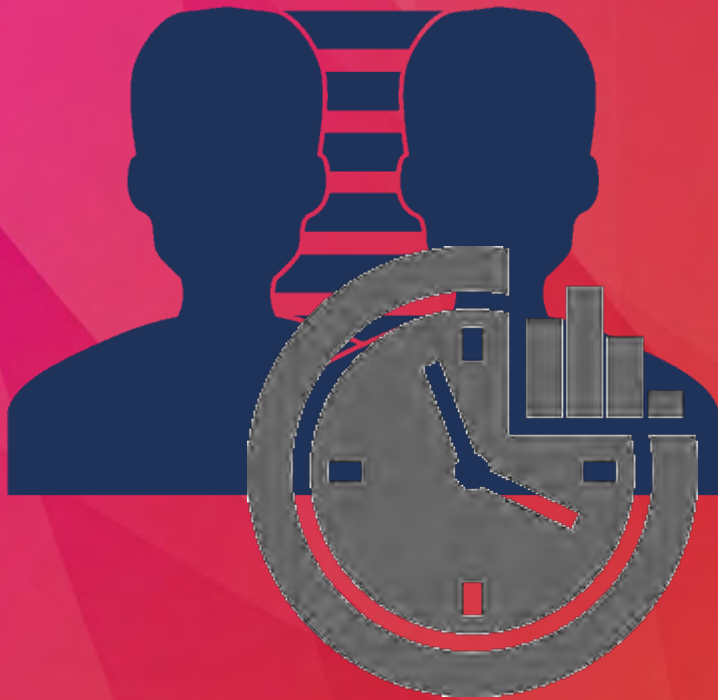


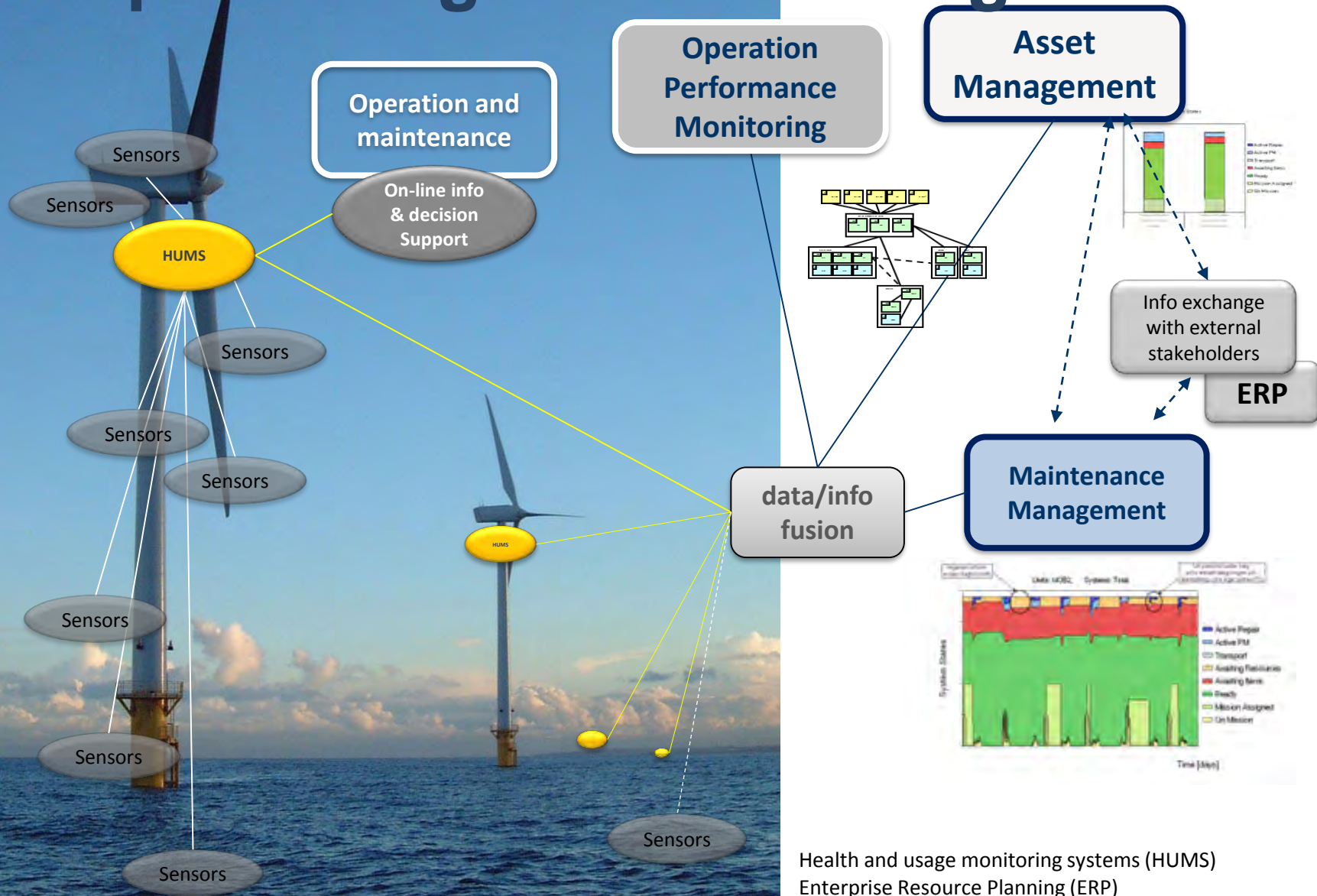
WE  
CAN DO  
SO MUCH  
TOGETHER

# Modelos híbridos para O&M. Aplicación en Virtual Wind