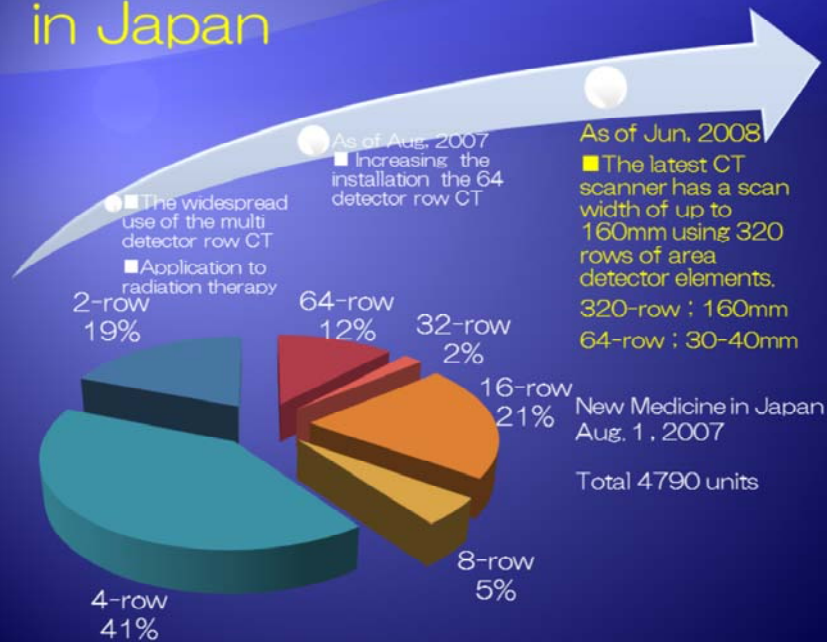Thank you, Mr. Chairman.
I really appreciate this opportunity.
Today, I am going to give a presentation under the title of the availability of network system for medical image processing.

Let me first introduction of my presentation.
In recent years, the multi detector row CT scanner is have been installed widespread in Japan.
Since 2007, installation of the 64 detector row CT scanner is increasing.
And in 2008, the area detector CT scanner was appeared.

The multi detector row CT scanner is possible to wide scan range by thin slice thickness in short scan time, and we use the volume data more often than before. Therefore, almost catheterization angiography replaced CT angiography using the 3D image reconstruction.
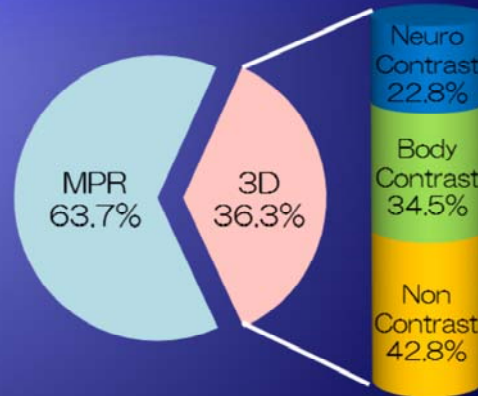Merits
Possible one-day outpatient
Low intervention level for patients
Possible shortening until emergency surgery
Reduction of patient cost
Useful information for surgery planning

Result of the 3D image processing

This show that number of the 3D image processing cases in Tokyo university hospital 2008.
The contrast CT study account for over half of the 3D image processing cases.
Many these cases are intended vascular disease, so it is required advanced techniques and accurate interpretation of the CT images.

Process working time survey

By the installation of the multi detector row CT, it is shortened in scan time and provided high resolution image data, however requires longer image processing time.
It is suggested that image processing is high technical level and expected larger percentage of the working time in CT scan.
The hospital facilities are increasing deploy exclusive technologist for image processing.

