UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

Civil Action
No. 10-11571-RWZ

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SKYHOOK WIRELESS, INC.,
Plaintiff and
Counterclaim-Defendant,

v.

GOOGLE, INC.,
Defendant and
Counterclaimant.

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TECHNOLOGY TUTORIAL

BEFORE: The Honorable Rya W. Zobel,
District Judge

APPEARANCES:

IRELL & MANELLA LLP (By Morgan Chu, Esq., Samuel K. Lu, Esq. and Lina F. Somait, Esq.) 1800 Avenue of the Stars, Suite 900, Los Angeles, California 90067-4276
- and -
GRIESINGER, TIGHE & MAFFEI, LLP (By Douglas R. Tillberg, Esq.), 176 Federal Street, Boston, Massachusetts 02110, on behalf of Skyhook Wireless, Inc.

BINGHAM McCUTCHEN LLP (By William F. Abrams, Esq.), 1900 University Avenue, East Palo Alto, California 94303-2223
- and -
BINGHAM McCUTCHEN LLP (By Robert C. Bertin, Esq. and Susan Baker Manning, Esq.), 2020 K Street, N.W., Washington, D.C. 20006-1806 on behalf of Google, Inc.

1 Courthouse Way
Boston, Massachusetts

October 21, 2011

THE CLERK: All rise, please.

THE COURT: Good morning. Please be seated.

Well, while they're doing that we can call the role.

For the plaintiffs?

MR. CHU: Good morning, your Honor. On behalf of Skyhook Wireless, Morgan Chu, my colleagues Sam Lu and Lina Somait. And then Douglas Tillberg.

THE COURT: Hold it. I have to --

(Pause in proceedings.)

THE COURT: Mr. Lu. Mr. Chu.

MR. CHU: Yes.

THE COURT: You have such a large number of lawyers who filed appearances, I have trouble finding you.

MR. CHU: Our apologies.

THE COURT: No, no reason to apologize.

MR. CHU: So on my left again --

THE COURT: So, Mr. Lu, Mr. Chu.

MR. CHU: Morgan Chu.

THE COURT: Yes.

MR. CHU: And then Sam Lu, L U. And then Lina Somait, S O M A I T.

THE COURT: Got it.

MR. CHU: And then from a different firm, Douglas Tillberg, who's with Griesinger, Tighe & Maffei.

THE COURT: Four of you.

MR. CHU: Four of us. But I would also like to introduce Ted Morgan who is a cofounder of Skyhook Wireless and is CEO.

THE COURT: Who was specifically invited to observe the proceedings.

MR. CHU: Yes. That's right, your Honor.

MR. MORGAN: Good morning.

THE COURT: Good morning.

MR. CHU: Thank you.

THE COURT: Okay, the defendants?

MR. ABRAMS: Good morning, your Honor. On behalf of Google, I'm Bill Abrams of Bingham McCutchen. With me are my partners, Robert Bertin and Susan Baker Manning.

And I would also like to introduce from Google in-house lawyers, Jennifer Pols and Mark Zavislak.

THE COURT: P U L S?

MS. POLS: P O L S.

THE COURT: P O L S. And, I'm sorry, and the other Google person?

MR. ABRAMS: Zavislak. Z A V I S L A K.

THE COURT: V A V A --

MR. ABRAMS: Oh, I'm sorry, Z. Z A V I S L A K.

THE COURT: And first name?

MR. ABRAMS: Mark.

THE COURT: Mark or Martin?

MR. ABRAMS: Mark.

THE COURT: Mark. Got it.

MR. ABRAMS: Thank you, your Honor.

THE COURT: That's it?

So are we working again? Is our machinery working?

MR. CHU: I think we are, and if we could switch to this side for the beginning of the tutorial.

THE COURT: Now, you wanted to be on the computers and you were. I almost have to learn this every time we -- you want the computer, and the question is which desk are you.

MR. CHU: Right. We're good.

THE COURT: Okay. So it's just a question of desk. Okay.

There is a motion to strike. Of course an emergency motion. I understand that every motion is an emergency motion in this case and I appreciate that. It seems to me that I need to understand the technology not entirely in the abstract but in the context of these patents. And, you know, since I'm doing this now on a judge-only basis, it is a tutorial, I think I would like to see whatever the parties have presented.

But before you begin, I also would like to understand how you propose to do this.

MR. CHU: So your Honor has set aside three hours and we'll make a presentation about the technology, in the context of the patents, of course, and hopefully with an absence of argument on claim construction issues which will be addressed at a different time, and then I assume that the defendant will also make a presentation. We hope to reserve a little bit of time or perhaps even a lot of time if it's necessary to respond to any points. My guess is that we will comfortably do everything in three hours or less.

MR. ABRAMS: I would agree, your Honor. I have compared the slides. I think there's a lot that we have in common and share and hope that this will be an efficient proceeding this morning.

THE COURT: So this is an adversarial tutorial? In a sense.

MR. ABRAMS: We hope it's cooperative. But it will be. We'll be, we'll be responding to their presentation. We had some discussion initially about doing a joint presentation and there is not an agreement on that. So, we have separate presentations. But I'm confident that there will be a lot of points that we agree upon, and we'll strive on our end to just sharpen the points that need to be sharpened in our view.

THE COURT: And how will you do this, by Mr. Chu talking?

MR. CHU: I will participate as well as my colleagues, Mr. Lu and Ms. Somait.

THE COURT: Okay. Now, before you begin you understand that I am tabula rasa in this. I am truly ignorant. I have read the abstracts of the patents so I understand that at least it has to do with mapping, and that's about as far as my understanding goes.

MR. CHU: Understood, your Honor, and feel free to stop us and interrupt and ask questions. No questions could be a bad question. All questions are welcome.

THE COURT: Well, that's not true.

MR. CHU: No questions from your Honor would be --

THE COURT: It's a bad question if it shows that I haven't gotten what you were trying to get me to get.

MR. CHU: That's the fault of the presenter. With that in mind, your Honor, may we --

THE COURT: We could go on like this.

MR. CHU: We, we could. And we could jointly be on Saturday Night Live.

THE COURT: All right. Please proceed.

MR. CHU: Thank you very much, your Honor.

THE COURT: And you're welcome on your return to this courtroom.

MR. CHU: Thank you very much, always a pleasure, your Honor.

Again, it's Morgan Chu on behalf of plaintiff, Skyhook Wireless. And Skyhook Wireless is a small start-up company. It is located 200 yards away, 300 yards away, 34 Farnsworth Street. It has about 30 employees, and they are focused on one area of technology and that is location services. And it's location services for mobile devices. And mobile devices of course --

THE COURT: What is a location service?

MR. CHU: A location service includes, for example, finding out where the mobile device and the person who's holding it is located. So, a common example would be many cell phones and all smart cell phones today, you can use one or many different applications and find out where you are located. So, you call up an application and there's usually a circle and a blue dot and it may be pulsing and then it may tell you, oh, I am right outside the federal courthouse, or I'm at 34 Farnsworth Street.

There are many different kinds of mobile devices in addition to cell phones. So when we refer to mobile devices we're referring to this entire family. So let me give you an example.

This is a mobile devices that hikers use. And of course a hiker will be off streets, in the woods someplace, and he or she will be keenly interested in knowing exactly where they are.

Another kind of mobile device is used for automobiles. And this is a kind of commercial device. Anyone can buy it, put it in their automobile. I think taxis you frequently see, they may put in an address and give them directions, and it will also tell them what street they're on and perhaps give driving directions, turn left at Boylston.

Another example is a tablet. Same thing, this tablet is loaded with numbers of applications where the holder of the tablet can find out where she's located by calling up those applications. And, what one can also do with a mobile device, cell phone, a tablet, or perhaps a laptop, is, I'm looking for my friend and colleague, Lina Somait. And I know she's in Boston someplace, but there are many applications, if she agrees to participate, where I can find out where she is, or she can find out where I am. And then one of us may say, well, let's go to a Starbucks between where the two of us are. So, I may ask the cell phone or the mobile device where are the nearest Starbucks. And usually in a matter of seconds, not minutes, I will be able to get on my cell phone or other device all the locations of the nearby Starbucks.

Some examples of other applications are searches. There was a very recent article published that was estimating what percentage of searches are considered to be local.

So first an example of a search that's not local. I'm interested in learning about Einstein's general theory of relativity because I read an article that some particles may be going faster than the speed of light. Well, that's not local. It doesn't matter whether you're in Canada, Mexico, the United States, to do that search. But I'm walking around the streets in this area and I may do a search for an aquarium, and depending on the kind of search program I'm using it may want to use my location to give me information that I'm most interested in. I didn't know to ask for the New England Aquarium, or I didn't say aquarium Boston, but it might discern that I'm interested in a nearby aquarium, I'm not interested in the one in New Orleans. And a lot of searches are local for, I want to buy a new pair of shoes, I want to find a bookstore, my Starbucks example as well.

So, it's a matter of great convenience. But it's also a matter of business and it's a matter today of very, very big business because the suppliers of the applications, the various businesses, bookstores, Starbucks, search companies such as Google, want to utilize the power of the location of an individual. It ends up being today, many analysts believe, a very, very powerful tool for the purposes I've described and many, many other purposes.

THE COURT: So this has nothing to do with mapping, it has to do with finding places and people.

MR. CHU: Yes. Places, people, things, wherever the device is.

Now, this is -- the basic problem has been around a long time and there have been numbers of solutions. So let me mention three typical solutions that existed before Skyhook was founded.

One I think most of us are familiar with. It's GPS, global positioning satellite. So, quite a number of years ago we started to put up satellites. And if you have three or four, or sometimes it's more than that, satellites that have a line of sight to one of these mobile devices, they can figure out over a period of time the location. Of course the earliest uses of GPS were used by governments, military. They could locate where a tank is, or they could locate a particular target. And smart bombs, some of them, not all, used GPS. Sometimes certain missiles are launched and guided by GPS. Many new automobiles today, and for the last several years, if you purchase a certain package, will come with a GPS device built in, usually to provide a map and directions.

THE COURT: The satellite technology has nothing to do with what you're talking about here?

MR. CHU: It's, it's different, although the actual technology that's used by devices today often combine a combination of perhaps GPS, satellite, the second kind of technology I'll discuss, which is cell phone towers, and another kind, which is the focus of this tutorial, which refers to Wi-Fi.

THE COURT: And Wi-Fi does not rely on satellite.

MR. CHU: Correct. Completely different. And let me make a brief stop at the cell phone towers.

So satellites are fixed in the sky. We know exactly where they are.

THE COURT: I think I know something about cell phone towers.

MR. CHU: Okay.

THE COURT: It's always in dispute. The location of them.

MR. CHU: They are always in dispute for a lot of reasons. Because some people don't like the way they look, some people don't like them next door, some people want more of them because they have their --

THE COURT: I haven't found any yet, other than the cell phone tower builders.

MR. CHU: Right.

So, cell phone towers, of course, can be used to pick up an electronic signal. And thinking of it in its most basic way, if I have three known points, three or more, and the cell phone towers are stationary, I will be able to get an approximate location of the mobile device. So that's the second one.

