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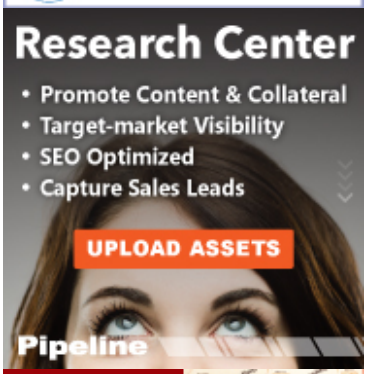

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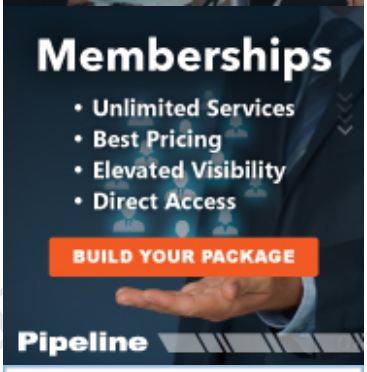

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End-to-End Solutions for Broadband Networks

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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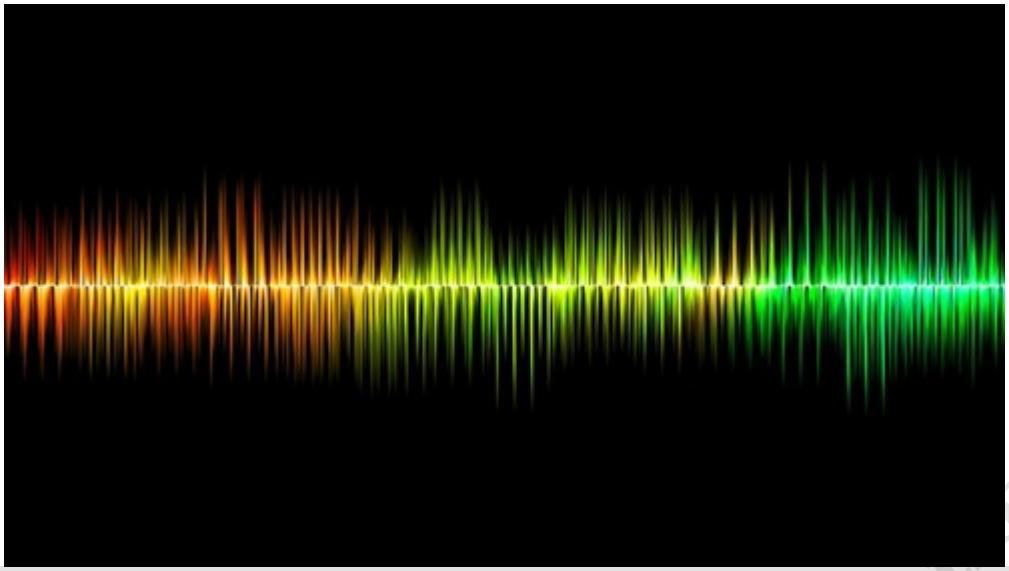

