On-demand transmission of Giga-bit-class Video

A Collaboration of Video Application and IP-optical Networking

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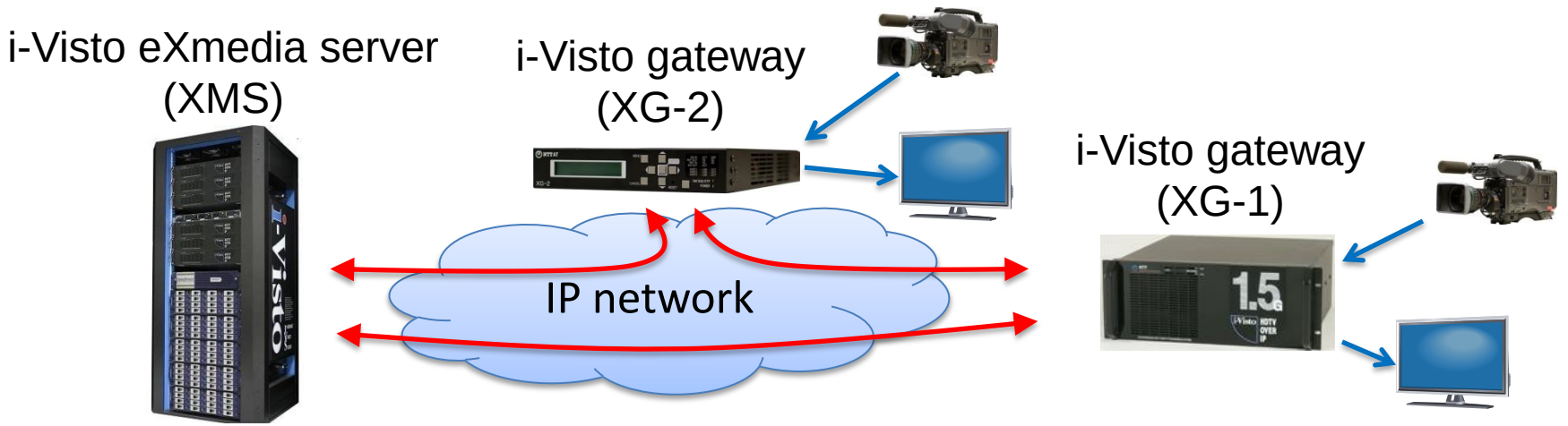
Uncompressed HDTV transmission in IP networks

- HDTV video is usually **compressed** before transmitting over networks
  - Compression causes encoding /decoding delays and Loss of information
- **Uncompressed** HDTV video transmission offers significant values
  - Low Delay enables high-presence, bi-directional visual communication
  - Broadcasting studios can share original materials to edit programs
  - Future advanced use of high-definition video in telemedicine, e-learning, etc

