Usage of Business Process Choreography

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Agenda

- Introduction
- Lifecycle
  - Design phase
  - Usage phase
  - Managing phase
- Remarks
About this talk

This talk is about possible usages with XML form of Business Process Choreography.

- Before usage discussion, we will consider what it means by standardizing Business Process Choreography in XML, utilizing Web Services within Business Processes.
- Focuses are on two kinds of usages, i.e. one in defining, and one in processing Business Process Choreography.
What is Process?

Process*: A collection of steps taking place in a prescribed manner and leading to an objective.

- A process may have multiple starting points and multiple end points.
- The prescribed manner may be a partially ordered sequence.
- A process specification can be a workflow specification.
- An enterprise specification may define types of processes and may define process templates.

* from ITU-T Rec. X 911| ISO/IEC 15414 RM-ODP Enterprise Language
What is Business Process and Choreography?

**Business Process:** A collection of **business** steps taking place in a prescribed manner and leading to **business** objective, where all the terms used to describe business process are independent of specific technologies. (my definition)

**Choreography:** “The sequence of steps and movements in dance, especially ballet.” (by The Concise Oxford Dictionary)
Business Process Choreography?

Business Process constructed from Choreography of Web Services, or Web Services Choreography to form Business Process (my definition again)
Business Process Modeling in OMG

- OMG has already developed specification for Business Process modeling, i.e., Business Process Profile in UML Profile for EDOC (Enterprise Distributed Object Computing).
- The specification defines a UML Profile (extension) to describe Business Process.
Business Process Profile

Component Collaboration Architecture
- Defines “ProcessComponent” as composable and de-composable modeling element with ports (interface) and protocol (behaviour) specification

Business Process inherits above and defines:
- CompoundTask (Process)
- Activity (Step)
- ProcessRole (Performer, Artifact, ResponsibleParty)
- Data Flow and Event
- …
EDOC Business Process Notations
Web Services?

How is EDOC Business Process related to Web Services?

Business Process Choreography is a kind of EDOC Business Process where:

- All the Responsible Parties are “Systems” (no human activities included), and
- All the Activities are performed locally or using Web Services.
Languages/Notations

*Some languages/notations in this area:*

- BPML (BPMI)
- BPSS (ebXML)
- BPEL4WS
- WSCI
- WSCL
- XPDL (WfMC) etc.

And, any one of above should be able to describe EDOC Business Process (Choreography), because they have rich enough descriptive power.
Semantically Common Vocabularies/Functions for BP Choreography

From EDOC Business Process Profile:
- Process
- Activity
- Port
- Event
- Exception
- Data flow
- Flow patterns
BP Choreography Definitions as XML documents

- All the existing languages are XML based.
  - Because, XML is currently the most accepted standard for defining/processing structured documents.

- There are several aspects.
  - Since they are XML “documents,” they can be considered as “data.”
    - “Data” should be stored and managed, and may be modified.
    - “Data” could be sent as message content.
    - “Data” could be combined and/or refined.

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Benefits

- People can understand and communicate with each other regarding business processes, because they are in text form (using XML tools).
- Systems can process them, because they are well structured (using interpreting software).
- And, more in the following slides.
BP Choreography Lifecycle

- **Design (Defining) phase**
  - How can I define or construct BP Choreography?

- **Use (Processing or executing) phase**
  - How can I find and make use of BP Choreography?

- **Maintenance or management phase**
  - How can I modify my BP Choreography to keep up with the changing business environment?
Design and Use

Defining XML documents is like creating office documents, so you will need:

- Editing tools (with/without GUI) or white paper with your pen
- Libraries (or fragments of usable XML documents)
- Templates (for instantiation)
- Composition/Decomposition tools (reuse of existing XML documents), and Basic Control Flow Pattern libraries
- Optimization tools

Processing of XML documents:

- Issues: by whom, from where, when, and how?
BP Choreography Design

- Requirements or UML diagrams (or EDOC Business Process Diagram) describing a sequence of steps to achieve its business objective

- Structural consideration

- Libraries
  - Template library
  - Parts library
  - Control Flow Pattern library
  - Existing BP Choreography Definitions library
Structural aspects

- Business Process may be hierarchical.
  - e.g. business processes defined according to organizational structure

- Business Process may be recursive.
  - e.g. to achieve various types of “loops”

- Business Process may have association or channel with other Business Processes.
  - e.g. to provide and/or get information with each others
An example

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Re-use

- Find the suitable & proven BP Choreography data
  - Meta-data or classification data useful
- Use it as is or adapt it for your needs

Business Process Choreography

BPC Library
Template Library

- Find the suitable & proven BP Choreography template data
  - Meta-data or classification data useful
  - Provide information (e.g. parameters) to instantiate the business process choreography to meet your needs
Parts or pattern Library

Find the suitable & proven BP Choreography parts data
- Meta-data or classification data useful
- Use parts to create the business process choreography to meet your needs
- May require tools

BPC Parts Library
Composition/Decomposition

- Composing BP Choreography

- Decomposing BP Choreography

  e.g.
  - Sub-Choreography
  - Schema
  - Activity def.
  - Control Pattern
  - ...

