IPTV Service Assurance
Challenges For A Comprehensive Solution

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New Business Requirements

ITU-T

o   Risk of not assuring the service

- Higher operational costs and expenses
- Customer churn

o   Streamline network and business operation for faster time-to-market

o   Need to increase ARPU and margin contribution with bundled, high-SLA services

o   Must assure the bundle

- Gain market share, maximize customer retention
- Win based on quality, not just price
- Build customer loyalty

The Impact of IPTV

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o IPTV is very complex

- IP infrastructure, multicasting, middleware, DRM, xDSL, home gateway, STB, etc.

o Increases traffic demands and network performance sensitivity

o Picture quality and response time is everything

- Users have high expectations and low tolerance

o Quality of experience is elevated
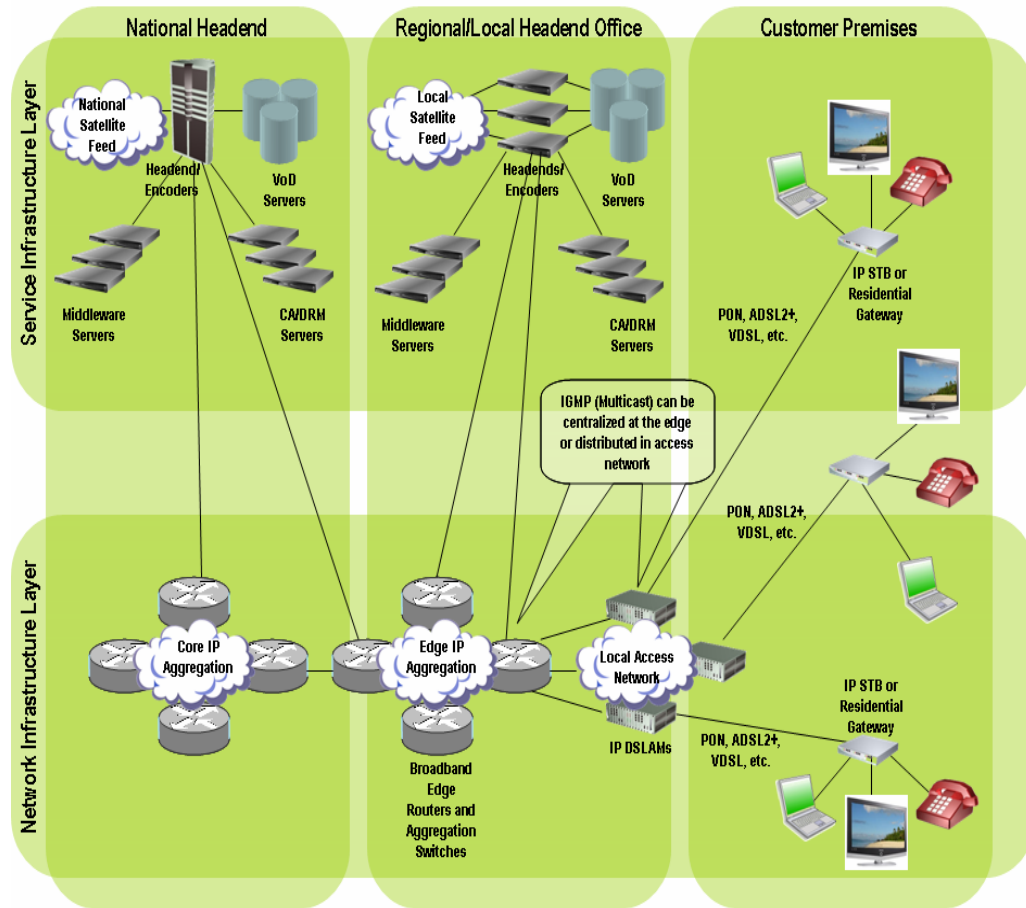
Source:Infonetics Research

