HOCHIMINH STOCK EXCHANGE
HOSE

Global **IT** Partner
›koscom

Member company's IT operation
following Vietnam's stock market system development plan
Based on Korea's capital market case

March. 2017

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IT paradigm change : IT is not a choice, it's a necessity.

As globalization has advanced and we are entering into severe competition era, securities IT a matter of investment, not an expense and it is compulsory for survival of securities companies

High Frequency Trading
IT : MMDB, RDMA, FPGA

"Technology Powers Finance"

✓IT is a compulsory factor for company's survival in information era.

✓ IT has emerged as key tool for a companies for breeding new business opportunity.

✓ IT industry is propelled by administrative factor rather than technological factor.

Viewpoint change of IT industry

▪ What is our company's business goal?

▪ How should IT be formed in order to meet the company's business goal?

Conventional view

Changed view

Business

IT

▪ How has company's business goal changed through IT introduction?

▪ How did IT devoted to meet business goal?
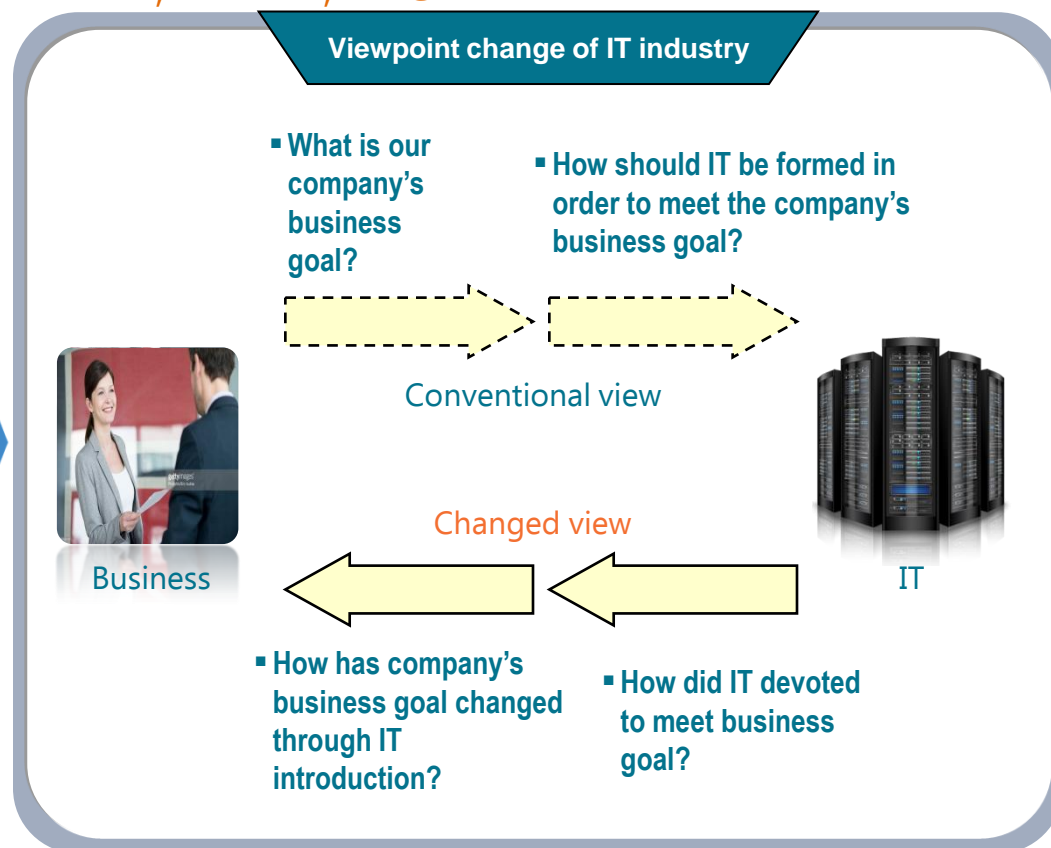
IT development and changes in service

Starting from computerization of securities firm's business, Korea's securities IT is now beyond the main competitiveness of a company and at the phase of creating new Biz opportunity. Changes in IT is leading securities service transition.

1st change (Branch Service)	2nd change (Home Service)	3rd change (Mobile Service)
IT development		
✓Main Frame ✓On-Line order system ✓PC ✓Electronic display, ATM, ARS	✓Down Sized Server ✓Wired internet, Mobile ✓HTS/internet banking ✓Electronic authentication, back up center	✓Cloud Service ✓Wireless internet ✓Smartphone/tablet
Changes in service		
✓Trading in off-line branches ✓Share off-line financial information ✓Cash based finance environment	✓Less visit to offline branch ✓HTS craze ✓Growth of online securities company ✓Development of related financial institution.	✓STS, simple payment ✓Smart Branch ✓Breakdown of barrier between financial sectors.

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1st change – Online computerization

The era which started computerization of stock market led by government , which made quantitative growth. The system was necessary in order to manage a bulk task effectively.

Changes in IT	Financial investment sector	Exchange	Koscom

- **Convergence between information and communication industry**

- **Computerization of manual task**

- **Computerization of manual task**

- **Main pillar of Korea securities market's computerization**

Save Cost, Pursue Efficiency

Changes in IT
- ✓ Advent of early task computerization attributed by IT technology.

- ✓ Stock exclusive net was formed by IT development

Financial investment sector
- ✓ Online terminal was installed in branches.
  ➡ Phone order was transformed to online order.

- ✓ Inclusive management of customer ledger by computer.
  ➡ Able to operate automated settlement daily.

- ✓ Dramatic performance enhancement

Exchange
- ✓ Secured rapid pace, accuracy and transparency of trade by development of trade matching & settlement system.

  (Past:: trade was made manually within POST in exchange)

Koscom
- ✓ Securities online ledger management system was operated – **ASP model** (83)

- ✓ Automatic matching system & settlement was operated (88)

- ✓ In charge of computerization of financial investment field until 96.
  ➡ Main pillar to brought 1st change

2nd change– Generalization of the internet

The internet was widely spread by 2nd industrial revolution and Home Trading was generalized in Korea, which ranked 1st in the world with high speed internet penetration rate

Changes in IT	Financial investment sector	Exchange	Koscom
▪ **The world connected with the internet**	▪ **Bull market and net profit increase**	▪ **Market diversification**	▪ **Preemptive measure for drastic financial environment change**

Changes in IT
- ✓ With the government's policy to provide PC, internet user has increased.

  140,000('94) → 19,000,000('00)

- ✓ Possible to construct High-speed communication net with ISDN service.

Financial investment sector
- ✓ private investor increased by bull market and HTS development
  - ➥ Enough capacity to invest in IT sector with the record high profit

- ✓ Tailored service for various customer's needs.
  - ➥ Active development and operation of exclusive ledger system

Exchange
- ✓ Various index including stock/bond/futures/option and derivative market

- ✓ Foreign exchange system development and support for constructing Northeast Asia financial hub.

Koscom
- ✓ Internet based HTS was initiated(`98)

- ✓ initiated digital certification business by establishing authentication center(`00)

- ✓ Opening of DR center (`02)

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3rd change – Mobile on daily basis

With the advent of IT, there has been a dramatic change in financial market and crisis and opportunity started to coexist . Technology was no longer an assistant, but became a leader of finance market.

Changes in IT	Financial investment sector	Exchange	Koscom

Changes in IT

- **Various IT mega trend was introduced**

- ✓ Mobile, Cloud, Big data, SNS, Open Source, Fintech

- ✓ Enlarge business area be yond IT sector to financial field.

