VideoFlow

THE NATIONAL ACADEMY OF TELEVISION ARTS & SCIENCES
2018 WINNER

Broadcast With CONFIDENCE.

Hybrid Satellite/IP Networks

A New Hybrid SAT/IP for Seamless Interference Recovery

VSF
VIDEO SERVICES FORUM

Presentation for Video Services Forum
VidTrans 2021

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About VideoFlow

- R&D team comprised of Broadcast and IT specialists
- Major technology contributor to VSF and RIST
- 5 Patents in Advanced IP delivery
- 3 new pending patents in Hybrid Sat

VSF VIDEO SERVICES FORUM

RIST RELIABLE INTERNET STREAM TRANSPORT MEMBER

RIST Forum

SMPTE

ATSC

iabm

Innovation Nonstop

Predicting customer needs years ahead

Matching IP network capabilities to broadcast requirements

Innovation in the fields of:

TSovIP De jitter

Error recovery and Bonding

Adaptive streaming

Optimized multicast error recovery

Hybrid Sat/IP

MEC

Satellite Service Challenges

Ground Station interference challenges

- 5G and C-Band co existence
  - No Federal oversite of Cell tower installation (specially micro cells) location
- Filter selection
- Adjacent Satellite interference
- Uncontrolled Radio sources
  - Military Radar
  - FM transmitters
  - Jammers
- Weather conditions and Sun Spots
- Aging equipment
- Training and education

Video is More Sensitive than other traffic types

- Visual impairments
- Interrupted service

“Land mobile (not only 5G) interfering C-band satellites’ communication is known worldwide. The satellites, using C-band frequencies 3.7 to 4.2 GHz for their downlinks, need protection, or a second source for their signal.”

Dr. Haim Mazar, Vice Chairman, ITU-R SG5 (Terrestrial Services)

Solar Flares Activity Increases

This new sunspot activity could be a sign that the Sun is possibly revving up to the new cycle and has passed through minimum.

On May 29, at 3:24 a.m. EST, a relatively small M-class solar flare blazed from these sunspots. When intense enough — they can disturb the atmosphere in the layer where GPS and communications signals are.

NASA report May 29, 2020

Checkout RCN's Website

Sun outages occur every year, in Fall and Spring, and last approximately about a week each time. This Spring, sun outages are expected between March 3rd and March 12th 2020. The approximate times for signal loss will be between 10:30am and 5:30pm and last only a brief time – from 5 minutes to 45 minutes

During the sun outage, you may experience a pixelated picture, picture freezes, or audio distortions for a brief period of time.

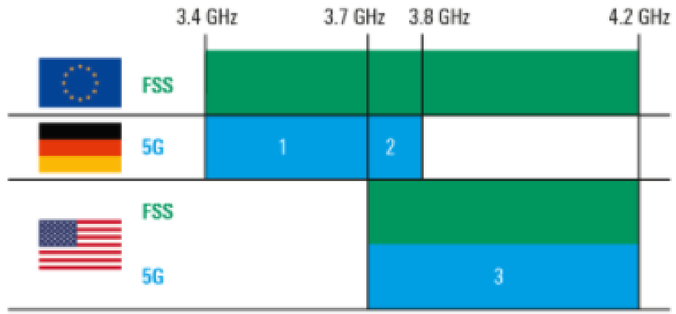
https://www.rcn.com/hub/customer-center/sun-outages/

5G Frequencies Interfere C-Band Satellites

Rohde & Schwarz take on the problem:

Background

The C band offers coverage of continental zones and is assigned to fixed satellite services (FSS). Frequency allocation for the downlink in the US is from 3.7 GHz to 4.2 GHz and in Europe from 3.4 GHz to 4.2 GHz. The C band is ideal for supporting telecommunications and broadcasting services in rural and marine areas, where a terrestrial infrastructure is sparse or does not exist. Another benefit of the C band is its low susceptibility to rain fade, which qualifies it for stable links in tropical areas. Additionally, services in the C band are essential in emergencies and in disaster recovery. However, sharing the same frequency spectrum (see Figure 1) with other parties implies interference (see Figure 2) to existing services. In the downlink, interference can drive the low noise blocks (LNB) into saturation. Filters cannot be applied in the existing receiving systems of fixed and mobile earth stations. The received signal, attenuated by traveling up to 36 000 km from a geostationary orbit to earth, is weak anyway and would no longer be detectable. While regulatory limits provide guidelines for planning a cellular network, they cannot ensure that waves do not radiate in a wider range than predicted.



