United States Court of Appeals for the Federal Circuit

AKAMAI TECHNOLOGIES, INC.,
Plaintiff-Appellant,

AND

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
Plaintiff-Appellant,

v.

LIMELIGHT NETWORKS, INC.,
Defendant-Cross-Appellant,

2009-1372, -1380, -1416, -1417

Appeals from the United States District Court for the District of Massachusetts in Case Nos. 06-CV-11109 and 06-CV-11585, Judge Rya W. Zobel.

Decided: December 20, 2010

DONALD R. DUNNER, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, of Washington, DC, argued for all plaintiffs-appellants. With him on the brief were KARA F. STOLL and ELIZABETH D. FERRILL. Of counsel on the brief was ROBERT S. FRANK, JR., Choate, Hall & Stewart LLP, of Boston, Massachusetts for The Massachusetts

Institute of Technology. Of counsel were G. MARK EDGARTON and CARLOS PEREZ-ALBUERNE.

ALEXANDER F. MACKINNON, Kirkland & Ellis LLP, of Los Angeles, California, argued for defendant-cross appellant. With him on the brief were ROBERT G. KRUPKA, and NICK G. SAROS. Of counsel on the brief was DION MESSER, Limelight Networks, Inc., of Tempe, Arizona.

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Before RADER, *Chief Judge*, LINN and PROST, *Circuit Judges.*

LINN, *Circuit Judge.*

Akamai Technologies, Inc. and the Massachusetts Institute of Technology (collectively, "Akamai") appeal the district court's judgment as a matter of law ("JMOL") overturning a jury verdict of infringement by Limelight Networks, Inc. ("Limelight") of claims 19-21 and 34 of U.S. Patent No. 6,108,703 (the "'703 patent"). *See Akamai Techs., Inc. v. Limelight Networks, Inc.*, 614 F. Supp. 2d 90 (D. Mass. 2009) ("*JMOL Opinion*"). Akamai also appeals the district court's construction of claim 1 of U.S. Patent No. 7,103,645 (the "'645 patent") and claims 8, 18, and 20 of U.S. Patent No. 6,553,413 (the "'413 patent"). Limelight cross appeals the district court's denial of JMOL relating to the jury's award of lost profits. *See Akamai Techs., Inc. v. Limelight Networks, Inc.*, Nos. 2009-1372, -1380, -1416, -1417, 2010 WL 331770 (Fed. Cir. Jan. 27, 2010) (finding Limelight's cross appeal in this case proper as to the lost profits determination).

Because Limelight did not perform all of the steps of the asserted method claims, and the record contains no basis on which to attribute to Limelight the actions of its customers who carried out the other steps, this court

affirms the finding of noninfringement and does not reach Limelight's cross-appeal regarding damages. This court also affirms the district court's judgment of noninfringement of the '645 and '413 patents based on its rulings on claim construction.

BACKGROUND

I. The Technology and the Nature of the Dispute

Information is typically delivered over the Internet from websites. Websites are collections of documents written using a standard page description language known as Hypertext Markup Language ("HTML"). Each web page is a separate HTML file with an identifying string of characters known as a Uniform Resource Locator ("URL"). Typically, a full URL (e.g., "http://www.cafc.uscourts.gov/forms") consists of several elements: a protocol (e.g., "http://"); a domain name (also referred to herein as a "hostname") (e.g., "www.cafc.uscourts.gov"); and sometimes a path (e.g., "/forms"). A typical web page consists of a base HTML document that includes text interspersed with various types of content such as images, video, and sound—referred to as objects. Most of these objects are not incorporated into the web page in their entirety, but instead are simply included as links, in the form of separate URLs, which reference the actual object stored elsewhere on the same computer or another computer in the same domain (a group of networked computers that share a common domain name). These objects are referred to in the patents as "embedded objects." An embedded object's URL is typically the same as that of the web page containing the embedded object, with the object's name appended thereto (e.g., "http://www.cafc.uscourts.gov/forms/pic.jpg").

The Internet maintains a Domain Name System ("DNS"), which uses computers, known as domain name servers ("DNS servers"), to convert the hostname of a URL into a numeric Internet Protocol ("IP") address, which identifies one or more computers that store content ("content servers"). This conversion process is referred to as "resolving." A user requesting a web page using a web browser (e.g., Netscape Navigator® or Microsoft Internet Explorer®) will receive an IP address from a local DNS server that corresponds to the content server for the requested web page. In response, the user's computer sends a request for the web page directly to that content server using the IP address. The content server sends the requested web page—the base HTML document and any embedded objects' URLs—to the user's computer. The user's web browser then requests each embedded object from the content provider's server using that object's URL in the same manner that it requested the web page until all of the objects have been retrieved and the web page is fully displayed on the user's computer.

This process of retrieving web content can be slow and unreliable. For example, Internet congestion problems may occur when a single content server receives many simultaneous requests for the same web page—sometimes referred to as "flash crowds." In addition, users may experience poor content delivery performance when the user's computer is located far away from the content server it is accessing. One known solution to these content delivery problems is called mirroring, in which an entire website is replicated on multiple servers in different locations. Mirroring, however, has scalability problems, including costs required by the multiple hosting facilities, additional overhead associated with keeping mirror sites synchronized, and a ceiling on the number of website copies that may be maintained concurrently. '703

patent col.1 ll.34-61.[1] In response to these known prob-
lems with delivering content, Akamai sought to provide a
scalable solution that could efficiently deliver large
amounts of web content and handle flash crowds. Akamai
obtained the three patents at issue, which all share the
same specification and disclose a system for allowing a
content provider to outsource the storage and delivery of
discrete portions of its website content.

