

# A Formalization of Algebraic Property Graphs

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## Goal of these slides

- ▶ An attempt to formalise the notion of *algebraic property graph* as defined within the data model of Algebraic Property Graphs.

# Postulated sets

- ▶ A countably infinite set  $\mathcal{L}$  of element labels.
  - ▶ These include node labels, edge labels and property names.
- ▶ A countably infinite set  $\mathcal{V}$  of primitive values.
- ▶ A countably infinite set  $\mathcal{P}$  of port names, which includes the special ports **in** and **out**.

## Definition

An *algebraic property graph* is a tuple  $(E, \lambda, \rho)$  where

- ▶  $E$  is a finite set of elements,
- ▶  $\lambda : E \rightarrow \mathcal{L}$  a function that maps each element to its label, and
- ▶  $\rho : E \times \mathcal{P} \rightarrow (E \cup \mathcal{V})$  a partial function that maps an element and a port name to what the port of that element with that name refers to,

such that

1. the domain of  $\rho$  is finite (i.e., a finite number of ports per element), and
2. the *refers relation* for elements, i.e., the binary relation over  $E$  that contains a pair  $(e_1, e_2)$  iff there is a port name  $p \in \mathcal{P}$  such that  $\rho(e_1, p)$  is defined and  $\rho(e_1, p) = e_2$ , is acyclic.