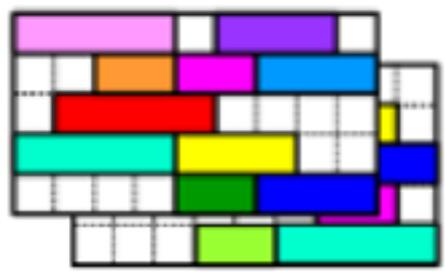


OPEN
APEREO 2018@
Montreal, Quebec, 3rd - 7th June



Credit: Photo by Loïc Romer

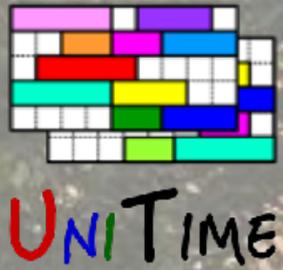


UNI TIME

Getting Started with UniTime

Tomáš Müller, Zuzana Müllerová





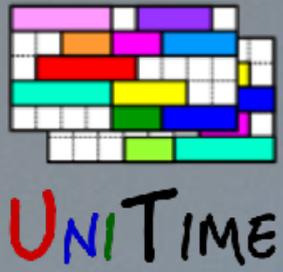
Agenda

Agenda

- Short introduction to UniTime
- System administration
- Data organization
- Users, roles, permissions, and statuses
- Data exchange
- Academic session setup
- Course timetabling (demo)
- Examination timetabling
- Event management

This presentation is available at www.unitime.org/present/apereo18-intro.pdf



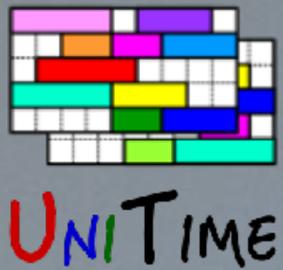


UniTime Demo Instance

Workshop Demo Instance

- A college with about 6,000 students
- 24 departments entering the data
- Distributed data entry, centralized timetabling
 - Distance learning timetabled separately
 - For this workshop, the timetabling has been decentralized
- Shared resources (especially rooms)
- Student demands based on curricula
- Loosely based on the College of Education, Masaryk University
- Web: demo.unitime.org/workshop
- Accounts: user00 | /pwd00 | ... user05 | /pwd05 |





demo.unitime.org/workshop

User	Department	Courses	Classes	Instructors
20, 26, 48	Art	57	154	43
38, 40	Biology	33	111	41
14, 49	Civics	58	95	21
17, 18, 28, 42	Czech	114	225	32
15, 30, 36	English	157	250	50
1, 22	French	56	81	18
24, 33	Geography	25	43	19
8, 12, 34	German	78	133	20
27, 47	Health Ed	21	39	17
6, 32	History	39	93	49
4, 45	IT	49	95	20
9, 10	Language	23	89	14
23, 25, 29	Mathematics	53	104	27
41, 51	Music	59	196	17
37, 46	Pedagogy	17	76	28
2, 7, 31, 35, 43	Physics	170	416	84
5, 19	Prime Ped	34	99	16
16	Psychology	40	109	14
21, 39	Physical Ed	24	64	16
11, 50	Russian	83	156	18
13	Social Ed	89	136	75
3, 44	Special Ed	135	231	74

Username:
user001

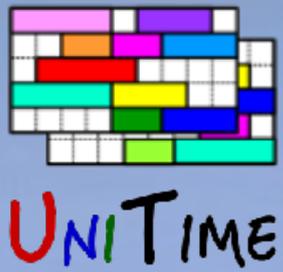
Password:
pwd001



Username:
user051

Password:
pwd051

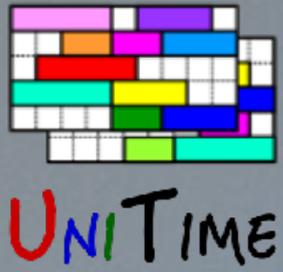




UniTime

UniTime Introduction





Educational Timetabling

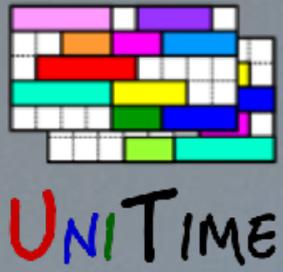
What is educational timetabling?

- The process of assigning classes (or exams) in time and space
- A difficult optimization problem with many competing objectives
 - Student conflicts, faculty requirements, space constraints

Why is it needed?

- Minimize student conflicts, thus help students receive degrees on time
- Help use resources more effectively
- Makes process easier to manage (knowledge transfer and cooperation)
- Fairness and satisfaction with the timetable
- What-if scenarios
- Ability to adapt to changes
- ...





Introducing UniTime

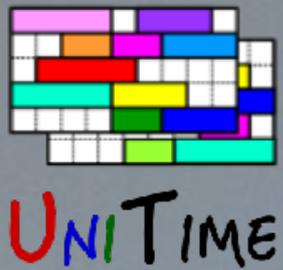
There is a gap between research and practice

- Practice: timetables are created manually
 - *Often reuse prior timetable as much as possible*
- Research: the problem has been extensively studied
 - *Subject of a lot of focus over the last two decades*
 - *Numerous useful algorithms have been developed that can be applied*
 - *Computers are becoming fast enough to solve large problems*

Here is where UniTime comes in place

- Began as a research project in 2000
 - *Goal of producing an automated course timetabling solution for a large university*
- Became an enterprise system meeting many university timetabling needs

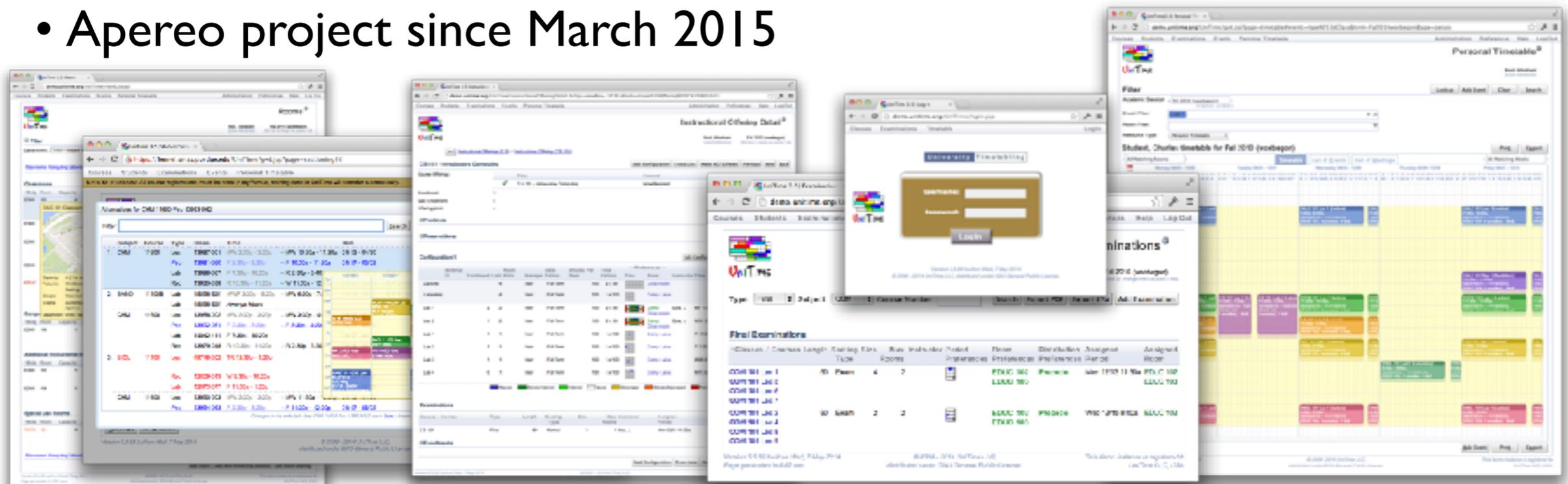


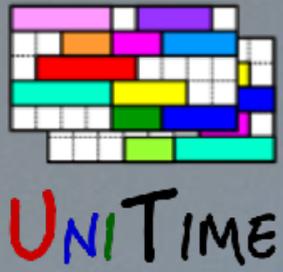


Introducing UniTime

What is UniTime?

- Comprehensive academic scheduling solution
- Four components: course timetabling, examination timetabling, student scheduling and event management
- Open source, web-based, written in Java using modern technologies
- Using state-of-the-art optimization algorithms
- Distributed data entry and timetabling in multi-user environments
- Apereo project since March 2015





Course Timetabling

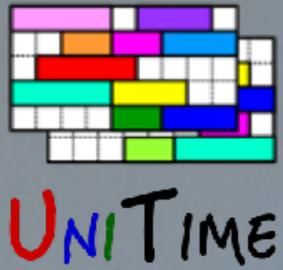
Constraints

- Rooms sizes, equipment, and availability
- Faculty time, room requirements and preferences
- Structures of courses that are to be offered
- Student course demands
 - Curricula, pre-registration, last-like course enrollments, etc.

Goal

- Assign class times and locations such that
 - All hard constraints and other requirements are met
 - Desirable objectives are satisfied as much as possible
 - Minimize student conflicts
 - Accommodate time and room preferences
 - Allow preferred class time distributions
 - Fairness, minimize travel times





Student Scheduling

Goal

Enroll students to classes in a way that maximizes the ability for students to get the courses they need

- Student fills in course requests
 - Including priorities, alternatives, and their availabilities
- System suggests a schedule that best meets student needs
- Students have the ability to modify their schedule

Student Scheduling Assistant

User: Student, Imogene Alice Click here to setup a student. Session: Spring 2018 (PWL) Click here to change the session.

UNITIME

Course Requests

1. Priority	BAND 111003	+ P X	↓	↑	🗑️
2. Priority	BIOL 11100	± P X	↑	↓	🗑️
	1. Alternative				
	BIOL 11200	+ P X			
3. Priority	CHM 11600	+ P X	↑	↓	🗑️
4. Priority	Free F 7:00a - 12:00p	P X	↑	↓	🗑️
5. Priority	HONR 19900P	+ P X	↑	↓	🗑️
6. Priority	MA 25000	+ P X	↑	↓	🗑️
7. Priority	VM 10200	+ P X	↑	↓	🗑️
8. Priority		P X	↑	↓	🗑️
9. Priority		P X	↑	↓	🗑️
10. Priority		P X	↑	↓	🗑️
11. Priority		P X	↑	↓	🗑️
12. Priority	Course with the lowest priority.	P X	↑	↓	🗑️

Tip: All courses below a few days will not overlap with the ones above (you will only get the course if there are sections that do not break the time limit).

Alternate Course Requests *(used only if a course requested above is not available)*

1. Alternate	PES 11500A	+ P X	↑	↓	🗑️
2. Alternate		P X	↑	↓	🗑️
3. Alternate		P X	↑	🗑️	

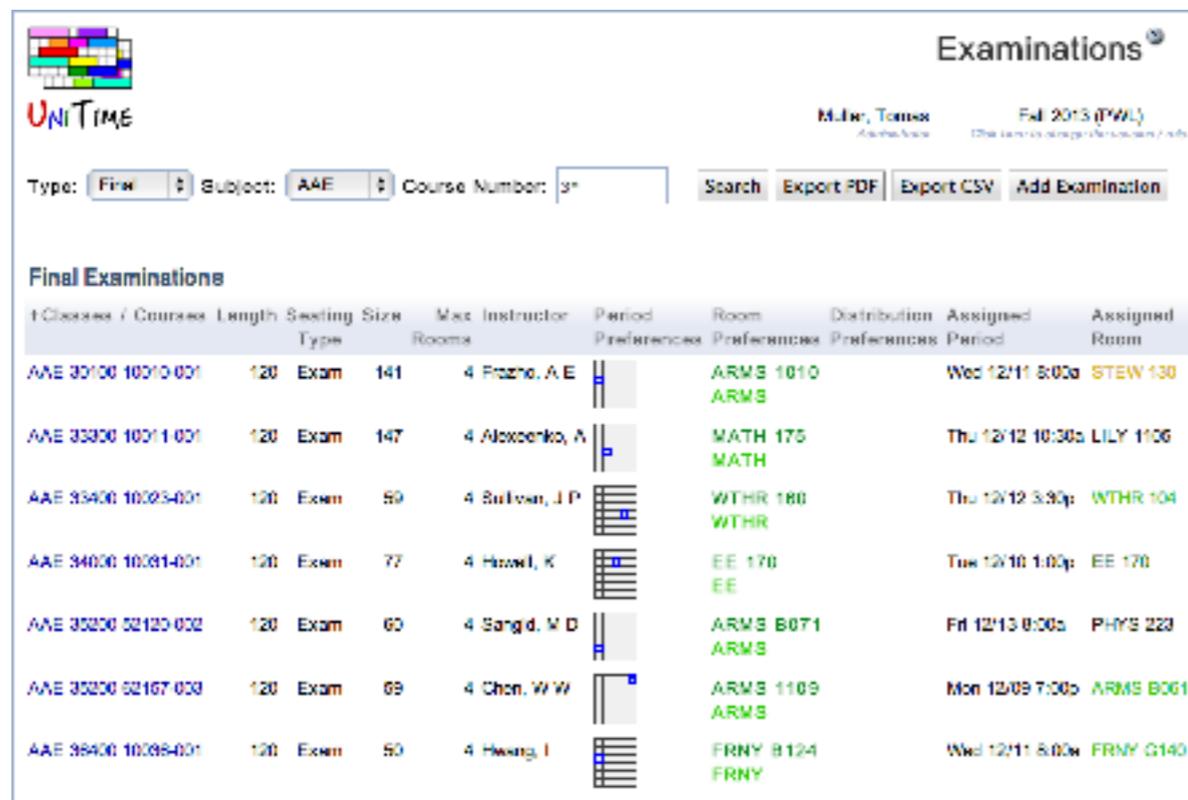
Degree Plan Build Schedule →

You are not registered for any classes yet. Please click the Build Schedule button in order to complete your registration.



Examination timetabling

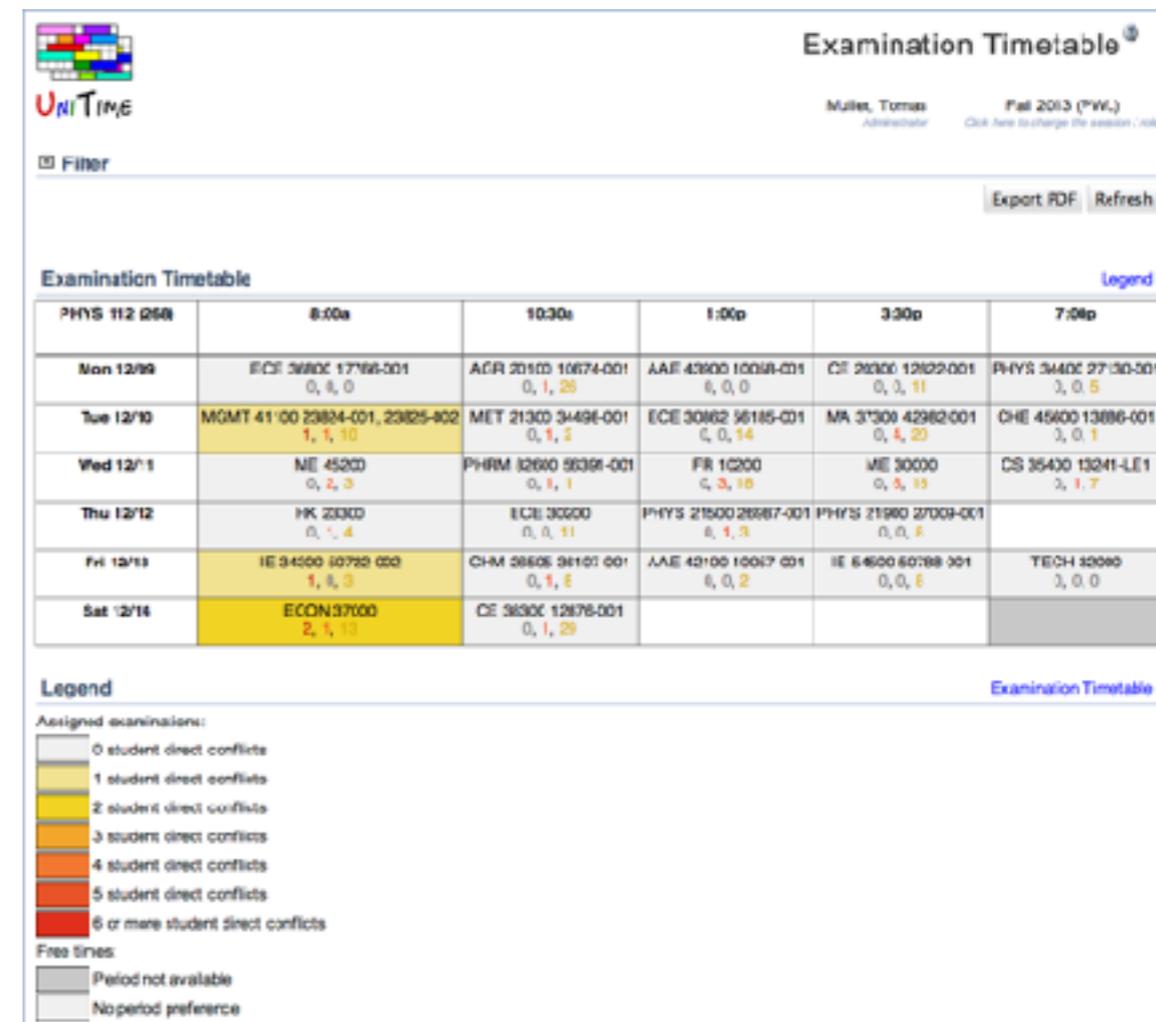
- An exam can be offered for a class, a course, or a combination of these
- Multiple examination problems (final exams, evening exams, etc.)
- Each exam is assigned in an examination period and one (or more) rooms
- Student conflicts are minimized
 - *Direct conflicts, more than two exams on a day, back-to-backs*



