Chapter 64
Filesystems

- **Network(ed) Filesystems.**

> **“There are three kinds of death in this world. There's heart death, there's brain death, and there's being off the network.”**

-- Guy Almes

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Chapter 64
Filesystems

- Agenda
  - Basic Threats for Network Filesystems
  - Selected Protocols
  - Feeding and Care

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Basic Threats for Network Filesystems

- **Use as designed.**

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Threats to Networked File Storage

- File data (obviously)
  - Few network file systems offer encryption
  - Focus on LAN & performance
- Login credentials
- Access controls
- Service discovery
  - Remote Procedure Calls (RPC)
- Denial of Service

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Distributed Computing

- Distributed Computing Environments (DCE)
  - require more than file services
  - process cooperation (locking)
  - clustering, local copies, replication
- Network traffic reveals roles of servers
- Replication shuffles data
  - Guard all replicated data!

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Selected Protocols

- Common Protocols for File Sharing.

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Appletalk

- Model OSI layer implementation
  - Covers layer 1 to 7
  - Uses addresses translated into names
- Local network protocol
  - Local services complete with routing
  - Zeroconf functions

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Network File System (NFS)

- Also known as “No File Security”
  - No authentication
  - NFS V2/V3 rely on UID/GID
  - NFS server handles security
- NFS V4 addresses shortcomings
  - RPC with Kerberos V5
  - SPKM/LIPKEY – Public Keys

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Server Message Block (SMB)

- Created by IBM in 1983
- Peer-to-peer protocol
  - Client sends requests, server answers
- Microsoft® modified original specs
  - NTLM V1/V2 authentication
  - Unicode, long filenames
- Different dialects in use (Windows, Samba)
- Vista uses SMB 2.0
  - Reduced complexity

Common Internet File System (CIFS)

- SMB 1.x with extensions
  - symlinks, hardlinks, larger file size
  - gets rid of NetBIOS ballast, pure TCP/IP
  - offers RPC and access to domain services
  - used for NAS services
- Available since MS Windows 2000

Feeding & Care

- **How To Keep File Stores Out Of Trouble.**

General Security Principles

- Limit network filesystems to local network
- Transport network FS traffic securely
  - Use VPN technology
  - Use encapsulation as necessary
- Monitor filesystem performance
  - Look for anomalies
  - Detect unauthorised access

Stress Tests

- Test network file systems
  - with various loads
  - with corrupted data (fuzzing)
  - with concurrent access (read/write)
- Test while backup system is running
- Establish a baseline for normal operation
- Monitor for anomalies

Separation

- Most network file systems are local
- Separate file services
  - Put public data into DMZs
  - Especially true for SAN/NAS
  - Take care of replication
- Allow only trusted clients to connect
  - Enable port security
  - Use 802.1X if possible

Chapter 64
Filesystems

- Summary
  - Filesystems belong to the LAN.
  - Limit access to file services.
  - Use secure transport when routing via WAN

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Thank You

- **Questions?**

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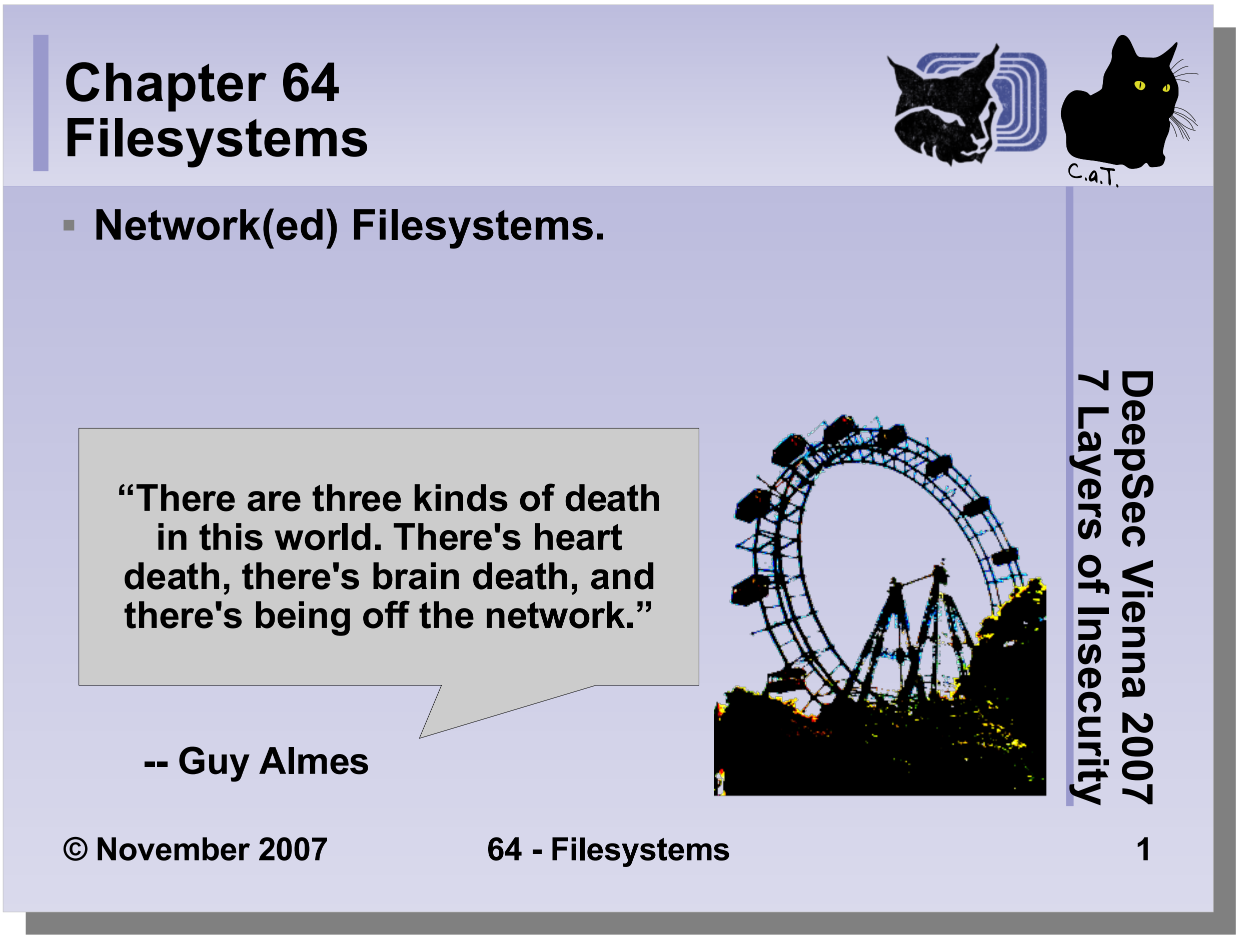

