

IBM Java™ 2 SDK HeapAnalyzer for Windows Version 1.1

Jinwoo Hwang jinwoo@us.ibm.com

Welcome to IBM Java 2 SDK HeapAnalyzer. This tool is for internal use only. Please do not distribute the tool externally since International Patent disclosures were submitted with this tool.

Introduction

The Heapdump contains a list of all the objects that are in the heap.

Heapdumps can be very large with millions of items in them.

It's not always easy to analyze a large file. This tool analyzes heapdumps of Java SDK 1.3.1 and 1.4.1.

HeapAnalyzer is an unofficial tool and is provided "as-is".

Prerequisite

Java 2 SDK 1.4.1 or higher (Java 2 runtime 1.4.1 is provided with this tool)

Definitions

root object An object for which no (different) object holds a reference.

parent object An object (for example, A) that holds at least one reference to some

(different) object (for example, B). In this case, A is said to be the

parent of B.

Owner object If an object has more than one parent object, a parent object is chosen as owner object.

Total size is calculated only with owner objects. **child object** An object (for example, B) for which at least one (different) object (for example, A) holds a reference. In this case B is said to be the child of A. **type** Collection of same objects **size** The size of an object is the amount of memory that is required to hold that object in memory. **total size** The subtree size of an object is the sum of its size and the sizes of

all the objects that it reached from its children. Note that each

object is assigned a unique parent and root during processing.

Features

Creates a tree from heapdump Calculates size of each objects Calculates total size of each subtree Finds size drop in a subtree Shows free heap space by size Shows object by size Shows types by size Shows types by count Shows types alphabetical order Shows free heap space distribution Shows detailed information of an object Finds type with regular expression Drag and drop support in input fields and text

How to run this tool

Java runtime environment is provided with this tool.

Usage jre\bin\java -Xmx[heapsize] -jar ha.jar

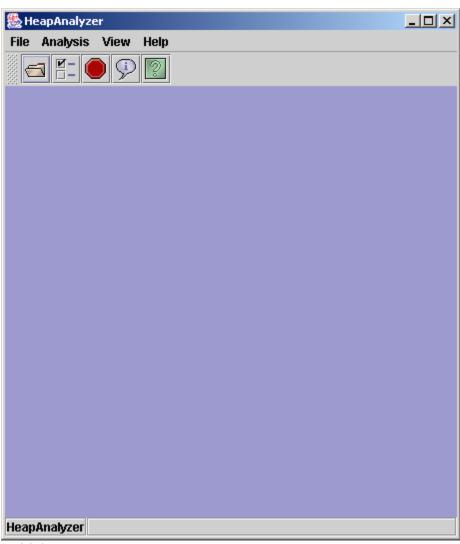
For example, jre\bin\java -Xmx1000m -jar ha.jar

If there's java.lang.OutOfMemoryError, please try increasing the maximum heap size (-Xmx) value to give the JVM more memory.

Maximum heap size should not be larger than the size of available physical memory size for this tool due to performance issue.

Feel free to contact me if you have any comments or suggestions.

1. Start the tool.



[Initial screen]

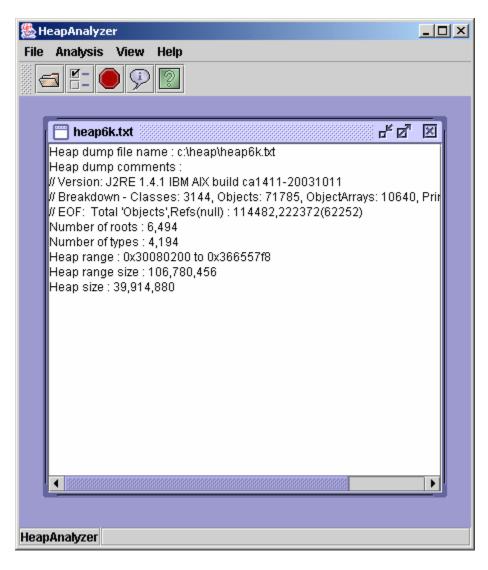
2. Select File -> Open and select a heapdump file

🌺 Open				×
Look <u>i</u> n:	C WebSphere51	 •	F	
📑 AppS	erver			
📑 Depla	ymentManager			
📑 IBMH	ttpServer			
File <u>N</u> ame	:			
Files of Ty	/pe: All Files (*.*)			•
			Open	Cancel
		L		

