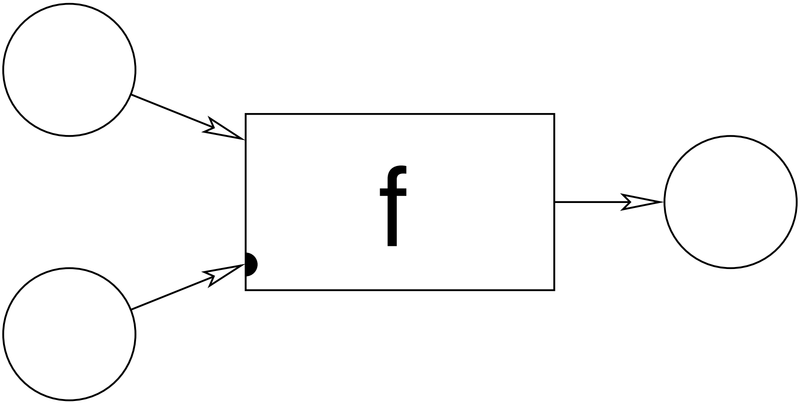
# Propagator Networks

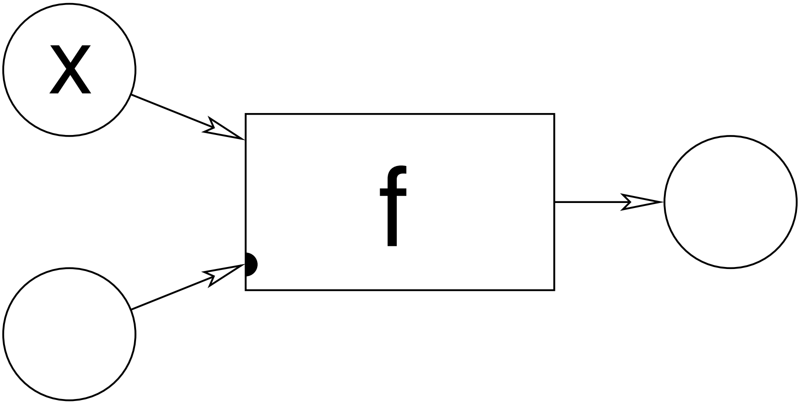
Alexey Radul

March 12, 2009, DIG Seminar



A propagator is a machine that reads some cells and can write to some cells

always on, asynchronous, stateless



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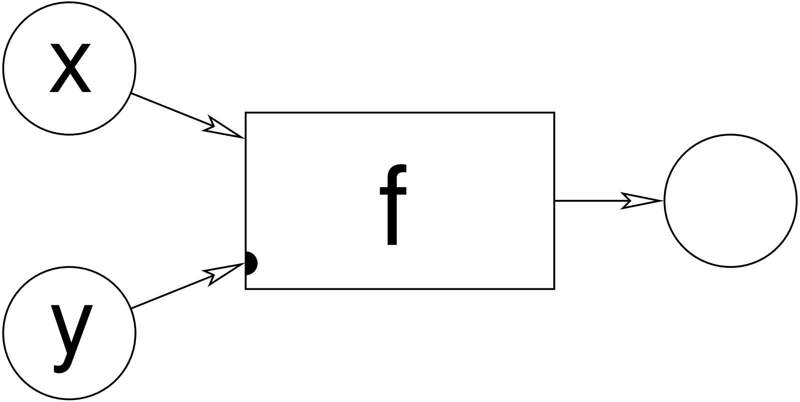

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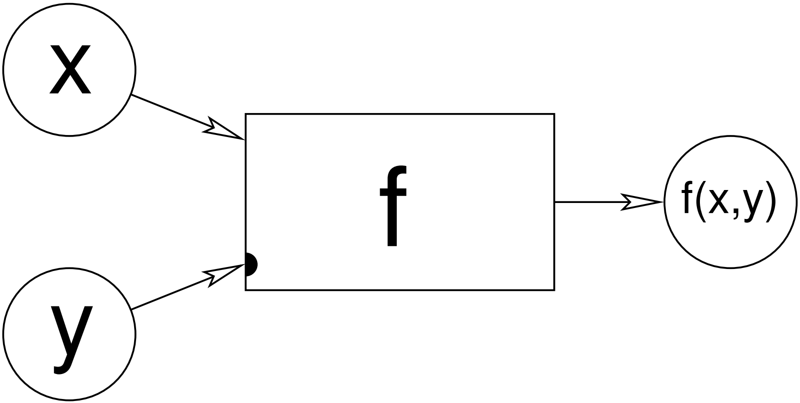

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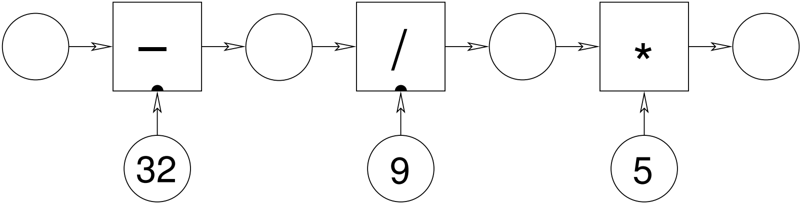
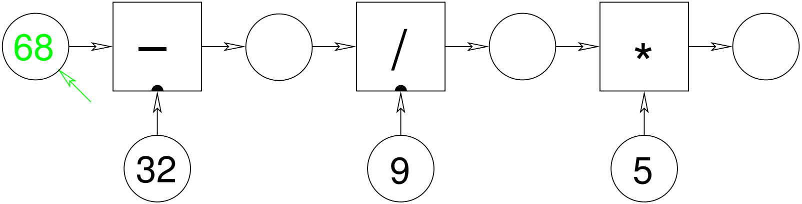


