

Advantages of the ETHERNET Powerlink (EPL) solution from SND

1) Turnkey solution

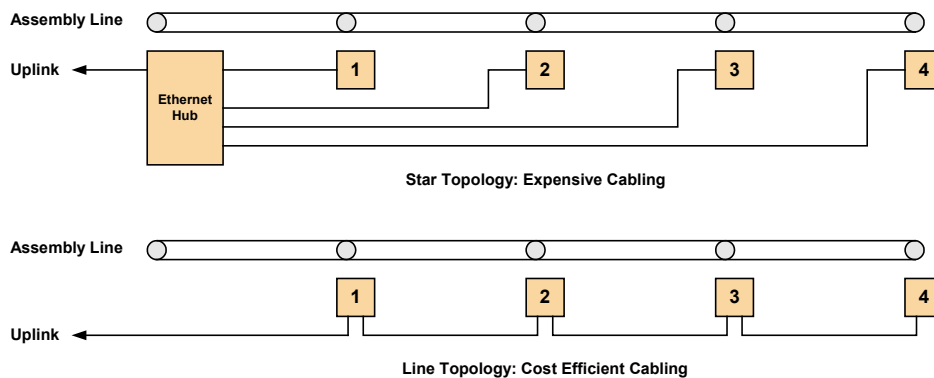
Both hardware and software issues are addressed with SND's EPL solution. As timing requirements in the EPL standard are very demanding (response time < 8 us and synchronisation jitter < 1 us) major parts of the software need to take the specific hardware into account. Also the OS environment and all other application tasks that need to run simultaneously have a significant influence on the software design why in our opinion there can never be a universal (portable) software solution for EPL that fits all possible hardware environments. SND's embedded network operating system HyNetOS™ is not only optimised to run on the 32-bit RISC/DSP architecture from Hyperstone but has also been adapted to Real-time Ethernet requirements in the way that a strictly deterministic behaviour is applied whenever needed. If applications, EPL stack, TCP/IP stack and device drivers within a real-time OS such as HyNetOS perfectly fit the given hardware (Micro WebTarget, EPL Unit) this can truly be called a comprehensive turnkey solution.

2) One hardware for all EPL modes

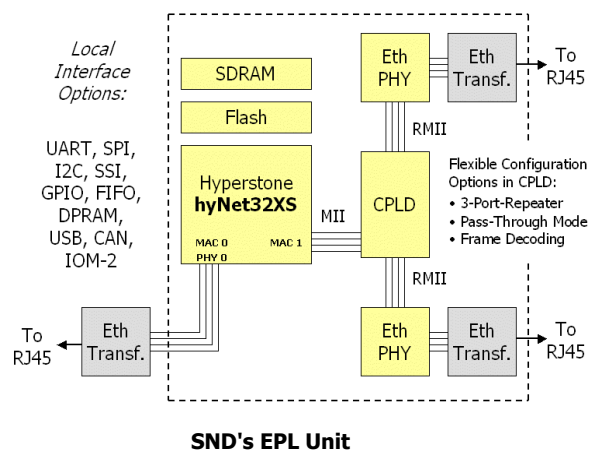
With SND's solution no difference is to be made, whether the EPL node is a Managing Node (MN = Master), a Controlled Node (CN = Slave), a gateway or a router. By using the powerful 32-bit RISC/DSP CPU architecture from Hyperstone there are enough computing resources even for demanding applications. This is true for the current E1-16XS/E1-32XS CPU (Micro WebTarget board) running at 128 MHz and even more for the new hyNet32XS running at 200 MHz (EPL Unit, available in the near future). In many cases the Hyperstone CPU can even do the job of a 2 CPU solution and will consequently save hardware cost.

3) Integrated Ethernet repeating hub

In industrial automation networks line and bus topologies are most often preferred over star topologies usually found in office networks.



