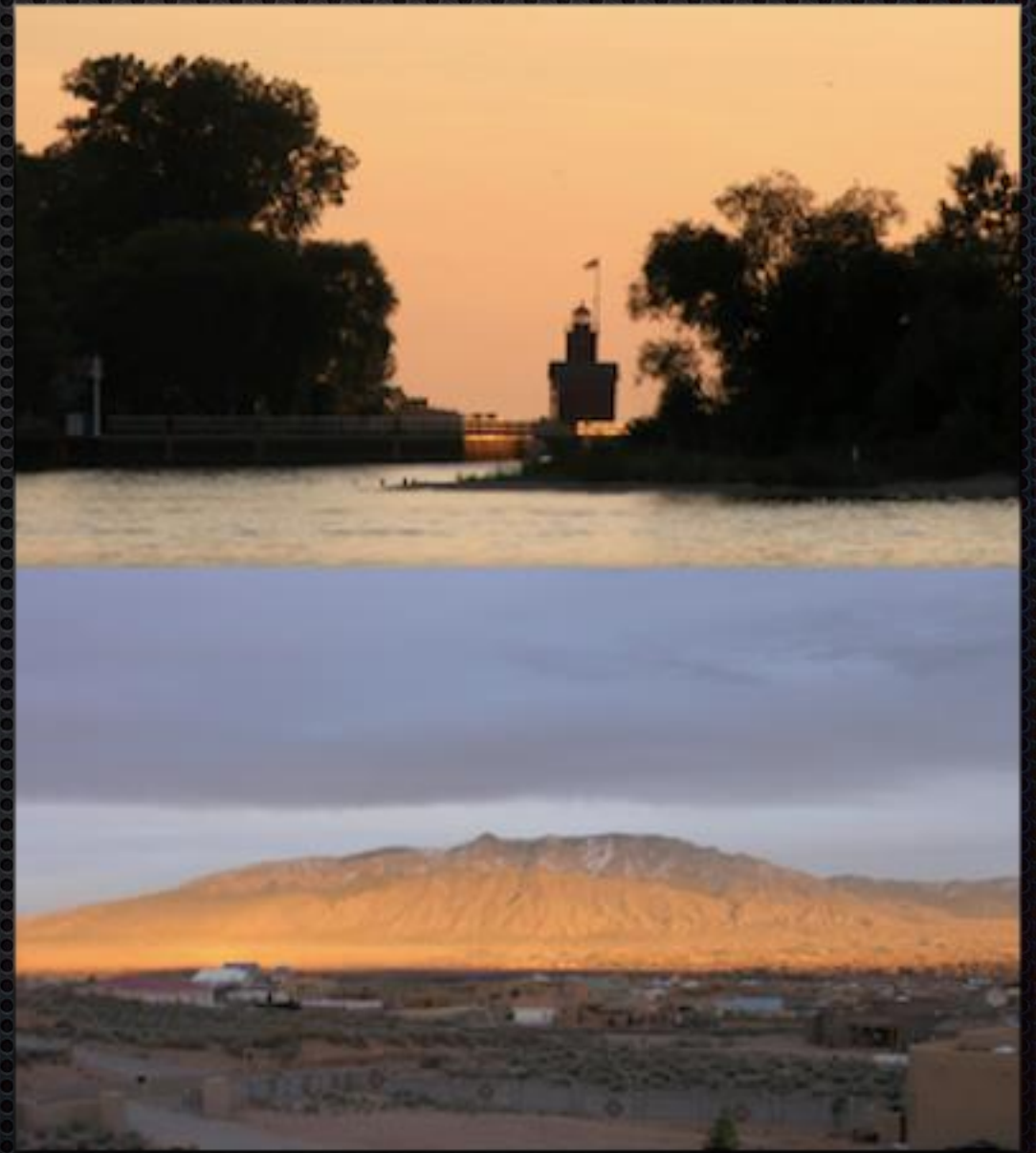


A PC104 Based BeagleBone Black Integrated Architecture and Tracking System for CubeSats

Andrew Santangelo, sci_Zone
CDW 2019

sci_Zone, Inc.

- Established in 2003
- Located in Holland, Michigan and Rio Rancho, New Mexico
- Core competencies: software development, satellite design, systems engineer, DO178B, Flight Systems, and Communications
- Customers include Space Dynamics Lab, AFRL, DARPA, NASA, DornerWorks, and Leidos



LinkStar

A Paradigm Shift in Satellite Communications

sci_Zone, Inc.