All three patents include method claims directed to a
content delivery service that delivers the base document
of a web site from a content provider's computer while
individual embedded objects of the website are stored on
an object-by-object basis on a Content Delivery Network
("CDN"). CDNs are systems of computers strategically
placed at various geographical locations to maximize the
efficient delivery of information over the Internet to users
accessing the network. The embedded objects are stored
on and served from the CDN's "hosting" or "ghost" serv-
ers. Instead of maintaining identical copies of the entire
web site content at a single location or at multiple loca-
tions by mirroring as taught by the prior art, only embed-
ded objects are replicated on and served from a CDN. To
allow users accessing a content provider's web page to
receive embedded objects from a CDN, the URL of the
embedded object must point to a CDN hosting or ghost
server instead of to a computer within the content pro-
vider's domain. To this end, the specification of the
patents describes modifying the embedded object's URL,
"to condition the URL to be served by the global hosting
servers." '703 patent col.6 ll.41-46. This process of modi-
fying an embedded object's URL to link to an object on the
CDN is referred to as "tagging."

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[1]   Because the specifications of all three patents are
substantially identical, we refer throughout to the specifi-
cation as it appears in the '703 patent.

Akamai and Limelight operate and compete in the market for CDN services. Limelight's accused service delivers content providers' embedded objects from its CDN. According to Limelight's contracts with its content provider customers, to use Limelight's CDN service, the content provider must perform several steps. First, the content provider must choose which embedded objects, if any, it would like to be served from Limelight's CDN. The content provider must then tag the URL of each chosen object as instructed by Limelight. Limelight then replicates the properly tagged objects on some or all of its servers and directs a user's request for one of these objects to an appropriate Limelight server.

II. Proceedings Before the District Court

On June 23, 2006, Akamai sued Limelight in the United States District Court for the District of Massachusetts asserting infringement of the '645, '703, and '413 patents. After a trial on infringement of independent claims 19 and 34 and dependent claims 20-21 of the '703 patent, a jury returned a verdict of infringement and awarded $40.1 million in lost profits and $1.4 million in reasonable royalty damages. The two independent claims asserted at trial cover methods that require tagging at least some embedded objects in a content provider's web page so that requests for those objects resolve to a domain name other than the content provider's domain name. Claim 19 also requires serving the requested web page from the content provider's domain. Claims 19 and 34 read as follows, with steps at the heart of this dispute emphasized:

19. A content delivery service, comprising:

replicating a set of page objects across a wide area network of content servers managed by a domain other than a content provider domain;

for a given page normally served from the content provider domain, tagging the embedded objects of the page so that requests for the page objects resolve to the domain instead of the content provider domain;

responsive to a request for the given page received at the content provider domain, serving the given page from the content provider domain; and

serving at least one embedded object of the given page from a given content server in the domain instead of from the content provider domain.

'703 patent col.19 ll.6-20.

34. A content delivery method, comprising:

distributing a set of page objects across a network of content servers managed by a domain other than a content provider domain, wherein the network of content servers are organized into a set of regions;

for a given page normally served from the content provider domain, tagging at least some of the embedded objects of the page so that requests for

the objects resolve to the domain instead of the content provider domain;

in response to a client request for an embedded object of the page:

resolving the client request as a function of a location of the client machine making the request and current Internet traffic conditions to identify a given region; and

returning to the client an IP address of a given one of the content servers within the given region that is likely to host the embedded object and that is not overloaded.

'703 patent col.20 ll.32-52.

It is undisputed that Limelight does not itself perform every step of the asserted claims. *JMOL Opinion* at 116. Limelight provides the information necessary for its customers, the content providers, to modify their web pages or Internet address routing information to use the Limelight service. However, the content providers perform the actual tagging step (emphasized above) themselves. There are two tagging methods used by Limelight's customers. As described by the district court:

In the first method, the customer changes the hostname address of one or more page objects in the initial web page to point to Limelight's servers (the "prepend method"). In the second method, the customer adds or changes alias information in

its DNS record so that the hostname addresses of
the page objects resolve to Limelight's servers
without requiring any change to the customer's
initial web page (the "CNAME method").

JMOL Opinion at 117 n.23. The content provider also
serves the web page from its own domain. Limelight
performs the rest of the steps of the asserted claims. This
divided process is explicitly set forth in Limelight's stan-
dard customer contract, which states:

Customer [i.e., content provider] shall be respon-
sible for identifying via the then current [Lime-
light] process all [URLs] of the Customer Content
to enable such Customer Content to be delivered
by [Limelight]

and

Customer shall provide [Limelight] with all coop-
eration and information necessary for [Limelight]
to implement the [Content Delivery Service].

J.A. 17807.

Because Limelight itself does not perform all the steps
of the asserted claims, Akamai presented a theory of joint
liability at trial. Akamai relied on the reasoning ex-
pressed by this court in *BMC Resources* that while
"[i]nfringement requires, as it always has, a showing that
a defendant has practiced each and every element of the
claimed invention," joint liability may be found when one
party "control[s] or direct[s]" the activities of another
party. *BMC Res., Inc. v. Paymentech, L.P.*, 498 F.3d 1373,
1380 (Fed. Cir. 2007). The district court, following *BMC
Resources*, instructed the jury that Limelight could only
be found to infringe if "the content provider, when [tag-

ging objects], acts under the direction and control[2] of Limelight such that Limelight can properly be deemed to be the one to do it." *JMOL Opinion* at 118. The district court added that the jury "should review the evidence, decide how the Limelight systems work, how does the interaction with the content provider work, and, specifically, does Limelight direct and control the modifications or does the content provider carry out these tasks entirely independently." *Id.*

Following the verdict finding infringement, Limelight moved for JMOL of noninfringement on the ground that substantial evidence did not support the verdict that Limelight directs or controls all the steps in the asserted claims. Initially, the district court denied the motion "because, unlike in *BMC Resources*, here there was evidence that not only was there a contractual relationship between Limelight and its customers, but that it provided those customers with instructions explaining how to utilize its content delivery service." *JMOL Opinion* at 119. Subsequently, this court issued its decision in *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318 (Fed. Cir. 2008), and Limelight moved for reconsideration. *Muniauction*, applying *BMC Resources*, held that an accused infringer's control over its customers' access to an online system, coupled with instructions on how to use that system, was not enough to establish direct infringement. *Id.* at 1328-30. On reconsideration, the district court granted JMOL of noninfringement to Limelight holding that there was "no material difference between Lime-

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[2] The district court initially instructed the jury that Limelight must both direct *and* control the actions of the Content Provider, but then issued a correcting instruction that "[i]t is either direct or control, control or direct; it doesn't have to be both." *JMOL Opinion* at 118 n.26.

light's interaction with its customers and that of Thomson in *Muniauction*." *JMOL Opinion* at 122.