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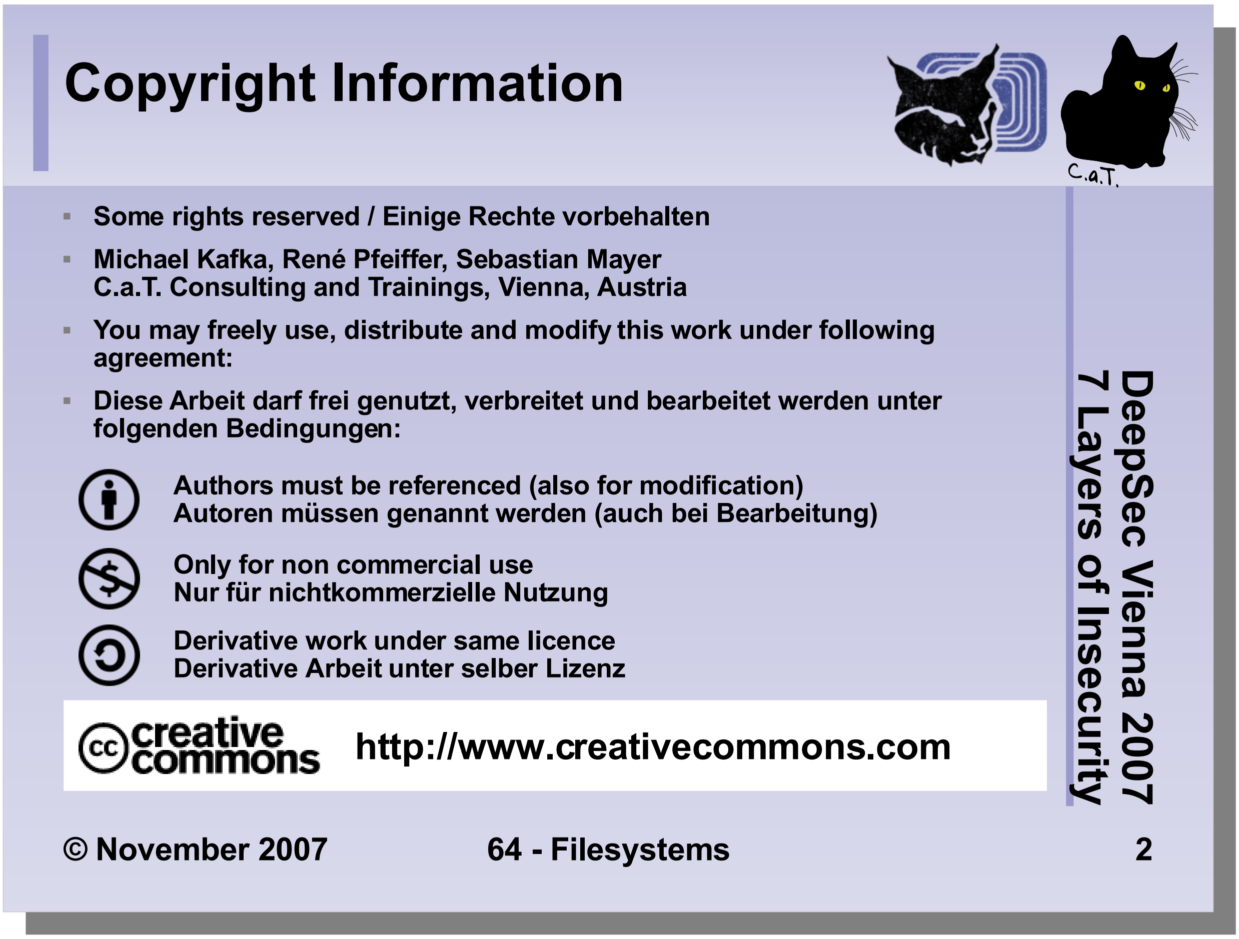

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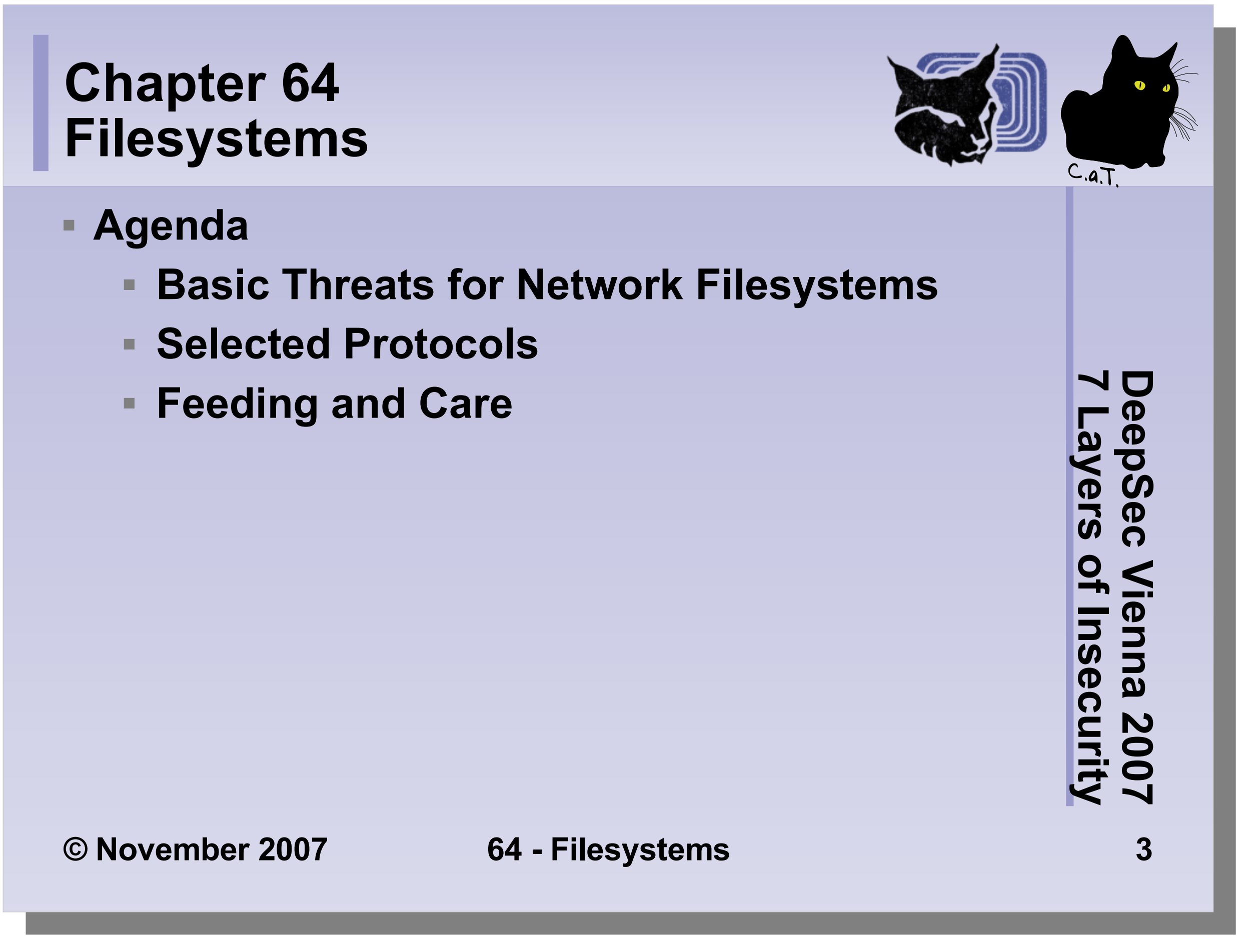

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Basic Threats for Network Filesystems

- Use as designed.