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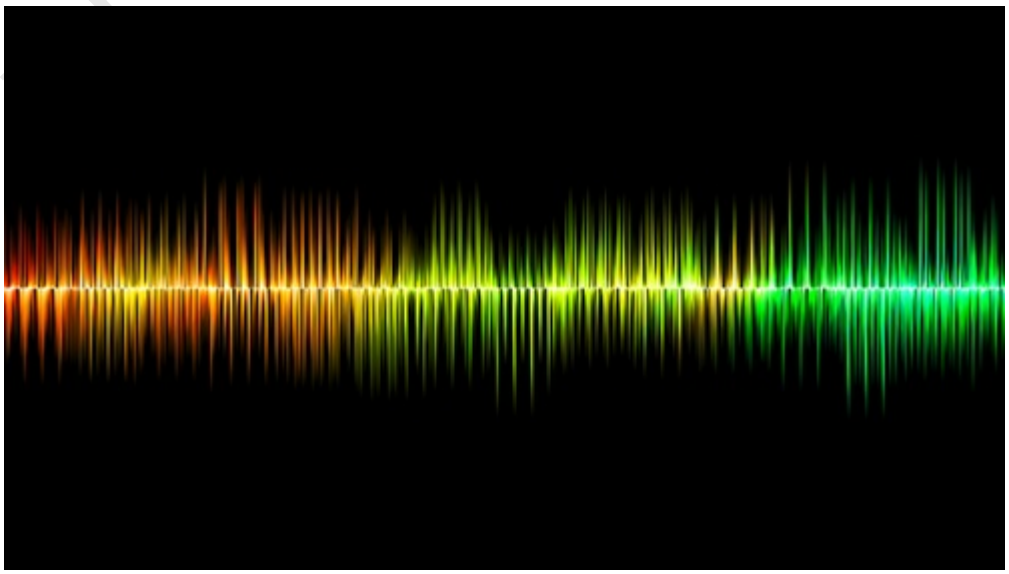
Mitigating risk and compliance for lawful intercept using lawful intelligence is explored in this Pipeline article feature SS8. Learn how CSPs can comply with lawful intercept regulation, while empowering law information with critical, real-time data.



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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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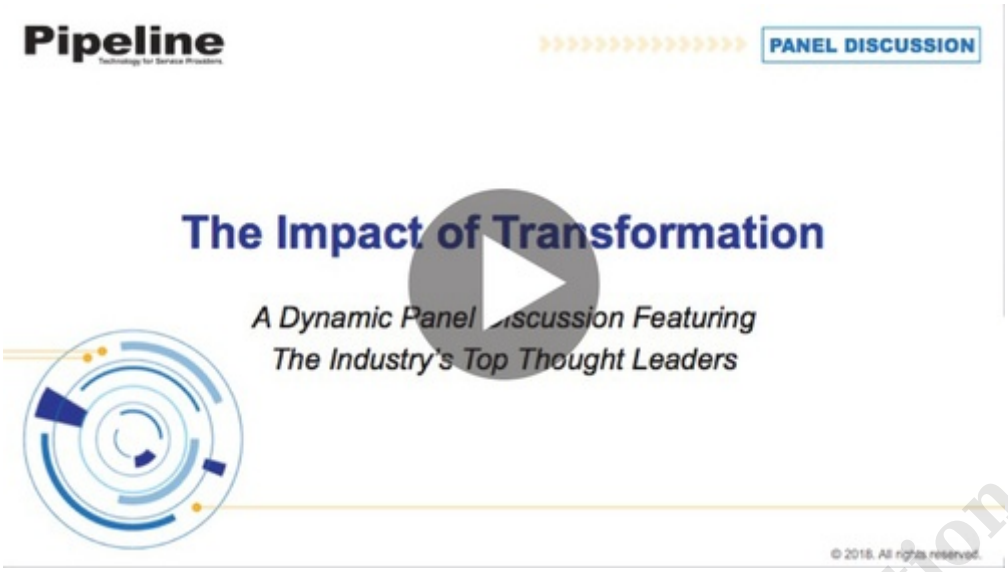

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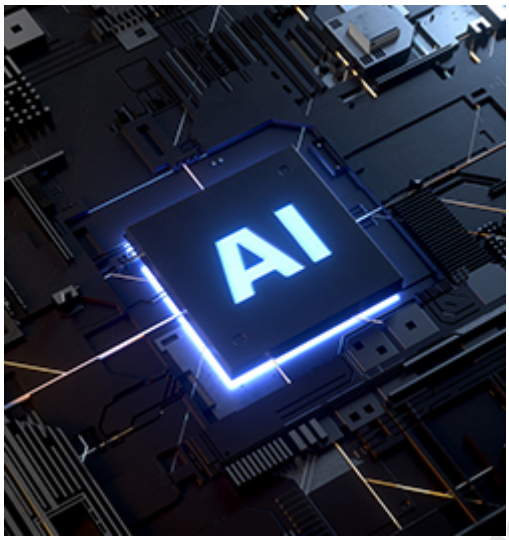

