United States District Court,
D. Massachusetts.

SKYLINE SOFTWARE SYSTEMS, INC,
Plaintiff.
v.
KEYHOLE, INC. and Google, Inc,
Defendants.

No. Civ.A. 04-11129-DPW

March 24, 2006.

Background: Patentee brought action for alleged infringement of patent describing method and apparatus for efficiently transferring information needed to display three-dimensional images.

Holdings: Following Markman hearing, the District Court, Woodlock, J., held that:
(1) term "data blocks" meant block or collection of data or digital information;
(2) subsequent references to term "data blocks" were shorthand references to "data blocks describing three-dimensional terrain";
(3) term "first data block" meant the first data block provided to the renderer from the local memory corresponding to the specified of coordinates;
(4) term "coordinates in the terrain" meant a set of numerical values that identifies a particular location in the terrain;
(5) term "resolution level" meant level of detail of the data per unit area; and
(6) term "indication of respective resolution level" meant the identification of the particular resolution level of the data required.

Ordered accordingly.

6,496,189. Construed.

H. Joseph Hameline, Geri L. Haight, Mintz, Levin, Cohn, Ferris, Glovsky & Popeo, PC, Boston, MA, for Plaintiff.

Carolyn Chang, Darryl M. Woo, Robin W. Reasoner, Saundra L.M. Riley, Fenwick & West LLP, Mountain View, CA, Kent Kemeny, Maclain Wells, Michael Sacksteder, Fenwick & West LLP, San Francisco, CA, Michelle Chassereau Jackson, Nelson G. Apjohn, Nutter, McClennen & Fish, LLP, Boston, MA, for Defendants.

MEMORANDUM AND ORDER

WOODLOCK**, District Judge.**

The Plaintiff, Skyline Software Systems, Inc., alleges infringement of United States Patent No. 6,496,189 (the " '189 Patent") by the Defendants, Keyhole, Inc. and Google, Inc. The '189 Patent describes a method and apparatus for efficiently transferring information needed to display three-dimensional images. Although Skyline moved for a preliminary injunction against the Defendants following the hearing on claim construction, before addressing the merits of that request, I separately resolve in this Memorandum and Order the threshold dispute between the parties regarding the construction of various claim terms. FN1 *See* Watts v. XL Systems, Inc., 232 F.3d 877, 880 (Fed.Cir.2000) ("The determination of infringement is a two-step process. First, this court construes the claims and, second, we compare the properly construed claims to the accused device.")

FN1. Attached as an Appendix to this Memorandum and Order at 37-39 is a Summary of Constructions, setting forth the proposed constructions by the parties and those I have adopted.

I. CLAIM CONSTRUCTION GENERALLY

Following the hearing on claim construction, the Federal Circuit issued an *en banc* decision designed to order the process of claim construction. Phillips v. AWH Corporation, 415 F.3d 1303 (Fed.Cir.2005) (*en banc*).

[1] "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.' " Id. at 1312 *quoting* Innova/Pure Water, Inc. v. Safari Water Filtration Systems, Inc., 381 F.3d 1111, 1115 (Fed.Cir.2004). Limited discovery surrounding the question of claim construction has occurred in this case, with each party providing its respective constructions of the claims in dispute. After shared constructions and full briefing by the parties, the construction of terms in two claims-characterized by the plaintiff as "representative" of the universe in dispute for this lawsuit-are presented in accordance with the comprehensive framework set out in Phillips. Since the Federal Circuit decided Phillips after the submissions and the Markman hearing in this case, I have reinterpreted the arguments made by the parties in light of the Phillips framework set out below.

[2] [3] [4] [5] Claim construction is a question of law to be determined by a judge, notwithstanding its evidentiary underpinnings. Markman v. Westview Instruments, Inc., 517 U.S. 370, 384, 390, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). Courts are to give claim terms "their ordinary and customary meaning." Phillips, 415 F.3d at 1312 *quoting* Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (1996). However, the ordinary and customary meaning of a claim is not the meaning understood by a layperson, but "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." FN2 Id. at 1313. This understanding provides "an objective baseline from which to begin claim interpretation." Id.

FN2. For purposes of claim construction, the "time of the invention" is the effective filing date of the patent application. Phillips v. AWH Corporation, 415 F.3d 1303, 1313 (Fed.Cir.2005).

[6] "In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." Id. at 1314. "In such circumstances, general purpose dictionaries may be helpful." Id. However, where the ordinary meaning of claim language as understood by a person of skill in the art is not readily apparent, Phillips directs district courts to a hierarchy of sources to aid in claim construction. The intrinsic record, including the claim terms themselves, the remainder of the specification, and the prosecution history, provides the best guidance as to the meaning of the claims. Id. at 1313-14. But extrinsic evidence, such as dictionaries, expert testimony, and

learned treatises, may also play a valuable role in claim construction. However, in a departure from the line of cases led by Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193 (Fed.Cir.2002), Phillips urges caution in their use. Id. at 1319-1324.

[7] [8] [9] Among the sources of intrinsic evidence, Phillips places primary importance on the claims themselves and the specification. The context in which a term is used in the asserted claim and the use of the term in other claims can be "highly instructive." Id. at 1314. The claims, "of course, do not stand alone." Id. at 1315. They "must be read in view of the specification, of which they are a part." Id. *quoting* Markman, 52 F.3d at 978. Thus, Phillips reaffirmed the long-standing principle that the specification "is the single best guide to the meaning of a disputed term." Id. at 1303. In addition to its statutory role as a full and exact description of the claimed invention, the specification may reveal a patentee's distinctive definition of a term or a disavowal of claim scope. Id. at 1316. The specification is such a valuable tool that it is "entirely appropriate for a court, when conducting claim construction, to rely heavily on the written description for guidance as to the meaning of the claims." Id. at 1317. Nevertheless, Phillips warned of "the danger of reading limitations from the specification into the claim." Id. at 1323. The purpose of the specification is to enable one skilled in the art to make and use the invention. Id. Specific embodiments of the invention described for teaching purposes should not be imported into the claim as a limitation. Id. The distinction between proper claim construction and improper limitation turns on "whether a person of skill in the art would understand the embodiments to define the outer limits of the claim term or merely to be exemplary in nature." Id. at 1323.