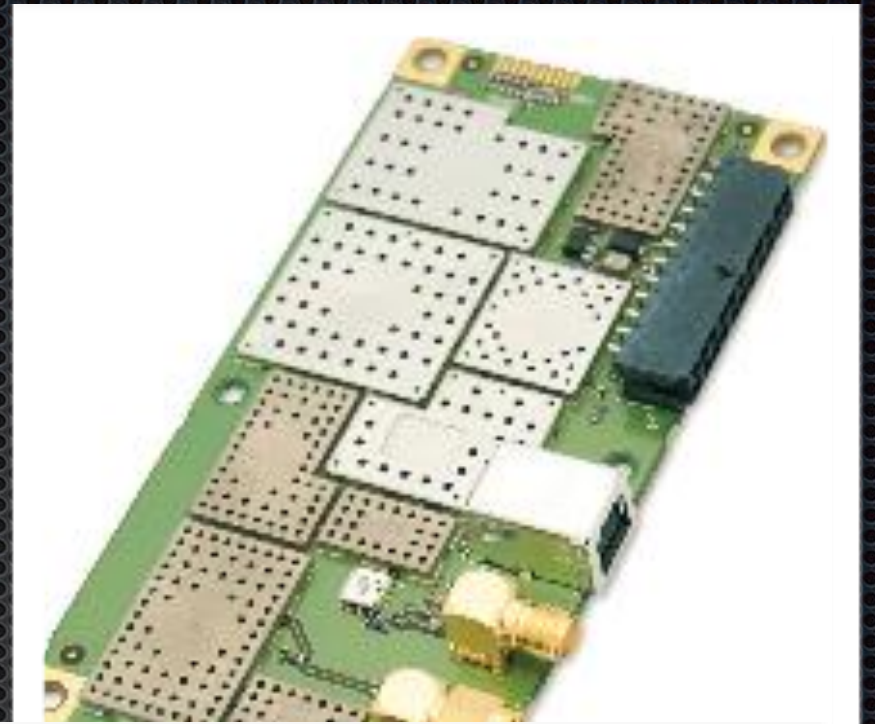
www.sci-zone.com

LinkStar-D, HD

Duplex

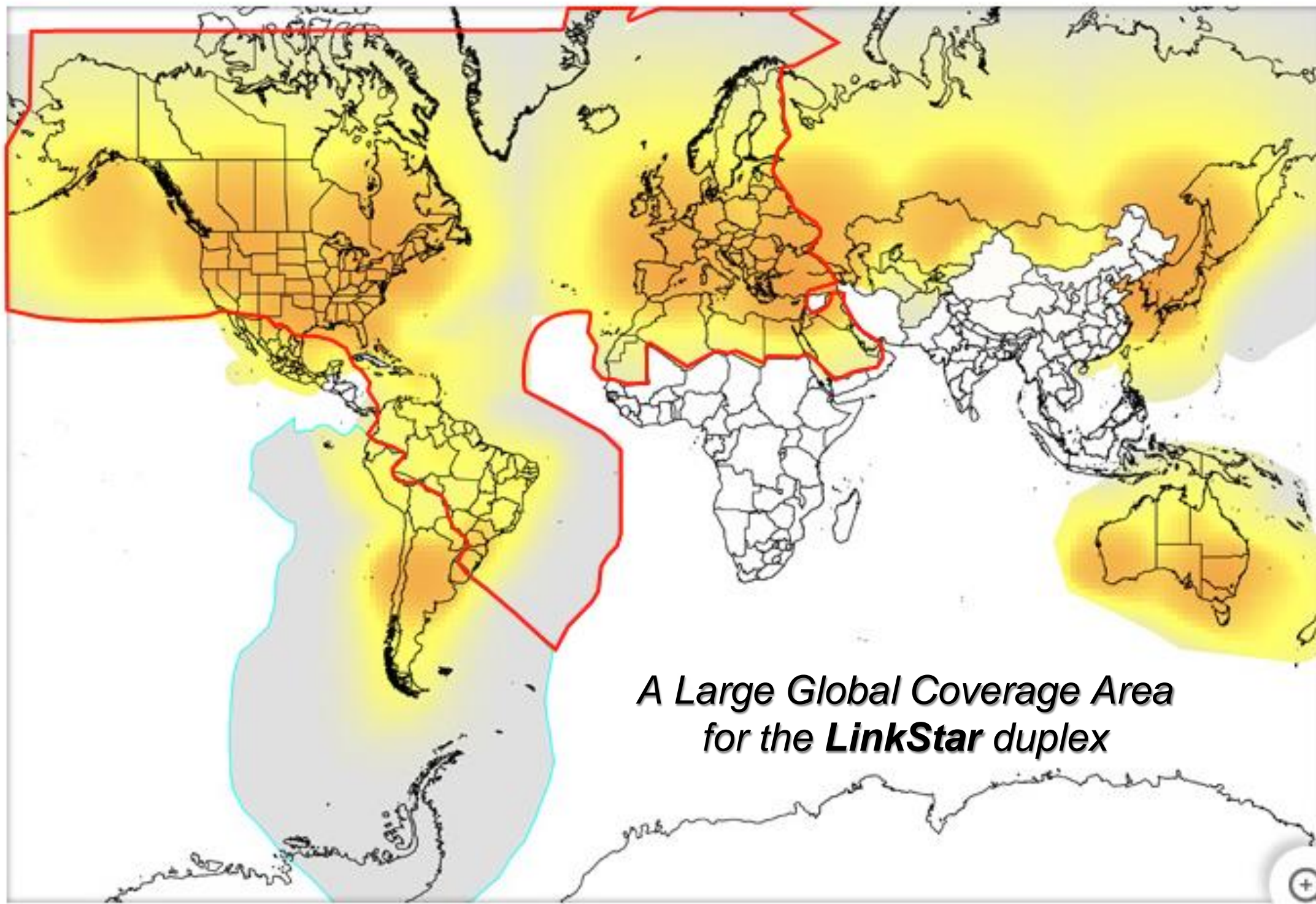
Product Features

- No deployables
 - up to 4.82 cm diameter circular patch for duplex
- Rapid acquisition
- Data rates
 - up to 70 kbps maximum
 - SMS Uplink Messaging



LinkStar Product Features

- Almost anytime, anywhere vehicle Telemetry, Tracking and Control
- Common FCC Satellite-to-Satellite License
- No Amateur bands
- No satellite to ground license required
- Globalstar will work with sci_Zone on obtaining FAA and FCC licenses
- Ground station over Internet Protocol (IP)
- *Access your vehicle from anywhere!*
- *Piggy-backs on established 2 billion dollar network*
- *Low Cost*



