



Software Group – Event Processing Technologies
and Architecture

Event Processing
as part of Enterprise Architecture
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Dr. Opher Etzion
IBM Senior Technical Staff Member
Lead Architect, Event Processing

Outline



Event Processing – what is it ?



Event Processing and Enterprise Architecture



Future Trends



What is Event Processing ?

My favorite example:

THE LUGGAGE PERSPECTIVE:

Across the 24 largest airlines more than 5.6 million bags went missing in 2006, this is an average of 15.7 bags per 1,000 travelers. 15% of the bags are never found.

BBC News, April 4, 2007



Orchestrate:
Passenger has been re-routed to another destination – send the luggage

Orchestrate:
Bag has reached to the wrong aircraft

Notify:

Bag has been checked but did not reach the ULD within 20 minutes

Notify: Bag has been checked but did not reach the connecting flight

Event-driven behavior

- A software module that has the following characteristics:
 - It executes because an event has been detected.
 - (which means - it is neither executed because of specific request, nor it is executed since it is now the “time in the flow” to execute it).
 - This event may be raw event (transmitted from outside the system) or derived (synthetic, complex) event that has been created by an event processing network



Explain :

- *what do you mean when you say event?*
- *what is an event processing network?*

What is an Event ?

- ❑ An **Event** is a significant (in the sense that it may affect some action) atomic (happens completely or not at all) occurrence (e.g. fact becoming true, a state transition) in the reality.
 - The computerized message to report the event (some use explicitly “event message”) is also called event.

- ❑ Event may represent various things:
 - Update of a database
 - State of Change in a process/workflow
 - Reported problem
 - Anticipated problem
 - Any “business situation” raised by an application

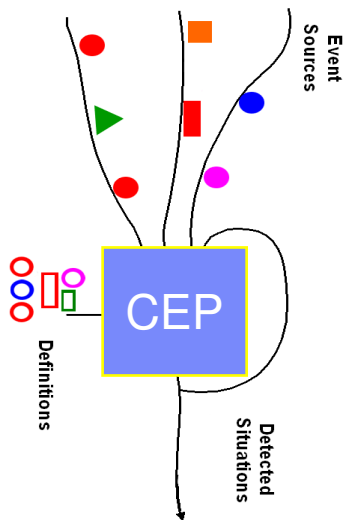
- ❑ Event has a type (whose structure is represented by a schema), time-stamp (or interval), and may have related events and entities

Event Processing is:

- ❑ Name of a discipline that deals with event driven behavior

Comment:

- ❑ EDA is a way to do event processing, but event processing may be done also in a synchronous mode.



- ❑ **Complex Event Processing:** The processing of “complex events”, i.e. multiple events are processed in order to get a result (not “complex processing of events” – processing can be simple !) the name **Event Stream Processing** has been used in the past by some vendors to denote the same type of processing (but has disappeared).

EP Solution Segments – Business Value

Getting the right information in the right granularity to the right person at the right time



Information Dissemination



BAM

**Detect
Decide
Respond**

Quick observation into exceptional business behavior and notification to the appropriate people.



Active Diagnostics



RTE



Predictive Processing

Mitigate or eliminate predicted events

Diagnose problems based on symptoms and resolve them

Reactions to events are done as part of business transactions – achieving low latency decisions, and quick reaction to threats and opportunities