Now, the third way, before we get to Wi-Fi, the Wi-Fi technology we're talking about today, is that there were certain kinds of technology used principally indoors to locate, it could be people, but often things. So, in a busy hospital they have, as an example, what are called crash carts. These are these carts, if you're watching a TV show, and they say Code Blue or whatever it is, people come running and they have carts and each cart has medical devices to resuscitate a patient that's just brought in on an emergency van.

Well, these carts move around. They need to move around. But the problem in a busy hospital is you don't know where they are, sometimes when you really need to know where they are. So what people have learned to do in hospitals and in other environments is to put an electronic device on the cart and then to have some fixed points inside the building, and they would use the electronic signals, the radio signals when they can't find the cart to say okay, I can find cart A. So, GPS, cell phones, and this kind of indoor tracking.

Now, all of those three --

THE COURT: I'm sorry, the indoor tracking uses which technology? Its own separate?

MR. CHU: It uses -- it's different from the first two. They all have similarities. It's different from the first two. And its basic principles are you have transmitters and receivers, you have fixed points, with signals, like cell phones. Think of it as a small cell phone tower, but their only purpose, or their main purpose, they could be used for other things, their purpose here is to find the location of a cart, it could be a person as well, or it could be inventory. It could be a pallet of something.

So it has fixed points. And then the unknown, that is, there's an electronic receiver or transmitter on the thing you're trying to find. So you notice with all three, satellites, cell phones, and the indoor technology you have fixed known positions. The satellite positions are fixed, same as cell phones, same with these little transmitters or receivers in my hospital example. And then you have an unknown. You want to find the location of something else. It could be the mobile device like this for hikers, or it could be the cart or something else, the cell phone.

Now, here's Wi-Fi. So, Wi-Fi comes into being, and it can have a number of uses. From a consumer point of view a common use is to use the Wi-Fi antenna, it's wireless. Wi-Fi I believe stands for wireless fidelity. It has a wireless radio signal. And let me give you an example.

This is a consumer kind of device. Businesses use the same thing. I have one at my home. Many people, if one has --

THE COURT: What is it?

MR. CHU: -- a laptop at home --

THE COURT: What is the device you're holding?

MR. CHU: It is a Wi-Fi access point. Okay. So, Mr. Lu's laptop, if this was plugged in -- and by the way, at home, I can get this kind of device and I just plug it into my normal telephone plug with that normal kind of wire that clips in, just as if it was another --

THE COURT: I think there's one in my house.

MR. CHU: Okay.

THE COURT: I just don't pay any attention to it.

MR. CHU: Okay. And that's a good thing, because you would pay attention when it went on the blink.

So, if Mr. Lu wants to connect to the Internet, his laptop will be able to discern the signal coming from this access point. If there are other access points near him he'll be able to pick them up as well. But he'll recognize this access point. And there's probably some security even for the home device, and when it's first used the laptop and this access point will be coordinated so that you can have secure transmissions and hopefully so someone who's snooping cannot easily come by, pick up the signals and find out where Mr. Lu is shopping. Okay.

THE COURT: Now, when you talk about Wi-Fi requiring an antenna, a wireless antenna, is this it?

MR. CHU: Yes.

THE COURT: Okay.

MR. CHU: These devices have become over the last half dozen plus years relatively inexpensive. There are, I'm not sure of the exact number, but many strewn around the office that I work in because they have a certain limited range and because the strength of the signal weakens the farther a laptop or other mobile device is from these access points.

Many, many consumers have them. Many businesses and indeed most businesses of any kind in urban areas probably have them. Large chains such as Starbucks and McDonald's and many others have them and advertise the fact that they have free Wi-Fi access. You just have to pay seven dollars for a cup of coffee at Starbucks and you get so-called free Wi-Fi access.

So, of course people knew that if you have these Wi-Fi access points they might be used to try and locate the cell phone, the unknown. But the Wi-Fi access points have a great, two great differences from the first three kinds of technology I mentioned. First of all, consumers put them up all the time. Businesses put them up all the time. They also turn them off. They add to them. And they can take an existing Wi-Fi access point and move it. Why would someone move it? Well, someone lives in Kansas and moves to Boston. They take their Wi-Fi access point, the rest of their furniture, and then they plug it when they get to Boston.

Or perhaps a large business, Filene's Basement, wants to use these but they find out they're not positioned correctly, so they take one and they move it a couple hundred meters.

So instead of having fixed known positions like the satellites, we have hundreds and thousands, and if you think about a metropolitan area such as Boston, tens of thousands, could be hundreds of thousands of different Wi-Fi access points. They are fixed for a period of time but they are also always moving. Because there are always some that are moved, some that are turned on, some that are turned off.

So, we're starting, the other problem is, we're starting with two unknowns. We don't know where the unknown located device is, such as this device for hikers, and we have this map, if we could create a map, of these access points, Wi-Fi access points, and that's always changing.

So, people start to say, well, how do we deal with this problem. First you might say why do we want to deal with this problem, because we have GPS and cell phones.

Well, each of the other kinds of technologies I mentioned have some advantages and disadvantages, and I'll mention a couple now.

GPS, you need a clear line of sight. It doesn't work indoors. And we spend a lot of our time indoors. People go to shopping malls. And of course they do searches on their cell phones or they want to find their friend in a large shopping mall, the Prudential Center, and it's very hard to find someone else in such a large mall.

So the GPS is for the most part useless indoors, it's useless in larger, in canyons, or other areas that have canyons, because there isn't a clear line of sight to the satellite, and there are also technical problems.

Cell phone towers, passing, that can penetrate walls, that's why you can use your cell phone indoors at home. So it solves that problem. But they have other problems as well. It's not as accurate. Speed is a problem, not as good for both of the first two that I mentioned. And there are other advantages and disadvantages.

One of the things that people really want to do is get their location reliably, accurately, and as quickly as possible. Because if you ask for it and you even have to wait 60 seconds, the human being gets frustrated. And, your Honor, if you're using a computer, 60 seconds doesn't sound like very much, but if you click on something and you have to wait 60 seconds it's a frustrating experience.

THE COURT: When the hiker is in the mountains --

MR. CHU: Yes.

THE COURT: -- how does the, how does the Wi-Fi reach the hiker?

MR. CHU: Well, the Wi-Fi is not going to be very useful there. So, this kind of device can have a combination of things, and it may say I'm going to look for GPS and I'll get the GPS.

THE COURT: Okay.

MR. CHU: Okay? But it may also be, because people hike in urban areas, depending on the nature of the device, if I can get the Wi-Fi signals and get my location faster and more accurately, I'll do that. And it's real easy for modern-day devices, a device bought yesterday --

THE COURT: Which Wi-Fi antenna does the, does the person use, or does the device use when the device is in a canyon, like Wall Street.

MR. CHU: Okay. So, in Wall Street, the good thing is there will be lots, many thousands.

THE COURT: So any one of them can be accessed.

MR. CHU: Any one or all thousand --

THE COURT: Hundreds.

MR. CHU: -- can be accessed. And you need several, right? If you only have one you can't determine your location. You need at least three. But in reality the way it works and works well is you will access many, many, many Wi-Fi access points to get your best location. Even today one can take a modern-day device, and if its technology that it's using isn't very good it can put you in the middle of Boston Harbor. And I've seen that in recent months with a device turned on, modern-day device, and it's trying to determine the location and it can't do it well.

THE COURT: It's like my GPS. Because when I leave home it sends me in a circle that ends me up right back at home after having traveled for half a mile.

MR. CHU: Yes. Yes, it does do that. And of course the automobile GPS system, it will also sometimes say I can't figure out where you are, usually with a voice because you're not on the road yet, and so you have to get to a road. And let's suppose it's using a GPS signal for the moment. The good thing about a car is there are other things that engineers can do depending on your system. They can know the speed of your car. They can know its direction, and a few other things, in addition to having a series of GPS locations over time.

THE COURT: So, whose devices, or whose antennas can be accessed by the device? I mean, for example, I'm pretty sure that my antenna requires some kind of a password to be accessed from inside my house.

MR. CHU: Yes.

THE COURT: Can people from outside the house access it or use it in some way?

MR. CHU: In some way they can. In other ways they can't, unless they know how to break the security.

THE COURT: So the some ways are what are used by this technology --

MR. CHU: Yes.

THE COURT: -- for positioning purposes.

MR. CHU: Yes. And here's the way in which it's used.

So we have this Wi-Fi access point, hundreds or thousands might be within the range of the moving cell phone. I don't have a way to break into the security. So I really can't use this Internet access unless the users open up their security, and some people do in urban areas. So I can't --

THE COURT: Like Starbucks.

MR. CHU: Starbucks does as an example. But what I can do is, I know that a radio signal exists. It's being transmitted. And the other interesting thing is every single one of these devices has, there are few exceptions to this, but for the most part has a unique identifier. And it's called a M A C, or MAC address. And the MAC address for this device is going to be different from the MAC address of the device you have at your home, your Honor.

And a way to think about it is it's like a license plate. It's conceivable you could have a duplicate license plate. But for the most part the goal is each car has its own license plate. And that MAC address can be picked up by a receiver.

So, just to give you an idea of this technology. Ted Morgan --

THE COURT: So what becomes known is that this receiver has picked up a particular antenna's address.

MR. CHU: Yes.

THE COURT: But does that necessarily say where the receiver is?

MR. CHU: No. Not yet.

THE COURT: So that's why you need the triangulation.

MR. CHU: Well, you need -- and we'll show more of the problem and the refinements. But the first part you're right on. Let me first show you this device. This is really packed with a lot of very sophisticated electronics. Ted Morgan, who's here --

THE COURT: What is it?

MR. CHU: -- says that at Skyhook they call this Big Bertha. She's not that big. She's actually very small.

And Big Bertha can be placed on a vehicle and it can ride down Commonwealth and Boylston and whatever the other streets are, and it can pick up the MAC addresses of the Wi-Fi access points that it has access to for that purposes. So it's not going to pick up an access point a mile away, unless it drives nearby, but if it's driving 50 meters, 25 meters away it's going to pick it up.

THE COURT: So the limit of the Wi-Fi MAC address to be received is something like 25 --

MR. CHU: I think, I think it can be a little more than that. But it's not going to be a half a mile. And a way to think about it is, I know that at my home I can take a mobile device that's using my Wi-Fi access point and I can go to any room. I can also walk outside. And at a certain point if I walk outside it gets sufficiently weak that it's useless for me, and then hence it's going to be very difficult for anyone else to pick it up.

THE COURT: So this technology is of no use when you're in the country or in the mountains or on the ocean, for finding where you are.

MR. CHU: In general, yes. In general, yes. The Wi-Fi aspect is not going to be very useful.

THE COURT: It's a city -- it's an urban.

MR. CHU: Urban/suburban kind of technology. That's right. Okay? But, of course, in industrialized countries people have left the farm and gone to urban and suburbia.

THE COURT: People in Kansas wouldn't like that.

