Agenda

1. Current Situations and Problems of Large-scale IT Systems

2. Introduction to MasterScope Invariant Analyzer

3. Functions

4. Product Information
Current Situations and Problems of Large-scale IT Systems
1-1. The Importance of Service Level Management

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

Performance degradation for these kind of system may have a great impact on your business!

- **Mission Critical Systems** (never to be suspended)
- **Datacenter Servicers** (manage their customers’ IT asset)
- **Systems Providing Social Infrastructure** (may cause a significant social impact)

Performance Management is the key for the efficient Service Level Management.
1-2. Performance Issues in Daily IT System Operation

Have you ever found yourself in a situation in which…
Complaints are coming in from users but there are no error messages?

In fact, a “Silent Failure” is occurring!

“Silent Failure”: performance degradation caused by undetectable bottlenecks, which may lead to actual serious problems.

For example…

By threshold monitoring approach, it is usually unable to detect silent failures since conventional tools only focus on threshold levels.
1-3. Challenges

If you operate systems never to be suspended, you cannot stay at ease because Silent Failures can always occur.

**Challenge #1**
Grasping the whole system’s status requires to check numerous data, which takes time and labor.

**Challenge #2**
Various system components need to be checked by each specialist. It requires higher skills and experiences to monitor over cross domain.

*Invarian Analyzer* addresses all these challenges!!!
Introduction to MasterScope Invariant Analyzer
2-1. What is Invariant Analyzer?

Invariant Analyzer is a system performance analysis software which can...

- **Detect and diagnose** Silent Failures.
- **Help you predict and avoid** future failures.

**Key Features**

**Feature 1: Automatic Detection**
Detects system performance issues *(Silent Failures)* before they become critical problems.

**Feature 2: Visualization**
With graphs and map views, it visualizes “abnormal behaviors” for quick and intuitive 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**
Performance data obtained from well-known monitoring tools is only required. Additional instrumentation are unnecessary.
2-2. Easy Steps for Fast Failure Resolution

0. Initial preparation
- Learn “invariant” relationships existing in performance data when the system is working normally.
- Generate a baseline model from those relationships.

1. Compare system status with the model
   - System status in operational stage (Performance data)
   - Baseline model
   - NEC’s technology is leveraged here!

2. Detect failures
   - Silent Failure
   - Business App System
   - System administrator
   - Silent Failure Report

3. Localize root causes
   - Business App System
   - System administrator
   - Visualize

4. Recommend actions to take
   - Knowledge Base
   - System administrator
   - That’s easy!!
2-3. NEC’s Unique Technology

Invariant Analyzer leverages an unique method, that focuses on relationships among performance data (= invariants).

- Search the relationships among performance data collected at various points.
- If modeled relationships continue to hold all the time, they can be regarded as invariants of the system.
- By checking if the modeled relationships (= invariants) of the input performance data continue to hold or not, you can detect and localize the problem.

Different from typical threshold monitoring!
### 2-4. Key Advantages

<table>
<thead>
<tr>
<th>Conventional tools</th>
<th>Invariant Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Frequent review of the thresholds required, in accordance with the various business conditions.</td>
<td>✓ It is unnecessary to set up thresholds since it focuses only on invariant relationships among performance data.</td>
</tr>
<tr>
<td>✓ Analyzing numerous data is not simple and easy.</td>
<td>✓ Numerous data can be analyzed simply.</td>
</tr>
<tr>
<td>✓ You have to find out the root cause by yourself.</td>
<td>✓ Easy to imagine the root cause visually.</td>
</tr>
<tr>
<td>✓ It requires each technical field’s expert knowledge.</td>
<td>✓ It becomes easy to analyze the entire system status without expert knowledge.</td>
</tr>
<tr>
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</table>

#### #1. Required implementation effort for management is very light.

Just input any performance data regardless of the contents!

#### #2. Realize efficient management by simple operation.

Just input any performance data regardless of the contents!

#### #3. Make it easier to localize the associated root cause.

Broken invariants
2-5. Benefits

Invariant Analyzer offers the **optimized performance management** through the fastest failure resolution.

**Before adoption**
- Period while Silent Failure is being unaware
- Silent Failure

**After adoption**
- Detect failures
- Localize causes
- Recommend solutions
- Eliminated delay by Invariant Analyzer
- Up to 90%!!

