

Patent No. 6,718,277
Petition for *Inter Partes* Review

Paper No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VERTIV CORPORATION

Petitioner

v.

VALTRUS INNOVATIONS LIMITED and KEY PATENT INNOVATION LTD.

Patent Owners

Patent No. 6,718,277
Original Issue Date: April 6, 2004

Title: ATMOSPHERIC CONTROL WITHIN A BUILDING

Inter Partes Review No. Unassigned

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § § 311-319 AND 37 C.F.R. § 42.100 *ET. SEQ.*

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LISTING OF EXHIBITS

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 6,718,277 (“the ’277 patent”)
Ex. 1002	Declaration of John P. Abraham, Ph.D.
Ex. 1003	Prosecution History of the ’277 patent
Ex. 1004	[RESERVED]
Ex. 1005	U.S. Patent No. 6,283,380 (“Nakanishi”)
Ex. 1006	U.S. Patent Publication No. 2002/0149911A1 (“Bishop”)
Ex. 1007	Infringement Claim Chart for the ’277 Patent in <i>Valtrus Innovations Limited v. Digital Realty Trust, Inc. et al</i> , Case No. 2-24-cv-00139-JRG
Ex. 1008	U.S. Patent Publication No. 2003/0067745A1 (“Patel”)
Ex. 1009	U.S. Patent Publication No. 2003/0158718A1 (“Nakagawa”)
Ex. 1010	U.S. Patent No. 6,188,189 (“Blake”)
Ex. 1011	Tom Lee & Mali Mahalingam, <i>System Level Thermal Simulation of a Computer Chassis Using FLOTHERM Software</i> , 1993 FLOTHERM Int’l User Conf. Presentations 1 (May 1993) (“Lee”)
Ex. 1012	1979 Merriam-Webster’s New Collegiate Dictionary definition of “map”
Ex. 1013	2002 MacMillian English Dictionary definition of “map”

LISTING OF CHALLENGED CLAIMS

Claim 1	
1[pre]	A method of controlling atmospheric conditions within a building, said method comprising the steps of:
1[a]	supplying a conditioned fluid inside said building;
1[b]	sensing at least one atmospheric parameter in a plurality of locations inside said building;
1[c]	generating an empirical atmospheric map from the results of said sensing step using software for processing input from said sensing step and for producing output in the form of said empirical atmospheric map;
1[d]	comparing said empirical atmospheric map to a template atmospheric map; and
1[e]	identifying pattern differentials between said empirical and template atmospheric maps.
Claim 2	
2[a]	The method as claimed in claim 1, further comprising the steps of: determining corrective action to reduce said pattern differentials; and
2[b]	varying at least one of the quantity, quality, and distribution of said conditioned fluid in accord with said determining step.
Claim 3	
[3]	The method as claimed in claim 2, wherein said supplying step comprises the step of operating a system having at least one of a plurality of vents, at least one blower, and at least one source of conditioned air.
Claim 4	

[4]	The method as claimed in claim 3, wherein said determining step comprises correlating at least one of the location, size, and intensity of said pattern differentials to at least one of the location of said plurality of vents, the speed of said at least one blower, and the capacity of said at least one source of conditioned air.
Claim 5	
[5]	The method as claimed in claim 4, wherein said varying step comprises adjusting at least one of the opening of said plurality of vents, the speed of said at least one blower, and the output of said at least one source of conditioned air.
Claim 6	
[6]	The method as claimed in claim 1, wherein said generating step comprises using thermal mapping software to process input from said sensing step and to produce output in the form of said empirical atmospheric map.
Claim 7	
[7]	The method as claimed in claim 1, wherein said identifying step comprises using pattern recognition software.
Claim 8	
[8]	The method as claimed in claim 1, wherein said plurality of locations of said sensing step comprises locations at various elevations within said building.
Claim 9	
[9]	The method as claimed in claim 1, wherein said sensing step comprises using at least one of temperature sensors, humidity sensors, pressure sensors, particle sensors, smoke sensors, and velocity sensors.
Claim 10	

[10]	The method as claimed in claim 1, wherein the step of generating an empirical atmospheric map comprises generating a map composed of temperature contours that define various isothermal regions.
Claim 11	
[11]	The method as claimed in claim 1, wherein the step of identifying pattern differentials between said empirical and template atmospheric maps comprises performing at least one of extrapolation and triangulation to determine locations of one or more hot spots.
Claim 12	
12[pre]	A method of cooling a data center having equipment therein, said method comprising the steps of:
12[a]	supplying a cooling fluid within said data center to cool said equipment within said data center;
12[b]	sensing temperature within said data center in a plurality of locations;
12[c]	generating an empirical thermal map of said data center from the results of said sensing step using software for processing input from said sensing step and for producing output in the form of said empirical thermal map;
12[d]	comparing said empirical thermal map to a template thermal map;
12[e]	identifying pattern differentials between said empirical and template thermal maps.
Claim 13	
13[a]	The method as claimed in claim 12, further comprising the steps of: determining corrective action to reduce said pattern differentials; and
13[b]	varying at least one of the quantity, quality, and distribution of said cooling fluid in accord with said determining step.
Claim 14	

[14]	The method as claimed in claim 13, wherein said supplying step comprises operating a system having at least one of a plurality of vents, at least one blower, and at least one source of conditioned air.
Claim 15	
[15]	The method as claimed in claim 14, wherein said determining step comprises correlating at least one of the location, size, and intensity of said pattern differentials to at least one of the location of said plurality of vents, the speed of said at least one blower, and the capacity of said at least one source of conditioned air.
Claim 16	
[16]	The method as claimed in claim 15, wherein said varying step comprises adjusting at least one of the opening of at least one of said plurality of vents, the speed of said at least one blower, and the output of said at least one source of conditioned air.
Claim 17	
[17]	The method as claimed in claim 12, wherein said generating step comprises using thermal mapping software to process input from said sensing step and to produce output in the form of said empirical thermal map, wherein said thermal mapping software triangulates locations of hot spots.
Claim 18	
[18]	The method as claimed in claim 12, wherein said identifying step comprises using pattern recognition software.
Claim 19	
[19]	The method as claimed in claim 12, wherein said plurality of locations of said sensing step comprises locations at various elevations within said data center.

Claim 20	
[20]	The method as claimed in claim 12 wherein the step of generating an empirical atmospheric map comprises generating a map composed of temperature contours that define various isothermal regions.
Claim 21	
[21]	The method as claimed in claim 12, wherein the step of identifying pattern differentials between said empirical and template atmospheric maps comprises performing at least one of extrapolation and triangulation to determine locations of one or more hot spots.

I. INTRODUCTION

Vertiv Corporation (“Petitioner”) requests *inter partes* review of claims 1–21 (“Challenged Claims”) of U.S. Patent No. 6,718,277 (Ex. 1001, “the ’277 patent”). The Challenged Claims relate to methods and systems of comparing a map of sensed atmospheric conditions to a template map of atmospheric conditions to identify differences in the maps. The prior art cited herein anticipates and renders obvious the Challenged Claims, and there is a reasonable likelihood that Petitioner will prevail. As such, Petitioner respectfully submits that the Board should institute review and cancel the Challenged Claims.

II. MANDATORY NOTICES

A. Real Party in Interest

Petitioner Vertiv Corporation is the real party in interest. No entity other than Vertiv Corporation is funding, controlling, or otherwise had an opportunity to provide input regarding this Petition; no entity other than Vertiv Corporation will fund, control, or otherwise have an opportunity to provide input regarding any resulting IPR trial; no entity other than Vertiv Corporation has reviewed this Petition.

B. Related Matters

The ’277 patent is the subject of the currently pending civil actions:

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- *Valtrus Innovations Limited et al v. DataBank Holdings Ltd.*, Case No. 2-24-cv-00777-JRG (E.D. Texas) (“*DataBank*”);
- *Valtrus Innovations Limited et al v. TierPoint, LLC*, Case No. 2-24-cv-00776-JRG (E.D. Texas) (“*TierPoint*”);
- *Vertiv Corporation v. Valtrus Innovations Limited*, Case No. 2-24-cv-00907-JRG (E.D. Texas) (“*Vertiv Declaratory Judgment Action*”);
- *Valtrus Innovations Limited v. NTT Data Services, LLC et al*, Case No. 2-24-cv-00361-JRG (“*Lead Case*”).

The *Vertiv Declaratory Judgment Action* has been consolidated for pre-trial purposes in the *Lead Case*.

In addition to the above actions, the ’277 patent was the subject of following civil actions, in which Petitioner had intervened, and which were dismissed by the parties:

- *Valtrus Innovations Limited v. Digital Realty Trust, Inc. et al*, Case No. 2-24-cv-00139-JRG (E.D. Texas) (“*Digital Realty I*”);
- *Valtrus Innovations Limited et al v. Digital Realty Trust, Inc. et al*, Case No. 2-24-cv-00535-JRG (E.D. Texas) (“*Digital Realty IP*”);
- *Valtrus Innovations Ltd. v. Dawn Acquisitions LLC (d/b/a Evoque Data Center Solutions)*, Case No. 2:2024-cv-00142-JRG (E.D. Texas);

- *Valtrus Innovations Ltd. v. CyrusOne, LLC*, Case No. 2:2024-cv-00534-JRG (E.D. Texas)

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D. Notice of Service Information

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E. Payment of Fees

Petitioner authorizes the Patent and Trademark Office to charge Deposit Account No. 50-4181 (Customer ID No. 70001) for the fees required by 37 C.F.R.

§42.15(a) for this Petition and authorizes the payment of any additional fees to be charged to this Deposit Account.

III. GROUNDS FOR STANDING

Petitioner certifies that the '277 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR on the grounds identified herein.

IV. IDENTIFICATION OF CHALLENGE AND RELIEF REQUESTED

The '277 patent issued from U.S. Appln. No. 10/123,403, filed April 17, 2002. EX1001, Cover. Thus, patentability is governed by pre-AIA 35 U.S.C. §§102-103.

Petitioner requests that the Challenged Claims of the '277 patent be cancelled based on the following grounds:

Ground	Claims	Description
1	1–21	Anticipated under §102(a) by Nakanishi (Ex. 1005)
2	1–6, 8–10, 12–17, 19–21	Anticipated under §102(e) by Bishop (Ex. 1006)
3	1–6, 8–10, 12–17, 19–21	Obvious under 35 U.S.C. §103(a) over Nakanishi in view of Bishop (Ex. 1006) and the knowledge of POSITA

Nakanishi issued on September 4, 2001, which was before the April 17, 2002, priority date of the '277 patent. Ex. 1005, cover. Thus, Nakanishi was publicly available and qualifies as pre-AIA 35 U.S.C §102(a) prior art. Ex. 1002 ¶¶ 100–114.

Bishop was filed on April 12, 2001, which was before the April 17, 2002, priority date of the '277 patent, and was published on October 17, 2002. Ex. 1006, cover. Thus, Bishop qualifies as pre-AIA 35 U.S.C §102(e) prior art. Ex. 1002 ¶¶ 115–123.

Petitioner's challenges are supported by the Declaration and testimony of John P. Abraham, Ph.D., an expert in design or evaluation of fluid flow systems for electronics cooling with more than 20 years of experience. Ex. 1002 ¶¶ 12-27.

V. THE '277 PATENT

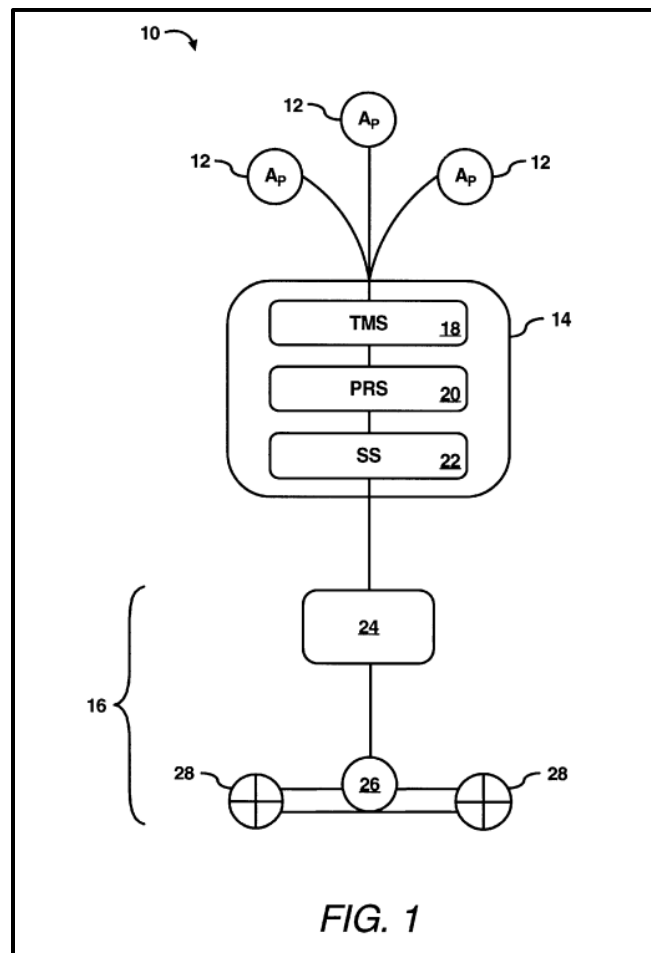
A. Summary of Subject Matter

The '277 patent is directed to systems and methods for controlling atmospheric conditions within a building such as a data center. The '277 patent contends that the disclosed systems and methods can cool data centers more efficiently by varying the cooling output of air conditioning units “based on the distributed, location-specific needs of the data center.” *See* Ex. 1001, 2:20–39.

More specifically, the '277 patent teaches “strategically distributing cooling fluid, or conditioned air, within the data center by substantially . . . increasing the cooling fluid flow to locations within the data center having racks that dissipate greater amounts of heat, and by substantially . . . decreasing the cooling fluid flow to locations having racks that dissipate lesser amounts of heat.” Ex. 1001, 3:43–49. The inventor asserted that the prior conventional cooling technology “operat[ed] at

substantially 100 percent of the anticipated heat dissipation from the racks” and that the purported invention improved upon that technology by cooling a building (such as a data center) “according to the actual location and area specific cooling needs.” Ex. 1001, 3:51–54.

Fig. 1 of the '277 patent purports to disclose an exemplary system capable of “strategically distributing cooling fluid” to cool a building. Ex. 1001, FIG. 1.