MR. CHU: So, now let's go back to the question that you raised. So let's say Bertha, or another device that's trying to pick up these signals, is going down a street and it picks up a lot of these MAC addresses or license plates, but it doesn't really know where that access point is. But now if it's driving north past it, it may take a left turn immediately, or it may be going down that east-west street ten minutes later or an hour later, and it may pick up the same access point. It knows it's the same point because it says the same MAC address. And it also knows where it is when it picked up the MAC address both times. Because it also has a GPS receiver. So it's using fixed satellites, they know where the vehicle is, and then they say, Ah hah, right at this location, when I'm driving by, here's the MAC address, and then ten minutes later on an east-west street here's that same MAC address and I know where I was when I picked it up. And then now I'm going west, let's say I turn left and I'm going south, and I pick up the MAC address again. So I've made a U around that one access point. And I know again for the third time my location, when I've picked it up, and now I've got three readings on that MAC address.

And if I'm really being smart, I'm also figuring out how strong the signal is. Because let's say, as in most urban areas, there's a grid, there's a block, and I can be on all streets on all four sides, but I don't know where in that rectangular block it is, but I have very good indications from three or four positions on adjacent streets and its signal strength each time I had the reading. And if I do this repetitively I get better --

THE COURT: You've got to drive around for a while in your example to be able to be found.

MR. CHU: Right. Right. So, at first people trying to figure out how to use Wi-Fi signals did a lot of different things. And it involved a combination of individuals who just liked technology, but also some big corporations such as Intel and Microsoft. And they did something that an individual would do. They call it wardriving. They figure out some electronics that could pick up these MAC addresses and they drive around a bunch of streets. And then what lots of individuals did was they said, well, let's just put it up in the public domain, let's put it up on the Internet. Anyone can use these. And it could be used for all kinds of things.

THE COURT: The location of the addresses.

MR. CHU: The location of the addresses.

THE COURT: Because the location of the device is by their address.

MR. CHU: Yes. And I actually remember some years ago seeing an article in, it might have been the New York Times, and it was talking about the fact that people were putting up Internet access points that didn't have security so that people could get free Internet access, instead of spending whatever it is, $30, to their phone company. So they could stand outside someone's apartment building and maybe two-thirds of them would have security and one-third wouldn't, and so people could get free Internet access. So it could be used for reasons other than location.

And companies such as Intel and Microsoft said, well, maybe we can use this data to create location services. But there were a number of problems. One is people tended to be on major thoroughfares. Arteries. They might be on the interstate. They might be on Boylston or Commonwealth or maybe even Newbury, but not so much on Farnsworth, which is kind of a dead end. And the problem is, and this is just one of the many problems, you don't get the location of the Wi-Fi access points very well. Because if you're on a single artery you know you have scores of access points on the left and on the right of where you are, but you haven't driven the other streets to pick up the other data that will help you determine the real location. And if you have error as to your, it turned out, best guess for each of the access points, then in locating the location of the unknown cell phone, you're going to also have that error. So you need to try and get the location of the access points as best you can and then do your calculations, use certain kinds of algorithms, there are a host of other problems involved, to find out the location of the unknown mobile device.

Now, keep in mind I mentioned those other nasty little problems. We have these MAC addresses being added, subtracted, and moved. And then there are also a series of other problems that deal with the topography and all kinds of other things. But for our purposes today, the way to think about this is nobody is claiming that GPS was invented by Skyhook or cell tower triangulation or indoor location, or even the use of Wi-Fi to try and find a location. What the problem was, that no one could really quite solve, for Wi-Fi, how you put it all together, with problems I mentioned, and more, and get it to work reliably, accurately, and quickly. And that's what they've done. So much so that some major companies went to Skyhook and licensed their technology instead of building it themselves. And some of these companies tried to build it themselves.

So, I'm going to go to a series of slides that illustrates this in greater detail, the basic technology background, and then I'm going to turn it over to Mr. Lu who's going to discuss a couple of the patents, and then Ms. Somait is going to address one of the patents, and then I think Mr. Lu's going to address the fourth, the last of the patents that we're going to be discussing today.

THE COURT: Before we do that let's stretch.

MR. CHU: Okay. A good idea.

(Pause in proceedings.)

THE COURT: Okay, Mr. Lu.

MR. CHU: No, I'm going to illustrate some of the technology and background --

THE COURT: Okay.

MR. CHU: -- before we get quite to the patents.

THE COURT: Okay.

MR. CHU: Okay. This shows where Skyhook is. Of course, across, is it Seaport Boulevard, the big road. And founded in 2003. And this is not just in the United States because Skyhook provides these location services for mobile devices throughout the world for practical purposes. And these are photographs of what it's done.

And here's the basic background. We want to quickly calculate locations. I've mentioned these three other kinds of technologies. Here's GPS. And of course I've mentioned how it works. There's the triangulation.

I didn't focus on the fact that you can get the satellite signal, but how does it do it. It actually counts. It figures out the amount of time for the signal to be received. And those tiny differences will help the device learn where it's actually located.

So, advantages. Worldwide. You can be hiking in the woods, and it can be quite accurate. Well, disadvantages. It doesn't work indoors, urban canyons, anywhere where there's no clear line of sight to the satellites.

There's another disadvantage and it's called multipath interference. And this is supposed to illustrate what happens when the signals may bounce off of something else. When they bounce off of a canyon, or, I understand one of the problems in Boston is actually the Prudential Tower, because it creates its own canyon.

Signals from the same satellite reach receivers at different times, and that gets to be a little bit confusing for the receiver. And it can be slow. It doesn't take fifteen minutes every time, but there could be a great deal of variation in how good that signal is translated into a location.

We've mentioned cell tower triangulation. And it has certain advantages. You don't need that direct line of sight. You can use it indoors. It's quicker than GPS. But there are some disadvantages. It's less accurate. There's no uniformity in the positioning of cell towers. And it happens even in some urban/suburban areas that can be a problem because the cell phone companies are positioning them, they say at least, to give consumers a good signal. But that array may not be good for location. When you get to a less populated area, guess what? They are along the interstates and they tend to be in straight lines and therefore not very useful for any kind of triangulation. So, this is indoor positioning. The hospital crash cart being an example. And there's certain advantages. It's accurate. It's quick. And you could try to use it outdoors, but it will generally be less effective. And, of course, where are you going to put all these fixed transmitters.

So, here's the basic Wi-Fi solution. And this is the heart of the work that Skyhook has focused upon.

They use this standard, this 802.11. The patents themselves actually refer to this, this body, the IEEE created standards for a variety of reasons.

THE COURT: What does IEEE stand for?

MR. CHU: Institute of Electrical Engineering and Electronics. Something like that. But it's a well-known organization. And the basic concept, not only for Wi-Fi, is that when you have communications devices, if they all use different electronic standards they won't communicate. They end up being useless. So the nature of the communications, the power is, if I use the same standard, I can build my own device. I can color it pink. I can call it a name Princess, whatever it is. So, too, with Wi-Fi. You don't want consumers walking into Radio Shack and saying, well, do I buy Sam's Wi-Fi, Lina's Wi-Fi, or something else. All they have to know is, oh, I'm buying something that's 802.11. And in fact if you walk into Best Buy or Radio Shack you're not going to find something else. You're just going to find for these purposes the 802.11.

We've described what an access point is and the fact that it has this MAC address. Hundreds of millions of them worldwide. In populated areas. And they have a limited transmission range.

So, here are some of the problems we've mentioned. Their unknown location. And they're controlled by these terrible third parties who don't want to be coordinated. They're individual businesses, individual consumers, and they're not going to report what they're doing with their particular access points, turning them on or moving them. And they can move.

And this is a figure from the patents. And it basically shows a truck, a vehicle collecting information about the access points, but also collecting information of the location of the truck from the GPS satellites. And here's an example. A truck driving the streets, picking up the location of different access points. And they also capture the GPS signal so they know the location of the truck.

And so, that single access point you see in the middle is being picked up even in one direction by the truck. So each of these three readings, even though it's not a different direction in my earlier example, is going to help us determine where it's located. You notice the signal strength is going to be strongest probably by that middle reading, all other things being equal. And of course you'll always know the address. And those are examples of the readings. We know the location of the vehicles from the satellites. And then that little yellow diamond is to show, okay, now we've calculated the location, what we think is our best estimate of the actual location.

So, here we see locations of Wi-Fi access points that are calculated. This again is from the patent. And we store this information in a database. The information is going from the vehicle collecting the information and we will be discussing --

THE COURT: The central data network that you just showed --

MR. CHU: Yes.

THE COURT: -- that is the location service?

MR. CHU: That's part of the location service.

THE COURT: Okay.

MR. CHU: So the basic technology for the location could be used, an individual business or an application. So let's say the application is a friend's social networking application and they want to have an ability for one person to find his or her friends. They usually require one to sign up and say yes, I'll let this group of people know my location. Interestingly, there's another kind of friend grouping, it's parents, who want to know where their kids are. Right? So, it's a group of people and that's the service that's provided to the consumer. You can find your other friends, but in the background, the power, the technology that allows them to do it is the location service that's provided by Skyhook.

So we refer to this reference database. And in this database we have a lot of information about the locations of these MAC addresses.

And this is showing the wireless device. It's receiving the access point signals. It's identifying those signals. It's measuring the signal strength.

And now we're using the database of the Wi-Fi access points and it's matching the Wi-Fi access points in its database, and it's computing the wireless devices location from them. Massive database, collected over time, in a particular way. And it can be used, these are examples of other types of consumer applications. Mapquest, a mapping service, finding out what the weather is, where you are actually located, or finding out your local Starbucks.

And now I'm going to turn it over to Mr. Lu who's going to address the first two of the patents.

MR. LU: Sure.

So the first two patents we're going to talk about are going to be the '694 and the '988 patents. These two patents relate to the database that we were just discussing. The '694 discloses the location beacon database and the '988 discusses a server, a computer server that has that location database on it.

So, Mr. Chu discussed briefly wardriving, and I just wanted to bring up a couple of slides and illustrate what wardriving is.

Now, Skyhook was not the first person to go out and collect data regarding Wi-Fi access points. When Wi-Fi access points were first introduced a lot of amateur computer enthusiasts went out and collected data regarding the Wi-Fi location access points. The locations of the Wi-Fi access points. And here you have illustrations of two of the amateur computer enthusiasts set up for collecting this data.

They called this process wardriving in reference to a 1980's movie "War Games" starring Matthew Broderick, and basically it involved driving streets and collecting data in a haphazard fashion.

Now, a number of companies, including most predominantly Microsoft and Intel, used this publicly collected wardriving data that was uploaded onto the Internet to try to calculate location. But this was a bit of a challenge. Because when Skyhook attempted to commercialize the notion of using Wi-Fi access points to calculate location it discovered that the publicly available wardriving data was really not conducive to building a commercial system. And the reason for this were many. But one of the biggest challenges was something called arterial bias. Specifically, the user supplied data, the wardriving data that was collected, suffered from something called arterial bias. And the patent describes arterial bias, as follows. Because the data is self-reported by individuals who are not following design scanning routes the data tends to aggregate around heavily trafficked areas. Those are the arteries that we were referring to earlier. The patent goes on to say that arterial bias causes a resulting location pull towards main arteries regardless of where the user is currently located causing substantial accuracy errors.

