



1791 Tullie Circle, N.E./Atlanta, GA 30329

404-636-8400

DRAFT

TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. TC 9.9 DATE January 13, 2019

TC/TG/MTG/TRG TITLE Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

DATE OF MEETING January 13, 2019 LOCATION Atlanta, Georgia

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

MEMBERS PRESENT	MEMBERS ABSENT	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
VOTING MEMBERS		Shawn Andrews
Jason Matteson	Ecton English	Reza Ghias
Dustin Demetriou	Lex Coors	Nigel Gore
Gerardo Alfonso	Mukesh Khattar	Marcus Hansen
John Bean		Benjamin Petsche
Donald Beaty		Douglas Sick
Jon Fitch		Darrin Watson
David Meadows		Rui Zhang
Christopher Muller		
Terry Rodgers		
Roger Schmidt		
Vali Sorell		
CORRESPONDING MEMBERS		
John Groenewold	Raymond Abraham	
Robert McFarlane	Robert Akkerman	
Joseph Gangemi	Robert Akkerman	
Richard Paviak	Stuart Aldridge	
Jack Glass	Henry Amistadi	
Paul Artman	Rangarajan Arulselvan	
Michael Collarin	Sean Ashburn	
Paul Finch	Robert Bader	
Arthur Giesler	William Bahnfleth	

David Grant	Andrew Baxter	
Steve Greenberg	William Beck	
John Gross	Chad Beery	
Hugh Hudson	Ng Kai Beng	
David Kelley	James Betts	
Matt Koukl	James Betts	
Nemat Lotfi	Michael Bishop	
David Moss	Byron Blackmore	
Shlomo Novotny	Alonzo Blalock	
John O'Brien	Sébastien Brasseur	
Lawrence Ollice	Tahir Cader	
Christian Pastrana	Aldo Calvi	
John Peterson	Nicholas Casale	
Justin Seter	Noe Casalino	
Mark Seymour	John Castelvechi	
Vali Sorell	Neil Chauhan	
Mark Steinke	Dale Cibene	
David Tootle	Alan Claassen	
Marianna Vallejo	Fabio Clavijo	
	Dan Comperchio	
	Howard Cooper	
	James Coyle	
	Craig Crader	
	Matthew Cronmiller	
	Bob Culver	
	Christopher Daniel	
	Steve David	
	Thomas Davidson	
	George Degroft	
	Bob Doherty	
	Daniel Donahoe	
	Robert Druga	
	John Dumler	
	Andrew Dunn	
	Dan Dyer	
	Michael Edie	
	Dennis Eisenbarth	
	Michael Ellsworth	
	Frank Erceg	
	Jeffrey Ewin	
	Huang Feng	
	Gregory Fennewald	
	Philip Flinn	
	Kamran Fouladi	
	Michael Frank	
	Terry Frantzis	
	F French	
	Paul Galloway	
	Hongwen Gao	
	Kevin Gebke	

	Rajat Ghosh	
	John Gideon	
	Robin Gilbert	
	Kenneth Gill	
	Charles Gullede	
	Edward Gutowski	
	Kamel Haddad	
	Stephen Halsted	
	John Haney	
	Andrew Harrison	
	Kyle Hasenkox	
	Scot Heath	
	Dennis Hellmer	
	Magnus Herrlin	
	Ted Hight	
	Elly Hiu	
	Kevin Hughes	
	Mark Hydeman	
	J C Ierschot	
	Gwenn Ivester	
	Madhusudan Iyengar	
	Charles Johnson	
	Rhonda Johnson	
	Alex Juncker	
	George Kaler	
	Rajendera Kapoor	
	Kailash Karki	
	Kanchan Kelkar	
	Daniel Kennedy	
	Michael Kester	
	Kishor Khankari	
	Richard Killian	
	William Kingrey	
	Marvin Kirshenbaum	
	Timothy Kittila	
	Erhard Klotz	
	Paul Knight	
	Michael Koerner	
	Devdatta Kulkarni	
	Pardeep Kumar	
	Sushil Kumar	
	Christopher Kurkjian	
	Osmo Kuusisto	
	Stephen Lahti	
	David Landsberg	
	John Lane	
	Federico Lang	
	John Lanni	
	Jon Larry	
	Geoff Lawler	

	Matt Lawrence	
	Stuart Lawrence	
	Christian Le	
	Sang Lee	
	Bret Lehman	
	Frank Lembo	
	Guillermo Leon Orellana	
	Hsing-Sheng Liang	
	Mike Licitra	
	Francis Allen Lumabas	
	Lu Luna	
	William Maltz	
	Alessandro Mandelli	
	Lawrence Markel	
	Ted Marwitz	
	Caroline Mason	
	Guillermo Massucco	
	James McAleer	
	Timothy McCann	
	Michael McKenna	
	Douglas McLellan	
	Godwyn Mendes	
	Francis Mills	
	Richie Mittal	
	Michael Monahan	
	Mark Monroe	
	Stephen Mowrer	
	John Murgida	
	Ram Narayanamurthy	
	Philip Naughton	
	C.D Nayak	
	David Nesheiwat	
	John Neubauer	
	Michael Nicolai	
	Budy Notohardjono	
	Mark Ogilvie	
	Michael Ohadi	
	Chandrakant Patel	
	Mark Pavol	
	Andrew Pearson	
	Craig Petersen	
	Joseph Prisco	
	Honore'du Puy	
	David Quirk	
	David Redford	
	Mark Reed	
	Gamal Refai-Ahmed	
	Charles Rego	
	William Reynolds	
	Steven Rosenstock	

