



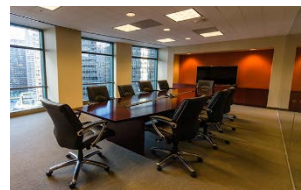
Towards A Generic Resource Booking Management System

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- Reservation of some resource in advance
- Booking in organizations
 - Important component in the operations of organizations of all sizes
 - Examples of use of booking in organizations
 - Rental service companies (cars, video, sport facilities etc.)
 - Schools (classroom, laboratory, library reservation)
 - Hotels
 - Hospitals
 - Complexity range - simple calendar to complex booking systems in ERP systems





Resource Booking Management (RBM) Systems



- Managing the access of people to resources at a future time interval
- Increasingly being provided online
- Benefits include
 - easiness, efficiency, availability, and cost effectiveness
- Several exist for different use cases /industry
 - Developed independently or as a part of a larger software framework

Bookings for 01/07/2011

Room	Period 1	Period 2	Period 3	Period 4
Room 17	Book Me	LFU 10-4 ICT	Book Me	LFU 5-5A-9A
Room 19	Book Me	TS 12C-176	Book Me	Book Me
Room 20	Book Me	CS 1A-173	CS 12D-175	CS 12D-175
82	Book Me	BNL C-Assessment	Book Me	SP 5-28-9A
LBC Room 1	GP 7B-171	GP 7A-174	GP ICT	GP 19-2 ICT
Room 13	AI CATa 5X K	AI CATa 5X K	10a 10A	Book Me

November 2012

2015 McPherson Lab

Day	19 mon	20 tue	21 wed	22 thu	23 fri
1 PM		Luncheon with Phil Lukatec			Astronomy
2 PM	Prep for MPherson and JD Wear	Astronomy			Real Art
3 PM			Student Seminars		Student Seminars
4 PM	Spectroscopy and/or Chem. Ed. Seminar	Potential Materials & Synthesis SFC	HOLD for possible seminar	Astronomy	
5 PM					
6 PM					
7 PM					
8 PM					

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Motivation – Resource Management in a Large Scale Research Project



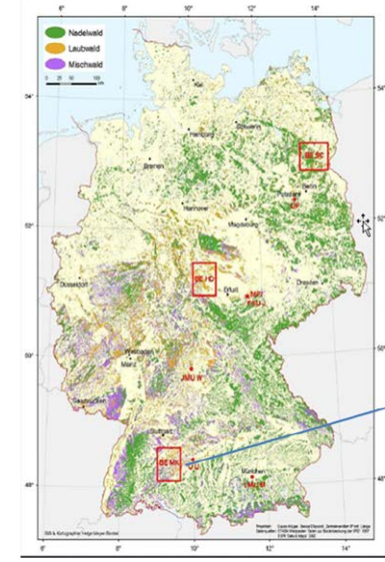
scit 1558

- Biodiversity Exploratories (BE)
 - Approx. 400 researchers
 - Areas of data collection
 - Schwäbische Alb, Hainich, Schorfheide
 - 500 grassland + 500 forest plots

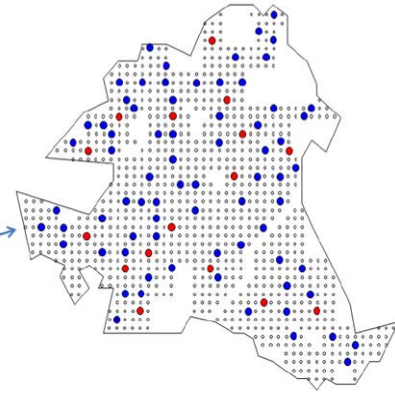
- Resources available per area
 - Rooms and Beds
 - Vehicles
 - Data collection tools e.g. nets, plough, binoculars, diggers books
 - Plots & Experiments to visit

- Requirements

- RBM application for integrated management of access to different types of resources, their dependencies and constraints
- Ability to easily add a new type of resource with maybe peculiar booking requirements



