Business Registries

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ABSTRACT

We are all aware of the White Pages, Yellow Pages and Internet Domain Name System as examples of a 'registry system' from which is derived a number of public and private benefits. Even as these systems evolve, there are in the wings a number of new registry types emerging such as ENUM (for general messaging) and UDDI and ebXML (for business and e-Commerce facilitation), that will further broaden both the call on individuals and companies for (duplicate) information and the range of information services available. The paper provides an overview of these registries and their technologies and analyses the scope for industry and market consolidation (on the one hand) and the likely regulatory and business impacts (on the other).

1. INTRODUCTION

In order to browse, select and transact, consumers and businesses (or businesses and other businesses) need to locate each other, identify the transaction and execute it. This can be done partially or totally online, with the (direct or indirect) assistance of online information collections/databases. This is sometimes called 'middleware' and 'infrastructure information services'.

Telephone directories, as an instance, are well known - through them, transactions can be set up and concluded through phone and FAX. In the case of the Internet and Web, the important elements are the various Search Engines (and information structuring tools) and the Domain Name System. The primary databases that support these 'directories' are usually called 'registries', with their associated registry operator responsible for administration and maintenance of the database itself. 'Registrars' are those who act as agent for the end-user ('registrant') in entering information into the databases through interaction with the Registry (Figure-1).

There has been increasing competition and diversification on the way the directories/registries are provided, and in the roles and functions of registrars. In the interests of globalisation, international standards bodies aim to achieve interoperability at the technical/service level in the presence of possible national treatments at the directory/registry/registrar level. A good example is the DNS where there reasonable harmonisation although true multilingual interoperability is still to be achieved.

In the mid-1990s, a concerted effort was made to deal with the 'directory search' problem from an architectural and standards perspective. Much of the

technology developed still exists and is in use in various guises. The X.509 standard, part of the series, is used in Digital Certificates in support of secure e-Commerce and the X.500 Information Model has proven robust. The early perception of these as overly complex is now beginning to change as the deficiencies of a Web/Browser-based solution to the (search, identify, engage, transact) problem are recognized. As information structure and semantics are coming under the realm of improved and globally accessible descriptors, search and retrieval efficiency and effectiveness improves. So on the one hand, we are seeing an increasing number of registries and on the other, improved ways of sharing and describing customer, product, registrant and corporate data.

In looking at business models around 'Registry and Registrar', a range of Registry and Registrar services can easily be supported from a single physical 'Registry" and by a single Registry Operator. As value is constructed in the 'Registry', a wider set of Directory/Information Services and hence expanded Business Models becomes accessible. Many companies are being faced separate registration processes for Domain Name, White Pages, Yellow Pages and possibly for their Web presence as an alternate media channel. Does it make sense to offer a service whereby the 'online presence' of a company is consolidated and managed from a single service provider in a multi-function Registry?

In evolution of the above, once we have found what we were looking for through a Registry or in a Directory compilation, we try to engage/transact. We may play telephone tag, or exchange emails, to reach a decision to purchase, then we go through another process of ordering, then order fulfilment and settlement. Each normally requires use of different registries/directories or the movement from online to offline operation and back again. Is it possible to construct multi-function Registries (or a semblance of same) to make the whole process much simpler and easier for companies and consumers?

At the moment, current providers offer restricted business function (Domain Names or Yellow Pages, say) and a restricted value proposition (at least in scope). Can similar functions be vertically and/or horizontally integrated into a broader range of infrastructure and application-oriented registry/ information services to meet current and emerging needs? In the marketplace we see signs already of 'encroachment' and niche developments - White Pages entries that look more like Yellow Pages; Yellow pages that offer some Domain Name type information; browseable collections by region and business type (locality and service-type).

There are therefore, for a number of reasons, increased interest in Registries/Directories of use to business.

