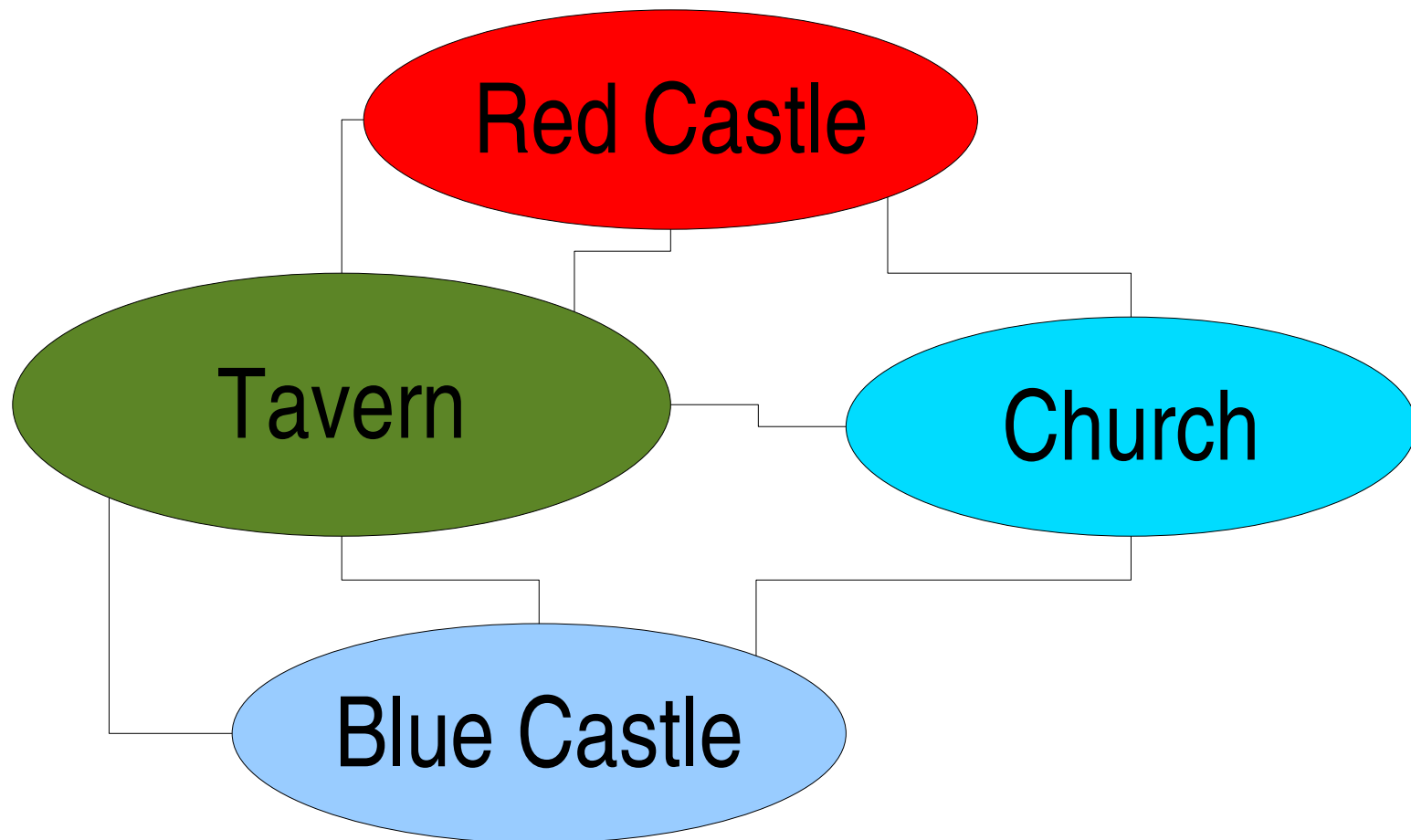


Eulerian Paths and Cycles

- Can the people of Königsberg “walk the bridges”?