1: Auction in spring 2019
2: Planned
3: Auction by the end of 2019

The allocation of frequencies is decided at national level. Therefore, state of the art is depicted for Germany and the US as examples. (GSA, 2019).

5G Frequencies Interfere C-Band Satellites

C-band 5G Interference Solution

The C-band 5G Interference Solution is Norsat's latest product offering for C-band operators that require 5G interference mitigation. With the onset of 5G, there is a need for specialized products to block or prevent interference from 5G base stations in proximity of C-band ground terminals. Norsat's solution comprises of interference suppression C-Band LNBs and specialized bandpass filters for effective satellite communication. Traditionally, C-band is used for satellite services, radar, and microwave links; however, with the terrestrial wireless industry's planned introduction of new mobile phone networks such as LTE, Wi-Max, and 5G, these C-band frequencies will now be shared amongst a wider range of services. The interference signals are powerful enough to saturate the sensitive C-band satellite receiving systems, causing a potential for total loss of service.

See : https://www.youtube.com/watch?v=UU2D6SpRiBg&t=49s

Why is 5G degrading my C Band Satellite reception?

The nature of terrestrial mobile services is such that their base stations transmit much higher power levels compared to signals received from satellites in geostationary orbit.

This means that despite 5G services being transmitted on slightly different frequencies to that of C Band, satellite services are severely degraded by the much greater signal level transmitted by 5G base stations due to signal overload. As an analogy, consider having a conversation with someone standing next to you at a music concert. It's difficult to hear them. In much the same way, C Band satellite reception equipment is simply overwhelmed by the noise and is driven into compression, degrading and denying the use of C Band for satellite services.

The impact of 5G is further compounded by its technology architecture that relies on deploying many base stations in order to concentrate coverage and ensure optimum 5G coverage in urban areas.

Adjacent Satellite Interference

Adjacent Satellite Interference (ASI)

As more satellites are launched, the slot spacing becomes more crowded with only 2 degrees of separation for many geostationary satellites. At the same time, the number of portable and mobile terminals is growing rapidly. These two conditions lead to an increase in adjacent satellite interference. Downlink ASI is caused when the earth station dish is able to see the signal from multiple satellites at the same time. This occurs when the satellite beam is poorly aligned to its target earth station or from side lobe beams transmitted from the satellite (see figure 14).

