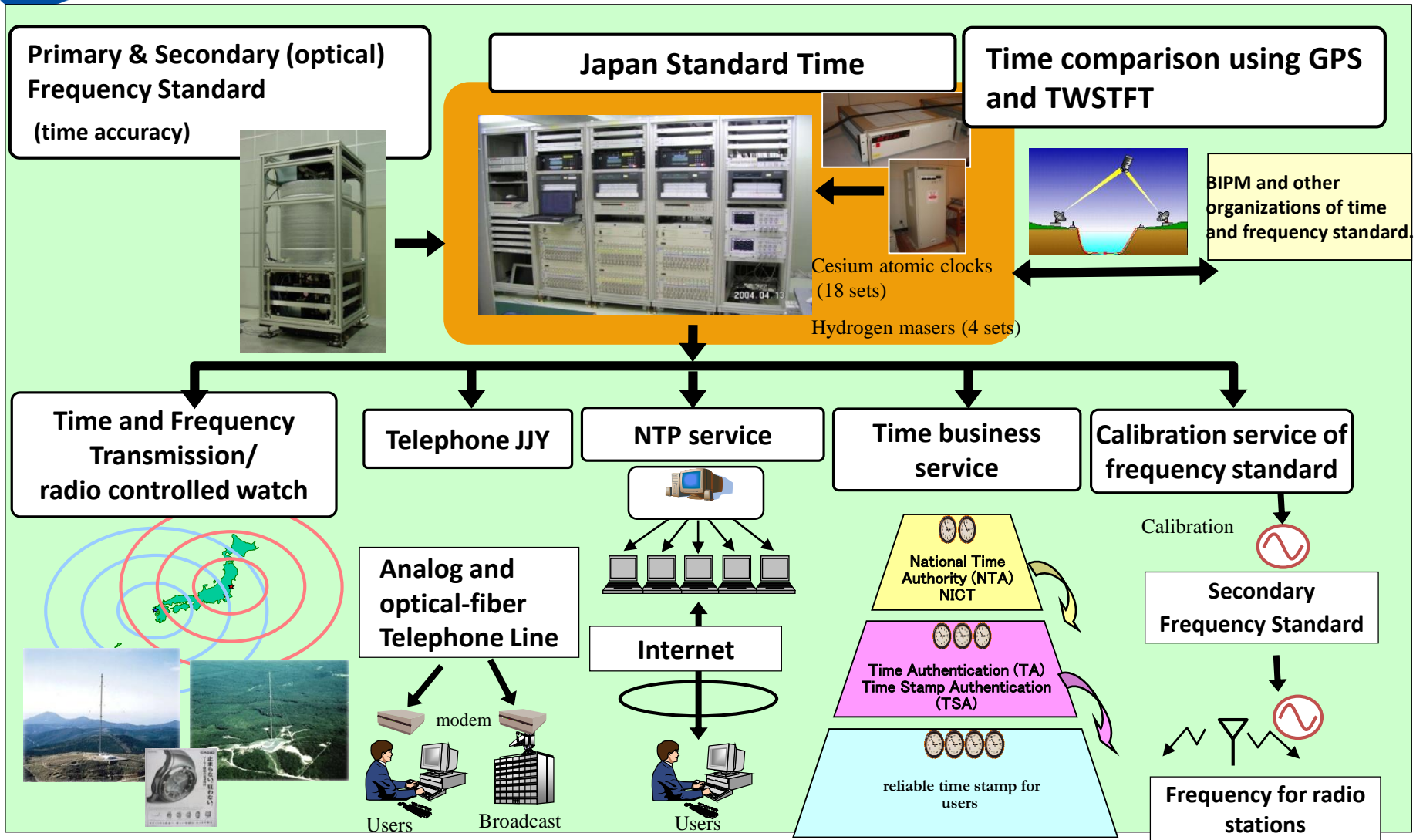


# Development of Precise Time Distribution Network and Time Application Server for ICT and IoT Applications

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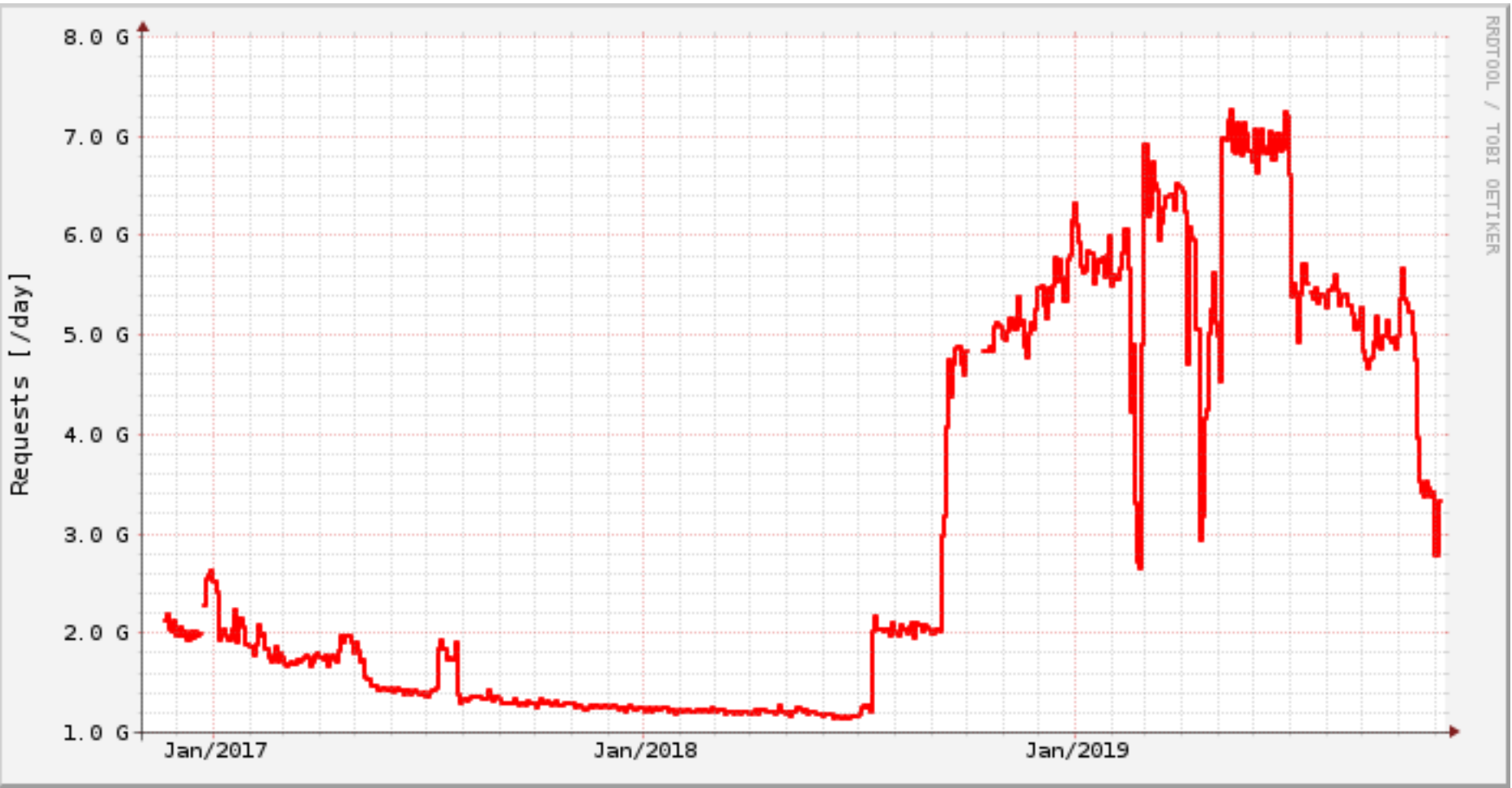
National Institute of Information and Communications Technology  
(NICT : Japan)

# NICT



NICT is not only an advanced research institute of ICT but also the **National Metrology Institute** of Time and Frequency and the **National Timing Center** in Japan.

