



# ***Perfect Video over Any Network***

*State-of-the-art Technology for Live Video Communications*



# Who We Are



- Established in 2004
- Focus on the Professional Video Market
  - Over 20 years of combined experience in **Broadcast** and **Enterprise** Video over Internet Protocol (IP) products
  - Patent-Pending Error Correction & Quality of Service (QoS)
  - Proven Patient-Critical Video Telemedicine Communications
- Our Competitive Edge
  - 6 Pending US Patents
  - Leading-edge QoS technologies for live video streaming
  - Adaptable to any IP network.

# Reference Customers



**CNN.com**



**NBC**

The  
WALT DISNEY  
Company



**controlware**

communicationssystems

**mobity.**



**CBS**



**communications**  
GCS

**GENESIS**

NETWORKS



**FRONTIERS**  
TECHNOLOGY

**KOLLMORGEN**

**Electro-Optical**

**SAIC**



**BAR CODE SPECIALTIES**

Your Single Source for Everything Barcode and RFID

# ***Advanced Video Transport & Interfacing***



- Support for Nearly Any Video Interface:
  - Digital: ASI, SDI, Firewire™, Ethernet, WiFi, WiMax
  - Analog: S-Video, Composite, Component
- SNMP & Web System Control & Device Management
- Fast, Custom Product Design Capability
- Low-Latency Live Video Transport
- Efficient & Reliable Video-on-Demand Transport
- Emphasis on Broadcast Quality Video

# Product Offerings



- Hardware Codecs
  - MPEG2 & MPEG4-SP (MPEG 2+4)
  - ProMPEG FEC & Patent-Pending ARQ Error Correction
  - Digital (SDI) & Analog Interfaces
- HD MPEG-2 4:2:2/4:2:0 Decoder with HD-SDI Output
- Firewire Gateways: HDV, DV & DVCPPro-HD
- DVB-ASI / IP Gateways w/Error Correction
- File Streamer Software
- Internet Streaming-Video QoS Replicator Servers
- HD & SD Software Decoder (StreamViewer):
  - MPEG-2, MPEG-4 (parts 2 & 10), H.264, DV, DVCPProHD

# Market Addressed



- Broadcast Backhaul
  - DVB-ASI to IP Gateways
- Production
  - Firewire IP Gateway
  - HD Decoder
- Education and Corporate Communications
  - MPEG 2+4 Codecs
- Enterprise
  - Firewire Gateway
  - MPEG 2+4 Codecs
- Retail
  - File Streamer

# Advantages



- IP technology Know How
  - Over 20 years experience in Video & Audio / IP transport
- ProMPEG Standards-Compliant FEC
  - Participants & compatible with industry standard for IP transport
- Qvidium Advanced FEC (patent-pending)
  - Goes beyond the capability of ProMPEG FEC
- Qvidium ARQ (patent-pending)
  - 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

