

Strategic Surveillance in the Philippine Capital Markets
and the expectations of surveillance technology

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Based on a series of Workshops presented by:

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Introduction

The purpose of this paper to provide a straightforward look at the goals and process of market surveillance. In coming to appreciate the scope and importance of surveillance in a properly functioning securities market, one thing should become evident: that the most important asset of a surveillance organization is not its state-of-the-art surveillance technology but the market intelligence and quality of surveillance staff.

This paper is based on three workshops on market surveillance presented in November, 2002 (see appendix A). Each of the presentation teams used their surveillance software to illustrate and describe surveillance needs and how software tools could be used to provide the appropriate information. The seminars [software] were given by:

- Capital Markets CRC [SMARTS]
- Millennium Information Technology [e-Surveillance]
- SDG Technologies [AWACS]

The material for this report was compiled, organized and edited by Helen Ujvarosy of Telchar Systems, Inc

Automated Trading and Settlement Impacts

As markets around the world move towards simultaneous settlement of trades (STP), markets become even more vulnerable to manipulation. The Philippines settlement system currently uses T+3 terms, however new systems being reviewed for purchase could reduce this to T+1 or even same day settlement.

In addition, new rules such as the Philippine Anti Money Laundering legislation and the landmark US Patriot Act (Anti-Money Laundering) make more demands on market surveillance. Resources for market surveillance (staff, budget, technology) may not keep up with the increasing speed of market transactions.

Overview of Market Surveillance

Surveillance is the process of monitoring market activity to identify unusual trading patterns or market conditions that may indicate violations of Securities and Exchange Commission (SEC) or other Self Regulatory Organization (SRO) or Securities Regulation Code (SRC) rules and regulations.

To deal with the volume and speed of trading activity exchanges employ some form of surveillance technology to collect and organize trading data for evaluation by market analysts. One way to think about surveillance is to compare it to an air traffic control system, monitoring and directing the flow of aircraft. The object of surveillance is not to slow or shut the market down, but to keep it moving at maximum efficiency and safety for owners, dealers and investors.

Ideally, a comprehensive surveillance system provides the ability to:

1. Quickly identify unusual trading behavior for any trading instrument;
2. Accurately analyze trading data and market news to determine if further investigation is needed;
3. Easily collect, document and manage facts relating to suspicious trading activity;
4. Effectively support appropriate enforcement action;
5. Continuously and fully inform the market;
6. Seamlessly link to other international exchanges to provide cross-market surveillance;
7. Proactively discourage abnormal trading activity; and
8. Minimally interfere with free market activity.

Objectives of Exchanges/Surveillance Dept

While it is often seen as a thankless job, the essence of surveillance is market support. A surveillance department can and should add value to the market by supporting the business objectives and rules of the local exchange. In thinking strategically about the role of surveillance, it is therefore important to understand the primary objectives of the exchange.

Here in the Philippines, “The Philippine Stock Exchange, Inc. (PSE) is a private organization that provides and ensures a fair, efficient, transparent and orderly market for the buying and selling of securities.”

As a private organization, the business objective of the PSE is to maximize profit for its owners. However, as a Self Regulatory Organization (SRO) the PSE operates under rules to protect investors and uphold market integrity. In the ideal market the trading price of a security accurately reflects the value of its underlying asset. While no market reaches this ideal, the PSE is responsible to provide full financial disclosure so that investors can make informed decisions to buy or sell. In addition the PSE is charged to prevent or proscribe market abuses that lead to price distortion.

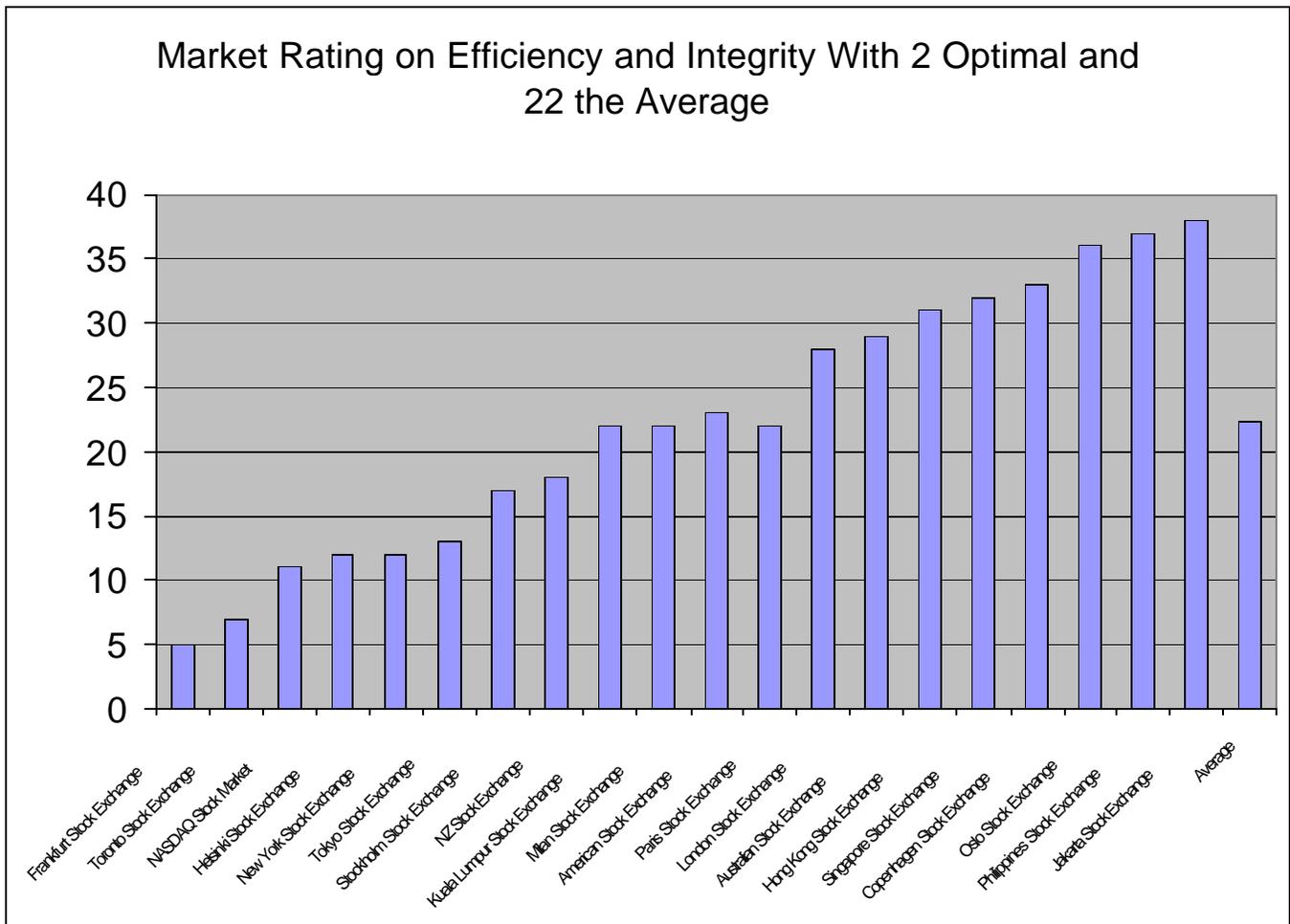
The Securities and Exchange Commission (SEC) as mandated in the Philippine Securities Regulation Code (SRC) Section 2, is a “government agency that oversees the Philippine capital market to “ensure full and fair disclosure about securities, minimize if not totally eliminate insider trading and other fraudulent or manipulative devices or practices which create distortions in the free market.”

The SEC (with its broader regulatory powers) and the PSE (as an SRO) work as a team to provide a capital market that meets the profit objectives of its owners and the legal obligations to its investors. The SEC relies on the PSE to self regulate, but may at any time instigate its own surveillance investigations or take a more proactive role (as seen in Hong Kong today).

Comparative Market Ratings

How is the PSE meeting its objectives relative to other world markets? According to an independent study conducted by noted surveillance expert, Prof. Michael Aitken, the PSE ranks nineteenth out of twenty in market efficiency, a measure of how well an exchange controls market abuse.