Akamai appeals and this court has jurisdiction under 28 U.S.C. § 1295(a)(1).

DISCUSSION

I. Joint Infringement of the '703 Patent[3]

On appeal, Akamai asserts that we should reverse the district court's JMOL of noninfringement of the '703 patent because substantial evidence supports the jury's determination that Limelight exercises control or direction over the entire claimed process. Akamai attempts to distinguish *Muniauction*, arguing that Limelight: (1) creates and assigns a unique hostname for the content provider; (2) provides explicit step-by-step instructions to perform the tagging and serving claim steps; (3) offers technical assistance to help content providers with their performance of the claim steps; and (4) contractually requires content providers to perform the tagging and serving claim steps if they utilize the Limelight service. Limelight responds that Akamai's evidence is indistinguishable from that found legally insufficient in *Muniauction* and therefore we should affirm.

It is well settled that direct infringement requires a single party to perform every step of a claimed method. *BMC Resources*, 498 F.3d at 1378-79 (citing *Warner-Jenkinson Co., Inc. v. Hilton Davis Corp.*, 520 U.S. 17, 40 (1997)). In both *BMC Resources* and *Muniauction* this court confronted the situation in which more than one party is required to perform the steps of a claimed

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[3]   Because Akamai waived any assertion of indirect infringement before trial, the question before us is one of direct infringement only. Feb. 26, 2008 Trial Tr. at 46:4-22.

method. The court concluded that there can be no infringement unless "one party exercises 'control or direction' over the entire process such that every step is attributable to the controlling party." *Muniauction*, 532 F.3d at 1329 (citing *BMC Resources*, 498 F.3d at 1380-81). In assessing whether "control or direction" is present, the court in *BMC Resources* made reference to the legal principle that imposed "vicarious liability on a party for the acts of another in circumstances showing that the liable party controlled the conduct of the acting party." *BMC Resources*, 489 F.3d at 1379 (citing *Engle v. Dinehart*, 213 F.3d 639 (5th Cir. 2000) (unpublished decision); Restatement (Second) of Agency § 220 cmt. d)). The court concluded that "[it] would be unfair indeed for the mastermind in such situations to escape liability." *Id.* at 1381. Moreover, the court in *BMC Resources* also explained that "[a] party cannot avoid infringement . . . simply by contracting out steps of a patented process to another entity." *Id.*

While the "control or direction" test of *BMC Resources* established a foundational basis on which to determine liability for direct infringement of method claims by joint parties, it left several questions unanswered, including the question of whether the furnishing of instructions is sufficient to attribute the actions of the instructed party to the accused. *Muniauction* addressed the question about instructions and, in concluding that the instructions in that case were not enough, reiterated the notion of vicarious liability mentioned in *BMC Resources*. The court in *Muniauction* held that the requisite level of control or direction over the acts committed by a third party is met in circumstances in which "the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party." 532 F.3d at 1330. Thus, both *BMC Resources* and *Muniauction* set

forth relevant factors in assessing liability for joint infringement.

While control or direction is a consideration, as is the extent to which instructions, if any, may be provided, what is essential is not merely the exercise of control or the providing of instructions, but whether the relationship between the parties is such that acts of one may be attributed to the other. Implicit in this court's holdings in *BMC Resources* and *Muniauction* is that the performance of a method step may be attributed to an accused infringer when the relationship between the accused infringer and another party performing a method step is that of principal and agent, applying generally accepted principles of the law of agency as explicated by the Supreme Court and the Restatement of Agency. The Restatement defines agency as "the fiduciary relationship that arises when one person (a 'principal') manifests assent to another person (an 'agent') that the agent shall act on the principal's behalf and subject to the principal's control, and the agent manifests assent or otherwise consents so to act." Restatement (Third) of Agency § 1.01. For an agency relationship to exist, and thus, for infringement to be found, both parties must consent that the agent is acting on the principal's behalf and subject to the principal's control. *See Dixon v. United States*, 465 U.S. 482, 505 (1984) (citing the Restatement (Second) of Agency § 1 for the rule that an "agency relationship [is] created when one person agrees with another 'that the other shall act on his behalf and subject to his control'"). Similarly, also implicit in the court's holdings in *BMC Resources* and *Muniauction*, is that joint infringement occurs when a party is contractually obligated to the accused infringer to perform a method step.

In assessing infringement based on the actions of joint parties, it is not enough to determine for whose benefit

the actions serve, for in any relationship there may be benefits that inure in some respects to both parties. This court therefore holds as a matter of Federal Circuit law that there can only be joint infringement when there is an agency relationship between the parties who perform the method steps or when one party is contractually obligated to the other to perform the steps. Neither is present here.

The court notes that the common law of agency encompasses not only the fiduciary relationship noted above, but also some other relationships, which may include those of independent contractors. *United States v. Hudson*, 491 F.3d 590, 595 (Fed. Cir. 2007) ("As a matter of legal custom and tradition, . . . nothing about the title independent contractor invariably precludes someone from being an agent under appropriate circumstances."); Restatement (Third) of Agency § 1.01 cmt. c ("The common law of agency . . . additionally encompasses the employment relation . . . . [T]he common term 'independent contractor' is equivocal in meaning and confusing in usage because some termed independent contractors are agents while others are nonagent service providers. . . . This Restatement does not use the term 'independent' contractor."); Restatement (Second) of Agency § 2(3) ("An independent contractor . . . may or may not be an agent."). This same principle applies to the question of joint infringement. A party that engages another to perform a step of a claimed method as its agent cannot escape liability simply by designating its agent an independent contractor if all the elements that otherwise reflect an agency relationship are present.

