

# EXPRoS 2nd Board Meeting

## NA4- Outreach

- 2007 May 29

EXPRoS Project Team

JIVE, Coordinating Institution

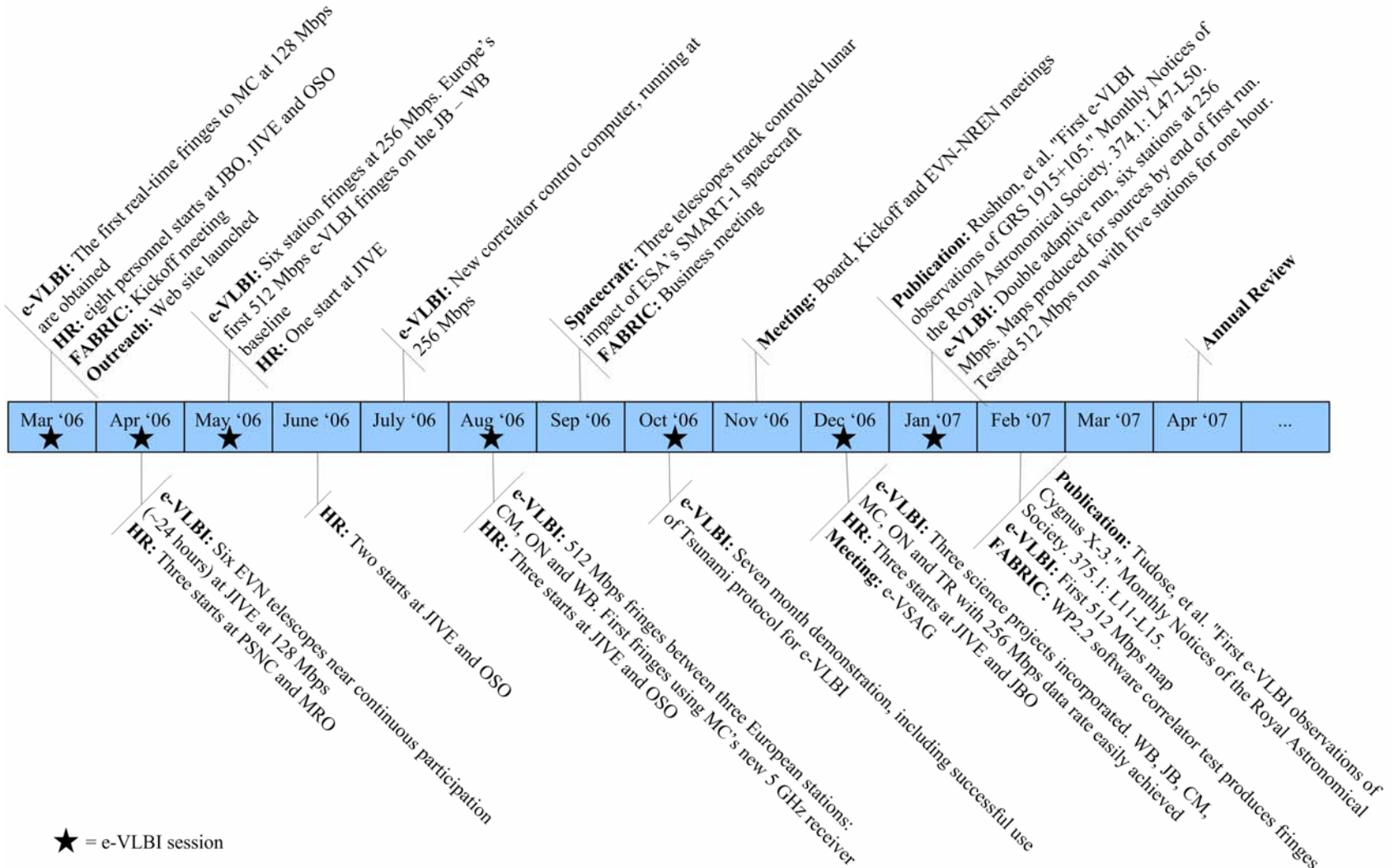


# NA4 output

- A variety of images and slides are now available for use by project members
  - Please feel free to use the images
  - Let us know that you are making presentations so that we can cross-link and post on our website
- Brochures
  - All partners were sent copies of the EXPReS Brochure
  - If you would like additional copies, please contact Kristine
- Upcoming
  - The next big project is a display board for large meetings. Alistair is working on this.

