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JUNGDO UIT

Thai Hoang Vinh

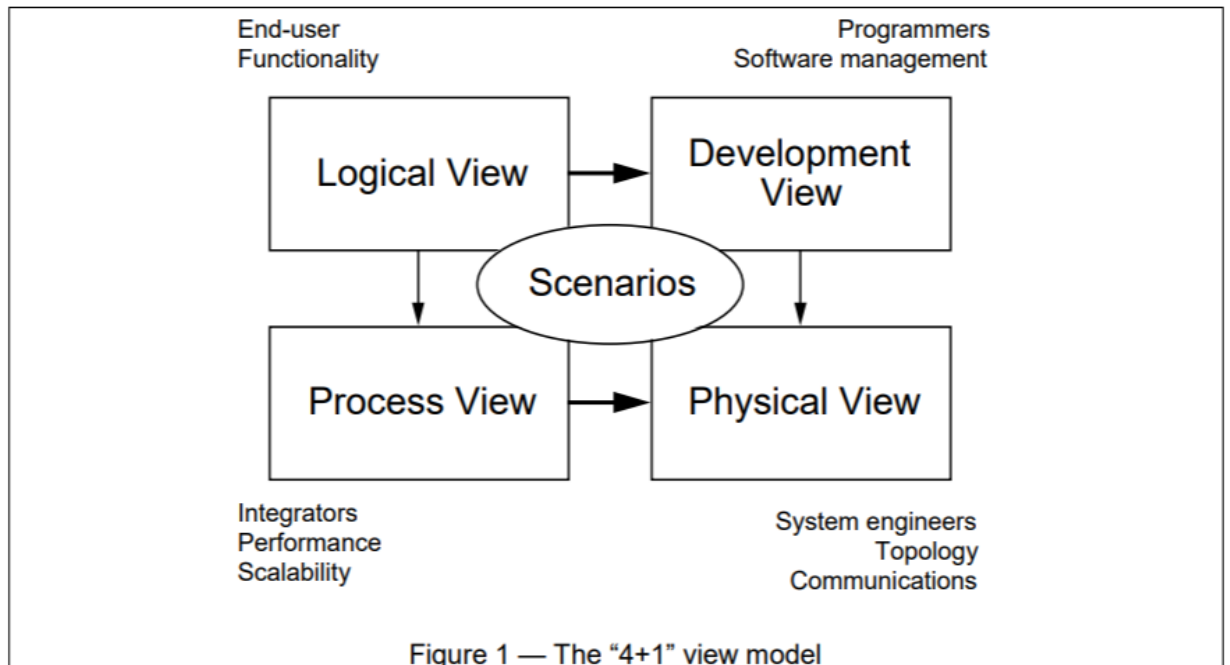
[PREVIEW OF SOLUTION ARCHITECTURE]

A preview of analysis the architecture requirements of Smart city Tamky Project based on research of existing IoT frameworks and previous projects on smart city field

1. Project vision

- Create a smart city operation and management platform
- Maintains a fundamental database for a smart city.
- Provide implementations to get involved of citizens (citizen engagement) on making decisions and policies related to smart city operations

2. Summary on the framework of architecture view points



Scenarios: The description of architecture is illustrated using a small set of use case, or scenarios. This view is also known as the use case view. In order to represent the view, we Use case diagram.

Logical View: The logical view is concerned with the functionality that the system provides to end-users. In order to represent the view, we use Class diagrams, or State diagram.

Process View: The process view deals with the dynamic aspects of the system, explains the system processes and how they communicate, and focuses on the run time behavior of the system. In order to represent the view, we use Sequence diagram, Communication diagram, Activity diagram

Development View: The development view illustrates a system from a programmer's perspective and is concerned with software management. In order to represent the view, we use Component diagrams and Package diagram.

