



The Converged Communications Desktop:
'Software + Services' blending the Web with the Telecommunications Network

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Abstract

A large transformation has been occurring in the way people communicate. As recent as 20 years ago, most people corresponded through the same means that they did for the previous 100 years, through switch/circuit telephone networks and letters mailed through the postal system. Those methods are antiquated when compared to the communications methods that have become common over the last two decades: voice over IP (VoIP); mobile voice; e-mail; instant messaging; short messaging service (SMS); and many other technologies.

Over the last couple of years we have seen a number of trends that create an environment that will revolutionize the communications industry:

Global Communications. The rise of social networking web sites like Facebook, LinkedIn and Twitter give people the ability to connecting with communities of people around the world. As long as people have access to the Internet, we can hear and see accounts of world events in near-real time on a global scale that was unthinkable just a few years ago.

Voice as an application. The mobile phone is becoming a small form-factor computer that provides voice service and other applications. Applications providing voice service on the personal computer, like Skype and Microsoft Office Communicator, have become mainstream for consumers and businesses.

Communications networks as programming platforms. Programmable communications services accessible via the Internet are becoming common. This trend has been given many names including Communications as a Service (CaaS) and programmable communications. There are many initiatives that are defining standards for programmable communications platforms including the Third Generation Partnership Project (3GPP) and many companies that have commercial offerings of these platforms.

Net neutrality. Regulations prohibiting network carriers from excluding applications that run over their network or negatively impacting the quality of service of an application are gaining ground in the US and other large nations.

Network carriers can increase their average revenue per user (ARPU) by applying the economic model of the web to the telecommunications industry. By offering value-added communications services over the Internet to consumers and business, network operators can capitalize on these trends. Fortunately for telecommunications providers, both the technical architecture for web communications and the business model of the Internet are not a far shift from how they have traditionally operated.

This paper will discuss these emerging trends in detail and propose a model in which communications carriers can ultimately increase their ARPU in the face of increased competition in the evolving global communications marketplace. This paper will also present a technical architecture based on a proof-of-concept between British Telecom's Ribbit subsidiary and Microsoft.

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1. Trends in Telecommunications

To capitalize in the rapidly changing field of communications, communications service providers (CSPs) need to understand the dynamics that are transforming the industry from economic, behavioral, and technical vantage points. Once the trends are understood from those vantage points CSPs can then formulate a strategy from which they leverage their strengths as leaders in the second largest global industry with an estimated \$2.5 to \$4 *Trillion* Dollars (USD) in annual revenues in order to offer differentiated services to consumers that will increase ARPU and sustain their leadership positions in consumer communications.

This whitepaper will present a technical architecture for a solution based on Microsoft technologies that can be leveraged by communications carriers in order to capitalize on the emerging communications trends. This document will also include a list of use cases that have been developed for an application to demonstrate these concepts.

An implementation of the architecture, the *Converged Communications Desktop* (CCD), has been developed in conjunction with British Telecom's Ribbit Subsidiary. The first release of the CCD will be demonstrated at the Mobile World Congress in Barcelona, Spain in February, 2010. This demonstration application implements many of the use cases described in this document.

1.1 Economic Trends

1.1.1 Voice becomes an Internet Service

It should be no surprise to anybody in the telecommunications industry that both NSPs and web companies are aggressively moving into providing Voice over IP (VoIP) services. Just over the last few months Google has released an over-the-top voice service, a mobile communications operating system, an "unlocked" mobile phone, and a browser plug-in for voice. Google has also released a device that is optimized for the Clearwire WiMax data network in which they have invested in.

Many Web 2.0 start-ups that provide programmable communications interfaces have recently been acquired by traditional phone companies in a way to capitalize on these trends, for example in 2008 British Telecom spent \$105 Million US Dollars to acquire Silicon Valley based Ribbit a provider of web-based programmable communications. In December 2009, JaJah was acquired by Telefonica.

1.1.2 Applying Internet Economics to Voice Services

The application of the still-evolving Internet business model to a century old industry may seem contradictory to many passive observers. But at a closer look the main revenue drivers in both industries are remarkable similar: subscription, transactions and advertising.

