

**RT LOGIC**

A **KRATOS** Company

# **Creating an IP Router for Space to Ground Communications**

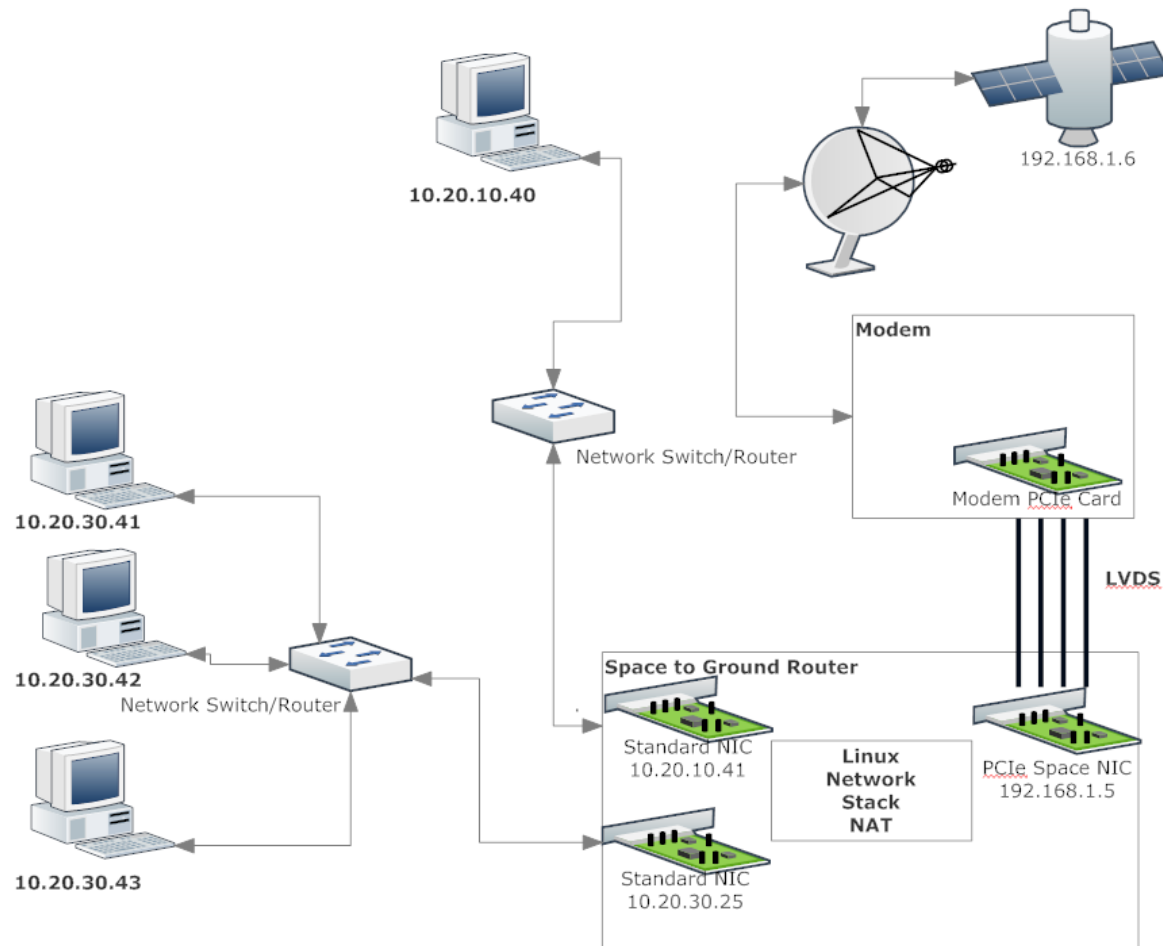
David Rolenc

# Ground System Complexity

---

- Racks of equipment
  - Proprietary and custom data formats
  - Integration of many systems just for communications
  - Long development/test time
-

