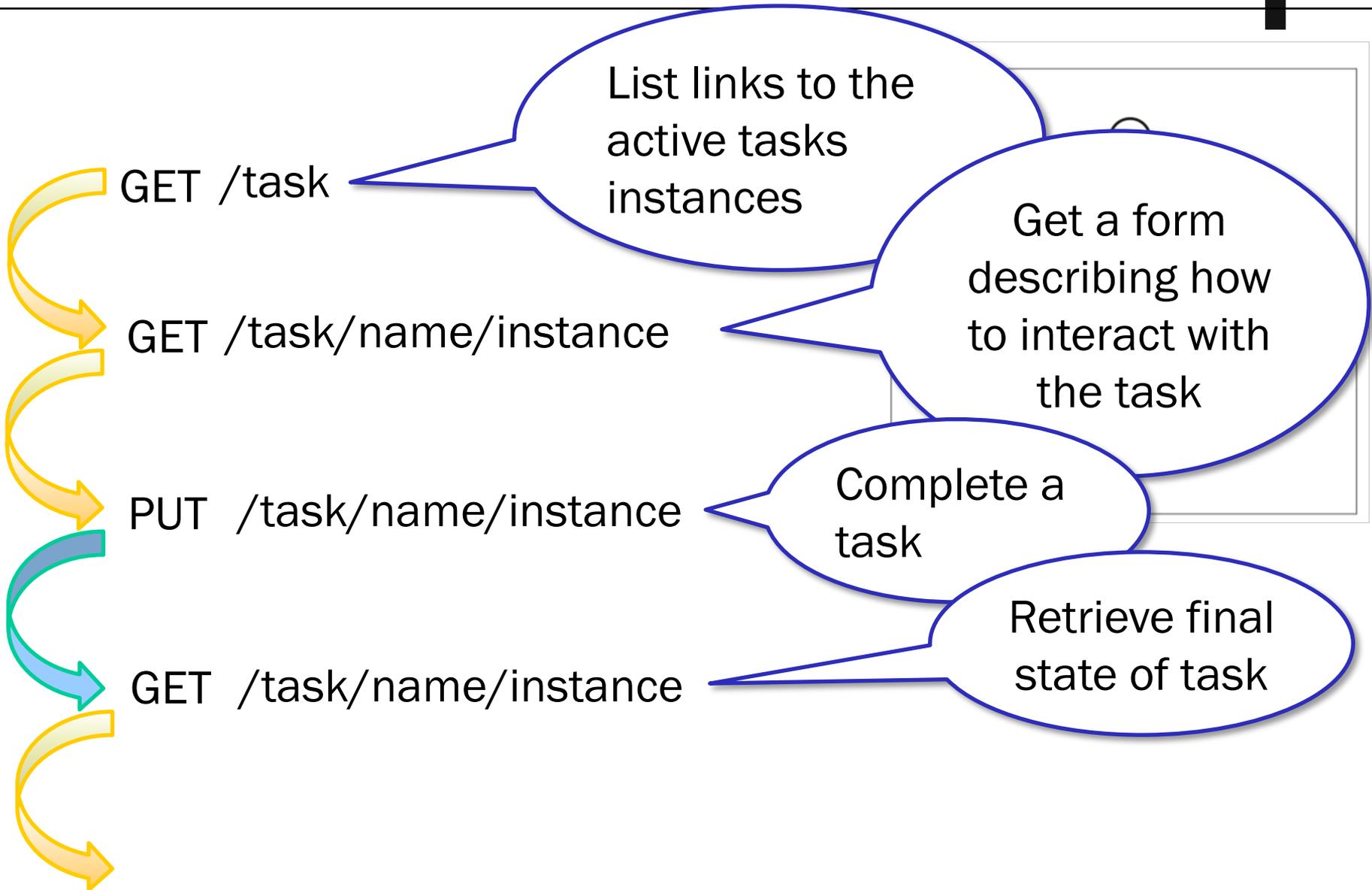


SubProcess
published as resource

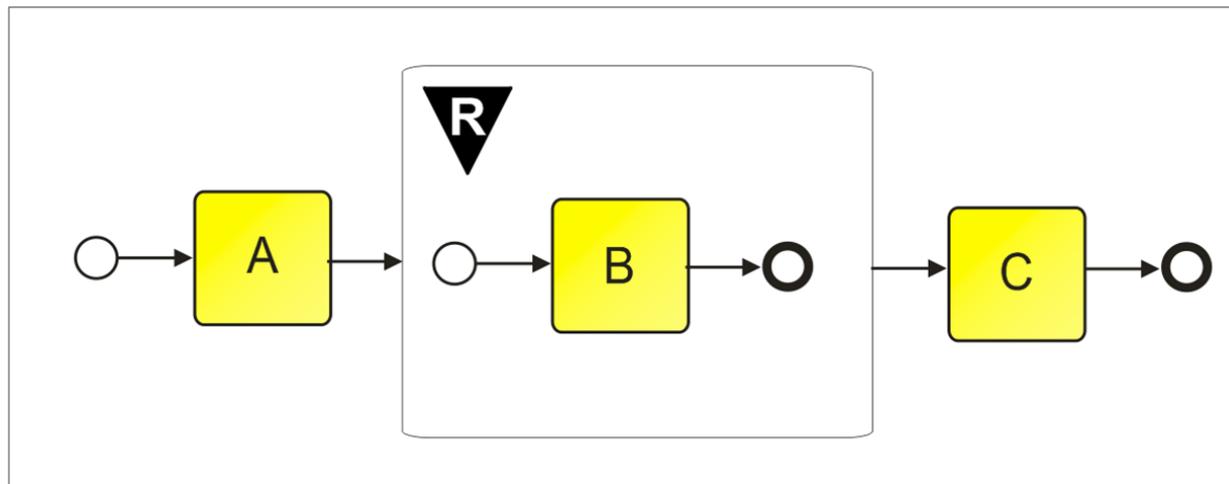
