Total Customer Experience

Philips – Hewlett Packard Success Story

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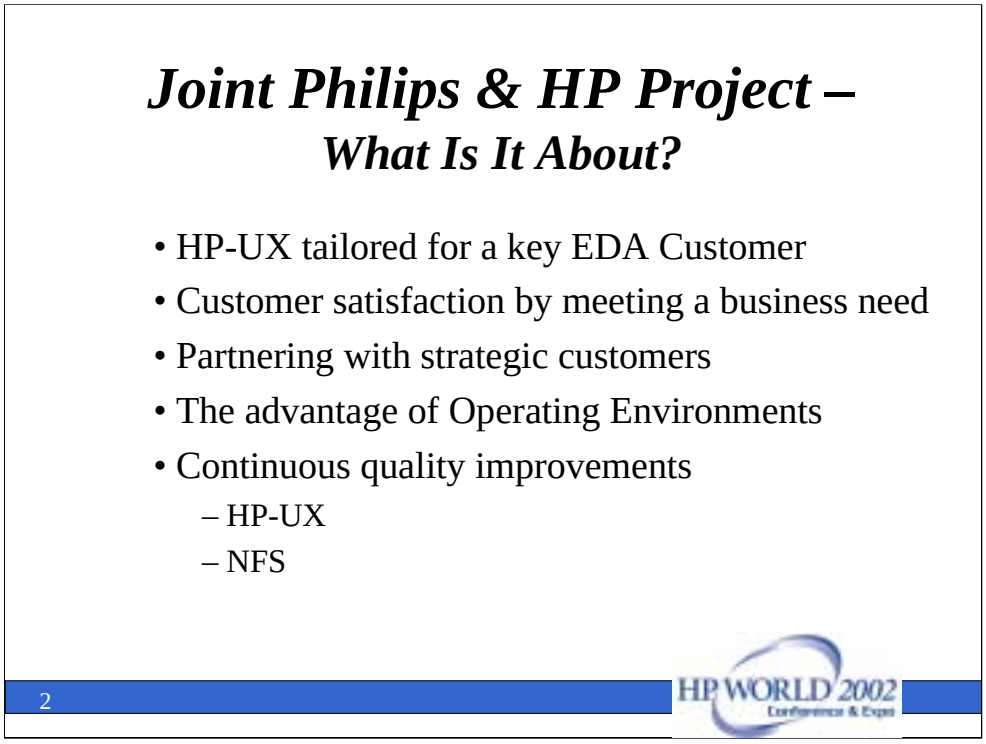
HP WORLD 2002 Conference & Expo

Major Presenter – Donie Collins – overall focus from a customers prospective

Secondary Presenter – Barbara Sutton – focus from a company prospective



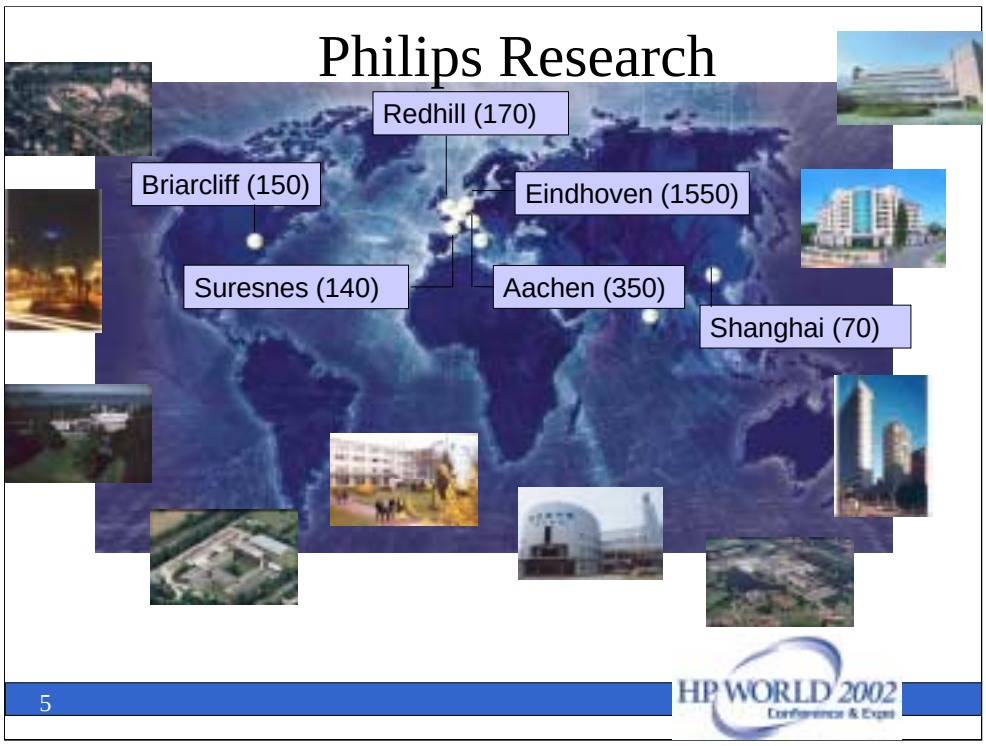
There were three key areas of focused development

- Jointly architect a solution for meeting a specific customer business need (save time and $)!
- Integrate new methodologies, process and quality improvements into HPs standard release processes
- Develop a HP-UX environment for EDA customers
- Quality improvement methodologies

Phase I : Where We Started

Royal **Philips** Electronics

- Global Corporation
  - HQ in Amsterdam, The Netherlands
- 186,090 employees in 60 countries
- Largest Electronics company in Europe
- Ninth on Fortune's list of global top 30 electronics corporations
- Sales in 2001 (approx) $32 billion
  - R&D: 8% of sales (average over last 4 years)
- active in the areas of lighting, consumer electronics, domestic appliances, components, semiconductors, and medical systems



Global organisation

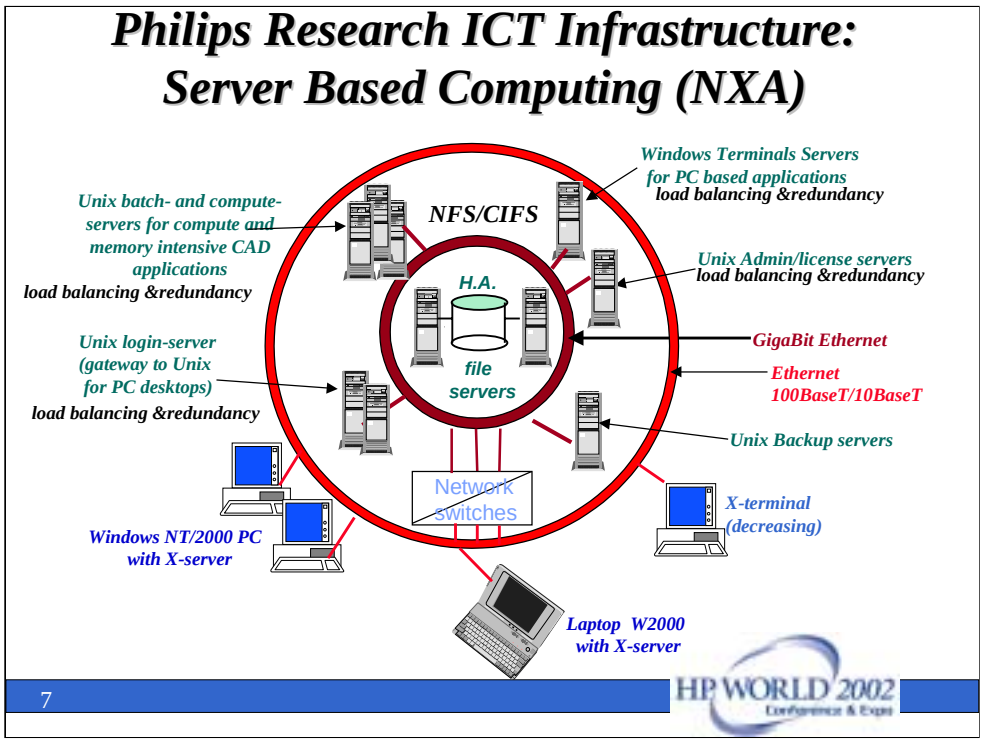
Laboratories in The Netherlands, England, France, Germany, China-Taiwan and United States

Mission Statement

Create value for Royal Philips Electronics through technology-based innovations which improve its global competitive position in current markets or that lead to the development of new businesses.

