



## Managing Dynamic Services

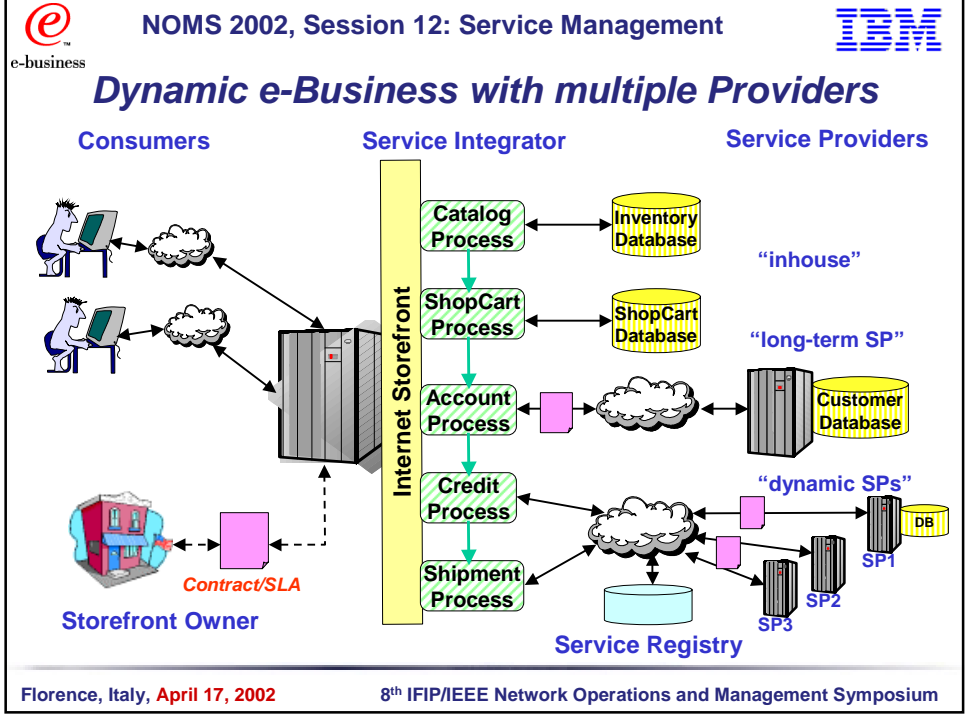
### A Contract based Approach to a Conceptual Architecture

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## *Implications of a Web Services Environment*

- ▼ What would happen if the cost of application integration suddenly went to zero?
  - you could easily switch between service providers
  - whenever you need to you could rework your business processes as your company's business vision evolves
- ▼ Short term
  - reduce integration time from years or months to a day
- ▼ Long term: completely dynamic e-Business
  - legal templates and automatic terms negotiation
  - integration and re-purpose in minutes or seconds
- ▼ Web services is how
  - businesses **describe functionality** (services) they want to externalize
  - businesses **publish** that information
  - businesses **discover** services
  - businesses **connect** to each other and invoke services with appropriate security, reliability, manageability and privacy



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- ### Real-world SLAs – and their Requirements
- ▼ Quality aspects of service relationship between service provider & customer
  - ▼ Today: Confined to Availability
    - ▼ "Availability% := (n-#hours\_Svc\_down)\*100/n"
    - ▼ "... Users being able to establish a TCP connection to the Server..."
    - ▼ "...Customer's ability to access the software application on the Server..."
    - ▼ "... if the Server is responding to HTTP requests issued by monitoring SW..."
  - ▼ Define new SLAs "on-the-fly"
  - ▼ Accommodate ANY QoS Parameter Definition and Service Level
  - ▼ Go beyond "Availability": Response Time, Throughput, Bandwidth...
  - ▼ Connect to existing application and resource instrumentation
  - ▼ Flexible specification of inter- and intra-organizational SLA parameters to the necessary detail
  - ▼ Support for customer/provider relationships of arbitrary depth
  - ▼ SLAs resemble B2B contracts; leverage existing work in B2B area
    - automatic negotiation,
    - contract frameworks & languages
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## SLA Framework

- ▼ SLA is associated with a service specification
  - References WSDL service description
  - Other service descriptions, e.g., for e-utilities, business processes, messaging, etc.
- ▼ XML-Schema based language for SLAs, current focus: IT resource level
  - Parties: primary and supporting roles,
  - SLA Parameters/Metrics: *what* to measure, Meas.Dir. & Functions: *how* to measure,
  - Service Guarantees and Actions

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## Contract Structure explained

