Press The Button Now

Developments with the digital oilfield

1st December 2011

ThinkTank Maths (TTM)

- A mathematics research company with the objective to create game-changing solutions and results in target markets
- Core competence in creative mathematics

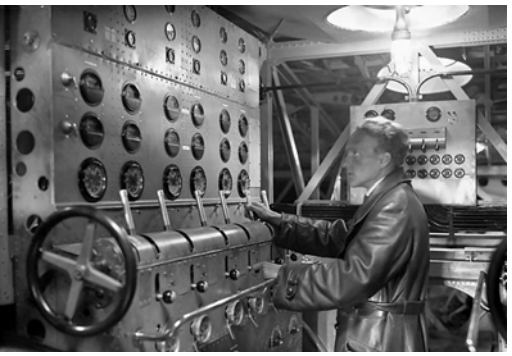
Need for increased automation

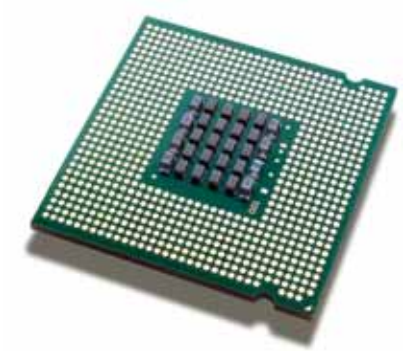
- Aging, complex reservoirs and mature assets
- Difficult operational environments
- HSE and cost-effectiveness
- Integrated operations and real-time data

Identifying root cause?

Nothing to report?

