Architectures & Solutions
with Key products
**Design challenges for VoD**

### Challenges

- Scale and manage volumes of on-demand content
- Converged services: broadcast & on-demand; TV, PC and mobile
- Enable real-time applications (time shifting, ad insertion) and unpredictable usage patterns
- Meet expectations for broadcast level service availability
- Operational overhead as network and services scale
- No vendor lock on main components to profit from price erosion

### Solutions

- Scalable system that automatically distributes content across network
- Unified platform designed for multiple networks, device and content types
- Real-time data transfers: ingest and commence streaming anywhere in network within seconds
- Network and content resiliency with automated hitless failover
- Manage as single fault-tolerant system, not device by device
- Choose for an independent back office
Main features driving the VOD Architecture

- Time-Shift TV (e.g. Delayed-TV, Restart-TV, n-PVR)
  - Scheduled recording of Live broadcast on (same) VOD-Server
- (Targeted) advertisement
- Content promotion e.g. Campaigns, Personal channels (Philips)
- Interactive (personal) Barker channel
- User Generated Content
- Playlist on demand
- Over the top TV
- Conditional Access /Digital Rights Management implementation
- Allow multiple content/services provider on the platform
- Mix internal and external created catalogues
- External resource management
- Pre-Paid and vouchers models
IPTV Architecture – No VOD – No CAS
IPTV Architecture – With VOD – No CA
RTES stands for Real-Time Encryption Server
STB Client Architecture based on iView Zaphire
eventIS VOD Platform Architecture
Automatic File-Based Asset Ingest

1. tar package upload
2. rename after upload
3. Unpack and move
4. ADI fetch
5. Picture fetch
6. Call: Video file load
7. ftp load movie file
8. ftp load preview file
9. Return load response code
10. Respose in case of success
11. Response in case of failure
Overview

**PRODIS**

**IT Systems**
- CRM
- Billing

**External IT systems**
- CRM record slave
- Royalty reporting
- Usage records

**Customer** → **Usage**

**PRODIS**
- Products
- Metadata
- Content

**Ingest**

**Product Management**

**Asset Management**
- Manual product definition
- VoD Catalogue
- Asset propagation
- Edit Metadata

**STB**

**VoD Server**

11
Overview

› Receive customer & product info from PRODIS
› Resource management
› Transaction management
  • Determine pricing and create entitlement
  • Authorize streaming
› Store and forward transactions to PRODIS
TRAXIS, transaction management

› Session authorization
  • Prevents unauthorized usage of the available streams
  • Closed loop between TRAXIS, STB and VOD server

› Optimized for transaction handling
  • Successful and unsuccessful transactions are stored
  • Individual streaming sessions per transaction/product are stored
  • Prices are determined upon transaction request of the customer and stored

› Redundant and distributed design
  • Load balanced server farm
Build-in support also for DVB-C (QAM) based networks
- QAM channel management
- Knowledge of the VoD topology
- Detection of VoD server and EdgeQAM failure

Interface for PCMM based bandwidth management available
- Acts as Application Server in PCMM framework
- Bandwidth management according policy push model

Support for external (U)SRM’s
CMTS
IPTV /DOCSIS 3.0 CMTS vs. Bypass

- IPTV /DOCSIS 3.0 network provides a standard based solution
  - Ease of management
  - Existing control mechanism for QoS and channel management
  - Multiple interoperable equipment suppliers
- Multiple services in the same Full DOCSIS 3.0 network
  - IPTV, data, VoIP services provided in the same network
  - QoS through DOCSIS service flows
- Video transport and control signaling carried in the same DOCSIS 3.0 CMTS
  - Bypass requires separate CMTS for control signaling, more complex management and total cost is actually higher than Casa Full DOCSIS 3.0 CMTS
- Automatic channel change
  - DOCSIS 3.0 CMTS provides support for automatic channel change through dynamic load balancing (DBC/DCC) and IGMP join
- Statistical gain with channel bonding
  - 4 bonded channels can provide significant statistical gain and less channel change
Traffic Planning Assumptions

- HD bit rate is 8Mbps
- SD bit rate is 3Mbps
- VOD concurrency rate is 10%
- Broadcast concurrency rate is 60%
- Total SD broadcast programs: 100
- Total HD broadcast programs: 20
- All VOD are HD
Two options for IPTV over HFC

- Option 1: Independent Bandwidth Groups
- Option 2: Dynamic Stream Management
Option1: Independent bandwidth groups