# Network them, and values propagate

this distributes naturally



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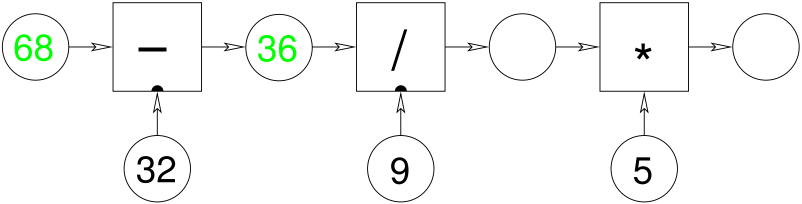

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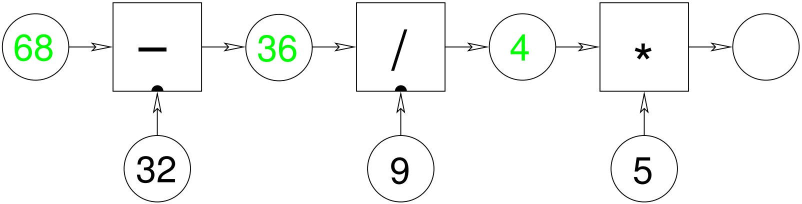

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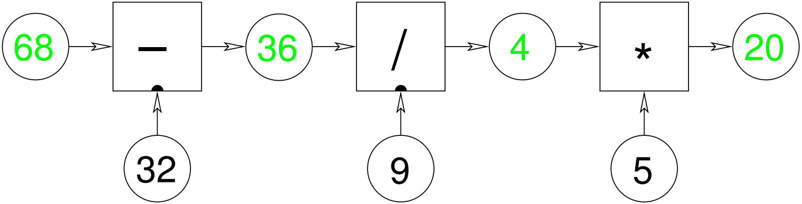

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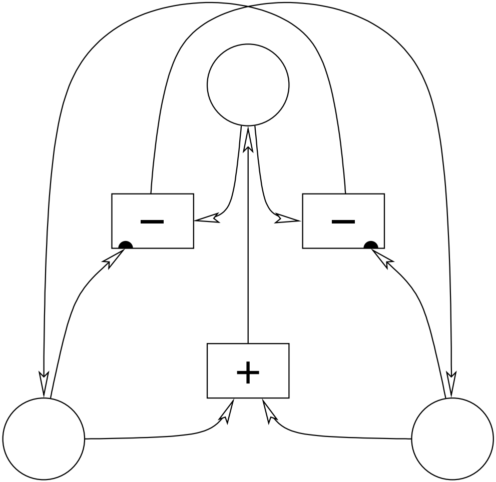
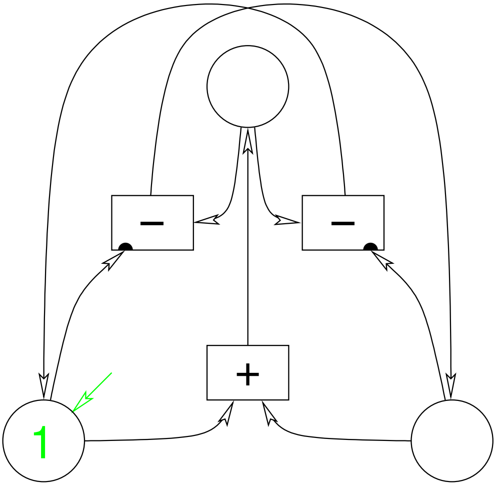


Win: Constraints are just piles of mutually inverse propagators



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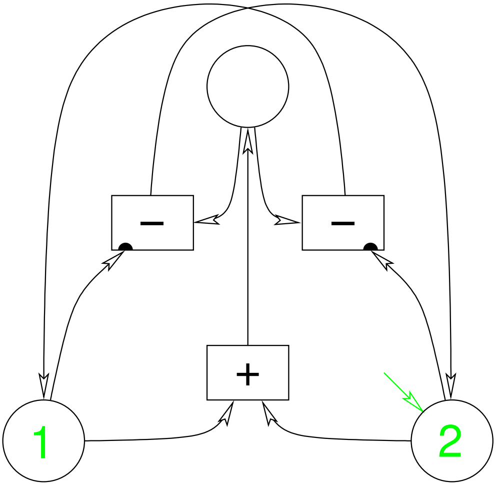

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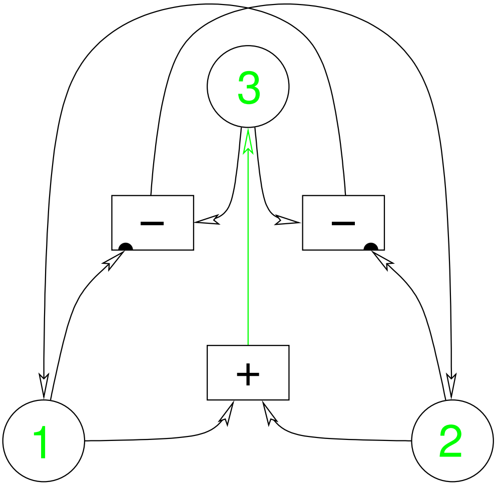

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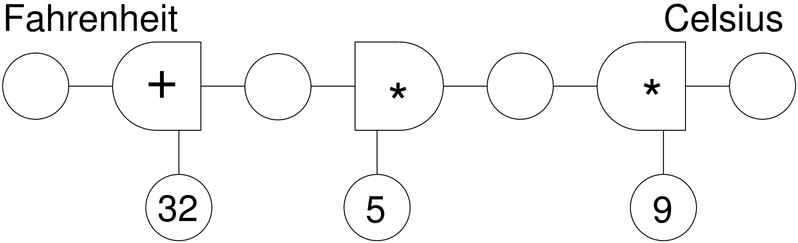
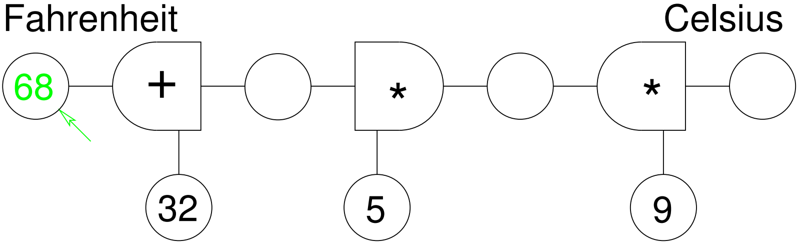


