

# Supporting Agile Space Operations with a Cloud Based Solution

New Space is Agile



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GSAW 2024, Los Angeles, February 26-29, 2024

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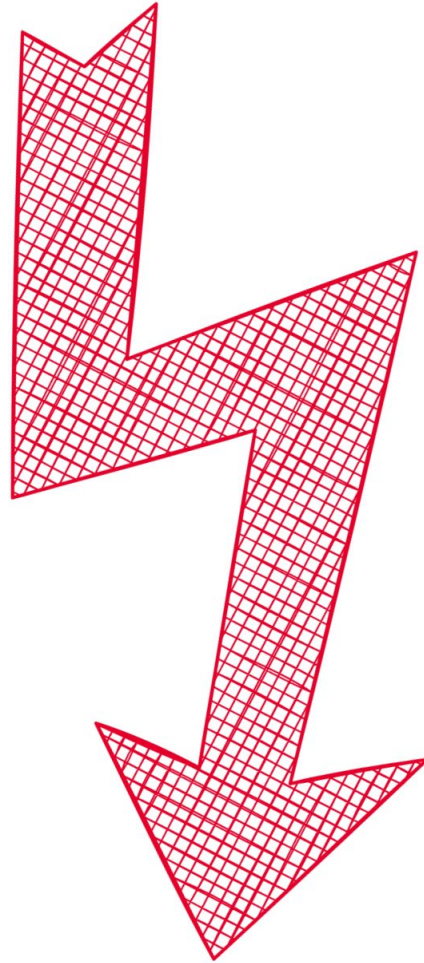
# Overview

- Agile Mission Preparation and Operations
- The Mission Model
- A Simplified System Overview
- System Security
- Independent Microservices
- Simple Scaling
- User Configurable Processing



# Enabling Agility in the Face of Hard Facts

- Working Agile
  - Achieve the best possible solution given time and budget
  - Ongoing (re-)assessment
    - “best possible”
    - priorities
  - Close contact to user/customer



- Non-Negotiable Hard Facts
  - You need to achieve a certain minimum viable solution
  - Think: you make the launch date or you don't
  - Think: you either support the necessary protocols for a spacecraft or you don't

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# Agile Mission Preparation and Operations

## Supplier

- Deliver base product
- Mission specific features
  - Custom protocols, features
  - Integration with other facilities
    - payload processing
    - service request processing
  - Implement, test, repeat

