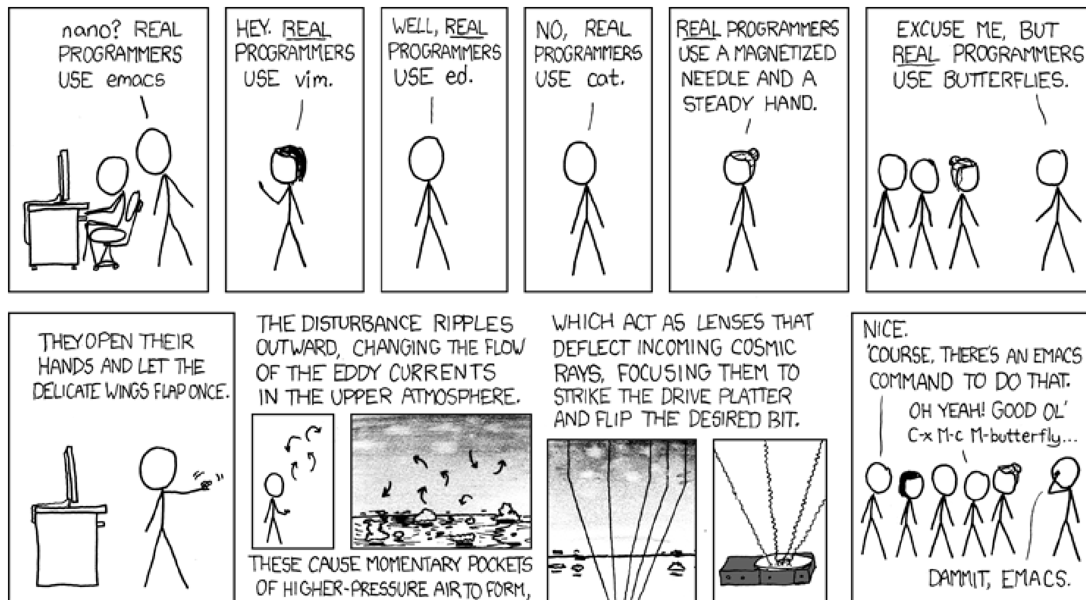
# Assignment 2: Give me your feature name and I'll call you

ETH Zurich

handout: Monday, 22 September 2014
Due: Wednesday, 1 October 2014




Real Programmers © Randall Munroe (http://xkcd.com/378)

## Goals

- Write more feature calls.
- Write your first standalone program.
- Get used to EiffelStudio (editor, navigation and debugger).
- Learn to distinguish between queries and commands.
- Learn what makes up a valid feature call.

## 1 Zurich needs more stations

In this task you will continue exploring Traffic and write more feature calls, with and without arguments.

## To do

1. Download `http://se.inf.ethz.ch/courses/2014b_fall/eprog/assignments/02/traffic.zip` and unzip it, copy the dir assignment_2 into directory traffic/examples and open `assignment_2.ecf` from within EiffelStudio. Look at the class *PREVIEW* again: you will see that the feature *explore* is now empty. If you run the program, you will see the map of Zurich and nothing else going on (nothing is highlighted or animated). In this task you will add feature call instructions to *explore* (between **do** and **end**) and check how they affect the map.

2. Let us add a new station to one of the tram lines in Zurich. To achieve that you will have to call a feature on the predefined object *Zurich*. Try to find out which feature it is: type *Zurich* followed by a dot, and go through the pop-up list until you see something that fits. Note that this feature requires some arguments: you have to provide Traffic with the name for the new station as well as its $x$ and $y$ coordinates. The name can be any text string you like in double quotes, for example **"Zoo"**. The coordinates are measured in meters starting from the city center. For example, $x = 1800$ and $y = -500$ would denote a location 1800 meters to the east and 500 meters to the south from the city center.

3. To add the new station to one of the existing tram lines invoke the feature *connect_station* on *Zurich*, giving it as arguments the line number and the name of the station.

4. If you run the program now, you won't see any changes on the map. This is because in Traffic we distinguish two kinds of objects: the model of the city (in our case *Zurich*) and its visual representation, the view (in our case called *Zurich_map*). Whenever you change the model, you have to let the view know that it has to update itself accordingly. Add a call to *Zurich_map.update* and you will see that the new station now appears on the map. If you would like the map to zoom automatically so that the new station fits on the screen, add a call to *Zurich_map.fit_to_window*.

5. Now let us attract some attention to the new station and make it blink. You can achieve that by highlighting and unhighlighting the view of the station several times in a row. In order to access the station view use the expression *Zurich_map.station_view* (...), which takes a station as an argument; to get to the station you can use *Zurich.station* (...), and provide the station name as an argument, for example **"Zoo"**.