	Joel Rutledge	
	Jeffrey Rutt	
	Nestor Salinas	
	Michael Salvatore	
	Peter Samain	
	Michael Schwarz	
	Michael Schwedler	
	Clifford Scofield	
	Ian Seaton	
	Darshit Shah	
	Anthony Sharp	
	Timothy Shedd	
	Saurabh Shrivastava	
	Thursten Simonsen	
	Mark Simpson	
	Shelby Sims	
	Satwinder Singh	
	Grant Smith	
	John Song	
	Marc Soucy	
	Ronald Spangler	
	Ronald Spangler	
	Jonathan Spreeman	
	Jeffrey Stein	
	Robin Steinbrecher	
	Morgan Stevens	
	Charles Stewart	
	Robert Sullivan	
	David Sundin	
	Jacob Svenkeson	
	Inn Tang	
	Edwin Teoh	
	Jeff Tepler	
	Ronald Thomas	
	Russell Tipton	
	Sengul Topuz	
	Robert Tozer	
	Chad Tramonte	
	Jeff Trower	
	William Tschudi	
	Edward Tsui	
	Saahil Tumber	
	James VanGilder	
	Richard Velten	
	Herb Villa	
	Ralph Webb	
	Andrew Wengerd	
	Kurt Wetzel	
	Katherine Whitenack	
	Robert Wichert	

	Larry Wong	
	Tony S F Wong	
	Stephen Woollard	
	Wangda Zuo	
PROVISIONAL CORRESPONDING MEMBERS		
Benedict Dolcich	Ahmed Abdel Salam	
DAVID DONGES	Antonio Aguayo	
Mark Fisher	Husam Alissa	
Steven Hyde	Mohammad Alkiswani	
Gary Johnson, Jr	Matthew Archibald	
Mark Malkin	Serpil Ari	
Mark Monroe	William Artis	
Ian Nelson	Jakki Artus	
Kourosh Nemati	Adenilson Belizário	
Stuart Redshaw	Paul Bemis	
Kazuynki Wakita	Satyam Bendapudi	
Casey Winkel	James Benville	
	James Bogart	
	Holly Brink	
	Douglas Brown	
	Jerrold Buterbaugh	
	Andrew Calder	
	David Chialastri	
	Sruti Chigullapalli	
	Brad Cochran	
	Benjamin Coe	
	Bryce Cox	
	Bryan Coyne	
	Greg Crumpton	
	Shelley Dangoor	
	Cuong Dinh	
	Aaron Duda	
	Jacqueline Eaton	
	David Edenburn	
	Hamza Erden	
	Maxwell Evans	
	Sophia Flucker	
	Clayton Foster	
	David Franczak	
	Charles Freda	
	Troy Goldschmidt	
	Scott Graf	
	Shaun Green	
	Dinesh Gupta	
	Mathias Hery	
	Robert Hewitt	
	Chris Hsieh	
	Ming-Ren I	

	Hifumi Iguchi	
	Julian Iosifescu	
	Alekhya Kaianathbhatta	
	Vijay Kasibhatla	
	Rehan Khalid	
	Srinivas Kodea	
	Yuichi Kurihashi	
	Yiu Wa Kwan	
	Yuk Kuen Lam	
	Yuk Kuen Lam	
	Elizabeth Langer	
	Allan Lee	
	Guy Majestic	
	William Mak	
	Noreshvarman Manisagar	
	Carl Massey	
	Christopher McDermott	
	Jaakko McEvoy	
	Michael Miller	
	Chad Moore	
	Salah Nezar	
	Zuokui Ning	
	Sean OHern	
	Denis O'Mahony	
	Leslye Paniagua	
	Farid Parsaei	
	Thomas Peddle	
	Tim Persoons	
	FLORIN POPA	
	Justin Prosser	
	Suhasini Pyarasani	
	Prakash Rapolu	
	Hitoshi Sakamoto	
	Angela Sampaio	
	Andres Sepúlveda	
	Matt Shumway	
	Ruben Sidranski	
	Annie Smith	
	Stuart Smith	
	Susan Smith	
	Mark Sprenger	
	Robert Sty	
	Kaiyu Sun	
	Micah Sweeney	
	SOON TATT	
	James Vallort	
	David Vranish	
	Aaron Wemhoff	
	Stephen Wren	

	Eric Yang	
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	Yang Zou	
	Benjamin Zuk	

Published Agenda

TC 9.9 Programs, Handbook and Research – GWCC, 3rd Floor, Building A, A301

Topic		Time	Presenter
Introduction	Welcome and around the room introductions	10	Jason Matteson
Programs	Atlanta & Kansas City	15	Nick Gangemi
Handbook Revision Update	Chapter 19	5	Bob McFarlene
Research	1675-RP : Guidance for CFD Modeling of Data Centers	15	Mark Seymour
	1755-RP : Impact of Gaseous Contamination and High Humidity on IT Equipment Corrosion	45	Dustin Demetriou
	Energy Modeling Update	15	Vali Sorell

Call to Order: 1/13/19 5:00 PM Jason Matteson

- Introductions and Welcome
 - Programs handbook and research meeting
 - Jason Matteson Current Chair, Dustin Demetriou- Vice Chair
 - Around the room introductions
 - Recognition of first time guests
 - Next meeting to be Kansas City for the Summer Conference
 - Sign-in sheet being passed
 - 2:15 to 7:00PM Monday meeting
 - Agenda for Sunday and Monday meetings is posted on TC 9.9 website.
- Membership List Discussion
 - As part of an effort to clean up the TC membership rolls all members were sent an e-mail to verify their information. If the e-mail delivery failed the member was removed. Sixty-five (65) people were removed from the rolls as a result.
 - If name does not appear on the attendance list and you may have been removed. If this is in error please contact Jason Matteson.
 - Members were encouraged to keep their e-mail up-to-date on the ASHRAE website to prevent any future issues.
 - Code of Ethics review.
- Program Update- Nick Gangemi
 - No handouts but the information is available on the TC 9.9 website.
 - Review of sponsored events at the winter conference.
 - 90% success rate on submissions being accepted.

