Business Entities:

An Artifact-Centric Approach for Business Process Management

Terry Heath - Senior Software Engineer
IBM T.J. Watson Research Center
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Overview of Lectures

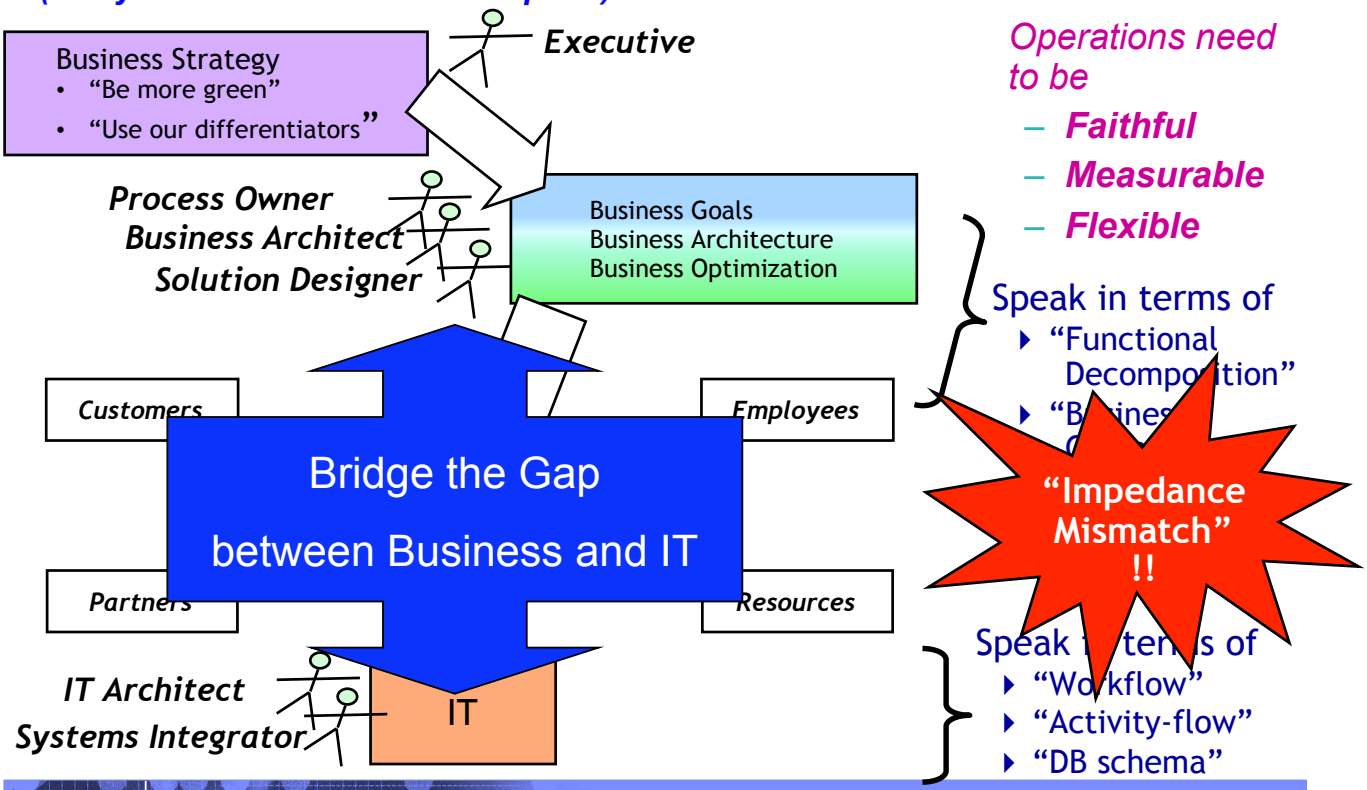
- **Lecture #1**
  - Artifact-Centric Approach
  - Comparison of Business Process Management Approaches
  - Brief introduction to Siena
  - Siena Demo
- **Lecture #2**
  - Review Siena Meta model
  - Review Siena Hotel Example (Deep Dive)
  - Install Siena
- **Lecture #3**
  - External Service Integration (REST and WSDL)
  - More Siena Examples (Patrizia and Alessio)
  - How to use Siena
  - Possible Homework Assignment
- **Lecture #4**
  - Review homework
  - Artifact Design Patterns
  - Open issues for Siena system
  - Future Artifact Designs

Lecture #1

- **Artifact-Centric Approach**
  - Introduction to Business Entities
- **Comparison of Business Process Management Approaches**
  - ***Process-Centric*** approach using Hotel Scenario
  - ***Artifact-Centric*** approach using Hotel Scenario
- **Brief introduction to Siena**
  - Overview
  - Architecture
- **Siena Demo**
  - Review Hotel example

A Key Challenge in Business Process Management

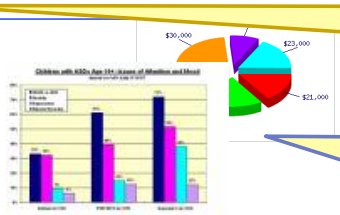
(Many Stakeholders in an Enterprise)



Basic Challenge: Today's approach to BPM environments is fundamentally disjointed

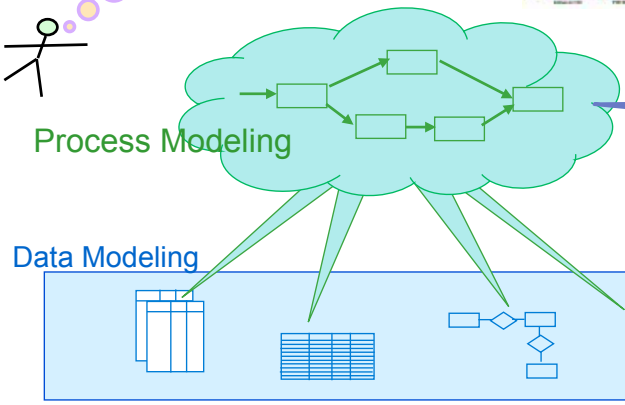
(Many disjoint Models)

If Guest is paying by AMEX
Then give 5% discount



One conceptual model for rules and policies

Another conceptual model for analytics and dashboards



Core BP model is based on activity flows

The data being manipulated is often an afterthought, not related to other conceptual models

Lack of coherence adds substantial complexity to an already very complex environment

"Business Entities": data + process combined to form a new, "holistic" foundation for BPM

- **Business Entities are Unifying Business Constructs**
  - Provides a skeleton that cuts across the Business
    - e.g., **Guest Stay**
      - From CheckIn to CheckOut
      - Blending of Data, Rules, Process, Measurements in the context of a Guest Stay

- **Includes specification of both**
  - The ***information model***, to hold relevant data about an artifact as it moves through the workflow, and
  - The ***possible lifecycles*** it might follow

- ***Insight:*** Gives business managers a unified, end-to-end view of their business operations
- ***Communication:*** Numerous stakeholders have a common basis for understanding
- ***Actionable:*** Natural mapping to organization & IT levels

Brief comparison of BPM approaches

Process-Centric Approach

- **Business Data is**
  - **NOT** the primary focus
  - Business data is merely an after thought
- **Process Steps are the main concern**
  - ***What*** do humans do in the business
  - ***What*** systems need to be integrated

Artifact-Centric Approach

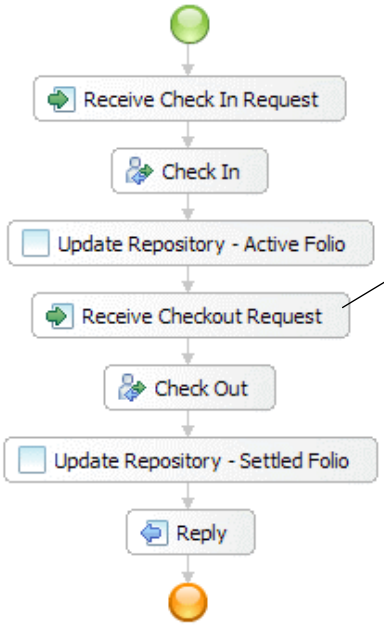
- **Business Data is**
  - The **PRIMARY** focus
- **Process steps occur in context**
  - The ***"Business Entity"*** needs ***which*** humans to do something to it.
  - The ***"Business Entity"*** needs to integrate with ***what*** certain systems.

Review of Hotel Scenario for comparison

- **Posting charges to the guest folio during a hotel stay**
- **Base scenario**
  - Guest checks in
  - Room charges are posted by the Night Audit process
  - Guest dines in the hotel restaurant
  - Guest checks out
- **Scenario evolution 1 – Handling of "lost" charges**
  - Guest has breakfast after checking out
- **Scenario evolution 2 – Handling of charges by "drop-ins"**
  - A non-guest dines at the hotel restaurant

Process-Centric approach for Hotel scenario

Check in- Checkout Process
(Process-Centric Approach)



Waiting for Checkout Request

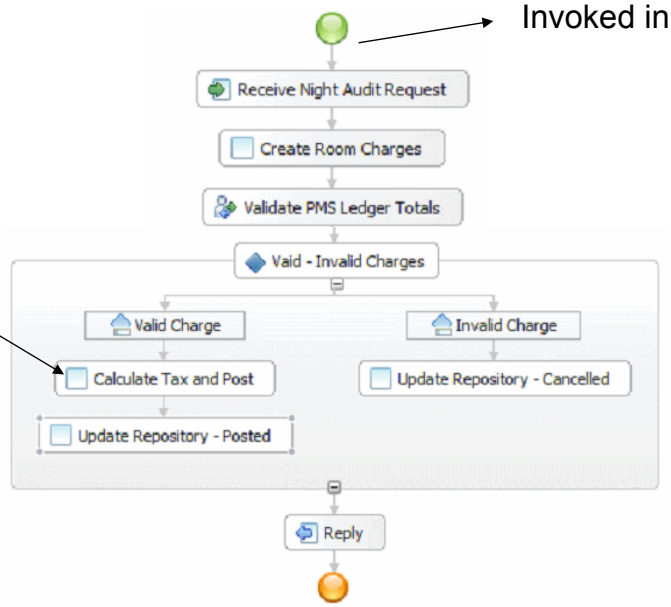
Long Running Flow:

- Remains active until Guest checks out
- The Guest Stay information is lost in the process instance data

Night Audit Process – Modeled as separate process
(Process-Centric Approach)

Invoked in Batch via Scheduler

Posting to Folio

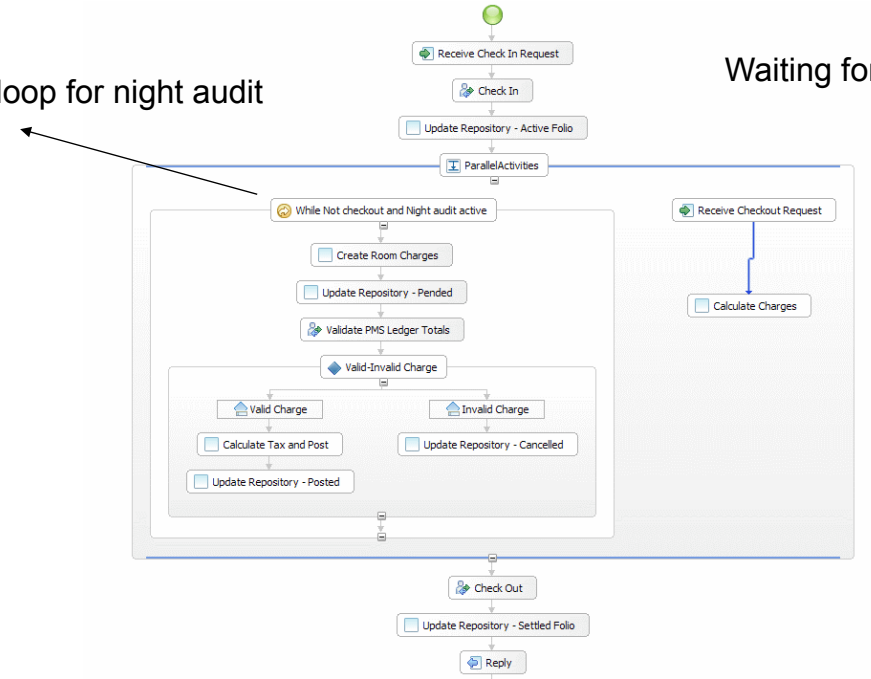


- Multiple instances of the process created for each day for each guest
- No direct link between check in process and night audit process.

Combined check in- Checkout and Night Audit Process
(Process-Centric Approach)

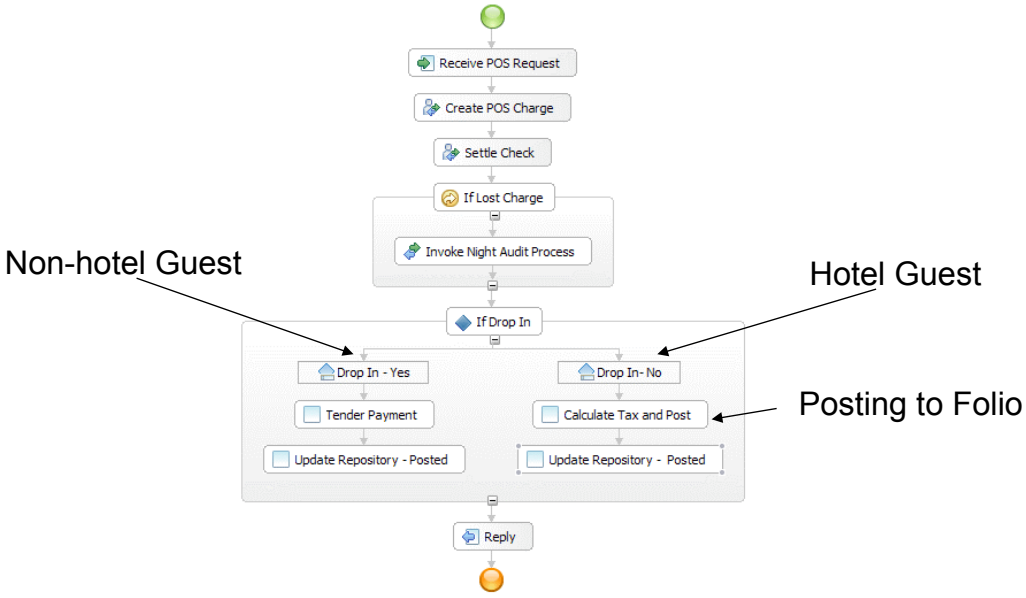
Infinite loop for night audit

Waiting for Checkout Request



Night audit process modeled as part of main flow to avoid multiple process instances being created.

Point of Sale (POS) Process
(Process-Centric Approach)



POS modeled as separate process as this can be instantiated independently any number of times.

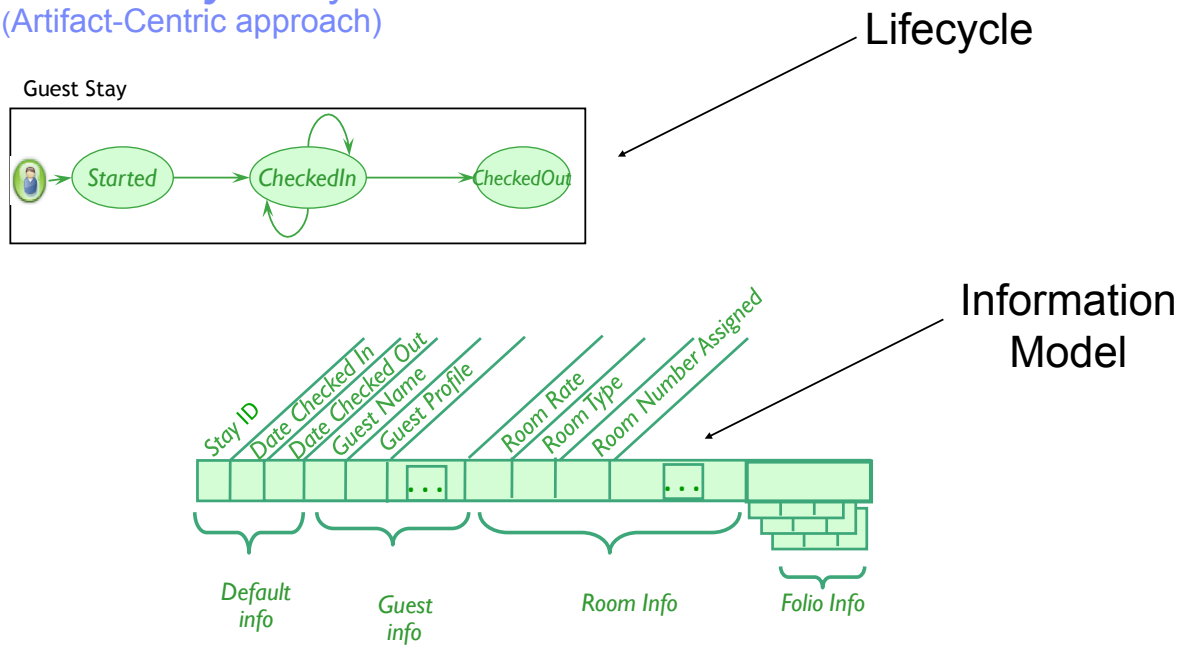
Summary
(Process-Centric Approach)

- **Discrete/Disjoint Processes**
- **Data is an after thought**
- **Guest stay information lost in long running process instances**
- **Lots of additional coding needed to integrate to Databases and Services**

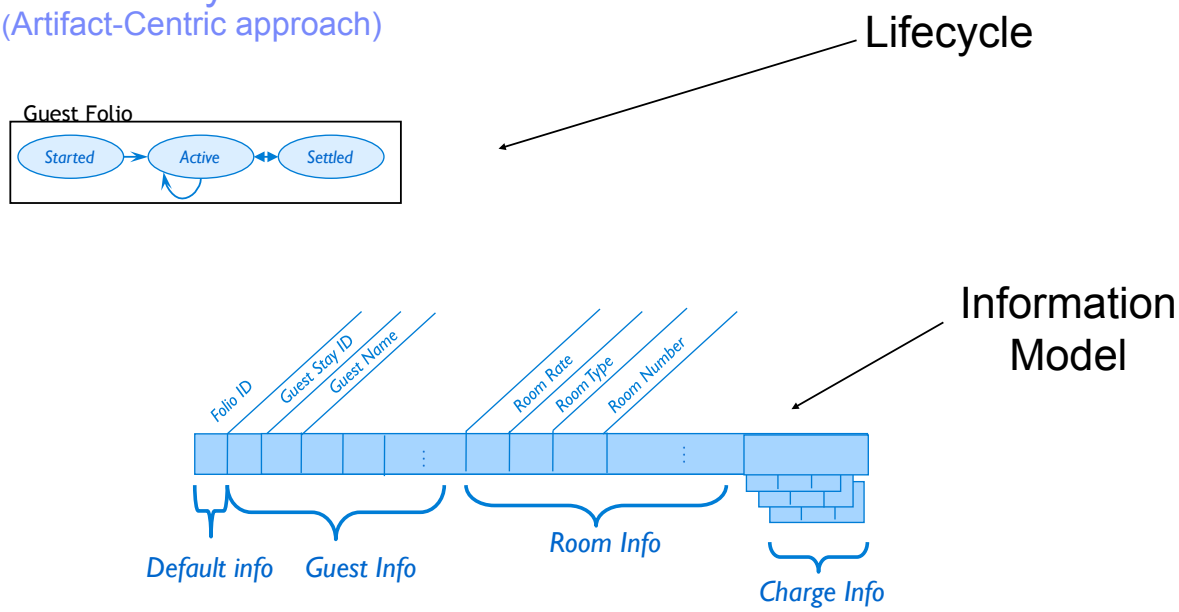
Entity-Centric approach of Hotel Scenario