Physical View: The physical view depicts the system from a system engineer's point of view. In order to represent the view, we use Deployment diagram

3. Functional Requirements and Non-Functional Requirements

Req_ID	Category	Description
FR_EA_01	Energy efficiency	Monitoring of most relevant KPIs (Key Performance Indicators) at different levels household, building and city. There are two types of KPIs as Indoor KPIs (e.g. temperature, humidity, energy) and Outdoors KPIs (e.g. street lights, temperature, speed of wind, humidity, waste collection)
FR_EA_02	Energy efficiency	The system should provide means of identifying energy consumption patterns
FR_EA_03	Energy efficiency	The system should provide means of detecting buildings in city with poor energy performance
FR_EA_04	Energy efficiency	The system should support decision making capabilities to guide stakeholders on the implementation of energy efficiency measures (e.g. Identification of priorities for intervention)
FR_EA_05	Energy efficiency	The system should support an integrated electrical and thermal network energy management
FR_EA_06	Energy efficiency	The system should have access to specific information from dwellings and buildings through sensors or meters to be installed (e.g. temperature, humidity, electricity consumption, gas, water), through a weather forecast station (exterior temperature, wind speed, sunshine)
FR_EA_07	Energy efficiency	The system should provide an energy use forecast at dwelling and city level by means of incorporating weather forecasts. A set of recommendations could be emitted to the end-users and ESCOs with the aim at managing the energy use in an efficient way
FR_MB_01	Mobility	The system should provide services that allow the optimization of public transportation routes and the last mile logistic
FR_MB_02	Mobility	The system should provide services that inform the users about the availability of shared green vehicles

FR_MB_03	Mobility	The system should provide services that allow the management of EVs recharging network and the availability of EVs recharging points
FR_MB_04	Mobility	The system should provide analysis results of CO2 emissions based on the efficient use of mobility resources
FR_MB_05	Mobility	The system should have access to specific information from vehicles through meters to be installed (e.g. distances travelled, geo-location) or provided by vehicle users (e.g. costs, investment, operation costs)
FR_MB_06	Mobility	The system should provide citizens with resources to calculate the total cost of ownership of EV
	Healthy	
	Environment	
FR_CE_01	Citizen Engagement	The system should provide citizens with information about smart city policies and implementation programs
FR_CE_02	Citizen Engagement	The system should provide information about schedules and routes of public transportation
FR_CE_03	Citizen Engagement	The system should enable the citizens to provide feedback about failures in the services (e.g. EVs charging points, public transportation, bike sharing)
FR_CE_04	Citizen Engagement	The system should allow launching surveys in the district about the smart city policies and implementation programs
FR_CE_05	Citizen Engagement	The system should enable the answering of questions from comments regarding the smart city implementation programs (technical, regulatory, process, funding, etc.)
FR_CE_06	Citizen Engagement	The system should have suitable data to offer citizens and a direct connection among platform and building owners for energy domains or platform user for other domains
FR_CE_07	Citizen Engagement	The system should allow to broadcast any type of information to the residents in the form of a digital TV channel
FR_DM_01	Device management	The system should provide a way to manage connected devices. Management activities include adding and removing devices, managing ownership and hierarchy, relations to other assets