In the sense of offering a turnkey solution SND also takes care about integrating a repeating hub into the new EPL unit. A most important parameter of such a repeating hub is a very low propagation delay. Ethernet switches usually have a propagation delay of at least 5 us whereas a hub will have values down to below 0.5 us. This is important so the overall delay of the network is kept small. On the EPL Unit SND realises the hub inside a small CPLD on MII level with 2 external PHYs as shown in the figure on the right side.



4) IEEE1588 support ensures compatibility to future EPL standards

The clock synchronisation protocol according to IEEE1588 is currently in discussion for being part of the next version of the EPL specification (V3) as it is part of other real-time Ethernet standards (e.g. Ethernet/IP and CIPsync from Rockwell Automation) already today. In any case a synchronisation accuracy of below 1 us can only be achieved if the hardware supports the IEEE1588 feature by means of hardware timing and measurement units. This is the case for the new hyNet32XS CPU which means that whenever this issue comes up a hardware based on the hyNet32XS CPU will already be prepared and will not need any change. Just smaller changes in the driver software and the timer system of HyNetOS will be needed, which can easily be done with a firmware update. EPL V3 is currently scheduled for second half of 2005.

5) Ultra-fast 128 Kbyte internal SRAM of the hyNet32XS for excellent performance

The new hyNet32XS CPU used on SND's EPL Unit will have 128 Kbyte of SRAM right on the chip. This memory is 32-bit wide and can be accessed in 1 CPU cycle. As the CPU runs at 200 MHz one cycle means 5 ns in which 32 bits (or 4 bytes) can be read or written. This corresponds to a data throughput of 6.4 Gbit/s! This is a speed usually found in cache memories of much larger CPUs. In the context of HyNetOS, for being a very small and efficient OS, not only the whole EPL stack can run in this size of memory, but also the drivers and the application code. It is as if the whole EPL node firmware would permanently run in the CPUs cache and never leave it. In many cases, apart from very complex applications, external SRAM or DRAM will not even be needed. And also with external memory this access speed is way beyond of what is physically possible.

6) Hardware design is available

Apart from offering the board level products Micro WebTarget and EPL Unit as off-the-shelf solutions in any volume, the hardware design of these boards can also be licensed to integrate the design in customer specific PCBs. This includes all design guides, component lists, hardware schematics as well as all CPLD contents (e.g. the integrated hub mentioned above). Porting the hardware design will even be assisted by SND's engineers, if required, in order to offer the customer the best possible solution also on this level.

7) SND's HyNetOS offers a lot more than just an EPL stack

Apart from the EPL stack for Managing Node and Controlled Node operation HyNetOS offers many more features such as a TCP/IP stack including ARP, ICMP, UDP and TCP protocols. It can run HTTP servers and clients (inkl. SSL), FTP servers and clients, E-Mail client protocols, SNMP network management and DHCP. HyNetOS offers a file system (RAM disk, Flash File System, FAT16 with memory cards), tracing, monitoring and configuration tools and APIs as well as a large range of pre-engineered device drivers including but not limited to UART, RS232, RS485, RS422, SPI, I2C, SSI, CAN, USB, LC-Display (any size, resolution and colour), touchscreen, keypad, touchpad, trackball. Should furthermore a required driver or protocol not be available yet, it can easily be added either by the customer or SND's engineering team.

8) Development and prototyping can start today

SND's new EPL Unit based on the hyNet32XS CPU is scheduled to be available in late summer this year, but there is no need to wait. With the existing Micro WebTarget board based on the Hyperstone E1-16XS (128 MHz clock) SND's EPL solution can be evaluated right now. Many of SND's existing EPL customers have successfully build EPL capable device prototypes using the Micro WebTarget as shown on the Hannover Industrial Fair in April 2004. All software developed on this platform will be compatible to the new EPL Unit. SND's Micro WebTarget Evaluation Kit *EPL Edition* can be delivered today.

9) Expect even more optimised solutions from Hyperstone and SND in the future

Should you decide for SND's solution today you can even expect more in the future. Hyperstone's CPU roadmap clearly shows how to integrate even more memory and the repeating hub on the chip. A true single-chip-solution at the lowest possible cost is already under development.