UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE of ENGINEERING

# Senior Design Project Description

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| **Company Name** | *Globalstratos, Inc.* | **Date Submitted** | *11/30/2020* |
| **Project Title** | *Infrastructure Design for Asseza™ Multiplex Container Laboratory – Phase 2* **(GLOBAL_ASSEZA2)** | **Planned Starting Semester** | Spring 2021 |

## Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

| Discipline | Number | Discipline | Number |
|---|---|---|---|
| Mechanical | 3 | Electrical | 1 |
| Computer | 1 | Systems | |
| Other ( ) | | | |

## Company and Project Overview:

Globalstratos focuses on regenerative, and inclusive, economic development and growth.

The Mission of Globalstratos is to:

Create, grow, and sustain value streams (e.g., economic, social, community) with the collaboration and/or participation, and for the benefit, of stakeholders (e.g., communities, individuals, families, government, private sector, faith institutions, civil society). These streams merge together as a tapestry for a diverse, but synergized global economy (of prosperity) that is inclusive and boundary spanning*.

*www.globalstratos.com

Our core capabilities include economic and project development, as well as management company services for ventures and projects. One of our streams is projects that leverage natural resource value chains in industrial projects.

We are spinning off product/platform ideas that complement our core capabilities. This project focuses on development of a technology and product platform to assist in natural resources management in the form of a mobile/portable laboratory/buy center. The lab will be designed in a 20 ft container. It will be manufactured in North Carolina. This project is partially supported by the NC Manufacturing Extension Partnership grant to help create jobs in North Carolina

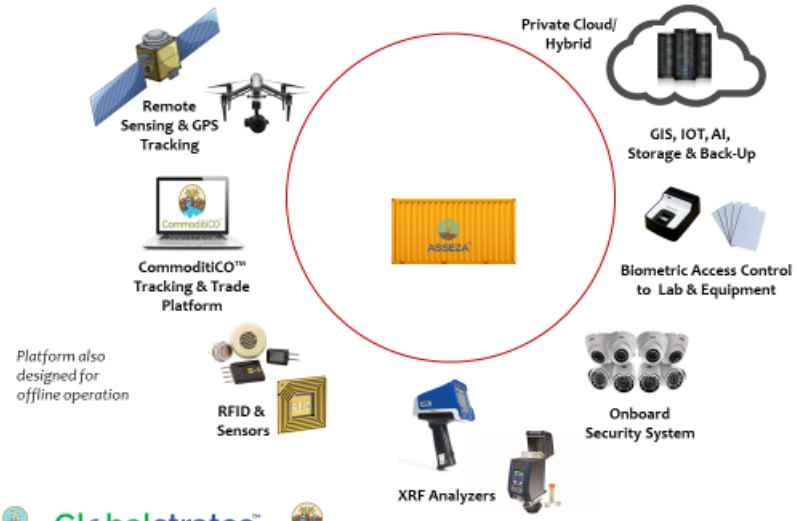
# Asseza™ Multiplex Mobile Lab


| Benefits | Configurations | Some Available Applications/Platforms |
|---|---|---|
| ▪ Designed for lay operators (non-scientific, non-technical)<br>▪ Provides real-time, quick analysis on site<br>▪ Provides analysis on a wide range of materials, e.g., water, soil, minerals, plants, in one mobile location<br>▪ Shifts many traditional lab tests to the field<br>▪ Combined with CommoditiCO™ trade software, Multiplex™ becomes a mobile buy center for commodities<br>▪ Provides reliable, highly-accurate results using modern technology, e.g., X-Ray Fluorescence (XRF)<br>▪ Manage/oversee mobile operations centrally and securely | ▪ Field kit<br>▪ Van<br>▪ Container (mobile and semi-permanent)<br>▪ Permanent (if client chooses)<br>▪ Customized | **Agriculture**<br>▪ Soil, seed, fertilizer, and field characterization<br>▪ Food quality and control inspection<br>▪ Plant and crop analysis<br>**Geology and Mining**<br>▪ Gemstone, metal, and other mineral analysis and assaying<br>▪ Fuel oil analysis<br>▪ Geochemistry<br>**Environmental**<br>▪ Soil, air, and water analysis<br>▪ Hazardous material<br>▪ Environmental monitoring<br>**Geographic Information Systems**<br>▪ Satellite and drone geospatial data for cross-sectoral analysis<br>▪ Sensors for continuous real-time data collection and analysis |