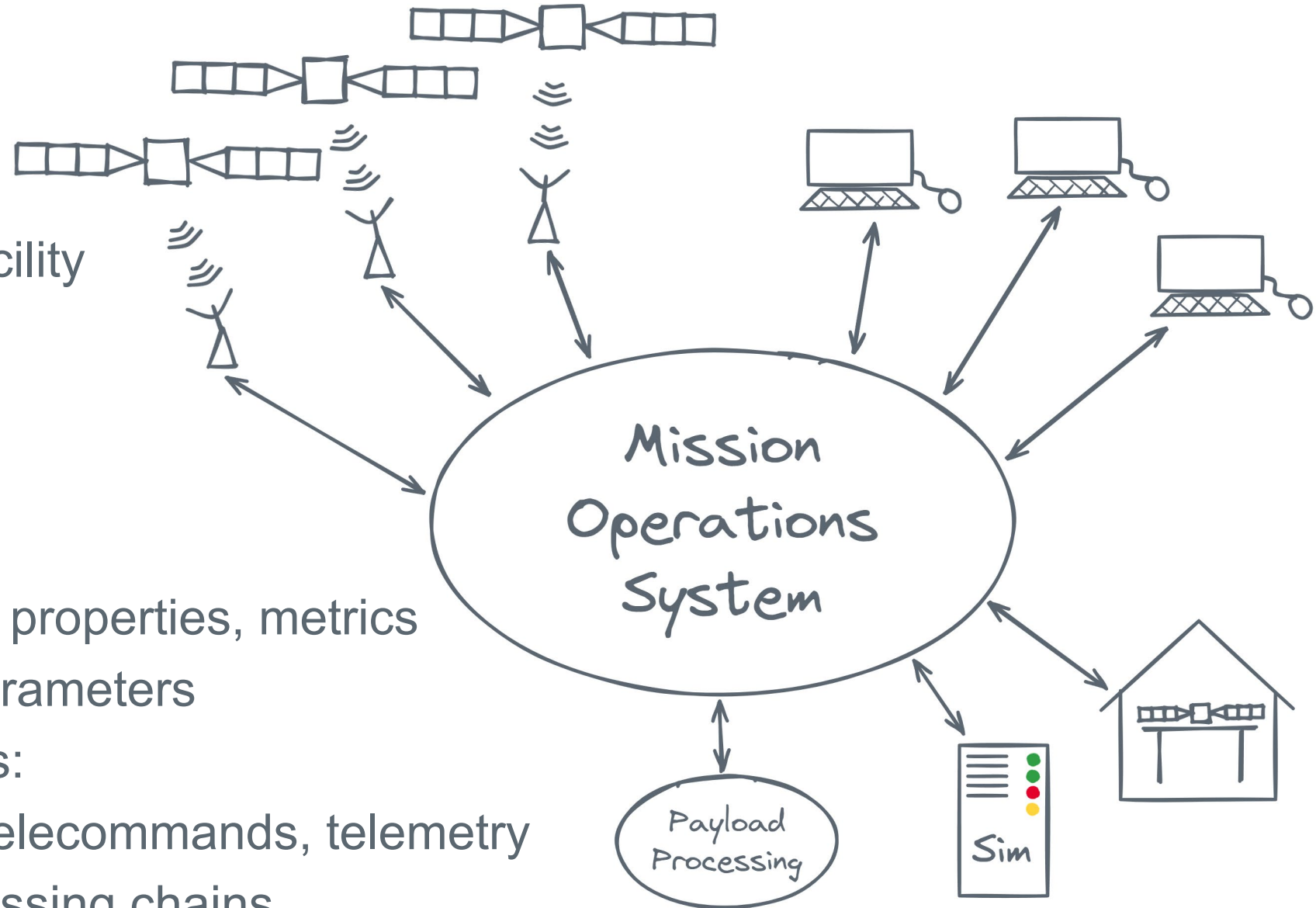
## Customer

- Production, configuration, integration, test, validation
- Mission assets and facilities
  - hardware (spacecraft, engineering models)
  - flight software (e.g. flat-sat)
  - payload processing
- Mission operations system
  - configuration



