Digital Divide in HEP in and to Japan

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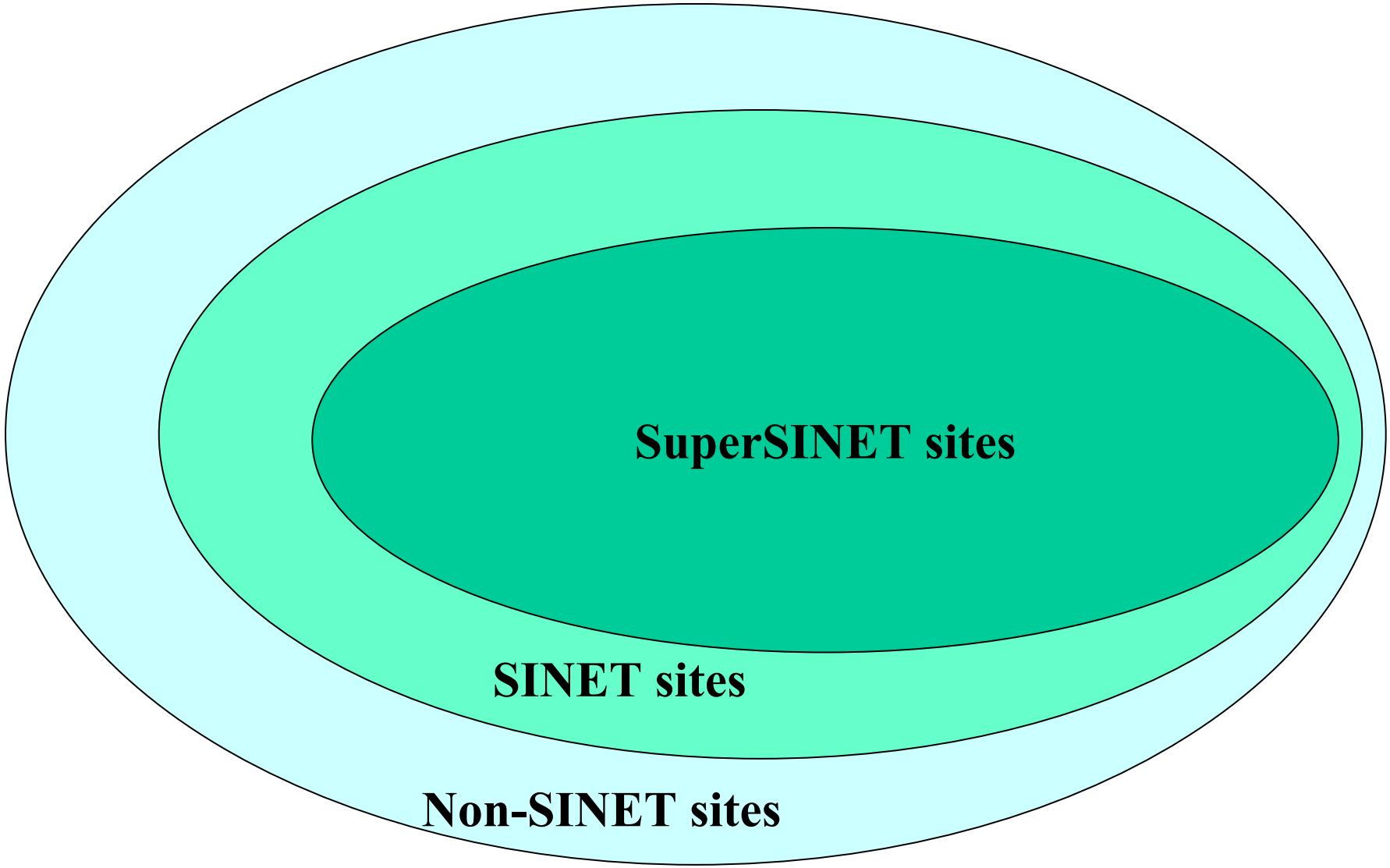
Summary of my presentation at the previous workshop held at Rio in Feb 2004

- In Japan, SuperSINET connects most of major universities and national laboratories and provides them of 10Gbps IP connection, discipline-dedicated inter-site GigE's, MPLS-VPN's, and 10Gbps bandwidth to Abilene, ESnet, and Geant, and is indispensable for HEP and other e-Sciences. However universities (especially private universities) that are not SuperSINET nodes are facing Digital Divide.
- In Asia, APAN is providing, or is expected to provide, the networks necessary for HEP and other e-Sciences. Its bandwidth in east Asia is, or is becoming, ~Gbps. However the bandwidth in the other areas are very low (<~Mbps), which is producing Digital Divide.