Financial investment sector

- **Fierce competition to secure business opportunity**

- ✓ Intensified competition due to the global financial crisis and long-term bear market
  ➡ Continuous decrease in profit due to lower brokerage commission

- ✓ Various IT trend including MTS, STS, and smart branch to Biz.
  ➡ Increased IT investment burden

- ✓ Barrier collapse between financial sectors. (banking/card/insurance/securities)
  ➡ Sector with high capital power could only survive.
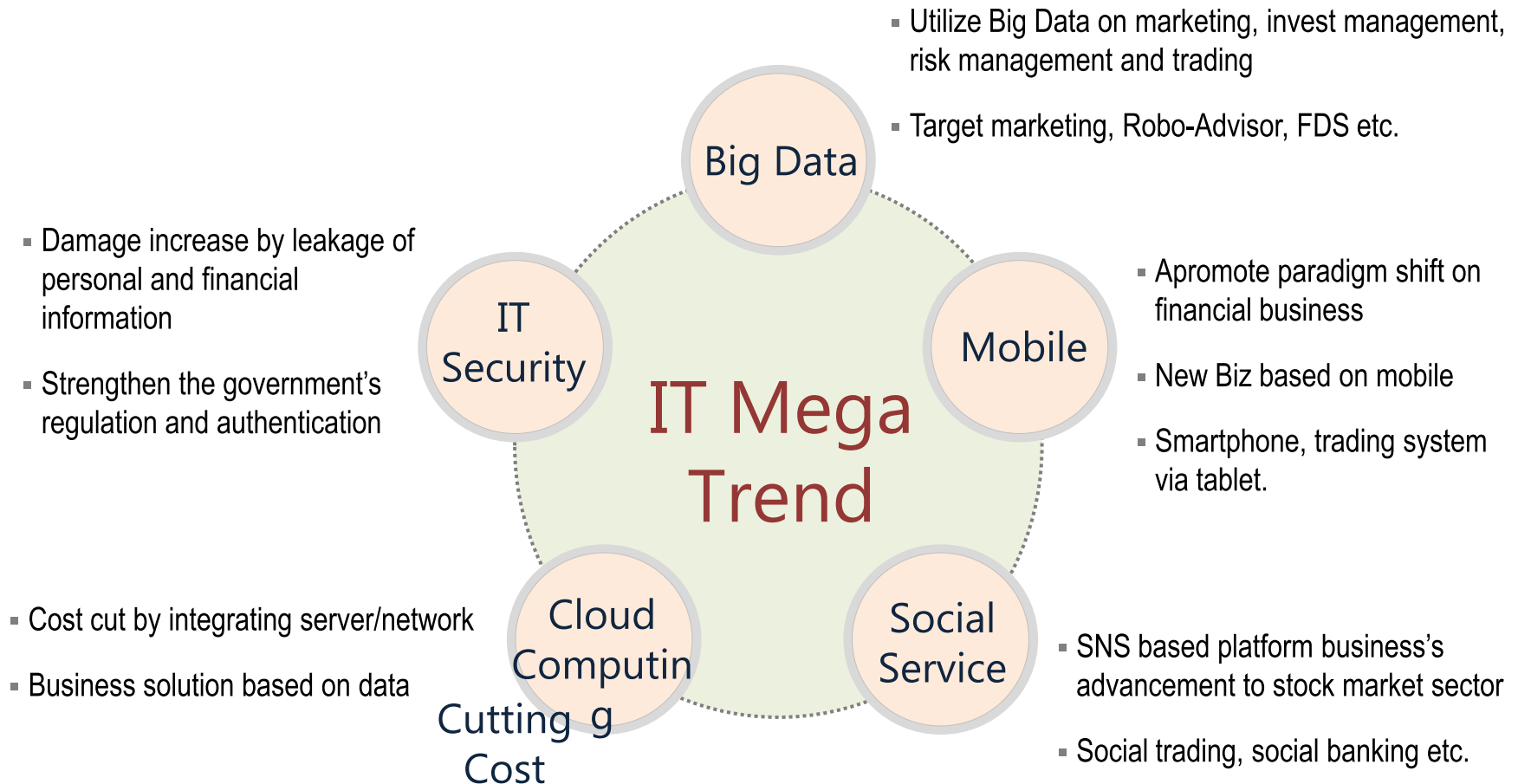
Exchange

- **Advent of global competition era**

- ✓ Profit decrease in exchanges due to economic downturn and stock market decline.

- ✓ Development and support system for fierce global competition including Low latency, ATS and cooperation between overseas exchanges.

Koscom

- **Leading securities IT sector via preemptive study**

- ✓ Apply Open Source, MTS, Big data, Cloud service development and leading IT trend

IT Mega Trend

Popularization of FinTech and Social Service, Big Data technology development, Cloud- Computing for cost cut is being regarded as Mega Trend in securities IT sector.

- Utilize Big Data on marketing, invest management, risk management and trading
- Target marketing, Robo-Advisor, FDS etc.

Big Data

- Apromote paradigm shift on financial business
- New Biz based on mobile
- Smartphone, trading system via tablet.

Mobile

- Damage increase by leakage of personal and financial information
- Strengthen the government's regulation and authentication

IT Security

IT Mega Trend

- Cost cut by integrating server/network
- Business solution based on data

Cloud Computing

Cutting Cost

Social Service

- SNS based platform business's advancement to stock market sector
- Social trading, social banking etc.

Quick Response To IT Changes → Quick Decision → Not Lose Biz Opportunity

IT Mega Trend – Big Data

Leading financial institutions forged intelligent opinion decision support system on various sectors including marketing, risk management, invest management and trading with financial data.

Major utilization field

Need Elaborate Decision Making ?

Big Data Analysis help you

- Credit rating system
- Early detection system
- Account manipulation detect system
- Continuous audit system
- Branch audit system
- Risk sign detect system
- Foreign exchange risk prevention system
- Money laundry prevention system
- Financial fraud detect system

Marketing

Utilization field

Risk Management

Trade Management trading
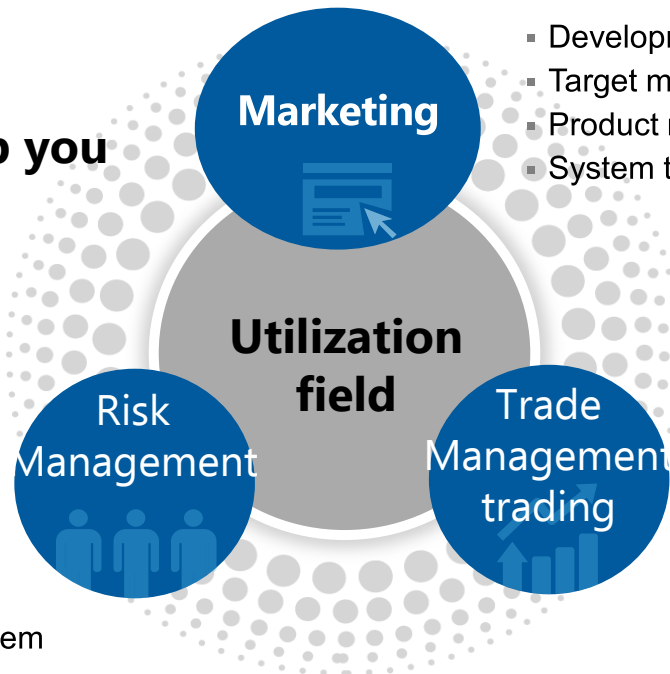
- Development of new product and service
- Target marketing
- Product recommendation system
- System to prevent customers from leaving

- Conduct investment procedure via online
- Optimized for short term investment portfolio
- Algorithm trading

