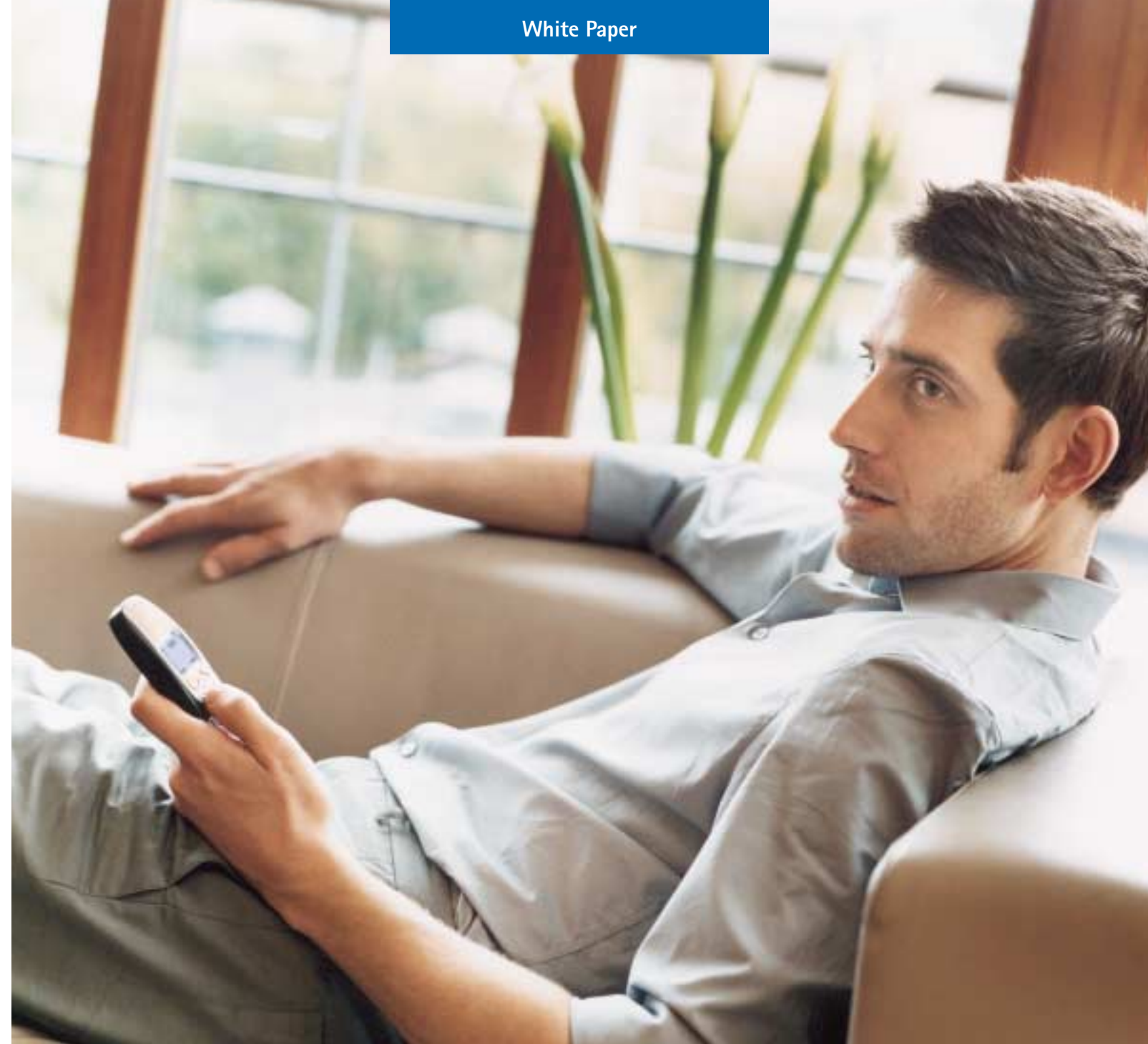


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Device Management – enabling effortless adoption of mobile services

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Introduction

As the functionality of mobile handsets grows at an increasing rate, users have less and less time to spend configuring and maintaining the services and applications on the devices. For instance, manually enabling WAP or GPRS access requires configuration of multiple settings, and each access point must be configured separately – a complex and time-consuming task at best. As more and more services and software applications find their way onto mobile terminals, the amount of configuration work will constantly grow.