- ▶ subset of 50 *experimental plots*
- ▶ sub-subset of 9 *intensive research plots*
- ▶ land-use gradient





Challenge – Re-usability of RBM Application

- RBM strongly tied to the “context” for which it is developed
 - Contexts include
 - Use case/scenario
 - Organization
 - Discipline
 - Reuse is difficult outside the exact context e.g. classroom vs laboratory booking
- Reasons for lack of reuse
 - Inflexible modelling of resources, booking period, booking constraints
 - Lack of the basic/generic functionalities in some RBM
 - Non-booking related functionalities requirements in some RBM system
 - Not all contexts are foreseeable
- Arguments for re-use
 - RBM systems conceptually have similar basic functionality
 - Reduced duplication of modelling and development effort



Our Approach To Solve Re-usability Issues

- We propose a RBM model which is
 - Generic
 - address core requirements of RBM systems
 - independent of any specific context
 - Flexible and configurable
 - To satisfy simple booking contexts
 - Easily extendable
 - With additional functionality to address complex context specific requirements
- Limitations
 - Simple and moderately complex booking models
 - Starting point of development for organizations whose booking requirements are not covered in the existing RBM system.



Requirements of Generic RBM System

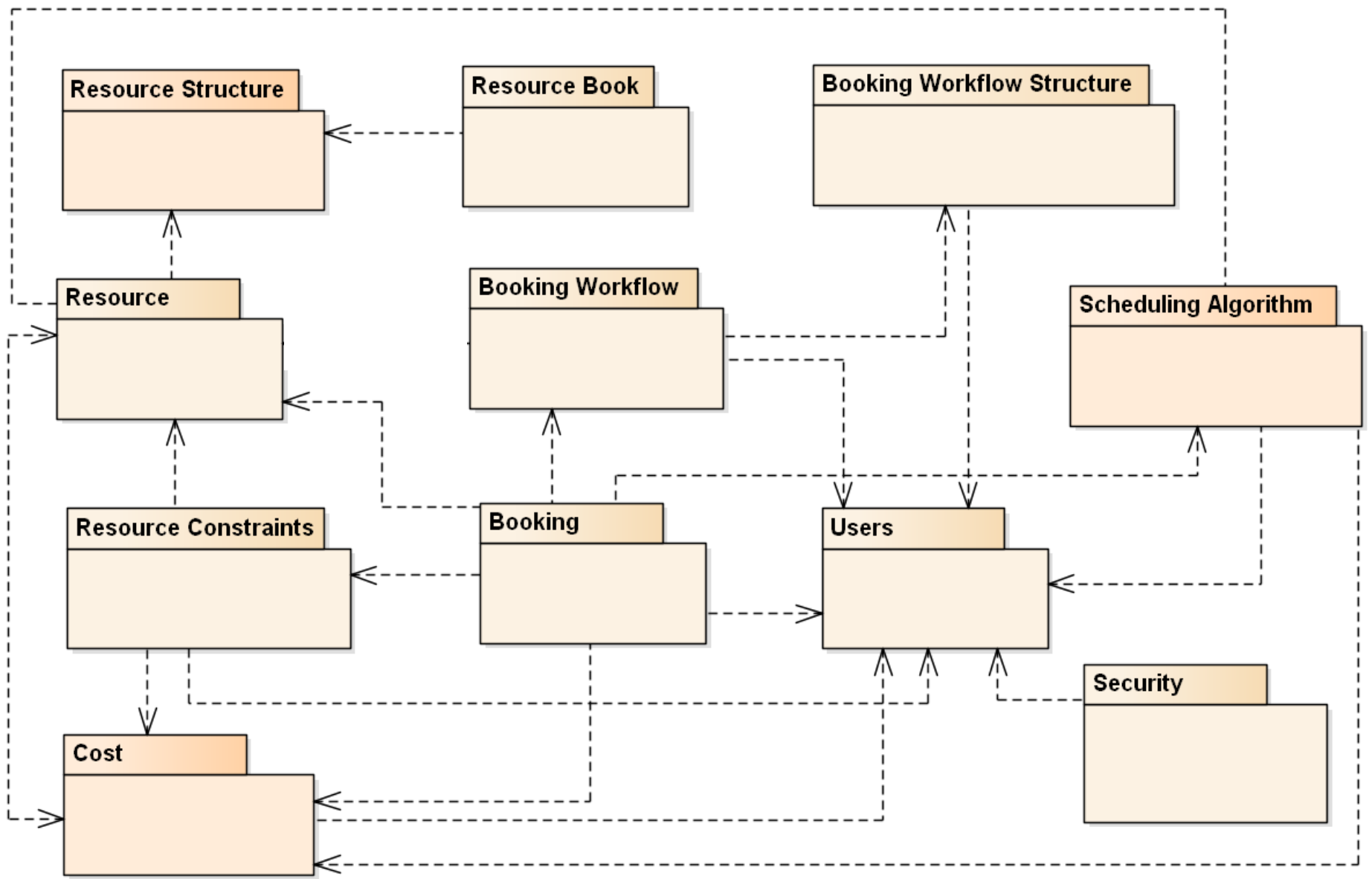
- Flexible definition of resource properties
- Unified framework for managing the booking of different types of resources
- Flexible modelling of relationships between different resources and between different booking instances
- Flexible booking workflow model
- Flexible modelling of time
- Possibility of specifying resource booking constraints
- Separation of resource allocation mechanism (algorithm) from the resource booking management



