

APPLICATION OF HPC IN NASA SPACE EXPLORATION

PROBLEM STATEMENT

NASA needs to analyze massive data and run complex space simulations. Traditional computers can't handle this scale, so High-Performance Computing (HPC) is essential for accurate modeling and mission planning.

INTRODUCTION

HPC powers NASA's most advanced research from spacecraft design to galaxy simulations. Using supercomputers like Pleiades, Aitken, and Discover, NASA performs trillions of calculations per second to explore space more safely and efficiently.

OBJECTIVES

- SIMULATE SPACECRAFT AND SPACE ENVIRONMENTS
- PROCESS LARGE DATASETS FROM MISSIONS
- IMPROVE MISSION PLANNING AND PREDICTION
- SUPPORT INNOVATION IN AEROSPACE RESEARCH

QUICK STATS

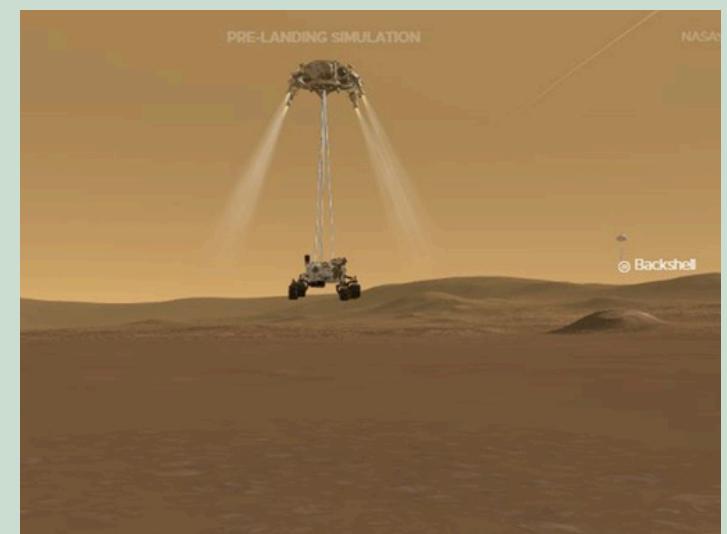
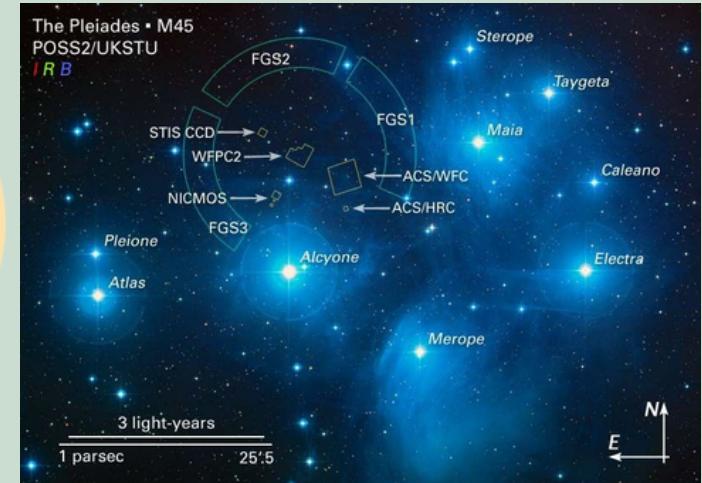
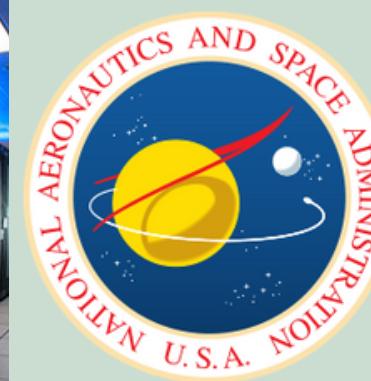
- PLEIADES HAS OVER 245,000 CPU CORES.
- HPC SIMULATES PLANETARY LANDINGS BEFORE SPACECRAFT LAUNCH.
- NASA PROCESSES PETABYTES OF DATA ANNUALLY FROM TELESCOPES AND SATELLITES.

BENEFITS

- ANALYZE MASSIVE DATASETS AND MODEL COMPLEX SPACE ENVIRONMENTS
- RUN SIMULATIONS TO PREDICT MISSION RISKS AND ENSURE SAFER LAUNCHES
- ENABLE FASTER PROBLEM-SOLVING DURING MISSIONS
- ACCELERATE DISCOVERIES AND REDUCE MISSION COSTS
- DRIVE INNOVATIONS IN SPACECRAFT DESIGN AND SPACE EXPLORATION
- PROVIDE DEEPER SCIENTIFIC INSIGHTS FROM MISSION DATA



SPACE SIMULATION IMAGES



FUTURE SCOPE

- XASCALE SUPERCOMPUTERS FOR EVEN FASTER SIMULATIONS
- REAL-TIME SIMULATIONS FOR SPACE MISSIONS
- IMPROVED CLIMATE AND PLANETARY MODELING FOR EARTH AND SPACE EXPLORATION
- HIGHER-RESOLUTION ASTROPHYSICAL SIMULATIONS (GALAXIES, BLACK HOLES, COSMIC PHENOMENA)

CONCLUSION

- HPC IS THE HEART OF NASA'S SPACE EXPLORATION, POWERING ALL CRITICAL MISSIONS, SIMULATIONS, AND DISCOVERIES. WITHOUT IT, NASA'S WORK WOULDN'T BE POSSIBLE.

REFERENCES

- [HTTPS://WWW.NCCS.NASA.GOV/SERVICES/HIGH-PERFORMANCE-COMPUTING](https://www.nccs.nasa.gov/services/high-performance-computing)
- [HTTPS://SCIENCE.NASA.GOV/UNIVERSE/BLOCK-HOLES/SUPERMASSIVE-BLACK-HOLES/NEW-NASA-BLACK-HOLE-VISUALIZATION-TAKES-VIEWERS-BEYOND-THE-BRINK/](https://science.nasa.gov/universe/black-holes/supermassive-black-holes/new-nasa-black-hole-visualization-takes-viewers-beyond-the-brink/)

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