RoweBots Limited

Software Data Sheet

Unison RTOS version 5.3

Ultra tiny embedded Linux™ or POSIX™ compatible RTOS

Unison and

Internet of Things (IoT) or Machine to Machine (M2M) Communication

Internet of Things (IoT) or Machine to Machine (M2M) Communications Architecture

IoT and M2M systems have evolved to the point where they are really the same thing. In the early days, M2M really meant that the communication occurred over a cell modem network. IoT was originally thought of as a solution for small devices and sensors to save data in the cloud. Today these have expanded and merged as a single environment involving communications across a network using a variety of protocols, and a cloud based environment for capturing and storing data and tools to build these environments in both the cloud and embedded sensor environment.

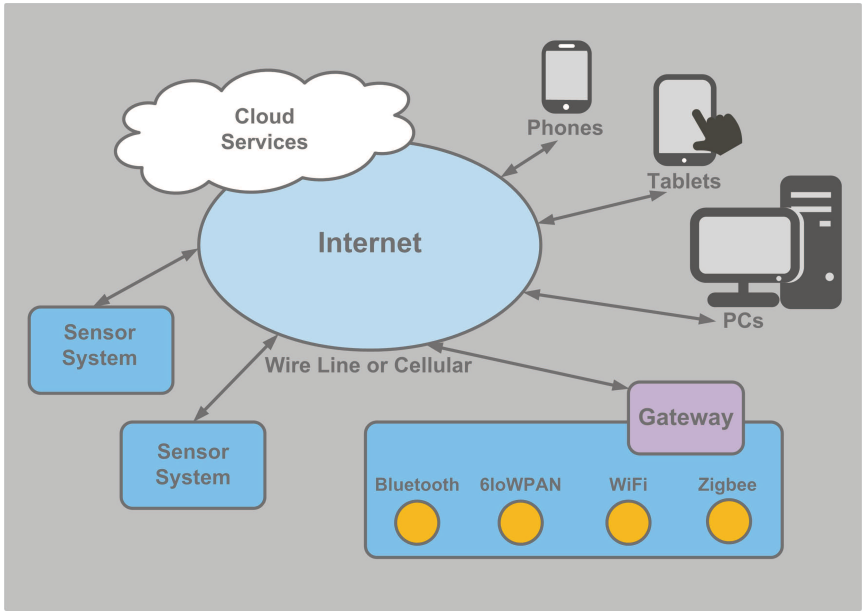

Figure 1: Internet of Things (IoT) and Machine to Machine (M2M) systems have identical components and system architectures today. They integrate sensors, communications and backend cloud storage and analysis.

Key Features

With a general agreement that the number of sensors on systems will grow substantially. The main requirements of IoT and M2M systems are:

- Many small and inexpensive sensor
- Low power sensors for many applications
- Wireless networking
- Internet communications
- Cloud based services which require integration with front end sensors
- Smart phone, tablet and computer access to database
- System security

These key requirements drive the implementation of software modules and services provided by RoweBots and lead to many other requirements.

Scalability

With the number of sensors growing exponentially, abundant smart phones and tablets, and the cloud offering almost limitless storage, the scalability of these systems is critical. These systems are often intended to support millions of nodes which changes the scope of the problem considerably.

The scalability issue leads directly to communication protocols which support publish subscribe type operation making it easier to deal with network connection and disconnection. In addition, this creates a need for low overhead on these protocols to reduce the cost of sensor nodes – lightweight protocols are highly desirable.

Low Power

Given the shear magnitude of the number of sensors, battery replacement is a big issue. Energy harvesting schemes are being employed to eliminate batteries or recharge them automatically over the life of the device.

Wireless Networking

With many small sensors, the cost and convenience of systems can be enhanced by making the devices wireless. For example, in large industrial installations, wireless networking can eliminate significant cabling requirements during installation and lead to adhoc network configuration.

Internet Communications

With standardized communications protocols offered by conformance to the broad set of W3 specifications, interoperability of systems is substantially enhanced. RoweBots focuses on industry standards in all areas to ensure that systems will be easily integrated and supported over time.

Cloud Based Services

Cloud based environments have been in IT departments for many years. They offer Internet connected services with security and a database to store the data. New IoT platforms are being developed as well. Ultimately, the IT department must be comfortable with the cloud platform selected and generally it will be one of the following offerings:

- Microsoft IIS, ASP.net, C# and Azure
- Oracle with Java and Javascript
- IBM Websphere
- MySQL

Due to the variety of environments that generally work with these platforms to connect protocols and various language implementations for business logic, RoweBots offerings are flexible to deliver a variety of solutions in this area to ensure IT needs are addressed.

