Empowered by Innovation NEC

MasterScope

Invariant Analyzer

System Performance Analysis Software

http://www.nec.com/masterscope/

NEC Corporation

July, 2013

Agenda

1. Current State and Issues faced in managing Large-scale IT Systems

2. MasterScope Invariant Analyzer

3. Enhancement

4. Features

5. Product Information

1

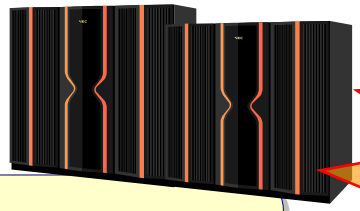
Current State and Issues faced in managing Large-scale IT Systems

1-1. The Importance of Service Level Management

As IT systems grow in scale and complexity,
it is getting more and more difficult to maintain high service levels.

Performance degradation is unacceptable and has a negative impact on business!

Service disruption



Business opportunity loss

Mission Critical Systems
(Zero Downtime Required)

Datacenter Servicers
(manage their customers' IT asset)

Limited time to **troubleshoot**

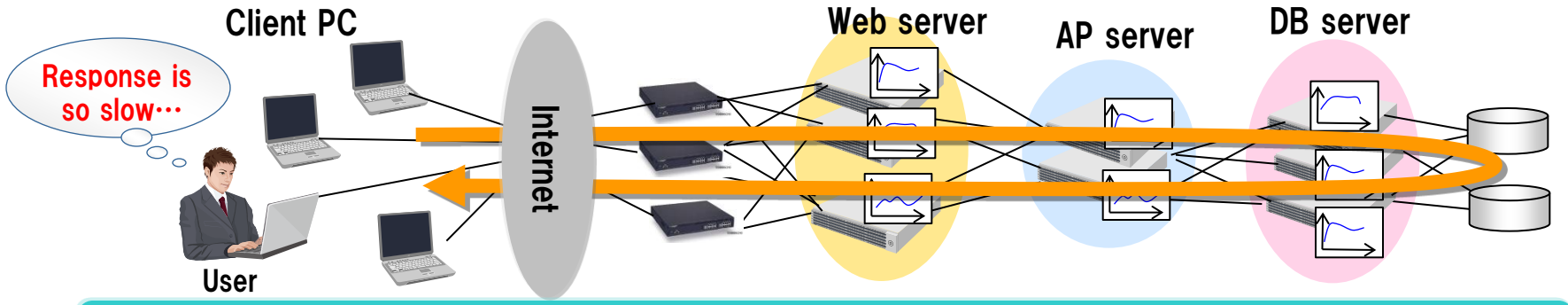
Systems Providing Social Infrastructure
(may cause a significant social impact)

Performance Management is the key.

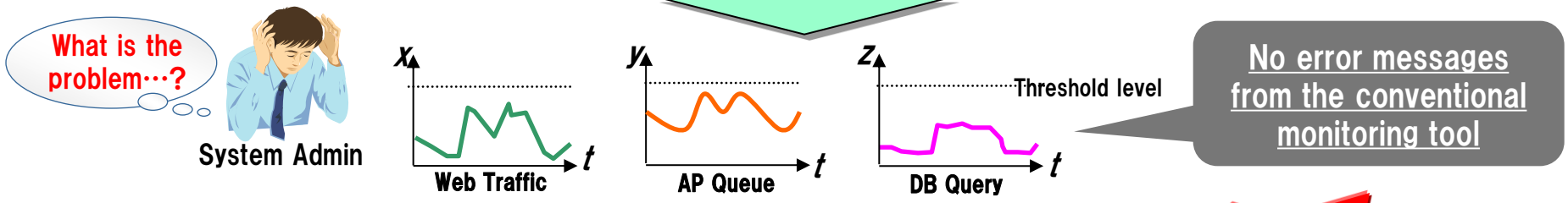
1-2. What is Silent Failure

Have you ever encountered the situation that there are many claiming from your system user but no error message was alerted?

- There is a failure which cannot be shown as error messages
- The invisible failure (= silent failure) takes huge time to identify and troubleshooting.



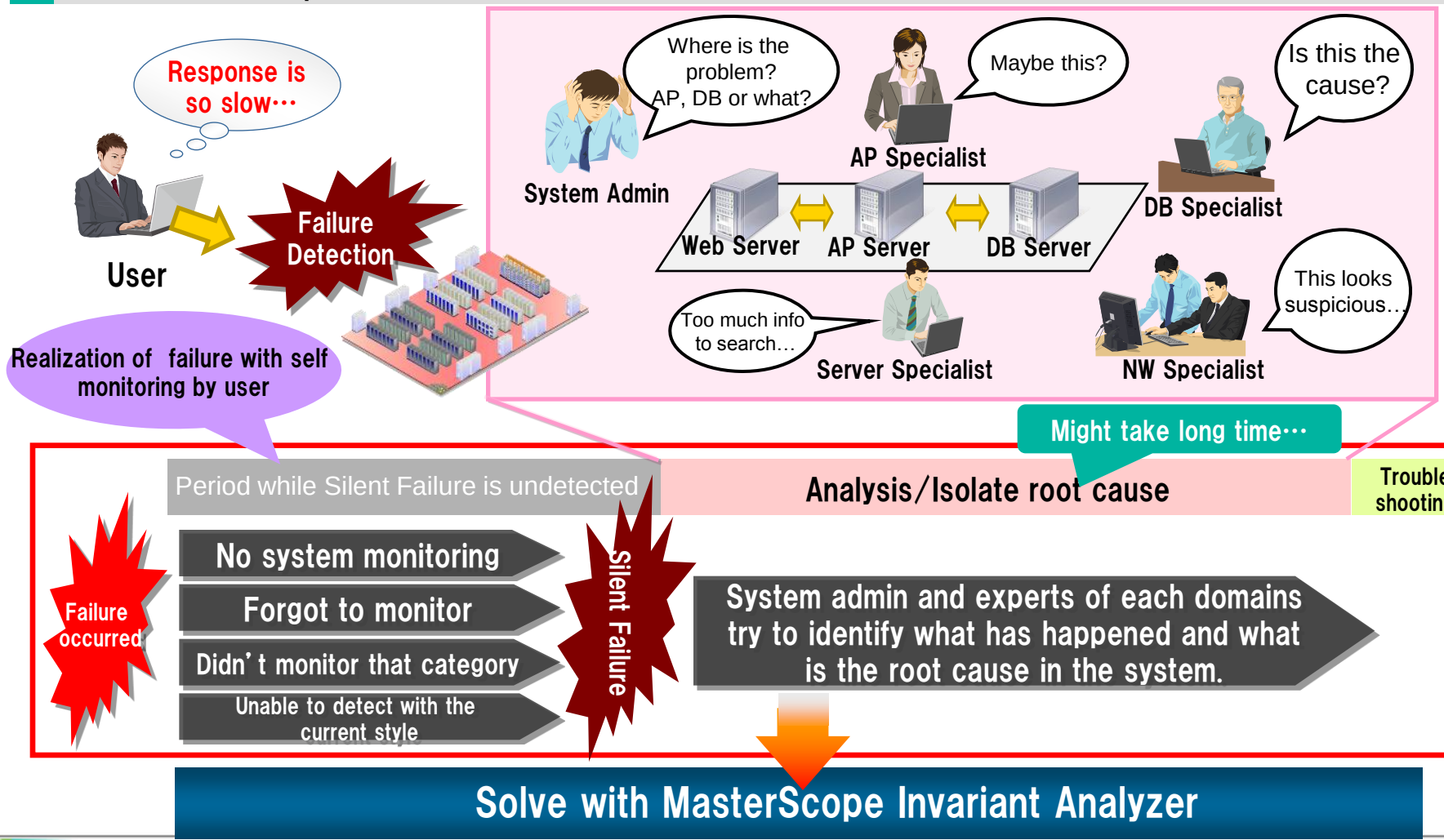
There is a claim that the service response is slower. Where is the bottle neck…?



Performance degradation w/o error message → **Silent Failure!**

1-3. Challenge of Silent Failure

Silent Failures are failures, which cannot be detected by error messages, needs experience of a highly skilled administrator in order to solve the problem. As a result, it takes longer time and high cost to troubleshoot the problem.