Philips Research Labs Eindhoven (PRLE)

- Located at Philips High Tech Campus
- wide range of disciplines:
  - physics, chemistry, mathematics, mechanics, Information Technology & software, storage, electronic engineering/EDA
- one IT department to support IT requirements (technical and office automation) of the diverse range of Research activities plus various Philips R&D related activities on-site
  - more than 3000 employees supported on site



"One of the best implemented client-server environments in the world"
Robert Lucke "Design & Implementing Computer Workgroups", Prentice-Hall 1999, ISBN- 0-13-082709-6

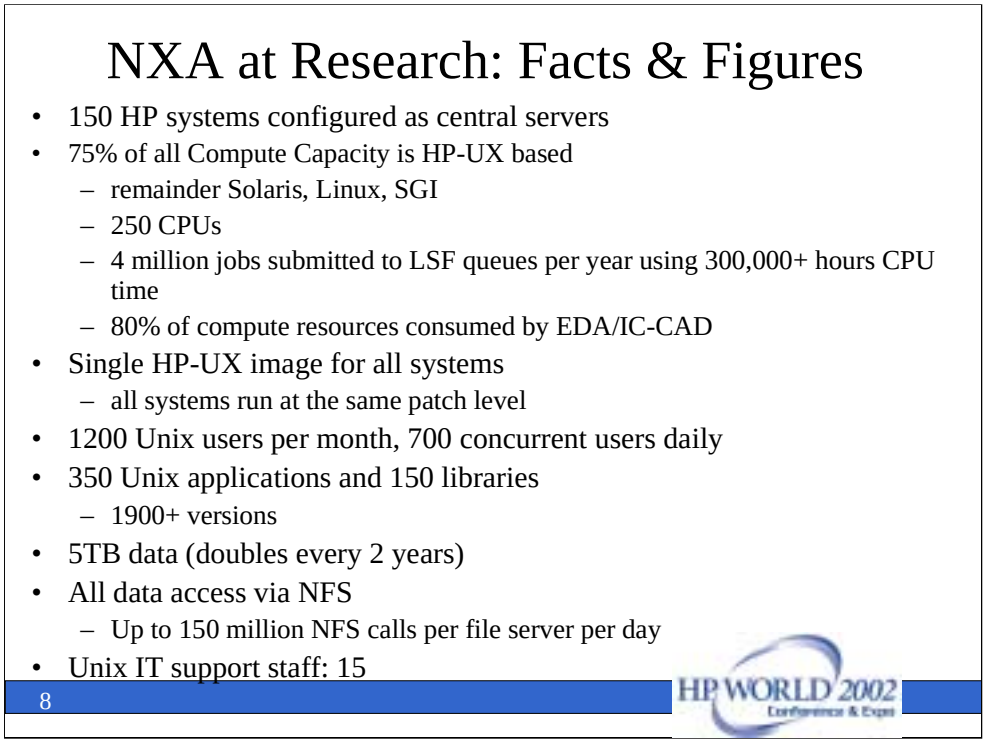
Philips Research Laboratories in Eindhoven is also known as the Natuurkundig (Physics) Lab or Nat.Lab. The architecture described here is known as NXA, which stands for Natlab X Architecture. Key to the infrastructure is high speed, broadband network to which central servers are coupled with dedicated tasks such as login servers, file servers en batch & compute servers.

On the enduser's desktop we place a PC or X-station, and in rare cases a workstation, which gives the user access to the servers on the network.

An important aspect of the concept is 'load balancing', a piece of software which ensures that the workload is spread evenly and efficiently over the available systems. The 'login' load-balancing software is an in-house product. For the compute and batch systems we use LSF (Load Sharing Facility) from Platform Computing.

Redundancy is another important aspect. In each category (login, compute, batch, admin/license) there are multiple servers all capable of performing every task required of their categorygroup. So loss of one or more servers does not lead to loss of functionality, at worst it leads to reduced capacity. Floating and not node-locked licenses are essential here. The only single points of dependency are the file servers, as data is protected by RAID-5 only and is not mirrored.

The environment is CPU intensive where the latest vendor CPUs are added on an annual basis. The average lifetime of a CPU in the compute or batch category is 18 months. To ensure maximum return on investment, we employ a 'food-chain' principle whereby systems which start off life as a compute or batch server either get a CPU upgrade or move down the 'food-chain', to finish as login or admin/licenses servers. All systems are replaced on a 3 or 4 year cycle.



Compute Servers

- mix of workstation and servers class systems, 2way or 4way systems

  - e.g. HP J6700, J6000, L1000-55, L3000-75

- medium memory: 4GB to 12GB per system
- supports between 2 and 40 users per system

Batch servers

- 4way or 8way systems
- server class only, N4000-75, L3000-75, RP7410-87
- large memory: 16GB to 32GB per system
- supports between 1 and 8 users per system

Login Servers

- mix of workstations and servers

  - e.g. older models D380, L1000-44. J5000

- low memory: 1GB or 2GB per system
- supports between 15 and 35 concurrent users

HP-UX image

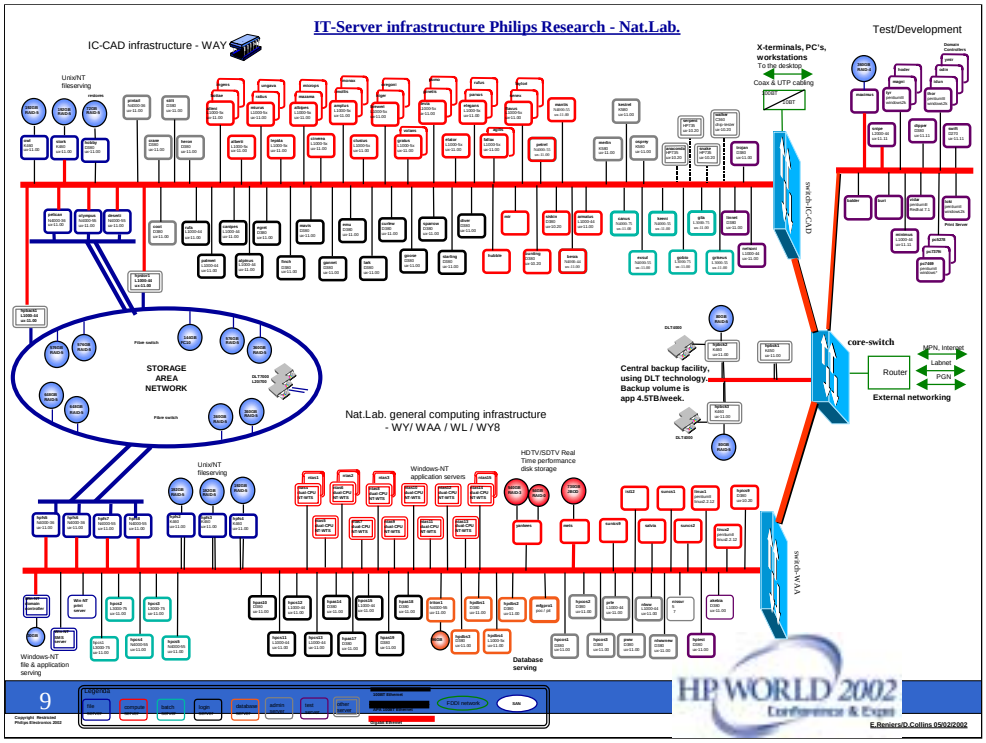
- The same HP-UX image runs on all systems