Farm

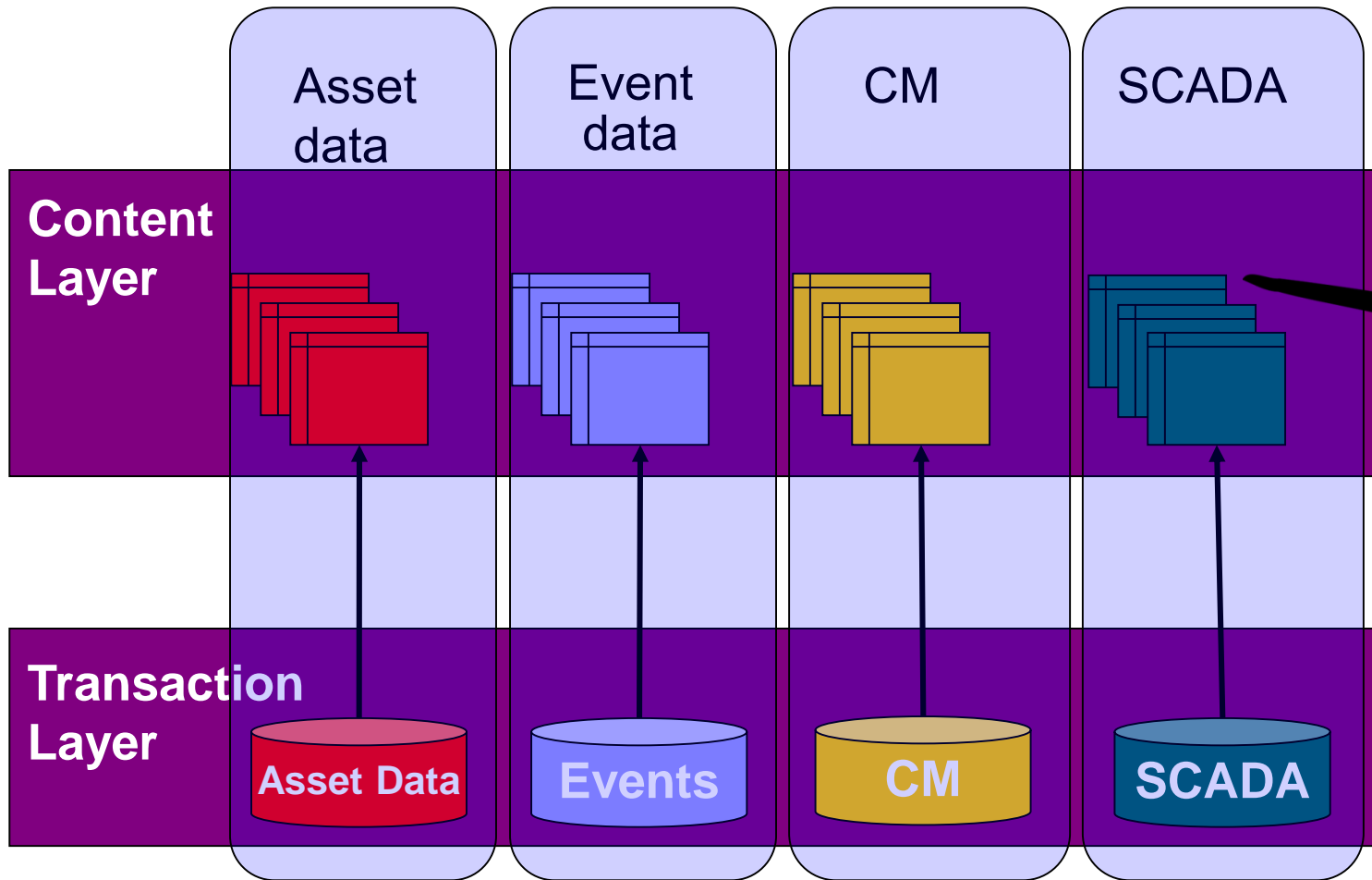
Professor Diego Galar



# Wind power.. a promising domain for big data



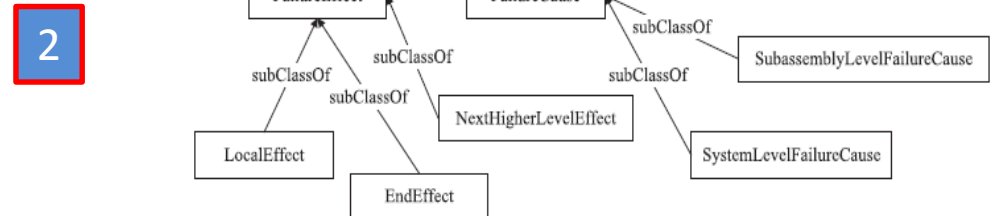
