

Lessons from Developing FPGA based Advanced Trading Systems for China's Capital Markets

• Louis Liu •

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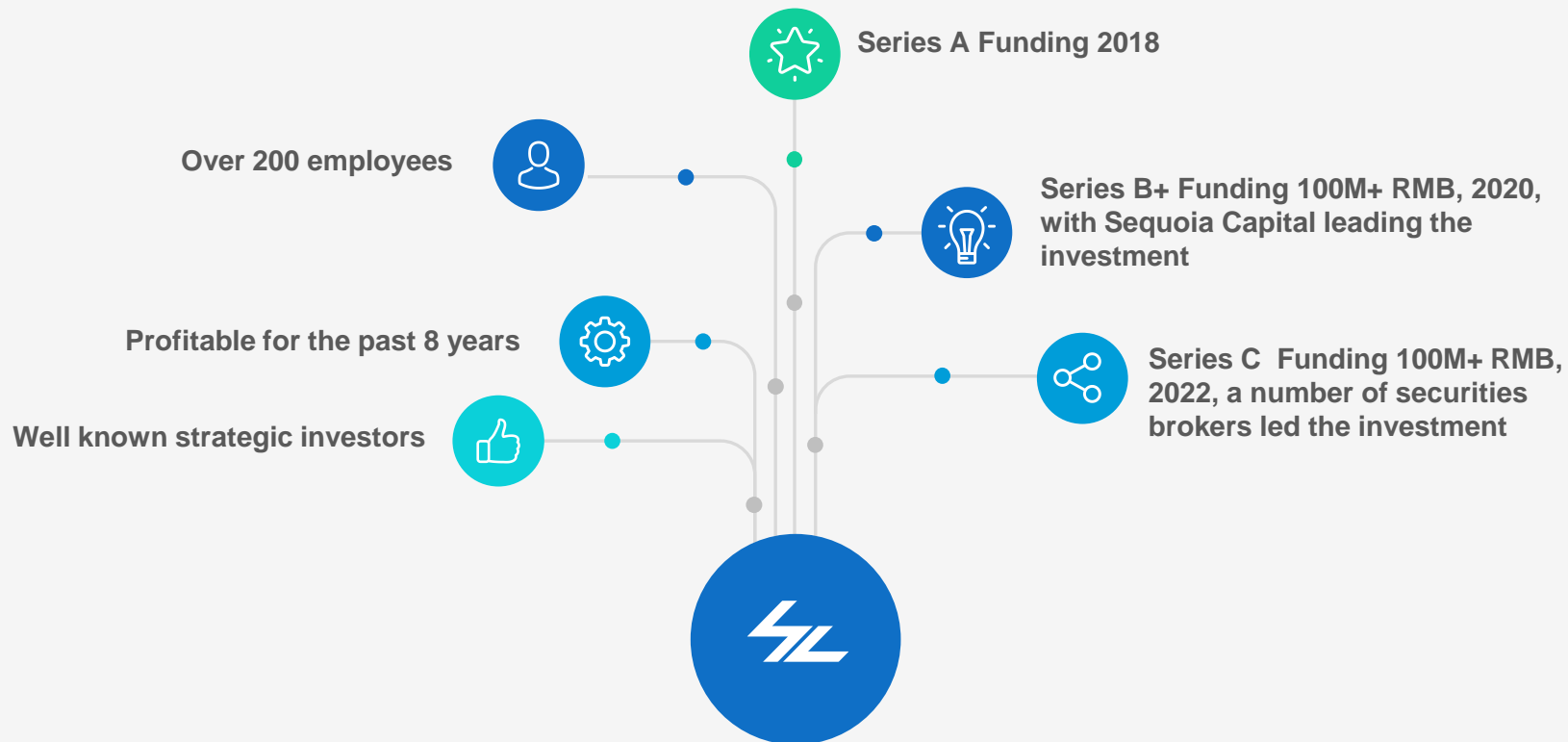
CEO

- Serial entrepreneur, close to 30 years of industry experience
- Datek Online, Island ECN
- Founder of Sonic Trading, acquired by BNY Mellon
- Previously MD of BNY Mellon
- BA and MS from Columbia University

