REST APIs for Emerging Social Media Platforms

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Abstract: People are quite acquainted with the emerging social networking sites like Facebook, Twitter, Pinterest©, and LinkedIn. Many web developers and technical industry professionals are using these websites and applications consistently but may not be aware of the types of APIs and supported tools available and used for leading social networking platforms. Social networking sites have millions of active users who discover and share an enormous amount of user-generated content on a daily basis. Most of these platforms provide APIs and tools for web developers to incorporate social sharing into their applications and make it possible for the applications to leverage the features and functions of the platforms. Using these APIs and tools provided by social networking platforms, developers can build varied and innovative applications that feature social sign-ins, streaming real-time social data, social sharing and engagement, and much more. This paper represents a review and comparative study of REST APIs or APIs, in general, of the emerging social network platforms by discussing their API structure along with an overall understanding of the varied features these sites are born with or were improved to. Ultimately, we understand the reasons to why REST has become the building block of most APIs and is the eventual future.

Keywords: Users; API; Social networking sites; Social sharing; Developers

I. INTRODUCTION

Social networking services are also called social media, or SNS which is a platform over the internet, or an online stage. Social networking is utilized by a large mass of people around the world to form connections with people of the same interests in various aspects like career, activities or backgrounds through a public or private profile in a bounded system [1]. Many in-built social networking services are available online through these sites in today's world and have characteristics that include [2]: 1. Web 2.0 internet-based application. 2. User-generated content, the essence of the SNS organisms. 3. Service-specific profiles for different applications or apps planned and sustained by SNS. 4. Enables easy connection of user-profiles with other individuals or group or groups of individuals that share common interests [3].Developers are used to integrating the functionality with websites and applications. API-driven apps can be designed to allow real-time, interactive and face-to-face collaboration

of people with each other. API strategies are commencing with an API-first design approach that recognizes the significance of providing a high skilled developer. They form the basis for application layers and include a user interface, integration points and more. Unlike web-driven applications, the customer requirements are met easily and the results are put out at their best. Apart from that, API integrated social media not only enhances the popularity of modern businesses like online shopping but also encourages users, corporate or non-corporate, to approach a wide range of audiences with only one click [4], [5]. The proper term to go by would be "social integration" which is like an API application that runs within an application but does rely on the external server for their data to be processed. It can be developed through any framework known, like JavaScript, CSS or Flash which forward the focus to the REST API tool.

REST (Representational State Transfer) API is one of the ways to provide interoperability between inter-connected computing systems. Social media has APIs based on Rest API. They provide these APIs for public use; hence people utilize it and have better experiences. REST is also known as ReST, or RESTful. REST-compliant web services may allow the receiver systems to access, and manipulate textual representations of web resources using stateless operations. These operations are uniform and predefined. Other kinds of web services such as WSDL and SOAP (Simple Object Access Protocol) expose their arbitrary sets of operations. These rely on a communications protocol that is cacheable, stateless and supports the client-server function. The HTTP protocol is used virtually for all such cases.

REST has an architecture style for designing networked applications. SOAP defines a standard communication protocol that has a specification for XML-based message exchange. It uses different transport protocols, such as HTTP and SMTP. However, REST refers to transferring "representations" where users can use one "representation" for varied operations like transferring the state of a resource in the server into the application state on the client. Let us discuss a few applications of REST API: 1. REST-based web browsers can make many REST API calls with appropriate URLs. 2. REST calls based on Java application allow the user to use standard Java methods to access TADDM-REST API. 3. Parsing REST query results are parsed, and these are used for Java application. Users can use standard X-Path or JX-Path-based methods. 4. Debugging REST applications: REST is easy to maintain and as a constrained set of methods

exist, only a few places require examination while debugging [6]. 5. Users can use the REST API to query model objects. 6. Adding of model objects is facilitated by RES. 7. Updating model objects using the REST API. 8. Deleting model objects using the REST API. 9. Organization of discoveries using the REST API: Users can use this API to start a discovery and manage these discoveries, discovery profiles, and discovery scopes. 10. REST resource reference: The REST API exposes resources that can be used to query, create, update, and delete model objects along with managing discoveries.

