Embedded OS Trend

in Wireless Network

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Agenda

- Enea In General
- Embedded OS Current Situation
- Technology Development Drives Demand
- Homogeneous Multi-core Embedded OS
- Heterogeneous Multi-core Embedded OS
**Leader in Communications Software & Services**

<table>
<thead>
<tr>
<th>Enea Software</th>
<th>Revenue per segment (2009)</th>
<th>Enea Consulting</th>
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<tbody>
<tr>
<td>Embedded OS Software and Tools</td>
<td><img src="chart.png" alt="Revenue per segment chart" /></td>
<td>Full product life cycle software development</td>
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<td>Among the most widely deployed in the world within telecom</td>
<td></td>
<td>Outsourcing capabilities</td>
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<td>- 5 billion phone calls every day</td>
<td></td>
<td>Training</td>
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<td>- installed in approx. 50% of all 3G base stations in the world</td>
<td></td>
<td>Solution centers for Android, Linux, wireless communication and certification</td>
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<td>- is installed in more than 1.5 billion mobile phones</td>
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**Global software and services company focused on solutions for communication-driven products.**

Founded in 1968

**Revenue per product (2009)**

- 4% Tools
- 16% Middleware
- 9% Software Related Services
- 71% RTOS

**85 M€ in Sales 2009**

- 620 employees
- 16 offices in:
  - Sweden (HQ), China
  - France, Germany, Israel,
  - Japan, North America
  - Romania and UK

**Enea Consulting**

- Full product life cycle software development
- Outsourcing capabilities
- Training
- Solution centers for Android, Linux, wireless communication and certification
Enea Family of Products

**Real-Time OS**

- **OSE**
  - Fault tolerant, preemptive
  - Memory protection
  - Highly available (99.999%)

- **OSEck**
  - Compact kernel version
  - Optimal for signal processing
  - Highly available (99.999%)

- **OSE Epsilon**
  - Ultra-Low Interrupt Latency
  - Very-Low memory footprint

- **Optima Tools**
  - Eclipse-based debug and profiling tools suite

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**Linux OS**

- Full Linux Distribution
- Integration of Enea features
- Strong Support Driven

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**Middleware Platforms**

**Element**

- System-wide IPC, discovery, and publish/subscribe services
- Ideal for networking infrastructure equipment and HA

**dSPEED**

- Ideal platform for controlling DSP farms & Multicore DSPs

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**Embedded Database**

**Polyhedra**

- SQL RDBMS
- Fault tolerant, in-memory
- Instant failover
- Highly available (99.999%)

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**Communication Protocols**

**LINX – IPC**

- Multiple OS, distributed, multicore / multiprocessor communications

**Netbricks - Telecom stacks**

- Sigtran, SIP, DIAMETER, MEGAC, FAX, ISDN, X.25, etc.
Single-Core OS dominate the industry, however it is changing……
Technology Development Drives Demand

- Ericsson predicts 50 billion connected devices by 2020
- Cisco believes mobile data traffic will double every year through 2014, increasing 39 times
# Trends in Wireless Broadband

<table>
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<tr>
<th>TREND</th>
<th>FOR Embedded OS vendor, THIS MEANS</th>
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| IP-based communications               | - An increase in demand for multicore solutions  
   - Data traffic will be 26 greater in five years  
   - 8.5 times more base stations                                                               |
| Latest hardware a must                | - Greater demand for commercial operating systems  
   - Constant switches to new hardware requires operating systems that can be transferred between hardware environments  
   - Greater emphasis on good relations with hardware manufacturers                               |
| Best solution for every case          | - Support is required for a number of OS – commercial and open source                            |
|                                      | - The best solutions must be combined to reach the high performance requirements                  |
Homogeneous Multi-core Embedded OS

Driver layer
Interrupt handling

HW devices

Multimedia packet handling

Scheduler 0
Scheduler 1
Scheduler 2
Scheduler 3

OSE5 Multicore Kernel

Core 0
Core 1
Core 2
Core 3

Kernel event messages
Heterogeneous Multi-core Embedded OS

Tools & Management

Linux

Bare-Metal or RTOS

Legacy OS

LINX IPC over 1 Ethernet/sRIO

Hypervisor

HW
Question & Answer