



SKY CAPTAIN *and the*  
SOA *of* TOMOAROW  
RM

# Agenda

- **Part 1: SOA Reference Model**
- **Discussion**
- **Part 2: Beyond tomorrow's SOA**
  - SOA + Ontology, Event causality, Context Framework.
- **Discussion**
- **References**

DEPT

# OASIS SOA Reference Model TC

- *Chartered February 2005*
- *Problem to be solved:*
  - "Service Oriented Architecture" (SOA) as a term is being used in an increasing number of contexts and specific technology implementations, sometimes with differing — or worse, conflicting — understandings of implicit terminology and components. The proposal to establish a Reference Model is intended to encourage the continued growth of specific and different SOA implementations whilst preserving a common layer that can be shared and understood between those or future implementations.

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# OASIS SOA Reference Model TC

- ***Purpose:***

- The SOA-RM TC will deliver a Service Oriented Architecture Reference Model (SOA-RM). Once the SOA-RM has been delivered, the TC may consider appropriate follow-up, including the creation of sub-committees, promotional material, liaisons or other promulgation of the TC's work, in order to promote the use of the SOA Reference Model in specific SOA implementations, in particular for vertical industries.

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# SOA is a ubiquitous buzzword

- Service Oriented Architecture – generally for software.
- Begs the questions:
  - 1. “What is SOA?”
  - 2. “What is Software Architecture?”
- Our task is to answer #1.
- We should agree on an answer to #2 before we answer #1

*“A software architecture for a system is the structure or structures of the system, which consist of elements and their externally visible properties, and the relationships among them”<sup>1</sup>*

[1] “Documenting Software Architectures”, Addison Wesley, Clements et al, pp xxv, ISBN 0201703726

# In order define SOA...

- We should not do it by referencing an implementation.
- If SOA is Architecture, as the name implies, it should be definable as architecture.
- A Reference Model is the best mechanism to define SOA. Why? (next slide).

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# An SOA Reference Model..

- Isn't architecture for a single SOA system.
- Is a model for a range of Service Oriented Architectures and analysis/comparison thereof.
- Is a framework for understanding significant relationships among the entities in a SOA environment.
- Is based on a small number of unifying concepts of all SOA's.

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# Charter Definition

- **Reference Model:**

A reference model is an abstract framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment. A reference model is based on a small number of unifying concepts and may be used as a basis for education and explaining standards to a non-specialist. A reference model is not directly tied to any standards, technologies or other concrete implementation details, but it does seek to provide a common semantics that can be used unambiguously across and between different implementations.