Now, taking a look --

THE COURT: I don't understand why that would be.

MR. LU: Well, figure 3 of the patent explains that. And it actually says an example scenario showing arterial bias.

In figure 3 we have some arteries, 304 and 305, these are the main streets that are driven. You can think of them as sort of like Commonwealth Avenue or other highly trafficked streets. You also have certain side streets, street 306 and 307. These are perhaps smaller streets, lots of stop signs, streets that people aren't going to drive down for any particular reason, or streets that aren't heavily trafficked because they're not optimal for driving.

Now, in this example you have a number of Wi-Fi access points. These are the actual locations of the Wi-Fi access points. And in the scenario where you have wardriving, a scanning vehicle drives only the main arteries, the arteries 304 and 305. And because it's only driving the main arteries it calculates the locations of these access points as being on the artery.

You can see how, thus, the calculated locations are pulled away from the actual locations into the main artery.

THE COURT: The actual locations of what?

MR. LU: The actual locations of the Wi-Fi access points. So this Wi-Fi access point would be located here. But when the scanning vehicle drives the artery it calculates the Wi-Fi access point as being here. And so you're getting a calculated location for the Wi-Fi access point, but it's not particularly accurate because it suffers from what the patents discuss as being the arterial bias problem. You're only driving the arteries.

THE COURT: Well, why wouldn't that occur if you only drive the little streets?

MR. LU: It would also occur if you drive only the little streets.

THE COURT: So the issue isn't what streets you drive but whether, artery or a side street, but that you drive the same street all the time?

MR. LU: Well, the issue is that you drive the same street and typically the street that's going to be driven by the wardrivers and others is going to be the main arteries.

THE COURT: All right. Even though they know that creates an inaccurate database?

MR. LU: Well, Skyhook was the first to recognize that problem and also to figure out a solution to that problem. And we'll explain that in a few moments.

But this illustration illustrates, this animation illustrates --

THE COURT: Excuse me. What is the Eulerian cycle?

MR. LU: The Eulerian cycle refers to a mathematical problem which is related to the Chinese Postman algorithm. And the basic idea is if you want to drive every street in an area, how do you do it in the most efficient manner. I can drive every street in a city with, you know, in perhaps, maybe infinite would not be the right word, but in a large number of ways. And if you want to, but if you want to optimize that and drive it in the fewest, with the fewest number of miles covered you would use the Chinese Postman algorithm, which is a variant of the Eulerian cycle problem.

THE COURT: Okay.

MR. LU: Okay?

THE COURT: If you say so.

MR. LU: So, this, this animation illustrates the arterial bias problem that was shown in the previous figure. You drive only Commonwealth Avenue scanning for Wi-Fi access points, you're going to locate the Wi-Fi access points in the arteries.

Now, in the next figure we actually see a screen shot from a database of wardriving data. This is Boston and the surrounding areas driven by wardrivers who have captured the locations, the Wi-Fi access points that they scanned. And if you zoom in you can see how these Wi-Fi access points that were scanned by the wardrivers are heavily concentrated on the main arteries. You don't see them all that much, and in some instances not at all, on the side streets.

Now, why is arterial bias a problem. Well, the specification describes in figure 5 how arterial bias emerges from the random model, introduces many scenarios where the end user moves into physical areas in which there are only recorded access point locations on one side of them. And here we have figure 5. The user who's carrying the Wi-Fi device, a tablet or cell phone, is located where that big black dot is. And the calculated locations of the access points are represented by the white diamonds. As you can see, these are located on one side of the user.

Now, the specification --

THE COURT: Excuse me. This is the calculation derived from the wardrivers?

MR. LU: This is a calculation of -- so, there are two calculations that we're going to be talking about in this figure. Right now we're only talking about the calculations of the Wi-Fi access points by --

THE COURT: The actual location.

MR. LU: Well, the actual locations would probably be somewhere off, off, away from the arteries. Because you're not going to have a Wi-Fi access point in the middle of Commonwealth Avenue. These are calculated locations. The calculated locations suffer from inaccuracies due to arterial bias, but these are the data points that were calculated by the wardrivers.

The second step that's going to happen is the user wants to calculate her location here. She's standing in the street. She wants to know where she is and she wants to find the nearest Starbucks, and we'll talk about that in a few moments.

Now, the patent talks about how the lack of symmetry that you saw in the previous slide in the distribution of reference points around the end user causes the positioning algorithms to calculate the device location with a great deal of error. And so, taking a look at figure 5 again, we have this circle which represents what the range of the user's cell phone is. And as you can see again all the Wi-Fi access points that are calculated by the wardriving scenario are to the left of the user, and as a result when the user's device performs a calculation it calculates its location as being at that X, suffering from a certain degree of inaccuracy.

So, here we have an animation that illustrates what was shown in figure 5. You have the Wi-Fi access points on Commonwealth Avenue. And the user's location is being shown on Commonwealth Avenue even though she is two blocks to the north of that.

Now, the '988 patent and '694 patents describe Skyhook's solution to the arterial bias problem. And specifically it says that another approach is to develop routing algorithms that include every single street in the target area so as to avoid arterial bias in the resulting collection of data thus producing a more reliable positioning system for the end users. In other words, drive every street in the target area.

Now, the next sentence of this portion of the specification discusses the Chinese Postman algorithm which you asked me about previously. It says that figure 4 describes an optimized routing algorithm known as the Chinese Postman to calculate the most efficient driving route for covering every single street in a target area.

And as I mentioned, there of course are other ways to drive every single street in the target area. The Chinese Postman algorithm just happens to be the most efficient.

So, figure 4 of the patent shows the Chinese Postman routing. And as you can see you've got a number of the actual physical locations of the Wi-Fi access points. You have a scanning vehicle that's going to drive these streets hitting every single street in the most efficient manner. You can see that every street is driven at least once, though in some instances you have streets that are driven twice. The patent further teaches that because you've driven all of these streets you've solved the arterial bias problem. You avoid arterial bias. And you notice how the calculated locations of the Wi-Fi access points, the white diamonds, are located much more closely to the actual locations of the Wi-Fi access points, the small black dots.

Figure 11 of the '694 and '988 patents illustrate this concept again. In the random scanning model on the left all of the calculated locations of the Wi-Fi access points driven by wardrivers are along an artery, and so as a result the actual physical location of the access point represented by the black diamond is located closer to the artery, and that calculated location of where the user is is represented by the cross.

In a situation where you have a Chinese Postman scanning model, because you've scanned around the Wi-Fi access point that you're trying to figure out the location of, the actual location of the access point matches more closely with the calculated location of the access point.

And here we have an animation that's going to show this whole concept. The notion that as you drive more streets you're able to derive more accurate calculated locations of the Wi-Fi access point.

This animation moves pretty quickly, but you'll be able to see how the positions of the calculated Wi-Fi, locations of the Wi-Fi, of the Wi-Fi access points change as more streets are driven. And the key below illustrates what we're showing here. The orange represents the actual locations of the Wi-Fi access points, and as you'll see in a few moments the little yellow diamonds will represent the calculated locations of the Wi-Fi access points.

So here goes the car. And you can see as the streets are being driven and as more streets are being driven the locations, the calculated locations of the Wi-Fi access point converge closer to the actual locations of the Wi-Fi access point.

So, once you have avoided arterial bias you produce what the patent refers to as reference symmetry. And this is taught in the patent. With the Chinese Postman model of scanning for access points, the user typically encounters a physical location in which there are numerous access point locations on all sides of the user within range of the device's 802.11 radio.

THE COURT: The point of the, of the scanning, the driving according to the Chinese Postman is to determine, before you ever look for the user, where the access points are, right?

MR. LU: Correct. You're -- when you drive substantially every street, and that can be using the Chinese Postman algorithm or just driving every street.

THE COURT: And then you use the more accurate location of access point to help to find the user for whom you're searching.

MR. LU: Right. You put all of those, that information in a database, you know, days, weeks, months later, a user who's standing on a street corner can then access that database with the software help.

THE COURT: So how often does the Chinese driver have to drive in order to maintain this access data?

MR. LU: Well --

THE COURT: Access database.

MR. LU: Well, the database is constantly changing, and I don't know the --

THE COURT: Even by input from the user who is looking for a location?

MR. LU: Even by --

THE COURT: Or whose location is trying to be found.

MR. LU: Well, the user has a Wi-Fi device and they're able to figure out where a, they're able to scan the Wi-Fi locations.

THE COURT: But their search and finding of the access point, does it become part of the database as well?

MR. LU: It can be, but that's not --

THE COURT: According to the patent does it?

MR. LU: Not, not in these patents.

THE COURT: So the patent determines the accurate access point by the Chinese Postman driving?

MR. LU: It determines the accuracy by driving all of the streets, yes.

THE COURT: Well, that's the Chinese Postman solution, isn't it?

MR. LU: No. The Chinese Postman solution is an optimized routing algorithm. So, for instance, you can drive every single street using a different routing algorithm. UPS, for instance, drives a routing algorithm that only makes right turns because they want to avoid waiting at a light. The Chinese Postman --

THE COURT: That's how you get out of the maze.

MR. LU: Pardon?

THE COURT: That's how you get out of the maze.

MR. LU: That's how you get out of the maze.

The Chinese Postman algorithm, or the Eulerian cycle problem, simply says, well, if you want to do it in the most efficient way how do you do it.

THE COURT: But in order to have as accurate a database as possible there has to be some driving of every street in order to cover, to get the location of every access, every address.

MR. LU: Yes, ideally.

THE COURT: And that's what the database consists of with, as ideal as possible reference to, ideally accurate reference to the addresses of the, of the, whatever they are.

MR. LU: The Wi-Fi access points.

THE COURT: The Wi-Fi access points.

MR. LU: Yes.

THE COURT: That's what this is about.

MR. LU: That's what this patent, these two patents are about.

THE COURT: So what, what is the, what is the particular point of the '988 patent?

MR. LU: The particular point of the '988 patent is to say that you -- well, the '694 -- the '988 patent says you drive substantially all of the streets in order to collect the data and you produce what's referred to, to avoid arterial bias, and to produce what you refer to as reference symmetry, and then you can use that to calculate the location.

THE COURT: Does it also tell you how you are to do this driving; that is, does it require you to do it according to the Chinese Postman method or any other method?

MR. LU: That is a subject of dispute between the parties. It's part of the claim construction issues. I can elucidate you on the positions if it helps your Honor. But Skyhook says no, the Chinese Postman algorithm is not required. The patent discloses that you just drive substantially all of the drivable streets and that an optimized routing algorithm, the preferred embodiment, is the Chinese Postman algorithm.

THE COURT: What about the other patent, the '694?