  High admin overhead to build each new image

- All systems run at the same patch level

  High admin overhead to maintain this on 130+ systems

- Ensures predictable response across all systems



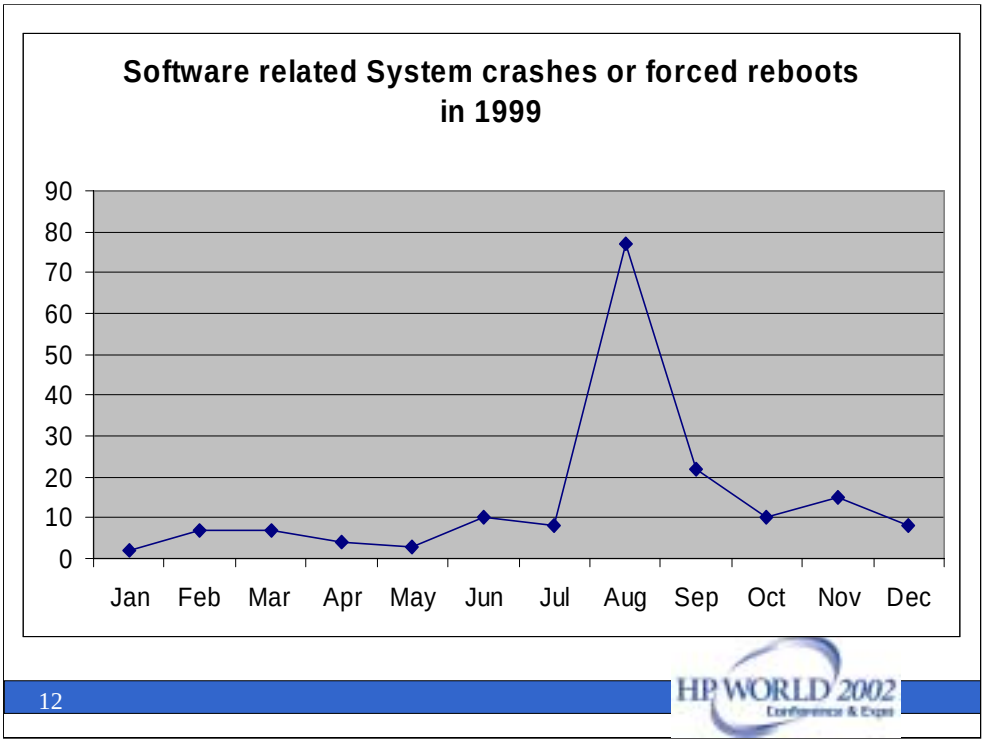
- Way too much information !…..
- …but it gives an idea of the scale of a real-life NXA environment

Philips Semiconductors

- 33,000 employees in over 50 countries in 100 offices
- Produces and supports more than 62 million ICs and discrete devices daily
- 34 EDA design centers and Systems Labs world wide
- NXA preferred architecture at EDA sites
- Over 1000 HP systems deployed
- Preference for new technology, Operating Systems (etc) to be tested and rolled out first at Research

Hp-UX 11.00 Rollout July 1999

- Upgrade from ux10.20 to ux11.00
  - NFS-PV2 problems in ux10.20
  - needed access to 64bit OS and 64bit applications
  - new server line (N4000) not support under ux10.20
  - requirement to move from NFS-PV2 to NFS-PV3
  - Philips Semiconductors waiting to start upgrade in September
- Problems
  - Serious NFS-PV3 related problems as load on systems grew



• Peak in July 1999 due to NFS-PV3 related system crashes and/or forced reboots

  • Large number of file server crashes “worst case scenario”

• Improvement in August as we learned how to avoid system hangs and crashes and denied access to some functionality that was causing problems.

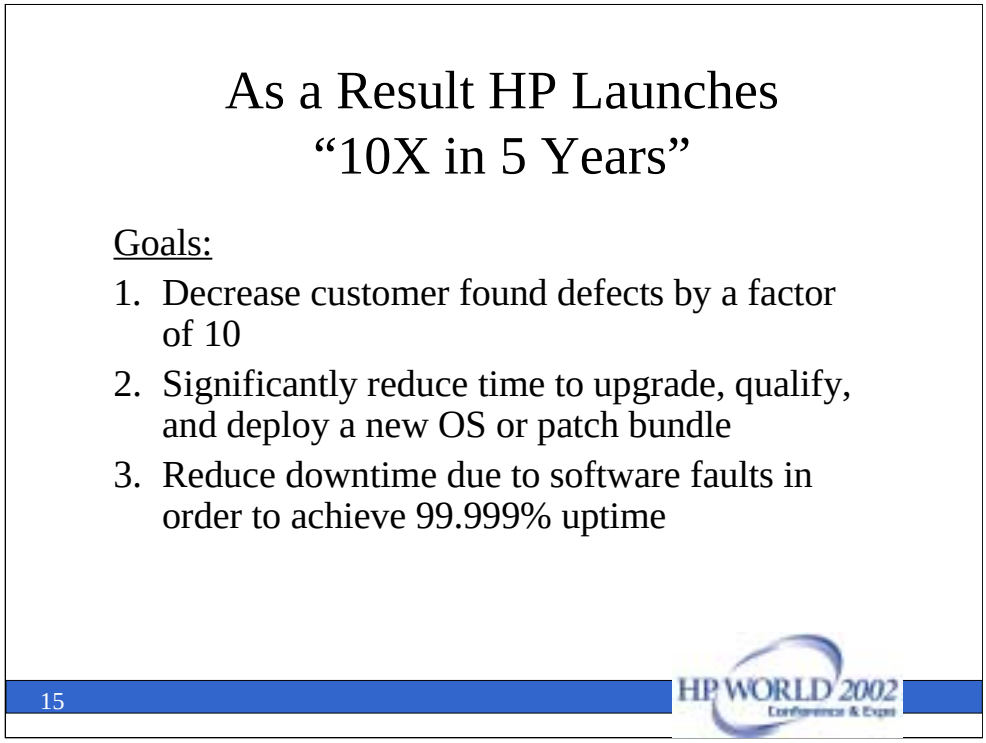
•Stabilisation in October/December as HP escalation plan came into effect

Philips Reaction

- Started escalation process with HP
- Escalation sponsors at VP level within Research and Semiconductors
- Semiconductors to delay rollout of NFS-PV3
- Research to stay on NFS-PV3 and ‘tough it out’
- Serious consideration given to replacing HP as primary Unix vendor
  - redeeming quality : power of PA-RISC processors combined with 64bit Operating System

1999: Opportunity of Improvement

- Lowest ranking of all categories in the Interex Engineering Investment Survey for 1999
  - Patch process (timeliness, effectiveness, number of, quality of, ability to manage) - Interex Engineering Investment Survey, 1999
- Most important strategic directions for HP in next 5 years(1999 Engineering Investment Survey):
  - Keeping customer costs down
  - Developing higher quality software



This is the 10X part of the program. Customer found defects of a product are reduced by a factor of 10 over the 5 years. (or approximately 2X every 18 months)

2nd goal addresses the initial customer experience with HP-UX. First we want to make installing a high confidence experience. Our internal goals are to reduce the time to upgrade to 2 weeks and to install a patch bundle to 1 day. Currently the largest inhibitor to the 2 week goal is the availability of HP's layered software when a release is available.

The single system reliability goal is 99.92% availability for a high availability configuration without clustering. We need to reduce the rate of panics, hangs, and data corruption by a factor 2.5 to reach this goal.

Our 10X goal over time says:

2.0X - 9/99

3.2X - 9/00

5.0X - 9/01

8.0X - 9/02

10.0X - 3/03

In actuality, these are more like 2X at 11.11, 3.2X at 11.21 or 6 months after the timeline noted above.