In the telecommunications industry, a user pays a minimum fee for a period of service, for example a monthly mobile phone plan. On the Internet a user can purchase a service using the same model, for example the Zune Marketplace allows a user to pay a monthly fee for unlimited access to the Zune music collection. In the telecommunications industry there has always been transactional billing of

services, like per-minute billing of long-distance voice services. The Internet also has transactional services, like the ability to purchase a single song from the Zune Marketplace for a small fee.

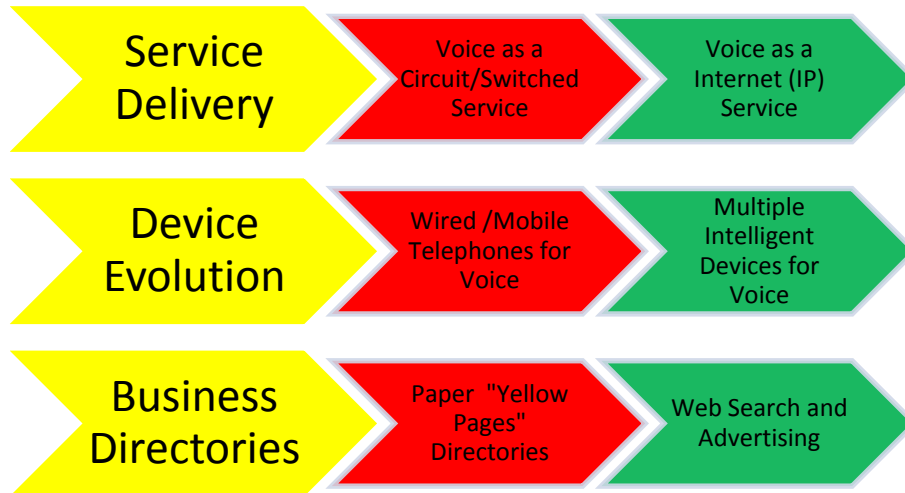


Figure 1: Evolution to Voice as an Application

1.1.2.1 Search and Advertising

In the United States telecommunications companies have always supported an advertising model as a source of revenues. Telecommunications companies provide business directories commonly referred to as "Yellow Pages," free of charge to their customers. In order to get included in these directories, businesses paid the communications providers to include advertisements of their products and services. The directory included the phone number and location of the business in which the user could contact the business. These directories were indexed by category, for example 'restaurants.' A user would go to the category and then select a business that provided the products or services that they desired.

This is a very similar model to the search and advertising business that provides the core revenues to many Internet businesses. In this model, businesses pay for every click on their link from an advertisement that has premium placement on the results page of a search engine.

1.1.3 Business Opportunities

There are two main opportunities for communications providers to offer voice services: (1) locally targeted advertising based on user preferences and (2) creating quick connections between users and businesses.

By combining services between web companies and communications providers, the opportunities for relevant targeted advertising abound. Web-company services like identity, search and maps and communications provider services, like mobile Global Positioning System (GPS) services, the IP address

of a computer's network connection, SMS, and voice provide the information that can make search results very specific to a user's tastes and needs.

For example, if a user searches and 'restaurants' in a geography the results can return the restaurants closest to their physical location. The results can provide a map and a click-to-call capability that can directly connect them to the restaurant giving the communications provider a payment for that transaction. By storing the results of who they navigate to, for example the cuisine they select, the results can become customized for the user preferences.