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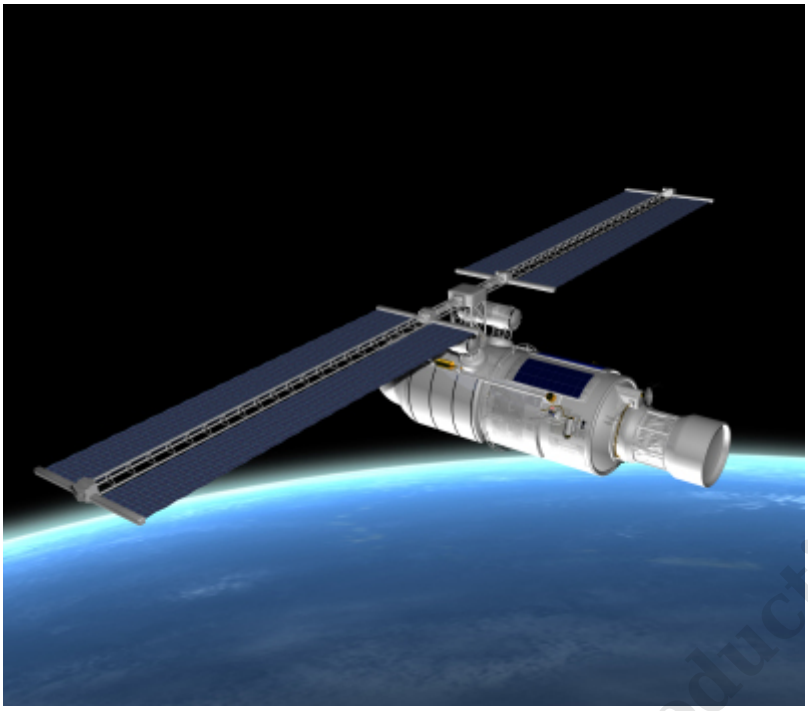

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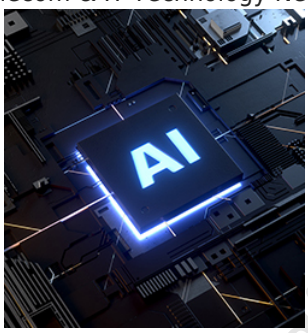

