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Save the Dates!

Spring Conference 2003
End-to-End Reliability: Best Practices
June 1-4, 2003
The Boca Raton Resort & Club
Boca Raton , FL

Fall Conference 2003
Theme TBD
November 16-19, 2003
Westin La Cantera Resort
San Antonio, TX

Spring Conference 2004
Theme TBD
June 6-9, 2004
The Ritz Carlton Orlando Grande Lakes Resort
Orlando, FL

Don't miss the tours, hospitality suites and the Spectacular Vendor Sponsored Events!

Visit www.7x24exchange.org in March for Spring Conference program details and to register.

Last Call for Presentations!

7x24 Exchange is seeking Spring Conference presentations. For additional information contact Tara Oehlmann, at tara@dolcimanagement.com or 646-486-3818 x104.

7x24 Exchange NewsLink

The leading knowledge exchange for those who design, build, use and maintain mission-critical enterprise information infrastructures, *7x24 Exchange's* goal is to improve end-to-end reliability by promoting dialogue among these groups.

2002 Fall Conference, *End-to-End Reliability: The Infrastructure,* Reaches New Heights

Spring conference attendees listen attentively to Monday presentations

by John Oyhagaray
7x24 Exchange Treasurer and Project Manger, Western Union Financial Services

If you were one of the 343 attendees at the Fall Conference last November you participated in one of the most successful conferences in 7x24 Exchange's history. From start to finish there was a high level of buzz that hasn't been seen for quite some time. Of course, my impression would not have much merit unless there was objective data to substantiate it.

Dolci Management Services, 7x24 Exchange's management company, has tabulated all 250 + evaluations that were turned in by the attendees. Every comment and rating was painstakingly tabulated.

On a scale of 1 – poor to 7 – excellent, the overall rating for the conference was an impressive 6 (5.992 to be exact) out of 7 which has now set a new all time high water mark in the 13 year history of this organization.

From a board perspective, we are very pleased with the conference results. Our secret for success comes from a careful review of the evaluations completed by attendees. Hence the reason we constantly stress the importance of completing them. Evaluation feedback gives the board a guideline to improve items that may need to be addressed while keeping constant others that work well. That feedback is our roadmap and we act upon it. We also share the results with our speakers – who look forward to learning how well they were received from a presentation and content point of view.

Congratulations to all of our presenters for a job well done!

Attendee comments attest to the results:

"Very applicable learning – thought provoking"

"Wow! This is the type of research the industry needs. Great to see it at 7x24."

"Overall this was a Top Notch Conference. I would not change a thing."

Each day kicked off with a keynote session that set the tone for the rest of the day. We were fortunate to have Ken Kane from Avaya present on the The World Cup Infrastructure on Monday, Bill Parsons from PeopleSoft present on the eCommerce Infrastructure on Tuesday, and Steven Rosenstock from the Edison Electric Institute discuss the Electric Industry Restructuring on Wednesday.

Mel Foster, Engineering Manager of United Parcel Service presents on the Infrastructure Designed for Effective Water Treatment

Each presentation thereafter was more specific and tailored to address certain areas of interest. An overwhelming majority of attendees felt that we had a good balance of IT and facility related Infrastructure topics.

Kevin Kealy from AT&T received tremendous accolades for his presentation on IT Security and we will do what we can to bring him back schedule permitting. The American Express Tour also received high marks thanks to Roy Chapman and John Jackson. Additionally, the Sunday tutorials continue to do well and we are very fortunate to have presenters willing to commit to offering these three hour sessions.

It's important to keep in mind that every conference follows 7x24Exchange's mission which is to be: *The leading knowledge exchange for those who design, build, use and maintain mission critical enterprise information infrastructures.* Every business has a purpose, i.e. a mission to accomplish, and through the intelligent use of IT systems with a high reliability infrastructure as its' foundation, it will be very successful. The IT systems and infrastructure serve as a means for the business to achieve it's mission, not vice versa.

