



## The role of open computing, open standards and open source in the public sector

*An IBM White Paper*

*There is a general consensus in governments around the world that "Open" is both important and good. There are also a great many people worrying about what "Open" means and debating the issue vigorously. We shouldn't be surprised by this. "Open" is critical to government. The defining of "Open" is also a critical dynamic in the competitive landscape of the information and communications technology (ICT) industry. There are, as a result, many points of view and many definitions. So a very important issue is how we answer the question, **"What is Open and how can it be leveraged to support dynamic, responsive, and cost effective government?"***

*Information systems are essential to help governments deal with the complexity of increasingly interconnected economies, unanticipated threats, citizen demands and fiscal constraints. Governments need considerable flexibility in the way they configure their information systems. They need to have those systems seamlessly communicate with other systems. They need to be able to reconfigure those systems easily. They need to have the flexibility to source technology from a variety of vendors and leverage innovative emerging technology. They need flexibility and the ability to move information around efficiently. This is where "Openness" comes in. "Openness" is all about the enablement of this flexibility.*

*Governments must also be "open" to their citizens, giving greater access to e-government applications and enhanced responsiveness when citizens and businesses need to interact with government. "Open" implies that public administrations allow access to e-government applications on a choice of platforms and with a variety of technologies so as not to impose a single platform or vendor's offering on the general public.*

*"Open" is simply a means to an end. It is essential that we do not lose sight of what the goal is. There are various goals of "Openness". They include:*

- *Ensuring flexibility*
- *Ensuring interoperability*
- *Avoiding vendor lock-in*
- *Avoiding imposing technology decisions on the citizenry*
- *Driving cost effectiveness*
- *Ensuring future access to information*
- *Ensuring a level playing field for competition*
- *Maximizing freedom of action*

There are, of course, a number of terms used when talking about “Open.” These include open computing, open standards and open source software. Some definitions:

**Open computing**, or simply “**openness**”, is the philosophical principle that describes architecture and technology procurement policies and practices that align ICT with the above stated goals. It permits interoperability by using published specifications for API's, protocols, and data and file formats. The specifications must be published without restrictions that limit implementations, or require royalties or payments (other than reasonable royalties for essential patents).

**Open standards** are a slightly more refined level of open computing. They are distinct because of the formal role of independent organizations who have adopted the specifications through some democratic process. Many characteristics help to define open standards. Varying degrees of openness are possible depending on the number of characteristics which apply to an individual standard, and standards may become more open over time. For instance, a proprietary standard may become largely open if it is endorsed by a standards setting body or consortium.

The characteristics of openness when applied to standards are:

- Published without restriction (other than reasonable royalties for essential patents),
- Freely available for adoption by the industry,
- Control by an open industry organization with a well-defined inclusive process for evolution of the standard,
- Implemented by offerings available in the market.

Standards evolve and move through a maturing process driven by pragmatism, speed to market and efficiency. Examples that many people are familiar with include HTTP, HTML, WAP, TCP/IP, XML, VoiceXML and SQL. They are typically built by software engineers from various ICT/software companies who collaborate under the auspices of organizations such as W3C, OASIS, OMA, ISO, and IETF.

**Open source software** is software whose source code is published and made available to the public, enabling anyone to copy, modify and redistribute the source code without paying royalties or fees. Open source code evolves through community cooperation. These communities are composed of individual programmers as well as very large companies. Some examples of open source initiatives are Linux, Eclipse, Apache, Mozilla, and various projects hosted on SourceForge.net.

## **The open computing environment**

Most major companies and governments have embraced the concept of open computing. They purchase ICT goods and services from a variety of vendors and expect the technologies to work together. They wish to have the flexibility to deploy hardware and software in a specific way in order to address specific problems in an organization. They do not wish to be locked into a specific vendor and subjected to the priorities and schedules of that vendor. Open computing provides them with a way to treat technology components as discrete modules that can be mixed and matched.

