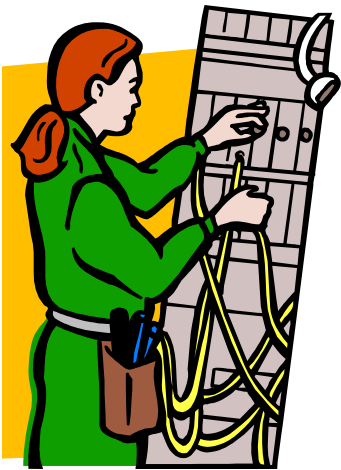


Process-based Approach to Semantic B2B Integration



Anne H. H. Ngu

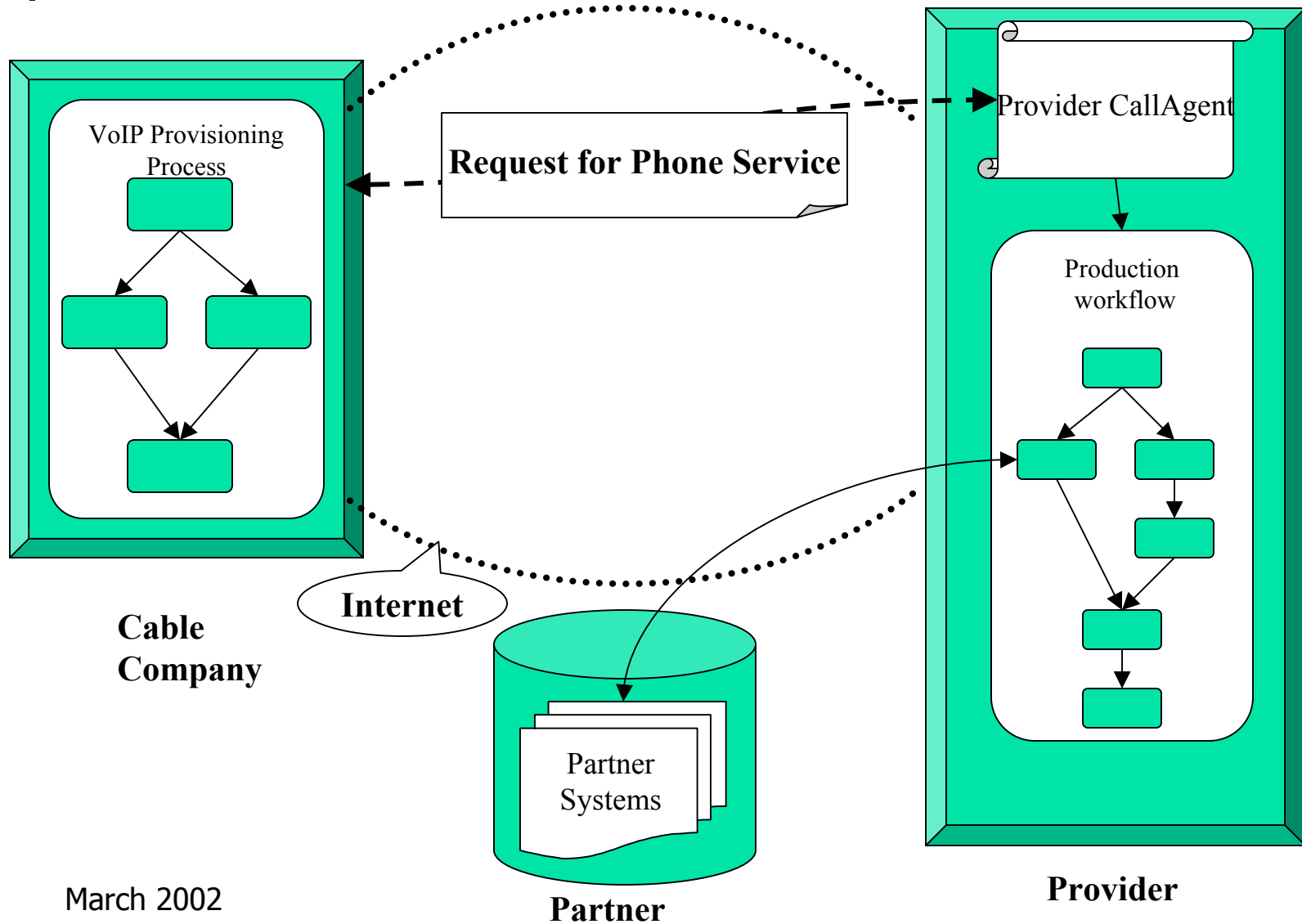
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Overview

- Problem Definition - VoIP Provisioning
- Collaboration Management Infrastructure (CMI), an advanced process-based approach to B2B integration
- How rapid B2B integration of the Cable OSS is achieved with an advanced process model
- Comparison with other B2B approaches
- Dynamic integration and coordination of e-services

What's B2B Integration?