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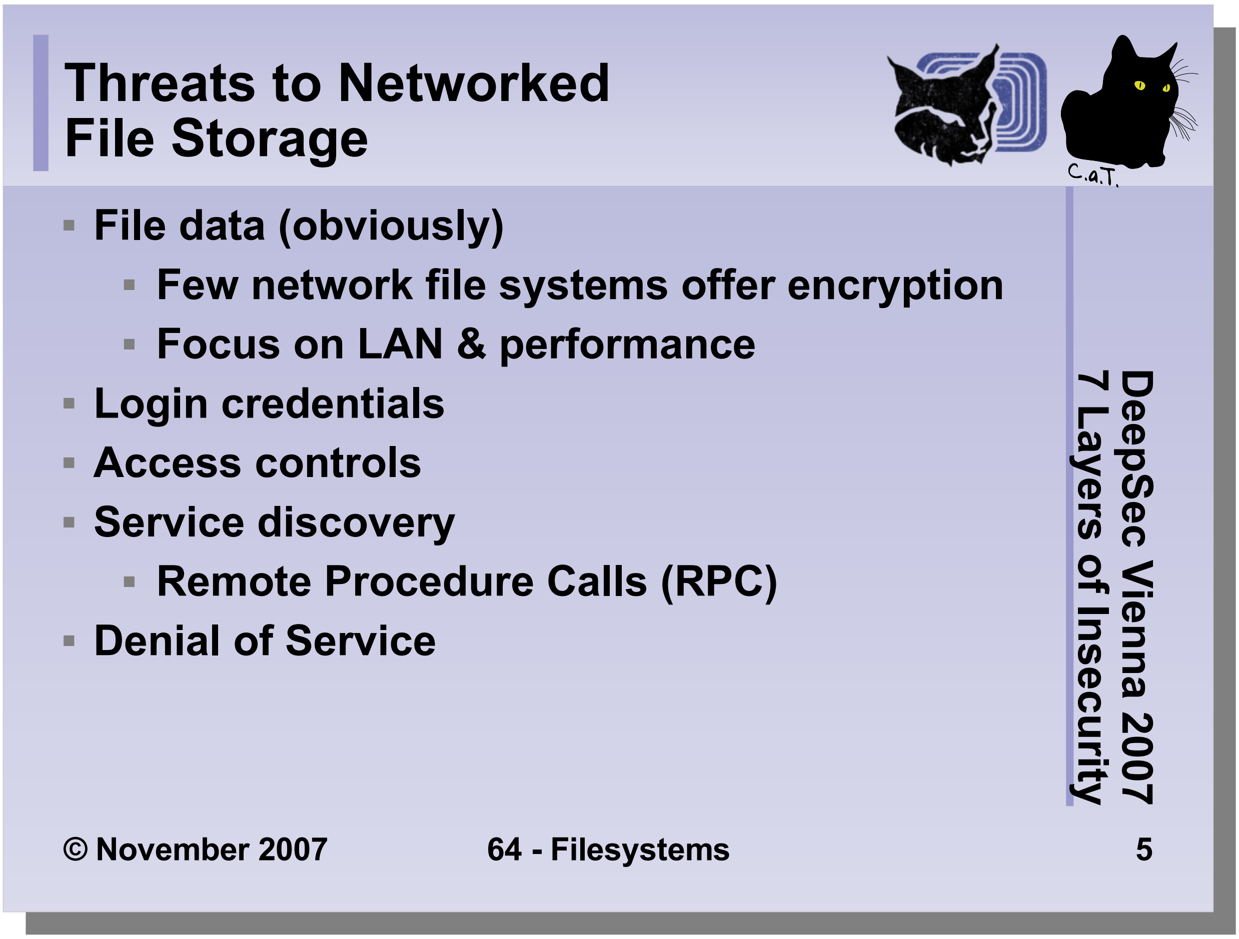

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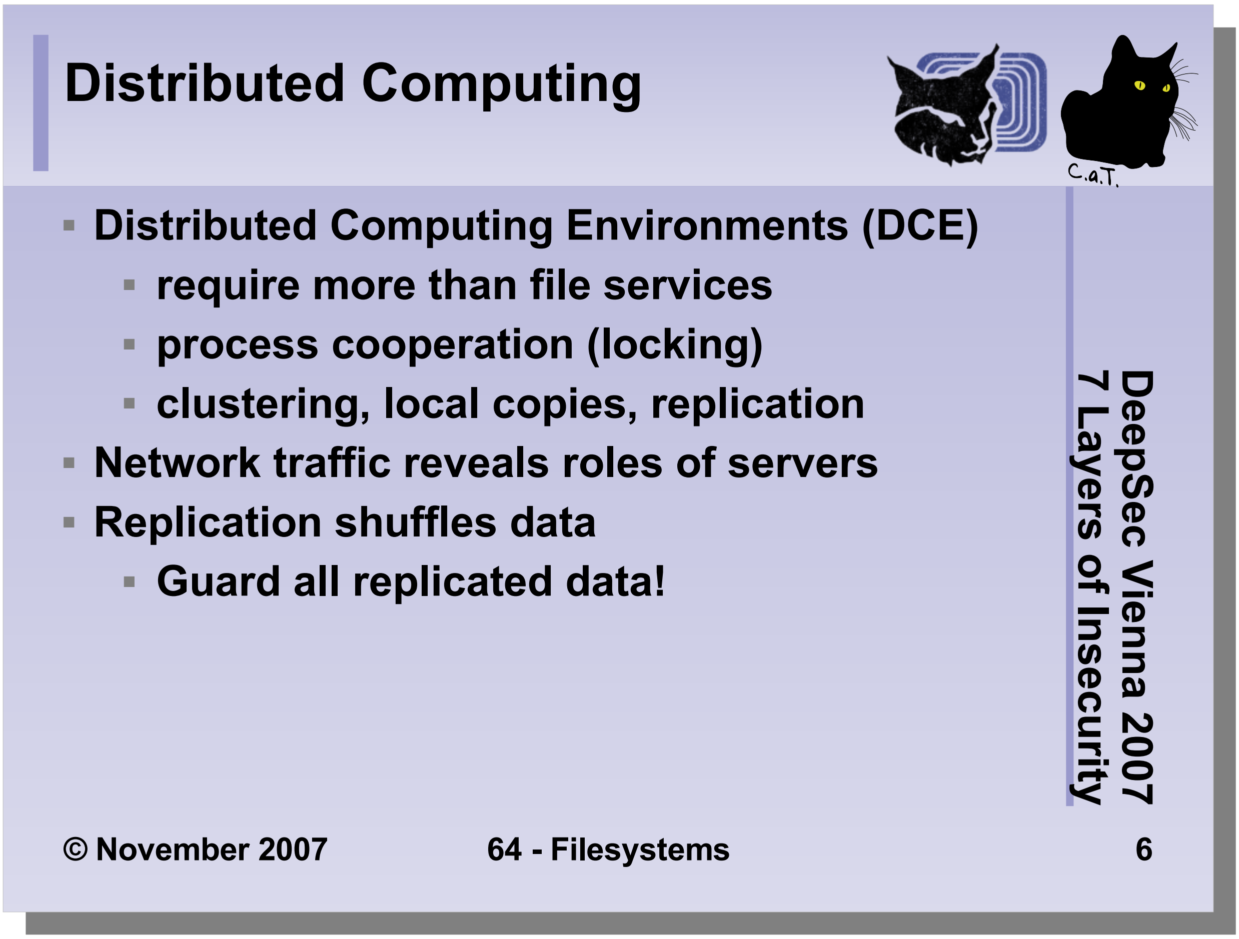

