**Dr. Gates:** Yeah, and, and when, when we start looking at multiple scopes I’m gonna ask that question, when you have more than one scope, um, you know it goes back to the wording has to be very careful because we have to say, well it depends, how, how are we doing that cause it’s an and, well could be an and or an or ??? that is not holding so, if we say it doesn’t hold on temperature, it never holds on temperature over this scope it’s also, we’re also saying it never holds if we have  two scopes.

**Dr. Salamah:** Right.

**Dr. Gates:** On the second reading, so when we talk about two scopes.

**Dr. Salamah:** Right I think that will be a little bit.

**Dr. Gates:** Later?

**Dr. Salamah:** When we.

**Dr. Gates:** Do the relations.

**Dr. Salamah:** Do the relations, um.

**Dr. Gates:** But I thought I heard that in your question, I mean, if you have two different sensors, the scope is, you know, there we assume that they are in sync.

**Student:** So they’re parallel scopes?

**Dr. Gates:**  Yeah

**Dr. Salamah:** Right, and the Boolean statement might be on one single statement with ands.

**Student:** Or both of them?

**Dr. Salamah:** Right, but, but it’s an anded in the statement so, it’s a combined statement but the first part of it might be applicable to first scope, the second part might be applicable.

**Dr. Gates:** On a more complicated one.

**Dr. Salamah:** Right.

**Dr. Gates:** The one we’re gonna go over next week.

**Student:**Thank you.

**Dr. Gates:**So maybe the case, that there’s, so that’s also a really good question.

**Dr. Salamah:** But yes, there’s a typo in here, I’m not sure everybody heard it so for, for the.

**Student:** For the existence.

**Dr. Salamah:**For the existence it, it should not read the formal definition, it should be the Boolean statement B should hold at some readings within the scope.

**Dr. Gates:** Well, we’ll correct it and post it on, on the, yeah, piazza. Okay, are you team one, ??? you’re 3. So one, who’s one? No one responded to haha okay, one, questions?

**Student:** I did have a question about the time stamps, um, for these sensors, is it just one gigantic reading from one period to the next or is it, like, some discreet intervals of time stamps that are read?

**Dr. Gates:** Yeah, that’s set up by the, the scientist will set it up, so the scientist can say we’re gonna collect data on, on the hour, or we’re gonna collect it continually, or every 5 seconds, or every minute, so it’s up to the scientist to set up how they want to collect the data.

**Dr. Salamah:**But however it’s set up, the scope is being built by.

**Dr. Gates:** Whatever that.

**Dr. Salamah:**Distinct angles, by distinct times??? so if you have, if we’re reading every hour for example, well, then we have a reading every hour, we have 24 hour readings, now the scope could be any one of those, any one, any subset of those 24 readings

**Dr. Salamah:** For the existence, it should not read, the formal definition should be should hold at some reading within the scope.

**Dr. Gates:** We’ll correct it and posted on piazza

**Student:** On piazza

**Dr. Gates:** Ok, are you team one? You’re three. So one. Who’s one? No one responded to one? Ok one. Questions?

**Student:** I did have a question about the time stamps. Umm for these sensors, is it just one gigantic reading from one period to the next. Or is it some discrete interval from time stamps that are read

**Dr. Gates:** that, that's set up by the, the scientist will set it up. So the scientist can say we will collect data on the hour or we are going to collect it continually, or every 5 seconds, or every minute. So it’s up to the scientist to set up how they want to collect the data

**Dr. Salamah:** but however, it’s set up the scope is being built by distinct, by distinct time steps. So if you have - if, if we're reading every hour for example, well then we have a reading every hour, we have 24 hour readings. Now the scope can by anyone of those - anyone- any subset of those 24. Yeah

**Dr. Gates:** whatever the ???

**Student:** I had a question about the formats. Umm, we talk about the interface as having to display the information, but did need to have us like also with have an implement of downloading the information with a certain format - like a text file or a uh document file like that, a pdf.

**Dr. Salamah:** I think that's more for

**Dr. Gates:** Ok so your question is -

**Student:** Like instead of just displaying the information, do they need us also to be able to like provide them with yeah like a or a form of download, like a PDF or text or

**Dr. Gates:** Ok, depends on what you’re talking about with the expected information. If you're talking about the information itself, umm you’re not concerned with the data of downloading the data. And then you format. That's an, that's a job of some other system right? But you’re concerned more about capturing the properties, and then possibly graphing the data to show you know the grasp in relationship to the properties so you're doing the visualization of that data. And that's umm there should be a lot of questions around and how they use - how do you start, how do you visualize the data, and how do you set that up. So if Dr. Pennington said I can be in front of machines and I could be even at this visualization wall and I may be sharing temperature data, I may be sharing a lot of data on this wall and I may I just I just want to see this continuous - if I’m doing near real-time and continuous feed of data and how it’s mapping on how it’s mapping to my properties. That may be you know one thing, but to do that I mean I’m going to stop there. So I’m going to prompt you to ask more questions. Did that answer - you were more concerned about the properties, displaying the properties and getting the report on what the anomalies were.

**Student:** Yeah, so like instead of having to like I guess log back in to the system and having to request the same properties to be displayed - if like a, like a document that's already pre - premade you could just like open that up and it already has that information

**Dr. Gates:** Right, so, so if I hear you right. I’m a scientist in the field. I’m working in Hornado, I have a lot of properties already. Right? I should be able to re-use those properties. yeah. The answer is yes. Or I should be able to look at those and change them and select from that. And create a subset. Then, yes, absolutely. Ok.

**Student:** Just to clarify on his question, ok so what I’m getting from him, it’s ok to implement a caching system, basically?