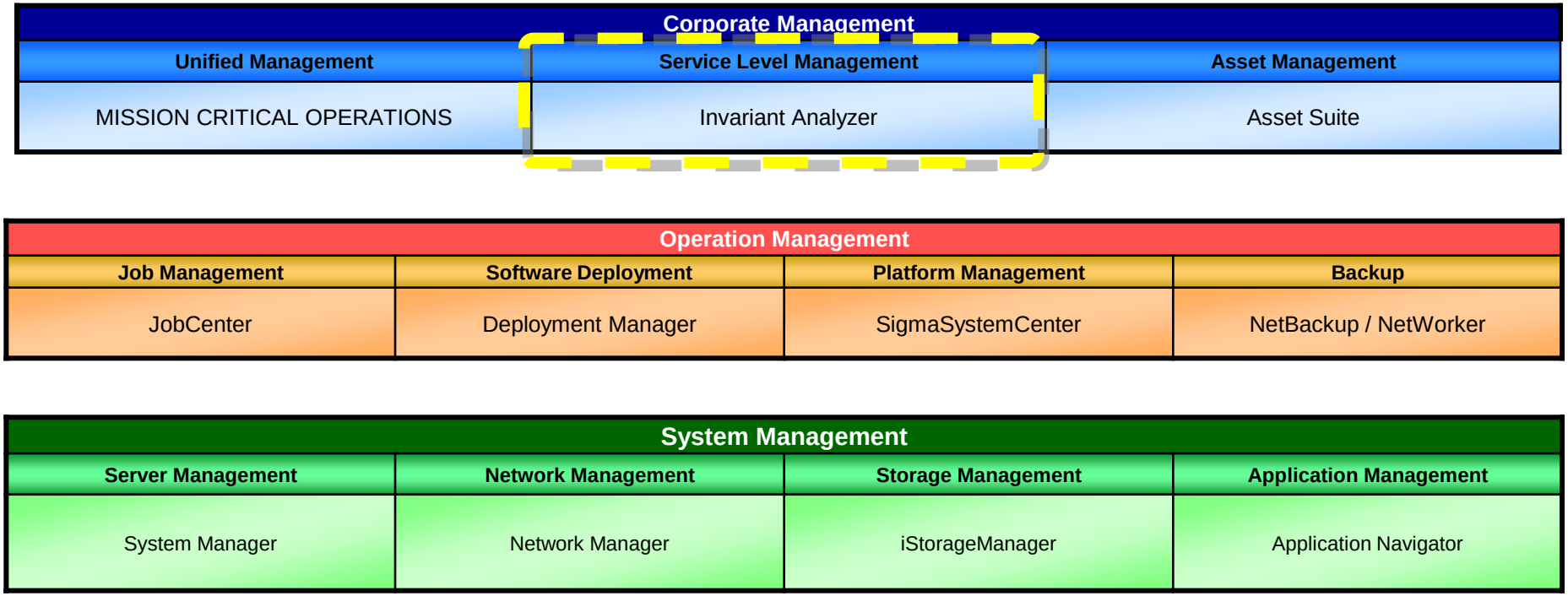
2

MasterScope Invariant Analyzer

2-1. Position in MasterScope Product Family

MasterScope is NEC's Integrated Operation Management Software Suite, which realizes simple and unified system management

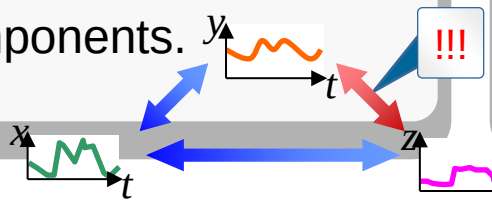
MasterScope Invariant Analyzer helps in maintaining service level and system performance by analyzing application performance and detecting silent failures.



2-2. Key Features

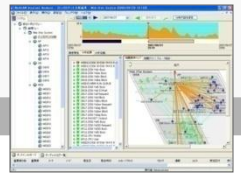
Feature 1 Automatic Detection

Detects Silent Failures based on performance data collected from various system components.



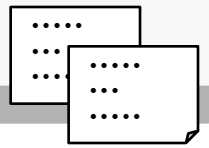
Feature 2 Visualization

With graphs and map view, it visualizes “abnormal behaviors” for quick understanding.



Feature 3 Knowledge Base

You can record actions you took for future reference to enable a prompt action to the current failure.

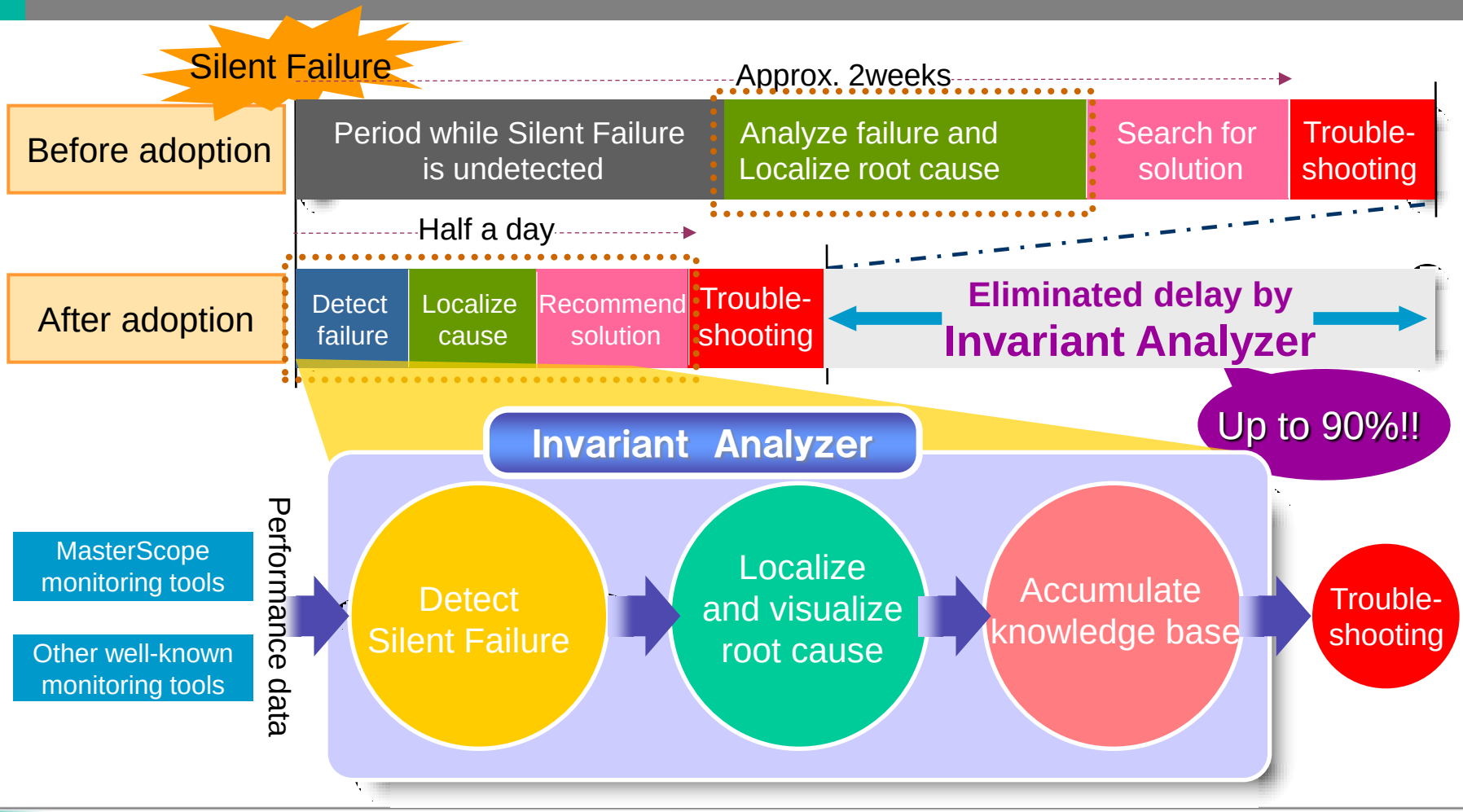


Feature 4 Easy setting

Just the performance data obtained from well-known monitoring tools is required. No additional component is required

2-3. Benefits

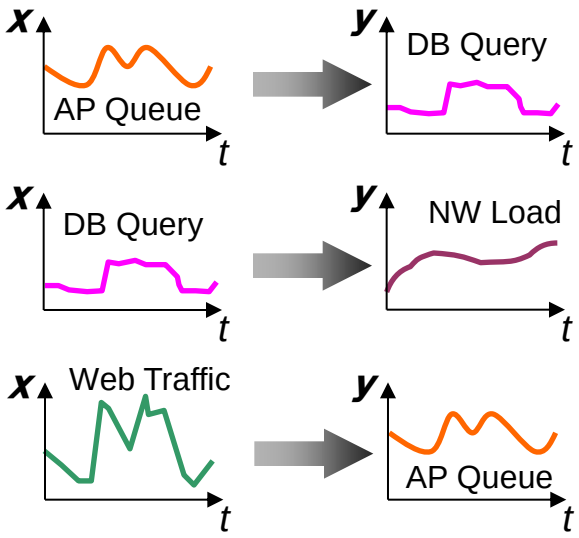
Invariant Analyzer offers optimized performance management through fast failure resolution.



2-4. Invariant Analysis Technology (1)

Search and extract “Invariant” relationships existing during normal system operation and model them as formulas of relationships between performance data.

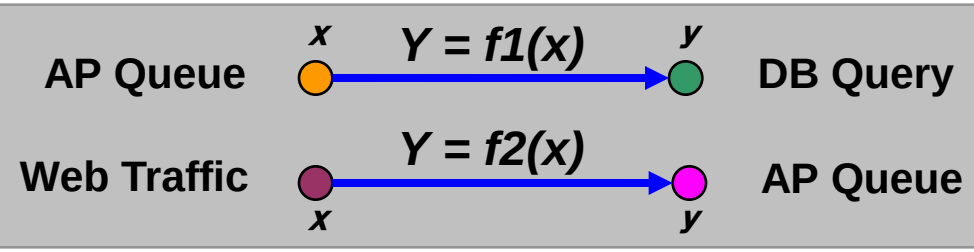
NEC advanced technology



Any relationships between them?

