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Computer Security

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Networks

Network Layers

The ISO/OSI model

- *Application layer*
- *Presentation layer*
- *Session layer*
- *Transport layer*
- *Network layer*
- *Data Link layer*
- *Physical layer*
  - Frequently simplified in practice
  - But even archaic network protocols can be examined in these terms.

A Comment About Layers

Transparency of a layer in a system

- *Transparent layers expose*
- *Opaque layers hide*

Opacity is valuable for security

- *To hide unsafe operations*
- *To prevent entry into unsafe states*

Transparency is valuable for efficiency

- *Bypass clumsy or inappropriate services*
- *Directly manipulate underlying layer(s)*

The Presentation Layer

Network API

application programmer view of network

Isolate program from implementation

Package network services sensibly

useful abstractions related to need

The Session Layer

Organize communication into:

- *reliable streams of text from end to end*
  - Telnet protocol is example
- *remote procedure calls*

Users are isolated from underlying

- *message structure*
- *physical network topology*

The Transport Layer

Move messages between logical addresses

eliminate concern for physical topology

Addresses may be

processes

Bad idea, common in naive thinking

ports

Better, typically asymetrical

mailboxes

Better, typically symmetrical

The Network Layer

Move data between machines

isolate users from actual topology

Once the data reaches the destination

kick it upstairs to the transport layer

Responsible for routing

this is a hard enough problem,
even without security issues.

Data Link Layer

Move data over one link between machines

not concerned with global topology

deals with details of the link itself

interrupt handlers

timeouts

collision resolution