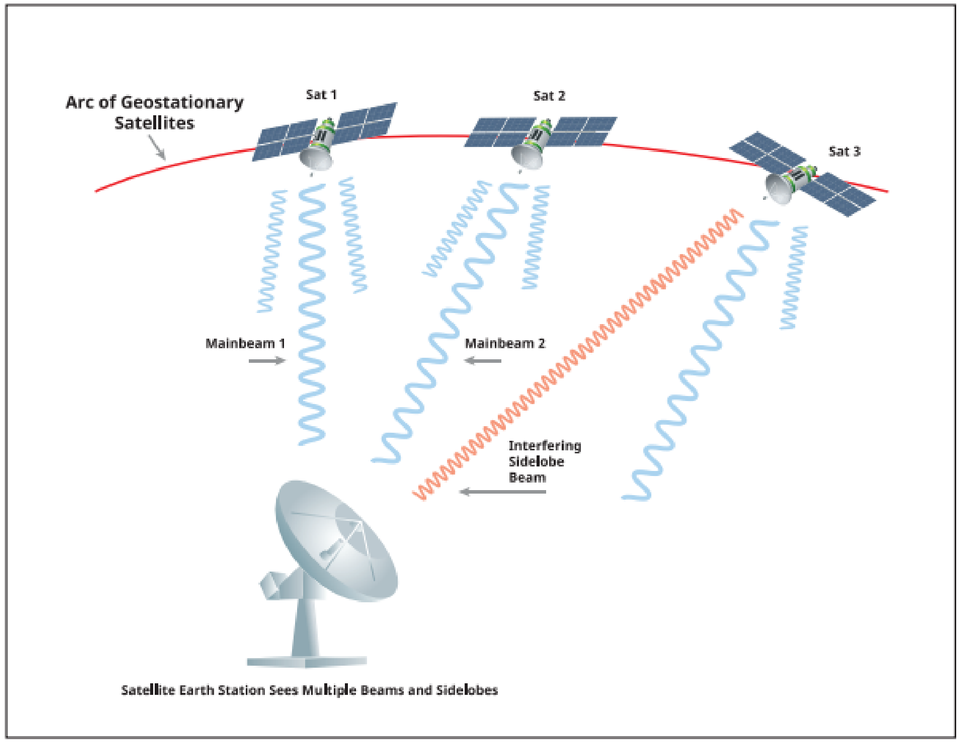


Figure 14. Adjacent Satellite Interferer

Source: Anrtisu: Resolving Interference Issues at Satellite Ground Stations application note

How To Resolve Satellite Interferences?

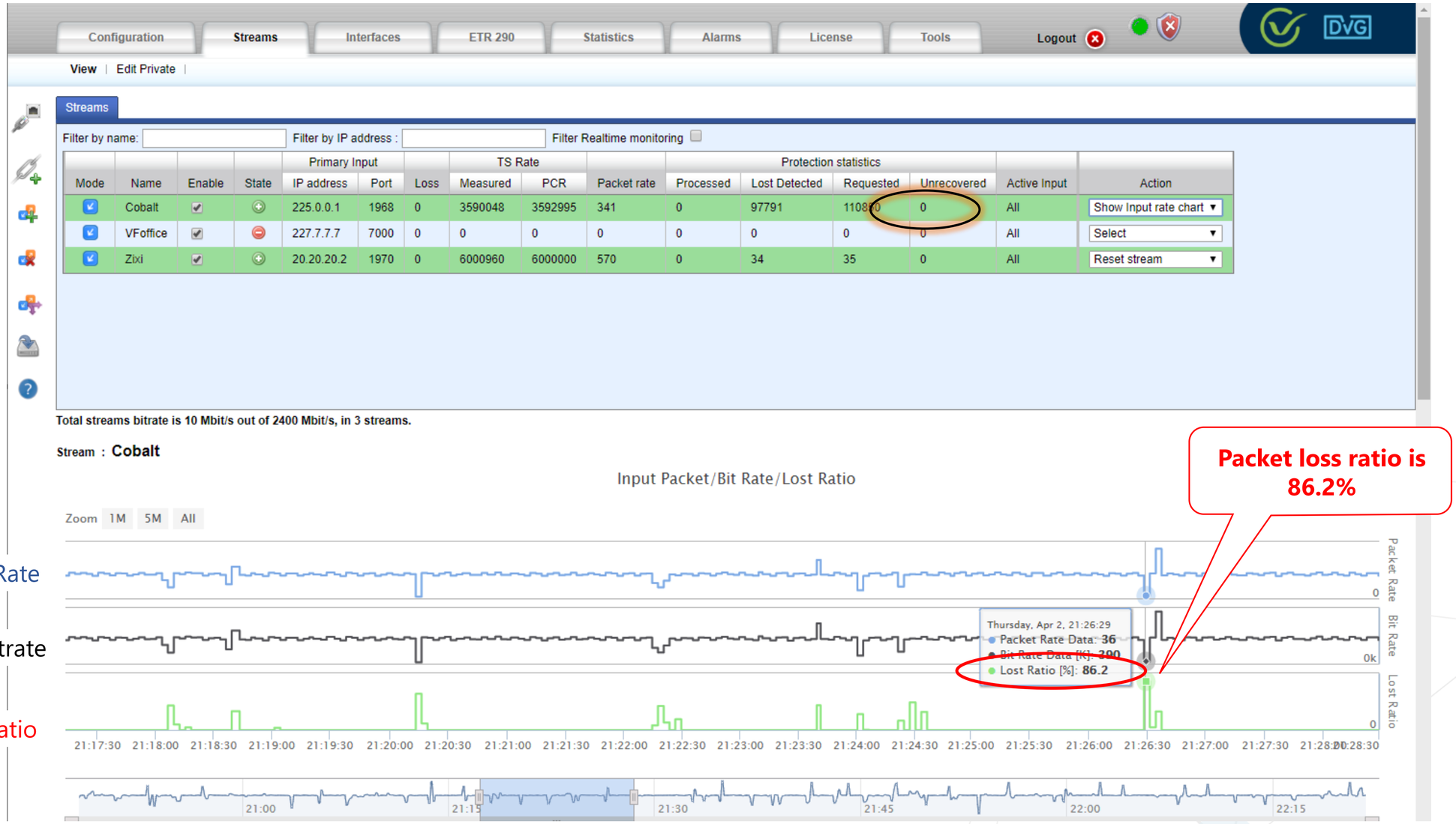
- Use backup link from another satellite
- Bundle geography separated earth stations
- Increase the transmission beam power
- Increase the diameter of earth stations dish
- Add filters against rouge frequencies
- Prevent 5G equipment near earth station
- Reduce the content or services
- Monitor nearby interference sources
- Add IP failover link
- Track and register interreferences

