EML: A TREE OVERLAY-BASED VISUAL LANGUAGE FOR BUSINESS PROCESS MODELLING

Lei Li[1], John Hosking[1] and John Grundy[1,2]

[1]Department of Computer Science

[2]Department of Electrical and Computer Engineering

University of Auckland, New Zealand

{L.Li, John, John-g}@cs.auckland.ac.nz

14 June 2007

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

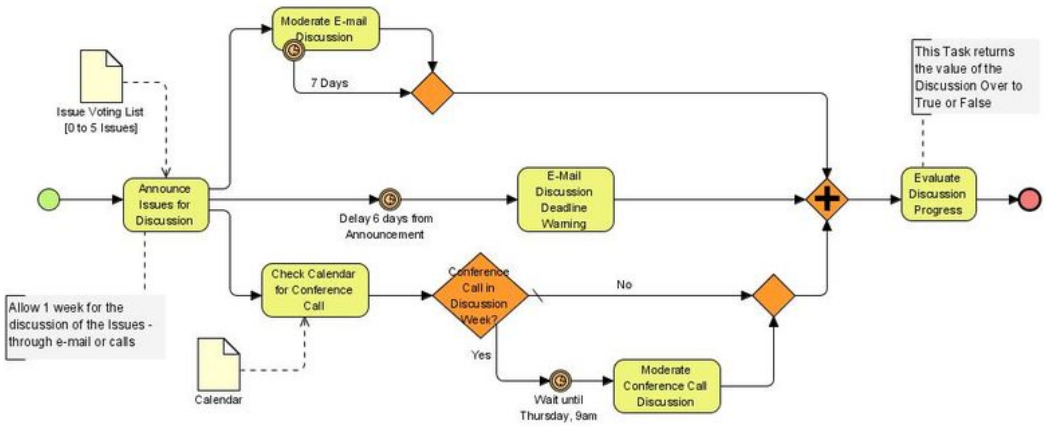
Outline

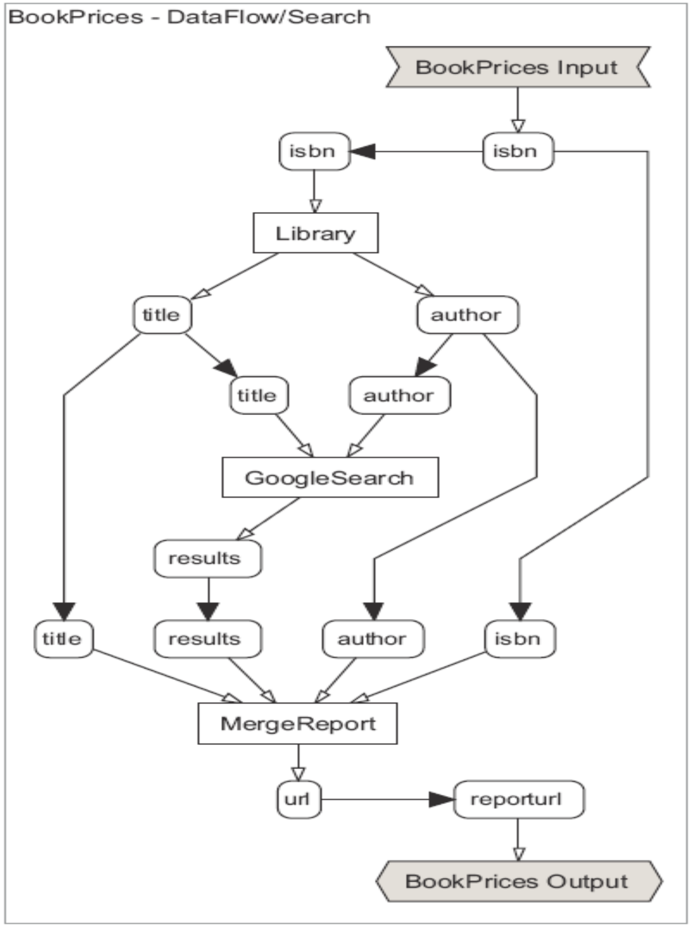
- Background and Motivation
- Research Question
- EML (Enterprise Modelling Language)
  - Tree Structure
  - Flow Overlay
- Marama-EML (Support Tool)
  - A platform for efficient producing EML
  - Multi-View Integration (EML, BPMN & Form-Chart)
  - Automatic BPEL Generation
- Discussion and Future Work

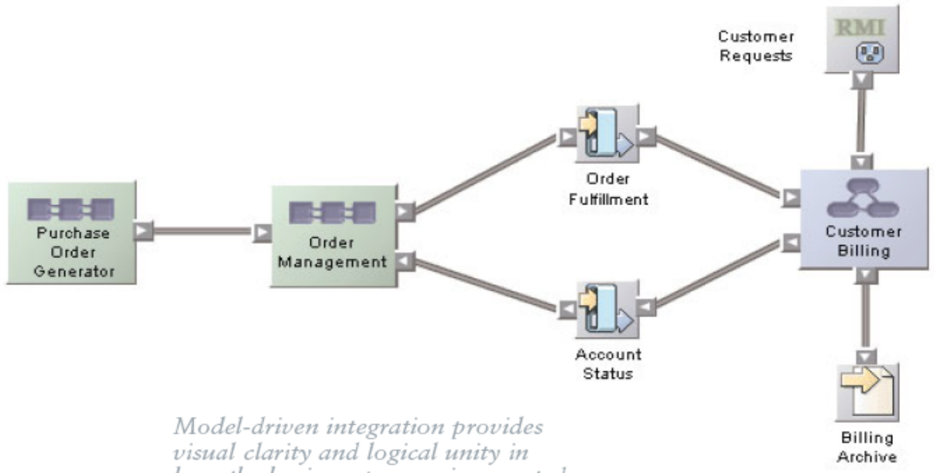
Background

- Since the early 1970s many languages, standards, methodologies and tools for business modelling have been created
- Methodologies --- Entity Relationship Models, Data Flow Diagrams, Flow Charts, Scenarios, Use Cases, and Integration Definition for Functional and workflow Modelling etc.
- Notations --- UML, BPMN, BioOpera, WTD, AOM etc.
- Tools --- JOpera, T-Web, ZenFlow, ARIS, WebSphere, Visio etc.

