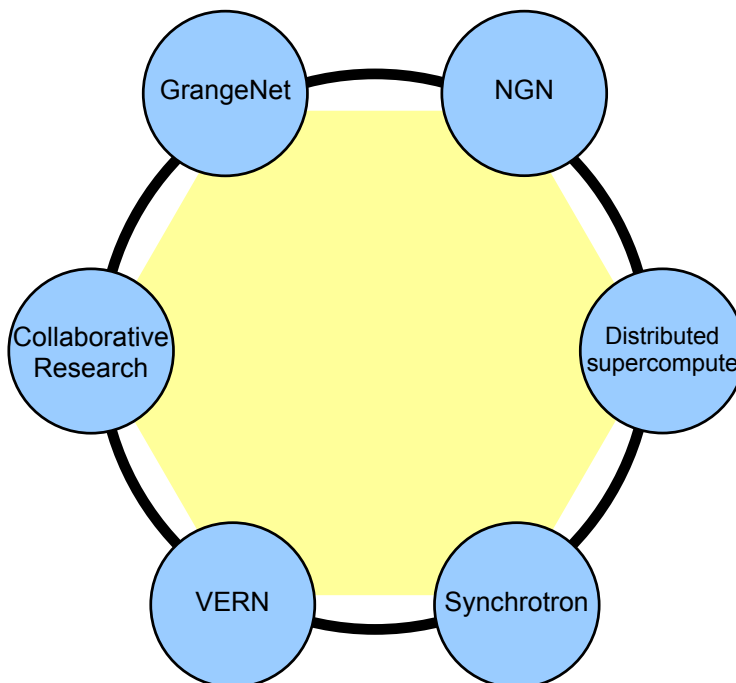


Infrastructure for Research

(an adjunct to the 2004 ITSP Retreat 2004)

Neil Clarke
IT Services Division
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Reported below are an inter-locking set of strategic infrastructure initiatives (GrangeNet, VERN and NGN) and flow-on opportunities for the provision of advanced computer network infrastructure to support research – in the areas of distributed super-computing, collaborative research across the sector, and the Synchrotron.



GrangeNet status

ITS' major contribution in 2003 to provision of facilities for research, was the extension to Monash of Australia's advanced experimental research network, GrangeNet (Grid And Next Generation Network).

Unlike some universities which have simply plugged their GrangeNet feed into their existing (lower capacity) production networks, Monash has built a complete and separate high capacity network specifically for Monash's Grid computing researchers. Grid computing research and applications is described elsewhere.

GrangeNet is available to various computer "clusters" in 5 Faculties (Engineering, InfoTech, Medicine, Pharmacy, Science) across 3 campuses (Clayton, Caulfield and Parkville). GrangeNet provides very high (1 Gbit/s) capacity connectivity to similar research groups throughout Australia and internationally.

Also, as envisaged in its Project Charter, Monash's GrangeNet Project has also been of great benefit to us in ITS-NIS. It has provided the opportunity for us to trial and obtain advanced exposure to all the new technologies that we have since commenced employing in Monash's Next Generation production Network Project, including: new generation Cisco (3750-series) network switching and routing equipment; BGP routing; multicast routing; Gigabit Ethernet; and advanced optical communications technologies CWDM and

Circulators, of central relevance to the VERN project. The GrangeNet Project has presented us with the need and motivation to develop ground breaking ensembles of these optical technologies, resulting in significant applied research outcomes in their own right. Our exposure to these advanced optical technologies has in turn been both very timely and invaluable to our leadership and design role for VERN.

VERN

Monash ITS is the lead partner in the development of the Victorian Education and Research Network on behalf of all Victorian universities and for the benefit of the broader research and education sectors in Victoria. VERN is a 3-way partnership between the Victorian universities, the Victorian State Government and the Federal Government (primarily through DEST, AARNet/AREN, and CSIRO). VERN has been in planning and grant application phase for the last ~2 years. Funding having been secured, collaborative partnerships and management arrangements are now being finalized and implementation phase is commencing.

VERN & collaborative research

Monash [ref: Prof Larkins VC at ITSP Retreat 2004] seeks to strengthen collaborative research ties, with CSIRO, with CRCs, and across the research sector broadly. VERN is a key enabling technology to achieving this.

Synchrotron

The Synchrotron is a major research opportunity for Monash. It has been said [ref: Prof Lewis Synchrotron Working Group] that if Monash does not end up the centre of Synchrotron-based research in Australia, then it has got it terribly wrong. The Synchrotron is in some senses still some distance away, but in others surprisingly close. From our (NIS) perspective, key points regarding current status are as follows. We have held initial discussions with the Synchrotron Project people from MPV (Major Projects Victoria – Stage Government). Steel and concrete are well under way already. System commissioning occurs in 2006. Their Project Office moves from Nauru House to *on-site* at Clayton at the end of *this year* 2004. Hence we will be supplying them internet access on-site from the end of this year. They are keen to contribute to the building of the VERN Clayton Precinct Loop, and are keen to use VERN to access AARNet, CSIRO, University of Melbourne, ANSTO and internationally.

Synchrotrons generate huge volumes of data which require huge amounts of transmission capacity, storage capacity, data processing, analysis and interpretation. The Synchrotron provides Monash with a major opportunity to provide the high-end “value added” services of data analysis and interpretation services for other researchers, rather than just shipping the raw data out to the world via the network. To take up these “value-add” opportunities, Monash must provision significant data storage, archiving, processing and compute infrastructure, as well as high capacity network. IT infrastructure planning & liaison should progress without delay.

Next Generation Network (NGN)

The Monash ITS Next Generation production Network (NGN) rollout Project replaces, over 3 years, all of the University’s physical core and edge network infrastructure. The NGN Project is currently approximately 50% complete. The NGN Project extends very high capacity “GrangeNet-style” (Gigabit Ethernet) networking to every desktop throughout Monash. NGN, in turn, depends on VERN to reach all of the campuses of Monash. NGN gives rise to interesting research possibilities:

Distributed super-computer

In the not too distant past – i.e. only a few years ago – researchers in computationally intensive areas would have given their university's entire research budget for a "super-computer" with lesser CPU capacity, less memory and less disk-space than currently sits lying around disused across the University's desktop computers and central servers. Incomprehensively large numbers ($\sim 10^{13}$) of CPU cycles are wasted every second of every day at Monash, if they're lucky running screen savers, but otherwise perishable goods down the drain. Similarly Monash owns vast amounts ($\sim 10^{13}$ Byte) of unused or poorly utilized disk capacity. A small sub-class of computationally intensive tasks are amenable to being carved up into multiple self-contained sub-tasks to be farmed out across a network of computers, using conventional *low-speed* internet network links – most famous examples being: the SETI Project (distributed hunt for Extra Terrestrial Intelligence), where many of the distributed networked computing techniques were first pioneered; and the subsequent distributed hunt for cancer curing molecules, that some Monash computers contribute to in an ad hoc grass-roots sort of way.

However, the combination of Monash's massive "spare" compute resource, when teamed with (i.e. connected together by) the *very high speed* (gigabit) Monash NGN network gives rise to a much more broadly applicable massively distributed, massively parallel super-computer of incomprehensible capacity literally sitting in the background waiting for someone to use it. A strategic push to apply it is indicated.

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