As shown above, the exemplary system can measure conditions of the atmosphere at various locations via atmospheric sensors 12, such as temperature

sensors. Ex. 1001, 4:12–15. A CPU 14 records atmospheric measurements and the corresponding sensor locations. Ex. 1001, 4:29–34. The CPU has software for generating maps of atmospheric conditions, such as thermal mapping software 18 to generate thermal maps of the data center. Ex. 1001, 4:38–40. The specification acknowledges that such software tools were “widely available and known to those skilled in the art.” Ex. 1001, 6:43–46. The specification explains that conventional thermal mapping software can process numerous input sensed temperatures and output map-like information, for example, a thermal map composed of temperature contours that define various isothermal regions of distinct temperatures. Ex. 1001, 4:41–46. The specification also highlights the capability of thermal mapping software to apply mathematical techniques the sensed temperature and sensor location data to calculate temperature gradients and locate “hot spots,” including those located between various temperature sensors. Ex. 1001, 4:46–67.

The specification also refers to a “template thermal map” or “master” or “model” thermal map, which “basically represents a thermal map of an optimally operating data center cooling system.” Ex. 1001, 6:36–41. The CPU 14 also includes “pattern recognition software 20” to identify pattern differences in the maps, and with respect to certain dependent claims, “strategic software 22” to “determine a course of corrective action to minimize or eliminate the pattern differentials.” Ex. 1001, 5:1–10 and, *e.g.*, claims 2, 13.

With respect to certain embodiments, the '277 patent discloses that when a pattern differential, such as a hot spot, is identified, the cooling system is used to vary one or more of the quantity, quality, and distribution of the cooling fluid “to target one or more hot spot locations within the data center.” Ex. 1001, 5:16-18, 43–52. For example, the quantity of cooling fluid may be varied by adjusting “the speed and/or baffling of the blower 26” or by varying “the percentage opening of the vents 28” of the cooling system 16. Ex. 1001, 5:38–41. The quality of cooling fluid (i.e., temperature, humidity, etc.) may be varied by increasing or decreasing the chiller cycle “between 0% and 100% of operating capacity.” Ex. 1001, 5:34–38.

B. Relevant Prosecution History

A Non-Final Rejection was issued by the Office on June 16, 2003, rejecting all pending claims. Ex. 1003, 339–40. Claims 1–5, 8–14, and 17–20 were rejected as being anticipated by U.S. Patent No. 5,290,200 (“Kiser”), claims 6 and 15 were rejected over Kiser in view of U.S. Patent No. 6,296,193 (“West”), and claims 7 and 16 were rejected over Kiser in view of U.S. Patent No. 5,506,768 (“Seem”). Ex. 1003, 341–44.

In a September 16, 2003, Response, the applicant, Hewlett-Packard Company (“Applicant”), did not amend any of the claims, but did add new claims 21–24. Ex. 1003, 278–83.

In the accompanying remarks, the applicant emphasized that the claimed invention involves sensing at least one atmospheric parameter in a plurality of locations followed by generating an empirical map from the results of the sensing step, comparing the atmospheric map to a template atmospheric map, and identifying pattern differentials between the two maps. Ex. 1003, 284–85. The Applicant argued that Kiser does not anticipate the claims because “there is no indication in Kiser that an empirical map is generated. Instead, in column 7, lines 20-24, Kiser merely states that current conditions noted by sensors are received by a control unit periodically.” Ex. 1003, 285–86.

The Applicant characterized Kiser as teaching that current conditions received from sensors are stored in memory and “compared to stored data representing the desired conditions at that location. . . .” Ex. 1003, 286. Applicant further distinguished Kiser by stating that “Kiser does not include a computer configured to generate the empirical map nor does Kiser disclose the step of generating the empirical map.” Ex. 1003, 286. The Applicant argued that “[t]he step of comparing current conditions to stored desired condition data is not equivalent to comparing a generated empirical map to a template atmospheric or thermal map”; and that “a comparison of noted conditions with desired parameters [] substantially differs from a comparison of pattern differentials from empirical maps.” Ex. 1003, 286, 288.

On December 24, 2003, the Office issued a Notice of Allowance, which included an Examiner's Amendment. Ex. 1003, 329–38. The Examiner's amendment amended application claims 1, 10, 15, and 18. Ex. 1003, 333–35. The amendments included adding language clarifying that the invention of the independent claims uses software for processing input from said sensing step and for producing output in the form of an empirical atmospheric or thermal map. *Id.*

On November 16, 2004, the Office issued a Certificate of Correction entering the amendments to independent Challenged Claims 1 and 12 and dependent Challenged Claim 17. Ex. 1003, 266–67.

C. Person of Ordinary Skill in the Art (“POSITA”)

A POSITA at the time of the alleged invention would have at least a bachelor's degree in mechanical or chemical engineering or an equivalent discipline, together with 4–5 years of experience in design and/or development and/or operations of atmospheric management systems for buildings or electronics or computer systems; or a master's degree in mechanical or chemical engineering or an equivalent discipline, with two years' experience in design and/or development and/or operations of atmospheric management systems for buildings or electronics or computer systems. Ex. 1003, 33–34.

D. Claim Construction

Pursuant to 37 C.F.R. § 42.100(b), claims subject to IPR are construed according to their plain and ordinary meaning as understood by a POSITA. Petitioner is unaware of any prior claim construction determination related to the '277 patent.

Patent Owner has served infringement contentions in several Related Matters showing Patent Owners' expected claim interpretations for the '277 patent. *See generally* Ex. 1007 (*Digital Realty I*, Patent Owners' '277 patent infringement contentions). The infringement contentions comprise Patent Owner's positions in a Related Matter in which Patent Owner set forth positions concerning the scope of the '277 patent claims and may be considered by the Board. 35 U.S.C. §§ 301(a)(2) and 301(d).

Petitioner's position is that the claim terms are understood pursuant to their plain and ordinary meaning as understood by a POSITA in light of the specification and file history. For comparison to Patent Owner's construction, Petition sets forth below that plain and ordinary meaning as discussed by Prof. Abraham. Ex. 1002 ¶¶ 76–88.

VI. THE PRIOR ART

A. Nakanishi

Nakanishi addresses the problem of operating data center cooling systems in an efficient manner responsive to localized cooling needs. Nakanishi’s approach involves monitoring temperatures at various locations, distributing cooled air

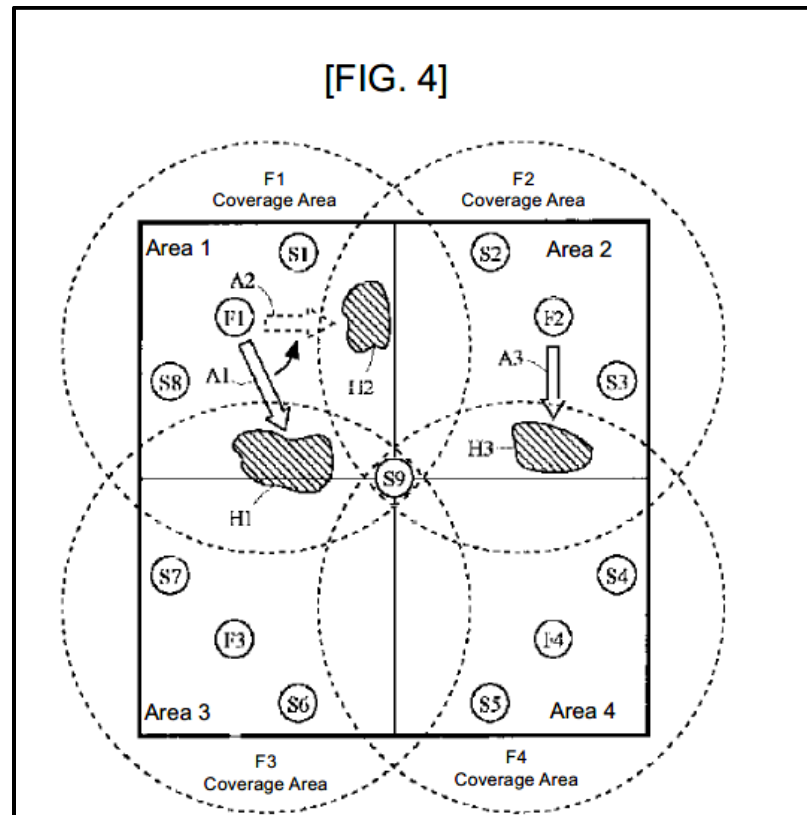
Claim Term	Petitioner’s Construction	Patent Owner’s Implied Construction
“empirical [atmospheric/thermal] map” (claims 1, 6, 10, 11, 12, 17, 20, and 21)	“data displayable as a visual representation of an area showing measured [atmospheric/temperature] conditions corresponding to locations”	“a set of measured [atmospheric/temperature] conditions corresponding to locations”
“template [atmospheric/thermal] map” (claims 1, 11, 12, and 21)	“data displayable as a visual representation of an area showing model [atmospheric/thermal] conditions corresponding to locations”	“a set of model [atmospheric/thermal] conditions corresponding to locations”

through multiple strategically located fans, and controlling the speed and direction of the fans to distribute cooling throughout a computer room (i.e., data center) based on the temperature distribution to achieve a “uniform temperature” and “for power saving.” Ex. 1005, 8:44–53.

Nakanishi recognizes that computer rooms contain various heat generating computer devices which create temperature fluctuations and distributions within the room, and which require air conditioning to maintain an optimal operating

environment. Ex. 1005, 1:11–43. These fluctuations can lead to stagnant high-temperature pockets “in a relatively narrow region” that are prone to move “unexpectedly,” thus making uniform temperature distribution difficult to achieve. Ex. 1005, 1:32–43. Nakanishi therefore addresses the same problem as the ’277 patent. Ex. 1005, 1:32–43.

An overhead view of a computer room area managed by Nakanishi's system is shown in Figure 4:



Ex. 1005, FIG. 4. As the figure illustrates, “[f]our fans F1 to F4 are set to the floor of [the] computer room” (Ex. 1005, 3:30–3) and “[a] plurality of temperature sensors

S1 to S9 [are]. . . arranged at selected positions of the computer room.” Ex. 1005, 3:42–45.

Once the temperatures at various locations of the computer room are measured, “a simulation is performed on the basis of the detected temperatures and the current airflow rates and airflow directions of the fans to obtain the temperature distribution in the computer room.” Ex. 1005, 3:46–50. The simulation is performed on a computer that “includes a simulation program for monitoring a temperature distribution.” Ex. 1005, 4:37–39. The temperature distribution simulation program can be any suitable commercially available temperature distribution analysis program, such as “FLOTHERM.” Ex. 1005, 5:42–45.

Nakanishi compares temperature distributions from the simulation to preset temperature ranges to determine “high temperature region[s]” in the data center so that a corrective action may be taken Ex. 1005, 3:46–4:9. For example, Figure 4 of Nakanishi identifies three high temperature regions—labeled H1, H2, and H3—identified by the simulation. Ex. 1005, 3:46–4:9.

The disclosed control method involves running simulations at regular time intervals to identify locations where the temperature falls outside of the preset temperature range. Ex. 1005, 3:56–4:9. If any out-of-range temperatures are detected during the cycle, the additional steps described in blocks 112 through 132 are executed to coordinate control of the speed and direction of each fan in a manner

responsive to the location-specific cooling needs identified by the comparison of the simulated temperature distribution to the model preset temperature range. Ex. 1005, 6:5–7:44.

B. Bishop

Bishop also addresses cooling of conventional computing environments, such as a raised floor system, *i.e.*, computer racks on a raised floor and a source of cooling air pumped below floor and through vents or baffles into the environment. Ex. 1006, [0012].

Bishop proposes, as a more efficient way to deliver cool air in critical computing environments, a system in which each cabinet or rack has its own controller equipped with air temperature, pressure and flow rate sensors and linked to temperature sensors associated with the cabinet and electronic modules. Ex. 1006, [0062], [0065]–[0066]. This is illustrated in Figure 2:

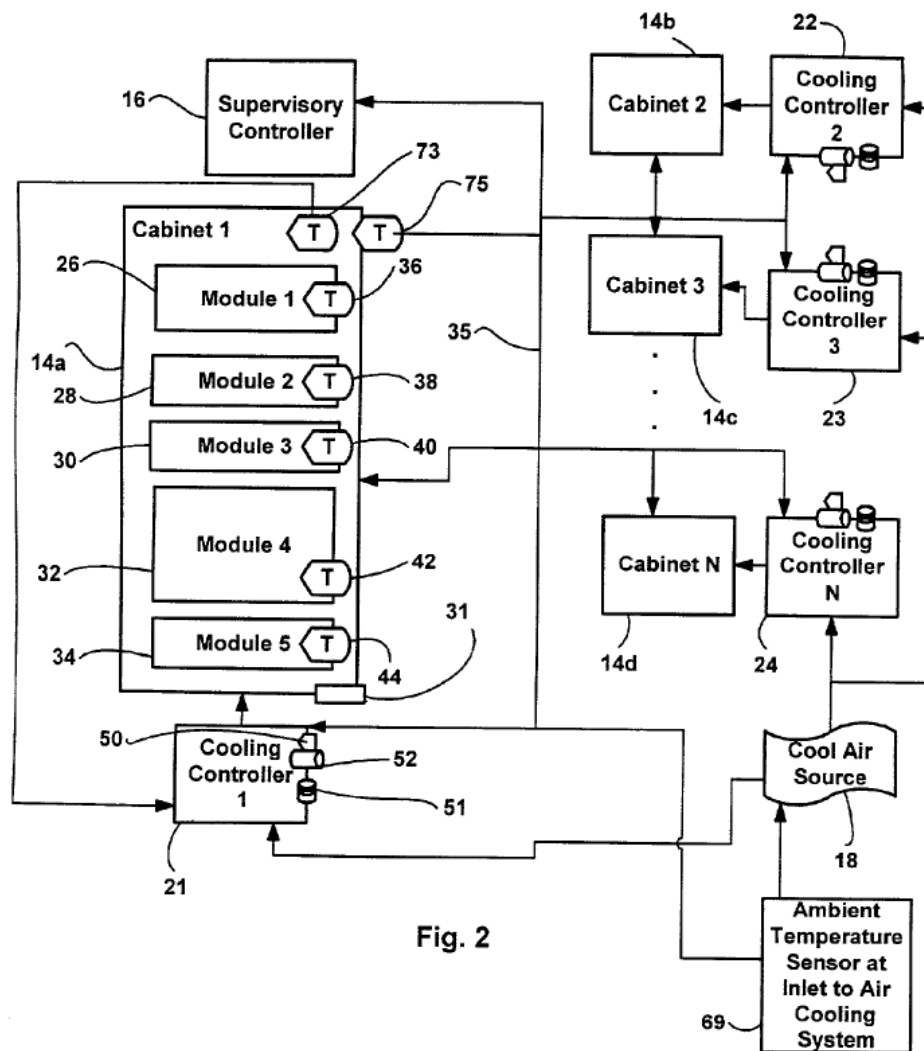


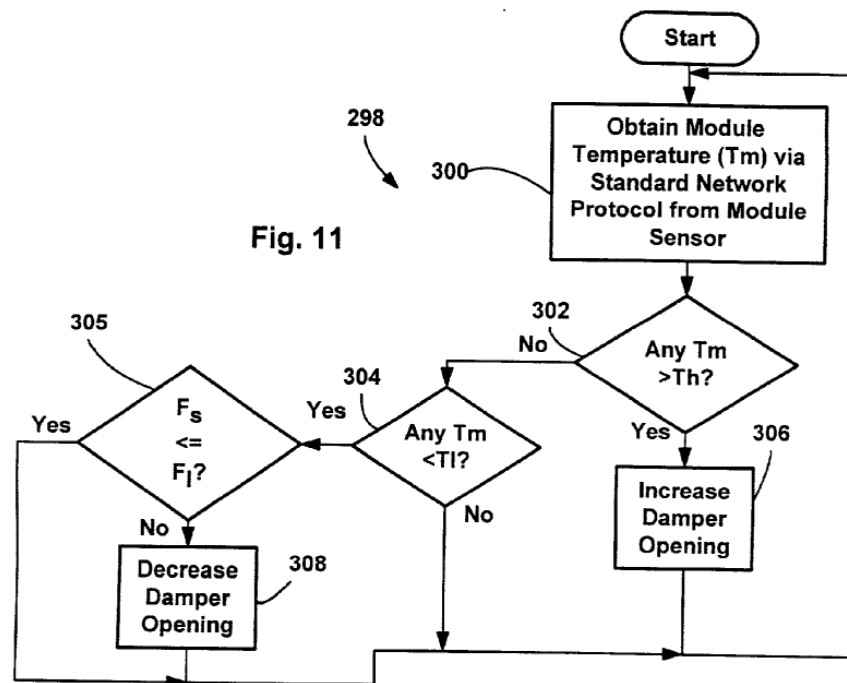
Fig. 2

Ex. 1006, Figure 2.

Cool air is provided through each controller 21 and associated air conduit into the cabinet space where it may be pulled by fans through each electronic module and over their heat generating components. Warm air expelled from the cabinets flows back into the critical environment and then recirculates to an air

cooling system where its temperature is again reduced prior to delivery back into critical environment. Ex. 1006, [0080].

Each cabinet cooling controller, in coordination with a supervisory controller, can adjust operations in response to temperature readings from the electronics modules. Ex. 1006, [0082]. One “exemplary method” disclosed involves strategically cooling a data center by controlling the opening of a damper that controls the cooled air flow to each rack based on temperatures measured by sensors associated with electronic modules. Ex. 1006, [0082]–[0086]. This exemplary method is illustrated in Figure 11 of Bishop, which is reproduced below.



Ex. 1006, FIG. 11. When any module temperature is below a threshold temperature, a controller decreases a damper opening to reduce cooling air flow to the cabinet.

Ex. 1006, [0084]. When a module temperature exceeds a high threshold, the damper opening is increased to provide more cooling air to the cabinet. Ex. 1006, [0085].

Bishop also discloses temperature sensors 75 outside of each cabinet, or averaging the individual module temperature readings, to provide temperature data at the cabinet location. Ex. 1006, [0106]. Bishop also teaches using temperature measurements associated with various cabinet locations in a data center to “generate a three dimensional temperature graph for observation by an environment administrator.” Ex. 1006, [0106].

Additional details about the disclosures of Bishop are set forth in Section IX below.

VII. STATEMENT OF HOW EACH CLAIM IS UNPATENTABLE

A. GROUND 1: CLAIMS 1–21 ARE ANTICIPATED BY NAKANISHI

As set forth below, claims 1–21 are anticipated under §102(a) by Nakanishi (Ex. 1005). Ex. 1002 ¶¶ 124–256.

1. Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by Nakanishi.

- **1[pre] – “A method of controlling atmospheric conditions within a**

building, said method comprising the steps of:”

If the preamble is limiting, Nakanishi discloses the preamble in relation to a method for “quickly and effectively controlling the temperature in a room.” Ex. 1005, Abstract. Additionally, Nakanishi is directed to air conditioning a computer room. Ex. 1005, Abstract, 1:11–1:50, FIGs. 1, 3, 4, and 7, for example. A POSITA would have understood that computer rooms exist within a building. Ex. 1002 ¶ 129.

- **1[a] – “supplying a conditioned fluid inside said building;”**

Nakanishi discloses element 1[a]. Ex. 1002 ¶¶ 130–133.

Nakanishi teaches supplying a conditioned fluid inside said building. Nakanishi discloses “cooling air supplied from the air conditioners 16 is sent to the computer room 10 by fans 14.” Ex. 1005, 2:33–41. The conditioned fluid in Nakanishi is the cooled air that has been conditioned by the air conditioners. Ex. 1005, 1:45–50. The ’277 patent confirms that “cooling fluid” and “conditioned air” are interchangeable terms: “the amount of energy typically required to cool a data center may be relatively reduced by strategically distributing *cooling fluid*, or *conditioned air*, within the data center.” Ex. 1001, 3:42–44 (emphasis added). Additionally, Nakanishi’ “computer room” resides within the building disclosed in the preamble.

- **1[b] – “sensing at least one atmospheric parameter in a plurality of locations inside said building;”**

Nakanishi discloses element 1[b]. Ex. 1002 ¶¶ 134–136.

Nakanishi teaches sensing at least one atmospheric parameter in a plurality of locations inside the building. For example, Nakanishi teaches “[a] plurality of temperature sensors S1 to S9 are located at selected locations in the computer room.” Ex. 1005, 3:42–45, FIGs. 3 and 4. Nakanishi discloses “detected temperatures” by the temperature sensors. Ex. 1005, 3:47–55, 4:10–17. Nakanishi additionally discloses a step of “detecting temperatures at a plurality of predetermined positions in the room by a plurality of temperature arranged at the positions.” Ex. 1005, Claim 11.

- **1[c] – “generating an empirical atmospheric map from the results of said sensing step using software for processing input from said sensing step and for producing output in the form of said empirical atmospheric map;”**

Nakanishi discloses element 1[c]. Ex. 1002, ¶¶ 137–145.

Nakanishi first teaches using the results of the sensing step as an input data used by the software for producing an empirical map. Nakanishi teaches:

“local PC 70 collects temperature values from all the temperature sensors Sn. The local PC 70 sends the collected temperature values and data on the current airflow rate and airflow direction of each fan to the remote PC 82.”

Ex. 1005, 5:31–35. Nakanishi also teaches that “the remote PC 82 performs a simulation on the basis of the temperature values” (as well as air speed and direction

data for each fan) to “obtain a temperature distribution in the computer room.” Ex. 1005, 5:36–40. Nakanishi further teaches generating this temperature distribution of the computer room by using “any suitable temperature-distribution analysis program that is commercially available,” such as “FLOTHERM.” Ex. 1005, 5:42–45. Thus, Nakanishi teaches using software for processing the temperature measurements taken at various locations in the sensing step to generate a temperature distribution.

The temperature distribution of Nakanishi discloses the “empirical atmospheric map” under both Petitioner’s construction of this term and Patent Owner’s construction as used in its infringement contentions in the Related Matters.

As discussed above, Petitioner’s proposed construction of “empirical atmospheric map” refers to “data displayable as a visual representation of an area showing measured atmospheric conditions corresponding to locations.” Nakanishi teaches “*image-displaying* a simulated temperature-distribution state on a monitor . . . [so] it is possible to monitor the temperature of an unattended computer room” Ex. 1005, 7:58–67 (emphasis added). The simulated distribution shows “the temperature distribution in the computer room.” Ex. 1005, 3:47–55. Nakanishi’s disclosure of generating the temperature distribution using “any suitable commercially available temperature distribution analysis simulation program,” such as “FLOTHERM.” Ex. 1005, 5:42–45. A primary purpose of FLOTHERM and similar simulation programs is to create visual or pictorial representations of how

atmospheric condition information corresponds to physical locations within an area. A POSITA would understand that the visual representation of the computer room showing the sensed temperatures corresponding to various locations in the room represents the claimed empirical map. Ex. 1002 ¶ 141.

Nakanishi's temperature distribution also discloses the "empirical atmospheric map" under Patent Owner's broader construction as used in its Infringement Contentions. Ex. 1002, ¶ 143; *cf.* Ex. 1007. As discussed above, Patent Owner applies this claim term to include any atmospheric condition data corresponding to physical locations regardless of whether the information is displayable as a visual representation of the area.

Having established that Nakanishi discloses the empirical map under Petitioner's more narrow construction, it is axiomatic that it also meets the limitation under Patent Owner's broader construction which requires collection of the same information without requiring that data to be displayable. For at least the reasons discussed above, Nakanishi discloses the empirical map using Patent Owner's construction.

- **1[d] – “comparing said empirical atmospheric map to a template atmospheric map; and”**

Nakanishi discloses limitation 1[d]. Ex. 1002 ¶¶ 146–157.

In addition to disclosing generating an “empirical atmospheric map,”

Nakanishi also discloses the template atmospheric map recited in this claim limitation.

Regarding the term “template,” the ’277 patent explains (while referring to temperature as an exemplary atmospheric condition):

“template thermal map could also be termed a master, or model thermal map. The template basically represents a thermal map of an optimally operating data center cooling system.”

Ex. 1001, 6:38–41. Therefore, according to Petitioner, the “template atmospheric map” refers to “data displayable as a visual representation of an area showing model atmospheric conditions corresponding to locations.”

Nakanishi states that “uniform . . . temperature distribution in a computer room” is “an optimum temperature state” of the computer room. *See* Ex. 1005, 1:31–43. Nakanishi teaches achieving a uniform temperature distribution by controlling “at least one of the airflow rate and airflow direction of at least one selected fan covering a position being at a temperature out of the predetermined temperature range.” Ex. 1005, 1:64–2:1. To determine locations in which the air speed and wind direction of a fan should be modified, Nakanishi discloses comparing temperature values and corresponding location coordinates from the simulated temperature distribution (i.e., the empirical atmospheric map) to a corresponding prescribed temperature range for those locations:

The local PC **70** determines whether the temperature of the coordinate

position at which an airflow direction was set in the previous cycle has fallen within the set temperature range.

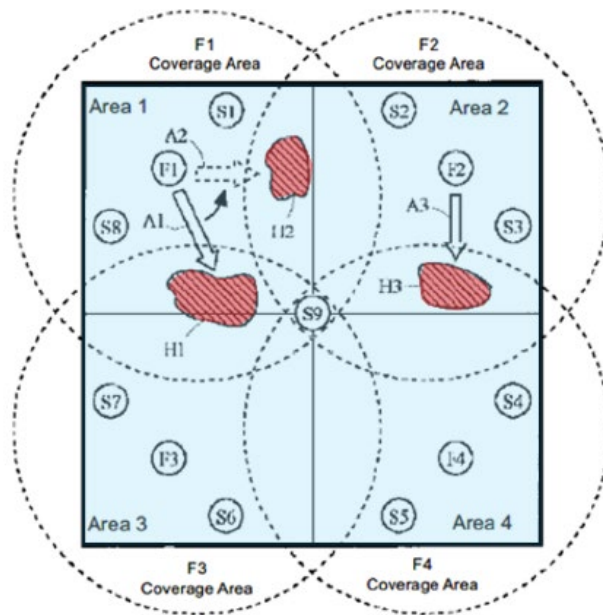
Ex. 1005, 6:14–18; *generally* 6:8–24. In Nakanishi’s system, this assessment is repeated at set time intervals, “and it is possible to quickly and properly control all areas so that temperatures of the areas are kept in the set temperature range.” Ex. 1005, 7:58–67.

As mentioned, the system disclosed in Nakanishi includes the capability of displaying an image of the simulated temperature distribution on a monitor. Ex. 1005, 7:58–67. A POSITA would understand that the image displayed represents a template atmospheric map when all temperatures of the distribution are within the prescribed range. This understanding is consistent with the teachings of the ’277 patent specification, which indicates that “[t]he template can be dynamic, generated either in real-time from current operating conditions, or can be static, generated prior to the comparing step 106” and further teaches that “CFD modeling can be used to output a master, template, or model thermal map to be emulated by adjusting cooling system variables.” Ex. 1001, 6:41–43 and 6:52–54.

The capability of Nakanishi’s system to generate both empirical and template atmospheric maps is also illustrated in its Figures 3 and 4. Figure 4, which depicts the “result of the simulation,” is a visual diagram showing the temperature distribution throughout the computer room. Ex. 1005, 3:47–55, FIG. 4. An annotated

version of Figure 4 of Nakanishi is reproduced below.

[FIG. 4]



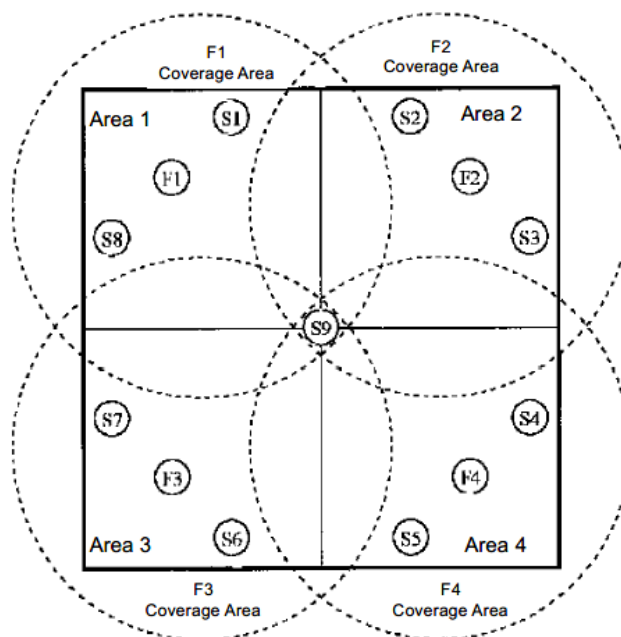
Ex. 1005, FIG. 4 (annotations added).