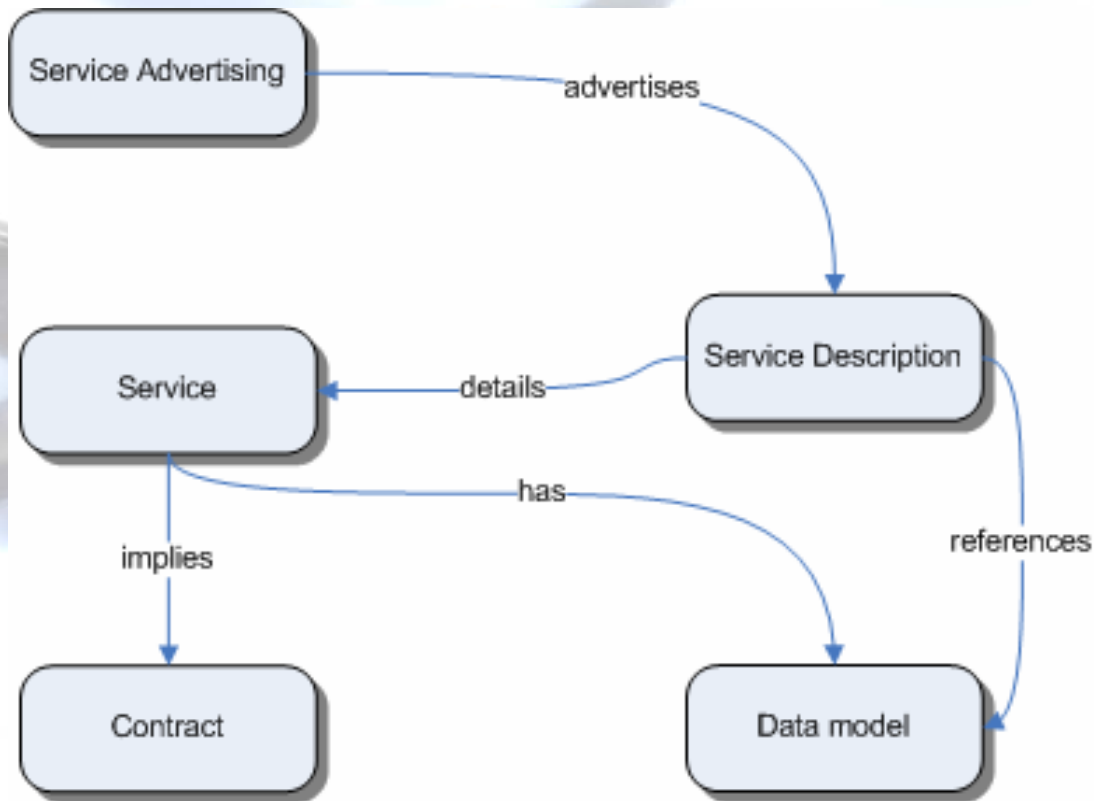


# Recurring Q&A...

- Why are things I see in other SOA's not in the reference model (security, reliable messaging protocols etc...)?
- Why don't I see two entities in the reference model (service consumer and service provider)?
- How does "infrastructure" fit into the reference model?
- Does the SOA reference model require definition of core infrastructure?
- How does the SOA RM relate to the pattern concept?

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# Candidate Base SOA Reference Model



# Base Components and Concepts of SOA

- **Service:** A service is a contractually defined behavior that can be implemented and provided by a component for use by any component solely based on the contract.
- **Service Description:** Technical parameters, constraints, policies that come together to define terms of invocation
- **Advertising:** Service must somehow communicate its service descriptions in a manner that is accessible to potential consumers.

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# Base Components and Concepts of SOA

- **Data Model:** The specification and constraints imposed on instance data within a Service Oriented Architecture environment.
- **Contract:** The implicit or explicit bi-lateral or multi-lateral agreement between the owners or agents of a service and those who use the service.