Win: Constraints compose into multidirectional computations



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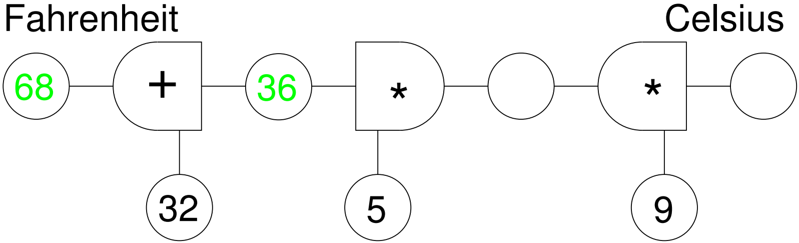

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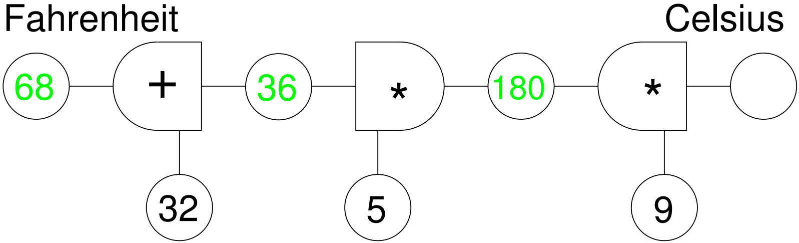

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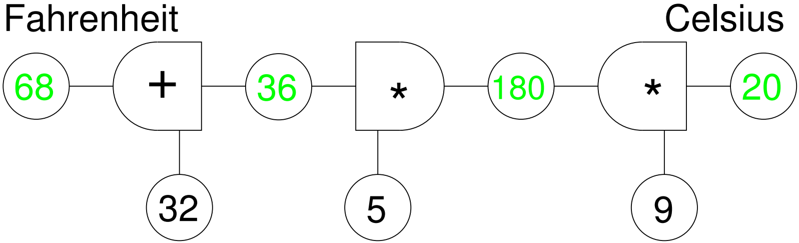

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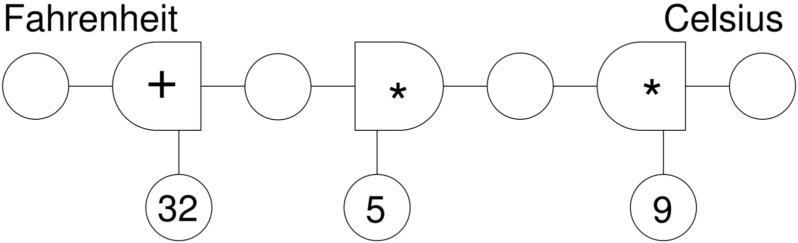

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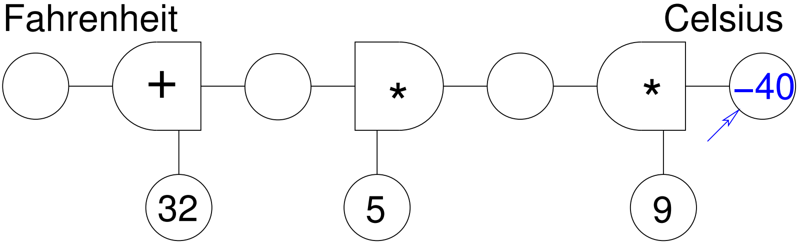

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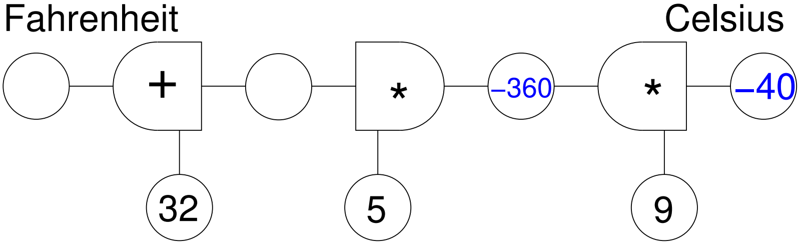

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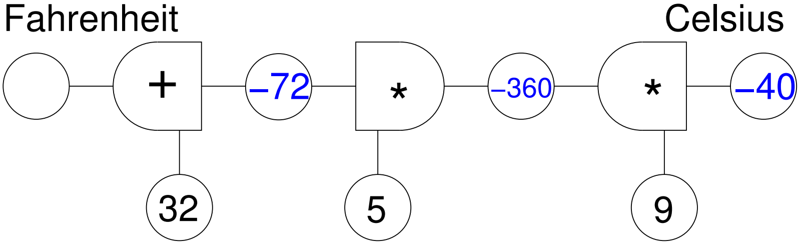

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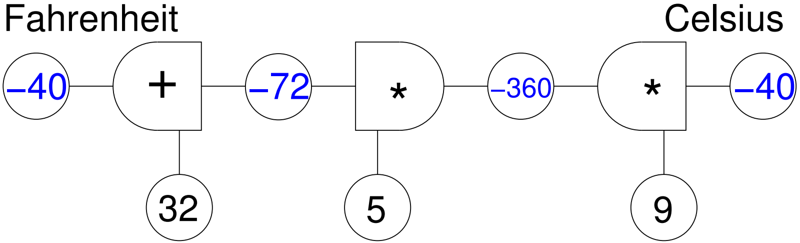