Augmenting Satellite Reliability with IP

- Use available IP connectivity to recover Satellite
  - Local fiber links
  - Broadband connectivity, if a land line is not available, perfect for rural
  - Low cost internet is cheap and affordable, download speed can accommodate high bit rate
  - Internet over cable/DSL/broadband is suitable for continuous operations
  - Perfect companion for non continuous recovery

Can I Trust IP Networks? Yes, You Can!

86% packets lost | 100% packets recovered | 100% packets received

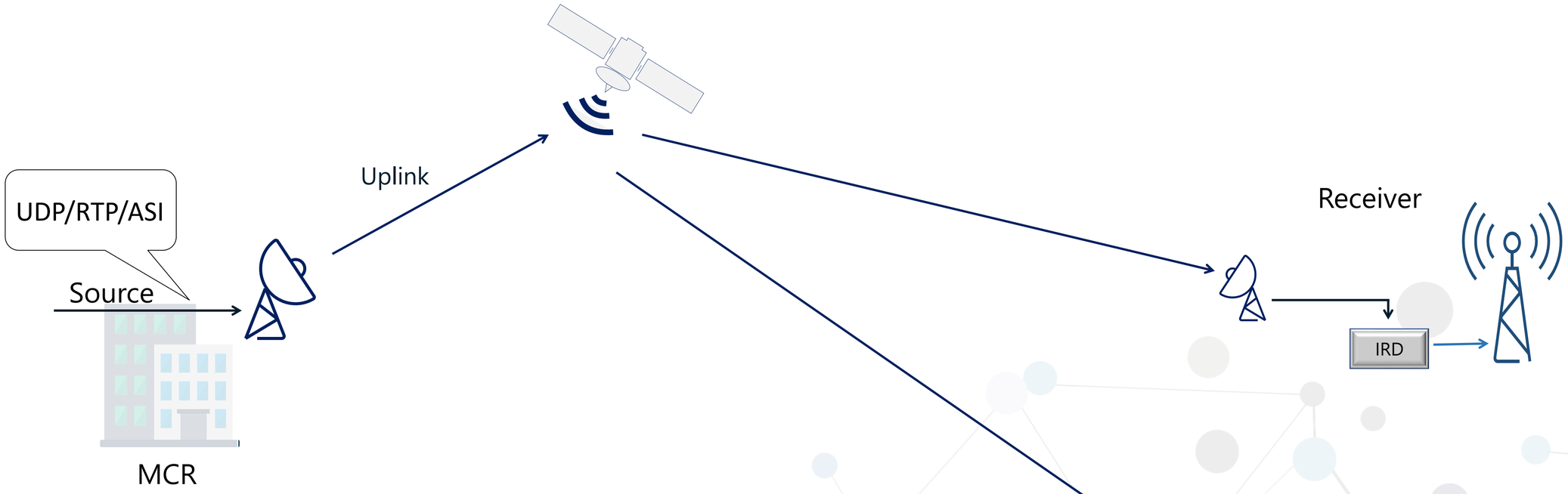


Increasing Transmission Reliability

- The satellite link is up but video quality is declining as a result of interferences
- VideoFlow's out-of-band **non-intrusive** packet recovery performs
  - Overcome adjacent and co-interferences
  - No additional bitrate overhead to the satellite link
  - Allows 10% packet error rate (PER) on the satellite receiver output
  - Recover **all** lost packets in the receiver via any IP network

