

TELEMETERING STANDARDS COORDINATION COMMITTEE



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INTERNATIONAL FOUNDATION FOR TELEMETERING

# TSCC Spring 2019 Chair Report

March 5, 2019 Spring TSCC Meeting at  
Staybridge Suites Las Cruces, New Mexico with  
Spring RCC TG Meeting at White Sands Missile Range

# TSCC Membership

- Academia (1)
  - Dr. Michael Marcellin
- Government (5)
  - Mark Bender
  - Albert Gabaldon
  - Richard Graham
  - Myron Moodie
  - Richard Graham
  - Tab Wilcox
- Industry (9)
  - Scott Brierley
  - Brad Fleury
  - Philip Ellerbrock
  - Wayne Klein
  - Steve Nicolo
  - Sergio Penna
  - Joe Sulewski
  - Gilles Freud
  - Malcolm Weir
- Ex-Officios
  - Clifford Aggen (IFT Rep)
- Members Emeritus
  - Lee Eccles
  - Merv MacMedan
  - Erwin (Terry) Straehley

# Agenda

- |              |  |                  |
|--------------|--|------------------|
| <b>18:30</b> | <b>Call to Order</b>                                 | <b>S. Nicolo</b> |
| <b>18:40</b> | <b>Attendance and determination of Quorum</b>        | <b>W. Klein</b>  |
| <b>18:45</b> | <b>Review and Approve Agenda</b>                     | <b>S. Nicolo</b> |
|              | <b>Review of new members and alternate proposals</b> |                  |
|              | <b>Vote on members</b>                               |                  |
| <b>18:50</b> | <b>Officer Reports</b>                               |                  |
|              | Chair  | <b>S. Nicolo</b> |
|              | Secretary-Treasurer                                  | <b>W. Klein</b>  |
|              | Approval & review of last Minutes                    |                  |
|              | Financial Status                                     |                  |
|              | Action Item Review                                   | <b>S. Nicolo</b> |

# Agenda (Continued)

## 19:10 Committee Reports

Nominating Committee	<b>S. Nicolo</b>
New nominations/follow-up on members	
Changes since Last meeting	
Radio Frequency	<b>S. Brierley</b>
RF Vender Working Group (Update)	<b>J. Pappas</b>
Telemetry Data Processing	<b>B. Fleury</b>
Networking and Protocols	<b>S. Nicolo</b>
<b>RCC TGG Network SC Report on 218</b>	<b>S. Perry</b>
Recorder / Reproducer	<b>M. Buckley</b>
Cyber Security (NEW Subcom-no report this meeting)	<b>M. Weir</b>
ETSC Report	<b>G. Freaud</b>

# Agenda (Continued)

<b>20:00</b>	<b>Website status</b>	<b>B. Baggerman</b>
<b>20:10</b>	<b>Old Business</b>	<b>S. Nicolo</b>
<b>20:20</b>	<b>New Business</b>	<b>S. Nicolo</b>
	Subcommittee Discussion	
	Discuss and decide on Fall Meeting (ITC)	
	ITC Standards Paper Award	
	TSCC Future activities	
<b>20:30</b>	<b>Adjourn</b>	<b>All</b>

# Subcommittee Changes

- Per Spring 2018 meeting we voted (via email vote) to suspend Transducer and Coding & Compression subcommittees due to lack of activity. Web site was updated to reflect this.
- Per Spring 2018 meeting we voted (via email vote) to add Cyber Security Group. Per Fall Meeting Action Malcolm Weir was appointed as Chair. Web site was updated to reflect this.

# Subcommittee's & Reports

## ■ CURRENT SUBCOMMITTEE REPORTS

- |                                     |                          |
|-------------------------------------|--------------------------|
| • Nominating Committee              | S. Nicolo (Acting Chair) |
| • Radio Frequency                   | S. Brierley              |
| • Networking and Protocols          | S. Nicolo (Acting Chair) |
| • Recorder / Reproducer             | M. Buckley               |
| • Telemetry Data Processing         | B. Fleury                |
| • Cyber Security (New SC No Report) | M. Weir (NEW)            |
| • ETSC Report                       | G. Freaud                |

# Member Summary

Last	First	Association	Member/alternate	Expires	Office	Committee	Last	First	Committee
Bender	Mark	Government	Aerospace Corp	2019	member	radio Freq			
Brierley	Scott	Industry	ULA	2021	Chair	radio Freq/transd	McNatt	William	radiofreq
Ellerbrock	Philip	Industry	Boeing	2023	member				
Fleury	Brad	Industry	Edge Consulting	2020	Chair	Data multiplex / RF	Rob Trepa	Edge	rec/rep;data multi
Grahm	Richard	Government	Corona	2018	member				
Gabaldon	Albert	Government	China Lake	2021	member	R & R			
Gilles	Freud	Industry	Airbus	2021	member		Mayer	Gerhard	
Klein	Wayne Dr.	Industry	Apogee Labs	2017	Treasurer	Network&Protocol	Weaver	Bob	data multi, Net
Marcellin	Michael	academic	Univ of AZ	2019	member		Creusere	Charles	
Moodie	Myron	Government	SwRI GDP	2019	member	Network&Protocol	Abbott	Ben	N&P
Nicolo	Steve	Industry	Space/Ampex	2015	Chair TSCC Chair	Chair TSCC Network&Protocol Nominating Committee	Weir	Malcolm	radiofreq
Penna	Sergio	Industry	Embraer	2019	member	Network&Protocol	Correa	Leonardo de Queiroz	
Sulewski	Joe	Industry	L-3	2018	member	Data Multiplex	Dehmelt	Chris	rec/rep, datamult,Net
Wilcox	Tab	Government	YPG	2021	member	R & R			
Weir	Malcolm	Industry	Ampex	2018	Chair	Cyber Security			
Aggen	Cliff	IFT			IFT				
Eccles	Lee	Emeritus	Boeing		member				
MacMedan	Merv	Emeritus			member	data comp			
Straehley	Erwin	Emeritus			member	data multiplex			