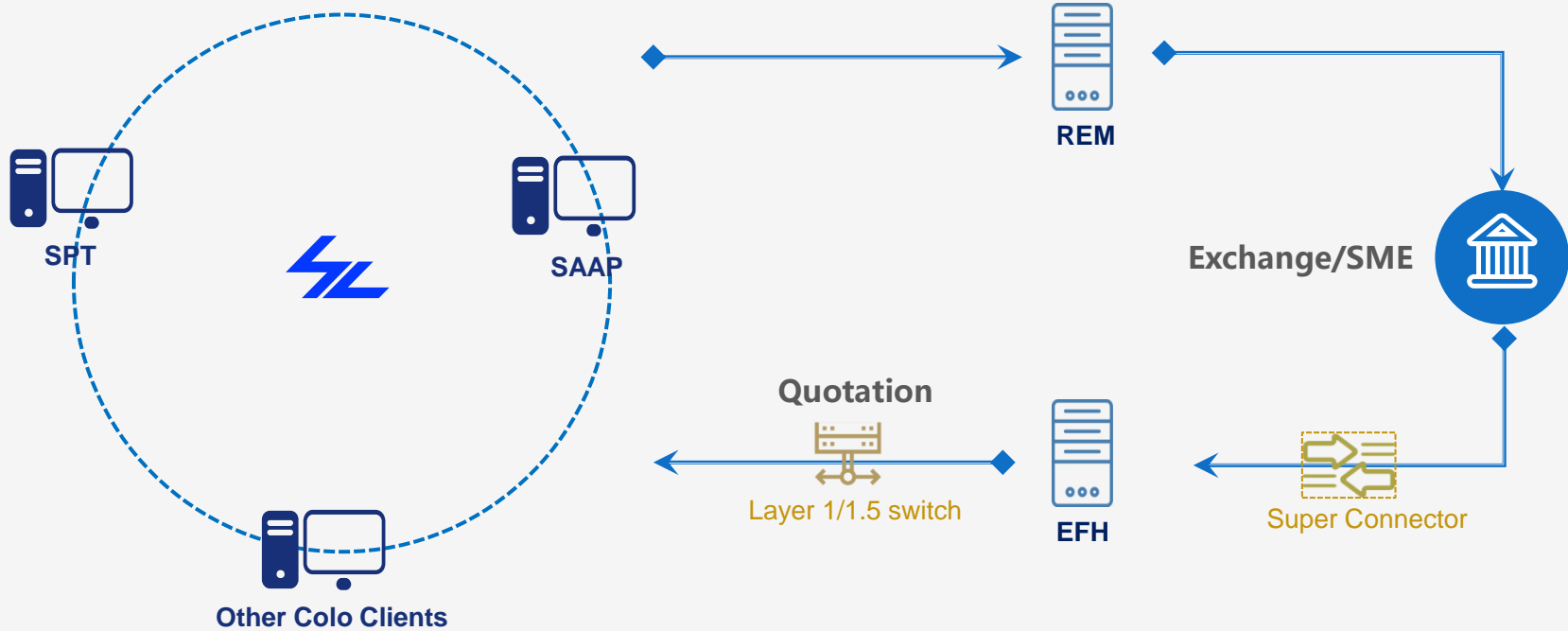
U.S. Experience

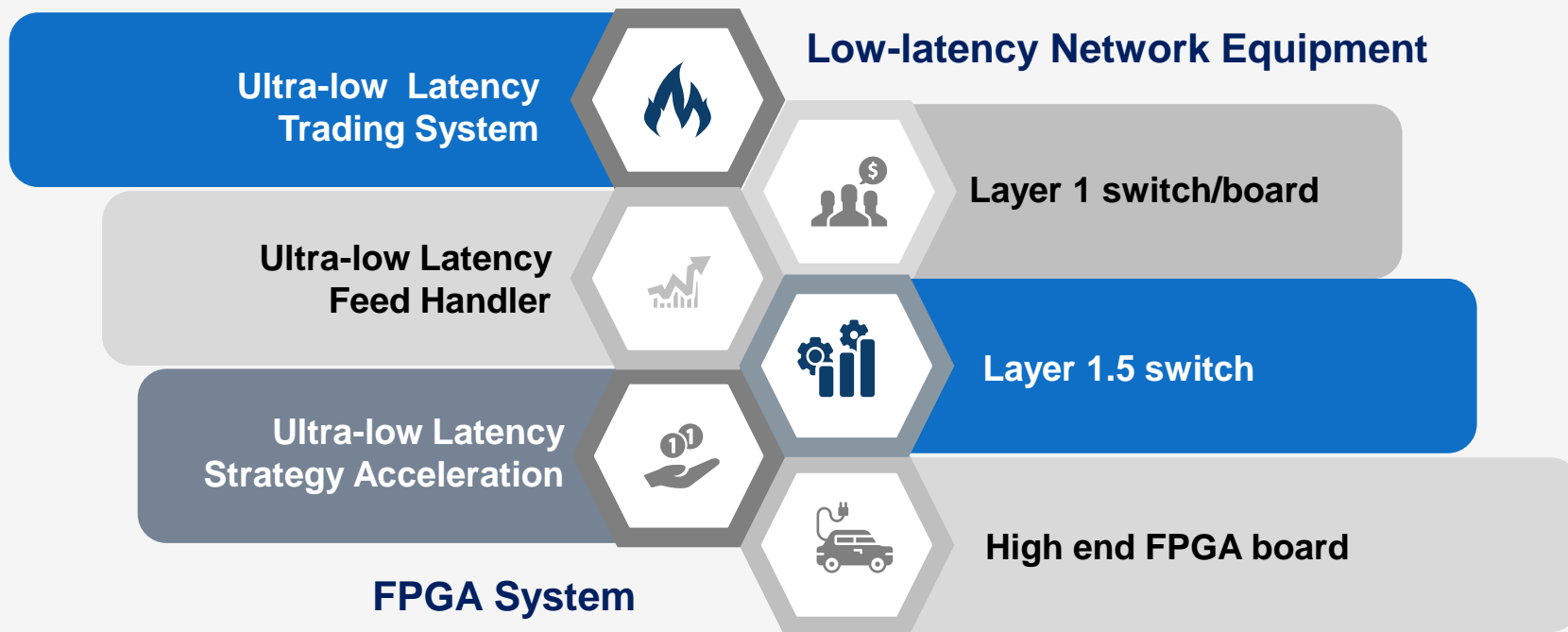
- SOES, SelectNet
- SuperDot
- SuperMontage
- Order Handling Rule- ECNs
- NYSE and NASDAQ buying ECNs
- REG NMS
- Dark Pools

China experience: Shengli



Shengli Trading Ecosystem





Securities Brokers

- REM Ultra-low Latency Trading System
 - Securities Edition
 - Option Edition (Market Maker)
- EFH Ultra-low Latency Feed Handler
- RiskGuard
- Layer 1/1.5 switch/board
- High end FPGA board
- Customized HPC

Futures Brokers

- REM Ultra-low Latency Trading System
 - Futures Edition
- EFH Ultra-low Latency Feed Handler
- Layer 1/1.5 switch/board
- High end FPGA board
- Customized HPC

Trading Firms

- SAAP Hardware-based Program Trading System
- Trading Simulator
- SPT Program Trading Platform
- Customized HPC

Partners & Clients (partial list)

