XR7 PTP
Time Synchronization Protocol Stack

XR7 PTP is IEEE 1588-2008 compliant implementation of the Precision Time Protocol for clock synchronization over IP and Ethernet.

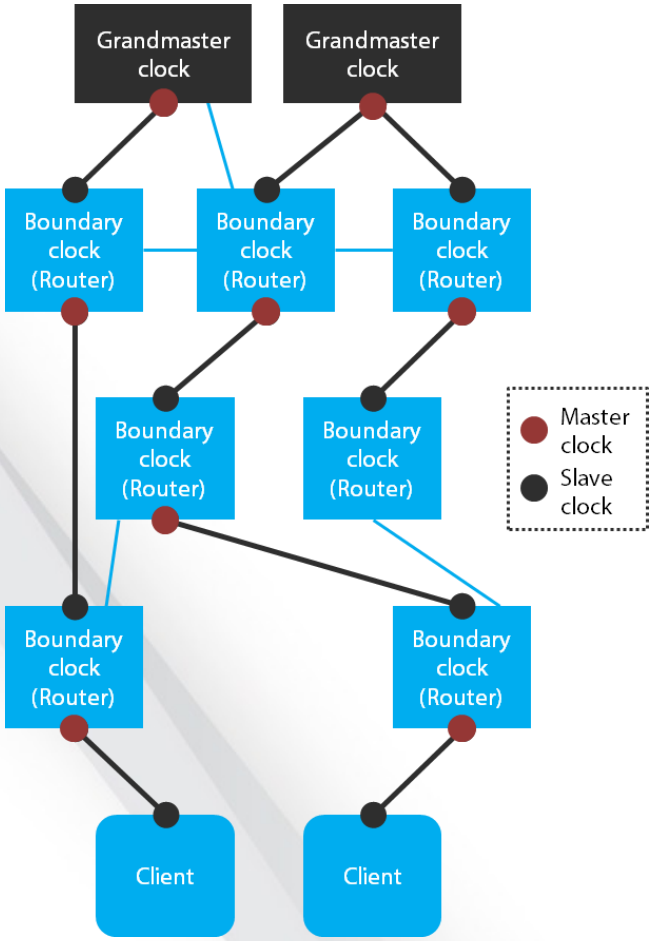
The implementation is written in pure C language and is ready to be used in Linux based systems. Hardware and operating system specific details are hidden behind an abstraction layer so that porting to other operating systems and environments is relatively easy.

Precision Time Protocol

Precision Time Protocol (PTP), defined in IEEE standard 1588, enables precise synchronization of device clocks in packet based networks. Devices are automatically synchronized to the most accurate clock in the network. The protocol supports system wide synchronization accuracy usually in sub microsecond range with minimal network and local clock computing resources.

