

VITASENIOR-MT: Architecture of a Telehealth Solution

Gabriel Pires¹ (gppires@ipt.pt), Ana Lopes¹, António Manso¹, Dário Jorge¹, Diogo Mendes¹, Luis almeida¹, Luis Oliveira¹, Nelson Gomes¹, Pedro Dias¹, Renato Panda¹, Telmo Pereira², Paulo Monteiro³, Carla Grácio⁴

¹ VITA.IPT Lab - Life Assisted by Intelligent Environments, Instituto Politécnico de Tomar, Tomar, Portugal

² Escola Superior de Tecnologia da Saúde de Coimbra do Instituto Politécnico de Coimbra, Portugal

³ Softinsa - Centro de Inovação Tecnológica de Tomar, Tomar, Portugal

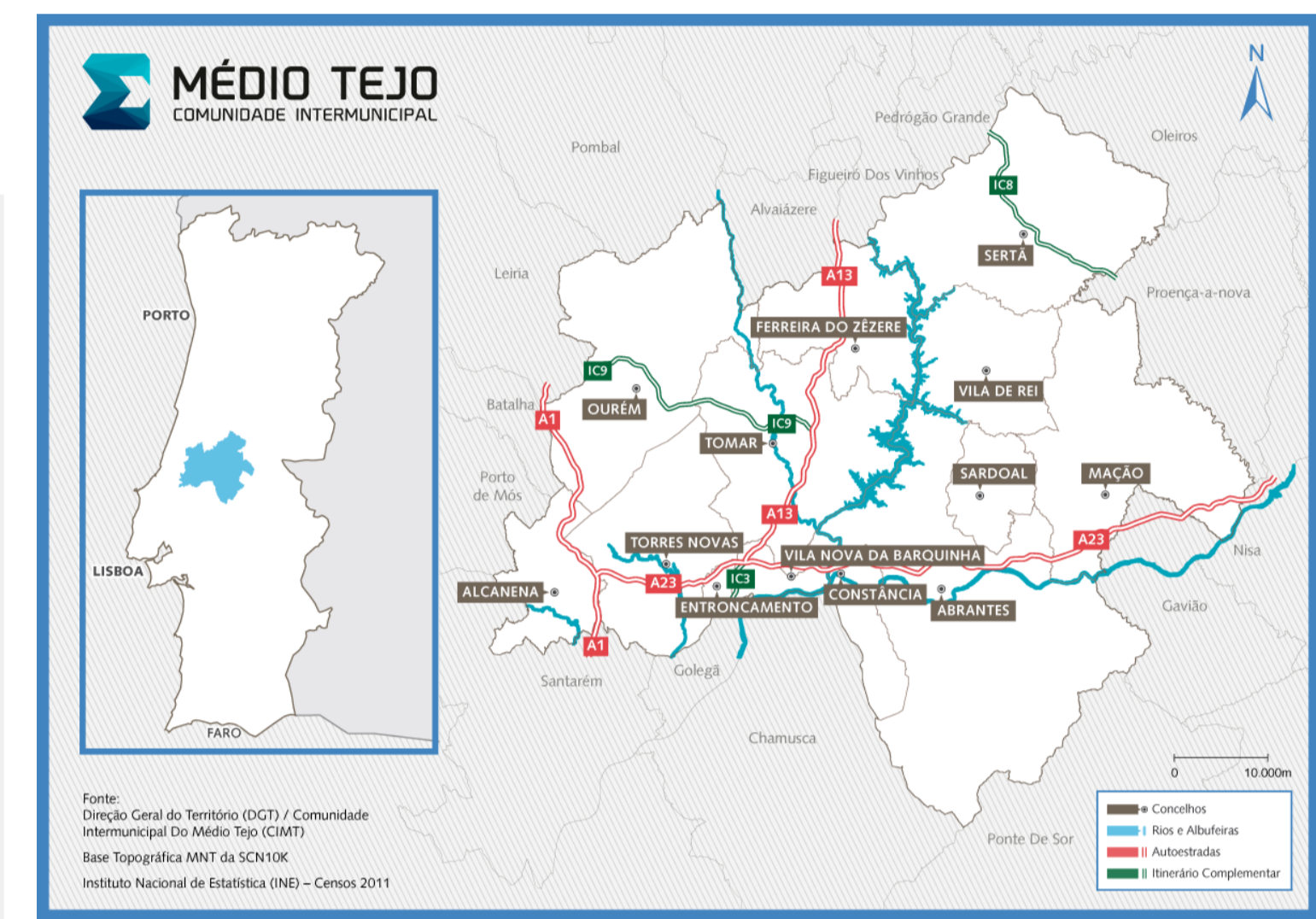
⁴ Comunidade Intermunicipal do Médio Tejo, Tomar, Portugal

