OSIsoft.

vCampus Live! 2011

Human Body Performance Monitoring and Modeling Using PI System 2010 and PI Coresight

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Who are we?

HULIX

- We strongly believe in the fact that every system has an unused potential and the only way to achieve higher level is with data.

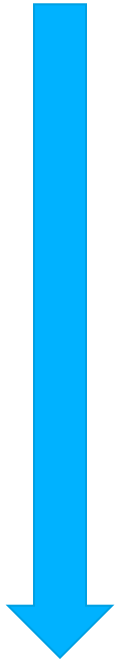
Agenda

- Model of performance
- On Ice Testing
- Mobile Lab infrastructure
- Energy expenditure monitoring
- Injury analysis
- Conclusion and questions

Human Performance

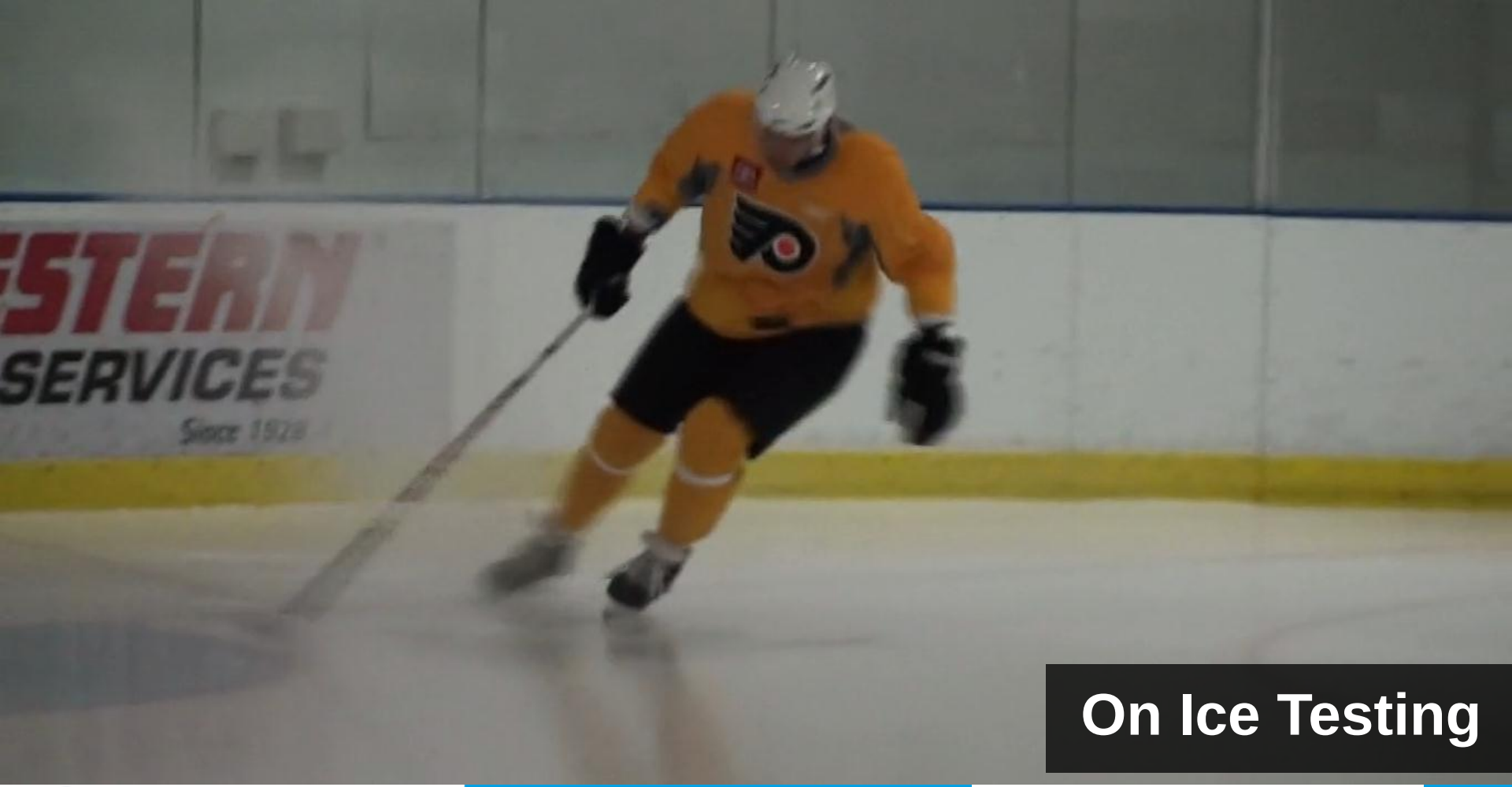
Human performance model

- Moment in time
- Context
- Values / Goals
- Oxygen uptake kinetics
- Biomechanics
