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- ▶ 5G-NTN Satellite Networks
- ▶ AI-Driven Transformation
- ▶ Trump & Space Commerce
- ▶ Ethical AI & Public Policy
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- ▶ Guide to DTW Ignite 2026
- ▶ IT & Telecom Technology News
- ▶ Letter from the Editor
- ▶ Article Index



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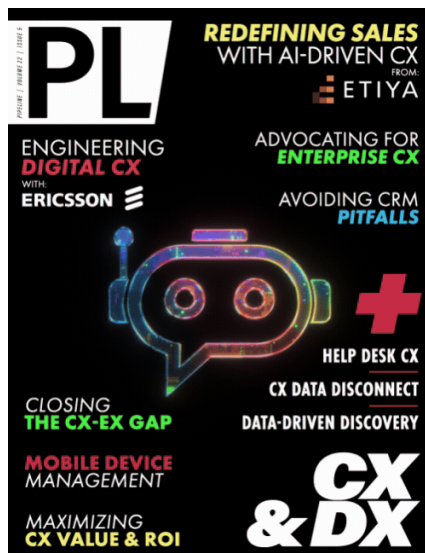
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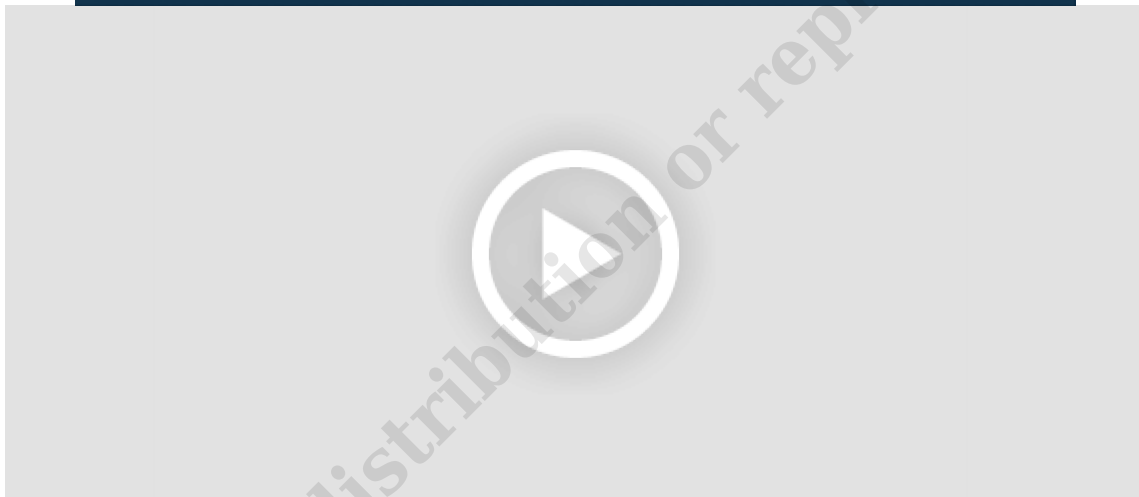
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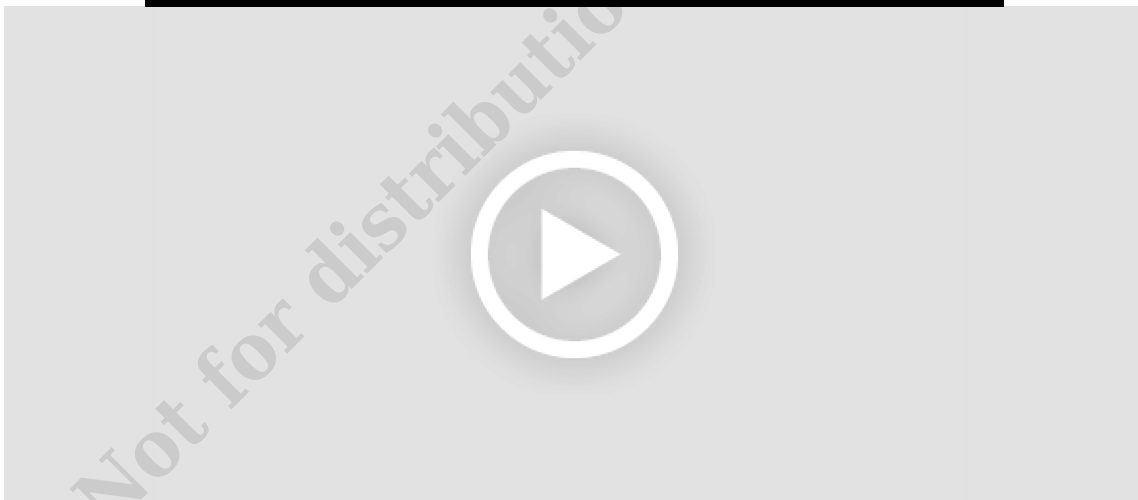
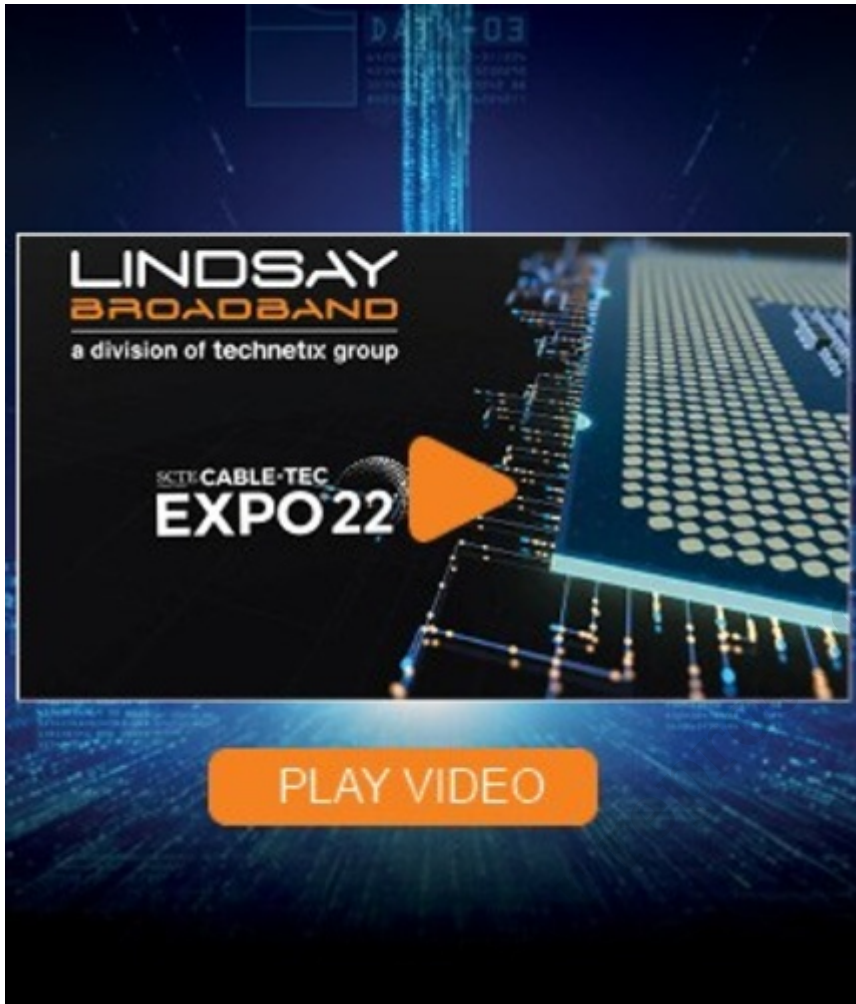
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End-to-End Solutions for Broadband Networks

