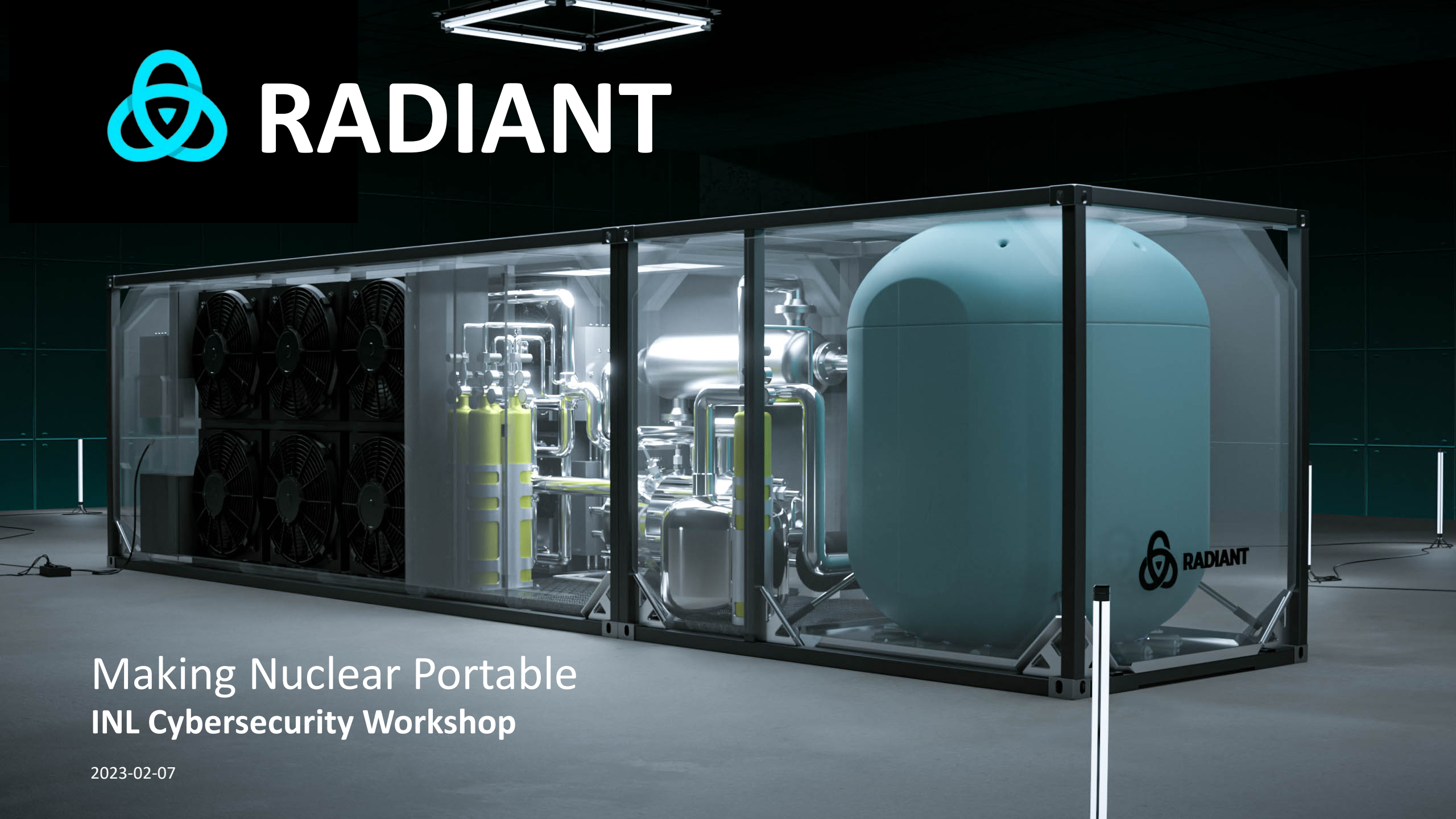


Making Nuclear Portable

INL Cybersecurity Workshop

2023-02-07

Speaker Introductions

Roger Chin

- 2 years Radiant
- 4 years SpaceX
- Prior work at Microsoft, Google
- B.S. BME, EE Duke
- M.Eng. EE Cornell

Bob Urberger

- Radiant Cofounder, CTO
- 6 years SpaceX
- Rocket Control Software Engr.
- B.S. Computer Engineering

