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National Defense Industrial Association (NDIA)
14th Annual Systems Engineering Conference
27 October 2011

DOTMLP_

The Lost Art of Facility Systems Engineering

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DOTMLP_ Agenda

- The Challenges
  - Introduction – What is DOTMLPF?
  - DOTMLP_ - The Missing Piece
  - Mandates Drive Facility Challenges
  - IT Trends and Convergence
- Holistic Approach Needed
  - USMC Case Study
  - Computational Fluid Dynamics (CFD) Modeling and Simulation (M&S)

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Introduction – What is DOTMLPF?

- Joint Capabilities Integration and Development System (JCIDS) uses DOTMLPF to define and interpret DoD capabilities:
  - **Doctrine**: The way we fight, e.g., emphasizing maneuver warfare combined air-ground campaigns
  - **Organization**: How we organize to fight; divisions, air wings, Marine-Air Ground Task Forces (MAGTFs), etc
  - **Training**: How we prepare to fight tactically; basic training to advanced individual training, various types of unit training, joint exercises, etc
  - **Materiel**: All the "stuff" necessary to equip our forces, that is, weapons, spares, etc. so they can operate effective
  - **Leadership and education**: How we prepare our leaders to lead the fight from squad leader to 4-star general/admiral; professional development
  - **Personnel**: Availability of qualified people for peacetime, wartime, and various contingency operations
  - **Facilities**: Real property; installations and industrial facilities (e.g. government owned ammunition production facilities) that support our forces

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DOTMLP_ - The Missing Piece

- Many DoD acquisition programs have facility requirements; particularly Major Automated Information Systems (MAIS) programs
- The DoD 5000 Defense Acquisition System as expressed in the Defense Acquisition Guidebook (DAG) includes:
  - Facility implications to system supportability
  - Habitability
  - Sustainability
  - Etc
- However, MAIS programs are oftentimes executed with insufficient, or belated understanding and planning for the systems engineering implications between the facility and IT infrastructure

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Federal Mandate – EO 13514

- Executive Order 13514 (5 October 2009) promotes and encourages Federal agencies to procure environmentally preferable technology
- In particular the Order seeks to promote electronics stewardship, by:
  - Ensuring procurement preference for Electronic Product Environmental Assessment Tool (EPEAT) registered electronic products;
  - Establishing and implementing policies to enable power management, duplex printing, and other energy-efficient or environmentally preferable features;
  - Employing environmentally sound practices with respect to the agency's disposition of all agency excess or surplus electronic products;
  - Ensuring the procurement of Energy Star and Federal Energy Management Program (FEMP) designated electronic equipment;
  - Implementing best management practices for energy-efficient management of servers and Federal data centers; and
- The Order also seeks to *"implement high performance sustainable Federal building design, construction, operation and management, maintenance, and deconstruction"*

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Federal Mandate – OMB

- In late 2010 Office of Management and Budget (OMB) published a 25-point plan to reform federal Information Technology (IT) management
  - It includes plans to reduce the government's 2,100 data centers to 1300 by 2015
  - As of 7 Oct, 81 data centers have been closed so far in 2011
  - Officials say they are ahead of schedule to close 800 data centers by 2015
- This appears to be a cascading effect from President Obama's 'Green' Executive Order
- Now, there are even more cascading effects at the agency level and below…

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DON Mandate – CIO Memo

- DON CIO Memorandum published 10 Jul 11 states:
  - *"A moratorium is established to halt all DON investment (to include individual program of record resources) in increased data storage capacity without first determining that existing DON data center capacity is insufficient to meet the storage requirements, and secondly determining it is not more cost effective to expand capacity in an existing DON owned Space and Naval Warfare Systems Command (SPAWARSYSCOM), Navy Marine Corps Intranet (NMCI), or Marine Corps enterprise or regional data center."*
  - *"Approval to make investments in data storage must be obtained from the DON Chief Information Officer (CIO) for Secretary of the Navy (SECNAV) organizations and DON enterprise programs; DON Deputy CIO (DDCIO) Navy for Navy organizations and programs; or DON Deputy CIO (DDCIO) Marine Corps for Marine Corps organizations and programs."*

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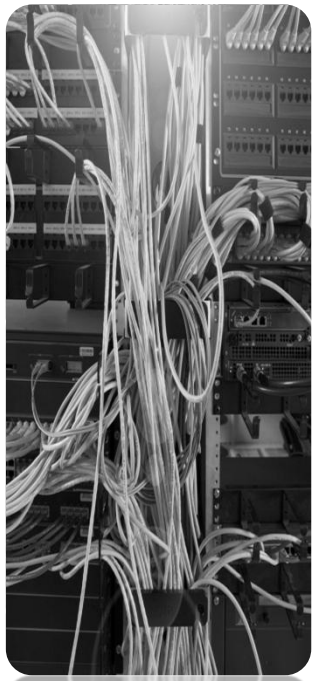
Information Technology Trends



- This intensified focus on data center consolidation and cloud-based computing is already radically changing the technologies being employed by IT systems
- Techniques such as server virtualization, blade servers and consolidated data storage management are optimizing IT footprint
- These techniques oftentimes result in high-density server cabinet configurations that consume 2 to 5 times more electrical power than legacy server cabinets
- This creates a critical requirement for advanced power and cooling management solutions

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Convergence of Challenges

- The goals of data center optimization, net-centricity, and cloud-based computing can work together to provide increased functionality and capability to the war fighter in what is expected to be a more fiscally constrained environment
- However, DoD will be seeking to achieve these goals in existing data centers that were generally not designed to meet these emergent requirements for power, cooling, fire protection, network and security
- It is expected that this practice area of facility systems engineering will necessarily burgeon to meet this demand