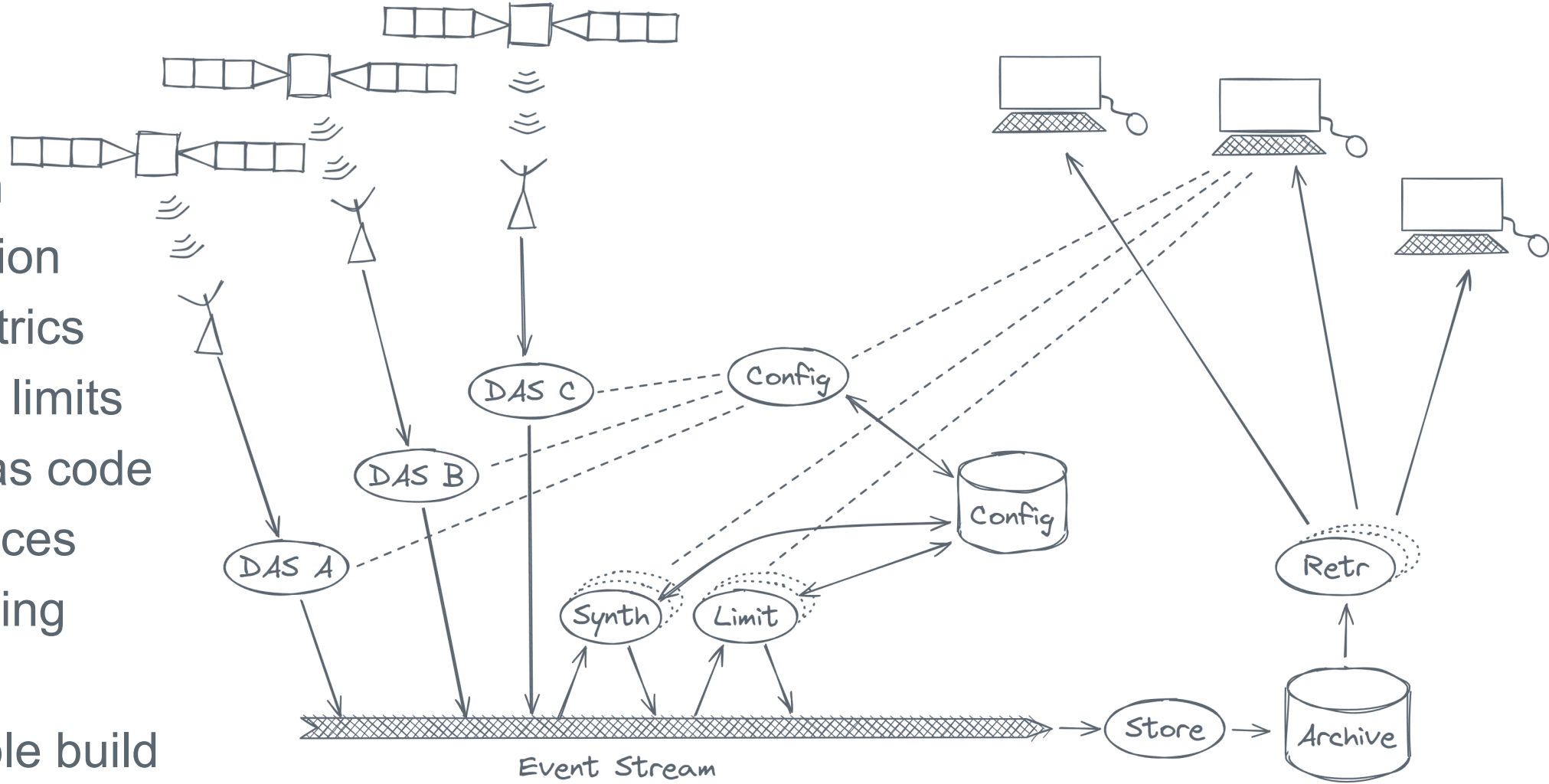
# The Mission Model

- Mission – multiple assets
  - Spacecraft
  - Payload Processing Facility
  - Simulators
  - Engineering Models
- Asset
  - Structural Aspects:
    - Component hierarchy, properties, metrics
    - Commands: name, parameters
  - Communication Aspects:
    - Data unit definitions: telecommands, telemetry
    - Configuration of processing chains