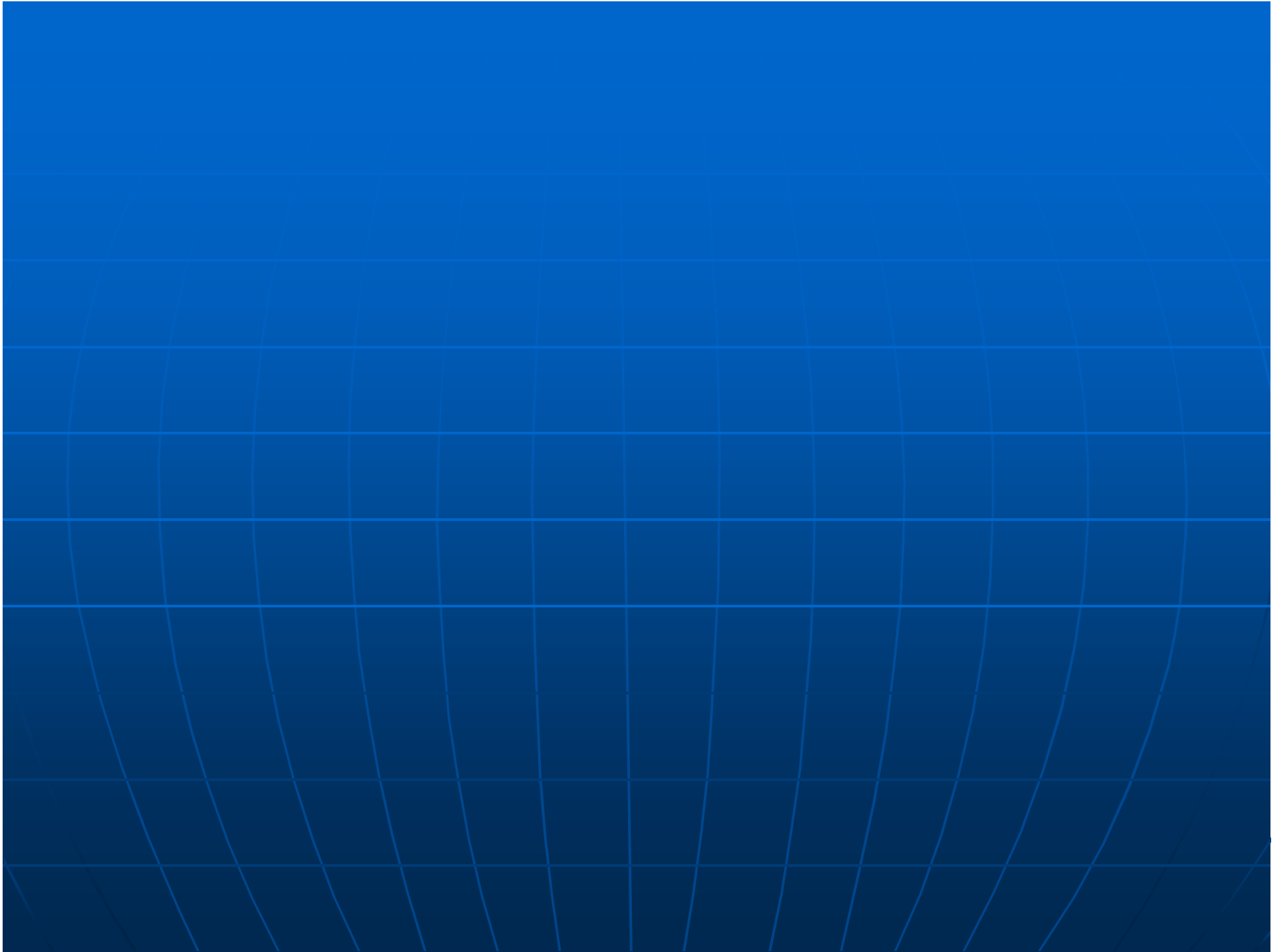
# TSCC Activities

## Pink Sheet Reviews

- IRIG 106-19 Chapter 9: Telemetry Attributes Transfer was distributed for review 4Q18

# Actions (NEW )

- S. Nicolo to add TSCC distribution list to web site (DONE)
- S. Nicolo to get letters from new members supervisors (DONE)
- *S. Nicolo: Reach out to Malcom Weir regarding Cyber Committee Chair. (DONE)*
- S. Nicolo Email out vote on officers (Vote at Spring 2019 Meeting)
- *One year Plaques still need to go out.... OPEN*
- Resolve/Update Attendance History Document (Treasurer will then take ownership)..... OPEN
- Need TSCC Co Chair and New Chair .... OPEN
- TSCC Status Report at ETTC
- TSCC Status Yearly Status Report for IFT
- OTHER: Webpage (Bob B.)
  - Encourages everyone to review the site and report/request any changes.
  - Subcommittee chairs should update emails for committees



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# TSCC Spring 2019 'Treasurer' REPORT

March 5, 2019 Spring TSCC Meeting at  
Staybridge Suites Las Cruces, New Mexico with  
Spring RCC TG Meeting at White Sands Missile Range

# Treasurer Report

for the Period 11/5/18 thru 3/4/19

■ INCOME		
• None	\$	0.00
■ EXPENDITURES (Total)	\$	0.00
■ Net Increase (Decrease) in Cash	\$	0.00
■ Beginning Cash Balance	\$	1965.77
■ Ending Cash Balance	\$	1965.77
• Note(s): TSCC account #: xxxxxx2632		

TELEMETERING STANDARDS COORDINATION COMMITTEE



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**TSCC Spring 2019**  
*Nominating*  
*Subcommittee Report*

March 5, 2019 Spring TSCC Meeting at  
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# Nominating Sub-Committee Membership

- Current Nominating Subcommittee Membership
  - CHAIR ...S. Nicolo Acting Chair (Diarmuid Retired)
    - Scott Brierley - United Launch Alliance
    - Wayne Klein - Apogee Labs
    - Stephen Nicolo - GDP Space Systems

# Sub-Committee Focus

- The nominating sub-committee shall propose TSCC members and officers for approval by the membership.
- Prospective TSCC members and officers can be nominated by the TSCC membership or by a nominating subcommittee.
- All nominations must be approved by a membership vote.