- **Identify key Business Entities**
  - Guest Stay
    - States: Started, CheckedIn, RoomAssigned, CheckedOut
    - Information: Stay_ID, CheckInDate, CheckOutDate Guest Name, Guest Profile, Guest Type,, Room Rate, Room Preferences, Room Number Assigned, Folio Info
  - Guest Folio
    - States: Started, Active, Settled
    - Information: Folio_ID, Guest Name, Room Number Assigned
  - Charge
    - States: Start, Pended, Paid, Posted, Lost, Cancelled
    - Information: Charge_ID, Date Incurred, Charge Type, Room Number, Payment Type, ItemInfo(code,desc, qty, cost), TaxInfo(Tax Rate, Desc, TaxTotal)
  - Night Audit
    - States: Started, InProgress, Completed
    - Information: Audit_ID, Stay_ID, Folio_ID, GuestName, Room Number, DataAuditStarted, DateAuditCompleted. reconciledCharges(1..n)

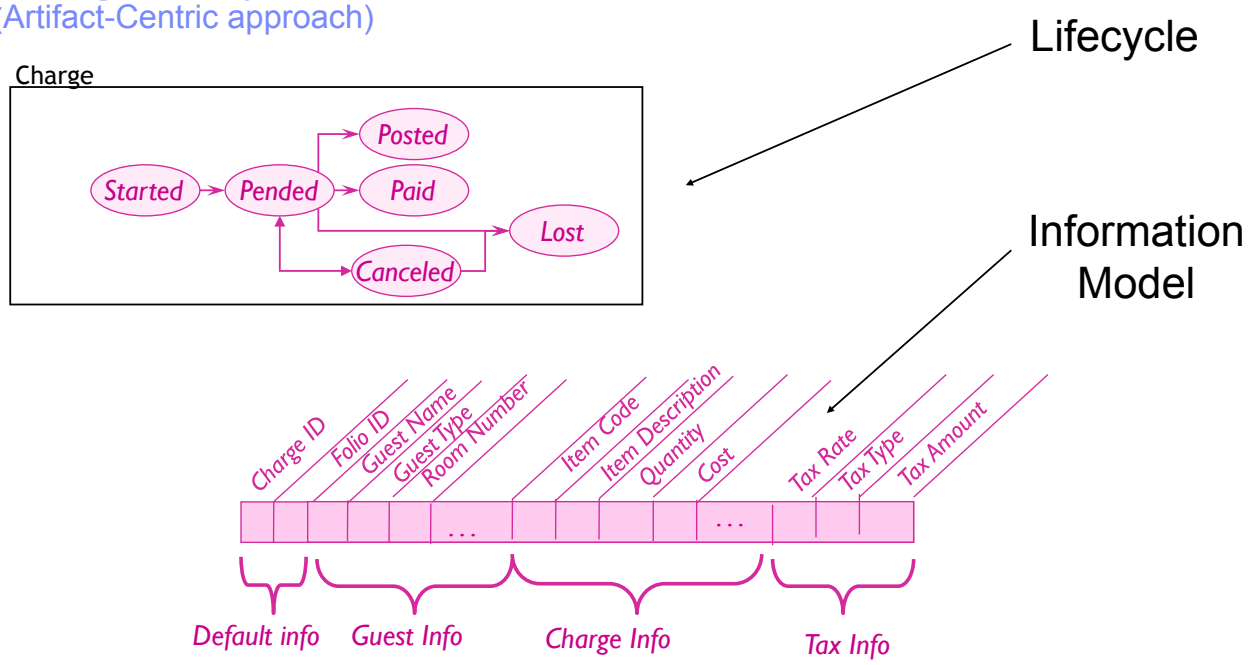
Guest Stay Entity
(Artifact-Centric approach)



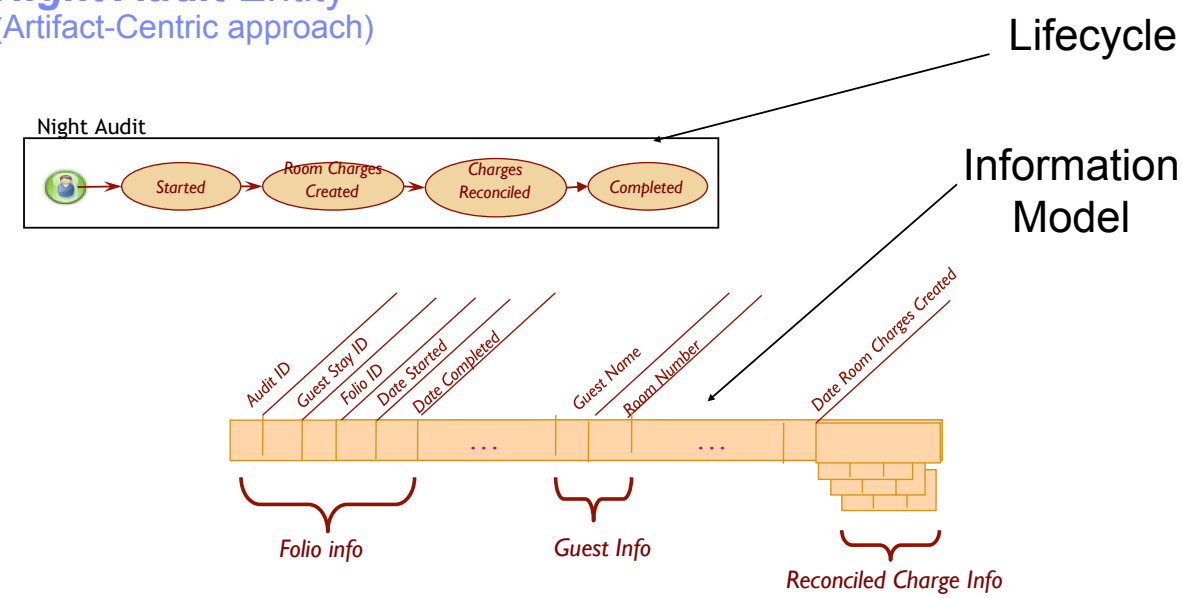
Folio Entity
(Artifact-Centric approach)



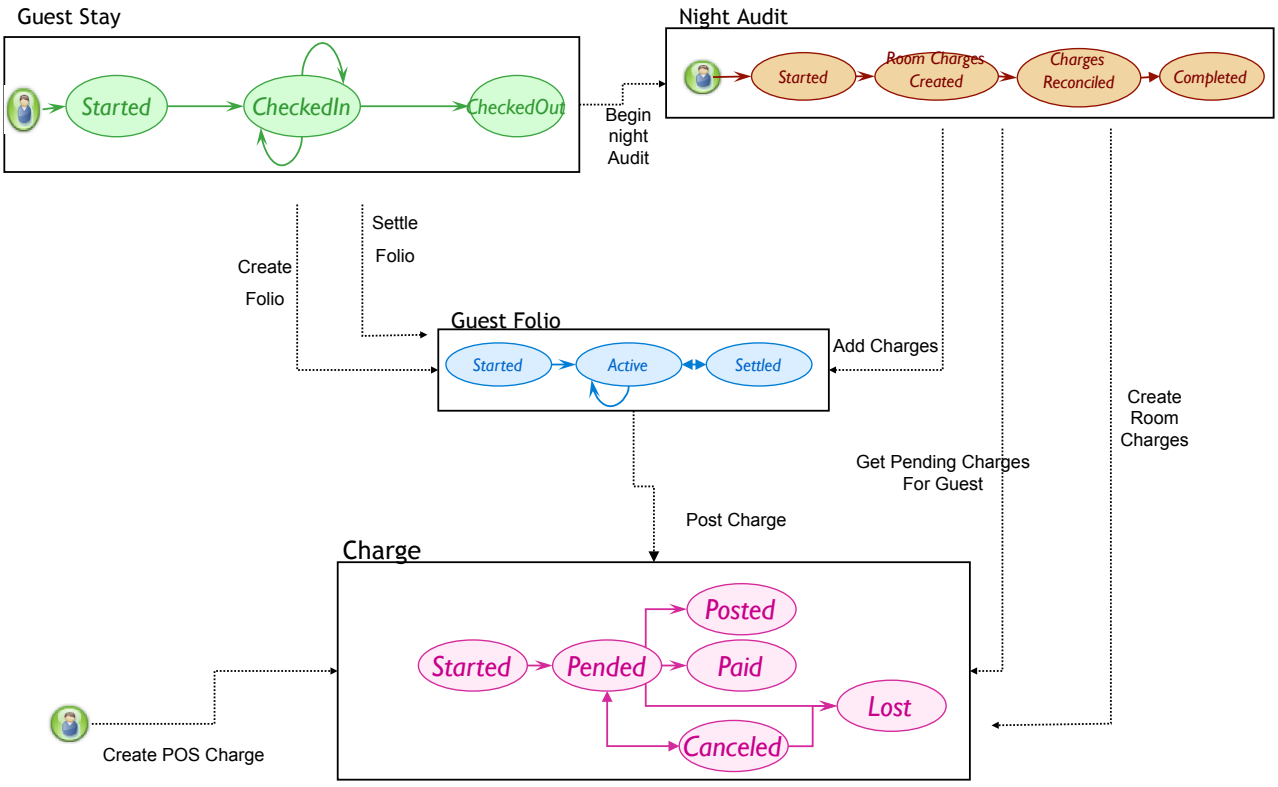
Charge Entity
(Artifact-Centric approach)



Night Audit Entity
(Artifact-Centric approach)



Business Entity Lifecycles and Business Entity Interactions

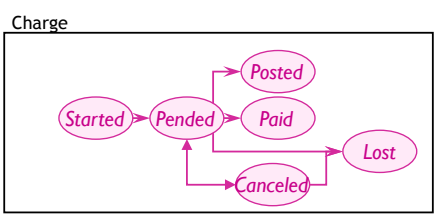


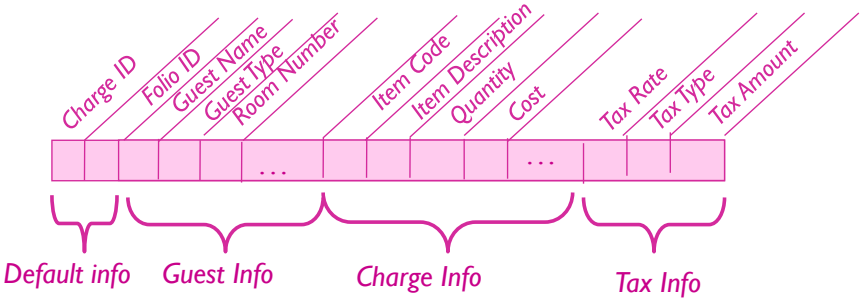
Some comparison points

- **Process-Centric Approach**
  - Process flows act as controllers
  - Data is an after thought
  - Some Operational data hidden in long running process data
  - Humans Work on "blocked" tasks in long running flows
  - Performance of long running flows not desirable
- **Artifact-Centric Approach**
  - Entities act as controllers
  - Data is Core
    - Business Entities accessible in DB
  - All Operation Data store in Business Entities
    - Queryable, Trackable, Measurable
  - Humans work on Business Entities that are ready
  - Performance of Entities (info, lifecycle, micro flows) considered acceptable

Business-Entities provide improved communication among stakeholders in the business

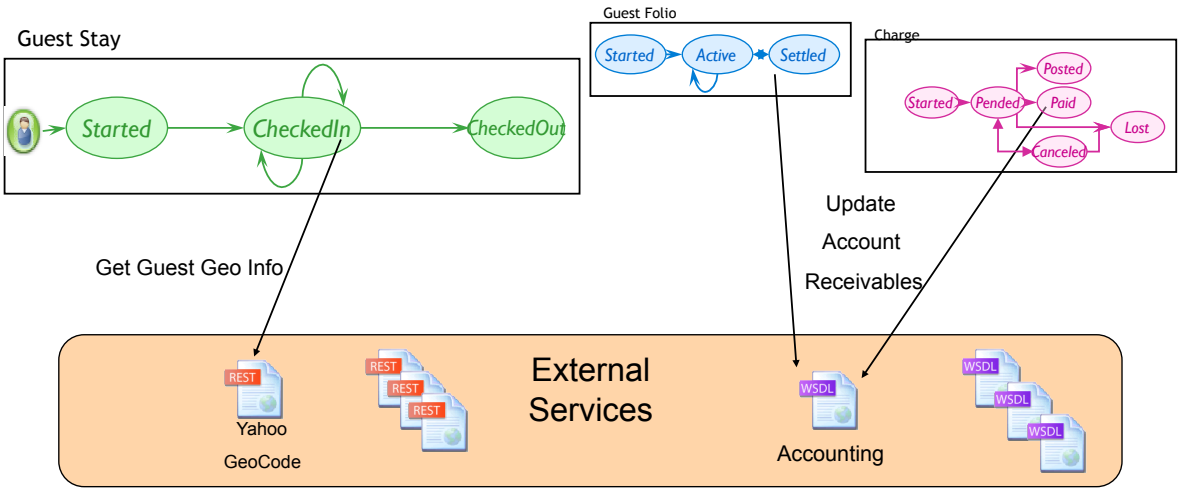
- **"Along" the artifact:**
  - People at "PENDED" can discuss meaningfully with people at "POSTED"
  - Can discuss attribute values produced, needed by different tasks
- **"Across variations":**
  - Different regions can communicate using shared abstract model
    - ***(Variation of Rules in lifecycles and Process Steps)***
- **"Up/down management chain"**
  - Artifact approach lends itself to more abstract / more detailed specifications





Business Entities give context for Service Invocations

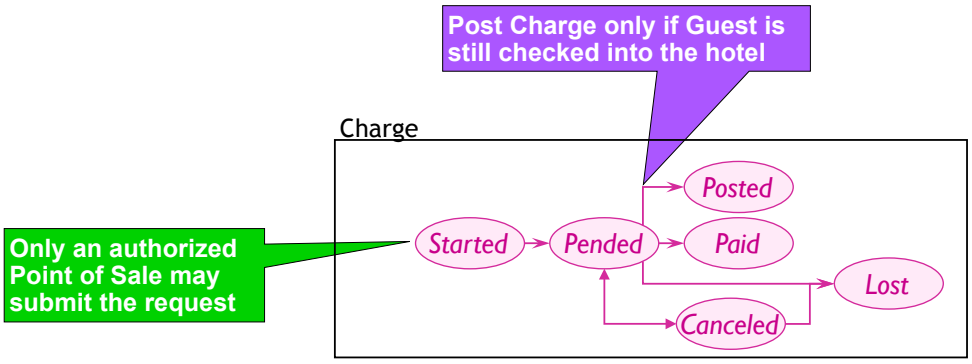
External Service Integration (REST and WSDL)



Large Collection of Externals Services Contextualized by Business Entities

Business Rules Constrain Access, Lifecycle, and Behavior

Business rules define task details & variations



- Rules define how lifecycles can be traversed
- Rules can also define how flows, and data can be manipulated

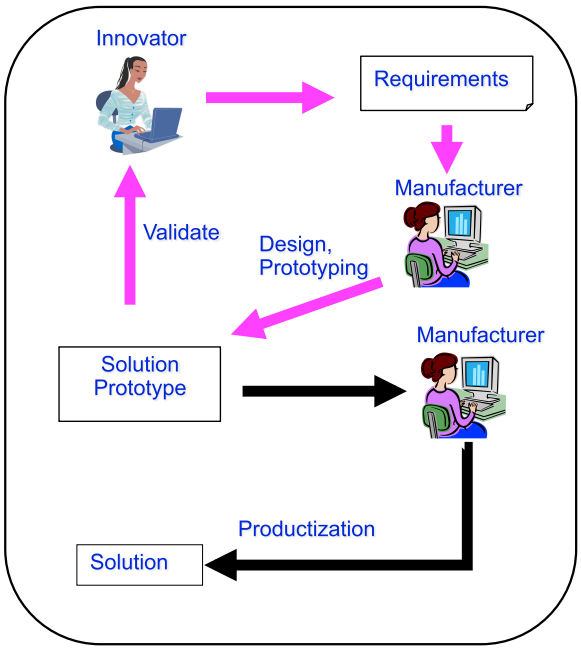
Introduction to Siena

(Light-weight Artifact-Centric Modeling and Execution tool)

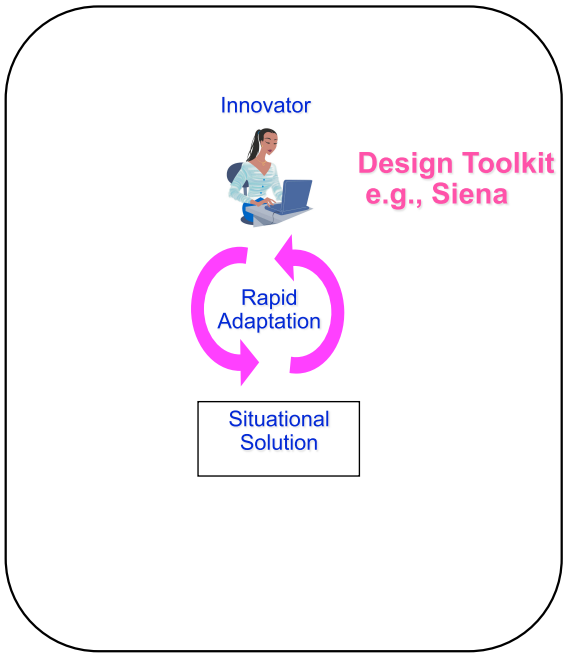
- **Empower SME's to easily Innovate new processes**
  - Tools and Runtime often too heavy and hard to understand
  - Innovators currently dependent on IT teams
- **Radical Simplification of Tools and Runtime**
  - ***Siena Core Meta Model***
    - Describes semantics for all modeling constructs of Business Entities
  - ***Model Management Engine***
    - ***Web UI Modeling*** tool for producing Business Entity models
  - ***Model Execution Engine***
    - Default Execution UI for deploying and executing Business-Entity models
    - Directly executes Business Entity models
    - No coding necessary, No code generation
    - Small footprint can be easily hosted anywhere including laptop

Innovator's toolkit for Business Process Modeling

(Democratization of Innovation -- Eric Von Hippel)



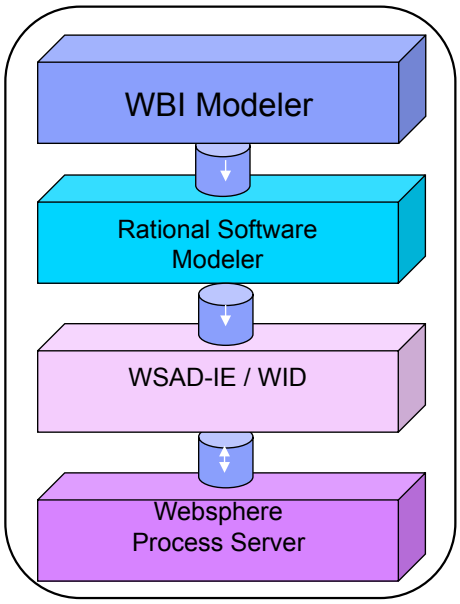
Manufacturer-centered innovation



Innovator-centered innovation

Radical Simplification of Tools and Runtime

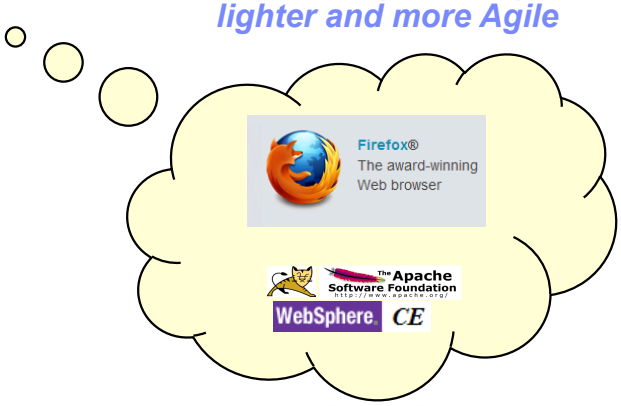
(Supporting Business Process Management Applications using Entity Centric Modeling)