MR. LU: '694 has similar, the same claim terms and the same issue arises. The '694 adds a twist to that insofar as it contains some limitations about updating the database to add locations for information for newly added Wi-Fi access points or access points that have moved. So, for instance, if you drive in January and then you drive again in April and you learn about new Wi-Fi access points or Wi-Fi access points that have moved that additional information gets put into the database.

THE COURT: So does that mean that, coming back to my original question, I'm still not clear on it, in order to maintain this database in as accurate a way as possible does the driving have to continue all the time?

MR. LU: Unless you come up with some other solutions which are addressed in other Skyhook patents, it would be, to have the most accurate --

THE COURT: So these patents assume that you'll keep on driving.

MR. LU: Well, these patents are agnostic as to that. It just simply says that the data, that you create a database and at least for a certain amount of time, assuming nothing changes, that database remains the same. The '694 patent I believe claims, you know, makes clear that, well, you can, you can redrive it and you can add additional, additional information regarding the, regarding the access points that --

THE COURT: So the '988 creates the database and '694 says what you may need to do in order to keep it updated.

MR. LU: In terms of the claims, and let me just go to --

THE COURT: Just in general?

MR. LU: In general. I mixed up the numbers. So, one of the patents says you create the database, the other patent says you create the database and you update that to include information about Wi-Fi access points that have moved and information about Wi-Fi access points that have been added.

THE COURT: But neither patent uses, or maybe the technology doesn't call for it under any circumstances, whatever data may be returned from the user, that is, the person that they're trying to find based on where that person is found.

MR. LU: The two, these two patents do not. There are other implementations and Skyhook does in fact use that data.

THE COURT: But that's not implicated.

MR. LU: But that's not implicated in these two patents.

THE COURT: Okay.

MR. LU: Okay.

THE COURT: Thank you.

MR. LU: So, going back to where we were. We have a scenario where you have, where the patent teaches from figure 6 positioning with reference symmetry. As before you have a user, big black dot. You have the calculated locations of the Wi-Fi access points. Because you've driven substantially all of the drivable streets you don't have those calculated locations, all being lined up along a major artery. And as a result the patent teaches how when you use a database that has reference symmetry the resulting position calculation has reduced location bias and is more accurate as a result. And we see --

THE COURT: And location bias is the same as arterial bias.

MR. LU: Yes. And so you see this here in this example, the circle representing the radio range of the user device and that X representing the calculated location of the user.

Let's compare figure 6 with what we previously saw in figure 5 which is a situation where there was no reference symmetry, and you can see how the location represented by the X is much closer to the user in figure 6 compared to figure 5.

And this animation illustrates how reference symmetry reduces location bias. What we have here was the previous slide we had which showed all of the calculated locations of the access points being on Commonwealth Avenue because only Commonwealth Avenue was driven. You have a situation where all the streets are driven. When you have reference symmetry you can see that the calculated location would be closer to the actual location of the user.

Now, we've already briefly touched upon this, but there's another aspect of the two patents which is the following. Wi-Fi access points are constantly in flux. New Wi-Fi access points may be added. Existing Wi-Fi access points may have moved. And so the patent teaches that during the database creation process new access points are added to the database and their physical locations calculated, and existing access points are repositioned based on any new data.

THE COURT: How are they added unless the driving takes place that points them out.

MR. LU: That's right, which is that you can, you can do the driving process again.

THE COURT: So the patent simply says that you need, that if you want to do that you got to keep driving.

MR. LU: One of the, one of the patents says that if you do it and you're building a database and you identify new access points they get added and existing access points that have relocated get moved. And that's in the '988 patent.

So, I'm going to turn things over to my colleague, Ms. Somait.

THE COURT: Which patent are we going to talk about now?

MS. SOMAIT: The '897.

So, the '897, now we're moving away from creating a database to a method of locating a user device, like a cell phone or an iPad or a computer. And it's called Continuous Data Optimization by Filtering and Positioning Systems.

I think Mr. Chu already talked a little bit about Wi-Fi enabled devices communicating with Wi-Fi access points, but the '897 goes into a little more depth about how that can be done.

The patent describes that the client device monitors the broadcast signal or requests its transmission via probe request.

So, monitoring the broadcast signal is passive. The user device just listens for signals that are broadcast by the Wi-Fi access points. And active is sending out a probe request which is basically the user device requests information from Wi-Fi access points and the Wi-Fi access points that get that probe request will then send information in response. And we have --

THE COURT: How does it do that? How does it ask for the information?

MS. SOMAIT: I have an illustration of that, but basically it sends out signals. Like we described before, the 802.11 standard that has sorts of defaults of how you do that and what sort of response the Wi-Fi access point has to give.

THE COURT: So does that mean that the user device doesn't automatically get information about available access points?

MS. SOMAIT: It can, but that would be passive communication, which is illustrated here. Like here, you'll see only the --

THE COURT: Well, why would it want more? I mean, why would it ask for more?

MS. SOMAIT: If you send out a probe request it's generally faster to get the information. Because if you wait for the signals to be broadcast, it's broadcast about, I think the default is a hundred, every hundred milliseconds. But if you send out a probe request then any Wi-Fi access point that receives it will then automatically send a response.

THE COURT: Do the devices do that automatically?

MS. SOMAIT: No.

THE COURT: Asking for probe requests?

MS. SOMAIT: No. So --

THE COURT: The user has to do it.

MS. SOMAIT: The user will, yeah, will want to know his location and then it can send out a probe request, or some, some sorts of applications won't send out a probe request, it will just wait to listen for access points that are broadcasting. But that could take a lot longer.

So here this illustration is the passive communication where the signals are going to the user, the user is just listening for it.

And then the next one is active communication. And here, first, the user device sends out signals. And you see that the Wi-Fi access point receives that signal and then it sends back its own signal. And either way, the Wi-Fi access points send information that identifies themselves. The MAC address that we were talking about before which we've been comparing to a license plate number.

So there are four access points and then they each have their own identifying information.

THE COURT: Now, where's the scanner, on the, on the user device?

MS. SOMAIT: It's on the user device.

THE COURT: And the locator?

MS. SOMAIT: The locator, it depends. I think it can be, it's generally, it could be on either the user device area or near the database area. It can -- I believe the patent describes it both ways.

THE COURT: But that is also on the user device?

MS. SOMAIT: Not necessarily. It could be at either end, either the user device or the database end. And the database can also be on the user device or it could be located remotely.

So once a user device receives information, the patent describes that the scanner passes the array of access points to the locator which checks the MAC addresses of each observed access point against the access point reference database.

And here this sort of illustrates it. You see the access points all around the outside. There are arrows towards the user device, that sends the information, and then the user device goes and checks the reference database to see if those access points have locations associated with them. Because each access point has sent their identifying information. So --

THE COURT: That's part of the passive or the active piece?

MS. SOMAIT: This can be either. See, the passive or active goes -- if it was active then the user device sends out probes to those access points all around and then information comes back, rather than the passive, then the information is just going to the user device without the probe request. So this --

THE COURT: Now, on this drawing, if the, if the user device becomes active --

MS. SOMAIT: Yeah.

THE COURT: -- how would the drawing change?

MS. SOMAIT: The drawing would just change, there would be like a two-way arrow between the user device and the access points on the outside. So they would first send a probe request and then the information would come.

THE COURT: And it comes directly to the, to the user's device.

MS. SOMAIT: Yes. The user device has a radio that receives that information.

THE COURT: And what role does the reference database then play?

MS. SOMAIT: That is -- the reference database contains all the Wi-Fi access point locations.

THE COURT: So it refines what, the information it gave.

MS. SOMAIT: No, because the Wi-Fi access points themselves don't tell you where they're located, or else it would be very easy to determine location. Rather, they tell you, okay, I'm access point A. And then the user device checks the reference database where all those calculated locations that we've already done through the driving all the streets are, and then it checks them. It will check, you know, do you have Wi-Fi access point A. And if it does, okay, great, we'll take that location and then will send it back to the user device so you can use it to calculate location.

THE COURT: So ultimately the user device then has the job of taking all the information and deciding where it is.

MS. SOMAIT: Right. Because the reference database just contains the locations of the Wi-Fi access points. And -- yes.

So, the next slide is --

THE COURT: So in order -- it has to go back to the database in order to get the actual location.

MS. SOMAIT: Yes, exactly.

THE COURT: You know you've got it, but now you have to find out where it is.

MS. SOMAIT: Yes.

THE COURT: Okay.

MS. SOMAIT: And the, yeah, as I said before, the database can be located on the user device or it can be remotely on the server. And once the recorded locations are received, the recorded locations, together with the calculated signal strength of the Wi-Fi access points are used to calculate the location of the user device.

And so here we show --

THE COURT: Is the signal strength strictly a function of distance?

MS. SOMAIT: I believe so. No?

MR. CHU: It depends on physical structures, walls and --

THE COURT: So in the canyon you can be a hundred feet away and get a weak signal, whereas further out you get a strong signal a hundred feet away.

MS. SOMAIT: Right. So if there are obstacles in the way. So it's not necessarily the case that it goes by distance, but often it does.

THE COURT: So the signal strength as -- so how does the signal strength in the user device determine the distance and therefore the location when there is a building in between?

MS. SOMAIT: Well, it doesn't determine based on the signal strength alone. It determines based on the identity of the Wi-Fi access point and the locations that are already present in the database. And in the database we've already done multiple scans.

THE COURT: But the signal strength helps to locate where it is or not?

MS. SOMAIT: Yes, sometimes you can use that to weight it because the general assumption is that by distance a stronger signal means you're, you're closer. Although that's not always the case.

THE COURT: Can the database be misled by, by weaker signals because there is an intervening building?

MS. SOMAIT: I believe there are multiple different algorithms to deal with specific situations and to determine the best location possible. Because you'll have a number of Wi-Fi access point locations that you can use.

THE COURT: Well, I think the answer is yes, it can be, but there's a method around it?

MS. SOMAIT: Yes, there is.

THE COURT: Okay.

MS. SOMAIT: So here we just show the calculated location being provided to the user device. And you see the location pop up on the user device there.

But as we mentioned before, Wi-Fi access points can move. They're very small. And people, if they move apartments or if they move across the country they'll just take their access points with them. So, this can lead to problems. And this is what is addressed by the '897 patent.

So, we have an example. Say there's a student studying at Stanford. She has a Wi-Fi access point. She's had it for four years. Then she decides to go to Harvard Law School. She takes her Wi-Fi access point with her.

Now, let's assume there's a user in Boston. He wants to find out a restaurant nearby and he's on the street in Boston. So, he searches --

THE COURT: This is the same student who has moved?

MS. SOMAIT: No, this is just somebody on the street in Boston.

So the student has moved to Boston to go to school. And this is just some random person on the street trying to find a nearby restaurant in Boston. And his cell phone picks up four different signals. And then the reference database is checked to see, you know, if it contains any of those Wi-Fi access points. And yes, it does. And three of them are located in Boston, but one is in Palo Alto, because this student brought her access point with her. And so the reference database shows it to be in Palo Alto even though it's not in Palo Alto anymore.

