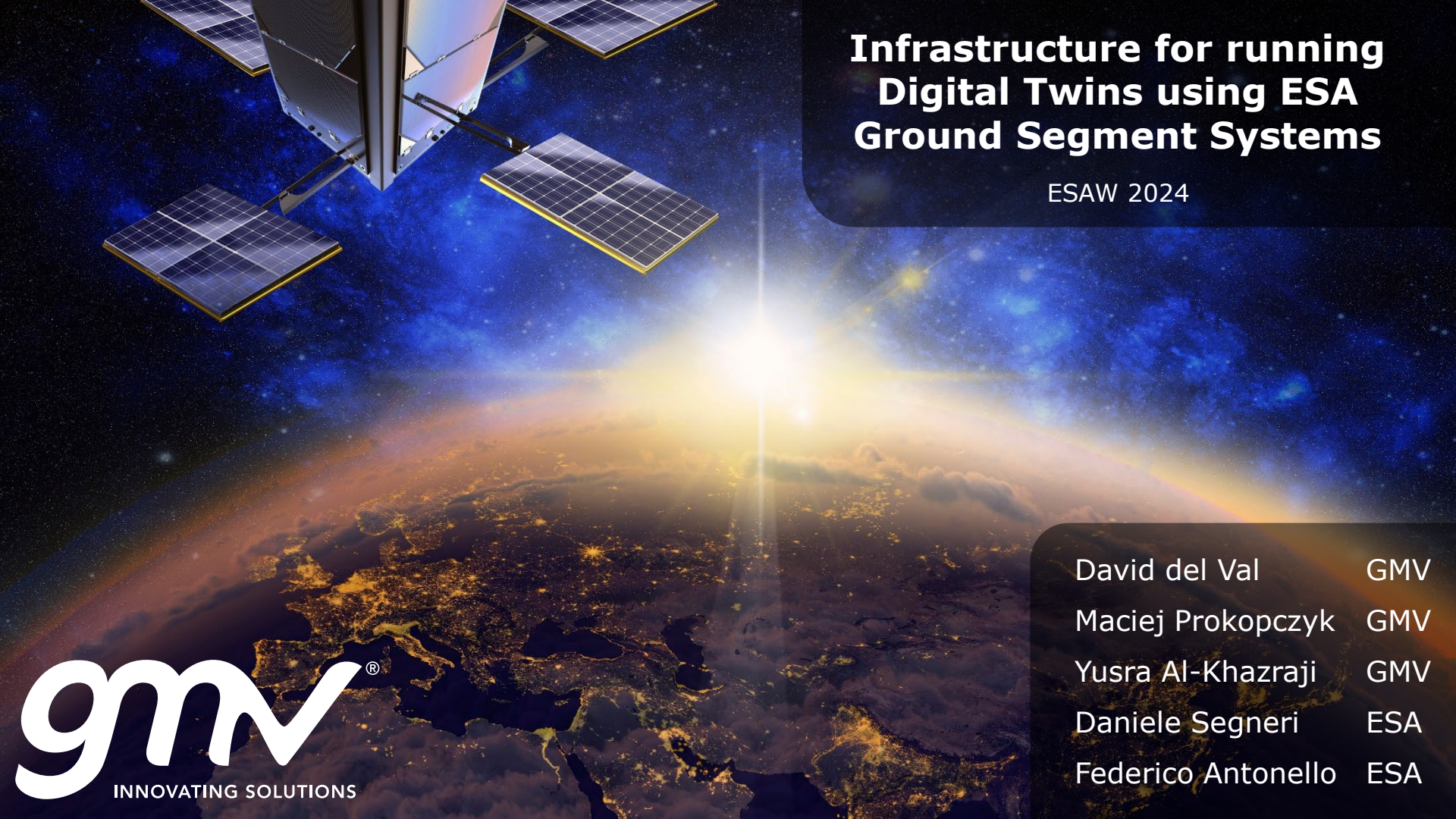

Infrastructure for running Digital Twins using ESA Ground Segment Systems

