

The European eHealth Initiative – Objectives and Solutions

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Abstract: eHealth applications are a key factor of success for national health systems. Background, objectives, definitions and an application taxonomy are presented. After this the paper gives a review about background, objectives and actions of the European Commission eHealth-strategy. Examples for card-based solutions in some of the member states are presented and in conclusion the main issues are discussed.

1 eHealth – Background, Objectives and Application Taxonomy

Daily work and leisure of citizens in all industrial countries worldwide are increasing affected by telematic applications. Hotel, ticket and car reservation, shopping via Internet, the retrieval of information in the World Wide Web or in databases, the organisation of company-spanning business processes and many other applications are used more and more. Telematic applications in general are institution-spanning applications independent from time and place to support or automate every kind of business process between business partners. Normally the collaboration is realised by interoperability of the institutional enterprise information systems. Sometimes dedicated functionality of these information systems – for example user-functions for reservations or purchasing or information retrieval like the Medline-Web-functions – are available via Internet for external partners, customers or citizens.

Unfortunately in healthcare work is more often than not paper-based – although treatment and medical decision making is an extremely information processing task. Why this? The special context of healthcare with most confidential information about a person, complex multi-media documentation and multilayered distributed organisation implies theoretical, practical, social, legal, ethical and financial barriers, that retard IT-innovation. But a “condicio sine qua non” for effective eHealth-applications are powerful and interoperable enterprise information systems in the care organisations. The

dissemination of medical enterprise information systems in hospitals, general practices, care services and other institutions supporting the internal documentation, organisation and communication is mandatory for eHealth. Additionally the interoperability of these information systems to support institution-spanning administrative and medical processes and documentations is also indispensable.

The background of the above mentioned common telematics development and the demographic and financial challenges puts now *more and more pressure* to health care organisations and health systems, *to use informatics and telematics applications* in an adequate manner – like in other lines of business.

The *definition of the term eHealth* is quiet delicate. There are varied definitions of eHealth and they depend on the role of the contemplater. Oh et. al. (Oh05) analysed 51 unique definitions and identified two universal themes (health and technology) and six less general themes (commerce, activities, stakeholders, outcomes, place and perspectives). The result of the analyses showed: There are numerous different definitions of the term “eHealth” and Oh argues that there is a tacit understanding of its meaning. The World Health Organisation i.e. defines: "eHealth is the use, in the health sector, of digital data – transmitted, stored and retrieved electronically – in support of health care, both at the local site and at a distance." (<http://www.who.int/eht/eHealthHCD/en/>, last access 29th Juli 2006). In the glossary of CEN/TC 251 – the European standardisation organisation for medical informatics – the term „eHealth“ is not present, but a definition of “telemedicine” is given as: „Telemedicine: Investigation, monitoring and management of patients which allow ready access to expert advice and patient information, irrespective of the distance or location of the patient or expertise or relevant information.“ (www.centc251.org/Ginfo/glossary/glosmen2.htm, last access january 2005) A more generic definition gives Haas (Ha2006): “The term eHealth – synonym health telematics – subsumes integrated use of information- and telecommunication-technology in healthcare to bridge place and time.”

Looking to definitions and implicated *objectives of eHealth*, there are *strategic objectives* from society, policy makers and insurance companies’ point of view as:

- Increased effectiveness of patient care, thereby cost saving,
- increased quality of care,
- entire transparency of treatment performance and resource consumption,
- profound data for health reporting and health system planning,
- developing new markets by means of new eHealth applications and medical services, thereby strengthening the health industry,
- improvement of patient safety,
- involvement of the patient and increased responsibility (patient empowerment).

The *operative objectives* from patients and health professionals point of view are:

- simplification of medical, administrative and billing processes,
- improved institution-spanning transparency of information for the treating health

- professionals about retrospective history and actual health status of patients,
- improved institution-spanning prospective planning and coordination of treatment to implement a patient centered disease- or case-management,
- improved access to up-to-date medical knowledge – also context-sensitive access during treatment procedures and
- improved flexibility in (further) education independent from place and time.

Against the background of varied eHealth applications a *taxonomy* can help to structure applications. At top level three eHealth application classes can be identified:

- Applications that directly support or connected with patient treatment.
- Applications that support information and knowledge retrieval or distance learning for citizens, patients and health professionals, but also for medical information systems like hospital information systems or systems in general practice.
- Applications that support research and health reporting.

