

## **UPV now comes with many utilities**

## h(t) veto production

Channels are processed one by one and vetoes are produced using the trigger frequency

### **Online vetoes**

The architecture to produce vetoes based on UPV thresholds is now in place

## h(t) hierarchical veto

Same approach as hveto:

- redundancies are removed
- dead-time is optimal

## **Matrix**

Every pair of channels is considered  $\rightarrow$  very useful to characterize noise paths and couplings

**UPV** 

## **UPV veto production**



### Why do we need a hierarchical approach?

UPV is run on several hundreds of channels. Many of them provide redundant data quality information.

We cannot blindly combine hundreds of vetoes. The channel-by-channel performance is very good but the overall performance is poor.

#### **Triggers selected by UPV**



 $\rightarrow$  We need to combine a minimal number of channels



## **UPV hierarchical report**



The hierarchical approach of UPV has many advantages:

 A minimal set of channels are selected for vetoing

- The dead-time is minimal

– Channels are naturally ranked  $\rightarrow$  helpful for noise investigations

Preliminary tests on VSR2 data show good performance:

For h(t) triggers with SNR>8:

- number of channels = 13
- dead-time = 1.2%
- efficiency = 48%

round

UPV report round by



The architecture to produce online vetoes based on UPV optimized thresholds is now in place

- Thresholds are produced by UPV and saved on disk (ROOT files). We need to determine how often this tuning should be performed
- Thresholds are loaded and veto segments are produced by <u>Omicron</u> when the triggers are produced (latency~20s)
- Veto segments are saved in a FrEvent structure and send to SegOnline
- Threshold files can be updated anytime without stopping any process

- $\rightarrow$  Some preliminary tests were successful. More tests (greater scale) are needed.
- $\rightarrow$  Some threshold history needs to be implemented
- $\rightarrow$  We need to think about a way to save these vetoes (I'm pessimistic about DQSEGDB)

# **UPV** matrix

ch critt, 2 matters are gaves	
tarst one as the coupling scale value	
second are 21 the frequency conversion	factor: x8 + sp-consercion

