Update of DiFX Correlation at KASI

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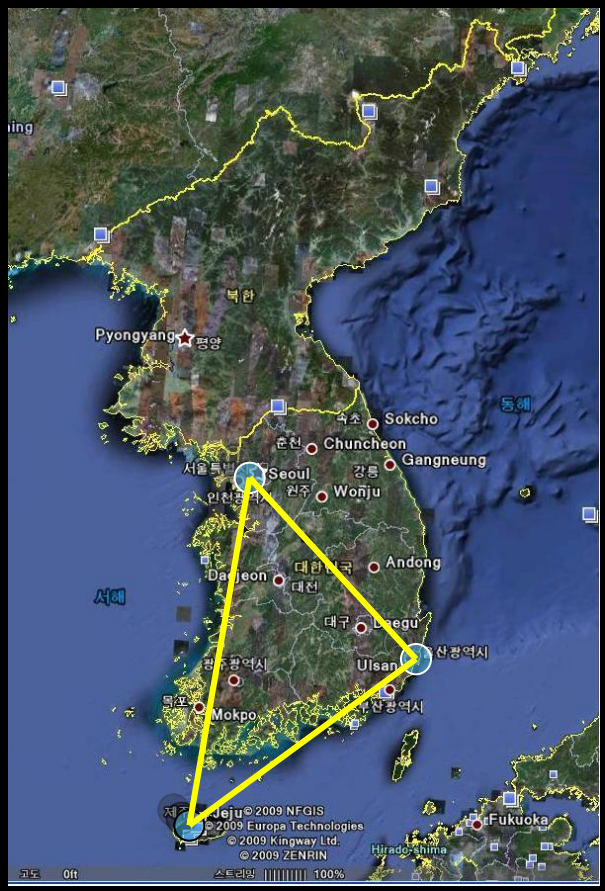
Korean VLBI Network

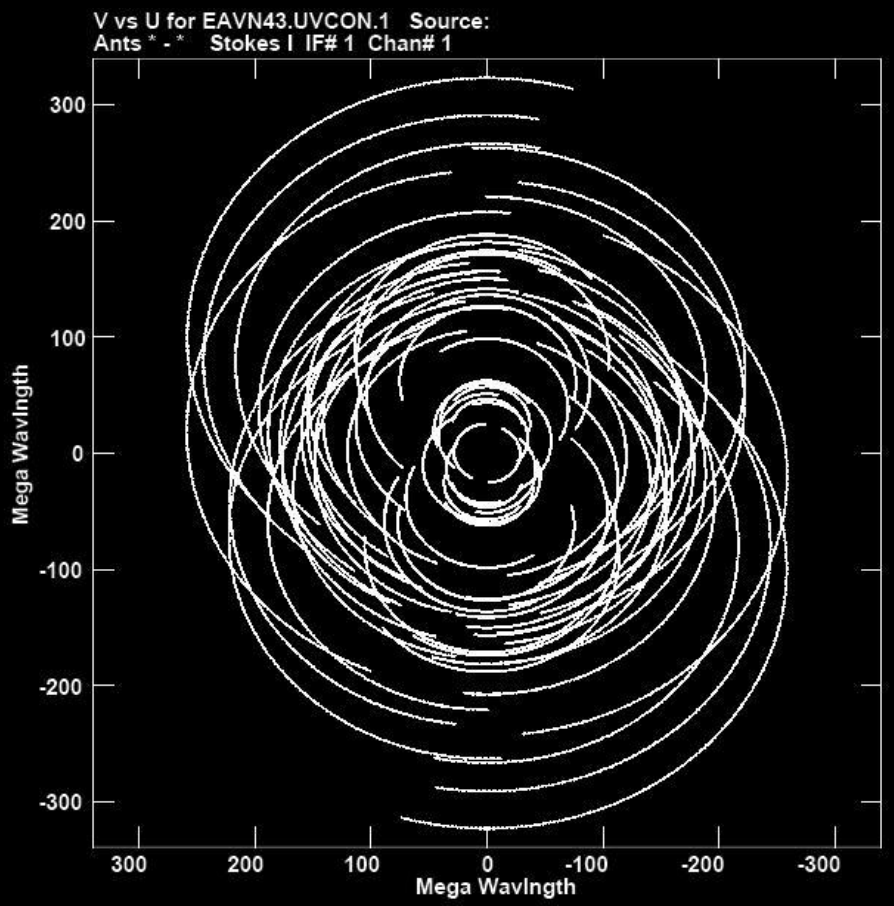
- 3 × 21m Antennas
- Maximum Baseline : 480 km
- 4 Channel (22/43/86/129 GHz), LCP/RCP
- Simultaneous Observing System
- Multi-Frequency Phase Referencing
- Correlators: Daejeon(HW), DiFX(SW)