<p><b>Parties:</b></p> <ul style="list-style-type: none"> <li>Primary Parties</li> <li>Supporting Parties</li> </ul> <hr/> <p><b>Service Description:</b></p> <ul style="list-style-type: none"> <li>Service Operations</li> <li>Bindings</li> <li>SLA Parameters</li> <li>Metrics</li> <li>Measurement Directives</li> <li>Functions</li> <li>Evaluation Period</li> </ul> <hr/> <p><b>Guarantee:</b></p> <ul style="list-style-type: none"> <li>Validity Period</li> <li>Predicate</li> <li>Actions</li> </ul>	<p><b>Involved Parties:</b></p> <ul style="list-style-type: none"> <li>IDs and interfaces of primary parties</li> <li>IDs and interfaces of supporting parties</li> </ul> <p><b>Service Characteristics &amp; Parameters:</b></p> <ul style="list-style-type: none"> <li>Operations offered by service</li> <li>Transport encoding for messages</li> <li>Agreed-upon SLA parameters (output)</li> <li>Metrics used as input</li> <li>How/where to access input metrics</li> <li>Measurement algorithm</li> <li>Measurement duration, sampling rate</li> </ul> <p><b>Guarantees &amp; Constraints:</b></p> <ul style="list-style-type: none"> <li>When is SLA parameter guaranteed?</li> <li>How to detect violation (formula)</li> <li>Corrective actions to be carried out</li> </ul>
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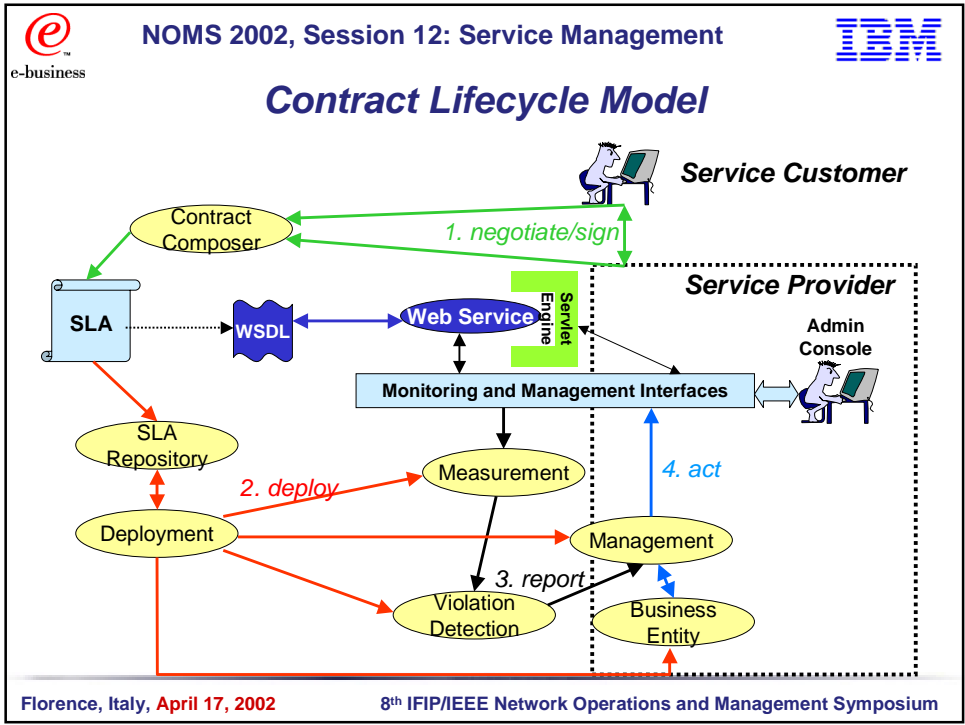
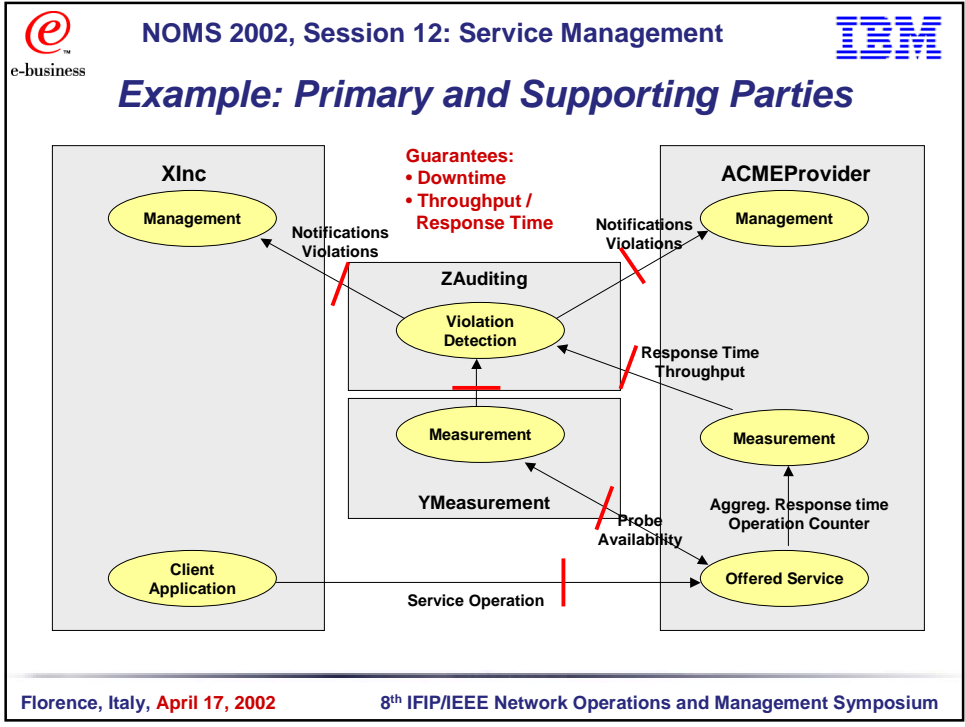
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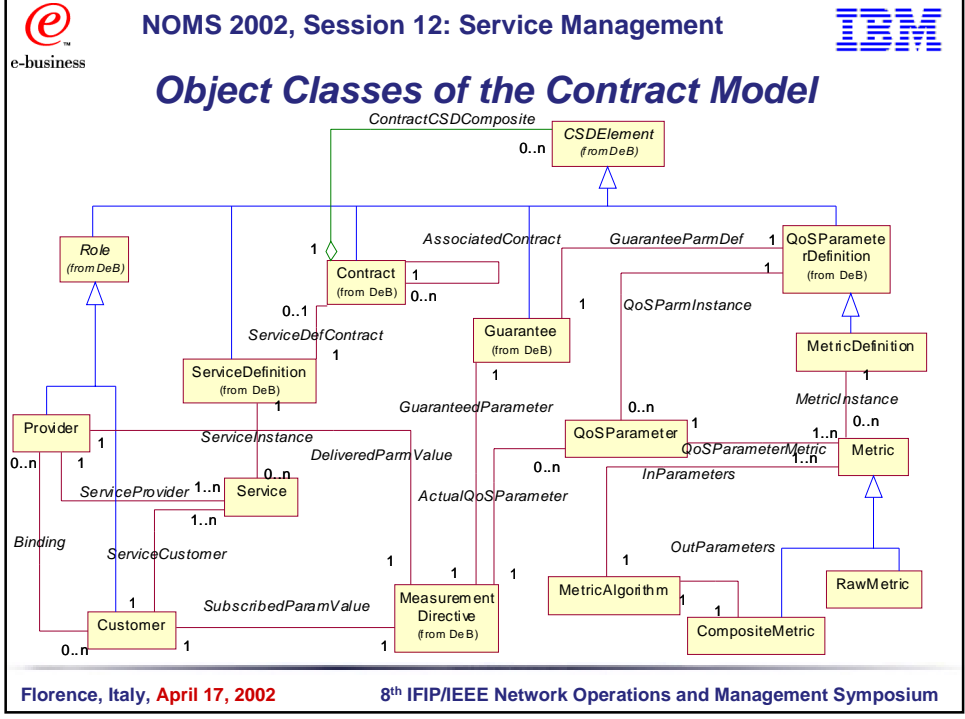
## Contract Structure Example: Service Throughput