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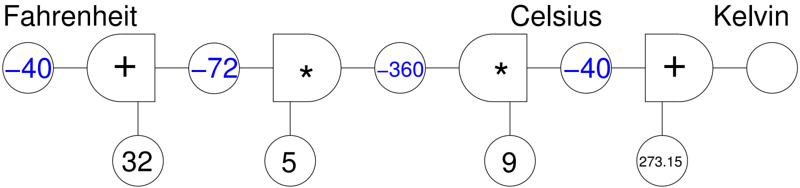
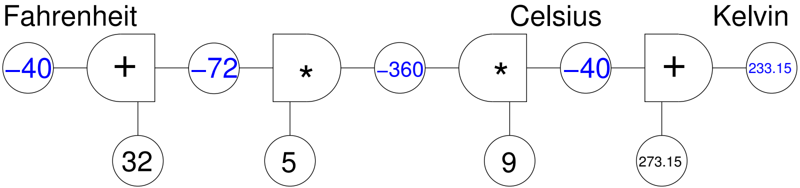


which can grow incrementally without adjusting explicit controls



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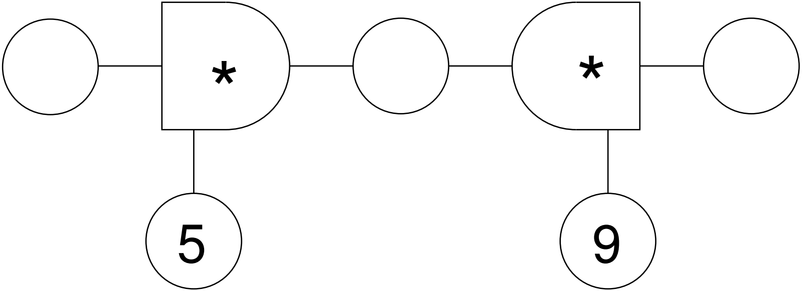
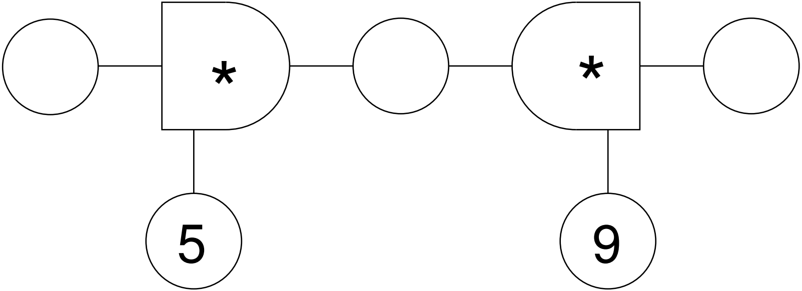


But: A cell can get stuff from multiple sources



But: A cell can get stuff from multiple sources

Is this bad?

# “Old View”: Cells hold values

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Leads to all kinds of trouble

- precedence
- overwriting
- infinite reactions and fights
- . . .

New View: Cells hold **information about** values

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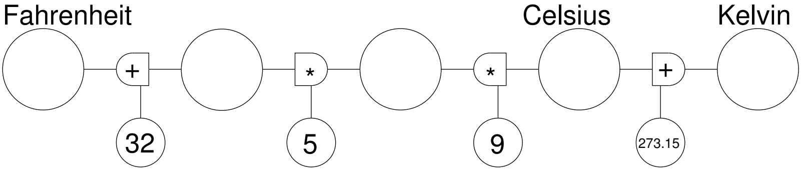
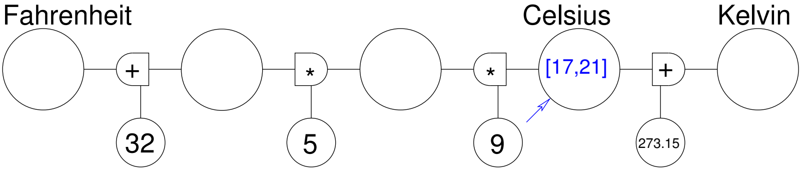
and merge it as it comes in from many sources



E.g. interval arithmetic is partial information



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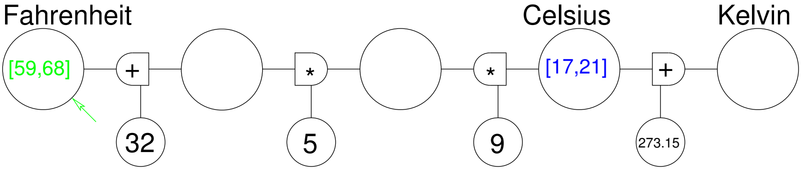

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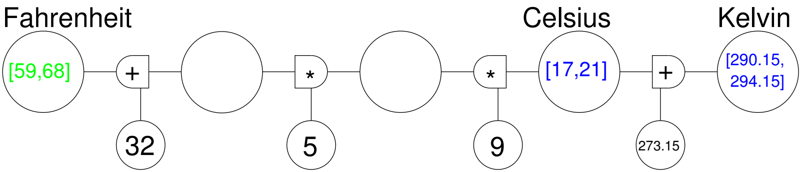

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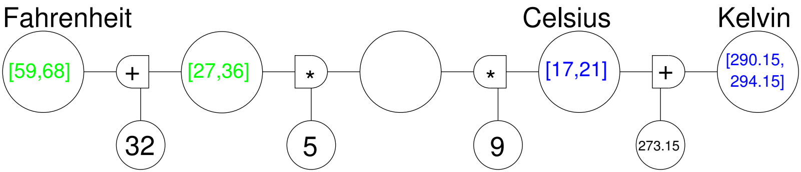

