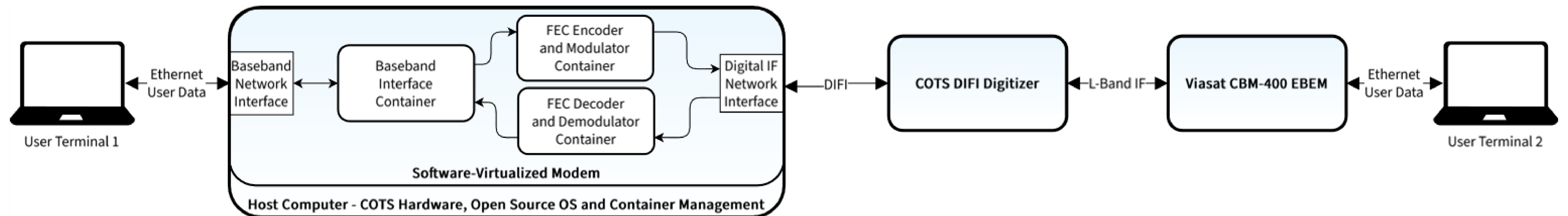


## Software-Based Modem Virtualization with DIFI

Demonstrating a Full-Duplex Virtualized Modem with Digital IF on COTS Hardware

Zach Amodeo, Gabriel Olariu, Doug Wilson

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### Demonstration

- CPU-based, virtualized EBEM modem, running on enterprise COTS hardware, performing all transmit and receive operations
- User data packetization and depacketization
- Forward Error Correction (FEC) codec
- Symbol generation and waveform framing
- Modulation, demodulation, and acquisition
- DIFI packetization and depacketization

### Impact Potential

- Allows DoD to focus on the warfighter, rather than hardware obsolescence, management, and sustainment
- Waveforms could be sold as a software license to run on generic COTS hardware
- Resiliency through DIF failover and ability to physically separate cloud modem from emitting agent by large distances
- Modular software increases the flexibility of systems to reduce the overall SWAP of systems
- Software operation in containers enables platform flexibility and isolation of data

### Lessons Learned

- Virtualized modems capabilities are highly scalable based on available processor resources
- Hardware acceleration (FPGA, GPU, ASIC) is still valuable for extreme data rates or large bandwidth signals and low SWAP
- DIFI v1.2 flow control will benefit mixed software/hardware systems with different buffering methods.

### Server Specifications

- Intel Xeon E-2488CPU @ 3.2 GHz (2023)
- 64 GB RAM
- Rocky Linux

### Applications

Various platforms due to software-based design:

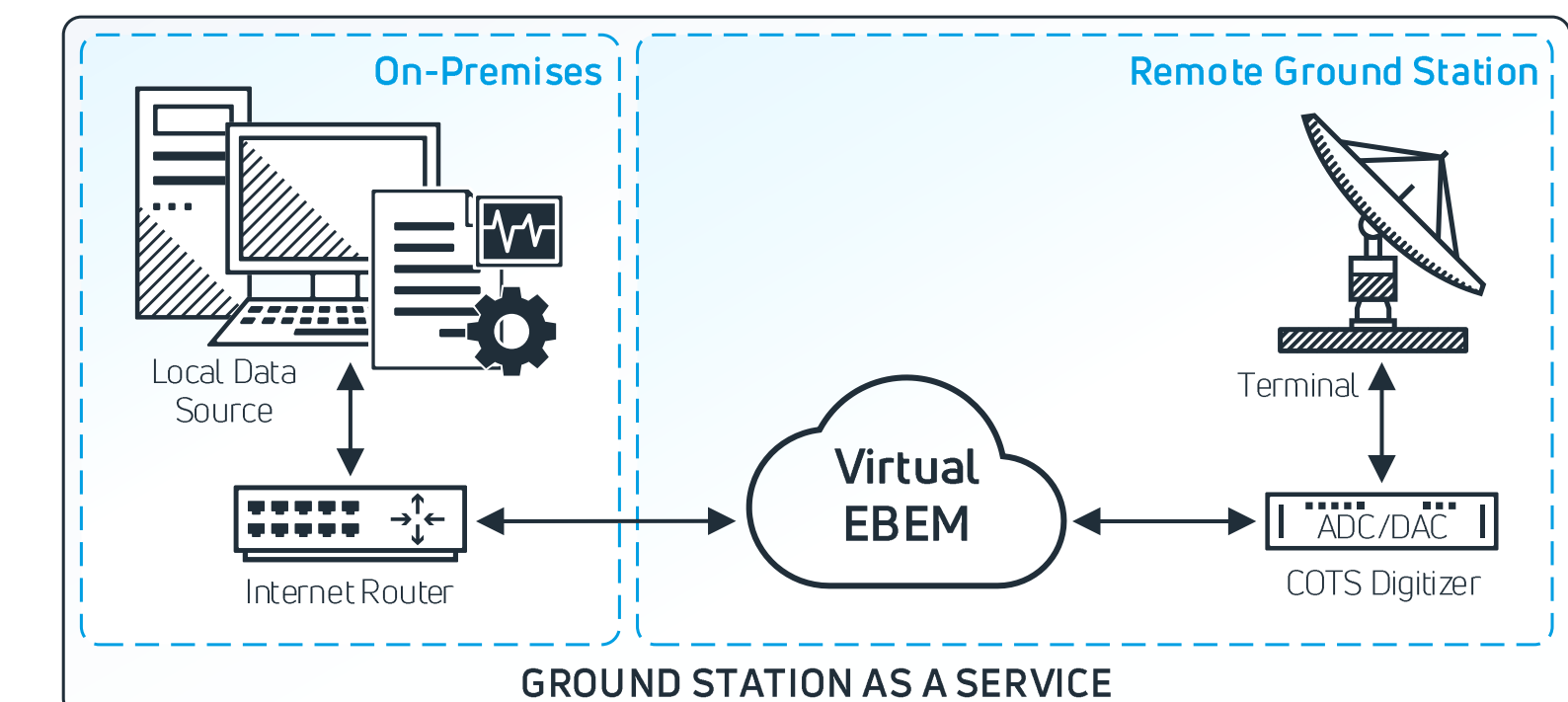
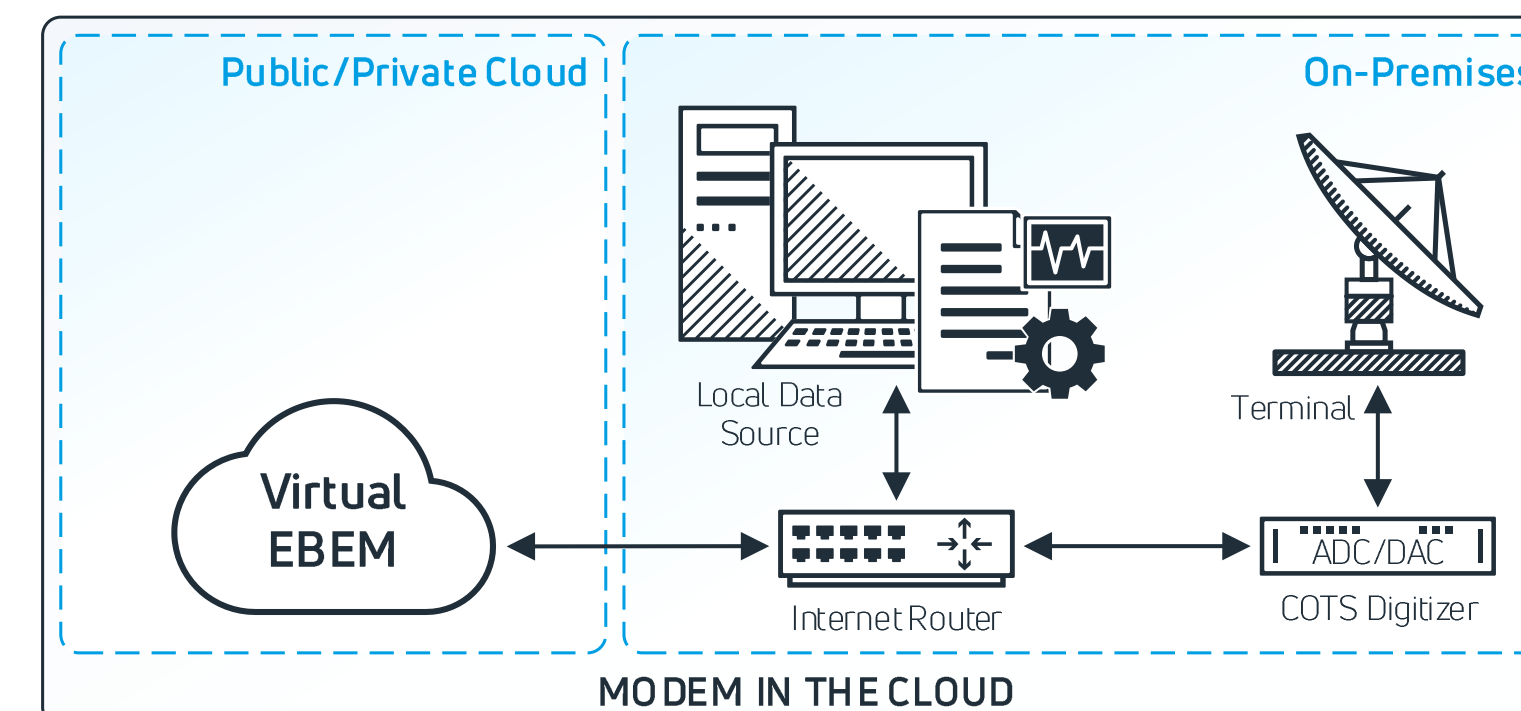
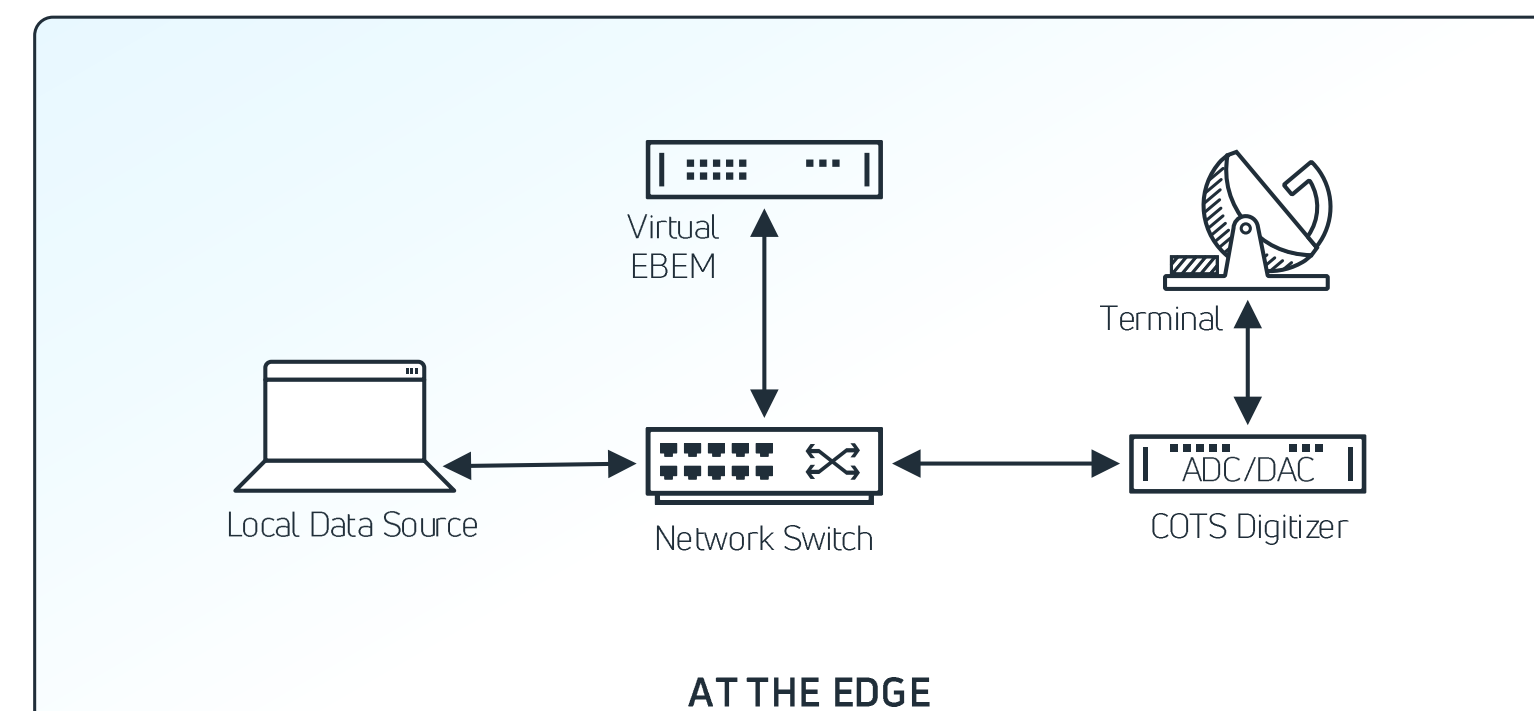
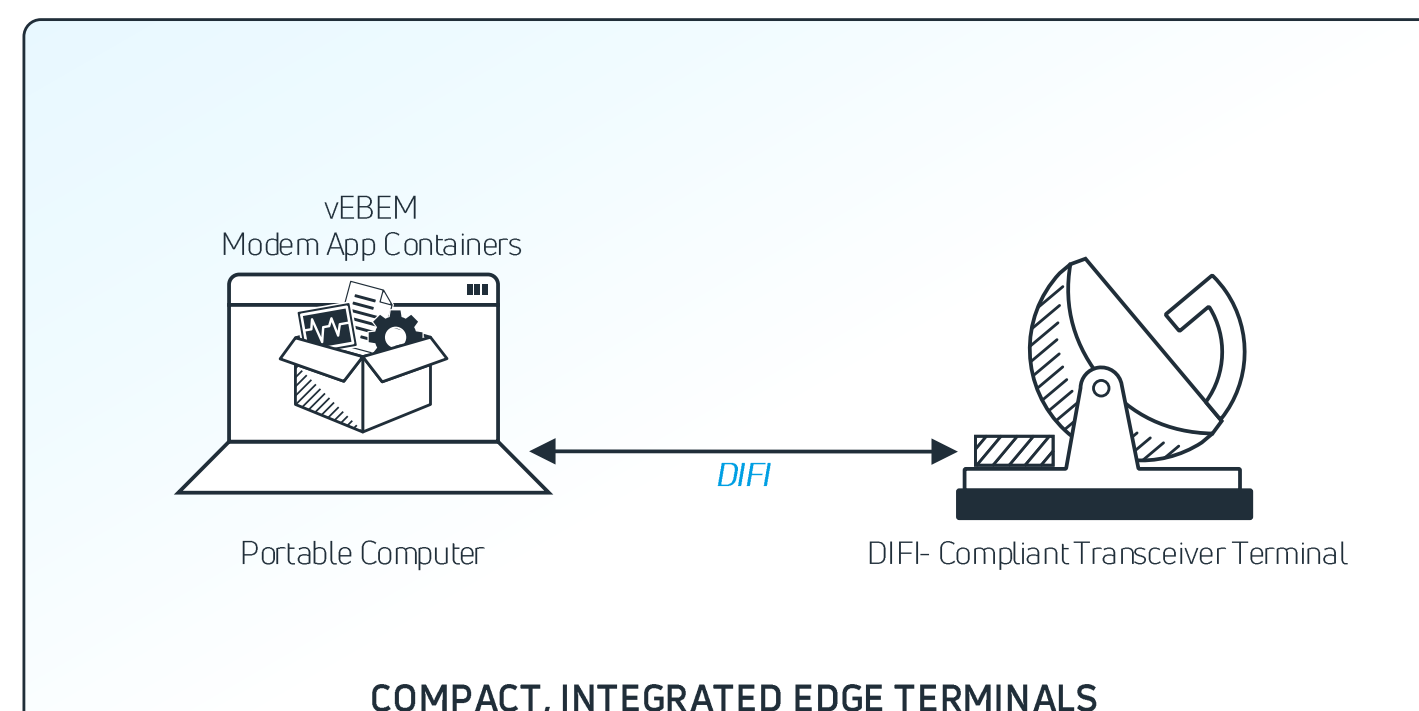
- Low data rate compact terminals
- Moderate performance edge terminals
- High performance, scalable cloud modems

### Future Development

- Software optimization for higher symbol rates
- Software TRANSEC

### Carrier Specifications

- 4.7 Msym/s, 9.4 Msamp/s
- 4.6 Mbps
- QPSK-1/2
- STANAG-4486 ed. 3 compliant



Flexibility for Portable Applications

Rapid Scalability for Teleport Applications