

**Table 19.1 Terms Relevant to ASN.1**

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Abstract Syntax	Describes the generic structure of data independent of any encoding technique used to represent the data. The syntax allows data types to be defined and values of those types to be specified.
Data Type	A named set of values. A type may be simple, which is defined by specifying the set of its values, or structured, which is defined in terms of other types.
Encoding	The complete sequence of octets used to represent a data value.
Encoding Rules	A specification of the mapping from one syntax to another. Specifically, encoding rules determine algorithmically, for any set of data values defined in an abstract syntax, the representation of those values in a transfer syntax.
Transfer Syntax	The way in which data are actually represented in terms of bit patterns while in transit between presentation entities.

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**TABLE 19.2 Universal Class Tag Assignments** (page 1 of 2)

Tag	Type Name	Set of Values
<b>Basic Types</b>		
UNIVERSAL 1	Boolean	TRUE or FALSE.
UNIVERSAL 2	Integer	The positive and negative whole numbers, including zero.
UNIVERSAL 3	Bit String	A sequence of zero or more bits.
UNIVERSAL 4	Octet String	A sequence of zero or more octets.
UNIVERSAL 9	Real	Real numbers.
UNIVERSAL 10	Enumerated	An explicit list of integer values that an instance of a data type may take.
<b>Object Types</b>		
UNIVERSAL 6	Object Identifier	The set of values associated with information objects allocated by this standard.
UNIVERSAL 7	Object Descriptor	Each value is human-readable text, providing a brief description of an information object.
<b>Character String Types</b>		
UNIVERSAL 18	NumericString	Digits 0 through 9, space
UNIVERSAL 19	PrintableString	Printable characters
UNIVERSAL 20	TeletexString	Character set defined by CCITT Recommendation T.61
UNIVERSAL 21	VideotexString	Set of alphabetic and graphical characters defined by CCITT Recommendations T.100 and T.101.
UNIVERSAL 22	IA5String	International alphabet five (equivalent to ASCII)
UNIVERSAL 25	GraphicString	Character set defined by ISO 8824
UNIVERSAL 26	VisibleString	Character set defined by ISO 646 (equivalent to ASCII)
UNIVERSAL 27	GeneralString	General character string

**TABLE 19.2 Universal Class Tag Assignments** (page 2 of 2)

<b>Miscellaneous Types</b>		
UNIVERSAL 5	NULL	The single value NULL. Commonly used where several alternatives are possible but none of them apply.
UNIVERSAL 8	EXTERNAL	A type defined in some external document. It need not be one of the valid ASN.1 types.
UNIVERSAL 23	UTCTime	Consists of the date, specified with a two-digit year, a two-digit month and a two-digit day, followed by the time, specified in hours, minutes, and optionally seconds, followed by an optional specification of the local time differential from universal time.
UNIVERSAL 24	Generalized Time	Consists of the date, specified with a four-digit year, a two-digit month and a two-digit day, followed by the time, specified in hours, minutes, and optionally seconds, followed by an optional specification of the local time differential from universal time.
UNIVERSAL 11-15	Reserved	Reserved for addenda to the ASN.1 standard.
UNIVERSAL 28-	Reserved	Reserved for addenda to the ASN.1 standard.
<b>Structured Types</b>		
UNIVERSAL 16	SEQUENCE and SEQUENCE OF	<p>SEQUENCE: defined by referencing a fixed, ordered list of types; each value is an ordered list of values, one from each component type.</p> <p>SEQUENCE OF: defined by referencing a single existing type; each value is an ordered list of zero or more values of the existing type.</p>

UNIVERSAL 17	SET and SET OF	<p>SET: defined by referencing a fixed, unordered list of types, some of which may be declared optional; each value is an unordered list of values, one from each component type.</p> <p>SET OF: defined by referencing a single existing type; each value is an unordered list of zero or more values of the existing type.</p>
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**TABLE 19.4 Allowable Data Types in SNMPv2**

