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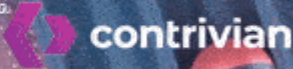
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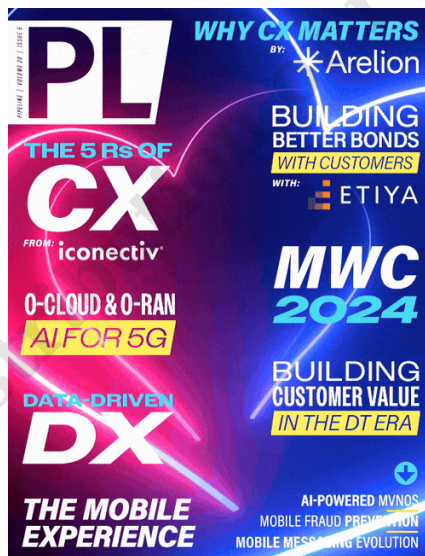
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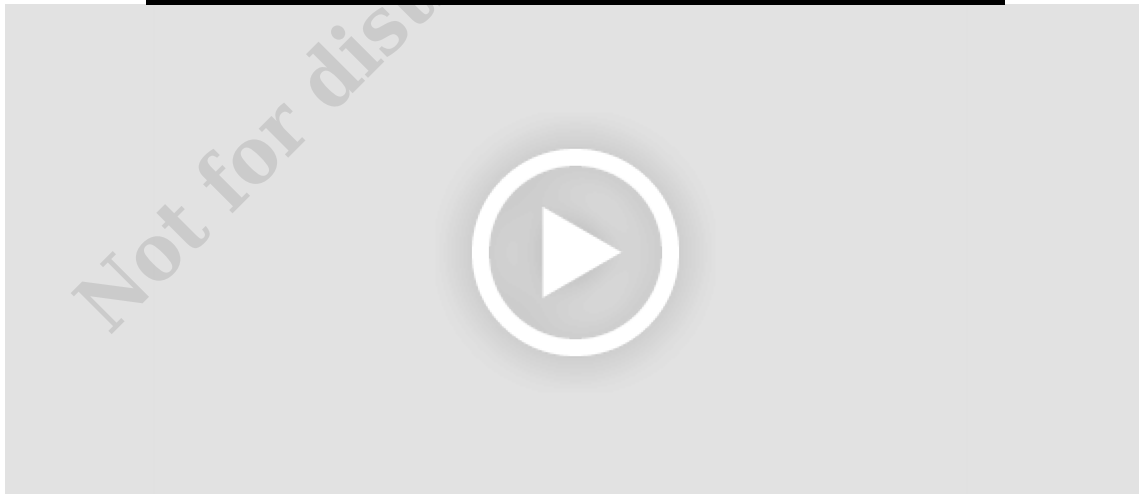
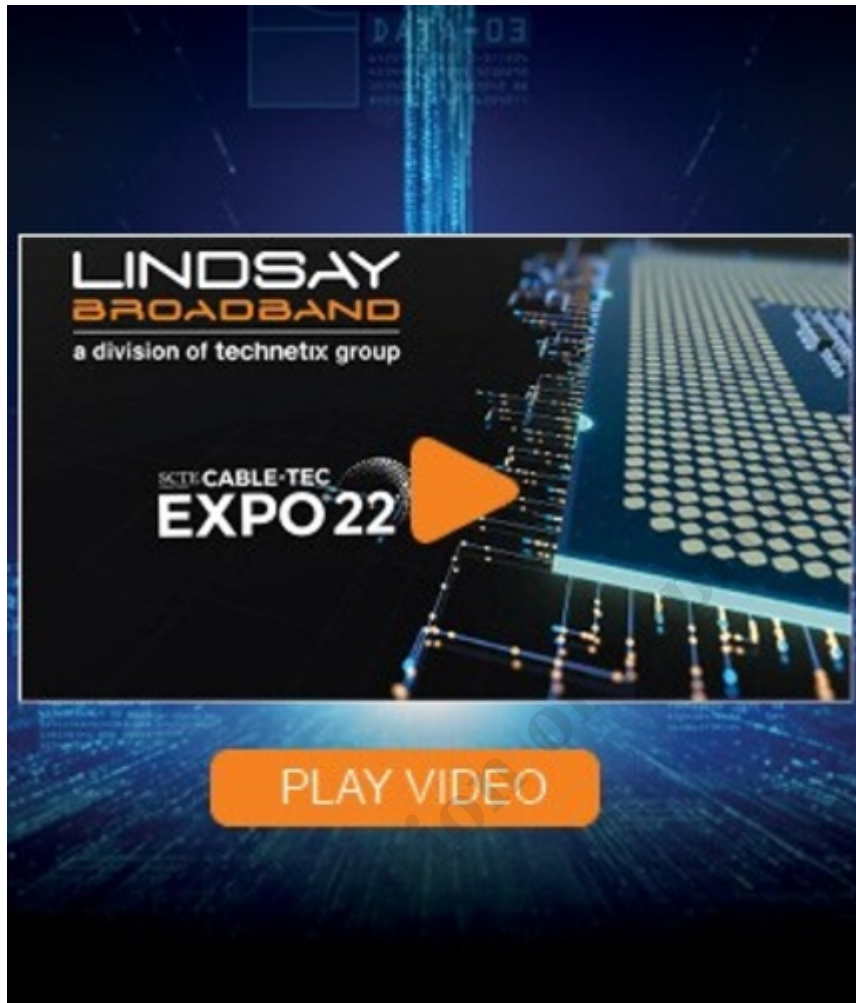
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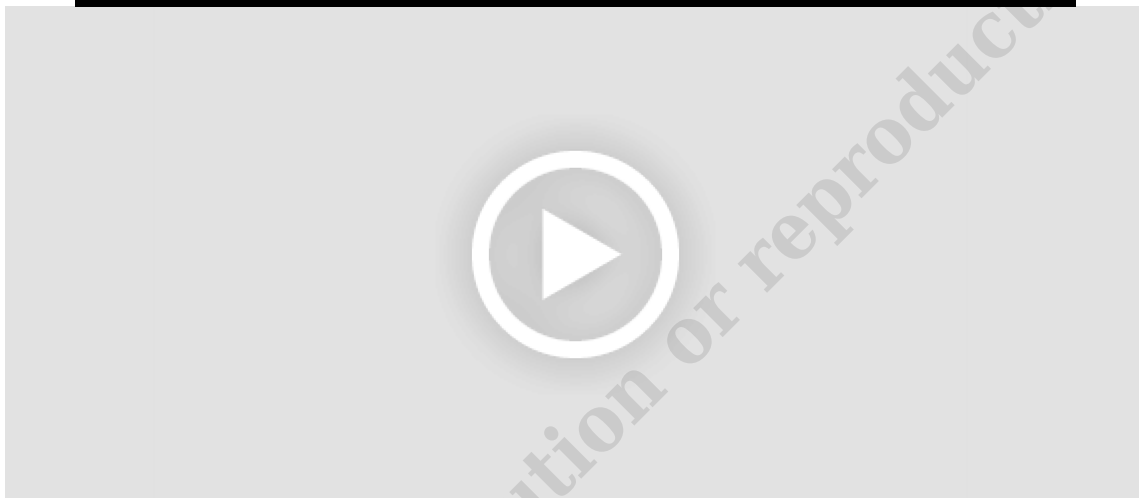