Box + Line style Diagrams


Moderate E-mail Discussion
7 Days
Issue Voting List [0 to 5 Issues]
This Task returns the value of the Discussion Over to True or False
Announce Issues for Discussion
Delay 6 days from Announcement
E-Mail Discussion Deadline Warning
Evaluate Discussion Progress
Allow 1 week for the discussion of the Issues - through e-mail or calls
Check Calendar for Conference Call
Conference Call in Discussion Week?
No
Yes
Calendar
Wait until Thursday, 9am
Moderate Conference Call Discussion

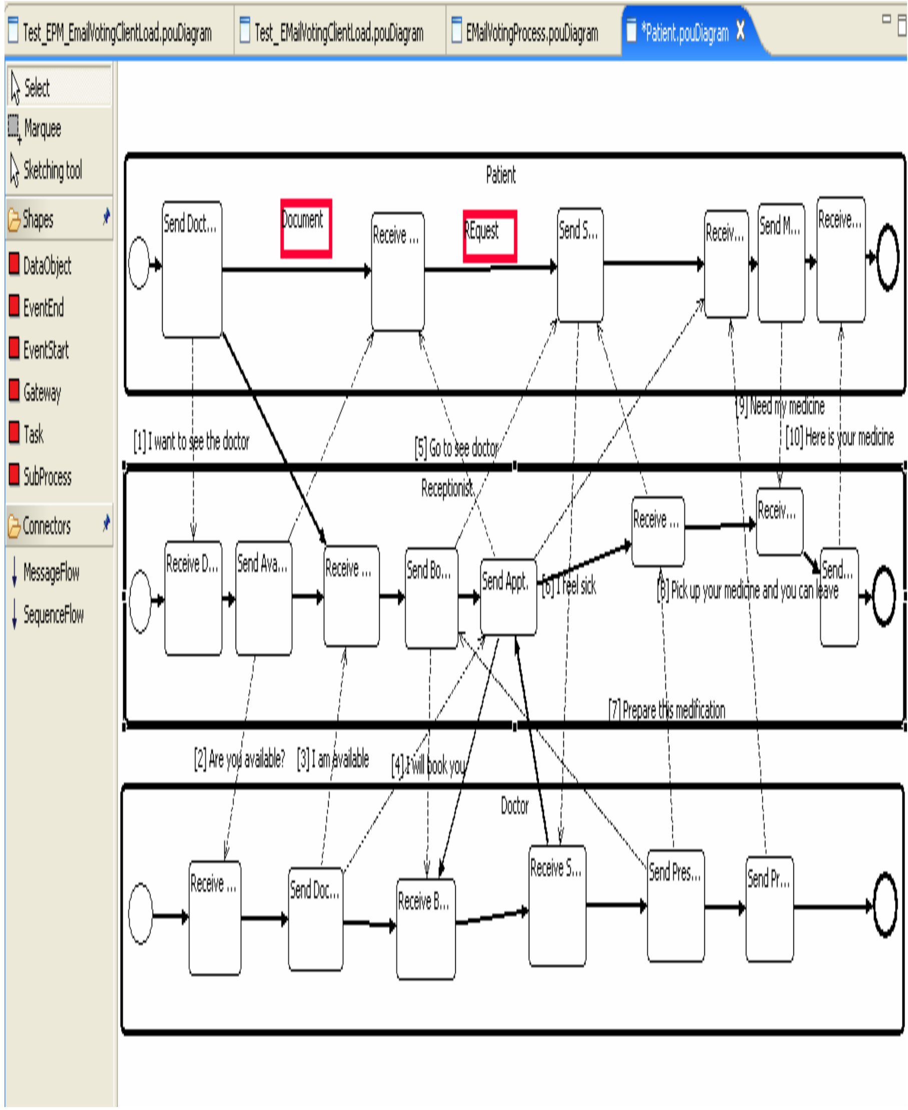


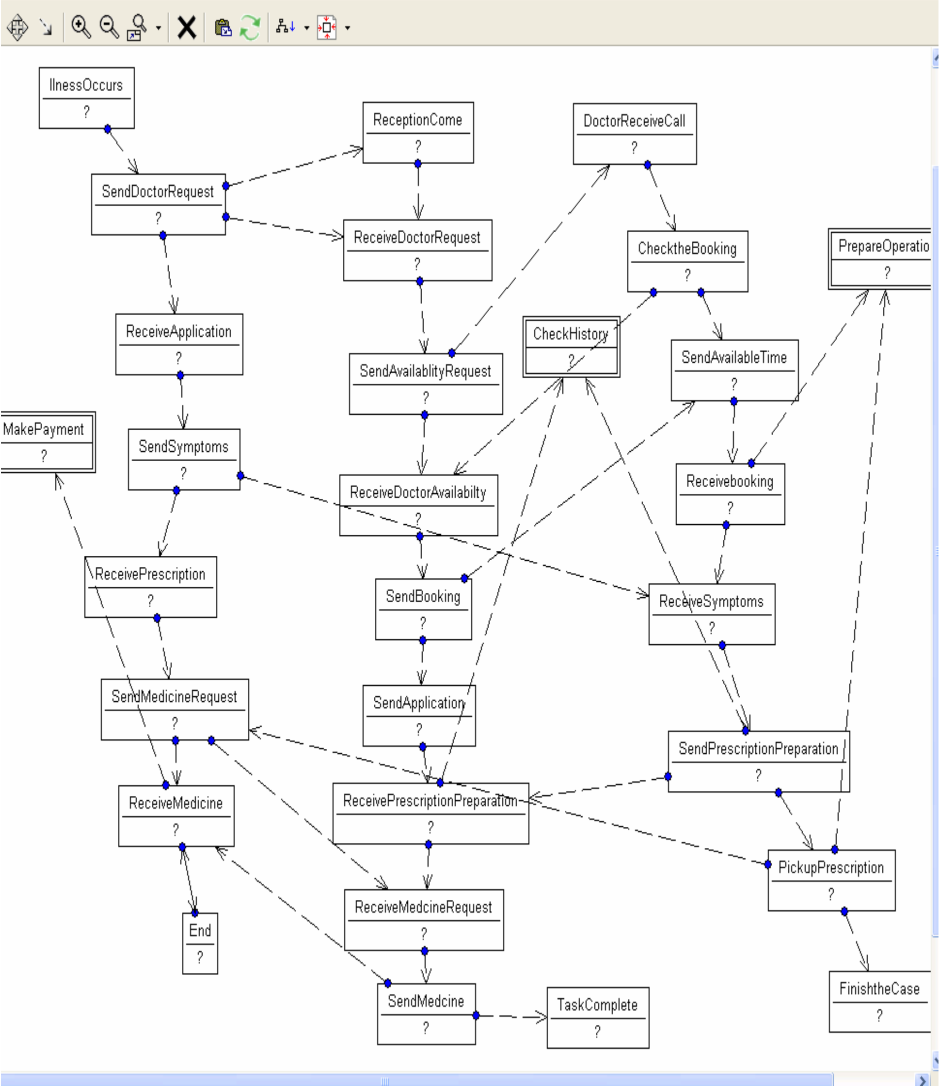


Model-driven integration provides visual clarity and logical unity in how the business process is executed across systems, trading partners

Motivation

- However, a common source of difficulty in all of these approaches is an appropriate visual method to reduce the complexity of large business modelling diagrams
- Most existing modelling technologies are effective in only limited problem domains or have major weaknesses when attempting to scale to large systems modelling e.g. “cobweb” and “labyrinth” problems


Test_EPM_EmailVotingClientLoad.pouDiagram
Test_EMailVotingClientLoad.pouDiagram
EMailVotingProcess.pouDiagram
*Patient.pouDiagram
Select
Marquee
Sketching tool
Shapes
DataObject
EventEnd
EventStart
Gateway
Task
SubProcess
Connectors
MessageFlow
SequenceFlow
Patient
Send Doct...
Document
Receive ...
REquest
Send S...
Receiv...
Send M...
Receive...
[1] I want to see the doctor
[5] Go to see doctor
[9] Need my medicine
[10] Here is your medicine
Receptionist
Receive D...
Send Ava...