Figure 4 shows locations in the data center at which temperatures are within the prescribed temperature range (annotated in blue). Figure 4 also shows regions where the temperature distribution is comparatively higher than the prescribed temperature range. Ex. 1005, FIG. 4; 3:47–4:9. These locations are termed “high-temperature region[s]” in Nakanishi and are displayed as shaded regions labeled H1, H2, and H3, respectively (annotated in red). Ex. 1005, FIG. 4; 3:47–4:9.

As discussed above, Nakanishi teaches that an optimal temperature state of the data center is when the temperatures at *all* locations are uniformly within the prescribed temperature range. A POSITA would immediately understand that when

all temperatures are within the prescribed range the displayed image representing the temperature distribution throughout the computer room would lack any shaded regions. Figure 3 of Nakanishi, reproduced below, discloses such an optimal state and represents a template atmospheric map.

[FIG. 3]



Ex. 1005, FIG. 3. Therefore, Nakanishi discloses model temperatures for locations throughout an area and further discloses displaying this information as visual representation of the area and Nakanishi discloses the template atmospheric map of this claim limitation 1[d] patent under Petitioner's proposed construction.

Nakanishi also discloses comparing the empirical atmospheric map (i.e., temperature and coordinate data of the generated temperature distribution) to a template atmospheric map (i.e., the temperature and coordinate data of the prescribed

temperature range) under Petitioner's construction of the "map" terms. Figure 4 illustrates Nakanishi's capability to identify and display the location and size of hot spots as a result of this comparison.

Nakanishi also discloses the template atmospheric map under Patent Owner's expected construction of that term. As discussed above, Patent Owner appears to view this term to refer to a set of model atmospheric conditions corresponding to locations within an area regardless of whether the information is displayable as a visual representation of the area. As discussed above, Nakanishi teaches that an optimally operating data center has a temperature distribution that is within the prescribed temperature range at all locations in the data center. Ex. 1005, 1:45–2:2. Nakanishi describes evaluating temperatures at various coordinates of the simulated temperature distribution to determine whether they are within the prescribed temperature range. Ex. 1005, 5:57–63. A POSITA would understand that this necessarily entails storing data defining the prescribed temperature range at locations throughout data center. Thus, Nakanishi discloses the template atmospheric map of the '277 patent under Patent Owner's expected construction (and would do so even if Nakanishi had not disclosed displaying an image of the template atmospheric map).

Nakanishi discloses that PC 70 determines whether the simulated temperature distribution includes a temperature value outside a preset temperature range. Ex. 1005, 5:57–63. This is also performed for other locations to determine relevant areas

and the fans to be controlled based on identified coordinate locations where temperatures are outside of the set temperature range. Ex. 1005, 6:25–34, 6:41–58. 6:66–7:19. Thus, Nakanishi discloses comparing said empirical atmospheric map to a template atmospheric map under Patent Owner’s expected construction of these terms, which are broader than Petitioner’s constructions.

- **1[e] – “identifying pattern differentials between said empirical and template atmospheric maps.”**

Nakanishi discloses limitation 1[e]. Ex. 1002 ¶¶ 158–163.

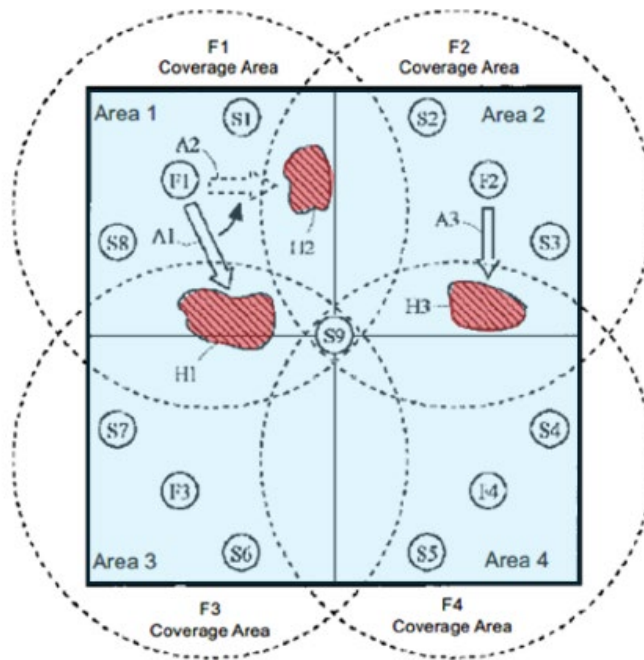
The simulated temperature distribution of Nakanishi, which correlates temperatures to coordinate locations and is displayable as an image, discloses the empirical atmospheric map, and the prescribed temperature range data for the coordinate locations, which is also displayable as a visual representation of the area, discloses the template atmospheric map of the ’277 patent.¹

Nakanishi teaches identifying pattern differentials between the simulated temperature distribution and the corresponding prescribed temperature range for each location. Regions of the data center in which the temperature distribution rises above the prescribed temperature range are identified in Figure 4 of Nakanishi via shade lines and are labeled H1, H2, and H3, respectively. Ex. 1005, FIG. 4; 3:47–4:9. An

¹ As set forth above, this analysis applies to either Petitioner’s or Patent Owner’s construction of either the “template map” or “empirical map” terms.

annotated version of Figure 4 of Nakanishi is provided below, with H1, H2, and H3 annotated in red.

[FIG. 4]



Ex. 1005, FIG. 4 (annotations added). A POSITA would understand that a high temperature region is a pattern differential identified based on a comparison of Nakanishi's disclosed empirical atmospheric map and template atmospheric map.

Ex. 1002 ¶ 162.

2. Claim 2

Each limitation of claim 2 is discussed below, in conjunction with the relevant disclosures of each claim limitation by Nakanishi.

- **2[a] – “The method as claimed in claim 1, further comprising the steps of: determining corrective action to reduce said pattern**

differentials; and”

Nakanishi discloses element 2[a]. Ex. 1002 ¶¶ 165–170.

Nakanishi teaches determining a corrective action to reduce these high temperature regions. Nakanishi’s disclosed system includes local PC 70 running an air conditioning control program “for controlling the entire cooling control process on the basis of temperatures obtained by the simulation program.” Ex. 1005, 4:40–42. With reference to Figure 6, Nakanishi discloses the control process flow in detail and explains how it coordinates adjusting the speed and/or direction of individual air fans in response to temperature conditions associated with designated areas. Ex. 1005, FIG. 6, 4:43–7:67. Fans are controlled to set their direction to the location of high temperature regions as determined by the simulation. Ex. 1005, 6:8–23. For example, Nakanishi teaches that “[w]hen a region H1 is determined to be a high-temperature region as the result of the simulation as shown in FIG. 4, the fan F1 covering the region H1 is controlled so as to supply cooling air toward the high temperature region H1.” Ex. 1005, 3:51–55. This discloses determining a corrective action as recited in claim 2.

The control system can detect when the temperature of a hot spot identified in a previous cycle has fallen back into the set temperature range such that it no longer requires temperature control. Ex. 1005, 6:8–23. For example, when the simulation is performed again and the temperature of region H1 falls within a preset temperature

range and region H2 is determined to be a high temperature region, “fan F1 is then controlled so as to supply cooling air toward the region H2 . . .” Ex. 1005, 3:56–4:9. Because the temperature of region H1 falls within the preset temperature range, H1 is no longer a high temperature region. Thus, Nakanishi discloses reduction (and elimination) of identified pattern differentials.

- **2[b] – “varying at least one of the quantity, quality, and distribution of said conditioned fluid in accord with said determining step.”**

Nakanishi discloses Nakanishi discloses element 2[b]. Ex. 1002 ¶¶ 171–174.

Nakanishi teaches controlling the direction of fans such as “the fan F1 covering this region H1 . . . to supply cooling air toward the high-temperature region H1.” Ex. 1005, 3:47–55.

Nakanishi further discloses “control[ling] the airflow rate” as another corrective action that may be taken to cool high temperature regions. Ex. 1005, 4:18–30. A POSITA would understand that changing the direction and/or airflow rate meets the limitation. Ex. 1002 ¶ 173.

- 3. Claim 3 – “The method as claimed in claim 2, wherein said supplying step comprises the step of operating a system having at least one of a plurality of vents, at least one blower, and at least one source of conditioned air.”**

Nakanishi discloses the limitations of claim 3. Ex. 1002 ¶¶ 175–179.

Nakanishi discloses an “air conditioning system” for a computer room with a

“plurality of under-floor fans 14 [] set to a floor 20.” Ex. 1005, 2:26–33. The air conditioning system also includes “[t]wo air conditioners [that] . . . supply cooling air to a space 18 under the floor. The cooling air from the air conditioners 16 is sent to the computer room 10 by fans 14. The air in the computer room 10 flows to a space 30 in a ceiling through exhaust ports 24 provided at the ceiling 22” Ex. 1005, 2:34–41.

4. Claim 4 – “The method as claimed in claim 3, wherein said determining step comprises correlating at least one of the location, size, and intensity of said pattern differentials to at least one of the location of said plurality of vents, the speed of said at least one blower, and the capacity of said at least one source of conditioned air.”

Nakanishi discloses the limitation of claim 4. Ex. 1002 ¶¶ 180–185.

Nakanishi teaches correlating the location of high and low temperature locations (i.e., pattern differentials) to the speed of at least one blower. For example, in Nakanishi, “the air conditioning control application program identifies an area and a fan to be controlled, on the basis of the coordinate position being at a temperature higher than the set temperature range” Ex. 1005, 6:66–7:3. Areas where the temperatures are higher than the set temperature range are identified as high-temperature regions, and this corresponds to the pattern differentials recited in claims.

Nakanishi’s disclosed system includes variable speed fans. Ex. 1005, 5:22–30. Nakanishi further discloses: “[t]he local PC 70 supplies a signal for designating a fan to be controlled and a signal for designating raising an airflow rate to a level ‘middle’

to the airflow-rate control circuit 76 (FIG. 5).” Ex.1005, 7:19–21. “Therefore, cooling air is supplied to the high-temperature region exceeding the set temperature range.” Ex. 1005, 7:24–27. If the temperature of a location falls below the set temperature range, the air speed of the relevant fan is reduced. Ex. 1005, 6:48–58.

5. Claim 5 – “The method as claimed in claim 4, wherein said varying step comprises adjusting at least one of the opening of said plurality of vents, the speed of said at least one blower, and the output of said at least one source of conditioned air.”

Nakanishi discloses the method of claim 5. Ex. 1002 ¶¶ 186–189.

See discussion above with respect to limitation 2[b].

6. Claim 6 – “The method as claimed in claim 1, wherein said generating step comprises using thermal mapping software to process input from said sensing step and to produce output in the form of said empirical atmospheric map.”

Nakanishi discloses the method of claim 6. Ex. 1002 ¶¶ 190–194.

Nakanishi discloses using thermal mapping software to process data from temperature sensors and produce a thermal map. According to Nakanishi’s teachings, local PC 70 collects temperature values from all temperature sensors and sends this data to a remote PC 82, which performs a simulation based on the temperature values to obtain a temperature distribution in the computer room. Ex. 1005, 5:31–56. Nakanishi recommends using “any suitable commercially available temperature distribution analysis program” and names FLOTHERM as an example. Ex. 1005, 5:42–45. A POSITA would understand that FLOTHERM and other thermal mapping

programs process temperature sensor values to produce a thermal map, which the '277 patent recognizes as a type of empirical atmospheric map. Ex. 1005, 1:53–2:2; 3:47–4:10; 4:32–43; 8:23–36.

7. Claim 7 – “The method as claimed in claim 1, wherein said identifying step comprises using pattern recognition software.”

Nakanishi discloses the method of claim 7. Ex. 1002 ¶¶ 195–198.

As previously explained with respect to limitation 1[e], the high temperature regions of Nakanishi, which disclose the recited pattern differentials, are identified by comparing temperature values from the simulated temperature distribution (i.e., values from the empirical atmospheric map) to the prescribed temperature range for the corresponding locations (i.e., values from template atmospheric map). In Nakanishi, “the local PC 70 including an air conditioning control application program determines whether the temperature distribution values include a temperature out of a preset temperature range.” Ex. 1005, 5:57–60. Therefore, Nakanishi’s system uses software to recognize differences between the simulated temperature distribution pattern and the preset temperature distribution pattern.

8. Claim 8 – “The method as claimed in claim 1, wherein said plurality of locations of said sensing step comprises locations at various elevations within said building.”

Nakanishi discloses the method of claim 8. Ex. 1002 ¶¶ 199–202.

Nakanishi further discloses “[a] plurality of temperature sensors S1 to S9 are

arranged at selected locations of the computer room.” Ex. 1005, 3:42–45. Nakanishi further states that the “[t]hough the number of and positions of temperature sensors are not strict, it is generally preferable to set the sensors on the wall and poles of a computer room at an equal interval.” Ex. 1005, 8:33–37. A POSITA would understand that Nakanishi’s disclosure includes implementations in which temperature sensors are placed at various elevations.

9. Claim 9 – “The method as claimed in claim 1, wherein said sensing step comprises using at least one of temperature sensors, humidity sensors, pressure sensors, particle sensors, smoke sensors, and velocity sensors.”

Nakanishi discloses the method of claim 9. Ex. 1002 ¶¶ 203–206.

Nakanishi discloses using temperature sensors for the sensing step. For example, Nakanishi teaches using “[a] plurality of temperature sensors Sn [to] supply temperature information to a local personal computer (PC) 70 through an analog-digital converter (ADC) 72.” Ex. 1005, 4:11–14.

10. Claim 10 – “The method as claimed in claim 1, wherein the step of generating an empirical atmospheric map comprises generating a map composed of temperature contours that define various isothermal regions.”