While Prof. Aitken's study points to obvious room for improvement, the market itself has given ample evidence of dysfunction prompting a major reorganization and refocusing of the PSE and SEC in August, 2000. Since that time there has been an increasing recognition that the PSE and SEC must be more aggressive in their approach to market surveillance. The sad state of the Philippine capital market is a matter of international record. If the Philippine capital market is to become competitive and grow, local investors and the world market must see signs of a "fair, efficient, transparent and orderly market."

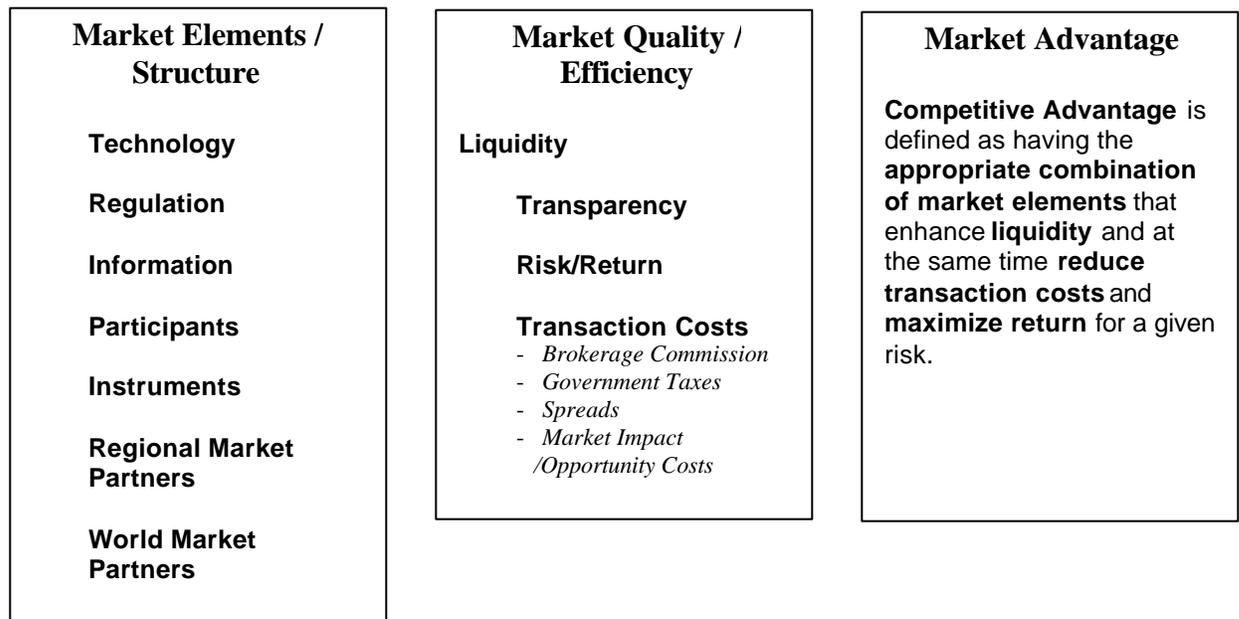


What Makes a Market Competitive?

Regulation (including surveillance) is just one of many complex elements that make up a competitive financial market including:

- Technology (automated, integrated trading, clearing, settlement and surveillance systems)
- Regulation (market rules that are well documented, accepted and policed; surveillance personnel who understand the market and pay attention to detail)
- Information (full, timely disclosure of company/instrument positions)
- Participants (knowledgeable brokers, clients willing and able to buy and sell, other market support professionals)
- Instruments (stocks, bonds, futures, commodities, etc.)
- Regional Market Partners (good standing in regional markets)
- World Market Partners (ability to keep pace with changes in global markets)

The most competitive markets have the best combination of market elements.



The right balance of market elements maximizes liquidity, minimizes transaction costs and provides the best best ratio of return to risk. Such a market promotes investor confidence and makes it easier to attract and retain capital.

Market Partners

Regional and world market partners will impact local markets whether or not there is any direct trading. Changes in the trading technology and practices of market leaders, like the trend toward Straight Through Processing (STP) continually raise the bar for trading partners and non-partners alike. In the next 5-10 years it is likely that world markets will centralize into 3-5 marketplaces with 24-hour main board trading and secondary boards

for individual country special interests. These external demands on exchange resources may significantly increase surveillance costs in the coming years.

Importance of a Competitive Market

Hardly a day passes without some negative press in the local Philippine or regional financial media on the shortcomings of the Philippine capital market. Known problems in the equities market cripple its ability to raise capital for corporate growth. It is a matter of the greatest economic urgency to take whatever actions are needed to remedy market conditions.

Key Concepts of Financial Markets

The goal of PSE is to provide a “fair, efficient, transparent and orderly” market. While there are no industry standards for these terms, it is significant that most capital markets around the world incorporate some variation of the concepts of fairness and efficiency in their goals.

Fair

A market is fair where the trading rules are clearly defined and uniformly enforced. Some rules can be operational zed through an automated trading system. For example, orders at the same price level are filled on a “first in first out” basis. Other rules such as those that protect investors from insider trading (trading on privileged information) require direct monitoring by surveillance officials. The Philippine SRC, Section 27.1, states that:

It shall be unlawful for an insider to sell or buy a security of the issuer while in possession of material information with respect to the issue or the security that is not generally available to the public.

Efficient, Transparent, Orderly

An efficient, transparent and orderly market is free from market manipulation (price movement based on false or no information). Market manipulation is defined as “a series of transactions designed to raise or lower the price of a security or to give the appearance of trading for the purpose of inducing others to buy or sell.” Manipulation also includes the dissemination of false or misleading information to induce price and market movement.

In practice, manipulation is a given in securities markets, partly as a function of market characteristics such as size and liquidity. Where securities are closely held the market becomes less liquid and more subject to manipulation. Any reduction in liquidity, including that resulting from changes in business rules increases the likelihood of market manipulation.

Liquidity & Transaction Costs

The main game for PSE, like all securities markets, is to maximize liquidity (the ability to quickly and effectively convert securities to cash and vice versa) and minimize transaction costs (the cost associated with achieving liquidity). The more liquid the market the more profitable for its owners, the less likely to be manipulated and the greater its ability to attract participants.

Objectives of Surveillance

The goal of surveillance is to help achieve Exchange objectives of efficiency, fairness and (by extension) liquidity.

Surveillance organizations, making effective use of surveillance technology, can meet these objectives directly and indirectly.

Directly

Day to day monitoring of trading activity and market news allows surveillance officials to note unusual trading activity that may indicate market manipulation or insider trading and take appropriate action. Other surveillance functionality may also directly serve the market.

First, surveillance guards against market manipulation by ensuring that price movements on the basis of false or no information are made known as soon as possible and those who attempt to manipulate are quickly confronted.

When the price of a stock moves up or down, someone knows something and is acting on that information. Automated surveillance technology quickly and systematically searches trading activity for unusual changes in a broad range of trading metrics, such as price, volume, orders and bid/ask spread. When abnormal activity is detected the technology automatically generates alerts.

Not every alert indicates illegal activity. Alerts give analysts the opportunity to consult market news or contact brokers or issuers to find out what is behind the price movement in order to keep the market fully informed. By monitoring such metrics as the bid/ask spread, automated surveillance technology makes it possible to identify aberrant behavior before it occurs and take proactive measures.

Next, surveillance guards against insider trading by ensuring that price-sensitive information is made public as soon as possible and by impeding the ability of insiders to take advantage of their information.

In order to preserve the image of the market as a “fair game” it is important that surveillance officials be able to identify insiders who act directly or through third party traders. Keeping the market continuously and fully informed (especially when insiders

may prefer to hide information), along with the authority to call market halts when insider trading is suspected also serves to protect the integrity of the market.

Third, surveillance may serve the market by assessing the impact of business rule changes on liquidity. Because of the direct correlation between liquidity and manipulation, it is important to evaluate the impact of new regulations on liquidity and volatility. It is especially important that new rules be implemented one at a time in order to be able to systematically test their effect on the market.

Fourth, surveillance may expand market potential by providing the ability to comply with external requirements such as anti-money laundering rules. This requirement is contingent on the technology's ability to store and analyze client level information and produce client level alerts.