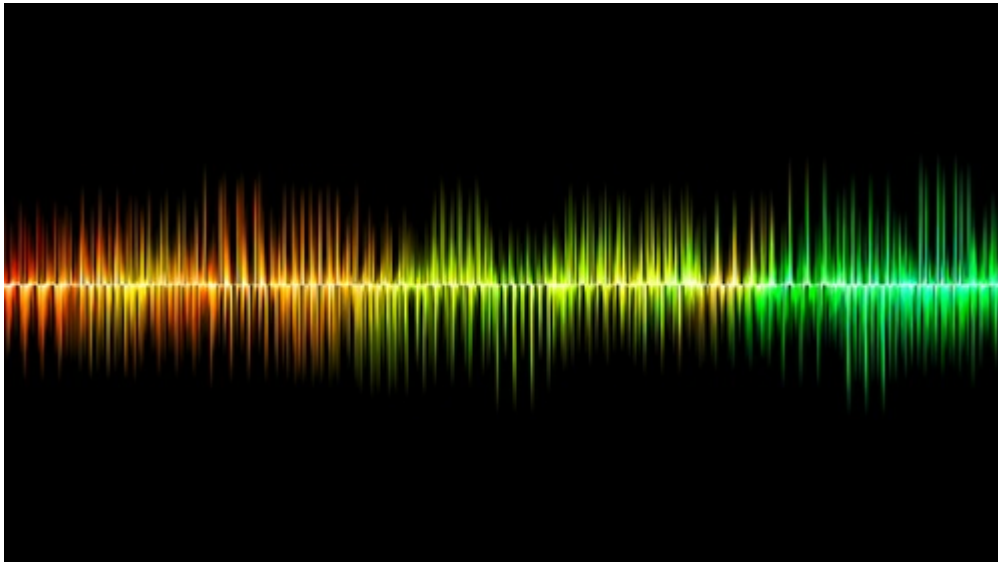
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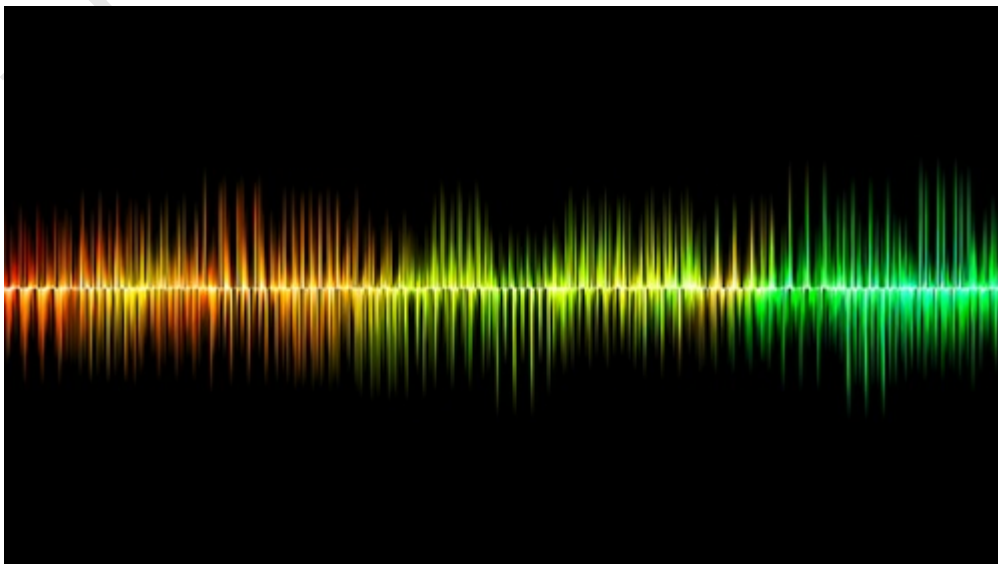
End-to-End Solutions for Broadband Networks

