ICT-eMuCo

Embedded Multi-Core Processing for Mobile Communication Systems

eMuCo software platform basis on multi-core ARM RealView evaluation board

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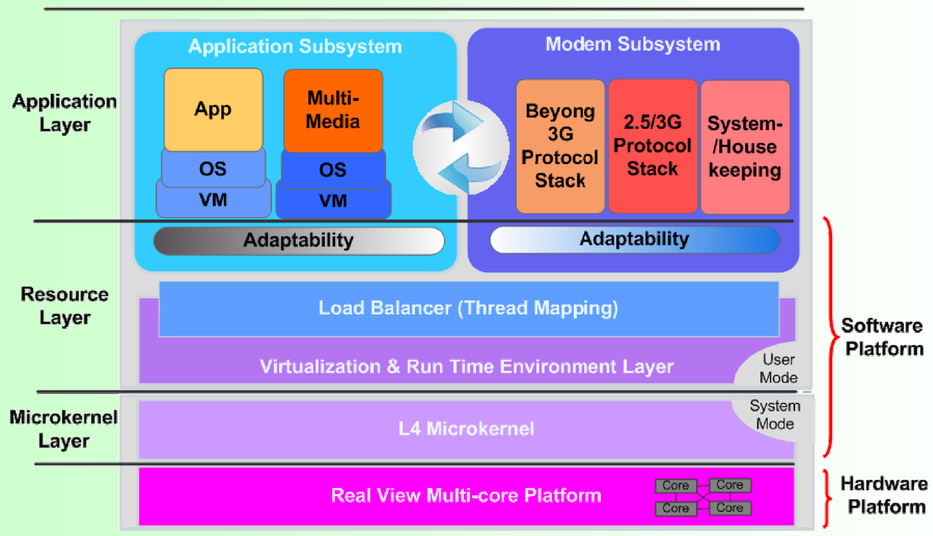
SEVENTH FRAMEWORK PROGRAMME

System Description

ICT-eMuCo project addresses a potentially commercial solution using ***multicore platforms and virtualization techniques*** to deal with outstanding problems faced by future mobile devices as ***enabling the coexistence of multiple software environments*** and ***provide much more computational capability than today's devices can provide with no more power consumption than today's requirement***.



Microkernel Layer

Microkernel layer based on the ***L4 microkernel***:

- Modularity, Flexibility, Extensibility
- Better footprint management
- Easier development, unit testing, maintenance and portability

Resource Layer

- ***Load balancer (LoBa)*** enables ***flexible resource usage*** of the multi-core platform.
- ***Para-virtualization***, as used on the ARM architecture, is supported by the runtime environment functionality.
- Virtualization technique is subject of ***security policies:*** guest operating systems with their applications are ***isolated*** from each other and from other parts of the system.
- ***Secure access to I/O resource*** such as devices is controlled by an I/O manager. Device drivers are implemented as user-level components.

Demo Scenario

This demonstrator scenario aims to show the main contributions of the eMuCo software platform to the future smart phones. For this purpose, the demonstrator puts together a data path component of the LTE protocol stack together with a multimedia application. The demo scenario is built on the following premises:

Application: video streaming under H.264 compression.

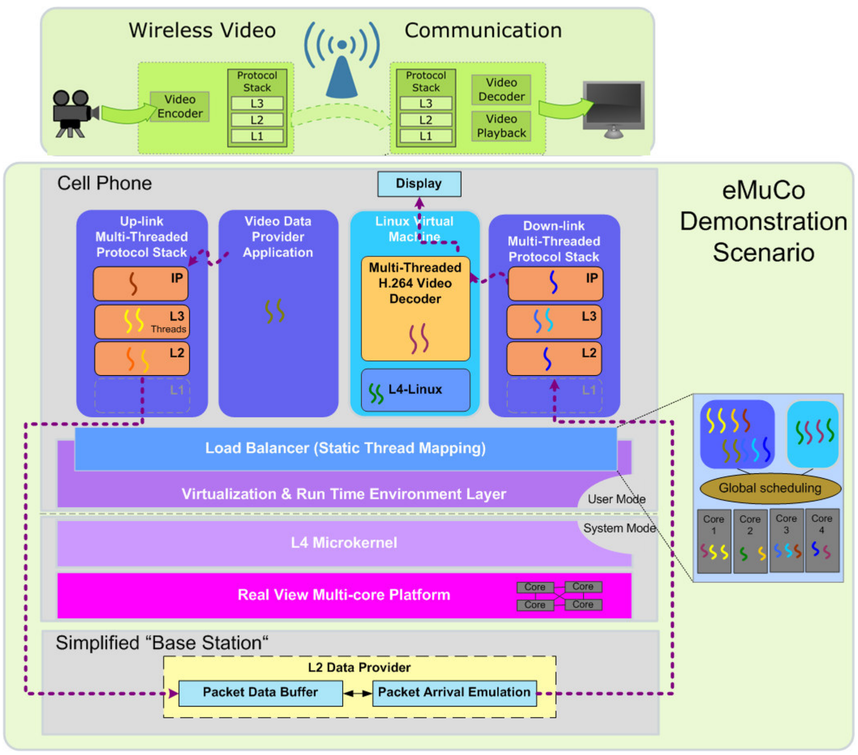
Operating system for running application: Para-virtualized Linux.

