Perfect Video over Any Network

State-of-the-art Technology for Live Video Comunications

Who We Are

- Established in 2004
- Focus on the Professional Video Market

  – Over 30 years of combined experience in **Broadcast** and **Enterprise** Video over Internet Protocol (IP) products

  – Patent-Pending Error Correction & Quality of Service (QoS)

  – Proven 24/7 Mission-Critical Video Telecommunications

- Our Competitive Edge

  – 3 Granted US Patents

  – Leading-edge QoS technologies for live video streaming

  – Adaptable to any IP network.

Reference Customers

Advanced Video Transport & Interfacing

- Support for Consumer & Broadcaster Video Interfaces:
  - Digital: SDI/HD-SDI/3G-SDI, ASI, HDMI, Ethernet
  - Analog: Composite, S-Video

- Web & SNMP System Control & Device Management

- Fast, Custom Product Enhancement Capability

- Efficient, High-Reliability Live Video Transport
  - Patented ARQ Error Correction (All Products)
  - SMPTE 2022 (ProMPEG) FEC

- Emphasis on Broadcast Quality Video
  - MPEG4-AVC (H.264) HP @ 4.1
  - MPEG2

Product Offerings - Encoder

- QVENC Encoder
  - SDI/HD-SDI/3G-SDI & ASI Digital Video Interfaces
  - Composite and S-Video Analog Video Interfaces
  - Up to 1080p50/60 Encoding
  - CEA-608 & CEA-708 Closed Captioning
  - 4 Audio Channels (2 stereo pairs)
  - QVidium Patented ARQ Error Correction
  - Optional AES Encryption & SMPTE 2022 ProMPEG FEC
  - AC3 Pass-through
  - Metadata insertion into Transport Stream
  - Dynamic Bit Rate Control w/ Constant Frame Rate
  - Video Down Scalar
  - Low Latency (~300ms to QVDEC over LAN)

Product Offerings - Decoder

- **QVDEC Decoder**
  - SDI/HD-SDI/3G-SDI & HDMI Digital Video Outputs
  - Up/Down Video Scalar and Frame-Rate Conversion
  - Composite SD Monitor Video Output
  - Up to 1080p50/60 Decoding
  - CEA-608 & CEA-708 Closed Captioning
  - 4 Audio Channels (2 stereo pairs)
  - QVidium Patented ARQ Error Correction
  - Optional AES Decryption & SMPTE 2022 ProMPEG FEC
  - AC3 Pass-through
  - Low Latency (300ms from QVENC over LAN)
  - Webcam (RTSP), HLS, Flash (RTMP) compatibility option

Product Offerings: All Hardware

- Built for 24/7 Reliability
  - Hardware watchdog
  - Multiple software watchdogs
- Internal Fan and AC/DC Power Supply
- Secondary 7 to 16 VDC failover power input
- High Temperature Rating (Tested to 55 C without fan)
- Rack-Mountable (can mount 1 or 2 units into 1-RU)
- Built-in Whitelist-based Firewall Software (Hacker proof)
- Configurable to bypass firewalls for streaming & control
- Push or Pull-modes of operation
- Network Management System Available

Product Offerings - Software

- Internet Streaming Video QoS Media Proxy Server
  - Hardware and Software Offerings
  - Works with 3rd-party Encoders & Decoders
  - Can be combined with Wowza Media Servers
  - Live Web Streaming, CDN, Flash/RTMP Compatibility
- HD & SD Software Decoder (StreamViewer):
  - MPEG-2, MPEG-4 (parts 2 & 10), H.264, DV, DVCProHD
  - SMPTE 2022 ProMPEG FEC
  - Qvidium Patented ARQ Error Correction
- File Streamer Software

Markets Addressed

- Cable Distribution

    - DVB-ASI / IP Encoding, Decoding, & Transcoding

- Broadcast & Production

- Education & Religious Distribution

- Corporate Communications

- Enterprise & IPTV

Technological Advantages

- IP technology Know How
  - Over 30 years experience in Video & Audio / IP transport