- Reception
- Preparation of the study
- Prepare to scan
- CT scan
- After patient care
- Image processing
- Account

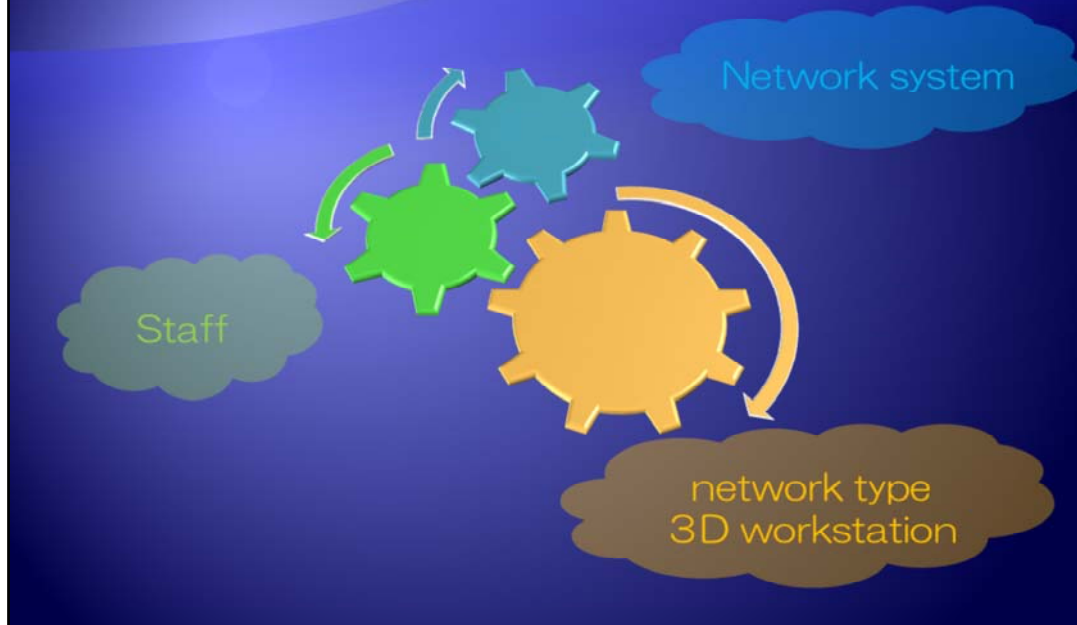Commission report of The Japan Association of Radiological Technologists in 2005

By the installation of the multi detector row CT, it is shortened in scan time and provieded high resolution image data, however requires longer image processing time.
This result is the CT scans working time by the Japan Association of Radiological Technologist in 2005.
It is suggested that image processing is high technical level and expected larger percentage of the working time in the CT scans.
The hospital facilities are increasing deploy exclusive technologsit for image processing.

It is necessary for efficient environment 3D image processing to staff appropriately and establish a network system which is able to make the best use of them.

In recent years, more hospitals have begun to use network type medical image processors which is composed of a server and clients because of performance advances at computers.
For this reason, several people are able to process the 3D images at the same time.
In this study, we report availability of using the network type 3D workstation at medical image process operation.

We measured time to make image processing such as coronary analysis and the 3D image construction by the volume rendering, and evaluated efficiency by estimating time to need for processing per a client.

