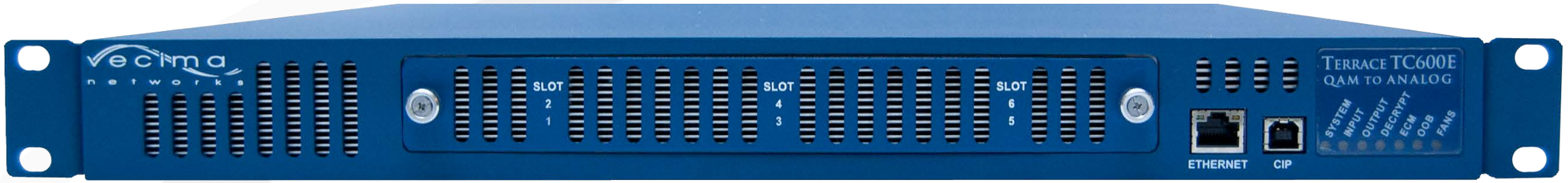


Terrace TC600E

QAM to Analog – MDU Gateway

vecima networks

LAST MILE SOLUTION®

June 2016

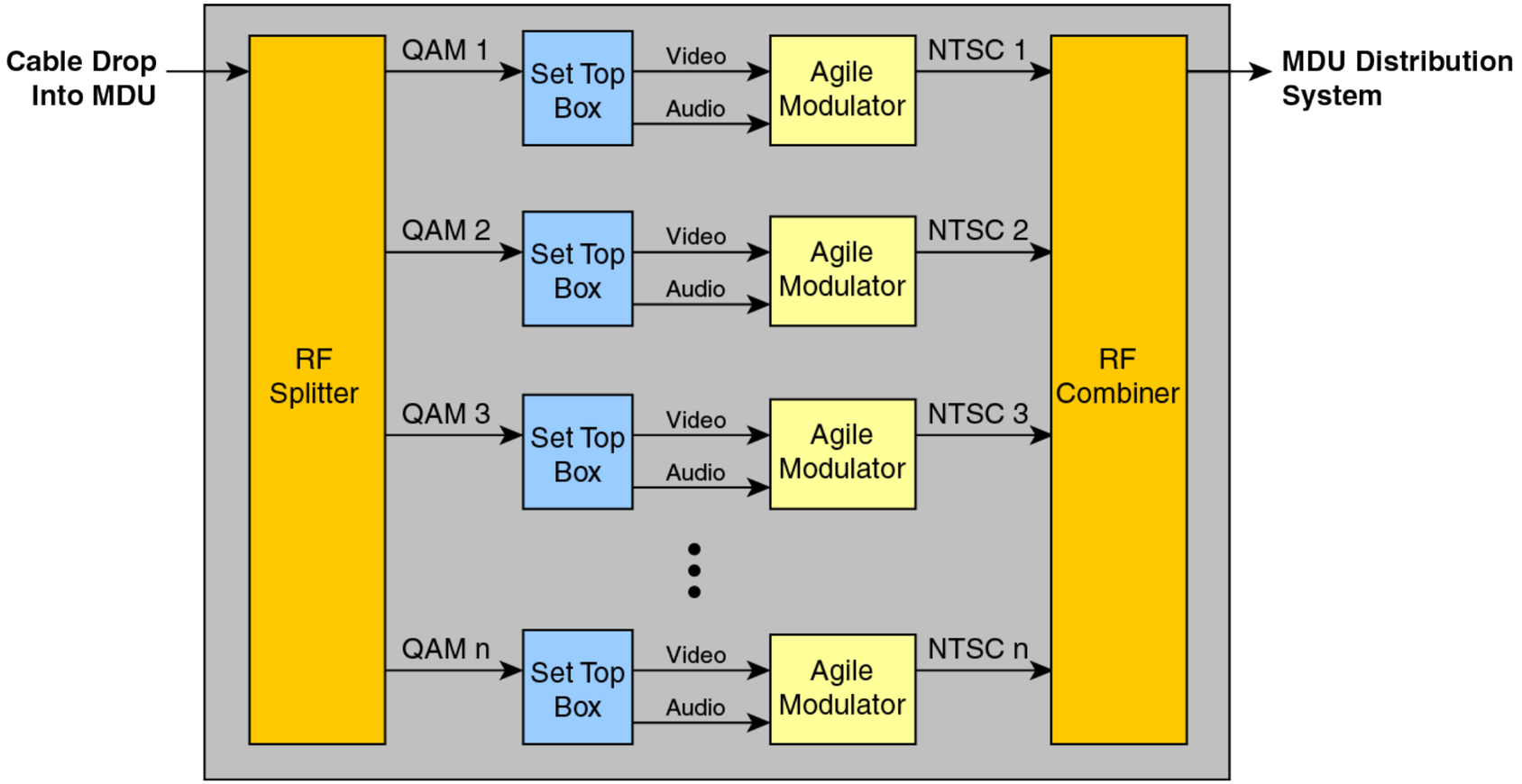
Presentation Outline

- The Challenge – QAM to Analog Conversion
- QAM to Analog – The Past
- Eco-System Architecture
- Basic Hardware Architecture
- Signal Flow Process
- Chassis Layout
- Basic Specifications
- Key Features
- Summary

