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We are pleased to introduce our second Quarterly Newsletter, Time to Sync; your source for the latest Timing and Synchronization industry news, products, events, and more! Time to Sync keeps you connected and updates you with the latest news on high performance timing and synchronization products and solutions from Microsemi.

We are excited to introduce the SyncSystem 4380A Master Timing Reference, a new high performance precise time and frequency product, to our synchronization systems family. The SyncSystem 4380A is used in metrology, defense, communications, aerospace, and other applications where performance and reliability are crucial.

Microsemi offers a set of complementary product lines including Power-over-Ethernet (PoE) midspan/injectors, Carrier Ethernet switches / PHYs and software, and equipment/data link security. We look forward to sharing some of these with you when available, while retaining focus of this newsletter to Timing and Synchronization.

Time to Sync is intended to be informative and educational, and to help you succeed! Please send us any comments or questions, including suggestions for future articles to ftdinfo@microsemi.com.

What's New?

Introducing Our New Timing and Sync Portal

We have updated Microsemi's Timing & Synchronization portal on www.microsemi.com, which makes it easier for you, our valued customers, to quickly find the latest details on our products/solutions and access your desired information. We welcome feedback on how we can continue improving our site to help you.

Network Transformation Again with SDN and NFV

Impact of SDN and NFV on Network Timing

Service providers and enterprises are looking to take advantage of the emergence of cloud architectures to grow their revenue streams and at the same time reduce infrastructure CAPEX and OPEX. Two key concepts that are central to this move towards cloud infrastructure are Software Defined Networks (SDN) and Networks Function Virtualization (NFV). NFV is the ability to virtualize network functions today implemented by dedicated hardware network elements and while able to host these functions in common hardware (server-based racks) at a shared location, often called a “hotel” or a data center. SDN, on the other hand, is the separation of the control plane from the data plane in order to facilitate ease and time to service activation or change without the high OPEX associated with truck rolls and associated fees. In both SDN and/or NFV, the role of timing and synchronization remains unchanged. In fact it becomes more critical as latency requirements in networks become more stringent. In such an environment, investments made by enterprise and service providers in timing and synchronization are preserved and future-proof.

Microsemi’s network management “TimePictra” already supports northbound interfaces to the control layer through SNMP. TimePictra can be used to provision and collect timing and related metrics from network timing nodes across the networks. Examples of the edge timing nodes include IGM deployed near the customer premise with indoor/outdoor small cells, TP2700 deployed at the aggregation and edge of the network, and the TP5000 deployed at the central offices and aggregation nodes. In addition, TimePictra is designed to collect timing metrics from third party Precision Time Protocol (PTP) clients and network elements, and will evolve to be more compatible with the SDN environment.

If you are interested in learning more about the future of SDN and NFV and how we can facilitate the transition of your network, we look forward to providing you with an overview of our plans and supporting you on the deployment and architecture scenarios.

Please contact sales.support@microsemi.com for more information on Microsemi solutions to address the SDN/NFV transition.

Traceable Frequency, Time and Phase for LTE-TDD and LTE-Advanced

As wireless operators are rushing to build Long Term Evolution (LTE) networks based on Time Division Duplex (TDD), Frequency Division Duplex (FDD) and/or LTE-Advanced (LTE-A), many are facing a familiar challenge on how to architect the network synchronization and timing requirements cost-effectively for both the short- and long-term. To enhance spectrum efficiencies and pack in more subscribers, LTE and LTE-A in particular has introduced some innovative technologies such as carrier aggregation, Multiple Input Multiple Output (MIMO), Coordinated Multi-Point (CoMP) and enhanced Inter Cell Interference Cancellation (eICIC). To maximize the advantages of these features, operators must evaluate their end-to-end network timing and synchronization needs, as some of these technologies require phase synchronization engineering rather than classical frequency pulse distribution. Such an evaluation can be a confusing and daunting task, and relying on poor or misguided information can lead to costly mistakes.

Microsemi recently released a whitepaper that describes timing requirements and recommends some best practices that are designed to help operators correctly architect network timing the "first time.” Download the Traceable Frequency Time and Phase for LTE-TDD and LTE-Advanced whitepaper for more information.

For more information contact sales.support@microsemi.com.

