

The WISE Portal 2.0 solution—Timely delivery of tailored mobile Internet services

Andy Johnston, Thomas Papanikolaou and Mike Sissingar

Two of the hottest issues in mobile communications today are the growth of the mobile Internet and the evolution of new portals. Both are interdependent. Mobile Internet growth requires new portals. The creation, deployment and continued enhancement of new portals require a world-class portal infrastructure, combined with attractive and creative applications. And there must be a well-defined methodology for delivering the portal and the applications in order to capture a viable share of the market.

Ericsson is working across several industry sectors to develop mobile Internet services and applications for mobile operators around the world. The authors describe the WISE Portal 2.0 solution, which is a cornerstone of this work.

Today's mobile communications users have high expectations at a time when deregulation and open systems have made the competitive landscape more aggressive. The mobile Internet offers a golden opportunity for creating new services and new revenue streams. The key to unlocking these opportunities is the ability to deliver services and applications that work, are available at the right time, and offer personalization.

The tool that enables mobile operators and service providers to deliver personalization is the portal. Over the past decade or so, the development and operation of portals over the fixed-access Internet have taught us many lessons, and these have been

brought to bear on the development of Ericsson's WISE Portal solution.

In the mobile environment, the portal enables its owner—the network operator or service provider—to tailor mobile Internet offerings to match the market requirements. For the user, the mobile portal provides a familiar, personalized service interface to employ the mobile Internet as a valuable yet simple tool that makes everyday life easier and more fun. An effective mobile portal helps ensure rapid end-user acceptance of mobile Internet services.

Ericsson's WISE Portal 2.0 is designed for the creation and delivery of targeted mobile Internet services that are user-friendly and closely tailored to individual users' needs. The solution has a crucial role to play in helping mobile users to access the services and information they want quickly and with a minimum number of clicks. Moreover, users can personalize the portal to suit their own preferences and needs.

The WISE Portal 2.0 seamlessly integrates the Internet and wireless application protocol-based (WAP) services so that they can be accessed from any personal computer, WAP phone or other mobile device.

Satisfying market expectations

The market has high expectations of portal solutions. First, the solutions must be usable. The WISE Portal 2.0 solution provides a unified user interface, called *bricks*, for WAP and Web access.

The solutions should also be scalable. The WISE Portal 2.0 solution can be scaled, for example, across processors and nodes, and in terms of the number of registered users, concurrent users, and content feeds that it can handle. The solution is available in several standard configurations.

The portals should offer high reliability and availability. The WISE Portal 2.0 solution can be supplied with "four-nines" (99.99%) or better availability.

Flexibility is also important. The WISE Portal 2.0 solution has a component-based architecture that enables flexible configurations as well as integration into portal operators' enterprise systems.

The portals must be global. The WISE Portal 2.0 solution can be deployed internationally and supports wide (16-bit) character standards, such as the universal transform format no. 8 (UTF-8) and unicode character set no. 2 (UCS-2).

BOX A, TERMS AND ABBREVIATIONS

3GPP	Third-generation Partnership Project	OSA	Open service architecture
API	Application program interface	PDA	Personal digital assistant
DNS	Domain name server	RADIUS	Remote authorization dial-in user service
DTD	Document type definition	RDBMS	Relational database management system
EJB	Enterprise JavaBeans	SDK	Software development kit
GPRS	General packet radio system	SMS	Short message service
GSM	Global system for mobile communication	SMS-C	SMS center
GW	Gateway	SSL	Secure socket layer
HDML	Handheld device markup language	UCS	Unicode character set
HTML	Hypertext markup language	UMTS	Universal mobile telecommunications system
HTTP	Hypertext transfer protocol	USC	User service center
ISP	Internet service provider	UTF	Universal transform format
IT	Information technology	WAP	Wireless application protocol
J2EE	Java 2 Enterprise Edition	WCDMA	Wideband code-division multiple access
JS	JavaScript of Java Servlet	WML	Wireless markup language
LDAP	Lightweight directory access protocol	XML	Extensible markup language
MAI	Mobile application initiative	XSL	Extensible stylesheet language
MSC	Mobile switching center		
O&M	Operation and maintenance		

The mobile environment puts additional demands on portal solutions. For example, mobile network operators generally have more stringent quality requirements than traditional portal operators. In all likelihood, mobile portals will have much greater numbers of simultaneous users than fixed portals. They will also have special integration requirements, for example, for charging and pre-payment systems. Similarly, strict conformance testing will be required during network integration. These demands for system quality have an impact on scalability, reliability, availability, security and interoperability—the task of managing the design, implementation and delivery of the portal is thus vital.

Therefore, a key element of Ericsson's WISE Portal 2.0 solution is the delivery methodology, which covers all aspects of the development of mobile Internet services and associated platforms, including the Service Network¹, positioning, transactions, integrated billing, portal core technology, an observational database, and personalization.

Ericsson has a mature solution-development methodology called *Framework*, which focuses on the business implications, design, and development, as well as the implementation and operation of the applications and platform on which the ser-

BOX B, THE WISE PORTAL 2.0 SOLUTION AT A GLANCE

WISE Portal 2.0 is a complete, end-to-end solution for the creation and development of mobile portals (Figure 1). With it, portal operators can choose to install and manage the portal in-house, or opt for an Ericsson-hosted portal, which comes complete with a generic set of applications and services.

The WISE Portal 2.0 meets the challenges presented by the mobile market by combining a number of key components:

- Ericsson WISE 2.0 Portal presentation layer and presentation layer bricks;
- BroadVision One-To-One enterprise application server;
- J2EE application server;
- Ericsson USC 1.2E; and
- Ericsson mobile Internet enablers.

vices run. Framework supports the development of customers' business and continues throughout delivery to maintain the momentum of each complex and concurrent element. It also includes management consulting, a project office, a systems design team, and applications development.

