



An IST Project



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Firmware of SCAMPI adapter

2nd SCAMPI Workshop

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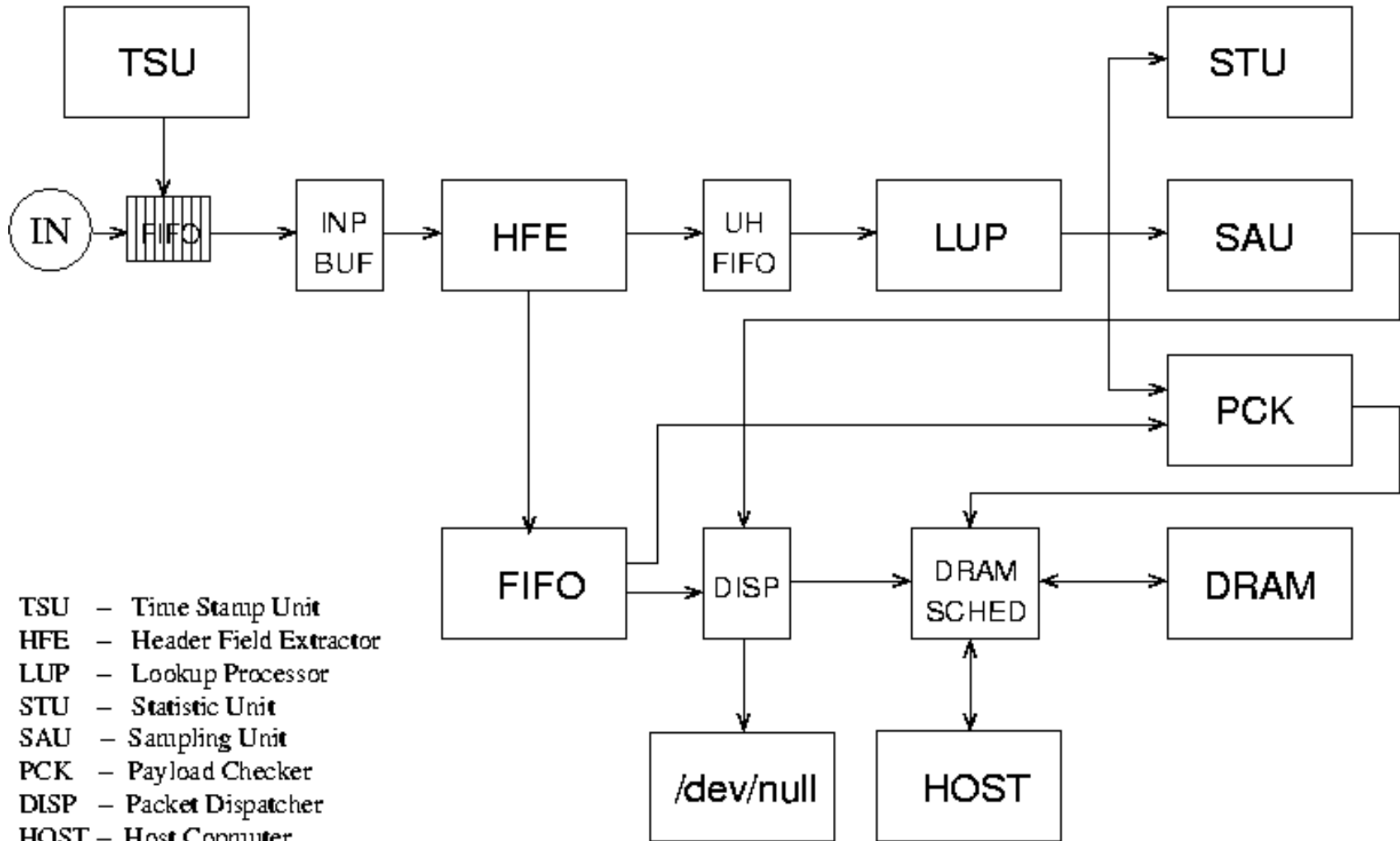