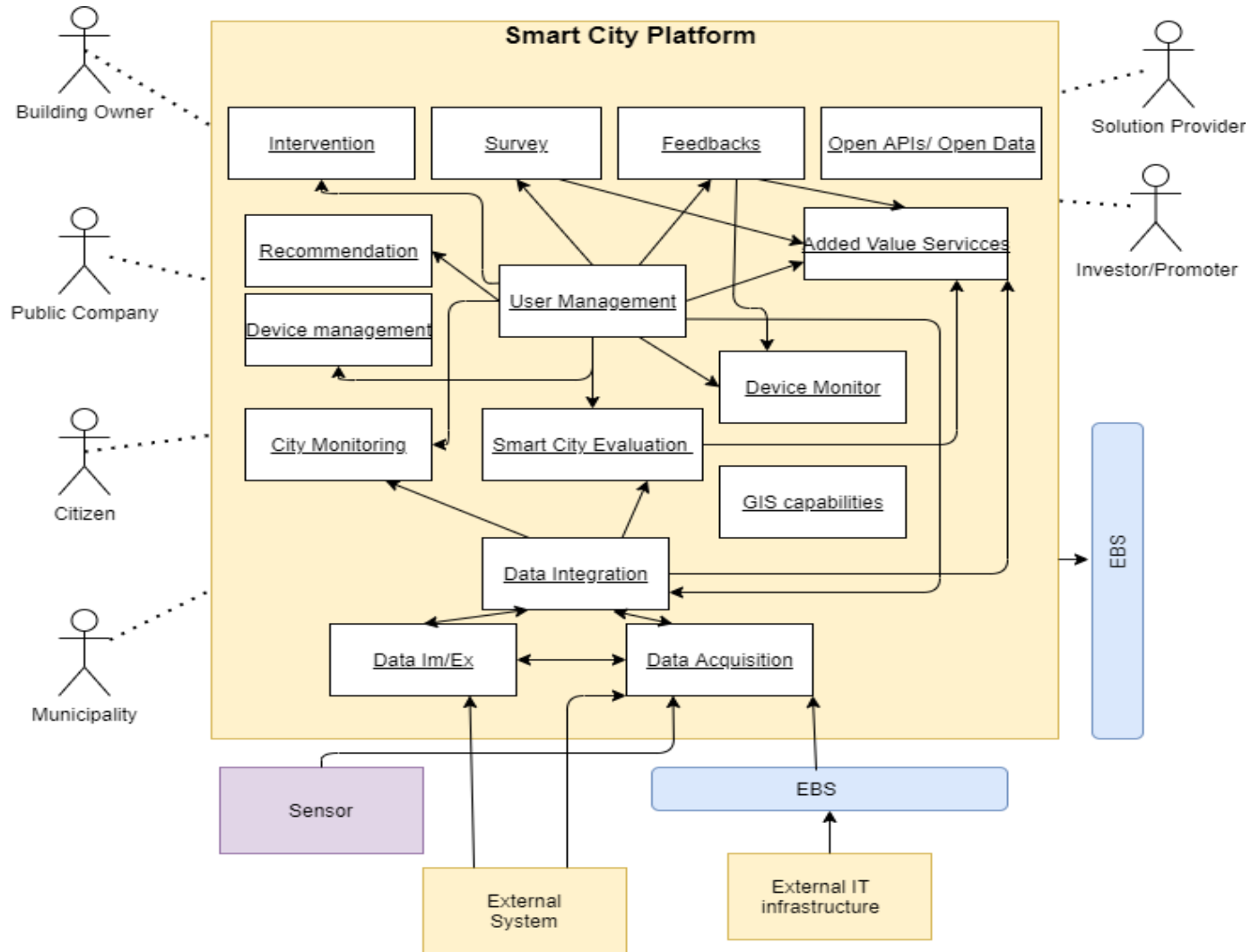
FR_DM_02	Device management	The system should provide means of defining and reusing the data model profiles for various devices
FR_DM_03	Device management	Devices should be able to advertise which services they provide (service discovery)
FR_UM_01	User management	The system should enable several users to access the system using their own username and password.
FR_UM_02	User management	Based on authorization level, existing users can add new user
FR_UM_03	User management	Users only have access to data of their own assets and to assets they have been given permissions to
FR_DE_01	Decision Engine	The system should provide a way to apply automatic business rules (for example turn on a light when motion in the room is detected). This may be either internal to the platform or using external callbacks
FR_RA_01	Remote Actions	The system should allow for certain actions to be triggered remotely, sending commands to the devices
FR_DA_01	Data Analysis	The system should provide a way to gather historical device measurements data
FR_DA_02	Data Analysis	The platform should support storing all communication with any device or component in an external data analytics platform
FR_DA_03	Data Analysis	The system should provide varying charts for visualize statistics data collected from vertical domain data
FR_DA_03	Data Analysis	It should be possible to export the data to be analyzed
FR_GEO_01	Geo-location	The system should enable storing the physical coordinates of devices
FR_GEO_02	Geo-location	The system should provide means of querying for devices by their coordinates
FR_GEO_03	Geo-location	The system should provide GIS capabilities for visualization of added value services

