Optimum 3G performance in Caja Duero with the Teldat 3Ge

Main facts :

- Customer : Caja Duero
- Number of offices : 330 offices
- Location : Spain

Initial Approach: Adding internal HSPA cards to existing corporate routers

- **Pre-analysis:** 100% 3G coverage in the target 330 offices, according to service providers coverage maps.
- **Results after HSPA card deployment:**
  - 38% of the offices connected to the 3G network
  - 44% only able to connect in 2G mode
  - **18% weren't able to connect through the cellular network**

The solution: Using Teldat's 3Ge adapter provided 99% success rate.

- Teldat 3Ge installed in the office spot with maximum signal strength.
- Teldat 3Ge interfaced with existing access router via the office's LAN infrastructure, being powered through PoE.
- **Results:**
  - **99% of the offices were able to connect at 3G speeds**
  - Only 1% of no coverage situations.

The Technological Challenge: Office backup communications on 3G

The financial entity, Caja Duero[1], has over 600 branch offices distributed throughout Spain and Portugal. These offices are intercommunicated through VPN-MPLS services supplied by the entity network operator. The main access line in their offices is ADSL, WAN Ethernet or Frame Relay and typically backed up through ISDN.

Caja Duero

When the office communications switch to backup, the business-critical applications performance diminishes significantly due to the limited capacity available (128 Kbps over ISDN lines). This restriction jeopardizes entity's evolution towards applications requiring greater broadband consumption (Unified Communications, IP remote surveillance, etc.) in their High Availability schemas.

Being aware of this limitation, Caja Duero decided to upgrade their backup lines to 3G HSxPA technology. 3G technology offers speeds similar to ADSL (7.2 Mbps downstream using HSUPA technology) thus greatly improving the critical business applications performance in backup and guaranteeing the entity's technological evolution. Thanks to its wireless nature, 3G provides a completely independent backup link for the offices' main fixed line, versus alternative copper-wire based lines such as ISDN or ADSL.

Adopted 3G Solution/approach

Caja Duero initially opted to integrate mobile backup in their modular router currently in use at their branches (the Atlas router). The 3G access is activated by inserting an HSPA interface card in one of the router's free slots and configuring the 3G service as per Caja Duero's cellular provider specifications.

The validation tests for this solution were carried out in Caja Duero laboratories during the first quarter of 2007 and achieved satisfactory results.

[1] **Caja Duero** is a Spanish financial entity pertaining to the EGFI Group ("European Group of Financial Institutions") and was founded in 1991 when Caja de Ahorros y Monte de Piedad Salamanca and Caja de Ahorros y Préstamos Soria merged. The financial entity announced an active volume for their 2008 balance sheet of 20,741 million euros and reported a net benefit of 77,6 million euros.

Coverage problems during 3G deployment

The deployment phase took place during the third and fourth quarters of 2007. The cellular provider equipped HSPA cards in the Atlas routers in 322 entity branches located in Wireless-WAN areas covered by the carrier.

Table 1 shows the distribution of the type of Wireless-WAN connection over the 322 offices situated inside the 3G coverage areas announced by the cellular carrier.

Technology	WWAN branches
3,5G (HSPA)	49,51%
3G (UMTS)	50%
2G (GPRS)	0,49%
Not covered	0%

Table 1. WWAN coverage distribution in branches (estimated)

However, once the deployment had been completed, the Wireless-WAN connectivity was significantly lower than that estimated, as reflected in the following table.

Technology	WWAN branches		
	Acceptable Coverage[2]	Optimum Coverage[3]	Total
3G (UMTS) y 3,5G (HSPA)	24,02%	14,22%	**38,24%**
2G (GPRS)	36,67%	6,86%	**43,53%**
Unacceptable coverage	--	--	**18,23%**

Table 2. Average WWAN distribution during HSPA card deployment

Some 18% of the installations were not completed due to the low Wireless-WAN signal level measured in the Atlas routers' immediate vicinity. Additionally, Caja Duero didn't consider 43.53% of the installations valid because their connection had been degraded to GPRS as there was insufficient 3G/3.5G signal coverage.

