



# Real Time Automation

## Best Darn Newsletter, Period!

*Industrial & Building Automation Protocol Newsletter*

[www.rtaautomation.com/newsletter](http://www.rtaautomation.com/newsletter)

November 2018

### John Falls Off the Time Sensitive Networking (TSN) Bandwagon

A Column of personal opinion by John Rinaldi, Founder and Owner of Real Time Automation.

**“ALL TRUTH PASSES THROUGH THREE STAGES. FIRST, IT IS RIDICULED. SECOND, IT IS VIOLENTLY OPPOSED. THIRD, IT IS ACCEPTED AS BEING SELF-EVIDENT.**

— ARTHUR SCHOPENHAUER

Many famous and influential people are ridiculed for their “controversial” ideas. Offering unpopular opinions, thoughts and concepts that don’t mesh with a popular opinion can bring scorn and worse upon you. You probably haven’t heard of Ignaz Semmelweis or William Harvey. Semmelweis was the in the mid-19th-century Hungarian doctor the mid-19th century ridiculed for telling doctors to wash their hands between patients. In a day when the liver was thought to turn food into nutrients and circulate blood, Harvey was the first to postulate that the heart is responsible for circulation. The most famous, of course, is Galileo Galilei.



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The Roman Inquisition of 1615 concluded that his views on the orbits of the planets were not only “foolish and absurd” but that he was a heretic.

I certainly wouldn’t put myself in that elite company. After all, I’m only one generation removed from a farm in the shadow of Mount Vesuvius. I still have Italian Vak (cow) manure under my fingernails. But I certainly do seem to have controversial thoughts on this whole Time Sensitive Networking technology that is being promoted by heavyweights like Cisco, National Instruments and others.

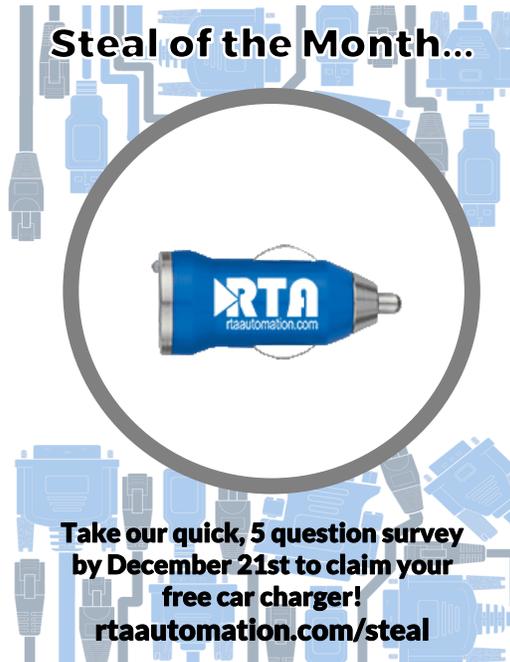
I just can’t understand why massive sums and huge resources are being used to develop this technology.

#### The Problem with Ethernet Today

The problem that TSN is trying to solve is very simple; get an Ethernet message to its destination when it needs to be there as closely as possible to when the application requires it to be there. Often it doesn’t matter. If you’re sending a tank level that changes very slowly and not very often, sometime later this morning is good enough. If you’re filling bottles of an adult beverage and must precisely close a valve, you need that close message to get there at a very specific time, every time.

Ethernet isn’t designed for that. It uses CSMA (carrier-sense multiple access), an arbitration scheme in which there are slots for messages and any node can choose to send a message in any slot. If multiple nodes choose the same slot, the slot goes empty. All the nodes retry some random time later. That works well for a few nodes, but the throughput rapidly decreases as nodes are added to the network. At worst case, messages can be delayed infinitely.

### Steal of the Month...



**Take our quick, 5 question survey by December 21st to claim your free car charger!**  
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That still works well in those tank level type applications but not so well in highly deterministic applications and motion applications. TSN is being designed to solve this kind of problem in telecommunications, energy, automotive and industrial control.

#### What is TSN?

Here’s how Cisco describes it in the opening paragraph of their TSN article:

“TSN is the IEEE 802.1Q defined standard technology to provide deterministic messaging on standard Ethernet. TSN technology is centrally managed and delivers guarantees of delivery and minimized jitter using time scheduling for those real-time applications that require determinism.”