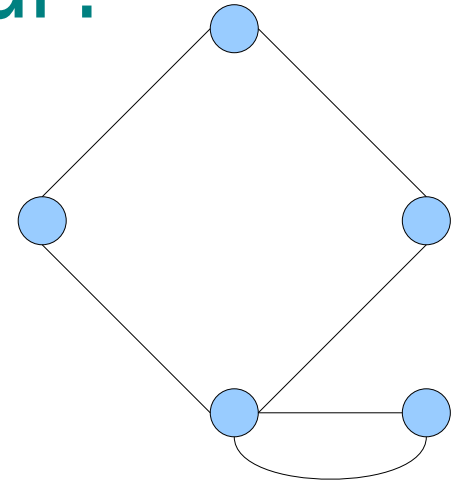


Eulerian Paths and Cycles

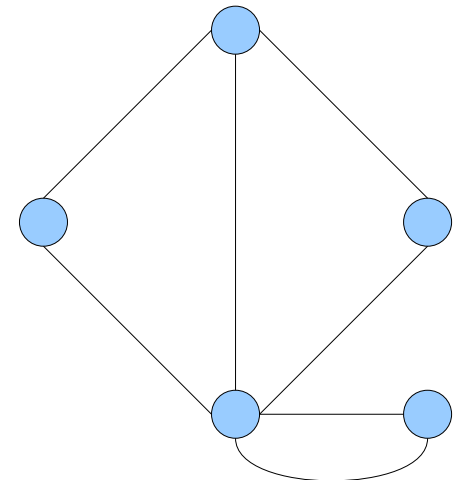
- An Eulerian path (EP): traverse every edge
- An Eulerian cycle (EC): start and end at same vertex
- Not the Traveling Salesman Problem

Is there a Eulerian Tour?

- EC: every node has even degree

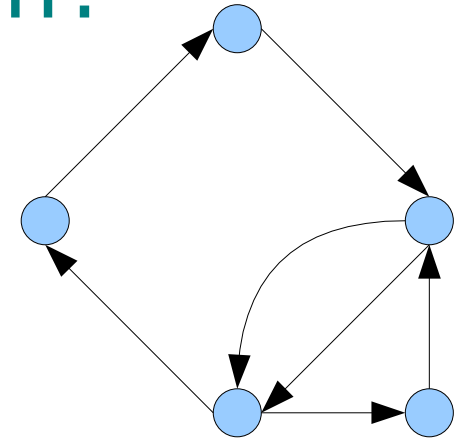


- EP: start and end have odd degree

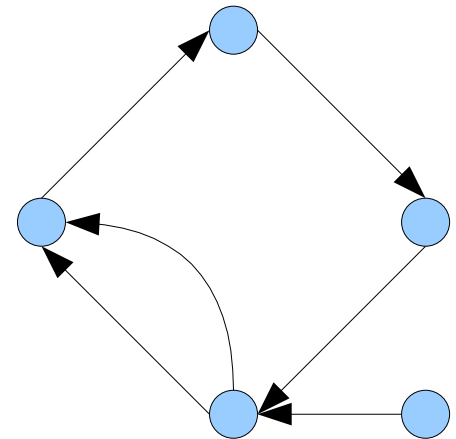


And in a directed graph?

