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**Technical Note. IDPU Packet Rate Performance Requirement**

The baseline requirement for FSW telemetry is to produce 100 packets per second and deliver these to the DMA circuit for "framing" on their way to the BAU. While the interface clock rate between the IDPU and the BAU is fixed at 2 Mbps, there are some tricky parts of the calculation. One is that the IDPU telemetry module has to handle variable size packets. A second is that the BAU can ingest only 2 frames before it is rate limited at the maximum downlink rate of 1 Mbps (when empty it can hit 2 Mbps for an instant).

In most systems, one simply designs for the worst case. That would be a packet with a data field of one byte and a total length of 13 bytes going at 2Mbps. Software would have to be designed to output about 19000 packets per second. Not a very practical answer.

In reality, most packets are much longer than that. The design minimum is 2048 bytes in their uncompressed form. Most are over 3000 bytes long. Nonetheless, to determine a practical design minimum was to consider a minimum of 2048 compressed by a factor of 2. This yields a packet with data of 1024 bytes and a total length of 1048 bytes. At 1 Mbps downlink rate, this yields roughly 100 packets per second.

Peak rates (>1 Mbps) are handled through an automatic fill circuit in the DCB Actel logic. If software cannot produce packets fast enough, the hardware circuit automatically fills the balance of the frame. This can happen if a packet shrinks to nothing during compression, such that software cannot keep up. Ironically, this means that the compressed packet actually causes a loss in effective data rate to the ground. We know that we have to find a middle ground on "how much is too much" compression.

The present HST interrupt is working at 256 Hz, which allows us to handle packets of 975 bytes in length at 2 Mhz continuously.