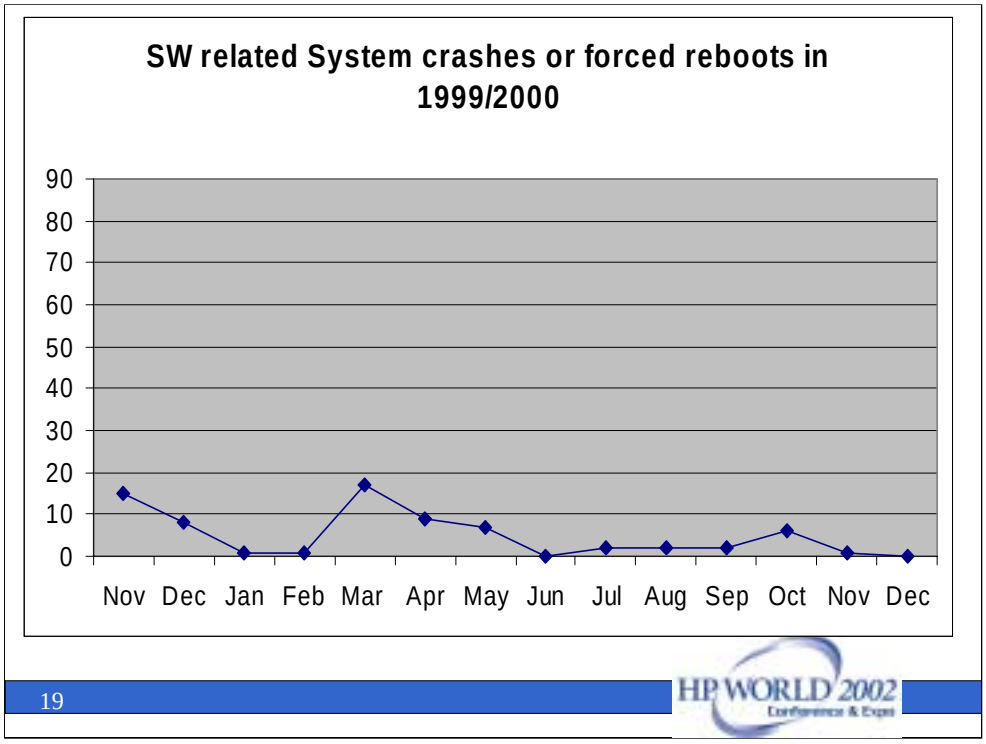
11.00 Versus 11i Quality

- Management stress that quality, schedule, and resources were givens, functionality was the variable in the release
- Defect analysis completed on every subsystem to determine root cause of escaped defects
- Retrained all our engineers on peer review process
- All new submissions had to pass 48 hour reliability test
- Open backlog goals set for each lab and tracked by management
- Testing of solution stacks including HP's layered software and major ISV software
- More complex configurations including typical 3 tiered model
- Installation and update testing of the entire operating environments
- Compatibility testing to ensure ISV 11.00 software ran on 11i
- Alpha testing and beta testing

Phase II: HP Commitment

HPs Reaction

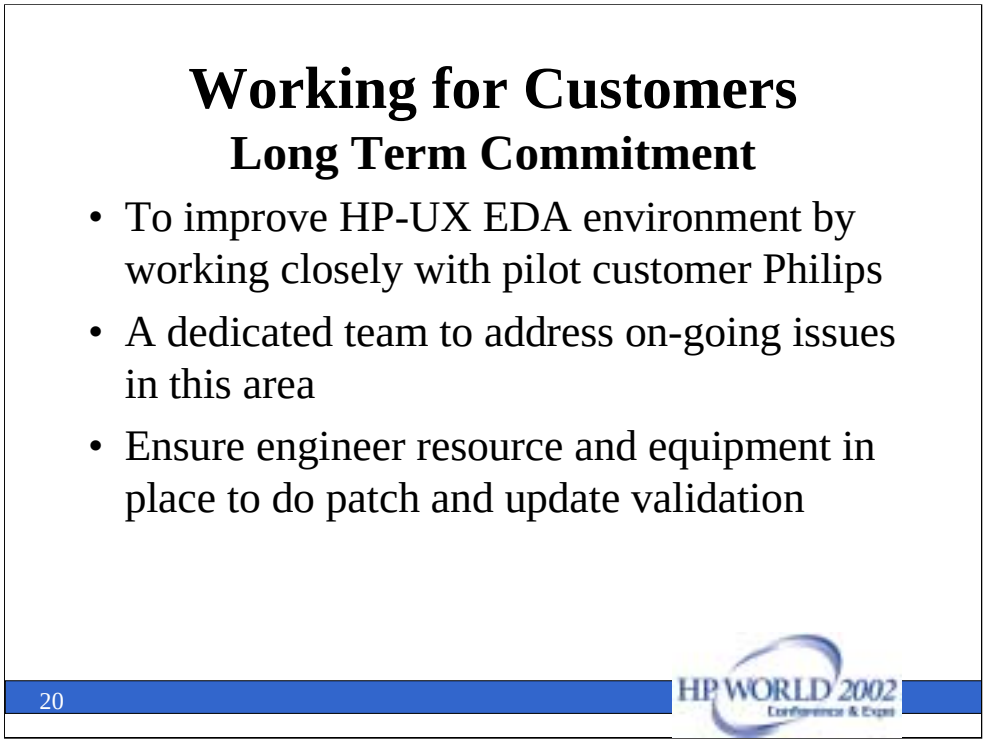
- Escalation team
  - drawn from Mngt, local expert centers, WTEC and HP Labs
  - Site visit by NFS experts form HP Labs
  - 21 major problems in HP NFS-PV3 identified
- Plan of action in 3 phases
  - fight the fires: get the site under control again
    - quick fixes, site specific patches, turn off some functionality
  - Long term fixes in GR patches
  - Identify the “Golden Nuggets”
    - what is different about this site and this customer?
    - what was missing in HP’s test procedures?



• Stabilisation from Q3 1999 continues into 2000

• Peaks in 2000 as some patches introduce new problems

• Very much hands on effort to manage NFS but this improves as GP patches replace site specific patches and quick fixes



After some immediate actions to unblock customers, HP start a long term plan to improve HP-UX EDA environment:

-Build a very tight relationship with Philips through dedicated contact points at Philips and HP.

-Collect information of Philips system environment to initiate EDA test ring effort with Philips like configuration.

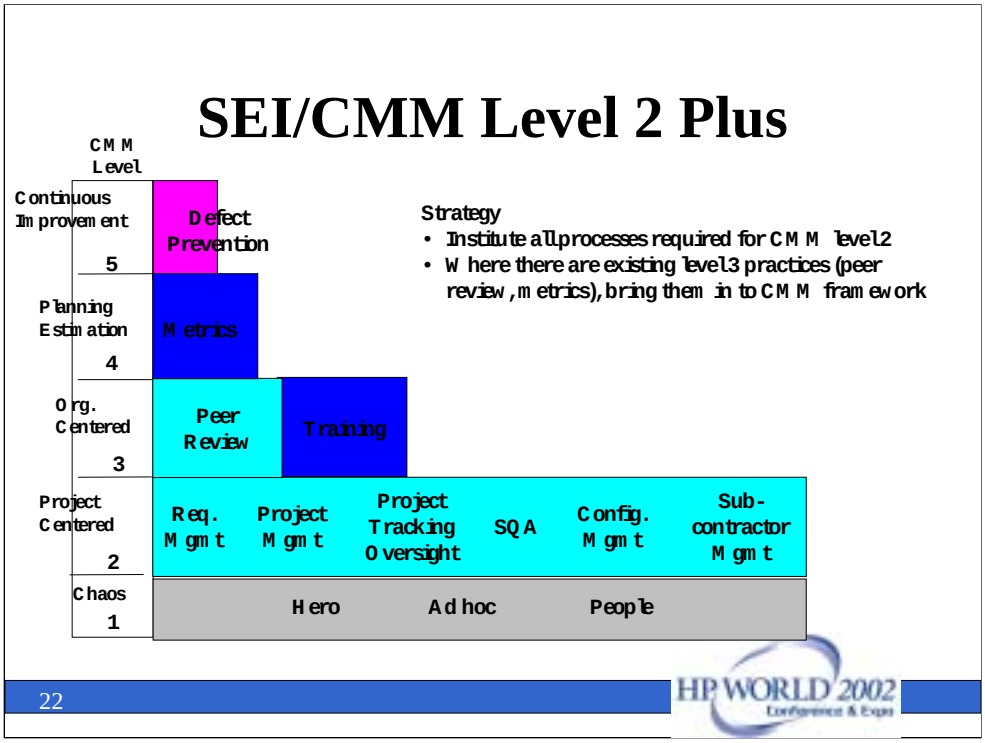
-Design test based on EDA/Philips system usage information and known defects

-Establish regular direct communications (emails between engineers from both companies and phone conference)

Working for Customers
HP-UX Process Improvements

- HP-UX Quality Improvement Program, decrease customer found defects by a factor of 10 in 5 years
- SEI/CMM Level 2 Plus certification in all HP-UX labs
- Improve turn-around time for fixing defects and additional validation of patches
- Testing reinvention

SEI (Software Engineering Institution) /CMM (Capability Maturity Model) is a framework that describes the key elements of an effective software process. The CMM describes an evolutionary improvement path from an ad hoc, immature process to a mature, disciplined process. The CMM covers practices for planning, engineering, and managing software development and maintenance. When followed, these key practices improve the ability of organizations to meet goals for cost, schedule, functionality, and product quality.



