WS-GAF – A Grid Application Framework based on Web Services Specifications and Practices

http://www.neresc.ac.uk/ws-gaf

Thanks to:

David Snelling

Peter Vanderbilt

Geoffrey Fox

Savas Parastatidis

Jim Webber

Paul Watson

Thomas Rischbeck

Outline

- Motivation
- Service Oriented Architecture – What is a Service?
- WS-GAF
- Conclusions

- Slides, documents, FAQ, links, etc @

http://www.neresc.ac.uk/ws-gaf

Make SERVICES not WAR

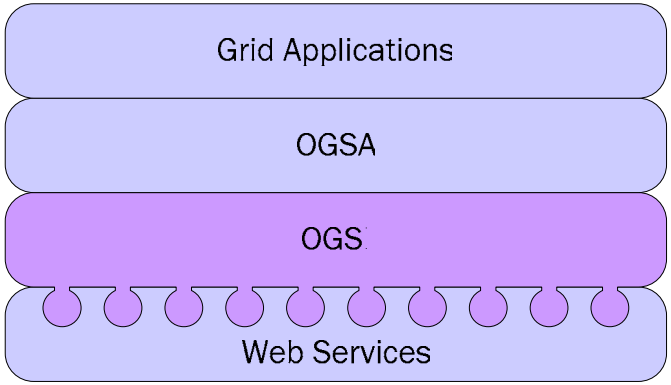
Motivation

- Contribute to the future evolution of OGSI (v2.0?)
  - Now that OGSI v1.0 is a GGF recommendation

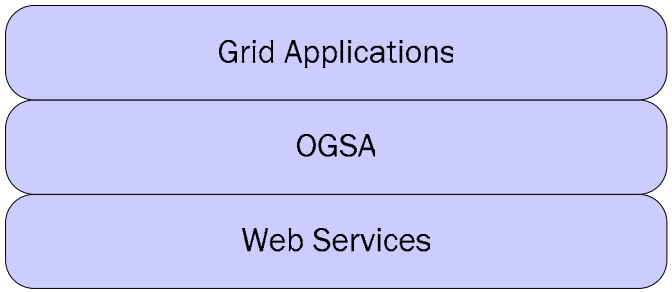
- Our approach
  - Assembled a team from Grid Service researchers and architects from the commercial Web Service world
  - Strict focus on meeting the same Grid requirements as OGSI
  - If we were to start now, how might these requirements be met?
    - Many specifications did not exist when OGSI work started
    - Looking forwards not backwards
  - Aim for simplicity & minimalism
    - Don't invent anything new unless it is absolutely necessary

Aiming for Simplicity and Minimalism

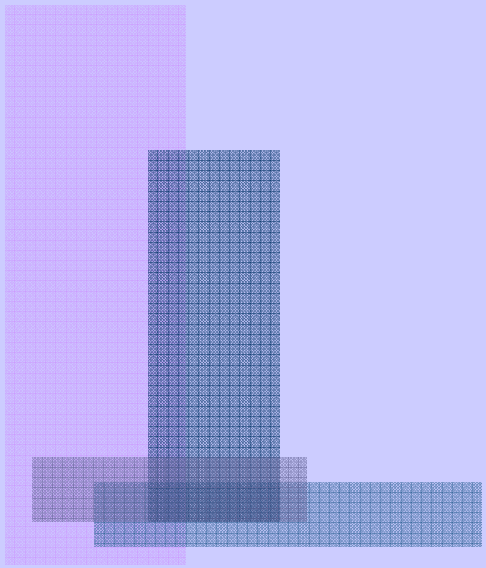
- OGSI v1.0 introduces a new (Object-Oriented) infrastructure to meet the requirements



- Aim: meet the same requirements without a new, mandatory infrastructure



Service Oriented Architecture



Service Oriented Architecture

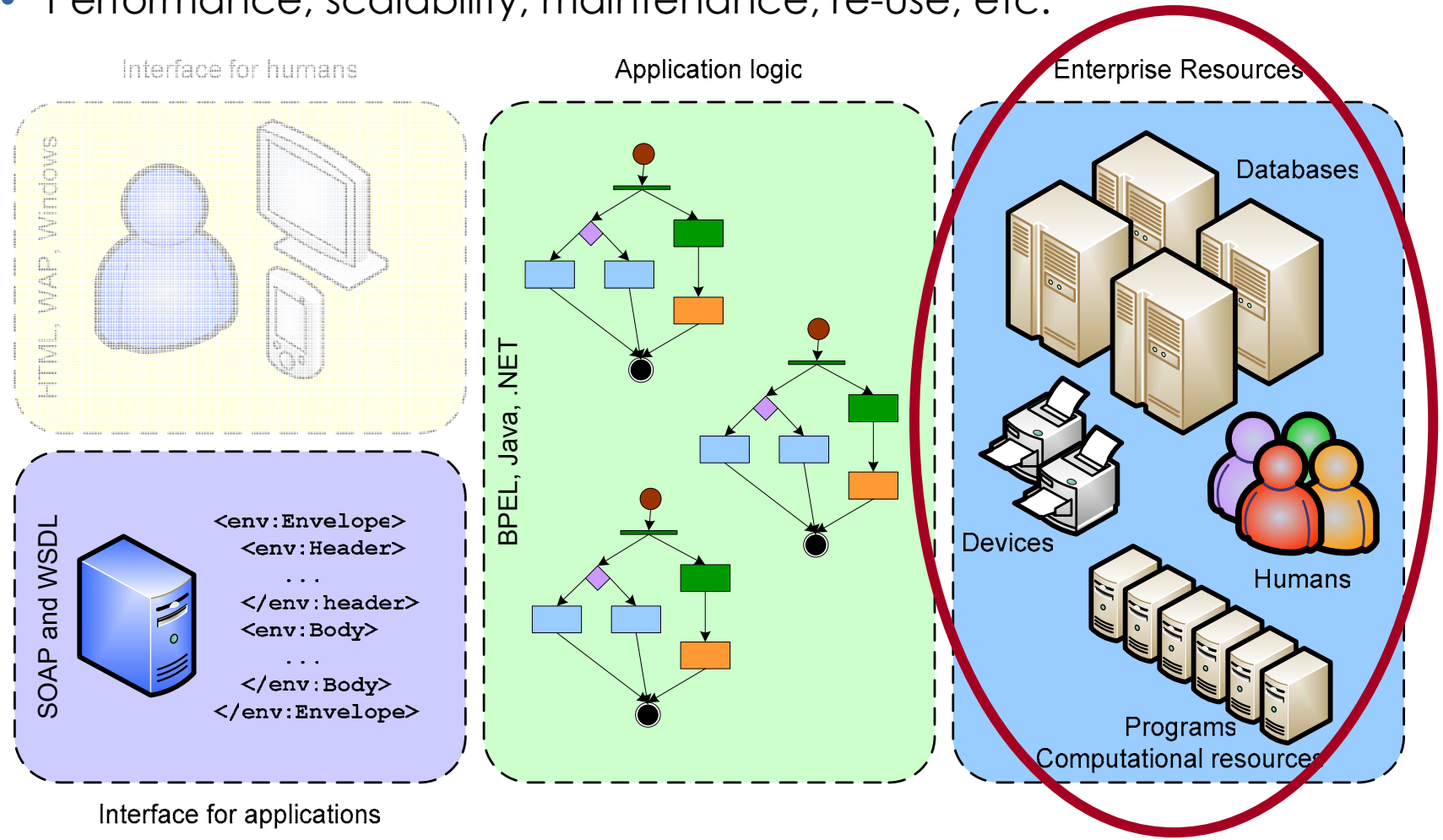
- Built around the concept of a service

- We see a service as *a logical manifestation of some physical resources (like databases, programs, devices, or humans) that an organization exposes to the network*