- ProMPEG Standards-Compliant FEC
  - Participants & compatible with industry standard for IP transport

- QVidium Advanced FEC (patented)
  - Goes beyond the capability of ProMPEG FEC

- **QVidium ARQ (patented)**
  - Rapid re-send no additional Overhead lower processor overhead
  - Only error correction to handle wireless & Internet connections

Streaming Video / IP Challenges

- Lost Packets
  - Network congestion
  - Poor connections
  - Overloaded routers & gateways
- Out-of-order packets
  - Dynamic routing
  - Small packet routing
  - Packet prioritization
- Stream Jitter
  - Queuing delay
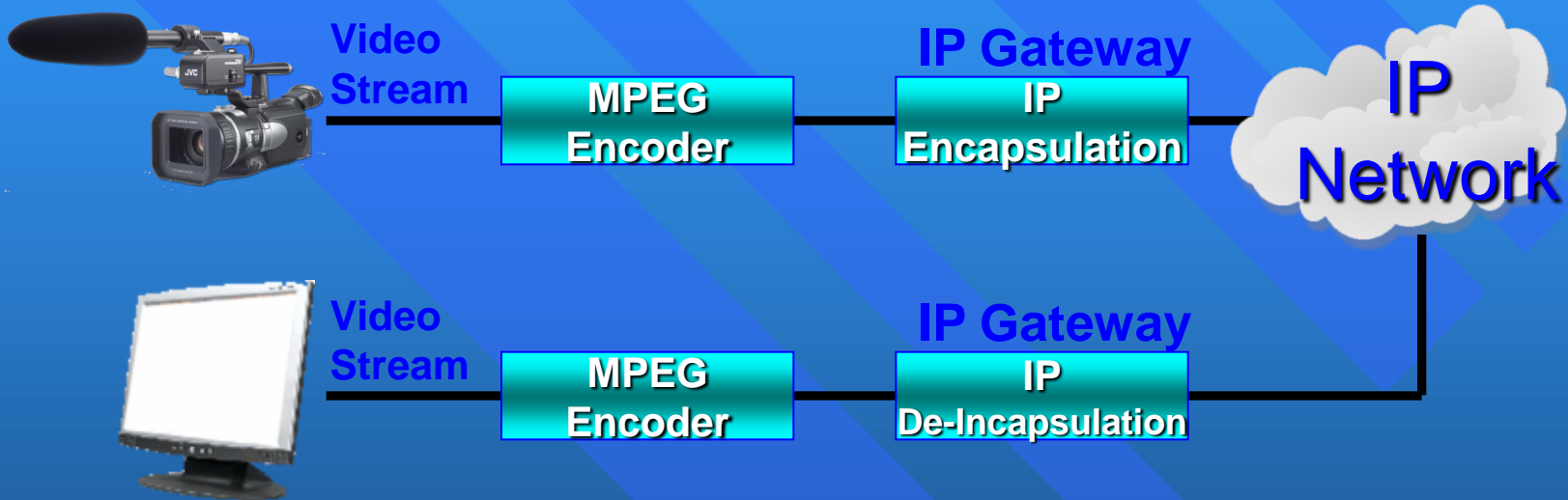 - Dynamic routing transport delay