KVN+VERA

Korea : KVN antenna
Yonsei (Seoul), Ulsan, Tanma (Jeju)
Japan : VERA antenna
Mizusawa, Ishigaki, Iriki,Ogasawara

1.4 mas@22GHz
0.7 mas@43GHz



Previous DiFX system

- one difx server: 16 cores (E5-2690), 64GB memory, CentOS 6.3
- Storage: 120TB+80TB RAID 6, direct attached to server
- Mark5 unit: Mark 5B+(SDK8.3), 5C(SDK9.2), direct connection to server with 1GE

New DiFX Cluster

- 1 front node: Intel Xeon E5-4650, 2.7GHz, 32cores
- 35 computing nodes: Intel Xeon E5-2470, 2.3GHz, 560cores (16core/node)
- Peak performance:
  11 Tflop/s
- Storage: 720TB (raid 6) directly attached to the front node
- Network: FDR IB, 10G, 1G
- Rocks 6.1
- Mark5s
- Installed on Dec. 2012

FDR Infiniband

- Mellanox SX6025 36-port 56Gb/s InfiniBand Switch Systems
- Mellanox Connect-3 VPI MCX353A-FCCT

  Single VPI FDR/40/56GbE

nodes

- Frontend node IBM x3750 M4
  - four Intel Xeon E5-4650, 2.7GHz, 32cores
  - 96GB memory
  - Internal ServerRAID M5100 card
  - Three LSI MegaRAID 9286CV-8eCC
  - 20 Dell PV MD 1200, 20*12*3TB=720TB
- Computer nodes IBM x3530 M4
  - two Intel Xeon E5-2470, 2.3GHz, 16 core
  - 48GB memory