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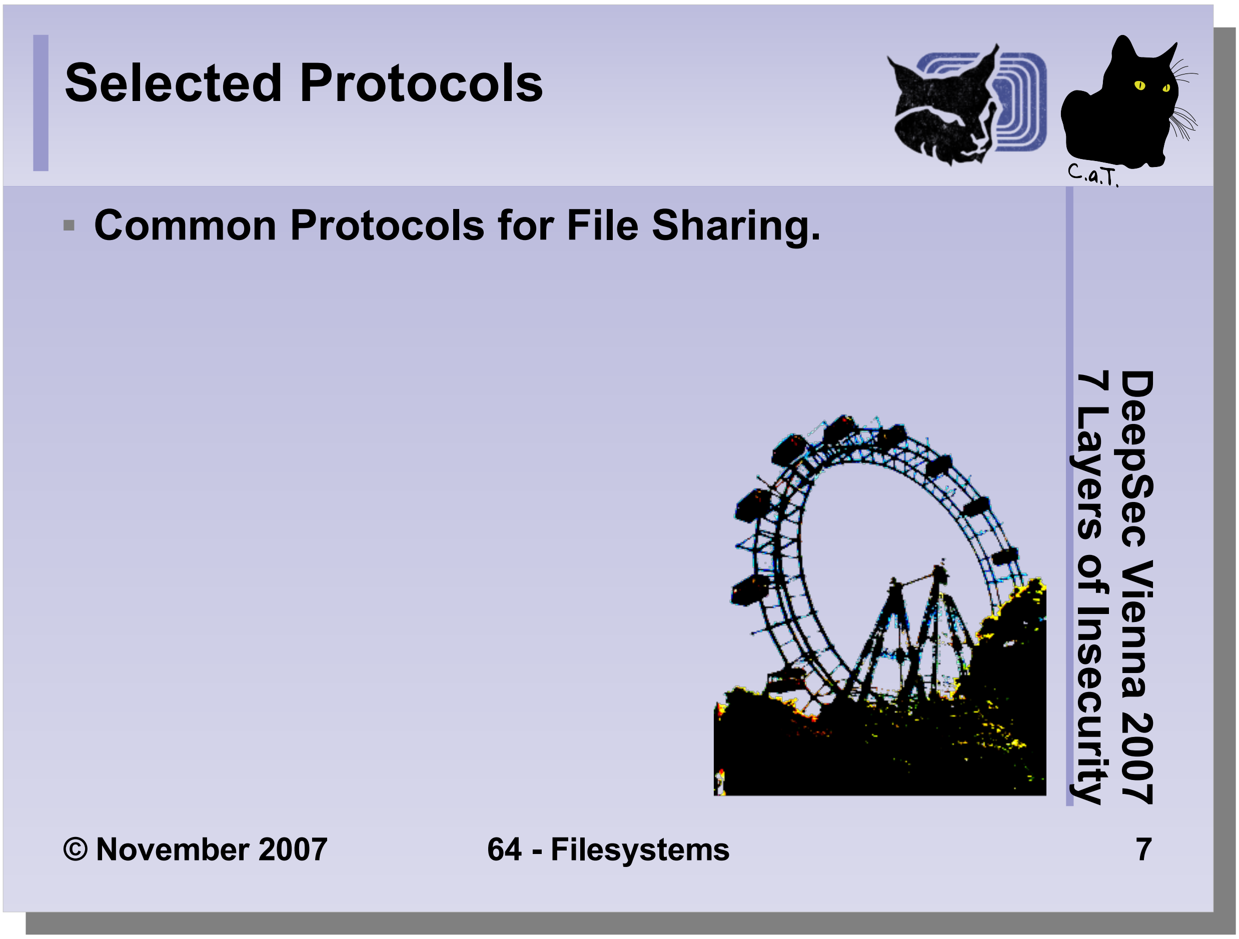

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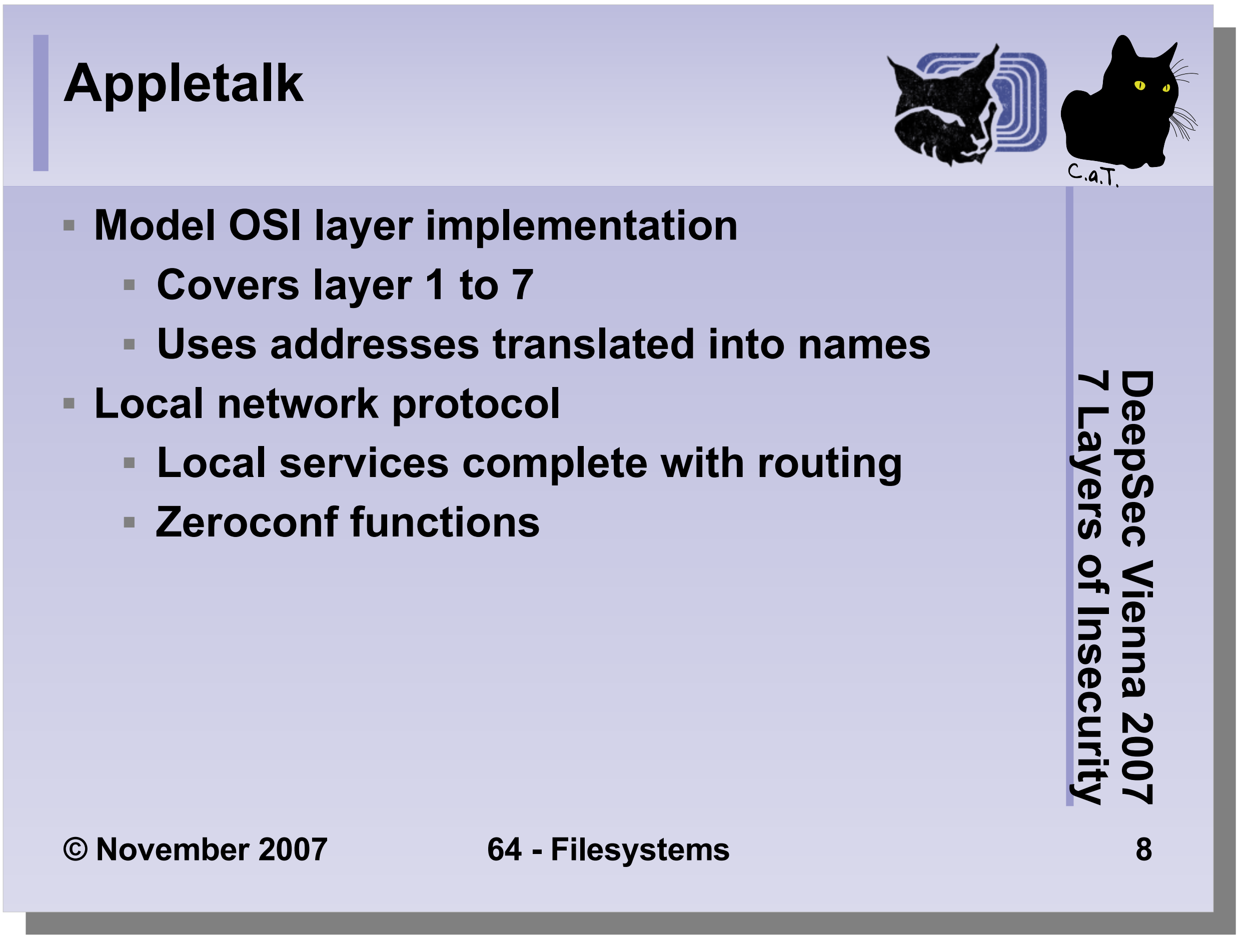