Smart Phones, Tablets and Computers

With the plethora of devices available today to receive data, and the growth in this list of devices with experimental devices in smart watches, home displays and other systems, access to information has never been easier. The access to information will expand exponentially too particularly as users get accustomed to immediate information and use their devices more.

System Security

Today, all systems need to be secure. The Unison OS offering includes complete security features and this is extended to the IoT offerings in a variety of ways. Please refer to the Unison RTOS System Security data sheet for Unison OS details, only the aspects related to IoT and M2M will be discussed here.

Communications Protocols

Although there is many features and requirements for IoT and M2M offerings, the core part of RoweBots offering is the communication protocol support and examples which enable the sensor systems to talk to the IoT gateway (or edge router if you prefer) and the edge router to talk to the backend cloud system.

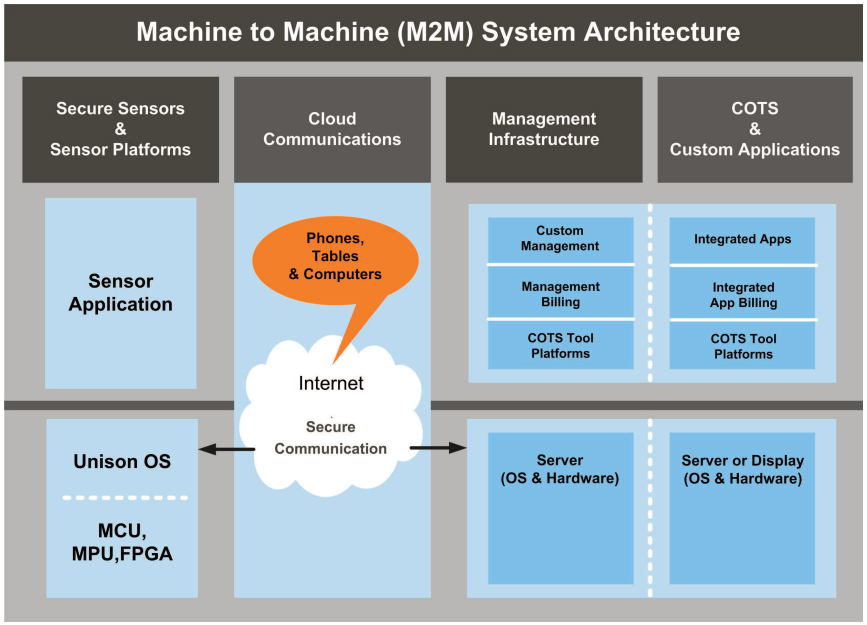

Figure 2: Unison offers off the shelf support for a broad set of wireless and wireline protocols along with a broad set of IoT / M2M protocols with full security provisions which are all necessary for application implementation on microcontroller (MCU) and microprocessor (MPU) processors. Examples for both management of devices and management of applications services are also provided.

Current Unison RTOS IoT and M2M Protocol Roadmap:

- CoAP
  - very light clients
  - security of a unique nature
  - requires special server
  - requires additional protocols for publish subscribe operation awaiting standardization
  - udp based

- MQTT
  - full publish subscribe / read write
  - TCP based
  - IBM supported
  - small efficient client implementation (3.5K Flash, 128 bytes RAM)

- DDS or Distributed Data Service
  - used for high bandwidth connections
  - best for shared memory or fast bus based systems
  - large memory footprint

- HTTP/RESTful
  - easy implementation
  - standard port 80 implementation
  - IT departments favor this incremental approach

- Websockets
  - secure
  - easy to use
  - not necessarily widely supported yet

- Odata
  - Used to encapsulate xml documents
  - Used with HTTP/RESTful solutions for document transmission
  - JSON and BSON are common data passing formats
  - Supported in Microsoft Azure and IBM Websphere as primary services for distributed communications

All protocols are in development with HTTPS/RESTful, DDS and MQTT shipping today. Please contact the factory for the release dates for other protocols.

Additional Information

Other seperately available RoweBots files for Unison OS:

- File Systems
- System Security
- Wireless
- USB
- Remedytools
- Internet Protocols
- Unison for Specific Processor Families

Software Version

- Unison 5.3

Availability

- HTTPS/RESTful–now
- DDS - now (3rd party)
- MQTT – now
- CoAP with HTTPS/RESTful upgrade -standardization delayed
- Odata – contact factory
- Websockets – contact factory

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