Solutions

- FEC (SMPTE 2022 – ProMPEG FEC)
  - Adds additional packets to re-build lost data
- ARQ (**A**utomatic **R**etransmission re**Q**uest)
  - Intelligent, rapid re-transmission of lost data
  - Similar to TCP/IP without the disadvantages
    - Uses UDP, no rate limiting, eliminates ACKs
    - Fixed, bounded delay
    - Can be used over satellites and long links
  - Maximizes Video Throughput
  - Optimized for low delay video
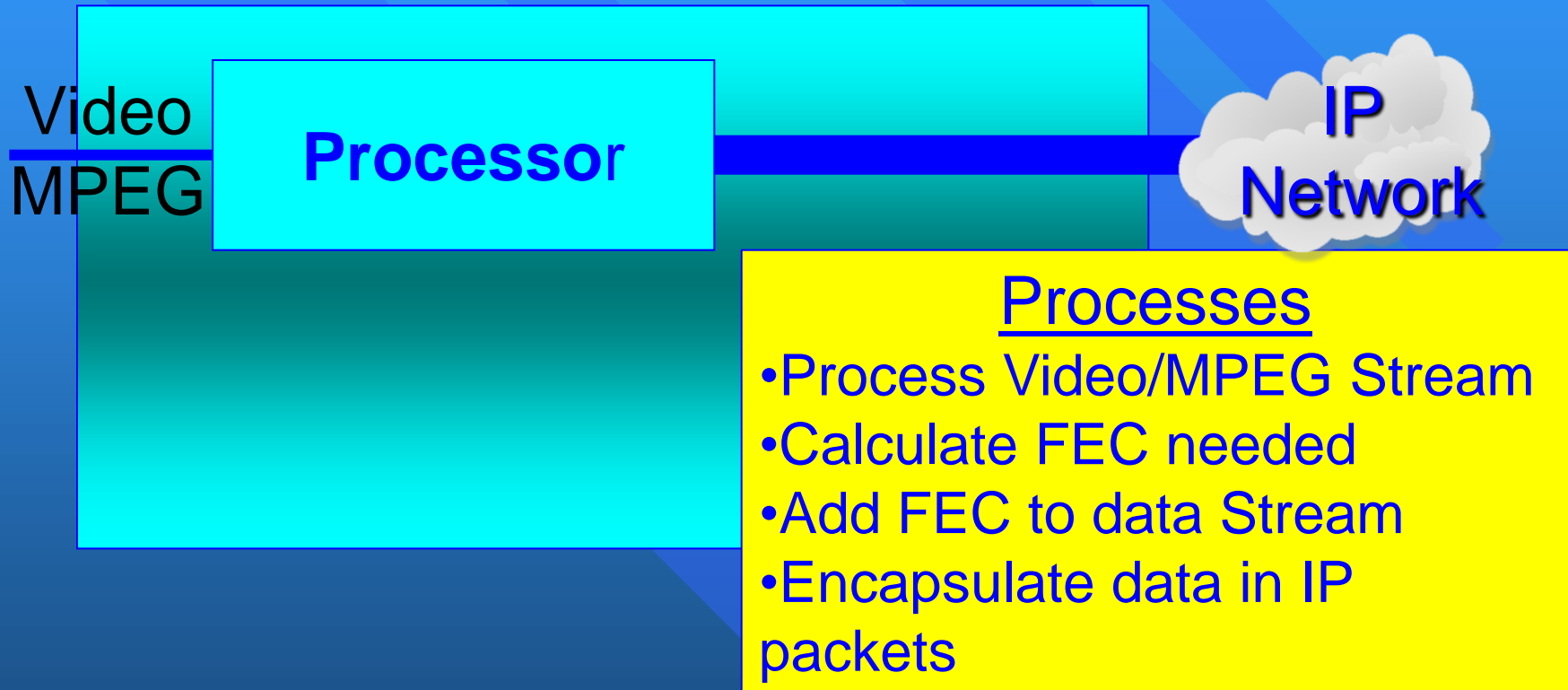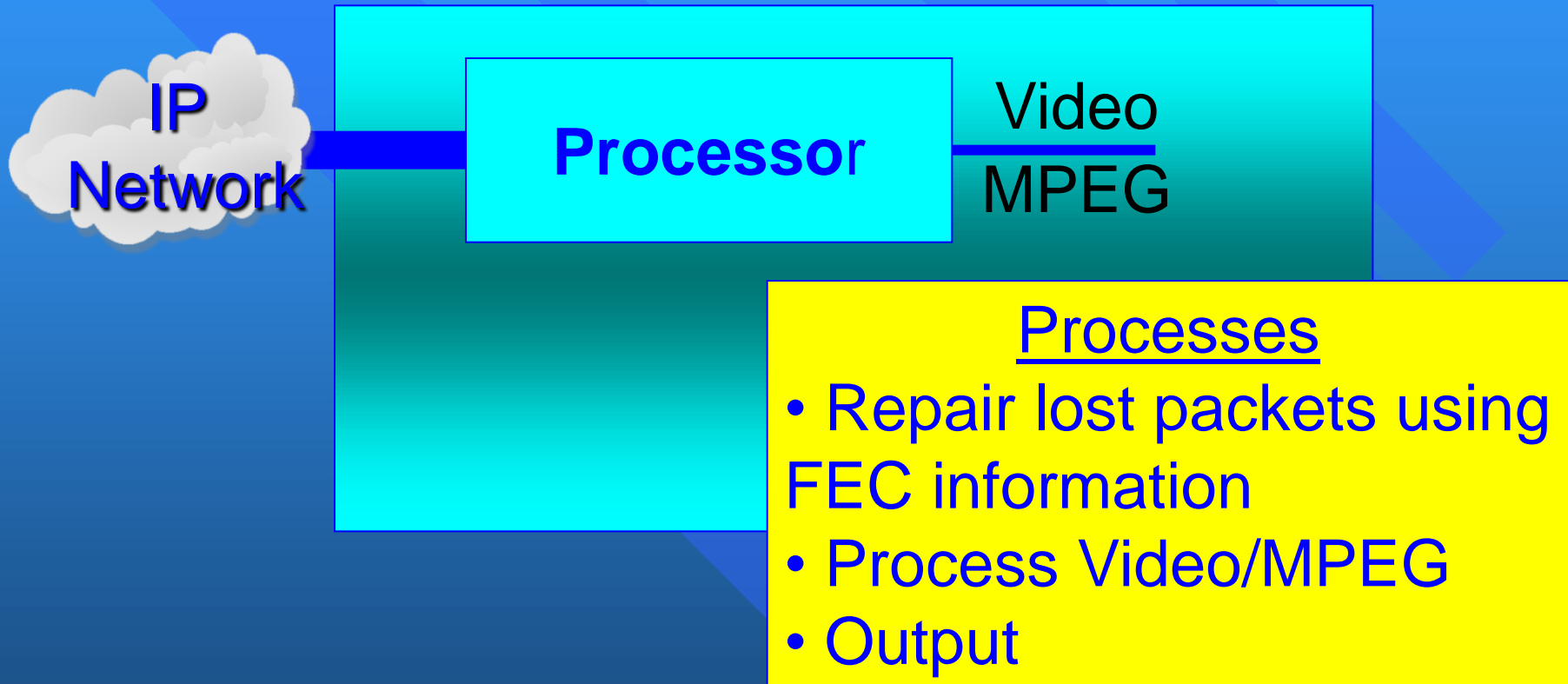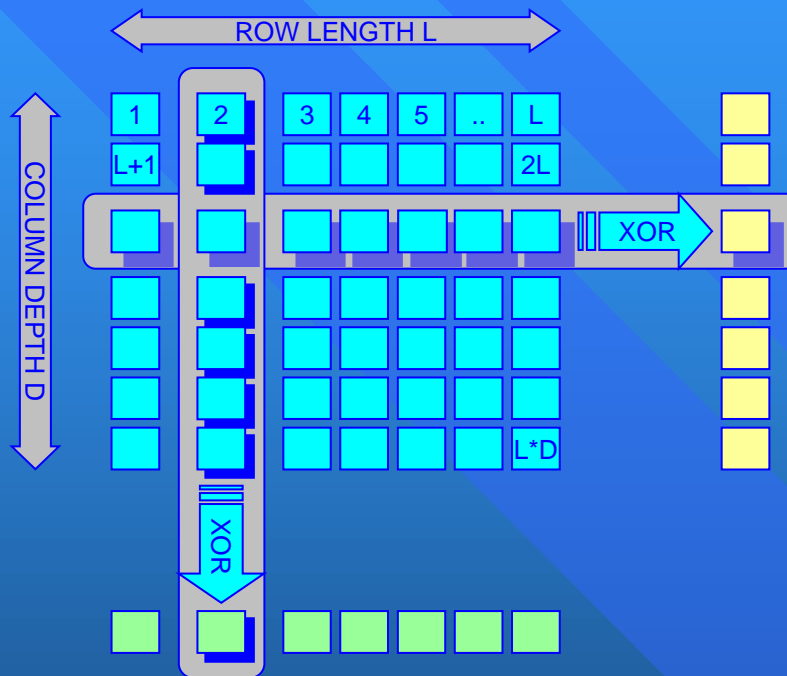 - Automatic configuration

