IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

RAYTHEON COMPANY,	§	
	§	
Plaintiff,	§	
	§	
v.	§	NO. 2:15-CV-1554-JRG-RSP
	§	
CRAY, INC.,	§	
	§	
Defendant.	§	

<u>MEMORANDUM AND ORDER ON CLAIM CONSTRUCTION</u>

On August 4, 2016, the Court held a hearing to determine the proper construction of disputed claim terms in United States Patents No. 7,475,274, 8,190,714, 8,335,909, and 9,037,833. Having reviewed the arguments made by the parties at the hearing and in their claim construction briefing (Dkt. Nos. 57, 67, and 71),[1] having considered the intrinsic evidence, and having made subsidiary factual findings about the extrinsic evidence, the Court issues this Claim Construction Memorandum and Order. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841 (2015).

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[1] Citations to documents (such as the parties' briefs and exhibits) in this Claim Construction Memorandum and Order refer to the page numbers of the original documents rather than the page numbers assigned by the Court's electronic docket unless otherwise indicated.

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I. BACKGROUND

Plaintiff has alleged infringement of United States Patents No. 7,475,274 ("the '274 Patent"), 8,190,714 ("the '714 Patent"), 8,335,909 ("the '909 Patent"), and 9,037,833 ("the '833 Patent"), which Plaintiff submits "relate to high performance computing ('HPC') technology, i.e., supercomputers." [Dkt. # 57] at 1.

The '274 Patent, titled "Fault Tolerance and Recovery in a High-Performance Computing (HPC) System," issued on January 6, 2009, and bears a filing date of November 17, 2004. The Abstract of the '274 Patent states:

> In one embodiment, a method for fault tolerance and recovery in a high-performance computing (HPC) system includes monitoring a currently running node in an HPC system including multiple nodes. A fabric coupling the multiple nodes to each other and coupling the multiple nodes to storage accessible to each of the multiple nodes and capable of storing multiple hosts that are each executable at any of the multiple nodes. The method includes, if a fault occurs at the currently running node, discontinuing operation of the currently running node and booting the host at a free node in the HPC system from the storage.

The '714 Patent, titled "System and Method for Computer Cluster Virtualization Using Dynamic Boot Images and Virtual Disk," issued on May 29, 2012, and bears a filing date of April 15, 2004. The Abstract of the '714 Patent states:

> A method for computer cluster virtualization includes selecting a distributed application. A policy associated with the distributed application is retrieved. One of a plurality of nodes is dynamically selected. Then, a boot image of the selected node is reset based, at least in part, on the retrieved policy, with the boot image being compatible with the distributed application. Then, a virtual disk image is associated with the node. At least a portion of the distributed application is then executed on the reset node using the associated virtual disk image.

The '909 Patent, titled "Coupling Processors to Each Other for High Performance Computing (HPC)," issued on December 18, 2012, and bears a filing date of April 15, 2004. The '833 Patent is a continuation of the '909 Patent, and "[a]s such, the '909 and '833 patents share a specification." [Dkt. 67] at 2. The Abstract of the '909 Patent states:

> A High Performance Computing (HPC) node comprises a motherboard, a switch comprising eight or more ports integrated on the motherboard, and at least two processors operable to execute an HPC job, with each processor communicably coupled to the integrated switch and integrated on the motherboard.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with preliminary constructions with the aim of focusing the parties' arguments and facilitating discussion. Those preliminary constructions are set forth below within the discussion for each term.

II. LEGAL PRINCIPLES

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). Claim construction is clearly an issue of law for the court to decide. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 970–71 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). "In some cases, however, the district court will need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Teva Pharms.*

USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 841 (2015) (citation omitted). "In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factual findings about that extrinsic evidence. These are the 'evidentiary underpinnings' of claim construction that we discussed in *Markman*, and this subsidiary factfinding must be reviewed for clear error on appeal." *Id.* (citing 517 U.S. 370).

To determine the meaning of the claims, courts start by considering the intrinsic evidence. *See Phillips*, 415 F.3d at 1313; *see also C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 861 (Fed. Cir. 2004); *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1314; *C.R. Bard*, 388 F.3d at 861. Courts give claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art at the time of the invention in the context of the entire patent. *Phillips*, 415 F.3d at 1312–13; *accord Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

The claims themselves provide substantial guidance in determining the meaning of particular claim terms. *Phillips*, 415 F.3d at 1314. First, a term's context in the asserted claim can be very instructive. *Id.* Other asserted or unasserted claims can aid in determining the claim's meaning because claim terms are typically used consistently throughout the patent. *Id.* Differences among the claim terms can also assist in understanding a term's meaning. *Id.* For example, when a dependent claim adds a limitation to an inde-

pendent claim, it is presumed that the independent claim does not include the limitation. *Id.* at 1314–15.

"[C]laims 'must be read in view of the specification, of which they are a part.'" *Id.* at 1315 (quoting *Markman*, 52 F.3d at 979 (en banc)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *accord Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). This is true because a patentee may define his own terms, give a claim term a different meaning than the term would otherwise possess, or disclaim or disavow the claim scope. *Phillips*, 415 F.3d at 1316. In these situations, the inventor's lexicography governs. *Id.* The specification may also resolve the meaning of ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex*, 299 F.3d at 1325. But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988)); *accord Phillips*, 415 F.3d at 1323.

The prosecution history is another tool to supply the proper context for claim construction because a patent applicant may also define a term in prosecuting the patent.

Home Diagnostics, Inc., v. Lifescan, Inc., 381 F.3d 1352, 1356 (Fed. Cir. 2004) ("As in the case of the specification, a patent applicant may define a term in prosecuting a patent."). "[T]he prosecution history (or file wrapper) limits the interpretation of claims so as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance." *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452 (Fed. Cir. 1985).

Although extrinsic evidence can be useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (citations and internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are entirely unhelpful to a court. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

III. THE PARTIES' STIPULATED TERMS

The parties reached agreement on constructions as stated in their May 19, 2016 Joint Claim Construction and Prehearing Statement. [Dkt. # 55] at 2–3. Those agreements are set forth in Appendix A to the present Claim Construction Memorandum and Order.

IV. CONSTRUCTION OF DISPUTED TERMS

A. "nodes"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a person having ordinary skill in the art ("PHOSITA") would understand this term to mean, "computing devices."	"a physical processing device with a unique address that identifies that device to all others on the network"

[Dkt. # 55] at 3, 5; [Dkt. # 57] at 4; [Dkt. # 67] at 3; [Dkt. # 71] at 1. The parties submit that this disputed term appears in Claims 1, 4, 9, 12–14, and 23–32 of the '909 Patent, Claims 1, 8, 11, 15, and 18–19 of the '833 Patent, Claims 1–3, 5–10, 12–18, 20–25, 27–29, 31–36, and 38 of the '274 Patent, and Claims 1–9, 11–23, 25–37, and 39–42 of the '714 Patent. [Dkt. # 55] at 3, 5.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "computing devices." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court therefore construes **"nodes"** to mean **"computing devices."**

B. "integrated onto," "integrating onto," and "integrated to"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "mechanically and electrically connect[ed/ing] to/onto."	"fabricated on the same motherboard without the use of daughterboards or other components"

[Dkt. # 55] at 3–4, 6; [Dkt. # 57] at 6; [Dkt. # 67] at 5; [Dkt. # 71] at 3. The parties submit that these disputed terms appear in Claims 1, 15, and 23 of the '909 Patent and Claims 1, 16, 27, and 38 of the '274 Patent. [Dkt. # 55] at 3–4, 6.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (reject defendant's proposed 'same motherboard' and 'without the use of daughterboards' limitations)."

(1) The Parties' Positions

Plaintiff submits that Defendant's proposed construction is contrary to the disclosure of daughterboards, and Plaintiff argues that Defendant cannot show any prosecution disclaimer. [Dkt. # 57] at 7–8; *see id.* at 19. Plaintiff also highlights that Figure 3B and the accompanying description disclose a switch that is integrated to, but not within, the motherboard. *Id.* at 7.

Defendant responds:

The '909 and '274 patents claim nodes comprising at least two processors and a switch 'integrated' onto a motherboard. *E.g.*, '909 patent claim 1;

'274 patent claim 1. The specifications repeatedly emphasize that these components are integrated, or fabricated, onto the motherboard as opposed to being located externally to the motherboard. *E.g.*, '274 patent at 4:64–67 and '909 patent at 4:10–13 (integrated switch minimizes distances between nodes); '909 patent at 7:57–62 (integration eliminates centralized functionality).

[Dkt. # 67] at 5. Defendant also cites prosecution history. *Id.* at 5–6. Finally, Defendant argues that Plaintiff's proposal of "mechanically and electrically connected to" has no support in the intrinsic evidence. *Id.* at 6.

Plaintiff replies that "fabricated" "is not defined or found anywhere in the patents," and Plaintiff reiterates that the specification discloses the use of daughterboards integrated to the motherboard of an HPC system. [Dkt. # 71] at 3.

At the August 4, 2016 hearing, Defendant urged that the patentee's arguments during prosecution foreclose whatever additional scope the patentee may have originally attempted to encompass with Figure 3B.

(2) Analysis

Claim 1 of the '274 Patent, for example, recites (emphasis added):

1. A system for fault tolerance and recovery in a high-performance computing (HPC) system, the system for fault tolerance and recovery comprising:

> a fabric coupling a plurality of nodes in an HPC system to each other, each node comprising a switching fabric *integrated to* a card and at least two processors *integrated to* the card;

> storage coupled to the fabric and accessible to each of the nodes, the storage operable to store a plurality of hosts each executable at any of the nodes; and

> a manager coupled to the fabric, the manager operable to monitor a currently running node in the HPC system executing a host and,

> if a fault occurs at the currently running node, discontinue opera-
> tion of the currently running node and boot the host at a free node
> in the HPC system from the storage.

The '909 Patent likewise discloses that a switch can be "integrated" with a blade, and these disclosures include a switch that is illustrated as being separate from the motherboard:

> Blade 315 is an *integrated* fabric architecture that distributes the fabric switching components uniformly across nodes 115 in grid 110 . . . . More specifically, blade 315 includes an *integrated switch 345*.

