

## CEP06 – Professor David Luckham (part 1)

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**Announcer:** Hello, and welcome back to the Complex Events Podcast, brought to you by Voices in Business and sponsored by BEA Systems. On today's show we feature an interview with David Luckham, Emeritus Professor at Stanford University.

Professor Luckham is a foremost expert on Complex Event Processing, and is often referred to as the father of CEP. In this interview he discusses the evolution of CEP and its applications, with Vicki Zesses of Voices in Business and David Fergie, Principal Solutions Architect at BEA Systems.

**Vicki Zesses:** Today we have with us David Luckham, Emeritus Professor at Stanford University, and co-hosting with me is David Fergie, Principal Solutions Architect with BEA Systems. Let me start in. David, if I can ask, you have been referred to as the father of CEP, now that's a very illustrious title. Can you tell us a bit about your background and how you came to receive this?

**David Luckham:** Well, I think that probably comes from the book "Power of Events" which was published in 2002 and was sort of a road map for developing complex event processing applications. I'm going to refer to that, by the way, as CEP.

The book was a compendium of research in event processing over a period of about 10 or 15 years at Stanford, together with an introduction written for the marketing department of a start-up company that was started in 2000, then folded in 2002. The only thing that remains of the company is the book. That was basically the road map for CEP, and I believe that's where the description of me comes from.

**David Fergie:** So David, in past articles, such as “SOA, EDA, DPM, and CEP are all Complimentary” and “What's the Difference Between ESP and CEP?”, you talk about the evolution of all of those various technologies. Can you update us on how you see CEP today, as opposed to event-driven SOA? Are they now the same thing in the eyes of the industry?

**David Luckham:** That's a fairly lengthy question; let me take it little bit by little bit. We have a number of different acronyms: Service Oriented Architectures – SOA; Event-driven Architecture; BPM - Business Process Management; CEP - Complex Event Processing; are all complimentary. Well, I believe that, I believe that these acronyms stand for areas of technology that can all be used to enhance each other if we understand what each one of them is.

The difference between Event Stream Processing (ESP) and Complex Events Processing (CEP) - that was an article that I wrote at a time in the development of event processing, when certain vendors had introduced this notion of streams processing as a marketing ploy, you might say.

They felt that - we're going back now to about 2001-2002 - and some marketing departments felt that they were getting resistance from potential customers if they mentioned the word 'complex' as in complex event processing. Other marketing departments didn't feel that at all, by the way.

But the field of event processing in general was in a stage where it had to educate its potential markets. So the marketing departments were going out and talking to people and some of them were saying, "Well we can get through to the managers much easier if we talk about streams processing, because the stream of events - such as a market feed, the stock market - is something that they understand."

Well, it turned out that they were really talking about the same thing, ESP and CEP, and I wrote an article at that time, making that point - that they were just different acronyms for the same set of concepts. The people who actually introduced ESP as a term now disown it, and wish they had not done so. I won't mention any names here.

That's the history, it was a - you might say, the kind of thing that happens in the early days of the development of any kind of technologies. You get battles about terminology and terms, and so on.

Now we come to the idea of how does complex event processing interact, or feed into Event Driven SOA. Well, first of all, what's "Event Driven SOA?" So service-oriented architecture is really an outgrowth of the whole software movement in object-oriented programming.

In its simple theoretical form I don't see very much difference between SOA and good object-oriented design. You have interfaces, you have separate implementations, and you have communication between the interfaces. SOA is a concept that has caught on in trying to build systems a bit better, design them better, make them more maintainable than has been their history.

Now all of the cloudiness about SOA comes from the part where you're trying to teach people how to turn their IT layer, or their IT facilities, their office applications, and so on into a better designed system, a Service Oriented Architecture. "Event Driven" simply means that the services react and respond to events, and that the communication in the SOA is by means of events.

CEP is a set of ideas that you can bring to bear on how you orchestrate that event

communication in an Event Driven SOA. So the whole thing comes around to a set of technology principles.

**David Fergie:** Right, so SOA really took on a life of its own in terms of addressing everything within the data centers - at least it was supposed to. Some adoption has been slow because of that overreaching and because of some of the “boil the ocean” projects.

CEP is now in a similar position to SOA a few years ago, in that everyone agrees that it makes sense for the future and you certainly talked about scenarios like air traffic control and global epidemic warning systems. Now, how do we avoid the same pitfalls for CEP that we may have got into with SOA?

**David Luckham:** We probably won't avoid the same pitfalls. That is, when an idea or set of ideas - like, say SOA - gets into the commercial world, all kinds of people get involved in putting their spin on it - whether they have a basic understanding of the technical principles behind the acronym or not. So that you're going to get this cloud of fuzz surrounding...

**David Fergie:** The hype.

**David Luckham:** [laughs] ... scientific principles. So in the case of SOA, as I say it grew out of very simple object-oriented ideas, and then you had all the buzz about how to actually build your particular system into a SOA architecture, there are umpteen different ways of doing that, and that led to all the fuzz.

Now, CEP is a rather simple set of principles about event processing and the use of events, and that is going to be subject to a similar set of commercialization fuzz in the future. I don't think it's avoidable. I think we can look forward to a - in fact, I would say it's already happened - that people are out there saying, "We do CEP" that do very little CEP.

There is quite a bit of confusion about what the basic principles of complex event processing are. I don't think it's avoidable, I think it will happen. Now I think your question... did it, David, imply that there was sort of a lag in adoption?