<b>Data Type</b>	<b>Description</b>
INTEGER	Integers in the range of $-2^{31}$ to $2^{31} - 1$ ,
UInteger32	Integers in the range of 0 to $2^{32} - 1$ ,
Counter32	A nonnegative integer that may be incremented modulo $2^{32}$ .
Counter64	A nonnegative integer that may be incremented modulo $2^{64}$ .
Gauge32	A nonnegative integer that may increase or decrease, but shall not exceed a maximum value. The maximum value can not be greater than $2^{32} - 1$ .
TimeTicks	A nonnegative integer that represents the time, modulo $2^{32}$ , in hundredths of a second.
OCTET STRING	Octet strings for arbitrary binary or textual data; may be limited to 255 octets.
IpAddress	A 32-bit internet address.
Opaque	An arbitrary bit field.
BIT STRING	An enumeration of named bits.
OBJECT IDENTIFIER	Administratively assigned name to object or other standardized element. Value is a sequence of up to 128 nonnegative integers.

**Table 19.6 SMTP Replies**

Code	Description
Positive Completion Reply	
211	System status, or system help reply
214	Help message (Information on how to use the receiver or the meaning of a particular non-standard command; this reply is useful only to the human user)
220	<domain> Service ready
221	<domain> Service closing transmission channel
250	Requested mail action okay, completed
251	User not local; will forward to <forward-path>
Positive Intermediate Reply	
354	Start mail input; end with <CRLF>.<CRLF>
Transient Negative Completion Reply	
421	<domain> Service not available, losing transmission channel (This may be a reply to any command if the service knows it must shut down)
450	Requested mail action not taken: mailbox unavailable (E.g., mailbox busy)
451	Requested action aborted: local error in processing
452	Requested action not taken: insufficient system storage
Permanent Negative Completion Reply	
500	Syntax error, command unrecognized (This may include errors such as command line too long)
501	Syntax error in parameters or arguments
502	Command not implemented
503	Bad sequence of commands
504	Command parameter not implemented
550	Requested action not taken: mailbox unavailable (E.g., mailbox not found, no access)
551	User not local; please try <forward-path>
552	Requested mail action aborted: exceeded storage allocation
553	Requested action not taken: mailbox name not allowed (E.g., mailbox syntax incorrect]



**Table 19.8 MIME Transfer Encodings**

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7bit	The data is all represented by short lines of ASCII characters.
8bit	The lines are short, but there may be non-ASCII characters (octets with the high-order bit set)
binary	Not only may non-ASCII characters be present but the lines are not necessarily short enough for SMTP transport.
quoted-printable	Encodes the data in such a way that if the data being encoded are mostly ASCII text, the encoded form of the data remains largely recognizable by humans.
base64	Encodes data by mapping 6-bit blocks of input to 8-bit blocks of output, all of which are printable ASCII characters.
x-token	A named nonstandard encoding.

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**Table 19.9 Radix-64 Encoding**

6-bit value	character encoding	6-bit value	character encoding	6-bit value	character encoding	6-bit value	character encoding
0	A	16	Q	32	g	48	w
1	B	17	R	33	h	49	x
2	C	18	S	34	i	50	y
3	D	19	T	35	j	51	z
4	E	20	U	36	k	52	0
5	F	21	V	37	l	53	1
6	G	22	W	38	m	54	2
7	H	23	X	39	n	55	3
8	I	24	Y	40	o	56	4
9	J	25	Z	41	p	57	5
10	K	26	a	42	q	58	6
11	L	27	b	43	r	59	7
12	M	28	c	44	s	60	8
13	N	29	d	45	t	61	9
14	O	30	e	46	u	62	+
15	P	31	f	47	v	63	/
						(pad)	=

