

Maxeler @ STAC

HFT & RISK deployed on FPGAs

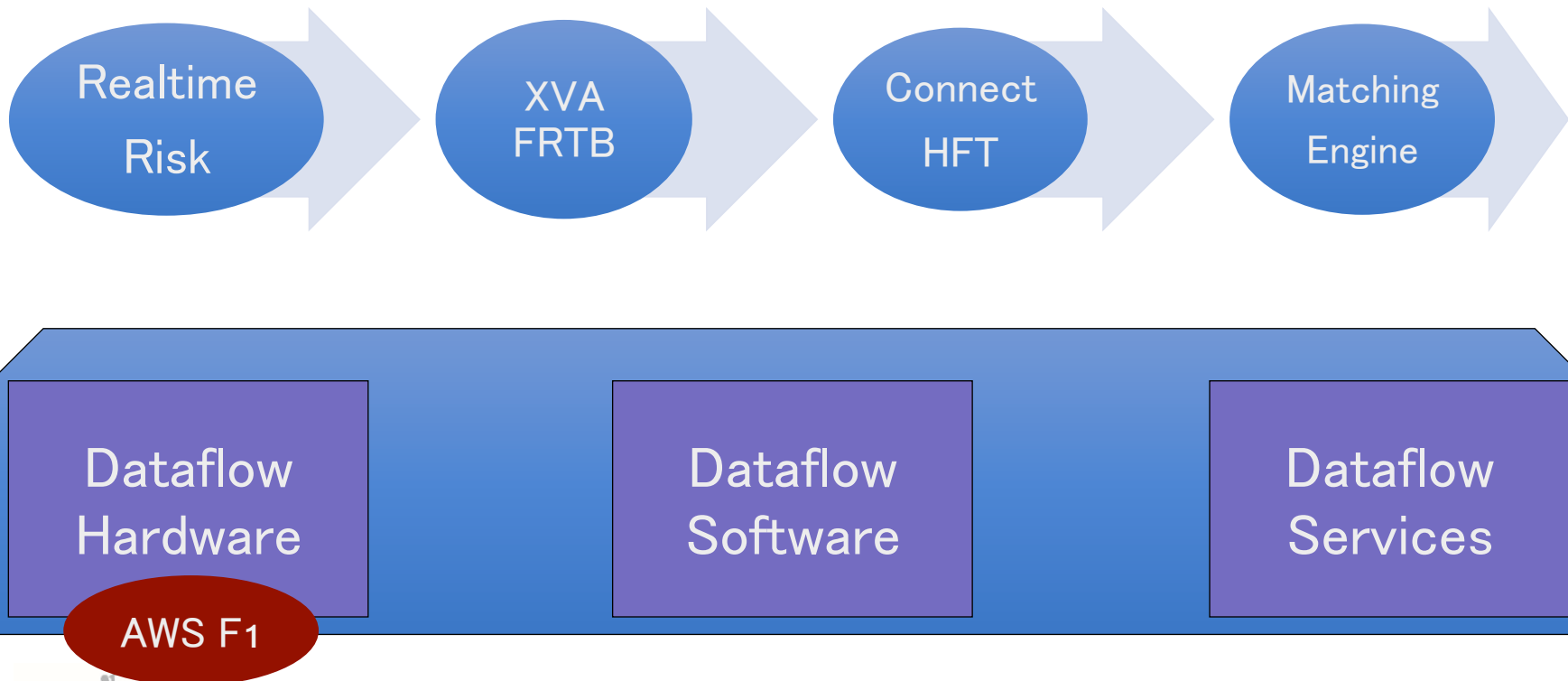
Nov 2018

MAXELER
Technologies
MAXIMUM PERFORMANCE COMPUTING

Solving Risk

By adapting the computer to the problem,
we are helping you to solve the previously unsolvable.

More Timely Information Intra-Day.



Real Time Risk as a Platform

MAXELER MARKET DATA SCIENCE APPLIANCE / RISK LIBRARY

Integrated Quant, Data Science Services & Model management

Open Source Machine Learning
Tools

Maxeler Market Data Science Appliance

AI	Tensorflow, Caffe, Keras, OpenCV, Java, Python, R
FinTech	Backtesting, Jupyter HUB Market Data Compression
Store	Open source storage stack

