**Work Package Title:** Signal Transport and Networks (STaN)

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| **Work package number** | WP2.4 | | **Start date or starting event** | | | | T+13 months | | |
| **Work package title** | Signal transport and networks | | | | | | | | |
| **Activity Type** | RTD | | | | | | | | |
| **Participant id** | 4 | 7 | | 9 | 10 | 11 | | 12 | 13 |
| **Person-months per beneficiary** | 6 | (4) | | (12) | (4) | (8) | | (12) | (12) |
| **Participant id** | 14 | 15 | | 21 | UMAN (SPDO) |  | |  |  |
| **Person-months per beneficiary** | (12) | (4) | | (28) | 10 |  | |  |  |

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| **Objectives:**  The WP2.4 programme of work will develop and demonstrate signal transport and timing system solutions that will meet the requirements of the SKA. In the case of new design solutions, this will include the development, production and evaluation of prototype systems. Where existing design solutions can be adopted from Pathfinders or Precursors, a detailed study will be undertaken to establish that these designs are compatible with SKA requirements. Work will be undertaken within the programme in order to collate the information required to formulate and assess tenders for turn-key solutions. |

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| **Description of work:**  In radio astronomy the signal transport networks are the backbone of the telescope. Signal transport networks connect to, and support many of the other telescope subsystems. Cost–effective data transport and timing signal distribution over a range of distances is an enabling technology for the instrument. PrepSKA will develop and demonstrate data transport and timing solutions that will meet the requirements of the SKA.  WP2.4 is divided into 4 tasks as set out below. All tasks are co-ordinated by UMAN (SPDO), with the Signal Transport domain specialist being the project leader.  WP2.4.1: **Dish cable systems**  This work covers the design, costing and deployment plan for signal transport and networks for antenna systems. It includes those systems equipped with PAF systems and/or WBSPF.  WP2.4.1.1: A cable infrastructure design will be produced, including specifications of cable and connectors and drawings describing interconnects on the antenna and routes through cable wraps. Where necessary, for example if analogue data transmission is provisionally adopted, pre-production prototype transmission systems will be built and evaluated.  WP2.4.1.2: PAF signal transmission solutions will be designed for an instantaneous bandwidth defined by the SKA technical specifications. It is likely that a pre-production prototype transmission system will be installed in conjunction with a PAF for the DVP dish (WP2.2.3).  WP2.4.1.3: Signal transport and networks for Wide Band Single Pixel Feed systems will be designed. This will include links from the output of the receiver system to a digitising stage. Adapting existing designs from the pathfinder telescopes may provide the best design choice for WBSPF. If this is the case much of the work will be concentrated on the choice between analogue or digital designs and the optimisation studies required in order to make that choice (which should also include antenna cabling configuration studies). Once a design choice has been made then the focus will be on the adaptation of an existing system for SKA specific dishes and subsystems, operating environment and cost drivers. It will be important to establish that the design will scale to an SKA implementation.  Participants: CSIRO, INAF, MPlfR, ASTRON  WP2.4.2: **Central Facilities Fibre Networks**  The internal fibre network at the central processor will need to be costed in PrepSKA. This includes the fibre links from the output of the digital data back haul network to the correlator. No detailed design work will be undertaken until the post PrepSKA period. Estimated costs for PrepSKA will be provided by the STaN domain expert and derived from the costs of fibre management for other telescopes, such as e-MERLIN, ALMA and EVLA. This work will be closely coupled with WP2.5.1 (correlator) and WP2.5.3 (Non-imaging Digital Processor).  Participants: UMAN (SPDO)  WP2.4.3: **Digital Data Backhaul (DDBH)**  This work package will provide costed designs and deployment plans for the wide area networks that connect from an AA station, an individual dish, or a dish-station to the correlator building. In each case the source of data will be a digitised signal. A network architecture will be produced for use in the site specific network planning phase of the project. This work will provide a costed digital network design. Alternatively, the DDBH design work may be provided under a turn-key contract with a commercial supplier. In this case the supplier will provide the SKA project office with a detailed analysis of SKA specific requirements, resulting in one or more potential designs and cost analyses.  Participants: ASTRON, UK (UCAM, UOXF, UMAN), IT, NRF, CSIRO  WP2.4.4: **Local Oscillator and Timing**  This work will provide costed designs and deployment plans for the provision of clocks, of the required precision, to antenna elements and digitising stages. In this area there are two distinct problems:  Identification of frequency standards available that meet SKA requirements,  Distribution of those frequency standards to elements in the SKA array by time transfer.  Time transfer is a recognised technique in aperture synthesis telescopes and most observatories around the world undertake some form of time transfer. This may be over radio (MERLIN), fibre (ATNF, EVLA & e-MERLIN) or GPS (LOFAR). This work package will need to establish the requirements of the various technical solutions proposed for the SKA. These requirements will not be uniform and a number of designs may emerge. It is very likely that some prototype designs will need to be built and tested, as well as commercial solutions examined for their applicability to the SKA.  Participants: This task will be led by UK (UCAM, UOXF, UMAN), with contributions from ASTRON and IT. |

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| **Deliverables**:  WP2 deliverables will be structured according to a series of standard Design Reviews (DRs), as laid out in the introductory part of this document. The documentation from all Work Plan sub-system tasks will be combined into an integrated document set for the particular review in question. A DR report on each review will be produced by an independent review team. The WP2 deliverable for each DR will be a report written by the UMAN (SPDO) referencing the DR report and all the input documentation. The items below describe the deliverables expected in the PrepSKA period. Subsequent DRs will take place after the end of the PrepSKA period (T+45 months).  1. CoDR for Signal transport and Networks.  *Type*: Report. *Delivery*: T+26  2. SRR for Signal transport and Networks.  *Type*: Report. *Delivery*: T+42  3. Final PrepSKA Wrap-up Progress Report (not a DR report).  *Type*: Report. *Delivery*: T+45 |