



A Standard for Web Services Transactions

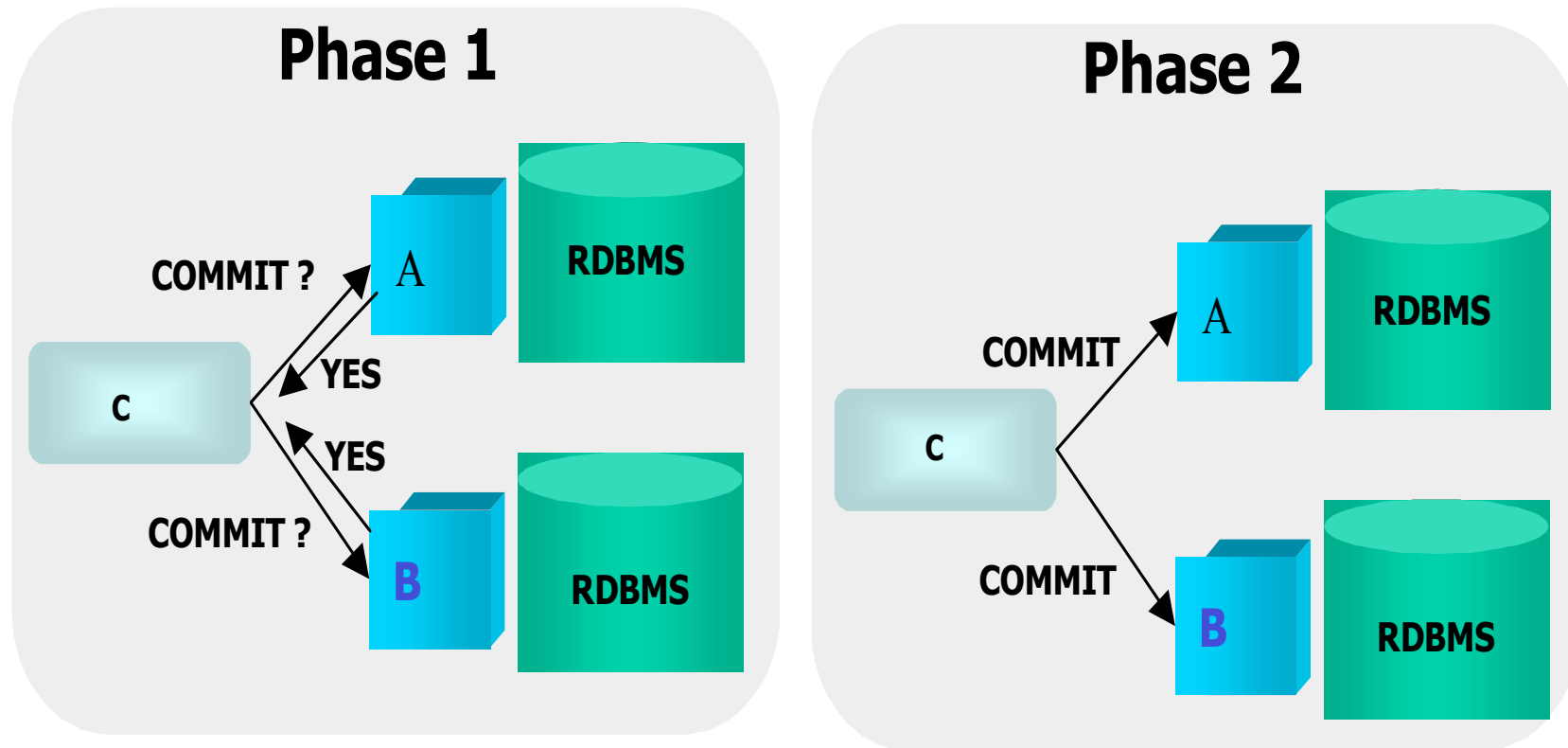
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- **Transactions and why they are important**
- **Web services and the problems they present**
- **WS-Coordination, WS-AT and WS-BA**
- **Example scenario**
 - WS-AT and WS-BA