# NTP Request / day



Number of NTP requests processed by two NTP servers operated by NICT  
(Max. about 7 billion requests/day)

With the development of ICT technology, the demand for precise time infrastructure in a variety of applications, such as the IoT applications or sensor networks is increasing more and more.

## Constructing the Precise time infrastructure

Required

- Time server with high accuracy and excellent tamper resistance
- Time distribution network for maintaining the time server
- Time related application services

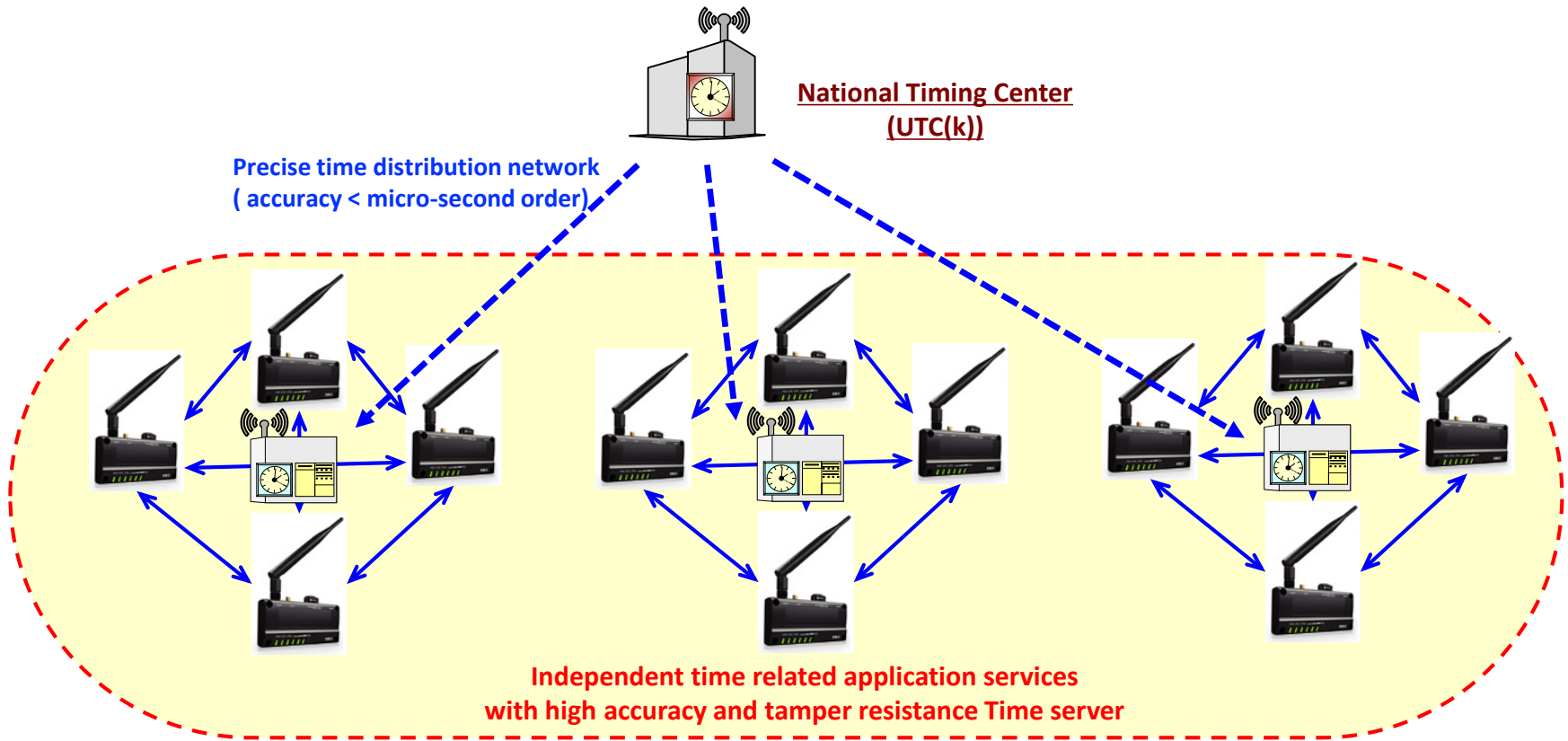
Especially in ASEAN region

the area is vast and the city is dispersed

 construction of the precise time distribution network is an important issue.

# Target

Development of Precise Time Distribution Network and Time Application Service for ICT and IoT Applications.

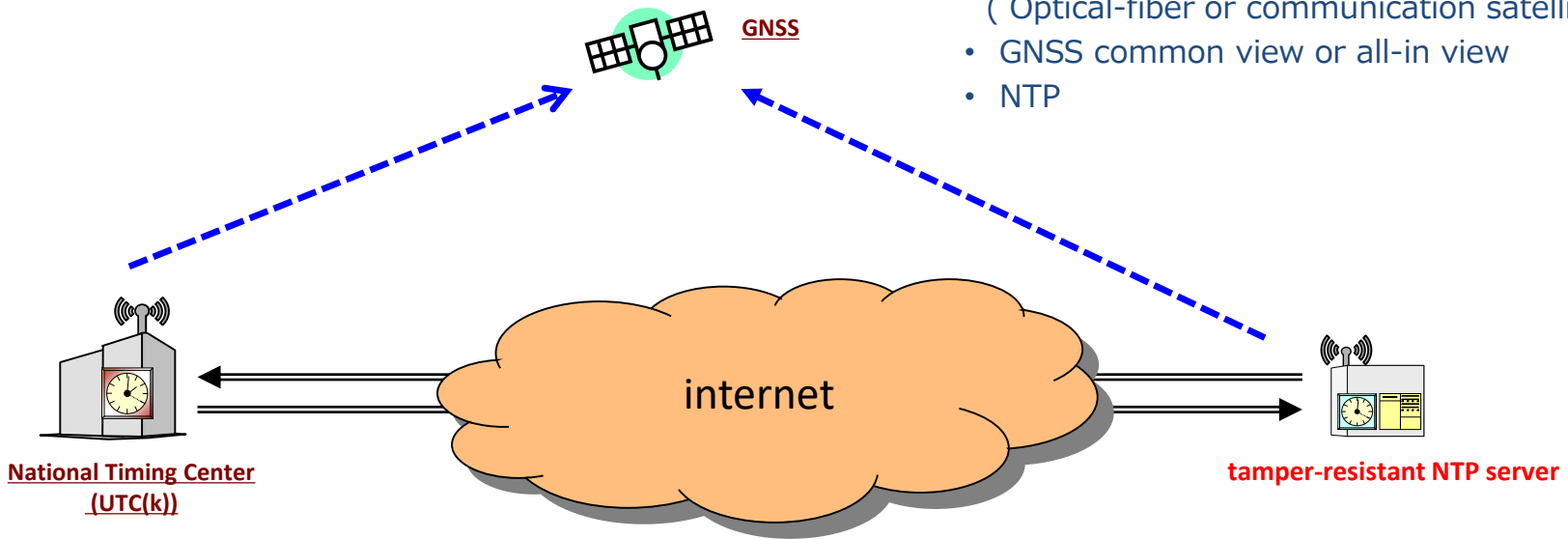


If the time source is **UTC**, it is possible to synchronize all independent time-related application services even if the countries are different.