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.



Predicting Colonial Pipeline: Mitigating Risk and Compliance

Mitigating risk and compliance for lawful intercept using lawful intelligence is explored in this Pipeline article feature SS8. Learn how CSPs can comply with lawful intercept regulation, while empowering law information with critical, real-time data.





Podcast: The Evolution to 6G

The world's eyes are already looking forward to the potential of 6G. Demands resulting from innovative use cases, for instance specific requirements from different industries and other user groups, as well as overarching goals like sustainability, are driving the standardization and development of mobile technologies.

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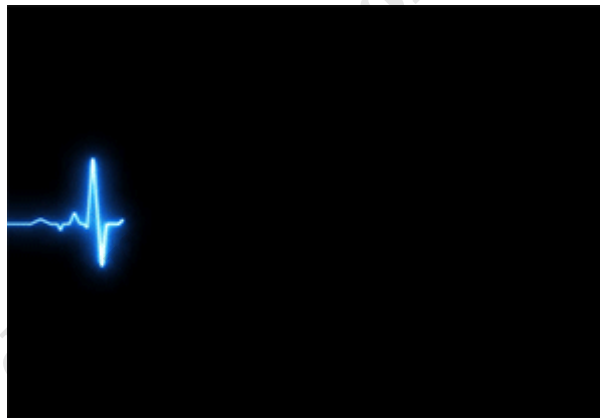
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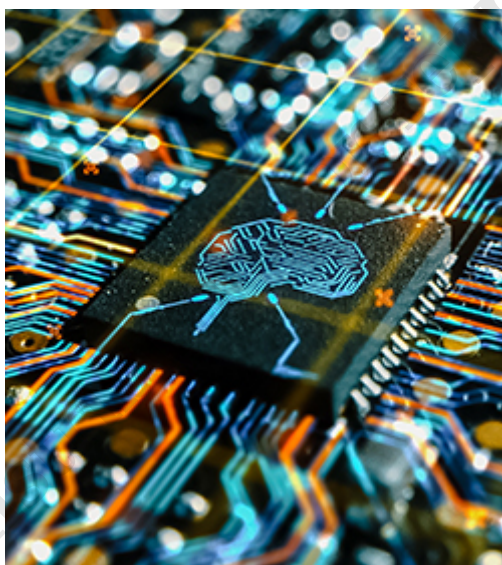
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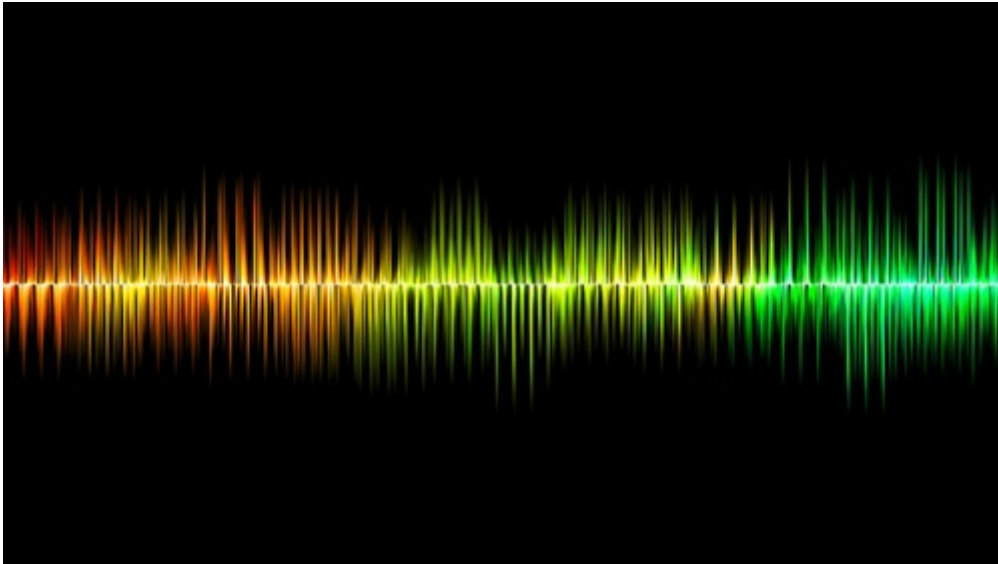


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Sigma Systems and TiVo

Orchestrating New and Enhanced Entertainment Experiences

As consumer demands for a more personalized video entertainment experience continue to skyrocket, service providers are seeking new ways to remain competitive and seamlessly deliver over-the-top (OTT) content to subscribers. Today, Sigma Systems and TiVo have developed an integration partnership to help service providers achieve this goal by embracing and provisioning the TiVo video platform as a part of their bundled service offerings.