Last, by minimizing market manipulation and insider trading, an aggressive, visible surveillance system not only encourages faith in the market, it also encourages faith in the power of the exchange to self-regulate. Self-regulation will almost certainly reduce the cost of regulation, which is ultimately passed on to the investor in the form of transaction cost.

Indirectly

Surveillance may indirectly affect the market simply by making its presence and skills known and felt.

A reputation for being in control of the market, one step ahead of questionable trading activity, may be enough to curb some market abuse before it occurs. For example, some markets hold regular seminars to show brokers what their surveillance technology can do. A quick call to a broker when something looks amiss sends a strong signal to other market participants to clean up their act.

Market Intervention

The goal of surveillance is to facilitate free, fair and open trading. Restriction of trading activity should be considered a last resort as it conflicts with the primary business objective of the Exchange.

Prosecution imposes heavy burdens on surveillance. A pre-prosecution strategy of sending a team of investigators to tie up broker resources for five to six days is more trouble than most brokers want to see and may discourage questionable behavior.

Alternative Approaches to Surveillance

Reactive

The traditional or reactive approach to market surveillance is to wait for complaints from disaffected brokers, clients or the media. Although market participants and the media will always be a source of valuable information, that information is always after the fact when the damage is already done.

Proactive

The research or proactive approach makes use of automated surveillance technology to collect and organize real-time market data. Alerts are generated as abnormal market conditions occur. Information is on-line and immediate, so surveillance officials can respond quickly before the market gets out of control.

In practice these two approaches always work hand in hand. In either case, surveillance officials must have a clear understanding of normal market behavior in order to decide if and when automated alerts or individual complaints merit further investigation.

Abusive Behavior	Real Time	Post Trade
Front Running		X
Marking the Close	X	X
Insider Trading		X
Wash Trades		X
Cornering the Market	X	X
Hype & Dump		X
Matched trades	X	X

Key Concepts- Automated Surveillance

Surveillance technology works by quickly collecting and organizing data from the trading engine (sometimes including clearing and settlement engines) and displaying that data in various screen representations and reports. Surveillance technology, no matter how advanced, is entirely dependent on the market intelligence of its users to return reliable market information.

Given an appropriate understanding of trading variables and metrics, it is possible to set meaningful benchmarks and alerts.

Market Intelligence

A successful surveillance system is always a dynamic partnership between technology and experienced surveillance professionals. Technology is never a substitute for market intelligence, which is based on the people and knowledge resident in the surveillance organization. At best, the technology crunches the numbers to provide a decision support

structure. Advanced surveillance technology actually increases the need for highly skilled surveillance staff who understand the market and pay attention to detail.

Variables, Metrics, Benchmarks, Alerts

Ideally, surveillance technology is a tool to help understand the market. Surveillance technology collects real time trading variables (data on liquidity, volatility, market participants) from the trading system and organizes these data into metrics or measurable representations of market activity (volume, spread, orders, bid-ask spread, etc).

Analysts review these metrics to establish patterns of normal trading behavior (by security, broker, trader, client, or any combination of the four). Normal trading behavior takes into account daily variations (upswings at market open and close) as well as longer term variations (weekly, quarterly, etc.). The most sophisticated technology can represent trading metrics in time series (i.e. once a day over 10 years) or as histograms, graphic representations that make it easier to identify extreme values.

When normal trading patterns are established, analysts define benchmarks (thresholds of normal trading activity). Benchmarks are unique to a specific market and will change as the market changes.

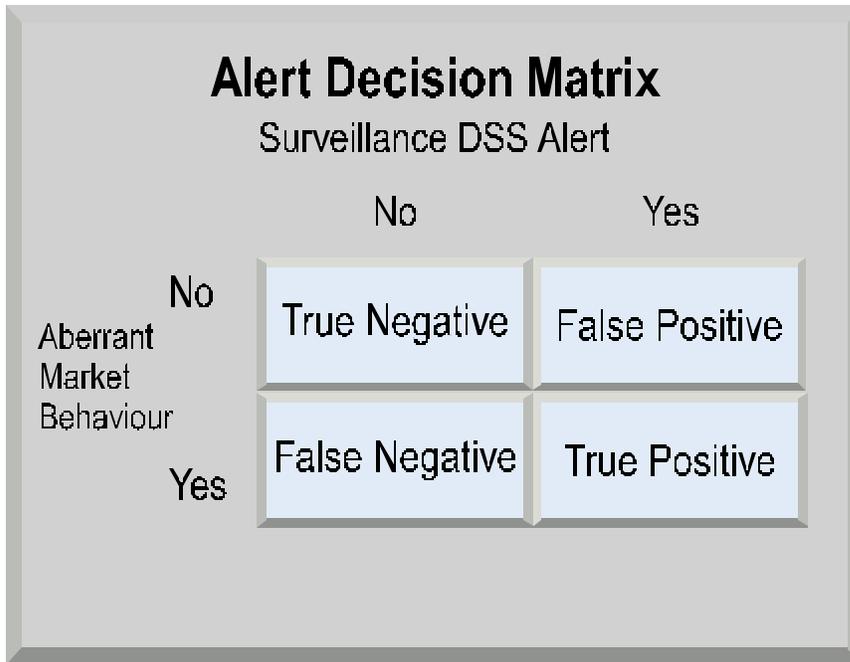
Based on current benchmarks, analysts set and revise alerts (rules that define when benchmarks have been exceeded).

Initial benchmarks are only a starting point. Analysts must constantly define and set new benchmarks and alerts as market conditions change, or as surveillance resources are allocated or removed.

It is important to develop and use documented procedures for each type of monitored market infraction.

Surveillance Technology as a Decision Support System

If surveillance technology is not a magic box, what exactly does it do? Surveillance technology can best be understood as a decision support system, which helps, makes correct decisions by maximizing true results, and minimizing false results. The more advanced the technology the finer the tolerance that can be set.



Surveillance Resources

To summarize, the three key resources needed to conduct surveillance that adds value to the market are:

1. **Market Savvy Staff**
Knowledgeable surveillance staff who understand the market and the process of surveillance, pay attention to detail, show initiative and take pride in their work.
2. **Appropriate Surveillance Technology**
Real-time surveillance technology integrated with trading, settlement and market news feeds, push alerts, user customizable to local market conditions, capital adequacy tracking; on-site training & support of 6-12 months, user friendly.

Starting with a simpler software package would allow surveillance staff to come up to speed on surveillance procedures.

3. **Detailed Process (Workflow) Documentation**
Well documented, step by step procedures for identifying and handling each type of market infraction, including sample tracking reports, to be updated as needed.

Stages in the Surveillance Process

Surveillance is a dynamic process using both technology and market knowledge. The process begins by understanding the market as the basis for all other stages and ends by updating the process as that understanding changes.

Below is an operational description of the surveillance process. Specific procedures for each type of market infraction should be thoroughly documented including samples of relevant tracking reports, official notices and correspondence and any other required documents.

Understand the market

The first and most important step in building a surveillance system is to understand normal market behavior, including variations in trading activity over a day or other selected time periods or modes, in order to set market benchmarks.

Define and create alerts

Based on market benchmarks, analysts set alerts to fire when benchmarks are exceeded. “Push” style alerts that trigger pop up messages are preferred to “pull” style alerts that require analysts to query the technology. It should be easy to set and change customized alerts using standard Windows tools and to determine how many alerts will result from a given setting.

