Quick look at veto bit frequencies

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Driving Question

- Some vetoes seem to be unnecessary, because their work appears to be handled by other vetoes
  - Why not eliminate them?

Veto Frequency for BackgroundAvgPdr+Albedo_Upwards Source

- Used a 95K event run of backgndavgpdr and albedo_upwards
- There were 9259 vetoes for 10278 triggers (all triggers considered), or 90% rejection
- Did not use any additional "albedo filters," because the focus here is on OnboardFilter alone
- Considered Inclusive and Exclusive Frequency
  - Inclusive means: how often the veto occurred, inclusive of other vetoes (it was NOT the only veto that occurred for that event)
  - Exclusive means: how often the veto occurred, exclusive of other vetoes (it WAS the only veto that occurred for that event)

Bit Frequency

Bold: "correct" numbers

Looking at **OnboardFilter** output			Looking at **FilterAlg** output		
Veto Bit	Exclusive Frequency	Inclusive Frequency	Veto Bit	Exclusive Frequency	Inclusive Frequency
15 - inactivated	0	0	15	0	0
16	143	354	16	143	354
17	107	583	17	107	583
18	120	199	18	120	199
19	43	1865	19	43	1865
20	94	4448	20	**89**	4448
21	140	762	21	140	762
22 - inactivated	0	0	22	0	0
23 - inactivated	0	0	23	0	0
24	36	2506	24	36	**2500**
25	4	3743	25	4	**3772**
26 - inactivated	0	0	26	0	0
27	1	2236	27	1	2236
28	217	4806	28	217	4806
29	24	1305	29	24	1305
30	4	6826	30	4	6826

Observations

- No evidence of problems with bit 29 in this sample
  - This problem was discussed last time
  - Sample may not be big enough, or some of our work on memory issues may have cleared it up
    - Will run more events to find out
- Bits 25, 24, and 20 differ going from OnboardFilter to FilterAlg, but the behavior is understood and expected
  - Veto 25 occurs first in the code, but sometimes misses vetoes. Veto 24 picks up some of these, and Veto 20 picks up more
    - Explains why OnboardFilter has a lower freq for V25, but higher for V24 and V20.
- Vetoes 30, 27, and 25 look to be ineffective if one looks at the Exclusive column
  - But this is deceptive!

"Low" frequency vetoes

- Note that V30 has only 4 exclusive vetoes, but 6826 inclusive vetoes.
  - This means it does a lot of the work of other vetoes before the others have a chance.

    Good for quick processing! Saves CPU time!
- Likewise, V27 and V25 have low exclusive freq, but high inclusive freq

Look at the details →

Veto 25 in detail

- Used this type of cut:
  - GltWord>3 && (FilterAlgStatus & veto 25 bit) && (FilterAlgStatus & veto "X" bit)
  - This gives the freq of events that have both V25 and at least one other veto, including veto "X"
  - Then do this, to go farther "downstream"
    - GltWord>3 && (FilterAlgStatus & veto 25 bit) && !(FilterAlgStatus & veto "X" bit) && (FilterAlgStatus & veto "(X-1)" bit)

Veto 25 results

(GltWord>3 && (FilterAlgStatus & 2**10) && (FilterAlgStatus & 2**9)) = 0, so veto 24 does not pick up the slack

(GltWord>3 && (FilterAlgStatus & 2**10) && FilterAlgStatus & 2**6)) = 72, so veto 21 is activated 72 times. That's 72 times that more CPU time is consumed than could have been.

(GltWord>3 && (FilterAlgStatus & 2**10) && (FilterAlgStatus & 2**5) && !(FilterAlgStatus & 2**6)) = 3323,

so for the events that make it through V21, V20 is activated 3323 times!

Eliminate veto 25, and veto 20 has to do all the work, but veto 20 is much more CPU intensive because it deals with track finding.

Veto 27 Results

Same method as used with Veto 25

- Veto 26 not activated
- Veto 25 would be activated 1082 times
- Veto 24 would be activated 851 times
- Veto 21, 20 times
- Veto 20, 154 times
- etc…

Point is: CPU intensive vetoes would have to do the work not done by V27

Veto 30

Not really necessary to look at, but for completeness…

If V 30 inactivated,

Veto 29 activated 829 times

Veto 28 activated 4093 times

etc…

Clearly, veto 30 should not be eliminated

Conclusion

- Certain vetoes seem to be redundant, and ineffective on their own…however, they save CPU time because they are encountered before more complicated filtering logic
  - Recommendation: Keep all vetoes currently in OnboardFilter/FilterAlg