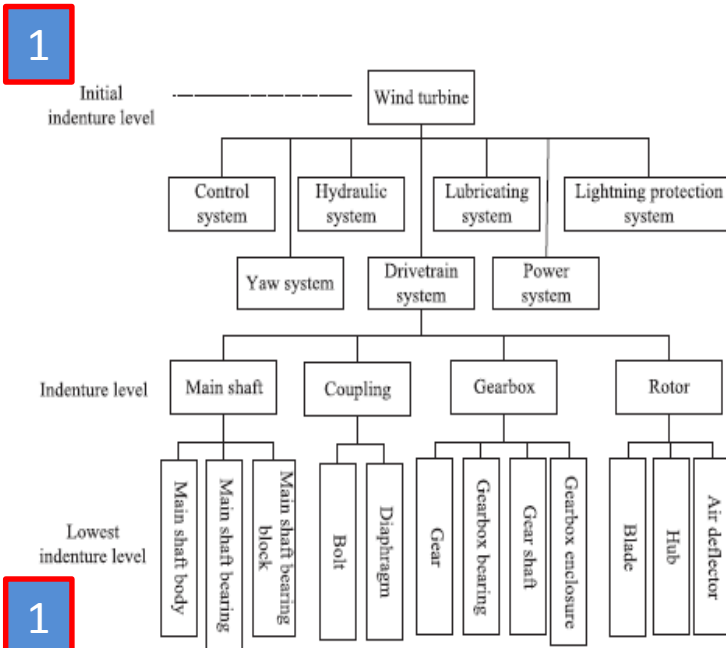
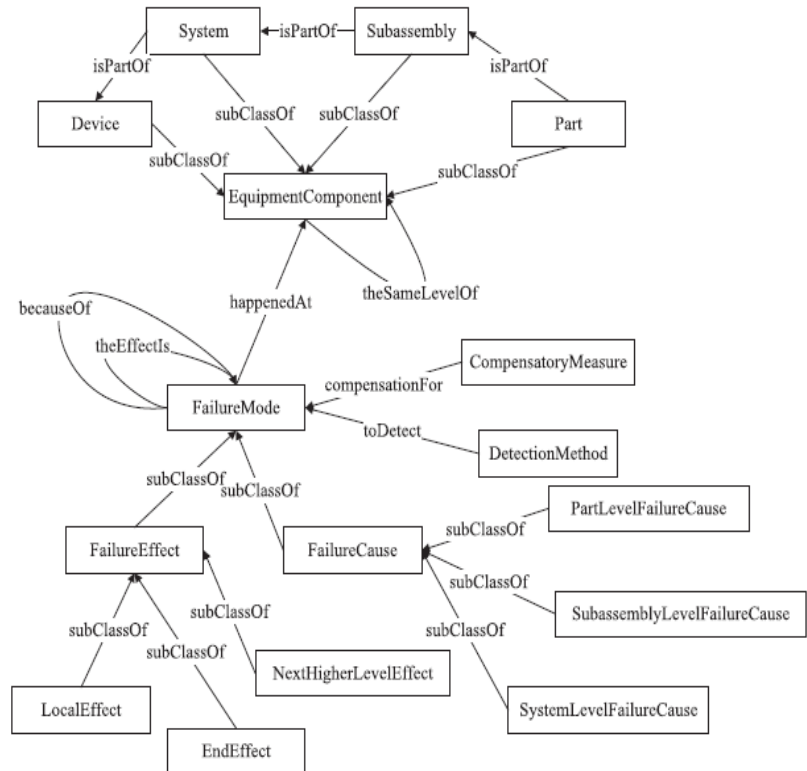
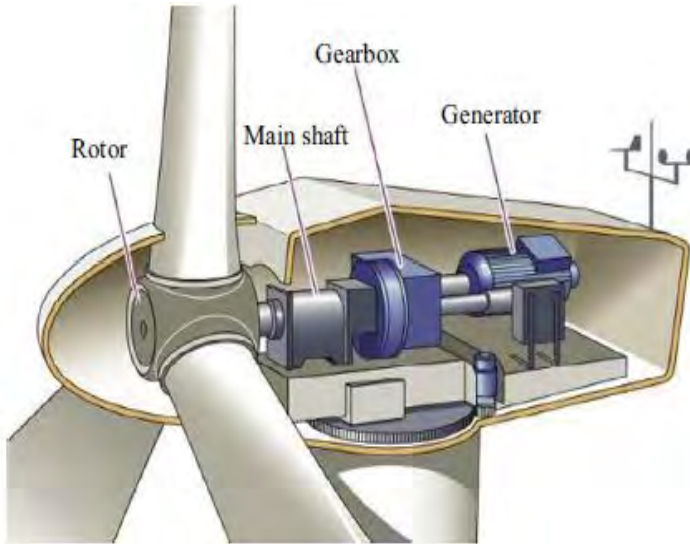
# Unified data format: What connections are needed?