The system configuration of the network type workstation.
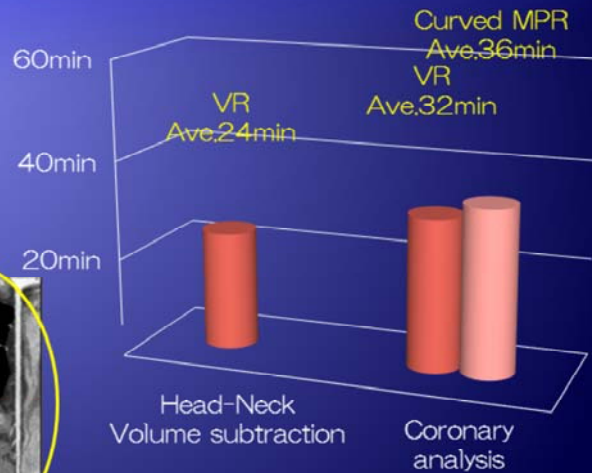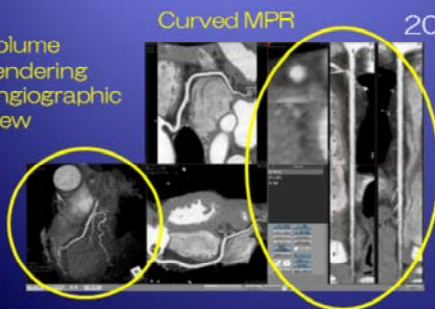This system consists of the data server, image processing server and multi clients.
Cases can be resumed from saved workspaces in the data server, streamlining workflow.
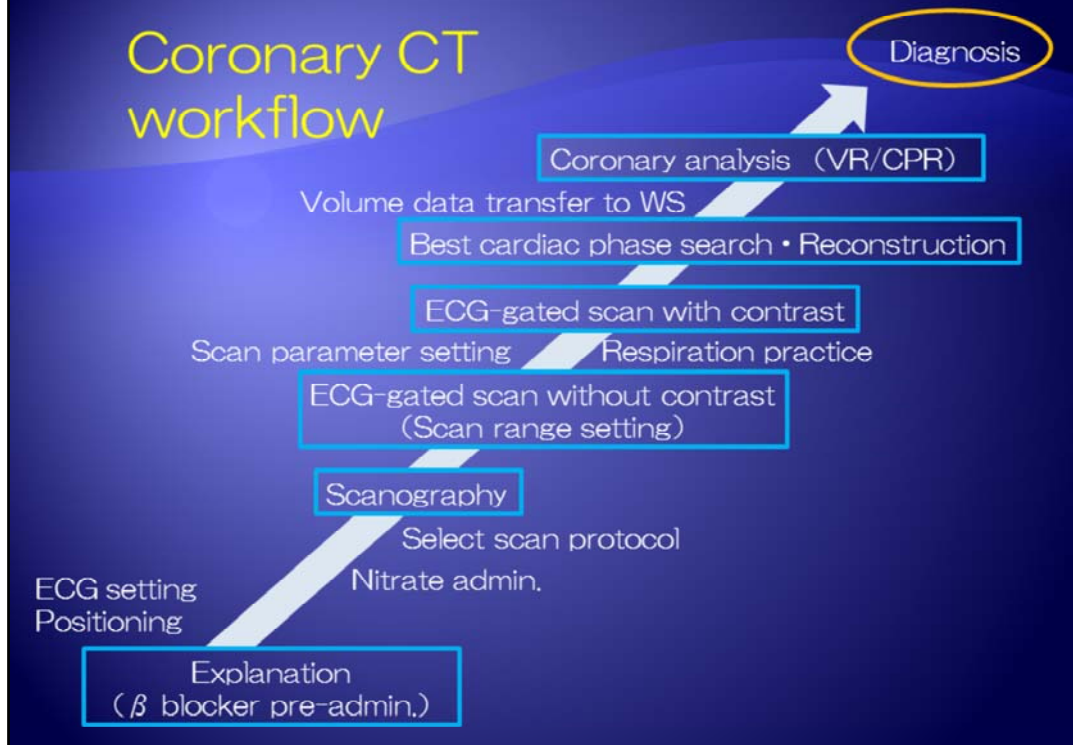
The 3D workstation includes various analysis tools.
The applications of the coronary analysis are curved MPR and volume rendering.
