

# The ABC of future global reachability

François Toutain, Emmanuel Le Huérou, Eric Beaufils

Orange Labs

Lannion, France

{francois.toutain, emmanuel.lehuerou, eric.beaufils}@orange.com

**Abstract**—Interpersonal communication services have evolved from standard, interoperable call and messaging provided by telcos to a plethora of competing, proprietary, over-the-top services leveraging IP connectivity. We analyze the current ecosystem and we argue that, even though a globally interoperable federation of services is presumably unworkable, some amount of cooperation between them, based on web technologies, could give rise to an offering where users would enjoy global reachability anew.

**Keywords**—interpersonal communication, interoperability, OTT, telco, user, reachability

## I. INTRODUCTION

Despite popular *over-the-top* (OTT) communication services such as WhatsApp or Facetime counting users by the millions, the biggest global communication network today is still the phone network, patiently built over decades with the explicit goal of providing planet-wide reachability between its subscribers.

The traditional telco business has been challenged for a dozen years by OTT services leveraging high-bandwidth internet access, computer and smartphone performance gains, and advances in user experience, to offer innovative services with great success (e.g. social networking, group media sharing, ephemeral communication...). However, this new ecosystem has evolved without any regard to interoperability, and the current situation is one of incompatible, competing services.

In this paper, we argue that global interoperability in the classical acceptance cannot be reached anymore, but that the current situation is detrimental to users and should be improved upon. We propose a different approach, leveraging the inherent flexibility of web technologies to provide a new kind of global reachability, with benefits for all interested parties.

## II. INTEROPERABILITY AND THE ALL-IP ERA

### A. Classical interoperability

Interoperable communication services classically require that cooperation be defined at three levels [3]:

- at the identity level, either a globally coordinated naming scheme is deployed (e.g. the international telephone numbering plan), or technically interoperable identities are used, using so-called

Single-Sign-On (SSO) solutions, such as IETF's BrowserID and OAuth2.0, extensively analyzed in [1];

- at the signaling level, administrative domains comply with standardized signaling profiles, implemented in network-network interfaces (NNI) in order to setup communications crossing them. Other standardized interfaces may come into play between user applications and core networks (user-network interfaces, UNI);
- at the content level, media formats and data transport protocols also have to be agreed upon.

### B. Limits to interoperability in an OTT world

[4] analyses that the current landscape of all-IP communication services is immature and fragmented, and advocates a change to an IP-based, interoperable communication suite. Nonetheless, we argue that there is no going back to classical interoperability, for a number of reasons:

The federation model implied by NNI interoperation was made available to IP communication systems, and notably implemented in XMPP [5] which was used by big players such as Google, Skype, Facebook, Apple or MSN. However almost no one chose to deploy this feature, and those who did endured security problems hampering further experiments.

At the UNI layer, several attempts were made to provide a unifying application, aggregating the diversity of OTT services under a common user-facing interface (e.g. Nimbuz, Fring). Again, repeated failures have shown that this kind of interoperability is not working in an IP world.

Standardizing every aspect of service cooperation is known to be a very time-consuming process, requiring several years to go from first drafts to interworking implementations. This is probably not compatible anymore with the increased pace of innovation that is now the norm in the OTT world.

Standardization also hampers innovation, in the sense that conformance to standards is completely at odds with being the first one to provide a new way of communicating. This is especially true of content-level standardization.

Current OTT communication services are deployed into a so-called walled-garden ecosystem. They are engaged in a fierce competition to enroll users and to expose them to a proprietary service offering, while at the same time preventing

challengers from gaining traction. This is largely due to the way OTTs indirectly capture value from their customers, by focusing on personal data, which can be monetized by way of targeted advertising. As a consequence, OTTs have no incentive to cooperate, even if their users would benefit from it. They also actively avoid being disintermediated, as this would imply losing the all-important user-facing interfaces they carefully build in order to gather personal data and to publish ads.

Lastly, it should be observed that OTT services potentially enjoy a planet-wide footprint, whereas telcos were historically grown nation-wide. Why interconnect with another operator serving a given user, when one can enroll this user directly?

### C. What users want

The current walled-garden situation is a consequence of the business strategies deployed by the big players [2]. It is not however the best possible ecosystem with respect to users.

According to market research performed at Orange, we learned that people using OTT communication services today basically cope with the situation, but they are calling for *simplification*. Using several incompatible services comes with the need to manage multiple credentials and the associated online identities. It also leads users to maintain a "mental cartography" of their contacts across the variety of communication services, so they can manage their various relationships and decide which communication service is suited to a given contact. This cognitive load is even depicted by advanced users, who sometimes feel confused about the number of services they have to master.