**Silos** of data by functional area

# Services: diagnosis and prognosis

## Taxonomies and ontologies

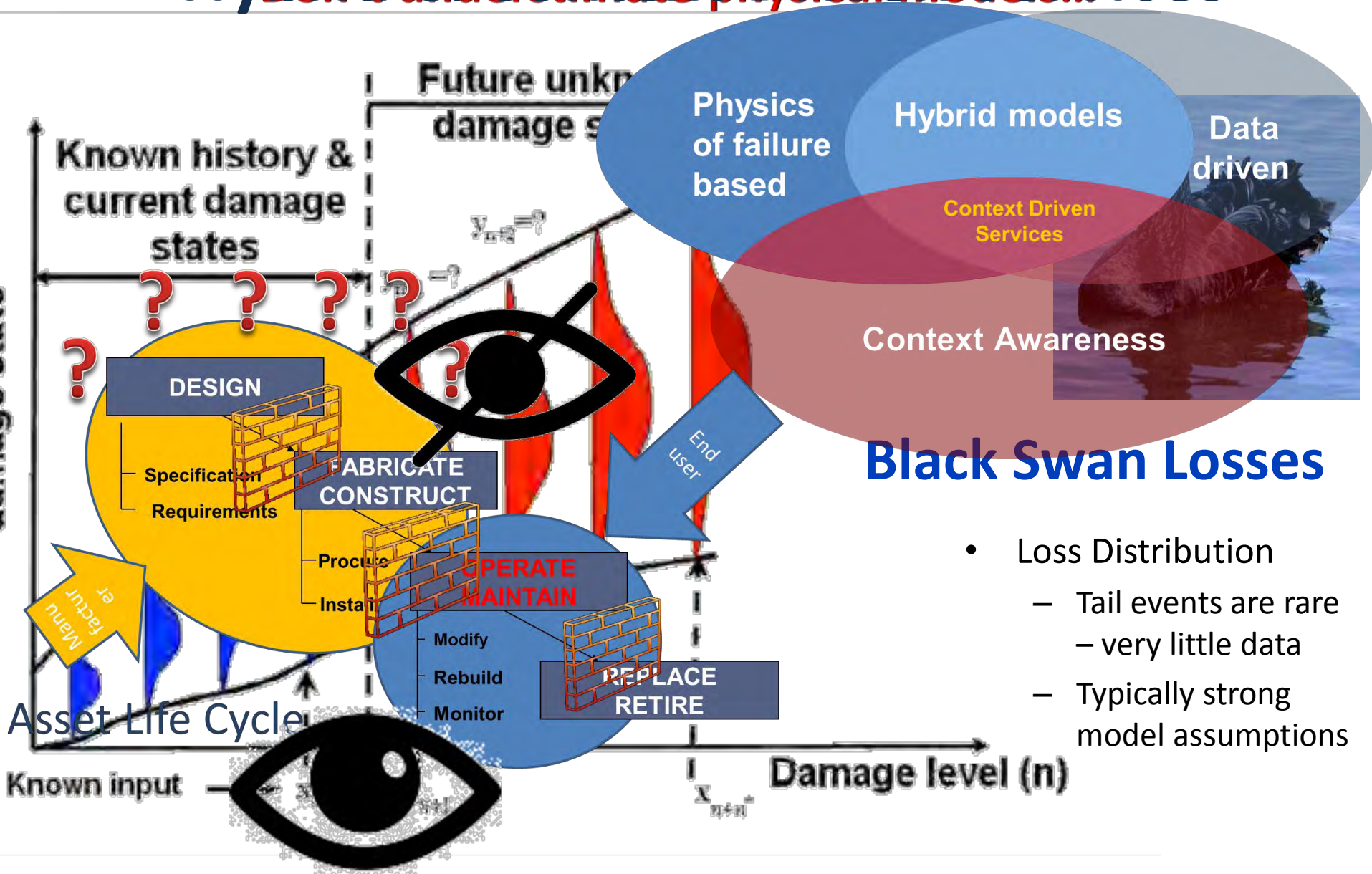


Rule-1

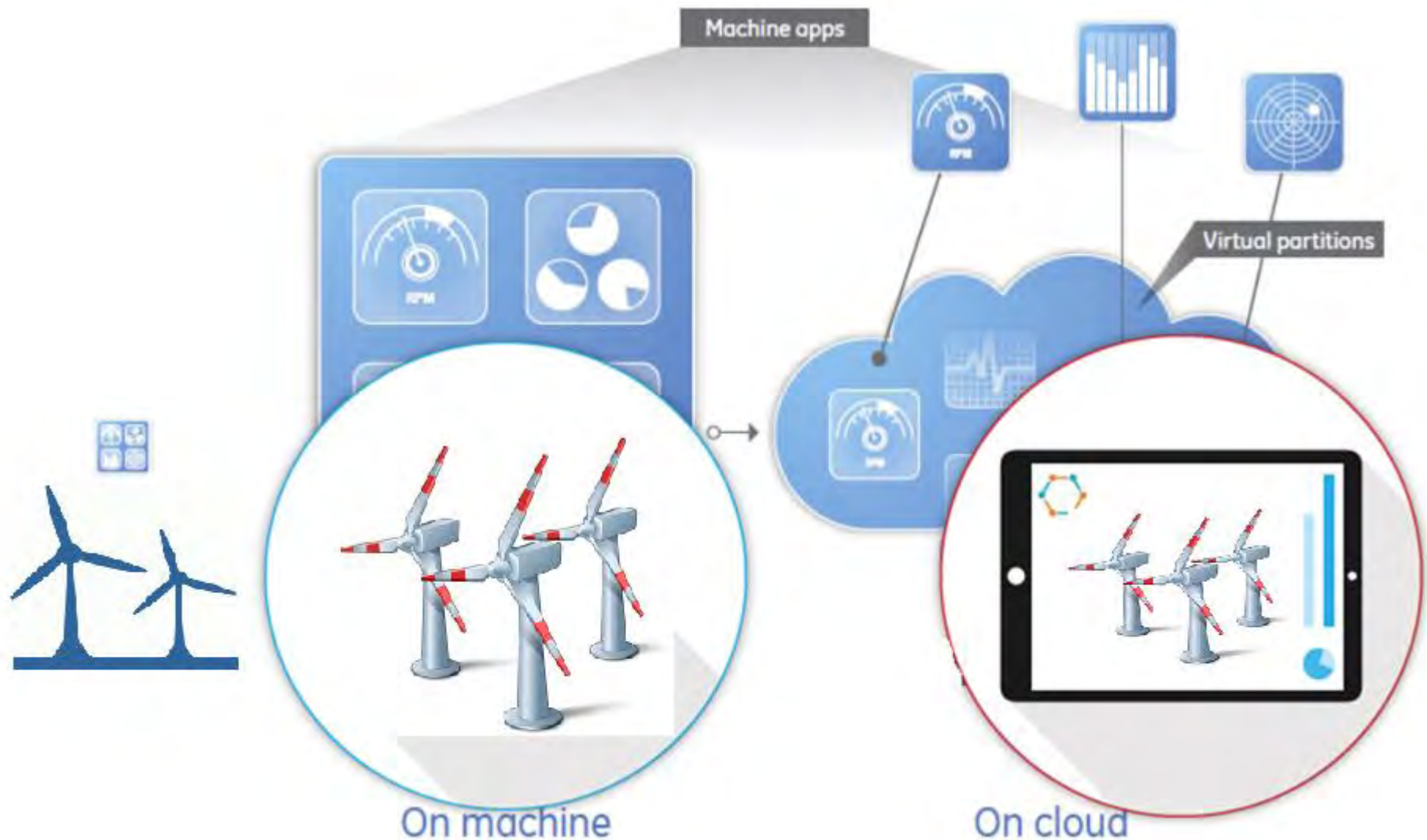
$\text{FailureMode}(\text{?x}) \wedge \text{hasHappened}(\text{?x}, \text{true}) \wedge \text{Device}(\text{?y}) \wedge$   
 $\text{happenedAt}(\text{?x}, \text{?y}) \wedge \text{FailureMode}(\text{?z}) \wedge \text{theEndEffectIs}(\text{?z},$   
 $\text{?x}) \wedge \text{FailureMode}(\text{?a}) \wedge \text{theHighEffectIs}(\text{?z},$   
 $\text{?a}) \wedge \text{theDirectFailureCauses}(\text{?x}, \text{?a}) \wedge \text{hasHappened}(\text{?a}, \text{true})$