*A Large Global Coverage Area
for the **LinkStar** duplex*

LinkStar-STX3

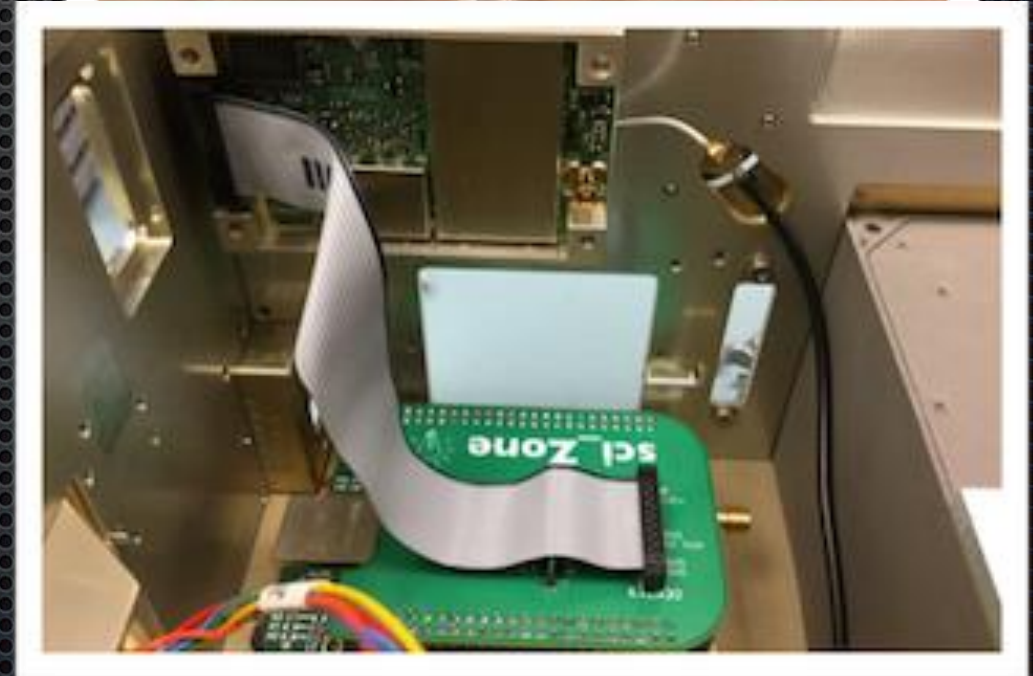
A Simplex Radio

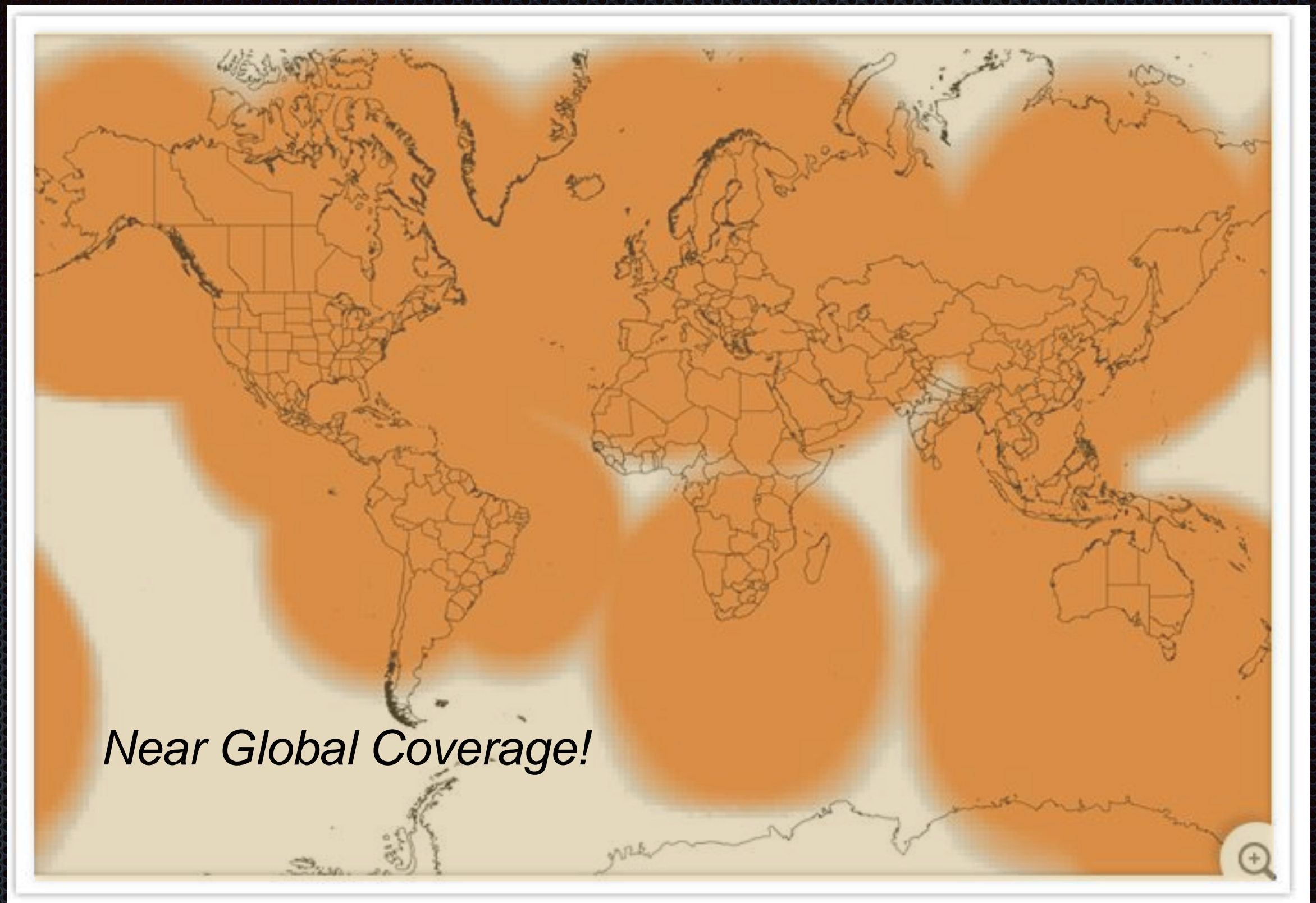
sci_Zone, Inc.

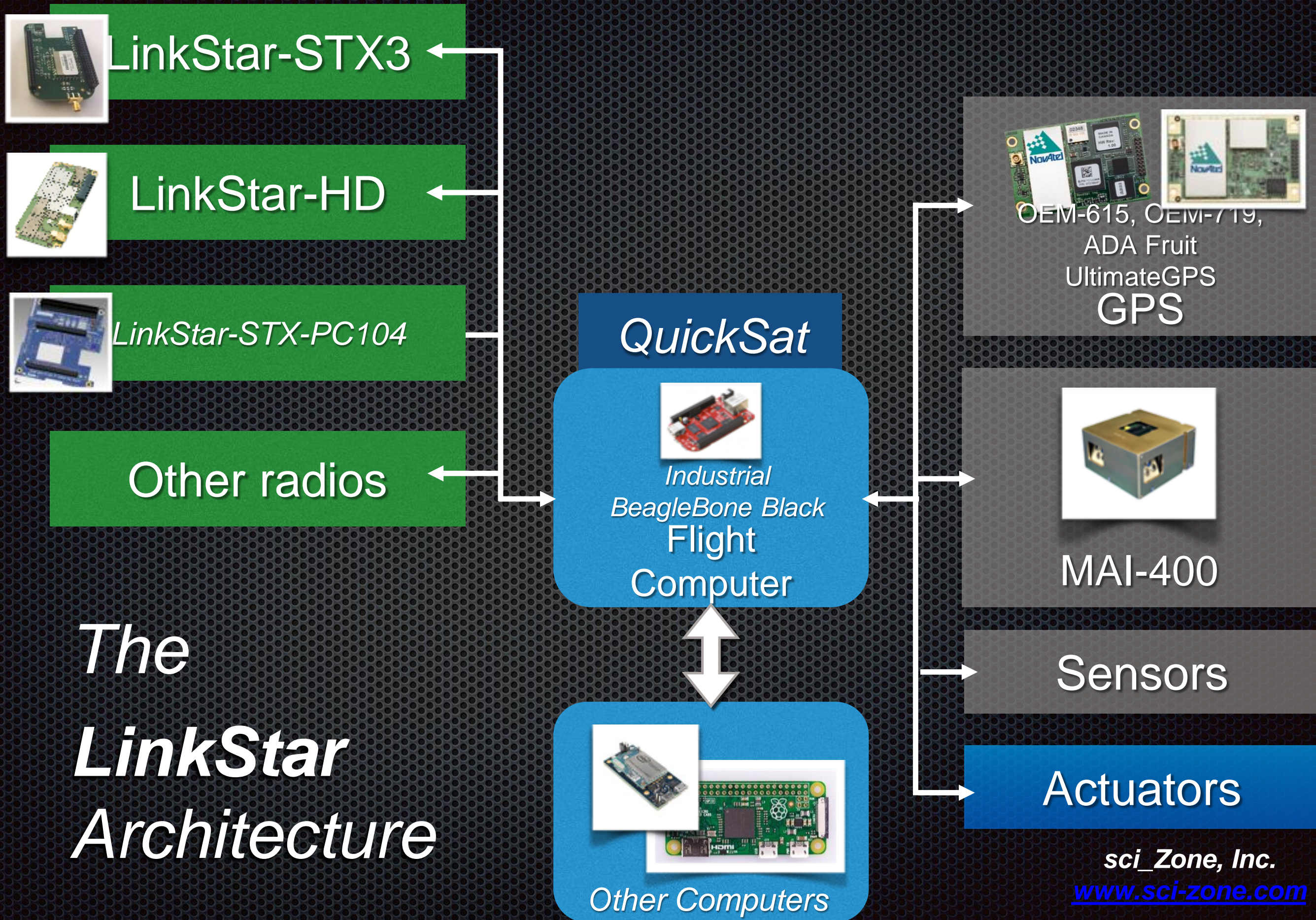
www.sci-zone.com

The *LinkStar-STX3*

- Beacon payload data only
 - GPS Data
 - Battery Life
 - Flight Data
- No control capability
- Can work with *LinkStar-HD*, *S-Band*, etc or standalone
- Full coverage U.S. for UAV, High Altitude, Vessels, other vehicles
- Near global coverage in space

