

# PERIKLIS - Electronic Democracy in the 21st Century Using Mobile and Social Network Technologies

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**Abstract:** PERIKLIS is a Greek National project for the development of an innovative e-Government platform for public services, using mobile and social network technologies. PERIKLIS consists of a content management system for publishing, editing and modifying content in both desktop and mobile and a middleware framework containing core functionalities and intelligence. The main services of the platform include: identity management, social relations analysis, degree of reliability calculation, interoperability with various social networking sites and e-Government services and provision of geo-located services. PERIKLIS e-government platform will be evaluated in two major national pilots. This work presents the core modules and system architecture plus their innovative research solutions for its construction and implementation.

## 1 Introduction

One of the main obstacles that may hinder the success of e-Government is the very low level of citizens' participation. Until now, most public services using electronic governance as a means of gathering public opinion and encourage participation in political issues, interact with a limited subset of the population; usually people who have the motivation and technological skills.

To encourage participation in public issues from a wider number of citizens, e-Government services should use innovative and widely used means to interact with the public. Indeed, citizens are more likely to want to interact online with government, by using technologies which they are accustomed to use in other aspects of their lives. For example, social networks during the last few years have dramatically increased their popularity, attracting a large number of users, who spend a significant amount of their time each day, in one of the leading social networking services (e.g., Facebook, Twitter).

In addition, one of the most difficult challenges for the e-Government services is how to deal with those people who do not want or cannot connect to the Internet. Today, mobile phone usage is widespread. Although mobile phones are used primarily for making phone calls and sending text messages, they also have personal computer functions that offer a way to interact with online public services. So the next logical step is the realization of the idea of a mobile government open to all and allowing citizens and public agencies to interact through the web, using mobile devices, barcodes sent as pictures, text messages and many other simple but powerful mechanisms.

PERIKLIS is a Greek National projects, funded from EU and Hellenic Government from ESPA funding scheme<sup>1</sup>, whose goal is to improve quality of life in the urban environment by increasing opportunities for interaction between citizens and between citizens and public services, through the use of mobile and social network technologies. In this way the goals of open government and transparency are achieved. The core services of the platform will allow users to interact with contacts from existing online communities such as social networks, and to enter and retrieve information from their mobile device (phone, tablet, etc.), while moving into the city and taking into account the current location. PERIKLIS will be evaluated in two use cases. The project results are expected to improve the way public services can "hear and be heard by the people".

The remainder is as follows: In Section 2 we report on previous work. Section 3 presents PERIKLIS platform architecture. In Section 4 we elaborate on PERIKLIS intelligent services and the various research, algorithmic and technological challenges. We also present the uses cases considered in Section 5. Finally, Section 6 concludes this paper.

## 2 Previous Work

Following the rapid growth of social networking, a number of e-government platforms and initiatives have emerged trying to take advantage of the popularity of virtual communities for government purposes. An indicative list of such initiatives includes the following: the official site of the UK Prime Minister's Office<sup>2</sup>, the Scottish Parliament ePetition platform<sup>3</sup>, BBC Action Network, Debatedepedia<sup>4</sup>, e-Consultation<sup>5</sup>, EPA.net<sup>6</sup>, East Palo Alto Community Network<sup>7</sup>, eDemocracy online forums<sup>0</sup>, Estonian state portal "Today I Decide"<sup>0</sup>.

While many of these initiatives have to some extent been successful in engaging communities in political discussions and exchange of ideas they have in their majority failed to meet with the requirements of the government agencies that employed them<sup>0 0</sup>, for a number of reasons. Firstly, these e-Government tools are predominantly applied using their own portals and these are partly inefficient because they lack scaling<sup>0</sup>, in the sense that they focus on specific groups without being able to easily ex-tend them (e.g., they

