IP NGN Network
Ready for IPTV ??

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Cisco ServiceFlex Design
Transforming Consumer and Business Services

Subscriber Edge
- Residential
- Business (Corporate)
- Mobile

Access
- MSPP
- Cable
- DSL
- PON
- FTTH

Edge Aggregation
L3—Video/Voice
HSI/Business—MPLS
- Distributed: L2 PW, L3VPN IP Multicast
- Centralized: H-VPLS, L3VPN IP Multicast
- Ethernet PE-Agg Aggregation
- Ethernet N-PE Distribution

IP/MPLS Edge
- BRAS
- DPI
- MSE PE

IP/MPLS Core

Policy/Service Layer
- Portal
- Subscriber and Service Database
- Authentication and Billing
- Broadband Policy Manager
- EMS and Provisioning

Application Layer
- iFrame Cache
- Managed Business Services (Storage, VoIP, Security)
- VoD
- VoIP
- Video Broadcast

Managed Business Services
- Storage
- VoIP
- Security

Policy/Service Layer
- Video Broadcast
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Application Layer
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Continuously Strengthening the IPTV Solution

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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<tr>
<td>Dec 2004</td>
<td>CRS-1 8-Slot SCE</td>
</tr>
<tr>
<td>Apr 2005</td>
<td>SIP/SP XR12000 7604</td>
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<td>Sep 2005</td>
<td>Video-to-Network Linkages ME 3400</td>
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<td>Dec 2005</td>
<td>IP DWDM for CRS-1 SEF/IPTV over IPNGN</td>
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<td>Oct 2006</td>
<td>Arroyo</td>
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- **Super Head End (SHE)**: National Content
- **Video Head End Office (VHO)**: Video CAC ISG with Policy Server
- **Video Switching Office (VSO)**: Video CAC ISG with Policy Server

**Diagram Components:***
- **Core Network CRS-1**: ME 3400 4500 7600
- **Regional VOD Vault**: DCM Encoder
- **Regional Content**: DCM Decoder
- **Metro Network**: 7600
- **PON**: STB
- **Gateway**: PC
- **Set-Top-Box (STB)**: SciCare
- **SciCare**: Feb 2006
- **Video CAC**: ISG with Policy Server
- **SciCare**: Jul 2006
- **ME 3400 4500 7600**: Regional Content Processing
- **Arroyo**: Oct 2006

**Technology Platforms:**
- **IP DWDM for CRS-1 SEF/IPTV over IPNGN**: Dec 2005
- **Scientific Atlanta Head End Set-Top-Box SciCare**: Feb 2006
- **Video CAC ISG with Policy Server**: Jul 2006
Cisco Wireline Video/IPTV Solution Test

- C-VISTA – Cisco Video / IPTV Systems Test & Archictecture
- First Release Launched AUG 2005, most recent in Dec 2006
  324 page DIG, “Cisco IPTV/Video Wireline Solution, Rel 1.2”
- Architecture’s fundamentals driven by leading providers
- Initiated key strategies and innovations
  Multicast Scale & Failover Performance Tested
  Video Bypassing the BRAS architecture
  Multicast N+M Encoder Redundancy using our PIM-SSM solution

Wireline Video/IPTV Solution Test Suite in San Jose, CA

- System Verification & Performance Testing in a real Video Service environment

- Solution Train Process
  - Ongoing Testing & Support
  - Phases in new platforms, functions
  - Secure software quality and feature consistence

- 7600s, 6500s, 4500s
  - CRS-1 being added as DER option

- Specialized video test gear (eg, Ixia & Ineoquest and more)

- Digital Satellite Feed (HD & SD)

- SFA head-end

- VoD, EPG servers, STBs, TVs

- Publishes Solution Design & Implementation Guide (SDIG) for each release along with various whitepapers, etc
Transport Architecture Components

SHE: Super Head-End
VHO: Video Hub Office
VSO: Video Service Office
Adding 7600 Carrier Ethernet Modules options
- CRS-1 as Distribution Router (DR) option
- More Head-End / Encoder Redundancy options
- Application Layer Redundancy
- Integrated Service Delivery Platform & IP-STB SFA Platforms
- Content Delivery System (CDS) platform inclusion
  - VoD & nPVR [eg, Anything Time-shifted, Start-Over]
- Integrated Video Admission Control (VoD)
- Visual Quality of Experience (VQE)
  - Error Repair and QoE monitoring/collection, etc
Ensuring high QoE Under “Zapping” Load
HDTV Head-end, Core, Edge

Ensuring QoE Under Zapping Load
Aggregation/Edge Routers at Higher Scale
Leave/join times ave <50ms under load
Handles 15K channel zaps / Edge
PIM-SSM Routing Optimizes Utilization
• Multiple video sources – National, local
  over the air, inter-region content sharing
Protect QoE Against Outages, Reducing Impact
IPTV Head-end, Core, Edge

Anycast IP Multicast

Redundant, Live IPTV Broadcast Streams per Channel

Multi-Path IP Multicast over Equal-Cost Paths

Metro Aggregation Network

IP/MPLS Core

Central/End Offices

District Offices

Home gateway

Home gateway

Home gateway

Home gateway

Home gateway

Home gateway

Home gateway

Live Broadcast & VoD Asset Distribution
Cisco 7600: Video and Multicast Connection Admission Control

Unmatched, end-to-end connection admission control manages Network oversubscription

### Broadcast TV
1. **IPTV Channel Change**
2. **Channel Request**
3. **Available Bandwidth Check**
4. **Request Denied/Accepted**

### Video on Demand
1. **VoD Request**
2. **VoD Request**
3. **Available Bandwidth Check**
4. **Request Denied/Accepted**
Think Video

Think IPTV

Think Cisco