# TSCC Membership Rules

- The TSCC shall have **16 members**.
- **Adequate representation** shall always exist from the **diverse groups constituting the telemetry community**
- Representatives of government and commercial entities shall each constitute a minimum of one-third (1/3) of the regular TSCC Membership
- The remaining one-third (1/3) may include, but is not limited to those in commercial, government, and academic organizations
- Membership by representatives of non-US entities shall not exceed 25% of the total regular membership

# TSCC Membership Terms

- TSCC Membership Terms are for five years
  - Terms are staggered so that the terms of 20% (rounded to the nearest integer) of the regular membership end each year
  - Members may be re-nominated for additional terms by the nominating sub-committee.
- Expirations – Fall 2018: (Must Vote)
  - Joe Suleski: Joe would like to serve for an additional term.
    - Must vote in Spring 2019 (Did not have a quorum in Fall 2018)

# TSCC Membership

- Academia (1)
  - Dr. Michael Marcellin
- Government (5)
  - Mark Bender
  - Albert Gabaldon
  - Richard Graham (New)
  - Myron Moodie
  - Tab Wilcox
- **SHORT 1 GOV or ACADEMIA MEMBER**
- Industry (9)
  - Scott Brierley
  - Brad Fleury
  - Philip Ellerbrock
  - Wayne Klein
  - Steve Nicolo
  - Sergio Penna
  - Joe Sulewski
  - Gilles Freud
  - Malcolm Weir (New)
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					Chair	Network&Protocol			
						Nominating Committee			
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Aggen	Cliff	IFT							
					IFT				
Eccles	Lee	Emeritus	Boeing		member				
MacMedan	Merv	Emeritus			member	data comp			
Straehley	Erwin	Emeritus			member	data multiplex			

# Membership Changes

- MEMNERS:
  - NEW FULL MEMBERS: Must Pick Subcommittees
    - Richard A. Graham Jr., Electrical Engineer, NSWC – Corona
    - Malcolm Weir, Chief Technology Officer at Ampex
  - Fall 2018 Voting (No Quorum in Fall)
    - Joe Sulewski (Term is up Fall 2018).
- Voting on Alternates:
  - None
- Alternates still needed for:
  - Mark Bender
  - Albert Gabaldon
  - Tab Wilcox
  - Malcolm Weir (Just became Full Member)
  - Richard A. Graham Jr (Just became full member)
  - Steve Nicolo (Malcolm was SN's Alternate)
- Retiring members:
  - None

# Open Membership Slots

- We had 13 full members in the Spring 2018. We voted in 2 new members (1 Government and 1 Industry). **Now have 15 total full members.** **Need 1 Government member** to maintain our approx 33% split between industry, academic and government.