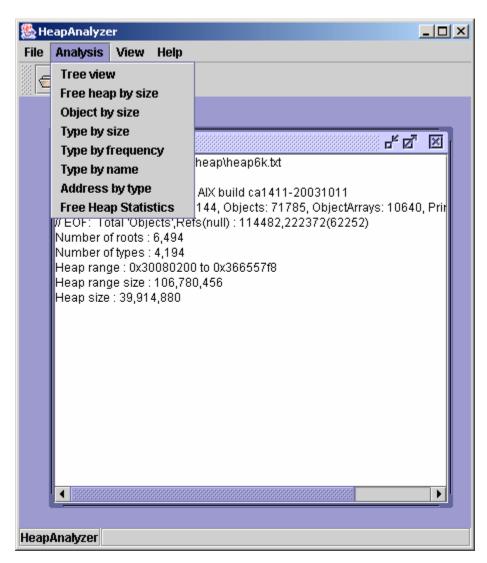
3. Progress is shown during processing heapdump.

🌺 Analyzing Heap Dump	×
Unit progress	
Loading heap dump file	
Overall progress	
0%	
0%	

4. It would take lots of time if you are processing large heapdump. The following is the screen when processing is complete. Please do not close this window until you do not need this heapdump.



Click on Analysis menu and select a menu item for further analysis.

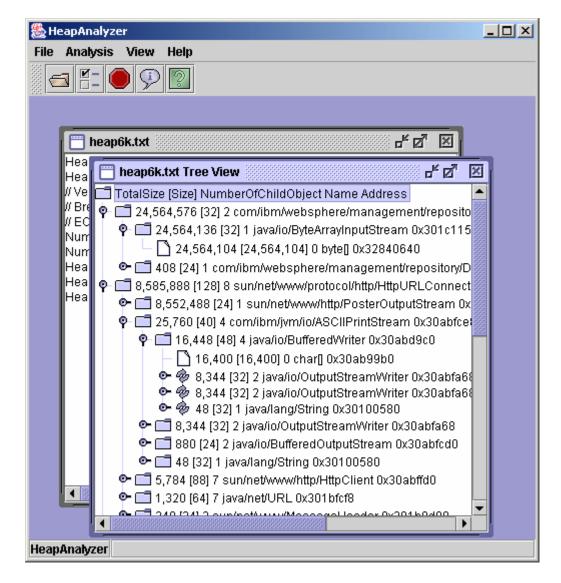


5. The following is tree view of the heapdump.

The icon, 🍫, indicates that it has already been included as a child object of owner object in tree view

Each tree node as in the following format:

TotalSize[Size] NumberOfChildObject Name Address



6. In tree view, you can see detailed information of a node , you can search for total size drop between parent and child

or you can find an address by selecting a node and click on right mouse button.

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File Analysis View Help	
neap6k.txt	
Hea Hea 📄 heap6k.txt Tree View	
// Ve 🗂 TotalSize [Size] NumberOfChildObject Name Address	
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WEC 9 24,564, SP Detailed node information am 0x301c115	
Num 🛛 🗋 24,5 🚜 Search for total size drop 0640	
Hea 🗢 🗂 408 [24] 🔗 Find an address nt/repository/D	
Hea of 128,585,888 [128] 8 sun/net/www/protocol/http/Http/RLConnect	
8,552,488 [24] T sunnebwww.mitprosteroutputstream ox	
P 🗖 25,760 [40] 4 com/ibm/jvm/io/ASCIIPrintStream 0x30abfce	
P I 16,448 [48] 4 java/io/BufferedWriter 0x30abd9c0	
- 🗋 16,400 [16,400] 0 char]] 0x30ab99b0	
 	
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🗣 🗔 8,344 [32] 2 java/io/OutputStreamWriter 0x30abfa68	
🗣 🗂 880 [24] 2 java/io/BufferedOutputStream 0x30abfcd0	
🗢 🗂 48 [32] 1 java/lang/String 0x30100580	
🗢 🗂 5,784 [88] 7 sun/net/www/http/HttpClient 0x30abffd0	
🖳 🛄 🔍 🗂 1,320 [64] 7 java/net/URL 0x301bfcf8	
HeapAnalyzer	
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"Search for total size drop" will find a size drop between the total size of a parent and the biggest total size of child of the parent.