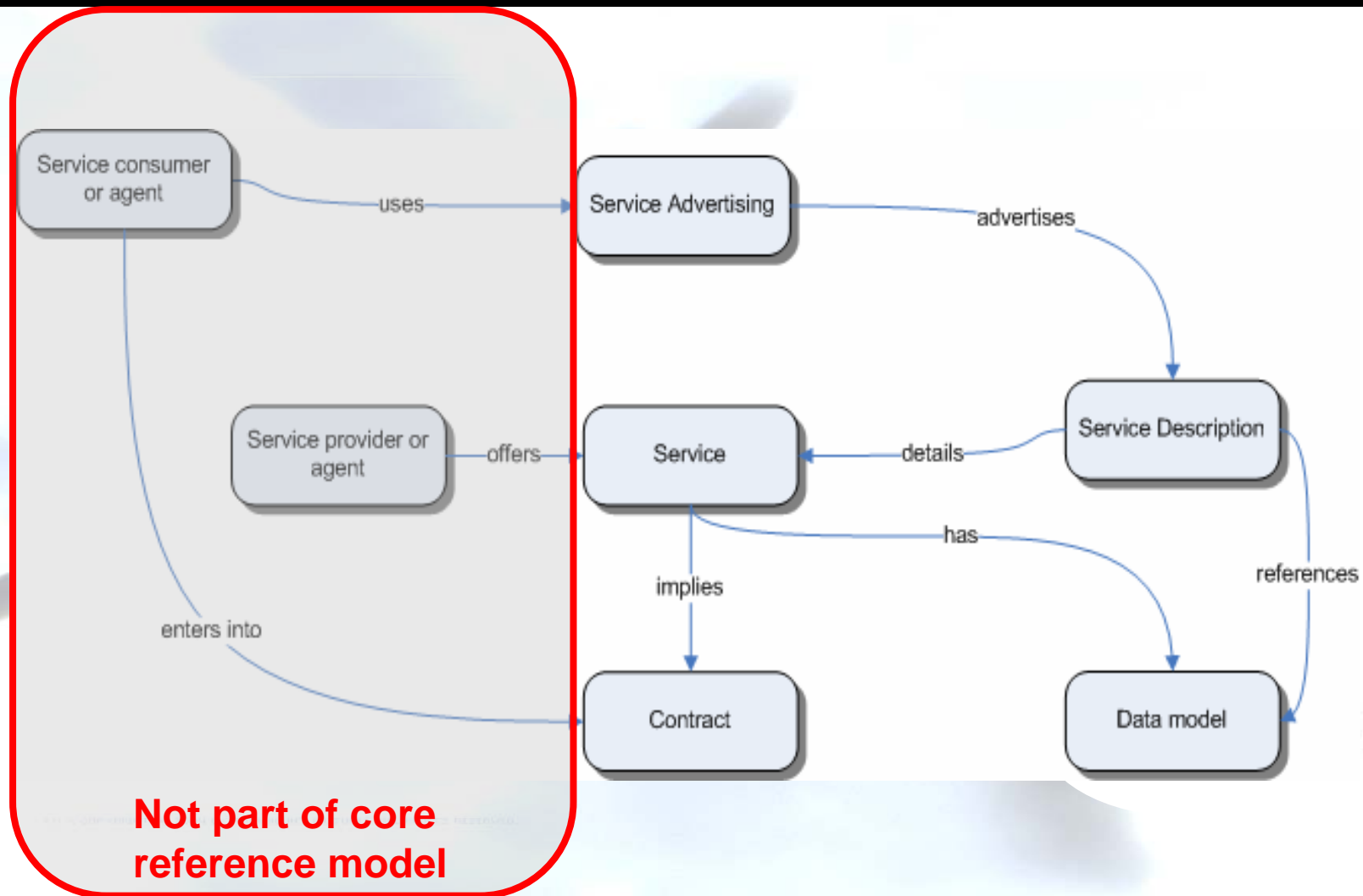
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# Extended view

- Is non-normative (not even considered for inclusion as part of Reference Model as of 02/2005)
- Provides context and clarifies relationship to current architectures.

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# Extended view of SOA concepts





# Concrete architectures...

- Are compliant if they mandate use of all SOA-RM elements in their normative architecture.
- May extend their scope beyond base elements:
  - Security protocols, messaging protocols
  - Define concrete bindings
  - Mandate other specifications within their infrastructure
- **Compliance list (based on candidate RM):**
  - W3C WS architecture
  - ebXML
  - Bluetooth
  - Corba
  - UN/CEFACT eBusiness Architecture
  - WWW
  - IECM
  - others....

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# Discussion points

- **Are there additional base components of a core SOA Reference Model?**
- **Messaging? Security?**
- **Where does Ontology work fit (RM or architecture)?**
  - Is the concept of semantics critical for service description, contract and data model?
  - If so, how to represent?
- **Other points?**



# PART TWO

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# The Future (2008-2012)

- **Image that**
  - SOA is ubiquitous.
  - Semantic reconciliation services have been built.
  - Ontology's (shared conceptualization of a domain) are commonplace.
  - There is but one upper merged ontology –SUMO ;-)
- **Base Components:**
  - Service oriented infrastructure
  - Semantic reconciliation & context framework
  - Ontology mapping
- **Can we build intelligent, thinking networks of logic?**

# IDEA = I.D.E.A.

- **Intelligence Driven Enterprise Architectures.**
- **Requires all base components from previous page.**
- **Basic infrastructure for future intelligent, self-acting cognitive applications and real time difference/inference logic analysis.**