ESAW 2024

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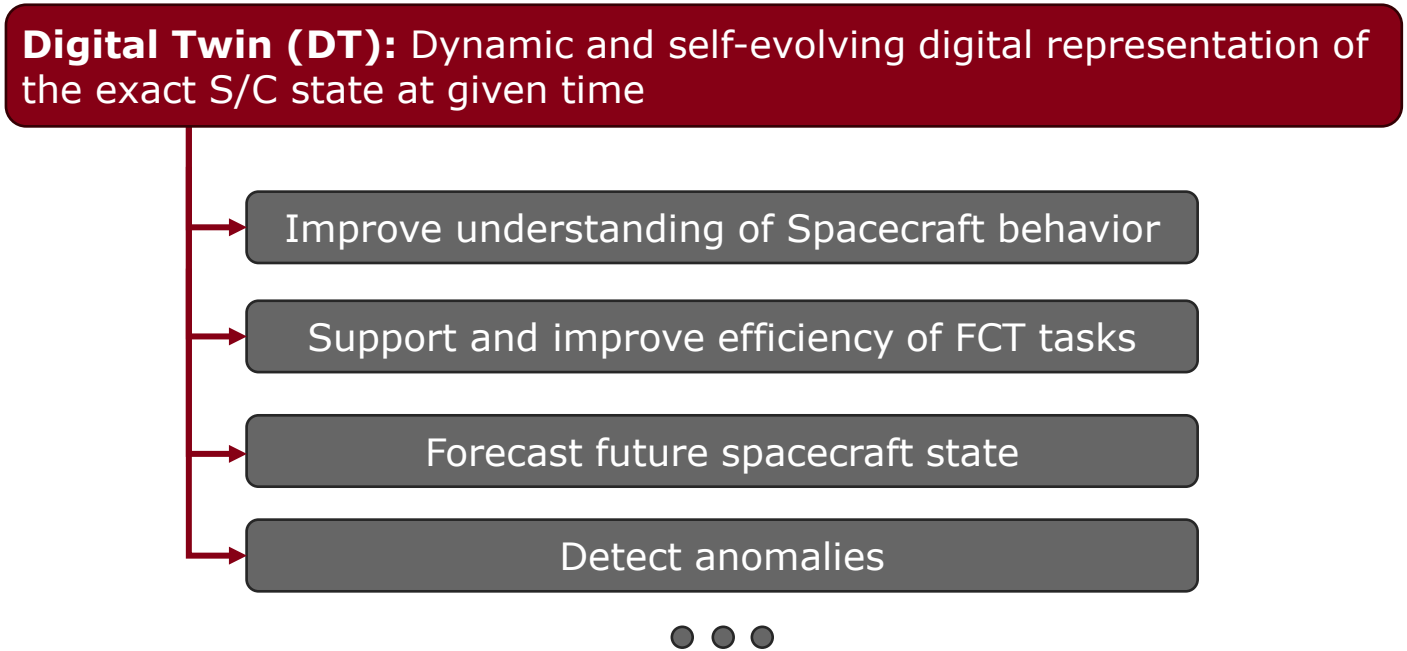