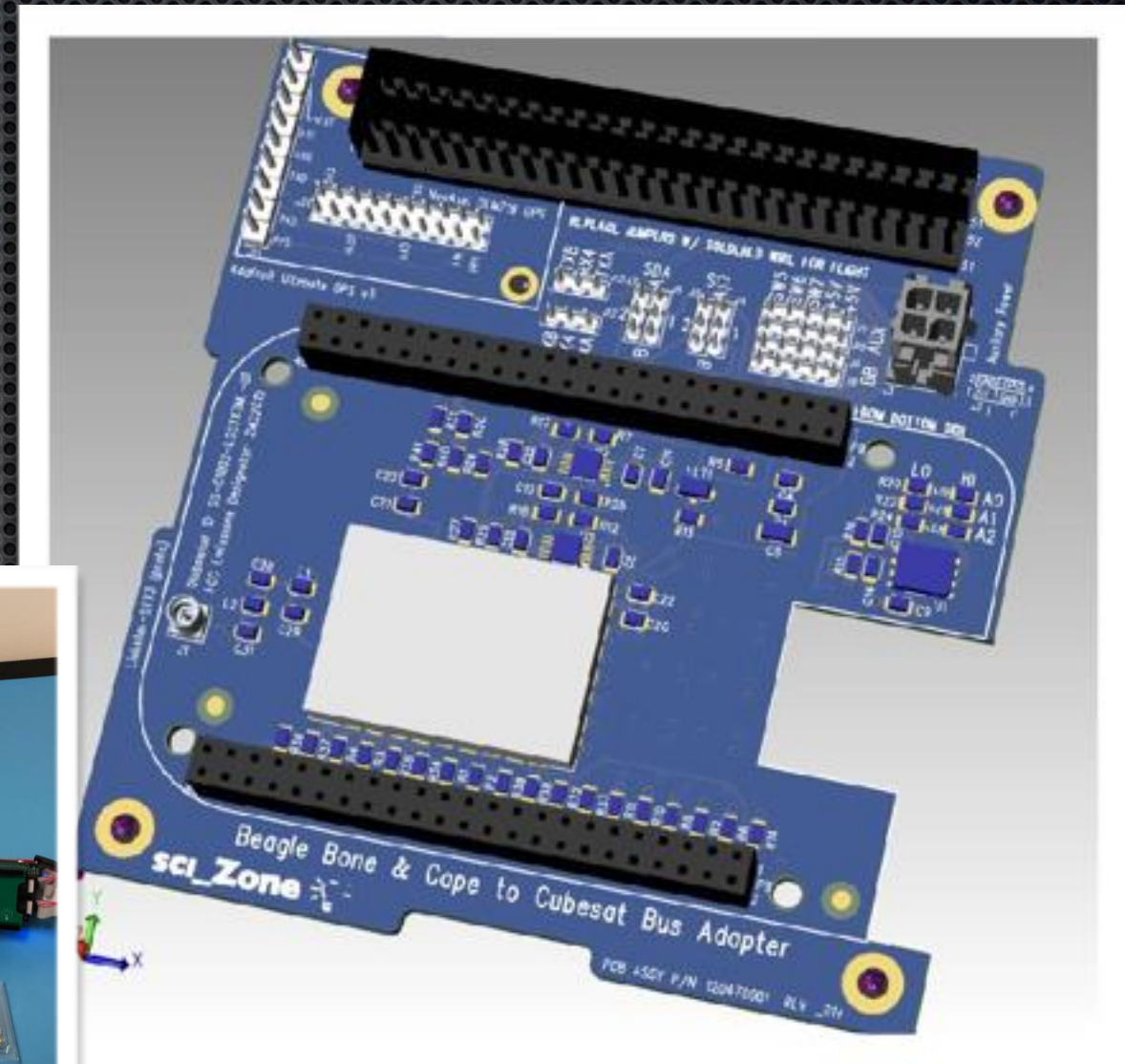




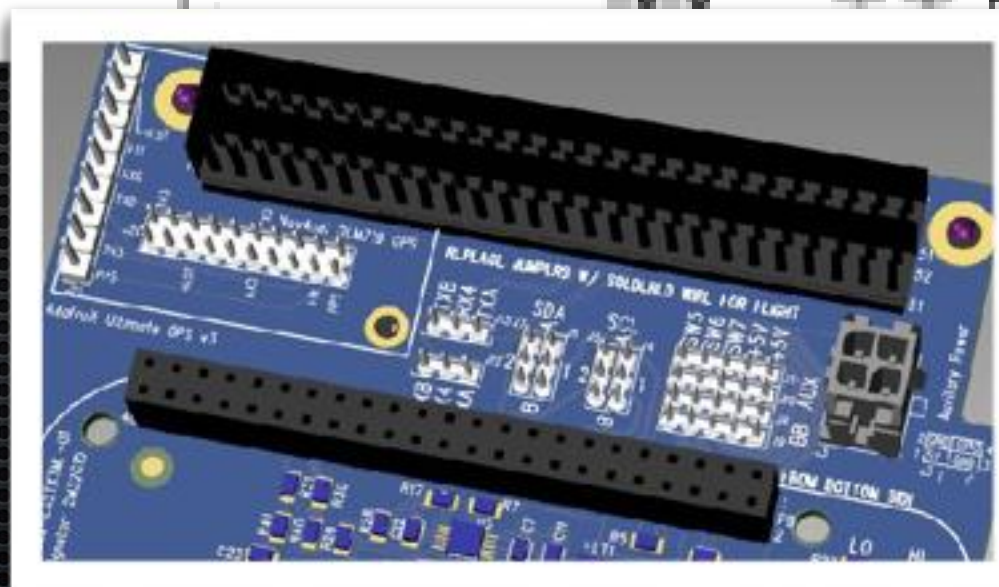
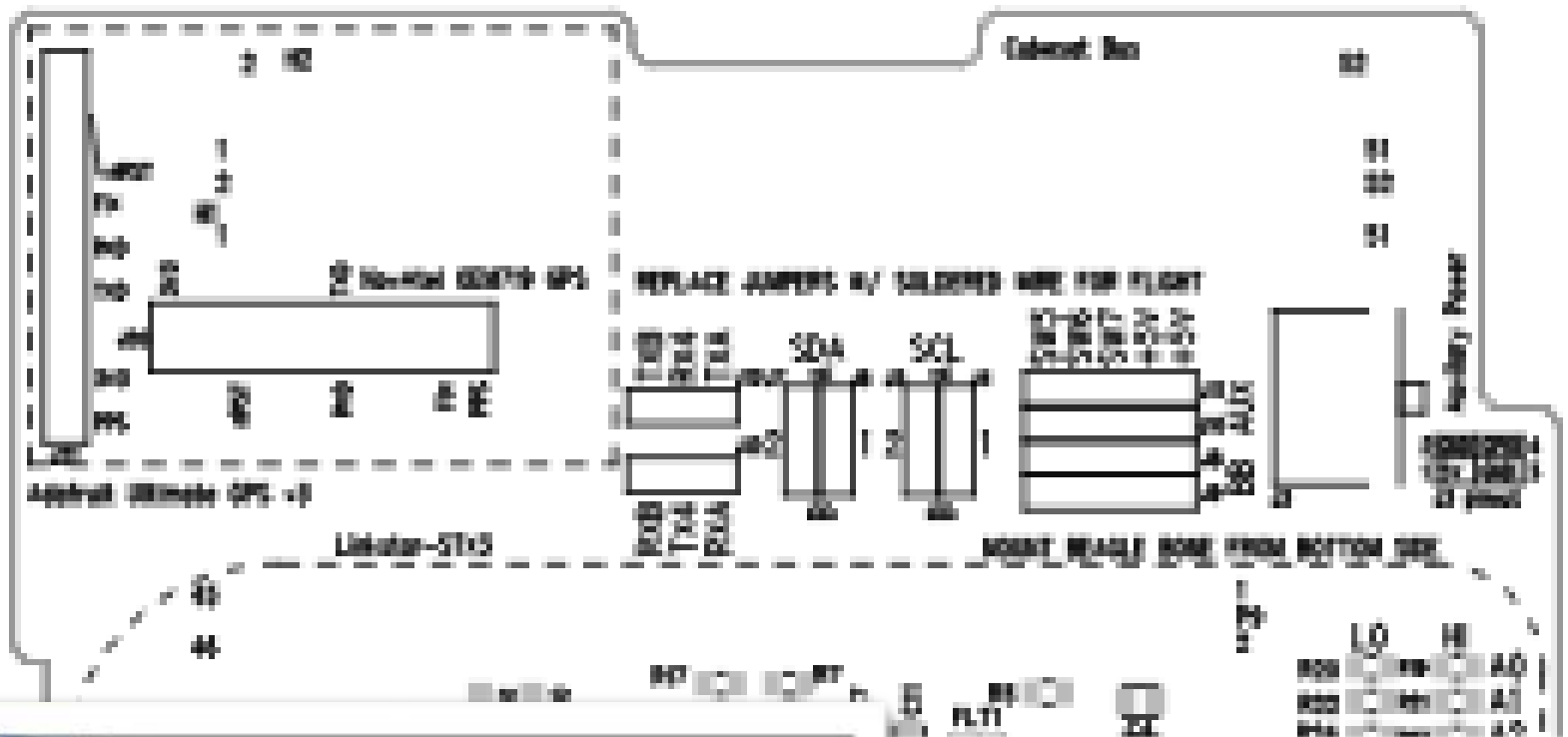
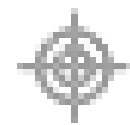
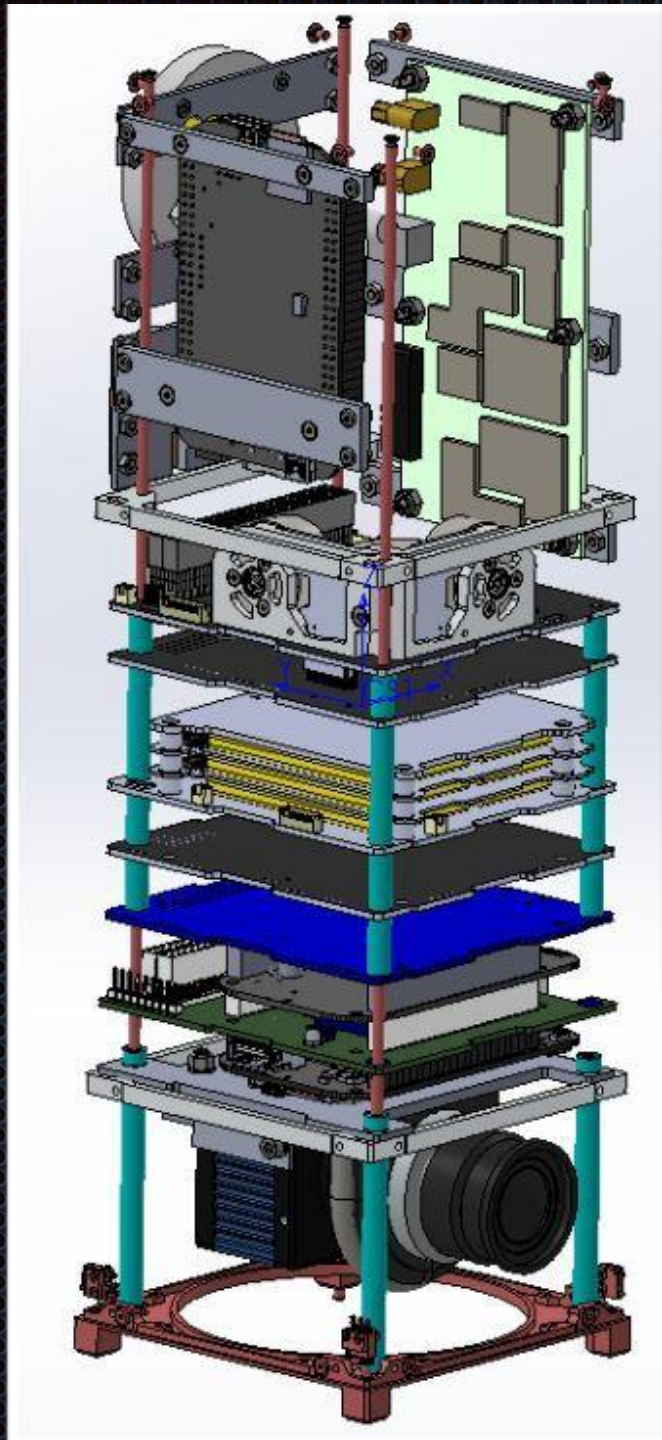


The LinkStar-STX3-PC104

- Complete Support for CubeSat Bus
- Powered by the STX3
- Integrated Flight Computer
- I2C Control
- Integrated GPS
- **Global tracking**
- **Global coverage**



