Operating System Concepts
discussed on the basis of
Windows 2000

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Unit 1: Introduction and Overview

1.1. Curriculum Module Overview

Part 1 – Windows 2000 Architecture

- Unit 1 – Introduction and Overview
  - Overview over the “Windows 2000 Architecture” lecture series
  - General operating system concepts and some historical remarks
  - Introduction into Windows NT technology – concepts & tools
  - Windows 2000 – features newly introduced with NT 5.0
- Unit 2 – Windows 2000 Architecture
  - Architectural concepts and structuring of Windows 2000
  - Win32 API – naming conventions, types
  - Lab: Managing multiple processes

Unit 3 - Processes and Threads

- Part A:
  - Windows 2000 process and system activity
  - Lab: A batch command interpreter
- Part B:
  - Details and data structures for process and thread creation
  - Process creation with Win32 – case study
  - Thread scheduling
  - Thread creation with Win32 – case study

Unit 4 – Memory Management

- Part A:
  - Memory management for multiprogrammed systems
  - Internals of Windows 2000 memory management
  - Win32 memory management and memory-mapped files
- Part B:
  - Details and data structures of Windows 2000 memory management
  - Lab: parallel computation of Mandelbrot sets (shared memory)
  - Win32 inter-process communication
    (basic concepts – some hints for the Mandelbrot lab assignment)

Unit 5 - System Mechanisms

- Windows 2000 system mechanisms
- trap dispatching, object manager & synchronization
- Win32 IPC - mailslots

Unit 6 – Protection and Security

- Part A:
  - The security problem – self-replicating programs, sendmail/finger-attack
  - Windows 2000 security concepts and mechanisms
  - Win32 - security descriptors
- Part B:
  - Security features new to Windows 2000
  - Overview over the OSF Distributed Computing Environment (DCE) and Kerberos
  - C2 Evaluation of Windows NT 4.0 SP 6a

Unit 7 - I/O System

- Principles of the input/output systems
- The Windows 2000 Input/Output System
- Win32 File & Directory Management
- Programming examples: ls.c, pwd.c, cd.c

Unit 8 – File System

- Part A:
  - Background: Unix file systems
  - The Windows 2000 File System (NTFS)
  - MS-DOS versus Win32 filenames

- Part B:
  - Encrypting File System Security in Windows 2000
  - NTFS - Recovery
  - Programming: Win32 Exception Handling

Unit 9 – Windows 2000 Networking

- Part A:
  - Networking components in Windows 2000
  - Win32 Socket Programming
- Part B:
  - Microsoft-specific extensions to Sockets; WNet API
  - Winsock 2.0 – new features
  - Quality-of-Service and Security - RSVP and IPsec

Unit 10 - Interoperability

- Windows 2000 - UNIX Interoperability
- Windows 2000 in a UNIX environment
- The Interix Subsystem for Windows 2000

Part 2 – Operating system concepts for embedded environments

Unit 11 - Windows CE System Architecture

- Windows CE Design Principles and Goals
- Basic System Components
- Process and Memory Model

Unit 12 – Concepts of Real-time Systems

- Introduction and Vocabulary
- Misconceptions
- Task Assignment and Scheduling
- Real-Time Systems with Windows CE

Unit 13 – Networking and Connectivity

- Networking mechanisms in Windows CE
- Host-communication with the Remote API (RAPI)
- Serial and Telephony Communications (TAPI)
- Device Drivers in Windows CE

Unit 14 – The Mach Operating System

- Mach Overview and System Concepts
- Threads and Scheduling in Mach
- Mach Memory Management
- The Shared Objects Net-interconnected Computer

Unit 15 –
Experimental Microkernel Systems

- The Amoeba Distributed Operating System
- Chorus: Microkernel and User-space Actors
- Comparison of Amoeba, Mach, and Chorus

Suggested Reading

Literature:

- David A.Solomon/Mark A.Russinovich, „Inside Windows 2000", 3rd Edition, MS Press, 2000.
- John Hart, „Win32 System Programming“, Addison-Wesley, 1997.
- Abraham Silberschatz, Peter B. Galvin, „Operating System Concepts“, John Wiley & Sons, 6th Ed., 2003.
- Gary Nutt, „OS Projects using Windows NT“, Addison-Wesley, 1999.
- Helen Custer, „Inside Windows NT", MS Press, 1993.
- Andrew S. Tanenbaum, „Distributed Operating Systems“, Prentice Hall, 1995.