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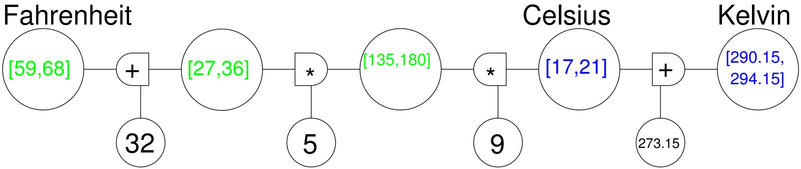

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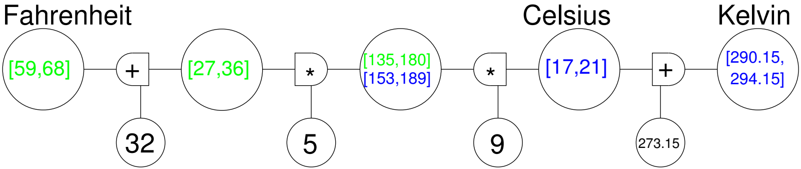

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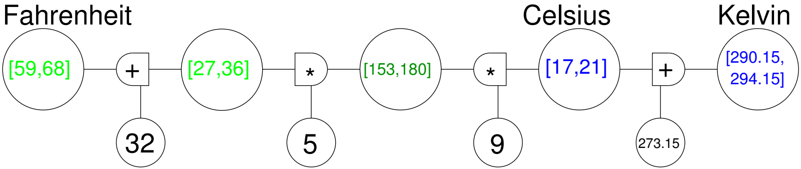

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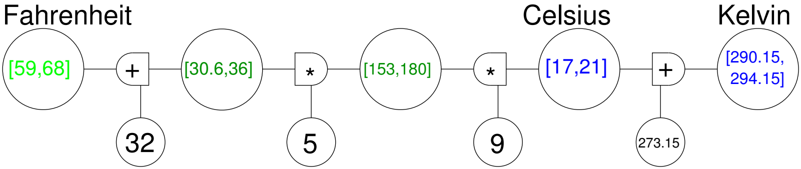

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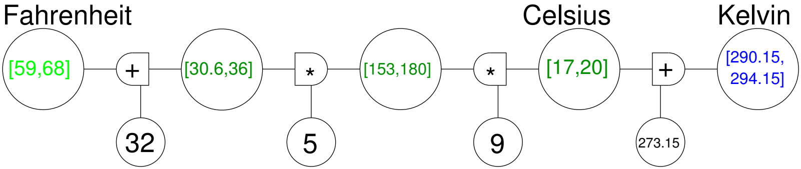

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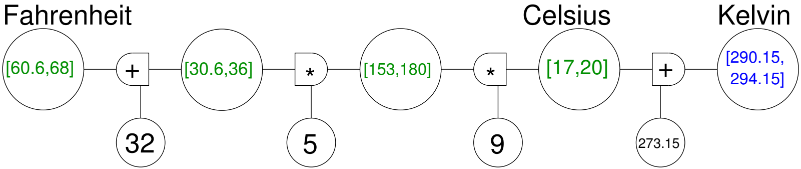

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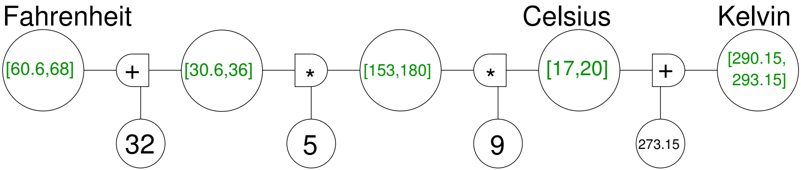

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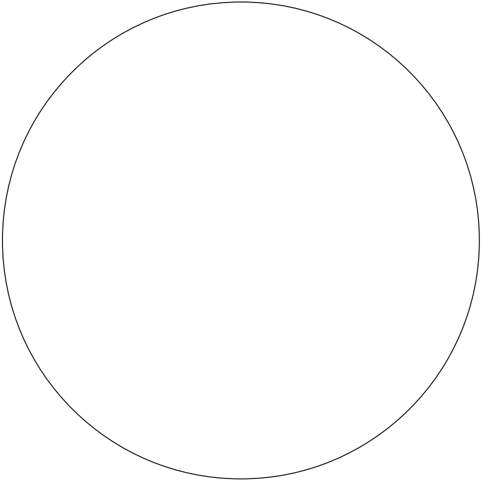
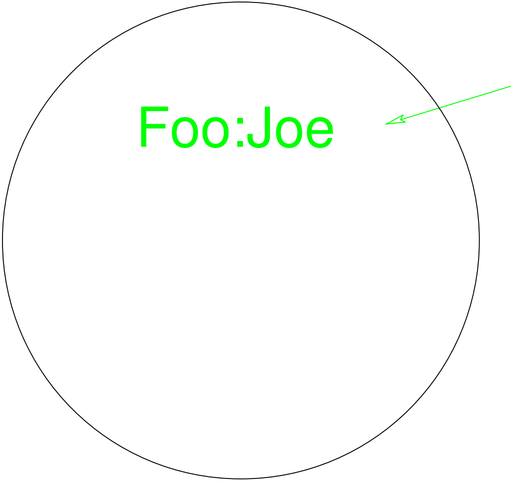


Win: Truth maintenance is partial information



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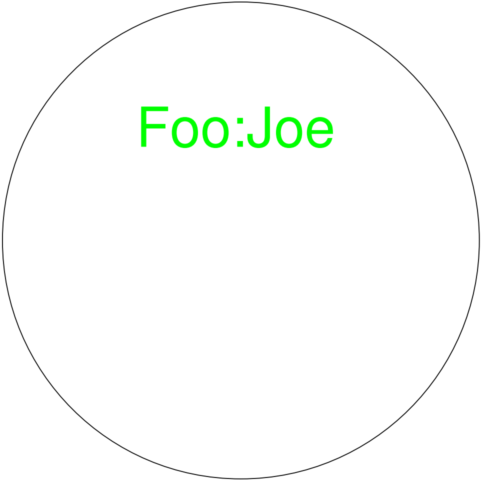