2

# Lack of data influences the prediction Hybrid & Context Driven Services

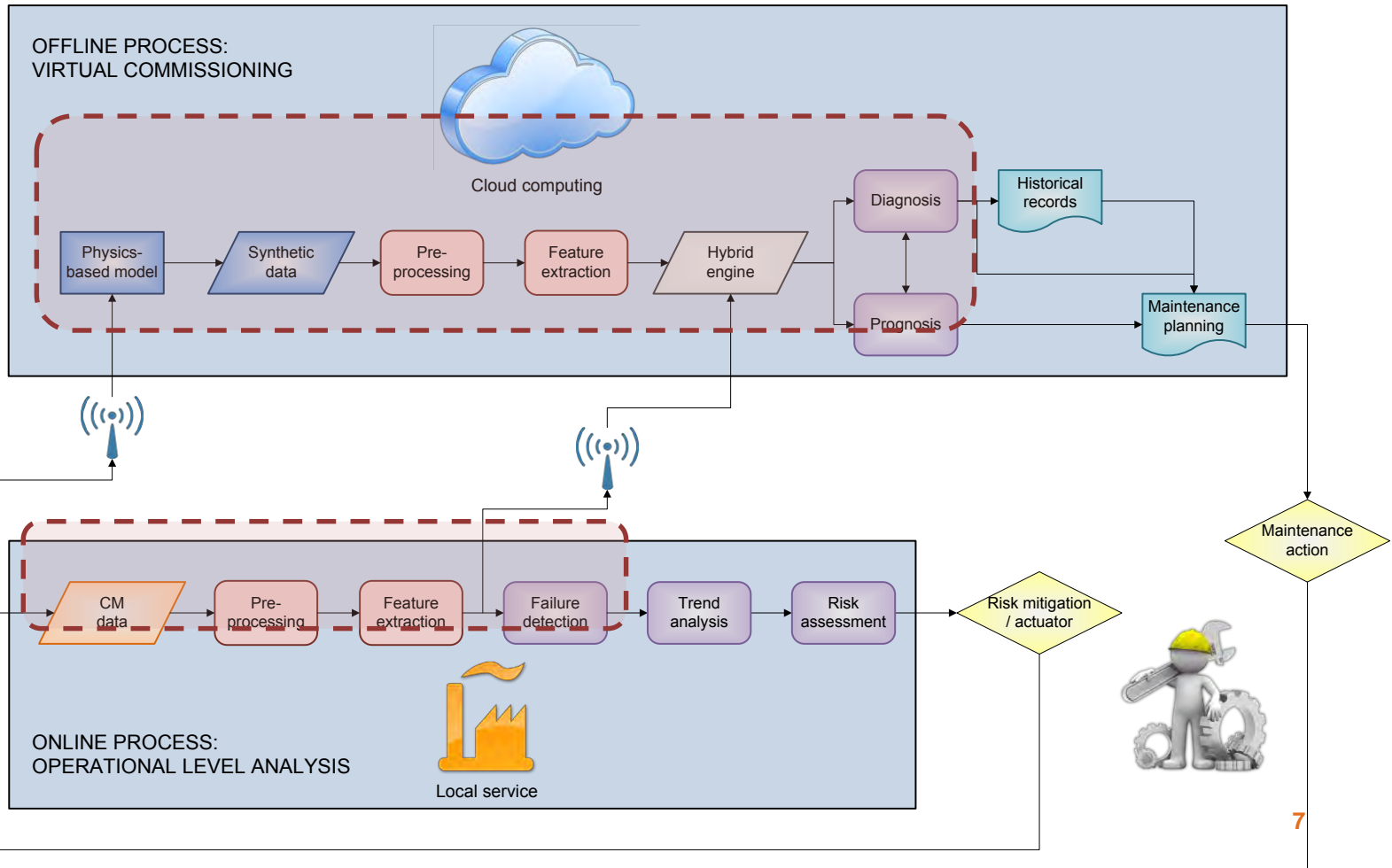


# Virtual wind assets