<sup>1</sup> <http://www.espa.gr>, Retrieved 2013

<sup>2</sup> UK PM: <http://www.number10.gov.uk/>, Retrieved January 20, 2011

<sup>3</sup> <http://epetitions.scottish.parliament.uk>, Retrieved Jan 20, 2011

<sup>4</sup> <http://debatedepedia.com/>, Retrieved January 2010

<sup>5</sup> <http://www.e-consultation.org/>: Retrieved January 27, 2011

<sup>6</sup> <http://www.epa.net/>, Retrieved January 2010

<sup>7</sup> <http://talklaw.co.nz/>, Retrieved January 27, 2011

focus on national level without being easily moved to international level). Secondly, by their very nature, the government agencies have a narrow focus, both in time and subject. They tend to focus on specific and simple topics, often aligned with the agency's central objective, and frequently fail to provide a holistic, long term view of an action's consequences. Thirdly, usually participation is restricted to specific target groups or citizens motivated enough by the service in question, so as to invest time in participating 00. The particular service provided may lie far outside of the general interests of certain groups of the society, such as the young or the old, people from particular regions, of particular faiths, genders or professions. The consequence is that "social capital created by opening up governance to community involvement tends to be concentrated in the hands of this small group" 0. In conclusion, existing e-Government attempts to capture the wisdom of the crowds still rely on attracting people to visit their dedicated sites rather than trying to reach out to existing communities.

### 3 Architecture

The basic architecture of PERIKLIS is presented in Figure 1. PERIKLIS platform needs to support the management of the data provided by the users. The Internet systems that implement the procedures for managing and accessing such data are the web content management systems (CMS). PERIKLIS incorporates such a CMS for publishing, editing and modifying content, while the basic functionalities of the platform are implemented by middleware services. After considering a number of known CMS (WordPress, Business Catalyst/Goodbary, Joomla!, Drupal , DotNetNuke, TYPOLight, SilverStripe, Alfresco, Concrete5, MODx), it has been decided after evaluation that PERIKLIS will use e-Centric CMS, mainly due to the project requirements and related partners expertise in this software framework. Two user interfaces have been designed and implemented for desktop computers and "smart" mobile devices/phones (smartphones) respectively.

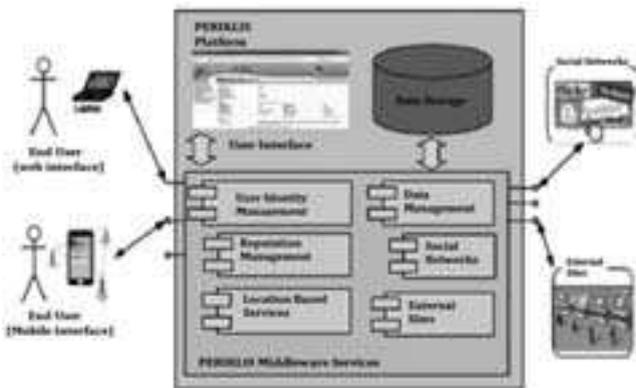


Figure 1: PERIKLIS basic architecture.

The main functionality of the PERIKLIS platform is implemented by the middleware services. The basic middleware services respond to the actions performed by the end user in the user interface (web interface or mobile interface), by receiving, storing and retrieving (e.g., searching) data to and from the "data warehouse".

Intelligent services (Identity Management Service, Data Management, User Location Services, Grade Reliability Assessment Service) give added value to the platform. The basic intelligent middleware services are exposed to the user interface (CMS) through a programming interface SOAP, the PERIKLIS application programming interface (API), which can be used independently from the remaining components of the platform.

## 4 Intelligent Services

Intelligent services include: i) Identity Management Service, ii) Data Management, iii) User Location Services, iv) Grade Reliability Assessment Service. The first two services have been implemented to a large extent while the latter two are in the design and development phase. Additionally, Data Management and Grade Reliability Assessment services are design and implemented in a way that permits their execution over cloud computing infrastructures. This is more than necessary considering cases where large amount of input data (“big data”) are provided that require the scalability of the proposed services during their analysis. This for example can be the case when PERIKLIS will serve all the Greece’s Municipalities.

### 4.1 Identity Management Service

A key challenge in the implementation of PERIKLIS is to manage the identity of the parties involved, whether legal or natural persons. Additionally, an important criterion for the success of the platform is the confidence end users (e.g., citizens of a society) that will show to Information Technologies (IT). Citizens may be reluctant to express their opinion about a topic covered (e.g., civil action), if they are unsure of their anonymity, especially when it comes to interaction with government agencies.