In case you missed Lindsay Broadband - a division of Technetix group at the SCTE Cable-Tec Expo, this video highlights the must-have, end-to-end solutions for your network.

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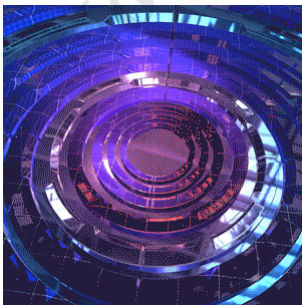
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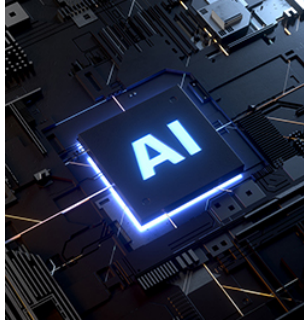
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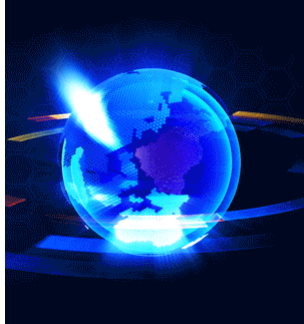
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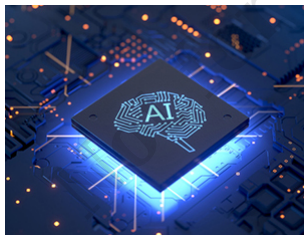
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Preparing the OSS Back Office for New SMB Services & Bundles

Written by:

Alan Breznick, Senior Analyst, Heavy Reading, in cooperation with
Rick Mallon, Vice President, Product Management, Sigma Systems

June 2011





AGENTIC AI

NEXT-LEVEL JOURNEY AUTOMATION



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Testing the Cloud

Mark Sytko, New Technologist EXFO Service Assurance

INTRODUCTION

Broadband, backbone and mobile wireless service providers see the cloud as an opportunity for growth. New applications running in the cloud drive new traffic to their network. The cloud also offers new revenues from new services that can be sold to customers. The business models for carriers and how they relate to the cloud are evolving quickly, but one fact is becoming clear: to achieve success in the cloud market, carriers must actively ensure that they offer a high quality of service to cloud consumers. The best way to assess cloud quality is to test the cloud.

A cloud is a shared computing platform available over the network used to run a variety of business or personal applications. The concept is hardly new; it has roots in service bureaus, outsourced data centers and utility computing. What makes the cloud work today is the rise of the web browser as a thin client that allows individual users to run any application, the wide availability of high-bandwidth networks, and virtualization technologies for computers, storage and networking. The cost savings, expanded reach, and improved quality gained by running an application in the cloud is proving to be a business success, as shown by the growth of cloud services into a market worth billions.



Figure 1. Cloud players: cloud users, cloud consumers, cloud providers and cloud centers

Cloud services are sold to cloud consumers who have a business need. To meet that need, the cloud consumer deploys an application to be run in the cloud for a user community. The cloud itself is driven by cloud data centers that provide an environment for running the application. The data centers provide servers, storage and

networking. User access to the cloud data centers is provided by cloud carriers. The cloud provider manages the cloud data centers and their servers, storage and networking. The carrier manages the interconnection between the user and the cloud data centers. The application may be owned and managed by the cloud consumer or the cloud provider.

The quality of the user's experience depends on both the carrier and the cloud provider. Together, they determine how well the application serves its users. The carrier manages bandwidth, latency, reachability, loss and other network key performance indicators (KPIs) that affect quality. The cloud provider manages processor utilization, storage, switch utilization and other resource KPIs that affect quality. But the KPIs that describe the quality of the service (QoS) provided to the consumer and the user are web download times, service availability, data delivery times, and other KPIs that are tied more directly to the service sold to cloud consumers. These service-oriented KPIs cannot be measured by any one actor; together, they either is determined by the business relationship between them, if they are independent, cloud carriers offer SLA guarantees to cloud providers. Cloud providers in turn offer SLAs to cloud consumers. If the carrier owns the cloud provider, then the single organization can offer the service-level agreements (SLA). These SLAs are one factor driving carriers and providers to test the cloud.

Actor	Definition
Cloud User	A person or organization that uses and benefits from the cloud.
Cloud Consumer	An organization or person that buys services from the cloud provider to use or run an application.
Cloud Provider	A person or organization that provides a cloud service.
Cloud Center	A communications service provider that provides connectivity and transport between users and the cloud or within the cloud.