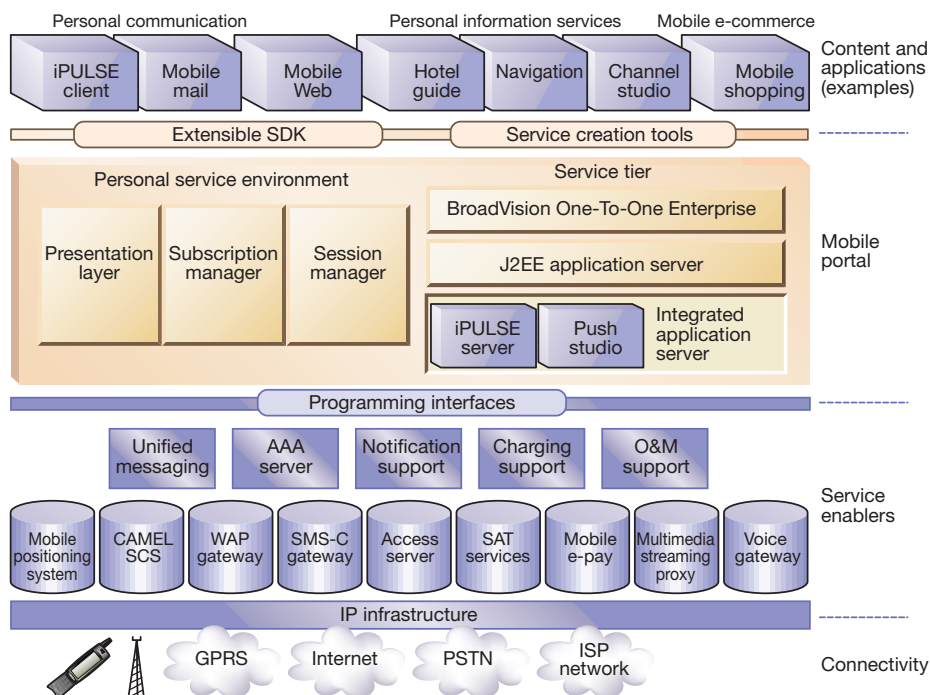
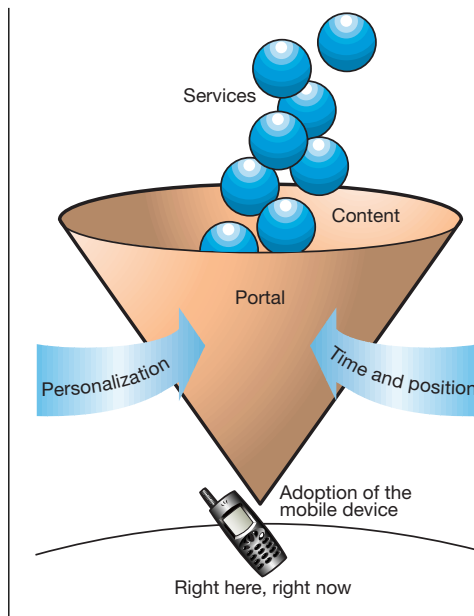


Figure 1
Overview of the WISE Portal 2.0 solution.

Figure 2
The “anywhere-Internet” concept.

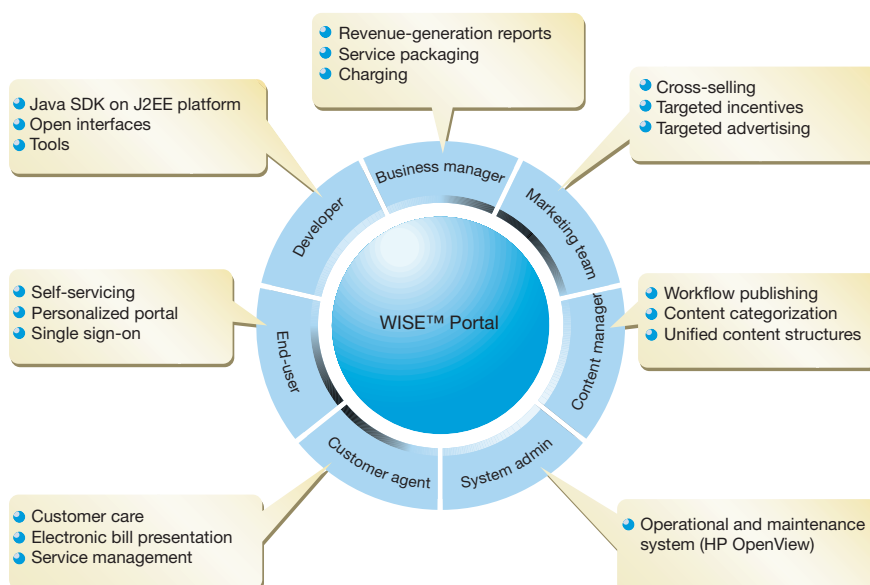


The power of mobility

A solution that supports several important service attributes is needed to realize the “anywhere Internet” concept (Figure 2). These attributes are

- personalization;
- time and position;
- device support;

Figure 3
Some ways in which players interact with the portal.



- services; and
- local content.

Personalization is key to mobile Internet services. Advanced personalization features help users to access information quickly and easily. Personalization and profiling features enable operators to serve their customers better—enhancing the “stickiness” of their offerings, encouraging customer loyalty, reducing churn, and growing the user base.

Intelligence in the network gives information on user whereabouts. When combined with time-of-day awareness, this information can be used to deliver highly targeted and relevant services.

The ability to support multiple devices for the delivery of mobile portal services is also a critical factor for success.

Compelling mobile Internet services are key to widespread take-up.