Identity management refers to the use of technology to manage information about user authentication and access control to the resources of the platform PERIKLIS. Identity management service includes the following procedures:

- *user registration*: This process allows the user to register on the platform.
- *user authentication through other social networks*: The process of user identification through other social networks allows users to enter the platform through their account from a social networking site (e.g., Facebook, Twitter).
- *user authentication through government systems*: This functionality aims to authenticate users via the platform interface with government certified information systems. Thereby ensuring the safety features as well as confidentiality, since people can register on the platform but do not need to provide authentication credentials. This feature is particularly important and increases the reliability of the platform PERIKLIS reducing to the least possible existence of false or malicious users. To realize this functionality PERIKLIS interacts, using web services (SOAP), with services offered by the Greek E-Government Social Security Administration (IDIKA - [www.idika.gr/](http://www.idika.gr/)). The certification of users is performed using their personal Social Security Number-SSN. The SSN is an important personal element and all Greek citizens are required to have the time of their birth. This service takes

as input the SSN (11 numbers) of a person and returns the data entered in the National Register for this SSN and the SSN force.

## 4.2 Data Management

The data management service analyzes the large volume of data entered by users in the CMS, producing useful analytics. This service will be useful to all users (citizens, government employees etc), providing recommendations for users with similar interests, for events or services related to the characteristics of users and other. The service includes three modules: i) the *aggregation unit*, ii) the *data processing unit* and iii) the *publishing unit*. The aggregation unit is responsible for the initial processing of the data and the application of well-defined filters in them, in order to remove non-essential or false (intentionally or not) information, as well as aggregating them to better and faster processing them. The data processing unit gathers all the algorithms and mechanisms for the extraction and exploitation of information. The data processing unit receives data from the aggregation unit, which is assigned to the appropriate algorithm or/and mechanism. The publishing unit provides the necessary mechanisms to update the platform with the new analyzed data.

In the data processing unit PERIKLIS uses social network analysis and event detection methodologies. The former are used in order to identify important entities (users, departments, topics) based on the user behavior, while the latter to detect new events based on the user posts in the PERIKLIS forums. The analysis of social networks (Social Network Analysis - SNA) is the systematic analysis of social networks, with emphasis on relationships between two or social entities. These networks are often represented as a graph, where nodes are shown as points and edges as bonds.

PERIKLIS defines a set of social graphs based on public sector related entities (user, department, topic) that capture the relationships between them, and then on these graphs applies various centrality based metrics  $0$ . The data processing unit produces the following information: i) users who are the most important, ii) topics with keen interest. Event detection methodology is based on  $0$  wherein signals are specified for individual words. These signals indicate the time "performance" of a word. In its simplest form such a word signal indicates the number of occurrences of the word in the forum posts collected in each period. A wavelet analysis is performed in these signals for easier processing and storage. The cross-correlations of these signals are calculated to filter not so important words and to determine a correlation graph of word signals. New events (groups of words that relate) are detected by suitably bisecting the created graph.

## 4.3 User Location Services

PERIKLIS system plans to offer the following location related services:

- Users will have the option using the PERIKLIS mobile application to publish their location information. In this way, information relating to the environment will be captured in photos, videos, voice notes, and text notes the user is publishing. Users through their mobile applications will also be able to choose whether to send or post

them to the central server, how often will do this, or which other users can see the location in which they are located.

- Users with the help of GPS in their mobile devices, will be able to find other users, who are near or events that occur around them.
- Participation in PERIKLIS events (e.g. polls) is possible only to users located in a pre-defined area. For example, if a poll is set up on a particular place (e.g. a park) for a related purpose (e.g. reconstruction of the park), it will be possible to enable voting permission to only those users located within the park or very close to it.