2. BUSINESS REGISTRIES

ENUM is the name given to the IETF protocol that will assist in the convergence of the Public Switched Telephone Network (PSTN) and the IP Network (Internet). It uses a complete, international telephone number (E.164 format) as a key and resolves it to a series of URLs or resources that provide subscriber access points and service information. At the directory level, ENUM is conceptually similar to X.500 with X.500, DNS and ENUM sharing much in common lineage.

The ENUM architecture must allow for different service providers competing openly to furnish the directory information required by clients to reach the desired telephone numbers. In that sense ENUM services look like DNS services in having a directory/ registry and in supporting multiple service providers (registrars) available to each subscriber (registrant). The ENUM architecture also supports multiple application service providers for each registrant in that a single E.164 number may have associated with it an email service, a Web service, other phone/FAX numbers and so forth. The registrar may have to deal with the subscriber and all their service providers to ensure the ENUM records (and information held by the registrar to support registration) are current. Reversing the perspective, a number of mail and Web hosting companies, and telcos, may nominate a registrar to act on behalf of (all) their subscribers. Given that the telephone number is being used as a direct key to services associated with a given subscriber, high levels of authorisation and authentication will be required by the end-user and associated application service providers..

Similar to the way that DNS supports 'private' IP spaces intra-organisation, and how companies have internal numbering systems through their PABXs, so ENUM can be operated within an organization in an 'internal' mode, with the PABX and IP Gateways carrying out remapping functions. That is large organizations may provide (or outsource) registrar/ registry functions (in generalisation of their email and telephony contact maintenance functions).

Business Models for ENUM favour the 'thin' registry with the service providers (registrars) holding registrant, service and application information. The business, technology and systems models are all therefore very similar with the current DNS, with the possible overlay of stronger authorisation and authentication and multiple ASPs (resellers). Service provider and registrar provisioning for ENUM is complex because, as noted above, it combines elements of the Domain Name registration process and the preferred telcos/ASPs selected to provide services to the holder of the Domain Name identified by the telephone number (assuming number portability).

On the infrastructure side of the registry, the E.164 number can be mapped into the equivalent of Zone files and delegation is supported (again very DNS-like). Zones can be delegated as Country Codes, or area codes (allowing locality-based services), or individual blocks (down to 1) facilitating institutional/ PABX delegation. Prospective industry structure appears similar to the DNS, as do the business processes themselves, and therefore current DNS service providers may be able to augment their business models, possibly in partnership with Telcos/ ASPs and in direct arrangements with large corporations/institutions.

The UDDI (Universal Description, Discovery, and Integration) Registry aims to accelerate the use of B2B and commerce over the Internet. It appears as both a generalisation of Yellow Pages and also as a means for implementing automatically an (engage/ transact) phase in addition to the (search/select) phase.

UDDI takes an approach that relies upon a distributed registry of businesses and their service descriptions implemented in a universal standards compliant way. The core component of UDDI is the UDDI Business Registration, an XML-standards-compliant file used to describe a business and its services. The Business Registration generally consists of three components: 'White Pages' including address, contacts and known identifiers; 'Yellow Pages' including services descriptions such as industrial categorisations of the services based on standard/recognised taxonomies and 'Green Pages' providing technical information about the service interfaces that are exposed by the business over the Web. The 'Green Pages' include references to specifications for Web-Services as well as support to pointers for other service access means such as file and URL-based discovery mechanisms. Much of what is placed in the "White" and "Yellow" categories (the Business and Service Data Model Elements) duplicates what companies already place in other registries/directories.

The ebXML Registry goes beyond that of UDDI in that it tries to provide means for describing the business aspects of business transactions as well as the IT aspects of business transactions. Given the right interpretation, ebXML can build on UDDI/ WebServices by adding the business perspective and also means of describing business processes within trading partners. Underpinning all of this is a Registry that stores descriptions of business requirements, business processes and information models/ schemas for every trading entity wishing to trade online using ebXML.