Atomic transactions

- **Scoping mechanism that provides “all-or-nothing” semantics**
- **Enables shared resources to be protected from concurrent users**
- **ACID properties**
 - Atomic
 - Consistent
 - Isolated
 - Durable

Two-phase commit



Environmental impact

- **ACID transactions implicitly assume**
 - Closely coupled environment
 - All entities involved in a transaction span a LAN, for example.
 - Short-duration activities
 - Must be able to cope with resources being locked for periods
- **Therefore, do not work well in**
 - Loosely coupled environments!
 - Long duration activities!

However ...

- **Web Services are as much about interoperability as they are about the Web**
- **In the short term Web Services transactions will be about interoperability between existing TP systems rather than running transactions over the Web**

B2B interactions

- **Business-to-business interactions may be complex**
 - involving many parties
 - spanning many different organisations
 - potentially lasting for hours or days
- **Cannot afford to lock resources on behalf of an individual indefinitely**
- **May need to undo only a subset of work**

Relaxing isolation

- **Internal isolation or resources should be a decision for the service provider**
 - E.g., commit early and define compensation activities
 - However, it does impact applications
 - Some users may need to know a priori what isolation policies are being used
- **Undo can be whatever is required**
 - Before and after image
 - Entirely new business processes

Relaxing atomicity

- **Sometimes it may be desirable to cancel some work without affecting the remainder**
 - E.g., prefer to get airline seat now even without travel insurance
- **Similar to nested transactions**
 - Work performed within scope of a nested transaction is provisional
 - Failure does not affect enclosing transaction
- **However, nested transactions may be too restrictive**
 - Relaxing isolation

- **Specifications released by Arjuna, BEA, IBM, IONA and Microsoft**
 - Now OASIS standard
- **Separate coordination from transactions**
 - WS-Coordination
- **Define two transaction models**
 - AtomicTransaction
 - Closely coupled, interoperability
 - Business Activities
 - Compensation based, for long duration activities