The Challenge – QAM to Analog Conversion

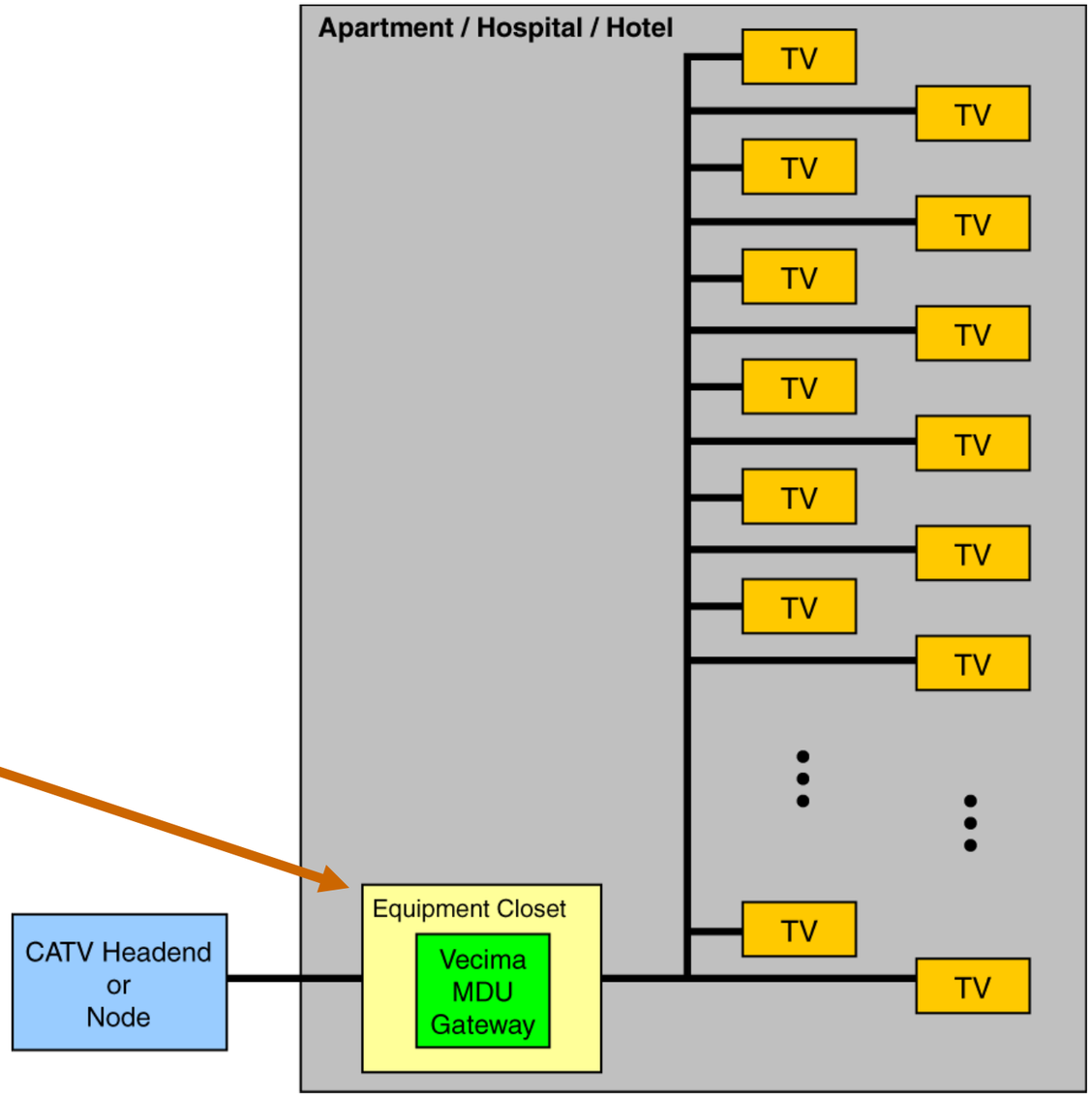
- CATV MSOs have moved to All Digital Simulcast (ADS)
- CATV networks are deploying increasingly more HD services
- Conversion of services from analog to digital and analog bandwidth reclamation
- Cost effectively converting from HD to analog at the MDUs remains a challenge
- The following are the problem locations:
  - » Hotels, hospitals, work camps and other commercial locations

