High-Performance Data Transfer for Full Data Replication between ITER and the Remote Experimentation Centre (REC)

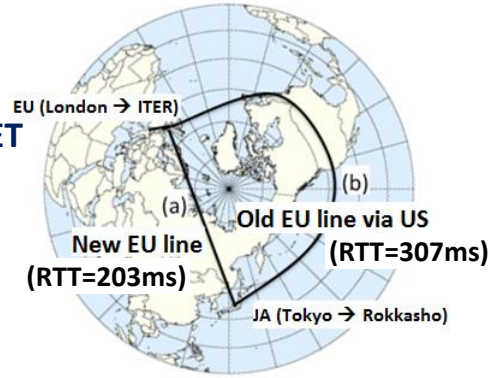
by Nakanishi H., et al. (NIFS, NII, QST, F4E)

- ✓ ITER REC R&D collaboration by JA-EU
- ✓ REC as **"ITER data full replication site"** is tested with QST, NIFS, NII, F4E, ITER.

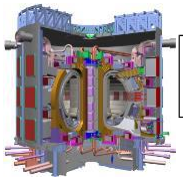
- ✓ TCP/IP speed down for longer distance: "Long Fat-pipe Network (LFN) problem"
- ↓
- ✓ **MMCFTP** using massively multiple connections is newly developed.
- ✓ **SINET5** has new 20 Gbps JA-EU line.
- ✓ L3 (Internet) vs. L2VPN (>10 Gbps) → **L2VPN** for safety, stability & speed.
- ✓ SSD-based fast storage is also needed for 10–100 Gbps data I/O.

- ✓ Transfer demo: 8h, 16h, 50h with:
  - ITER data (initial): 2GB x 500s → 1TB
  - 20 pulse/day → 30 min. cyclic
  - Target speed → 8 Gbps limit on 10 Gbps
- ✓ Achieved data transfer speed: max. 7.92 / min. 5.48 / ave. 7.17 Gbps
- ↓
- → ITER replication site is very realistic!
- → **50 TB/day** achieved new world record of inter-continental long data transfer.

❑ Route Overview – Int'l 10Gbps L2VPN via RENATER–GÉANT–SINET



❑ Data Replication Test Environment



Read from SSD
Send 1TB data
in every 30 min.

1TB

Target speed: 8 Gbps
Duration time: 8h, 16h, 50h
(1TB transfer takes 17–18 min.)

Receive 1 TB data
Store into SSD
Erase & trim SSD in 1 min.

1TB

Sender

Receiver

CPU: Xeon E5-1650 v3
6C12T 3.5GHz
Memory: 32GB
SSD: Intel SSD 750 (1.2TB)
OS: CentOS 6.8
NIC: Chelsio T310
MTU: 1500 Byte

ITER

International L2VPN
(RENATER–GEANT–SINET)

round-trip time = 200 ms

REC

CPU: Xeon E5-2630 v2
6C12T 2.6GHz
Memory: 32GB
SSD: Intel SSD 750 (1.2TB)
OS: CentOS 6.8
NIC: Intel X520
MTU: 1500 Byte

❑ Demonstrated Results (ITER → REC)