The worst-case scenario resulting from this emergence of mobile services is that users will be unable to benefit from them since they are not able to, or do not want to configure the settings. The outcome of such a scenario would be low usage of mobile services, leading to decreased user benefits, decreased operator and developer revenues, increased customer care costs, and increased churn rates. There would ultimately be a serious slowdown in the widespread adoption of mobile services.

An alternative scenario: the obstacles to configuration are removed and users are able to conveniently install and use the services and applications of their choice on their mobile handsets, greatly helping to

increase the rate of adoption of mobile services. Operators and developers can serve their customers in a cost-effective manner and generate substantial revenue from the new services.

In order to make the latter scenario a reality, Nokia has been actively developing solutions through which the mobile users' configuration problems can be solved by a third party (for example, an operator or service provider) managing the devices for them. Nokia has also been an active member of the standardisation work carried out in this area.

The set of tools to make the adoption of new mobile services as easy as possible has been given the general term Device Management. Device configuration, upgrades, and troubleshooting are tasks that are necessary and can be made effortless for the mobile user. Device configuration is being transformed into a task that the mobile user hardly notices.



What is device management?

Device management comprises all operations that are necessary to manage a mobile terminal. It is a generic term for the tools that can be used to configure, manage, and update mobile devices on behalf of or by the users. Through the use of device management, operators or service providers can help the users to start using new services and to effortlessly modify the configuration of existing ones.

Device management is an enabling technology that makes it possible for the user to easily configure different applications on their terminal device. Different applications, such as MMS, calendar, e-mail and games, will all need separate configuration settings, making the manual configuration difficult to navigate. Through its capabilities related to solving manual configuration issues, device management offers tangible benefits for all members of

the mobile value chain.

Device management technology offers services for other applications; for example, it provides them with configuration data. It cannot be classified as a stand alone technology or application but as a critical enabler for mobile terminals with a large number of mobile applications. The functionality of device management is described in Figure 1.

Device management offers direct and concrete business benefits. Even in the short term, device management enables competitive advantages via parameter provisioning, service activation, the ability to keep track of device fleet capabilities, and direct cost savings as a result of increased efficiency. This is illustrated in Figure 2.

In the short term, the nature of mobile terminals is dramatically changing as their functionality

increases with the addition of new, more powerful, and richer applications. At the same time, these increasingly advanced terminals remain in mass-market environments and may be used by mobile users with limited technical interest or skill. A good current example of this is WAP; the average customer finds the manual configuration of the WAP parameters very inconvenient and, in the worst case, impossible. The fact that mobile users cannot use mobile services due to configuration issues translates directly into a considerable amount of lost revenue for, and customer dissatisfaction with, the operators and service providers. In short, there is a need for a technological tool for the convenient provisioning of key parameters.

This development is leading us into a situation where external parties need to be able to maintain or configure handsets for mobile users in order to speed up the use of new mobile services, and to ensure that mobile users are able to reap the full benefits of those services.

Device management technology tools enable provisioning services to be provided at this time and are a credible technology evolution path to enable advanced service and application functionalities in the future. Fragmentation of the market into different proprietary device management solutions would slow down the roll out of the technology. A solution based on open standards is required to guarantee fast adoption of the technology, and it will also enable a multitude of devices to be managed with only a



single infrastructural investment, while any possible infrastructure lock-in can be avoided.