 <p>华泰证券 HUATAI SECURITIES</p>	 <p>中国银河证券 CHINA GALAXY SECURITIES</p>	 <p>中金财富 CICC Wealth Management</p>	 <p>国信证券 GUOSEN SECURITIES</p>	 <p>兴业证券 INDUSTRIAL SECURITIES</p>	 <p>湘财证券 XIANGCAI SECURITIES</p>	 <p>光大证券 EVERBRIGHT SECURITIES</p>	 <p>国泰君安证券 GUOTAI JUNAN SECURITIES</p>
 <p>浙商证券 ZHEJIANG SECURITIES</p>	 <p>东兴证券 DONGXING SECURITIES</p>	 <p>中泰证券 ZHONGTAI SECURITIES</p>	 <p>东方财富证券 Eastmoney Securities</p>	 <p>招商证券 CHINA MERCHANTS SECURITIES</p>	 <p>东方证券 ORIENT SECURITIES</p>	 <p>华鑫证券 CHINA FORTUNE SECURITIES</p>	 <p>财达证券 CAIDA SECURITIES</p>
 <p>UBS</p>	 <p>粤开证券 YUEKAI SECURITIES</p>	 <p>CICC 中金公司</p>	 <p>华创证券</p>	 <p>广发证券 GF SECURITIES</p>	 <p>中信证券 CITIC SECURITIES</p>	 <p>东吴证券 SUOCHOW SECURITIES</p>	 <p>长城证券 GREAT WALL SECURITIES</p>
 <p>安信证券 ESSENCE SECURITIES</p>	 <p>财通证券 CAITONG SECURITIES</p>	 <p>德邦证券 Topsperity Securities</p>	 <p>甬兴证券 YONGXING SECURITIES</p>	 <p>申万宏源证券 SHENWAN HONGYUAN SECURITIES</p>	 <p>开源证券 KAIYUAN SECURITIES</p>	 <p>麦高证券 MYGUIDE SECURITIES</p>	 <p>上海中期期货 SHANGHAI CIFCO FUTURES</p>
 <p>中信期货 CITIC FUTURES</p>	 <p>海通期货 HAITONG FUTURES</p>	 <p>华泰期货 HUATAI FUTURES</p>	 <p>东证期货 ORIENT FUTURES</p>	 <p>光大期货 EVERBRIGHT FUTURES</p>	 <p>兴证期货 INDUSTRIAL SECURITIES FUTURES</p>	 <p>国泰君安期货 GUOTAI JUNAN FUTURES</p>	 <p>银河期货 GALAXY FUTURES</p>
 <p>鲁证期货 LUZHENG FUTURES</p>	 <p>国信期货 GUOSEN FUTURES</p>	 <p>广发期货 GF FUTURES</p>	 <p>申银万国期货 SHENYIN & WANGUO FUTURES</p>	 <p>中信建投期货 CHINA FUTURES</p>	 <p>南华期货 NANHUA FUTURES</p>	 <p>方正中期期货 FOUNDER CIFCO FUTURES</p>	 <p>五矿经易期货有限公司 MINMETALS & JINWEI FUTURES CO., LTD.</p>
 <p>华闻期货 HUA WEN</p>	 <p>宝城期货 BAOCHENG FUTURES</p>	 <p>新潮期货 WWW.XINHU.CN</p>	 <p>招商期货 招商期货</p>	 <p>瑞达期货 RUIDA FUTURES</p>	 <p>浙商期货 ZHEJIANG FUTURES</p>	 <p>美尔雅期货 www.mfc.com.cn</p>	 <p>大有期货 DAYOU FUTURES</p>
 <p>山金期货有限公司 SHANJIN GOLD FUTURES CO., LTD.</p>	 <p>广州期货 GUANGZHOU FUTURES</p>	 <p>金瑞期货 江铜集团 JINRUI FUTURES</p>	 <p>财信期货 CHASING FUTURES</p>	 <p>东兴期货 DONGXING FUTURES</p>	 <p>建信期货 OCB FUTURES</p>	 <p>长江期货 CHANGJIANG FUTURES</p>	 <p>中州期货 ZHONGZHOU FUTURES</p>
 <p>天风期货 TF FUTURES</p>	 <p>中银国际 BOC INTERNATIONAL</p>	 <p>宏源期货 HONGYUAN FUTURES</p>	 <p>中融汇信期货 ZHONG RONG XING FUTURES</p>	 <p>弘业期货 HOLLY FUTURES</p>	 <p>国元期货 GUOYUAN FUTURES</p>	 <p>国富期货 GUO FU FUTURES</p>	 <p>Hicend 海证期货</p>
 <p>金元期货 GOLDSTATE FUTURES</p>	 <p>云财富期货</p>	 <p>招金期货 ZHAO JIN FUTURES</p>	 <p>华西期货 HUAXI FUTURES</p>	 <p>国盛期货 GUOSHENG FUTURES</p>	 <p>恒泰期货股份有限公司 HENGTAI FUTURES CO., LTD.</p>	 <p>ITG 国贸期货</p>	 <p>平安期货</p>

Shengli Network Equipment Series 1/2

SLink_33048_H



MG11_41100



NF11_41100



Model	Number of Ports	Interface	Application	Weight	Note
SLink_33048_H	48	SFP+	Nodewatch/414 40/level1 switch	9.5kg	Intel Agilex® 7 FPGA Adopt dual card design Support firmware remote upgrade Support optical module information acquisition Support fan and power status detection Support ILO function
MG11_41100	2	QSFP+	Over the Counter System	940g	Intel Agilex® 7 FPGA Board size: 3/4 length, full height PCIe board FPGA : AGFB027R24C2E1V PCIe x16 : Gen3.0/Gen4.0; QDR-IV : X2 144Mb 1066MHz; DDR4 : X2 32GB DualRank ECC RDIMM
NF11_41100	2	QSFP+	Market Data	290g	Intel Agilex® 7 FPGA Board size: half-height, half-length PCIe board FPGA : AGFB014R24B1E1V PCIe x16 : Gen3.0/Gen4.0; DDR4 : X2 2GB