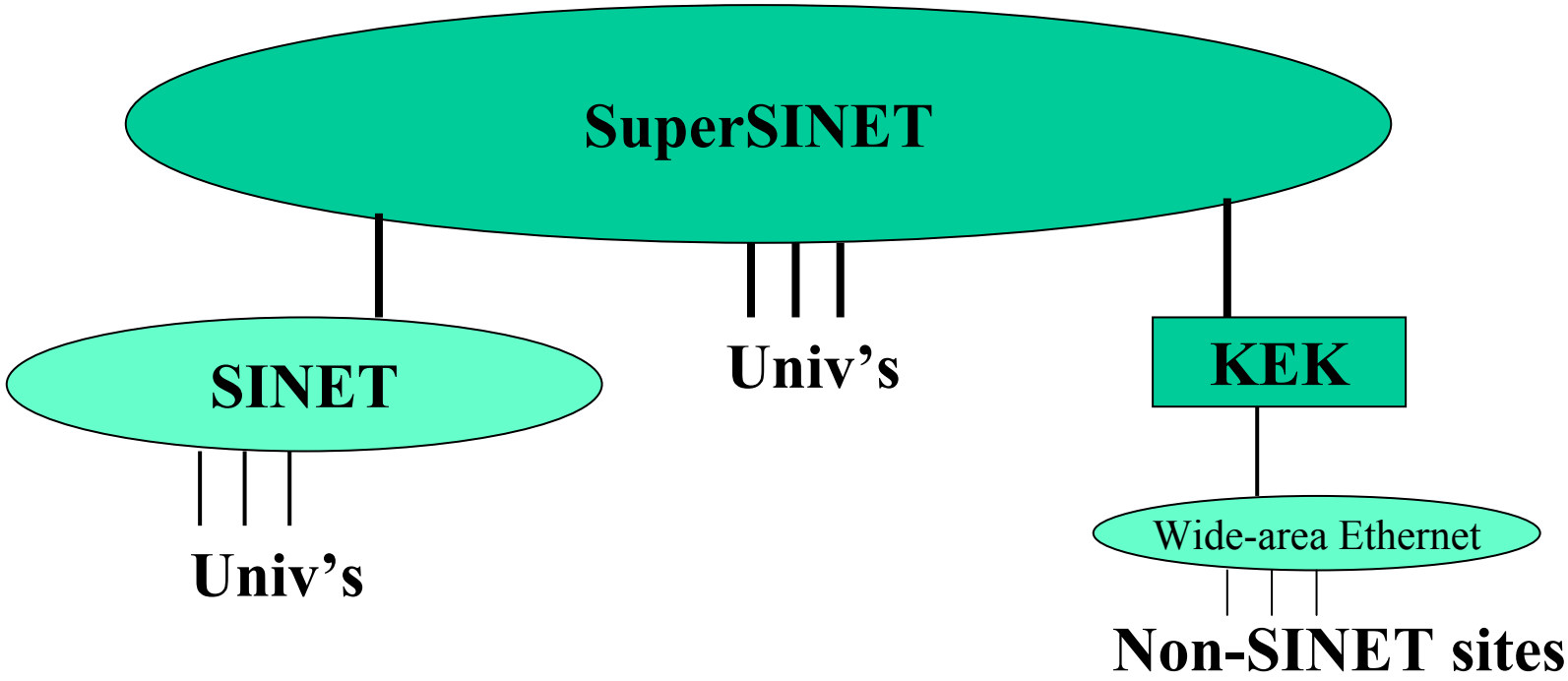
- Domestic connectivity for HEP in Japan
  - Had own links before, still have some, but depend on NII mainly
  - SuperSINET
    - I believe SuperSINET is one of the most advanced networks
    - Upgrade is being planned
  - SINET
  - Non-SINET

- International connectivity for HEP
  - America/Europe
    - Had own link before, but depend on NII now
  - Asia
    - Had own links before, still have one, but depend on APAN mainly
    - Becoming Gbps in east Asia, but still poor in other areas

Digital Divide in Japan



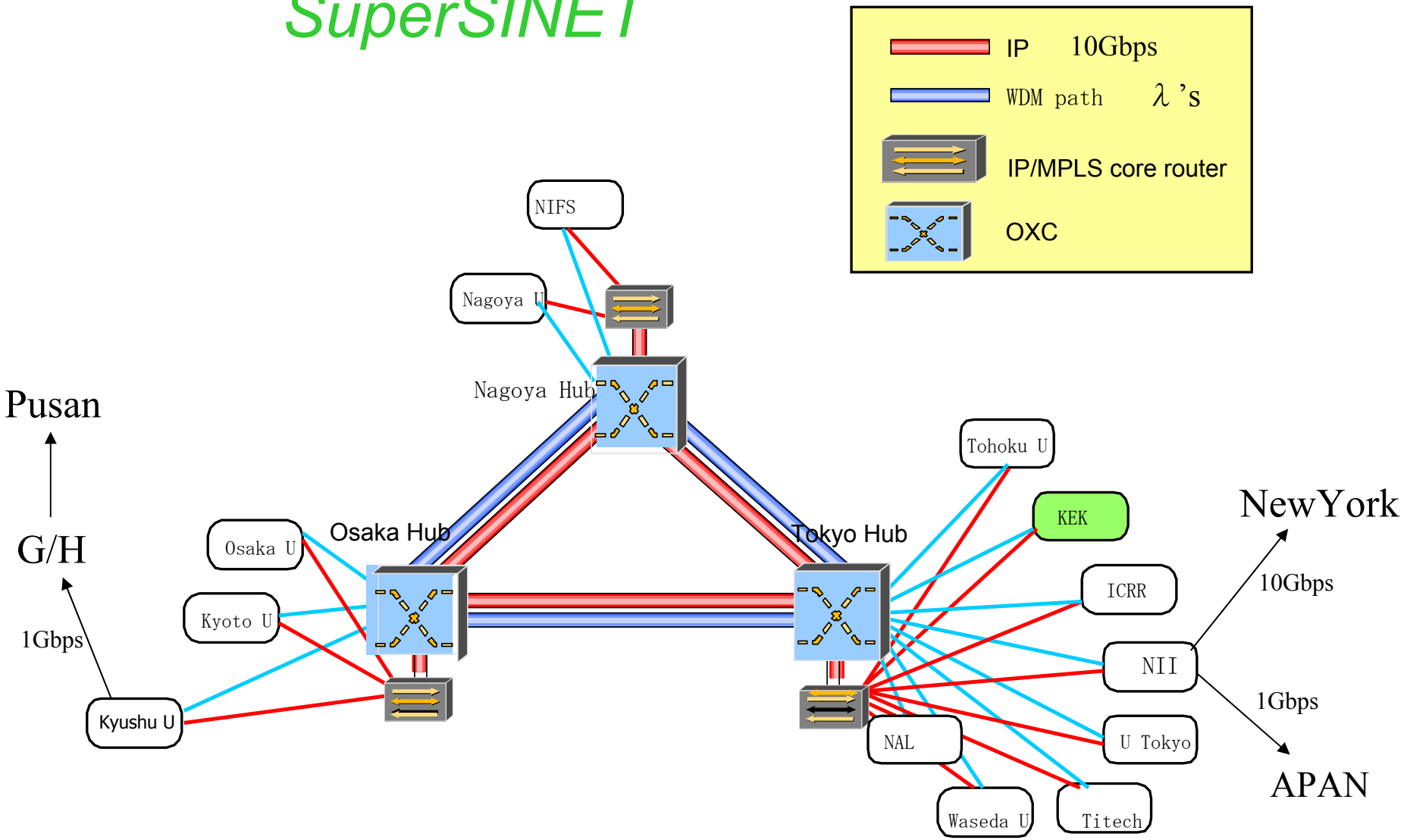
Domestic connectivity for HEP in Japan



SuperSINET

- 10Gbps IP/MPLS Backbone
  - Star-topology OC192 connection from Hub
  - Non-shared 10Gbps
  - MPLS-VPN's are configured on request
- GigE / 10GE Bridges for peer-connection
  - lambdas separate from the 10G IP/MPLS connection
  - Lightwave permanent path
  - L2 p2p service
  - Tagged-VLAN's can run on a path
- Operation of Optical Cross Connect (OXC) for fiber / wavelength switching
- Operational from 4th January, 2002
- Next generation is being planned