There are a number of common beliefs associated with this trend. ICT organizations investing in open computing believe it will maximize their flexibility and, consequently, the amount of business agility they have. They believe that open computing will allow them to rapidly adopt technology innovations and to exploit technology cost reductions. They believe open computing will provide them some degree of vendor independence.

Of course, there are a number of tactics implementers of an open computing philosophy will use. Well thought-out architecture and open standards are critical elements of open computing. Furthermore, many governments and companies are leveraging the fact that the community

development process, because of its requirement that technologies from many entities must work together in a complimentary fashion, must discriminate in favor of open standards. As a result, governments and companies are using open source software as a means of accelerating the adoption of open standards which subsequently allows them further to implement open computing.

## **Interoperability**

Interoperability should not be looked at solely as a technical issue. It should ultimately be defined by user experience. Interoperability is achieved when users' expectations regarding the exchange and use of information and application functionality between a variety of devices and between the offerings of various vendors are met. Any technical barrier to interoperability should only be tolerated in some special cases involving legitimate cases such as security requirements.

Interoperability is also a powerful economic force. It is an enabler of a "network effect" which promotes economic development through the linking of services. Trade, competitiveness, GDP growth, higher employment and the facilitation of efficient trade are all benefits of interoperability of information systems.

## **Open standards**

Open standards are not born; they evolve and mature at different rates and to different levels of openness. Typically one vendor or initiator will craft a specification related to their perception of some technical or business requirement. These specifications will often go through a second phase where a "core group" works to mature the specification. This group may consist of a small number (in some cases as few as 2) of technology vendors and/or end users. This core group will evolve and mature the specification at a relatively accelerated rate. They often will publish the specification and may produce a reference platform. They may even release the reference platform as open source software. They will often put commercial products in the market that implement the specification once it has reached a certain level of maturity. If the specification has been published, many vendors may deliver products that use the specification to the market. The specification then typically moves to a third phase where it is transferred to some independent organization which is usually composed of many vendors and technology implementers. These standards organizations will further enhance the specification, may develop interoperability testing suites and procedures, and will maintain it over an extended period of time. As time goes on, the specification will typically undergo increasingly fewer modifications and become very stable.

The reason that specifications undergo these phases is entirely pragmatic. When a specification is developed by one or a small core of vendors, it can evolve at an accelerated pace and the technology can be delivered to the market in a more timely manner. Its subsequent adoption by a standards body increases the likelihood that the specification will be implemented by a large number of vendors in a consistent manner.

One danger here is the propensity for some vendors to "embrace and extend" an open standard. That is to say, a vendor may incorporate a standard into a product but add to it and extend it in a proprietary way that introduces incompatibilities and inhibits interoperability. For example, if there is a published standard for email formatting and encryption and everyone used it, then any email program could create an email that could be opened and read by users of other standards compliant email programs. However, if one vendor adds proprietary or non-standard extensions to the standard so that emails created with their software could not be opened and read by others, the customer values of the standard as an enabler of interoperability and of avoiding vendor lock-in would be reduced. In most situations this strategy is an attempt by a vendor to regain a control point, meaning some technology that enables a vendor to dictate the terms of the evolution of a certain technology and potentially the ecosystems surrounding that technology which was nullified by the open standard. It is important to apply a critical eye to vendors who "extend" standards in some proprietary way as their actions may be contrary to the goals of open computing.

## Procurement policy and open standards

This life cycle of a specification gives rise to a policy dilemma. If governments insist on formal open standards as defined above, they may be limiting their ability to exploit new and useful technologies. There may be specifications that have not made their way through all the phases of maturing to the point where they are formally adopted by a standards group, yet that are published, are implemented in commercial offerings, and could deliver significant value to customers.

Governments need to be pragmatic. They need to make sure they reflect on the top level goals of "openness." If the specification is published and can be implemented by a number of vendors, and if the core group sponsoring the specification consists of vendors who represent a sizable market share and have a certain degree of influence in the industry, and if the specification is being delivered in commercial products from a number of vendors, then there is a high likelihood that the specification will evolve to become an open standard. This situation largely meets the openness test and governments should feel comfortable implementing products that use these specifications. If, on the other hand, the specification is not published and is not or can not be implemented by a number of vendors, and if it is being advocated by a core group that may not have the market strength to ensure its success, then it may not evolve to become an open standard. Thus, it fails the openness test.