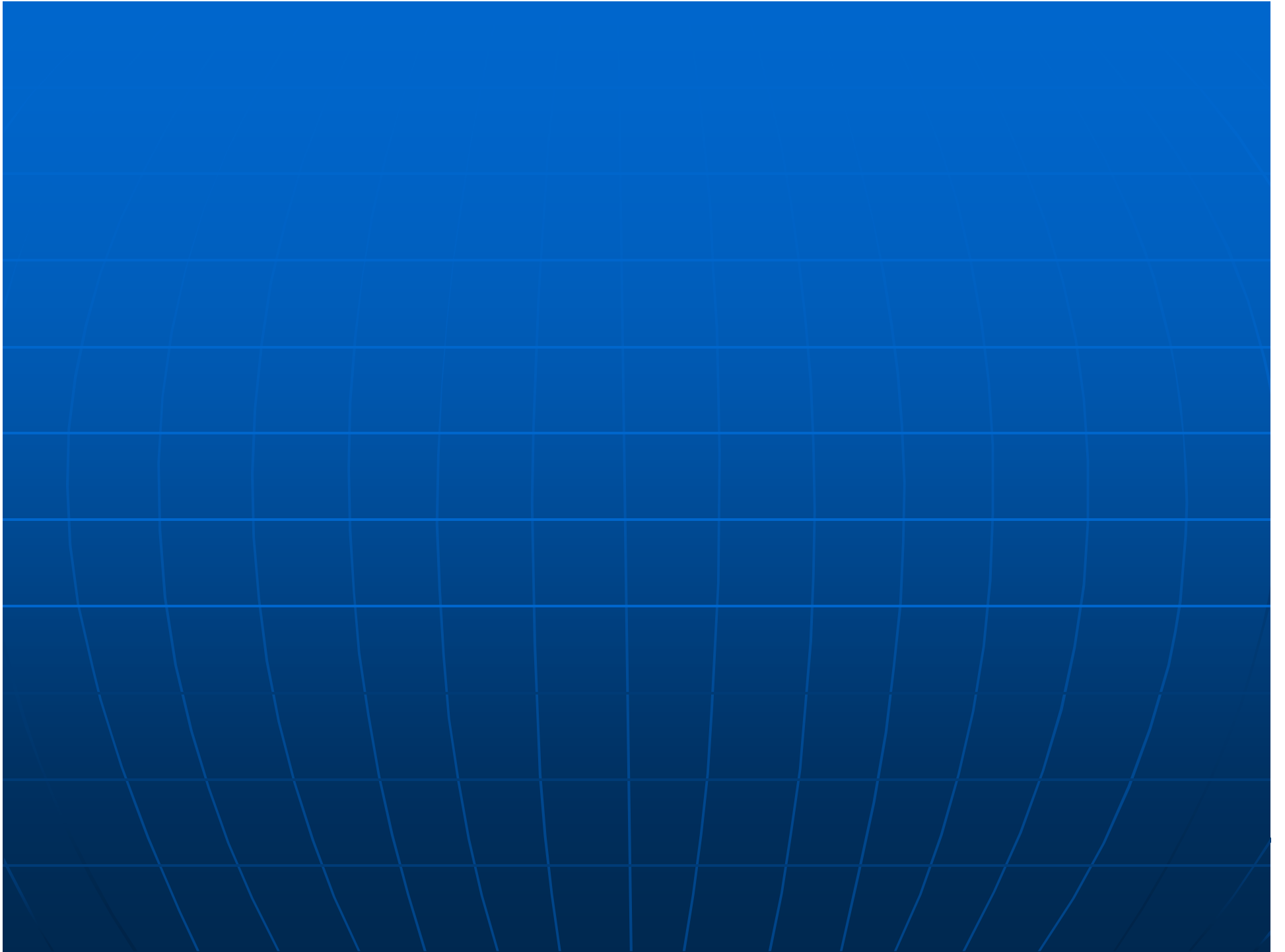
# TSCC Officers

- **Officers shall serve for a two year term of office**
  - The **term** of office shall begin at the **start of the TSCC Year** in even calendar years
  - Traditionally the **TSCC Vice-Chair** succeeds to the Chair's position to fulfill a two year term as Chair
  - The Secretary-Treasurer may be re-elected
  - **Officer Terms up December 31, 2018**
- Current Officers:>>>> MUST VOTE THIS MEETING (No Quorum in Fall 2018 Meeting)
  - Chair – Steve Nicolo (2<sup>nd</sup> Consecutive Term)
  - Vice-Chair - Vacant!!!!!!!!!!
  - Secretary-Treasurer – Wayne Klein
- Subcommittee Chairs
  - Need someone to chair the Network Subcommittee (S. Nicolo is acting chair)

# Open Actions

- TSCC has 1 open position. Should be Government or Academic.
- **TSCC MEMBERS MUST BECOME MORE INVILVED AS OFFICERS & SUBCOMMITTEE CHAIRS**
- Officers: MUST VOTE Spring 2019 (No Curium in Fall 2018)
  - TSCC Chair: S. Nicolo (2<sup>nd</sup> Consecutive Term)... Must Vote In
  - TSCC CoChair (NEED Vice-Chair)
- Committees
  - Subcommittee Chairs
    - Network Subcommittee Chair Needed (S. Nicolo Acting Chair)
- Alternates still needed for:
  - Mark Bender
  - Albert Gabaldon
  - Tab Wilcox
  - Malcolm Weir (Just became Full Member)
  - Richard A. Graham Jr (Just became full member)
  - Steve Nicolo (Malcolm was SN's Alternate)





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# TSCC Spring 2019 RF SUBCOMMITTEE REPORT

March 5, 2019 Spring TSCC Meeting at  
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Spring RCC TG Meeting at White Sands Missile Range

# Sub Committee Membership

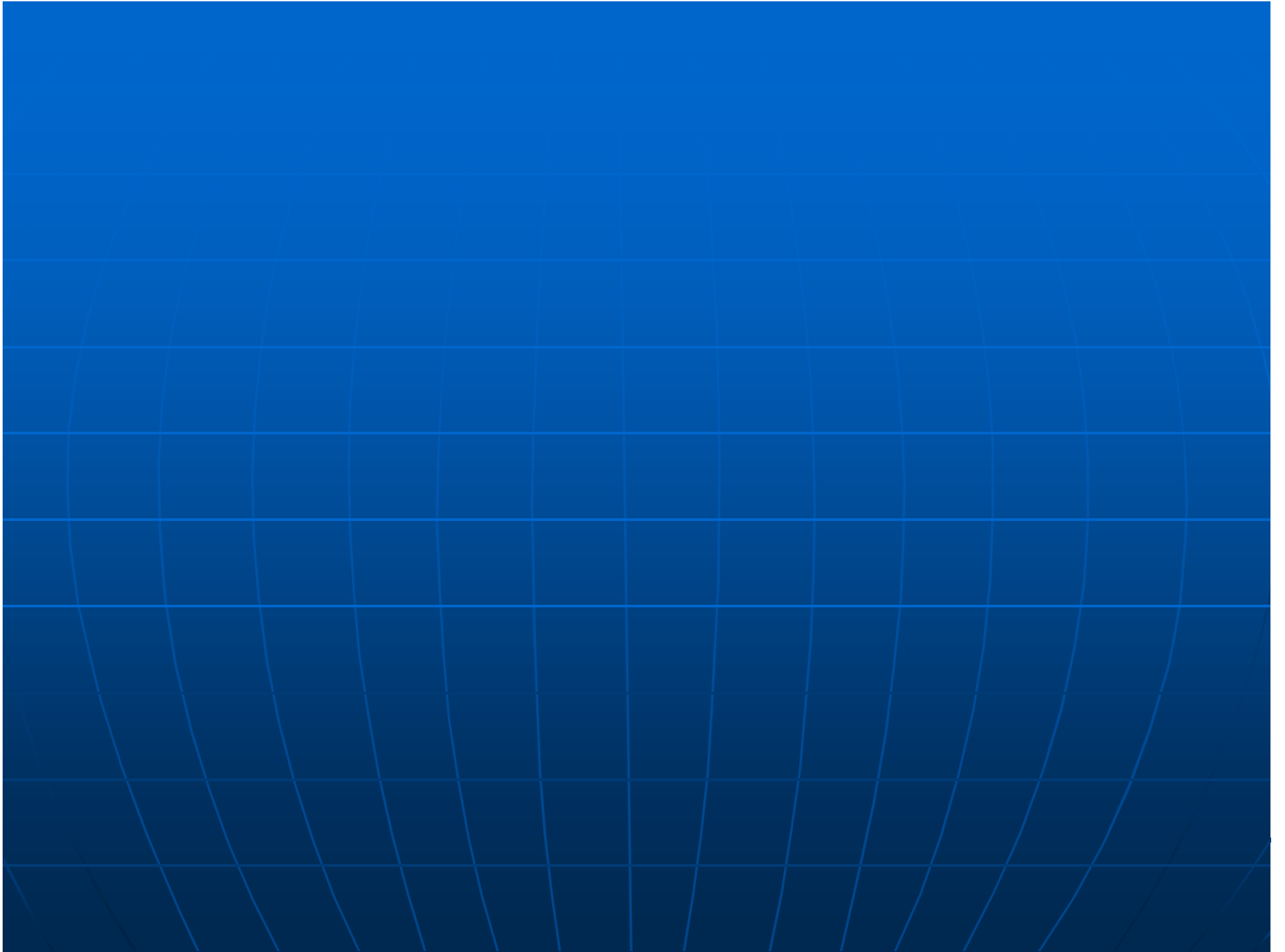
- Scott Brierley, Chairman
- Members:
  - Johnny Pappas
  - Mark Bender
  - Mark Dapore
  - Brad Fleury
  - Lloyd Lautzenhiser
  - Bill McNatt
  - Rich Siegal
  - Brad Oney
  - James Carwell

