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IBM Linux Update

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Executive Summary

In early 1999, we began a get started in Linux strategy for IBM. That strategy stated that IBM must participate in the emerging Linux market. We wanted to position ourselves for leadership should this market become significant. The principles of the strategy were:

- Support customer demand for Linux.
- Keep Tier 2 open.
- Reinforce IBM's commitment to heterogeneity.
- Use Linux as a lever to grow with the web.

The strategy called for providing Linux support in all of IBM's core businesses. It required IBM to act in unison across five basic initiatives: software, hardware, services, alliances, and open source - managed by a cross-brand executive team. Most of the initial goals have been accomplished. IBM has had a notable impact on the Linux market and we have received benefits from the Linux "halo" effect:

- Tier 2 openness has been strengthened.
- IBM's commitment to heterogeneity has been demonstrated.
- Netfinity is a marketshare and mindshare leader for Linux servers.
- IGS has a leadership 24x7 support services solution.
- Market interest is high in Domino and DB2 (with a combined 90,000+ downloads).
- IBM has developed a solid relationship with the Linux community and our distribution partners.

The market has continued to evolve. Linux is now established in certain customer use scenarios (web infrastructure, file/print, mail on small servers). The lack of functionality, scalability, and significant applications on Linux are still critical barriers to entry for many enterprise markets. Competition is moving forward in response to the opportunity. The Red Hat IPO has changed the economic landscape and accelerated venture capital interest.

The industry estimates of the hardware server opportunity have increased and are now estimated at between \$3.3B (preliminary GMV) and \$5.7B (Dataquest) for 2003. The software and services opportunities are roughly estimated at \$1-2B and \$6-9B, respectively.

These market changes require that IBM's Linux strategy be strengthened. Our implementation direction of putting products into the market quickly (without large investments) to gauge market interest followed by plans to invest more heavily as the market matured was sound. The question now is one of investment rate and pace.

The most significant actions required to assure continued success are:

- Continue to speak with one voice to the market.
- Strengthen business unit support for the IBM Linux strategy.
- Invest for leadership in established Linux customer use scenarios (web infrastructure, file/print, and mail on Netfinity servers).
- Invest for leadership with 24x7 service and support.
- Complete Linux support in IBM's core businesses for those customer scenarios where Linux is beginning to emerge (such as collaboration, e-business, etc.).
- Continue to position Linux in the context of a broader IBM UNIX strategy.
- Begin a new round of "get started" investments: Thinkpad, Intellistation, S/390, AIX....

This market is still emerging and will continue to evolve rapidly. We need to continually monitor customer usage, vendor actions, and the evolution of the Linux technology itself. IBM support of Linux remains strategic in strengthening its role as a game changer.

Background

In 1998, Linux started to emerge in various customer segments. IBM regularly received customer requests for hardware, software and services built around the Linux platform. Linux presented an opportunity to keep the middle tier open while playing to IBM's strength in heterogeneity. It provided an entree to enlist a new constituency in IBM's open computing strategy. That new customer set was comprised of net gen companies, ISPs/ASPs, small and medium businesses, autonomous departments in large enterprises, and academia.

The strategy chosen in 1Q 1999

- **Position IBM as supportive of open source and Linux**
 - ...to gain mindshare
- **Enable IBM's businesses (hardware, software, services)**
 - ...to take advantage of early opportunities
- **Create a value net with alliances**
 - ...to leverage our investments.
- **Position IBM to increase investment when required**
 - ...to take advantage of new opportunities quickly.

Implementation of the strategy began immediately with a major announce by IBM at LinuxWorld in March, 1999. We announced our strategy focused on the initiatives - software, hardware, services, alliances, open source. We made statements of direction for Netfinity, IGS, and other brands. These announcements met with positive press, consultant, and customer response.

Market Update

Customer Use Evolution

We believe that Linux is still a growing early adopter market. Barriers to entry for use in large enterprises still exist:

- Lack of applications.
- Inadequate systems management.
- Missing functionality.

Although there have been large-scale rollouts (by Netfinity, for example), most placements are custom solutions with point products and services. Customer demand for middleware products and professional services will help signal the next stage in adoption.

Initial usage of Linux was predominantly web infrastructure and file/print servers. Although the IDC estimate of 750,000 Linux software server licenses was a substantial number (17%) of all

server operating system licenses shipped in 1998, we concluded that most of these deployments were on older, existing hardware. Entry into the enterprise was driven by the technical community. Primary IT decision makers were not involved in these deployment decisions.