IT Mega Trend - Mobile

Environmental base is solid, since smart phone users can be potential consumer of the trading service.
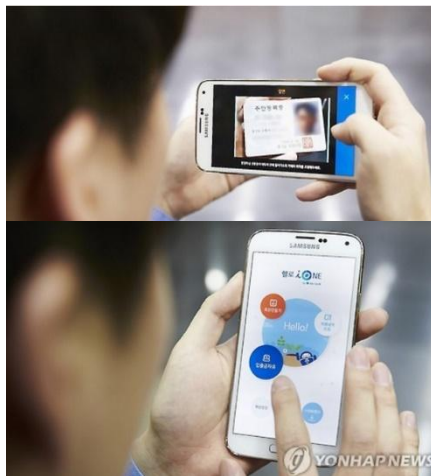
Smart phone is the best opportunity for stock trading and the most optimized device

Service trend

Face to face	Through the non-face	Always in my hand

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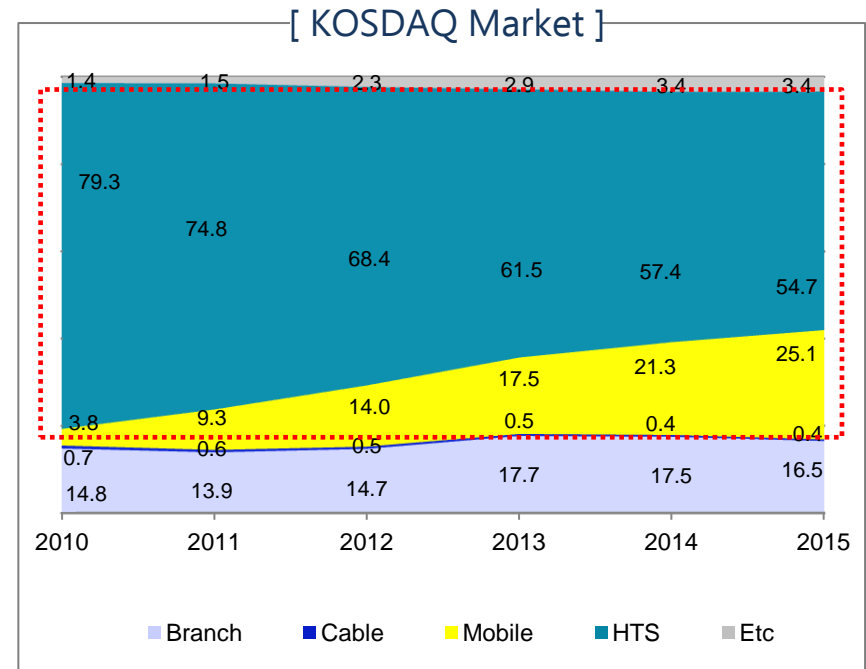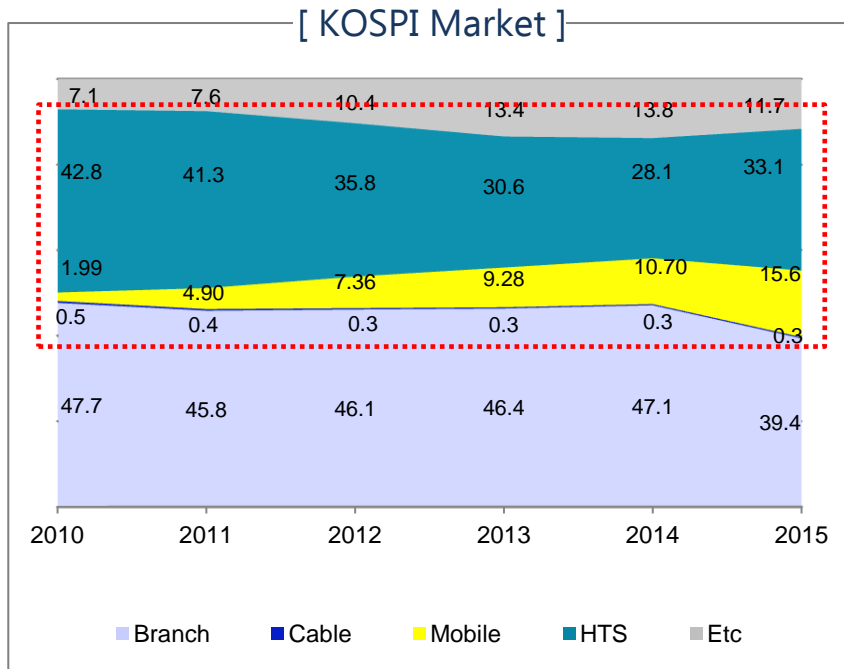HOSE

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IT Mega Trend case - Mobile/Web Platform

As usage of mobile device is being generalized, the rate of trading through HTS is on the downward trend and the rate of trading with MTS is on the rise.

Average daily trade portion per order channel (%)

[KOSPI Market]

	2010	2011	2012	2013	2014	2015
Etc	7.1	7.6	10.4	13.4	13.8	11.7
HTS	42.8	41.3	35.8	30.6	28.1	33.1
Mobile	1.99	4.90	7.36	9.28	10.70	15.6
Cable	0.5	0.4	0.3	0.3	0.3	0.3
Branch	47.7	45.8	46.1	46.4	47.1	39.4

Branch ■ Cable ■ Mobile ■ HTS ■ Etc

[KOSDAQ Market]

	2010	2011	2012	2013	2014	2015
Etc	1.4	1.5	2.3	2.9	3.4	3.4
HTS	79.3	74.8	68.4	61.5	57.4	54.7
Mobile	3.8	9.3	14.0	17.5	21.3	25.1
Cable	0.7	0.6	0.6	0.5	0.4	0.4
Branch	14.8	13.9	14.7	17.7	17.5	16.5

Branch ■ Cable ■ Mobile ■ HTS ■ Etc

IT Mega Trend - Social Service

SNS data, which includes news and events that effect the market, is being analyzed, provided to traders and utilized for trading

Major social trading companies and performance

Main service of social trading

eToro
Trading Starts Here

- Founded in 2007 (Israel)
- Investment platform based on derivative product.
- $18.9m of funding for 4 years since its establishment.
- 2,000 of new accounts (daily basis)
- 2.75m users in 149 countries

covestor

- Founded in 2007 (US)
- Recorded $1b of accumulated trading amount since introducing mirroring account service in 2009.
- $12.5 m of funding in 2013.