Standard Satellite distribution

Most efforts are on the Uplink



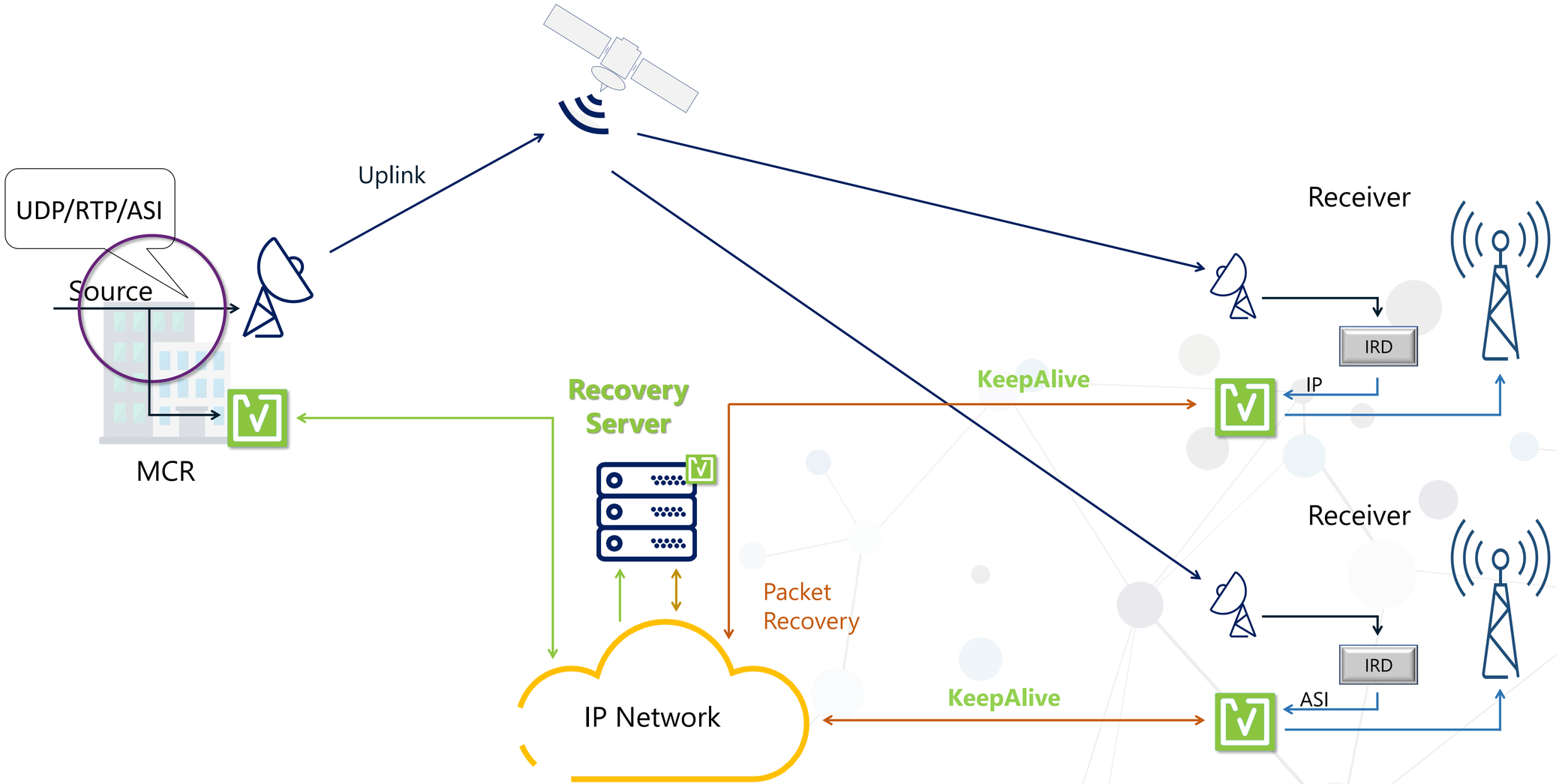
Add Network Elements

- Origin Device at the source
  - Sends the stream to the recovery server(s)
  - Secured tunnel connection
  - Reliable video delivery
- Recovery Server in the cloud
  - Stores the stream from the source
  - Receives requests for data recovery
  - Sends data recovery to recovery clients
- Recovery Client at the destination
  - Identifies missing data
  - Request missing data from the recovery server
  - Merge recovered data with original stream