Several applications of REST that involve 1. Application Services 2. Partner applications 3. Cloud-based Services 4. Web applications 5. Mobile applications 6. Legacy applications and much more but there are a few disadvantages as well, or challenges, of REST over the implementation of HTTP.: 1. Most notable of these is named "lo-rest", which means REST only uses the functions GET and POST. While technically it might still be RESTful, but a uniform interface with only two best functions is too small to be helpful. 2. One problem that is not HTTP specific is handling REST-programming languages which are not resource-oriented. So, the handling code that maps URIs tends to get messy. 3. Making REST API hyper-text driven has been a difficult task. 4. Many assume that REST is a solution for everything, and its implementations support the notion of pub/sub. However, that stands untrue. 5. Not particularly a disadvantage but harmful as REST is seldom considered synonymous over HTTP, meaning HTTP and REST are the same. The REST has its own merits and demerits. It often seems simple but it is not – it requires a shift in thinking (e.g. identifying resources, externalizing the state transitions, etc.). However, it has proved to be an important tool in today's time.

II. LITERATURE REVIEW

REST has emerged as the basic API architecture for most of the social networking sites utilize, especially for social websites as they are continuously working on improving the ease and speed of interaction for a user [3]. The following functions are used in combination with HTTP request types: 1. GET: Retrieves data from the server. 2. POST: This request type assists in two tasks – completes web form submission and uploading a file. The data is sent to the server from a new entity. 3. PUT: Similar to POST but the main purpose is to deal with the replacement of an existing entity. 4. PATCH: This request type helps in updating certain specific fields within an existing entity. It is somewhat similar to PUT. 5. DELETE: As the name suggests, this request type removes data from the server. 6. TRACE: This request type is used for testing how a machine responds whenever a request is being made along a network path. 7. OPTIONS: The request method supported by a service that is availed as request information by the clients is done using this request type. 8. HEAD: This request type is similar to the GET method for a resource however only the response headers are returned. 9. CONNECT: A network connection towards resource can be established primarily using CONNECT. The sites may not use REST and have different kinds of APIs as their structure. However, the architecture followed is based on the REST API. The focus has been on

understanding the Rest API and how various social websites are using it and then utilizing it for further purposes via other APIs [7].

REST API is an application program interface that, as well established by now, uses HTTP requests to perform functions like DELETE, POST, GET and PUT data. REST is readily accepted as the "language" of the internet and has become a significant factor in designing networked applications; basically, an appropriate architectural style [8]. Web services that use the conventional REST architecture are known as RESTful APIs or simply REST APIs [9]. It speaks of the XML-based webpage which describes and includes the required content. Fig 1 shows the architectural style of REST, respectively [10].
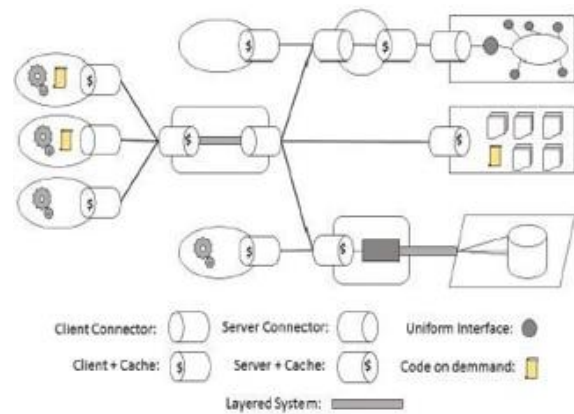
Fig. 1. REST Architectural Style

REST relies on certain communication protocols via the HTTP protocol and also forms the functions of the same. These in all, define the basis of RESTful style. 1. A uniform interface 2. Statelessness 3. Cache-ability 4. Client-server functions 5. Defined layered system 6. Optional code on-demand service. The most essential factor related to the architectural style of REST is its uniform interface. Such an interface has all the resources recognized separately or independently via URIs. Statelessness ensures that servers do not store client contexts between requests; only session state is held in the server [11]. REST allows clients to cache responses and follows a client-server feature that separates clients from the servers. The layered system is also one of the basic characteristics of REST. No client is able to tell of their connection with the server, that is, whether it is to the end server or an intermediate in between. The code on demand is an "optional" characteristic. It lets the servers to momentarily enlarge or modify client's functions. This is done by transferring code in executable form.