KALEIDOS | Nuclear replaces diesel

1,000+ kWe

World's first portable microreactor

Powers microgrids, military bases, datacenters

Provides emergency relief to disaster zones

Zero waste

No permanent waste on-site

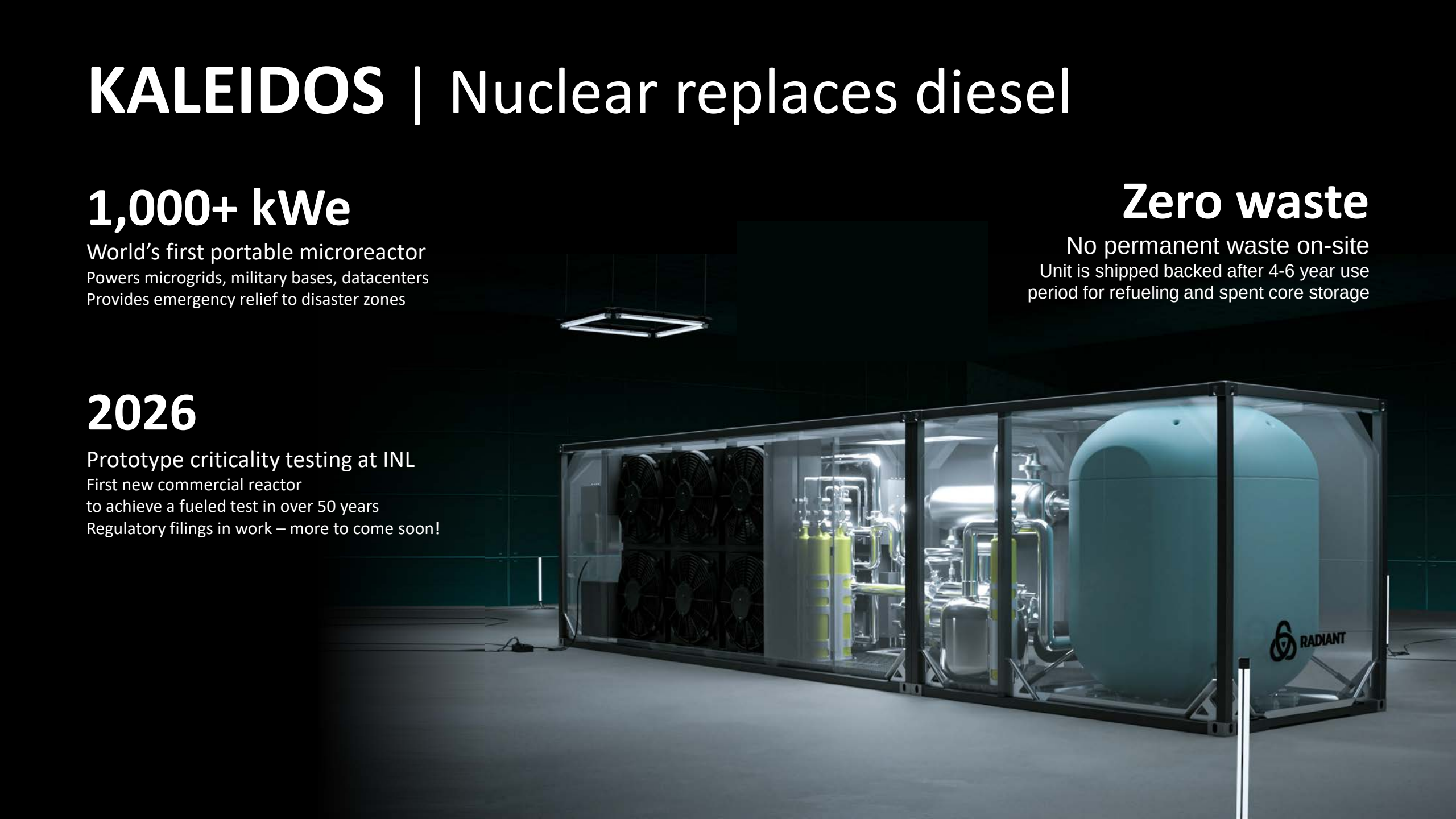
Unit is shipped backed after 4-6 year use period for refueling and spent core storage

2026

Prototype criticality testing at INL

First new commercial reactor to achieve a fueled test in over 50 years

Regulatory filings in work – more to come soon!



Full Autonomous Operation

- Kaleidos is designed for full autonomous operation.
- No onsite operator – targeting sites where on-site monitoring is impractical.
  - Rural communities, isolated communities
  - Electric vehicle charging stations
  - Disaster relief
- Fault-tolerant computing, redundant hardware, remote monitoring and commanding are required for success.
- Fleet monitoring via telemetry allows a centralized operator to handle multiple units.
- Remote shutdown capability for centralized operators.

Telemetry and Commanding

- Current design is to use a red-black network
- Encrypted fieldbuses are limited in selection
  - Not impossible, incurs extra cost, limits hardware flexibility.
  - Incurs extra complexity for crypto key management.
- Reactor computers run bare metal / RTOS.
  - Limited capability machines.
  - Not routable to / from internet.
- Gateway computer is a more standard server running a hardened OS.
- Gateway VPNs via Satellite, Cell, Point to Point microwave, etc.