**Table 19.10 Key Terms Related to HTTP**

<p><b>Cache</b></p> <p>A program's local store of response messages and the subsystem that controls its message storage, retrieval, and deletion. A cache stores cacheable responses in order to reduce the response time and network bandwidth consumption on future, equivalent requests. Any client or server may include a cache, though a cache cannot be used by a server while it is acting as a tunnel.</p> <p><b>Client</b></p> <p>An application program that establishes connections for the purpose of sending requests.</p> <p><b>Connection</b></p> <p>A transport layer virtual circuit established between two application programs for the purposes of communication.</p> <p><b>Entity</b></p> <p>A particular representation or rendition of a data resource, or reply from a service resource, that may be enclosed within a request or response message. An entity consists of entity headers and an entity body.</p> <p><b>Gateway</b></p> <p>A server that acts as an intermediary for some other server. Unlike a proxy, a gateway receives requests as if it were the original server for the requested resource; the requesting client may not be aware that it is communicating with a gateway. Gateways are often used as server-side portals through network firewalls and as protocol translators for access to resources stored on non-HTTP systems.</p> <p><b>Message</b></p>	<p><b>Origin Server</b></p> <p>The server on which a given resource resides or is to be created.</p> <p><b>Proxy</b></p> <p>An intermediary program that acts as both a server and a client for the purpose of making requests on behalf of other clients. Requests are serviced internally or by passing them, with possible translation, on to other servers. A proxy must interpret and, if necessary, rewrite a request message before forwarding it. Proxies are often used as client-side portals through network firewalls and as helper applications for handling requests via protocols not implemented by the user agent.</p> <p><b>Resource</b></p> <p>A network data object or service which can be identified by a URI.</p> <p><b>Server</b></p> <p>An application program that accepts connections in order to service requests by sending back responses.</p> <p><b>Tunnel</b></p> <p>An intermediary program that is acting as a blind relay between two connections. Once active, a tunnel is not considered a party to the HTTP communication, though the tunnel may have been initiated by an HTTP request. A tunnel ceases to exist when both ends of the relayed connections are closed. Tunnels are used when a portal is necessary and the intermediary cannot, or should not, interpret the relayed communication.</p> <p><b>User Agent</b></p>
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<p>The basic unit of HTTP communication, consisting of a structured sequence of octets transmitted via the connection.</p>	<p>The client that initiates a request. These are often browsers, editors, spiders, or other end-user tools.</p>
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**Table 19.11 Augmented BNF Notation Used in  
URL and HTTP Specifications**

- Words in lower case represent variables or names of rules.
- A rule has the form

name = definition

- DIGIT is any decimal digit; CRLF is carriage return, line feed; SP is one or more spaces.
- Quotation marks enclose literal text.
- Angle brackets, "<" ">", may be used within a definition to enclose a rule name when their presence will facilitate clarity.
- Elements separated by bar ("|") are alternatives.
- Ordinary parentheses are used simply for grouping.
- The character "\*" preceding an element indicates repetition. The full form is:

<I>\*<J>element

indicating at least I and at most J occurrences of element. \*element allows any number, including 0; 1\*element requires at least one element; and 1\*2element allows 1 or 2 elements; <N>element means exactly N elements.

- Square brackets, "[" "]", enclose optional elements.
- The construct "#" is used to define, with the following form:

<I>#<J>element

indicating at least I and at most J elements, each separated by a comma and optional linear white space.

- A semicolon at the right of a rule starts a comment that continues to the end of the line.