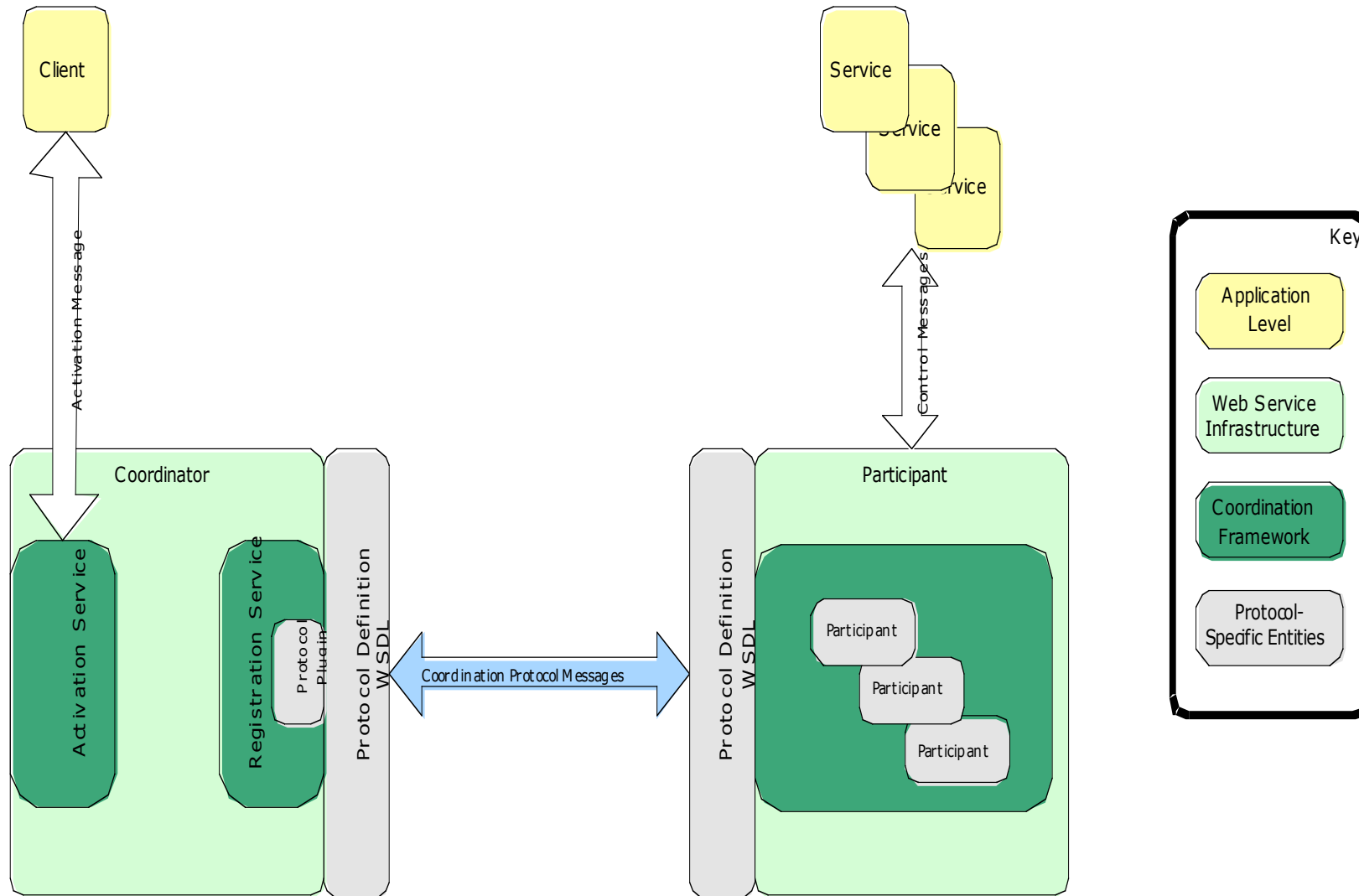
Web Services Coordination

- **Coordination is more fundamental than transactions**
 - Transactions, security, workflow, replication, ...
 - But each use may require different protocol
 - Two-phase, three-phase, QoS specific, ...
- **Define separate coordination service**
 - Allow customisation for different protocols

WS-Coordination

- **Defines typical roles of coordinator and participant**
 - Coordinator split into two roles
 - Activation service
 - Context
 - Registration service
 - Participant interface is implied by specific protocol

