CREATING AN ENABLING PLATFORM FOR THE DELIVERY OF SPATIAL INFORMATION

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Abstract

The ability of single organisations or government agencies to deliver services and tools that meet user needs within the spatial information market is shrinking. Users now require precise spatial information in real-time about real-world objects. This requires governments and industry to work together to create such products and services. The problem in Australia however, is that much of the spatial information needed to create these services resides within government agencies which is often difficult for industry to access.

Governments are moving forward in relation to creating policies and initiatives which open up some of this information to the public. They are also creating whole-of-government initiatives such as Western Australia’s Shared Land Information Platform (SLIP) and Information Queensland which aim to make governmental spatial information accessible across all government agencies. What is lacking however is the ability for industry to engage directly with these whole-of-government/cross-agency initiatives. There is a need to create an infrastructure or enabling platform linking government and private industry from which applications and services can be leveraged and value added, providing the ability to grow the private sector and spatial information industry as a whole.

This paper aims to describe the issues surrounding the creation of an enabling platform linking governments spatial information initiatives and the private sector. It also explores the relationship between top-down research required to specify strategic goals and vision, prioritize plans, resolve policy issues and build enabling framework and the bottom-up commercialisation required to promote various local initiatives and build application-specific and enterprise-wide databases and services. This is done through an analysis of the concept of a virtual jurisdiction, outcomes of case studies undertaken within five Australian jurisdictions on spatial data infrastructure and spatial information initiatives and the identification of technical and institutional issues that will need to be overcome to create an enabling platform for the delivery of spatial information.

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INTRODUCTION

The capacity to meet user needs and deliver services and tools within the spatial information market has gone well beyond the ability of single organisations. One of the major challenges internationally is linking distributed, heterogeneous spatial information resources from different providers in an application and user-oriented way. Users require precise spatial information in real-time about real-world objects. The development of the Virtual Australia concept as an enabling platform by the Cooperative Research Centre for Spatial Information (CRC-SI) aims to facilitate this by linking public and private industries and facilitating the sharing of spatial data and services. The ability to deliver Virtual Australia successfully depends on the ability to research and implement key institutional arrangements and a governance framework that encourages whole-of-government solutions to major economic, social and environmental issues.

A pervasive feature of organisations world-wide, including Australian governments and industry is a reluctance to collaborate with others outside ones immediate work group. Where a strong business driver exists, then collaboration and sharing is possible, however negotiations are generally time-consuming and difficult and at best short-term rather than strategic long-term. This makes multi-agency cooperation on long-term strategic Spatial Data Infrastructures (SDI) very difficult to organize. Virtual Australia would not only provide ready and seamless access to spatial data, information products and tools, but would also need to comprise jurisdictional governance and inter-agency collaborative arrangements for such cross jurisdictions and government-industry collaboration.

With this in mind, this paper aims to outline a review and analysis of current national spatial data and SDI initiatives, including related developments in selected jurisdictions at state level in Australia, in order to develop a preliminary set of concepts and principles to facilitate the development of Virtual Australia. This is being completed by Project 3.1 within the CRC-SI, in conjunction with related activities in the Centre for SDI and Land Administration within the University of Melbourne. The research outcomes of this review will provide a foundation for identifying best practice and key performance indicators to aid in implementing a Virtual Australia. The project is being guided by the generic concepts and principles of SDIs and the current mechanisms to support the creation, maintenance and management of a collection of authoritative datasets upon which government decisions are increasingly reliant.

SPATIAL DATA INFRASTRUCTURE AND VIRTUAL JURISDICITONS

Spatial data is not the same as integer, alphanumeric or symbolic data and hence cannot be treated in the same way. Spatial data is scale dependent; spatial queries are inherently complex; all spatial queries, analysis and modeling are dependent on data models which have many and varied dimensions; and integrating spatial data with other data types is particularly difficult due to their different data structures. While it is correct that spatial data can now be included and manipulated in large data bases, understanding the collection, management, manipulation, integration, use, presentation and querying of spatial data requires not just a technical understanding of these processes, but also an institutional understanding (Williamson, 2004).