# EXPReS Timeline

## EXPReS Timeline



# (some of) The Faces of EXPReS



Please send your picture if you would like to be included on this page

# EXPReS Brochure, inside cover

## EXPReS: The Next Generation of Very Long Baseline Interferometry

Radio astronomers, network engineers and software designers are pushing the boundaries of radio astronomy through the development of electronic, real-time VLBI, known as e-VLBI.

The goal of EXPReS is to create a production-level electronic VLBI service in which 16 inter-continental radio telescopes at a time are reliably connected to the central data processor of the European VLBI Network (EVN) at the Joint Institute for VLBI in Europe (JIVEI). With an aggregate data flow of up to 15 Gbps into the central processor, EXPReS aims to create a robust e-VLBI infrastructure of continental and inter-continental dimensions. This creates a unique facility to generate high-resolution images of cosmic radio sources in real-time.

EXPReS also seeks to design and prototype elements of the hardware, software and data transport services required to support future e-VLBI facilities in which the net VLBI data flows will be hundreds of Gbps. Research into future correlators focuses on deploying the data collection on wide-spread, Grid-based computing resources.

Very long baseline interferometry (VLBI) is a technique in which widely separated radio telescopes observe the same region of sky simultaneously in order to generate very high-resolution images of cosmic radio sources. The detail with which VLBI can image bright radio sources is unsurpassed in astronomy and can be one hundred times better than the resolution of the best optical telescopes. The technique also has practical applications in geodesy (measuring continental and periodic motions of the Earth's surface and variations in the Earth's rotation rate) and has recently been used in precision spacecraft navigation.

This revolutionary new way of carrying out observations is called e-VLBI.

Since VLBI telescopes are usually separated by many hundreds of kilometres, data from each telescope are digitally sampled and stored locally, using high-capacity computer disk arrays. These disks are physically transported to a central data processor, a purpose-built supercomputer, where the data from each telescope are decoded, accurately aligned and then correlated together in an exhaustive pair-wise fashion for every possible telescope combination.

The total flow of data into the central processor is approximately 10-100 Terabytes per observation, reduced to 1-100 Gigabytes after processing. After initial calibration, these data are handed over to the astronomer, who computes sky images from the data for further astrophysical analysis.

The process of shipping disks is elaborate and expensive, however, it can take weeks for the data to arrive at the processor, and there is a risk that they will be delayed, lost or even damaged on the way. In the case of transient events, astronomers are extremely keen to receive the correlated data in a timely fashion so as not to miss these so-called Targets of Opportunity.



Today the 19 radio astronomy institutes and national research networks, comprising the EXPReS project are working to connect telescopes by high speed, optical networks. This allows the data to be correlated in real-time, creating in essence an astronomical instrument of inter-continental dimensions, significantly improving the rate at which astronomers receive data and fully utilise Targets of Opportunity. This revolutionary new way of carrying out observations is called e-VLBI.



# EXPReS Public Online Presence

<http://www.expres-eu.org/>



- The EXPReS website is the public's interface into the project. From this point general, scientific and technical information is accessible.
- Many of the physical publications produced by the project are available for download
- The EXPReS wiki is a dynamic forum where project members create and edit project related information.

# EXPreS Project Site- wiki

[[**expres:expres**]] JIVE WIKI HOME

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To register for this Wiki, please contact the Wiki administrator at [kyun@jive.nl](mailto:kyun@jive.nl). Be sure to include your full name, desired username and password and your relationship to the EXPreS project. Thank you.