At the same time, users are genuinely enjoying the wide choice of OTT services, and they have no trouble installing a new application if it is fashionable and their relatives promote it. This abundance and freedom of usage is now the norm, and there is no going back to simpler, more rigid telecommunication means.

Users may also fear lock-in situations, where they are forced to bear with a hegemonic service because the majority of their contacts are using it. Switching to a new telco provider does not preclude a user from accessing her contacts, while unsubscribing from an OTT service certainly does.

In summary, from the point of view of users, an improved ecosystem would be made of multiple, independent services, cooperating to provide explicit management of online identities, contacts and relationships, and communication means, in a simple manner.

## III. NOVEL APPROACHES AND THEIR LIMITATIONS

Several ongoing initiatives show that the fundamental need for global reachability is still current, but they differ in the cure they promote. In this section we review two of them and we discuss their relevance to the problem at stake.

### A. Matrix

This open initiative promotes an architecture for open, distributed, real-time communication over IP [6]. Matrix

defines a decentralized federation of interoperating servers, with standardized content definition, a technical identity scheme leveraging existing proprietary and SSO mechanisms, and interoperable client APIs (*application programing interfaces*).

We do not expect this proposal to gain much traction, because it assumes full cooperation between communication services (at the NNI, UNI, content, and identity levels), mimicking the legacy telco approach, notwithstanding the current ecosystem and its conflicting goals.

### B. Android M

The latest version of the mobile operating system Android, version 6 or M, introduces API level 23. It relaxes some constraints with respect to third-party applications accessing personal communication means. Typically, Android M allows any app to become the default user interface (UI) with respect to incoming and outgoing communications (by way of the *InCallService* service), whatever the communication service used. Furthermore, the operating system now allows communication services to provide APIs that the UI will use when sending or receiving communications (*PhoneAccount* objects). Hence, when placing a call from the default UI, users are given a choice of communication services.

We believe OTT services will likely implement UI applications and strive to get users to use it as the default dialer on their phones, thereby getting unified access to the proprietary OTT service as well as to the telco standard services (calls and messaging). As there is only one default dialer, the competition will intensify. However, OTT providers have no incentive to deliver *PhoneAccount* APIs, since it would disintermediate their service, to the benefit of the competitor providing the current default dialer.

Of course, the discussion above is restricted to Android devices. It remains to see whether the two other mainstream mobile operating systems (iOS and Windows) will follow suit.

## IV. ABC: LEVERAGING ALL-WEB TECHNOLOGIES

We envision that webRTC technologies [7] are a big opportunity to go beyond the walled-garden model, without the need to enforce some technical interoperability, but by promoting limited high-level service cooperation.

Our proposal, named ABC for "Address Book and Call-log", is based on decoupling these assets from the communication services. Current OTT services are monolithic: they implement proprietary versions of the building blocks of a communication service, namely identity, security, address book, call-log, dialer, synchronous and/or asynchronous communication and the user interface. We argue there is no need for services to manage their own address books and call-logs, and it is actually prejudicial to users. This is probably why Android M opened up the default dialer app to third parties.

Having a single address book and call-log is a great benefit for users, but only if the various services a contact can be reached with are listed. Indeed it materializes the "mental cartography", and makes it simple to grasp the range of

communication means available to reach a given contact. The Android M *PhoneAccount* concept could answer this need, but, as we saw before, being disintermediated will prevent OTT services from rallying to it. So we require the address book to expose *any* service a contact is willing to be reached with. This is easily done with web technologies.

The figure on the right depicts the ABC approach: a user X enjoys a single address book where contacts Y and Z are depicted with the various communication services A, B and/or C they are clients of. Using web technologies, simple URLs can be used to reference user pages on the various services, for additional information and to start actual communication with them. For this to work, OTT services have to provide to the address book "deep links" which reference user pages. Additionally they could provide widgets to be embedded in the address book. Symmetrically, the user's call-log must list all communications, whatever the service which was used. This requires that OTT services feed the call-log with deep links pointing to their conversation histories.

An important requirement of this approach is for communication services to open up to non-subscribers: for a given contact in a user's address book, some communication means may refer to services she is not subscribed to. This should not prevent her from calling her friend using this service if wished. This is where the full-web approach shines: using webRTC (*web real time communication*) and JavaScript implementations, it is a simple matter to provide a user with a live communication inside a service she has never used before. Besides, here is a great opportunity for OTT services to expose users to their offerings, and possibly enroll them for subsequent cross-sales and/or personal data gathering.