Req_ID	Category	Description
NFR_SEC_01	Security	User data should be protected from unauthorized access from many services deployed and accessed remotely
NFR_SEC_02	Security	The security and privacy mechanism should sufficient to be trustworthy for the clients
NFR_SEC_03	Security	The system should make it difficult to spy on messages communicated in the system (for example, use HTTPS)
NFR_SEC_04	Security	The system should provide a secure environment protected from common attack vectors
NFR_SEC_05	Security	The system components should be updateable to protect against known vulnerabilities
NFR_PRI_01	Privacy	The system should respect user's privacy, preventing unauthorized access
NFR_PRI_02	Privacy	Users without applicable permissions should not be able to track what other users are doing in the system
NFR_PRI_03	Privacy	It is ok to publicly share aggregated user data (data combined for a number of users for some prolonged period of time)
NFR_PRI_04	Privacy	The physical location of users should not be made accessible to other parties without the required permissions
NFR_PRI_05	Privacy	The system should prevent tracking of devices by unauthorized entities
NFR_PRI_06	Privacy	The system should not be configured to collect more data than it needs
NFR_PRI_07	Privacy	When relocating existing devices, the new owner should not be able to view the history of previous device owner
NFR_PRI_08	Privacy	In case of aggregated data, it should not be determinable exactly from