- Review of number of papers submitted versus number that are approved.
- Review of the different types of submittals.
- Kansas City, June 22-26 is the next conference.
- Extension has been granted for some submittals for Kansas City.
- Deadline of Feb. 8th is the critical deadline for us with respect to KC.
- March 15 deadline for conference papers summary for Orlando.
- Need papers and reviewers
- Contact Nick.gangemi6@gmail.com
- Handbook Revision Update – Bob McFarlene
 - HVAC Applications handbook is due for a new published version this year (4 year rotation, last one came out on 2014).
 - Last revision was a total rewrite and keyed to the Datacom book series.
 - Out of sequence updates are in the online version.
 - There were so many volunteers that not everyone was utilized.
 - A new version was submitted for the 2019 version.
 - Bob is currently waiting on proofs.
 - Out of sequence updates were automatically included in the 2019 version.
 - Roger Schmidt had the final review of the submittal.
 - The last out of sequence update took two years due to technical and bureaucratic issues.
 - The out of sequence updates can take place at any time.
- Research
 - 1675 RP: Guidance for CFD Modeling of Data Centers - Mark Seymour
 - TC 4.10 research project that TC 9.9 is the co-sponsor.
 - Awarded to Florida International University.
 - Unfortunately, FIU's laboratory was determined to be unacceptable and this had led to considerable delays.
 - Laboratory portion was subcontracted to Georgia Tech University in Atlanta.
 - Subcontract with GT has been signed.
 - Kickoff meeting with FIU, GT and members of the PMS has occurred at the GT laboratory.
 - FIU has been sourcing some server simulators and work put in by PMS to make sure the server simulators work like real servers with respect to pressure drop and heat load.
 - Prototype server simulator airflow could not be turned down

enough to simulate a real server. This has since been resolved and new version works much better.

- New server simulators have better fan control with the ability to turn individual fans off. Questions about recirculation with fans off remain.
- FIU has surveyed the GT laboratory and has been building the computer models.
- Airflow tiles that were donated are now on-site. These are higher airflow, more free area airflow tiles with a lower pressure drop compared with the existing tiles.
- There was a payment issue with the server simulators that was resolved.
- Remaining units have reportedly been manufactured and are being tested for quality assurance.
- Once the server simulators have been received we should be in a position to start the laboratory portion of the work.
- FIU is currently building the first model. Simulations will be performed first to identify the test scenarios that we want to perform in the lab.
- We are currently in a no-cost extension period until the end of March 2019.
- PMS has agreed to request another one year no-cost extension.
- 1755 RP: Impact of Gaseous Contamination and High Humidity on IT Equipment Corrosion - Dustin Demetriou
 - TC 9.9 is the lead sponsor.
 - No cost extension was granted until December 31, 2019
 - Will be coming to a close this year.
 - Probable review of results in detail at the summer meeting.
 - PMS meeting Monday morning, 7:30-9:00 am.
 - Overview of the project presented.
 - Final draft of the results is being reviewed by the PMS.
- RTAR (Research Topic Acceptance Request) 1867: Development of a Model for assessing corrosion risk of datacom equipment. – Dustin Demetriou
 - RTAR was submitted to RAC (Research Activities Committee) and was rejected.
 - Reasons for rejection:
 - RAC could not tell what the difference was between the proposed project and 1755-RP.

- RAC also wanted to see 1755-RP come to a close and be reviewed by the PMS before investing any more money into additional research on the topic.
 - We will revisit after the conclusion of 1755-RP.
- General – Dustin Demetriou
 - No new research projects from TC 9.9 have been proposed and nothing new is currently in the pipeline.
 - Ideas on research should be sent to Dustin
 - Authors of any RTAR are allowed to bid on the project but they cannot write the work statement.
 - Work statements are written by the committee after the RTAR has been approved.
- Energy Modeling Update- Vali Sorell
 - There has been little progress since the last meeting.
 - Review of history of the effort.
 - Originally intended to provide guidance on the necessary energy calculations needed for compliance with ASHRAE Standard 90.4.
 - Currently available commercial energy calculation software is not set up for the data center environment and is difficult to adapt.
 - Working on recommended methods for energy calculations.
 - Create outline/table of contents is first priority.
 - Henry Amistadi wants work on implementation based on standard mathematical notation and has started creating models in Mathcad.
 - The Mathcad model would become the basis of a whitepaper.
 - Henry wants to move away from the use of spreadsheets due to the difficulty in dealing with the coding and formulas.
- Open Forum/Wrap up
 - Henry Amistadi offered the idea of putting together a compilation of articles and whitepapers as a special publication.

