



### UniTime 4.2: Instructor Scheduling



UNITIME June 2017

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#### Agenda

- Short introduction of UniTime
- State of the project
- New features of UniTime 4.2
  - Instructor scheduling
  - Other features
- Next release (UniTime 4.3) & long term

This presentation is available at www.unitime.org/present/apereol7-instructors.pdf

St. A. H. Barres

Agenda

# UNITIME

### Introduction

### 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

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### State of the Project

#### **Releases / Achievements**

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- UniTime 4.2 to be released in June 2017
  - Following a steady schedule of one release every 15 months
- UniTime 4.3 is being spected out
  - Planned release Q3 2018
- 76 institutions from 42 countries filled our voluntary registration form during the last 12 months
- 55 institutions indicated that they use UniTime in production
- Steady increase in interest and adoption from literally around the world
  - USA, Czech Republic, Pakistan, Croatia, Poland, Turkey, Peru, Kuwait, Canada, Malaysia, Spain, UAE, Palestine, Zambia, Kenya,...
  - ... but still very little outside contributions
- Both sides of the interface with Ellucian Banner are now available



### New Release: UniTime 4.2

#### UniTime 4.2

- To be released in June 2017
- Brand new Instructor Scheduling component
- Mobile-friendly user interface
- Improved ability to keep students of a particular group together
- Point in time reports
- Many other improvements across the whole application

See https://goo.gl/4g1XQV (UniTime 4.2 Release Docs) for more details.



### Instructor Scheduling

#### Instructors

- Attributes: skills, qualifications, seniority, certifications, etc.
- Maximal teaching load
- Availability and preferences (on time and courses)
- Other: hiring cost, back-to-back / same day / same room preferences, ...

#### Courses

- Teaching requests (classes that need an instructor)
- Teaching load
- Number of instructors needed
- Requirements and preferences (instructor and attributes)
- Other: same course, same lecture preferences

**Goal:** assign instructors to classes in a way that maximizes satisfaction while all the constraints are met

### Instructor Scheduling

#### **Problem Description**

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- Assignment of instructors to classes
  - Automatic (using the solver)
  - Interactive (with conflict checking and suggestions)
- Respecting various constraints
  - Instructor availability, teaching load, required skill, no overlaps, etc.
- Optimization problem
  - Preferences on time, attributes, courses, instructors, etc.
  - Maximize original assignment (in MPP mode)
  - Minimize unused instructor load, etc.
- Instructors are assigned after the timetabling and student scheduling is done
  - Making use of student availability (for teaching assistants)
- Much like examination timetabling or (batch) student scheduling
  - Instructor assignments are committed (made visible, etc.) when done

See https://goo.gl/Zb2aES for the Instructor Scheduling manual.



### Instructor Scheduling Example

#### **Teaching Assistants for Chemistry**

- Each course has
  - One or more lectures (already assigned to a professor)
  - Many labs and practices (forming pairs and related to a particular lecture)
- Each teaching assistant should teach one or two pairs of a lab and a practice
  - Full time TAs get two assignments, half-time TAs get just one
  - A TA can only teach one course (both pairs must be of the same course)
  - Preferably of the same lecture (same professor)
  - Must be available for the classes and the lecture (he/she cannot be enrolled in an overlapping class as a student)
  - Each course may have a different set of skills and qualifications needed
  - Some (higher level courses) may require particular TAs
- Each course also needs one or two teaching assistant supervisors
  - These get assigned as course coordinators (do not show up for classes)

• TA supervisors should be available for most of the lectures



### Instructor Scheduling Example

						-Timetable	
		External Id	Limit	Time Pattern	Time	Room	Room Cap
	CHM 11100		240	General Ch	emistry		
	Lecture		240	2 x 50			
	Practice Study Observation		240	1 x 50			
	Laboratory		240	1 x 150			
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	Lab 1	13765-009	24	1 x 150	W 11:30a-2:20p	BRWN 1164	24
	Pso 2	13784-028	24	1 x 50	⊺ <b>7:30a-8:20a</b>	BRWN 3104	30
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1	Lab 3	13757-017	24	1 x 150	W 11:30a-2:20p	BRWN 1134	24
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## Instructor Scheduling Example

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### nstructor Scheduling Example

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Common: two assignment can share (typically the lecture) TA Supervisor gets assigned as course coordinator

### Instructor Scheduling Solver

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Same Lecture	100% (177)						
Time Overlaps	3 h						
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Unused Instructor Load	100% (0)						
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- Just like any other solver in UniTime
- Using the same constraintbased solver framework and algorithms, just a different constraint model
- Fully automated or interactive
- Variable: teaching request (one or more classes that need an instructor)
- Value: teaching assignment

   (assignment of an instructor to a teaching request)



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### Instructor Scheduling

#### More Features...

- Teaching conflicts reporting
- Data exchange and roll forward
- Teaching assignments in Scheduling Assistant

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°			Lab	7	0/1	w	3:00p	5:60p	Full Term	EDUC 106	J Novak	2	
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ĉ.	CALC	10100	Lec	A	0/4	MWF	7:30a	820e	Full Term	EDUC 101 (Display Name)	J Doe		
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5	PHAR	10100	Lec	1	1/4	т	8:30a	920a	Full Term	EDUC 101 (Display Name)			
h	ENGL	10100	Lec	6	0/1	MWF	1:30p	2.20p	Full Term	EDUC 103			
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### ther Features in UniTime 4.2

#### Mobile-friendly user interface

- All GWT-based pages are made responsive (this cover all pages accessible by students and instructors)
- Same look and content
- Only a few new components (like the menu or notifications)
- Some improvements to older (Struts-based) pages too



#### Course Requests

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You have made some changes in your schedule. Please click the Build Schedule button to update your registration.										
Version 4.2.1	built on ? © 2008 - 2017 The Apere	o Founda	lion, Iorekon d	, ,						
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### Other Features in UniTime 4.2

#### **Student Group Scheduling**

- Students of a group or a curriculum are kept together
- Additional criterion measuring probability of two students (of a group) attending the same class
- More powerful student sectioning algorithm (in course timetabling)
- Student preferences for instructional methods and individual sections

#### **Point In Time Reports**

• Snapshot of current state of students and their registration, class limits, etc.

- Using the Data Exchange page
- Multiple snapshots can be imported
- Full set of reports (weekly class hours, room utilizations, etc.)
- Roll forward

See https://goo.gl/4g1XQV (UniTime 4.2 Release Docs) for more details.



### Next Release: UniTime 4.3

#### UniTime 4.3

- Planned release: Q3 2018
- Student Scheduling
  - Interfaces, student schedule quality / fairness, ...
- Event Management
  - Event approval workflow, ...
- Continue the effort of making the user interface look & feel more modern, mobile friendly, and better localizable



### Conclusion

#### Long Term

- Constraint Solver: instructor and student scheduling, team building
- UI: moving from Struts to GWT, localization, documentation, mobile
- Interfaces: IMS Course Planning & Scheduling, more APIs and XMLs

#### For more details, please see us at the conference

- UniTime: Best Practices (Sunday, I:30pm 4:30pm in Flower)
- Case Study: UniTime at Masaryk University (Monday, Showcase Reception)
- UniTime 4.2: Instructor Scheduling (Tuesday, 10:15am 11:00am in Flower)
- Course Timetabling Around the World (Tuesday, 2:30pm 3:15pm in Flower)
- Or visit <u>www.unitime.org</u>

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