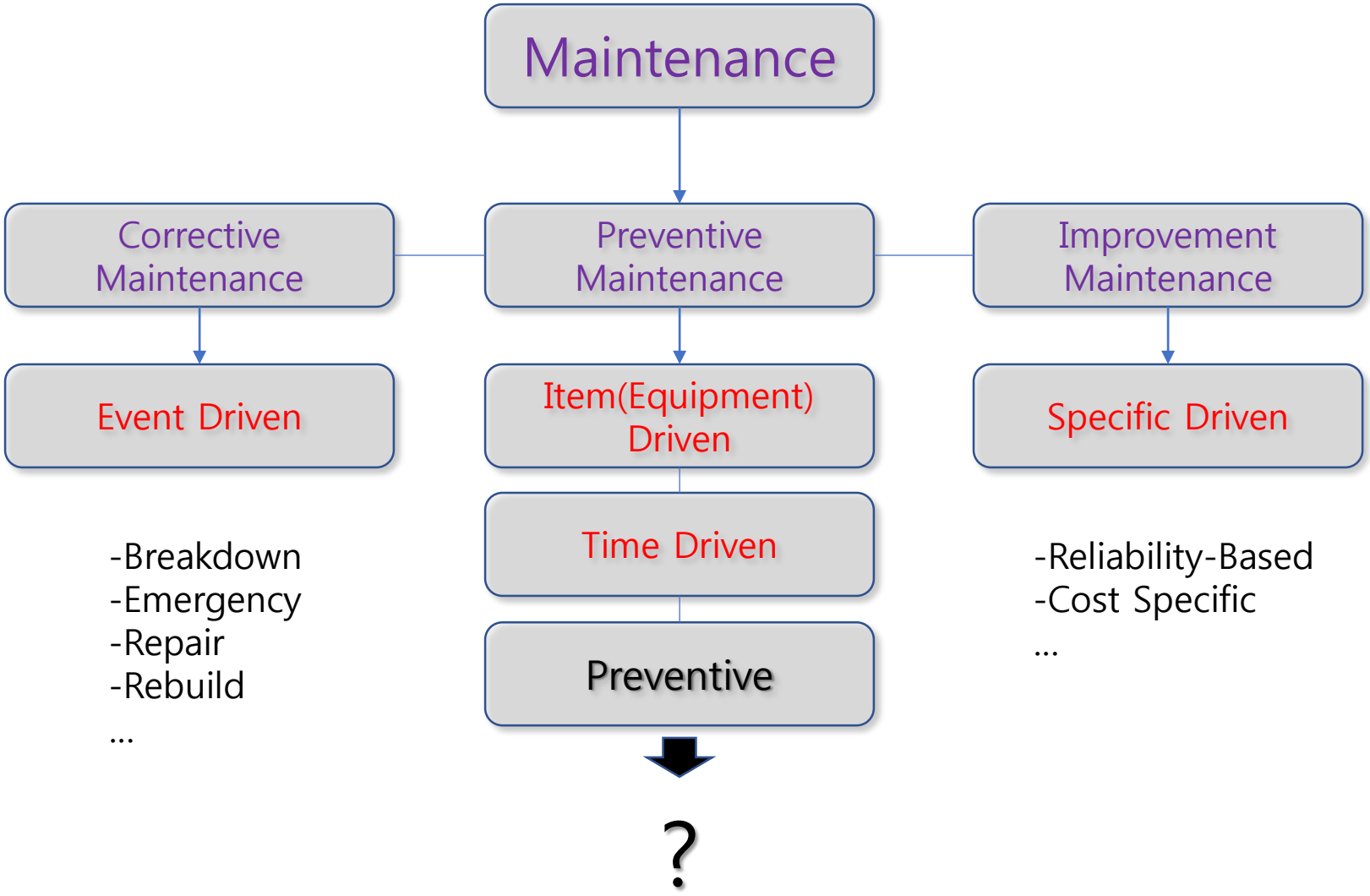
CBM+ AI ML 그리고 PHM

모아소프트
장주수

1. Maintenance History



2. Why Change?

1. 무기체계의 복잡도 증가
2. 체계 운용-유지비용의 폭발적인 증가
3. 정비를 바라보는 정책의 변화