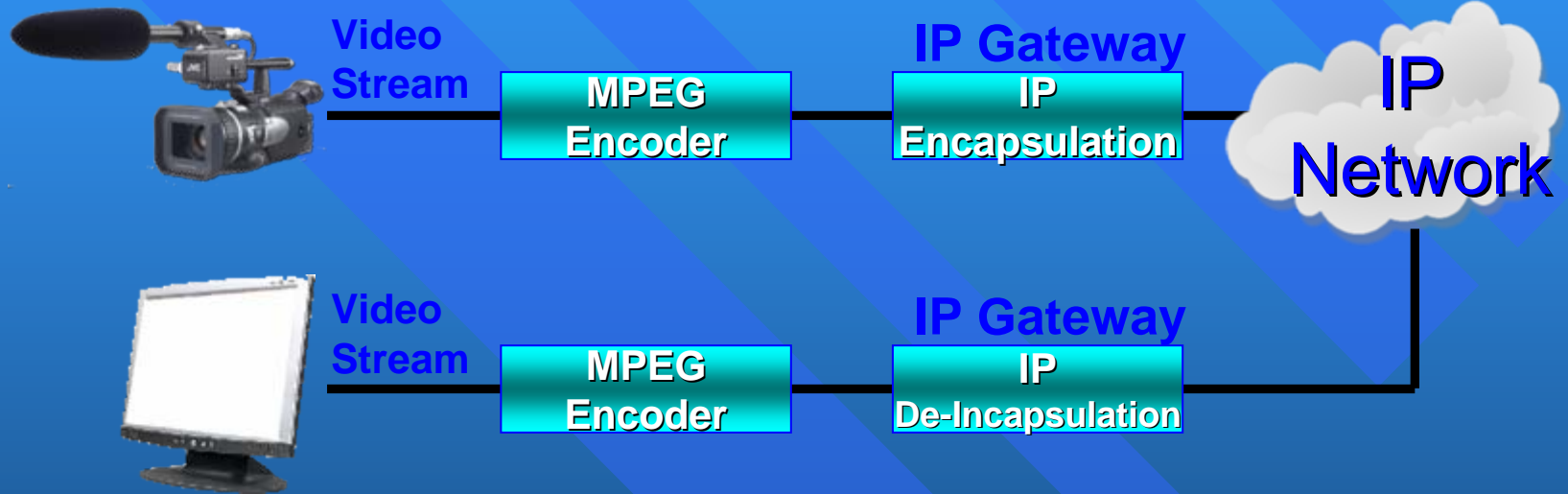


- FEC
  - Adds additional packets to re-build lost data
- ARQ
  - Intelligent, rapid re-transmission of lost data
  - Similar to TCP/IP without the disadvantages
    - Uses UDP, no rate limiting, eliminates ACKs
    - Fixed, bounded delay
    - Can be used over satellites and long links
  - Maximizes Video Throughput
  - Optimized for low delay video
  - Automatic configuration