Receive ...
Send Bo...
Send Appt.
[6] I feel sick
Receive ...
Receiv...
[8] Pick up your medicine and you can leave
Send...
[7] Prepare this medification
[2] Are you available?
[3] I am available
[4] I will book you
Doctor
Receive ...
Send Doc...
Receive B...
Receive S...
Send Pres...
Send Pr...


IlnessOccurs
ReceptionCome
DoctorReceiveCall
SendDoctorRequest
ReceiveDoctorRequest
ChecktheBooking
PrepareOperatio
ReceiveApplication
SendAvailablityRequest
CheckHistory
SendAvailableTime
MakePayment
SendSymptoms
ReceiveDoctorAvailabilty
Receivebooking
ReceivePrescription
SendBooking
ReceiveSymptoms
SendMedicineRequest
SendApplication
SendPrescriptionPreparation
ReceiveMedicine
ReceivePrescriptionPreparation
PickupPrescription
End
ReceiveMedcineRequest
SendMedcine
TaskComplete
FinishtheCase

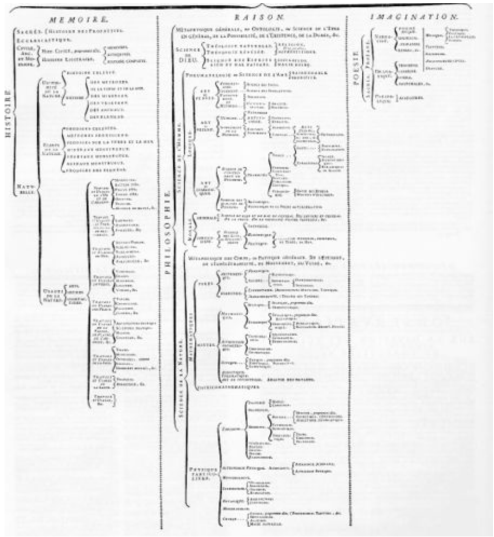
Motivation

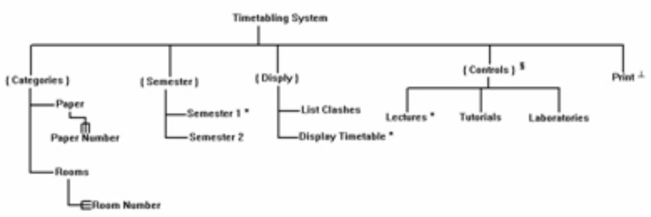
Multi-view tool support and multi-level structure approaches have achieved some success but cannot fully solve the problem

- just reduces individual diagram complexity
- increases hidden dependencies
- requires long term memory
- lack multiple levels of abstraction support

Tree Structure

- using a tree structure is an efficient way of representing the hierarchical nature of complex systems graphically
- Trees also support navigation, elision and automatic layout in ways difficult to achieve with graph-based approaches
- We have designed EML, a novel tree overlay-based visual notation and its integrated support environment to supplement and integrate with existing enterprise level modelling solutions