Share investment opinion

Show another user's profit rate & trade details

Follow high profit user and copy trading

29337 Followers Follow
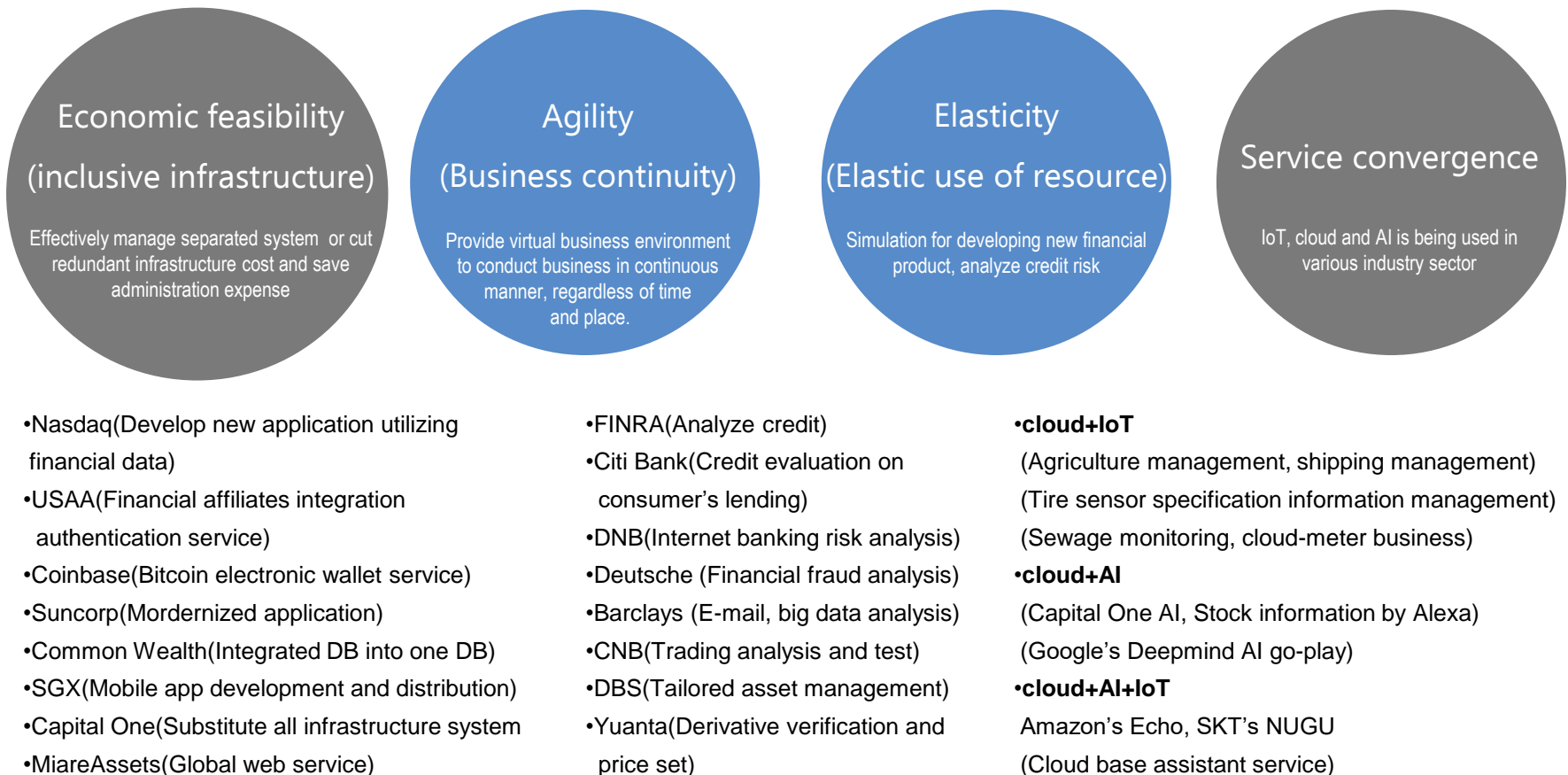199 Copiers Copy

IT Mega Trend - Cloud Computing

Economic through inclusive infrastructure , agility through business continuity, elastic use of resource and convergence with 4th industrial revolution by cloud computing.

Economic feasibility (inclusive infrastructure)
Effectively manage separated system or cut redundant infrastructure cost and save administration expense

Agility (Business continuity)
Provide virtual business environment to conduct business in continuous manner, regardless of time and place.

Elasticity (Elastic use of resource)
Simulation for developing new financial product, analyze credit risk

Service convergence
IoT, cloud and AI is being used in various industry sector

- Nasdaq(Develop new application utilizing financial data)
- USAA(Financial affiliates integration authentication service)
- Coinbase(Bitcoin electronic wallet service)
- Suncorp(Mordernized application)
- Common Wealth(Integrated DB into one DB)
- SGX(Mobile app development and distribution)
- Capital One(Substitute all infrastructure system
- MiareAssets(Global web service)

- FINRA(Analyze credit)
- Citi Bank(Credit evaluation on consumer's lending)
- DNB(Internet banking risk analysis)
- Deutsche (Financial fraud analysis)
- Barclays (E-mail, big data analysis)
- CNB(Trading analysis and test)
- DBS(Tailored asset management)
- Yuanta(Derivative verification and price set)

- **cloud+IoT**
 (Agriculture management, shipping management)
 (Tire sensor specification information management)
 (Sewage monitoring, cloud-meter business)
- **cloud+AI**
 (Capital One AI, Stock information by Alexa)
 (Google's Deepmind AI go-play)
- **cloud+AI+IoT**
 Amazon's Echo, SKT's NUGU
 (Cloud base assistant service)

IT Mega Trend case - IT security

The government is strengthening regulation on security and authentication due to surging data breach and hacking cases followed by financial IT development.

Data breach

Hacking (9.7%)

Insider with certain intention(21.8%)

Accidental mistake by insider(64.9%)
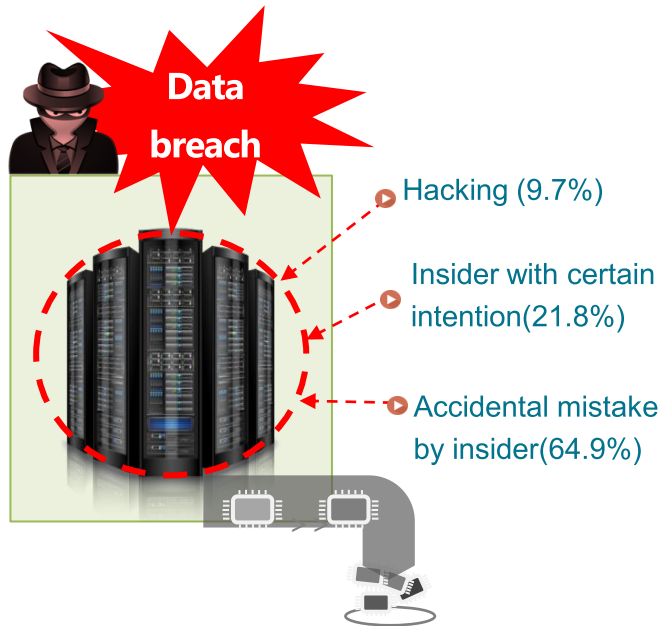
Security solution and countermeasures

✓ Network separation : business use and internet use, Firewall

✓ Document encryption solution, solution to prevent data breach, security USB

✓ Personal information(DB) encryption, Secure Coding

✓ Intensified authentication process :public authentication, FIDO(fingerprint, iris, palm etc)

- ▪ Personal data breach case within 5years
  : 130m cases

  - case which leaked 10,000 information at one time: 67

  - It is estimated that over 500million cases have leaked more than 5,000 case at one time.

Development Paradigm shift

Continuous paradigm shift in order to secure competitiveness on the speed, cost reduction and enhanced productivity.

Makes it more easier for developers because they can focus not other technical problems **but only business logics.**

① Open Source
  ➥ Linux, OpenDBMS, Web related solution etc.

② Programming language and methodologies
  ➥ JAVA, C# is being highlighted (JAVA based financial framework, Polyglot)
  ➥ Methodologies including MDD, SPL(Software Product Line) etc.

③ Changes in service architecture
  ➥ Monolithic Architecture is now being replaced to Micro Service Architecture(MSA) followed by
    introduction of mass digital storage era.

Monolithic Architecture

Application
UX Front End
User | Product | Order
Data Base

Micro Service Architecture

UX Front End

User management
Product management
Order management

API
(Remote communication)
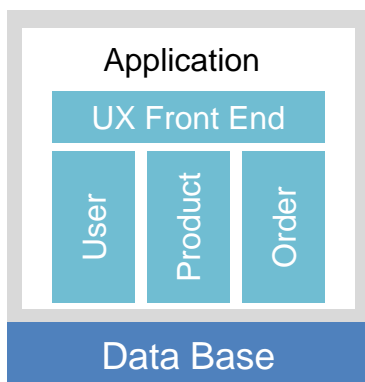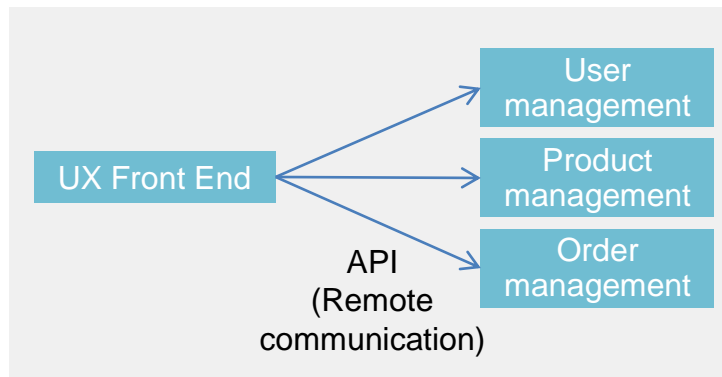
Low Latency & High Throughput

Due to globalization and coupling of trade market, capital markets around the world started to competitively introduce Low Latency and High Throughput technology in order to survive and secure liquidity.

