

# University Timetabling

- Paul Ahern
- Constraint-Based programming
- OPL Studio 3.7

# Motivation

“When to the sessions of sweet silent thought,  
I summon up remembrance of things past,  
I sigh the lack of many a thing I sought,  
And with old tears new wail my dear time's waste.”  
- William Shakespeare, sonnet 30

# Year One Term Two

- Majority of Classes from outside department

Time	Mon	Tue	Wed	Thur	Fri
09:00	CS1100	MA1054	CS1100	MA1054	CS1100
10:00		CS1101			
11:00		MA1003	MA1003	EC1401	CS1102
12:00				EC1401	
13:00			CS1101		
14:00		CS1102	MA1054		
15:00			MA1015		
16:00	MA1015				
17:00					

Computer Science

Other Department

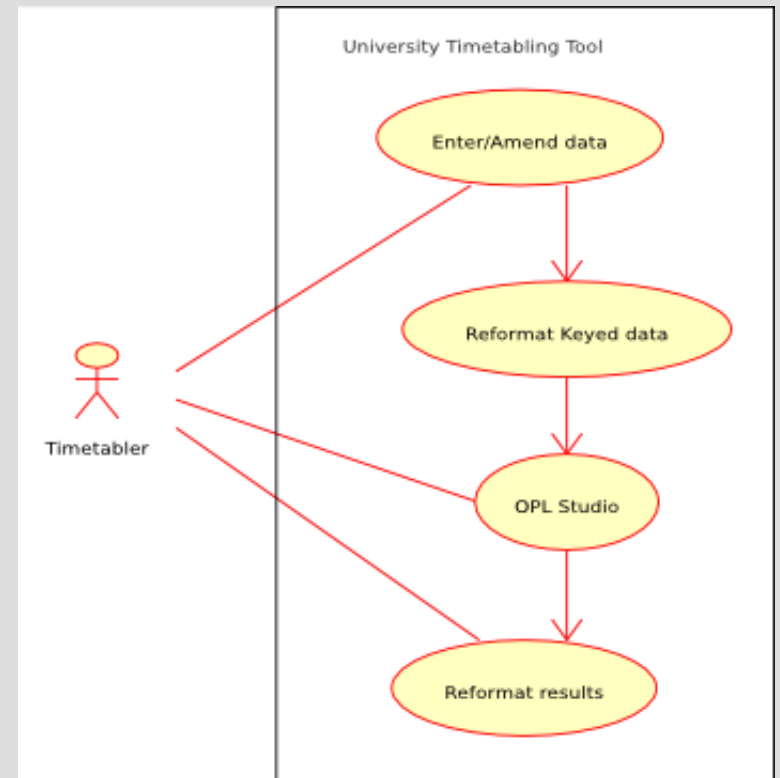
# OPL

- Optimisation Programming Language
- OPL Studio 3.7
- Sample OPL:

```
forall (c in Classes)  
    (RoomSize[Location[c]] >= ClassSize[c]);  
    //Room must be big enough
```

# Tool Structure

- 1) Enter timetable
- 2) Reformat data
- 3) Run OPL
- 4) Reformat results



# Keyed Data

//Lecturers and what Modules they can teach	Name	Taught Courses:		
ModulesTaught	Augustus	CS3316	CS6002	CS6001
ModulesTaught	Tiberius	CS3314	CS4408	CS7200
ModulesTaught	Caligula	CS4409	CS3315	CS2205
ModulesTaught	Claudius	CS2200	CS5205	CS4150
ModulesTaught	Nero	CS4402	CS2021	CS6004
ModulesTaught	Galba	CS5013	CS5012	CS2204
ModulesTaught	Otho	CS6003	CS3310	CS3306
ModulesTaught	Vitellius	CS560	CS4000	CS6002
ModulesTaught	Vespesian	CS2201	CS3313	CS1064
ModulesTaught	Titus	CS5201	CS5204	CS4409
ModulesTaught	Domitian	CS1100	CS4404	CS4001
ModulesTaught	Nerva	CS1102	CS1061	CS1063
ModulesTaught	Trajan	CS1063	CS1061	CS3305
ModulesTaught	Hadrian	CS4054	CS7400	CS4404

## CSV form:

```
//Lecturers and what Modules they can teach","Name","Taught  
Courses:",,,,,,,,,,  
"ModulesTaught","Augustus","CS3316","CS6002","CS6001","CS4405","CS4408","CS10  
64","CS1061",,,  
"ModulesTaught","Tiberius","CS3314","CS4408","CS7200","CS1102",,,,,,,,,
```

# Derived Data

```
ModulesTaught = #[
    Augustus: {CS4405, CS4408, CS1064, CS1061},
    Tiberius: {CS4408, CS1102},
    Caligula: {CS4409, CS5205, CS5201, CS5203},
    ...
]#;

LecturersForModule = #[
    CS4405: {Augustus, Antoninus, Cassius,
    Commodus, Elagabalus},
    CS4408: {Augustus, Tiberius, Nerva,
    Cassius},
    ...
]#;
```

# OPL Results

```
TimeTable, Slot, Day, HourOfDay, Module  
Lecturer Room  
CSYear5, 5, Mon, 14:00, CS555a Thrax E1  
CSYear5, 14, Tue, 14:00, CS555b Thrax E1  
CSYear5, 23, Wed, 14:00, CS560a Vitellius E1  
CSYear5, 32, Thur, 14:00, CS560b Vitellius E1  
CSYear5, 15, Tue, 15:00, CS565a Aurelius E1  
CSYear5, 24, Wed, 15:00, CS565b Aurelius E1  
CSYear5, 9, Tue, 9:00, CS567a Caesar E1  
CSYear5, 18, Wed, 9:00, CS567b Caesar E1
```



# Formatted Results

Note  
CS567  
at 09:00  
on Tue  
and Wed.

CSYear5	Mon	Tue	Wed	Thu	Fri
09:00		CS567a Caesar PF1	CS567b Caesar PF1		
10:00	CS563a Julianus PF1	CS563b Julianus PF1	CS5012a Galba PF1	CS5012b Galba PF1	CS5013a Macrinus PF1
11:00	CS5203a Commodus PF1	CS5013b Macrinus PF1	CS555a Thrax PF1	CS5205b Pertinax PF1	CS5014a Elagabalus PF1
12:00		CS5201a Caligula CeG10		CS5201b Caligula CeG10	CS5014b Elagabalus PF1
13:00			CS5205a Pertinax PF1	CS5203b Commodus PF1	
14:00	CS555b Thrax PF1	CS560a Vitellius PF1	CS560b Vitellius PF1		
15:00					
16:00					
17:00					

# Conclusion

- OPL Studio 3.7 lacks user-friendly means to import data.
- Timetable requirements ill-defined.
- Timetabling problem is over-constrained.
- A tool which shows what changes are available to an existing timetable more useful than one which generates timetables from scratch.

Questions?

