Combining CubeSat Modularity and Integration

A Unified CubeSat-PocketQube Board Standard

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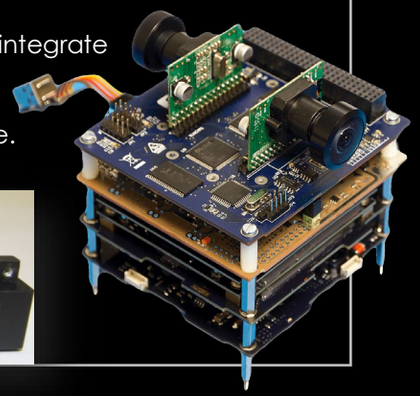
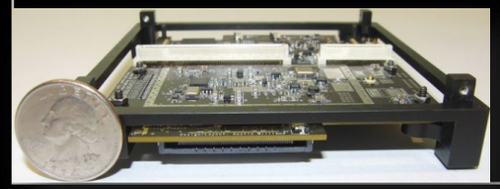
INTRODUCTION

The evolution of CubeSat construction and architecture took a turn in 2012, when a new paradigm for CubeSat design was presented by Tyvak. Previously, most CubeSats had consisted of vertically stacked modular boards, each designed for a specific subsystem. The presentation called to light:

- Smartphone electronics are compact and tightly integrated, as opposed to large interchangeable desktop parts
- CubeSats could do the same to integrate components into a single board.
- Modularity was wasteful of space.





STATE OF THE INDUSTRY

Today, CubeSats can be divided into two segments – highly integrated turnkey systems following the Tyvak philosophy, and modular interoperable platforms of the classic design.
The former approach has mostly been adopted by end-to-end integrators, while COTS CubeSat vendors still utilize the latter.

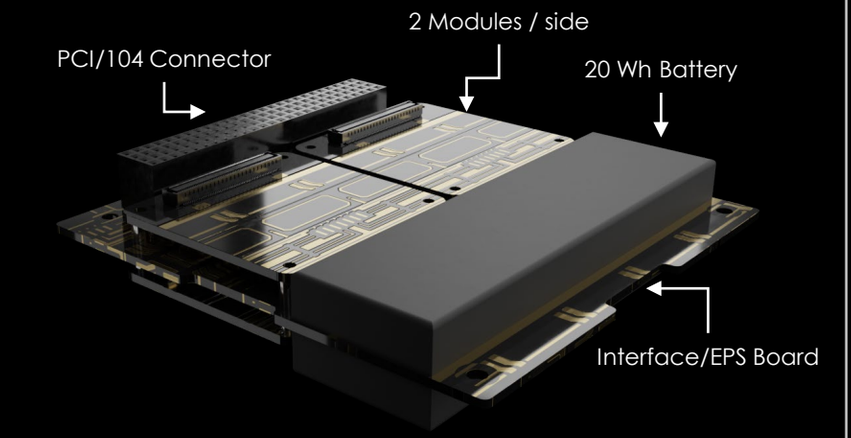
MODULARITY	INTEGRATION
• Components from different vendors remain interoperable • Easy to rapidly customize system to requirements • Massive space requirements	• Entire system can fit on a single board • Lower power consumption and increased performance • Hard to integrate custom parts

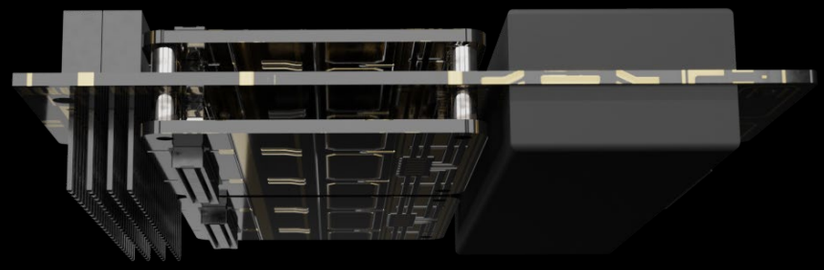
A SATELLITE ON A BOARD

We developed a new paradigm for building nanosatellites that combines the best of both worlds, keeping the flexible modular architecture, while allowing the entire satellite, including the electrical power system, to fit within a single PCI/104 board.

Our design centers around a universal module architecture, which can be combined through a centralized carrier board backwards-compatible with existing CubeSats. Requirements for the design included:

- An open standard for all manufacturers and users, maintaining compatibility with existing products.
- Integration of a complete satellite on one board.
- The ability to rapidly integrate third/second-party modules.





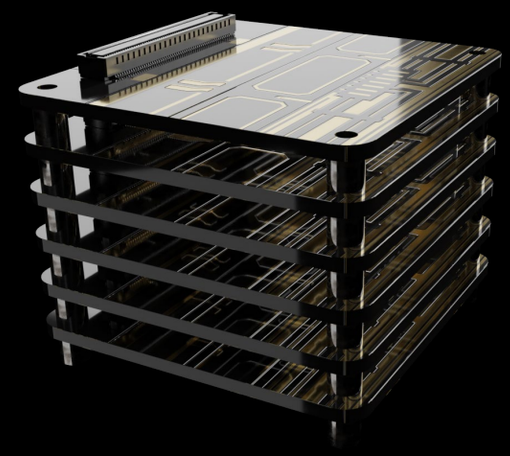
PICOSATELLITE FORM FACTOR

Each module is compatible with the PCI/104 interface board for CubeSats but can be stacked directly on top of other modules for a PocketQube-sized assembly mechanically compatible with existing board standards.

In order to facilitate universal interoperability, modules are fully compatible with the electrical interface of the PCI/104 carrier board by implementing a 120-pin Molex BB H4 connector.

This in turn enables PocketQube modules to be fully compatible with the CubeSat architecture, and vice versa, making the advancements of one the advancements of the other.

As innovation in PocketQubes and picosatellites has until now been mostly done by individual companies and architectures, we hope this new synergy will enable a world of universally-compatible products in open ecosystem.



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