JBOD: Just-a-Bunch-Of-Disks

Model 1, Model 2, Model 3
Model 4, or any prop Model

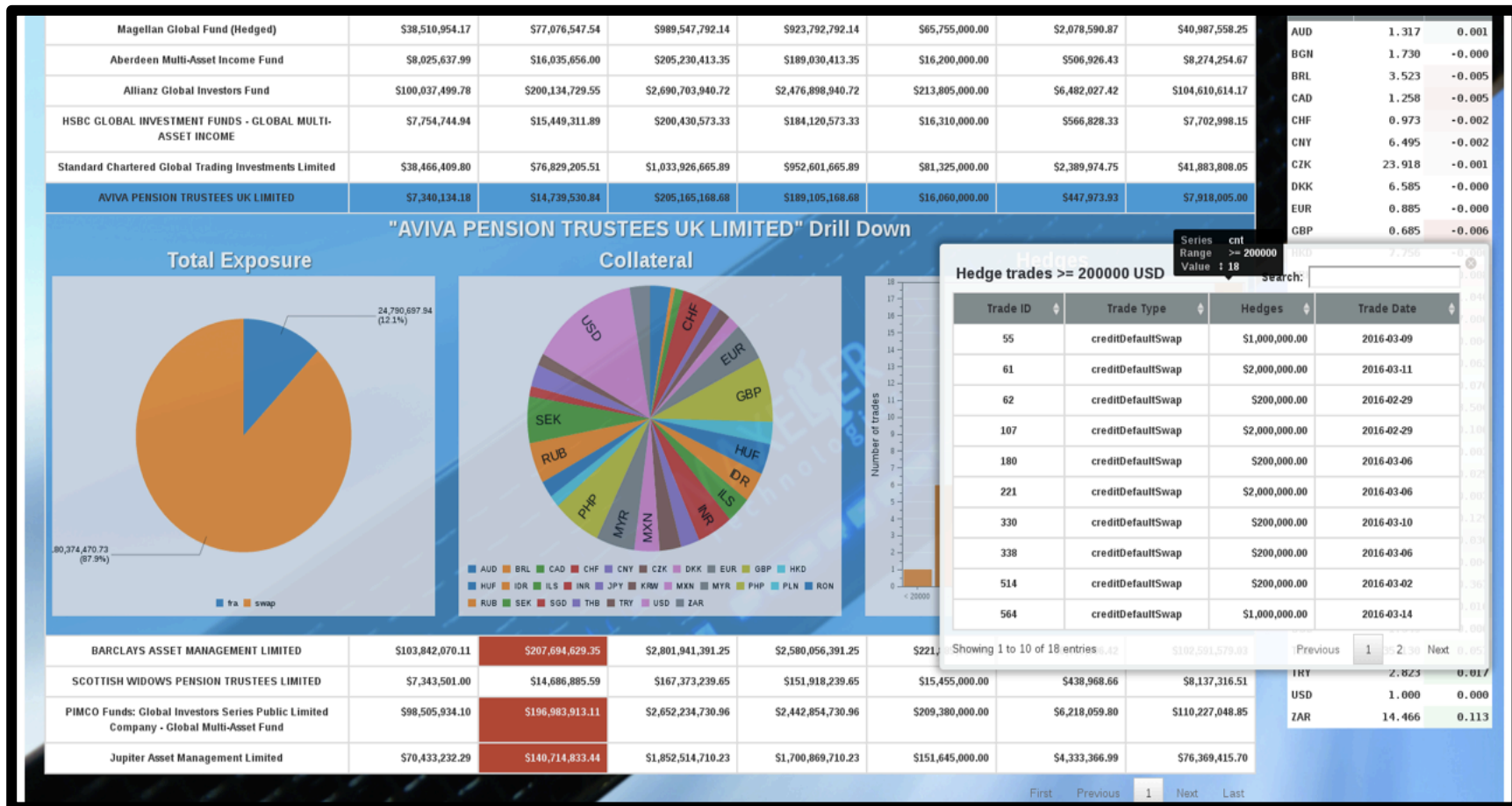
Maxeler Risk Library

Assets	Options, Futures, Swaps, Swaptions, Forwards
Models	Black Scholes, Local Stochastic Volatility
Apps	FRTB, CCR, CVA, RTR

Plain CPUs

AWS F1 & Xilinx FPGAs

Vertical Integration from FPGA to Dashboards



HITACHI

Hitachi Data Systems



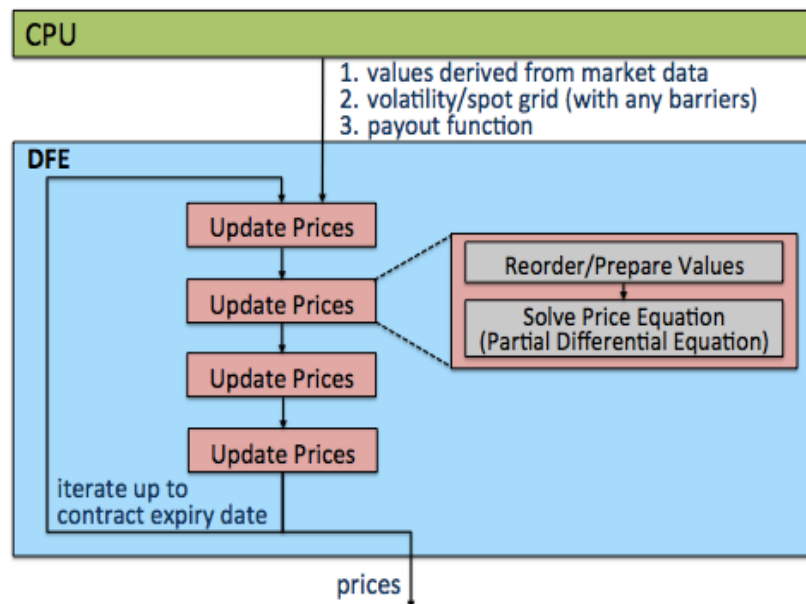
MAXELER
Technologies
MAXIMUM PERFORMANCE COMPUTING