Tooling Stack

10 Gigs Download/Disk Space, 1-2 Days successful installation, At least 2 Gigs Memory

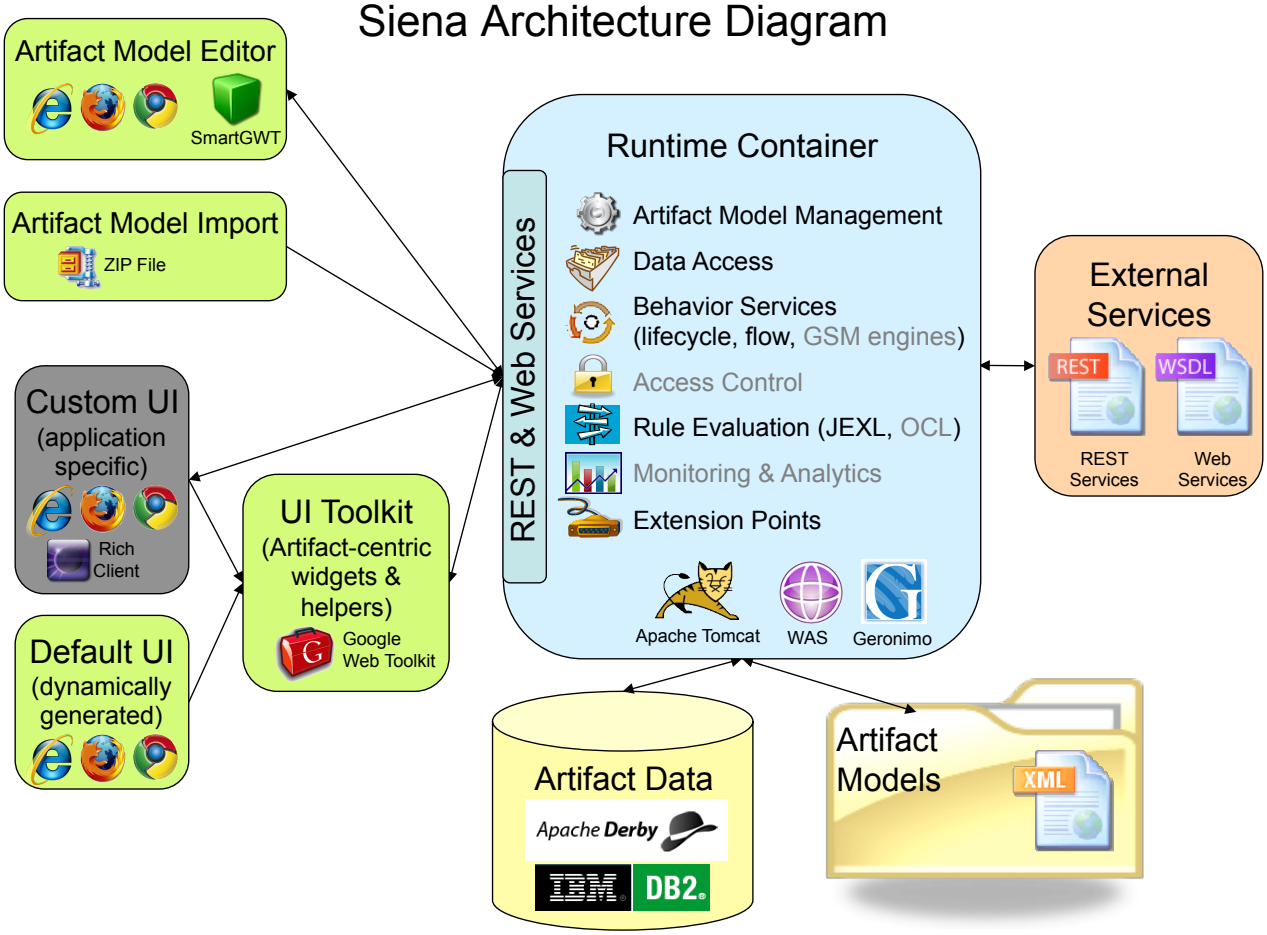
Dreaming of being lighter and more Agile



50 Megs Download/Disk Space, 5-10 minutes, < 1 Gig Memory

Reduced set of BPM abstractions to define and create BPM solutions.

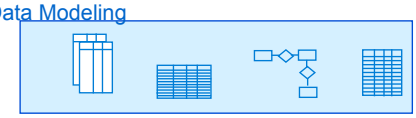
Siena Architecture Diagram



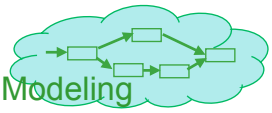
Review: What is a Business Entity? (Deeper Inspection)

- **It's a Unifying Business Construct:**
  - ***Structured by***
    - Core business data models
    - Artifact lifecycles
      - State machines (Siena)
      - Declarative stages (Project ArtiFact™)

Data Modeling



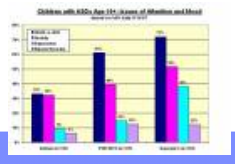
  - ***Providing Services***
    - Data services
    - Flow services



  - ***Protected by Access Control***
    - Users and Roles
    - Entitlements
      - Data access rights
      - Service access rights

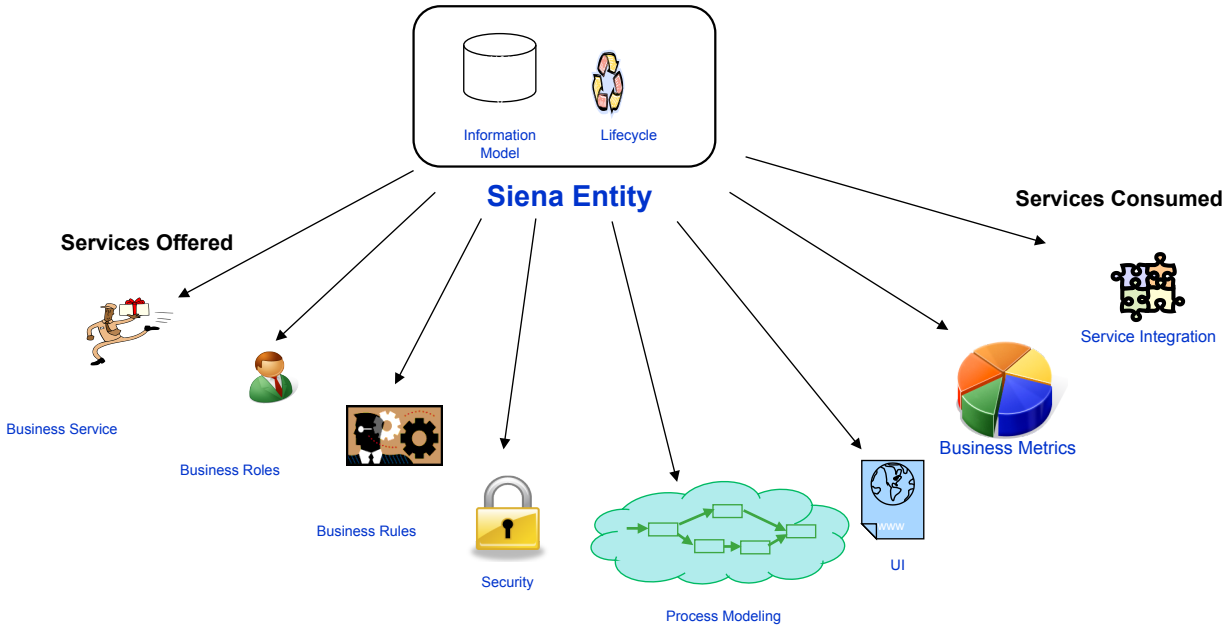
  - ***Constrained By Business Rules***:
    - Data, services, lifecycles, flows, behavior

  - ***Has measurable features***
    - Data, lifecycles, flows, tasks



IBM Research

Siena Entity *(The Core of Siena)*



Siena Demo: Example of an Entity-Centric Solution

- **Review Hotel Design**
- **Run Hotel Design**

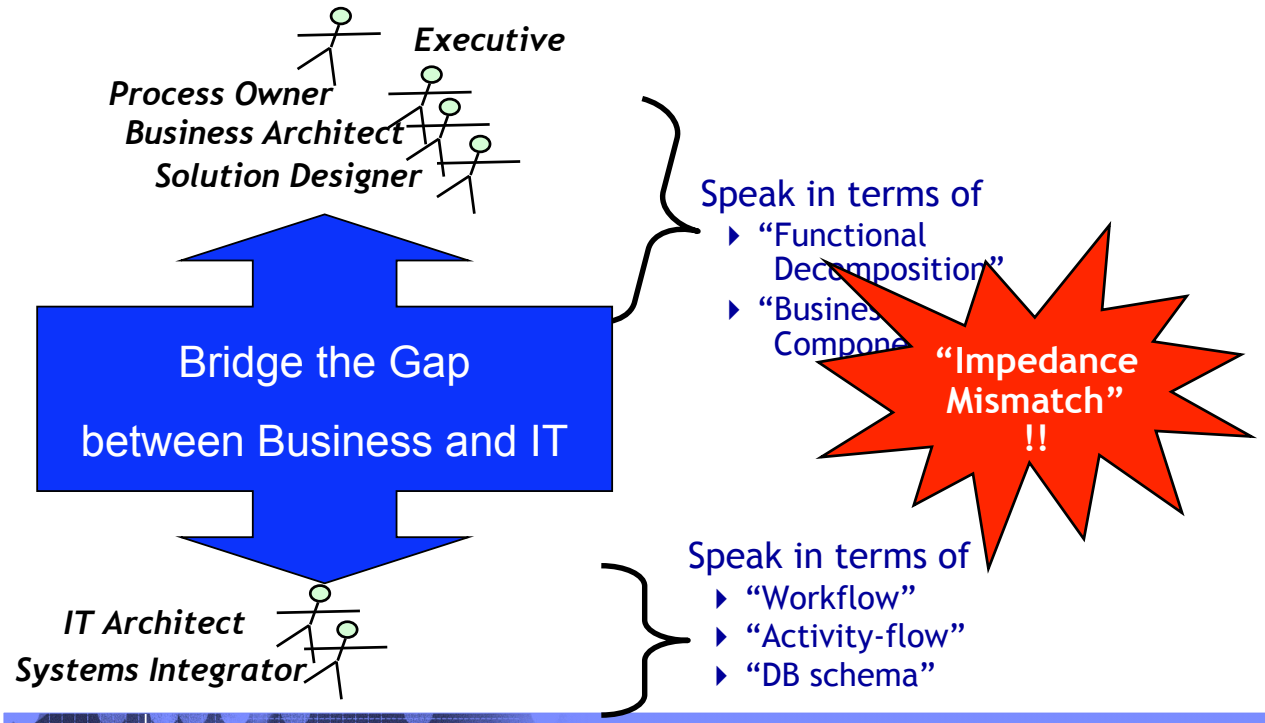
Demo Wrap Up Questions and Answers

Lecture #2

- ***Summary of Lecture #1***
- ***Review Siena Hotel Example (Deep Dive)***
  - Review the Siena Modeling Tool
  - ***Review the Model Execution Engine***
- ***Install Siena***
  - ***Hello World (Follow Instructor)***
- ***Possible Homework Assignment*** Due on Lecture #4 (Review)
  - **Homework Lab: (No External Services)**
    - **Procurement** *(Purchases with multiple items)*
    - **Insurance** *(Claims with payments or fraud detection)*
    - **Banking** *(accounts with deposits and withdrawals)*
  - *Final Project*
    - *Use some external services*
      - *Internet or Custom Servlets*

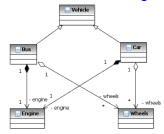
Review: A Key Challenge in Business Process Management

(Many Stakeholders in an Enterprise)

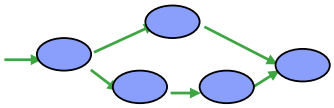


Basic Challenge: Various disjoint BPM models

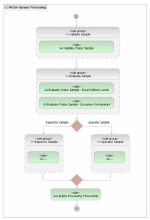
(Disjoint Models lacking coherence)



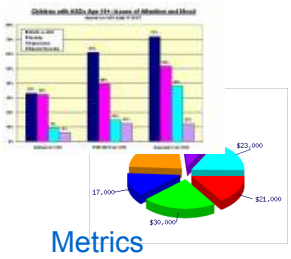
Organization



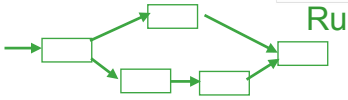
Process



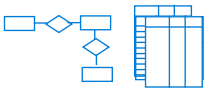
Rules



Metrics



Statemachine

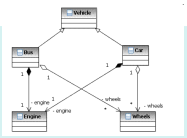


Data Models

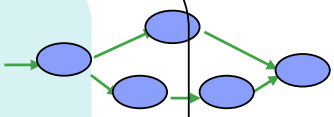
Lack of coherence adds substantial complexity to an already very complex environment

Solution: Unified Business Construct

Business Entity: (e.g. Purchase Order)

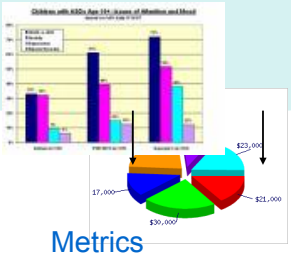


Organization



Process

Rules



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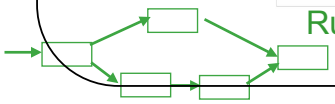

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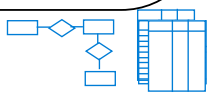


Alignment of Models
Contextualized as a Business Entity
Coherence Achieved

Brief comparison of BPM approaches

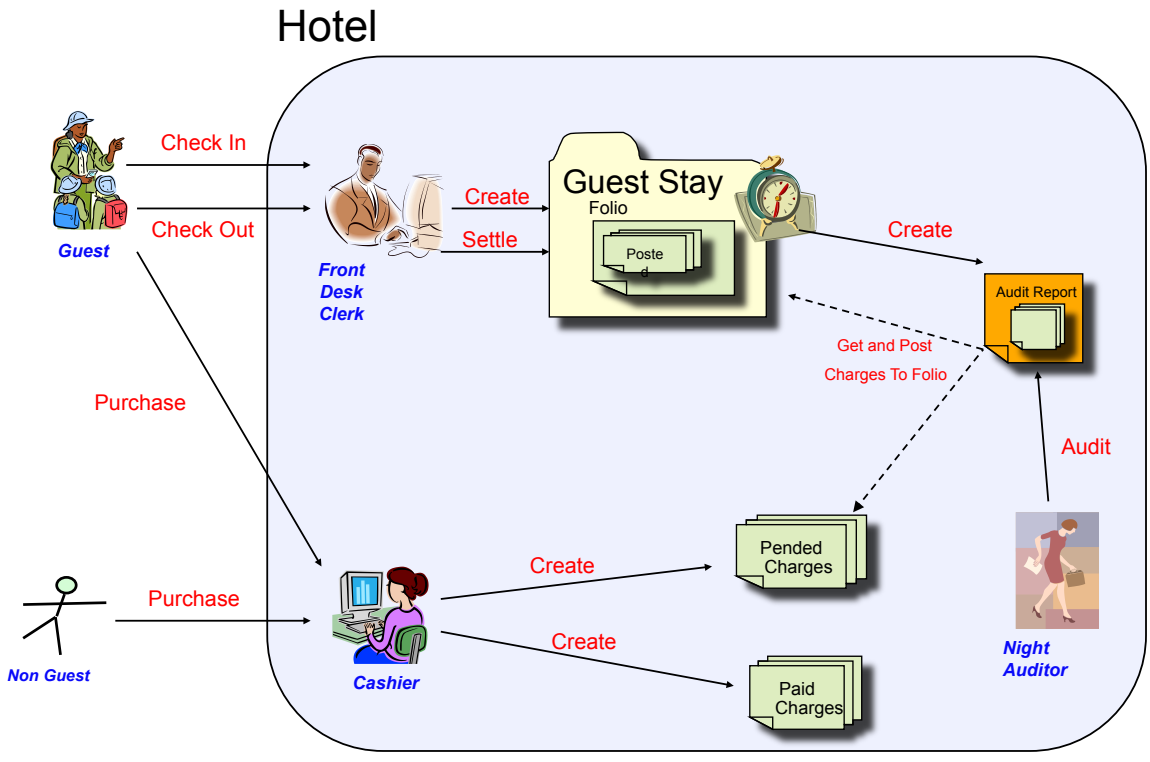
Process-Centric Approach

- **Business Data is**
  - **NOT** the primary focus
  - Business data is merely an after thought
- **Process Steps are the main concern**
  - ***What*** do humans do in the business
  - ***What*** systems need to be integrated

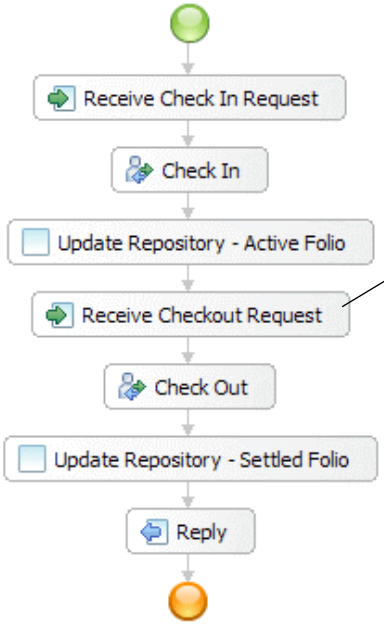
Artifact-Centric Approach

- **Business Data is**
  - The **PRIMARY** focus
- **Process steps occur in context**
  - The ***"Business Entity"*** needs ***which*** humans to do something to it.
  - The ***"Business Entity"*** needs to integrate with ***what*** certain systems.