Parties:	<b>Involved Parties:</b>
Primary Parties	"customer.com", "provider.com"
Supporting Parties	"msp.com, keynote.com, ..."
Service Description:	<b>Service Characteristics &amp; Parameters:</b>
Service Operations	"StockQuoteService:GetQuote()"
Bindings	"SOAPGetQuote"
SLA Parameters	"average throughput of service"
Metrics	"#requests(svc)"
Measurement Directives	"www.msp.com/getMetric?Requests(svc)"
Functions	"AVG(#Requests(svc))"
Evaluation Period	"over 24 hours, every 60 minutes"
Guarantee:	<b>Guarantees &amp; Constraints:</b>
Validity Period	"weekdays, 9am-5pm"
Predicate	" > 5.000.000 TA/hour"
Actions	"open TT", "pay penalty/premium"

## Service Categories

- ▼ **Deployment Service**
  - Deploys the relevant (!) parts of the contract to the different parties
    - ▼ E.g., multiple Measurement Services may not "see" each other
- ▼ **Measurement Service**
  - Probes and measures Resource Metrics according to Contract Specification and aggregates them into QoS Parameters
- ▼ **Violation Detection Service**
  - Compares QoS parameters obtained from Measurement Service against specified Service Levels (Guarantees)
  - Notifies the involved primary parties that a Violation has occurred during a valid time period
- ▼ **Management Service & Business Entity (not yet supported)**
  - Access to proprietary tuning knobs and configuration parameters of managed resources & corrective actions often not available,
  - Must be checked against business policies embodied by B.E.





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- ## Conclusions and Outlook
- ▼ **Results:**
    - Service and IT resource-level guarantees
    - Flexible specification of inter- and intra-organizational SLA parameters to the necessary detail
    - Support for nested customer/provider relationships
    - Definition of external ("supporting") parties in SLA management
    - Formal, XML-Schema based description language
    - Extensible to various kinds of services (Web Services, Storage, eUtilities, etc.) and their corresponding metrics
  - ▼ **Current Work:**
    - Comprehensive contract framework, also covering:
      - ▼ Business Metrics and Pricing,
      - ▼ Business Processes, Workflow and Service Composition,
      - ▼ Contract editing and reuse of common Artifacts
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