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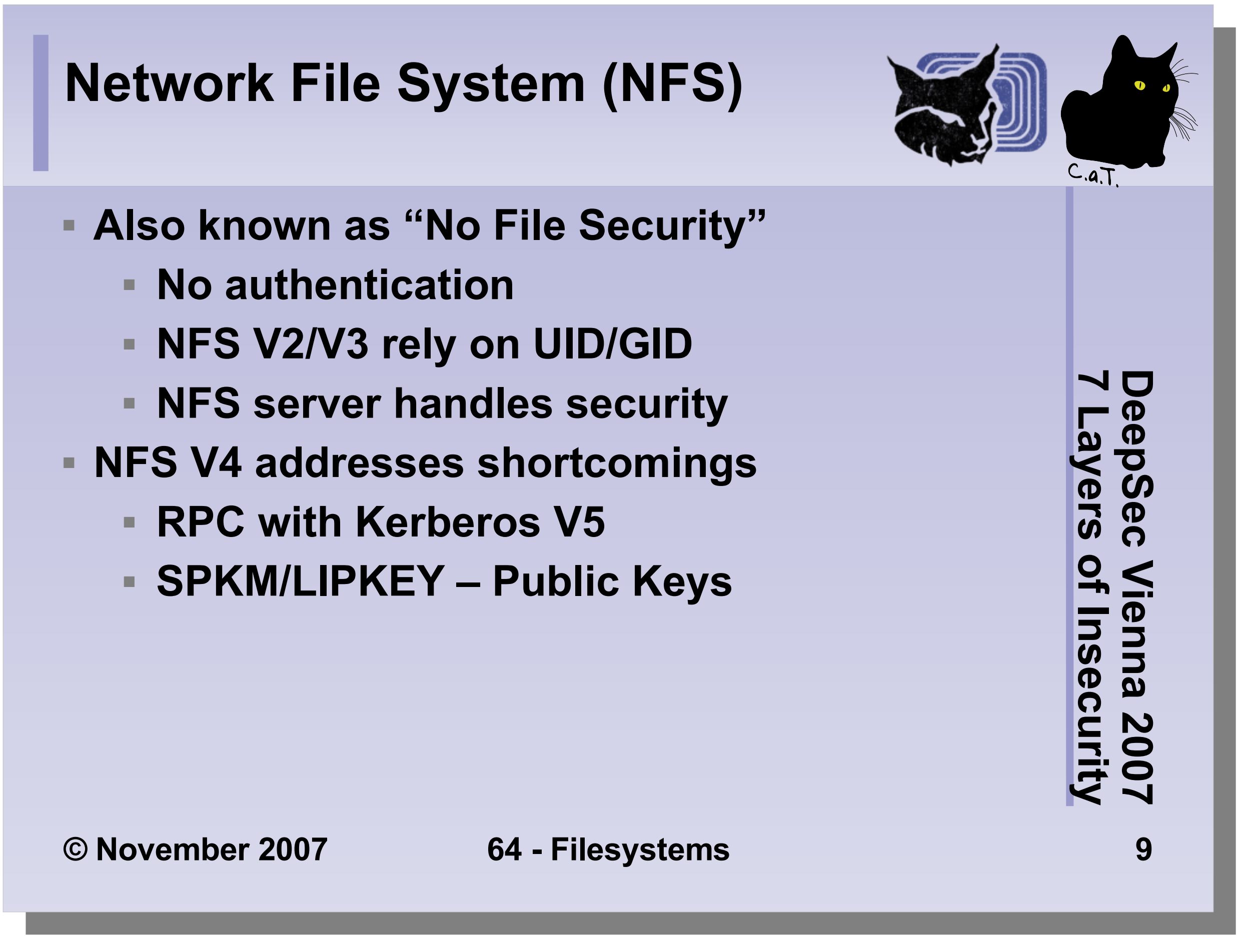
AppleTalk has been largely replaced by data transfers over TCP/IP beginning with Mac OS X. Nevertheless it may be used somewhere and should be taken care of. Mac OS X still supports it. Recent bugs found in AppleTalk also affect modern systems.



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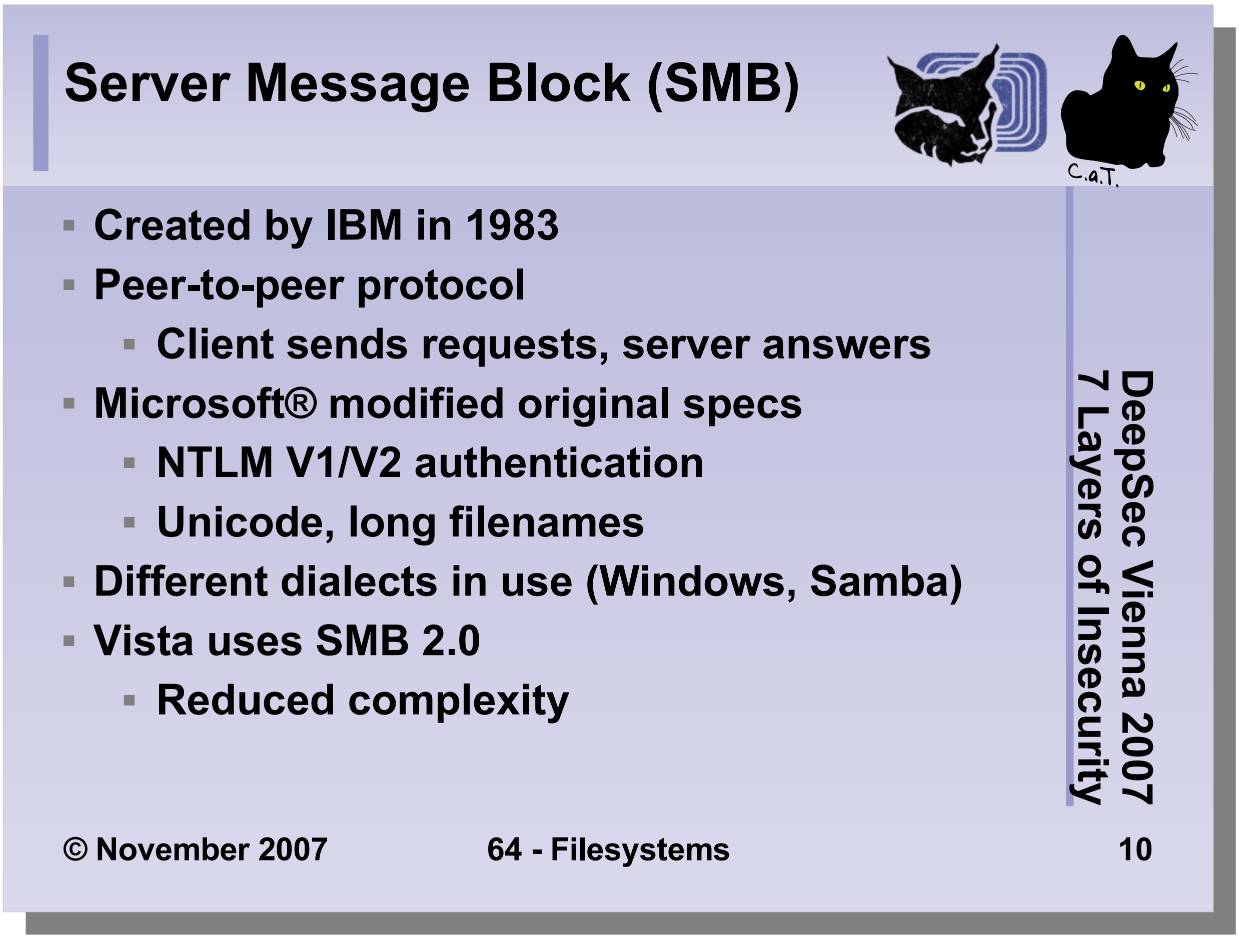
The Network File System (NFS) exists since 1989 (for version 2). NFS V3 was “ready” in 1995. NFS was originally developed by SUN Microsystems. SUN handed the development to the Internet Engineering Task Force (IETF). NFS V4 was specified in 2000, influenced by the Andrew File System (AFS) and Common Internet File System (CIFS).