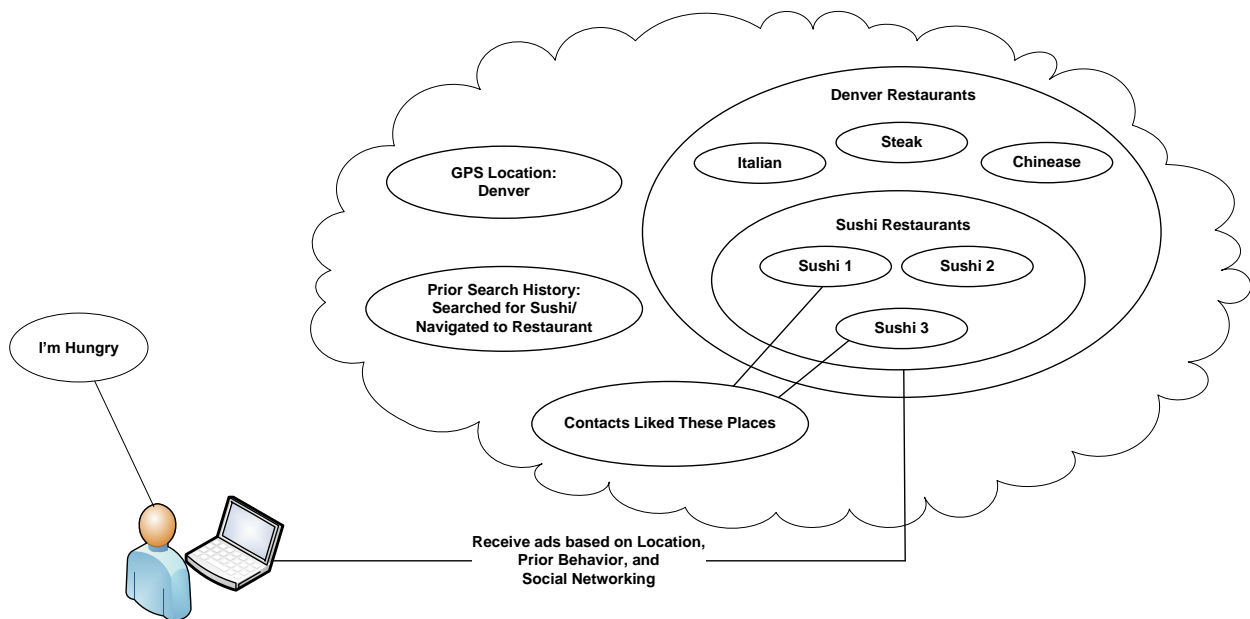


Figure 2: Targeted Internet Advertising

By adding voice communications to targeted advertising, the communications provider has the added benefit of increasing the likelihood of a sale of the product that is being advertised, allowing them to charge a premium for advertising. According to a September 4, 2009 article in the Wall Street Journal entitled "Three Best Ways to Convert Web Traffic into Sales" the top two ways of increasing web sales are by implementing communications services: (1) Click to Call; and (2) on-line chat.

By adding these communications services to web advertisements the communications providers can charge premiums for advertising as well as for the selection to make the direct connections.

1.2 Behavioral Trends

1.2.1 Social Computing

With the advent of social computing we have seen large changes in how people communicate with each other on a global scale once unimaginable. People are no longer only communicating through voice over the switched/circuit telecommunications network. The mobile device and computers have become equal partners as communications endpoints. People no longer think about phone numbers, they think of names to communicate with their friends and colleagues.

Social networking sites have connected friends and family members from remote parts of the world and allow them to send e-mail and instant messages to each other and join communities based on a common interest. These communities have grown virally in size and scope over the last few years touching millions of people. Nowhere is this more evident than with the unrest in the Islamic Republic of Iran following the national presidential elections in 2009. People were filming the unrest on mobile devices with embedded video cameras and posting the videos to social networking web sites like YouTube for world-wide consumption.

These trends turn the web into a primary platform for communications. Along with providing a valuable means of entertainment to users on a global basis, these social networking sites have the added value of understanding demographic and behavioral data of the users of these platforms. Based on an opt-in model, the companies who own this data can market and advertise to their users based on their understanding of people's tastes, their geographic location, and their social graph.