Assumptions for Provisioning of VoIP Service Over Cable

■ Customer

- has cable TV service connected to his/her home
- has purchased a cable modem certified by the cable company

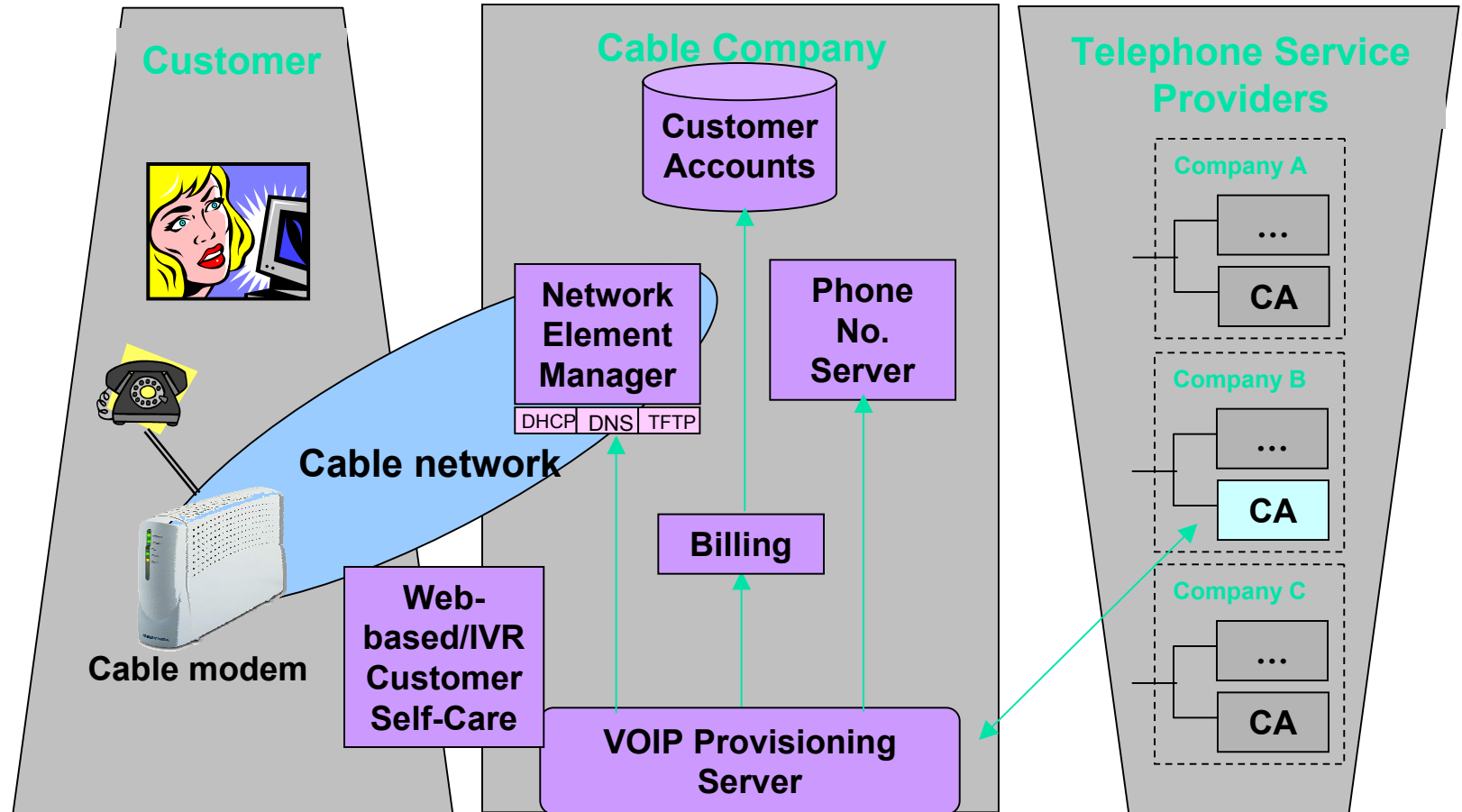
■ Cable company

- owns the customer record and billing account
- provisions and activates phone service using IP over cable
- uses other companies for telephone service (business arrangement is worked out a-priori)
- allows customer to select his telephone service provider

■ Telephone service providers

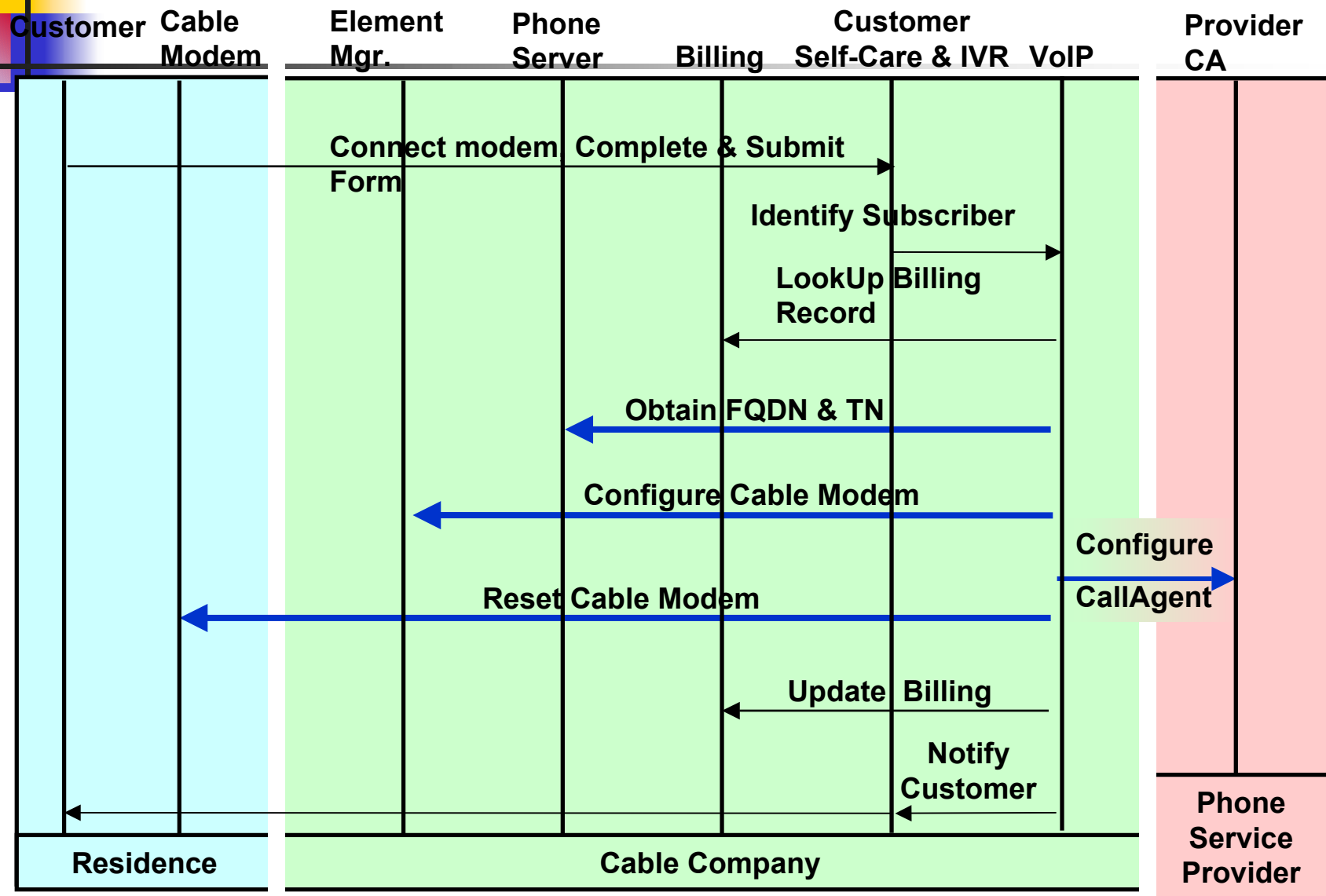
- own call provisioning capabilities for public telephone network
- fulfill the cable company requests for local exchange involving phone service over IP