If you cannot find any size drop from the menu "Search for total size drop", you need to decrease Minimum total size drop for search in options.



You can find an address in the tree view by selecting the menu "Find an address"

🌺 Find an address	×
Please enter an address (i.e. 0x00FC)	
0x300fc380	
Find Cancel	

The following is the result of address search :

🌺 HeapAnalyzer 📃	
File Analysis View Help	
📄 heapôk.txt 🖉 🗵	
Hea 📄 heap6k.txt Tree View 🖉 🖾	
// Ve 🗖 TotalSize [Size] NumberOfChildObject Name Address	
// Bre 💁 🗂 24 564 576 [32] 2 com/ibm/websphere/management/reposite	
// EC Num 🛛 🕈 🗂 24,564,136 [32] 1 java/io/ByteArrayInputStream 0x301c115	
Num 24,564,104 [24,564,104] 0 byte[] 0x32840640	
Hea 408 [24] 1 com/ibm/websphere/management/repository/D Hea 8 585 888 [128] 8 sup/pet/www/protocol/http://ttp.//RL/Connect	
Hea P- 📑 8,585,888 [128] 8 sun/net/www/protocol/http/HttpURLConnect Hea P- 📑 8,552,488 [24] 1 sun/net/www/http/PosterOutputStream 0x	
P = 25,760 [40] 4 com/ibm/jvm/io/ASCIIPrintStream 0x30abfcet	
• 🖬 16,448 [48] 4 java/io/BufferedWriter 0x30abd9c0	
— 🗋 16,400 (16,400) 0 char[] 0x30ab99b0	
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16 [16] 0 char[] 0x300fc380	
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HeapAnalyzer	

7. The following is the screen of detailed node information in heapdump tree

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File Analysis View Help
heap6k.txt
Hea 💼 heap6k.txt Tree View
🖉 Ve 🗂 TotalSize [Size] NumberOfChildObject Name Address 📃 📃
// Brit 🕈 🗖 24,564,576 [32] 2 com/ibm/websphere/management/reposito
Tava/io/ByteArrayInputStream at 0x301c1158
Address : 0x301c1158 Object : java/io/ByteArrayInputStream Number of children : 1 Owner address: 0x301c1178 Owner object: com/ibm/websphere/management/repository/DocumentContentSource Size : 32 Total size : 24,564,136
 48 [32] 1 Java/lang/string 0x30100580 8,344 [32] 2 java/io/OutputStreamWVriter 0x30abfa68 880 [24] 2 java/io/BufferedOutputStream 0x30abfcd0 48 [32] 1 java/lang/String 0x30100580 5,784 [88] 7 sun/net/Www/http/HttpClient 0x30abffd0 5,784 [88] 7 sun/net/URL 0x301bfcf8 340 [24] 2 outplot the un/hospecial lood or 0x201 b0d00
HeapAnalyzer

8. The following is free heap space view

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File Analysis View Help	
📄 heap6k.txt 🖉 🖾	
Hea Hea 📅 heap6k.txt Tree View	
// Ve 🗂 To 💼 heap6k.txt Free heap space 🖉 🖉 🖉	
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HeapAnalyzer	

9. Object view by size

Ana	lysis	١	/iew Help						
	[=](92						
m	heap	06k	txt			් වේ 🗵	1		
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// Br	6		📋 heap6k.t	xt Objects					a 🖂
// EC		ē	Size	Total	Address	Object	NumberOfC	hildObject	
Nun		1	24,564,104	24,564,104	0x32840640	byte[]	0		333
Nun			8,552,464	8,552,464	0x31d23388	byte[]	0		
Hea		9	65,552	65,552	0x305d84b8	byte[]	0		
Hea	Ш.Т.		65,552	65,552	0x305e84c8	byte[]	0		
Hea		é	63,352	63,352	0x3012fef8	byte]	0		
		d	36,696	36,696	0x30447060	byte[]	0		
		1	26,424	26,424	0x301c2950	byte[]	0		222
			16,400	16,400	0x3010a040	char[]	0		
			16,400	16,400	0x3010e050	char[]	0		
			16,400	16,400	0x305915d0	char[]	0		
			16,400	16,400	0x30ab99b0	char[]	0		
			12,096	12,096	0x30444120	byte[]	0		
			10,256	2,620,632	0x30904730	array of jav	/a/lang/Object	1,750	
			8,304	8,304	0x3018ad30	byte[]	0		
			8,216	8,528	0x31aef710	array of jav	/a/lang/Object	7	
			8,208	8,208	0x300fd9c8	byte[]	0		
		٩	8,208	8,208	0x30106658	byte[]	0		
•			8,208	8,208	0x301f2bc0	byte[]	0		
		d	8,208	8,208	0x3057f648	byte[]	0		-
								202020202020202	