One Managed View of Video Access Entitlements

Critical to the success of offering a service like TiVo to customers is the ability to seamlessly enable them to access and view subscribed content from the TiVo device. Sigma Systems provides the service orchestration for the necessary authorizations, entitlements and provisioning of the TiVo service for subscribers through a single OSS solution – an essential element to delivering both on-network and 3rd party content and entertainment services. Subscribers receive the content they want, while service providers maintain customer satisfaction.

Provision and Manage Premium Video Service Products & Packages

Delivering new entertainment experiences to subscribers doesn't have to involve an immediate and costly video network evolution. Sigma Systems empowers service providers to leverage existing video networks in order to move beyond linear for services such as digital TV, PPV, VOD and DVR/PVR through support for next-generation IP video platforms, like TiVo, on a single integrated OSS service management platform. This co-existent service fulfillment environment manages the provisioning and activation of all video services, helping service providers to launch new premium video services and bundled packages that drive new revenue and reduce customer churn. In addition to viewing premium video and entertainment services offered by TiVo, service providers can also integrate with and deliver existing video products on the TiVo set-top box.

Effectively Manage the Entire Video Delivery Chain

Sigma Systems is the only OSS vendor today that has created a TiVo solution adaptor. With this unique solution adaptor, we have extended our video service fulfillment expertise beyond linear TV by enabling the support, integration, and provisioning of the TiVo service. Our single, integrated OSS solution seamlessly provides order management, provisioning and entitlement management across all technologies and systems. This single integrated solution manages one image of the TiVo service delivery value chain for the subscriber, network, device and content from the cloud.





case study **TruOps Common Language**
 simplify financial compliance, streamline asset management

challenges

- Maintain accurate view of fixed assets
- Track assets in multiple networks/territories
- Fixed Asset Register compliance.

solution

iconectiv TruOps Common Language®

results

- Realize ~ 10 percent saving on procurement costs
- Simplify tracking and reporting to meet financial compliance requirements

knowing what you have, what you need and what you don't

For mobile service providers, maintaining an accurate view of the fixed assets across an entire network has always presented a challenge. For group operators, that challenge is multiplied - tracking the value of its fixed assets in multiple networks across different territories, managed, maintained and upgraded locally with equipment sourced from multiple vendors is near impossible using traditional methods.

Whether it's a service provider or a group operator, an accurate fixed asset register allows a service provider to more proactively manage and improve performance across a variety of business, operational and financial metrics. For example, an improved understanding of the capabilities of the assets on the register not only allows for more informed purchasing decisions, it also allows both the operations and finance teams to be more proactive. On top of that, in a group situation it enables information across networks to be consolidated to deliver economies of scale for the procurement team.

"Common Language helps service providers meet compliance requirements, it helps measure the return on its capital expenditure on network equipment and it supports operational efficiency in network management and maintenance. No other single solution can help service providers meet their Regulatory, Capex and Opex targets quite like Common Language."

the driving factors

From a business perspective, being able to demonstrate that the Group keeps an accurate Fixed Asset Register is essential from a compliance perspective. For many service providers, the audit process usually involves inspectors taking samples from the Fixed Asset Register and then checking the actual locations where the equipment was reported to be held to determine the accuracy of the inventory.

Only if all the assets sampled, in all the locations, delivered an exact match, could the auditors say that the company's assets were properly safeguarded. The unpalatable truth is that, for many service providers, the mismatch between the data on the registry and the equipment in the field is significant.

What's more, it is vital that the same granularity of details be held by both the operations and the finance team and that exactly the same descriptors are used across the business. Without that commonality, accurate records cannot be maintained.