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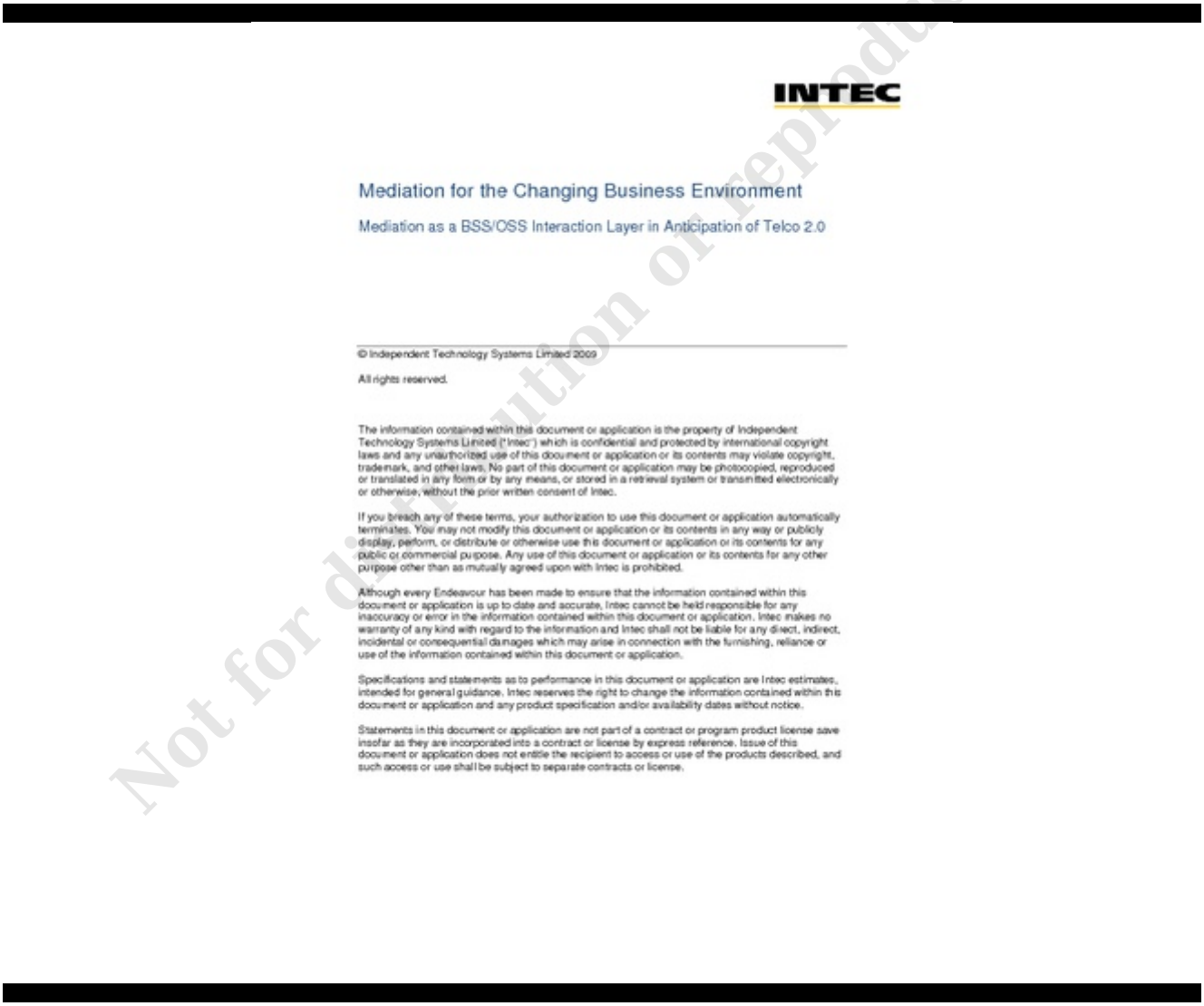