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HALL IN THE OF IS	5.000 ( 5.00				Local Data and the	12231-0.20	1271.438	1.000 10.00	5.00 5.00	5.30 5.30 5.342 5.342	5.0015.00			1000.000	1001100	1201-120	12011-0.20	1201-120	1201-1220	120110.00 120	1.4.12 0.000 I B.	30 1.271 1.4.32	5,000 5,00 5	0013.0 0013.00	100 100 100 1	271.632 1271.632	12711-0.02	1001110	1001-014	121110
CADITY & D IN 10	8.300   8.30	LINE OF COLUMN LINE				1001-010	100.00		8.300   8.30	1.00   1.00   1.00   1.00	1011410 1201	14.02 1.211	4.0 1.0 1.4.0			LINEAR	LINELE	LINE	LINE LINE	12221-0122	1442 20114	12 1221 14.12	8.300   9.30 P	0013.0 8.30018.	1201-010 1		107100	120711.00	2.001-0.00	P.MC.LER.
NAMES AND ADDRESS		terran C terran C terran	C 101100 101100 100	NIGHT NAME AND ADDRESS OF ADDRESS	8.300   8.300   8.30 8.30	1201-032	828X 1 6.02	8,300   9,30		5.300   5.300   5.30 5.30	8,001 8,00 8,002	14.20 2.201	14.20 2.2011-0.20	0.00x ( 0.00	8.00× 19.00	1211-0.0	8.271 1 4.32	1271-0.0	1211-112	1072-0400 E-0	1.40.00 B.300 I B.	30 1.112 1.0.20	8,300   9,30   9	00   5.30   5.300   5.	B 2201 - 0.00 B	2010.0	82811-0.00	2021426	1201-0.02	12121-035
NACES A VIEW OF	<u>1001-010</u>	1001410 ENEL410	1001-0.00 1001-0.00 100			1.071-0.00	1071030	8,800   9,30			1001402 1007	10.00	1438 <u>1011438</u>	2.262 - 2.26	100100	1.00110.00	2.00112.00	140110.00	100.000	1071420 10	1.4.00	100 1001-020	2.300   2.30	<u>19 19 19</u> 2300 19	<u>102-03</u>	02140 <u>0</u> 102140	102100	1001120	LIN: LE	100100
MACHINE & LANCER		1011-010 1212-010 101-01			530 <u>1001 100</u>	1001-010	100100	11010.00		5.300   5.300   5.30 5.30	ENGLAND EAST	14.32	14.00 8.00114.00			102110	102112	102110	102.110	1217-1410 121	1440	120 12121	8,300   9,30   9	80   8,30   8,300   8.	107110.00		100110.00	8.200 I 8.3H	1021030	100.110
and a Fight on an	0.000 10.00				1.00   1.00   1.00	1201-020	1201-120	100100	0.000   0.00	5.50 5.500 5.500 5.500	5.500   5.30	10.00				8.200 - 6.00	8.200 - 0.00	12001-010	5.200   -6.30	1001400 L0	1.000 T 8.	10 1.200 1 4 54	0.000 0.00 0		12001-0.02 1	2001-0.00 1207-1-0.00	12071-030	1001430	100100	1071434
	1.000   1.00					8.0714.00	107 14.0	100110.00	5.000   5.00	5.50 5.50 5.500   5.500	1.000 1 0.000 1 0.000 1 0.000	14.82 8.280				Lang Lang	AND INC.	1.0211.0	1.02 1.0	1207 14.00 1.207		120114.00	1.00 1.00 1		8.228   4.38		1.07 1.00	120411.0	1.00 1.00	Long Law
CARGONI & C. D. D.				LAN DRAIDS DATE	100 1000 1000	1.011-0.02	100110.00	1001-020		5.300   5.300   5.300   5.300	8.000 ( 9.00 ) 24(72)	14.00 0.0721	and arrian			101100	11111-010	1111-012	10111-010	MILLER C MIL	10 10 B 200 I B	30 1/71/4.00	8,300   9,30   9	0013.0 0.0013	101102	1011030 1001030	2.021-0.02	120110-0	10721-010	1001-021
NACES 1 1 10 10 10		1200 1410 1410 1200 1410	C 101140 101180 10		1.002 L 102	<u>8.020 - 6.04</u>	8.020 ( - 0.0K	8.300   9.30			1001000 1000	14.00	an <mark>ti amanti</mark>	NAME OF A DESCRIPTION O	101112.00	1071-010	11071-010	10011-000	1001-000	101110	1436 23614	100 10001-0.04	8.300   9.30 23	<u></u>	<u></u>		1011-010	10010.00	1001-010	10011030