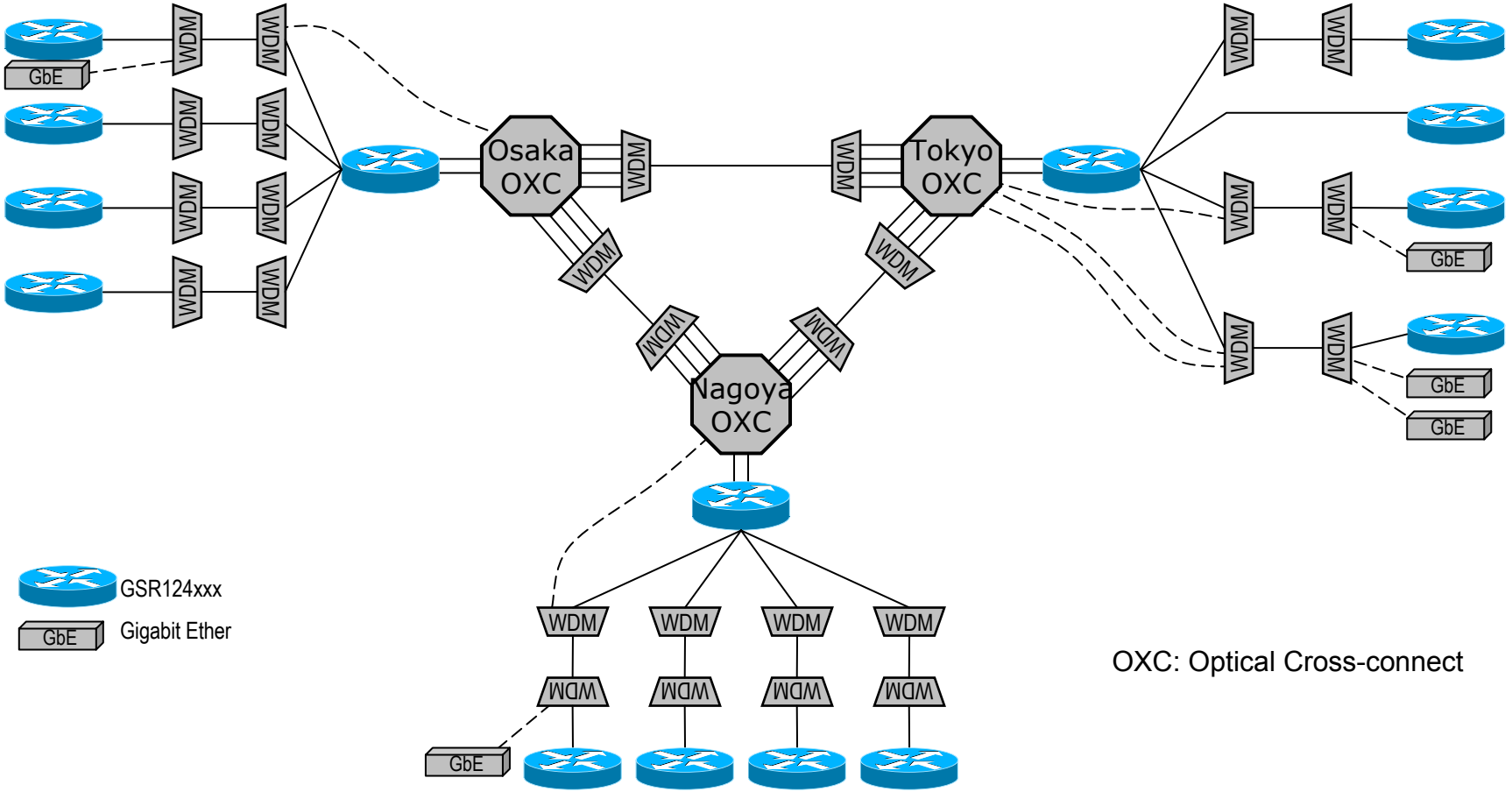
SuperSINET



Only some nodes are shown.

SuperSINET Network Configuration

SuperSINET is composed of multiple lambdas constructed with dark fibers and DWDM.



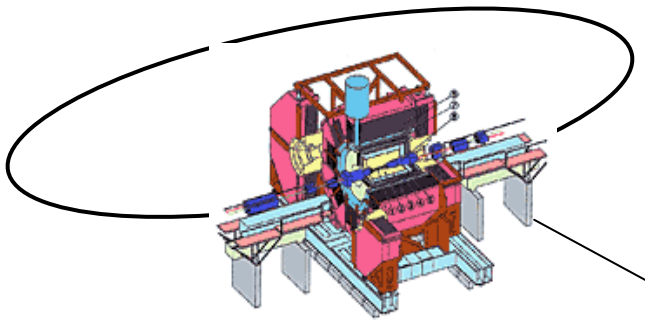
HEP VPN's in SuperSINET

Each of the following HEP groups have its own VPN constructed with dedicated GigE's and/or MPLS-VPN's in SuperSINET .