**Table 19.12 HTTP Elements**

ALL MESSAGES			
General Header Fields		Entity Header Fields	
Cache-Control	Keep-Alive	Allow	Derived-From
Connection	MIME-Version	Content-Encoding	Expires
Data	Pragma	Content-Language	Last-Modified
Forwarded	Upgrade	Content-Length	Link
		Content-MD5	Title
		Content-Range	Transfer-Encoding
		Content-Type	URI-Header
		Content-Version	extension-header
REQUEST MESSAGES			
Request Methods		Request Header Fields	
OPTIONS	MOVE	Accept	If-Modified-Since
GET	DELETE	Accept-Charset	Proxy-Authorization
HEAD	LINK	Accept-Encoding	Range
POST	UNLINK	Accept-Language	Referer
PUT	TRACE	Authorization	Unless
PATCH	WRAPPED	From	User-Agent
COPY	extension-method	Host	
RESPONSE MESSAGES			
Response Status Codes			Response Header Fields

Continue	Moved Temporarily	Request Timeout	Location
Switching Protocols	See Other	Conflict	Proxy-Authenticate
OK	Not Modified	Gone	Public
Created	Use Proxy	Length Required	Retry-After
Accepted	Bad Request	Unless True	Server
Non-Authoritative	Unauthorized	Internal Server Error	WWW-Authenticate
Information	Payment Required	Not Implemented	
No Content	Forbidden	Bad Gateway	
Reset Content	Not Found	Service Unavailable	
Partial Content	Method Not Allowed	Gateway Timeout	
Multiple Choices	None Acceptable	extension code	
Moved Permanently	Proxy Authentication Required		

**Table 19.13 HTTP Status Codes** (page 1 of 2)

<b>Informational</b>	
Continue	Initial part of request received; client may continue with request.
Switching Protocols	Server will switch to requested new application protocol.
<b>Successful</b>	
OK	Request has succeeded and the appropriate response information is included.
Created	Request fulfilled and a new resource has been created; the URI(s) are included.
Accepted	Request accepted but processing not completed. The request may or may not eventually be acted upon.
Non-Authoritative Information	Returned contents of entity header is not the definitive set available from origin server, but is gathered from a local or third-party copy.
No Content	Server has fulfilled request but there is no information to send back.
Reset Content	Request has succeeded and the user agent should reset the document view that caused the request to be generated.
Partial Content	Server has fulfilled the partial GET request and the corresponding information is included.
<b>Redirection</b>	
Multiple Choices	Requested resource is available at multiple locations and a preferred location could not be determined.
Moved Permanently	Requested resource has been assigned a new permanent URI; future reference should use this URI
Moved Temporarily	Requested resource resides temporarily under a different URI.
See Other	Response to the request can be found under a different URI and should be retrieved using a GET on that resource.

Not Modified	The client has performed a conditional GET, access is allowed, and the document has not been modified since the date/time specified in the request.
Use Proxy	Requested resource must be accessed through the proxy indicated in the Location field.

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**Table 19.13 HTTP Status Codes** (page 2 of 2)

<b>Client Error</b>	
Bad Request	Malformed syntax in request.
Unauthorized	Request requires user authentication.
Payment Required	Reserved for future use.
Forbidden	Server refuses to fulfill request; used when server does not wish to reveal why the request was refused.
Not Found	Requested URI not found.
Method Not Allowed	Method (command) not allowed for the requested resource.
None Acceptable	Resource found that matches requested URI, but does not satisfy conditions specified in the request.
Proxy Authentication Required	Client must first authenticate itself with the proxy.
Request Timeout	Client did not produce a request within the time that the server was prepared to wait.
Conflict	Request could not be completed due to a conflict with the current state of the resource.
Gone	Requested resource no longer available at the server and no forwarding address is known.
Length Required	Server refuses to accept request without a defined content length.
Unless True	Condition given in the Unless field was true when tested on server.
<b>Server Error</b>	
Internal Server Error	Server encountered an unexpected condition that prevented it from fulfilling the request.
Not Implemented	Server does not support the functionality required to fulfill the request.
Bad Gateway	Server, while acting as a gateway or proxy, received an invalid response from the upstream server it accessed to fulfill the request.

Service Unavailable	Server unable to handle request due to temporary overloading or maintenance of the server.
Gateway Timeout	Server, while acting as a gateway or proxy, did not receive a timely response from the upstream server it accessed to fulfill the request.

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