The classes – especially the first one – can be divided in subclasses, according to the specific support of the applications.

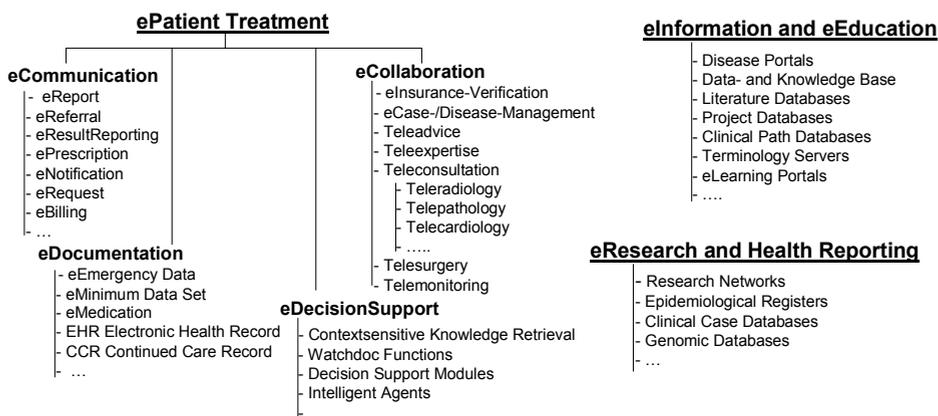


figure 1: Taxonomy of eHealth applications

2 Action Plan for a European eHealth Area

2.1 History and background

In December 1999 the European Commission introduced the initiative “eEurope – An Information Society For All” (EC99). The objective was “to bring every citizen, home and school, every business and administration into the digital age and online, creating a digitally literate Europe and to ensure, that the whole process is socially inclusive with high consumer trust and strengthens social cohesion.” One of the 10 defined areas of

activities was called “healthcare online” with the objectives, to improve the quality and accessibility of health care for all citizens of the Union, whilst constraining overall costs. The targets i.e. by the end of the year 2003 (“All European citizens should have the possibility to have a health smart card to enable secure and confidential access to networked patient information”) and by the end of 2004 (“All health professionals and managers should be linked to a telematic health infrastructure for prevention, diagnosis and treatment”) were ambitious – and could not be achieved. The “eEurope action plan 2002” (EC00) was launched with three main objectives: A cheaper, faster, secure Internet, investing in people and skill and stimulate the use of the Internet in different business areas – also in healthcare. On the basis of these action plans “eEurope 2005 – An information society for all” (EC02) was launched at the Seville European Council in June 2002 with core objectives to stimulate secure services, applications and content – based on a widely available broadband infrastructure. Also indicators, so called “policy measures” were defined for benchmarking national progress. The latest plan is the strategic framework “i2010 – A European Information Society for growth and employment” (EC05), that gives broad policy orientation for the way to a *single European information space*, were not only fast networks are critical factors of success, but also rich content of the applications, interoperability of systems and services and security to increase trust amongst investors and consumers. As key bottlenecks and research fields are addressed here: interoperability, security and reliability, identity management, rights management and ease of use – together with the patients informational self-determination also the bottlenecks for implementing (inter)national eHealth platforms.

All above-mentioned action plans showed the difficulty, to address complex business areas like healthcare in such common plans in detail. Except the first two plans, all following papers defined objectives and actions in a more generic way and significant for all lines of business.

For healthcare the EU focused in their health strategy on the major challenges to create a common health market for all European citizens. “I am convinced that as European integration and globalisation progress, this process of adaptation cannot take place solely at national level. There must be a role for the Community to influence further, health and health systems in Europe.” (By2002) Byrne also emphasised the important role of information: “Finally, I am convinced that the Community has an important role to play in the dissemination of information and the empowerment of citizens. Many of whom have become active partners in managing their own health. One key action is to improve health information and make it more widely available. By ensuring easy access to timely, accurate and authoritative information, we can minimise the risk of people relying on partial, biased or misleading information and advice. ... A major action will be the establishment of a health portal, which can point patients towards authoritative online information.”

