BY ALAN LUNDBERG

Complex Events in

This is the second part of a two-part interview with Dr. David Luckham, Professor Emeritus at Stanford University, the world's leading expert in this emerging field. His latest book, "The Power of Events", was published by Addison-Wesley in 2002. The first part of the interview can be found at www.nowmagnow.com

In the first part of the interview, Dr. Luckham discussed the differences between event-driven SOAs and "classic' SOAs, noting that the former don't rely on remote procedure calls as their primary form of communication. As a result, efficiencies rise and event-driven SOAs become part of newly disruptive technology within enterprise IT. Dr. Luckham noted that companies can "save a lot of losses with busines-event content validation," and with that, we proceed to part II of the interview.

NOW Magazine: In addition to avoiding losses, one can see other applications for complex event processing, such as security, for example. Do you have any security examples where CEP has relevance?

Dr. David Luckham: There are lots of examples of that, and they're occurring on a weekly basis. One particularly egregious was the great credit card theft, in which Mastercard lost data for 40 million credit cards--just stolen, vanished. The guilty party in this case was Card Systems Solutions, which was in business in Texas, but is no longer in business. According to Mastercard what happened is that the thieves were able to install spyware on Card Systems Solutions IT because they hadn't secured their IT.

But the deeper level of truth that the US Public Interest Research Group has told us is that the general public just isn't conscious of the hodge-podge of legacy systems that has grown up in the credit card transaction processing business. The issue is that you have a rogue program on the enterprise IT layer sending data off to someplace outside.

Now why didn't this anomalous event traffic alert anyone? Obviously Card System Solutions didn't have an adequate business event monitoring capability. They're no longer in business as a result.

So the lessons that you might take from this particular example is, let me see, know where your business information is at all times! And, of course, when it's vul-

Enterprise IT

Today's business environment DEMANDS AGILITY. Event-driven SOA, or a new idea called complex event processing, offers a new way to provide business insight that can help IT contribute toward bottom-line operational excellence.

Dr. David Luckham, Professor Emeritus at Stanford University, is the world's leading expert in this emerging field. His latest book, "The Power of Events," was published by Addison-Wesley in 2002. Dr. Luckham was recently interviewed by *NOW Magazine* about his favorite topic. This is part one of that interview. The final installment will appear in the next issue.

David Luckham

nerable, track event-signifying information flow and unencrypted operations. And for God's sake detect activity that isn't resulting from your own processes. All of this is well within the capabilities of the area of business activity monitoring today.

NOW Magazine: Absolutely, but how about the core issue? How does CEP help with event-driven SOA management?

Luckham: Let's think about the event activity on the IT layer of a modern enterprise. This forms an event cloud because the events result from activities that happen all over the place, in a large enterprise all over the world. The events don't form a nice, orderly sequence, although there are lots of relationships between them, such as timing and causality.

We can gain a lot of insight into how to manage our enterprises and protect them from the information in this cloud of events that is flowing through the IT layers of the enterprise. CEP relates to this idea by embodying principles for building solutions to provide management insight from any cloud of events.

NOW Magazine: And some of these prinicples are…

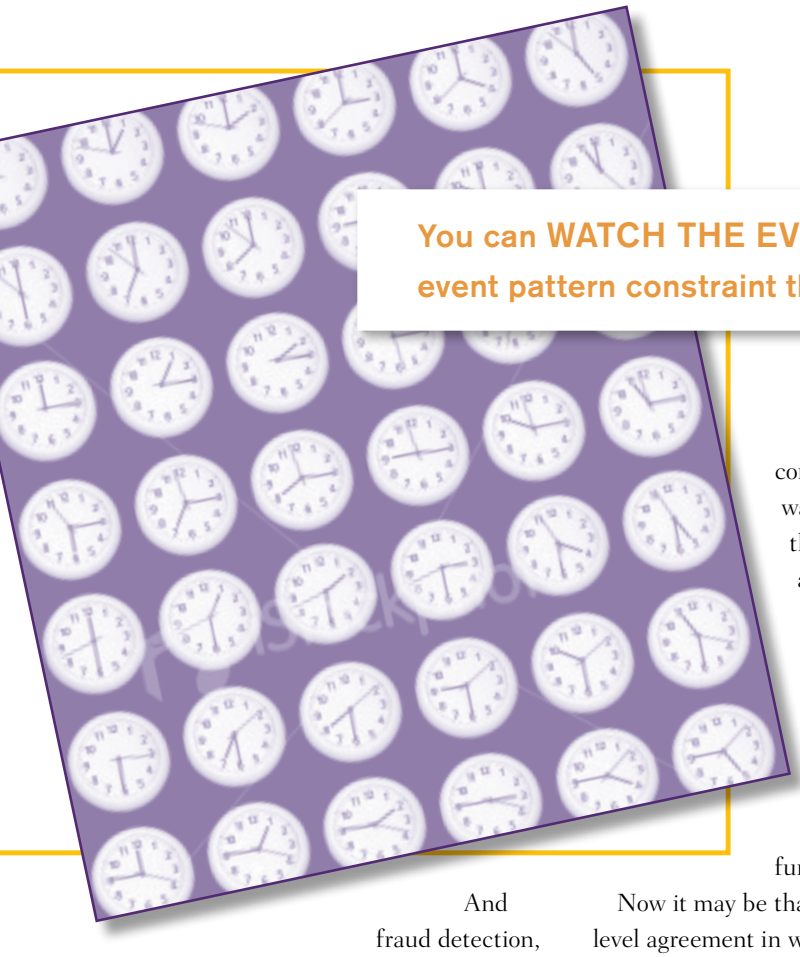
Luckham: The use of patterns of events to detect and track activities (and they might be long-lived patterns in some cases). Reactive rules triggered by complex patterns of events. The abstraction of information from complicated patterns to form understandable higher level events. Executive reports if you like, event pattern constraint monitoring, which is very important in monitoring what's happening to your service level agreements, or in conformance.