# Specific consideration 1

## ○ Time distribution network

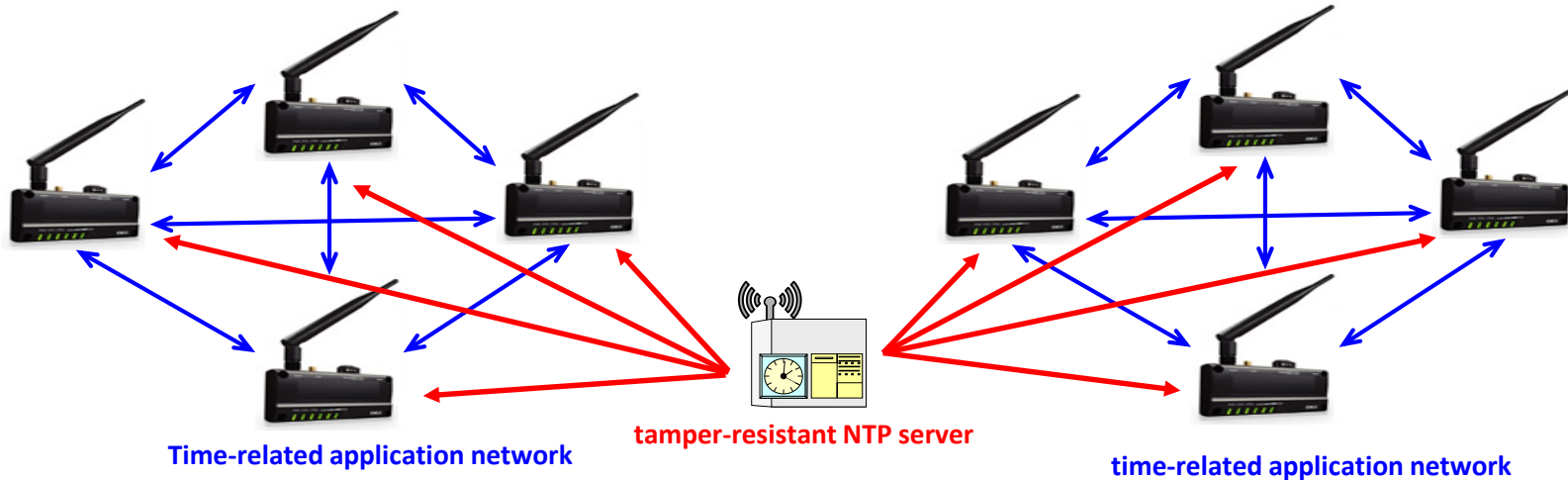
- ◆ major time comparison method
  - Two way time transfer ( Optical-fiber or communication satellite )
  - GNSS common view or all-in view
  - NTP



To maintain the time synchronization which method is satisfactory and economical  
Two way time transfer methods are not the target because they are quite expensive

- GNSS common-view or all-in view
- NTP
- Another method

## ○ Time related application services

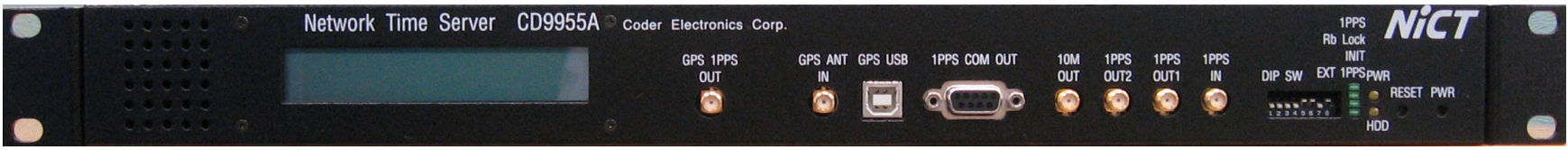


Research about the possible deployment methods and operating method of application servers and application services

EX.

