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## ***Plug-and-play PowerHub***

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### **Distributed Power**

PnP Innovations, Inc has developed several key avionics components to support the Space Plug –and- play Avionics (SPA) standards. The SPA standards are essential to rapidly assemble configurable spacecraft. One such component is the PowerHub, which can be a stand-alone board or integrated into the PnPSat structural panel. The PowerHub is a novel approach in distributed spacecraft power. The primary purpose of the PowerHub is to measure and switch spacecraft power to endpoints on the satellite. Each endpoint can be configured to soft trip if the current draw exceeds an amount specified by the component's xTEDS. Each of the ten endpoints support up to 4.5A, with one high powered endpoint supporting 30A continuous power. The PowerHub continuously monitors and reports current consumption of each of the endpoints to within 25 mA.

### **Timing Synchronization**

Timing synchronization and distribution is a key concept in SPA. A differential signal line is distributed to all endpoints in the system. The rising edge of this 1 Hz signal indicates a time hack on the SPA network. This signal is distributed to all endpoints on the network via the PowerHub. The PowerHub is capable of detecting and distributing the time synch pulse from the ten supported endpoints and two off panel connections.



### **Test ByPass Interface**

The last key function served by the PowerHub is the support for signal injection. Integrated within the PowerHub board is circuitry which performs routing of Test ByPass data. Test ByPass is used in ground testing for signal injection and integration – it is unpowered on orbit. Coupled with an external 6DOF simulator, extensive spacecraft testing can be rapidly performed.

### **Radiation Tolerant PowerHubs**

The PowerHub incorporates some of the same radiation tolerant circuitry utilized on the ASIM to perform general purpose programming and SPA interfacing. Additional components are all radiation tolerant (30krad and up) and flight qualified. Prototype boards are available to for lab testing and experimentation. The second generation PowerHub incorporates many improvements over previous designs. The most notable improvement is the implementation of a fully isolated power design, both in the monitoring & reporting electronics, as well as the power switching to each of the endpoints.