The corollary of eEurope-plans and EU health strategy was, to evolve a special strategy for eHealth. The active process started in 2003 with the ministerial declaration on eHealth (EC03). “eHealth refers to the use of modern information and communication technologies to meet needs of citizens, patients, healthcare professionals, healthcare

providers, as well as policy makers. On this occasion, Ministers expressed their commitment to the development of national and regional eHealth implementation plans as an integral part of eEurope 2005". This declaration defined the cornerstones for the first special action plan "eHealth - making healthcare better for European citizens: An action plan for a European eHealth Area" published in April 2004 (EC04).

A core activity of EU to give more international transparency about the different national approaches is the support of the organisation of so called "eHealth Higher Level Conferences". This platform enables policy makers, experts and practitioners and other stakeholders in eHealth since 2003 to discuss objectives, national strategies and dedicated problems as well as implementations and the ongoing experiences. Informative Web-Sites to most conferences are available: The first of these conferences took place in Brussels (Belgium), 22-23 May 2003 (http://europa.eu.int/information_society/europe/ehealth/conference/2003/programme/index_en.htm, last access 27th July 2006), the second in Cork (Ireland), 5-6 May 2004, the third in Tromso (Norway), 22-23 May 2005 (<http://www.ehealth2005.no/index.php?cat=30679>, last access 27th July 2006) and the fourth in Malaga (Spain), 10-12 May 2006 (<http://www.ehealthconference2006.org/>, last access 27th July 2006).

2.2 Challenges and Expectations

The eHealth action plan outlines at first the challenges for most of the countries of the Union, i.e.:

- Rising demand for health services, due to an aging population, higher income and educational levels,
- increasing expectations of the citizens regarding quality and availability of health services,
- increasing mobility of patients and health professionals,
- management of huge amounts of health information in a secure and accessible way for the use in different context.

The expectations presented are grouped into the different point of views: The *care organisations* with eHealth technologies in combination with organisational changes and development of new skills may provide better services and offer these to a great community. Also improved efficiency and productivity will take place. The *health consumers* may benefit from better health education and will be able to manage their own diseases, risks and lifestyle. Also their competence for involvement in decisions related to their own health can improve. Managing their own electronic health record may also improve quality of care and patient safety. For the *health professionals* eHealth on the one hand supports the lifelong learning and education as well as the access to actual and evidence based medical knowledge. On the other hand the fast and easy access to electronic health records at the point of need may support the daily work of health professionals in many ways. A better management of public health and clinical health is one of the targets for *health authorities and health managers* and can be undertaken only on the basis of comprehensive and qualitative administrative and

clinical data. With eHealth technology exchange of experience and data and benchmarking can be realized on national and European level. Last but not least the *eHealth industry* will benefit from broader deployment of ICT in healthcare and so endorse the objectives of i2010.

2.3 The major challenges

eHealth systems and services in today patient and health professional life are not often present. Beside of many pilot projects real productive and comprehensive applications can not be found often. The eHealth action plan emphasises the following *challenges to wider implementation*:

- Commitment and leadership of health authorities.
- Interoperability of eHealth systems and services to bring the different institutional information systems together to enable institution spanning business processes and transparent data access.
- User friendliness of EHealth systems and services i.e. through fast connection and high speed, good integration of eHealth functionality in information systems.
- Standardisation of eHealth technologies, accreditation of products and the harmonisation of national regulations to enable eHealth industry and health institutions future-proof investments.
- Harmonised concepts and solutions for confidentiality and security. For medical data are the most sensitive data in information society, a special code of conduct for this domain is necessary – for health professionals but also for systems and services.
- Issues relating to the mobility of patients, including the cross border circulation of goods and services, among which eHealth services are of growing importance. So a European strategy is needed to ensure that citizens can exercise their rights to seek care in other Member States if they wish.
- Implementation of a stronger cooperation among health providers across Europe. I.e. the establishment of European networks of reference to provide healthcare services for conditions, where they need special expertise.
- Needs and interests of citizens, patients and health professionals as primary users of eHealth systems should be better integrated into the development and promotion.
- A global community requires the access for all groups of society to eHealth systems and services.
- A common understanding and concerted efforts are needed by all stakeholders, because a successful implementation requires understanding and active co-operation of all the others.

2.4 Action Plan

The European eHealth action plan is divided in three target areas:

- To address common challenges and create the right framework to support eHealth,

- pilot actions to jump start the delivery of eHealth, and
- sharing best practices and measuring progress.