INTEC

Mediation for the Changing Business Environment

Mediation as a BSS/OSS Interaction Layer in Anticipation of Telco 2.0

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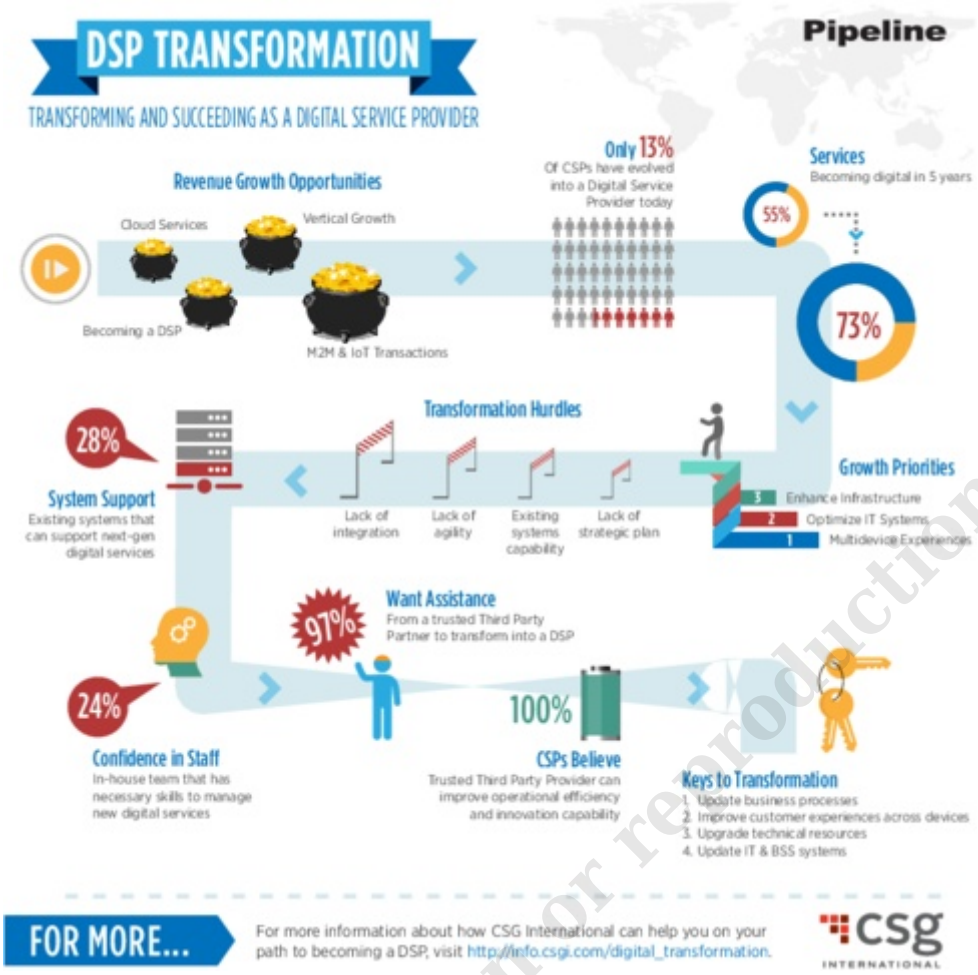

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PTP Test Applications

Hammadoun Dicko, 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 to service*	*Field technician*	*- EtherSAM (Y.1564) - PDV, GL measurements - Client emulation*	*30 minutes to 1 hour*	*NetBlazer Series*
Sync network installation	*Performed when a sync network is being deployed or when a new grandmaster is added*	*Network engineer*	*- Wander measurements - Dir, PDV, offset - Slave/client emulation*	*24 to 48 hours*	*SyncWatch ITO*
Troubleshooting					
Basic troubleshooting	*Packet metrics issues/defective slave client*	*Field technician*	*- EtherSAM (Y.1564) - PDV, GL measurements - Client emulation*		*NetBlazer Series*
Advanced troubleshooting	*Incorrect clock output/defective grandmaster*	*Network engineer*	*- TIE, MTIE - Dir, PDV, offset - Slave/client emulation*		*SyncWatch ITO*

Table 1. Synchronization applications

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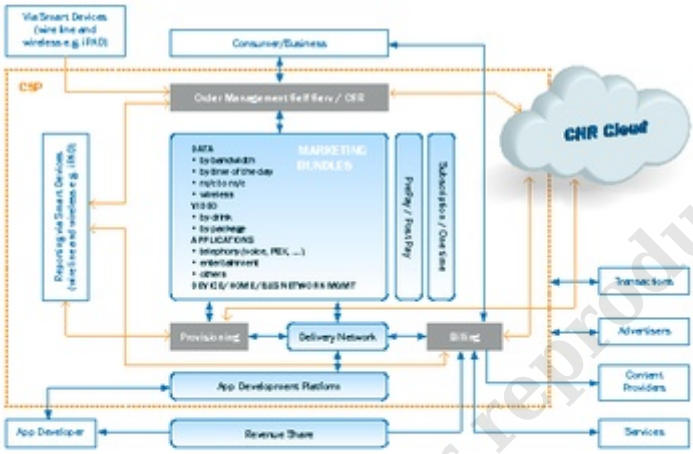

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White Paper 030

TCP Technology and Testing Methodologies

By Hammadoun 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, FTTP, 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 acknowledgement (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.