[10] A court may also consult the prosecution history, which "consists of the complete record of the proceedings before the PTO [the Patent and Trademark Office] and includes the prior art cited during the examination of the patent," when construing a claim. Id. at 1317. Like the specification, the prosecution history "can inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." Id. *See* Chimie v. PPG Indus., Inc., 402 F.3d 1371, 1384 (Fed.Cir.2005) *quoting* ZMI Corp. v. Cardiac Resuscitator Corp., 844 F.2d 1576, 1580 (Fed.Cir.1988) ("The purpose of consulting the prosecution history in construing a claim is to 'exclude any interpretation that was disclaimed during prosecution.' "). However, the prosecution history is not a final product; it "represents an ongoing negotiation between the PTO and the applicant." Phillips, 415 F.3d at 1317. As such, it "often lacks the clarity of the specification and thus is less useful for claim construction purposes." Id.

Although the Phillips court attached greater value to intrinsic evidence, it approved the use of extrinsic evidence in a limited fashion. Specifically, technical dictionaries are helpful to the extent that they assist a court to " 'better understand the underlying technology' and the way in which one of skill in the art might use the claim terms." Id. at 1318 *quoting* Vitronics, 90 F.3d at 1584. Expert testimony is also valuable for providing background on the technology at issue, explaining how an invention works, or describing a distinctive use of a term in a particular field. However, neither dictionaries nor expert testimony, are reliable sources for claim interpretation for a variety of reasons. As such, I have considered Dr. Feiner's Declaration and the dictionary definitions proposed by both parties, but do not rely heavily on them in construing the terms at issue here.

The Phillips Court's greatest concern with extrinsic evidence, particularly dictionaries, is that it may lead judges to construe terms in an overbroad manner.

The problem is that if the district court starts with the broad dictionary definition in every case and fails to fully appreciate how the specification implicitly limits that definition, the error will systematically cause the construction of the claim to be unduly expansive.

Id. at 1321. Because dictionaries provide a broad array of definitions, "heavy relianceon the dictionary

divorced from the intrinsic evidence risks transforming the meaning of the claim term to the artisan into the meaning of the term in the abstract." Id. The Texas Digital line of cases adopted this "dictionary down" approach, thereby reducing the role of the specification to a mere "check on the dictionary meaning of a claim term." Id. at 1320. In contrast, Phillips articulated a "claims up" approach, instructing courts to focus "at the outset on how the patentee used the claim term in the claims, specification, and prosecution history, rather than starting with a broad definition and whittling it down." Id. at 1321.

[11] Ultimately, there is no magic formula for conducting claim construction when the ordinary meaning of the disputed terms as understood by a person of skill in the art is not readily apparent. Id. at 1324. The key lies in giving appropriate weight to each "source in light of the statutes and policies that inform patent law." Id. Accordingly, the claims and the specification are most significant, followed by prosecution history, and finally by extrinsic sources. Id.

II. DISPUTED TERMS

Claim 1 reads:

A method of providing **data blocks** describing three-dimensional **terrain** to a **renderer**, the **data blocks belonging to a hierarchical structure** which includes blocks at a plurality of different resolution levels, the method comprising:

receiving from the **renderer** one or more **coordinates in the terrain** along with **indication of a respective resolution** level;

providing the **renderer** with a **first data block** which includes data corresponding to the one or more coordinates, from a **local memory**;

downloading from a remote server one or more additional data blocks at a resolution higher than the resolution level of the first block which includes data corresponding to the one or more coordinates if the provided block from the **local memory** is not at the indicated resolution level.

(col.16, ll.28-43) (emphasis supplied)

Claim 12 reads:

Apparatus for providing **data blocks** describing three-dimensional terrain to a **render[er]**,FN3 the **data blocks belonging to a hierarchical structure** which includes blocks at a plurality of different resolution levels, the apparatus comprising:

FN3. "Render" appears to be a typographical error and neither party contends that the term should be construed as anything other than "renderer."

a **local memory** which stores data blocks corresponding to coordinates proximal to a current viewpoint of the renderer;
a **communication link**, through which the memory receives the data blocks from a remote server;

a **processor** which receives one or more specified coordinates along with **indication of a respective resolution** level from a **renderer**, provides the **renderer** with a **first data block** which includes data corresponding to the one or more specified coordinates from a **local memory**, and downloads over the **communication link** one or more data blocks of a resolution level higher than the resolution level of the

first block which include data corresponding to the one or more coordinates if the first block is not from the indicated level.

(col.18, ll.12-31) (emphasis supplied)
From these claims, the parties dispute the meaning of the following terms: data blocks, data blocks belonging to a hierarchical structure, first data block, terrain, coordinates in the terrain, indication of a respective resolution level, renderer, and local memory.

The Plaintiff characterized these claims as "representative" and contends that the representative claims "contain[ ] all the claim terms that are in dispute in claims 1 through 24." (Transcript, p. 5)

A. Data Blocks

[12] I begin with a term found throughout the patent-"data blocks", often referred to simply as "blocks" in the specification.

Initially, Skyline suggested that the court construe "data block" broadly to mean "a quantity, set or amount of information or data representing a portion of the terrain." The Defendants offered instead the following narrower construction, on the premise that the patentee acted as his own lexicographer with respect to this term: "an image of a terrain area that is composed of pixels, where each data block optionally also contains data associated with the image of the terrain area, such as data describing other objects that overlay the terrain; each block has one particular resolution." At the Markman hearing, however, the Defendants did not protest Skyline's critique of equating data with image, and both parties were open to the idea of data blocks meaning something like information necessary to render graphically an image of all or part of the terrain, including any additional features overlaid thereto, at a particular resolution level. (Transcript, pp. 12-13) Given the principles in Phillips, I find that the most accurate construction will be one that includes the insights provided by the specification and the claims themselves.