6:19 PM Meeting Concluded

TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. TC 9.9 DATE January 14, 2019

TC/TG/MTG/TRG TITLE Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

DATE OF MEETING January 14, 2019 LOCATION Atlanta, Georgia

MEMBERS PRESENT	MEMBERS ABSENT	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
VOTING MEMBERS		Roy Fraley
Jason Matteson	Ecton English	Nigel Gore
Dustin Demetriou	Lex Coors	Benjamin Petsche
Gerardo Alfonso		Douglas Sick
John Bean		Darrin Watson
Donald Beaty		Rui Zhang
Jon Fitch		Mikhail Gorbonnov
Mukesh Khattar		Marija Stefanovic
David Meadows		Dan McInnis
Christopher Muller		Anh Tran
Terry Rodgers		Adam Smith
Roger Schmidt		Hoshi Daruwalla
Vali Sorell		Galen Gerig
		Farah Singer
		Fabio Battaglia
		John Petronyolo
		Michael McRee
		Cheng-Xian Lin
CORRESPONDING MEMBERS		
John Groenewold	Raymond Abraham	
Robert McFarlane	Robert Akkerman	
Joseph Gangemi	Robert Akkerman	
Richard Pavlak	Stuart Aldridge	
Jack Glass	Henry Amistadi	
Paul Artman	Rangarajan Arulselvan	
John Dumler	Sean Ashburn	
Dan Dyer	Robert Bader	
Paul Finch	William Bahnfleth	
Kevin Gebke	Andrew Baxter	
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Steve Greenberg	Ng Kai Beng	
John Gross	James Betts	

Hugh Hudson	James Betts	
Kevin Hughes	Michael Bishop	
David Kelley	Byron Blackmore	
Matt Koukl	Alonzo Blalock	
Christopher Kurkjian	Sébastien Brasseur	
Nemat Lotfi	Tahir Cader	
David Moss	Aldo Calvi	
Shlomo Novotny	Nicholas Casale	
John O'Brien	Noe Casalino	
Lawrence Ollice	John Castelveccchi	
Christian Pastrana	Neil Chauhan	
John Peterson	Dale Cibene	
David Quirk	Alan Claassen	
Joel Rutledge	Fabio Clavijo	
Justin Seter	Michael Collarin	
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Mark Steinke	Craig Crader	
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	Michael Ellsworth	
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	Jeffrey Ewin	
	Huang Feng	
	Gregory Fennewald	
	Philip Flinn	
	Kamran Fouladi	
	Michael Frank	
	Terry Frantzis	
	F French	
	Paul Galloway	
	Hongwen Gao	
	Rajat Ghosh	
	John Gideon	
	Robin Gilbert	
	Kenneth Gill	
	Charles Gulledge	
	Edward Gutowski	
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	Stephen Halsted	
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	Kyle Hasenkox	
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	Gwenn Ivester	
	Madhusudan Iyengar	
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	Rhonda Johnson	
	Alex Juncker	
	George Kaler	
	Rajendera Kapoor	
	Kailash Karki	
	Kanchan Kelkar	
	Daniel Kennedy	
	Michael Kester	
	Kishor Khankari	
	Richard Killian	
	William Kingrey	
	Marvin Kirshenbaum	
	Timothy Kittila	
	Erhard Klotz	
	Paul Knight	
	Michael Koerner	
	Devdatta Kulkarni	
	Pardeep Kumar	
	Sushil Kumar	
	Osmo Kuusisto	
	Stephen Lahti	
	David Landsberg	
	John Lane	
	Federico Lang	
	John Lanni	
	Jon Larry	
	Geoff Lawler	
	Matt Lawrence	
	Stuart Lawrence	
	Christian Le	
	Sang Lee	
	Bret Lehman	
	Frank Lembo	
	Guillermo Leon Orellana	
	Hsing-Sheng Liang	
	Mike Licitra	

	Francis Allen Lumabas	
	Lu Luna	
	William Maltz	
	Alessandro Mandelli	
	Lawrence Markel	
	Ted Marwitz	
	Caroline Mason	
	Guillermo Massucco	
	James McAleer	
	Timothy McCann	
	Michael McKenna	
	Douglas McLellan	
	Godwyn Mendes	
	Francis Mills	
	Richie Mittal	
	Michael Monahan	
	Mark Monroe	
	Stephen Mowrer	
	John Murgida	
	Ram Narayanamurthy	
	Philip Naughton	
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	Chandrakant Patel	
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	Andrew Pearson	
	Craig Petersen	
	Joseph Prisco	
	Honore'du Puy	
	David Redford	
	Mark Reed	
	Gamal Refai-Ahmed	
	Charles Rego	
	William Reynolds	
	Steven Rosenstock	
	Jeffrey Rutt	
	Nestor Salinas	
	Michael Salvatore	
	Peter Samain	
	Michael Schwarz	
	Michael Schwedler	
	Clifford Scofield	
	Ian Seaton	
	Darshit Shah	
	Anthony Sharp	