Plus Parts are coming from 2 aspects:

- Continue doing what we are doing well (Peer review) or what we feel necessarily (metrics, training, some aspects of defect prevention) and not contradict to what we are trying under CMM framework.
- Due to the nature of our business (HP-UX development in multiple locations), it is almost inevitable and implicitly required to look at some of the KPA's(Key Process Area) that address organizational aspects.

Org Process Definition: To develop and maintain a usable set of process across the org (which we are trying to do with the cmm committee)

Intergroup Coordination : to establish a means for the engineering groups to work effectively with one another

Training and Metrics has light pattern. That is because we are not implementing as full activities in terms of CMM KPA in each level. In the same context, Peer Review has been and will be implemented fully.

Defect prevention as a KPA in level 5 involves a lot more activities and maturity of the organization. We, however, feel that not injecting defects is just as important as finding defects at earlier phases of life cycle (that is addressed in Level 2 activities). We showed it on the list as HTRP thinks the "concept" is important and SISL is, in fact, adding the KPA into their Plus part voluntarily.

Test Reinvention Themes

- Increase the branch flow coverage of our tests
- Developers are able to find 90% of their own defects Test resources (tests, networks, SPUs) are delivered as services to the developer teams. (e-test)
- Have quarterly release testing approach what we do for major releases

Test Reinvention Themes

- Continue to move from OS focused test to customer solution validation:
  - *Market segment*
  - *Software stacks*
  - *Multi-vendor peripherals*
  - *In a customer like environment*
  - *Move from finding defects to providing better information*

Phase III: Test Ring and ETSE

EDA/Philips Test Ring

- The project officially launched in June 2001
- The Goal of the test ring is:
  - *reflect the Philips environment, ensuring a better quality experience for Philips and other EDA customers. (OS, Network and NFS flawlessly integrate)*
  - *Simulate Philips NFS workload on multiple servers and multiple clients NFS configuration*

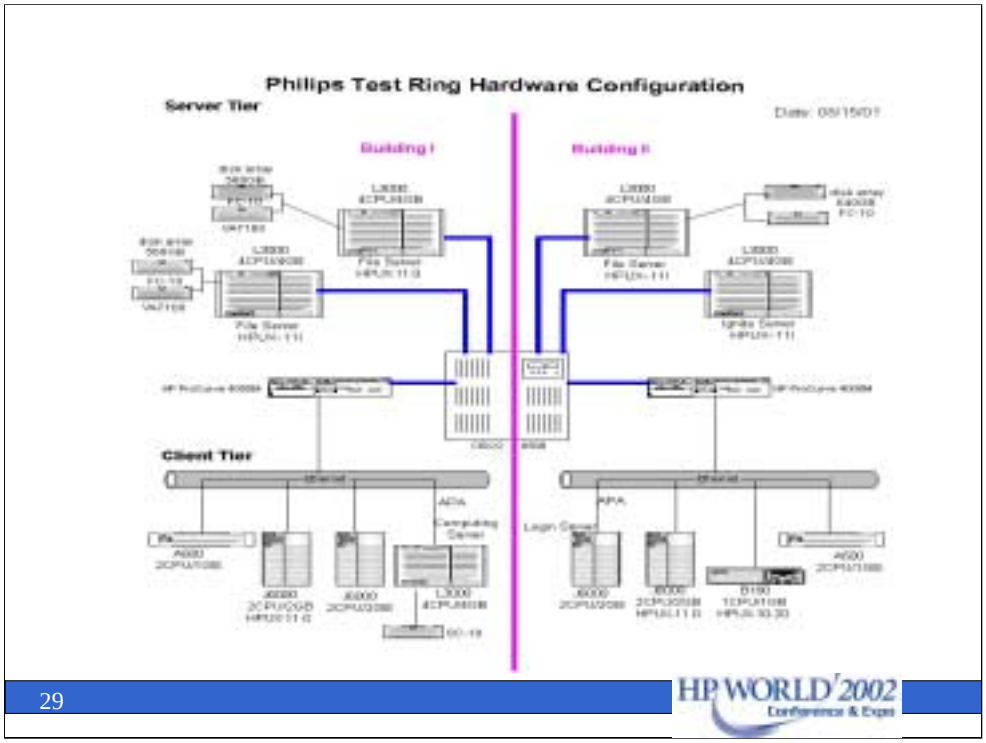
EDA/Philips Test Ring Construction

"Golden Nuggets" from Philips, what is this customer doing differently?

- NFS client dominated environment
  - Multi CPU (2-8) NFS clients
  - Multiple users (5-50 users) per NFS client
  - Multiple applications & multiple versions of applications running on the same NFS-client at the same time
  - Multi-threaded applications
  - NFS cross mounts:clients are also servers/servers are also clients
- File system layout
  - File sizes vary from 128KB to 2GB; but
  - 95% of files are less then 1MB

EDA/Philips Test Ring Construction

- Server choices (a mixture of Commercial servers, technical servers and workstations)
- Multiple versions of HPUX to start from
- Network design (a combination of 100BT and 1000BT) Simulation of 2 buildings (2 subnets) with one Cisco switch
- Each file server has at least 500+ GB storage (Most FCMS)



This is the first phase Philips test configuration.

•Cisco 6509 is utilized for simulating 2 subnets.

•There is a L3000 client system which is as powerful as server, it serves as both server and client.

•Most systems in the ring have HPUX11i, but there are also 3 systems with HPUX11.0 Philips image and one system with HPUX10.20.

•Network connections for all servers (Marked in blue) are all 1000BT lans, network connections for all clients are 100BT lans, some have APA configuration.

Test Ring Configuration

- One NIS server manages mount map across the test ring
- Each standard file server has at least 500GB of disk storage which is divided into 15 file systems each of which will be between 4 and 200GB in size
- File size ranges from 100Kbytes to 2GB. 25% of files are symbolic files to random files in random file systems
- All NFS are cross mounting through autofs. There are total about 8K mount points
- Both NFS v2 and v3 are tested
- 50 test users are created to own different files with different permissions
- A Mix of HPUX 11.0 and 11i

Load Simulations

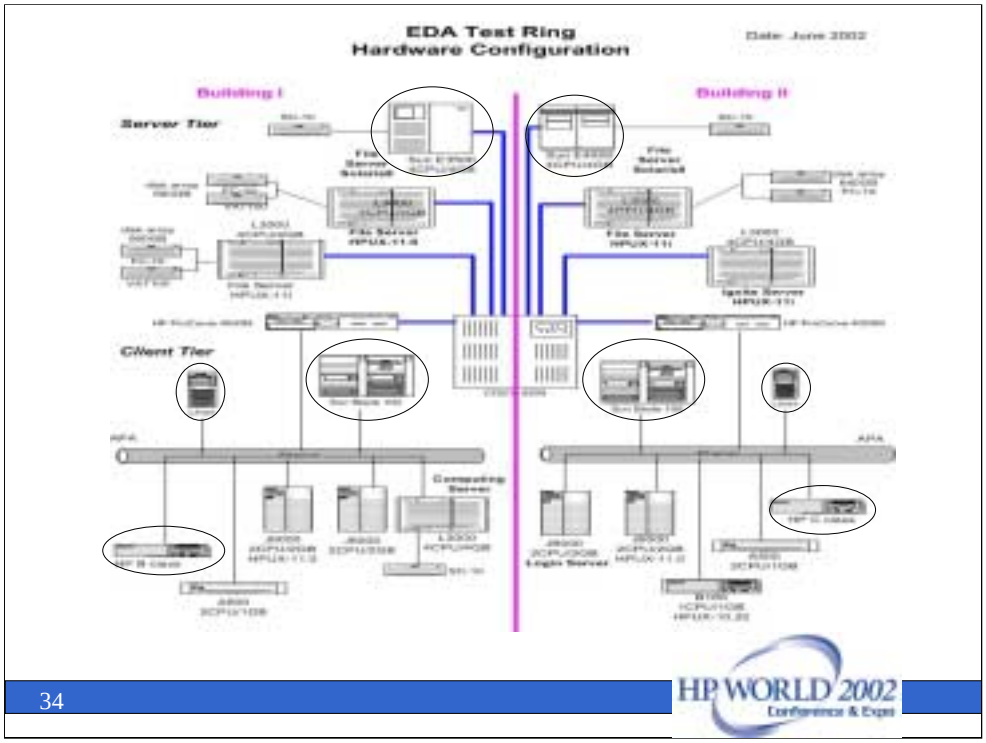
- Developed a new NFS stress test suite with Philips inputs. The testing starts on all systems at the same time, every test process is launched by different users from pre-defined 50 test users
  - *Randomly pick a file in the exported filesystem from the fileserver*
  - *Opens the directory that file exists in and reads all the contains of the directory*
  - *stat() the file (or link)*
  - *Processes the file*
- Continuous test analysis (load and NFS system call coverage) and test improvements