8-80471 4 0 PT 07 10		LOSI 4.0 1201 4.0 1201 4.0	L2121-0.22 L2121-0.22 D		830 <u>2001 20</u>	1211-122	1271.128	11711110		8.360   8.360   8.36   8.30	1.040 ( 0.00 1 1 200 )	14.32	1-8-24 <u>8-260 1-8-24</u>	2.000 ( D.00 <sup>-</sup>	<u> 2000 - 2007</u>	1001100	10010.00	100100	2.012 ( 2.02	1211102 12	1.4.0	12011-0.02	8.300   9.30 9	88   5.38   5.388   5.	120710.00		101110	120111.0	8.007 1 8.00	1001100
HALL CARE OF B		100100 C 100100 100100	2 1.001-0.02 1.001-0.00 1 1.00		1.000 <u>1.000 1.000</u>	10110.0	101140	1101110		5.300   5.300   5.300   5.300	1001000	14.02	14.00 5.00014.00		2007 - 200 🖬	100.000	1001110	100100	100110.00	82081-0.00 8.20	8,300 1 8	30 <u>1218   0.00</u>	8,000   9,00   9	80   5.30   5.300   5.	8.228.1-0.30 E	101103	5.000 1 40.00	8.207 ( B.3H	<u>8.002 ( 0.04</u>	107110
1011 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	8.300   8.30	DELEN DELEN DELEN		100 0 100 100 100 000 000	AND MACHINE &	2021424	AND LODE	1.001.0.00	5.00 5.00	5.00 5.00 5.00 5.00	5.00   5.00				100.000	10100	100.000	100.000	10110	Lines 10	1000 B.000 F.	and the second	2.00 2.00 2	5.00 13.00 13.	120103	ARCAN MARKED	CORTON:	1011112	END OF	
101 1 2 10 00 10 10 00	1.000   1.00					100.000	100.00	1101111	5,300   5,30	1.001 0.001				100110	100110	1201110	1.224   1.30	1.001 1.00	1224 1122				5.0015.00 5	0011.00		20110.02	120010.00		1011430	
HALL IN THE REAL PROPERTY OF A DEC	5.000 ( 5.00				1.10 1.100 1.4.10	ENGLENI	LINE I LINE	1.000 1.000	5.00   5.30	5.30 5.30 5.300   5.300	10011010 1000			A DECISION OF T		100.100	100110	100.110		120110.00 120			5,000 5,00 5	0013.0 00.000	ENDIERO		Line in the		LIGHTLE STREET	THE R. P.
CASHI LO IN S		THE FAM C LINE AND ADDRESS		ALLER LATING		2.001-0.00	100100	100.00		530 530 530 530	1011010 102	14.12 1.220	4.00 0.0001-0.00	1.221 1.225	1/21 1.10	LITLER.	MALLER	101118	101110	1011410 10		12 132 432	8,300   9,30   9	00   0.30 0 0.300   0.	0 <u>1122   1.10</u> 1		1.111.1.10	11201110	1171110	LIBLIE
NAMES OF BRIDE			1 107140 100101 T		1001 100 <u>1000 100</u>	100110	1.22 ( 1.25 B	1.000 ( D.00		5.300   5.300   5.30 5.30		1426 20020		<u>1.000 - 1.000</u>	<u> 2000 - 2000</u>	100100	100 C 10	100 110 <b>1</b>	100 A 10	1201-0.00 120	1.0.0	1 1001-0.00	8,300   9,30 21	<u>0.1349</u> 🖬 0.300 ( 0.	1.00 L 10 L		100100		1011110	-
MARKING & LONG		ETELAN ENTINE ETELES			1.000 1 2000 1 200	8.200 ( 8.32	8.200 ( 8.82	111212.0		8.300   8.300   8.30 8.30		110.00		2.007 1 2.00	2.007 1 2.00	<u> 1.001 (1.00</u>	1.222 ( 1.16)	<u> 2.222 - 2.25</u>	<u>1.222   1.25</u>			-	8.300   9.30 2	83 18.30 8.300 18.	121010.00	2011030 12251030	122111.00	1200-11-00	120013.00	1.200 ( B.20
BACKET LINE OF B		1071410 1001410 EMIL40		100 0 100 100 100 100 100 100 100 100 1	838 <u>2002 1938</u>	8.007 ( 8.00	8.007 ( 8.80	1.00.000		2.300   2.300   2.30 2.30	1001-010 1072	1.0.0	100 100 100	<u></u>		12011120	120110.00	120110-0	120110.00	100100		-	8.000   9.00   11	N 1842	121010.00		120111-010	1200 I D.00	1211110	8.007 ( 8.00
max 1 Mar or 10			D 112-122 120-123 D	1.4.10 <u>1.001 1.000</u>	5.00 <u>1.002 ( 4.00</u>	1.000 1.0.00 D	1.001 ( 1.00 B	1.001 ( 1.00 D		8.300   3.300   8.30 8.30	100.100 B	1.1.2		2.000   2.42	2.000 1 2.42	100 100 B		1.00 1.00 B	<u></u>	120112-0		1 100 100	5.0019.00 0	88 8.308 8.308 15.	102123	<b>1</b>		<u>1.129 - 1.13</u>	1.071 ( 1.00 B	100 (1 () <b>D</b>