Review: Hotel Scenario



Check in- Checkout Process
(Process-Centric Approach)

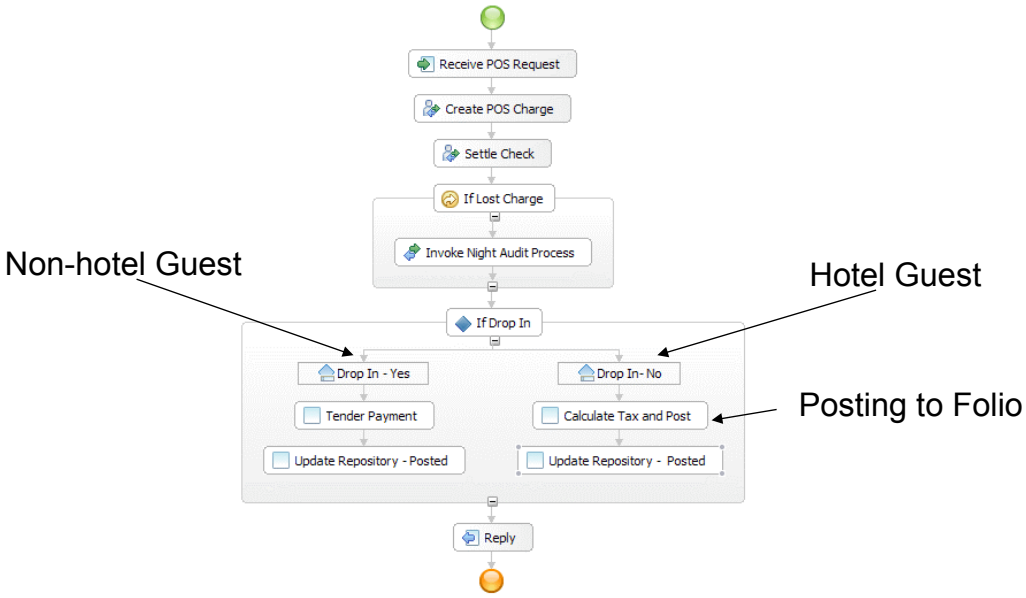


Waiting for Checkout Request

Long Running Flow:

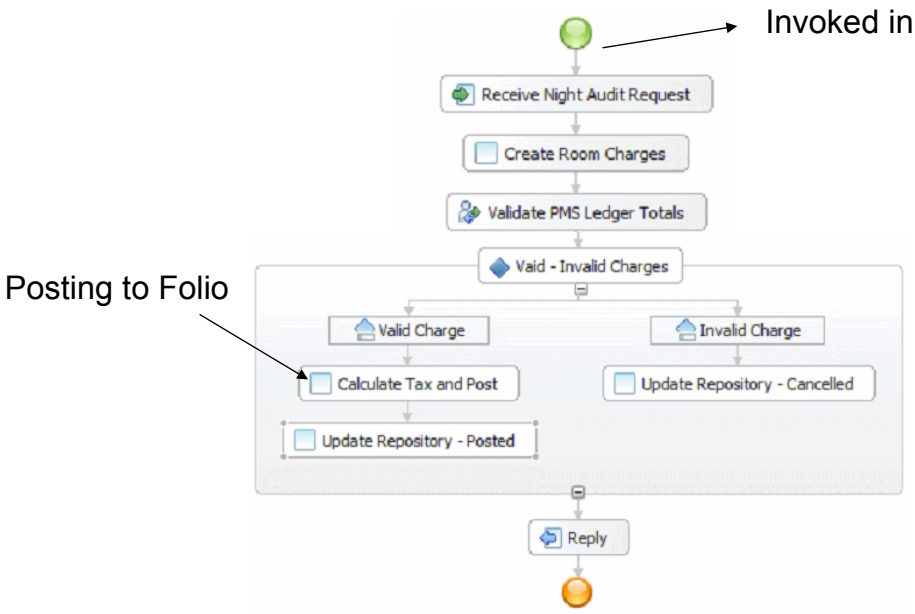
- Remains active until Guest checks out
- The Guest Stay information is lost in the process instance data

Point of Sale (POS) Process
(Process-Centric Approach)



POS modeled as separate process as this can be instantiated independently any number of times.

Night Audit Process – Modeled as separate process
(Process-Centric Approach)



- Multiple instances of the process created for each day for each guest
- **No direct link between check in process and night audit process.**

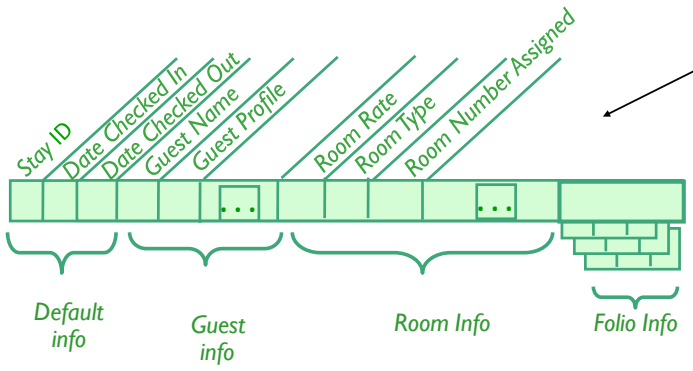
Summary
(Process-Centric Approach)

- **Discrete/Disjoint Processes**
- **Data is an after thought**
- **Guest stay information lost in long running process instances**
- **Lots of additional coding needed to integrate to Databases and Services**

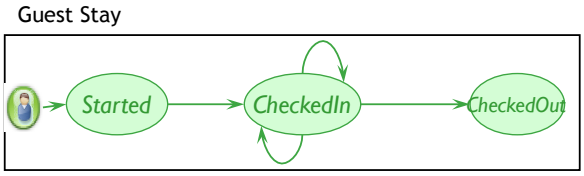
Entity-Centric approach of Hotel Scenario

- **Identify key Business Entities**
  - ***Guest Stay***
    - Information
    - States
  - ***Guest Folio***
    - Information
    - States
  - ***Charge***
    - Information
    - States
  - ***Night Audit***
    - Information
    - States

Guest Stay Entity
(Artifact-Centric approach)



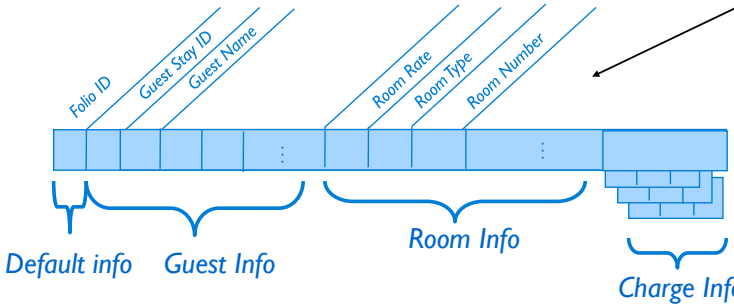
Information Model



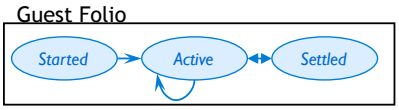
Lifecycle

Folio Entity
(Artifact-Centric approach)

Information Model

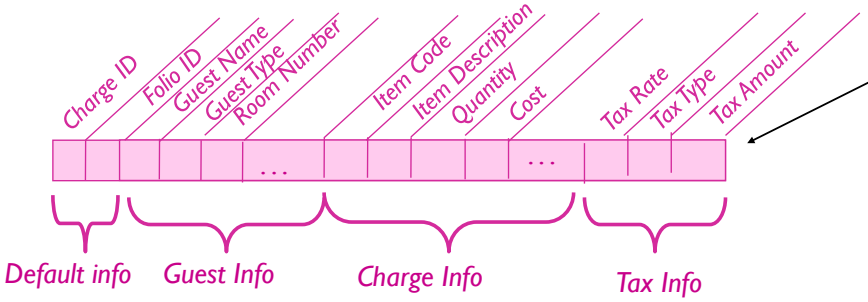


Lifecycle

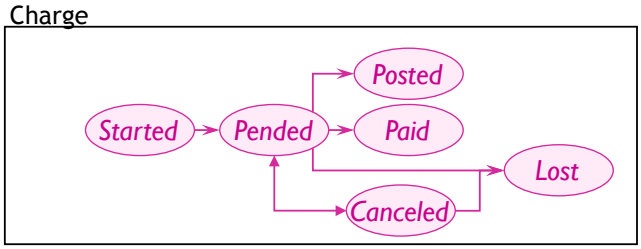


Charge Entity
(Artifact-Centric approach)

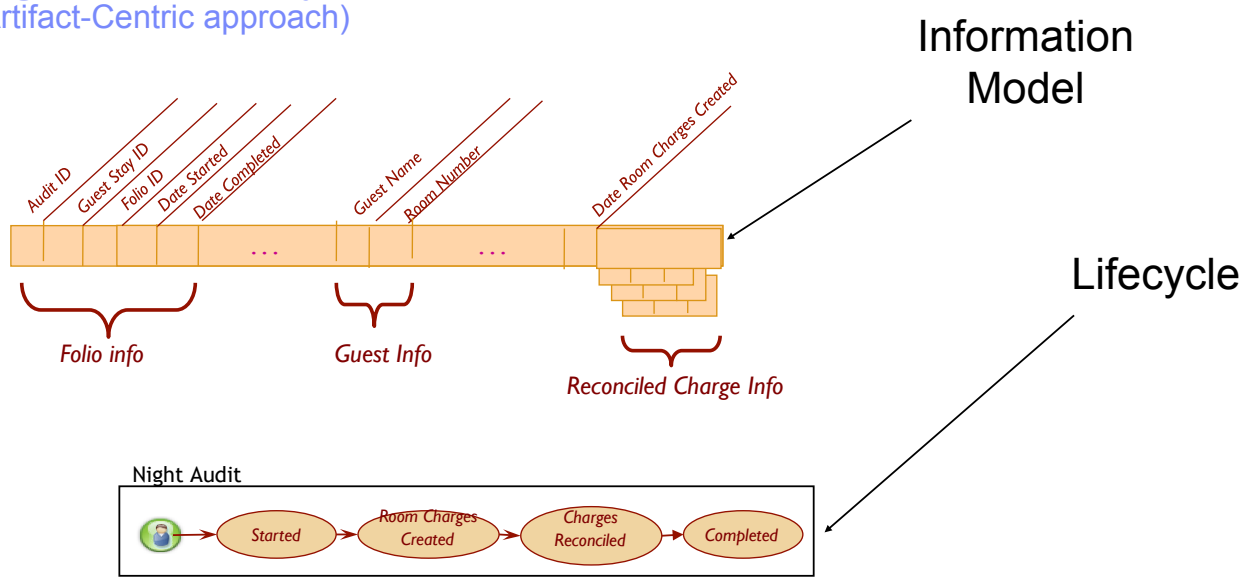
Information Model



Lifecycle

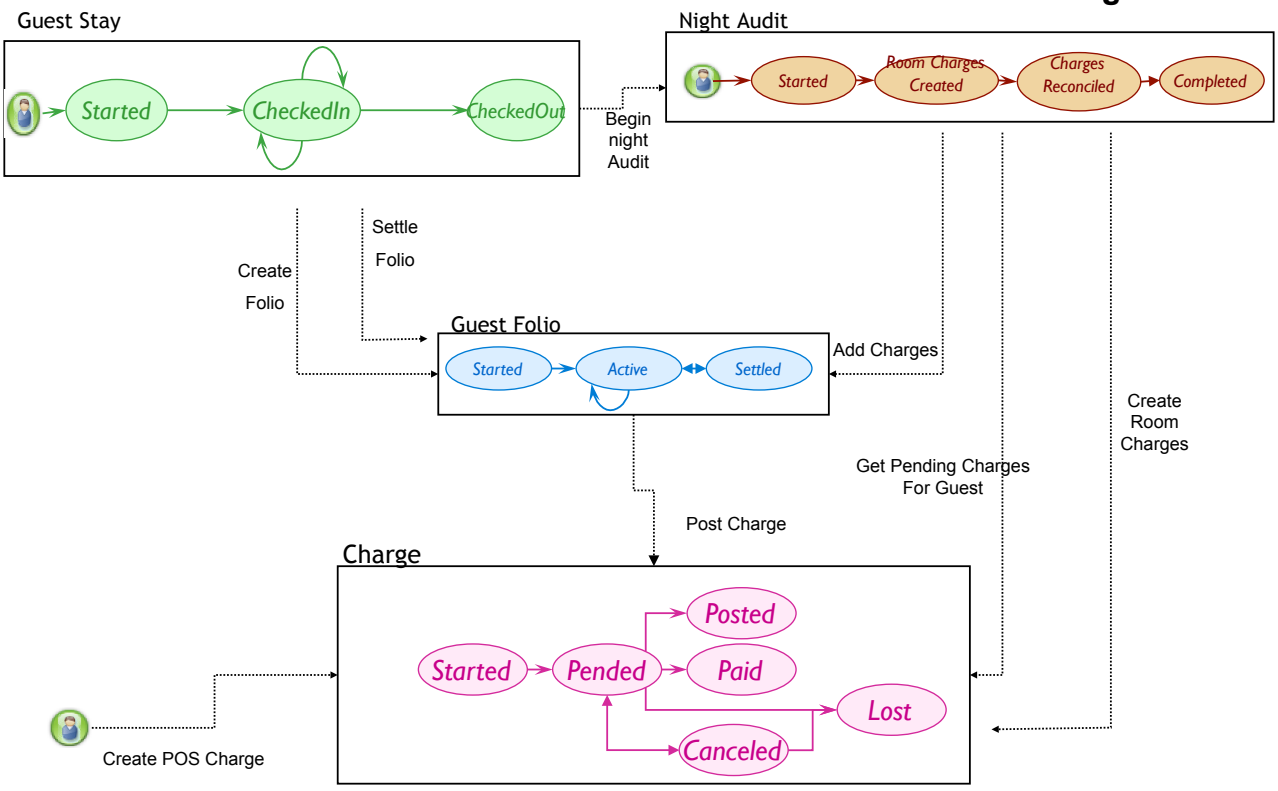


Night Audit Entity
(Artifact-Centric approach)



Determine Entity Interactions

- **Direct link between check in and night audit.**

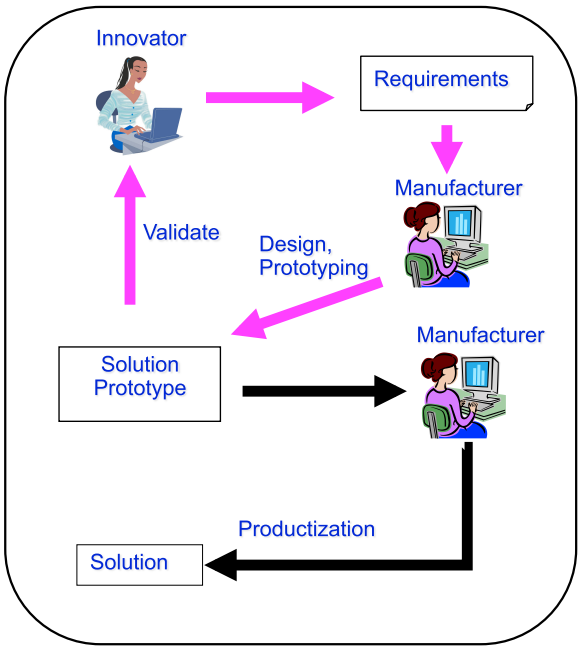


Some comparison points

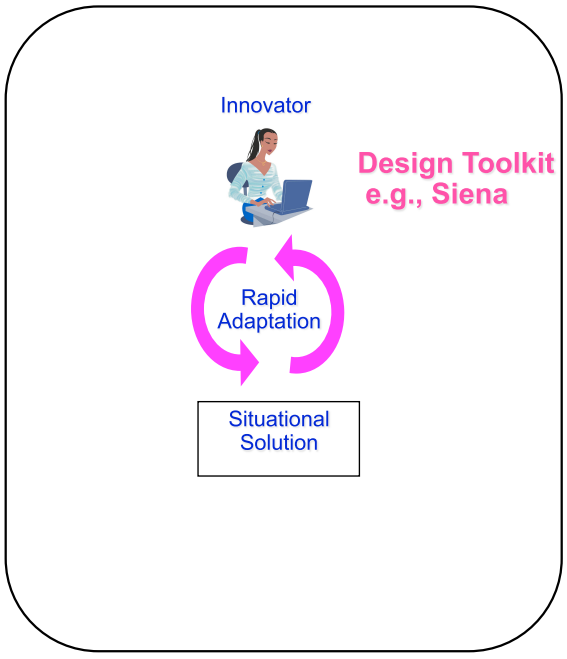
- **Process-Centric Approach**
  - Process flows act as controllers
  - Data is an after thought
  - Some Operational data lost in long running process data
  - Humans Work on “blocked” tasks in long running flows
  - Performance of long running flows not desirable
- **Artifact-Centric Approach**
  - Entities act as controllers
  - Data is Core
    - Business Entities accessible in DB
  - All Operation Data store in Business Entities
    - Queryable, Trackable, Measurable
  - Humans work on Business Entities that are ready
  - Performance of Entities (info, lifecycle, micro flows) considered acceptable

Innovator’s toolkit for Business Process Modeling

(Democratization of Innovation -- Eric Von Hippel)



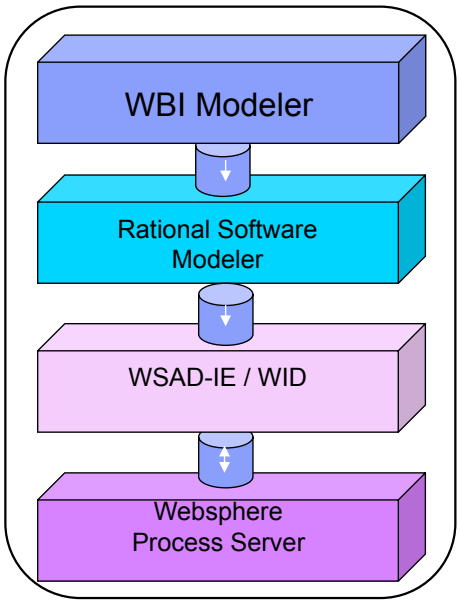
Manufacturer-centered innovation



Innovator-centered innovation

Radical Simplification of Tools and Runtime

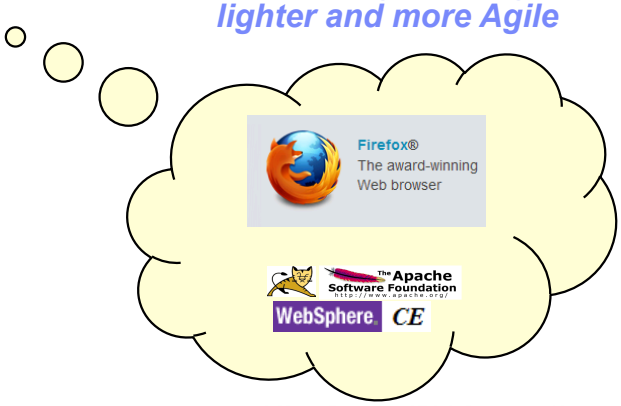
(Supporting Business Process Management Applications using Entity Centric Modeling)



Tooling Stack

10 Gigs Download/Disk Space, 1-2 Days successful installation, At least 2 Gigs Memory

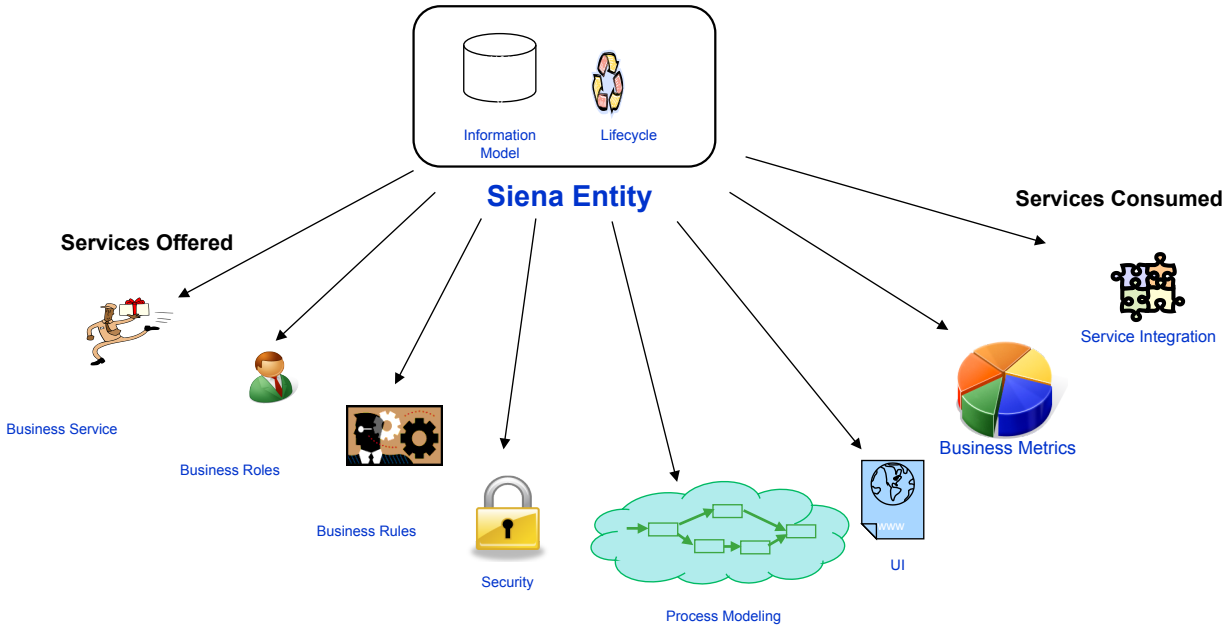
Dreaming of being lighter and more Agile



50 Megs Download/Disk Space, 5-10 minutes, < 1 Gig Memory

Reduced set of BPM abstractions to define and create BPM solutions.