Another requirement is to have an interoperable identity system. Indeed, providing access to non-subscribers assumes that these "visitors" can be properly identified anyway. Following [1], we think such a goal is attainable, and it could be a subject worth investigating by regulatory bodies. We also believe telcos could play a significant role here, leveraging the strong authentication associated with the SIM card. On the plus side, this is a great opportunity to develop innovative search and directory services. On the minus side, it paves the way to spamming and unwanted communications, much in the same way that globally interoperable e-mail is suffering from high levels of spam. This issue must be thoroughly understood and suitable protection mechanisms have to be designed. For instance, user pages hosted by the various communication services could deliver variable or custom content depending on the identity of the visitors and whether they are contacts of the user or not.

## V. CONCLUSION

In this paper, we have investigated the issue of communication services interoperability, and we have shown that, while the current walled-garden situation is prejudicial to users, for a variety of reasons it will probably never turn into a federation of OTT services interoperating at the technical level

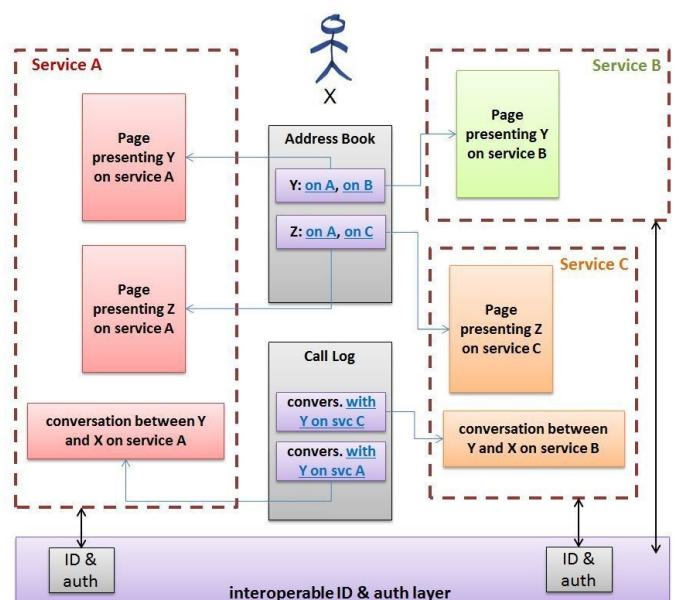


Figure 1. The ABC approach.

(unless enforced by regulatory bodies). Nevertheless, we argued that a certain form of cooperation (or "coopetition") can be attained, with benefits for all interested parties.

Future work will focus on implementing a workable prototype, studying acceptability with respect to users and to OTT services, as well as studying regulation issues.

With our ABC approach, the major consequence is that the required standardization effort is reduced to a minimum, namely an interoperable identity mechanism, and an API to provision "deep links" to subscribers and conversations. We believe this standardization task could fit well within the IETF or W3C missions. It is also moved away from the communication services themselves, which can freely evolve and innovate.

## References

- [1] V. Beltran, E. Bertin, N. Crespi, "User Identity for WebRTC Services: A Matter Of Trust", IEEE Internet Computing, , Volume 18, Issue 6 (2014), Page 18-25, IEEE
- [2] N. Paterson. "Walled Gardens: the new shape of the public Internet". in Procs. iConference 2012, Feb 7-10, 2012, Toronto, Canada
- [3] F. Toutain, E. Le Huérou, E. Beaufils, "On webco interoperability," in Procs. 1st Workshop on All-Web Real-Time Systems (AWeS 2015), Bordeaux, 2015 .
- [4] GSMA Europe, "Network 2020 – Delivering on the Green Button Promise: How mobile operators can meet the latent demand for rich and reliable all-IP communications", provided at <http://www.gsma.com/>, accessed September 30th, 2015.
- [5] P. Saint-Andre. "Extensible messaging and presence protocol (XMPP): Core." (2011).
- [6] Matrix.org, Draft Online Matrix Specifications, provided at <http://matrix.org/docs/spec/>, accessed Feb. 16, 2015.
- [7] A. Bergkvist, D. Burnett, C. Jennings. "WebRTC 1.0: Real-time Communication Between Browsers. " World Wide Web Consortium WD WD-webrtc-20120821 (2012).