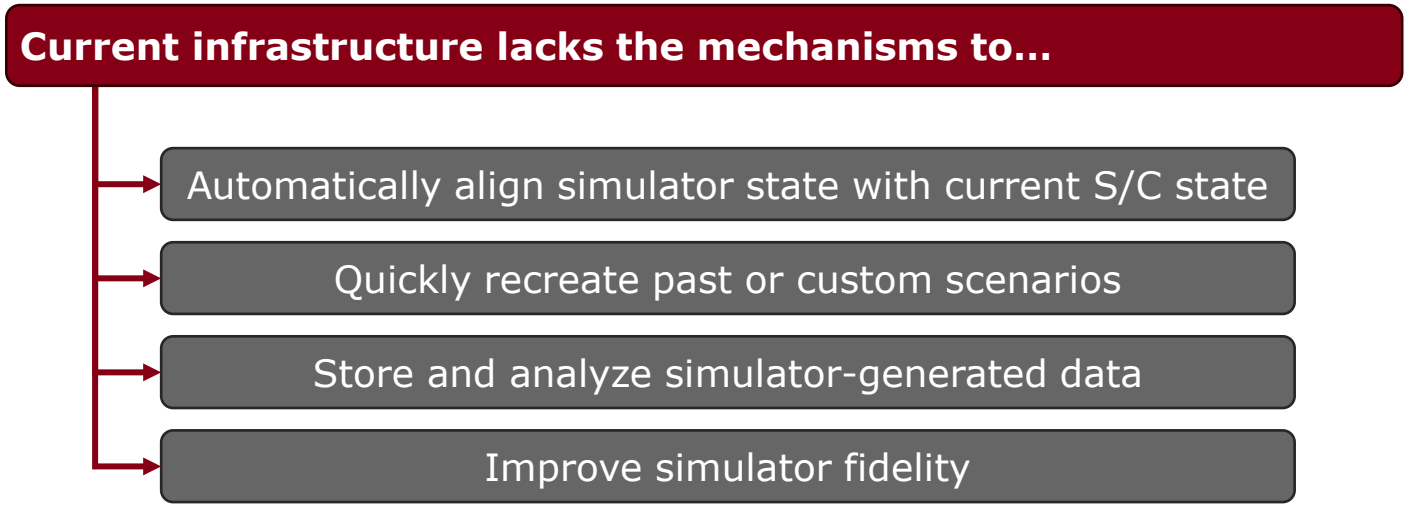
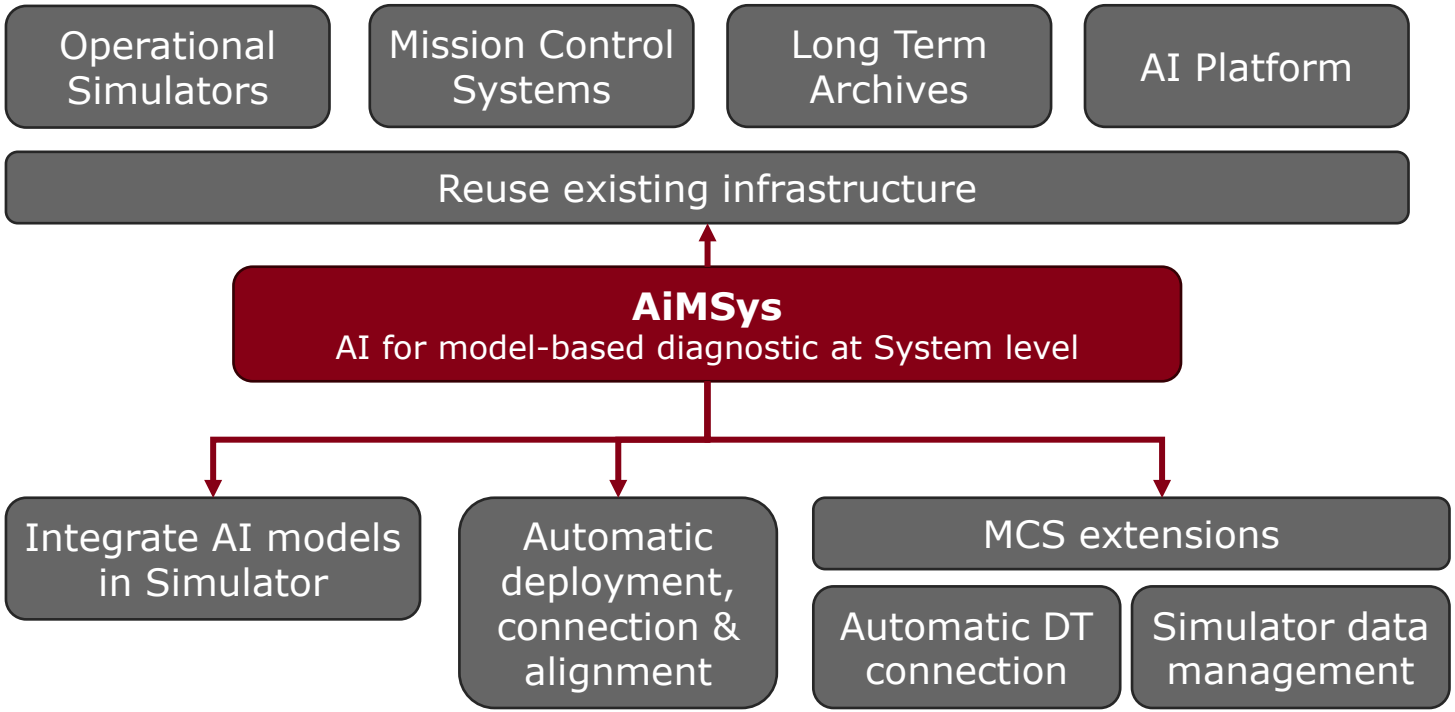
Introduction



