Shared Memory In-Class Assignment

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In this in-class assignment you will create a producer and consumer. The producer will produce data to a shared memory segment and the consumer will consume it (display it). You will create two programs each with generated from their own source file. The first file will be named 'producer.c', the second 'consumer.c'.

In the producer file you will:
- Create a struct, named 'myStruct', that contains both an integer and a character string (max length 40).
- Generate a shared key using the 'ftok' command by referencing 'producer.c' as the filename.
- Create a shared memory segment using the 'shmget' command. The size of the shared memory segment should be the same size as the struct 'myStruct'. Use the following string for the permissions: "S_IWUSR|S_IRUSR|S_IRGRP|S_IWGRP|IPC_CREAT". You should store the ID (the return value) in the variable 'sharedMemoryID'.
- Print an appropriate error message and exit the program if the above step fails.
- Attach to the memory segment using the 'shmat' command. Use the shmid generated from the shmget command and store the pointer in the variable 'sharedMemoryPointer'.
- Print an appropriate error message and exit the program if the above step fails.
- Statically assign the shared memory segment values as follows:
  - The integer value to 42
  - The character string to "Not Hello World".
    - You may find the 'strcpy' command to be useful for this.
- Detach from the shared memory segment using the 'shmdt' command.'
- Run the ipcs command, make a note of the shared memory segments.
- Compile and run your program.
- Run the ipcs command, make a note of the shared memory segments.

In the consumer file you will:
- Create a struct, named 'myStruct', that contains both an integer and a character string (max length 40).
- Generate a shared key using the 'ftok' command by referencing 'producer.c' as the filename.
- Create a shared memory segment using the 'shmget' command. The size of the shared memory segment should be the same size as the struct 'myStruct'. Use the following string for the permissions: "S_IWUSR|S_IRUSR|S_IRGRP|S_IWGRP|IPC_CREAT". You should store the ID (the return value) in the variable 'sharedMemoryID'.
- Print an appropriate error message and exit the program if the above step fails.
- Attach to the memory segment using the 'shmat' command. Use the shmid generated from the shmget command and store the pointer in the variable 'sharedMemoryPointer'.

- Print an appropriate error message and exit the program if the above step fails.
- Display both the integer value and the character string
- Detach from the shared memory segment using the 'shmdt' command.
- Destroy the shared memory segment using 'shmctl' command with 'IPC_RMID' as the second option.
- Compile and run your program.
- Try running the reader a second time, what is output and why? (include your answer in the submission text)
- Run the ipcs command, make a note of the shared memory segments.