



API-FICATION

CORE BUILDING BLOCK OF THE
DIGITAL ENTERPRISE



**DIGITAL
SYSTEMS
INTEGRATION**

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DIGITAL ENTERPRISES

The trend of publishing APIs to encourage the development of user applications is not new. Born digital businesses, such as Yahoo! or Google have back-end platforms and user-facing applications that provide well-defined APIs to allow access to the business functionality and data. Online businesses are poised for digital growth by providing APIs to widen the community of developers. The ubiquity of mobile devices and the proliferation of social interactions have been an additional stimulus for enterprises to provide APIs. APIs became the core building blocks of Digital Businesses, which is clearly seen in their adoption and growth as depicted in the picture below.

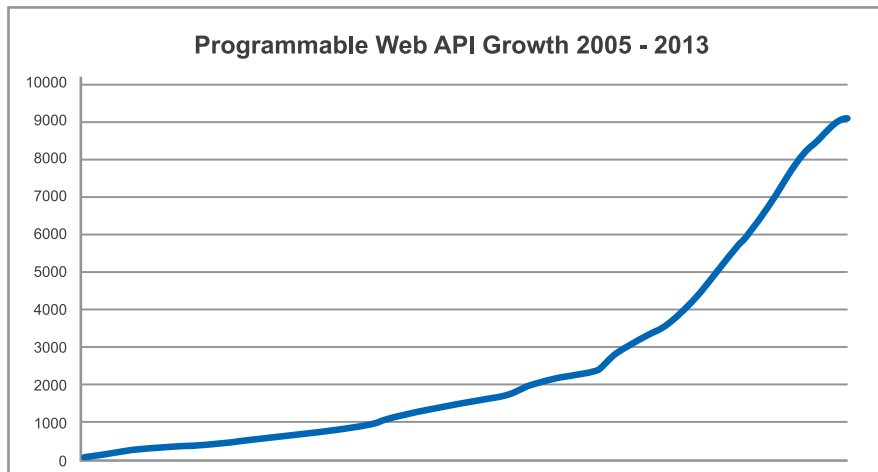


Figure 1: Programmable Web API Growth 2005-2013

This paper focuses on what Web APIs (Web Application Programming Interfaces, called APIs hereafter) are, why they benefit enterprises, and in what situations enterprises need an API infrastructure. The details about various API platforms, and their comparison, and implementation methodologies will be covered in the follow-ups to this paper.

This paper is meant for IT and Product executives who are responsible for:

- Enabling mobile application development
- Developing partner eco-systems
- Evangelizing products and services in developer communities
- Search of new revenue streams

This paper illustrates ways to leverage existing assets exposed by an enterprise's internal systems and make them available to different sets of users — customers, partners, developers, or internal users, as well as ways to make the enterprise services available to users on different devices – tablets, handsets and desktops, and through different channels – in-store, online, call center, or phone.

In this paper, we also discuss a compelling rationale for API offerings, the recent hyper growth of APIs, the approaches for creating API-based offerings, and the relative merits of the leading API management platforms. Finally, we present three key business transformation case studies in Retail, Financial Services, and Pharmaceutical domains.

This paper does not focus on exploring the comparison of various API enablement platforms and stacks that are currently available in the market; these will be addressed in subsequent white papers.

API - A CORE BUILDING BLOCK OF A DIGITAL BUSINESS

Historically, business had a product or process centric approach – often customizing large scale ERPs to achieve automation in quest of efficiency. The recent drive towards customer and user centricity demands that applications be built rapidly with frequent iterations. Moreover, to support different segments of users, enterprises need focused applications that bring the business functionality to the specific customer context. In this pursuit of user centricity, the key enablers of the “digital shift” are the mobile shift – for reaching out to the users wherever they are, the cloud shift – to enable rapid adjustment to fluctuation in demand and a faster, cheaper innovation cycle, and the multi-channel shift– to allow users to access enterprise assets at their convenience. Finally, all these changes are supported by improving the user experience through modern UI techniques and usage patterns such as social elements.

However, the digital shift has inherent complexities such as the following needs:

- Need to serve both internal and external needs within an enterprise with conflicting goals of governance and security
- Need to leverage key assets and services, without compromising the focus on agility and customer centricity
- Need for building capabilities that support new business models without causing business disruption in the existing business services
- Need to support agility in development, delivery and operations and support adjustment to elasticity of demand often through cloud (public or private), and yet leverage the existing assets in infrastructure, processes, and support, by crafting suitable business case for selective transformations

APIs are the defined interfaces through which interactions happen between an enterprise and users of its assets. An API can become the primary entry point for enterprise services, for its own website and applications, as well as for partner and customer integrations.