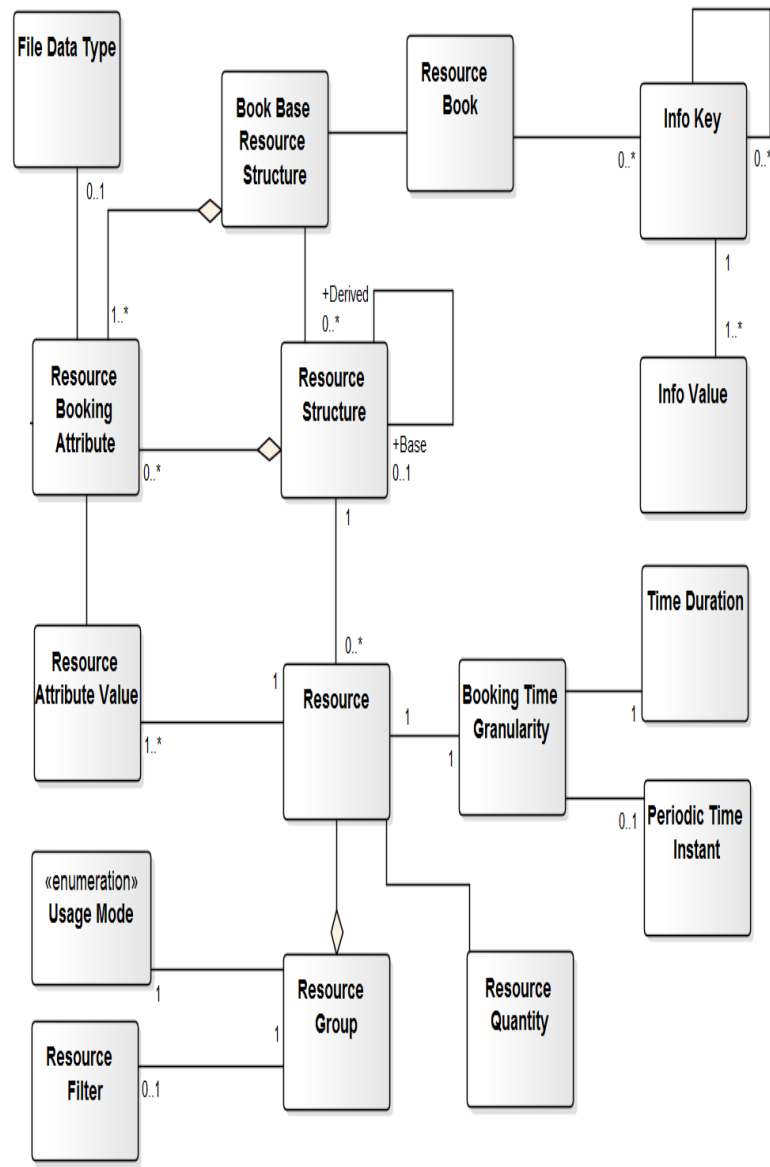
- RBM systems typically address specific booking contexts
- RBM requirements
 - Core booking requirements
 - Context-specific requirements
- Current generic RBM systems functionalities
 - searching , planning and reservation of features
 - too limited for moderately complex booking requirements