TSN, as they define it, is a way of guaranteeing message delivery in these applications where determinism is an important consideration. That’s fine. We

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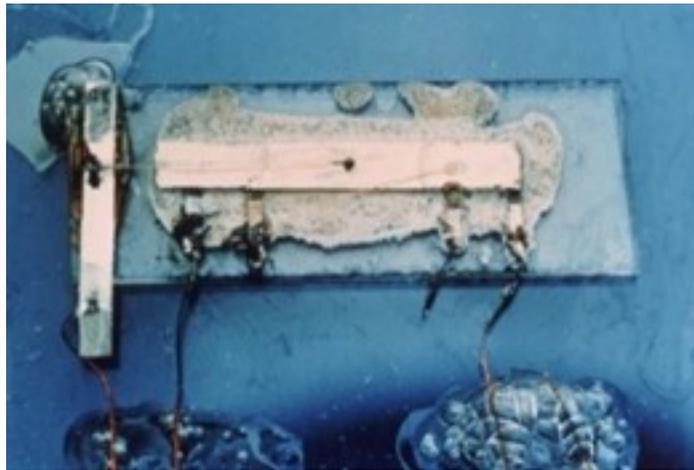
# A BIG YEAR FOR HISTORY BUFFS

*John Rinaldi*

I've always enjoyed history; everything from the destruction of Pompei to the fall of Soviet communism in 1991. I find history fascinating, and for people like me, 2018 is a year of anniversaries quite unlike any other.

1968, 50 years ago, was one of the most climatic years in our nation's history. North Vietnam launched the Tet offensive. Richard Nixon defeated Hubert Humphrey to become the 37th President. Apollo 8 orbited the moon where the crew famously read from the book of Genesis on Christmas Eve. People wept at Dr. Martin Luther King's assassination and then, 60 days later, wept again at Robert Kennedy's assassination. Race and anti-war riots broke out in many parts of the country, including a very bloody riot at the Democratic National Convention in Chicago.

Going back 60 years, to 1958, we find an invention, arguably more important than the printing press, the steam engine or electricity. That summer, a relatively new employee of Texas Instruments skipped the summer vacation that was common in Texas before the invention of air conditioning. On September 12, 1958, he finished development of an ugly, half-inch long piece of silicon that was the world's very first integrated circuit. Jack St. Clair Kilby placed a single transistor, a capacitor and a resistor on a slab of germanium and began a



revolution of life on earth that has yet to reach culmination (above.)

A few years later, Robert Noyce, developed a photo printing technique to deposit aluminum wires on those silicon circuits, that made those ugly cockroach-looking things manufacturable. His work led to the Type 502 Flip Flop. A pricey little item, that single bit flip-flop. If you wanted to buy one in the 1960s, it would set you back \$450 (almost \$3500 today). Of course, that one bit turned into four and then 16, 32 and 64. ICs began the shrinking and capacity started expanding until today, where we

now count atoms. Our world would be unrecognizable without that work done in that hot TI lab in the summer of 1958.

And I'd be remiss if I didn't mention what happened in Bedford, Massachusetts 50 years ago this year. It was in 1968 that a little company, called Bedford and Associates, developed a solid-state device with 125 words of memory that was programmable with the same ladder logic used in the relay control systems of the day. The late Dick Morley, known as the father of the PLC, liked to recount that he

was extremely hungover on that New Year's Day in 1968 when he designed that first PLC. But because he designed it to use the programming symbols and diagrams used to program relay logic, factory electricians found it easy to use

and the rest, as they say, is history.

So, as we begin to wind-up 2018, let's not end it without a tip of the hat (and a raised glass) to the Jack Kilby's, Robert Noyce's, Dick Morley's and the many other engineers that have so enriched our world.

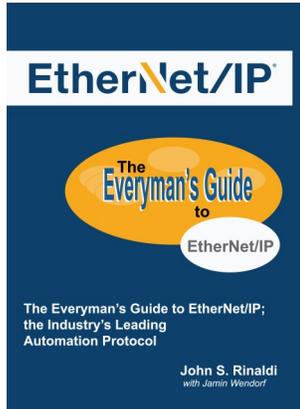
PS: As this is my last newsletter of the year, I wish each of you a very Merry Christmas and a Happy New Year!

*John*

# EtherNet/IP Fest

- Application Layer Protocol Training -

EtherNet/IP Fest was three days of valuable information, hands-on training and a little fun too!  
Keep an eye out for our 2019 training schedule!



## FREE BOOK!

**We Need Your Help!**

Our very own Dr. Phil of Industrial Automation **John Rinaldi** has a new book **The Everyman's to EtherNet/IP**, and need YOUR feedback! The first 50 people to respond to this offer will get a FREE advance copy to share your feedback with John!