Exchanges   IT Vendors   Financial Service Providers

Item	Main technology	Main features
Application	• Multi-threading • Maintain Cache Locality	• Understand debugging and x86 architecture is necessary for **optimized programming** • Locking mechanism is important to concurrency control
System S/W	• In-memory DB • RDMA based Middleware	• Error countermeasures for volatile memory storage • Provide API for users to easily employ RDMA function
Operating System	• Light weightening Linux Kernel • Real time Kernel	• Eliminate unnecessary module loaded to Kernel • Kernel parameter optimization (Scheduling, networking etc.)
Server	• X86 Numa Architecture • X86 server BIOS tuning, high speed memory	• Forming Affinity and multi-channel memory between CPU and process is important • System BIOS tuning for low latency
Network	• Connect ASIC to Infiniband RDMA, NIC ASIC • 10GbE (iWRAP, RoCE, TOE)	• Compatibility between firewall and NIF, easy development, standard support • Check weak spot of error countermeasures including Switch, NIC dualization

Generalization of securing technology power through M&A

NYSE Euronext did 9 consecutive M&A since 2006, focusing on company with fundamental technology, for internalize new technology and drive IT innovation
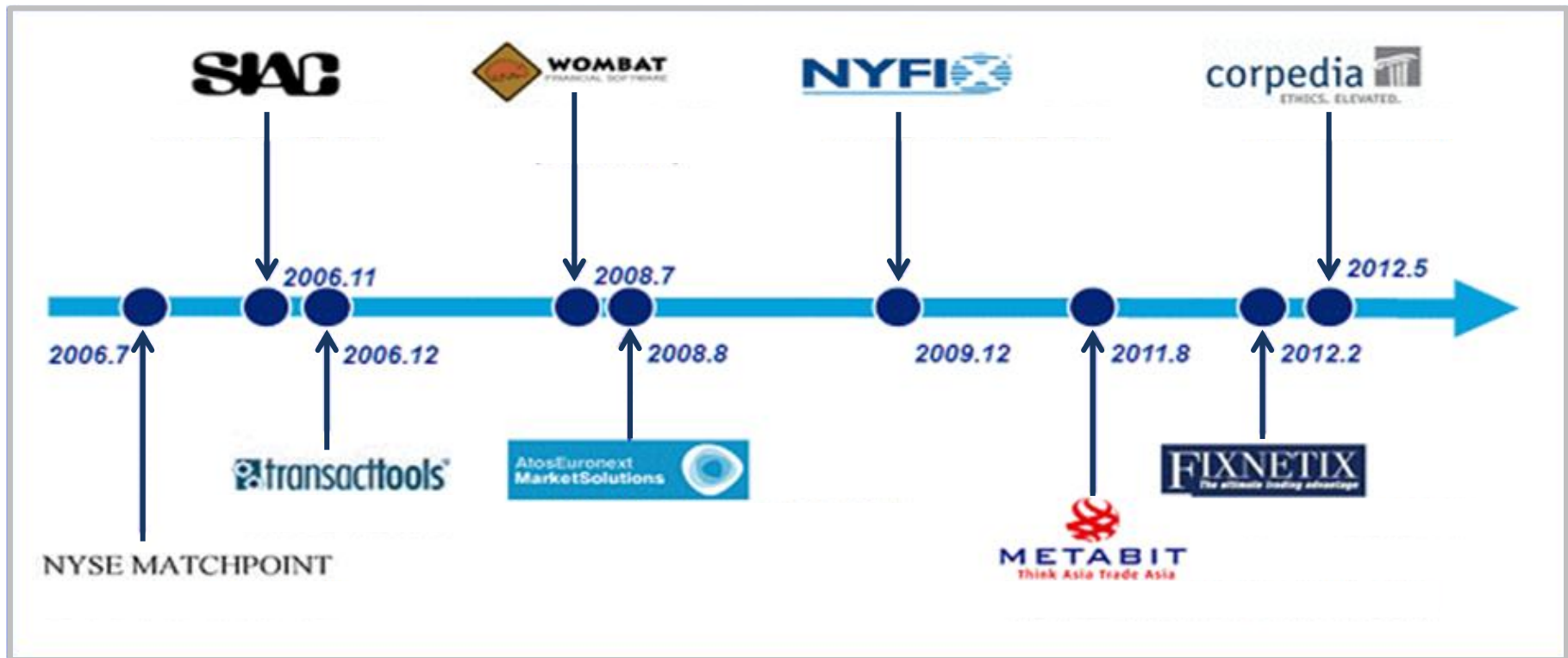
NYSE Euronext M&A case
ICE M&A Case

Competition

Year 2000 : 100%
Year 2003 : 80%
Year 2013 : 25%

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Exchange system : Main changes

Along with Exchange System Upgrade, There should be many factors which member firm system should consider.

1 **Establishment of new market and regulation**

① Introduction of derivatives market
- Opening of index futures market
- Index option market is planned to open in future

② Various Request & Order Type
- Request : New, Amend, Cancel
- Order : Limit, Market, Iceberg, Stop Limit, Stop Market, Same-side Best, Opposite-side Best

③ Day Trading is possible

2 **Protocol and terminal UI change**

④ Front Office Protocol change
- FIX (Financial Information eXchange) Protocol (ver 4.3)
- Set dualization(primary/backup)
- DR switch (4hrs)

⑤ Back Office Protocol change
- KRX TCP/IP Protocol (Structure type fixed message)
- Dualization

Member's system : Introduction of derivatives market

Management of accounts information, margin and risk management are compulsory factors. Connect with spot account or additional development of settlement process is required depending on the market.

1. Front-Office need to enlarge risk management method

- Set for additional Interface or ordering system for derivative(New order system for derivatives)
- Develop pre limitation)
- Risk manage Client side
- Managemen line increase
- Margin per a

2. Forging env

- Additional de
- Trading repo
- Margin(rate)
- Input/Query service includ

2819 Futures/Optio

> Qry Type 1.Branch
> Bal Type 1.All
> Detail Qry Type 1. All

Account No	Accou

1622 Account Margin and Deposit Status

> Account No. 001-03-702164 001-테스트계좌명-일ᄇ > Password   Forward F12

Maxium Deposit	1,028,726,141	Cash DPst+Check	1,028,726,141	Amt.of Substitute Securities Deposit	0
Tot.Appropriation Deposit Amount	1,028,726,141	Tot.Appropriation Deposit Cash	1,028,726,141	Futures P & L	0
Max Withdrawal Amt.	923,302,298	MaxWithdrawal Cash	0	Max Withdrawal Substitute Secu.	0
Total Margin	105,335,453	Cash Margin	-5,929,218	Under. Deposit Amt.	0
Maximum Order Amt.	923,390,688	Maximum Order Cash	923,390,688	Max.Order Substitute Secu.	0
Total Margin Call	0	Cash Margin Call	0	Check Deposit Am	0

Cate.	Index Group	Volatility Group	Interest rate group	Currency group	Energy group
Pure Risk Margin	58,021,945	7,641,563			
Margin for Pricce Fluctuation	49,421,945	7,641,563			
Spread Margin	0	0			
Margin Rdct Amt.	0	0			
Minimum Margin	5,000,000	50,000			
Opt.Price Margin	8,600,000	0			
Futures P&L	0	0			
Option Net Buying Amt. of Money	-9,750,000	0			
Brokerage Margin	97,693,890	7,641,563			

17:23:15 SONBQ105 (0136) Inquiry completed.