Anatomy of a Service

- Large grained, loosely coupled
  - Performance, scalability, maintenance, re-use, etc.

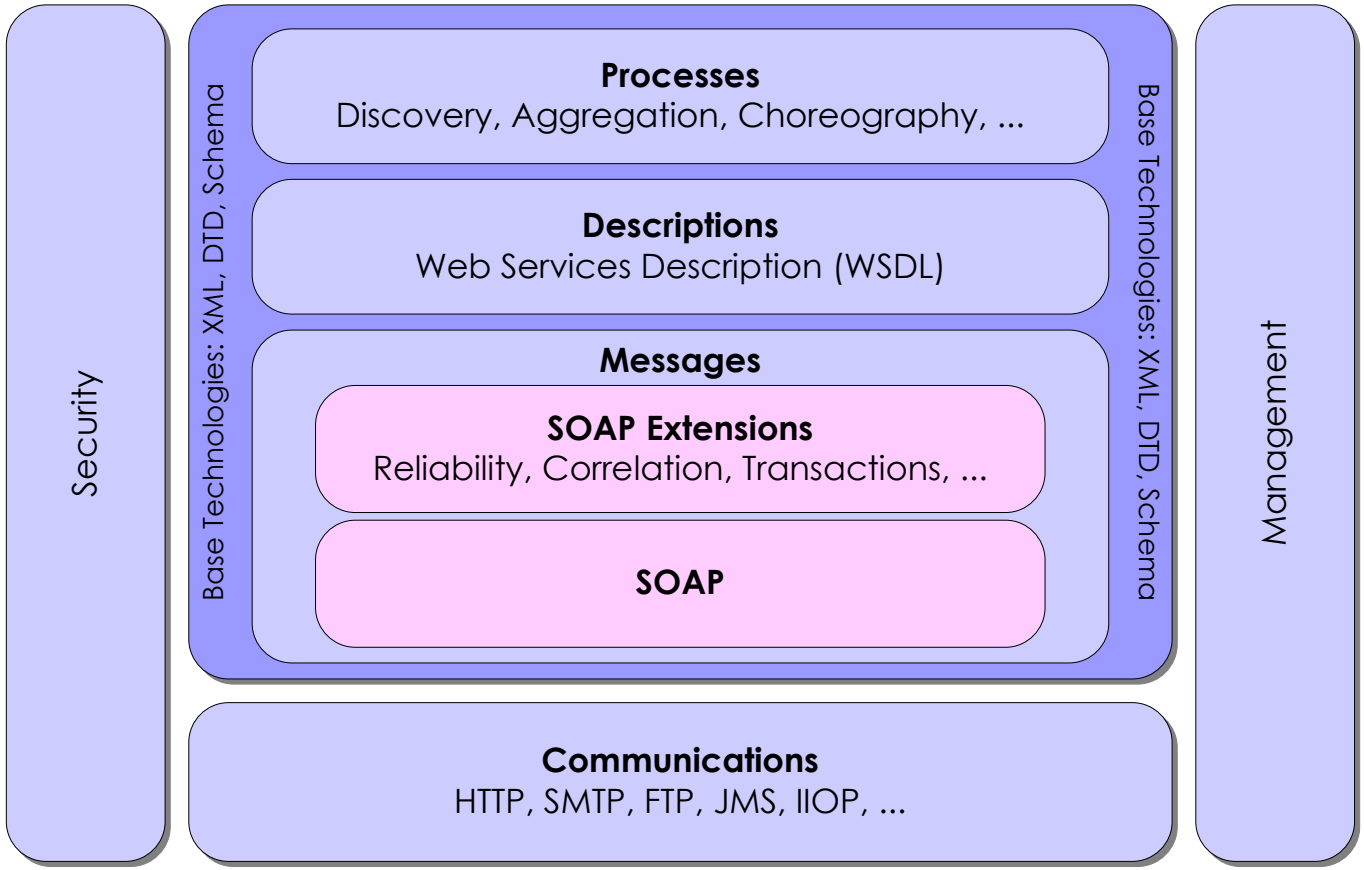
State



State in Web Services

- Two types of "state"
  - Internal service state (not our concern)
  - Interaction state (stateful interactions)
    - Provided by contextualised message exchanges

Web Services Architecture (WSA)

