NOKIA

CONNECTING PEOPLE

Openness

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Executive Summary

The debate between proponents of proprietary systems and those supporting open systems has raged over countless technological innovations. The lessons from history prove that open systems generate compelling business benefits over the long run. This White Paper places openness into its context within mobile telecoms.

Open standards with mobile telecoms have, for instance, helped to develop greater revenue streams through roaming calls as well as increased traffic with interoperability of SMS text messaging. The industry recognises the lessons from these early successes and is adopting openness for further success with multimedia messaging and more advanced 3G type services.

All parties involved in mobile telecoms derive benefits from openness. Consumers benefit from a wider selection of terminals, a broader selection of services, and lower costs. Network operators benefit from faster deployment of new services and lower costs. Equipment vendors benefit from greater scale and therefore from lower costs. Application developers, suppliers and subcontractors benefit from greater accessible markets and scale.

Introduction

Technical innovation has often seen the battles of proprietary standards versus more open standards. The video cassette recorder wars had VHS competing against Betamax. The dominant VHS standard eventually tipped the balance in its favour as video rental stores stocked more movies on the more popular format. Laws of greater accessible markets will always determine the eventual winner.

The emergence of the fixed Internet pitted against each other the closed groups of “BBS” Bulletin Board Systems and the open Internet. Similarly in the Internet domain a centrally controlled rigid standard known as Gopher that controlled how data was stored, met with the HTML based open standards of the World Wide Web. BBS became a relic of computer networking as did Gopher. Open standards prevailed in a remarkably rapid fashion and were the basis for the spectacular growth of the Internet.

Some engineers like to point out that at any given point a system typically built to a proprietary standard can initially deliver greater technical performance than one built upon a rival open standard – interestingly, an argument that was passionately proposed in support of both Betamax and Gopher. This argument looks only at the short-term and neglects the greater commercial benefits and success of open systems. Any short-term technical gains that a proprietary standard might achieve can soon be copied into the open standard. But the benefits of larger scale and its overwhelming market economics cannot be copied by proprietary standards. Any technical advantage would be a short term illusion while the greater commercial gain would be permanent and ultimately overwhelming.

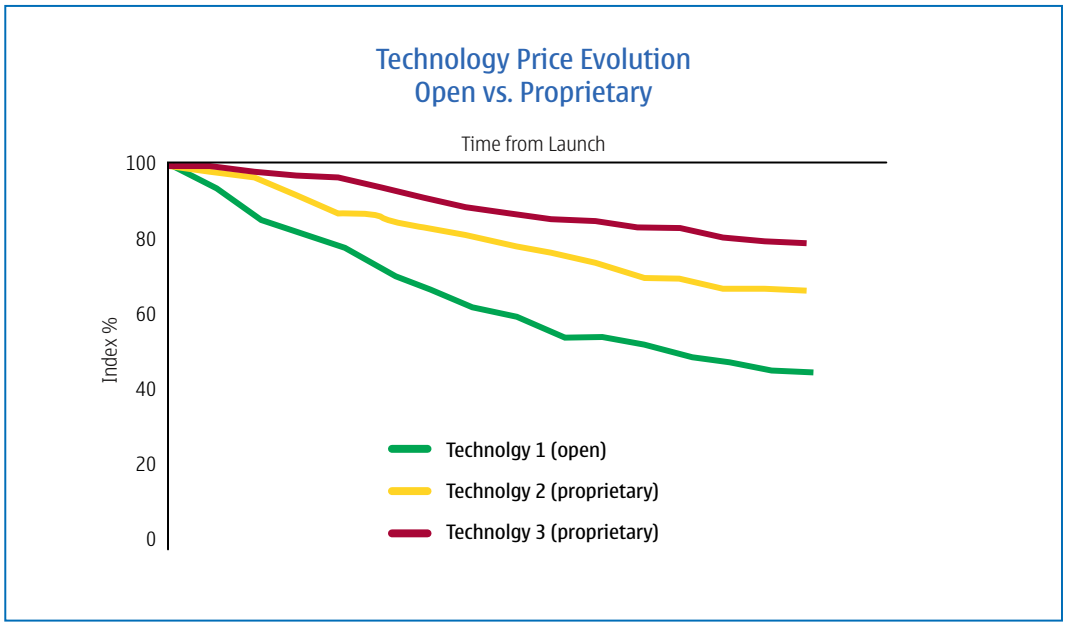


Figure 1.
Technology price evolution; Open vs. proprietary
("Experience shows that proprietary technology will result in higher prices & less supply", Michael Porter 1996.)

