White paper
FUJITSU Thin Client FUTRO delivering desktop experience

Thin Client technology is a prospering market with a healthy growth forecast. And there are many good reasons for deploying Thin Clients as opposed to fully-fledged PCs: Thin Clients reduce costs, lower power consumption, improve reliability and maintainability and increase data security and compliance. On top of these advantages, Fujitsu has added true desktop experience extending the use-case for Thin Client technologies to all the upcoming next generation apps that are cloud-connected and driven by visual experience. For these next generation FUJITSU Thin Client FUTRO, the AMD Embedded G-Series SoC family delivers the technological basis.

Content

The reason why - Thin Clients

Both in the private and public sectors, numerous areas of work exist where groups of employees are working on very similar or identical tasks. Their workflows are largely identical and the configuration of their workstations is homogeneous. In the past these applications constantly needed even more powerful PC systems, but now, thanks to increasing network bandwidth, more centralization of the intelligence and computing performance is possible.
IT administrators are restructuring their IT environments and progressively opting for client/server architectures. Particularly for streamlined installations Thin Client technologies come into their own. And there are a number of good reasons for that. In comparison to distributed PC systems, they reduce costs, lower power consumption, improve reliability and maintainability and increase data security and compliance.

As early as 2008, research by Gartner[1] or the Fraunhofer UMSICHT[2] came to the conclusion that Thin Client infrastructures could save up to 70% of the Total Cost of Ownership (TCO) compared to classic, non-centrally managed PCs. In the case of centrally managed PCs, the figure is still around 32%. This cost calculation should still be valid today, as application-ready server performance is available via the cloud and Thin Clients have become relatively more inexpensive despite their performance increase.

Thin Client markets

Subsequently, there are application areas for Thin Client technologies in countless markets as the following work area overview depicting work collaboration and homogeneous tasks shows:

	Call Center (Sales Inbound/Sales Outbound/First Level Support)	Accounting department	ERP / Logistics / Supply Chain / fork lift terminals	PPS / Shop floor terminals / GUI for industrial machinery	Human Resource departments	Kiosk /POS / Digital Signage	e-learning
Industry / OEM	+++	+++	+++	+++	+++		
Inter Logistics / Fleets	+++	+++	+++		+++		
Retail stores / system catering	+	++	+++		+++	+++	
Wholesale / mail order / online shops	+++	+++	+++		+++		
Banks and insurances	+++	+++	+++		+++	+++	
Telco carrier and service provider	+++	+++	+++	+++	+++	++	
Advertising industry / Market research	+++	++			++	+++	
Government	+++	++	+++	+++	+++	+	
Public Transport	+++	+	+++	+++	+++	+++	
Emergency services and authorities	+				+++		
Hospitals		++	+++	+++	+++	++	
Schools and universities	+	+			+	+++	+++

The drive towards cloud applications means that Thin Client application areas are spreading even further. The Internet of Things is also embracing Thin Client technology: for example, Thin Client based digital signage systems are an ideal application for deploying centrally provisioned visualizations. The standardization of apps towards TCP/IP and, for example, Java also results in even highly heterogeneous tasks placing relatively homogeneous demands on the front end systems. The application field of Thin Clients therefore is widening significantly with the increase in cloud-based Software as a Service (SaaS) offerings. Accordingly, analysts assume that at present a stable CAGR of around 7% can be reached by 2018. The average revenue per system is expected to grow as end users – amongst other factors due to IP telephony and video conferencing – are increasingly opting for more powerful Thin Clients.

Conversion costs

The Fraunhofer UMSICHT[3], for example, assumes that a switch to Thin Clients is worthwhile as from around 25 workstations, i.e. for companies with over 40 employees (assuming that more than 60% of workplaces are equipped with computers)[4]. Over 60% of all workers in Germany are employed in companies such as these[5]. This adds up to a potential of around 15 million installed systems[6]. Assuming only 10% of workplaces in the G20 countries, which represent 80% of the gross domestic product (GDP), are equipped with a computer, then more than 213 million Thin Clients could be installed worldwide[7]. Add to this all the installations in the IoT environment.