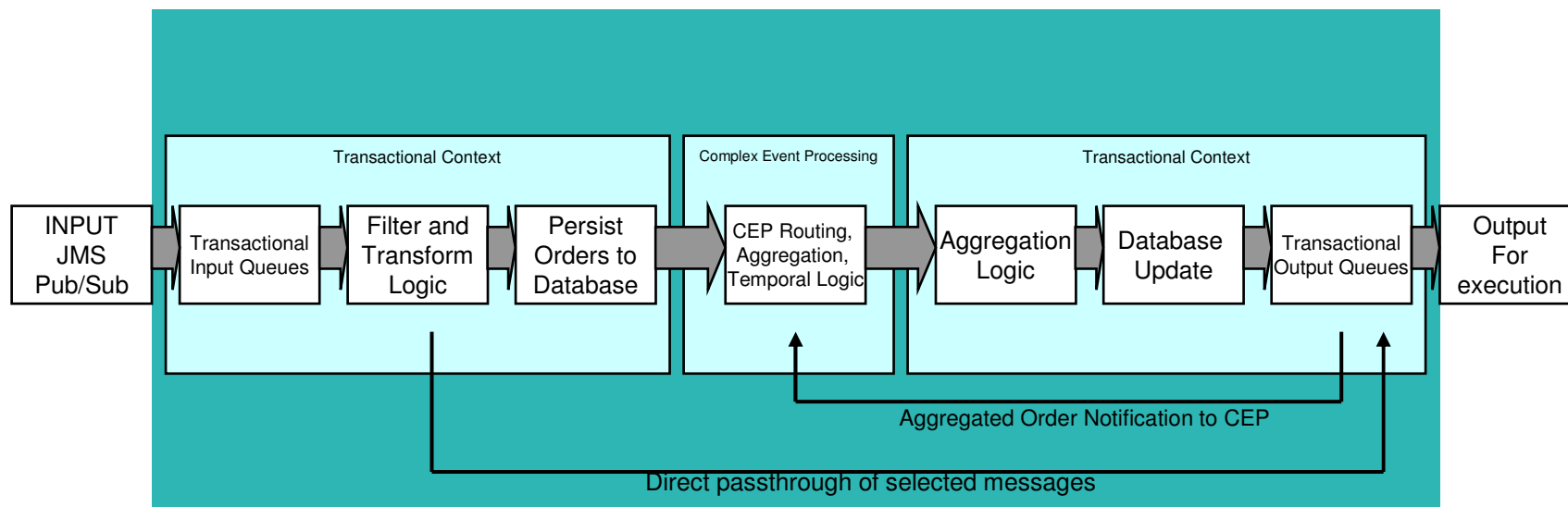
Foreign exchange aggregation system for financial services – RTE example

- ❑ Increase in number but reduction in size of Foreign Exchange trades is increasing middle and back office overall costs
- ❑ Increased complexity for channel management in number of clients, on-line markets and link to other assets (derivatives)
- ❑ Each order executed externally incurs an execution and settlement charge... expensive
- ❑ *If it were possible to detect – and act on – opportunities to aggregate orders, significant savings would be realised through lower transaction costs*
 - Orders that could be netted could eliminate two transaction charges
 - Orders that could be aggregated could eliminate multiple charges

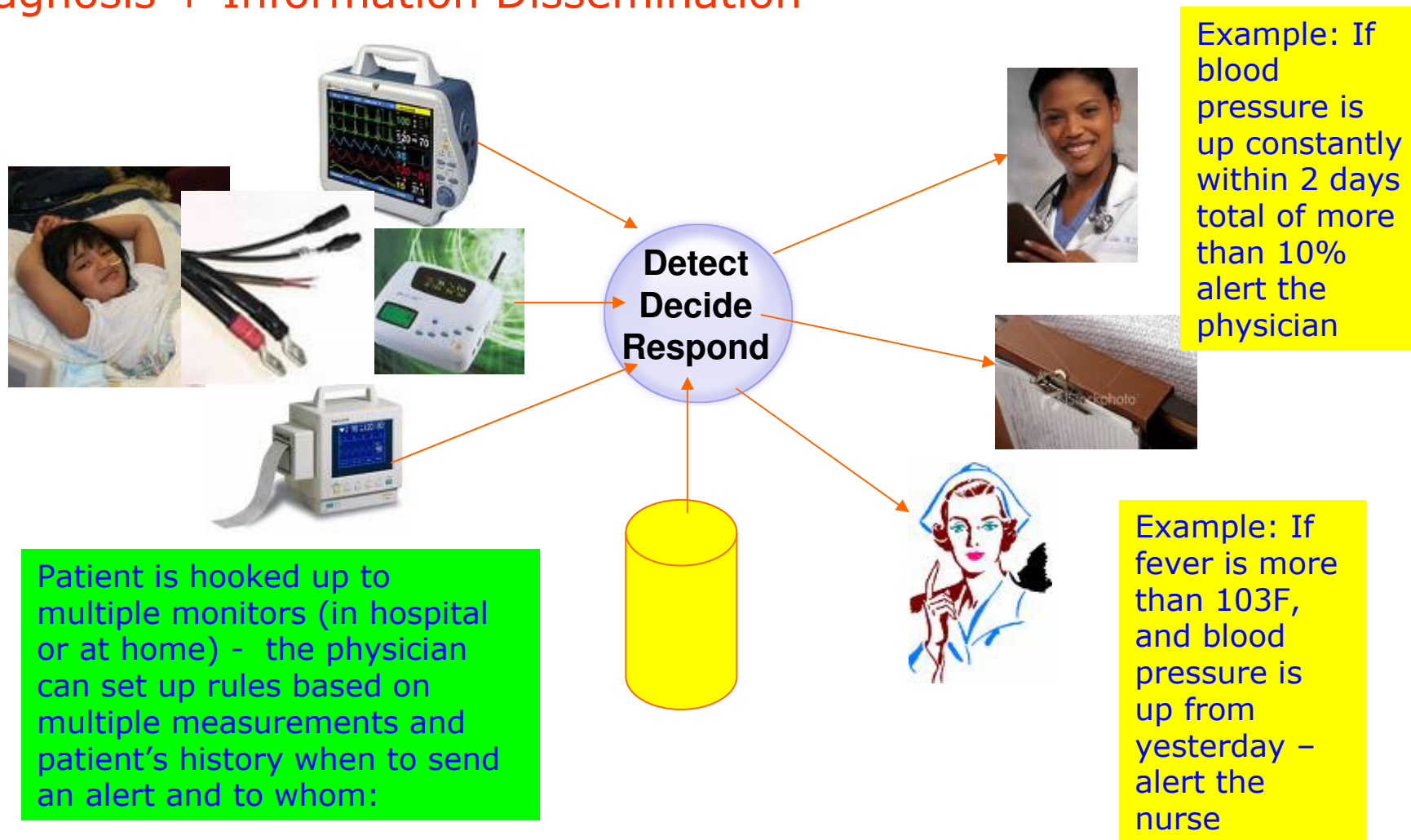
Solution:

Configurable aggregation rules

- Thresholds by currency
- Thresholds by time
- Thresholds by counterparty/client . . .



Healthcare scenario: Personalized Health Monitoring– Diagnosis + Information Dissemination



Retail BAM Example: Smart Shelf

Individual shelf Alerts:

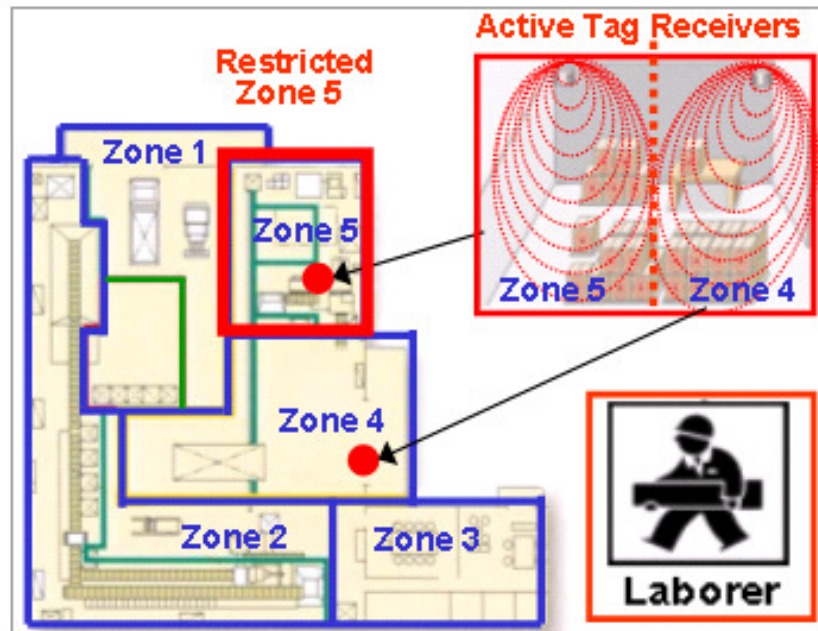
- ❑ More than 25 percent of those who touched a product in the last 2 hours – returned it back to the shelf.
- ❑ More than 30 percent of the product on the shelf has been removed in the last 15 minutes
- ❑ A product that does not belong on the shelf has been put there

Business Level Alerts:

- ❑ A Certain product was not been taken from any shelf in the last hour
- ❑ A certain item has been taken from the shelf, but did not reach the checkout within 2 hours