The effects of open and proprietary systems have been studied and the findings have been consistent in showing that open systems deliver lower prices and greater numbers of suppliers. This was illustrated very dramatically by Michael Porter in 1996 (Figure 1) when comparing three competing technologies. The open standard yielded the lowest price and largest amount of supply.

Speed of Innovation

Proprietary standards tend to allow faster adoption of changes, especially over the short term. This is mostly related to the control imposed upon the standard by its proprietary owner. With open standards it takes longer to achieve consensus on how to develop the system, however this approach tends to have greater latitude of change enabling evolution over longer periods of time and over the long term actually produces greater positive transformation. (Table 1).

Whereas the whole system may evolve less rapidly, individual components on an open system tend to develop much faster than those on proprietary standards. This is due to the effects of competition. It is a fundamental feature of openness that smaller participants can

enter the value system with low costs of entry. With more participants joining to develop components to the open system, more innovation is involved. This in turn helps the whole industry cycle of evolution to more advanced solutions.

	Proprietary standard	Open standard
Anticipated needs	known	emerging
Speed of change	fast	slow
Extent of change	narrow	broad
Evolution of ecosystem	slow	fast
Intellectual property	standard owner	innovator
Business model	stable	evolving
Participants	few	many
Competitiveness	short term	long term
Use	purpose-built	general purpose

Table 1.
Proprietary vs. Openness

Openness in Mobile Telecoms

In the mobile telecoms world the very first analogue systems were national standards that were incompatible with each other. A significant innovation was the NMT (Nordic Mobile Telecom) standard, which was the first international standard for mobile telecoms. In each of the Nordic countries, the local manufacturers of Ericsson and Nokia, as well as the local mobile operators of Telia of Sweden, Telenor of Norway, Tele Danmark and Sonera (then Telecom Finland) were able to gain considerable benefits of scale even though individually each of the four countries had small domestic populations.

When second generation (2G) mobile systems were being standardised, the GSM (Global System for Mobile communications) standard took the lessons from NMT and adopted philosophies of open standards. Although GSM's market potential was initially similar to the other digital 2G standards, TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access) and PDC (Pacific Digital Cellular), GSM grew much more rapidly and has become the undisputed leading digital standard. In fact during 2002, GSM numbers swelled by 165 million subscribers which is more than the total existing subscriber base of any of the other three digital standards[1]. Today GSM dwarfs its rival 2G standards with over 825 million subscribers on 474 GSM mobile networks in 172 countries[2].

[1] (source: EMC, Dec 2002)
[2] (source: GSM Association)

Revenues from Roaming Calls

Due to its legacy with NMT, international roaming was made a fundamental aspect of GSM. Consequently in all GSM markets the local mobile operator gains extra revenues from foreigners who place roaming calls. GSM operators discovered early that roaming calls were very lucrative, delivering disproportionately high revenues. Pyramid Research has calculated that Western European operators typically earn 7% of their total revenues from roaming customers visiting their networks.

In GSM countries heavily dependent on tourism, such as Croatia, Tahiti and Cyprus, the effect of tourist traffic is much more dramatic. A good example is Cyprus. The island population is about 690,000 but during the peak tourist season the population swells to 2.5 million. As the European mobile phone penetration on the whole is about 80%, practically all travellers to Cyprus tend to bring their GSM phones with them. The number of users, the amount of traffic, and very importantly the increased amount of revenues per user are all multiplied during the peak summer season, according to the Cypriot Communications Ministry.

