Security Risk Assessment III – Part 2

Reasoning about Frequency and Consequence

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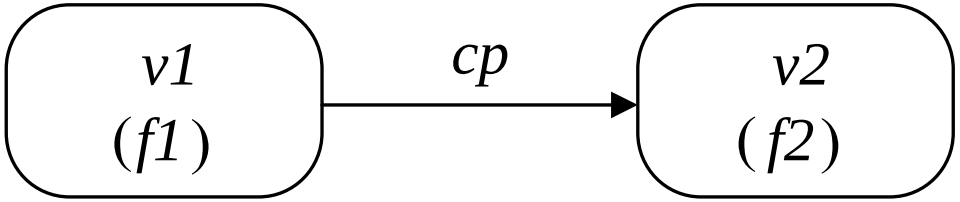
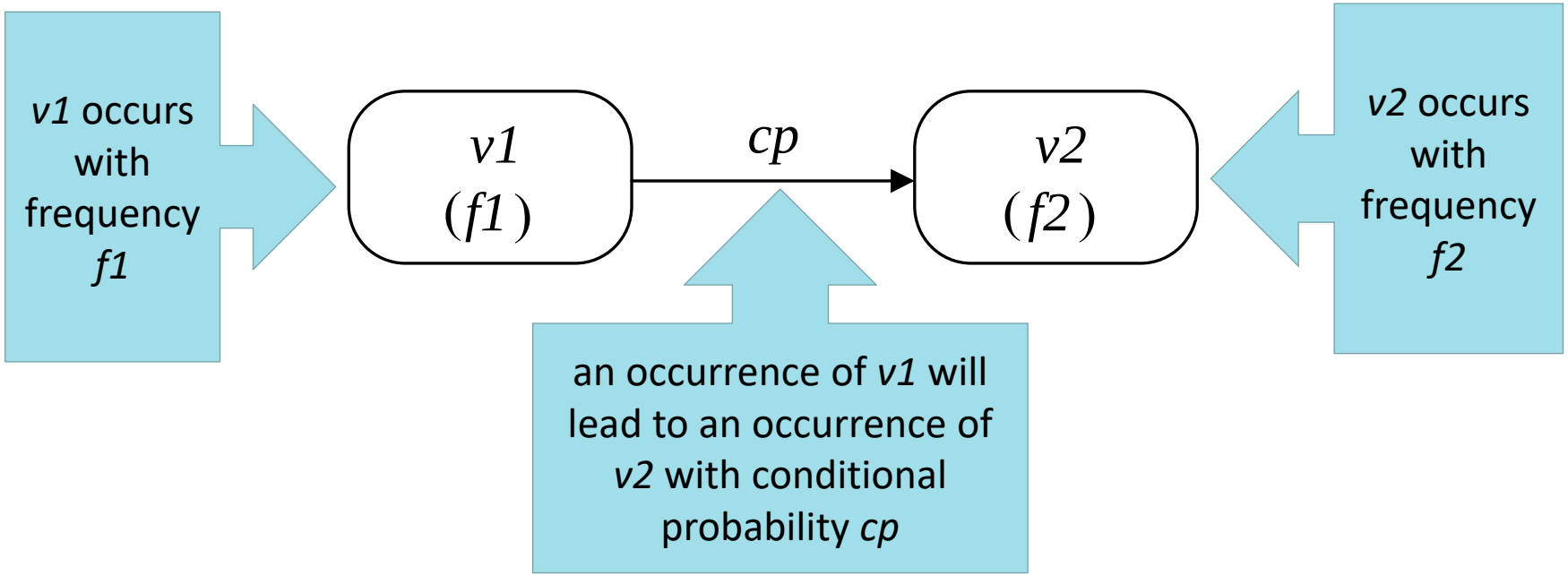
Frequency calculation

CORAS leads-to relation

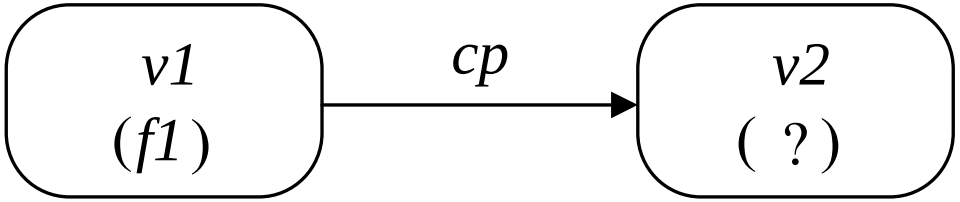


vertex v1 is either a threat scenario or an unwanted incident
vertex v2 is either a threat scenario or an unwanted incident
f1, f2 are frequencies
cp is a conditional probability

CORAS leads-to relation - Semantics



Given that *f1* and *cp* are known, what can we deduce about the frequency of *v2*?