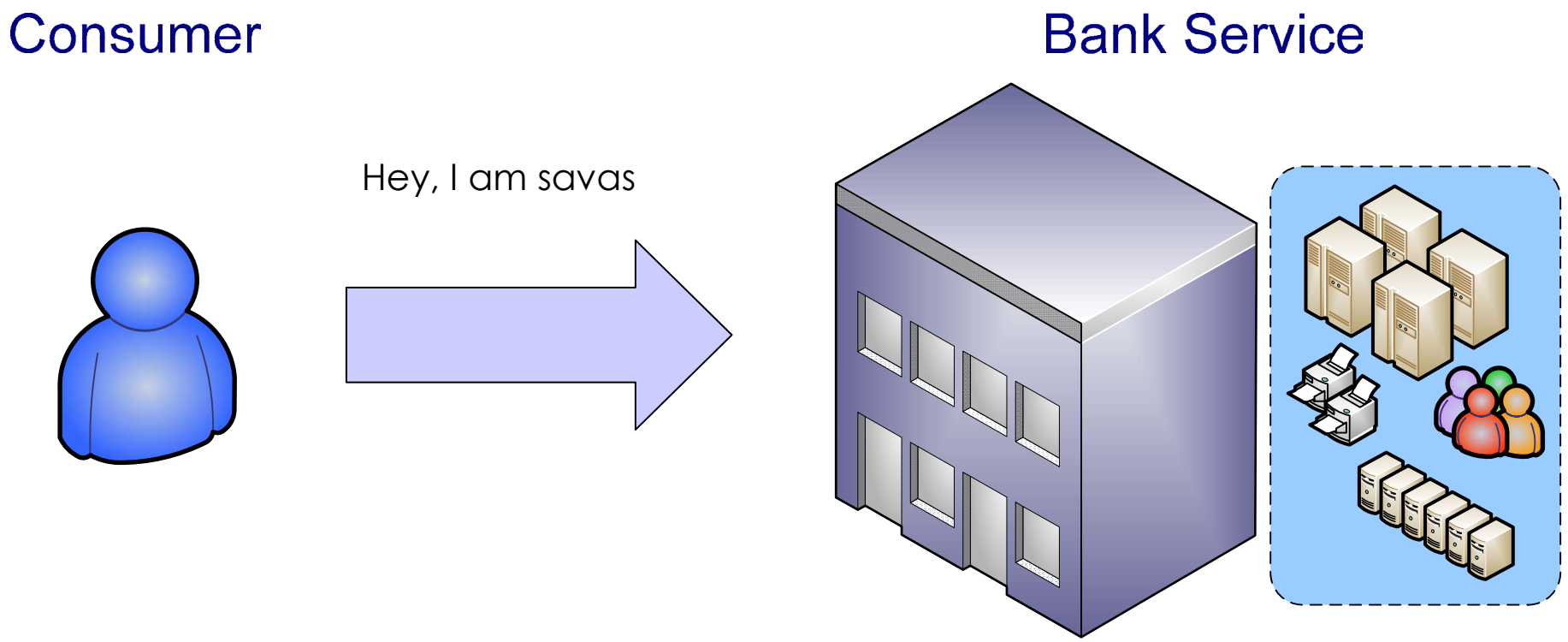


The description of a service in a SOA is essentially a description of the messages that are exchanged. This architecture adds the constraint of stateless connections, that is where all the data for a given request must be in the request.

Web Services Architecture (WSA), W3C Working Draft 8 August 2003

Web Services Interaction

- Stateless interaction



Web Services Interaction

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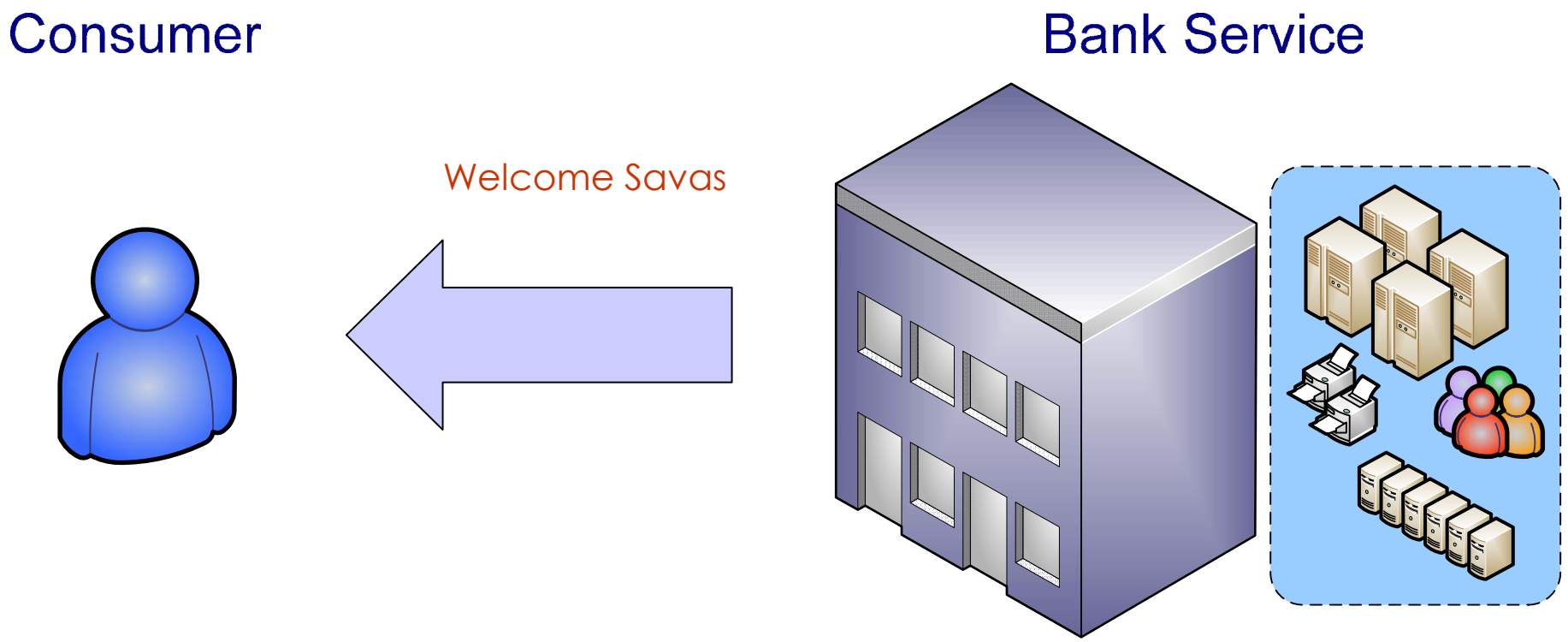

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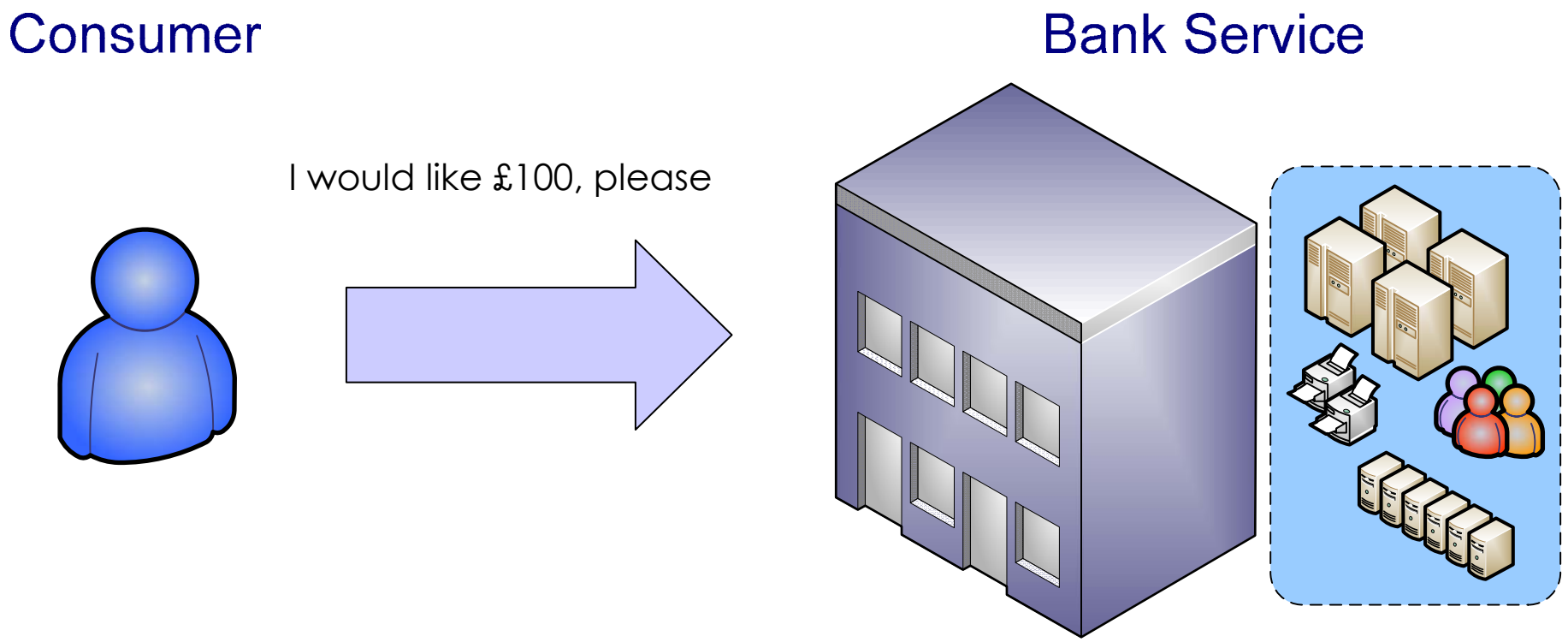