Procurement policies that insist that products be open make eminent sense. However, procurement policies that insist products implement *formal* open standards may be discriminating against very useful technologies unnecessarily. When crafting the language of ICT procurement policy, governments should insist that products meet the test of open computing and that the *goal* of openness always be taken into account.

## The role of open source software

It has become clear that open source software (OSS) has an important role to play in the ICT industry and in business, in general. Yet there is considerable confusion about the strengths and weaknesses of OSS. Some believe it will eventually replace the commercial software model; even that OSS is a critical element of a modern democracy. Others decry OSS as the single greatest threat to capitalism and the principles of intellectual property--the ruin of Western society. Neither of these extremes is accurate. OSS, for the most part, represents a software development process. It can be leveraged to provide considerable value and complement commercial software products. Many commercial products--a number which is likely to grow--use open source technology under the covers as componentry in what is referred to as a "hybrid model." Commercial software products will continue to play a critical role for the foreseeable future.

Open source software isn't usually developed by any one company; it is developed by a community, and it comes in many flavors. For example, the Linux movement was started by an individual who was quickly joined by many others who used the Internet to collaborate on the project we know today as the leading open source platform. Others such as Apache are offshoots of academic work. Some such as Mozilla and Eclipse, were seeded by substantial code donations from major software companies.

## Procurement policy and open source software

Procurement policy should not establish preferences or mandates. Preferences and mandates work against the goals of openness. They may force the adoption of suboptimal technologies that reduce flexibility and interoperability and whose total cost of ownership is more than commercial alternatives. It only makes sense that procurement be directed at the best product at the best value which maximizes interoperability and flexibility and the other openness goals, regardless of the development practices used.

Open source software can be very useful and may be a cost effective way of deploying technology. It certainly is a widely used development approach that can be found inside a large number of products in the market. There may be a rationale in putting in place procurement policy that insures that open source-based offerings are being considered along side commercial offerings as a means of overcoming institutional or historical biases or of ignorance of alternatives.

## **What is driving open computing, open standards, and open source success?**

The reasons for the success of open computing and open standards are obvious. They are a necessary feature of a networked world and they are essential to the critical factors of organizational flexibility and agility. However, the explanation for the popularity of open source software is a little less clear.

In general, businesses and governments see value in the following OSS features:

- **Flexibility to modify.** Some businesses or governments require specialized modifications to a code base to accommodate specific business or technical requirements. OSS offers this flexibility. The National Security Agency (NSA) has done just this and created a secure version of Linux.
- **Cost effectiveness.** OSS often has some attractive up-front cost advantages although there is much debate as to the total cost of ownership (TCO). There is anecdotal evidence that some companies have realized considerable license savings. On the other hand, it is argued that scarcity of skills translates to higher support and maintenance costs which nullify the up-front cost advantage. The economic case will vary from geography to geography as the availability of skill and labor rates vary. Customers will need to make an assessment of the TCO advantages or disadvantages of OSS on a case-by-case basis.

## **Conclusion**

Open computing, open standards, open source software, and commercial software which implements open standards are all succeeding because they are enablers of technological advancement and because businesses and governments recognize value in them. Businesses and governments will strive to attain the flexibility and business agility of the on demand world. Open computing platforms--both hardware and software--are essential underpinnings of the journey towards on demand computing. The role that open computing and open standards have played in the evolution of e-business has been well established. The role that open computing and open standards *will* play as part of the open commercial and open source projects that embrace those specifications and standards is central to the further progress towards more responsive, focused, and resilient e-business and e-government capability.

Businesses and governments are embracing open computing, open standards, and some open source projects. Procurement policies should be pragmatic, insist on openness and take into consideration the goals of openness.

IBM has made the strategic decision to embrace these concepts and is aligning its hardware, software, services, and consulting businesses to support its customers on the journey toward on demand.