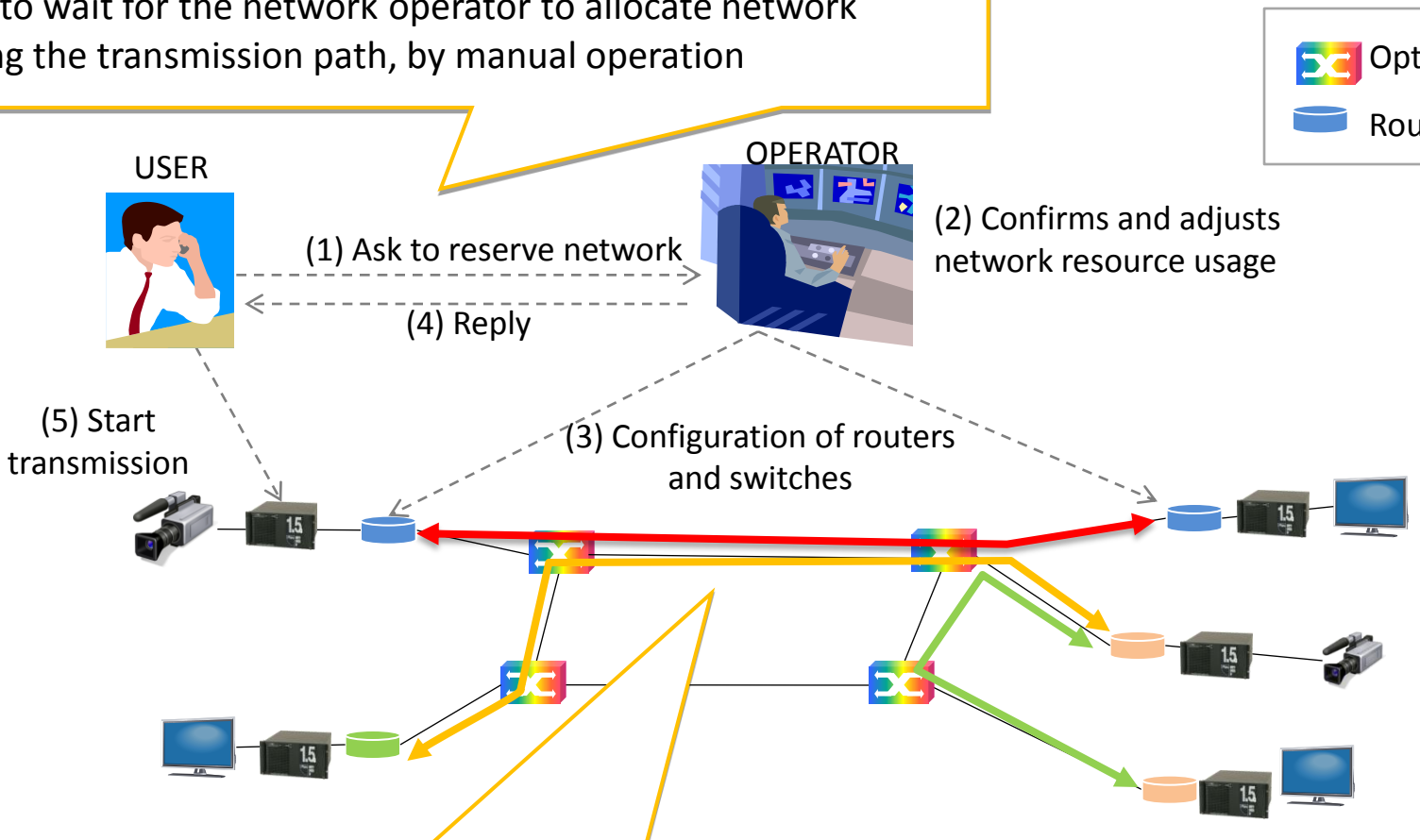
i-Visto: Internet Video Studio System for High-resolution Video Production