Shengli Network Equipment Series 2/2



SLink_41016_L



SLink_31016_L



SLink_5X036_L



SLink_3X048_L



SLink_32112_L

Model Type	Data Channel	Switching Delay	Total Latency	Data Rate	Product Characteristics	Weight
SLink_41016_L	16	0.25-3ns	<3ns	1G/10G/25G/40G/100G	<ul style="list-style-type: none"> Low latency, flexible application and almost no performance jitter No additional cabinets and power supply are required It can be directly inserted into the server 	170g
SLink_31016_L	16	0.25-1ns	<1.3ns	1G/10G/40G	<ul style="list-style-type: none"> Low latency, flexible application and almost no performance jitter No additional cabinets and power supply are required It can be directly inserted into the server 	180g
SLink_5x036_L	36	<2ns	<4ns	1G/10G/40G	<ul style="list-style-type: none"> 1U Standard, supporting 40G Almost no performance jitter 	8.25kg
SLink_3x048_L	48	0.25-1ns	<3ns	1G/10G	<ul style="list-style-type: none"> 1U Standard, almost no performance jitter Implement topology between switches Multiple switches are cascaded to form with more ports 	8.95kg
SLink_32112_L	112	<2ns	<4ns	1G/10G	<ul style="list-style-type: none"> 2U Standard with up to 112 physical ports Almost no performance jitter 	10.65Kg

Not STAC Benchmarks

REM EMS Overview



System Functions



FPGA Hardware Technology



Mature Technology



Ultra-low Latency



High Availability

EFH

Shengli Extreme Feed Handler (EFH) is the first, revolutionary product, built on cutting-edge FPGA technology to provide market data handling and distribution in China.

