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Chapter 8

Processes and Threads

Like Windows NT, Windows CE is a fully multitasking and multithreaded operating system. What does that mean? In this chapter I'll present a few definitions and then some explanations to answer that question.

A *process* is a single instance of an application. If two copies of Microsoft Pocket Word are running, two unique processes are running. Every process has its own, protected, 32-MB address space as described in Chapter 6. Windows CE enforces a limit of 32 separate processes that can run at any time.

Each process has at least one *thread*. A thread executes code within a process. A process can have multiple threads running "at the same time." I put the phrase *at the same time* in quotes because, in fact, only one thread executes at any instant in time. The operating system simulates the concurrent execution of threads by rapidly switching between the threads, alternatively stopping one thread and switching to another.

PROCESSES

Windows CE treats processes differently than does Windows 98 or Windows NT. First and foremost, Windows CE has the aforementioned system limit of 32 processes being run at any one time. When the system starts, at least four processes are created: NK.EXE, which provides the kernel services; FILESYS.EXE, which provides file system services; GWES.EXE, which provides the GUI support; and DEVICE.EXE, which loads and maintains the device drivers for the system. On most systems, other processes are

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also started, such as the shell, EXPLORER.EXE, and, if the system is connected to a PC, REPLLOG.EXE and RAPISRV.EXE, which service the link between the PC and the Windows CE system. This leaves room for about 24 processes that the user or other applications that are running can start. While this sounds like a harsh limit, most systems don't need that many processes. A typical H/PC that's being used heavily might have 15 processes running at any one time.

Windows CE diverges from its desktop counterparts in other ways. Compared with processes under Windows 98 or Windows NT, Windows CE processes contain much less state information. Since Windows CE supports neither drives nor the concept of a current directory, the individual processes don't need to store that information. Windows CE also doesn't maintain a set of environment variables, so processes don't need to keep an environment block. Windows CE doesn't support handle inheritance, so there's no need to tell a process to enable handle inheritance. Because of all this, the parameter-heavy *CreateProcess* function is passed mainly NULLs and zeros, with just a few parameters actually used by Windows CE.

Many of the process and thread-related functions are simply not supported by Windows CE because the system doesn't support certain features supported by Windows 98 or Windows NT. Since Windows CE doesn't support an environment, all the Win32 functions dealing with the environment don't exist in Windows CE. While Windows CE supports threads, it doesn't support fibers, a lightweight version of a thread supported by Windows NT. So, the fiber API doesn't exist under Windows CE. Some functions aren't supported because there's an easy way to work around the lack of the function. For example, *GetCommandLine* doesn't exist in Windows CE, so an application needs to save a pointer to the command line passed to WinMain if it needs to access it later. Finally, *ExitProcess* doesn't exist under Windows CE. But, as you might expect, there's a workaround that allows a process to close.

Enough of what Windows CE doesn't do; let's look at what you can do with Windows CE.

Creating a Process

The function for creating another process is

```
BOOL CreateProcess (LPCTSTR lpApplicationName,
                    LPTSTR lpCommandLine,
                    LPSECURITY_ATTRIBUTES lpProcessAttributes,
                    LPSECURITY_ATTRIBUTES lpThreadAttributes,
                    BOOL bInheritHandles, DWORD dwCreationFlags,
                    LPVOID lpEnvironment,
                    LPCTSTR lpCurrentDirectory,
                    LPSTARTUPINFO lpStartupInfo,
                    LPPROCESS_INFORMATION lpProcessInformation);
```

While the list of parameters looks daunting, most of the parameters must be set to NULL or 0 because Windows CE doesn't support security or current directories,

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