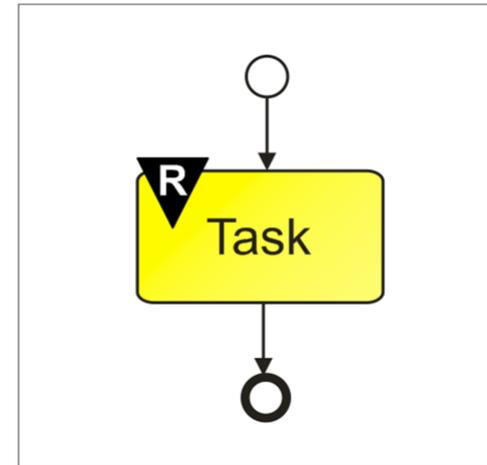
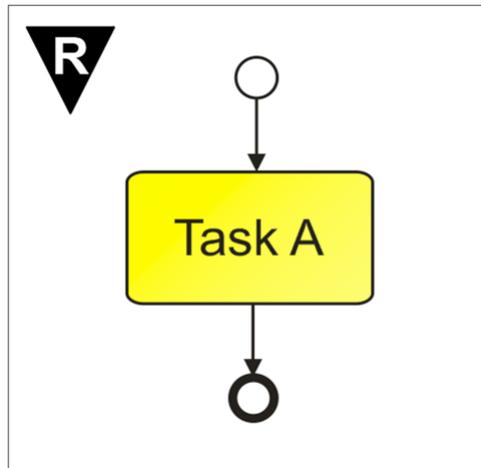
Publish Process as Resource