While 80% of all government information has a spatial dimension or location, the majority of government organisations and businesses currently under-utilise this dimension (Budic and Pinto 1999, Lemmens 2001). Spatial information has the opportunity to link sectors such as mining, forestry, agriculture, fisheries and oceans, and the environment and can be a strategic export industry for countries such as Australia who have a highly regarded research and development sector. The major use of spatial data however is currently in dealing with land management and administration. Australia is a Federation of states with each State undertaking its own system for spatial data management and services. This causes fragmentation of spatial data, as each jurisdiction collects, manages and disseminates spatial data differently (Dalrymple et al., 2004). There are also many issues regarding the storage and access of data in various jurisdictions concerned with custodianship, different jurisdictional responsibilities, different institutions, privacy and different legal and regulatory regimes, which all impact on the effective delivery of spatial data. In order to address this, the concept of a SDI has been developed.

SDIs have been effective in meeting user needs to a point, however to fully meet such requirements, there is a need to create a collaborative environment such as a Virtual Jurisdiction in which spatial information providers from various backgrounds can work together with current technologies to meet the dynamic and fast growing user market.
This has led to the rapid advancement in information and communications technology to meet these differing needs. The CRC for Spatial Information aims to create such a collaborative environment, bringing together over 40 private companies, State and Commonwealth Government agencies and several academic institutions to create innovative spatial information applications that are affordable and useable, at any time and in any place.

According to Radwan et al. (2003), in a virtual jurisdiction, individual (small as well as large) organisations or partners work as a collaborative network to deliver specialised products or services on the basis of common standards (like OGC) and business understanding. A virtual jurisdiction combines distributed functions provided by the participating organisations to deliver services. It is structured and managed in such a way that it is seen by third parties as one single enterprise.

With this in mind, the aim of Virtual Australia is to create an enabling platform to support government and business activities and services at both a small and large scale. As shown in Figure 1, Virtual Australia is a vehicle from which both textual and spatial data are utilized to form a range of supported functions for those within the industry as well as non-spatial and non-technical user groups. Each state jurisdiction has a range of initiatives and functions being both used and created often in isolation from one another. The creation of Virtual Australia will help to modularize the development of SDI – creating services and functions that can be utilized at further levels up the information chain, including across jurisdictions (Rajabifard et al., 2005).

The development of such a virtual system requires a set of concepts and principles to enable the design of an integration platform that facilitates interoperability and inter-working of functional entities within a heterogeneous environment. The spatial data communities within any jurisdiction can benefit from the various models and tools that have been developed in other jurisdictions for integrated modeling, as well as the work of Open GIS
Consortium (OGC) to develop standard, interoperable access interfaces, to facilitate access to GIS services over the Internet (Web Services, Internet GIS).

**CASE STUDIES**

In order to develop such a Virtual Jurisdiction for Australia, there is a need to look at how spatial information, systems and tools are currently being managed and developed within various jurisdictions. Project 3.1 of the CRC-SI has reviewed selected Australian state and national spatial data and SDI initiatives to identify their potential and limitations to assist the development of an enabling platform to link public and private industries, facilitating the sharing of spatial data and services. From this, a preliminary set of concepts, functions and principles will be identified to facilitate the development of Virtual Australia. The outcomes will also provide a foundation for developing best practice and key performance indicators to aid in implementing the CRC-SIs overall vision of making world class spatial information applications that are affordable, useable and readily available to all – at any time and in any place.

A key objective of this project will be the need to obtain an understanding of the needs and priorities of the states and territories, the Australian Government and the Spatial Information Industry across the Nation. The understanding of state-federal relationships, which in an SDI context usually focuses on large-scale people relevant data and small scale data issues, is particularly critical to the success of the project, as is articulating the framework of policies, protocols and standards for SDIs. Five case studies were undertaken within Victoria (Vic), Queensland (Qld), New South Wales (NSW), Western Australia (WA) and nationally, with the outcomes aiding in creating a collaborative national enabling platform that meets the CRC-SIs vision of providing a single entry point to spatial information modeling and visualisation tools.

**National**

Coordination of spatial information at a national level is being led by ANZLIC, which has put in place a rigorous and inclusive structure incorporating representatives from all of Australia’s jurisdictions (and New Zealand). The development of an Australian SDI is the major role of ANZLIC and both the strategic and operational aspects of creating an ASDI have in the past been provided by ANZLIC and its committees. The coordination and implementation of a national infrastructure however is hampered by the Federated system of government in Australia. Neither the Federal Government nor the State Governments have direct jurisdiction over mapping and spatial information, hence there has been duplication of effort and a gap in coordination. They do however have some clearly defined roles in relation to managing certain forms of spatial data and mapping such as cadastral mapping (State Government). ANZLIC has managed to effectively coordinate activity in this regard, but it does not have the regulatory authority to enforce the adoption of standards, policies and technical solutions for the implementation of a National SDI.