**Detect Silent Failures**
- Invariant Analyzer

**Localize and visualize root causes**
- Invariant Analyzer

**Accumulate knowledge base**
- Invariant Analyzer

**Troubleshooting**
- Invariant Analyzer

**Performance data**

- **MasterScope monitoring tools**
- **Other well-known monitoring tools**
3

Functions
# 3. Functions at a Glance

<table>
<thead>
<tr>
<th>Functions</th>
<th>Overview</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic screen</td>
<td>Basic screen</td>
<td>Simple and easy to understand basic screen displays analysis results on one screen.</td>
</tr>
<tr>
<td>2. Root cause</td>
<td>1. Visualize</td>
<td>Graphs indicate the time of occurrence and severity of the failures. Adamant component primarily causing abnormal behavior and their impact.</td>
</tr>
<tr>
<td>visualization</td>
<td>failure occurrence by graphs.</td>
<td>Map views show specific component primarily causing abnormal behavior and their impact.</td>
</tr>
<tr>
<td></td>
<td>2. Localize failure occurrence by map views.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Visualize failure location by pie charts.</td>
<td>Pie charts can help administrators determine the failure’s root cause from the statistical point of view.</td>
</tr>
<tr>
<td>3. Failure</td>
<td>Knowledge base</td>
<td>Actions taken in response to each failure can be recorded in knowledge base for future reference.</td>
</tr>
<tr>
<td>resolution</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3-1. Basic Screen

Simple and easy to understand basic screen displays analysis results on one screen.

Show analysis targets hierarchically

Indicate “abnormal behavior” by clear graph

Visualize “abnormal behavior” specifically
3-2. Visualize Failure Occurrence by Graphs

Graphs indicate the time of occurrence and severity of the failures.

You can see when the “abnormal behavior” occurred and how abnormal the behavior is.

Visualize “abnormal behaviors”

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

Clear graphical presentations prevent oversight of failures.
3-2. Localize Failure Occurrence by Map Views

Map views show specific component primarily causing “abnormal behavior” and their impact.

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

Visualize by map views

The red point indicates the main component causing the "abnormal behavior" and its severity. The blue points indicate all the component affected by the root cause.

Easier and quicker investigation will be realized!!
3-2. Visualize Failure Location by Pie Charts

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

Indicate which server the failure occurred on most likely.

The pie chart is separated into two parts. The outer part shows on which part of the system (e.g. web servers) the failure is occurring most likely. The inner part shows on which specific server the "abnormal behaviors" are occurring a lot and its detailed score.

Required efforts to localize the root cause will be greatly reduced.
3-2. Visualize Failure Location by Pie Charts

You can estimate the root cause of Silent Failure easily by pie charts.

For example, these estimations below are possible:

<table>
<thead>
<tr>
<th>Graph</th>
<th>Estimation</th>
<th>Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many differences are occurring on Web.</td>
<td>Abnormal Web access occurred?</td>
<td>Wrong command has been entered to Web server.</td>
</tr>
<tr>
<td>Many differences are occurring on DB.</td>
<td>DB server is acting abnormally?</td>
<td>Inadequate tuning for DB server has resulted in too many accesses.</td>
</tr>
<tr>
<td>Differences occurring are balanced.</td>
<td>A failure might be occurring on an AP server which effects DB and Web servers.</td>
<td>An application on AP server has been stalled and occupied CPU.</td>
</tr>
</tbody>
</table>
3-3. Knowledge Base

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

- By simply referencing to those actions for similar abnormal behaviors in the past, current failures can be readily resolved.

Present 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 here will be accumulated in the knowledge base for future reference.

Eliminate time to search for the action and accelerate failure resolution!!
Product Information
4-1. Configuration Example

**Manager**

Input performance data from monitoring tools.

**MasterScope monitoring tools**

**Other well-known monitoring tools**

**Servers etc. 30 units**

**Analysis targets**

**Management console**

- x1 unit

**Analysis targets**

- x3000 counters (100 counters x 30 servers)

“Counters” means performance parameters to be analyzed. (e.g. CPU usage, memory usage, disk usage etc.)

List price: $130,000 USD (Including Manager, Management console and 5000 counters)

Contact us for the prices in other currencies.
## 4-2. System Requirements

### For Manager and Management console

<table>
<thead>
<tr>
<th></th>
<th>Manager</th>
<th>Management console</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>Intel Dual Core Xeon and successions, or equivalent processors</td>
<td>Intel Dual Core2 and successions, or equivalent processors</td>
</tr>
<tr>
<td>Minimum memory size</td>
<td>2GB</td>
<td>128MB</td>
</tr>
<tr>
<td>Minimum disc size</td>
<td>1GB</td>
<td></td>
</tr>
<tr>
<td>Screen size</td>
<td>More than 1024 x 768 pixels</td>
<td></td>
</tr>
</tbody>
</table>

*Regarding analysis target, Invariant Analyzer also supports operating systems such as UNIX, Linux, etc. Contact us for the detail.*
Summary: Invariant Analyzer

A performance analysis software which can…

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

NEC’s unique technology is leveraged.

- Focusing on the invariants of the performance data.

Please go to the website for the details.

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

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

*MasterScope is originally sold under the name of WebSAM in Japan.

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