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Energy efficient attribute based encryption technique for health records via virtual machines in the cloud

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ABSTRACT

The Bloom Records of patients should abide the constant acreage and should be able to appearance them calmly and deeply to their called caregivers and institutions. In this paper, we present My PHR Machines (My Personal Bloom Almanac Machines), a cloud-based PHR system, which uses a new architectural band-aid to bloom almanac portability**.** Patients can allotment their abandoned basic apparatus affair with assertive caregivers, who will charge alone a Web browser to admission the pre-loaded bits of their lifetime Health Records. In this cardboard an ancestor of My PHR Machines activated to two use cases, i.e., radiology angel administration and adapted medicine.

KEY WORD: My PHR Machines, VM, PHR

1. INTRODUCTION

Personal health record (PHR) is defined as "a set of computer-based tools that allow people to access and coordinate their lifetime health information and make suitable parts of it accessible to those who need it." PHRs should be portable, contain lifelong information and should not be restricted by file formats or other local issues. These can also be called as electronic health records (EHRs) that are owned by patients. This paper deals with how a sustainable and privacy-compliant IT infrastructure is designed which facilitates at least for a patient's lifetime and across the boundaries of care institutions and medical specialism (1) the storage of raw PHR data and (2) the use of this data with specialized software. Sustainability, in this context refers to the financial and political aspects of the health care and software industries.

Point (1) focuses on raw PHR data since care institutions may not be able to provide their EHR data in "one" standardized PHR format. With point (2) we aim at the functional interoperability which can be defined as "the ability of two or more systems to exchange information so that it is readable by the receiver." Concretely, we aim at providing patients (and their trusted caregivers) remote desktop or tablet computer access to all their PHR data, and support this access by the software that matches the data format.

Cloud computing offers unique opportunities for supporting long-term record preservation. In this paper, MyPHR Machines, a cloud-based PHR system that answers our research question is used. One of the agreed key requirements for shareability of the EHR is to break the nexus between the EHR and the EHR system. The MyPHR Machines architecture clearly separates PHR data from the software to work with these data.

Proposed System: My PHR Machines allows patients to build PHRs which are robust across the space and time dimensions.

Space: Patients relocating or effectively journeying across unique nations in the course of their lifetime will normally be equipped to reproduce their normal health files and the program required to research/visualize these. That is quite often no longer viable for the reason that of the high useful and architectural heterogeneity of wellbeing care understanding programs across exclusive nations/states.

Time: As technology evolves, appliance software about becomes obsolete.

On the server-side, MyPHRMachines prevents abuse problems by virtualizing beheading environments holistically. The software to actualize the arcadian environments on abreast accouterments and software is maintained by big vendors, behindhand of the MyPHR Machines-specific extensions.

Design and implementation of myphrmachines: The main idea behind My PHR Machines is to leverage the cloud for allowing patients building their own personal health data repository and share these data with different care institutions. In the current implementation, patients have to manually upload the data they obtained from care institutions, e.g., in a DICOM CD, in the repository. Once stored in My PHR Machines, patients can flexibly share these data with any other care institution or interested stakeholder. Access to My PHR Machines, in fact, requires only a Java-enabled browser, and access to a selected part of the repository can be easily granted by patients to any care institution, e.g., a GP, a hospital, or an insurance company.

Methods of technical Architecture: Within MyPHR Machines, we distinguish between the Execution and Storage layers. Each VM in the execution layer represents the virtualization of specific application software (or a software bundle) serving the purpose of either viewing or analysing patients' health data. Patients can log into MyPHR Machines and decide which VM to load in a given session using a standard Web portal. The Hypervisor is a generic piece of software to start, stop, clone VMs, and control their Internet access.

The storage layer includes the repository of VM images, i.e., virtual disks containing a bootable operating system and additional applications. In order to publish new VM images, software vendors go through the following procedure: first, they clone an existing VM containing the right operating system and perhaps some additional libraries of interest through the MyPHR Machines Web portal. Users cannot change the published VM image since any personal instance of a VM image is stateless. One can deploy updates at the VM image level which is more scalable and secure, by keeping VM instances stateless, than trying to do this at the level of patient specific VMs.
The PHR data are stored into network folders, which remain private folders within the MyPHR Machines domain. Put differently, the VM-based architecture ensures that all patient data can remain on the server-side, on a trusted infrastructure.
Clients can view remote VM sessions using the remote desktop protocol (RDP). Therefore, VM sessions can be viewed in any Java-enabled Web browser without installing any additional software, by using a simple applet-based RDP viewer. For operating systems not supporting Java, e.g., iOS, a native RDP client is required. SSH delivers all communication between hypervisor and the Web portal, to prevent man-in-the –middle attack.