EXPreS  
 • Activities  
 • Documents  
 • Meetings

**EXPreS**

**Activities**

NA1: Management of I3 (direct link to [deliverables table](#))  
 NA2: EVN-NREN Forum  
 NA3 e-VLBI Science Forum  
 NA4: e-VLBI Outreach, Dissemination & Communications  
 JRA1: FABRIC (Future Arrays of Broadband Radio-telescopes on Internet Computing)  
 SA1: Production e-VLBI Service  
 SA2: Network Provision for a Global e-VLBI array

**Documents**

Description of Work: [dowanexi.pdf](#)

**Meetings**

- Second EXPreS Board meeting: Tuesday 29 May 2007
- Kickoff, Board and EVN-NREN meetings: Tuesday 31 October - Wednesday 1 November 2006
- Gigaport Next Generation seminar for astronomers: 2 November 2006

Other Meetings and Conferences of Interest - upcoming (dynamic list)  
 Other Meetings and Conferences of Interest - past

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**Deliverables Table (version from Plan for Months 1-18)**

D#	A	AD#	Descrip	Plan	Actual	Status	Nature	DisLev
D1	NA4	NA4.01	Creation of Public EXPreS web-site	2	1	4	O	PU
D2	JRA1	J1.1	Data acquisition requirements document	2	3	4	R	PU
D3	JRA1	J1.2	Protocols strategic document	2	2	4	R	PU
D4	NA2	NA2.01	EVN-NREN meeting No. 1 (under auspices of EXPreS) ( <a href="#">minutes</a> )	3	6	4	R	PP
D5	SA1	SA1.1	Central data link control, Correlator Control Code modifications (not documented)	3	7	4	D	PU
D6	NA3	NA3.1	First meeting of eVSAG under auspices of EXPreS ( <a href="#">minutes</a> )	4	9	4	R	PP
D7	NA4	NA4.02	Creation of EXPreS web-based management tools	4	4	4	O	PP
D8	JRA1	J1.3	Visualization software	4		→	P	PU
D9	JRA1	J1.4	Correlator design specification <sup>1)</sup>	5		3	R	PU
D10	NA4	NA4.03	Generation of PR material (phase 1: <a href="#">logos</a> and posters, <a href="#">PowerPoint template</a> , <a href="#">press releases</a> and news clippings, <a href="#">brochure</a> )	6	1	x	O	PU
D11	SA1	SA1.2	Job preparation utilities	6		2	D	PU
D12	SA1	SA1.3	Fast/adaptive scheduling tools	6		1	D	PU
D13	SA2	SA2.01	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant CNIG-IGN	6	9	4	R	PU
D14	SA2	SA2.02	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant MPIR	6	9	4	R	PU
D15	SA2	SA2.03	Equipment of the last-mile infrastructure for participant INAF (telescope in Medicina) ( <a href="#">via protected link</a> )	6	9	4	O	PU
D16	SA2	SA2.04	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connections to the nearest GEANT NREN node for participant CAS (Shanghai, Urumqi, Miyun, Yunnan )	6	9	4	R	PU
D17	SA2	SA2.05	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant VIRAC	6	9	4	R	PU
D18	SA2	SA2.06	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant HRAO	6	9	4	R	PU
D19	SA2	SA2.07	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant NAIC (Arecibo)	6	9	4	R	PU
D20	SA2	SA2.08	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to the nearest NREN node for participant TIGO	6	9	4	R	PU
D21	SA2	SA2.09	Feasibility study ( <a href="#">via protected link</a> ) of the last-mile connection to AARNET for participant CSIRO	6	9	4	R	PU
D22	JRA1	J1.5	Overall design document	6		0	R	PU



# Work on display by Alastair Gunn



## Express Production Real-Time e-VLBI Service

- ★ EXPReS is an Integrated Infrastructure Initiative (I3) funded under the European Commission's Sixth Framework Programme (FP6)
- ★ The 19 astronomy institutes and national research networks involved in EXPReS are working together to connect radio telescopes across the globe via high-speed optical networks
- ★ The goal of EXPReS is to create a production-level, real-time, electronic VLBI service in which up to 16 intercontinental radio telescopes are simultaneously and reliably connected to the central data processor of the European VLBI Network (EVN) at the Joint Institute for VLBI in Europe (JIVE)