In mobile contexts, local content is of much greater importance than in the fixed Internet. Content must be filtered and delivered in a format that can be understood by the user.

Market requirements

Ericsson has been driving the mobile Internet since its inception, and this has helped the company identify the key success factors for mobile portal-based services. In addition to meeting the market expectations outlined above, the mobile portal requires

- broad support among industry players;
- best-of-breed components;
- personalization;
- content management;
- service development; and
- universal delivery.

Broad support

While the user is certainly the focus of attention, there are many other players who have key roles in provisioning mobile services. These players include the developer, business manager, marketing team, content manager, system administrator and the customer’s agent. The mobile portal solutions must support these different players (Figure 3).

Best-of-breed components

Industry-wide open interfaces enable components to be mixed and matched. Excellence in design, performance, and availability is essential, as is choice, because monolithic or proprietary solutions are generally unacceptable today.

The guiding principle in selecting components for the WISE Portal solution has been to choose the best-of-breed components from third-party suppliers in each major product area (directory server, application server, firewall, and so on). This requires evaluating the components against a rigorous set of criteria to ensure that they are feature-rich and of high quality. The components need to be proven market leaders. And the vendor must be reputable and have relevant expertise.

Ericsson then contributes its own business and technical know-how and experience, adding value to *de facto* standard architectures and developing third-party components for use in the mobile environment. The reuse of tried and tested technologies and components cuts time to market and enhances quality.

Personalization

Personalization is a proven way of creating customer loyalty and generating repeat visits to mobile portals. Advanced forms of personalization can be created through new mobile network features, such as positioning (Figure 4).

The WISE Portal allows users to personalize their services in terms of presentation, service and service category selection, service delivery mechanisms, and content, and can provide automatic personalization based on an analysis of user behavior.

A portal solution that offers multi-dimensional personalization must provide concepts as well as features and tools that allow operators to immediately deliver and benefit from personalized services. The WISE Portal provides a range of easy-to-use tools that portal operators can use to create personalization rules without programming. These tools enable editors and content creators to produce and manage content—for example, while an extensive profiling system records user preferences. The WISE Portal solution can also observe user actions and learn from them.

Content management

Content management is key to offering compelling portal services. Portal solutions must provide comprehensive and efficient support for content management, especially when large numbers (100 or more) of content providers are involved.

The main content-management functions are creation, editing, removal, classification, integration, scheduling and staging. Other

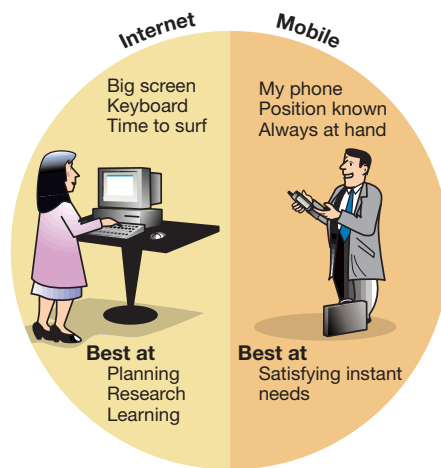


Figure 4
Personalization means a service that immediately satisfies needs regardless of user location.

functions include managing adapter connections and controlling the quality of content feeds (Figure 5).

Several qualitative characteristics are also important. These include the ability to manage and process both static and dynamic feeds, and to process real-time feeds. The portal should be able to accommodate pop-

Figure 5
Content management using uncomplicated procedures.



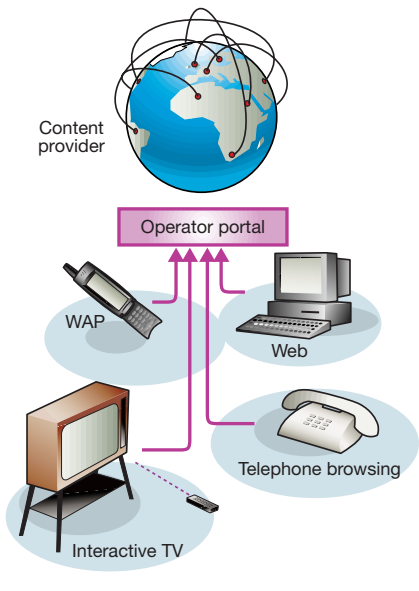


Figure 6
Mobile portals need to be independent of the devices that access them.

ular data feeds (such as newswire services) via packaged content adapters, and secure access to content. It must also be able to handle content in multiple character sets, including wide character sets (16-bit characters).

The WISE Portal 2.0 solution includes a unified content-management architecture with a supporting tool set via the BroadVision One-To-One Enterprise application service.

Universal service delivery

Many mobile devices are already capable of accessing portal services (Figure 6). Examples include

- devices that can handle short message service (SMS) notification;
- WAP-enabled phones;
- smart phones and personal digital assistants (PDA) that can handle WAP, handheld device markup language (HDML) or hypertext markup language (HTML);
- voice-browsing systems; and
- interactive television.

Mobile portals need to be independent of the devices that access them. They must also provide a universal delivery service.

Service development

Portal platforms must offer the rapid development and deployment of compelling services. Portal developers must be able to create simple services without complex programming—for example, through rule-

based programming and profile- and content-driven service behavior. They must also be able to create complex services using standard programming languages and environments, such as the Java 2 Platform, Enterprise Edition (J2EE) server-side Java standards. Similarly, mobile portal operators or their subcontractors need a well-documented set of service-development concepts and interfaces with which to create services.

The WISE Portal uses the BroadVision One-To-One enterprise application server to support the creation of release-based profile- and content-driven services. Likewise, it uses the BEA WebLogic J2EE application server as a deployment platform (and any of the myriad Java development tools available on the open market as development environment) to support programmatic service creation.