QAM to Analog – The Past

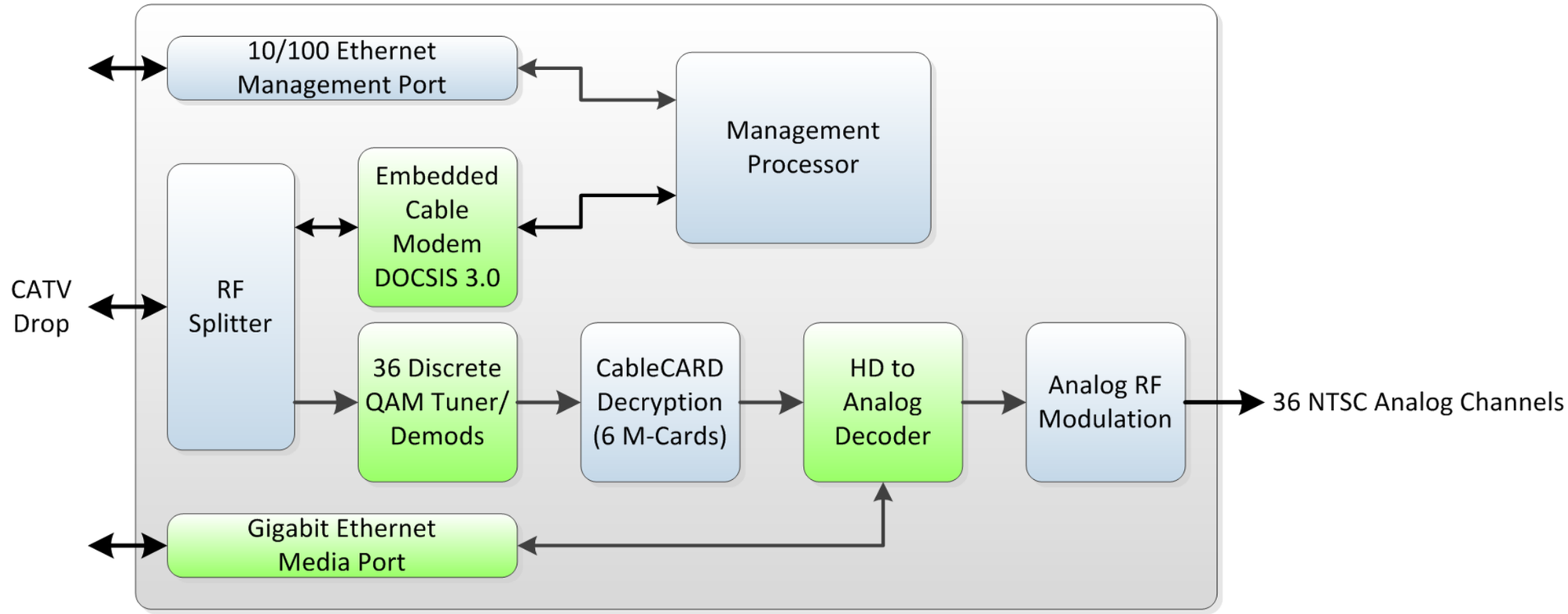


- Very expensive (product cost, setup time and re-occurring maintenance)
- Unmanaged and no redundancy
- Consumes a huge amount of space for the electronics plus wiring

- Product installation location is typically:
  - » Centrally located in a electronics equipment room
  - » Limited in size
  - » Not environmentally controlled
  - » Hot, Humid and Dusty



Basic Hardware Architecture



- 36 Independent QAM carriers in → 36 NTSC Analog channels out
- 6 Multistream CableCARDs™ (ARRIS-Motorola or Cisco-SA)
- Remote configuration/monitoring via eCM or Ethernet

Chassis (Front & Rear)

QAM IN
IP IN

NTSC
OUT

- Front panel access to CableCARD slots
- 10/100 Ethernet port
- USB Console port
- Integrated Gigabit Ethernet media port for Unicast and Multicast IP Input
- RF (CATV) Input port
- RF (Analog channel) Output port

Basic Product Specifications

- RF Input:
  - » Demodulated QAMs 36 independent
  - » Modulation 64/256 QAM Annex B
  - » Frequency Range 54 – 1002 MHz (Band Edges)
- RF Output
  - » Number of RF Channels 36 channels within a 48 channel (294 MHz) block
  - » Frequency Range 54 to 600 MHz (EIA channels 2 to 86, 95 to 99) FCC and per channel offsets supported
    - The TC600E supports flexible channel plans via web GUI and console port
  - » Output Level +26 dBmV per Channel (Downstream)

Basic Product Specifications (cont'd)

- General
  - » Enclosure 1.75" x 19" x 22"
  - » Connector type F-type, female
  - » Power 100 – 240VAC (<175 watts)

