

# MODMED Project

## An Overview of the Monitoring Engine

Yoann Blein

16 December 2016



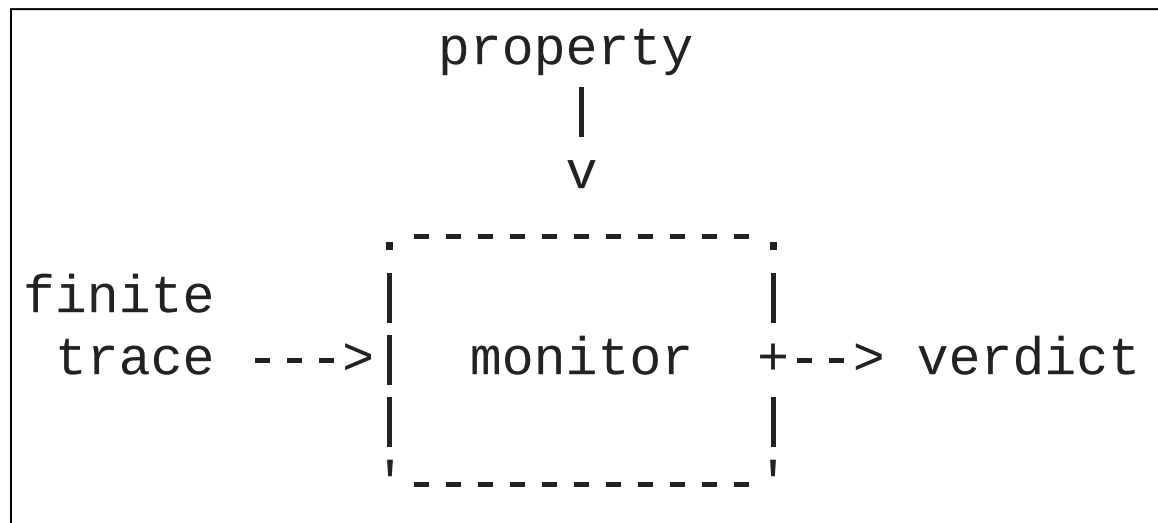
# Input Trace

```
[
  ...
  EnterState {ts: 1449651016.953, state: "main.Load Profile.select pro
  ActionNext {ts: 1449651038.625}
  ExitState {ts: 1449651038.671, state: "main.Load Profile.select prof
  EnterState {ts: 1449651038.671, state: "main.Load Profile.load profi
  ExitState {ts: 1449651039.093, state: "main.Load Profile.load profil
  EnterState {ts: 1449651039.093, state: "main.Load Profile.profile lo
  ExitState {ts: 1449651039.093, state: "main.Load Profile.profile loa
  ExitState {ts: 1449651039.093, state: "main.Load Profile"}
  Temperature {ts: 1449651039.126, v1: 43.01}
  EnterState {ts: 1449651039.296, state: "main.TrackingConnection"}
  EnterState {ts: 1449651039.406, state: "main.TrackingConnection.Loca
  CameraConnected {ts: 1449651043.593}
  ExitState {ts: 1449651043.875, state: "main.TrackingConnection.Local
  EnterState {ts: 1449651043.875, state: "main.TrackingConnection.Trac
  SearchTrackers {ts: 1449651043.89, types: ["P", "F", "T", "G"]}
  ...
]
```

# Property Verification on Traces

- Validate correctness and robustness
- Validate assumptions
- Understand the product usage
- Contribute to the certification process

