



Trailblazer: Proof of Concept CubeSat Mission for SPA-1

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Why Trailblazer?



- Space Plug-and-play Architecture (SPA) has been around for several years – open source bus architecture.
- COSMIAC (and their partners) have taught more than 500 individuals in the past 18 months.
- Free SPA training available upon request
- It was time to have a proof of concept flight



Overview

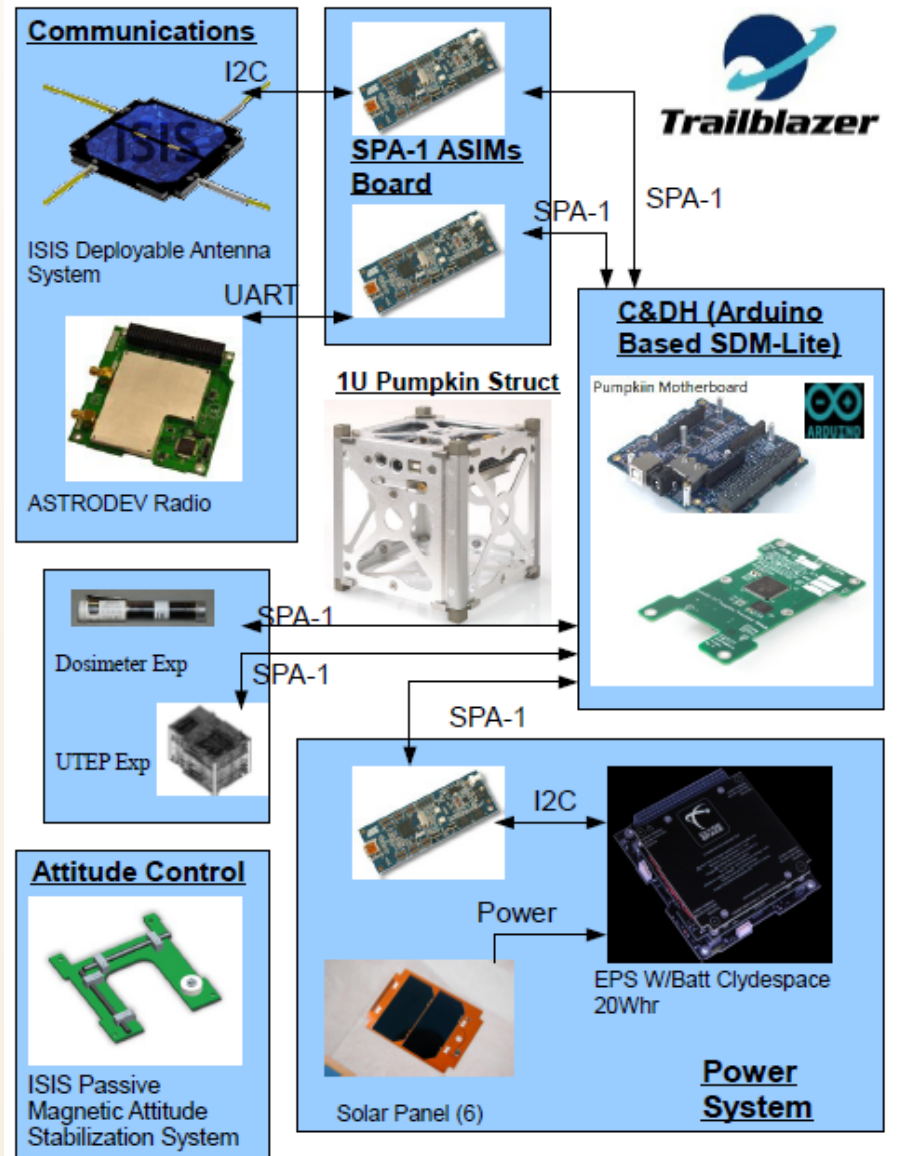


- 1U Cubesat
- 0.2W to 3W UHF downlink at 9600bps, VHF uplink
- Passive magnetic stabilization
- Orbit 325km at 51.6°
- Arduino based Pluggable Processor Module (C&DH)
- Two experiments
 - Dosimeter from AFRL
 - 3D rapid prototype Function Test
- **Mission**
 - Provide flight heritage to the SPA-1 protocol
 - Test the radiation exposure experienced within a low earth orbit
 - Test the materials used in a 3D rapid prototyped PCB device