	Timothy Shedd	
	Saurabh Shrivastava	
	Thursten Simonsen	
	Mark Simpson	
	Shelby Sims	
	Satwinder Singh	
	Grant Smith	
	John Song	
	Marc Soucy	
	Ronald Spangler	
	Ronald Spangler	
	Jonathan Spreeman	
	Robin Steinbrecher	
	Morgan Stevens	
	Charles Stewart	
	Robert Sullivan	
	David Sundin	
	Jacob Svenkeson	
	Inn Tang	
	Edwin Teoh	
	Jeff Tepler	
	Ronald Thomas	
	Russell Tipton	
	Sengul Topuz	
	Robert Tozer	
	Chad Tramonte	
	Jeff Trower	
	William Tschudi	
	Saahil Tumber	
	Marianna Vallejo	
	Richard Velten	
	Herb Villa	
	Ralph Webb	
	Andrew Wengerd	
	Kurt Wetzel	
	Katherine Whitenack	
	Robert Wichert	
	Larry Wong	
	Tony S F Wong	
	Stephen Woollard	
	Wangda Zuo	
PROVISIONAL CORRESPONDING MEMBERS		
Aaron Wemhoff	Aaron Duda	
Ahmed Abdel Salam	Adenilson Belizário	
Benedict Dolcich	Alekhya Kaianathbhatta	
Benjamin Coe	Allan Lee	
Brad Cochran	Andres Sepúlveda	
Casey Winkel	Andrew Calder	
Charles Freda	Angela Sampaio	

Chris Hsieh	Annie Smith	
DAVID DONGES	Antonio Aguayo	
Gary Johnson, Jr	Benjamin Zuk	
Ian Nelson	Bryan Coyne	
James Bogart	Bryce Cox	
Kazuynki Wakita	Carl Massey	
Mark Fisher	Chad Moore	
Mark Malkin	Christopher McDermott	
Mark Monroe	Clayton Foster	
Micah Sweeney	Cuong Dinh	
Rehan Khalid	David Chialastri	
Steven Hyde	David Edenburn	
Stuart Redshaw	David Franczak	
	David Vranish	
	Denis O'Mahony	
	Dinesh Gupta	
	Douglas Brown	
	Elizabeth Langer	
	Eric Yang	
	Farid Parsaei	
	FLORIN POPA	
	Greg Crumpton	
	Guy Majestic	
	Hamza Erden	
	Hifumi Iguchi	
	Hitoshi Sakamoto	
	Holly Brink	
	Husam Alissa	
	Jaakko McEvoy	
	Jacqueline Eaton	
	Jakki Artus	
	James Benville	
	James Vallort	
	Jerrold Buterbaugh	
	Julian Iosifescu	
	Justin Prosser	
	Kaiyu Sun	
	Kourosh Nemati	
	Leslye Paniagua	
	Mark Sprenger	
	Mathias Hery	
	Matt Shumway	
	Matthew Archibald	
	Maxwell Evans	
	Michael Miller	
	Ming-Ren I	
	Mohammad Alkiswani	
	Noreshvarman Manisagar	
	Paul Bemis	
	Prakash Rapolu	

	Robert Hewitt	
	Robert Sty	
	Ruben Sidranski	
	Salah Nezar	
	Satyam Bendapudi	
	Scott Graf	
	Sean OHern	
	Serpil Ari	
	Shaun Green	
	Shelley Dangoor	
	SOON TATT	
	Sophia Flucker	
	Srinivas Kodea	
	Sruti Chigullapalli	
	Stephen Wren	
	Stuart Smith	
	Suhasini Pyarasani	
	Susan Smith	
	Thomas Peddle	
	Tim Persoons	
	Troy Goldschmidt	
	Vijay Kasibhatla	
	William Artis	
	William Mak	
	Yang Zou	
	Yiu Wa Kwan	
	Yuichi Kurihashi	
	Yuk Kuen Lam	
	Yuk Kuen Lam	
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	Zuokui Ning	

Published Agenda

Topic		Time	Presenter
Introduction	Welcome and around the room introductions	10	Jason Matteson
	Who is TC9.9	10	Jason Matteson
	TC9.9 Officers & Membership	10	Jason Matteson
Recognition		5	Jason Matteson
Webmaster		5	Ecton English
Liaison Reports	Standard 90.1	10	Rick Pavlack
	Standard 90.4 Review	10	Dave Kelley
	SPC-127	5	John Bean
	AHRI 1360	5	Dave Kelley
	DMTF Redfish	5	Jason Matteson
	International	5	Don Beaty
Marketing Subcommittee	Update	5	Paul Finch
Break			
Industry Engagements	Department of Energy Update	10	Steve Greenberg

	Fuel Cell workshop at NREL	5	Dave Moss
	EU Regulation and ASHRAE Journal Article	10	Paul Finch
Publications	Datacom Book #3: Design Consideration for Datacom Equipment Centers	15	Larry Ollice
	Datacom #14: DCIM	5	Dustin Demetriou
IT Subcommittee Reports		90	Roger Schmidt
	Liquid Cooling Whitepaper		Mark Steinke
	HDD Whitepaper		Matt Shumway
	Cold Shipping Requirements		Joe Prisco
	Liquid Cooling in CoLos		Dave Moss
	IEC/ASHRAE		Roger Schmidt
Executive Session	Voting Members	TBD	Jason Matteson

Call to Order: 1/14/19 2:08 PM Jason Matteson

Introduction – Jason Matteson

- Review of topics covered in Sunday night meeting; Programs, Handbook and Research.
- Introductions
- Discussion of TC membership status and process
 - July 1st is the date when the roster is updated (Provisional to Corresponding member).
 - TC 9.9 is the largest technical committee
- Review of ASHRAE Code of Ethics
- ASHRAE & TC 9.9 Overview
- Review of Officers

Position	Name
Chair	Jason Matteson
Vice Chair	Dustin Demetriou
Secretary	John Groenewold
IT Subcommittee Chair	Roger Schmidt
Handbook Subcommittee Chair	Robert McFarlane
Program Subcommittee Chair	Nick Gangemi
Standards Subcommittee Chair	Richard Pavlak
Membership Subcommittee Chair	Jack Glass
Webmaster	Ecton English