So, if that was used to calculate the location of the user device then we'll end up somewhere like Bloomington, Indiana, and then the user on the street in Boston will be frustrated because he can't find a restaurant nearby.

THE COURT: There's no mechanism by which this obviously off kilter access device is not used?

MS. SOMAIT: Yes, that is what the '897 does.

THE COURT: Oh.

MS. SOMAIT: So the '897 decides which access points aren't going to be used.

So the patent describes, if the distance of any individual access point to the reference point is calculated to be more than a given distance, it is ruled a suspect access point and recorded in the feedback file to be sent back to the access point reference database. And then it further explains that those suspect access points are then removed from the list of access points used to calculate the location of the user device.

So, in this example, the Palo Alto location is not going to be used because it's too far away from the other locations which are all in Boston. And so that's kicked out. And so the location of the user is accurately calculated to be in Boston near where he is.

THE COURT: How does the database catch up with the new address, or is there no new address?

MS. SOMAIT: The new address --

THE COURT: Does that particular access point continuously maintain the old and wrong address?

MS. SOMAIT: No. Like, that would then be addressed by the patents that Sam just described, the '988 and '694. If, for example, whoever's controlling the database now rescans in Boston they'll find that access point and they'll find that it has moved because there will be new location information and then the database can be updated.

THE COURT: But does the address change on the access point?

MS. SOMAIT: The MAC address doesn't change, but then the address associated with it, it won't, it will no longer be Palo Alto.

THE COURT: So the MAC address is irrelevant in the long run.

MS. SOMAIT: No, the MAC address is how you search the database. Because you have to associate the MAC address with the location where, where it is.

THE COURT: But I thought you said that it doesn't, it doesn't move from Palo Alto to Boston. It's just that the database at some point discovers that this device is now no longer in Palo Alto but it's now in Boston and makes that adjustment but it still has the old address.

MS. SOMAIT: It still has the old MAC address which is the license plate of the Wi-Fi access point. But the -- so this would be at first associated, would have associated with it the Palo Alto address. And then when you moved to Boston, it still be associated, the Palo Alto address would still be associated with it until it gets rescanned by one of those scanning vehicles and then it realizes that, hey, this has moved to Boston, we need to update the database. And then the same MAC address would then be associated with the Boston address and the old Palo Alto address would be taken away.

THE COURT: So on the database it at some point ceases to have the Palo Alto address --

MS. SOMAIT: Yes.

THE COURT: -- even though that is its, its birth certificate, if you will.

MS. SOMAIT: Well, its birth certificate because, this is the whole problem with Wi-Fi access points. They move. So it takes account of its movement. The MAC address is just like the, like a license plate.

THE COURT: It's an identification.

MS. SOMAIT: It's an identification.

THE COURT: Yes.

MS. SOMAIT: It's something to associate it with so you can locate it in the database, otherwise, you can't really locate what the address is in the database.

THE COURT: So it will be known as the MAC address Palo Alto now in Boston.

MS. SOMAIT: Yes, it would just be, yes, the Palo Alto location would just be removed.

THE COURT: Potentially, as the case may be.

MS. SOMAIT: Right. Exactly.

And now I think I'm going to turn back to Sam.

MR. LU: So the final patent we're going to discuss today is the '245 patent. And its title is: Location based services that choose location algorithms based on number of detected access points within range of user device.

And the whole sort of concept of this patent is really effectively captured by this title: Choosing location algorithms based on number of detected access points within range of the user device.

Now, in building its commercial Wi-Fi positioning system, Skyhook discovered something. It discovered that different algorithms perform better under different scenarios. Different location algorithms perform better under one scenario than another location algorithm would perform better in a second scenario. And one of the factors that was important in the performance of a location algorithm was the number of observed Wi-Fi access points. This is taught in the patent where it states that the decision of which algorithm to use is driven by the number of access points observed.

So, here we have an example of a user trying to figure out where she is in Boston. And her cell phone detects three access points in range. And whether through experimentation or whatnot, folks know that algorithm A performs best when you have three or fewer Wi-FI access points that are within range. In fact, certain algorithms only perform with three or fewer Wi-FI access points within range.

But what happens if the user --

THE COURT: Are the algorithms -- are the algorithms that are involved in these proceedings all public property or are they part of the patent?

MR. LU: The basic concept of the algorithms are known. So, for instance, the notion of triangulation or trilateration --

THE COURT: The particular algorithms that the patent says are better for three access points or five access points, are those patented, patented in this patent as well?

MR. LU: Yes, in the '245 patent the dependent claims do recite certain algorithms that can be selected.

THE COURT: Okay.

MR. LU: Okay.

THE COURT: But, can be collected or that have been devised by the inventors of this patent?

MR. LU: Those, those algorithms, the specific algorithms that are claimed were not devised by the inventors of the patent.

THE COURT: So they're public.

MR. LU: They are, yes.

THE COURT: Okay.

MR. LU: So we had the example of three algorithms being appropriate for, for algorithm A. If you had four Wi-Fi access points within range you might choose a different algorithm, algorithm B. And so, what happens when location calculation occurs is that the user device or the computers on the server end which do the calculation of location, determine which algorithm to use based upon the number of observed Wi-Fi access points. And in this case because you've observed four Wi-Fi access points algorithm B is selected.

THE COURT: And the number of access points is the only variable, not the distance from each other or from the subject?

MR. LU: Right.

THE COURT: Just the number.

MR. LU: The patent discusses other things that can be used, but at least in terms of the claims, the focus is solely on the number of Wi-Fi access points being observed.

And these are just some examples of algorithms that can be selected.

THE COURT: Is that it?

MR. CHU: That is, your Honor. Thank you very much.

THE COURT: Thank you very much. I think we'll take a recess before we go on to --

MR. ABRAMS: Thank you, your Honor.

THE COURT: -- the counterproposal.

(Recess.)

THE COURT: Please be seated.

Mr. Abrams, you may proceed.

MR. ABRAMS: Your Honor, we have copies of our slides which we would like to present to the Court.

MS. MANNING: May I approach?

MR. ABRAMS: We've given counsel copies.

And I need to get the --

THE COURT: Oh, they come from your computer?

MR. ABRAMS: These are going to come from our computer, yes, your Honor.

There you go. Thank you, your Honor.

THE COURT: I never remember, I have four different attorney computers and I can never remember which table is which.

MR. ABRAMS: Thank you, your Honor.

We listened to the presentation by Skyhook and there's information and context that I think is useful and helpful, but there's additional information and context that we would like to present to the Court that will assist it as it proceeds with this case.

Now, this case is about a claimed improvement to determining the location of a mobile device. And we're primarily talking about cell phones and other things that people carry around these days.

THE COURT: Could you keep your voice up a little, please, Mr. Abrams.

MR. ABRAMS: Yes. I'm sorry.

THE COURT: Thank you.

MR. ABRAMS: This is about a claimed improvement --

THE COURT: No, I understood that.

MR. ABRAMS: Okay. And just for context, the parties will be before your Honor on November 9th for claim construction. We agree on nine constructions --

THE COURT: And I came with one of your books.

MR. ABRAMS: And we hope it will be even more interesting after all our presentations are concluded.

We are in agreement on nine constructions but we have disagreement and competing constructions on several terms, and we also seek summary judgment on the grounds that certain claims are indefinite, and we provide alternative constructions for certain of those terms if the summary judgment motion is denied.

There are four patents in this case, and we heard a review of those patents, and two of them are what we call the database patents, the '988 and the '694 patents.

Now, the key to these patents is that both of these database patents, your Honor, claim a database of substantially all access points in a target area and at any given time the database and the target area have to match. So both of these patents require the database to be kept up-to-date. We'll see that as we proceed along. So that the lesson is keep driving, keep driving.

There was some, there was some reference to UPS and UPS trucks and how they may have a certain kind of a route that may be acceptable. But the patent teaches us, and this is from the '988 patent, at column 7, beginning at line 54, start out with various models of doing the scanning that we saw and that I'll illustrate for the Court further. And it says that: Each of these models has its own benefits and limitations. One approach, known as the Random Model, Places scanning devices in vehicles as they are conducting daily activities for business or personal use. These vehicles could be delivery trucks, taxi cabs, traveling salesmen or just hobbyists. The concept is that over time these vehicles will cover enough streets in their own random fashion in order to build a reliable reference database. The model does in fact provide a simple means to collect data but the quality of the resulting data is negatively affected due to issues of, quote, arterial bias, close quote.

Then it goes on to say, and this is on column 8, beginning on line 28: Another approach is to develop routing algorithms that include every single street in the target area so as to avoid arterial bias in the resulting collection of data thus producing a more reliable positioning system for the end users. Figure 4 describes an optimized routing algorithm known as the Chinese Postman to calculate the most efficient driving route for covering every single street in a target area.

So, what they're talking about is a method that is deliberate and that is planned and that includes the shortest route that covers every end possible, every end point.

The other two patents, '245 and '897, go to mobile device location. Now, we heard about the '245 patent is about choosing an algorithm. And one of the issues in this that will come forward in our claims construction is that this patent does not disclose how to choose an algorithm, nor does it disclose what algorithms can be used.

Now, algorithms are formulas, your Honor, not general notions or ideas. And there's no specific formula for an algorithm that's disclosed in these patents. And that's key. Because development of an algorithm is a very specific job, it's a very time consuming job, it's a proprietary issue for many companies, and nothing is disclosed in this patent that talks about how to choose an algorithm or what algorithm to use.

THE COURT: I thought I understood it had to do with the number of access devices that are available.

MR. ABRAMS: There's no --

THE COURT: Not access -- yes, access points.

MR. ABRAMS: The patent says that there may be an algorithm but it doesn't offer what algorithm, what formula is to be used. That would be the point of novelty, or a point of novelty. But that specific algorithm's not disclosed. It just says choose an algorithm. But it's indefinite because the algorithm is not disclosed, nor is the method of choosing an algorithm disclosed.

Now, we saw some overview of wireless location technologies and we now know that that's the idea of trying to find out where you are. And sometimes it's called a blue dot because on many of the smartphones or iPads there's a blue dot that will show you where you are. And here, for example, it shows that there's some restaurants nearby. A tourist wants to find where Cheers is located and this tells you where that is. And these location technologies have a long history that are worth touching on to show that this is very old science.

So, in ancient times this method of triangulation was used to estimate the heights of objects and the distances to objects. And triangulation is just basic trigonometry. And there are three sides and three angles to every triangle. And if you note three of these things, the angles or the distances, you can determine the other three. And that's how you can measure the height of an object, for example. In the Middle Ages triangulation was used for navigation and map making. And, for example, here -- I need one of the lasers -- here the distance was known between alpha and data and probably other points in between, and between, by doing that they could calculate where the ship was and what the distance was to the ship. Again, very old science.

Then in the 1940's we began to see radio based electronic positioning. That is the precursor to what we're talking about here with these patents. So, there was something called LORAN, which was LOng Ranged Aid to Navigation, which used arrays of multiple low frequency transmitters to figure out the ship location. This is actually multi-lateration, more than triangulation. And the key here was that distances between these two transmitters that would send out signals to the ship was known, and in reality there probably would be a series of transmitters here. And what was being measured here was the time of flight. How long it would take for these signals to get from this location of the ship, from this location of the ship, from this location of that ship to that location of that ship. And that was a proxy for distance. And by making a calculation using this time of flight, or flight time as it's called, you could determine what was the location of the ship.