- Always reacting to each other
- Not always reacting ✗
- Always reacting to each other

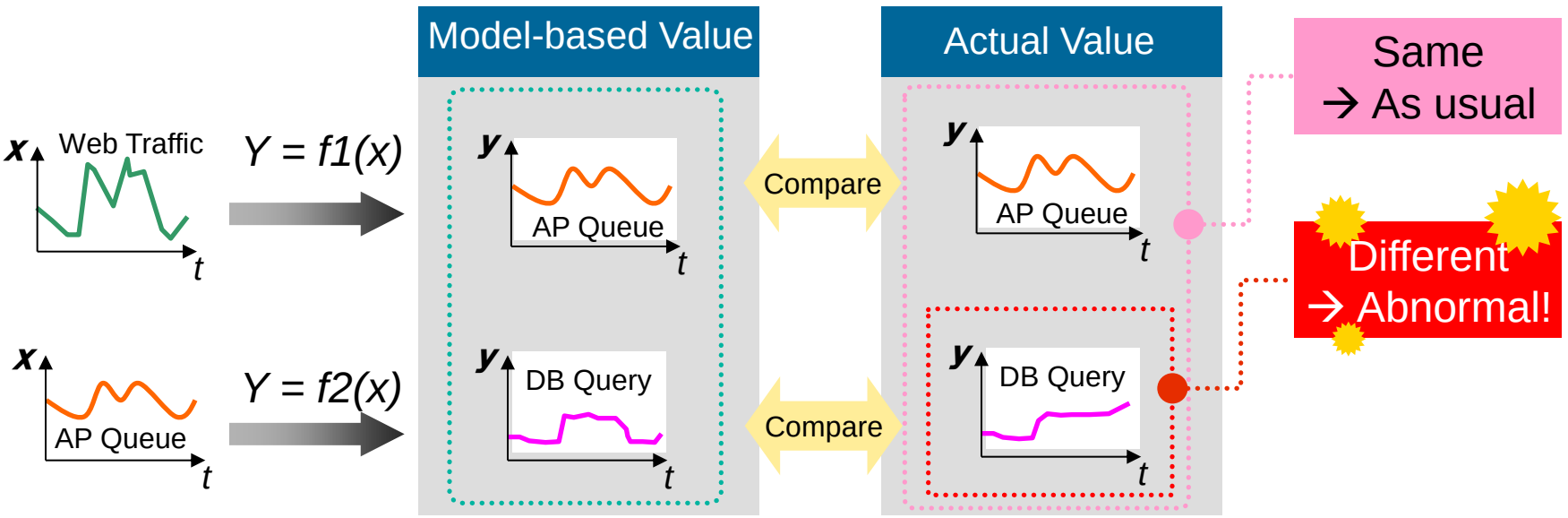
Generate a model based on formulas created from invariant relationships



2-4. Invariant Analysis Technology (2)

- Detect anomalies by comparing actual performance data with the value expected from the model to check if they differ.
- This method can localize the root cause because it uses performance data, which is collected from each system component.

NEC advanced technology



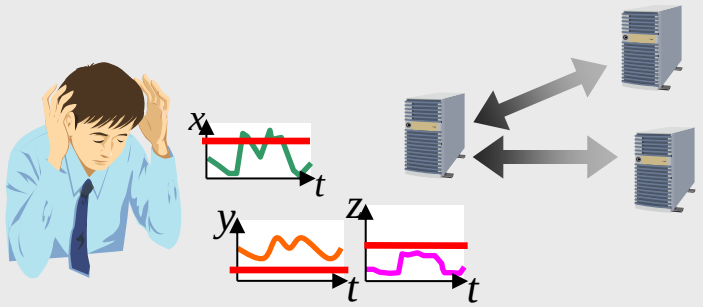
Silent Failures are detectable as an abnormal system behavior!

2-5. Advantages of NEC's Unique Technology (Summary)

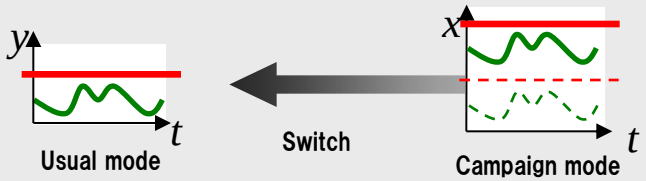
It is needless to set up performance thresholds, since it focuses only on invariant relationships among performance data.

Conventional performance monitoring tool

For a large system, administrator needs to configure a number of threshold settings (ex. 200 items per servers)



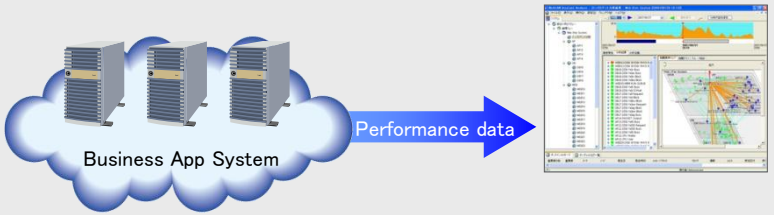
Frequent review of the threshold values is required, whenever business condition changes.



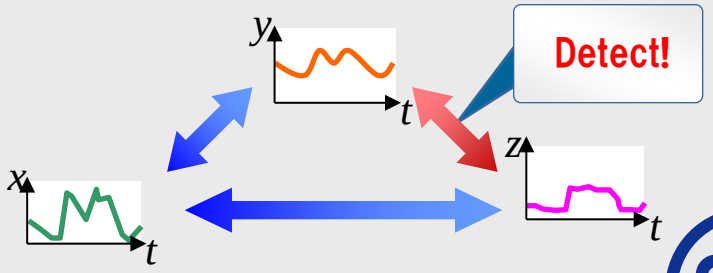
Required effort is

Invariant Analyzer

No need of complex setting is required.
Just import performance data



IA monitors relationship between performance counters, so reviewing monitoring configuration is not required



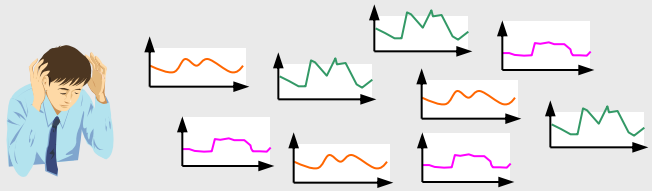
Required implementation effort is very low.

2-5. Advantages of NEC's Unique Technology (Preparation 1)

Complex configurations are not required. You just need to input performance data.

Conventional performance monitoring tool

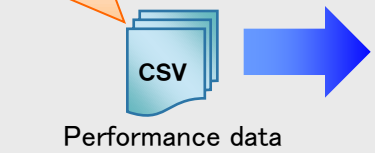
- Analyzing numerous data points is not a simple and easy task.



- It requires specialized expertise .

Invariant Analyzer

Imports CSV file irrespective of data contents.



Performance data

Just input performance data generated by any application/tool

➔ Numerous data points can be analyzed easily.

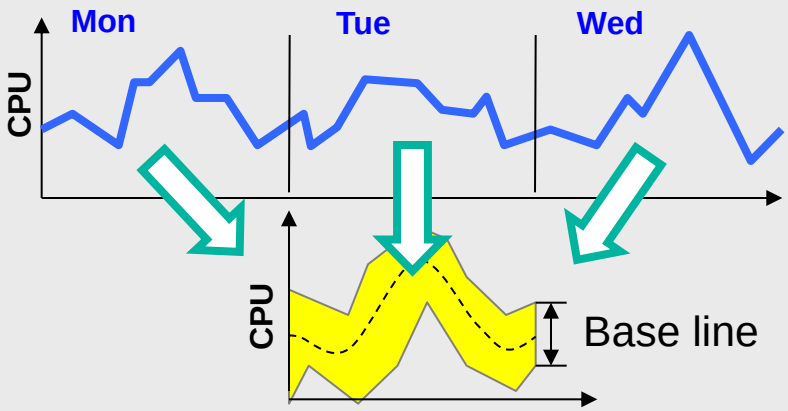
➔ Easy analysis can be done without specialized expertise.

Simple operations results in efficient management.

2-5. Advantages of NEC's Unique Technology (Preparation 2)

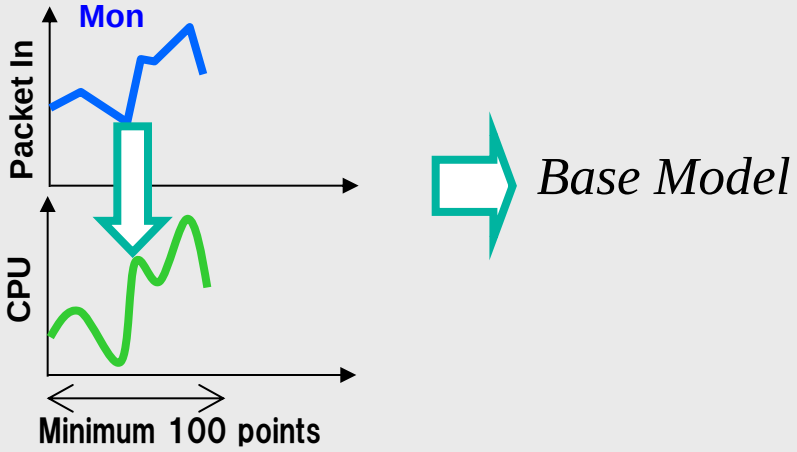
Invariant Analyzer has capability to create base model from minimum 100 points (less than 2H with 1 minute interval).

