

# AMERGINT

## Cloud Ground Services

**GSAW**

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# Luis Rodriguez

Director, Advanced Development  
AMERGINT Technologies

# 70+

## National Programs

AMERGINT's solutions are comprised of applications that are built using small, atomic, TRL-9 ready components and combine to create signal and data transformations supporting over 70 national programs.



# How a Cloud Ground Service Works



Downlink

**Government**

- Tactical
- Mobile Vans
- Tanks

**Commercial**

- Global Comms
- Navigation
- Earth Observation

**GSaaS**      **Data Center**

The diagram shows a ground station antenna on the left and a server rack with a gear icon on the right, both within a blue-bordered box. A dashed arrow points from the satellite constellation down to the ground station, and another dashed arrow points from the ground station to the data center.

**AMERGINT**

# Cloud Ground Services Solve Problems



## Access

to satellite and space data via managed network of ground station antennas using marketplace software and data flows



## Immediate Availability

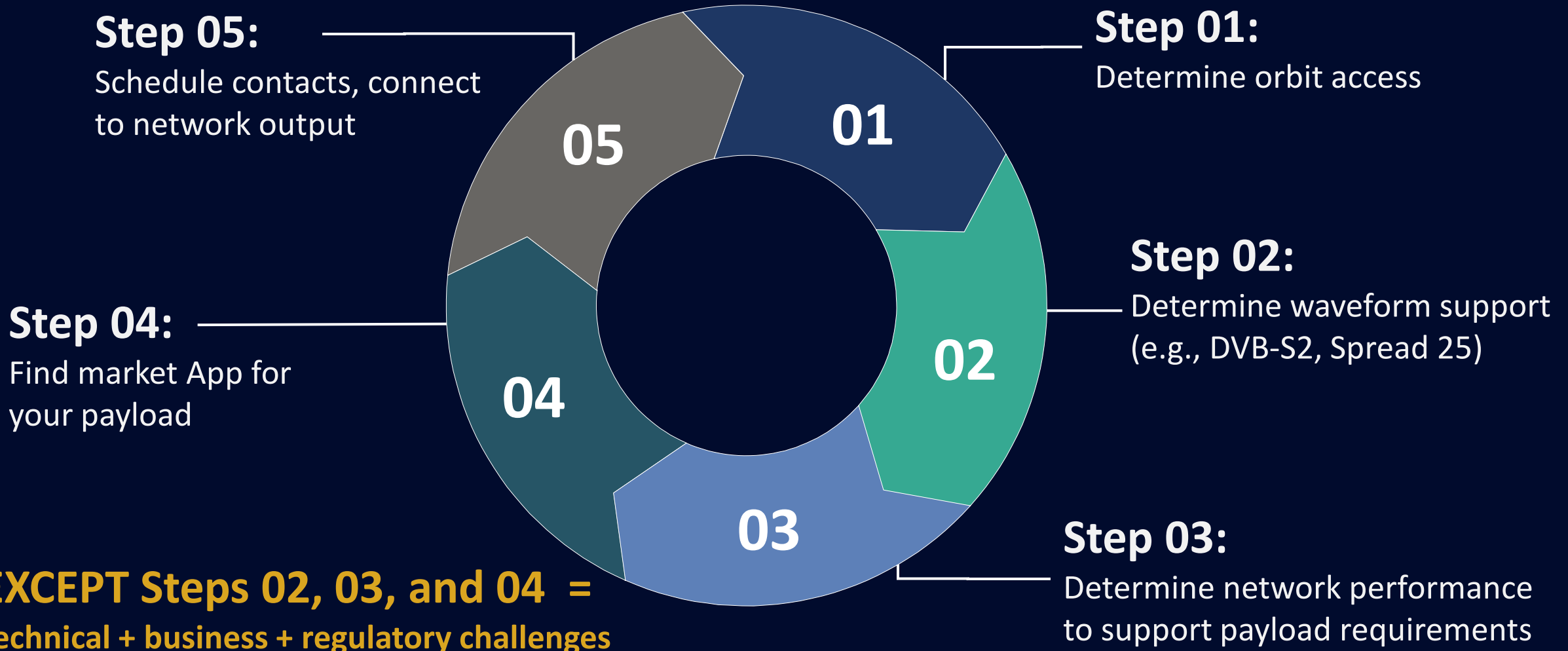
of data if your processing is already running on the associated cloud infrastructure