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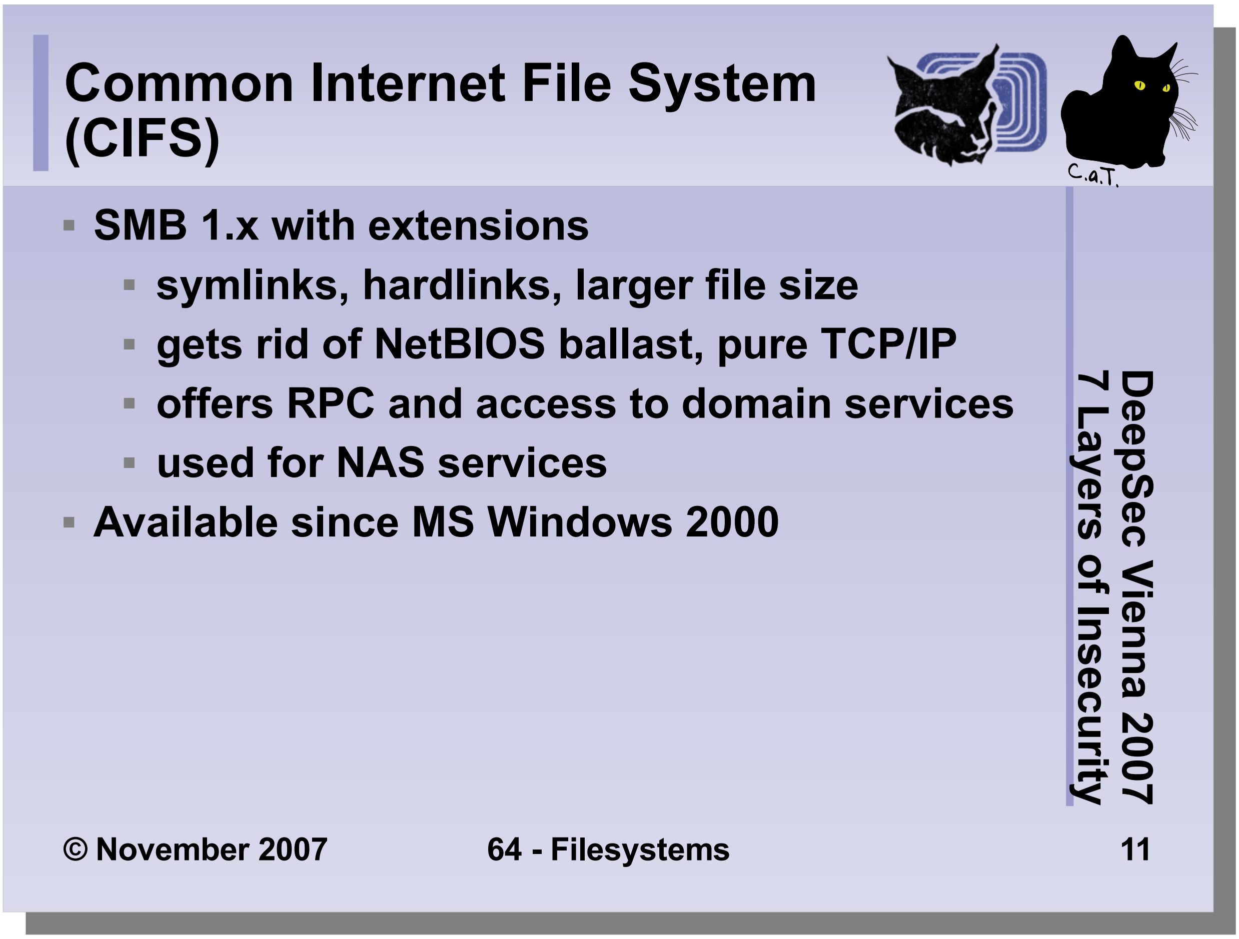

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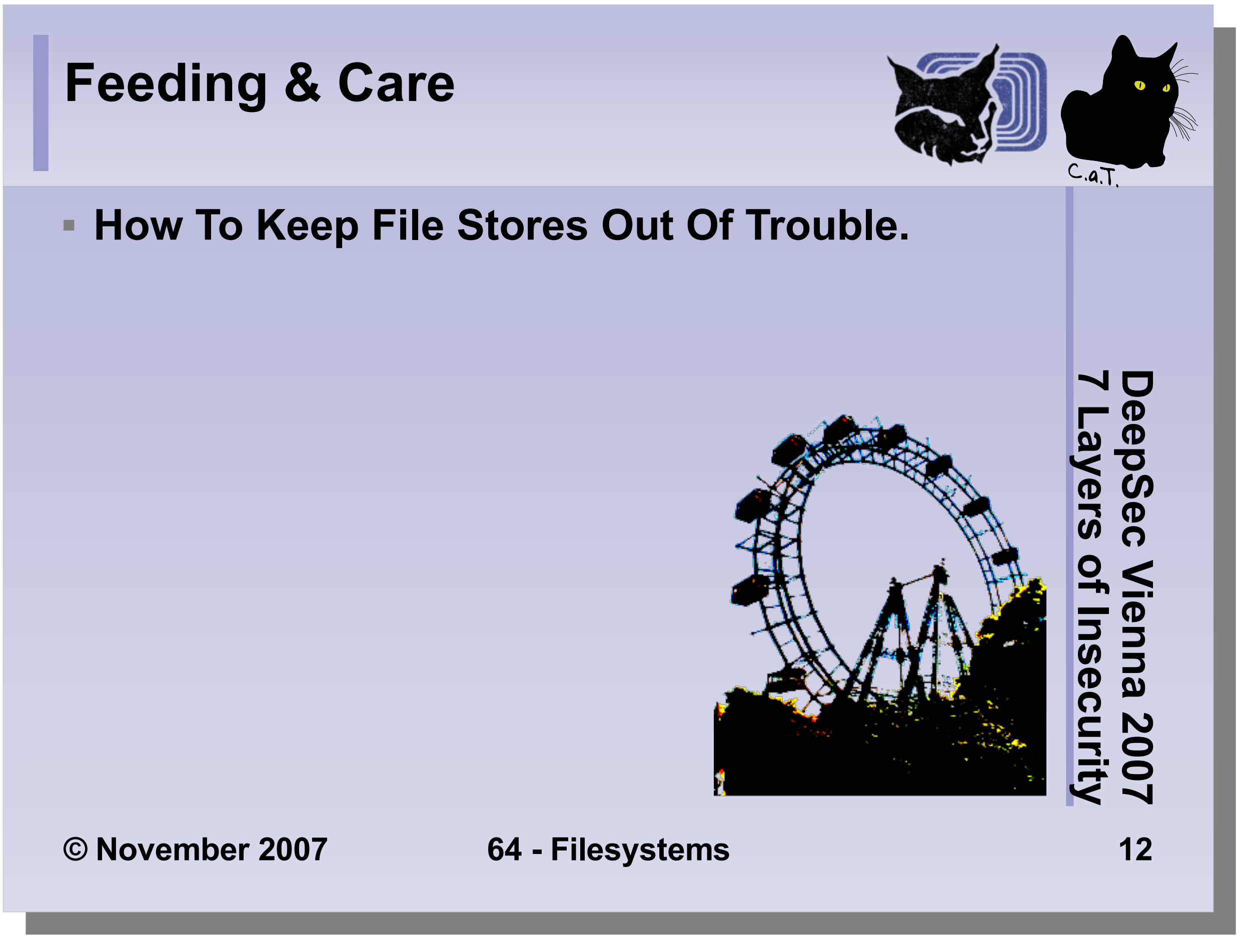