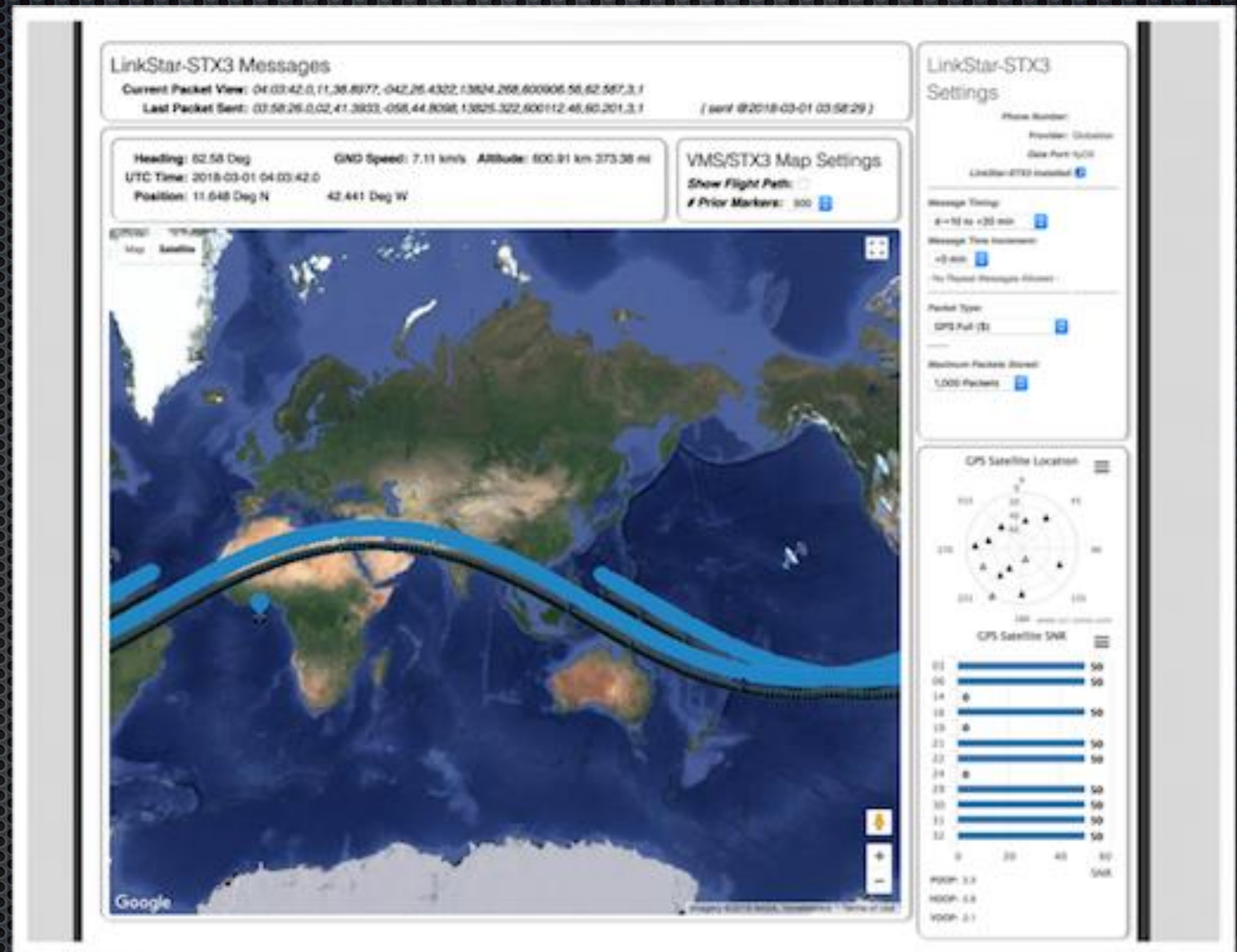
Interfaces



Integrated GPS

OEM719 GPS with the **LinkStar-STX3-PC104** provides global tracking in space from **ANYWHERE** in Low Earth Orbit!

Acquisition time within 15 seconds. Location within 4-6 minutes



Screenshot from **QuickSAT/VMS**
on the **LinkStar-STX3** in LEO.
Yes, you see a speed of 7.11
km/s!

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www.sci-zone.com

QuickSAT/VMS

*Flight and Health Management
with a Communications Framework*

QuickSAT/VMS

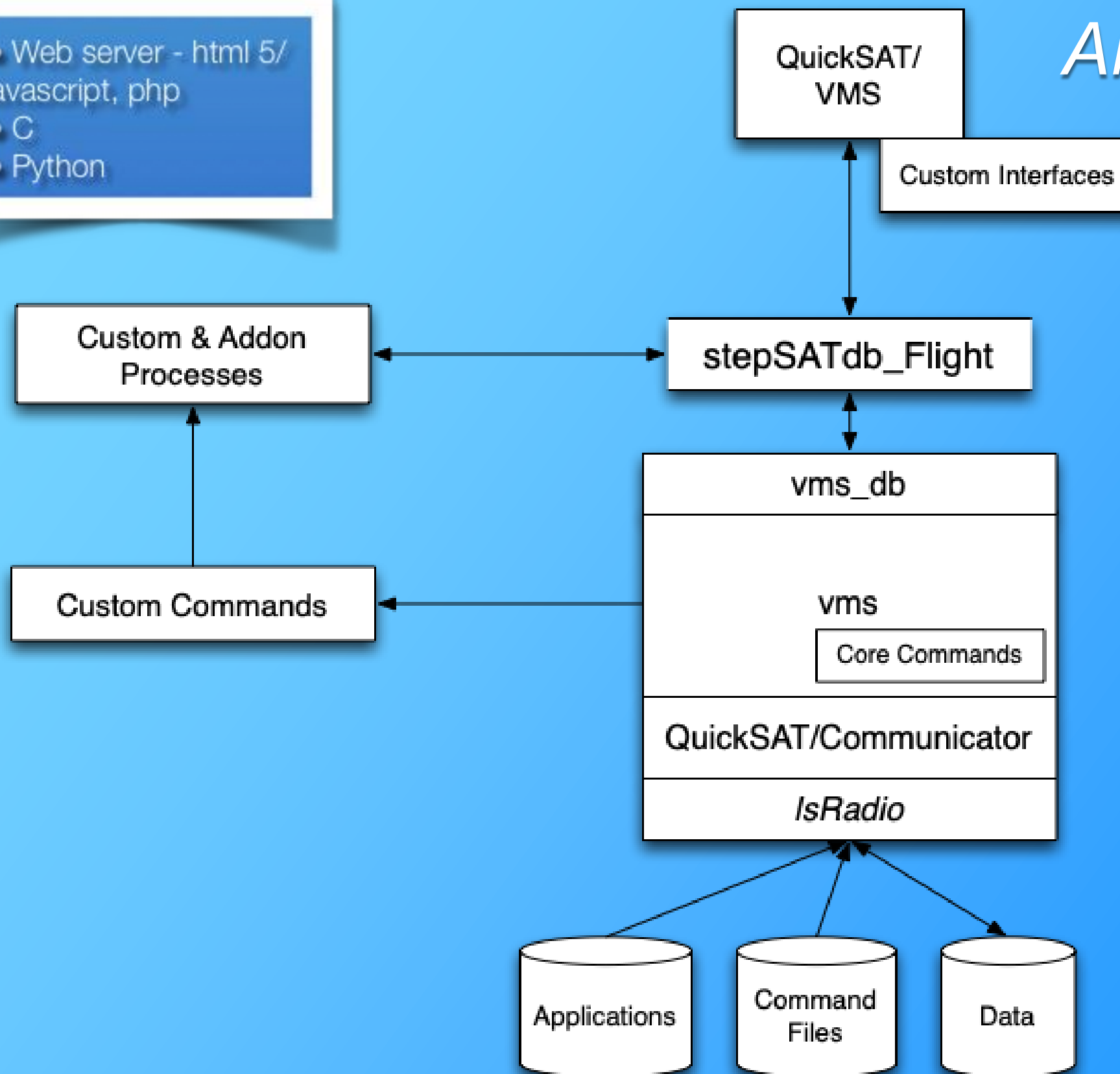
- Broad Use: *Aviation, Satellites, Cars*
- A complete Flight and Health Management System
- Vehicle Health Management & Monitoring
- Vehicle Commanding Services
- Communications services
- Test/Monitoring interface

QuickSAT/VMS

- Can serve as a stand alone ground station or part of an expanded environment
- Customizable
- Utilizes open source software where possible
- Works on a range of flight hardware
- Web based - PCs, Tablets, etc.
- Certified DO178B for Aviation