In addition, given the frequency with which the technology evolves and the constant replacing and upgrading of parts, today's Fixed Asset Register needs to be both dynamic and easily maintained. This will ensure that as assets are added and removed, any changes in functionality are accurately tracked to a granular level. Without that dynamism and accuracy, the register may be behind reality and the auditor's sampled assets may have already been replaced.

keeping the world connected



Communication is our lifeblood. It's what makes the world run and gives our lives meaning. Though technology evolves, the desire to seamlessly and securely access and exchange information anywhere, anytime never changes. While technological advances make communications simpler and more ubiquitous, efficiently interconnecting disparate applications, networks and devices and delivering it to the right person, at the right time, in the right way is enormously complex.

Creating a globally connected world is what iconectiv does better than anyone. Our cloud-based Software as a Service (SaaS) solutions and **trusted communications platforms** span network and operations management, numbering, business-to-consumer communications and fraud prevention.

At iconectiv, **our vision** is a world without boundaries, where the ability to access and exchange information is simple, seamless and secure.

And **our mission** is enabling the world of tomorrow through the simple, seamless and secure interconnection of networks, devices and applications.

business principles

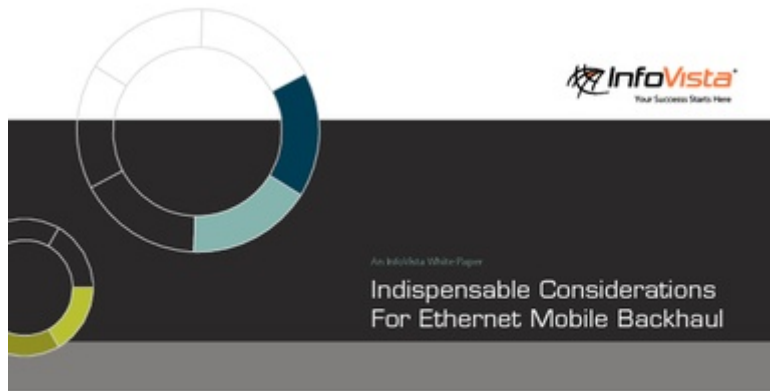
With unparalleled leadership and legacy in global communications, iconectiv strives to make connectivity:

simple – making the systems and processes that are extraordinarily complex, comprehensible

seamless – simplifying information exchange, on a global scale, and making it instantly available

secure – entrusted with the critical data that makes the world run





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PTP Test Applications

Harmonium Docks, 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 sub-microsecond 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) - PDG GE measurements - Client emulation	30 minutes at 7 hour	NetFilter Series
Sync network installation	Performed when a sync network is being deployed or when a new grandmaster is added	Network engineer	- Wander measurements - DC PDG offset - Slave/client emulation	24 to 48 hours	SyncWatch PRO
Troubleshooting					
Basic troubleshooting	Packet metrics issues/detective slave client	Field technician	- EtherSAM (Y1564) - PDG GE measurements - Client emulation		NetFilter Series
Advanced troubleshooting	Incorrect clock output/detective grandmaster	Network engineer	- DE, MTIE - DC PDG offset - Slave/client emulation		SyncWatch PRO

Table 1. Synchronization applications

EXFO | Assessing Next-Gen Networks

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White Paper

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

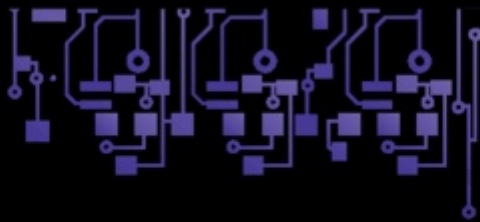
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Whitepapers



**GSM v. CDMA:
Technical Comparison of
M2M Technologies**



Whitepapers



A Best Practices Framework for the Telecom Ecosystem

It is proposed to develop a best practices framework for the telecom ecosystem to boost investment in innovation and increase vendor diversity. The design and implementation of this framework should involve telecom operators, both large and small vendors, investors, government agencies and other relevant players.

