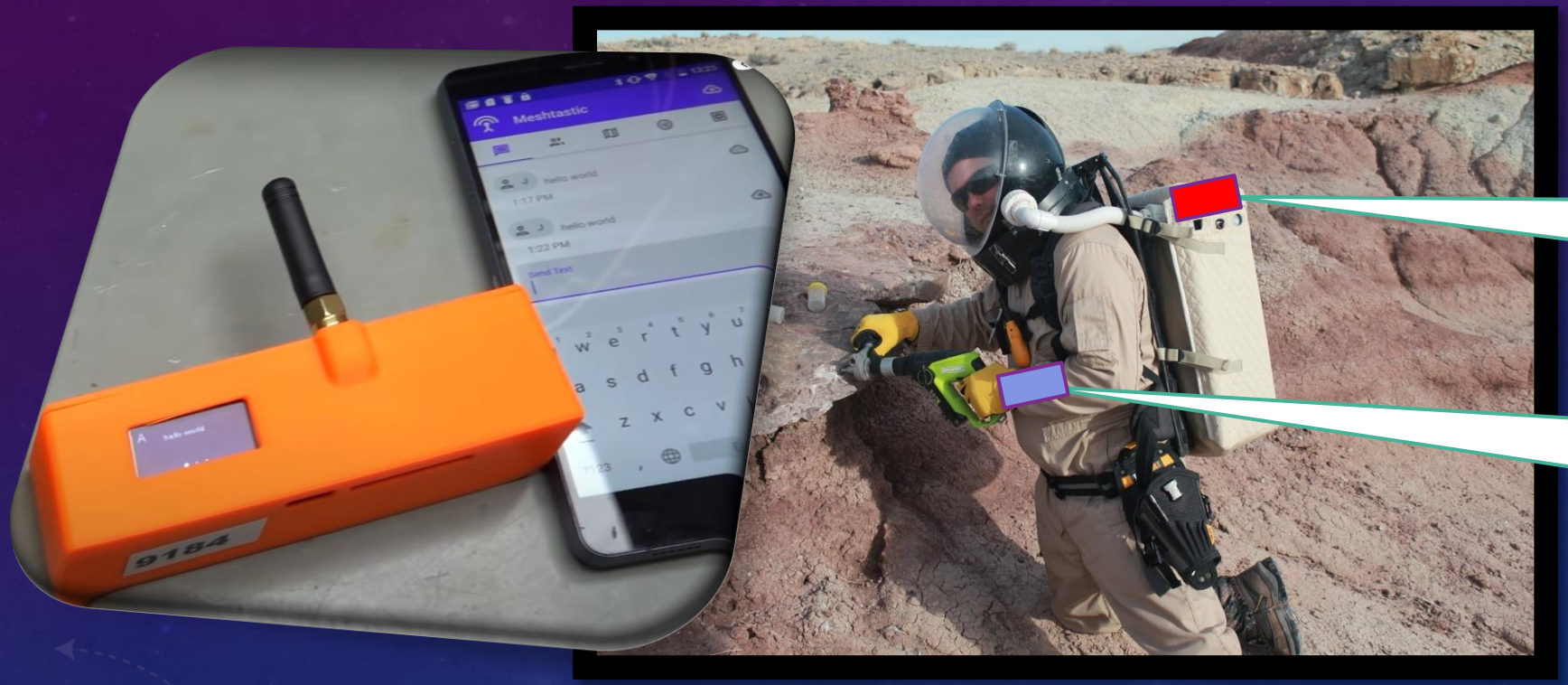
MDRS MESHNET PROJECT

MARS SOCIETY CHICAGO CHAPTER PROJECT PROPOSAL

EVA SUIT LORA MESH NETWORK RELAY

Long range, low power text messages and data sets with GPS coordinates.