Once businesses describe themselves and register, the discovery following a query returns:

- What business processes are supported
- What service interfaces are offered in support of each business process
- What business messages are to be exchanged between their respective service interfaces
- Technical configuration of the supported transport, security and encoding protocols.

With the exception of the business process and requirements description, these are very similar to UDDI/WSDL and efforts are being made to avoid duplication and standardise approaches/technology solutions. The ebXML Registry Architecture allows both centralised and distributed implementations and allows for an API. Similar to UDDI, it will have document/process schema, shared and controlled vocabularies for precise descriptions. As ebXML is in early stage development (earlier than UDDI), there are few concrete observations although there are some test/reference implementations. It is expected though, given it is a complex set of standards/ architectures aimed at SMEs etc, that there will need to be systems integrators, business profilers etc (as in UDDI but more at the business analysis and requirements levels) to build templates and business process pro-forma for insertion into the registries.

3. BUSINESS MODELS

The models generally assume a set of registrants, registrars and registry operators. In terms of the stakeholders (and following Figure-1):

- The Registrants obtain a Directory entry, which is particular to them, and a key or licence. Registrants need the registry/directory entry in order to conduct or promote their business.
- The Registry operator obtains a fee (annual licence fee) for holding the data and 'publishing' the public data and/or distributing infrastructure files.
- The Registrar obtains a fee normally through 'ownership' of the registrant, as only 'licenced' or 'accredited' registrars may directly access the registry.
- The public or information seekers access registry or directory information through extracts and can pay a subscription or access fee for this arrangement.

In infrastructure registries (such as DNS or telephony), basic information is usually provided free. The nature of information held in registries/directories; its management; its actual or potential use; the balance of rights between the registrant, registrar and registry are all critical to determining what types of business model are accessible and likely to be feasible. Particularly in western societies, Information Privacy regulations are placing constraints on the collection, use and distribution of registrant data where this contains information about individuals.

In the case of the Australian White Pages Telephony Directory, for example, all registrants holding telephone accounts/numbers (fixed and mobile) have by virtue of that the right to a basic directory entry. The directory is rendered both to hardcopy (which is updated annually and delivered free around Australia) and to an online version (which is updated every 24 hours). Registrants can also provide additional contact information (FAX, email address, Internet address (WWW), PO Box,....) and have this content maintained and published (to hardcopy and online), but for a fee. Registrants can also subscribe to (and pay for) both 'banner'-type brand logos in the online version and for targeted advertising on a search-type or state/locality basis - to be 'popped' into the outgoing Web page whenever a user query is lodged, through a browser, that covers keywords, categories or locality.

In the case of the Australian Yellow Pages Directory, given the registrants are businesses that wish to present themselves for public search and discovery, there are further options for directory/ registry information gathering and search services. Registrants pay for all entries (as opposed to the White Pages), hardcopy and online renders are made available, a number of 'what, who, where' search services and browse categories are available, public search access online is free and hardcopies are distributed free. Specialities of the Yellow Pages (based on the business name, business services, business locations themes) are the Service Categories and Service Location/Locality services. For those without access to the hardcopy or a desktop PC (e.g. non-WAP mobile users), there are operator-assisted searches against business name, type, keywords etc. charged on a per call/search basis. Businesses normally subscribe to both White and Yellow pages, and in the latter case to (multiple) categories and locality groupings. The fixed