Components of our Proposed Model

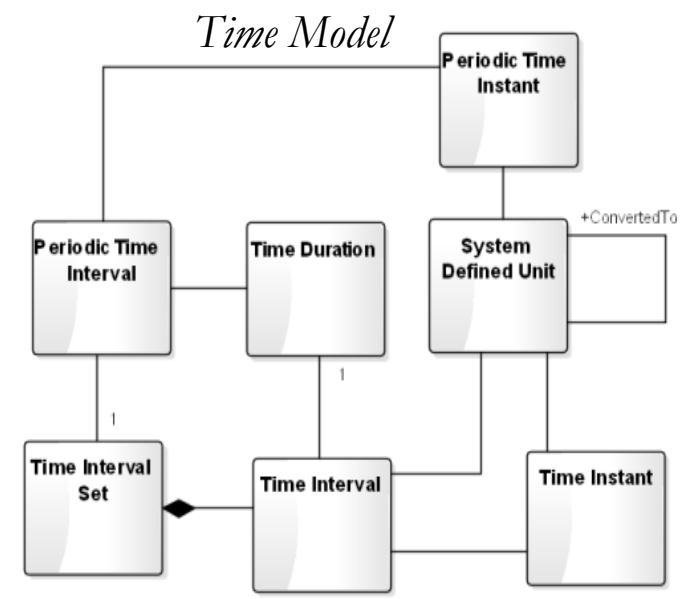
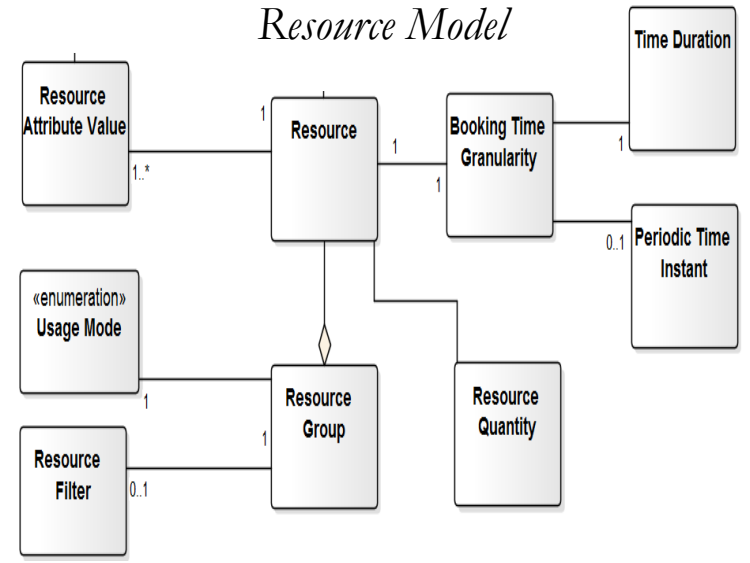


