# *Apps & SLA*

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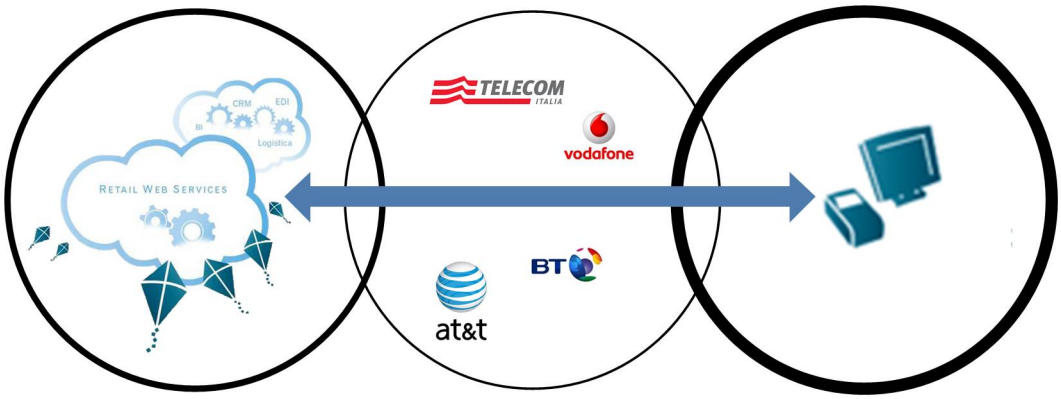
## *The Total SLA*

In assessing the quality of software services provided from the Internet, the focus is mainly on the Service Level Agreement (SLA) of the Cloud Computing platform from which these services are delivered. Less attention is paid to the fact that the end result depends on the SLA connectivity provided by telephone companies, and finally PCs, thin clients and routers deployed at the edge.

In Retail Stores, the Front-Store SLA should be higher than many other business services because POS is characterized by relatively small and frequent transactions that cannot be postponed. In a temporary POS blackout, customers can be lost, not only sales! In contrast, in a B2B environment often a document issue can be postponed without serious disruption to the customer.

The SLA is the percentage of time with regular service, in other words the probability that everything runs smoothly. Less than 100 is instead the probability of a service halt. For example, a better than 99.9 % SLA is equivalent to a failure probability lower than 0.1 %.

When service is provided by datacenters that may have blackouts, delivered through lines that can disconnect and used by a PC that can fail, the intuitive conclusion is that the chain cannot be stronger than its weakest link. In mathematical terms, the probability of a regular service is the product of individual SLA, all less than 100%.



To build some quantitative reasoning, we make the following assumptions:

$$SLA_{Cloud} > 99{,}9\ \% \qquad SLA_{Line} > 99\% \qquad SLA_{PC} > 99{,}99\%$$

These figures are hypothetical, except those of Cloud Computing that meets the minimum guaranteed by Microsoft Azure. According to these assumptions, the probability of a regular service is

$$\mathbf{SLA_{Total}} = SLA_{Cloud} * SLA_{Line} * SLA_{PC} > 99{,}9\% * 99\% * 99{,}99\% = \mathbf{98}{,}89\ \%$$

Even though the Cloud SLA could improve to the exceptional value of 99.999 %, the final situation would not improve significantly. In fact:

$$SLA'_{Total} = SLA'_{Cloud} * SLA_{Line} * SLA_{PC} > 99{,}999\% * 99\% * 99{,}99\% = \mathbf{98}{,}989\ \%$$

Therefore a huge effort to increase the Cloud SLA one hundred times would only raise the final value from 98.89 to 98.989 %. **By the way it is intuitive that it is of little use to strengthen the more robust link, and that instead focus should be put on the weakest one.**

It may seem ungenerous to telecommunications companies to identify them as the weakest link in the chain. Clearly, some of them are able to provide high SLA connectivity at premium prices, or redundant mobile connections to reduce the last mile problems, but at a higher cost and complexity. The difficulty arises not so much for the chain HQ, given the low incidence on total costs of a second or third channel to the Internet, but for individual stores, especially if small and numerous, some of which may not even be served by a normal ADSL line.

An important aspect of line failures is not their frequency, but their duration. In the case of regular telephone lines it is common experience that failures are infrequent but often last several hours.

Moreover, when considering SLA, the **period by which it is measured** is often neglected. A failure of 1 entire day during 1 month represents a probability of more than 3.3 % (1/30) and a SLA lower than 96.7 %. If measured on an annual basis, the probability falls to 0.28 % (1/360) and SLA moves to a more presentable 99.72 %. **Clearly, a month is the maximum period over which the SLA should be measured.**

As for the PC, it is assumed that professional products with UPS and subject to proper management are utilized. It is common experience that in such a situation, the PC is the most reliable link. The 99.99 % SLA used in the example is just an order of magnitude. Furthermore, a system with multiple POS in the same store can be designed without a single point of failure, so a PC or external device fault may cause a service degradation but not a stop. For this reason, PC and other HW failure impact is neglected in the remaining considerations.

## *Is SLA in Retail Stores condemned to low values or high costs?*

Rather than looking for solutions inside a pre-internet vision and keep adding complexity through more alternatives and additional outdated options, it is possible to move to a new paradigm based on Service Oriented Architectures (SOA) and Apps, carefully dividing **services** into **Embedded** and **Global**. The first group, essential for normal operations and related to prices, promotions, customers, etc. are embedded in each POS by means of a local compact database, while Global Services, for example related to inventory and reports, are managed from the Clouds and shared across the entire chain and even with partners.