Conventional performance monitoring tool



Need to setup threshold values individually else it requires more time to learn system behavior.

Invariant Analyzer



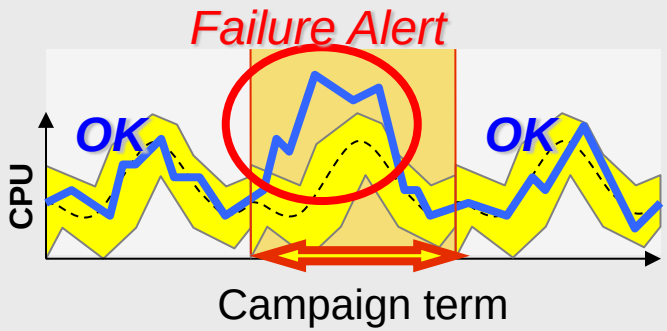
Using IA, user can detect appropriate system behavior in minimum time. (minimum 100 points)

Enables to analyze Short-Term system data

2-5. Advantages of NEC's Unique Technology (Analysis Quality)

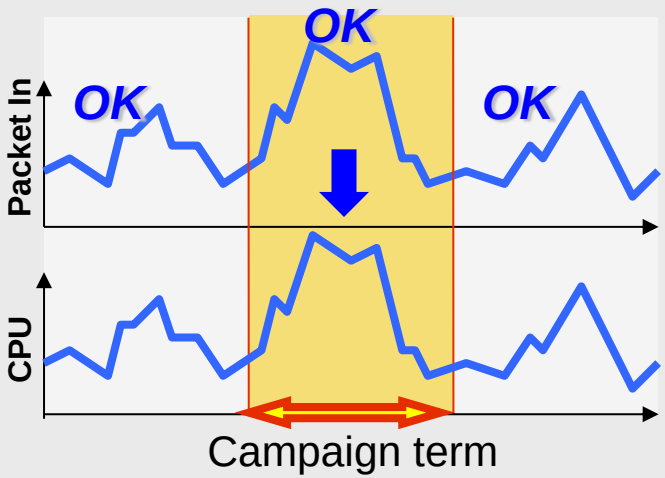
As long as the system behavior doesn't change, Invariant Analyzer will not generate any alert for a tentative change in performance.

Conventional performance monitoring tool



If the value exceeds the threshold level, failure alert will be sent imperfectly.

Invariant Analyzer



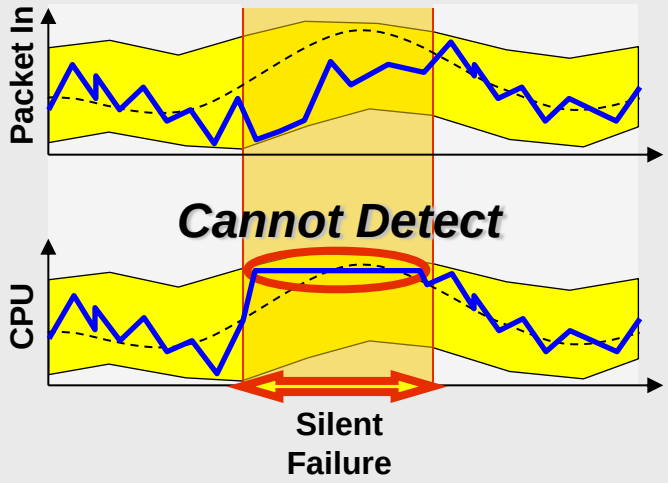
If there is no problem between invariant relationship (means normal behavior), no alert will be sent

Less Error

2-5. Advantages of NEC's Unique Technology (Silent Failure Detection)

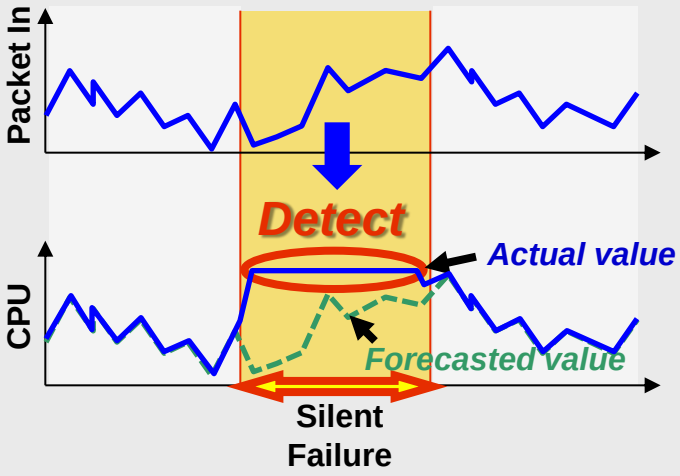
Invariant Analyzer has the capability to detect even small changes, which enables to find silent failure

Conventional performance monitoring tool



No alert message will be sent as long as it exceeds the threshold level

Invariant Analyzer



In case the invariant relationship is broken, IA will generate an alert even for small changes.

Do not even miss minor prediction

2-6. Three ways to analyze performance

On-demand analysis

- Analyze anytime on need basis
- Off-line analysis

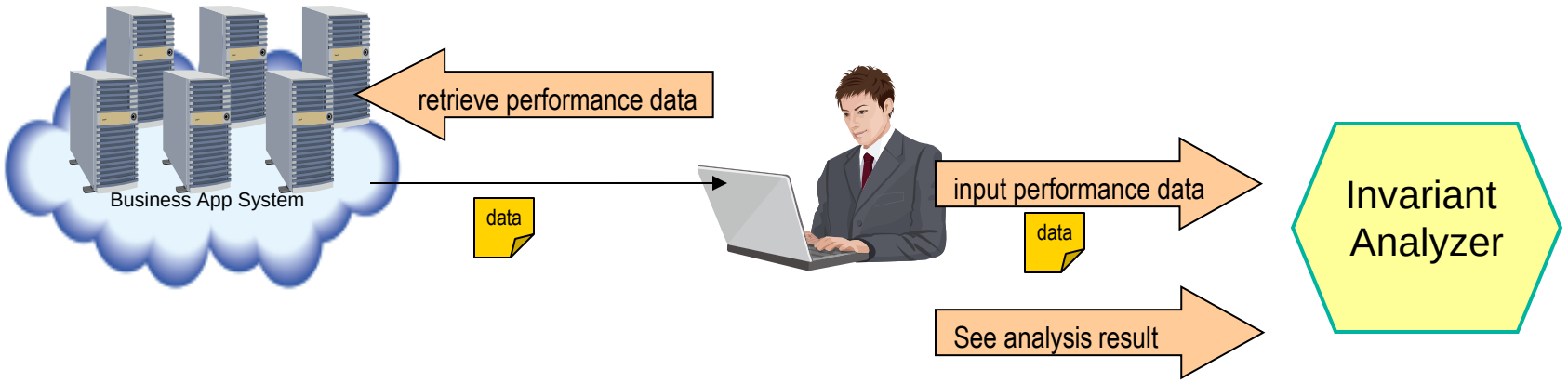
Periodical analysis

- Analyze periodically and notify the administrator in case a failure is detected
- Near real-time analysis (with short analysis interval)

Real-time analysis

- Analyze continuously and notify the administrator when a failure is detected
- Real-time analysis

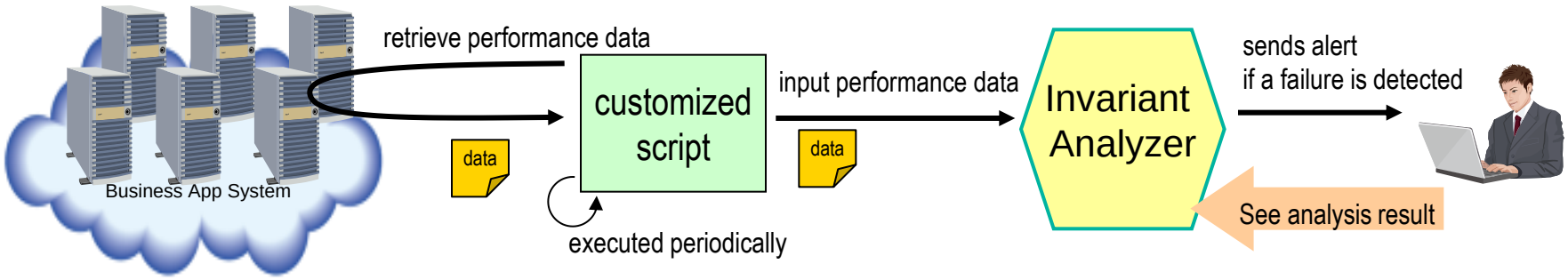
2-6. On-demand analysis



Typical scenario:

- The system performance data is continuously gathered and stored
- One day, administrator gets many complaint from end users regarding the performance of the system
- Then, administrator decides to analyze the performance using Invariant Analyzer
  - Retrieve the performance data for the period of the complaint
  - Input that data into IA and let IA analyze it
  - See the analysis result and try to find the root cause