Immediate Results of the Test Ring

- 3 Critical issues found through testing during first month
  - Automounted file system can not be umounted after stress testing. NFS patch is ready and released
  - APA links keep dropping. 2 patches (one from btlan drive , the other from APA) are ready and released
  - Automountd core dump with excessive memory usage when there are large number of mounts through autofs in several minutes. A work-around is available and verified with minimal performance impact. The final fix will be in the next enterprise release

Continuous Improvements

- Solicit more customer inputs to reflect more EDA customer requirements
- Expand the test ring configuration
- Improve test suites, more coverage, more robust and automated
- Work with HP internal partners to ensure effective product and patch testing

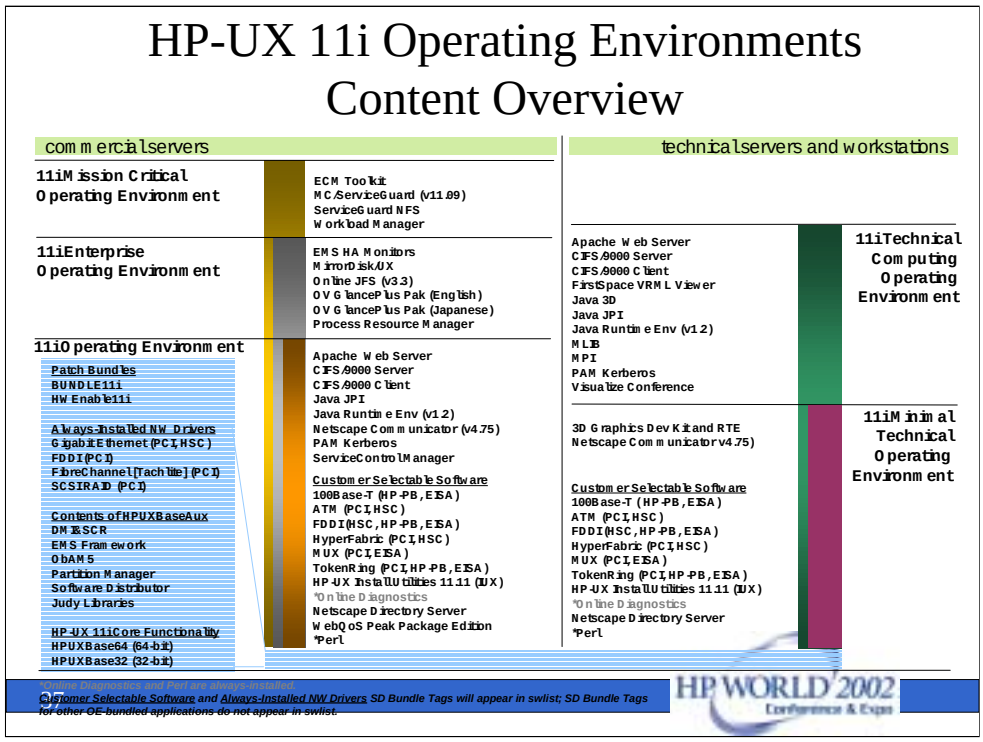

EDA Test Ring
Hardware Configuration
Building I
Building II
Server Tier
Client Tier
Computing Server

EDA Test Ring

- Advantage to us as a customer
  - **More visibility for our type of environment within HP**
    - even more interaction between HP and our major ISVs
  - **Serious problems identified before we install software**
  - **Problems identified within HP site by HP staff**
    - HP moves to resolve the problems immediately

ETSE

Enterprise Technical Server Environment



Info Philips had on OEs

- There are five Operating Environments;
    - 3 Commercial (MC; Enterprise; Base)
    - 2 Technical (TC; Minimal TC)
- Each OE is a superset of the previous one.
- Products contained on the OE media do not need to be ordered separately
- No code words required for products on the OE media.
- Commercial Server OEs are not supported on Technical Systems (i.e. s800 only)
- Technical Computing OE is supported on ALL systems.
- Minimal Technical OE is only supported on workstations (i.e. s700 only)
- An OE must be ordered with every HP-UX 11i system

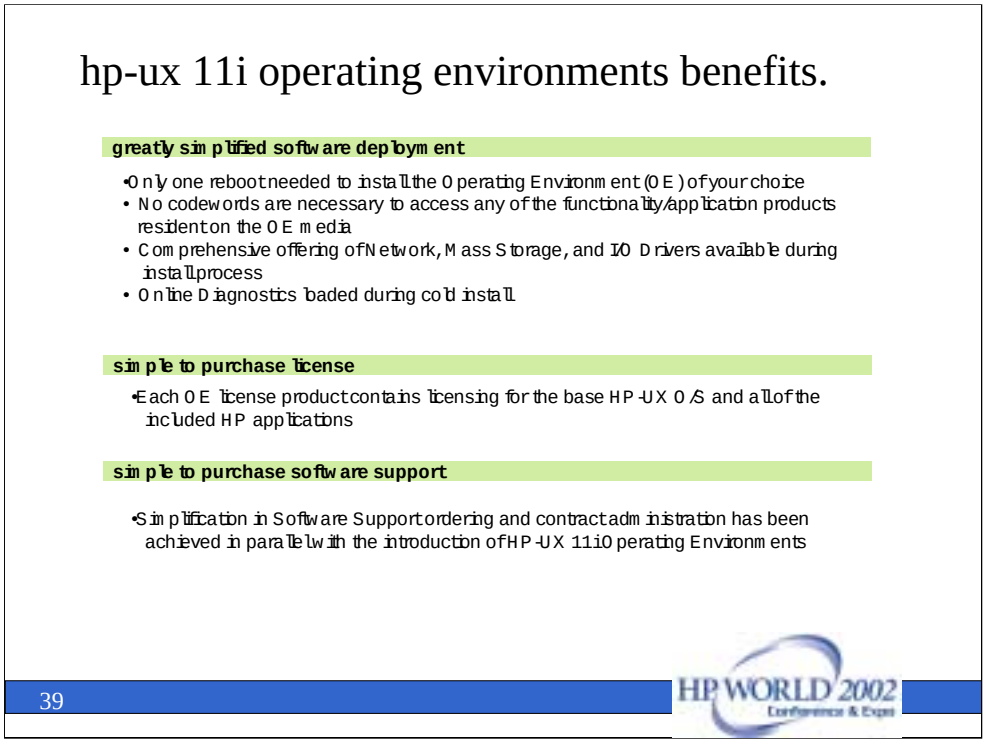
How Philips reacted:

- We both use commercial servers (s800) and technical systems (s700) in the same category groups, which OE do we choose?
- We looked for an OE that would run on both s800 & s700 and contained the HP applications we used like Glance, Mirror/UX, OnLine-JFS, EMS

Philips Is Interested in OEs Because:

- An OE is required from HP-UX 11i onwards
- HP will integrate and test OS, Applications and Patches
  - we are now doing this ourselves
- OEs will be used by ISVs in their QA

- but there did not seem to be an OE that fitted seamlessly into NXA……



All these benefits apply to all 5 standard OEs.

Hp-UX 11.11 Solution for EDA/Philips

- A new initiative started on top of test ring:

  *Define and deliver an 11i OE implementation (**ETSE: Enterprise Technical Sever Environment**) for EDA customers like Philips. (Easy and Rapid deployment with high quality assurance).*

- Objectives of the effort:
  - *Create a completely integrated Enterprise Technical Server Environment solution that allows instant installation and upgrades with minimal system administration effort, which supports a mix of commercial and technical systems.*
  - *Reducing the OS installation, patching, tuning, and other manually- intensive configuration efforts.*
  - *Software delivered as an Ignite-UX bootable image that will automatically install the OS.*

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Before working on 11.11 solutions for EDA customers like Philips, the test ring has Philips 11.0 HPUX software stack and 11.11 Enterprise OE and 11.11 Technical Computing OE. But 2 images of 11.11 doesn't fit Philips' requirements.

