

Middleware in a Service-oriented World:

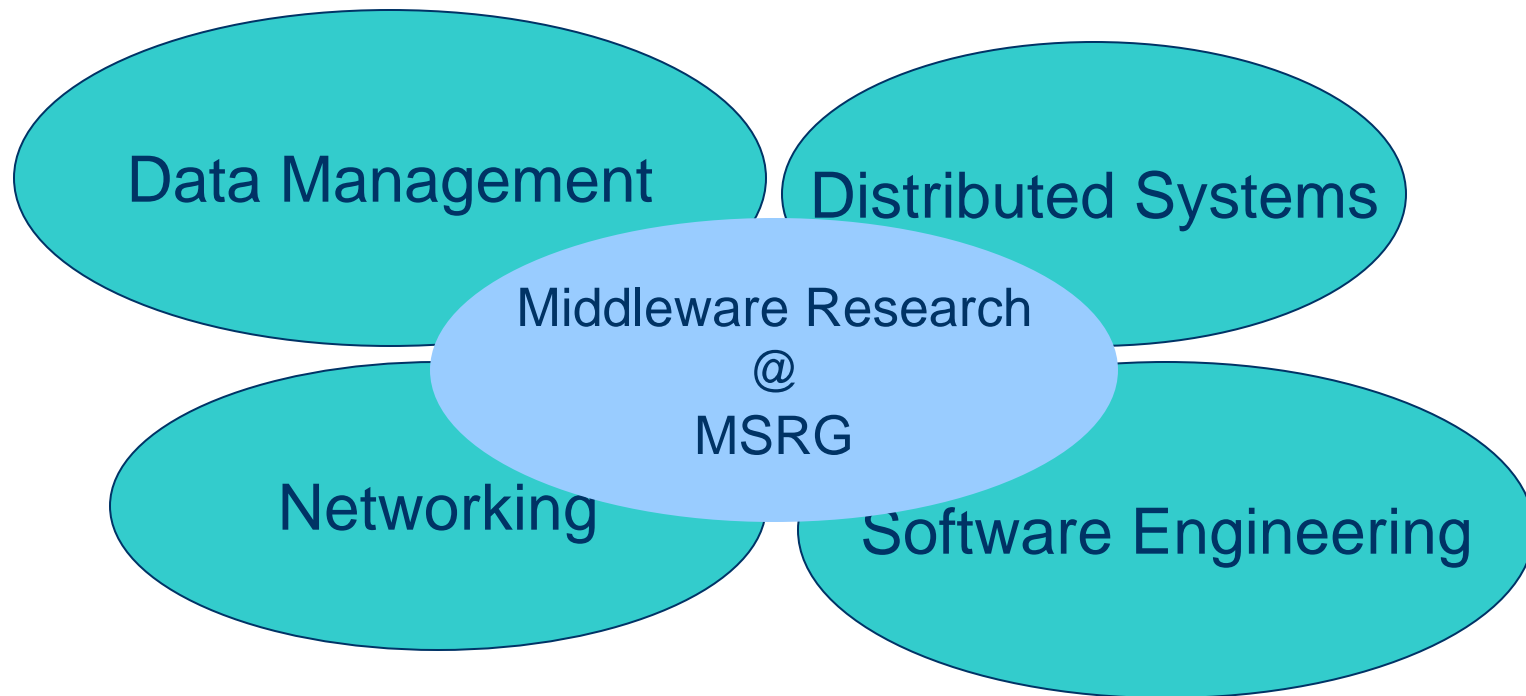
Enabling software application architectures
from *embedded sensor networks* to
distributed enterprise computing

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**MIDDLEWARE SYSTEMS
RESEARCH GROUP**

How I See Our Research Fit In



Research Scope and Methodology

- ***Middleware systems*** comprise a set of services and abstractions that facilitate the design, development, integration and deployment of distributed applications in heterogeneous, distributed environments.
- **Research methodology**
 - We build systems, applications, and algorithms
 - Measure, analyse and improve systems and algorithms
 - Mostly above the transport layer and below the application
- **Current focus**
 - Service-oriented Architectures
 - Event-driven Architectures
 - Model-driven development
 - Enabling software product families