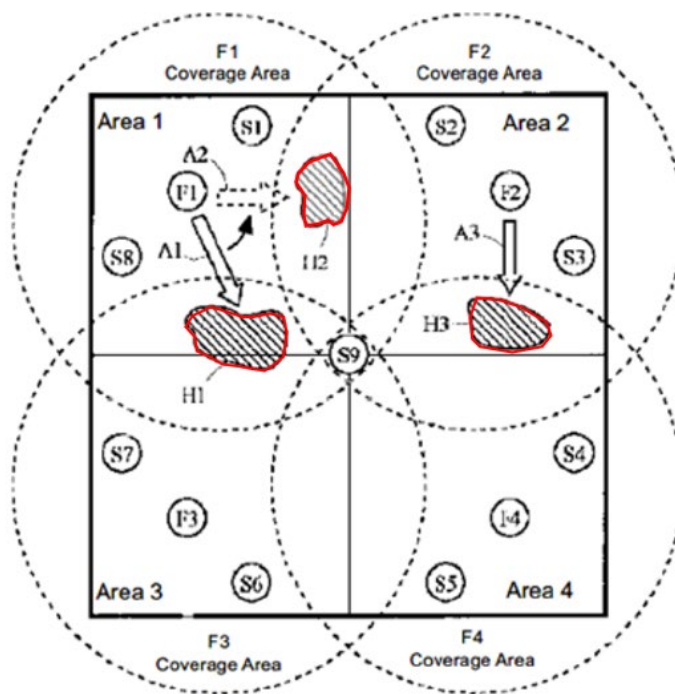
Nakanishi discloses the method of claim 10. Ex. 1002 ¶¶ 207–213.

The ’277 patent reflects the conventional understanding of isothermal regions: “a thermal map is composed of temperature contours that define various isothermal regions, or isotherms, of distinct temperatures. The most severe of these isotherms

are commonly known as ‘hot spots.’” Ex. 1001, 4:44–47.

Nakanishi’s disclosed temperature distribution map includes temperature contours that define isotherms, such as hot spots. For example, high temperature regions (H1, H2, and H3) of a computer room are outlined by contour lines in Figure 4 of Nakanishi. Ex. 1005, FIG. 4; 3:47–4:9. These contour lines are annotated in red in the annotated version of Figure 4 of Nakanishi, provided below.

[FIG. 4]



Additionally, Nakanishi teaches generating the temperature distribution of the computer room using “any suitable temperature-distribution analysis program that is commercially available,” such as “FLOTHERM.” Ex. 1005, 5:42–45. A POSITA would understand that these programs produce maps showing temperature contours that define isothermal regions. Dr. Abraham’s discussion of his 1993 conference paper shows an example of a temperature distribution map produced by FLOTHERM showing temperature contour lines that define hot spots. Ex. 1002, 212; Ex. 1011, 13.

11. Claim 11 – “The method as claimed in claim 1, wherein the step of identifying pattern differentials between said empirical and template atmospheric maps comprises performing at least one of extrapolation and triangulation to determine locations of one or more hot spots.”

Nakanishi discloses the method of claim 11. Ex. 1002 ¶¶ 214–220.

With reference to Figure 6 of Nakanishi indicates that “[i]n block 102, the local PC 70 collects temperature values from all the temperature sensors Sn. The local PC 70 sends the collected temperature values and the data of the current airflow rate and airflow direction of each fan to the remote PC 82.” Ex. 1005, 5:32–36. “In block 104, the remote PC 82 performs a simulation on the basis of the temperature values and the current airflow rate and airflow direction of each fan to obtain a temperature distribution in the computer room.” Ex. 1005, 5:37–56.

In an exemplary embodiment, Nakanishi describes using sensors S1 to S9, “arranged at selected positions of the computer room.” Ex. 1005, 3:42–45. Using nine

sensors provides only limited temperature information. The simulation program generates a more comprehensive evaluation of the temperature distribution throughout the computer room. Ex. 1005, 3:46–55. A POSITA would understand that the simulation program uses techniques such as extrapolation or triangulation based on the temperature measurements to simulate the temperatures at additional locations within the computer room. Moreover, Nakanishi’s disclosure that “the current airflow rate and airflow direction of each fan” are additional inputs sent to the remote PC 82 to simulate the temperature distribution confirm that Nakanishi discloses extrapolating or triangulating based on the empirical temperature measurements to simulate the temperatures of locations in the computer room that lack a temperature sensor. Ex. 1005, 5:31–36. A POSITA would understand that those additional inputs are used to thermodynamically model the effects of air circulation in the process of extrapolating from the measured information to estimate temperatures at locations away from the temperature sensor locations.

Nakanishi further discloses using these simulated temperatures in the temperature distribution to identify the locations of hot spots in the data room. For example, “[i]n block 106, the local PC 70 including an air-conditioning control application program determines whether the temperature distribution values include a temperature out of a preset temperature range.” Ex. 1005, 5:57–63. “In block 126, it is determined whether there is a temperature higher than the upper limit of the set

temperature range.” Ex. 1005, 6:59–65. As explained previously, regions of the computer room where the temperature distribution is above the upper limit of the set temperature range are considered high temperature regions, i.e., hot spots.

The ’277 patent states that “thermal mapping software can extrapolate or triangulate the location of the actual hot spot from the known locations of the temperature sensors.” Ex. 1001, 4:50–52. This reflects the knowledge of a POSITA that a program, such as FLOTHERM, disclosed in Nakanishi extrapolates or triangulates from a select number of measured temperatures to generate a comprehensive temperature distribution and identify the locations of hot spots.

12. Claim 12

Nakanishi discloses the method of claim 12. Ex. 1002 ¶¶ 221–226.

Independent claim 12 corresponds closely to claim 1 with only minor differences:

- Claim 1 refers to cooling a building; Claim 12 refers to cooling “a data center.”
- Claim 1 refers to sensing at least one “atmospheric parameter,” generating an “empirical atmospheric map” and comparing it to a “template atmospheric map”; claim 12 recites essentially the same method with the “atmospheric parameter” being “temperature.” Claim 12 thus recites “sensing temperature,” generating an “empirical thermal

map” and comparing it to a “template thermal map.”

The analyses and opinions set forth in Sections VII.A.1–11 above in relation to claims 1–11 apply equally to claims 12–21, because Nakanishi’s disclosures encompass cooling of a data center (see Ex. 1002 ¶¶ 222–224) and further disclose using temperature as the relevant atmospheric parameter.

With particular reference to claim 12’s use of “data center,” the terms “computer room” and “data center” have been used interchangeably in the field at all relevant times, and a POSITA would recognize that Nakanishi’s cooling system is intended and readily implementable for cooling data centers. The ’277 patent itself confirms that a data center is a type of computer room. Ex. 1001, 3:54–58 (“the racks may be positioned throughout the *data center* according to their anticipated heat loads to thereby enable *computer room air conditioning* (CRAC) units located at various positions throughout the *data center*”). The depiction of a computer room illustrated in Nakanishi’s Figure 1 resembles the data center illustrated in Figure of the Patel reference incorporated by reference into the ’277 patent specification. See Ex. 1002 ¶¶ 91–97.

13. Claim 13

Equivalent limitations to limitations 2[a] and 2[b] and disclosed by Nakanishi. Ex. 1002 ¶¶ 227–232.

14. Claim 14

Equivalent to claim 3 and disclosed by Nakanishi. Ex. 1002 ¶¶ 233–235.

15. Claim 15

Equivalent to claim 4 and disclosed by Nakanishi. Ex. 1002 ¶¶ 236–238.

16. Claim 16

Equivalent to claim 5 and disclosed by Nakanishi. Ex. 1002 ¶¶ 239–241.

17. Claim 17

Equivalent to claim 6 and disclosed by Nakanishi. Ex. 1002 ¶¶ 242–244.

18. Claim 18

Equivalent to claim 7 and disclosed by Nakanishi. Ex. 1002 ¶¶ 245–247.

19. Claim 19

Equivalent to claim 8 and disclosed by Nakanishi. Ex. 1002 ¶¶ 248–250.

20. Claim 20

Equivalent to claim 10 and disclosed by Nakanishi. Ex. 1002 ¶¶ 251–253.

21. Claim 21

Equivalent to claim 11 and disclosed by Nakanishi. Ex. 1002 ¶¶ 254–256.

B. GROUND 2: CLAIMS 1–6, 8–17 AND 19–21 ARE ANTICIPATED BY BISHOP

As set for below, claims 1–6, 8–17, 19–21 are anticipated under §102(e) by Bishop (Ex. 1006). Ex. 1002, ¶¶ 257–386.

1. Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by Bishop.

- **1[pre] – “A method of controlling atmospheric conditions within a building, said method comprising the steps of:”**

If the preamble is limiting, Bishop discloses the preamble in relation to a cooling assembly and system for “cooling at least one electronic module inside a module cabinet.” Ex. 1006, [0039]–[0043]. Additionally, Bishop teaches that these “electronic modules [are] in special ‘critical environment’ computing and warehousing rooms.” Ex. 1006, [0005], which a POSITA would have understood to exist within a building. Ex. 1002 ¶¶ 259–263.

- **1[a] – “supplying a conditioned fluid inside said building;”**

Bishop discloses element 1[a]. Ex. 1002 ¶¶ 264–268.

Bishop discloses a system in which warm air expelled from cabinets inside a building flows into an air-cooling system that reduces its temperature and circulates it back into the critical environment. Ex. 1006, [0080]. Such conditioned air is a conditioned fluid, and the '277 patent confirms that “cooling fluid” and “conditioned air” are interchangeable terms. Ex. 1001, 3:42–44.

- **1[b] – “sensing at least one atmospheric parameter in a plurality of locations inside said building;”**

Bishop discloses element 1[b]. Ex. 1002 ¶¶ 269–272.

Bishop teaches sensing at least one atmospheric parameter in a plurality of locations inside said building. For example, Bishop teaches electronic modules that “monitor their own operating temperatures and to that end have a module temperature sensor located at a critical area (e.g., proximate a heat sensitive component) within the module. In FIG. 2 the temperature sensors in modules 26, 28, 30, 32 and 34 are identified by numerals 36, 38, 40, 42 and 44, respectively.” Ex. 1006, [0081].

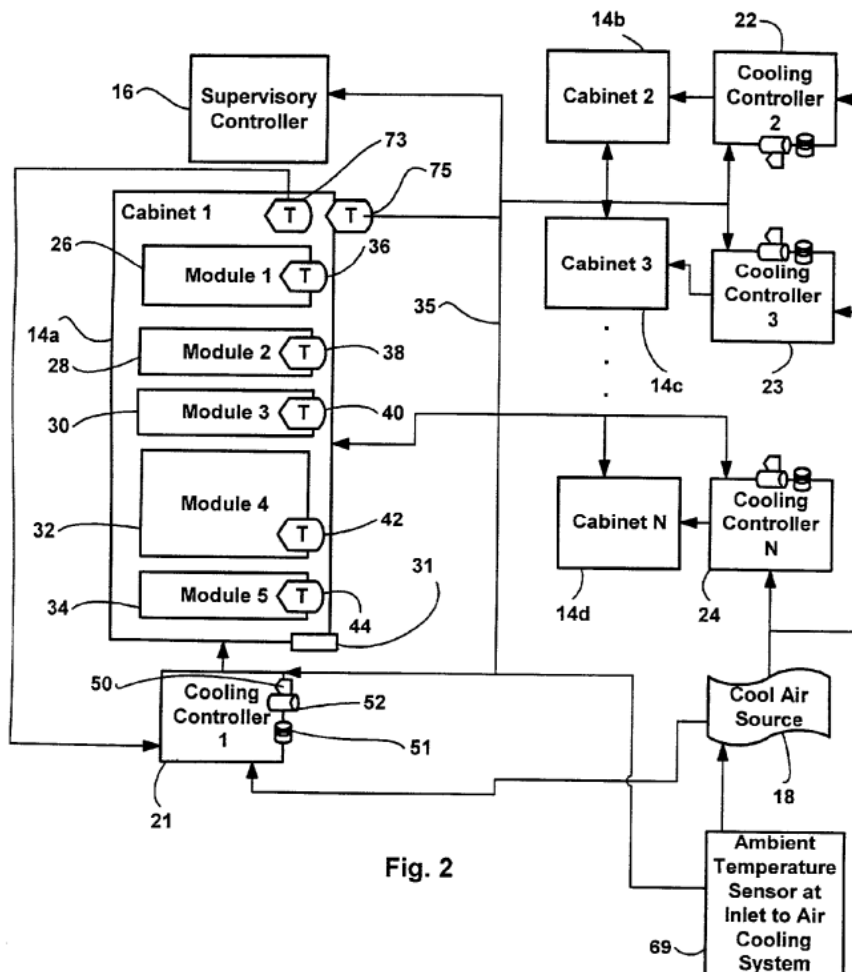


Fig. 2

Ex. 1006, FIG. 2. Bishop also discloses additional temperatures at other various locations, such as inside and outside cabinets (e.g., temperature sensor 73

inside cabinet 14a).

- **1[c] – “generating an empirical atmospheric map from the results of said sensing step using software for processing input from said sensing step and for producing output in the form of said empirical atmospheric map;”**

Bishop discloses element 1[c]. Ex. 1002 ¶¶ 273–280.

As discussed above, a POSITA would understand the “empirical atmospheric map” to mean “data displayable as a visual representation of an area showing measured atmospheric conditions corresponding to locations.” *Supra* Section V.D.

Bishop’s discloses an approach for managing air flow that involves taking “a plurality of temperature readings” and feeding these temperature readings “into a computer that generates a three dimensional map of temperature in the environment as a function of location within the environment” in its discussion of conventional approaches. Ex. 1006, [0017].

Bishop’s improved system teaches such a mapping capability. In particular, the sensors 75 on the outside of each cabinet are linked to supervisory controller 16 and provide an ambient temperature reading at each cabinet location. Bishop describes that “the temperature readings from all of the external sensors (e.g., 75) may be used to generate a three dimensional temperature graph for observation by an environment administrator.” Ex. 1006, [0106]. Such temperature graph provides a visual representation of the critical space that shows ambient temperature, i.e., an

atmospheric condition, information for at least the cabinet locations.

Under Petitioner’s construction of “empirical atmospheric map,” i.e., “data displayable as a visual representation of an area showing measured atmospheric conditions corresponding to locations”), the temperature graph of Bishop discloses this term. Bishop’s temperature graph also discloses said “empirical atmospheric map” under Patent Owner’s broader construction as used in its Infringement Contentions, which includes any atmospheric condition data corresponding to physical locations regardless of whether the information is displayable as a visual representation of the area.

