Automata on Infinite Structure
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Exercice Sheet 1

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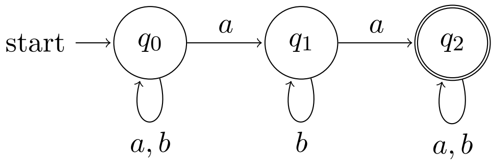
Exercice 1

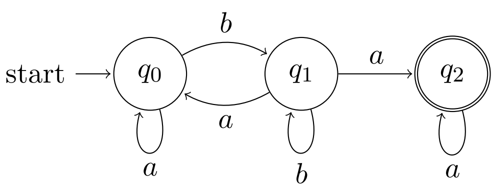
$$
\begin{aligned}
\mathcal{L}(A_1) &= (b|a)^* a^+ \\
\mathcal{L}(A_2) &= a(ba)^*|b(ba)^*|(ab)^*|(ba)^* \\
\mathcal{L}_\omega(A_1) &= b^*(ab^*)^\omega \\
\mathcal{L}\omega(A_2) &= (ab)^\omega|(ba)^\omega
\end{aligned}
$$

Exercice 2

1.



2.



3.

To construct such an automata, we have to create state which uniquely check every possible sequence of appearence of the letter from Σ. The number of different sequence is $n = 2^{|\Sigma|} = 2^{26} = 67'108'864$, as said during the exerice classes.

To do the construction :

1. Create an initial state q_0 with transition to $|\Sigma|$ other state $q_i, i \in [1; |\Sigma|]$ labelled with each letters of the alphabet. Each of those state check the presence of one specific letter.

2. For each of those state, we add $|\Sigma| - 1$ transition to another $|\Sigma| - 1$ states labeled $q_{i,j}$ where $j \in [1; |\Sigma| - 1]$. To check the second letter.

3. We repeat 1 and 2 until every possible sequence is recognize.

4. Each state as a transition to itself with all the letters which is previusly recognize by the run.