- EC: out-degree = in-degree

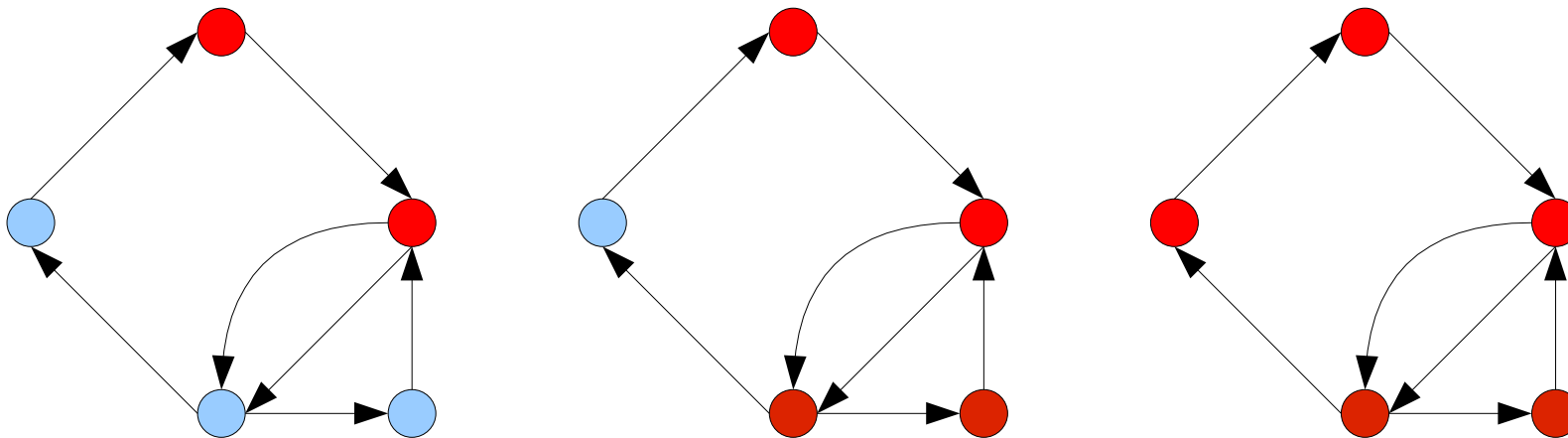


- EP: start has extra outward edge and end has extra inward edge



Finding the Circuit

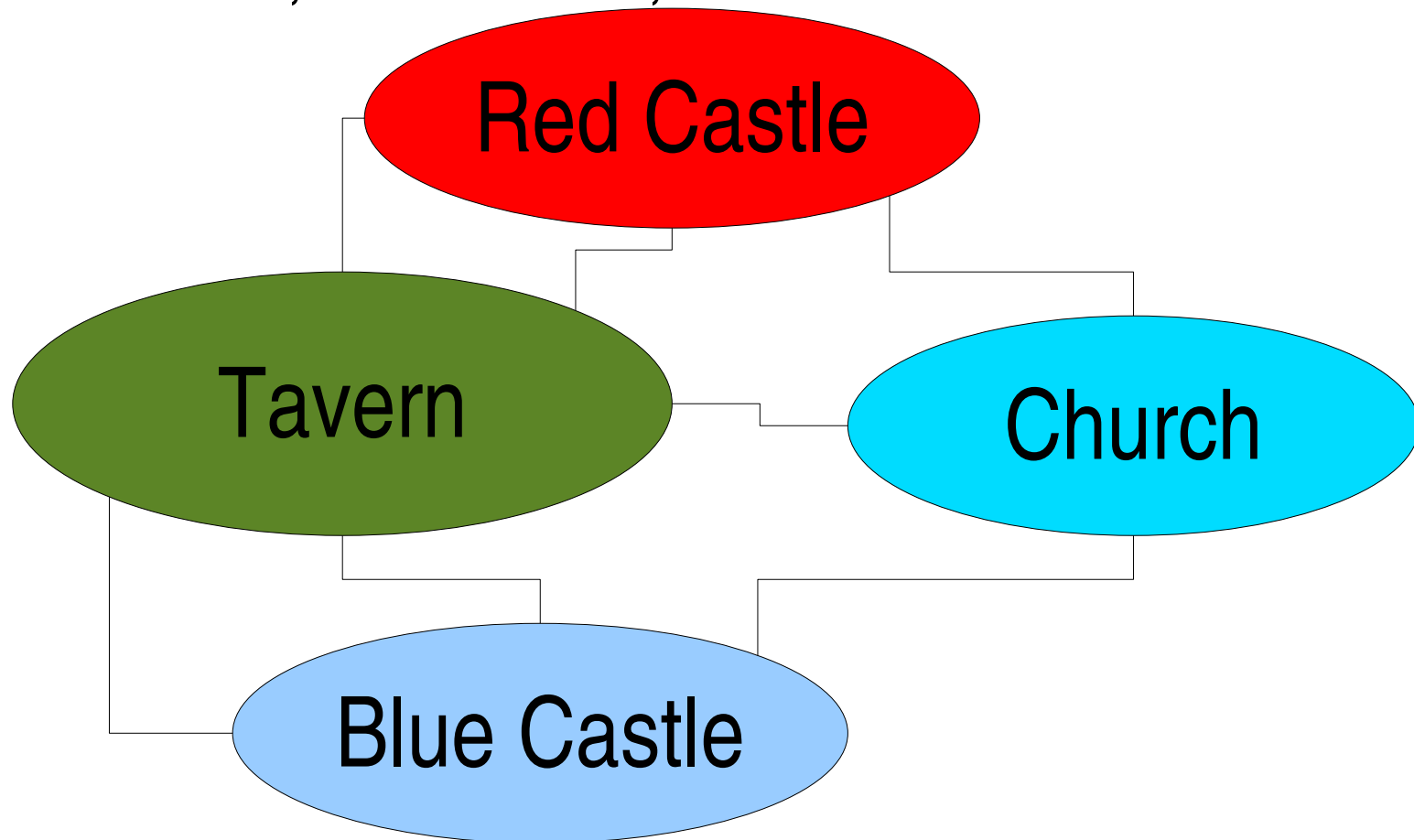
- A graph with an EC consists of several cycles
- Each cycle shares a vertex with at least one other cycle
- So find one cycle
- And using a depth-first search, find cycles attached to each node in that cycle