Whether one is in IT or on the Infrastructure team, we must not lose sight of this. As your business model changes, so too will its' underlying IT components and Infrastructure. In some cases what worked yesterday will in actuality cause a system outage today. One has to unlearn to learn a new and more effective preferred way of executing new tasks. The laws of physics won't change, but the business focus and priorities will.

After all, all IT systems are dependent on having the best Infrastructure that supports the business model in place. We all need to see the connection from the bottom up to the business that we are associated with.

So, what does all of this have to do with End to End Reliability: The Infrastructure? Everything!

Every Information system consists of a network, hardware and applications(software) to perform business functions while housed in an Infrastructure that has mechanical, physical, electrical, life safety, and environmental systems. Surrounding this are the people, processes, and operational budget that more or less determines what can or can't be done. All of these components have to work in harmony with each other and no one component can survive or function by itself. A mission critical infrastructure without an IT component or vice versa serves no business purpose. By knowing as much as we can about each one of the links that constitutes our environment, the more we can appreciate what it takes to achieve world class operational excellence in providing the information that our business needs to succeed.

Without a well designed Infrastructure, Avaya would not have been able to provide the voice and data capability to all the soccer fans that needed real time information. By having HP as their business partner managing the Infrastructure , PeopleSoft could focus on their Software/Application solution for their global customers. And of course, it takes power for all of these systems to function, so we need to know what the issues are that are impacting the Electric Industry that keeps everything going.

Our next conference will be June 1st – 4th at the Boca Raton Resort & Club in Florida. On behalf of the board, we all look forward to seeing you again in Boca Raton!

Spring Conference 2002

End-to-End Reliability: The Infrastructure

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WINTER 2003

Cooling Issues in a Data Center: The Role of Computational Modeling

by Suhas V. Patankar, Ph.D.
President, Innovative Research, Inc.

The Raised-Floor Concept
A raised-floor data center is a fundamentally clever concept, which can provide an assured supply of cooling air at any desired location. Just place a perforated tile anywhere and you have a fountain of cool air there.

Unfortunately, the reality is not that great. Cold air pushed into the under-floor space does not come out from the perforated tiles in a uniform or desired manner. As the flow from the Computer Room Air Conditioner (CRAC) spreads in the under-floor space, it causes pressure variations that influence the flow through the perf tiles. Further, the actual distribution is somewhat counter-intuitive. Whereas we would expect the flow to decrease as we go away from the CRAC, in reality we get very little flow near the CRAC and a lot of flow through the perf tiles located far away. As a result, the computer equipment placed near the CRAC does not get much cooling air.

What Causes Hot Spots?
A computer server is usually composed of a number of horizontal racks with internal fans creating a front-to-back flow. The fans create the airflow rate (CFM) needed for cooling the server. The server design assumes that the inflow air will be cold (55 F) and that it will exhaust at about 75 F. Figure 1 shows the ideal situation, where the 300 CFM airflow

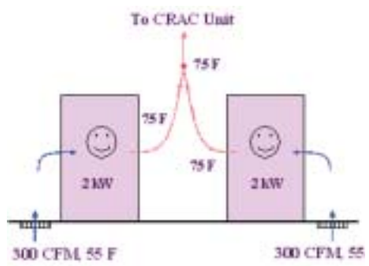

Figure 1. The Desired Situation

demanded by the server is actually supplied from the perf tiles.
Since the airflow distribution can be highly non-uniform, you can have, in some parts of the data center, a situation similar to the one in Fig. 2. Here, although the servers need 300 CFM, the perf tiles supply only 150 CFM, which is sufficient to cool the racks in the lower half. The fans in the upper racks draw air from the ceiling region. Obviously, this air is not cold (55 F); it has originated in the "hot aisle" from the exhaust of the servers. This is how a hot spot is created in a data center. The result is that the cooling of the upper racks is seriously compromised.

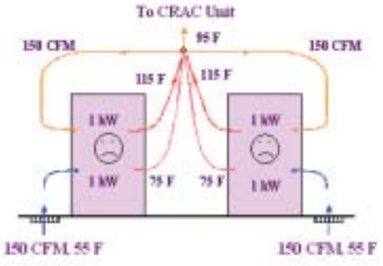

Figure 2. Insufficient Flow Leading to Hot Spots

The Key to Success
If we want all locations in a data center to look like Fig. 1, we must deliver the required amount of airflow at the foot of each server. This does not necessarily mean that the airflow distribution should be uniform; what we want is that the supplied airflow matches the local airflow demand of the equipment. Certainly, all the critical and high-heat-load servers must get their required airflow delivered at their doorstep.