- Radio-controlled watch and clock services
- IoT applications
- Sensor network systems
- And other effective application services are welcome

## ○ Tamper-resistant NTP server



FPGA controlled NTP server



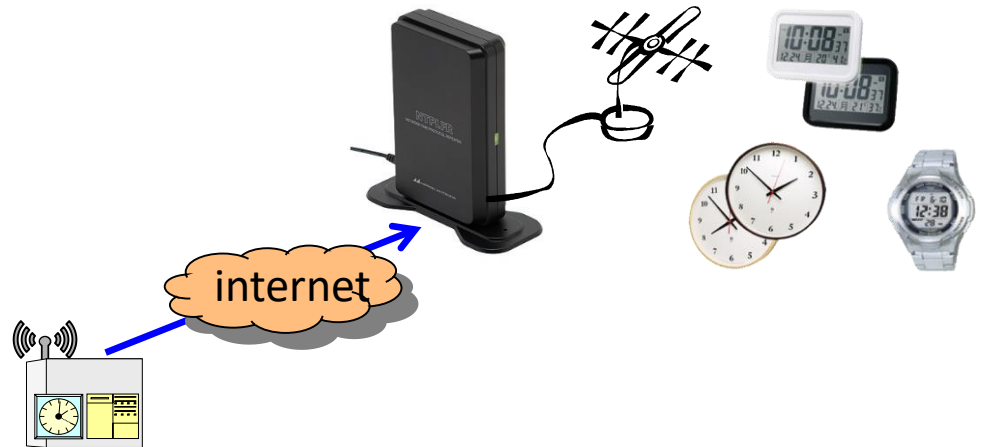
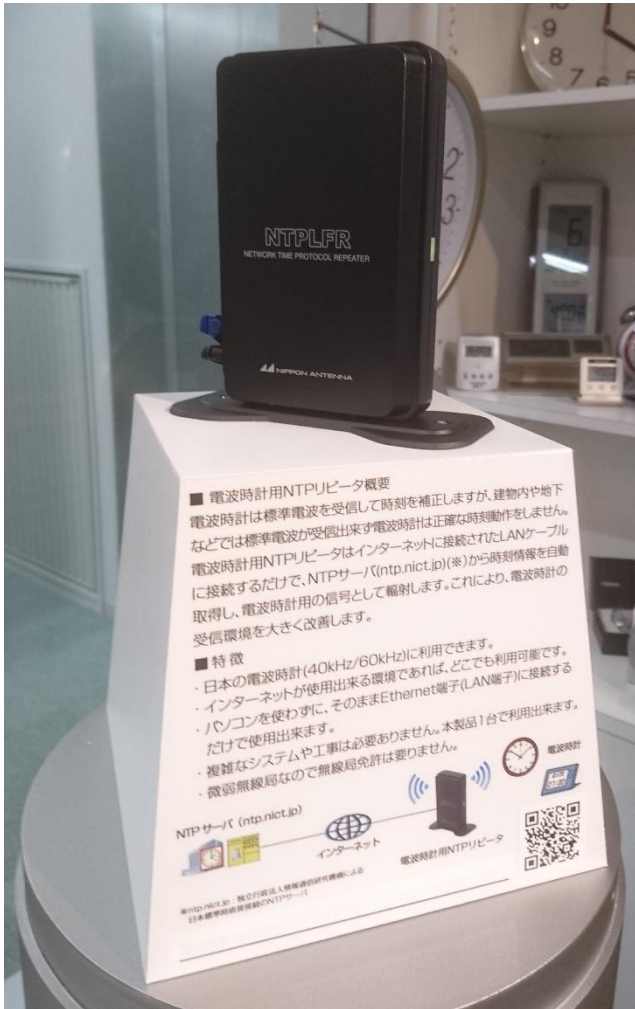
Single channel GNSS receiver

Full hardware tamper resistant NTP server include GNSS receiver

- FPGA full controlled full hardware SNTP system
- Time accuracy is less than 10 nano seconds
- 1 Gbps wire-speed throughput
- Processing speed is more than 1 mega request per second
- This server has GNSS receiver in addition to NTP