To target area 1 the following objectives are defined:

- *Health authorities leadership*, by the end of 2005: “Each Member State is to develop a national or regional roadmap for eHealth. This should focus on deploying eHealth systems, setting targets for interoperability and the use of electronic health records, and address issues such as the reimbursement of eHealth services.”
- Fostering *Interoperability of health information systems* through support actions that cover the development of standards and exploration of the possibilities of open source applications, support of reference implementations for care services and the exchange of experience in the use of standards and open source solutions.
- Support of the development of standards for a common approach to *patient identifiers* and *electronic health record architecture*. “By end 2006, Member States, in collaboration with the European Commission, should identify a common approach to patient identifiers. ...”
- *Interoperability of electronic health records*: “By end 2006, Member States, in collaboration with the European Commission, should identify and outline interoperability standards for health data messages and electronic health records, taking into account best practices and relevant standardisation efforts.”
- Support of the *mobility of patients and health professionals* i.e. through improving the exchange of information and establishing specialised reference centres for health information.
- The availability and affordability of secure and fast networks with special eHealth services on top – so the *infrastructure and technologies* – are a crucial success factor in establishing an international eHealth Community. “During the period 2004-2008, Member States should support deployment of health information networks for eHealth based on fixed and wireless broadband and mobile infrastructures and Grid technologies.”
- The special aspects of health information call for secure and certified components in eHealth. *Conformity testing and accreditation* can guarantee good quality of products and services. “By mid 2005, the Commission should produce a summary of European best practices as guidance for Member States and by end 2007, a Member States should adopt conformity testing and accreditation schemes following successful best practices.”
- Like mentioned above, a future-proof investment – i.e. for international acting ICT-industry – today is hardly to realise. To accelerate the deployment of eHealth, investments of the basis of standards, reference models and implementations should be funded. “By end 2006, a collaborative approach should be undertaken among Member States to supporting and boosting investment in eHealth.”
- Last but not least a lot of *legal and regulatory* issues are addressed. For this a baseline of regulations and frameworks should be defined.

For target area 2 “Pilot actions” the action plan envisions by the end of 2005 a European

Union *public health portal* and a strengthening of early warning, detection and surveillance of health threats through enhanced information and communication technologies tools. Also an *integrated information health network* linking hospitals, pharmacies, primary care and social centres and promotion of the use of cards in healthcare, that carry emergency data or medical networks are issues of this action area. “By end 2008, the majority of all European health organisations and health regions (communities, counties, districts) should be able to provide online services such as teleconsultation (second medical opinion), e-prescription, e-referral, telemonitoring and telecare.”

Objectives of the target area 3 “Working together and monitoring practice” are the *dissemination of best practices, benchmarking of progress* and *international collaboration*. During 2004 and 2010 a European study on the state of the art in deployment, examples of best practice and benefits of eHealth should be published, by the start of 2005 an overall approach to benchmarking should be available.

2.3 State of Activities

The objectives and action timetable in the European eHealth action plan are still ambitious and could not be achieved. But the plan led to extensive national activities in the member states, some of them published comprehensive national strategies and started the development and dissemination of defined health telematics applications like e-prescription, e-report, patient health cards and health professional cards. The yearly “high level conference” brought transparency to the national activities and the next steps still in operation. The “2006 ICT Standardisation Work Program” [EC06a] lists three actions for eHealth: *Action 23* highlights the further standardisation work, based on a detailed and well documented work programme, *Action 24* focus to the deployment of the European Health Insurance Card (EHIC) and *Action 25* focus to the question, how standardisation could play a role in fostering activities concerning the coding of information and the traceability of human tissues and cells pursuant.

The in May 2006 published paper “eHealth Interoperability Staff Working Paper “Connected Health: Quality and Safety for European Citizens” (EC06b) shows with unabashed openness: “To make further progress towards health systems and services that are connected at the local, regional, national and pan-European level further concrete steps are urgently needed.” Also the EU has realised now the complexity of eHealth and the fact, that other aspects than technological solutions hamper rapid development: “One finding is that interoperability is not just a technical matter. It is about legal, ethical, economic, social, medical, organisational, and cultural matters. To approach eHealth interoperability, all these aspects need to be addressed. It could be argued that, under certain conditions, the technical requisites for eHealth interoperability may be the ones that can be more easily fulfilled in this complex equation.” The paper defines as result of the short term activities a “Recommendation on European eHealth Interoperability” which will be issued during 2007 – also ambitious. Specific topics identified are *Identification and authentication of actors and organisations, Patient summaries, Emergency data set, Infrastructure, Authorisation and Sustainability of the financial*

model.