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# Partner Logos



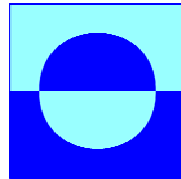
ISTITUTO NAZIONALE DI ASTRONOMIA  
E FISICA



Max-Planck-Institut  
für Radioastronomie



HELSINKI UNIVERSITY OF TECHNOLOGY  
Metsähovi Radio Observatory



The University of Manchester  
Jodrell Bank  
Observatory

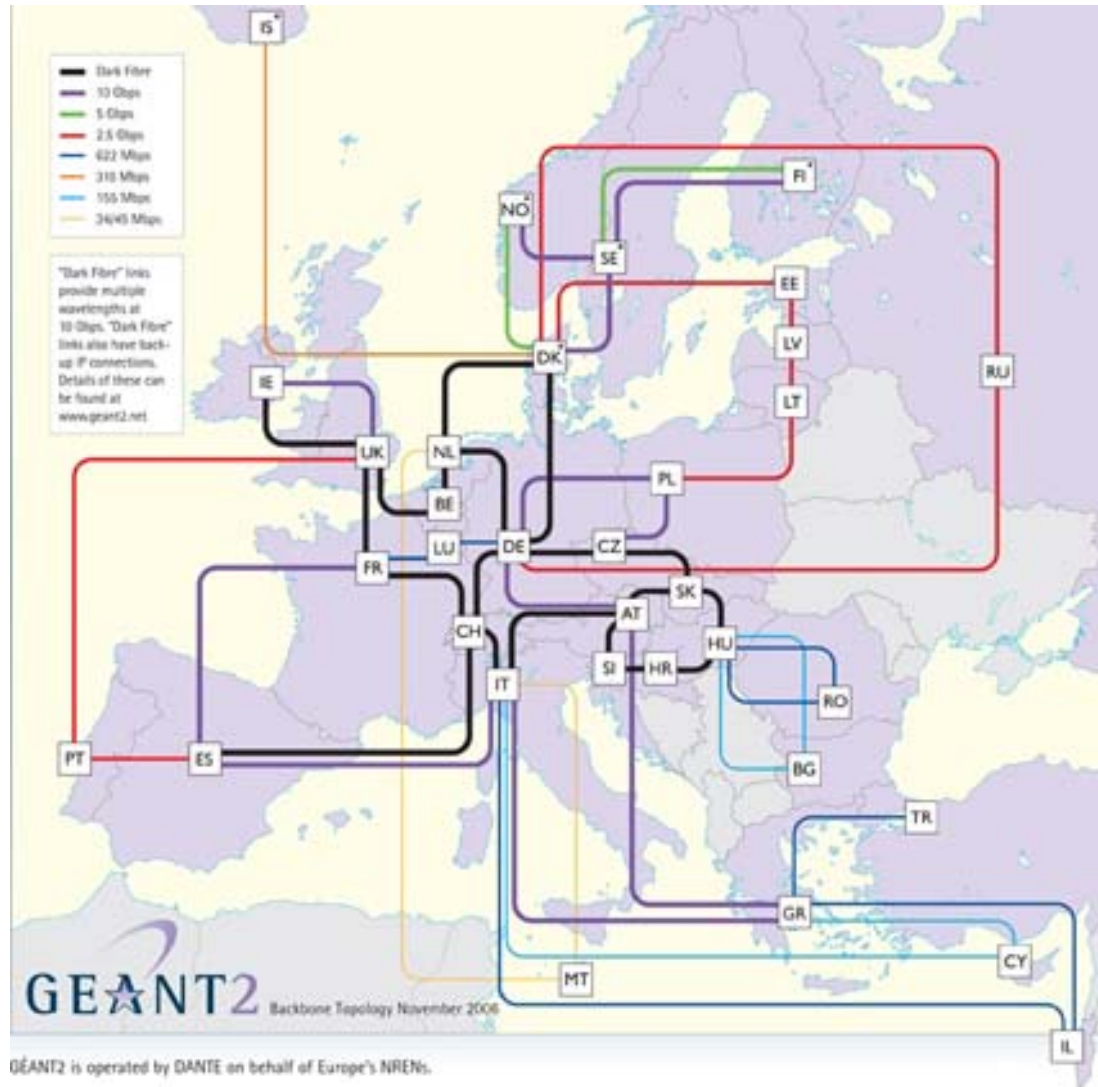


JOINT INSTITUTE FOR VLBI IN EUROPE

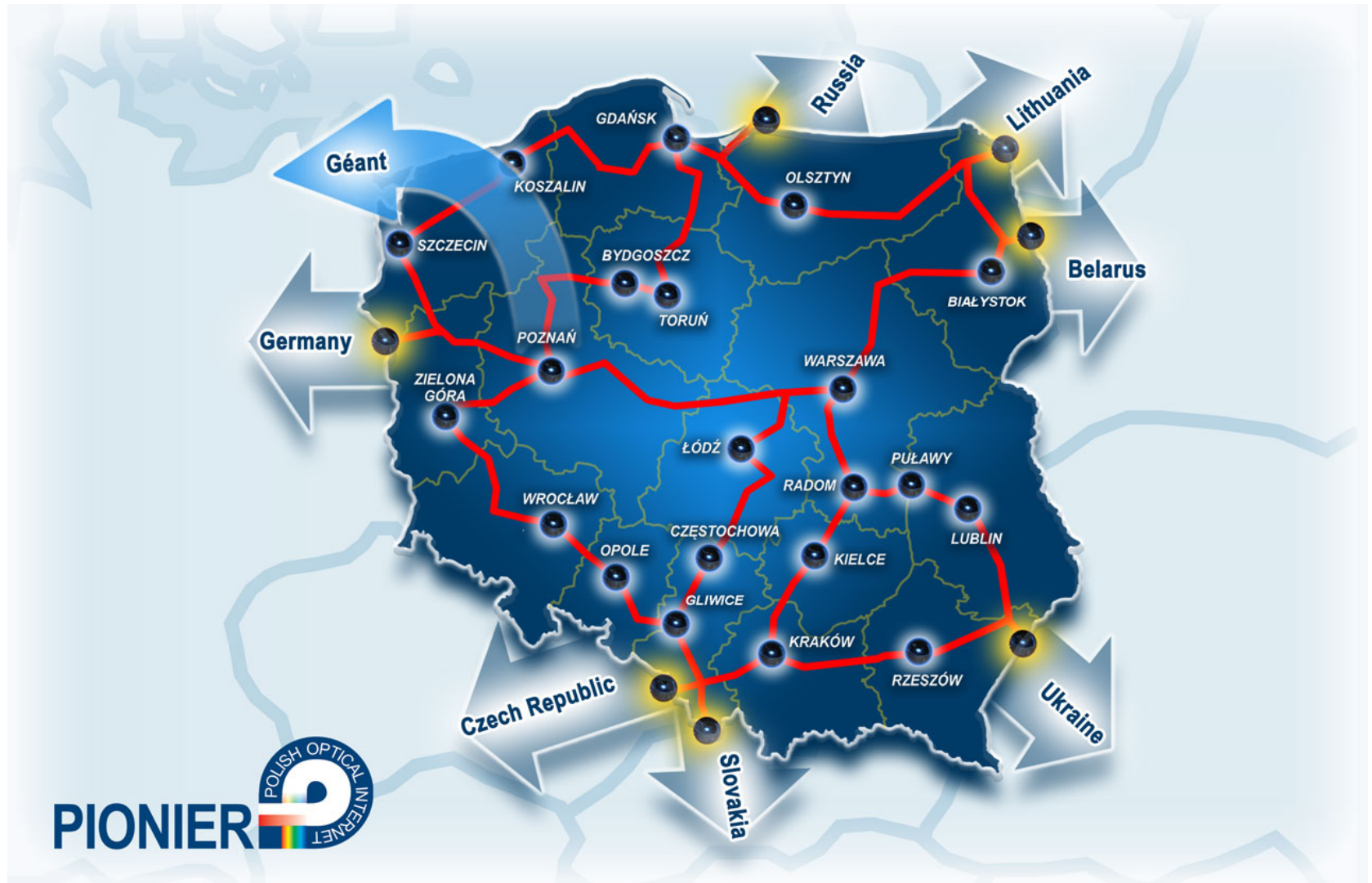


