Justification of Resources

Network Costs

There are three major components **Networking**, **Exchanges** and **Outreach**

1. Network activities will include two formal meetings of the **working group** per annum, with an anticipated cost of £100 per head for 20 people - £4000 per annum. In addition, interleaved with these the CCP organises two community **workshops** per annum; examples of use include developers' training, specialist user course sessions as well arenas for defining new science. These complement more regular sessions including the monthly software show-and-tell sessions. The total is budgeted at £6000 pa.

2. **Staff Exchanges** are a convenient way of developing best practice and delivering new algorithms for the community. It is envisaged that any network member can apply competitively for one of 3 short exchanges each year, at £1500 pa. Two **International Imaging Fellows** per annum at a cost of £1000 per visit specifically aimed at helping to bring new algorithms into practical implementation.

3. **Advocacy/Public engagement:** We will continue having exhibition space in Materials conferences and related industrial locations; and from this 3 experimental highlights will be selected to be converted into two minute promotional animations for 2D or 3D projection to government, VIPs, local funders, school children or the general public (£1k each and £2K for exhibition spaces). These will be made available to all network members for use in engagement activities. **Engaging with new academic communities.** We require funds to present our work at 2 international conferences per year to such communities, including the annual ToScA symposium (£3k pa).

Summary of Network Costs per annum:

Working Group Meetings	£4000	Extending to new acad. Communities and	
Monthly, Quarterly and Annual Community		Annual Symposium	£3000
Workshops	£6000	3 Staff exchanges	£1500
Exhibition Spaces	£2000	3 Highlight animations	£3000
International Imaging Fellowships	£2000		

This amounts to an anticipated total network cost of £21,500 per annum.

Engagement Toolkit

Arising out of discussions at the annual ToScA symposia we have been asked for extra resources to aid engagement activities. For this purpose there is a small technical fund, £5600, for IT Research Services to assist in the development of three engagement tools:

1. Use of Additive Manufacturing (i.e. 3D printing) techniques taking 3D images direct from volume segmentation results to create 3D physical models (using CCPi quantitative visualisation toolkit)
2. Lenticular screen printing for poster sized stereoscopic images allowing multiple (up to 5) view images to be seen without glasses (using CCPi reconstruction toolkit).
3. Development of touch-screen interface exemplars using the Prayog (Drishti) open source software system

Core support:

This project aims to provide the framework and toolboxes for image correction and calibration, 3D image reconstruction and 3D image analysis algorithms. In simple terms it is estimated that the project requires

0.2FTE Secretariat role for maintaining network, website, running workshops and training course, benchmarking, licensing issues etc;

0.5FTE for developing and construction of framework building on work from x-ray and neutron facilities as well as EU links.

0.5FTE developing and maintaining the image capture toolbox; this has been highlighted in feedback from many users need as a priority; including algorithm development, but also training and networking.

0.5FTE for developing and maintaining the 3D image analysis toolbox; this has been highlighted in feedback from many novice users as a priority theme both in terms of algorithm development, but also training and networking.

0.5FTE for developing and maintaining the image reconstruction toolbox – here users have expressed great interest in parallel (GPU/multi-core) based reconstruction algorithms to reduce the time from data acquisition to 3D image.

In addition significant benefit to this CCP are envisaged through links with the CCPs in: Software and algorithms for emerging architectures with respect to transferring iterative algorithms to GPU or other parallel architectures such

that they can handle the large datasets typical of x-ray imaging and Computational Engineering for the input of realistic microstructures taken from 3D images into large scale numerical models.

Academic staff costs

In addition Prof Withers will contribute 2 hours per week on the benchmarking of the algorithms on real data. Prof. Lee 1.7 hours per week on developing the 3D image analysis toolkit project, Dr Solemani 1.7 hours per week on toolbox platforms and design, and Prof Lionheart 1.7 hours per week on iterative algorithm development.

Lower funding scenario

Were the **core support to be reduced** from 2.2 to 1.5 FTE then we would only be able to support software developments relating to 3D analysis of x-ray images (and other types of 3D data) and we will not be able to construct completely our pre-processing and reconstruction toolkit. The estimated community and training numbers would also have to reduce by about 30% to account for the lower core team support. Further the implementation of a Phi/GPU based reconstruction platform which would greatly speed up image reconstruction would not be possible under a reduced funding commitment.

An alternative means of saving manpower costs that would not lead to a loss of outputs would be to combine certain roles with a related proposed CCP notably CCP_PETMR (Synergistic PET-MR Reconstruction; Dr Kris Thielemans, UCL) with whom we have already had some discussions. We are already proposing to share some meetings and activities. Were the two CCPs run side by side it would be possible to achieve a reduction of 0.5 FTE (0.25 FTE per CCP) across the two bids, by combining some of the core SCD/STFC administration and basic development roles.