These challenges are inherent – that is, they cannot be answered by technology alone. Any digital shift for an established enterprise must balance with the existing assets, processes, systems, and operations.

A primary candidate for basing the API systems on is SOA, to support reusability; however, as SOA itself is actually “built up” from legacy systems of record there are several problems such as:

- SOA services are dependable and stable, but slow to change
- SOA services are inward focused and promote reusability, making them coarse grained and complex
- SOA services are standardized in their output, which makes the output slower to modify, and subject to interpretation
- SOA services are unable to keep pace with the current speed of innovation and short iterations in app development because of the nature of “built-up” SOA services and their relationship with the legacy systems

APIs allow different groups of developers, internal, external and partners to gain access to enterprise systems in an easily consumable way. Typically, by using an API platform (that comprises of API layer, API governance, API design time components, API discovery and documentation, to name a few), these challenges of building and delivering APIs from SOA and other existing infrastructures are addressed. These platforms can address the varied demands on security, performance, governance, stability, flexibility, and agility. In this white paper, we will present a few examples of API platforms, after we discuss the rationale and the popular applications of APIs.

APIs Defined

APIs are the defined interfaces through which interactions happen between an enterprise and applications that use its assets. An API can become the primary entry point for enterprise services, for its own website and applications, as well as for partner and customer integrations. APIs are defined through a contract so that any application can use it with relative ease. In contrast to SOA services, APIs are focused on programmable web, which includes web and native applications. As such, the technical characteristics of the APIs are different than earlier generation services.

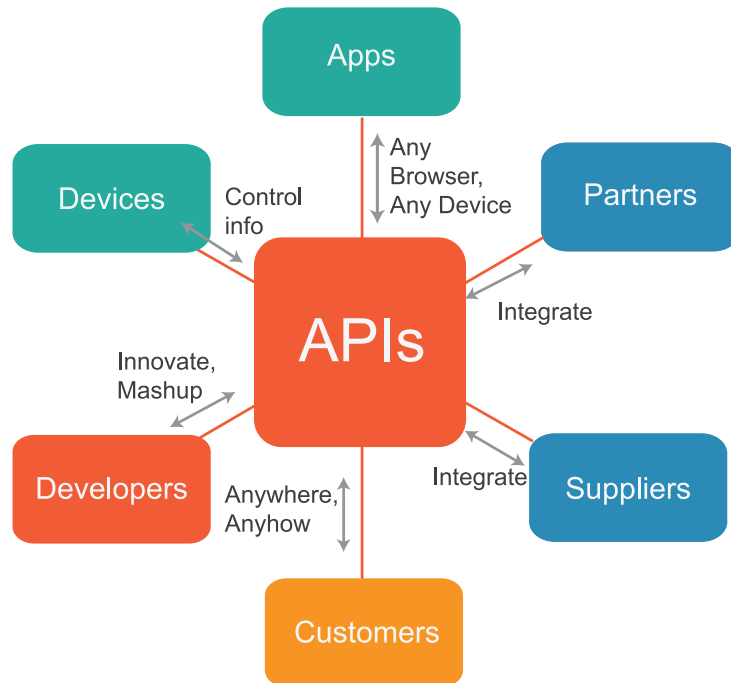


Figure 2: Reusable services serving many yet unknown consumers

An API approach is an architectural approach that revolves around providing programmable interfaces to a set of services to different applications serving different types of consumers. It assumes that these different user groups might change or evolve over time in the way they utilize services. The API approach creates a loosely coupled architecture that allows a component service to have a wide range of future uses, and is technology agnostic. Though the API approach is designed to enable app developers to build apps that rapidly adapt to end user needs, it is built on the same principles as Service Oriented Architecture (SOA), albeit with different focus – namely by focusing on developers to enable them to program the web.