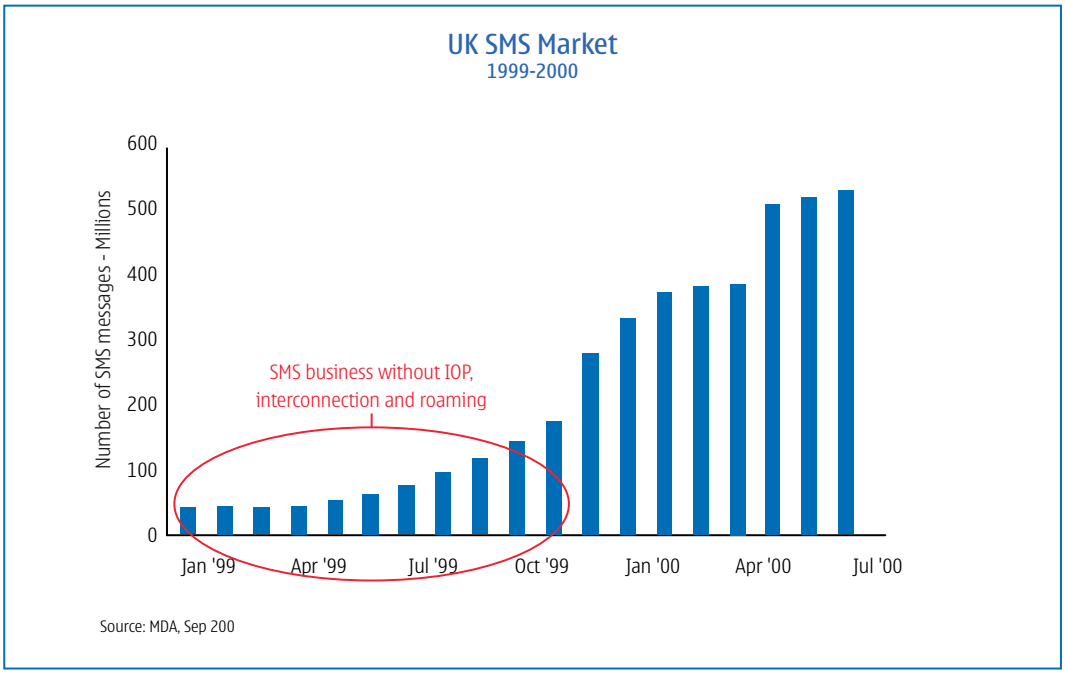


Figure 2.
SMS market in the UK 1999-2000 after interconnect

As the world's mobile phone population is well in excess of 1.1 billion and about 70% of the users are using the GSM standards, any mobile operator, which uses a TDMA, CDMA or PDC digital standard, abandons significant additional revenues from tourists and travelling businessmen. The GSM Association has calculated that 650 million people travel to other countries every year wishing to use their mobile phones. During 2002 there were over 900 million roaming phone calls made each month on GSM networks with the number continually growing.

Messaging

In the early 1990s the philosophy of openness inherent in GSM helped bring about SMS interoperability between early SMS adopting operators. This in turn facilitated the market success of the first mobile data service, SMS text messaging, enabling a new dimension to the market economics of mobile telecoms. Countries with only GSM networks soon experienced a dramatic boost to text message use. In countries with mixed systems it took much longer to engage in the technical work and commercial agreements needed for SMS interconnect. The USA market was among the very last to adopt SMS interconnect between all mobile operators during April 2002, but even there, as everywhere else before, the immediate effect was a dramatic jump in the total use of SMS text messages.

The effect of interconnect in messaging is immediate and dramatic. Nokia 3G Business Consultancy isolated the inflection point for the surge in messaging as the combined effects of SMS interoperability within a country, and a subscription penetration of 28-30%. The pattern of a solid surge in traffic was clearly established for example in the UK during 1999-2000. Yankee Group has since calculated that the actual jump in SMS text message use is typically 40% but can be even higher such as in the USA where the Wireless Services Corporation reports over 100% increase in SMS text messages after the adoption of SMS interoperability.

With Multimedia Messaging (MMS) the needs of open standards and MMS interoperability are even more critical. The complexity of MMS is much greater than that of SMS and requires more work to ensure end-to-end delivery of multimedia messages as they were intended. The rewards can be considerable as Jupiter Research has estimated that MMS could generate global revenues of $8.3 billion by 2004, with the prerequisite that MMS interconnection is enabled between networks. The end-users can build upon their recently learned behaviour of sending text messages from holiday and business trips. As the camera-phones start to replace holiday snapshot cameras, the ability to send picture messages will provide compelling benefits to users. Similar to the patterns on SMS, MMS is likely to see a dramatic uptake after a certain level of MMS enable phone penetration is achieved.