The screenshot shows the 'Rule Builder' window with the following configuration:

- Rule ID: KLSE-2002-100
- Apply to: Orders
- Level: Level 1
- Category: (empty)
- Alert Message: Normal Board - AIC.N000 Buy Orders above RM 101
- Main Parameters: BOARD, INSTRUMENT, ORDER, PARTICIPANT, SECTOR
- Sub Parameters: BOARD_ID, BOOK_TYPE
- Rule: `[[BOARD.BOARD_ID]=NORMAL] AND
[[INSTRUMENT.INSTRUMENT_ID]=AIC.N0000] AND
[[ORDER.BuySell]=BUY] AND
[[ORDER.Price] > 101] AND
[[ORDER.Qty] > 10000]`
- Buttons: 7, 8, 9, +, -, *, /, MAX, 4, 5, 6, AND, OR, NOT, ABS, MIN, 1, 2, 3, =, !=, (,), 0, ., >, >=, <, <=
- Options: Enabled, Repeat, Save Alert, Popup Alert, Halt Market
- Buttons: Add, Cancel

Illustration from e-Surveillance

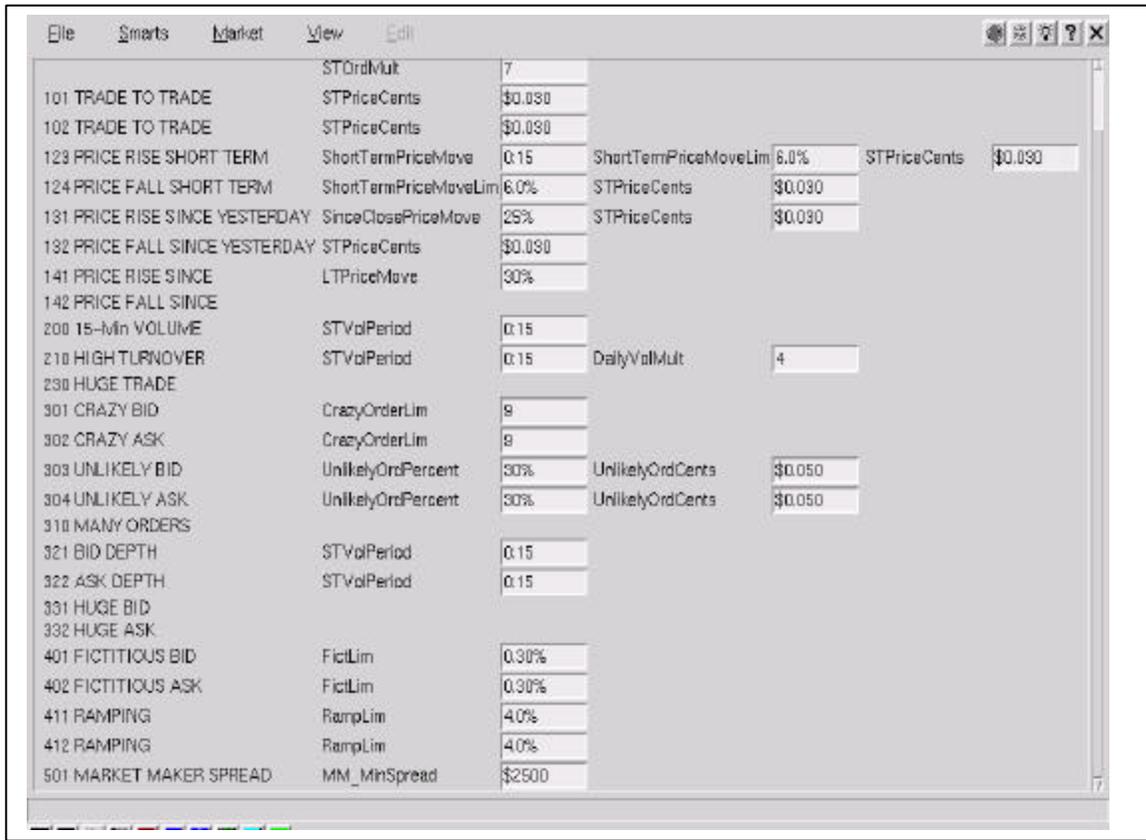
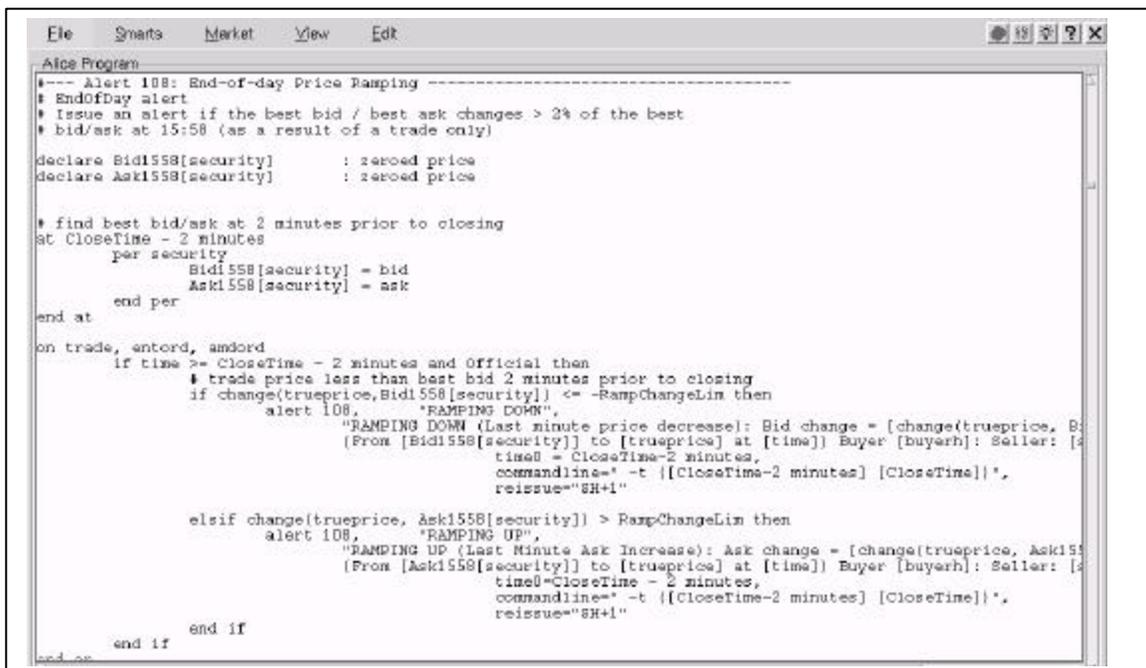


Illustration from SMARTS

In some cases such as the SMARTS there is a sophisticated language like ALICE that is used to create the alerts.



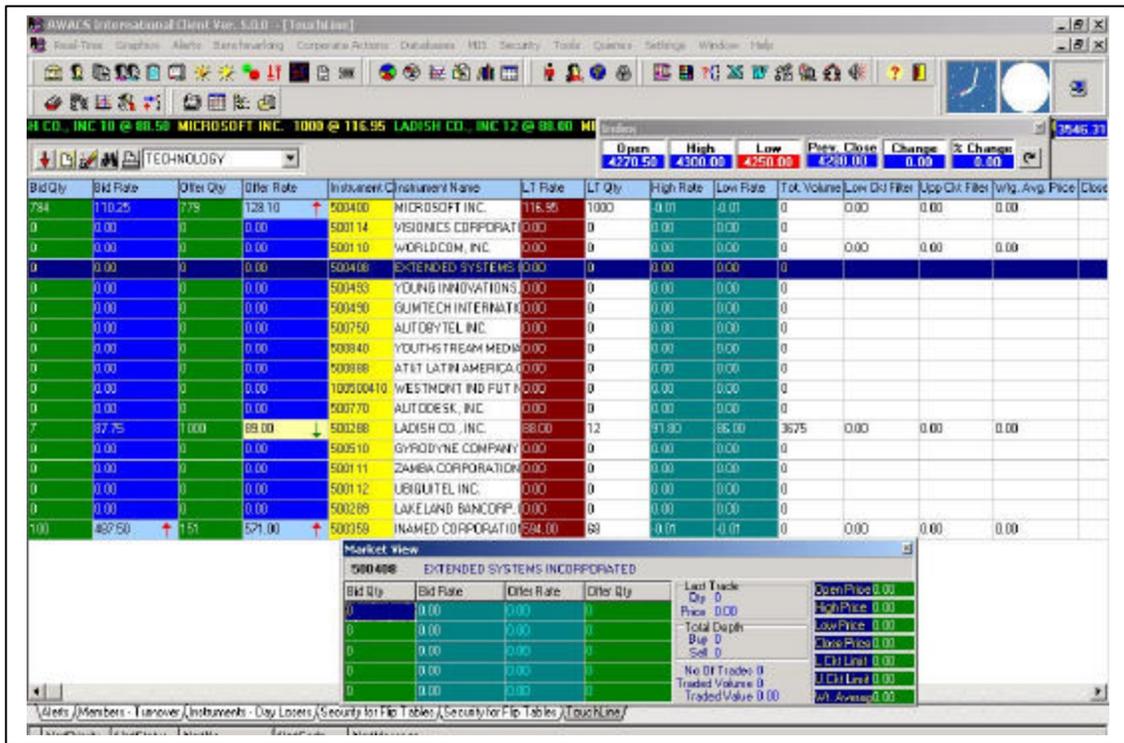


Illustration from AWACS

Manage alerts

Once an alert has been triggered, it should be easy for managers to assign and track alerts as needed. Alerts may be shared, locked or sorted by a range of categories. If appropriate, a case may be opened and associated with one or more alerts.