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Holistic Approach Needed

- A team approach is needed to help customers; to include:
  - Mechanical engineers
  - Electrical engineers
  - Fire protection engineers
  - Building Industry Consulting Service International (BICSI) Registered Communications Distribution Designers (RCDD)
- Once the team conducts a site investigation and understands future growth and IT plans they can;
  - Develop a baseline of the mechanical, electrical, fire protection, telecommunications and network capability
  - Recommend opportunities for optimization and improvement
- One particular useful tool is Computational Fluid Dynamics (CFD) Modeling and Simulation (M&S)

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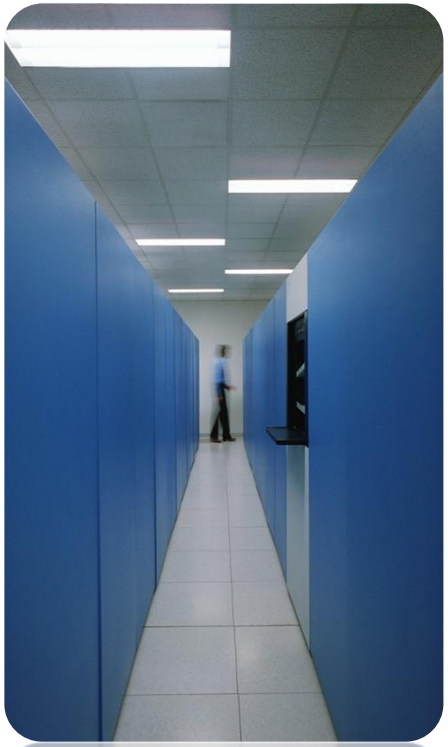
USMC Case Study Discussion

- Kansas City, MO
  - Enterprise IT Center
  - Contracted by Government Services Administration (GSA) Public Building Services (PBS)
- Marine Corps Logistics Base (MCLB) Albany, GA
  - Disaster Recovery/Continuity of Operations Plan (DR/COOP)
  - Contracted by Naval Facilities Command (NAVFAC)



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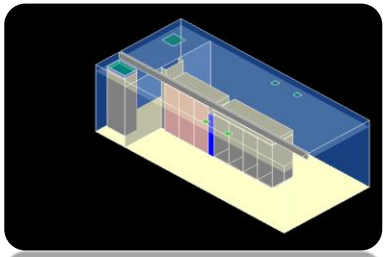
Computational Fluid Dynamics (CFD) Modeling and Simulation (M&S)



- Tremendous optimization gains can be achieved in the challenging area of mechanical requirements
- Tests compliance with ASHRAE TC9.9 Best Practices for Datacom Facility Energy Efficiency
- CFD allows thermal and air flow analysis
  - Model temperature profile across the rack, row, and throughout room
  - Model prospective cooling plant and free cooling techniques
  - Model thermal and air flow for various possible configurations
  - Model potential updated IT infrastructure and other cooling techniques
- Once the original computer floor is modeled, new models can be generated and analyzed rapidly

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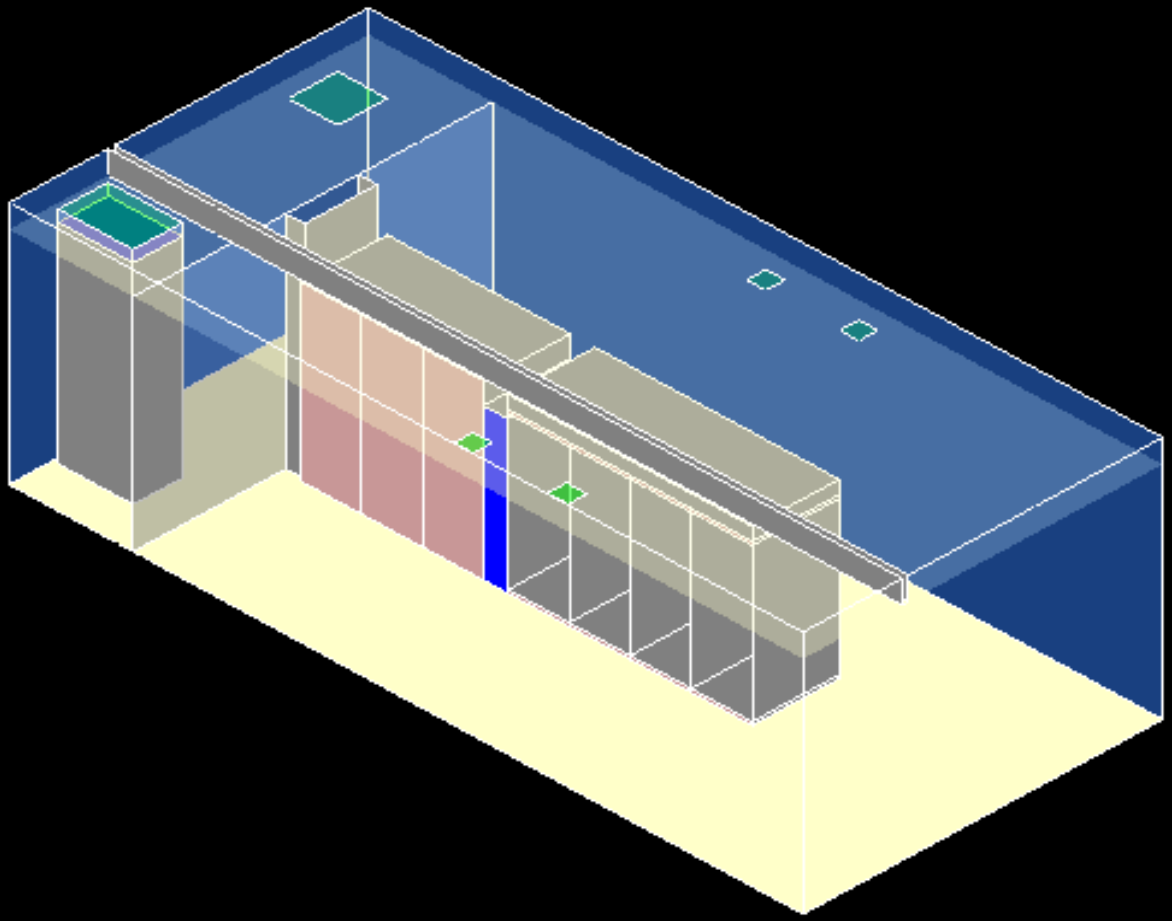
Base