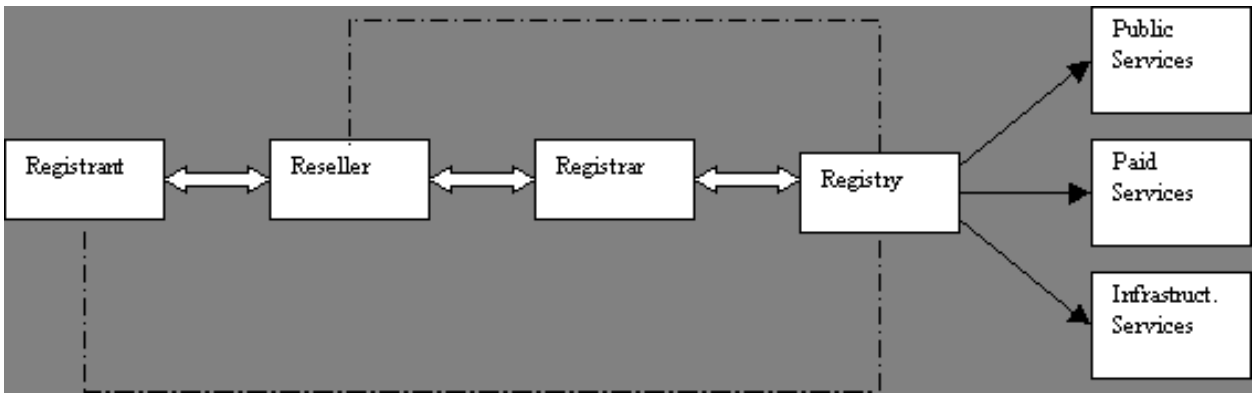

Figure 1: Business Registries

categories in the hardcopy and online versions have a fixed vocabulary (service or industry classification). In the operator-assisted Yellow Pages, keywords are constrained by a controlled vocabulary for best search and retrieval performance.

The most widely used and known Internet Directory/Registry is the Domain Name Service (DNS). Registrants register (through normally a reseller and registrar) their (computer) name to address translation information. The registry determines and distributes the Zone-File periodically for infrastructure support and publishes basic information in 'who is' databases for public consumption.

The business models able to be supported, and business efficiencies able to be sustained, by the registrar and registry operators depend partly on the amount of information held and used by each. Although the registry strictly needs very little information to support the core infrastructure function, the holding of registrant information facilitates change of registrar/registration, and the range of information services able to be supplied by the registry. Contrariwise, the balance of economic power shifts to the registrar. Limits on the holding of information, and its use, may be placed by the regulator or by any party contractually along the service chain, although this may be constrained by licence agreements and privacy legislation.

The scope for (dis)intermediation in the Domain Name service chain is marked and quite fluid with many contributing factors, including 'thin/thick' balance; interface technologies; accreditation requirements and regulatory constraints

The balance between the different service agents is to a large extent governed by the authority under which the licences (registrant, registrar, registry) are granted. Globally this authority is ICANN operating under US Government charter. ICANN issues licences for registries directly for the gTLDs (global top-level domain names) and has historically favoured a 'thin' registry model until recently, with some of the new gTLDs operating in 'thick' mode. The Country Code TLDs operate under ICANN licence with the endorsement of the sovereign state. In Australia, the authority is AuDA. The ccTLD authority can determine independently its registry mode and service chain agreements, and competition model as long as the requirements of the ICANN licence are met. The most common businesses models appears to be:

- Registries operating under a fixed annual per name fee, but not accessible to registrants or resellers. Some of the fee supports the industry regulator. The registry operates as a monopoly provider under SLAs and for a fixed term.
- Registrars having accredited registry access and active in one or more registry domains. Registrars pay a licence fee and commit to meeting requirements of the registry access protocols (RRP) including systems, financial, and security requirements.
- Resellers operating under codes of conduct through one or more registrar partner and under contractual obligations to (either or both) the registrar and registry.

With open price competition at the wholesale and retail levels, the economics are such that market share tends to fall to those registrars with strong brand position, good (i.e. competitive) pricing, efficient operation and strong value-add. Competitive dynamics may also echo closely those observed in the mobile telephony and airline markets.