**Apps** are lightweight and Internet-centric applications deployed automatically from a web page at a cost and speed comparable to thin clients. They use embedded services both in connected AND disconnected mode, achieving higher speed because they do not suffer any Internet latency. When a customer has made his choice, he does not want to waste time queuing at the checkout!

App to Cloud communication, and vice versa, can be based on asynchronous message queues, adding further scalability and reliability even in intermittent and low speed environments.

If some chains consider 100% availability of Global services vital and cannot bear the risk of a normal line, a back-up line can be added, as is usually done in thin clients or browser based solutions. But even in this case, an intelligent App based solutions has a vast scalability and speed advantage.

## *SLA with intelligent Apps*

Starting from a Cloud Computing 99.9 % SLA, the inevitable connectivity degradation lowers the value available at the edge. To develop the subsequent considerations, we assume that values are between:

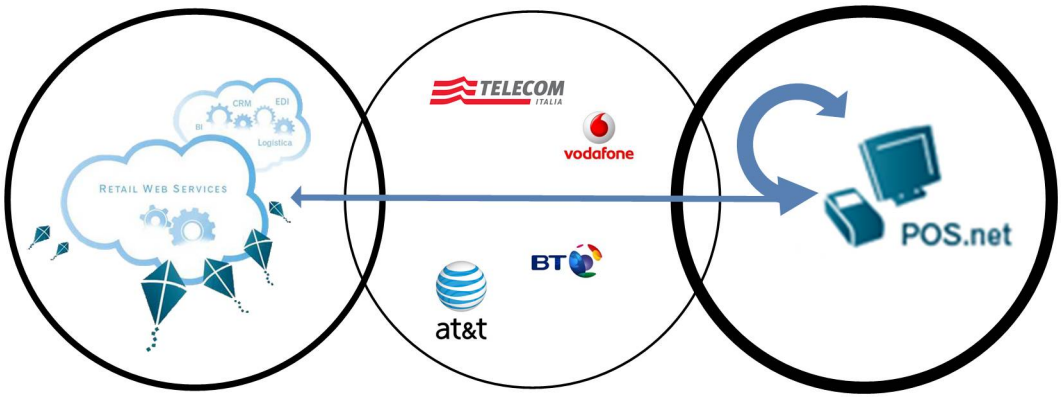
- 98,9 % with 1 line ($SLA_{Cloud}$ 99,9 % * $SLA_{1Line}$ 99 %)
- 99,89 % with a second backup line ($SLA_{Cloud}$ 99,9 % * $SLA_{2Lines}$ 99,99 %).
  Mathematical steps to prove that two lines each with 99 % SLA offer a total value of 99.99% are simple and are therefore omitted.

In a software service used by means of thin client or browser, SLA is between:

$$\mathbf{98,9\ \% < SLA_{ThinClient} < 99,89\ \%}$$

Looking at the situation from the failure probability standpoint, it is between:

$$0,11\ \% < P_{Cloud+Line} < 1,1\ \%$$




In a distributed and service-oriented architecture based on local and remote services, problems arise only if connectivity is lacking when a centralized service must be provided. If connectivity is missing when normal services are delivered, no degradation is perceived.

The frequency with which special services that come only from the Clouds are provided in the Stores depends on the sector and, within it, on the distinctive characteristics of the chain. A range from 1 % up to 10 % can be assumed

$$1\ \% < P_{GlobalServices} < 10\ \%$$

The probability that two events occur together is the product of individual probabilities and is within the range:

$$0{,}11\ \% * 1\ \% < P_{ServiceKO} < 1{,}1\ \% * 10\ \%$$
$$0{,}0011\ \% < P_{ServiceKO} < 0{,}11\ \%$$

Transformed in SLA figures:

$$\mathbf{99{,}89\ \% < SLA_{SmartClient} < 99{,}9989\ \%}$$

This is where the worst case is related to a single line and high online transaction frequency and the best case is that of a double line and low frequency.

Please recall that initial SLA was between 98.89 % and 99.89 % and the **improvement** is from one to two orders of magnitude (**10 to 100 times**).

How can SLA be improved without intervening on the individual components through which it is delivered? Even knowing only superficially the principles and laws of probability and physics, this seems to defy logic.

The intuitive answer is that a **chain cannot be stronger than the weakest link**, but is possible to reduce failures by **using it as little as possible**.

# *aKite : a High SLA Cloud-native SaaS*

**aKite** is a POS and In-Store SaaS suite (www.akite.net) designed to fully exploit the advantages of a modern PaaS (Platform-as-a-Service) such as Microsoft Azure near-infinite scalability, efficient resources usage and very high and guaranteed SLA.

While **Retail Web Services**, the intelligent hub in the Clouds which manages the Stores Apps and delivers standard Global services is state of art, aKite Embedded services on SQL Compact Edition database reduce Stores dependency on connectivity and, at the same time, accelerate POS operations. Moreover the system is designed to avoid any single point of failure within multiple POS environments.

Deployment is completely automatic from a Web page through Microsoft ClickOnce technology, achieving cost and speed similar to thin client or browser based solutions.

***About BEDIN Shop Systems***

*The company has more than 20 years of experience in software development for retail stores and an internationally recognized innovation track record, including the first POS designed on .NET, the first intelligent hub between headquarters and stores based on Service-Oriented-Architecture (SOA) and delivered in SaaS mode, as well aKite: the first POS and In-Store SaaS suite designed for "real" Cloud Computing. Web www.akite.net , email wladimiro@bedin.it , phone +39 0423 839834*

aKite
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