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Basic Control Patterns

Some example of basic control patterns

- Chain (sequencing)
- Joining
- Dividing
  - Spawn (parallel execution w/o joining)
  - Fork (parallel execution w joining)
- Nesting
- Looping
- Conditional Branch
Refine or Optimization

Necessary when:
- configuration of systems change (including introduction of new sub-systems), or
- when two or more choreographies are composed into one (there may be some redundancies or different policies or …)

Remember a term “BPR”? It is about reengineering (refining, optimizing) business processes.
BP Choreography Usage

- **Dynamic or Runtime Usage (Processing)**
  - Register business process choreography document
    - to public registry (possibly with BP Language ID)
  - Discover and instantiate business process choreography document
    - discovery by enquiry, or
    - discovery by notification (publish/subscribe)
    - instantiation with e.g. initial value provision
  - Drive business process
    - from central control node
    - from multiple control nodes (hierarchical)
    - from each participating node
Registration or Publication

Web Services based
- Put it on private registry and share them within e.g. the enterprise.
- Put it on public registry for search and access

Proactive publication
- Publicize it to parties and systems via notifications (e.g. email, messaging, and pub/sub notification)
Discovery

- Enquiry
  - To private registry
  - To public registry
  - To known systems

- Getting notified
  - Email
  - messaging
  - Pub/Sub notification
Instantiation

Based on the following:

- Business Process Choreography Data
- Business Process Choreography Template
- Business Process Choreography Parts
- Business Process Choreography Control Pattern Parts

Construct complete Business Process Choreography and provide "values" to make it ready for execution
Processing style

♦ A term just for this presentation
♦ A target of “Technology Mapping” in OMG Model Driven Architecture where:

- Platform Independent Model = Business Process Choreography/Definition
- Platform Specific Model = Models described with specific “Processing style” with more details (e.g. model for CORBA system or model for .NET)
Processing style

- **Central Control (no central reference)**
  - BP Choreography is processed at Central Control system, and Web Services is used to request services provided by each participating systems.

- **Central Reference (no central control)**
  - BP Choreography is placed on central server and is accessed from participating systems.

- **Multiple Copies (no central control)**
  - BP Choreography is copied and placed on every system for execution of each part.

- **Distributed Control (no central control)**
  - BP Choreography itself is communicated among participants for execution of each part.
Central Control

Central Control (no central reference)

- BP Choreography is processed at Central Control system, and Web Services is used to request services provided by each participating systems.
- Like Workflow Engine
Central Reference

Central Reference (no central control)
- BP Choreography is placed on central server and is accessed from participating systems.
Multiple Copies

- Multiple Copies (no central control)
  - BP Choreography is copied and placed on every system for execution of each part.
Distributed Control

- Distributed Control (no central control)
  - BP Choreography itself may be communicated among participants for execution of each part.
  - Combination of BP Choreography and Distributed Computing framework
Distributed Control

A simple B2B example:

- Purchase raw material of X
- Dependent on the quality of delivered X, purchased material will be divided into two sets and provided to:
  - Manufacturer XA to produce product A, for X with quality grade $\geq G$
  - Manufacturer XB to produce product B, for X with quality grade $< G$
- After production is complete, products are shipped to packaging company (the company starts packaging when both products arrives)
Distributed Control

XML document

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Distributed Control

BP initiator

BP terminator

The Internet

Monitoring

Packaging

X Producer

Manufacturer A

Manufacturer B

Message carrying BP Choreography (XML) document

Message carrying BP Choreography (XML) document

Message carrying BP Choreography (XML) document

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Distributed Control

What’s good about this?
- Control is distributed (no central authority) therefore every participant can be equally autonomous.
- A system executing the next step could be discovered dynamically (with UDDI etc.)
- Executing systems can perform their tasks with good understanding of the business context.

Trade-offs
- Monitor is needed for tracking and initiating compensation actions when necessary.
- Requires interpreting software.
- May require more security e.g. digital signature.
Managing BP Choreography Data

XML document is Data:

- May be managed by Web Server and DBMS
  - Needs security capability
  - Access control, digital signature, etc.
- Updated by Update Transactions
  - Needs transaction capability
  - May be a part of Business Process (updating Business Process Choreography Data)
Remarks

- Once captured as XML document, Business Process Choreography or Web Services Choreography becomes data.
- Data can be managed centrally or distributed (DBMS).
- There are two phases regarding data: designing/defining and using/processing.
- Processing of BP XML data should be looked at with processing styles (abstract platforms).
- Central control is not the only solution.
References

- **UML & UML Profile for EDOC**

- **W3C Web Services Choreography WG**

- **OMG Web Services Workshop 2002 Proceedings**
Thank you very much for listening!

Any questions or comments?