- Shortest path through every edge
- EP is best
- Otherwise MST+Floyd+EP+... = fancy algorithm

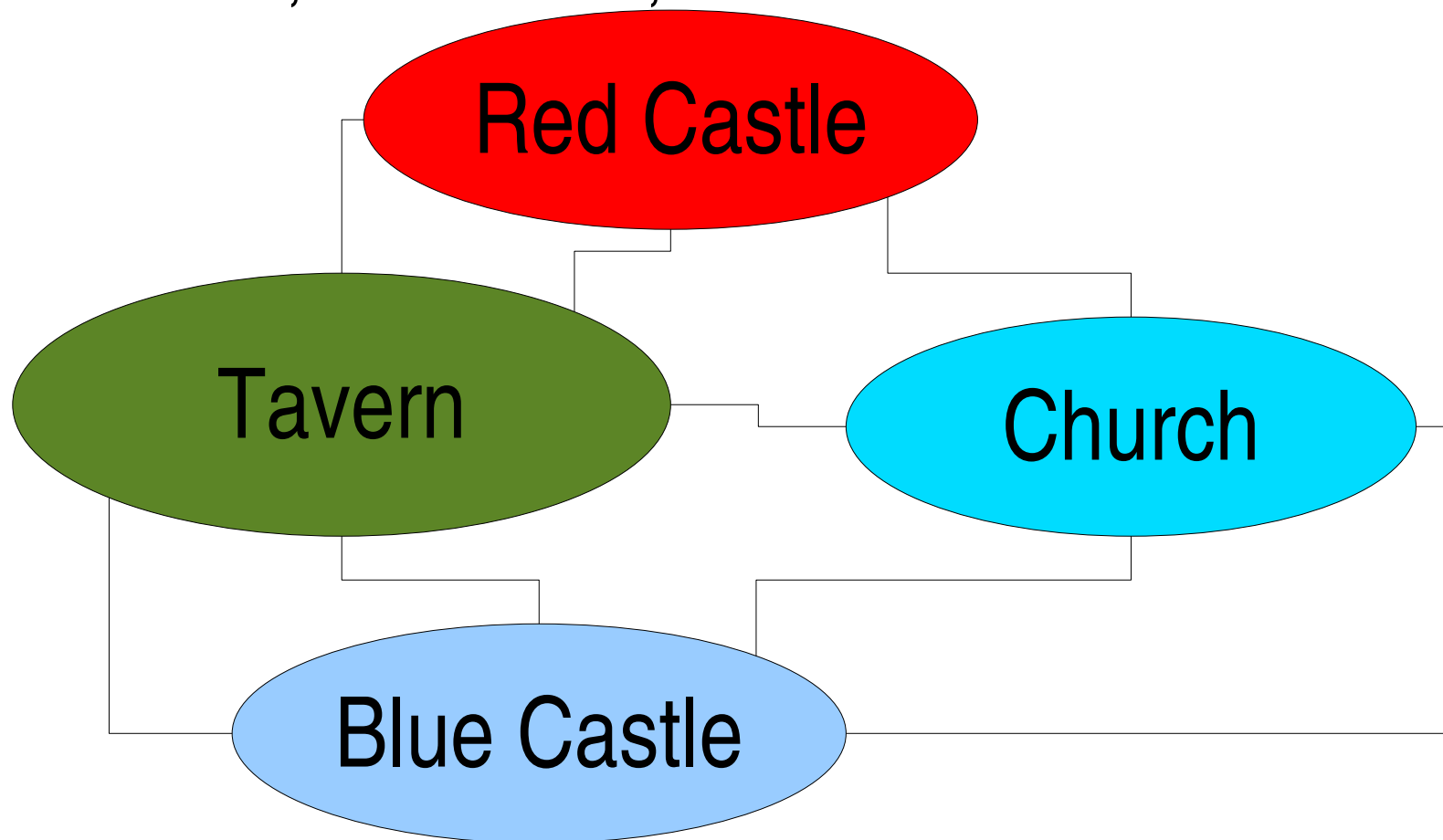
More trouble in Königsberg

- Can the Red Prince build a bridge so he can make an EP to the tavern, but his rival, the Blue Prince cannot.



