Arris (C-COR)  
Switched Digital Video (SDV)  
Training  
SDV-101
Introductions

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Training Objectives

• Explain the difference between switched digital video and broadcast systems
• List the benefits of SDV
• Identify the major components of SDV
  • Video Plane
  • Control Plane
  • Client Plane
• Describe the major functions of the SM (Session Manager)
• Describe the major functions of the ERM (Edge Resource Manager)
Why Switched Video?

Haven’t we got enough to do ALREADY???

Look what we are facing:

- **Competitive threat:** Direct TV launches 140 HD channels
- **Bandwidth issues:** Remove unwatched programs from plant
- **Content limitations:** Enables cable to deliver unlimited content
- **No idea** what subscribers are viewing
- **Advertising challenges:** targeted advertising

- **TWC has over 1 MILLION subs on SDV today!**
SDV Enables more (‘unlimited’) Niche Programming

- Niche programming represents the vast majority of broadcast tier
- 10% of the programs represent 90% of the views
- In one trial 50% of the broadcast tier was NEVER watched
- Switched Digital Video takes advantage of the way subscribers watch “large collections” of content
Defining Switched Digital Video (SDV)

*Switched Digital Video* (SDV) delivers broadcast content *selectively* on subscriber requests. The graphic below depicts the difference between broadcasting and “narrowcasting” (SDV).
SDV Component Interaction

- **Content Source**
  - Program A
  - Program B
  - Program C
  - Program D
  - Program E
  - Program F
  - Program G
  - Program H
  - Safe Channel

- **GigE Switch**
  - "joined" programs

- **Edge Device**
  - QAM allocation status and history
  - Requests to "join" programs
  - Program requests, QAM allocation instructions

- **nABLE Management**
  - Console (MC)
  - Configure and control

- **nABLE Management**
  - QAM allocation status and history

- **Edge Resource Manager (ERM)**
  - Configure and control
  - Service group autodiscovery, channel change status and history

- **SDV-Session Manager (SDV-SM)**
  - Initialization instructions, updated channel maps, monitor STB status

- **Set-Top Box (STB)**
  - Service Group 1
  - Service Group 2
  - Service Group 3

- **QAM allocation**
  - Modulated over RF

- **Programs**
  - Program A
  - Program B
  - Program C
  - Program D
  - Program E
  - Program F
  - Program G
  - Program H

- **Safe Channel**

**Content Source**
- Set-Top Box (STB)
- Edge Device
- requests to "join" programs
- QAM allocation status
- Program requests, QAM allocation instructions
- Service group autodiscovery, channel change status and history
- Initialization instructions, updated channel maps, monitor STB status

**Graphical Description**
- Connections between devices and channels
- Color-coded lines indicating different channels and services
- Diagram highlighting interaction among components

**Textual Content**
- SDV Component Interaction
- Arris Switched Digital Video Training
- Meeting the demands of an on demand world.
SDV Component Interaction

Content Source
- Program A
- Program B
- Program C
- Program D
- Program E
- Program F
- Program G
- Program H
- Safe Channel

GigE Switch
- "joined" programs
- requests to "join" programs

Edge Device
- QAM allocation status
- program requests, QAM allocation instructions

nABLE Management
- configure and control

Console (MC)
- QAM allocation status and history
- configure and control

Edge Resource Manager (ERM)
- Service group autodiscovery, channel change status and history

SDV-Session Manager (SDV-SM)
- Initialization instructions, updated channel maps, monitor STB status

Programs:
- Program A
- Program B
- Program C
- Program D
- Program E
- Program F
- Program G
- Program H

Safe Channel

Set-Top Box (STB)
- content modulated over RF

Service Groups:
- Service Group 1
- Service Group 2
- Service Group 3

Content modulated over RF
SDV Component Interaction

**Content Source**
- Program A
- Program B
- Program C
- Program D
- Program E
- Program F
- Program G
- Program H
- Safe Channel

**Video Plane**
- GigE Switch
- "joined" programs

**Edge Device**
- QAM allocation
- status and history

**Control Plane**
- nABLE Management Console (MC)
- configure and control
- QAM allocation status and history
- configure and control
- Service group autodiscovery, channel change status and history

**SDV Control Traffic**
- SDV-Session Manager (SDV-SM)
- Initialization instructions, updated channel maps, monitor STB status