- Thoughts / Perceptions
- Failure consequences
- Stress Level
- Time Pressure
- Fatigue
- Decision Making



Amount of energy available

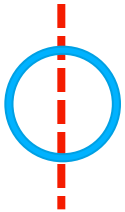
Performance



On Ice Testing

Test Protocol

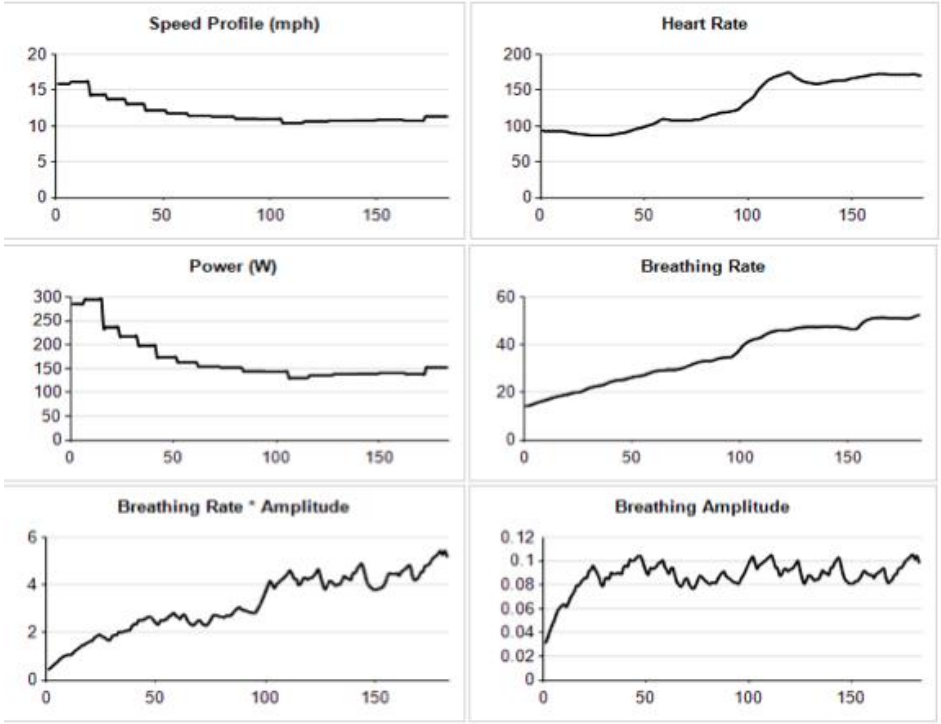
- 3 minutes all out test
- Chest band monitoring heart rate, breathing patterns, posture, motion and skin temperature
- Logs more than 135 records per second



m2mlab

On Ice Testing

www.labm2m.com - 1.877.838.3341

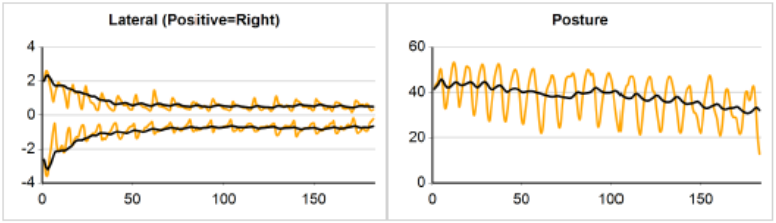


Heart Rate	
Predicted:	195
Maximum:	175
Reserve:	20
Est. VO2max:	51

Power (W)	
Max. Power:	295
Critical Power:	144
Ratio Pmax:	48.7%
Work (KJ):	30.8
WEP (KJ):	7.1