How APIs Benefit Enterprises

The strategy of providing APIs leads to the following benefits:

1. **Reduction of costs:** APIs is a cheaper way of building applications by increasing the reuse of services. Providing a usage or analytics-based evolutionary development platform decreases cost of development and change to services. As the number of applications increase, the benefits are more evident.
2. **Increasing business agility and foraying into different eco-systems:** Since APIs offer integration with any technology stack, they allow higher productivity for the developers. Moreover, APIs let the enterprise reach out to a larger pool of application developers to build apps on a suitable app eco-system (iOS, Android, Kiosks, desktops) of their choice.
3. **Increasing innovation and new business models:** By allowing others to build applications that integrate with their captive data and processes, enterprises see new applications using their services in new and previously unforeseen contexts. Developers can incorporate enterprise data and combine it with any third-party data enabled by APIs such as location or social data.
4. **Increasing consumer loyalty:** By involving consumers and passionate developers in a new generation of applications, the enterprise can increase brand awareness and loyalty in the core groups. These early adopters can drive the market into new directions that the enterprise is promoting.

While existing digital businesses make the transition easily, we have seen that brick and mortar businesses can also adopt the same strategy by leveraging APIs to explore and foray into new business models.

What enterprises are doing with APIs

As discussed earlier, there has been a shift in how enterprises are exposing their services and data - driven by various elements of consumer centricity. Some of the key areas that are driving API adoption are:

- Supporting mobile applications and enterprise app stores through APIs while hiding the complexity of underlying systems
- Extending business functionality and systems into the developer eco-system to drive development of apps with cloud and social mash-ups, which in turn fosters innovation
- Embracing APIs as a form of new revenue streams

Nissan exposed its APIs to the charging feature. Now, users can schedule their cars for charging during non-peak times, a feature that is made possible by an external application built on the APIs provided by the company.

A case in point is BMW, which built cars with iDrive, a driver's-side radio dial for controlling the display dashboard. By exposing the APIs to iDrive, they enabled a class of applications that extend the range of in-car services with apps that people already use, such as web radio, Google Local Search or Facebook, providing a seamless user experience. Similarly, Nissan exposed its APIs to the charging feature. Now, users can

schedule their cars for charging during non-peak times, a feature that is made possible by an external application built on the APIs provided by the company.

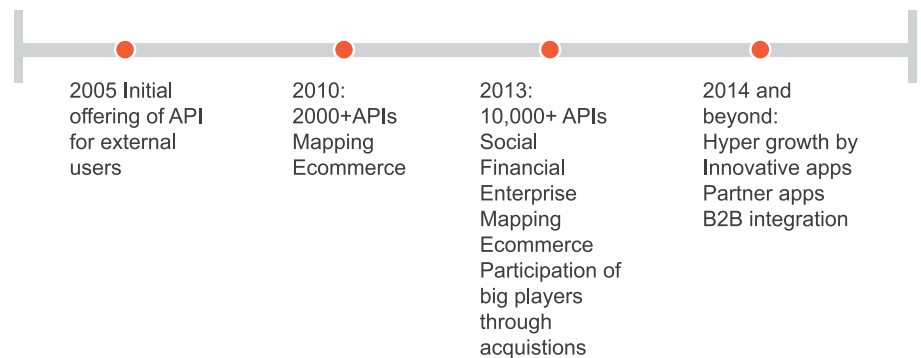


Figure 3: API Growth in Enterprises

Another example is of a fast food chain that provides APIs to access customer activities, which can be used by brands to offer special discounts. If a consumer has shown a preference for a brand of soda, they can be offered a discount coupon to that drink at a nearby grocery store. In this case, the restaurant chain shares the revenue from the targeted brand by providing an API to the user transactional data.

A Retail API can give access to the inventory levels and location, which can be used by mobile applications to guide consumers to stores in the vicinity. The creative use of such data by a community of application developers creates an additional business opportunity for retail businesses.

In the financial world, there has been innovation on the payments side from PayPal, Stripe, Square and many more organizations. In banks, APIs can be used for bank-to-bank straight through processing. Banks can use data insights to help customers benefit from their life events such as marriage and their changing economic conditions. This works better than exploiting the customer situation and cross-selling. To make such insights available, APIs can ingest inbound events and enable real-time actionable analytics using “outbound” push events.

API PLATFORMS

As described earlier, APIs are best served through a platform that supports design, development, deployment, operations, and support. Depending on the context, these platforms are named Back-end-as-a-Service (BaaS), mBaaS (mobile BaaS), API gateways, API management platforms etc. They can be based on conventional (hosted, in-premise, or on cloud) as well as a pay-as-you-go cloud model. In the figure below, we categorize different providers based on their origin and offerings. Enterprises can de-risk and accelerate API development and increase adoption by using tried and tested API Platforms.