Device management, as a mechanism, is very versatile and can be used to manage different types of data objects. Some of the data objects are simple numeric or textual parameters, while others are binary. Numeric objects may include connectivity parameters, such as access point addresses and proxy configurations. Binary objects may be security keys or even content that can be displayed, such as animation, screen savers, and caller identification animations.

In the longer term, the functionality of mobile devices will be further enhanced, and some will even be comparable to personal computers. This will also introduce a need for upgrading software and providing patches. For corporations and operators, this means that they will have an immense fleet of mobile devices to manage and maintain, each comparable to a personal computer. Device management is the ideal tool for this purpose. In the future, the device management system could even be used to distribute and install executable software.

In short, there is a need for a device management solution that both offers a tool for the provisioning of the key parameters that are currently required for mobile services, and has a credible technology growth path so that mobile users can also be efficiently served in the future. Nokia believes that device management is vital for allowing users to easily adopt new services and will therefore enable the growth of a successful mobile service business.

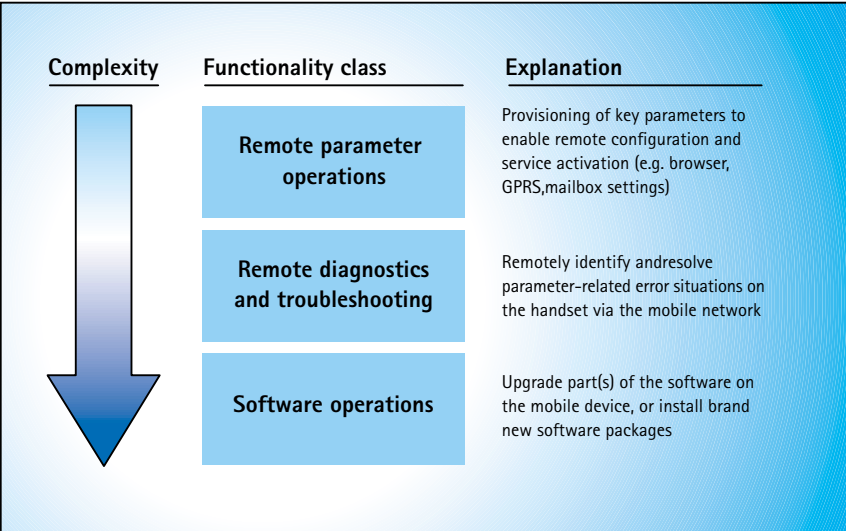


Figure 1. Classes of device management functionality

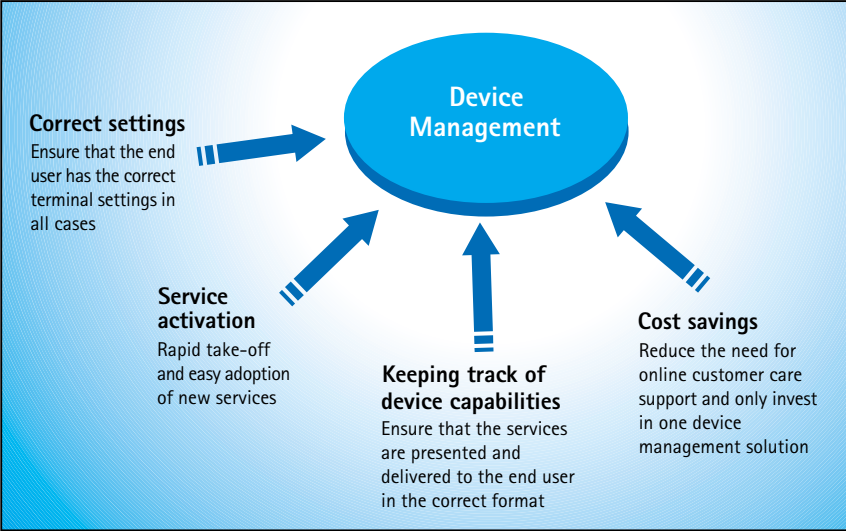


Figure 2. Business Drivers for device management

How does it work?