The specification teaches that "image blocks ... contain data representing the terrain" (col.8, ll.18-20), and the claims speak of "data blocks describing three-dimensional terrain" (Claim 1, col. 16, ll. 28-29; col. 4, 1. 12), such that "each terrain area is described in a plurality of blocks at different resolution levels." (col.3, ll.5-6) The method for preparing the database in accordance with the preferred embodiment of the present invention requires a processor, referred to as a Terra Builder, to cut up images it receives into blocks. (col.9, 1.55) The end result is that the user's "processor renders three-dimensional terrain images responsive to the data blocks" corresponding to the requested coordinates and viewpoints on a display. (col.6, ll.56-57)

These excerpts from the specification demonstrate-despite the seemingly anomalous statement that "[b]locks are preferably real-life images of terrain areas received from airborne or satellite cameras" (col.8, ll.36-37)-that the term does not refer to the actual images of the terrain area, but to the data or information that represents sections of the terrain in the preferred embodiment. In the preferred embodiment, the blocks may "include altitude data of the terrain" and "optional objects to be overlaid on the terrain." (col.5, ll.38, 40-41) These objects may "include, but are not limited to, labels, annotations, lines and 3D objects." (col.8, ll.38-42)

[13] [14] Having said that, the patent specifically disclaims the idea that the data streaming methods only describe the display of images of terrain. Rather, the patent specifies that "the data streaming methods of the present invention may be used to convey large databases of data which are to be displayed graphically, such as in graphic displays of stock values." (col.16, ll.20-24) Consequently, I must technically construe the term "data block" broadly as a block or collection of data or digital information, but I do so only with the understanding that the terms "data block describing three-dimensional terrain" and "image block", refer to a block or collection of data or digital information that represents or describes a section of three-dimensional

terrain at a particular resolution level and that includes any additional data overlaid on the digital image of the terrain, such as altitude, labels or optional objects. I construe the subsequent references to "data blocks" in Claims 1 and 12 as referring in shorthand to "data blocks describing three-dimensional terrain", as opposed to any kind of data block, because the scope of the claimed invention is a method and apparatus for providing data blocks describing three-dimensional terrain to a renderer.

Construction: (data block) A block or collection of data or digital information.

Construction: (data block describing three-dimensional terrain) A block or collection of data or digital information that represents or describes a section of three-dimensional terrain at a particular resolution level and that includes any additional data overlaid on the digital image of the terrain, such as altitude, labels or optional objects.

B. Data Blocks Belonging to a Hierarchical Structure

[15] The parties agree that this phrase, as used in the patent, would be understood by one of ordinary skill in the art to mean data blocks that are organized into multiple levels of resolution. Skyline, however, takes issue with the two additional limitations proposed by the Defendants: data blocks that are organized into multiple levels of resolution, whereby (1) each level contains data blocks at the same resolution, and (2) each successive level contains data blocks of a higher resolution than those in the preceding level.

First, in its submissions and at the Markman hearing, Skyline questioned whether or not the concept of hierarchy, as used in the patent, includes the idea of "directionality", that is whether each successive level contains data blocks of a higher resolution than those in the preceding level. Second, at the Markman hearing Skyline also questioned whether each level of the hierarchy must contain data blocks at the same resolution, contending that this construction could be interpreted as meaning that each data block must contain the same amount of data. Instead, Skyline prefers the less specific construction that the "data blocks are arranged into multiple levels of resolution, wherein each level of the structure contains blocks of a different resolution." For support, Skyline cites to col. 6, ll. 3-6 of the '189 patent.

The portion of the specification cited by Skyline describes how U.S. patent application Ser. No. 08/939,948 (now United States Patent No. 6,111,583 (the '583 Patent)), which is incorporated by reference, "uses a hierarchical database in which substantially each terrain area is described in a plurality of blocks at different resolution levels." The '583 Patent is relevant because "[i]n some preferred embodiments of the present invention, the data is stored at the remote server in accordance with the hierarchical structure described in the "8 application." (col.3, ll.13-15) The '583 Patent describes arranging the units of data into an ordered hierarchy according to successive resolution levels.

FIGS. 3A and 3B ..., taken together, are simplified pictorial illustrations of a data structure useful in storing a terrain image constructed and operative in accordance with a preferred embodiment of the present invention. A terrain image is typically stored as a hierarchy of one or more two-dimensional grids of one or more tiles, with each grid representing the image at a given resolution.... Each grid has four times more detail then the grid preceding it in the hierarchy.

('583 Patent, col. 7, ll. 36-49)

The '189 Patent provides even more detail in describing its Fig. 2, "a schematic block diagram illustrating the data structure of images stored in a database ... in accordance with a preferred embodiment of the present invention." (col.7, ll.27-31)

Blocks 42 are preferably stored in *database* 40.... Blocks 42 are classified in *successive resolution levels* 44

labeled 44A, 44B, etc., according to the height from which they view the terrain and, therefore, the level of detail which they include. A plurality of blocks 42A which belong to the lowest resolution level 44A, labeled "level 1," cover the largest area per block and therefore have the least detail per area unit. It is noted that the size of the geographical area covered by blocks 42A of "level 1" is dependent on the specific application of database 40 and may be very diverse. For example, in some flight applications, a single block 42A includes an image of the entire Planet Earth, while in an atom-simulation application, which shows the terrain of an atom, block 42A shows the entire atom. Blocks 42B of the next level 44B, labeled "level 2," preferably cover a quarter of the area of blocks 42A of "level 1". Thus, for substantially each block 42A, there exist four blocks 42B which cover the same area. In a similar manner, each successive level 44 comprises blocks 42 which cover a quarter of the area of the blocks 42 of the lower resolution level.