The business models for ENUM are hard to cover simply because about the only thing settled (more or less) is the technology architecture. At the core of ENUM are databases for converting global telephone numbers (E.164 addresses) down through a hierarchy of delegation to national then corporate/'domain' telephony to IP-address resolvers. It is expected with ENUM that there be a global 'Tier-0' registry, delegating to national 'Tier-1' registries, then to Tier-3 registries which may operate at a corporate or service provider level or be further government controlled. So ENUM would appear somewhat as a mix of the 'White and Yellow' Pages structure, with regulatory controls and DNS-type registrar-registry processes. It is envisaged that ENUM may be implemented first within large corporations (with say 5,000+ individual telephone numbers) which are dispersed and able to secure benefits from the cost-efficiencies offered by voice-over-IP. It is expected it will be some time before new ENUM-enabled applications make much impact due to the need for a critical mass of ENUM-registered customers (registrants) to be secured.

Some ENUM services may be provided on an infrastructure basis (i.e. paid for by telephony providers) for core services and other services may be on a fee-for-service or subscription basis. Although

the economic model for the ENUM registry may appear more 'White or Yellow Pages' like, the industry model for the Registry and Registrars may change. As with Telephone Number Portability, do we expect to see an 'arms-length" registrar/registry appear?? Will it be wholesale to the telephony providers or mixed wholesale/retail. Will the registry operate under a licence/ fixed charge basis or be free to develop new products and services and develop new business partnerships? Will we see the emergence of a new 'registrar class' that provides outsourced ENUM services to large corporations or systems integrators?

The industry model for ENUM remains to be resolved. At a policy and industry regulation level, will ENUM sit with Telephony or the Domain Name system? Within Australia, the Australian Communications Authority oversights both the Telephony and Domain Name spaces but has two separate managers - will we get a third for ENUM? The need for possible 'arms-length' arrangements and standards/interoperability compliance possibly argues for some form of industry structure. Nevertheless, there will need to be reseller/registrar/registry processes.

The UDDI initiative is different from most of the initiatives we have studied in that it does not derive from a government-regulated space - such as telephony or (increasingly) the Internet. The UDDI Registry initiative is entirely a commercial one, developed by major B2B infrastructure vendors (IBM, Microsoft,....) to encourage further technology and systems developments/investment in B2B systems integration.

The UDDI initiative currently allows a number of 'public' registries open for all for interrogation similar to the White/Yellow Pages. Becoming a 'public' registry operator involves satisfying the current registry operators that you can support the registry consistent with service and security standards. Subscribers (registrars) select a public registry for account purposes and to be the location of the lodgement record for that subscriber's information. UDDI also allows 'private' registry operators who associate with a public registry and whose 'private' registry contains information for, say, an industry classification or conglomerate. UDDI currently allows registrants direct access by account generation and through manual Web interfaces or automatic computer-programmable Application Programming Interfaces (APIs). There are currently no separate registrant-to-registrar and registrar-to-registry protocols.

Although this might make lodgement and update of the White and Yellow Pages components of the UDDI Registry 'trivial', it still requires authentication and secure access, a level of knowledge on the part of the registrant especially regarding services and service types (the Yellow Pages components), and does not address the Green Pages (technology and service integration elements). It also does not address the higher-level business process integration elements of ebXML over UDDI - that is the conditions of access/use and any contractual/financial elements of trading.

We therefore may see the emergence, in a transformation of the role of the registrar, of 'profilers' - companies which provide a service at the interface between the registrant and the registry in grooming and tailoring the registrant's service offerings into the world of Web Services. The 'profiler' sets the industry codes and keywords (the controlled vocabulary) appropriate to the registrant, sets or selects the tModels (the service transactions technology models) and matches the registrants services interfaces to these tModels.

The types of business opportunity that might exist in the UDDI space, additional to the above, include those of public or private Registry Operator or Portal Provider.

4. CONSOLIDATION AND CONVERGENCE

Opportunities for (dis)intermediation, consolidation and changes in economic power/opportunity clearly exist depending on the regulatory position, legal constraints and contractual position. It is worthwhile looking the other way, vertically, across all registrations/registrants; across all registries, and across all registrar functions, where these exist (Figure-2).

