

Open source, open standards, and collective invention in the space industry

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Background

Collective invention enables significant technological advance through free exchange of information. This is demonstrated through academic journals, open source software, open standards, and benchmarks.

We researched the history of collective invention and how it's currently implemented in the automotive industry to inform recommendations for NASA, commercial space companies and academia.

Motivation: The advantages of collaboration can generate more rapid advances with lower cost barriers within the space industry. Open source and collaboration exist on a spectrum. We present many different frameworks that incite collaboration to result in desirable outcomes.

Open source & collaboration in the space industry



Robonaut 2 on the ISS uses open source ROS & Orocos



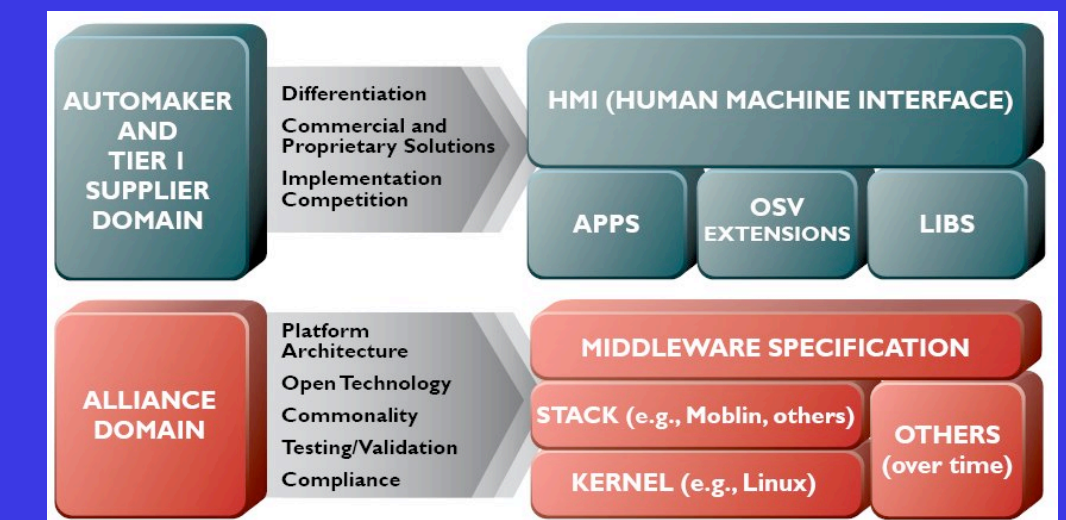
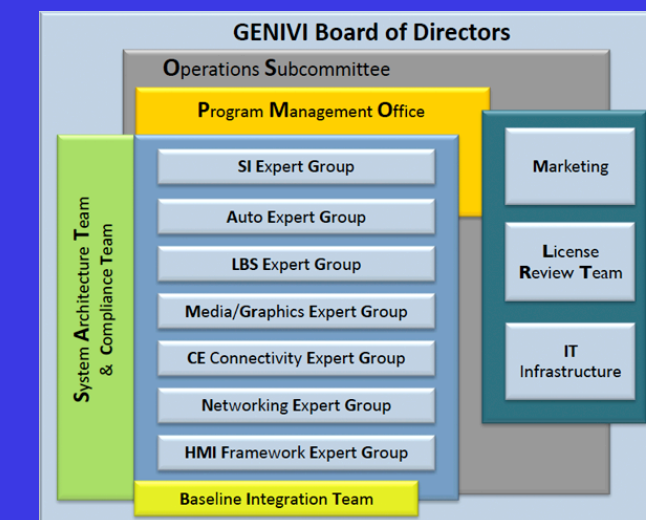
Linux is used to control some rockets and satellites

Space missions are notoriously constrained by time and cost.

Developing in open source environments is familiar and can reduce onboarding time for academia and lower project cost with increased code reuse.

Examples from the automotive industry

A number of similarities exist between the automotive and space industries – the level of competition between commercial companies, rigorous safety standards, and dependencies on many tiers of suppliers.

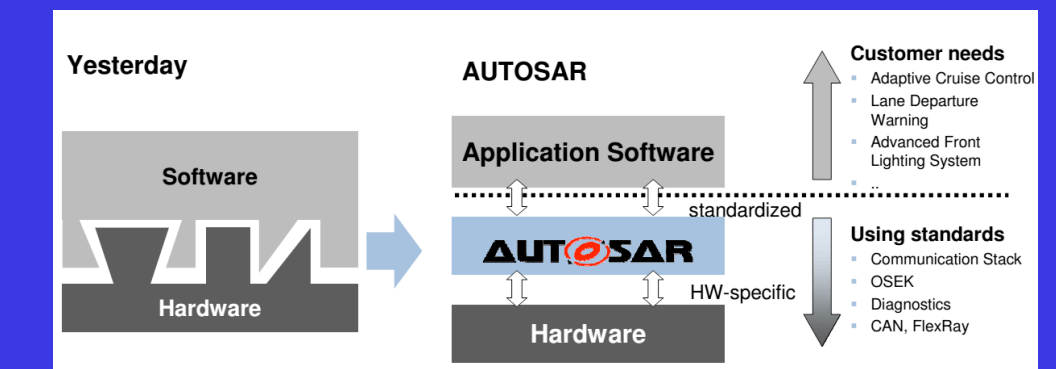


The open consortium COVESA (formerly GENIVI Alliance) leverages collaboration between competitors and suppliers to develop open standards for in-vehicle entertainment systems.

The KITTI Vision Benchmark Suite

A project of Karlsruhe Institute of Technology and Toyota Technological Institute at Chicago

Benchmarks for autonomous driving draw parallels to potential benchmarks in terrain relative navigation (TRN).



Closed, invitation-only consortia like AUTOSAR join competitors to generate standards that improve interface efficiency.

Recommendations

NASA is in a unique position to financially or contractually encourage open source software or release of data like SPICE kernels after lunar landings. Commercial companies can form pre-competitive collaborations like open consortia to expedite innovation without losing competitive business differentiators.