Why a Leap Second Was Added On 30 June, 2015

Figure 1 · **SyncServer S200**

The worldwide timing community experienced the rare insertion of a leap second on June 30, 2015. At midnight UTC on June 30, 2015, one additional second was inserted to align atomic time with astronomical time. Many people ask why a leap second is needed. Is it because atomic time is not accurate? Actually, atomic time is based on the coordination of several hundred high precision atomic clocks around the world. This coordinated time scale is highly precise and consistent. Astronomical time, on the other hand, is based on the earth's rotation around its axis which is slowing down at a very small rate of change over time. Atomic time is actually more consistent, so it tends to get ahead of the ever slowing astronomical time. When the atomic timescale is sufficiently ahead, a leap second insertion is scheduled by International Earth Rotation and Reference System Service (IERS) based in Paris, France. This notification is transmitted through timing distribution systems such as GPS as a pending leap second indication flag for a specific time in the future. That is how your Microsemi timing systems know that a leap second is scheduled, and exactly when to insert the additional second to stay in alignment with UTC. Microsemi staff monitor for leap second announcements, and test and certify all of our systems to assure leap second insertions are handled properly to maintain time scale alignment for your precision timing requirements. Those who watched and tracked the June 30, 2015 leap second event were able to see a day with 86,401 seconds versus the usual 84,000 seconds. Truly, the longest day of the year.

For any questions regarding the leap second, please contact Microsemi technical support.

- North and South America: FTD.Support@microsemi.com
- Europe, Middle East, and Africa (EMEA): FTD.EMEASupport@microsemi.com
- South Asia: FTD.Support@microsemi.com

End Market Corner

Telecom and Enterprise

Small Cell Developments: Rise of the Middleprise

Enterprise is a key and growing segment according to the latest mid-year small cell market update from Infonetics Research. The research firm is forecasting a 70% year on year growth in the number of small cell units installed this year. Most of the growth is expected from a segment called "middleprise" made up of medium-sized enterprises and venues. Keeping up with this trend is the Integrated GNSS Master (IGM) product that is getting great feedback and momentum from customers worldwide. We are also working with key small cell vendors to ensure interoperability.

Demo units are available now by contacting sales.support@microsemi.com.

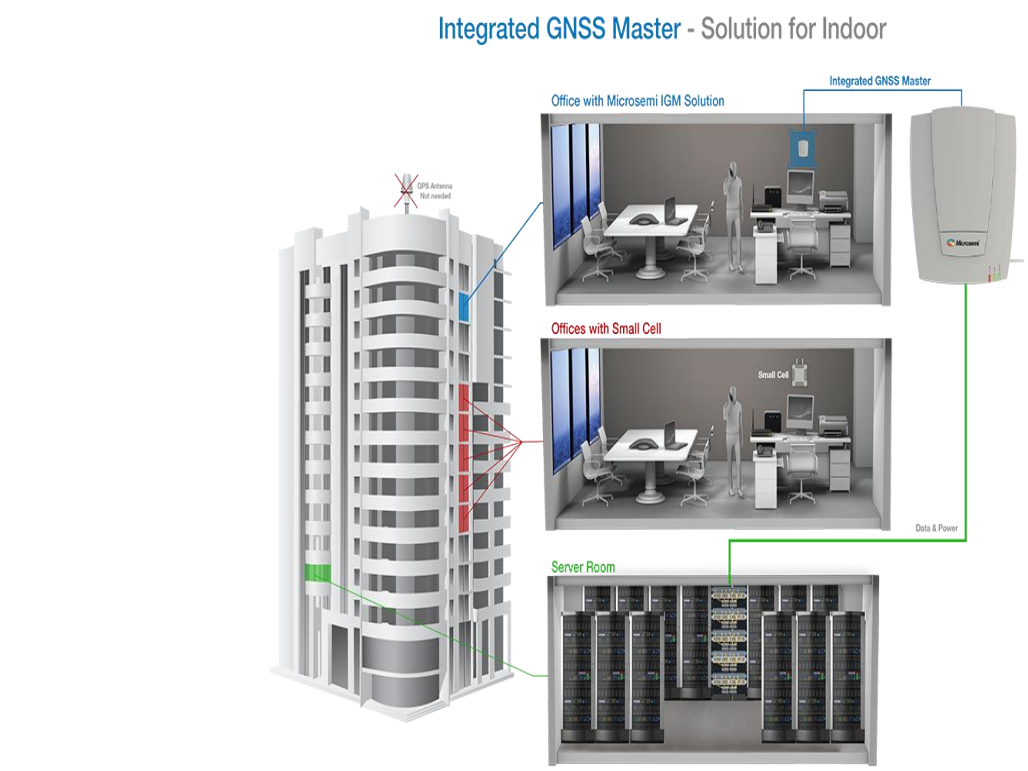

Figure 2 · **Integrated GNSS Master (IGM) – Solution for Indoor**

View the latest press release on the Microsemi website at Integrated GNSS Master

For more information, visit www.microsemi.com/igm.