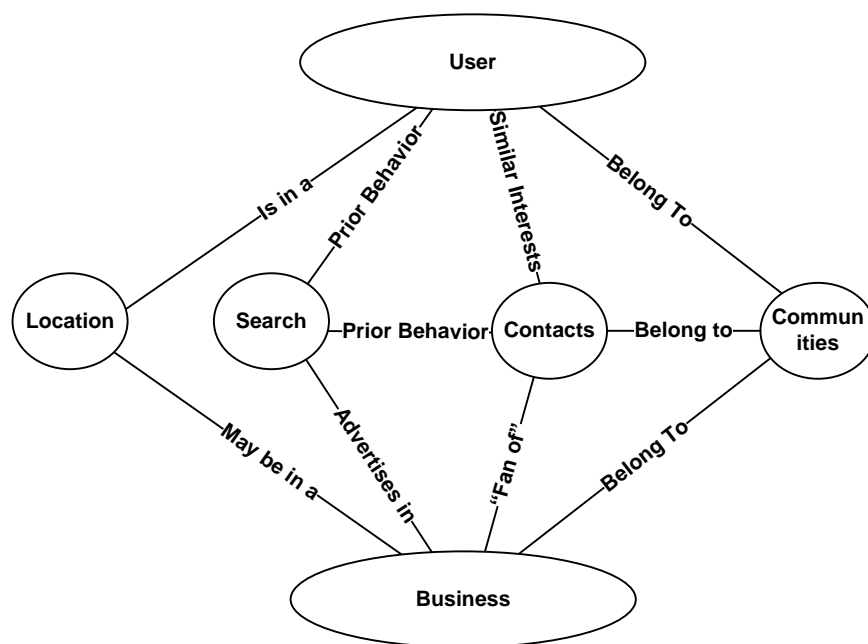


Figure 3: Simplified User's Social Graph

1.2.2 Business Opportunity

Along with incorporating user behavioral data into the advertising models discussed earlier in the economic trends section, there is an opportunity for communications providers to provide call origination and termination over the Internet globally.

By providing call origination and termination globally, the communications provider can enter markets that they were once unable to reach due to the national regulation of phone systems or the cost of building out network assets. The communications provider can use a combination of advertising revenues for local service and have a subscription or transactional model for international call termination.

1.3 Technical Trends

There is an overarching trend in computing today: distributed solutions with software running on networked devices with different form-factors, like computers and smart phones, accessing programmable services through the Internet (the cloud). This paradigm is commonly referred to as 'software + services.'

1.3.1 The Network as a Platform

'Software + Services' is not only a paradigm for the web and software vendors, the telecommunications industry is becoming a programmable platform itself moving toward providing programmable services over the IP network and in the mobile networks for a number of years now. These services provide programmable interfaces for communications services that allow applications to terminate calls on the mobile network and on the Public Switched Telephone Network (PSTN). Programmatic access has been written into the IP Multimedia Subsystem (IMS) specifications with the adoption of the Open Services Access (OSA) APIs developed by the Parlay Group and the evolution to ParlayX Gateways exposing web services accessible by computer applications.

There are also a number of Web 2.0 companies that provide communications as a service (CaaS) from a programmable platform, including British Telecom's Ribbit subsidiary. These offerings closely resemble Software as a Service (SaaS) platforms which benefit from a scalable virtualized environment that can achieve economies of scale on a global level. Net neutrality rules and legislation proscribing network providers from discriminating against any application from running on their networks help enable this segment of the communications industry.