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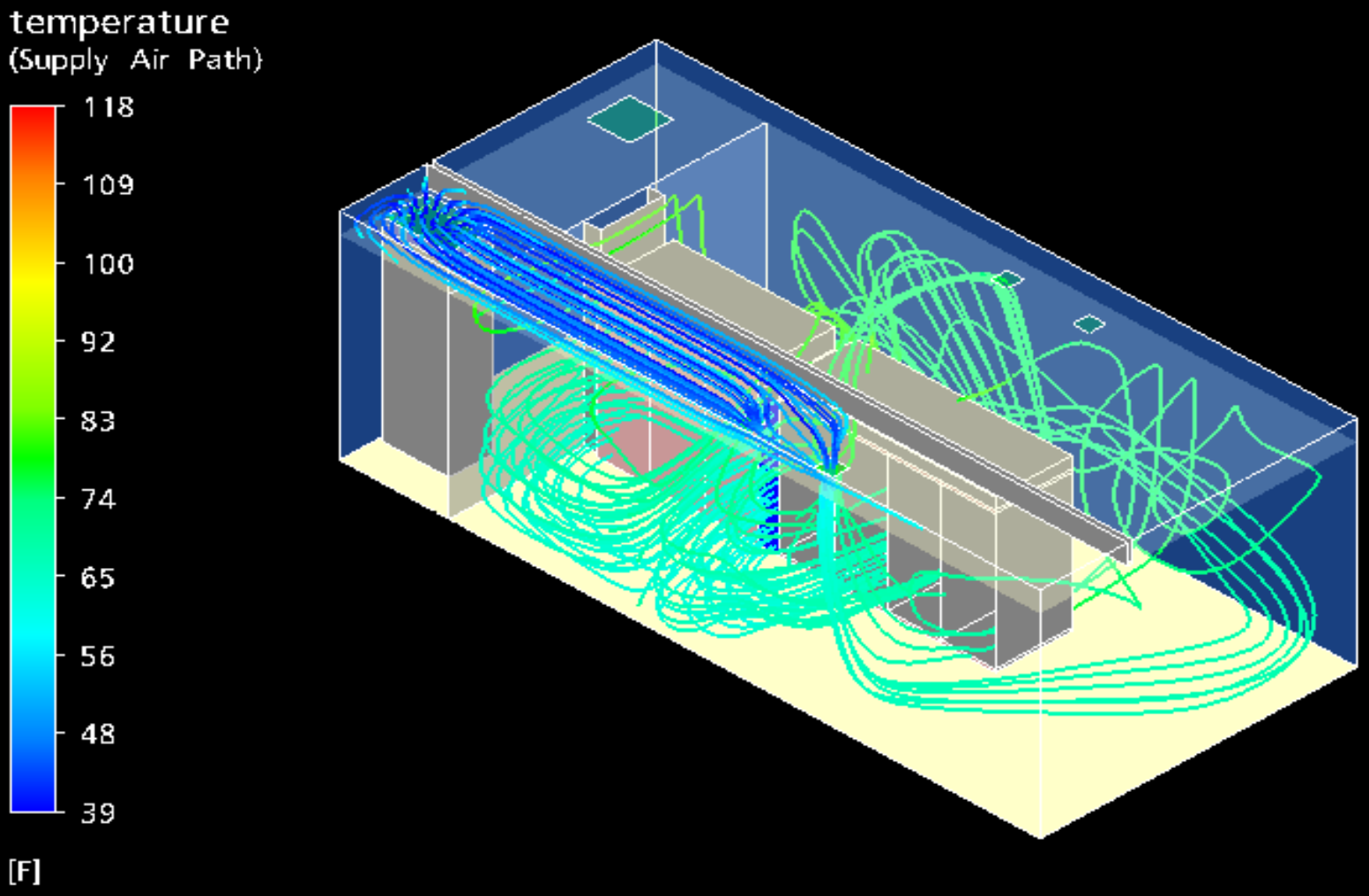

