REAL TIME OPERATING SYSTEM PROGRAMMING-II: Windows CE, OSEK and Real time Linux

Lesson-3:

Windows and Memory Management

1. Windows

Windows

- Many Windows on a screen. A screen top (desktop) is a window.
- A command-tool-task bar is window.
- A button is a window.
- The Windows are related to each other. There may be a hierarchical (parent child) relationship in the windows.
- There may be a sibling relationship or owner-owned relationship.

Main Window

- Top-level window — main
- Main window — does not have parent.
- Main window— can have child windows.
- When a parent is moved or deletes, the all child windows shall also move or delete.
- Child window is invisible except at the edges.

2. Windows Management

Windows Management functions

- CreateWindowEx or CreateWindow creates a Window and uses same messages and procedures as the main.
- A 32-bit style parameter dwStyle when set as WS_Child the child window creates.
- An 8-bit style parameter bMenu parameter is used in child window and equals to the ID of that window

Windows Management functions

- FindWindow– to find a window and get Handle for that
- GetParent– to fund the parent
- GetWindow– to query and get the owner, children and siblings

3. Memory Management

Virtual and page memory

- Virtual memory may at the flash or disk.
- The application program uses the physical addresses at the RAM.
- A virtual memory management systems maps the virtual addresses of the pages with the physical addresses of the pages after the pages of the program has been loaded at RAM.

Page

- A fixed sized memory-unit, which is loaded from disk or flash to the RAM.
- WCE uses page size of 1 kB or 4 kB─ depends on the system-processor.

Three types of virtual pages

- Committed page— a page reserved for application and directly maps to the RAM address.
- Reserved page — at virtual address cannot be used in the application.
- Free page — can be used and is allocated during the run.

Windows CE 6.0 Virtual Memory

- Virtual memory (VM) limit of 2 GB (earlier 32 MB) for each process and
- Upper 2 GB VM space as the kernel VM space.
- Extended VM support in CE 6.0— enables the creation of complex 3-D graphics
- Enables animation and gaming applications

System memory

- Between 1 MB-64 MB
- OS needs minimum 512 kB of memory and 4 kB RAM.
- Windows CE also provides for managing the low memory conditions.

RAM

- Two sections: *program memory* (called system heap) and *object store*.
- Memory is allocated to the program from a pool of unused memory area called the heap.
- The application program that is running uses the heap and stacks.

Memory allocation to Application

- An application allocated memory blocks (in place of the pages) from the heap and is in reserved virtual memory space region.
- A block in heap can also be freed later when not required.
- A heap can be local heap of 188 kB or separate heap in case of reuirement of bigger number of memory blocks

Object store (256 MB)

- Virtual RAM disk for permanent store, which is protected from power turning off.
- Individual file can use up to 32 MB in case of RAM as object store.
- Object store stores files, registry and WCE databases

PIM (personal information manager)

- PIM data at the object store memory
- PIM includes data of the contacts, calendar and task-to-do.
- A contact includes name, address, e-mail ID, phone numbers of home, office and mobile

Object store

- Handheld or PocketPC has a backup battery, which provides power to object store data and files.
- WCE on power ON searches the previously loaded object store at RAM and uses that object if available.

ROM execute-in-place file

- A file in ROM for execution that cannot be opened and read by standard file functions open and read.

Static Allocations

- Allocates two allocations,
- one for read only and
- other for read/write data

4. Stacks

Stack

- Stores the temporary variables
- processor registers for the application and
- OS functions.
- WCE provides for 58 kB maximum stack size and 6 kB of stack for guarding the stack for underflow or overflow.

Thread Stack

- WCE provides for separate stack for each thread.
- An application can also specify the thread stack size

Summary

We learnt

- Main window
- Parent window
- Child Windows
- Windows Management functions to create, style and menu parameters,to find Window and its Handle, parent, sibling and owner.

We learnt

- Virtual memory and page sizes
- RAM sections as program memory and heap
- Object store
- Execute in place ROM file
- Stacks
- Thread stacks

We learnt

- WCE provides for system memory between 1 MB-64 MB and OS needs minimum 512 kB of memory and 4 kB RAM.
- WCE also provides for managing the low memory conditions.

End of Lesson-3 of chapter 10 on

Windows and Memory Management