LORA Relay device connected via Bluetooth. (Backpack)

Android/iOS device (forearm) as terminal for text communications, GPS map

MDRS BASE STATION

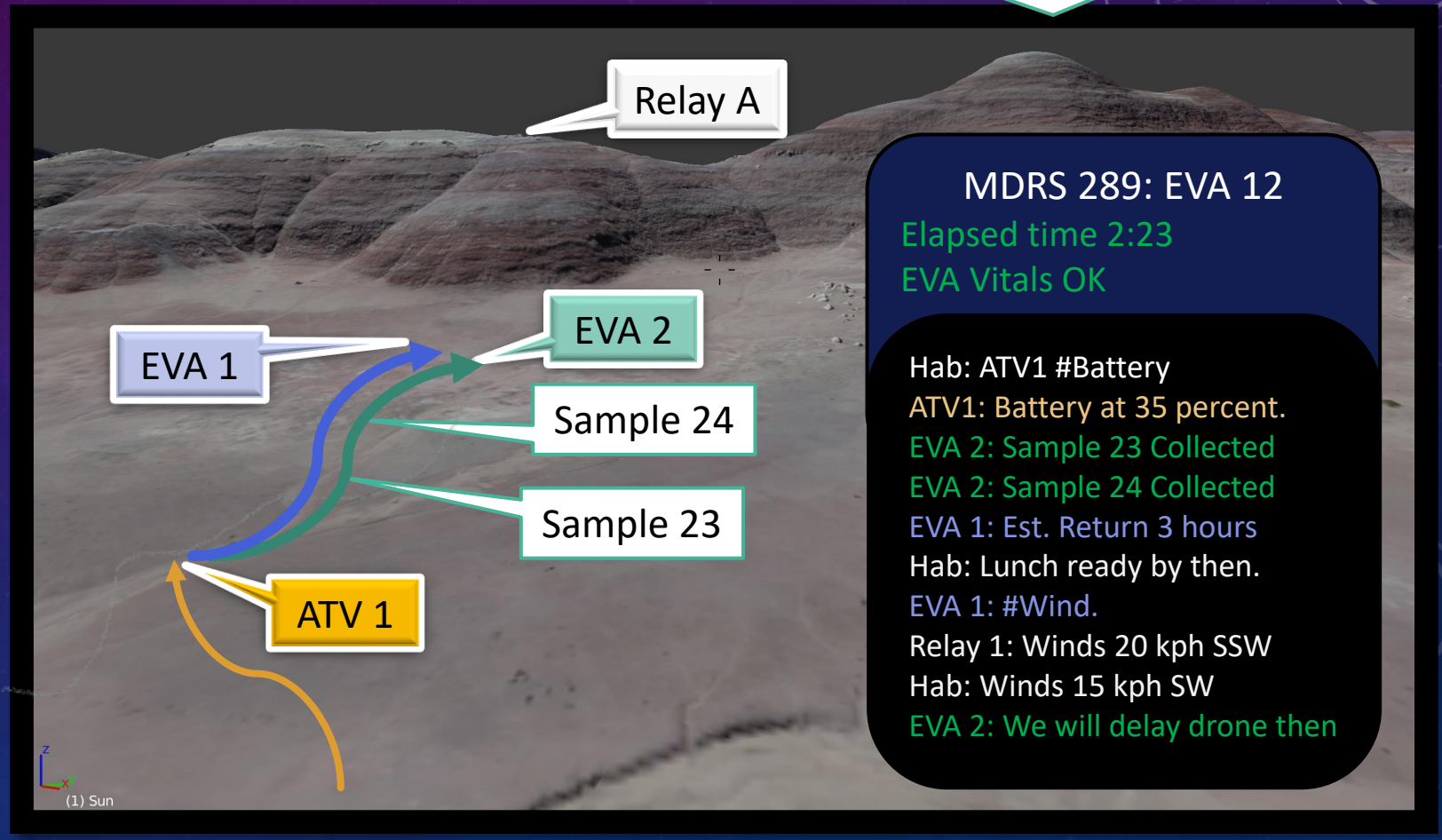
Hab 4K TV with fanless PC and Lora relay
Displays EVA progress and network chatter between EVA, Hab, and remote instruments. These would be time stamped and logged.

Show EVA, communication in real time on 3D elevation map on a 4K monitor. Two-way texting with EVA crews at very long range.

Geotag samples in the field as collected.

Associate post-EVA lab work on those samples with the locations in this geotagged, searchable database.

Researchers can filter a map of locations for various sample collection sites (desert varnish, gypsum, etc.) and plan further work. Science continuity across rotations.