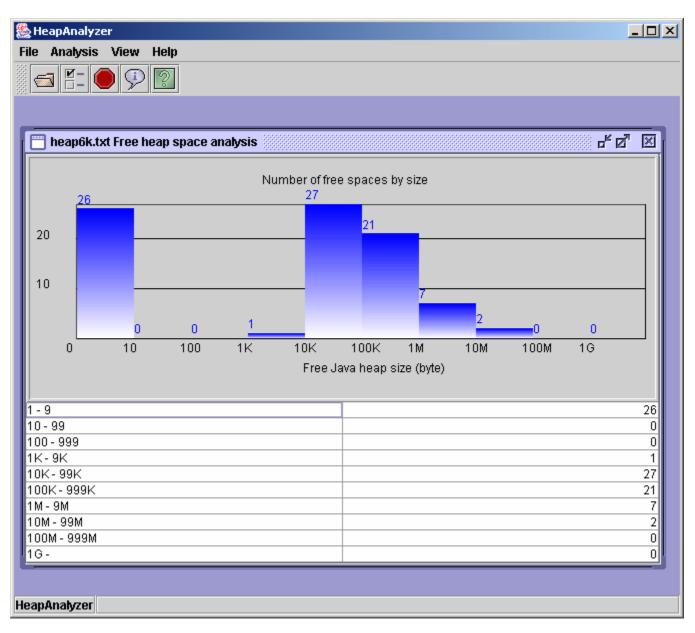
10. Type view by total size view

HeapAnalyzer File Analysis A	view Help			×
	e ap6k.txt Tree ' talSize [Size] Nu		년 2 포 나 2 포 dObject Name Address otal Size	
Num Ÿ Num Hea © Hea ♀ ⊑ Hea ⊚	Sum of sizes 33,630,144 2,179,344 905,344 382,624 163,664 150,720 133,992 117,624 104,768 85,688 74,600 73,248 73,024 64,776 43,008	Count 989 27,167	Type byte[] char[] java/lang/String java/util/HashMap\$Entry array of java/util/HashMap\$Entry java/util/HashMap java/util/HashMap java/util/HashMap org/eclipse/emt/ecore/impl/EAttribute array of java/lang/Object int[] array of java/util/Hashtable\$Entry java/util/Hashtable\$Entry org/eclipse/emt/ecore/impl/EReferen org/eclipse/emt/ecore/impl/EReferen org/eclipse/emt/ecore/impl/EReferen org/eclipse/emt/ecore/impl/EClassIn java/util/Hashtable java/util/Hashtable	
HeapAnalyzer				

11. Types view by frequency

HeapAnalyzer File Analysis Vie	w Help		
	o 6k.txt Tree Vie Size (Size) Numl		다 2 또 다 Name Address
Hea o⊷ [Hea o⊷ [Hea o⊷ [♥ [Count 28,292 27,167 11,957 5,583 3,144 3,140 2,603 2,569 2,289 1,131 989 968 914 896 852 811 739	Sum of sizes 905,344 2,179,344 382,624 133,992 163,664 150,720 41,648 104,768 73,248 117,624 33,630,144 37,656 74,600 43,008 34,080 32,440 17,736	Type java/lang/String char[] java/util/HashMap\$Entry java/util/Jar/Attributes\$Name array of java/util/HashMap\$Entry java/util/HashMap java/util/HashMap java/util/HashAble\$Entry org/eclipse/emt/ecore/impl/EAttribute byte[] array of java/lang/String array of java/lang/String array of java/lang/String array of java/util/Hashtable\$Entry java/util/Hashtable org/eclipse/emt/ecore/util/EObjectCo org/eclipse/emt/ecore/util/EObjectIr org/eclipse/emt/ecore/util/EObjectIr
HeapAnalyzer			