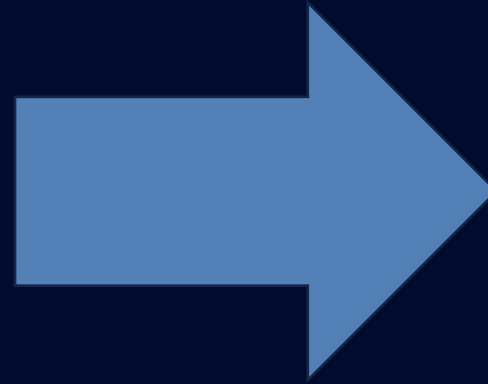
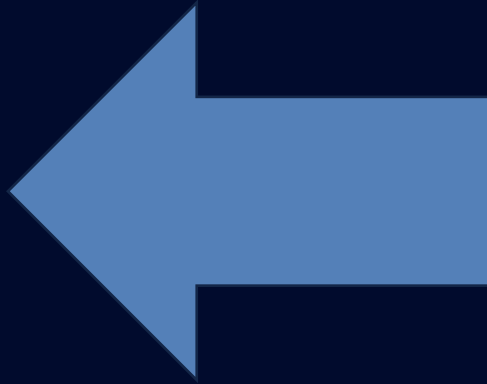
## Budget Constraints

by reducing or eliminating capital expenditures on ground system infrastructure

# Easy, Right?



# Technical Model Challenges



## Tradition Model was:

- Satellite provider provided performance requirements to vendor, often with data to validate and/or provided requirements for a test system. CLOSE partnership
- Vendor provided test systems and ground equipment that is validated ahead of mission and guaranteed to work.

## Cloud Model is now:

- Provide solution without knowing end user, absolute data requirements, scenarios, etc.
- Vendor modifies processing.

**Ques:** How do we deliver support for a payload processor we don't have? How do we test without a vehicle? Requirements are suggestions.



# Waveform Challenges

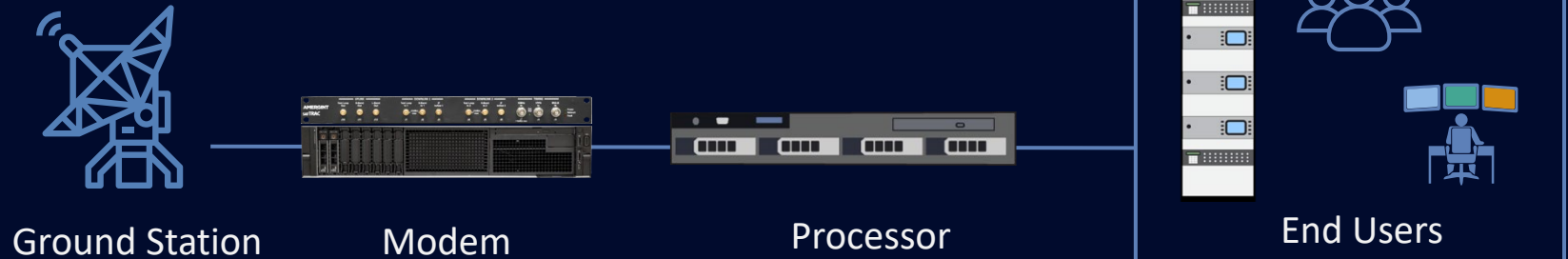
- Meeting waveform performance requirements
- Link acquisition challenges:
  - Doppler
  - SNR (Signal to Noise Ratio)
- Access to test data for validation
- Wideband waveforms require lots of network bandwidth and CPU