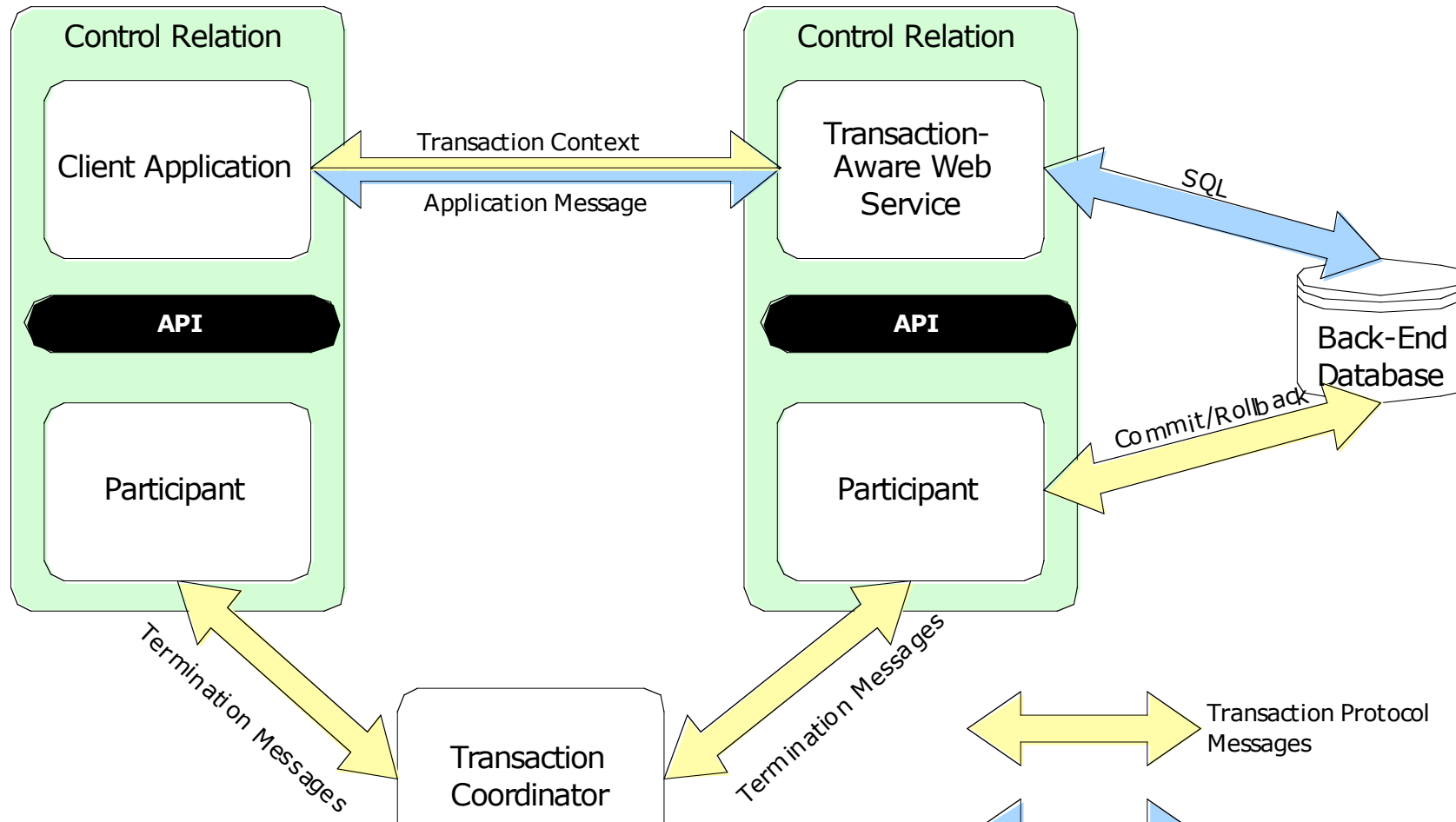
Coordination service



- **Coordinator protocols**
 - Atomic Transaction
 - Completion, DurableTwoPhase, VolatileTwoPhase
 - Business Activity
 - BusinessAgreementWithCoordinatorCompletion, BusinessAgreementWithParticipantCompletion

- **Assume ACID transactions**
 - High degree of trust
 - Isolation for duration of transaction
 - Backward compensation techniques
 - Does not allow heuristic outcomes
- **Integration with existing transaction systems**
 - Important to leverage investments
- **Interoperability between transaction systems**
 - Something of a holy grail to date