Examinations
M. Lee, Tomasz Administrator Fall 2013 (PWL)

Type: Subject: Course Number: Search Export PDF Export CSV Add Examination

Class(es) / Course	Length	Seating	Size	Max Instructor Rooms	Period Preferences	Room Preferences	Distribution Preferences	Assigned Period	Assigned Room
AAE 30100 10010-001	120	Exam	141	4 Prozko, A E		ARMS 1010 ARMS		Wed 12/11 8:00a	STEW 130
AAE 33300 10011-001	120	Exam	147	4 Alexowenko, A		MATH 175 MATH		Thu 12/12 10:30a	LILY 1106
AAE 33400 10023-001	120	Exam	59	4 Sullivan, J P		WTHR 180 WTHR		Thu 12/12 3:30p	WTHR 104
AAE 34000 10031-001	120	Exam	77	4 Howel, K		EE 170 EE		Tue 12/10 1:00p	EE 170
AAE 30200 52120-002	120	Exam	60	4 Sangid, M D		ARMS B071 ARMS		Fri 12/13 8:00a	PHYS 223
AAE 30200 52167-003	120	Exam	69	4 Chen, W W		ARMS 1109 ARMS		Mon 12/09 7:00p	ARMS B061
AAE 38400 10038-001	120	Exam	50	4 Hwang, I		FRNY B124 FRNY		Wed 12/11 8:00a	FRNY G140



Examination Timetable
M. Lee, Tomasz Administrator Fall 2013 (PWL)

Filter Export PDF Refresh

	8:00a	10:30a	1:00p	3:30p	7:00p
Mon 12/09	ECE 3800 17166-001 0, 3, 0	AGR 2010 10674-001 0, 1, 26	AAF 4200 10018-001 6, 0, 0	CE 2020 12022-001 0, 3, 11	PHYS 3400 27130-001 3, 0, 5
Tue 12/10	MGMT 41 00 23884-001, 23825-802 1, 1, 10	MET 2130 34496-001 0, 1, 2	ECE 3062 56185-001 0, 0, 14	MA 3130 42982-001 0, 4, 20	CHE 4500 13886-001 3, 0, 1
Wed 12/11	ME 4500 0, 2, 3	PHRM 3260 9036-001 0, 1, 1	FR 1020 0, 3, 18	ME 3000 0, 5, 15	CS 3540 13241-LE1 3, 1, 7
Thu 12/12	HK 2030 0, 1, 4	ECE 3050 0, 0, 11	PHYS 2150 26687-001 6, 1, 3	PHYS 2190 27009-001 0, 0, 8	
Fri 12/13	IE 3400 10750-002 1, 3, 3	CHM 2860 36101-001 0, 1, 8	AAE 4210 10017-001 6, 0, 2	IE 6400 60788-001 0, 0, 6	TECH 3090 3, 0, 0
Sat 12/14	ECON3700 2, 1, 10	CE 3600 12876-001 0, 1, 29			

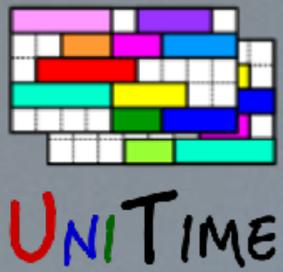
Legend

Assigned examinations:

- 0 student direct conflicts
- 1 student direct conflicts
- 2 student direct conflicts
- 3 student direct conflicts
- 4 student direct conflicts
- 5 student direct conflicts
- 6 or more student direct conflicts

Free times:

- Period not available
- No period preference



Other Features

Event management

- Management of the remaining classroom space
- Fully distributed, including an approval process

And more

- Data exchange, room distances (travel times), date patterns, ...

Events
Miller, Texas

Filter: Academic Session: Spring 2014 (FW1)
Event Filter: All Events
Room Filter: All Rooms

CL50 224 events for weeks 03/31 - 05/18

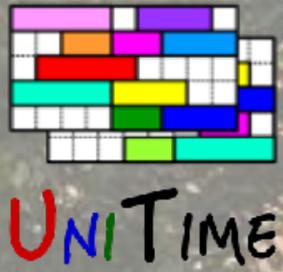
ID	Name	Section Type	Time	Date	Published	Site	Location	Capacity	Instructor / Sponsor	Start	Contact	Approved
AGSC 2138	10962-01 Lecture Human Evolution	MWF	08:21 - 09:00	2014	12:30p - 1:15p	CL50 224	476	100	Waters, A. E.	09/15/2013	Heenan, C. J.	09/15/2013
AGSC 2138	10962-01 Lecture Selling Agr. Business	TR	04:01 - 05:01	2014	10:30a - 11:45a	CL50 224	476	100	Waters, A. E. Deveney, W.	09/15/2013	Heenan, C. J.	09/15/2013
ANTH 2000	11241-001 Lecture Human Culture Diversity	MW	08:21 - 09:00	2014	2:30p - 4:20p	CL50 224	476	100	Ficks, A. D.	09/15/2013	Heenan, C. J.	09/15/2013
CLCE 2030	30067-001 Lecture Comparative Mythology	MW	08:21 - 09:00	2014	11:30a - 12:00p	CL50 224	476	100	Diabara, K. M.	09/15/2013	Heenan, C. J.	09/15/2013
GOV 2000	10294-001 Lecture Principles of Government	TR	04:01 - 05:01	2014	2:30p - 4:15p	CL50 224	476	100	Morgan, D. E.	09/15/2013	Heenan, C. J.	09/15/2013
ECON 2000	17229-002 Lecture Macroeconomics	TR	04:01 - 05:01	2014	5:00a - 13:50a	CL50 224	476	100	Thompson, J. D.	09/15/2013	Heenan, C. J.	09/15/2013
ECON 2000	30299-001 Lecture Macroeconomics	TR	04:01 - 05:01	2014	2:30p - 4:45p	CL50 224	476	100	Thompson, J. D.	09/15/2013	Heenan, C. J.	09/15/2013
ENR 1000	19037-001 Lecture Intro Envir. Conservatn	MW	08:21 - 09:00	2014	1:30p - 2:20p	CL50 224	476	100	Dunning, J. D.	09/15/2013	Heenan, C. J.	09/15/2013
IE 3700	20984-001 Lecture Intro Processes I	MW	08:21 - 09:00	2014	2:30p - 3:20p	CL50 224	476	100	Chen, G. J.	09/15/2013	Heenan, C. J.	09/15/2013
MA 1000	57358-002 Lecture P. Analy. Geo. Calc. II	MW	08:21 - 09:00	2014	5:30a - 13:20a	CL50 224	476	100	Deruelle, R.	09/15/2013	Heenan, C. J.	09/15/2013
MOET 2000	22914-002 Lecture Intro Accounting	TR	04:01 - 05:01	2014	4:30p - 5:45p	CL50 224	476	100	Traut, R.	09/15/2013	Heenan, C. J.	09/15/2013
MOET 2000	22301-001 Lecture Intro Accounting	TR	04:01 - 05:01	2014	11:30a - 1:15p	CL50 224	476	100	Traut, R.	09/15/2013	Heenan, C. J.	09/15/2013
PSY 1000	18177-008 Lecture Intro Psychology	MW	08:21 - 09:00	2014	8:30a - 9:30a	CL50 224	476	100	Ward, E. R.	09/15/2013	Heenan, C. J.	09/15/2013
SOC 1000	27351-005 Lecture Intro Sociology	MW	08:21 - 09:00	2014	10:30a - 11:20a	CL50 224	476	100	Harris, R. S.	09/15/2013	Heenan, C. J.	09/15/2013
SOC 1000	51608-002 Lecture Intro Sociology	TR	04:01 - 05:01	2014	1:30p - 2:45p	CL50 224	476	100	Waters, C. M.	09/15/2013	Heenan, C. J.	09/15/2013
Speech and Debate Competition I	Special	Fri	04/11, 2014	8:30p - 10:30p	CL50 224	476	100	Keller, B. C.	10/08/2013			
Speech and Debate Competition I	Special	Sat	04/12, 2014	7:00a - 10:30p	CL50 224	476	100		10/08/2013			
Speech and Debate Competition I	Special	Sun	04/13, 2014	7:00a - 10:00p	CL50 224	476	100		10/08/2013			
Speech and Debate Competition II	Special	Fri	04/25, 2014	8:30p - 10:30p	CL50 224	476	100	Keller, B. C.	10/08/2013			
Speech and Debate Competition II	Special	Sat	04/26, 2014	7:00a - 10:30p	CL50 224	476	100		10/08/2013			
Speech and Debate Competition II	Special	Sun	04/27, 2014	7:00a - 10:00p	CL50 224	476	100		10/08/2013			
WU Nationals Debate Tournament	Special	Fri	04/11, 2014	8:30p - 10:30p	CL50 224	476	100	Richard Feltouse, Tom Schultz, J. P.	11/14/2013			

Personal Timetable
Miller, Texas

Filter: Academic Session: Spring 2014 (FW1)

Hover: Blair Nichols Timetable for Spring 2014 (FW1)

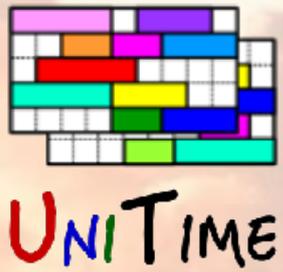
Day	Time	Event
Monday	12:30p - 1:15p	AGSC 2138
Tuesday	10:30a - 11:45a	AGSC 2138
Wednesday	2:30p - 4:15p	GOV 2000
Thursday	5:00a - 13:50a	ECON 2000
Friday	1:30p - 2:20p	ENR 1000
Saturday	8:30p - 10:30p	Speech and Debate Competition I
Sunday	7:00a - 10:00p	Speech and Debate Competition I



UniTime

System Administration





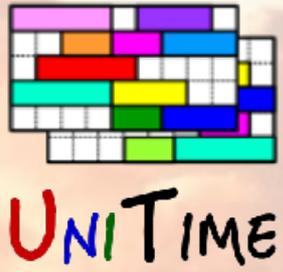
UniTime Setup

Installation

- UniTime can be downloaded from <http://builds.unitime.org>
- Installation Instructions: help.unitime.org/Timetabling_Installation
 - *See Windows, Linux, or Mac specific notes at the bottom of the page*
- Hardware Requirement
 - Any system capable of running Java and MySQL/Oracle
 - Linux is recommended, should have enough memory, could be a VM
 - E.g.: 8 cores, 12 GB RAM, 100 GB drive
 - Oracle database is recommended for production environments
- Prerequisites
 - Java, MySQL or Oracle Database, Apache Tomcat
- Cluster containing web servers and remove solver serves
 - For larger institutions (and especially when students can access)

Do not forget the `-Xmx` parameter and the MySQL/Oracle JDBC driver!

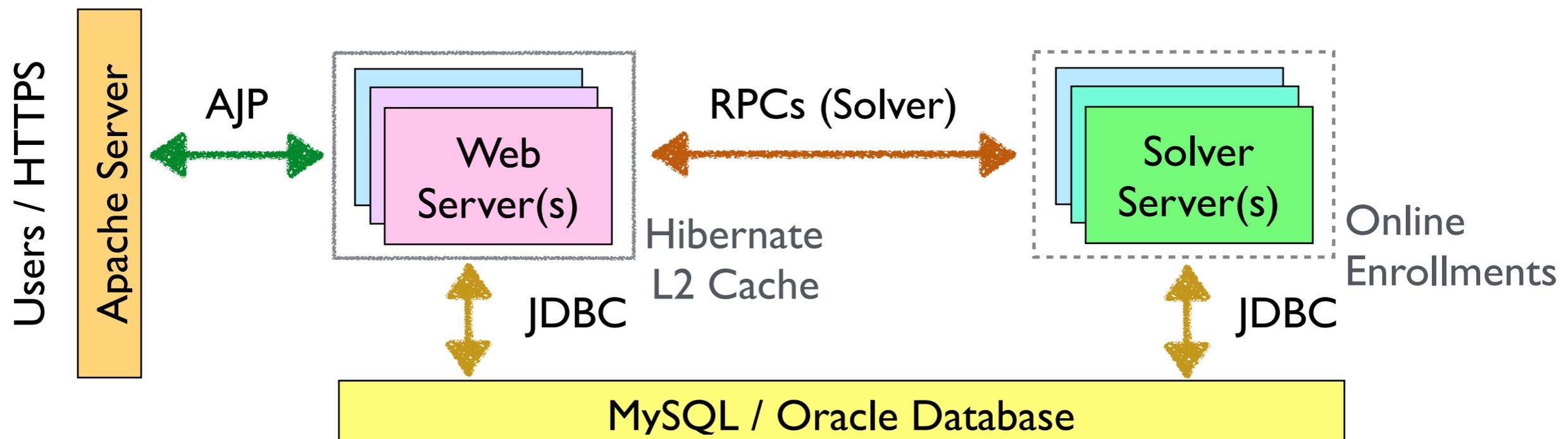


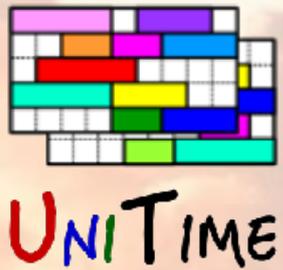


UniTime Setup

Cluster

- One or more web servers (Apache Tomcat / UniTime.war)
- One or more remote solver servers (Java)
- JGroups Clusters
 - Hibernate L2 Cache (web servers only)
 - Solver Cluster (RPCs)
 - Online Student Scheduling Server replications (optional)

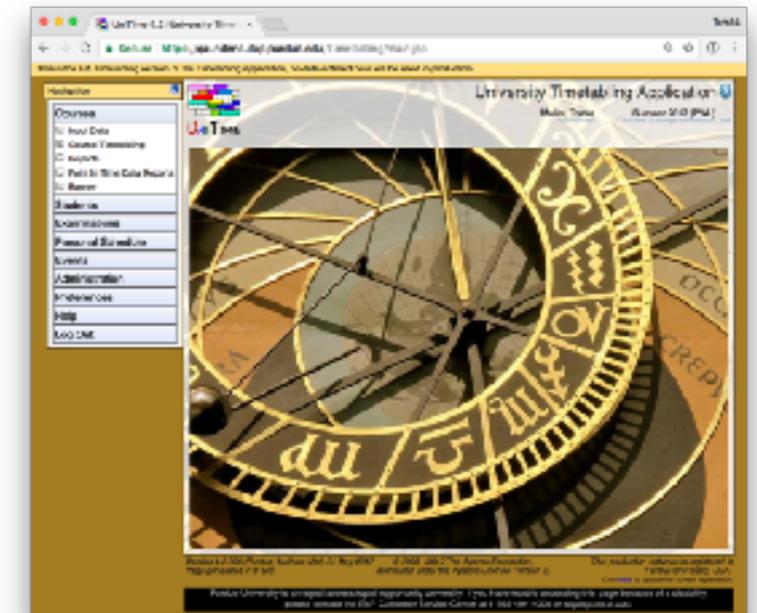




UniTime Setup

Customization

- Custom properties
 - Application Configuration page
 - Custom properties file
- Custom CSS, welcome message, disclaimer, menu content & style
- Much more, see the Application Configuration page for the list

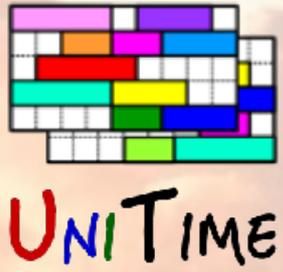


Authentication

- By default, the Users page is used
- CAS or LDAP can be configured (*or anything else using Spring Security*)
- We need an external ID of an authenticated user
 - Students, Instructors, Advisors, Timetable Managers
 - No match: No Role or Anonymous (can be disabled)

See <http://help.unitime.org/Customizations> for more details.