Four blocks 55 of a certain level 44C, which cover the same area as a block 57 of the preceding level 44B, are referred to as descendants of block 57. Conversely, block 57 is referred to herein as the parent of blocks 55. The parent block 59 of block 57 is referred to herein as an "ancestor" of blocks 55, and is said to be of a lower resolution level than its descendants. It is noted that in FIG. 2, the lower resolution levels appear higher on the page.

(col. 8, ll. 59-67; col. 9, ll. 1-21) (emphasis supplied)

From these descriptions, it is clear that the patent claims a database with a hierarchical structure in which each successive level contains data blocks of a higher resolution than those in the preceding level. While I recognize that Fig. 2 is only a schematic and level 1, level 2, level 3 etc. are just labels, it is important to include the successively ordered nature of the database in the construction of the term "hierarchical structure", even if a database might be arranged conceptually from the top down rather than from the bottom up.

As for Skyline's concern over describing the hierarchical structure with the limitation that each level contains data blocks at the same resolution, I disagree that the limitation erroneously suggests that each level has the same amount of data. As Skyline contends, the amount of data in a given resolution level depends on the image being depicted. Or as the specification explains, the "size of the geographical area covered by blocks of 'level 1' is dependent on the specific application of database and may be very diverse. For example, in some flight applications, a single block includes an image of the entire Planet Earth, while in an atom-simulation application, which shows the terrain of an atom, block shows the entire atom." (col. 8, 1. 67; col. 9, ll. 1-7)

Construction: (data blocks belonging to a hierarchical structure) Data blocks that are organized into multiple levels of resolution,whereby each level contains data blocks at the same resolution, and each successive level contains data blocks of a higher resolution than those in the preceding level.

C. First Data Block

[16] Skyline would have the term "first data block" construed as simply "a designation of a data block that may be one of a plurality of data blocks." Defendants suggest the following construction instead: "*the* data block stored in local memory that is the first data block to be provided to the renderer in response to the coordinates in the terrain and the indication of a respective resolution level received from the renderer."

In the Markman hearing, Skyline explained that it agreed with the idea that "at some point" in the process the computer has to call a first data block from the local memory, and that the first data block is provided at a lower resolution level, with higher resolution levels being streamed or downloaded to the computer to provide the higher-resolution image. (Transcript, p. 70, 76) FN4 From Claims 1 and 12, it is clear that "a first data block" refers, as the Defendants suggest, to the data block stored in the local memory that is the

first to be provided to the renderer. (col. 16, ll. 35-27; col. 18, ll. 21, 23-25) The first data block provided is not necessarily the block with the lowest resolution corresponding to the coordinates in the local memory. As Skyline contends, and the Defendants appear to accept, the first data block could "be the closest data block in the cache manager to the resolution level being requested." (Transcript, p. 75) Nevertheless, however software might adapt the invention, neither the "representative" claims nor the specification stipulate the relative resolution level of the first data block to be provided from the local memory.

FN4. Skyline questioned, however, the suggestion that the computer has to provide a new first data block for every new coordinate in order for there to be infringement. (Transcript, pp. 70-71, 76) I am not ruling on infringement in this Memorandum, I am only construing the claims. Consequently, I do not address whether the computer needs to provide a new first data block for every new coordinate in order for there to be infringement.

Construction: (first data block) The first data block provided to the renderer from the local memory corresponding to the specified of coordinates.

D. Terrain

[17] Quoting from *The American Heritage College Dictionary* 1400 (3d ed.1997), the Defendants contend that "terrain" has a plain and ordinary meaning-"the surface features of an area of land; topography"-and that the use of "terrain" in the patent is consistent with that meaning. The Plaintiff does not offer a dictionary definition of the term, but instead argues that the term "is used in the '189 Patent broadly to include 'the physical features of an area, object or material, which includes geographic and/or elevation attributes and may include other features, such as color attributes and objects.' "

The purpose of the '189 Patent is to provide three-dimensional images of the Earth's surface to be used by pilots and others, but the specification also provides that "the terrain is not limited to the Earth or parts thereof, and may cover other planets (real or virtual) and/or 3D views of surfaces of real or imaginary objects, such as views showing the atomic structure of a material, and the like." (col.16, ll.16-20) Consequently, the term terrain is plainly not limited to the surface of the Earth. The Defendants also accept that the concept of terrain as the surface features of an area can include color. (Transcript, p. 20) The dispute appears to turn, therefore, on whether the term "terrain," as used in the Disputed Claims, includes "objects" overlaid on the surface of the area in addition to underlying topography of the surface of the area. (Transcript, p. 19-20, 21)

The Patent contemplates overlaying additional objects or "virtual structures *on the terrain*." (col.8, 1.51) (emphasis supplied) "For example it is possible to add planned buildings *to the terrain* and thus see the effect of the buildings on the view. Further alternatively or additionally, the objects may be used to overlay map symbols and other marking *on the terrain*." (col.8, ll.51-55) (emphasis supplied) This allows "an operator of the server and/or the user ... [to] add to the data which describes the terrain annotations which describe specific points in the scene, such as runways or other destinations. Alternatively or additionally, the operator may add three-dimensional objects, such as planned buildings, vehicles, etc. In a preferred embodiment of the present invention, a group of vehicles are tracked according to their position, and they are constantly superimposed on the landscape images." (col.2, ll.55-64) "Preferably, the user is able to switch between viewing the *terrain with and without the objects,* so that, for example, the user may easily compare the view of a desired area with and without a group of planned structures." (col.13, ll.58-61) (emphasis supplied) Accordingly, the additional markings or structures that are overlaid on the terrain or the landscape images are not part of the "terrain".