   To make the blinking visible, call the feature *wait* after each highlight and unhighlight instruction, giving as an argument the number of seconds you want to wait. Notice that *wait* is not invoked as the other features, by using an object name and then a dot, but just as it is (it is an *unqualified call* [Touch Of Class, page 134]).

6. Let us find out where the feature *wait* comes from. As it appears in an unqualified call, it must be defined either in the same class or in an *ancestor* class. An ancestor class for a class $C$ is a class that $C$ *inherits* from. You may have noticed the **inherit** *ZURICH_OBJECTS* clause after **class** *PREVIEW*. It means that *PREVIEW* can use all the features defined in *ZURICH_OBJECTS*.

   In *PREVIEW* there is no *wait*, so let us check *ZURICH_OBJECTS*. Right-click on the label *ZURICH_OBJECTS* and choose the option "Retarget to class *ZURICH_OBJECTS*". You can also type "zurich objects" in the drop down box on the top left (labeled "Class").

   Let us now check the features of class *ZURICH_OBJECTS*. On the bottom of the right panel select the tab labeled "Features". You should now see a list of all the features defined in class *ZURICH_OBJECTS*, including *wait*.

   **Hint** There are two shorter ways to find *wait*. While in class *PREVIEW*, type "wait" in the drop down box labeled "Feature" above the editor window. Alternatively, right-click

on *wait* in the program text and then select "Retarget to Feature *wait*". This will bring up the desired feature in class *ZURICH_OBJECTS*.

**Hint** To check the list of all available features, press "Ctrl + Space" while in the editor window. To check the list of available features whose names start with a certain prefix, type this prefix and then press "Ctrl + Space" (see Figure 1). When you declare a variable or need a class name, to check the list of available classes whose names start with a certain prefix, type this prefix and then press "Ctrl + Shift + Space".

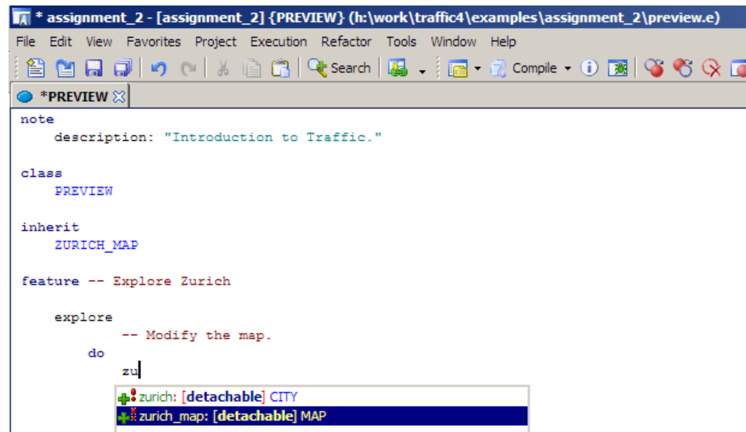



Figure 1: EiffelStudio's auto-completion feature

### To hand in

Hand in the code of feature *explore*.

## 2 Introducing yourself

In this task you will write your first standalone program (not based on Traffic). The program will introduce yourself to your assistant.

### To do

1. Download `http://se.inf.ethz.ch/courses/2014b_fall/eprog/assignments/02/introduction.zip` and unzip it to a directory of your choice.

   Open "introduction.ecf" in EiffelStudio. In the "Groups" tool on the right you can see that the whole project consists of a single class *APPLICATION*. Open this class in the editor. You will see that it has a single feature, *execute*, whose body is empty so far.

2. Modify the feature *execute* so that it prints the following text (replace the information about John Smith with your personal data):

   ```
   Name:  John Smith
   Age:  20
   Mother tongue:  English
   Has a cat:  True
   ```

   You can also add any other information you like.