However, a shift has begun towards wider Linux acceptance as a viable platform. Numerous early adopters have successfully deployed Linux-based solutions:

- Web-serving, file/print, mail, internet infrastructure now in production.
 - ♦ Cisco, Sony, US West, Daimler Chrysler, Virginia Power.
- Emerging in departmental database, transactions, and scientific, technical, and education
 - ♦ Amerada Hess, Cendant(Ramada, Howard Johnson), Argonne.
- New customer sets (ISP/ASP, net gen, .com, SMB).
 - ♦ Dejanews.com, Netscape, Akamai, BroadQuest.com, France CyberMedia.

Customer usage has been quite successful - Linux is stable and performs.

Analysts and surveys are beginning to reflect the evolution of Linux from "not ready" to "ready for certain workloads":

- IDC
 - ♦ 13% of CIO's surveyed now say that Linux is a part of their environment, up from 0% last year.
 - ♦ Linux growth is coming at the expense of Windows.
 - ♦ Linux will be the second most popular operating system for servers (after WinNT) by 2001.
- Miller Freeman
 - ♦ 49% of IT managers state that Linux will fit well in their enterprise (and 63% are adding it incrementally today).
 - ♦ In addition to use of Linux for Internet and web tools, a growing percentage of end-user workstation applications are being deployed on Linux.
 - ♦ The leading applications that CIOs expect to deploy on Linux in the next twelve months are IBM Websphere (15%), Computer Associates Unicenter (15%), and SAP (15%).
- Information Week - More than 48% of IT managers plan to use Linux on a server in the next twelve months.
- Aberdeen - Linux continues to be an effective bottoms-up movement within the enterprise, reminiscent of how PCs crept into the enterprise.
- Giga - "Linux provides a common, stable and inexpensive Unix operating system across a multitude of platforms, hence lowering overall costs...the threat to Microsoft is not just the Linux operating system but a business model based on open standards."

Competitor Evolution

The competition has been moving rapidly in providing Linux solutions:

- **Software.** Computer Associates has been aggressive in providing their products free or in trials. Oracle and BEA have started delivering their solutions on Linux. Microsoft has created a marketing team whose sole purpose is to discredit Linux in the marketplace.
- **Hardware.** Compaq, Sun, Dell, and Hewlett-Packard have all announced Linux offerings on both the clients and servers. Amdahl has announced its intention to provide Linux capability on an Intel base. Linux clusters have emerged as a competitive offering from system vendors (Dell, VA Linux Systems, Compaq) and from startup firms (Alta, Carrera, Paralogic, Penguin, Atipa, Veritas).
- **Services.** With the exception of H-P, services are currently being provided via Linux-centric companies such as Red Hat and LinuxCare. Professional services groups have not announced offerings as yet.

Alliances Evolution

Our strategy has been to partner with the four major Linux distributors (Caldera, Red Hat, SuSE, TurboLinux). Our continuing goal of IBM is to ensure openness in the distributor market (no one distributor gains a lock on the market).

- Red Hat - Is the market share leader in North America. Their successful IPO has enabled them to quickly expand into Europe and Japan. Red Hat continues to lead the market in brand awareness and identity.
- Caldera - Has focused their efforts on a channel development strategy. Their successful North American channel road show has identified over 800 partners ready to work with them on Linux deployments.
- TurboLinux - Is the market share leader in Asia and is trying to break into the US. They are also attempting to establish themselves as leaders in the Linux clustering market.
- SuSE - Continues to have strong presence in Europe.

We are actively working to support and leverage all of these alliances.

We are also working towards building a partnership with VA Linux Systems (a Linux hardware systems vendor). Specifically, we are focused on leveraging their reach to new customers: ISPs and leading edge net gen businesses. We are working to strike a partnership with VA around IBM software, PSG offerings, and linking their linux.com community site with the IBM developerWorks web-site.

Linux Technical Evolution

It is too early to predict when Linux will be suitable for every enterprise application. It continues to evolve more quickly than any prior operating system. In April, DH Brown (a leading Unix consultant) published a comprehensive analysis that reached two conclusions comparing Linux to conventional UNIX and Windows/NT:

- "Linux has developed from....into a full-fledged UNIX implementation worthy of production deployment for low-end server applications".
- There are functional deficiencies where Linux must improve before it can be considered for deployment for many mission-critical applications.