UniTime Setup

Localization

- Current locales: en, en_UK, cs
- Use en_UK to switch UniTime to use 24h times and dd.mm.yyyy dates
- Default can be set using unitime.locale property
 - Can be changed per user (User Settings),
 - or for HTTP session with the locale parameter

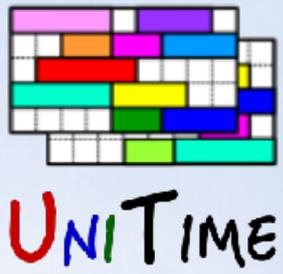
Translations

- Translations are provided in property files
- Zanata can be used to provide translations
- Czech, French, Polish, Turkish, and a few other (less complete)

See <http://help.unitime.org/Localization> for more details.

See <https://demo.unitime.org/UniTime?locale=cs> for UniTime in Czech.

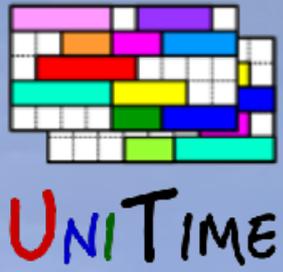




UniTime

UniTime Data Organization



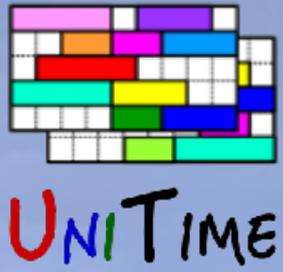


UniTime Data Organization

Academic Session Independent

- User Roles & Permissions
 - Each permission contains a check (e.g., a schedule manager can only edit classes of his/her department when allowed by session status)
- Statuses (*Initial Data Load, Data Entry, Timetabling, Published, Closed*)
- Instructional Types (*Lecture, Lab, Recitation, ...*)
- Room Types (*Classroom, Computing Lab, Outside Location, ...*)
- Room Feature Types (*Seating Type, Room Configuration, A/V, ...*)
- Many more (course types, instructional methods, position types, ...)
 - See items under Administration > Other menu
- Solver Configuration (could be done much later, based on the data)

UniTime contains good default data for these.

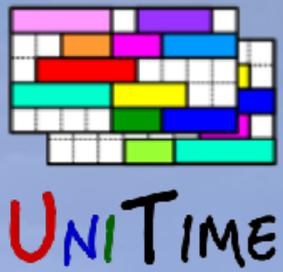


UniTime Data Organization

Academic Session Dependent

- Time Patterns, Date Patterns
- Academic Areas, Classifications, and Majors
- Buildings, Rooms, Room Features, and Room Groups
- Administrative Users (Timetable Managers)
- Departments
- Application Configuration Properties (when needed)
- Examination Periods



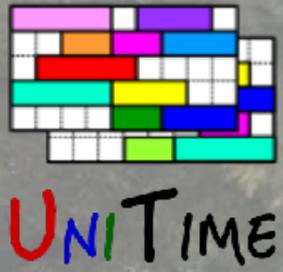


UniTime Data Organization

Department Dependent

- Users and their permissions
 - Depends on the role (e.g., Session Administrator is a department independent role)
- Subject Areas
 - Courses and their classes
 - Though some classes can be timetabled by a different department (external manager)
- Room Sharing
- Instructors
- Solver Groups
 - A solver group defines what departments are to be timetabled together

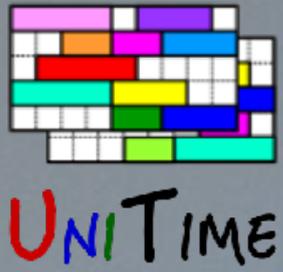




UniTime

Users, Roles, Permissions, Statuses





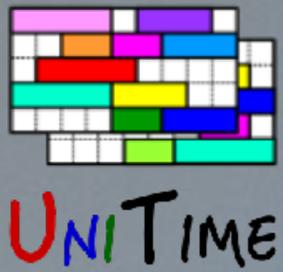
Users and Roles

Users and Roles

- Timetable Managers
 - All administrative users (administrators, schedule managers,...)
 - Session independent, but with relation to departments
 - One or more roles (one primary)
- Instructors
 - One instructor can belong to multiple departments
- Students
 - Related only to an academic session
- Advisors
 - Many to many with students
- No Role (authenticated, but without UniTime role)
- Anonymous (not authenticated)

Using external id of the authenticated user





Permissions

Permissions

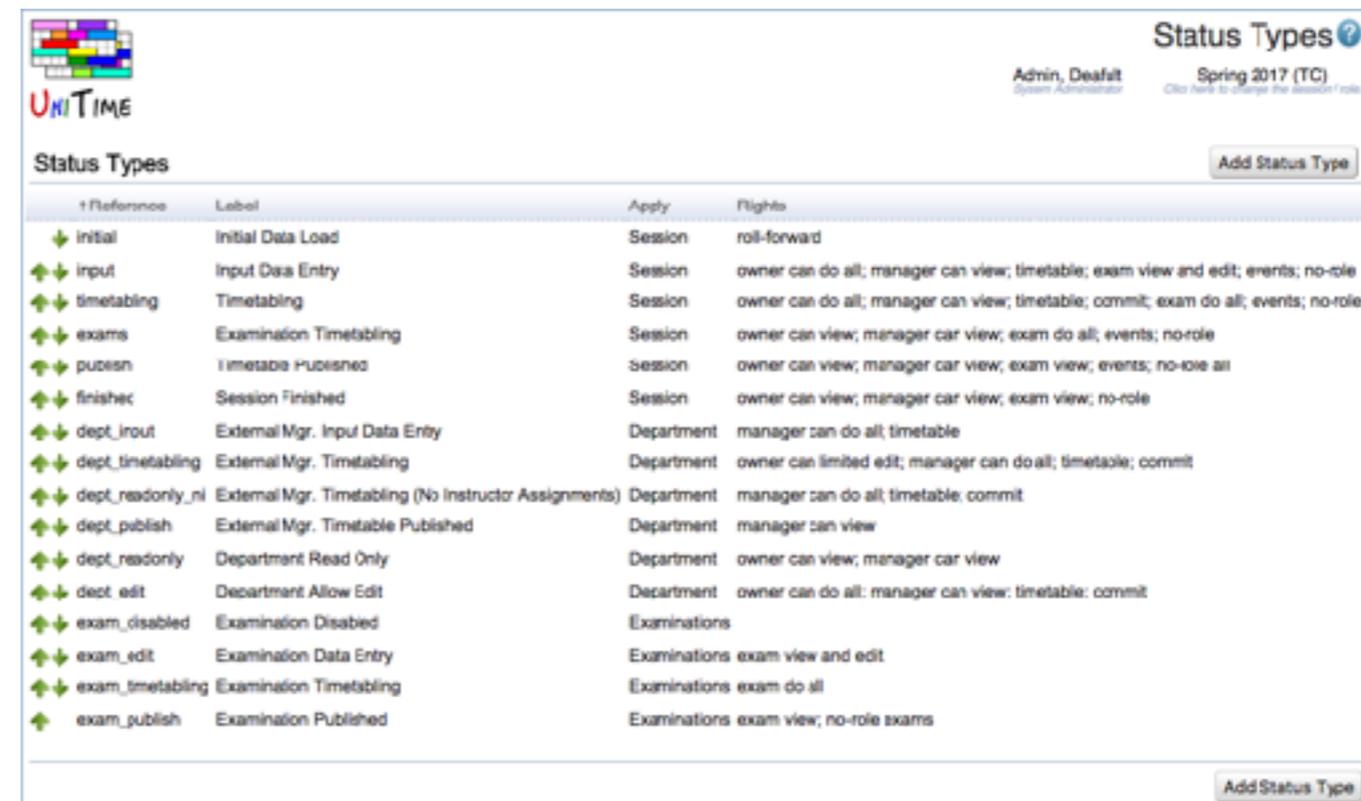
- Defined for each role
 - For each page/operation
 - Few special: Session Default, Session/Department/Status Independent
 - Applies to an object in question
- Permission Check
 - Relation to the user's department
 - Status of session/department
- Example: Class Edit
 - Controlling Department
 - Managing Department (e.g., LLR)
 - Department Status
 - Online Student Scheduling

The screenshot shows the UNITIME Permissions interface. At the top right, it says "Permissions" and "Admin Default Spring 2017 (TC)". Below this is a table with columns for "Name", "Level", and several permission categories: "Anonymous", "No Fee", "Student", "Instructor", "Dept", "Schwd Mgr", "Administrator", and "SysAdmin". The table lists various permissions such as "Session Default Current", "Session Default First Future", "Session Default First Examination", "Session Independent", "Session Independent if No Session Given", "Allow Test Sessions", "Department Independent", "Status Independent", "Has Role", "Is Admin", "Night School", "Instructional Offerings", "Instructional Offerings Export PDF", "Instructional Offerings Worksheet PDF", "Classes", "Classes Export PDF", "Class Assignments", "Class Assignments Export PDF", "Class Assignments Export CSV", "Instructional Offering Detail", "Add Course Offering", "Edit Course Offering", "Edit Course Offering Note", "Fill Course Offering Coordinates", "Offering Can Lock", "Offering Can Unlock", "Offering Make Not Offered", "Offering Make Not Offered No Enrollment Check", "Offering Make Offered", and "Offering Delete". Each cell in the table contains a red 'X' or a green checkmark indicating the permission status for that role.

Name	Level	Anonymous	No Fee	Student	Instructor	Dept	Schwd Mgr	Administrator	SysAdmin
Session Default Current	Global	X	X	✓	✓	X	✓	✓	✓
Session Default First Future	Global	X	X	X	X	✓	X	X	X
Session Default First Examination	Global	X	X	X	X	X	X	X	X
Session Independent	Global	X	X	X	X	X	X	X	✓
Session Independent if No Session Given	Global	X	X	X	X	X	X	X	X
Allow Test Sessions	Global	X	X	X	X	X	X	X	✓
Department Independent	Global	X	X	X	X	X	✓	✓	✓
Status Independent	Global	X	X	X	X	X	✓	✓	✓
Has Role	Global	X	X	X	X	✓	✓	✓	✓
Is Admin	Global	X	X	X	X	X	X	✓	✓
Night School	Global	X	X	X	X	X	X	X	✓
Instructional Offerings	Department	X	X	X	X	✓	✓	✓	✓
Instructional Offerings Export PDF	Department	X	X	X	X	✓	✓	✓	✓
Instructional Offerings Worksheet PDF	Department	X	X	X	X	✓	✓	✓	✓
Classes	Department	X	X	X	X	✓	✓	✓	✓
Classes Export PDF	Department	X	X	X	X	✓	✓	✓	✓
Class Assignments	Session	X	X	X	X	✓	✓	✓	✓
Class Assignments Export PDF	Session	X	X	X	X	✓	✓	✓	✓
Class Assignments Export CSV	Session	X	X	X	X	✓	✓	✓	✓
Instructional Offering Detail	Instructional Offering	X	X	X	X	✓	✓	✓	✓
Add Course Offering	Subject Area	X	X	X	X	✓	✓	✓	✓
Edit Course Offering	Course Offering	X	X	X	X	✓	✓	✓	✓
Edit Course Offering Note	Course Offering	X	X	X	X	X	X	X	X
Fill Course Offering Coordinates	Course Offering	X	X	X	X	✓	✓	✓	✓
Offering Can Lock	Instructional Offering	X	X	X	X	✓	✓	✓	✓
Offering Can Unlock	Instructional Offering	X	X	X	X	✓	✓	✓	✓
Offering Make Not Offered	Instructional Offering	X	X	X	X	✓	✓	✓	✓
Offering Make Not Offered No Enrollment Check	Instructional Offering	X	X	X	X	X	X	X	X
Offering Make Offered	Instructional Offering	X	X	X	X	✓	✓	✓	✓
Offering Delete	Instructional Offering	X	X	X	X	X	✓	✓	✓

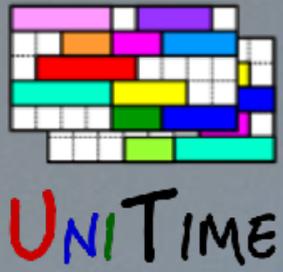
Statuses

- Progress of the term
 - Data Entry, Course Timetabling, Timetable Published, Session Finished
- Various levels
 - Academic Session, Department, Examinations (examination type, session), Events (department, room type)
- Helps Control
 - Data Entry (Courses, Exams)
 - Timetabling
 - Student Scheduling
 - Event Management
 - Schedule Publication



The screenshot shows the 'Status Types' management interface in UNI TIME. It includes a table with columns for 'References', 'Label', 'Apply', and 'Rights'. The table lists various status types such as 'initial', 'input', 'timetabling', 'exams', 'publish', 'finished', and department-specific statuses like 'dept_input' and 'dept_publish'. Each row shows the applicable level (e.g., Session, Department, Examinations) and the associated permissions (rights).

References	Label	Apply	Rights
initial	Initial Data Load	Session	roll-forward
input	Input Data Entry	Session	owner can do all; manager can view; timetable; exam view and edit; events; no-role
timetabling	Timetabling	Session	owner can do all; manager can view; timetable; commit; exam do all; events; no-role
exams	Examination Timetabling	Session	owner can view; manager can view; exam do all; events; no-role
publish	Timetable Published	Session	owner can view; manager can view; exam view; events; no-role all
finished	Session Finished	Session	owner can view; manager can view; exam view; no-role
dept_input	External Mgr. Input Data Entry	Department	manager can do all; timetable
dept_timetabling	External Mgr. Timetabling	Department	owner can limited edit; manager can do all; timetable; commit
dept_readonly_ni	External Mgr. Timetabling (No Instructor Assignments)	Department	manager can do all; timetable; commit
dept_publish	External Mgr. Timetable Published	Department	manager can view
dept_readonly	Department Read Only	Department	owner can view; manager can view
dept_edit	Department Allow Edit	Department	owner can do all; manager can view; timetable; commit
exam_disabled	Examination Disabled	Examinations	
exam_edit	Examination Data Entry	Examinations	exam view and edit
exam_timetabling	Examination Timetabling	Examinations	exam do all
exam_publish	Examination Published	Examinations	exam view; no-role exams



Manager Roles

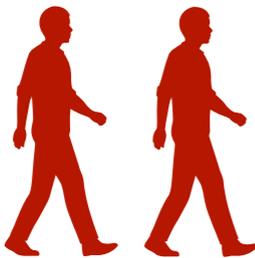
System Administrator



Installation / Updates
Common Configuration
Solver Configuration
(Administration > Other)
IT Support

University Level
(IT Department)

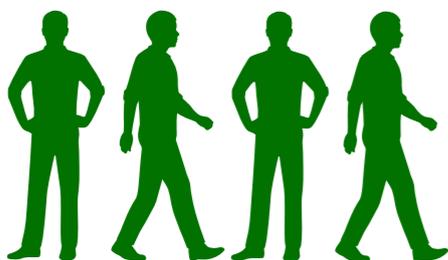
Session Administrator



Academic Session Setup
Roll-forward, Data Exchange
(Administration > Acad. Session)
Rooms and Sharing
Creates Timetable (Runs Solver)
Makes Timetable Changes
Supports Schedule Managers

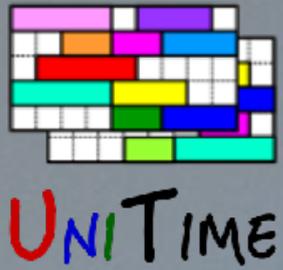
Campus Level
(Registration Office)

Departmental Schedule Manager



Collects Faculty Requirements
Instructors
Courses & Classes
Requirements & Preferences
Verifies Timetable

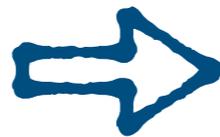
Departmental Level
(One or more departments)



User Responsibilities (A)

System Administrator

Installation / Updates
Common Configuration
(Administration > Other)
Solver Configuration
Provides IT Support



Session Administrator

Academic Session Setup
Imports (Catalog, Students)
(Administration > Acad. Session)
Rooms and Sharing
Support Schedule Managers

Verifies Input Data
Creates Timetable (Runs Solver)
Makes Timetable Changes

Makes Timetable Changes
Publishes Timetable

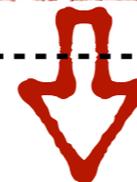


Departmental Schedule Manager

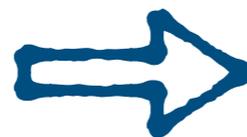
Collects Faculty Requirements
Instructors
Courses & Classes
Requirements & Preferences