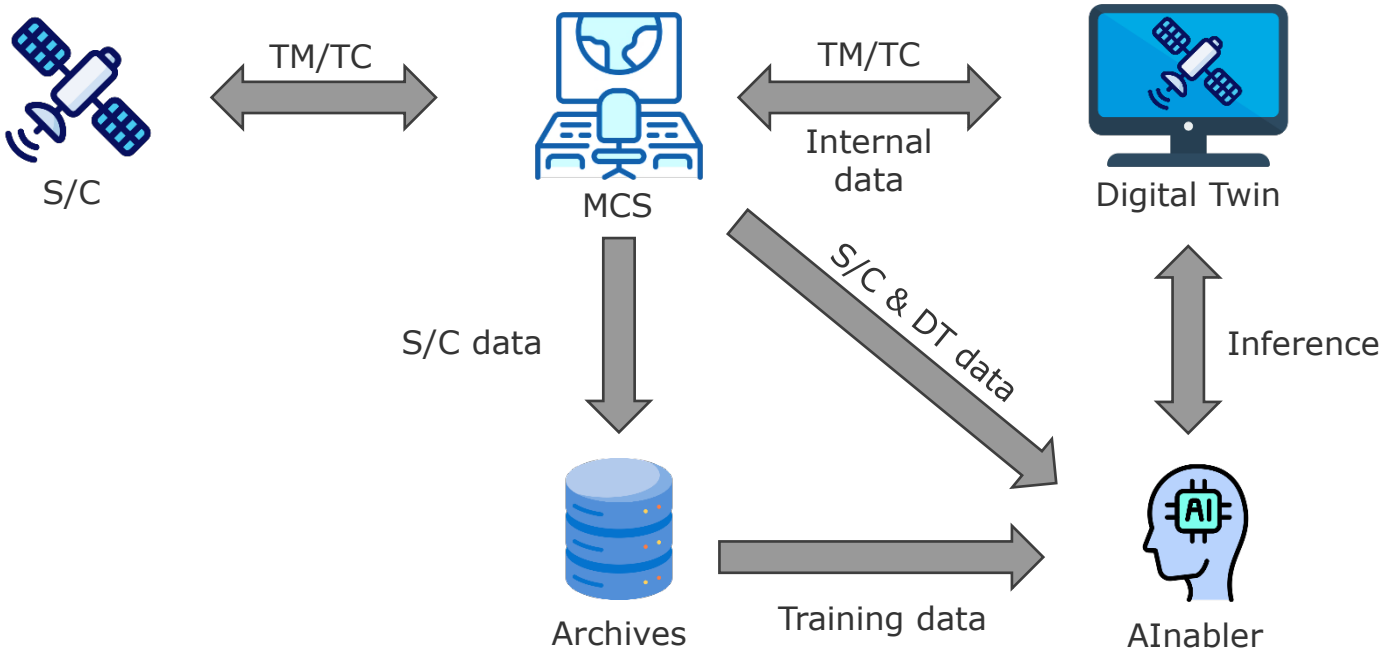
Introduction: current gaps



Introduction: Proposed approach



AiMSys infrastructure



Automatic DT alignment