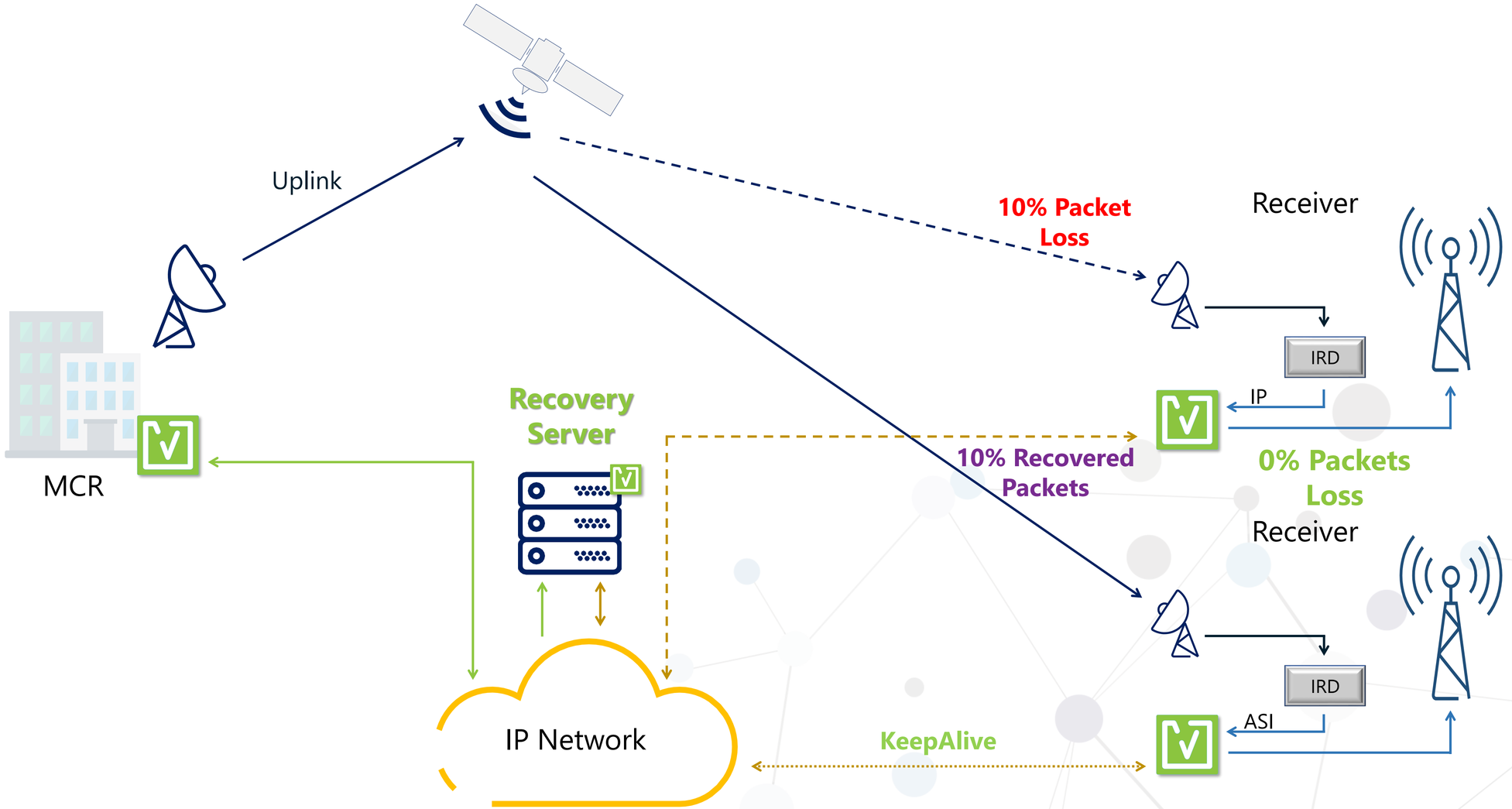
Adding a VideoFlow Non-Intrusive solution

