

# Situational Intelligence for Resource Optimization

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## Abstract

The recent trends in deregulation, industry reorganization and social environmental changes are significantly changing the environment that surrounds the utility business sector, such as in the electricity and gas supply companies. Under these circumstances, radical reforms of business organization and operations, further improvements of equipment and the use of big data are tending to be increasingly required. For these reasons, NEC jointly with Space-Time Insight, Inc. is deploying Situational Intelligence as a solution that allows utility businesses to identify their current circumstances accurately and to make decisions collaboratively based on projected perspectives. This paper is intended to give a presentation of the Situational Intelligence solution.

### Keywords



Situational Intelligence, utility businesses, visualization & analysis, equipment management, big data, real-time operation

## 1. Introduction

The environment of utility businesses such as the electricity and gas supply companies are recently undergoing far-reaching changes. An example of these changes in the field of politics is the review of energy policy as represented by the liberalization of electricity and gas supplies. This trend is imposing deregulation and industry reorganization as well as requiring radical reforms of organizations and business operations. Social environmental changes such as the retirement of aged workers and an insufficiency of young workers are also becoming important issues. Moreover, the aging of the infrastructures that were massively introduced in Japan's high growth period is also making increases in the equipment maintenance/management costs a target of concern. Under these circumstances, we are currently challenged by the issue of how to effectively utilize the big data and sensor technologies that have been advancing noticeably in recent years.

To deal with the above issues, NEC in collaboration with the U.S. company, Space-Time Insight, Inc. (STI) is deploying the Situational Intelligence solution that

allows the utility businesses to enable accurate identification of their current circumstances and make effective decisions based on projected perspectives (**Fig. 1**).

In this paper, we present the Situational Intelligence solution that has been researched and developed in collaboration with STI.



Fig. 1 Example of Situational Intelligence Solution display.

## 2. Space-Time Insight, Inc. (STI)

### 2.1 STI Company Overview

STI is a company established in January 2008 with its head office based in San Mateo, California<sup>1</sup>. The main business of the company is to promote IT solutions for the utility industry, transport industry, national and local governments and oil/gas industry. In particular, as a key element of its business strategy the company currently sets the situational Intelligence solution for providing customers conducting businesses that use huge amounts of facilities and equipment with a means for making quick, reliable business decisions. The solution has already been introduced in more than thirty businesses in utility, operations and railroad enterprises<sup>2</sup>.

### 2.2 NEC-STI partnership

NEC and STI formed a smart energy business alliance in August 2014 and jointly deploy the STI's Situational Intelligence solution in Japan and the APAC region<sup>3</sup>. The key motive of the deployment is to link the solution with NEC's power storage system and ICT solutions in order to further improve added values.

## 3. System Outline & Features

### 3.1 System Outline

**Fig. 2** shows the system concept of the situational Intelligence solution as it is deployed together with STI. The system is positioned in the layer above the existing operation and control systems possessed by each customer. It collects information from the existing operation and control systems as well as from certain outside systems such as meteorological sources as required,

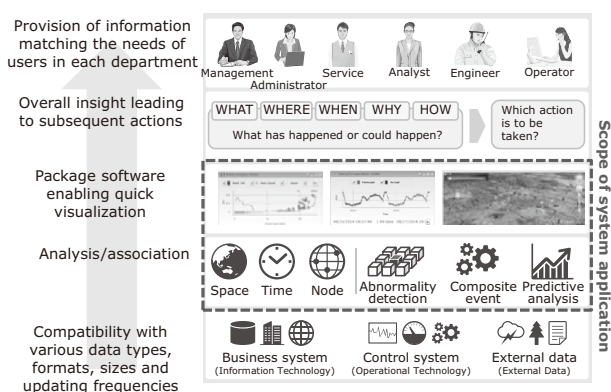


Fig. 2 System concept.