Performance-Based Logistics

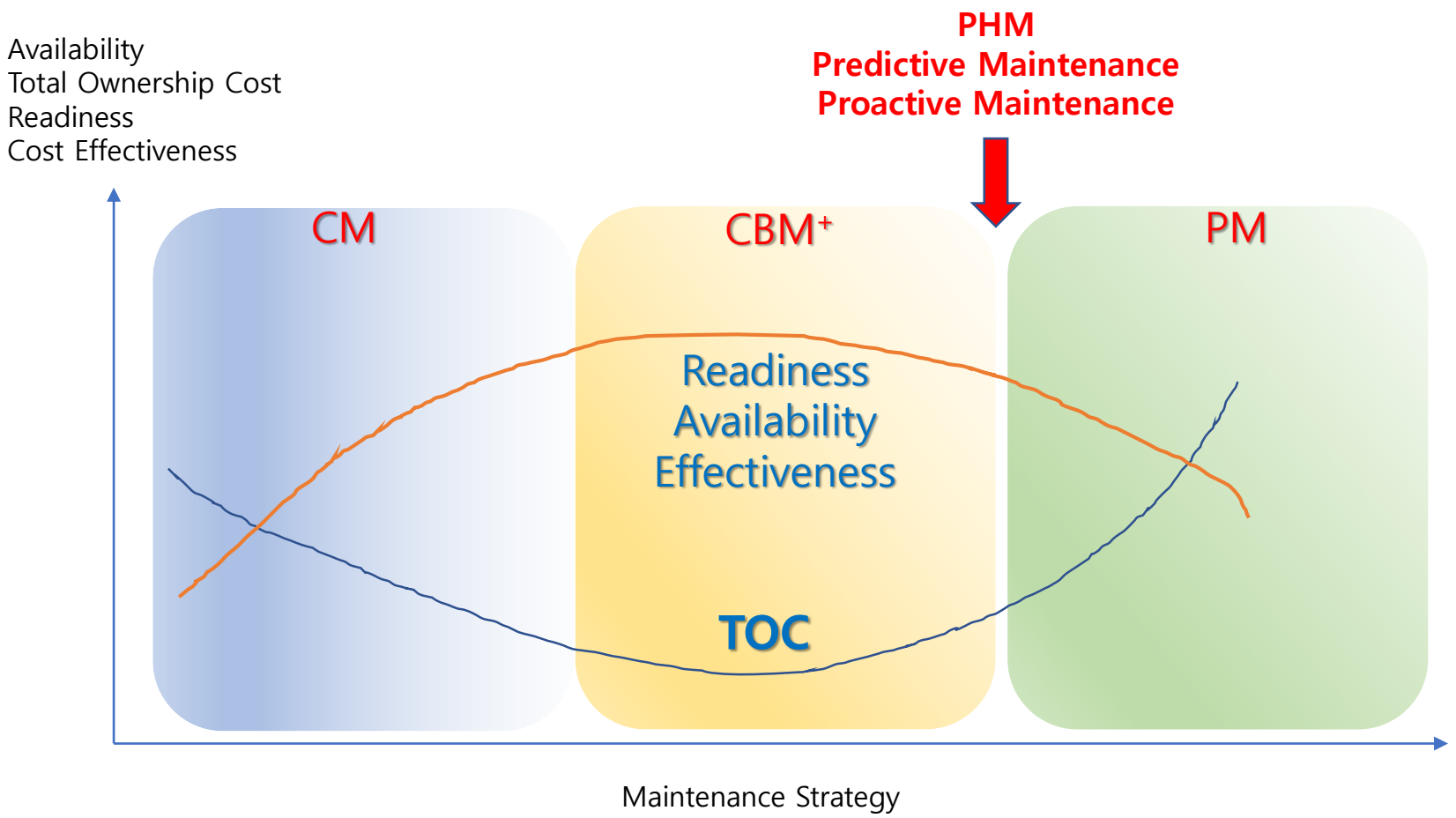
CBM+

Continuous Process Improvement

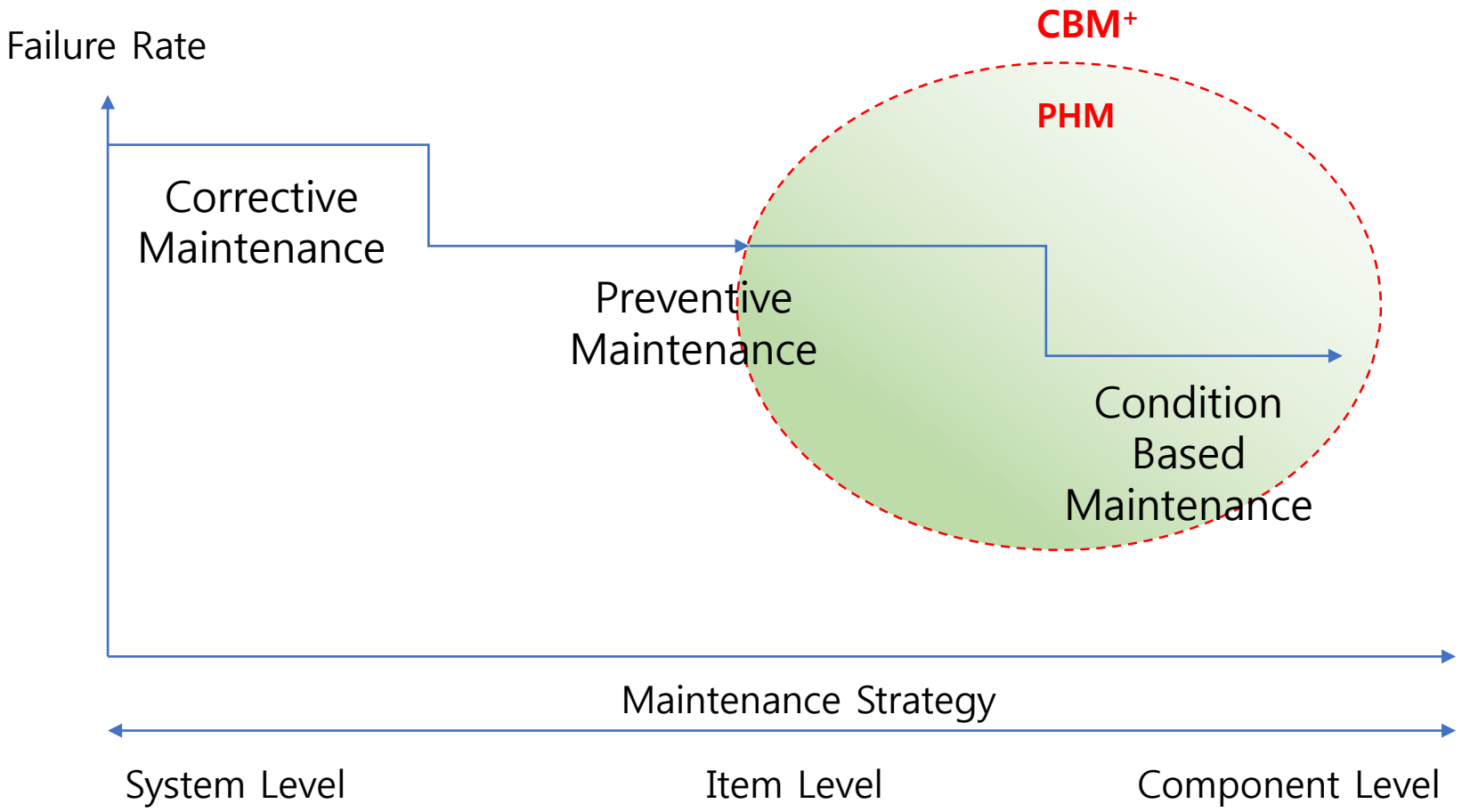
Modeling & Simulation

TLCSM

2. Why Change?


Availability
Total Ownership Cost
Readiness
Cost Effectiveness
PHM
Predictive Maintenance
Proactive Maintenance
CM
CBM+
PM
Readiness
Availability
Effectiveness
TOC
Maintenance Strategy