Critical Resource Tracking - BAM Example



Business Requirements

- **Environment** Safety regulations require that location of all on-site personnel is known at all times.
- **Requirements:** Establish visual console that automatically locates personnel. In real-time, monitor entry into danger zones where a specific individual may not be qualified to enter – send alerts if needed

Benefits

- Meet Government Safety Regulations
- Improved service level by routing "qualified" technicians to emergency situations
- Labor reduction via more efficient utilization of worker

High level use case

- Active RFID Tag is worn by personnel
- At the entrance of each physical area active RFID receivers detect automatically personnel in a zone and thus trigger a worker location update
- The HR system is queried to determine if worker is certified to be in restricted zone. If not, alerts are generated for possible safety breach.
- Zones are virtual and rules/permissions may vary over time. Example – Hazardous construction area.

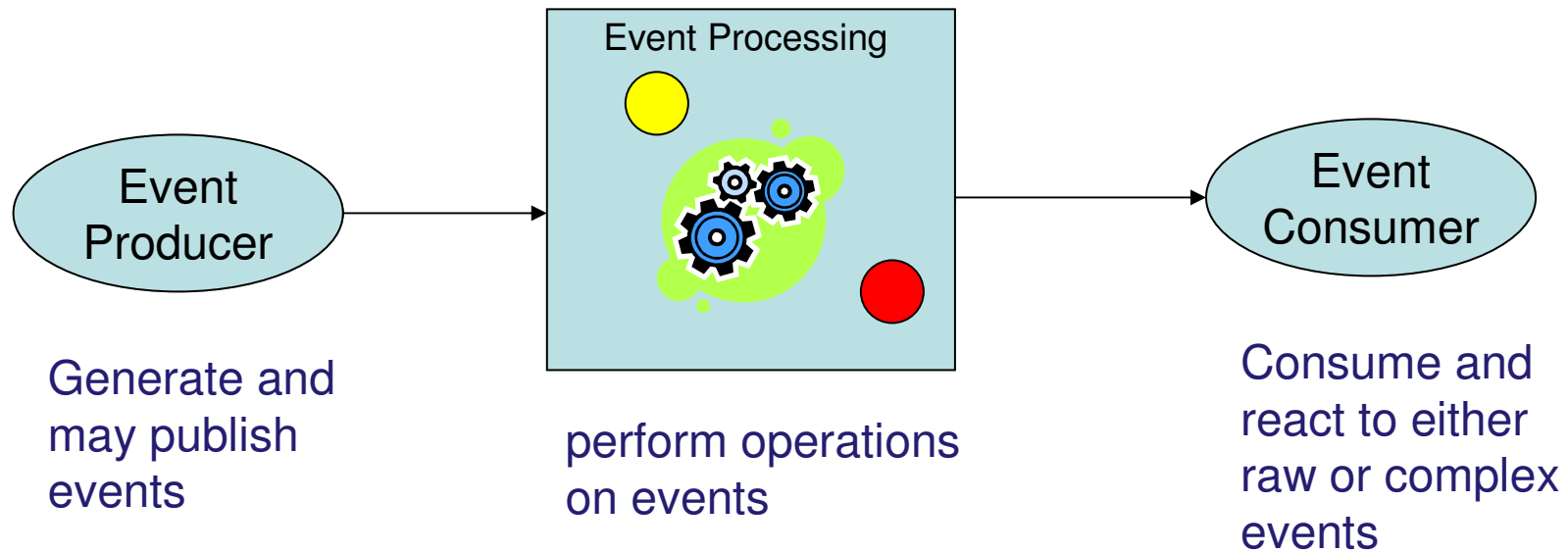
Components

- RFID tag: Active
- RFID receivers placed through-out facility
 - RFID receivers triangulate and provide continuous feed of real-time location data
 - Dangerous tools may also be tagged – For example - "welding equipment" – that may also be subject to zone rules
- Integration to Enterprise HR system where worker certification credentials are kept.