IPTV Service Quality

Problem	Reason
Availability	System/network availability
Slow Start, channel change time	IGMP/network performance
Picture freeze	IGMP/network performance
Video/audio availability & quality	Packet loss & jitter
Unobserved bandwidth	IGMP performance, fast channel change
Video/audio synch.	System configuration

Key Performance Indicators

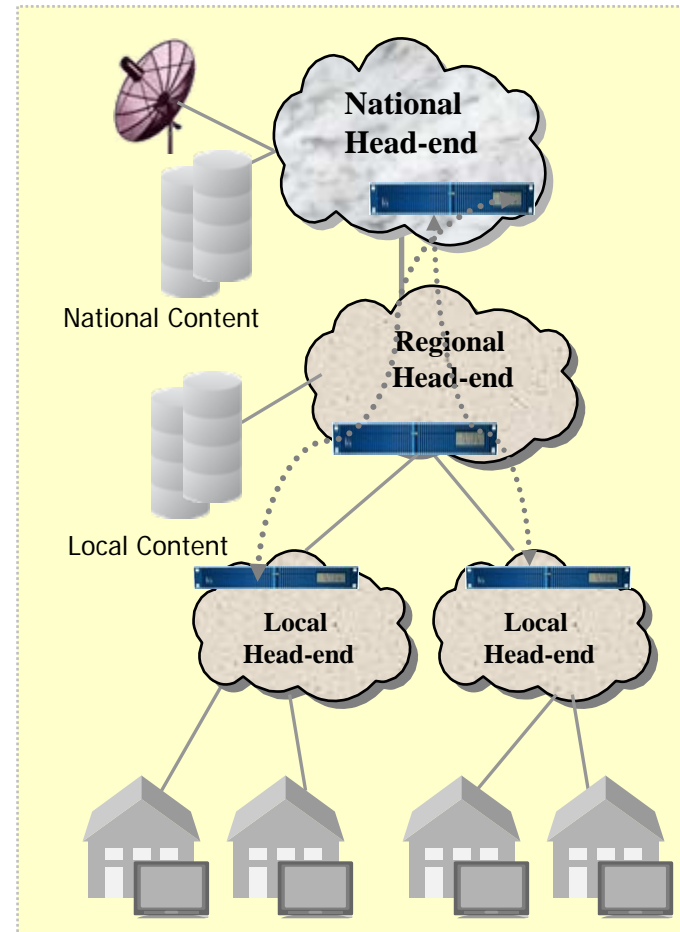| Transport (IP)	Signaling (IGMP)	Content (Video/Audio)	Service (IPTV)
One-way /round-trip Latency (one-way/round-trip) Packet loss Jitter, jitter buffer Initial buffer time, re-buffers Hop count	IGMP Join/leave times Join/leave gap Join/leave overlap Query count HTTP Middleware	MOS, bandwidth Start time Picture loss Frame loss, rate First picture time Freeze/skip frame events	Channel availability Channel start time Channel change time Channel join time Channel change failure rate DRM response time

Top 3 Issues

o **Content availability**

- Availability of channel
- Issues: content provider, multicast core, video source, access network, home network

o **Content quality**

- Quality of audio & video
- Issues: multicast core, video source, access network, home network

o **Channel change time**

- User wait time while changing channels
- Issues: IGMP performance, middleware, multicast core, UDP performance
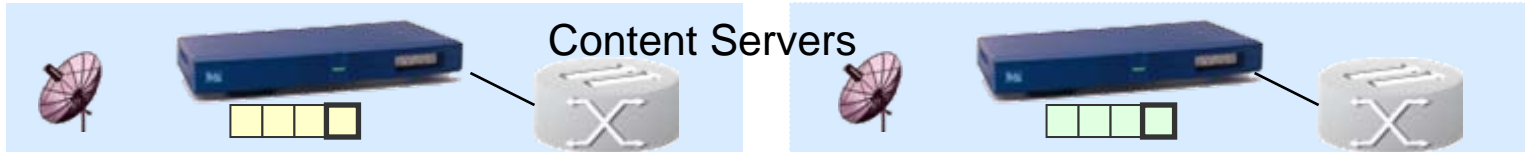
Infrastructure Quality