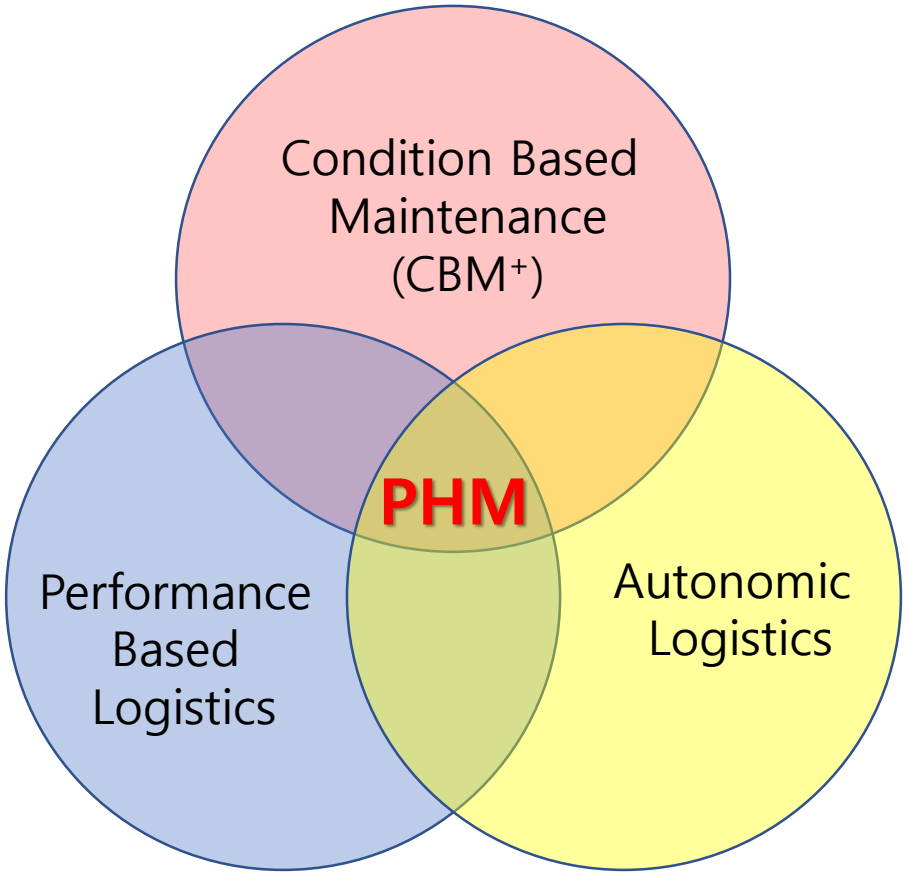
2. Why Change?


Failure Rate
CBM+
PHM
Corrective Maintenance
Preventive Maintenance
Condition Based Maintenance
Maintenance Strategy
System Level
Item Level
Component Level