On the other hand, I find that the specification supports a construction of the term "terrain" that includes

existing objects or structures that are captured in the virtual images of the land or other surface. The data blocks are preferably made from "real-life images of terrain areas received from airborne or satellite cameras." (col.8, ll.36-37) Such images will include, therefore, structures built on the land, such as existing buildings, that can be viewed sufficiently well. (col.8, ll.49-50) In fact, the specification contemplates the processor being able to "automatically derive[ ] ... objects from the images. For example, the processor may identify roads and/or runways in the images and represent them as objects so that they appear more clearly in substantially any resolution of display." (col.10, ll.9-14) In that example, the roads and runways would be part of the terrain, although the enhancement of them as objects overlaid on the land would not be part the terrain.

Construction: (terrain) The surface features of an area of land, an object, or a material, including color, elevation, and existing objects or structures on the land, object or material.

E. Coordinates in the Terrain

[18] The Plaintiff construes the phrase "coordinates in the terrain" to mean "any of a group of one or more numbers used to determine a position in the terrain, such as x, y, longitude, latitude, height, and/or resolution level." The Defendants counter that "coordinates in the terrain" must refer to "a pair of numerical coordinates, such as latitude and longitude or x and y coordinates, of a particular location in the terrain." Before turning to the heart of the dispute, I note that resolution level is not within the meaning of the "coordinates in the terrain." Claim 1 and various parts of the specification refer to the "coordinates in the terrain" and the "resolution level" as separate variables.

The debate with respect to the term 'coordinates' is a consequence of the fact that the term connotes two different meanings, as understood by a person of skill in the art that may be readily apparent even to lay judges, and that the term appears to be used in the two different ways within the patent specification. Thus, my task requires choosing the most appropriate meaning as used in the claims in light of the two uses in the specification.

A 'coordinate' typically refers to an individual value, such as an x-coordinate, which along with another coordinate on a different axis (y), would locate a point in a two-dimensional plane. Thus, a longitude coordinate and a latitude coordinate would together locate a point on the Earth's surface. By adding a third coordinate (z), the three values together would specify a point in a three-dimensional space. Consequently, with respect to storing a proposed flight plan, the specification speaks of inputting "three-coordinate points which describe the route. The three coordinates preferably represent longitudinal, latitudinal, and height coordinates of the points along the course[.]" (col.10, ll.39-41) Similarly, "each block is referenced using longitudinal and latitudinal (x,y) coordinates of one of the points in the block, such as the top right corner pixel, together with the resolution level of the block." (col.9, ll.35-38) However, the term 'coordinates' can also be used to refer to a set of two or more values used to determine the position of a point on a plane or in space. In this sense, the statement that "[e]ach object is preferably accompanied by coordinates which state the position of the object within sub-block" can be thought of as referring to a set of at least two coordinate elements that together identify the object's location. (col.8, ll.43-44) From this perspective, the plural form of 'coordinates' simply contemplates that more than one data block may be requested at a time and that to identify each block one needs a set of coordinates. Consequently, 'coordinates' may refer to the plural of 'coordinate' or to the set made up of at least a pair of coordinate points.

The question, then, becomes whether "one or more coordinates in the terrain" refers to one coordinate, such as x, or more than one coordinate, such as x and y, or rather to one set of coordinates, such as x/y, or more than one set of coordinates, such as x/y and x1/y1. I find that adopting the latter understanding reconciles the claim language ("one or more") with the Defendants' concerns and the specification. This meaning also makes sense when contrasted to the reference in other claims to a "plurality of coordinates", that is to more

than one set of coordinates requiring more than one data block to represent the terrain to be viewed.

If "one or more coordinates" meant that only one numerical value ('coordinate') would be sufficient, the processor could not provide the renderer with the data block(s) corresponding to the coordinates of the terrain specified. The preferred way of structuring the data blocks is to have "a header record compris[ing] an index to the blocks", (col.9, 11.25-26), and to reference each block "using longitudinal and latitudinal (x,y) coordinates of one of the points in the block, such as the top right corner pixel, together with the resolution level of the block." (col.9, 11.35-38). Then the "renderer determines the exact blocks needed and calls for them using their (x,y) coordinates and their resolution level. Alternatively or additionally, renderer specifies, for each resolution level, the coordinates of the boundaries of the necessary areas, and cache manager determines the identities of the required blocks." (col.14, 11.10-15) Consequently, even in the alternative scenario, the system requires multiple sets of numerical values ('coordinates') that define the boundaries of the particular area of the terrain.

Construction: (coordinates in the terrain) A set of numerical values that identifies a particular location in the terrain.

F. Resolution Level

[19] In construing "indication of a respective resolution level", the Defendants suggested that resolution level referred to "the amount of detail per unit area." In its Reply Brief, the Plaintiff argued that "the amount of detail" is not tied to a "unit area." However, in the Plaintiff's Memorandum in Support of its Motion for Preliminary Injunction, the Plaintiff indicated that "[t]he blocks with the highest resolution level have the most amount of detail per unit area. '189 Patent, col. 3, lns. 6-9." While not specifically addressed at the Markman hearing by either party, Defendants' construction appears appropriate.

Although, the specification anticipates that "the data streaming methods of the present invention may be used to convey large databases of data which are to be displayed graphically, such as in graphic displays of stock values," (col.16, 11.20-24), as opposed to just three-dimensional views of the surfaces, Claims 1 and 12 specifically claim a "method of providing data blocks describing three-dimensional terrain" and an "[a]pparatus for providing data blocks describing three-dimensional terrain." (col. 16, 11. 28-29; col. 18, 11. 12-13) Consequently, classifying data blocks describing three-dimensional terrain "according to the height from which they view the terrain and, therefore, the level of detail which they include," (col.8, 11.62-64), requires that the concept of resolution levels include a per unit area dimension. The specification affirms this meaning by stating plainly that "[t]he blocks at lower resolution levels include less detail per unit area, while the blocks of higher resolution levels include more detail per unit area." (col.3, 11.6-9) I construe the term "resolution level" as the level of detail of the data per unit area, even though in the preferred embodiment "the resolution level is *also* dependent on the number of pixels in the image displayed on display. Preferably, the resolution levels are chosen so that an approximate 1:1 ratio is achieved between the number of displayed pixels and the number of data pixels." (col.11, 11.32-37) (emphasis supplied)

Construction: (resolution level) The level of detail of the data per unit area.