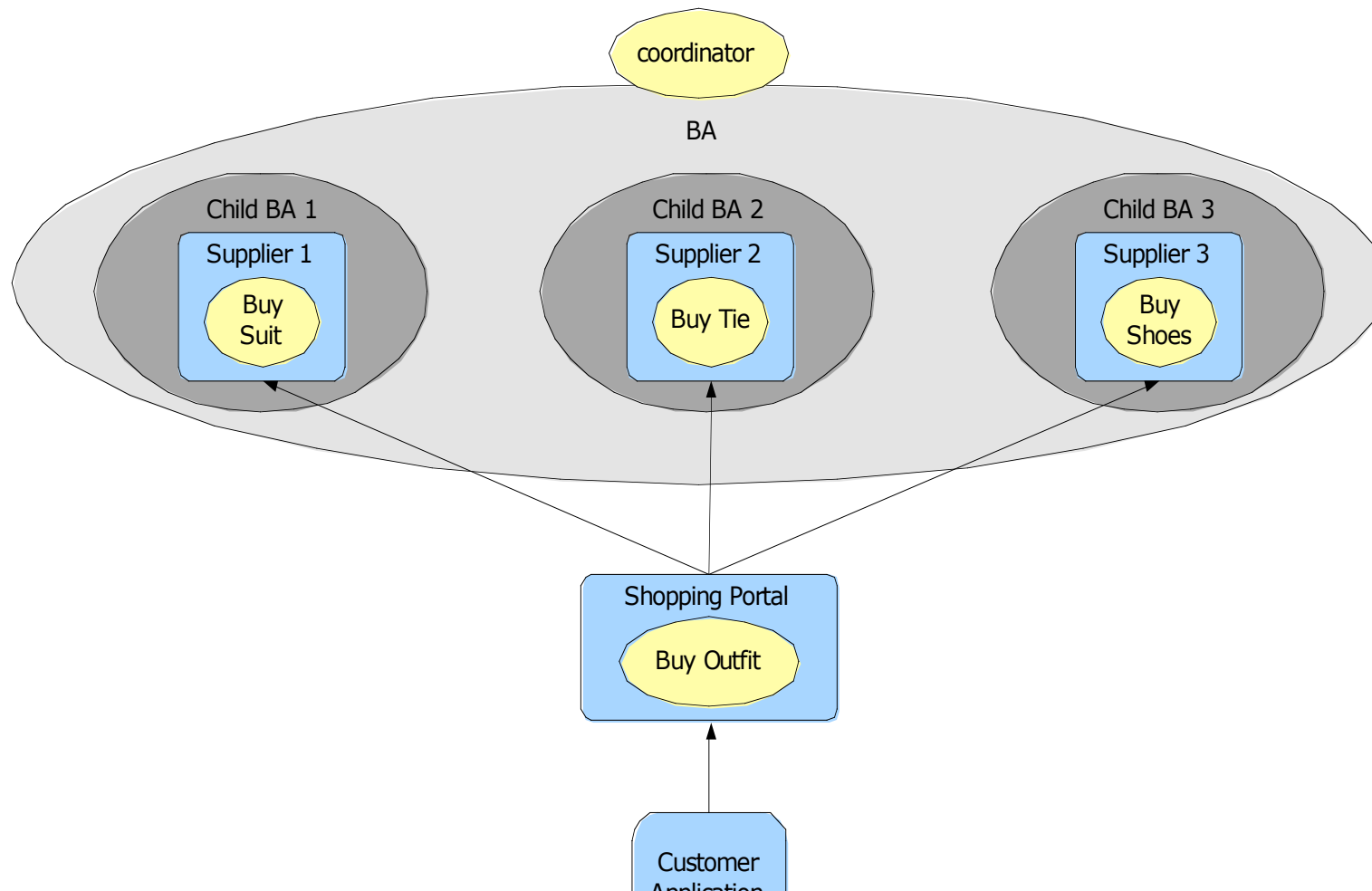
Services, participants and context



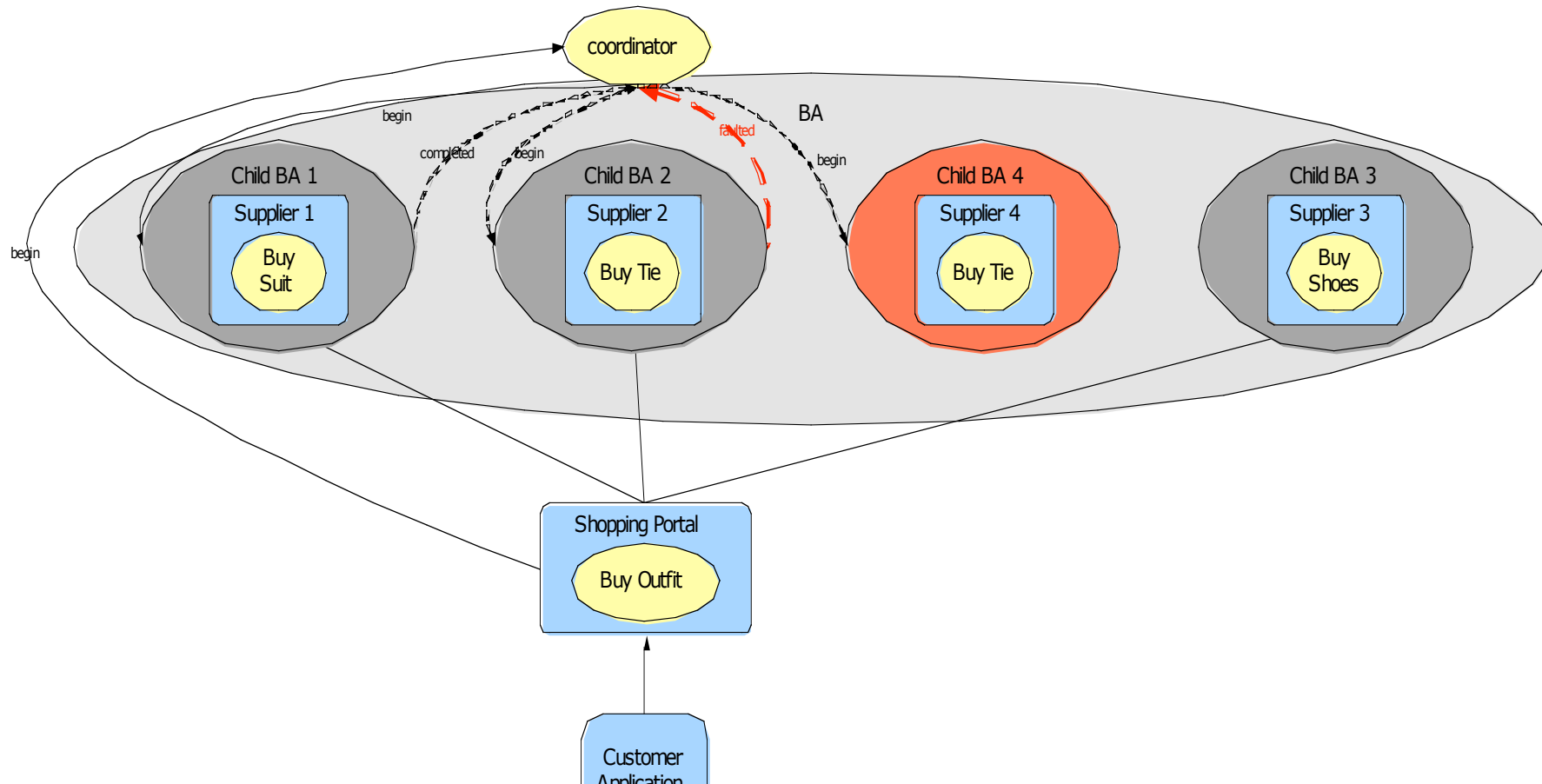
WS-BusinessActivity

- **Workflow-like coordination and management**
- **Business activity can be partitioned into tasks**
 - Parent and child relationships
 - Select subset of children to complete
 - Parent can deal with child failures without compromising forward progress
- **Tasks can dynamically exit a business activity**
- **Tasks can indicate outcome earlier than termination**
 - Up-calls rather than just down-calls

WS-BA example



Compensating BA



- **Transactions are important in mission critical environments**
 - Definition of “transaction” needs to be re-thought for Web Services
 - But ACID transactions still important
- **OASIS WS-TX defines the standard for Web Services Transactions**
 - Multiple protocols for different use cases
 - Demonstrated interoperability between
 - Red Hat/Jboss
 - IBM
 - Microsoft
 - IONA Technologies