Why, however, are not all work spaces equipped with Thin Clients? To date, it has been a question of the relatively high initial costs. First, these include the central servers for hosting data and applications –compared to PC systems the major additional investment – as well as a stable connection to the server. Depending on the usage model, software requirements present an additional cost factor - for example, multi-user applications with classic Server Based Computing (SBC), and Virtual Desktop Infrastructure (VDI) needs virtualization software.
If Thin Client applications are run via cloud computing – which represents a new form of server-based multi-user structure – essentially, only a browser is required on the on-site client. Everything else can be obtained on-demand from third parties. This new form of Thin Client computing can therefore significantly accelerate the break-even point. If bandwidths of around 100 Mbit are available, entering Thin Client computing makes sense right from the first unit, if the workplace is to be based purely on SaaS and cloud data storage. With SaaS and STaaS companies benefit from infrastructure cost savings and rapid application deployment, which can cut the cost of a switch to Thin Client computing.

Challenges of Thin Client computing

Despite all the advantages and the reduced initial costs, when deploying Thin Clients, new challenges arise. These become apparent when graphics- or data-intensive applications fully use or exceed the bandwidth of the LAN or WAN connection.

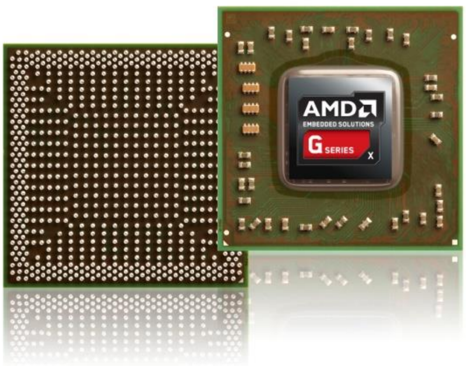
- Medium-level graphic demands are required by call center applications or broker terminals who need quick response graphics on high-resolution widescreen monitors with 1920 x 1080 pixels to significantly increase the productivity of the employees. Some workplaces are even equipped with multiple monitors driven by a single system.
- High-level graphic demands have to be fulfilled for applications such as e-learning. High resolution videos and animations play a significant role in knowledge transfer. Smooth HD video playback and (interactive) 3D animations, often via Flash, are crucial. The same applies to digital signage applications.
- Premium graphics requirements come from healthcare applications – for example in hospital radiology, where the systems have to cope with large amounts of data in the electronic health records of the patients. Plus, vast amounts of image and video data have to be displayed fluently and quickly for diagnostic imaging.

New demands on graphics are coming from Unified Communication applications, such as software-based IP telephony, web and video conferencing via Thin Clients. This is especially true in the latter applications where voice and video data has to be transmitted efficiently as an upstream from the Thin Client to the servers.

Next generation Thin Clients therefore have to offer true desktop experience and be able to tackle multimedia data accordingly, whether it is routed from the server to the Thin Client or takes the opposite path. If this data is transmitted uncompressed, a bottleneck can quickly evolve in the bandwidth used for transmitting screen content between the server and client. Multimedia redirection offers a solution to this bandwidth problem. It transmits multimedia content in a compressed form. The content is decoded upon arrival at the Thin Clients, using protocols such as Citrix HDX (3D), Microsoft RFX and PCoIP. Additionally, for Unified Communication, an encoding of the video and audio signals recorded on the Thin Client is required. So, on the client side a processor is required that couples Thin Client efficiency with desktop PC multimedia performance.

Thin Client technology for desktop experience

One manufacturer that has cast these somewhat contradictory features into a highly-efficient SoC processor is AMD: On just one single chip, the highly scalable second generation AMD Embedded G-Series System on Chip (SoC) processors integrate a dualcore or quadcore CPU, an AMD Radeon™ AMD Radeon R5E/R3E Next-Generation Graphics Core and an I/O controller for common PC interfaces. This high level of integration enables particularly space-saving Thin Client designs with outstanding performance per watt efficiency in the low-power x86 microprocessor class: Compared to previous G-Series SoC solutions it provides up to 53 percent more overall performance[8] and compared to the two chip APU G-Series platform the AMD G-Series SoCs Steppe Eagle boast a 113% improvement in CPU performance when running multiple industry-standard compute-intensive benchmarks[9].



