Towards a Service-Oriented Cross-layer Infrastructure for Distributed Smart Embedded Devices

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SOCRADES: an unprecedented constellation of all major European ICT players of the industrial value-chain.

Main Facts
- 3-years Project (01.09.2006 - 31.08.2009)
- 15 Partners from 6 European Countries
- Total Efforts: 1100 [PM]
- Efforts 1st 18-Months: 556 [PM]
- Total Budget: 13.746.808 [Euro]
- Total EU Funding: 8.599.274 [Euro]
- Budget 1st 18-Months: 7.001.815 [Euro]
- EU Funding 1st 18-Months: 4.458.671 [Euro]
- Web site: www.socrades.eu
Coupling of real and business world

Business World

SOCRADES

Real World
Goals

- Methodologies, technologies and tools for modeling, design, implementation and operation of networked systems made of smart embedded devices

- Co-operation of heterogeneous smart embedded devices to achieve enhanced system intelligence

- Middleware technologies based on Service-Oriented Architecture (SOA) paradigm.

- SOCRADES SOA as software component encapsulating device-specific functionality.
Problem Statement

ERP
- Enterprise
- Resource
- Planning

MES
- Manufacturing
- Execution
- System

DCS
- Distributed
- Control
- System

Orders
Invoice
Business Level
Production Control Level
Process Control Level

DISCONNECT

Raw Mat.
Goods
Towards the Real-Time Enterprise

Business Processes
KPIs
Cost
Compliance
Level of Service
CRM
SRM

Enterprise Concepts Domain

Enterprise Level Service Domain

Device Level Service Domain

Manufacturing, Automation, Machines, Building automation, HVAC, Power Meters

Filtered events enriched with business context

Work orders
Motivating Example

If(OverheatingAlert) then
  stopProduction()
  triggerMaintenance()
  rescheduleProduction()
  informAccountManager()
Requirements of a Device-to-Business Integration Architecture

- Communication Standards
- Event-driven architecture
- Multi-faceted enterprise services
- Service Lifecycle Management
- Alerting / Device status
- Business Process Modeling / Monitoring
- Intermittent connected assets
- Real-time messaging, Events, Alerts...
- WS support
Initial Integration Architecture
Distributed Business Intelligence

Business Process Execution Today

Business Process Execution in an Smart Item Infrastructure

Distributed Business Intelligence

Internet Service

Passive participation in Business Process

Active participation in Business Process

Backend Systems

Smart Item Infrastructure
Web Service mash-up factories

Intelligent SOA-ready Devices
**Things to take**

- Networked Embedded Devices that are empowered with Web-services (SOA-ready) will transform future factories to web-service mash-ups.

- Future Devices will be able to consume and offer (complex) services.

- Future Factory will realize dynamic-discovery, automatic dynamic re-/configuration, real-time plug and play, structural and behavioral, horizontal and vertical collaboration (from shop floor to higher level of Inter- and Intra-enterprise levels) and direct knowledge/interaction with manufactured pieces of equipment.

- We are moving towards Cross-Layer collaborative infrastructures that are:
  - open for extensions to unknown devices and/or aggregation of devices and services
  - able to use uniform protocols for vertical and horizontal, peer-to-peer asynchronous communication
  - able to use wired and wireless media

- Target: Manufacturing system intelligence by a large population of smart and networked embedded devices at a high level of granularity.
Thanks for your attention!

More info: http://www.socrades.eu

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