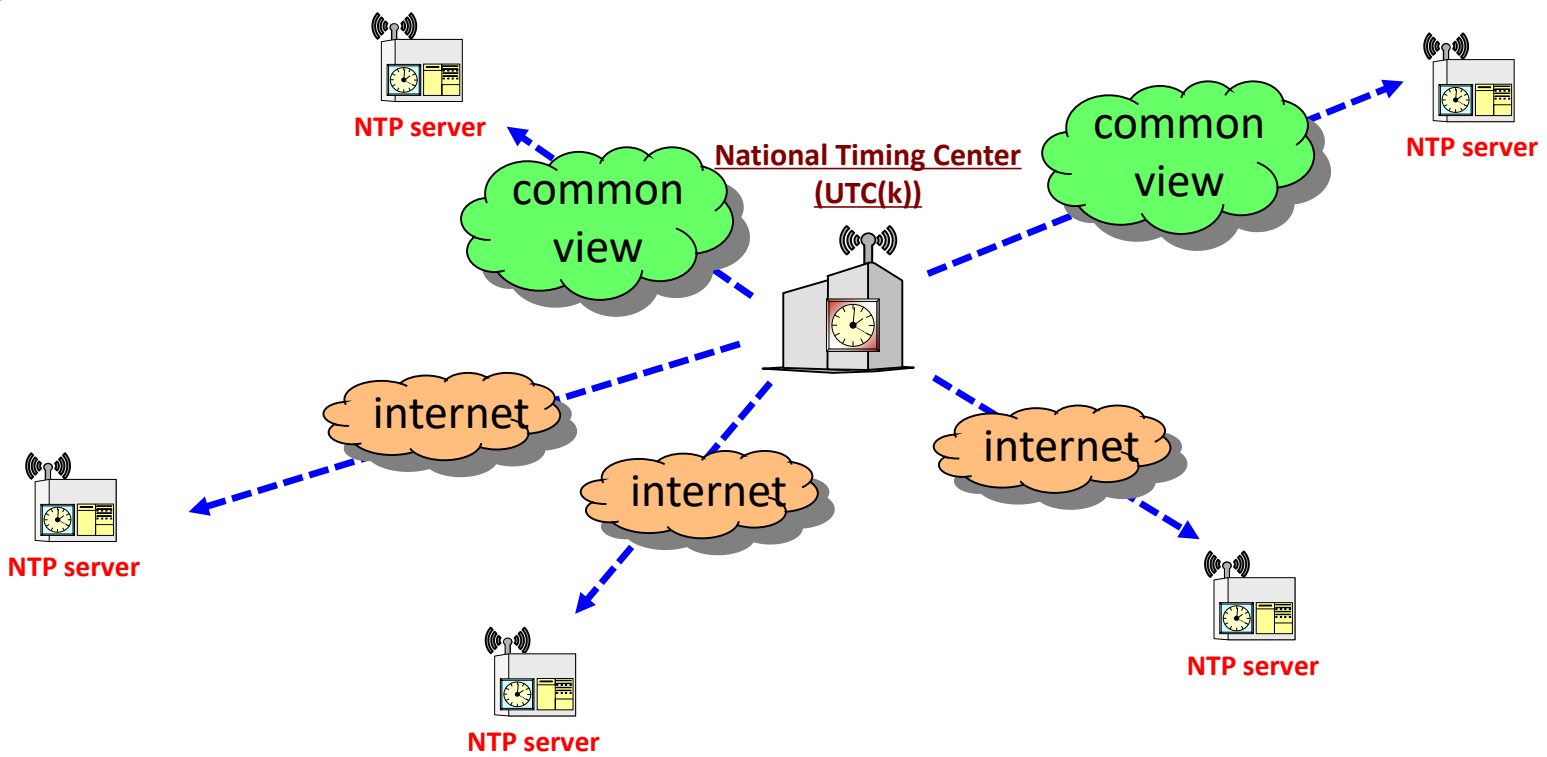
## ○ NTP repeater for radio controlled clock and watch



tamper-resistant NTP server

### Specifications

- NTP based Time source
- Time accuracy is less than 10 milli seconds
- Effective receiving range is less than 10 meters
- Time zone is selective