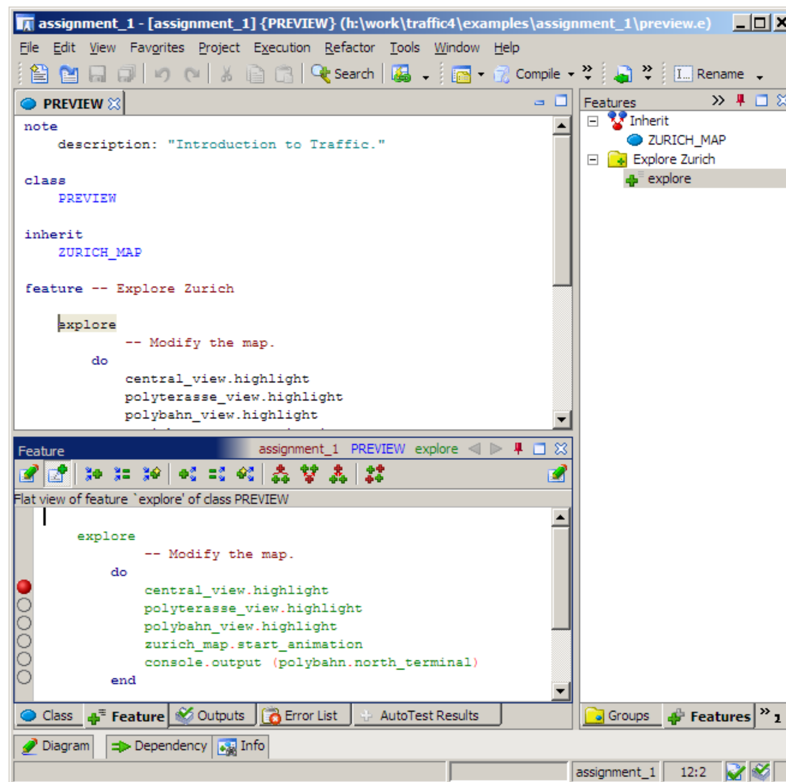



Figure 2: Setting a breakpoint

To do the printing you will use the predefined object called *Io* (input-output). The features you can call on *Io* are defined in the class *STD_FILES*. Browse this class to find the features you need. In particular pay attention to:

- feature *put_string* that takes a text string (e.g. **"Hello, world!"**) as an argument and prints it;
- feature *put_integer* that takes an integer number (e.g. 5) as an argument and prints it;
- feature *put_boolean* that takes a boolean value (**True** or **False**) as an argument and prints it;
- feature *new_line* that moves to the next line.

Compile and run your program. **Hint:** the console window with the program output does not automatically pop out on all platforms. If your program appears to be doing nothing, look for a minimized window. On Linux always start EiffelStudio from a console; then the output will be printed to the same console.

3. Until now you have compiled and executed a program without having the possibility to check what happened after every single instruction was executed. Now let us see how to use EiffelStudio in *debug mode* [Touch Of Class, page 170]. Being in debug mode means being able to observe the application execution instruction by instruction, therefore increasing the chances to discover errors ("bugs").

Right-click on the feature name *execute* in the program text and choose "Pick feature execute". Now right-click in the context tool (the area below the editor). The code of *execute* should now appear in the context tool, with gray circles on the left (see an example in Figure 2). These circles identify instructions that will be executed. Click on the first gray circle; it should become red. You have just set a breakpoint, at which the program will pause execution.

Now click the "Run" button (see Figure 3) or press "F5": the program will start, but almost immediately it will pause its execution at your breakpoint. Now you can observe the program behavior step by step by clicking the "Step" button (or pressing "F10"). To resume the normal execution click on the "Run" button again (or press "F5").

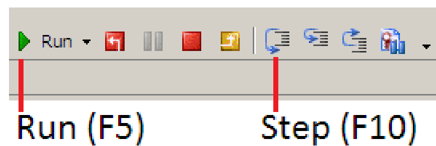



Figure 3: "Run" and "Step" buttons

### To hand in

Hand in the code of feature *execute*.

## 3 Command or Query?

### To do

Features listed below can be found in class *CITY*. You task is to find out which features are *commands* and which features are *queries* [Touch Of Class, page 29]. You are supposed to base your decision on the feature *definition* rather then its name (the name can give you a hint, but it can also be misleading sometimes). If the feature definition appears in the class text in the form:

*feature_name*: *CLASS_NAME* or *feature_name* (...): *CLASS_NAME*,

then it is a query. If it appears in the form:

*feature_name* or *feature_name* (...),

then it is a command.

Now for each of the following features in *CITY*, figure out whether it is a command or a query:

1. Feature *name*, as in *Zurich.name*.
2. Feature *buildings*, as in *Zurich.buildings*.
3. Feature *add_line*, as in *Zurich.add_line* (2, **"tram"**).
4. Feature *connecting_lines*, as in *Zurich.connecting_lines* (*central*, *polyterrasse*).
5. Feature *move_all*, as in *Zurich.move_all* (0.5).
6. Feature *north*, as in *Zurich.north*.

### To hand in

Hand in your answers.

## 4 MOOC: Objects and Classes

### To do

1. Access the main course web page at http://webcourses.inf.ethz.ch, click on the "This MOOC" hyperlink at the beginning of the first paragraph and register using your ETH email. After confirming the registration (you should receive an email) please enroll in the 2014/15 edition of the course, by clicking on the "Administration/course administration" menu and then on the "enroll me in this course" link on the bottom left of the course page (click on the 2014/2015 course link first, so that you can see the published units).
2. Listen to the short review lecture on Object and Classes.
3. Take the Object and Classes Quiz. Your goal is to provide all correct answers. You can take the quiz as many times as you want. If you succeed, you will be awarded a badge.