Verifies Timetable
Communicates with Faculty

Next Academic



Installation / Updates
Common Configuration
(Administration > Other)
Solver Configuration
Provides IT Support



Creates Academic Session
Roll-Forward
Imports (Catalog, Students)
Academic Session Setup (Changes)
Support Schedule Managers



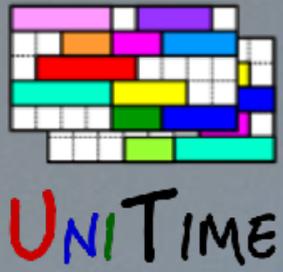
Collects Faculty Requirements
Instructors
Courses & Classes
Requirements & Preferences

University Level
(IT Department)

Campus Level
(Registration Office)

Departmental Level
(One or more departments)





User Responsibilities (B)

System Administrator

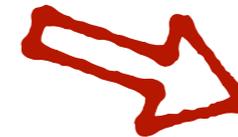
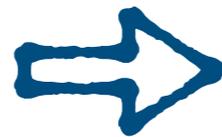
Installation / Updates
Common Configuration
(Administration > Other)
Solver Configuration
Provides IT Support

Session Administrator

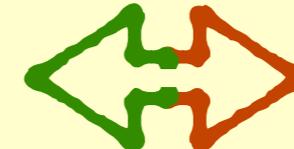
Academic Session Setup
Imports (Catalog, Students)
(Administration > Acad. Session)
Rooms and Sharing
Support Schedule Managers

Departmental Schedule Manager

Collects Faculty Requirements
Instructors
Courses & Classes
Requirements & Preferences



Provides Assistance & Coordination
(may run & commit the solver for all first)



Verifies Input Data
Creates Timetable (Runs Solver)
Makes Timetable Changes

Makes Timetable Changes
Publishes Timetable

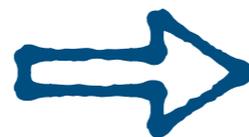


Verifies Timetable
Communicates with Faculty

Next Academic



Installation / Updates
Common Configuration
(Administration > Other)
Solver Configuration
Provides IT Support



Creates Academic Session
Roll-Forward
Imports (Catalog, Students)
Academic Session Setup (Changes)
Support Schedule Managers



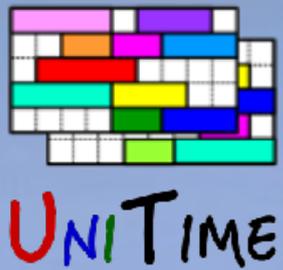
Collects Faculty Requirements
Instructors
Courses & Classes
Requirements & Preferences

University Level
(IT Department)

Campus Level
(Registration Office)

Departmental Level
(One or more departments)

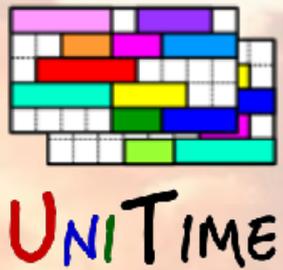




UniTime

Data Exchange





UniTime Data Exchange

Data Exchange

- A lot of the data can be imported via XML
- Departments, subject areas, rooms, staff, ...
- Beware: rooms and staff do not get imported directly
 - Rooms: use Update Data on the Buildings page
 - Staff: use Manage Instructor List on the Instructors page
- Course Offerings XML can be used to import just courses, the whole structure, or anything in between

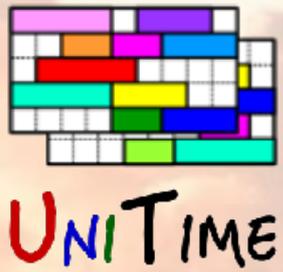
APIs

- Mostly to get data out of UniTime in real time
- Can be extended as needed

See http://www.unitime.org/uct_interfaces.php for the list of XML interfaces.

See <https://goo.gl/LIsEVN> for UniTime 4.2 APIs.





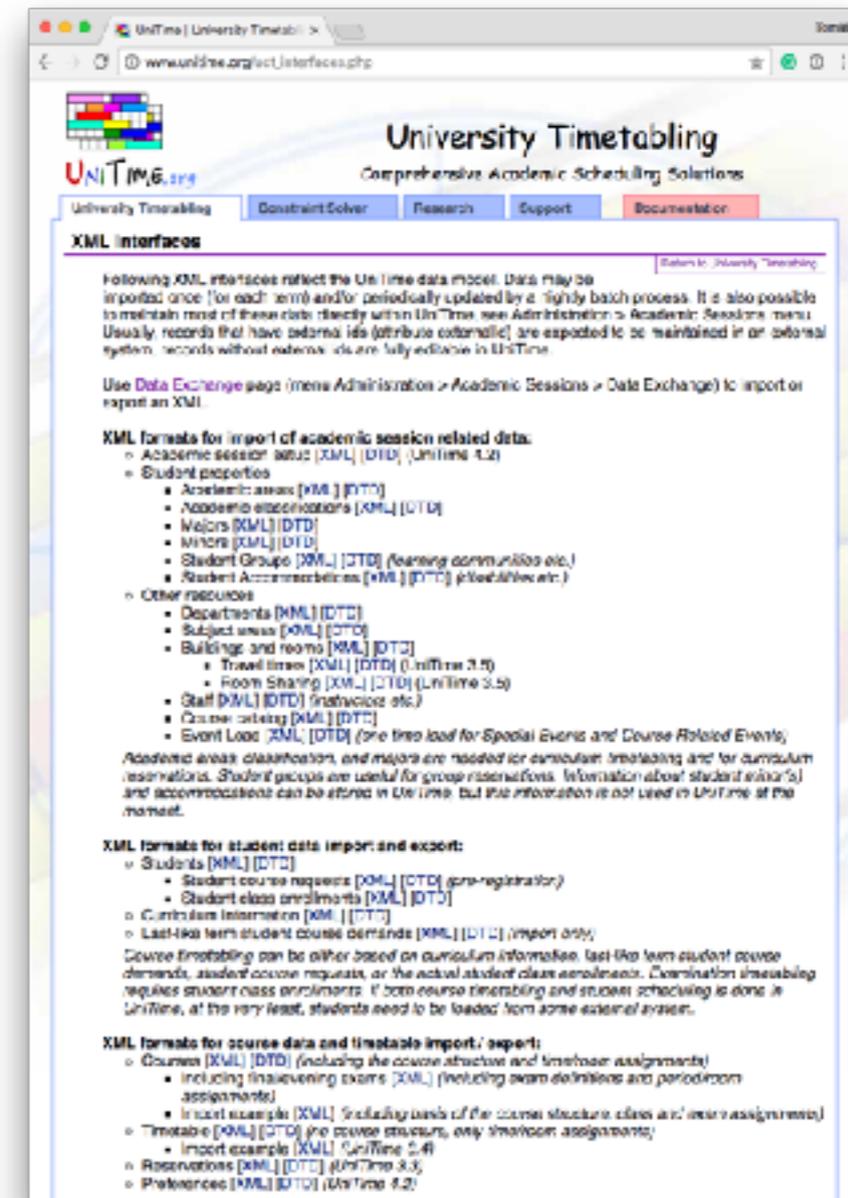
XML Interfaces

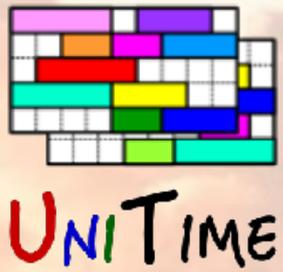
First Year

- Academic Session Setup
 - Date Patterns, Time Patterns,
 - Departments, Subject Areas, Solver Groups
 - Academic Areas, Classifications, and Majors
- Building and Rooms
- Staff (Instructors)
- Course Catalog
- Student Course Demands

Following Years

- Course Catalog
- Student Course Demands





APIs, Exports, Other

APIs

- Restful APIs, mostly to get data out of UniTime in real time
- Basic authentication or an API key
- Can be also used to import or export an XML file
- Script execution, HQL reports

Exports

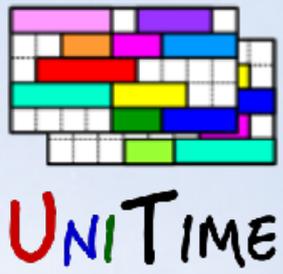
- Mostly CSV or PDF
- Events Management also iCalendar
- A lot of filtering capabilities (especially room and event exports)

Other

- Academic Session Backup/Restore
- Solver XML export

See <https://goo.gl/EqG5AA> for UniTime 4.2 Exports.

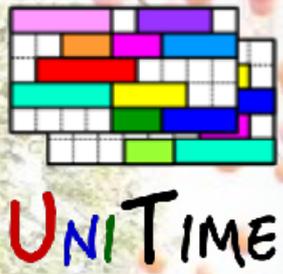




UniTime

Academic Session Setup





Academic Session Setup

- Dates
 - Session start date
 - Examination start date,
 - Holidays, ...
- Date Patterns
- Time Patterns
- Departments
- Subject Areas
- Buildings and Rooms
- Solver Groups
- Timetabling Managers

Department

Most of the UniTime data are related to a particular department

See the online demo <http://demo.unitime.org> for some examples.





Time-related Setup

Date Patterns

- Weeks of instructions (All weeks, Even/Odd weeks, Week 5, ...)

March 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
10	1	2	3	4	5	6	7
11	8	9	10	11	12	13	14
12	15	16	17	18	19	20	21
13	22	23	24	25	26	27	28
14	29	30	31				

April 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
14				1	2	3	4
15	5	6	7	8	9	10	11
16	12	13	14	15	16	17	18
17	19	20	21	22	23	24	25
18	26	27	28	29	30		

May 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
18						1	2
19	3	4	5	6	7	8	9
20	10	11	12	13	14	15	16
21	17	18	19	20	21	22	23
22	24	25	26	27	28	29	30
23	31						

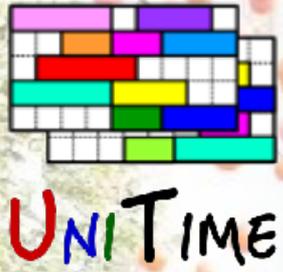
Time Patterns

- Possible time slots within a week

2h

from:	7:30a	8:25a	9:20a	10:15a	11:10a	12:05p	1:00p	1:55p	2:50p	3:45p	4:40p	5:35p	6:30p
to:	9:10a	10:05a	11:00a	11:55a	12:50p	1:45p	2:40p	3:35p	4:30p	5:25p	6:20p	7:15p	8:10p
Mon	Discouraged	Strongly Preferred	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Tue	Discouraged	Strongly Preferred	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Wed	Discouraged	Strongly Preferred	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Thu	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

- Required
- Strongly Preferred
- Preferred
- Neutral
- Discouraged
- Strongly Discouraged
- Prohibited



Departments Setup

Departments

- **Organizational units** at a campus
- **Courses** are offered by departments
- **Rooms** and **staff** are related to departments
- **Users** are related to departments
- Some **permissions** (event management, data entry, etc.) can be set on the departmental level
- **Course timetables** are created for courses of a department

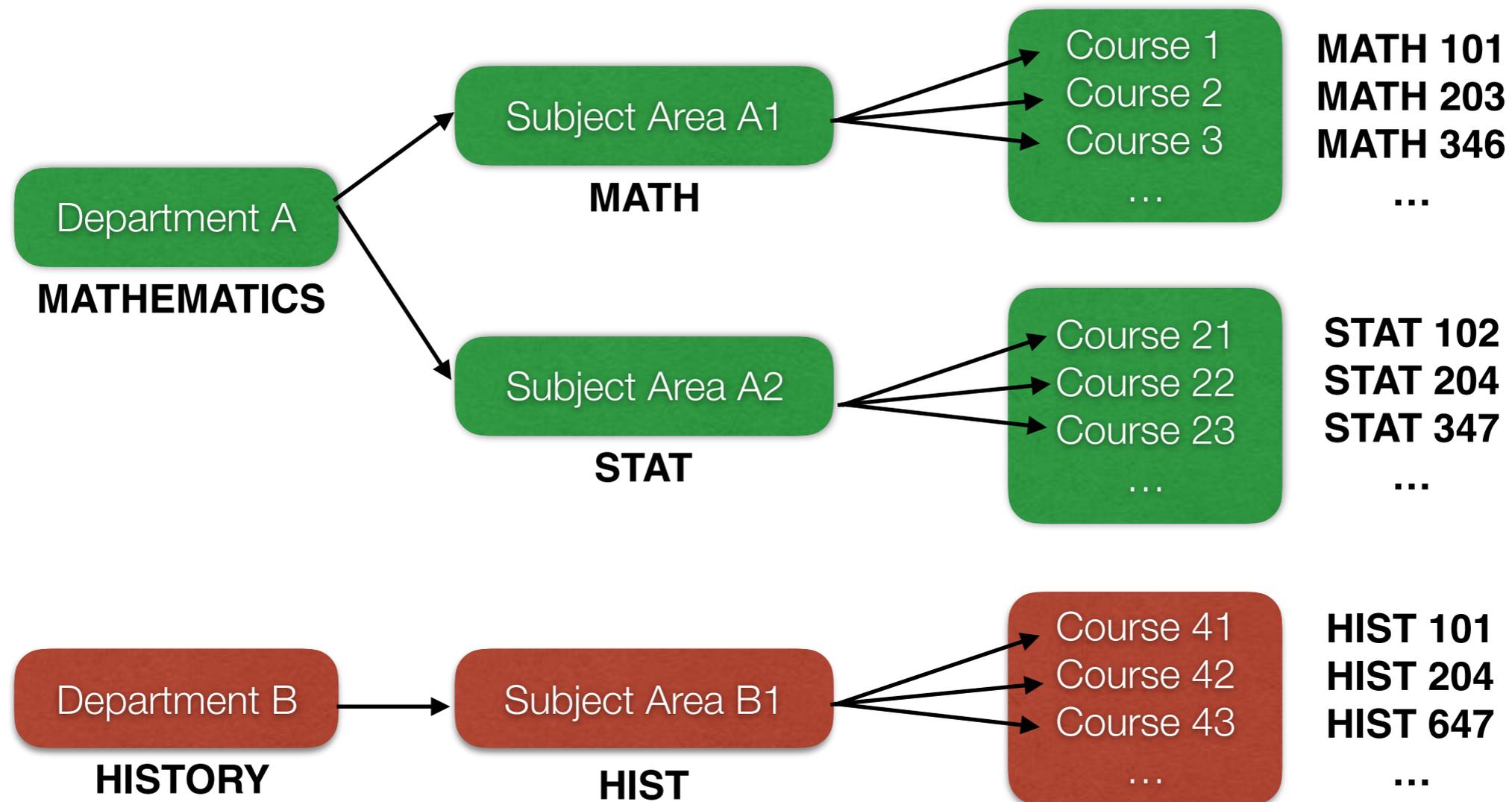




Subject Areas Setup

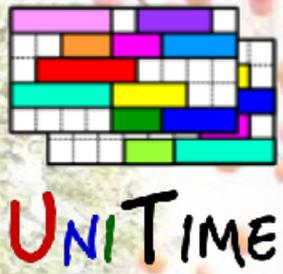
Subject Areas

- Help organize courses from a department to meaningful group



- Each course has one subject area, each subject area belongs to one department





Room-related Setup

Buildings

- Buildings can only be entered by the session (or system) administrator
- Usually they are imported from an external source for the first semester and then rolled forward from one semester to the next one
- Mandatory fields: Name, Abbreviation, External ID

Edit Building Update Back

Name:

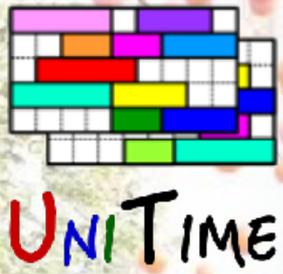
Abbreviation:

External ID:

Coordinates: , Euclidean metric (1 unit equals to 10 meters)

Map:

Update room coordinates to match the building coordinates. Update Back

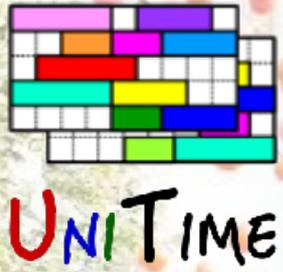


Room-related Setup

Rooms

- Rooms within buildings
 - Non-university locations (which are not a part of buildings) can be entered by the departmental schedule managers
- Capacity
- Types of rooms
- Room sharing, availability
- Global room features (available to all departments)
- Global room groups (available to all departments)
- Preference (for each department)
- GPS Coordinates, Travel times, Room pictures, ...
- Event department and status





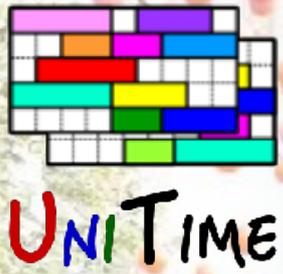
Room-related Setup

Travel times

- Time it takes to get from one location to the other
- Calculated from GPS coordinates or entered in a matrix
- Important for students and instructors