'909 Patent at 7:57–62 (emphasis added). Figure 3B of the '909 Patent illustrates "N-Port Switch 345" as separate from the motherboard and is reproduced here:

FIG. 3B
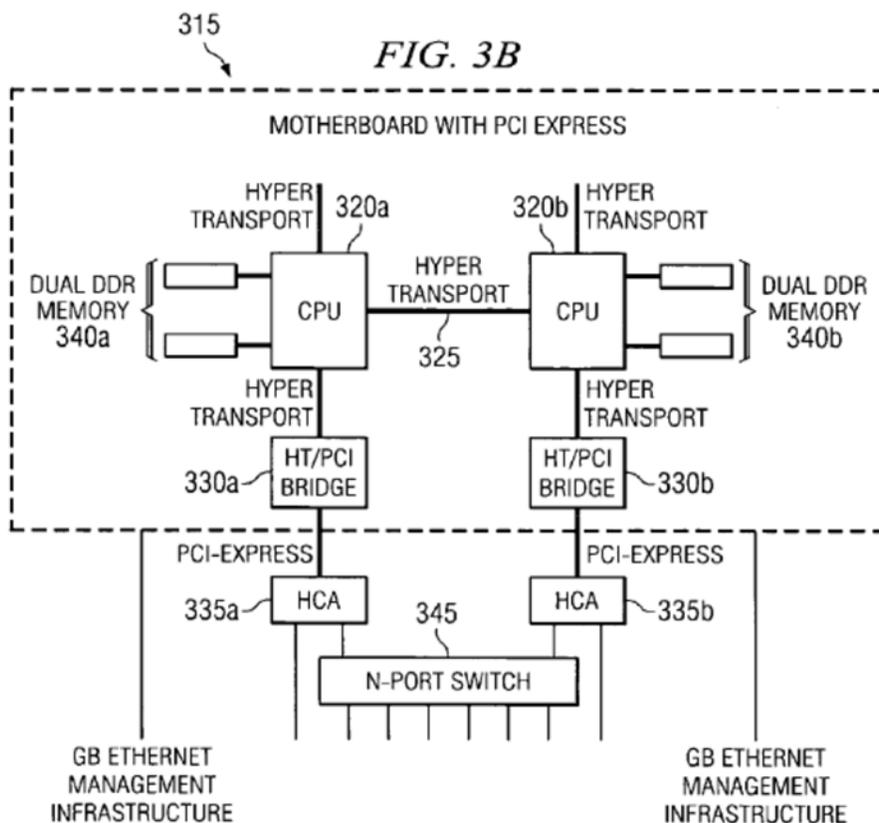
Further, Figure 3C of the '909 Patent illustrates a blade 315 with a "Daughter

Board," but the specification nonetheless states that "[b]lade 315 is an *integrated* fabric

architecture." '909 Patent at 7:57 (emphasis added). Figure 3C is reproduced here:
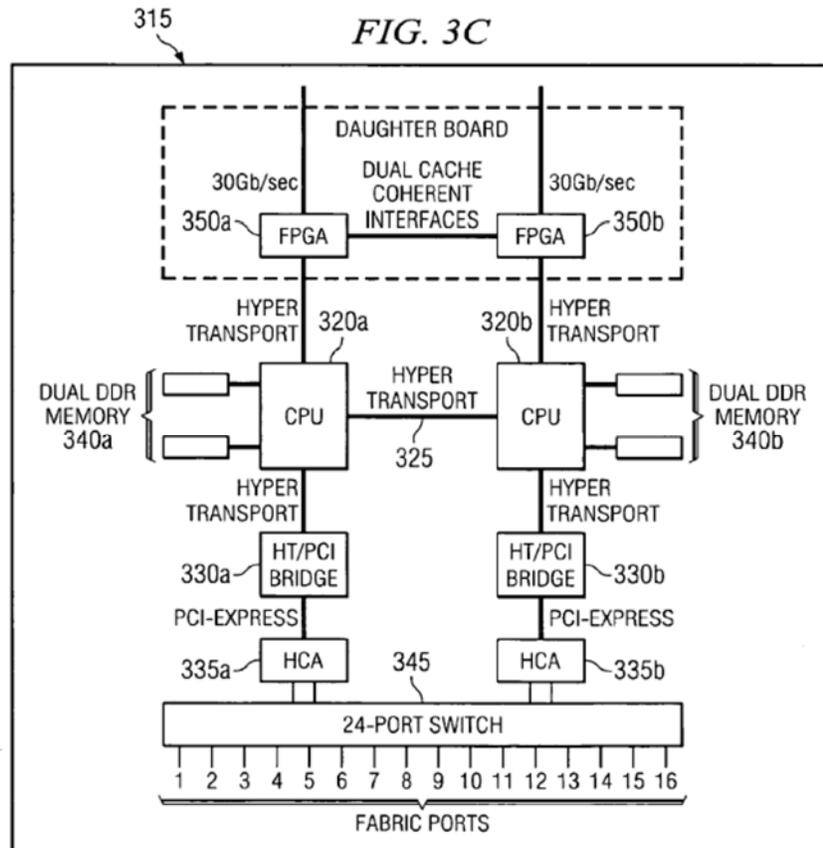
Defendant has cited prosecution history of the '909 Patent in which the patentee

argued that the "Osten" reference failed to disclose utilizing a single board. Dec. 5, 2006

Response [Dkt. # 67-7] at 13–14. The claims at issue, however, recited "integrated *on*" or

"integrated *with*," not integrated "to" or integrated "onto." *Id.* at 6–7, 9 & 13. Also, the

patentee's arguments centered on components being separated by a backplane slot con-

nector. *See id.* at 12–14. On balance, Defendant has failed to show that the patentee made

any definitive statement as to the disputed terms. *See Omega Eng'g v. Raytek Corp.*, 334

F.3d 1314, 1324 (Fed. Cir. 2003) ("As a basic principle of claim interpretation, prosecution disclaimer promotes the public notice function of the intrinsic evidence and protects the public's reliance on *definitive* statements made during prosecution.") (emphasis added); *see also Golight, Inc. v. Wal-Mart Stores, Inc.*, 355 F.3d 1327, 1332 (Fed. Cir. 2004) ("Because the statements in the prosecution history are subject to multiple reasonable interpretations, they do not constitute a clear and unmistakable departure from the ordinary meaning of the term . . . .").

Later, during the same prosecution, the patentee argued that in the "Karpoff" reference "the CPUs and the switch reside on opposite sides of a server boundary, which clearly teaches away from the CPUs and the switch in Karpoff *being integrated on the* same *motherboard,* as independent Claim 1 recites." May 29, 2007 Response [Dkt. # 67-9] at 7. Here again, the claim language at issue recited integrated "on" or "with," not integrated "to" or "onto," *see id.* at 2–3 & 5, and the patentee focused on the distinction of a server boundary. *See Omega Eng'g*, 334 F.3d at 1324; *see also Golight*, 355 F.3d at 1332.

Finally, above-reproduced Claim 1 of the '274 Patent recites "a fabric coupling a plurality of nodes in an HPC system to each other, each node comprising a switching fabric integrated to a card." This recital of a fabric that connects multiple nodes but that is nonetheless "integrated to a card" reinforces that a structure need not be fabricated as part of whatever structure it is "integrated to."

The Court therefore expressly rejects Defendant's proposal of "fabricated on the same motherboard without the use of daughterboards or other components." Nonetheless, "[t]he Court believes that some construction of the disputed claim language will assist the jury to understand the claims." *See TQP Dev., LLC v. Merrill Lynch & Co., Inc.*, No. 2:08-CV-471, 2012 WL 1940849, at *2 (E.D. Tex. May 29, 2012) (Bryson, J.). As to Plaintiff's alternative proposal of "mechanically and electrically connect[ed/ing] to/onto," however, the word "connected" is potentially overbroad because it might be interpreted as allowing for many intermediate layers of connections. Instead, the word "affixed" more appropriately conveys the required degree of directness, particularly in light of surrounding claim language reciting that components are integrated to or onto a card or motherboard.

The Court therefore construes **"integrated onto," "integrating onto,"** and **"integrated to"** to mean **"mechanically and electrically affix[ed/ing] [to/onto]."**

C. "associated with"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "related with."	"fabricated on the same motherboard without the use of daughterboards or other components"

[Dkt. # 55] at 4; [Dkt. # 57] at 9; [Dkt. # 67] at 7; [Dkt. # 71] at 3. The parties submit that this disputed term appears in Claims 1 and 8 of the '833 Patent. [Dkt. # 55] at 4.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (reject defendant's argument that 'associated with' has the same meaning as 'integrated onto')."'

(1) The Parties' Positions

Plaintiff argues that "[t]he use of the 'integrated' terms in claims of the '909 patent demonstrates that 'associated with' means 'related with,' which is a separate and distinct meaning from the 'integrated' terms." [Dkt. # 57] at 10. Plaintiff also argues that Defendant's proposal would improperly exclude a disclosed embodiment. *Id.* at 10–11.

Defendant responds that "[t]he entirety of the intrinsic record makes clear that 'associated with' carries the same meaning as 'integrated onto.'" [Dkt. # 67] at 7. Defendant urges that Plaintiff's proposal should be rejected because it is inconsistent with the prosecution history and because "the specification nowhere uses the term 'associated with' to describe the relationship between processors, switches, and motherboards." *Id.* at 9.

Plaintiff replies that different terms are presumed to have different meanings, and "other than attorney argument that the (nonexistent) prosecution disclaimer of 'integrated' in the '909 patent attaches to 'associated' in the '833 patent, [Defendant] alleges no other support for limiting 'associated with' as [Defendant] proposes." [Dkt. # 71] at 4.

(2) Analysis

As a threshold matter, Defendant's proposed construction should be rejected for substantially the same reasons as discussed regarding the "integrated" terms, above, particularly as to the prosecution history cited by Defendant.

As to Plaintiff's argument that "associated with" must have a meaning different from "integrated onto," Claim 1 of the '833 Patent for example recites "configuring at least two first processors to be associated with a first motherboard" and "configuring a first switch to be associated with the first motherboard and coupling the first switch to the first processors." Plaintiff argues that different terms are presumed to have different meanings, but Plaintiff has not shown any instance in which "associated with" and "integrated with" appear in claims of the same patent, let alone within the same claim.

Nonetheless, the specification uses "associated" as well as "integrated," and Defendant has not demonstrated that the terms are used interchangeably. *See, e.g.,* '833 Patent at 4:33–34 ("management node 105 may periodically poll agent 132 to determine the status of the associated node 115"), 7:25–27 ("virtual cluster 220 may be associated with one research group, a department, a lab, or any other group of users likely to submit similar jobs 150") & 16:53–55 ("Cluster management engine 130 then determines if a job 150 is associated with failed node 115 at decisional step 815."); *see also id.* at 8:48–50 ("PCI channel 325 comprises any high-speed, low latency link designed to increase the communication speed between integrated components.").

The Court therefore expressly rejects Defendant's proposal that "associated with" has the same meaning as "integrated onto." No further construction is necessary. *See U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) ("Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the deter-

mination of infringement. It is not an obligatory exercise in redundancy."); *see also O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) ("[D]istrict courts are not (and should not be) required to construe every limitation present in a patent's asserted claims."); *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1207 (Fed. Cir. 2010) ("Unlike *O2 Micro*, where the court failed to resolve the parties' quarrel, the district court rejected Defendants' construction."); *ActiveVideo Networks, Inc. v. Verizon Commcn's, Inc.*, 694 F.3d 1312, 1326 (Fed. Cir. 2012); *Summit 6, LLC v. Samsung Elecs. Co., Ltd.*, 802 F.3d 1283, 1291 (Fed. Cir. 2015).

The Court accordingly construes **"associated with"** to have its **plain meaning**.