*EXPReS*

# GEANT2

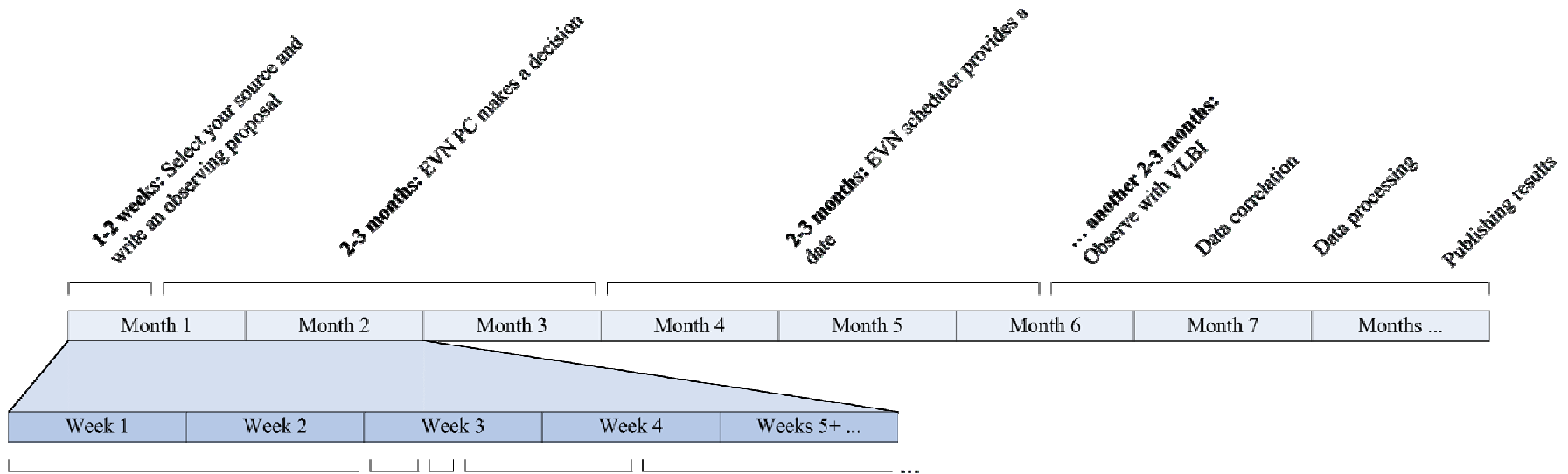


# PIONEER

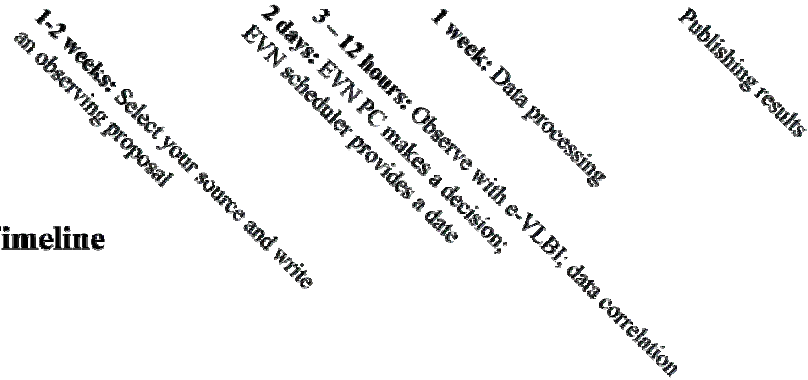


# e-VLBI vs. Traditional VLBI

## Traditional VLBI Timeline



## e-VLBI Timeline



# Network structure