	A 50	D 20	K 73	140A	JAMU	
A 50		5	5	19	22	A 50
D 20	5		0	17	20	D 20
K 73	5	0		17	22	K 73
140A	19	17	17		10	140A
JAMU	22	20	22	10		JAMU
	A 50	D 20	K 73	140A	JAMU	



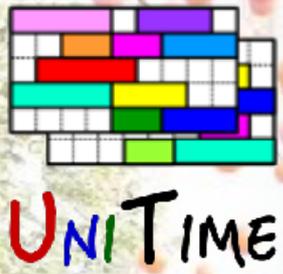


Data Entry: Rooms

Best Practices: Rooms

- Room features can be categorized by feature types (seating type, desk arrangements, audio/video, ...)
- Having good room groups and room features helps with preferences
 - Think about the faculty preferences you may get (*E.g., I want a room with a white board and a data projector, which could be used both at the same time*)
- Approved events can be used to block certain times in a room.
- There can be pseudo rooms that do not check for overlaps (*E.g., off-campus, instructor's office, hospital*)
- Dept. room preferences are useful to minimize use of a room
 - **Prohibited** ... cannot be used (for what-if scenarios)
 - **Strongly Discouraged** ... only when there is a direct preference
 - **Discouraged** ... minimize use of the room (avoid if possible)



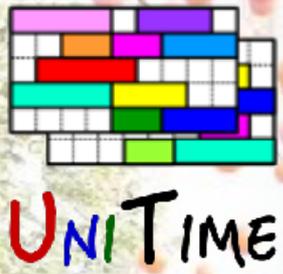


Solver Groups

Solver Groups

- A solver group consists of **one or more departments** for which a **timetable** should be created
- A timetable can be created for more solver groups together
 - Each solver group can then modify their timetable separately
- Typical cases
 - Campuses with centralized timetabling have one solver group
 - Larger campuses (such as the pilot college) with decentralized timetabling have several solver groups

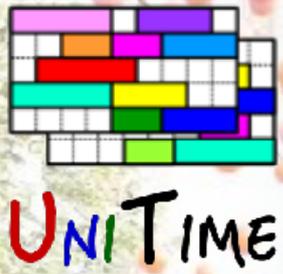




Student Properties

- **Academic Area**
 - Program of study (Agriculture, Chemistry, Computer Science)
- **Classification**
 - Semester / year of study (Freshmen, Sophomore, Junior, Senior)
- **Major**
 - Field of study / specialization (Databases, Computer Vision, ...)
 - Related to academic areas
- A student can have multiple ACMs
- Useful for display & reporting, reservations, in curriculum timetabling, and student grouping (keep students of the same curriculum/group together)
- **Minors, Student Groups, Student Accommodations**



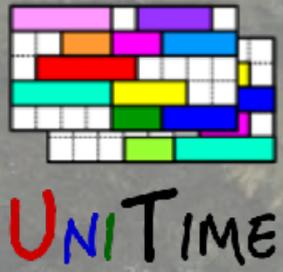


UniTime Setup

Best Practices: UniTime Setup

- Make sure UniTime has enough memory, especially for the solver
- Departments & subject areas need to be carefully defined
 - Instructors, room sharing, data entry / access
- Distributed or centralized data entry and/or timetabling
 - Most often: distributed data entry, centralized timetabling
- Student Course Demands
 - Last-like demands are the easiest to get, but may not be as good
 - Student course requests allows for individual students to be considered
 - Curricula are good, when available
(can be combined with last-likes for optional course estimates)

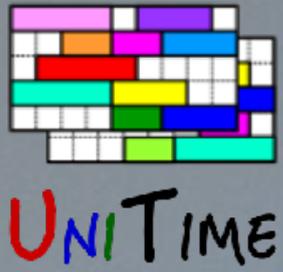




UniTime

Course Timetabling: Data Entry





Course Timetabling

Data Entry

- Courses
- Rooms
- Instructors
- Relations between courses / classes (distribution preferences)
- Student course demands

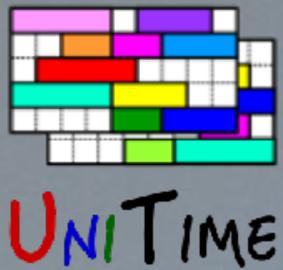
Timetabling

- Running the solver
- Manual changes

Additional Administrative Tasks

- Academic session setup
- Roll-forward



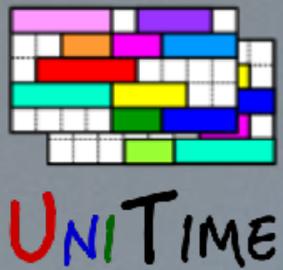


Course Structure

Instructional Offering

	Limit	Date	Pattern	Minutes Per Week	Time Pattern	Time	---Preferences---		
							Room	Distribution	Instructor
MA 170	40		Statistics I						
STAT 170			Introductory statistics						
Lecture	40	Full Term		50	1 x 50		Classroom		
Laboratory	40	Full Term		150	3 x 50		EDUC CompPr	Same Room	
Lec 1	40	Full Term		50	1 x 50		ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith





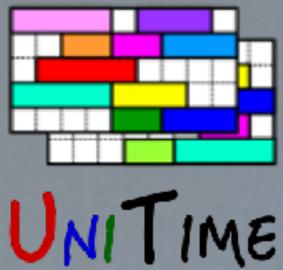
Course Structure

Instructional Offering

Course Offerings

	Limit	Date	Pattern	Minutes Per Week	Time Pattern	Time	---Preferences---		Instructor
							Room	Distribution	
MA 170 STAT 170	40		Statistics I Introductory statistics						
Lecture	40	Full Term		50	1 x 50		Classroom		
Laboratory	40	Full Term		150	3 x 50		EDUC CompPr	Same Room	
Lec 1	40	Full Term		50	1 x 50		ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith





Course Structure

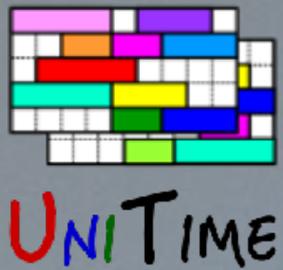
Instructional Offering

Course Offerings

Scheduling Subparts

	Limit	Date	Pattern	Minutes Per Week	Time Pattern	Time	---Preferences---		
							Room	Distribution	Instructor
MA 170 STAT 170	40		Statistics I Introductory statistics						
Lecture	40	Full Term		50	1 x 50		Classroom		
Laboratory	40	Full Term		150	3 x 50		EDUC CompPr	Same Room	
Lec 1	40	Full Term		50	1 x 50		ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith





Course Structure

Instructional Offering

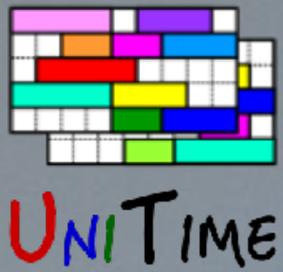
Course Offerings

Scheduling Subparts

Classes

	Limit	Date	Pattern	Minutes Per Week	Time Pattern	Time	---Preferences---		Instructor
							Room	Distribution	
MA 170	40		Statistics I						
STAT 170			Introductory statistics						
Lecture	40	Full Term		50	1 x 50		Classroom		
Laboratory	40	Full Term		150	3 x 50		EDUC CompPr	Same Room	
Lec 1	40	Full Term		50	1 x 50		ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term		150	3 x 50		EDUC CompPr	Same Room	J. Smith





Dates and Times

Date Patterns

- Weeks of instructions (All weeks, Even/Odd weeks, Week 5, ...)

March 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
10	1	2	3	4	5	6	7
11	8	9	10	11	12	13	14
12	15	16	17	18	19	20	21
13	22	23	24	25	26	27	28
14	29	30	31				

April 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
14				1	2	3	4
15	5	6	7	8	9	10	11
16	12	13	14	15	16	17	18
17	19	20	21	22	23	24	25
18	26	27	28	29	30		

May 2015

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
18						1	2
19	3	4	5	6	7	8	9
20	10	11	12	13	14	15	16
21	17	18	19	20	21	22	23
22	24	25	26	27	28	29	30
23	31						

Time Patterns

- Possible time slots within a week

2h

	from:	7:30a	8:25a	9:20a	10:15a	11:10a	12:05p	1:00p	1:55p	2:50p	3:45p	4:40p	5:35p	6:30p
	to:	9:10a	10:05a	11:00a	11:55a	12:50p	1:45p	2:40p	3:35p	4:30p	5:25p	6:20p	7:15p	8:10p
Mon		Discouraged	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Tue		Discouraged	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Wed		Discouraged	Strongly Preferred	Strongly Preferred	Preferred	Neutral	Neutral	Neutral	Neutral	Discouraged	Strongly Discouraged	Strongly Discouraged	Prohibited	Prohibited
Thu		Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

Required	Required
Strongly Preferred	Strongly Preferred
Preferred	Preferred
Neutral	Neutral
Discouraged	Discouraged
Strongly Discouraged	Strongly Discouraged
Prohibited	Prohibited



Rooms

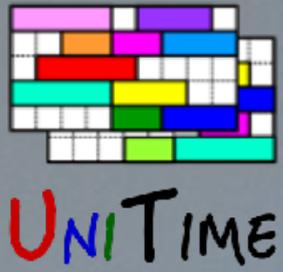
- Each department may have a different set of rooms
- Some times may be unavailable or given to a different department

K 73

Workdays × Daytime																						
	from: 7:30a	8:00a	8:30a	9:00a	9:30a	10:00a	10:30a	11:00a	11:30a	12:00p	12:30p	1:00p	1:30p	2:00p	2:30p	3:00p	3:30p	4:00p	4:30p	5:00p	5:30p	6:00p
	to: 8:00a	8:30a	9:00a	9:30a	10:00a	10:30a	11:00a	11:30a	12:00p	12:30p	1:00p	1:30p	2:00p	2:30p	3:00p	3:30p	4:00p	4:30p	5:00p	5:30p	6:00p	6:30p
Mon																						
Tue	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL	BIOL
Wed	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC													
Thu	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC	CIVC													
Fri	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

- Room coordinations, travel times

	A 50	D 20	K 73	140A	JAMU	
A 50			5	5	19	22
D 20		5		0	17	20
K 73		5	0		17	22
140A		19	17	17		10
JAMU		22	20	22	10	
	A 50	D 20	K 73	140A	JAMU	



Room Preferences

Minimal Room Size

- Calculated from class limit and room ratio

Room Preferences

- Particular room or building
- Room group
- Room feature

Room Groups:	Geology Classroom (Department) Classroom
Rooms:	B 11
Buildings:	Y - Porici 7, budova Y
Room Features:	Data Projector
Available Rooms:	34 (A 51, A 53, A 54, A 55, ...)

Required Strongly Preferred Preferred Neutral Discouraged Strongly Discouraged Prohibited

Instructors

- Each department has a list of instructors
 - Connection between departments through external id
- Instructor availability (prohibited times)
- Instructor preferences & requirements
 - Time, room, distribution

Preferences

Time:

Workdays × Daytime

Horizontal

	from: 7:30a	8:00a	8:30a	9:00a	9:30a	10:00a	10:30a	11:00a	11:30a	12:00p	12:30p	1:00p	1:30p	2:00p	2:30p	3:00p	3:30p	4:00p	4:30p	5:00p	5:30p	6:00p	6:30p
Mon																							
Tue																							
Wed																							
Thu																							
Fri																							

■	Strongly Preferred
■	Preferred
■	Neutral
■	Discouraged
■	Strongly Discouraged
■	Prohibited

Room Groups: **Computer Lab**

Buildings: **D - Porci 31, budova D**
K - Porci 31, budova K

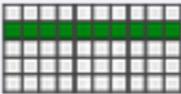
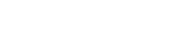
Room Features: **Interactive Blackboard**
Plano

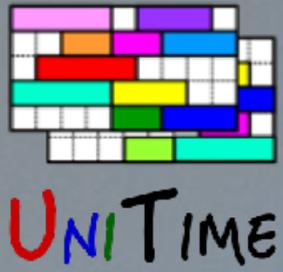
Distribution: **At Most 5 Hours A Day**

■ Required
 ■ Strongly Preferred
 ■ Preferred
 ■ Neutral
 ■ Discouraged
 ■ Strongly Discouraged
 ■ Prohibited

Combination of preferences

- Preferences can be set on scheduling subpart, class, or instructor
- The end result is displayed on the class and used by the solver

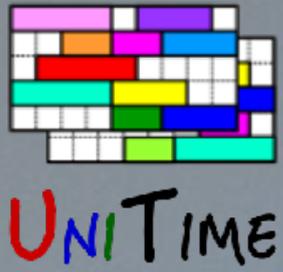
	Limit	Date	Pattern	Minutes	Per Week	Time	Time	---Preferences---		
								Room	Distribution	Instructor
MA 170	40		Statistics I							
STAT 170			Introductory statistics							
Lecture	40	Full Term		50	1 x 50			Classroom		
Laboratory	40	Full Term		150	3 x 50			EDUC CompPr	Same Room	
Lec 1	40	Full Term		50	1 x 50			ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term		150	3 x 50			EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term		150	3 x 50			EDUC CompPr	Same Room	J. Smith



Distribution Preferences

- Relationship between two or more classes
- Examples
 - Back-To-Back
 - Same Room
 - Same Days
 - Meet Together
 - At Most 6 Hours A Day
 - Can Share Room
- Set directly between classes / subparts or on an instructor





Student Course Demands

Curricula

- For a group of students
 - Identified by their academic area, major, and classification
- Requested enrollment
- List of courses and their expected attendance
- Courses can be grouped together (same / different students)

Course Projections

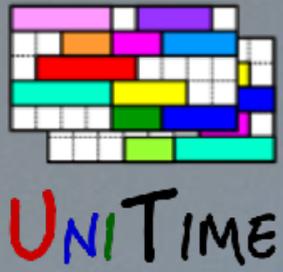
Group	Course	01
Required	ALG 101	100.0%
Required	CALC 101	100.0%
Elective	ENGL 101	60.0%
Elective	SPAN 101	40.0%
	BIOL 101	10.0%
	CHM 101	20.0%

Course Projections

Group	Course	01	
M1 and M2	M or N or O	M1	50.0%
M1 and M2		M2	50.0%
N1 and N2	M or N or O	N1	30.0%
N1 and N2		N2	30.0%
O1 and O2	M or N or O	O1	20.0%
O1 and O2		O2	20.0%

Other possible sources: historical enrollments, course requests, or their combination





Student Course Demands

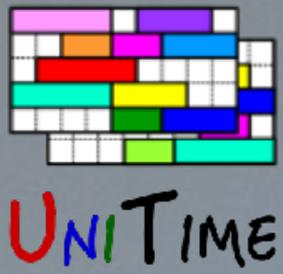
Student Course Requests

- A list of courses for each student
 - The courses the student would like to enroll into
 - Ordered by priority (example: mandatory courses first)
- Can be used as input for the student scheduling (that is, creating a schedule of classes for each individual student)

Course Requests

					↓ Wait-List
1. Priority	ENGL 101	+ 🔍 ✕	<input type="checkbox"/>	↓	🗑️
2. Priority	ECON 101	+ 🔍 ✕	<input type="checkbox"/>	↑ ↓	🗑️
3. Priority	ALG 101	+ 🔍 ✕	<input type="checkbox"/>	↑ ↓	🗑️
4. Priority	PHIL 101	+ 🔍 ✕	<input type="checkbox"/>	↑ ↓	🗑️
5. Priority	or a free time, e.g., Free MWF 7:30 - 8:30	🔍 ✕	<input type="checkbox"/>	↑ ↓	🗑️





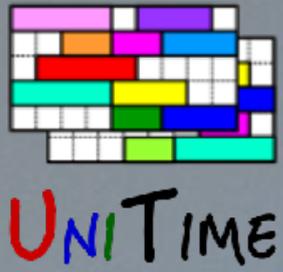
Data Entry: Instructors

Best Practices: Instructors

- Use instructor preferences in combination with subpart preferences
 - Especially time availability and preferences
- Useful Distribution Preferences *
- Max N Hours
- N Hour Work Day
- Max Blocks
- Max Breaks
- N Days a Week

*) Some need to be registered first, see <https://goo.gl/ufqW1t> for the scripts.



