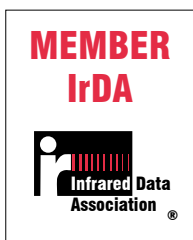


IPMS_IRHSP – IrDA High Speed Protocol Stack



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IrDA: An Overview

The IrDA Infrared Data Communication standard is a simple to use, powerful and competitive wireless data link. It caters to an expanding market of portable as well as stationary devices. Communication with IrDA is the centre of attention thereby. The Infrared Data Association standardized the IrDA protocol. It is established in PCs as standard and is excellently supported by the current operating systems. Within IrDA, data rates from 9.6 kbit/s to 16 Mbit/s are supported. Because of a multitude of different application layers, the use of IrDA compatible data communication is possible for numerous applications. Devices with integrated IrDA include notebooks, PDAs, cameras, mobile phones, measuring devices, data loggers, watches, etc.

High Speed, Low Power IPMS_IRHSP IrDA Protocol Stack

The independent development of an IrDA protocol stack is very complex and difficult. The implementation of a pre-cast, powerful IrDA protocol stack component is in all aspects better. For this reason the Fraunhofer Institute for Photonic Microsystems developed the powerful high speed, low power IPMS_IRHSP IrDA protocol stack. It supports data rates from 9.6 kbit/s to 16 Mbit/s. This IrDA protocol stack enables the user to a simple system integration of an IrDA compatible communication interface. There are conceivable applications for high speed yet low power systems. The complex functionality of the IrDA protocol can be utilized via a simple to use API. The user does not have to acquire knowledge about the functionality of the IrDA protocol.

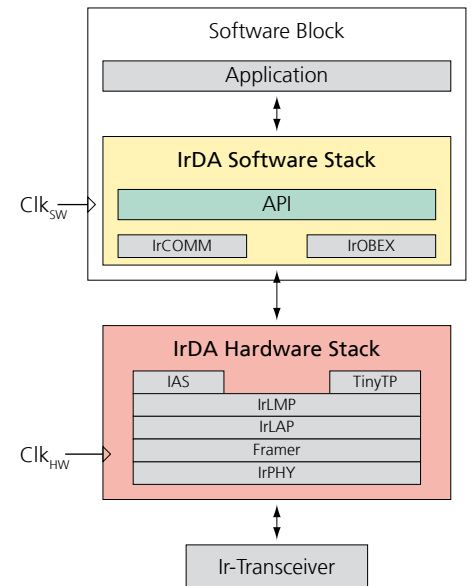


Fig. 1: System with integrated IPMS_IRHSP IrDA protocol stack

Design

The IPMS_IRHSP IrDA protocol stack is a hardware/software co-system. With the help of an optimized combination made of hardware and software, the high performance requirements and the requirements at complexity and flexibility can be better guaranteed in relation to other solutions. The IPMS_IRHSP IrDA protocol stack consists of both hardware and a software part (fig. 1) and realizes the entire IrDA protocol from physical to application layer. The IrDA protocol stack is completed by an external IrDA transceiver.

The hardware stack is a synthesizable behavioral description in VHDL. It was verified successfully with a XILINX FPGA. Because of the use of progressive modulators and demodulators, the maximum necessary clock frequency of the hardware stack can be drastically

IrDA Mode	Data Rate	Clock (Clk _{HW})
SIR	9,6 - 115,2 kBit/s	2 MHz
MIR	576 - 1 115,2 kBit/s	8 MHz
FIR	4 MBit/s	24 MHz
VFIR	16 MBit/s	72 MHz

Tab. 1: Clock frequency of the IrDA hardware stack with different IrDA data rates

reduced (tab. 1). An internal adaptive clock control and further optimizations are included for enormously reducing energy consumption.

The software stack is programmed in C. It has only a minimum of requirements for microcontroller systems. The consumed resources in microcontroller systems can be strongly reduced in relation to other solutions. Thereby the software stack can be used on numerous microcontroller architectures without extensive adaptations. The integrated API supports IrCOMM and IrOBEX. The IPMS_IRHSP IrDA protocol stack can also support other application layers specified by IrDA. The use of IPMS_IRHSP in many applications is possible.

The hardware and software stack are connected by a robust interface. A synchronisation of clock frequency between hardware and software stack is not necessary. It is possible to clock the software stack with a lower frequency than the hardware stack.

System Integration

The portable IPMS_IRHSP IrDA protocol stack is ideal for the integration in system-on-chip solutions with varying system specifications. An automated

Partitioning	A	B	C	D	E
IrCOMM / IrOBEX	SW	SW	SW	SW	SW
TinyTP	SW	SW	SW	SW	SW
IAS	SW	SW	SW	SW	SW
IrLMP	SW	SW	SW	SW	SW
IrLAP	SW	SW	SW	HW	HW
IrPHY / Frammer	HW	HW	HW	HW	HW

Tab. 2: Possible partitioning of the IPMS_IRHSP IrDA protocol stack by hardware (red) and software (yellow)

configuration process enables an uncomplicated, fast and reproducible modification of the IPMS_IRHSP IrDA protocol stack properties. The data rate and the primary and secondary functions can be adapted.

It is also possible to modify the allocation of particular layers in hardware or software (tab. 2) depending on system specification and existing resources. An ideal adaptation of system properties (fig. 2) like chip area, microcontroller resources, performance, energy consumption and function is attainable. The IPMS_IRHSP is more advantageous compared to pure software stack solutions, which require more powerful processor/controller and system hardware.

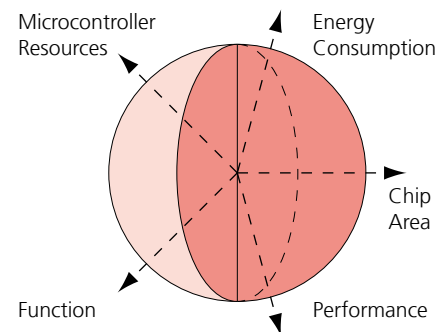


Fig. 2: Modifiable properties of the IPMS_IRHSP IrDA protocol stack by automated configuration

Features

- Complete IrDA protocol stack (IrPHY, Frammer, IrLAP, IrLMP, IAS, TinyTP, IrCOMM, IrOBEX)
- Primary and secondary function (scalable)
- Data rates from 9.6 kbit/s - 16 Mbit/s (scalable)
- IR remote control function (optional)
- Reusable IP
- Automatically configurable IP
- Simple system integration
- Easy operation over API
- Small resource consumption
- Synthesizable behavioral description in VHDL
- C code usable by numerous microcontroller architectures

Applications

- Portable high-speed systems
- Portable low power micro systems
- Use in system-on-chip solutions or as a stand-alone chip

Support

- Supply and adaptation of the IPMS_IRHSP IrDA protocol stack (VHDL code and C code)
- System integration
- System applications