Components involved in VoIP Service Provisioning over Cable IP Network



Customer buys cable modem and an IP phone, plugs them in, fills a web form, gets the phone service within 2 minutes without customer service representative.

Process for VoIP Service Provisioning Over Cable

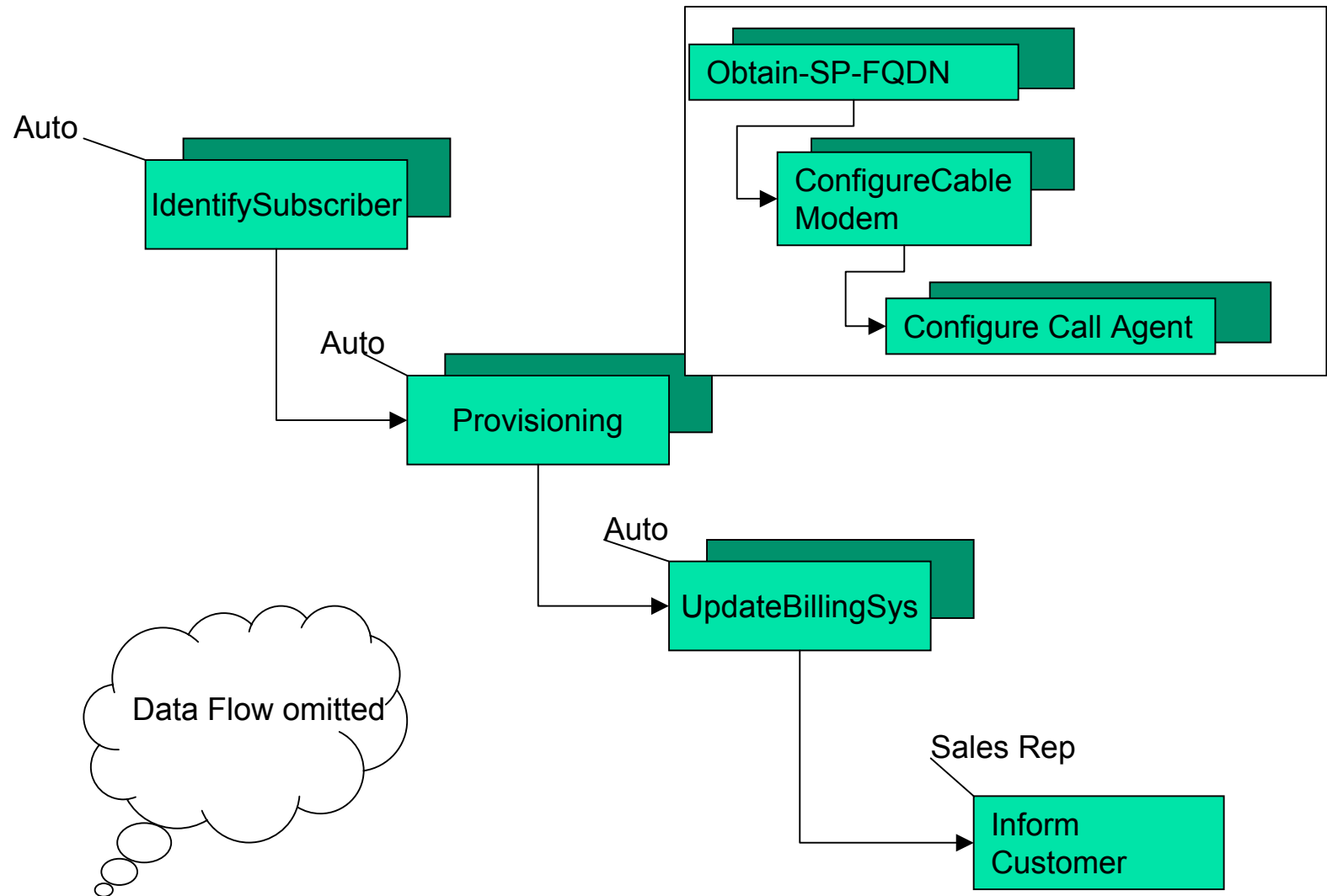




Problems to Overcome

- **Need to deal with evolving components, standards and flows**
 - naïve programming-based approach will end up with lots of code-rewrite
 - naïve workflow-approach will end up with tedious re-design
- **Need to deal with heterogeneity by de-coupling interface from implementation**
 - traditional workflow model bundle interface with implementation
- **Need to capture conversational semantics in applications**
 - traditional workflow models do not support conversational activities