#### **4.4 Grade Reliability Assessment Service**

The viability of the platform will be achieved not only by providing citizens with assurances that their data is safe but also by providing them with reliable and useful information that they can rely on. It is therefore necessary to develop mechanisms to evaluate users based on their background and behavior in the PERIKLIS platform and determine whether the information provided may contain some value for society. Thus this service's goal is to achieve a quality control that aims to isolate incidents of malicious or unnecessary use of the platform and to establish its credibility. This will be achieved by developing mechanisms that detect malware behavior patterns and assign low degree of reliability to users who exhibit similar behaviors. Users with consistently low reliability may accept recommendations or eventually deleted from the system. The reliability can also be used to determine the allowable actions of a user on the platform. For example, the manager of the platform can be configured, so that only users with a degree of reliability and above can raise a problem report, or the employee creates a new discussion with sensitive topics to restrict the ability to add comments on the basis of the degree of users reliability. The reliability will also be used as a filter, when analyzing the results and presenting them to the end user. For example, when creating a poll, the end user may not wish to exclude the participation of unreliable users, but it is nevertheless useful for him to filter the results based on the reliability of the participants, in order to receive more accurate conclusions.

## **5 Evaluation**

PERIKLIS e-government platform will be evaluated under two use cases. The use cases titled "Citizens and Politics" and "Concerned Citizens in Action" were selected to cover a possible wider range of functions of the platform. These use cases are highly correlated with the daily operations of a Municipality along with the needs of the citizens for participation. As the usage of mobile phones in Greece is quite high (1st position among EU countries in mobile subscriptions in 2009 [Eu12]), we believe PERIKLIS will open through its scenarios new era in use ability of ICT e-government services.

### **5.1 Use Case: Citizens & Politics**

A government agency sets up a cooperation platform that pulls users from popular social networking sites. In this platform users can interact with each other i.e. set up polls, participate in forum discussions, create/sign petitions, etc. Polls and topics in forum

discussions can also be initiated by the government agencies that want to assess public opinion on diverse governmental issues. The public will use this platform to receive updates on community matters, such as upcoming elections, quality of life, etc.

A citizen may want to gather like-minded fellow citizens in taking specific actions against a political or business decision and initiate a petition (on-the-fly). As opposed to what is already available (e.g. <http://www.petitiononline.com>), the user can directly reach interested people within the community and potentially even initiate discussion groups. Furthermore, signers are identified through their profile in the infrastructure. This is an advantage to the current simple e-mail implementation, which allows the same individual to sign several times, thus rendering the petition results principally untrustworthy. This, for instance, can even be extended by integrating a simple policy language into the API, which allows interested parties (politicians, industry, etc.) to be informed of the petition as soon as the amount of signatures crosses a certain threshold.

In a typical use case, a governmental body would be interested e.g., in making a living area equally attractive to younger and elderly people – a situation that typically clashes due to the different interests. Thanks to the PERIKLIS infrastructure, elderly and younger people can actually discuss the issue together and provide relevant feedback in a condensed form to the query issuer. The infrastructure will thereby take care that all interest groups can get the information in a form appropriate to them.

The results can be analyzed on the basis of common agreements and substantial disagreements, allowing for additional plugging in of statistical analysis filters, visualization tools etc. allowing the query issuer to basically interactively see the results of the poll. As the system allows for full participation of all members, the query issuer can directly intervene in the discussion, and / or adjust the poll if the results indicate that specific actions / directions need to be pursued further.



Figure 2: Use Cases: i) Citizens and politics, ii) Citizens in action.

## 5.2 Use Case: Citizens in Action

A municipality sets up a new service on the cooperation platform for citizens to send notifications for urban problems and incidents. Notifications consist of pictures, videos, textual or voice descriptions of the problem. The mobile cooperation platform is context aware, which enables it to pull information on the user's whereabouts and sending it to

other people that have expressed interest in this specific area. Interests can be expressed in semantically rich ways: users can subscribe to geographic areas, to events occurring in a particular building, to specific topics that match a given ontology, to events generated by people with similar profiles, etc. Other users receiving the notification can send their own experience on the problem, their own comments, more photos etc.

## 6 Conclusions

PERIKLIS is a Greek National project, funded from EU and Hellenic Government from ESPA funding scheme (<http://www.espa.gr>), whose goal is to improve quality of life in the urban environment by increasing opportunities for interaction between citizens and between citizens and public services, through the use of mobile and social network technologies. PERIKLIS integrates innovative research methodologies with actual development of a platform that handles all user and Municipalities' interactions and the related analytics, leading to the modernization of the public sector. In the future, we plan to extend PERIKLIS platform, evaluating its services in the whole Greek public sector.

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