From Fig 1, REST is an architectural style for distributed hypermedia systems. Web services are provided via a huge number of social networks and come with certain advantages gained by using REST API [4]. 1. Compared to other architectural styles, the requests and responses are comparatively shorter for REST-based API. 2. The bandwidth required for the transfer of requests and responses is smaller than any other architecture. 3. Less processing time and memory are required to process the requests and responses. 4. Easy to integrate:

A good RESTful API is discoverable from the initial URI onward. Especially, the property hypermedia provides the roadmap of what to do next. 5. REST over HTTP uses ubiquitous standards. Considering HTTP, accessing the library is much simpler than for others that can connect a developer on any platform and language. 6. The ability to execute stateless communication and effortlessly replicate the repository, REST proves to be extremely scalable. Hence, REST proves itself to be the most appropriate architectural style that can be used by any website. But it should be duly noted that all benefits go in vain with even a single bad implementation.

III. REVIEW ON REST APIs AND THE SOCIAL SITES

A. LinkedIn©

To start with, the world's largest business social networking hub, called LinkedIn©, has its purpose to let its listed users keep contact details of a certain number of the mass population they know, known as Connections. They are permitted to invite anyone they wish to connect with and become their Connection. The REST API is the heart of all programmatic interactions with LinkedIn. As a result, even with mobile or JavaScript development, it's still worth taking the time to familiarize self with how the REST API works and what it can do. LinkedIn makes use of two types of APIs, one of which is the basic REST API which offers a simple and reliable representation of the mass, their jobs, the companies to work in and their respective interactions with each other [12]. REST API requests are throttled to prevent abuse and ensure stability. The data in XML and JSON is read by the query language at the granularity and aggregation that is so chosen. OAuth1.0a is used to authorize users and is utilized to make calls using any programming language. The REST API is the core of all programmatic relationships when it comes to LinkedIn. All other methods of communication in LinkedIn, like Mobile SDKs (a type of software development tool that permits the creation of applications) and JavaScript, simply work as "wrappers" around REST API as a convenient factor for the developers. Consequently, even when mobile or JavaScript development is happening, it is worth familiarizing oneself with the working of REST API and how to move forward with processes. LinkedIn values the integrity and security of its members' data above everything. If the applications need admittance in LinkedIn member files or information or on behalf of the same, they must be validated. LinkedIn trusts the conventional OAuth2.0 protocol as it helps in the easy yet safest form of access to data.

B. Twitter©

Next is Twitter, the most used social networking site after Facebook. The REST API provides programmatic admittance to perform basic functions like write and read Twitter data. Twitter REST API allows one to retrieve tweets and related information from Twitter. Twitter applications are identified by REST API where OAuth is used for security purposes. OAuth is a commonly used open standard for authorization which provides consent to the websites or applications, giving them access to the data of other websites without the usage of any passcodes [9]. This procedure is utilized by various well-known companies such as Google©, Facebook, Microsoft© and Twitter of course, to allow the users to share content that may involve accounts' data and their interaction with other applications. Hence, it is used for authentication where the responses are received in the JSON format. The other API, that is, the Streaming API, is used for monitoring or processing Tweets in real-time. It is an API that delivers new responses to queries of REST API over a long-lived HTTP connection. Over-polling rate-limited applications utilize Streaming APIs.