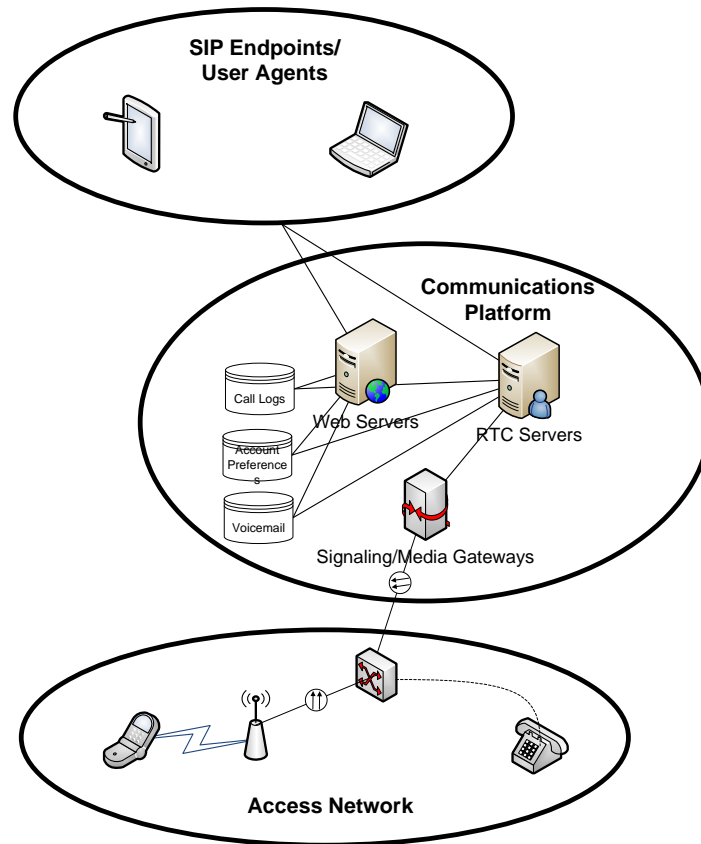


Figure 4: The Network as a Platform

1.3.2 Business Opportunity

The 'software + services' paradigm combined with the movement toward the 'network as a platform' creates great opportunities for communications carriers in the area of application development. By providing communications services like 'click to call,' 'click to conference,' 'call transfer' between devices, presence and location based services, among many others, innovative solutions can be developed that drive revenues by increasing network traffic and through API consumption.

A great use case for the Converged Communications Desktop is extending the application across multiple endpoints like the computer desktop, the mobile phone and even an intelligent automobile dashboard. In this solution a user can be on a call using the speaker on their PC and then transfer the call to their mobile device without disrupting their call. Since many locations ban the use of mobile phones in a car the user can then transfer the call to their dashboard and continue their conversation in their car uninterrupted.

The communications provider can increase revenues and application adoption by adding value added services including: search, maps, an on-line directory and a consistent look and feel with a rich user experience to simplify the navigation of the application. These services and application can be provided as a premium subscription service increasing ARPU.

Enabling this business requires an understanding of the Internet's business model as well as the economics of software platforms. The Internet's business model was discussed earlier in this document, so it will not be repeated here. Volumes have been written about the economics of software platform companies, but to summarize: platforms are successful if they are open and can be accessed by large numbers of developers. Carriers opening up their platform to developers will need to understand how to lower the barrier of entry to developers and how to differentiate their platform to competitors to encourage innovation on their platform as opposed to their competitors.

2 The Converged Communications Desktop Technical Architecture

This section provides an in-depth description of the architecture for the Converged Communications Desktop (CCD). The solution is an excellent example of Software + Services applied to the telecommunications industry. The ultimate goal of the solution is to apply the economic, behavioral, and technical trends impacting the telecommunications industry and create an application that can ultimately increase ARPU for a network service provider.

The CCD runs on the Windows 7 (Win7) Operating System and is designed to access Windows Live Services (WLS), which has over 250 million unique IDs and Microsoft's Bing technologies. The CCD also accesses Ribbit's programmable communications platform via the Session Initiation Protocol (SIP) and the Representational State Transfer (REST) protocol. It needs to be noted that the Windows Live and Bing features are not part of the initial release of the demo.

2.1 Architecture Overview

The CCD architecture for blended communications applications includes the following components providing key features of the application:

- User Agent (UA) - The solution front-end is based on a rich client application using touch-screen features from Microsoft's Windows Presentation Foundation (WPF). The UA has a SIP stack and media stack running in the same process. The UA can run on a PC or another device that can support microphone and speaker access.
- Social Network - The CCD will access Windows Live Services for 'Contacts' and 'Messenger' functionality. The application is designed to be extendable to access social network information from other social networking sites.
- Search – Bing is the search engine for the CCD.
- Ribbit – The Ribbit platform supplies the communications features for the solution including: click-to-call; click-to-conference; visual voicemail; call log viewing; account administration; SMS; and call-transfer.
- Access Networks – the access network allows call origination and termination on the circuit/switched and mobile networks.

The following diagram gives a high-level overview of the different components of the solution, including the protocols for communicating in the distributed environment.