Disclaimer

The recommendations presented in this paper are intended to seed industry discussion with the aim of gaining wide acceptance across the industry. We recognize that not all the recommendations may be supported by all players participating in the discussions. Our intent is to identify the most important areas to achieve meaningful change, and to work towards consensus on implementing them within an effective best practices framework for the telecom ecosystem.

Background

Telcos need significant innovation to address their key challenges of: generating new revenue streams, reducing the energy consumption of networks, managing complexity (which is different from reducing complexity) and making networks more robust to vendor failures, cyber-attacks and environmental extremes (e.g., floods, high temperatures, hurricanes). Current telco innovation and procurement practices, rather than encouraging the innovation they need, are unfortunately deterring it. Our international consultation with telecom vendors and industry stakeholders^{1,2} has identified key areas where telecom operators globally should improve their processes for engagement with the telecom ecosystem in order to encourage more investment in innovation more widely.

We organized a series of colloquiums with leading telecom industry veterans to consider the following questions:

- What does innovation mean in the context of the telecom industry?
- How can supply chain diversity be encouraged and supported?
- What are the barriers to innovation, and how can they be overcome?
- How can investment risk be reduced?

The discussions were held under Chatham House Rules to encourage candor and we followed this up with a series of published articles.^{3,4,5} This paper summarizes the recommendations which emerged from these discussions and is derived from our "code of conduct" proposal published in November 2020.⁶

Importance of Startups

Our recommendations are predicated on the assumption that the telecom ecosystem benefits when startups are motivated to invest in R&D and offer innovative new products. Large companies typically begin as startups but tend to become less innovative and less responsive to their market as they grow, making them vulnerable to disruption by more innovative and nimble new players. This creates a cycle of destruction and renewal which drives advancement in every field of human endeavor.⁷

Final May 18, 2022

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Whitepapers

TCP Technology and Testing Methodologies

By Hamadoun Dicko, Product Specialist, EXFO

As enterprises use more and more applications, such as Voice-over-IP (VoIP), Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP), service providers are now faced with the obligation to enforce stringent service level agreements (SLA). Furthermore, the typical SLA parameters such as throughput, latency, jitter and frame loss only cover the network performance up to the IP (Internet Protocol) layer and do not necessarily reflect the true user experience. How can service providers make sure that the end-user's most important applications make use of the full bandwidth?

TRANSMISSION CONTROL PROTOCOL

TCP is one of the two original components of the IP suite commonly referred to as TCP/IP. It provides connection-oriented, end-to-end communication services at an intermediate level between application programs and the IP. It offers reliable communication and guarantees orderly delivery to the upper layers for non-real-time applications such as email, FTP, HTTP, etc. The term connection-oriented means the two applications must establish a TCP connection before they can exchange data.



Figure 1. OSI reference model and network layers

HOW TCP OPERATES

The primary purpose of TCP is to provide reliable connection services between hosts. However, this becomes challenging on less reliable networks such as the Internet. This hurdle is overcome by the implementation of flow control, which ensures the integrity of each segment sent, and the congestion control mechanism for each byte stream, which allows the receiver to limit the amount of data a sender can transmit. To accomplish this, TCP provides the following:

Basic Data Transfer

TCP is able to transfer a continuous stream of bytes in each direction between applications by packaging the traffic into TCP segments, which are passed to the IP layer for transmission. TCP has the ability to decide when to block or forward data.

Reliability

TCP is able to recover from data that are damaged, lost, duplicated or delivered out of order by assigning a sequence number to each byte transmitted, and requiring a positive acknowledgment (ACK) from the far end. If the ACK is not received within the timeout interval, the data is retransmitted. In addition, the receiver uses the sequence number to rearrange segments that may be received out of order and eliminate duplicate segments. A checksum added to each transmitted segment is checked at the receiving end to discard damaged segments.