D. "configured to communicate with each other via a direct link between them"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "configured to communicate with each other via a point-to-point link between them."	"capable of communicating with each other through locally connected cache or memory"

[Dkt. # 55] at 4; [Dkt. # 57] at 11; [Dkt. # 67] at 10. The parties submit that this disputed term appears in Claims 1, 15, and 23 of the '909 Patent. [Dkt. # 55] at 4.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (reject defendant's pro-

posal that communication must occur 'through locally connected cache or memory')." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court therefore expressly rejects Defendant's proposal that communication must occur "through locally connected cache or memory," and the Court construes **"configured to communicate with each other via a direct link between them"** to have its **plain meaning**.

E. "the switches for each of the n>8 interconnected nodes are configured in a router-less manner such that each of the n>8 interconnected nodes has its own switch"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "the switches for each of the n>8 interconnected computing devices are configured such that each of the n>8 interconnected computing devices has its own switch."	"there is a 1-to-1 correlation between nodes and switches and no routers are used to pass messages between nodes"

[Dkt. # 55] at 4; [Dkt. # 57] at 12; [Dkt. # 67] at 11; [Dkt. # 71] at 4. The parties submit that this disputed term appears in Claims 1 and 8 of the '833 Patent. [Dkt. # 55] at 4.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (apart from the court's construction of the constituent term 'nodes,' which is addressed separately above)."

(1) The Parties' Positions

Plaintiff argues that the meaning of this term is evident from surrounding claim language. [Dkt. # 57] at 12. Plaintiff submits that Defendant's proposal "departs from the plain claim language" and "wholly omits the claim phrase 'for each of the n>8 interconnected nodes.'" *Id.* Further, Plaintiff argues that the specification discloses each node has an integrated switch and explains the benefits of using a node with its own switch. *Id.* at 12–13. Plaintiff urges that "there is no support in the specification that each switch works exclusively with only one node, as [Defendant] proposes." *Id.* at 13 (citation and alterations omitted).

Defendant responds: "By the plain claim language, 'each' node 'has its own switch.' In other words, if there are 24 nodes, there must be 24 switches." [Dkt. # 67] at 12. Defendant argues that this interpretation is consistent with the specification, and Defendant also cites prosecution history. *Id.*

Plaintiff replies that "[t]he plain language of the claims defines 'routerless manner,' which is reflected in the 'such that' portion of the claim." [Dkt. # 71] at 4. Plaintiff also argues that neither the specification nor the prosecution history contain any statement requiring a one-to-one correlation between nodes and switches. *Id.*

(2) Analysis

As Defendant has highlighted, the specification of the '833 Patent discloses:

Blade 315 is an integrated fabric architecture that *distributes the fabric switching components uniformly across nodes 115 in grid 110*, thereby pos-

sibly reducing or eliminating any centralized switching function, increasing the fault tolerance, and allowing message passing in parallel.

'833 Patent at 7:63–67 (emphasis added); *see id.* at 8:16–24 ("Each node 115 is configured with an integrated switch."). Also, during prosecution, the patentee distinguished the "Thorson" reference as having switching functionality that is centralized to routers when there are more than eight nodes. *See* Mar. 19, 2014 Amendment [Dkt. # 67-13] at 8–9.

Defendant's proposed construction, however, essentially merely restates the "routerless" and "has its own switch" limitations that are already set forth in the disputed term. At the August 4, 2016 hearing, Defendant emphasized that there must be at least as many switches as nodes because each node must have at least one switch. Because this is already evident from the "has its own switch" language on its face, this requirement need not be reiterated.

Finally, nothing in this claim language is contrary to allowing for a node that has its own switch to also be connected to another switch. *See, e.g., Gillette Co. v. Energizer Holdings, Inc.*, 405 F.3d 1367, 1371 (Fed. Cir. 2005) ("The word 'comprising' transitioning from the preamble to the body signals that the entire claim is presumptively open-ended."). To whatever extent Defendant has suggested to the contrary, the Court expressly rejects any such negative limitation.

The Court therefore rejects Defendant's proposed construction. No further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at

1362; *Finjan*, 626 F.3d at 1207; *ActiveVideo*, 694 F.3d at 1326; *Summit 6*, 802 F.3d at 1291.

At the August 4, 2016 hearing, the parties also presented some disagreement as to how to determine whether a node has "its own" switch or, in other words, whether a particular switch belongs to a particular node. Ultimately, this issue depends upon details of particular implementations and is a question of fact regarding infringement rather than a question of law for claim construction. *See Acumed LLC v. Stryker Corp.*, 483 F.3d 800, 806 (Fed. Cir. 2007) ("The resolution of some line-drawing problems . . . is properly left to the trier of fact.") (citing *PPG Indus. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1355 (Fed. Cir. 1998) ("after the court has defined the claim with whatever specificity and precision is warranted by the language of the claim and the evidence bearing on the proper construction, the task of determining whether the construed claim reads on the accused product is for the finder of fact")); *see EON Corp. IP Holdings LLC v. Silver Springs Networks, Inc.*, 815 F.3d 1314, 1318–19 (Fed. Cir. 2016) (citing *PPG*).

The Court therefore construes **"the switches for each of the n>8 interconnected nodes are configured in a routerless manner such that each of the n>8 interconnected nodes has its own switch"** to have its **plain meaning** apart from the Court's construction of the constituent term **"nodes,"** which is addressed separately above.

F. "Northbridge"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "a circuit that enables a processor to communicate with memory, a PCI bus, Level 2 cache, or any other related components."	"a device which communicates with the processors and controls communications with memory, a PCI bus, Level 2 cache, or any other related components"

[Dkt. # 55] at 4–5; [Dkt. # 57] at 13; [Dkt. # 67] at 13. The parties submit that this disputed term appears in Claims 5 and 12 of the '833 Patent. [Dkt. # 55] at 4–5.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "a device which communicates with the processors and controls communications with memory, a PCI bus, level 2 cache, or any other related components (reject defendant's proposal of requiring a physically separate 'device')." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court accordingly rejects Defendant's argument that a "Northbridge" must be a physically separate device, and with that understanding the Court construes **"Northbridge"** to mean **"a device which communicates with the processors and controls communications with memory, a PCI bus, level 2 cache, or any other related components."**

G. "topology enabled by the first switch of each of the plurality of nodes"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "topology enabled by the first switch of each of the two or more nodes."	"topology enabled by the number of motherboards to which the first switch of each motherboard can connect"

[Dkt. # 55] at 5; [Dkt. # 57] at 14; [Dkt. # 67] at 14. The parties submit that this disputed

term appears in Claim 9 of the '909 Patent and Claim 15 of the '833 Patent. [Dkt. # 55] at

5.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (reject def[endant]'s proposal of referring to motherboards)." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court accordingly rejects Defendant's proposal of limiting this disputed term to motherboards, and the Court construes **"topology enabled by the first switch of each of the plurality of nodes"** to have its **plain meaning**.

H. "folded topology"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "topology that has links of equal length that are minimized."	"topology of motherboards in which the motherboard at the physical edge of the interconnected motherboards is connected to a corresponding motherboard at the axial edge"

[Dkt. # 55] at 5; [Dkt. # 57] at 15; [Dkt. # 67] at 14. The parties submit that this disputed term appears in Claim 11 of the '909 Patent. [Dkt. # 55] at 5.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "topology of nodes in which a node at the physical edge of the interconnected nodes is connected to a corresponding node at the axial edge." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court therefore construes **"folded topology"** to mean **"topology of nodes in which a node at the physical edge of the interconnected nodes is connected to a corresponding node at the axial edge."**

I. "distributed application"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "an application capable of running across at least two nodes."	"a single instance of an application that is run across more than one computing device and that appears to a client computer as a single application"

[Dkt. # 55] at 5–6; [Dkt. # 57] at 16; [Dkt. # 67] at 15; [Dkt. # 71] at 5. The parties submit that this disputed term appears in Claims 1–2, 5–8, 11–12, 15–16, 19–22, 25–26, 29–30, 33–34, and 39–40 of the '714 Patent. [Dkt. # 55] at 5–6.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "a single instance of an application running across more than one node."

(1) The Parties' Positions

Plaintiff argues that its proposed construction is supported by the specification as well as by the ordinary understanding of the disputed term in the relevant art. [Dkt. # 57] at 17. Plaintiff argues that Defendant's proposed construction is contrary to the specification, fails to cover applications that are collaborative rather than client-server, and relies upon an inapplicable dictionary definition. *Id.*

Defendant responds that its proposal is consistent with the specification as well as with the opinion of Plaintiff's expert. [Dkt. # 67] at 16.

Plaintiff replies that Defendant's proposals of "single instance" and "appears to a client as a single application" have no support in the intrinsic evidence, and "[Defendant's] only alleged support is the declaration of its expert and [Defendant's] mischaracterization of an out-of-context statement by [Plaintiff's] expert." [Dkt. # 71] at 5.

(2) Analysis

At the August 4, 2016 hearing, Plaintiff argued that the disputed term could encompass multiple instances of the same application running on multiple nodes. Defendant responded that Plaintiff's position in that regard is inconsistent with the specification, such as Figure 1 of the '714 Patent, which illustrates applications 114a and 114b with lines that emanate therefrom having arrows pointing to multiple nodes 108. Defendant argued that application 114a, for example, represents a single instance of an application and that the lines illustrate the single instance running across multiple nodes. Plaintiff replied that there is no disclosure that supports Defendant's interpretation of Figure 1, which Plaintiff argues could just as easily be interpreted such that each line emanating from application 114a represents a different instance of that application. Of note in this regard, the specification does not use reference numerals 114a and 114b but rather refers simply to "applications 114." *See* '714 Patent at 2:16–18.

Even setting aside Figure 1, however, the specification discusses "distributed application 114" in the context of using multiple nodes:

> In one aspect of operation, dynamic boot engine 105 selects a distributed application 114. Based on one or more associated policies 132, dynamic boot engine 105 may *dynamically add or subtract one or more selected*

nodes 108 to the particular application environment or virtual cluster. Based on the retrieved policies 132, dynamic boot engine 105 selects the appropriate boot image 132 for the selected nodes 108. For example, if there are already four nodes 108 executing a portion of application 114, then dynamic boot engine 105 automatically selects the fifth boot image 132 (at least partially based on node's 108 hardware and other characteristics and the one or more policies 132) that is compatible with application 114. Based on the retrieved policies 132, dynamic boot engine 105 may also select the appropriate virtual local disk image 134 for the selected nodes 108. Once the appropriate boot image 132 and/or virtual local disk image 134 are selected, dynamic boot engine 105 flashes node 108 with a pointer or other reference to the selected boot image 132 and virtual local disk image 134 and reboots node 108. Once node 108 is initialized (normally less than fifteen seconds), dynamic boot engine 105 (or some other job scheduler) executes the appropriate task, process, or other *portion of application 104 [sic, 114]* on the selected node 108.

'714 Patent at 7:62–8:17 (emphasis added); *see also id.* at 3:58–60 ("Nodes 108 comprises [*sic*] any computer, blade, or server operable to *execute at least a portion* (such as a task or process) of application 114.") (emphasis added) & Fig. 1.

