

Operating systems and concurrency B01

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- ... to the module
- ... to operating systems
- ... to device drivers

Introduction to the module

- View the [module home page](#)

What is an operating system?

A modern computer consists of:

- One or more processors
- Main memory
- Disks
- Printers
- Various input/output devices

Managing all these components requires a layer of software – the **operating system**

What is an operating system?

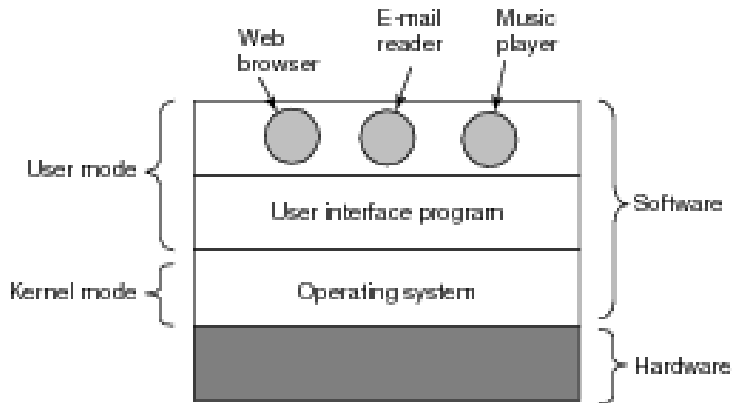


Figure: Where the operating system fits in

The operating system as an extended machine

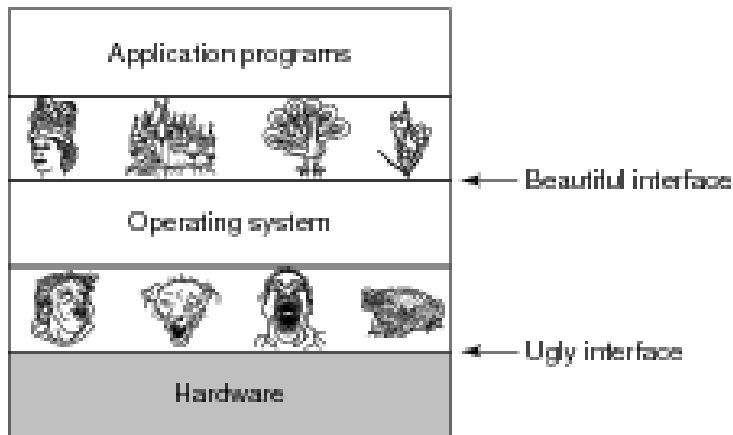


Figure: Hardware Abstraction Layer: making the ugly beautiful

The Operating System as Resource Manager

- Allow multiple programs to run at the same time
- Manage and protect memory, I/O devices, and other resources
- Includes multiplexing (sharing) resources in two different ways:
 - In time
 - In space

- uC/OS-II
- Well-developed, standards-compliant OS that is small enough to understand thoroughly during the course of this module.
- See the [uC/OS-II datasheet](#)
- Used to give practical experience with the task concept, scheduling and concurrency.

Hardware used in the lab

- Embedded Artists LPC4088 Experiment Bundle
- This is state-of-the-art hardware – ARM University Program Embedded Systems Education Kit
- See the [manufacturer's description](#)
- Used to give practical experience of working with an OS using modern hardware.

- Common concepts
 - Port
 - Bus (daisy chain or shared direct access)
 - Controller (host adapter)
- I/O instructions control devices
- Huge variety of I/O devices, each requiring handling in a device-specific way
 - OS separates device-specific behaviour from generic behaviour

- Devices have addresses, used by
 - Direct I/O instructions
 - Memory-mapped I/O
- Devices on LPC4088 are memory-mapped
- See [simplified block diagram of LPC4088](#) (p. 10 of user manual)
- See p.16 ff. for memory map of LPC4088

Device driver development

- See [lab instructions](#) for output device driver

Acknowledgements

- Silberschatz, A., Galvin, P. and Gagne, G., Operating systems concepts, John Wiley, 8th edition, 2009
- Tanenbaum, A., Modern Operating Systems (3rd edition), Prentice Hall, 2008