Table 1. Cloud actors

In this complex business environment, carriers have strengths. First, they own the network that connects users to the application running in the cloud. Second, they provide the circuits that connect cloud data centers to the Internet and each other. Third, they can provide the security and privacy customers want through dedicated circuits or virtual private networks that isolate one customer's traffic from another's. Finally, they know how to offer a high-quality service backed by the guarantees of an SLA.

remain in
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Regulatory considerations are crucial to the success of any communications company. Do you need expert testimony or interpretation of a tariff or FCC order? Perhaps you've worried about QALEA, CPNI and Red Flag compliance, or need a wireless, efficient or interconnection agreement. More importantly, do you need assistance in interpretation and identifying the revenue impacts of the FCC's most recent USF/ICC Reform Order?

CHR's Business Compliance group provides you with the information needed to stay on top of important federal issues affecting small and rural telcos - allowing your business to remain in compliance during regulatory change.

CHR can help you with timely compliance reporting and assist with the implementation of regulatory requirements. CHR's FCC Report provides crucial information on key regulatory issues affecting your day-to-day business operations. Our Business Compliance group provides state and national regulatory services and implementation services associated with regulatory requirements. The Business Compliance group works with regulatory commissions, legislative bodies, and national and state associations to help develop and implement telecommunications policies.

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PTP Test Applications

Harmedoun Douki, Product Specialist, Transport & Datacom Business Unit

4G/LTE deployments and increased bandwidth requirements in Carrier Ethernet services are the driving force behind the new backhaul network technology. Synchronization is required for cellular and wireless network operations because base stations must be synchronized in order to hand off calls between base stations, minimize dropped calls and ensure proper billing. Since precision time protocol (PTP) provides both phase and frequency, it is quickly becoming the synchronization technology of choice for packet networks.

WHAT IS IEEE 1588V2/PTP?

PTP provides high clock accuracy in a packet network by continuously exchanging packets with appropriate timestamps. In this protocol, a highly precise clock source, referred to as the grandmaster clock, generates timestamp announcements. It also responds to timestamp requests from boundary clocks, thus ensuring that the boundary clocks and the slave clocks are precisely synchronized with the grandmaster clocks. By relying on the holdover capability, the precision of the integrated clocks and the continuous exchange of timestamps between PTP-enabled devices, the frequency and phase accuracy can be maintained within a submicrosecond range, thus ensuring synchronization throughout the network.

The objective of PTP deployment is simple: by exchanging timestamps, the slave clock can determine its offset from the grandmaster clock and thus adjust itself. This provides frequency and phase synchronization through packet distribution.



Figure 1. PTP network

PTP USE CASES

PTP is a packet-based technology. As the synchronization packets used by PTP are forwarded throughout the network between the grandmaster and hosts, they are subject to delay (latency), delay variation (packet jitter) and frame loss. Despite applying high priority to synchronization flows, synchronization packets will still experience congestion as well as routing and forwarding issues (e.g., out-of-sequence packets and route flaps). The host clock's holdover circuit must be stable enough to maintain synchronization in the event that synchronization packets experience these network events.

In addition to testing packet metrics to make sure they meet the service level agreement (SLA), in some cases, it may also be critical to validate the frequency measurements of the sync signal. A few use cases are detailed herein. Table 1 summarizes the different synchronization testing applications.

Service Turn-Up	When	Who	Tests	Duration	Product
Ethernet backhaul and PTP client turn-up	Performed every time a tower is put in service	Field technician	- EtherSAM (Y1564) - PDV GE measurements - Client emulation	30 minutes at 7 hour	NetFlacker Series
Sync network installation	Performed when a sync network is being deployed or when a new grandmaster is added	Network engineer	- Wander measurements - DC PDV offset - Slave/client emulation	24 to 48 hours	SyncWatch PRO
Troubleshooting					
Basic troubleshooting	Packet metrics issues/detective slave client	Field technician	- EtherSAM (Y1564) - PDV GE measurements - Client emulation		NetFlacker Series
Advanced troubleshooting	Incorrect clock output/detective grandmaster	Network engineer	- DE, MTE - DC PDV offset - Slave/client emulation		SyncWatch PRO

Table 1. Synchronization applications

EXFO | Assessing Next-Gen Networks

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software solutions

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DIGITAL **TRANSFORMATION** FOR TELCOS:

101 guideline

November 2023



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WHY OPERATIONAL MANAGEMENT IN VIRTUALIZED DATA CENTERS IS CRITICAL TO DELIVERING SERVICE ASSURANCE

Most large enterprises' business processes require IT to function smoothly and efficiently, making a robust and predictable IT environment vital.

