



INTEROPERABILITY & STANDARDISATION

Middleware, IP, XML



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OUTLINE

- What is Middleware?
- WHERE WE ARE NOW – SECTORS AND SILOS
- NEW CROSS SECTOR APPLICATIONS
- THE MARKET
- WHAT ARE THE BASICS FOR INTEROPERABILITY
- A STANDARD EVERYONE CAN USE





What is Middleware?

Middleware is computer software that connects software components or applications. The software consists of a set of enabling services that allow multiple processes running on one or more machines to interact across a network. This technology evolved to provide for interoperability to support complex, distributed applications. It includes web servers, application servers, content management systems..... Middleware is especially integral to modern information technology based on XML, SOAP, Web services, and service-oriented architecture.



- source: Wikipedia



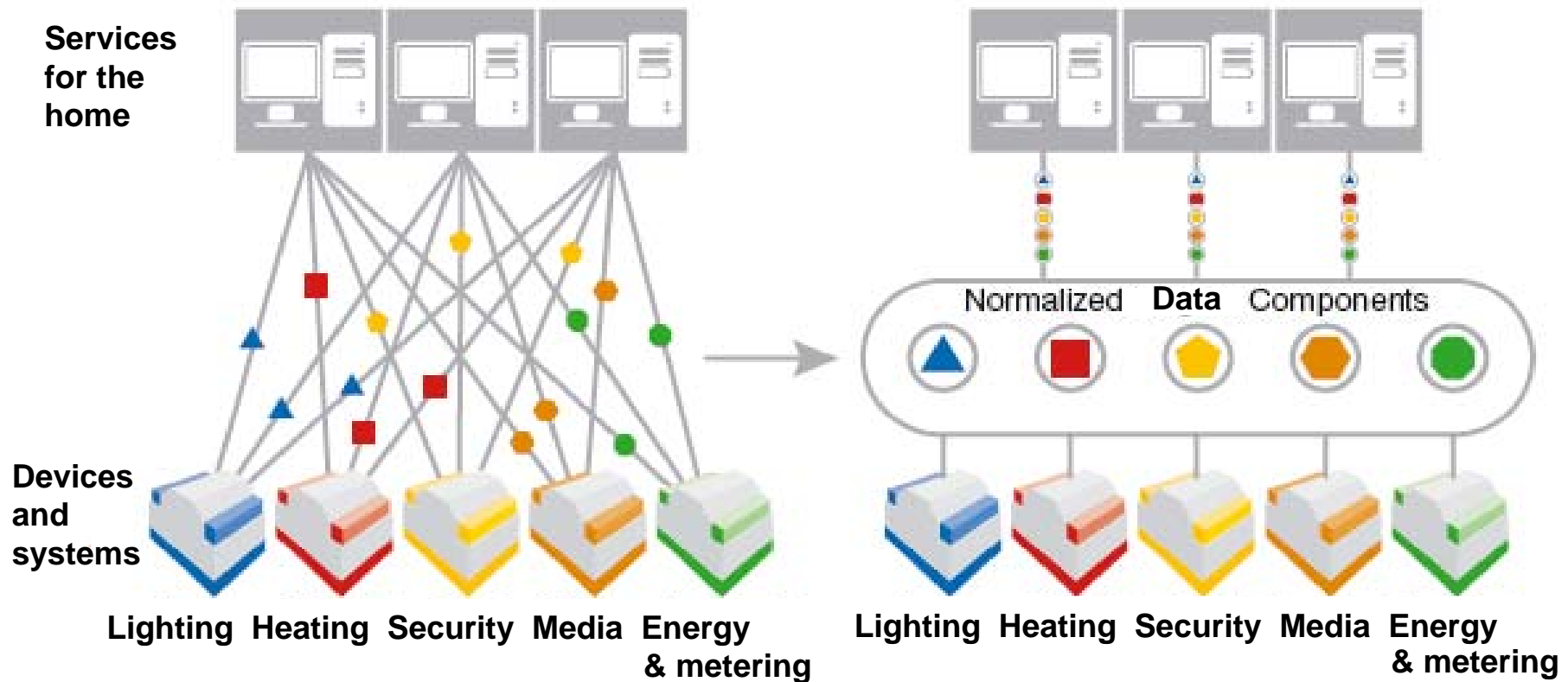
The Interoperability Problem and the Solution

Now

Lots of connections, complexity and cost
- creates barriers to customer take-up

Interoperability Framework

Simplified interfaces; lower barriers
greater, faster customer take-up





Middleware for the Home

What must it do?