This seems to be one of the first concrete steps to give eHealth industry the basis for future-proof investments to realise eHealth applications i.e. electronic health record systems. The EU action plan now is on the way to foster investments and to achieve the since a long time presented objectives of eEurope 2005 and eHealth action plan.

3 Examples of National Activities: Health Card Implementations

As already mentioned earlier the objectives of the several European plans could not be achieved in all cases, but at least they stimulated strategies for a telematic infrastructure in a lot of member states, many of them starting with the introduction of a health card. Presently there are card systems or pilots implemented in 10 European countries, namely in Austria, Belgium, Czech Republic, France, Germany, Ireland, Italy, Netherlands, Norway and Slovenia. Some countries have gained experience in several pilots, four systems run on a nationwide basis and will be briefly presented in the following.

The European Commission funded several projects to gain experience in the use of such cards and to stimulate their introduction in Europe. The best known in this series are DIABCARD, CARDLINK and NETLINK.

Most of the smart card and IT network software applications deployed in the scheme of local or national health information systems are however available only in the context of national regulation - they were designed for the national or local health care information system. Most of the services provided by such systems are not available abroad and many may not even be interoperable between different regions within the same country. Administrative procedures for international cases therefore still rely on paper in the Member States even where smart cards are used. In the Member States where patient clinical data are, or will be, electronically available (i.e. on smart cards or through networks), Health Professionals still cannot in international cases have access to the patient clinical data, even in an emergency situation. Standards will help to gain that desired interoperability. In Example there is an eight part standard under development in the ISO TC 215 "Health Informatics" Working Group 5 "Cards" on "Patient Healthcard Data". Parts 1 to 3 have been published officially as ISO – Standards ISO/IS 21549 1 – 3 on May 15th 2004 including definitions of a limited emergency data set, immunisation and blood transfusion details. This will be extremely helpful for all countries planning to introduce cards with medical content. The other parts are in different stages of development inside the standardisation process.

The Belgium SIS - Card

The Belgian Health Coverage's (Mutualités Belges) Social Identity System (SIS) requires smart cards for patients and doctors, pharmacists, hospitals (where the third party paying system applies). It should enable more rational management of the health sector and also help to simplify reimbursement.

The SIS health insurance card became mandatory for all social insured citizens (about

10.5 million) in the beginning of the year 2000 and contains a microchip with information about the person's health insurance. The SIS card is personal and stores two types of data in its memory chip: Unprotected data, visibly indicated on the card and also keyed in electronically using a reader. Protected data, which only key holders can access with a professional health service card called SAM and PIN verification.

The French Vitale Card

Today's Vitale card is a microprocessor card containing roughly eight pages of text and replacing the standard paper individual health insurance card. The first, family version (Vitale 1) of the card contains administrative data, available to physicians for the immediate printout of a health claim form during the visit. The Sesame-Vitale card is the heart of the health network (Reseau Sante-Social - RSS), aiming to link through a secured computer network each individual patient with all kinds of healthcare providers. Already more than 45 million of these cards have been issued.

The second card generation (Vitale 2) - an individual health card - will include medical information, that will only be available to health professionals using a 'health professional card' for identification. 65 million of these cards will be rolled out.

Parallel to the Vitale 1 card, France introduced a Health Professional Card (CPS – Carte de Professionnel de Santé). It identifies the Health professional and also provides authentication, digital signature and data encryption. Pharmacists and medical staff also receive a card, which can easily be recognised by its colour.

The German Cards

In 1992 a law was enacted which ordered the introduction of *smart cards* for all statutory health insurances. In 1994 over 80 Million cards were issued. In addition, over 147.000 card readers and dot matrix printers were issued to all licensed statutory physicians as well as ambulatory centers and old people's homes. The focus of these cards was naturally the administrative data of the statutory health insurance system. So to this day, almost all German citizens have and use one of these cards.