# Sub-Committee Focus

- RF Subcommittee reviews standards dealing with the Radio Frequency (RF) telemetry link
- Current standards
  - RCC IRIG-106
  - RCC IRIG-118
  - RCC RF Handbook
  - CCSDS-401
  - CCSDS-411
  - SGLS
  - STDN
  - 1451.5

# Open Actions

- RF Vendors Working Group
  - RCC/IFT doesn't recognize this as an activity of the TSCC RF Subcommittee



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# TSCC Spring 2019 Committee Report

**Brad Fleury**  
**Edge Consulting and Sales**

# Committee Members

- Brad Fleury – Director Edge consulting and sales
- Alternate – Rob Tropa, Director Edge Consulting and Sales



# Sub-Committee Standards

- Current standards
  - IRIG-106 -17 (-19)
  - Telemetry App's Handbook.
    - TMATS use cases, complete but updates are made as needed
    - RCC XML handbook for IHAL and DDML XML

# Sub Committee Membership

Jon Morgan – RCC lead EAFB

Joe Sulewski – L-3 Communications

Joe Merritt – RT Logic

Jack Sheldon

Erwin Straehley

Duane Wheaton

# Sub-Committee Focus

- Lots of discussion about TMATS S-groups
- See attached S-group data structure
- Joint meetings with Recorder committee and network committee
- Also discussing chapter 11, MDT, TMNS

# Open Actions

- Support RCC ongoing efforts:
  - TMATS Handbook releases
  - IRIG standards
- Support RCC –TG Telemetry Data Processing telecons and RCC meetings.

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# TSCC Spring 2019 Networks Subcommittee Report

March 5, 2019 Spring TSCC Meeting at  
Staybridge Suites Las Cruces, New Mexico with  
Spring RCC TG Meeting at White Sands Missile Range

# Sub Committee Membership

- Steve Nicolo, (Acting Chair) – GDP Space Systems, Ground Telemetry (NEED CHAIR)
  - Ben Abbot, Southwest Research Institute
  - Rich Hoffman, GDP Space Systems
  - Gary Thom, Delta Information systems
  - Myron Moodie, Southwest Research Institute
  - Wayne Klein, Apogee Labs
  - Fil Macias, White Sands Missile Range
  - William Malatesta, NAVAIR
  - Hyong Yi, Curtiss-Wright Controls, Avionics and Electronics
  - Robert Weaver, Apogee Labs
  - Chris Dehmelt, L3 Telemetry – East
  - Joe Sulewski, L3 Telemetry
  - Malcolm Weir, Ampex
  - Sergio Penna, Embraer
  - Dave Buckley, Curtiss-Wright Controls

# Subcommittee Focus

Standard	Location	Contact
<b>RCC IRIG-106 Chapters 21-28</b>	<a href="#">irig106p2-chpt21-28.zip</a>	Secretariat Range Commanders Council U.S. Army White Sands Missile Range New Mexico 88002-5110
<b>SCPS</b>	<a href="http://www.scps.org">http://www.scps.org</a>	<a href="http://www.scps.org/html/contact_points.html">http://www.scps.org/html/contact_points.html</a>
<b>CCSDS</b>	<a href="http://public.ccsds.org/default.aspx">http://public.ccsds.org/default.aspx</a>	<a href="http://public.ccsds.org/about/contact_us.aspx">http://public.ccsds.org/about/contact_us.aspx</a>
<b>TCP</b> (Transmission Control Protocol)	<a href="http://www.faqs.org/rfcs/rfc793.html">http://www.faqs.org/rfcs/rfc793.html</a>	
<b>UDP</b> (User Datagram Protocol)	<a href="http://tools.ietf.org/html/rfc768">http://tools.ietf.org/html/rfc768</a>	
<b>SNMP</b> (Simple Network Management Protocol)	<a href="http://tools.ietf.org/html/rfc3411">http://tools.ietf.org/html/rfc3411</a>	<a href="http://tools.ietf.org/html">http://tools.ietf.org/html</a>
<b>EEE-1588</b> (A Precision Clock Synchronization Protocol for Networked MEasurement and Control Systems)	<a href="http://ieee1588.nist.gov">http://ieee1588.nist.gov</a>	<a href="http://www.ieee-ims.org/site/index.php">http://www.ieee-ims.org/site/index.php</a>
<b>FTP</b> (File Transfer Protocol) <a href="http://www.ietf.org/rfc/rfc959.txt">http://www.ietf.org/rfc/rfc959.txt</a> <a href="http://tools.ietf.org/html">http://tools.ietf.org/html</a>	FTP (File Transfer Protocol) <a href="http://www.ietf.org/rfc/rfc959.txt">http://www.ietf.org/rfc/rfc959.txt</a> <a href="http://tools.ietf.org/html">http://tools.ietf.org/html</a>	FTP (File Transfer Protocol) <a href="http://www.ietf.org/rfc/rfc959.txt">http://www.ietf.org/rfc/rfc959.txt</a> <a href="http://tools.ietf.org/html">http://tools.ietf.org/html</a>