Transfers, stores and delivers high-quality uncompressed video over IP network



Problems in gigabit-class video transmission

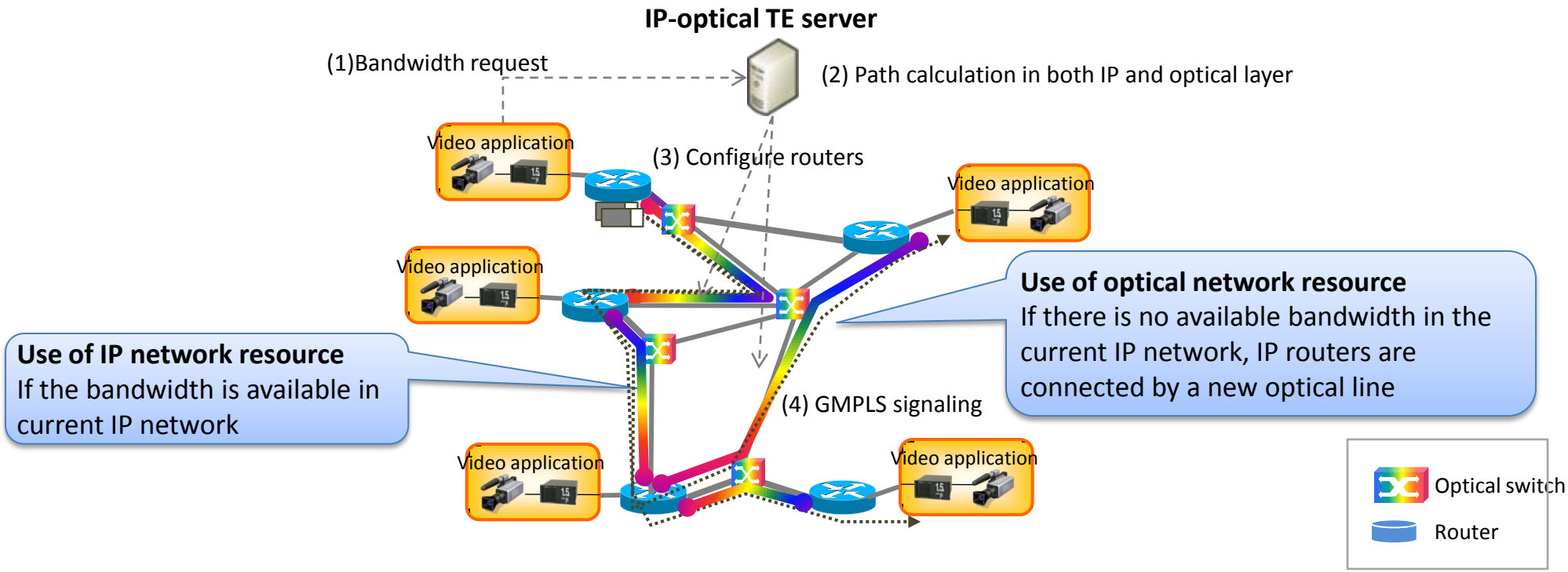
Users needed to wait for the network operator to allocate network resources along the transmission path, by manual operation



The set path is occupied even when it is not used (Resource cannot be flexibly utilized.)

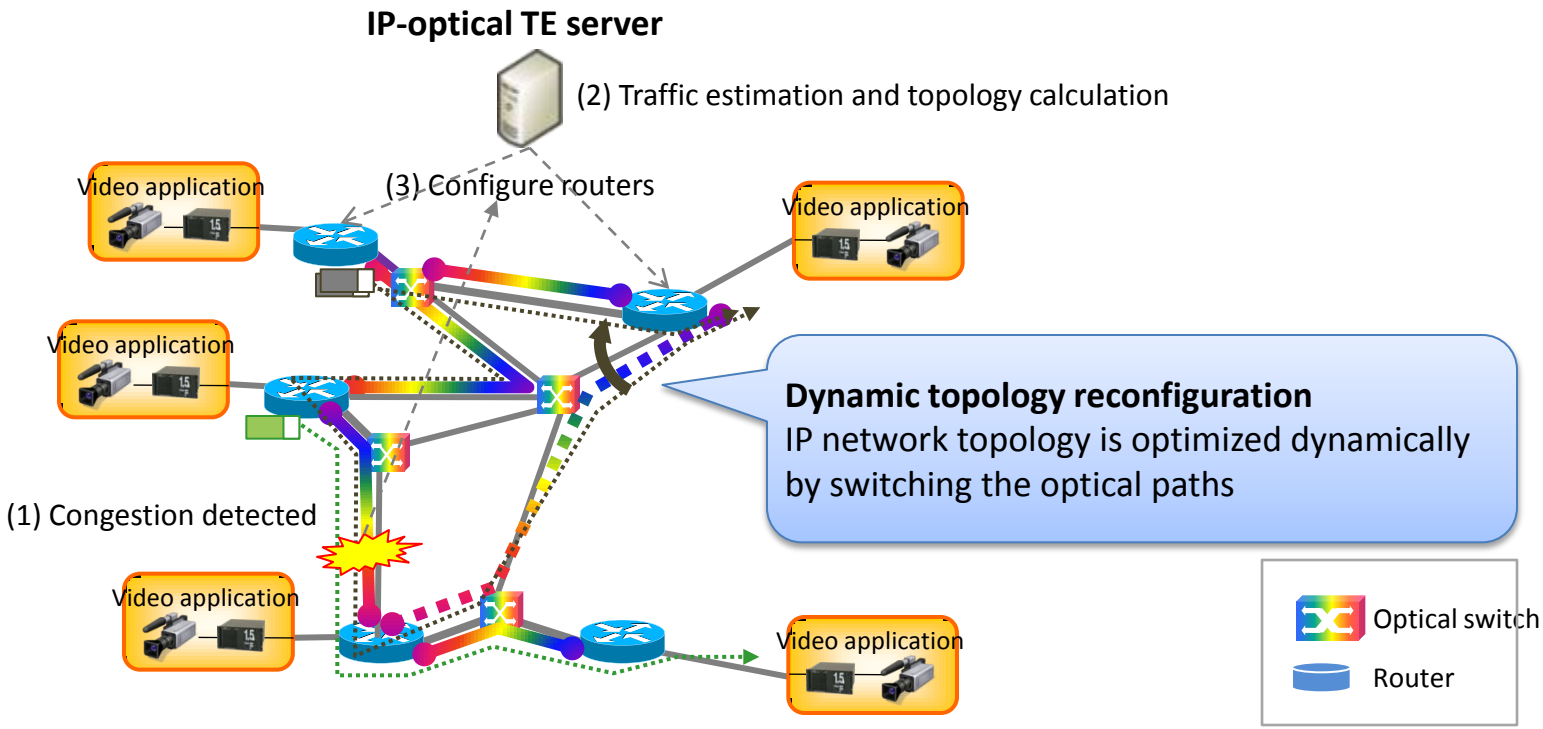
Development: On-demand transmission of Giga-bit-class Video