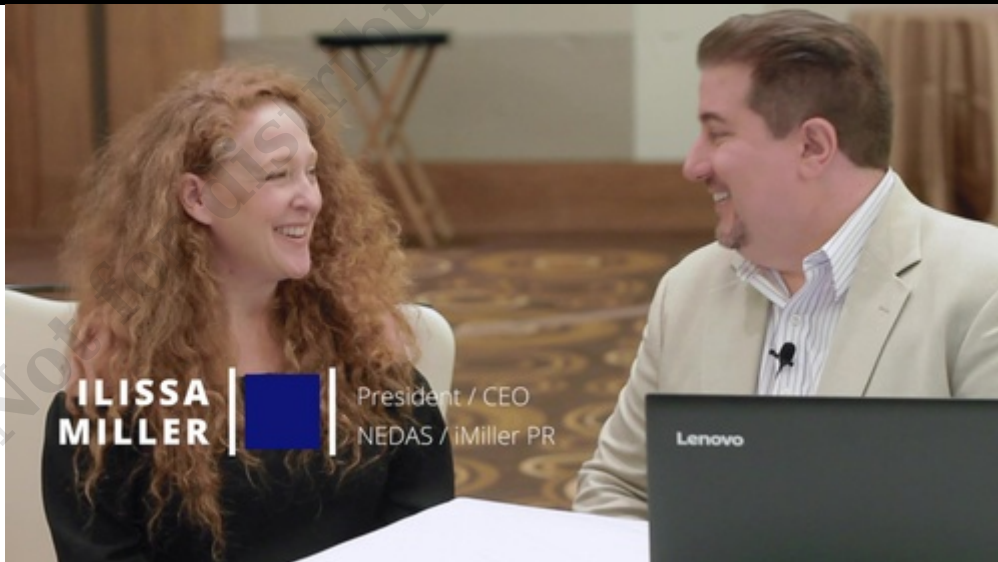
As underlying IT infrastructure evolves, management capabilities also must keep pace so performance and availability remain at or above promised service levels. Mitigating growing IT complexity and reducing business risk requires a management system that can provide end-to-end management and visibility for IT operations, assure accuracy and reliable remediation for configuration updates and changes, proactively deal with availability and performance problems before they impact users and service levels, and rapidly identify problem root causes and deploy the right resources to quickly restore normal operations.

This EMC Perspective highlights why IT needs to provide service assurance; the management obstacles to achieving this; what's needed in an infrastructure management solution for enabling service assurance; how EMC's Solution for Service Assurance delivers the management capabilities required to meet these needs; as well as results and value being achieved by EMC customers.