 - traditional workflow models must define each interaction in a conversation as a separate activity
- **Need to deal with multiple and dynamic trading relationships**
 - traditional workflow hardwires each relationship (only good for small number of trading partners)

Top-Level VoIP Provisioning Process

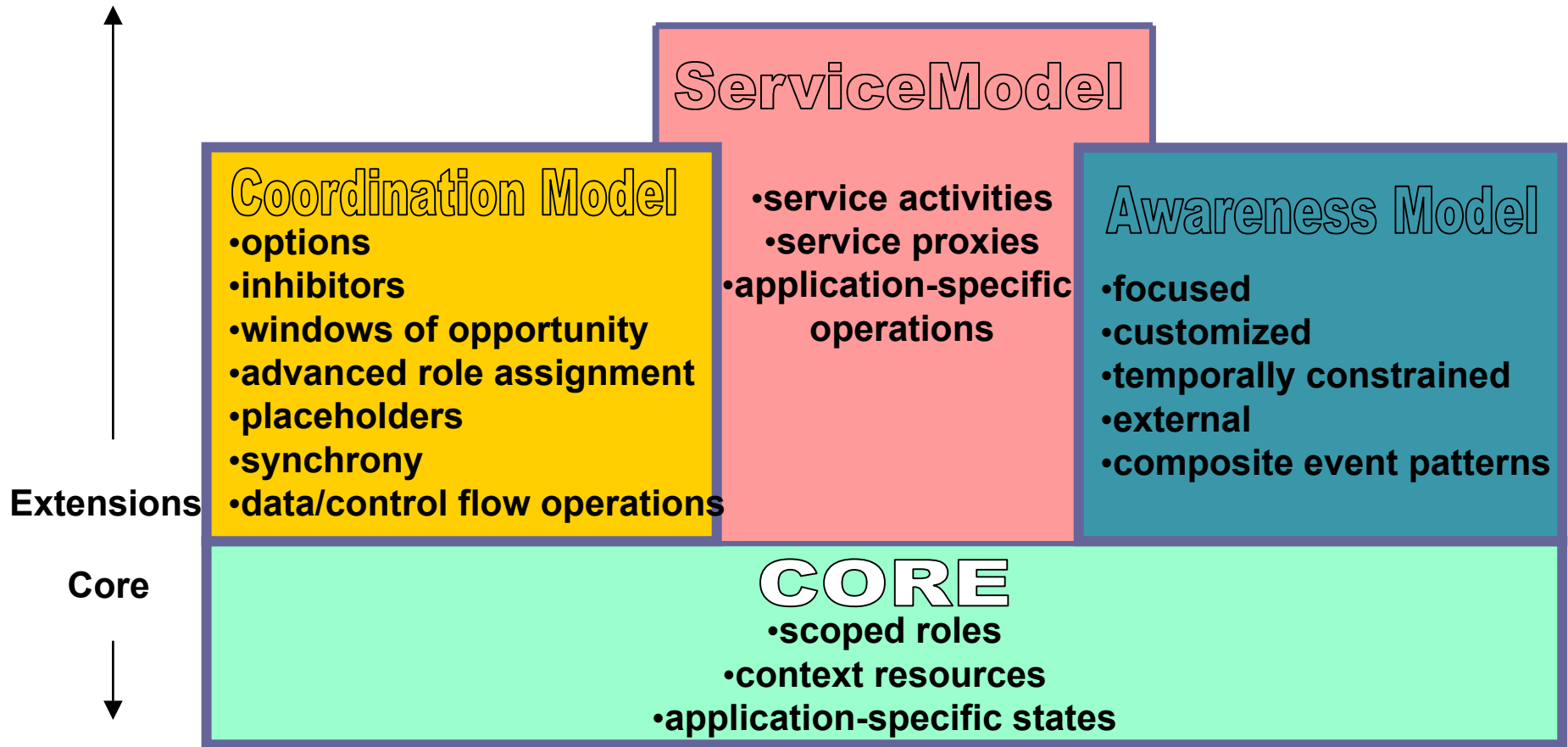




What is CMI

- CMI technology was originally developed at MCC as a consortium project
- CMI is a process model and a highly scalable software system supporting:
 - Advanced modeling concepts for B2B integration
 - Coordination of the activities performed by humans and applications
 - Awareness and customizable monitoring
- Combines the component integration capabilities of object-based middleware with the coordination capabilities (i.e., control flow and dataflow) of both workflow and groupware systems.