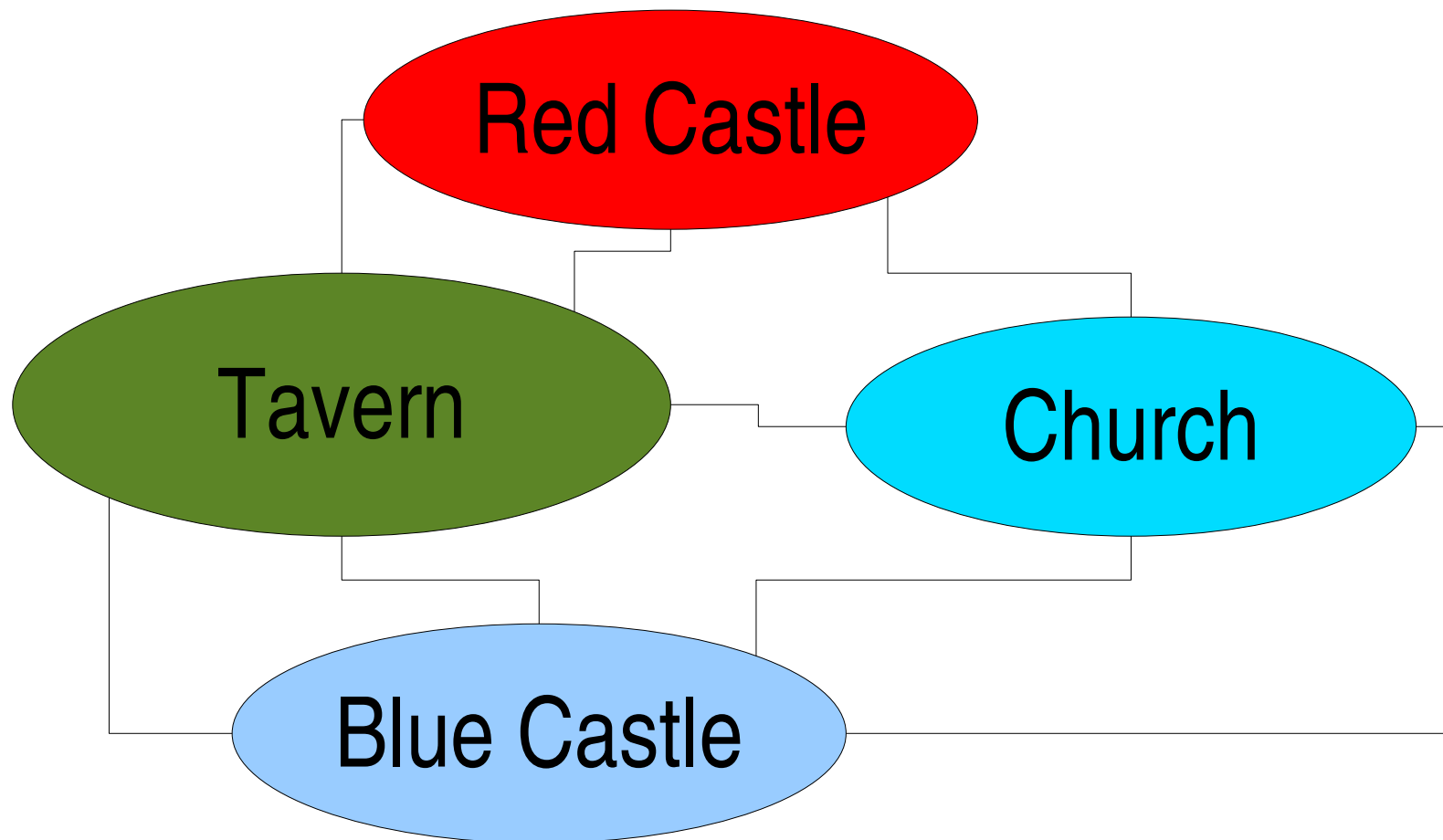
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