01. Shanghai Stock Exchange

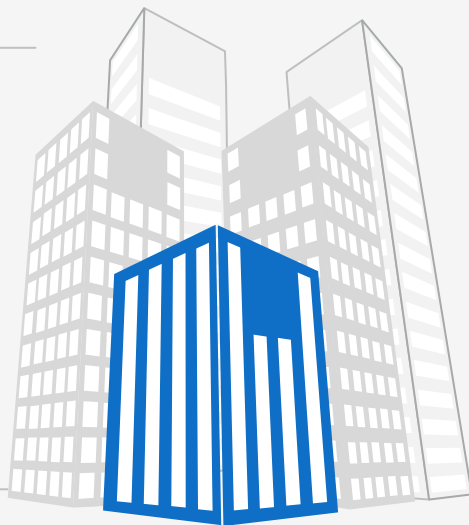
Binary market data

Level-1, Level-2 book, ETF options
market data

02. Shengzhen Stock Exchange

STEP market data

Level-1, Level-2 book, ETF options
market data



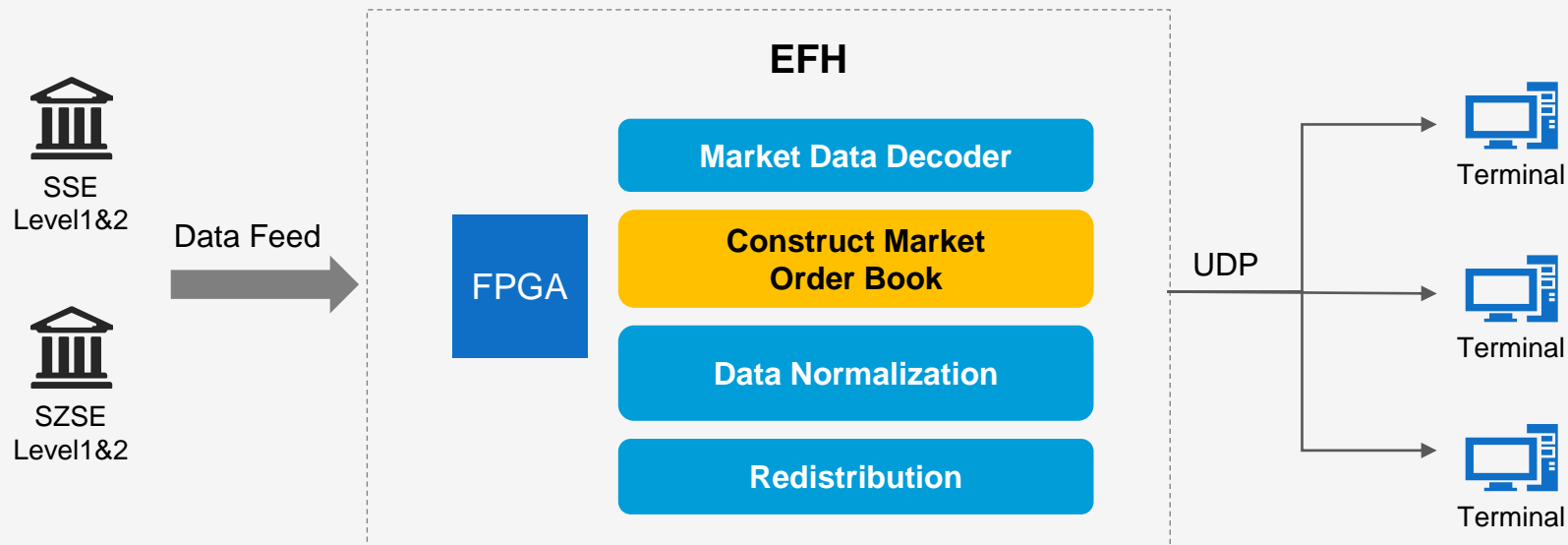
03. Build full order book

Based on tick-by-tick data

04. Indices market data

05. Bond market data

EFH: Professional Version



Shengli Solution - RiskGuard



- RiskGuard is an ultra-low latency pre-trade risk control system developed by Shengli's team based on FPGA technology. The system is built entirely around preventing abnormal transaction risks.
- The system is deployed at the network link level, and customers are directly connected to the exchange gateway. It not only prevents quantitative investors and member companies from being warned or punished by regulatory agencies due to abnormal transactions, but at the same time can achieve ultra-low latency performance.

System Features



<500 ns average
latency



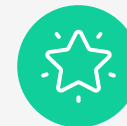
System load capacity
exceeds 1 million
messages per second