In this case, there is nothing to indicate that Limelight's customers are performing any of the claimed method steps as agents for Limelight. To the contrary, Limelight's CDN is a service similar to Thomson's on-line auction system in *Muniauction,* and Limelight's relation-

ship with its customers is similar to Thomson's relationship with the bidders. In both cases, customers are provided instructions on use of the service and are required to perform some steps of the claimed method to take advantage of that service. In *Muniauction*, the customers performed the step of bidding. Here, the customers decide what content, if any, they would like delivered by Limelight's CDN and then perform the step of "tagging" that content. Limelight's customers also perform the step of "serving" their own web pages.

Akamai argues that in *Muniauction*, the direction or control provided by Thomson was "only tangentially related to the claimed process" because it related to controlling access to the auction system, not directing users on what bid information to input. Akamai's Principal Br. at 44. According to Akamai, here the control or direction is directly related to the claimed step because Limelight tells providers not only how to tag, but also what hostname to use as a tag. Further, Akamai points out that by including the word "direct" in the "control or direct" test, this court in *BMC Resources* must have meant the word "direct" to mean something other than "control," and this case "presents the ultimate in direction" because of the detailed instructions and technical assistance provided to customers by Limelight. Akamai's Principal Br. at 42. However, the words in the *BMC Resources* test must be read in the context of traditional agency law. "An essential element of agency is the principal's right to control the agent's actions. Control is a concept that embraces a wide spectrum of meanings, but within any relationship of agency the principal initially states what the agent shall and shall not do, in specific or general terms." Restatement (Third) of Agency § 1.01 cmt. f. Like *BMC Resources*, the Restatement and the Supreme Court refer to the words "control" and "direction"

when assessing whether an agency relationship exists, but there is no indication that an agency relationship arises when one party simply provides direction, no matter how explicit, to another party. All the elements of an agency relationship must be present. *See Meyer v. Holley*, 537 U.S. 280, 286 (2003) ("The Restatement [ ] specifies that the relevant principal/agency relationship demands not only control (or the right to direct or control) but also 'the manifestation of consent by one person to another that the other shall act *on his behalf*, and consent by the other so to act.'").

Akamai also argues that the relationship between Limelight and its customers compels a finding of joint infringement because Limelight "contracts out to content providers the claim steps that it alone does not perform." This conclusion stems from Limelight's standard form contract that, according to Akamai, "obligates content providers to perform the claim steps of tagging the embedded objects and serving the tagged page so that requests for the embedded objects resolve to Limelight's network instead of the content provider's." Akamai's Principal Br. at 40. For this argument, Akamai relies on the statement in *BMC Resources* that "[a] party cannot avoid infringement . . . simply by contracting out steps of a patented process to another entity." *BMC Resources*, 498 F.3d at 1381. Akamai's reliance on this statement is misplaced.

As discussed above, Limelight's customers decide what content, if any, they choose to have delivered by Limelight's CDN and only then perform the "tagging" and "serving" steps. The form contract does not *obligate* Limelight's customers to perform any of the method steps. It merely explains that the customer will have to perform the steps *if* it decides to take advantage of Limelight's service. *See Muniauction*, 532 F.3d at 1329 ("[M]ere

'arms-length cooperation' will not give rise to direct infringement by any party."). What is critical here is whether the evidence shows that the relationship between Limelight and its customers is such that the steps in question are performed by the customers as agents of Limelight or under a contractual obligation and are, thus, properly attributable to Limelight. It is true that Lime-light's agreement calls for its customers to assign a unique hostname, requires content providers to perform certain claim steps if they choose to use Limelight's service, and provides instructions and offers technical assistance for performing those steps. However, none of those points establishes either Limelight's control over its customers or its customers' consent to Limelight's control. To the contrary, the agreement merely provides the customers with the tools to allow them to exercise their independent discretion and control over how and in what respect they implement the system. Limelight's custom-ers did not perform the actions of tagging and serving as Limelight's agents and were not contractually obligated to perform those actions. Instead, the evidence leaves no question that Limelight's customers acted principally for their own benefit and under their own control.

While acknowledging the difficulty of proving in-fringement of claims that must be infringed by multiple parties, this court has noted that such concerns "can usually be offset by proper claim drafting. A patentee can usually structure a claim to capture infringement by a single party." *BMC Resources*, 498 F.3d at 1381. Akamai recognizes and, indeed, asserts that the other two patents at issue in this case (the '645 and '413 patents), which share the same specification, do not implicate this joint infringement issue because of the way the asserted claims were drafted. Oral Arg. 10:35-11:10, *available at* http://oralarguments.cafc.uscourts.gov. This court also

observes that in addition to initially structuring a claim to capture infringement by a single party, patentees may be able to correct a claim that can only be infringed by multiple parties by seeking a reissue patent. *See* Mark A. Lemley et al., *Divided Infringement Claims*, 33 AIPLA Q.J. 255, 278-79 (2005).

Here, the asserted claims were drafted so as to require the activities of both Limelight and its customers for a finding of infringement. Thus, Akamai put itself in a position of having to show that the allegedly infringing activities of Limelight's customers were attributable to Limelight. Akamai did not meet this burden because it did not show that Limelight's customers were acting as agents of or were contractually obligated to Limelight when performing the tagging and serving steps. Thus, the district court properly granted JMOL of noninfringement to Limelight.

* * *

Limelight argues as an alternative ground for affirmance that Akamai presented no substantial evidence that Limelight or its customers actually performed the tagging limitation as properly construed. Because we find that the district court properly granted JMOL of noninfringement on the ground stated, we need not and do not address this argument. Likewise, we do not reach Limelight's conditional cross-appeal of the damages award alleging that Akamai failed to present economic proof of a causal link between Limelight's infringement and any Akamai lost sales.