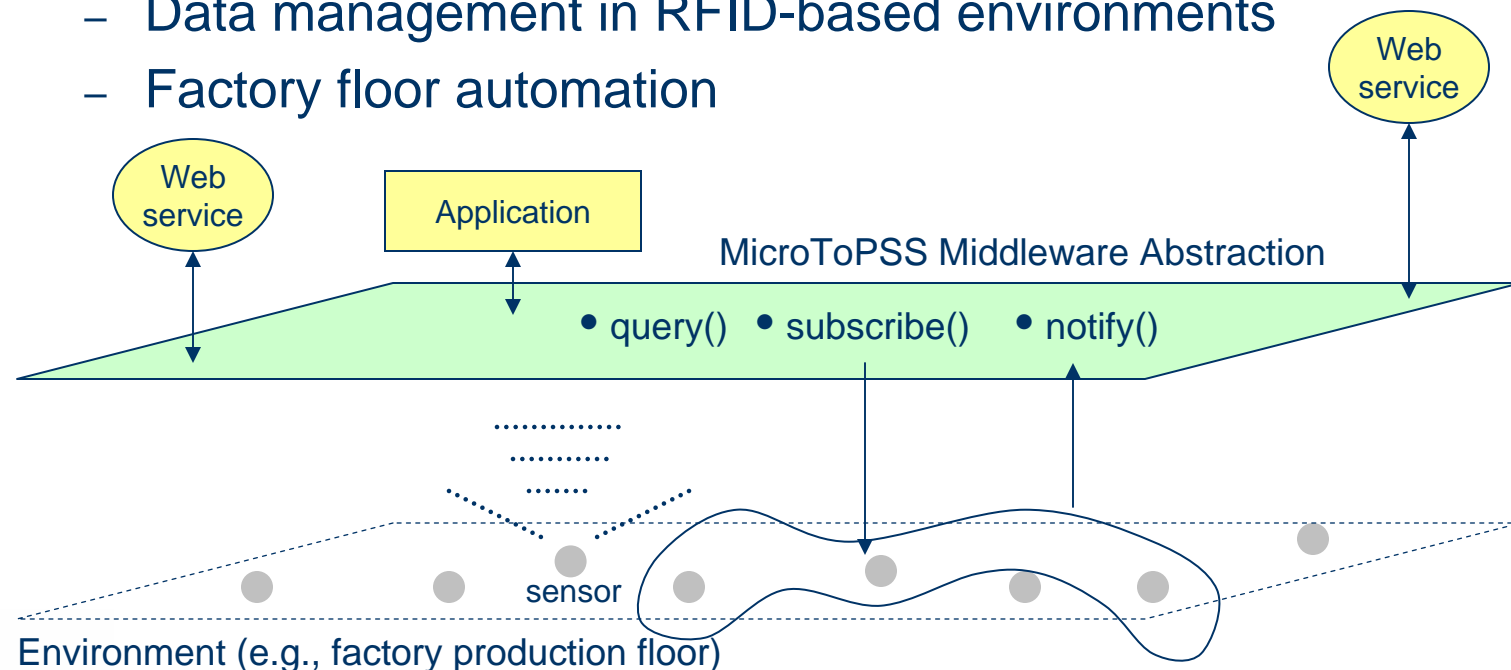


MicroToPSS

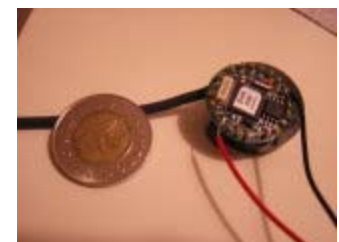
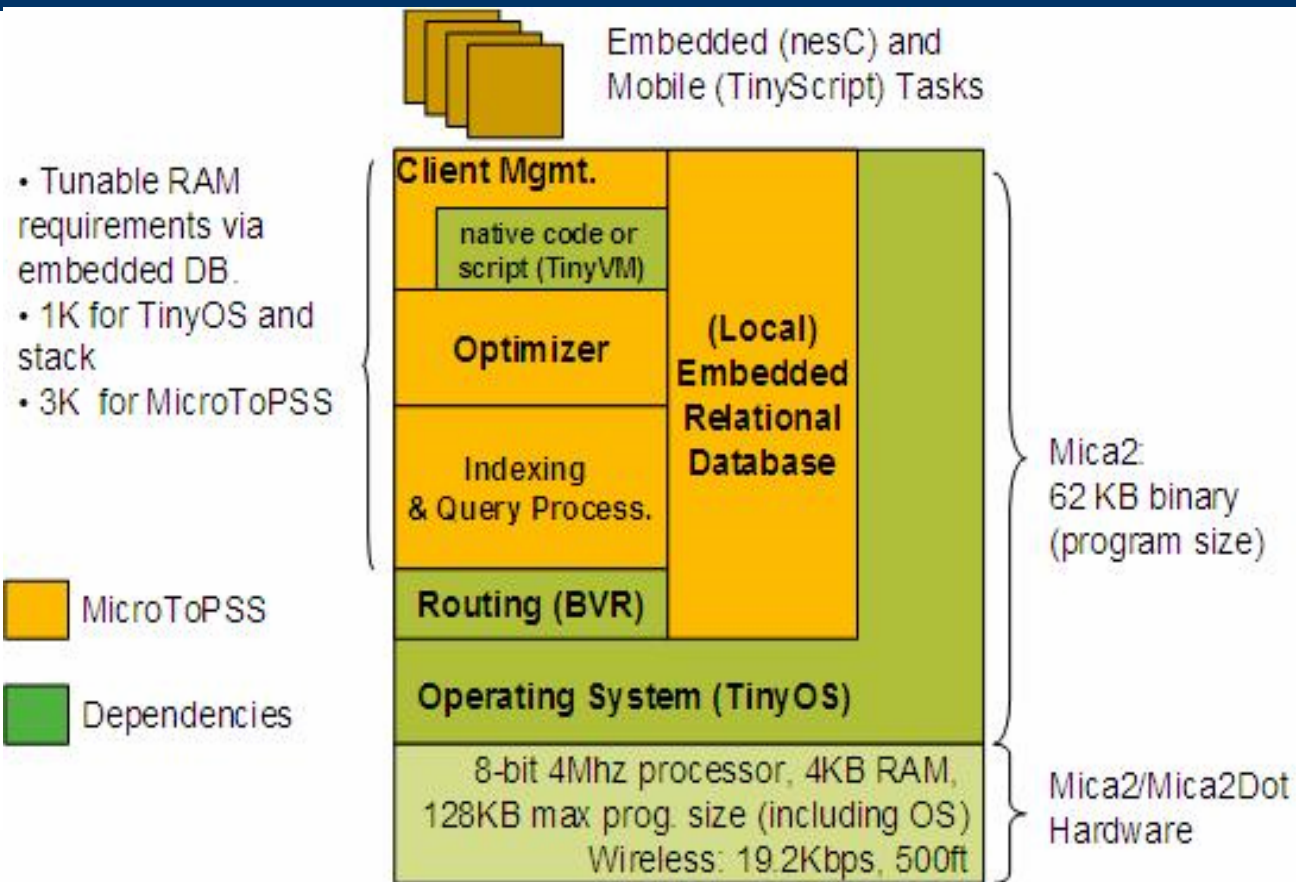
code available under BSD

<http://microToPSS.msrg.utoronto.ca/>

- A middleware for sensor networks enabling
 - Sense-and-response applications
 - Data management in RFID-based environments
 - Factory floor automation