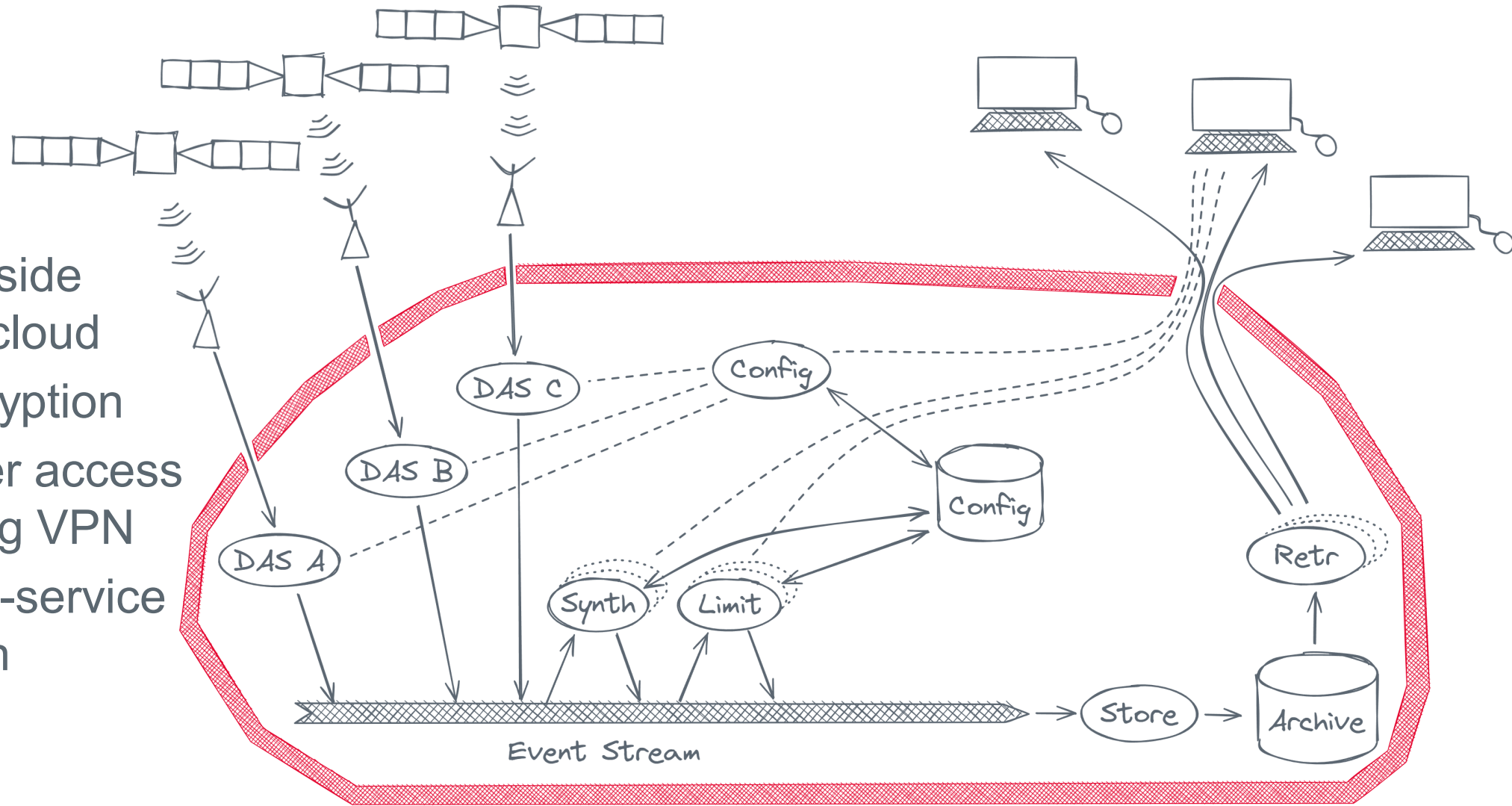
# A Simplified System Overview

- Microservices
  - Configuration
  - Data acquisition
  - Synthetic metrics
  - Check metric limits
- Infrastructure as code
- Managed services
  - Event streaming
  - Archive
- Fast and reliable build and deployment