Need for Openness in the Future

The mobile telecoms industry is facing several simultaneous upheavals causing potential disruption. The introduction of simple SMS text messaging in the 1990s is now giving way to the advent of advanced mobile data services. Theorists a few years ago projected that

the diminishing revenues from voice minutes will eventually be offset by new revenues from mobile data. That trend is now being witnessed by the early adopting countries. The ten leading mobile operators with high proportions of revenues from data services each report over 15% of total revenues coming from data. The global leaders, Smart and Globe in the Philippines are approaching 40% of mobile data revenues. The fascinating fact is that eight of the top ten high data revenue operators are GSM operators, with the remaining two in Japan using PDC technology. Figure 3.

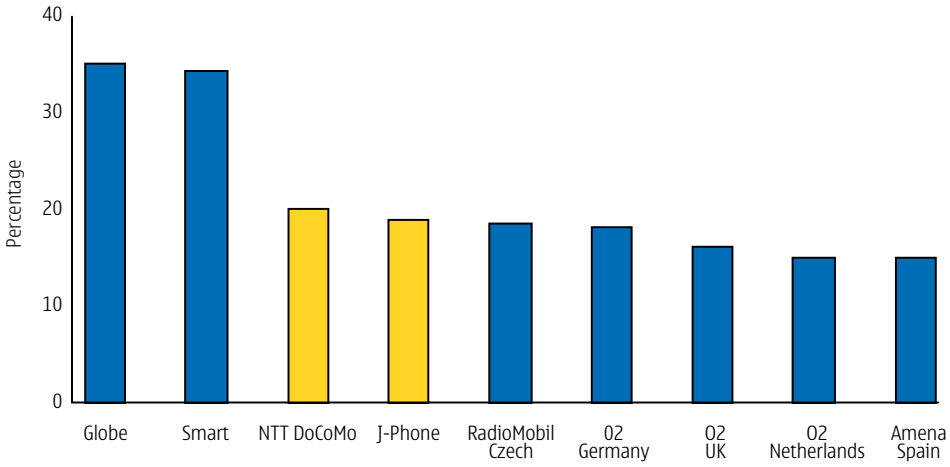
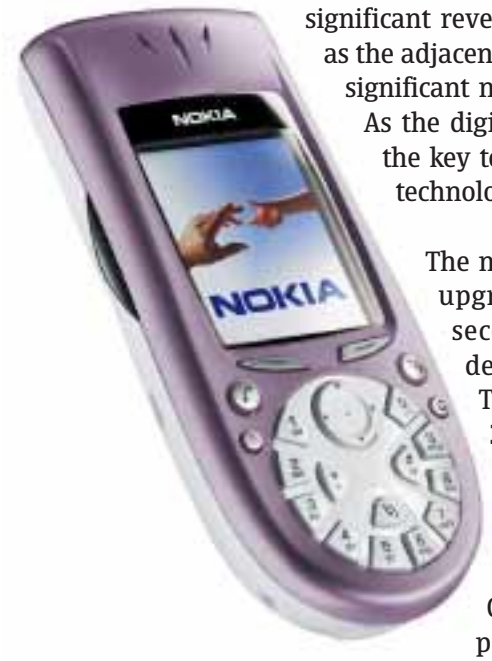


Figure 3.
Data as percentage of ARPU

The mobile telecoms industry is also seeing the digital convergence of content and delivery, with many industries now converging. Early examples include games; news updates; music in the form of ringing tones, all of which are delivering significant revenues for the mobile telecoms industry as well as the adjacent industries. SMS-to-TV for example is delivering significant new revenue streams to the television industry. As the digital convergence takes place, again openness is the key to attracting new participants who share in the technology, benefits and revenues.



The mobile telecoms industry is also engaged in the upgrade of the technical delivery platform from second to third generation. 3G standards were defined first in IMT-2000 (International Mobile Telecommunications for 2000) and the primary 3G standards that emerged are the evolution path of GPRS (General Packet Radio System) to EDGE (Enhanced Data for GSM Evolution) and WCDMA (Wideband Code Division Multiple Access) and the evolution path of CDMA2000 1X to CDMA2000 EV-DO and CDMA2000 EV-DV. The primary evolution paths for the existing 2G systems are summarised in the figure 4.