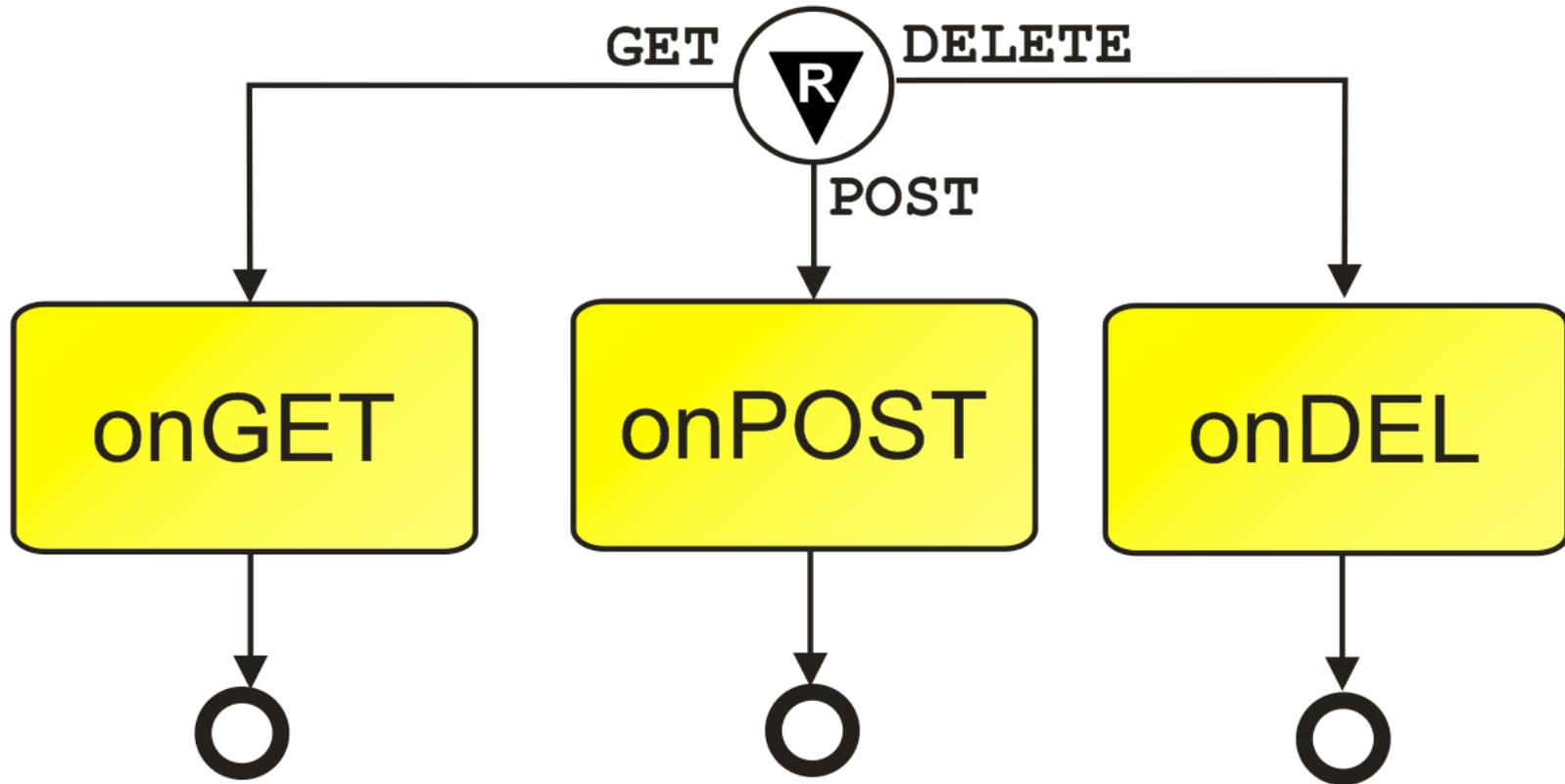


Publish Task as Resource