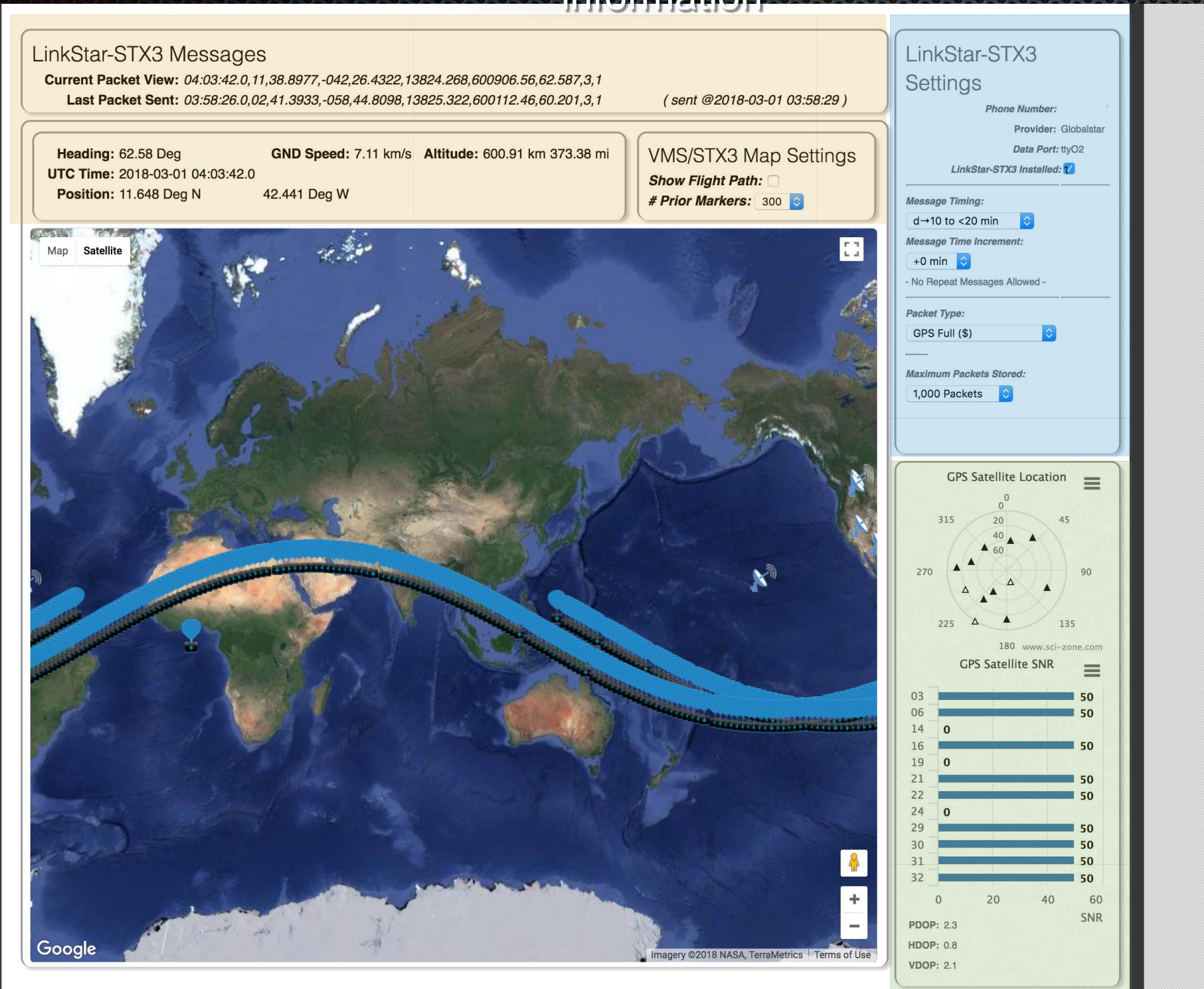
Architecture

- Web server - html 5/ javascript, php
- C
- Python



Interface

Message and GPS information

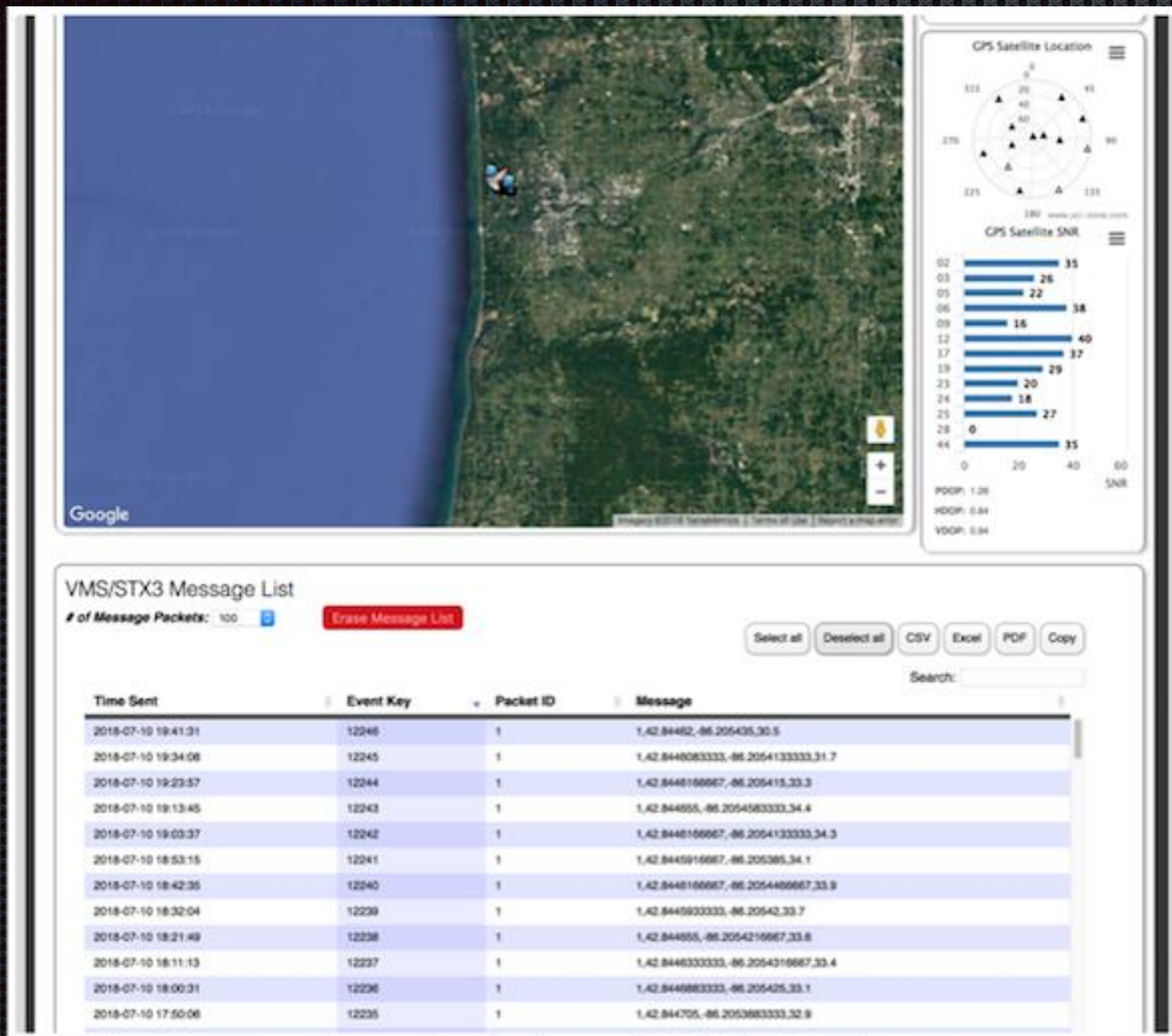


Radio
messaging
control and
radio
information

GPS signal
quality
information

OEM 719 Accepts
SNR > 29 db

Screen Shots: *LinkStar-STX3*



You can also view how many GPS satellites you are tracking, where they are located and the strength of the signal.