- A bandwidth group
  - A bonding group of 3~4 downstream channels for DOCSIS 3.0 system
  - A single channel for a DOCSIS 2.0 system
- CMs are evenly distributed into bandwidth groups through static load balancing at registration time
- Each bandwidth group can provide mixed services of
  - Broadcast TV & VOD
  - Data & VoIP
- Bandwidth groups are independent of each other in providing services
  - Multicast streams may be replicated in each bandwidth group
- Dynamic Channel Switching
  - A CM is moved to a new bandwidth group through DCC or DBC if its bandwidth group is congested
  - A CM will NOT be moved to a new bandwidth group to receive a multicast stream already in the new group
Option 1 Video services

- EPG is provided by IP multicast
  - EPG is replicated in every bandwidth group
- Broadcast TV is provided by IP multicast
  - Each bandwidth group has its independent multicast program lineup
  - All multicast streams for a bandwidth group are dynamically created
  - A STB in a bandwidth group will use IGMP join to request a multicast stream. If the multicast stream does not already exist in the group, a multicast stream will be dynamically created in the group
  - A multicast stream will be deleted from a group when the last STB leaves
- VOD is provided by IP unicast
  - CMTS-CM is transparent to STB-to-Server signaling, no CMTS involvement is needed to set up a VOD stream
  - The CMTS classifies a VOD stream into a high priority service flow to guarantee bandwidth
- There is no signaling needed between video system and CMTS-CM
For a bandwidth group consisting of 4 QAM channels bonded: total bandwidth is 200Mbps (Annex A)

- Assumptions:
  - 70% subscribers are watching TV
  - 10% are watching VOD
  - 60% are watching Broadcast TV
  - Every broadcast stream is received by 4 STBs
  - 20% of multicast stream is in HD, 80% is in SD

- Total number of CM/STBs can be served by the bandwidth group is 142
  - \# of STB = 200Mbps / (10%*8Mbps+60%/4*(20%*8Mbps+80%*3Mbps)
  - 14 STBs are receiving VOD
  - 84 STBs are receiving Multicast
  - 21 unique multicast streams per bandwidth group

- A C2200 chassis with 32 DS channels can serve 1142 CM/STB
- A C3200 chassis with 64 DS channels can serve 2284 CM/STBs

For DOCSIS 2.0 modems, a bandwidth group is a single channel, the bandwidth efficiency is significantly lower because lower statistical gains can be obtained for multicast traffic with a smaller group of STBs
**Option 2: Dynamic Stream Management**

- CMs are evenly distributed into bandwidth groups through static load balancing at registration time
- Each service group can provide mixed services of
  - Broadcast TV & VOD
  - Data & VoIP
- **CMTS has a Dynamic Stream Manager (DSM)**
  - DSM maintains a database of all multicast streams running in the CMTS
  - Only one multicast stream is active in the CMTS for a given broadcast program, no replication in each bandwidth group
  - All multicast streams are dynamically created, this is similar to switched broadcast instead of static broadcast. There is no limit in the number of broadcast programs that can be provided by a CMTS
- **Dynamic Channel Switching**
  - A CM is moved to a new bandwidth group through DBC or DCC if its bandwidth group is congested
  - A CM will also be moved to a new bandwidth group to receive an existing multicast stream
**Option 2 Video services**

- **EPG is provided by IP multicast**
  - EPG is replicated in every bandwidth group?
- **Broadcast TV is provided by IP multicast**
  - Only one multicast program lineup in one CMTS chassis
  - All multicast streams are dynamically created
  - A STB in any bandwidth group will use IGMP join to request a multicast stream. The IGMP join request will be copied to the CMTS DSM. If the multicast stream already exists in the CMTS but in another bandwidth group, the CM/STB will be switched to the group where the multicast stream is already active. If the multicast stream does not exist in the CMTS, a multicast stream will be dynamically created in the group the modem is already in
  - A multicast stream will be deleted from a group when the last STB leaves
- **VOD is provided by IP unicast**
  - CMTS-CM is transparent to STB-to-Server signaling, no CMTS involvement is needed to set up a VOD stream
  - The CMTS classifies a VOD stream into a high priority service flow to guarantee bandwidth
- **There is no signaling needed between video system and CMTS-CM**
Bandwidth is managed on a per chassis basis instead of individual bandwidth groups

- Assumptions:
  - 70% subscribers are watching TV
    - 10% are watching VOD
    - 60% are watching Broadcast TV
  - Every broadcast stream is received by 16 STBs (much higher statistical gains can be assumed across the chassis)
  - 20% of multicast stream is in HD, 80% is in SD

- Total number of CM/STBs can be served by C2200 chassis (32-CH): 1684
  - # of STB = 200Mbps / (10%*8Mbps+60%/16*(20%*8Mbps+80%*3Mbps)

- A C3200 chassis with 64 DS channels can serve 3368 CM/STBs

- Dynamic stream management works better for DOCSIS 2.0 modems than independent bandwidth groups, much higher statistical gains can be obtained for multicast traffic, more channel switching may be needed for 2.0 CMs