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OS Support for Adaptive Real-Time Systems

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Operating System Support For Adaptive Real-Time Systems

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OS Support for Adaptive Real-Time Systems

Why are we here?

- Todays RT applications are becoming more and more complex (in SW & HW)
- Memory and processing power impose strong limitations in the development
- Other constraints:
  - ⇒ Cost, Efficiency
  - ⇒ Timeliness, QoS
  - ⇒ Adaptivity to cope with dynamic changes
  - ⇒ Portability
  - ⇒ Security
  - ⇒ Fault-tolerance
  - ⇒ Energy consumption

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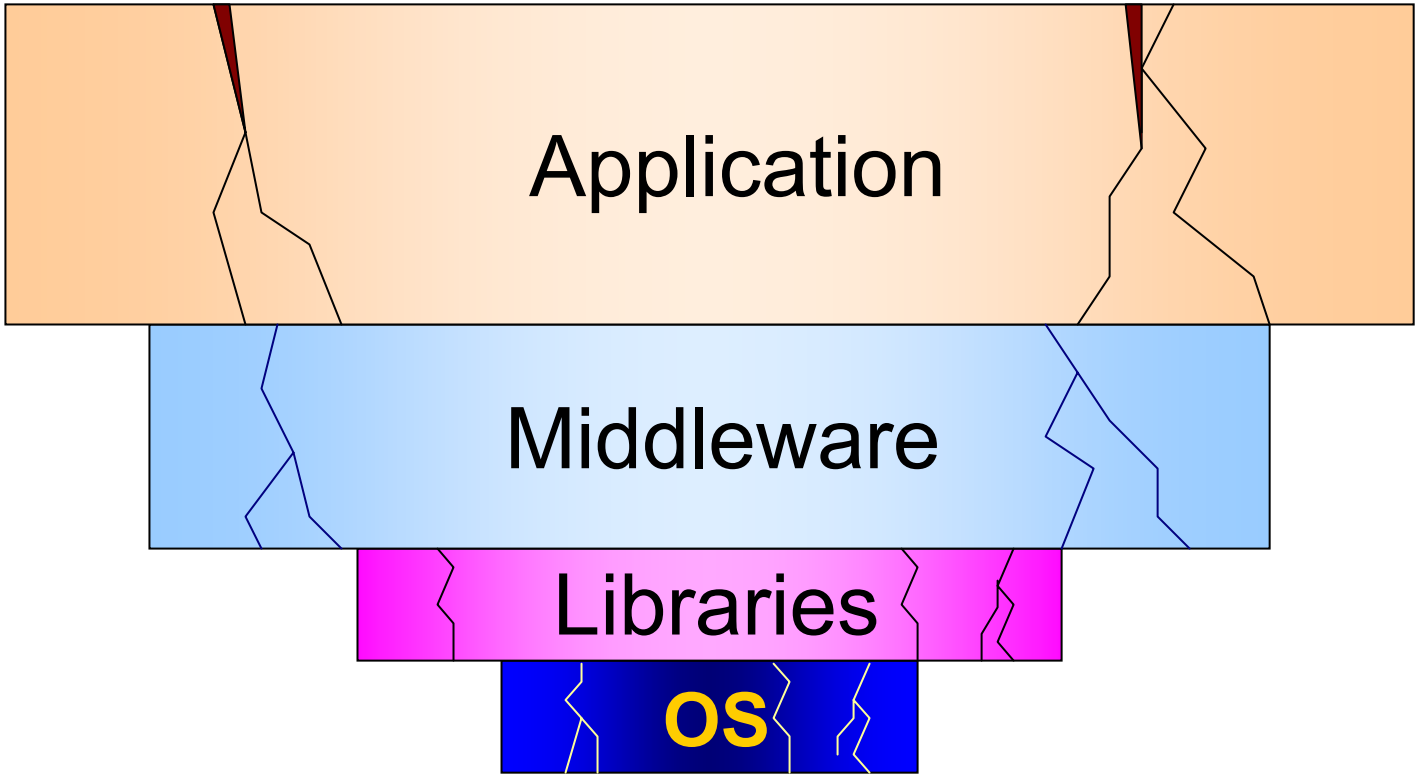
OS Support for Adaptive Real-Time Systems