BACHTED IN D		THE PARTY PARTY IN THE PARTY INTERPARTY IN THE PARTY INTERPARTY INT			110 <u>1100 14.00</u>	102 110 B	2.002   2.00	1.001 ( 1.10 <sup>-</sup>		2.30 2.30 2.30 2.30		10.20		2.001 2.12	2.000 1 2.02	LICE AND	100.000	100100	100.00	127113.00		1001-010	8.300   8.30   9	8.00 8.00 8.00			-	100 I I I I	100.110	1000 (1000 D
	9.000   9.00			1000 0 1000 0 100 0 100 0		1000100		Lagran and	5.00115.00	2.30 2.30				Last to a	the second		Ling and	Line Line					5.000 ( 3.00 ) 11	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1201-0.00		-		1771.410	
NACITY I N IN M	0.000   0.00					Law LLC	1.01 1.02	LUC LU	5.00 5.00	838 838 8388 8388	1.00   0.00					LEVIN	LOS I LOS	1.0011.00	1.01 1.01	LAND LAN							Lat Lan	1.222   1.32	1.201   1.02	Local Date
MACHINE OF BRIDE	8,200   8,20	1412 1810 1814 1810 1820 1810	LILLE DESIGN	TANK DATE OF TANK	2001 2001 400 T	100110	100100	1.001 1.01	8,000   8,00	5.00 5.00 5.00 5.00 5.00 5.00		1.4.21	110 110 110	1000 1000	2.242 1 2.25	100110	110110	110110	100.00	1217 ( 4.10 1.21	1.4.20	-	8.000   9.30	11112 <b>1</b> 1100 11	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Log Log		100110	100110
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			1 1.1171-0.00 1.1010 1.1010 1.1010		1001 <u>1001 100</u> <b>1</b>	101111	110111	1.001 0.00		8.300   8.300   8.30   8.30				2001200	2000 10:00	100100	100110 T	1073 I LIN	100 LAN		1422 230123	an market	8.000   9.30 23	C 10.02 1 0.000 1 0.000 1 0.000 1 0.000	1.1211.12 L		100,000		1001100	
0.000 E		100100 100100 F	844 0541096.4 0641096.4 <b>17</b>	01030 0300 0300 020 000	8.00   8.00   8.00 8.00	1001100 <b>0</b>		1.000 ( B.40)		8.300   8.300   8.30 8.30	8.001 8.00 8.000	113.30 2.30511		8.300   9.30	8.00010.00	LIST LESS	100 100 T	<u> 2002 ( 200</u>	100 100 <b>1</b>	8.300   8.30 8.31		30 3300 330	8.300   9.30 9	100 13.30 B.001 B.0	<b>n</b>		1000	8.000   8.30	2.001.0.00	1.001 1.00
8-800 80 00 80	8.300   8.30	LINCOLS LINCOLS LINCOLS	1 100 100 10 100 100 10 100 100 100 100	10 18.50 <u>18.00<sup>-</sup> 18.02</u> <b>1</b> 19.00 <sup>-1</sup> 1	8.300   8.300   8.30 8.300	2010/201	1.00 ( 0.00 B	8,000   8,00	8.300   8.30	2.300   2.300   2.30 2.30	1.000   1.00 P	1000	111 R 1101 R	2.000 1 2.00	2.000 1 2.00	10010.00	0.000110.00	8.000 ( B.M	8.000   9.00	100111.12 R	18.07 R 8.000 F 8	10 LICE 1.12	8.300   9.30	11045 <b>1</b> 1047102	<b>n</b> <u>1001110</u> 9 1	0 0	101 3 M	8.802 I B.M.	8.001 ( S.M. 9	100110.0
NO LA DOR N D	8.000   8.00	5.000 5.00 5.00 5.00 5.00 5.00	5.00 0.00 0.00 0.00 0.00 0.00	01530 5301530 5301 5 301 5 3001 5 301 5 30	5.00 5.000 5.00 1.000 5.000 5.00	5.000 15.00	8.000   8.00	8.000   9.00	5.000 15.00	8.30 8.30 8.300 8.300	5.000 5.00 5.000	10.00 0.0001	1.00 1.00 1.00	8.300   8.30	8.000 19.00	1.00 1.00	8.001 8.00	5.300   5.30	5.000   5.00	5.00 5.0 5.0		30 1.00 1.00	5.00 5.0 5	00   5.30   5.300   5.		100 0.10 0.100 0.100	5.00   5.00	5.500   5.50	5.000   5.00	5.000   5.00
AND A REAL PROPERTY OF THE		And the second se	and the second sec	1.10	ALC: NOT THE OWNER OF THE OWNER OWNER OF THE OWNER OWN					1.10 1.10							And the second second	the second second	Concession of the second								and the second sec			Contraction of the local division of the loc