IP Gateway Application

FEC

Video Stream → **MPEG Encoder** → **IP Gateway** **IP Encapsulation** → **IP Network**

Video Stream → **MPEG Encoder** → **IP Gateway** **IP De-Incapsulation** → **IP Network**

QVidium Digital Video

A Closer Look

IP Gateway Sender

Video
_____
MPEG

Processor

IP Network

Processes
- Process Video/MPEG Stream
- Calculate FEC needed
- Add FEC to data Stream
- Encapsulate data in IP packets

Qvidium Digital Video

A Closer Look

IP Gateway Reciever

IP Network

Processor

Video MPEG

Processes
• Repair lost packets using FEC information
• Process Video/MPEG
• Output

FEC Premise

- Understanding of the network conditions
- Fixed, Preset FEC Rows and Columns
- Hope you get the correct settings
- If the network condition deteriorates
  - Stop Transmission
  - Change FEC Settings
  - Re-Start Transmission
- Challenging for live transmission
  - Must find break in programming to make change to FEC settings

FEC Pros and Cons

Pros

- Can fix many problems
- Standardized

Cons

- Needs Powerful CPU
- Hard configure
- Delay for interleaving
- Not Dynamic
- Add'l BW Required
- Cannot handle large random packet loss

Qvidium QoS Technology Patents

- **A**utomatic **R**etransmission re**Q**uest
- 3 US Patents Granted:
  - #7,522,528 for ARQ error correction,
  - #7,551,647 for Internet Clock Synchronization, &
  - #7,539,187 for Advanced Video-Optimized FEC
- Intelligent & rapid re-send of data: like TCP
- Optimized for low delay video & audio
- Automatic configuration

Qvidium ARQ Advanges over TCP

- TCP (RTMP, HLS, MSS, DASH)
  - Large Added Buffering
  - Designed for Data -> Not Video
  - Throughput limited by latency (bad for satellite & int'l. links)
- QVidium Patented ARQ
  - Negative Acknowledgement
    - No wasted bandwidth when no errors
    - Can operate at maximum network throughput
    - No need to wait for Acknowledgement
  - Does not freeze video waiting for ACK
  - Minimal Buffering (2 to 3 Round-Trip Times)