A Java-based software development kit (SDK) provides additional programmatic service support through key system interfaces to

- subscriber directory access;
- charging and billing services;
- SMS notification services;
- presentation layer rendering services;
- operation and maintenance (O&M) and logging facilities; and
- session-management facilities.

Mobile portal solutions must extend service development to areas that add value in a specifically mobile context, for example, through interfaces to the mobile positioning system² and terminal characteristics database. In addition, mobile portal solutions must accommodate the interfaces currently being specified by the Third-generation Partnership Project (3GPP) and Parlay for the third-generation open service architecture (OSA).

Ericsson is also encouraging third parties to develop applications and services. The Ericsson Developers' Zone has been created to offer third-party application developers access to a wide range of Ericsson mobile application technologies and product (Figure 7). After registering with the Ericsson Developers' Zone, developers gain access to information and tools that enable them to build and test applications. The Ericsson Developers' Zone also includes an Alliance Program for companies who work closely with Ericsson on the development of mobile Internet applications and content.

Ericsson's Mobile Applications Initiative (MAI) program is designed to drive the

Figure 7
The Ericsson Developer's Zone.



GPRS and WCDMA/UMTS applications industry and to expand knowledge, experience and opportunities in these technology sectors. The aim is to stimulate market interest and to ensure that high-quality applications become available.

WISE Portal feature round-up

The WISE Portal 2.0 contains four key components that combine to create a complete solution for delivering personalized, easy-to-use, portal-based services to mobile users:

- the WISE Portal presentation layer;
- BroadVision One-To-One;
- the J2EE application server; and
- the user service center (USC).

WISE Portal presentation layer

The presentation layer, which is the user interface to mobile portal services, provides a scalable and robust extensible markup language-based (XML) publishing framework for portals and is capable of presenting services on multiple devices using multiple markup languages.

Using XML, the presentation layer clearly separates presentation from business logic. It also provides a specification that allows users to develop new or to integrate existing services into the presentation layer architecture. Services delivering plain HTML or plain wireless markup language (WML) can also be integrated.

The presentation layer provides extensive capabilities for branding, and for specifying the “look and feel” and behavior of the portal (the personality). It can support multiple “personalities” and comes with a default personality (bricks).

Presentation layer components

The connection manager is responsible for receiving a user request, transforming it into the standardized internal format of the presentation layer (Figure 8), and establishing the connection between the end-user and an application. Establishment of the connection usually includes the creation of a user session and additional security checks. This is checked by the user manager. To provide scalability, the connection manager is implemented using Java Servlet technology.

The request broker is responsible for retrieving the data requested from the user, by accessing the application’s communication protocol. All information that is rele-

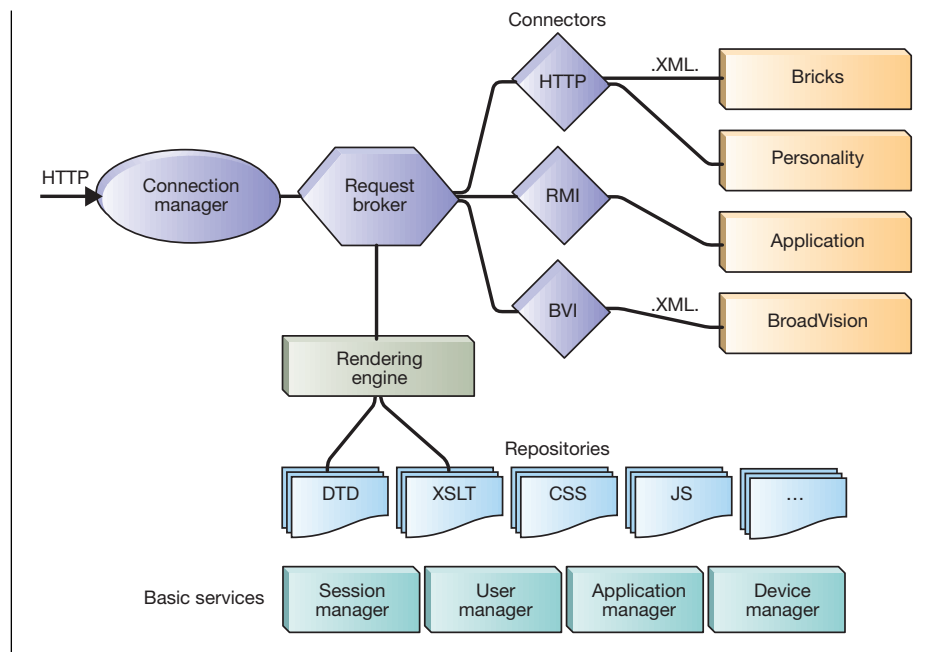


Figure 8
The architecture of the WISE Portal presentation layer.

vant to the application (such as the communication protocol) is stored in the application manager.

XML data returned by applications is forwarded to the rendering engine, which parses, validates, and transforms the data appropriately for the user’s device, using device information retrieved from the device manager and extensible stylesheet language (XSL) transformations.

Presentation layer repositories store all resources required for validating XML data sent by applications (document type definitions, DTD), transforming XML into a language understood by the end-user’s device, and so on. The repositories enable resources to be associated with applications, and provide versioning facilities for the publishing framework.

The basic services are a minimal set of interfaces on which the presentation layer is implemented. The presentation layer can function with any component that provides sufficient functionality for implementing the basic services. In the current implementation, the basic services are implemented using Ericsson’s USC user and application manager and the WISE Portal 2.0 session and device manager.



Figure 9
Presentation layer bricks.

Presentation layer bricks

Figure 9 shows a typical bricks portal entry page for HTML. The portal user is presented with a set of bricks, grouped into six categories (shown as tabs above the bricks grid. In this example, the tabs are Favorites, Finance, David, Travel, Messaging and Leisure).