Speed (mph)	
Max:	16.17
Avg.at CP:	10.99

Report Example

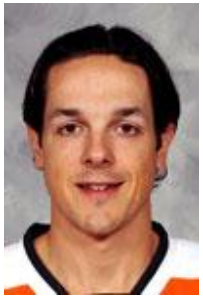
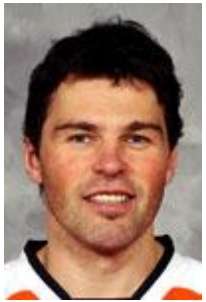


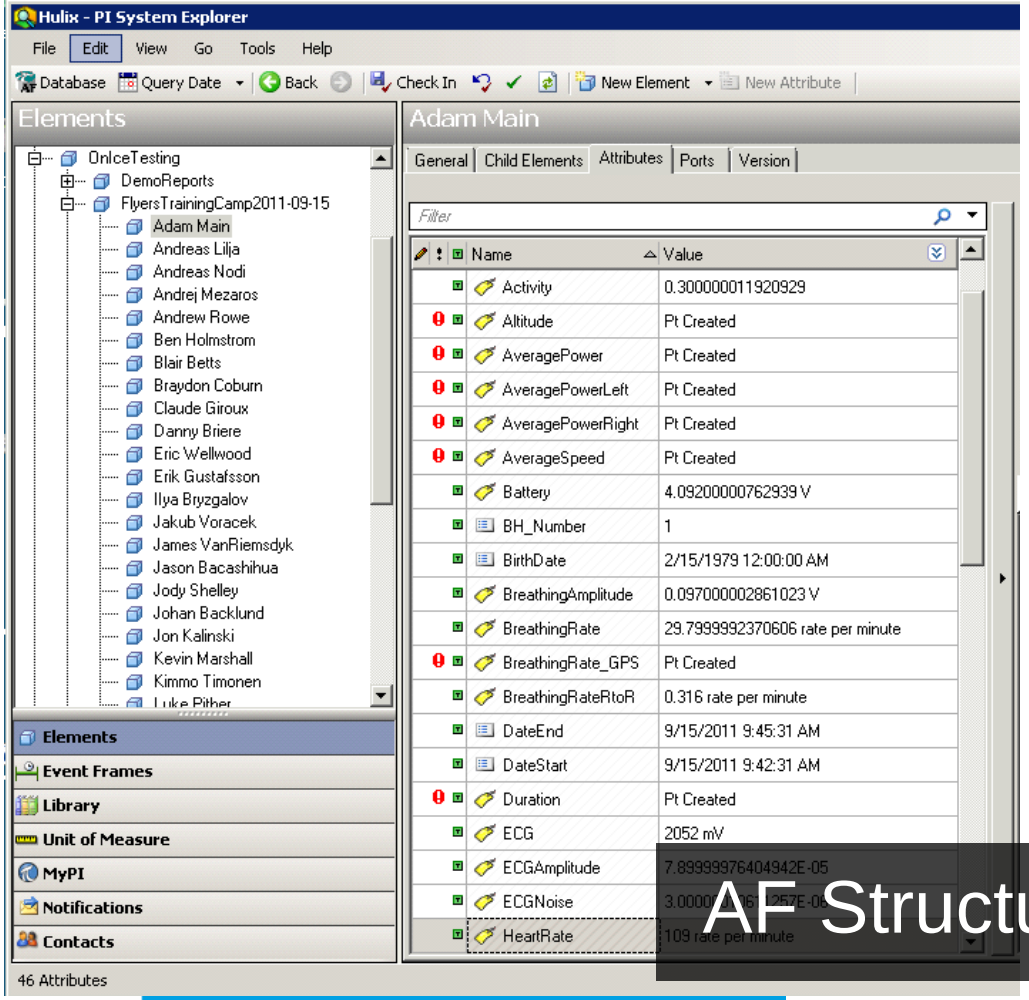
Run	Duration (s)	Speed (mph)	Power (W)	Power Ratio	HeartRate (bpm)	Breathing Rate (bpm)	Left	Right	Posture from Vert.
1	7.64	15.89	286	96.8%	93	14.9	(2.45)	1.84	45.1
2	7.51	16.17	295	100.0%	92	17.0	(1.63)	1.38	43.8
3	8.32	14.61	244	82.7%	89	18.9	(1.22)	1.18	44.1
4	8.78	13.82	220	74.5%	87	20.8	(1.09)	0.85	41.3
5	9.23	13.16	200	68.0%	89	23.2	(1.03)	0.67	41.3
6	9.88	12.29	177	59.9%	95	25.4	(0.95)	0.65	40.1
7	10.26	11.82	164	55.7%	105	27.4	(0.86)	0.59	39.1
8	10.59	11.46	155	52.6%	108	29.3	(0.78)	0.61	36.4
9	10.70	11.34	152	51.6%	111	31.5	(0.72)	0.55	40.7
10	11.00	11.04	145	49.1%	119	33.8	(0.72)	0.53	40.7
11	11.05	10.99	144	48.7%	133	37.5	(0.66)	0.52	38.3
12	11.60	10.47	131	44.5%	163	43.5	(0.75)	0.49	38.0
13	11.40	10.65	136	45.9%	170	46.3	(0.72)	0.47	35.7
14	11.28	10.76	138	46.8%	160	47.4	(0.77)	0.58	36.7
15	11.26	10.78	139	47.0%	164	47.5	(0.79)	0.58	33.1
16	11.17	10.86	141	47.6%	170	48.4	(0.73)	0.52	33.4
17	11.28	10.76	138	46.9%	173	51.3	(0.70)	0.48	31.1
18	10.69	11.36	153	51.7%	172	51.4	(0.72)	0.57	32.6