**Interactive Program Requests**
- service group autodiscovery, program requests

**Interactive Client**
- Service Group 1
- Service Group 2
- Service Group 3

**Video Traffic**
- content modulated over RF

**Content**
- modulated over RF

**Interactive Video Plane**
- Video Traffic
- Interactive Program Requests
- SDV Control Traffic
- Control Plane

**SDV Video Traffic**
- content in digital format

**Interactive Client**
- Set-Top Box (STB)
SDV Communication Flow

Encrypted program content ready to stream

Encryptor → GigE Switch → Edge Modulator
- QAM X
- QAM Y
- QAM Z

→ Set-top Box

Video over Ethernet
Video over RF
Communication flow event

Edge Resource Manager (ERM)

Session Manager
SDV Communication Flow

Encrypted program content ready to stream

1. Send IGMP “join program” request to GigE switch
2. Pass request to ERM
3. Forward program request to Edge Modulator
4. Send IGMP “join program” instruction to QAM
5. Respond to ERM
6. Stream program content to Set-top Box
7. Respond to ERM
8. Pass response to SM
9. Send channel tuning data to Set-top Box
10. Tune to requested channel

Video over Ethernet
Video over RF
Communication flow event
SDV Communication Flow

1. Request a switched channel
2. Pass request to ERM
3. Forward program request to Edge Modulator
4. Send IGMP “join program” request to GigE switch
5. Send IGMP “join program” instruction to QAM
6. Stream program content to Set-top Box
7. Respond to ERM
8. Pass response to SM
9. Send channel tuning data to Set-top Box
10. Tune to requested channel

Encrypted program content ready to stream

- Video over Ethernet
- Video over RF
- Communication flow event

START

END
Role of the Management Console (MC)

Users can *configure* the entire system using the MC GUI
  
  - For example:
    - Configure *switched* programming
    - Select *timeout* and other critical values
    - Identify *edge resources* (modulators)

Users can *troubleshoot* the entire system using the MC GUI
  
  - For example:
    - Determine the status of either the *ERM* or *SM*
    - View *active tuners* in a service group
    - Determine *QAM* status
    - Monitor system event status including warnings and error

A *report* feature gathers statistics on subscriber activities
  
  - For example:
    - *Top channels* by viewing time
    - *Top service groups* by views
    - Channel views by day, hour, and minute
Meeting the demands of an on demand world.
Role of the Session Manager (SM)

- Manages communication with the SDV client
- Tracks ALL switched services
- Monitors the state of every tuner within every STB
- Sends usage data to the Management Console for processing
- Receives configuration information from the Management Console, and adjusts accordingly
- Sends out the mini-carousel
- Directs the Edge Resource Manager to allocate/de-allocate bandwidth.
Role of the Edge Resource Manager (ERM)

- Processes requests from the **SM** to setup or teardown sessions on the **edge device**
- Supports the **RTSP** protocols (**S6/D6/R6**)
- Manages BOTH used and available bandwidth. (The “capacity” for bandwidth is in the **QAM** itself)
- Managers the process of both adding and deleting Edge Devices (eg., D5 edge QAM) from the resource pool
SDV System Components

Video Plane

Stage 1: Signal aggregation and homogenization
- Program Acquisition: HD, SD, music streams, VBR or CBR, GigE or ASI output, SPTS or MPTS
- Grooming: VBR >> CBR, ASI >> GigE, MPTS >> SPTS (Any other conversions)
- MPEG-2 over UDP/IP

Stage 2: Encryption
- Encryptor

Stage 3: Switching and RF modulation
- GigE Switch
- Edge Modulator (QAMs)
- IGMP v2 or later

Control Plane

- MC (Management Console)
- SM & ERM (Session and Edge Resource Manager)
- Application Switch

SDV Clients
- STB

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SDV Servers

In the High-Availability configuration: 6 total servers in a basic SDV system

- The Management Console: 2 servers (one active, one standby)
- The SM: 2 servers (one active, one standby)
- The ERM: 2 servers (one active, one standby)
- Both SM and the ERM are clustered and utilize virtual IP (VIP)
- The MC, SM and ERM are high availability (HA) servers and are configured for failover.
- The MC, SM and ERM constantly communicate, replicate information between each other
SDV Acronyms

- SM: Session Manager (Arris, Motorola)
- ERM: Edge Resource Manager (Arris, Motorola)
- MC: Management Console (Arris, Motorola)
- HA: High Availability
- VBR/CBR: Variable Bitrate, Constant Bitrate
- SD/HD: Standard Def, High Def
- ASI/DHEI: Async Serial Interface, ?
- GigE: Gigabit Ethernet
- SPTS/MPTS: Single Program Transport Stream, Multiple Program Transport Stream
- RTSP: Real Time Streaming Protocol (ERM <-> Edge QAM)
- IGMP: Internet Group Multicast Protocol
- S6/D6: Comcast speak for “Session” and “Discovery” protocols
Questions?
Thanks!