MERA’s M2M pilot projects
Introduction

• MERA is a full ETSI member and is actively involved in M2M technology investigation and expertise development in the M2M domain. As such we have a full time R&D team dedicated to the study of use-cases, standards and technologies applicable to & approved for the M2M domain. The goal of the team is to advance MERA’s software expertise in the area of M2M.

• MERA’s M2M R&D team is currently exercising two pilot projects:
  • **ETSI-compliant M2M gateway**: Intended to build MERA’s experience in advanced M2M standards and protocols being developed by ETSI – the world recognized M2M standards body.
  • **M2M application framework**: Devoted to the creation of a technology-prototype which demonstrates: M2M network management, visualization and QoS analysis.

• The following slides describe these prototypes above in more details.
The following ‘demo’ architecture is being utilized:

- A temperature-sensor network emulator (thousands of devices)
- Such sensors are connected via the ETSI dIa interface
- The emulator allows us to update the temperature-data for the simulated sensors
- The M2M application subscribes to the temperature changes
- If the threshold is reached, the M2M application raises an alarm and sends the command to the thermal ‘cooler’ (which is also emulated)
- The thermal ‘cooler’ in turn causes the emulated sensors to update their temperature data appropriately
ETSI is developing a set of general standards and recommendations applicable to all M2M domains: smart metering, automotive & e-health

MERAs M2M R&D team is following this ETSI initiative and designing an M2M gateway prototype according to the GCSL (Gateway Service Capability Layer) ETSI standards

In the first phase this prototype will include the following parts of ETSI M2M standard:
- Generic ETSI M2M data model
- Resources management and all applicable operations
- Subscriptions and notifications
- Access rights
- Applications and SCLs registration

There are four main goals of this prototype:
- **Conformance** to the ETSI M2M standard
- **Re-usability** of its components for NSCL (Network Service Capability Layer): NSCL and GSCL share most of the features and use-cases. As such, a single product can be used as an M2M gateway or M2M platform and installed in an M2M device domain or M2M network domain accordingly
- **Flexibility** in new device management protocols integration due to a ‘plug-n-play plug-ins’ concept
- **Scalability** being achieved because of the prototype architecture (more powerful HW -> more active processes -> greater performance and coverage)

The primary use-case covered by our prototype is ‘Smart Metering’ but in general it is applicable to any of the M2M application areas
MERA’s M2M gateway will evolve in the following direction:

- Full ETSI M2M standards package integration, transparent communication with ETSI based NSCL and DSCL
- Automatic M2M devices’ firmware upgrade
- Popular management protocols integration (OMA-DM, TR-069)
- Device management protocols (Zigbee, PLC, etc) integration through Linux drivers, i.e. on OS level for better performance and flexibility
- Plug-ins configuration console
- “Light” M2M gateway to run on Android and STB
- Components to convert gateway to DSCL or NSCL
M2M Visualization Framework
Highlights

- Fully integrated development & test environment built on TFS + VS 2010 Ultimate (incl. Microsoft Test Manager) + Sharepoint Foundation 2010
- MERA Presentation Framework as server side with on-premise architecture ready for Windows Azure migration
- Presentation layer built on Telerik RAD Controls for Silverlight 5
  - Modular - Full MVVM support
  - Base assembly for RIA clients creation (message dispatcher, async repositories, security manager, delegate commands, custom binding collections)
  - Dependency Injection using MEF
- DDD approach for SW development
- Real-time client update - Silverlight client event push using http polling duplex WCF communication
- Code-First approach for DB creation
- Passive Security Token Service (ASP.NET Web Forms Web Site) implementation based on Windows Identity Foundation (incl. Single-Sign-On)
- Rich reporting framework based on Telerik Reporting
- MQTT Broker integration
- Sensor event generation tool (Windows Forms application)
- Successfully deployed under IIS 7
Passive STS approach based on Windows Identity Foundation supporting SSO

- The Silverlight Client host Web site redirects unauthenticated users to the STS page;
- STS authenticates the user;
- Once the user successfully authenticated, the outcome of the authentication and the claims are packaged and sent back to the original site.
- Here they are verified, and if everything looks OK the user is granted access to the page and its content.
UI highlights (1)

1. Ribbon-styled main menu
2. Dockable windows
3. Silverlight theme applied
4. Navigation using both Network Tree View and Map View
5. Network Tree on-demand loading
6. Reports export to popular formats: PDF, CSV, Excel, RTF, TIFF, Web Archive
7. Real time updates of sensor values and charts! for selected network node.

Views:
- Network Tree
- Properties
- Summary/Sensor Values
- Events
- Charts
- Map
- Reports
- Configuration
UI highlights (3)

- Rich reporting framework based on Telerik Reporting
- Once report is registered within the Framework it becomes available on the RIA Client.
- Report groups support
- Report export to popular formats: PDF, CSV, Excel, RTF, TIFF, Web Archive
UI highlights (4)

1. New location creation, removal, location properties modification.
2. Sensors registration in the location by drag’n’drop operations.
3. Sensors movement between locations by drag’n’drop operations.