# Transport / Network Ingest Challenges

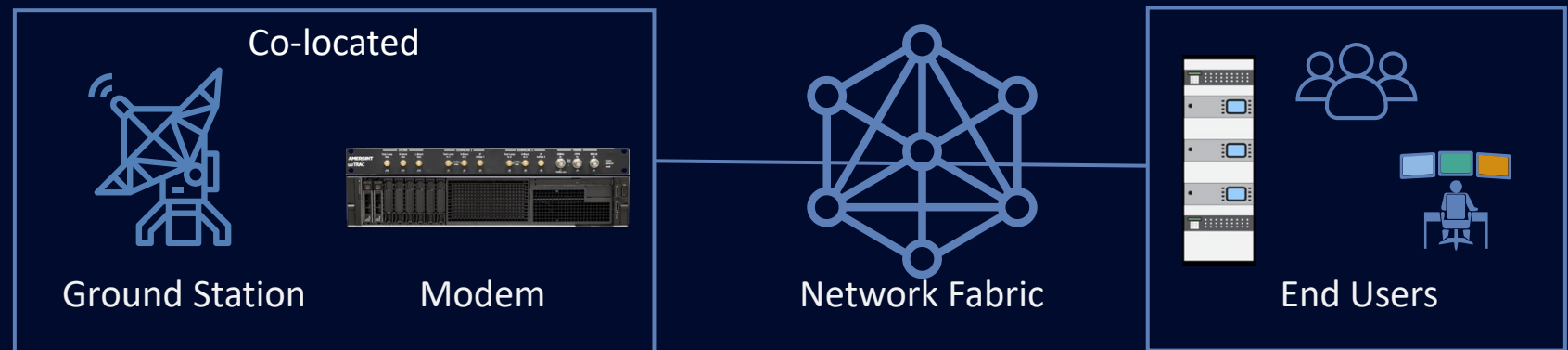
## Traditional

You own the network, characteristics, and decisions



## GSaaS

Non-deterministic. Cannot rely on standard network transport, like TCP/IP





## Other Network Challenges

- Cloud platforms are geared around providing IP connectivity between VMs
- Layer 2 access is difficult to impossible on the platform
- Exactly which virtual network adapter chosen has a big impact
- Highly configurable monolithic systems
  - Parameterized function selections: Packet, frame, symbol, sample handling
- New or changing requirements add complexity
- Every new feature adds complexity and risk

**Taken together these multiply out badly**



# End User Challenges

- We create a marketplace offering without knowing or understanding the end user
- Each end user has unique requirements and business needs
- End users don't care about the onboarding process, they just want their data (value = communications, maps, weather updates, etc.)
- Options multiply out badly





## Business Model Challenges

- Onboarding is difficult
- How do you find the correct marketplace processing offering?
- Creating marketplace offerings
- Uploading VMI with correct characteristics to the marketplace
- Protecting IP in marketplace apps
- How do vendors turn the offering into value for their business

# How We Mitigate

## Collaborate

- We work closely with cloud provider to integrate guaranteed delivery network solutions

## Test and validate

- We deploy to wide range of compute instances
- We characterize behavior and network performance

## Advise cloud provider and end user

- We identify minimum compute required to complete mission (because every min = \$)
- We get all the necessary data out of each pass