An API platform is an API infrastructure that is ready to build and run APIs with minimum features and common services required of Web APIs, with elements of the tech stack that digital enterprises need such as caching and security, and preferably with a built-in support for API development and management. Ideally, it is configured in the standard way and validated.

API management is the process that provides publishing, promoting, developer self-help, and governance of APIs in a secure and scalable environment. Optionally, it also enables creation of end-user support artifacts, forums and collaboration environment.

Following are 10 categories that can determine the relative strengths of API platforms:

1. Ability to support mobile as well as web devices
2. Integration with other APIs
3. Ease of administration
4. Analytics and reporting
5. Rapid development, such as automated conversion to REST (Representational State Transfer) APIs
6. Scalability and compliance to security requirements
7. Support for cloud and on-site offerings
8. Ability to support any geographic location, user management, and policy/authentication mechanisms
9. Ability to support digital operations such as push notifications, data-caching, localization, and geo-targeting
10. Ability to leverage existing services & middleware infrastructure



Figure 4: API Platform Landscape

Based on the relative strengths in these 10 categories, we can classify the API platforms as shown in figure 4 into four segments. The image is defined in detail below.

Consumer Apps

The segment 1 is for API management platforms for mobile apps that are mainly consumer-centric. Such apps are built on technologies such as HTML5 to provide a dynamic user interface across different channels. The applications are largely standalone and simple to use. Also, they use limited data, typically related to user interactions. However, there can be very large number of users for such applications. Sencha and Verivo have established themselves in this market.

Flexible & Lightweight API

The segment 2 is for newer API management platforms, which make it easy to start small, possibly with lightweight enablement of API for different eco-systems. Ease of deployment of the APIs, rapid automated on boarding of application partners and continual enhancement are the key characteristics of this quadrant. Mashery, which was acquired by Intel, and 3 Scale have been innovators in this area.

Enterprise Grade API

The segment 3 signifies secure and scalable API management platforms that also support extensive business intelligence on the API usage. These applications get launched on a large scale and need to be robust, secure, with high levels of monitoring, and reporting right from the start. Other key requirements in this space are smooth onboarding of application partners, and business intelligence at an aggregate level with the ability to drill down. Computer Associates' Layer7 and IBM's Cast Iron have built a significant customer base because of traditionally robust enterprise level offerings. Because of the longevity of the API management platform, both companies have a large market base, with Layer7 being the bigger of the two. Apigee and MuleSoft have an established customer base due to the ease of use and innovation.

Low Cost API

The Segment 4 is for cheaper and quicker way API management platforms that make it easy to start small, possibly with mobile first, and then have it grow into large, scalable offerings. Ease of deployment of the APIs; rapid, automated on-boarding of application partners; and continual enhancements are the key characteristics of this quadrant. WSO2 provides an open source-based approach to API management.

Custom-built Platforms as an alternative

Enterprises can build their own API platforms using open source rapid development platforms like Express over Node.js, Grails, Spring, and Rails. These frameworks can be augmented by digital enablement features such as push notifications, data caching, transformation, orchestration and aggregation, device-specific data delivery, localization, validation, error handling, and logging and analytics. This approach is vendor-agnostic and provides complete control over the operations and the cost for high volume or sensitive systems.

The integration of core APIs with common services and a robust framework aids user adoption significantly.

API PLATFORM ENABLEMENT

Most enterprises, moving towards a digital presence, are creating an API infrastructure to expose services to internal and external developers. The important factors for such an API platform are clearly identified user groups such as internal teams, partners, and a community of developers, and the identification of the core value of the services that expose business functionality and value potential in the captive data. Wherever feasible, common services such as user authentication, logging, and reporting can

be abstracted out as platform features. The integration of core APIs with common services and a robust framework aids user adoption significantly.

Another important consideration for an API platform is its customization for target audiences – internal, partners and external developers.

- The APIs for internal consumption have a fewer numbers of users. Here API management is fairly limited, and development as well as the implementation can proceed in parallel
- A partner-facing API strategy is dependent on the number of partners and their relative maturity. In a scenario with a handful of mature partners, APIs can keep evolving and will only need moderate management, whereas for a large number of partners, more mature APIs and management platforms are required
- For a broader developer base - internal as well as external, robust APIs and management platforms are essential for faster adoption and scalability

Our Approach

API platform enablement includes the definition of business APIs, platform implementation and deployment including integration with common services APIs, launch, management, and continued monitoring of the API platform. HCL provides expertise across all these phases.

