Pervasive *Smart IP*™ Devices

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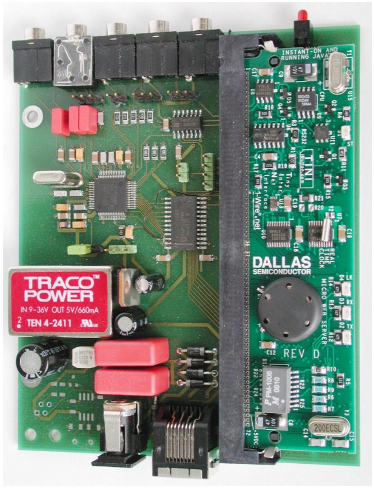


Example Smart IP board

"Smart IP devices", i.e. sub-computer nodes with fully integrated IP stack, have been developed for the integration of infrastructure networks for building-control ('infranets') into wider intranets and the Internet.

With the aim of *Seamless Networking*, traditional but proprietary infrastructure networks such as LON, EIB, etc. are being avoided, in order to provide "Gateway-less" or "Zero-gateway" structures.

Small "internet appliances", providing an IP socket connection and an HTTP server, are programmed in Java. Cabling cost is reduced by supplying electricity via "Power over LAN"; or by connecting them wirelessly.

The current core module (Dallas Semiconductor / Maxim TINI) has the size of a memory module. It will be replaced by a one-chip solution, currently under development. It offers a Real Time Operating System (RTOS) and a built-in Java Virtual Machine (JVM).

The following task-oriented boards are available:

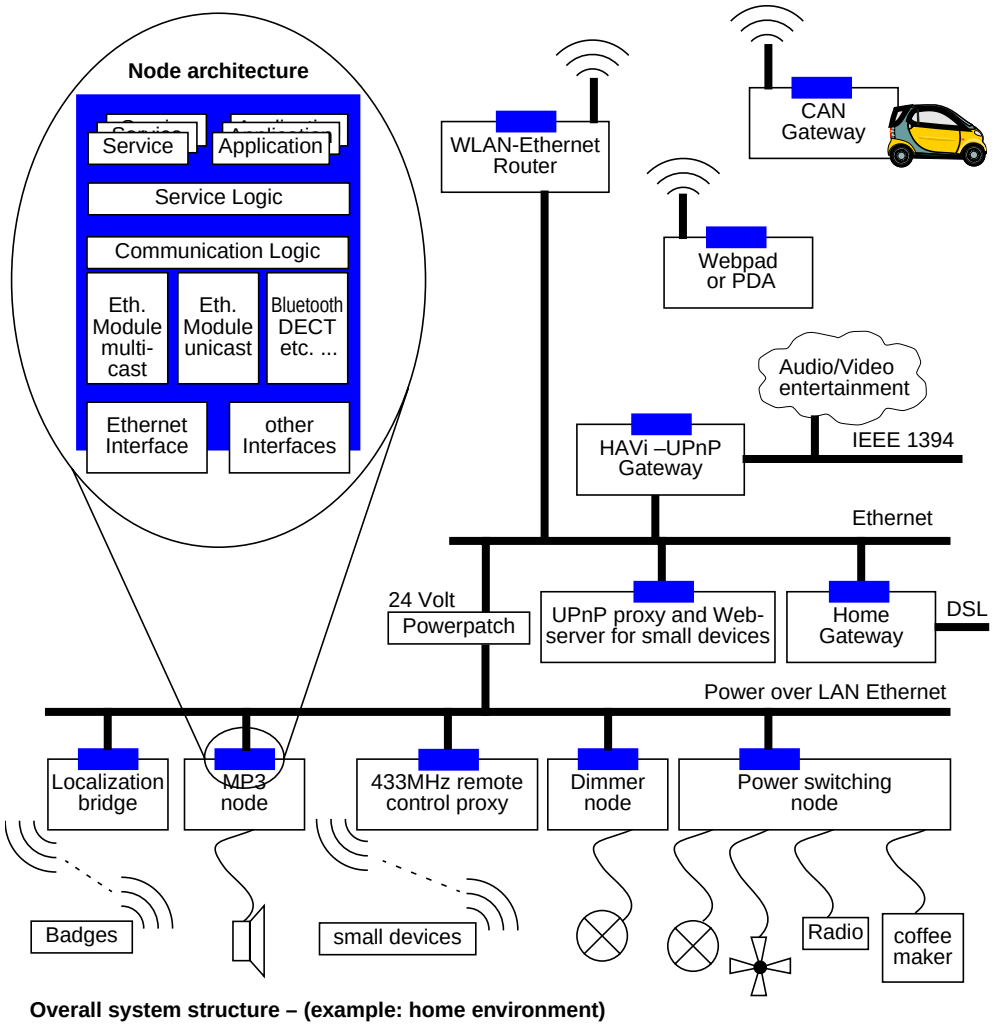
- Digital I/O card with 4 output channels, equipped with 230 V / 16 A power switches, and 4 sensor input channels, serving as the core for all controlling of light, heating, household appliances, etc.,
- customizable D/A and A/D converters, where the micro controller can drive a large variety of converter chips for different precisions and sampling rates,
- low-end D/A for dimming,
- Online Door-Plate, using a b/w 320 x 240 pixel LCD display and a touch screen, interworking with an Internet based room booking and accounting system,
- GUI device, similar to the door-plate, using a b/w 320 x 240 pixel LCD display and a touch screen, with smart buttons for interaction with the home/office environment,
- Smart IP streaming audio MP3 player, including a 1 W power amplifier,
- Smart IP MP3 encoder for audio capturing and streaming,
- FM radio, tunable and controllable via IP as an add-on for the MP3 encoder,
- active desktop image frame, using a 320 x 240 colour display,
- CAN (Controller Area Network) gateway for accessing automotive environments.

The *VistaSeek Local Positioning* System provides major improvements compared to the traditional badge/sensor pairs in Active Badge systems. The advantages described here are achieved by introducing a third major component type, counting now as:

- Stationary, stand-alone infrared ID beacons,
- Mobile, IR receiving and RF transmitting badges,
- Stationary RF receivers with LAN (or WLAN) interface, realized as a Smart IP device (Localization bridge).

Outlook:

- Implementation of a UPnP stack and "virtual" UPnP devices
- Hardware miniaturization – to fit into standard cylindric ligth-switch wall mounts (68 mm diameter in Germany)



Overall system structure – (example: home environment)

Conference Demonstration: Pervasive 2002, International Conference on Pervasive Computing, Aug 26-28, Zurich, Switzerland