Assignment 2: Dynamic List

Topics:	Singly-linked list, Dynamic Memory, Procrastination, Git
Date assigned:	Monday, September 16, 2019
Date due:	Part 1: Wednesday, September 25, 2019 Part 2: Wednesday, October 2, 2019
Points:	40

For this assignment, you are to implement the List ADT in a file called **list.c** using the header file **list.h**. Your list will contain **void*** (pointer) so you can store any type of data in the list. You can find this header file on zeus in **/home/CS300Public/2019/02Files**. All of the data structures and function prototypes are defined in list.h. Further, each function prototype has been described to the point that you should be able to implement each list function in the file list.c.

In addition to implementing the list data structure, you must provide a Makefile and test driver (**listdriver.c** that produces an executable named **listdriver**) that thoroughly tests your list functions. The listdriver must display to the screen a series of SUCCESS or FAILURE messages with enough description that a user can quickly spot broken list functionality. Code your driver for SUCCESS tests. No test in your driver should Fail. If a FAILURE happens, your program is to terminate. Use success(), failure(), assert(), and processError() from stack as a model.

You may add any helper static functions you need to list.c. You may not alter list.h in anyway.

0. You must build an Eclipse project in the Git repository cs300f19_punetid in workspace CS300_Git_Example.
1. Your code is to be written in C using Eclipse. Programs written in other environments will not be graded. Create an Eclipse project named **GenericDynamicList**. This project must contain the directories: src, include, and bin.
2. The Makefile must contain the necessary targets to build the listdriver as well as a clean and tarball targets. Typing **make** on the command line must build listdriver in the bin directory.
3. Submit a color, double-sided, stapled packet of code by that same deadline. The packet must be in the following order:

   List Driver (.h then .c if you have both, otherwise just .c)
   list.c (do not print list.h)
   Any extra .h/.c modules
   Makefile
4. Test one function at a time. This will lessen your level of frustration greatly. Commit after writing and testing a significant function. You will not be sorry.
5. You are to use the coding guidelines of the coding standards on the CS300 Web page.

Goals for this assignment:

1. Code and test your program one function at a time.
2. Write efficient/clean code
3. Use the debugger to effectively develop a correct solution
4. Thoroughly test your code.
5. Fully understand Makefiles.
6. Use Git.

The list struct, function prototypes, as well as a list of error codes that each function can produce are part of list.h. Further, the error codes are listed in order of precedence. If a function can produce multiple errors, the function must return the error code first on the list.

Since the interface for the list may be hard to understand at first, here is a very small example of how to walk a list and print out every element. For brevity, no error checking is done.

Sample Code

```
lstLoadErrorMessages ();
lstCreate (&sTheList);

charValue = 'A';
printf ("List size = %d\n", lstSize (&sTheList));
lstInsertAfter (&sTheList, &charValue, sizeof (char));
//assert(lstSize(&sTheList) == 1, "Size is 1", "Size is not 1");

printf ("List size = %d\n", lstSize (&sTheList));
intValue = 300;
lstInsertAfter (&sTheList, &intValue, sizeof (int));
//assert(lstSize(&sTheList) == 2, "Size is 2", "Size is not 2");

printf ("List size = %d\n", lstSize (&sTheList));

size = lstSize (&sTheList);
lstFirst (&sTheList);

lstPeek(&sTheList, &charValue, sizeof(char));
printf ("%c\n", charValue);

lstNext (&sTheList);

lstPeek(&sTheList, &intValue, sizeof(int));
printf ("%d\n", intValue);
```

Run Results of Sample Code

```
List size = 0
List size = 1
List size = 2
A
300
```

Part A: Here is a list of the functions that must be completed for Part A and the order in which I recommend you implement each function:

1. lstLoadErrorMessages
2. lstCreate
3. lstInsertAfter
   – malloc() data pointed to by void*
   – use memcpy() to fill the void* buffer from the user's buffer
4. lstTerminate – free() data pointed to void* and the ListElements.
5. lstSize
6. lstIsEmpty
7. lstFirst
8. lstPeek
9. lstNext
10. Don't forget to build a driver that tests each of these functions!

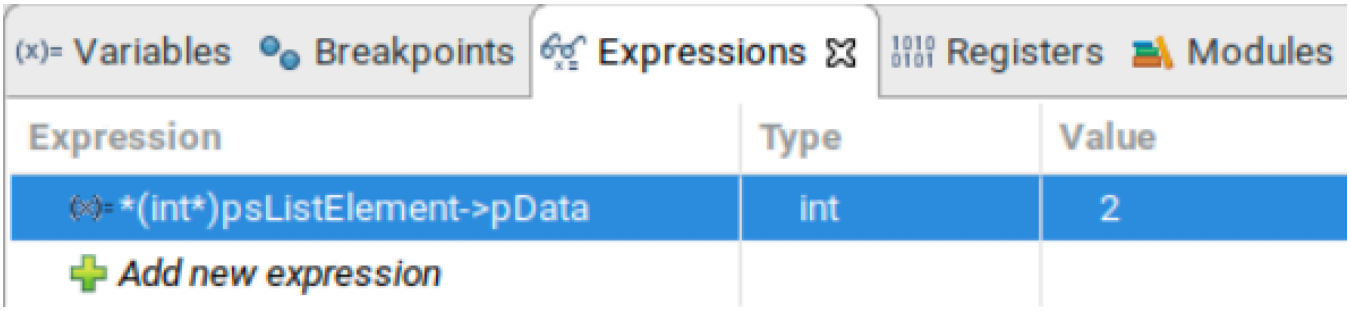
Submit your assignment as **cs300_2A_punetid.tar.gz.** *You must use the submit script on Zeus!*

Part B: Implement all functions in list.h. Add code to your driver to test all of the list functions. Submit your solution as **cs300_2B_punetid.tar.gz**.

lstInsertBefore and **lstDeleteCurrent** are difficult.

To view data using a void*, you will need to use the **Expressions tab**. In the debugger, you will need to enter expressions in the **Expressions tab**. (Window | Show View | Expressions) The Expressions tab is shown below.

You can click **Add new expression** and type in a C code expression such as:
***(int*)psListElement->pData**



I expect you to start this project early. **This code will be reused in subsequent assignments.** Coding this last minute will cause headaches for much of the rest of the course!

To be on schedule, you should have your Eclipse project built, Git repository working, and Makefile done by 11:59pm September 18!

Go back and read the assignment carefully one more time!

Use this page to draw yourself some Lists!

Here is the list produced by the sample code on page 2.