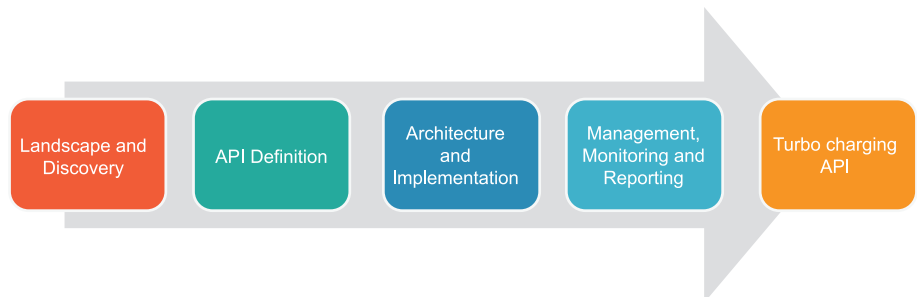


Figure 5: HCL API Enablement Framework

API Landscape and Discovery

The discovery phase includes evaluation of the business model, API assessment for completeness, API strategy, packing and monetization. A strategy workshop is conducted during this phase to finalize the API roadmap, the high level definitions and timeline for the implementation of the roadmap, and the monetization options.

API Conception and Definition

API definition should focus on the core business services because common services such as user management, authentication, metering/billing can be availed from various platform libraries. For example, a retail business API will include access to the product inventory, prices, discount coupons, product reviews, and store locations while services such as payment or billing or shopping cart management can be availed from existing libraries.

Captive data, which has high potential, needs to be exposed with the right usage including relevant aggregations. At the same time, a multi-tenant platform needs to be carefully managed for access rights to the data.

Architecture and Implementation

The API design needs to be architected to service the target audience. Multiple choices are available for the API management platform and their relative merits are discussed below. Choosing the right API management tool in the early phase is very important.

- **Architecture and Tradeoffs**

RESTful API design is recommended for the future scalability of the platform and for integration with tools and services from other vendors. Existing APIs need to be evaluated and modified, where necessary, for compliance with RESTful API guidelines.

APIs must have hooks into the logging, metering, billing and reporting infrastructure. Granularity and breadth of interfaces are determined by the audience requirements and goals.

- **Seamless Integration**

Core APIs need to be presented in a seamlessly integrated offering to create a unified experience for users. Any repetitive operation between APIs, such as multiple requests for user credentials creates barriers to a wider adoption of the APIs. Integration with common services such as authentication, logging, and metadata management will facilitate the creation of a complete package for application developers.

- **Certification and Launch**

An API is expected to be a multichannel offering that enables operation across multiple browsers of devices. Good design and a strong testing framework are necessary to validate the functions across multiple channels. Such API launches also include examples of applications or use cases of APIs.

Management, Monitoring and Reporting

Continuous support and improvement of the platform or the API requires detailed data on API use, data traffic, and exceptions. A management dashboard to display aggregate data is an essential part of IT operations.

Frequent reports and online monitoring of the APIs will help provision for fluctuation in API usage needs, identify bottlenecks that inhibit scalability as well as suggest operational improvements. Visualization tools are available for a wide-ranging audience such as the API support staff, and for the operations management team.

Turbo charging API Adoption

Post-development, there may be initial challenges in API adoption. This is a very critical phase in API enablement. During this time, use of analytics helps optimize the API offerings for users and in turn increases adoption. Usage analytics can include data flow, peak demands, most widely used APIs, and least likely to be used APIs.

Developing use cases for API usage, new apps, and setting up an innovation center are other steps that can be taken to turbo-charge the adoption of APIs.

HCL SERVICE LINES

The goal of every API strategy is to increase business by catapulting innovation through a community of developers. The success of such initiatives hinges on continuous API adoption. The right approach starts with a careful design of the initial offering and continuous improvements based on target audience understanding. It is an iterative process where time-to-market is a critical factor. HCL's expertise can help optimize effort and reduce misplaced iterations in the following critical areas of API strategy:

- **Intelligent choice of APIs:** It is critical to design APIs that expose the core value proposition and data from the business, and minimize any effort on a utility API that can be available from other sources. With our knowledge and expertise in wide-ranging utility APIs, we can reduce the cycle time for this critical activity. We also aggressively promote the design of RESTful APIs
- **API lifecycle management:** After the first version of the API, continual monitoring of its use, both from a feature and volume and frequency perspective, is critical for its continual adoption by customers. HCL can put into place the right monitoring and improvement processes that will ensure that the adoption grows continually
- **API management platform and reporting:** Choosing an API management platform that fits the business strategy is critical to success across the API lifecycle. HCL can help choose and implement the right API platform from the vast array of traditional ESB platforms, as well as new solutions that started with API management as their core focus