12. Free heap space distribution view



13. You can configure setting in File-> Options menu

Options	×
Maximum number of subtrees	20
Maximum number of entries in free heap list	50
Maximum number of entries in object list	50
Maximum number of entries in type (size) list	50
Maximum number of entries in type (count) list	50
Mininum total size drop for search	10000000
Maximum number of entries in address list	50
Maximum number of entries in type (name) list	50
Apply Cancel	

14. Type by alphabetical order

🎇 HeapAnalyzer	
File Analysis View Help	
📄 heap6k.txt Types by name 🛛 🖉 🗵	
Type \$Proxy0 array of [B array of [C array of [Ljava/lang/Byte; array of [Ljava/lang/Object; array of [Ljava/lang/String; array of [Ljava/lang/ref/SoftReference; array of [C array of [C array of com/ibm/ejs/models/base/bindings/ejbbnd/CMPResAuthType]	
array of com/ibm/ejs/models/base/extensions/commonext/Connectio array of com/ibm/ejs/models/base/extensions/commonext/IsolationLu array of com/ibm/ejs/models/base/extensions/commonext/Iocaltran/L array of com/ibm/ejs/models/base/extensions/commonext/Iocaltran/L array of com/ibm/ejs/models/base/extensions/commonext/Iocaltran/L array of com/ibm/ejs/models/base/extensions/commonext/Iocaltran/L array of com/ibm/ejs/models/base/extensions/commonext/Iocaltran/L array of com/ibm/ejs/models/base/extensions/ejbext/AccessIntentKin array of com/ibm/ejs/models/base/extensions/ejbext/AccessIntentKin	}Entry
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	EContents -
HeapAnalyzer	

15. Address by type to find types include string "byte"

🌺 Find an address	×
Please enter type or regular expression	
(For example .*byte.* for types include string "byte")	
.*byte.*	
Find Cancel	

The following is the list of types which have "byte" in their names.

Theap6k.txt			2				
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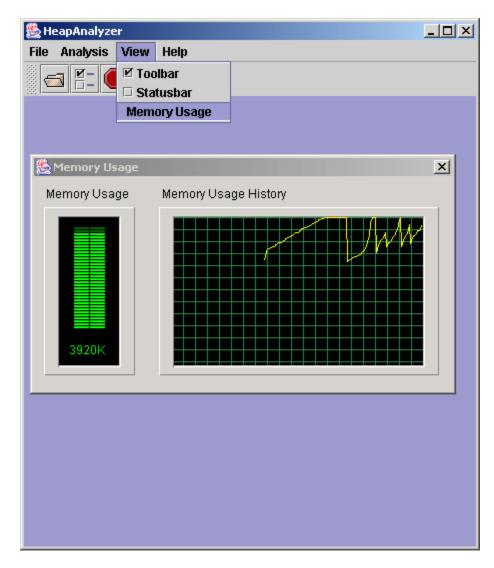
You can also enter exact name of a type:

🎇 Find an address	×
Please enter type or regular expression	
(For example .*byte.* for types include string "byte")	
byte]	
Find Cancel	

The following is the list of types of byte[]

	apAnalyz							
File	Analysis	Viev	v Help					
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		40	•	[464] [16]	0 0	0x300f9a58		
_		24		[24]	0	0x300f9d88		
		48		[48]	0	0x300f9e90		
		40		[40]	0	0x300fa2a0		
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		16		[16]	0	0x300fd048	-	
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16. You can monitor memory usage in "Memory Usage" menu.



Summary of regular-expression constructs

Construct	Matches
Characters	
x	The character <i>x</i>
$\setminus \setminus$	The backslash character
$\setminus 0n$	The character with octal value $0n$ (0 <= n <= 7)
\0 <i>nn</i>	The character with octal value $0nn$ (0 <= $n \leq 7$)
\0 <i>mnn</i>	The character with octal value $0mnn$ ($0 \le m \le 3, 0 \le n \le 7$)
$\ \ hh$	The character with hexadecimal value 0xhh
\u <i>hhhh</i>	The character with hexadecimal value 0xhhhh
\t	The tab character ('\u0009')
∖n	The newline (line feed) character ('\u000A')
\r	The carriage-return character ('\u000D')
∖f	The form-feed character ('\u000C')
\a	The alert (bell) character ('\u0007')

