

# CIM: Cybernetic Incident Management

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CIM project

## Problems

- Incident Management usually involves many parties having to cooperate, it has a distributed multi-agent character.
- Specific type of errors is likely to occur in the interaction and coordination between these parties. Causes:
  - Procedures have low accessibility.
  - People involved often lack experience.
  - Analysis and reconstruction difficult due to chaos.

## Proposed solution

- Create a constantly adapting system that processes information in an adaptive, interactive and intelligent fashion to support human decisions.
- Knowledge is contained in communication structures and supporting software in the form of distributed agents.
- Maintenance and evolution of the system by performing simulations and training sessions.

## Contribution of VU

Main contribution Vrije Universiteit Amsterdam:

- The analysis of disaster case-studies in order to obtain traces.
- Develop methods to provide automated support for analysis of cause of failure in traces.
- In the future traces can also be obtained from the system itself.

## Informal

### Hercules disaster

(1) Incorrect information

(2) Incomplete information

(3) Use of different protocols

### Dakota disaster

(4) Exception Handling

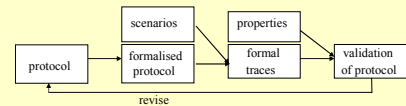
(5) Contradictory information

(6) Work Overload

## Formal

Why formalise a trace?

- The properties that should hold within a trace can be formally verified.
- The cause why a property isn't satisfied can be given, also when caused by a chain of events.
- It is possible to develop/verify a protocol:



The trace of the Hercules disaster:

Technology

## Validation

**(P2)** At any points in time  $t_1$  and  $t_2$ ,  $t_2 \geq t_1$ , if ATC generates information to AFD about the plane crash at  $t_1$ , and the number of passengers is more than 10 at  $t_2$  then at a later point in time  $t_3$  AFD declares scenario 3.

not satisfied

**(P4)** At any point in time  $t_1$ , if AFD receives information from ATC about the plane crash, then at a later point in time  $t_2$ , a MAC will join AFD, and at a still later point in time  $t_3$  will come to the disaster area in less than 3 minutes upon the plane crash information reception

satisfied

Formalisation

$\forall t_1, t_2, x [ t_2 \geq t_1 \Rightarrow [ \text{state}(\gamma, t_1, \text{input}(\text{AFD})) ] = \text{communication\_from\_to}(\text{ATC}, \text{AFD}, \text{inform, crash}) \ \& \ x > 10 \ \& \ \text{state}(\gamma, t_2, \text{input}(\text{AFD})) ] = \text{communication\_from\_to}(\text{ATC}, \text{AFD}, \text{inform, amount}(\text{people, } x)) ] \Rightarrow \exists t_3 > t_2 \ \& \ \text{state}(\gamma, t_3, \text{output}(\text{AFD})) ] = \text{communication\_from\_to}(\text{AFD}, \text{AFD}, \text{declare, scenario3}) ]$