By combining all the components on a single chip, the AMD G-Series SoCs pave the way for very compact Thin Client system designs.

Multimedia redirection performance

For graphics and multimedia performance – relevant for multimedia redirection – the AMD Embedded G-Series SoCs deliver up to 20% higher performance compared to the previous generation. The featured Universal Video Decoder 4.2 unloads the CPU to enable smooth MPEG-2 and DivX (MPEG-4) HD video playback. And to ensure best compatibility to conventional Thin Client operating systems and applications, the SoCs support the powerful graphic APIs DirectX® 11.1, OpenGL 4.1 and OpenCL 1.2. Video conferencing scenarios are enhanced by the SoCs offering the possibility of encoding the video stream directly on the Thin Client, thus saving valuable bandwidth.

Low-power efficiency

The AMD Embedded G-Series SoCs combine all these features with a low-power requirement of only a few watts. The SoCs' low-power requirements enable fanless designs with less waste heat. The clients (as from FUJITSU FUTRO S720) can also be powered by Power over Ethernet (PoE). The reduced cabling also ensures even greater reliability, as problems caused by loose cabling are further minimized.

Furthermore, the AMD G-Series SoCs take less than one millisecond to switch from energy-saving mode to full performance which is ideal for applications where the Thin Client is not in permanent use. The systems can switch to the energy-saving 'deep power down' mode without compromising usability. Backing the long service life of the Thin Clients is AMD's pledge of 10 years long-term availability on the Embedded G-Series SoCs. This is an important precondition, so that even after several years, administrators can rely on having a homogeneous hardware landscape reducing the administration effort compared to mixed installations – a highly interesting point for industrial IoT installations with widely distributed systems.

FUJITSU Thin Client FUTRO

Fujitsu has made the AMD Embedded G-Series SoC available within a range of several products for the varying demands in the SBC, VDI and cloud computing areas. The FUTRO Thin Client family offers Thin Client technology with desktop experience in different power and performance options ranging from dual- to quad core. This high degree of scalability enables Fujitsu's customers to standardize their entire Thin Client landscape on one single Thin Client product line able to fulfill the individual demands of multiple use cases including dual operation as a Fat / Thin Client for cloud computing. This single platform approach helps customers to further homogenize their IT landscape and consequently reduce their IT infrastructure's TCO.

Users benefit from these homogeneous systems in more ways than just from it being a single standardized Thin Client platform with desktop experience. They profit from the systems' high level of Made in Germany quality which even industrial users rely on. The cross-platform standardized functions of Fujitsu's own remote management solution Scout Enterprise present a further convincing argument. Scout Enterprise helps system administrators manage their IT infrastructure more smoothly and with greater efficiency. With Scout Enterprise, IT administrators can take stock of all their distributed systems including all the attached peripherals and the image administration. In addition, the complete range of troubleshooting features such as switching on and off or rebooting are supported.

All FUTRO Thin Clients are prepared for SBC and VDI with Citrix, VMware and Microsoft. Customers can order the FUTRO Thin Clients with either eLux™ RP (an embedded Linux derivative especially designed for Thin Clients) or Windows Embedded Standard 7 operating systems. Furthermore FUJITSU plans to introduce 'Windows 10 IoT Enterprise for Thin Clients' on availability within the year for its AMD Embedded G-Series SoC based Thin Clients FUTRO, which is a further future proof argument.

The FUJITSU FUTRO S520

is the versatile entry-level Thin Client for SBC and VDI. With a FUJITSU exclusive AMD Embedded G-Series GX-212ZC processor it offers powerful graphics capabilities including dual monitoring and desktop experience despite its low-power design. It also features latest interface technology, including USB 3.0.

The FUJITSU FUTRO S720

is silent, user-friendly and offers straightforward integration and manageability. With its 2.2 GHz dualcore AMD G-Series GX-222GC SoC it covers all mainstream demands in Thin Client computing as well as delivering a user-friendly desktop experience. TPM and PoE options as well as extended connectivity with 6x USB and a WLAN option underline its versatility.