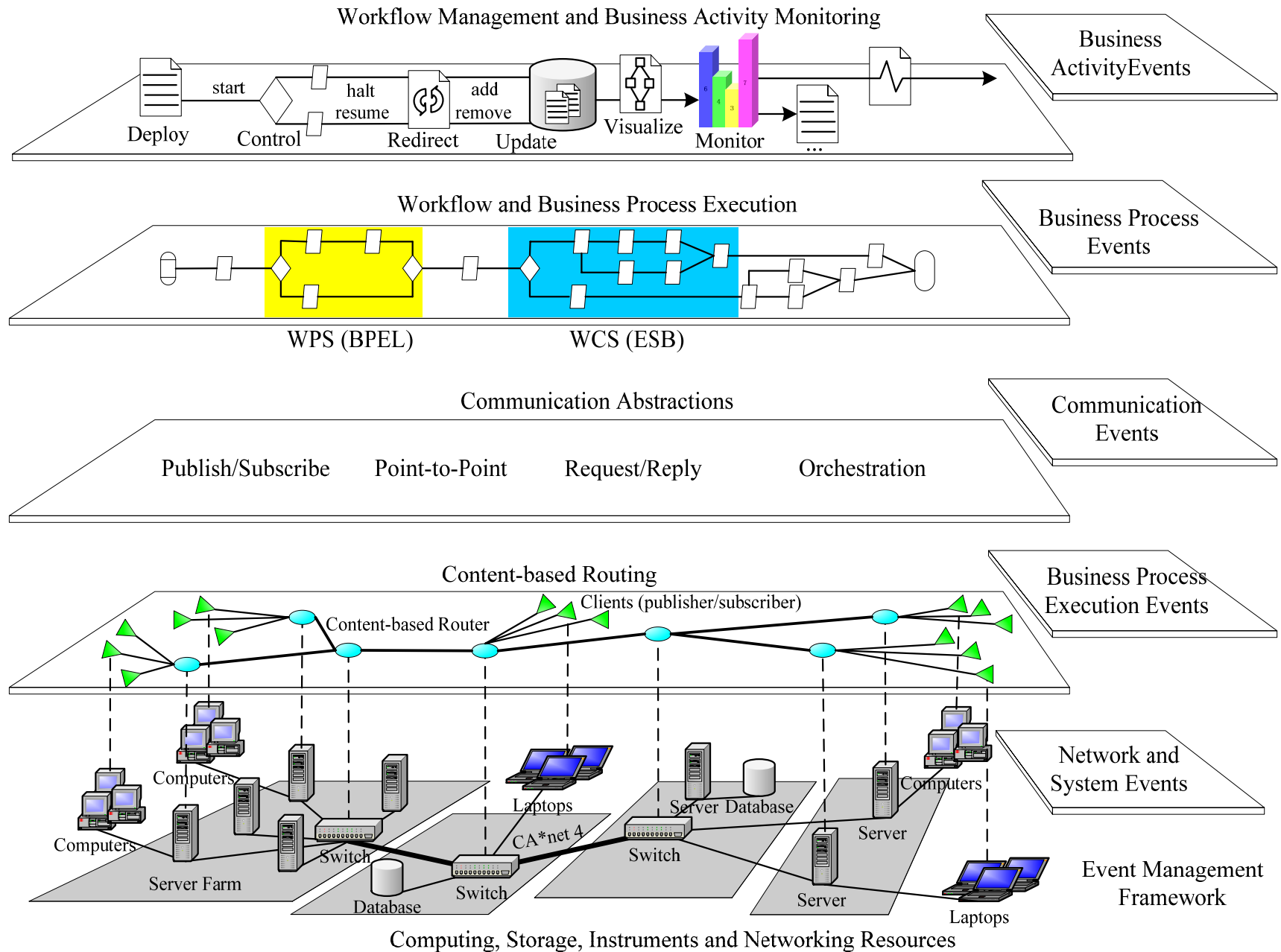
MicroToPSS Details



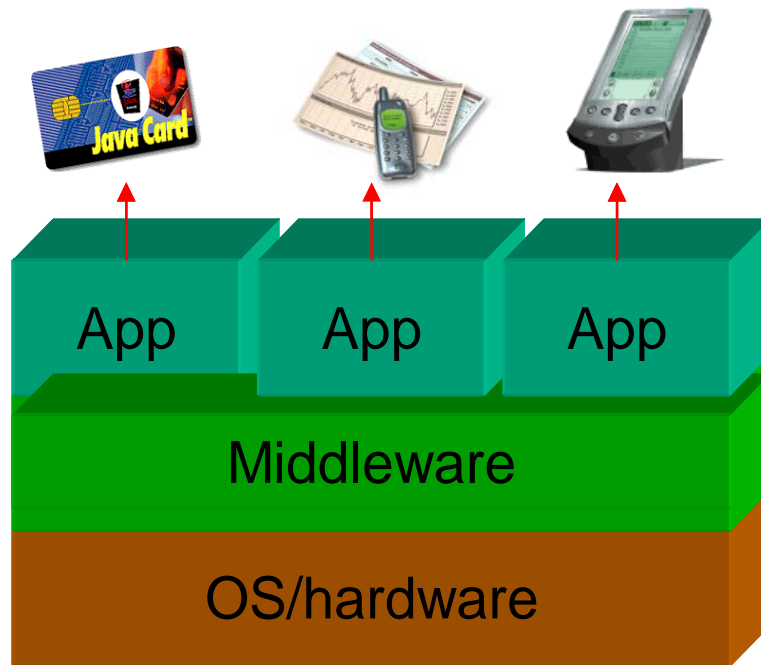
Middleware for Enterprise Computing

- Towards an **event-driven real-time enterprise**
- Enable **decentralized business process execution** (based on BPEL & Web services)
- Provide **business activity monitoring** and tracking of KPIs across distributed enterprise
- Based on **flexible content-based routing** messaging substrate
- Offers a **data-centric networking abstraction**

Data-centric Networking



Customizable Middleware Product Families for Embedded Devices *et al.*



- Middleware product families reduce development cost
- Proven concepts on Java Card & J2ME
- Based on Aspect Orientation
- Prove for C-based systems in progress
 - Ethernut embedded OS
 - www.AspectC.net

Middleware Systems Research Group

- Selected links and projects
 - Middleware for sensor networks
 - <http://microToPSS.msrg.utoronto.ca/>
 - Middleware for enterprise computing & business process management
 - <http://padres.msrg.utoronto.ca>
 - Modularity, customization, and software product families
 - <http://www.AspectC.net>
- MSRG group web site
 - <http://www.msrg.utoronto.ca>