# TSCC Activities

## Pink Sheet Reviews

- IRIG 218 : TMoIP Standard: Status from Shawn Perry 3/5/19
  - The standard will be published this year (2019).
  - Shawn Perry has update for this meeting



# Open Actions

- Need New Chair of Network SC

# IRIG 218 TMoIP Update Status

ITC 2017  
(updated 2/28/19)  
Shawn T. Perry  
NAWCAD Pax River  
RCC TTG Chairman

# TMoIP Origin

- Developed as Ranges transitioned from ATM to IP
- Goal of providing simple transport of SST
- Based on standards such as pseudowire
- 218-10 mentions future growth possibilities (RTP, IPv6)
- Great success so far for Range implementations
  - Distributed flight testing at contractor sites
  - Opens door for Range interconnectivity for LVC
- Ambiguities led to interoperability difficulties
  - Vendors developed proprietary variations

# Changing Paradigm

- New requirements emerged
  - Test articles lacking Ch4 time
  - TMoIP not just for muxes anymore
  - Software decoms, best source, receivers, IP decryptors
  - PCM and DQE frame payload shaping
- Vendors and Ranges reached out to RCC TG
- RCC TG reached out to RCC TTG
- RCC TTG posted RFI on 218 growth requests

# RFI Results

- Timestamp top priority
  - RTP vs Control Word expansion
  - Format requests varied (UTC vs TAI)
  - Nanosecond resolution
- Unused Control Word bits
- Payload shaping
  - PCM and DQE frames with bit sync status
- Improved interoperability
  - Ability to auto-adjust to bit rate changes and user selected parameters (minimal latency)

# TTG 218-19 Goals

- Identify valid requirements
- Maintain 218-10 functionality
- Maintain vendor proprietary variants
- Make update painless to implement on deployed hardware
- Create process for continual improvement
- Account for Range timing transition to 1588

# TTG 218-19 Changes

- TMoIP Control Word additions
  - 64-bit Timestamp with nanosecond resolution.
  - Time source reference flag for UTC or TAI.
  - Payload shaping for minor frames and DQE.
  - Frame sync status for payload shaped frames.
  - Fragmentation flag for managing shaped payloads and MTU.
- TMoIP Control Word subtractions
  - Identify failures in local TM interface.
  - Fault signaling capability across the network.
  - LEN field.
- Reserved a Control Word version to preserve proprietary variants.
- Bit rates and changes in bit rates shall be calculated using packet timestamps and algorithms. For compliance, no proprietary packets or bits shall be used.
- Removal of RTP from Timing as an Option for Clock Recovery.
- Removed many references to Range use of ATM.

**TABLE 3-5. TMOIP 218-19 CONTROL WORD**

Field	Bits	Description
VER	4	Version identifier “0010” indicates 218-19
PLD	2	Payload type “00” indicates no frame alignment “01” indicates PCM frame aligned, first or only packet “10” indicates DQE frame aligned, first or only packet “11” indicates frame aligned, continuation packet
mFSS	2	Minor Frame Sync Status (used for PLD = “01” only) “00” indicates Search “01” indicates Check “10” indicates Lock “11” indicates Flywheel
MFSS	2	Major Frame Sync Status (used for PLD = “01” only) “00” indicates Search “01” indicates Check “10” indicates Lock “11” indicates Flywheel
FRG	1	Fragmented Payload (used for PLD = “01” only) “0” indicates first payload fragment with frame sync or DQE “1” indicates subsequent payload fragments
RES	4	Reserved
TSR	1	Timestamp Source Reference “0” indicates UTC “1” indicates TAI
SEQ NUMBER	16	Sequence Number
TIMESTAMP	64	64-bit Timestamp – PTP format. See Figure 3-6. 32 bit seconds field 2 bit Reserved 30 bit nanoseconds field Prime epoch 00:00 01 Jan 1970