- BELLE Group
- KamLAND Group
- SK/K2K Group
- CDF Group
- ATLAS Group
- Gfarm Group
  - for development and evaluation of Data Grid for HEP
- HEPnet-J/SC Group
  - for distributed large scale simulation
- Accelerator Control Group
  - for study of accelerator control
- Generic HEPnet-J

BELLE is transferring the data with SuperSINET/GigE's

Started in 1999



Data rate : 20 MB/sec
Data Volume : 200 TB/year or more

Data Storage: 630 TB

PC Farm

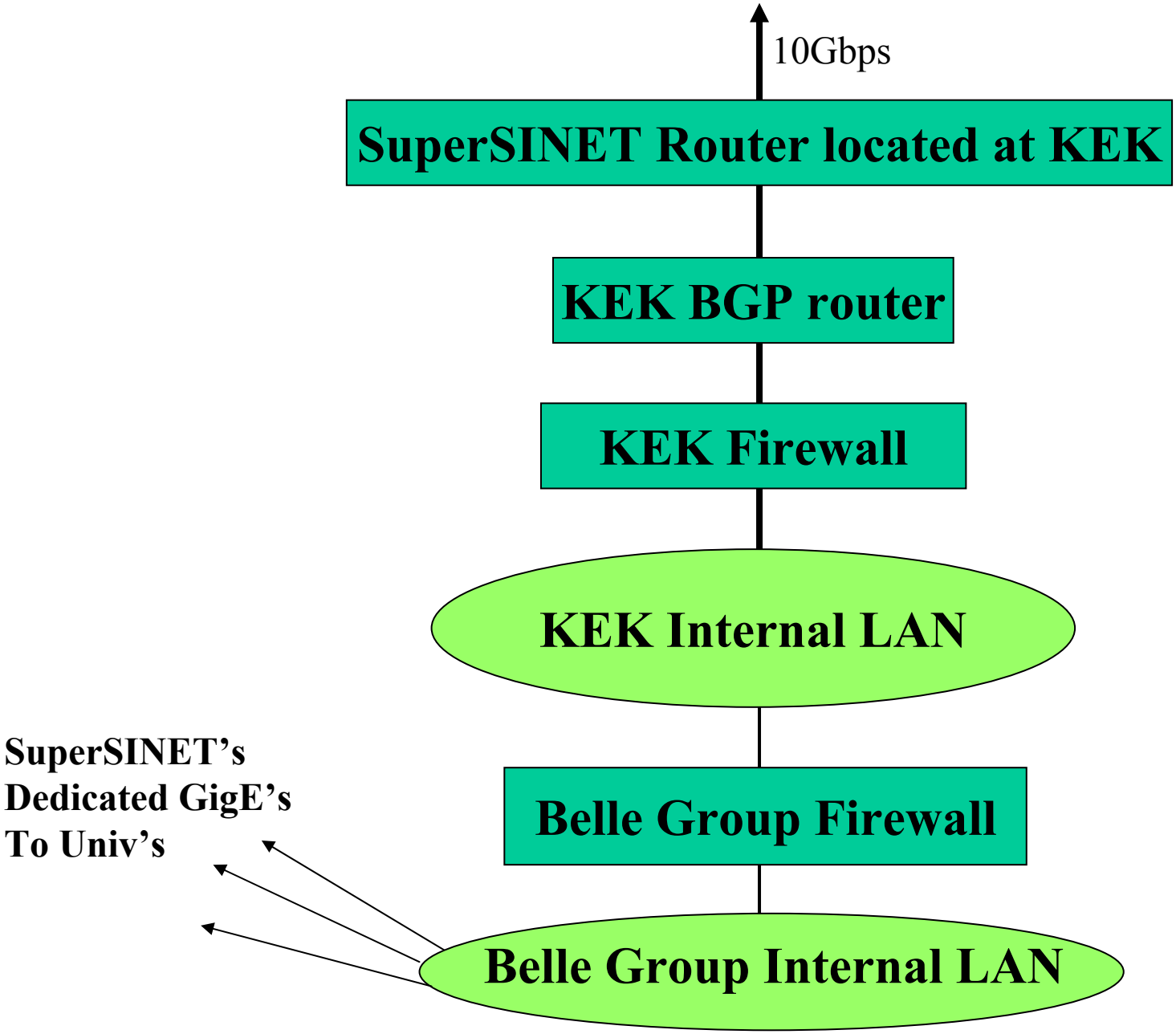
Compute Server

Disk: 14 TB

Internal Servers

LAN

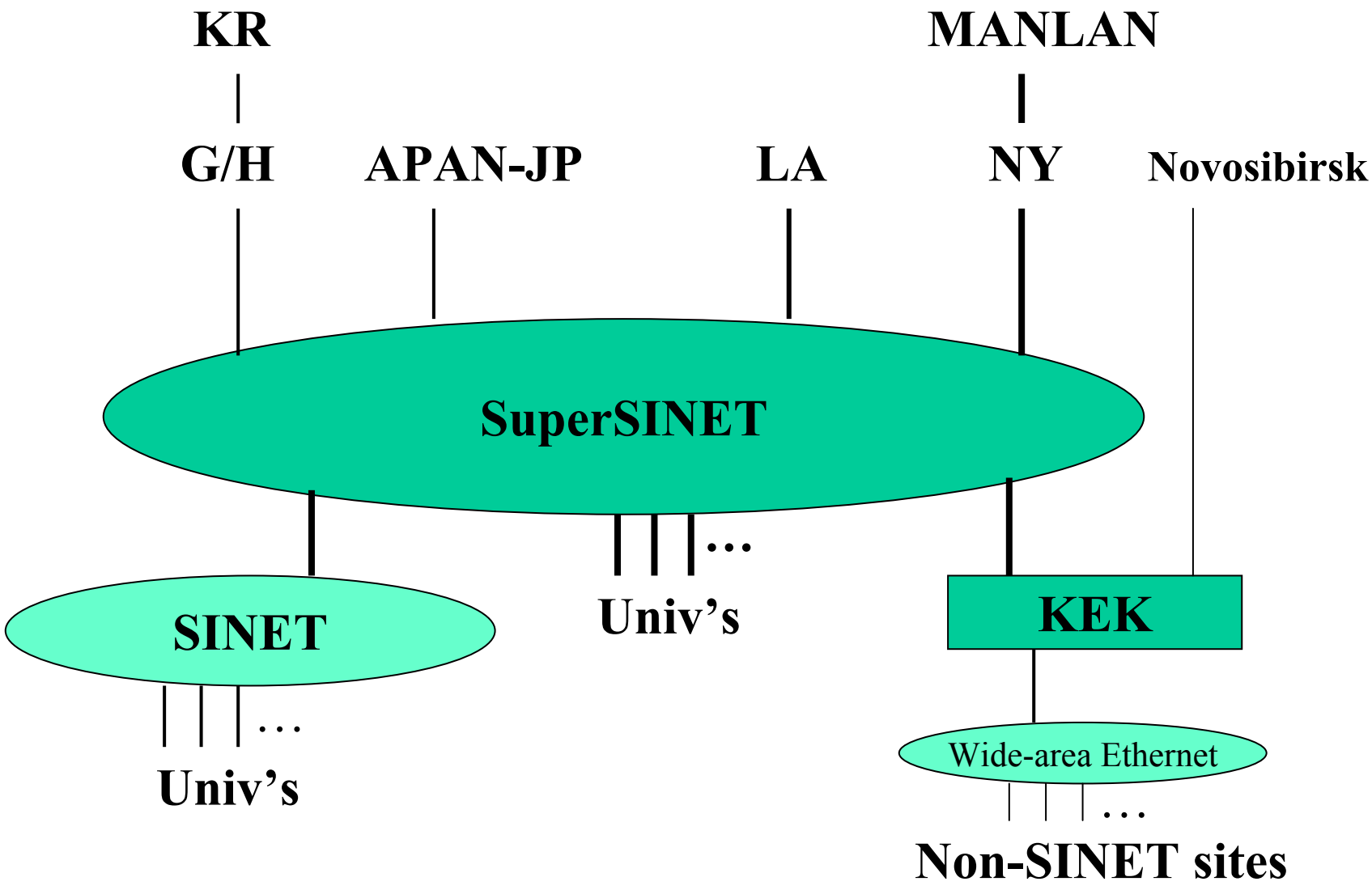
SuperSINET / GigE's to Universities


10Gbps
SuperSINET Router located at KEK
KEK BGP router