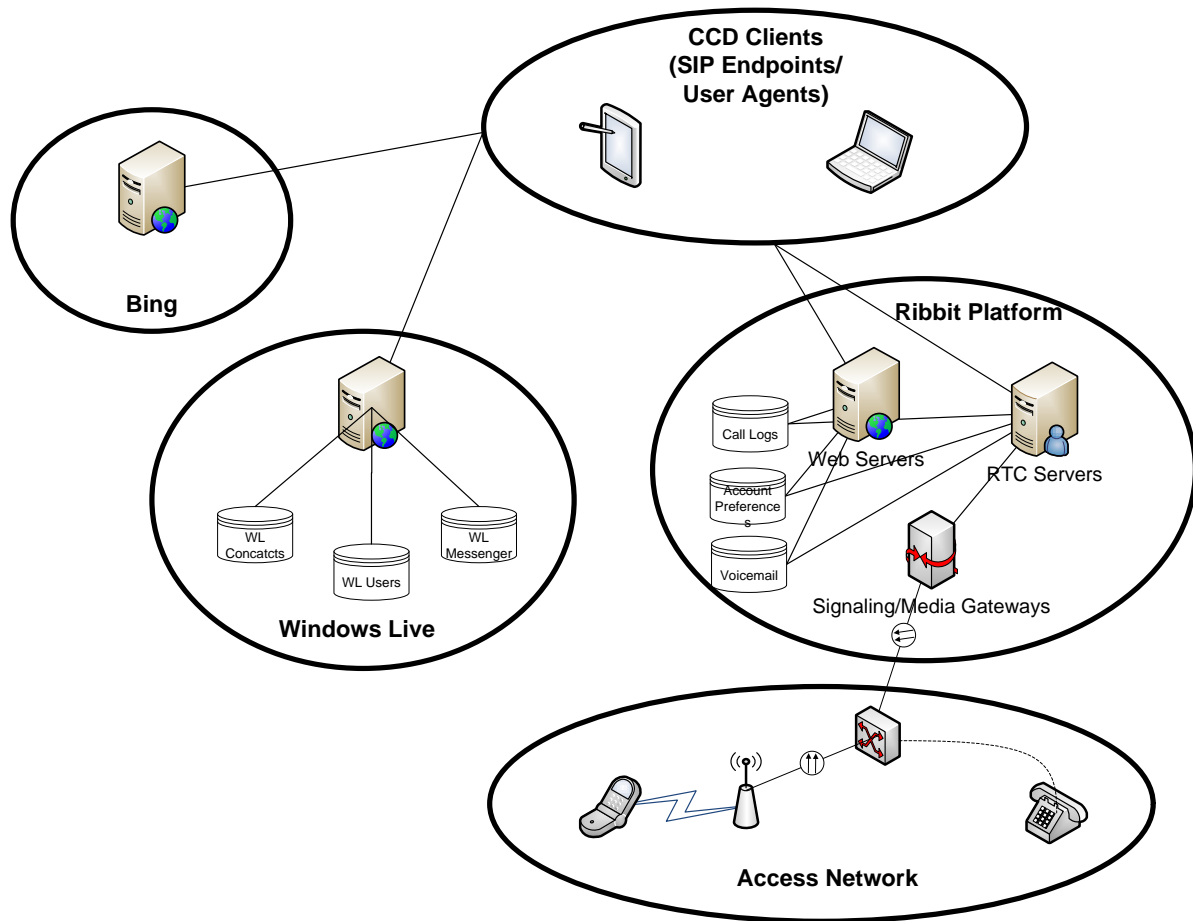


Figure 5: Conceptual CCD Architecture

2.2 Guiding Principles

The CCD architecture was influenced by a number of objectives, including:

2.2.1 Rich User Experience

A key differentiator of the CCD when compared to other IP-based telephony products is to support a rich user experience to encourage wide adoption. User Interface Features highlighted for the CCD are:

- Touch-screen interface for input without a keyboard.
- 'Flick' and tabs for easy navigation.
- Drag/Drop capabilities to call a person or multiple people without entering multiple phone numbers.
- "Cards" containing a contact's communications information instead of phone numbers.

2.2.2 Simplicity

The initial development effort for the CCD needed to occur in seven weeks, including two weeks that were shortened by holidays. The compressed development schedule forced us to minimize risk through architectural decisions. The main architectural decision that was influenced by the compressed schedule was to run the client-side application in a single operating system (OS) process. That decision reduced the amount of development required to run the solution in multiple processes and focus on the core capabilities of the application.

2.2.3 Loose Coupling

The solution was architected in a way that is mindful that a carrier may wish to change out the search engine, the social networking features, run the solution using their own ParlayX interface for voice communications, or use the CCD as a front-end for MS Office Communications Server Wave 14. The solution can be simply modified to adhere to any carrier's requirements.