Download the product brief at http://www.microsemi.com/products/timing-synchronization-systems/time-frequency-distribution/gnss.

Are Your trading clocks in sync with new FINRA and SEC rules?

Both the FINRA Reg. Notice 14-21 and SEC Rule 613 address tightening trading clock accuracy and granularity. SEC Rule 613 goes even further as to specify maximum clock drift. Difficult to believe? See the very recent article from the Wall Street Journal on this very topic.

It is likely that the SEC Consolidated Audit Trail requirements and real-time auditing by SEC systems will quickly identify trade time-stamp discontinuities often related to illegal trading practices. Microsemi's comprehensive network timing solutions can synchronize your trading clocks to an extent that this will never happen in your trading network operations.

Microsemi, the world leader in precise time solutions, has a complete portfolio of NTP and PTP Time Servers including the SyncServer S300 with a Rubidium atomic clock that offers the accuracy and drift performance to keep you well within the requirements issued by FINRA and the SEC.

By using a Microsemi SyncServer with GPS technology, you get the traceability to NIST as well as exceed the time accuracy and granularity required. With a very affordable atomic clock option the system can maintain the time for an extended period if GPS is unavailable and likely will not exceed the drift limit before you have had plenty of time to address the problem.

For safeguarding operations, we can provide the software to monitor the time on your network systems, maintain an audit trail of synchronization accuracy across systems and provide alerts if any clocks are outside predefined accuracy limits.

Exceed FINRA/SEC Requirements: Microsemi SyncServer with an Atomic Clock

Figure 3 · **SyncServer S300**

- Nanosecond caliber accuracy to UTC
- A few microseconds of drift per day (if GPS unavailable)
- Synchronize thousands of server clocks
- Multiple NTP ports for easy network configuration and adaptation
- Intuitive web interface for easy control and maintenance

Download the following collateral to see why SyncServer will aid you in complying with the new FINRA guidelines.

- White paper - Five Essential Elements of Network Time Synchronization
- White Paper - Compliance with Regulatory Mandates Demand Accurate Time Synchronization in Financial Networks
- White Paper - Five Dangers of Poor Network Timekeeping
- Microsemi SyncServer Product Comparison
- Microsemi SyncServer Options
- Microsemi SyncServer S300 Datasheet

For more information visit our website or contact sales.support@microsemi.com.

Making Secure 1588 a Reality: Timing over MACsec

Highly accurate coordination of time is an essential part of operating many distributed systems including power grids, water and gas distribution systems, mobile communications networks and industrial automation. PTP, defined in IEEE 1588, is used in all of these applications for time distribution.

As today's connected world is greatly dependent on reliable access to services—such as electricity and water, Internet and mobile services and efficient manufacturing of goods—virtually any sector is vulnerable to cyber threats, making the security of operations vital. The good news is that MACsec, as defined in IEEE802.1AE, can be used to eliminate threats on vulnerable Ethernet links and even connections over third-party Ethernet service providers. The need for a combined solution is clear: MACsec must secure the PTP distribution tree.

For tight network synchronization, PTP requires accurate timestamping of the packet. However, MACsec requires insertion and removal of the 24-byte to 32-byte long MACsec header on all or some of the frames on the link, causing large delay variations between the egress timestamping point and the link connector (and similarly on the ingress). The PTP protocol assumes that the delay on a link is constant. However, with MACsec, this is not the case.

Encryption and timing accuracy have historically been incompatible. Microsemi has solved this challenge with our Intellisec™ PHYs, which fully preserve timestamping accuracy on a MACsec-enabled link. Secure 1588 is a reality. To learn more, visit www.microsemi.com/products/physical-layer.

