



## CONVERGENCE@WIPRO: IMPLEMENTING IP BASED NETWORKS



### **Wipro Technologies**

Wipro Technologies is a business unit of Wipro Limited and is engaged in providing on-site, off-site and offshore software development services. With over 9000+ software professionals spread across 21 Development Centers across the globe, the company's software services business has grown on the foundation of continued focus on customer satisfaction and quality.

The Bangalore-based company has just moved its corporate office into an impressive all-Wipro campus in sub-urban Bangalore. Further, it has Development Centers in Hyderabad, Chennai, Gurgaon, Pune & Mumbai in India. Moreover, it also has presence internationally in Japan; key European markets such as Finland, France, Germany, UK – as well as offices in Canada and the US.

In terms of numbers and statistics, Wipro Technologies' financial highlights for the year 2001 – 02 speak for themselves

- Profit After Tax was at a record Rs. 8.9 billion representing an increase of 32% over previous year
- Revenue increased 28% for the year ended March 31, 2002, at Rs. 23 billion.
- Wipro Technologies retained its margin with PBIT growth of 28% in line with revenue growth

Truly, Wipro is well on its way to realise its vision of breaking into the Top 10 IT Service Providers list in the world. The company's drive is best exemplified by its mission statement - "With utmost respect to Human Values, we promise to serve our Customer with Integrity, through a variety of Innovative, Value for money Products & Services, by Applying Thought, day after day."

### **Industry Brief:**

In 2000 – 01, India's software exports accounted for 13.1% of India's total exports –amounting to a massive US \$ 6.24 billion. With the slowdown in the global economy, India has clearly been identified as the preferred destination for companies looking to out source their key business processes. Further, the Indian domestic market has been identified as a growth area – as a result of increased investments in IT by banks & financial institutions, government departments, the telecom and the retail sector etc. Indian software services companies will need to leverage the global slowdown to enter new areas of business as well as drive efficiencies into existing business processes that will enable them to sustain the growth rates of the past.



Despite the global slowdown, the Indian Software Exports has continued to grow – albeit at a slower pace – at 25%. As per NASSCOM estimates, the performance of the Indian software and service exports sector for the third quarter (Q3: October–December, 2001) of the financial year 2001-02 revealed that software and services exports from India generated revenues of Rs. 9,100 crores in Q3 of 2001-02. This was up from Rs. 7,270 crore for the corresponding period in the previous year. As per the National Association of Software and Services Company (NASSCOM) forecasts, the industry would witness 30% growth to reach Rs. 37,000 crores in FY '01-02.

### **Wipro Technologies' – the IT infrastructure then...**

Wipro Technologies' core business is IT solutions & services for enterprise and technology markets. Wipro's business model relies on the "offshore" model of software development – and the Intranet was designed to inter-connect all of the Offshore Development Centres (ODC's).

The standard network for Wipro comprised of a converged data/voice/video communication link connecting every remote client location to the ODC LAN of one of the Development Centers in India. Every development center was connected to the primary & secondary WAN Hubs on 2Mbps lines. The interoffice links were designed for high availability using alternate paths & auto routing network protocols. Policy-based networking & Quality of Services rules were defined and configured to ensure highest priority for business critical applications. The IT infrastructure at each WT office was Network ready for easy access with 10/100Mbps bandwidth to the desktop and Gigabit backbone.

At Wipro, the IT department is organized into two strategic focus areas - Operations and Core services.

- The Operations team manages the day-to-day IT Operations, which covers Helpdesk management, Systems management, Network management & Network Security management.
- The Core services team is involved in Standardization, Policy decisions, Quality System initiatives, Network Architecture/Design, Capacity Planning, Network Security, Service Level Management and providing Technology solutions & directions to the IT Department.

Wipro's network architecture has three dimensions to it to cater to the business specific requirements. Sudip Banerjee, Chief Executive-Operations and Staffing, Wipro Technologies said, "Our Company Intranet, Extranet and the Internet form the 3D network of Wipro Technologies. All employees - working from any of the 21 development centers in India and abroad - are part of the intranet. The Extranet connects the customer locations across the globe and Internet is the common media for anytime – anywhere access to all onsite employees working from customer sites and also for mobile users."

#### **Given this Wipro's traditional network infrastructure was implemented thus:**

- LAN – Gigabit cabling infrastructure, Ethernet, 10/100Mbps to desktop, Gigabit with trunking on the backbone, Campus networking, L3 VLANs



- WAN – Redundant E1 links across locations, HDLC protocol, OSPF protocol, TCP/IP protocol. 80+Mbps of domestic bandwidth, 15+Mbps of international bandwidth and nearly 15Mbps of Internet bandwidth.
- Operating Systems – Windows 95,98,NT and 2000, Solaris 2.x and HP UX 10.x.
- Primary protocol and Application – SAP, HTTP, SMTP, LDAP, POP, IMAP, Netbios, CRM, Computer based training(CBT).
- Desktop application – Office 2000, McAfee Antivirus, Outlook 2000, Netscape and Internet explorer browser.