o Video-over-IP applications have unique, user-visible impairments

- Caused by video-over-IP distribution and underlying IP network architecture

- Key performance indicators (KPIs) that impact IP video service quality include jitter, latency, and frame loss

o Infrastructure Verification

- Evaluate quality and performance of multicast distribution layer

- Monitor and report results on multicast IP video distribution for IGMP (join/leave) times for channel change response times
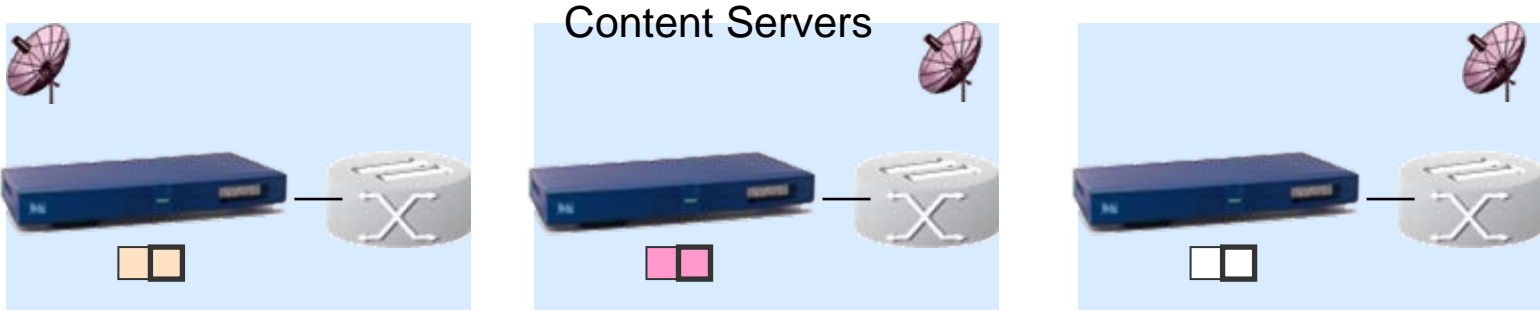

National Head-end

National Content

Regional Head-end

Local Content

Local Head-end

Local Head-end

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Multicast Verification

o National/regional verifiers distribute high- & standard-def channels

o Local verifiers join/leave channels

o High-availability deployment – hot-standby verifiers

o KPIs – VQI, MOS, per channel change time

Content Quality

o Video content quality...picture quality is imperative

- Brix Video Quality Index: Objective video quality score (1-5 scale) similar to MOS for voice

o Video reference monitoring

- Synthetic transactions of true video traffic
- User control over traffic pattern
- Well suited for troubleshooting,root cause analysis, and baselining

o Live video session analysis

- VoD services
- Broadcast TV
- Ideal for behavioral analysis and video quality issues

Quality of experience

o **Testing channel change response time**

- Test and monitor IGMP (join/leave) latency, video start delay, and access to first I-frame
- Test simulate channels by emulating set-top box for zap and VoD function delays

o **Live channel monitoring - join test channel**

- Monitor channel change performance

o **Monitor customer traffic**

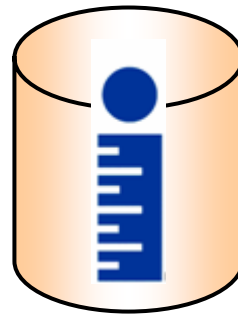- Capture customer's experience
- Provide usage statistics

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Service Assurance Architecture