C. Picasa©

We often want to keep our memories safe. Pictures are what make our dream come true. Picasa is one of the applications that provide the facility. Client applications can utilize the Picasa Web Albums Data API to form albums and perform conventional user activities related to "snaps" like uploading, adding commenting and editing, deleting or collecting photos as albums. The Picasa Web Albums Data API permits websites and programs to assimilate with Picasa Web Albums, enabling users to recover photos and albums. The developers design applications in such a way that uploading pictures from varied gadgets and web applications becomes easy. A full-featured application for consumers is introduced for activities involved with PWA. Integrated PWA that caters to blogging software is familiarized to showcase pictures and a collection of the same on PWA easily [13]. It also lets users utilize PWA to power digital photo frames. Picasa being a photo-editing application utilizes its API to the fullest to give the best experience to its users [14].

D. WhatsApp©

WhatsApp has an internal and unofficial API that helps users to send and receive messages. This, evidently, contains a lot of sensitive information like phone numbers, personal messages, photographs and more. There is nothing else that would be accomplished by using numbers except exposing them to salesmen or saleswomen, who might use that information for their own benefits, which the public is always reluctant to. Thus, no open APIs exist for WhatsApp [9], [13]. However, the new WhatsApp for Business API allows small businesses to connect with their customers. It enables online retailers to integrate the API with their working systems and receive the required outreach to their target audience. Even the WhatsApp for Business API makes use of the REST API with JSON data formats and follows the conventional request-response exchange of the HTTP.

E. Facebook©

Coming to the most famous and advance SNS in the world, Facebook, has a user base of 2.5 billion. Facebook had REST API until recently when it upgraded to the Graph API. The Graph API is based on the same architecture as the REST API but is designed a little differently. The Open Facebook API is also one of the APIs that Facebook uses but only for "Login through Facebook" options that we see in most other applications.

It also includes replying to posts, developing complex games and contests via other applications. The RestFB API is simply used to get information and publish them as new items on Facebook.

The developers provide in-built operations for all the important constituents. In spite of that, every constituent or component may be replaced with a habituated operation. Hence, RestFB integrates flawlessly in all project types, for example, Android projects [7]. They are simple POJOs with distinct comments. This configuration aims to ease of use and to describe custom types. The user is not required to include any supplementary libraries in their project. There will not be any risk of running into dependency clashes. Adding to that, RestFB is highly convenient and operational for both Android and normal Java applications.

F. Instagram©

Instagram is a photo-sharing application, now bought by Facebook. It provides a service through which users are able to share pictures and videos, either publicly or privately. Instagram has edaciously elaborated API client registration and authorization process. The Instagram API access limitations can prevent a lot of wastage because they often result in unexpected data rather than straight forward authentication errors that are easier to diagnose. All endpoints are only accessible via https and are sited at "api.instagram.com". Instagram has tight security measures, which makes the restrictions more intuitive to work around. It has different modes to consider. One of them is the Sandbox mode which is the gatekeeper between developers and full API access. Most projects remain here as Instagram only and it allows full access to a handful of cases. In Sandbox mode, the API goes to a "magic island" where only you exist and if you like, a few other users may co-exist too. In technical terms, anything a user does will only show him results in accordance with the current population of the so-called magical island. Instagram requires the users to use scopes to access any kind of data in both "live" and "sandbox" modes. It has recently adopted the Instagram Graph API which is similar to the WhatsApp for Business API, given their present owner. The former allows businesses to monitor their progress or actions on the application. It uses OAuth 2 for authentications and security [15].

G. Snapchat©

Last but not the least; we will discuss the application with a novel concept, Snapchat, which has an unofficial API. It is an image messaging and multimedia mobile application. Snapchat has an Ads API, for third-party users and developers that allows them to publish ads for their benefits. Other than that, Snapchat, so to speak, has four other APIs, namely Snap Login API which allows users to use their Snapchat usernames to create accounts on other applications, Snap Camera API, which lets users share pictures from other apps directly to their "Snapchat Story", another which enables use of users' "Bitmoji avatar" into other applications yet again and the last one which lets the developers use users' public photos and videos to create Stories on particular themes on third-party websites or applications.