Subassemblies

- Clyde Space Powersystem
- Astrodev Radio
- ISIS PMASS
- SPA Dosimeter
- UTEP 3D PCB
- Pumpkin Structure
- Pumpkin Motherboard
- SPA ASIM conversion Board

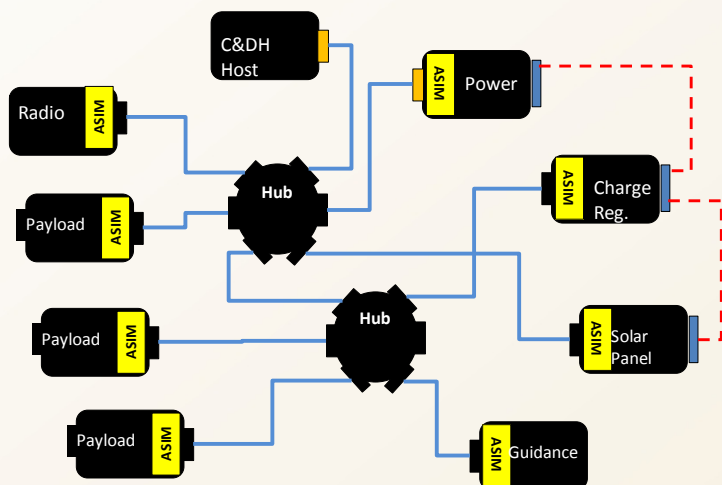




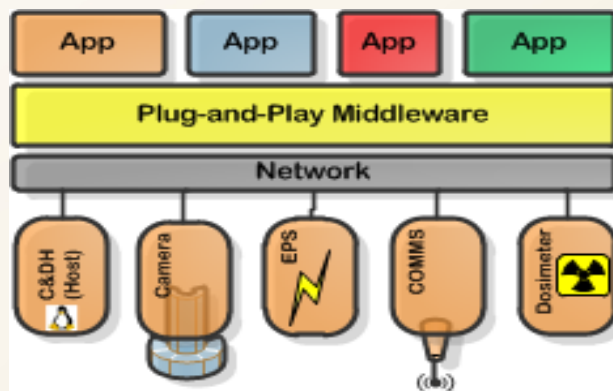
SPA as a *brand* of PnP



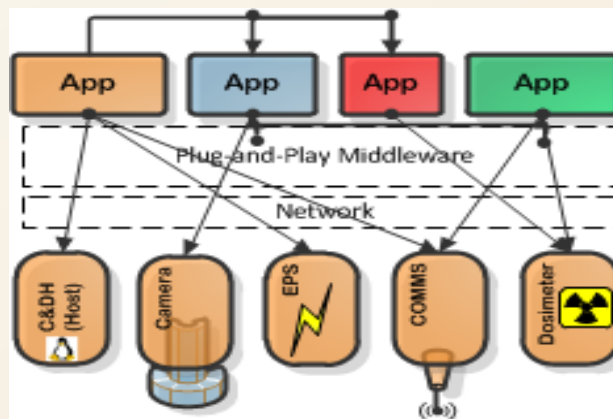
Self-describing Components



Self-organizing Networks

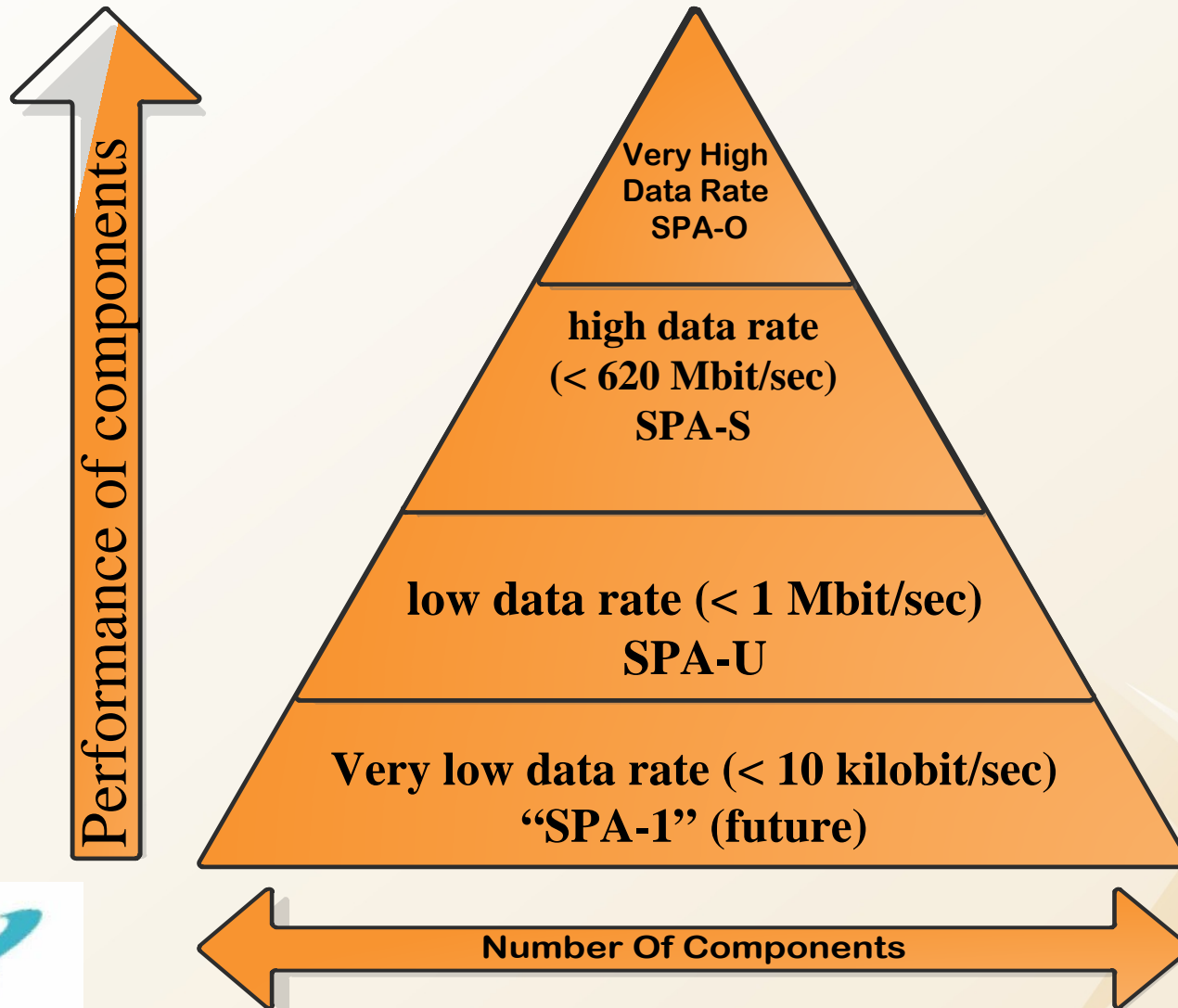


Composable Applications



Plug-and-play aware software

One size DOES NOT fit all: Distribution of bandwidth in systems

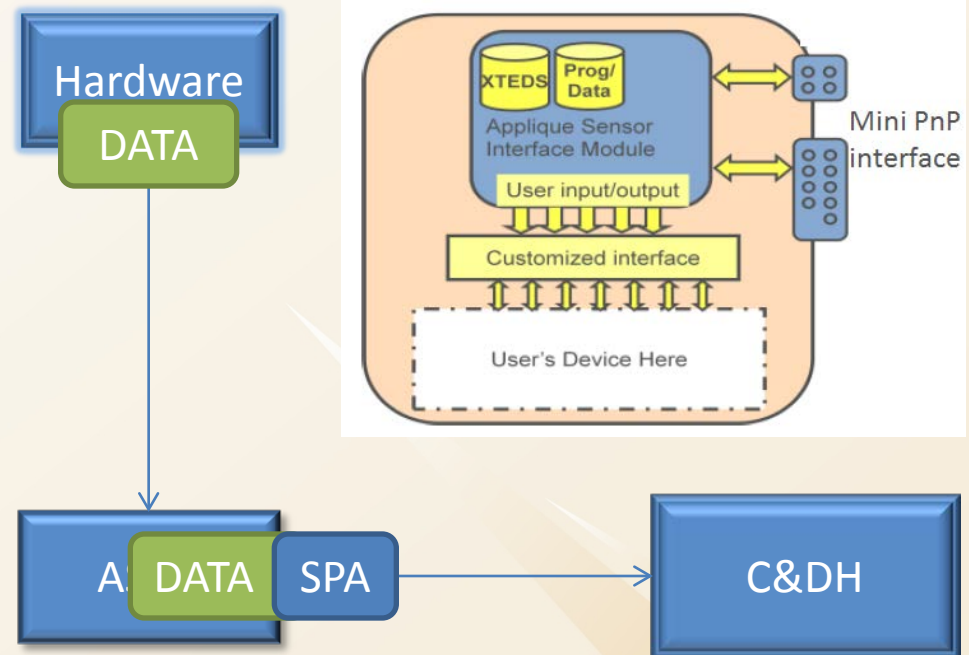




SPA-1 Conversion



- The ASIM provides the translation from the Hardware to the SPA network