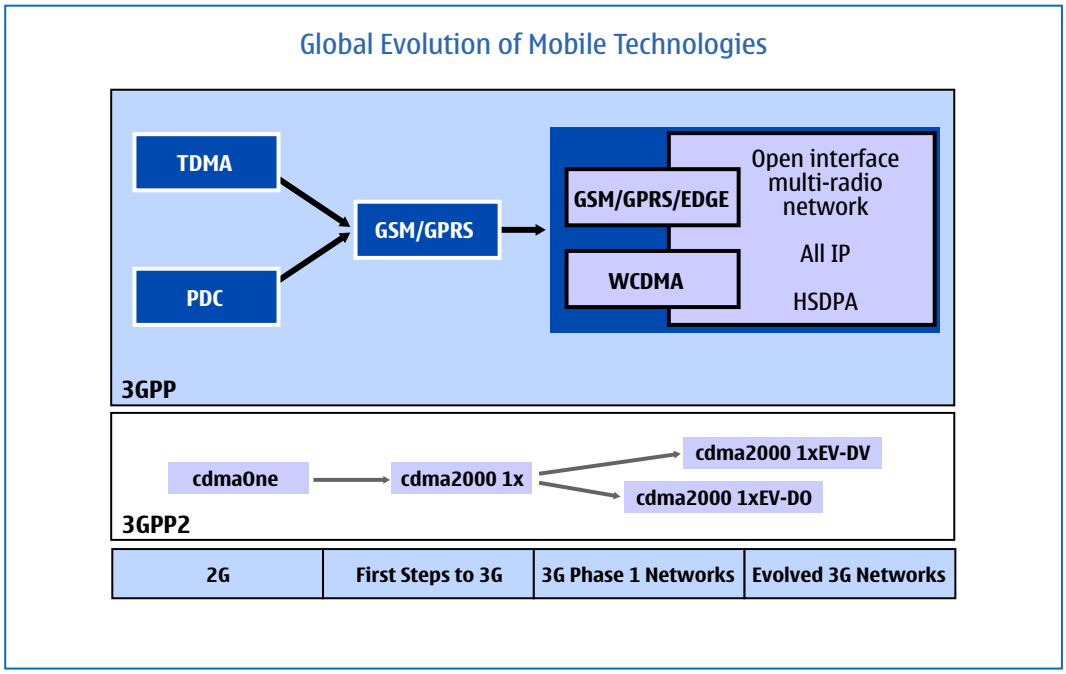


Figure 4.
Evolution to 3G

Benefits of Open Standards

The benefits from openness affect all interested parties involved in mobile telecoms. The consumer, subscriber or end-user benefits from openness in many ways. The initial decision for most consumers is the selection of the mobile phone or handset. Open standards allow more handset manufacturers to enter into the market, which means more choice in mobile phone handsets, modems and other terminals. Consumers also benefit from open standards in how systems can interact with each other - significant with travelling for example. Consumers also gain from a wider selection of services, and reduced costs of phones and the associated mobile services.

As the gate keepers to the whole mobile telecoms technology and opportunity, mobile operators (wireless carriers) have the ability to affect every part of the value chain and to select which parts they want to participate in. Open standards allow interchangeable components used in the network, further reducing costs. In addition, open standards permit faster deployment of new services increasing revenues and providing competitive advantages and opportunities to differentiate. Mobile operators also benefit from open standards through easier integration of services, network components and user equipment onto new networks. Easier integration and implementation reduce costs for operators. All of these relate to better customer satisfaction and better business management.

The application developers, content providers, as well as the various suppliers and subcontractors serving mobile operators, application developers and equipment vendors will find greater accessible markets through open standards. What previously might have been a market where the global opportunity was that of one equipment vendor now becomes a market with dozens of major customers. The suppliers and subcontractors can find economies of scale that bring down costs. These savings in turn help the industry overall achieve gains in cost-benefits. As can be seen, the whole ecosystem gains through openness.

Equipment vendors may find conflicting interests between open systems and proprietary ones. A proprietary system can be used to lock in a customer and can help bring rapid changes and customisation. However, over the longer term an open system will invariably deliver more competition, more innovation, lower cost and better performance than any short term gains of a proprietary system. That is why equipment vendors should embrace openness and seek to utilise their own competitive advantages within an open system, rather than fight the trend and force customers into proprietary based, locked in solutions.

Summary

A proprietary system may yield short-term benefits and may provide temptation to be adopted for given immediate technical interests. However, the overwhelming business benefits of openness, in reducing barriers to entry, increasing addressable market size, expanding offerings and promoting innovation through competition produce long term benefits that far outweigh any short term gains. Overall openness yields costs savings all throughout the value systems from voice or content creation to delivery right to the end-user. With mobile telecoms open systems are beneficial to the end-users, mobile operators, equipment vendors, application developers, content providers and the various subcontractors all involved in developing a more advanced mobile telecommunications system. The GSM evolution path through GPRS, EDGE and WCDMA and the leading open standards bodies promote the expansion of the total business opportunity for all involved and creates a sustainable business case that has been proven time and time again.