**However, the network had some key limitations such as**

- Lack of reliable Network Performance/Quality of service
- Inability to scale up to demand for more & more bandwidth
- Lack of scope to maintain the balance between Network Security & Internet access
- Deploying Complex technologies
- Acquiring new skills and keeping pace with the fast technology changes.

Going forward, the key challenges were very clearly – greater scalability and decrease in time to deploy, greater reliability and higher Time to Service (High Availability) and ensuring anytime-anywhere connectivity to intranet with adequate Network Security.

**Defining the problem**

Given the growth of Wipro's business in the past few years, Wipro's network architects have a serious challenge ahead of them – to keep the network “growth-proof”. Not only was the network expected to be able to factor in headroom for future business growth but also have a low level of obsolescence. Therefore, despite having invested heavily into setting up a scalable, redundant network, there was never ending, always growing demand for bandwidth seems to have constrained the network.

Says Sudip Banerjee, “Two key trends were driving the need to change. One, with work styles changing and more & more employees looking for flexibility of work hours and working-from-home options, the network had to gear up to maintaining the balance between the need for network security and anytime-anywhere access. Secondly, the network had to be compatible with keeping pace with fast, very fast, technology changes - Network performance was getting restricted as increasingly complex technologies and applications are hosted on to the Intranet.”

Wipro, therefore, had its task cut out. Given the high level of investments already made into setting up the infrastructure, the way ahead was to leverage on the existing IP infrastructure to converge data, voice & video traffic, optimize the resources and bring in significant cost saving – such as to deliver:

- Convergence to the desktop for video streaming, e-learning and unified messaging.
- 99.999% availability & 24/7 Global Network Support.
- Anytime and everywhere secure easy access

Very clearly, the need at Wipro Technologies was for a network that is 100% available, fully secure and future proof network – efficiently supported 24/7. Moreover, since this was business critical, the time-to-deploy had to be minimal.



## Seeking the solution

Setting up a comprehensive New World, IP based network seemed to be the only solution for Wipro. The technological need of Wipro was to adopt technology inline with growing business needs – by leveraging the existing IP infrastructure to drive converged data, voice & video traffic. The network architecture of WT, accordingly, needed to be purely based on new generation IP-specific technologies - to make Convergence@Wipro a reality.

The Campus LAN infrastructure is an Hierarchical Architecture using Catalyst 8540, Catalyst 6500 Switches for the Core / Distribution layers. The Access Switches used are Catalyst 4006 and desktop switches like Catalyst 29xx, Catalyst 35xx, Catalyst 19xx. The Backbone infrastructure is based on the Gigabit Ethernet Technology; features like Gigabit trunking and L3 VLANs are implemented on the LAN infrastructure. The desktop connectivity is on 10/100Mbps.

The WAN Network is used for connecting the various Wipro Technologies offices across the world and also for the connectivity to their customer locations. For the WAN Network Bangalore is the Hub location using Cisco 7206 routers. Each remote location has redundant E1 links to the Central location. The routers used in the remote locations are Cisco 3600, and Cisco 2600. ISDN backup connectivity is used for the remote locations to access the Central locations in case of the leased line failure. The Routed Protocol is IP & routing Protocol used is OSPF. Wipro Tech has 80+ Mbps of domestic bandwidth, 15+ Mbps of International bandwidth. The total Internet bandwidth available is about 15Mbps which is distributed across the locations.

This entire backend infrastructure was set up to support key front and backend applications, which were expected to deliver the benefits of a Converged Network Ecosystem -

1. Centralized Applications: SAP; CRM Application, Intranet
2. Distributed Application: Computer Based Training, Email, Internet Access
3. Voice and Video Applications: Voice over IP, Video Conferencing and IP Telephony using Cisco Call Manager.

“The idea was to enable a New World network that would take Convergence to every Wiproite’s desktop. The network needed to not only smoothen external communication but also make it possible to use smarter eLearning platforms. While apps such as Unified Messaging would make work management better, technologies such as Video-on-Demand and Video Streaming would make every employee empowered about her own training and development.” says Sudip Banerjee

This New World Network also consisted of Cisco IP based PBX technology using Cisco Call Manager and Cisco IP Phones and also incorporates Cisco Unity, an IP based Unified Messaging Application. Wipro Technologies has installed about 700 Cisco IP Phones till date. In order to offer further productivity enhancement tools - via video conferencing solutions - Wipro has implemented IP based Video conferencing architecture using Cisco IP Multi Conferencing Unit (MCU) and Cisco Multiconference Manager (MCM). To integrate legacy ISDN video conferencing systems, Wipro has provided the facility using Cisco IPVC3520 H.320 to H.323 gateway – thereby deploying smarter e-learning platforms using Cisco’s IPTV solutions.

He added, “Our New World network will be the key to Wipro realizing its potential of being among the Top 10 IT Service Providers in the world. This would require us to be among the top 10 companies in the world with best-of-breed IT infrastructure, and certainly Number One in India.”