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Major change of member company's system is margin and ledger update followed by order and order confirmation (new, amend, cancel, amend/cancel confirmation, Rejection, Execution)

Client Screen : Simple vs   Biz Logic : More Complicated than you think

1. **Interface program and order confirmation business program amendment**
   - Amendment of interface, order confirmation and receiving/sending program is needed, based on exchange's new message.
   - Order co...

2. **Based on**
   - Order Typ...
     upper/low...
     ledger ma...
   - Client ord...
     check and...

Compute Margin based on the margin price change

Order entry screen showing:

Sell (F1 | Buy(F2 | Amend (F3 | Cancel (F4

- Symbol: 201M3270 KOSPI 200 CALL 1703 270
- Side: 1.Sell — Sell (F1 | Buy (F2
- Price: 0.00 Sell1 0 Max.Ord.Vol
- Lot: 0 10 20 30 40 Set Vol
- Type: 00.Limit — Normal / IOC / FOK
  - 00.Limit
  - 03.Market
  - 05.Conditional order
  - 06.Best Available
  - 10.Limit(IOC)
  - 20.Limit(FOK)
  - 13.Market(IOC)
  - 23.Market(FOK)
  - 16.Best Available(IOC)
  - 26.Best Available(FOK)
- Trade
- Ord.No.

SELL F12

Futs. * 5...
Accnt. Nm...

R-Upper/Lower is differents from Real Upper/Lower that order will be rejected.

Ask Case	Ask Vol	15:32:18	Bid Vol	Bid Case
11	20	1.98	Curt.Price	1.93
12	24	1.97	Change	0.21
14	33	1.96	%Chg	12.21
13	32	1.95	Contract Vol	39,050
8	20	1.94	Unfill Vol	20,660
Bas.Price 1.72	1.93		13	4
Open 1.73	1.92		33	13
High 2.04	1.91		33	18
Low 1.58	1.90		24	16
Prev.Price 1.72	1.89		22	12
58	129	Total	125	63
190	1,150	Total	1,323	375
Upper 20,60	Lower	0,01	Equi.Prc	0,00
R-Upper 5,78	R-Lower	0,01		

Refresh Transaction | Refresh Balance

Ord Number	O... Ord	...	e	Side	Amend/Cancel	Lot	Price	Trade Vol	Trade Price	Unfill Vol	Typ

Member's system : Day Trading

In case of Day Trading, unsettled balance and margin should be managed before settlement date(T+1, T+2, T+3 etc.)

Matching : don't care balance of day trading
Member system : need to calculate balance before settlement

1. Basic information table item change

- Add item to record Day Trading amount and quantity on account margin or stock balance table

2. Add reuse management method

- Add available selling amount Logic
- In case of unsettled selli
- Adjust different criteria fo
  margin rate. (Created wh
- Apply request from mem
- Business change based

Date	Action	Cash	Margin	Unsettled Buy Amt	Unsettled Sell Amt	P&L	Equity	Buyable
T	Cash Deposit 100$	100$					100$	
	Buy A-share (margin rate 10%) 100 * @10$	100$	100$	1000$			0$	
T+1	Sell A-share (margin rate 10%) 100 * @10.1$	100$	100$	1000$	1010$	10$	100$ + 10$	
	Buy B-share (margin rate 50%)	100$	100$	1000$	1010$	10$	100$ + 10$	??

Change is compulsory based on exchange and other institution's interface protocol and countermeasure is needed for margin management and RDS change followed by adapting new system.

1,000 process

Amendment of Interface program and order execution business program followed by matching system change

- Amendment of interface and receiving/sending order program based on exchange's new message.
- Order execution detail update and margin detail amendment.
- If there is a huge gap between existing method, significant change is needed.

(ex,

seq	Fix Tag	Fix Tag Name	KRX order layout	Data Type	length	Remark
1			MESSAGE_SEQUENCE NUMBER	Long	11	clients should set a sequence number
2			TRANSACTION_CODE	String	11	New Order : TCHODR10001 Amend : TCHODR10002 Cancel : TCHODR10003
3	336	TradingSessionID	BOARD_ID	String	2	G1 : Regular Session G2 : The Auction with closing price of the previous day before market open G3 : The Auction with closing price of the day after market close G4 : The Action with single price after market close
4	8001	KRXMemberNo	MEMBER_NUMBER	String	5	Member ID assigned by KRX Ex> "00"+Firm No(3) * In Amend and Cancel, this value should be identical with the value in original order.
5	8002	KRXBranchNo	BRANCH_NUMBER	String	5	Branch number registered in KRX Ex> "00"+Bran No(3) * In Amend and Cancel, this value should be identical with the value in original order.
6	11	ClOrdID	ORDER_IDENTIFICATION	String	10	The combination of Branch_Number and Order_ID is unique key. The range, 9000000001 ~ 9999999999, is reserved for emergency order. (Do not use) -The client should request the BIZ Part of PowerBase the range (s)he can use beforehand
7	41	OrigClOrdID	ORIGINAL_ORDER_IDENTIFICATION	String	10	* Insert blank space when you make a new order.
8	55	Symbol	ISSUE_CODE	String	12	ISIN Code
9	54	Side	ASK_BID_TYPE_CODE	String	1	1: Sell(Ask) 2: Buy(Bid) * In Amend and Cancel, this value should be identical with the value in original order.

Member's system : Front-Office (Continued)

Member Affected Area		EXTURE	EXTURE+
Protocol	**Order Transport Mode**	Synchronous (wait for the reply)	Asynchronous (no wait)
	Order acceptance ordering	Guarantee an acceptance ordering	Guarantee an acceptance ordering by issue
	How to reply orders	Reply through an order service(Sync)	Reply through a trade service(Async)
	Resend an order request	Resend a request to 1 order (or can be blocked)	Resend a request to N orders
	Block order	Possible	Not possible
	Order Denial		
	Session Level Control		
ETC	**BOARD**		

Member   **KRX**
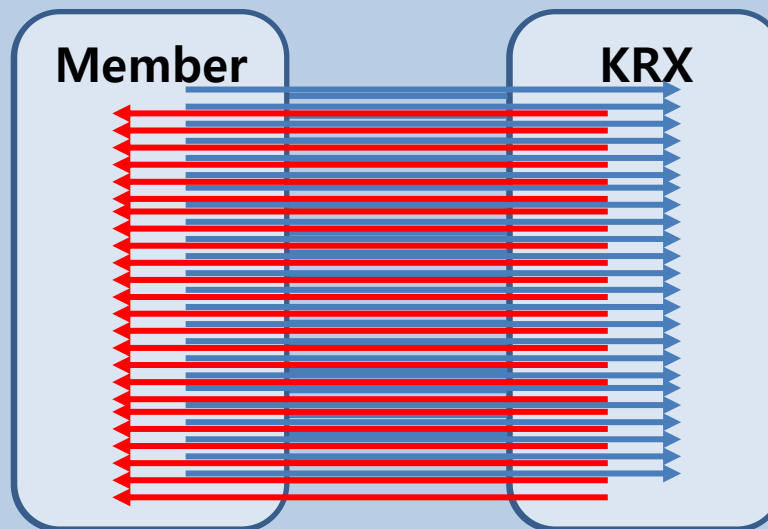
Member's system : Back-Office

Data support for Front-office and add additional business area followed by adjusting new system (RDS, clearing and settlement change)

