UPnP®

Enabling Standard IoT:
Future-proofing device communications

# Taking IP interconnectivity to the next level with UPnP+

Data centres, telecom, cable TV, mobile networks, and home, office and business services are moving towards increased interconnectivity, greater complexity and higher bandwidth. For each sector, the drivers are different. In telecom, we see a vast uptake of mobile devices, Web 2.0 software and social networking. For office networks, it's the uptake of portable computing, apps and the introduction of new - mobile and offsite - ways of working. In data centres, the arrival of 10/40G is key. There's also a growing market for video content streaming, and on-demand broadband video. These developments all largely rely on solid, error-free high-speed interconnections and compatibility.

Today, a rapidly increasing number of devices - in the home and workplace - is equipped with an IP address, allowing them to communicate online. In part, this is driven by dropping costs and wider availability of CPU power and connectivity. The resulting inter-device network is known as the 'Internet of Things'. This will further develop into the 'Internet of Everything', which provides tremendous opportunity for employment, innovation and growth by bringing together people, process, data, and devices.

The installed base of 'things connected' will reach 212 billion by the end of 2020, including 30.1 billion connected autonomous 'things', says IDC, a globally leading market research, analysis and advisory firm specialising in information technology, telecommunications and consumer technology. Intelligent systems will be installed and collecting data by this point. Internet of things technology and services spending amounted to $4.8 trillion in 2012 and the market will amount to $8.9 trillion in 2020, with a compound annual growth rate of 7.9 percent, according to IDC.

Global consumer spend on digital movies, games, and apps grew 30% from 2012 to 2013.
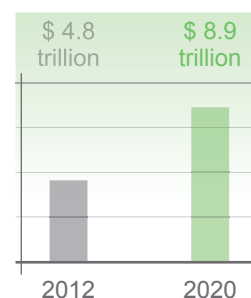In total, global digital spend in 2013 surpassed $ 57 billion.

*Source: 2013 IHS Digital Content Report*
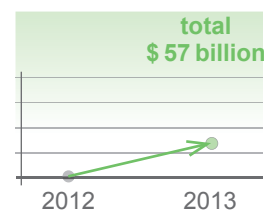
Global digital consumer spend

Internet of things technology and services spending amounted to $ 4.8 trillion in 2012 and will amount to $ 8.9 trillion in 2020 (7.9% CAGR).
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Source: IDC

IOT technology and services spending

- Mobile video traffic is growing by 60% annually

- Global smartphone subscriptions hit 1.2 billion in 2012, and are due to reach 4.5 billion by the end of 2018

- 60% of the world's population due to be covered by LTE in 2018

- Smartphone users spend most time on social networks.

- Data traffic volumes doubled between Q1 2012 and Q1 2013, and are expected to grow 12-fold by 2018.
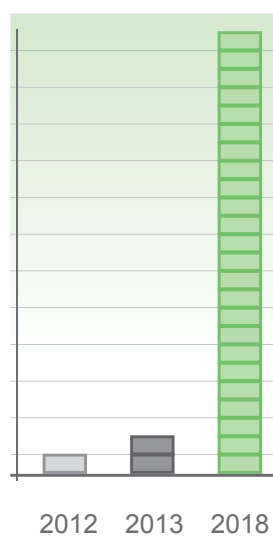
Source: Ericsson Mobility Report 2013

2012   2013   2018

Data traffic volumes

The majority of U.S. businesses are currently using cloud computing in some form.

Source: Neovise

Worldwide, 80 percent of some 700 organizations approached intend to use cloud services in one form or another within 12 months, including 55 percent of the organizations not doing so at the time of the survey. (August 2013)

Source: Gartner, Inc.

Changing requirements

As a consequence, new features and functionalities which seamlessly integrate inter-device and inter-platform communication and always-on connectivity are vital strategic ingredients in the development of future cable industry products. However, to become truly successful, the Internet of Things requires an open means for allowing devices to find one another and communicate. Data has to be able to flow freely between countless apps and platforms, on to any device, whether it's a fixed thin client, a smartphone, laptop, a tablet, a computer at home or any other device with an IP-address - cars, building security systems, alarm clocks, wearable health monitoring devices, navigation equipment, lighting solutions and much more...

Not only does everyone already expect fully secure and private access to data and applications anywhere, anytime and on any platform, they will also increasingly expect to read, analyse and control every network or device from every other network or device. To make this more complicated, only the individual user can determine which software versions and Operating Systems are used. Without multi-vendor interoperability, things might simply come to a grinding halt at any time, and the user experience will be, to say the least, unsatisfactory.

Ecosystems must be bridged

Today's ecosystems lack integration and interoperability

- Proprietary solutions for high-end consumers
- Bridge specification is poorly designed
- Bridging requires differences at PHY, protocol and semantic levels
- Simply introducing new protocols only means more confusion

Owing to a previous absence of standardisation, and with mainly short-term convenience and cost considerations in mind, most 'Internet of Things' projects to date have been built up vertically. All devices and connectivity are provided by a single vendor, which means there is no (or extremely limited) interoperability with other vendors' products and systems. This leads to segmentation in the (emerging) market, with end-user interfaces and apps lacking compatibility. Functions can't be added, combined or merged, which incapacitates systems and limits end-user choice, system flexibility and functionality, especially when considering future technology developments.