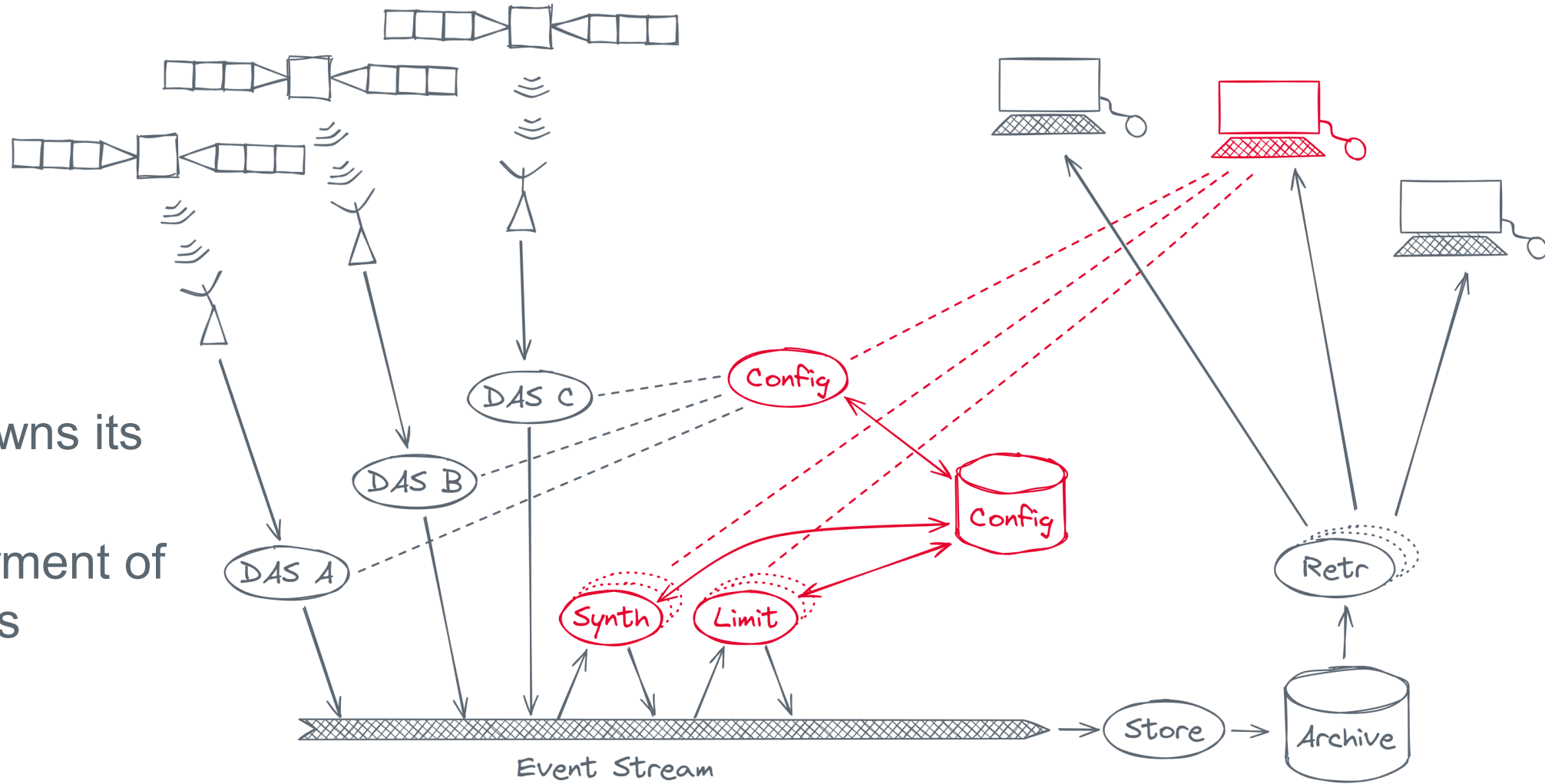
# Security

- Deployment inside virtual private cloud
- Transport encryption
- Possible further access restriction using VPN
- Zero trust inter-service communication