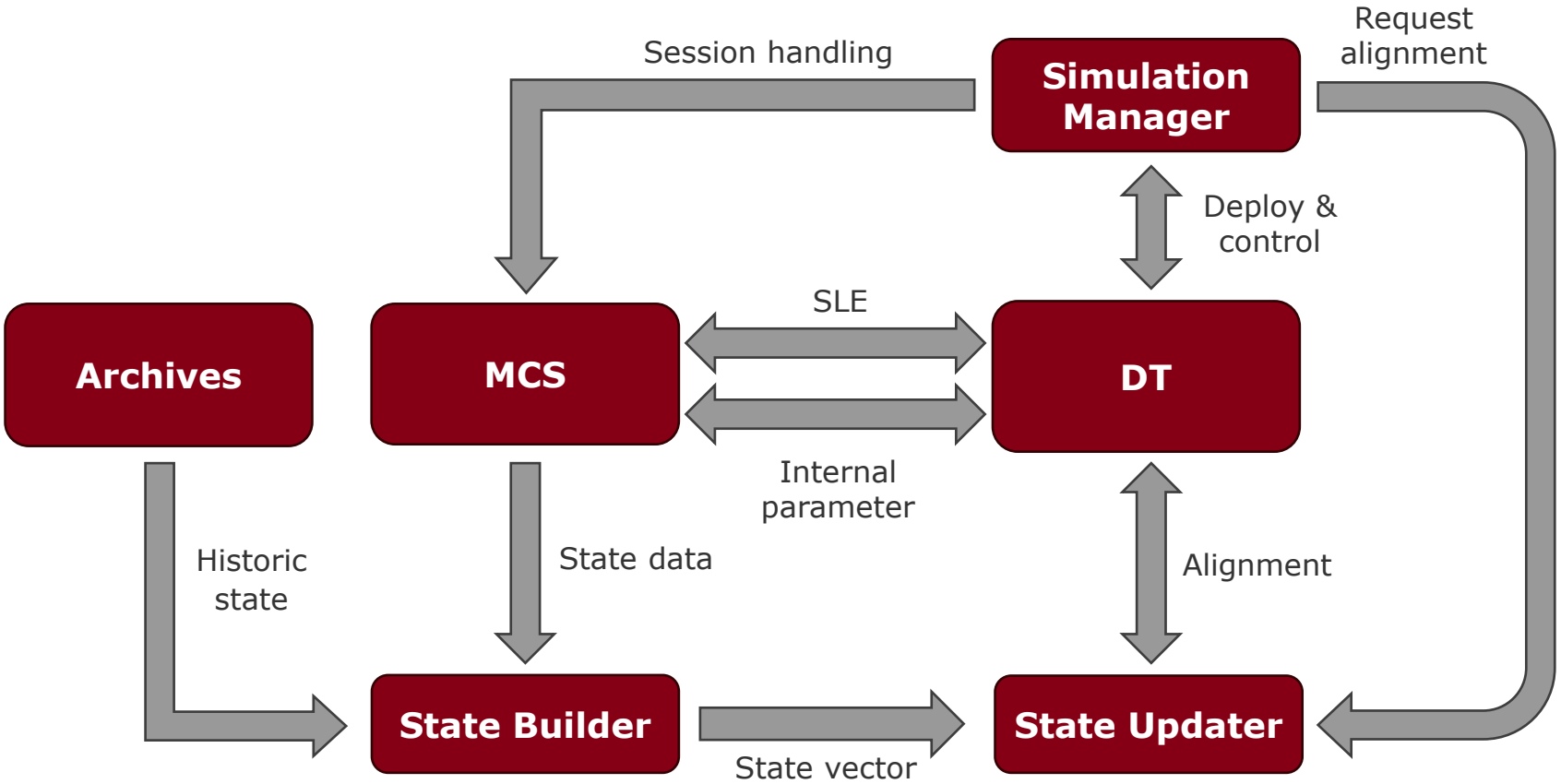
State Vector

- Formed by S/C telemetry
- Defines the S/C state at a certain moment
- Used as a target state for alignment process