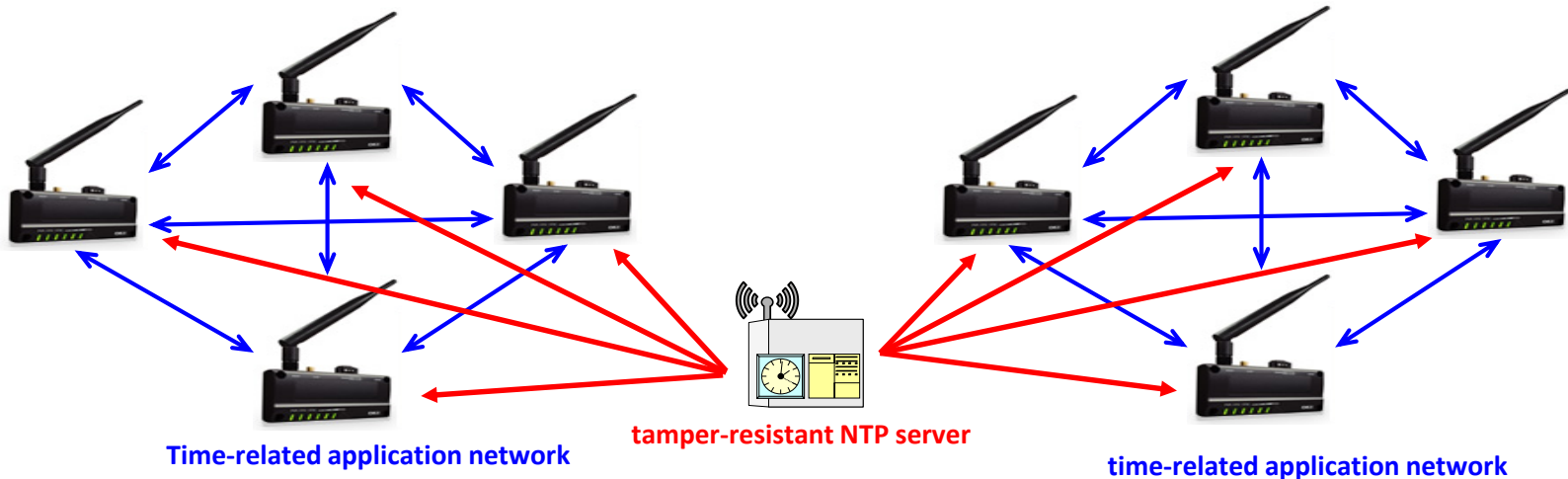


## Precise Time distribution network

Estimating the optimal time comparison methods according to network and other environments

If time synchronization within 1 micro-second from National Timing Center (NMI) can be realized in each country, a precise time distribution network can be constructed in the whole ASEAN region. (Because each NMI is synchronized on the order of few 10 nano-seconds)

[We welcome partners who provide actual test areas](#)



## Time related application services

Establishment of techniques for synchronizing all small and independent time related applications by using precise Time distribution network described above

For example, by developing a built-in NTP repeater in wifi routers installed in the open sites so that the radio controlled watch and clock displays the correct time according to the time zone, regardless of where in the ASEAN region

[We welcome a partner who suggest such time related application services](#)

- ◆ We aim to construct the Precise time infrastructure
- ◆ Our study consists of the following two issues
  - Precise Time distribution network
  - Time related application services
- ◆ We already developed some effective devices
- ◆ About the precise Time distribution network, we welcome partners who provide actual test areas
- ◆ About the time related application services, we welcome a partner who suggest the time related application services like a NTP repeater.

Thank you for your attention