Towards Trusted Autonomy





Time

Human operated

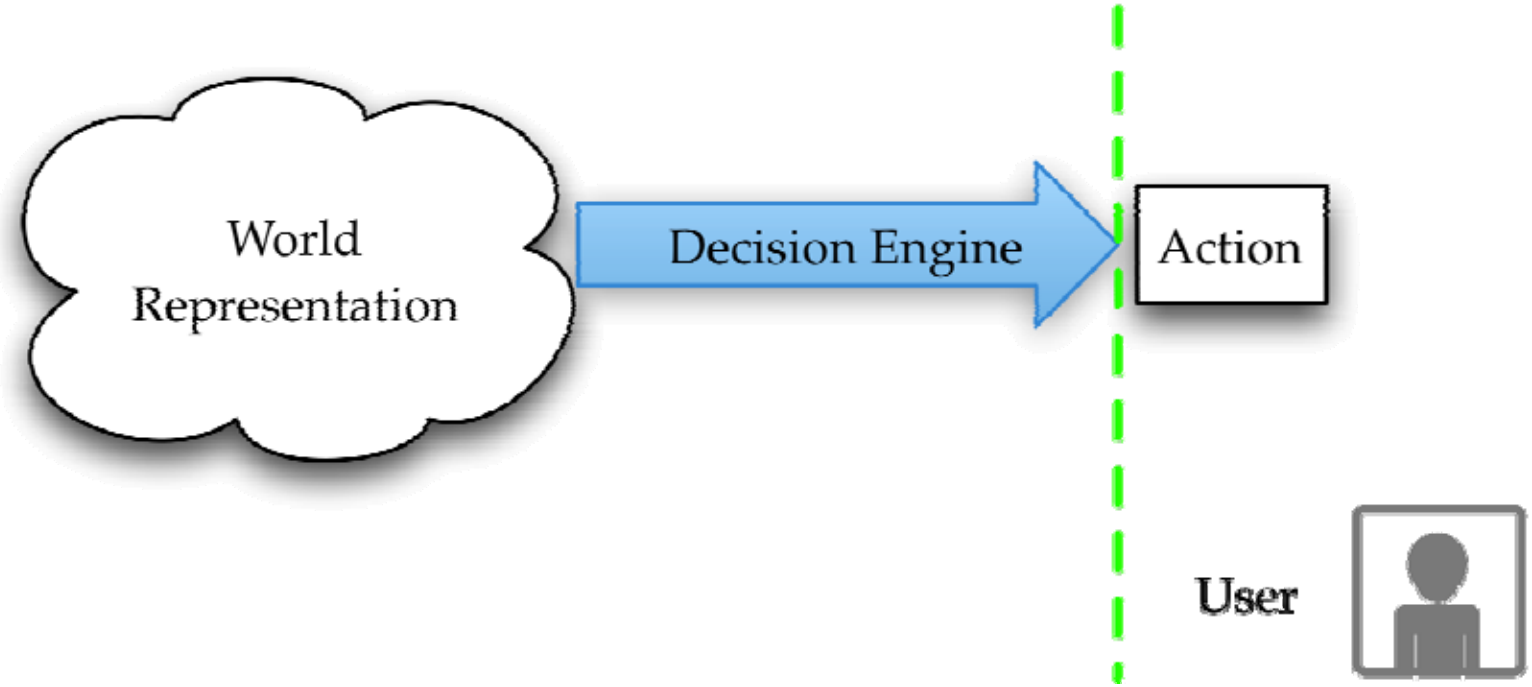
Semi-Automatic Systems

Automated

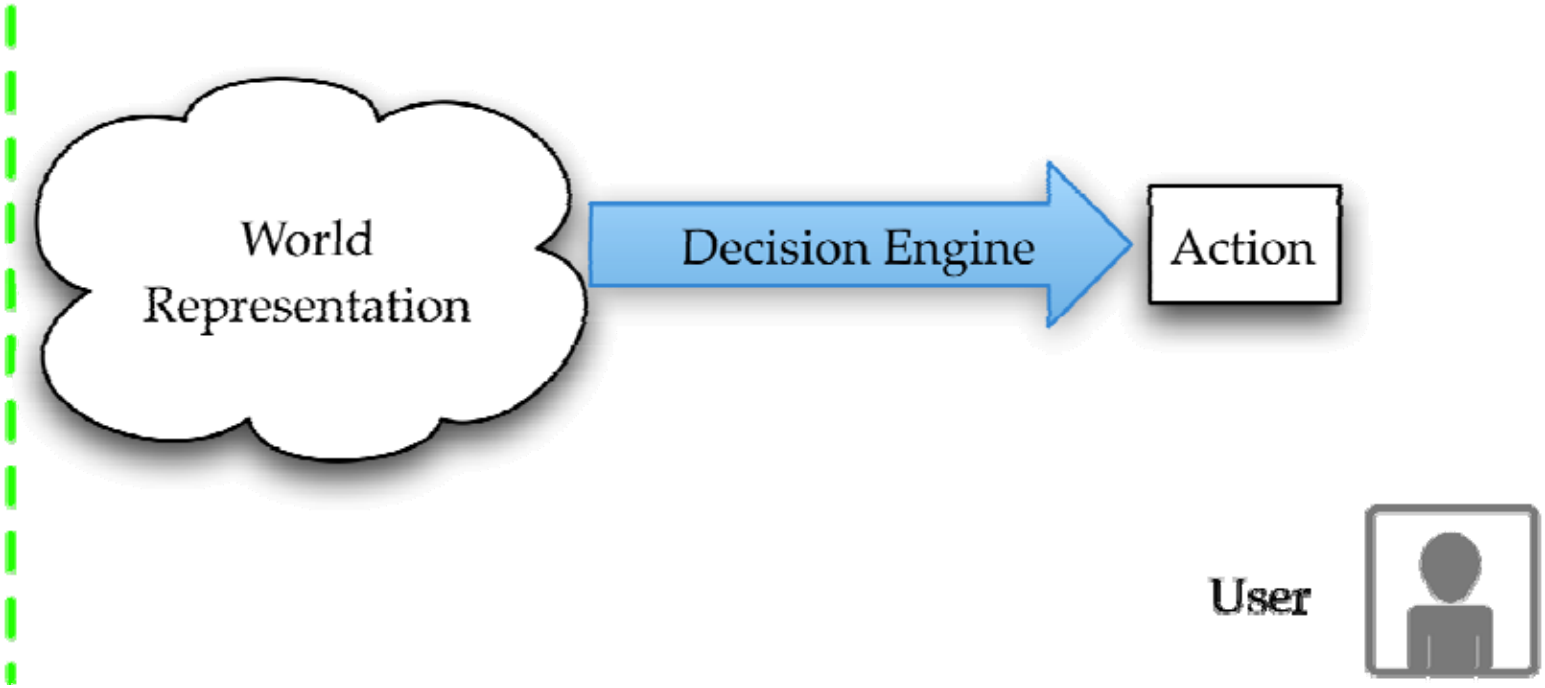
Trust

Explanation & Reliability

Autonomous Decision-Making



Autonomous Decision-Making

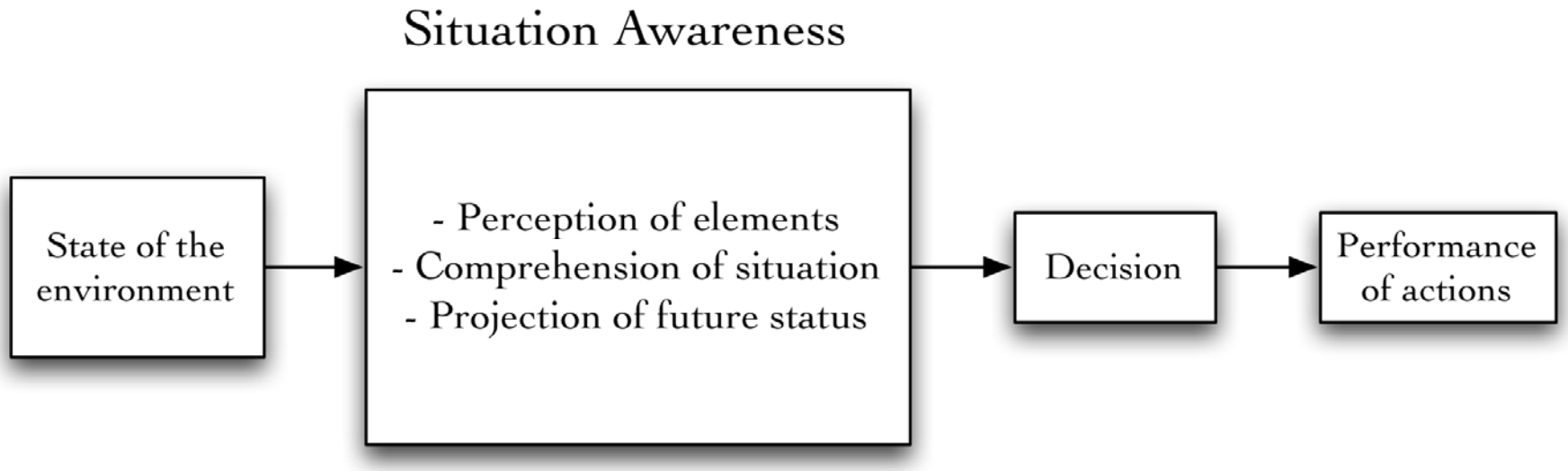


```
### chunk number 25:
mydata
predict(in1c, response=c("lung","bronc"), newdata=mydata,
 predictors=c("smoke", "asia", "tub" , "dysp", "xray"), type="class")

in1c2  <- enterEvidence(in1c,nodes=c("asia"),states=c("yes"),propagate=FALSE)
##evidence(in1c2)
in1c2  <- enterEvidence(in1c2,nodes=c("dysp"),states=c("yes"),propagate=FALSE)
##evidence(in1c2)
in1c2 <- propagate(in1c2)
evidence(in1c2)
```