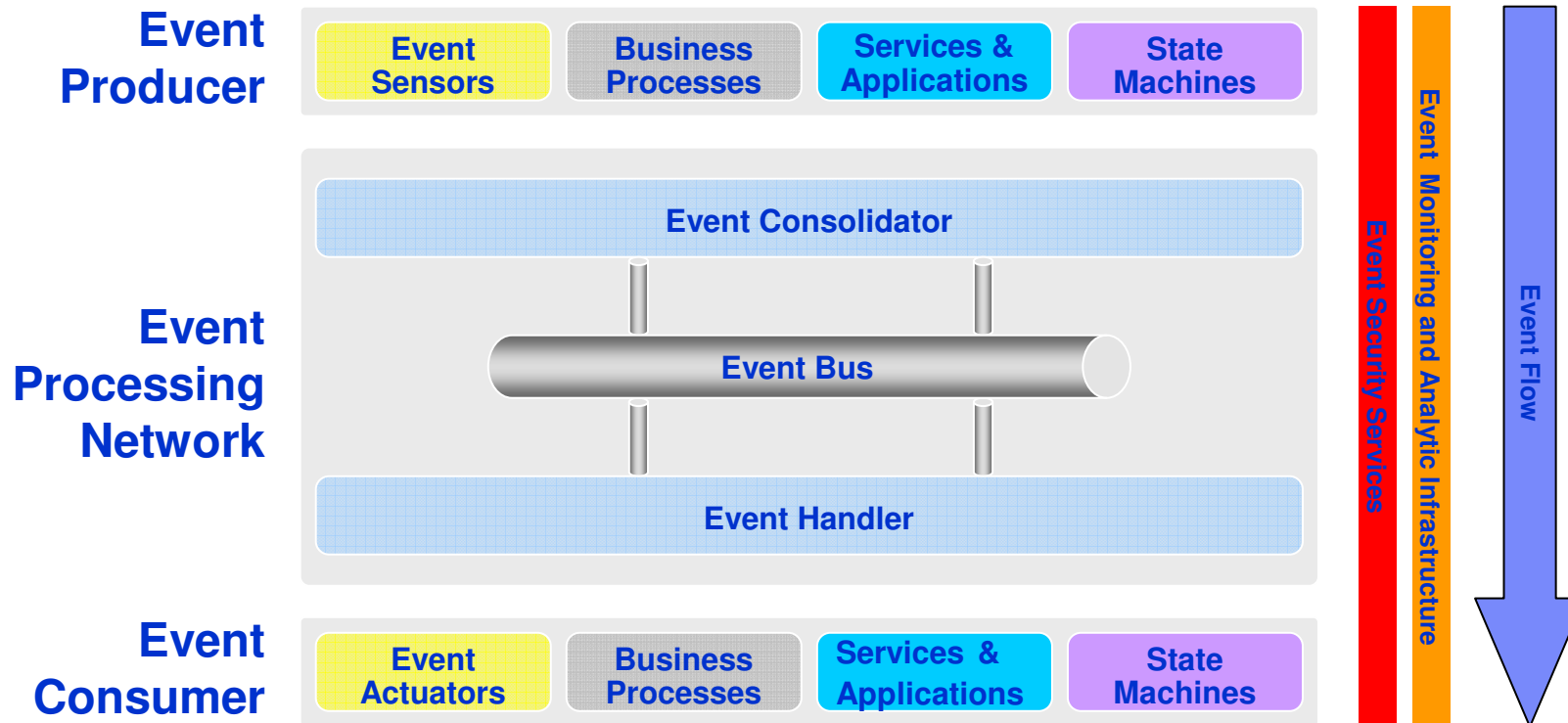


*Event Processing
as part of
Enterprise Architecture*

Event Processing – The Big Picture



Conceptual Model Overview

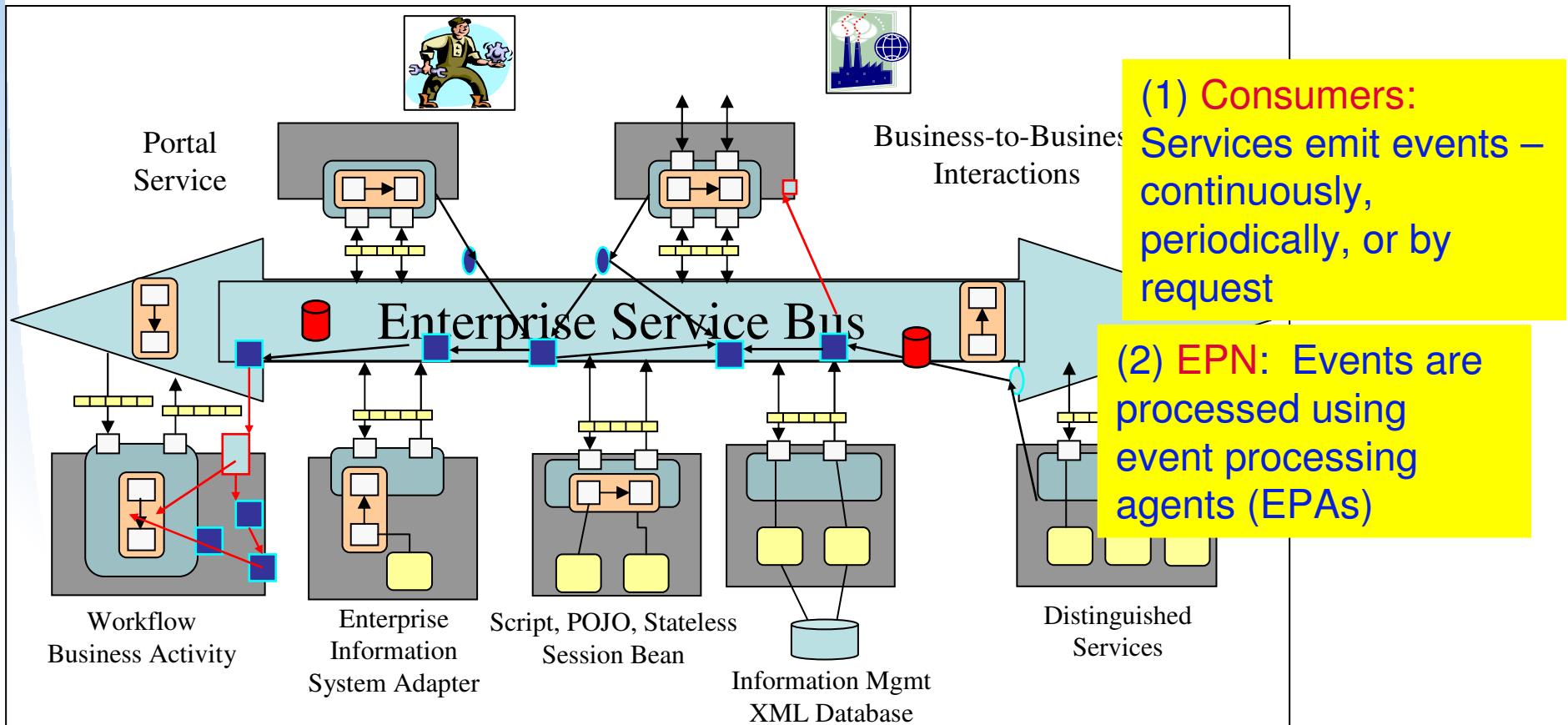


Three major building blocks:

- Event Producers,
- Event Processing Network
- Event Consumers

Relationship with SOA:

Extending the Business Value - Event Driven SOA

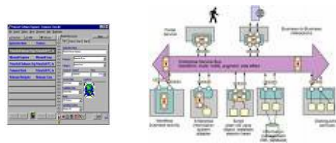


(4) **Consolidator/ handler:** EPAs can be implemented anywhere – not necessarily only within the ESB

(5) : Event Processing can also be retrospective

(3) **Actuators:** Processed events can either notify or orchestrate

The Players – Event Producers



Applications/services



Direct Media



BP state observers



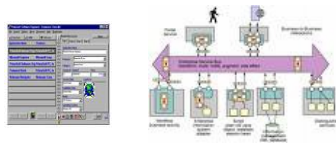
Sensors



Data Stores

- **Push** - producer sends an event over a channel by its own initiative
- **Periodic pull** - Channel uses “pulling adapter” to obtain events periodically
- **On-Demand pull** - An agent initiates pull in an ad-hoc fashion.