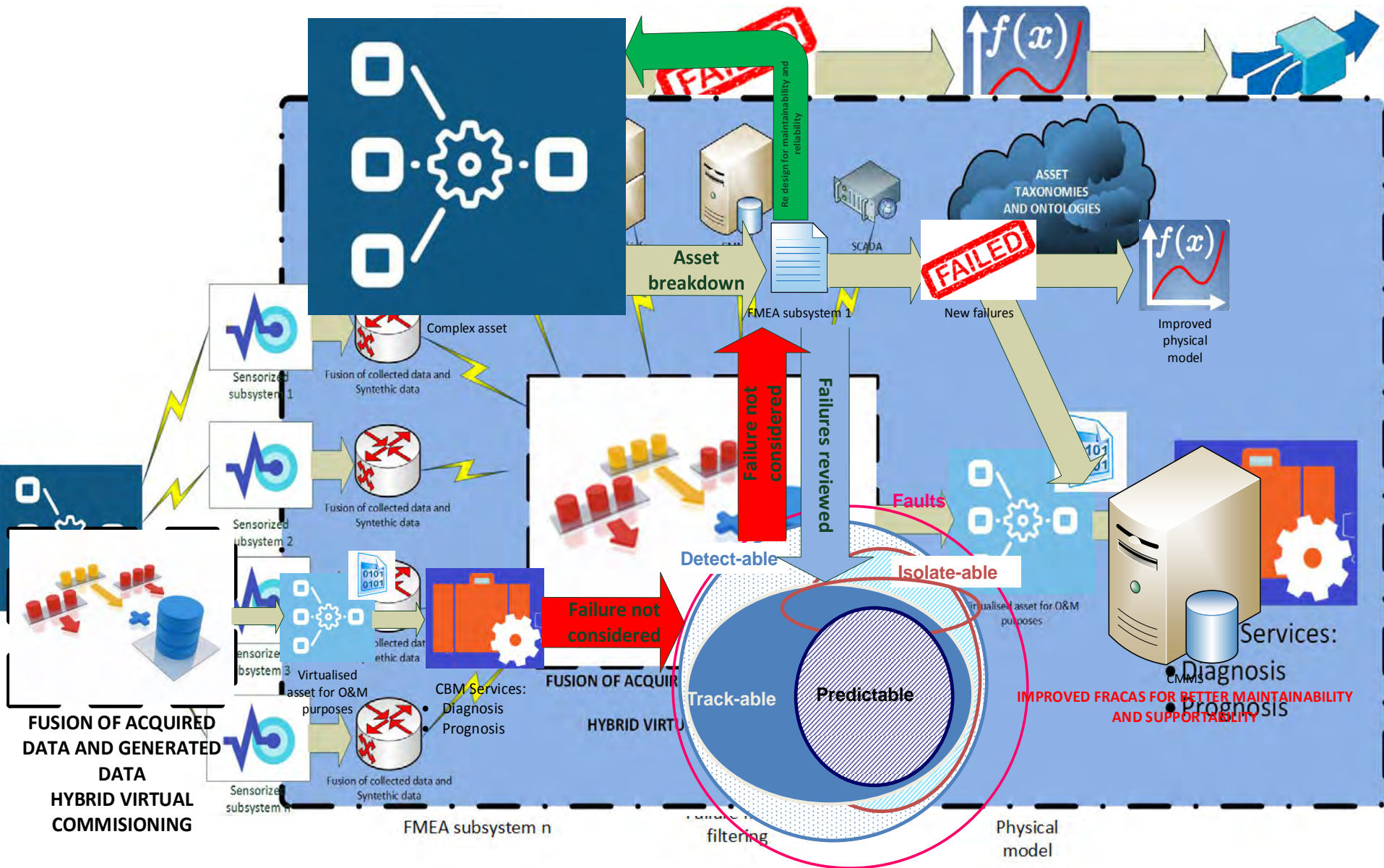


# Hybrid

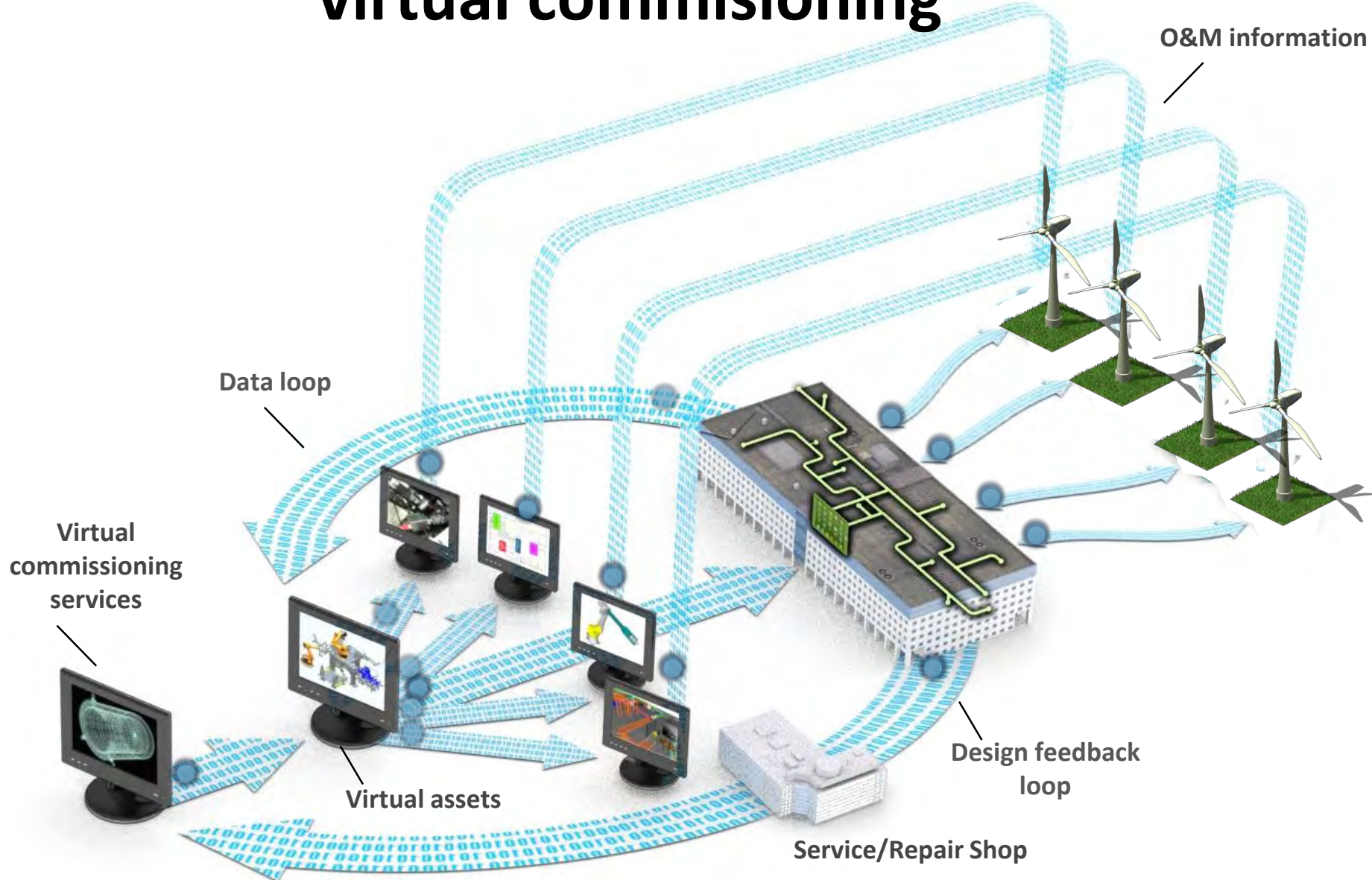
# maintenance modelling



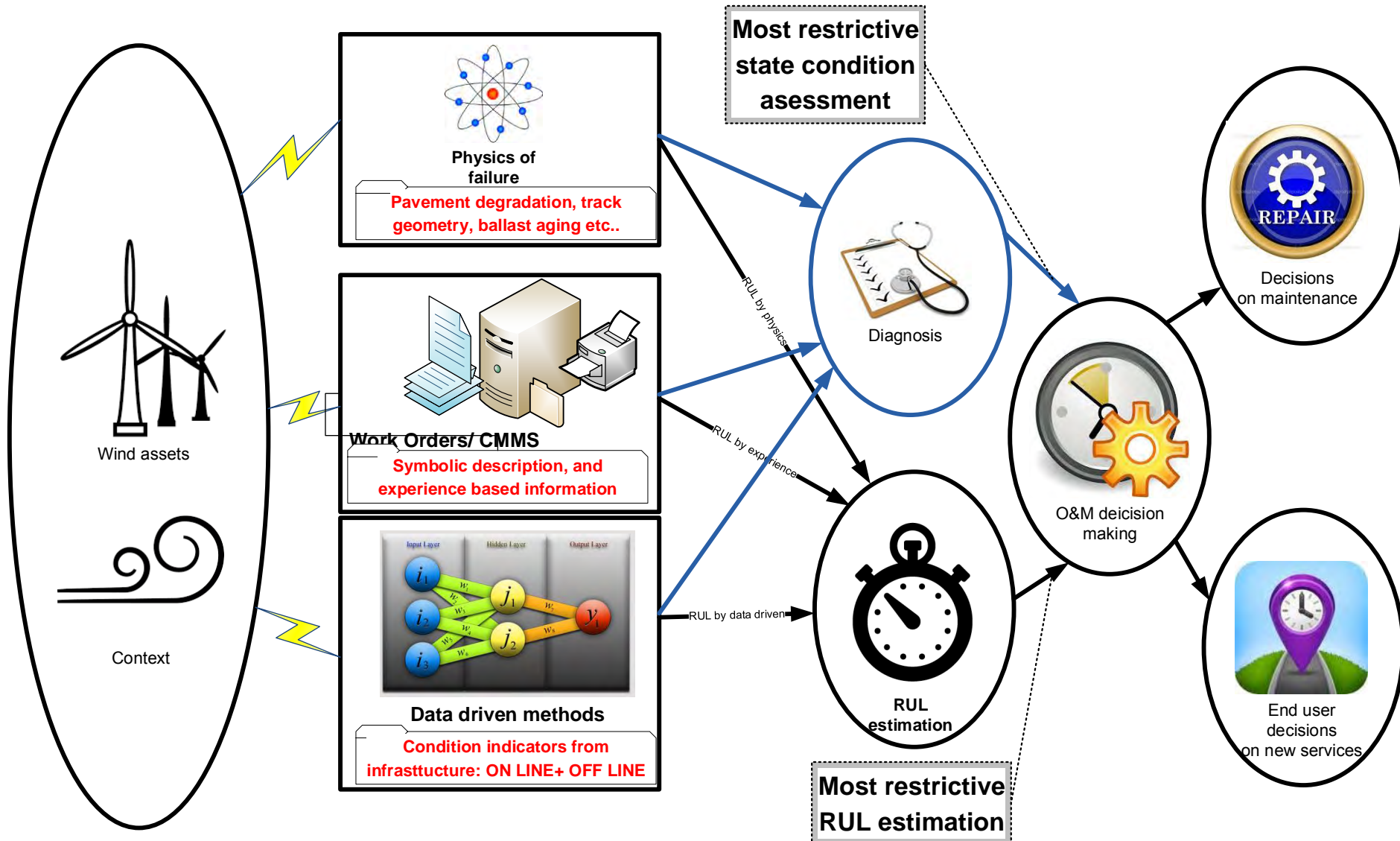