MDRS LAB NOTEBOOK

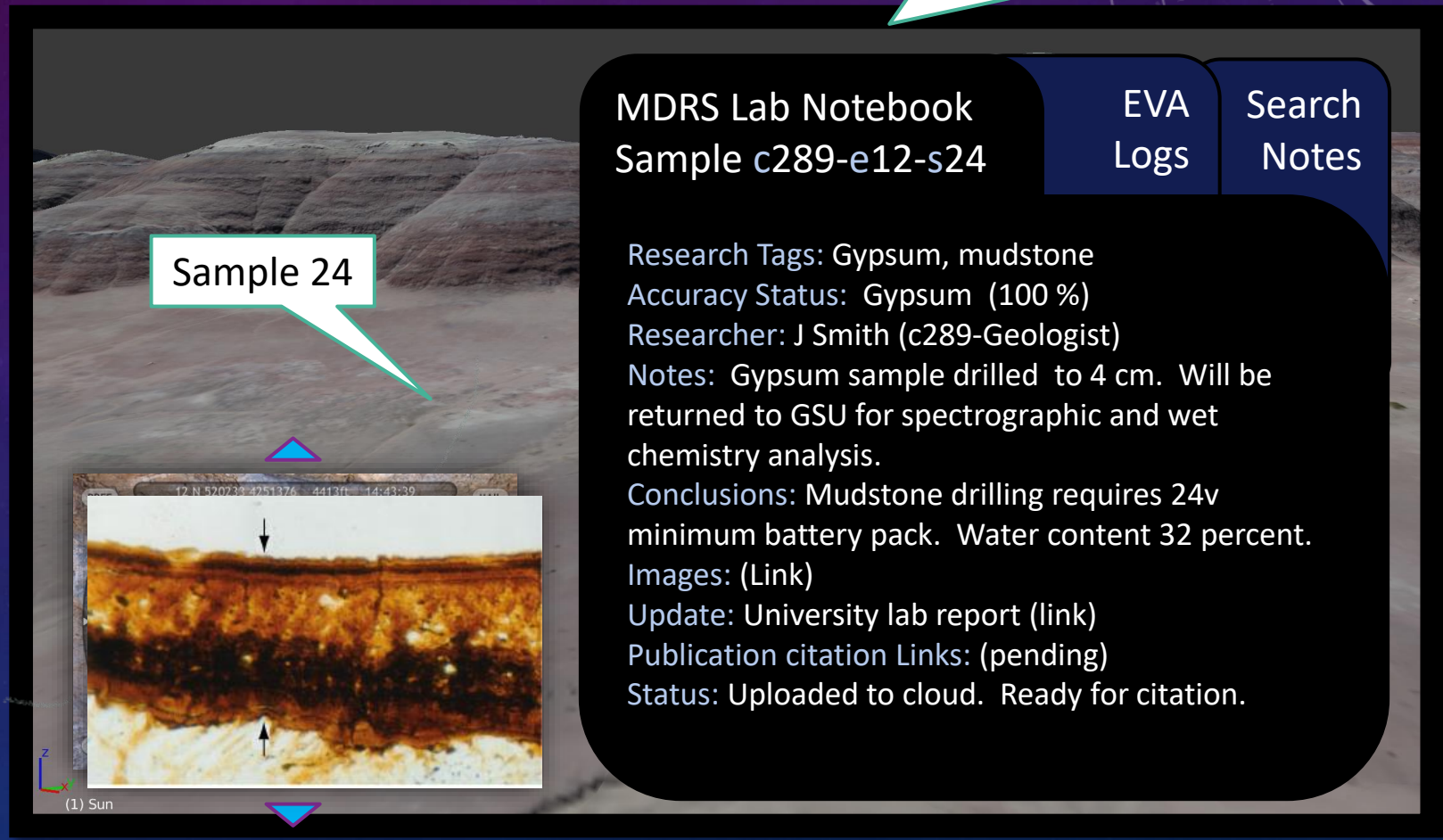
On return from EVA, initial research on a given sample is logged in a central database.

Future researchers can filter on the tags and find sample sites, images, and notes from past crews.

Remote “virtual explorers” can contribute to this analysis or conduct independent studies citing this database.

