European FET-Flagship initiative:

Pilot Project
"Ubiquitous Complex Event Processing"

interdisciplinary with computational socio-geonomics, neuroscience, epigenetics, brain research, epidemic research, weather/global catastrophe emergency management etc.

Infoday FET-FLAGSHIP INITIATIVE, Brussels, 30 Sept 2010

Rainer von Ammon / Rüdiger Klein / Miriam Leis / Behrooz Mobasher / Themis Palpanas / Bernhard Seeger et al.
Proposed consortium partners – will be restricted to 15

Industry:
• Deutsche Telekom AG, Bonn, Germany, Shahrok Mosheni, Behrooz Mobasher
• Continental Automotive GmbH, Vahrenwalder Str. 9, D-30165 Hannover, Jürgen Broda
• Siemens Corporate Technology CEE, Munich/Brasov, Septimiu Nechifor
• IBM HRL, Israel, Opher Etzion
• Software AG, Darmstadt, Germany, Harald Schöning/Walter Waterfeld
• Telecom Italia, Manzalini Antonio
• France Telecom
• OFFIS, Oldenburg, Germany, Jorge Marx-Gomez

SME
• CITT GmbH, Regensburg, Germany, Rainer von Ammon (SME)
• Biomathec, Plamen Simeonov, Berlin, Germany (SME)

RTO/University
• Fraunhofer IAIS, Bonn, Germany, Rüdiger Klein
• University Marburg, Germany, Bernhard Seeger
• FZI, Karlsruhe, Germany, Rudi Studer
• TNO, The Netherlands, Miriam Leis
• University of Trento, Italy, Themis Palpanas
• Telefonica Spain, Oscar Jesus Diez
• University of Reading, UK, Atta Badii

International partnership, e.g. with:
• Event Processing-Technical Society (EPTS)
• University of Stanford, David Luckham
• Caltech Pasadena, Mani Chandy
• University of Toronto, Hans-Arno Jacobsen
• www.ieee-smartgridworld.org
The Principle of U-CEP – Reference Model

Integration with other proposals:
e.g. Towards a theory of the evolution of the web (Wendy Hall)

Middleware

Process Modeler

Monitor / Analyze / Act

Domain specific reference models for event patterns

Event Modeler

Monitoring Cockpits

MiddleWare

Process Models

Process Engine
tbd: Process Execution Language

CEP Engine
tbd: Event Processing Language for U-CEP

IF ...
AND ...
FOLLOWED BY...
WITHIN...
ACTION

Event Type Adapters

Event Store

analyse history...

Normalized events, build higher level events

Low Level Event Streams

„unus mundus“ – Internet services and their events

• Which events are important?
• How are events correlated?
• When and how should we react?

e.g. JMS pub/sub

e.g. GPS-signal

e.g. Traffic Message Controls

e.g. Weather Forecast

e.g. RFID ...
Ubiquitous CEP - Current domains and their interdependencies: What we are already going to start and what we will do until 2020 and Beyond

The forecast of Ubiquitous CEP for the next decades

The forecast of Prof. David Luckham...

... until 2020 and beyond

... we are only at the end of the period of Simple CEP

European Challenges and Flagships 2020 and Beyond – Topics from the ISTAG, to be launched by 2013:
- Understanding life through future ICT
- Anticipation by simulation – Managing complex systems with future ICT
- Future Information Processing Technologies
- The Team Player: Future Problem Solving Technologies
- Robot Companions for Citizen

Figure 1: The four stages in the evolution of CEP applications.
Themes of the Pilot Project in more detail

**Event-Driven BPM: Integrating Internet of Services**
- Integrating Complex Events in BPM
- Deterministically managing of a “concert” of collaborating business processes based on complex events
- Non-deterministically managing of collaborating business processes
- Needed enhancements of modeling standards like BPMN
- Enhancements of execution standards like BPEL
- Enhancements of the NEXOF-Reference Architecture based on edBPM

**Ubiquitous CEP: Concepts for the integration of a new kind of Services**
- New modeling and design approaches
- Unified Modeling Language and enhanced notations/diagrams for modeling complex dynamics
- New Agent Based Modeling approaches (e.g. for smart devices)
- New application domains like Epigenetics, Cell Biology, Brain Research, etc.
- U-CEP based robot companions for citizens, Cyborgs → better AGI?
- Weather/global catastrophe emergency management
- New Human Enhancement Technologies (HET) and U-CEP related product ideas like Smart Navigation Systems, Intelligent Cars, U-CEP based SmartPhones, Exocortex products…
- Computational Socio-Geonomics and Social Simulation, e.g. in the case of 10 billion human agents
- From energy to matter – Higgs Boson, Higgs field, quantum physics
- Super-Computing, Bio-Computing, Quantum-Computing
- Challenges for Event Processing Languages (EPL) from the perspective of Bio-Computing and Quantum-Computing
Milestones of this Preparatory Action

• Organisation of International Workshops about U-CEP in order to evangelize the idea and to bring together the high potential interdisciplinary experts with the potential adopters (ServiceWaves/Future Internet Conferences, U-CEP Dagstuhl seminar…)

• Organisation of a Course of Study U-CEP, curriculum and concept for Live-long Learning, new eLearning concept

• Set up of first Proof of Concepts according to where edBPM/U-CEP will start from (Conti use case Change Management, Unicredit use case Risk Management according to an edBPM enhanced NEXOF-Reference Architecture ...), in order to convince potential future adopters from different domains

• Defining explicit interdisciplinary U-CEP ideas and radically new long-term products
Additional slides about some interdisciplinary ideas of the U-CEP flagship sketch
Submitted to the January/June 2010 FET-F-workshops,
if needed
Computational Socio-Geonomics / Social Simulation / e.g. 10 Billion Agents

“Emergences” of the Computational Socio-Geonomics discipline correspond to “Complex Events” of the U-CEP discipline

Integration with other proposals:
e.g. Live-Ecology, S-Gaia, FuturIcT, Socionome Metaloger

Agents Based Modelers

Event Store

Analyse history...

Event Type Adapters

e.g. JMS pub/sub
e.g. GPS-signal
e.g. Traffic Message Controls
e.g. Weather Forecast
e.g. RFID ...

Low Level Event Streams

Monitor / Analyze / Act

Computational Socio-Geonomics and Social Simulation (Complex Systems)

Build higher level events

CEP Engine
tbd: Event Processing Language for U-CEP
IF ...
AND ...
FOLLOWED BY ...
WITHIN ...
ACTION

Process Engine
tbd: Process Execution Language

Agents Activity Monitoring

Agents Based Models

“unas mundus”

- Internet services and their events

Which events are important?

How are events correlated?

When and how should we react?
Enhancing human intelligence and cognitive or physical abilities connect humans to more events of the universe (resp. Internet services)

Integration with other proposals:
e. g. - Ray Kurzweil: Singularity is Near / Henry Markram Blue Brain /
- Bruce H. Lipton: Epigenetics – Intelligent cells /
- Karlheinz Meier: Design, construction and Operation of a Neuromorphic Computation facility
- Plamen Simeonov Integral Biomathics, 
- Francois Képès, Marc Schoenauer : Using Evolution to compute
- Kevin Warwick: Brain Computer Interface - Cyborg

Event Modeler

Monitor / Analyze / Act

Intracellular effectors = Event Processing Agents

Extracellular receptors = event adapters

Low Level Event Streams

Adapters
e. g. JMS pub/sub
e. g. GPS-signal
e. g. Traffic Message Controls
e. g. Weather Forecast
e. g. RFID ...

" unus mundus" - Internet services and their events

Protein machinery

Protein machinery

Which events are important?
• How are events correlated?
• When and how should we react?
DNA-based Biocomputers / Quantum Computing
the obviously appropriate computer technology for U-CEP because of massive parallel processing

Integration with other proposals:
e.g. Peter Zoller ICT beyond limits

„unus mundus“
- Internet services and their events

Event Store
analyse history...