The principal deficiencies that the report highlighted include functionality, scalability, availability, and serviceability. Most of these topics are being actively worked by the Linux development community, aided by significant technology contributions from vendors (e.g., SGI - Journaled File System & Scalability, Siemens - Scalability). A new release is expected at year end.

Momentum for Linux continues to be supported by a community of top-notch software developers. The open source development process has proven to be effective in addressing technical requirements quickly.

Opportunity and Market Readiness

Opportunity

A preliminary opportunity estimate for servers using Linux was developed by the Global Market View (GMV) in June. Some of the key highlights include:

- **Hardware Server Opportunity** - In 2003, the Linux opportunity grows to 600k worldwide units (8% of the total) and \$3.3B hardware revenue (4% of the total). In comparison, NT, Netware, and Unix are expected to ship 4500k, 1900k units, and 560k, respectively. However, Unix, NT, and Netware will each command 5-10 times the hardware revenue of Linux, due to product mix.

Server appliances which Dataquest estimates at 1.5M units and \$3.8B in 2003, is not included in these estimates. Linux is expected to capture a major portion of this opportunity. Linux continues to be 90+% Intel-based and most placements in this period will be for low-end servers of <\$15k, but growth is expected in the >\$15k range as Linux functionality increases.

- **Software Server Opportunity** - The Linux software revenue has not yet been estimated by the GMV. A rough estimate by Software Group market intelligence is \$1-2B in 2003.
- **Services Opportunity** - A similar state exists for services opportunity estimates. A rough estimate is \$6-9B in 2003.

The hype is high, but so too is the potential opportunity. The full detail of the preliminary GMV data report is included in Appendix B.

Market Discontinuities

Potential market discontinuities and forces may significantly alter the market dynamics. A confluence of these factors could radically change market evolution. The key potential discontinuities and forces are:

- Rate of transition from IA-32 to IA-64.
- Unix/Intel standardization to Linux/Intel.
- Accelerated shift to thin servers.

- Industry skills shortage (Linux prevalent in academia).
- Rate and pace of application availability.

We must monitor these changes closely.

Market Segment Readiness

The rate of maturation in the Linux market will affect our core business implementation plans at different points in time. We have evaluated Linux customer use scenarios and placed them into one of three states of market readiness:

- **Established - Repeatable sales.** *Market data and analyst opinion that Linux is deployable in large numbers:*
 - Web infrastructure.
 - File/print and mail.
 - 24x7 service and support.
- **Emerging - Market opportunities exist (RFPs and bids), but market size is unknown:**
 - Transactions.
 - Scientific, technical, and education.
 - Desktop and mobile.
 - Application Framework for e-business middleware.
- **Speculative - Market interest is anecdotal:**
 - All uses on large and medium servers.
 - Tier 0 and client hardware.
 - Applications (both industry specific and cross-industry).
 - Professional Services.

The conclusion drawn from the market data is that for certain uses of Linux (where it is *Established*), Linux has already proven itself to be good enough for significant customer use.

Execution Status

IBM has established a clear leadership position in the Linux market, as evidenced by feedback from the press, analysts, and our customers. We are well-positioned for exploitation as Linux matures.

IBM - Goal: Deliver one message to the marketplace and to the Linux development community. Create a cross-brand management structure to manage interdependencies, the IBM message, and our strategy.

- Our initiatives have yielded positive press for the IBM Corporation.
 - ♦ 2300+ articles mentioning IBM + Linux.
 - ♦ This share of voice is more than Dell, Oracle, HP, Compaq, and SGI.
- A cross-brand executive team has been established to manage IBM's Linux strategy, with an Executive chair who has overall responsibility for IBM's Linux strategy.
- A worldwide marketing focal point to manage the market messages is in place.
- A Linux systems manager has been created to manage product interdependencies.
- An IBM-wide technical leadership body, the Linux Technology Center, has been created and staffing begun.

Software Group - Goal: Deliver all essential elements of the Application Framework for e-business middleware on Linux.