KEK Firewall
KEK Internal LAN
SuperSINET's
Dedicated GigE's
To Univ's
Belle Group Firewall
Belle Group Internal LAN

- Digital Divide in participating in HEP experiments in America/Europe from Japan

  = Digital Divide in Japan

International connectivity for HEP from Japan

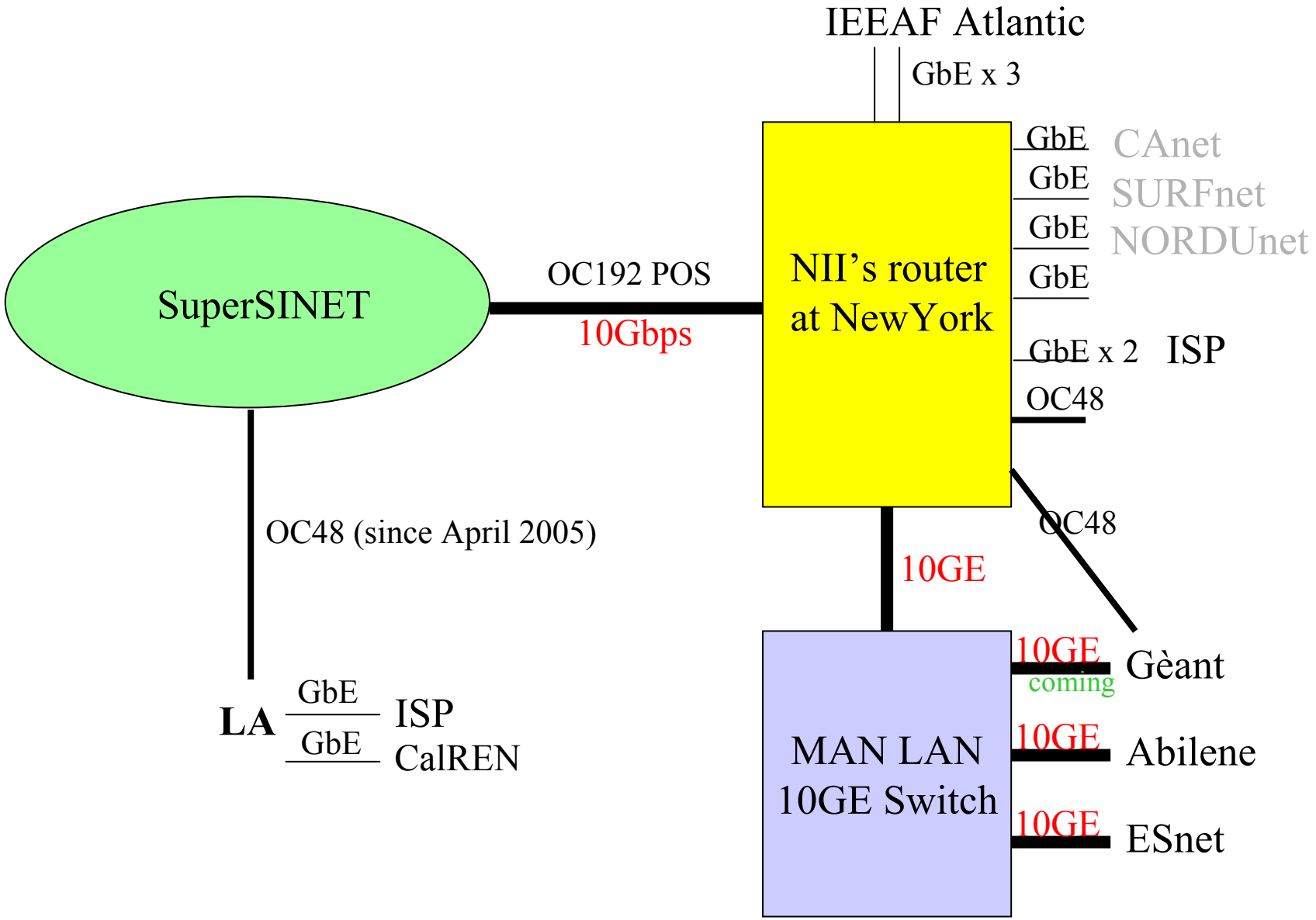


SuperSINET's links to America and Europe

- NII locates and operates a router at New York for SuperSINET's peering with R&E networks in America and Europe.
- New York is the only place where SuperSINET can peer with all of Abilene, ESnet, and Geant.
- SuperSINET's link to New York has been 10Gbps and has been connected to MAN LAN with 10GE since December 2003.