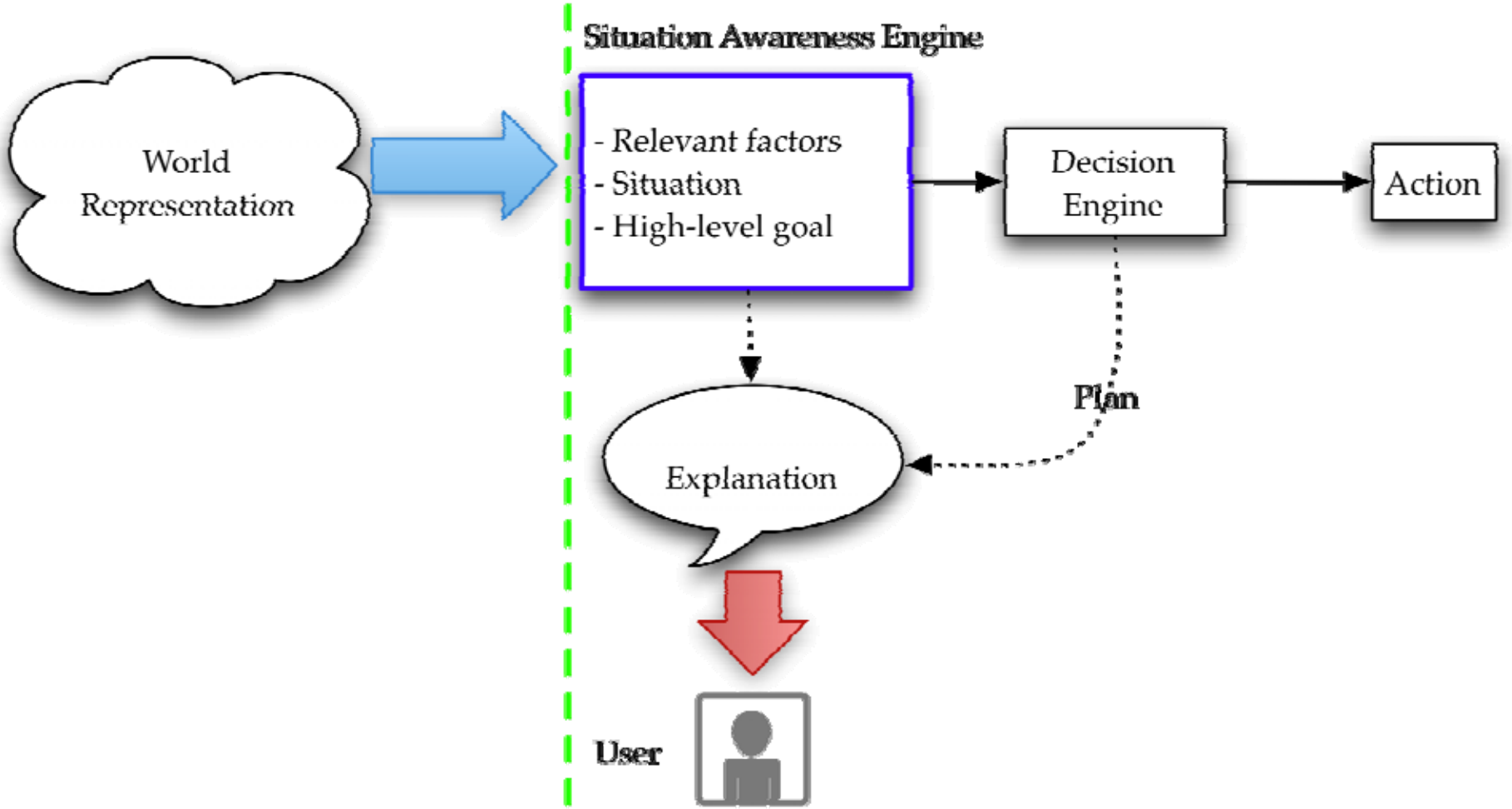
A Language Barrier

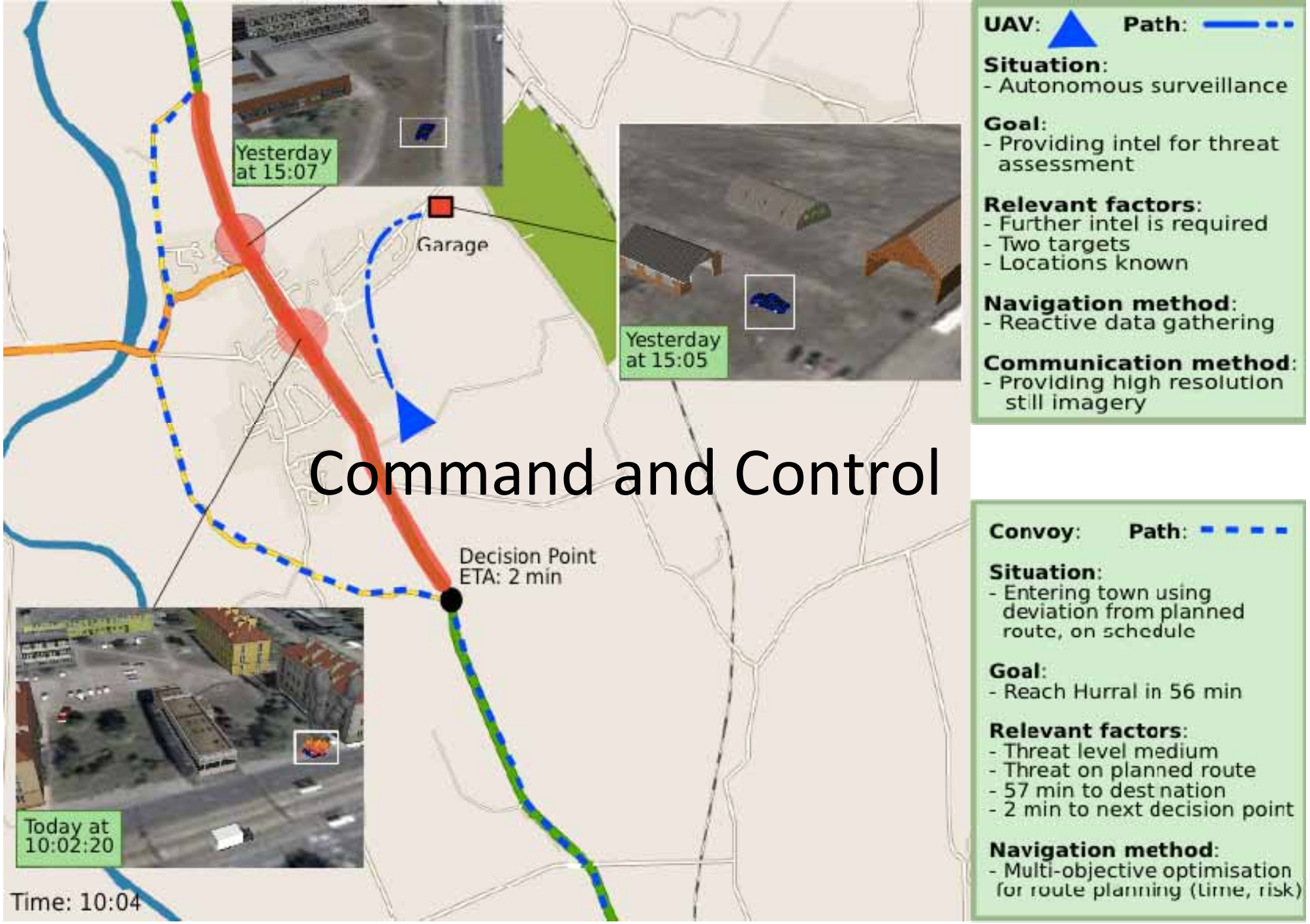
```
### chunk number 26:
predict(in1c, response=c("lung","bronc"), newdata=mydata,
 predictors=c("smoke", "asia", "tub" , "dysp", "xray"), type="dist")


### chunk number 27:
chestNames <- c("asia", "smoke", "tub", "lung", "bronc", "either", "xray",
"dysp")
gmd <- newgmData(chestNames,valueLabels=c("yes","no"))
gmd
```

Situation Awareness



The TTM Trusted Reasoning Architecture




Yesterday
at 15:07
Garage
Yesterday
at 15:05
Command and Control
Decision Point
ETA: 2 min
Today at
10:02:20
Time: 10:04
UAV:
Path:
Situation:
- Autonomous surveillance
Goal:
- Providing intel for threat assessment
Relevant factors:
- Further intel is required
- Two targets
- Locations known
Navigation method:
- Reactive data gathering
Communication method:
- Providing high resolution still imagery
Convoy:
Path:
Situation:
- Entering town using deviation from planned route, on schedule
Goal:
- Reach Hurral in 56 min
Relevant factors:
- Threat level medium
- Threat on planned route
- 57 min to destination
- 2 min to next decision point
Navigation method:
- Multi-objective optimisation for route planning (time, risk)