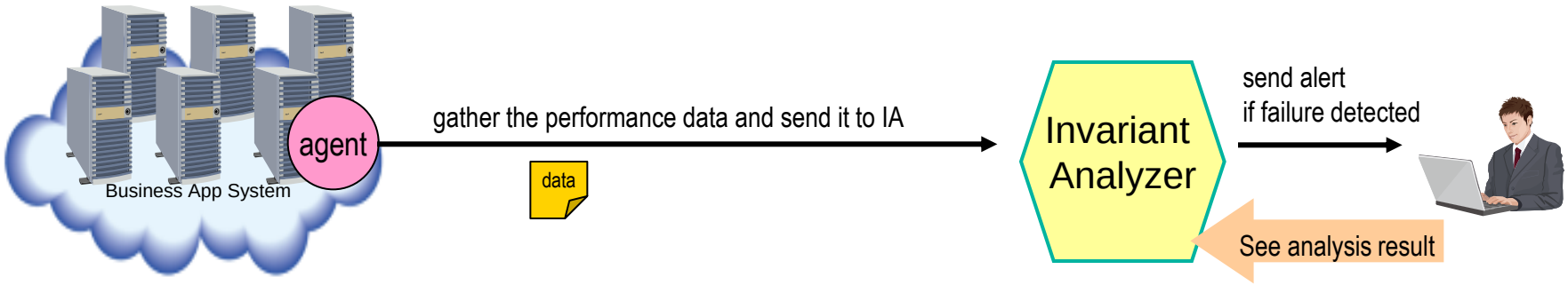
2-6. Periodical analysis



Typical scenario:

- Customized script is created using command-line interface
  - To get the performance data from the other monitoring tools and to input it into IA
- Periodically execute the customized script
  - Near real-time analysis, if a short period is selected
- If a failure occurs, administrator will be alerted by IA
- Then, administrator can see the analysis result and find the root cause

2-6. Real-time analysis



Typical scenario:

- MCO agent is installed in the target machine beforehand
  - Agent automatically gather the performance data and send it IA continuously
- One day, the failure occurs and administrator will be alerted by IA
- Then, administrator will see the analysis result and try to find the root cause

3

Enhancement

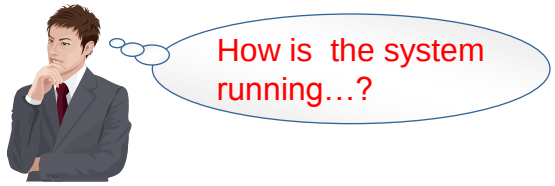
3. Enhancement

From Ver1.5

Automated schedule creation and analysis assistant function

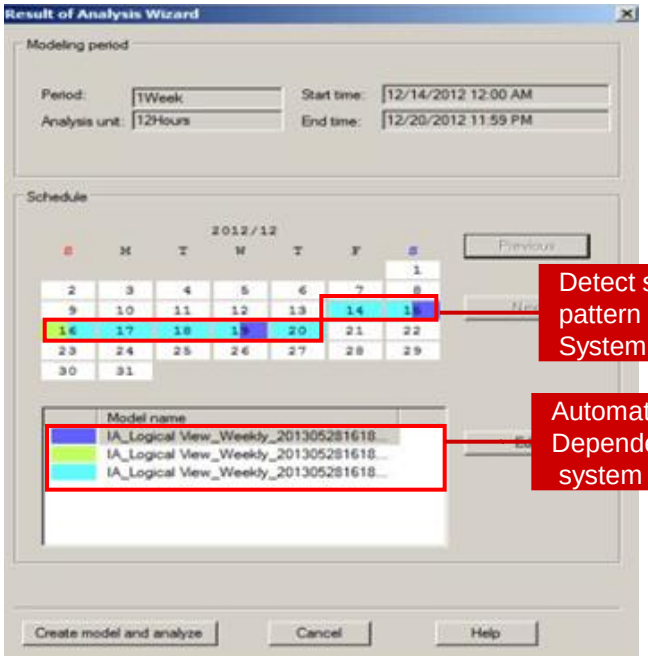
● Initially, administrator could improve analysis quality by using IA schedule function, which enables administrator to apply different models depending on the schedule. However, it was difficult for administrator to understand the schedule.

Sun	Mon	Tue	Wed	Thu	Fri	Sat



●IA automatically detects the pattern of system behavior depending upon the schedule such as weekdays/weekends, working hours/non-working hours, etc. and it also creates base model automatically. This function enables to **decrease user task and improves the quality of analysis**.

●Analysis assistant function provides wizard function for automated schedule creation as well as analysis, which makes **operations easier** .



4

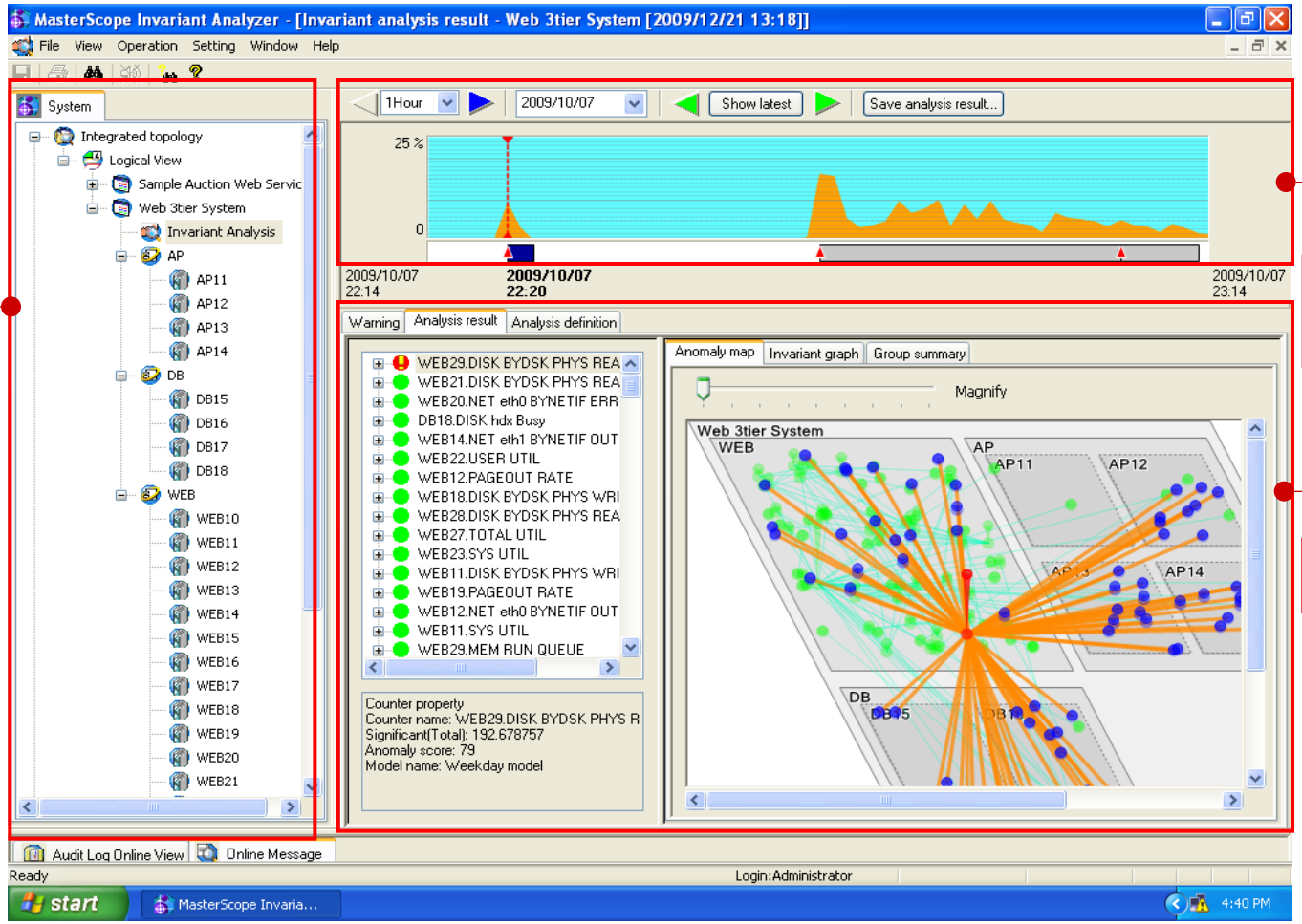
Features

4. Functions at a Glance

Functions	Overview	Descriptions
3-1. Main screen	Main screen	Simple and easy to understand GUI, displays analysis results in a single console.
3-2. Automatic analysis	Automatic analysis of performance data	Analyzes performance data automatically and detects failure
3-3. Root cause visualization	1. Visualize failures using graphs.	Graphs indicates the time of occurrence and severity of failures.
	2. Locate Failure using Map View.	Map view shows specific component primarily causing “abnormal behavior” and it’s impact.
	3. Visualize Failure using Pie Charts.	Pie charts can help administrators to determine the failure’s root cause from the statistical point of view.
3-4. Failure resolution	Knowledge Base	Action taken in response to each failure can be recorded in knowledge base for future reference.

4-1. Main Screen

Simple and easy to understand initial screen displays analysis results in a single screen.