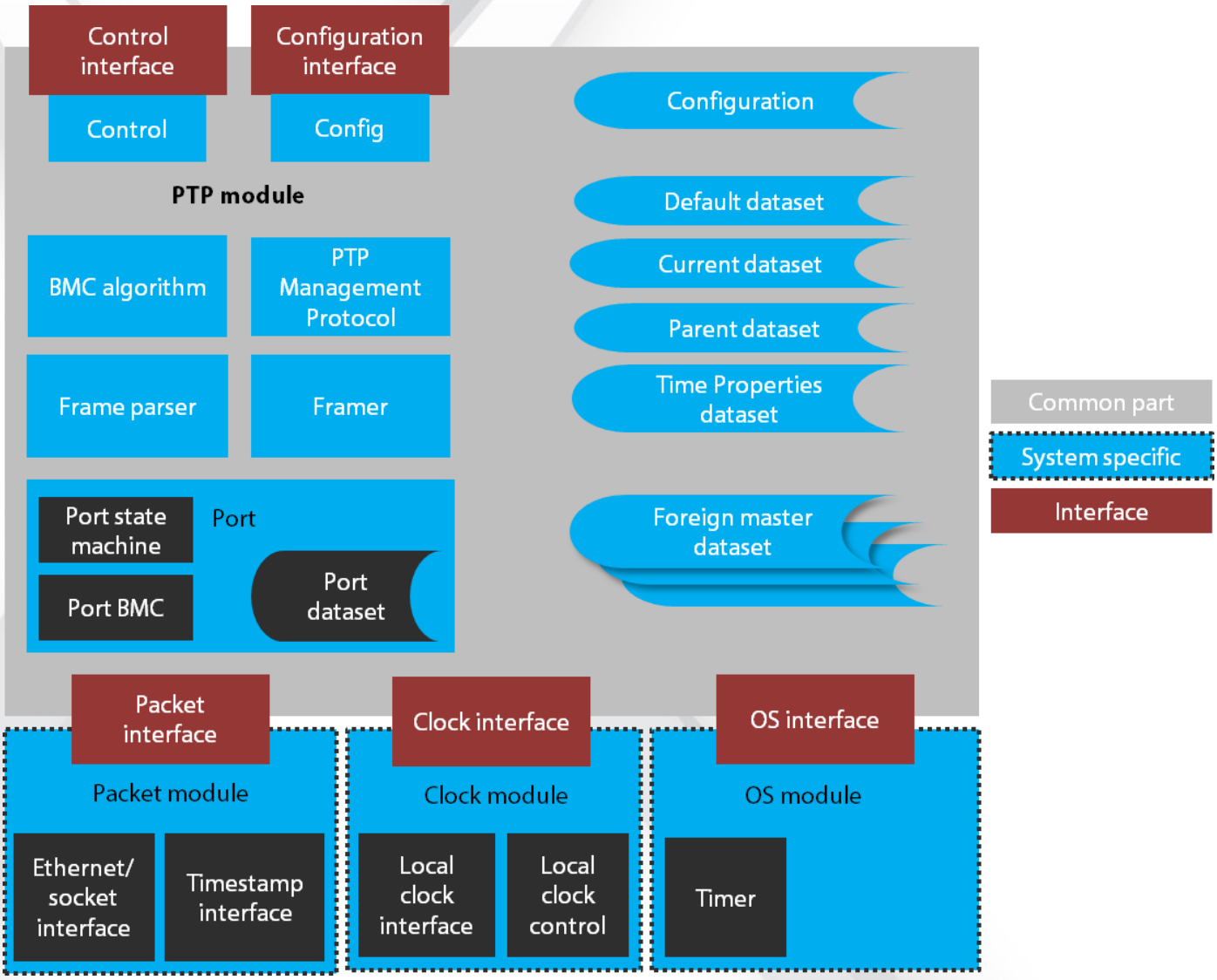
PTP accuracy is based on an assumption that the delay in Ethernet is approximately constant and symmetric. The protocol is Master-slave type, and it includes a Best Master Clock selection algorithm that organizes the clocks in the network to form a tree-like structure: Master clocks use the BMC algorithm to determine whether they should remain master clokcs, or follow some better master. Non-master clocks use the BMC algorithm to determine which master clock to follow, or whether to become masters clocks themselves. A few different kinds of clock types exist:

- A Master clock has typically an external clock source connected to it, or it has a very accurate internal time reference, for example an atomic clock. Master clock is a source of time information for the PTP network.
- A Slave clock uses the PTP protocol to follow the time of its selected master clock.



- A Boundary clock is a clock that is located between two or more network segments. A Boundary clock acts as a slave clock in one of the network segments and as a master in the other segments. Boundary clocks forward the clock information from a network segment to another.
- Transparent clocks forward clock information like Boundary clocks, but they are not visible to IP layer or to the PTP protocol. An example of a transparent clock is an Ethernet switch that modifies PTP frames on-the-fly minimizing the effect of its own packet queuing delays to the synchronization accuracy.

FLEXIBILIS



The XR7 PTP implementation is divided into a common part and a system specific part, which makes it easier to port it for different operating systems and hardware environments. The common part is the same for all environments and it contains the most of the functionality, including PTP message transfer, Best Master Clock selection protocol and clock adjustment algorithm. The system specific parts provide standard interfaces for the common part, through which it can employ the functionality of different hardware and operating systems. With XR7 PTP, it is possible to achieve nanosecond class accuracy in time synchronization over a packet based network.

Features

- IEEE1588-2008 compatible
- Master, slave and boundary clock functionality
- One-step and two-step clock
- IEEE1588 Default Profile and Power Profile
- IEEE802.1AS
- Best Master Clock (BMC) selection algorithm
- Asymmetry corrections
- Adjustable message transmission intervals
- PTP Domain support
- Interface for adjusting local on-board oscillator
- GNU/Linux operating system support

Flexibilis Oy
Tullikatu 6
33100 Tampere
Finland
http://www.flexibilis.com