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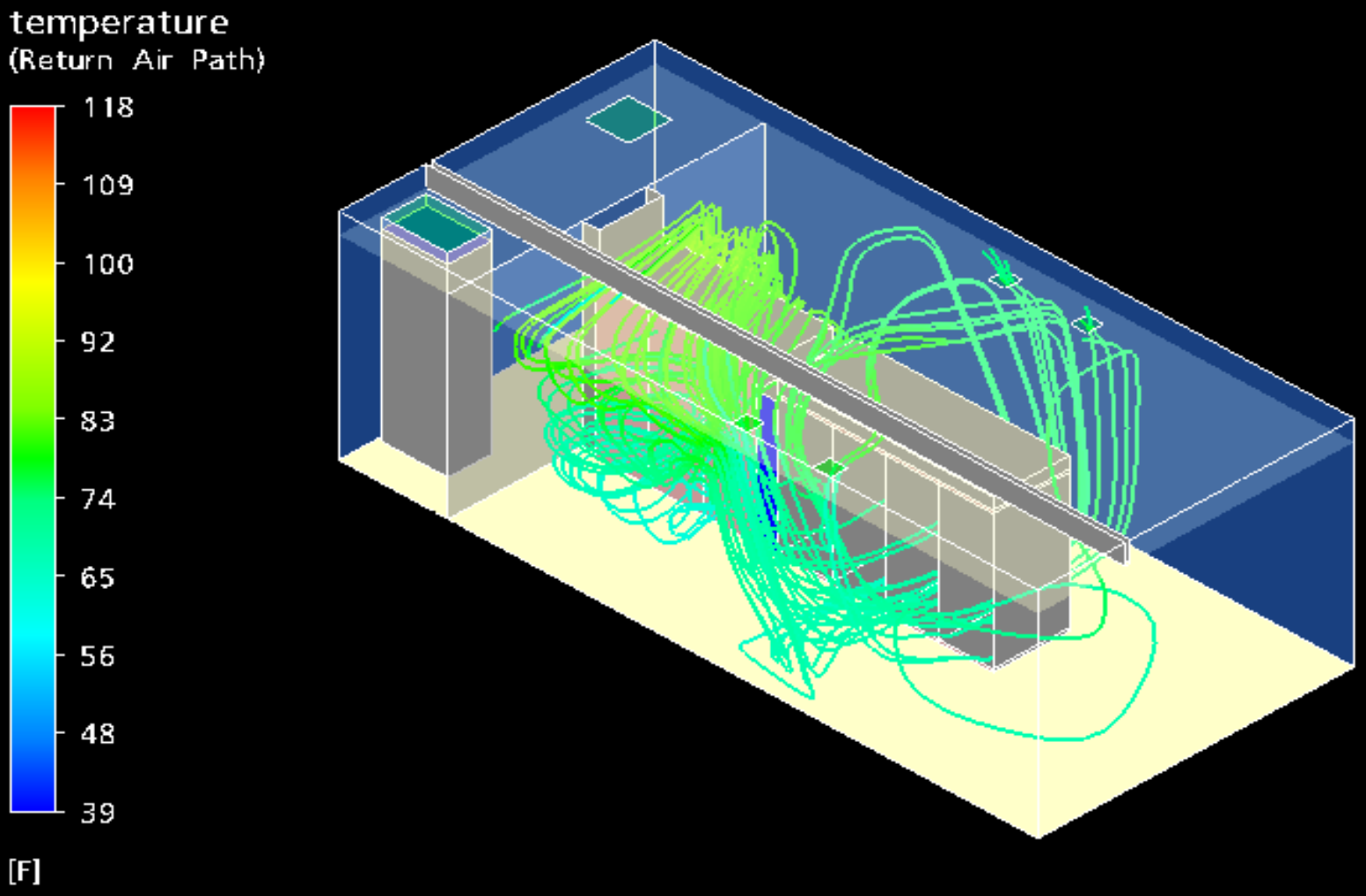

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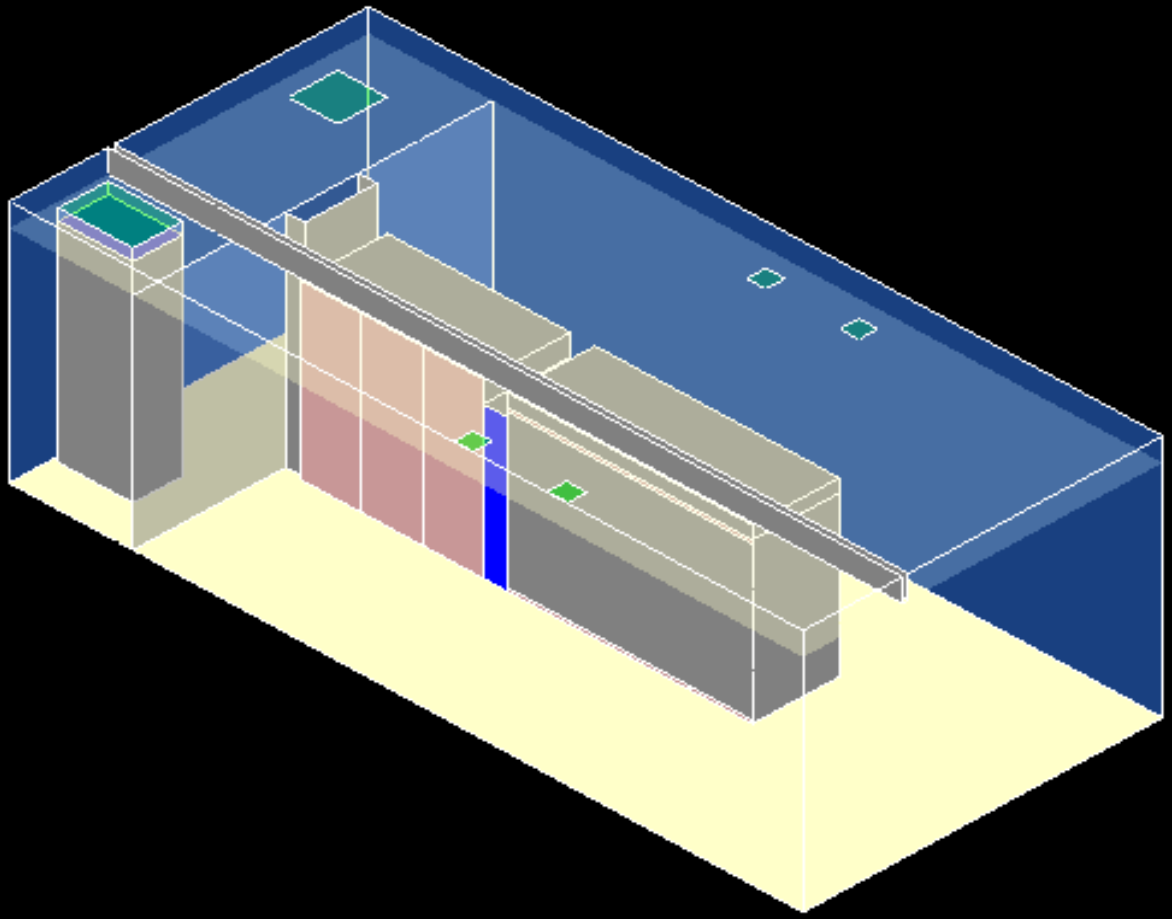
Blanking Panels