- Resource Structure defines the schema (set of properties) of resource types. E.g.
 - Car [Owner, Type, Year of Registration]
 - Room [Size, Furnished]
 - Classrooms [inherits Room, Class]
- Book Base Resource Structure
 - Common set of properties of all resources in a RBM system
- Resource book
 - Information management in a RBM system
- Resources created based on a Resource Structure

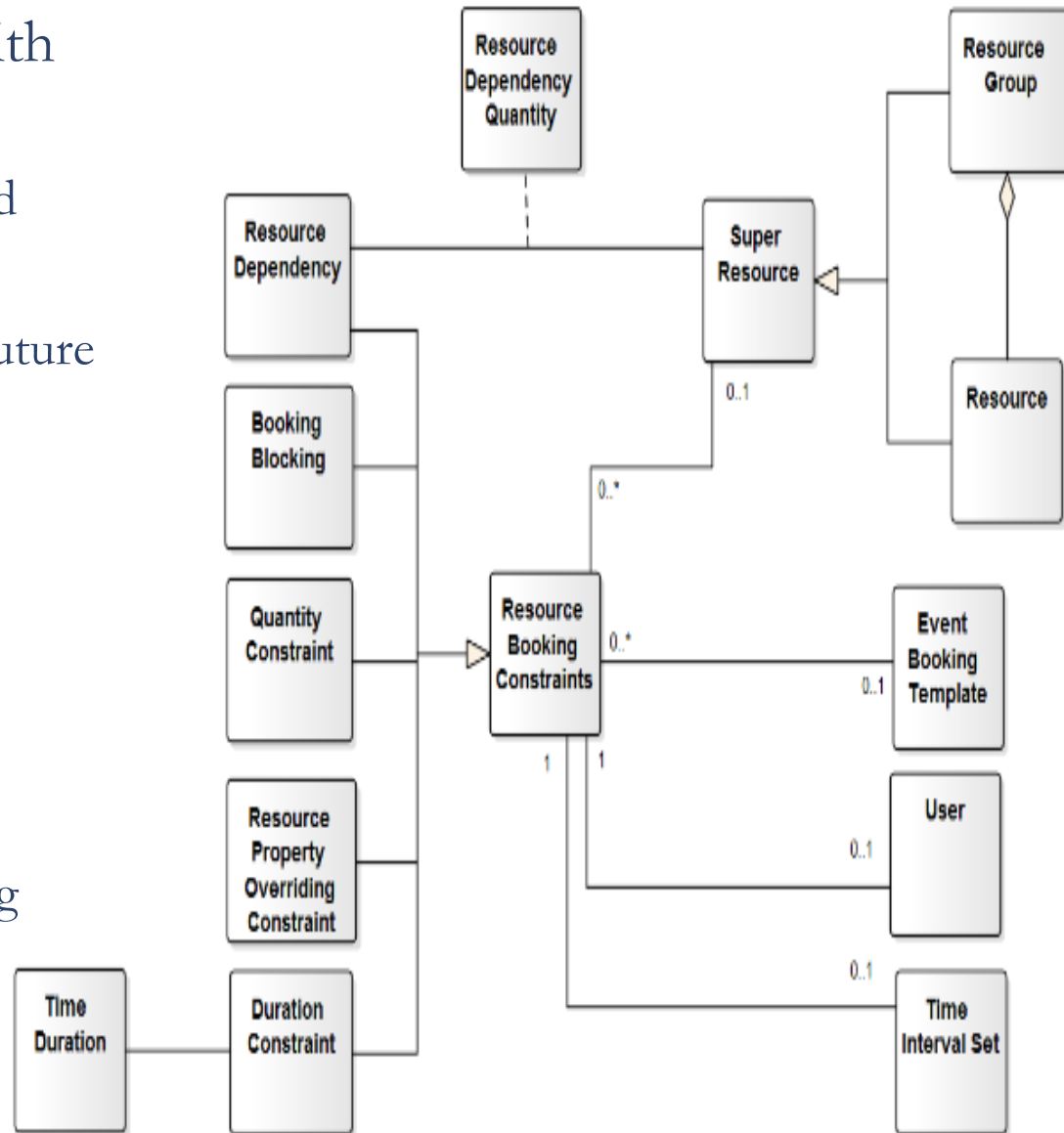


- Resource
 - Has a quantity (Resource Quantity)
 - Can be grouped together into Resource Group
 - Associated with the Booking Time Granularity (the minimum amount of time the resource can be booked)
 - E.g. 1 day, 3 hours, Every hour from 8 am daily
 - Defined based on the time model

- Time model
 - Defined to satisfy booking requirements

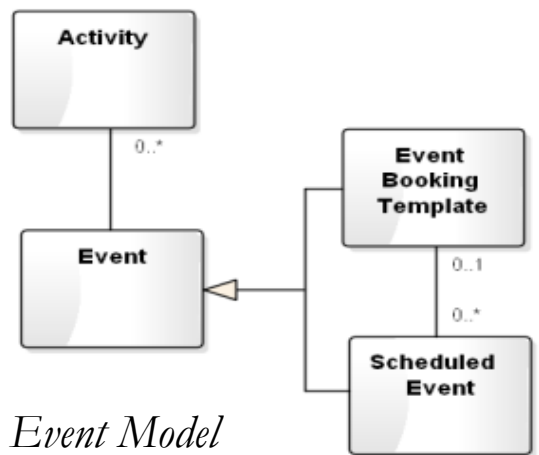


- Constraints is associated with
 - User
 - Time Interval when it is valid
 - Resource
 - Event Template (a type of future event)
- Constraint types include
 - Resource dependency
 - Booking Blocking
 - Quantity Constraint
 - Duration Constraint
 - Resource property overriding constraint