Foo:Joe

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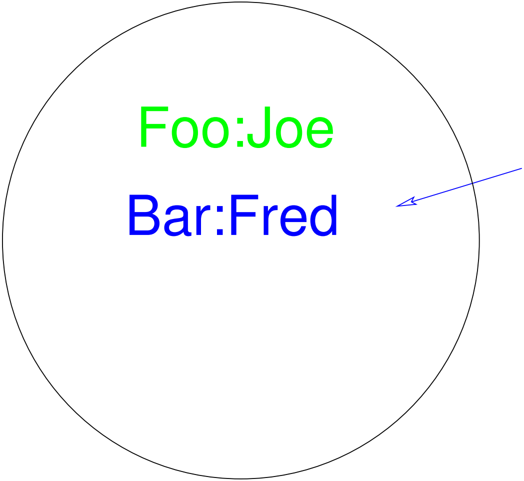
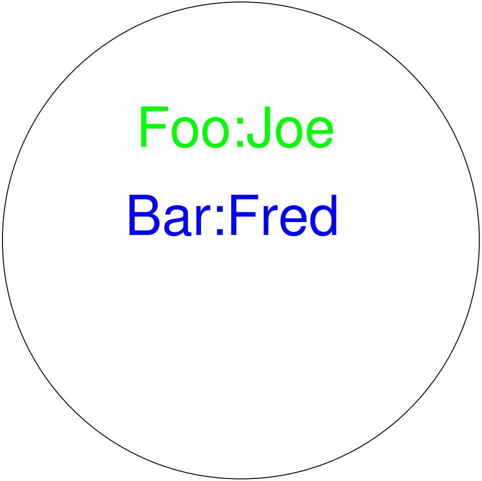


Foo:Joe

Bar:Fred

Win: Truth maintenance is partial information



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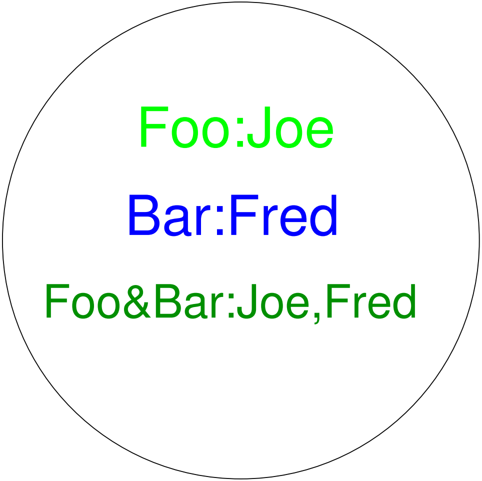

Foo:Joe

Bar:Fred

Foo&Bar:Joe,Fred

Win: Truth maintenance is partial information

Win: Making `merge` generic decouples the accident of kind of accumulator from the essence of propagation

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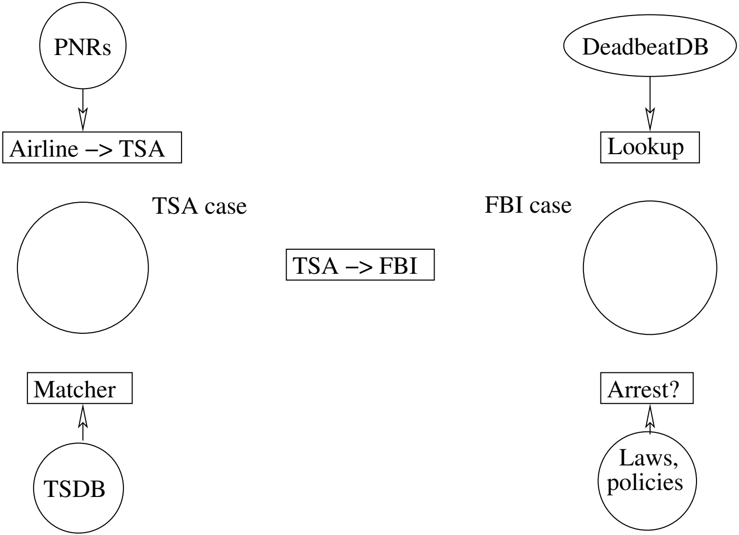
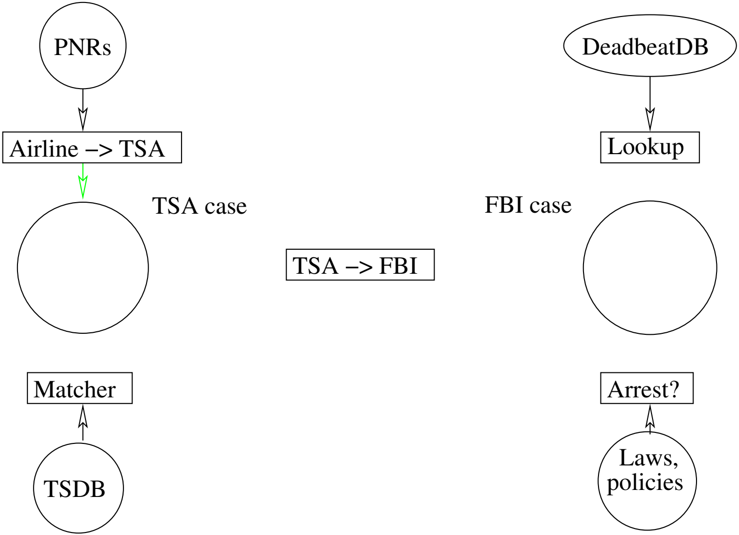
and now we can use many different kinds of accumulators