Government

Mitigating GPS Vulnerabilities

Positioning, Navigation, and Timing (PNT) systems throughout the world are heavily reliant on GPS. The fundamental issue is that GPS is treated as a "trusted source" of PNT. Few systems have the mechanisms to ensure the integrity of the GPS information that they receive. In many cases, there are deliberate attempts to disrupt the GPS signal to take control of critical assets or to bring down certain systems. GPS attacks are categorized according to the failure mode they induce.

The first is called "GPS jamming," which causes partial or complete loss of the GPS signal. This is commonly the result of unintentional interference from nearby RF sources. More complex jamming attacks can be orchestrated by adversaries to make it more difficult to detect the source of the jamming but the result is the same. In such cases, the GPS receiver fails to receive the GPS signal.

The second category of outages is caused by “GPS spoofing,” which is the result of reception of illegitimate GPS signals. The GPS receiver is “tricked” into tracking GPS-like signals and it continues to operate, but the solution for position and time given by the receiver will be wrong. These types of attacks are almost always intentional attacks and can be difficult to detect.

The most common type of GPS signal outages are caused by weather effects, example, high winds, flooding, large hailstones, lightning strikes, heavy snow, etc., all of which can damage or affect the performance of an outdoor GPS antenna. Back-up systems are needed for assured timing and synchronization of critical infrastructure services, example, power, telecommunications, banking, etc.

Microsemi provides a complete solution set to protect network disruption for the 24/7, 365 day world we live in.

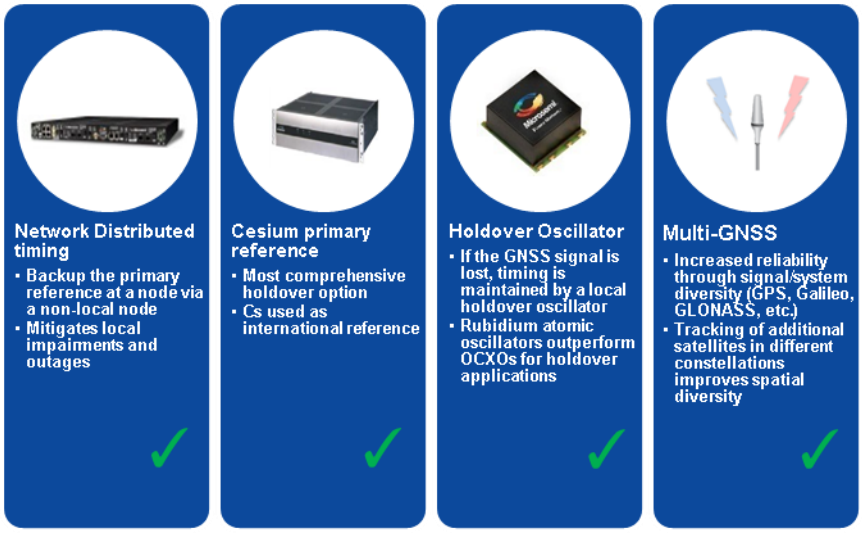

Figure 4 · **Microsemi Solution to Protect Network Disruption**

If you have suggestions or concerns regarding cyber security and infrastructure protection go to:

http://www.microsemi.com/design-support/white-papers-support#gnss-gps.

For more information contact: sales.support@microsemi.com.

SyncSystem 4380A Master Timing Reference

High quality components and advanced algorithms deliver world-class performance

Figure 5 · **SyncSystem 4380A**

At the ION GNSS Conference in Tampa, Florida recently, Microsemi announced a brand new high performance precise time and frequency product, the SyncSystem 4380A Master Timing Reference, for use in metrology, defense, communications, aerospace and other applications where performance and reliability are vital. The device is particularly well-suited for applications requiring accurate synchronization as well as repeatable timing performance demanding the highest levels of reliability.

World-Class Timing Performance

Microsemi's new SyncSystem 4380A employs an internal rubidium oscillator and an L1/L2 GPS receiver to ensure accurate synchronization of the 4380A with Coordinated Universal Time (UTC)/U. S. Naval Observatory (USNO) and repeatability customers can depend upon every single day of operation. L1-only GPS receivers are plagued by unpredictable events such as solar storms, which impact timing performance by stimulating an increase in the Total Electron Count (TEC) of the ionosphere. These events degrade the performance of timing systems unless an L1/L2 receiver is used, as it enables a direct measurement and correction for the delay of GPS signals through the ionosphere. Microsemi's SyncSystem 4380A's L1/L2 GPS receiver is a must-have for applications requiring repeatable timing performance with the highest levels of reliability.