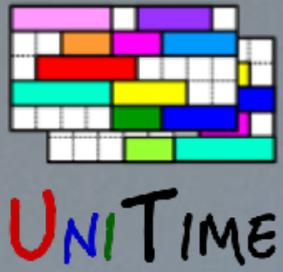


Data Entry: Preferences

Best Practices: Courses

- There can be multiple configurations
(with different instructional method, e.g., traditional x online)
- If a class does not follow a standard time pattern, it could be split
- Reservations can be used to direct students to the appropriate configurations / classes
- Use cross-lists whenever a course is offered under multiple names
- Meet together constraint can be useful, but use it wisely
- Externally managed departments can be used to timetable some classes as a different problem (large lecture rooms, computing labs)
 - It is possible to move control of such classes from the department of the course to the external department with a status change





Data Entry: Preferences

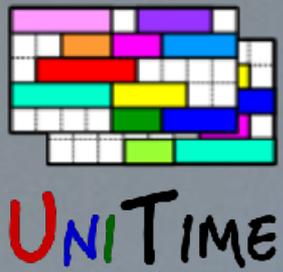
Best Practices: Subparts and Classes

- Minimal room size: room ratio times class limit
- Classes of a scheduling subpart are spread in time (can be disabled)
- Only matching time patterns are visible
 - *E.g., minutes per week = number of meetings × minutes per meeting*
- Too many start times result in a bad timetable
 - Too many small holes, hard to swap rooms

A34 153 (100)	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	1
Mon			np 2117 Sem 1			np 2065 Sem 1	np 2040 Sem 2	np 2040 Pfd 2	np 2119 Sem 1a				
Tue			np 2120 Sem 2	np 2120 Sem 1			bp 2272 Sem 3a 5.11. - 10.12.				bp 2058 Sem 1		
Wed	bp 2010 Sem 1		bp 3216 Sem 1 18.9. - 27.11.				np 2040 Pfd 1	np 2040 Sem 1			np 20		
Thu			bp 3216 Sem 2 25.9. - 4.12.									bp 22	7.11
			bp 2010 Sem 2		bp 2010 Sem 3								
			v 2025 Sem 1 19.12.										

A34 153 (100)	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	1
Mon			bp 2010 Sem 1								bp 3216 Sem 1 15.9. - 20.10.		
Tue					np 2120 Sem 2	bp 3216 Sem 1 16.9. - 21.10.				bp 2058 Sem 1		np	
			o 991 Sem 1 16.9. - 2.12.			bp 2272 Sem 4a 4.11. - 2.12.							
Wed					np 2040 Sem 4			np 2040 Sem 2			bp 2272 28.10.		
Thu					bp 2010 Sem 4			bp 2010 Sem 2			p 974 Sem 3 18.9. - 4.12.		





Data Entry: Preferences

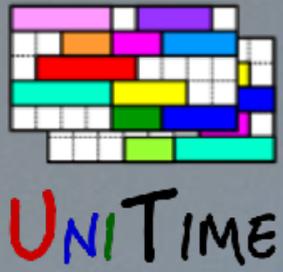
Best Practices: Preferences

- Preferences can be set on scheduling subpart, class, or instructor
- The end result is displayed on the class and used by the solver
- Put as many preferences as possible on instructors and subparts
 - Class overrides can be highlighted in yellow

`unitime.preferences.highlightClassPrefs`

	Limit	Date Pattern	Minutes Per Week	Time Pattern	Time	Room	Distribution	Instructor
----Preferences----								
MA 170	40	Statistics I						
STAT 170		Introductory statistics						
Lecture	40	Full Term	50	1 x 50		Classroom		
Laboratory	40	Full Term	150	3 x 50		EDUC CompPr	Same Room	
Lec 1	40	Full Term	50	1 x 50		ThtrSeat Classroom		G. Newman
Lab 1	20	Full Term	150	3 x 50		EDUC CompPr	Same Room	J. Smith
Lab 2	20	Full Term	150	3 x 50		EDUC CompPr	Same Room	J. Smith



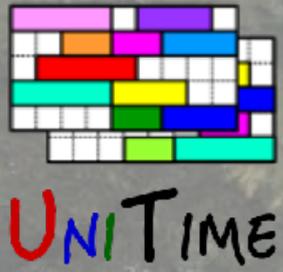


Input Data

Importance of having good input data

- The solution will only be as good as the input data
- No preferences
 - A class can end up anywhere (unpopular time, wrong room)
- Too many requirements
 - Impossible to find a complete timetable
 - Too many student conflicts
 - Difficult to make modifications





UniTime

Course Timetabling: Solver



Constraint-based Solver

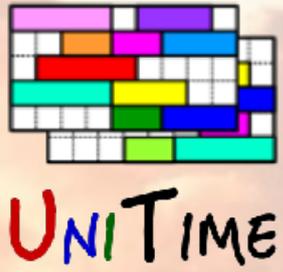
- Can be used in modes between manual and fully automated
- State of the art
 - Work published a number of research papers
 - Winner of the International Timetabling Competition 2007
- Easy to extend

Suggestions

<u>Score</u>	<u>Class</u>	<u>Date</u>	<u>Time</u>	<u>Room</u>	<u>Students</u>
+15.2	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 7:30a	BRNG 2280	+11
+31.7	POI 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+36 (h+3)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 1:30p	BRNG 2280 → BRNG 2290	
+36.6	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+36 (h+4)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 7:30a	BRNG 2280	
+44.1	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+34 (h+2)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 3:00p	BRNG 2280 → BRNG 2290	
	OBHR 330 Lec 1	Full Term	TTh 3:00p	BRNG 2290 → LWSN B155	

(all 15/1 possibilities up to 3 changes were considered, top 4 of 17 suggestions displayed)

[Search Deeper](#)

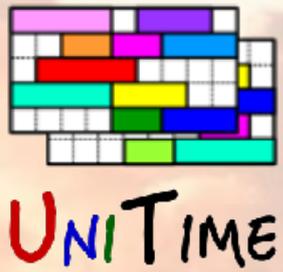


Problem

Model

- Variable: class
- Value: time and room placement
- Constraints: hard and soft





Problem

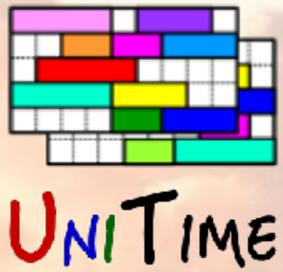
Model

- Variable: class
- Value: time and room placement

Hard Constraints

- Room size, sharing, availability
- No instructor / room can have two classes at the same time
- Required or prohibited preferences





Problem

Model

- Variable: class
- Value: time and room placement

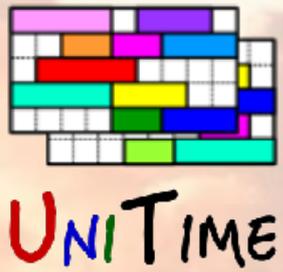
Hard Constraints

- Room size, sharing, availability
- No instructor / room can have two classes at the same time
- Required or prohibited preferences

Soft Constraint (Objectives)

- Time, room, and distribution preferences
- Student conflicts
- Additional criteria (too big rooms, back-to-back instructors, ...)

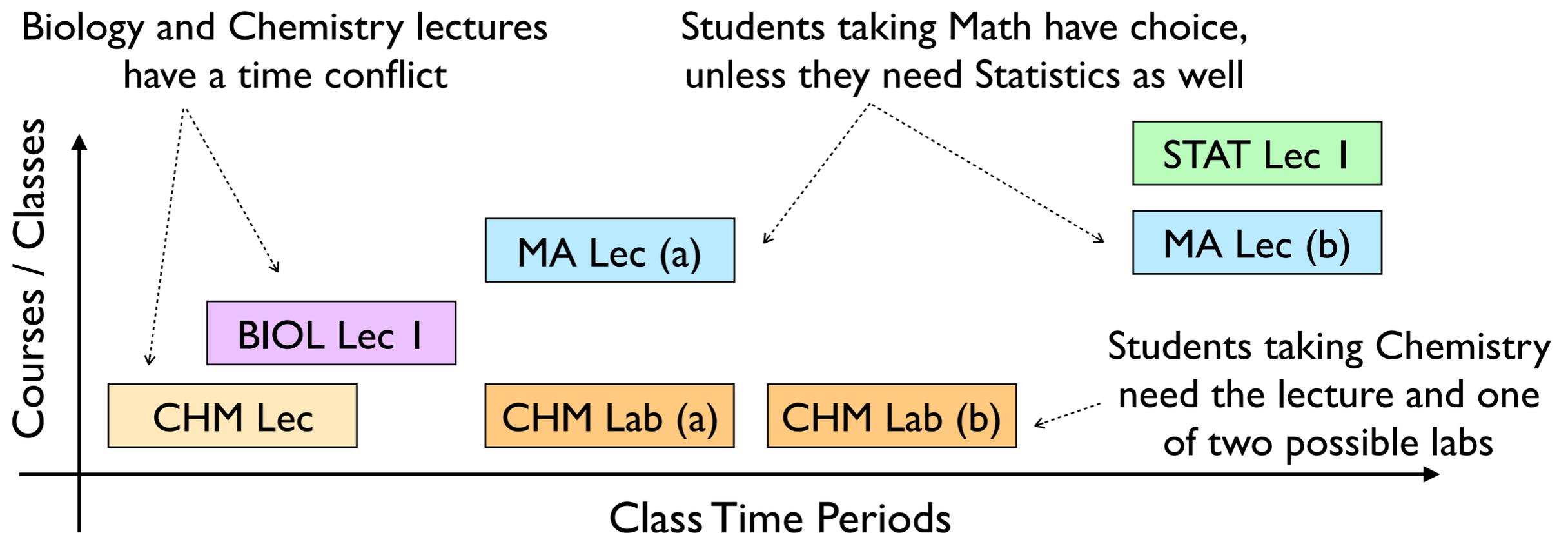


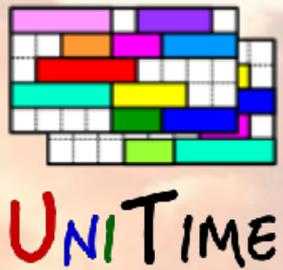


Student Conflicts

A student cannot take a combination of courses

1. Classes overlap in time
 - or one after the other in rooms that are too far apart
2. There is not enough space in a non-overlapping combination of classes





Timetabling: Step 1

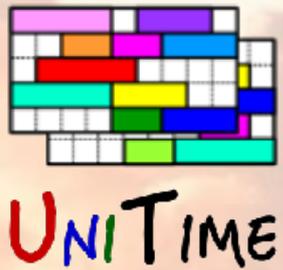
Using the Solver

I. Make sure the problem has a solution

- All classes are assigned
- Using check configuration
- Conflict-statistics can be used to discover issues

- [-] 15851× C S 110 Lec 1
 - [-] 6384× MW 1:30p - 2:20p Full Term EE 129 KING, ERIC J
 - [-] 6318× Instructor KING, ERIC J
 - [-] 5771× C S 110 Lec 2 ← MW 1:30p - 2:20p Full Term EE 129 KING, ERIC J
 - [-] 3541× MW 12:30p - 1:20p Full Term LILY 1105 KING, ERIC J
 - [-] 3019× Instructor KING, ERIC J
 - [-] 2931× C S 110 Lec 2 ← MW 12:30p - 1:20p Full Term LILY 1105 KING, ERIC J
 - [-] 3467× MW 12:30p - 1:20p Full Term EE 129 KING, ERIC J
 - [-] 3408× Instructor KING, ERIC J
 - [-] 2932× C S 110 Lec 2 ← MW 12:30p - 1:20p Full Term EE 129 KING, ERIC J
 - [-] 2459× MW 1:30p - 2:20p Full Term LILY 1105 KING, ERIC J
 - [-] 1268× Room LILY 1105
 - [-] 1265× BIOL 221 Lec 1 ← MWF 1:30p - 2:20p Full Term LILY 1105 SANDERS, DAVID
 - [-] 1191× Instructor KING, ERIC J
 - [-] 1191× C S 110 Lec 2 ← MW 1:30p - 2:20p Full Term LILY 1105 KING, ERIC J
- [+] 15840× C S 110 Lec 2
- [+] 2588× BIOL 221 Lec 1
- [+] 338× AGECE 217 Lec 3





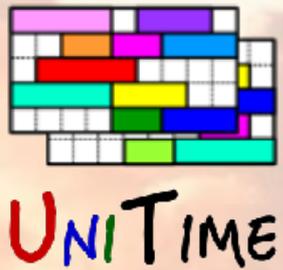
Timetabling: Step 2

Using the Solver

1. Make sure the problem has a solution
2. Run the solver to produce a timetable
 - Using default configuration
 - It is possible to iterate (if needed), or start the solver from the previous timetable

Type	Course Timetabling Solver
Solver	Solving problem ...
Phase	Improving found solution ...
Progress	5 of 100 (5.0%)
Owner	A. Root as ART & BIOL & CIVC & CZ & ENG & FRN & ...
Host	local <input type="button" value="Change"/> <input type="button" value="Refresh"/>
Session	Spring 2015 (ED)
Version	4.0.16
Assigned variables	100.00% (1813/1813)
Overall solution value	-17554.24
Time preferences	91.26% (-36722.00)
Student conflicts	807 [committed:0, distance:1, hard:177]
Room preferences	93.31% (-1385)
Distribution preferences	96.37% (-625.00)
Back-to-back instructor preferences	99.98% (1)
Too big rooms	19.84% (1280)
Useless half-hours	0.63% (0 + 1316)
Same subpart balancing penalty	36.58
Room Size Penalty	17.36
Perturbation variables	9.60% (154 + 8)
Perturbations: Total penalty	330.10
Time	0.06 min
Iteration	1940
Memory usage	1791.38M
Speed	520.45 M/s
Block Constraints	100% (0)
Important student conflicts	495 [hard: 34]





Timetabling: Step 3

Using the Solver

1. Make sure the problem has a solution
2. Run the solver to produce a timetable
3. Once there is a decent timetable
 - Make manual changes, using interactive configuration

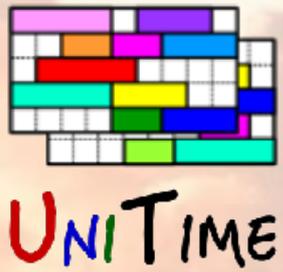
Score	Class	Date	Time	Room	Students
+15.2	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 7:30a	BRNG 2280	+11
+31.7	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+36 (h+3)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 1:30p	BRNG 2280 → BRNG 2290	
+36.6	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+36 (h+4)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 7:30a	BRNG 2280	
+44.1	POL 101 Lec 3	Full Term	TTh 12:00p → TTh 10:30a	BRNG 2280	+34 (h+2)
	HIST 342 Lec 1	Full Term	TTh 10:30a → TTh 3:00p	BRNG 2280 → BRNG 2290	
	OBHR 330 Lec 1	Full Term	TTh 3:00p	BRNG 2290 → LWSN B155	

(all 15/1 possibilities up to 3 changes were considered, top 4 of 1/ suggestions displayed)

Search Deeper

Solver Configuration: it is possible to tweak solver parameters if needed
(there is a tradeoff between times, rooms, distributions, and student conflicts)



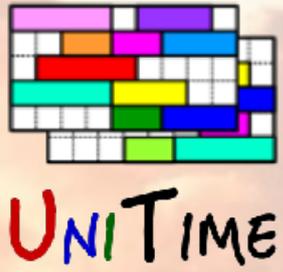


Timetabling: Making Changes

Making changes

1. Minimal Perturbation Mode (MPP)
 - When many changes are needed
 - Fully automated (default configuration with the mode set to MPP)
 - Additional criterion: changes from the initial solution
 - Different weights, e.g., time changes are usually more penalized
2. Once there is a timetable saved, use the interactive configuration
 - Can break some constraints
 - Solver provides suggestions, but does not make any decisions
3. When the timetable is published
 - Changes can be made without loading the data into the solver





Cooperation on Timetabling

Decentralized Timetabling

- Defined by solver groups
 - One or more departments that are to be solved together
- Committed solutions of other problems are used as basis
- Multiple problems can be solved together, manual changes can be made separately