- Membership Update
 - We are the largest TC at more than 400 members.
 - Roster review and removal of those whose e-mail failed and bounced back. Sixty-five (65) people were removed from the rolls as

- a result.
- 106 Provisional Corresponding Members (2 years to be provisional and to become active in the TC).
- 239 Corresponding Members (can be voting members and elected to become officers).
- Voting Members
 - Must be made up of corresponding members and have been an active corresponding member for at least one year.
 - Consists of an average of 12, minimum of 6 and a maximum of 18.
 - Shall be appointed annually by the chair for not more than 4 consecutive one year terms.
 - Number of voting members required to be present to conduct business or a quorum is more than half of the number of voting members.
 - Current Voting members:
 - Jason Matteson
 - Dustin Demetriou
 - Ecton English
 - Gerardo Alfonso
 - John Bean
 - Don Beaty
 - Lex Coors
 - Jon Fitch
 - Mukesh Khattar
 - David Meadows
 - Christopher Muller
 - Terry Rodgers
 - Roger Schmidt
 - Vali Sorell
 - Roster update will go into effect on July 1st, 2019 just after the Kansas City conference.
 - Record of votes for 2018:

Vote	Date	Approved
St. Louis Meeting Minutes	January	Yes
Chicago Meeting Minutes	April	Yes
Corrosion Risk RTAR*	July	Yes

HVAC Handbook : Chapter 19	October	Yes
Houston Meeting Minutes	November	Yes
DCIM Datacom Book #14	December	Yes
Water Cooled Servers Whitepaper	January ('19)	Yes

- Operating Manual for Chairs requires meeting minutes to be voted out and timeframes for agenda.
- Potential Technical Committee Reorganization
 - TAC would like to reduce the number of functional group meetings.
 - Concern about all the meetings that are overlapping with the conference presentations that people are paying for.
 - Target to reduce the number from 110 to 30 technical working groups.
 - Looking for feedback to give TAC by end of next week and there is a form to be filled out.
 - This might mean that some other committees might get pulled into our committee.
 - Don Beaty is encouraging some of the smaller, less active committees to become virtual.
 -

Webmaster – Jason Matteson substituting for Ecton English

- Tc0909.ashraetcs.org
- Encourage members to use my profile to update e-mail addresses.
- Atlanta Agenda posted on website.
- There is a Join button under the membership tab.

Recognition – Jay Kohler

- Presented Hightower Award to David Moss.
- Given once a year given to a member of a TG/TC for outstanding service.

Handbook Chapter Update – Bob McFarlane

- TC 9.9 is responsible for Chapter 19 of the HVAC Applications Handbook

Liaison Reports

- Standard 90.1 – Rick Pavlak
 - Dozens of addendums being published.
 - 2016 was the last publication
 - It takes years for the model code to be adopted by ICC and then by the individual states.
 - Three things going on with the 90.1 committee in Atlanta
 - Addendum BV – Fall of 2018, public review closed in November. Going out as a second public review.
 - Addendum CZ is dead.
 - Get updated by getting registered on the list-server.
 - Rick was pleased with the language of BV that will make 90.4 an alternative path for data centers.
 - Section 8 of 90.1 will have 90.4 integrated into its language.
 - Addendum BE, update to the computer room equipment table vetted by AHRI. It is expected to be approved.
 - Changing the Title, Purpose and Scope of 90.1. Unknown what this means to the data center world. Change is open for comment. Exact wording is not public yet.
 - News concerning these addendums will be posted to the TC 9.9 website.
- Standard 90.4 Review – Dave Kelley
 - Education efforts about 90.4 continue.
 - Washington state is in the process of adopting chapters 6 & 8 with lower MLC numbers than what is in the standard today.
 - WA adoption would go into effect in 2020.
 - Only two weather zones are in the state of Washington so those are the only MLC numbers they had to adjust.
 - Two meetings in Atlanta on 90.4
 - Three new addendums voted out and will be available first half of the year.
 - ELC numbers change based on UPS efficiencies numbers.
 - Elimination of the design MLC
 - Lower the MLC for all climate zones plus created two MLC numbers with a breakpoint based on the size of the load in the room at 300 kW.
 - Optional compliance path with a pure prescriptive path if using a VAV system with an air-cooled economizer.
 - Talked about educating the general public but need to educate ASHRAE on what 90.4 is all about.

- Seminar and a panel session in Kansas City around 90.4.
- New standard is due to be published this Fall.
- Spanish article on 90.4 was published in region 12.
- 90.4 is being embedded into the compliance flowchart in 90.1.
- AHRI 1360 – Dave Kelley
 - Last year ceiling units were added into the standard.
 - In Houston, AHRI proposed new efficiency numbers to 90.1 for floor mount units and new numbers for ceiling mount units.
 - Member of DOE on 90.1 that was ok with ceiling units because they were new and had nothing to compare but believed they were backsliding on the floor mounted units from what was already in the federal register and 90.1-2010.
 - Numbers were submitted and were voted out with the promise to work with the DOE over the summer.
 - Last day of comment period, proposed new numbers that everyone and the DOE were happy with.
 - Those new numbers were voted out today and will be in the new 90.1- 2019.
 - Numbers for in-row cooling units were also updated from what appeared in 90.1-2016 but were not previously in the federal register.
 - DOE is supposed to react within 18 months of the publication of 90.1 and either use the new numbers or create their own numbers.
 - Current numbers in the federal register are from 90.1-2012.
 - We expect the DOE to adopt the new numbers and put them in the federal register to go into effect by 2021.
- SPC-127 – John Bean
 - Method of Test for Air-Conditioners serving data centers and technology equipment.
 - 2nd draft is now ready and has been through SPLS and all the votes are in.
 - It will be out for public review again on Jan. 18, 2019.
 - Was specific to CRAC units has now been expanded to a larger market of the equipment serving data centers.
 - Now the standard encompasses all equipment that actually takes energy out of the air.
 - Only system that is not covered is direct evaporative systems because they don't actually take energy out of the air.
 - Indirect evaporative air systems are covered.
 - Method of test is based on the return air temperature as some tables of what should be used for outside air wet bulb and dry bulb