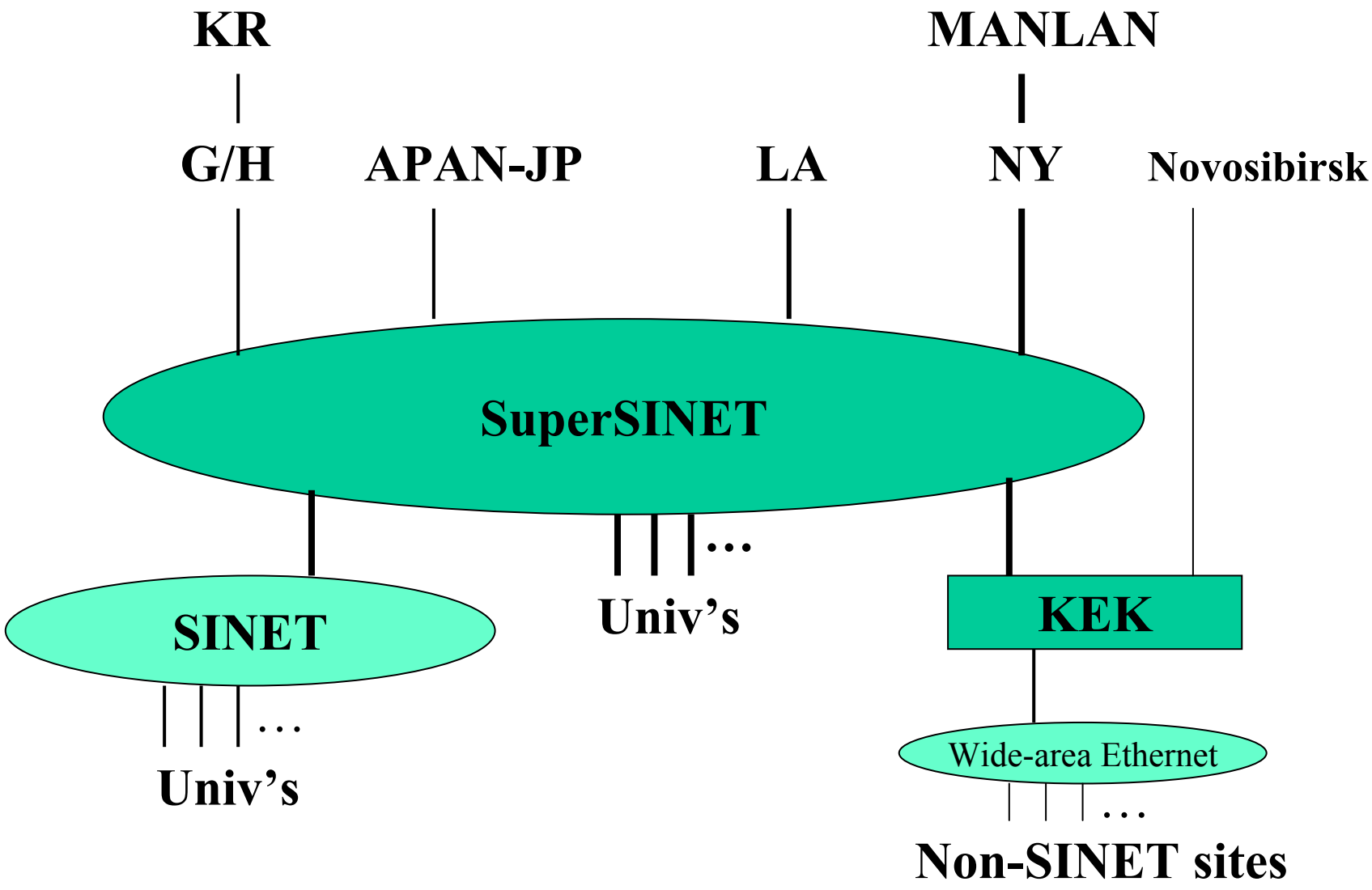
- America/Europe
  - NII's 10Gbps link to New York
    - OC192 from Tokyo to a router at New York
    - 10GE connection from the router to MANLAN
    - Abilene and ESnet are already there with 10GE
    - Geant is expected to come there with 10GE
      - Currently, Geant is connected to the router with OC48
  - NII's 2.5Gbps link to Los Angels
    - OC48 from Tokyo to Los Angels since this April
    - Can provide shorter RTT but smaller bandwidth
    - Peering there includes CalREN which includes SLAC
      - Caused a trouble for the BINP-SLAC traffic

