CPCI FlexiSwitch leverages installed base of VoIP and Media Gateways

By Dr. Stephan Rupp

Rising transactions and traffic may generate a bottleneck in existing VoIP installations by lack of internal and external switching capacity.
In this article Stephan discusses how innovative CPCI switches may handle the ever increasing transaction load and traffic load in VoIP installations in the most seamless and cost effective way.

Voice over IP installations now have become main stream in enterprise networks and already have a significant installed base in carrier networks. Early deployments have started 8 years ago, with CPCI being an indispensable technology in existing installations. CPCI now is the leading technology used in Call Servers, Media Servers and Media Gateways.

The concept of current installations is clearly cut: Call Servers keep track of call states and session states. Media streams are handled by Media Servers and Trunking Gateways. Trunking Gateways provide the transitions to traditional POTS networks (PSTN) and 2G mobile networks (PLMN). Media Gateways provide support for handling call sessions by announcements, conference facilities, voice mailboxes, or IVR for user guidance. They also may provide streaming media to user sessions, which stay in the IP domain. As shown in Figure 1, both Media Gateways and Trunking Gateways are controlled by Call Servers.

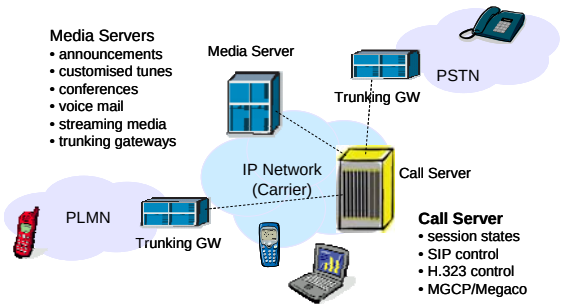

Figure 1: VoIP installed base

An emerging trend in VoIP and media processing is the handling of different classes of services. Different classes correspond to different qualities of service (QoS). The network infrastructure will need to support DiffServ to differentiate between packets and to assign different lasses of service. This basically means, that the first network element upstream and the first network element downstream will need to classify packets according to their class of service. Every other network element in the chain will need to process packets according to their class. Missing out one element generates the same effect as a single lane segment on a highway. Both support and management of QoS also generate higher requirements on processing of transactions and traffic and needs QoS enabled infrastructure.

New users and more complex call transactions increase transaction load and traffic load

With a growing user base, the number of transactions to be handled by Call Servers has been ever growing. But this is not the only source of increasing load: call transactions are getting more complex by adding extra features to services. Among the extra features are individual, customised waiting tunes and user specific announcements. Also, users get better control over their calls by being able to hold calls, transfer calls, set up conference calls, or make use of voice mailboxes in the network. While such facilities are limited in the established PSTN and PLMN networks, the may easily be provided in the VoIP domain and represent a significant differentiator in there.

In general, VoIP calls are easier to integrate into IP based or Web based services, such as triggering a call directly from a Web-based telephone directory. For users who stay in the IP-domain, calls may be combined with any kind of media streaming and any kind of web-based control, such as VoiceXML. Some of the new

features may be translated into the PSTN and PLMN. The use of voice mailboxes has successfully been increasing the airtime and transactions in mobile networks. The same will happen with all the features available in the VoIP domain.

The consequence of an increasing number of users and more complex call transactions is an increasing transactions load and increasing traffic load on Call Servers and Media Gateways. If QoS is envisaged, the network infrastructure also will need to support the required standards and will need to carry the extra load. This situation may easily generate a bottleneck in existing installations: increasing traffic needs to be fed into the system, but also needs to be distributed and processed within the system.

How to extend the capacity for transactions and traffic load

While most systems are well prepared for capacity extensions, the switching fabric itself may become a headache. Individual switches need extra space and extra patchwork. They also poorly integrate into the system and into system management. Patch cables are error prone and missing integration into system administration may jeopardise carrier grade installations.

Also, the traffic needs to be distributed within the shelf to the processing units in an efficient way. Exterior switches cannot handle this situation. Also, such a solution hardly is cost effective. A high performance CPCI switch may overcome those problems.

A build-in high-performance CPCI switch for Call Servers, Media Servers and Gateways can provide:

- seamless integration into the shelf and into shelf management by IPMI
- hot swap capabilities
- flexibility to adjust to the individual requirements of the installation
- increase of capacity within the shelf over native CPCI connections
- latest technology in layer 2 and layer 3 switching and routing
- high capacity uplinks to the exterior world (10GbE)
- the most cost effective solution.