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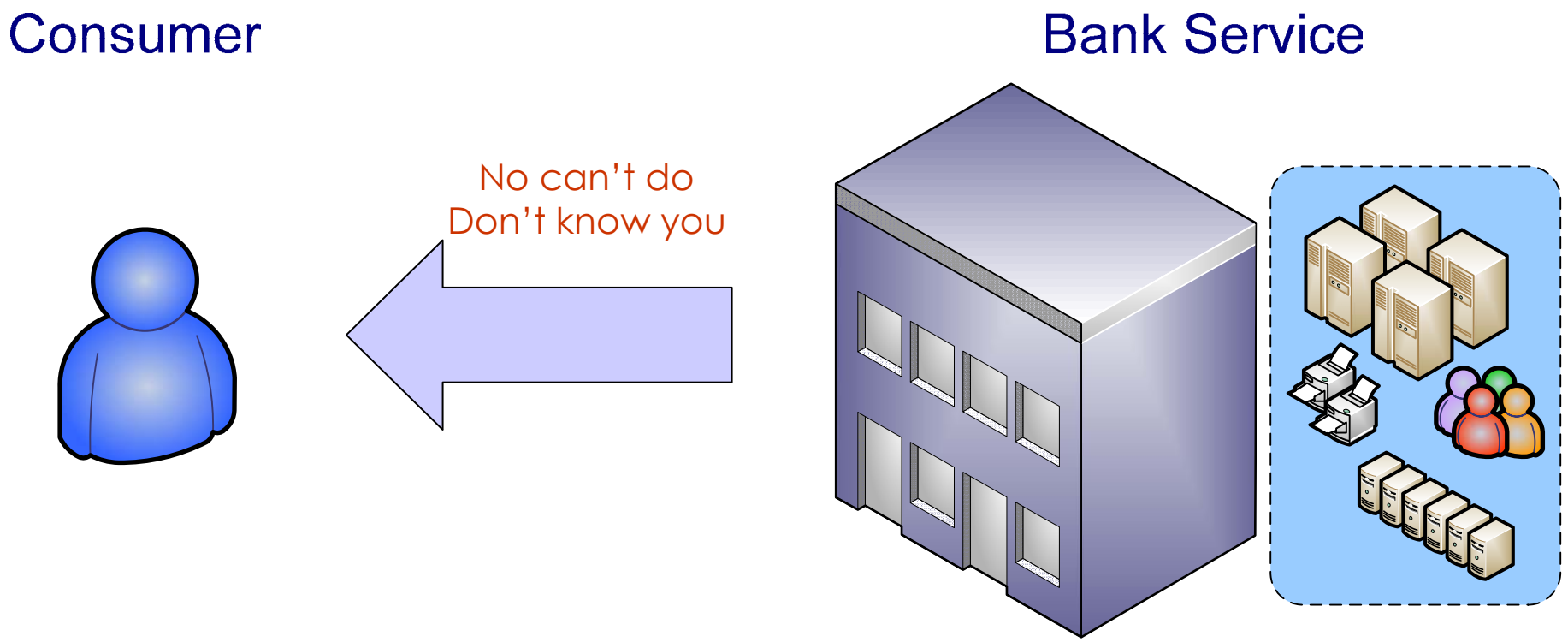

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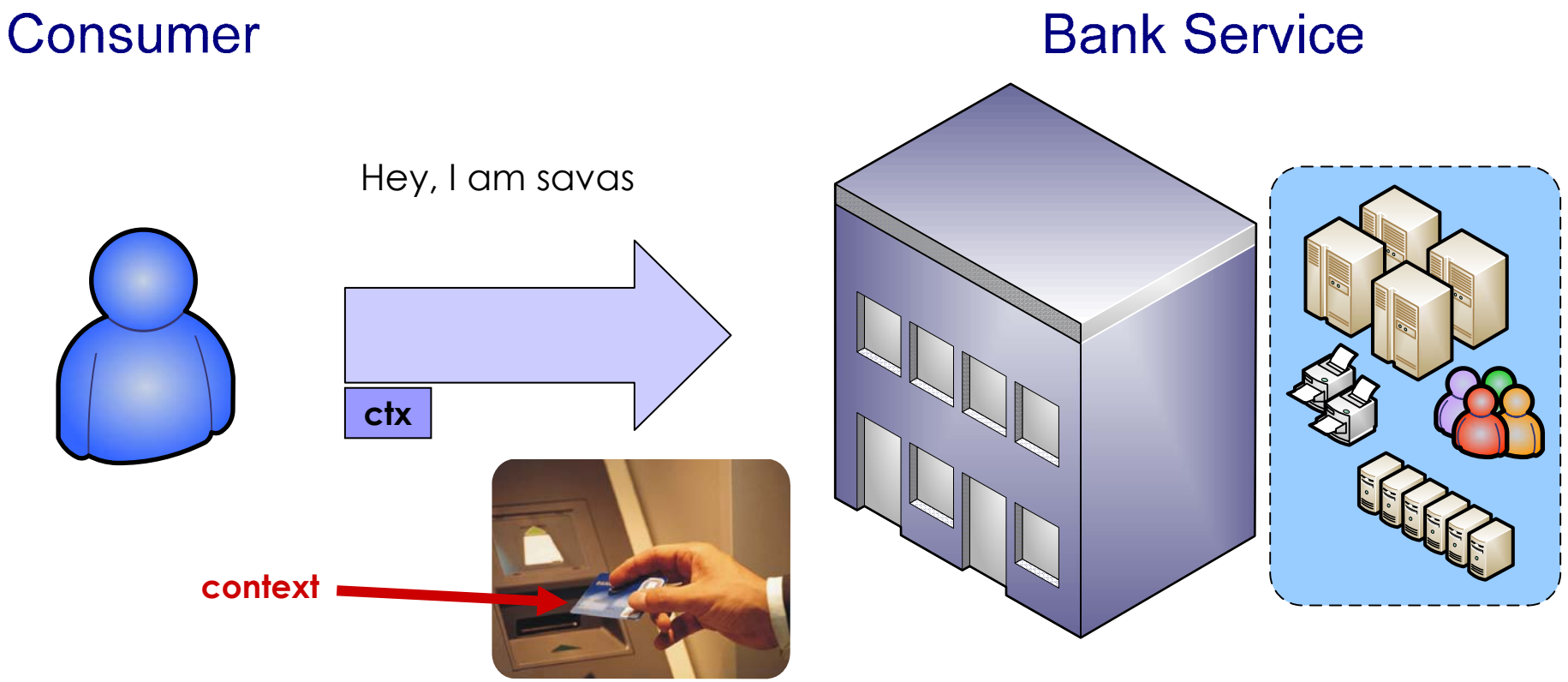