IV. COMPARATIVE STUDY

A comparative study between all the social networking sites discussed above has been done in order to understand the usage of the kinds of APIs available and how they are different from each other, and to make the best out of it [12], [16].

As mentioned earlier, Facebook used REST API until recently when it upgraded to the Graph API. The Graph API is based on the same architecture as the REST but is designed a little differently. While the basic characteristic of Graph API is to get information and publish them as new items, Snapchat has an unofficial API which plans to release an Ad Only API that will sell the ads out. WhatsApp has an internal API that not everyone can utilize along with the newly developed WhatsApp for Business API that is beneficial to the business providers, as the name suggests. LinkedIn, Instagram, Twitter, and Picasa utilize the basic REST API as it not only provides interoperability between computer systems on the internet but also has characters like good portability, visibility, modifiability and simplicity that make it the best API to go for. The interactions between its components are the most dominant factor that it carries [17].

Coming to complexity, the REST API was disordered and hampered with unreliable behavior. Performing the simplest task was difficult without making multiple API calls and some complex data interpolation [14]. But the afresh platform so announced changed the convention, which is technical inefficiencies and has made it easier for applications to perform various user activities such as posting or consumption of data. Snapchat and WhatsApp do not have a public user API, so there is no question of discussion as its presumed that they are less complex comparatively. LinkedIn's JavaScript SDK is a convenient way to enable LinkedIn integrations within websites and web-based applications without the need for any back-end programming, making it more flexible and less complex.

When it comes to Instagram, once the developer registers his client, it becomes easier for the same to request data from the concerned application. All endpoints are only accessible via https and are sited at api.instagram.com. Twitter and Picasa have advanced options, if one needs. The latter is comparatively complex and utilizes Google's "Picasa API". This company does not use an indigenous API. Performance-wise, Twitter API gives the best experience to any user and is the smoothest. Facebook API which works extremely slowly for a lot of people. The Instagram API is mostly used for advertising and works perfectly, without any hindrance whereas Picasa comes to a point where it becomes unusably slow. Compatibility is one of the most crucial characteristics as well, to judge how the APIs work. Twitter takes the crown, followed by Facebook as the developers have no choice but to make these two social networking sites the epitome of flexibility as they are extremely engaging worldwide [15]. The developers have kept up to the users' expectations. Coming to the other three sites/apps, Instagram, LinkedIn and Picasa, they are compatible as put in the order; compatible, less compatible and least compatible.

Picasa uses a complex and slow API, which makes it the most difficult website to handle. But the other two, Instagram and LinkedIn, are comparatively better. In spite of both using REST API, Instagram uses its own API, though based on REST API, namely, Instagram API. This API makes it more accepting when it comes to the API getting utilized by its own site. LinkedIn becomes a little less flexible, hence less compatible as it does not go by the same rules. Comparing the states of resources for the APIs for all the websites, other than Picasa, all come out to be active whereas Picasa is dormant. Only one book of the library can be active at a time but active instead of dormancy at all times compliments the APIs so used by the websites; but for Picasa, it is a drawback [5], [13].

Every API needs security, authentication, and safety. All use versions of OAuth for the same. It is a flexible standard for authorization that helps in the authorization of websites and applications and provides access to the data about other websites stored in it. This process does not involve the sharing of any passwords. Many well-known companies use this mechanism; some of them include Facebook, Microsoft, Twitter and many more. This offers permission to consumers to share data about their accounts with other websites or applications. Facebook has a massive number of users, 2.5 billion of them, which is close to half the world population. The photo-sharing app, Facebook owned Instagram, is a far second with a billion users. Twitter stands next in line with about 330 million users. Microsoft owned LinkedIn has about 20 million users. Then there are WhatsApp and Snapchat, which are fairly new to the market and have not gained many users just yet, compared to the ones under consideration but are progressing.

