

Minimal Strong Admissibility; a complexity analysis

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Why Strong Admissibility Matters

- How to show that an argument is member of a preferred extension?
Don't construct the entire preferred extension. Instead, show membership of an admissible set.
- How to show that an argument is member of the grounded extension?
Don't construct the entire grounded extension. Instead show membership of a strongly admissible set.

Definition Strong Admissibility (extensions approach)

A set of arguments $Args$ is strongly admissible iff
every $A \in Args$ is defended by some
 $Args' \subseteq Args \setminus \{A\}$
which in its turn is strongly admissible

Definition Strong Admissibility (labellings version)

An argument labelling is admissible iff for each argument:

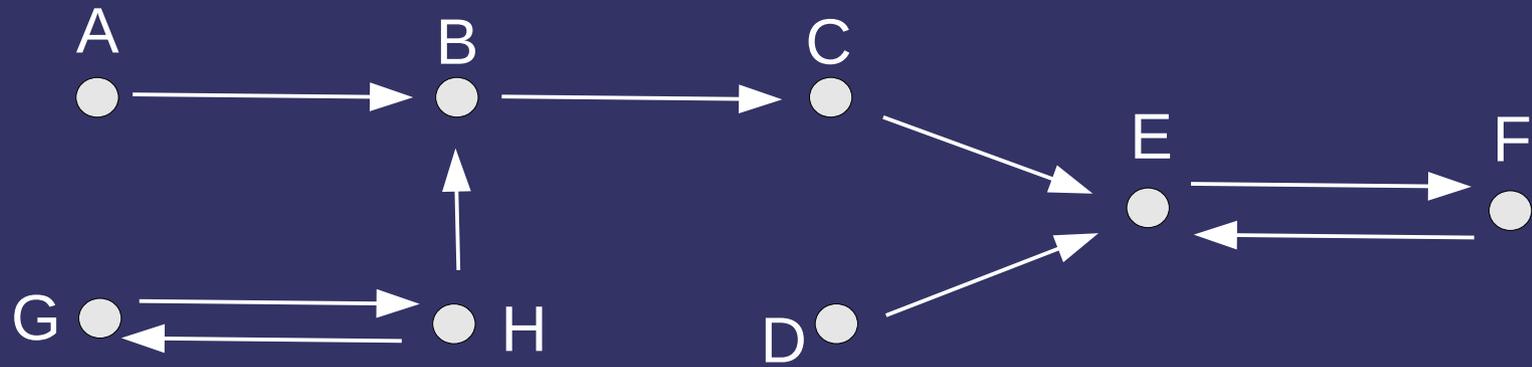
- if the argument is **in** then each of its attackers is **out**
- if the argument is **out** then it has an attacker that is **in**

A min-max numbering of an admissible labelling assigns each **in** or **out** labelled argument a natural number or ∞ s.t.

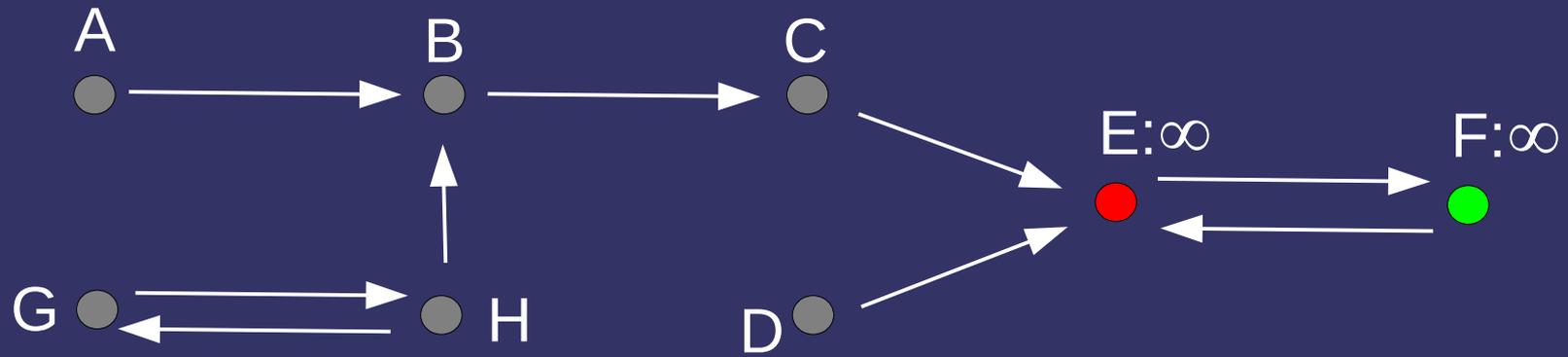
- the min-max number of an **in** labelled argument is the maximal number of its **out** labelled attackers +1
- the min-max number of an **out** labelled argument is the minimal number of its **in** labelled attackers +1

A strongly admissible labelling is an admissible labelling whose min-max numbering contains natural numbers only (so no ∞)