And finally, something that the industry just really hasn't come to terms with yet in any standardized way, and that is hierarchies of events, to standardize the use of event processing in enterprise management. This insight can lead to the topic of distributed event processing rules engines, which is also something that's beyond the state of the art at the moment as far as I know.

NOW Magazine: As you know, the IT environment found in the financial services business presents some of the most demanding real time environments in all of business. How does complex event processing address some of the finance industry challenges?

Luckham: Yes indeed, financial services is a very active applications area for CEP. These kinds of applications often demand dealing with very high event throughputs. Some applications process several market feeds simultaneously, such as in hedge funds. Numbers as high as a hundred thousand events per second are often mentioned.

One of the CEP applications on the market now in this area is with competitive pricing of stocks in markets, where a bank has been ordered to sell some stock and it wants to know what the current price that it should quote would be. Another is computation of lending rates in online loan application processing (which has been pioneered by German banks) allows you to apply online for a loan and get an answer within a day. Compliance monitoring in the stock markets, that's a big area, and it's being developed in certain stock markets in the U.S. right now.



You can WATCH THE EVENTS from the process steps, and have an event pattern constraint that checks each of these process instances.

And fraud detection, of course, in banking and credit card transactions and other areas.

NOW Magazine: Do you see events or complex event processing as being complementary to business process management in any way?

Luckham: Well yes, there's a lot of talk in the business process management world about event-driven processes. I think that there's a move to incorporate events as an integral part of not only driving processes but also monitoring how they're progressing, and that's one of the areas in which CEP has a lot to offer.

Let me illustrate that with a rather simple example—dealing with mortgage loan applications. The three initial steps of the process are to do an income review of the applicant, a credit check, and a house appraisal, and these steps are going on concurrently. And by the way, in some large banks these days these steps are totally outsourced, sometimes across the Atlantic or the Pacific. The reslts of these steps are fed to the risk management step, which feeds to the funding step.

Now it may be that you have a service level agreement in which you've promised applicants that you're going to give them an answer in, say, three business days. If your process is running behind schedule and you're in danger of violating that service level agreement, you can watch the events from the process steps, and have an event pattern constraint that checks each of these process instances.

So we have an event pattern in place that's looking at the first three steps in the processes. If the elapsed time to complete those first three steps is greater than some bound, then this event-triggered control process is going to raise the priority with which the risk management is executed to try and keep the service level agreement within bounds.

NOW Magazine: So you've provided some good technical and anecdotal examples. Our question, though, is why is this topic of such personal interest to you?

Luckham: Well, I could answer that question on multiple different levels. From a point of view of event processing, I got into event processing twenty years ago at least, and as part of software design, and I've been working it ever since.

Of course one likes to see a field come to fruition if you like, and the field is still developing. In fact it was rather slower to develop than we all predicted it would when I was running a research group at Stanford. So it still needs quite a bit of helping along and evangelizing. There are some standards processes beginning now, so there's still a lot of activity, and I'd like to see it come to a reasonable successful conclusion.

But on a deeper level you can ask why the heck one gets into anything in life, and there are plenty of things that I could have done. In my early days I might have done architecture, I might have gone into history, or literature. I started out in mathematics as a matter of fact, because when I started there wasn't any computer science, at least not formal departments. There are times when I wish I'd done something else, but that isn't because I'm unhappy with what I'm doing, but because I can see so many other things that I would have liked to have tried my hand at. But of course one only has one life.

AD— SL