Universities/Campuses represented:

ATU Sligo
DCU
Maynooth University
MTU Cork
MTU CSM
SETU
TUS Limerick
TUS Midlands
UCC
UCD
UL
UniTime
University of Galway
University of Manchester

The first workshop for timetabling coordinators across the HEI space was held in a blended format with in-person attending in MTU and online attendees. We had 32 attendees across 10 Irish HEIs, with speakers both national (MTU/UCD) and international (University of Manchester, Purdue University, Materysk University).

The SATLE MTU team (Diarmuid Grimes, Ignacio Castineiras, Cemal Ozturk) gave a general introduction to the timetabling problem, including

- a discussion of different viewpoints affected (student/staff, environmental/societal impact, sustainability goals).
- a description of different ways of defining the problem: solve from scratch vs start from previous year, centralised vs decentralised, etc.
- a discussion of different timetabling software available, with a focus on the most widely used (Syllabus+), looking at how it solves the problem and how the choices made by the coordinator impact/influence the solving process.
- anaylsis of results of a student survey deployed in MTU.

Figure 1: Dr. Diarmuid Grimes and Dr. Ignacio Castineiras (MTU)

Prof. Patrick Grace spoke about his experience in UCD working on timetabling in UCD since the late 80s. In particular he spoke about the infrastructural changes in UCD (move to dedicated Enginnering building, lack of large lecture theatres for Engineering) and delivery changes (modularisation and semesterisation) over that time and their impact on the timetabling problem within the engineering department. He then described his own timetabling software tool (ttsearch) that he had developed initially just for his own dept, how this tool evolved to become the main timetabling tool for all engineering departments, and demo'd the different functionality and the logic behind their additions.

Figure 2: Prof Patrick Grace (UCD)

Prof. Steve Pettifer spoke about the Timetabling Project he lead for University of Manchester. This involved identifying best practice in moving from individual school-level timetable creation to a more coordinated, faculty-level approach, with clearer, standardized processes, better data, earlier timelines, and more fairness. Steve described the engagement process, which involved workshops with timetable schedulers in the different schools, followed by surveys of staff and students to understand their order of preferences amongst a set of predefined options.

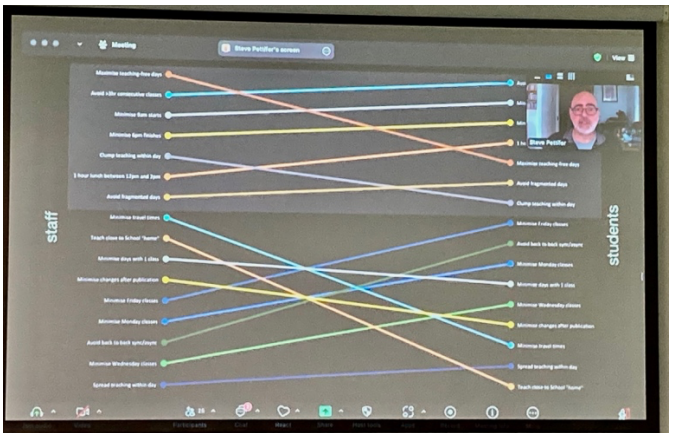

Figure 3: Prof. Steve Pettifer (University of Manchester)

Finally, Dr. Tomas Muller and Zuzana Mullerova delivered a more technical talk, describing the open source software tool *Unitime* (https://www.unitime.org/) they founded. This tool is used in a number of universities around the world (Purdue University and Masaryk University for example, where they each teach respectively) for handling different variants of the university timetabling problem.

