Regular Expression Expansion Operator

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This document describes the semantics for an expansion operator that supplements the standard operators for regular expressions such as | (or), ? (zero or one), * (zero or more), or + (one or more). This expansion operator serves to take any regular expression and translate it into another regular expression that specifies sub-patterns of the pattern specified by the first regular expression. In particular, the sub-patterns are those that start from all points in the original pattern and end as it does. For example, the expansion operator would translate the simple regular expression a, b, c into $a, b, c|b, c|c$. Located below are the rules for applying the expansion operator to a regular expression, where a is any terminal character within a regular expression and X, Y, and Z are any sub-expressions within a regular expression.

1. $a^{exp} \rightarrow a$
2. $(aX)^{exp} \rightarrow aX|X^{exp}$
3. $(X?)^{exp} \rightarrow X^{exp}$
4. $(X?Y)^{exp} \rightarrow (XY)^{exp}$
5. $(X|Y)^{exp} \rightarrow X^{exp}|Y^{exp}$
6. $((X|Y)Z)^{exp} \rightarrow (X^{exp}|Y^{exp})Z|Z^{exp}$
7. $(X^*)^{exp} \rightarrow X^{exp}X^*$
8. $(X^*Y)^{exp} \rightarrow X^{exp}X^*Y|Y^{exp}$
9. $(X^+)^{exp} \rightarrow X^{exp}X^*$
10. $(X^+Y)^{exp} \rightarrow X^{exp}X^*Y|Y^{exp}$