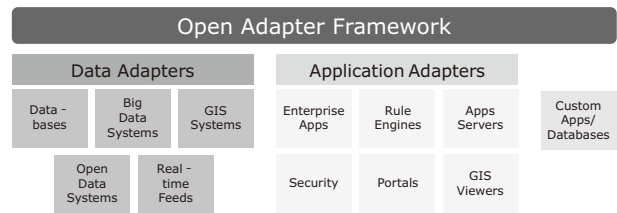


Fig. 3 Open Adapter Framework.

and performs arrangement and analysis of geographical, time-domain and judgement information. The results are visualized in the form optimized for the purpose of each user from the management to the field operators.

In this way, the system gives an insight (notice and presence) that supports quick, accurate decision making related to the operation and planning of various businesses.

### 3.2 System Features

The system has the following features.

#### (1) Facilitation of integration of existing systems and operations

The situational Intelligence system adopts the open adaption framework for easy linkage with various data sources and applications of customers (**Fig. 3**). This strategy facilitates linkage of operations and control systems that the customer administers and operates individually in each business domain. This means that a cross-sector system platform can be built in order to enable linkages of business operations.

#### (2) Variety of analysis functions enabling advancement of business operations

The system is equipped with various analysis and prediction functions that enable the advancement of customers' business operations. It performs correlational analysis of data acquired from the customer's information/control systems and outside systems to identify the status of a customer's resources from all directions. For example, the patented STN (Spatial-Temporal-Nodal) technology of STI can be used to analyze and visualize the service life and risks of each piece of equipment in order to predict failures accurately as well as to simulate the effects of equipment changes. In the example of the analysis shown in **Fig. 4**, an AHI (Asset Health Index) is set by indexing the elapsed years of the equipment and its health in order to plot the equipment status. This procedure enables finding the relative relationships between equipment as well

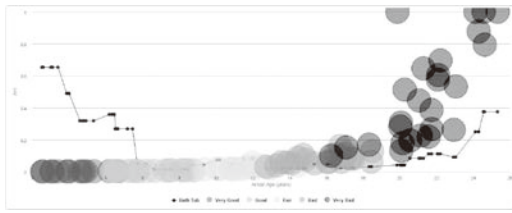


Fig. 4 Example of failure risk analysis chart.

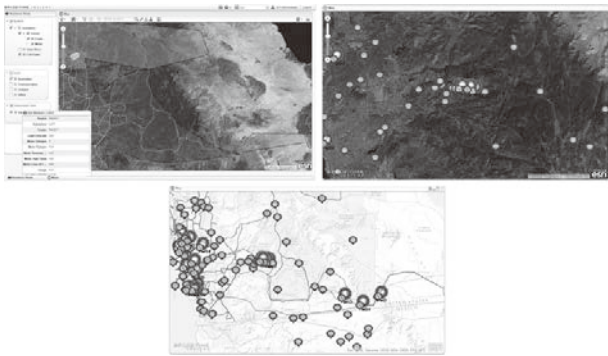


Fig. 5 Examples of various expression formats (\* Examples assuming linkage with Esri GIS services).

comparing the standard failure rate curves provided by the manufacturers (shown with a line chart), so that equipment with a high risk can be discovered easily.

The effective use of these analysis and visualization functions contribute to make the operational level uniform because even unskilled engineers and administrator can accurately find the current status and the risks of faults, etc.

**(3) Various expression functions for supporting notices**

Situational Intelligence is equipped with a variety of expression functions linked with the GIS (Geographic Information System) and it is capable of displaying the analysis results in a wide range of intuitive visualization formats (Fig. 5). This allows system users to identify the equipment operating situations accurately and in real time, progress of investment plans, critical events/situations and countermeasures taken to deal with legal regulations, etc.