Today's connected consumer view

Consumers see devices as connected -
now matter how or where they are connected

- Consumers locked into a single app per device or ecosystem
- How it all works is not always clear
- Quality and seamlessness of apps can be 'hit and miss'

Future connected consumer view

Number of devices will continue to grow
along with an app per gadget

- Growing user frustration
- Difficulty dealing with underlying technologies
- Requirement to learn many apps

The solution : building on home connectivity

First, let's take a closer look at the UPnP standard. This is, in essence, a comprehensive, vendor-neutral and integrated set of audio/visual and firewall control standards, which are used in consumer electronics and residential gateways. However many UPnP standards go beyond media and networking, as the full portfolio includes standards for connected thermostats, lighting, remote user interfaces, telephony, device management and more. UPnP standards are also being integrated into web browsers and applied in healthcare and energy management applications around the world. Already deployed in billions of devices worldwide today, UPNP can be used for any device supporting IP - of which billions more will be introduced.

THE UPnP SOLUTION

- Leverage gateways as a platform for PHYs and protocol bridging
- Define IP-level interfaces for non-IP PHYs to bridge to
- Leverage the Cloud to provide a solution everywhere

Next-generation UPnP+ builds on all these existing standards, whilst adding new features and capabilities in a complete, integrated solution that will enable the next major phase of cross-platform device and network functionality. It provides a solid, future-proof basis for integration of Cloud content and services. One important and fast-growing user requirement is being able to access devices from remote locations, often using a mobile device. Ensuring home connectivity can be leveraged from outside the home (or workplace) allows for the development of new integrated functionalities, user cases and business models. Security is a vital element in the design and usage of such applications, but the UPnP Cloud standards have this 'built in', along with access control configurability.

UPnP+

- Full integration of IPv6 with seamless backwards compatibility to IPv4
- Integration of content and services from the cloud
- Access to UPnP devices and services from web browsers
- Improved support for low-power and mobile devices
- Grouping or pairing of similar devices and services
- Bridging to non-UPnP networks (e.g. ZigBee, Z-Wave, Bluetooth, ANT+) for a broad range of applications including wellbeing & fitness, energy management and home automation

UPnP+ supports implementation of web browser control for a wide range of functions, ensures future connectivity and makes new services possible, in areas such as health and fitness, energy management, security and sustainability. For example, to improve the efficient use of resources, it is important that the whereabouts, age, condition and commodities used in a product or component are always available. Tracking of end user products, enabled by the internet and standardisation, makes this possible.

UPnP+ allows devices from different manufacturers to work together seamlessly, based on a single underlying technology, which is backwards-compatible and easy to deploy. Not every device might be suitable for incorporation of UPnP+ functionality, for example due to the varying price points of chipsets. However, the UPnP bridging concept does allow different local networks to interact. This includes legacy device network protocols such as Bluetooth or Zigbee. Entirely new domains, introduced as a result of the rise of Internet of Things and Cloud computing, which couldn't be fully accommodated within UPnP will be facilitated with UPnP+ and can be standardised.

Future connected devices

WAN Discovery,
IP protocols,
Open Source

Devices with WAN
Connectivity

Cloud services
Inc. 2nd and 3rd tier

Non-WAN
aware device
bridged to
WAN

Non-IP
protocols
bridged to
LAN and WAN

IP-enabled Home Devices

Non-IP-enabled Home Devices

Taking UPnP+ standardisation to the cloud

UPnP+ Cloud is built on mature technology (UPNP, Internet, XMPP...) which caters for all of tomorrows connectivity requirements, removing boundaries and enabling full device and network compatibility. UPnP Forum's latest activities accommodate 'Cloud' developments and bridge distinct protocols.

This newly introduced UPnP+ standard takes a step beyond consumer media devices and provides connection with cloud services, support for IPv6 and integration with new networks of devices. This initiative is focused on delivering new technical capabilities, to enhance product functionality and provide a more sophisticated, intuitive and deeper user experience across platforms.

UPnP Cloud

- Backwards compatible (UPnP still works in the home environment)
- Cloud extensions made on existing (proven) technology (XMPP)
- Works from a browser (XMPP – BOSH / XMPP websockets)
- Secure communication channel
- User can select who is allowed to use UPnP cloud devices
- Easy to deploy

Summary

For over a dozen years, UPnP technology has offered consumer electronics and computing devices a uniform connectivity platform. UPnP+ will focus on expanding these capabilities as new paradigms for mobile connected computing evolve, including cloud-based service delivery, smartphone content sharing, and the Internet of Things. Many users can't currently access the true potential of their devices, let alone combine or expand functions across devices and platforms. A lack of standards for cloud service delivery combined with the proliferation of next-generation services leaves many users flipping between a multitude of applications, or frustrated at the lack of support on their platforms.

The need for providing safe, reliable remote access to applications and information and meeting 'big data' requirements is placing more demands on the Cloud and the interconnecting network solutions and devices. With the arrival of new Cloud services and information-hungry applications, new inter-device standardisation is urgently required to meet consumer usage demands and expectation. The UPnP initiative will provide an enhanced, seamless experience for the consumer and create new values and opportunities for manufacturers, developers and integrators. This is an opportunity to better integrate solutions beyond devices into the products, apps, cloud and web services that consumers are currently utilising and demanding. UPnP is taking the concept of 'allowing devices to talk to each other' and expanding it towards a new paradigm of 'total interconnectivity and limitless functionality.'

UPnP: promoting interconnectivity

UPnP Forum, established in 1999, is an impartial global industry standards body, that has paved the way for seamless connectivity between more than a billion devices. Its 1000+ companies and organisations work together to enable device-to-device interoperability and facilitate easier, better home networking. UPnP promotes adoption of uniform technical device interconnectivity standards and certifies devices conforming to these, paving the way for seamless connectivity between more than a billion home devices running above the IP layer.

The Forum has widened its scope to encompass the Cloud, including integration for content and services, as well as bridging to non-UPnP networks (ZigBee, Z-Wave, Bluetooth, ANT+...). This enables a broad range of applications including health & fitness, energy management and home automation.

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