Flow Control

The receiver controls the amount of data the transmitter can send by returning a window size value with every ACK. The window size value indicates the number of bytes the sender may transmit before receiving further permission. In addition, the sequence numbers and receive windows behave like clocks that shift every time the recipient receives and acknowledges a new data segment. The sequence number loops back to zero, once it runs out of numbers. Figure 2 is a visual representation of the sequence numbers and its maximum values in the TCP.

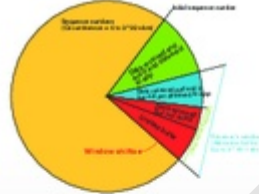


Figure 2. TCP window

Multiplexing

Many processes or communications can run within a single TCP host. A network socket uniquely identifies each connection by binding ports to processes. Consequently, multiple sockets can be used during a single exchange between two hosts, thus reducing the impact of high latency networks and the window allocation buffer limit.



never underestimate the power of identity

hackers in an increasingly vulnerable digital world

Without question, the power of the digital economy permeates nearly everything we do. Evolving well beyond eCommerce and mBanking, the connected society includes social media, video subscriptions, file sharing, ride hailing, and home stay, all of which have quickly become a regular part of our lives every day. While the convenience is a lure, the risk can be alarming. These applications often contain payment and other confidential information that need to be secure in order to ensure that only the right people see properly and have access to the information of users involved. To continue to evolve further, applications are constantly trying to improve the user experience by reducing the friction in the authentication process. Unfortunately, making it easier for the attacker is also making it easier for fraudsters.



"Hackers can have access to your bank accounts, bitcoin, payment services and many other aspects of your digital life before anyone is the wiser."

According to an article by CBS News New York, a woman lost more than \$20,000 USD when a fraudster posing as her bank took over her account. The article says the scammer did this by telling the woman her account was compromised, then sent her text messages to change her password – giving the scammer access to her account. Scams can have access to your bank accounts, bitcoin, payment services and many other aspects of your digital life before anyone is the wiser. That is a powerful proposition for fraudsters.

Clearly, the digital world is increasingly vulnerable. Fraud is getting progressively sophisticated and more difficult to prevent resulting in billions of dollars in financial losses annually. Victims are not only unsuspecting senior citizens and elderly millennials, but also occasional shoppers and everyday consumers. Even the chief technologist of the very organization vested with the responsibility to protect consumers by stopping unfair, deceptive or fraudulent practices in the marketplace has been a victim of fraud. Interestingly, the telephone number, which is the entryway for much of this fraud, is being exploited by adept criminals in novel ways. Fortunately, the victims no longer need to be victimized because much can be done to protect consumers from this type of identity theft and related harms.

iconectiv



Introducing our New State-of-the-Art Geographic Platform

One of the ultimate goals of Broadband providers is to bring fast, reliable service to their customers, who are often located in rural parts of the country. Connecting unserved or under-served communities through broadband technology improves their way of life and closes the digital divide. But doing so can be costly and time consuming.

What if there were a way to make it all easier by streamlining each phase of your network implementation, improving decisions by using real-time data and therefore optimizing your current and future operations?

CHR Solutions is a proven industry leader with over 75 years of experience and we have found a way to expedite your builds, decrease labor costs, forecast in real-time, and increase monetization to speed up broadband access to rural America.

Geospatial Data is Not New— But the Way We Use It Sure Is.

By using Geospatial data in a unique way, we provide our clients with a platform that utilizes real-time information to improve efficiencies, take the guesswork out of decisions, and ultimately increase speed to market. The platform features a customizable dashboard that enables all aspects of your business to format and display the data in a way that optimizes its use in their specific operations.

CHR's Geographic Platform

- Improves efficiencies
- Takes the guesswork out of decisions
- Increases speed to market

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From wireless to wireline networks, CHR has the insight and expertise that empowers the services connecting customers and communities. We stand ready to partner with you on all your project needs—from concept to construction. Whether you're deploying new networks or launching next-generation services, from funding to field services, CHR is with you every step of the way.

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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Network Automation Blueprint

A best practice reference architecture for achieving secure & reliable digital services



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