The Players – Event Consumers



Applications/services



Actuators



Individuals and Groups



Workflows



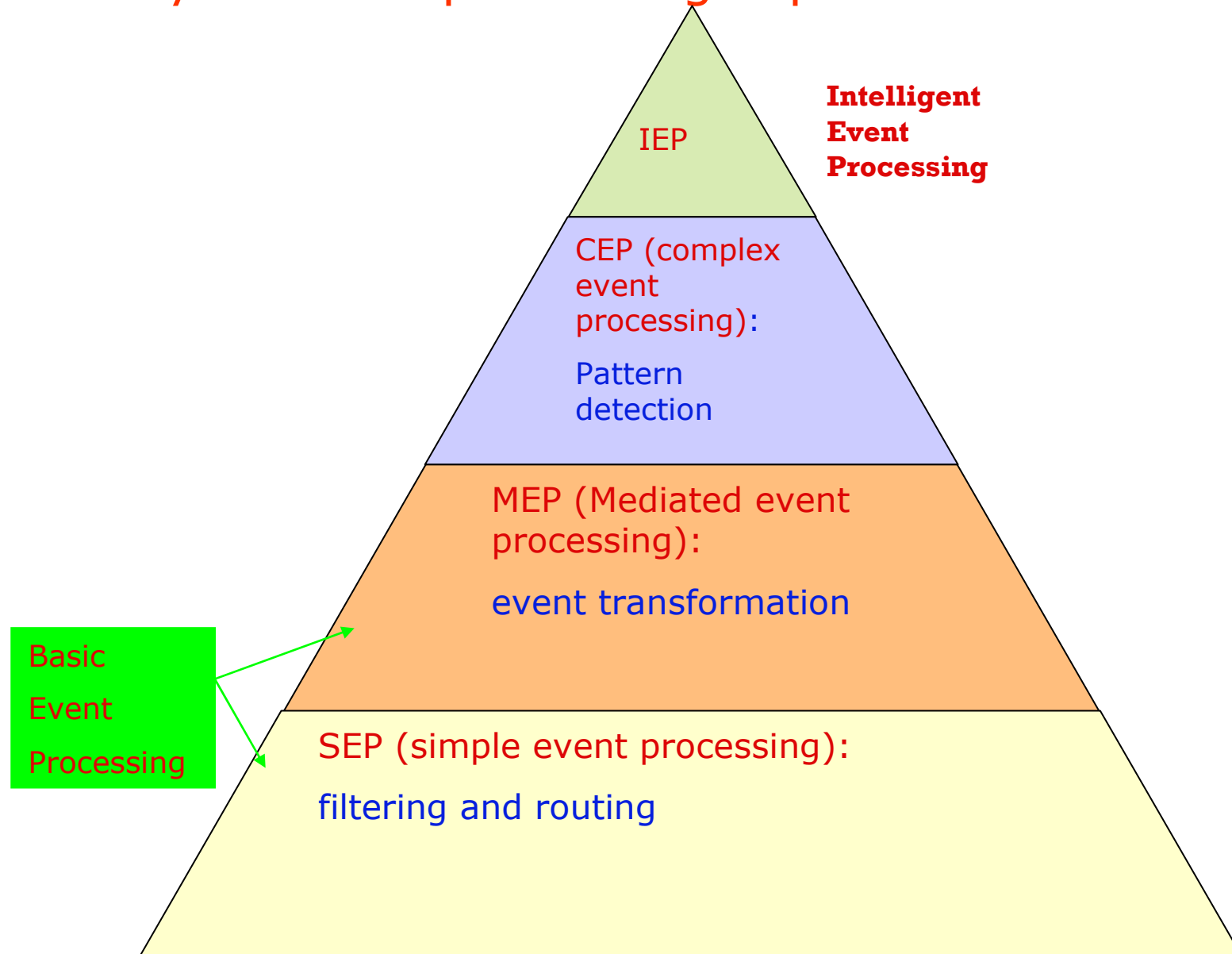
Dashboards



Data Stores

- **Notification** The consumer is notified
- **Orchestration** – The consumer acts