Except for Snapchat and WhatsApp, all other applications under discussion have a public API that can be accessed by anyone with an access token. Snapchat and WhatsApp have an integral API mainly due to personal content. Facebook Query Language (FQL), Cloud Element Query Language (CEQL) and Graph Query Language (GQL) are the languages used. Coming to operating speeds, they are mostly very good these days because "performance" is a priority for all users. Picasa is a little slower than the rest. Facebook being the most advanced is the best among these.

In 2005, 105 APIs were tracked. By 2008 this number had grown 6-fold to 601 APIs with social and traditional media seeing the value in opening up their data to third parties. By the end of 2010 developers had over 2,500 APIs. The graph changed from least to a maximum. Even though SOAP and REST have identical functionalities, the procedure or steps to produce a new function in the former could be complicated, whereas for the latter, it might be as easy as appending a

The table below gives the comparison made of social networking sites. Twelve parameters have been taken under consideration for all the social media platforms. It has been put into two parts to compensate for space. Facebook, WhatsApp and Instagram are considered as independent entities.

piece of code to an existing resource and adding links to the relevant pages for handling a new method. It results in clients being able to access the new function by browsing the site as they did earlier. Similarly, there are multiple examples that have proven REST to be better than the existing APIs, consequently leading to the replacement of SOAP or simply designing sites using the REST. Fig 2 below shows how REST has replaced the most commonly used APIs, given its remarkable features and functionalities [18]. Fig 3 depicts the increase in the use of the REST API compared to the other APIs known, based on the directory of web APIs listed at Programmable Web, November 2011 [19].
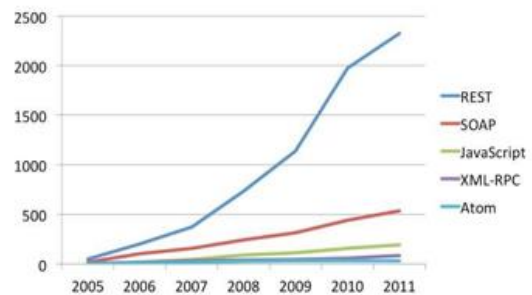

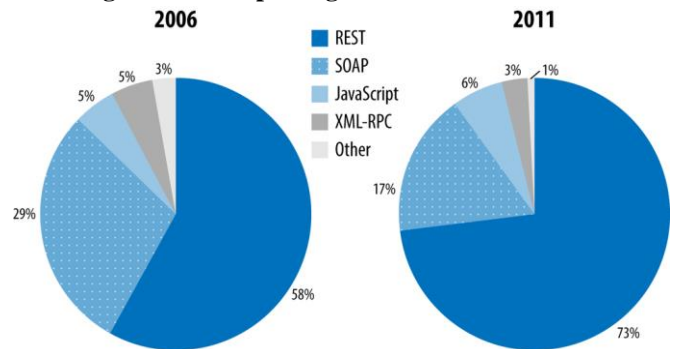**Fig. 2. REST replacing SOAP and other APIs**

Fig. 3. Distribution of API protocols

Adding to that, the market has come across a new technology API named GraphQL. This API uses only a single query to fetch the concerned data. This API has a hypermedia-like ability to use a single query to fetch the required data across multiple resources. But GraphQL APIs also borrow from the concept that REST-styled API is built on [20]. Evidently, REST acts as the parent structure for most APIs so designed.