\e	The escape character ('\u001B')
$\backslash cx$	The control character corresponding to <i>x</i>

Character classes

[abc]	a, b, or c (simple class)
[^abc]	Any character except a, b, or c (negation)
[a-zA-Z]	a through z or A through z, inclusive (range)
[a-d[m-p]]	a through d, or m through p: [a-dm-p] (union)
[a-z&&[def]]	d, e, or f (intersection)
[a-z&&[^bc]]	a through z, except for b and c: [ad-z] (subtraction)
[a-z&&[^m-p]]	a through z, and not m through p: [a-lq-z](subtraction)

Predefined character classes

	Any character (may or may not match line terminators)
\d	A digit: [0-9]
\D	A non-digit: [^0-9]
\s	A whitespace character: [\t\n\x0B\f\r]
\S	A non-whitespace character: [^\s]
\w	A word character: [a-zA-Z_0-9]
$\setminus M$	A non-word character: [^\w]

POSIX character classes (US-ASCII only)

\p{Lower}	A lower-case alphabetic character: [a-z]
\p{Upper}	An upper-case alphabetic character: [A-Z]
\p{ASCII}	All ASCII: [\x00-\x7F]
\p{Alpha}	An alphabetic character: [\p{Lower}\p{Upper}]
\p{Digit}	A decimal digit: [0-9]
\p{Alnum}	An alphanumeric character: [\p{Alpha}\p{Digit}]
\p{Punct}	Punctuation: One of ! "#\$%&' () *+,/:;<=>?@[\]^`{ }~
\p{Graph}	A visible character: [\p{Alnum}\p{Punct}]
\p{Print}	A printable character: [\p{Graph}]
$p{Blank}$	A space or a tab: [\t]
\p{Cntrl}	A control character: $[\x00-\x1F\x7F]$
\p{XDigit}	A hexadecimal digit: [0-9a-fA-F]
\p{Space}	A whitespace character: [\t\n\x0B\f\r]

Classes for Unicode blocks and categories

\p{InGreek}	A character in the Greek block (simple block)
\p{Lu}	An uppercase letter (simple category)
\p{Sc}	A currency symbol
\P{InGreek}	Any character except one in the Greek block (negation)
[\p{L}&&[^\p{Lu}]]	Any letter except an uppercase letter (subtraction)

Boundary matchers

^	The beginning of a line
\$	The end of a line

\b	A word boundary
∖B	A non-word boundary
\A	The beginning of the input
\G	The end of the previous match
$\backslash Z$	The end of the input but for the final terminator, if any
\z	The end of the input

Greedy quantifiers

<i>X</i> ?	X, once or not at all
X^{\star}	X, zero or more times
X+	X, one or more times
$X{n}$	X, exactly <i>n</i> times
$X\{n, \}$	X, at least n times
$X\{n,m\}$	X, at least n but not more than m times

Reluctant quantifiers

<i>X</i> ??	X, once or not at all
X^{\star} ?	X, zero or more times
X+?	X, one or more times
$X{n}?$	X, exactly <i>n</i> times
$X\{n,\}?$	X, at least <i>n</i> times
$X\{n, m\}$?	X, at least n but not more than m times

Possessive quantifiers

X?+	X, once or not at all
X^{\star} +	X, zero or more times
X++	X, one or more times
$X_{n} +$	X, exactly <i>n</i> times
$X\{n, \}+$	X, at least <i>n</i> times
$X{n,m}+$	X, at least <i>n</i> but not more than <i>m</i> times

Logical operators

XY	X followed by Y
X Y	Either X or Y
(X)	X, as a capturing group

Back references

Quotation

\	Nothing, but quotes the following character
\Q	Nothing, but quotes all characters until \E
\Έ	Nothing, but ends quoting started by \Q

Special constructs (non-capturing)

(?:X)	<i>X</i> , as a non-capturing group
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(?idmsux-idmsux)	Nothing, but turns match flags on - off
(?idmsux-idmsux:X)	X, as a non-capturing group with the given flags on - off
(?=X)	X, via zero-width positive lookahead
(?! <i>X</i>)	X, via zero-width negative lookahead
(?<=X)	X, via zero-width positive lookbehind
(? X)</td <td>X, via zero-width negative lookbehind</td>	X, via zero-width negative lookbehind
(?>X)	X, as an independent, non-capturing group

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