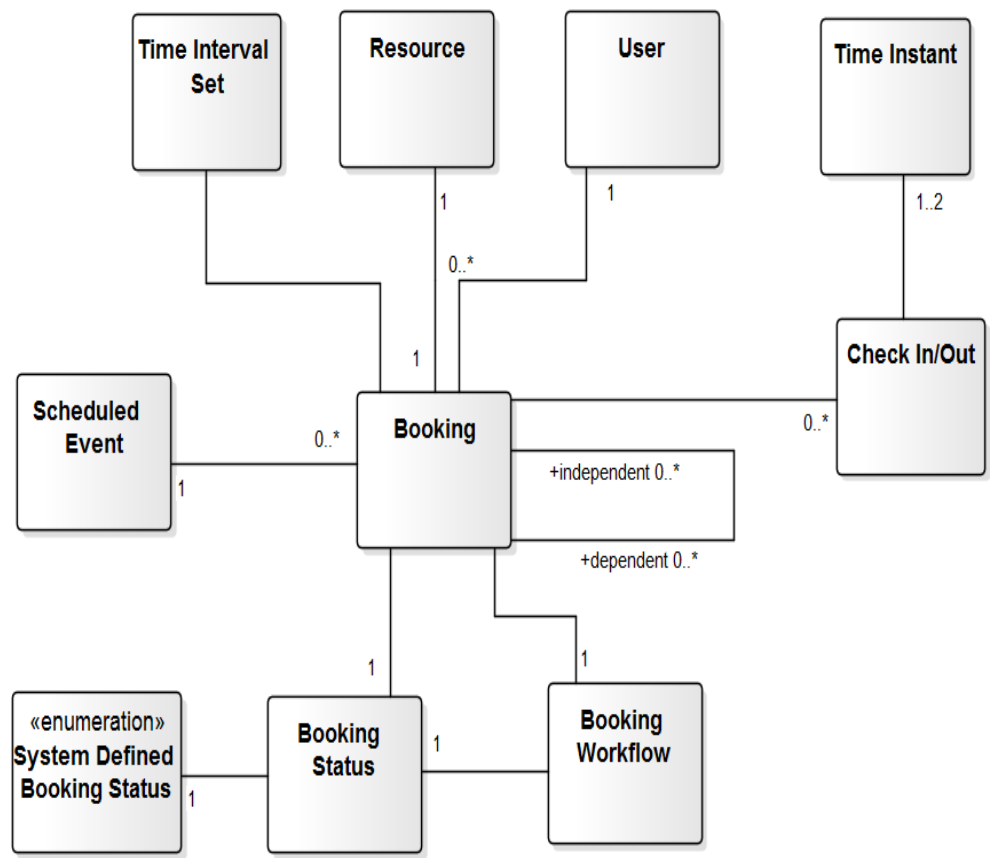


- Booking associate

- Resource
- User
- Time duration
- Event
- Other bookings
- Booking status
- Booking workflow
- Check in/out