1. Amendment based on changes of Native message(structure type)– RDS

- NOT FIX protocol
- Significant amendment of basic information management system. (stock information management etc.)
- If there is a gap compared to existing method, significant change is needed.
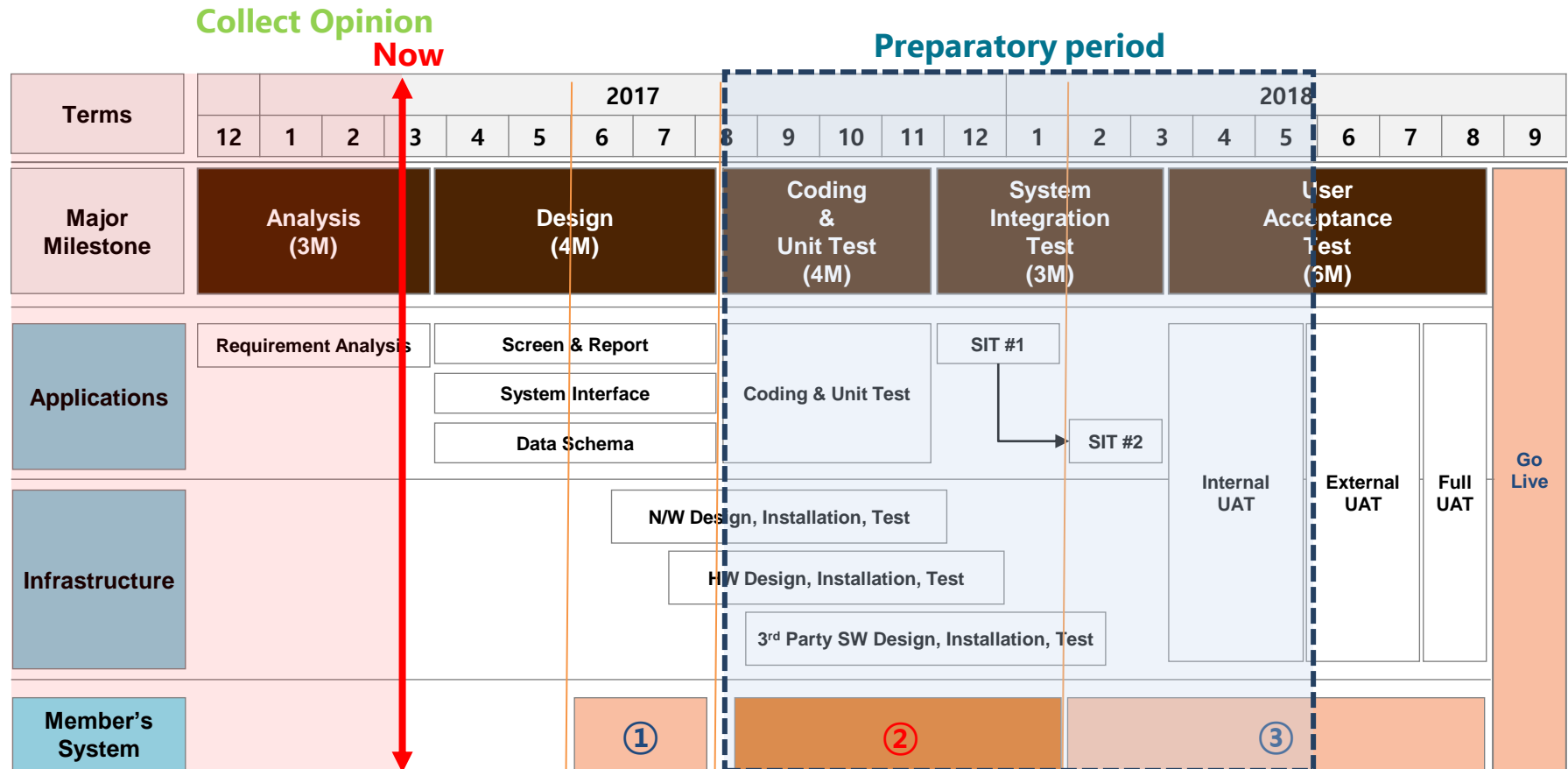
2. Clearing and settlement system change

- Message between exchange and Back-Office is expected to change and there would be a substantial change.
- Settlement process within Back-office should all be changed.

Vietnam exchange's IT development schedule

Preparatory period for member companies : 9.5 month

Collect Opinion

Now

Preparatory period

Terms								2017										2018					
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9

Major Milestone	Analysis (3M)	Design (4M)	Coding & Unit Test (4M)	System Integration Test (3M)	User Acceptance Test (6M)	

Applications
- Requirement Analysis
- Screen & Report
- System Interface
- Data Schema
- Coding & Unit Test
- SIT #1
- SIT #2
- Internal UAT
- External UAT
- Full UAT
- Go Live

Infrastructure
- N/W Design, Installation, Test
- HW Design, Installation, Test
- 3rd Party SW Design, Installation, Test

Member's System
- ①
- ②
- ③

① **The Exchange distributes Interface Specifications for Members' system**
② **Period for developing Member's IT system**
③ **Test with Exchange system till go-live**

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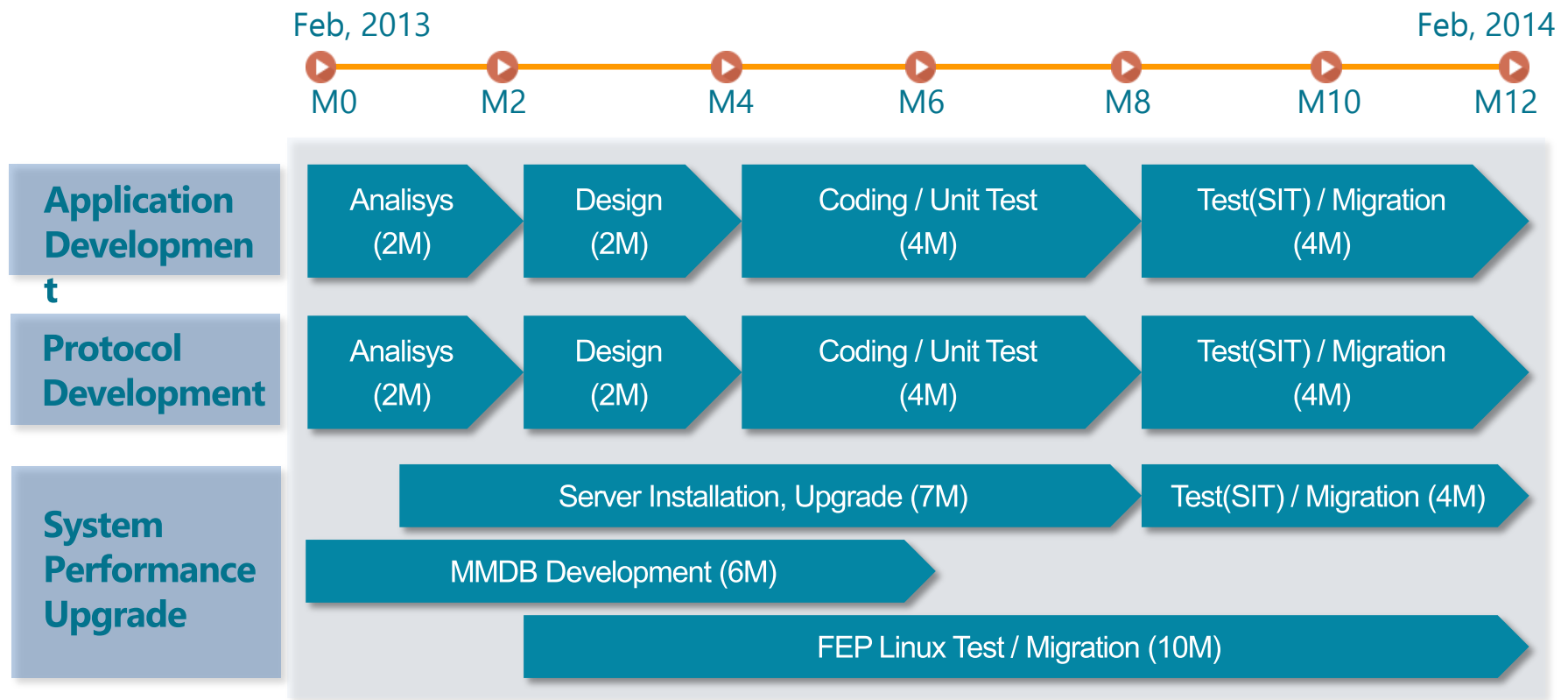# Korean case : Member company's system change

Korean securities companies have experienced changes followed by alteration of EXTURE+ system. The main issue was to adjust Front-system's performance to new matching engine.