# Independent Microservices

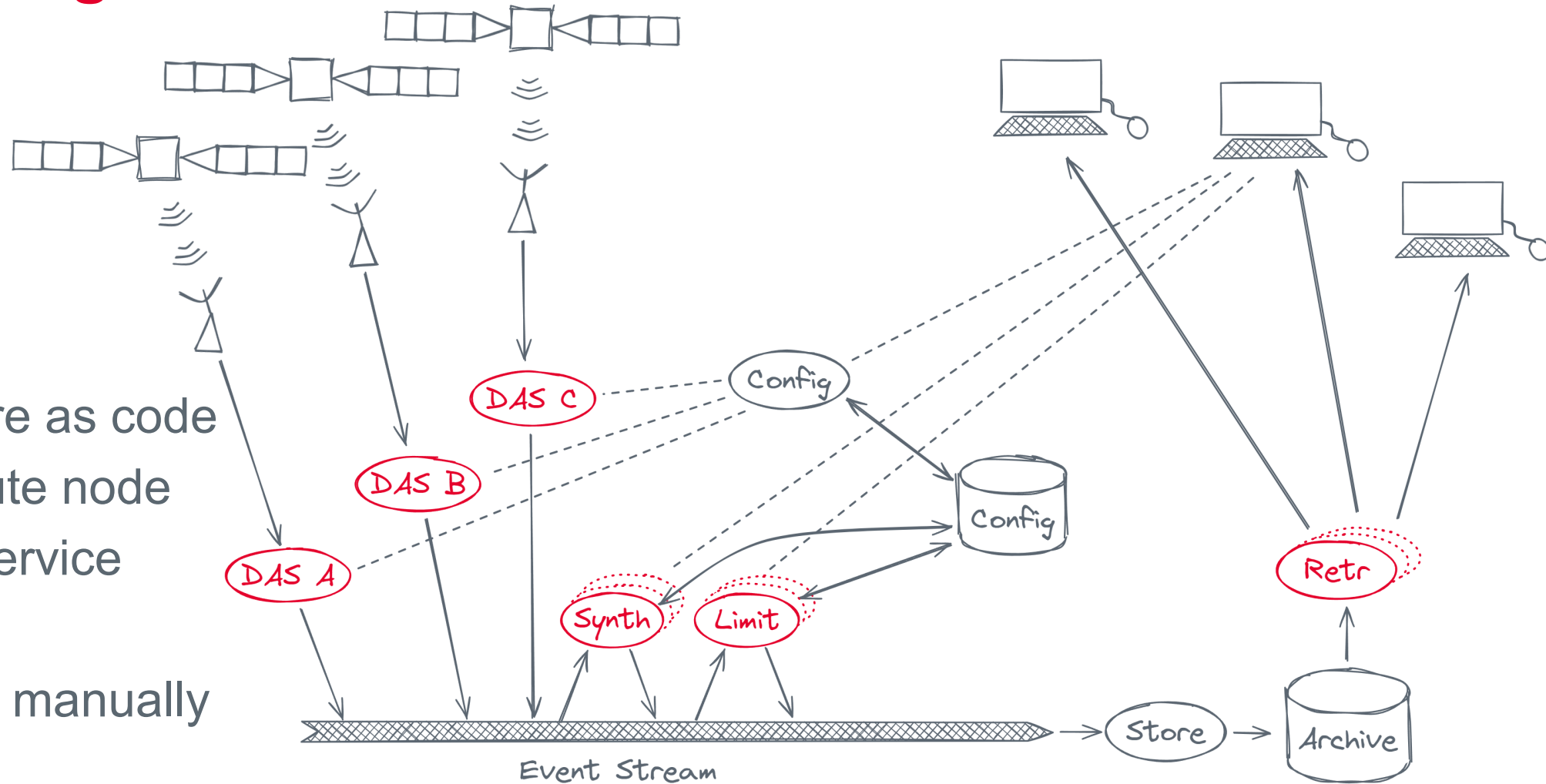
- Low coupling
- Microservice owns its configuration
- Simpler deployment of service updates





