Appendix A

Glossary

This appendix gives a glossary of technical terms used throughout this thesis. Where terms are taken from another source, the source is cited in the definition of the term. Italicised words represent terms that are defined elsewhere in this glossary.

Acknowledgment A response sent by a *Receiver* to indicate successful reception of information. Acknowledgments may be implemented at any level [Comer 88].

ACK Abbreviation for *Acknowledgment* [Comer 88].

Application A computer program.

Bandwidth The difference between the limiting frequencies of a continuous frequency spectrum [Stallings 91]. Used colloquially in this thesis to mean the overall *Bit Rate* capacity of a *Link*.

Binary Feedback Mechanism A mechanism which returns a single bit of data as its feedback. DecBit [Jain *et al* 87] and PRCA [Hluchyj 94] are binary feedback congestion control mechanisms.

Bit Rate The rate at which bits are transmitted, in bits per unit time. See also *Data Rate*.

Bottleneck The network resource which is limiting the *Bit Rate* of a transmission.

Buffer An amount of computer memory used to store information. Routers have a finite amount of buffers (also known as *Buffer Space*) in which to hold incoming *Packets* for forwarding. *Hosts* also have a finite amount of buffer space to hold incoming packets and packets which they have generated but not yet transmitted.

Buffer Occupancy The current level of *Buffer* use, either in terms of *Packets* queued, or bits queued.

Byte A colloquial term for *Octet*.

Capacity The highest *Data Rate* that can be sustained through a network from a *Source* to a *Destination*, or through part of a network. See also *Sustainable Rate*.

Congestion The state when the resource demands on a network (or a part of a network) exceeds its *Capacity* [Jain & Ramakrishnan 88].

Congestion Avoidance A congestion control scheme allows a network to operate in the region of low *Delay* and high *Throughput*, where *Power* is at its optimum [Jain & Ramakrishnan 88]. See Section 1.3 for more details.

Congestion Control A congestion control scheme tries to bring a network back into an operating state, when demand has already exceeded *Capacity* [Mankin & Ramakrishnan 91].

Connection The path between two *Protocol* modules that provides reliable delivery service [Comer 88].

Connection Setup The stage of a *Connection-Oriented Service* where the *Connection* is established between two *Hosts*.

Connection Teardown The stage of a *Connection-Oriented Service* where the *Connection* between two *Hosts* is broken.

Connectionless Service Characteristic of the *Packet* delivery service offered by most hardware and the Internet Protocol. The connectionless service treats each packet as a separate entity that contains the *Source* and *Destination* address. Usually, connectionless services can drop packets or deliver them out of sequence [Comer 88].

Connection-Oriented Service A communication service which is based upon the concept of a *Connection.*

Data Rate The rate of data in bits per unit time. See also *Bit Rate*.

Datagram The basic unit of information passed by a Network Layer across a network. It contains a *Source* and *Destination* address along with data [Comer 88]. See also *Frame*, *Packet* and *Segment*.

Delay The amount of time it takes for data (or a quantum of data such as a *Packet*) to leave a *Source* and reach its *Destination*. See also *End-to-End Time*.

Destination The *Host* which is the intended destination of a flow of data across a network.

End-to-End Something which is performed by a *Source* and *Destination*, of which the intermediate components of the network have no knowledge. *Flow Control* is an end-to-end mechanism.

End-to-End Time The time between the transmission of a *Packet* at the *Source* and its reception at the *Destination.* See also *Delay*.

Field An individual item of data within a *Header*.

Flow Control Control of the rate at which *Hosts* or *Routers* inject *Packets* into a network. Flow control mechanisms can be implemented at various levels [Comer 88].

Frame Literally, a *packet* as it is transmitted across a serial line [Comer 88]. In this thesis, it refers to a packet as it travels across a *Link* between two peer Link Layers.

Gateway A dedicated computer that is attached to two or more networks and routes *Packets* from one to the other. In particular, an Internet gateway routes IP datagrams among the networks to which it connects [Comer 88]. Although the term has a completely different meaning within the OSI Reference Model, its meaning as defined here is widely used in the Internet community, and is used as such throughout this thesis. See also *Node*, *Router* and *Packet Switch*.

Go Back N Acknowledgment A method of data acknowledgment where the first loss of data is indicated. Upon receipt of this acknowledgment, a *Source* must retransmit all data from the point of first loss onwards. Compare *Selective Acknowledgment* and *Selective Retransmission*.

Header System defined control data that precedes user data [Stallings 91].

Host A computer attached to a network that is not a *Router*. It is usually a *Source* or *Destination* (or both) of data flows.

Interface The physical connection of a *Host* or *Node* to a network. A network-connected computer may have one or more interfaces.