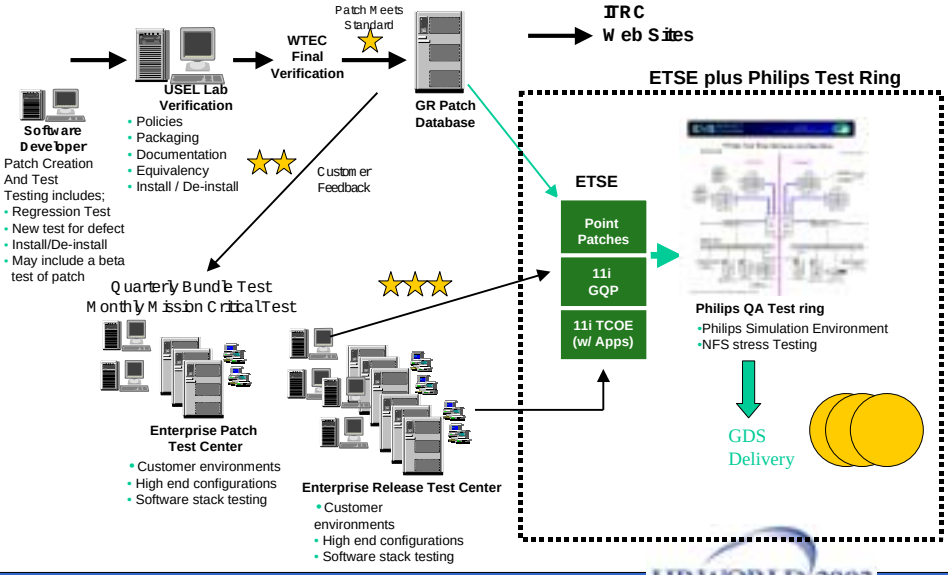
Software Selections for EDA/Philips

- One image for both workstations and servers
- Software requirements
  - MLIB, MPI, NFS, CIFS, Java, Kerberos (etc)
  - all required drivers(GbE, 100baseT, Fibre Channel, etc)
  - APA
  - Middleware: JFS 3.3/Online JFS; Mirror Disk/UX; LDAP; EMS; Glance
- Patch requirements
  - ISV patch requirements
  - Special patches not yet in quality pack

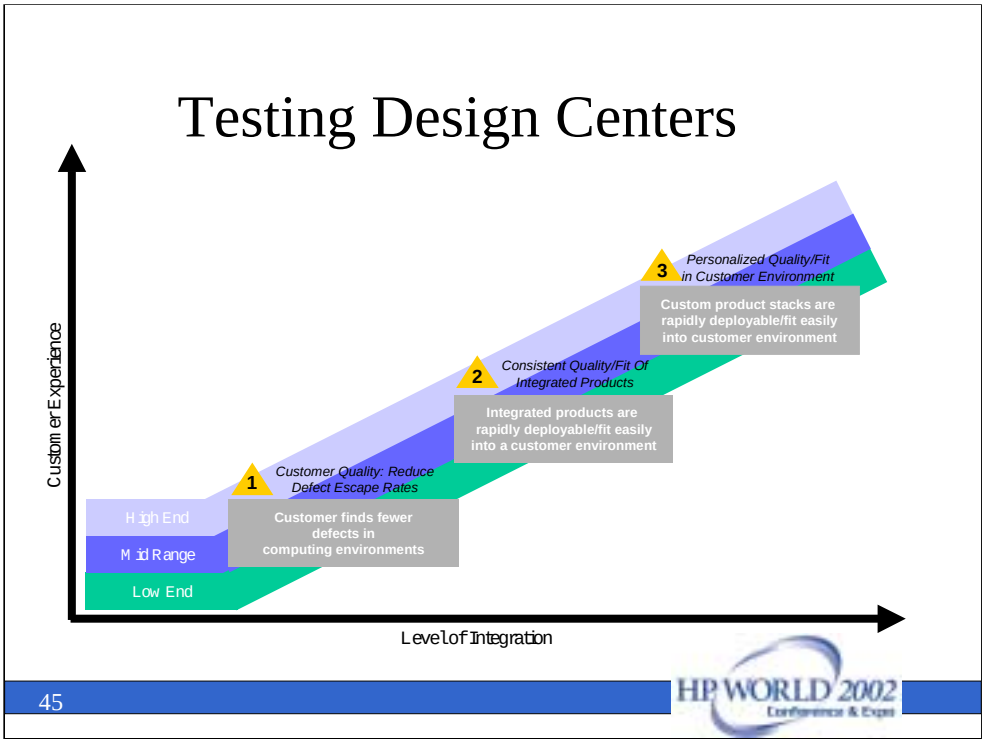
ETSE 03/2002 Contents

- March 2002 Technical Computing Operating Environment (TCOE)
- December 2001 Golden Quality Pack (GQPK)
- March 2002 Application Releases (AR)
  - B.11.11 MirrorDisk/UX
  - B.11.11.01 HP-UX Developer's Toolkit for 11.11
  - C.03.55.00 HP GlancePlus/UX Pak
  - B.11.11 HP OnLineJFS
  - A.03.20.01 HA Monitors
  - B.02.00 LDAP-UX Integration
- Latest necessary GR patches
  - Patches planned for June 2002 HWE
  - Patches planned for June 2002 GQPK
  - Patches recommended to Philips by ISVs but not already included

ETSE QA Test Process



Phase IV: Current Status & Future Plan



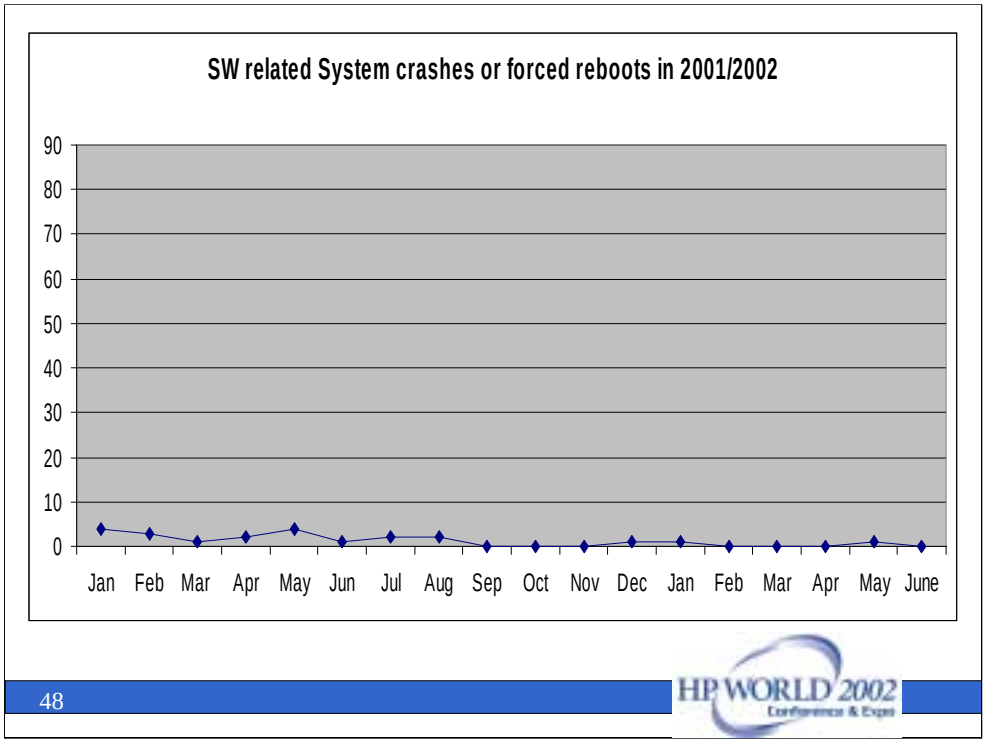
Test design centers are concepts for describing the activities performed at higher levels of integration and the effect those activities have on customer experience; i.e., integrating at higher levels allows more opportunity to positively affect customer experience