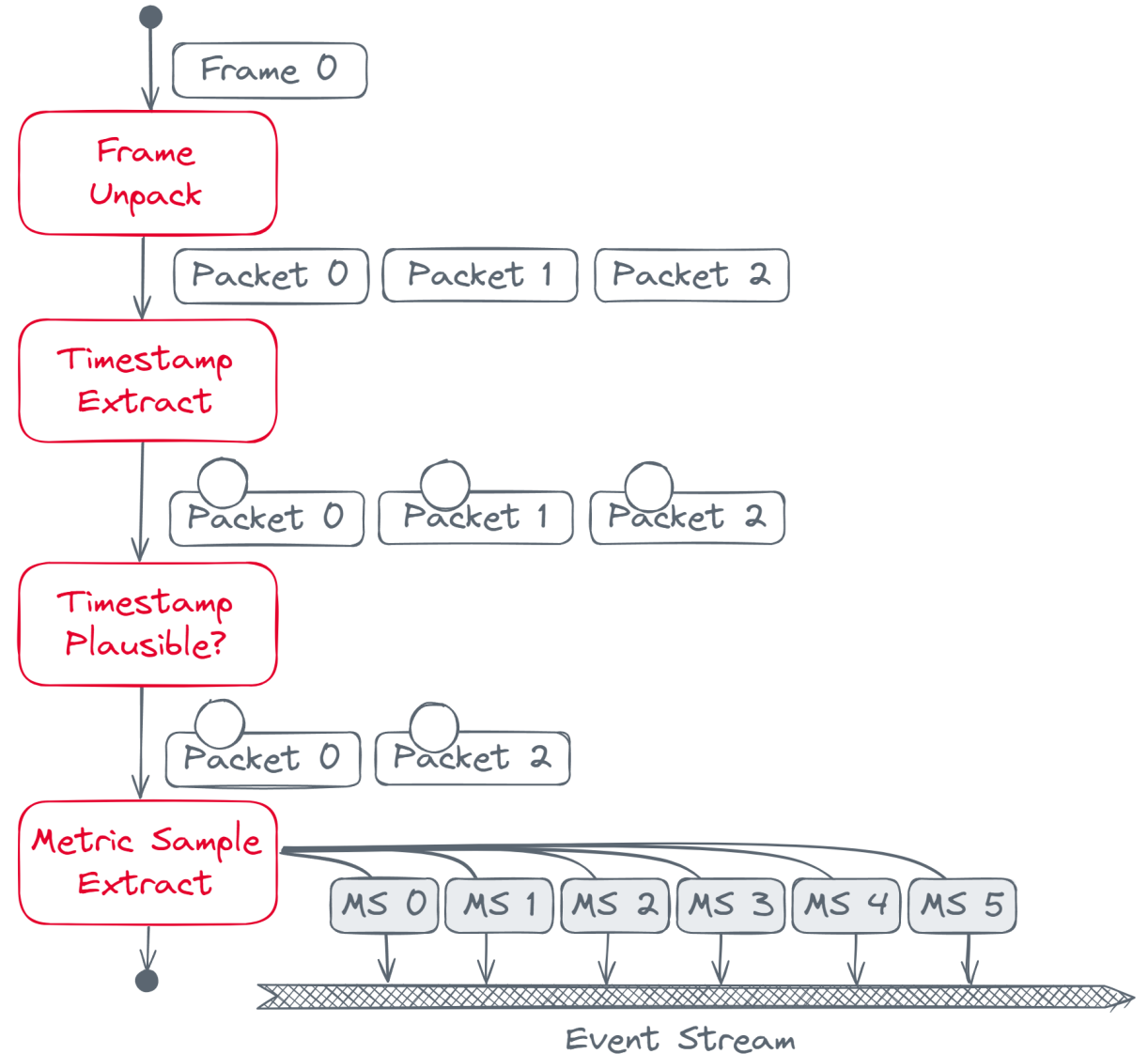
# Simple Scaling

- Per asset
  - Configure
  - Activate
    - Infrastructure as code
    - Start compute node
    - Run microservice
- Other services
  - Auto-scale or manually adapt to load
- Simple horizontal scaling



# User Configurable Processing: Data Acquisition Service

- Per asset
- Modular processing pipelines
- Configurable processing stages (plugins)
- Design for flexibility
- Extendible, examples:
  - Decryption
  - Data forwarding
  - Higher Level Protocols (CFDP, ...)



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# Integration with Payload Processing Facilities

- Monitor and control the facility:
  - Model the processing facility as an asset
  - Receive facility telemetry
  - Control the facility via facility telecommands
- Data feed:
  - Identify and forward payload telemetry to facility (custom DAS processing plugin)
  - Forward information received from facility to spacecraft



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# Summary

- Agile mission preparation and operations
- Mission operations system and the mission model
- Simplified system overview and analysis
- Microservices, scalability, modularity, user configurability
- How cloud computing helps





THANK YOU  
FOR YOUR ATTENTION

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