Figure 10 shows the WAP variant of the interface described above. The tabs are shown on the WAP deck as a set of links. Selecting the Favorites link calls up the presentation of a second WAP deck with a set of links for each brick under Favorites.

Figure 11 shows how the user can personalize the bricks interface by dragging service bricks from the pane on the right to the bricks grid on the left.

Figure 10
WAP screenshot of presentation layer bricks.



Figure 12 shows a single mobile trading brick and its associated set of controls (*max*, *config*, *help* and *info*).

BroadVision One-To-One

BroadVision One-To-One provides content management, personalization, and rule-based service-development functions within the WISE Portal 2.0 solution (Figure 13). BroadVision and Ericsson have cooperated to design and develop a set of components that bring key BroadVision One-To-One functionality closer to the mobile network. These include interfaces to SMS gateways, charging systems and subscriber databases.

BroadVision One-To-One enables the development of portals that treat users as unique individuals, thereby increasing the level and regularity of user activity. It remembers and tracks data and transactions from visit to visit, stimulates transactions and feedback, and supports continuous improvement in the level and scope of personalized services.

Content management

The BroadVision One-To-One content-management features are the heart of the WISE Portal unified content-management architecture, providing authoring, workflow, scheduling, classification, tagging, persistence, audit trails of uploads and downloads, and previews. There are six types of pre-defined content, each with extensive semantics:

- templates;
- product catalogs;
- editorials;
- discussion groups;
- incentives; and
- advertisements.

A unique feature of BroadVision One-To-One is that it allows content creators to categorize the content in hierarchical folders. Matching attributes can be attached to content to enable powerful personalization. For example, a content creator can attach language, product, job title and level of technicality to each item which is then matched with the user's profile to show only the relevant content.

BroadVision also includes a publishing center (Box B). This is a configurable, Web-based tool designed for all participants in the content-management lifecycle, from full-time content professionals (who create, maintain, schedule, and manage content) to casual content contributors (who occasionally author and submit content).

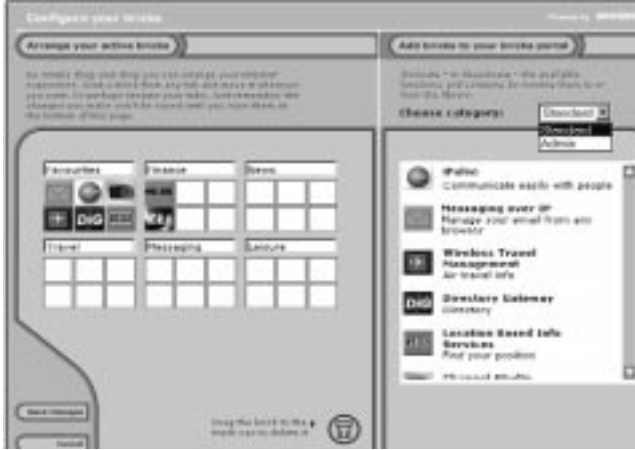


Figure 11
The bricks interface.

BroadVision One-To-One has a comprehensive user-profile concept and architecture, which forms a sizeable proportion of the WISE Portal approach to user profiling. This concept includes an extensive, persistent user profile that can be used by all parts of the BroadVision system as well as externally. There are two main sources of information on user profiles:

- the WISE Portal user information component, which is based on the USC subscription manager and is used to store relevant, general, cross-application information on the user profile; and
- the BroadVision One-To-One profile manager, which is used to store BroadVision application-specific profile data.

User profiling

BroadVision One-To-One tracks users as either members or guests of the site. Members have registered, retrievable profiles; guest profiles are typically limited to the current session. User profiles are stored in database tables (internal or external relational database management system, RDBMS). The contents of a user's profile can be extended and changed by the portal operator.

Session profiling

The BroadVision One-To-One command center can be used to create session rule sets that contain references to session and user-profiles attributes. By creating multiple session rules, it is possible to have a set that assigns different values to the same session profile variable for different visitors.

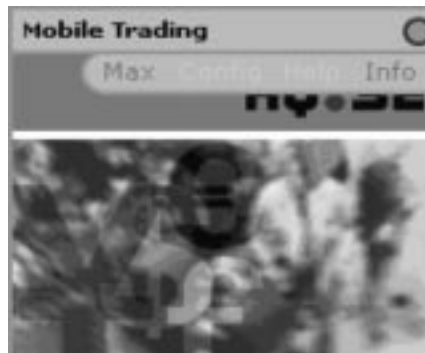
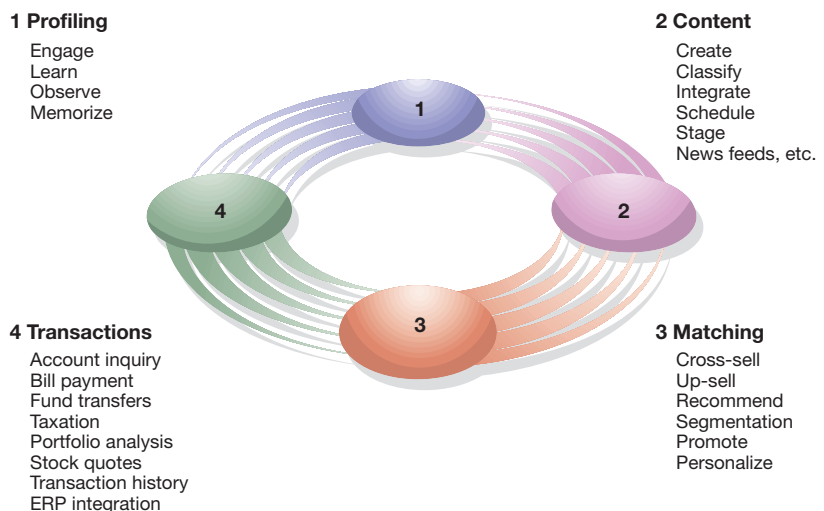


Figure 12
Mobile trading example.