SOURCES →	H1:ALS- Y_QPD_B_NSUM_OUT_DQ	H1:IMC- DOF_1_P_IN1_DQ	H1:IMC- DOF_1_Y_IN1_DQ	H1:IMC- DOF_2_P_IN1_DQ I
TARGETS ↓				
<u>H1:ALS-</u> Y_QPD_B_NSUM_OUT_DQ	<u>0.998 / 0.00</u>	0.000 / 0.00	0.000 / 0.00	0.000 / 0.00
H1:IMC-DOF_1_P_IN1_DQ	0.000 / 0.00	<u>0.992 / 0.00</u>	<u>0.110 / 0.01</u>	0.300 0.01
H1:IMC-DOF_1_Y_IN1_DQ	0.000 / 0.00	<u>0.086 / 0.09</u>	<u>0.995 / 0.00</u>	<u>0.064 / 0.07</u>
H1:IMC-DOF_2_P_IN1_DQ	0.000 / 0.00	<u>0.720 / -0.00</u>	<u>0.092 / -0.01</u>	<u>0.993 / 0.00</u>
H1:IMC-DOF 2 Y IN1 DQ	0.000 / 0.00	0.106 / 0.07	<u>0.807 / -0.01</u>	0.093 / 0.06
H1:IMC-DOF 3 P IN1 DQ	0.000 / 0.00	0.250 / 0.11	0.044 / 0.12	0.202 0.11
	0.000 / 0.00	<u>0.250 / -0.11</u>	0.044 / -0.12	0.3937 -0.11
H1:IMC-DOF 4 P IN1 DQ	0.000 / 0.00	<u>0.078 / -0.07</u>	<u>0.019 / -0.06</u> 🔽	<u>0.143 / -0.08</u> 🖳
H1:IMC-DOF 4 Y IN1 DQ	0.000 / 0.00	0.129 / -0.05	<u>0.134 / -0.04</u>	<u>0.162 / -0.06</u> 🖳
H1:IMC-F_OUT_DQ	0.000 / 0.00	<u>0.012 / -0.09</u>	<u>0.017 / -0.01</u>	0.058 / -0.07 🖤

### up/down conversion indicator



Diagnostic plots are provided for each identified coupling









- The UPV algorithm can be used for many purposes (veto, online, detchar...)
- UPV is being used in LIGO (N. Christensen)  $\rightarrow$  more and more stable/reliable
- UPV will be a useful tool for Virgo detchar
- UPV is user-friendly: one command line  $\rightarrow$  analysis + web report
- A paper is in preparation (co-written with Nelson)