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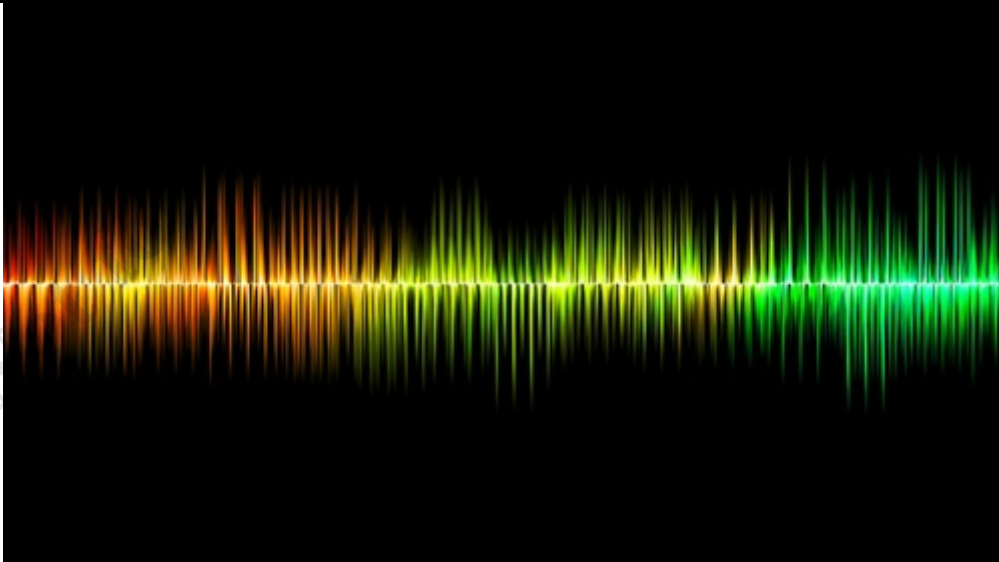
Whether your goal is to implement a WiFi network that guarantees outstanding coverage for broadband Internet access or you're seeking new revenue streams by becoming a VoIP or Wireless Internet Service Provider, our experience enables the entire ecosystem.

CHR's WiFi Solutions include flexible end-to-end or à la carte options that range from concept to construction, to customer management. Our certified engineers and best-of-breed partners stand ready to aid in every aspect of your WiFi project.

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Prepared for Progress Actional
February 2009

**The Total Economic Impact™ Of
Progress Actional Management For
Interconnected Applications**

Implemented by a communication and media service
provider

Project Directors: Paul Devine and Sebastian Seihorst

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CloudSmartz' mission is to help Communications Service Providers (CSPs) transform and innovate faster by making it easy to optimize business intelligence and generate revenue through a unified digital experience.

Acumen360™ Foundational Platform

Digitize Operations & Enable New Revenue Streams



Acumen360 Overview

Acumen360 enables an end-to-end customer experience portal that provides a multi-dimensional view into on-demand services as well as traditional products, including hooks into all legacy systems. Enterprise and SMB users will have self-service activities at their fingertips, including service ordering, customer care, provisioning status, network visibility, billing, ticketing, reporting, and more. Acumen360 allows for a 360° view into the customer and the business, enabling an award-winning customer experience platform unique to the telecommunications industry.

Pains That Weigh Down Service Providers

- Lack 360-degree visibility into customer touchpoints
- Lack overall digitization & automation strategy
- Provisioning time is way too long
- Net Promoter Score continues to decline with CX
- Need to drive revenue from new services & solutions
- Internal teams lack time or skillset to innovate



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Weathering the Wireless Tsunami
**How MNOs Can Reach
High Ground in Today's
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By ConceptWave Software Inc.



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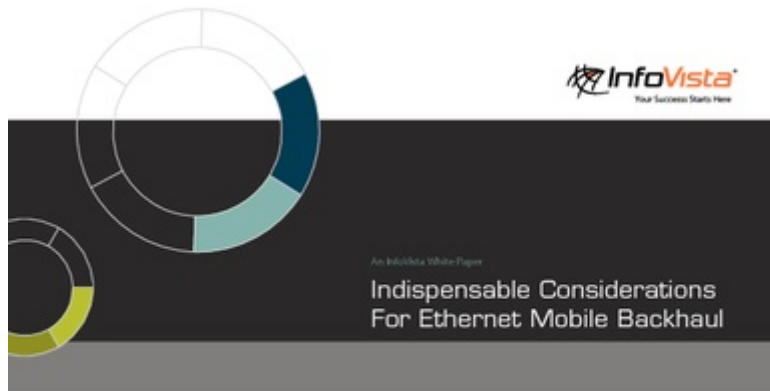
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CHR's Connected Services provide the platform for next-gen networks and brings them to life. Our expertise in execution enables IP evolution—guaranteeing improved network reliability and scalability to support the services that maximize ARPU, reduce churn and generate new revenue while achieving regulatory requirements and reducing CAPEX.

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