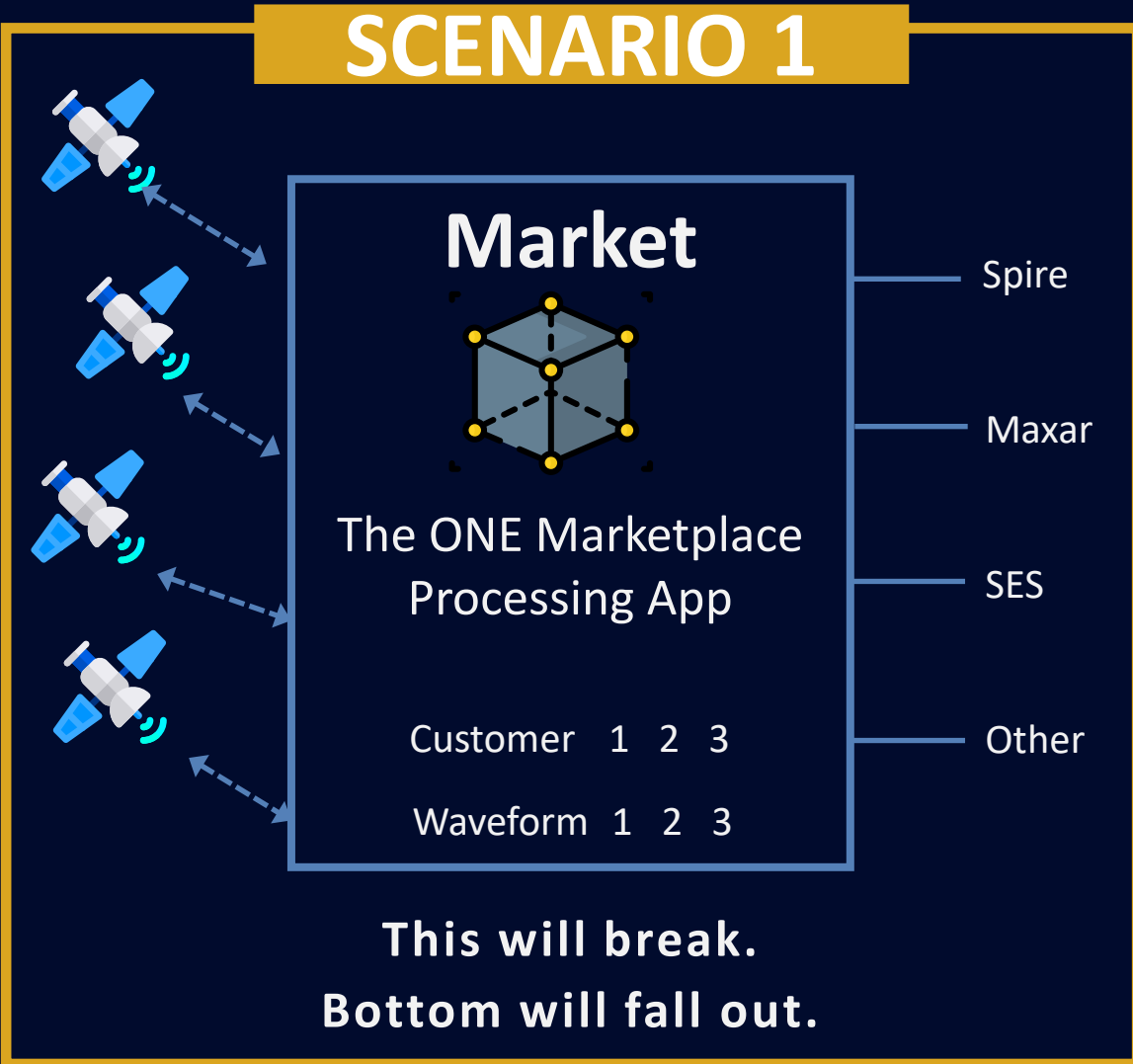


# Technologies That Help

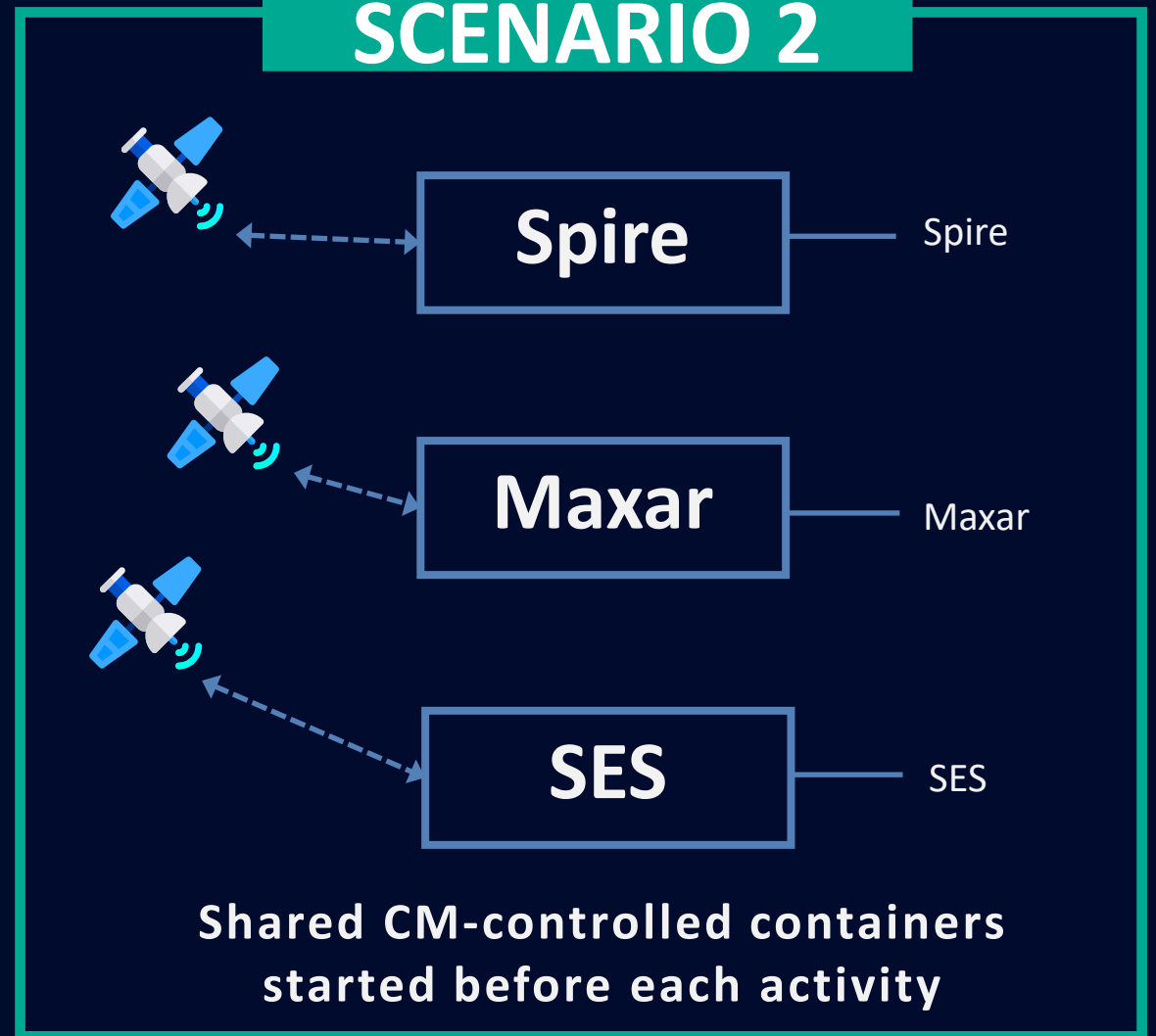
- **Standard waveforms help** (e.g., DVB-S2)
- **FEC transport technologies** allow flexibility in network configuration and leverages lossy network fabric
- **DPDK** can help
- **Containers and K8S** allow flexibility in configuration as well as processing topologies

# Containers Can Help

## SCENARIO 1



## SCENARIO 2





Questions?





### Phone Numbers

719-522-2800 phone  
719-522-2810 fax



### Email

info@amergint.com  
support@amergint.com



### Offices

2315 Briargate Parkway, Suite 100  
Colorado Springs, CO 80920  
  
11101 West 120th Avenue, Suite 220  
Broomfield, CO 80021



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facebook.com/AMERGINT/  
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