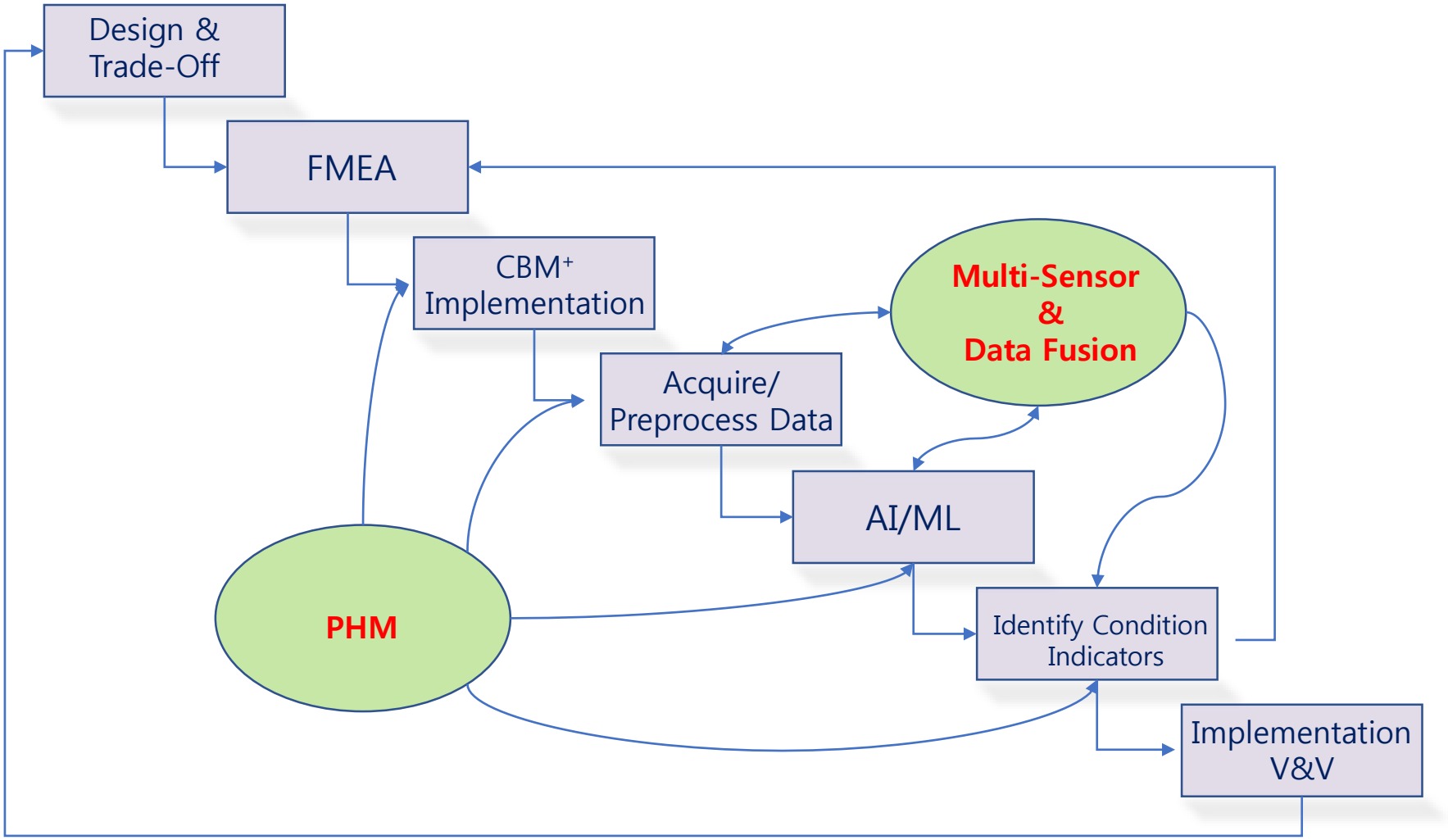
3. What?

1. How to predict equipment **failure**?
2. How to get a holistic view of equipment **condition**?
3. How to get more accuracy in **failure prediction**?
4. How to reduce the **cost of ownership**?
5. How to reduce equipment **mean down time**?
6. How to improve equipment and component **reliability**?
7. How to optimize equipment **performance**?