# And much can look like propagation

if you squint



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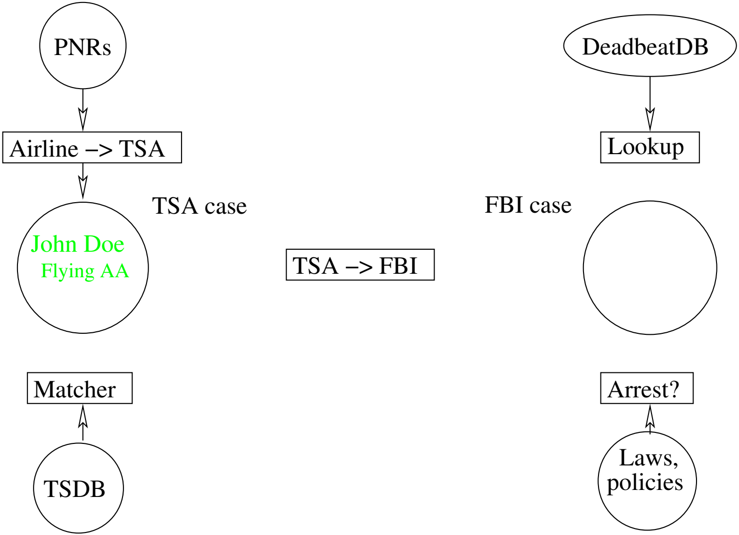

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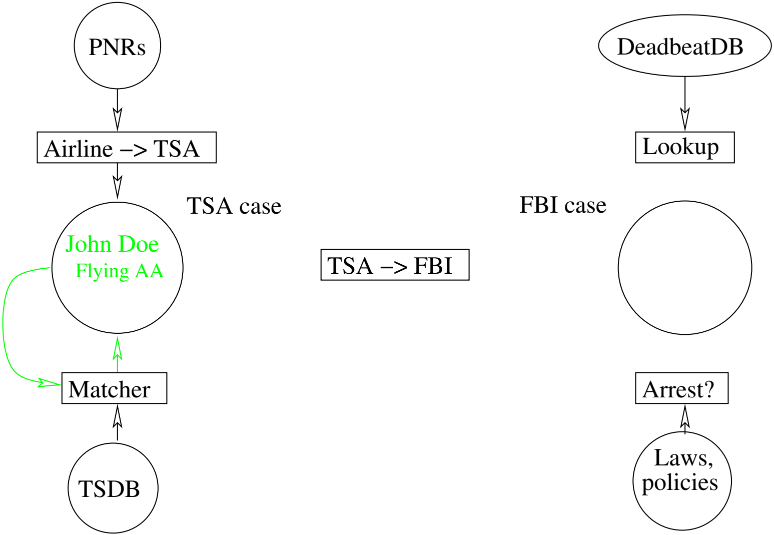

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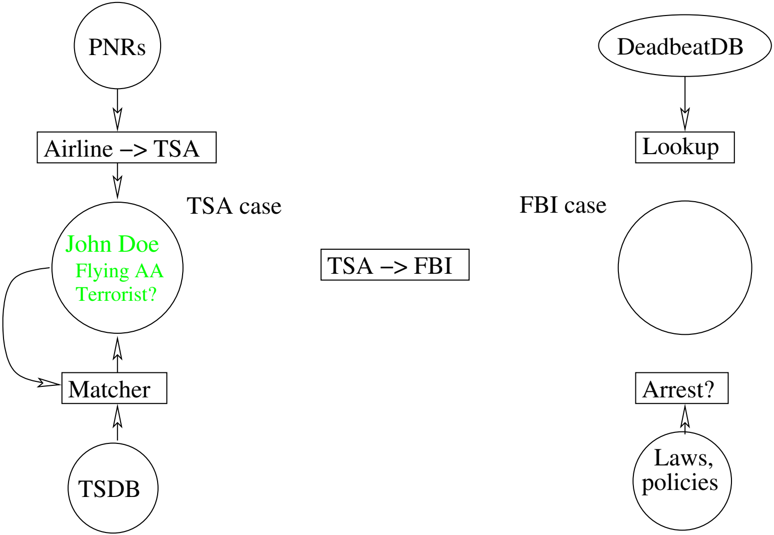

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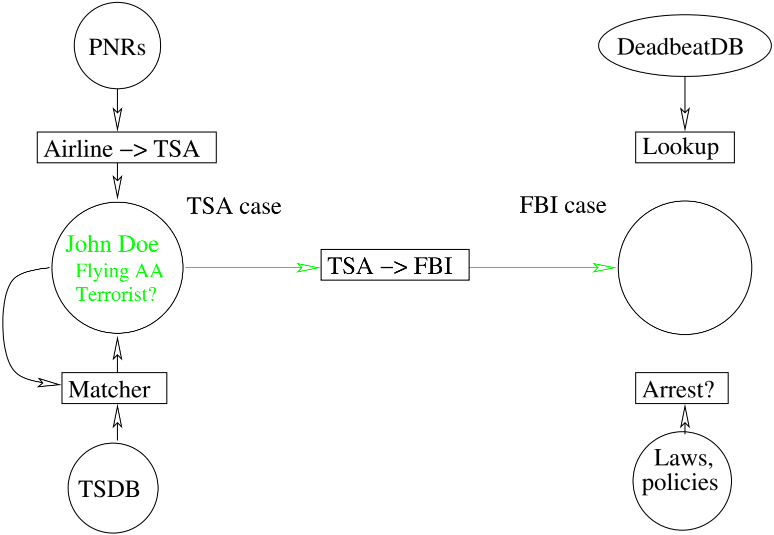