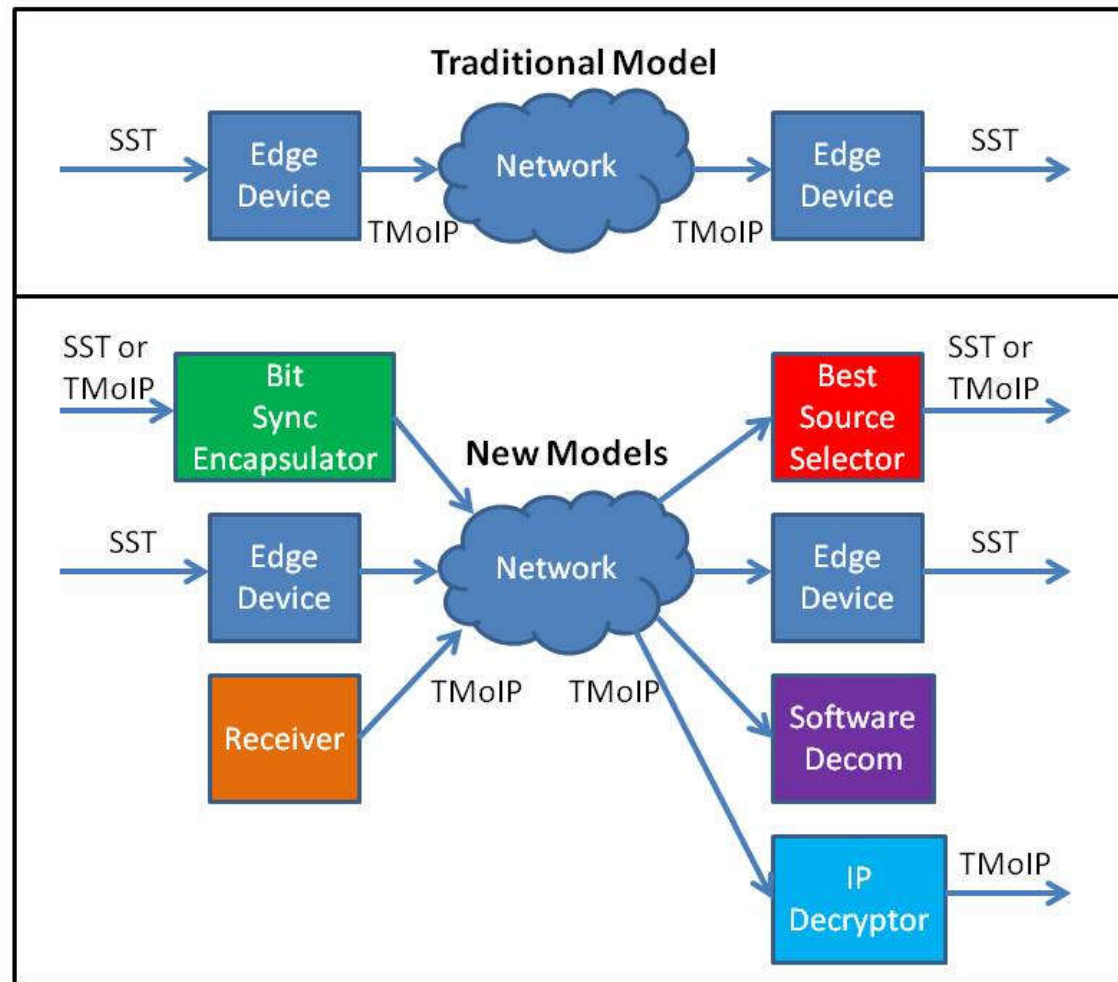


# Conclusions

- Successful vendor interoperability test at ITC
  - Few test cases with interoperability issues
  - Vendors identified “bugs” and work-arounds
- Didn't break 218-10 or proprietary methods
- Should be backward compatible with existing HW
- New features
  - 64-bit 1 ns resolution PTP timestamp format
    - 00:00 01 Jan 1970 prime epoch
    - TAI or UTC source reference flag
  - Payload shaping for minor frames and DQE
  - Bit sync status information metadata
  - Fragmentation flag for payload shaping over smaller MTU network

# Backup Slides

# TMoIP Models



**TABLE E-1. TMoIP PACKET SUMMARY**

<b>Field</b>	<b>Description</b>		<b>Length</b>	<b>P/C/F <sup>(1)</sup></b>
<u>Ethernet Dest Addr</u>	Identifies station(s) to receive frame		6	P
<u>Ethernet Src Addr</u>	Identifies station that originated frame		6	C
<u>802.1Q Length/Type</u>	Virtual LAN (VLAN) tag length/type		2	F = 0x8100
<u>VLAN Tag Ctrl Info</u>	<u>Bit</u>	<u>Description</u>	2	
	0 - 2	User Priority Field		P
	3	Canonical Format Indicator (CFI)		F = 0
	4 - 15	VLAN Identifier (VID)		P
<u>Length/Type</u>			2	F = 0x0800
<u>IP Header</u>  20 Bytes Total	<u>Byte</u>	<u>Description</u>		
	0	Version + IP header length	1	F = 0x45
	1	TOS	1	P
	2 - 3	Total length of IP packet	2	C
	4 - 5	16 bit ID	2	C/F
	6 - 7	Flags + Fragment Offset	2	F
	8	TTL	1	F/P
	9	Protocol (UDP)	1	F = 0x11
	10 - 11	IP Header checksum	2	C
	12 - 15	Source IP address	4	P
<u>UDP Header</u>  8 Bytes Total	<u>Byte</u>	<u>Description</u>		
	0 - 1	Source Port	2	P
	2 - 3	Destination Port	2	P
	4 - 5	UDP Length	2	C
	6 - 7	UDP Checksum	2	C
<u>Payload</u>	<u>TMoIP Control Word</u>		4 (or 12)	C
	<u>TM Raw Packet Data</u>		<u>Var</u>	C
<u>Ethernet FCS</u>	<u>Ethernet Frame Check Sequence</u>		4	C

<sup>(1)</sup> P = Programmable by user.  
 C = Calculated or placed in packet without user intervention.  
 F = Fixed.  
Var = Variable.

# TMoIP Control Word

**TABLE 3-3. TMoIP CONTROL WORD**

Field	Bits	Description
VER	4	Version identifier “0000” indicates 218-10 “0001” is reserved for proprietary modified 218 formats “0010” indicates 218-18 “0011” through “1111” reserved for future versions
VDB	12	Version Defined Bits
SEQ NUMBER	16	Sequence Number

**Notes**

218-10 remains unchanged.

218-P version was added to maintain functionality of several proprietary modified 218-10 variants in use.

218-18 version removes the unused alarm bits, adds the ability to designate that a payload is sized to a PCM or DQE frame, adds bit sync status for PCM frame aligned payloads, and adds a 64-bit timestamp.