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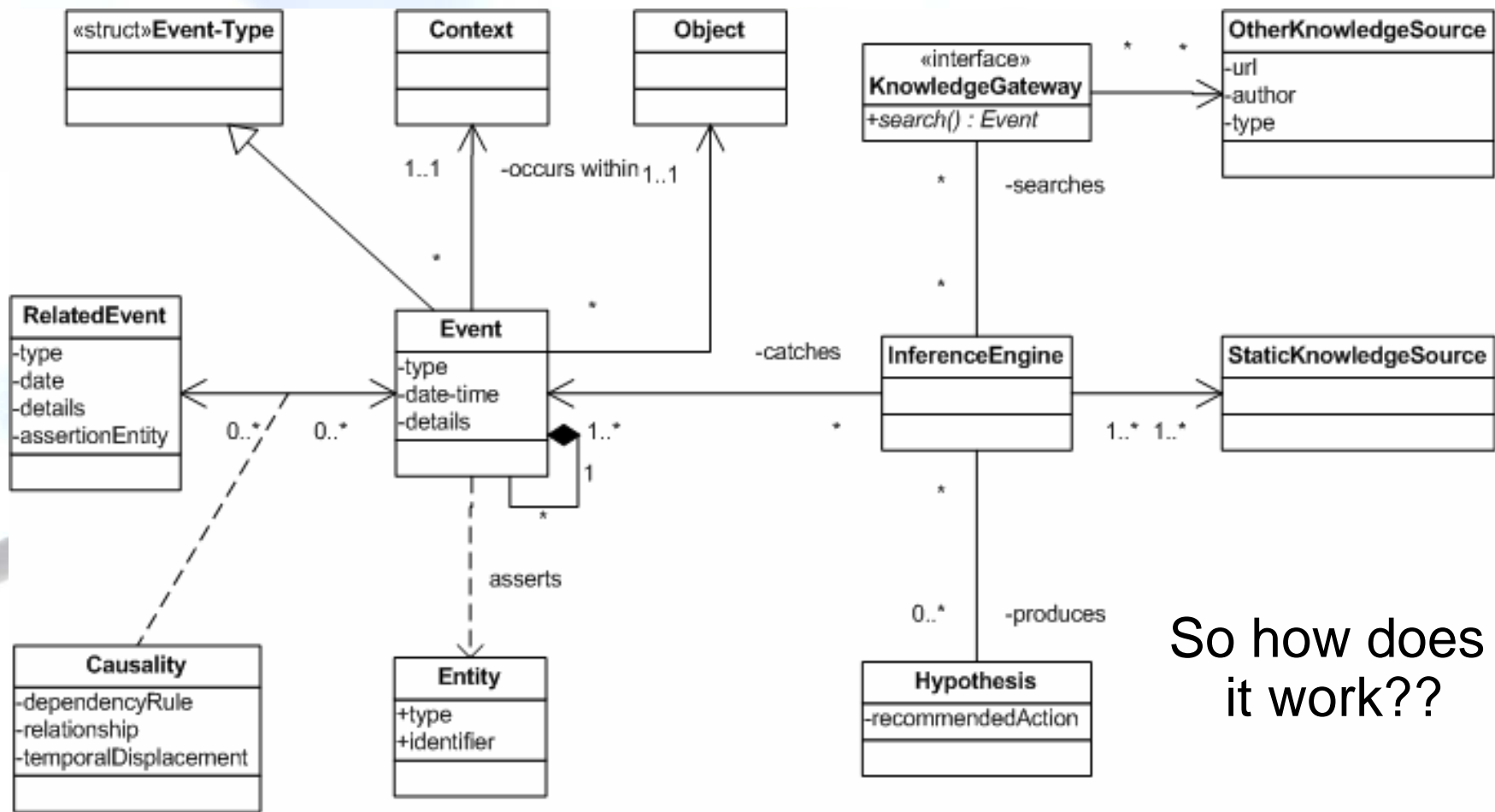
# Event Reconciliation = power

- (Patterns of events) + (understanding of causality relationships) + knowledge = ability to hypothesize.
- Theorem analysis can relate to possible courses of actions.
- So what is IDEA exactly?

IDEA



# IDEA Concepts



So how does it work??