2.3 Architectural Layers

The following diagram outlines the architectural layers of the CCD solution. The computers on the front-end represent the computers that the user will interact with. The clouds in the services layer represent the Windows Live, Bing and Ribbit platforms.

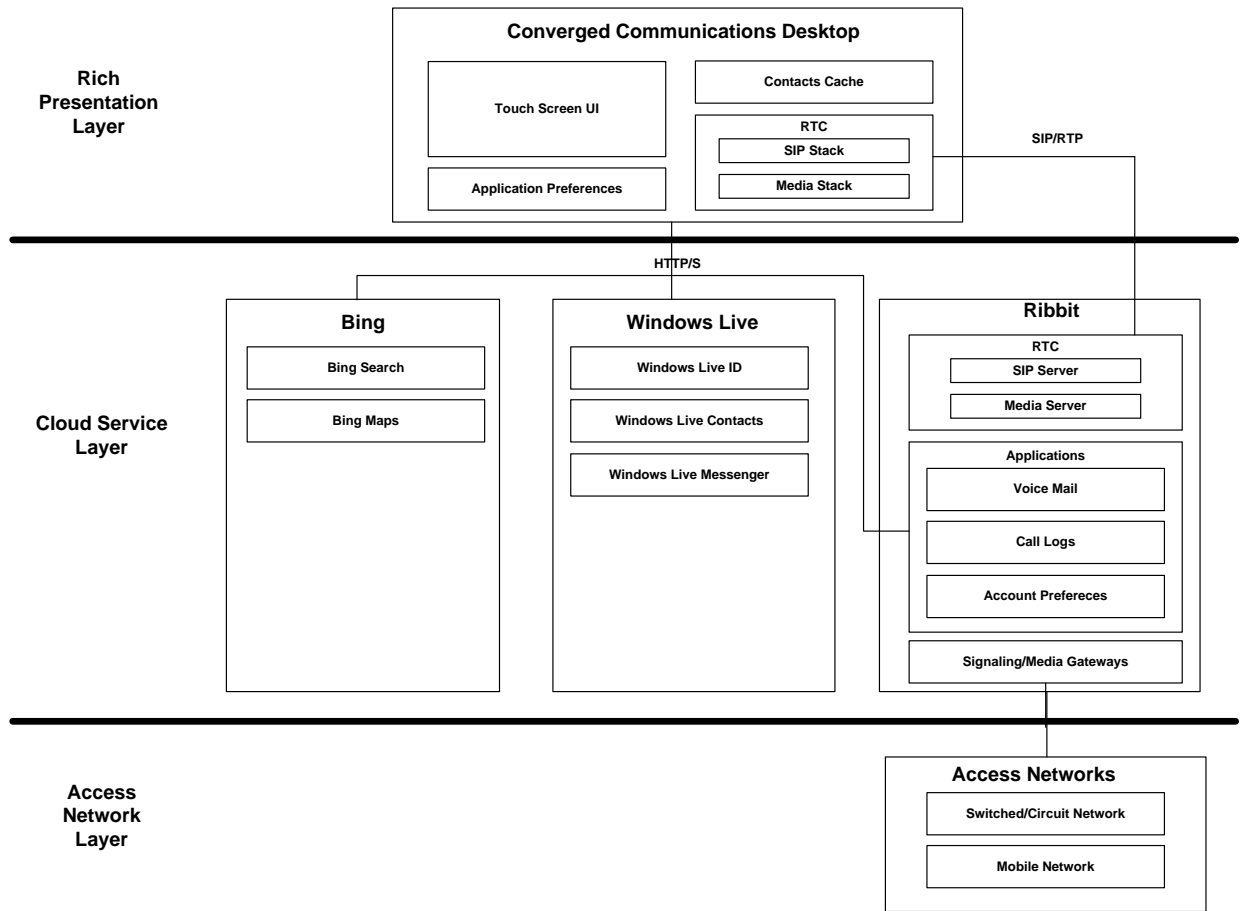


Figure 6: CCD Layered Architecture

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<<http://online.wsj.com/article/SB125207251462486505.html>>