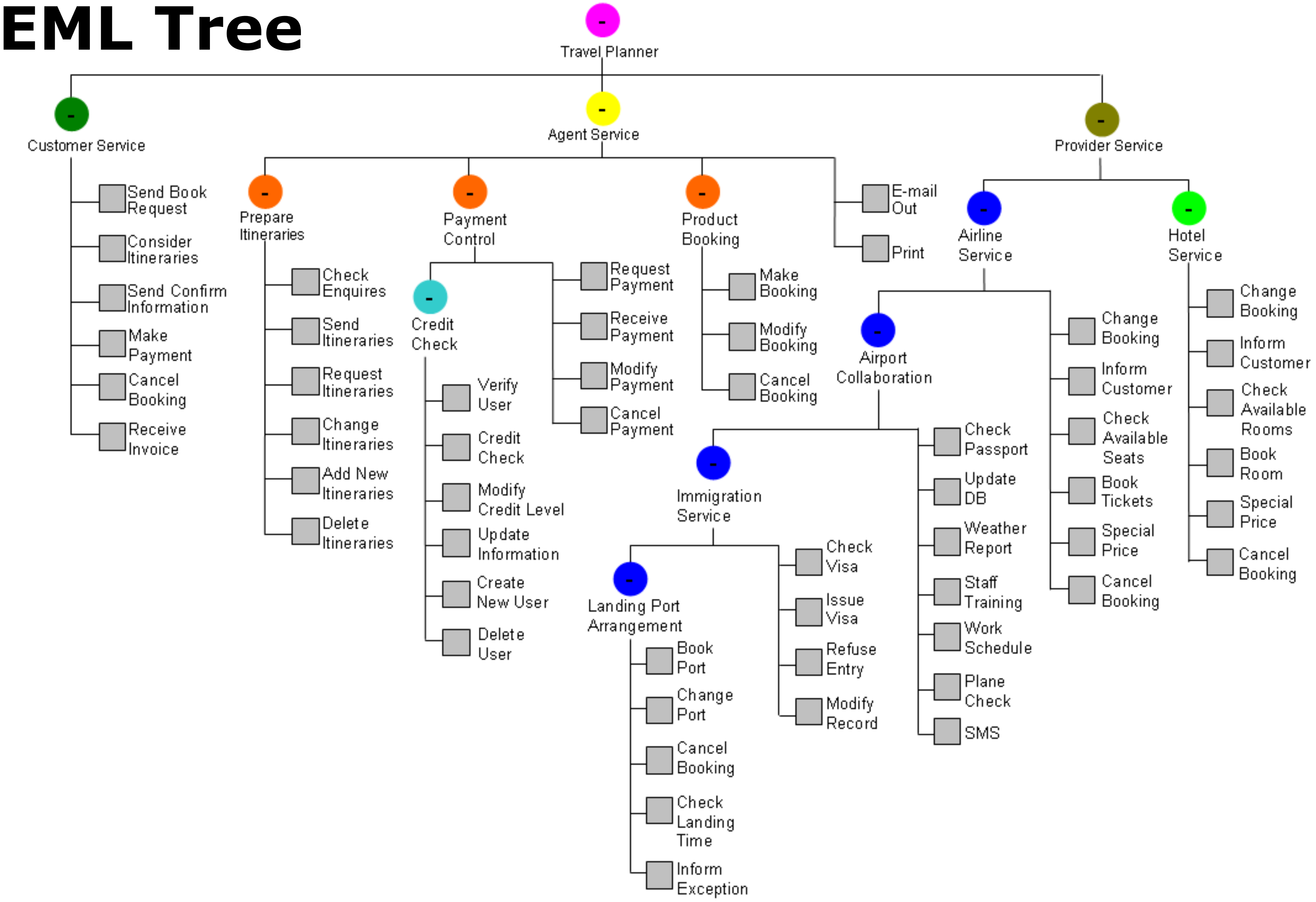


Research Question

- whether it is valuable to use EML’s novel tree structure-based visual modelling language as a supplement to overcome the shortcomings of existing business process notations?

- whether EML models of complex business processes effectively reduce presentation complexity?