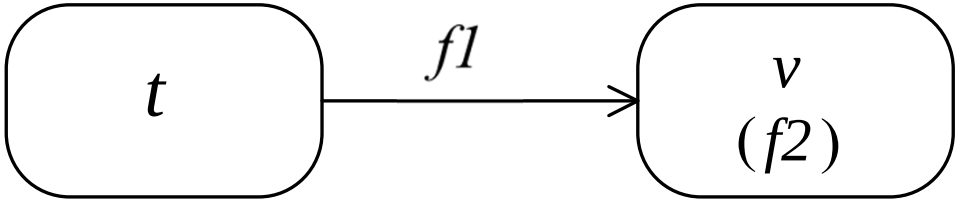
if any occurrence of *v2* appears as an effect or result of an occurrence of *v1* **then**
the frequency of *v2* is equal to the product of *f1* and *cp*
else
the frequency of *v2* is greater or equal to the product of *f1* and *cp*

We will use

$$v_1 \sqcap\!| \; v_2$$

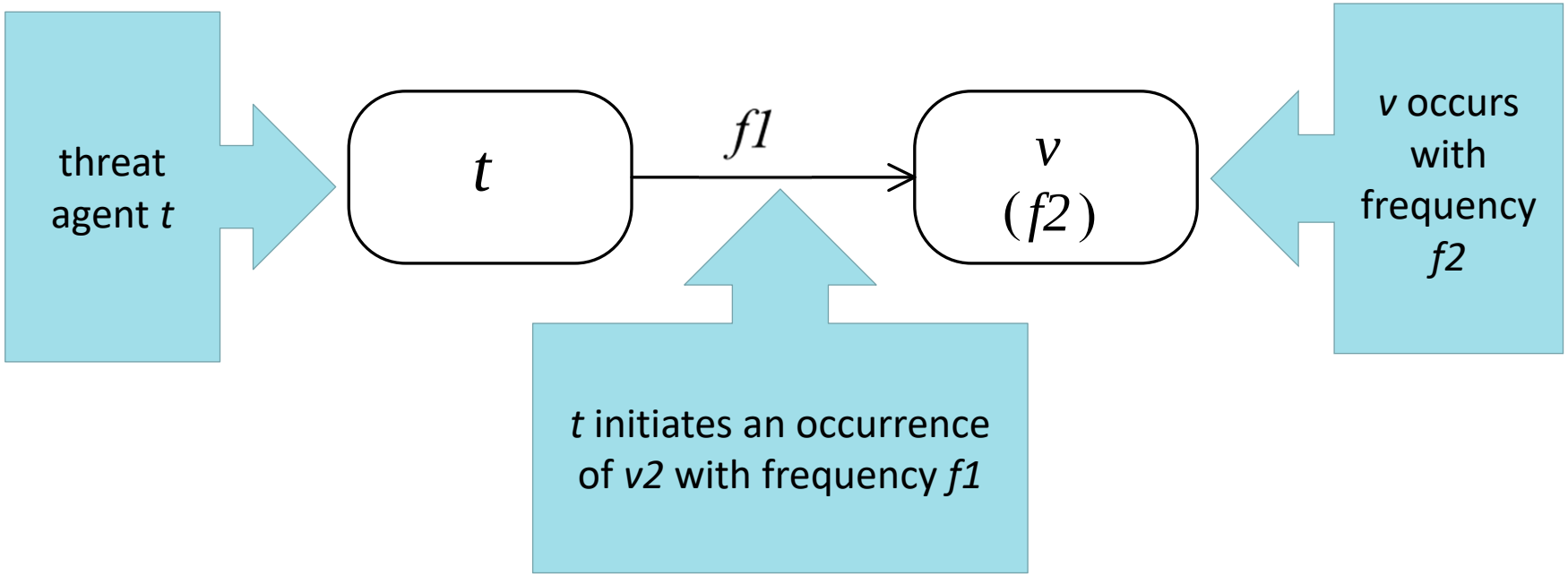
to denote the "part of" vertex *v2* that is the result
or effect of an occurrence of vertex *v1*

CORAS initiate relation

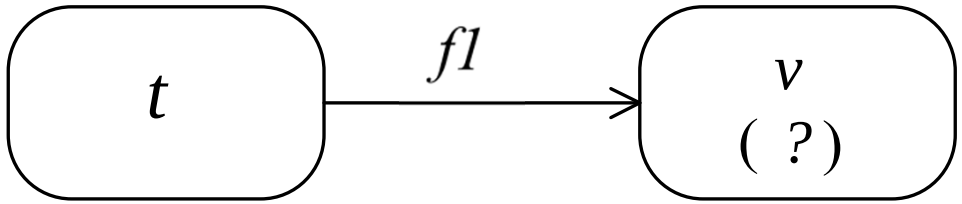


vertex t is a threat
vertex v is either a threat scenario or an unwanted incident
f1, f2 are frequencies

CORAS initiate relation - Semantics



Given that *f1* is known, what can we deduce about the frequency of *v*?



if any occurrence of *v* is initiated by *t* **then**
the frequency of *v* is equal to *f1*
else
the frequency of *v* is greater or equal to *f1*

Given the frequencies of *v1* and *v2* are known to be *f1* and *f2*, what can we deduce about their disjunction?

if

an occurrence of *v1* cannot count as an occurrence of *v2* **and**
an occurrence of *v2* cannot count as an occurrence of *v1*

then

v1 **or** *v2* occurs with frequency *f1+f2*

else

v1 **or** *v2* occurs with a frequency that is less than or equal to *f1+f2* and greater than or equal to **max**(*f1,f2*)

We say that vertices *v1* and v2 are separate if

an occurrence of *v1* cannot count as an occurrence of *v2* **and**
an occurrence of *v2* cannot count as an occurrence of *v1*

Consequence calculation

Pre-requisite

- Not possible unless the relevant consequence scales have been converted into a common scale
- In the following we assume consequence is measured in terms of average loss in EURO per occurrence
- We also assume that the frequencies are "number of occurrences per year"

Rule for aggregation of consequence

if

incident *v1* occurs with frequency *f1* and consequence *c1*

incident *v2* occurs with frequency *f2* and consequence *c2*

incident *v1* and incident *v2* are separate

then

the *v1* **or** v2 occurs with consequence *(f1*c1+f2*c2)/(f1+f2)* (weighted average)

* and / represent multiplication and division