Also, as to the term "the distributed application is operable to execute at a subset of the plurality of nodes" (which is no longer disputed, as noted below), Defendant had proposed that the corresponding structure is "a database management system (DBMS) or financial software." Plaintiff's expert opined: "There are many more distributed applications in this world than just DBMS and financial software programs. [Defendant] limits its construction to two types of distributed applications, but ignores that the distributed application may be any suitable software to run a *single instance* on more than one node." Scherson Decl. (May 19, 2016) [Dkt. # 57-5] at ¶ 202 (emphasis added) (citing '714 Pa-

tent 4:19–22). Although Plaintiff argues that Defendant has cited this statement out of context,[2] it is noteworthy that Plaintiff's own expert has referred to a distributed application as being a single instance running on multiple nodes.

Defendant further submits the following extrinsic definition: "A distributed system is a collection of independent computers that appears to its users as a single coherent system." Andrew S. Tanenbaum, et al., *Distributed Systems: Principles & Paradigms* (2007) [Dkt. # 67-24] at 2.

On balance, in light of the above-discussed intrinsic and extrinsic evidence, Defendant has adequately supported its proposal that, in the context of an application, the term "distributed" requires that the application is a single instance running across more than one node rather than, as Plaintiff has suggested, multiple instances of an application being run separately by different nodes. Plaintiff's proposal in that regard fails to give meaning to the constituent term "distributed" and is therefore rejected.

Defendant's proposal of "appears to a client computer as a single application," however, lacks adequate support, is potentially redundant, and would tend to confuse rather than clarify the scope of the claims.

The Court therefore construes **"distributed application"** to mean **"a single instance of an application running across more than one node."**

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[2] *See* Scherson Decl. (July 14, 2016) [Dkt. # 71-1] ¶ 15 (stating that Defendant's expert "mischaracterizes my prior declaration because I never admit that a distributed application *must* run as a single instance").

J. "switching fabric"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "one or more switches on a fabric."	"the combination of hardware and software components, including a switch, that connects the two or more processors on the card to the adjacent node(s) in the network"

[Dkt. # 55] at 6; [Dkt. # 57] at 17; [Dkt. # 67] at 16; [Dkt. # 71] at 5. The parties submit

that this disputed term appears in Claims 1, 16, 27, and 38 of the '274 Patent. [Dkt. # 55]

at 6.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "a network of switches and links between switches."

(1) The Parties' Positions

Plaintiff argues that its proposal is consistent with surrounding claim language as well as the specification. [Dkt. # 57] at 18.

Defendant responds that "[t]he intrinsic record demonstrates that 'switching fabric' is more than simply switches, as [Plaintiff] contends, but rather includes the hardware and software connecting the processors of different nodes." [Dkt. # 67] at 17.

Plaintiff replies that Defendant's proposal ignores the phrase "on a fabric" and "ignores [Plaintiff's] explanation that the term 'fabric' refers to the network that allows communications between nodes." [Dkt. # 71] at 5. Plaintiff also argues that Defendant's

proposals of "combination of hardware and software components" and "connects . . . to the adjacent nodes" are "each unsupported by the claims and the specification." *Id.* at 5–6.

<u>(2) Analysis</u>

The specification discloses: "Each node 115 is configured with an integrated switch." '274 Patent at 4:64–65. Also, the specification discloses: "In particular embodiments, the network fabric of HPC server 102 includes switches 166 coupled to each other according to a topology encompassing a three dimensional torus, as described above." *Id.* at 62:46–49; *see id.* at Abstract ("[a] fabric coupling the multiple nodes to each other and coupling the multiple nodes to storage accessible to each of the multiple nodes").

At the August 4, 2016 hearing, Plaintiff argued that including the links would be inconsistent with the recital in the claims that the "switching fabric" is "integrated to a card" because the links cannot be built into a card. Claim 1 of the '274 Patent, for example, recites (emphasis added):

> 1. A system for fault tolerance and recovery in a high-performance computing (HPC) system, the system for fault tolerance and recovery comprising:
>> a fabric coupling a plurality of nodes in an HPC system to each other, each node comprising *a switching fabric* integrated to a card and at least two processors integrated to the card;
>> storage coupled to *the fabric* and accessible to each of the nodes, the storage operable to store a plurality of hosts each executable at any of the nodes; and
>> a manager coupled to *the fabric*, the manager operable to monitor a currently running node in the HPC system executing a host and, if a fault occurs at the currently running node, discontinue opera-

tion of the currently running node and boot the host at a free node in the HPC system from the storage.

The Court separately addresses the term "integrated to," above. Regardless of the Court's construction of that term, however, Plaintiff has not shown that finding that a link is part of something that is "integrated to a card" would require that the entire link is integrated rather than merely a portion or terminus thereof. Also of note, the above-reproduced claim itself uses the term "fabric" to refer to couplings between a plurality of nodes (rather than merely the switches at the nodes).

On balance, the above-quoted portions of the specification, together with the context of the above-reproduced claim, demonstrate that the term "switching fabric" refers to a network of switches and links between switches. Further, this interpretation is consistent with the extrinsic definition submitted by Defendant ([Dkt. # 67-14] ("The term is sometimes used to mean collectively all switching hardware and software in a network.")), and is also consistent with the opinion of Plaintiff's expert that "switching fabric" refers to switches and "a set of links" (Scherson Decl. (May 19, 2016) [Dkt. # 57-5] ¶ 143).

Finally, Defendant's proposed reference to "processors on the card" is rejected as tending to confuse rather than clarify and as being redundant of other claim language requiring a "card."

The Court therefore construes **"switching fabric"** to mean **"a network of switches and links between switches."**

K. "host"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "program."	"a physical or virtual computing system capable of providing one or more services over a network or fabric"

[Dkt. # 55] at 6; [Dkt. # 57] at 19; [Dkt. # 67] at 18; [Dkt. # 71] at 6. The parties submit

that this disputed term appears in Claims 1, 6–7, 12, 16, 21–22, 27, 32–33, and 38 of the

'274 Patent. [Dkt.#. 55] at 6.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "operating system."

(1) The Parties' Positions

Plaintiff argues that whereas its proposed construction is consistent with the specification, Defendant's proposal "imposes unnecessary, unsupported limitations. In particular, defining 'hosts' as only 'services' contradicts the specification which describes 'hosts' as 'a thread or process.'" [Dkt. # 57] at 19 (citing '274 Patent at 7:57–60).

Defendant responds that "[a]lthough 'host' is not defined in the '274 patent, [Defendant's] proposal captures the disclosures in the intrinsic record." [Dkt. # 67] at 18. Defendant also argues that Plaintiff's proposed construction "is contrary to the patent's disclosures" because "[t]he specification never equates hosts with applications/programs; in fact, it refers to them separately." *Id.* at 19 (citing '274 Patent at 62:40–42).

Plaintiff argues that "there is no disclosure of a 'host' being 'physical' or being a 'computing system' anywhere in the specification or claims," and "limiting 'hosts' to only 'services' is contrary to the specification, which teaches that hosts could also refer to the 'processes' of a distributed application." [Dkt. # 71] at 6 (citing '274 Patent at 7:57–60).

At the August 4, 2016 hearing, the parties' dispute crystallized into whether a "host" must include an operating system. Defendant was amenable to the Court's preliminary construction of "host" as meaning "operating system," but Defendant argued that the preliminary construction was incomplete because additional structures are required for running an operating system. Nonetheless, Defendant stated that construing "host" as "operating system" would adequately resolve the parties' dispute in the present case. Defendant also noted that the parties agreed to the Court's preliminary construction of "boot image" (addressed below) as "*operating system* data that is used to initialize a node."

Plaintiff responded that a "host" need not include an operating system. Plaintiff emphasized dependent Claim 12 of the '274 Patent, which recites limitations as to what a "host" includes but which does not recite an operating system. In response to Defendant's arguments, however, Plaintiff stated that it would be amenable to construing "host" to mean "program that creates an execution environment."

(2) Analysis

Claims 1 and 12 of the '274 Patent, for example, recite (emphasis added):

1. A system for fault tolerance and recovery in a high-performance computing (HPC) system, the system for fault tolerance and recovery comprising:

> a fabric coupling a plurality of nodes in an HPC system to each other, each node comprising a switching fabric integrated to a card and at least two processors integrated to the card;

> storage coupled to the fabric and accessible to each of the nodes, the storage operable to store a plurality of *hosts* each executable at any of the nodes; and

> a manager coupled to the fabric, the manager operable to monitor a currently running node in the HPC system executing a *host* and, if a fault occurs at the currently running node, discontinue operation of the currently running node and boot the *host* at a free node in the HPC system from the storage.

12. The system of claim 1, wherein a host comprises an Internet Protocol (IP) address, a boot image, a configuration, and a file system usable to boot the host at a node in the HPC system.

The specification appears to distinguish between "hosts" and "applications." *See, e.g.,* '274 Patent at 62:40–42 ("Centralized storage 540 includes application data including data on *hosts and applications* executable at nodes 115 in grid 110, as described below.") (emphasis added) & 65:7–10 ("restart the host and the application at a second node 115 in grid 110").

The specification further discloses that hosts can be "instantiated": "Instantiation manager 534 may interact with one or more components of cluster management engine 130 (such as, for example, physical manager 505, virtual manager 510, or both) to dynamically *instantiate one or more hosts at one or more nodes 115* in response to a con-

nection request from a client 120, according to particular needs." *Id.* at 61:19–24 (emphasis added).

> In particular embodiments, instantiation data 536 includes one or more boot images for *instantiating hosts at nodes 115 to provide services.* In particular embodiments, instantiation data 536 also includes one or more file systems for instantiating hosts at nodes 115 to provide services. In particular embodiments, instantiation data 536 also includes one or more OS configuration files for instantiating hosts at nodes 115 to provide services.

Id. at 61:60–67 (emphasis added).

As to Defendant's proposal of "providing one or more services," the specification discloses that a node may perform merely a portion of a task. *See* '274 Patent at 7:58–61 ("A node 115 includes any computing device in any orientation for processing all or a portion, such as a thread or process, of one or more jobs 150.").

As to Defendant's proposal of a "computing system," the above-quoted claim refers to booting a host on a node or at a node. The specification is similar. *See id.* at 2:10, 63:9–21, 64:20–21, 68:64–65 & Abstract. The specification is also consistent with Defendant's proposal of something more than merely a program. *See, e.g.,* '274 Patent at 61:25–62:17. Also, the opinion of Defendant's expert that "one would not use the verb 'boot' to refer to software" is persuasive to the extent that what is booted is not merely a program but rather is something capable of running a program. *See* Livny Decl. (June 30, 2016) [Dkt. # 67-3] ¶ 25 n.1.