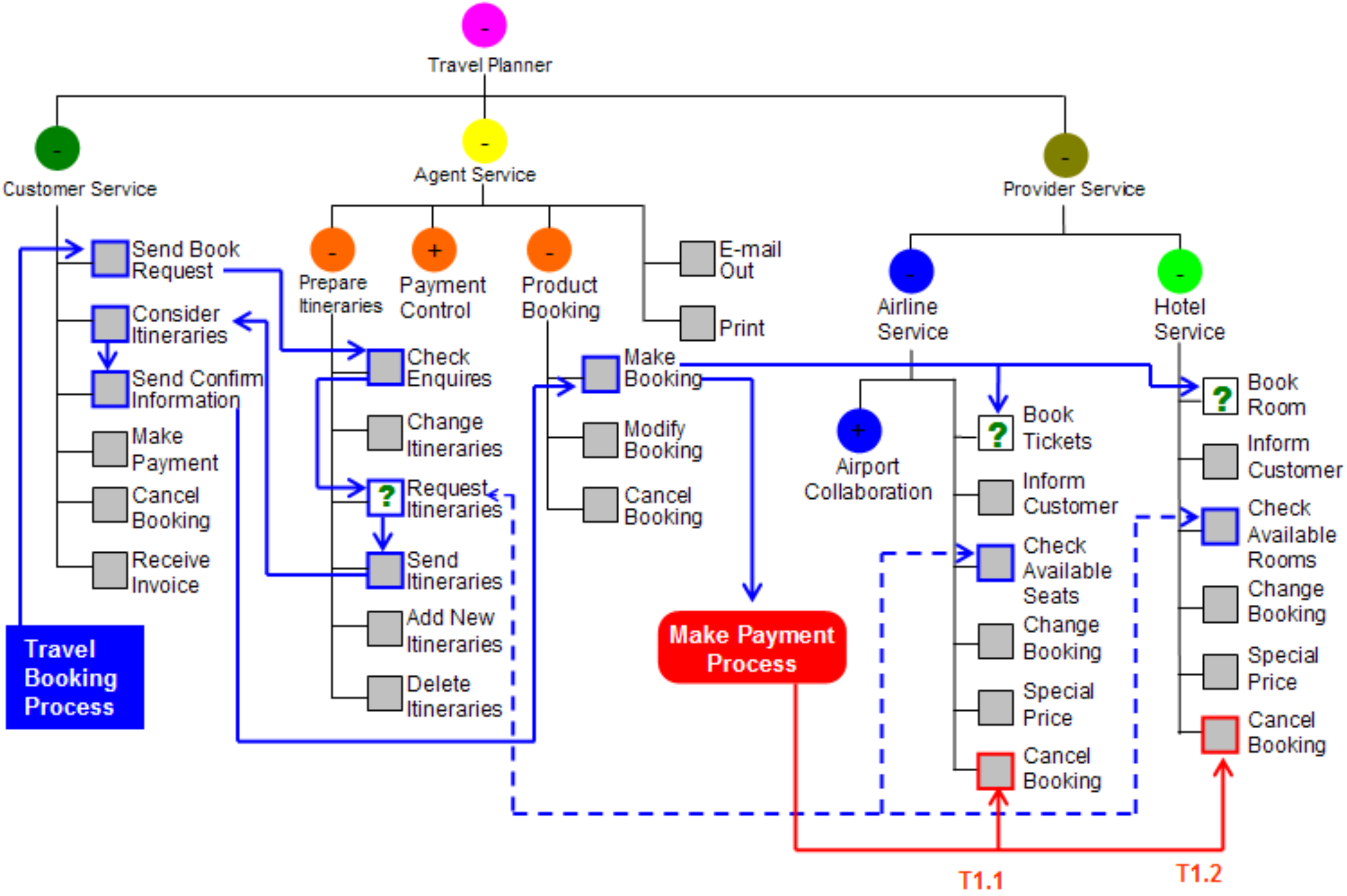
EML Tree



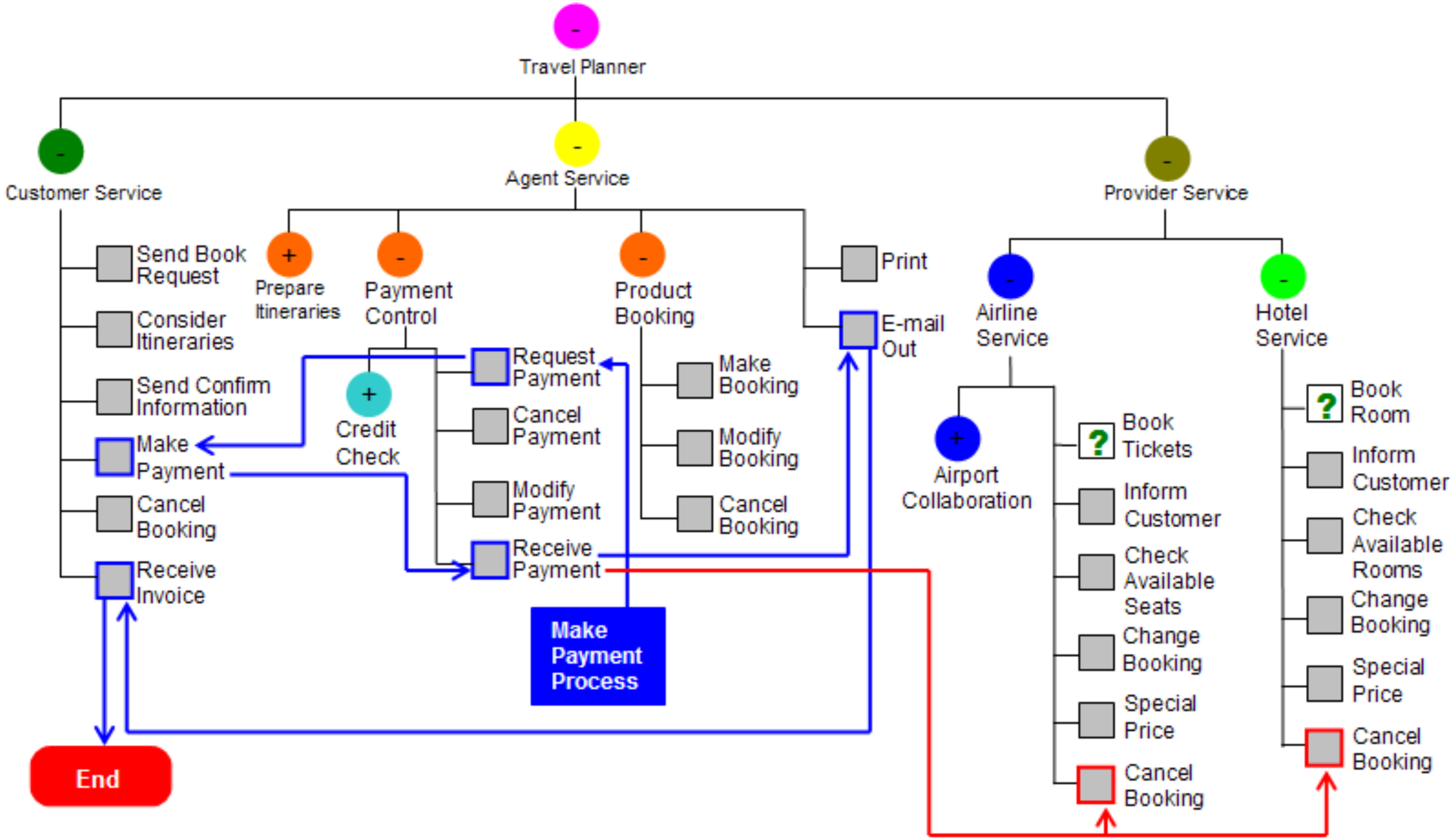
- Travel Planner
  - Customer Service
    - Send Book Request
    - Consider Itineraries
    - Send Confirm Information
    - Make Payment
    - Cancel Booking
    - Receive Invoice
  - Agent Service
    - Prepare Itineraries
      - Check Enquires
      - Send Itineraries
      - Request Itineraries
      - Change Itineraries
      - Add New Itineraries
      - Delete Itineraries
    - Payment Control
      - Credit Check
        - Verify User
        - Credit Check
        - Modify Credit Level
        - Update Information
        - Create New User
        - Delete User
      - Request Payment
      - Receive Payment
      - Modify Payment
      - Cancel Payment
    - Product Booking
      - Make Booking
      - Modify Booking
      - Cancel Booking
    - E-mail Out
    - Print
  - Provider Service
    - Airline Service
      - Airport Collaboration
        - Immigration Service
          - Landing Port Arrangement
            - Book Port
            - Change Port
            - Cancel Booking
            - Check Landing Time
            - Inform Exception
          - Check Visa
          - Issue Visa
          - Refuse Entry
          - Modify Record
        - Check Passport
        - Update DB
        - Weather Report
        - Staff Training
        - Work Schedule
        - Plane Check
        - SMS
      - Change Booking
      - Inform Customer
      - Check Available Seats
      - Book Tickets
      - Special Price
      - Cancel Booking
    - Hotel Service
      - Change Booking
      - Inform Customer
      - Check Available Rooms
      - Book Room
      - Special Price
      - Cancel Booking