Shows analysis targets hierarchically

Indicates “abnormal behavior” using graph

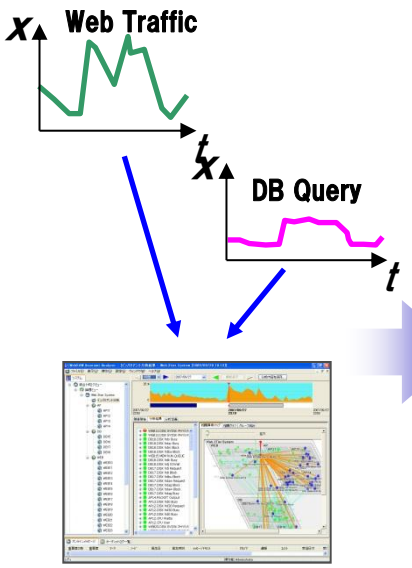
Visualizes “abnormal behavior”

4-2. Automatic analysis

Detects failure sign by automatically analyzing system performance data

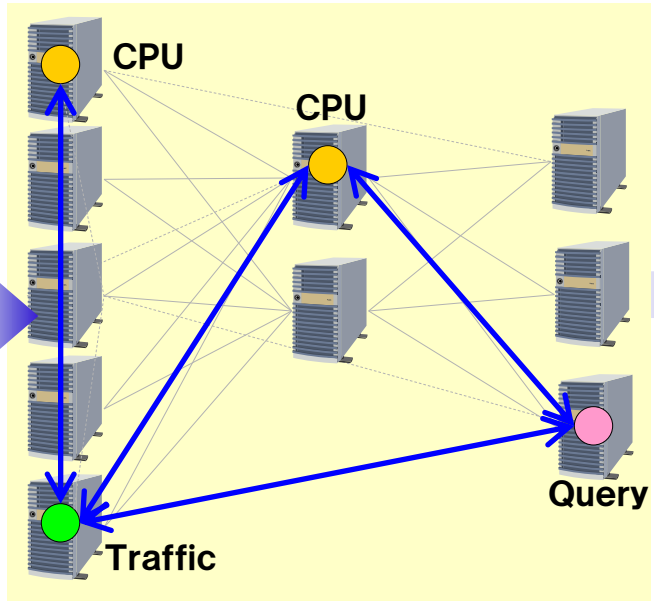
- Neither specific know-how nor complicated configuration is required.
- IA looks at invariant relationships between each performance counters, thus no need to adjust the configuration from time to time due to business conditions.

Preparation



Import performance data which was collected by monitoring tool

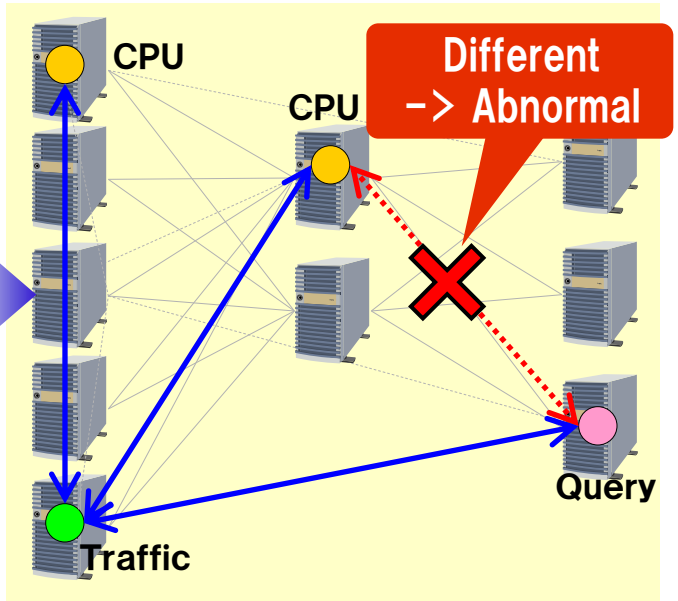
Make models of relationships



Automatically analyzes the performance data and finds invariant relationships which are detected during the period when the system was running properly.

Silent Failure Detection

Detect broken invariant relationship

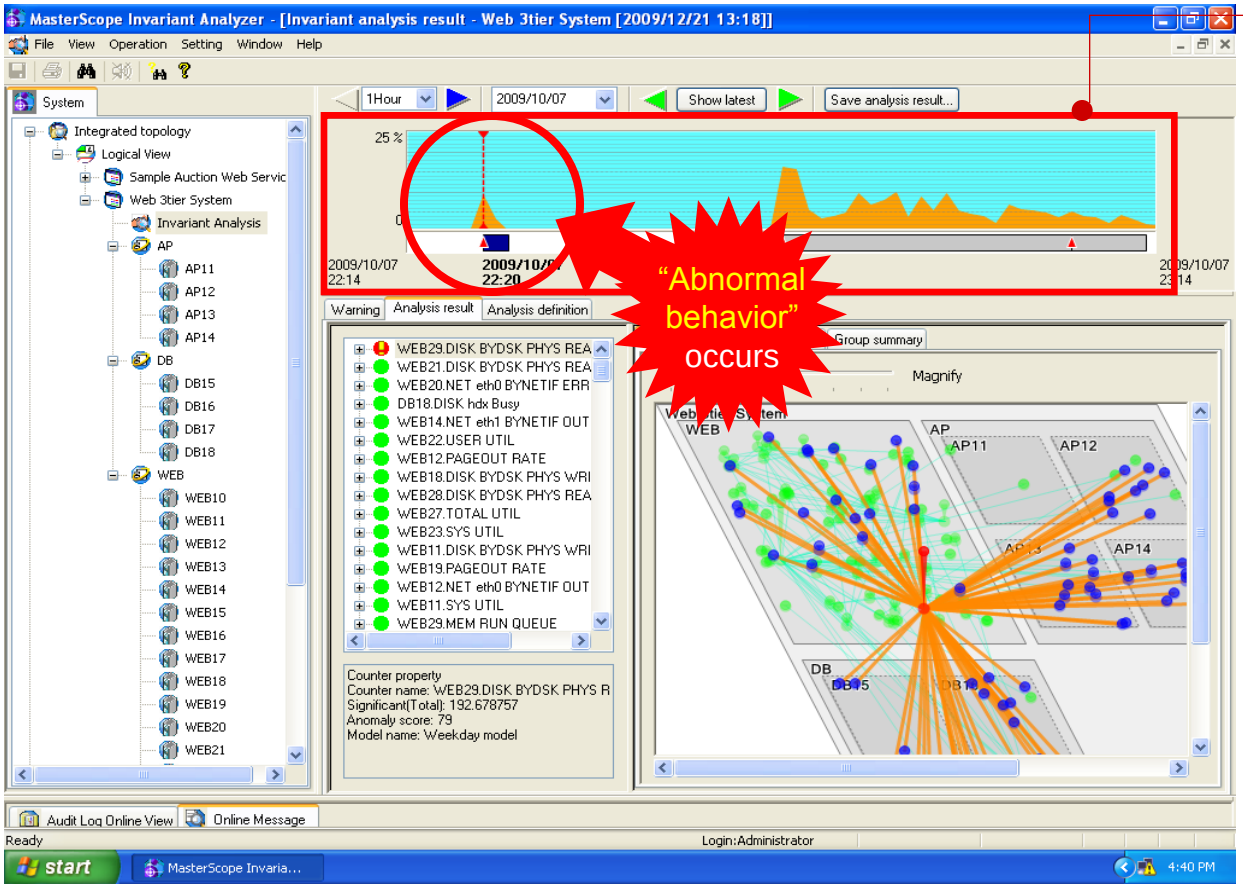


IA compares the imported data and invariant model and detect "system unusual behavior"

4-3. Visualize Failure using Graphs

Graphs indicate the time of occurrence and severity of failures.

Observe “abnormal behavior” and its impact



Visualize “abnormal behaviors”