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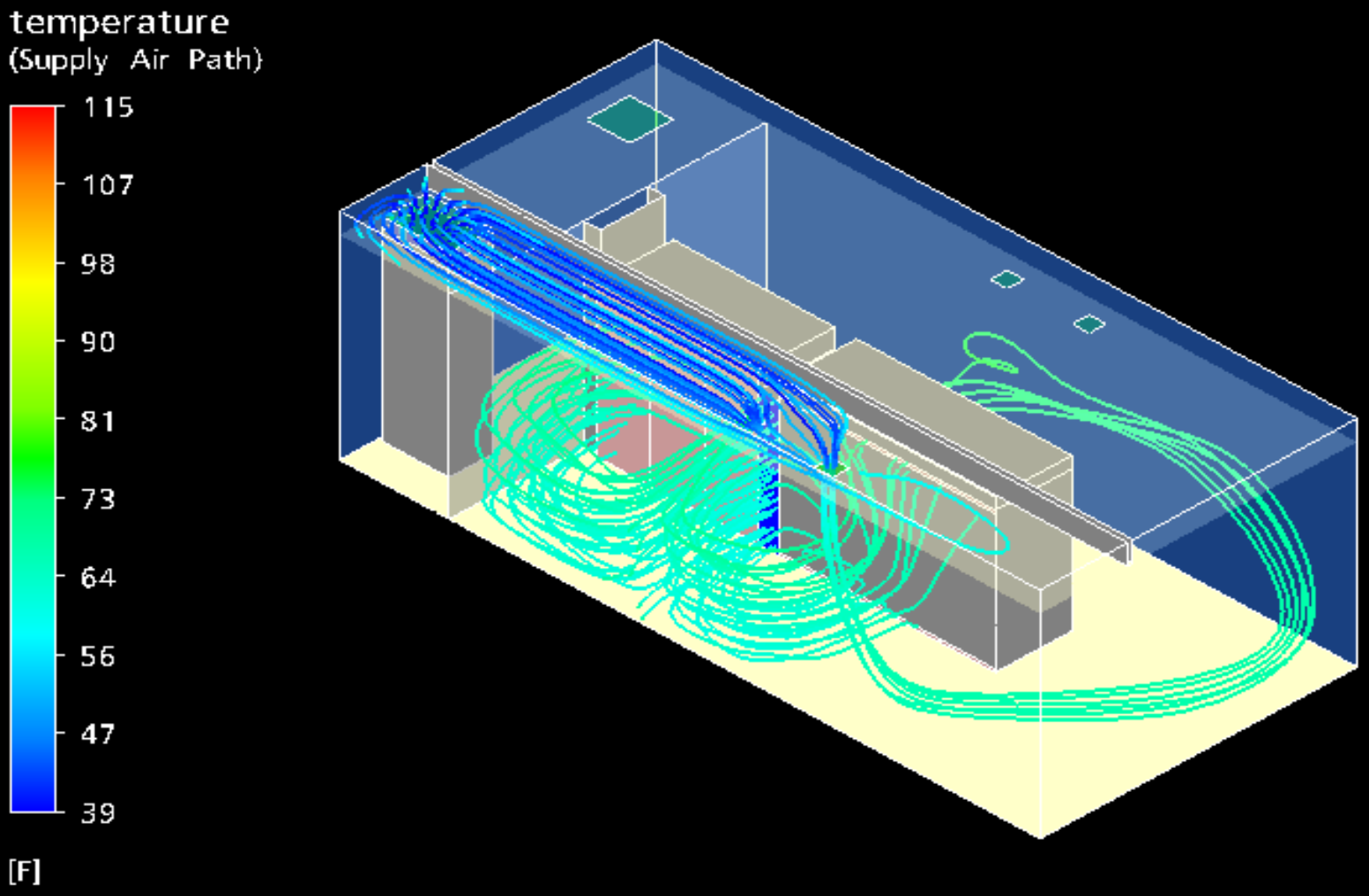