II. Claim Construction of the '645 and '413 Patents

After the district court's claim construction order, *Akamai Technologies, Inc. v. Limelight Networks, Inc.*, 494 F. Supp. 2d 34, 39 (D. Mass. 2007) ("*Claim Construc-*

tion Order"), Akamai stipulated that it could not prove infringement of the '645 patent under the district court's construction. The district court thus entered judgment of noninfringement. The district court subsequently entered summary judgment of noninfringement of claims 8, 18, and 20 of the '413 patent. Akamai appeals the district court's construction of several terms in the '645 and '413 patents. While Limelight does not concede that the '645 and '413 patents do not implicate a joint infringement issue similar to that found in the '703 patent above, both parties agree that even if such an issue does exist, it is not properly before the court in this appeal. Oral Arg. 10:35-11:10; 30:40-31:40 (Limelight's counsel stating that the joint infringement issues for the '645 and '413 patents were not developed at the trial court). Thus, we decide Akamai's appeal of the district court's construction of several terms in the asserted claims of the '645 and '413 patents independent of any potential joint infringement issues.

We review claim construction de novo. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1451 (Fed. Cir. 1998) (en banc). "We begin a claim construction analysis by considering the language of the claims themselves." *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1327 (Fed. Cir. 2009). However, "the written description can provide guidance as to the meaning of the claims, thereby dictating the manner in which the claims are to be construed, even if the guidance is not provided in explicit definitional format." *Scimed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1344 (Fed. Cir. 2001).

A. The Technical Setting

As part of a system for efficient content delivery, the '645 and '413 patents describe a framework including a set of "hosting" or "ghost" servers used to store and deliver

a website's embedded objects. '703 patent col.3 ll.4-7. To determine the location of a hosting computer on which a particular object is stored, the framework includes a second set of servers that are configured with functionality that is similar to, but not exactly the same as, a typical Internet DNS server, such that the servers resolve URLs specifically for the CDN. The specification refers to this second set of servers as "top-level" DNS servers. *Id.* col.3 ll.17-21, 31. The specification also describes a third set of servers that provide "low-level DNS" functionality. *Id.* col.3 ll.22-24. Together, the top-level and low-level servers form an "alternative domain name system." According to the patents' preferred embodiment, when a user's machine requests a web page from a content provider, the web page base document is delivered to the user's computer from the content server in the traditional manner described above. *Id.* col.3 ll.24-27. Any embedded objects in that web page that are stored on the CDN's hosting servers, however, are located using the invention's framework. First, the top-level DNS server determines the user's location in the network and uses that information to identify a list of low-level DNS servers. *Id.* col.3 ll.29-33, 60-61. The top-level DNS server then redirects the request for the embedded object to one of the identified low-level DNS servers that, in turn, resolves the request into an IP address for the appropriate hosting server that delivers the object to the user's computer. *Id.* col.3 ll.33-37. The specification does not limit the framework to two levels of DNS servers, but describes "a hierarchy of DNS servers that consisting [sic] of several levels." *Id.* col.3 ll.37-41. In addition, the top-level and low-level DNS functionality may be combined into a single DNS level. *Id.* col.5 ll.54-57.

The specification also describes load balancing across the set of hosting servers. *Id.* col.3 ll.66-67. Load balanc-

ing is the process of equalizing the workload on multiple computers. The specification describes a load balancing technique based on distributing the embedded object requests. This technique can be included in the tagging process by modifying the embedded object URL using the hostname of a "virtual server." *Id.* col.4 ll.1-5. A virtual server is simply a reference to a hosting server whose physical location is not determined until a user attempts to access a specific object. This allows users to retrieve the objects stored on hosting servers efficiently based on a number of continually changing factors (e.g., network traffic, user location). Thus, upon retrieval of a modified web page by a user, the hosting framework maintained by the CDN will resolve the virtual server hostname in the modified URL into the IP address of the appropriate hosting server from which to retrieve the object.

Claim 1 of the '645 patent provides:

In a wide area network in which an Internet domain name system (DNS) is useable to resolve DNS queries directed to participating content provider content that is available from participating content provider sites, a method of content delivery wherein participating content providers identify content to be delivered by a service provider from a set of content servers that are distinct from the participating content provider sites and associated with the service provider, wherein *a given object of a participating content provider is associated with an alphanumeric string*, the method comprising:

having the service provider establish an alternative domain name system (DNS), distinct from the Internet domain name system and any client

local name server, and having authority to *resolve the alphanumeric strings associated with the objects* identified by the participating content providers so that the objects identified by the participating content providers are available to be served from the service provider's content servers, the service provider's alternative domain name system having one or more DNS levels, wherein at least one DNS level comprises a set of one or more name servers;

for each of one or more participating content providers, delivering a given object on behalf of the participating content provider, wherein the given object is delivered by the following steps;

responsive to a DNS query to the given object's associated alphanumeric string, the DNS query originating from a client local name server, receiving the DNS query at a given name server of a lowest level of the one or more DNS levels in the service provider's alternative domain name system, *the given name server that receives the DNS query being close to the client local name server as determined by given location information*;

having the given name server that receives the DNS query resolve the alphanumeric string into an IP address that the given name server then returns to the client local name server, wherein *the alphanumeric string is resolved without reference to a filename for the given object*, wherein the IP address returned as a result of the

resolution is associated with a content server within a given subset of the set of content servers, the subset of the set of content being associated with the given name server, the content server associated with the IP address returned by the given name server being selected according to a load sharing algorithm enforced across the subset of the set of content servers associated with the given name server;

at the content server associated with the IP address, receiving a request for the given object, the request having the filename associated therewith;

if the given object is available for delivery from the content server associated with the IP address, serving the given object from the content server.

'645 patent col.17 ll.39-col.18 ll.29 (emphases added).

