# 【CN】Day9

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| Type | |
| Materials | Internet Layers |
| Reviewed | ☐ |

## 【Ch1】Computer Networks and the Internet

### 1.5 Protocol Layers and Their Service Models

#### 1.5.1 Layered Architecture

The following is a human analogy on Internet architecture:

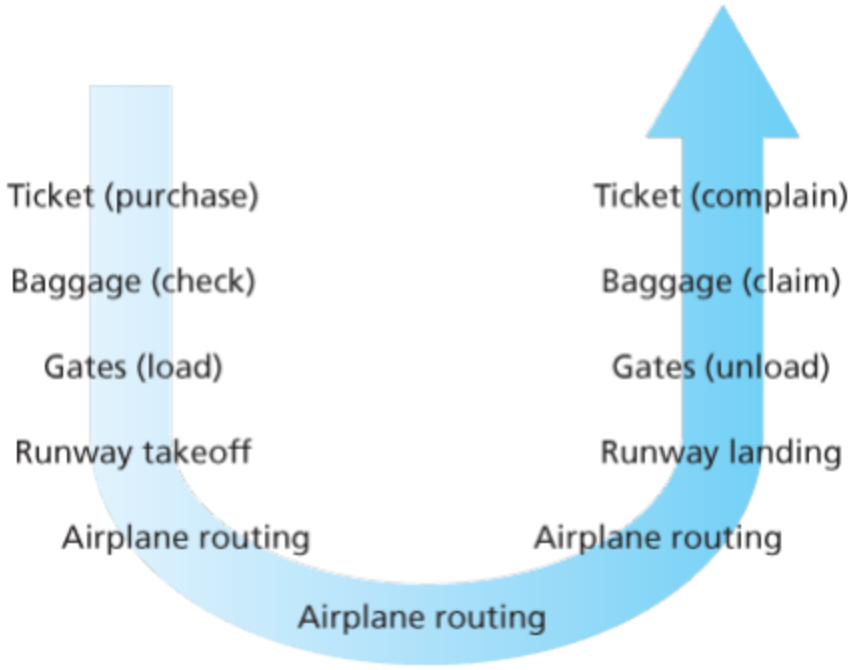


**Figure 1.21 Taking an airplane trip: actions**

We can also see this analogy in a horizontal manner:

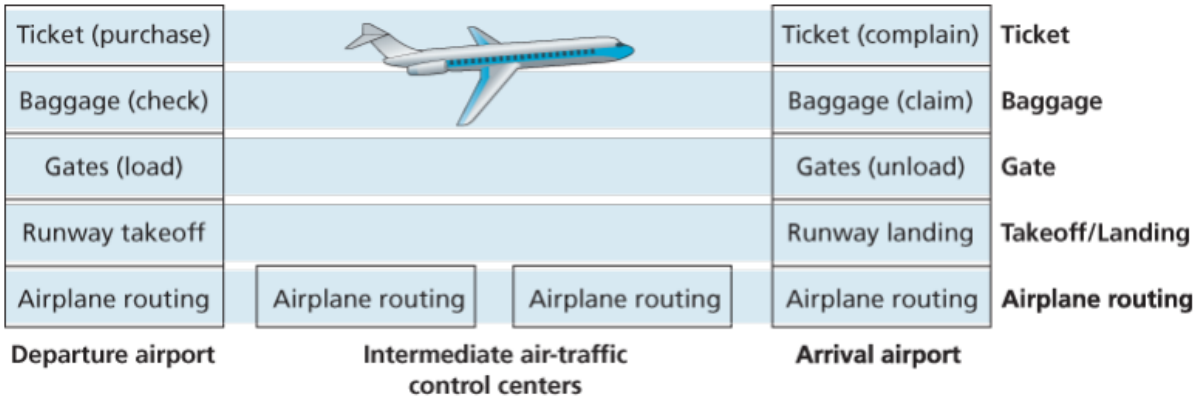


**Figure 1.22 Horizontal layering of airline functionality**

Each layer provides its service by

1. Performing certain actions within that layer
2. Using the services of the layer directly below it

### *Protocol Layering*

To provide structure to the design of network protocols, network designers organize protocols-and the network hardware and software that implement the protocols-in layers.

Each protocol belongs to one of the layers. And we are interested in the services that a layer offers to the layer above-the so-called service model.

However, some researchers and networking engineers are opposed to layering.

One potential drawback of layering is that one layer may duplicate lower-layer functionality.

A second drawback is that functionality at one layer may need information that is present only in another layer. This violates the goal of separation of layers.

When taken together, the protocols of the various layers are called the protocol stack.

The Internet stack consists of five layers: the physical, link, network, transport, and application layers.

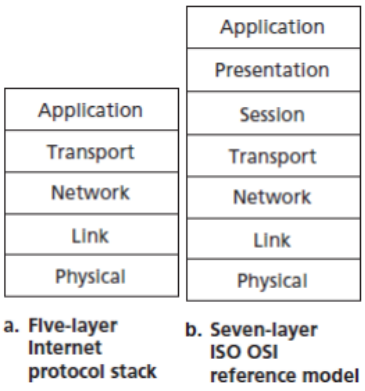


**Figure 1.23 The Internet protocol stack (a) and OSI reference model (b)**

### *Application Layer*

The application layer is where network applications and their application-layer protocols reside.

The Internet's application layer includes many protocols, such as the HTTP protocol(which provides for Web document request and transfer), SMTP(which provides for the transfer of email messages), and FTP(which provides for the transfer of files between two end systems).

An application-layer protocol is distributed over multiple end systems, with the application in one end system using the protocol to exchange packets of information with the application in another end system. We refer to this packet of information at the application layer as a message.

### *Transport Layer*

The Internet's transport layer transports application-layer messages between application endpoints.

In the Internet there are two transport protocols, TCP and UDP.

We refer to a transport-layer packet as a segment.

### *Network Layer*

The Internet's network layer is responsible for moving network-layer packets known as datagrams from one host to another.

The Internet transport-layer protocol(TCP or UDP) in a source host passes a transport-layer segment and a destination address to the network layer.

The Internet's network layer includes the celebrated IP protocol, which defines the fields in the datagram as well as how the end systems and routers act on these fields.

### *Link Layer*

To move a packet from one node to the next node, the network layer relies on the services of the link layer.

At each node, the network layer passes the datagram down to the link layer, which delivers the datagram to the next node along the route. We refer to the link-layer packets as frames.

### *Physical Layer*

The job of the physical layer is to move the individual bits within the frame from one node to the next.