There are 3 service lines that HCL offers as a part of API enablement:

1. API Landscape & Discovery: Enabling customers with an API strategy and a discovery phase.
2. API Development & Life Cycle Management: Designing and developing APIs based on an API platform, monitoring, support, and management.
3. API Adoption & Turbo Charging: Setting up an innovation center, app development, and use case development for faster and sustained adoption of APIs.

CASE STUDIES

Three case studies have been selected from HCL's many API-related engagements and are discussed below. They are from multi-channel retail, life sciences, and financial services domains.

Multi-Channel Retailer Uses an API Platform to Reduce App Development Time

A multi-channel retailer had a requirement to create a modern web platform that could be accessed through multiple customer channels — in-store, call center, online and through multiple devices — tablets, laptops, desktops. The platform had to be

available to partner channels with adequate controls and security. The retailer was also looking to accelerate the time-to-market for apps, and drive marketplace innovation to gain a competitive edge.

HCL helped create an API services platform that had common services and frameworks for authorization, security, I18N, validation, error handling, logging and regression testing available to developers of different business modules. The effort spanned fifty people months. The platform was built in a DIY mode using Grails as MVC framework. The API platform was consumed by an HTML5-based App platform using Bootstrap.js. The common UI components and templates were prebuilt as per UX guidelines, reducing iterations between business, user experience, and development teams. The use of iterative development and loose coupling between the Apps and Backend APIs resulted in fast mockups and parallel development on APIs. This reduced the development time for apps built using the platform by 50%, and provided consistency in the App portfolio built by geographically-spread teams.

Life Sciences Company Enables APIs for Internal and External Consumers

HCL is currently working with a pharmaceutical organization to integrate multiple in-house applications and provide a unified API platform to a diverse audience of developers, partners, employees, and to multiple devices including mobile phones. The cloud-based platform includes the separation of enterprise data, API development, API management, and client application development. Currently, the API management platform evaluation is underway.

HCL will implement fifty APIs. The project goal is an 80% reduction in the store activation time, and a 75% reduction in the channel partner on-boarding time.

Financial Services Company Uses APIs to Integrate Digital Channels with Complex Back-end Systems

For UK's leading Foreign Exchange supplier offering a range of services including management of prepaid Travel Money Cards, HCL developed an API layer to be consumed by digital channels such as mobile and tablet apps, internet browsers, and other external and internal consumers. The APIs exposed workflows for Top-up, Account Unlocking, and account management from any device.

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ABOUT HCL

About HCL Technologies

HCL Technologies is a leading global IT services company working with clients in the areas that impact and redefine the core of their businesses. Since its emergence on the global landscape, and after its IPO in 1999, HCL has focused on 'transformational outsourcing', underlined by innovation and value creation, offering an integrated portfolio of services including software-led IT solutions, remote infrastructure management, engineering and R&D services and business services. HCL leverages its extensive global offshore infrastructure and network of offices in 31 countries to provide holistic, multi-service delivery in key industry verticals including Financial Services, Manufacturing, Consumer Services, Public Services and Healthcare & Life Sciences. HCL takes pride in its philosophy of 'Employees First, Customers Second' which empowers its 91,691 transformers to create real value for customers. HCL Technologies, along with its subsidiaries, had consolidated revenues of US\$ 5.4 billion, for the Financial Year ended as on 30th June 2014. For more information, please visit www.hcltech.com

About HCL Enterprise

HCL is a \$6.5 billion leading global technology and IT enterprise comprising two companies listed in India – HCL Technologies and HCL Infosystems. Founded in 1976, HCL is one of India's original IT garage start-ups. A pioneer of modern computing, HCL is a global transformational enterprise today. Its range of offerings includes product engineering, custom & package applications, BPO, IT infrastructure services, IT hardware, systems integration, and distribution of information and communications technology (ICT) products across a wide range of focused industry verticals. The HCL team consists of over 95,000 professionals of diverse nationalities, who operate from 31 countries including over 505 points of presence in India. HCL has partnerships with several leading global 1000 firms, including leading IT and technology firms. For more information, please visit www.hcl.com



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