The roles that the various levels of government and the private sector play in spatial information are beginning to change. There has been a movement away from small scale mapping products and initiatives which have been the domain of national government to large scale state government dominated cadastral mapping. This has meant that the States and local governments have taken on a larger operational role of building SDI. The need for national data products (delivered through PSMA) and national initiatives such as counter terrorism mean that the national government still has a real role to play in strategic coordination of spatial information initiatives, as opposed to being the sole jurisdiction building the infrastructure needed in order for SI initiatives to be effective.

Arguably the major drivers at a national level creating the need for spatial information initiatives are counter terrorism and emergency management, natural resource management and water management. ANZLIC is currently undertaking a Counter Terrorism (CT) project designed to contribute to Australia’s counter-terrorism capability through a focus on ‘spatial capability’. Technically, the delivery of counter terrorism and emergency management operations is being progressed within various state government initiatives. The ANZLIC CT Project needs to address coordination between these systems, as without deliberate design for purpose in their further design stages, the outcome of a national system will be increasingly difficult to achieve (Conybeare, 2003).
Coordination between the CT Project and other SI initiatives and communities of practice such as the Spatial Interoperability Demonstrator Project (SIDP) and natural resource management is also important. The development of an open, standards based notional architecture by the SIDP is a major outcome of the project and will help in creating a national infrastructure, as it is being developed through collaboration with initiatives in WA and Qld. The infrastructure is based on the ASDI and aims to create a platform providing uniform and consistent managed access to distributed web services operated by authoritative custodians (Starling et al., 2004). According to the SIDP, the ubiquity of the Internet has fundamentally undermined the need to have to co-locate information services or create expensive customized networks in order to integrate them, however this does remain an option to be chosen on the basis of business requirements.

There are also several other initiatives at a national level to aid in more effective natural resource management (National Land and Water Resources Audit) and in the management of Australia’s marine environment (NOO Marine Portal). Generally the area of natural resource management has lagged behind the land administration sector in utilising and effectively managing spatial information. These two initiatives are helping to bridge the gap through the creation, management and implementation of access mechanisms for spatial information.

**Victoria**

Victoria is a world leader in land and property information systems, creating innovative products and services such as the Land Exchange, from which other jurisdictions can build upon. Victoria has developed a strong vision for Spatial Information management through progressive policies reviewed every 3 years. The current Victorian Spatial Information Strategy 2004-2007 has been developed through wide consultation within government, local government and the private sector. Victoria has also recently put in place more effective Spatial Information coordination mechanisms in a similar fashion to bodies in Queensland (QSIIS) and Western Australia (WALIS). The Victorian Spatial Council (VSC) and Victorian Government Spatial Committee (VGSC) provide a high level whole of industry and government approach to the creation, access and distribution of Spatial Information within the State. This development is a major one, enabling the State to more effectively manage the development of its Spatial Data Infrastructure. Spatial Information Infrastructure (SII) the coordinating agency for spatial information within Government has recently moved from within Land Victoria into Strategic Policies and Projects, in order to broaden the use and management of SI into other sectors of government.

Technically, Victoria has an excellent base layer of framework datasets. These datasets are continuously updated and maintained, often through partnerships with private industry, creating important linkages between the two sectors. The use of spatial information for natural resource management however is not as well coordinated, with a real need to bring the natural resource management and traditional land information mechanisms closer together. This will enable the state to create a more holistic SDI and effectively meet the needs of sustainable development. The movement of SII out of Land Victoria into a more strategic role should aid in this. The need for greater emergency management capabilities since late 2001 has also been the catalyst for the progression of a Geospatial emergency Information Network. GeIN is the Victorian Governments first initiative aimed at bringing together whole-of-government access and distribution of spatial information, in effect the physical implementation of the States SDI. The project is yet to get funding approval and hence a technical architecture outline is not available for comment, however the ability to access spatial information anytime, anywhere is a key feature of GeIN, in line with the vision of a Virtual Australia.

