Home server form factor for 600x300 mm ETSI racks

I argue that manufacturers of home servers and NAS appliances should standardize on the half-depth ETSI subrack form-factor and cabling conventions: 19" mounting plate, 240 mm deep, all connectors on the front panel.

READ THE HYPERTEXT VERSION HERE:
http://www.pabr.org/etsibox/etsibox.en.html

Revision History		
1.0	2008-04-29	Initial release.

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1. Introduction

The concept of always-on file servers for home networks is popular again. And again, manufacturers are offering a variety of incompatible form factors. One variant is a VCR-like appliance intended to be installed in the living room. Such devices are intrinsically limited because they must be silent, hence fanless and low-power. The other, more scalable approach is a headless server in a dedicated cabinet, together with wiring panels, networking equipment and uninterrupted power supplies. Although one can undoubtedly build such a cabinet from current off-the-shelf hardware, the lack of standard form factors and engineering conventions inevitably leads to inelegant assemblies which make poor use of what little space one is willing to allocate for this in a home.

State of the art for residential buildings . The electrical equipment industry should be credited for standardizing the ubiquitous 35 mm DIN mounting rail. Although sophisticated home automation products can now be found in DIN rail form factor, it is unlikely that general purpose computers and mass storage peripherals will ever be developed for this format. Actually, in many countries, building codes now require dedicated network wiring panels in all new residential constructions, located near the electrical service panel inside a 600 mm wide, 200 mm deep duct. While this is a step in the right direction, these dimensions are obviously intended for only a few patch cables, a DSL modem, a small ethernet switch, and their power supplies.

Small businesses are on the right track . In office buildings, network wiring panels and ethernet switches are typically installed in 19" wall-mounted rack enclosures. Unfortunately, computer manufacturers do not design rack-mountable server cases suitable for such cabinets, whose depth does not exceed 400 to 600 mm. The absence of common, standards-based dimensions probably explains their lack of interest.

Enterprise servers waste too much space . In datacenters, heavy-duty servers are typically mounted in 19" rack enclosures 42 U (2 m) high and 900 to 1200 mm deep. Again, there is no standard depth, which results in inefficiencies: a 150 mm deep ethernet switch occupies the same unit of space as a 1000 mm long server, i.e. 1 U of rack height. Another problem is that almost all rack-mountable servers are designed to be inserted from the front of the cabinet but connected from the rear, which requires clearance on both sides for maintenance operations; this is not a reasonable expectation in residential installations.

Industrial solutions are expensive . From time to time, server manufacturers revive the concept of "computing blades", i.e. boards which slide into a chassis and plug into a backplane. Some implementations are based on solid standards: VMEbus, CompactPCI, and now AdvancedTCA. This approach brings many benefits in terms of form factor, structured cabling, power management and cooling, but is still marketed only for high-end application.

2. The perfect home server enclosure

The telecom industry has been installing and maintaining roomfuls of electronic equipment and cabling for decades, and has captured this expertise in the form of standards such as the EN 300 119 series. Telecom cabinets come in 600x600 mm and 600x300 mm form factors; the later is suitable for home use. Mounting rails are actually wider than 19", but the standards have provisions for mounting 19" equipment with adapters.

Therefore, the perfect rack-mountable home server case, described below, aims to comply with [EN 300 119-4] and [EN 300 119-5].

- Thick front plate with 19" mounting holes.
- Height must be a multiple of 1 U, i.e. 1.75" or 44.45 mm.
- Width must not exceed 450 mm.
- Depth (measured from the mounting rails) must not exceed 240 mm. At 240 mm, the back side will be flush against the wall of the cabinet.

- All serviceable parts (connectors, switches, indicators, drive bays) must be on the front side. Other sides should be considered out of reach after mounting. Exceptions can be made for large connectors (e.g. an IEC power socket on the left or right side), provided that the case can still be connected and inserted from the front of the cabinet only.
- The 19" mounting rails will have 40 mm clearance from the door of the cabinet. Handles, connectors, cables and other mechanical features of the front panel must not protrude by more than 40 mm. In order to meet minimum cable bend radius requirements, sockets and ATX I/O plates can be recessed 10-20 mm into the front plate. (The EN standard is arguably excessively stringent here; in practice, 19" cabinets available for sale will be slightly deeper than 300 mm and have extra clearance on the front.)
- For cooling, air input must be from the left or front.
- Air output must be to the right (or to the back if depth allows it).
- Vents on the top and bottom covers, seen in some rack-mountable cases, are simply forbidden. For obvious reasons, any device whose cooling relies on vertical airflow has no place in a high density heterogeneous rack.

3. Example

- 19" x 2 U
- VIA C7 Eden 1.2 GHz
- 4 x tray-less hot-swappable SATA2 3.5" drives
- 4 x gigabit ethernet
- Spare room for one thin optical drive.

4. Roadmap

I expect the home computing market to evolve in the following ways, all of which will fuel demand for compact, standards-based infrastructure equipment.

- Shared DC power supplies (+12 V DC or -48 V DC) will be common, and possibly integrated with UPS and solar batteries.
- Power-over-Ethernet (PoE, IEEE 802.3af) will become popular. It is perfect for powering DSL modems, WLAN access points, IP phones, wall-mounted screens, etc. Besides, managed PoE switches make it possible to automatically shutdown unused features (e.g. at night) and power-cycle crashed devices.
- Wireless home networks will fall out of grace. ISM bands will become overcrowded; standards committees will have to ensure that their new radio protocols steal bandwidth from old devices, making

those less reliable over time; and eventually end-users will start worrying about the security of access points connected directly to their personal data.

- Powerline networks were a convenient way to delay expensive re-cabling work; they will disappear as users bring their electrical installations up-to-date with construction standards. And this is a good thing, because webs of hundreds of meters of unshielded, untwisted copper wire, arranged in branches of random length and orientation, look very much like wide-band jamming antennas and certainly not like transmission lines capable of carrying 1-100 MHz signals efficiently.
- A low-bandwidth, low-power communication standard will emerge for various automation functions (HVAC, motorized blinds and gates, ...). It will not be wireless, because users will be reluctant to swap dozens of batteries each year. It will probably not be powerline either, because one of its prominent applications will be security: smoke detectors must keep working even after a power circuit has shorted, started a fire and triggered the breaker. In Europe, the KNX bus standard seems to be the main contender.

Bibliography

[EN 300 119-4] *Environmental Engineering (EE); European telecom standard for equipment practice; Part 4: Engineering requirements for subracks in miscellaneous racks and cabinets.* . . http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=19276.

[EN 300 119-5] *Environmental Engineering (EE); European telecom standard for equipment practice; Part 5: Thermal management.* . . http://webapp.etsi.org/WorkProgram/Report_WorkItem.asp?WKI_ID=15949.