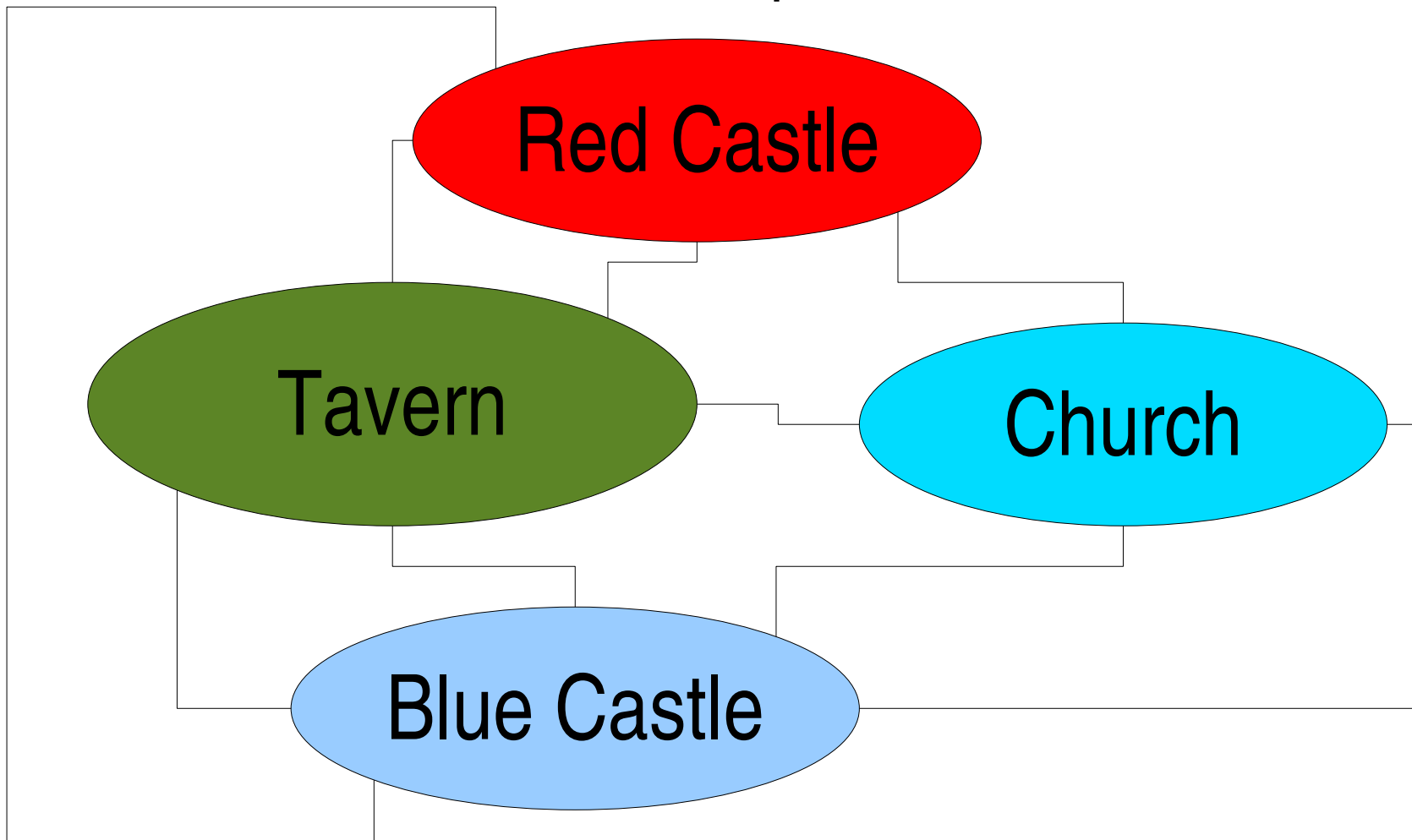
More trouble in Königsberg

- Can the Blue Prince do the same to the Red Prince?