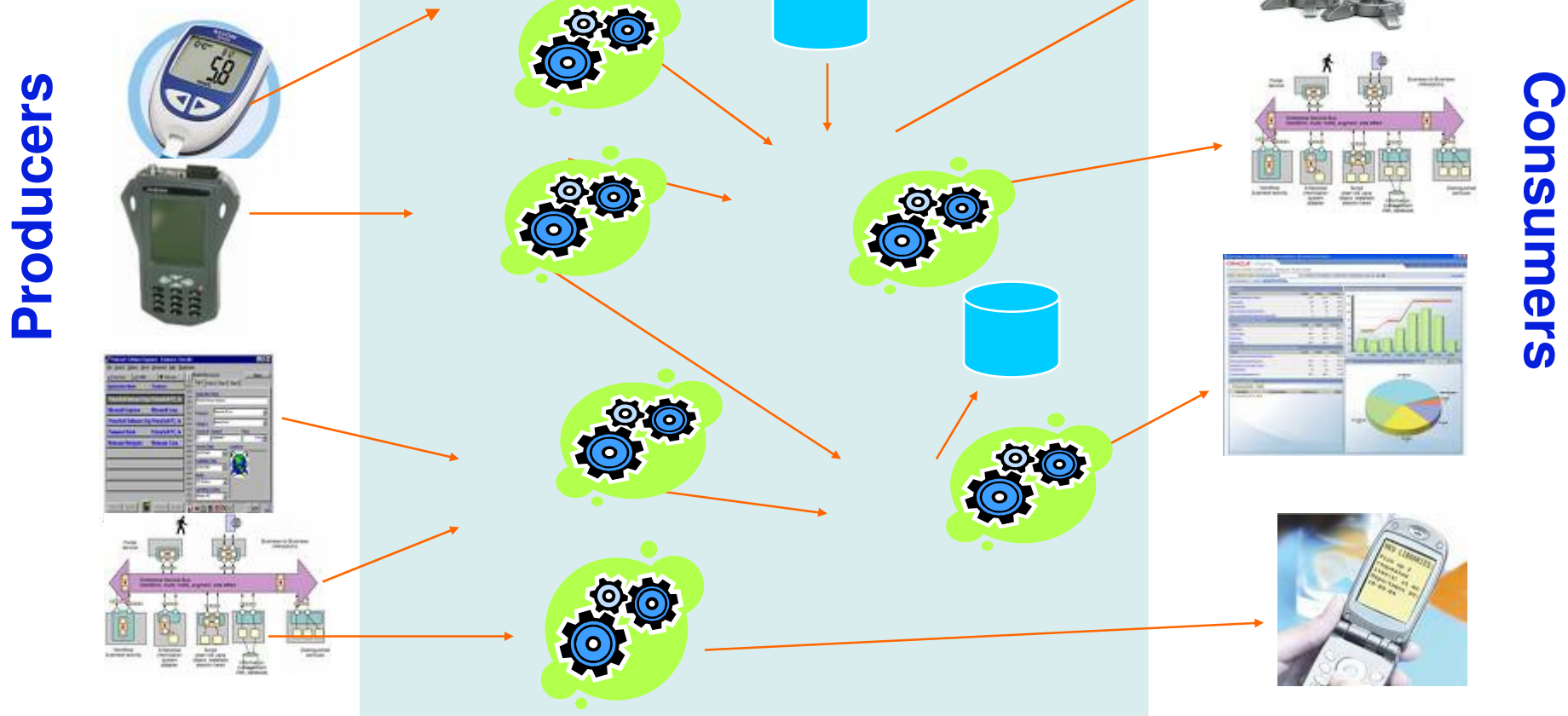
Hierarchy of event processing capabilities



The Players - Processing Agents

*Detect
Patterns,
Enrich,
Filter,
Transform,
Route*

Event Processing Network





Future Trends

Business Trends – where the market is going?

- ❑ Event-Based Platforms: EPN as a programming model
 - Extreme Transaction Processing: distribution on grid – internet scale EPN.
- ❑ Financial Services dominant --→ pervasive in multiple industries
- ❑ Development tools --→ Packaged applications
- ❑ Proprietary based --→ Standard Based
- ❑ Monolithic engines --→ Mix and match component
 - Different implementations based on non-functional requirements
 - Possible appliances to accelerate certain functions



Event Processing: standards evolution

- ❑ Terminology
 - Agreement between the vendors that terminology should be normalized; getting agreement on details in a challenge
 - Proposal open to comments in:
<http://complexevents.com/?p=124#more-124>
- ❑ Event formats
 - Two levels: domain specific schema (e.g. WEF for management events, SIP for Telco session events...)
- ❑ Interoperability standards
 - Extension of WS-Notification/ eventing
- ❑ Event processing modeling standards
 - UML extension
- ❑ Event processing languages standards
 - Meta-language as a common standard
 - Particular standards for programming styles: SQL, Reaction rules.