The development of initiatives such as the **Spatial Smart Tag** by Geomatic Technologies Pty Ltd in cooperation with Microsoft and the Victorian Government also shows the positive interaction between private sector companies and government data. The Spatial Smart Tag is a revolutionary new tool that enables desktop users to quickly and easily access spatial information. Currently being developed by the private sector company Geomatic Technologies, the tag is installed on a Microsoft Office XP or Office 2003 desktop to enable verification of property addresses, look up postcodes, get map references, view maps and obtain property reports from Word or Excel. There is also the ability for customisation of layers within the spatial smart tag to meet specific business needs (eg. administrative boundaries) (GT, 2005). Such processes and initiatives which enable interaction between government and private industry need to be further developed, which will in turn continuously grow the private sector.
New South Wales

NSW has led other jurisdictions in creating access to natural resource information held within various state agencies, departments and within the community. This has been done through the Community Access to Natural Resource Information (CANRI) project which uses an open sourced, interoperable distributed architecture in order to create access to information from across various stakeholders. The heavily institutionalised nature of departments and agencies within NSW makes it extremely difficult to co-locate information needed to effectively manage natural resources. The distributed architecture used creates access to information while giving the custodians the ability to continue to update and maintain information critical to their particular needs. NSW was also the first jurisdiction to develop an Environmental Information Coordination Unit (EICU). The EICU is bringing together relevant spatial information needed to effectively respond to natural disasters as well as react to terrorist threats. Initially, data is being co-located within the EICU in order to create interoperability as well as developing common symbology. Due to privacy concerns and the corporate nature of some datasets, the datasets will be housed by the original custodians and maintained over a distributed network.

NSW has some unique attributes in relation to coordination of spatial information however. Decentralisation of the Lands Department coupled with the large population base and large land area have hampered coordination within the State, creating a somewhat fragmented picture of spatial information management. Spatial information activities tend to be silo based with a lack of overarching coordination, demonstrated by the large number of small initiatives occurring in isolation of each other. This is also due to the presence of mega-departments within NSW such as the Department of Lands and Department of Infrastructure, Planning and Natural Resources. Recently the Board of Surveying and Spatial Information (BOSSI) moved to create a whole-of-government spatial information strategy for the State. This should improve institutional mechanisms within the state, speeding up the process of effectively implementing the states SDI, through the integration of State and local government as well as private sector initiatives.

Western Australia

Western Australia has developed a successful model for collaboration of spatial information through the Western Australia Land Information System which has been running since the 1980’s. Over the past several years, the operational role of WALIS has begun to be undertaken more by the Department of Land Information, however there is still a need for a policy and coordination role which WALIS can undertake, relatively independently from departments. WALIS also needs to make sure that it communicates any change in role (if it occurs) effectively to minimise stakeholder concerns. There is no doubt however that WALIS has fostered a great deal of cooperation and created dialogue between departments and agencies within WA, enabling the state to progress further than other jurisdictions in implementing whole-of-government processes.

Progress in establishing the states SDI is well developed with initiatives such as the Client Resource Information System (CRIS) and Shared Land Information Platform (SLIP) at the forefront of infrastructure development. The whole-of-government SLIP initiative is based on the establishment of an enabling framework across all government departments and agencies in order to create a platform for information sharing. This enabling framework is based of a distributed network utilising standard IT services (OGC compliant) in a portal environment married with GIS specific requirements, including the provision of WMS and WFS. The Department of Agriculture has also developed an integrated Client Resource Information System (CRIS) to manage information about dealings with agricultural properties. This provides a property centric view of data and access to information through web based inquiry and viewing facilities.

An important aspect of initiatives within WA is that they are being brought together to create whole-of-government initiatives. For example the Department of Agriculture is leading a focus area within the development of SLIP, of which CRIS will form a key area. The ability for such initiatives from different departments and agencies to be integrated is largely due to WA’s use of open and interoperable technology. The creation of an enabling framework across government also means that other information and services can “piggy back” on the infrastructure, saving both time and money through less duplication of infrastructure. There does seem to be however the need for Government to engage with the private sector to a larger extent in creating a whole-of-government initiative so that private industry are not locked out of the benefits of the creation of a platform for information access and sharing.
Queensland

Queensland has a well developed strategy for spatial information management across government through the Queensland Spatial Information Infrastructure Strategy (QSIIS). Although the strategy promotes the use and benefit of spatial information within both government and the private sector, the private sector involvement in accessing and developing spatial information initiatives is limited. Queensland is only now beginning to introduce mechanisms for the access and distribution of information over the internet through the Smart Map Information Service (SMIS). Queensland is however leading the way in looking at methods to integrate spatial information mechanisms with broader social and statistical information through a greater focus on ICT as the enabling technology in providing access and distribution of information. The government has also identified the area of organisational and semantic interoperability as a research area which needs to be progressed in order to develop the appropriate interoperable systems for Queensland.