G. Indication of a Respective Resolution Level

[20] Although the Plaintiff did not construe the phrase "indication of a respective resolution level" in its opening brief, the Plaintiff, in its Reply, took issue with the Defendants' suggestion that this phrase be construed to mean "data specifying the amount of detail per unit area corresponding to a level of resolution in the hierarchical structure of data blocks." Skyline now offers instead the following broad construction: "something that indicates, points out, or signifies a respective resolution level."

The first step of the method claimed in Claim 1 is for part of what I will refer to as "the system" to receive from the renderer "one or more coordinates in the terrain along with indication of a respective resolution level." (col.16, 11.32-34) That part of the system is then able to "provid[e] the renderer with a first data block which includes data corresponding to the one or more coordinates, from a local memory" and if that first block "is not at the indicated resolution level," the system downloads more data blocks corresponding to the coordinates. (col.16, 11.39-44) In Claim 12, it is the "processor which receives one or more specified coordinates along with indication of a respective resolutionlevel from a renderer [and then] provides the renderer with a first data block ... and downloads ... one or more data blocks ... if the first block is not from the indicated level." (col.18, 11.21-30) The specification describes how preferably the "renderer determines the exact blocks needed and calls for them using their (x,y) coordinates and their resolution level." (col.14, 11.10-12) All of these references suggest that "indication of a respective resolution" simply means the renderer indicates (to the processor) or identifies the particular resolution level or the particular level of the hierarchical database of the data required.

At the Markman hearing, the parties agreed with this construction except that Skyline questioned whether it is necessary to bring the concept of hierarchical structure into this definition. (Transcript, p. 66) Upon reflection, I find that it is unnecessary to include hierarchical database within the construction of this term because it is already agreed that the database is organized hierarchically by resolution level.

Construction: (indication of respective resolution level) The identification of the particular resolution level of the data required.

H. Renderer

[21] Plaintiff offers the following construction for this term:

something that may be implemented entirely in software or may include a dedicated hardware processor along with a software package running on a general purpose processor, which performs one or more steps of the recited method and assists in the display of the terrain based on the data provided.

Defendants contend that it is not nearly so broad, offering the following construction instead:

a software and/or hardware object that performs each of the following steps: (1) determines the coordinates of the terrain data required to create an image and sends the needed coordinates along with a specified resolution level to another object; (2) receives the data blocks corresponding to the provided coordinates; and (3) uses the received data blocks to create an image.

Claim 1 teaches a "method comprising: receiving from the renderer one or more coordinates in the terrain along with indication of a respective resolution level" and "providing the renderer with a first data block ... from a local memory." (col.16, 11.31-37) Claim 12 provides for an "[a]pparatus for providing data blocks ... to a render[er] ... comprising: a local memory which stores data blocks corresponding to coordinates proximal to a current viewpoint of the renderer" and "a processor which receives one or more specified coordinates along with indication of a respective resolution level from a renderer, [and] provides the renderer with a first data block[.]" (col.18, 111.12-13, 16-18, 21-24) This language shows that important aspects of the method run through the renderer. But according to Claim 9, the renderer does not simply act as a go-between, providing coordinates and receiving data blocks, it also has the undisputed job of ultimately converting the information into an image and rendering the view from the current viewpoint. (col.17, 11.65-67)

The specifications provide a similar picture of the renderer's three functions in the preferred embodiment with references to 'renderer', 'renders', and 'rendering program'.

In some preferred embodiments of the present invention, the processor runs a *rendering* program which displays the three dimensional images based on the viewpoint, the size of the displayed image and the blocks received from the server. The *rendering* program orders the blocks it needs using a cache manager, which is preferably a software routine running on the processor. If the cache manager has the ordered block, it provides it to the *rendering* program. However, if the block is not carried by the cache manager, it is ordered from the server, and a replacement block from a lower resolution level is passed to the *rendering* program.

When the *rendering* program requires a block including a new point or area for display, the cache manager first requests the block of the lowest resolution level which covers the area with the least detail and then requests subsequent blocks with successively increasing detail, until the block with the level of detail required by the *rendering* program is sent. The *rendering* program *renders* the three-dimensional image using the blocks it has on hand. Each time another block is received, the image is *rendered* again. Thus, the user sees an image at substantially all times and is not prevented from moving the viewpoint while additional data is being sent from the server.

There is therefore provided in accordance with a preferred embodiment of the present invention, a method of providing data blocks describing three-dimensional terrain to a *renderer,* the data blocks belonging to a hierarchical structure which includes blocks at a plurality of different resolution levels, the method including receiving from the *renderer* one or more coordinates in the terrain along with indication of a respective resolution level, providing the *renderer* with a first data block which includes data corresponding to the one or more coordinates, from a local memory, and downloading from a remote server one or more additional data blocks which include data corresponding to the one or more coordinates if the provided block from the local memory is not at the indicated resolution level.

. . . . .

Preferably, the method includes downloading excess blocks not currently needed by the *renderer* to fill up the local memory when not downloading blocks required by the *renderer*.

. . . . .

Preferably, the *renderer renders* a view from a current viewpoint[.]

(col. 3, ll. 54-67; col. 4, ll. 1-23, 56-59, 60-61) (emphasis supplied)

Detailed descriptions of the figures in the patent further substantiate that the renderer performs at least three functions: it determines the coordinates needed; receives the appropriate data blocks; and renders an image with the data provided. (*See, e.g.,* col. 11, ll. 19-24 ("Processor preferably ... comprises a *renderer,* which calculates the view from the viewpoint and continuously *renders* the view on display" and "determines the coordinates of the pixels it needs in order to *render* the view and requests the descriptions of these pixels from a cache manager."); col. 12, ll. 58-63 ("*Renderer* uses blocks from cache manager to *render* the required view on display. Preferably, when cache manager provides a block of a lower resolution level than that requested by *renderer,* the *renderer* uses the provided block to interpolate a higher resolution-level block."); col. 14, ll. 10-13 ("Preferably, *renderer* determines the exact blocks needed and calls for them using their (x,y) coordinates and their resolution level. Alternatively or additionally, *renderer* specifies, for each resolution level, the coordinates of the boundaries of the necessary areas, and cache manager determines the identities of the required blocks."); *see also* col. 14, ll. 27-46; col. 15, ll. 33-46.)