CMI's Collaboration Management Model





CMI Contributions to B2B Integration

- Main contributions include process modeling primitives and corresponding engines supporting:
 - Coordination flexibility (data flow, context resources, state-dependent control flow)
 - Service model for heterogeneous process integration
 - Placeholders and abstract process
 - Declarative process design tool



CMI Process Modeling Primitives

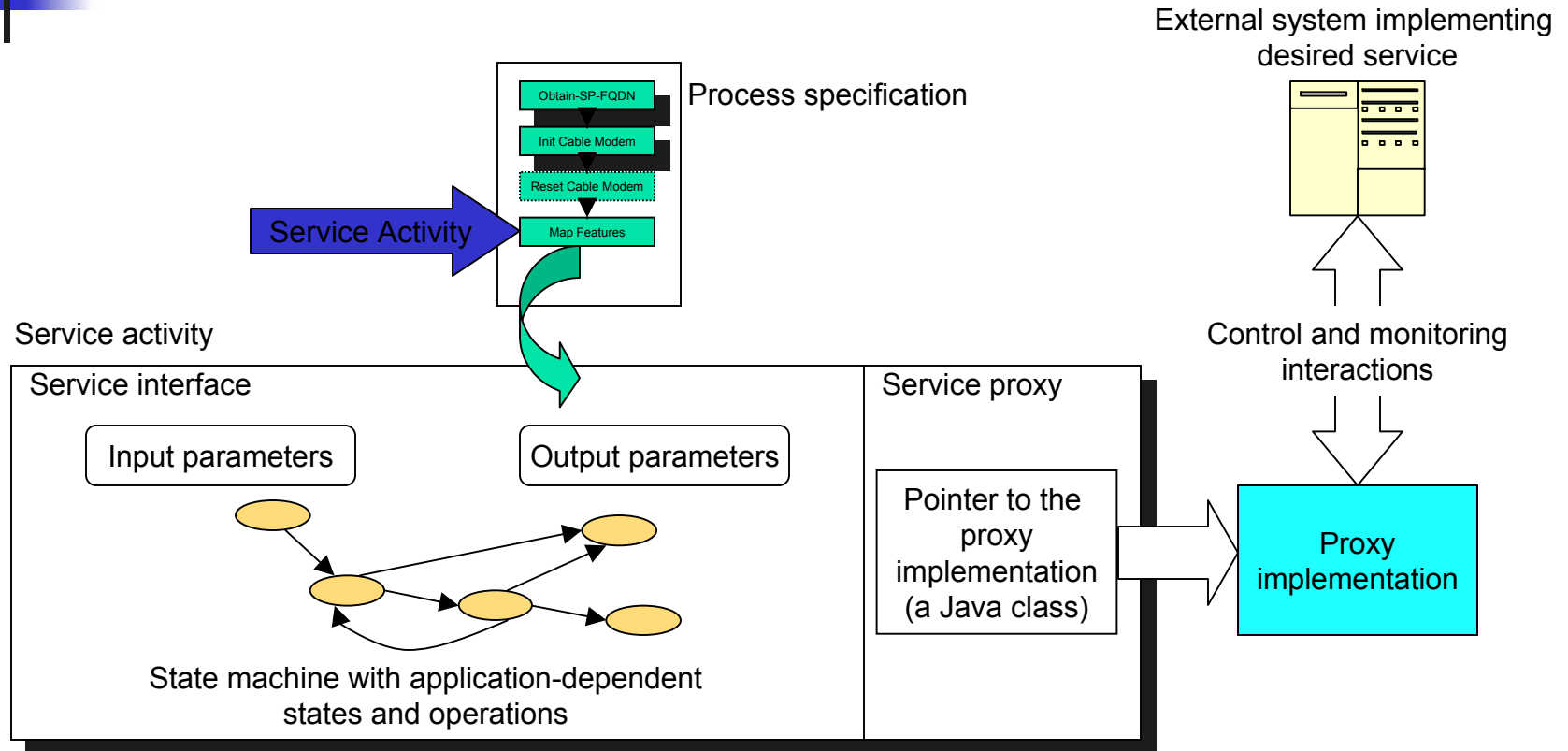
- **Process Activity** specifies the complex or composite activity.
- **Basic Activity** specifies the program (or script) to be run to complete an activity in a process
- **Placeholder Activity** specifies an ***abstract process*** to which the run-time substitution of the actual process or activity can be made via a ***selection policy***.



CMI Process Modeling Primitives (cont.)

- **Service Activity** specifies a ***service proxy*** and a ***service interface*** that captures the ***interactions*** with external systems.
- Service interface captures functional abstractions of external applications using ***state machine***.
- The service proxy is an ***adapter*** to external systems with well-defined generic and application-specific operations.

Service Activities: supporting Conversational Interactions



- Service interface captures abstractions of external applications using **state machine**
- The service proxy is an **adapter** to external systems
- States and operations defined in the interface are used by process to control and **converse** with the external service