Web Services Interaction

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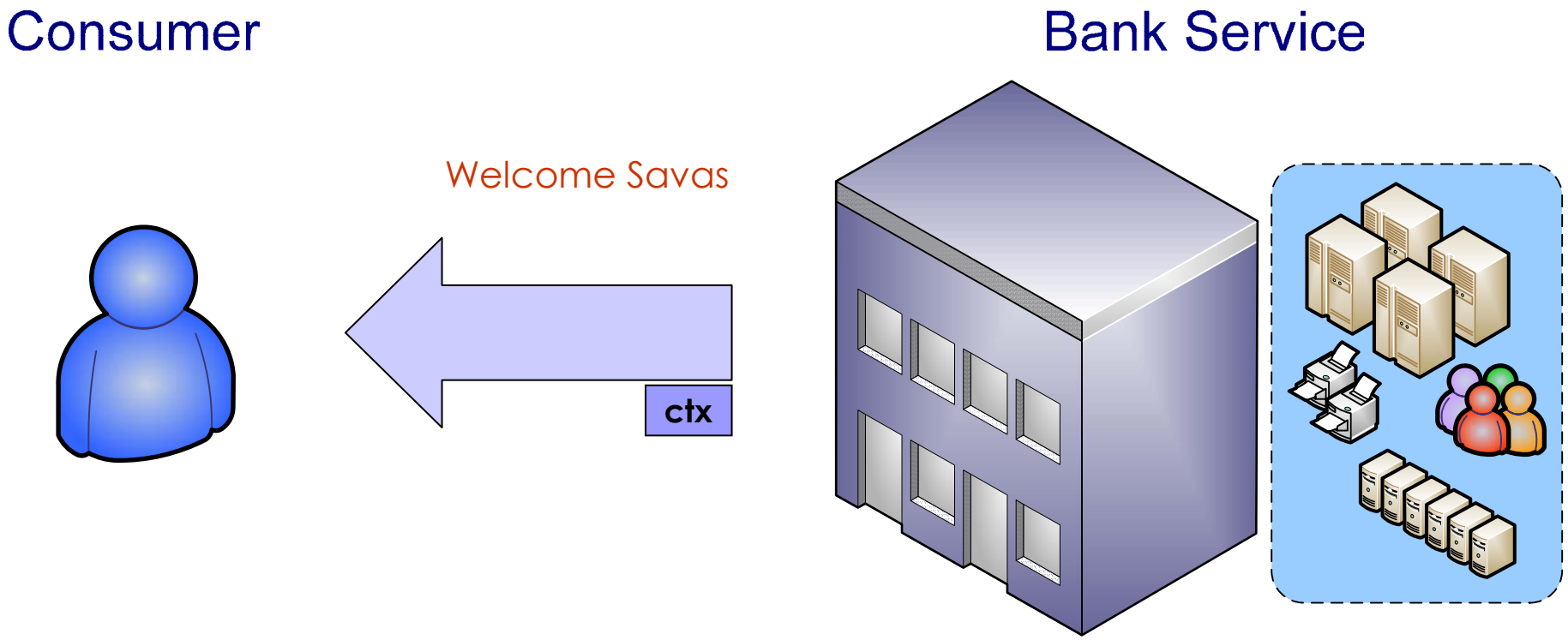

Web Services Interaction

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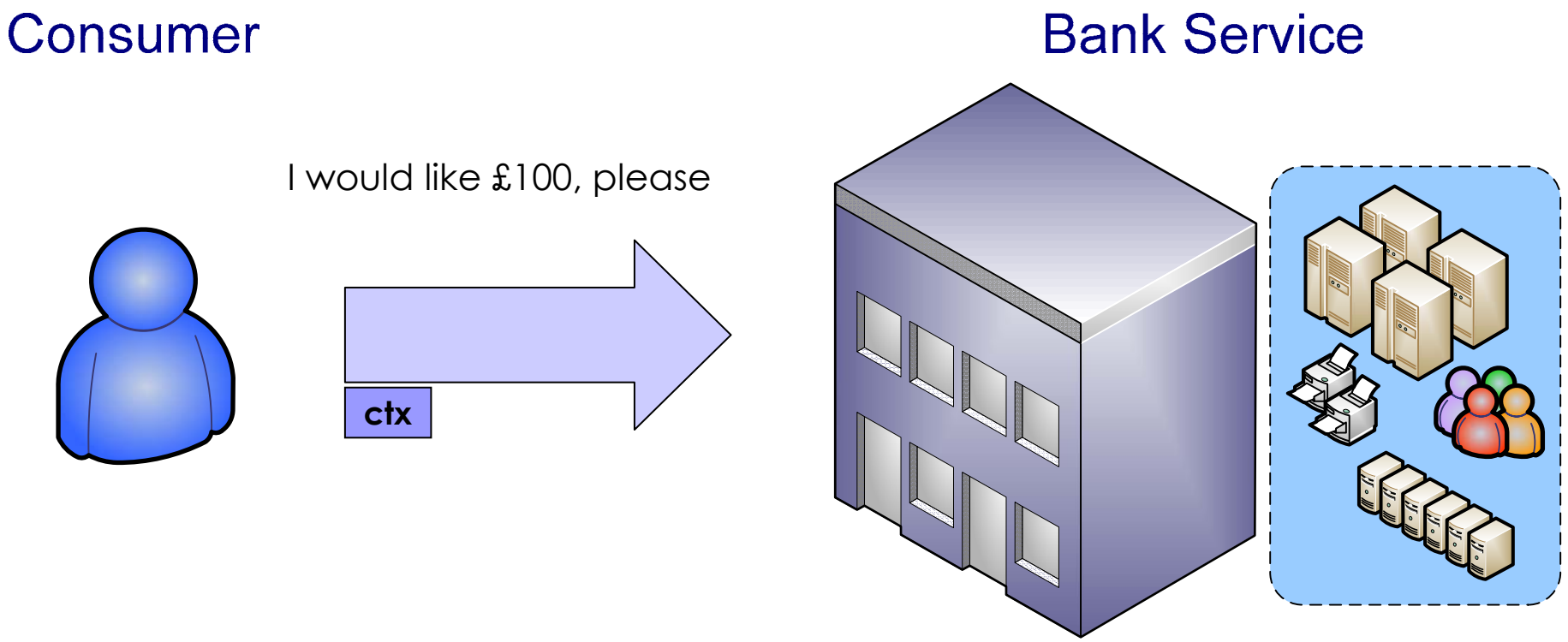