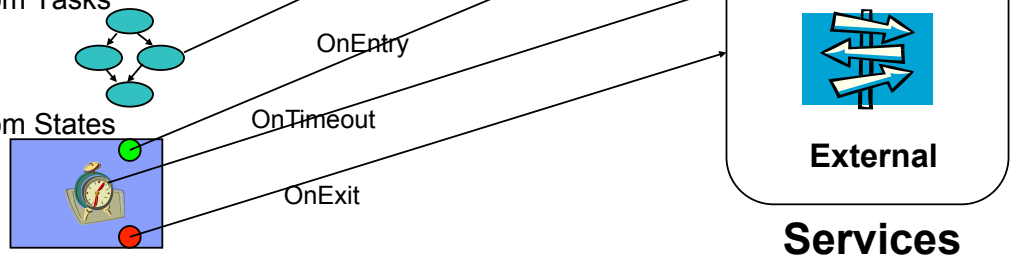
Siena Entity *(The Core of Siena)*



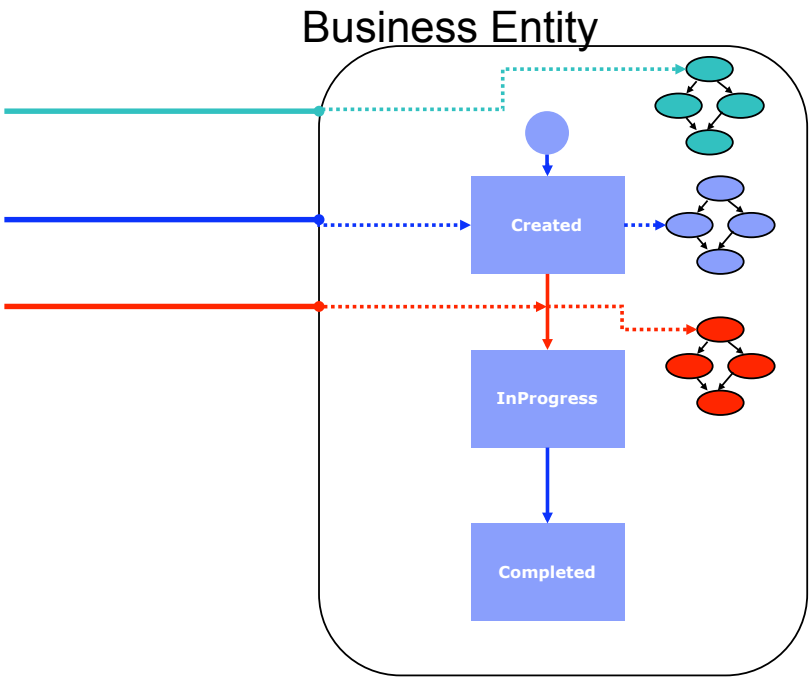
Services

REST & WSDL Services

- **Service Definitions**
  - Flow Services
  - Data Services
  - External Services
- **Service Invocations**
  - From Tasks
  - From States

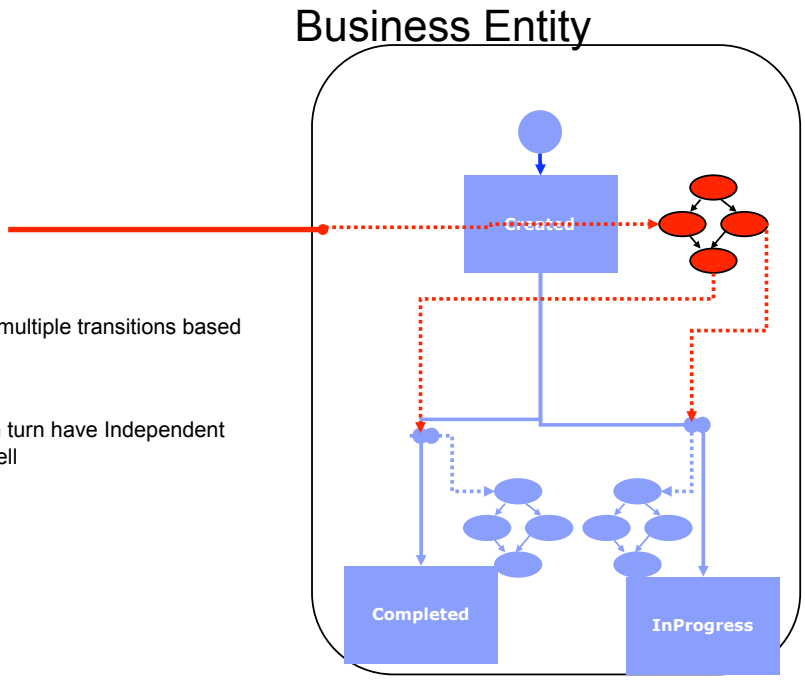


Basic Flow Patterns

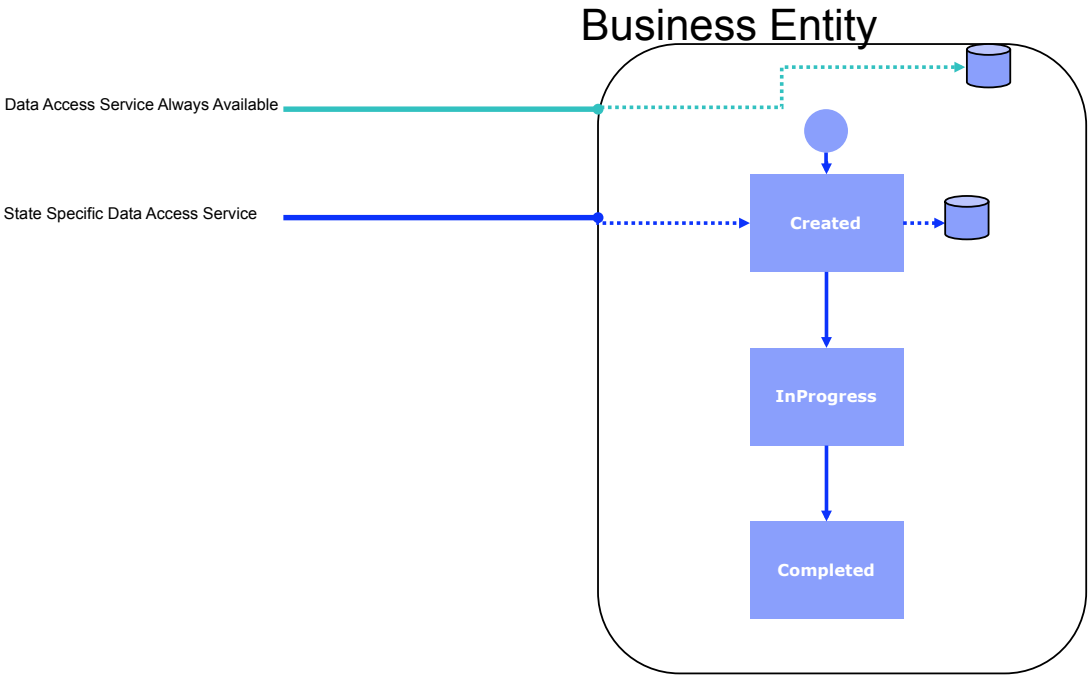


Advance Flow Pattern

- One Flow can invoke multiple transitions based on Flow outcome
- Each Transition can in turn have Independent Transition Flows as well

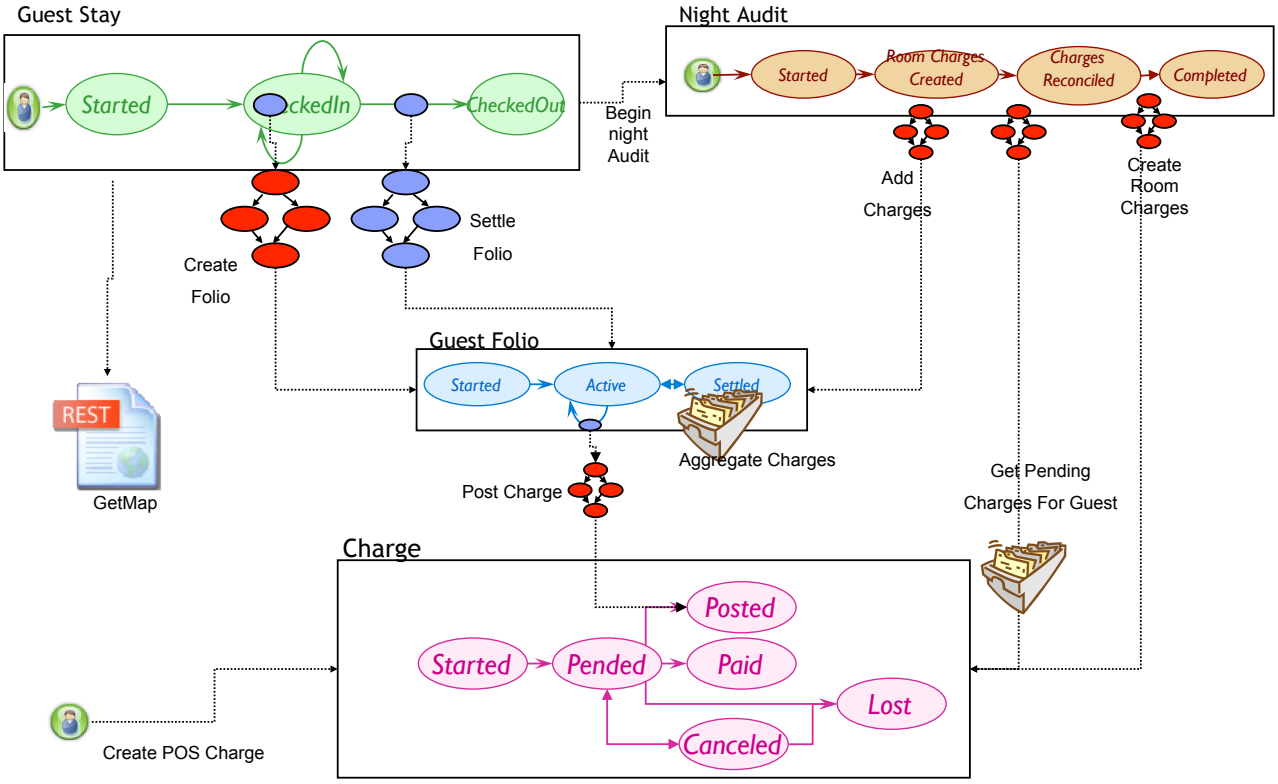


Basic Data Access Patterns



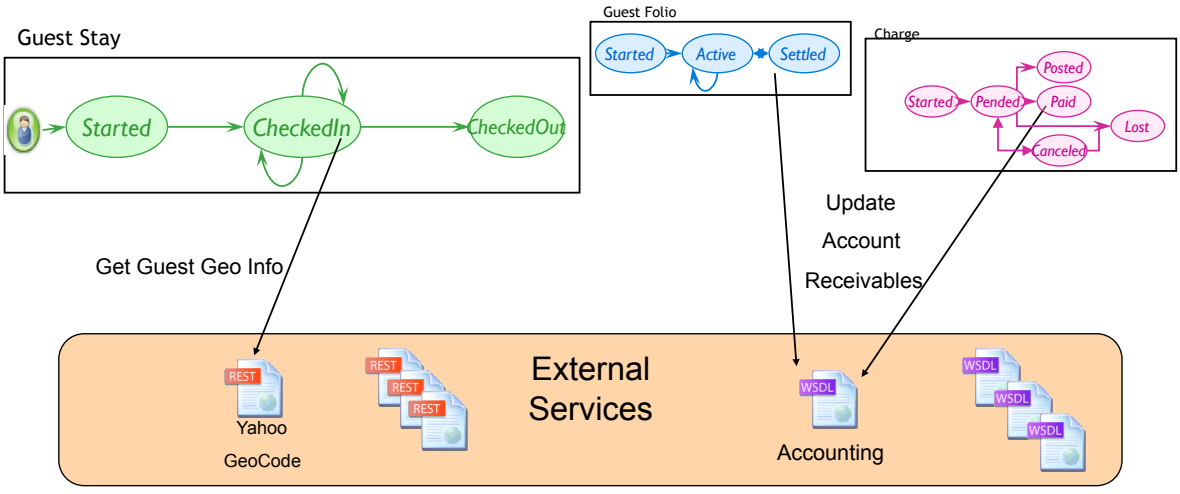
Determine Entity Interactions

- **Direct link between check in and night audit.**



Business Entities give context for Service Invocations

External Service Integration (REST and WSDL)



Large Collection of Externals Services Contextualized by Business Entities

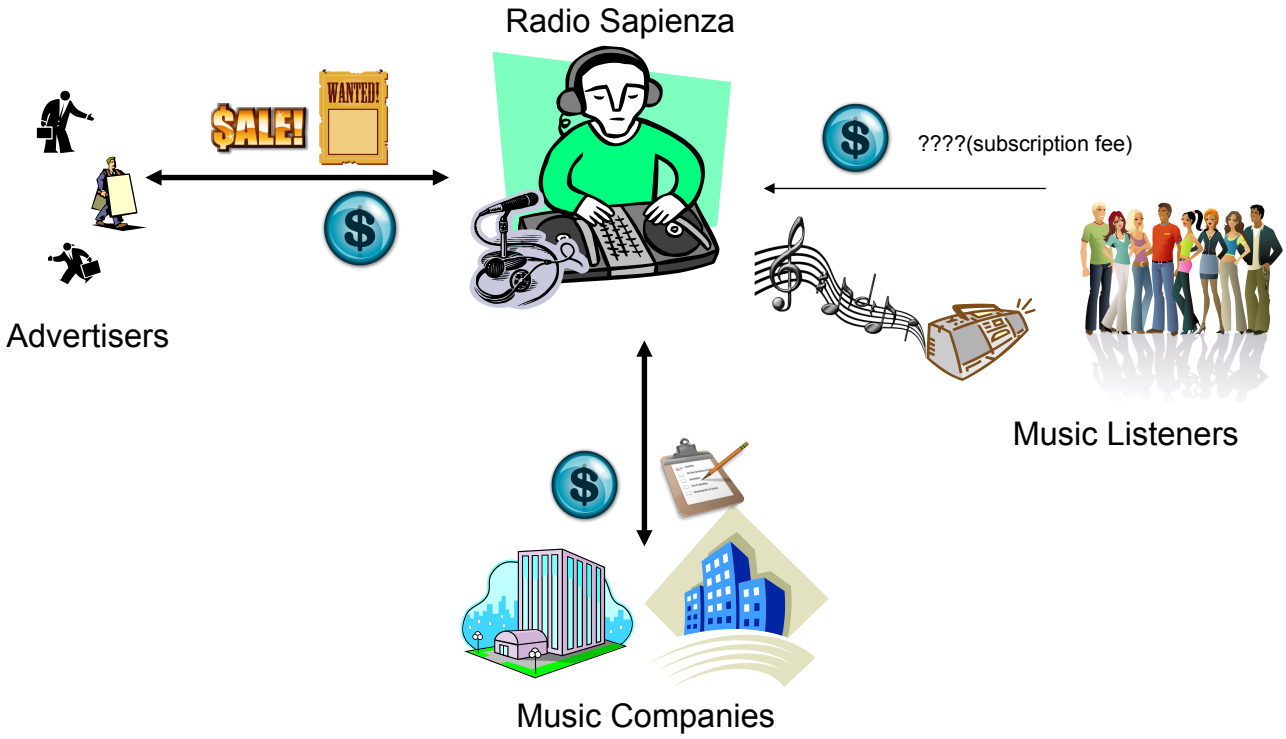
Time to Install Siena

- **Pass USB Sticks around the room and install onto your laptops**
  - Install/Unzip into C:\SienaWeb
    - Double click startup.bat UID: defaultAdmin pwd:
- **Follow Instructor on Presentation Screen**
  - Hello World example with 1 artifact
    - Information Model
    - Lifecycle Model
- **Work in groups of two or three**
  - Discuss steps among each other
- ***Possible Homework Assignment*** Due on Lecture #4 (Review)
  - **Homework Lab:** **(No External Services)**
    - **Procurement** *(Purchases with multiple Line Items)*
    - **Insurance** *(Claims with Payments and Fraud detection)*
    - **Banking** *(Accounts with Deposits and Withdrawals)*

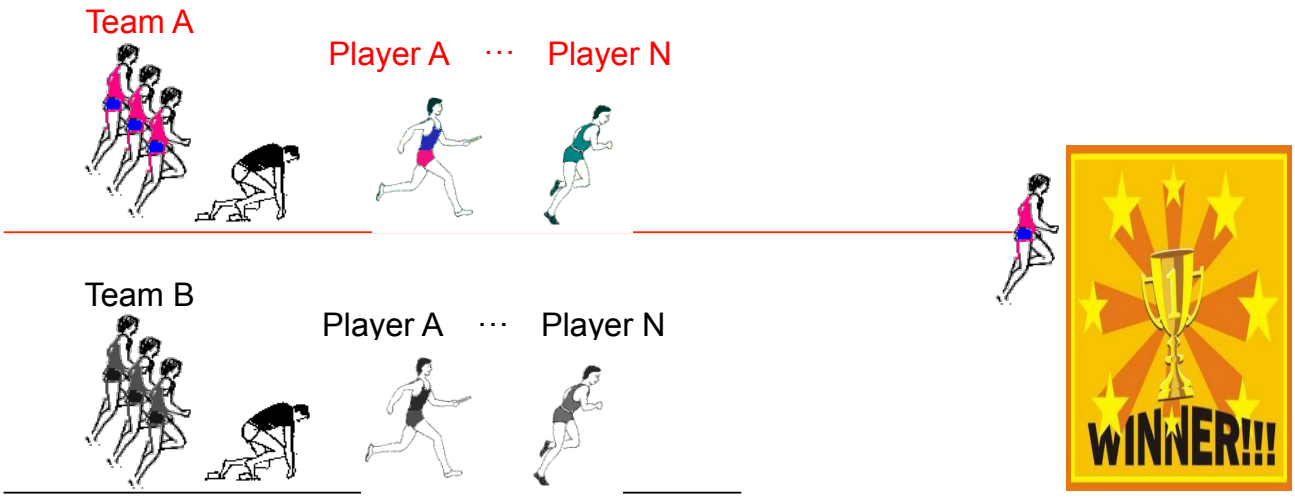
Lecture #3

- ***More Siena Examples (Patrizia and Alessio)***
  - Radio Sapienza
  - Relay Race
  - Color Bricks
  - Clinical
- ***Review Siena Meta Model***
  - Review model elements
  - Review an instance of Siena.XML
- **Model Driven Architecture**
  - Explain Models an MDA…..Explain traditional Models to Code Generation
- **Model Driven Execution**
  - *Explain Model Driven execution.*

Radio Sapienza Overview (Patrizia and Alessio)



Relay Race Overview (Patrizia and Alessio)



- All Players Run at Random Speeds
- Siena Controls Relay Race Servlets/External Services

CLINIC

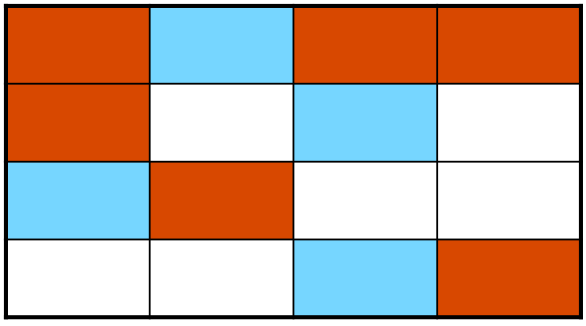
- **Manages information about the examinations: data of patients, description of the reports, admissions to a ward.**
- **Manages the ambulances: external services to find destination address and to visualize the map.**

COLOR BRICKS

Columns: 4

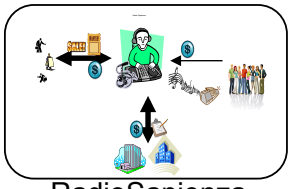
Rows: 4

Cells: 10



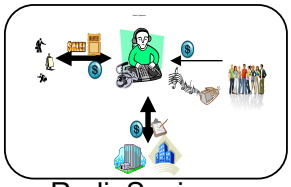
- **Plays a game respecting the constraints.**
- **The user can choose the number of cells and the dimension of the matrix.**
- **Purpose: Siena is able to manage a big amount of instances.**

RADIO SAPIENZA ARTIFACTS



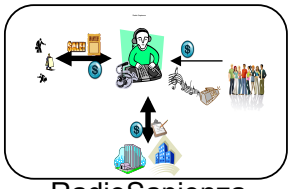
- PLAYLIST
- TRACK
- PLAYER

Information Model: PLAYLIST



- ***Name*** (string):
  - name of the playlist.
- ***DurationTot*** (long):
  - total duration of the playlist.
- ***PlayerID*** (long):
  - ID of the player that is playing the playlist.
- ***TrackList*** (TypeTrack):
  - list of tracks that compose the playlist.
- ***TrackPlayed*** (TypeTrack):
  - informations of the track that is actually played.