The delivery of spatial information and services is currently being progressed through the Access Queensland and Information Queensland initiatives which aim to integrate all online government services and information and deliver them through a service delivery unit, built on the current Smart Service Queensland model. Delivery is based on an interoperability architecture based on distributed custodial data management and open standards. This is in a similar vein to the development of SLIP in WA, helping to create infrastructure that can be progressed at a National level. There is however some criticism of the Information Queensland initiative in that it focuses too heavily on the “big-picture” infrastructure creation without having fully consulted with stakeholders on their actual user-needs.

Overall Points from Case Studies

A variety of progressive and positive approaches in utilising, managing and accessing spatial information was observed through five case studies within various jurisdictions of Australia (National, Victoria, NSW, WA, Qld). The development of an SDI as an enabling platform for the nation as a whole was the major driving force in the majority of government activity at both a Federal and State level. Australia is recognised internationally as a leader in SDI development. National leadership through ANZLIC is attempting to lay the foundations for the creation of a nationwide SDI. So far however, the arrangements for SI sharing and access have been on a cooperative basis. Basic standards such as the ANZLIC metadata standards have been adopted but the depth and breadth of application varies across the states.

Overall however, there is still duplication of effort and expense occurring in creating data, infrastructure and a framework for data sharing throughout jurisdictions at all levels of administration, due in part to the Federated system of government within Australia. There is also a lack of interaction between the traditionally strong land and property information focus of spatial information with management of the natural resources, scientific information and socio-economic information. State Governments in particular however are addressing these issues through the operational SDI role that Sub-national (State and Local Governments) governments are now taking which was formerly the domain of the national government.

State governments are beginning to implement whole-of-government spatial information initiatives. The major aim of these initiatives is to give cross-jurisdictional government agencies access to spatial information in a more efficient and effective manner. Instead of people having to deal with several different agencies to get information they need, one online system will eventually provide access to key information controlled by various agencies. This is an attempt to move from ‘silos’ - where agencies tend to keep their expertise, data and knowledge within the agency – to a more accessible approach, reducing duplications and inefficiencies, improving service delivery and yielding strategic and commercial benefits for the Government.

CREATING VIRTUAL AUSTRALIA

The investigation of current spatial information initiatives undertaken within the case study jurisdictions provides insight into the facets of research needed to create a Virtual Australia. Government entities have identified the need for improved data access and sharing arrangements and have started building their spatial data infrastructures and virtual systems for jurisdictions (Rajabifard et al., 2005). The development of Virtual Australia needs to link with
and build on this technical and institutional experience and progress made towards the development of virtual jurisdictions.

**Technically**

The technical basis for delivery of whole-of-government on-line systems is through an interoperability architecture based on distributed, custodial data management and open standards. This is being implemented in the form of an enabling platform which provides uniform and consistent managed access to distributed web services operated by authoritative custodians. The aim of this architecture is to allow initiatives to grow in an open environment that gives agencies the ability to operate in an integrated manner. This creates an opportunity for a national initiative to develop from the often-fragmented developments occurring at State level. The National government and ANZLIC – the Spatial Information Council need to continue to play a leading role in coordination for such a national initiative to occur. This type of architecture was also seen to be the most effective method of creating a national initiative. The spatial/textual infrastructure being developed by the SIDP is based on the ASDI and has been developed in consultation with and evolved from collaboration with State based counterparts within Western Australia and Queensland.