Why was the real result so different from that expected? The answer is quite simple. The Wireless-WAN signal on its path from the Base Station towards the Communications Room, (Atlas router location), was being attenuated when passing through the office walls (e.g. the facade and the walls in the branch department itself). This type of attenuation is more severe in the 3G signal (2100MHz band) than in 2G (900MHz and 1800MHZ bands).

[2] Acceptable 3G/3.5G coverage is meeting an RSCP signal value between -85dBm and -100dBm depending on Telefónica's specification.
[3] Optimum 3G/3.5G coverage is meeting an RSCP signal value above -85dBm depending on Telefónica's specification.

The subsequent results showed the scant or non-existent Wireless-WAN coverage in the Communications Room preventing the service from being implanted in 18% of the installations and this was degraded in another 43%.

The Ultimate Solution: Teldat 3Ge

The branch office communications setup didn't allow the routers to be moved out of the Communications Room, towards the point of maximum Wireless-WAN coverage inside the branch office. Caja Duero also discarded the possibility of boosting the 3G signal strength at the router front-end by placing RF antennas outside the Room, which were fed into the router by means of an ultra-low loss coaxial cable. This solution was not viable for two reasons:

- Higher costs, both regarding the RF cable (approximately15€ per meter) and its installation (new cable wiring needed).
- In order to deliver the 3G signal to the router with an acceptable quality, the coaxial cable could be no longer than a few meters. This distance was insufficient for branches where the maximum 3G coverage point was various meters away from the Communications Room.

Teldat presented the Teldat 3Ge (also referred to as 3Ge) to both Caja Duero and its cellular carrier. This device could be located anywhere in the office as it's not a router but a detachable 3G Access Point. It's the branch router that controls the office devices' 3G access, where the backup service IP intelligence resides, and it is also the router that manages the 3Ge in the same way as it does with its integrated communication interfaces.

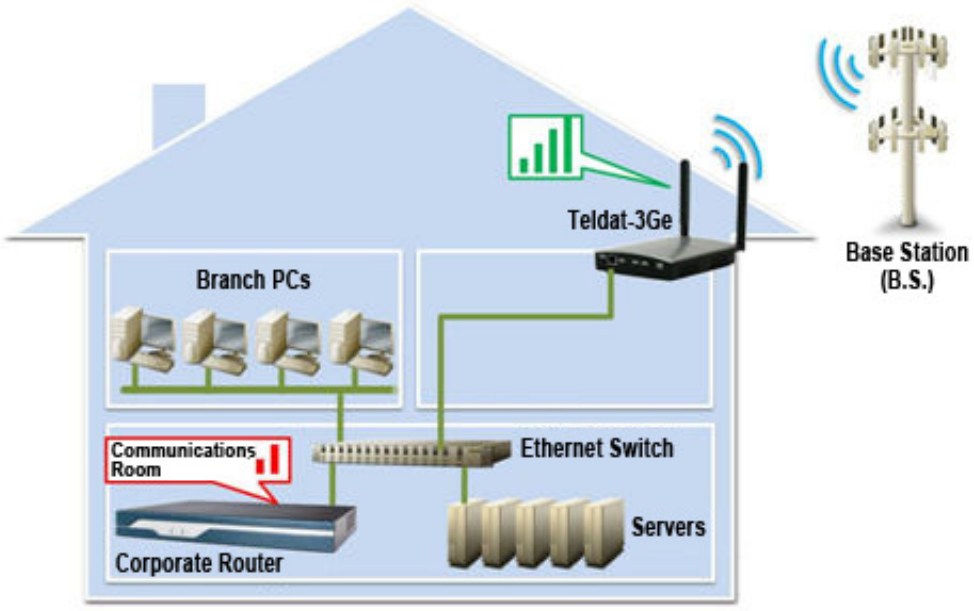

Figure 1. Teldat-3Ge network scenario

The 3Ge delivers the WWAN connectivity to the router over the existing Ethernet (connecting to any Ethernet point in the office), overriding the need for expensive coaxial wiring and consequently not limiting the 3Ge installation to within a radius of a few meters from the router.