- Delivered or have in plan elements of the Application Framework for e-business: DB2, WebSphere IBM HTTP server and SE, Domino, MQ client, Java runtime environment and VisualAge tools, Tivoli, etc.
- Market interest is high: 50,000+ download of DB2 beta and 40,000+ downloads for the Domino beta. Customer interest has not yet translated into IBM revenue.
- With the ISP ISU, created a plan for the first Linux software bundles for Service Providers.

Personal Systems Group - Goal: Lead with Netfinity. Evaluate customer interest for other products.

- Netfinity
 - ♦ Sales of \$18M through 6/99 -- a market leader in revenue and mindshare. Increased Netfinity press mentions by 60+% in 145 articles.
 - ♦ All servers now "built for Linux". The ServerProven program for Linux launched. A WW industry-leading service and support program established. Ten ISVs in place, with 29 in progress.
 - ♦ Large installs at Taiwan schools (900+) and Hillhouse Hammond Insurance - UK's second largest insurance firm (250+). Sales have been replicated system deployments made at the IT architect level through our traditional client sales teams.
 - ♦ Delivered a ServRAID driver in open source, IBM's first official contribution to Linux.
 - ♦ With SWG, will deliver in October four server appliances for Service Providers - firewall, web-caching, web-server, email-server.
- Intellistation - Workstation models certified and available.
- Thinkpad - Models certified and available.

Server Group - Goal: Test market interest with basic functionality on all servers.

- RS/6000 - Made available a native port of Linux on the RS/6000.
- AIX - Announced a Linux application execution environment and support for open source application tools on AIX to strengthen our message of heterogeneity.
- AS/400 - Delivered AS/400 interoperability with Linux systems.
- S/390 - Has native Linux running, and is working with a large IBM customer to consolidate existing non-S/390 Linux and SUN servers. They are preparing an extended customer joint study program. They will also deliver S/390 interoperability with Linux.

IGS - Goal: Deliver availability of worldwide 24x7 support, training, and education.

- 24x7 support available on special bid basis (NA & AP in place, EMEA announced, and LA in planning). IGS closed a special bid of Linux support at Intel for \$471K.
- Worldwide education and training curriculum in place and being provided to customers. Traditional customer base is enrolling (By year end 1999, 650 customers and \$1.5M revenue in 35 countries).
- Professional services portfolio development underway.

Alliances - Goal: Establish relationships with distribution partners (Caldera, Red Hat, SuSE, TurboLinux), begin to leverage each distribution's strengths in the marketplace.

- Formal agreements signed with key distributors encompassing co-marketing, service and support, and developer support. (Note: IBM led the industry in supporting multiple distributors. Competitors followed our lead - HP, Oracle, Computer Associates).
- IBM participated in Red Hat's pre-IPO funding and has 318,370 shares (cost \$1M - value of \$32M on 9/14/99).

Open source - Goal: Ensure proper balance between IBM's business needs and the community's desire for open technology.

- Created the IBM Public License and had it certified as open source by the Open Source Initiative, allowing IBM to open source IBM software without detrimental "viral" effects of standard open source licenses. Good community response.
- Created internal control processes to protect business interests. Worldwide internal IBM developer open source education is under construction.
- Open sourced the Java compiler, XML parsers, DataExplorer visualization library and Unicode-enabling library.
- Started an industry-wide open source project to fully internationalize Linux.
- IBM, Cygnus, HP, Intel, SGI, and VA Linux Systems combining to port Linux to IA-64, to be available at IA-64 GA.

Strategic Alternatives

There are four alternatives for IBM:

1. Ignore Linux.
2. Compete with Linux.
3. Support Linux with limited investment.
4. Fully embrace Linux.

With the substantial momentum that Linux has, neither alternative 1 nor 2 is a realistic choice. Ignoring Linux would mean ignoring market forces and excluding IBM from opportunity in emerging markets. Competing with Linux weakens our open Tier 2 strategy. The choice continues to be between alternatives 3 and 4. To fully embrace Linux would require significant expense by product development, marketing, sales, and technology contributions to Linux. This would require a substantial reallocation of resources. Our interpretation of the market dynamics and current market readiness does not lead us to recommend that strategy. In response to the market changes we do need to increase our support for Linux with targeted investment for additional work.

Next steps - actions recommended

The actions required by IBM to support the strategy fall into the following categories:

IBM - We must continue to present one voice, one strategy to the Linux community.