Service Proxy

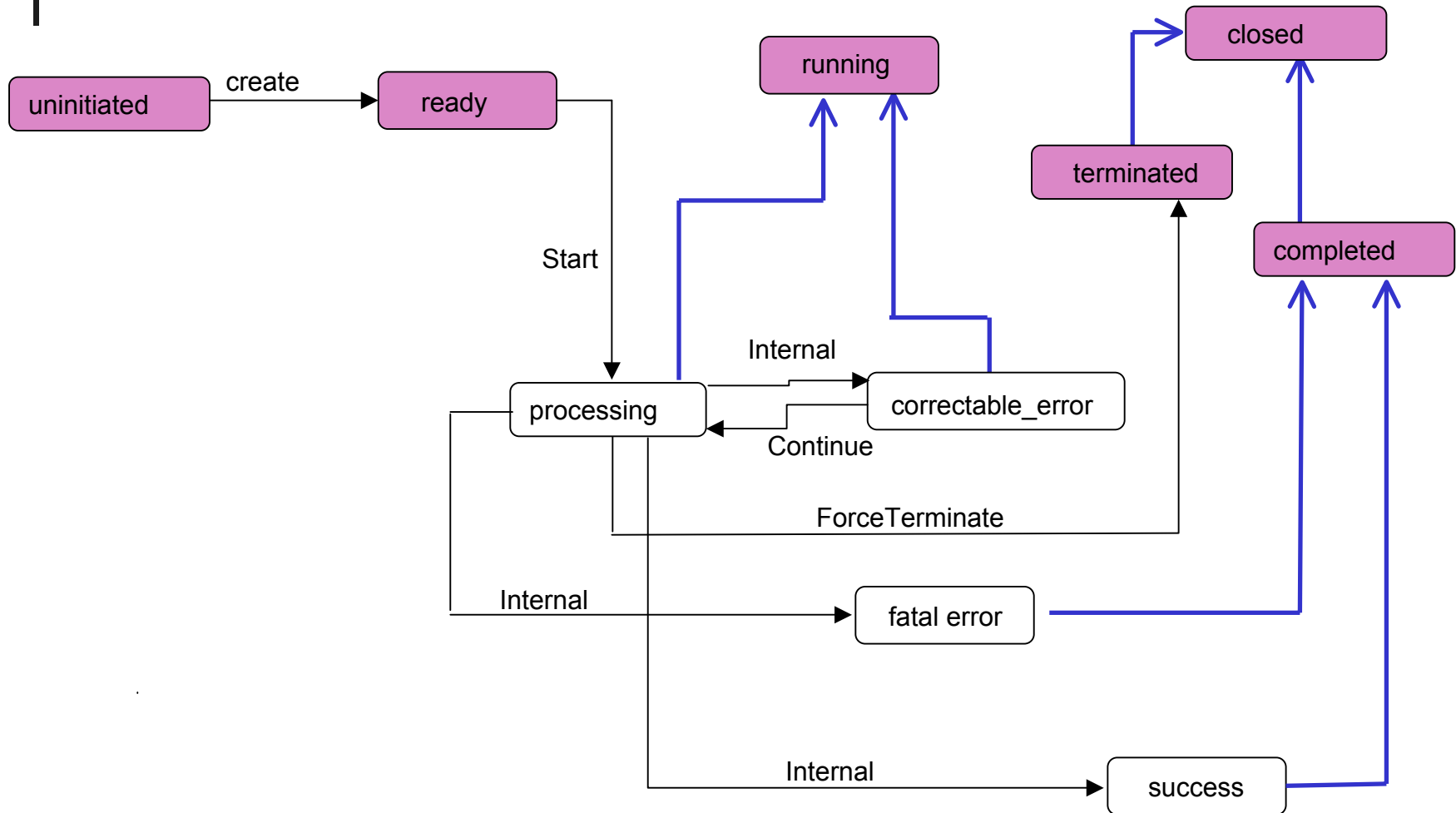
- Can be specified as part of a service activity definition
- Implements service interface (does not implement service, since service implementations may be secret)
- Handles the invocation and communication with a service implementation
 - can be classified by the type of communication protocols (HTTP, TCP/IP, CORBA) and the messaging format (XML, EDI) used.
- Enhances object-based middleware proxies with application specific operations for controlling interaction with external services



Service Interface

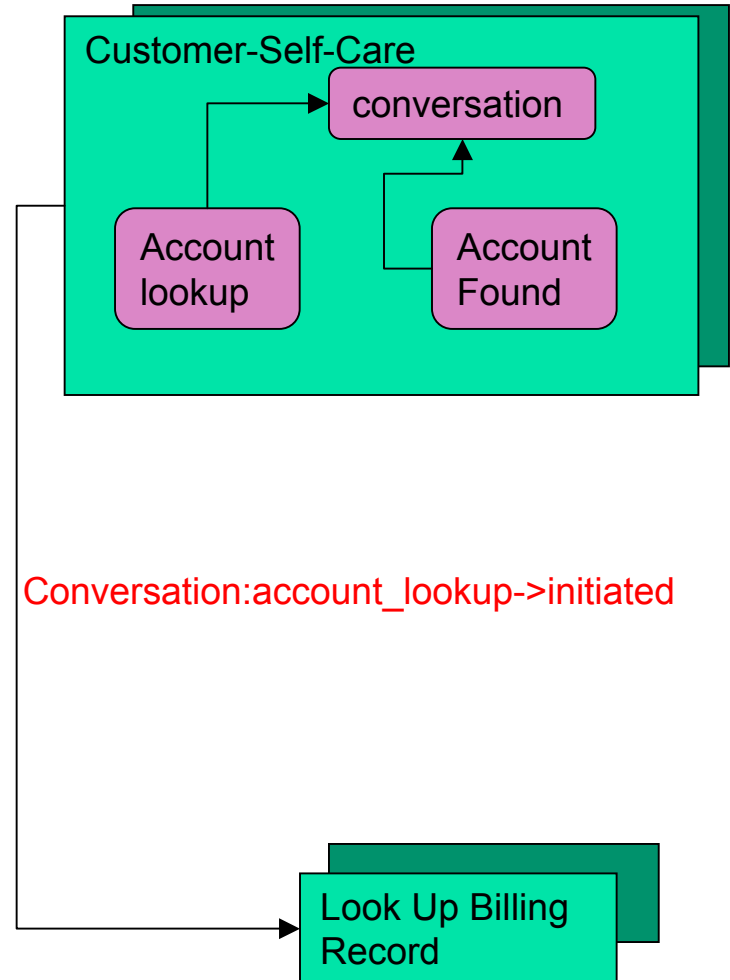
- Each **service interface** is a state machine that describes the behavior of a process or service activity. One state machine can be used in multiple service activities.
- Each state machine consists of:
 - **State names** which can be application specific
 - **State transitions** (activity operations)
 - **Substate relationships**