- Application-network cooperation is investigated for advanced video transmission technology
- Video application requests guaranteed bandwidth
- IP-optical TE server sets up gigabit-class optical circuit by reserving the resources along the path



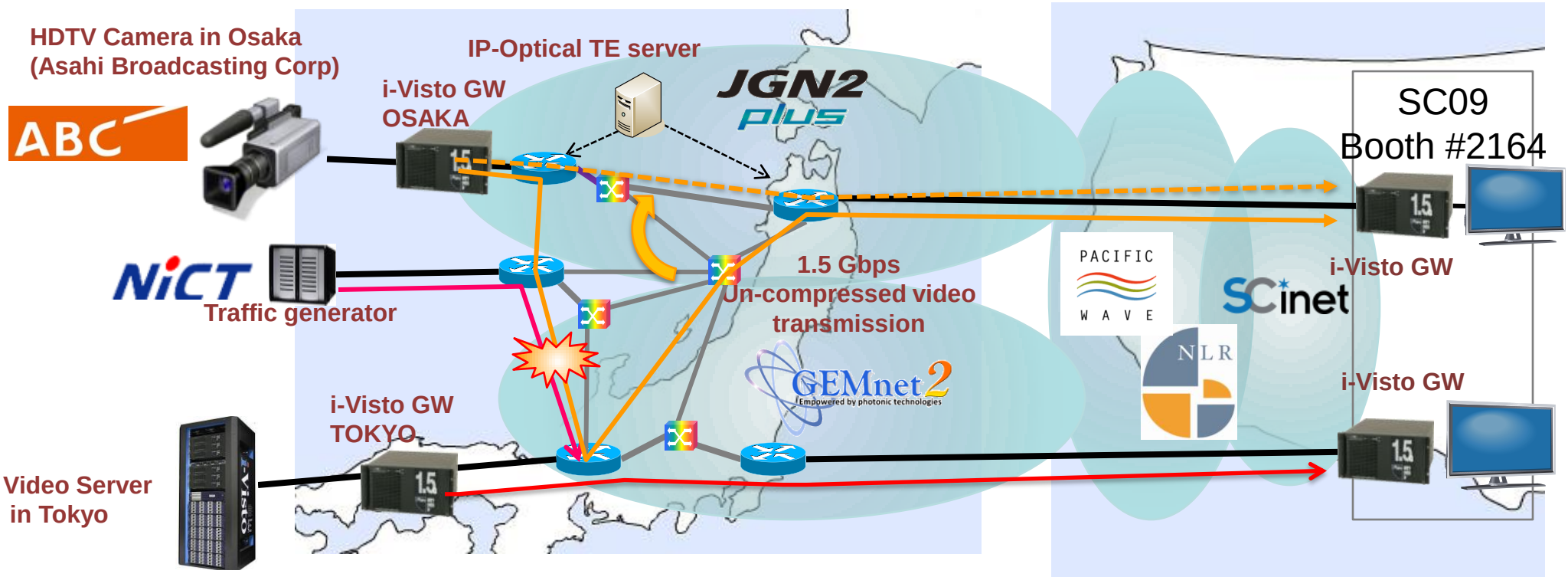
Development: Dynamic reconfiguration of IP network topology