SuperSINET's links to America/Europe



- Digital Divide in participating in HEP experiments in Japan from outside Japan

International connectivity for HEP to Japan



Networks for the HEP collaboration in Asia

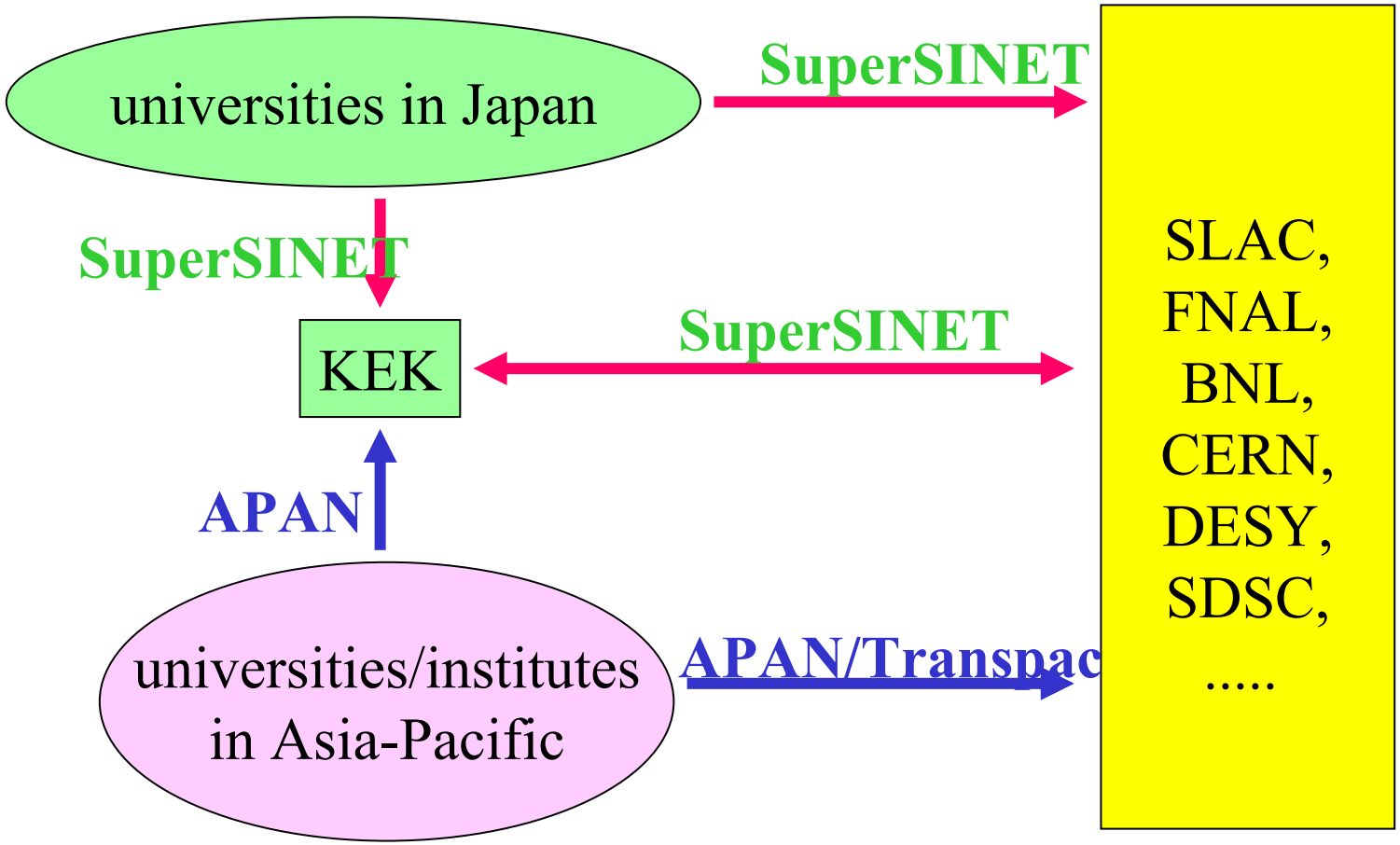
- HEP links (history/present status)

  The network is essential for the HEP collaboration, and we needed to have it by ourselves.

  The cost for each half-circuit was/is paid by each end.

  - KEK-IHEP (Beijing, China)
    - Since 1994 Until 2003
  - KEK-BINP (Novosibirsk, Russia)
    - Since 1998
  - KEK-AcademiaSinica (Taipei, Taiwan)
    - Since 1999 Until 2002
- APAN
- Gloriad
- IEEAF …

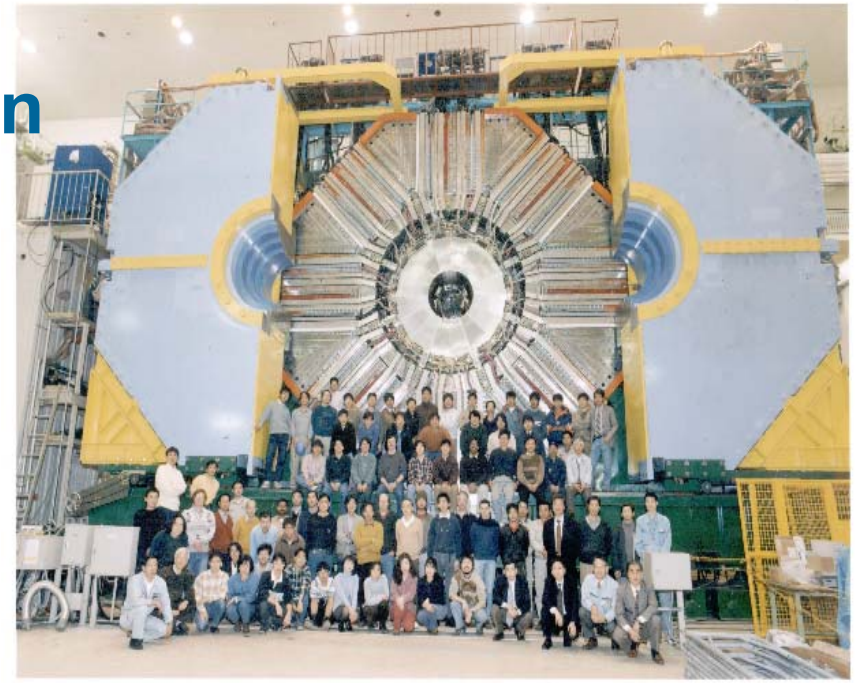
SuperSINET's America/Europe links are for the traffic from/to Japanese universities/institutes, while APAN/Transpac links are for the traffic from/to universities/institutes in Asia-Pacific.



The Belle Collaboration

>300 researchers from 55 institutes

- Aomori Univ.
- Budker Inst. of Nucl. Physics, RU
- Chiba Univ.
- Chuo Univ.
- Univ. of Cincinnati
- Univ. of Frankfurt
- Gyeongsang Nat'l Univ., KR
- Univ. of Hawaii
- Hiroshima Inst. of Tech.
- Hiroshima Coll. of Maritime Tech.
- Inst of Cosmic Ray Res., U of Tokyo
- IHEP, CN
- ITEP, RU
- Joint Crystal Collab. Group
- Kanagawa Univ.
- KEK
- Korea Univ., KR
- Krakow Inst. of Nucl. Physics
- Kyoto Univ.
- Kyungpook Nat'l Univ (CHEP), KR
- Univ. of Melbourne., AU
- Nagasaki Inst. of Applied Science
- Nagaya Univ.
- Nara Woman's Univ
- Nat'l Central Univ., TW
- Nat'l Kaoshiung Univ, TW
- Nat'l Lien-Ho Coll. of Tech., TW
- Nat'l Taiwan Univ., TW
- H. Nievodniczanski Inst of Nucl. Phys., Krakow
- Nihon Dental Coll.
- Niigata Univ.
- Osaka Univ.
- Osaka City Univ.
- Panjab Univ., IN
- Peking Univ., CN
- Saga Univ.
- Seoul Nat'l Univ., KR
- Univ. of Sci. and Tech. of China, CN
- Sugiyama Woman's Coll.
- Sungkyunkwan Univ., KR
- Univ. of Sydney, AU
- Tata Inst., IN
- Toho Univ.
- Tohoku Univ.
- Tohoku-gakuin Univ.
- Univ. of Tokyo
- Tokyo Inst. of Tech.
- Tokyo Metropolitan Univ.
- Tokyo Univ. of Agriculture and Tech.
- Toyama Nat'l Coll. of Maritime Tech.
- Univ. of Tsukuba
- Utkal Univ., IN
- Virginia Polytechnic Inst (VPI)
- Yokkkaichi Univ.
- Yonsei Univ., KR



An on-going HEP experiment at KEK, Japan

- The connectivity from China, Taiwan, Russia, and Korea are shown in the following slides.