Abstract

VITASENIOR-MT is a telehealth solution under development that aims to monitor and improve the healthcare of elderly people living in the region of Médio Tejo. This solution performs both remote and local monitoring of biometric parameters of the elderly, and also of environmental parameters of their homes. The biometric variables include heart rate and temperature measurements collected automatically, by means of a bracelet, throughout the day. Blood pressure, body weight, and other biometric parameters are measured on a daily basis by the senior's own initiative, and automatically recorded. The environmental parameters include temperature, carbon monoxide and carbon dioxide measurements. A TV set is used as a mean of interaction between the user and the medical devices. The TV set is also used to receive medical warnings and recommendations according to clinical profiles, and to receive environmental alerts. All data and alerts can be accessible to senior's family and healthcare providers. In alarm situations, an automatic operational procedure will be triggered establishing communication to predefined entities.

MOTIVATION

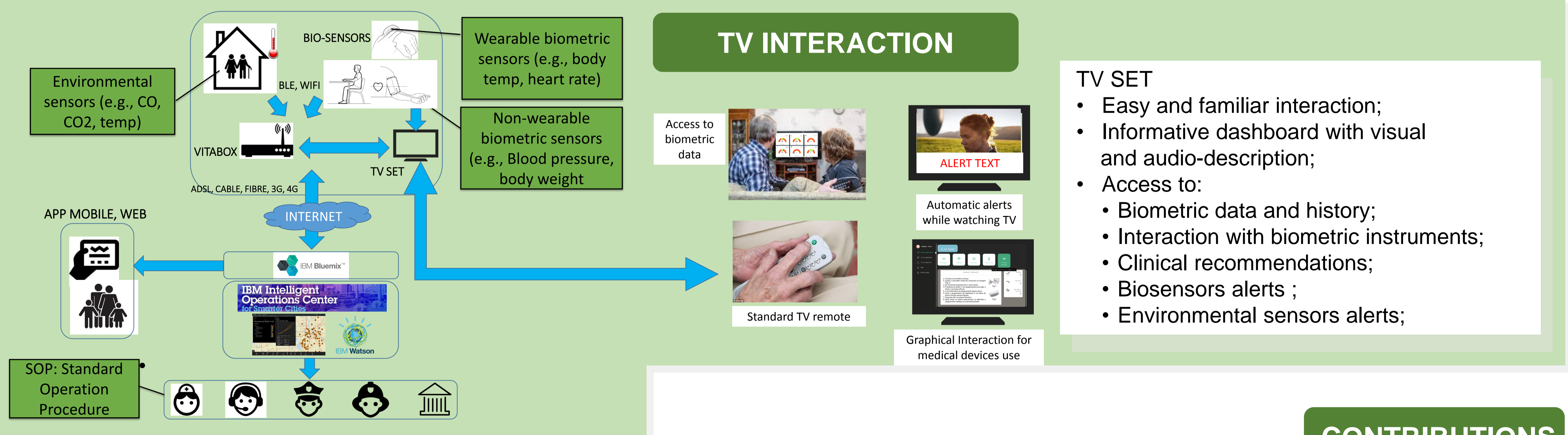
- Portugal has about 2 million people older than 65 years (aprox. 20% of the population) and 1 million older than 75 years (aprox. 10% of the population). From these 2 million, almost half live alone;
- The elderly are usually affected by chronic comorbidities (arterial hypertension, diabetes and dyslipidemia);
- In the MEDIO TEJO region the rate of aging and population decrease are higher than the national and center region averages. In particular at Mação and Vila de Rei:
 - The index of dependence, i.e., the ratio between dependents (population 0-14 years and over 65) and the active population (15-64 years), is 70%;
 - The population density is 18 inhabitants/Km²;
- In face of this scenario, Municipalities of Medio Tejo have to carry out a continuous home monitoring to provide assistance to the elderly population;
- Complementing this service with teleassistance and telehealth is not only a request but also a claim of several municipalities of the Médio Tejo region, which can bring a major contribution to elderly healthcare, their autonomy and safety, and that may also lead to a significant social and economic impact;
- One of the strategic orientations of CIMT for 2014-2020 is the promotion of quality of life, social inclusion and territorial cohesion. The development of VITASENIOR project is part of this strategy.