Event Type Adapters
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e.g. Weather Forecast
e.g. RFID ...

Agents Based Modelers

Event Processing Model
e.g. GPS-signal

Monitor / Analyze / Act

CEP Engine
tbd: Event Processing Language for U-CEP
IF ...
AND ...
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• Which events are important?
• How are events correlated?
• When and how should we react?
Robot Companions for Citizen – driven by Event Processing

Integration with other proposals:
e.g. Paolo Dario Robot companions for citizens

• Which events are important?
• How are events correlated?
• When and how should we react?
Audi/VW also presented Shelley TT – driverless car e.g. JavaOne Sept 2010
Ideas for SmartEnergyGrids – based on edBPM/U-CEP
NSF keynote Mani Chandy/Caltech Pasadena 2010

Technology fulfilling needs: energy

Sensors, actuators, information networks and the smart grid

Managing dynamic renewable energy portfolio integrated with nuclear and fossil fuel generation; energy storage; dynamic demand; and time-sensitive pricing

Southern California Edison
Some slides about previous related edBPM curricula to be enhanced for U-CEP
Dissemination and Teaching ED-BPM
The business modeler and the event modeler – different qualifications not in personal union

A proposal for a curriculum of a new international Master course of study “Event-Driven Business Process Management”

1. Description: Curriculum together with required credits and examinations

Certificate: Master of Science
Programme Duration: Four Semesters (120 credits/cr)

Mastercourse-EDBPM-v02.doc
The business modeler and the event modeler – different qualifications not in personal union

Concept:

The course consists of the fields of study Business Process Management, Complex Event Processing, Business Activity Monitoring included Business Intelligence and Data Warehousing, Computer Networks, Messaging as well as several application disciplines like Algorithmic Trading, Supply Chain Management in the retail domain, fraud detection in the banking and insurance domain etc. All courses are completed with course-related tests and Credits (cr) according to European Credit Transfer System (ECTS) are awarded. All courses are given in English and are designed as distance learning/eLearning courses.

→ course will be based on a new Technology-Enhanced-Learning approach, developed in the project “CloudBox-edBPM“
Some slides about previous related edBPM workshops
Dissemination and Previous Preparatory Work

Examples of last contributions to conferences (+ additional events from 2009 and 2010)

edBPM/DoReMoPat
FP7-ICT Proposers' Day 2009, January 22, Budapest
http://ec.europa.eu/information_society/events/cf/stream-items.cfm?id=20

edBPM exhibition SSOKU 2009
on Software Services and SOKU technologies, Brussels, January 13 – 14, 2009

edBPM-Workshop

9th edBPM Expert Meeting
Regensburg, Germany, December 7 – 8, 2009

Rainer v. Ammon, Andreas Hehmann
Mainz, Germany, October 7 - 9, 2008
http://www.bpm-event.com/
"Event-Driven Business Process Management Taking the Example of Hamburger Sparkasse"
EDBPM-Haspa.ppt

Rainer v. Ammon, Christoph Emmersberger, Florian Springer, Christian Wolff
Vienna, September 28 - 30, 2008
FIS 2008 / 1st International Workshop on Complex Event Processing for Future Internet
"Event-Driven Business Process Management and its Practical Application"
FIS08_AmmonSpringer.pps

Rainer v. Ammon
New York/Stamford, September 17 - 19, 2008
4th EPTS symposium
"Proposal for a new Master course of study in Event-Driven Business Process Management"
EDBPM-mastercourse.ppt

Adrian Paschke, Rainer v. Ammon
Irsee Monastery, Bavaria, Germany, July 9 - 11, 2008
Focus Group for EuroPLoP 2008
Domain-specific Complex Event and Rule Patterns
http://hillside.net/europlop/
Agenda for the focus group...