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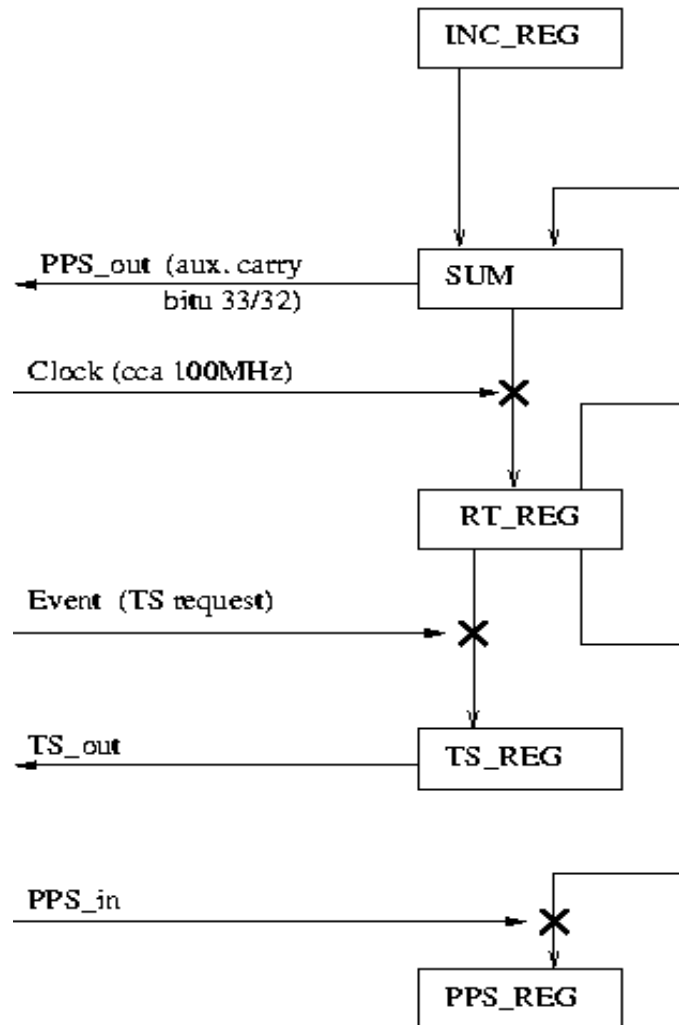
Timestamp unit



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- timestamp format - 64 bit fixed point
 - 32 number of seconds (since 1.1.1970)
 - 32 fraction of second (precision about 230 ps)
- 100 MHz clock (oscillator 10 MHz, multiplied by 10)
 - TCXO - temperature compensated
 - resolution 10 ns (64 bytes at rate 10Gb/s ~ 50 ns)
- controlled by PPS input (e.g. GPS receiver)
 - accuracy (with PPS) ~ 1 us
 - accuracy (with NTP) ~ 50 us
 - accuracy of calibrated oscillator without PPS ~ aging of quartz
- PLL derived from 'nanokernel' of NTP project

Timestamp unit (cont.)





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VHDL blocks



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- **HFE** (header field extractor)
 - extracts data from TCP/UDP and IP headers
 - unified header structure assembling
- **LUP** (look-up processor)
 - CAM matching (width 272 bits)
 - evaluation of conditions - programmable engine for processing of unified header fields (32 bits comparison)
 - result of classification - 32-bit word
- **SAU** (sampling unit)
 - deterministic sampling - each n -th packet is passing through
 - probabilistic sampling - packet is passing with probability $1/n$



- **PCK** (payload checker)
 - checks payload for defined patterns (16 bytes)
 - patterns aggregated into groups
- **STU** (statistic unit)
 - packets lengths statistic: number of packets, total length, sum of squares of lengths, min/max value
 - statistics of intervals between packets: number of packets, total time, sum of squares of intervals, min/max
- computed statistics
 - length: average data rate, average length of packets, variation of packets lengths
 - time: total time of data flow, average inter-packet interval, variation of inter-packet interval



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Control word



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- control word describes processing of packet
 - 32 bits
 - output from packet classification
- SAMASK (16 bits)
 - assigns packet to SAU
 - packet might be processed by several SAU
- STATID (8 bits)
 - identifies STU
 - only 1 (of 256) STU processes the packet
- PCMASK (8 bits)
 - defines subset of 8 groups of patterns



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Adapter output



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- **id** - 2 bytes
 - interface number
 - result of SAU and PCK processing
- **timestamp** - 4 bytes
- **control word** - 4 bytes
- **rlen** - 2 bytes
 - length of this record
- **wlen** - 2 bytes
 - wire length of the packet
- **data** - up to 1560 (up to 16 kBytes)
 - captured packet



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Limitations



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- **LUP**
 - up to 2000 rows in CAM (matching part)
 - up to 8 condition (processing part)
 - 32 bits of output word (classification)
- **Control word**
 - size of word limits number of addressed units
 - at least 48 bits needed for better utilization
- **STU**
 - ‘time’ part limits utilization of rules parsing
 - more STU processing units is required - limited by addressing
- **PCK**
 - throughput is 3 Gb/s



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Conclusion



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SCAMPI adapter advantages:

- Advanced functionality on adapter
- Open system, users can download their own firmware
- Low cost of 10 Gb/s adapter