This provides research continuity across teams and a great model for any field exploration system

Lab notebook PC for sample analysis logging, photos, etc. (Crew 289, EVA 12, Sample 24. Generic Sample University)



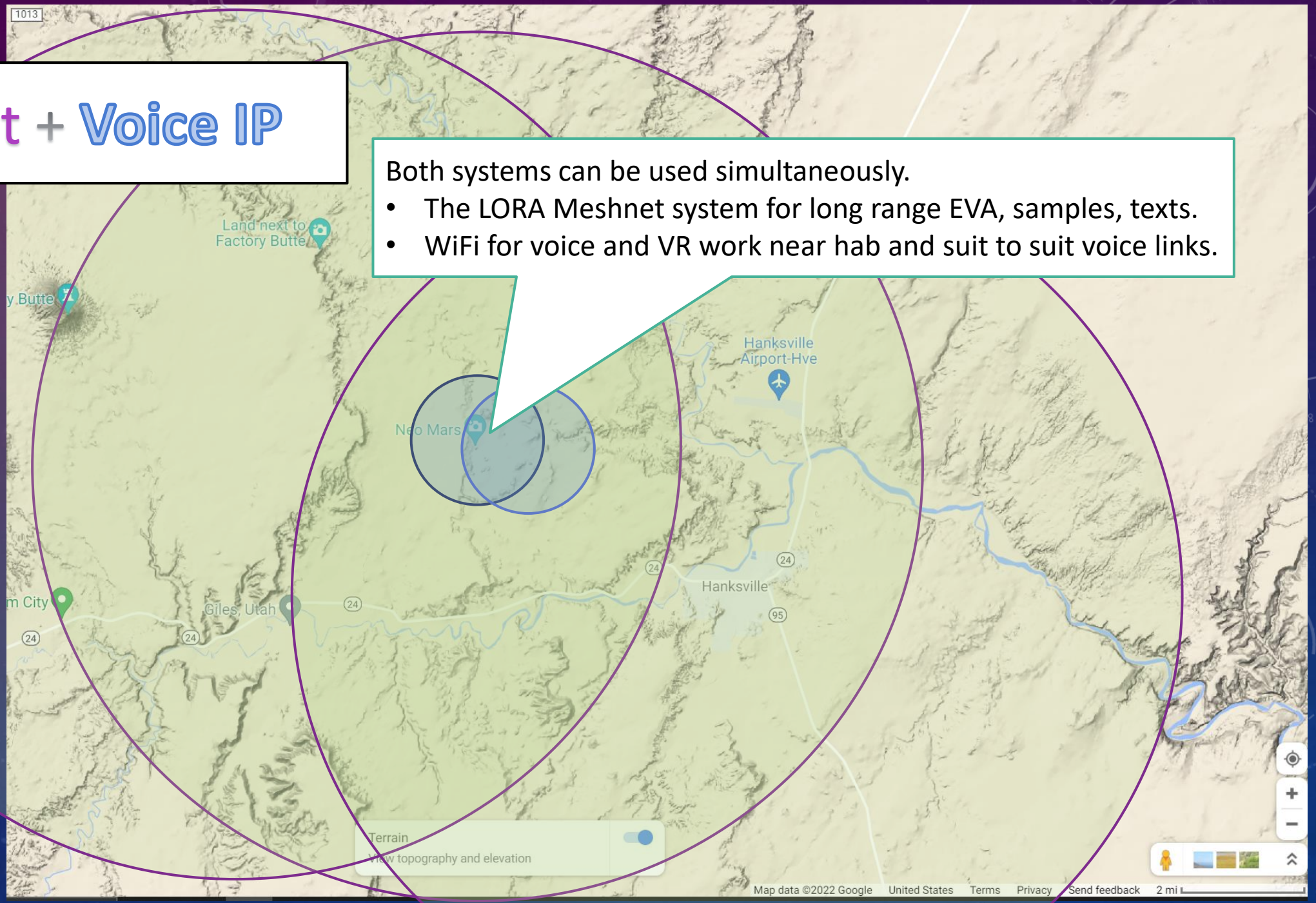
PRIMARY GOALS (BASELINE SYSTEM)

Users	Features	Benefits
EVA Crew (Field)	• GPS tracking of suits, ATVs, and supported equipment relayed to Hab every minute or two. • SMS equivalent text messages back to Hab and between crew members in secure network	• Distress call tracking (Safety) • Sample Position tracking and other data point recording (Science) • Immersion in EVA/Mars experience (Sim) • Log EVA paths and compare planned/actual paths • Identify interesting locations for revisit/research
Hab Crew	• Long range text communications with crews • EVA tracking with geotagged database of reports and sample analysis	• Prompt response in emergencies or important message links. • More immersion and experience in a situation far closer to actual Mars EVA, with hab-based support
Science	• Crews can log sample analysis work along with locations in permanent MDRS database	• Future crews can scan database for sample locations and analysis results relevant to research • Mars VR “Crowdsploring” but with sample data libraries

Meshnet + Voice IP

Both systems can be used simultaneously.