- The current Linux Executive team must ensure the right level of brand actions and synergy with the overall strategy.
- Market opportunity work must continue and needs to include all hardware (not just servers), software, and services.

Software Group - The strategic element for software is the Application Framework for e-business. Full support on Linux remains the primary direction.

- Port the remaining elements of the Application Framework for e-business.
- Domino must create a plan to capitalize quickly and become the dominant collaboration provider as the market for collaboration software on Linux matures. Domino has a strategic opportunity in the absence of Microsoft Exchange.
- The client-side of IBM's Linux strategy needs to be formulated. We recommend formal study to determine IBM's Linux client-side strategy for both software and hardware. This includes Tier 0 where Linux may present an opportunity to strengthen openness, akin to that in the middle tier.

Personal Systems Group - Netfinity's continued aggressive embrace of Linux and pursuit of leadership must continue and is the *key* to IBM succeeding in Linux (software and services growth is dependent on the higher attach rate on IBM hardware than non-IBM hardware). The

IBM Linux server focus remains Netfinity. The goal for Netfinity must be to become the clear market leader (market share and revenue) in the *Established* segments (file/print, mail, web infrastructure).

- Netfinity must make available its key product differentiation elements (X-architecture and Systems Management) on Linux (not currently in plan). Incremental investment dollars are required.
- Netfinity should investigate leveraging the Linux community (where interest is high) to port X-architecture functions to Linux (such as hot-plug PCI).
- Linux clusters are a topic of customer requests and competitive focus and must be addressed as part of Netfinity's overall leadership.
- Thinkpad should continue its get started effort. Linux on Thinkpad is the number one request of IBM at Linux shows and by the press.
- Intellistation should continue its get started effort. The desktop may be more important than usual as its occasional role as "semi-server" fits well with the usage of Linux server functions on non-server hardware.

Server Group - On our medium and large servers, we need to support Linux and to let market reaction determine follow on action.

- AS/400 and RS/6000 have the right get started plans in place and need only to gauge market interest for future investment.
- S/390 should pursue their proposal to enter the market with a native Linux port to ascertain market potential. This initial thrust will be in the server consolidation marketplace.
- Continue to position Linux and AIX as complementary solutions. That positioning is working in the market (with customers and analysts). AIX has the right get started plan in place as well.

IGS - Committed to delivering a complete portfolio of Linux service offerings and will continue to invest in the skills and infrastructure to support market growth. IGS must continue to be the leader in 24x7 service and support. The services goal is to maintain a strong market image as a complete Linux services provider.

- The Linux team in IGS is recommending full development of on-site services as well as a complete market analysis of the service and support opportunity.
- Additional expansion of professional services is necessary to serve the *Established* markets of file/print, mail, and web infrastructure.

Alliances - Continue to build a value net around IBM's Linux offerings.

- Continue to deliver hardware, software, and services solutions that support *all* of our distribution partners (Caldera, Red Hat, SuSE, TurboLinux). It should be noted explicitly that this increases our development expense: Testing, certification, training, etc.

- Proceed with shipping a subset of Linux where a distribution is not required (thin servers and server appliances). Accompany that subset with strong marketing messages that this is not an IBM "distribution".
- The "net generation" companies and ISPs/ASPs are changing the relationships in the Internet between servers, software, and customers and many use Linux as a key enabler. We need to prepare a formal strategy to study the relationships and how Linux could be used by IBM as a lever to build alliances with those net gen companies.
- IBM should also work with the emerging hardware vendors to enable the attachment of IBM software and services. Examples are: VA Linux Systems, Cobalt, and Penguin.

Conclusions

IBM support of Linux remains strategic to solidify its role as a game changer and is an important lever keeping the middle tier open. Our initial efforts have been successful. We are an established player in the growing Linux market and are seen as one of the leaders. Customers have declared that Linux is good enough for many applications and are deploying it successfully. Enterprise customers have a growing awareness of Linux. However, Linux remains at an early adopter stage and is not ready for all enterprise applications.

Our Linux strategy needs to be strengthened with targeted investments aimed at leadership where Linux acceptance is established. We will continue to position offerings in our core businesses for future success in markets where Linux is still emerging. We will continue to position Linux in the context of a broader IBM UNIX strategy. We will continue to give one message to the market and to manage Linux with a cross-brand team. We will continue to closely monitor developments to ensure we remain positioned for future success. We will re-examine this strategy in six months.