# IP Gateway Application



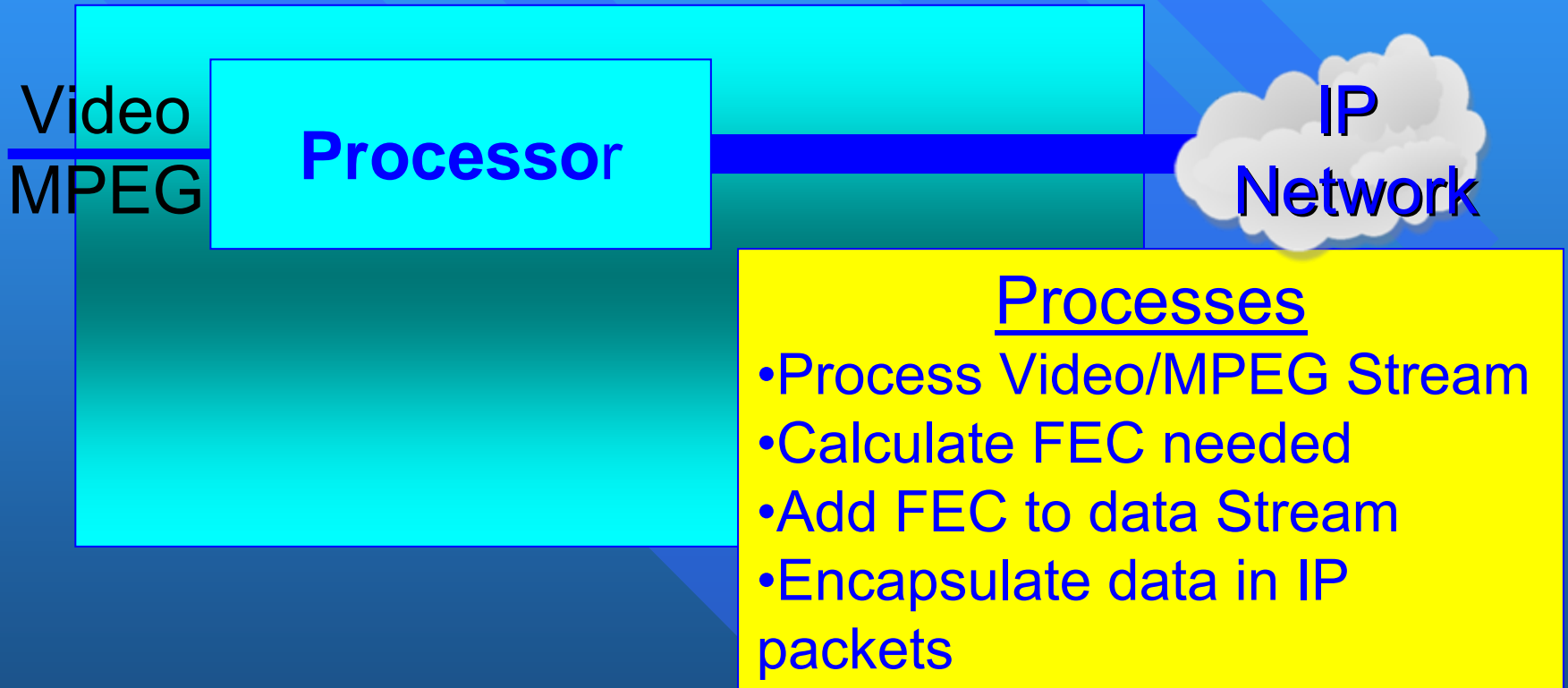
**FEC**





# A Closer Look

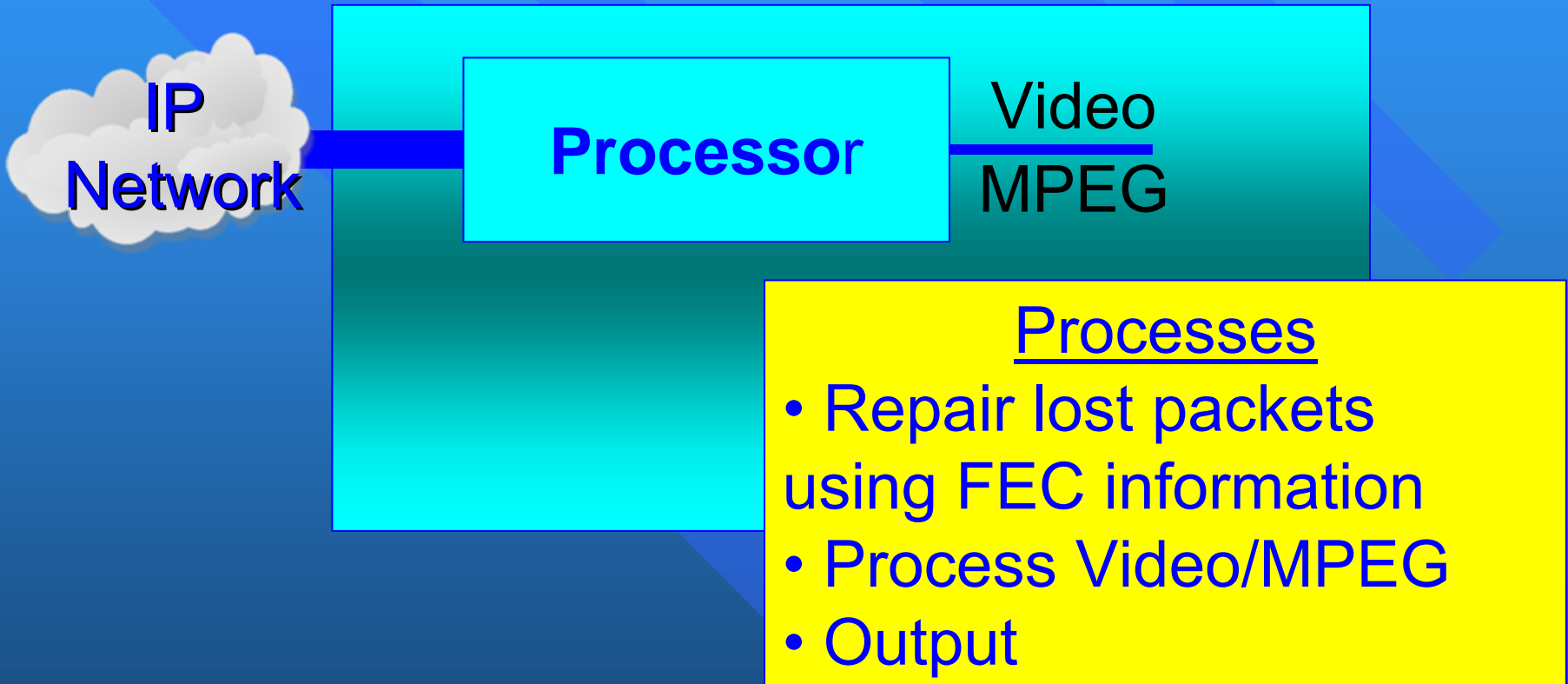
## IP Gateway Sender



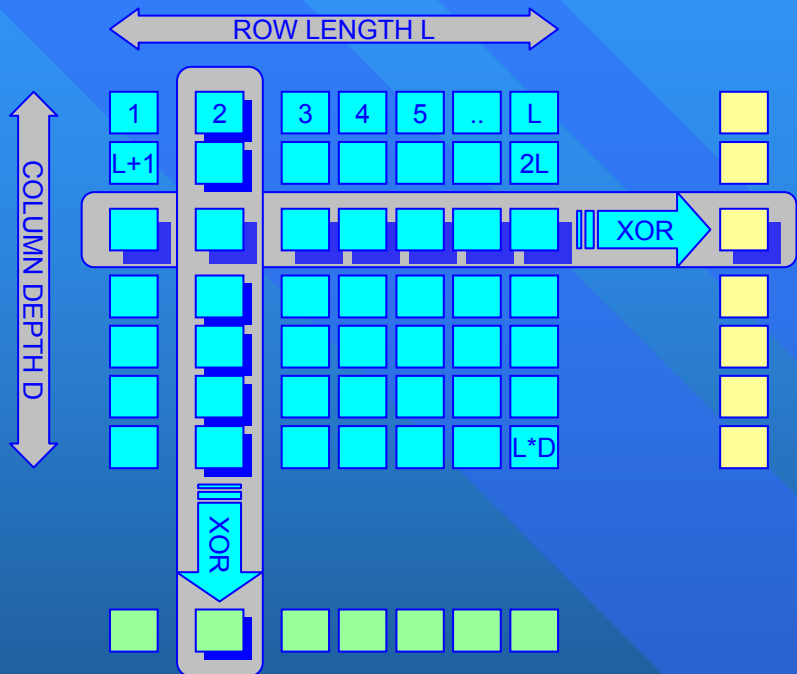
# A Closer Look






## IP Gateway Receiver



# Row Column FEC



-  *Payload Packet*
-  *Column FEC Packet*
-  *Row FEC Packet*

**Default mode: Column FEC**  
Typical overhead 5-10%

**Optional Mode:  
Column and Row FEC**  
Typical Overhead 6% - 15%

## Common properties

- Burst loss up to row length correctable via data interleaving
- Max row length: 250
- Max LxD: 1500
- Latency with skew matrix  $\sim L \times D$