One of the latest developments in high-performance switches is the CP6923. It incorporates the latest technology in switching, which is now also available on CPCI. The CP6923 Flexi-Switch is a PICMG 2.16 compliant 6U CPCI Gigabit Ethernet switch with 24 channels. It provides leading edge technology to CPCI installations, thus maximising their usage and life-time. A value line version provides basic layer 3 switching. The performance line provides non-blocking layer 3 switching and routing with two 10GbE uplink ports.

A practical case

The CP6923 is compliant to PICMG 2.0 R3.0 specifications, PICMG 2.1 R.2.0 hot swap specifications, PICMG 2.9 R1.0 system management, PICMG 2.16 R1.0 packet switching backplane, IPMI specification V1.5, IEEE 802.3, 2000 and IEEE 802.3ae. It contains a 24 port GbE layer 3 switch with 19 link ports to CPCI boards and 1 link port to second fabric boards (all ports 10/100/1000Base-T). Concerning uplinks, it supports

- 4 uplinks GbE (10/100/1000Base-T copper based) on the CP6923-C
- 4 uplinks 1GbE SFB on the CP6923-O
- 2 uplinks 10GbE XFP on the CP6923-O.

Figure 2: CP6923 CompactPCI Switch Architecture

The CP6923 includes a fully managed software environment and a comprehensive firmware package. It contains:

- Board level management according to IPMI V1.5
- Reliable field upgrades for all software components
- Dual boot images with roll-back capabilities
- Management via SNMP with standard MIBs and command line interface
- System Access via Telnet, SSH and serial line
- Hot-Swap support
- Reset of basic fabric
- Integrated IP-Router on base fabric

- Modular software architecture for project specific customisation.

The Ethernet implementation supports QoS (IEEE 802.1p) on all ports, as well as VLAN including VLAN registration with GARP/GVRP (IEEE 802.1q). The routing capabilities also support DiffServ standards and redundancy of the routing functionality using a second switch hub board. The services include onboard event management, test and trace facilities, power on the shelf diagnostics and the persistent storage of configuration across restarts. They also support the retrieving and installing of multiple configurations. The CP6923 is positioned as a high-end solution with superior features combined with low costs.

The future of CPCI

While later generations of technology are emerging, as now is ATCA, it has never been a good strategy to neglect an installed base. While there is little doubt that ATCA will provide the next generation of carrier grade solutions, it also represents today a high-end technology for high performance, high availability and a high level of operational support. In comparison, CPCI today provides cost efficient, compact and less complex solutions. There can also be little doubt, that a replacement of running CPCI installations would inevitably generate a considerable overhead.

Thus, leveraging the installed base of CPCI seems to be a good strategy in terms of gain per cost. One of the critical points for existing installations of Call Servers, Media Gateways and Trunking Gateways is the increase of performance in terms of transactions and traffic load. The latest in CPCI switches may provide the extra connectivity needed, both externally towards other systems and internally within the shelf.

About Kontron

Kontron AG is a worldwide leading manufacturer of embedded computer technology and robust solutions for mobile use. It supplies leading OEMs, system integrators, and application providers in a wide variety of market segments such as data and telecommunications, automation, measurement and control technology, traffic engineering, medical and military technology, as well as aviation and energy. Kontron's goal is to enable customers to significantly reduce their time to market and to create clear competitive advantages through products such as high-performance open computer platforms and systems, single board computers, HMIs, and mobile computers. Kontron employs over 2,500 people worldwide with production facilities in Europe, North America, and the Asia-Pacific region. The company is listed on the German TecDAX 30 with the company symbol "KBC". Kontron is the only company based in Europe which has premier status in the Intel® Communications Alliance and, thus, has early access to leading Intel technologies and preferred engineering support. For more information about Kontron, visit the company's website: www.kontron.com.

Authors biography: Stephan Rupp is a senior systems architect with Kontron Modular Computing and responsible for the design of communication platforms. Before joining Kontron, he has been responsible for the design of network solutions, systems integration and business development with Alcatel. Stephan holds a PhD in electrical engineering from RWTH, Germany, and has background in research of medical systems and digital image processing.