Report Example

Why PI System 2010?

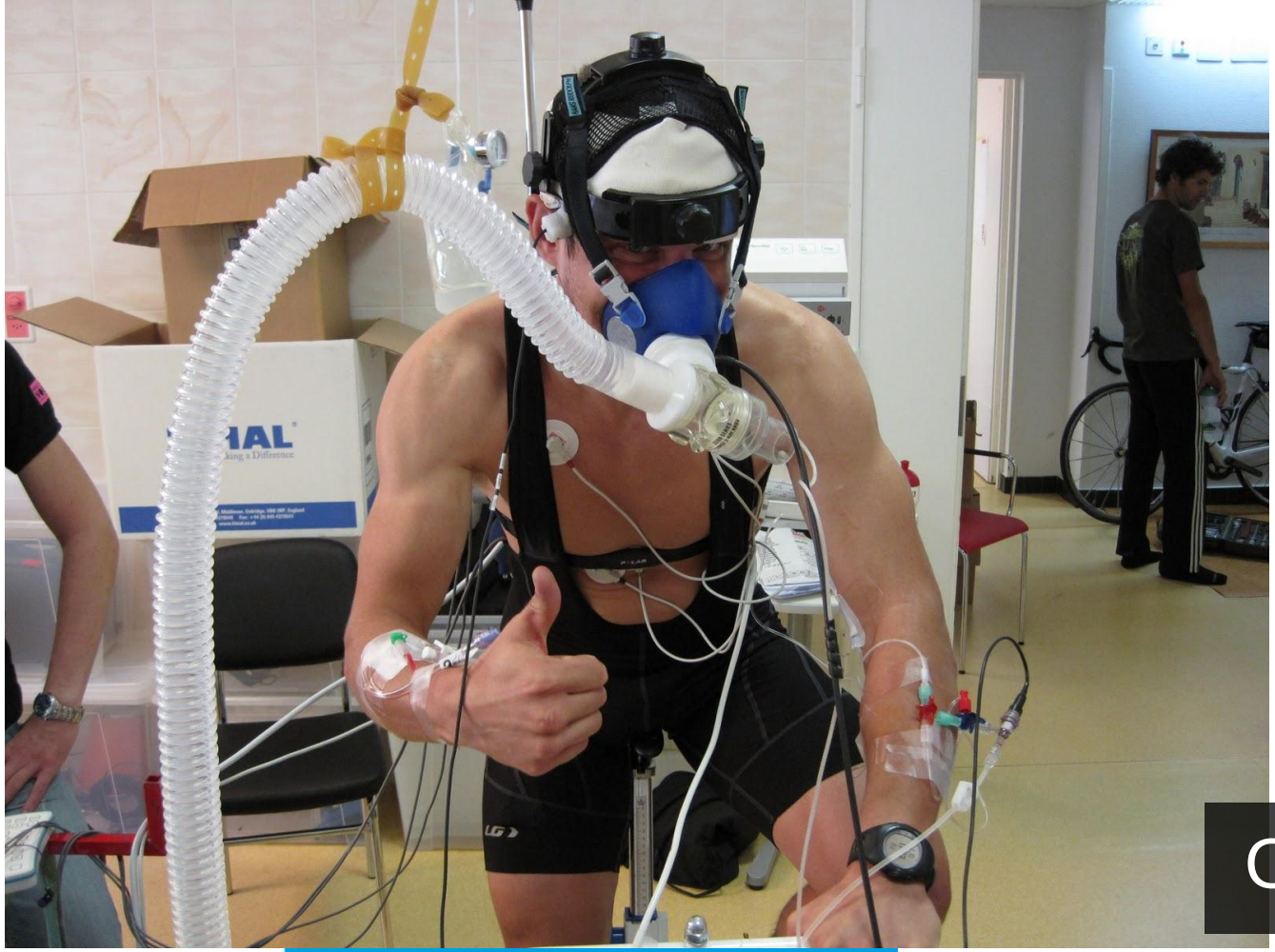
- 25K records per test
- Need to do automated analysis and reporting
- Asset management where every “element” cost you few MM$ per year

AF Structure Example

Mobile Lab



Old Way

New Way

Local DB

CSV - FTP

AF-SDK Apps

PI System 2010

Mobile Lab

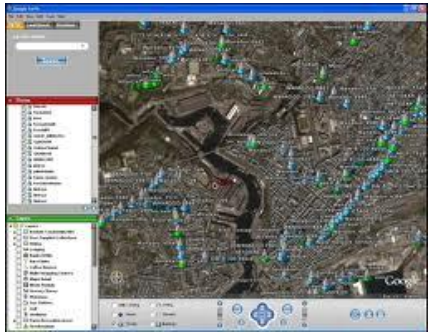
Energy Expenditure, Canadian Forces

- In the field, real-time energy expenditure monitoring
- Musculoskeletal injuries
- 35MM records per day