Network connectivity

Dedicated 1GE connection through KREONET

among

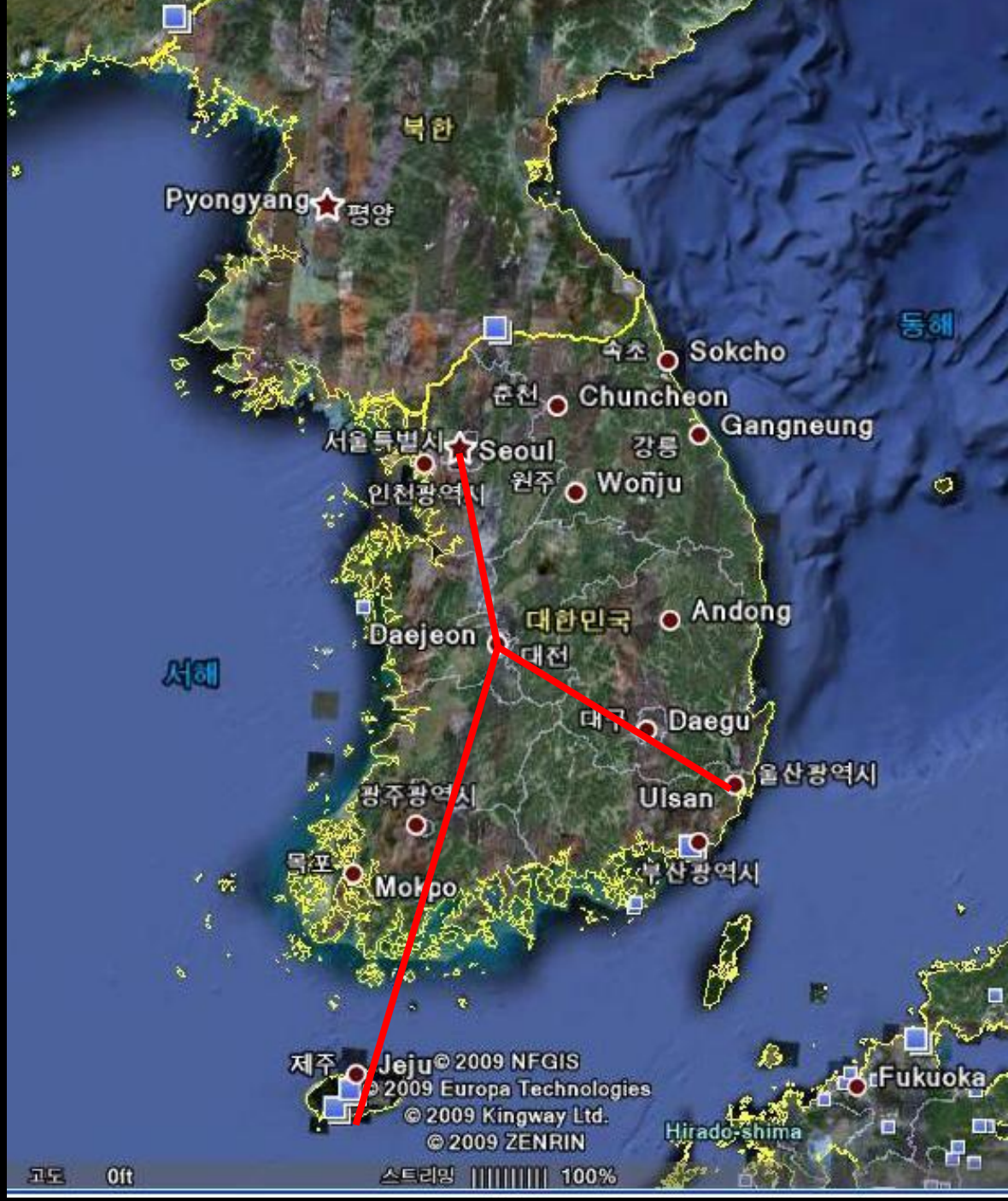
Daejeon (Headquater)

Seoul (KY)

Ulsan (KU)

Jeju (KT)

10GE upgrade will be done in near future



Performance of DiFX cluster

- Correlation time for a 1Gbps observation of KVN (three baselines) with 64 cores is same as the observation time
- IBoIP improves disk IO by compute nodes. (We don’t use a machine file, which is good for sharing the cluster with theorists using SGE.)

DiFX development at KASI

- Difference between KVN DAS (Data Acquisition System) and Mark5B format
  - KVN DAS records bit stream in IF sequence
  - Mark5B format reads in time sequence
- Richard (and me) implemented “KVN5B” format to read data streams recorded using, for example, the KVN mode 4.

Example, KVN mode 4 and 5

(4) Mode4 [32MHz-2b]×8stream (1024Mbps, 32Mclock)

Bit Number (RBSn)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Output Stream	S1				S2				S3				S4				S5				S6				S7				S8			
Bandwidth (MHz)	32				32				32				32				32				32				32				32			
Output Sample Time	0		1		0		1		0		1		0		1		0		1		0		1		0		1		0		1	
MSB/LSB	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L

(5) Mode5 [16MHz-2b]×16stream (1024Mbps, 32Mclock)

Bit Number (RBSn)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Output Stream	S1		S2		S3		S4		S5		S6		S7		S8		S9		S10		S11		S12		S13		S14		S15		S16	
Bandwidth (MHz)	16		16		16		16		16		16		16		16		16		16		16		16		16		16		16		16	
Output Sample Time	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
MSB/LSB	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L

Future Plan

- E-VLBI operation
- Correlation for KVN+VERA
  - Require copy of VERA 2000 tape to Mark 5 diskmodule or storage
  - New Japanese recording system based on hard disk, the so-call OCTADISK, will be introduced to the KVN soon.