As to extrinsic evidence, Defendant has submitted dictionary definitions of "host" as meaning: "An intelligent device attached to a network" (*Newton's Telecom Dictionary*

(16th ed. 2000) [Dkt. # 67-18] (CRAY00021621)); and "A computer containing data or programs that another computer can access over a network or by modem" (*Dictionary of Computer Words* 133 (1995) [Dkt. # 67-19]). These definitions thus reinforce Defendant's proposal that a "host" is not merely a program but rather is something that can execute a program.

On balance, Defendant has persuasively shown that a "host" is an environment in which programs can be executed, and therefore a host includes an operating system. *See, e.g.,* '274 Patent at 7:34 ("Cluster management engine 130 may also manage and provide a unique execution environment for each allocated node of virtual cluster 220."). Indeed, at the August 4, 2016 hearing, Plaintiff alternatively proposed that a "host" is a "program that creates an *execution environment*."

The Court therefore construes **"host"** to mean **"execution environment, including an operating system."**

L. "boot image"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "boot file."	"any form, image, pointer, or reference to at least a portion of the boot drive primary operating system partition"

[Dkt. # 55] at 6; [Dkt. # 57] at 19; [Dkt. # 67] at 20; [Dkt. # 71] at 6. The parties submit

that this disputed term appears in Claim 12 of the '274 Patent and Claims 1, 2, 4, 8, 10–

11, 15–18, 22, 24, 29–32, 36, and 38–39 of the '714 Patent. [Dkt. # 55] at 6.

Shortly before the start of the August 4, 2016 hearing, the Court provided the par-

ties with the following preliminary construction: "operating system data that is used to

initialize a node." At the August 4, 2016 hearing, the parties agreed to the Court's prelim-

inary construction.

The Court therefore construes **"boot image"** to mean **"operating system data**

that is used to initialize a node."

M. "[resetting / reset] a boot image of the selected node"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "[resetting / reset] a boot image of the selected node."	"[changing/change] the selected node's form, image, pointer, or reference to at least a portion of a different boot drive primary operating system partition from its current setting"

[Dkt. # 55] at 7; [Dkt. # 57] at 23; [Dkt. # 67] at 21; [Dkt. # 71] at 8. The parties submit

that these disputed terms appear in Claims 1, 15, and 29 of the '714 Patent. [Dkt. # 55] at

7.

Shortly before the start of the August 4, 2016 hearing, the Court provided the par-

ties with the following preliminary construction: "plain meaning (reject def[endant]'s

proposal of 'changing')."

<u>(1) The Parties' Positions</u>

Plaintiff argues that whereas its proposed construction "is consistent with the understanding of a POSITA [(person of ordinary skill in the art at the time of the invention)] in view of the specification," "[Defendant] improperly limits resetting a boot image to changing the selected node's form, image, pointer, or reference, a proposed construction improperly imported from the specification." [Dkt. # 57] at 23.

Defendant responds that because "reset" is used in the specification in two different contexts, namely resetting a node and resetting a boot image, "the term 'reset' as used in the patent lacks clarity, and should be construed in the context of its use in the disputed claim term." [Dkt. # 67] at 21. Defendant argues that "the 'resetting' step does not merely mean that a boot image is reapplied to a node; the node must be reset using a different boot image." *Id.* at 22.

Plaintiff replies that "the specification passage [Defendant] cites . . . indicates that a different boot image is possible, but not required." [Dkt. # 71] at 8 (citing '714 Patent at 3:31–35).

<u>(2) Analysis</u>

The specification discloses embodiments in which resetting a node involves selecting a different boot image:

> Generally, dynamic boot engine 105 manages one or more applications 114 by starting and stopping application environments on the individual nodes 108. For example, dynamic boot engine 105 may *reset the particular node 108 with a different boot image 131* from boot image file 130, which is specific to or compatible with the desired application environment.

'714 Patent at 3:29–35 (emphasis added).

> If node 108 is not compatible with application 114, then dynamic boot en-
> gine 105 brings down the selected node using any suitable technique at step
> 225. . . . Based on the selected policy 132, dynamic boot engine 105 *flashes*
> *the selected node with a pointer to a new boot image 131* at step 235 and
> associates virtual local disk image 134 at step 237. As described above, dy-
> namic boot engine 105 may flash EEPROM 111 or any other suitable com-
> ponent. Next, dynamic boot engine 105 *boots the selected node 108 using*
> *the new boot image 131* at step 240.

Id. at 8:51–66 (emphasis added); *see id.* at 8:25–28.

The Court has addressed the constituent term "boot image" separately, above. As to Defendant's argument that "resetting" means that a *different* boot image must be used, Defendant has not adequately justified such a limitation. No such lexicography or disclaimer is evident. Although Defendant has argued that the context of surrounding claim demonstrates that "resetting" occurs only if a different boot image is needed, no such limitation is apparent in the claims at issue. *See* '714 Patent at Claims 1, 15 & 29.

Instead, this is a specific feature of particular embodiments that should not be imported into the claims. *See Comark*, 156 F.3d at 1187; *see also Phillips*, 415 F.3d at 1323. Also, analogously, the specification discloses "recover[ing] server 102 from single hardware component failures by automatically replacing and dynamically rebooting a *replacement* node 108 for the failed node 108." '714 Patent at 3:51–54 (emphasis added). From this disclosure can be inferred the potential desirability of restarting a failed node using the same boot image rather than a different boot image.

The Court therefore expressly rejects Defendant's proposed construction. No further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362; *Finjan*, 626 F.3d at 1207; *ActiveVideo*, 694 F.3d at 1326; *Summit 6*, 802 F.3d at 1291.

The Court therefore construes "**[resetting / reset] a boot image of the selected node"** to have its **plain meaning**.

N. "policy associated with the distributed application"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "requirements for the distributed application."	"set of variables that define the required characteristics of a node in order to run the distributed application, including at least information related to a boot image and a virtual disk image"

[Dkt. # 55] at 7; [Dkt. # 57] at 21; [Dkt. # 67] at 22; [Dkt. # 71 at 7. The parties submit that this disputed term appears in Claims 1, 15, and 29 of the '714 Patent. [Dkt. # 55] at 7.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "one or more parameters that define the required characteristics of a node in order to run the distributed application."

(1) The Parties' Positions

Plaintiff argues that whereas its proposed construction is consistent with the specification, "[Defendant's] construction improperly ties 'policy' to 'the required characteris-

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tics of a node' rather than a 'distributed application'" and "is overly-narrow because it limits 'set of variables' to 'information related to a boot image and a virtual disk image.'" [Dkt. # 57] at 21.

Defendant responds that their proposed construction "takes into account the context of the claims, which reflects that the policy contains information concerning the boot image and virtual disk." [Dkt. # 67] at 22. Defendant also cites prosecution history. *Id.* at 22–23. Further, Defendant submits that its proposed construction "does not limit the contents of the policy to any particular information; rather, it includes any content whatsoever as long as it includes the two types of information the inventors considered mandatory given the focus of the claims." *Id.* at 23.

Plaintiff replies that "[Defendant] fails to explain why its proposal is more helpful [than] just using the word 'requirements,'" and "[t]he prosecution history also does not support [Defendant's] proposal." [Dkt. # 71] at 7.

<u>(2) Analysis</u>

Claim 1 of the '714 Patent, for example, recites (emphasis added):

1. A method comprising:
   selecting a distributed application;
   retrieving a *policy associated with the distributed application*;
   dynamically selecting one of a plurality of nodes;
   resetting a boot image of the selected node based at least in part on the retrieved *policy*, wherein the boot image being compatible with the distributed application, wherein resetting the boot image of the selected node comprises: automatically shutting down the

> selected node; resetting the boot image of the selected node; and restarting the selected node using the reset boot image;
>
> associating a virtual disk image with the selected node based at least in part on the retrieved *policy*; and
>
> executing at least a portion of the distributed application on the selected node, as reset, using the virtual disk image associated with the selected node, the execution performed by at least one processor of the selected node.

Surrounding claim language thus provides that the "policy associated with the distributed application" pertains to selecting an appropriate boot image and virtual disk image based on characteristics that are necessary for running the distributed application. Such limitations, however, are set forth by the surrounding claim language. Defendant has not demonstrated that such limitations are inherent features of the "policy."

The specification discloses:

> Policies table 132 includes any parameters for managing nodes 108 and applications 114. For example, policies 132 may be for automatically adding or subtracting nodes 108 to application environments.

'714 Patent at 5:45–48; *see id.* at 5:45–6:18. The specification thus better supports referring to "parameters" rather than Defendant's proposal of "variables."

Defendant has also cited prosecution history in which the patentee argued:

> Furthermore, the cited portions of Lortz fail to disclose . . . that the policy in Lortz has anything to do with a boot image or a virtual disk image such that a boot image of a selected node could be reset based at least in part of [*sic*, on] the retrieved policy and that a virtual disk image could be associated with the selected node based at least in part of [*sic*, on] the retrieved policy, as would be required for the [*sic*] Lortz to even possibly disclose the retrieved policy of Claim 1.

Jan. 27, 2011 Response [Dkt. # 67-20] at 13; *see* July 15, 2011 Pre-Appeal Brief Request for Review [Dkt. # 67-21] at 2 (similar); *see also* Sept. 26, 2011 Appeal Brief [Dkt. # 67-22] at 19–20 (similar).

On balance, this passage does not give rise to a clear disclaimer so as to require that the policy must include information related to a boot image and a virtual disk image. *See Omega Eng'g*, 334 F.3d at 1324 ("As a basic principle of claim interpretation, prosecution disclaimer promotes the public notice function of the intrinsic evidence and protects the public's reliance on *definitive* statements made during prosecution.") (emphasis added); *see also Golight*, 355 F.3d at 1332 ("Because the statements in the prosecution history are subject to multiple reasonable interpretations, they do not constitute a clear and unmistakable departure from the ordinary meaning of the term . . . ."). In particular, Defendant has not shown that selecting a boot image or a virtual disk image based on a policy necessarily means that the policy itself contains information about a boot image or a virtual disk image. Instead, this prosecution history merely sets forth limitations that appear in surrounding claim language.

Finally, whereas Defendant has proposed construing this disputed term with reference to "characteristics of a node," the specification discloses that an application may need multiple nodes. *See* '714 Patent at 5:45–48 (quoted above); *see also id.* at 5:61–63 ("policies table 132 may store individual virtual cluster policies including: i) minimum/maximum number of nodes 108 assigned to an application environment; . . . ."). The construction should therefore refer instead to an "execution environment."

The Court rejects Plaintiff's argument that the policy refers to characteristics of an application because, in the above-cited prosecution history, the patentee distinguished the policy in the Lortz reference as not having "anything to do with a boot image or a virtual disk image." Jan. 27, 2011 Response [Dkt. # 67-20] at 13; *see Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1381 (Fed. Cir. 2011) ("The patentee is bound by representations made and actions that were taken in order to obtain the patent.").