The ability to deliver the concept of Virtual Australia however will also require an investigation of the way that data will be stored in the future. The ability to allow massive consolidation of spatial data sets across all jurisdictions may enable the creation of a seamless Virtual Australia, although there is the need to look closely at the advantages and disadvantages of both a distributed data model verses a consolidated model. It will be important that the concept is based upon and takes advantage of the latest technologies. It is acknowledged that new data base management software and technology promises to change the way that data is stored and the underlying technology that will support and drive a Virtual Jurisdiction in general. The benefits of such technology are already being seen in the development of the Geocoded National Address File (GNAF), the concept of virtual libraries, the emerging GRID computing technologies and super servers throughout the world. However there is general acknowledgement that the major challenges in implementing the Virtual Australia concept are not technical, but institutional, legal and administrative in nature.

**Jurisdictionally/Institutionally**

Within the context of a Virtual Jurisdiction, such as a Virtual Australia, it is important that the leading research organisations like the CRC-SI develops its concept with the full cooperation of current initiatives. As mentioned above the majority of whole-of-government initiatives based at a state level are being developed through open standards based distributed network architectures. Technically, existing state based spatial information and SDI initiatives have the potential to contribute to the development of Virtual Australia – however a lot of work needs to be done with respect to institutional practices to make the technology effective. Virtual Australia must have systematic interaction between developers and potential end-users to understand information needs as a data centric design approach is not desired. An enabling environment for all needs to be created which includes both a top-down and bottom-up approach to building Virtual Australia, based on current spatial information initiatives.

It was noted however throughout the case studies that the current initiatives being developed mainly by governments do not fully take into account the needs of the private sector. This was especially relevant in the Queensland case study, with NRM discussing with the project team the possibility of conducting research into the ability to create industry access to the majority of spatial information held by government agencies and department. Giving the private sector access to the huge data resources of the State government would grow the industry exponentially through the creation of further products and tools such as the Spatial Smart Tag as developed by Geomatic Technologies.

The completion of the case studies within five jurisdictions in Australia have provided the Project with the basis to progress the concept of Virtual Australia through the identification of functions, concepts and principles that will facilitate the development of Virtual Australia. Collectively each state has been seen to be developing initiatives which, when guided on a national level, would help to form a “Virtual Australia”. As discussed above, States are developing initiatives based on current SDI thinking and practice, based in most cases on an open standards based distributed architecture. There is a need to integrate these existing federal, state and local spatial data initiatives and
policies for access and delivery of data/information, to create a Virtual Australia. This will enhance the capability of
government, the private sector and the general community to engage in systems based, integrated and holistic
decision making about the future of Australia.

CONCLUSION

The development of Virtual Australia will enhance the capability of government, the private sector and the general
community to engage in systems based, integrated and holistic decision making about the future of Australia. It will
allow decisions to be based on a model where a wide variety of data/information in both vector format and raster
format can be accessed to build a view of the nations social, environmental and economic management. It must be
remembered however that the realisation of the Virtual Australia concept is not an easy task, and hence there is the
need for the CRC-SI to take into account current practice amongst both partners and within the various spatial
information initiatives in order to harness a combined effort.

Issues and observations from the case studies which will be especially relevant to progressing the concept of Virtual
Australia include:

- SDI moving from ‘data access’ focus to a ‘service/business delivery’ focus – development needs to be
driven by business needs.
- Need to create an enabling environment to support government and business activities. The environment
should be open sourced and interoperable.
- Lack of spatial awareness and education - existing work practices do not include a strong culture of using
maps and spatial information.
- Lack of cross-jurisdictional relationships.
- Implied control and privacy concerns over spatial information by various agencies – limiting availability
and access.
- Institutional and cultural issues are still the big barrier to implementing an effective SDI.
- Ability to effectively research softer issues of Virtual Australia such as governance models or frameworks
and institutional aspects.

Further development of Information and Communications Technology, as well as developments in the area of
Computing and Data Base Management may begin to provide some other ways of going about the creation of a
Virtual Australia. Design strategies for Virtual Australia need to link the old – state based SDI infrastructure
development, with the new – developed functions and principles identified within research and new developments in
technology, in an interoperable way. The research being undertaken as part of this project aims to overcome the
inherent, locked-in effects that current systems have created over time, providing an enabling environment in which
spatial based applications and user communities can grow. There is also a strong need for private-public cooperation
in order to build effective SDIs. Governments and agencies such as ANZLIC cannot ’build’ SDIs by themselves –
they set policy and an overarching framework. It is the private sector involvement that stimulates and enables the
infrastructure to be build physically. This link is a key driver behind Virtual Australia.

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