Control of resources for parallel and concurrent execution: L4 Fiasco Microkernel in combination with load balancer.

Hardware platform: ARM Realview PB11MP

Wireless communication protocol: Layers two and three of Long Term Evolution (LTE) protocol stack.

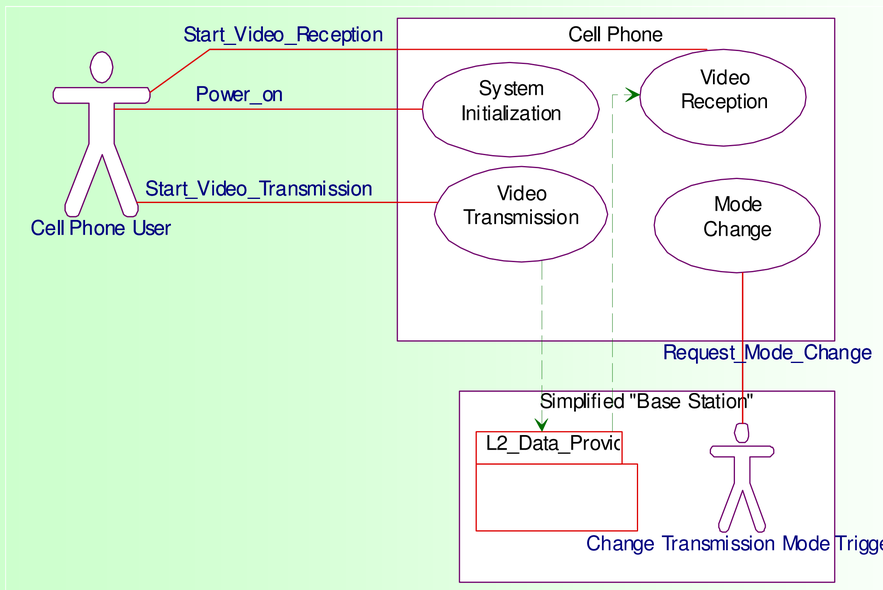
Radio transmission/reception to/from the base station: replaced by a "L2 data provider" which stores the data packets sent to the base station and emulate the arrival of the L2 data packets to the mobile device.



The basic demo scenario illustrated above shows the sequence into a mobile device to send a video to the "base station" and receives it back to display it at the same mobile.

Use Cases

The use cases illustrate the functionalities that demand processing capacity in the cell phone from eMuCo demo prospective.



System Modes

ICT-eMuCo demonstrator system will use (in a next release) two transmission modes to invocate the load balancing functionality:

High bandwidth mode: characterised by generating/processing the data packets of a video stream with a high data rate.

Low bandwidth mode: characterised by generating/processing the data packets of a video stream with a low data rate.

Modem & Application Subsystems

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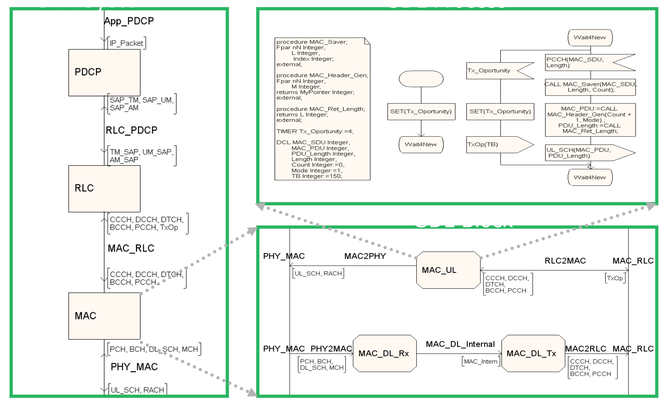
Video Codec



LTE Protocol Stack

- Video streaming & parallel decoding
- LTE Protocol stack model using SDL
  - Processes a data transfer through layer 2&3
  - Uplink and Downlink functionality
  - Radio Packets represent Video stream
- L2 data provider to emulate arrival of packets from Base station
- Passing data to the Protocol stack through environment functions xInEnv() and xoutEnv()
- Shared memory interface between L4Linux and Modem subsystem
- Processed packets are transferred to the Video Codec
  - H.264 video player
- Displaying decoded frames on the monitor

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