The device management technology used on many Nokia terminals since 1997 is the Nokia-Ericsson smart messaging solution. In practice, this means that a mobile user may, for example, set the WAP browser settings on their mobile phone by sending an SMS to the operator requesting the settings and then receiving them via smart messaging. After receiving the settings, the mobile user only needs to accept them to have a functioning WAP browser.

In a situation where open device management standards did not yet exist, the smart messaging-based solution was a good place to start to make it easy for mobile users to have the correct configurations for mobile

services provisioned, and hence stimulate the launch of these services. However, in light of continuously evolving mobile devices and services, the smart messaging platform has some limitations, resulting in the need for a more advanced solution.

In the future, Nokia believes that a device management process based on open standards will be critical for the widespread adoption of device management and for ensuring mobile user satisfaction through interoperability. Nokia has participated in developing such a solution, which can be divided into two separate parts: a bootstrap process and continuous management. The division and the key points of the framework are highlighted in Figure 3.

Bootstrap technology, based on WAP Forum 2.0 Client Provisioning, is used to provision the essential service activation parameters over the air to enable "out-of-the-box" functionality, and to also enable the initial settings and a trusted relationship for continuous provisioning. After the bootstrap phase, only continuous provisioning between a mobile terminal and a device management server is necessary. In general, the bootstrap process is carried out through an unsolicited message functionality such as WAP Push over SMS.

Continuous provisioning, based on SyncML Device Management (version 1.1), is used for all the repetitive management actions that are carried out for the mobile device. This includes parameter modifications, diagnostics, and troubleshooting. Continuous provisioning requires a two-way connection between the device management server and the device being managed. Also, to ensure security, continuous provisioning requires that a trusted relationship must be maintained between the device management server and the device being managed. This trusted relationship is established during the bootstrapping phase. Continuous management can take place via GPRS data call, TCP/IP, or OBEX, for example.

Nokia believes in the open device management framework that utilises WAP Forum 2.0 Client Provisioning for bootstrapping and SyncML Device

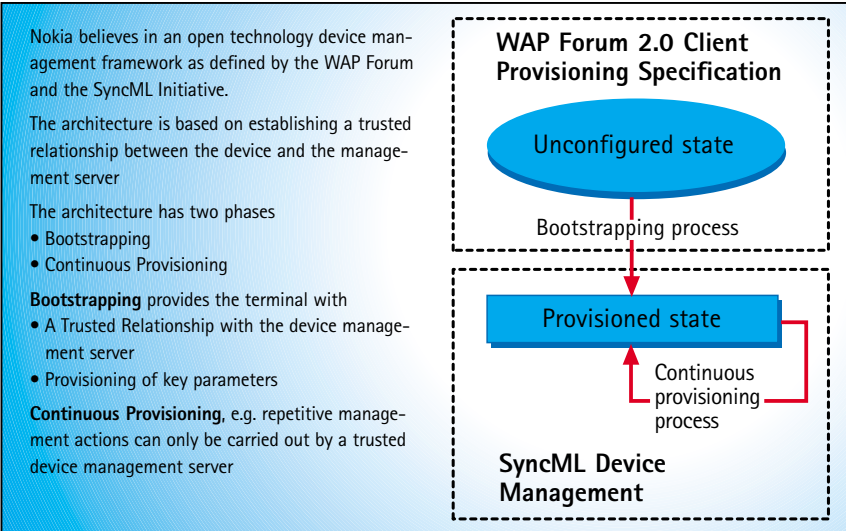


Figure 3. Open Device Management Framework – Key Points

Management for continuous management. These are the only open technologies available that can offer the functionalities that are necessary to fulfil the market requirements.