Every single Wipro employee is committed to this Dream. Every network manager works closely with business managers in identifying the business goals and drivers – AND to help them comprehend the business drivers for Wipro – such as assuring stringent quality standards and ensuring customer satisfaction is on the top priority.

To emphasize how important such commitment is to Wipro, Sudip Banerjee says, “It is essential for the business and the IT guys to work together – to make sure that we are able to set up the best fit for the consumer. Infact, we have now formed this new IT team – apart from the Operations and Core services - to focus on driving WT’s new converged network architecture. We need to ensure that the company’s network will be ready to grow – as the company’s business grows.”

### **The evaluation process..going the Cisco way**

Wipro Tech was very clear on the requirements – the top priority was on ensuring that employees got what they wanted, by way of the IT experience, to deliver consistent value to the customer. Care was taken to choose technology that will enable a scalable network design to tie into the business needs of every employee.

Given this, the entire LAN/WAN infrastructure was built mostly on Cisco components. The AVVID solution for IP Telephony was implemented to leverage the existing Cisco infrastructure with minimal configuration changes to define quality of service for different applications based on business priorities.

On why Wipro laid its bets on the Cisco solution; Sudip Banerjee says, “Cisco’s AVVID was the clear choice, because it offers an end-to-end networking platform to configure all the solutions we needed. Cisco is the only One-Stop shop which could meet our requirements for an open-standards, converged, IP-based network.”

### **Implementing the Cisco solution**

The project to rollout VoIP services was undertaken based on an internal audit of the spending on PSTN voice calls between Wipro offices. A detailed cost benefit analysis was worked out – to clearly define the benefits from moving to VoIP. Based on the usage pattern discerned, the first phase of VoIP implementation was planned with varying technology like FXS and toll bypass technology in 3 months.

Then came the plan of rolling up the sleeves and drawing out the exhaustive network design and plan which will enable such a ambitious initiative of networking Wipro Technologies globally. Says Sudip Banerjee, “It was in this phase that we first implemented the IP telephony solutions – as well as tested its interoperability with FXS and voice gateway solutions. HOWEVER, before that could be done, we had to go through the entire process of designing the network topology, estimating bandwidth sizing, predicting the number of active trunk channel, analyzing infrastructure readiness like voice cabling, space, mounting of PBX AND finalizing the actual configuration and testing of all equipment to implement the network.”



He added, "It was relentless work – BUT it needed to be done. I must admit it took all our best brains all their time, effort and wit to get it all together. I am glad we had all the help from Cisco to help us plan, design and implement what we believe is a comprehensive solution. Infact, I must mention here that we had a little doubt on the IP-based solutions put forth – BUT it worked like a dream."

Given that this implementation was one of the first of its kind in India, it was a tremendous learning experience for both Wipro and Cisco engineers. While the overall solution was quite satisfactory – by way of scalability, reliability, manageability and security – there are a few key learning's, which may be worth looking out for in the future:

- Configuration size increases required on routers – As soon as there is any new location brought into the VoIP network, the network needs a configuration change in all routers.
- No tool to identify/monitor the quality of the voice and check the effectiveness of QoS.
- Accounting on VoIP usage, bandwidth utilization and capacity planning is a concern area.
- Initial Delay of 25-30 seconds before the VOIP call is established

Says B Ashok, Vice President, Cisco India, and "Cisco has, of course, tried to address each of the implementation issue. The Cisco Gatekeeper seems to be the solution for the huge configuration issue but it is a solution that needs to be evaluated. On the other fronts, the Cisco voice manager is highly recommended as the solution for the VoIP Usage Accounting – however, this again needs to be customized to India. QoS has been partially implemented across the network – we are confident that it will be manageable once it is implemented across the enterprise."

### **Benefits to Wipro Technologies**

Convergence@Wipro set out to build not only a single converged network to carry voice, video and data traffic – but also one that would be scalable, secure and reliable network. The benefits of managing ONE network – instead of two or three – has already started delivering sizeable cost and resource benefits. The benefit of the Cisco implementation has been to extend this benefit by building an IP based, scalable and future-proof network.

Such a network makes it possible to implement next-gen services such as Unified Messaging and IP-based contact centers within a relatively short time span. Moreover, the efficient utilization of bandwidth allows for easier network management – since the solution is end-to-end and dramatically reduces internal support requirements. An IP-based network allows for enhanced internal communications – through delivery of eLearning modules to employee desktops, better information sharing between offices, effective training modules.



To sum up the Convergence@Wipro initiative, here is what Sudip Banerjee has to say, "Remarkably, as more and more IP-based services are delivered to employee desktops, something remarkable happens. The firm starts to realise potential and opportunity where none existed before – the converged network architecture has actually opened up new market opportunities for us - by delivering crucial competitive advantage to us in an extremely global market."

***Convergence@Wipro is underway...the mission is to take the initial momentum forward and bring in TRUE convergence by having end-to-end IP platform to deliver voice, video and data.***