Information obtained using the situational Intelligence system can also be applied for example to discussions on new businesses and projects. For instance, the rapid progress of big data and sensor technologies has made effective utilization of data an important issue. This issue requires a step-by-

step approach, which starts with formulating and verifying hypotheses based on visualization and the analysis of current data, and then proceeds to extend the data used and decide on investments in the sensor infrastructures based on the verification results. The situational Intelligence system is also expected to be effective in such an approach.

**4. Flow of Study**

Table shows how to advance research regarding the introduction of the situational Intelligence system. In the image confirmation after implementation in Phase 1, the customer submits some of the customer’s data in a CSV-format file to the evaluation PC of NEC so that the customer can experience the insight (notice and presence) given by the visualization function of the solution. In Phase 2, the solution is actually introduced as a part of the customer’s environment as a trial operation. Finally, based on the results of the phases discussed above, the customer studies the actual introduction. Such step-by-step processes allow the customer to study the implications of introduction while confirming the value gained at each step.

**5. Actual Cases of Introduction**

As mentioned above, the situational Intelligence solution has been introduced to more than 30 businesses in utility companies and national/local governments in North America. The specific cases include the grid operators managing some of the biggest power grids at these locations such as the power distributors and power companies of local governments. The introduction of the situational Intelligence solution has succeeded in seamless inter-departmental cooperation, quick fault

Table Flow of study.

	Phase 0	Phase 1	Phase 2	Phase 3
	Presentation	Confirmation of the image after implementation	Trial introduction	Actual introduction
Details	Presentation via data and demonstrations	Sample input in evaluation PC	Trial operation using part of actual operation data	Construction in customer’s actual environment
	Customer hearing on issues and requirements	Confirmation of image after introduction based on collected data		Start of use in actual business operations
Period		1-2 months	3-5 months	5-6 months
Environment		Notebook PC for evaluation (either belonging to NEC or customer)	Customer’s verification environment	Customer’s actual environment
Data linkage		If files (CSV, etc.) are not handed, dummy data can be used.	File handing or system linkage	System linkage

counteractions and reduced equipment investments for these customers.

In addition to power companies, the introductions are also increasing among a wider range of business types such as water utility companies and transport/logistic companies. The water utility companies use the solution for monitoring the operating situations and faults at their widespread facilities, while the transport/logistic companies use it for optimization of their distribution routes.

As seen in the above, the situational Intelligence solution provides value not only for the utility companies but also for dealing with the issues that are commonly experienced by any business possessing and managing a large amount of resources over a wide area. Considering the potential for customer value provision over a wider range of business domains, NEC recommends studying the adoption of the situational Intelligence solution for those customers encountering similar issues to those surrounding the utility companies as described in the above.

## 6. Conclusion

In this paper, we have presented the situational Intelligence solution that allows the utility companies possessing a huge number of facilities spread over a broad area to identify the situations of current resources accurately. It also enables making decisions efficiently by taking projected perspectives into consideration.

Currently, we are advancing demonstrations of the present solution jointly with several utility companies, including power companies inside and outside Japan. The key concern in these demonstrations is to verify the potential for an improvement of added values through fusion with other energy solutions such as NEC's energy management technology and electricity storage battery technology. As referred to above, the solution is designed as a platform for cross-sector integration of several systems so that fusion with other systems or technology elements is achieved easily. At NEC, we continue to research the shapes of real-time resource management operations of the next-generation utility companies that will be developed around the solution presented above.

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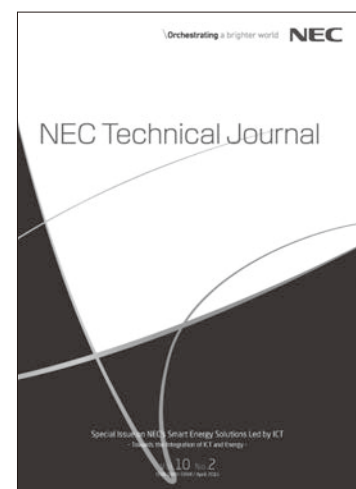
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