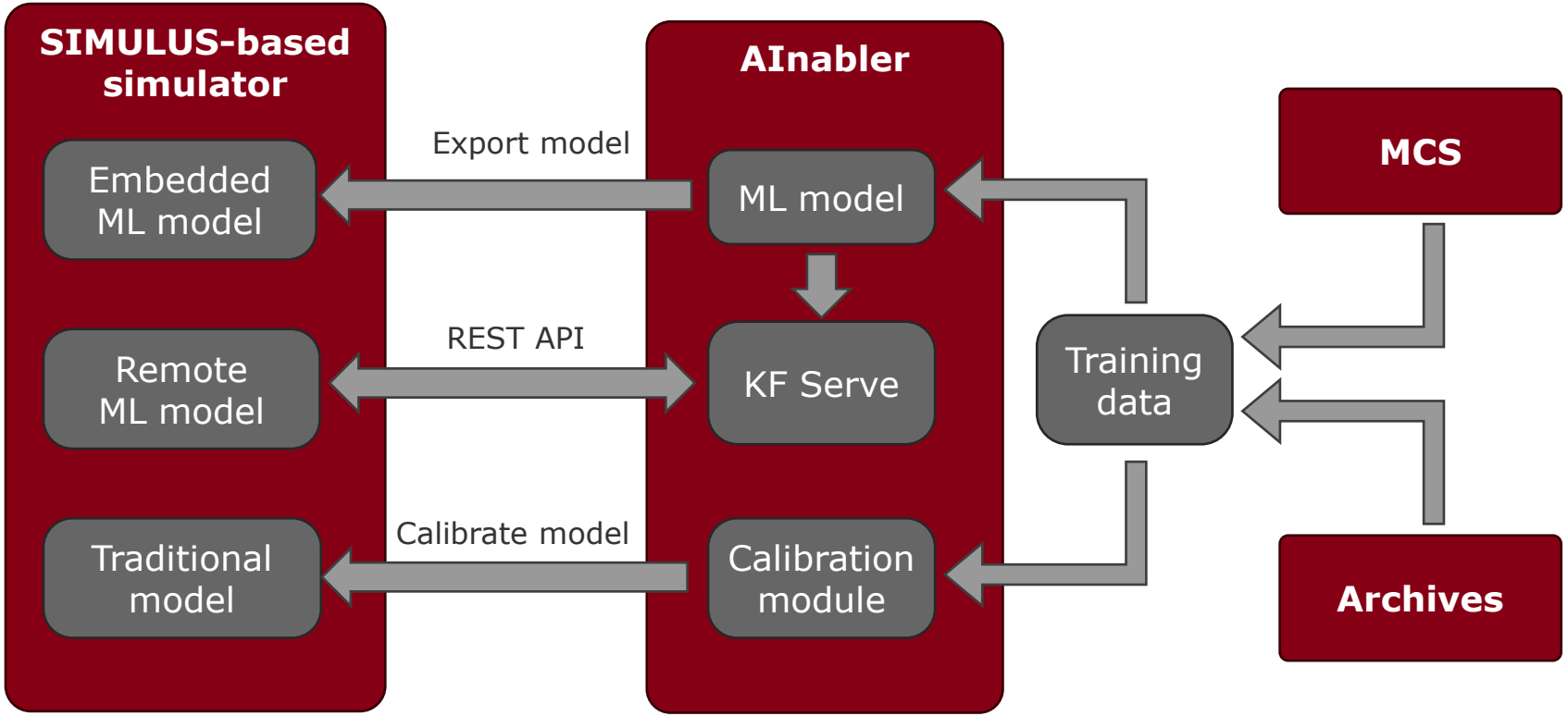
Alignment

- Synchronize operational state
- Apply calibration data

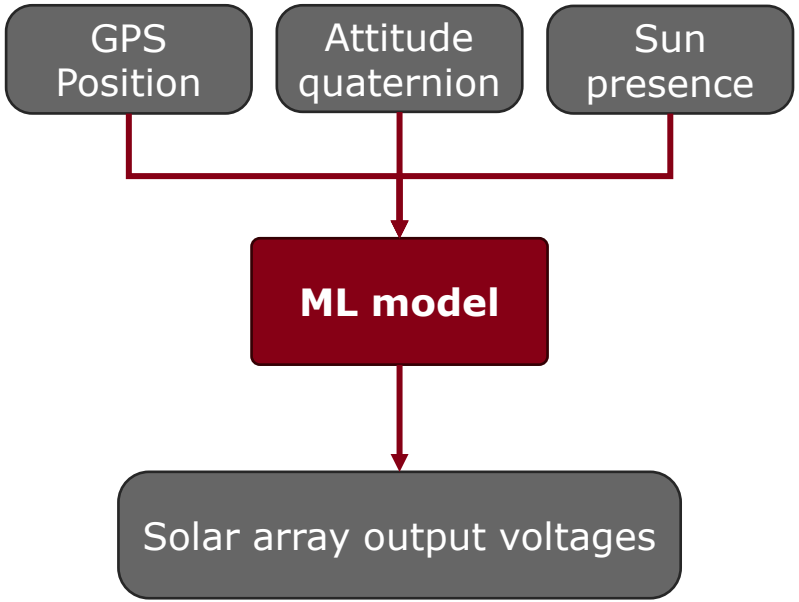
Alignment infrastructure



AI models in DT



Example: ML model



Key aspects

- Time-invariant model
- Polynomial feature expansion
- Training data interpolation
- Best results with ridge regression