# ***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

# ARQ

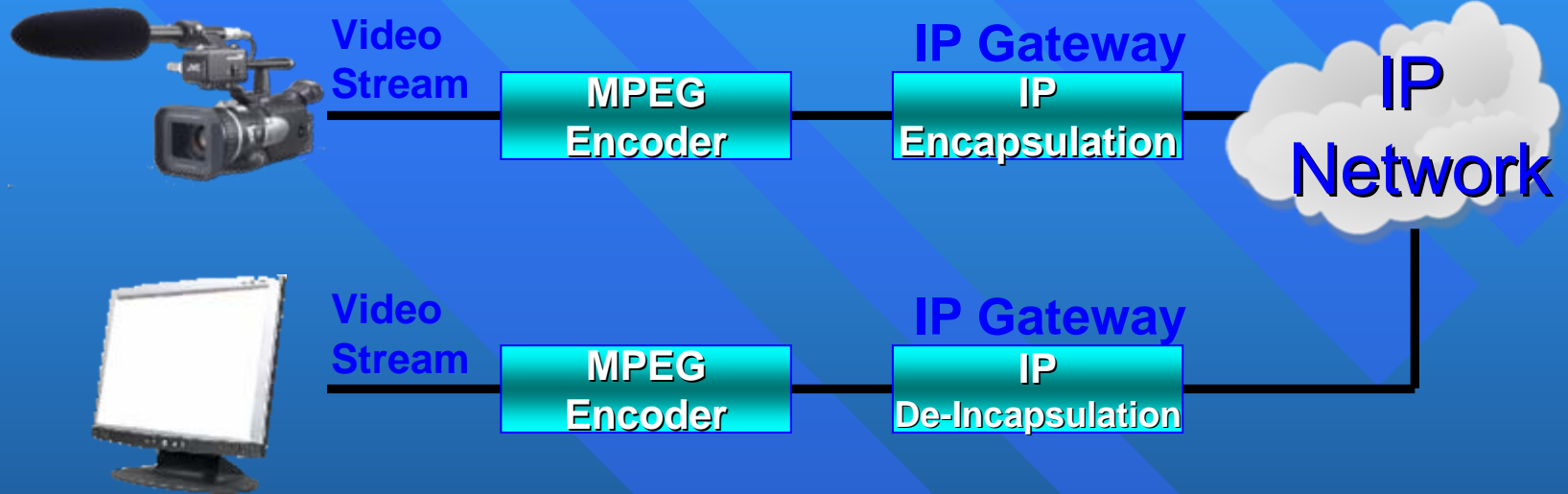


- Simple 2-step process:
  - Step 1: Transmit the DATA
  - Step 2: If there is trouble on the line re-transmit only the missing data
- Adds small fixed delay at receiver
  - Can repeat as time allows
  - Multiple retries → nearly zero loss
- Auto measurement & configuration
- Ideal for wireless connections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