You can view all the messages transmitted and save them to *CSV*, *Excel*, and *PDF* format files!

Plotting and Data Tracking with *LinkStar*

QuickSAT/VMS on the *LinkStar* radio system allows you to track your data, monitor it, and even generate plots!

Plots can be saved in JPG, PNG, PDF and SVG formats. Data can be saved in CSV, Excel and PDF formats.

LinkStar-STX3 Parameter Data

Update Parameter Data Table

of Parameter Data Items: 200

Select Plot Parameter (1):

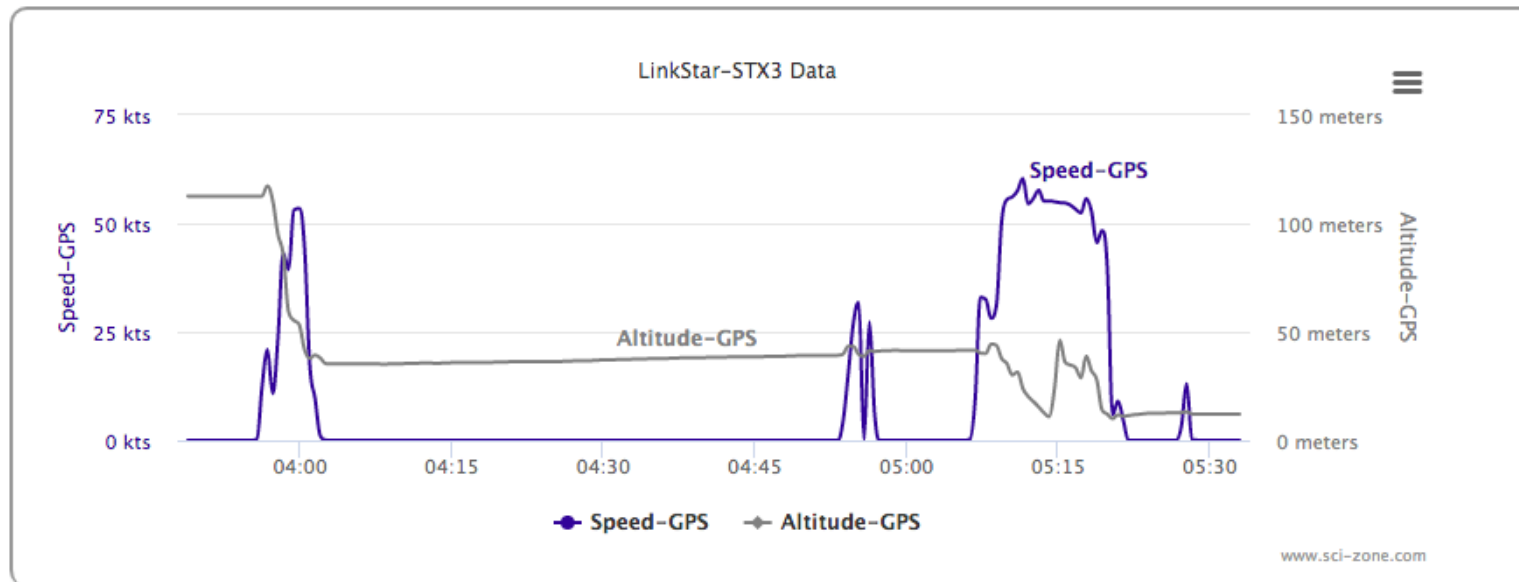
Speed-GPS

Select Plot Parameter (2):

Altitude-GPS

Select Plot Parameter (3):

Select Plot Parameter (4):



Select all

Deselect all

CSV

Excel

PDF

Copy

Search:

Time (UTC)	Horizontal Speed (kts)	Altitude (m)	Altitude (ft)
2018-04-30 03:49:20	0.01	112.6	369.42
2018-04-30 03:49:52	0.01	112.5	369.09
2018-04-30 03:50:23	0.01	112.5	369.09
2018-04-30 03:50:55	0.01	112.5	369.09
2018-04-30 03:51:26	0.02	112.5	369.09
2018-04-30 03:51:58	0.01	112.4	368.76
2018-04-30 03:52:29	0.01	112.4	368.76

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Up coming Missions Featuring *LinkStar* and the *Globalstar* network

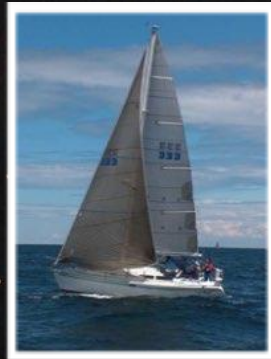
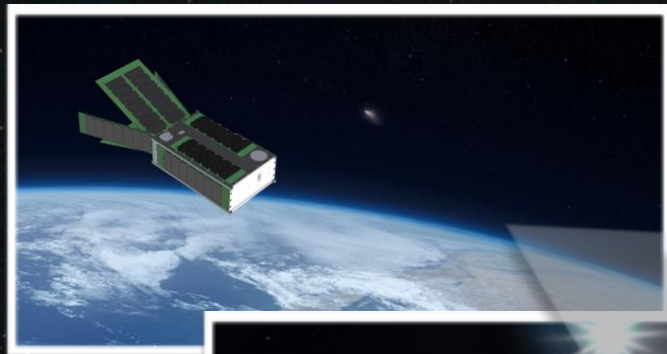
	Mission Name	Mission	Expected Launch Date
Space Dynamics Lab/DoD	Not Public	Not Public	December 2019
Carthage College	CaNop	Imaging rainforest canopy, plus studying impact of LED lights on night skies	October 2019
Hawaii Space Flight Laboratory	Neutron-1	Measuring low energy neutron flux in LEO	October 2019
New Mexico State University	INCA	Student Test Flight; Virgin Galactic Test Flight	2020
Auburn University	TRYAD	Detect and study Terrestrial Gamma Ray Flashes	2020
University of South Alabama	TBD	Magnetosphere Studies	2020
North Dakota State University	OpenOrbiter-1	Test flight open cubesat platform; 3D printing in space	2020

Plus numerous more missions from Boeing, U.S. Naval Academy, DARPA and others!

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www.sci-zone.com

	LinkStar-HD	LinkStar-STX3
Communications Type	Duplex	Simplex
Data Rate	up to 70 kbps	up to 144 Byte Packets
Input Power	~ 4 W	~200 mW
Pointing Required?	Yes, $\pm 40^\circ$	No
Internet Access in Orbit	Yes	No
Coverage	~ 40%	Near 95%
Messaging	Uplink only - 35 bytes	Downlink only - up to 144 bytes
QuickSAT/VMS	Yes!	Yes!

Globally connected through *Globalstar*



sci_Zone™
Servers



*Customer
Mission
Control*



Next STEP - Join the Fun!

- email: andrew_santangelo@sci-zone.com
- web: www.sci-zone.com