# 218-10

TABLE 3-3.1. TMoIP 218-10 CONTROL WORD

Field	Bits	Description
VER	4	Version identifier “0000” indicates 218-10
L	1	Local Defect Alarm, indicates local circuit fault in the TM stream
R	1	Remote Defect Alarm, indicates remote circuit fault in the TM stream
M	2	Local Defect Alarm Modifier
RES	2	Reserved
LEN	6	If non-zero, LEN indicates <u>TMoIP</u> Payload Length, defined as the <u>TMoIP</u> Control Word + Raw Packet Payload If zero, LEN indicates <u>TMoIP</u> Payload Length greater than 63 bytes. In this case the <u>TMoIP</u> payload length is determined via length fields in lower protocol layers.
SEQ NUMBER	16	Sequence Number

## Notes

Req The TMoIP raw packet size shall be user configurable.

Opt The TMoIP raw payload size may be auto-configurable, based on user priorities (e.g. stream/delay characteristics).

Req The minimum TMoIP raw packet size = 1 byte.

Notes: a. To limit the effects of Ethernet fragmentation, the final Layer 2/3/4/6 packet size should be less than the Ethernet Maximum Transmission Unit (MTU).

b. Padding may be required to meet the minimum Ethernet MTU size.

# 218-P

**TABLE 3-3.2. TMoIP 218-P CONTROL WORD**

Field	Bits	Description
VER	4	Version identifier “0001” indicates Proprietary variants of 218-10
PDB	12	Proprietary Defined Bits
SEQ NUMBER	16	Sequence Number

**Notes**

This version allows vendors who created modified versions of 218-10 to maintain functionality. Due to variances in implementation, not recommended in mixed vendor environments.

# IRIG vs NTP vs PTP

- IRIG
  - >64 bits and can't achieve 1 ns resolution
- NTP
  - Most likely implemented time source (minimal effort)
  - 64 bits with 233 ps resolution
- PTP 1588
  - Questions concerning 1588 profiles which affect format
  - Greatest implementation impact to vendors
  - Greater long-term use potential, but immature now



TELEMETERING STANDARDS COORDINATION COMMITTEE



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# “TSCC Spring 2019 Committee Reports”

RCC TG 136  
March 5, 2019  
WSMR, NM

# Sub Committee Membership

- Mark Buckley (Telspan Data), Chairman
- Albert Gabaldon (NAVAIR), Alternate Chairman
  - Balázs Bagó (Zodiac)
  - Bob Baggerman (AVTest)
  - Paul Carrion (Calculex)
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  - Malcolm Weir (Ampex)
  - Craig Wierzbicki (TTC)
  - Rick Williams (SDS)

# Sub-Committee Focus

- Data Recorders, Ground and Airborne
- Standards in Place
  - IRIG 106-17 – Range Commanders Council (RCC) Telemetry Standards  
<http://www.wsmr.army.mil/RCCsite/Pages/Publications.aspx>
  - STANAG 4575 – North Atlantic Treaty Organization (NATO) Standard Agreement (STANAG) – NATO Advanced Data Storage Interface (NADSI) Allied Engineering Documentation Publication (AEDP)  
<http://www.nato.int/STRUCTUR/AC/224/standard/4575/4575.htm>
  - ANSI INCITS 175-1999 (R2004) 19mm Type ID-1 Recorded Instrumentation Digital Cassette Tape Format (revision and redesignation of ANSI X3.175-1990 (R1995))
  - MIL-STD-2179 – Helical Digital Recording Format For 19-MM Magnetic Tape Cassette Recorders/Recorders

# Significant Activity

- RCC Telemetry Group Recorder & Reproducer Committee
  - IRIG 106-19 Chapters 6/9/10/11 Pink Sheets
    - Waiting for public release approval
- STANAG 4575, AEDP-6 Ratification
  - No update

# Significant Activity

RCC Document 106-19 Ch's 6,9,10,11

- TSCC R&R to take a more significant roll in CR reviews & recommendations
  - Help ease the TG R&R work load & approval process
- 2019 approved CR's
  - (Following pages)

# R&R CRs for 2019

5 Mar 2019

CR No	Description	Status	
tmpRR_16_CR-003 (CR)	PCM (not) Inverted	Clarification, Text Added	<b>Pink sheet</b>
tmpRR_17_CR-010	Update S-Group	Under Review	<b>Pink sheet</b>
tmpRR_17_CR-011	New PCM Formats	Implemented	<b>Pink sheet</b>
tmpRR_18_CR-005 (CR)	Simple TMATS Corrections, R-Group	Typos, Clarifications	<b>Pink sheet</b>
tmpRR_18_CR-006 (CR)	Simple TMATS Corrections, P-Group	Typos, Clarifications	<b>Pink sheet</b>
tmpRR_18_CR-011 (CR)	Secondary Header	Typos, Clarifications	<b>Pink sheet</b>
RR_18_CR-012 (CR)	Parallel Data Type	Typos, Clarifications	<b>Pink sheet</b>
RR_18_CR-013 (CR)	TMATS Streaming packets	Typos, Clarifications	<b>Pink sheet</b>
RR_18_CR-014 (CR)	Data Stream Format 3	Typos, Clarifications	<b>Pink sheet</b>
RR_17_CR-000	New CR number	Implemented	
RR_16_CR-001 (CR)	PCM Rewrite	<b>CLOSED, Judiciously</b>	

# R&R Working/Closed CRs

5 Mar 2019

CR No	Description	Status	
RR_17_CR-001	Ver 2 Packet Header	CANCELED???	
tmpRR_17_CR-002	MDL Header Data Type	Working	
tmpRR_17_CR-003	Fix Video Formats	Working	
tmpRR_17_CR-004	Distribution Statement	Working	
tmpRR_17_CR-005	Add PN fields	Working	
RR_17_CR_006 (CR)	UART, First Packet Flag	Working	
RR_17_CR-009	New EtherNet, FC	Proposed	

# Open Actions

- TSCC –
  - CH10/11 in a networked world
    - Recording CH10 Publishers as Native Packets w/ Correlated Time
    - V2 Header w/ 1588 Time
  - Standardization of range/test article NAS
  - Metadata hooks into a post/real-time CH10 architecture