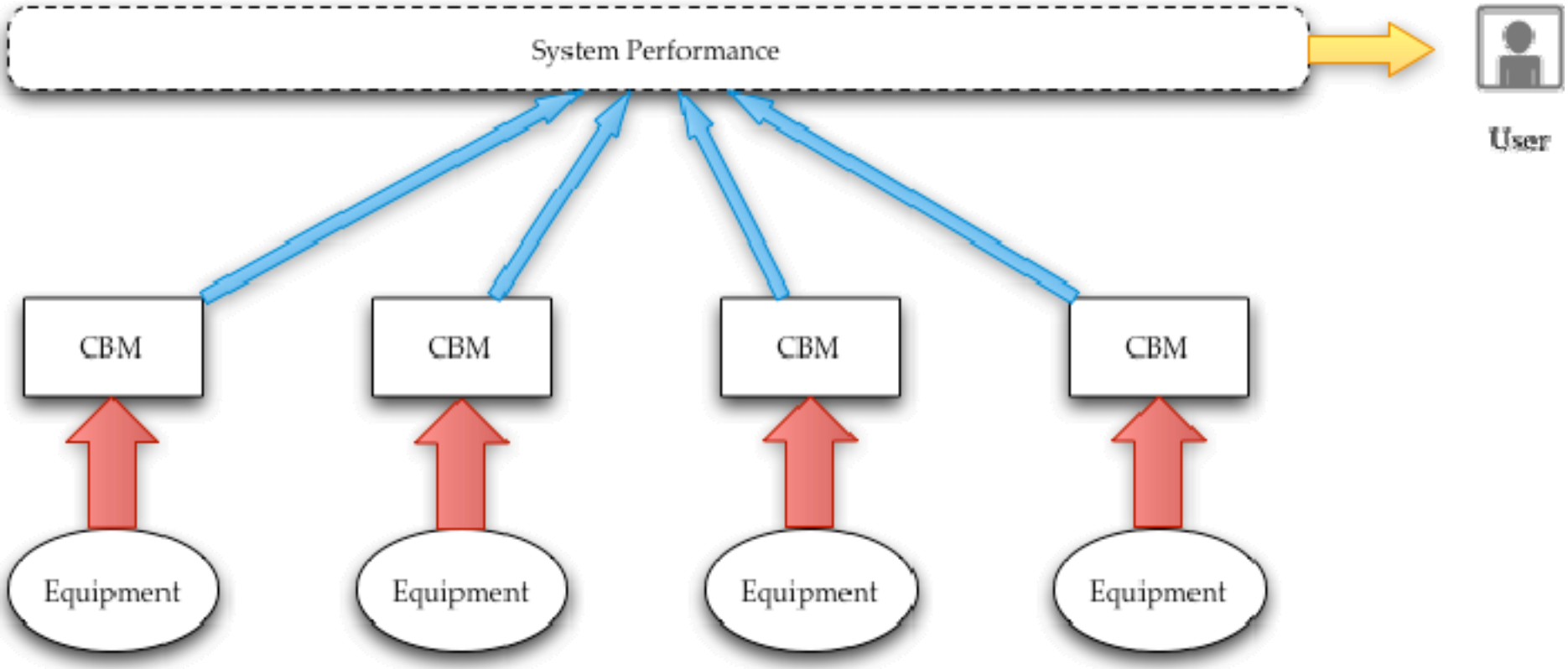
Anomaly/Atmospherics Detection

Autonomous Underwater Systems

Automated Drilling

Production and Plant Operations

Systemic Situation Awareness



Conclusions

- Safe deployment of automation requires an intelligent, systemic approach
- Next-generation systems must enable a true two-way dialogue between human and machine
- Existing approaches to Trusted Reasoning developed in the defence sector have potential in several oil and gas applications

Contact

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