Visualize

Analyze

Aggregate

Measure

User

Premises

Edge

Core

Aggregate

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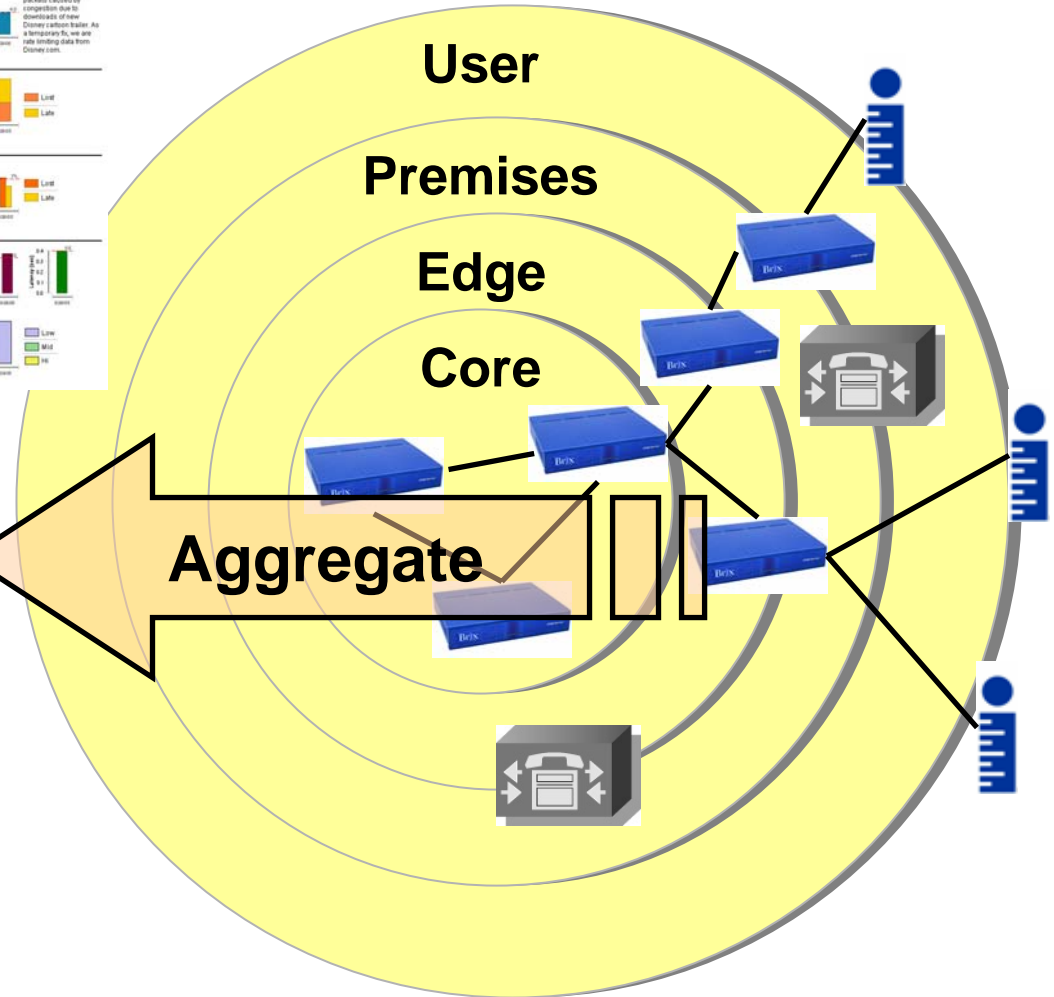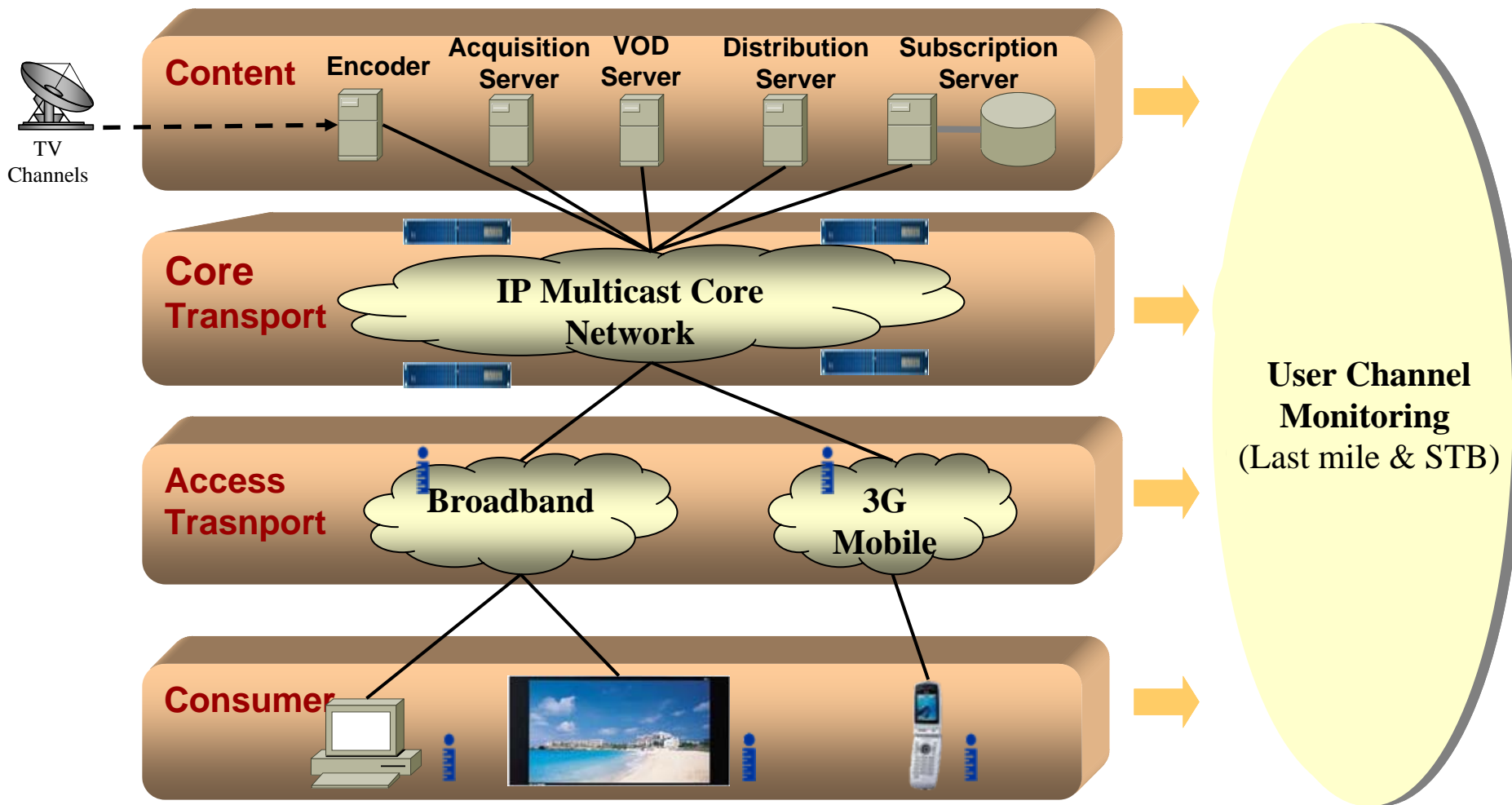
Standards

o **Packet metrics**

- IETF IPPM – Accuracy and definition of metrics
- Types of packet loss, effects of jitter, round-trip & one-way latency

o **Protocols**

- RTCP-XR: RFC3611, reporting of packet/frame-based statistics & video content metrics by endpoints

o **Video quality algorithms**

- Active full-reference: J.144
- Passive no-reference: ongoing work in VQEG & ITU-T

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