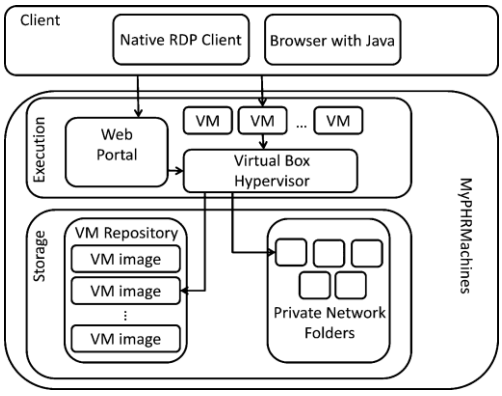

Figure.1.Block Diagram of MyPHRMachines

Results of X-ray Machine:

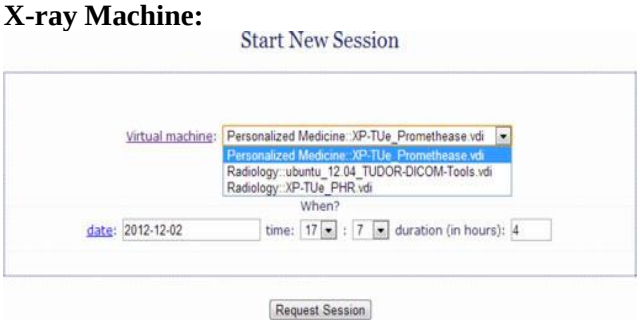

Figure.2. New Session

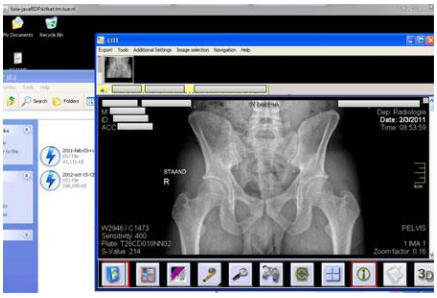

Figure.3. Uploading of X-Ray file

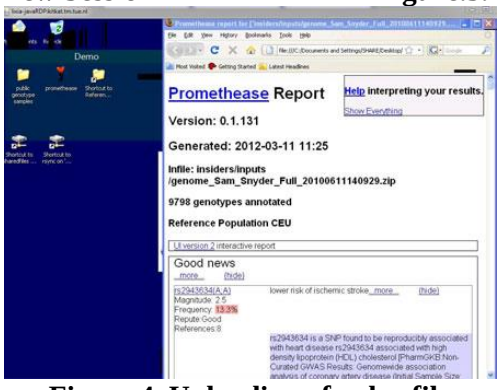

Figure.4. Uploading of a doc file

Limitations: We distinguish the limitations from the ones related to the functionality of MyPHR Machines as currently implemented and the ones related to the research method adopted for its evaluation.

About the functionality, MyPHR Machines is likely to lead to numerous personal application islands, in which each patient collects heterogeneous PHR data and application software. This can lead to a very chaotic repository of health information and related functionality that can be very hard to maintain for the average patient. The issue can be overcome by a careful design of the interface of MyPHR Machines used by patients to upload, share and generally, organize their PHR data, which should be intuitive and hide technical details.

Another limitation previously identified is the lack of Internet access for the VMs. In principle, this prevents a VM to call external (Web) services and, therefore, to combine together such services, e.g., pipelining genomic diagnostics services available on the Internet. Another consequence of the lack of internet access in end user VM sessions is that the software inside such VM sessions cannot automatically update itself.

About the research method, MyPHR Machines is currently fully implemented using real PHR data and real medical application software. The system, however, has not yet been experimented in clinical settings by real patients. Thus, the above study is based on the analysis of the literature and qualitative discussions with the stake holders. This remains at a qualitative level and experimentation with actual patients will allow us to evaluate the people institutional factor related to MyPHR Machines adoption.

Related work: We can first classify current PHR solutions into free-standing (third party), provider-tethered, and integrated PHR systems. Free-standing PHR systems are stand-alone software applications that help patients maintaining their personal health information. Provider-tethered solutions are implemented and made available by a single care institution. In terms of the number of users, the most successful PHR solutions belong to the latter category, with examples such as the EPIC MyChart system, tethered from hospitals using the EPIC EHR, and My HealtheVet, promoted by the US Department of Veterans Affairs.

MyPHR Machines can be classified as an integrated PHR solution. Integrated PHRs are free-standing solutions that collect information from a EMRs, medical insurance, pharmacy data or data entered directly by patients. Integrated solutions, such as Indivo X or Microsoft HealthVault are less successful in terms of adoption when compared to provider-tethered solutions.

2. CONCLUSION

Leveraging virtualization techniques, MyPHR Machines allows patients to build lifelong PHRs. The records can be shared by the patient with any stakeholder interested in those. MyPHR Machines allows also the controlled sharing of application software that is required to view and/or analyze health records. Patients seeking care by caregivers in different geographical areas will be able to reproduce their original records, in spite of the limitations imposed by the local health care information systems. Moreover, as technology evolves, patients will always be able to use original software to view and analyze data, even when that software becomes obsolete and possibly no longer supported by the stakeholder that produced the data. One of the major extensions regards creating an open App market for application software, through which medical software providers could compete to provide the best suited functionality required by patients. We are currently studying the issue of how various security techniques can be employed to protect data in MyPHR Machines at various levels, such as encryption techniques at the level of VM instance logs, private key transfers between RDP clients and remote VMs, and encryption at the level of mounted network folders. Finally, we will deploy data translation services to MyPHRMachines. Such services will enable a smooth transition from the already provided functional interoperability to the deeper system interoperability. The private network folders will be used as the blackboard for exchanging data between different VMs.

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