Configurable and Scalable

The SyncSystem 4380A is well-suited to satisfy today's timing needs and provides the scalability to meet future requirements as well. Each 4380A has six expansion ports for hot-swappable output modules that provide an array of timing signals. Output modules exist for most conceivable timing signals and new modules are routinely developed to support specialized timing signals for users with unique requirements.

Although the 4380A already employs an internal rubidium oscillator, the standard 4380A also has the ability to use an external frequency reference (Example, 5071A, MHM 2010) when available. This further enhances the performance of the 4380A without requiring additional upgrades.

Product Availability

Microsemi's new SyncSystem 4380A product will be available for order starting in fall 2015. For more information, visit http://www.microsemi.com/products/timing-synchronization-systems/time-frequency-distribution/gps-instruments/4380a.

To request a product datasheet or further product details, email sales.support@microsemi.com.

Microsemi Events

Microsemi frequency and time products have recently been featured at a number of events including Small Cells World Congress, NIST/WSTS, Joint Navigation Conference (JNC), IEEE International Frequency Control Symposium & European Frequency and Time Forum (IFCS-EFTF), and ION GNSS.

Summary

Small Cells World Summit

At Small Cells World Summit 2015 in London, Microsemi showcased a variety of our solutions for precise timing, synchronization and Power-over-Ethernet (PoE), including:

- IGM-1100i, a ground breaking solution focused on reducing deployment costs for indoor small cell precise synchronization
- TP2700, an IEEE 1588v2 grandmaster clock and boundary clock designed to meet the stringent timing requirements of 4G/LTE networks, now supporting a higher capacity up to 128 clients at full PTP rates
- PD-3501G, a PoE single port midspan offering a compact and cost effective, fully IEEE 802.3af-compliant solution for IP phones, WLAN access points, network cameras and other IP terminal installations

ION GNSS+

At ION GNSS+ Conference, Microsemi introduced our new SyncSystem 4380A Master Timing Reference, with high performance components and advanced algorithms to deliver a world-class timing reference addressing our customers' most stringent performance requirements. Learn more at http://www.microsemi.com/products/timing-synchronization-systems/time-frequency-distribution/gps-instruments/4380a.

Upcoming Events:

4th Annual Security Forum: October 1 (Baltimore, Maryland, USA)

ISPCS: October 11-16, 2015 (Beijing, China)

ITSF: November 2-5, 2015 (Edinburgh, Scotland)

LTE North America: November 17-19, 2015 (Dallas, Texas, USA)

To request a meeting with Microsemi at any of our upcoming events, please email sales.support@microsemi.com.

Microsemi in the News

- Philippine National Agency Selects Microsemi's Precise Time Scale System for the Country's Astronomical Observation and Time Service Unit
- Microsemi Doubles Precision Time Protocol Client Capacity that Provides Synchronization to LTE Networks
- Microsemi Introduces SyncSystem 4380A Master Timing Reference with Highest Levels of Accuracy and Performance at ION GNSS+ Conference

Microsemi new product press releases can be viewed at http://investor.microsemi.com/releases.

Latest Collateral

SyncSystem 4380A

Microsemi's SyncSystem 4380A builds upon the legacy of the DVB SyncSource 4307A with a completely updated product design that uses high end components and advanced algorithms to deliver world class performance for the most demanding precise time and frequency applications

http://www.microsemi.com/document-portal/doc_download/135425-syncsystem-4380a-data-sheet

Collateral Update: Datasheets, Webinars & Videos

- Webinar: Precision Time Protocol (PTP): Best Practices for Frequency, Phase and Time Synchronization. https://attendee.gotowebinar.com/recording/9216145314950330882
- Webinar: When Looking for Holdover & Precision Frequency Reference in Your GNSS/GPS-enabled Infrastructure. https://attendee.gotowebinar.com/recording/7461944881728641537
- Whitepaper: Traceable Frequency, Time, and Phase for LTE TDD and LTE-Advanced http://www.microsemi.com/design-support/white-papers-support%23ieee-1588-ptp

Small Cell Magazine Article

Making LTE Technologies Play Nice with Small Cells: How to Synchronize LTE-TDD and LTE-A Networks While Simplifying Small Cell Deployment

http://online.qmags.com/SCM0915#pg28&mode2

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