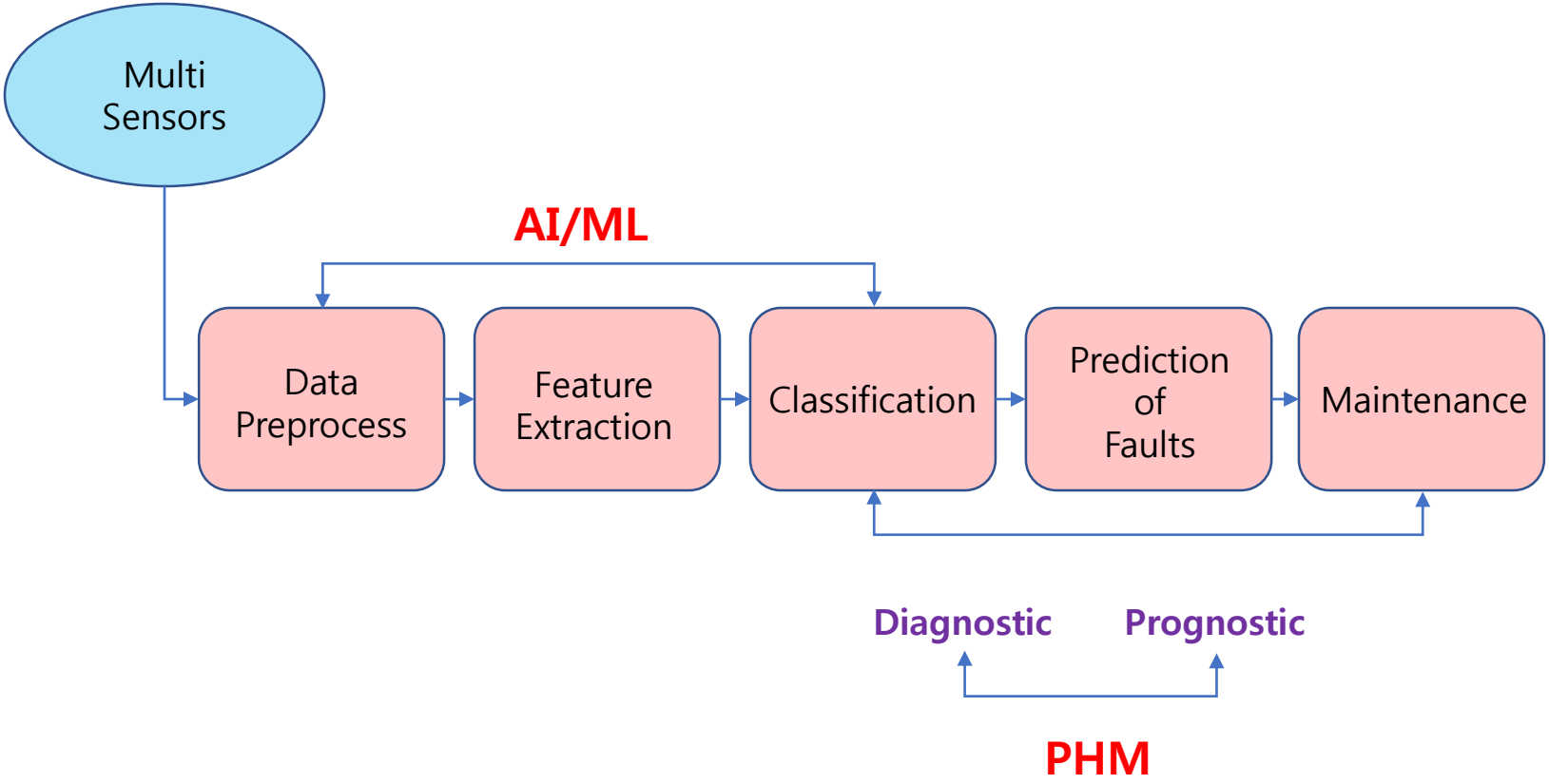
4. AL-PBL-CBM+-PHM



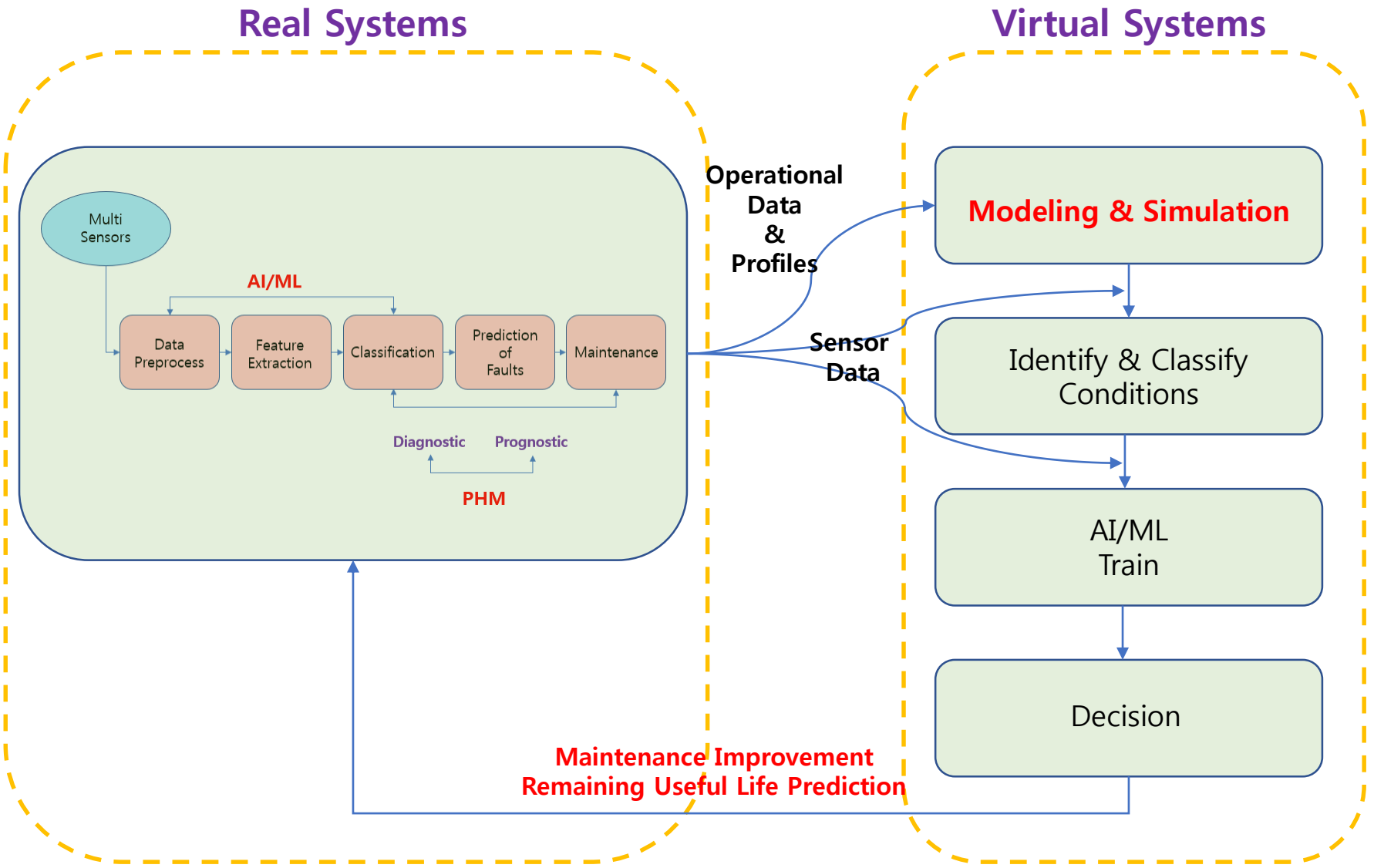
5. Integrated Approach to CBM+/PHM



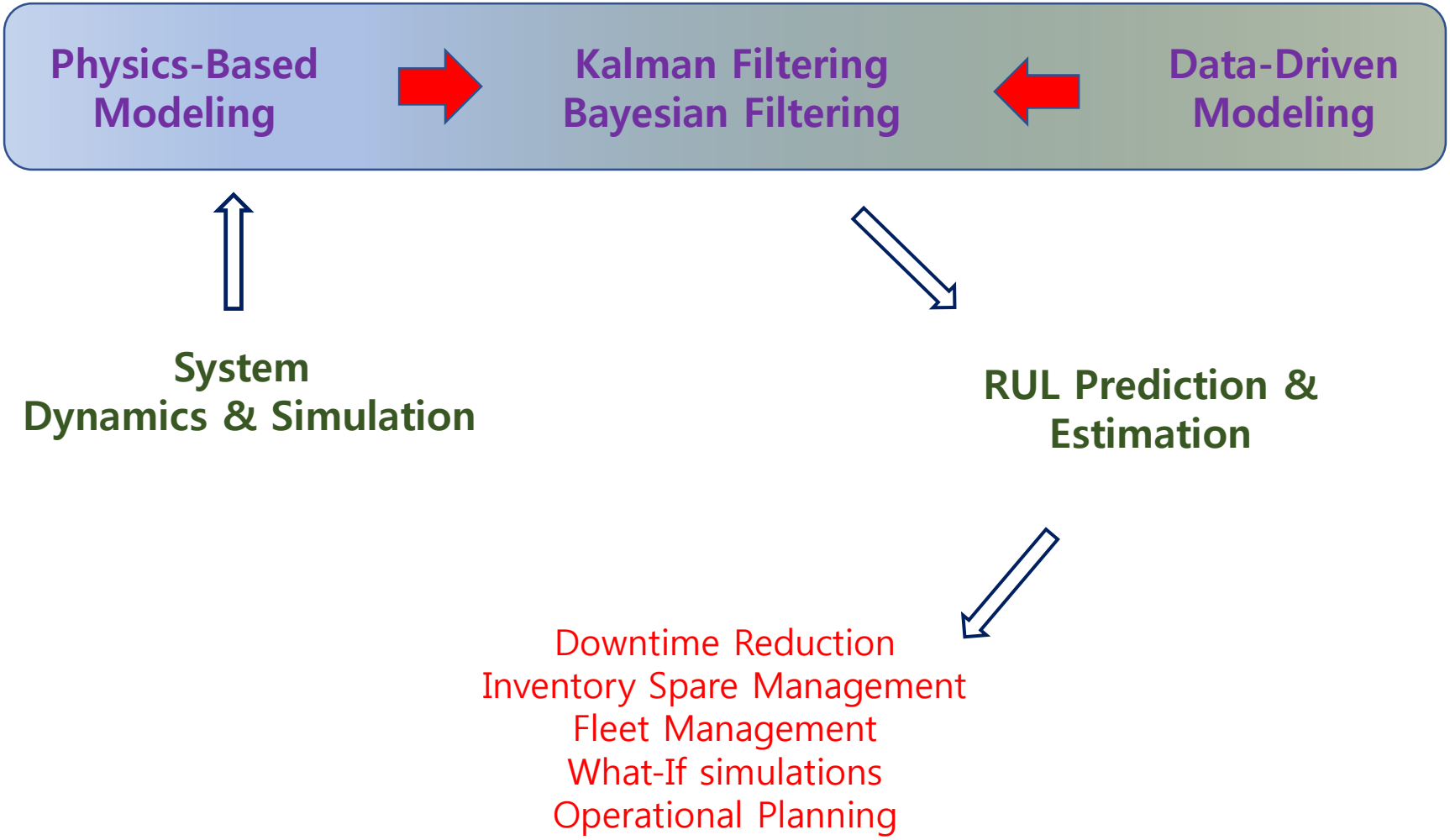
6. CBM+/PHM


Multi Sensors
AI/ML
Data Preprocess
Feature Extraction
Classification
Prediction of Faults
Maintenance
Diagnostic
Prognostic
PHM

7. Digital Twin



8. RUL


Physics-Based Modeling
Kalman Filtering Bayesian Filtering
Data-Driven Modeling
System Dynamics & Simulation
RUL Prediction & Estimation
Downtime Reduction
Inventory Spare Management
Fleet Management
What-If simulations
Operational Planning

9. References

1. George Vachtsevanos, Frank L.Lewis, Michael Roemer, Andrew Hess, and Biqing Wu, Intelligent Fault Diagnosis and Prognosis for Engineering Systems, John Wiley & Sons, 2006.

2. Condition Based Maintenance Plus DoD Guidebook, 2008.