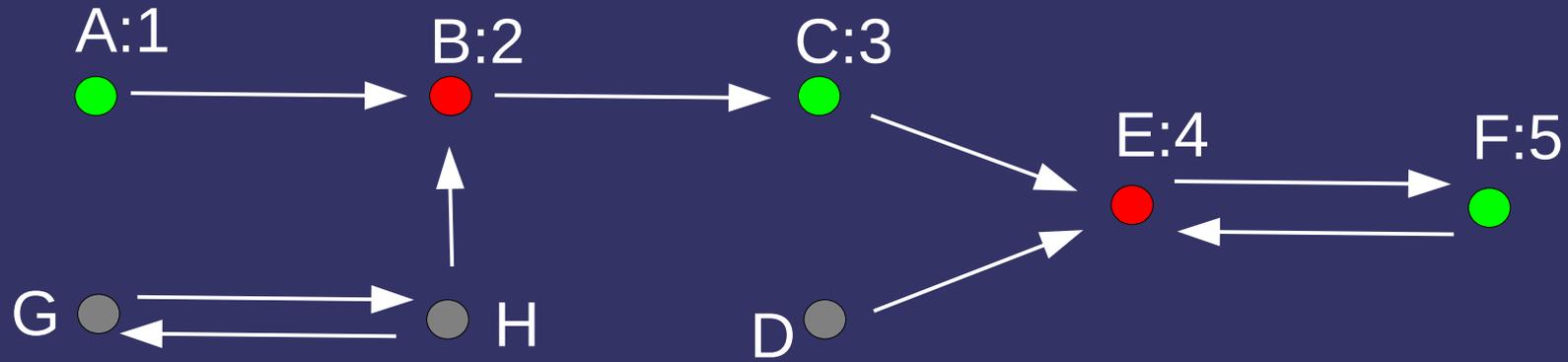
Example



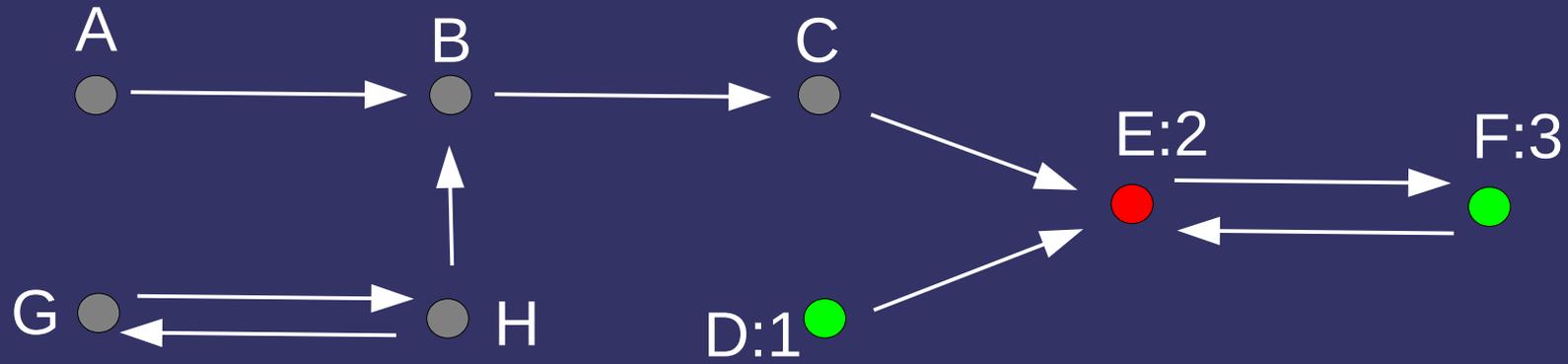
Example



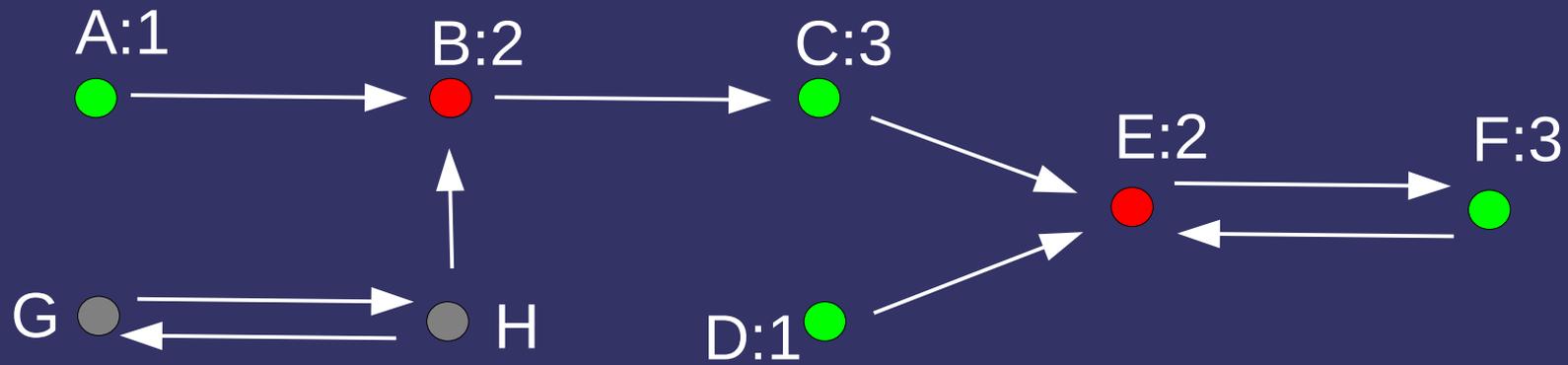
Example



Example



Example



Our Research Questions and Findings

We want to find a small strongly admissible labelling
(w.r.t. the number of **in** and **out** labelled arguments)

What is the computational complexity of this?

In particular, for argument A:

- Is there a strongly admissible labelling that labels A **in** and is no bigger than k?

complexity: NP-complete

- Given a strongly admissible labelling that labels A **in**, is it a *minimal* one to do so?

complexity: coNP-complete

What's next?

- 1) Using strongly admissible labellings for Explainable AI.
How to use a strongly admissible labelling to explain that an argument is in the grounded extension?
(e.g. Caminada TAFA 2015)
- 2) Writing a fast approximation algorithm for finding a small strongly admissible labelling for a particular argument