Web Services Interaction

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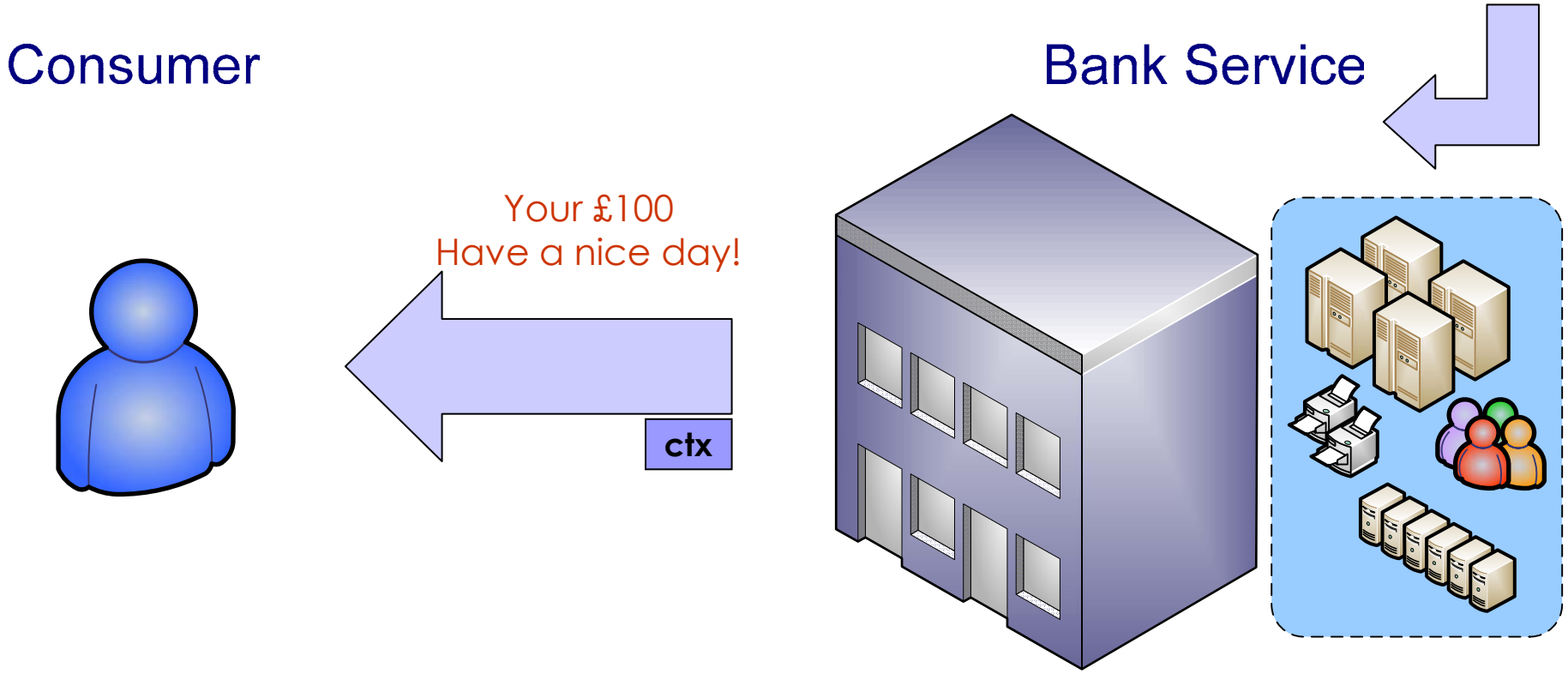
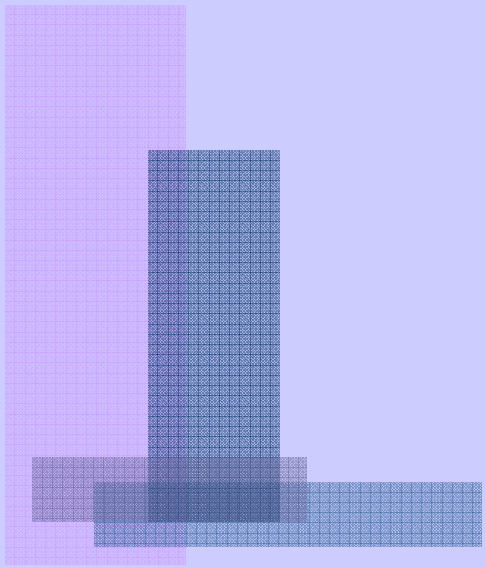


Contextualisation

- Context is a way to decorate messages with metadata
  - Out-of-band mechanism (SOAP Headers)
  - Used by many existing WS specs (WS-Coordination, WS-Transactions, WS-Security, WS-Context, WS-CoordinationFramework, WS-TransactionManagement, WS-ReliableMessaging)
- Contextualisation as the means for message correlation
  - Conforms to WSA definition of a service
  - Orthogonal to the use of other protocols/specifications
  - Optional

- WS-Context
  - Part of the OASIS WS Composite Application Framework
  - Naturally supports activities – distributed units of work
    - E.g., the foundation for transactions, workflows, etc. for sets of services

