UniTime 3.1

- Build on modern technologies
  - Enterprise Java Application
  - Relational database (Oracle, MySQL, …)

- Publically available
  - Open source (GNU GPL license)
  - Web: www.unitime.org
    - 1200+ downloads, online documentation, support

- State of the art
  - Modern constraint based solver with wide scope of applicability
  - Well accepted by the research community
    - Published papers, citations, etc.
    - International Timetabling Competition 2007
UniTime 3.1: Design Goals

- Examinations are fully integrated with course timetabling
  - Exams are visible (and can be defined) on courses and classes
    - By schedule deputies (which may have limited rights)
    - By examination timetabling managers
  - Student class enrollments are considered
  - Class assignments may be considered
    - Final exams for evening classes, room assignment of a class, etc.

- Consistent look and feel
  - Preferences
    - Same room preferences (different set of rooms)
    - Period versus time preferences
  - Etc.
UniTime 3.1: Examination Model

- Examination Periods
  - Not overlapping, of various length and preferences

- Examination Rooms
  - Coordinates, seating capacity, examination seating capacity
  - Problem (final / evening examination)
  - Period preferences

- Examination
  - Problem (final / evening examination), Length, Instructor(s)
  - Relation with courses
    - A set of classes, configuration, offerings, or courses
  - Period and room preferences

- Distribution Preferences
  - Same/different period, room, precedence
UniTime 3.1: Period Preferences

- Consistent range of preferences
  - Prohibited, strongly discouraged, … required

- Can be set on various levels
  - Preferences set directly on a period
    - Prohibited period cannot be used,
    - otherwise acts as a default for period preferences that are set on an exam
  - Period preferences on rooms
    - Prohibited: cannot be used
    - Strongly discouraged: cannot be used, unless specified on an exam
    - Discouraged: usage of a room should be minimized
  - Period preferences on an exam
UniTime 3.1: Period Preferences

- Final examination period preferences

- Evening examination period preferences
  - If the same two periods are defined for each day

March 27, 2008
UniTime 3.1: Examination solver

- Goal
  - Same solver (as for course timetabling)
  - Different model (same for both evening and final exams though)
  - Similar/consistent user interface

- Different modes
  - Batch (Initial problem, Minimal perturbation problem)
  - Interactive (Suggestions are provided to the user)
  - Instant (An exam can be rescheduled without loading into the solver)

- Only one solution exists in the database
  - Solver still works with current, initial and best solutions

- Visible solution (reports, exams, etc.)
  - Current solution of the solver (if loaded)
  - Saved solution
UniTime 3.1: Reporting Capabilities

- Similar as on course timetabling
  - Assigned, not assigned exams
  - Examination timetable (grid)
    - For a room, an instructor, or a subject area
    - In row, per week, per day
    - Various backgrounds and orderings

- Additional reports
  - Directly accessible from the application
    - Current (loaded) solution, saved solution
  - PDF and CSV export
  - Filtering (by a subject area, and/or expression)

- Other reports
  - PDF (legacy-like) reports
## UniTime 3.1: Preliminary Results

### Fall 2007 Final Examinations

<table>
<thead>
<tr>
<th>Solution property</th>
<th>Fall 07 Schedule</th>
<th>UniTime 3.1 (no rotation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct student conflicts</td>
<td>156</td>
<td>79</td>
</tr>
<tr>
<td>More than 2 exams a day</td>
<td>1,129</td>
<td>557</td>
</tr>
<tr>
<td>Back-to-Back conflicts</td>
<td>6,119</td>
<td>6,695</td>
</tr>
<tr>
<td>Room splits</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>Period penalty</td>
<td>591</td>
<td>654</td>
</tr>
<tr>
<td>Room size penalty</td>
<td>84,620</td>
<td>47,827</td>
</tr>
<tr>
<td>Rotation penalty</td>
<td>37,423</td>
<td>39,116</td>
</tr>
<tr>
<td>Not-original room penalty</td>
<td>473</td>
<td>506</td>
</tr>
</tbody>
</table>

Rotation penalty: $P_{index} \cdot P_{avg}$
UniTime 3.1: Additional features

- Non-standard examinations
  - Using event management capabilities
- Interfaces with Banner, Astra
  - Course structure including course timetable
  - Student class enrollments
  - Room availabilities
- Roll forward
- Individual student/instructor examination schedules
  - Either PDF, or a web interface