Now, that applied to satellites in the 1960's. So in the mid-1960's the Transit and Timation satellite systems were the first to use satellite navigation. Again, beaming down on an object using this time of flight as a proxy for distance to make the computation of location.

Now, Chinese Postman is a routing algorithm, which is not really part of the history of positioning techniques and systems, but I put it there because we've mentioned it and we're going to get into more detail. And it's important to see where it fits in chronologically.

The Chinese Postman, or Eulerian logic, dates back to 1736 by a mathematician named Leonhard Euler who was trying to figure out a puzzle, the Konigsberg Bridge Puzzle, how to get the shortest route to touch all the bridges and all sides of all the bridges in the shortest distance. And that's part of the cycle and that's the Chinese Postman --

THE COURT: Why is it called that?

MR. ABRAMS: Because in 1962 a mathematician who's Chinese came up with this algorithm and was published in a publication called Chinese Mathematics. Hence, the Chinese

Postman.

So that comes in in 1962. Again, not a radio based electronics positioning development, but it's here for the context for all the other developments that we're going to discuss.

In the 1970's, we began to see GPS, which is the global positioning systems. And this was developed as counsel said by the military. And this is a satellite positioning system where the satellites again would make transmissions to a GPS device, in flight time, how long did it take to get to the particular device was used to determine what the location was and the positioning was of the device. And here the device itself would calculate the positioning.

And then in the 1980's, GPS is not only used for military but a low resolution version of a hundred meters of accuracy is released to the public. And as a historical context this is a result of the Korean Air disaster, Korea Air Flight 007 which was shot down in September of 1983. In response to that there was a concern that this positioning technology ought to be made available for civilian uses, and so it was released in the 1980's.

And then along the spectrum, in 1996 the FCC adopted rules that required location reporting by mobile phones. This was called E911. And the point of this was to require mobile phones to be able to broadcast in an emergency where they're located, and this was a catalyst for further development of positioning techniques and systems using radio signals.

Then concurrent with this is this standard in 1997, 1999, the IEEE 802.11 Wi-Fi standard. And again this is not so much an issue of the development of electronic positioning, but it is a standard that becomes popular and it's a frequency that's reliable and that everybody uses.

And then in 2000 the further development is that all restrictions were removed on GPS use by civilians. And so as a result we got these kind of handheld models for the hikers that Mr. Chu was demonstrating to the Court. We began to see it in automobiles. We saw it for all sorts of use.

Also in 2000 we saw standalone cellular radio based location systems which was again a response to this E911 standard. And this was both network based, that is, something on the server side outside of the device, requiring no changes to mobile phones, or this could be done by the mobile phone itself requiring some new technology to be inserted, software/hardware. That again was using this time of flight and the calculation could be done either by the device or off the device.

Now, in all of these instances we know where these points are. We know where the satellites are. We know where some of these other things are. There's not a problem of doing their location. And as a result of this development and the release of the E911 standard, and commercial demand, more and more interest is in determining different ways to get access to data, to get information about data points. Access points.

And, for example, the patent itself talks about a Finnish system called Ekahau. And Ekahau is used for indoor, recording the location of indoor access points, much like this hospital crash cart that you heard about earlier. If you want to know where all of these are located, they might be located on the crash cart or on a gurney. And so this was a system that could use, was used to record a database of where these devices were.

And similarly, in September of 2001 we have something called WiGLE. WiGLE is a database of mapped Wi-Fi access points that are contributed, uploaded by amateurs, these so-called wardrivers. And they would upload the data that they collected and put it into this WiGLE database. WiGLE would then take the raw scanned data and it did some location positioning calculations that are then posted on the site.

And in December of 2001, Kismet Software appears. Sometimes called an access point sniffer. And this automated the process of collecting the Wi-Fi access points and their locations by recording these MAC addresses, the so-called license plates, and their signal strengths at the same time, simultaneously with GPS readings. And this was an advance in the database that, a way to record this information.

Similarly, NodeDB comes along in May of 2002. This is an Australian based system much like WiGLE. Amateurs contribute their information. And then a popular consumer site called Wi-FiMaps also locates, takes this information, but it's telling you where these Wi-Fi hot spots are, primarily to allow people to determine, hey, where's a hot spot, where can I log on, where can I use my device, less for positioning.

We heard about PlaceLab which was formed by Microsoft and Intel, again to be a database -- this is disclosed in the patent -- to find out where access points are located from contributed information.

Now, all of these predate the patent. All these are disclosed in the patent. As is, in 2004, Wi-FiFoFum, which is software that automates the process of collecting Wi-Fi access points.

Now, in 2005 we heard about GPS. GPS has a drawback because it has a problem of being slow as well as these multipath errors. And so something called assisted

GPS comes in. And assisted GPS uses a cell tower to transmit certain database information about the location of the satellite to a user device. The bandwidth from the satellite to the user device with the GPS signal is a very thin one. And if it tries to give the user device additional information, a database, as it were, sometimes called an almanac, about its location, it slows down the process. Because the idea here was to assist it by beaming it down from a cell tower on a bigger pipe, more bandwidth, and then this could just deal with the GPS signals that resulted in speeding things up.

So, overview of wireless location technologies. We have the global positioning system and assisted GPS, cell tower type location, which we'll get into in a moment, and Wi-Fi type location as well. And these technologies are deployed together on mobile phones and each has strengths and weaknesses.

We've heard a lot about GPS and it can be highly accurate and it's available all over the globe. There are 24 satellites that are above us and they are beaming down this information. We have a problem, it requires a clear line of sight. So, up in outer space where these satellites are you don't see the obstacles. They're beaming down. But as you get closer, right here in Boston you see that there are barriers which interfere with it and which cause these multipath errors that you saw a very nice illustration of. So it's accurate and highly available, but it presents some of these challenges. Clear line of sight, accuracy and reliability are affected by buildings, weather, and it's slow.

Cell tower location. So this is cell tower triangulation. And you use three or more cell towers to exchange information. Again, it's time of flight, the time of arrival, the angle of arrival in some instances, and the distances from the cell towers.

So, in this example we have three cell towers, right here in Boston. And they're beaming signals to the user. And another example, the user is beaming signals to them. And it's adjusting and making decisions about the time of flight, computing the information either on the server if it's coming out from the user or within the device itself if it's coming into the user, and then it determines where are the signals and where the signals are located, here, that's the location.

Now, if you only use two, you use that circle and that circle, it would tell you that the users are either here or here, but with three they all intersect there, and that's the approximate location of the user.

Now, there's some disadvantages to this. It is not as accurate and there are lack of towers in rural areas as we've heard, and it's also affected by multipath errors.

And then there's Wi-Fi access point location. And this is something that's been available for some time. They didn't invent Wi-Fi access point location. It's another way to solve this problem, or to address the problem. It depends on Wi-Fi access points. So they held up some of their routers. We'll show some of our routers. But these are devices that you put in your house and you connect them -- you actually have to go through an Ethernet connection and typically through a modem, and then you plug it in and probably put in a password or some other information. And these have these MAC addresses that you heard about.

THE COURT: They have these what?

MR. ABRAMS: These MAC addresses. That's how they are identified. They have unique identifiers.

So in this example, we have a number of these Wi-Fi access points. And the key is to find out where these access points are located. Because we don't have, we don't know -- we know the cell tower is down on a street and we know exactly where the satellite is. But we don't know where these are located.

And so we heard about wardriving, or collection. And what happens is we have scan vehicles. And the scan vehicle, sometimes called a wardriver, but it can be any kind of a vehicle, and it has several things. It has a GPS antenna which will tell it where it is as it's going down the street, and then it has an antenna which will collect information from the various wireless devices or access points, rather, that are in the area.

So, here we have two of them. And they're out there and they're scanning and getting information. And so it has the AP or the access point identification. That's the MAC address. And then it has a signal strength. It's measuring how strong that signal is, which may or may not be a proxy to determine the distance, but it's a data point that's used to determine positioning. And it also records from the GPS the latitude and longitude coordinates of where the scan vehicle is.

Now, the scan vehicle is reporting where it is. So it gets the GPS information as to where the scan vehicle is, not to where the access points are. That's a very significant point. So it's collecting this data, and as it's -- we're going to show you an animation of how it does it. But keep in mind that it's not stopping in front of every structure and then collecting information and going to the next one and stopping. They're moving down the street and they're making perhaps tens or hundreds of readings or samples a second. So they're continually getting information and sucking that in.

THE COURT: So the GPS signal here indicates where the wardriver is and then one can calculate from that, because the signal has come, having in mind also the signal strength where the, where the wireless, the antenna is. Is that right? Is that how it works?

MR. ABRAMS: That is -- yes. And so the idea is to get as many readings as possible from as many different perspectives so that you can do a mathematical calculation, fancy math, or averaging, that will come in and say there's all these readings of this MAC address number 1 and we'll average them out, and this is where it's got to be, it's got to be at whatever address it is, latitude and longitude. That's why you want to get a lot of these.

THE COURT: So you use the same mechanism to detect the device -- the access point that is ultimately used to detect where the user is.

MR. ABRAMS: We will use that information to determine where the user is. But first you got to build your database.

THE COURT: Right.

MR. ABRAMS: And as these patents disclose, you have to constantly be doing this driving, this collection as part of it.

So, we have the two scan vehicles. They are getting raw scan data. And to the right you see the existing database. There's already a database that says lat/long database, or latitude/longitude database for access points.

So, these scan vehicles are collecting information. And here's, wardriver number 2 sends his information out to the server, the computer that is maintaining this database, and then it inserts it in and it makes a calculation. So we've got new information and it will insert that into the database. Similarly, wardriver number 1 transmits its information and in it goes to the database. And then the database has all this information for later use in determining positioning.

Now, there's an intersection, your Honor, right here where you have access points 3, 4 and 5 with scan information from both of the vehicles, and when that happens those get averaged and they're included in the database.

Access point scanning. So, in this illustration we have an area where we see two access points. And in comes our scan vehicle and it's going around the block. And this makes it look as if it's getting, stopping and getting signals at four places where in reality it's constantly getting signals. But let's just say for purposes of this it's stopping and getting signals and signal information of the same two access points but from different perspectives. And the result of that is from these four positions it has different information about them from different perspectives. And there it is. So it's trying to get as much information to locate that. Because if it only took one picture, one snapshot, or one series going down one street it wouldn't have the well-rounded perspective, it wouldn't give you as accurate of a reading.

And that's illustrated here where we've got the wardriver going down the street and it's looking at these two access points, but there's no way to get to the other side. It looks like there's a park or a yard there. And you can't get to the other side as you did on the other to get the information. And the result of that is that in this instance you're just going to have this one set of data points and it may affect where the access points are calculated to be located.

