Stream Computing: Real-time Processing of Massive Data

What does it solve?

- Fine visualization and control by the real-time collection and analysis of huge amounts of time-series data continuously acquired from various sensors.

Use example:
- Very fine traffic congestion data supplied by the real-time processing of floating car sensors on individual vehicles.
- Eco-friendly data center administration by control based on understanding detailed server load.

The amount of data dealt with in the ubiquitous society will expand explosively by a factor of 200 by 2025. A huge increase in IT devices and amount of data processing will produce a rapid 500% increase in power consumption by 2025.

Visualization of traffic congestion

Currently
- Only main roads; updated every several minutes.

Future (with new NEC technology)
- Smaller roads included; updated in less than a minute.

More efficient data center administration

Thin client terminals

- VM relocation
  - Move the VM and power down the server.

*VM: Virtual Machine (thin client environment)
Real-time Processing of Massive Data

Features of the technology

- Real-time analysis without data stream stagnation by multi-stage partial analysis of data

- Efficient partial analysis of massive time-series data
  - Faster processing through partial analysis execution of an incremental algorithm that re-uses prior results

Conventional technology (database)

- Massive data from sensors, etc.
- Analysis
- Database
- Application
- Data overflow
- Decreased processing speed due to access conflict

This technology

- Massive data from sensors, etc.
- Partial analysis 1
- Partial analysis 2
- Partial analysis 3
- Application
- Raw data is discarded
- Efficient processing of massive time-series data
- Assembly-line processing
Real-time Processing of Massive Data

Future development

Market needs/technical prospects

- Collect and make use of the huge amount of data from sensors embedded in various locations and devices or terminals that anyone can carry (PC or cell phone)
- Sensor fusion and sensor networking
- New computer architecture
- Break through limits on processing speed and scale with a new architecture for handling massive data
- Utilizing explosively increasing data
- Discover new value by advanced analysis of massive data
- Fusion of real-world data and cyber data
- Real-time processing of massive data

R&D roadmap

- Social infrastructure
  - Health management, Traffic analysis, Crime Prevention, etc.
- New business
  - Mobile advertising and marketing that makes use of cell phones
- IT systems
  - Data center administration (energy conservation)
- More added-value data such as marketing data
- Distributed sensor network (location and behavior/movement)
- More sensor data
- Sensor fusion
  - (CPU, memory, temperature, GPS, IC cards, etc.)
- Stream processing for distributed system
- Stream processing for multi-core CPUs
- Hierarchical stream processing

2009 2010 2012 2014
Expanding market

Future development