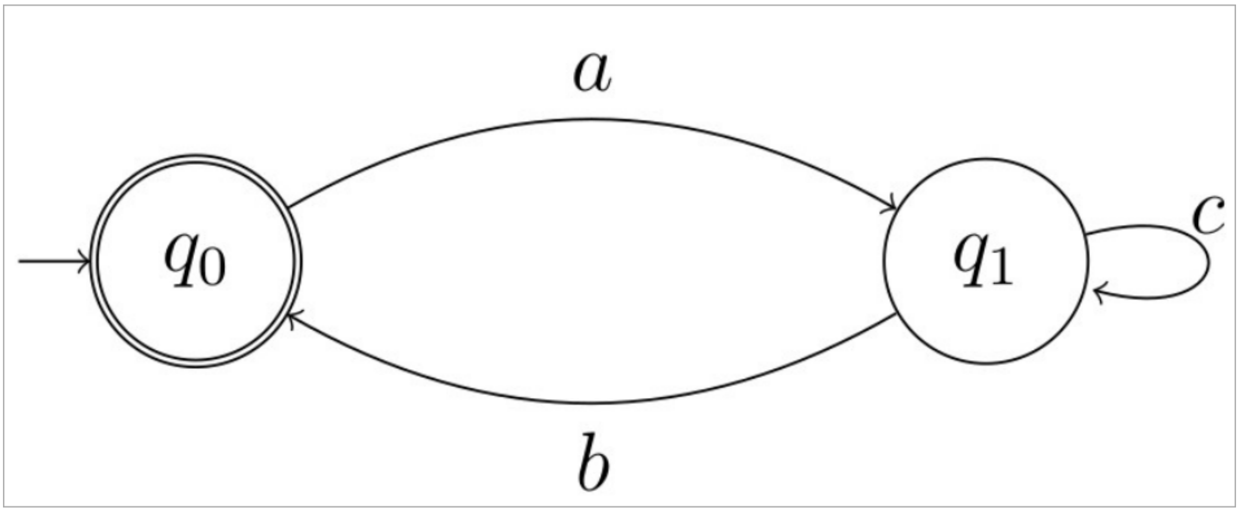
Sebastian Mohr - 23141808 - Part II

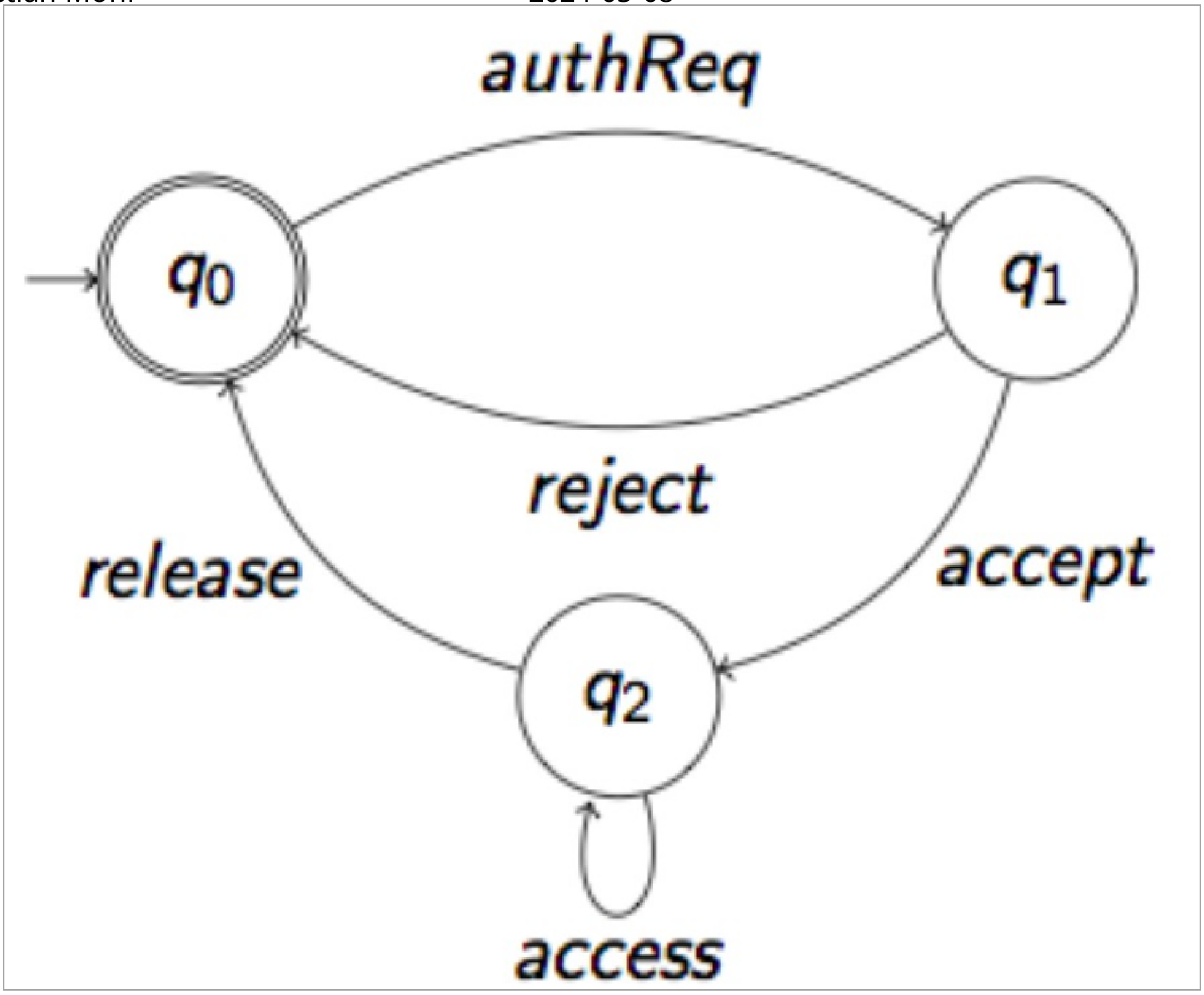
a



$$\omega = (ac * b)^{\omega}$$

It's an infinite loop, that can starts with the a transformation. Afterwards it can revolve around c or take path b, which brings it back to the state where the next transformation is a.

b



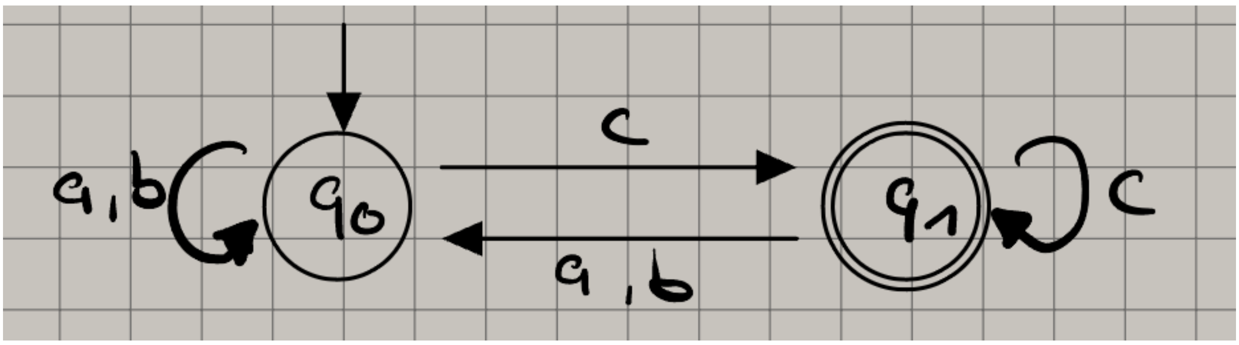
$$\omega = \emptyset + ((authReq(acceptaccess \ast release)) + (authReqreject))^{\omega}$$

To reach the accepted state q_0, the automaton can take 3 different paths:

1. 0 transitions, start state is accepted state.
2. The transition goes to q_1 and back to q_0, with $authReq$ and $reject$ each executing once.
3. The transition goes to q_1 with transition $authReq$. Afterwards it reaches q_2 by executing $accept$ once, then $access$ $0 - \infty$ times. Executes $release$ once to reach final state q_0.

The automaton is a loop, which means it can execute infinite times.