The 3Ge further protects Caja Duero's investment as this peripheral can also upgrade with 3G the entity's Cisco routers and doesn't occupy any interface slot, which can be reserved for future use.

Caja Duero consequently decided to substitute the HSPA card for the 3Ge in the rejected installations and those connected to GPRS.

The Teldat 3Ge makes this service viable

The 3Ge rollout was carried out in the first quarter of 2008. The 3Ge greatly improved the Wireless-WAN connectivity as shown in the final rollout results in Table 3.

Technology	WWAN Branches		
	Acceptable coverage	Optimum Coverage	Total
3,5G (HSPA)	9,59%	61,64%	**71,23%**
3G (UMTS)	7,22%	20,55%	**27,77%**
2G (GPRS)	0%	0%	0%
Unacceptable coverage	--	--	**1%**

Table 3. WWAN distribution after substituting the HSPA cards for Teldat 3Ges

On comparing the results from Table 3 with Table 2, one can see the Wireless-WAN coverage level had significantly increased:

- Installations previously rejected due to the lack of coverage now have 3G/3.5G connectivity. Only 1% of these installations have been rejected.
- All installations connected to GPRS now have 3G/3.5G coverage through the 3Ge.
- All told, the percentage of installations with 3G/3.5G coverage has almost doubled compared with HSPA cards.

What also stands out is the fact that the greater part of the installations using 3G/3.5G has increased their coverage level from Acceptable to Optimum. The signal stability under these conditions has resulted in an improved perception on the 3G service quality (the average communications speed has increased and the link latency and jitter has been reduced).

Conclusion

The Teldat 3Ge has allowed the cellular provider to improve the 3G/3.5G coverage inside the Caja Duero branch offices in a simple and economically efficient way.

After substituting the HSPA cards with 3Ges, the financial entity branches without 3G/3.5G or those with degraded connectivity to GPRS (roughly 60% of the finished installations) were able to connect to the 3G/3.5G network with optional signal coverage. As we can see in Table 2, the final results are similar to the estimated ones after analyzing the entity's operator coverage maps.

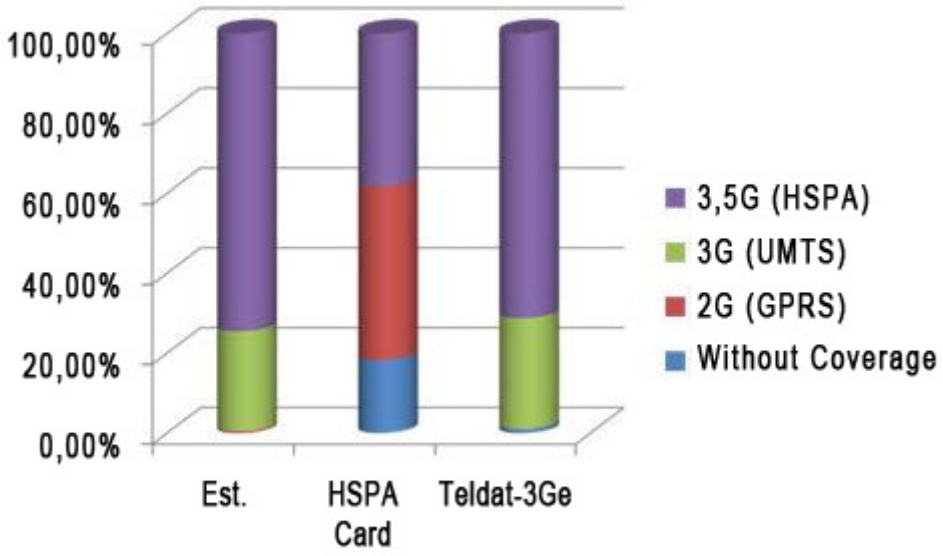

Figure 2. WWAN connectivity in the branches (Estimated / with HSPA cards / with Teldat-3Ge)

The carrier is currently supplying Caja Duero with a stable and high quality VPN backup service based on 3G technology, sustaining a very high level of satisfaction at the financial entity.