# Monitoring Engine



# **DSL**

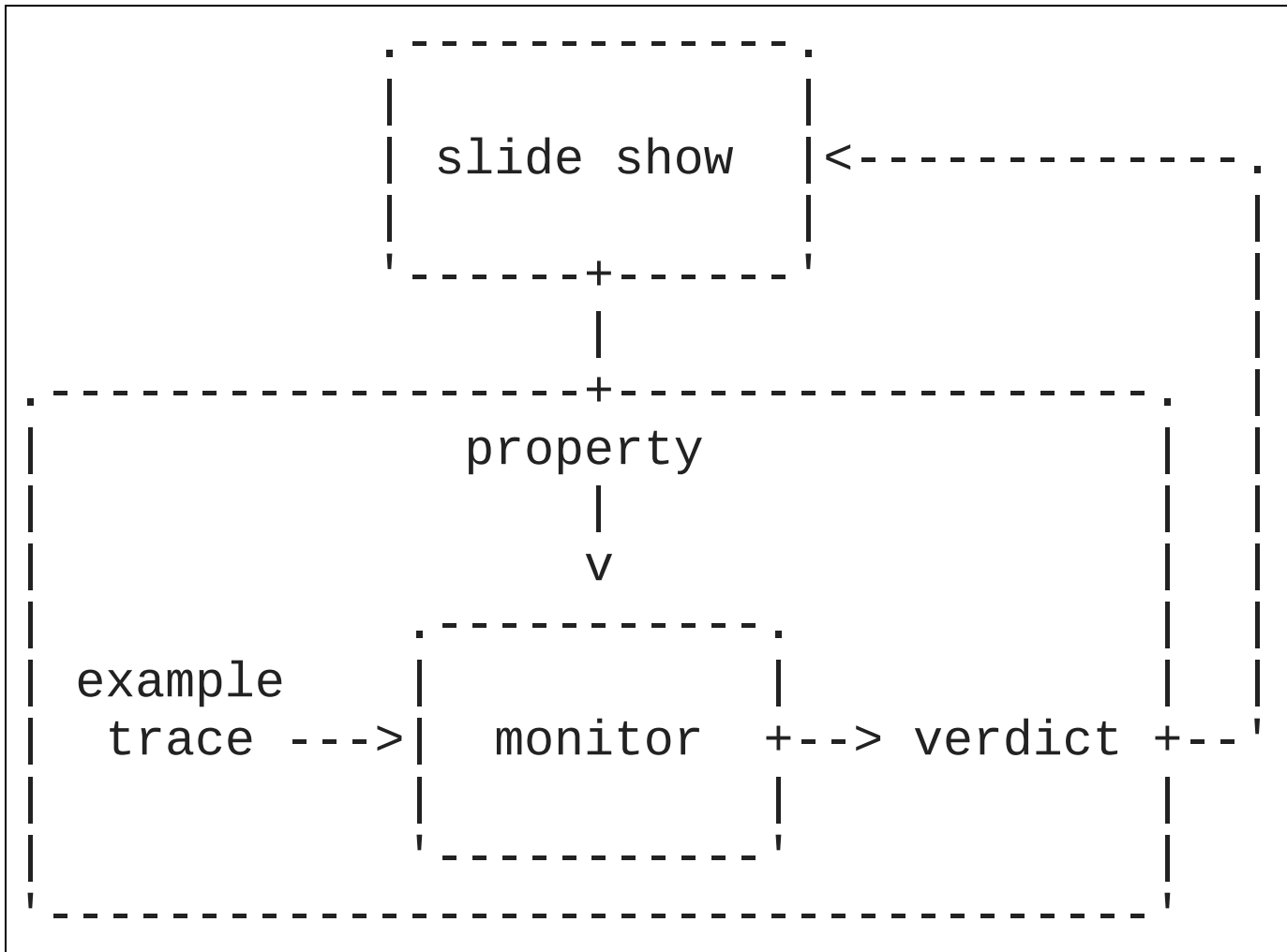
## **Domain Specific Language**



# DSL Objectives

- Usability
- Expressiveness
- Data-oriented
- Declarative

# Live Demo





*The camera has been connected*

---

```
...  
CameraConnected {ts: 1449651043.593}  
...
```

```
occurrence_of CameraConnected
```

```
> OK
```

---

*The temperature is never inferior to some threshold*

---

```
absence_of Temperature t where t.v1 < 40.0
```

```
> OK
```

```
absence_of Temperature t where t.v1 < 44.0
```

```
> KO:
```

```
the event Temperature[ts=1449651039.13, v1=43.01] should not have  
occurred
```

---

*The camera must be connected before used*

---

```
...  
CameraConnected {ts: 1449651043.593}  
...  
SearchTrackers {ts: 1449651043.89, types: ["P", "F", "T", "G"]}  
...
```

```
CameraConnected precedes SearchTrackers
```

```
> OK
```

---

*The temperature is never inferior to some threshold  
after the camera is connected*

---

```
...  
Temperature {ts: 1449651039.126, v1: 43.01}  
...  
CameraConnected {ts: 1449651043.593}  
...  
Temperature {ts: 1449652414.34, v1: 44.06}  
...
```

```
after first CameraConnected,  
absence_of Temperature t where t.v1 < 44.0  
  
> OK
```

## *Cancelling an acquisition prevents it from succeeding*

```
after each AcquisitionCancel,  
absence_of AcquisitionSuccess
```

> KO:

in the scope starting after AcquisitionCancel[ts=1449658116.10],  
the event AcquisitionSuccess[ts=1449658118.60] should not have occurred

```
...  
AcquisitionBegin { ts: 1449658115.6 },  
AcquisitionCancel { ts: 1449658116.1 },  
AcquisitionBegin { ts: 1449658117.7 },  
AcquisitionSuccess { ts: 1449658118.6 }  
...
```

```
since AcquisitionCancel until AcquisitionBegin,  
absence_of AcquisitionSuccess
```

> OK

---

*All trackers are detected before leaving the state  
"TrackingConnection"*

---

```
SearchTrackers {ts: 1449651043.89, types: ["P", "F", "T", "G"]}
TrackerDetected {ts: 1449651120.34, ty: "F"}
...
ExitState {ts: 1449651823.1, state: "main.TrackingConnection"}
```

```
between SearchTrackers st
and ExitState e where e.state == "main.TrackingConnection",
forall ty in st.types,
occurrence_of TrackerDetected td where td.ty == ty
```

```
> OK
```

# DSL Grammar

```
<prop> ::= <pattern>
        | <scope> ',' <prop>
        | 'forall' <ident> 'in' <expr> ',' <prop>
        | '(' <prop> ')'
        | 'not' <prop>
        | <prop> ('and' | 'or' | 'equiv' | 'implies') <prop>

<scope> ::= ('after' | 'before') ('each' | 'first' | 'last') <event>
        | 'between' <event> 'and' <event>
        | 'since' <event> 'until' <event>

<pattern> ::= 'absence_of' <event>
           | 'occurrence_of' <expr> <event>
           | <event> 'followed_by' <event>
           | <event> 'precedes' <event>

<event> ::= <ident> [<ident> ['where' <expr>]]
```

# Thanks!

MODMED Project:

<https://sites.google.com/a/minmaxmedical.com/modmed/>

[yoann.blein@imag.fr](mailto:yoann.blein@imag.fr)