Transport Stream Details

Video Format	MPEG-2, MP@ML MPEG-2, HP@HL H.264, High Profile, Level 4.0
Video Bitrate	Up to 17 Mbps
Video Decode Channels	Up to 36 MPEG-2 HD/SD or 24 MPEG-4 AVC / H.264 HD *Certain combinations of MPEG-2 HD/SD and MPEG-4 AVC / H.264 HD channels are also possible*
Audio Licensed	BTSC/SAP
Audio Formats	Dolby Digital® (AC-3)
Audio Bitrate	Dolby Audio 512 kbps max
Audio Sample Rates	32 kHz, 44.1 kHz, 48 kHz
Audio Downmix	Multichannel downmix to stereo or mono as necessary

Channel Lineup Examples

TC600E Channel Plan	Contiguous Encrypted Lineup (with FM)	Contiguous Encrypted Lineup (no FM)	Number of CableCARDs Required*
Single Unit	**36 Channels**		**6 Total**
TC600E (EIA = 2)	2-32, 95-99	2-37	6
TC600E (EIA = 33)	33-68 … 42-77	33-68 … 42-77	6
TC600E (EIA = 39)	42-77 … 51-86	42-77 … 51-86	6
Dual Stack	**72 Channels**		**12 Total**
TC600E (EIA = 2)	2-32, 95-99	2-37	6
TC600E (EIA = 33)	33-68	38-73	6
Triple Stack	**90 Channels**	**85 Channels**	**15 Total**
TC600E (EIA = 2)	2-32, 95-99	2-37	6
TC600E (EIA = 33)	33-68	38-73	6
TC600E (EIA = 39)	69-86	74-86	3

* CableCARDs required assumes fully encrypted channel lineup with 6 channels per CableCARD. Unencrypted channels are not counted against the CableCARD decryption limit.

(1) The TC600E supports flexible channel plans via web GUI and console port. Select the lowest EIA number of the desired Channel Plan and the TC600E will derive the appropriate channels for that plan.

The TC600E can output up to 36 channels within a 294 MHz (48 channel) frequency block allowing the user to enable 36 non-contiguous channels

For example: 2, 4-7, 9-15, 17-30, 33-41, 45

Key Features

- Highly integrated – Combines QAM demodulation, decryption, NTSC modulation and RF upconversion
- Supports MPEG-2 and MPEG-4 AVC / H.264 video decoding
- Demodulate up to 36 QAM channels and/or receive up to 36 IP streams
- Convert up to 36 MPEG-2 HD/SD or 24 MPEG-4 AVC / H.264 HD programs to analog channels
- Supports up to 6 Multi-Stream CableCARDs to decrypt up to 36 streams

Key Features (cont'd)

- SCTE-18 Force Tune EAS Support
- SCTE-20,21 Closed Captioning / VBI support
- Integrated DOCSIS 3.0 cable modem
- Supports IPv4 and IPv6 on Ethernet Management Port
- Supports unencrypted Unicast and Multicast IP Input
- Scalable – Generate up to 90 contiguous channels with 3 co-located units

Key Features (cont'd)

- Single point of control for remote management of all services
  - » Includes demodulation, CableCARDs, analog modulation and interface for cable modem control in one chassis
  - » Ethernet management port
  - » Capable of central management
- Management Interfaces
  - » Front mount USB craft interface port for local technician diagnostics
  - » Embedded DOCSIS 3.0 cable modem for remote management
  - » 10/100 Ethernet management port
  - » SNMP monitoring with traps for critical events and alarms
  - » Password-protected web GUI showing status, alarms and logs

Key Features (cont'd)

- Secure Software Download
  - » Firmware image verification similar to DOCSIS Secure Download
- Automatic Video Provisioning
  - » Automatic parsing of SI/PSI
  - » Output channels mapping
  - » Configurable Front End Tuners
  - » Source ID and/or VCN program mapping

Summary

- Solves the MDU challenge:
  - » Most Cost effective – lowest capital, installation and maintenance costs
  - » High performance – decoding happens right at the last 100 ft
  - » Remotely manageable – embedded cable modem
  - » Most flexible platform (long term solution)
  - » Compatible with HITS QT+
- Highly integrated - Combines QAM demodulation, decryption, NTSC modulation and RF upconversion in a single product
- Supports MPEG-2 and MPEG-4 AVC / H.264 video decoding
- Supports HD downscaling

Contact Vecima

Corporate Head Office:

771 Vanalman Avenue Victoria, B.C., Canada V8Z 3B8
Ph: (250) 881-1982
Fax: (250) 881-1974

Main Facility:

150 Cardinal Place, Saskatoon, SK, Canada S7L 6H7
Ph: (306) 955-7075
Fax: (306) 955-9919
Web: **www.vecima.com**
Email: **sales@vecima.com**