Figure 13
BroadVision One-To-One functionality.



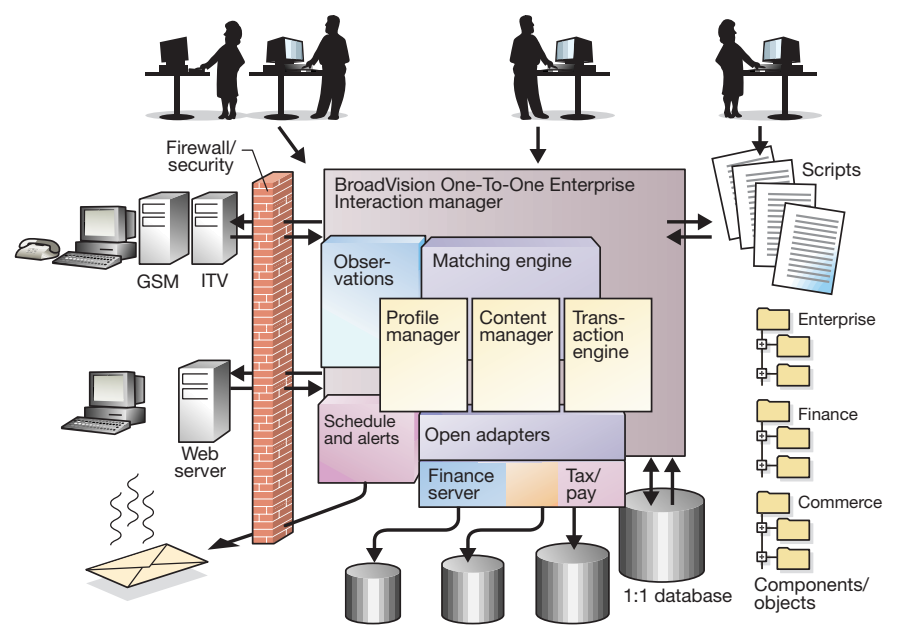


Figure 14
The main components of BroadVision One-To-One.

Matching

BroadVision One-To-One supports rule-based matching, which is a useful feature for determining which content to show a visitor. Matching rules are defined in the BroadVision One-To-One command center and evaluated when an application asks for relevant content. It supports

- rule-based matching;
- query matching;
- community rating;
- collaborative filtering; and
- taxonomy matching for targeting content to individuals according to their profile.

The BroadVision One-To-One intelligent matching agent presents content according to an individual visitor's specified preferences for categorization, type, or content. It does so by comparing matching attributes in the visitor's profile with the matching attributes associated with specific content.

At the heart of the BroadVision One-To-One application solution are five main business components (Figure 14):

- The profile manager facilitates the capture, management and use of user profiles. This data can originate from legacy databases, data-mining applications, or from the site. The profile is extensible and can

exist in the One-To-One database or in external databases.

- The content manager offers tools for creating, classifying, integrating, scheduling and staging all types of content into a site. Any type of information can be included. The content-management system is fully extensible, which means that additional content types can be defined and existing content types can be extended.
- The transaction engine manages electronic commerce (e-commerce) functions within the BroadVision applications. These functions include account enquiry, bill payment, fund transfers, credit checks, tax calculation, shipping calculations, news feeds, order forms, quotes and transaction histories and incentives.
- When an application delivers content to visitors, the observation engine records observations, such as *saw*, *selected* and *purchased*, in order to effect the matching engine outcomes, user profile and reporting.
- All these components are directed by the interaction manager, which manages user sessions and session information (serving hundreds of dynamic Web pages per second) and includes advanced caching.

J2EE application server

The WISE Portal 2.0 solution employs a J2EE application server as an execution environment for

- the portal presentation layer, including its Java-based XML/XSL processors and bricks personality;
- the portal session manager;
- internal use of the WISE Portal 2.0 SDK interfaces; and
- component integration.

The J2EE, which is the *de facto* standard for developing multi-tier enterprise applications, simplifies enterprise applications by basing them on standardized, modular components; providing a complete set of services to the components; and automatically handling many details of application behavior.

J2EE is becoming the preferred model for the development of programmatic services in the portal environment. The J2EE application model encapsulates the layers of functionality in specific types of component. Business logic is encapsulated in Enterprise JavaBean (EJB) components. Client interaction can be presented through plain HTML Web pages, Web pages powered by Java technology-based applets, the Java Servlets API, JavaServer Pages technology, or stand-alone Java applications.

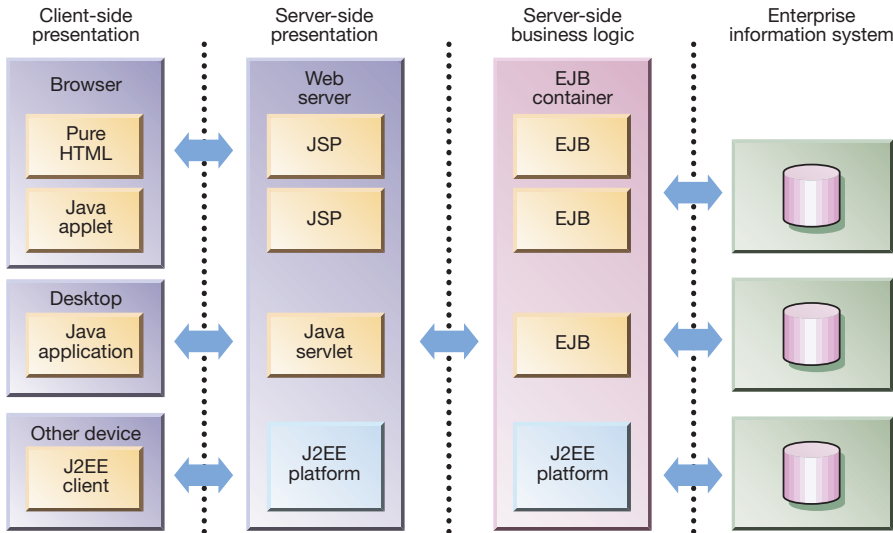


Figure 15
The main components of the J2EE application server.