The Court therefore construes **"policy associated with the distributed application"** to mean **"one or more parameters that define the required characteristics of an execution environment in order to run the distributed application."**

O. "dynamically [selecting / select] one of a plurality of nodes"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "[selecting/select] a node, at-least-in-part at run-time, based on one or more variables."	"[selecting/select] a node at least in part at run-time based on one or more variables, excluding manually selecting nodes"

[Dkt. # 55] at 7; [Dkt. # 57] at 22; [Dkt. # 67] at 23; [Dkt. # 71] at 7. The parties submit that these disputed terms appear in Claims 1, 5, 15, 19, 29, and 33 of the '714 Patent. [Dkt. # 55] at 7.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "[selecting/select] a node at least in part at run-time based on one or more variables."

(1) The Parties' Positions

Plaintiff argues that "'[d]ynamically' is explicitly defined by the patent." [Dkt. # 57] at 22 (citing '714 Patent at 2:33–35, 3:10–14, 3:49–57, 7:34–49 & 7:62–66). Plaintiff submits that Defendant's proposal is inconsistent with that express definition, and Plaintiff argues that "by 'excluding manually selecting nodes,' [Defendant] improperly reads out an embodiment allowing for manually selecting nodes on-the-fly." [Dkt. # 57] at 22.

Defendant responds that the specification and the prosecution history distinguish between dynamic selection and manual selection. [Dkt. # 67] at 23–24. Defendant also argues that Plaintiff has failed to demonstrate that Defendant's proposal reads out any disclosed embodiments. *Id.* at 24.

Plaintiff replies that "[Defendant's] proposed limitation finds no support in the specification or any 'clear and unmistakable' disavowal in the prosecution history." [Dkt. # 71] at 8.

(2) Analysis

The parties appear to agree that the following passage sets forth a definition for "dynamically" or, at least, that the following specified attributes of "dynamically" should be included in the construction of the disputed term:

In short, system 100 is any computing environment that automatically al-
lows nodes 108 to be dynamically allocated on-the-fly as application 114
requirements, parameters, and processing needs change. The term "dynami-
cally," as used herein, generally means that certain processing is deter-
mined, at least in part, at run-time based on one or more variables.

'714 Patent at 2:29–35.

The remaining dispute is whether "dynamically" excludes "manually." On one

hand, the specification contrasts the terms "dynamically" and "manually" as follows:

Method 200 begins at step 205, where dynamic boot engine 105 determines
that software application 114 should be allocated more nodes 108. This de-
termination may occur using any appropriate technique. For example, the
administrator may *manually* add node 108 to the application environment
for application 114. In *another* example, dynamic boot engine 105 may *dy-
namically* determine that nodes 108 may or should be used based on poli-
cies 132.

Id. at 8:34–41 (emphasis added).

On the other hand, the specification discloses that an administrator may make

changes:

In one embodiment, GUI 122 may allow an administrator to create, delete,
copy, and modify application environments. The administrator may also set
up application environment sharing policies, activate and deactivate appli-
cation environments, monitor states and loads of application environments
and nodes 108 using GUI 122. Further, GUI 122 may *allow the adding or
subtracting of nodes 108 from active application environments*.

Id. at 7:34–41 (emphasis added). Moreover, the term "automatically" is specifically de-

scribed apart from "dynamically," which demonstrates that the '714 Patent does not use

"dynamically" to mean "automatically":

The term "dynamically," as used herein, generally means that certain processing is determined, at least in part, at run-time based on one or more variables. The term "automatically," as used herein, generally means that the appropriate processing is substantially performed by at least part of system 100. It should be understood that "automatically" further contemplates any suitable user or administrator interaction with system 100 without departing from the scope of this disclosure.

Id. at 2:33–41. In addition, this passage further counsels against Defendant's proposed negative limitation by noting that even the term "automatically" can encompass some amount of "user or administrator interaction." *Id.* The intrinsic evidence thus demonstrates that, in the '714 Patent, "dynamically" merely means at least in part at run-time.

Finally, Defendant has also cited prosecution history, but no definitive statements in this regard are apparent. *See* Sept. 26, 2011 Appeal Br. [Dkt. # 67-22] at 20–21; *see also* Oct. 27, 2011 Office Action [Dkt. # 67-23] at 5–6; *Omega Eng'g*, 334 F.3d at 1324.

The Court therefore construes **"dynamically [selecting / select] one of a plurality of nodes"** to mean **"[selecting/select] a node at least in part at run-time based on one or more variables."**

P. "[associating / associate] a virtual disk image with the selected node"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand this term to mean, "[associating / associate] a virtual disk file(s) with the selected node."	"[storing/store] a pointer or other reference to a simulated disk drive in persistent storage at the selected node"

[Dkt. # 55] at 7; [Dkt. # 57] at 23; [Dkt. # 67] at 25. The parties submit that these disputed terms appear in Claims 1, 15, and 29 of the '714 Patent. [Dkt. # 55] at 7.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "[providing/provide] the selected node with a pointer or other reference to a virtual disk drive." At the August 4, 2016 hearing, the parties agreed to the Court's preliminary construction.

The Court therefore construes **"[associating / associate] a virtual disk image with the selected node"** to mean **"[providing/provide] the selected node with a pointer or other reference to a virtual disk drive."**

Q. "low utilization"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
Plain and Ordinary Meaning, no construction necessary. If the Court determines a construction is required, a PHOSITA would understand th[is] term[] to mean, "low use."	[Defendant] alleges that this term is indefinite.

[Dkt. # 55] at 7–8; [Dkt. # 57] at 24; [Dkt. # 67] at 27; [Dkt. # 71] at 9. This disputed term appears in Claims 6, 20, and 34 of the '714 Patent. [Dkt. # 55] at 7; [Dkt. # 72-2] at 7.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (not indefinite)."

(1) The Parties' Positions

Plaintiff argues that the claims and the specification provide context for understanding this relative term. [Dkt. # 57] at 24. Plaintiff also argues that Defendant's indefiniteness argument should be rejected because it is "made without any extrinsic or testimonial support" and because "[t]he specification shows that low utilization means a node that is doing less work than other currently-running nodes." *Id.* at 25 (citing '714 Patent at 9:4–10).

Defendant argues that this disputed term is indefinite because "[i]t is a subjective determination of the user," and "[e]ven the metric is unclear." [Dkt. # 67] at 27.

Plaintiff replies that "[t]he cases that [Defendant] cites deal with the concept of 'low' (i.e., low angle or low-efficiency) in the absolute sense, and not in the relative sense that is used in the '714 patent." [Dkt. # 71] at 10.

(2) Analysis

The Supreme Court of the United States has "read [35 U.S.C.] § 112, ¶ 2 to require that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). "A determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005) (citations and internal quotation marks omitted), *abrogated on other grounds by Nautilus,* 134 S. Ct. 2120.

Claim 6 of the '714 Patent recites (emphasis added):

6. The method of claim 5, further comprising, in response to none of the nodes being unutilized, selecting one of the nodes utilized by the other distributed application based on one or more of the following:
    the retrieved policy;
    low utilization of the selected node;
    priority of the selected distributed application; or
    compatibility of the selected node with the selected distributed application.

The specification demonstrates that the term "low utilization" refers to a relative degree of utilization:

Returning to decisional step 210, if there were no computing nodes 108 available, then dynamic boot engine 105 selects an optimum utilized node

108 for application 114 at step 250. This selection of optimum node 108 may occur in any appropriate fashion such as, for example, determining the *least utilized node* 108, selecting a compatible node 108, or determining some other "best fit".

'714 Patent at 9:4–10 (emphasis added).

Defendant's expert opines that "[t]here are many different ways to measure the 'utilization' or 'use' of a computer system," such as "what portion of processor time is spent executing non-idle threads," "the amount of available physical or virtual memory," "the current network load," "number of concurrent processes, or the number of current users logged in." June 30, 2016 Livny Decl. [Dkt. # 67-3] ¶ 65.

Yet, Defendant's expert acknowledges that "a particular measure of utilization assessed at one system can be compared with the same measure assessed at another system" and "can be used to determine which system has a higher level of utilization and which has a lower level of utilization." *Id.* at ¶ 66. Because the claim language and the specification, as set forth above, demonstrate that "low utilization" is used as a relative term rather than an absolute term, Defendant has not demonstrated that the claims at issue fail to "inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus*, 134 S. Ct. at 2129; *see Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370 (Fed. Cir. 2014) ("We do not understand the Supreme Court to have implied in *Nautilus*, and we do not hold today, that terms of degree are inherently indefinite.").

The Court therefore expressly rejects Defendant's indefiniteness argument, and the Court construes **"low utilization"** to mean **"lower utilization."**

R. "the distributed application is operable to execute at a subset of the plurality of nodes"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
[Plaintiff] disagrees with [Defendant's] assertion that claims 2 and 30 of the '714 Patent should be construed under 35 U.S.C. §112 ¶ 6. If the Court determines a construction is required under 35 U.S.C. §112 ¶ 6, [Plaintiff] proposes the following function and structure: Function: execute at a subset of the plurality of nodes Structure: Dynamic boot engine	This term is a means plus function limitation subject to 35 U.S.C. § 112 ¶ 6 and is indefinite. Function: execute at a subset of the plurality of nodes Structure: Indefinite. Alternatively, a database management system (DBMS) or financial software. (Col. 4:17–19)

[Dkt. # 55] at 8; [Dkt. # 57] at 25. The parties submit that this term appears in Claims 2 and 30 of the '714 Patent. [Dkt. # 55] at 8.

Plaintiff argued that this disputed term is not a means-plus-function term because it "merely further limits 'distributed application'—a term the parties separately construed and agreed was not subject to 35 U.S.C. § 112 ¶ 6—to having operability to execute at a subset of the plurality of nodes." [Dkt. # 57] at 25 (citations omitted). Alternatively, Plaintiff argued that "[Defendant's] identification of alternative structures, DBMS or financial software, is overly-narrow because the specification provided those alternative structures only as non-limiting examples." *Id.* at 26 (citing '714 Patent at 4:17–22). In other words, Plaintiff argued that "[Defendant's] identification of alternative structures

unduly limits the distributed application to two types and fails to provide structure that would allow a distributed application to run on a subset of nodes." [Dkt. # 57] at 27.

Defendant responds that it "no longer seeks construction of this term." [Dkt. # 67] at 28; *see* [Dkt. # 72-2] 3 n.1. The Court therefore does not further address this term.

S. "a manager coupled to a fabric, the manager operable to monitor a currently running node in the HPC system executing a host and, if a fault occurs at the currently running node, discontinue operation of the currently running node and boot the host at a free node in the HPC system from the storage"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
[Plaintiff] disagrees with [Defendant's] assertion that claim 1 of the '274 Patent should be construed under 35 U.S.C. §112 ¶ 6. If the Court determines a construction is required under 35 U.S.C. §112 ¶ 6 Function: monitor the currently running node and discontinue operation of the currently running node and boot the host at a free node from storage Structure: "management node," which may include software such as a fault tolerance and recovery manager	This term is a means plus function limitation subject to 35 U.S.C. § 112 ¶ 6. Function: monitor the currently running node and discontinue operation of the currently running node and boot the host at a free node from storage Structure: a daemon running on each node provides a heartbeat to a management node, and in response to information contained in the heartbeat, the management node forces a node to idle or power down, reboots the node, or prevents communication to the node by updating one or more routing tables or updating software or other logic at centralized storage. Booting the host is accomplished by Wake-On LAN, Intelligent Platform Management Interface (IPMI), Preboot Execution Environment (PXE), or Dynamic Host Configuration Protocol (DHCP). (Col. 63:14–37, Col. 64:29–45)

[Dkt. # 55] at 8–9; [Dkt. # 57] at 27; [Dkt. # 67] at 28; [Dkt. # 71] at 10; [Dkt. # 72-1] at 3. The parties submit that this disputed term appears in Claim 1 of the '274 Patent. [Dkt. # 55] at 8.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "plain meaning (not subject to 35 U.S.C. § 112 ¶ 6)."