- IP network topology can be dynamically reconfigured by setting up and/or tearing down the optical paths between any pair of IP routers.
- Topology reconfiguration is triggered in accordance with the environmental changes such as traffic demand and network failures.
- We have implemented a dynamic topology reconfiguration based on traffic matrix estimation



Wide area Experiment and SC09 Exhibition

- We have implemented and successfully verified our on-demand video transmission and dynamic topology reconfiguration with a experimental network constructed upon R&D testbeds: JGN2plus (NiCT) and GEMnet2 (NTT)
- Demo shown at SC09 booth #2164, through international connections supported by JGN2plus, GEMnet2, and Pacific Wave



Highly-accurate network monitoring

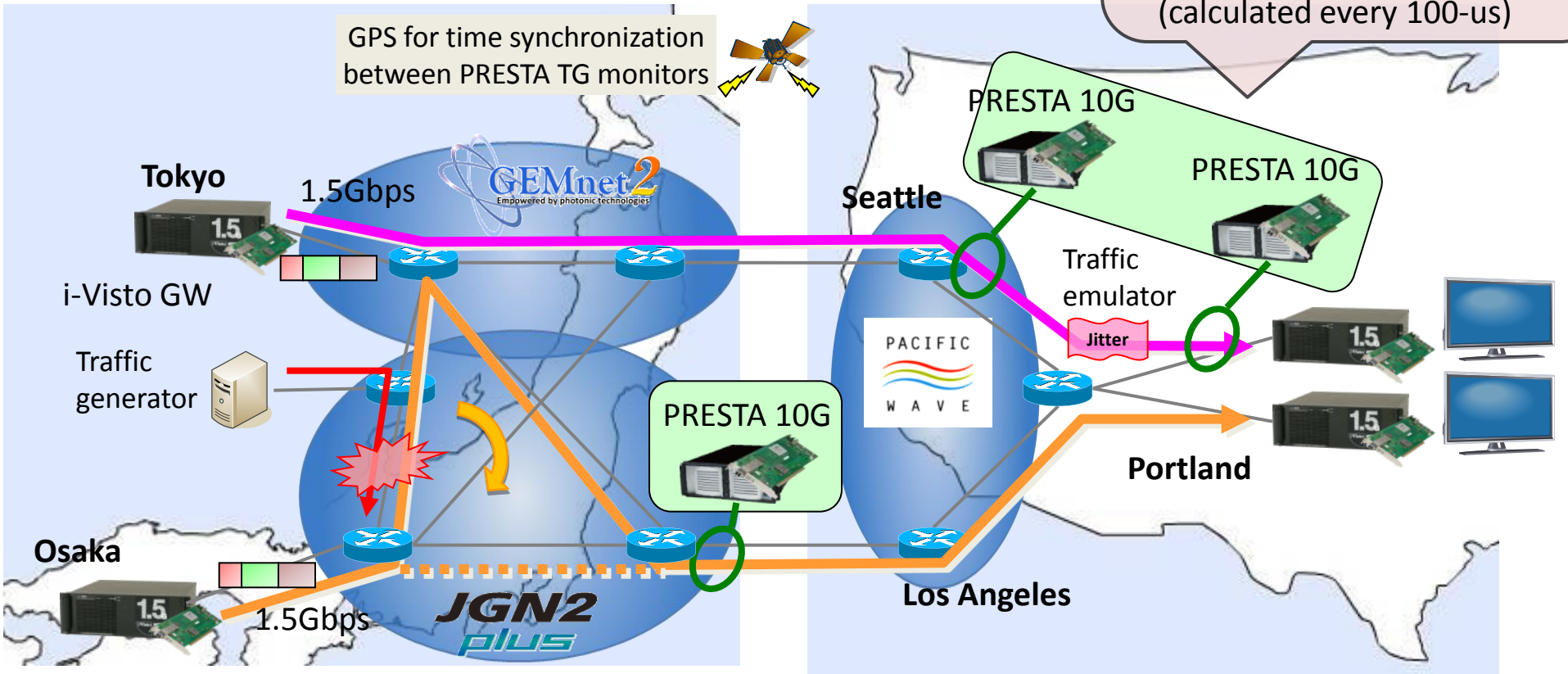
NTT

➢ Distributed In-service QoS Monitor System