The J2EE application model divides enterprise applications into three fundamental parts: components, containers and connectors (Figure 15). Components are the key focus of application developers. By contrast, system vendors implement containers and connectors to conceal complexity and promote portability.

Containers, which intercede between clients and components (providing services transparently to both), include transaction support and resource pooling. Container mediation permits the behavior of many components to be specified at deployment time, instead of in program code. The connectors, which are located beneath the J2EE platform (defining a portable service API that plugs into existing enterprise vendor offerings), promote flexibility by enabling the implementation of a variety of services.

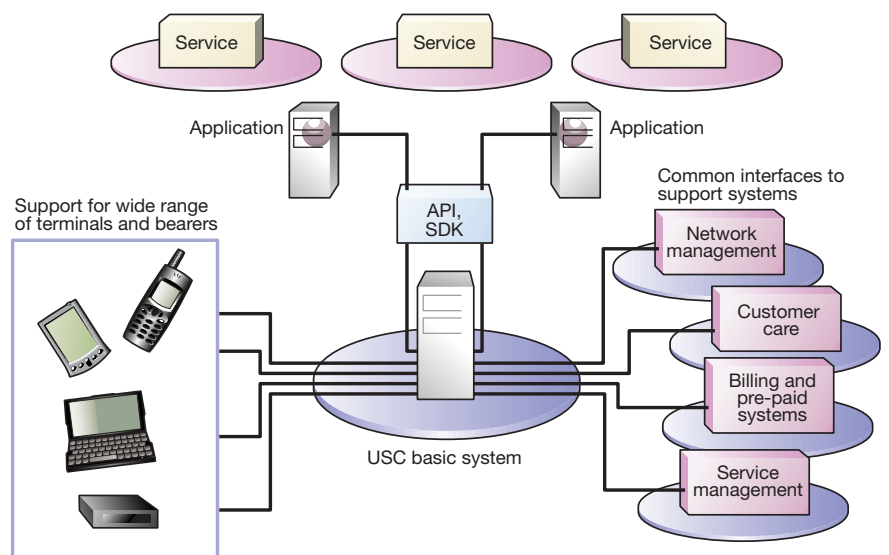
In the future, J2EE technology will be fully integrated into the BroadVision One-To-One architecture and product. It will also be used as an execution environment for applications written using the WISE Portal 2.0 software development kit.

User service center

The USC, which is Ericsson's first step toward a third-generation Service Network¹, supports a variety of Internet-related applications and services from Ericsson and third-

party suppliers. It provides the link between the mobile network and the Internet, and is a complete solution for mobile Internet service providers (ISP). The central functions of the USC are common subscriptions and system management (Figure 16).

Figure 16
Ericsson's user service center is a complete solution for mobile Internet service providers.



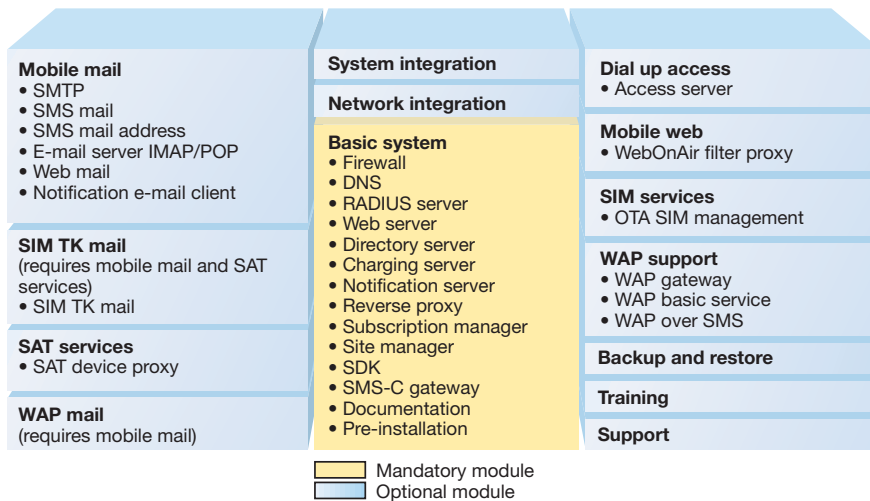


Figure 17
An overview of the USC.

BOX C, KEY FEATURES OF THE BROADVISION PUBLISHING CENTER

Increased publishing process control—content publishers can control the publishing process by

- granting and restricting publishing rights to individual users;
- subjecting content to a workflow process in order of appearance; and
- previewing content before it appears live on the site.

Increased publishing participation—content contributors can submit and edit content using Instant Publisher forms, which are tailored and personalized to each user's access and skill level.

The open solution leverages existing content in the enterprise (for example, in Documentum, Lotus Notes, Microsoft Office) and works with existing authoring tools, such as Macromedia, and versioning tools, such as Interwoven.

Flexible, rule-based interface—Instant Publisher provides personalized and customized forms for casual content contributors and sophisticated content-management tools for content editors.

Content profiling allows authors to profile content, which in turn, enables BroadVision matching agents to deliver personalized content by matching content and user profiles.

Browser compatibility—the Java-based solution supports Web-based publishing access and administration using a Java-compliant browser.