PATENT PENDING

Transparent add-on solution – no changes to the TS



Hybrid Sat/IP – Increase Reliability



Slicing

Fixed output

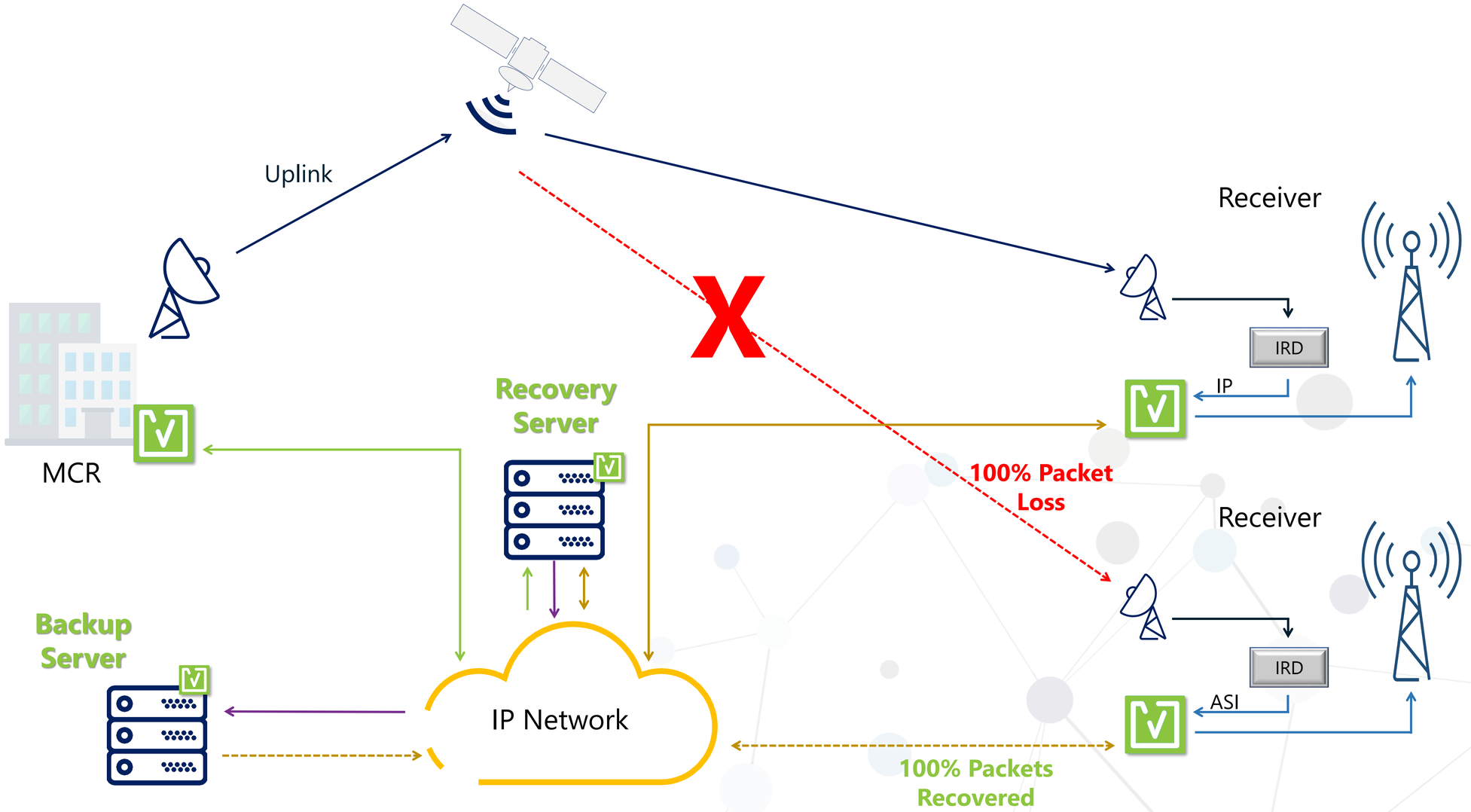
Satellite output

Small
Recovery packet

Original stream

Let see it visually

Hybrid Sat/IP – Hitless Failover



VideoFlow's Hybrid Sat/IP Benefits

- Overcome satellite link interferences
  - Non-intrusive
  - No bit rate increase to the satellite link
  - Seamless recovery of missing data in satellite link
- Hitless changeover from the satellite link to the IP link and vice versa.
- Increase Operational efficiency
  - Cut the number of truck rolls with secure in-band management of the remote sites.
  - Increase team collaboration and decrease the meantime to repair (MTTR) with confidence feed return, confidence monitoring, ETR290 stream monitoring, and live network statistics.

VideoFlow

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CONFIDENCE.

Thank You

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