c

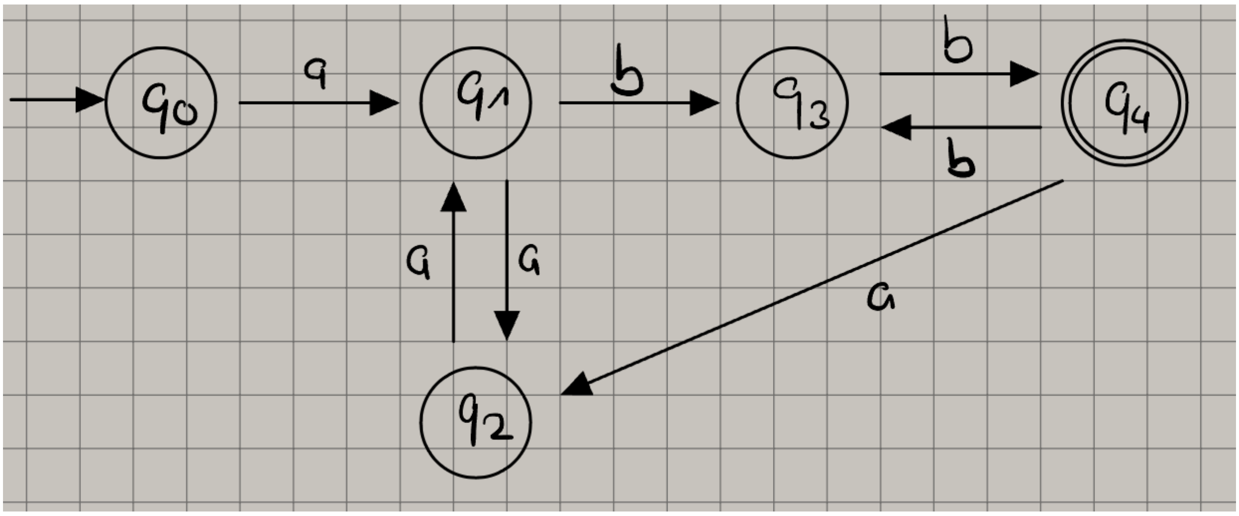


The automaton accepts $\omega = (a \ast b \ast c)^{\omega}$, which translates to:

- $0 - \infty$ times a
- $0 - \infty$ times b
- exactly 1 times c

This process can loop inifinite times, that means that the accepting state always has to have a c leading to it.

d



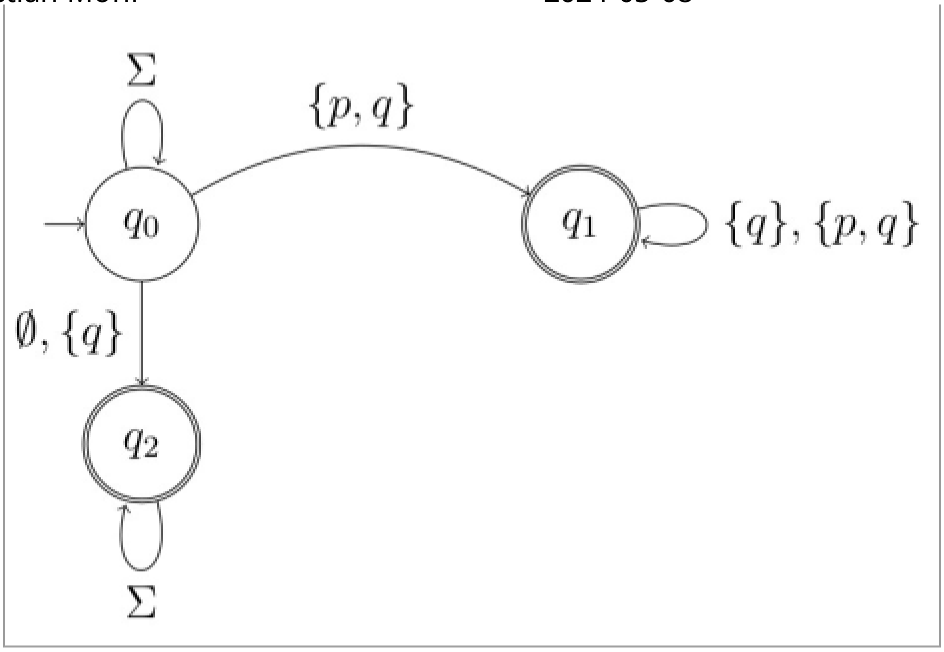
The automaton accepts $\omega = a((aa) * bb)^{\omega}$, which translates to:

- exactly 1 a
- and then looping the following:
  - 0 - ∞ times a and a
  - exactly 1 times b and b

e

LTL-formula: $F\ (p\ \rightarrow\ G\ q)$

Alphabet: $\sum := \{\emptyset, \{p\}, \{q\}, \{p, q\}\}$



The given LTL-formula means: in the *Future* p leads to *Globally* q being true

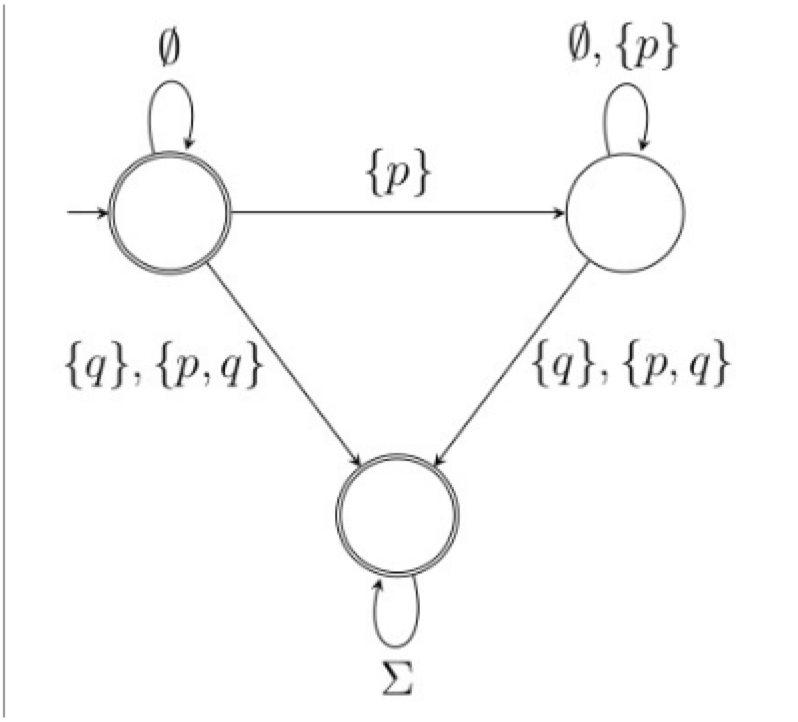
As the automaton switches to the accepted state q_1 when executing p, there is a path that proves the LTL-formula.

Also the automaton can switch to accepted state q_2 when executing q first. There the entire alphabet loops over the state, so the LTL-formula can also be proved.

That means, that the Büchi automaton accepts the runs staisfying the LTL-formula.

f

Alphabet: $\sum := 2^{\{p,q\}}$

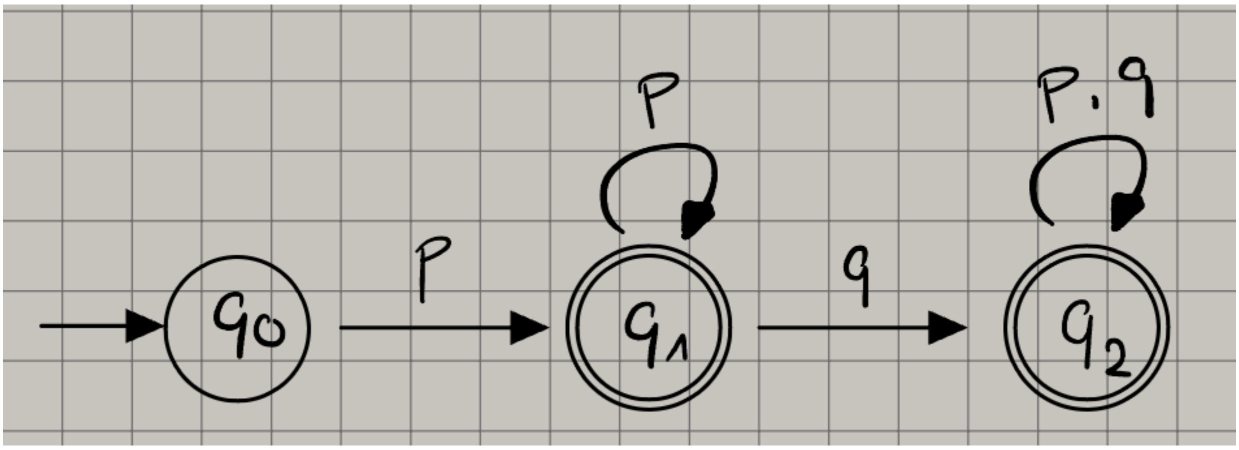


LTL-formula: $(\emptyset) \vee G\ ((p \vee \emptyset)\ U\ (q \vee \{p, q\}))$

There are 2 different ways to reach an accepted state in this automaton:

- The automaton accepts $\emptyset$, which means it already starts in an accepting state.
- The automaton accepts only p or $\emptyset$, until at least one q or $\{p, q\}$ is put in. Afterwards the entire alphabet is staying in the accepted state.

g



The automaton accepts $G\ p \lor F\ (p \land q)$, which translates to:

- *Globally* p is true, **OR**
- in the *Future* p **AND** q are true