temperatures.

- DMTF Redfish – Jason Matteson
 - Open Industry Standard Schema
 - RESTFUL API that allows for communication between different pieces of equipment.
 - Getting widespread adoption.
 - Distributed Management Task Force (DMTF)
 - Task Force is where the work takes place.
 - The task force/working group has been taking up all things DCIM.
 - ASHRAE TC 9.9 wanted to have a liaison in the working group.
 - We are actively involved in a weekly working group to drive the standards for DCIM down to the IT level.
 - Should greatly open up the ability for the user to get information from the IT equipment.
 - Over 40+ sensors that will be included.
 - All this will be included in a 2018.3 schema that has been released.
 - PowerPoint presented will be available on the website.
- Comment on Publications – Don Beaty
 - ASHRAE has been too slow to market with the graphics so we have that prepared.
 - PDF version is color but the hard copy is black and white and many times it does not translate well.
 - We do the rework faster than what ASHRAE would normally do.
 - Every week that we delay past Sept. 1st greatly increases the possibility it will not be published for the winter.
 - Getting something published for the summer is not nearly as critical.
 - We try to stay away from whitepapers because the books have more credibility in our eyes.
- International – Don Beaty
 - Lots going on in Japan, Europe and Spain.
 - Gerardo Alfonso has translated the Thermal Guidelines book to Spanish.
 - The book was submitted by November.
 - Spanish version of the Thermal Guidelines will be ready in March/April.
 - European Commission – Paul Finch
 - European Commission was looking to legislate around server efficiency.
 - Paul and Roger Schmidt met with EU representatives about the Thermal Guidelines and IT server efficiency.

- Thermal Guidelines have now been incorporated into regulation.

Marketing Subcommittee – Paul Finch

- Launched TC 9.9 LinkedIn site while in Houston to raise awareness on the TC.
- Approximately 133 people currently follow the LinkedIn site.
- Compared the figure with 239 people on the roster.
- We need content to put on the LinkedIn account to draw followers.
- Trying to get the 90.4 presentation on the account.

Japan Data Center Council – Jason Matteson

- Over the last two weeks been corresponding with them.
- Design guide document trying to reference latest Power Trends chart from latest update.
- They were using that without context and they were thinking it was the new Thermal Guidelines.
- We were able to get them the correct references.

TPC-1.6 Terry Rodgers

- Project committee that is developing guidelines for commissioning data centers.
- 2nd meeting held this week.
- Need End Users to participate.
- Will address existing, expansions and new construction.
- Monthly conference calls and then divide into subgroups.
- Sister document to follow standard 202.
- Contact Terry Rodgers to get involved.

Industry Engagements

- Department of Energy/Lawrence Berkeley National Laboratory Center for Energy Efficiency in Data Centers – Steve Greenberg
 - <https://datacenters.lbl.gov>
 - Funded by DOE.
 - Small Data Centers
 - Small data centers are where the energy efficiencies can be gained.
 - Half of the servers reside in small data centers.

- Develop prescriptive packages for utilities to use to incentivize.
 - Webinars sponsored by DOE.
- Data Center optimization initiative
 - Fed govt. initiative to get people to consolidate their data centers and is operated by the OMB with cooperation with GSA.
- Data Center Energy Practitioner Program
 - IT Specialist module will be available soon.
 - Outreach to India and China
- Working on a liquid cooling specification.
- Working on a measurement verification guide along with case studies.

Data Center Energy

Practitioner (DCEP) Training

The DCEP training program certifies energy practitioners qualified to evaluate the energy status and efficiency opportunities in data centers. A list of DCEP Program Developers, Instructors, and Practitioners is also maintained and available here.

Training

List of upcoming and on-demand training events and news via our Twitter feed. Content is focused on information and opportunities to facilitate energy efficiency projects in data centers with special attention paid to resources for federal agencies.

Small Data Centers

Energy efficiency efforts and attention for data centers have historically focused on larger data centers. Despite their comparatively small size, small data centers (defined as server closets, rooms, and localized data centers under 5,000 square feet of computer floor) have significant energy savings potential.

China

Unprecedented demand and policies are driving rampant growth in data centers throughout China. Asia is experiencing 27% data center growth- which is expected to last through 2020. This is over two times the growth rate of other regions, and is dominated by China (Data Center Dynamics, Shanghai 2017). DOE and LBNL are working with China's Ministry of Industry and Information Technology (MIIT) and industry to promote open standards, test procedures, specifications, and evaluation metrics for U.S. and Chinese data centers.