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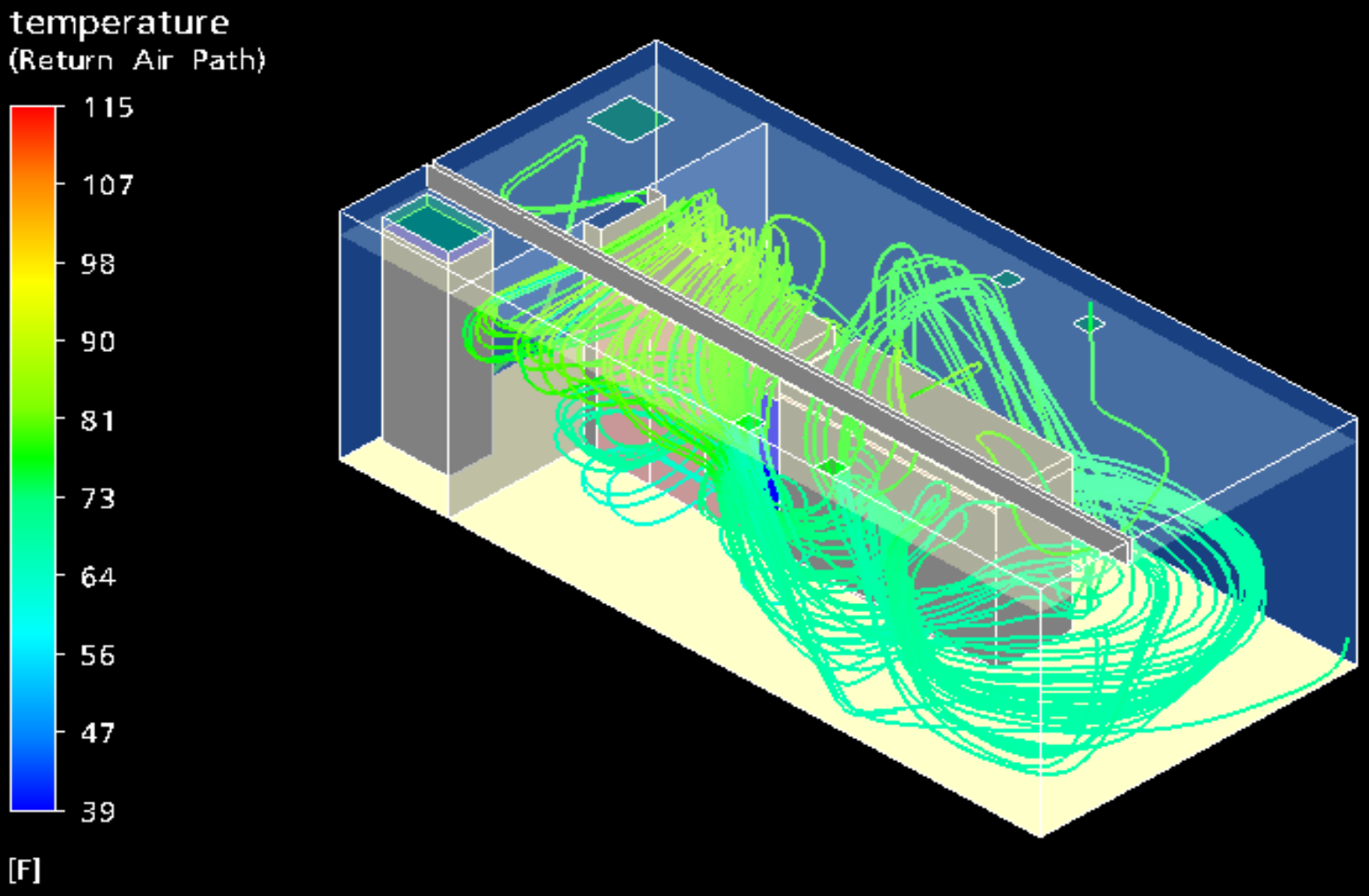