(1) The Parties' Positions

Plaintiff argues that Defendant cannot overcome the presumption against means-plus-function treatment, and "[o]nce the court resolves the construction of disputed terms in this phrase, e.g., 'node,' the meaning of the [disputed term] is clear." [Dkt. # 57] at 27. Alternatively, Plaintiff argues that the specification discloses a "management node" as performing the claimed function. *Id.* at 27–28. Plaintiff also urges that Defendant's proposal should be rejected because "[Defendant's] identification contradicts the specification because the management node may run other modules than a daemon to monitor the system's health." *Id.* at 28 (citation, alteration, and internal quotation marks omitted).

Defendant responds that the presumption against means-plus-function treatment is overcome because although "the inventor used the word 'manager,' . . . the specification makes clear that the term is simply a name given to any number of software modules in the patented system." [Dkt. # 67] at 29.

Plaintiff replies: "[Defendant] does not define the structure based on any specification passages cited in its brief. Instead, [Defendant] relies only on its expert's declaration." [Dkt. # 71] at 10.

At the August 4, 2016 hearing, Defendant urged that even if "manager" is deemed to be a structural term because of its recitation as being "coupled to the fabric," the "manager" is nonetheless a generic "black box" that lacks any boundaries.

(2) Analysis

Title 35 U.S.C. § 112, ¶ 6 provides: "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

"[T]he failure to use the word 'means' . . . creates a rebuttable presumption . . . that § 112, para. 6 does not apply." *Williamson v. Citrix Online LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (citations and internal quotation marks omitted). "When a claim term lacks the word 'means,' the presumption can be overcome and § 112, para. 6 will apply if the challenger demonstrates that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function." *Id.* at 1349 (citations and internal quotation marks omitted).

Williamson, in an *en banc* portion of the decision, abrogated prior statements that the absence of the word "means" gives rise to a "strong" presumption against means-

plus-function treatment. *Id.* (citation omitted). *Williamson* also abrogated prior statements that this presumption "is not readily overcome" and that this presumption cannot be overcome "without a showing that the limitation essentially is devoid of anything that can be construed as structure." *Id.* (citations omitted). Instead, *Williamson* found, "[h]enceforth, we will apply the presumption as we have done prior to *Lighting World . . . .*" *Id.* (citing *Lighting World, Inc. v. Birchwood Lighting, Inc.*, 382 F.3d 1354, 1358 (Fed. Cir. 2004)). In a subsequent part of the decision not considered *en banc*, *Williamson* affirmed the district court's finding that the term "distributed learning control module" was a means-plus-function term that was indefinite because of lack of corresponding structure, and in doing so *Williamson* stated that "'module' is a well-known nonce word." *Id.* at 1350.

Claim 1 of the '274 Patent, for example, recites (emphasis added):

1. A system for fault tolerance and recovery in a high-performance computing (HPC) system, the system for fault tolerance and recovery comprising:

    a fabric coupling a plurality of nodes in an HPC system to each other, each node comprising a switching fabric integrated to a card and at least two processors integrated to the card;

    storage coupled to the fabric and accessible to each of the nodes, the storage operable to store a plurality of hosts each executable at any of the nodes; and

    a manager coupled to the fabric, the manager operable to monitor a currently running node in the HPC system executing a host and, if a fault occurs at the currently running node, discontinue operation of the currently running node and boot the host at a free node in the HPC system from the storage.

The term "manager" as used here is distinguishable from the word "module" in *Williamson*. *Id.* at 1348 ("What is important is . . . that the term, as the name for structure,

has a reasonably well understood meaning in the art.") (quoting *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996)). Defendant has cited disclosures in the specification that "[p]hysical manager 505 is any software, logic, firmware, or other module operable to . . ." and "[v]irtual manager 510 is any software, logic, firmware, or other module operable to . . . ." '274 Patent at 13:4–5 & 13:15–16. Although the determination of whether 35 U.S.C. § 112, ¶ 6 applies is performed in the context of the specification, the ultimate inquiry is whether the claim term at issue is structural, not whether a particular embodiment is characterized in the specification as potentially being a "module." *See id.* Further, the specification also refers to other managers without referring to a "module." *See* '274 Patent at 61:8–12 & 62:33–37; *see also Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1296 (Fed. Cir. 2014) ("[W]e must construe the claim limitation to decide if it connotes 'sufficiently definite structure' to a person of ordinary skill in the art, which requires us to consider the specification (among other evidence)."), *abrogated on other grounds by Williamson*, 792 F.3d 1339.

In finding that 35 U.S.C. § 112, ¶ 6 does not apply, the Court applies long-standing principles articulated prior to the abrogated *Lighting World* decision. *See, e.g., Linear Tech. Corp. v. Impala Linear Corp.*, 379 F.3d 1311, 1320 (Fed. Cir. 2004) ("when the structure-connoting term 'circuit' is coupled with a description of the circuit's operation, sufficient structural meaning generally will be conveyed to persons of ordinary skill in the art, and § 112 ¶ 6 presumptively will not apply"; noting "language reciting [the circuits'] respective objectives or operations"); *Apex Inc. v. Raritan Computer, Inc.*, 325

F.3d 1364, 1372 (Fed. Cir. 2003) ("While we do not find it necessary to hold that the term 'circuit' by itself always connotes sufficient structure, the term 'circuit' with an appropriate identifier such as 'interface,' 'programming' and 'logic,' certainly identifies some structural meaning to one of ordinary skill in the art."); *Personalized Media Commc'ns, LLC v. Int'l Trade Comm'n*, 161 F.3d 696, 705 (Fed. Cir. 1998) ("Even though the term 'detector' does not specifically evoke a particular structure, it does convey to one knowledgeable in the art a variety of structures known as 'detectors.' We therefore conclude that the term 'detector' is a sufficiently definite structural term to preclude the application of § 112, ¶ 6."); *Greenberg*, 91 F.3d at 1583 (finding that "detent mechanism" was not a means-plus-function term because it denotes a type of device with a generally understood meaning in the mechanical arts).

No further construction is necessary. Indeed, Defendant has not proposed any alternative construction.

The Court therefore construes **"a manager coupled to a fabric, the manager operable to monitor a currently running node in the HPC system executing a host and, if a fault occurs at the currently running node, discontinue operation of the currently running node and boot the host at a free node in the HPC system from the storage"** to have its **plain meaning**.

T. "means for monitoring a currently running node in an HPC system comprising a plurality of nodes"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
This term is a means plus function limitation subject to 35 U.S.C. § 112 ¶6.	This term is a means plus function limitation subject to 35 U.S.C. § 112 ¶6.
Function: monitor a currently running node in an HPC system comprising a plurality of nodes.	Function: monitor a currently running node in an HPC system comprising a plurality of nodes.
Structure: "management node," which may include software for monitoring currently running nodes, such as a fault tolerance and recovery manager."	Structure: a daemon running on each node provides a heartbeat to a management node, and in response to information contained in the heartbeat, the management node forces a node to idle or power down, reboots the node, or prevents communication to the node by updating one or more routing tables or updating software or other logic at centralized storage. (Col. 63:25–37)

[Dkt. # 55] at 9–10; [Dkt. # 57] at 28; [Dkt. # 67] at 29–30; [Dkt. # 72-1] at 22. The parties submit that this disputed term appears in Claim 38 of the '274 Patent. [Dkt. # 55] at 9.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "structure: '(1) fault tolerance and recovery manager 538 and a daemon or other software component at node 115 providing a heartbeat or checkpointing mechanism, and equivalents thereof; or (2) physical manager 505 and agents 132, and equivalents thereof.'"

<u>(1) The Parties' Positions</u>

Plaintiff submits that the parties agree that this is a means-plus-function term, but the parties dispute the corresponding structure. [Dkt. # 57] at 28. Plaintiff argues that "[a] POSITA would understand that the disclosed corresponding structure is the 'management node,' which may include software for monitoring currently running nodes, such as a fault tolerance and recovery manager." *Id.* Plaintiff urges that "[Defendant's] proposed identified structure improperly excludes other disclosed embodiments, including the em-bodiment where the management node may run modules other than a daemon, such as 'a fault tolerance and recovery manager 538' to monitor the HPC system's health." *Id.* at 29 (citing '274 Patent at 62:31–54).

Defendant responds that the corresponding structure must be an algorithm and that its proposed construction "identifies the patent's disclosures of the algorithm for perform-ing the claimed function." [Dkt. # 67] at 30.

Plaintiff replies: "As with the previous term, [Defendant] relies only on its expert's declaration for its proposed ¶ 6 structures. [Defendant's] proposals based only on extrin-sic evidence should be rejected." [Dkt. # 71] at 10 (citation omitted).

<u>(2) Analysis</u>

When it applies, 35 U.S.C. § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347.

Construing a means-plus-function limitation involves multiple steps. "The first step . . . is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). Here, the parties agree that the claimed function is to "monitor a currently running node in an HPC system comprising a plurality of nodes."

"[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

The specification discloses a "management node 15" that includes a "fault tolerance and recovery manager 538." '274 Patent at 62:30–32. "Fault tolerance and recovery manager 538 includes a hardware, software, or embedded logic component or a combination of two or more such components for *detecting faults* at nodes 115 in grid 110 and ini-

tiating recovery from such faults." *Id.* at 62:32–36 (emphasis added). The specification

then provides additional detail regarding a "heartbeat mechanism":

> In particular embodiments, when a node 115 executes a host, fault tolerance and recovery manager 538 monitors the host to *track health* of node 115 and one or more applications running at node 115. In particular embodiments, *fault tolerance and recovery manager 538 uses a daemon or other software component at node 115 providing a heartbeat mechanism to monitor health of node 115*. The daemon communicates heartbeat messages to fault tolerance and recovery manager 538 at regular intervals indicating whether node 115 is functioning properly. A heartbeat message from the daemon may provide status information regarding node 115. As an example and not by way of limitation, a heartbeat message from the daemon may provide status information regarding node 115 indicating a temperature of node 115, an average speed of a fan at node 115, and a level of power consumption at node 115. In response to status information indicating a fault at a node 115, fault tolerance and recovery manager 538 may automatically and without user input initiate action to recover from the fault, notify an administrator of HPC server 102 of the fault, or both.
>
> In particular embodiments, *fault tolerance and recovery manager 538 considers a node 115 healthy if fault tolerance and recovery manager 538 continues to receive heartbeat messages from node 115 providing status information indicating that node 115 has not exceeded one or more configurable thresholds*. If fault tolerance and recovery manager 538 does not receive a heartbeat message from node 115 providing status information indicating that node 115 has not exceeded one or more configurable thresholds, fault tolerance and recovery manager 538 may automatically and without user input initiate action to recover from the fault, notify an administrator of HPC server 102 of the fault, or both.