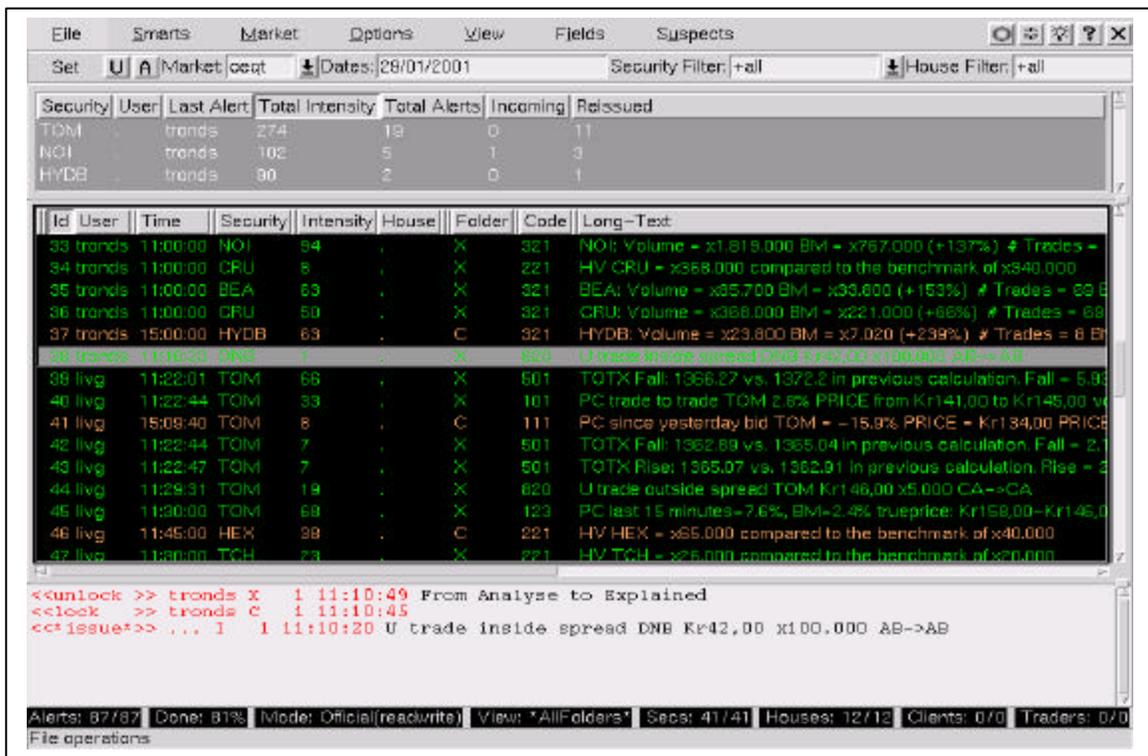


Illustration from SMARTS

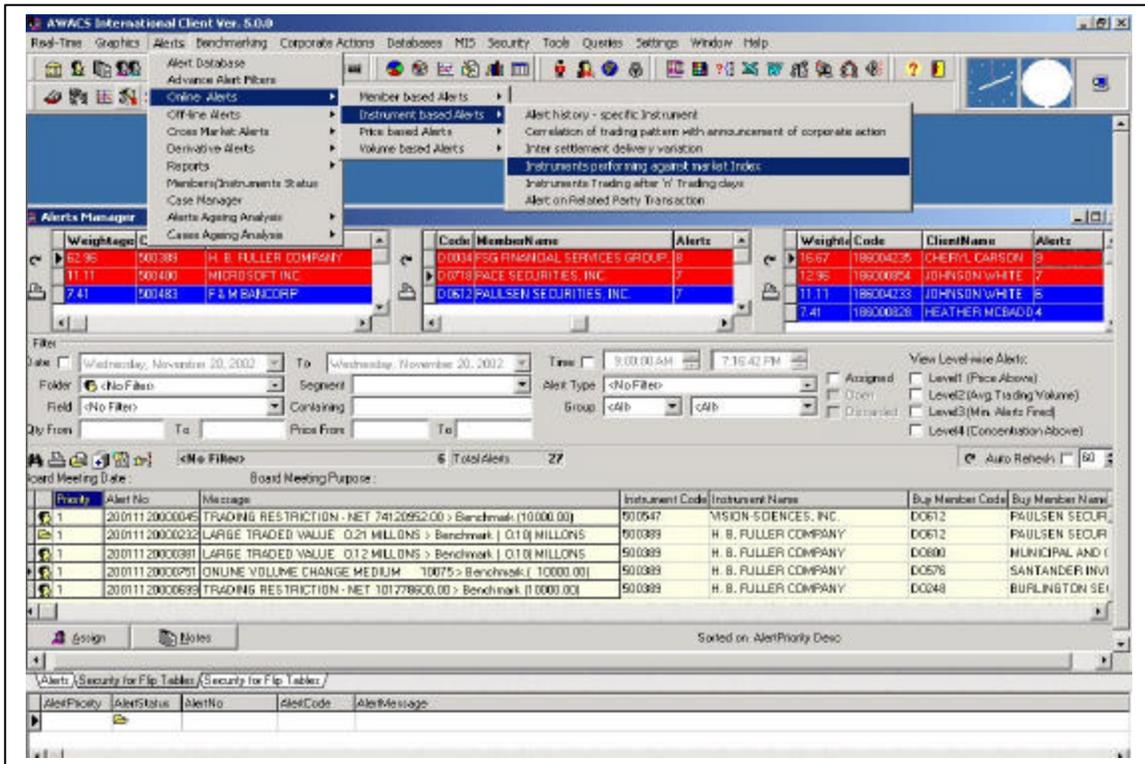


Illustration from AWACS

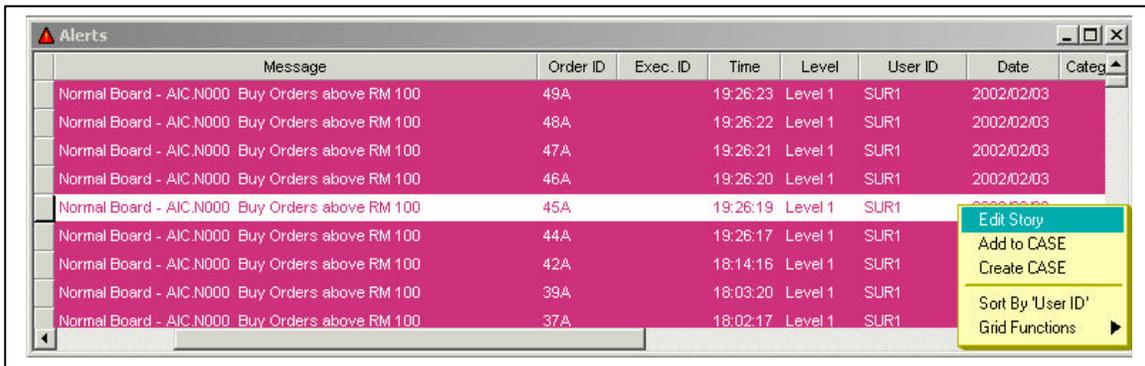


Illustration from e-Surveillance

Identify information (or lack of), as well as past and present trading circumstances

When researching an alert, analysts need access to a variety of visual and text-based representations of the suspicious trading activity, including the presence or absence of any related market news. The analyst must examine the suspicious behavior in the context of surrounding trading activity for any relevant time period and be able to replay the market tick by tick.