And here it compares arteries on one side, you have an incomplete picture. Arteries on all sides, you have --

THE COURT: In the one-sided version does the angle matter?

MR. ABRAMS: Well --

THE COURT: I mean, could you, for example, measure from directly opposite the left point and then both of them directly from the right point or somewhere in between? Does the -- can you calculate more accurately the location of the access point if you get from the same vehicle different angles at different places?

MR. ABRAMS: I don't think so, your Honor. Because what's really happening here is it's taking the information and scanning consistently here and it will input that information as it gets -- the GPS will say where the scan vehicle is as it's going down the street.

THE COURT: But if, yeah, if the vehicle goes down the street --

MR. ABRAMS: Yes.

THE COURT: -- it gets, it gets to the same access point but at different angles. And that doesn't matter?

MR. ABRAMS: I don't believe it matters, your Honor.

THE COURT: Okay.

MR. ABRAMS: It's just -- what it is is measuring the GPS, both scan vehicles are measuring the signal strength for each one of these and then it's getting that information and sending it to the database. But the database, the key fact here is that it doesn't have it from the other perspectives.

All right. One of the problems with Wi-Fi access point scanning is that a large area must be scanned. And it's got to be -- or there's a radius of at least ten miles. And as you can see from this illustration that's a very wide area with a very large populated segment in much of it, but also there's water on the other side of this.

And another problem, significant problem is that access points can change. So, using this illustration, in July we have access points, various routers along this route, and we'll get to the difference between blue and the red in a moment, but that changes over time. As people move in or people install new devices for access points and as some people move out or they take them away. And it's constantly changing. People are updating. People are moving. New businesses come in. They may change the location as we saw the one in the left, second from the left. And the database needs to be updated as this happens in order to be accurate.

Now, another problem is that some of the routers or the access points may not be configured to broadcast their identification information. And this is the so-called active versus passive access point scanning. So some of them, the red ones are out there and they're saying hello, my name is MAC address 1, my name is MAC address 2, and the wardriver can pick that up. But there's a number of them in this illustration, the ones in blue, that are not doing that. They're not configured to do that. They're not set to do that.

And so, the wardriver sends out a probe request. The probe request is essentially saying anybody there?

Anybody out there? And then the probe requests go out and you get a probe response, says hello, I'm here. My MAC address is, whatever it is. And here's the probes going out and the probes getting the information coming back.

So, passive scanning only reveals some access points, and active scanning gets the remainder except in limited circumstances.

Now, the assertion was made, and this will come up in claim construction, that the '897 patent, for example, does not require active scanning. The '897 patent, column 12, line 15 talks about a Wi-Fi enabled device communicating with Wi-Fi access points within range of the Wi-Fi enabled device so that observed Wi-Fi access points identify themselves.

So, this will come up on November 9. This is a preview of what the issue is where Google believes that it's not, that it requires active scanning, not just passive.

So, mobile devices such as a mobile phone determine their location using the signals received from nearby Wi-Fi access points. And let's take a look at how this works.

So, locating a mobile device. So, you're there just off the street, you want to find out where you are. And your phone detects these signals and it says, all right, I detect access point 7, access point 9, access point 10, and they have these signal strengths. And then it goes, sends a message to the database and says, well, all right, where am I. Here's what I'm finding. I'm finding 7, I'm finding 9, I'm finding 10. And it gets the information. And it says here's where you are, here's the locations of those access points and it calculates it. And then we get the calculation in a blue dot. So if you look on your smartphone or your iPad it will tell you where you're at.

Now, the patents describe random data collection methods such as wardriving or using delivery trucks as creating something that they call arterial bias. And as part of the technology tutorial, arterial bias is not a term of art that had been used within this, this area of technology. It was something that was coined within the context of these patents.

The patents describe driving a systematic, planned route on all drivable roads as the solution to this thing that they call arterial bias. And they use the Chinese Postman algorithm to plan the route. And as we said, this is a well-known, well-established, well over, almost 50 years now, approach to this Eulerian cycle problem. And it plans the shortest path deliberately along all drivable streets that minimize repetition. And it's all drivable streets. Not substantially, not some, not many, it's all drivable streets.

Now, you can see here the illustration of the

Chinese Postman routing that's in the patent, in figure 4. And this is in all four of the patents. And that's not the only method of collection.

Now, we talked about wardriving. Chinese Postman is one method of collection. And it could be random. Another method of getting, collecting, collecting data about access points is random collection by cell phone users. So one of the things that happens with today's smartphones is they can be configured to broadcast their information. And they'll say, well, I'm here at this latitude and longitude. They're receiving, they're detecting the various access points and they're making a report on that and that goes into a database.

THE COURT: You mean knowing where the cell phone user is allows description of where the access points are?

MR. ABRAMS: In this configuration, yes. So that's another --

THE COURT: But, I mean, in practice can you do it? I thought you said before you could not.

MR. ABRAMS: I'm sorry?

THE COURT: Can you determine the location of access points by knowing the location of the cell phone user, the device whose location you're looking for --

MR. ABRAMS: Okay.

THE COURT: -- without anything more.

MR. ABRAMS: Okay, this is a different situation. In this situation, the person who has their cell phone on is acting almost like a wardriver and they're getting information about all the other access points and transmitting that information. It's invisible, you don't know it's happening, but your cell phone can be configured to do that.

THE COURT: But is the cell phone able to determine the actual location of all the devices?

MR. ABRAMS: All the access points?

THE COURT: The access points, yes.

MR. ABRAMS: Yes, it can. That are in the area. So, in the typical situation, if I'm --

THE COURT: So it's a mutual arrangement?

MR. ABRAMS: It can be. Lots of things are going on. So if I have my cell phone that's configured and I'm, you know, standing in the middle of the park and I want to find out where I am, I'm lost, I can activate it and it's going to follow the technique of, it's going to follow the technique that we discussed before, it will, you know, get its information, send it out, and then it will be told here's where you are based upon comparison of the database. This is a different technology. It's not part of the patents. And this is just, it's a separate way of collecting information that is now used, not covered by the patents, not in controversy, where a cell phone can act as, like a scan vehicle and get the data, get the access points and transmit them to a database. This is just a comparison. That's not covered by the patents.

Nor is a random collection by driving. So, sticking a GPS and scan machines on a FedEx or on a UPS truck is random. Now, it may be that UPS or FedEx have a rule you got to turn right instead of making a left turn. But it's not a deliberate programmatic way of finding the shortest possible route to go through all the different streets.

THE COURT: So your position is that only the shortest route is disclosed by the patent.

MR. ABRAMS: The shortest, most efficient and deliberate route, not something that's coincidental with what somebody else is doing. It's purposeful.

Now, there's something again that's referred to as reference symmetry. Reference symmetry again is a coined term found only in these patents. It wasn't part of the art before.

And the illustration that was used is showing that there's a lack of what they call reference symmetry. When we have calculated points, access points, this is where they're calculated. We're not showing in this illustration where they actually are, and how the user would, using these calculated points, the user would be told, well, you're here, when you're really here. So the example is given that if you have reference symmetry then the calculated positions of these access points turn out to be here. Now, we don't know in this where the actual locations are. But they tell us this is where the calculated positions are. And it says, well, look at how accurate it is. But in real life that doesn't often happen. Because that assumes that there's some kind of an even or balanced and robust distribution of these access points that enable them to be clustered there and to give this kind of, this illustration which concludes with an accurate -- this laser seems to be out -- which seems to be pretty accurate as to where the user actually is, the calculated location. In real life they're not, these access points may not be clustered like that. They may not be evenly balanced. And the access points could all be down here or over to the side. Or maybe the user isn't here, the user is down there. And so, you need to ensure that the access points are distributed evenly, robustly, and balanced with other users and that doesn't always happen.

So, in conclusion, radio based location techniques are not new. Wi-Fi location systems are not new. Incremental improvements in Wi-Fi location are claimed here with terms that the parties dispute as to their clarity and scope. And the patents describe driving a systematic, planned, deliberate route, that is, the Chinese Postman route, throughout all streets in a large target area as yielding more accurate data about Wi-Fi access point locations and as a basis for Wi-Fi location systems.

THE COURT: What's the issue between the parties? I mean, what's the alleged infringement?

MR. ABRAMS: Getting to the merits of infringement?

THE COURT: I'm just curious where the dispute is.

MR. ABRAMS: Well, the dispute is they claim that Google, on the merits and substance, if these patents are valid and if they're definite enough, that Google infringes because it practices what they say the patent says.

THE COURT: The deliberate, the deliberate determination, driving to determine the location.

MR. ABRAMS: They claim that the patent is construed to say that. Our contention before we even get to infringement is that these patents are indefinite.

THE COURT: I understand.

MR. ABRAMS: Then we have other defenses that relate to invalidity, and then we can certainly get to noninfringement. But we think on noninfringement we don't do that, that the patents are flawed because of indefiniteness as well as other issues.

THE COURT: Okay.

MR. ABRAMS: Thank you, your Honor.

THE COURT: That's it?

MR. ABRAMS: That's it.

THE COURT: You're not talking about the other two patents?

MR. ABRAMS: I'm not going to go into detail on those patents.

THE COURT: Any rebuttal, Mr. Chu? Mr. Lu?

MR. CHU: Just a quick thought, your Honor. There are a number of claim construction disputes. I think we're scheduled before you on November 9th at 9:00 a.m. An example is, and I think it's already been discussed by opposing counsel, is they want to read the Chinese Postman driving algorithm into the claims as being a requirement of the claims, and we say that it is an embodiment that is described and the claims are not limited to the Chinese Postman algorithm. And that will be clear in terms of the briefs on both sides. But that's an example of the claim construction dispute.

THE COURT: Are we still at twelve different disputes?

MR. CHU: Yes.

THE COURT: Of course by the time we get there that will have been whittled down a little more.

MR. CHU: Well, we already did some whittling down.

THE COURT: Oh, I know, I know. I have your agreed ones. But the agreed ones are fewer in number.

MR. CHU: That suggests a goal being put forward.

THE COURT: No, actually --

MR. CHU: I think we have nine on which we agree, your Honor.

THE COURT: Yes. The disputed ones are twelve, and the agreed ones aren't numbered. But I accept your number on that.

MR. CHU: Thank you very much, your Honor. Thank you very much for your time and attention.

THE COURT: Well, thank you very much. I always find these tutorials simply wonderful. Of course, whether they took remains to be seen.

Thank you all.

MR. CHU: Thank you, your Honor.

MR. ABRAMS: Thank you, your Honor.

THE COURT: I will cogitate what you have tried to teach me today, on what you've tried to teach me, and hopefully it will be helpful to all of us.

MR. LU: Thank you.

THE COURT: And we are now recessed until, I don't know when.

(Whereupon the matter concluded.)

C E R T I F I C A T E

I, Donald E. Womack, Official Court Reporter for the United States District Court for the District of Massachusetts, do hereby certify that the foregoing pages are a true and accurate transcription of my shorthand notes taken in the aforementioned matter to the best of my skill and ability.

/S/ DONALD E. WOMACK 10-25-2011

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