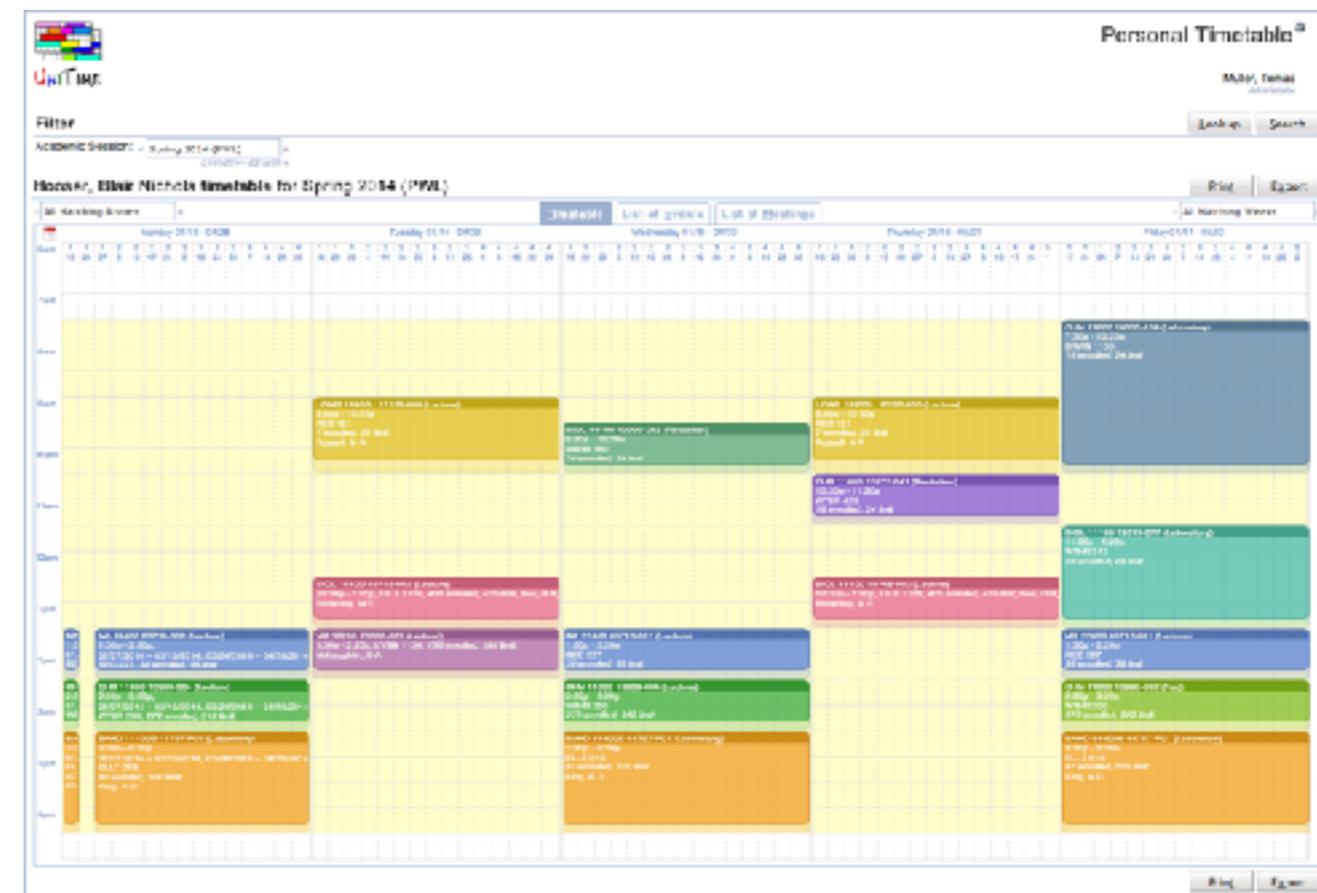
Externally Managed Classes

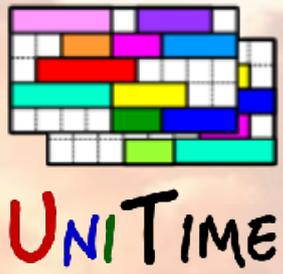
- For instance, distance learning classes are solved separately
- Different set of rooms
- Timetabled before or after the departmental problems
- Other examples: large lecture rooms, computing labs, need room



Publication

- A committed timetable can be published by changing the status on the academic session
- Instructors and students can see the timetable
- Next steps
 - Export to an external system
 - Student scheduling
 - Examination timetabling
 - Event management





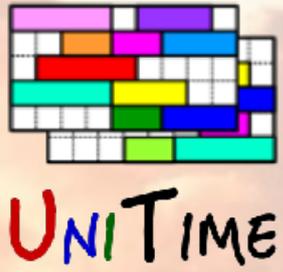
Best Practices: Timetabling

Best practices: Solver

- Multiple problems can be timetabled together
- Multiple solutions can be saved
- It is important to commit a solution when you wish the assignments to show in other problems
- Use distribution preference priority for problems that are solved before or after the departmental problems (see Departments page)
- Use Reload Input Data when there is a change in the inputs

- Use Chameleon if you want to run several solvers at once
- Create several timetables, then choose the best one



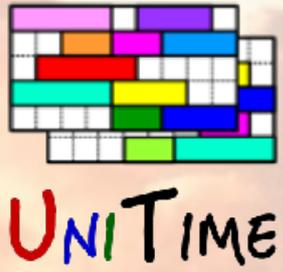


Best Practices: Timetabling

Best practices: Solver parameters

- Optimization can usually be achieved by setting up a combination of solver parameters
- Example: Hard conflict weights
- Example: No student conflicts
- Example: Times are way more important than rooms
- Distance conflict settings (student speed, distances between non back-to-back classes, ...)
- Automatic distribution constraints
- ...
- Try experiment with various solver settings



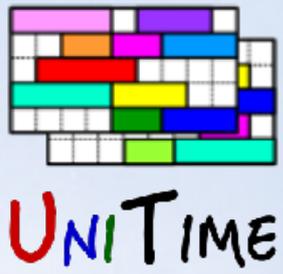


Best Practices: Timetabling

Best practices: Making Changes

- Use the Interactive solver (from the Timetables page) to be able to break some hard constraints
- MPP penalization can tell the solver what changes are hard
- Do not use the solver when students are already being enrolled, use Class Assignment page instead

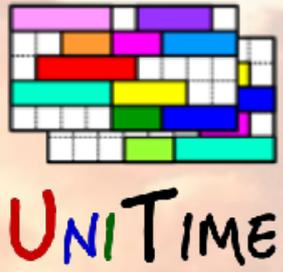




UniTime

Publishing Timetable



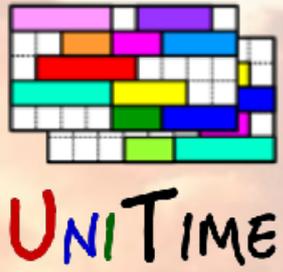


Solution Commit

Solution Commit

- There can be multiple solutions saved for each problem (solver group)
- The final one needs to be committed
 - This will tell the other problems what times are taken
 - This will create course related events
 - This will send the class schedule to Banner
 - Other departmental schedule managers will be able to see the schedule (Class Assignments, Events)
- A commit may fail if there is a conflict
- It is still possible to make changes
- Students and instructors cannot see the schedule just yet



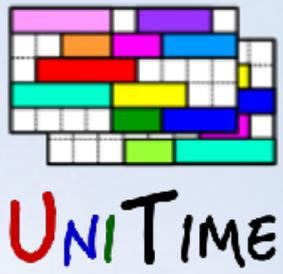


Solution Commit

Other Considerations

- If you like the solution, use Save & Commit (especially if multiple rooms are being shared)
 - Room sharing: Free For All
 - Instructor sharing: same external Id
- If some critical resources are being shared, it is advised to
 - run the solver for multiple departments first,
 - save and commit,
 - and then let each department make changes

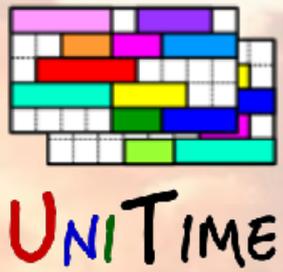




UniTime

Course Management

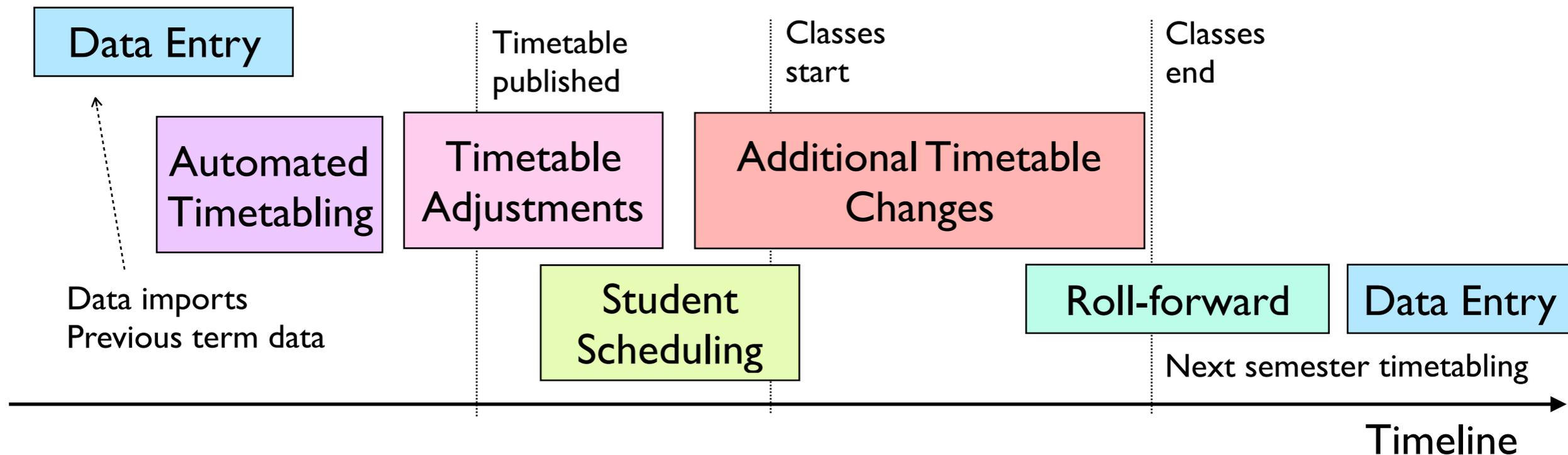


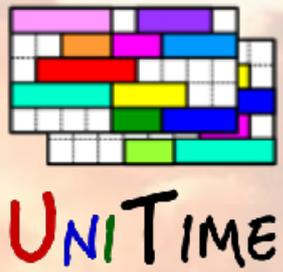


Course Management

Lifecycle of a Course Timetable

1. Data entry
2. Automated timetabling (solver is used to compute a timetable)
3. Timetabling adjustments (interactive changes)
4. Student scheduling, classes start
5. Additional, ad-hoc (mostly room) changes made throughout the term
6. Roll-forward of selected data into the next like term





Making Changes

Once there are students enrolled

- It is no longer practical to run the solver to make a change
- Most changes are room swaps
- Use Class Assignment page instead
 - Select a new time and/or room
 - Conflicts are checked
 - It is possible to override a lot of constraints
 - Student conflicts are displayed
- Class Detail > Class Assignment

UNI Class Assignment

Class ECET 49900D Lec 1

Manager: 1415 - Electrical & Comp Engr Tech
Class Division/Section: 17563081
Enrollment: 11
Class Limit: 15
Number of Rooms: 1
Room Ratio: 1.0 (Minimum Room Capacity: 10)
Conflict Checked Instructo(r)s: McNally, Helen
Assigned Time: TTh 12:00p - 1:15p
Assigned Room: KNOY B015
Selected Time: TTh 12:00a - 11:45a

New Assignment(s)

Class	Instructor	Time Change	Room Change
ECET 20700 Lec 1	Hendell, Jeffrey	TTh 12:00a - TTh 12:00p	KNOY B016
ECET 49900D Lec 1	McNally, Helen	TTh 12:00a - TTh 12:30a	KNOY B016 - Select below ...

Do not unassign conflicting classes:

Student Conflicts

Student	Class	Time	Room
1	ECET 20700 Lec 1 CR 200000 Lec 4	TTh 12:00a - 1:15p TTh 12:00p - 1:15p	KNOY B016 BRNA F061

Available Times for ECET 49900D Lec 1

TTh 7:30a - 8:45a 0; TTh 9:00a - 10:15a 2; TTh 10:30a - 11:45a 0; TTh 12:00a - 1:15p 1; TTh 1:30p - 2:45p 5; TTh 3:00p - 4:15p 4; TTh 4:30p - 5:45p 2;

Available Rooms for ECET 49900D Lec 1 (selected size: 1 of 10)

Size: 16 - 50 Filter: Allow conflicts: All rooms: Order: Name (asc) Apply

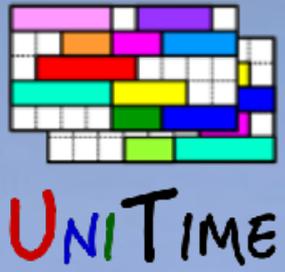
Room Types: Classrooms Computing Labs Teaching Labs
 Left Rooms Conference Rooms Special Use Rooms
 Building Lobbies Outside Locations Non-University Locations

Room Groups: Central Campus Classroom North Campus
 Fenwick Campus South Campus Village Area

Room Features: 2 Computer Projectors Audio Recording Chalkboard ~ 20 Ft. Chalkboard ~ 20 Ft. Computer Cluster Seat Computer Column Seat
 CompLab How Seating Computer Computer Projection
 Document Camera ECHC360Audio4Video Fixed Seating
 Horseshoe Arrangemt Mac PC
 Sympodium Tables and Chairs Tablet Arm Chairs
 Theater Seats Taper Seating

KNOY-DIA 31; KNOY B016 60; MGL 1210 16; MGL-D14 22; MGL-1004 16; MGL-1002 30
MGL-1209 16; MGL-1204 20; MGL 1204 20; MGL-1208 20;

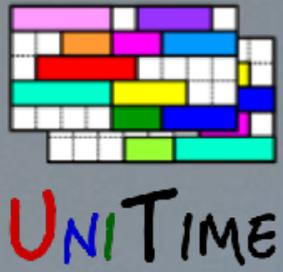
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UniTime

Examination Timetabling



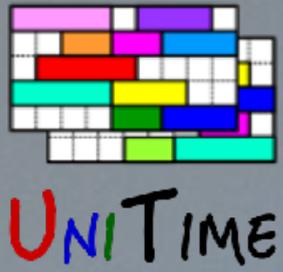


Examination Timetabling

What is Examination Timetabling?

- The process of assigning examinations to time periods and locations
- A difficult optimization problem with many competing objectives
 - Student conflicts, faculty requirements, space constraints





Examination Timetabling

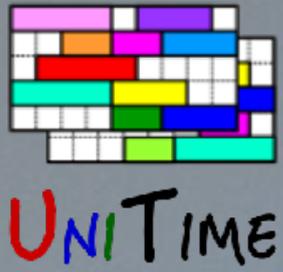
What is Examination Timetabling?

- The process of assigning examinations to time periods and locations
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Why is it needed?

- The traditional process of mapping lecture times to examination periods does not really work
- More choices for courses mean more potential scheduling conflicts
- Make process easier to manage, fairness and satisfaction, what-ifs





Examination Timetabling

What is Examination Timetabling?

- The process of assigning examinations to time periods and locations
- A difficult optimization problem with many competing objectives
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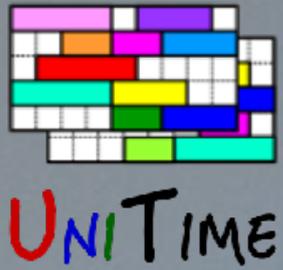
Why is it needed?