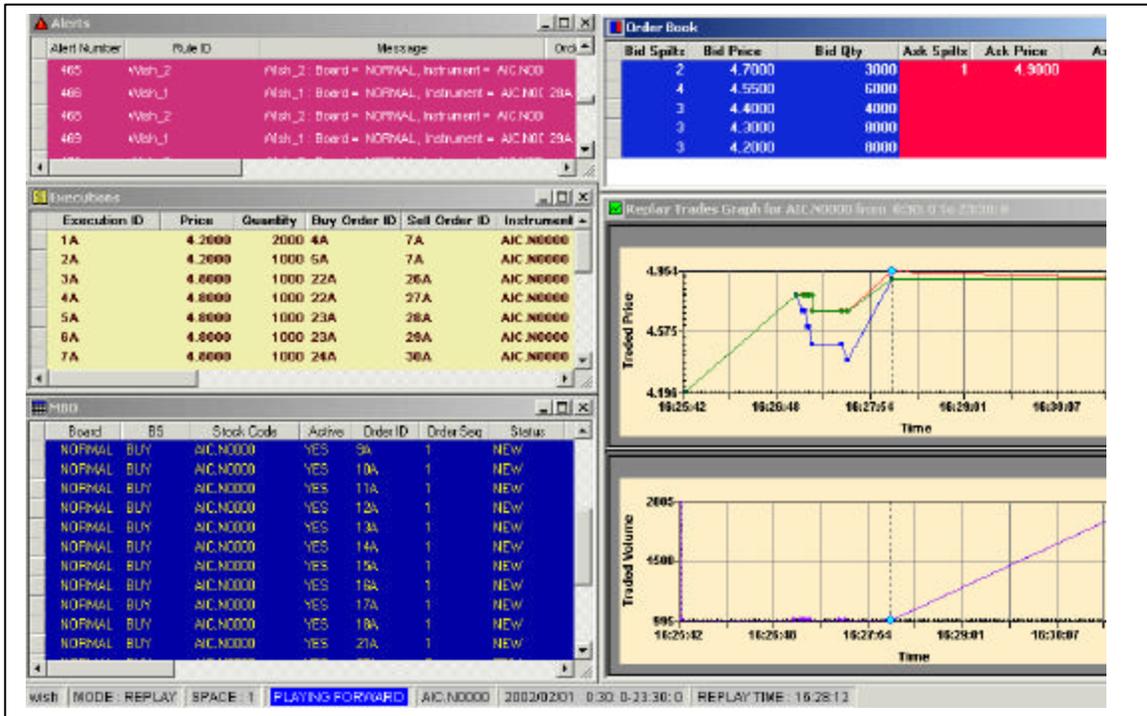


Illustration from e-Surveillance

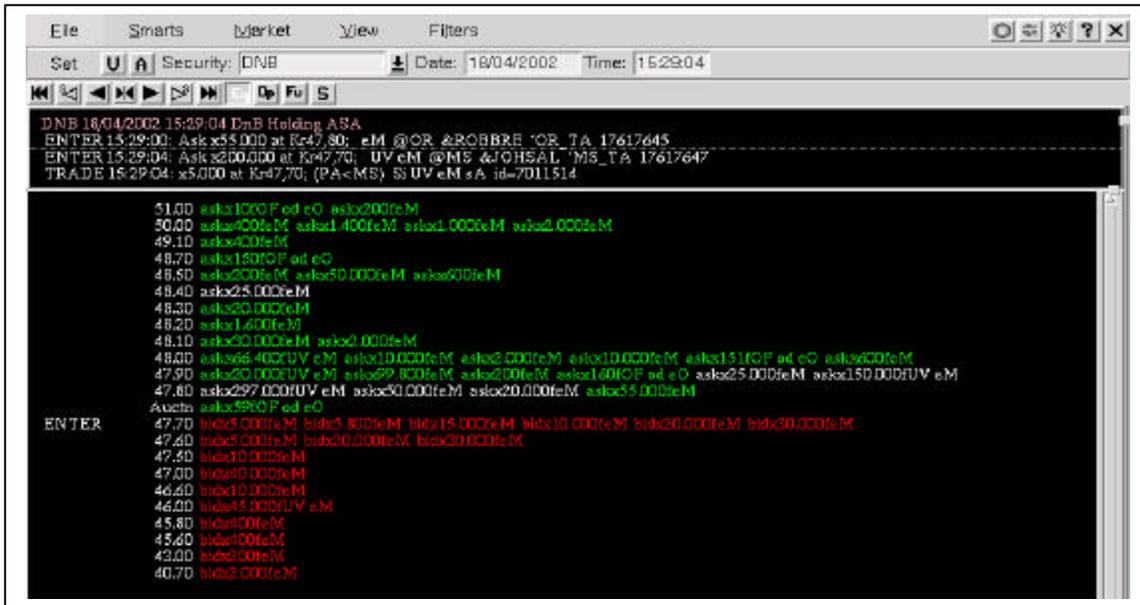


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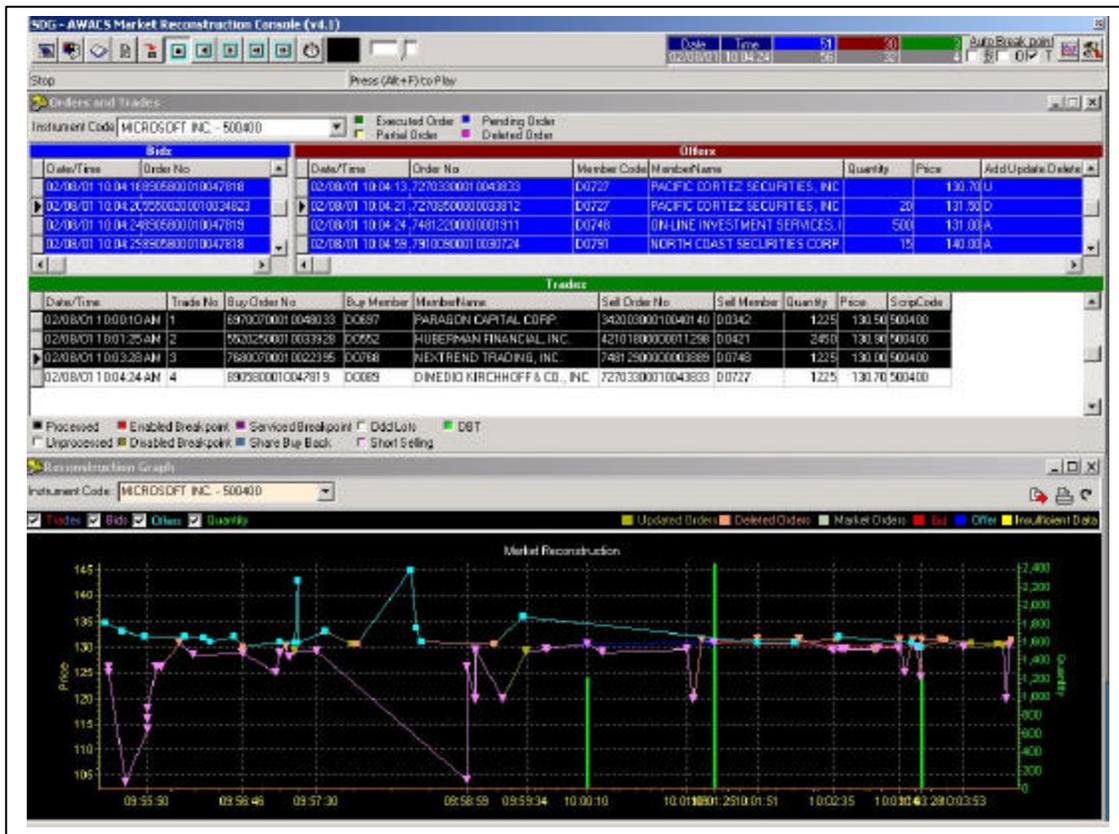


Illustration from AWACS

Make decision on type of aberrant market behavior

Once the analyst has identified the probable market infraction, it may be useful to gather additional information on other major trading parties in a security. Ideally this and other general trading statistics would be available in real-time customizable tables for ease of viewing.

Approach brokers for client information (standard form)

A standardized report format for contacting brokers and other external parties is now needed to speed up the flow of information. Customizable reports should be exported to a standard Windows application such as Excel, to include additional data fields such as client name for the broker to complete.