Claim 8 is representative of the asserted claims of the '413 patent. It provides:

A method of content delivery wherein participating content providers identify content to be delivered by a content delivery network service provider from a set of content servers associated with the content delivery network service provider, wherein a given object of a participating content provider is associated with a [URL] that includes, *in addition to a filename, an alphanumeric string*, comprising:

having the content delivery network service provider establish a domain name system (DNS) having authority to resolve the alphanumeric strings in the URLs of the objects identified by the participating content providers, the content delivery network server provider's *domain name system having one or more DNS levels*, wherein at least one DNS level comprises a set of one or more name servers;

for each of one or more participating content providers, delivering a given object on behalf of the participating content provider, wherein the given object is delivered by the following steps;

responsive to a DNS query, selecting a given one of the name servers in the content delivery network service provider's domain name system;

at the given one of the name servers, resolving the alphanumeric string to an IP address, wherein

the alphanumeric string is resolved without refer-
ence to the filename for the given object;

at a server associated with the IP address, the
server being one of the set of content servers, re-
ceiving a request for the given object, the request
having the filename associated therewith;

from the server, serving the given object; and

caching the given object at the server so that
the given object is available for delivery from the
server for a given time period in the event that a
new DNS query to resolve the alphanumeric
string is received at the domain name system and
is resolved to the IP address of the server.

'413 patent col.18 ll.14-51 (emphases added).

B.   Associated with an Alphanumeric String

Akamai appeals the construction of the term "a given
object of a participating content provider is associated
with an alphanumeric string" in the preamble of claim 1
of the '645 patent.[4]   The district court construed the
limitation to require that the alphanumeric string include
the embedded object's original URL (the URL including
the hostname of the computer on which the actual object
resided within the content provider's domain). *Claim
Construction Order* at 39. The court reasoned that the

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    [4]   Neither party contends that the term in question
is not a limitation because it is part of the preamble.

written description portion of the '645 patent "describes *the invention* as associating a particular object of a content provider with an alphanumeric string consisting of a virtual server hostname prepended onto the URL for the object." *Id.* at 40. The court found that "[t]he specification discloses no other way that an object is associated with an alphanumeric string, nor is there any suggestion or teaching that an association which did not include the URL for the embedded object could be used in an embodiment of the invention." *Id.* The district court declined as overly broad Akamai's proposed construction of the term "associated" according to its dictionary definition of "brought into some kind of relationship with."

Akamai contends that the court imported a limitation from the specification into the claims and thereby improperly limited the scope of the claims to the specification's preferred embodiment. According to Akamai, nothing in the claim language supports requiring that the alphanumeric string include the original URL. Akamai relies on the parties' stipulation that "alphanumeric string" is "a character string up to 24 characters drawn from the alphabet (a-z), digits (0-9), minus signs (-), and periods (.)." Stipulated Order Establishing the Constructions for Certain Claim Terms as Agreed Upon by the Parties at 3, *Akamai Techs., Inc. v. Limelight Networks, Inc.*, No. 06-CV-11109 (D. Mass. Apr. 24, 2007). Akamai asserts that the specification and prosecution history do not define "associated" as having any meaning other than its ordinary meaning. Thus, Akamai argues that the ordinary meaning of the words in the claim compel a broad interpretation without the limitation introduced by the district court. Akamai also argues that the specification very clearly indicates that including the object's original URL in the alphanumeric string is merely the preferred method. Akamai contends that one of ordinary

skill in the art would understand that other tagging methods may be used to associate an alphanumeric string with the object.

In addition, Akamai points to the prosecution history, other claim limitations in the '645 patent, and the use of "alphanumeric string" in claim 18 of the '413 patent as evidence contradicting the district court's construction. Akamai notes that (1) none of the examples of alphanumeric strings cited by Akamai during prosecution included the original URL; (2) other claim limitations of the '645 patent use the term "alphanumeric string" as a virtual server hostname, not a URL; and (3) the preamble of claim 18 of the '413 patent requires a URL to include an alphanumeric string, not the other way around.

Limelight responds that the district court correctly limited the claim term to include the object's original URL because it reflects the '645 patent's explicit description of the invention. Reiterating the points made by the district court, Limelight asserts that the patents consistently describe "the invention" as associating an alphanumeric string with an object by prepending a virtual server hostname to the original URL that identifies the object in the absence of the CDN. Limelight adds that including the original URL in the alphanumeric string is not merely a preferred embodiment in the patents because all the examples in the patents contain the object's original URL.

This court agrees with Limelight and the district court that the claim term "a given object of a participating content provider is associated with an alphanumeric string" limits tagged alphanumeric strings to those strings including the object's original URL. Here, as in *Honeywell International, Inc. v. ITT Industries, Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006), alphanumeric strings including the object's original URL were not merely

discussed as a preferred embodiment. Instead, the written description specifically refers to strings including the object's original URL as "the invention":

> According to the present invention, load balancing across the set of hosting servers is achieved in part through a novel technique for distributing the embedded object requests. In particular, each embedded object URL is preferably modified by prepending a virtual server hostname into the URL. More generally, the virtual server hostname is inserted into the URL.

'645 patent col. 4 ll.13-19.

> According to the invention, the embedded object URL is first modified, preferably in an off-line process, to condition the URL to be served by the global hosting servers.

Id. col.6 ll.54-57.

> Thus, according to the present invention, a virtual server hostname is prepended into the URL for a given embedded object . . . .

Id. col.7 ll.36-38.

> With the above as background, the inventive global hosting framework is now described in the context of a specific example. . . . Instead of re-

turning the usual page, according to the inven-
tion, the Web site returns a page with embedded
object URLs that are modified according to the
method illustrated in the flowchart of FIG. 4.

Id. col.7 l.49-col.8 l.2

If, however, no copy of the data on the ghost ex-
ists, a copy is retrieved from the original server or
another ghost server. Note that the ghost knows
who the original server was because the name was
encoded into the URL that was passed to the
ghost from the browser.

Id. col.12 ll.54-60.