4.1 REGISTRANT PERSPECTIVE

A given registrant may have a number of registration activities to undertake (excluding motor registration, ...) apart from the White Pages which may be automatic. These include:-

- One of more ccTLDs or gTLDs for DNS
- What does ENUM mean for me - my mobile and FAX machine Internet addressable - how do I register?
- Should my business go on UDDI? How and who

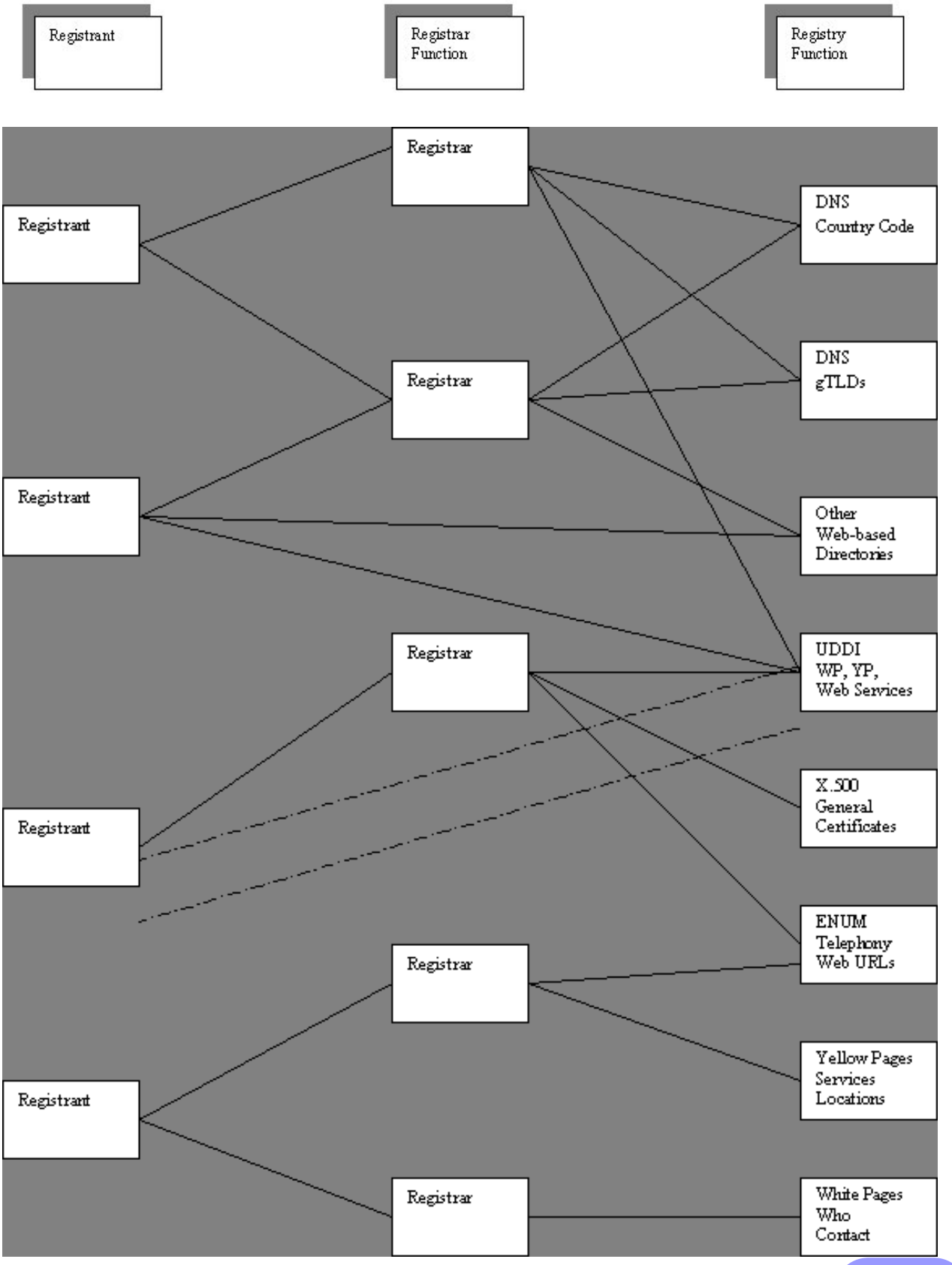

Figure 2: Consolidation and convergence

can help me do it? Public or Private?