The coronary analysis time is longer than other the 3D image processing time.
The processing time vary according to the applications, among them, efficient the operation of the coronary analysis is important for improvement of the 3D image processing throughput.
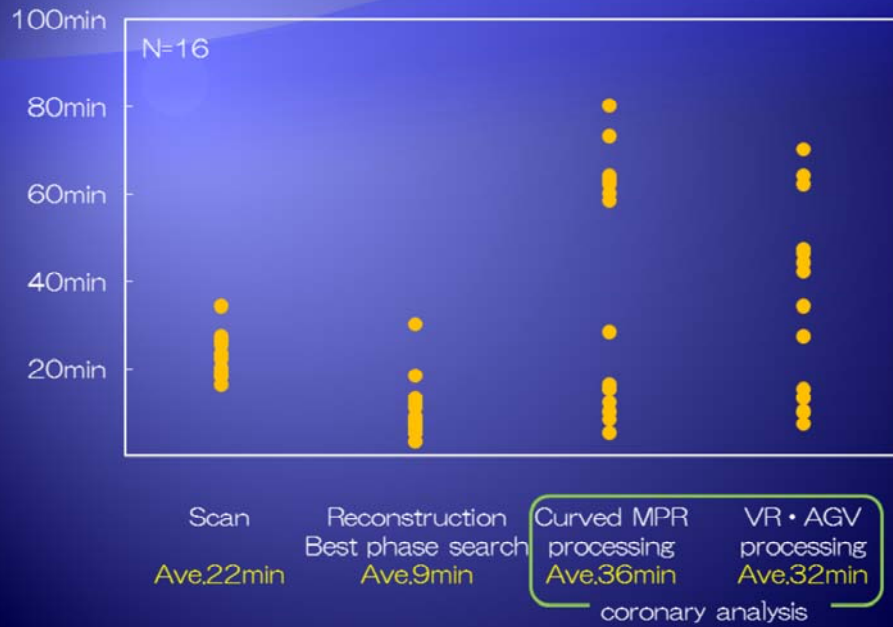
The coronary CT workflows has many processes.
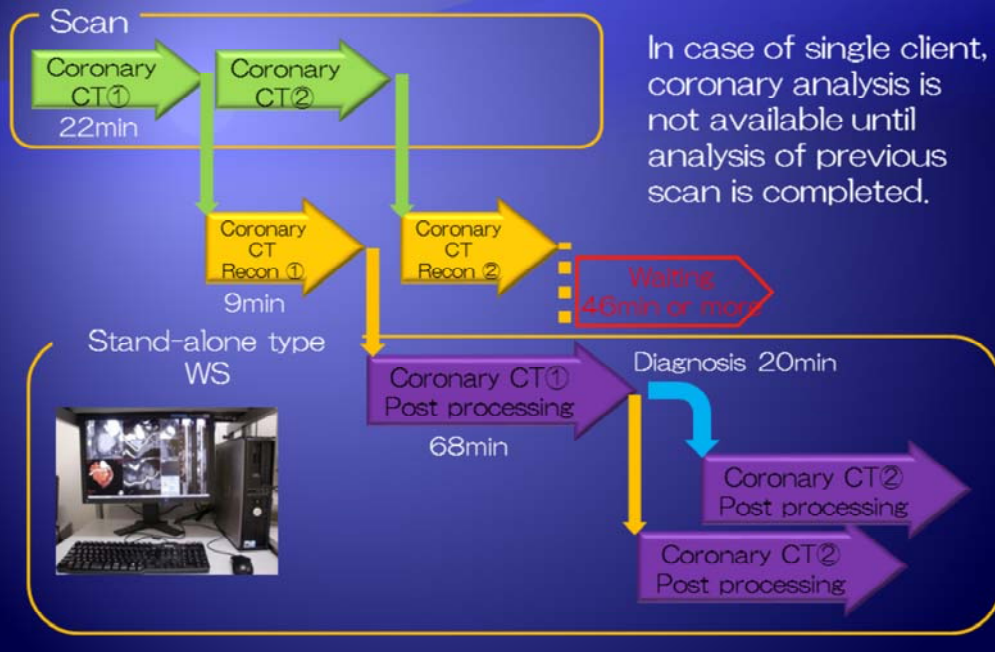Therefore it is more higher technical level than any other CT examination workflows.