High Performance Computing

Demand for High Performance Computing (HPC) is growing in both the public and private sectors. It is also highly energy-intensive. LBNL has organized a HPC Working Group to address the energy-efficiency issues related to these technologies and provides guidance and resources tailored to HPC.

Utility & State Engagement

Utilities and state energy offices are critical partners in disseminating energy efficiency information, opportunities, and incentives for the marketplace.

Data Center Optimization

Initiative (DCOI)

The Data Center Optimization Initiative (DCOI) requires federal agencies to develop and report on data center strategies to consolidate inefficient infrastructure, optimize existing facilities, improve security posture, achieve cost savings, and transition to more efficient infrastructure, such as cloud services and inter-agency shared services.

Tools & Resources

Toolkits and calculators are available to support the implementation of best practices. Tools cover areas such "early stage" data center profiling to establish a baseline and efficiency potential, and more detailed sub-system assessments to identify opportunities.

Accelerating Energy Efficiency

in Indian Data Centers

Initiative

The energy intensity of data centers, the growth of data center infrastructure in India, and the existing power deficit in the country calls for increased energy efficiency in Indian data centers. A public-private partnership is working to increase the energy efficiency of data centers in India.

Better Buildings Data Center

Partners (Challenge or

Accelerator)

DOE is working with public and private building owners to reduce energy use in data centers. There are over 34 partners committed to date through the Better Buildings Challenge and Data Center Accelerator programs.

Related FEMP Activities

A number of activities supported by the Federal Energy Management Program (FEMP) assist in making data centers more energy efficient. These activities and accompanying resources include the purchase of energy- and water- efficient products, project financing, and institutional change for sustainability.

Development of a Liquid

Cooled Rack Specification

There are currently no common specifications with most liquid cooling solutions being unique and proprietary. Such lack of standards and lack of multi-source solutions are seen as impediments to wide market adoption of liquid cooling. The scope of this project is to develop an open specification for the secondary fluid (closed loop between the CDU and the IT equipment), manifolds, tubing, quick connectors, and the operating conditions.

- Fuel Cell Workshop at NREL – David Moss
 - Fuel Cells and data centers
 - March 20th in Seattle

Publications

- Datacom Book #3: Design Considerations for Datacom Equipment Centers – Larry Ollice
 - Been working on book for two years.
 - Chapter 14 is the last chapter to be finished.
 - Mark Fisher is leading the group working on chapter 14.
 - Need drawings to be integrated and updated from other books.
 - Aiming to be ready end of February and voted on by TC 9.9 voting members by end of March.
- Datacom Book #14: DCIM – Dustin Demetriou
 - Book is complete.
 - Voted and approved by TC 9.9 in December.
 - Sent to Don Beaty for final formatting.
 - Has a new title: Advancing DCIM with IT Equipment Integration
 - Cover shown for new book.
 - 137 pages with six chapters
 - Discussion of the subject matter for each chapter.

IT Subcommittee

- Introduction – Roger Schmidt
 - Liquid cooling white paper was voted out of TC 9.9.
 - Hope to get it out in the next couple of months.
- Liquid Cooling Whitepaper – Mark Steinke
 - Focused only on water systems.
 - Create guidelines and recommendations so we have a common language.
 - Moving from niche to more commodity based systems.
 - Pressure ratings of fittings have been addressed.
 - Discusses failure modes.
 - Final edits to do and then over to publishing. Hoping for a March release.
 - Water quality is addressed.
 - Construction materials are addressed.
 - Filtration and pressure testing is addressed.
 - Working with the IEC to set reasonable pressure test values.
 - It will appear on the TC 9.9 website when it is published.
- HDD Whitepaper – Matt Shumway (not present) covered by Roger Schmidt
 - Matt is finalizing the whitepaper.
 - Concerns the vibrations caused by the cooling fans in the server and the performance/impact on hard drives.
- Cold Shipping Requirements – Joe Prisco (not present) covered by Roger

Schmidt.

- Concerns the requirements for treatment of IT equipment that goes from extreme cold to indoor environments and precautions that need to be taken.
- Joe was working on engaging other manufacturers to get information on the subject.
- Maybe a good candidate for a RTAR?
- Liquid Cooling in Co-Lo's – Dave Moss
 - Met this morning with IT vendors and discussed reasons for hesitancy/fear around liquid cooling.
 - Long term that want to discuss all the reasons for the fear of liquid cooling in the data center.
 - 6-8 weeks to put together a teaser table of contents and then start to work on the larger effort.
 - This is a separate effort from the liquid cooling whitepaper.
 - Weight of the liquid was brought up as a barrier to implementation in existing data centers.
 -
- IEC/ASHRAE – Roger Schmidt
 - Concerns power connections at the back of the server and temperatures.
 - The workgroup that makes the standards for power connectors did not understand our definition of inlet temperature at the server.
 - We define the inlet/ambient temperature at the front of the server.
 - By the time the air gets to the back of the server the air could be 60C+.
 - IEC looks at the local ambient at the connector. Typical rated at 35-40C.
 - Workgroup asked a lot of questions of the IT equipment designers and gained a lot of knowledge.
 - Meeting in October in Brussels of the IEC.
 - The connectors need to be designed for worse case.
 - IEC has not decide on how to handle.
 - Possible that they may require special connectors instead of the standard connectors used today.
 - Not optimistic that IEC will accept derating.
 - AC and DC connectors included in scope.
 - This only concerns power but should be expanded to include networking.

Executive Session – Jason Matteson

- Not Held

DRAFT