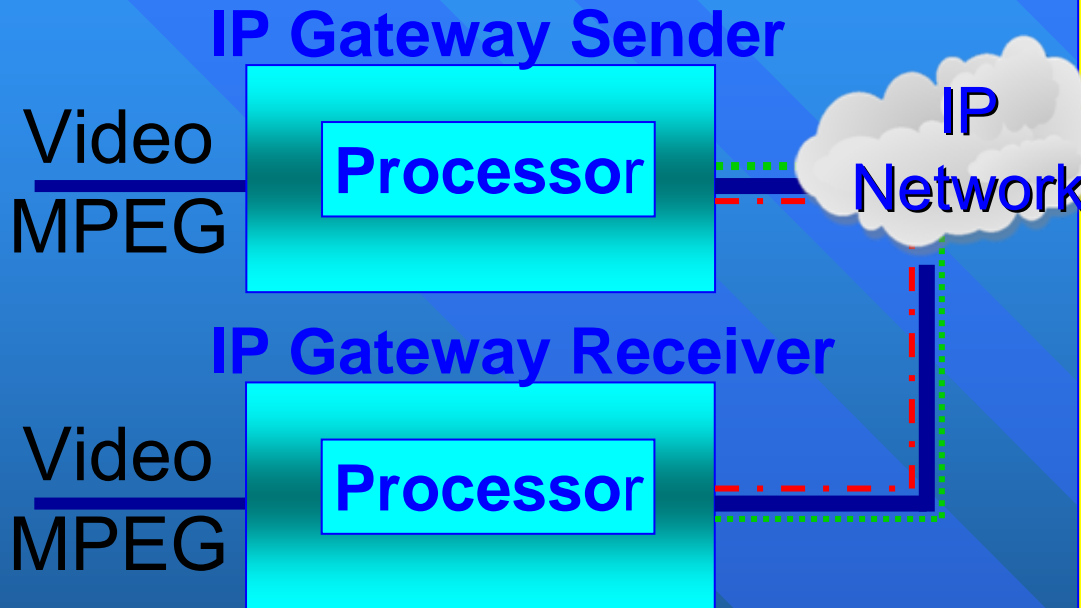
# IP Gateway Application



**ARQ**



# A High-level Look at ARQ



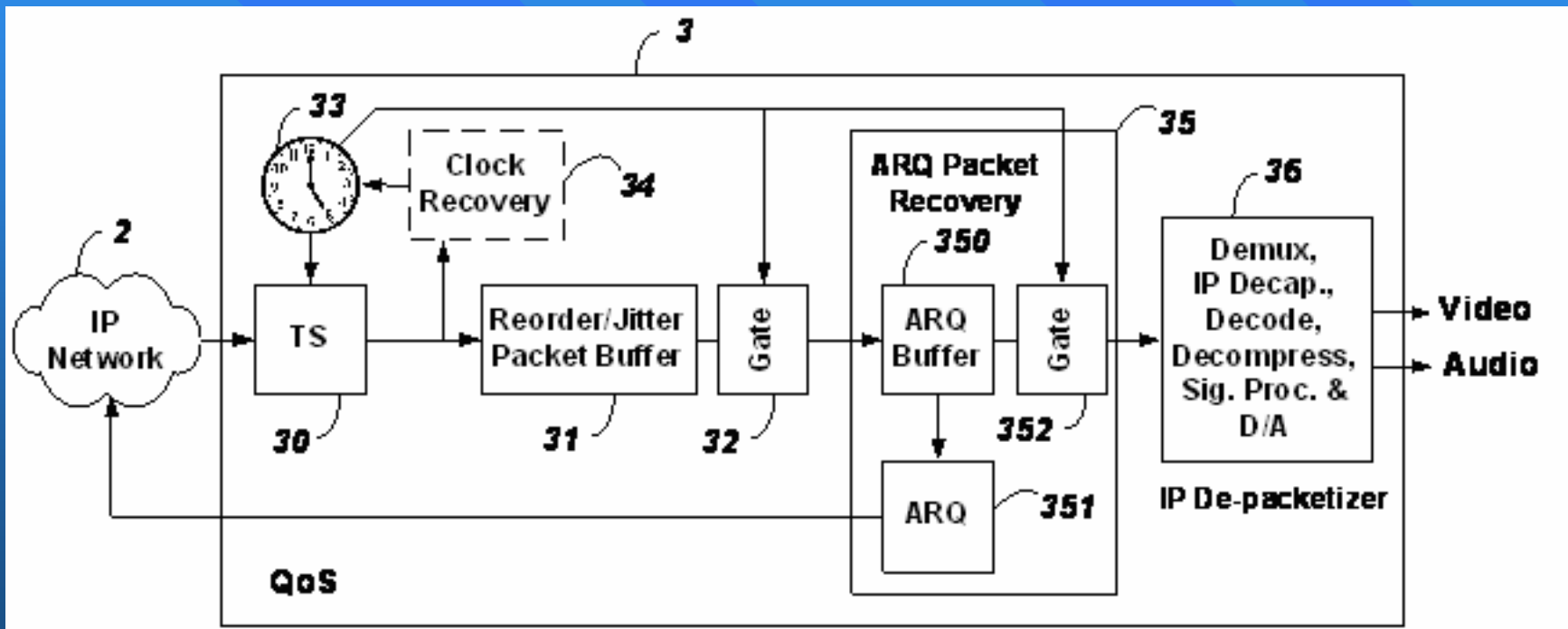
## Processes

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

# A Detailed Look at ARQ



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

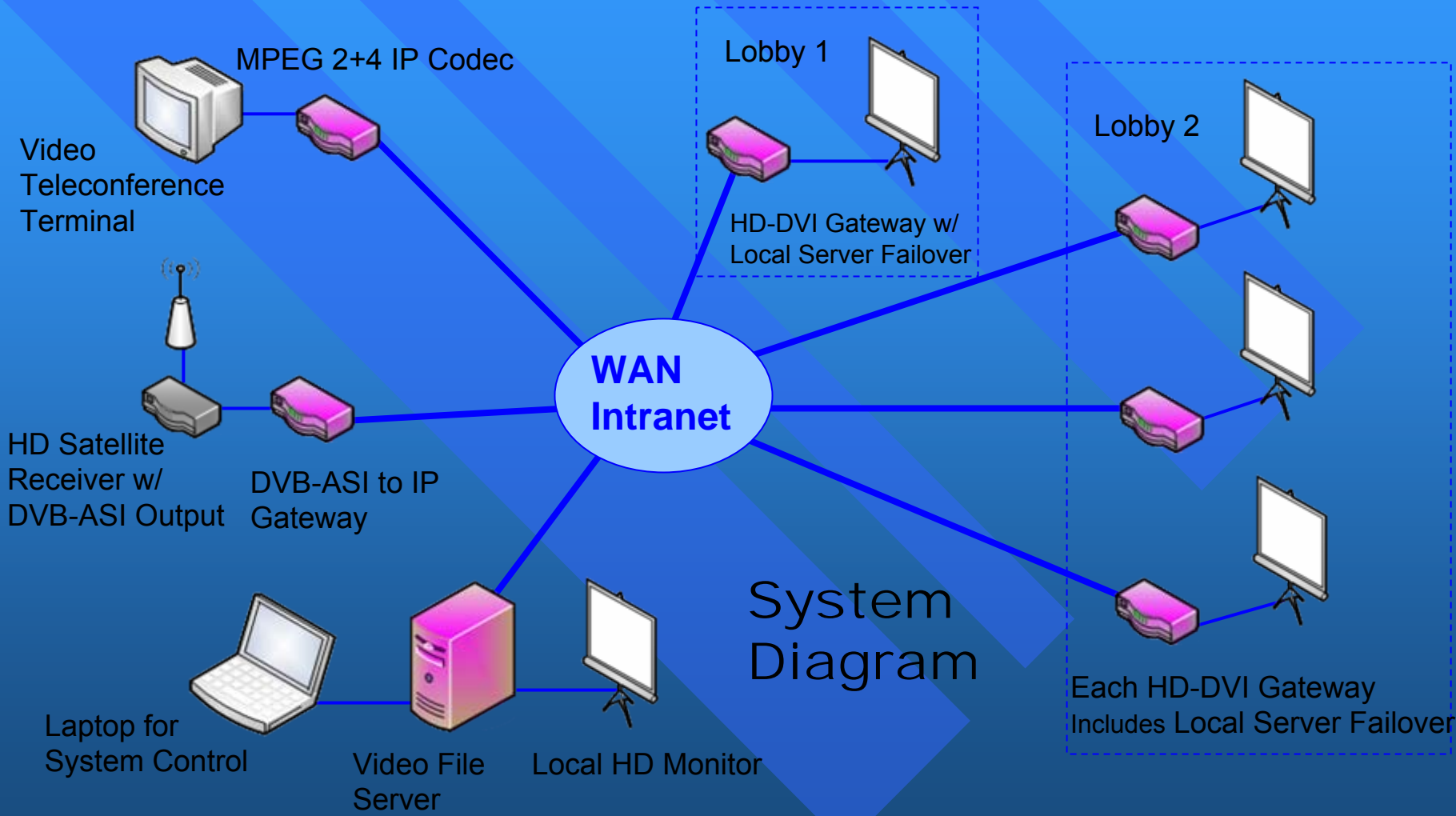


# ***Advanced Microsoft Video Technology Integration***



- Windows Media 9 video encoding
- Windows DirectShow
  - Network Send and Receive QoS and Error Correction Filters
- Video and Audio multiplexing
- Patent Pending Galois Field FEC
  - Protects Windows Media 9 I,B,P video frames independently
  - Protects audio frames optimally
- Synchronized pipeline for low latency playback
  - Patent pending network clock synchronization
  - Patent pending network de-jitter buffer
  - Patent pending ARQ and FEC Error Correction
  - Audio and Video DirectShow Rendering

# Deployed Video / IP System Example



System Diagram