- Normalise the data from different devices
- Provide an abstraction layer
 - definitions for a door, a thermostat, a camera, an appliance etc.
- Recognise connected devices automatically
- Manage the priority and quality of communications
- Record changes
- Enable easy maintenance; remote provisioning
- Report problems





Middleware for the Home

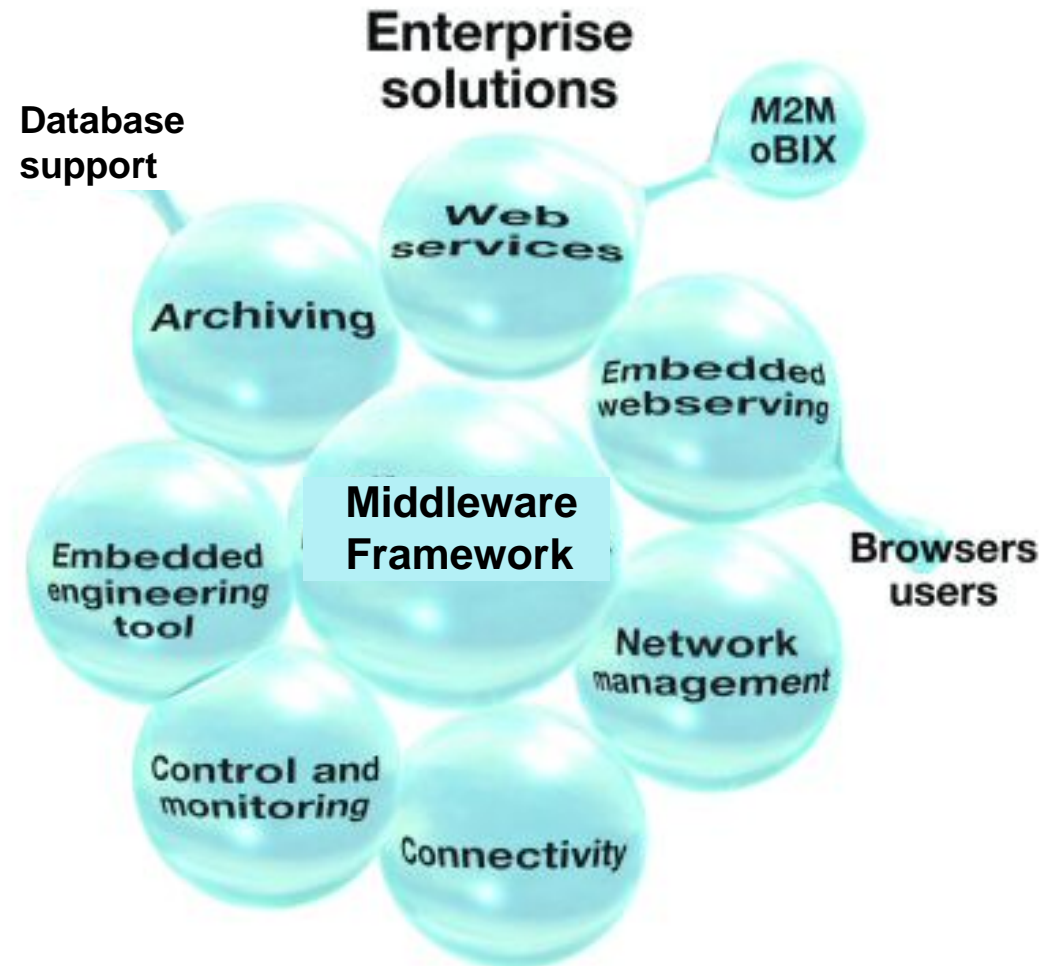
What more could it do?