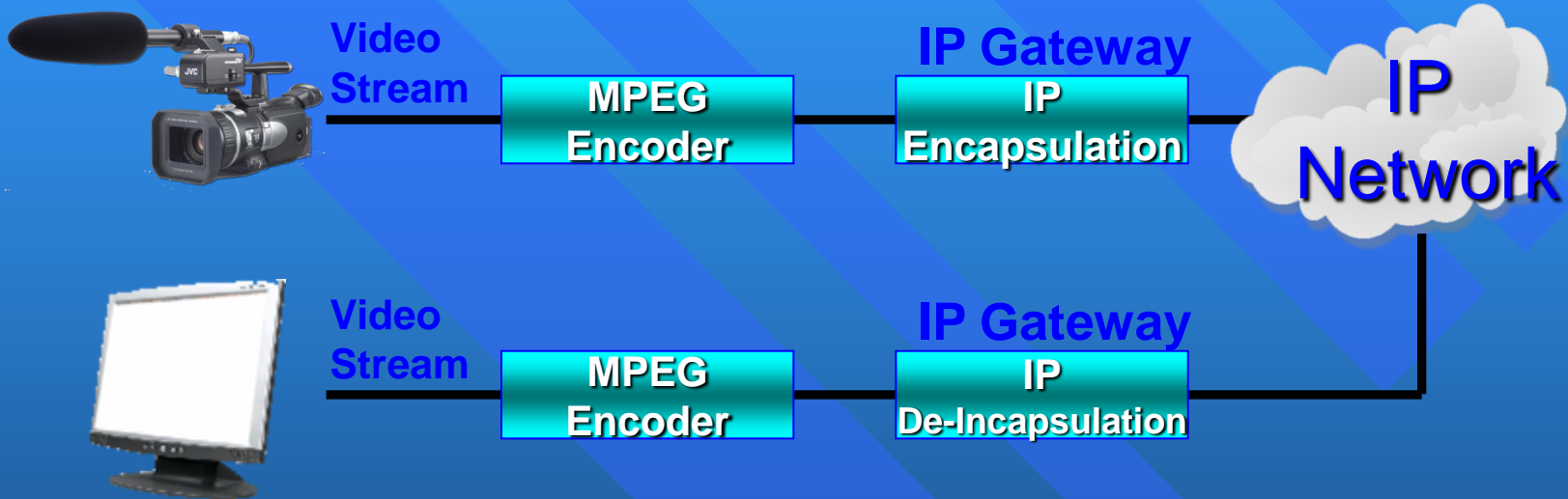# *Qvidium ARQ Error Correction*

- Simple 2-step process:
  - Step 1: Transmit the DATA
  - Step 2: If there is trouble on the line re-transmit only the missing data
- Adds small fixed delay at receiver
  - Can repeat as time allows
  - Multiple retries → nearly zero loss
- Auto measurement & configuration
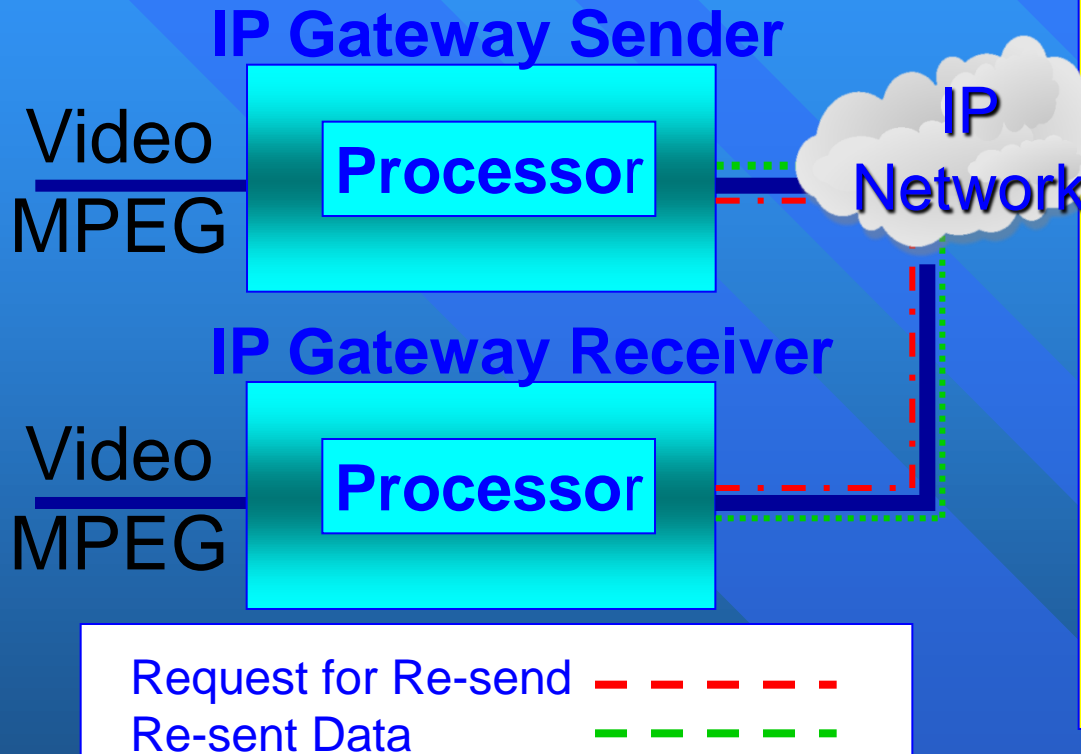- Ideal for wireless connections & Internet