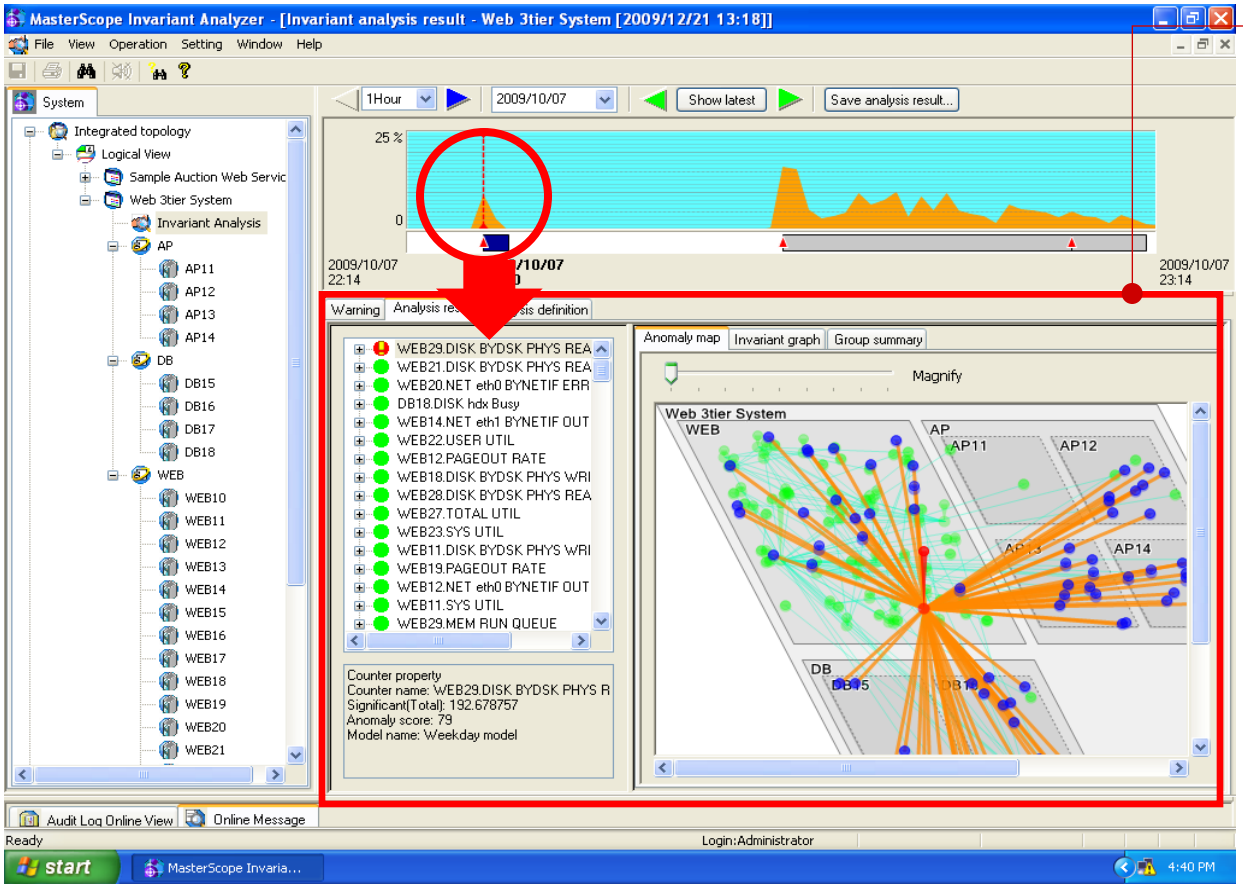
Shows the time of occurrence and the severity of the abnormal behavior using an intuitive graph.

Clear graphical presentation prevent oversight of failures.

4-3. Localize Failure using Map View

Map view shows specific component primarily causing “abnormal behavior” and it’s impact.

- Extract and visualize specific component primarily causing the ”abnormal behavior” by automatic analysis.
- The impact of abnormal behavior can also be observed at a glance.



Visualize by map views

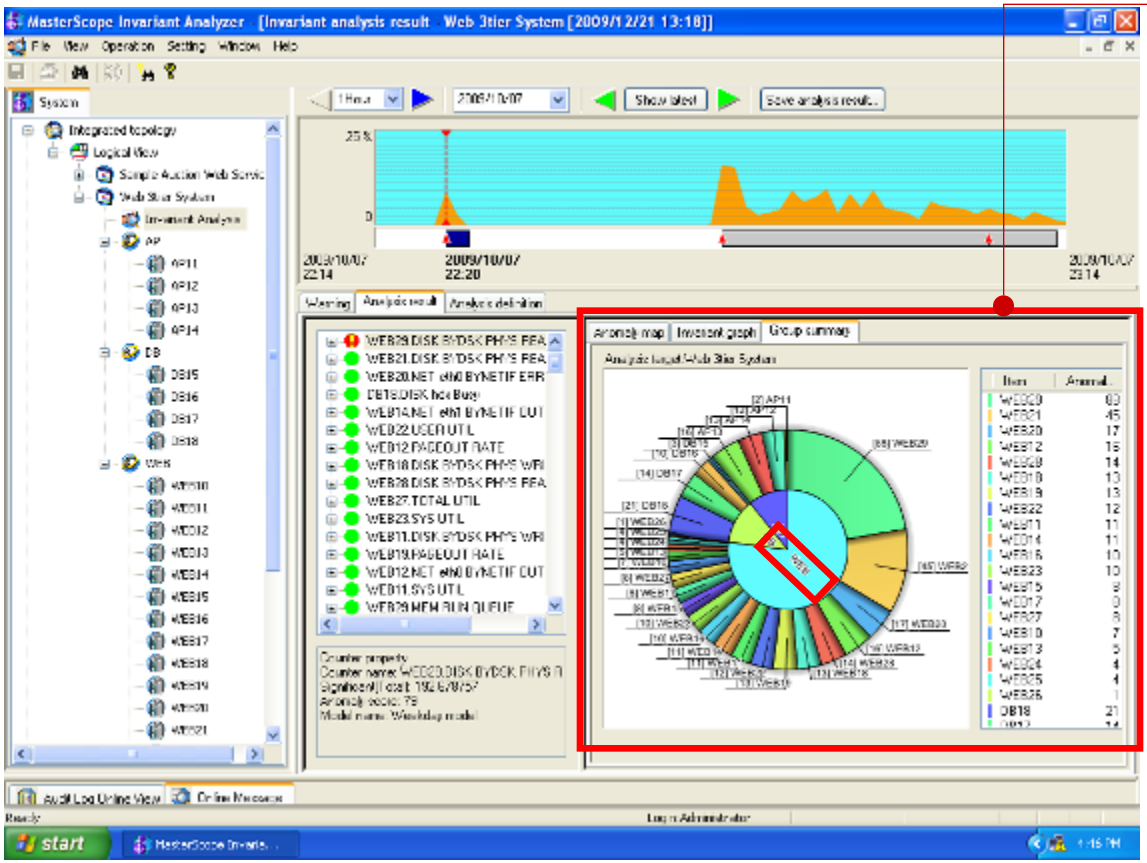
The red point Indicates the component primarily causing the ”abnormal behavior” and its severity.
The blue points indicate all the component s affected by the root cause.

Easier and quicker investigation achieved

4-3. Visualize Failure using Pie Charts

Pie charts can help administrators determine the failure's root cause from the statistical point of view.

Identify which server is most likely to fail.



Visualize by pie charts

The pie chart is divided into two parts. The outer part shows on which part of the system (e.g. web servers) the failure is occurring most often.

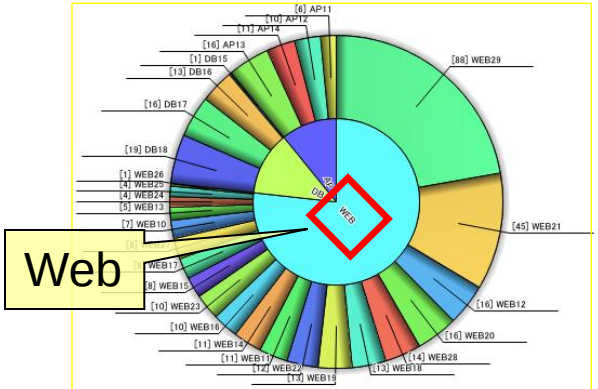
The inner part shows on which specific server "abnormal behaviors" are occurring a lot and its detailed score.

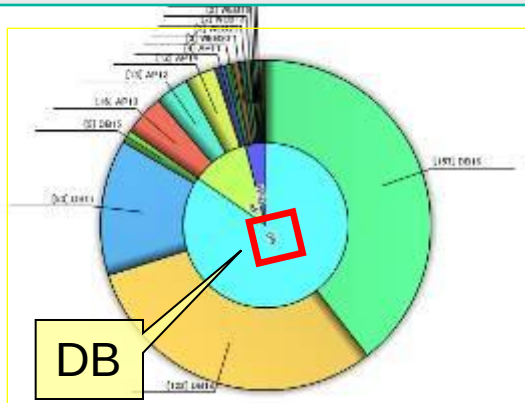
Required efforts to localize the root cause is greatly reduced.

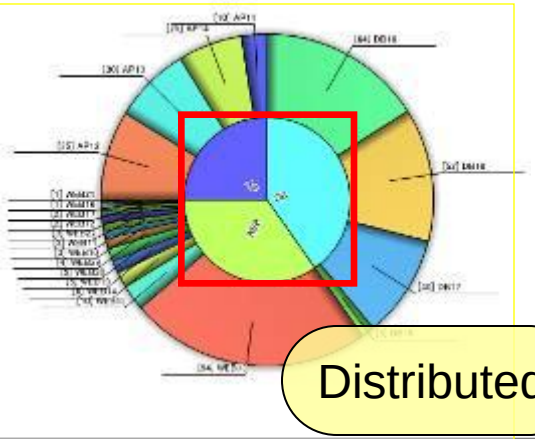
4-3. Visualize Failure using Pie Charts

Easily identify the root cause of Silent Failure using pie charts.