ONC+ (NFS) Improvements

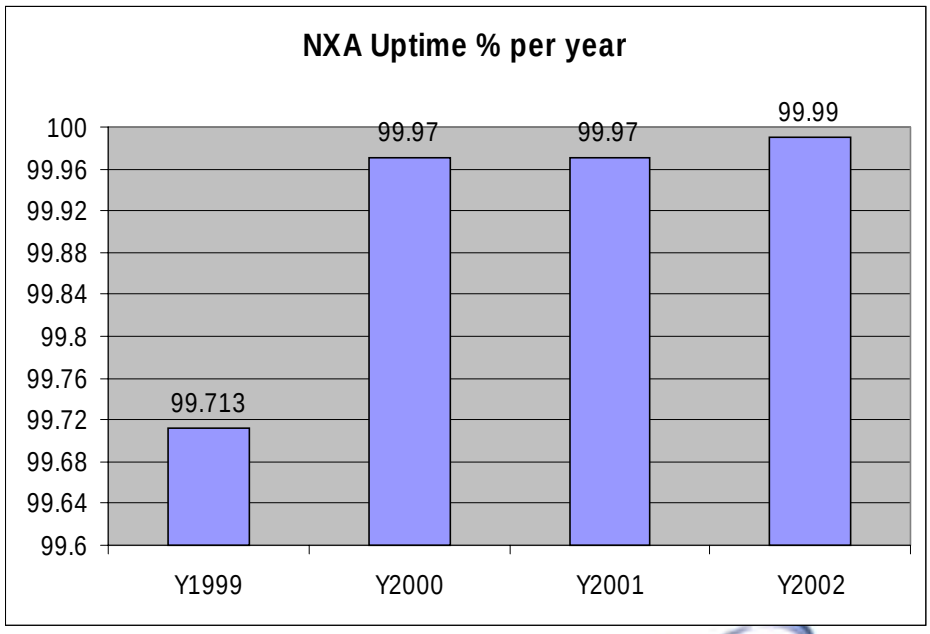
- **Quality has improved greatly since 1999**
  - ✓ *defect backlog: from 80+ to <10 active*
  - ✓ *number of lab escalations now typically 0*
  - ✓ *high quality patches*
- **Customer focus**
  - ✓ *enhancements done for technical computing market place*
  - ✓ *specific patches made for customer needs*

Current ETSE Status at Philips

- Successful rollout at Research July 2002
  - over 140 HP servers and workstations running ETSE 03/2002
  - 1200 users
- Rollout to early adopter Semiconductor sites August 2002
  - 10 sites in US, Europe, Asia
- Rollout to remaining Semiconductors sites in progress



• This is how it should always look !


NXA Uptime % per year
100
99.96
99.92
99.88
99.84
99.8
99.76
99.72
99.68
99.64
99.6
99.713
99.97
99.97
99.99
Y1999
Y2000
Y2001
Y2002

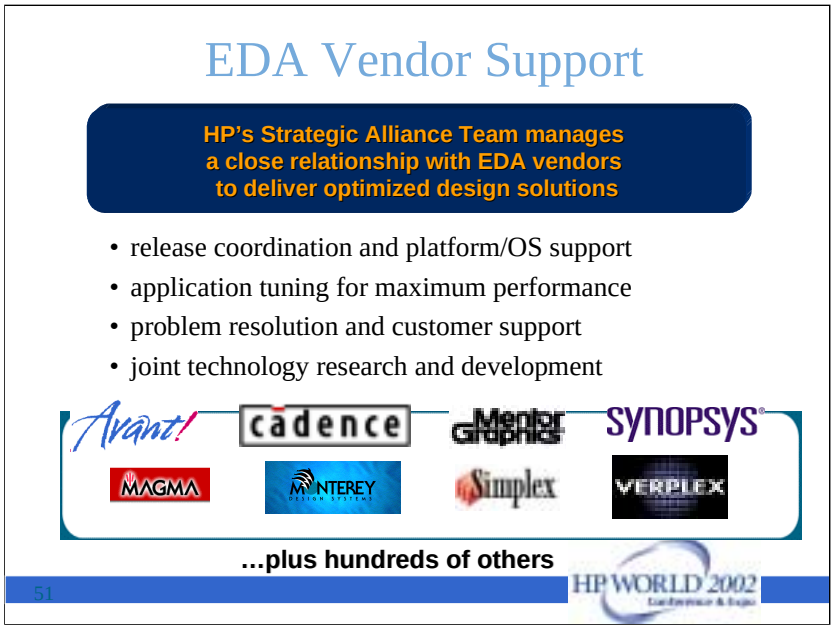
What Has Philips Gained?

- HP software tested by HP in our typical environment
  - HP catches the serious problems, not us
  - Issues resolved quicker if identified within HP (with customer tie-in)
  - Point patch selection influenced by HP and ISVs
- Pre-installation effort dramatically reduced
  - Months of man-effort to select & config OS/OE reduced to days
- ISV interest
- Post installation stability and reliability
- Best of both Worlds
  - power of PA-RISC processors **&** stable/reliable OS
- Greatly improved working relationship with HP
  - "Partnership" mentality

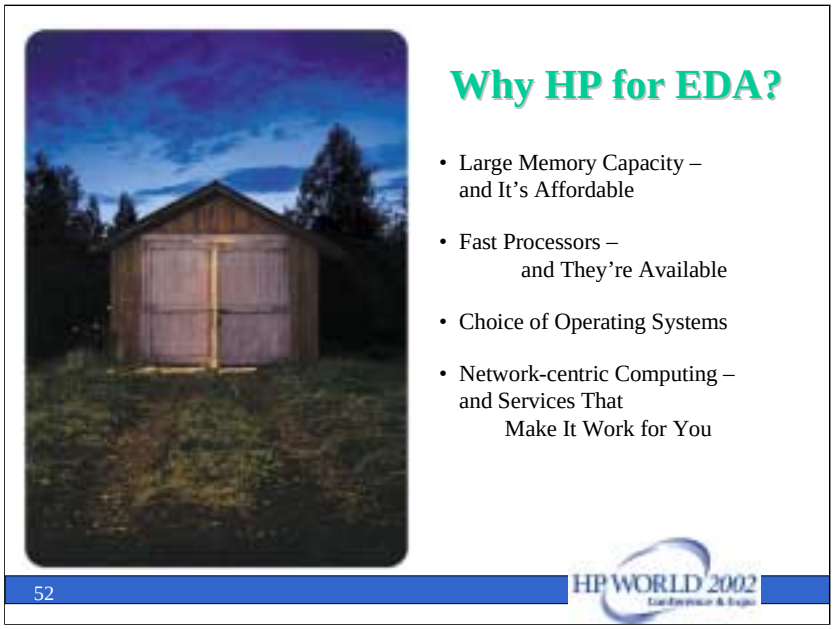
• We started in 1999 as highly irate customers screaming at HP

• The process start off fixing NFS issues and this has evolved into large joint projects, which today work and feel more like a partnership and less like strict vendor-customer relationship.

•The whole process, from the NFS escalation in 1999 through to the EDA test ring and leading into ETSE, has worked because we were prepared to work together for common gains.



HP understands that the computing environment is only a piece of the EDA solution puzzle. We know that it takes a close partnership with the EDA vendors to make their applications work for you. So we have a team of managers and technical consultants who work with the EDA vendors to coordinate operating system and application software releases – and to ensure the applications are tuned for maximum performance on HP systems. HP's engineers and the EDA vendors put their heads together to research new and innovative solutions – we leverage our own design efforts to make sure when you get to the same problems, the solutions are already there.



We live EDA. We breathe EDA. We stake our reputation on EDA. Unlike some vendors who claim to be the "dot in dot.com" – HP is committed to being the "A in EDA". We leverage our own design expertise to develop innovative ways – new ways – to design in EDA.

We understand your need for physical memory – we understand the issue of complexity – and we make it affordable. HP delivers server memory capacity at workstation prices. You probably don't realize how much more memory you can afford with HP systems. Check it out for yourself – don't limit your engineer's productivity.

Performance. HP is and always has been all about performance. Our track record of delivering high-performance processors speaks for itself. And you can be confident we'll continue to provide the most performance – available performance – with our commitment to the new Itanium family of processors.

We understand how to squeeze every drop of efficiency from technical computing environments. We are pioneering a new way to design with network-centric computing. Computing that puts all the power your engineers need to get their job done as close as the Internet. Always on. Always available. Why not get more for your money? Why not get more utilization out of your EDA applications. HP can show you how – and we'll make it work for you.

That's our promise. We'll make it work for you.

Whom to Contact?

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