WAP Forum 2.0 Client Provisioning (Bootstrapping)

The WAP Forum 2.0 Client Provisioning specification is used for the initial provisioning of key parameters to the handsets over the air. It enables operators to initially provide key parameters (WAP gateway, network access points, etc.) and to provide continuous management by establishing a trusted relationship between the managed handset and the Device Management server. By provisioning key parameters during bootstrapping, operators can enable full functionality of key applications for the customers at the point of sales. Using the WAP Forum mechanism and security features means that bootstrapping is secure and safe. The main shortcoming of WAP Forum 2.0

Client Provisioning is, however, that if used alone, it will be a limited solution as it only allows the configuration parameters to be written once and does not allow modification or deletion of existing parameters. Therefore, an additional solution is required to enable addition, modification, and deletion of parameters after the initial configuration.

SyncML Device Management

SyncML Device Management, together with the WAP Forum 2.0 Client Provisioning specification, enables a complete device management solution. SyncML Device Management supports continuous management by utilising the trusted relationship created by the WAP Forum solution. Using this protocol, it is possible to add, modify, and remove parameters, provide new services and applications, and perform troubleshooting by identifying configuration issues.

SyncML Device Management is designed to work well in the wireless

environment and is transport independent, making it possible to use, for example, HTTP for data transport. It also provides an extensible, mature and flexible security model, and the independence of a run-time environment.

Together, WAP Forum 2.0 Client Provisioning and SyncML Device Management enable a fully functional, secure, and interoperable device management solution, that can be used over virtually any kind of data transport mechanism. The following use cases illustrate what can be achieved with this solution.

- "Out-of-the-box" provisioning. When buying a new phone, all services and applications that are requested by the user can be fully configured at the sales point.
- Reactive or proactive provisioning of new service settings. The mobile user may request new settings for a service, or they can be automatically provisioned (providing that the mobile user has authorised automatic provisioning) due to service upgrades by the operator, for example.
- Troubleshooting. If the mobile user experiences difficulties in using a mobile service due to incorrect settings, an operator helpdesk, for example, can check the settings on the mobile device, determine what caused the problem, and fix it by provisioning the correct settings to the phone.
- Mass configuration. An example would be, when a new service is launched, the operator may send a message to a select customer group informing them of the new service and offering to provision it upon approval. Corporate IT-departments can also easily configure similar settings across their entire mobile device fleet.

	Nokia-Ericsson Over The Air Settings Specification (Smart Messaging)	WAP Forum 2.0 Client Provisioning Specification	WAP Forum 2.0 Specification & SyncML Device Management
Basic device management (Insertion of configuration parameters)	✓	✓	✓
Open industry standard		✓	✓
Advanced device management (Editing, deleting, replacing, and adding parameters)			✓

Figure 4. Device management evolution path

The need for open technologies and standardisation

Device Management, as such, is not a new concept as proprietary solutions, such as the Over The Air Settings Specification, have existed for some time. However, without open technology standards, many of the potential benefits of device management will be ignored.

The mobile user may have a terminal that does not support the device management solution that is used by the operator, or the operator may be forced to support many competing solutions, that increase complexity and costs, and not benefiting anyone. Openness brings multiple benefits for all parties involved.

Consumers/mobile users

Device management, as such, will be invisible to the mobile user (except for authorising and accepting provisioning and new parameters), but will enable them to enjoy all the benefits of the new services and applications with easy-to-use installation, configuration, and management. Any problems that occur will be dealt with by operators or service providers, for example, either proactively or through reactive remote diagnostics. However, if no open solution exists, none of these benefits will be realised as the myriad of different interfaces, devices, and technologies will simply make a fully functional device management solution impossible to achieve. It is only through an open solution that the mobile user can be

sure that all devices, applications and services are interoperable, which will enable efficient device management.