- An ASIM can be implemented on most microcontrollers
- Trailblazer uses two methods of conversion
 - Adding a Microcontroller to function as an ASIM
 - Adding the ASIM code to a current microcontroller and thus not changing the board design

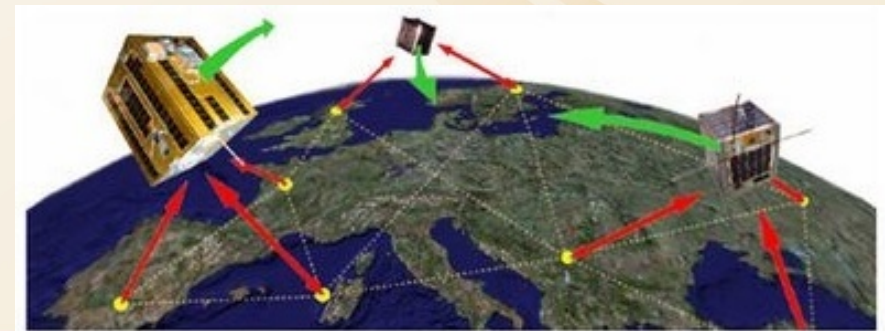




Background – GENSO

Global Education Network for Satellite Operations (GENSO) is a software standard which allows each ground station on the network to communicate with non-local spacecraft and transmit data to different ground terminals that have access to the specific satellite.

GENSO was developed primarily by volunteers in the educational / amateur radio community. ESA took the lead under auspices of the International Space Education Board