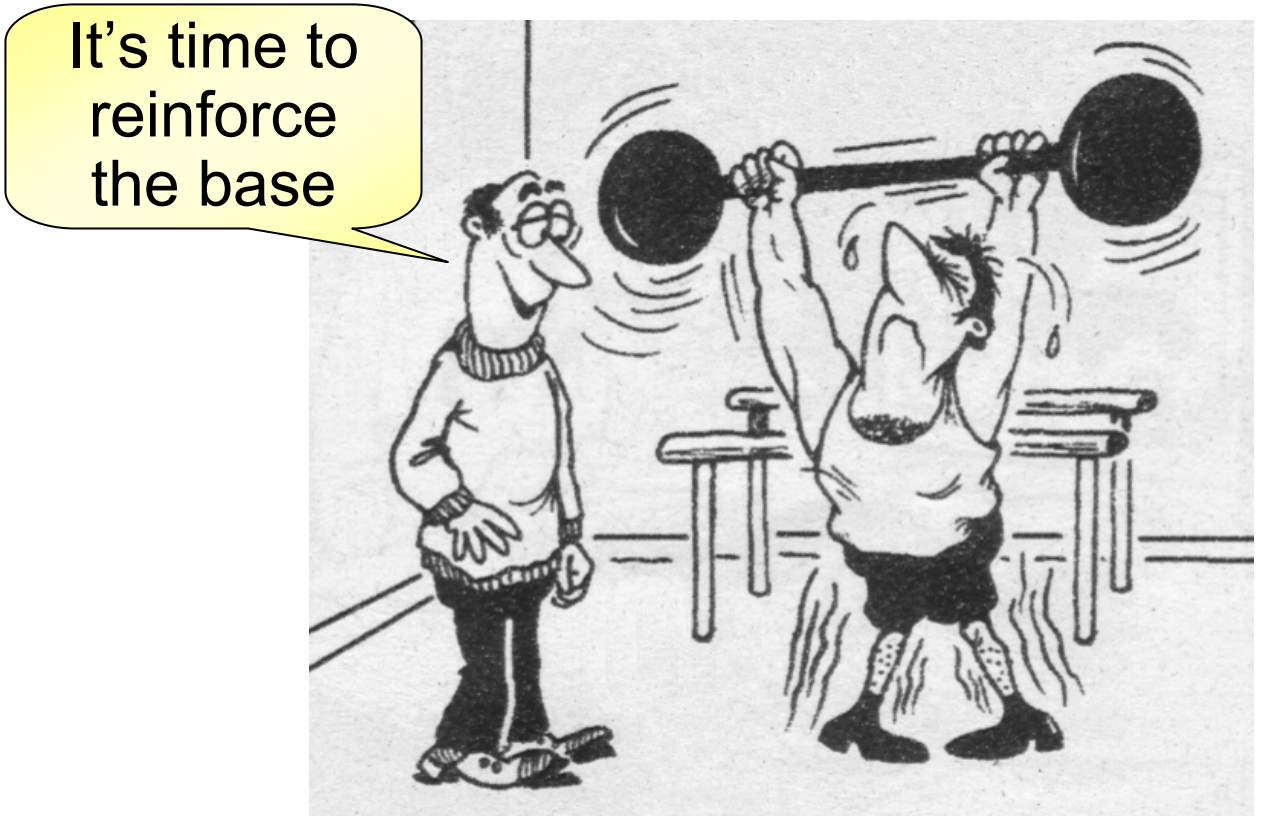
Current approach

- RTOSs are still the same as 10 years ago
- Complex applications are developed on top of kernels unsuited for supporting such features



Consequences

- Most of the times the application works fine, but sometime it fails, unpredictably
- The **"Plug and pray"** paradigm is not acceptable any more



Open issues

- Technically this is feasible (several research kernels already exist)
- Lot of open questions:
  - Which features are most important?
  - Should the OS interface be modified?
  - What is the impact on standards
  - How to break the market?

Challenge

- Identify the minimal set of features that need to be included in current RT kernels to enable the development of embedded systems that are:
  - Predictable
  - Efficient
  - Resource-aware
  - Adaptive
  - Secure
  - Capable of coping with dynamic changes in the controlled environment

Main focus

- To achieve this goal, we will mainly focus on different aspects, including
  - ⇒ scheduling
  - ⇒ resource management
  - ⇒ modularity and portability
- Open discussion about impact on
  - ⇒ design methodologies
  - ⇒ runtime overhead
  - ⇒ implementation complexity
  - ⇒ standard OS interfaces

Technical Program

1. Liesbeth Steffens, Philips Research, NL
   Trends in operating systems: resource management for future CE systems
2. John Stankovic, Univ. of Virginia, USA
   Adaptive Wireless Sensor Networks

Coffee Break

3. Paolo Gai, Evidence Srl
   Implementing temporal isolation in tiny real-time systems
4. Moon-Hae Kim (KonKuk University), Hyung-Seok Lee (ETRI, Korea)
   Embedding Real-Time Objects into Embedded Linux and Related Research Issues
5. Albert Benveniste (INRIA / IRISA, France)
   Alberto Sangiovanni Vincentelli (U. of California @ Berkeley)
   OS Support in the Hard Real-Time System Design Flow