The parties do not dispute that the renderer is an object that may be implemented entirely in software or

may include hardware, (Transcript, p. 22), for as the specification describes:

Preferably, *renderer* is as described in the above mentioned U.S. patent application Ser. No. 08/939,948.FN5 Alternatively or additionally, *renderer* may operate in accordance with any other method known in the art. *Renderer* is preferably implemented entirely in software. Alternatively, *renderer* includes a dedicated hardware processor, such as a 3D graphic accelerator, along with a software package running on general purpose processor which provides blocks to the dedicated hardware processor.

FN5. "It is appreciated that the [terrain rendering] method of FIGS. 1A-1C may be implemented partly in computer hardware and partly in software, or entirely in custom hardware. Preferably, the apparatus of the present invention is implemented in suitably programmed computer hardware comprising, for example, a Pentium-Pro/MNX based central processing unit (CPU)." ('583 Patent, col. 6, ll. 4-10)

(col.13, ll.8-17)
The parties also agree that the renderer receives data blocks corresponding to the specified coordinates and uses the data provided to display real-life images of terrain or three-dimensional images of an object or material. FN6 (Transcript, p. 22) The Plaintiff disputes, however, whether the renderer is limited by the three steps identified by the Defendants and whether something else, namely the cache manager, may perform those steps. More specifically, the essence of the debate crystallized during the Markman hearing into understanding the impact of the statement in the specification that "[a]lternatively, cache manager determines the identity of the required blocks and/or sub-blocks." (col.11, ll.26-27) (Transcript, pp. 24, 27, 31-33)

FN6. The Plaintiff insists on the verb "assists" (Pl.Brief, p. 10), citing to col. 11, ll. 19-col. 13, ll. 17 and Figs. 5, 8. I do not agree that the word "assists" is necessary. It is clear from the specification that it is the renderer that renders the view. *See* col. 11, ll. 19-21 (The renderer "calculates the view from the viewpoint and continuously renders the view from the viewpoint and continuously renders the view on display."); col. 12, ll. 58-59 ("Renderer uses blocks from cache manager to render the required view on display."); and col. 12, ll. 66-67, col. 13, ll. 1-7 ("When cache manager finishes downloading an additional block of a higher resolution level from server, the block is provided to renderer, which updates the rendered view accordingly. Preferably, when the viewpoint is in motion, renderer updates the view at least ten times per second so that the user has a perception of constant movement, although other rates of update may also be used. Preferably, renderer renders the view each time from scratch without using previously-rendered views.") To the degree that other components are required for the renderer to render the view, such assisting components do not detract from the renderer's function of using the received data block to display an image.

It is clear from Claims 1 and 2 that in describing both the method and the apparatus, a part of the system (the processor in Claim 12) "*receives* one or more specified coordinates along with indication of a respective resolution level *from a renderer* [.]" (col. 16, ll. 32-34; col. 18, ll. 20-23) (emphasis supplied) This step is also described in the specification as the "[r]enderer determines the coordinates of the pixels it needs in order to render the view and requests the descriptions of these pixels from a cache manager." (col.11, ll.21-24) As a result, something must perform the function of determining which data blocks correspond to the coordinates identified as required by the renderer so that the appropriate data block may be sent to the renderer. Preferably, it is the "renderer [that] determines which blocks and/or sub-blocks include the required pixels", (col.11, ll.24-26), and therefore the "[c]ache manager downloads from server the blocks and/or sub-blocks *required by renderer* ..." (col.11, ll.62-63) Alternatively, however, it is the "cache manager [that] determines the identity of the required blocks and/or sub-blocks" from the coordinates received from the renderer. (col.11, ll.26-27) But, in both embodiments of the method, it is clear that the renderer at least performs the function of determining and specifying to another object what

coordinates are required along with identifying the respective resolution level.

Construction: (renderer) Software and/or hardware object that performs at least the following functions: (1) determining and providing to another object the required coordinates in the terrain along with a respective resolution level; (2) receiving the data blocks corresponding to the specified coordinates; and (3) using the received data blocks to display a three-dimensional image.

I. Local Memory

[22] The Plaintiff argues that " 'local memory' requires no more detailed a definition than 'memory of a local computer,' " quoting the *Microsoft Computer Dictionary*. Defendants proffered construction is consistent with a more narrow definition of local memory: "a memory that is part of the local computer that is performing the steps of the recited method." But, during the hearing, the parties agreed to the construction "memory easily accessible to the client computer, either because it is physically part of the processor or is attached directly thereto-as distinct from the memory of the remote server from which data must be downloaded." This definition addresses the Plaintiff's concern that local memory need not actually be physically part of the computer, for example, if located in a thumbdrive, and the Defendants' concern that it be clear that the local memory is distinct from the processor that may be running on the remote server. (Transcript, pp. 68-69)