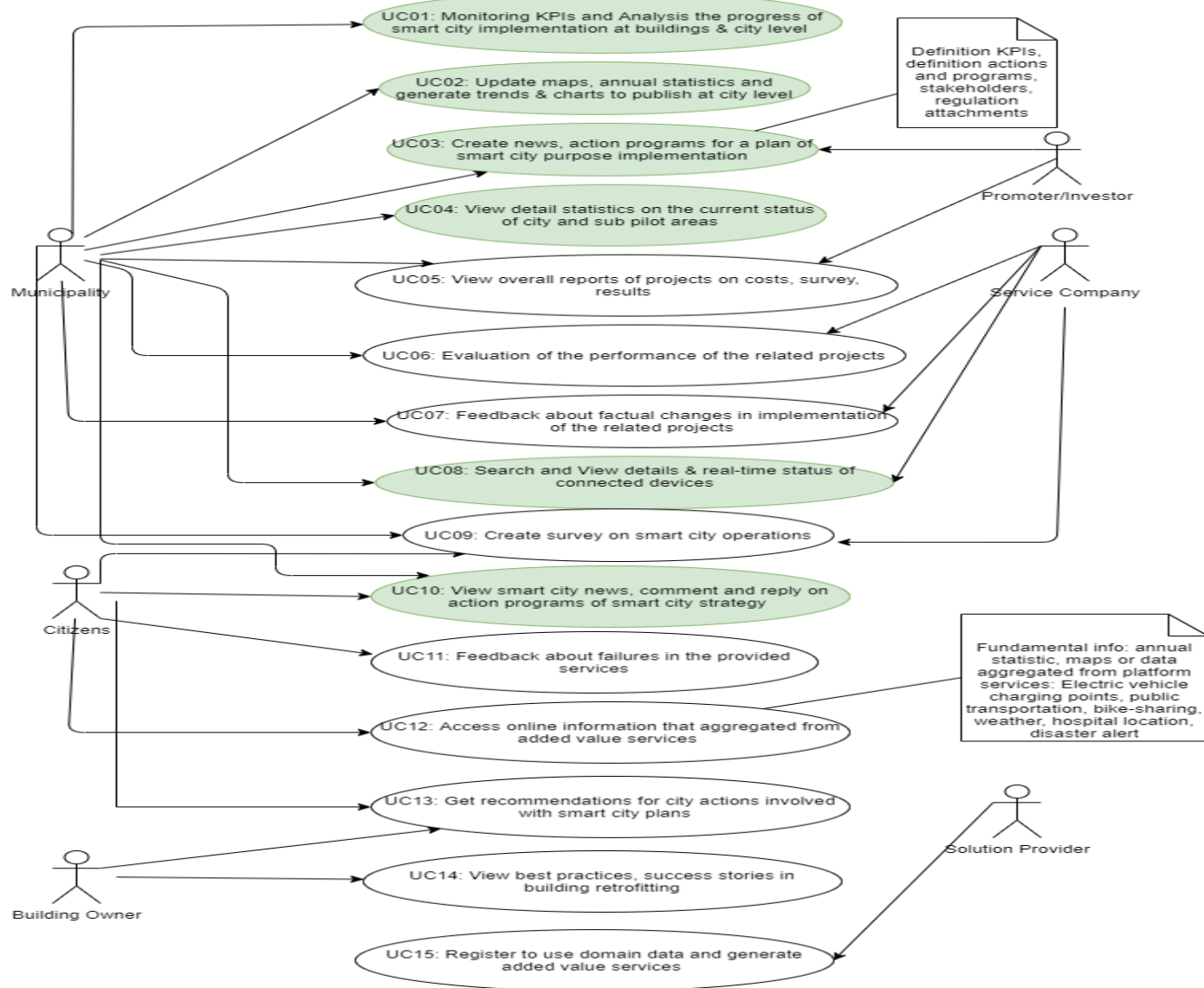
		whom was this data gathered from
NFR_NET_01	Networking	The platform should be able to operate over different networks (wired and wireless internet, GSM)
NFR_NET_02	Networking	It's a benefit if the system uses standard HTTP communication, not requiring special firewall configurations
NFR_NET_03	Networking	The system should be able to handle heterogeneous networks such as wireless internet and data over mobile networks
NFR_NET_04	Networking	The system should be able to run on distributed networks and operate over VPN if required
NFR_NET_05	Networking	When using networks such as mobile network, the system should be able to gracefully handle roaming services
NFR_NET_06	Networking	Support for IPv6 is a benefit
NFR_AUD_01	Auditing	All changes made to the system should leave an automatic and permanent audit trail showing who and when made which changes
NFR_BAC_01	Backup	The system should provide means or ways to back up the data periodically
NFR_BAC_02	Backup	The system should provide means to restore to a backed up version
NFR_HOS_01	Hosting	The data stored and generated in the system should belong to the clients and operators and be subject to laws of the deployed country
NFR_HOS_02	Hosting	It's a benefit if it's possible to host the platform on the operator's infrastructure
NFR_EXT_01	Extensibility	The system should be extensible with new functionality either through modifying its source code or by utilizing the API interfaces to build external 3 rd party modules
NFR_AVA_01	Availability	The system should take measures to provide high availability
NFR_AVA_02	Availability	The system should provide high Quality of Service
NFR_SCA_01	Scalability	The system requirements meet a large number of users access concurrently and the number of users will increase unexpectedly in the future
NFR_INT_01	Interoperability	The system should provide ways for different external 3rd party systems to communicate with the platform

NFR_INT_02	Interoperability	If the system has its own administration interface, the provided API should allow performing all the same functions by 3rd party application given sufficient privileges
NFR_FAU_01	Fault tolerance	The system should be able to handle faulty or compromised devices sending invalid data or at high rates
NFR_FAU_02	Fault tolerance	The system should be able to detect and notify about devices not reporting expected data
NFR_MAI_01	Maintainability	The system should be designed to be operated and maintained for a prolonged period of time
NFR_MAI_02	Maintainability	The components and dependencies should be updateable
NFR_MAI_03	Maintainability	The system should not lock the client into a certain vendor
NFR_DOC_01	Documentation	The platform and its functions should be sufficiently documented so new people could be included to work on it without dependence on original developers
NFR_DOC_02	Documentation	The public API interface should be extensively documented

4. Systems



5. Scenarios



- 6. Logical View**
- 7. Process View**
- 8. Development View**

- 9. Physical View**
- 10. Technical stack on summary**
- 11. References**