# The Space Router



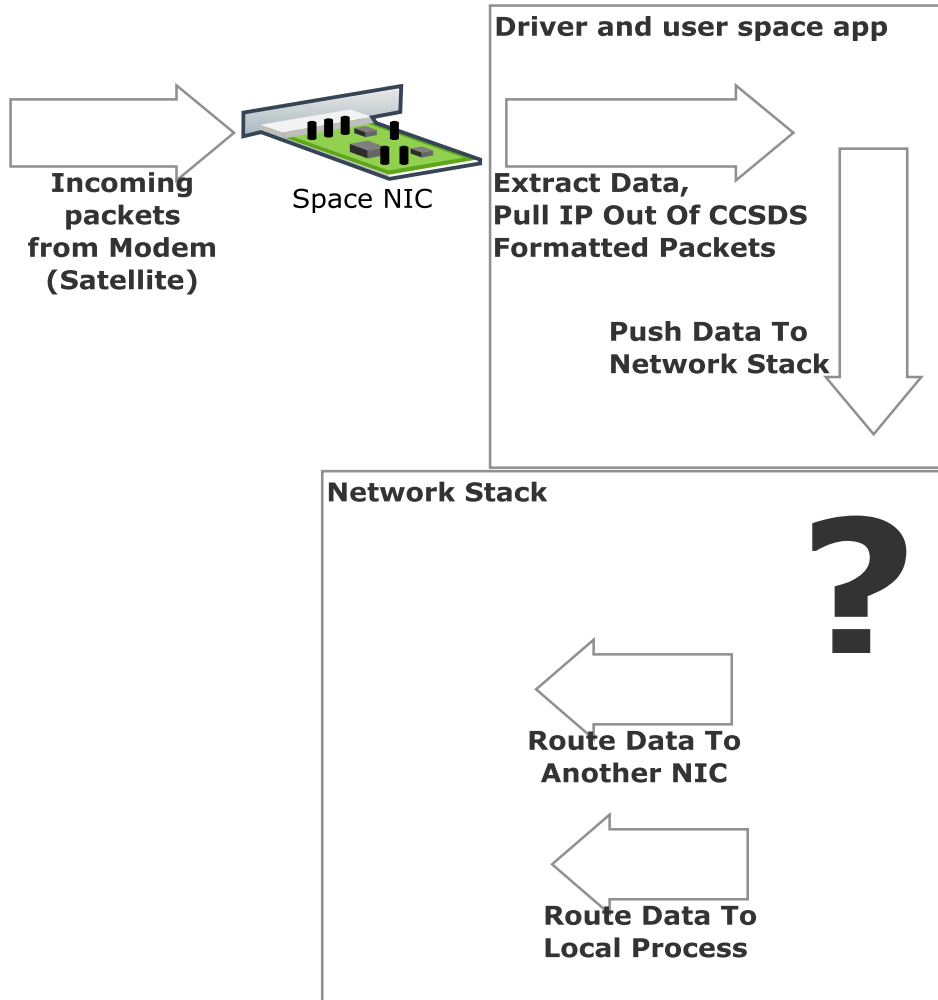
# CCSDS Standards

---

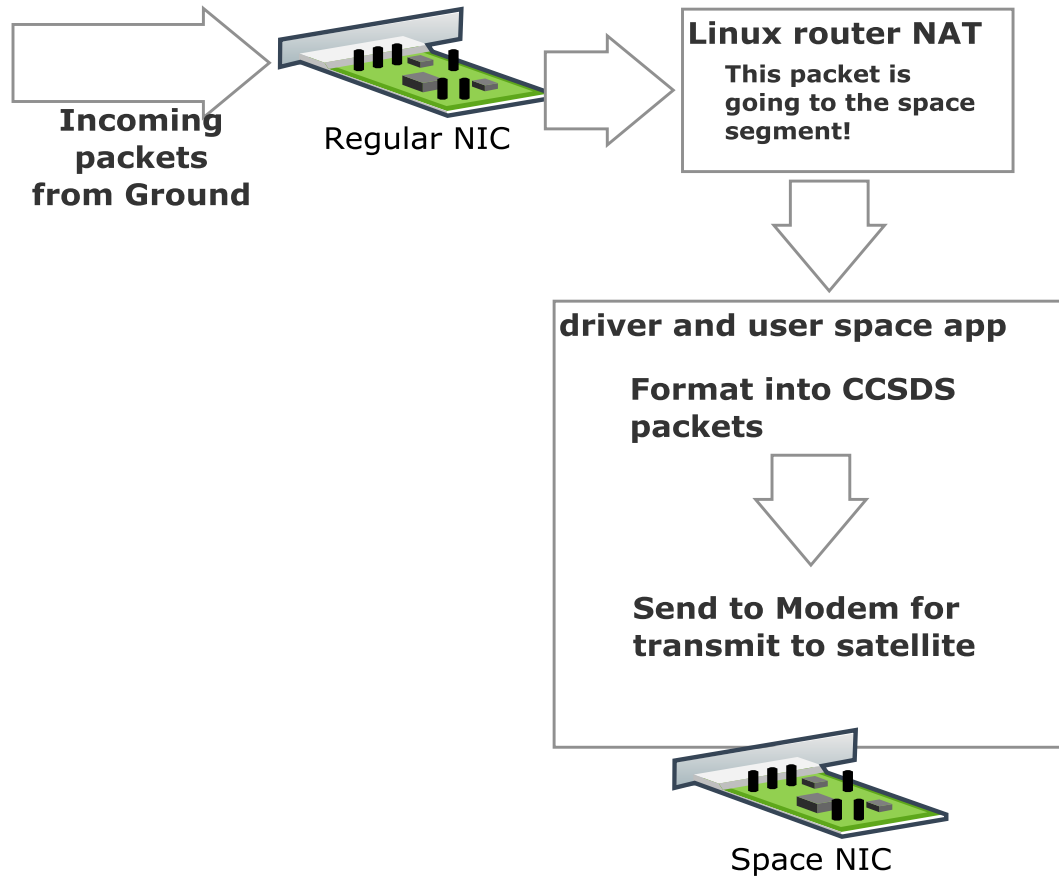
<b>CCSDS Standard</b>	<b>Title</b>
702.1-B-1	IP Over CCSDS Space Links
131.0-B-2	TM Synchronization and Channel Coding
732.0-B-2	AOS Space Data Link Protocol
231.0-B-2	TC Synchronization and Channel Coding
232.0-B-2	TC Space Data Link Protocol
132.0-B-1	TM Space Data Link Protocol

---

# Packets from Satellite



# Packets from Ground



# Some Considerations...

---

- Encryption
  - Packet Loss
    - Forward Error Correction
    - TCP/IP vs UDP vs Other
  - TCP/IP Congestion Avoidance
  - Nagle Algorithm
  - Delayed Acks
-

# Benefits

---

- Ease of integration
  - Fast development time
  - Ease of test
  - Ease of update
  - Availability of resources
-