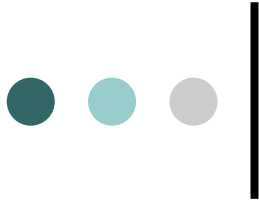
- Web serve graphical interface(s) for the home occupier
 - Locally and remotely
- Log data
 - Energy usage, occupancy status, temperatures etc.
- Send alarms/alerts to mobile phones
- Stream video to a web browser
- Email information
- Provide home management control logic



● ● ● | What a Framework looks like

- IP connected
- Web-enabled
- Supports open standards
- Integrates all systems
- Web services support
- Open for developers
- Cross platform





If we need to build a new application in the home or a new service to the home, What do we need?





What we need to make Interoperability work

Definition of each Application/Service

Definition of its operating requirements

Definition of its service requirements

What it depends on



TOA – SERVICE SUPPLY CHAIN DECONSTRUCTION



Use Case Example

Energy Usage Analysis service

- Sends homeowner regular report shows actual usage profile, and highlights higher than usual energy consumption/costs compared to other similar homes
- Needs at least half hourly meter data for all energy sources (elec, gas, solar etc.) and electricity usage data from major appliances
- Needs high data integrity but at low frequency (daily data transfer is okay)
- Relies on existence of metering devices on main supplies, and appliance monitors





Use Case Example

Independent living monitoring service

- Monitors elderly occupant, and raises alerts remotely if any abnormal behaviour. Also enables monitoring bureau and/or carer to see occupant remotely via video in a browser
- Needs video camera(s) streams, PIR inputs and other status data (bed pressure sensor, water pressure sensor)
- Needs enough bandwidth for video streaming and priority for alerts
- Relies on existence of video camera(s), PIRs, and other monitoring devices such as audio





Framework Standard Definitions

RESOURCE DECLARATION OBJECT DESCRIPTION

In any home

What resources (devices, networks,
communications) are available?

What do they do?

How are they described?



TOA – SERVICE OBJECTS



Framework Standard Definitions

SERVICE AGENTS MANAGEMENT & CONTROL

How are objects controlled?

How does the service/application establish end to end operation?

How does the service monitor QoS?



TOA – SERVICE AGENTS



XML and oBIX

- XML = **Extensible Markup Language**
- Very widely used for sharing of structured data
- oBIX = **Open Building Information Exchange**
- International standard for data exchange between real time automation systems
- Easy to understand, easy to implement

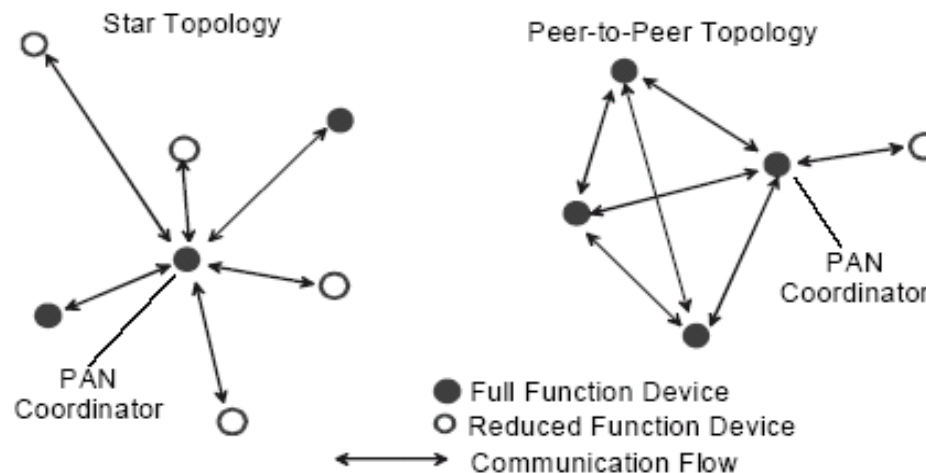
- Proposed Interoperability Framework can use these standards – no point inventing new ones





Pervasive IP

- Computer networks will be everywhere
- Global standards for addressing and comms.
 - TCP/IP and IPv6
- Now can have IP addressing for all devices
 - 6LoWPAN = IPv6 over Low power Wireless Personal Area Network
- Can be wired or wireless



Star and peer-to-peer topology examples



SUMMARY

- The (very large) future market depends on things working together
- Most work to date is within market sectors and does not look outwards
- Systems in homes will be very varied and potentially unpredictable
- New services and applications will need resources from any sector
- WE NEED A FRAMEWORK STANDARD TO SET THE RULES FOR INTEROPERABILITY