**David Fergie:** Yes.

**David Luckham:** As a result of the fuzz, so to speak?

**David Fergie:** Yes, absolutely. I think possibly management in the IT department is immune to some of the claims, and has slowed the strategic adoption of SOA.

**David Luckham:** I don't see a lot of good answers out there. The field at the moment, the complex event processing area is, in fact, wrapped up in SOA quite a bit. There are a lot of vendors out there who are marketing CEP as an add-on to their SOA offerings, and their event driven SOA offerings.

The whole field seems to be in a bit of a gold rush era. I think that's going to continue for some time and people will be sitting back saying, "Now what of all this fuzz is really going to be profitable for us?" It's something I don't see how to avoid it anyway.

**David Fergie:** Right, and along those lines, in a more recent article "A Short History of Complex Event Processing", you talk about four discreet technologies: discreet event simulation, computer networks, active databases, and middleware, that historically form the foundation for CEP. Do you expect to see convergence or consolidation of those different types of tools into a unified CEP product suite?

**David Luckham:** That particular article - the first in a series of articles on a short history of developments to CEP - was really prompted by a question that I got in a talk I was giving at Yale.

I gave a talk on complex event processing, what it is, how you apply it, what the ideas are, what's been going on so far, and at the end of the talk one of the questions was, "Well event processing has been going on for 50 years, what's different?"

So what that article does is it's actually just one PowerPoint slide in a talk I give now. It lays out the four basic areas of event processing that have been going on for 50 years. It all starts with discreet event simulation in the 1950s up to the present time. We still do a lot of simulation today in all kinds of areas, from testing designs before we build the system to predicting weather. So, discreet event simulation is an area of event processing.

Then somewhere around the end of the '60s and the 1970s we had networking that introduced a different kind of event processing dealing with communication between computers over floored systems. You know, your network might drop bits here and there, so your communication had to be reliable over an unreliable system.

Then you had active databases, which was an area of databases to bring them more into the real-time. And then finally, people began to say, "Well, we've grown up with networks and various sort of communication systems, let's wrap them into middleware and give people a simplified interface to their communication system- the IT layer."

All of those four technologies; simulation, networking, active databases, and middleware are built on particular kinds of event processing. Now the issue was, "What's different about complex event processing?" And it's a different take on what you do with events, from what you do with them in simulation, what you do with them in networks.

Simulation is about pushing them around fast so you can simulate big systems. Networking is about communicating with them. Active databases is about getting your databases to react in real-time. Middleware is wrapping all your communications up into a nice simplified form.

Now, complex event processing is about using events in a more unified way. You now

have the problem of deciding what information you can extract from your IT layers. So CEP is about patterns of events. What kinds of patterns do you want to recognize? How do you define patterns? What are the important elements of an event pattern? For example, is timing important? Is large numbers of events important? Are their cause or relationships important? Should you be able to define patterns that involve the causality between events? So on.

What do you do when you recognize a pattern? Can you abstract it into a higher level event? OK, now you have hierarchies of events. So now, what sorts of hierarchies are important in event processing? Can you define your own hierarchy? Can you change it easily? Can you drill down from a higher-level event to find out how it happened? All of those kinds of issues form the principles of complex event processing. It's just a different take on what you do with that.

**David Fergie:** OK, and would you like to give us an insight into what's coming in part two of that article?

**David Luckham:** The part two of the history deals with the motivation and opportunities. Why this kind of complex event processing had an opportunity to become a commercial event, if you like. It gets into the notion of event clouds. When the networking and the middleware stuff grew up and became the basis for commercial enterprising in the 1980s.

By the end of the 1980s you had a situation where the average event driven enterprise - well, it had become event driven - it had become dependant on what was now called its IT layer. It began to understand that there was an awful lot of business intelligence flowing through the events in the IT layer, and it didn't understand what it was.

So now let's find out what's going on. The kind of problems that you might be interested in dealing with on your IT layer might be, "Well, are our business processes running on time or correctly?" and that might apply to anything, from a supply chain across national boundaries to online retail websites.

"Are our customers dropping their trading baskets and disappearing?" or another question you might be interested in answering is, "Is our information at risk?" "Is our credit card data getting stolen by spy ware?" "Are our own employees violating their permissions?" for example like Societe Generale recently, and many other situations.

"Are our accounting processes complying with government regulations?" I know of large enterprises that have got internal programs ongoing to monitor just that one problem across the whole enterprise 24/7.

Another question might be, "Can we detect an opportunity for arbitrage in our trading department?" If you're running call centers, "Are we servicing our customer's requests in timely fashion?" So it's a whole range of questions like this that you want to apply the principles of CEP to.

If you want to build up event monitoring on top of the IT layer, then CEP tells you how to do that, the principles apply to that. So the history is about the opportunity, OK? It's those kinds of opportunities that have arisen for the application of complex event processing. Then it goes on to deal with how it began, and who were the early actors involved, and then where it is now, and where it's going next.

**David Fergie:** OK, great. I'm looking forward to that article.

**Announcer:** That concludes the first part of our two-part interview with Professor David Luckham of Stanford University. For more information please visit our Website, [www.complexeventspodcast.com](http://www.complexeventspodcast.com) where you'll find details of how to subscribe to the podcast and how to get in touch if you want to leave comments or feedback.

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Thanks for listening. Goodbye.

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