# 2nd step of hybrid and VCC



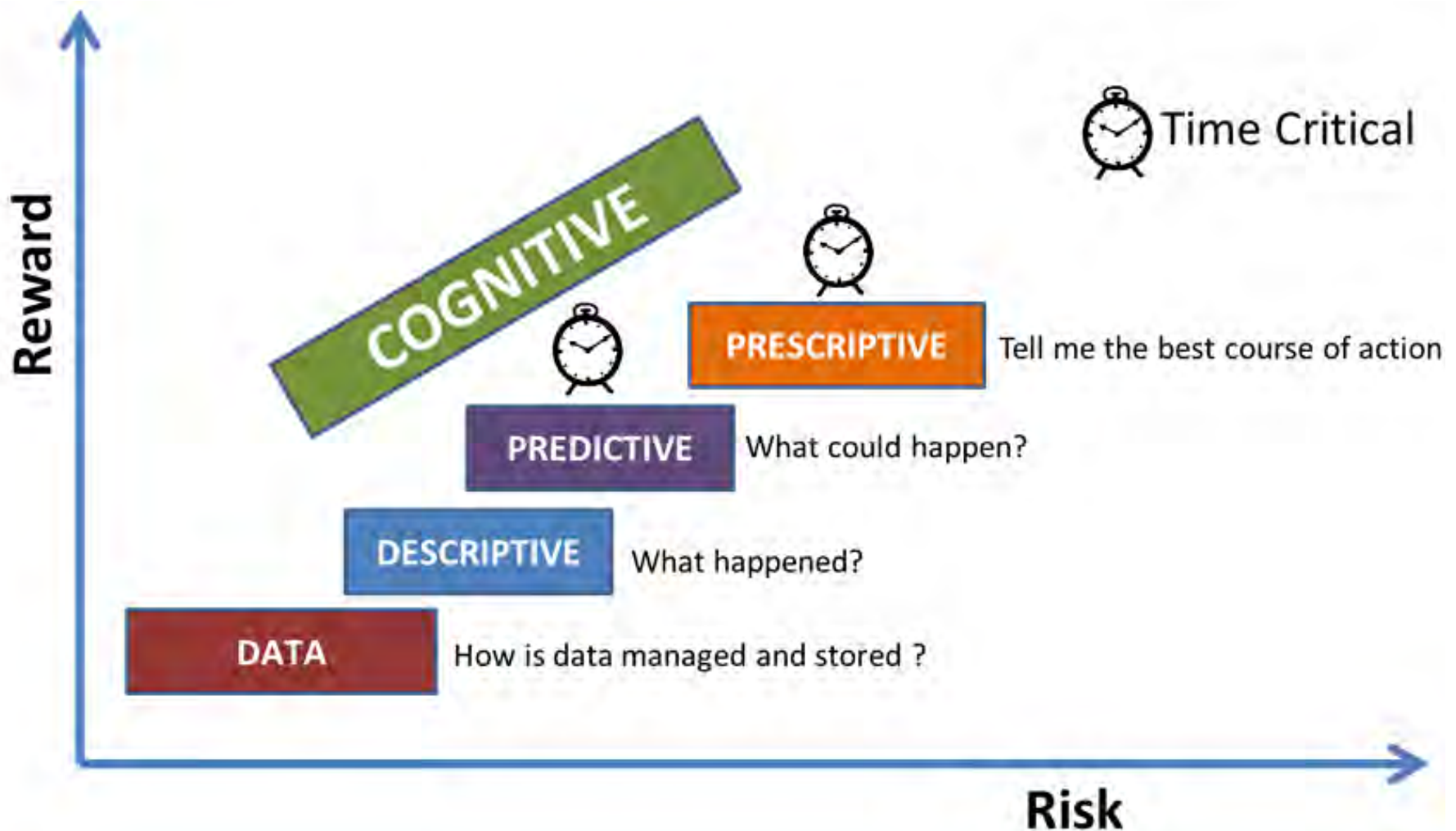
# Application of wind farm virtual commissioning



# Diagnosis and Prognosis, enablers for new business models



# Prescriptive O&M, one step ahead of prediction





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