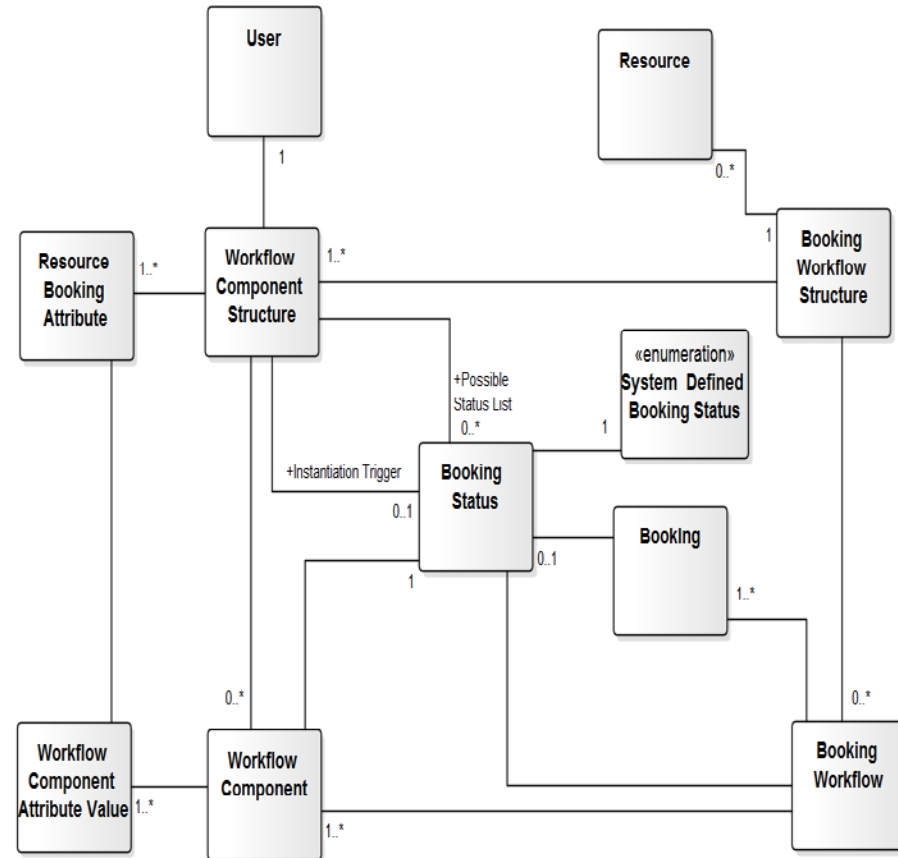


Event Model





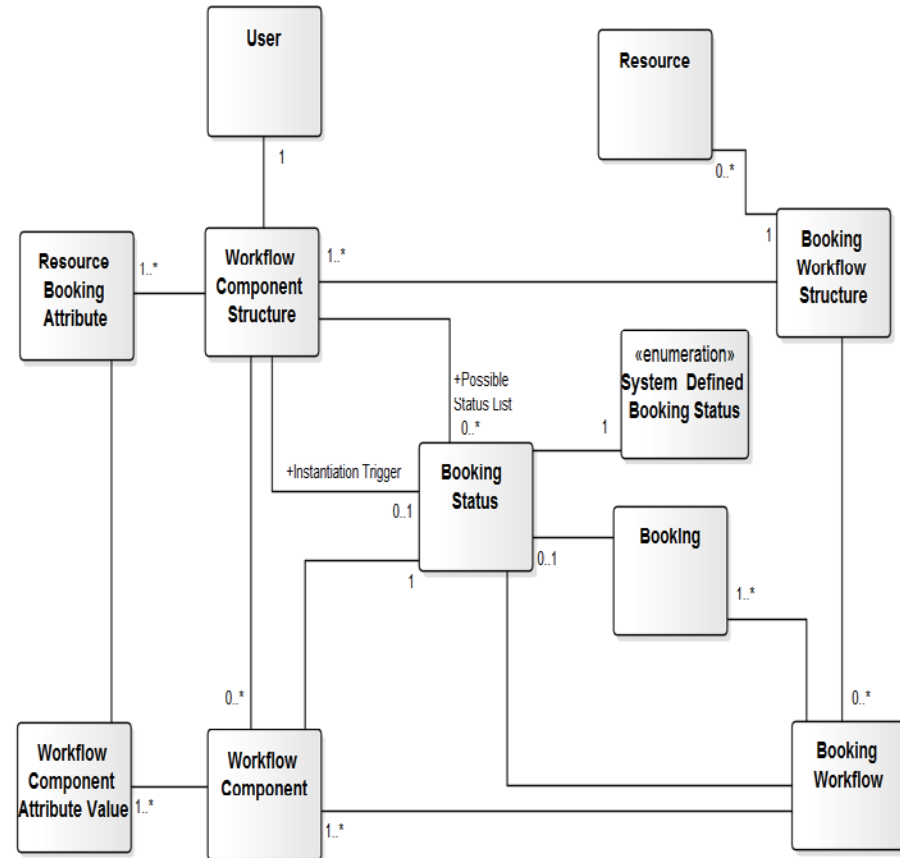
- Booking Workflow Structure
 - Defines the steps to be taken during a resource booking process
 - E.g. User register interest → resource manager approves → user accepts
 - System user fills some form and take an action at each stage
 - Associated with a resource
- Workflow Component Structure
 - Represent the structure of each stage which the Booking Workflow Structure
 - Consist of a set of attributes (form fields) associated with the stage
 - Associated with a set of possible booking statuses and a trigger booking status
 - Associated with a set of users





Booking Workflow & Booking Workflow Structure

- Booking workflow
 - Associates Booking and Booking Workflow Structure
 - Comprises of Workflow Components based on Workflow Structure of the associated Booking Workflow Structure
- Workflow Component
 - Instantiates Workflow Component Structure
 - Associated with a booking status
- Booking Status of a Booking is the Booking status of the last instantiated Workflow Component



- Security
 - CRUD (create, read, update, and delete) rights
 - Users
 - Entities of the RBM system
 - Resource, Resource Structure, Booking, Booking Workflow, Booking Workflow Structure, Booking Status, Events, Users, and Resource Constraints
- Booking Algorithm
 - First come first served rules
 - Can be replaced by specific booking algorithm



<http://bx2test.inf-bb.uni-jena.de:2001/>

Demo

rbmDemo



- Several RBM system exist for managing resource booking
- RBM System are tightly coupled to some particular context
- Re-usability is still a issue with RBM systems
- A generic, configurable and extendable model/application can provide a solution to the re-usability issues of RBM system
- Components for managing resource, resource structure, resource constraints, time, workflow , workflow structure are included in our proposed model
- Model is implemented in BExIS 2 research data management application