EML Example (1)

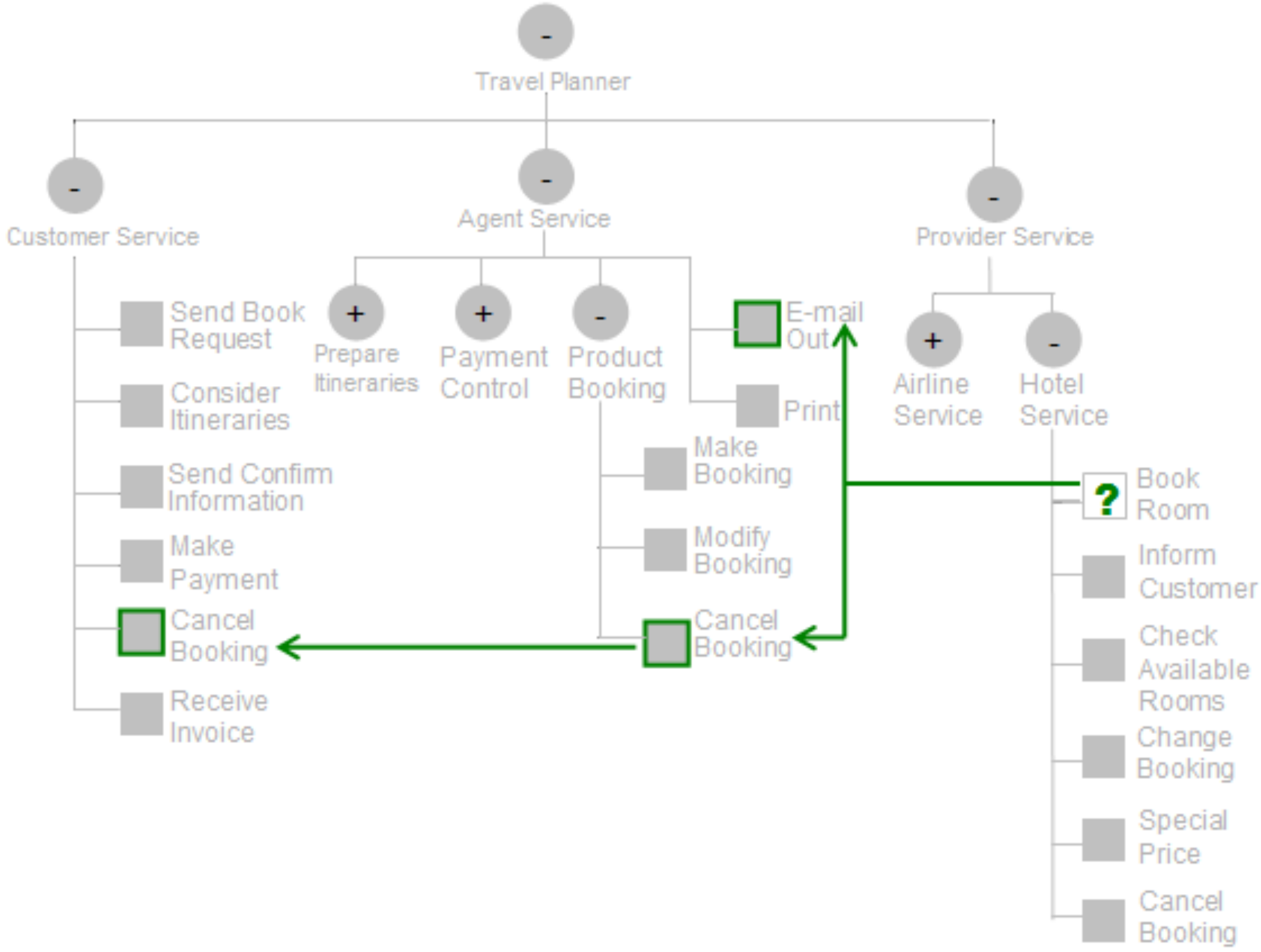
THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau



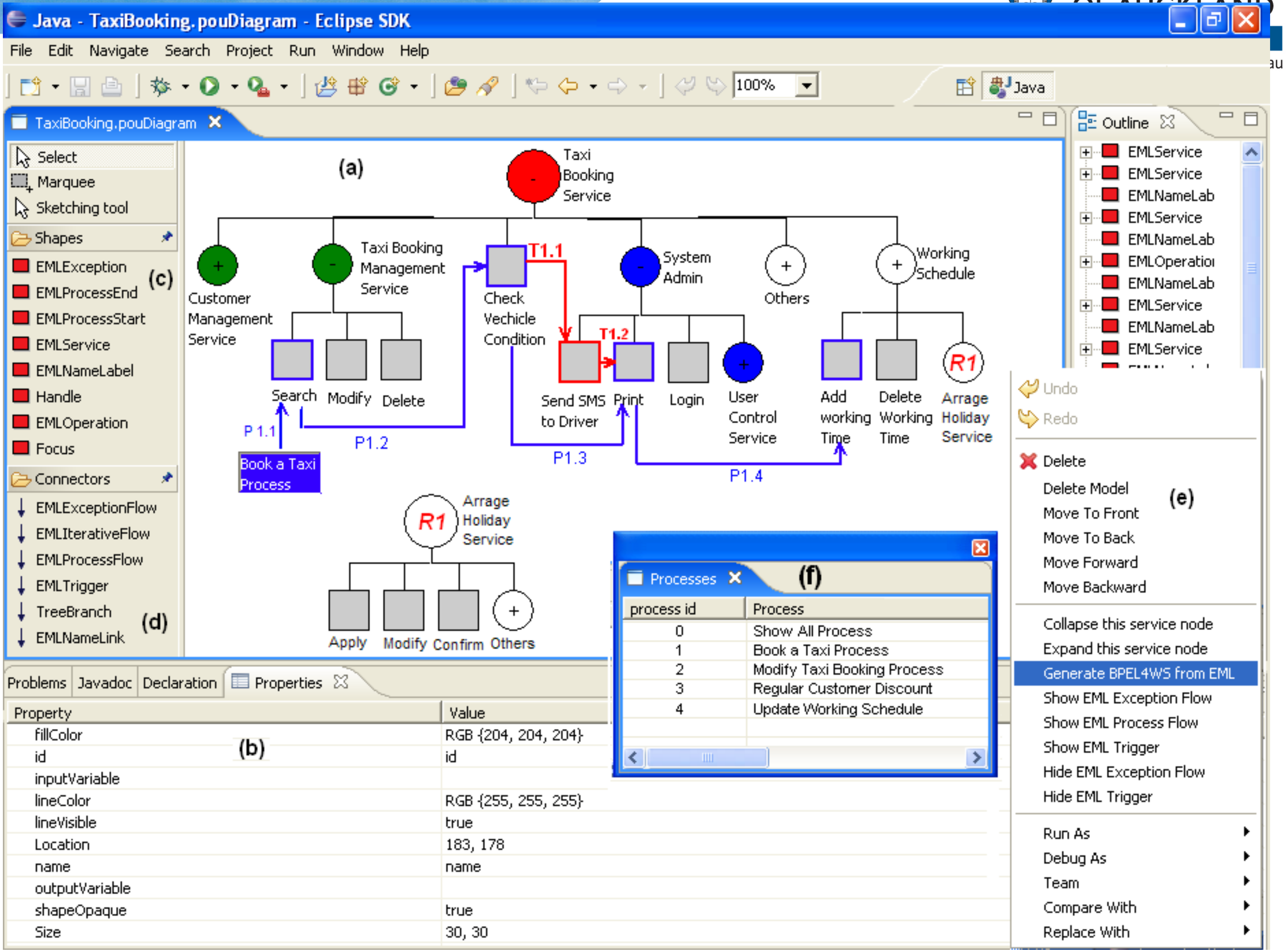
EML Example (2)



EML Example (3)



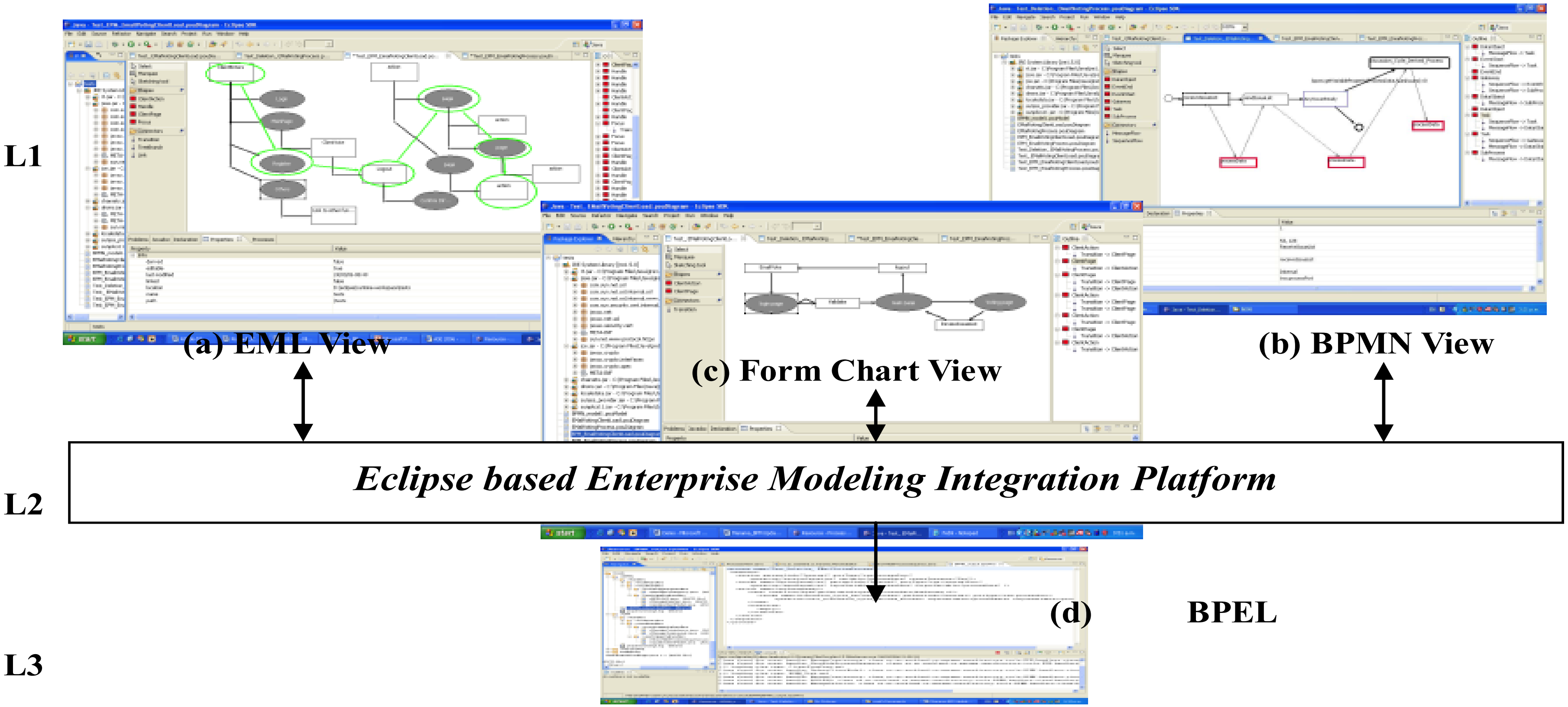
MaramaEML



process id	Process
0	Show All Process
1	Book a Taxi Process
2	Modify Taxi Booking Process
3	Regular Customer Discount
4	Update Working Schedule