IP Gateway Application

ARQ

Video Stream → **MPEG Encoder** → **IP Gateway** / **IP Encapsulation** → **IP Network**

Video Stream → **MPEG Encoder** → **IP Gateway** / **IP De-Incapsulation** → **IP Network**

A High-level Look at ARQ

IP Gateway Sender

Video MPEG

Processor

IP Gateway Receiver

Video MPEG

Processor

IP Network

Request for Re-send ▬ ▬ ▬ ▬ ▬
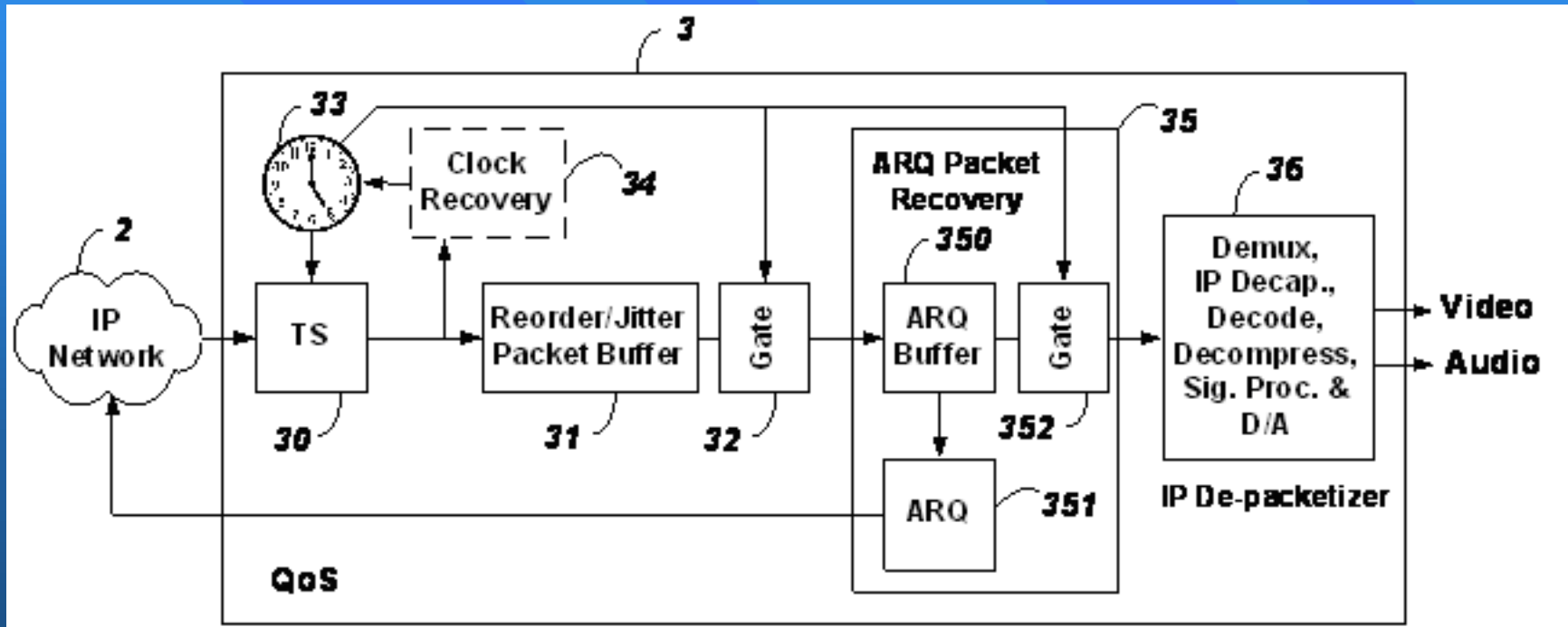Re-sent Data ▬ ▬ ▬ ▬ ▬