Operators, Service Providers, and Corporations

Operators, service providers, and corporations managing their employees' devices are at the forefront of device management and have a responsibility to ensure that mobile users can have access to effortless configuration and management of devices. Unless an open solution is supported, they too will need to support a variety of non-interoperable, proprietary technologies, resulting in the need to invest in and operate numerous proprietary systems, increasing costs and complexity, which will decrease mobile user satisfaction and greatly reduce the benefits of device management.

Device Manufacturers

An open device management technology will allow device manufacturers to concentrate their efforts on supporting one solution instead of trying to deal with a range of technologies and solutions. Naturally, this will lead to cost and quality benefits, as all efforts can be focused towards one goal.

Application Developers

For application developers, an open and interoperable device management

solution improves the possibility of supporting a wide range of devices and networked data. Furthermore, it reduces the amount of costly support for multiple device management technologies.

In conclusion, the market needs an open standard for device management. The following arguments support this:

Interoperability

It is only through common agreements on technology and mechanisms that interoperability across product lines and between different vendors can be guaranteed.

Industry adoption

A solution that is only supported by a limited number of industry players is not effective for operators and service providers. By supporting an open standard solution, operators, service providers, and equipment manufacturers are ensuring true end-to-end interoperability. The end result is a solution that is almost invisible to the mobile user.

Only one infrastructure investment

Operators and service providers need only to invest in one open standard based infrastructure solution to support a multitude of terminals and services. Moreover, they are not tied to the infrastructure in the future, as any solution that supports open standards can provide them with similar functionalities.

Schedule for Device Management

Device management technologies are ready for implementation. The SyncML Initiative has agreed on device management specifications in the SyncML 1.1 specifications that were approved in April 2002, with the WAP Forum Client Provisioning Specification 2.0 having also been released.

Device management can thus be implemented on handsets, PDAs, device management servers, network infrastructure, service offerings, and customer care interfaces. Nokia believes that the first open standard device management products will enter the market in 2003.



Summary

Mobile devices will be host to a number of applications and services. With current enabling technologies, the management and configuration of these would be challenging for any user. Device management based on open standards will usher in a new age of mobile communications by removing the burden of configuration and troubleshooting from the mobile user.

Device Management is the generic term used for the technology that will allow third parties (mobile operators, service providers, corporate IT-departments) to remotely provision and configure mobile devices on behalf of subscribers. This includes remote provisioning of new services, configuration and management of user terminal parameters and settings, and remote handset diagnostics and troubleshooting.

Device Management technology is a key feature for:

- 1) Enabling value-added services in the mobile domain;
- 2) Ensuring widespread adoption of mobile services by making it easy for the user to get the correct service settings provisioned over the air;
- 3) Enhancing the operators' service level through service provisioning and troubleshooting;
- 4) Enabling direct cost savings in customer care and management;
- 5) Collecting and utilising customer care information.

In a situation where open device management standards did not yet exist, the Nokia-Ericsson smart messaging-based solution has been a



good place to start to make it easy for mobile users to have the correct access point configurations provisioned.

However, in order to take full advantage of the potential of device management, an open standards based technology solution is needed. Nokia believes that an open standard framework consisting of two parts would be the best approach for the industry in this important area. The two parts of the framework are bootstrapping and continuous management. The WAP Forum 2.0 Client Provisioning specification for bootstrapping and SyncML Device Management for continuous management fulfil the criteria for openness and offer sufficient flexibility and extensibility to become industry standards.

Device management technology offers services to other applications: for example, it provides them with

configuration data. It cannot be classified as a stand alone technology or application, but as a critical enabler for mobile terminals with a large set of mobile applications.

Soon, mobile users will be able to access a wealth of applications and services with their terminal devices. Naturally, all of these will need to be configured to function properly, but with device management based on non-proprietary technologies, this will be a task that the mobile users will not need to carry out. The full scope of the mobile world is accessible to the user without complex configuration or management tasks. It is the responsibility of all players in the mobile world to ensure that the mobile user can access mobile services by adopting non-proprietary device management.

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