Property	Value
fillColor	RGB {204, 204, 204}
id	id
inputVariable	
lineColor	RGB {255, 255, 255}
lineVisible	true
Location	183, 178
name	name
outputVariable	
shapeOpaque	true
Size	30, 30

MaramaEML Integration Framework



L1

(a) EML View

(c) Form Chart View

(b) BPMN View

L2

Eclipse based Enterprise Modeling Integration Platform

L3

(d) BPEL

Discussion --- EML

- EML is the first tree overlay structure visual language in the area of business process modeling
- Service architectures are represented as trees and business sequences are modelled as process overlays on the service trees
- By combining these two mechanisms EML gives users a clear overview of an enterprise system structure while business processes are modelled by overlays on the same view
- EML uses a multi layer structure to model business processes, exception handlers and dependency triggers in different levels
- This approach significantly reduces the complexity of business processes

Discussion --- MaramaEML

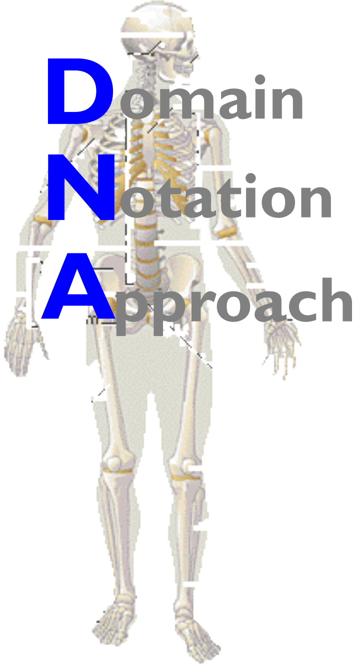
- We have developed an integrated design environment (MaramaEML) for creating EML specifications
- MaramaEML aims to provide a platform for efficiently producing EML visual models and to facilitate their creation, display, editing, storage, code generation and integration with other diagrams
- MaramaEML provides a good basis to enhance the integration and generation ability of different notations
- By using generated XML-based BPEL scripts as an interchange format a single notation can be integrated effectively with other modelling technologies
- This integration approach provides multi-level framework support for flexible and broad integration of complex enterprise system models

Summary

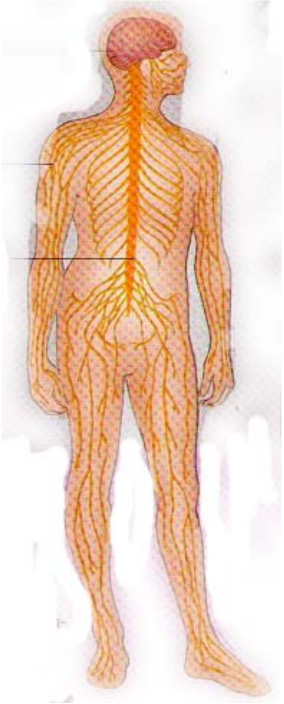
Domain
Process Modelling

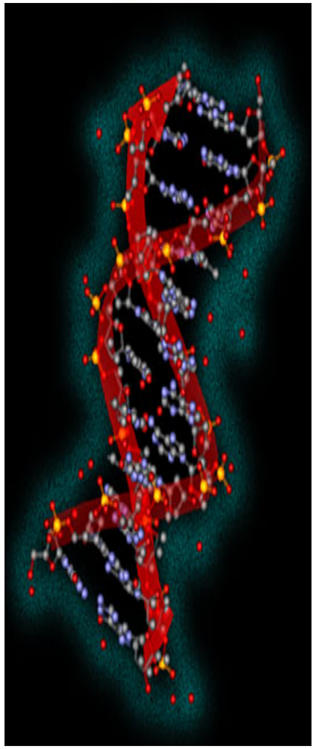
Notation
Enterprise Modelling Language

Approach
Integration Framework
(Marama-EML)



Domain
Notation
Approach





Future Work

- We are developing a distortion-based fisheye zooming function to enhance the complex diagram navigation ability
- We are working on the traceability issues for MaramaEML multi-view support
- A formal usability evaluation is applying to the EML and MaramaEML

THANKS

Enterprise Modelling Language

References

- Li, L, Grundy, J.C., Hosking, J.G. A visual language and environment for enterprise system modelling and automation, Journal of Visual Languages and Computing, vol. 25, no. 4, April 2014, Elsevier, pp. 253-277
- Grundy, J.C., Hosking, J.G., Li, N., Li, L., Ali, N.M., Huh, J. Generating Domain-Specific Visual Language Tools from Abstract Visual Specifications, IEEE Transactions on Software Engineering, vol. 39, no. 4, April 2013, pp. 487 - 515.
- Li, K, Grundy, J.C., Hosking, J.G. Li, L. Visualising Event-based Information Models: Issues and Experiences, In Proceedings of Visual Analytics in Software Engineering, Workshop at 2009 IEEE/ACM Automated Software Engineering Conference, Auckland, New Zealand, 16 Nov 2009.
- Li, L., Hosking, J.G. and Grundy, J.C. MaramaEML: An Integrated Multi-View Business Process Modelling Environment with Tree-Overlays, Zoomable Interfaces and Code Generation, Demo session, In Proceedings of the 2008 IEEE/ACM International Conference on Automated Software Engineering, L'Aquilla, Italy, 15-19 September 2008, IEEE CS Press.
- Li, L. Hosking, J.G. and Grundy, J.C. Visual Modelling of Complex Business Processes with Trees, Overlays and Distortion-Based Displays, In Proceedings of the 2007 IEEE Symposium on Visual Languages and Human-Centric Computing, USA, Sept 23-27 2007, IEEE CS Press.
- Li, L., Grundy, J.C. and Hosking, J.G. EML: A tree overlay-based visual language for business process modelling, In Proceedings of the 2007 International Conference on Enterprise Information Systems, Portugal, 13-17 June 2007.
- Grundy, J.C., Hosking, J.G., Li, L. And Liu, N. Performance engineering of service compositions, ICSE 2006 Workshop on Service-oriented Software Engineering, Shanghai, May 2006.