Processes
- Process Video/MPEG Stream
- Encapsulate data in IP packets
- Send Packets out
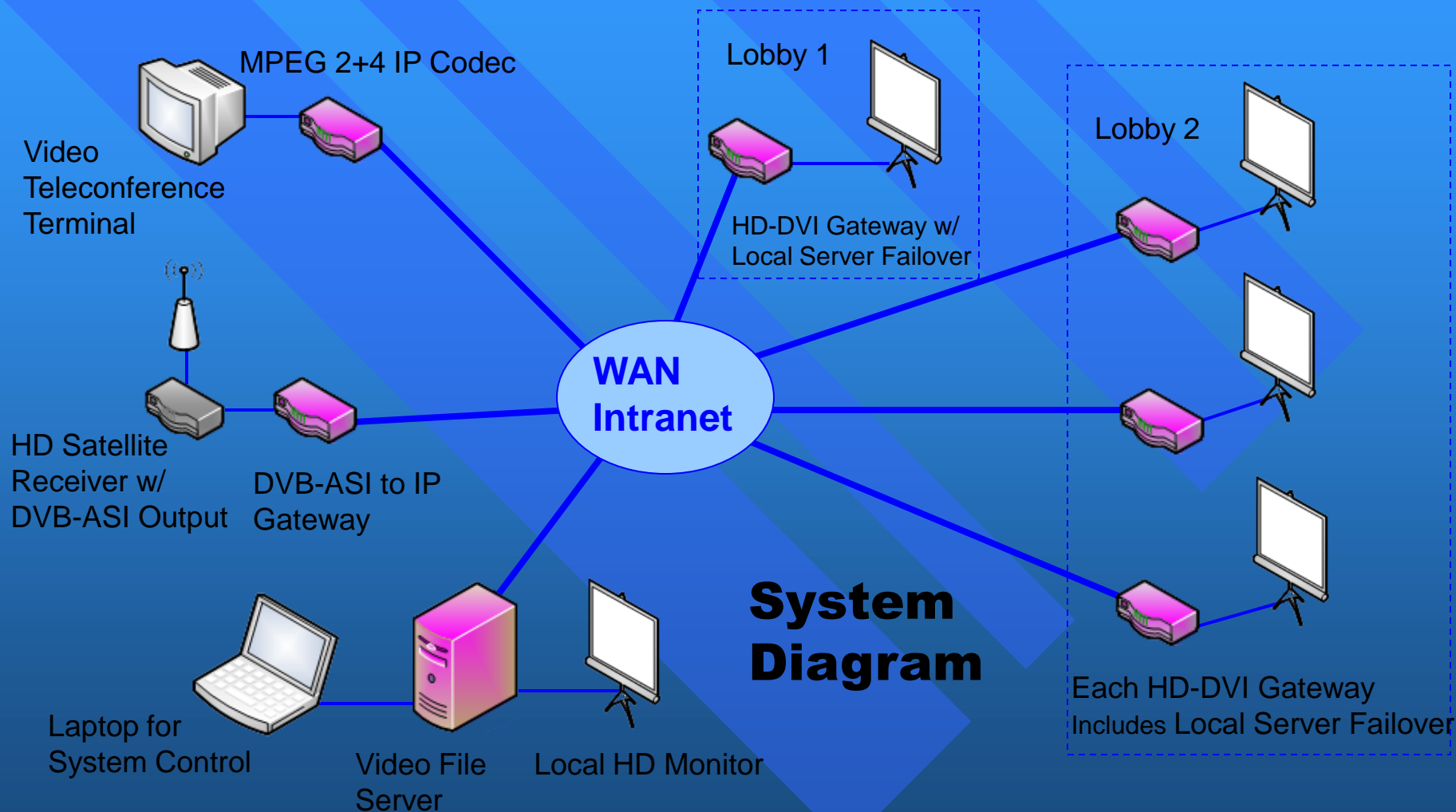- If data is lost request for re-send is sent from Reciever

A Detailed Look at ARQ

Patent for Low-Latency Automatic Repeat Request Packet Recovery Mechanism for Media Streams

Deployed Video / IP System Example

Qvidium Advantages

- No Recurring Fees

- Free Technical Support

- Free Software Updates

- Free Add-ons and New Features

- Customizable w/ APIs