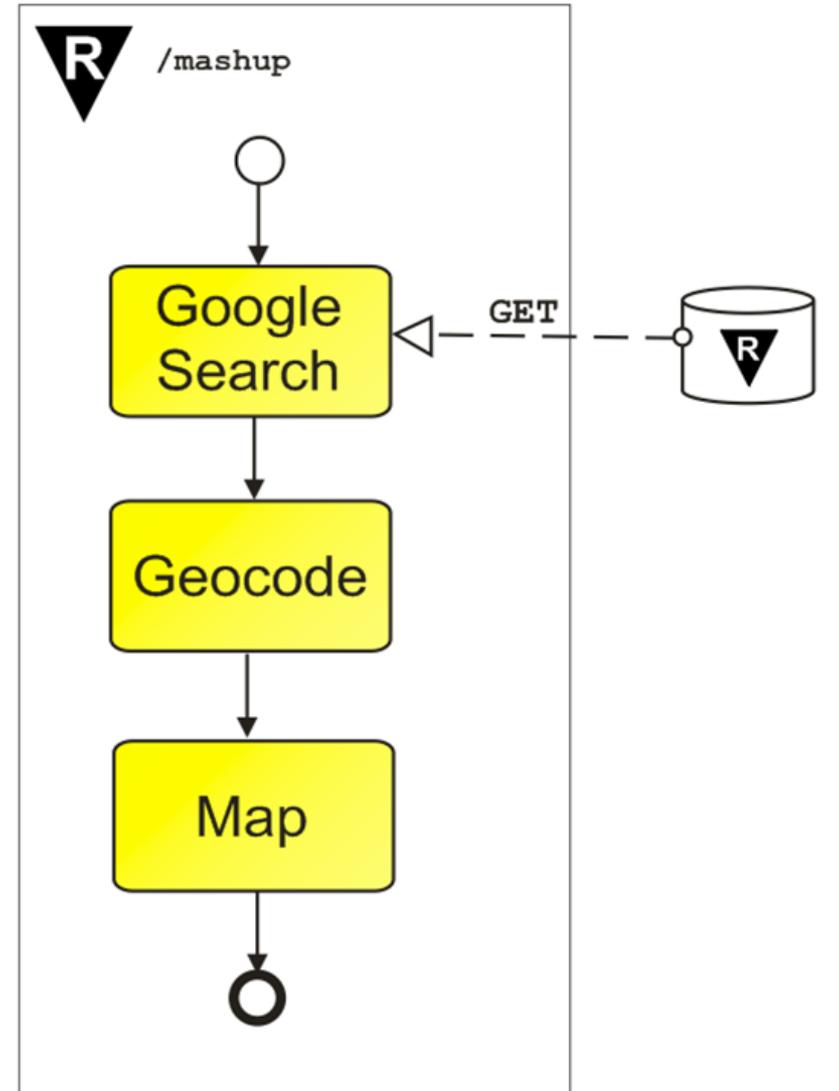
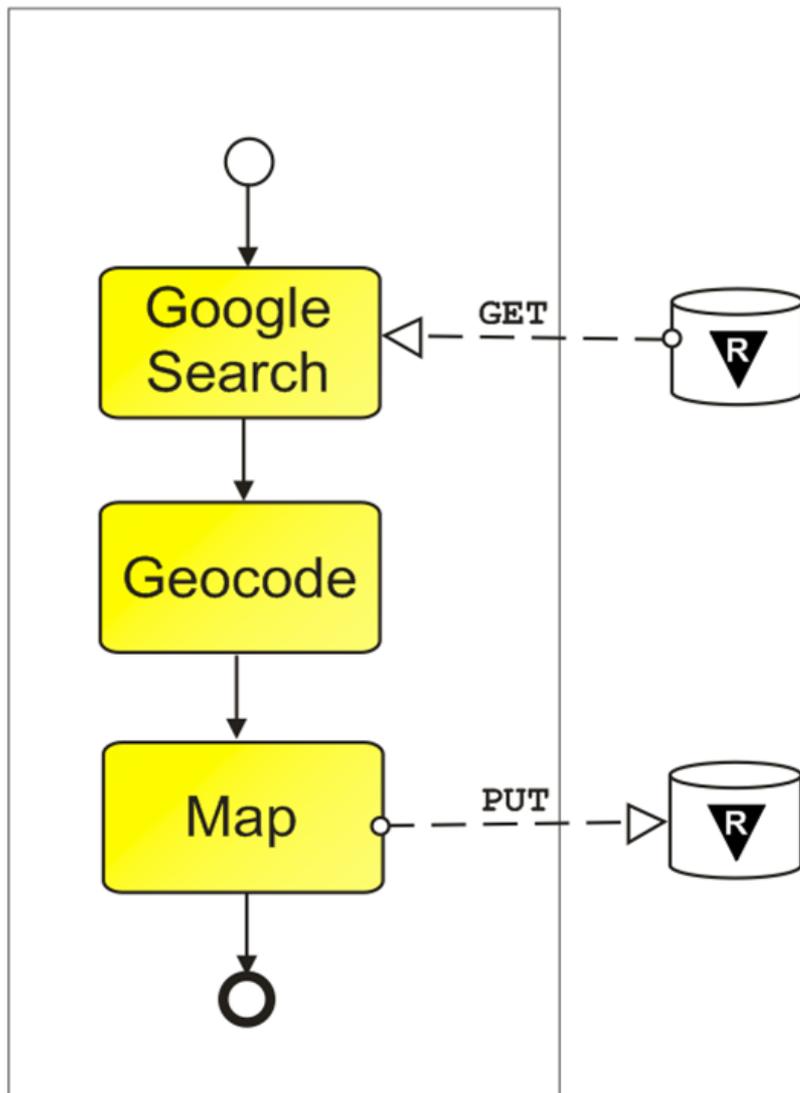
Publishing X as Resource