Example of a State Machine

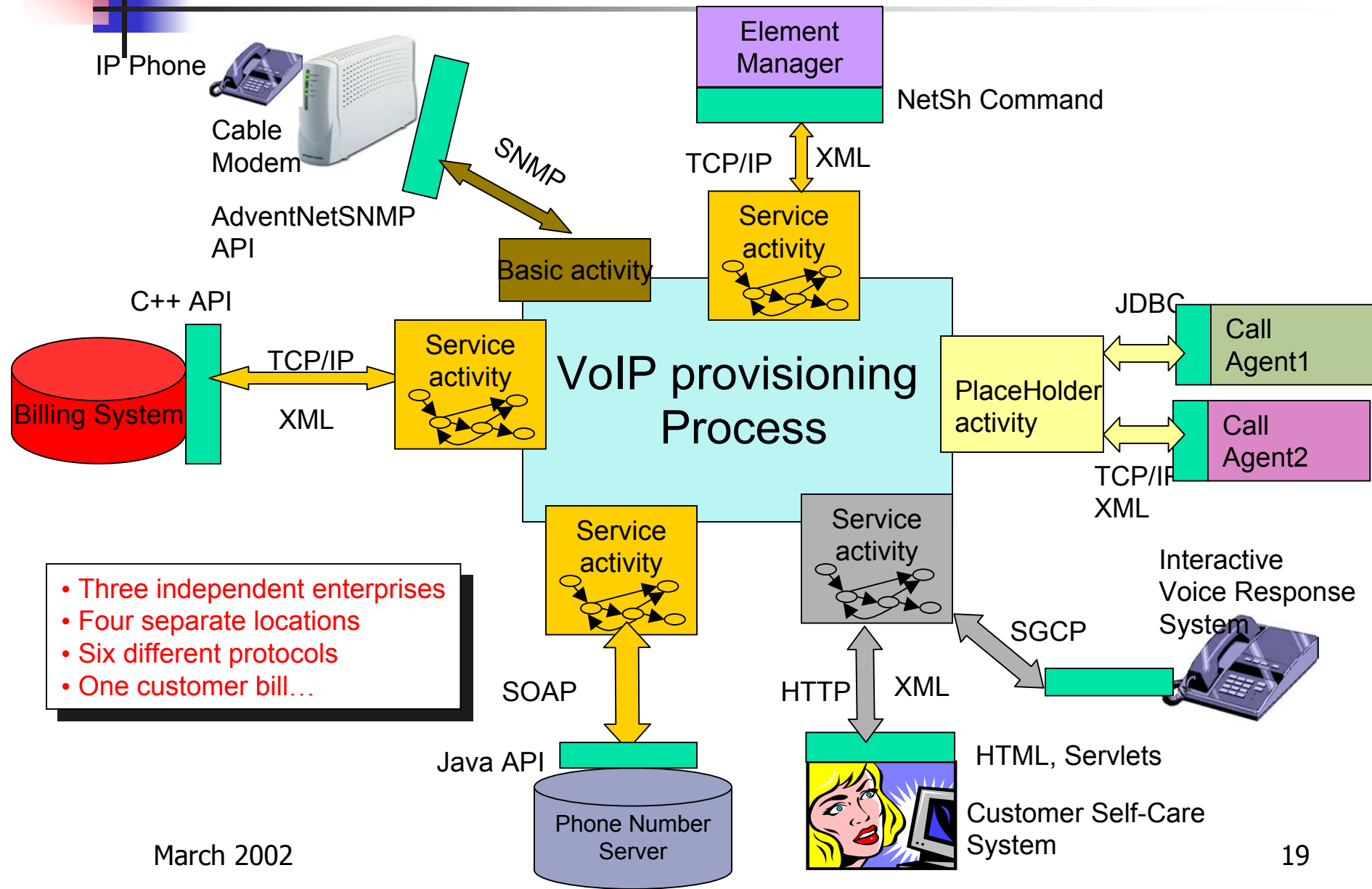


State-based Control Flow

- Together with service activity, it allows modeling of conversational activities
- Give additional option on when activity can be started
- Enable coordination of parallel processes



Cable OSS Component Integration





How is semantic and rapid integration achieved in process-based approach?

- Semantic-based component modeling using service model (enables application specific states and operations to be captured)
- State-based control flow for modeling conversational activities
- Placeholder activity allows late binding of activity
- Reuse of service interface and proxies
- Reuse of activities and sub-processes
- Modeling of process using a declarative design tool



B2B Integration solutions

- Fax, phone
- EDI (OBI, Internet-based EDI)
- Component-based frameworks (J2EE, CORBA, DCOM)
- XML-based frameworks (eCo, cXML, RosettaNet)
- Process-based (Vitria, CMI)
- ...