Ground Segment Systems

MCS Monitors & Controls DT as if it were a real S/C

Isolated data spaces for DT experiments

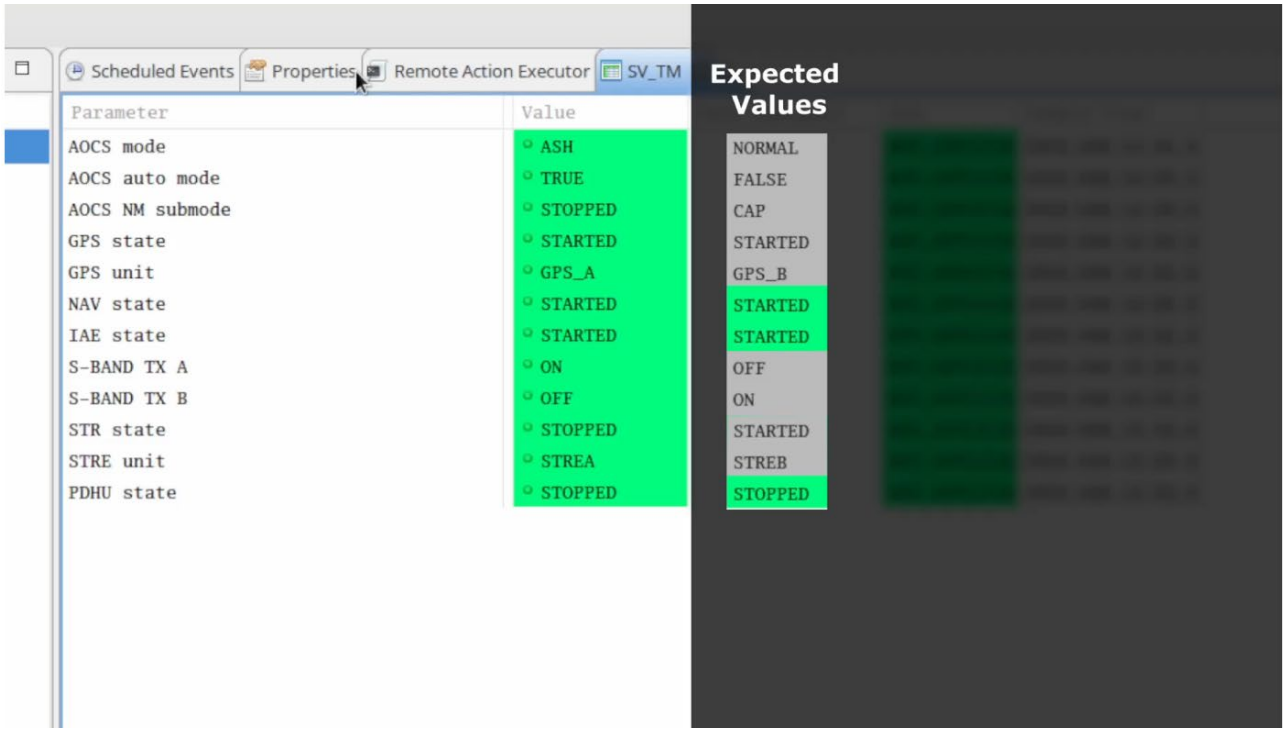
Persist internal state of the DT

AInabler can access and compare S/C and DT data for analytical purposes