With the last health care reform, effective since Januar 2004, the so-called Statutory Health Insurance Modernisation Law, a comprehensive legal basis for implementing health telematics in the German health system has been set up within the German Social Code V. The new legislation for the first time supports the priority of Electronic Communication within the Health System. Further regulations i.e. allow the Financing of Personal Electronic Health Records by the Statutory Health Insurance Funds.

Of special importance are the regulations for the new health insurance, like the electronic prescription as obligatory application, access using Qualified Electronic Signature and a comprehensive infrastructure for Health Telematics Applications like the Electronic Health Record. Based on the legislation on the information, communication and security infrastructure the organisations of the self governing system have meanwhile established a task force to prepare the necessary steps. The first laboratory tests and "mini"-tests with patient healthcard and health professional card started mid 2006.

As a consequence of this new legislation, also a Health Professional Card became mandatory. In 2003 the specification version 2.0 had been finalized, officially approved and made available for pilot projects, the distribution of this cards started at the end of 2005. This official *German Physicians' ID* implements five different functions, which are specific to the user as a person: First, this card is a classic visual identification card with a personalisation, including a picture. A second, similar function is in the electronic chip where a base certificate electronically signed by the issuing Medical Association identifies the holder by name and digitised picture and specifies his role as a physician. All other functions, specifically three private keys from asymmetric key pairs, are protected by a PIN and have to be explicitly activated. Each of these keys is dedicated to a specific purpose like authentication within a medical application system, for transport encryption and for the generation of a personal electronic signature. A set of specific attribute certificates issued by the state Medical Association or the state Administration of Office Based Physicians can be appended to this signature by the signer if he so wishes.

The Slovenian Health Insurance Card

Following a four-year period of design and development, the introduction of the health insurance card in Slovene health care was completed in October 2000. Through this project, the entire Slovene health care system relies on electronic documents certifying health insurance (the health insurance card - 'HIC'), with a virtual network interconnecting health insurers and all health care service providers. The HIC system, which effectively combines smart card technology and network services, consists of the following technological components: insured person's cards, health professional cards, health care service providers' data processing environment, and an on-line network of self-service terminals. The system has been 'up and running' in all regions since its introduction. The evaluation results of monitoring this new mode of work have demonstrated that the card has been accepted by the insured, health care professionals, and the staff of insurance providers as a normal mode of routine work. The goals set for the projects' first phase have been achieved. The insured, physicians, pharmacists, health care professionals and the insurance providers are interconnected by an electronic system providing fast and user-friendly communication, as well as a higher degree of identification and accountability. The system offers opportunities for advanced organisation of operations, as well as neat and controlled individualisation of services in the health care sector - these are preconditions for well-regulated and transparent operation.

6 Conclusion

eHealth subsumes integrated use of information- and telecommunication-technology in healthcare to bridge place and time. Main application classes are those which directly support patient treatment, applications supporting information and knowledge retrieval and education, applications for research and health reporting.

While on the one hand demographic and financial challenges require effective use of

resources – only reachable with telematics support – on the other hand the healthcare context implies theoretical, practical, social, legal, ethical and financial barriers, that retard dissemination of eHealth applications. eHealth applications have high complexity and their introduction into healthcare is not only a technical artefact, because “It is about legal, ethical, economic, social, medical, organisational, and cultural matters” (EC06b).

The European Commission launched in 1999 an active strategy for a European information society and gave more details for healthcare from 2003. Ambitious objectives and timetable at the beginning left out of consideration the complexity of eHealth. Latest action plans focus on an interoperability framework and address now six important areas: Identification and authentication of actors and organisations, Patient summaries, Emergency data set, Infrastructure, Authorisation and Sustainability of the financial model. But the availability of a (inter)national eHealth platform is not sufficient: One key to success for treatment oriented eHealth applications i.e. e-prescription, e-order-communication, electronic health record is also the availability of interoperable enterprise information systems installed in all health care organisations. The interoperability requires a broad range of technical and semantic standards, accepted by all members of the Union.

EU initiative led to extensive national activities in the member states, most of them defined comprehensive national strategies and started the development and dissemination of defined health telematics applications. Health professional cards and patient health cards play and will play a key role for infrastructure and are introduced in many member states. But unlimited eHealth applications in Europe will not work in the near future because many of the real issues are still unsolved.

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