Evaluation of B2B Integration Solutions

- Informal but useful guidelines for assessing integration solutions = B2B Integration (B2Bi) dimensions
- Example dimensions: ***coupling among partners, Heterogeneity, interaction, Autonomy, Adaptability, External Manageability, Security, Scalability.***
- Existing solutions: variation in their tradeoffs with regard to B2Bi dimensions

Comparison of B2B Integration Solutions

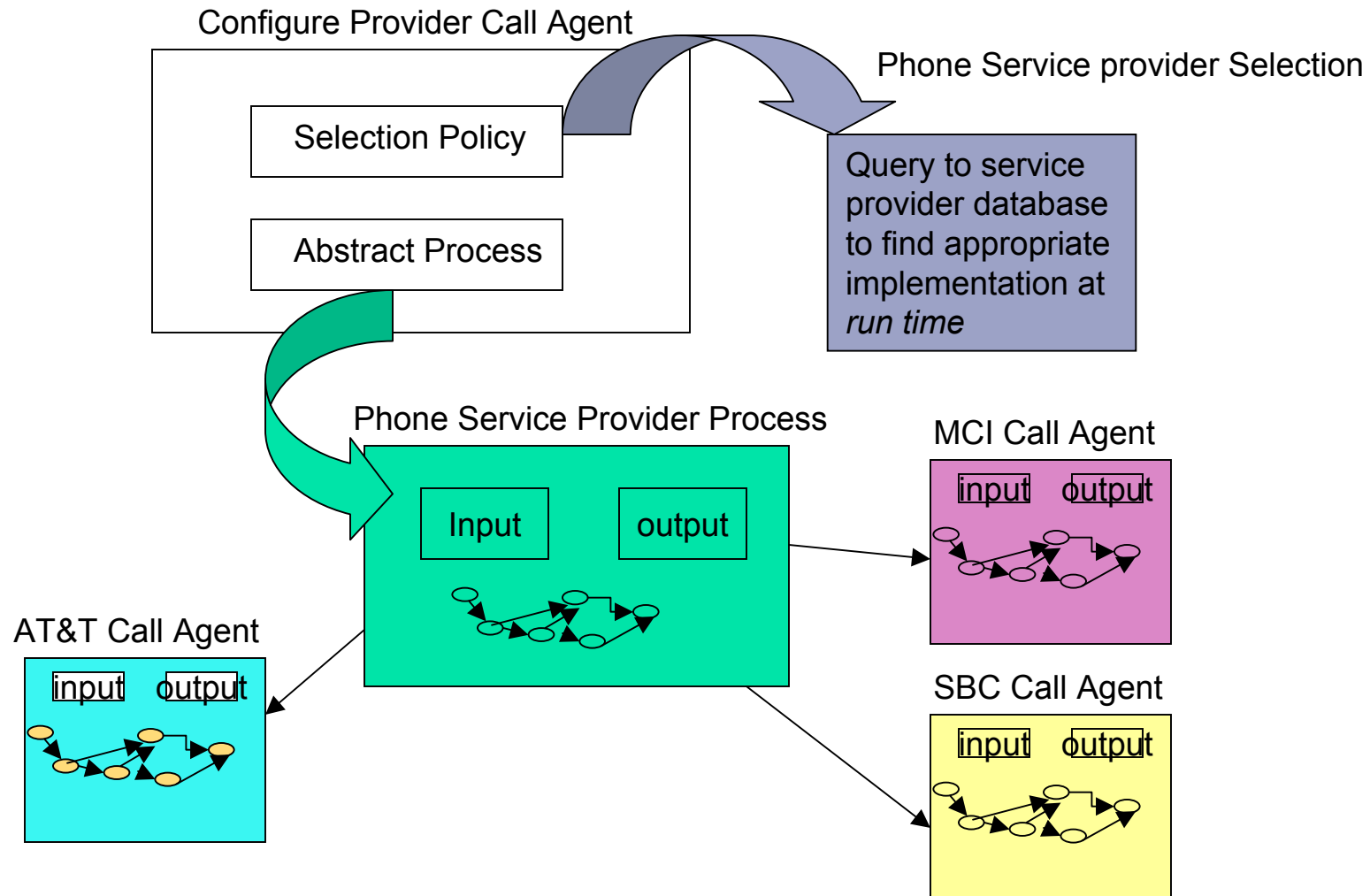
	XML-based	Component-based	Process-based
Coupling among Partners - Centralised - Federated - On-the-fly	X	X	X
Heterogeneity - service interface - service implementation - standards (global process)	X	X X	X X
Interaction - Single invocation/reply - Conversational	X	X	X X
Adaptability - Reconfiguration of processes - Change management			X
Autonomy - view partners as black box	X	X	X
External manageability - Control of application states			X
Scalability - Transaction - Persistent		X X	X
Security - role - authentication		X X	X



Dynamic Integration and Coordination of E-Services

- Process-based technology has successfully enabled the integration of cross-enterprise business processes with pre-defined trading relationships
- The type of services (process) available on the web is increasing dynamically
- The web environment is volatile and dynamic; services appear and disappear around the clock.
- Placeholder allows dynamic binding of processes at run-time
- Placeholder does not allow establishing dynamic trading relationships

PlaceHolder Activity





Service Discovery

- Service ontology (e.g. WSDL)
 - defines the basic concepts and terminologies which will be used by all the participants in a specific domain
- Service registering/advertising (e.g. UDDI, portal)
 - a tool for service providers to register their services using a consistent ontology
- Service Selection based on:
 - semantic-brokering
 - negotiation
 - auction
- Generate CMI service activity (service interface and proxy)



Future Work

- Incorporate a semantic multi-brokering component in a process engine such that it allows dynamic discovery of services
- Extend the monitoring technique in the process engine to allow monitoring of Service Level Agreements between trading partners
- Develop a set of generic operators for dynamic reconfiguration of business processes
- Develop methodologies for rapid process integration



Research Projects at UNSW

- Peer-to-peer provisioning of dynamic web services
- Agent-based Dynamic Process Integration
- Multimedia databases
 - modeling and querying of moving objects
 - indexing scheme to support fast and accurate retrieval of multimedia data