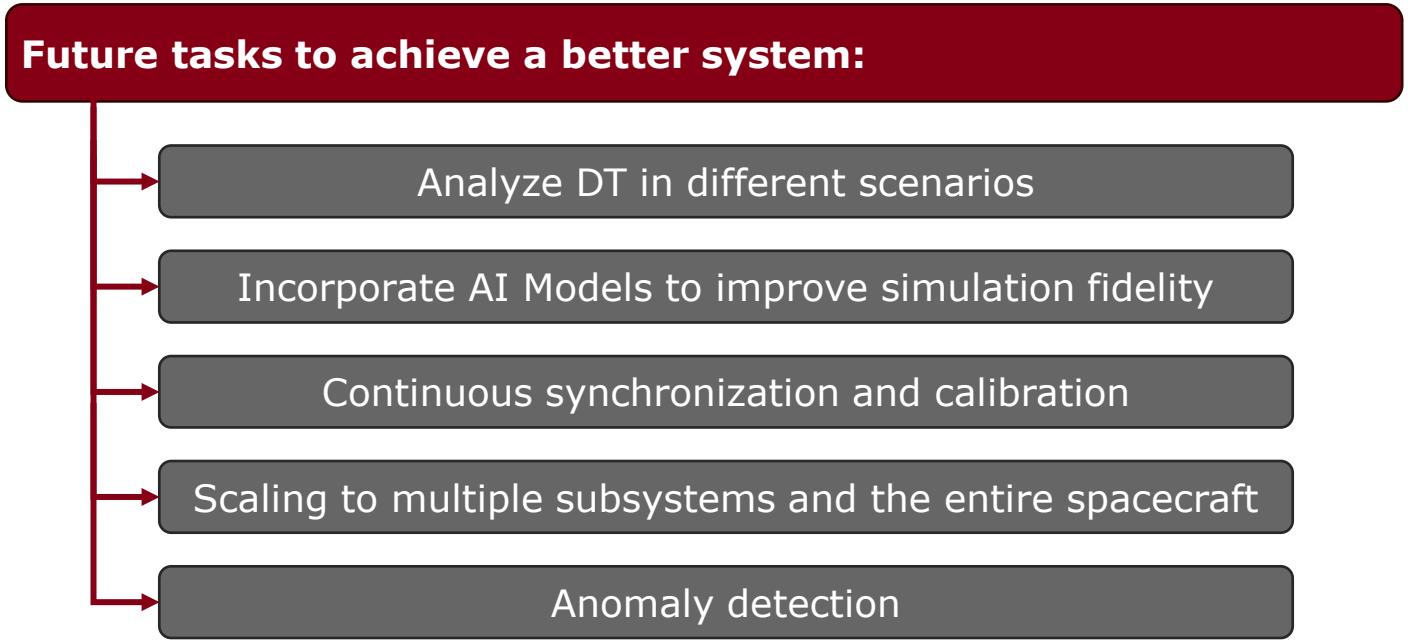
Mission Planning System can evaluate scenarios in DT

Demo

Demo



Future steps



Thank you

Questions?

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