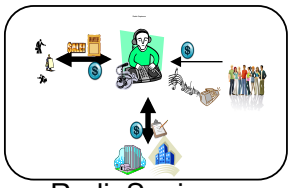
Information Model: TRACK



RadioSapienza

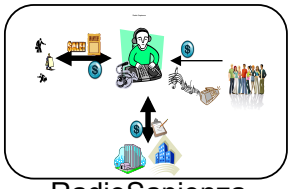
- ***TempPlaylistID*** (long):
  - ID of the playlist that is playing the track.
- ***StartTime*** (dateTime):
  - date and time in which the track is played
- ***PauseTime*** (dateTime)
- ***ResumeTime*** (dateTime)
- ***RemainingDuration*** (long):
  - remaining duration of the track after a "resume" action.
- ***TrackInfo*** (TypeTrack):
  - informations of the track.

Information Model: PLAYER



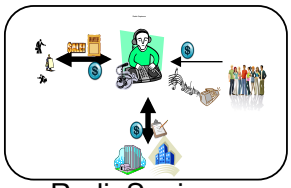
RadioSapienza

- ***NumberTracks*** (int):
  - Number of the tracks played.
- ***PlaylistID*** (long):
  - ID of the playlist that the player is playing.


RadioSapienza

EXTERNAL SERVICE: BrowseAmp

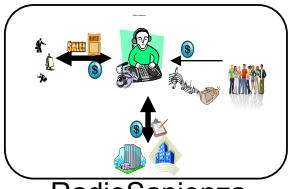
- **WinAmp is a media player.**
- **It is controlled by the plugin** "BrowseAmp"**.**
- **BrowseAmp offers a RESTful service**
  - –Allows us to control WinAmp with simply URLs
    - Play
    - Stop
    - Pause
    - Resume

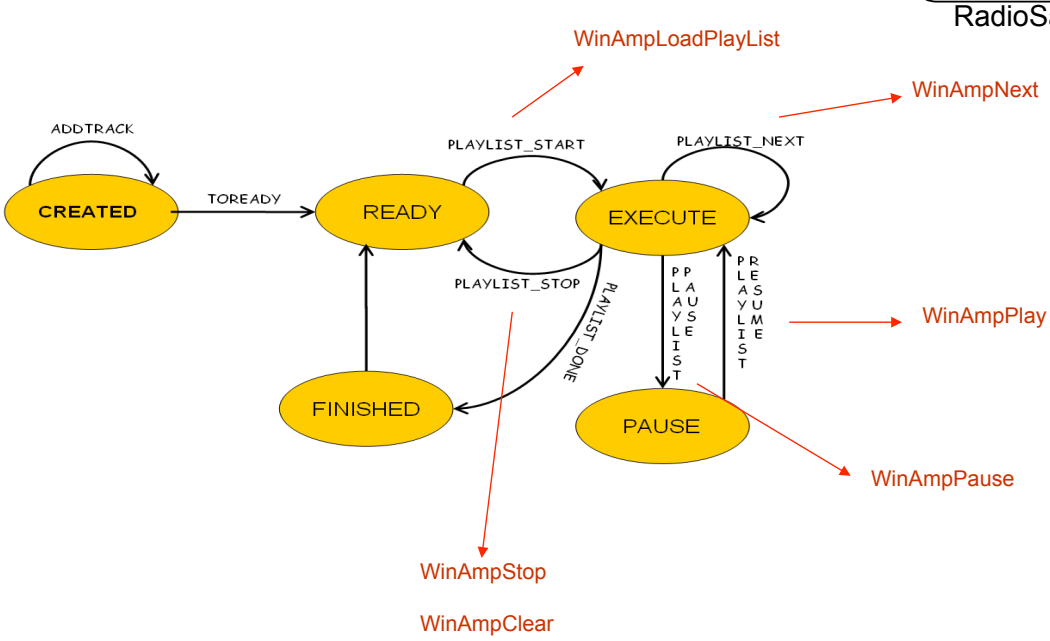

RadioSapienza

OTHER SERVICES: ODDCAST E ICECAST

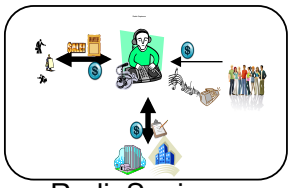
- **We use two free softwares in order to simulate a radio station on internet.**
- Oddcast **sends the parameters to WinAmp that it is playing on the port 8002.**
- IceCast **broadcasts on internet the stream of data that arrives on that port.**
- **The users can listen the playlist using the link: http://151.100.59.92:8002/Radiosapienza.m3u (address of the server in which all the applications run).**

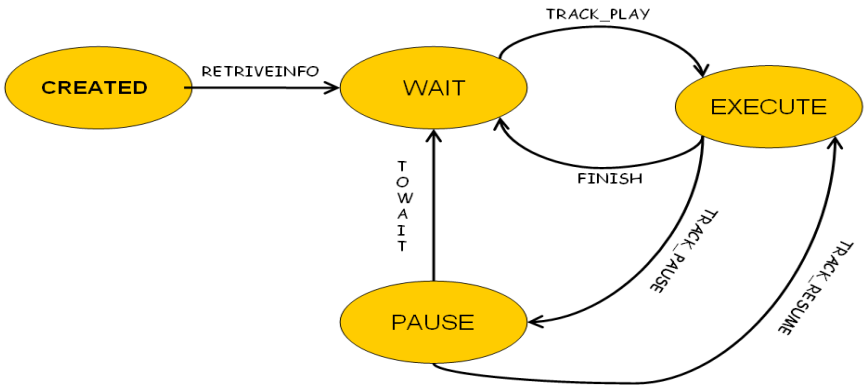
State Diagram: PLAYLIST



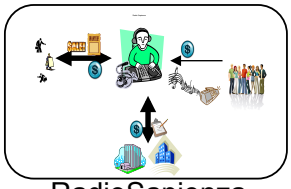


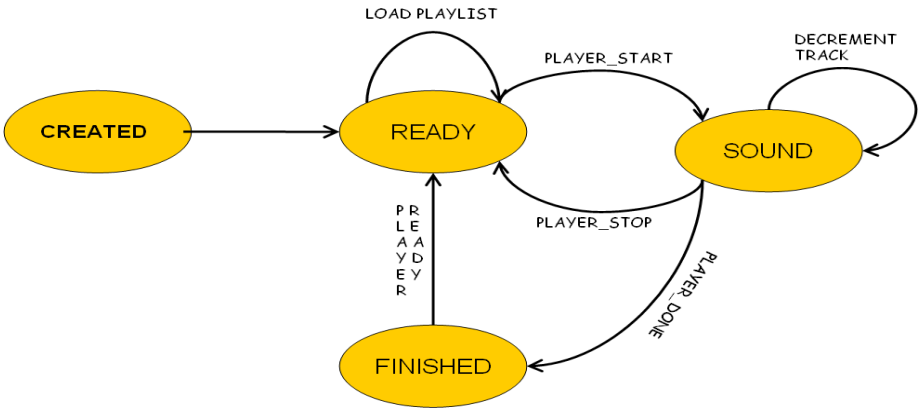
State Diagram: TRACK



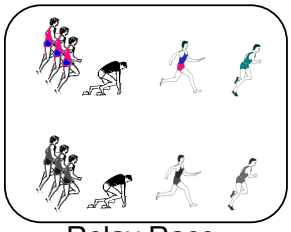


State Diagram: PLAYER


RadioSapienza

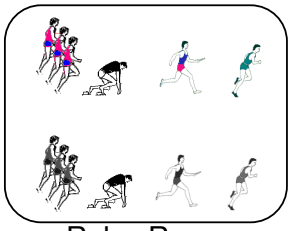


RELAYRACE: ARTIFACTS


Relay Race

- PLAYER
- TEAM
- RACE

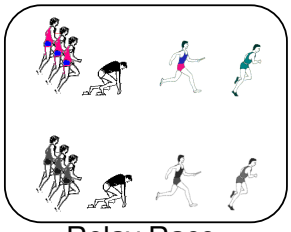
Information Model: PLAYER


Relay Race

- ***Name*** (String):
  - Player's name.
- ***Speed*** (Float):
  - Player's velocity.
- ***Time*** (Long):
  - Space / Speed (m/s).
- ***TeamID*** (Long):
  - ID of the player's team.

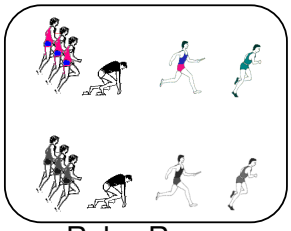
IBM Research

Information Model: TEAM


Relay Race

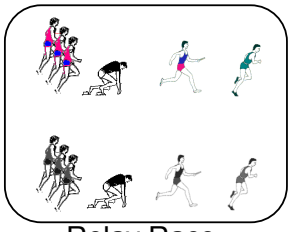
- ***Name*** (String):
  - Name of the Team.
- ***TotalTime*** (Long):
  - Time spent to finish the race.
- ***RaceID*** (Long):
  - ID of the race in which the team is playing.
- ***PlayerList*** (PlayerType):
  - List of players of the team.

Information Model: RACE


Relay Race

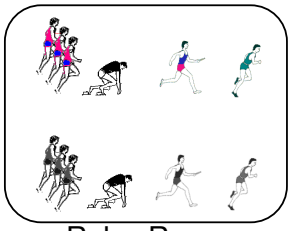
- ***Name*** (String):
  - Name of the Race.
- ***TeamList*** (TeamType):
  - List of team that takes part in the race.
- ***Results*** (Results):
  - Arrival ranking of the teams at the end of the race.

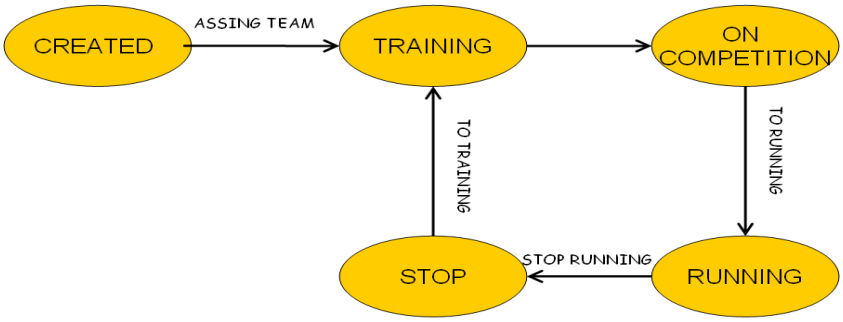
EXTERNAL SERVICES


Relay Race

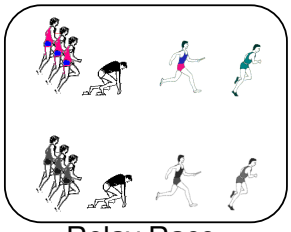
- **We use Java JSP and Java Servlet in order to implement external services useful for our application.**
- **Siena manages the race, controls the competition and sends to the JSP pages all the attributes required.**
- **The external services are:**
  - **RaceService**:
    >http://localhost:8080/Race/Race creates the Race.
  - **ShowRace**:
    >http://localhost:8080/OpenURL/Open opens a window that shows the race.
  - **Winner**:
    >opens a window with all the informations about the winner.