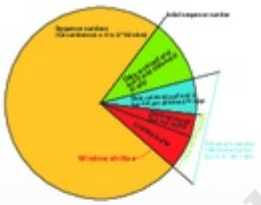

Figure 2. TCP window

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.

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white paper

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, web hosting, all of which have quickly become a regular part of our lives every day. While the convenience is alluring, the risk can be alarming. These applications often contain payment and other confidential information that need to be secure if used to ensure that only the right people are properly entitled to access the information or assets involved. To complicate matters further, applications are constantly trying to improve the user experience by reducing the friction in the authentication process. Unfortunately, making access easier for the consumer 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[1], a woman lost more than $30,000USD 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 con-artist access to her account. Hackers 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 always-connected millennials, but also bitcoin entrepreneurs 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.

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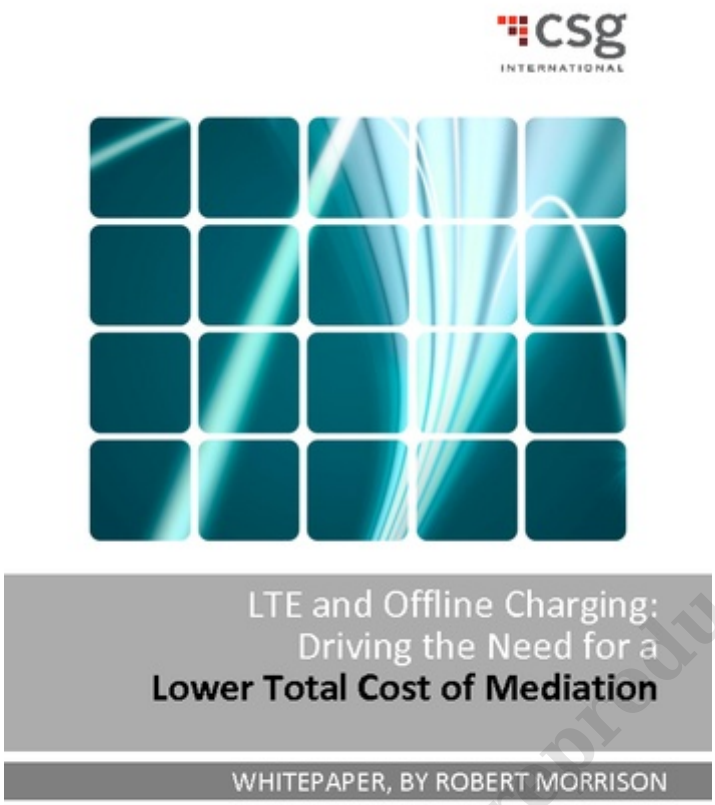

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A Whitepaper: State of the Industry and Suggestions for Success

Joe Conn, Sr. Director of Wireless Engineering

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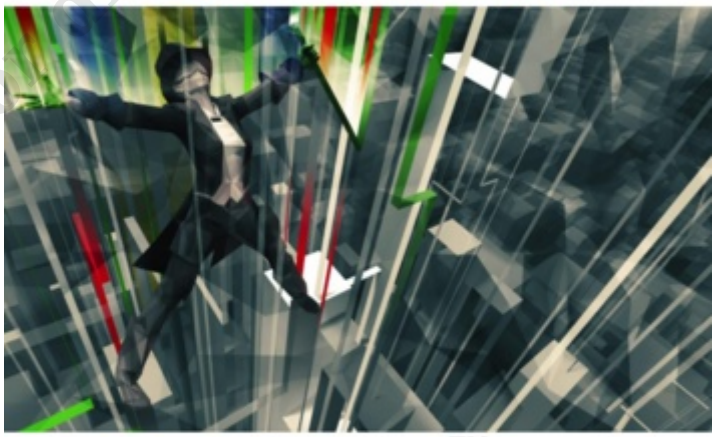

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Company Fact Sheet

About Cycle30
Cycle30 provides hosted order-to-cash billing services for telecom, cable and utility operators in North America. Cycle30 is a subsidiary of GCI, Alaska's largest telecommunications and cable provider (NASDAQ: GNCMA).