The coronary analysis time is about 100 minutes, as the result of working time measurement.

This slid shows that working time analysis using the stand-alone type workstation.
In this case, coronary analysis is not available until analysis of previous scan is completed.
And it is impossible to diagnose on a workstation at the same time processing coronary analysis.
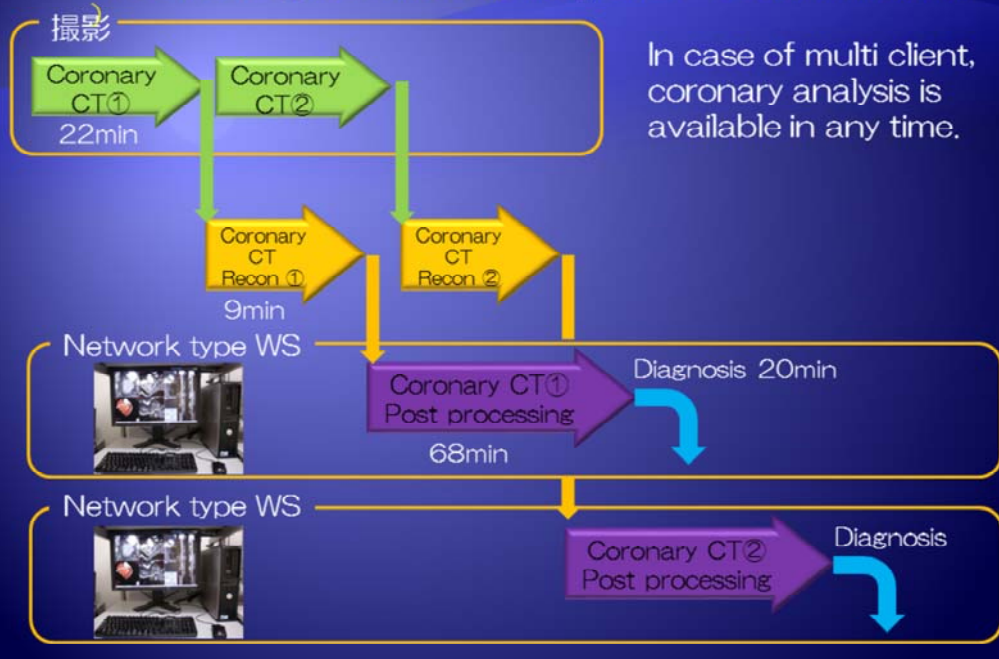
However, using the network type workstation, waiting time is eliminated by distributing coronary analysis to each clients.
Diagnosis and analysis of coronary is able to hold at the same time.

Working time analysis

Turnaround time : TAT
The time until output of the analysis results of Nth coronary CT
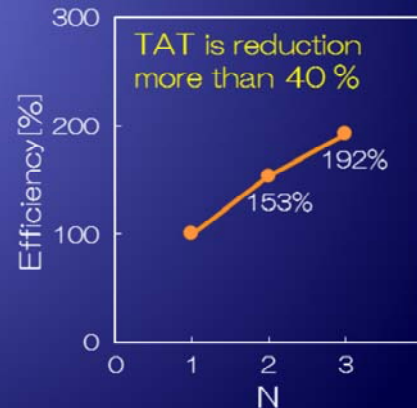9min(Recon)
 +68min(Post processing)
  +20min(Diagnosis)
   =97min (minimum TAT)

Efficiency

$$\frac{\text{Single client TAT}}{\text{N-clients TAT}} \times 100$$

$$N = 2 ; \quad \frac{216}{141} \times 100 = 153[\%]$$

$$N = 3 ; \quad \frac{313}{163} \times 100 = 192[\%]$$

TAT is reduction more than 40 %

192%

153%

Efficiency [%] (0, 100, 200, 300) vs N (0, 1, 2, 3)

We define the time until output of the analysis results as turnaround time.
Using a network type workstation, turnaround time is minimized because of without waiting time to image processing and diagnosis.
The efficiency is the turnaround time ratio to single client and N-clients in N-cases coronary CT scans.
The turnaround time by multi clients is less increasing rate than single client, the efficiency improve depending on clients.

In using the network type 3D workstation, all tools was available without processing load at the multi accesses.
Because the operation of coronary analysis tend to take time longer than other processing, waiting time of process becomes short by using a client, it shows an effect on reduction of the turnaround time from CT scan ending to reading.

The network type 3D workstation of multi-client system is useful in improvement of the 3D image processing throughput.

The network type is better than the stand-alone type in cost performance, and it has advantage of consolidating images. However, an thorough security measure is necessary to each client computers such as protection against viruses and restriction on the access to the network through the use of passwords for prevent illegal use.

In the years ahead, it is thought that standardization of operation and management procedures is necessary for the network type 3D workstation

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