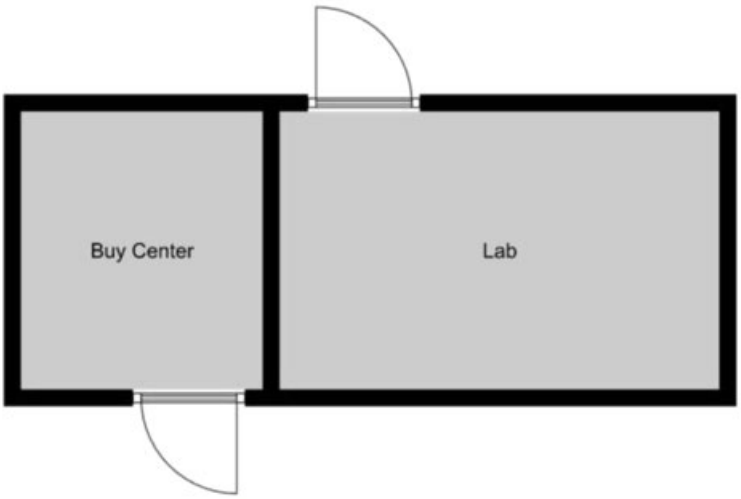


# Asseza™ Multiplex Connected Platform

**(Remote services, management, and oversight)**



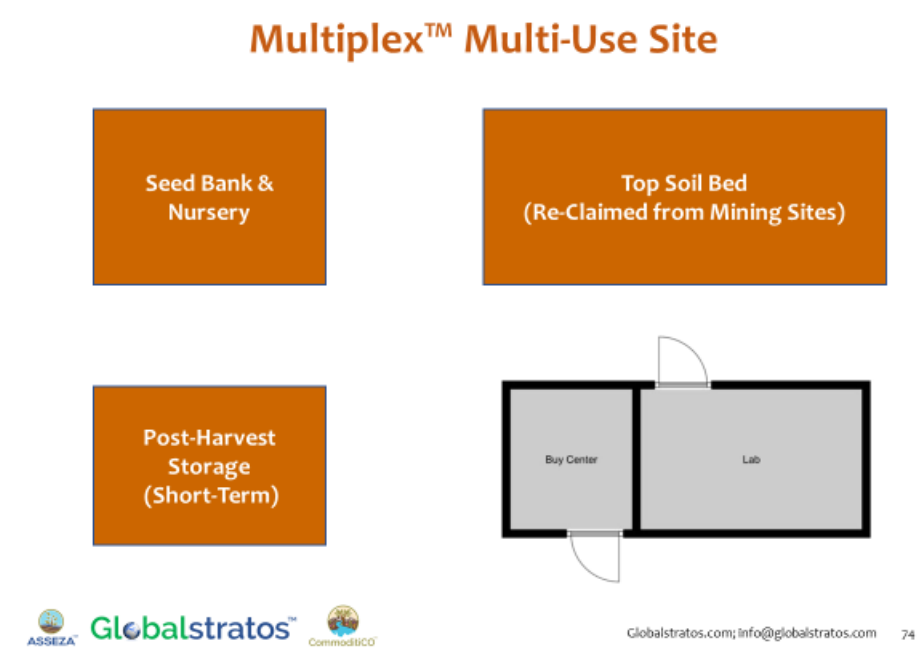
# Multiplex™ Container Basic Structure






# Multiplex™ Multi-Commodity Buy Site

- Multiple minerals
- Multiple agricultural commodities
- Combination of minerals and agricultural commodities




**Project Requirements:**

Local communities and stakeholders often are unable to acquire information on their natural resources and environmental issues in an expeditious manner. Localized labs will allow them to manage their natural resources more effectively. There are other containerized laboratories available but they are costly. The focus for this project will be to develop a design at minimal cost so if will be affordable in developing countries.

Phase 1 of this project started in the Fall of 2020 with the GLOBAL_ASSEZA project team. That team is focusing on a 20 ft container design that incorporates the design for the two buy center cubicles with the laboratory. This design accounted for the water, electrical, mechanical infrastructure, HVAC, security and power systems.

The Phase 2 team will work with the Phase 1 team's product to develop refinements and variants for this design. The variants of the design will be modular in nature, so the building blocks can be selected to construct multiple design implementations for different missions. The initial weeks of activity for the student team will be to understand the various plans for container services and then crystallize the electrical and mechanical design goals in the Project Performance Specifications and Statement of Work which will be agreed upon by the student team, mentor and Globalstratos.

Requirements:

- Operate in environments from -10 Celsius to +45 Celsius
- Self-contained power, air, and water systems that provide a healthy working environment for lab teams and visitors
- Use materials that support antibacterial environments.
- Interior modular design that can be re-configured easily for multiple uses (could do sub-unit modules).
- Temperature controlled
- Ability to use local water sources (cleaning system)
- Provide a highly flexible lab environment while keeping costs down
- Majority of maintenance able to be conducted in-country where mobile lab is located (developing country)

**Expected Deliverables/Results:**

- Mobile Design Variant – Condense the functionality of the Lab/Buy Center to a mobile version that can be mounted in a pick-up truck version.
- Agriculture Only Variant – The design from Phase 1 includes capability to do a buy center for minerals and agriculture products. One of the biggest design drivers in that implementation is an induction furnace. In the Ag Only variant, the design would include only those elements needed for the Agriculture function with no mineral capability.
- Power Variant Version – The Phase 1 design has the capability to be powered by PV solar, batteries and diesel engine. This variant would be a "starter" lab that is powered only by the diesel generator to have a low cost starting point. Define the cost and design to add PV and batteries at a later date.
- Support Container – The Phase 1 design had a second container that was outside the team's scope. This second container was to house batteries and inverters. Define a mechanical and HVAC design for this second container. This container has a control computer screen for power management. Add the capability to monitor and control the power system from the Container 1 Computer system.
- User Interface refinement – The Phase 1 team will produce a graphical user interface for the systems in the lab. The Phase 2 team will integrate the standalone power system management capability into the main lab GUI monitoring system.
- It will not be possible to build prototypes for all of the design variants, so the team will agree with the Supporter what part of the design can be prototyped in the second semester.

**Disposition of Deliverables at the End of the Project:**

- At the end of program, the product and all created work, including design documents, reports, prototype, electronic files, CAD, etc. should be turned over to Supporter.
- Reference list of all articles, books, and other resources used in production of prototype. (Include electronic copies if possible.)

**List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):**

- Interest in sustainable technology to facilitate fair trade.