Id. at 63:22–63:53 (emphasis added); *see id.* at 63:54–64:12.

This above-quoted passage discloses that structures for monitoring a currently

running node are the "fault tolerance and recovery manager 538" as well as "a daemon or

other software component at node 115 providing a heartbeat mechanism." *See id.* at 63:25–28. The specification also discloses a "checkpoint" mechanism, wherein instead of simply receiving a heartbeat mechanism the fault tolerance and recovery manager 538 actively requests information from nodes. *Id.* at 64:65–65:16.

Nonetheless, Defendant's proposal that "the management node forces a node to idle or power down, reboots the node, or prevents communication to the node by updating one or more routing tables or updating software or other logic at centralized storage" is rejected as not linked to, or necessary to perform, the claimed function. *See, e.g.*, *Northrop Grumman Corp. v. Intel Corp.*, 325 F.3d 1346, 1352 (Fed. Cir. 2003) ("Under section 112, paragraph 6, structure disclosed in the specification is 'corresponding' structure only if the specification or the prosecution history clearly links or associates that structure to the function recited in the claim. . . . A court may not import into the claim features that are unnecessary to perform the claimed function.") (citations and internal quotation marks omitted).

Finally, the specification also discloses a "[p]hysical manager 505" and "agents 132" that interact so as to "determine the physical health" of nodes:

> Physical manager 505 is any software, logic, firmware, or other module operable to *determine the physical health of various nodes 115* and effectively manage nodes 115 based on this determined health. Physical manager may use this data to efficiently determine and respond to node 115 failures. In one embodiment, physical manager 505 is communicably coupled to a plurality of agents 132, each residing on one node 115. As described above, *agents 132 gather and communicate at least physical information to man-*

ager 505. Physical manager 505 may be further operable to communicate alerts to a system administrator at client 120 via network 106.

'274 Patent at 13:4–14 (emphasis added). A patent may disclose multiple "alternative structures for performing the claimed function," and the Court may identify those alternatives rather than attempt to formulate a single claim interpretation to cover multiple alternatives. *Ishida Co., Ltd. v. Taylor*, 221 F.3d 1310, 1316 (Fed. Cir. 2000).

The Court therefore finds that **"means for monitoring a currently running node in an HPC system comprising a plurality of nodes"** is a means-plus-function term, the claimed function is to **"monitor a currently running node in an HPC system comprising a plurality of nodes,"** and the corresponding structure is **"(1) fault tolerance and recovery manager 538 and a daemon or other software component at node 115 providing a heartbeat or checkpointing mechanism, and equivalents thereof; or (2) physical manager 505 and agents 132, and equivalents thereof."**

U. "means for, if a fault occurs at the currently running node: discontinuing operation of the currently running node; and booting the host at a free node in the HPC system from the storage"

Plaintiff's Proposed Construction	Defendant's Proposed Construction
This term is a means plus function limitation subject to 35 U.S.C. § 112 ¶ 6. Function: if a fault occurs, discontinuing operation of the currently running node and booting the host at a free node from storage. Structure: "management node," which includes software to allow an HPC system to, if a fault occurs, discontinue operation of the currently running node and boot a host at a free node from storage, such as a fault tolerance and recovery manager	This term is a means plus function limitation subject [to 35] U.S.C. § 112 ¶ 6. Function: if a fault occurs, discontinuing operation of the currently running node and booting the host at a free node from storage. Structure: force a node to idle or power down, reboot the node, or prevent communication to the node by updating one or more routing tables or updating software or other logic at centralized storage. Booting the host is accomplished by Wake-On LAN, Intelligent Platform Management Interface (IPMI), Preboot Execution Environment (PXE), or Dynamic Host Configuration Protocol (DHCP). (Col. 64:29–45)

[Dkt. # 55] at 10–11; [Dkt. # 57] at 29; [Dkt. # 72-1] at 23. The parties submit that this disputed term appears in Claim 38 of the '274 Patent. [Dkt. # 55] at 10.

Shortly before the start of the August 4, 2016 hearing, the Court provided the parties with the following preliminary construction: "fault tolerance and recovery manager 538; and equivalents thereof."

(1) The Parties' Positions

Plaintiff submits that the parties agree that this is a means-plus-function term, but the parties dispute the corresponding structure. [Dkt. # 57] at 29. Plaintiff argues that "[Defendant's] proposed construction improperly omits meaningful structures from its construction and should be rejected." *Id.* at 30.

Defendant responds that the corresponding structure must be an algorithm and that its proposed construction "identifies the patent's disclosures of the algorithm for performing the claimed function." [Dkt. # 67] at 30.

Plaintiff replies: "As with the previous term, [Defendant] relies only on its expert's declaration for its proposed ¶ 6 structures. [Defendant's] proposals based only on extrinsic evidence should be rejected." [Dkt. # 71] at 10 (citation omitted).

(2) Analysis

Legal principles regarding 35 U.S.C. § 112, ¶ 6 are set forth as to the term "means for monitoring a currently running node in an HPC system comprising a plurality of nodes," above.

As to the present disputed term, the parties agree that the claimed function is: "if a fault occurs, discontinuing operation of the currently running node and booting the host at a free node from storage."

As to the proper corresponding structure, the specification discloses:

> In particular embodiments, fault tolerance and recovery manager 538 considers a node 115 healthy if fault tolerance and recovery manager 538 continues to receive heartbeat messages from node 115 providing status infor-

mation indicating that node 115 has not exceeded one or more configurable thresholds. If fault tolerance and recovery manager 538 does not receive a heartbeat message from node 115 providing status information indicating that node 115 has not exceeded one or more configurable thresholds, *fault tolerance and recovery manager 538 may automatically and without user input initiate action to recover from the fault*, notify an administrator of HPC server 102 of the fault, or both. * * *

In particular embodiments, if a heartbeat message from a daemon at a first node 115 indicates that a nonrecoverable fault has occurred in hardware executing a host at first node 115 and a configurable script for carrying out customized recovery with respect to first node 115 specifies a recovery method that includes restarting the host at a second node 115 in grid 110, *fault tolerance and recovery manager 538 may select a second node 115 for executing the host and then boot the host at second node 115 for execution at second node 115*. Fault tolerance and recovery manager may then update one or more routing tables to enable the host to communicate with other nodes 115 in grid 110 and clients 120 external to HPC server 102. Fault tolerance and recovery manager 538 may indicate in the routing tables or elsewhere in HPC server 102 that first node 115 is offline and notify an administrator of HPC server 102 of the fault at first node 115.

In particular embodiments, if fault tolerance and recovery manager 538 has detected a fault at a first node 115 executing a host and, in response to the fault, booted a second node 115 and successfully initialized the host at second node 115, *fault tolerance and recovery manager 538 may take steps to discontinue operation of first node 115*. As an example and not by way of limitation, to discontinue operation of first node 115, fault tolerance and recovery manager 538 may update one or more routing tables at HPC server 102 to prevent communication to and from first node 115, update software or other logic at centralized storage 540 to prevent first node 115 from accessing centralized storage 540, force node 115 to idle or power down, or reboot first node 115. Discontinuing operation of first node 115 may be preferable if first node 115 failed not because of a fault in hardware at first node 115, but because of a network failure or a failure in an OS or other software at first node 115.

'274 Patent at 63:42–64:45; *see id.* at 63:14–18 ("To boot the host, fault tolerance and recovery manager 538 may use one or more of Wake-On LAN, Intelligent Platform Management Interface (IPMI), Preboot Execution Environment (PXE), and Dynamic Host Configuration Protocol (DHCP).").

The Court therefore finds that **"means for, if a fault occurs at the currently running node: discontinuing operation of the currently running node; and booting the host at a free node in the HPC system from the storage"** is a means-plus-function term, the claimed function is **"if a fault occurs, discontinuing operation of the currently running node and booting the host at a free node from storage,"** and the corresponding structure is **"fault tolerance and recovery manager 538; and equivalents thereof."**

V. CONCLUSION

The Court adopts the constructions set forth in this opinion for the disputed terms of the patents-in-suit. The parties are ordered to not refer to each other's claim construction positions in the presence of the jury. Likewise, in the presence of the jury, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the Court. The Court's reasoning in this order binds the testimony of any witnesses, but any reference to the claim construction proceedings is limited to informing the jury of the definitions adopted by the Court.

SIGNED this 9th day of June, 2017.

ROY S. PAYNE
UNITED STATES MAGISTRATE JUDGE

APPENDIX A

Term	Parties' Agreement
"processor(s)" ('909 Pat., Cls. 1–7, 15–21, 23, 25–30, 32) ('833 Pat., Cls. 1–6, 8–13)	The Parties understand this term to mean "device that executes instructions."
"communicably coupled," "communicably couple," and "communicably couples" ('909 Pat., Cls. 1, 4–6, 15, 20, 23, 27–29) ('833 Pat., Cls. 1, 8, 11, 12)	The Parties understand this term to mean "connected / connect / connects, to permit communications."
"couples"/"coupling" ('909 Pat., Cls. 2, 3, 15–19, 25–26) ('833 Pat., Cls. 2, 3, 4, 9, 10)	The Parties understand this term to mean "connects / connecting."
"Host Channel Adapter (HCA)" ('833 Pat., Cls. 2 and 9)	The Parties understand this term to mean "adapter that provides channel-based connections."
"switch comprises twenty-four ports and enables a toroidal topology comprising four dimensions" ('833 Pat., Cls. 7 and 14)	The Parties understand this term to mean "switch with at least twenty-four ports and forms a four dimensional topology where each node connects to exactly eight neighbors."
"peripheral component interconnect (PCI) bridge" ('833 Pat., Cls. 3 and 10)	The Parties understand this term to mean "circuit that interfaces a PCI or PCI Express bus/link to another bus or link."
"daemon" ('274 Pat., Cls. 2, 4, 5, 17, 19, 20, 28, 30, 31)	The Parties understand this term to mean "background program."
"checkpoint" ('274 Pat., Cls. 6, 21, 32)	The Parties understand this term to mean "snapshot."

"routing table" ('274 Pat., Cls. 7, 22, 33)	The Parties understand this term to mean "table of network addresses and/or ports to route data."
"timing of the selection of the node" ('714 Pat., Cls. 9, 23, 37)	The Parties understand this term to mean "calendar date or time of the selection of the node."
"three dimensional torus" ('274 Pat., Cls. 10, 25, 36)	The Parties understand this term to mean "three dimensional topology where each node connects to exactly six neighbors."

[Dkt. # 55] at 2–3.