

RNTuple CMS Updates

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RNTuple Split Leaf Fields

- RNTuple has a compression optimization called 'splitting'
 - Leaf fields (e.g. UInt32, Float64, etc) are 'split' by high and low bytes
 - high and low bytes are written to their own buffers and compressed separately
- ROOT team found this did not always lead to best compression - Based on studying files from ATLAS and CMS
- Can programmatically set a sub-field to be unsplit

iField.SetColumnRepresentatives({{ROOT::Experimental::EColumnType::kUInt16}});

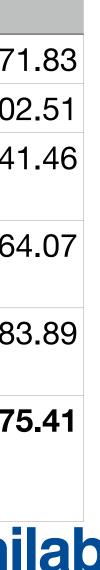


Experimenting with Unsplit Fields

- Created MiniAOD RNTuple file with all leaf fields being unsplit
- Compared sub-field by sub-field which take less space unsplit
 - 11 selected to be unsplit
 - most important is > 10x more space saving compared to 2nd

	File Size	File Size Ratio	Max Allocation Difference	Max RSS Difference	Throughput 1 thread	Throughput 4 threads	Throughput 8 threads
TTree	4,685,680,260	1.000	С	0	36.98	71.69	71.83
RNTuple streamer	4,389,401,160	0.937	671,073,224	645,521,408	46.42	160.95	202.51
RNTuple streamer NoBufferedWrite	4,458,400,816	0.951	-483,245,408	-399,437,824	43.26	41.37	41.46
RNTuple streamer zipCluster 25M	4,371,796,184	0.933	156,402,944	166,908,559	44.52	123.46	164.07
RNTuple selectUnsplit	4,329,154,343	0.924	706,087,944	668,169,830	46.54	156.03	183.89
RNTuple selectUnsplit zipCluster 25M	4,299,318,060	0.918	173,786,808	109,907,968	44.12	135.48	175.41
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MiniAOD Writing Summary



Throughput