If this can be done, there is no need to worry about hot spots and wonder as to what happens to the air exiting from the servers. It will simply collect in the hot aisle and return to the CRACs without getting entrained into the inlets of the servers. We need to focus on supplying the right airflow rates at the right locations.

Role of the Flow Field Under the Raised Floor
How does the cooling airflow distribute among all the perf tiles located throughout the data center? What factors influence this distribution? Interestingly, the answer lies in the fluid mechanics of the space below the raised floor. It is not the large, visible, above-floor space that controls this flow distribution. It is the air movement in the tiny under-floor space that decides how much air will emerge from each perf tile.

Using the techniques of Computational Fluid Mechanics (CFD), it is now possible to simulate the under-floor flow in complete detail. The calculated flow field will include the flow impingement and turning under the CRACs, the horizontal spreading of the flow to various perf locations, collision or merging of the air streams coming from different CRACs, and the flow disturbance caused by under-floor blockages such as pipes and cable trays. The simulated velocity field is accompanied by the corresponding distribution of static pressure, which decides the CFM coming out of each perf tile.

This type of detailed calculation of the flow under the raised floor not only gives the CFM values at the perf tiles but also explains why we get the particular distribution. We can see the velocity vectors, air circulation patterns, and flow distortion due to pipes and cables. The simulation reveals the static-pressure variation that results from all these influences and helps us to understand the corresponding CFM values we get from the perf tiles.

The Basic Cause of Flow Maldistribution
At first sight, it is not obvious why the perf tiles away from the CRAC should carry the most flow. Figure 3 explains the root cause. The air velocity in the vicinity of the CRAC is very high since it has to carry the entire flow delivered by the CRAC. As we go from left to right and as the flow leaks out of the perf tiles, successively less and less flow moves in the horizontal direction. Thus, the horizontal velocity decreases from left to right. Laws of fluid mechanics tell us that a velocity decrease is accompanied by a pressure increase. Thus, the static pressure increases as we move away from the CRAC. Now, it is easy to see why the perfs near the CRAC give smaller flow than those far away.

Simulation or Trial and Error?
The ability to simulate the airflow in the under-floor space allows us to predict the effect of many factors such as the

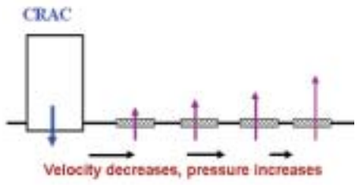

Figure 3. Cause of Flow Maldistribution

floor height, use of more restrictive or more open perf tiles, selective use of open and restrictive tiles in different regions, placement of the CRACs, use of turning vanes, and so on.

When the flow distribution in a data center can be predicted from a simulation based on scientific principles, there is no going back to conventional trial and error in which we endlessly keep moving things around with the hope of improving the flow distribution. Obviously, the trial-and-error approach is costly, time-consuming, and of limited utility. Before investing time and money in relocating some CRACs or repositioning certain under-floor blockages, we should look to the simulation to give us scientific guidance about the new flow distribution that we are likely to get. In this manner, we can design new data centers and modify the existing ones to get higher reliability and efficient operation.

For more information, please look up:

1. Presentations by Roger Schmidt and Suhas Patankar at the National Conferences of 7x24 Exchange in Nov 2000, Nov 2001, and June 2002.
2. Karki, Radmehr, and Patankar, "Use of Computational Fluid Dynamics for Calculating Flow Rates Through Perforated Tiles in Raised-Floor Data Centers," to appear in Int. J. of HVAC&R Research, March 2003.

Attendees enjoy lunch outdoors at The Phoenician.

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Conference attendees enjoy a game of foosball at Tuesday evening's Vendor Sponsored Event: 7x24 Player's Club