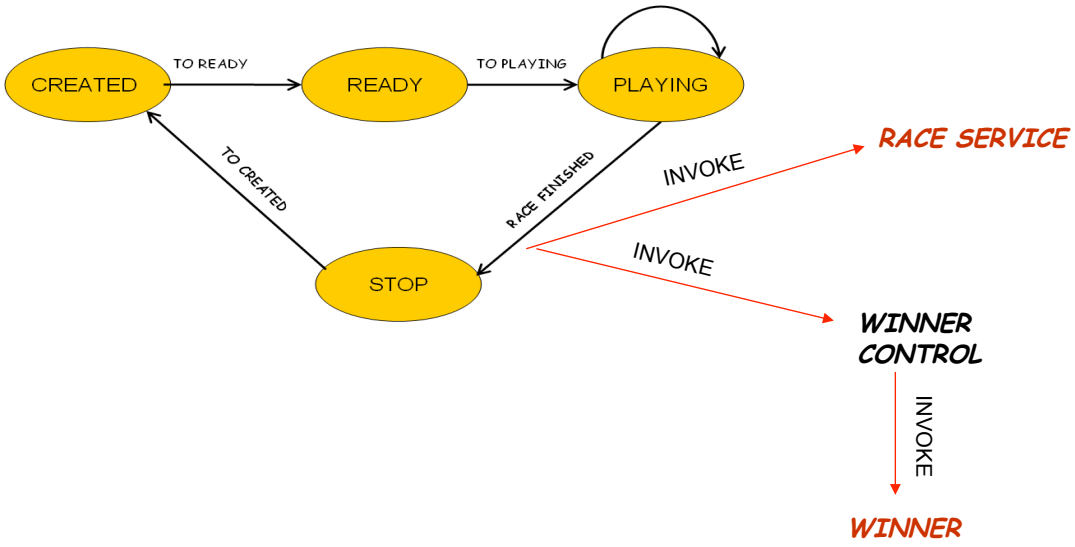
State Diagram: PLAYER


Relay Race

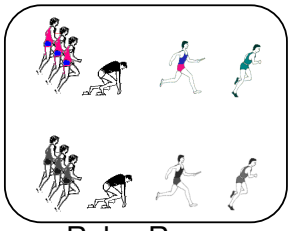


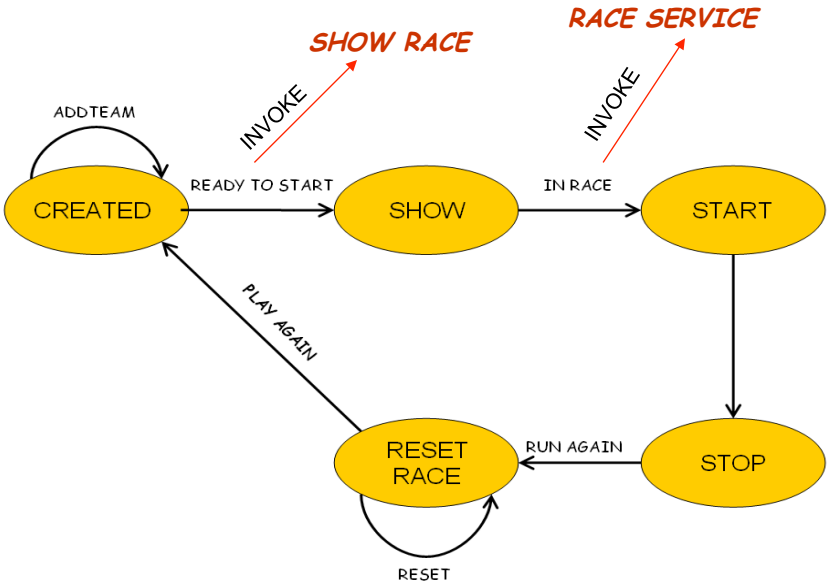
State Diagram: TEAM


Relay Race

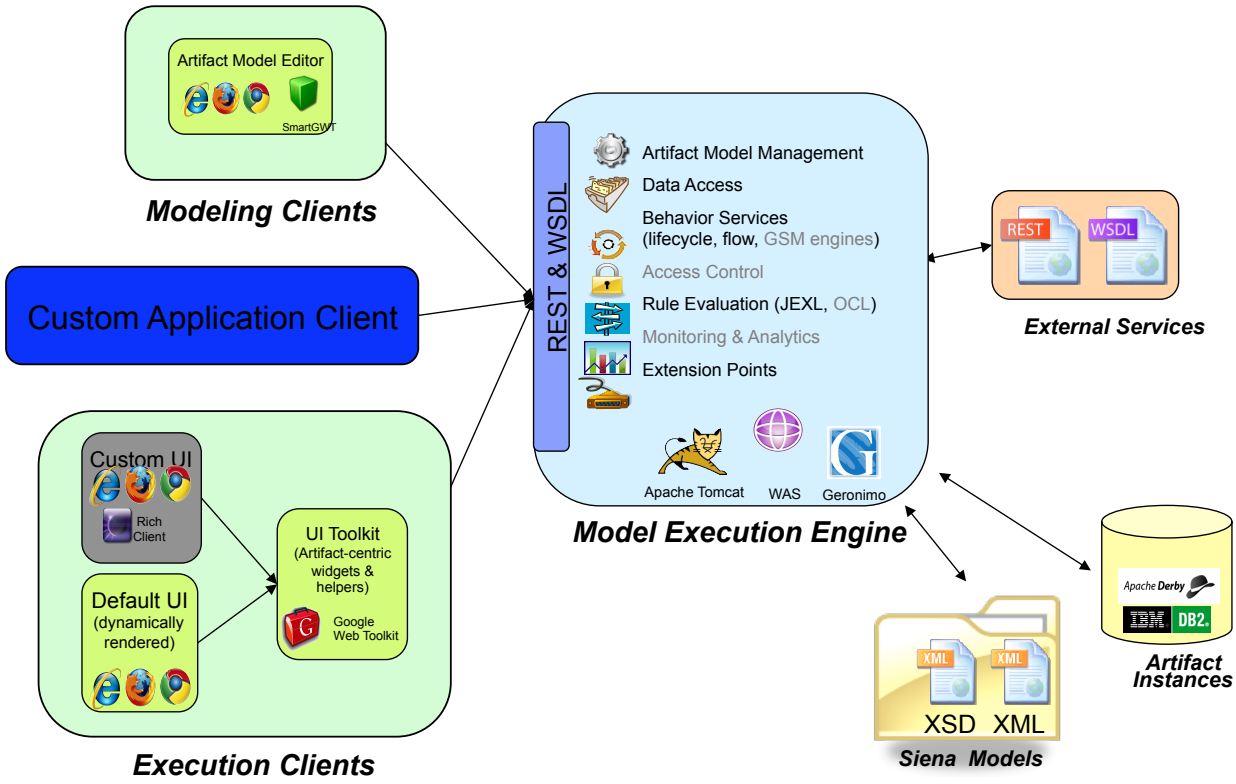


State Diagram: RACE

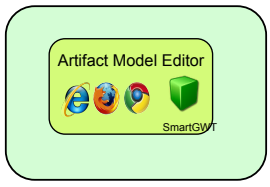

Relay Race



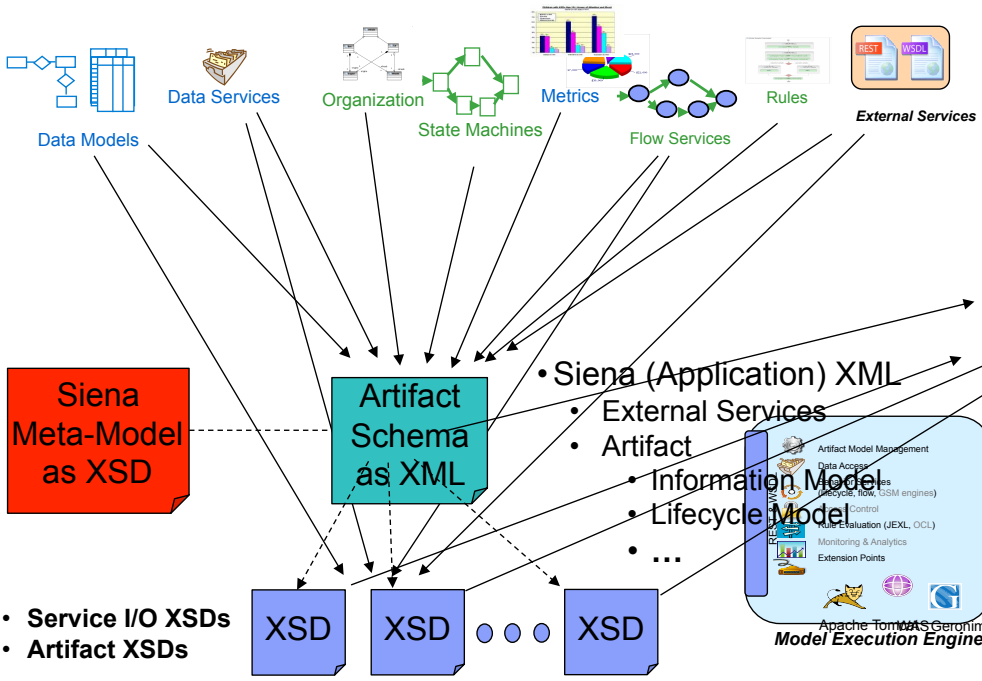
Siena Architecture Diagram



What makes up a Siena Application?

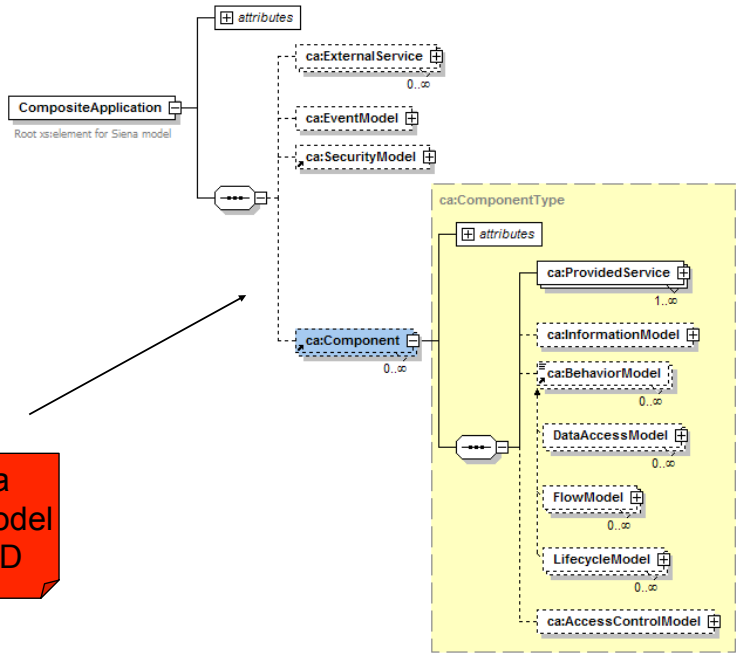


Modeling Clients

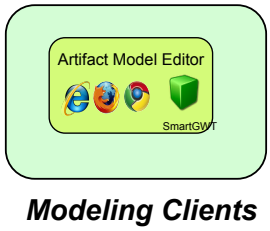


Siena Schema (Meta-Model)

Composite Application

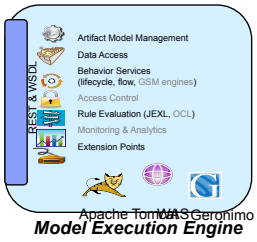


Siena
Meta-Model
as XSD



Modeling Clients

- ***Modeling Tools Constrained by Meta-Model***

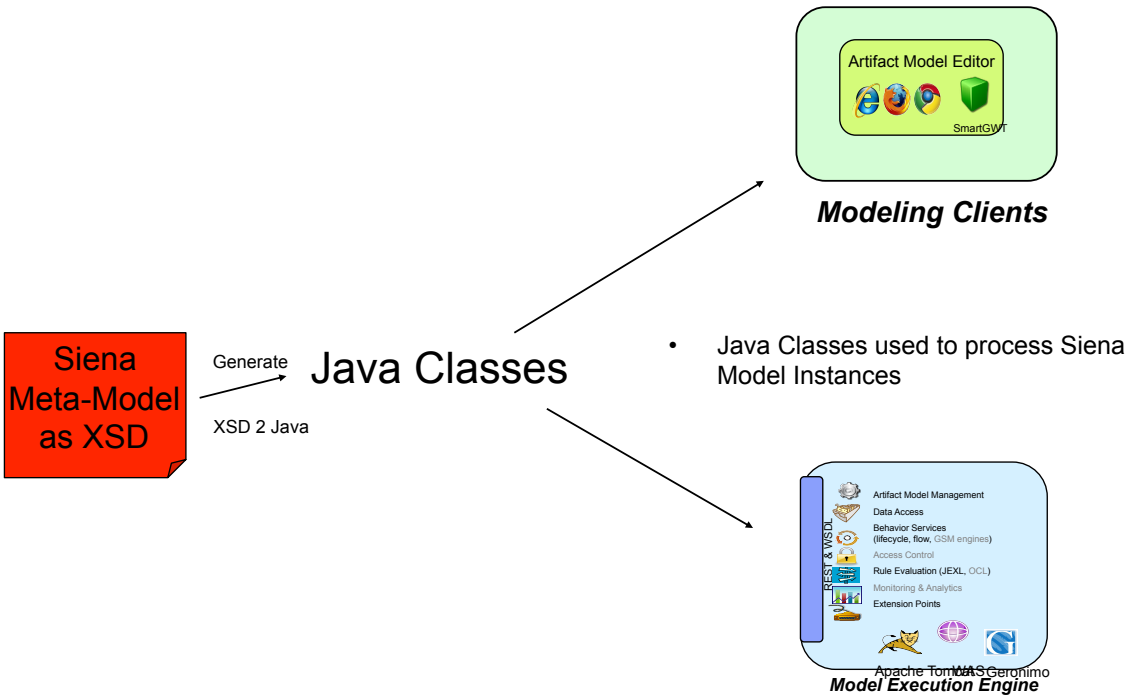


- ***Execution Engine Uses Meta-Model to Execute Model Instances***

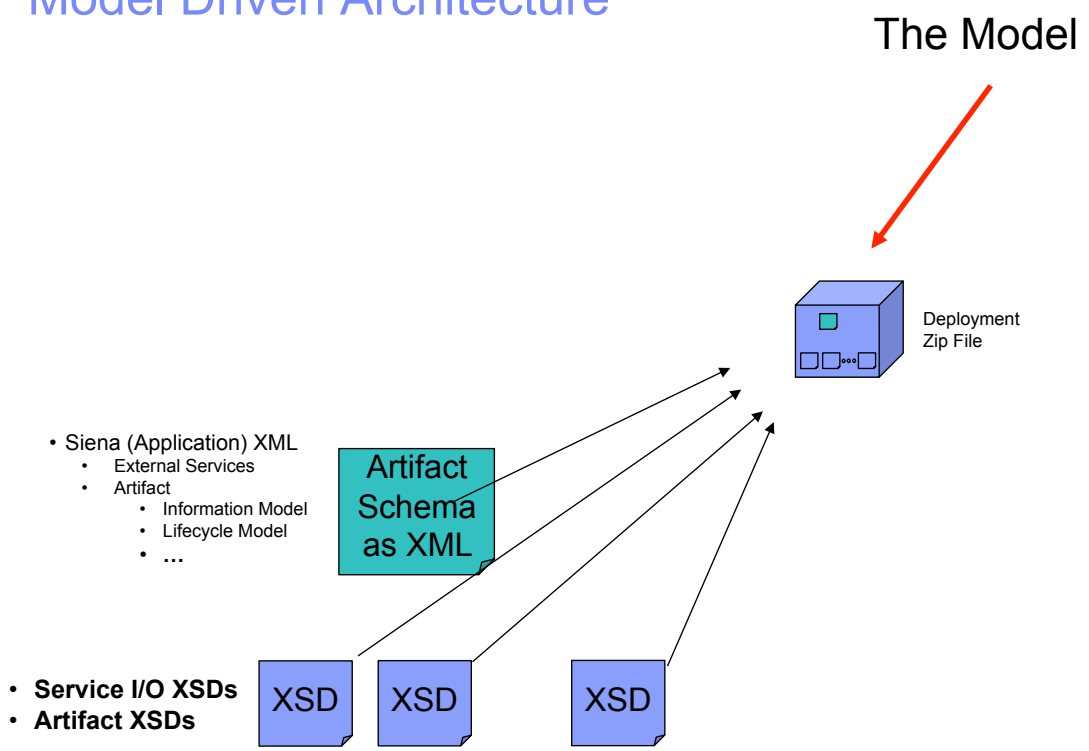
Lets now Inspect the model Using an XML Editor

Explore the Development Environment in Eclipse

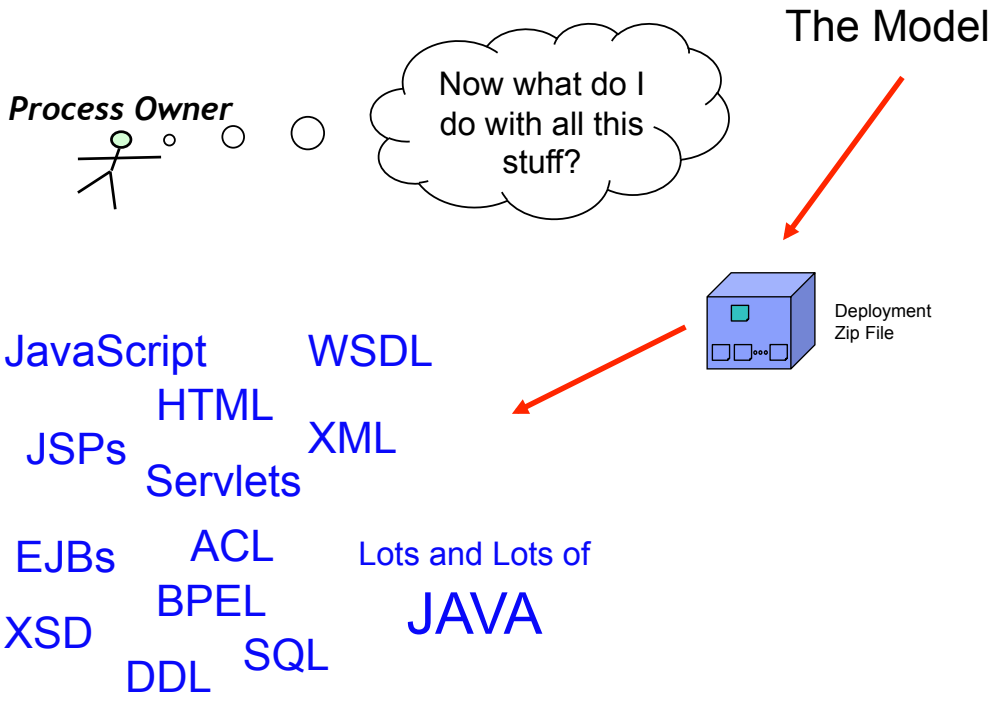
Generate Java from Siena Meta-Model



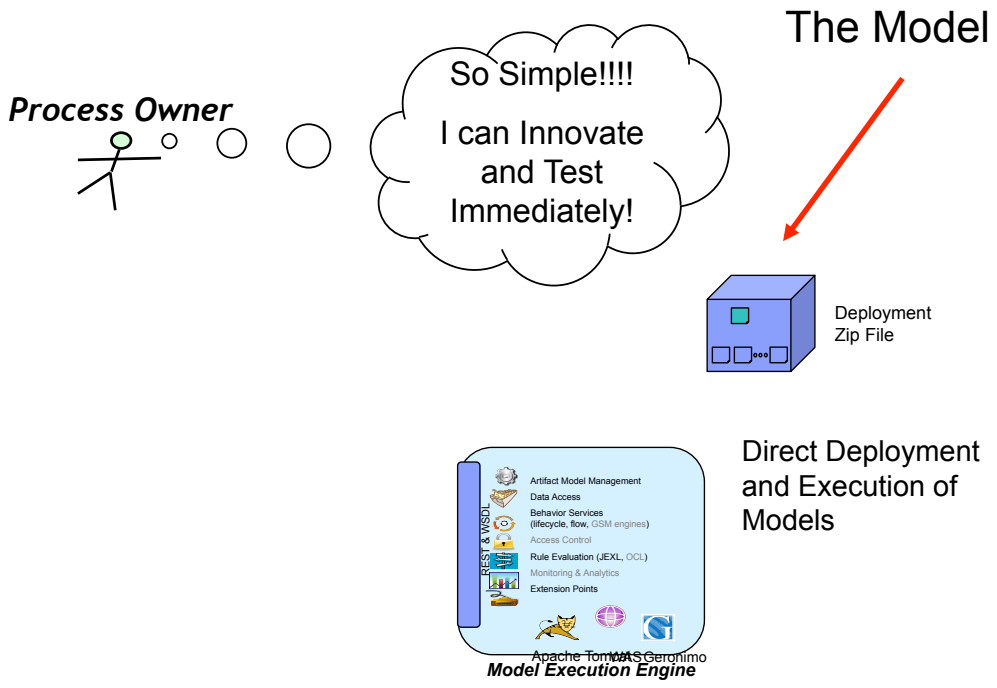
Model Driven Architecture



Traditional Approach: *Generate Model Into Code*



Siena Approach: *Direct Deploy and Execute Models*



Direct Deployment and Execution of Models

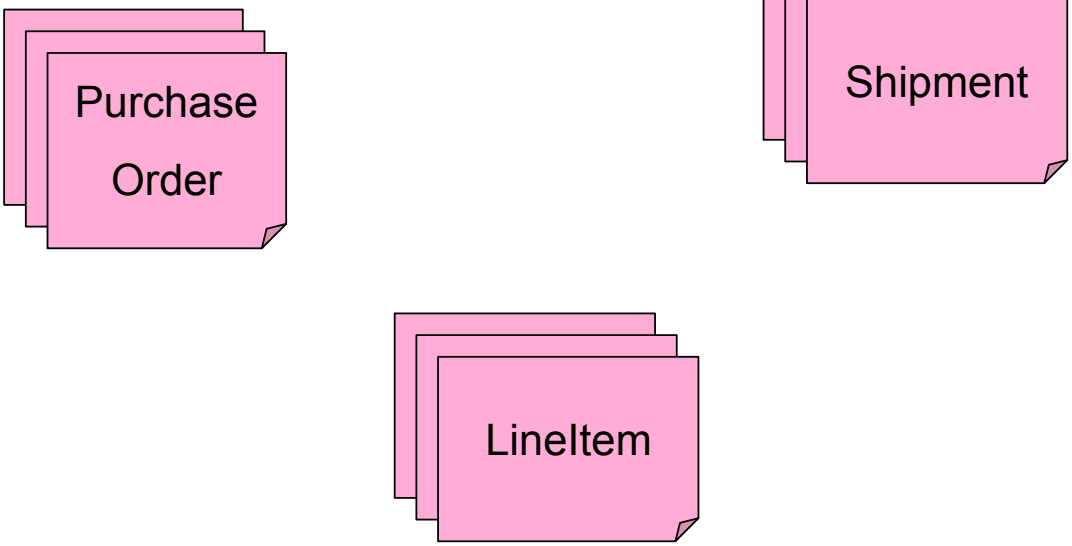
Lecture #4

- **Review homework**
  - *DEMOs*
  - *Questions and Answers*
- **Siena System Internals**
  - *Questions and Answers*
- **Web Services**
  - ***Service Facade***
    - RESTful
    - WSDL
  - ***Service Invocation***
    - ***Internal***
      - Flow, Data
    - ***External***
      - RESTful and WSDL
- **Future Artifact Designs**
  - ***GSM style***
    - Event Driven
    - No Wires/Transitions
- **Artifact Design Patterns**
  - ***One-One***
  - ***One-Many***
  - ***Many-Many***
- ***Feedback***
  - ***Course improvements***
    - ***Content***
    - ***More Systems?***
    - ***More Database?***
    - ***More Services***
    - ***More???***

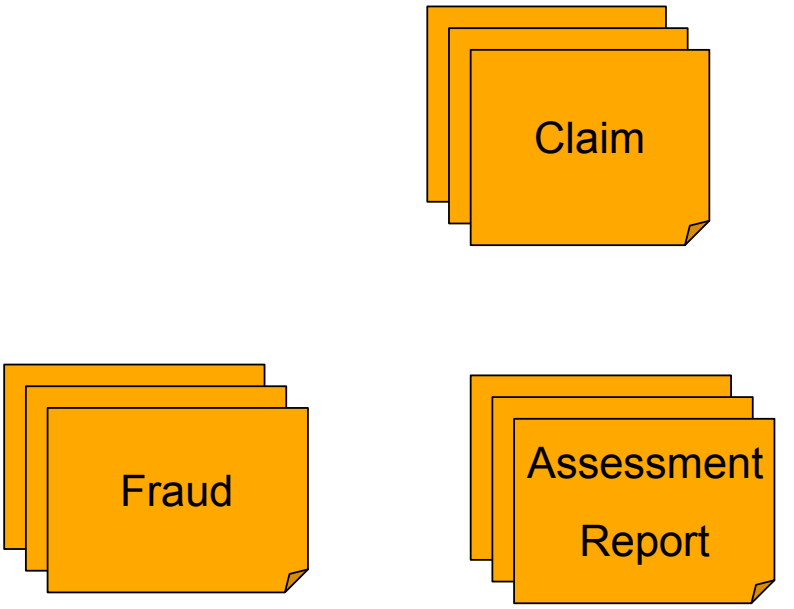
Review Homework Problems

- ***Homework reviews/demos***
- ***PLEASE ASK QUESTIONS***
- **Questions and Answers**
  - **Procurement** *(Purchases with multiple items)*
  - **Insurance** *(Claims with payments or fraud detection)*
  - **Banking** *(accounts with deposits and withdrawals)*