powered by
amazon
web services™

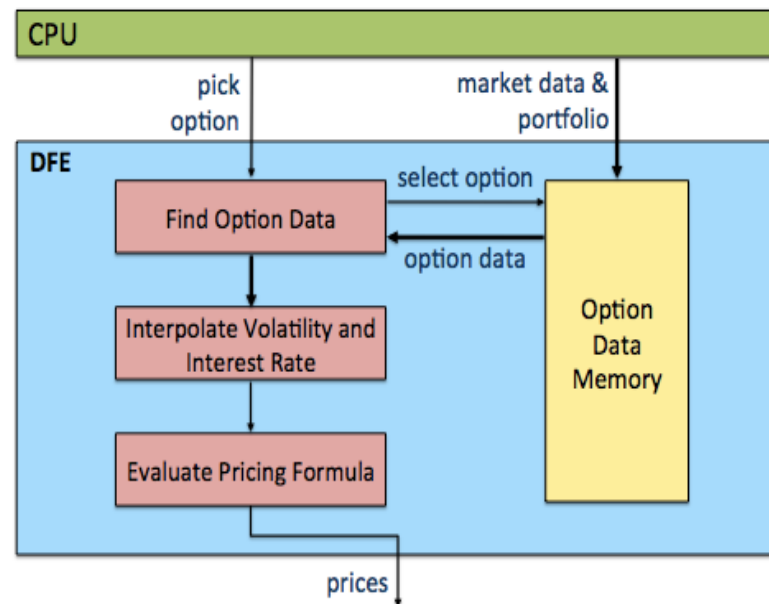
Real Time Risk at a Tier 1 Bank

Spot Slide		Width					1%					
		-2.50%	-2.00%	-1.50%	-1.00%	-0.50%	0.00%	0.50%	1.00%	1.50%	2.00%	2.50%
EURUSD	Spot	1.0481	1.0535	1.0589	1.0643	1.0696	1.0750	1.0804	1.0858	1.0911	1.0965	1.1019
\$ 985,236	PnL	(\$311,426)	(\$252,084)	(\$195,863)	(\$145,281)	(\$97,102)	\$0	\$82,352	\$18,174	\$207,105	\$261,207	\$317,135
	VaR											
	\$ Delta	(\$56,212)	(\$350,495)	(\$1,257,185)	(\$4,198,281)	(\$13,982,850)	(\$24,857,894)	(\$8,082,877)	\$21,223,144	(\$2,756,095)	(\$1,262,855)	(\$512,937)
	Gamma	\$1,081	\$7,385	\$13,688	\$14,441	\$15,193	\$15,946	(\$331,453)	(\$178,974)	(\$23,906)	(\$13,530)	(\$6,489)
	dDelta/dVol	\$49,391	\$175,372	\$301,352	(\$1,182,173)	(\$2,665,699)	(\$4,149,224)	(\$3,712,182)	\$4,733,363	\$194,695	\$219,753	\$151,446
	Vega	\$674	\$5,362	\$10,050	\$11,473	\$12,896	\$14,319	(\$149,937)	(\$126,143)	(\$15,161)	(\$9,546)	(\$4,937)
	W Vega											
	Theta	(\$1,202)	(\$1,609)	(\$2,015)	(\$2,369)	(\$2,722)	(\$3,076)	\$30,442	\$27,715	\$3,594	\$2,449	\$1,320
	DV01 / Rho											
	VaR	\$121,875	\$122,500	\$123,125	\$123,750	\$124,375	\$985,236	\$125,625	\$126,250	\$126,875	\$127,500	\$128,125

FX Exotics Real-time Risk



FX Vanilla Real-time Risk



Maxeler's 5 solutions for the Financial Industry

		Description	USPs	Customer segment	Technology Readiness
1	High Frequency Trading	FPGA Appliance co-located at the exchange, for CME, Eurex, Nasdaq, etc.	Low latency	Banks Hedge Funds	TRL 9
2	Finance Gateway	Processing of the connection between exchange and the traders	Low latency On AWS F1	1. Banks 2. Hedge Funds 3. Exchanges	TRL 9
3	Risk Analytics Software	The only FPGA based solution for calculating complex Risk scenarios: from hours to minutes	Speed of execution On AWS F1	1. Banks 2. Hedge Funds 3. Exchanges 4. Insurance	TRL 8
4	Market Data Science Appliance	Collaboration solution for back testing, market events forecasting and data analysis	Low latency On AWS F1	1. Banks 2. Hedge Funds 3. Exchanges 4. Insurance	TRL 8
5	Matching Engine	Technology that enables matching of supply and demand at wire speeds	Speed of execution On AWS F1	Exchanges	TRL 6