1 Application change

✓ Kill Switch
  - Ledger/self Trading

✓ Limit on over quoting submit
  - Ledger/FEP/self Trading

✓ Combination Order
  - Ledger/FEP/self Trading

✓ Market operation board
  - Ledger/FEP/self Trading

2 Protocol change

✓ Communication method
  - Sync → Async / IF

✓ Message length
  - Ledger /FEP /Trading /HTS

✓ Block Order Removed
  - FEP

✓ Bonds Market Message
  - Ledger/ IF

✓ Bulk order separation
  - Ledger / IF

✓ Add order identifier
  - Ledger / FEP / Trading / Client

3 System Performance Upgrade

✓ Server Upgrade
  - 1.9Ghz → 3.92Ghz

✓ Order process speed upgrade
  - Common Module, Logging (Ledger)
  - X86/Linux, MMDB (FEP)

✓ Order / market price speed upgrade
  - X86 / Linux (Connect Server)
  - 1G → 10G (Network)

✓ LL-FEP construction
  - Low Latency FEP construction
  - X86 / Linux
  - MMDB
  - 1G → 10G (Network)

Korean case : Member company's system change

EXTURE+ countermeasures

Feb, 2013 · Feb, 2014

M0 · · · · · M2 · · · · · M4 · · · · · M6 · · · · · M8 · · · · · M10 · · · · · M12

Application Development	Analisys (2M)	Design (2M)	Coding / Unit Test (4M)	Test(SIT) / Migration (4M)
Protocol Development	Analisys (2M)	Design (2M)	Coding / Unit Test (4M)	Test(SIT) / Migration (4M)

System Performance Upgrade

Server Installation, Upgrade (7M) Test(SIT) / Migration (4M)

MMDB Development (6M)

FEP Linux Test / Migration (10M)

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Member company's IT system structure(example)

Member company's IT system has to be prepared for continuous scope change made by market, product, business and readily respond to value – based strategy caused by the advent of IT Trend.

Financial Company Conceptual Diagram

Access Channel	Branch	MTS	Home Trading	API		FEP	Etc

Front/Back Business

[Front Office]

Invest information	ordering		
Information & Market data processing	Account	Trading	
	Prop	Loan	
	Oversea trading	Wrap	

[Back Office]

Back office			Biz analysis
Settlement	Deposit / Withdrawal	Financial product	Sales support
Stock management	Public offering	Claim	CRM
Investment trust	Settlement payment	**+α**	SFA

Data Workloads

MMDBMS	Oracle	DB/2	Cloudant
Mainframe	Unix	X86 Linux	Appliance

Server , Storage

ASP	Traditional	On Premise Private	Off Premise Private/Public

System requirement for member company

System should be equipped with ability to handle trading volume increase, big-data management, safe back-up and restoration followed by stock market advancement

Vietnamese Stock Market Expected to grow continuosly → Prepare for the Data Growth, Transaction Growth

System requirement for member companies

Factors	Requirements
Stability	• Stable transaction processing when transaction reaches to peak • Quick bulk-order process
Scalability	• CPU and memory scalability • Scalability of middleware and DB
Flexibility	• Data share and integration between multi-channel and heterogeneous system
Viability	• System monitoring and fault recovery • Ceaseless service (24/7)

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IT strategy establishment criteria

Advancement of Vietnam's exchange goes beyond replacement of past trading system to a new one. It is to enhance the nation's competitiveness and securities companies. Member companies need set IT strategy, considering financial environment change, stability, cost.

How readily respond to the changes without errors?

Response to Financial Environment Change

System Performance & Stability

Development & Operation Cost

- **Respond readily to financial environment change based on task increase, regulation change and selling channel**

- **Readily respond to IT Trend**

- **Secure system stability through standardization of development process application and architecture simplification**

- **competitive edge on performance and processing pace**

- **Reduce development cost and development period through standardization and modulaization**

- **Yearly operation cost for system operation and maintenance**

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Suggestion for IT model

It is sensible to choose model which suits company's business type, regarding adaptability to financial environment change, system ability and stability and development/operation cost.

1 **Overhaul of system with Big Bang method**

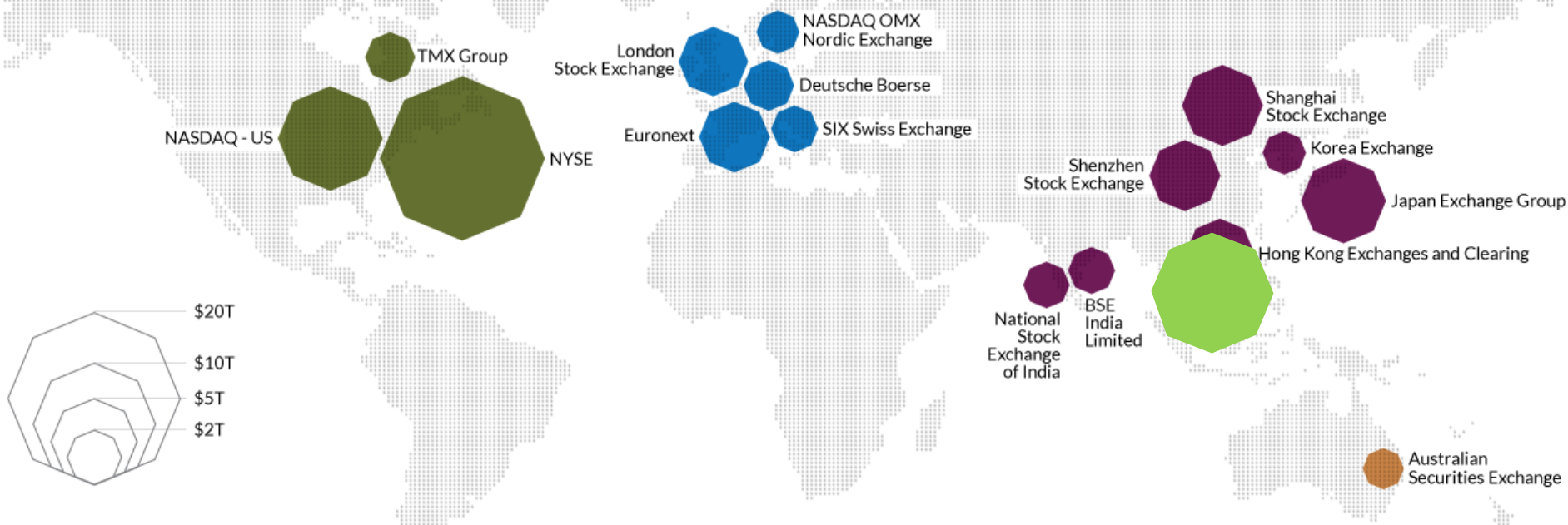**2** **Development of changes in trading system (based on legacy system)**

3 **Use joint system (3rd Party or Association of member company)** **Cost Saving, Effective Mgmt.**

Choose "IT model" which suits company's business strategy

Thank You

Who's got the big potential?

Q & A