Let’s look at this toy language.

$L_1 = \{ x \mid x \in \{0, 1\}^*, x \text{ has an even number of 0s or starts with a } '1' \}$
Here is an NFA that accepts our language $L_1$: 

![NFA Diagram]

- $q_0$: Start state.
- $q_{even 0s}$: State for even number of 0s.
- $q_{odd 0s}$: State for odd number of 0s.
- $q_{start 1}$: State that accepts strings starting with 1.

Transitions:
- $q_0$ transitions to $q_{even 0s}$ on input 1.
- $q_{even 0s}$ transitions to $q_{odd 0s}$ on input 0.
- $q_{odd 0s}$ transitions to $q_{even 0s}$ on input 0.
- $q_{start 1}$ transitions to itself on input 0,1.
What does the computation of $w = 1000$ on our NFA look like?
Current states = \{q_0\}, \ w = 1000

Before we look at any symbols we can make a \(\lambda\)-move.
Current states = \( \{q_0\} \), \( w = 1000 \)

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Current states $= \{q_0, q_{\text{even 0s}}\}, \ w = 1000$
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Now we will look at input symbols. The idea is that before we make a transition using symbols, we make any possible transitions using $\lambda$-moves first.
Current states = \{q_0, q_{even \ 0s}\}, w = 1000

Given the set of states and reading symbol ‘1’, we need to look at all possible transitions based on our current states. This gives:

\[ \delta(q_0, 1) = \{q_{start \ 1}\} \]

\[ \delta(q_{even \ 0s}, 1) = \{q_{even \ 0s}\} \]

We combine the results (take the union) to give us our new set of states:

\[ \{q_{start \ 1}, q_{even \ 0s}\} \]
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We combine the results (take the union) to give us our new set of states: \(\{q_{start \; 1}, q_{even \; 0s}\}\).
Current states = \{q_{start 1}, q_{even 0s}\}, \ w = 1000

Before we make the transition for the next symbol, we have to ask if there are any $\lambda$-moves out of any of our current states, which there are not. If there were $\lambda$-moves we would keep adding states to the set via those moves until there were no more states to be added.
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Current states = \{q_{\text{start } 1}, q_{\text{even } 0s}\}, \ w = 1000

Given this information, our new set of states becomes \{q_{\text{start } 1}, q_{\text{odd } 0s}\}.

Again, there are no \(\lambda\)-moves from these states so this is our new set of states.
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We have finished reading all the characters and all transitions are finished. Now we need to decide if this string was accepted by the NFA. Well if any of our current states belong to F, i.e., are accepting, then we say the string is accepted. Since \(q_{\text{start 1}} \in F\) \(w\) is accepted by this NFA.
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