# Introduction

This follows on to Murata-san’s e-mails in the threads “My proposals: content type and media ypest” (last from 21 Feb 2015) and “Which RFC(s) for media type should we refer to?” (last from 11 Dec 2014) analyzing the regular expression in the schema for ST\_ContentType in Part 2 Annex D. It simplifies the [XML Schema regular expression](http://www.w3.org/TR/xmlschema-2/#dt-regex) and compares it to RFC 2616’s definition of media-type. It then compares the definition of media-type in RFC 2616 and RFC 7231, which obsoletes RFC 2616.

Tracked changes show the progression of analyzing the regex. In at least Microsoft Word, you can click on a comment to see it highlight only the segment of BNF it relates to.

John Haug, 27 Feb 2015

*Edit 7 Apr 2015:* Fix typo with parenthesis location in “… replace chunk with Y …” section below. See WG 4 e-mail of 7 Apr 2015.

# Part 2 schema regex simplification

## Original Part 2 schema regex pattern (ST\_ContentType)

(((([\p{IsBasicLatin}-[\p{Cc}&#127;\(\)&lt;&gt;@,;:\\&quot;/\[\]\?=\{\}\s\t]])+))/((([\p{IsBasicLatin}-[\p{Cc}&#127;\(\)&lt;&gt;@,;:\\&quot;/\[\]\?=\{\}\s\t]])+))((\s+)\*;(\s+)\*(((([\p{IsBasicLatin}-[\p{Cc}&#127;\(\)&lt;&gt;@,;:\\&quot;/\[\]\?=\{\}\s\t]])+))=((([\p{IsBasicLatin}-[\p{Cc}&#127;\(\)&lt;&gt;@,;:\\&quot;/\[\]\?=\{\}\s\t]])+)|(&quot;(([\p{IsLatin-1Supplement}\p{IsBasicLatin}-[\p{Cc}&#127;&quot;\n\r]]|(\s+))|(\\[\p{IsBasicLatin}]))\*&quot;))))\*)

## Replace same chunks with X (not using correct XSD entity reference notation for simplicity)

((((X)+))/(((X)+))((\s+)\*;(\s+)\*((((X)+))=(((X)+)|(&quot;(([\p{IsLatin-1Supplement}\p{IsBasicLatin}-[\p{Cc}&#127;&quot;\n\r]]|(\s+))|(\\[\p{IsBasicLatin}]))\*&quot;))))\*)

## Remove obvious unnecessary parentheses

X+/X+((\s+)\*;(\s+)\*((X+)=(X+|(&quot;(([\p{IsLatin-1Supplement}\p{IsBasicLatin}-[\p{Cc}&#127;&quot;\n\r]]|\s+)|(\\[\p{IsBasicLatin}]))\*&quot;))))\*

## Remove other unnecessary parentheses, modifiers (+) and character specifications (\n\r covered by \p{Cc})

X+/X+(\s\*;\s\*(X+=(X+|(&quot;(([\p{IsLatin-1Supplement}\p{IsBasicLatin}-[\p{Cc}&#127;&quot;]]|\s+)|(\\[\p{IsBasicLatin}]))\*&quot;))))\*

Remove unnecessary parentheses, replace chunk with Y (ignore whitespace added for ease of grouping/reading)

X+/X+(\s\*;\s\*(X+=(

X+ | (&quot;(Y | (\\[\p{IsBasicLatin}]))\*&quot;)

)))\*

Simplify (remove added whitespace)

X+/X+(\s\*;\s\*(X+=(X+|(&quot;(Y|(\\[\p{IsBasicLatin}])\*)&quot;))))\*

# Definitions #1 – RFC 2616 and regex

### RFC 2616

NOTE: This uses old [RFC 822](http://tools.ietf.org/html/rfc822)-style augmented Backus-Naur Form (not the same as [RFC 5234](http://tools.ietf.org/html/rfc5234) ABNF)

media-type = type "/" subtype \*( ";" parameter )  
type = token  
subtype = token  
parameter = attribute "=" value  
attribute = token  
value = token | quoted-string  
quoted-string = ( <"> \*(qdtext | quoted-pair ) <"> )  
qdtext = <any TEXT except <">>  
quoted-pair = "\" CHAR  
TEXT = <any OCTET except CTLs, but including LWS>  
LWS = [CRLF] 1\*( SP | HT ) ; linear white space  
CRLF = CR LF  
token = 1\*<any CHAR except CTLs or separators>  
CHAR = <any US-ASCII character (octets 0 - 127)>  
CTL = <any US-ASCII control character (octets 0 - 31) and DEL (127)>  
separators = "(" | ")" | "<" | ">" | "@" | "," | ";" | ":" | "\" | <"> | "/" | "[" | "]" | "?" | "=" | "{" | "}" | SP | HT  
OCTET = <any 8-bit sequence of data>  
CR = <US-ASCII CR, carriage return (13)>  
LF = <US-ASCII LF, linefeed (10)>  
SP = <US-ASCII SP, space (32)>  
HT = <US-ASCII HT, horizontal-tab (9)>  
<"> = <US-ASCII double-quote mark (34)>