To claim your copy, visit [www.rtaautomation.com](http://www.rtaautomation.com), complete the Contact Us form and tell us you want a free advance copy of **The Everyman's Guide to EtherNet/IP** for review.

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### September Survey Results

How familiar are you with EtherCAT?

Expert	0%
Knowledgeable	7.98%
Somewhat Knowledgeable	18.40%
<b>Beginner</b>	<b>37.42%</b>
What is EtherCAT?	36.20%

How many times have you used IEEE 1588, the Precision Time Protocol?

Often	3.07%
Occasionally	19.63%
<b>Never</b>	<b>39.26%</b>
I don't know what IEEE 1588 is	38.04%

In the plants where you've worked, how many applications required a real motion control system?

Most	11.04%
Many	19.63%
<b>A few</b>	<b>49.08%</b>
None	20.25%

What is your favorite motion control technology?

PROFINET IRT	14.11%
Sercos	11.66%
EtherCAT	12.88%
<b>CIP Motion</b>	<b>39.88%</b>
Other	21.47%

Pick a team to win the 2019 Super Bowl:

**Green Bay Packers (yes, we cheated, there's only one choice) 100%**



(continued from page 1)

all agree that there are applications that can tolerate jitter (slight variations of a signals arrival) and others that can't.

Did you note the words "centrally managed" in that definition? That means that there is some central piece of software that is going to receive and process requests from all the devices needing deterministic delivery. Once it has that list, it must determine the timing and the path through the network for those messages. Then it must ensure that every router and switch in the network reserves the bandwidth for those messages. And it's going to do that for some of these sizeable networks that we find in large manufacturing facilities. That is a very difficult software problem far beyond the computational resources typically available on the factory floor, but I'll come back to that a little later.

**I Have Questions...**

Again, I don't understand the rush to TSN. Here are the questions that I can't get answered.

*What percentage of devices need that much determinism?*

I don't know anything about telecommunications, energy or other places where TSN might be useful, but I do know that we need determinism in motion applications. It seems clear to me that with mechanical systems, there is a physical limit to how fast things can move and it's a lot slower than a bunch of electrons. We are never going to have applications requiring nanoseconds of jitter.

*Won't faster bandwidth solve this problem?*

1Ghz Ethernet is now common. Does anyone believe it will stop there? Does anybody believe that in three years we won't have 10Ghz and within five years, 100Ghz or even 200Ghz? We may need fiber or some other kind of media, but it's clear that our networks are going to get faster. And when they do, we can use something called probabilistic determinism - big words that mean, at high speeds, there is so much available bandwidth that packets will arrive consistently with almost non-existent jitter. Combine that with a clock synchronization protocol like IEEE 1588 and the problem is solved for the vast majority, if not all, of our

applications requiring some level of determinism. And without having to purchase and maintain some very highly complex, critical piece of software infrastructure.

*Where is this "centrally managed" software coming from?*

I've asked some of the folks at these companies who are heavily investing in TSN to identify who is going to provide that "centrally managed" software, and the answer I always get is "not us." My impression is that the big money lies in selling the silicon - the routers, and switches, and not in developing, providing and supporting the software. Every demonstration of TSN I've seen is hardcoded; the routers and switches are all manually configured to pass specific messages and defer all other traffic.

Now, remember, I'm the guy with manure under his fingernails, only a few years away from a small farm in southern Italy. I don't claim to be one of the sharper knives in the drawer. I'd like to understand why money, time and resources are pouring into this effort - an effort I don't see being successful.

*fun facts...*

**The average snowflake falls at about 3 mph.**

**Snow is translucent, not white.**

**Earth is closest to the sun during winter.**

**Snow is a mineral.**

# Newsletter from:

Real Time Automation, Inc.

*For System Integrators and Control Engineers*

## Inside this issue...

- The TSN Bandwagon
- A Big Year for History Buffs
- November's Exclusive "Steal of the Month"

## CHRISTMAS SONG TRIVIA...

Name the original Christmas song titles based on the following hints.

1. Felicitations for the Season
2. Theurgical Cool Guy
3. Senior Flattened by a Cloven Aviator
4. Commencement of Yuletide Complexion
5. Altitudinous Celestials Acclaim
6. Planetary Jubilance

				1	7	4		
7						3	5	
2				5	4		6	
8	9	5						
		7				1		
						5	7	8
	7		5	2				3
	4	1						2
		2	9	4				

<http://1sudoku.com>

n° 223095 - Level Medium

n° 223095

*Happy Holidays from all of Us  
at RTA!*

Play on your mobile device or  
get answers using this code:

