

# Performance Improvement of the PLM CAD Workstations

# Summary

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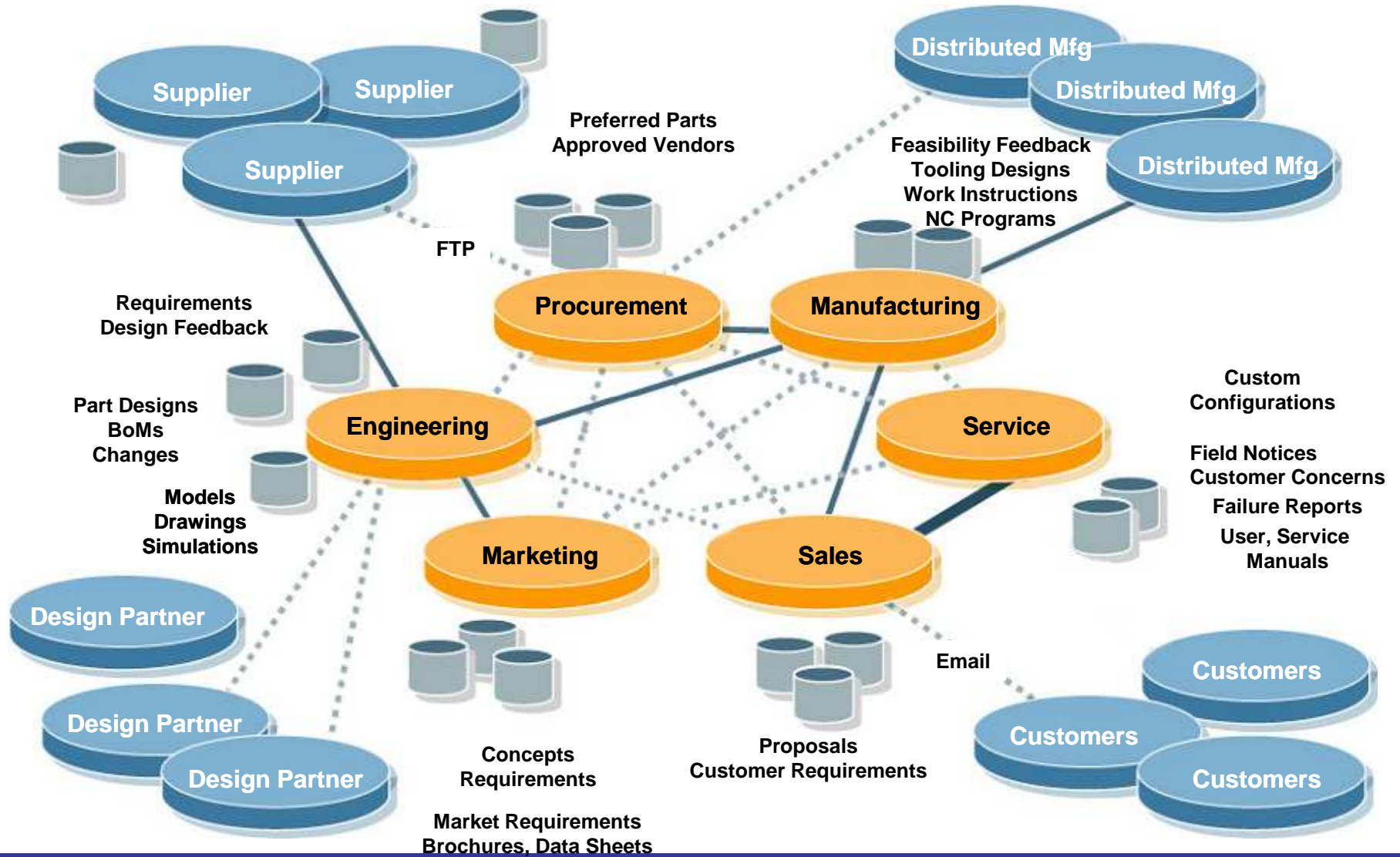
- **Problematic issues of loss of productivity due to client PTC ProE application crashing.**
- **Current statistical analysis reveals 2 major root causes/requirements:**
  - **network connectivity between the PLM server and 130-150 workstation clients**
  - **client workstation configuration of OS, RAM and video**
- **This proposal will be based on 3 possible solutions on the network connectivity**
  - a) Upgrading the connections to the closets to 10gbps**
  - b) Upgrading the connection between PTC Windchill system of server to 10gbps**
  - c) Remote server based workstations with local graphical clients**
- **All solutions will focus on factors of cost of**
  - **implementation**
  - **supportability in terms of labour and complexity**
  - **Scalable and flexible**

# Summary of Cost of Options

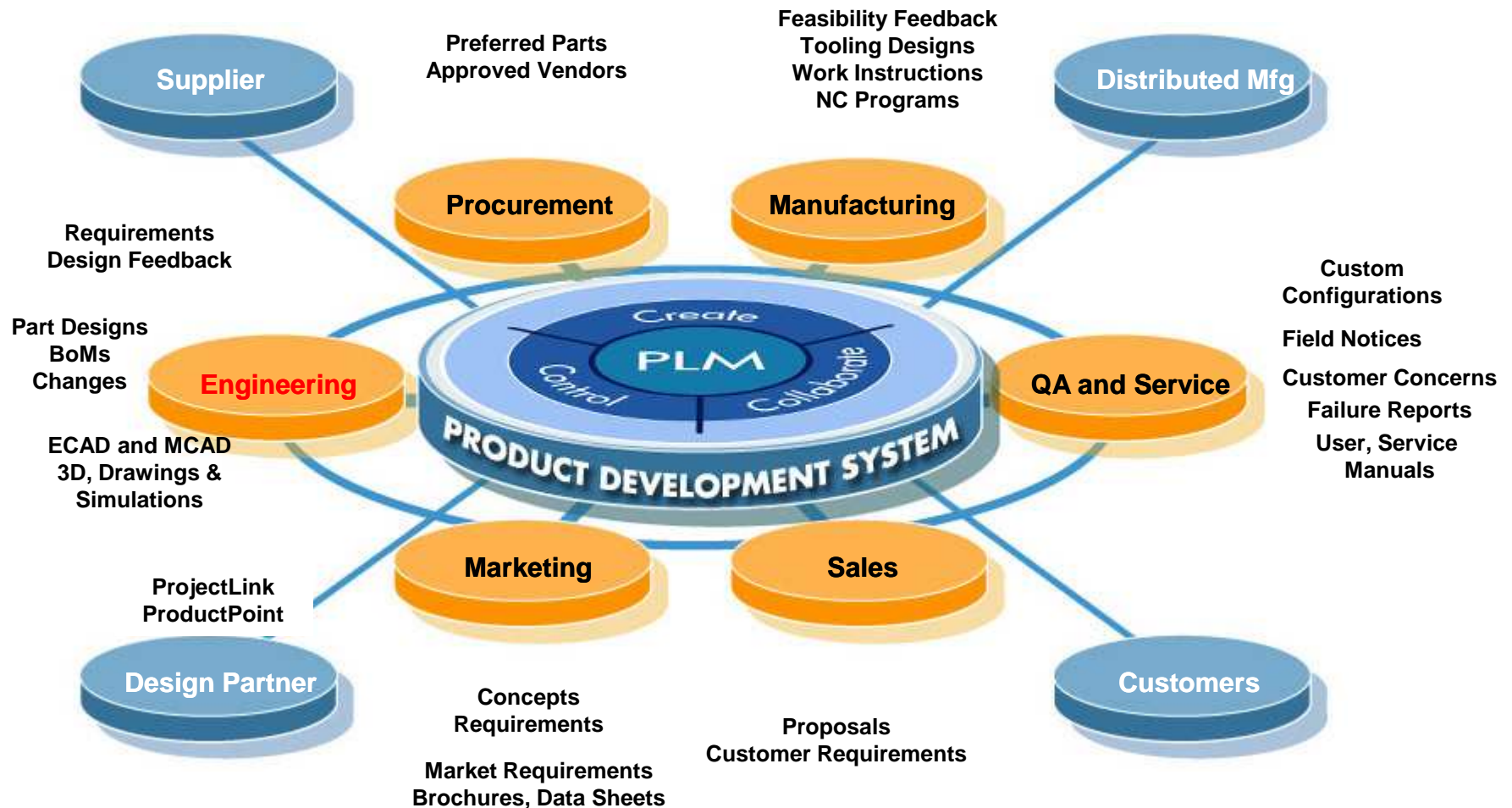
- Assumptions, does not include CAD software
- Only considering MIS infrastructure

|   | Option 1       | Option 2 | Option 3                       |
|---|----------------|----------|--------------------------------|
| Solves the network requirements                                 | YES            | NO       | YES                            |
| Network Cost  | 403,000.00     | na       | 0.00                           |
| Complete Cost including All Workstations refresh on 3 year plan | 1,131,000.00   | 2,000.00 | 1,128,348.64                   |
| 16 Workstation Upgrade Phased Cost                              | 96,000.00      | na       | 184,318.00                     |
| Number of workstations to upgrade with in infrastructure        | 112 to 150     | na       | constant 77                    |
| Flexibility of moving cost                                      | 77,014.00      | na       | 0.00                           |
| Upgrading to Workstation Status                                 | \$6500-\$83000 | na       | 0.00                           |
| Time to order and client to receive a workstation               | weeks          | na       | 0.00                           |
| Scalability increasing number of users                          | \$6500-\$83000 | na       | <0 decreases overall cost      |
| Downtime for user to refresh workstation                        | 1 man day      | na       | 0.00                           |
| Backup and recovery   | Remote EVA     | na       | not required, locally on EVA   |
| Remote office site supportability                               | no             | na       | yes, but requires >10 mbps QOS |

# Background - Business Vision



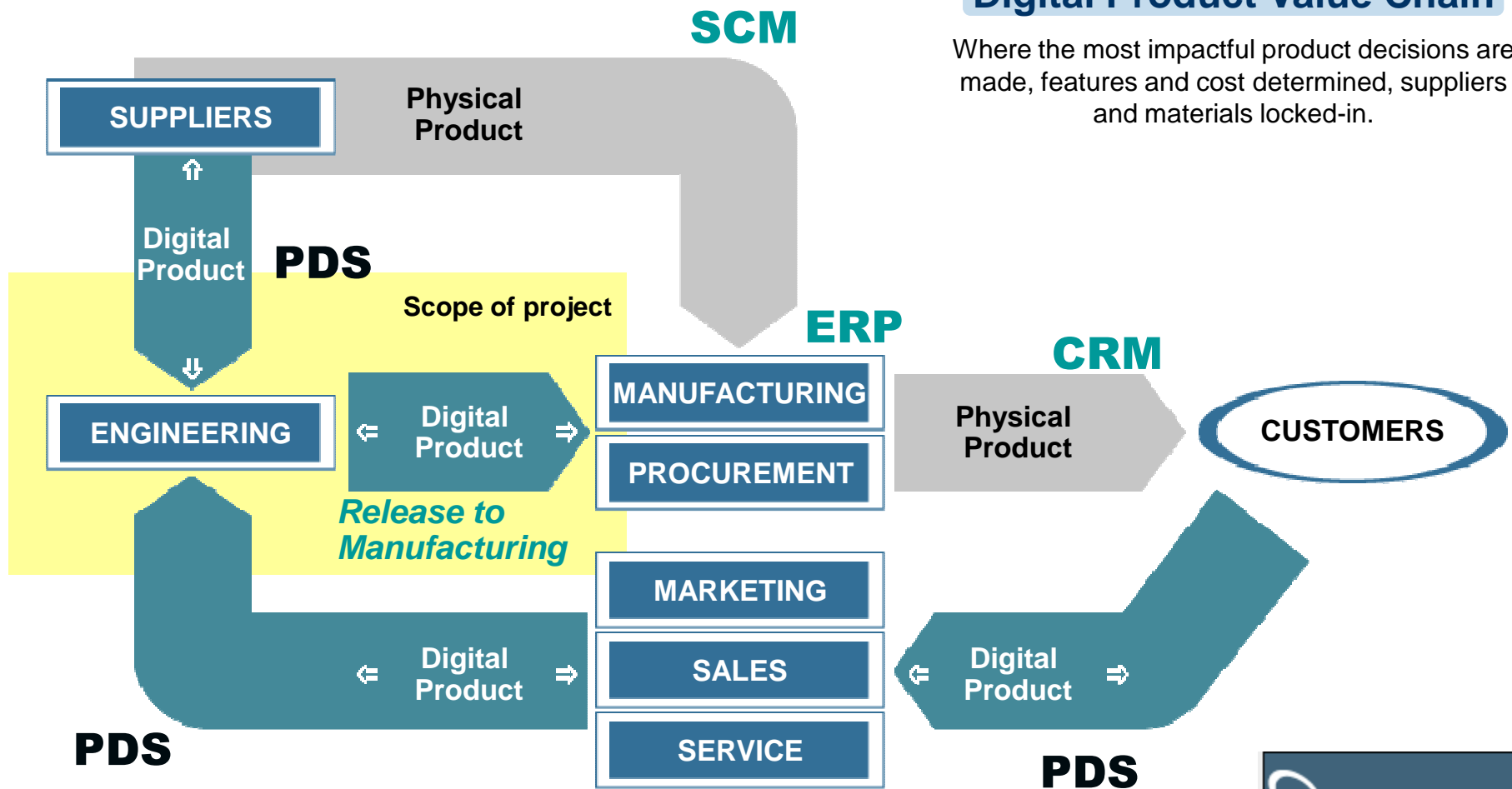
# Optimized Product Development System



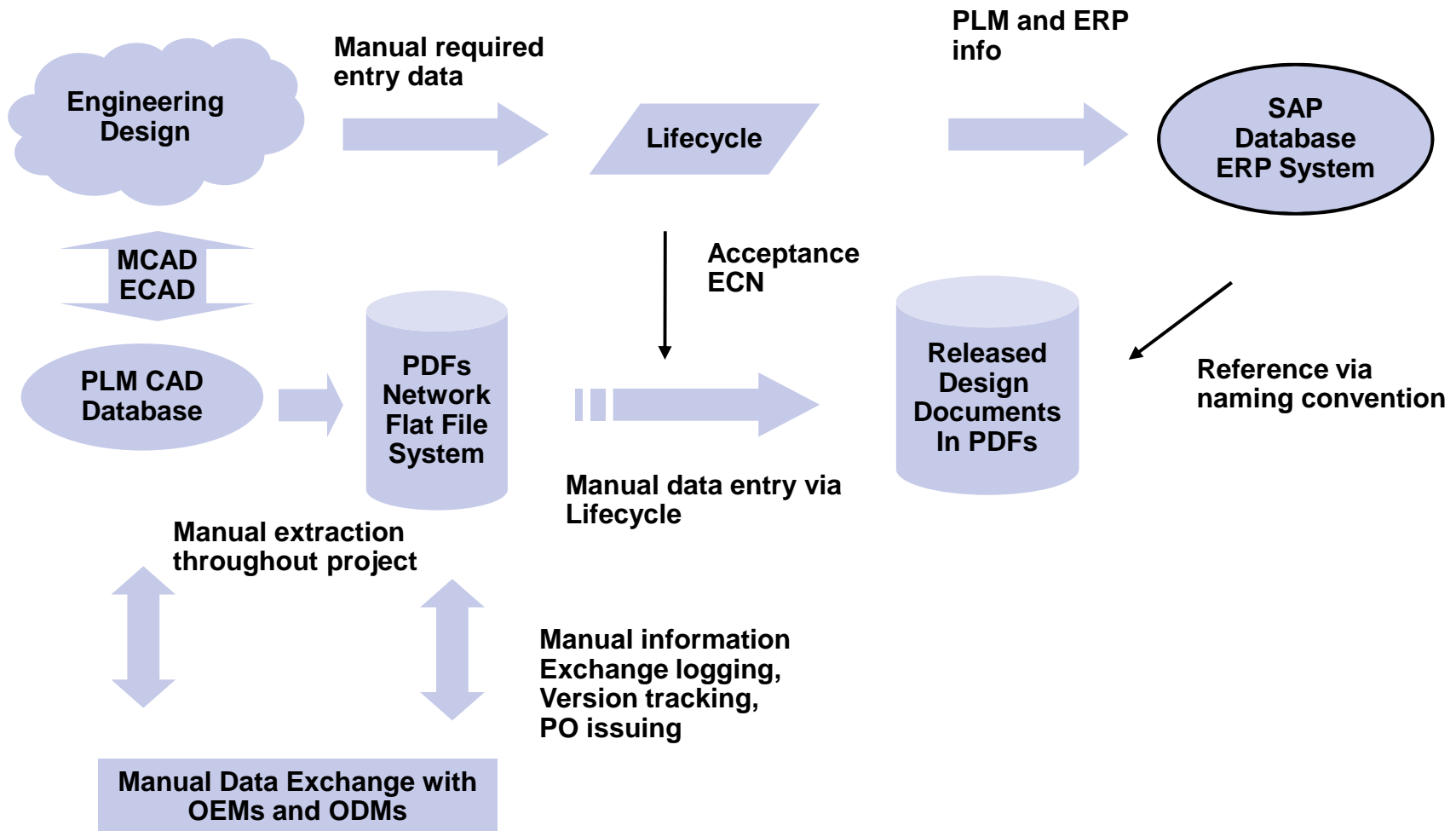
# Complete Business Vision

## Digital Product Value Chain

Where the most impactful product decisions are made, features and cost determined, suppliers and materials locked-in.

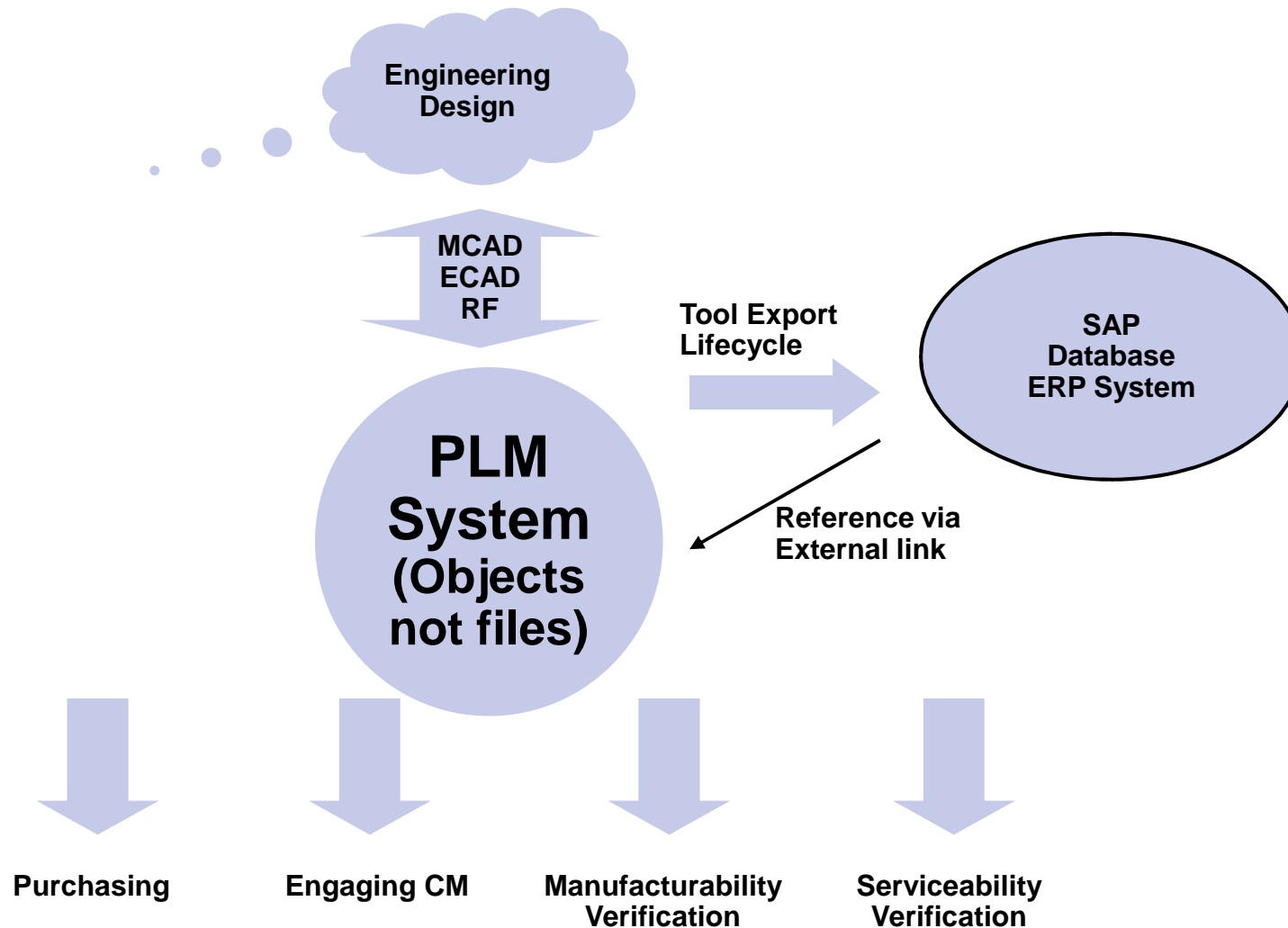


# Product Development Today



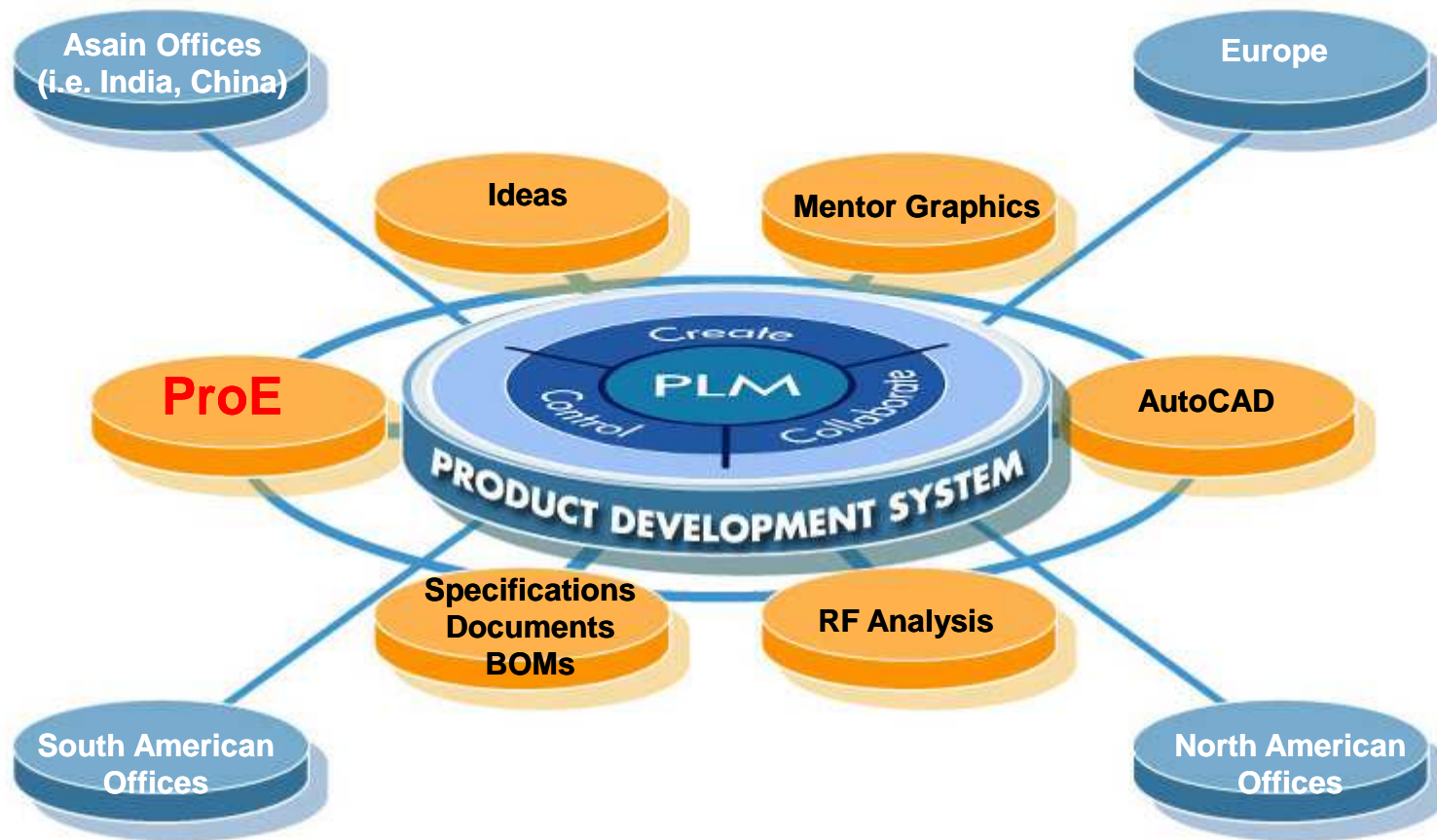
# Completion of Stage 2

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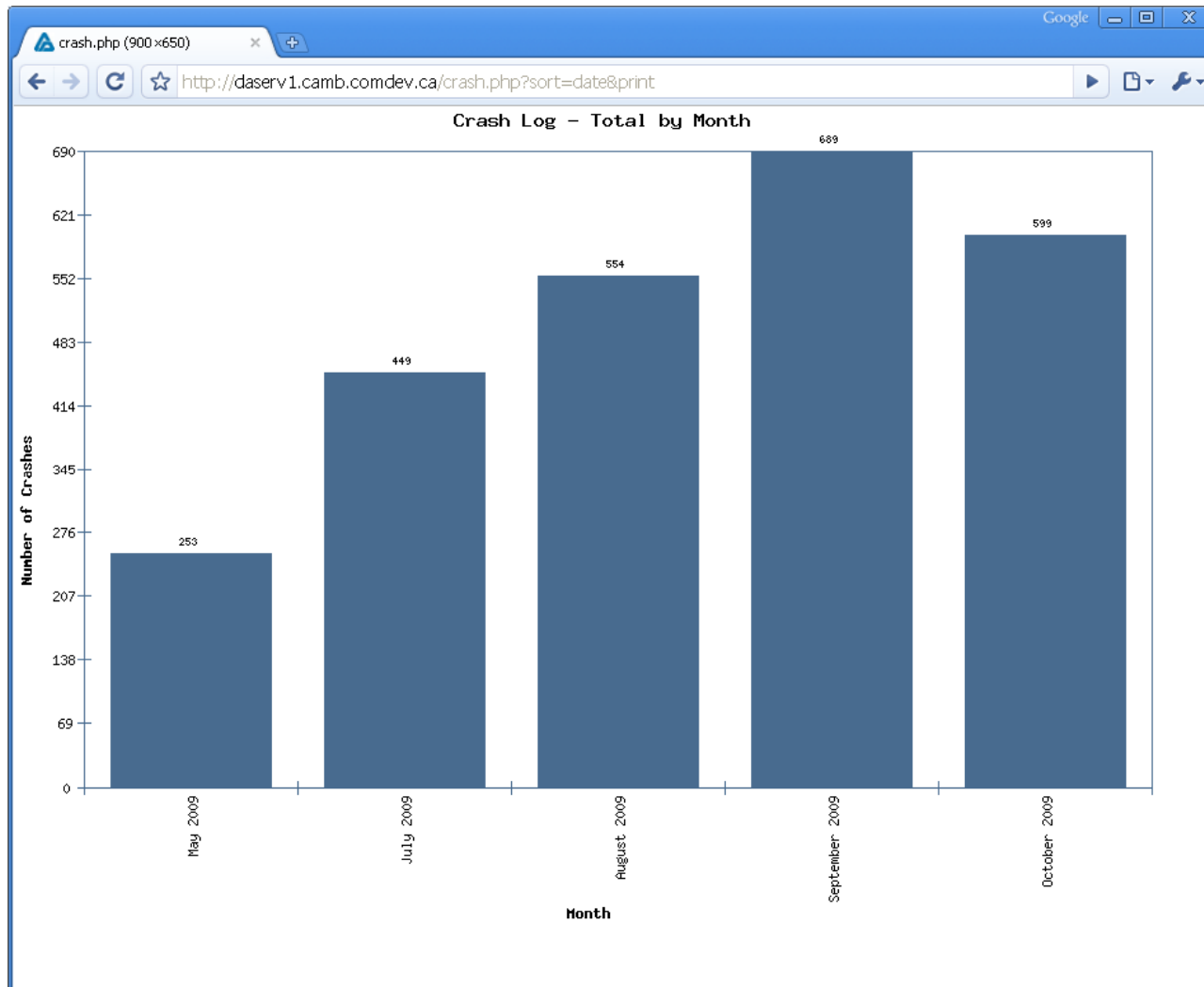




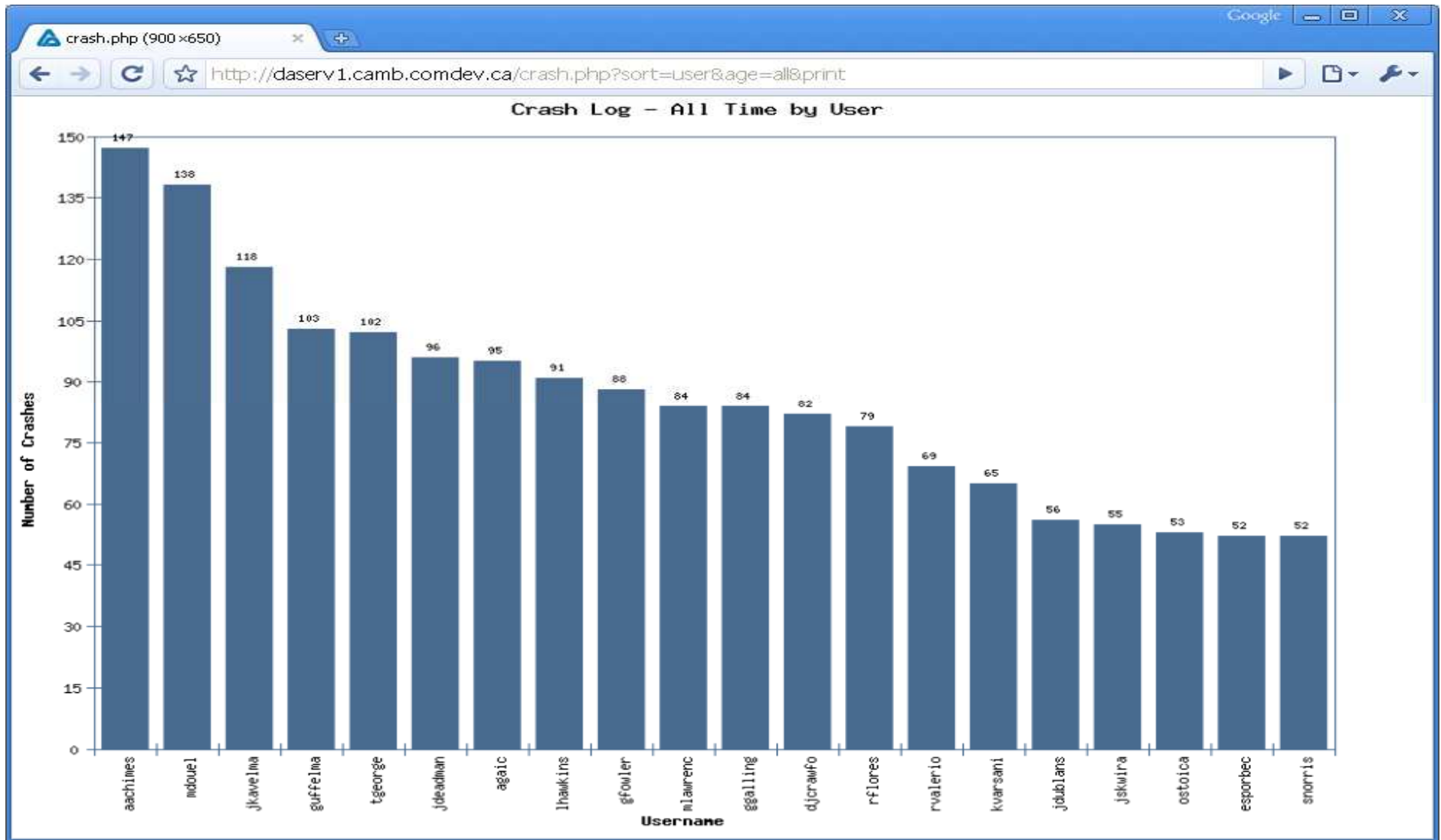
# Optimized Engineering Application Focused



# History – ProE Crash Logs Monthly Summary

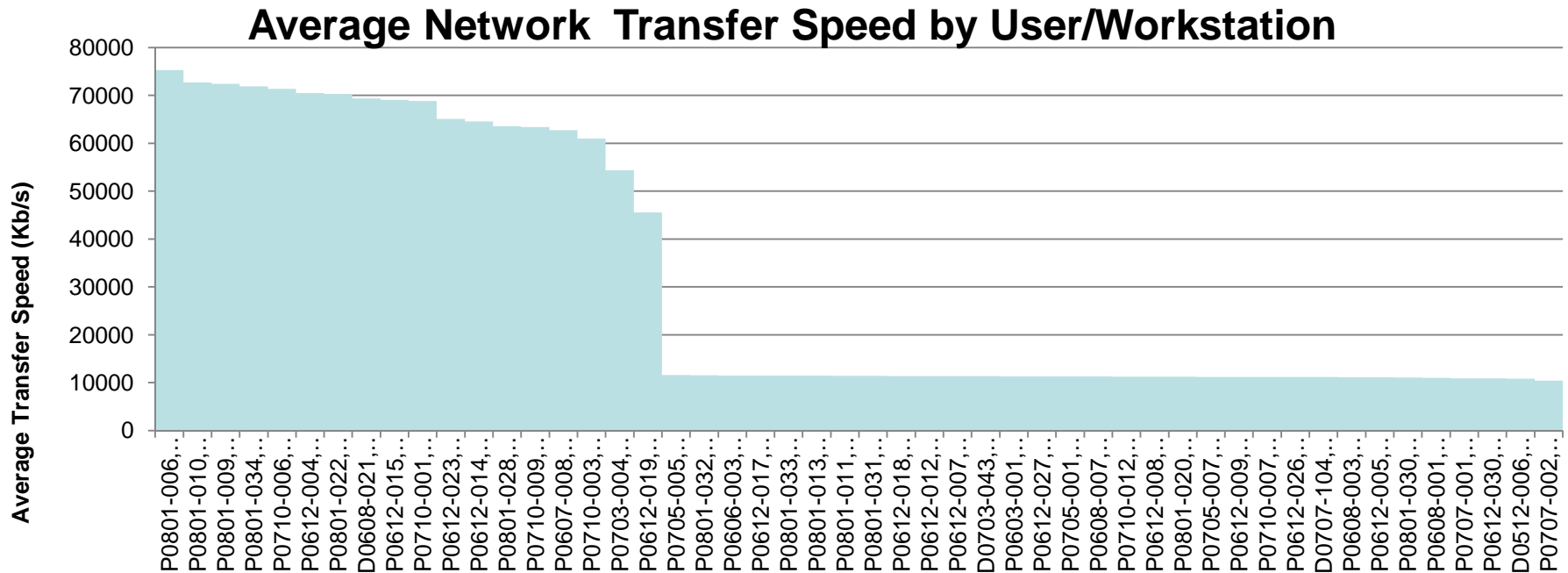


# High Probability due to Network Connectivity



# Direct Correlation between users that crash

- Unlike ERP system, PLM is **both** transactional and content/file management intensive
- Determined network requirements for local client PLM ProE workstations
  - **300mbps sustained speeds**
  - **1000mbps/1Gbps burst speeds**



# Option 1 – Upgrading Closets to 10GB/s

- Assumptions

- This is only for 112 local 165/155 Sheldon users are fixed at their desk
  - All user desk ports are connected to the new 1GB/s switches
  - 1 GB/s switches are only allocated for these 112 users

| 6 Closet Cost  |     |            |            |
|--|-----|------------|------------|
| Item   | QTY | Unit Cost  | Total Cost |
| Cost per switch and cables                             | 6   | 30,000.00  | 180,000.00 |
| Labour Cost  | 6   | 5,000.00   | 30,000.00  |
| Upgraded Server Room Core Cost                         |     |            |            |
| 10GE to Server Nexus 5000                              | 1   | 100,000.00 | 100,000.00 |
| Uplink - SPF-10GE-SR*12                                | 2   | 24,000.00  | 48,000.00  |
| Uplink - Link Port*6                                   | 2   | 18,000.00  | 36,000.00  |
| Labour Cost  | 1   | 5,000.00   | 5,000.00   |
| Upgrade Blade Ethernet switches to 10G ProCurve 6120XG |     |            |            |
| Difference in price                                    | 2   | 2,000.00   | 4,000.00   |
| Total  |     |            | 403,000.00 |
| Based on 112, cost per users                           |     |            | 3,598.21   |

Scalability in groups of 48 depending on location, full or old closet

77,014.00

# Option 1 – Advantages and Disadvantages

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- **Advantages**

- **Upgraded Core to meet the demands of the users**
- **All servers will be communicating at 10gbms**
- **Servers have the available bandwidth to feed the users at 1gbms sustained**

- **Disadvantages**

- **Very dependent on static users not moving from desk to desk**
- **This solution does not extend to 30-40 external CAD contractors and external offices**
- **Scalability is both limited to closet space and switches in the closet**
- **Difficulty in standardizing software installations both remotely and locally on clients.**
- **Network remote installed CAD software sharing results in drawing/pulling files across the user network just to run the applications**
- **Down time is possibly 1 weekend.**

# Option 2 – Upgrading Server Communication to 10GB/s

- Assumptions

- No upgrades to closets
- Focused on PLM system of 4 possible servers:
  - PLM Windchill, Oracle, CAD worker and Document worker
  - All Production servers are blade servers installed on 1 HP C7000 chassis
- No need to upgrade EVA connection speed at 3gbps



#### Publishing Worker 1

HP ProLiant BL460c G6 Blade Server  
2 X Intel® Xeon® Quad-Core  
X5460 processor (3.16 GHz, 2 x 6 MB L2 cache, 1333 MHz FSB)  
32 GIG RAM > upgrade to 64 GIG later  
NVIDIA Quadro FX 3600M (512 MB)  
PCIExpress Fibre Cards QLogic QMH2562 8Gb FC HBA  
HD: 2X 300 GIG SAS

OS: Windows 2003 X64  
Applications:  
ProE WF 4.0  
Product View Adapter 12.1 M020



#### PLM Production Server

HP ProLiant BL460c G6 Server  
2X Quad-Core Processors  
Intel® Xeon® processor X5460 (3.160 GHz, 1333MHz, 120W)  
12MB shared L2 cache  
RAM: 32 GIG  
HD: 2X 300 GIG Serial Attached SFF Hot plug SAS  
2X PCIExpress Fibre Cards QLogic QMH2562 8Gb FC HBA  
Attached to EVA8000 SAN

OS: Red Hat Linux 4.0 64 bit AS  
Applications:  
Apache 2.2.# Web Server (Multiple forest AD connection)  
Tomcat 6 Servlet Engine  
Aphelion LDAP (LDAP adapters connection)  
Java JDK 1.6.0\_12  
Oracle 10G Client  
Windchill PDMLink 9.1 M030  
Thumbnail Generator  
All applications mapped to EVA8000 SAN File Server mount



Current Production SAP  
HP Blade System c7000 Enclosure  
16 single blade units  
6 single units available



#### Document Publishing Worker 2

HP ProLiant BL460c G6 Server  
2 Quad-Core Processor  
Intel® Xeon® processor X5460 (3.160 GHz, 1333MHz, 120W) 12MB  
shared L2 cache  
RAM: 32 GIG > upgrade to 64 GIG later  
HD: 2X 300 GIG Serial Attached SFF Hot plug SAS  
2X PCIExpress Fibre Cards QLogic QMH2562 8Gb FC HBA  
Attached to EVA8000 SAN

OS: Red Hat Linux 5 64bit  
Applications:  
Red Hat Linux 5.0 VM Server  
VM PLM 9.0 M040 Server  
All applications mapped to EVA8000 SAN File Server mount



#### PLM Oracle Production Server

HP ProLiant BL460c G6 Server  
2X Quad-Core Processors  
Intel® Xeon® processor X5460 (3.160 GHz, 1333MHz, 120W)  
12MB shared L2 cache  
RAM: 32 GIG  
HD: 2X 300 GIG Serial Attached SFF Hot plug SAS  
2X PCIExpress Fibre Cards QLogic QMH2562 8Gb FC HBA  
Attached to EVA8000 SAN

OS: Red Hat Linux 5.0 64 bit AS  
Applications:  
Oracle 10G

# Option 2 – Cost, Advantages & Disadvantages

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- **Cost**
  - **\$2000** extra for replacing the specified HP BLc Cisco switch 3120X with the ProCurve 6120XG on 2 chasis for test and production
- **Advantages**
  - CAD and document workers can now perform file transfers, conversions to dynamically meet the demands of over 112 CAD Workstations and over 600 other document authors
  - Oracle connections and communication is matched in speed as EVA
- **Disadvantages**
  - **Does not** solve the issue for crashes and user environment performance over the network
  - Down time of 1 day if required to upgrade the blades after installation



# Option 3 – Blade Workstations Cost

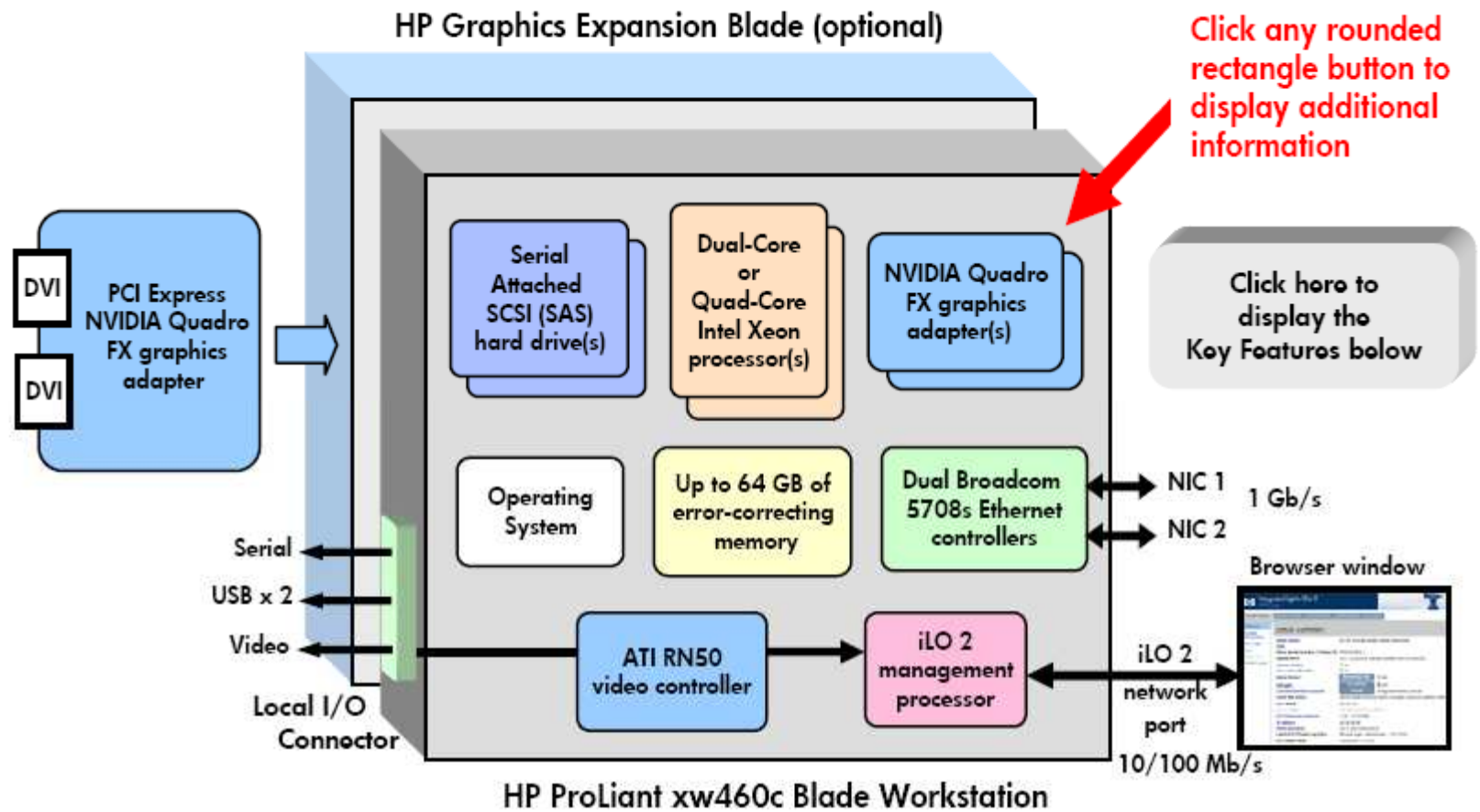
- Assumptions

- To fulfill the requirements and demands of all users remotely and locally
- Can purchase in groups/phases of 16 per chassis to meet the refresh rate at \$184K
- Current racks available
- Software licenses not include

| Item   | QTY | Unit Cost    | Total Cost        |
|--|-----|--------------|-------------------|
| <b>HP C7000 Chassis and Workstation Blades</b>           |     |              |                   |
| HP ProLiant xw460c G6 Blade Workstations                 | 16  | 9,140.00     | 146,240.00        |
| 10 U height c7000 Chassis bundled unit                   | 1   | 38,078.00    | 38,078.00         |
|  |     |              | 184,318.00        |
| <b>HP 42U Height Rack Bundle</b>                         |     |              |                   |
| 42 U Height Rack bundle including PDU and UPS            | 1   | 27,089.32    | 27,089.32         |
| <b>Complete Solution based on number of app licenses</b> |     |              |                   |
| 77 Blade Workstations 5 chassis                          |     |              | 894,170.00        |
| 2 Racks required   | 2   | 27,089.32    | 54,178.64         |
|  |     | <b>Total</b> | <b>948,348.64</b> |
| Unit cost for  | 150 | users        | 6,322.32          |
| Unit cost decrease as users increase                     | 200 | users        | 4,741.74          |
| Cost per user for standard basic PC                      |     |              | 1,200.00          |
| Total Cost for basic PCs for                             | 150 | users        | 180,000.00        |

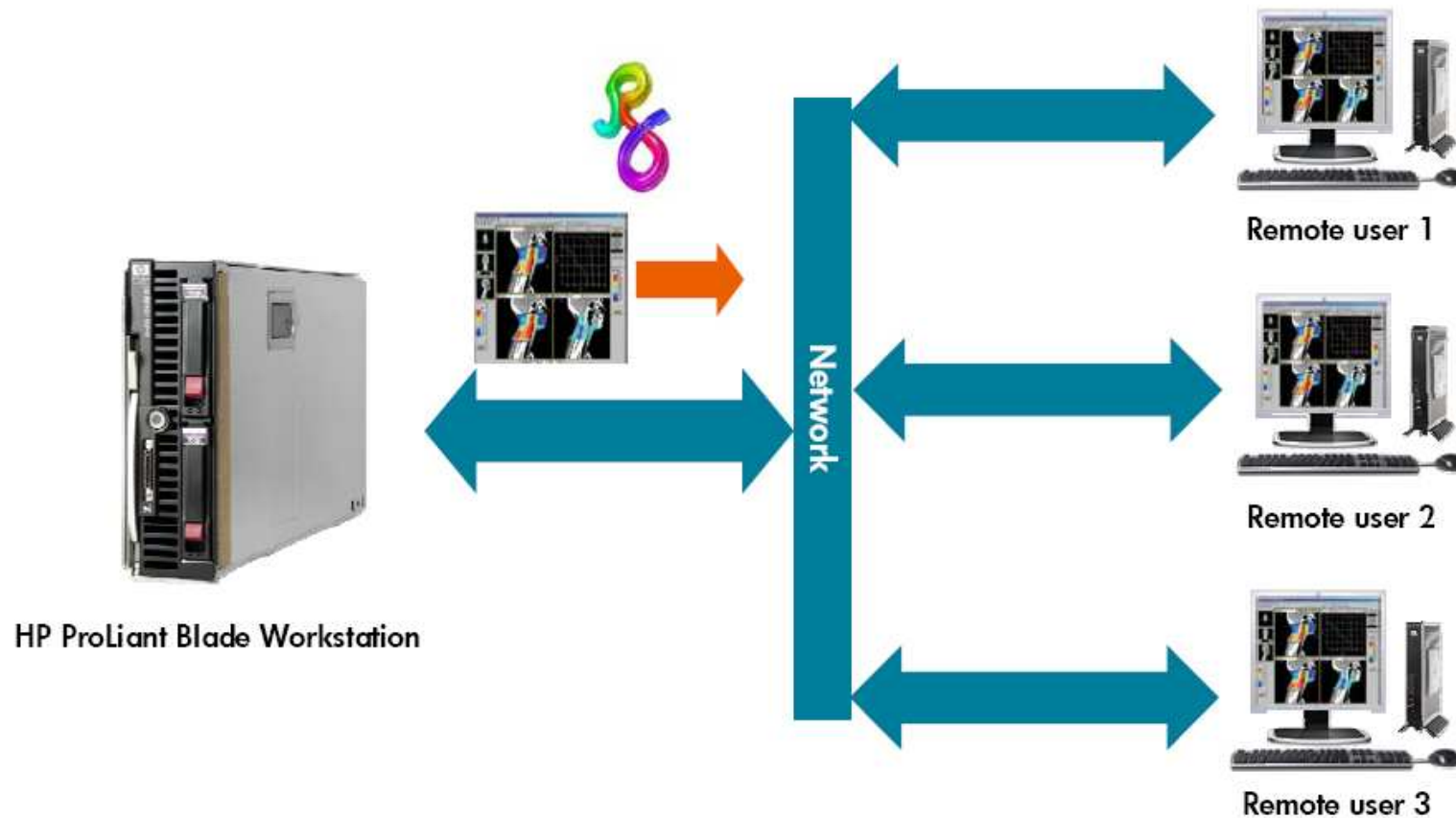


## Option 3 – Network Requirements of 10/100 Mb/s (testing required)



## Option 3 – Collaboration between clients

**Figure 12.** HP RGS can be used in a collaborative environment to share the desktop with remote users, all of whom can view and interact with the same application running on the blade workstation.



# Option 3 – Cost, Advantages & Disadvantages

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- **Advantages**
  - **Solves requirement and more, thus option 1 of upgrading network is not required.**
    - **No need to share drives to all clients, no conflicts of standardized network drives among company sites.**
    - **Constant performance based on minimal requirements of display transfers**
    - **Only display information passed through the network**
  - **Information in kept locally**
  - **Ease of maintenance**
  - **Can use existing basic PC's and removes the cost of local workstations and network upgrade (112 locally + 40 remotely) X \$6500 + \$403,000 = \$1,131,000 which constantly increases from \$6500 to \$83,000 for an additional user and or closet.**
  - **No downtime for PC updates and software upgrades, currently it takes 1 man day to refresh 1 workstation which corresponds to 1 lost day of productivity**
  - **Standardization – all users are locally assigned a basic MS Application desktop PC.**
  - **Scalability – incremental cost decrease as number of users increase**
  - **All intellectual property is kept locally and not on local desktops but maintained on the EVA.**

# Option 3 – Disadvantages

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- **Disadvantages**
  - **Initial cost and “new technology” (resemblance to mini mainframes)**
  - **Training required for support and maintenance**
  - **May not work for locations that have no network connectivity**
  - **Though the total cost decreases with the number of users, the user still has to have a basic desktop client (approximate cost is \$1200)**