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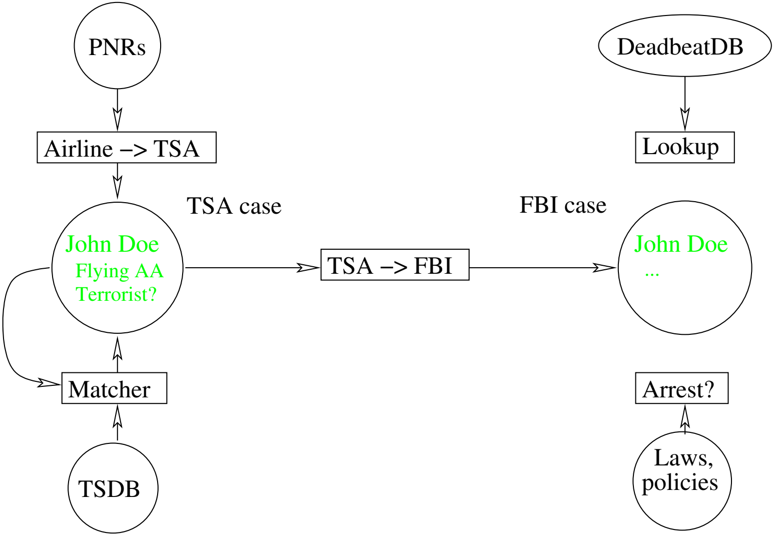

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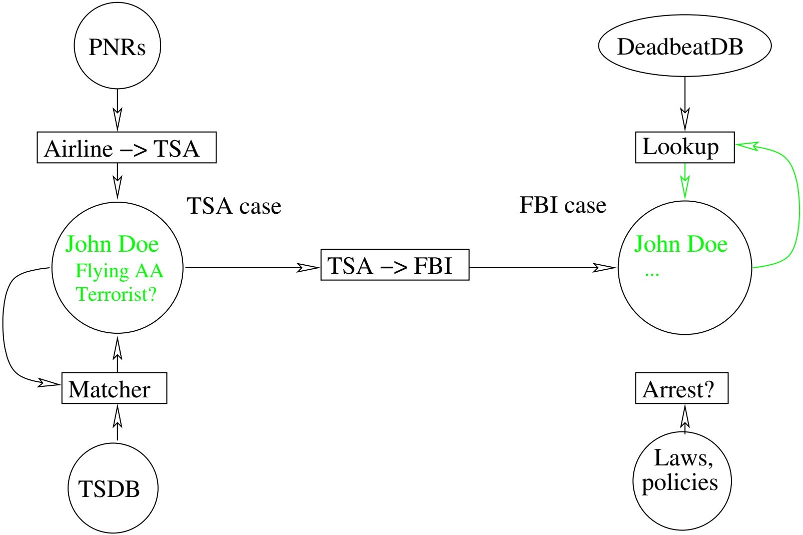

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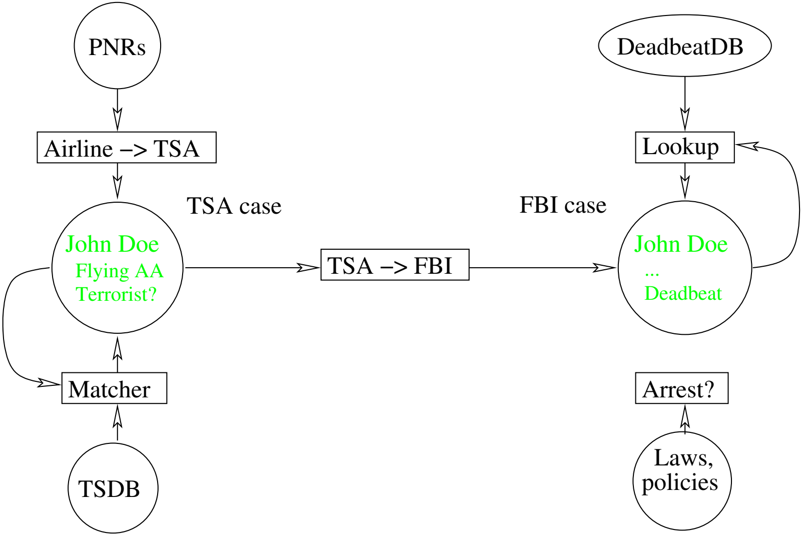

PNRs

Airline –> TSA

TSA case

John Doe
Flying AA
Terrorist?

Matcher

TSDB

TSA –> FBI

FBI case

DeadbeatDB

Lookup

John Doe
...
Deadbeat

Arrest?

Laws,
policies

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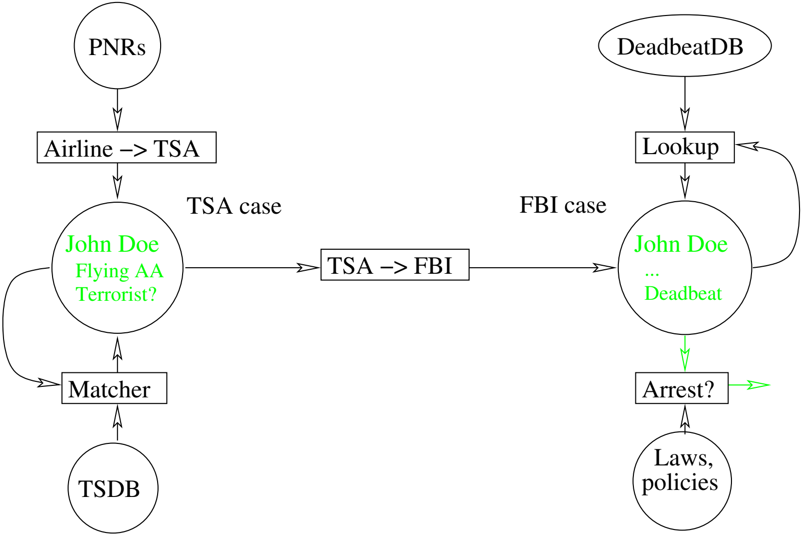

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Pick the knowledge representation for your own problem, but

Partial information and propagator networks are essentially intertwined