Topics: Objects and Handles in Windows.
Calling System Services and Checking their Return Codes.

Exercise 1

Write programs that perform the tasks specified below. When a System Service returns an error, display both the numeric value of “last error”, and the associated text from within your program. Does the message text appropriately describe the problem, or which other message text would you suggest?

a) Create an object (CreateMutex is relatively simple), and close the handle to it twice.

b) There only is a single namespace for all objects, irrespective of their type. Create a named object of type 1 (e.g. a mutex), and open a handle to this object with an Open<object-of-type2> function (e.g. OpenSemaphore).

c) Get a pseudohandle for the current process or thread, then close the pseudohandle.

Exercise 2

Write a program to obtain a handle to one of the processes in the system, requesting different access rights (including PROCESS_ALL_ACCESS). Test your program
- with a process belonging to yourself
- with a system process other than the idle process,
- with the idle process.
In each situation display both the last error value and the associated text.
If you are running the program on your own computer, do so both as a normal user and as an administrator.

Exercise 3

With the Windows Performance Monitor you can display the number of certain system objects, including processes and threads.

Compare the number of process and thread objects shown by the Performance Monitor with the number of processes and threads reported by Task Manager.

By mere accident, you might see as many process and thread objects as there are processes and threads in Task Manager. But there may also be one* fewer process resp. thread object, or any number more. Give an explanation for why these numbers may be different (you may have to guess for the case of fewer objects).

* On certain systems two or more fewer thread objects. (This remark, and Exercise 2, may also help you find the explanation for the observed behavior.)
Exercise 4 (recommended reading, nothing to turn in)

Read the article “Pushing the Limits of Windows: Handles” by Mark Russinovich. It nicely complements the topic dealt with in this lab assignment. Among other things, the article discusses the differences between 32 and 64 bit Windows, limits on the number of handles, and ways for detecting handle leaks.

Remarks on the solutions to be turned in:

You may (and should) solve the exercises in groups of at most 2 students. However, each member of the group must be able to present and explain the solutions.

The turned in solutions should be a meaningful and comprehensible documentation of your work. In particular, it must show that your conclusions are based on your own programs. However, it should only contain commented (excerpts of) source code when this is necessary for the understanding. On the other hand, screenshots with a few additional explanations often are a useful and concise way of documentation, provided that your program was written to produce meaningful output. (Tip: Invert the display of the console window in order to save toner.)

The solutions must be turned in on paper at the appointed due date and time, which will always be the beginning of a class, during which the exercises will be discussed. Solutions turned in any later cannot be considered.

You have to obtain a passing grade in each of the lab assignments.

Observe the following decision of the examination committee:

"Alle Studienarbeiten und Leistungsnachweise sind mit einer Erklärung des Studierenden zu versehen, dass er/sie die Arbeit selbständig verfasst, keine anderen als die angegebenen Quellen oder Hilfsmittel benutzt, sowie wörtliche und sinngemäße Zitate als solche gekennzeichnet hat. Diese Erklärung ist vom Studierenden zu unterschreiben."

In English: „All paperwork turned in as part of an exam activity must contain an assertion that it was prepared independently by the student, that no sources or tools other than the ones specified were used, and that all literal or analogous citations were marked as such. This assertion must be signed by the student."