Municípios	Densidade Populacional (hab./km ²)	População Residente 2011 (N.º)	Área (km ²)
Abrantes	55	39325	715
Alcanena	109	13868	127
Constância	51	4056	80
Entroncamento	1443	20206	14
Ferreira do Zêzere	45	8619	190
Mação	18	7338	400
Ourem	110	45932	417
Sardoal	43	3939	92
Sertão	36	15880	447
Tomar	116	40677	351
Torres Novas	136	36717	270
Vila de Rei	18	3452	192
Vila Nova de Barquinha	146	7322	50
Médio Tejo	74	247331	3345

Local de residência (NUTS - 2013) (1)	Índice de envelhecimento (N.º) por Local de residência (NUTS - 2013): Anual					Local de residência (NUTS - 2013) (1)	Índice de dependência de idosos (N.º) por Local de residência (NUTS - 2013): Anual				
	2015	2014	2013	2012	2011		2015	2014	2013	2012	2011
Portugal	146,5	141,3	136	131,1	127,6	Portugal	31,8	31,1	30,5	29,4	28,8
Médio Tejo	204,8	198,4	191,3	185,6	182,6	Médio Tejo	40,1	40	39,6	38,2	39
Abrantes	232	224,4	216,7	210,9	207,4	Abrantes	44,6	44,3	43,4	42,6	42,4
Alcanena	193,1	186	181,4	174,6	172,1	Alcanena	40,3	39,1	38,2	37	36,2
Constância	153,9	144,9	137,6	142,3	143,5	Constância	35,4	35,2	34,7	34,6	34
Entroncamento	119,9	116,6	115	110,9	107,6	Entroncamento	27,8	27,6	27,2	26,6	26
Ferreira do Zêzere	243,3	228,1	223,3	216,8	216,1	Ferreira do Zêzere	44,2	45,1	45,5	45,8	46,5
Mação	481,4	464,2	440,9	427,8	415,2	Mação	67,2	66,7	67,1	68,1	70,9
Ourem	186,3	182,7	186,3	180,4	182,2	Ourem	33,2	33,5	33,4	33,1	33,3
Sardoal	251,5	248,9	220,7	221,3	217,9	Sardoal	40,4	40,3	40,6	41,2	41,5
Sertão	239,9	233,9	226	221	212,7	Sertão	46,7	46,9	46,3	46,6	46,6
Tomar	239,8	229,9	217,4	206,1	201,1	Tomar	43,1	42,7	42	40,9	40,2
Torres Novas	192,9	187,1	179,9	177,3	175,7	Torres Novas	38,2	38,7	38,4	38,2	37,8
Vila de Rei	515,4	483,2	487,9	485,3	412,6	Vila de Rei	58,1	62	64,2	63,9	64,5
Vila Nova de Barquinha	207,3	198,8	187,7	184	178,3	Vila Nova de Barquinha	42,8	42,4	41,8	40,9	40,5

ARCHITECTURE



CONTRIBUTIONS

- Telehealth solution (biometric and environmental monitoring with automatic alerts);
- VITABOX-TV: easy and familiar frontend for interaction with the elderly;
- Backend and frontend based on cloud computing, making available all sensor data (biometric and environmental) in multi-platforms;
- Definition of health/clinical protocols based on user profiles which will be used to automatically trigger alerts and recommendations;
- Support connectivity end-to-end between the cloud based management system and the sensors, for infrastructure management;
- Intelligent operational procedures in case of emergency situations, and monitoring and management of the technological infra-structure (under development);

Conclusion and further work

- The software and hardware infrastructure of a complete telehealth solution was implemented and tested in lab environment;
- Second phase of the project: adjustment of the system using a user-centered design approach, involving real end-users;
- Third phase: the system will be set up on three houses inhabited by elderly people (aged 65 or more) during several months;

Acknowledgments

This work has been financially supported by the IC&DT project VITASENIOR-MT Programa operacional regional do centro CENTRO-01-0145-FEDER-023659