**Dr. Gates:** Not caching, well caching - I don’t know if he's saying?

**Student**: I guess it's like what he's saying because he wants he wants to download something and reuse it instead of sending a request. So in a similar way a cache could be storing information

**Dr. Gates**: Yeah but caching is if you're talking about caching away, I understand caching from operating systems is that in as more information comes in your cache is only so large, it goes away. Right, if you keep on adding new information that goes into your cache. Umm. The reuse, the reuse is - means that for me it’s more of a repository I don't think it’s truly a cache because you're going to be, once you're monitoring, you're monitoring over, you're monitoring over months. I mean you set it up and it’s going for months. Unless you're going from site to site to site. What you set up is what you set up, for that period of time. You’re not setting up for 24 hours typically, you're setting it up for weeks. So these files are huge. And that's a huge, that's a big problem for the monitoring side of it. We're not going to worry too much about that. Yeah, I don't think it’s, I don't, I’m not sure how a cache would be, and still that's more of a solution of the of a model for that.

Yes?

**Student:** You were saying the files uh in storage might actually be of a greater size, so that would affect the performance and affect the actual time enhancement, so how would we go about informing the client of that.

**Dr. Gates:** So there is, there is this whole again, separation of concerns, in terms of - of may- maybe some separation of concern - well, ok. It is at one level. So separation of concerns is, is how do you deal with large files and then how do you do the monitoring. And it’s more of a concern when we're starting to look at near real-time. Right? When we're starting to look at near real-time it’s streaming. So we're streaming information. You're system is not concerned about storing that information. It’s being streamed and you're just pulling it out in real time. The data logger system is the one really storing that. Or it may be transmitting it to some, you know, storage. Umm. So I would separate that because we're not concerned with that side of how it’s storing it. Umm. Well, if you start looking at historical data, then that's a different story right? Umm. Now we're saying I’m looking at what I have in real time and I want to compare against data that was collected last year. So that is stored some place. So, so far we haven't heard from the, from the, any requirements that deal with performance, so performance is a quality umm, attribute. Right? And it’s an important thing to talk about. You want to ask the customer that they are concerned about the performance. But it all depends on, again, on how you implement it. So you may have this huge file but you may just pull out the area, the time of interest. Which is not as large. Ok. So again, we go back to implementation issues. Uh, it’s a good question to ask if performance is an issue. That goes back to your customer, to the scientist.

**Dr. Gates:** I like the kind of questions you're asking. I mean I think they're really potent I want to hear from more people. Team four? Let’s see, we went one, we went two, right, we went three. Team four?

**Student:** That's us right? Yeah. Well I know we, I know you touched on the rf at the f, if the rf did not exist. What if the rl did not exist. Do we just not - do anything about that? And just keep moving forward every time?

**Dr. Salamah:** You're scope is not built. If rl you're saying that the left part of the scope. Until you get that l until you get that first condition that builds that left side of the scope, then that, then you're, you're scope is not built, you don't care about the property yet. Once that happens, then you wait for your r for the - r letter - the reading correspondent to the r. And then that's your scope is complete. But if any one of these, if the l is not there, your scope is not built. If the r between l and r is not there, your scope is not built. And you don't care about the property anymore. So you first have to make sure that your scope is built.

**Student:** Ok. And that's always determined by rl. Lr , I’m sorry I’m ??? the name.

**Dr. Salamah:** But now, the question that was asked is, if we're doing this real time, you're not going to wait until the scope is built. Right. So, that's, that's the harder question. You have to think about how that can relate. Do you understand the problem? You’re thinking existence between l and r. Will L happen? Now I’m looking for if this sets of some sort of a condition, will, but I know if I really care about it or not because I don't know if the scope has been built yet because of the r. So that's an issue that you have to really.

**Dr. Gates:** So you're going to be creating use-cases out of this problem right? A use-case is real-time. You have a display. You're finding potential anomalies, haha, because, you reached r but you haven't gotten to r yet. When you - you're um building onto l, haha, you don't know if r is there, but you’re finding if these properties are not holding. That's a scenario right? What does the display look like? Mmkay? So just think about it. So this is going more towards the prototyping part, because you're going to be looking at potential solutions and you're going to be presenting them to the user when you prototype to say this is how we think it should – what - what we should do. Or you don't do anything right? Are you going to do it at [inaudible]. And there's a lot of decision inquirements here, but part of dealing with complex problems, you know I think may be convinced that this is a complex system that you're trying to build? I mean it’s not that easy. You can't just go out and build it. Umm maybe originally you thought oh yeah we can create this. But once you start digging in, thinking oh. We're the - there are different scenarios. That's when you - that's the complexity of it. And trying to nailing that down this semester before we start implementing next semester

**Dr. Salamah:** I’m just going to add something in terms of software engineering. What you're doing right now is really one of the hardest things. Is making sure you understand what needs to be done and whether or not you can do whether or not it’s feasible or not. So one of the things you really have to learn is to push back with that customer and say you know what, this, we - we just can't do this. But now, you have to know how to do this. And you cannot just say we can't do it. You have to document why. You have to bring a convincing argument why this can’t be done. In terms in performance for example the performance the customer requires specific performance attributes saying that it has to be, from this within this second. You have to do some calculations and go and say you know what, this is just not feasible. So you have to learn that not everything that the customer says has to be done, preferably yes, but you can push back that’s part of your job, but you have to say why you’re pushing back and why it’s not feasible.

**Dr. Gates**: We have this afternoon a highly distinguished speaker, Dr. Amelia Flores from IBM, smart planet. So she spoke to us yesterday, to women on campus. One of the things she said is the biggest attribute for the people she hires. So she hires students who come in and she hires people to work for here on the smarter planet initiative, smart cities, you know what that is? It’s IBM’s big push to bring in technology to make it a better world on how we do things with the technology.