- China
  - Japan (APAN-JP) is connected to Gloriad HK node with OC48 since this January.
  - Gloriad HK and Beijing is connected with OC48.
  - Thus, there is 2.5Gbps for China-Japan traffic.

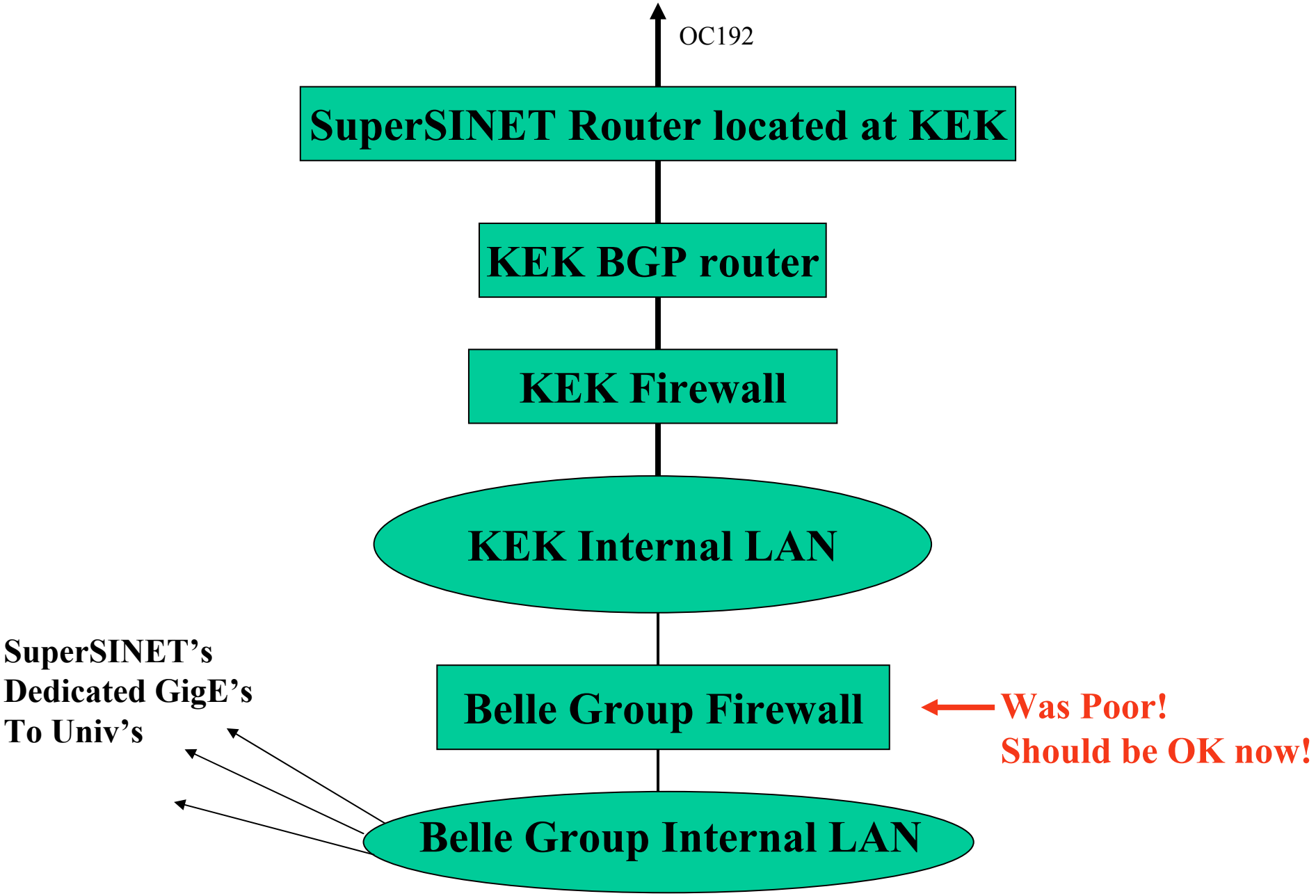
- Taiwan
  - APAN-Taiwan has a router at Tokyo, which is connected to Taiwan at 622Mbps.
  - APAN-JP router peers with APAN-Taiwan router with GigE.
  - KEK is preparing to peer with APAN-Taiwan router directly with GigE.

- Russia
  - KEK's 512Kbps link to BINP
    - Established for the Russia-Japan HEP traffic.
    - Provides transit for the Russia-ESnet traffic.
      - In order to exclude the foreign traffic, an IP tunnel connecting ESnet and KEK is used.
    - Upgrade to 2Mbps?
  - Gloriad
    - Is expected to be available for Russia-Japan and Russia-ESnet HEP traffic, and to replace the KEK-BINP link.

- Korea
  - G/H (Genkai-Hyeonhae) started to operate in early 2003.
  - SuperSINET peers with KOREN with GigE, independently from APANJP-KOREN peering.
  - So there is 1Gbps between KOREN and SuperSINET.

Access to Belle's data from Internet
- What happened there-

- High-bandwidth access from SuperSINET to Belle Internal LAN is easy.
- There was no need for high-speed access to Belle data from Internet but SuperSINET, before.
  - Belle group's poor Firewall from Internet was sufficient enough.
- High-speed connection from Korea established in 2003 was the first case of the high-speed access from Internet.
- The environment was reorganized last year. There should be no problem any more for the access at ~Gbps!?
- The further reorganization will be made in March 2006, when 10Gbps access to the Belle data server will become possible.


OC192
SuperSINET Router located at KEK
KEK BGP router
KEK Firewall
KEK Internal LAN
SuperSINET's
Dedicated GigE's
To Univ's
Belle Group Firewall
Was Poor!
Should be OK now!
Belle Group Internal LAN

Thank you!