Examples of root cause identification





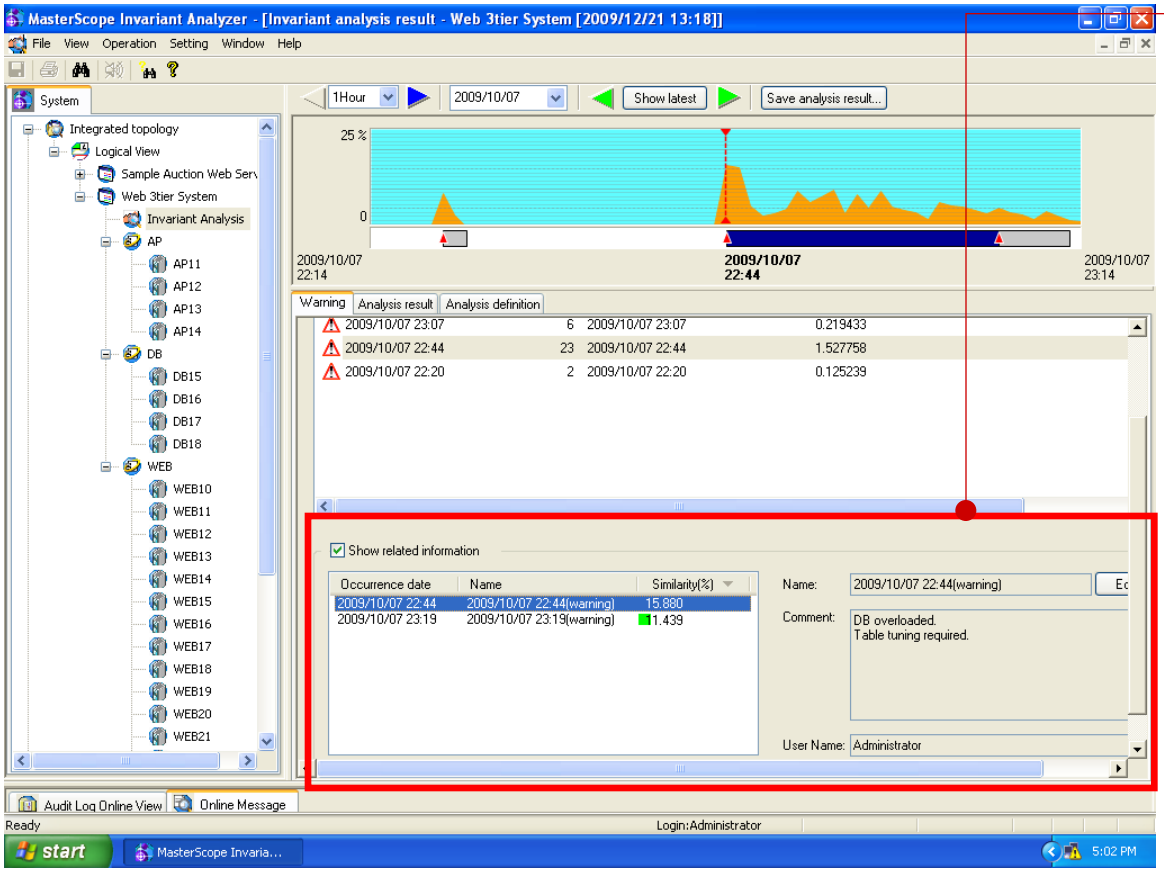


Graph	Lot of Web relationships are abnormal	Lot of Db relationships are abnormal	Anomalies are evenly distributed
Possible Cause	Web server may have some issue?	Db server may have some issue?	An issue on AP server may be effecting DB and Web servers.
Fact	A wrong command has been issued to Web server.	Improper tuning of DB server has resulted in too many accesses.	An application on AP server has stalled and occupied CPU.

4-4. Knowledge Base

Actions taken in response to each failure can be recorded for future reference.

- Failures can be quickly resolved by referencing previous actions taken for similar abnormal behavior.



Presents records of actions taken in the past.

Shows the similarity between the current failure and previous ones by percentage as well as the action you took in the past.

These actions recorded are accumulated in the knowledge base for future reference.

Eliminate time to search and accelerate failure resolution!!

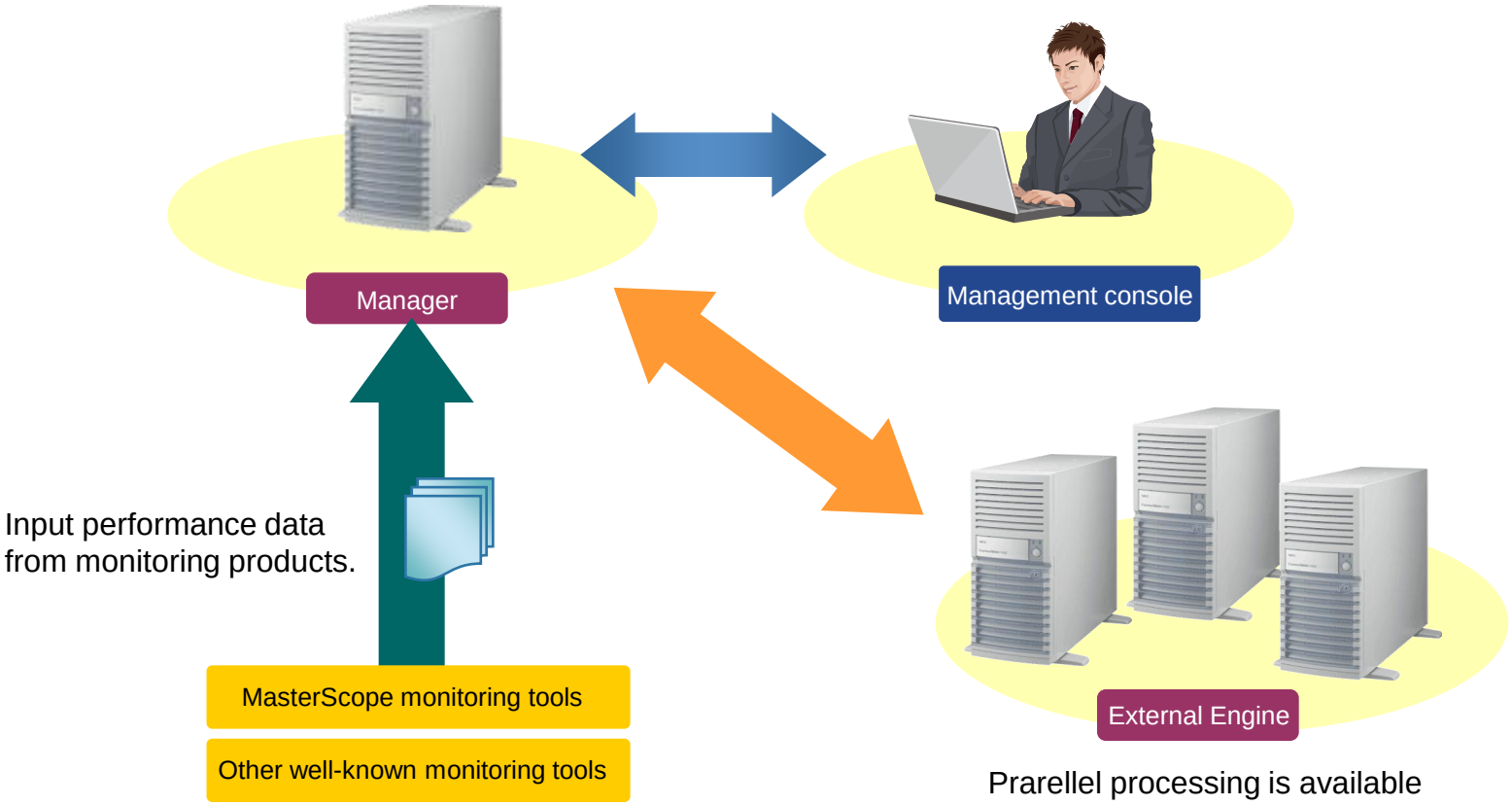
5

Product Information

5-1. System Overview (System Configuration)

Product configuration is simple.

Just Manager and Management Console are required; Performance data can be inputted to the manager through management console.



5-2. System Requirements

Windows Manager and Management console

CPU	Manager	Intel Dual Core Xeon and successions, or equivalent processors
	Management console	Intel Dual Core2 and successions, or equivalent processors
Minimum memory size	Manager	1 GB or more (2GB or more is recommended)
	Management console	128MB or more
Minimum disk size	Manager	1GB
Screen size	Management console	More than 1024 x 768 pixels
OS	Manager	Windows Server 2008 / 2008 R2 Windows Server 2003 SP2 or R2 SP2
	Management console	Windows 8 Windows 7 Professional Windows Server 2008 / 2008 R2 Windows Server 2003 SP2 / 2003 R2 Windows XP Professional SP3 Windows Vista Business SP2

5-2. System Requirements

Linux Manager and External Engine

CPU	Manager	Intel Dual Core Xeon and successions, or equivalent processors With external engine, Intel PentiumIII 1GHz or more
	External Engine	Intel Dual Core Xeon and successions, or equivalent processors
Minimum memory size	Manager External Engine	1 GB or more (2GB or more is recommended)
	Management console	100MB
Minimum disk size	Manager	1GB
OS	Manager External Engine	Red Hat Enterprise Linux AS/ES 4 Red Hat Enterprise Linux 5/6

Summary: Invariant Analyzer

A performance analysis software which can…

- Detect and diagnose Silent Failures.
- Help predict and avoid future failures.
- Deliver improved service levels.

NEC's unique technology.

- Focuses on the invariants of performance data

For details please refer our website

http://www.nec.com/masterscope/invariantanalyzer/

Invariant Analyzer Search

or E-mail to global@soft.jp.nec.com

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Thank You

Realize simple and integrated system operation

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