Subject: Fwd: our software development process
From: Joseph Picone <picone@temple.edu>
Date: 1/6/23, 4:32 PM
To: ECE 1111 <temple_engineering_ece1111@googlegroups.com>

This discussion is a bit advanced for you, but it exposes you to something we will stress this semester – software design.

We spend most of our time designing and documenting code. We spend the last amount of time actually writing the code. If you get the design correct, implementation is easy.

–Joe

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Subject: our software development process
Date: Fri, 6 Jan 2023 16:30:36 –0500
From: Joseph Picone <joseph.picone@gmail.com>
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I want to make sure everyone understands our software development process. Note that it does not start with writing code – it starts with designing the interfaces.

For a C++ class, we begin by writing the header file:

https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fisip.piconepress.com%2Ftmp%2Fisip_code%2Fifc%2Fclass%2Fsystem%2FChecksum%2FChecksum.h&
data=05%7C01%7Cjoseph.picone%40temple.edu%7C98c02b636e1241d6b50908daf02d8ee9%7C716e81efb52244738e3110bd02ccf6e5%7C0%7C0%7C638086375709956632%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0
%3D%7C3000%7C%7C%7C&sdata=3Hd0VubNG40FHi%2FUuC0AdMnyEMhmMDetjNZsvNLDvWs%3D&reserved=0

C++ made this step clear because the header file declares the class and functions, but does not provide implementations. If you read the header file above, you will see everything is documented. You can understand how the class is designed from the header file, what functions programmers are expected to use, etc. Very little is left unspecified.

C++ also made it clear what part of the class is exposed to the public and what part of the class is private. So the application programming interface (API) is clear.

In Python, we tend to mix the specification of the class, and the implementation of the class together on one file. For example:

https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fisip.piconepress.com%2Ftmp%2Fisip_code%2Fnfc%2Fclass%2Fpython%2Fnedc_edf_tools%2Fnedc_edf_tools.py&
data=05%7C01%7Cjoseph.picone%40temple.edu%7C98c02b636e1241d6b50908daf02d8ee9%7C716e81efb52244738e3110bd02ccf6e5%7C0%7C0%7C638086375709956632%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0
%3D%7C3000%7C%7C%7C&sdata=j5SUAbz6F51H8SwXpTI2HDjRCsyvbS%2B0%2FvT4nweE4Hk%3D&reserved=0

In this case, in the initial design stage, we write everything you see in this file except the implementations. The file just contains the class definitions, the internal data, and the functions (with arguments). You don't start implementation until the design is reviewed and approved.

For a command line utility, I think many of you know that we start by creating the help and usage files:

https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fisip.piconepress.com%2Ftmp%2Fisip_code%2Fnfc%2Futil%2Fpython%2Fnedc_pyprint_signal%2F&
data=05%7C01%7Cjoseph.picone%40temple.edu%7C98c02b636e1241d6b50908daf02d8ee9%7C716e81efb52244738e3110bd02ccf6e5%7C0%7C0%7C638086375709956632%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0
%3D%7C3000%7C%7C%7C&sdata=pz6zSDOJugYOP%2BBqZ%2F5KnYyxE6F3oekBVW8vW4BCu8g%3D&reserved=0

These are the files with the extensions *.help and *.usage. The help file completely defines the command line interface. Once that is agreed to, we usually copy and edit an existing program – we never start from a blank page.

We can save a lot of time by iterating on the design before coding is started. It takes some experience to be able to review code, like a header file, and provide intelligent feedback. But that is what senior software engineers do – they review designs. An incorrect design can cost millions in wasted development dollars. This is why lead software engineers are extremely well paid these days.

Software development is very collaborative. You need to understand who your users are, what their needs are, and then craft a nice simple interface that meets the needs of your users yet builds on top of all your existing software. You rarely start a program from nothing (or from scratch as we say).

–Joe

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