Assimilate client information with trading records

Having made it easy for the broker to respond, the completed report can quickly be integrated with trading data to determine things like the preponderance of a given client or group of clients.

Establish relationships between traders or between traders to company through access to regulatory databases, electronic white pages and mailing lists.

Those who engage in insider trading often hide behind third party traders. The ability to link to external databases allows analysts to explore these and other possible relationships that may be material to a market violation.

Prepare report and briefing for prosecutor.

If prosecution is pursued, the analyst prepares briefing papers and other reports as requested by court officials. A replay screen that emulates the trading screen makes it less likely that a broker will claim a lack of understanding of trading events (as may happen when the facts of the case are laid out on paper).

Close the case.

At any time after the case is opened, the analyst may, at the discretion of the manager, close the case. When the case is closed, the reason should be clearly stated. A case management system is an important function.

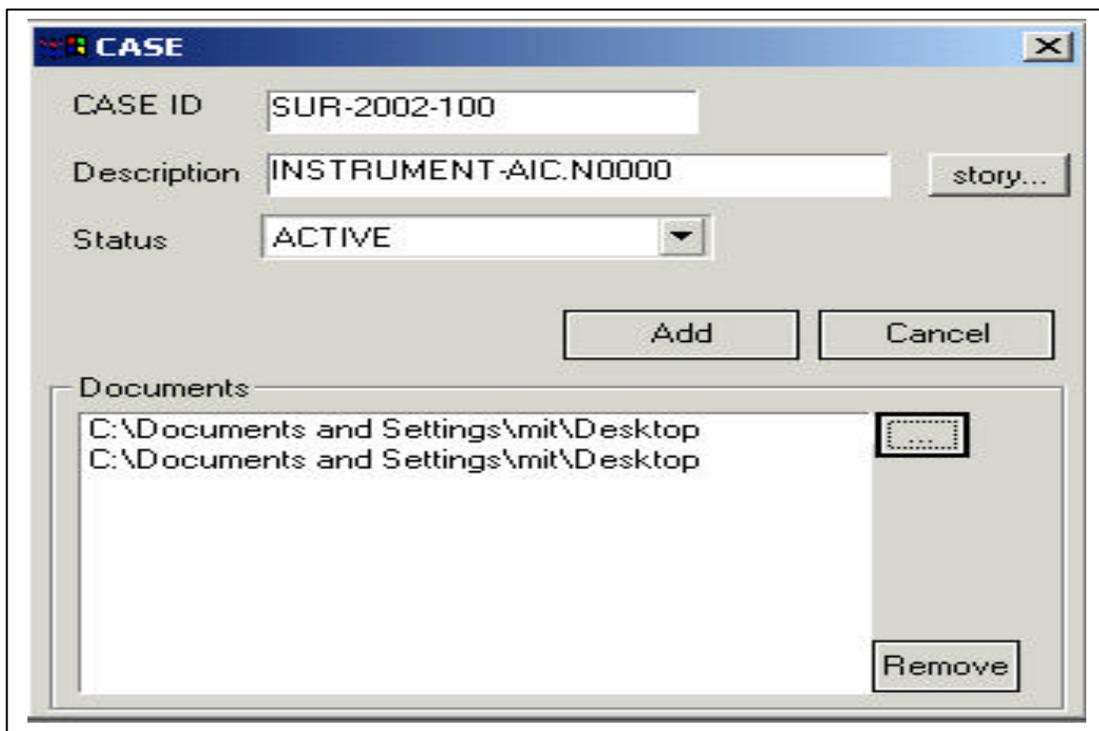


Illustration from e-Surveillance

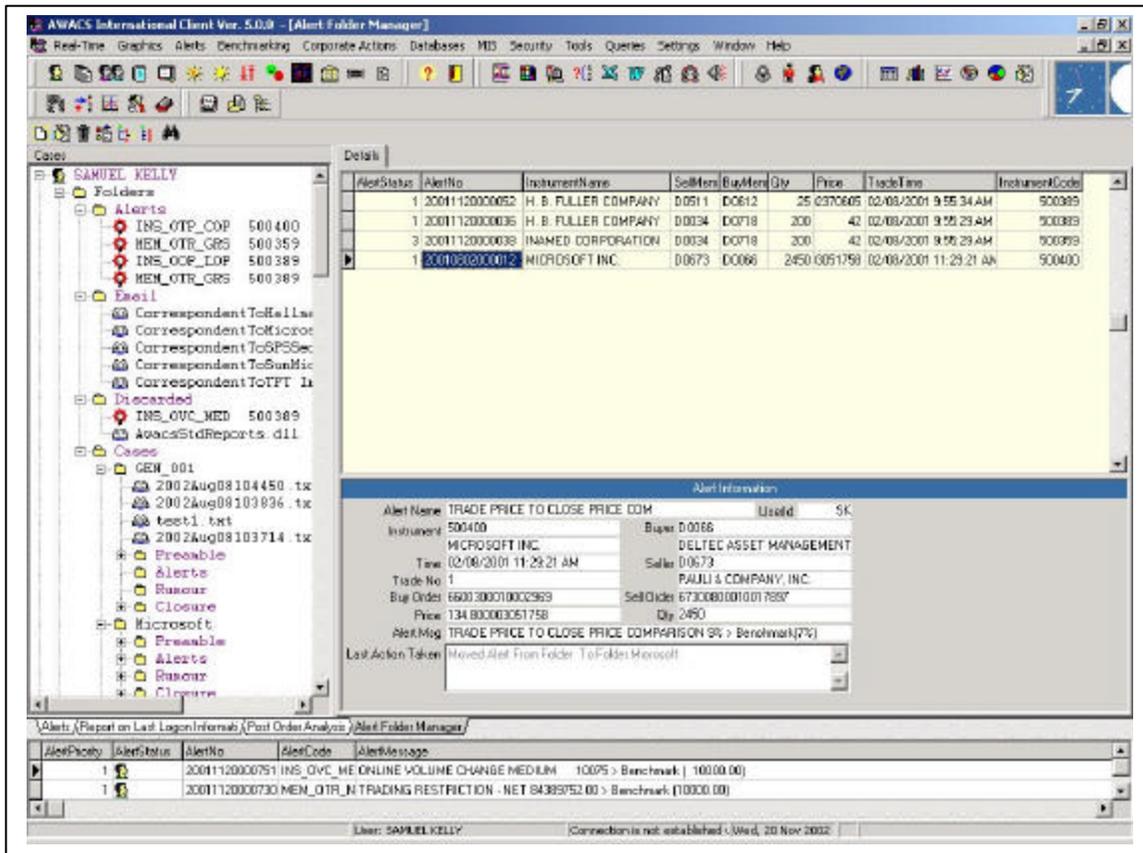


Illustration from AWACS

Ideal Surveillance Environment for PSE/SEC

A (partial) wish list:

Personnel and Objectives

Hire/train staff with a sense of the market and an attention to detail.

Align surveillance objectives and procedures with the objectives of the exchange.

Data Feeds

Receives multiple feeds from trading, clearing, and settlement engines

Ensures that trading, clearing and settlement technology is fully automated and integrated providing perfect audit trail.

Receives market news and associates it to the appropriate security

Potential link to CDS

Benchmarks and Alerts

Sets benchmarks for “normal” trading behavior.

Provides generic alerts

Creates alerts for any financial instrument.

Manages alerts for any financial instrument (alert log).
Provides user customizable alerts using standard Windows tools
Sets alerts for groups of brokers, traders, securities
Sets designated alert times
Assigns alerts to more than one case
Auto generates letters of inquiry to brokers
Filters data to show events for a selected alert
Calculates number of alerts based on benchmark settings
Calculates number of staff needed to handle current alerts
Allows client level alerts
Routes alerts to specific officers
Assigns alerts after a defined number of occurrences
Identifies circular stock movements

Screen Displays

Parameter settings for All, or for selected brokers, traders, securities
Real-time updates for appropriate screen displays
Color-coded table format for easy viewing of trading data, with detailed or snapshot view
Drill down capability where appropriate

Market Replay

Visualizes and replays marketplace tick by tick.

Database Interfaces

Acquire software capable of interfacing with regulatory databases.
Acquire software capable of interfacing with external information databases including newspapers and commercial information vendors.
Acquire software capable of interfacing with broker/client information databases.