Open content support for content created from any tool, including HTML editors, Microsoft Office products, and Lotus Domino; ability to pull content from external content and document repositories including Documentum and Lotus Notes.

Publishing access control makes it possible to create and populate customizable access-control groups that grant rights (read, edit and approve publishing) to individual publishers.

Publishing workflow (customizable workflow states to support any publishing process) supports multiple start states, state branching, and "pass-back." Each portal can use multiple workflows.

Content scheduling makes it possible to manage a content programming calendar and to schedule content to go online and offline automatically.

Content preview before a presentation is put online.

Instant Publisher forms (simple, personalized, and easy-to-use publishing forms), which are tailored to each user's publishing tasks and skill level, make use of the powerful One-To-One Publishing Center functions, but solely expose what is needed to casual contributors.

The BroadVision One-To-One Publishing Center seamlessly integrates into InterWoven's TeamSite for content versioning and roll-back. Other versioning vendors' products can also be integrated.

The USC can be scaled in terms of performance, availability characteristics, and number of users. It consists of modules (Figure 17) for

- basic IP infrastructure support;
- application support functions;
- operation and maintenance support;
- service capability servers; and
- application and service development support.

The USC is built from standard hardware components, taking advantage of the latest developments in the information technology (IT) industry. This approach ensures that the USC always offers the best performance and provides world-class availability characteristics with trouble-free operator experience at a very competitive price.

In terms of software, the USC consists of a mix of industry-standard software and components developed by Ericsson. This mix gives the right balance between short time to market and suitability for the operator market. In July 2000, USC 1.2 went into commercial operation with operators in Europe and Asia.

Security

Because the USC is connected to external systems, such as the Internet, its services must be protected against unauthorized use. The USC thus provides firewalls, switches, reverse proxies, and remote authorization dial-in user service (RADIUS) servers. Support for the secure socket layer (SSL) protocol and other security features are also provided.

Directory server

Central to the USC architecture is a directory server that maintains all information on subscribers and the services to which they subscribe. The directory server is based on the lightweight directory access protocol (LDAP), to help ensure high performance and conformance to standards. The implementation is currently based on the Netscape Directory Server, which runs on Sun Solaris.

Web server

Many applications require the use of a Web server to host HTML and WML documents and applications. A highly scalable and reliable Web server is tightly integrated into the security architecture of the USC. The Web server can also be used for third-party and operator-specific applications.

Charging service

For services managed by the USC, a built-in charging service offers a variety of charging events. All services can generate charging records by calling the charging API. The subscription manager automatically generates a charging record when an end-user subscribes to or unsubscribes from a service. The charging service software (developed by Ericsson) runs on Sun Solaris.

Site manager

All components within the USC system, as well as the applications it manages, are supervised and managed by the site manager. Operators can thus

- manage complex multi-vendor information systems; and
- control resources, such as network components, computers, operating system, databases, and file stores.

The site manager is based on HP OpenView building blocks and a database whose management console runs on Sun Solaris.

Service capability servers

In current (GSM) mobile networks, an SMS center (SMS-C) is responsible for sending, receiving, storing and forwarding short messages between mobile terminals and servers that use proprietary protocols for communicating with applications.

The USC includes an SMS-C gateway that shields applications from the specific details of each vendor's SMS center. The gateway is based on the Across Wireless Transport Server, which runs on Sun Solaris and supports the major brands of SMS centers.

Application and service development support

The USC is an open system, which—thanks to the service development kit—can serve as a platform for components delivered with the USC, third-party equipment and existing operator equipment. The SDK gives interfaces to charging, subscription-management and notification functions.

Conclusion

More than anything else, the mobile Internet is set to be the most dynamic of markets the industry has ever addressed. Competition encourages users to shop around for services, and fashions change almost overnight. Keeping ahead of the market is one of the secrets of success. This has been a key con-

sideration in the development of the WISE Portal solution.

The open architecture of the WISE Portal enables new services to be created and new technologies to be introduced easily and quickly. *Framework* (the design, implementation and delivery) includes market monitoring and feedback procedures which ensure that changes in taste and demands are identified and responded to immediately.

The WISE Portal 2.0 solution provides a highly adaptable gateway between service providers and users where mobile Internet services can be adapted to meet the changing needs of the market and individual users.

REFERENCES

- 1 Boman, L.: Ericsson's Service network: a "melting pot" for creating and delivering mobile Internet service. *Ericsson Review*, Vol. 78(2001):2, pp. 62-67.
- 2 Swedberg, G.: Ericsson's mobile location solution. *Ericsson Review*, Vol. 76(1999):4, pp. 214-221.

TRADEMARKS

BEA and WebLogic are registered trademarks of BEA Systems, Inc.

BroadVision and the BroadVision logo are trademarks or registered trademarks of BroadVision, Inc. in the United States and other countries. BroadVision One-To-One, BroadVision One-To-One Enterprise, BroadVision® Command Center, and One-To-One Publishing Center are trademarks of BroadVision, Inc.

Documentum is a trademark or registered trademark of Documentum, Inc. in the United States and throughout the world.

The Interwoven and TeamSite name and logo are registered trademarks of Interwoven, Inc.

HP OpenView is a trademark of the Hewlett-Packard Company.

Sun, Sun Microsystems, Solaris, Java, JavaBeans, Enterprise JavaBeans, JavaServer

Pages, and Java Servlet are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

Lotus Domino and Lotus Notes are trademarks or registered trademarks of Lotus Development Corporation.

Macromedia is a trademark or registered trademark of Macromedia, Inc. in the United States and/or other countries.

Microsoft is a U.S. registered trademark of Microsoft Corporation.

Netscape and the Netscape Directory Server are trademarks or registered trademarks of Netscape Communications Corporation in the U.S. and other countries.

WISE is a trademark of Telefonaktiebolaget LM Ericsson.