Risk checks are
completely performed
in hardware

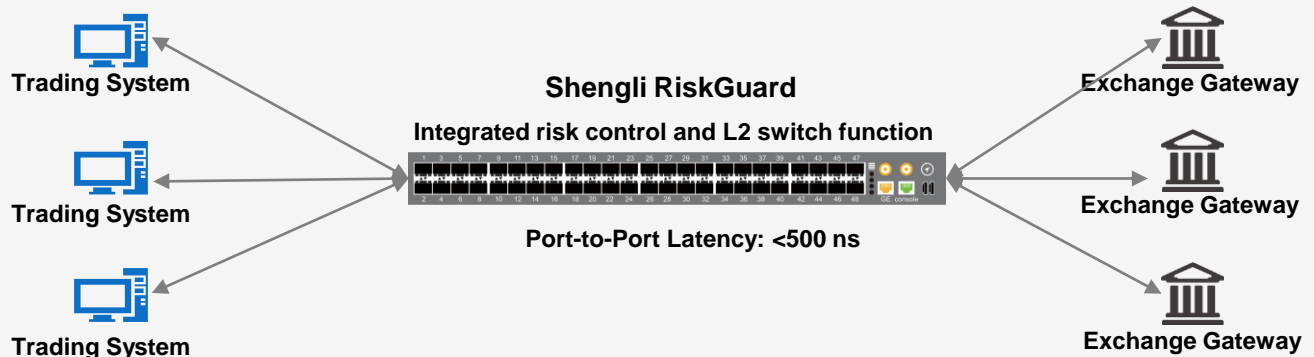


Over 20 transaction
compliance checks

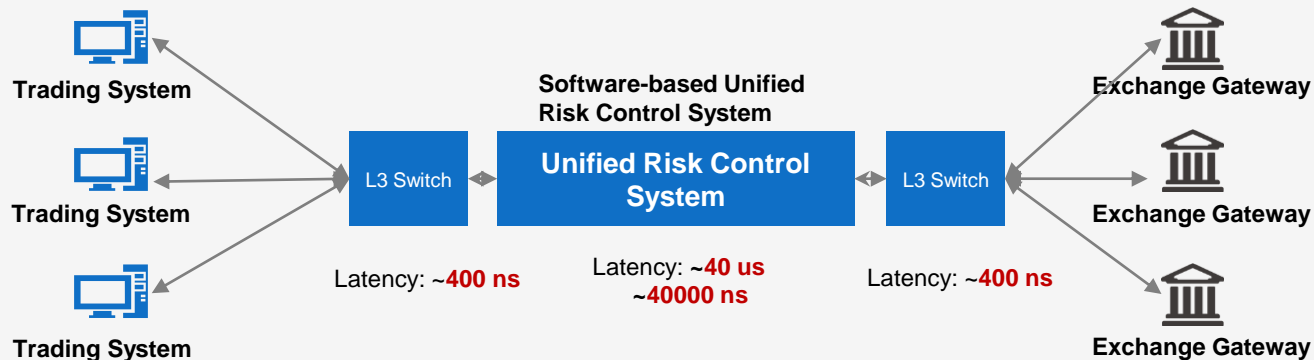


Rapid deployment
without affecting the
current business

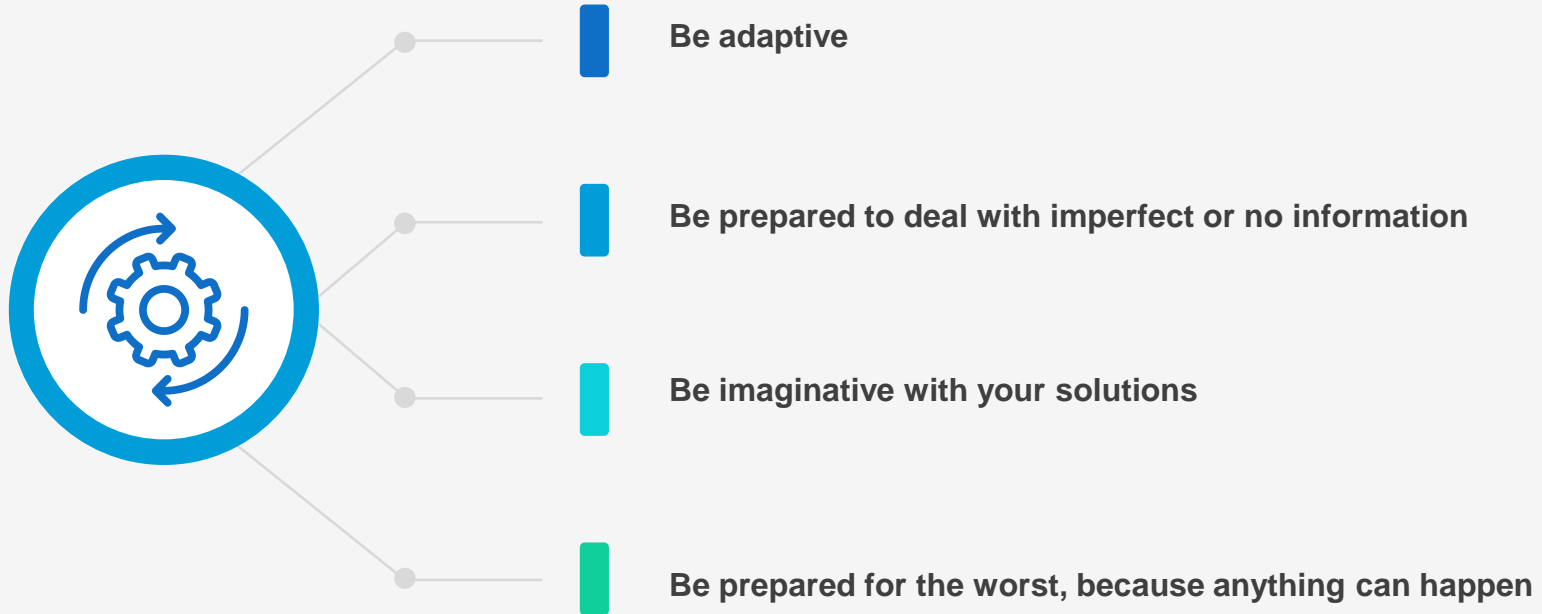
Technical Highlight 4: Improve Performance and Simplify Deployment



VS



Not STAC Benchmarks



THANKS! –

TRADE WITH EDGE

Contact info: Louis Liu,
Louis@shenglisoft.com