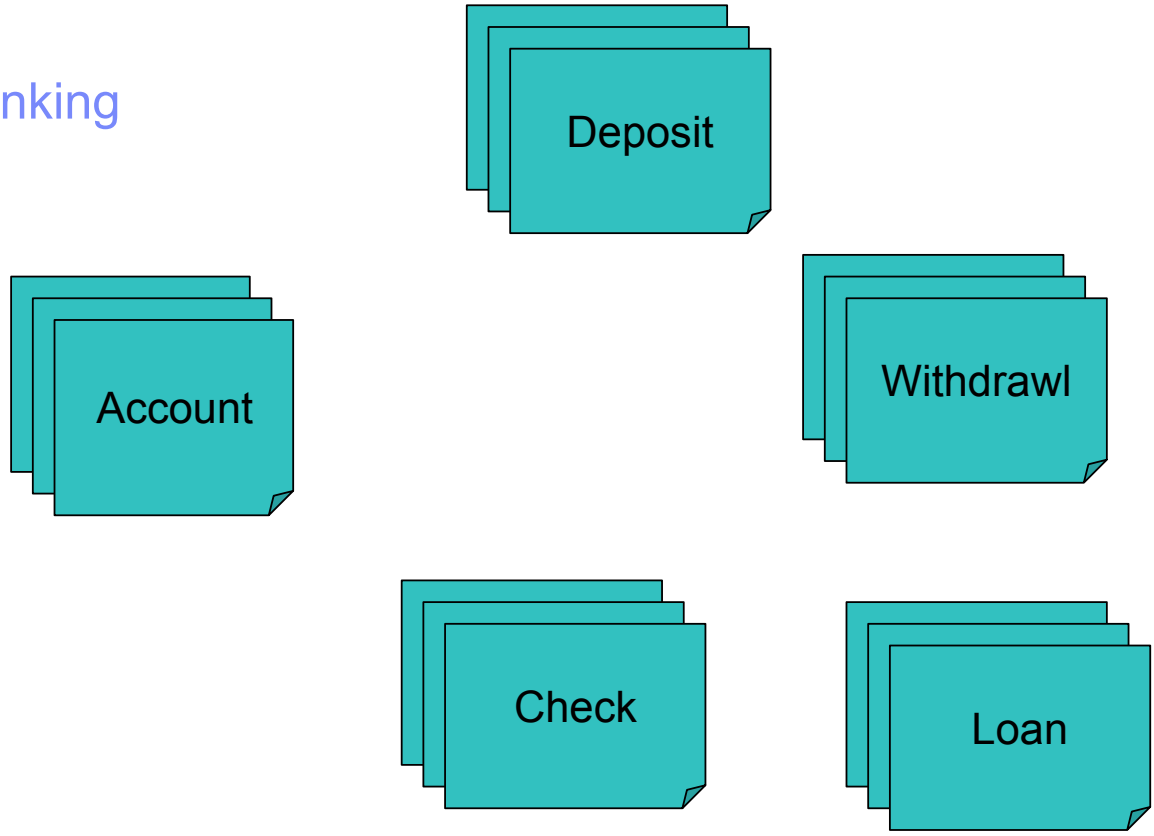
Procurement



Insurance



Banking



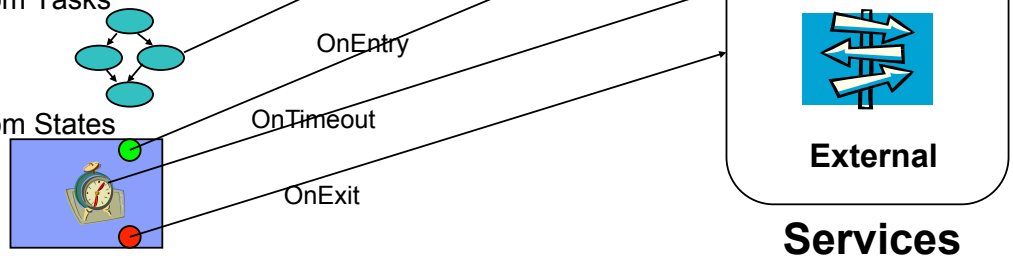
Siena System Internals

- **Questions and Answers**
  - *Meta-model*
  - *Model Instances*
  - *Modeling UI*
  - *Model Execution Engine*
  - *Default Execution UI*
  - *Custom UIs*

Services

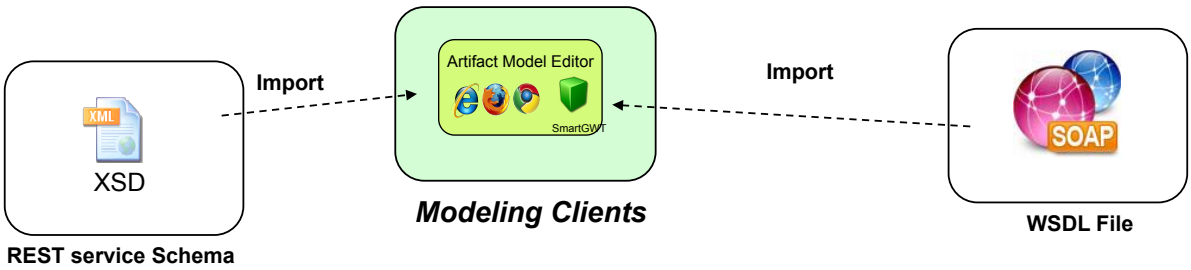
REST & WSDL Services

- **Service Definitions**
  - –Flow Services
  - –Data Services
  - –External Services
- **Service Invocations**
  - –From Tasks
  - –From States



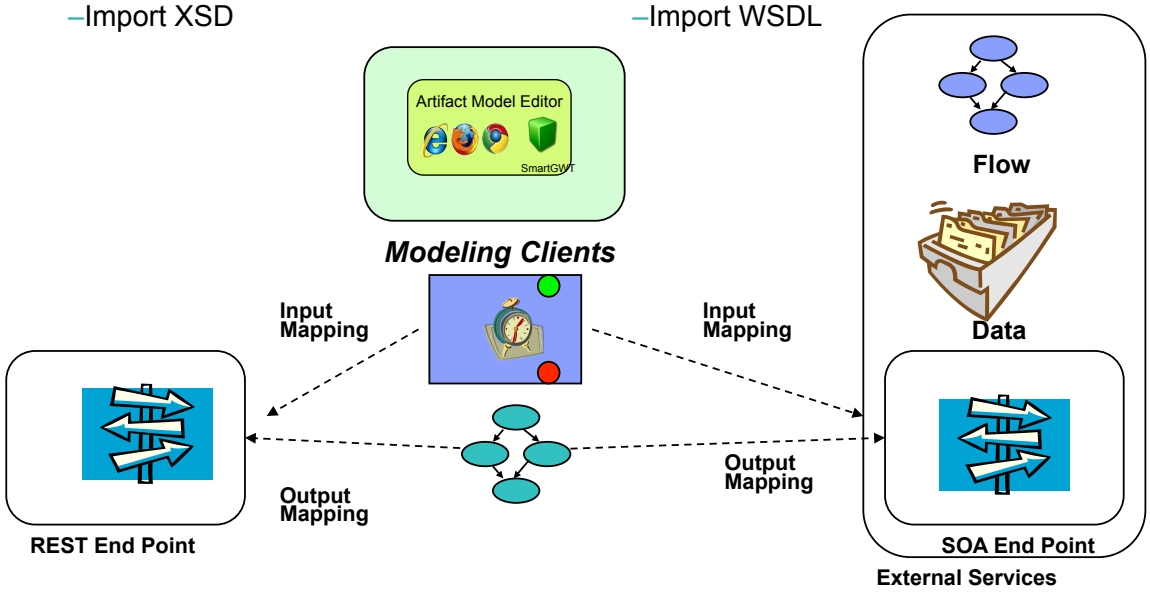
Registering External Services

- **REST**
  - –Specify Service End Point URI
  - –Import XSD
- **WSDL**
  - –Point to Remote WSDL File
  - –Import WSDL



Binding and Mapping External Services

- **REST**
  - Specify Service End Point URI
  - Import XSD
- **WSDL**
  - Point to Remote WSDL File
  - Import WSDL



Client Toolkit: Siena API Façade
(***RESTful*** Siena)

- ***SienaServiceClient*** API
  - Generic RESTful API to call Siena
  - Support for XML Input, XML Output, JSON Input, JSON Output
  - API:
    - SienaServiceClient sienaClient = new SienaServiceClient();
      - Restful Service Façade
    - sienaClient.invokeXml();
      - Invoke Services (flow services, data services, transition services)
    - sienaClient.retrieveListXml();
      - Retrieve Artifact Instance Lists
    - sienaClient.retrieveXml();
      - Retrieve a single Artifact Instance
    - sienaClient.saveXml();
      - Save a single Artifact Instance

Inspect Code: using eclipse

```
static String  appName = "ClientTest";
static String  dataItemId = "MyArtifact";
static String  serviceId = "MyArtifact-ANY-to-Created-0Transition";
static String  inProgressServiceId = "MyArtifact-Created-to-InProgress-0Transition";

String ArtifactXML = "<MyArtifact
                        attribute1='Via Labicana' attribute2='Roma' attribute3='Terry' attribute4='Heath'>
                      </MyArtifact>";
            //  Make a New Client
            SienaServiceClient client = new SienaServiceClient("http://localhost:8080/SienaWeb", "defaultAdmin", null);

            // Invoke Any to Created
            String invokeXmlOutputMessage = client.invokeXml(appName,serviceId, URLEncoder.encode(ArtifactXML));

            // Extract newly created ID from new Instance
            String id = parseIDFromXML( invokeXmlOutputMessage );

            // Invoke Created to InProgress
            String inProgInputXML = "<MyArtifact ID='" + id + "' />";
            String inProgOutputXML = client.invokeXml(appName,inProgressServiceId, URLEncoder.encode(inProgInputXML));
```


Run Example Client from Eclipse

- **Jump to IDE**
- **RUN**

Client Toolkit: Siena API Façade
(***RESTful*** Siena)

- ***WSDL Siena***
  - ***Solution Specific WSDL files***
    - Generated into deployed solution
    - Use your favorite IDE to bind to WSDL files and invoke
    - Generate JavaProxy Web Service Client
    - Begin to Invoke WSDL Operations onto the Solution Specific Artifacts

Artifact Relationship Patterns

- **(One to One)**
  - Insurance Claim can related to 1 Fraud
- **(One to Many)**
  - ***Parent / Child***
    - Purchase Order
      - Line Items
- **(Many To Many)**
  - ***Purchase Order***
    - Each Purchase Order can be delivered in 1 or more shipments
  - ***Shipment***
    - Each shipment can contain Line Items from different Purchase Orders

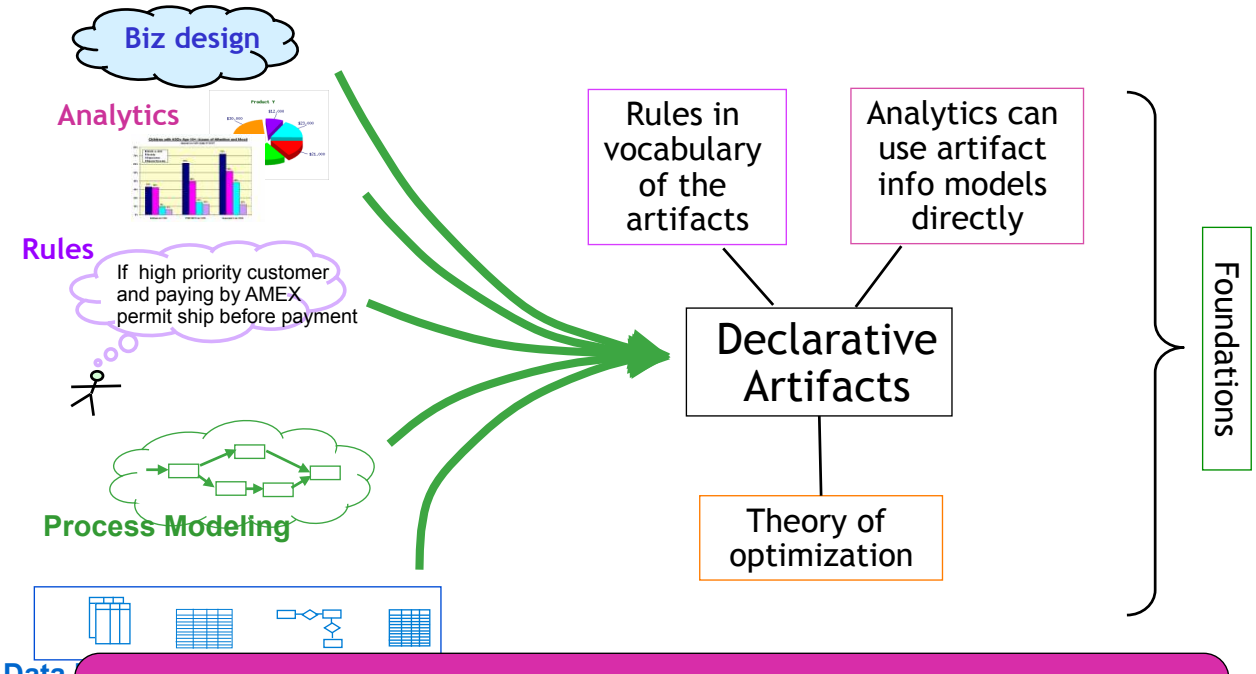
Future Artifact-Centric work

- **Further Siena Web Tooling Features**
- **Optimize Siena Engine**
- **Project ArtiFact ™**
  - Declarative Approach (no wires or transitions)
    - Guards, Stages and Milestones

What is Project ArtiFact™ GSM

- **Hierarchical Units of Work**
  - Units of Work (***Stages***)
    - Launch by Conditions (***Guards***)
    - Completed by Expressions (***Milestones***)

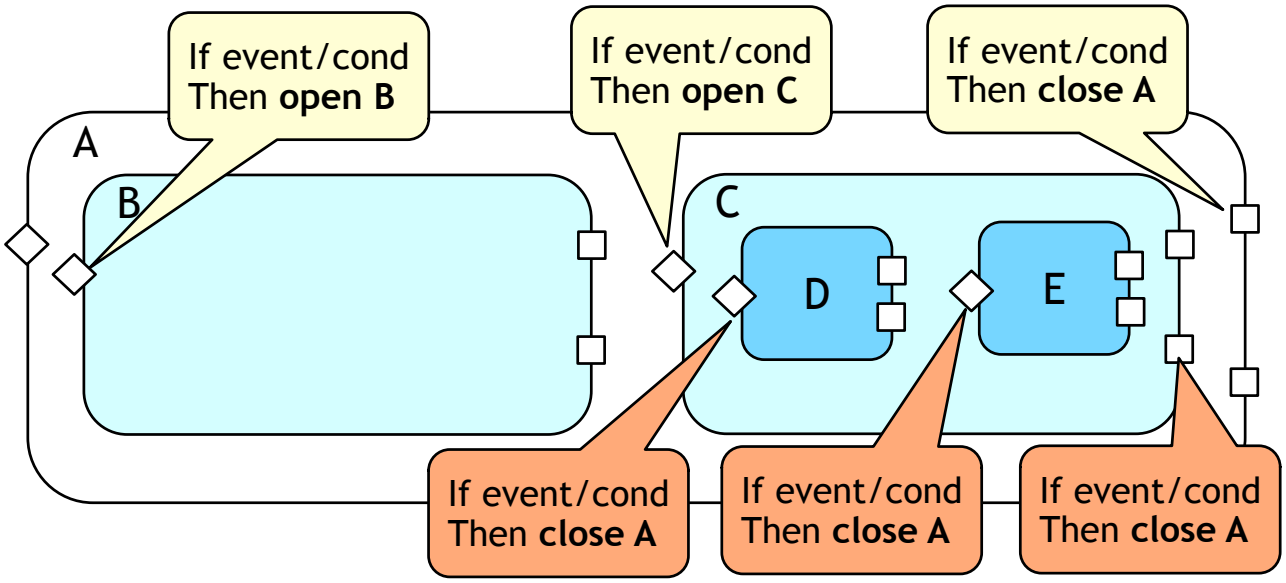
Declarative Artifact-Centric as a unifying basis for future BPM



Declarative Artifacts might play the role for BPM that Relational Model played for Database Mgmt

Hierarchical Stages (Units of Work)

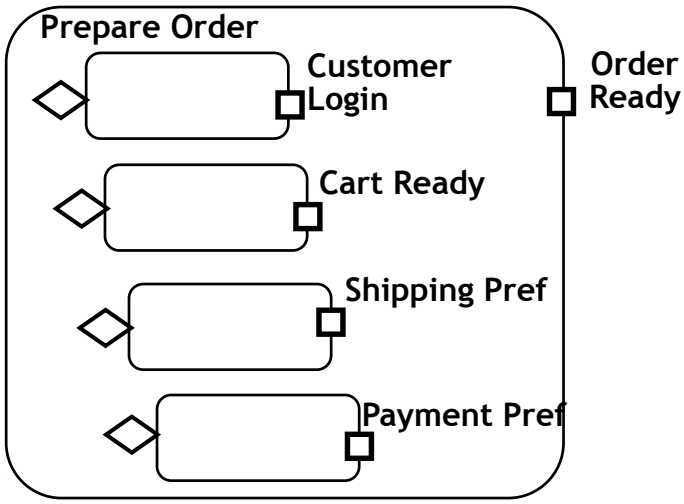
with contextual Rules

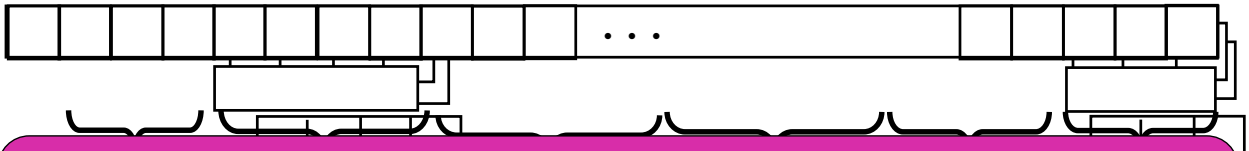


A stage focuses on a natural, small cluster of related rules

More on the "guarded" style for lifecycle specs

- ***Can put a variety of rules / conditions into the "guards", e.g.,***
  - Can only enter Customer login stage once
  - If you change Cart you must revisit Shipping Pref
  - Cannot enter Payment Pref until either you are logged in or put stuff in Cart
- ***Can vary the guards based on region, customer category, etc.***
  - Variation at any level of hierarchy





Flow charts and state machines useful in some contexts; "Ad hoc" style useful in other contexts

IBM Research

Feedback

- ***Please Fill out the Feedback Form***
- ***Course improvements***
  - ***Too Slow?***
  - ***Too Fast?***
  - ***More Content?***
  - ***More Systems?***
  - ***More Database?***
  - ***More Services***
  - ***More???***