Reports

Provides generic reports and report templates
Allows customized reports and report templates
Output reports directly to email

Case Management & Event Studies

Provides case management with folder structure.
Allows text, voice, email attachments
Allows case transfer to other analysts
Allows case sharing
Case security set by manager
Provides event studies.

Other Exchanges

Ensures that agreements are in place with other exchanges to share information especially for exchanges offering substitutable instruments.

Cost Management

Share technology to reduce costs and provide practical information sharing.
Ensure that surveillance software covers both the issues of detection and management.
Minimal hardware investment

Risk Management

Tracks minimum capital requirements for brokers
Shared by risk management and surveillance.

Information Management

Connects to external market news feeds such as Reuters, Bloomberg, etc.
Associates and attaches announcement to specific trading events
Provides secure email facility

System Security

Manager-defined security levels

Other Considerations

There are certain considerations that should be part of any software purchase.

Turnkey vs. Add On

To provide a more complete audit trail, an integrated end-to-end product is usually preferable to an add-on product that links to existing software. Updates in one or both systems may cause software conflicts that neither software vendor considers itself obligated to remedy.

Flexibility

As much as possible software should be user-customizable with standard Windows tools without requiring third party code rewrites.

Installation/Training/Documentation/Support

Installation, training and support are critical stages in implementing new technology. Vendors should provide customized installation, training, documentation and support and use customer data for training. Ongoing training, coaching and support are a key factor in operational success

Source Code

Vendors should provide source code as part of the purchase agreement. Even vendors who protect their code as a trade secret should be required to place copies of the source code in escrow so that it would be available to the purchaser if the vendor went out of business or was unable to provide support for the product(s)

Appendix A, Workshop Descriptions

This paper is based on three workshops on market surveillance presented in November 2002. We are grateful for the support of the Asian Development Bank, Australian Agency for International Development (through the Philippine Australian Governance Authority), International Securities Consultancy and the Aries Group for their support of these programs.

Capital Markets CRC [SMARTS]

On November 8, PAGF, ADB, ISC and Aries jointly sponsored an all-day workshop at ADB headquarters on market surveillance to invited guests from the SEC, PSE, PCD, SCCP, ADB, etc. The morning presentation was designed to give senior SEC and PSE staff a strategic understanding of market surveillance and the processes that make up a market surveillance system. The afternoon demonstrated one example of software surveillance technology (SMARTS) to SEC and PSE operational staff.

These two workshops were presented by Prof. Michael J. Aitken, Chair of Capital Market Technologies, University of New South Wales, Sydney, Australia. Prof. Aitken is a noted expert on automated surveillance systems, which he developed under a major grant from the Australian government. He is a key researcher at the Capital Markets Cooperative Research Centre (CMCRC) funded by the Australian government. Prof. Aitken has designed surveillance systems for major Exchanges around the world including NASDAQ, Bombay and Australia, and designed and built surveillance systems for Exchanges in Hong Kong, Singapore, Indonesia, New Zealand, Malaysia, Sweden, Norway, Denmark, Iceland and Russia. Prof. Aitken also designed and built surveillance systems for the SECs of Hong Kong, Singapore and Russia.

Millennium Information Technology [e-Surveillance]

On November 15, ADB, ISC and Aries jointly sponsored an all-day workshop on market surveillance at ADB headquarters to invited guests from the SEC, PSE, PCD, ADB, etc. The presentation was designed to give senior SEC and PSE staff a live demonstration of surveillance technology and allow the audience to interact with the presenters to develop a more comprehensive understanding of market surveillance and the processes that make up a market surveillance system

The second workshop was presented by Mr. Reeza Zarook, Mr. Jit Seneviratne and Mr. Chaminda Wickeramasinghe of Millennium Information Technologies, Colombo, Sri Lanka using their e-Surveillance system and a trading system to simulate trading activity. The e-Surveillance system has been installed in the Colombo Stock Exchange, Malaysian MESDAQ exchange and the Stock Exchange of Mauritius.

SDG Technologies [AWACS]

On November 20, ADB, ISC and Aries jointly sponsored a half-day workshop at ADB headquarters on market surveillance to invited guests from the SEC, PSE, PCD, ADB, etc. The presentation was designed to give senior SEC and PSE staff a third perspective on approaches to surveillance technology and allow the audience to interact with the presenter to refine their understanding of market surveillance and the processes that make up a market surveillance system.

The third workshop was presented by Mr. S. V. Bharat of SDG Technologies, Hyderabad, India and utilized their AWACS surveillance software. AWACS is installed at the Stock Exchange of Mumbai, the Bangalore Stock Exchange, The Calcutta Stock Exchange and the Delhi Stock Exchange.

Appendix B – Surveillance Software Comparisons

Criteria	Definition	Computershare	Millennium IT	SDG Technologies
System Name		SMARTS	e-Surveillance	AWACS
Business Rules Compliance	System Behavior should comply and follow business rules, procedures, and practices	Yes System is so flexible to customize and comply with exchange’s and clients specifications on monitoring and surveillance issues	Yes System was designed to be Rule-based, the company call it “Rule Based Programmable Software Components”	Yes System was designed to be Rule-based.
Real-time Connectivity	Ability to capture and reflect actual trading activities (volume, price, quotes, etc.)	Yes	Yes	Yes
Market Replay	System should be able to re-run any given session for review or audit	Yes	Yes	Yes
Defined Alerts*	Basic alerts (volume, price deviation, unusual trends, concentrations, etc.)	Yes	Yes	Yes
Custom Alerts	System can be appendable to more customized alert features	Yes With its propriety scripting language, ALICE, one can develop unlimited customized alerts	Yes System has a built-in feature called RULE BUILDER	Yes
Seamless Connectivity to the Exchange’s Data	The System is designed to directly be directly connected to the Exchange especially during installation	Yes	Yes	Yes

System Scalability and Extensibility	Management of additional terminals, clustering, load balancing issues, etc.	Yes	Yes	Yes
Fault Tolerance	System should be automatically manage downtimes and system disruption	Yes	Yes	Yes
Technical Support	Manual or electronic system maintenance, troubleshooting, upgrades, etc.	No Not readily available in the Philippines. Usually flies in from the nearest available area (e.g. Australia)	No Since there is not local presence here, we are not sure how the company resolves this issue	No Since there is not local presence here, we are not sure how the company resolves this issue.
Disaster Recovery and Reconstruction	Data maintenance, backups, recovery, restoration, etc.	Yes Built-in	Yes Built-in	Yes Built-in
Availability		Out of the Box Installation support billed separately	Out of the Box Installation support included	Out of the Box Installation and configuration support included
Startup Cost		US\$1.0 Million to US\$1.5 Million (negotiable)/ (Basic package comprised of 8 modules, 11 optimal)	US\$ 400 Thousand to US\$ 500 Thousand (negotiable)	US\$ 300 Thousand (negotiable)
Annual Maintenance Cost		US\$ 200 – 300 Thousand	US\$ 100 Thousand	US\$ 30 Thousand (if PSE buys) US\$ 100 Thousand SEC alone
Proposal of Acquisition	Suggested By the Vendor	Outright Purchase Installment Term of Purchase Lease to Own	Outright Purchase	Outright Purchase Installment Term of Purchase Lease to Own
Website		www.smarts.com.au	www.millenniumit.com	www.sdgsoftware.com

*Basic alerts would cover the usual parameterized flags and more:

- **Cumulative Price** - It lists and notifies if there are issues deviating beyond a variance limit on cumulative price
- **Cumulative volume** - It lists and notifies if there are issues deviating beyond a variance limit on cumulative volume
- **Cross transaction**- It lists all brokers that significantly engaged in heavy cross transactions, compared to their regular floor transactions.
- **Run-off alert**- It lists all significant trading activity proximately prior to the run-off period. Normally this alert looks for “marking the close” transactions of particular brokers.
- **Significant shares concentration**- It lists the brokers and issuers who had unusual concentration of traded shares activity
- **Significant broker concentration**-it lists all issues whose bulk of traded shares are participated significantly by a broker
- **Significant trading alert**-it lists all issues with unusually significant market activity, based on issue’s statistical average trading volume