Having established that Bishop discloses the empirical map under Petitioner’s narrower construction, it is axiomatic that Bishop also satisfies the limitation under Patent Owner’s broader construction, which requires collection of the same information without requiring that data to be displayable.

- **1[d] – “comparing said empirical atmospheric map to a template atmospheric map; and”**

Bishop discloses limitation 1[d]. Ex. 1002 ¶¶ 281–294.

In addition to disclosing generating an “empirical atmospheric map,” Bishop also discloses the template atmospheric map recited in this claim limitation.

Regarding the term “template,” the ’277 patent explains (while referring to temperature as an exemplary atmospheric condition):

“template thermal map could also be termed a master, or model thermal map. The template basically represents a thermal map of an optimally operating data center cooling system.”

Ex. 1001, 6:38–41. Therefore, according to Petitioner, the “template atmospheric map” refers to “data displayable as a visual representation of an area showing model atmospheric conditions corresponding to locations.”

Bishop teaches that “[i]deally the environment temperature throughout the critical environment should be maintained at the same temperature so that if modules are swapped into or out of a cabinet the modules will always be exposed to the same optimal ambient temperature.” Ex. 1006, [0012]. Bishop’s control system receives temperature readings from multiple locations corresponding to electronics modules and cabinets and compares measured temperature values to “threshold temperatures to determine if [the measured] temperatures are within an optimal range.” Ex. 1006, [0082]. The two threshold temperatures are the low threshold temperature (T_l) and the high threshold temperature (T_h). Ex. 1006, [0083].

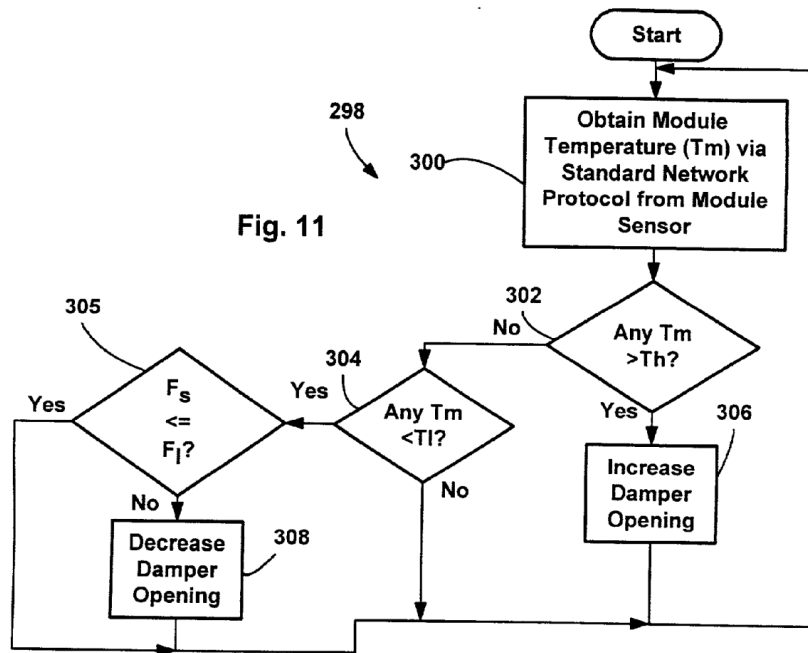
Therefore, Bishop teaches that an optimally operating data center is one in which all measured temperatures (and the corresponding three-dimensional map) are above the low threshold temperature (T_l) and below the high threshold temperature (T_h) at all locations. Bishop discloses that usage of thermal mapping software tools to identify “hot spots” and evaluate how cooling system adjustments would affect the temperature distribution were generally known at the time, Ex. 1006, [0017], and that

its system could generate a “three dimensional temperature graph for observation by an environment administrator.” Ex. 1006, [0106]. Combining these teachings, the displayed thermal map in Bishop would lack any hot spots when all temperatures were between the low threshold temperature (T_l) and the high threshold temperature (T_h).

Therefore, Bishop discloses a set of model atmospheric conditions (i.e., temperature range of T_l – T_h) that are displayable as a visual representation and correspond to locations (i.e., all locations in a data center), which corresponds to a POSITA’s understanding of the plain and ordinary meaning of “template atmospheric map.”

Bishop also discloses the template atmospheric map under Patent Owner’s expected construction of this term, which refers to a set of model atmospheric conditions corresponding to locations within an area regardless of whether the information is displayable as a visual representation of the area.

The control logic of Bishop’s system compares measured temperatures to low threshold temperature (T_l) and high threshold temperature (T_h) and adjusts damper openings until all measured temperatures are between the T_l and T_h . Ex. 1006, FIG. 11 (reproduced below).



Ex. 1006, FIG. 11. For example, Bishop teaches that when a measured temperature exceeds the high threshold temperature (T_h), a damper opening should be increased “to increase the cooling air flow to the corresponding cabinet.” Ex. 1006, [0085]. When any module temperature is below a threshold temperature, a controller decreases a damper opening to reduce cooling air flow to the cabinet. Ex. 1006, [0084].

Additionally, there is no corresponding language in Claim 1 that indicates that the comparison of step 1[d] or the identification of step 1[e] be performed “using software,” like step 1[c] for generating an empirical atmospheric map. Claim 1 can be further evaluated from the standpoint that the last two recited steps, including comparing computer-generated thermal maps as a way of evaluating corrective adjustments made to a cooling system, may be performed manually, which Bishop

also teaches.

In particular, Bishop discloses: “a plurality of temperature readings . . . are then fed into a computer that generates a three dimensional map of temperature in the environment as a function of location within the environment. Where ‘hot spots’ occur the administrator then adjusts tile baffles. Thereafter the administrator again collects temperature readings throughout the environment and causes the computer to generate the map to see the results.” Ex. 1006, [0017]. For an administrator to be able to visually observe hot spots in the three-dimensional map of measured temperatures, Bishop necessarily discloses a visual or pictorial representation of the model temperature range that can be compared to the three-dimensional map of measured temperatures.

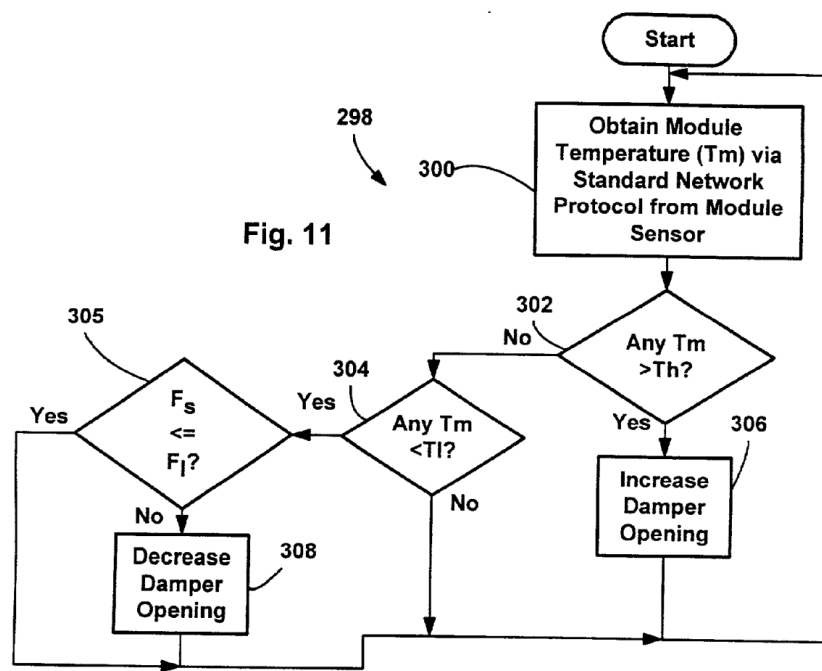
- **1[e] – “identifying pattern differentials between said empirical and template atmospheric maps.”**

Bishop discloses limitation 1[e]. Ex. 1002 ¶¶ 295–299,

The '277 patent explains that “thermal hot spots” are an example of pattern differentials that may be identified when comparing empirical and template atmospheric maps “in the case of data center cooling.” Ex. 1001, 6:64–66.

Bishop teaches identifying pattern differentials between the three-dimensional map and the optimal temperature range that is bounded by the low threshold temperature (T_l) and the high threshold temperature (T_h) and its visual representation.

Further, in block 302 of Figure 11, Bishop discloses identifying hot spots where the “supervising controller 16 compares each module temperature T_m to a threshold temperature that is at the high end of an acceptable temperature range” and controlling a damper to regulate air flow and correct the hot spot. Ex. 1006, [0083]–[0085].



Ex. 1006, FIG. 11. Bishop also teaches the conventional technique of manually identifying pattern differentials between thermal maps generated at different times for the purpose of identifying hot spots and adjusting the cooling system operation to eliminate the hot spots. Ex. 1006, [0017].

2. Claim 2

Each limitation of claim 2 is discussed below, in conjunction with the relevant disclosures of each claim limitation by Bishop.

- **2[a] – “The method as claimed in claim 1, further comprising the steps of: determining corrective action to reduce said pattern differentials; and”**

Bishop discloses element 2[a]. Ex. 1002 ¶¶ 301–305.

Bishop discloses identifying “hot spot” pattern differentials by comparing and determining whether measured temperatures associated with an empirical atmospheric map are not within the preset optimal range established by a model temperature ranged defined by low (T_l) and high (T_h) threshold temperatures. *Supra* Section VII.B.1.1[c]–1[e]; Ex. 1006, [0017], [0082]–[0085].

Bishop further teaches determining a corrective action to reduce these hot spots, such that “where ‘hot spots’ occur the administrator then adjusts tile baffles” to increase the flow of cooling air towards the hot spots, Ex. 1006, [0017], or where the measured temperature of a module exceeds the high threshold temperature (T_h), Bishop teaches “increas[ing] the damper opening to increase cooling air flow to the corresponding” module to diminish the hot spot. Ex. 1006, [0085].

- **2[b] – “varying at least one of the quantity, quality, and distribution of said conditioned fluid in accord with said determining step.”**

Bishop discloses element 2[b]. Ex. 1002, ¶¶ 306–309.

As explained above, a POSITA would understand that cooling air is one type of conditioned fluid, *supra* Section VII.B.1.1[a], such that varying the flow of cooling air towards hot spots to diminish or eliminate the hot spots, as disclosed in element

2[a], varies the quantity of conditioned fluid in accord with said determining step.

3. Claim 3 – “The method as claimed in claim 2, wherein said supplying step comprises the step of operating a system having at least one of a plurality of vents, at least one blower, and at least one source of conditioned air.”

Bishop discloses the limitations of claim 3. Ex. 1002 ¶¶ 310–316

Bishop discloses a system having a plurality of vents provided in any of various housing 106 walls, including “opposing lateral walls 108 and 110, a back wall 112 . . . , a bottom wall 114, a top wall 116 and plenum door assembly 118” to allow venting of heat to the ambient.” Ex. 1006, [0067]; Figure 2, Figure 5 (both reproduced below). Other components include a baffle wall 144 that “when assembled with other plenum components, is vertically arranged and forms a plurality of openings” and a plurality of brackets 176 that “cooperate to mount baffle assembly 144 against wall assembly 142 for slideable movement to any of several vertical positions” Ex. 1006, [0071]–[0074]. Thus, Bishop discloses a system having a plurality of vents.

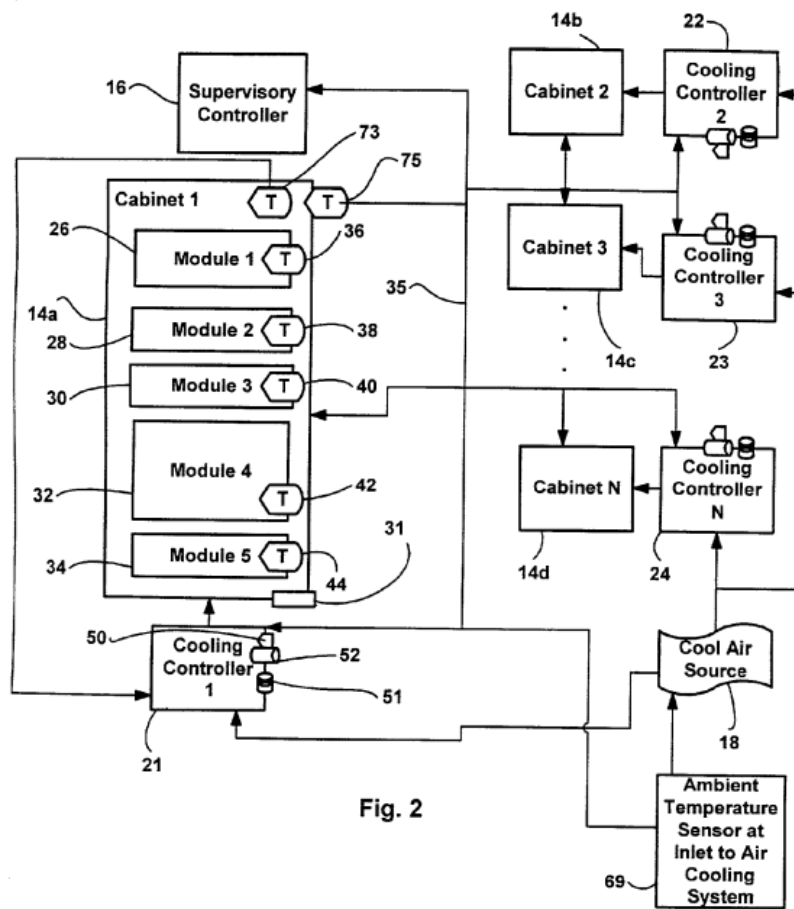
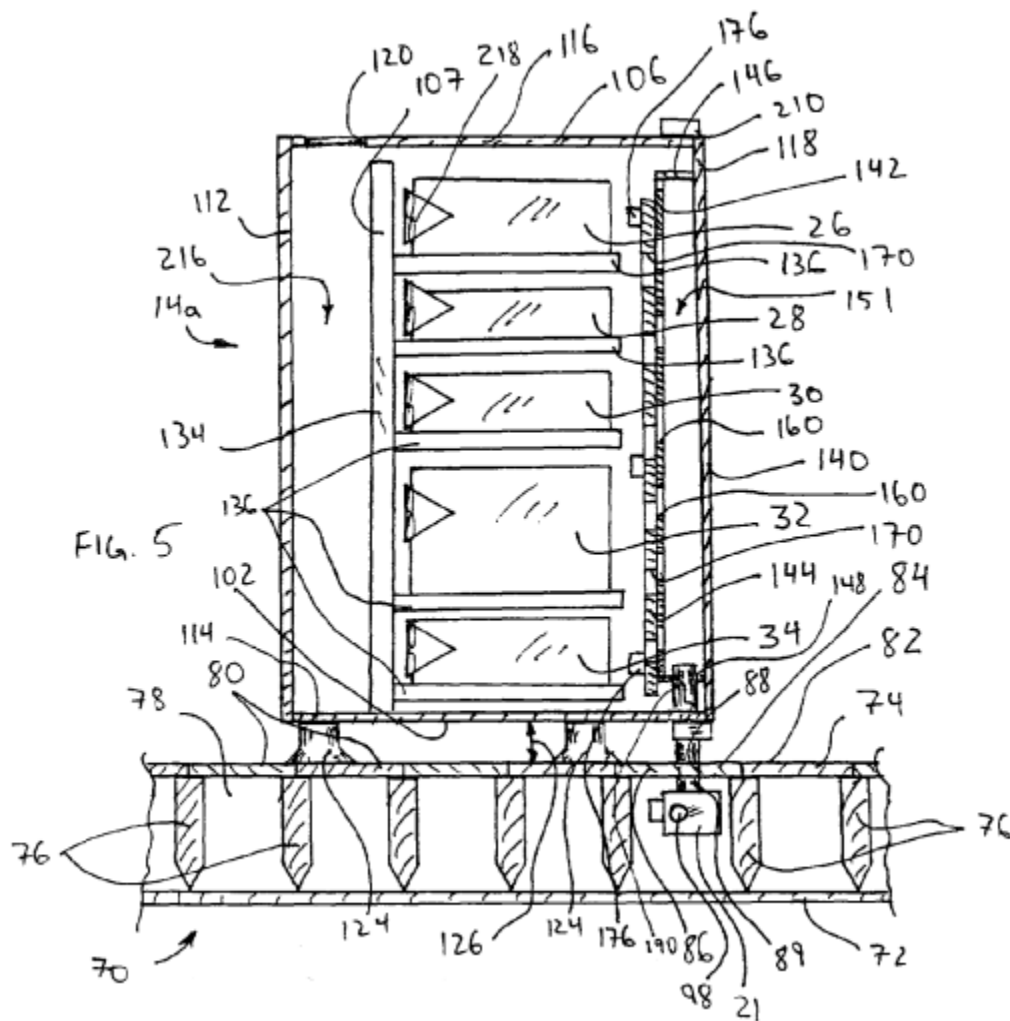