Feeding & Care

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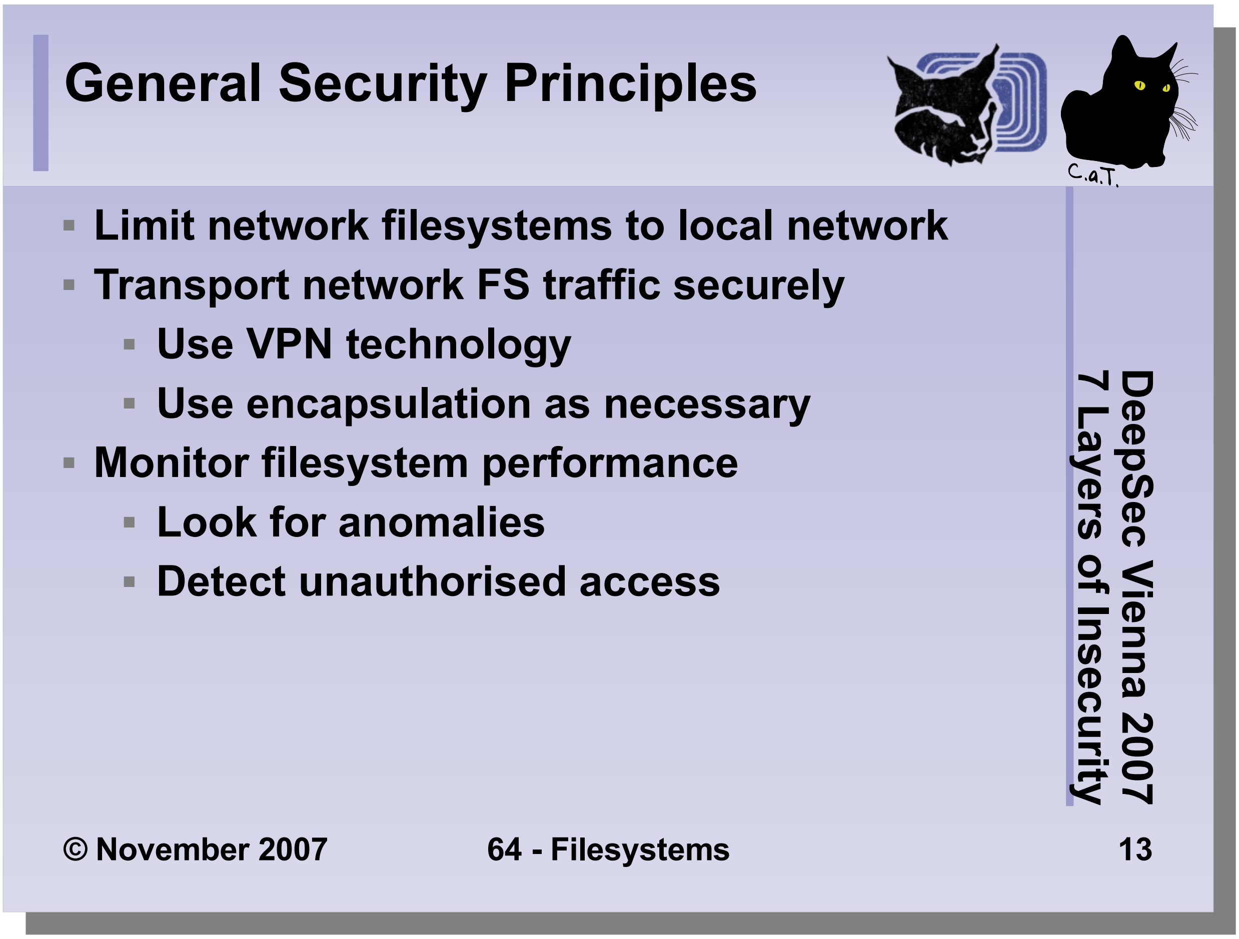

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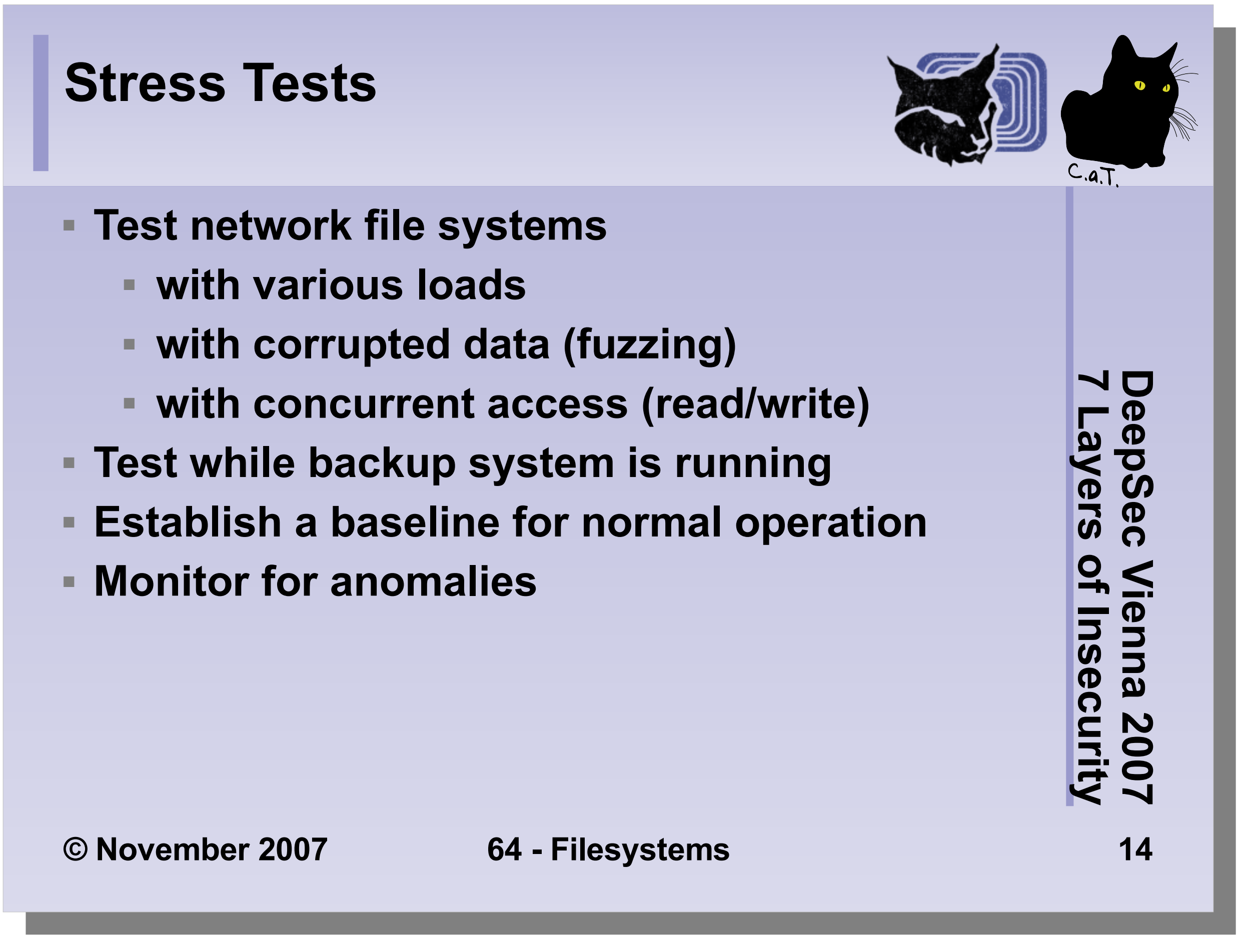