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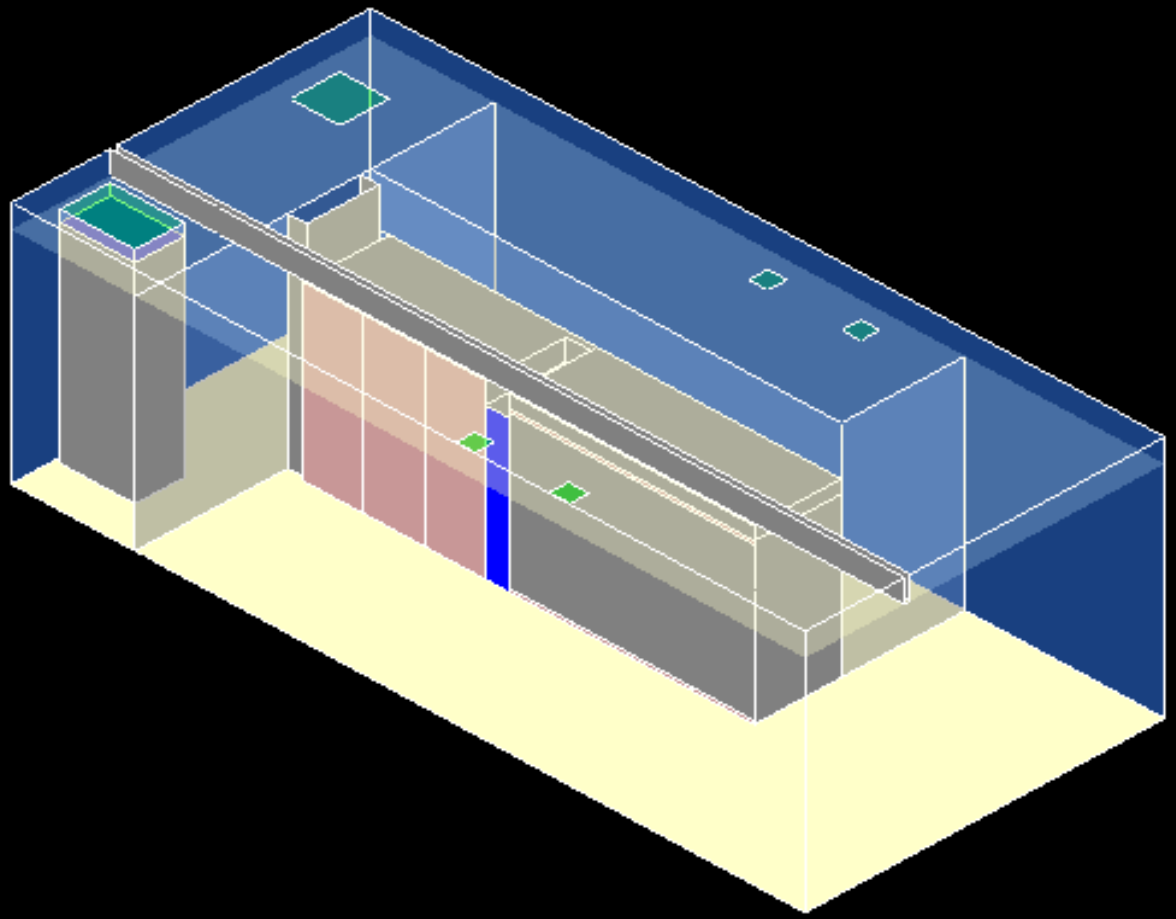
Containment



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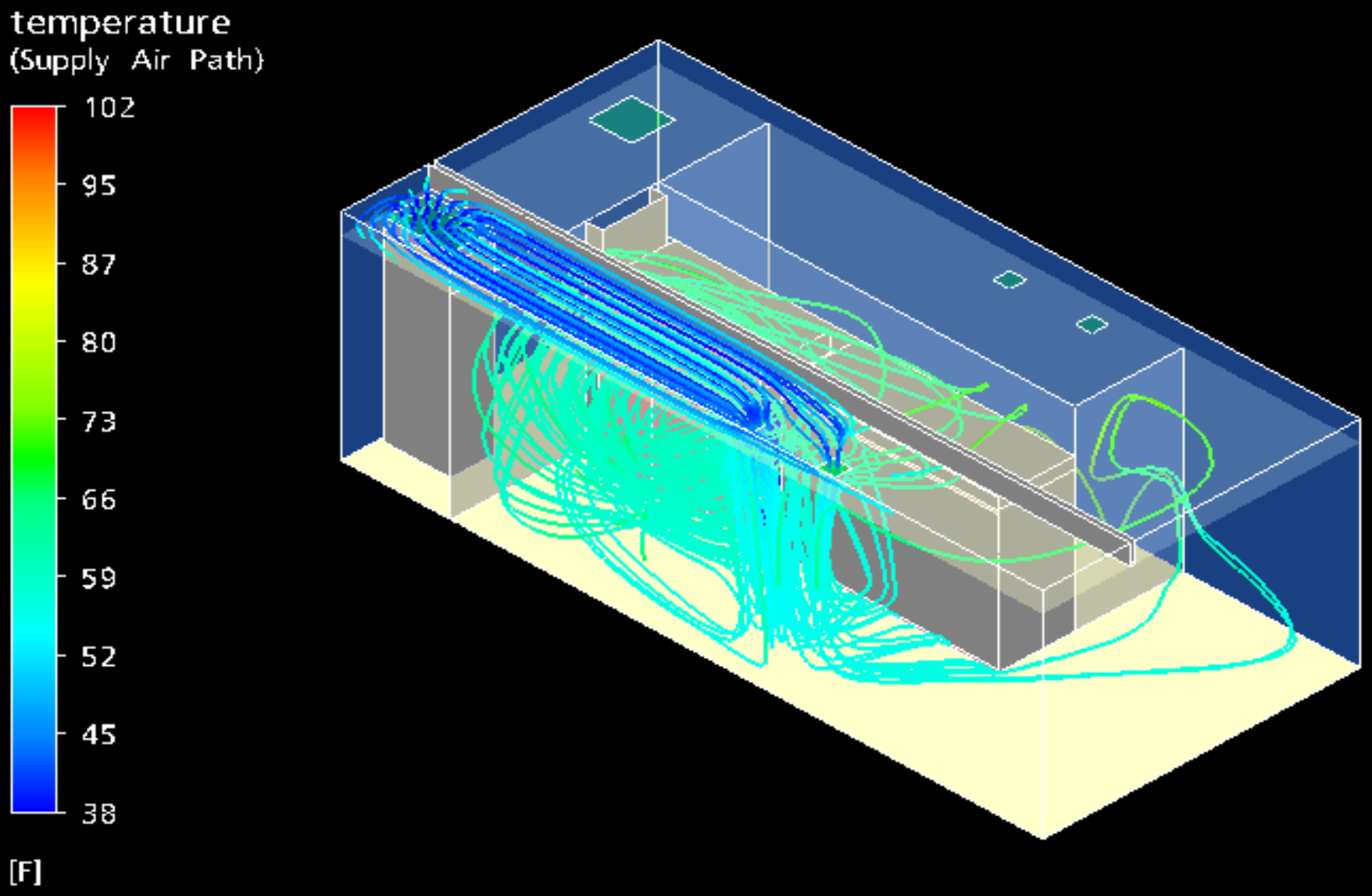