Fig. 2

Ex. 1006, FIG. 2.



Ex. 1006, FIG. 5.

Bishop further discloses the systems having blowers (i.e., fans), for example: “although not illustrated, a fan may be provided within outlet 120 to draw warm air out of housing 106,” Ex. 1006, [0068], or additionally, the electronic modules 26, 28, 30, 32 and 34 each include one or more small fans 218 facing frame member 134 and air circulation space 216 so that “when the fans operate, cool air is pulled through each entire electronic module and over heat generating components therein prior to

being expelled into space 216.” Ex. 1006, [0078]–[0080].

Bishop further discloses that a “cooling air source 18 provides cool air within space 78,” Ex. 1006, [0063], such air source being synonymous with and a type of conditioned fluid. Thus, Bishop discloses operating a system having all three elements of Claim 3.

4. Claim 4 – “The method as claimed in claim 3, wherein said determining step comprises correlating at least one of the location, size, and intensity of said pattern differentials to at least one of the location of said plurality of vents, the speed of said at least one blower, and the capacity of said at least one source of conditioned air.”

Bishop discloses the limitation of claim 4. Ex. 1002 ¶¶ 317–323.

Bishop teaches correlating the location of high and low temperature locations (i.e., “hot spot” pattern differentials) to the speed of at least one blower. For example, as summarized in Figure 11, Bishop teaches that the control logic identifies when a measured temperatures associated with a cabinet is outside of the optimal range and responds by manipulating the damper through which cooling air flows to that cabinet. The damper functions as a vent by controlling the amount of air that flows to the cabinet. Bishop also teaches the conventional approach of manually correlating the location of a hot spot to the location of baffles, such that “[w]here ‘hot spots’ occur the administrator then adjusts tile baffles.” Ex. 1006, [0017].

5. Claim 5 – “The method as claimed in claim 4, wherein said varying step comprises adjusting at least one of the opening of said plurality of

vents, the speed of said at least one blower, and the output of said at least one source of conditioned air.”

Bishop discloses the limitation of claim 5. Ex. 1002 ¶¶ 324–328.

Bishop teaches adjusting opening vents to vary the quantity of conditioned fluid delivered to an identified hot spot. For example, as performed automatically by the system, where “controller 21 may control its corresponding damper simply as a function of one or more temperatures in cabinet 14a[or, i]n the alternative, controller 21 may receive one or more temperature readings from within cabinet, determine a desired flow rate as a function of the temperatures and then modify damper position to achieve the desired flow rate.” Ex. 1006, [0108], FIG. 11; *see also* [0038], [0096], [0100]. Bishop alternatively teaches the conventional approach of “the administrator then adjust[ing] tile baffles . . . [w]here ‘hot spots’ occur.” Ex. 1006, [0017].

6. Claim 6 – “The method as claimed in claim 1, wherein said generating step comprises using thermal mapping software to process input from said sensing step and to produce output in the form of said empirical atmospheric map.”

Bishop discloses the method of claim 6. Ex. 1002 ¶¶ 329–332.

Bishop discloses generating three dimensional maps by a computer or a controller, which necessarily execute software to generate these. Ex. 1006, [0017], [0106].

7. Claim 8 – “The method as claimed in claim 1, wherein said plurality of locations of said sensing step comprises locations at various elevations within said building.”

Bishop discloses the method of claim 8. Ex. 1002 ¶¶ 333–337.

Bishop teaches that external sensors are located throughout cabinets, shown exemplarily in Figure 2, so that “the temperature readings from all of the external sensors (e.g., 75) may be used to generate a three dimensional temperature graph for observation by an environment administrator.” Ex. 1006, [0106]. The temperature sensors 36, 38, 40, 42, 44, and 75 are at various elevations, as may be appreciated in Figure 2.

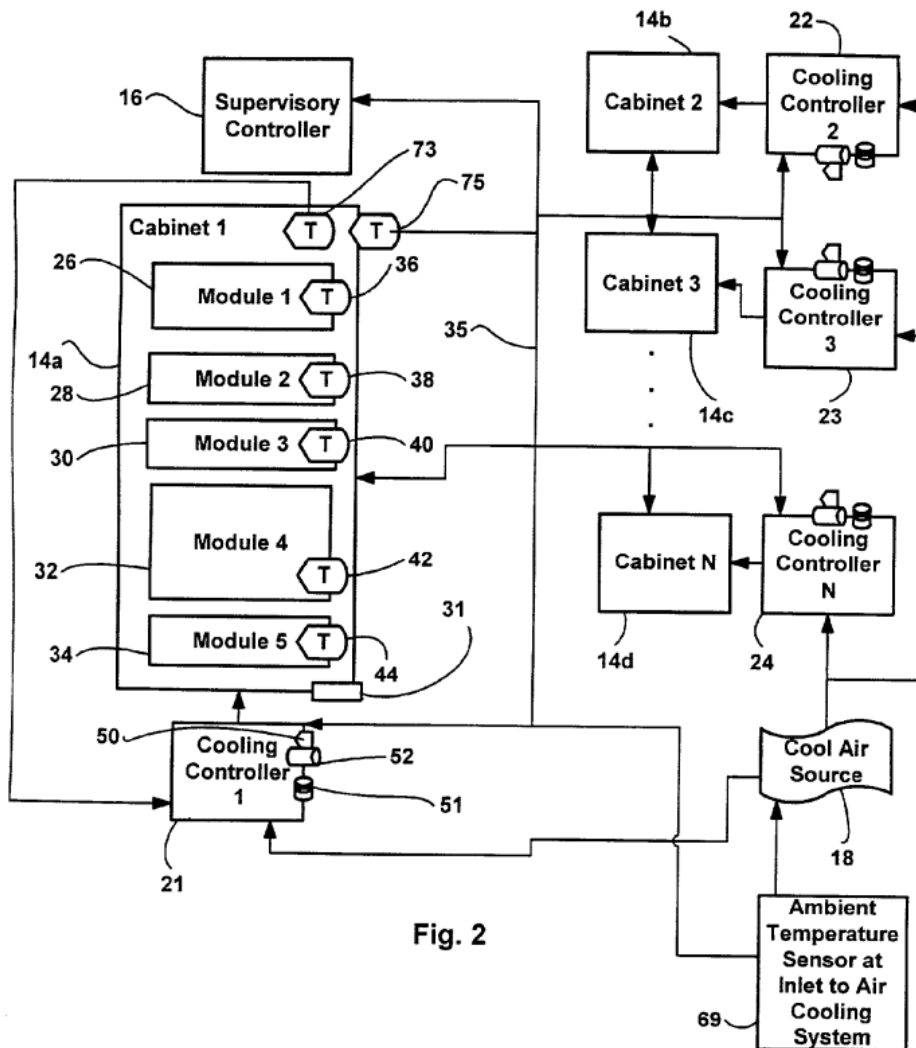


Fig. 2

Ex. 1006, FIG. 2.

8. Claim 9 – “The method as claimed in claim 1, wherein said sensing step comprises using at least one of temperature sensors, humidity sensors, pressure sensors, particle sensors, smoke sensors, and velocity sensors.”

Bishop discloses the method of claim 9. Ex. 1002 ¶¶ 338–341.

Bishop discloses using temperature sensors for the sensing step, for example, the temperature sensors 36, 38, 40, 42, 44, and 75 shown in Figure 2 of Bishop.

9. Claim 10 – “The method as claimed in claim 1, wherein the step of generating an empirical atmospheric map comprises generating a map composed of temperature contours that define various isothermal regions.”

Bishop discloses the method of claim 10. Ex. 1002 ¶¶ 342–347.

As explained above, Bishop discloses the method of claim 1.

The '277 patent reflects the conventional understanding of isothermal regions: “a thermal map is composed of temperature contours that define various isothermal regions, or isotherms, of distinct temperatures. The most severe of these isotherms are commonly known as ‘hot spots’.” Ex. 1001, 4:44–47.

Bishop teaches feeding measured temperatures “into a computer that generates a three dimensional map of temperature in the environment as a function of location within the environment,” such map displaying non-even “hot spots” areas that deviate from other measured temperatures. Ex. 1006, [0017]. Tile baffles may be adjusted where these hot spots occur to “adjust air flow . . . and even out environmental temperature.” Ex. 1006, [0017]. Such thermal mapping where non-even hot spots areas with elevated temperatures are identified across a space with homogenous temperatures refers to a temperature contour defining an isothermal region.

10. Claim 11 – “The method as claimed in claim 1, wherein the step of identifying pattern differentials between said empirical and template atmospheric maps comprises performing at least one of extrapolation and triangulation to determine locations of one or more hot spots.”

Bishop discloses the method of claim 11. Ex. 1002, ¶¶ 348–353.

Bishop teaches taking a plurality of temperature readings at relatively small spatial intervals throughout a critical environment and then feeding the readings “into a computer that generates a three dimensional map of temperature in the environment as a function of location within the environment” and displays ‘hot spots’. Ex. 1006, [0017]. Because the sensors are spaced apart, the computer would necessarily extrapolate or triangulate from the measured temperature values to generate such three-dimensional map for those areas that were not empirically measured. Further, since the three-dimensional maps display hot spots, the performed extrapolations or triangulations are used to determine the locations of hot spots. Ex. 1006, [0017].

The ’277 patent confirms that the thermal mapping software used by the computer to generate the three-dimensional maps of temperature in Bishop extrapolates or triangulates based on the measured temperature values to determine locations of one or more hot spots. For example, the ’277 patent states that “thermal mapping software can extrapolate or triangulate the location of the actual hot spot from the known locations of the temperature sensors.” Ex. 1001, 4:50–52. Thus, the ’277 patent acknowledges that the thermal mapping software used in Bishop extrapolates or triangulates the location of hot spots based on measured temperatures.

11. Claim 12

Bishop discloses the method of claim 12. Ex. 1002 ¶¶ 354–359.

As discussed above, independent claim 12 corresponds closely to claim 1 with

only minor differences. The analyses and opinions set forth in Sections VII.B.1–11 above in relation to claims 1–11 apply equally to claims 12–21, because Bishop’s disclosures encompass cooling of a data center (*see* Ex. 1002 ¶¶ 355–357) and further disclose using temperature as the relevant atmospheric parameter. Bishop expressly refers to the environments referenced therein as “data centers.” Ex. 1006, [0032].

12. Claim 13

The limitations are equivalent to limitations 2[a] and 2[b] and are disclosed by Bishop. Ex. 1002 ¶¶ 360–365.

13. Claim 14

Equivalent to claim 3 and is disclosed by Bishop. Ex. 1002 ¶¶ 366–368.

14. Claim 15

Equivalent to claim 4 and disclosed by Bishop. Ex. 1002 ¶¶ 369–371.

15. Claim 16

Equivalent to claim 5 and disclosed by Bishop. Ex. 1002 ¶¶ 372–374.

16. Claim 17

Equivalent to claim 6 and disclosed by Bishop. Ex. 1002 ¶¶ 375–377.

17. Claim 19

Equivalent to claim 8 and disclosed by Bishop. Ex. 1002 ¶¶ 378–380.

18. Claim 20

Equivalent to claim 10 and disclosed by Bishop. Ex. 1002 ¶¶ 381–383.

19. Claim 21

Equivalent to claim 11 and disclosed by Bishop. Ex. 1002 ¶¶ 384–386.

**C. GROUND 3: CLAIMS 1–21 ARE OBVIOUS OVER NAKANISHI
IN VIEW OF BISHOP**

As set for below, claims 1–21 are rendered obvious under § 103 over Nakanishi (Ex. 1005) as modified in view of Bishop (Ex. 1006). Ex. 1002, ¶¶ 387–509. The modifications and combinations discussed above regarding these references are referred to herein as the “Nakanishi/Bishop Combination.”

1. Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by the Nakanishi/Bishop Combination.

- **1[pre]**

If the preamble is limiting, the Nakanishi/Bishop Combination renders obvious the preamble for the same reasons provided herein for each individual reference. Ex. 1002 ¶¶ 396–397.

- **1[a]**

The Nakanishi/Bishop Combination renders obvious element 1[a] for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 398–399.

- **1[b]**

The Nakanishi/Bishop Combination renders obvious element 1[b] for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 400–401.

- **1[c]**

The Nakanishi/Bishop Combination renders obvious element 1[c] for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 402–403.

- **1[d]**

The Nakanishi/Bishop Combination renders obvious element 1[d] for the same reasons herein provided for each individual reference, including its relation to Bishop's disclosed preferred embodiment and Bishop's Background section discussing conventional practices for monitoring, assessing and adjusting data center cooling systems. Ex. 1002 ¶¶ 404–416.

To the extent that limitation 1[d] is interpreted to require comparing two visual map *images*, i.e., comparing an empirical atmospheric map *image* to a template atmospheric map *image*, and the Board does not find that Nakanishi discloses this limitation, this would have been obvious to a POSITA based on the combined teachings of Nakanishi and Bishop and a POSITA's knowledge of conventional technologies, tools, and practices, and Dr. Abraham had personally done this before the priority date of the '277 patent.

Nakanishi and Bishop both disclose cooling systems that generate temperature maps using various techniques and use known thermal mapping software to identify hot spots in the temperature maps. To do this, Nakanishi teaches comparing the temperature and coordinate data of the generated temperature distribution (data that Nakanishi teaches is displayable as a map image) to temperatures and coordinate data of a prescribed temperature range (data that Nakanishi also teaches is displayable as a map image). While Nakanishi may not expressly describe performing a visual comparison of the displayed simulated (empirical) map image to the displayed template map image, Bishop describes such conventional practice of comparing computer generated thermal maps to evaluate adjustments made to its cooling system.

Accordingly, the step of using Nakanishi's system to compare an image representing the temperature distribution throughout the computer room (i.e., empirical atmospheric map) to an image representing the prescribed temperature range throughout the computer room (i.e., template atmospheric map) to identify locations where current temperatures are not within the prescribed range and determine the corrective actions would have been obvious to a PHOSITA in view of Bishop, for at least the following reasons: (i) Nakanishi's system already has the capability to generate thermal map images and teaches such visualizations (both empirical and template) as an effective way to monitor and assess computer room

temperature conditions; (ii) Bishop is analogous art and teaches visually comparing thermal maps for identifying hot spots, which is the same purpose of Nakanishi; (iii) software for performing such visual comparisons and identifying hot spots was commercially available at the time and a routinary step for a PHOSITA wanting to automatize the process; and (iv) the step of performing a visual comparison would have been fairly low-cost and readily interchangeable with comparing data coordinates providing a PHOSITA reasonable expectation of success in attempting such step.

- **1[e]**

The Nakanishi/Bishop Combination discloses element 1[e] for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 417–422.

As with limitation 1[d], to the extent that limitation 1[e] is interpreted to require comparing two visual map *images*, i.e., comparing an empirical atmospheric map *image* to a template atmospheric map *image*, and the Board does not find that Nakanishi discloses this limitation, this would have been obvious to a POSITA based on the combined teachings of Nakanishi and Bishop and a POSITA’s knowledge of conventional technologies, tools, and practices, for at least the same reasons stated in Section VII.C.1.1[d]. Pattern differentials correspond to “hot spots,” i.e., regions where current temperatures are above the desired temperature range.

Bishop expressly teaches generating a thermal map when the operational state of the cooling system is adjusted and visually inspecting the thermal maps to see how each adjustment affects the temperature distribution to identify said hot spots. For the reasons stated in Section VII.C.1.1[d], it would have been obvious to a POSITA using Nakanishi's system to compare an image representing the current temperature distribution throughout the computer room to an image representing the desired temperature range throughout the computer room to identify hot spot locations where current temperatures are not within the prescribed range so that corrective action can be taken.

2. Claim 2

The Nakanishi/Bishop Combination renders obvious elements 2[a] and 2[b] for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 423–430.

3. Claim 3

The Nakanishi/Bishop Combination renders obvious claim 3 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 431–435.

4. Claim 4

The Nakanishi/Bishop Combination renders obvious claim 4 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 436–440.

5. Claim 5

The Nakanishi/Bishop Combination renders obvious claim 5 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 441–445.

6. Claim 6

The Nakanishi/Bishop Combination renders obvious claim 6 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 446–450.

7. Claim 7

The Nakanishi/Bishop Combination discloses and renders obvious claim 7 for the same reasons herein provided for Nakanishi. Ex. 1002 ¶¶ 451–456.

Pattern recognition capabilities were known and available to a POSITA at the time of invention of the '277 patent, and a POSITA would have been motivated to incorporate such features with Nakanishi's cooling system to automate the process of comparing empirical atmospheric map images to template map images. Such combination would have been a low-cost and readily interchangeable step, such that a POSITA would have had a reasonable expectation of success for providing more accurate and consistent hot spot identification and cooling system corrections, which is critical for data centers and other computing that typically operate on a continual basis. Such automatization would also have generated cost savings and improved computing systems' performance by detected and corrected undesirable environmental conditions more quickly, and would have been easily implementable,

as Nakanishi's cooling system was already automated with control software that compared simulated temperature values at various locations to adjust ventilation systems.

8. Claim 8

The Nakanishi/Bishop Combination renders obvious claim 8 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 457–461.

9. Claim 9

The Nakanishi/Bishop Combination renders obvious claim 9 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 462–466.

10. Claim 10

The Nakanishi/Bishop Combination renders obvious claim 10 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 467–471.

11. Claim 11

The Nakanishi/Bishop Combination renders obvious claim 11 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 472–476.

12. Claim 12

The Nakanishi/Bishop Combination renders obvious claim 12 for the same reasons herein provided for each individual reference. Ex. 1002 ¶¶ 477–479.

As discussed above, independent claim 12 corresponds closely to claim 1 with only minor differences. The analyses and opinions set forth in Sections

VII.A.1–11 and VII.B.1–11 apply equally to claims 12–21, because Nakanishi’s and Bishop’s disclosures encompass cooling a data centers (see Ex. 1002 ¶¶ 222–224; Ex. 1002 ¶¶ 355–357) and further disclose using temperature as the relevant atmospheric parameter. Bishop expressly refers to the environments referenced therein as “data centers,” Ex. 1006, [0032], and Nakanishi refers to a “computer room,” which is another term “data center.”

13. Claim 13

The limitations are equivalent to limitations 2[a] and 2[b] and are rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 480–485.

14. Claim 14

Equivalent to claim 3 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 486–488.

15. Claim 15

Equivalent to claim 4 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 489–491.

16. Claim 16

Equivalent to claim 5 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 492–494.

17. Claim 17

Equivalent to claim 6 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 495–497.

18. Claim 18

Equivalent to claim 7 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 498–500.

19. Claim 19

Equivalent to claim 8 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 501–503.

20. Claim 20

Equivalent to claim 10 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 504–506.

21. Claim 21”

Equivalent to claim 11 and is disclosed and rendered obvious by the Nakanishi/Bishop Combination. Ex. 1002 ¶¶ 507–509.

VIII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION UNDER SECTIONS 314(a) OR 325(d)

The Board should decline to exercise its discretion to not institute trial under Sections 314(a) or 325(d).

A. Section 314(a)

The parties are both involved in the *Vertiv Declaratory Judgment Action*, but

that litigation is at an early stage. As explained below, the factors identified by the Board in *Fintiv* favor institution. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5–6 (PTAB Mar. 20, 2020) (precedential).

Factor 1: This factor is neutral where no party has requested a stay. *See, e.g., Nokia of America Corporation f/k/a Alcatel-Lucent USA Inc. et al v. Wireless Alliance, LLC*, PTAB-IPR2024-00619, Paper 19 at 9 (PTAB Sept. 13, 2024) (granting institution); *Google LLC v. Flypsi, Inc.*, PTAB-IPR2023-00361, Paper 9 at 7–8 (PTAB July 31, 2023) (same).

Factor 2: Jury selection has been scheduled for April 6, 2026, in the *Lead Case*. *Lead Case*, Dkt. 60 at 2. Any final written decision would likely be due by approximately August 26, 2026, making any final decision in this proceeding statutorily due less than four months after trial. Thus, factor 2 weighs against discretionary denial. *See, e.g., Ericsson Inc. et al v. XR Communications LLC d/b/a Vivato Technologies*, IPR2024-00868, Paper 8 at 29 (PTAB Dec. 13, 2024) (“[T]rial is currently scheduled less than five months before the Final Written Decision in this proceeding is due We determine that the facts pertaining to this factor weigh against exercising our discretion to deny institution under § 314(a).”).

Factor 3: To date, the parties have invested little in the *Vertiv Declaratory Judgment Action*. Claim construction proceedings have not begun, there have been no depositions, and expert reports have not been exchanged. “Because of the

significant investment that remains in the parallel district court proceeding, . . . factor 3 weighs against exercising discretion to deny institution.” *Hewlett Packard Enterprise Company et al v. Cobblestone Wireless, LLC*, IPR2024-00707, Paper 17 at 49 (PTAB Sept. 24, 2024).

Factor 4: If trial is instituted, Petitioner does not intend to assert in the *Vertiv Declaratory Judgment Action* that the claims of the ’277 patent are invalid on the same grounds raised during this proceeding. *Ericsson Inc. et al v. XR Communications LLC d/b/a Vivato Technologies*, IPR2024-00868, Paper 8 at 30 (PTAB Dec. 13, 2024) (explaining that such a stipulation “mitigates to some degree the concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions.”). Additionally, Petitioner has not raised any issues of invalidity in the *Vertiv Declaratory Judgment Action* at this time.

Moreover, Petitioner, as an Intervenor, previously served invalidity contentions in the prior *Digital Realty* and *CyrusOne* actions that have since been dismissed. Those contentions were based on several prior art references not in the Petition, as well as invalidity based on non-patent/publication prior art. Accordingly, “there is not complete overlap in the issues. . . . [and thus,] this fourth factor does not favor discretionary denial.” *SAP America, Inc. v. Isix IP LLC*, IPR2024-00615, Paper 9 at 25 (PTAB Sept. 26, 2024).

Factor 5: The parties to this proceeding and the *Vertiv Declaratory Judgment*

Action are the same. Patent Owners are plaintiffs in *TierPoint* and *DataBank* in which they assert the '277 patent against Vertiv's customers, but Vertiv is not a party to those actions.

Factor 6: This Petition presents “compelling” arguments for unpatentability of the challenged claims for the reasons discussed above. *See* USPTO Memorandum, Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation, 4–5 (June 21, 2022) (“the PTAB will not deny institution based on *Fintiv* if there is compelling evidence of unpatentability”); *see also CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 3–5 (Feb. 27, 2023) (precedential) (evidence is compelling when it is “highly likely that the petitioner would prevail with respect to at least one challenged claim”). Thus, institution is consistent with the significant public interest against “leaving bad patents enforceable.” *Thryv, Inc v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020).

The balance of considerations under the *Fintiv* factors strongly favors institution of trial.

B. Section 325(d)

The *Becton Dickinson* factors weigh in favor of institution under 35 U.S.C. §325(d). This Petition relies largely on references not identified or evaluated during any stage of the prosecution of the '277 Patent. Under 35 U.S.C. §325(d), the art and

arguments must have been previously presented to the Office during prosecution for discretionary denial to be appropriate. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6, at 8 (PTAB Feb. 13, 2020) (precedential).

This Petition thus presents new issues warranting an exercise of discretion to institute trial. 35 U.S.C. §325(d). For example, two of the three grounds asserted rely upon references that were not cited or evaluated in any manner; Grounds 2 and 3 rely on Bishop, which was not presented to the Office during prosecution and, therefore, the Examiner could not – and did not – consider when evaluating the Challenged claims against Bishop’s disclosure. Further, Bishop is not cumulative of the art considered by the Examiner.

Ground 1 relies on anticipation of the Challenged Claims by Nakanishi. Nakanishi was disclosed in an IDS along with other references, but it was not substantively evaluated by the Examiner. The Examiner erred by not substantively evaluating it. *See Scientific Design Co. v. Shell Oil Co.*, IPR2021-01537, Paper 7 (P.T.A.B. Mar. 18, 2022) and IPR2022-00158, Paper 7 (P.T.A.B. Apr. 4, 2022); see also *Apple Inc. v. Smith Interface Technologies, LLC*, IPR2024-01084, Paper 7, 30–31 (Jan. 28, 2025); *Carrier Fire & Security America’s Corp. v. Sentrilock, LLC*, IPR2021-00664, Paper 12 at 21-23 (P.T.A.B. Sept. 16, 2021). As shown above, Nakanishi is highly relevant, anticipates the Challenged Claims, and with the non-

disclosed Bishop reference, renders the Challenged Claims obvious. That can be seen through the testimonial evidence in Abraham Declaration in paragraphs 387 to 509 in which the relevance of Nakanishi is established, including the detailed assessment of how it discloses the very limitation added through the Examiner's Amendment in which the claims were allowed over the Kiser reference.

IX. CONCLUSION

Petitioner respectfully requests institution of IPR.

Respectfully submitted,

Dated: February 26, 2025

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CERTIFICATE OF COMPLIANCE

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains approximately 13,818 words, excluding the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1), which is less than 14,000 words. Counsel relies on the word count of the computer program used to prepare the response on February 26, 2025.

Dated: February 26, 2025

By: /Timothy P. Maloney/
Lead Counsel for Petitioner

Patent No. 6,718,277
Petition for *Inter Partes* Review

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing Petition for *Inter Partes* Review together with all exhibits and other papers filed therewith was served on February 26, 2025, by placing a copy into FEDERAL EXPRESS directed to the attorney of record for the patent at the following address:

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A courtesy copy has also been provided to the following counsel of record for Patent Owner in *Vertiv Corporation v. Valtrus Innovations Limited*, Case No. 2-24-cv-00907-JRG (E.D. Tex.):

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