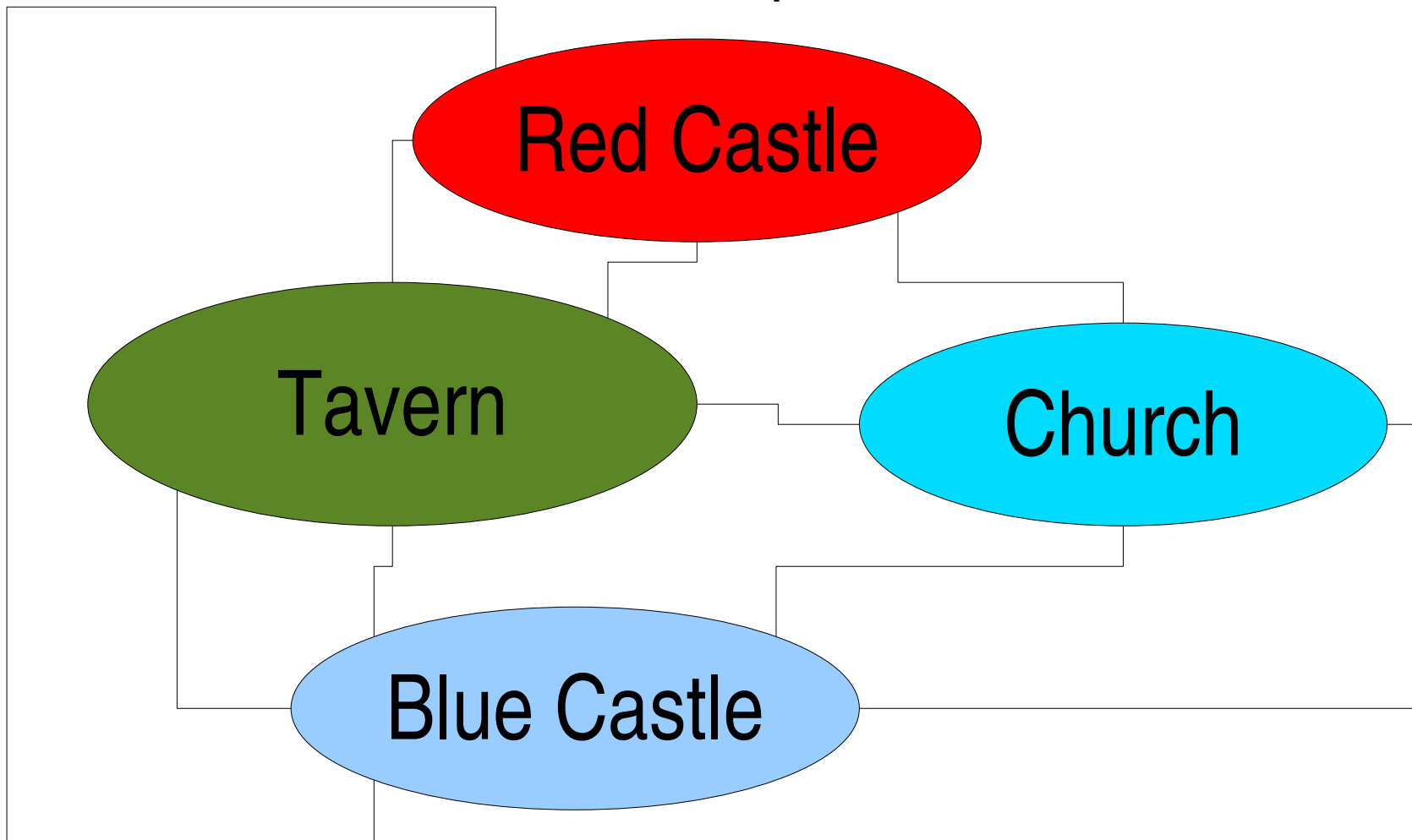
More trouble in Königsberg

- Now the tavern-keeper wants *everyone* to end up at his tavern – can he make an EC possible?



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