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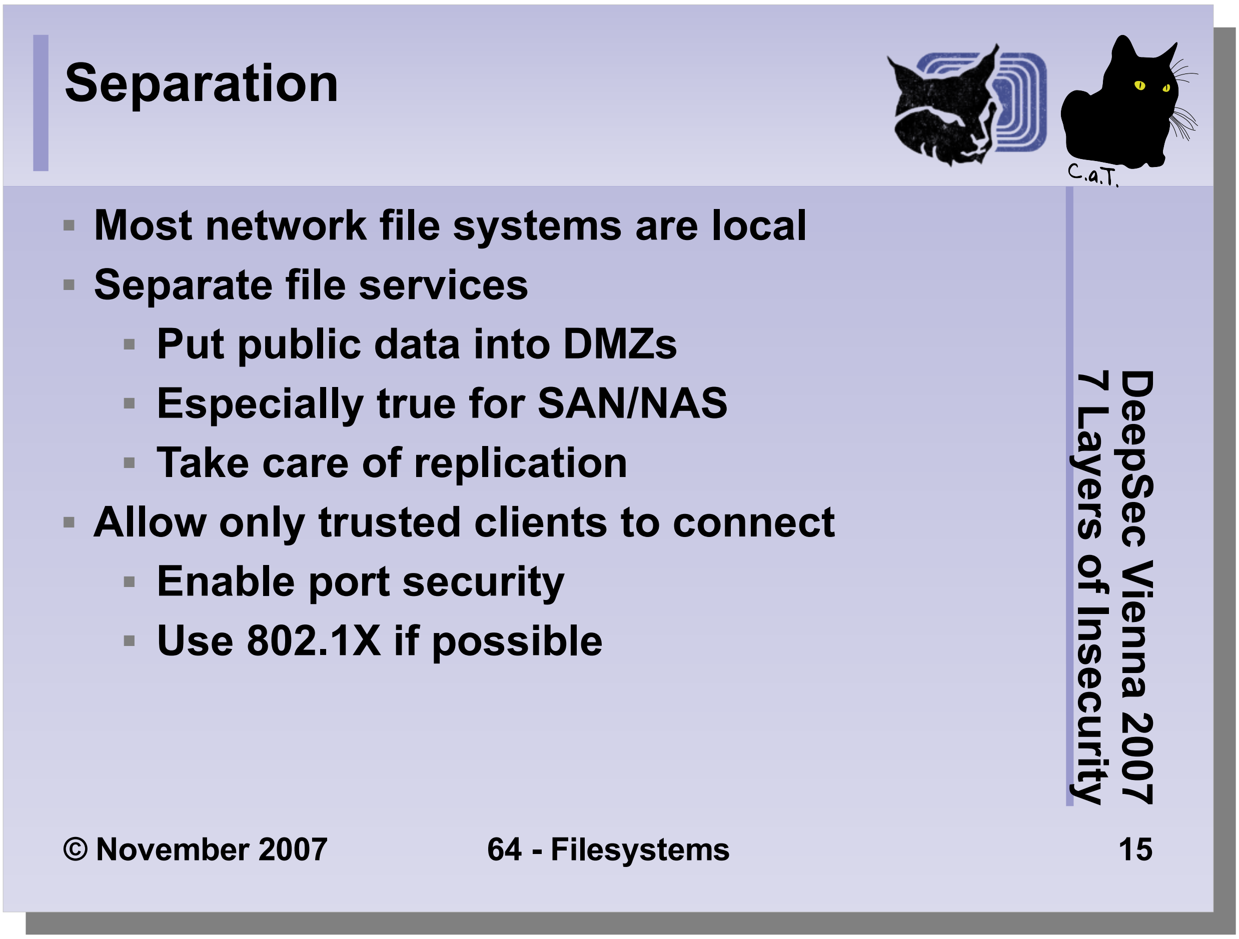

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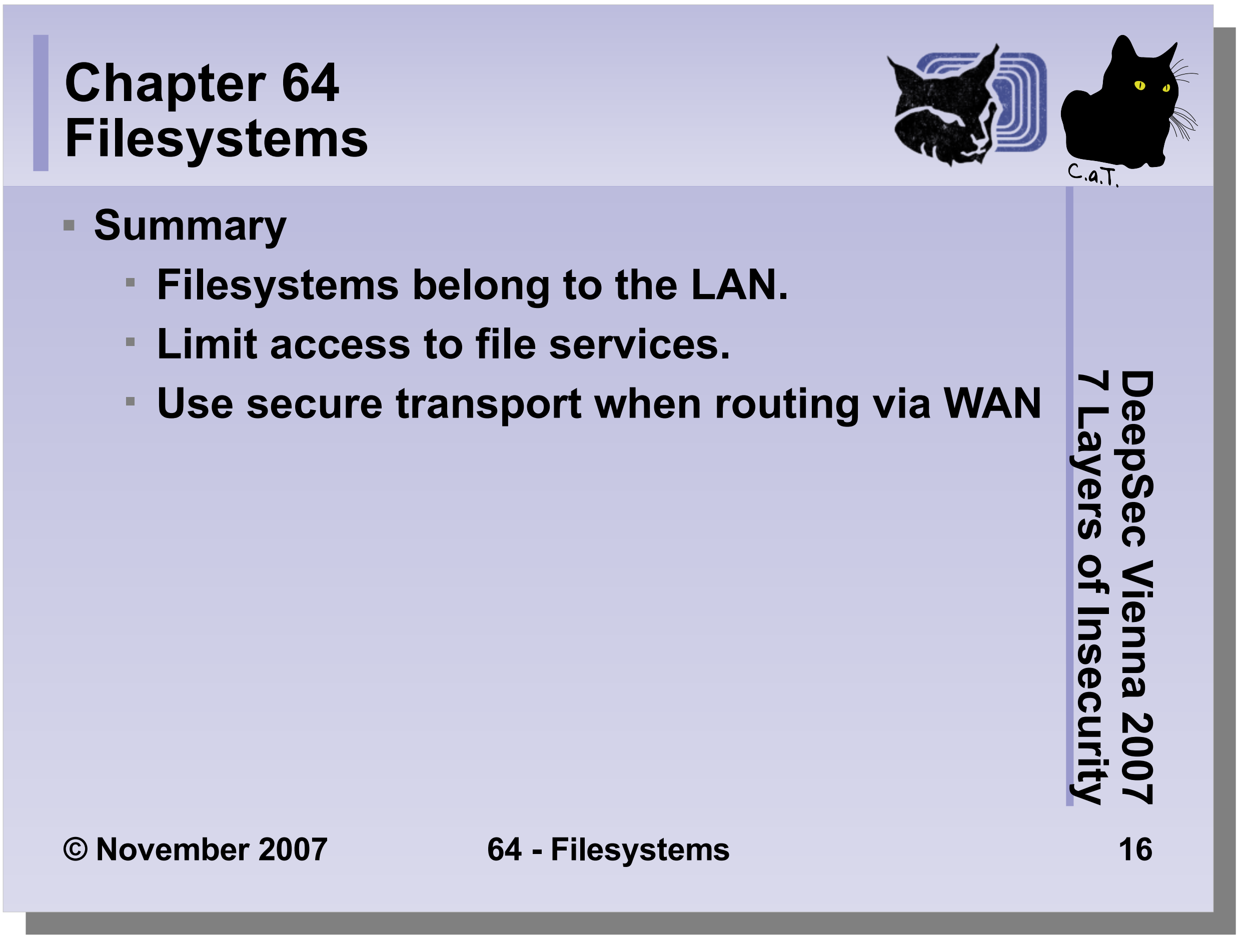

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