The top of the line FUJITSU FUTRO S920

excels with its expansion slots and unique connectivity options including support of up to four independent displays. The powerful AMD G-Series GX-424CC quadcore processor makes it the right choice for highly productive workspaces with desktop experience.

The All-in-One FUJITSU FUTRO X923-T

incorporates three different technologies in a monolith design: an AMD G-Series GX-415GA quadcore processor-based Thin Client, a high resolution1080p 58.4cm (23-inch) monitor and a touch screen for intuitive control (optional). Multiple USB ports and the option to drive a secondary monitor make the all-in-one design a highly integrated powerhouse with desktop experience.

[1] http://web.citrix.com/go/m2l/hi/pdf/GartnerReport.pdf
[2] (Source: Fraunhofer UMSICHT: PC vs. Thin Client 2008 - Wirtschaftlichkeitsbetrachtung): http://publica.fraunhofer.de/documents/N-112922.html; http://cc-asp.fraunhofer.de/docs/PCvsTC-de.pdf
[3] (Source: Fraunhofer UMSICHT: PC vs. Thin Client 2008 - Wirtschaftlichkeitsbetrachtung): http://publica.fraunhofer.de/documents/N-112922.htm; http://cc-asp.fraunhofer.de/docs/PCvsTC-de.pdf
[4] http://www.bitkom.org/de/themen/54633_76727.aspx
[5] Medium-sized enterprises (19,7 %) and large enterprises (39,7 %) employed in 2012 59,4% of all jobholders in Germany (https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/UnternehmenHandwerk/KleineMittlereUnternehmenMittelstand/Tabellen/Insgesamt.html).
59.4 % of 41,5 Million employees overall in Germany in 2012 result in 24,7 Million employees (https://www.destatis.de/DE/PresseService/Presse/Pressemitteilungen/2013/01/PD13_001_13321.html).
[6] 61 % of 24,7 Million employees in medium-sized and large enterprises result in 15,03 Million PCs.
[7] The total number of employees in the G20 does not include the numbers of the EU28. Source: https://www.destatis.de/DE/ZahlenFakten/LaenderRegionen/Internationales/Land/G20/G20Details.html?cms_gtp=194114_list%253D4%2526194102_slot%253D2&https=1
Summe: 2.130.755.000,00 Beschäfigte ohne EU-28
[8] Overall performance was measured using a suite of industry benchmarks consisting of 3DMark06, 3DMark11, POVRay v3.7, Passmark v7, PCMark8 v2.0, and BasemarkCL 1.0. The GX-412HC's TDP is 7W and GX-210HA's TDP is 9W. The performance delta of 53% was calculated based on GX-412HC's geometric mean of 555.3 and GX-210HA's geometric mean of 363.6. The performance-per-watt delta of 96% was calculated based on GX-412HC's performance-per-watt ratio of 79.3 and GX-210HA's performance-per-watt ratio of 40.4. The AMD Steppe Eagle GX-412HC and G-S SOC GX-210HA used an AMD Larne motherboard with 4GB DDR3-1333 memory and 320GB Toshiba HDD. The system ran Windows® 7 Ultimate. EMB-104
[9] AMD GX-415GA scored 209, AMD G-T56N scored 98, based on an average of Sandra Engineering 2011 Dhyrstone, Sandra Engineering 2011 Whetstone and EEMBC CoreMark Multi-thread benchmark results. AMD G-T56N system configuration used iBase MI958 motherboard with 4GB DDR3 and integrated graphics. AMD GX-415GA system configuration used AMD "Larne" Reference Design Board with 4GB DDR3 and integrated graphics. All systems running Windows® 7 Ultimate for Sandra Engineering and Ubuntu version 11.10 for EEMBC CoreMark.

Contact
FUJITSU Technology Solutions GmbH
Address: Mies-van-der-Rohe-Str. 8, D- 80807 Munich
E-mail: CCD.info@ts.fujitsu.com
Website: www.fujitsu.com/fts
2015-08-13 EM EN