V. RESULT AND DISCUSSION

Table- I (a): Comparison of Social Media Platforms

REST APIs for Emerging Social Media Platforms

#	Parameters	Facebook	Snapchat	WhatsApp
1	API used	Graph API (Along with the following APIs: • Live Video API • Marketing API • Pages API • WhatsApp for Business API • Instagram Graph API) The last two come under Facebook after its acquired WhatsApp and bought Instagram on 2nd April 2012 and 19th February 2014, respectively.	• Ads API • Snap Login API • Snap Camera API and two others.	• Internal (unofficial) API • Business API
2	Complexity	The REST API for SNS was disordered and hampered with unreliable behavior. Performing the simplest task was difficult without making multiple API calls and some complex data interpolation. But the afresh platform so announced changed the convention, which is technical inefficiencies and has made it easier for applications to perform various user activities such as posting or consumption of data.	Complex	Business API comes with complex integrations.
3	Performance	Facebook API works fast according to the developers	The API methods are working and up-to-date with the current version, hence performance is good.	The performance of WhatsApp API is marked "good", especially after the functioning of the Business API.
4	Compatibility	Compatible	Compatible	Compatible
5	State	Active	Active	Active
6	Authentication	OAuth 2.0	Two Factor Authenticator	Apikey, DSL
7	Language	XML and JSON	JavaScript	ERLANG
8	Error Handling	Errors are easier to extract and interpret. Uses/ NSError and NSErrorRecoveryAttempting.	Weak and easily corruptible, the following problems may occur: • App crashing • No way to login to Snapchat once forgotten password. • Cannot connect to Snapchat Server and cannot Send Snaps.	Errors handled by Android 4.4.1 KitKat.
9	Operating Speed	Fast	Slow	Slow
10	User Base	2.5 billion	210 million	200 million
11	Access	Public	Private	Private
12	Query Language	FQL : Facebook Query Language	Graph QL	SQL: Structured Query Language

Table- I (b): Comparison of Social Media Platforms

#	Parameters	LinkedIn	Instagram	Twitter	Picasa
1	API used	REST API	• Instagram REST API • Instagram Graph API	• REST API • Streaming API	• Picasa Web Albums • Data API
2	Complexity	LinkedIn's JavaScript SDK is a convenient way to enable LinkedIn integrations within the websites and web-based applications without the need for any backend programming, consequently, making it less complex.	Once the developers register clients, it becomes easy to request data from Instagram. All endpoints are only accessible via https and can be viewed at api.instagram.com .	They are rather simple but they have advanced options to approach if one needs. Hence, it is comparatively less complex.	When it comes to complexity, Picasa is comparatively complex. It displays its pictures and web albums using Google's Picasa API.

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3	Performance	Smooth	The Instagram API is being used worldwide and it works perfectly.	Good level of a performance rate.	The latest version of Picasa is unusably slow for many users. The response time from its API is noticed to be very slow.
4	Compatibility	Less compatible	Compatible	Most Compatible	Least Compatible
5	State	Active	Active	Active	Dormant
6	Authentication	OAuth 2.0	OAuth	OAuth	OAuth 2.0
7	Language	JS	C, Node.JS and OpenGL	JSON	Java, .net, PHP, Python
8	Error Handling	HTTP status codes match error conditions. Also, a help URL is put in response	All errors are taken care of by using lib/instagram/error.rb	HTTP status codes	Sometimes unable to handle errors like "Failed to check online album error" but common errors like "CBlock errors" are handled by preserving face tags to revert to the particular database in use.
9	Operating Speed	Medium fast	Medium	Fastest	Slow
10	User Base	20 million	1 billion	330 million	2 million
11	Access	Public	Public	Public	Public
12	Query Language	SQL	CEQL: Cloud Element Query Language	SQL	SQL

VI. CONCLUSION AND FUTURE ASPECTS

We have presented the role of REST based APIs and their functionalities in various emerging social media platforms. These REST-based APIs minimize time and keep our social standing on point. Moreover, these APIs are flexible, secure and less bandwidth-driven which not only facilitates the developers but also the clients. REST-based APIs are facilitated with a smooth process to modify, create programs as per requirements, and has an online fraud-free experience. They can be utilized more like a collective integrative API for social networking sites. An interface will form a native application for better experience and integration of the future applications. In addition to that, REST comes with consumer-based testing, and has simpler development and troubleshooting facilities. Moreover, it is quite scalable. Hence, basing the future web services on REST will be further more efficient, simple and compatible to users and developers.

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