Inter-packet Delay The interval between successive *Packet* transmissions from a *Source* to a particular *Destination*.

Latency The propagation time of a bit or *Frame* across a *Link*.

Leaky Bucket A single-server queueing system with constant service time [Turner 86].

Link A physical connection between two *Nodes* on a network. Data flows between the *Nodes* on a network via links.

Link Layer The communications layer that provides for the reliable transfer of information across a *Link* [Stallings 91].

Load The *Data Rate* being offered to a network, or part of a network. See also *Capacity*.

Network Layer The communications layer that provides for the delivery of information across a number of *Links*.

Node The computers in a network which transfer data between *Links*. In a *Packet-Switched Network*, a *Node* is also known as a *Packet Switch* or *Gateway*. See also *Router*.

Octet A group of eight bits. Often colloquially known as a *Byte*.

Output Interface The *Interface* used by a *Host* or *Node* to transmit on a *Link*.

Packet The basic unit of data flow in a *Packet-Switched Network*. Packets can vary in size between a fixed range of octets. See also *Datagram*, *Frame* and *Segment*.

Packet Admission The insertion of a *Packet* into a network via an *Output Interface*.

Packet Switch A dedicated computer that is attached to two or more networks and routes *Packets* from one to the other. See also *Gateway*, *Node* and *Router*.

Packet Switched Network A network which uses *Packet Switching* as its method of data flow.

Packet Switching A method of transmitting data through a network, in which long messages are subdivided into *Packets*, which are transmitted one at a time across the network via *Packet Switches* [Stallings 91].

Packet Loss The loss of *Packets* at a *Node* due to the lack of available *Buffer* space to queue them.

Path Length The length of the communications path between the *Source* and *Destination*. This may be measured in distance, delay, or by the number of intermediate *Nodes*. See also *End-to-End Time*.

Power The ratio of *Throughput* to *Delay* [Mankin & Ramakrishnan 91].

Protocol A set of rules that govern the operation of functional units to achieve communication [Stallings 91].

Queue A first-in, first-out *Buffer*.

Queue Length An alternative term for *Buffer Occupancy*.

Receiver An alternative term for *Destination*.

Response Time An alternative term for *Delay*.

Round Trip Time The *Delay* for data or a *Packet* to reach a *Destination* and the *Acknowledgment* for that packet to return to the *Source* from the destination.

Route The path that network traffic takes from its *Source* to its *Destination*.

Router A device used to connect two networks that may or may not be similar. The router employs an internet *Protocol* present in each router and each *Host* of the network. The router operates at the Network Layer (layer 3) of the OSI Reference Model [Stallings 91].

Segment The unit of transfer sent from TCP on one machine to TCP on another. Each segment contains part of a stream of bytes being sent between the machines as well as additional fields that identify the current position in the stream and contains a checksum to ensure validity of received data [Comer 88]. See also *Datagram*, *Frame* and *Packet*.

Selective Acknowledgment A method of data acknowledgment where only the data that has been lost is indicated as such. Compare *Go Back N Acknowledgment*.

Selective Retransmission A method of retransmission in the face of network errors where only that data which has been lost is retransmitted.

Sender An alternative term for *Source*.

Sequence Number A *Field* within a *Header* that uniquely identifies the location of a *Packet's* contents within a *Traffic Flow*.

Sliding Window Characteristic of *Protocols* that allow a *Sender* to transmit more than one *Packet* of data before receiving an *Acknowledgment*. After receiving an acknowledgment for the first packet, the sender 'slides' the packet window and sends another. The number of outstanding packets or *Octets* is known as the *Window Size* [Comer 95].

Source The *Host* which is the source of a flow of data across a network to a *Destination*.

Sustainable Rate The maximum *Bit Rate* at which a *Source* can transmit data to a *Destination* without causing congestion in the intermediate *Nodes* in the network. See also *Capacity*, *Load*.

Throughput The ratio of *Data Rate* being offered to a network by a *Source* or sources to the data rate being received by the corresponding *Destinations*.

Traffic Flow A flow of data over a *Connection* between a *Source* and its *Destination*.

Transmission Rate The rate of data transmission in bits per unit time. See also *Bit Rate*, *Data Rate*.

Transport Layer The communications layer that provides reliable, transparent transfer of data between end points; it provides *End-to-End* error recovery and *Flow Control*.

Utilisation The use of a *Link* for data transmission, averaged over a time interval. The value is often normalised, so that the value of 1 indicates that the link was completely utilised over the time interval.

Variance The non-uniformity of a set of samples from a constant value. Mathematically, the square of the set's standard deviation.

Window See *Sliding Window*.

Window Size The number of outstanding *Packets* or *Octets* in a *Sliding Window*.