The specification does include language indicating
that the patentee intended certain aspects of the descrip-
tion to represent preferred, rather than required, ele-
ments of the invention. *See, e.g.*, '645 patent col.4 ll.15-17
("[E]ach embedded object URL is preferably modified by
prepending a virtual server hostname into the URL."); *id.*
col.6 ll.57-58 ("A flowchart illustrating the preferred
method for modifying the object URL is illustrated in FIG.
4."). This court also acknowledges that much of the
language describing a string including a URL as "the
invention" occurs within the section entitled "Detailed
Description of the Preferred Embodiment" or in the de-
scription of Figure 4, which is referred to as a "preferred
method for modifying the object URL." However, the
specification as a whole makes clear that including the
object's original URL is the only method to achieve the

claimed association between an alphanumeric string and the embedded object. Indeed, it is the only method described. *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001) ("Although the specification need not present every embodiment or permutation of the invention and the claims are not limited to the preferred embodiment of the invention . . . neither do the claims enlarge what is patented beyond what the inventor has described as the invention.") (internal citations omitted). *See also Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1271 (Fed. Cir. 2001) ("[W]hen a patentee uses a claim term throughout the entire patent specification, in a manner consistent with only a single meaning, he has defined that term 'by implication.'") (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). Moreover, the specification specifically limits the object's modified URL to either prepending or inserting a virtual server hostname into the URL. '645 patent col.4 ll.15-19 ("In particular, each embedded object URL is preferably modified by prepending a virtual server hostname into the URL. More generally, the virtual server hostname is inserted into the URL."). Both of these methods include the original URL of the object in the modified string. Finally, the specification describes the proper functioning of the invention as motivation for including the object's original URL in the modified string, "the ghost knows who the original server was because the name was encoded into the URL that was passed to the ghost from the browser." *Id.* col.12 ll.56-58.

This court is not persuaded by Akamai's argument that the patentee established a broader scope during prosecution or that other uses of the term "alphanumeric string" compel a broader interpretation. Akamai argues that during prosecution the patentee made it clear that

an alphanumeric string can be comprised of just a host-name as opposed to requiring the inclusion of an entire URL. Akamai refers to the patentee's description of an examiner interview in a preliminary amendment. The remarks describe the interpretation of the phrase "alphanumeric string" and cite "numerous examples of such strings, such as . . . 'a1234.g.akamaitech.net,'" in the written description. *Id.* col.7 ll.14-15. However, in the specification, the reference to the indicated hostname is in the context of determining a virtual server hostname for ultimate inclusion in the tagged string. The specification does not indicate that this virtual hostname can eventually be the entire string. Instead, the specification clearly describes that the hostname will be "prepended into the URL for the given embedded object" once the hostname is determined. *See, e.g., id.* col.6 ll.63-64. In fact, all the examples in the specification indicate that the ultimate tagged string contains the object's original URL. '645 patent col.8 ll.24-25; *id.* col.8 ll.56-57; *id.* col.9 ll.25-26. Even if we agreed with Akamai that the patentee indicated in the prosecution history that the alphanumeric string associated with an object could include only a hostname, this is not enough to overcome the clear description of the invention in the specification. *See Honeywell*, 452 F.3d at 1319 ("Where, as here, the written description clearly identifies what his invention is, an expression by a patentee during prosecution that he intends his claims to cover more than what his specification discloses is entitled to little weight."); *Biogen, Inc. v. Berlex Labs.*, 318 F.3d 1132, 1140 (Fed. Cir. 2003) (stating that "[r]epresentations during prosecution cannot enlarge the content of the specification."). Akamai's arguments that other uses of "alphanumeric string" in the '645 and '413 patents require a broad interpretation such that the string may include only a hostname are likewise not persuasive. None of the uses of "alphanumeric string" in

either patent clearly limits the contents to just a host-
name. In fact, Akamai does not explain how a string
made up of just a virtual server hostname would be
"associated" with the original object even under the
broadest definition of that term.

Akamai argues that the district court's requirement
that the alphanumeric string include an entire URL is
nonsensical because DNS servers resolve hostnames, not
URLs. Akamai also asserts that the district court's
statement that "[t]he URL of the object is necessary to the
inventive global framework in order to retrieve the object
from the content provider's server if no copy exists on a
ghost [i.e., content] server" in its claim construction order,
Claim Construction Order at 40, demonstrates a "funda-
mental misunderstanding of the requirements of the
invention." Akamai's Principal Br. at 57. According to
Akamai, this statement ignores that the specification
describes retrieving any missing content from either the
content provider's original server or another content
server in the CDN. None of these arguments are persua-
sive. At no place does the specification indicate that the
entire string must be used by the DNS server. Even if
only the hostname is used by the DNS during the resolv-
ing step, this does not mean that an alphanumeric string
cannot contain other information not used by the DNS
during this step. Indeed, this must be the case since the
specification explicitly notes that "the ghost knows who
the original server was because the name was encoded
into the URL that was passed to the ghost from the
browser." '645 patent col.12 ll.56-58.

C. Selection by the Alternative Domain Name System

Akamai also appeals the district court's construction
of "the given name server that receives the DNS query
being close to the client local name server as determined

by given location information" in claim 1 of the '645 patent and "selecting a given one of the name servers in the content delivery network" in claims 8, 18, and 20 of the '413 patent. The district court interpreted both limitations to require that the name server be selected by the alternative domain name system.[5] *Claim Construction Order*, at 42, 45. The court found that the specification compelled this interpretation because "[r]ead in light of the specification, the invention claims an alternate DNS system that selects a DNS server in response to a user request based on the location of the user." *Id.* at 43. Akamai, citing *DSW, Inc. v. Shoe Pavilion, Inc.*, 537 F.3d 1342, 1347 (Fed. Cir. 2008), argues that the district court improperly incorporated a structural limitation—the alternative domain name system—into method claims. Moreover, Akamai asserts that claim 1 of the '645 patent

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[5]   The claim limitations and their associated construction differ slightly for the '645 and '413 patents. For the '645 patent, the limitation "the given name server that receives the DNS query being close to the client local name server as determined by given location information" was construed by the district court to be "the particular name server that receives the DNS query is selected by the alternative domain name system and is close in Internet terms to the client local name server." *Claim Construction Order* at 42. Claims 8 and 18 of the '413 patent include the limitation "responsive to a DNS query, selecting a given one of the name servers in the content delivery network," which is construed as "in response to a DNS query, the [CDN's] [DNS] selects a particular name server." *Id.* at 45. Claim 20 of the '413 patent includes the limitation "responsive to a DNS query received from a client local name server, selecting a given one of the name servers in the [CDN]," which is construed as "in response to a DNS query received from a client local name server, the [CDN's] [DNS] selects a particular name server." *Id.* at 45. These distinctions are not germane to the issue presented in this appeal.

does not use the term selecting at all. Akamai points out that claim 1 only requires that the CDN's DNS server receiving a DNS query be close to the client's local name server. In addition, Akamai argues that nothing in the '413 patent claim language, specification, or prosecution history supports the court's requirement of selection by the alternative domain name system. Limelight responds that the district court did not import a new structural limitation because claim 1 expressly requires an alternative domain name system.