- The traditional process of mapping lecture times to examination periods does not really work
- More choices for courses mean more potential scheduling conflicts
- Make process easier to manage, fairness and satisfaction, what-ifs

Many flavors

- Final examinations, evening examinations, mid-terms, ...
- Additional objectives





Examination Data

Input Data

- Examinations (*with students enrolled in them*)
- Periods (*not overlapping, can have various durations*)
- Rooms (*with capacities, availabilities, and period preferences*)
- Individual examination requirements and preferences
- Distribution constraints (*same/different room, same/different period, precedence*)

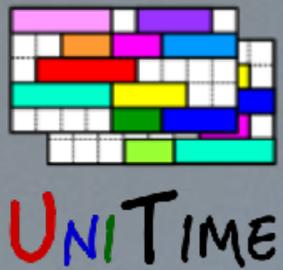
	from: 8:00a	10:30a	1:00p	3:30p	7:00p
	to: 10:00a	12:30p	3:00p	5:30p	9:00p
Mon 12/09					
Tue 12/10					
Wed 12/11					
Thu 12/12					
Fri 12/13					
Sat 12/14					

	Required
	Strongly Preferred
	Preferred
	Neutral
	Discouraged
	Strongly Discouraged
	Prohibited

Evening Examinations

- Mondays - Thursdays
- 6:30p - 7:30p or 8p - 10p
- 3 days & early / late
- 2-3 exams for a course
- Student availability



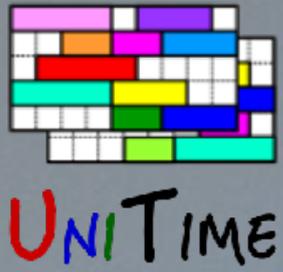


Example Data Entry

Final Examinations

↑ Classes / Courses	Length	Seating Type	Size	Max Rooms	Instructor	Period Preferences	Room Preferences	Distribution Preferences	Assigned Period	Assigned Room
MGMT 20000	120	Exam	881	4					Thu 12/12 7:00p	LAMB F101
MGMT 20010 50874-T01	120	Exam	205	4			PHYS 114 PHYS		Mon 12/09 8:00a	WTHR 200
MGMT 20100	120	Exam	437	4					Thu 12/12 3:30p	STEW 183
MGMT 29000B 23766-002	120	Exam	36	4			KRAN		Fri 12/13 10:30a	KRAN G016
MGMT 30400	120	Exam	115	4					Tue 12/10 1:00p	LILY 1105
MGMT 30500 23769-001	120	Exam	280	4			RAWL 1086	Same Per	Wed 12/11 1:00p	WTHR 200
MGMT 30500 23771-003							RAWL			WTHR 104
MGMT 30500 23772-004										
MGMT 30500 23770-002										
MGMT 30500 23773-005	120	Exam	70	4			RAWL 1062	Same Per	Wed 12/11 1:00p	WTHR 172
MGMT 30600	120	Exam	236	4					Mon 12/09 8:00a	STEW 183

Required
 Strongly Preferred
 Preferred
 Neutral
 Discouraged
 Strongly Discouraged
 Prohibited

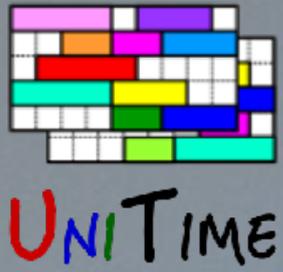


Examination Problem

Hard Constraints

- No two exams in the same period and room
- Examination must fit the period and room (or rooms)
- Room must be available
- An exam cannot be placed in a period or a room that is prohibited
- Required (*hard*) distribution constraints must be satisfied



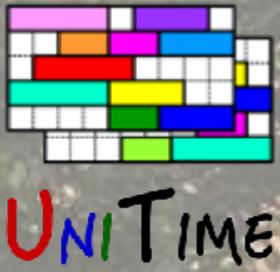


Examination Problem

Soft Constraints / Objectives

- Direct conflicts
 - More than two exams on a day
 - Back-to-backs
 - Period, room, and distribution penalties
- ... and a few others
- Minimize room splits (*and the distance between these rooms, if an exam is split*)
 - Distance to original room (*i.e., the room where the class took place*)
 - Large exams first
 - Rotation (*average period*)
- } student conflicts

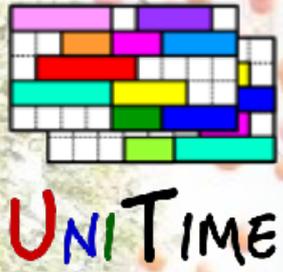




Event Management

- Management of the remaining classroom space
- Fully distributed, including an approval process
- No billing etc. (just room reservations)

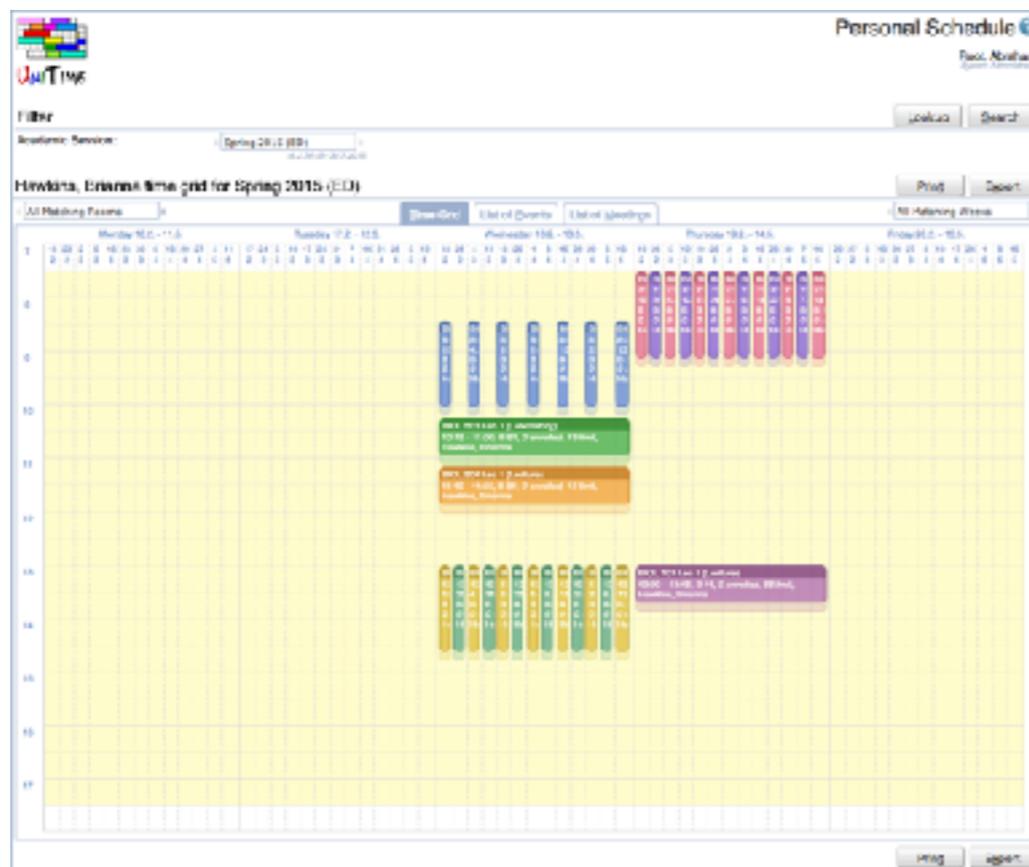




Classes / Exams

Published Timetable

- Academic session in Timetable Published state
- Events > Timetable
- Personal Schedule
- PDF, CSV, iCalendar Exports



The 'Subject Timetable' interface displays a list of classes for the Spring 2015 academic session. The list includes columns for Name, Section Type, Title, Date, Published Time, Location, Capacity, Instructor, and Sponsor. The classes listed are:

Name	Section Type	Title	Date	Published Time	Location	Capacity	Instructor / Sponsor
ENG 101L	1 Lecture	Phonetics and Phonology E	Mon 02/10, 2015 Mon 03/02, 2015 Mon 03/16, 2015 Mon 03/30, 2015 Mon 04/06, 2015 Mon 05/04, 2015	10:10a - 11:00a	A 40	30	Johnston, F
ENG 101L	2 Lecture	Phonetics and Phonology E	Mon 03/02, 2015 Mon 03/09, 2015 Mon 03/23, 2015 Mon 04/13, 2015 Mon 04/27, 2015 Mon 05/11, 2015	10:15a - 11:00a	A 57	30	Johnston, F
ENG 107	1 Lecture	Phonetics and Phonology E	Mon 03/02, 2015 Mon 03/09, 2015 Mon 03/23, 2015 Mon 04/13, 2015 Mon 04/27, 2015 Mon 05/11, 2015	10:15a - 11:00a	A 57	30	Johnston, F
ENG 117	1 Lecture	Phonetics and Phonology E	Fri 02/19 - 02/19, 2015	4:45p - 5:20p	B 5	30	Johnston, F Solo, R
ENG 225	1 Lecture	History and Culture of Great Britain	Tue 03/17 - 03/17, 2015	10:30p - 12:50p	B 5	30	Robert, N
ENG 226	1 Lecture	British Literature	Thu 03/19 - 03/19, 2015	11:10a - 11:55a	B 5	30	Winn, L
ENG 236	1 Lecture	System E	Tue 03/17 - 03/17, 2015	9:20a - 10:05a	A 53	20	Fuller, L
ENG 102L	1 Recitation	Grammar B	Mon 02/16, 2015 Mon 03/02, 2015 Mon 03/16, 2015 Mon 03/30, 2015	1:00p - 2:40p	A 57	30	Bowman, S



Published Schedule

Timetable Managers

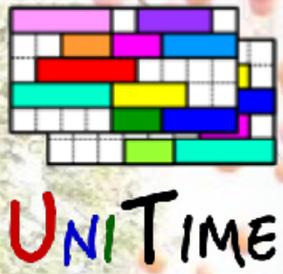
- Can use the Events pages to see a schedule once it is committed

Other Users

- Students, Instructors, No Role (authenticated users without a UniTime role), or even anonymous users (no authentication)
- Schedule must be committed
- Class Schedule: session status must allow for Class Schedule
- Examination Schedule: allow Final/Midterm Examination Schedule
- See Administration > Other > Status Types
- Permissions: user role must have Events permission

Event Management

- | | |
|-------------------------------|--|
| Events: | <input checked="" type="checkbox"/> <i>Event management is available to non-administrative users (when not set, all rooms are treated as with No Event Management status).</i> |
| Class Schedule: | <input checked="" type="checkbox"/> <i>Class schedule can be presented to unauthenticated users or authenticated users without a role.</i> |
| Final Examination Schedule: | <input checked="" type="checkbox"/> <i>Final examination schedule can be presented to unauthenticated users or authenticated users without a role.</i> |
| Midterm Examination Schedule: | <input checked="" type="checkbox"/> <i>Midterm examination schedule can be presented to unauthenticated users or authenticated users without a role.</i> |



Other Events

Other Events

- Need event management to be enabled
- Special Events (name, contact(s), meetings)
- Course-Related Events
- Not-Available Events

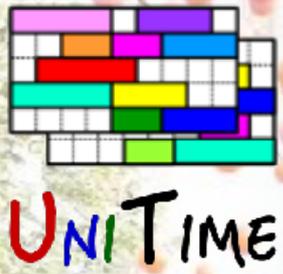
Approval Workflow

- Pending, Approved, Rejected, Cancelled
- Pending meeting can be deleted, approved can be only cancelled

Permissions

- Based on Event Department, Room Type pairs
- Can be overridden on individual rooms
- Request: authenticated users, departmental users, event managers
- Approval: automatically approved, event managers, no approval





Event Setup

Event Departments

- Academic session status must allow for Event Management
- Department must allow for events (Departments page)
- Rooms must be associated with an event department (Rooms page)
- Event status not *No Event Management* (Event Statuses, Rooms page)

Event Manager

- Event Manager role (usually related to one or more departments)
- May delegate other users (instructors) from the department

Other Properties

- Event confirmation emails (Application Configuration page)
- Can edit / approve past events (Permissions page)
- Allow modification of class or examination events (Permissions page)





Examples

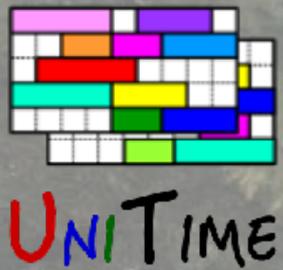
Examples

- Display schedule of a room, and a personal schedule
- Request a special event
- Approve an event

More Details

- Event Manual <https://goo.gl/QMQeoR>
- Event instruction sheet from Purdue University
<http://www.purdue.edu/registrar/documents/scheduling/Instructions-Sheet.pdf>

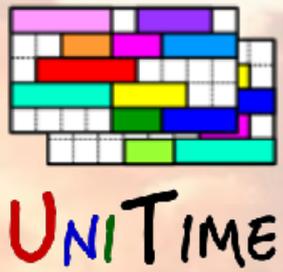




UniTime

Reporting





Exports

Exports

- Many pages have Export PDF or Export CSV buttons
- Events can be exported to iCalendar format
- For events and rooms, it is possible to subscribe to an export URL

The screenshot shows the UNITIME Personal Schedule interface. The main content is a time grid for a student named Brian time grid for Fal 2010 (woebegon). The grid displays various courses and their schedules. A modal window titled "iCalendar" is open, providing the following information:

iCalendar

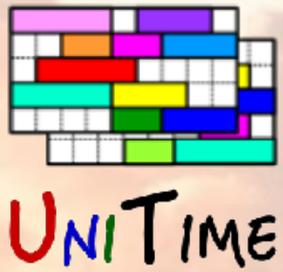
You can subscribe to the following iCalendar URL in your favorite calendar application. It will always show your up-to-date schedule.

<https://demo.unitime.org/UnitTimeExport?view=44b70mccx45466250evet5jgsm3310>

Please click OK to copy the calendar URL, and Close to hide this dialog.

Or you can download an iCalendar file by clicking the Download button below. While it is often easier to import an iCalendar file, such a calendar will not get updated automatically.

Buttons: Download, Close



HQL Reports

Custom Reports

- Custom reports can be written using HQL
- May contain parameters
 - E.g., %DEPARTMENT% will create a drop down with departments
- Requires a good knowledge of the UniTime data model

Exit Cross-listed Courses

Name: Cross-listed Courses

Description: List all courses of a given subject area (or subject areas) that are cross-listed.

Query:

```
select
  co.instructionalOffering, unique as ...Offering,
  co.subjectAreaAbb || ' ' || co.courseNum as Course,
  co.title as Course_Title,
  st.subjectAreaAbb || ' ' || cbr.counselor as Controlling,
  st.title as Controlling_Title
from courseoffering co, courseoffering cbr
where
  co.subjectArea in %SUBJECTS% and co.aControl is false and co.instructionalOffering = cbr.instructionalOffering
and cbr.aControl is true order by co.subjectAreaAbb, co.courseNum;
```

Flags:

- Appearance: Courses
- Appearance: Examinations
- Appearance: Student Sectioning
- Appearance: Events
- Appearance: Administration
- Restrictions: Administrator Only

Save Test Delete Back

UNI time Course Reports

Muller, Thomas / administrator Summer 2013 (FWL) [Click here to change the session / role.](#)

Filter

Report:

Description: List classes assigned into classrooms that are smaller than their limit.

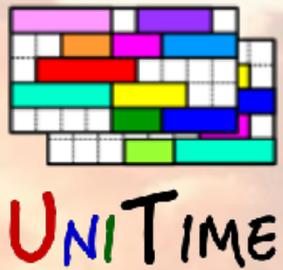
Subject Areas: AAE AAS ABE AD

Results Showing all 2 lines.

Class	Class Limit	Enr	Num Rooms	Rm Ratio	Room	Room Capacity	Room Type
AT 20300 Lab 1	20	0	1	0.0	NISW 110	16	Teaching Labs
STAT 59700 Lec 1 25		0	1	0.8	MATH G1R2 10		Other Dept Rooms

Version 3.4.249 built on Tue, 2 Jul 2013 © 2008 - 2013 UniTime LLC. This UniTime instance is not registered.
distributed under GNU General Public License.

See http://help.unitime.org/Course_Reports for more details.

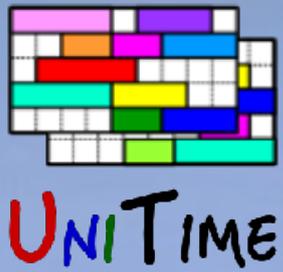


Scripts

- Using JSR 223: Scripting for the Java Platform
- JavaScript or Python, can call UniTime methods
 - For Python, put Jython Standalone JAR to Tomcat/libs
- Can have parameters (including a file)
- Can produce a file
- Convenient for additional administrative tasks, custom CSV imports and exports, etc.
- Some examples are available at <https://goo.gl/ufqW1t>
- Permission (users with the given permission can run the script)
- Requires knowledge of the UniTime code base
- Allows for automation (new in UniTime 4.3)
- Script API (new in UniTime 4.3)

See <http://help.unitime.org/Scripts> for more details.





Conclusion

UniTime

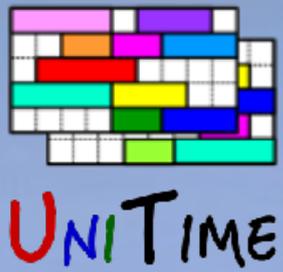
- Comprehensive system
- A lot to configure, customize, or otherwise to do
- But the defaults work well

For more details, please see us at the conference

- Getting Started with UniTime (Sunday, 9 am in Liszt)
- UniTime: State of the Project (Monday, 2:30 pm in Debussy)
- UniTime Introduction (Monday, 5:30 pm, Showcase Reception)
- Student Scheduling at Purdue University (Tuesday, 11:15am in Debussy)
- Internationalization of UniTime (Wednesday 11:00 am in Debussy)
- Or visit www.unitime.org

An online demo is available at <https://demo.unitime.org>





Conclusion

More Materials

- Online Help help.unitime.org
 - Installation Instructions help.unitime.org/Timetabling_Installation
 - Customizations help.unitime.org/Customizations
 - Localization help.unitime.org/Localization
 - Authentication help.unitime.org/CAS and help.unitime.org/LDAP
- Research Publications www.unitime.org/publications.php
- Presentations www.unitime.org/presentations.php
- Webinars www.unitime.org/webinars.php
- GitHub github.com/UniTime
- Downloads & Nightly Builds builds.unitime.org

An online demo is available at <https://demo.unitime.org>