The language in the disputed claims and the specification highlights that the "local memory", or "cache memory",FN7 is the memory directly tied, although not necessarily physically, to the processor and not memory local to any other computing device or remote server. The data in the local memory must be available to the processor in a direct, rapid way that memory found elsewhere-such as in the remote server-is not. *See, e.g.,* col. 11, ll. 58-61 ("[T]he term cache memory is used herein generally to refer to any relatively small memory which can be accessed rapidly by processor and is used to save data which is most likely to be used by the processor."); col. 14, ll. 31-45 ("When a request for block, identified as "x," and having resolution level N, is received from renderer, cache manager determines, as indicated in block (FIG.8), the level j of the highest resolution-level ancestor of block x stored in cache memory. If the block itself is stored in *cache memory* (i.e., j=N), the block is provided to renderer. Otherwise, the highest resolution level ancestor of block x which is stored in *cache memory* is provided to renderer, as indicated in block. As described hereinbelow, cache manager downloads the rest of the ancestors of block x from *server* in order of increasing resolution levels, as indicated by an arrow in FIG. 9. As the blocks are received from the *server*, they are supplied to renderer so that the user sees an image whose resolution increases with time.) The distinction between the local cache memory and the larger memory stores that are accessible through a "communication link" is at the heart of the invention. Unlike prior art, this patent purports to display three-dimensional images on a user's computer without requiring an unusually large "local memory" by streaming data from a remote source, preferably over the Internet. (col.2, ll.7-20, 26-33)

FN7. The figures included in the patent refer to the "cache memory 32", and it seems clear that this is what is referenced when the patent speaks of the "local memory." *See* col. 3, ll. 24-27 (referring to a "local cache memory"); col. 13, l. 40 ("local cache memory").

Construction: (local memory) Memory easily accessible to the user's processor, either because it is physically part of the processor or is attached directly thereto, and distinct from the memory of the remote server from which data must be downloaded.

J. Communication Link & Processor

[23] The Plaintiff construes "communication link" to refer to "the connection between computers that

enables data transfer" citing *Microsoft Computer Dictionary* 98 (4th ed.1999). The Plaintiff defines a "processor" to be "a unit comprised of hardware and/or software that processes computer-readable instructions." The Defendants did not propose an alternative to the Plaintiff's suggested constructions of "communication link" and "processor". In the hearing, the Defendants suggested that I adopt the Plaintiff's unopposed construction, so long as I also adopt their unopposed constructions of various other terms in the other claims. Since the scope of this construction is limited to terms in dispute in Claims 1 and 12, I need not consider the proposed constructions for other terms in the other claims. But, I will adopt the Plaintiff's constructions for "communication link" and "processor". Given the Defendants' concerns with respect to local memory, however, I adopt the Plaintiff's construction of "processor" with the caveat that it is a unit of the user's computer as distinct from the "remote server." (col.2, l.8)

Construction: (connecting device) A network connection, such as the Internet, used for transferring data between computers.

[24] **Construction**: (processor) a unit of hardware and/or software, distinct for the remote server, that processes computer-readable instructions.

APPENDIX

SUMMARY OF CONSTRUCTIONS

Disputed Term	Skyline's Construction	Defendants' Construction	Court's Construction
data block	a quantity, set or amount of information or data representing a portion of the terrain	an image of a terrain area that is composed of pixels, where each data block optionally also contains data associated with the image of the terrain area, such as data describing other objects that overlay the terrain; each block has one particular resolution	A block or collection of data or digital information
data block describing three-dimensional terrain			A block or collection of data or digital information that represents or describes a section of three-dimensional terrain at a particular resolution level and that includes any additional data overlaid on the digital image of the terrain, such as altitude, labels or optional objects
data blocks belonging to a hierarchical structure	data blocks arranged into multiple levels of resolution, wherein each level of the structure contains blocks of a different resolution	data blocks that are organized into multiple levels of resolution, whereby each level contains data blocks at the same resolution, and each successive level contains	Data blocks that are organized into multiple levels of resolution, whereby each level contains data blocks at the same resolution, and each successive level contains data blocks of a

		data blocks of a higher resolution than those in the preceding level	higher resolution than those in the preceding level
first data block	a designation of a data block that may be one of a plurality of data blocks	the data block stored in local memory that is the first data block to be provided to the renderer in response to the coordinates in the terrain and the indication of a respective resolution level received from the renderer	the first data block provided to the renderer from the local memory corresponding to the specified coordinates
terrain	the physical features of an area, object or material, which includes geographic and/or elevation attributes and may include other features, such as color attributes and objects	the surface features of an area of land; topography	The surface features of an area of land, an object, or a material, including color, elevation, and existing objects or structures on the land, object or material
coordinates in the terrain	any of a group of one or more numbers used to determine a position in the terrain, such as x, y, longitude, latitude, height, and/or resolution level	a pair of numerical coordinates, such as latitude and longitude or x and y coordinates, of a particular location in the terrain	A set of numerical values that identifies a particular location in the terrain
resolution level	the level of detail of the data	the amount of detail per unit area	The level of detail of the data per unit area
indication of a respective resolution level	something that indicates, points out, or signifies a respective resolution level	data specifying the amount of detail per unit area corresponding to a level of resolution in the hierarchical structure of data blocks	The identification of the particular resolution level of the data required
renderer	something that may be implemented entirely in software or may include a dedicated hardware processor along with a software package running on a general purpose processor, which performs one or more steps of the recited method and assists in the display of the terrain based on the data provided	a software and/or hardware object that performs each of the following steps: (1) determines the coordinates of the terrain data required to create an image and sends the needed coordinates along with a specified resolution level to another object; (2) receives the data blocks corresponding to the provided coordinates; and (3) uses the received data blocks to create an image.	Software and/or hardware object that performs at least the following functions: (1) determining and providing to another object the required coordinates in the terrain along with a respective resolution level; (2) receiving the data blocks corresponding to the specified coordinates; and (3) using the received data blocks to display a three-dimensional image image
local memory	memory of a local computer	a memory that is part of the local computer that is performing the steps of the recited method	Memory easily accessible to the user's processor, either because it is physically part of the processor or is attached directly thereto, and distinct from the memory of the remote server

		from which data must be downloaded
communication link	a network connection, such as the Internet, used for transferring data between computers	A network connection, such as the Internet, used for transferring data between computers
Processor	a unit comprised of hardware and/or software that processes computer-readable instructions	A unit of hardware and/or software, distinct for the remote server, that processes computer-readable instructions

D.Mass.,2006.
Skyline Software Systems, Inc. v. Keyhole, Inc.

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