The various open standards bodies and Nokia warmly welcome any new participants to contribute and join the largest global mobile ecosystem.

Industry Efforts for Openness

Third Generation Partnership Project (3GPP)

The original spectrum allocations for 3G systems were set by the WRC (World Radio Congress). The family of standards was defined in the IMT-2000, after which the 3GPP (Third Generation Partnership Project) has been the primary standardisation body for harmonising the various network technical standards. The GMS path of 3G evolution was given the name UMTS (Universal Mobile Telecommunication System) to reflect the fact that it was selected by the vast majority of existing network operators as well as being the only standard present in all major markets of the world. The WRC and IMT-2000 were mainly involved with ensuring common frequencies for 3G globally.

3GPP is a collaboration agreement, which brings together standards bodies for developing the standards for WCDMA as well as GSM/EDGE technologies. The group started developing the WCDMA standards in early 1999, and the 3GPP Release 1999 standard is the first release introducing the WCDMA air interface and radio access network. GSM/EDGE standards have been developed as part of the project since 2001. (www.3gpp.org)

Linux / Open Source Development Lab

Linux is an open standards based operating system for computers. It is increasingly being used in telecoms applications and it has an Open Source Development Lab, a non-profit organisation, which guides the development of Linux for enterprise and carrier-grade uses. Its Carrier Grade Working Group is focused on telecoms operator needs. (www.osdl.org).
Nokia joined the Open Source Development Lab's Carrier Grade Working Group in 2002.

Symbian

The idea of an open standard for mobile phone handsets is a relatively new one. A modern mobile phone handset in 2.5G and 3G is incredibly sophisticated in its technology where the radio components tend to be most demanding and challenging. Modern handsets need to be a finely tuned balance of size, weight, battery life, colour display, memory storage, as well as increasingly multi-radio transceivers. The integration of cameras, radios, music players, game players, input devices, etc. adds to the complexity of higher end mobile phone handsets. Open standards are vital enablers of achieving such complex, advanced and integrated devices.

The biggest factor in allowing openness in terminals is an operating system based on open standards. Symbian was established for that purpose in 1998 and Symbian is jointly owned by the major handset manufacturers, Ericsson, Motorola, Nokia, Panasonic, Psion, Siemens and Sony. Symbian aims to drive the convergence of mobile computing and wireless technology by promoting user interfaces, applications, frameworks, application and development tools, as well as standards for interoperation of wireless terminals with networks, content services, messaging and solutions. (www.symbian.com). Nokia is a founding member of Symbian.

Open Mobile Alliance (OMA)

Mobile services are the newest of the technical developments and experiencing the greatest change currently. With an explosion of new mobile services including mobile

commerce, entertainment, information, communication services as well as various data access applications, this area is likely to see dramatic innovation and completely new service concepts. The needs of service and application developers bring about their own desires of open standards.

The leading global body involved in services related open standards is the Open Mobile Alliance, OMA, which emerged to harmonise the work of numerous separate bodies involved with services and applications. OMA's focus is on improving the end user experience. OMA promotes open global standards where the service applications layer is bearer agnostic and independent of the operating system while services and applications are interoperable with seamless roaming. Numerous bodies including Wireless Village, Location Interoperability Forum, SyncML Initiative, Multimedia Services Interoperability Group, Mobile Gaming Interoperability Forum and Mobile Wireless Internet Forum have been integrated into OMA. (www.openmobilealliance.org). Nokia is a founding member of OMA.