### Regex

From <http://www.regular-expressions.info/unicode.html>:

\p{Cc} or \p{Control}: an ASCII 0x00–0x1F or Latin-1 0x80–0x9F control character

From <https://msdn.microsoft.com/en-us/library/20bw873z(v=vs.110).aspx#SupportedNamedBlocks>:

|  |  |  |
| --- | --- | --- |
| **Code point range** | **Block name** | **Note** |
| 0000 - 007F | IsBasicLatin | ASCII 0-127 |
| 0080 - 00FF | IsLatin-1Supplement | Extended ASCII 128-255 |

# Interpretation of X and Y in Part 2 regex

X: [\p{IsBasicLatin}-[\p{Cc}&#127;\(\)&lt;&gt;@,;:\\&quot;/\[\]\?=\{\}\s\t]]

* English approximation: Any single ASCII character except controlchars DEL ( ) < > @ , ; : \ " / [ ] ? = { } SPACE TAB

X+ is the same as RFC 2616’s token

Y: ([\p{IsLatin-1Supplement}\p{IsBasicLatin}-[\p{Cc}&#127;&quot;]]|\s+)

* English approximation: Any single extended ASCII character including linear whitespace except controlchars DEL "

Y is the same as RFC 2616’s qdtext

# Comparison of simplified Part 2 schema regex and RFC 2616 media-type

media-type = type "/" subtype \*( ";" parameter )

= token "/" token \*( ";" attribute "=" value)

= token "/" token \*( ";" token "=" (token | quoted-string))

= token "/" token \*( ";" token "=" (token | (<"> \*(qdtext | quoted-pair) <">)))

= token "/" token \*( ";" token "=" (token | (<"> \*(qdtext | "\" CHAR) <">)))

X+/X+(\s\*;\s\*(X+=(X+|(&quot;(Y|\\[\p{IsBasicLatin}]\*)&quot;))))\*

# Definitions #2 – RFC 7231

## RFC 7231

NOTE: This uses [RFC 5234](http://tools.ietf.org/html/rfc5234) Augmented Backus-Naur Form

media-type = type "/" subtype \*( OWS ";" OWS parameter )  
type = token  
subtype = token  
parameter = token "=" ( token / quoted-string )  
quoted-string = DQUOTE \*( qdtext / quoted-pair ) DQUOTE  
qdtext = HTAB / SP / %x21 / %x23-5B / %x5D-7E / obs-text  
quoted-pair = "\" ( HTAB / SP / VCHAR / obs-text )  
token = 1\*tchar  
tchar = "!" / "#" / "$" / "%" / "&" / "'" / "\*" / "+" / "-" / "." / "^" / "\_" / "`" / "|" / "~" / DIGIT / ALPHA  
 ; any VCHAR, except delimiters  
VCHAR = %x21-7E ; visible (printing) characters, RFC 5234 Appendix B.1  
DIGIT = %x30-39 ; RFC 5234 Appendix B.1  
ALPHA = %x41-5A / %x61-7A ; A-Z / a-z  
obs-text = %x80-FF  
OWS = \*( SP / HTAB ) ; optional whitespace, RFC 7230 Section 3.2.3  
SP = %x20 ; RFC 5234 Appendix B.1  
HTAB = %x09 ; horizontal tab, RFC 5234 Appendix B.1

# Differences between RFC 2616 and RFC 7231

## media-type

RFC 2616 disallows whitespace around the semi-colon preceding a parameter. RFC 7231 allows any number of SP and/or HTAB.

## token

No differences

## qdtext

RFC 2616 includes LF (octet 10 / %x0A), CR (octet 13 / %x0D), \ (octet 92 / %x5C). RFC 7231 disallows these characters.

## quoted-pair

RFC 2616 allows any character in the standard ASCII range (octets 0-127). RFC 7231 disallows the range octets 0-31 except for octet 9 (HTAB).