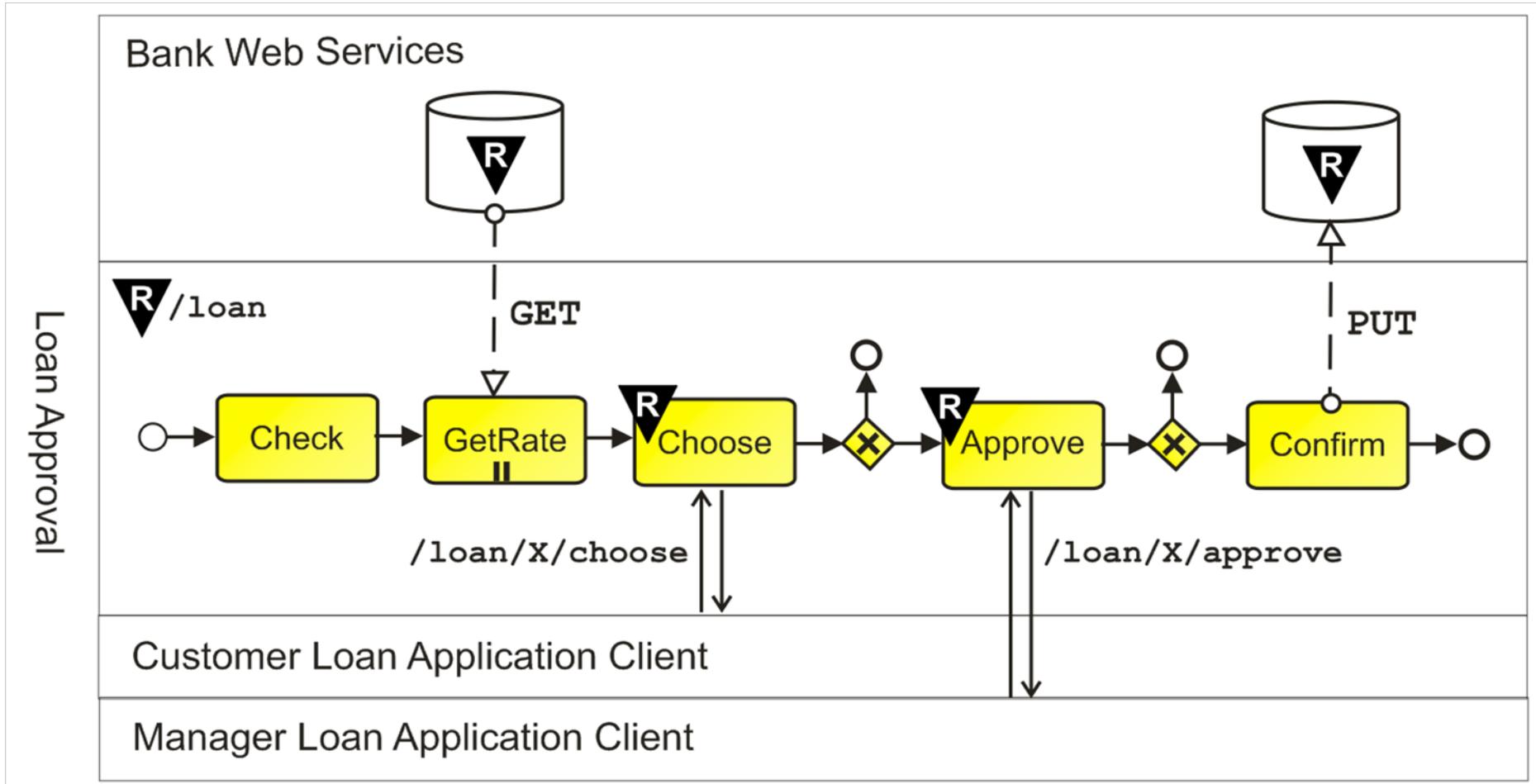


The event models the arrival of a specific resource request method

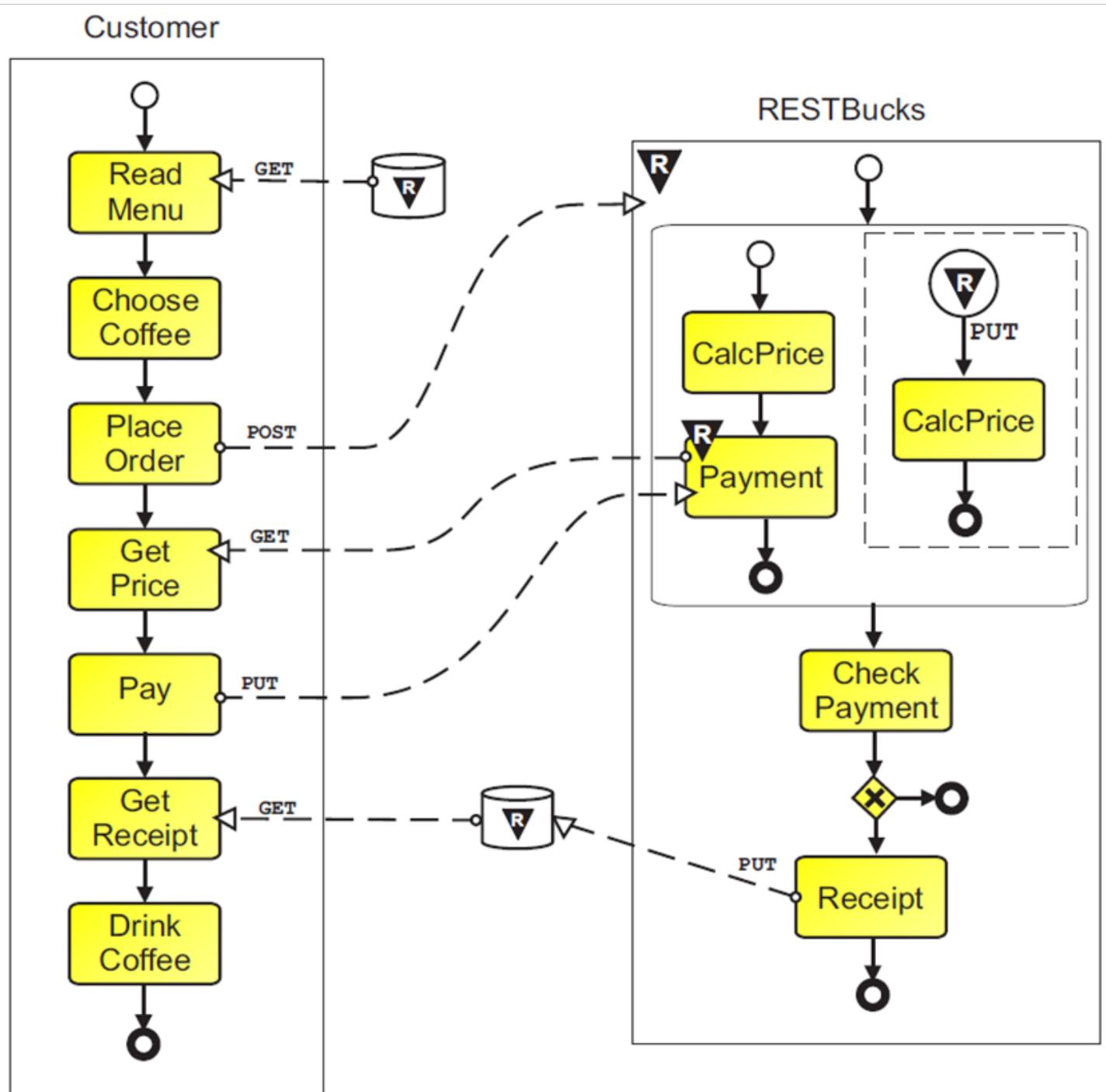
Local Search Mashup



Loan Approval Example



RESTBUCKS Example



- RESTful business process can be modeled using our simple BPMN for REST notation extension
- Processes interact with external resources (e.g., Web 2.0 APIs) which are fully decoupled from their lifecycle
- Processes publish their state as a resource:
 - Entire Tasks and SubProcesses
 - Use Events to model Resource Requests
- The graphical syntax and extended semantics of BPMN for REST was only informally sketched, more work is needed to specify the XML meta-model for the extension and its formal semantics



10th International Conference on Business Process Management (BPM 2012)

September 3-6 2012, Tallinn, Estonia

<http://bpm2012.ut.ee>



ws://rest.2012

Third International Workshop on RESTful Design

16-20 April 2012, Lyon, France

<http://ws-rest.org/2012>



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Benjamin Carlyle,
Thomas Erl,
Cesare Pautasso,
SOA with REST,
Prentice Hall, 2012

<http://soabooks.com/rest/>