# IDEA could mitigate pain points

- **Infectious Disease – patterns of events signal impending outbreaks**
  - US Center for Disease Control
  - Mad Cow – events signal impending problem.
  - Avian virus – tracking victims could help quarantine.
  - SARS – 7 to 321 cases in 30 days (45 X exponential growth)
- **Nick Leeson – cost Barclay's Bank UK \$27 billion.**
- **NYC – major Manhattan bank's customers deposits hijacked. Could have been detected by event-semantic-causality reconciliation.**
- **Phishing...(next page)**

IDEA

# Phishing phor phun

<http://211.119.135.159:81/signin.ebay.com/ws2/eBayISAPI.dll/b2baf0b6a57d39abd0c44b48d6fe3559112c21e54b7e705ecc5116b3c7c38c37949e8aa81848934faf0821be04210e8c2ded3c4159edbee3ee1439f3892a3e91/>

Subject: Account Violate The User Policy Second Notice  
From: eBay <eBay@eBay.com>  
Date: 11/28/2004 10:05 AM  
To: dnickull@adobe.com



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D'oh!!!

# IDEA is more than just defense

- Correlating events and understanding causality = opportunities.
- Ending IT blindness.
- Builds true mechanical intelligence (not Artificial Intelligence).
- Consumes input (events, data).
- Uses SOA infrastructure.
- Outputs = thoughts, ideas, hypothesis.

IDEA

# Semantic Associations/Event Reconciliation

- **Semantics = What does something mean?**
- **Only part of story for event and causality awareness**
  - How does one concept relate to another?
  - What does an event signify? *Does an association of Concepts in an Ontology mean we should look for events associated with that concept and try to infer a hypothesis?*
  - Is it related to other events?
  - How should we re-act to it?
- **Application of “blackboard AI pattern” depends on knowledge source. Ontology’s must be part of that KS.**
- **More needed ->**

# More Needed

- Applications need to know how to locate and acquire additional information when they need it dynamically.
- By querying an ontology, implemented over an SOA infrastructure, associated systems can be queried for profiled events.
- Associations between concepts and logic must be exposed.
  - Do you Agree/disagree with this statement?
  - Does this enable true mechanical intelligence?

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# Artificial Intelligence a misnomer?

- It is either intelligence or it is not. Thinking like a human is complex and requires context framework:

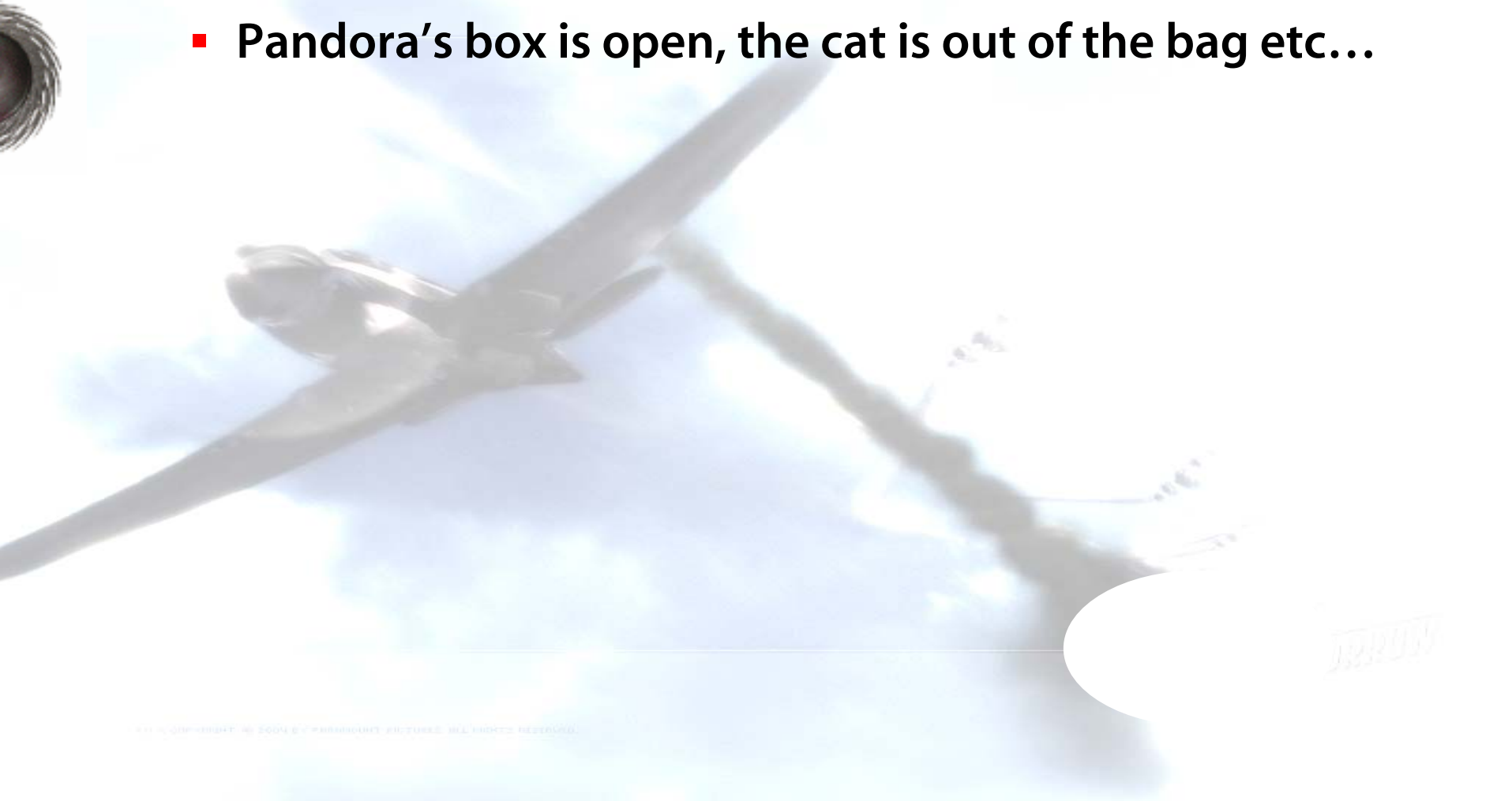
Event	Processing	Tuple Actions
Stimuli	Passive or active cognition of thing	Put() Read()
Get context	Recognition of Context in which thing exists	Put()
Evaluate()	Significance, hypothesis in context (develops)	Put()
Evaluate()	Raise in thinking stack to more visible position	Put() Read()
Evaluate() Create()	Possible action matrix	Log()

# AI Blackboard pattern – grounds for an “Inference Engine”?

- Blackboard pattern is basis for reconciling cognitive capabilities, events, context and analysis to develop an *awareness* for a given set of circumstances.
- Main components – events, knowledge sources and the active “blackboard”.
- Inference engine asserts events occurring in a certain context mean “something”. Build and evaluate hypothesis.
- Many problems to overcome – hypothesis explosion, analysis algorithms, etc.

# Discussions?

- Pandora's box is open, the cat is out of the bag etc...



# References

- OASIS SOA RM TC - [http://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=soa-rm](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=soa-rm)
- IT blindness and incompetence lead to \$27billion loss for Barclays. [David Luckham](#) is a visionary in the space of event causality relationship and computational models. He is also one of my main inspirations for working in this area - <http://www.xmlwebservices.co.uk/pdfs/David%20Luckham.pdf>
- Blackboard pattern - <http://c2.com/cgi/wiki?BlackboardMetaphor>
- Tuple Space - In the 1980s, [David Gelernter](#) of Yale University had a very clever idea about coordinating parallel computations, which he described in his book Mirror Worlds ([ISBN 019507906X](#)). At that time, the two preferred approaches to parallel computing inter-process communication were shared memory (expensive, requires custom hardware) and message-passing. <http://www-unix.mcs.anl.gov/dbpp/text/node44.html>
- Context work – part of the United Nations CEFACT eBusiness vision is the Core Components which includes the Context Methodology Framework. <http://www.unece.org/cefact>
- Inference Engine - <http://www.semanticweb.org/inference.html>

Thank you – Duane Nickull, [duane@nickull.net](mailto:duane@nickull.net)