This court is not persuaded by Akamai's argument. *DSW* is inapposite. In *DSW* this court reversed the district court's claim construction importing a limitation from a preferred embodiment because the claim language was unambiguously broader than the preferred embodiment, not because it imported structural limitations into a method claim. *Id.* at 1347. Method claims often include structural details. *See e.g.*, *Microprocessor Enhancement Corp. v. Tex. Instruments, Inc.*, 520 F.3d 1367, 1374 (Fed. Cir. 2008) ("Method claim preambles often recite the physical structures of a system in which the claimed method is practiced, and claim 1 is no different."); *Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1342 (Fed. Cir. 2003) (construing a method claim as including "steps that require the operation or manipulation of the particular structure identified and described by the preamble"). All of the asserted claims in both the '645 patent and the '413 patent explicitly refer to the alternative domain name system as a detail associated with the claimed method. '645 patent col.17 ll.50-51 ("having the service provider establish an alternative domain name system (DNS)"); '413 patent col.18 ll.22-23, col.19 ll.44-45, col.20 ll.25-26 ("having the content delivery network service provider establish an alternative domain name system (DNS)"). Therefore, the structural element of the alterna-

tive DNS framework was explicitly and properly included in the claims.

Akamai also asserts that the district court's interpretation improperly limits the inventive framework to a multi-level DNS system. Akamai points out that because the patents explicitly allow for a framework with a one-level DNS framework, a multi-level restriction is unduly limiting. '703 patent col.5 ll.56-57 ("Alternatively, there may be a single DNS level that combines the functionality of the top-level and low-level servers.").

The district court responded to this exact argument in its claim construction order. Specifically, the court explained that because the specification states that "the functionality of the top and low-level servers" may be combined in "a single DNS level," the specification requires that a single-level DNS system accomplish the same steps as the two-level system described in the preferred embodiment. *Claim Construction Order* at 45. Thus, the district court's construction *does* support a single-level DNS system, and is not limited to a multi-level DNS system. As the district court recognized, the steps described in the preferred embodiment—(1) a top-level DNS server of the CDN selects a close-by low-level DNS server and redirects the user to that server and (2) the user's local DNS server requests the object's IP address from the low-level server—can be accomplished by one DNS server. *Id.* at 46 (citing '413 patent col.9 ll.44-50). Specifically, the district court explained:

> In a single-level DNS embodiment, as suggested by the specification, the user's local name server would still contact a content delivery provider's top-level name server to resolve the IP address of a server to serve an object. This name server, however, would then *directly* communicate with a

particular local name server, based on the user's location, to resolve the server's IP address and return it to the user, rather than require the user to conduct a second lookup. Thus, the user would obtain the IP address of the appropriate ghost server with only a *single* DNS request, however the selection of a particular name server would still be the result of a DNS lookup by the service provider's DNS system. Such an embodiment would satisfy the claimed "one" level of DNS, yet not be in conflict with [the district court's adopted] claim construction.

Id. at 45-46.

This explanation is entirely consistent with the specification's description of the invention and effectively counters Akamai's argument that the court's construction improperly limits the invention to a multi-level DNS system. Akamai also asserts, however, that one of these "other techniques" could be substituted for the top-level DNS servers in order to implement a one-level DNS framework. Thus, according to Akamai, the patent, but not the district court's construction, allows for a one-level DNS framework in which "other techniques," such as "Anycasting," would be used to select the ultimate CDN DNS server—instead of a top-level DNS server—because "the specification encompassed techniques known in the prior art." Akamai's Br. at 61 (citing *BJ Servs. Co. v. Halliburton Energy Servs., Inc.*, 338 F.3d 1368, 1372 (Fed. Cir. 2003). This court does not agree that the patent's description allows for such a broad reading of the claims. The patent disclosure supports only one method for choosing the ultimate CDN DNS server—the alternative DNS system. There is no support in the specification for any method of choosing a particular name server other than by a DNS lookup and no disclosure that would have

suggested to a person of ordinary skill in the art that anything other than a DNS lookup should be contemplated. There is no evidence that, given the lack of detailed disclosure in the patent's language, a person of skill in the art would have looked to other known techniques to implement this portion of the claimed invention.

In fact, the patent repeatedly defines using DNS lookup for choosing the ultimate CDN DNS server as the "invention." As noted by the district court, the specification describes "the present invention" as "manipulat[ing] the DNS system so the name is resolved to one of the ghosts that is near the client." '703 patent col.9 ll.26-28. In addition, under the heading entitled "Brief Summary of the Invention," the specification states that "[t]o locate the appropriate hosting servers to use, the top-level DNS server determines the user's location in the network to identify a given low-level DNS server to respond to the request for the embedded object." '703 patent col.3 ll.29-33.

Akamai conceded that under the district court's construction, Limelight does not infringe the '645 patent. Akamai also does not argue that Limelight would infringe the '413 patent under this construction. Therefore, this court is left to conclude that the district court properly entered judgment in favor of Limelight on the issue of infringement.

CONCLUSION

For the foregoing reasons, this court affirms the district court's grant of Limelight's motion for JMOL of noninfringement of the '703 patent. This court also affirms the district court's entry of judgment of noninfringement of the '645 and '413 patents.

AFFIRMED