- The LORA Meshnet system for long range EVA, samples, texts.
- WiFi for voice and VR work near hab and suit to suit voice links.



Phase	Project Elements	Capacities
Base System	• Simple Mesh network using off the shelf open source software and smartphone links. • Simple GIS system for logging routes, samples, and crew text messages back and forth, including SOS. • Simple lab notebook for simple report on each sample upon return to MDRS Science Dome.	• Communicate and track EVA across 5-15 km with just basic system. • Promotes safety, simulation immersion and science dramatically. • Gives continuity logs across crews and filtered research on topics.
Full System	• Add secondary digital voice system, improved logging, and solar-powered hilltop relays.	• Secondary digital voice system across medium range.
Open API	• Give a common API for interfacing field gear with the system, allowing motion studies, free-standing weather stations, photo tagging, smart-suit add-ons, and other capabilities. • Allow data mining of the research database.	• Allows future crews, volunteers and university teams to expand the sensor and science network. • Add AI analysis, crowd-exploration, and other democratization efforts
2.0 System	• Suit temperature/movement data, follow-me drones, voice transcription and SMS to remote researchers.	• Everything NASA MDRS crews were doing in 2004 using four moving trucks of equipment.

NASA AT MDRS 2006

- ✓ Satellite Navigation
- ❑ Digital Panorama Pictures
- ✓ Digital Relay
- ❑ Voice Recognition
- ❑ Follow Me AI/Autonomy
- ✓ Network over entire area

- ❖ Digital Voice Comms
- ✓ Tag sample data (GIS)
- ✓ Email info from field to SMEs directly

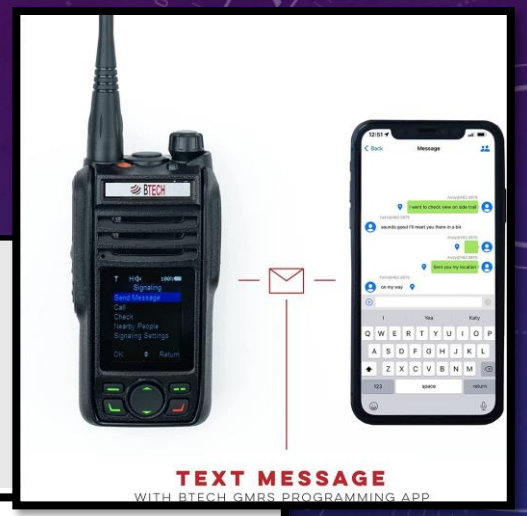
Three box trucks of equipment

TALENT NEEDED

Users	Tasks	Skills Needed
EVA Unit Assembly	• Assembly of units • Software loading units (Meshnet) • Customization of MeshNet client on Android phone (long term).	• 3D printing • Soldering • Technical downloads in development environment
Hab Console Software Development	• Data Stream Logging at Hab (Meshnet to partitioned data) • Display of data on 3D GIS map	• Streaming input software development • GIS Visualization (Mars VR and GPS data set). • User Interface and Dashboard development
Science Lab Logging System	• Photo integration and lab equipment data collection • Logging in CMS (SharePoint/etc.)	• CMS development experience • Database and visualization (Geocodes, GeoJSON) • User Interface and Dashboard development • Lab equipment integration development
Long Term	• Remote science equipment integration • Bot queries (weather, power, etc.)	

ADDITIONAL DIGITAL RADIO OPTIONS

BTECH GMRS-Pro ($140)	• 5-Watt GMRS Voice/Data Radio. Weather alerts. • Send GPS locations from connected Cell phone, texts. • Can configure as repeater • Requires HAM Radio License
Garmin Rino 755T ($580)	• All in one unit (compass, barometer, GPS) • 3-inch touchscreen with Typo maps • 5-Watt GMRS radio – 20-mile LOS range • 8 MP camera built-in with GPS geotagging • Bluetooth Headset • Smartphone connection (text messages, weather) • Weather downloads via Wi-Fi • Requires HAM Radio License
Garmin 66i ($600+ $65/mo.)	• Satellite Link for Text messages, SOS Geolocation. • Works anywhere in the world (Iridium) • Map (satellite download via Wi-Fi) • No voice option. Will connect to cell phone. • Subscription is expensive, but no license required



DATABASE STRUCTURE