1.Showing necessity of high-resolution measurement

2.Measuring influence of route change

- Inter-packet gap distribution (100-ns resolution)
- One-way delay distribution (100-ns resolution)
- Bit-rate characteristics (calculated every 100-us)



i-Visto packet with time-stamp

TS	Data	IP/UDP

SC09 in Portland

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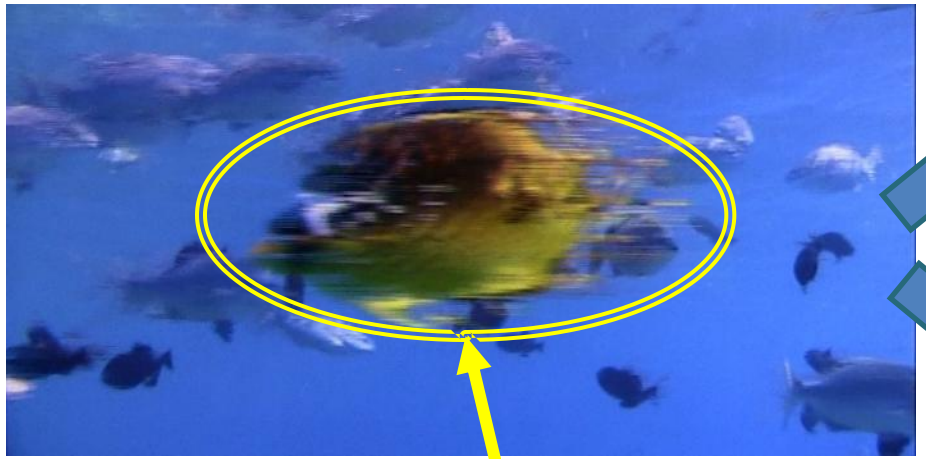
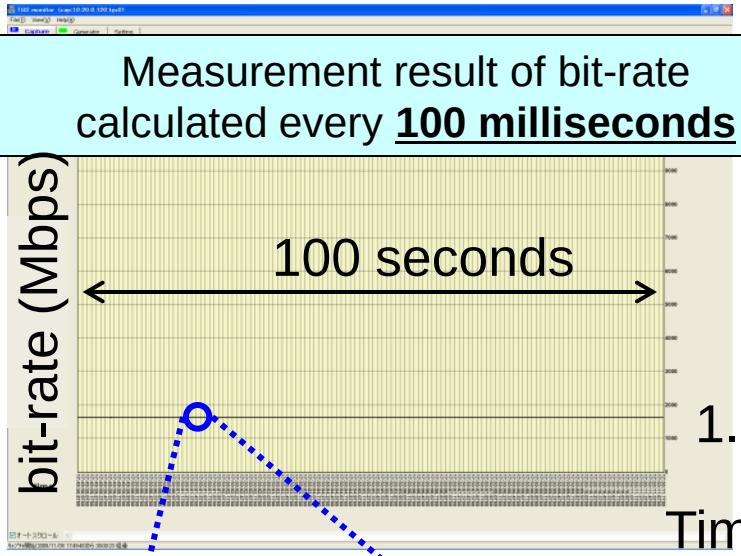
Need for high-resolution network measurement

In 10-Gb/s networks, the microsecond-order temporal resolution is essential for measuring the video stream of 1-Gb/s or higher.



Video distortion due to packet drops (uncompressed HDTV transmitted by i-Visto)

Measurement result of bit-rate calculated every **100 milliseconds**



Measurement result of bit-rate calculated every **500 microseconds**