CSV Log File

3G

AF-SDK Apps

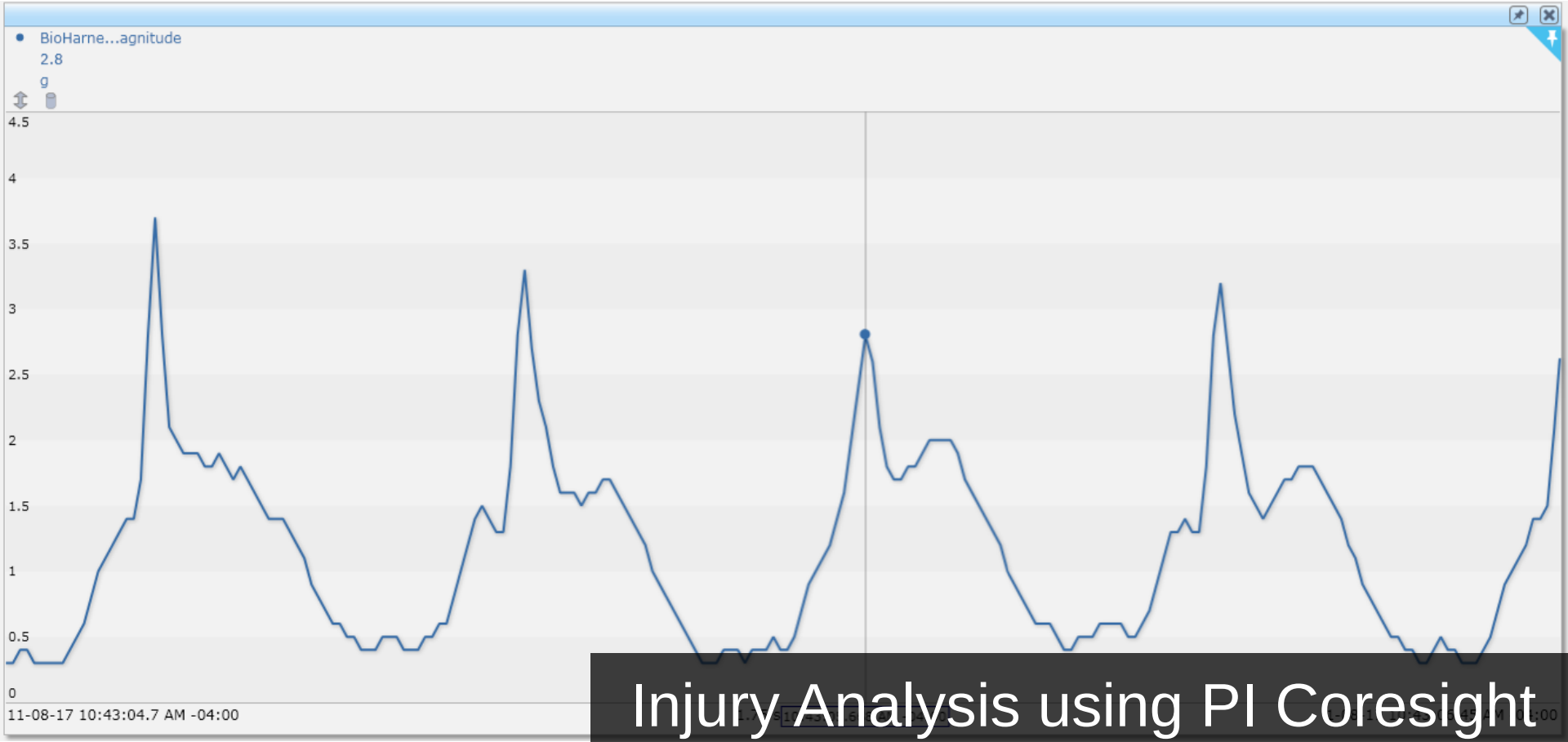


.Net Modeling Library

PI System 2010

Scilab PI-ODBC

Energy Expenditure



Injury Analysis using PI Coresight

PI Coresight Added Value

- Easy navigation and data manipulation (Even a Doctor can do it…)
- Save special events in the cart
- Easy deployment on client side

Future improvements

- Incorporation of PI Event Frame to make data analysis more efficient
- Better PI Web Services interaction with mobile device
- Testing new devices every month…

Conclusion

- Large amount of data to deal with
- Data access is a key feature
- Visualization act as jet fuel in building algorithms
- Future projects with Marine Corps, Olympic Athletes, Workers, Canadian Forces, NHL Players

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President

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Thank you