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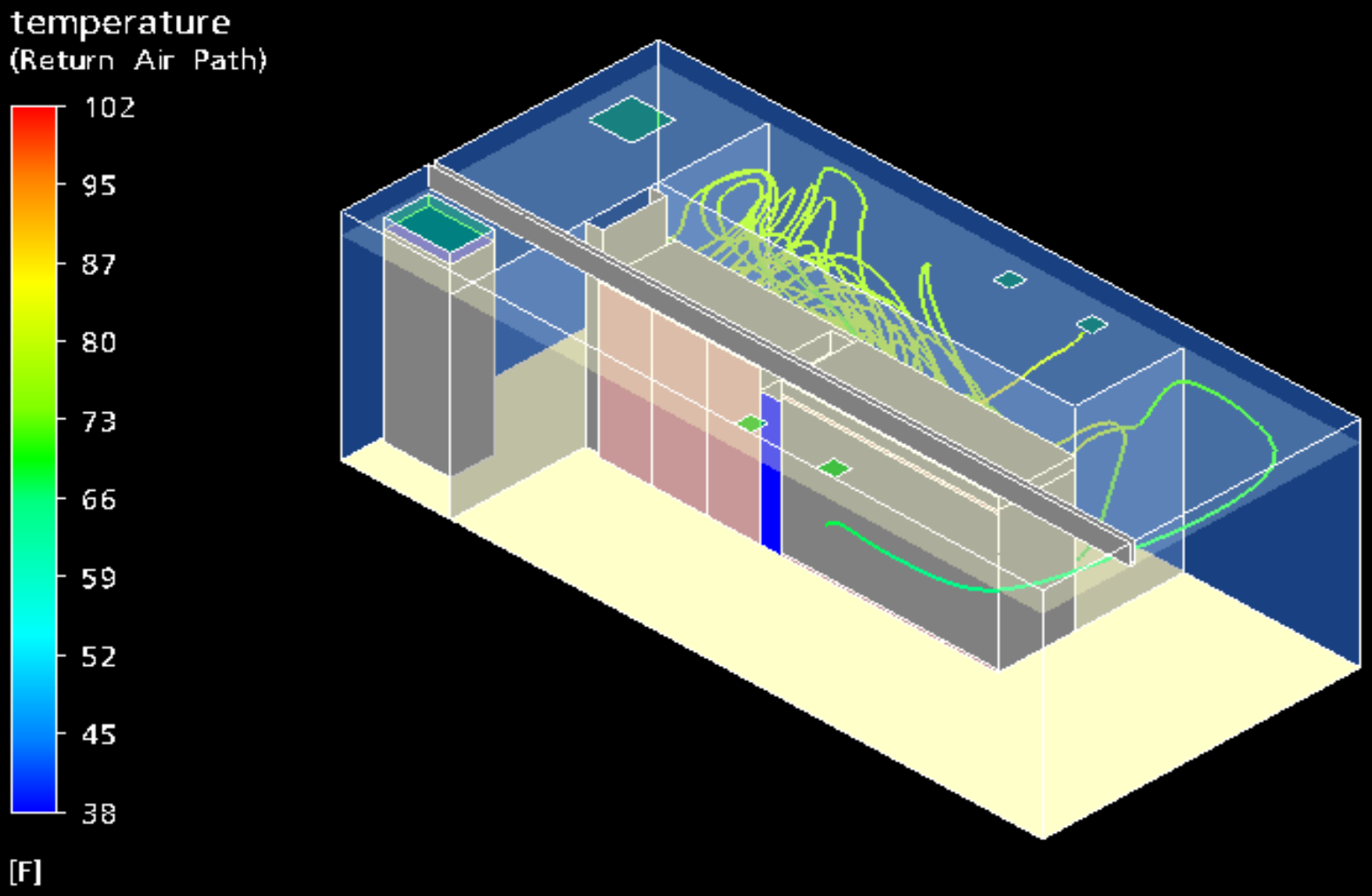

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CFD M&S Benefits

- CFD M&S can achieve the following operational benefits:
  - Lower computer center operational costs by identifying excess cooling capacity
  - Identify how to increase the computer capacity without increasing the cooling capacity
  - Predict the maximum IT capacity for the computer center floors
  - Predict the impact of adding computer capacity or cooling capacity to the computer floors
  - Optimize the equipment placement by performing "what-if" virtual designs

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Summary – Questions?

- MAIS programs often miss the Facilities piece of DOTMLPF
- Multiple mandates driving datacenter consolidation
- IT trends in cloud / virtualization increasing density
- Holistic approach is needed to address multiple challenges
- CFD M&S approach has multiple benefits

Questions?

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Additional Information

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About Craig Amundson

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» Craig Amundson is the Kansas City Lead for Cask and directly supports USMC datacenter efforts there. He has more than 10 years experience in Major Automated Information Systems (MAIS) program management for DoD. Prior to his current position at Cask, as an active duty Marine he served as Program Manager for Marine Corps Enterprise IT Services (MCEITS), a portfolio of programs that constitute over a $500M footprint across the FYDP. He is DoD DAWIA Level III certified in Program Management and a PMP.

Mr. Amundson earned a BS in Nuclear Engineering from Iowa State University and an MS in Electrical Engineering from the Naval Postgraduate School.

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