From Web Services to the Grid



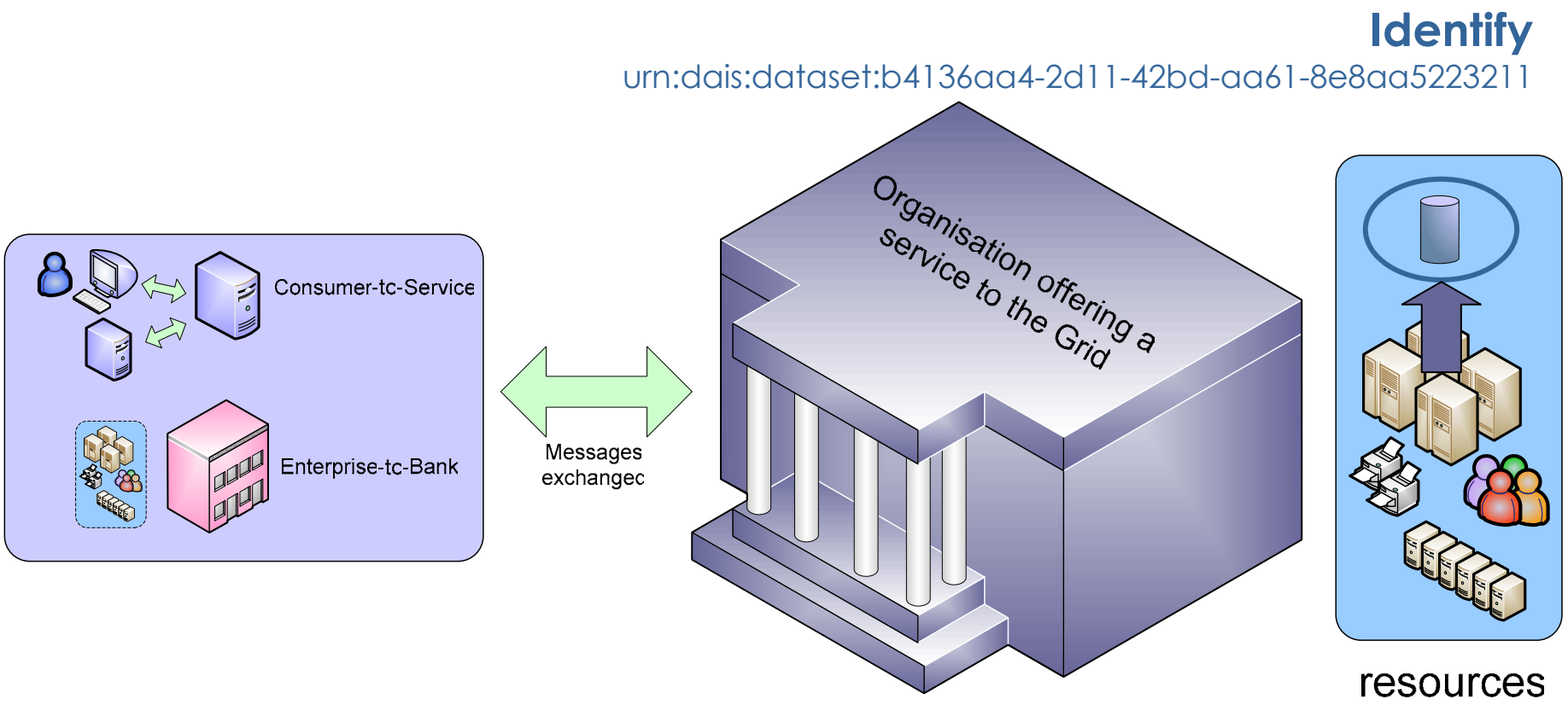
The WS-GAF approach

From Web Services to the Grid

- Stateful interactions
  - Contextualisation
- Resource identification
  - Grid Resource Specification
- Lifetime management

Resource identification

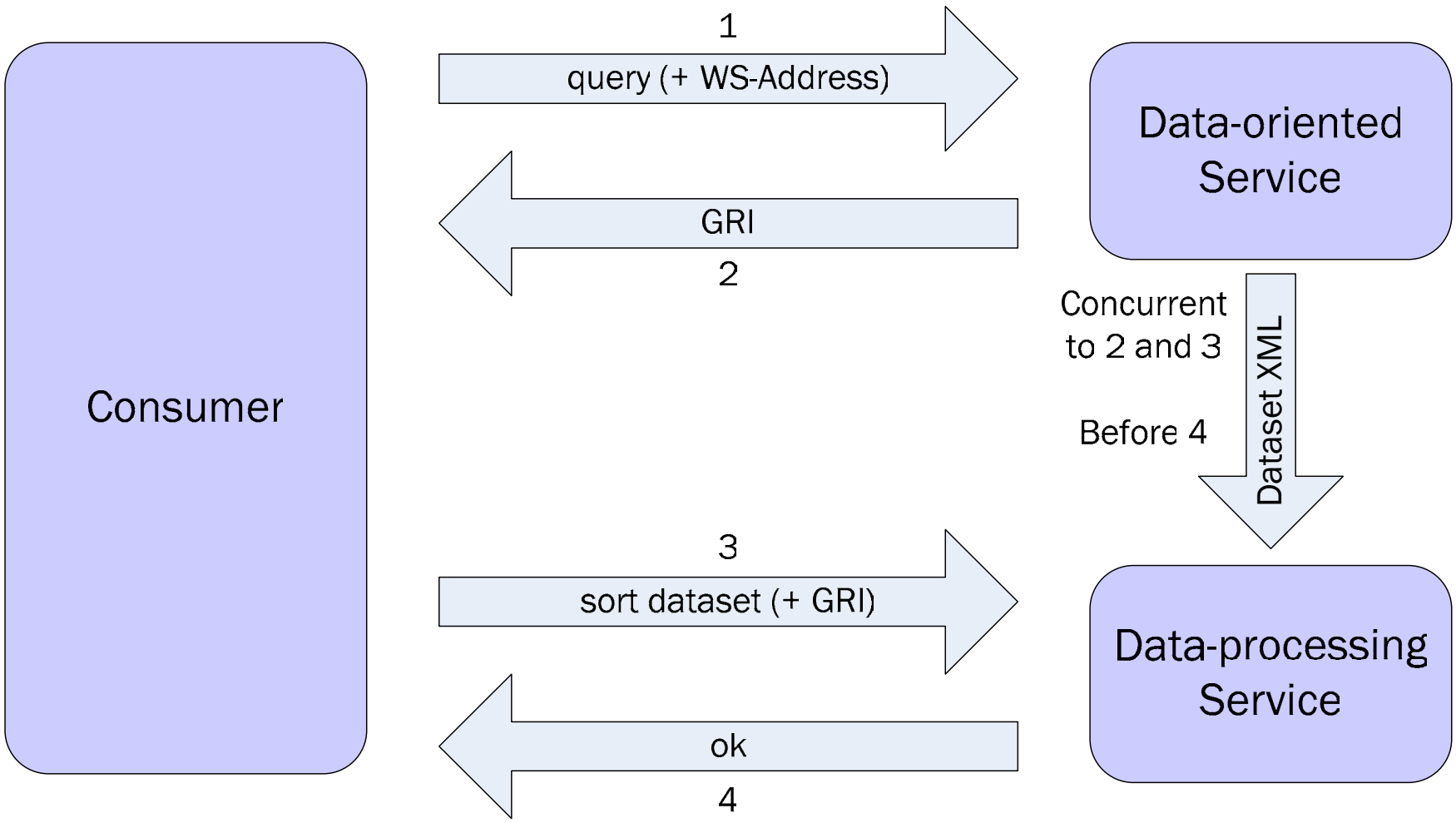
- Resources are usually hidden
- There are cases where resources need to be identifiable outside an organisation's boundaries