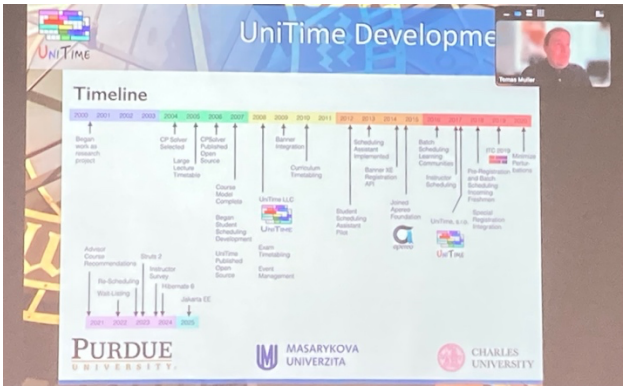

Figure 4: Dr. Tomas Muller (Purdue University)

Roundtable Discussion

The final session of the day was a hybrid roundtable discussion where the following points were discussed:

Minimal perturbation

Many attendees stated that they treat the problem as a minimal perturbation, where they start from last years' solution and adapt it to current requirements, minimising the number of changes year-to-year.

Steve made the point that one issue with this approach is that people who get a "bad" timetable are stuck with it. In Manchester they solve from scratch each year (with random tie breaking, etc. to achieve different timetables).

Note that this would more affect a member of staff than a student cohort since the latter would only experience it for the one year of their studies. On the flip side, staff may prefer the consistency of the minimal perturbation, even if it isn't ideal, over changing each year. This would particularly be the case where there may be additional factors for staff like children school runs etc, having to come up with a new solution to these additional factors each year might be much more of a detriment than having a non-ideal timetable (indeed such staff constraints might not be elicited until it becomes problematic).

Nevertheless, care should be taken when adding constraint to minimise changes, that it doesn't restrict from making improvements on previous timetable. For example, if the weighting in the scheduling preferences were greater for minimising changes than for minimising isolated activities, the solver would leave an isolated activity because it was in the same timeslot in the previous years timetable.

Electives

A number of attendees mentioned how electives are a big challenge from a timetabling perspective. Arts courses in particular are challenging from this perspective.

Data can be used to understand typical behaviour (e.g. numbers choosing each option, and combinations), with graph theory for maximising disjunct sets.

Some use pre-registration for electives, some have a policy that an elective will be open only if x number of students choose it.

Others allow students to attend electives for first few weeks at start of semester to allow students to get a feel for which one they would prefer, but this results in big challenges from a timetabling perspective.

Different variants

Timetabling across multiple campuses, with constraints about maximum daily travel between campuses due to distances (e.g. at most maximum change of 1, with morning block in campus A and afternoon block in campus B).

Integrated approach between departments/faculties requiring conflict resolution.

It was mentioned that hospitals are different, due to equipment etc.

Similarly campuses like CSM have very different requirements and so use different setup.

Over-constrained problem.

A point mentioned by Steve in his presentation that seemed to reach much consensus is that the number of constraints one poses when solving the problem matters. There is a point where a certain amount of constraints lead to good (and sensible) solutions. However, as the number of constraints keeps increasing, a zone of "zero sum" is

reached, where each change to a timetable to benefit "lecturer/class group/room A" comes by making it a worse timetable for "lecturer/class group/room B". Indeed, as the number of constraints keeps increasing, it eventually reaches a zone where no potential improvements are achieved for anybody.

Issues facing students

Large commutes is an issue (due to lack of housing, cost-of-living, etc).
This is another reason why students want compact timetables, it was mentioned the possibility of timetablers trying to add soft constraint of full day without contact (ideally Fridays), in other words that the solver would try to find a solution consolidated in 4 days a week.
However, a very important counterpoint to this, and one that students are possibly less aware of or at least factor less, is that it was commented that more compact timetables have been shown to result in a drop in passing rates.

Sustainability

The link between timetabling and sustainability was discussed, in particular the impact on transportation and energy consumption.

Software being used

The majority of attendees were using some variant of Technology One Sylabus Plus, with some using UniTime. Indeed, Tomas and Zuzanna stated that most of the universities using their software did so by starting small while thinking big (i.e., to start introducing UniTime by using it in a single department/faculty, with the aim of further integration in subsequent years).