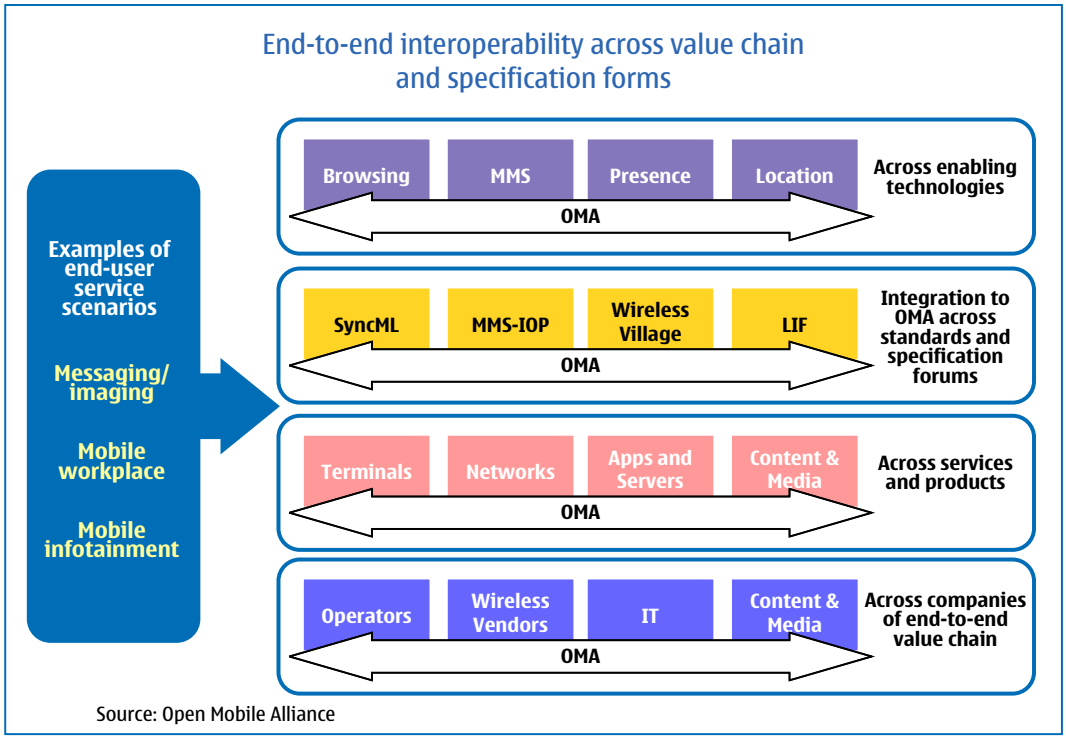


Figure 5.
OMA interoperability

Mobile Electronic Transactions (MeT)

Mobile Electronic Transactions is a company founded to establish a framework for secure mobile transactions, ensuring a consistent user experience with mobile commerce independent of device, service, and network. The MeT is sponsored by Nokia, Ericsson, NEC, Panasonic, Siemens, and SonyEricsson. MeT is addressing the needs of application areas such as identification, authorisation, credit and debit card payments, loyalty schemes, and ticketing. (www.mobiletransaction.org).

Web Services Interoperability organisation (WS-I)

Web Services Interoperability organisation (WS-I), is an open, industry organisation chartered to promote Web services interoperability across platforms, operating systems,

and programming languages. Nokia supports mobile Web services as a key technology in linking systems and enhancing business opportunities between operators and content providers. (www.ws-i.org)

Java Community Process (JCP)

Java™ technology includes both a programming language and application execution environment. The technology allows third parties to create new and exciting applications for Java enabled mobile phones and other devices. The specification and development work of Java is now carried out by an open industry organisation called the Java Community Process (JCP). (www.jcp.org). Nokia is actively involved with JCP.

OSS through Java™ Initiative

The OSS (Operational Support Systems) through Java™ initiative develops application programming interfaces for OSS solutions where all applications function together. This helps service providers to jumpstart the deployment of end-to-end services on next-generation wireless networks and to leverage the convergence of telecommunications and Internet-based solutions. (http://java.sun.com/products/oss/). Nokia is a founding member of OSS through Java Initiative.

Nokia Efforts for Openness

Series 60

Beyond the operating system, Nokia has also pursued openness in the licensing of the terminal software. The Nokia Series 60 Platform is a source-code product that terminal manufacturers can integrate into their own smartphone hardware designs. To develop a large applications market, Nokia is fostering an open development community, with licensees, around the Series 60 Platform. This open development provides licensees with full access to the application source, to contribute in the product's development, and the freedom to choose the direction of their own Series 60 Platform development. (http://www.nokia.com/cda1/0,,2816,00.html)

Forum Nokia

Nokia's global developer programme, Forum Nokia, connects developers to the tools, technical information, support, and distribution channels they need to build and market applications around the world. Forum Nokia provides hundreds of technical documents, developer communities, application testing, etc. (www.forum.nokia.com)