Grid Resource Specification

- Grid Resource Identifier (GRI) (like an LSID)
  - Everlasting, unique resource identifier (Uniform Resource Name, URN)
  - Can be stored in a database or printed in a journal
- A document-based approach to providing metadata about resources
  - Generalisation of the DataRef idea
- Grid Resource Metadata (GRM) document (extensible)
  - gri
  - type
  - lifetime
    - Lifetime of the resource
  - set of endpoints (WS-Address and lifetime)

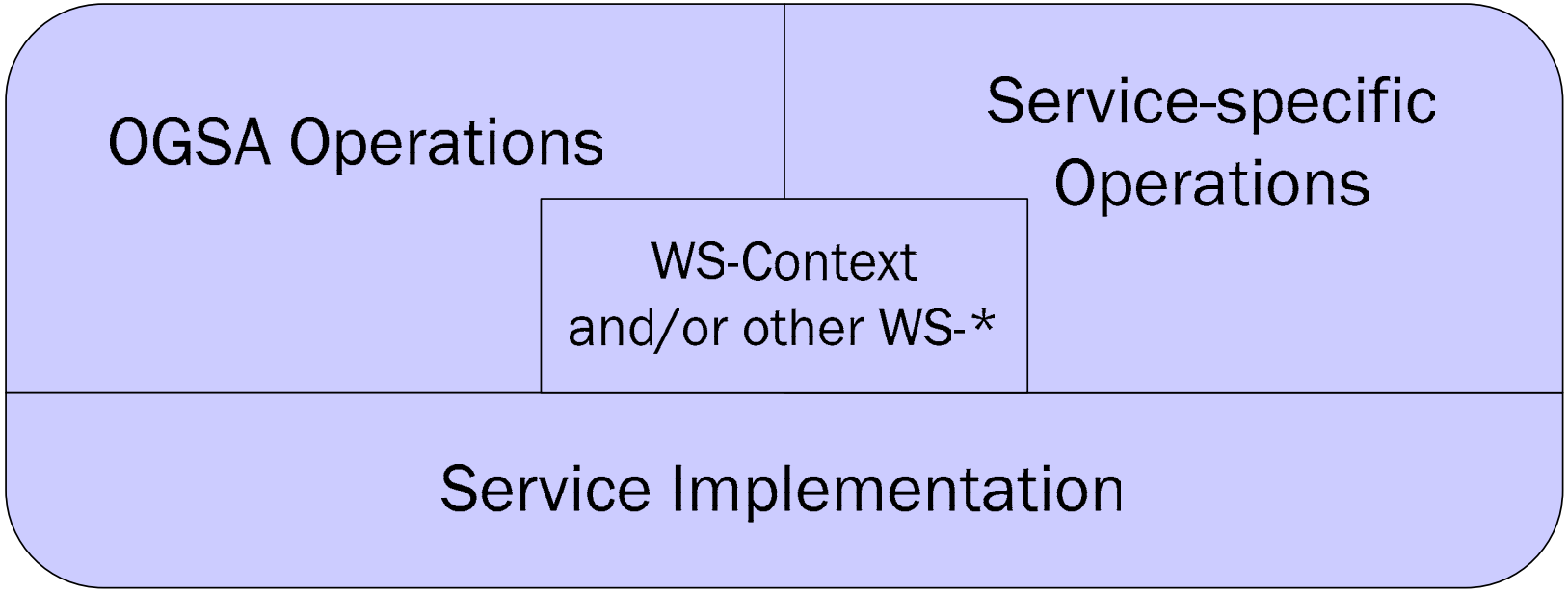
For example


Consumer
1
query (+ WS-Address)
GRI
2
Data-oriented Service
Concurrent to 2 and 3
Before 4
Dataset XML
3
sort dataset (+ GRI)
ok
4
Data-processing Service

Lifetimes in WS-GAF

- Separate out and define orthogonal lifetimes
  - Context lifetime (for stateful interactions)
  - Grid Resource lifetime (for globally identified resources)
  - Endpoint lifetime

- There is no mandatory functionality
- Designers can choose the functionality supported by their services
- OGSI WG selects the set of specifications (out of existing ones) that should be used when necessary
  - e.g., WS-Context for contextualisation, GRI for resource identification and GRM documents for metadata
  - Defining the Grid-Interoperability Basic Profile (similar to WS-I BP)?



Benefits of WS-GAF

- Simplicity and Minimalism
  - Meets Grid requirements without inventing new infrastructure
  - Uses existing contextualisation and addressing specs
  - Uses URN for resource identification
  - Low entry and maintenance costs for new Grid services
- W3C Web Services Architecture conformant
  - No changes in the semantics/characteristics
  - Synergy with existing WS specifications and practices
  - Avoid effort involved in influencing WS community
  - Avoid risk associated with not being able to influence WS community

Benefits of WS-GAF

- Supporting tools
  - No divergence from WS technologies and tools (e.g., WSDL)
  - Do not need anything other than existing industry and open-source provided WS tools and platforms (e.g., ASP.NET, Axis, etc.)
- Education materials
  - Industry investment

Benefits of WS-GAF

- Factorisation
  - No mandatory functionality, separation of concerns (no overloading of service semantics)
- Moves the focus from the low-level "networking" to the more important OGSA platform
  - OGSA should be the focus for Grid standards
- Performance and scalability
  - Encourages large granularity, loose coupling (richer, fewer message exchanges)
- Explicit identification of resources
  - Resource lifetimes, everlasting resource IDs

Conclusions

- We believe that WS-GAF meets the same requirements as OGSI v1.0 by using today's WS specifications and practices
- We believe that WS-GAF has a range of benefits
- The OGSI WG still has a vital role to play
  - Define the Grid-Interoperability Basic Profile

- We submit this as input to the discussion for OGSI v2.0

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People

- University of Newcastle upon Tyne (North-East Regional e-Science Centre, NEReSC)
  - Savas Parastatidis
    - savas@parastatidis.name
    - http://savas.parastatidis.name
  - Paul Watson
    - Paul.Watson@newcastle.ac.uk
    - http://www.cs.ncl.ac.uk/people/paul.watson
- Arjuna Technologies
  - Jim Webber
    - Jim.Webber@arjuna.com
  - Thomas Rischbeck
    - Thomas.Rischbeck@arjuna.com