Over 10 years, the Cycle30 organization helped transform GCI from a multi-product carrier of disparate services to a truly converged operator of bundled telecom services, consolidating nine billing systems, and increasing operational efficiency and competitive agility. The Cycle30 platform also enabled GCI to improve product strategy and successfully merge consolidate multiple providers under a common billing/OSS system.

Proven over years of real-world operator experience with GCI, the Cycle30 organization now operates as a separate company, offering its converged billing platform as a hosted service to small-and-medium-size converged operators everywhere.

Cycle30 Services
Around its core billing engine, Cycle30 has integrated leading commercial software for ordering, provisioning and business support. This makes the Cycle30 hosted platform the only one of its kind in the world, with all the ordering, provisioning, billing and back-office revenue systems a converged provider needs for a complete order-to-cash system.

Management
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Wendy Gonzalez – *Products + Services*
Jeth Harbinson – *Global Sales*
John Hegarty – *Service Delivery*
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Operations
Cycle30 manages all operations from its headquarters in Seattle. The primary data center is located in Aurora, Colorado, with recovery and on-demand data centers in Scottsdale, Arizona and Philadelphia, Pennsylvania.

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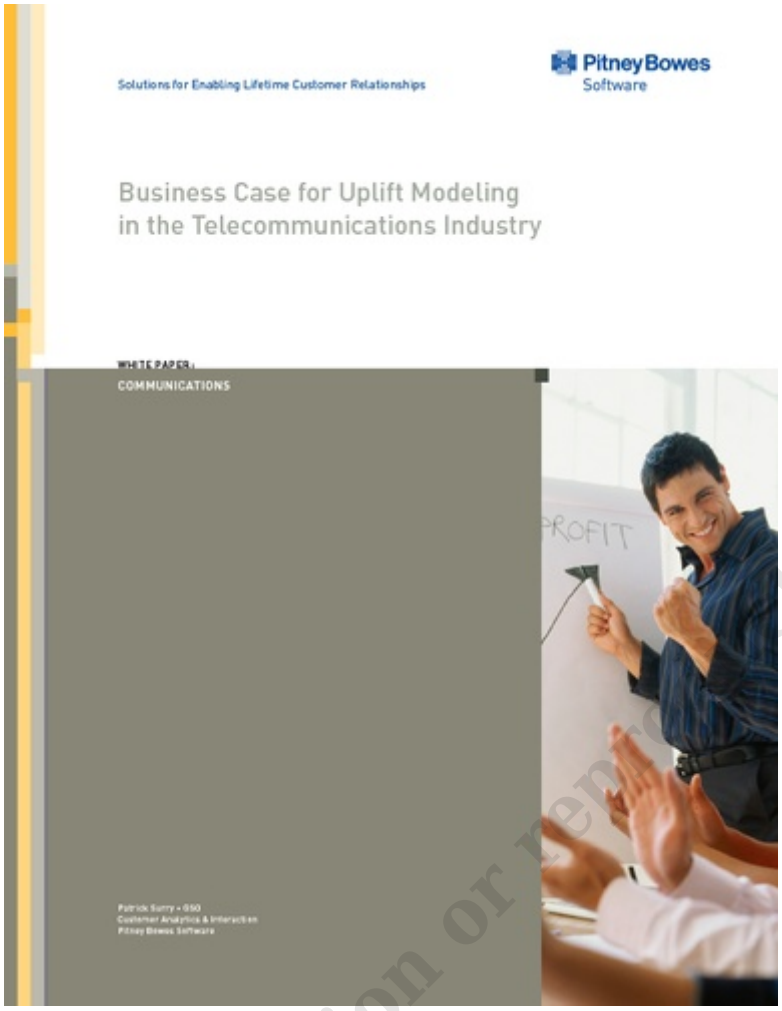

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