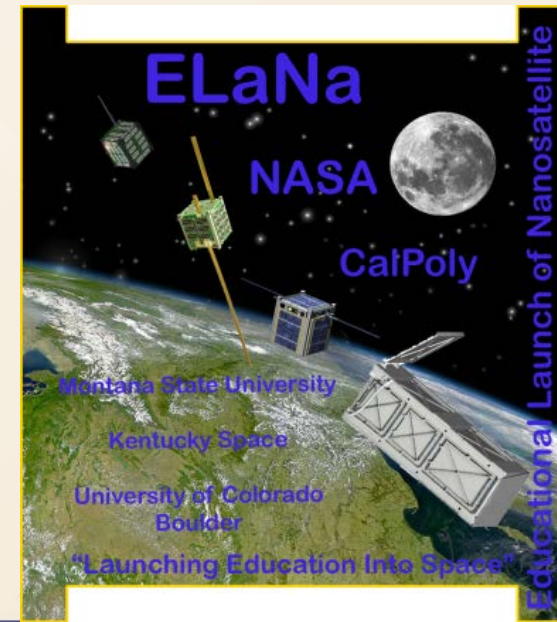




Background – ELaNa



- ▶ The selections are from the second round of the CubeSat Launch Initiative. The satellites are expected to conduct technology demonstrations, educational research or science missions. The selected spacecraft are eligible for flight after final negotiations when an opportunity arises. The satellites come from the following organizations, which include the first high school proposal selected for a CubeSat flight.
- ▶ COSMIAC at UNM was selected.





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Thank You! Questions?