- Do I need Digital Certificates. Which X.500 CA?
- What of my phone, FAX, mobile? Do I register/ publish these? Telephony and/or Internet directories?
- What special purpose directories/search services should I be visible to?

There is increasing complexity, cost and confusion at the registrant level in terms of the addressable services and contacts they provide to the public and (prospective) business partners. At the Registry level, there already appears overlap and confusion. Many special purpose registries or portals/gateways struggle to find a clear niche and fail to achieve their business objectives likely because of lack of a clear function and service fragmentation and expansion.

4.2 REGISTRAR PERSPECTIVE

There are possible business opportunities in consolidating the registration processes for given registrants and/or aggregating specific groups of registration activities for an identified group of registrants.

The 'one-stop' shop can operate at many levels. For a reseller/aggregator, the registrar is accredited across multiple registries and therefore business efficiencies are gained through a single reseller-registrar arrangement (with the registrar dealing with multiple registries on the resellers behalf). This model is a proven one in the DNS where the registrar covers ccTLDs, gTLDs etc. What of a wider registry set inclusive of ENUM and UDDI? This depends on the registrant base but for corporations (or an industry group) there appears a case to roll UDDI in with DNS.

4.3 REGISTRY PERSPECTIVE

There are clear economies of scale on the publications outputs side with access relatively straightforward to arrange. Fixed costs in terms of data centres and high-speed Internet access are common to most Registry/Directory operations. Online 'read-only' APIs are relatively straightforward and the increasing use of 'neutral' information exchange through XML and XML-Schema are making the export of Registry Database information simple for all bar the most complex queries.

Barriers to registry consolidation would appear regulatory and input constrained. Would regulators allow a single registry/directory (with X.500 type information flexibility and controlled access) to be established to cover some or all of DNS, ENUM, UDDI and Yellow Pages/White Pages? There are few, if any, technology or capacity impediments - a single XML file could hold personal or corporate profiles and be exported/imported to one of more databases as required.

On the inputs-side (registrar or registrants), similarities in API or business processes would be necessary in order for registry-type consolidation (e.g. YP and UDDI) to generate the benefits of consolidation through adding business at low marginal (as against average) cost.

Technically, a number of the registries could be combined, most easily if a single key could be associated with a given registrant identity (UDDI does this through a unique global key per business entity; ENUM effectively through a single E.164 number). Putting it all together in a single 'subscriber record' would almost take us back to X.500. It is unlikely that politically a single mechanism would ensue at the registry level, but certainly a registrar, charged by a registrant with maintaining an online presence in multiple registries, could effect some efficiencies.

5. SUMMARY AND CONCLUSIONS

The paper has summarised the key features of current and emerging infrastructure-related Business Registries/Directories and the information requirements driving their introduction. It has also set out the increasing information and process duplication and registrant (user) onus as new services are introduced. Analysis of industry structure and regulatory environments indicate that the scope for extensive vertical and horizontal consolidation in the registrar/registry/directory space exists and there will be increasing tension between users seeking rationalisation, and current regulatory and industry models. Privacy legislation and concerns (users) may further constrain the commercial imperatives for consolidation. Further detailed research is being undertaken on UDDI to assess the degree to which its (White, Yellow, Green) Pages capability is being taken up by commerce, and the management of the overlap with traditional White and Yellow Page services and providers.

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