Corporate Network Capacity Planning
- ‘Is There a Need?’

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Introduction

- Capacity planning - a review
- The challenges
- Methodology
- Conclusions
Capacity planning - a review

• **Evolution**
  • Techniques developed in mainframe environments
  • Variety of maturity levels

• **Today**
  • Mainframe environment
    • Data and tools are in abundance
    • Techniques are well known
    • Parallel Sysplex needs to be grasped
Capacity planning - a review

• Today
  • Distributed environment
    • Data and tools are scarce
    • Techniques need to be established
    • Many new technologies needs to be grasped

• Paradigm shift
  • Network vs Mainframe centric

• Responsibilities
  • Who is responsible?
  • Centralised or distributed functions
Why plan the network?

- End-user demand for consistent levels of service
  - Response, throughput and availability
- The required levels of service should form the basis of the performance goals
- Balance cost vs change vs service

Cost Service Change
Put another way ..... 

- What happens when network capacity is not managed?
  - Inconsistent service delivered
  - No balance
    - Costs out-weigh service delivered or vice-versa
  - Dissatisfied customers
  - Loss making organisation
  - Loss of customer base
  - Threat of out-sourcing
What needs to be managed?

- What is a corporate network?
  - Networking Hardware
    - Lines, bridges, routers, hubs and gateways
  - Workstations (PCs, MACS, UNIX Stations)
  - Systems (servers, midi and mainframes)
  - Operating systems (NT, OS/2, UNIX, Netware)
  - Applications
When is planning needed?

- Application development
- Introduction of service management
- Introduction of accounting/chargeback
- Corporate infra-structure changes
- System planning projects
- Network planning projects
Capacity planning the network

- **Who?** - Central or distributed functions
- **Why?** - Service delivery
- **What?** - Network centric
- **When?** - Change

“Who” and “What” are the differences
Characteristics of the network

• Interconnected network components
  • Bridges, routers, switches, gateways, servers, etc..
• Characteristics of each component
• Interoperability
  • Workstations sharing resources and applications
• Heterogeneity
• Distributed systems and applications
What are the challenges?

- Understanding the network infrastructure
- Current state of the network
- The cost of poor performance and unavailability
- What needs to be measured and why?
- Application growth
- Impact of change
- Reporting
- *Reality check* - *Sacrifice depth of analysis for breadth of knowledge*
How do we begin?

- Project/Methodological based approach
  - that includes the following ....
    - Scope analysis
    - Needs analysis
    - ‘Test-bed’ implementation
    - Production Implementation
    - Evaluation
    - Document

Cyclical steps
Methodology

• 6 stage approach
  1. Overall objectives
  2. Identify main components of network
  3. Identify current and potential problems
  4. Basic measurements required
  5. Implementation processes
  6. Reporting and action
1. Overall objectives

- Establish the reason for planning
- Probables ..... 
  - Cost management
  - Service Level Management
  - Control of Performance
  - Application re-development
  - Expanding the network

Establish an internal sponsor for the project!
Methodology (revisited)

• 6 stage approach

1. **Overall objectives**
2. Identify main components of network
3. Identify current and potential problems
4. Basic measurements required
5. Implementation processes
6. Reporting and action
2. Network infra-structure

- **MAN and WAN**
  - Services used (frame-relay, ATM, X25, ISDN)
  - Interconnecting hardware (bridges, routers, gateways, brouters, switches)
  - Applications (e-mail, mainframe access, telnet, ftp)
2. Network infrastructure

- **Local Area Network**
  - Topologies (bus, ring, ethernet, FDDI, token-ring)
  - Network operating systems (NT, UNIX, Novell)
  - Transport protocols (Netbui, TCP/IP, IPX, LU6.2)
  - Server configurations (file, database, print servers)
  - Segmentation devices (bridges, switching hubs)
  - Applications (e-mail, EIS, workgroups)
2. Network component design characteristics

- Devices
  - e.g. Bridges (‘forward or dis-regard’ action)

Segment ‘a’          Bridge          Segment ‘b’

Link from w/s 1 to ...... ..... w/s 2

Bridge decides to ‘forward’ or ‘disregard’ packets. Dependant on target LAN or segment activity
2. Network component design characteristics

• Operating systems
  • Peer based network operating systems (NOS)
    • Typically uses DOS based file allocation routines
    • File Allocation Table (FAT)
    • Slow and in-efficient
  • Server based network operating systems
    • Uses ‘re-direction’ instead of FAT routines
    • NOS intercepts data access
    • Hands data back to Workstation version of DOS
    • Transparent to the user and application
Methodology (revisited)

- 6 stage approach
  1. Overall objectives
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3. Problem analysis (current)

- Are there problems?
- What are the symptoms?
- Is there a probable cause?
3. Problem analysis (current)

- Establish perceived problems
- Prioritise and list
- Tackle the highest priority

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible problem</th>
<th>Probable solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Login times</td>
<td>Server bottleneck</td>
<td>Modify login process</td>
</tr>
<tr>
<td>High response times</td>
<td>General LAN over utilisation</td>
<td>Balance workloads</td>
</tr>
<tr>
<td></td>
<td>High level of network collisions</td>
<td>Segment the LAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Introduce switching hubs</td>
</tr>
</tbody>
</table>
3. Problem analysis (potential)

- Are there potential problems looming?
- How can these be identified?
  - Intermittent problems
  - Native reporting tools (local or remote)
  - Experience
Methodology (revisited)

• 6 stage approach

1. Overall objectives
2. Identify main components of network
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4. Basic measurements required
5. Implementation processes
6. Reporting and action
4. Required basic measurements

- Critical stage of methodology
- By now we know what metrics are required
- Categorise data requirements
- Based on ‘overall objectives’
4. Required basic measurements

- Types of data needed for capacity planning activities

<table>
<thead>
<tr>
<th>Data Category</th>
<th>Capacity planning categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation</td>
<td>Prediction, performance</td>
</tr>
<tr>
<td>Response</td>
<td>Prediction and service</td>
</tr>
<tr>
<td>Capacity</td>
<td>Capacity and accounting</td>
</tr>
<tr>
<td>Availability</td>
<td>Service</td>
</tr>
<tr>
<td>Throughput</td>
<td>Capacity, prediction and service</td>
</tr>
</tbody>
</table>
4. Required basic measurements

- Where do the metrics come from?
- Re-visit main components of network
- Do these components provide measurements?
  - Yes, but in what form?
  - Event or interval driven?
- Can this ‘disparate’ data be stored centrally for analysis ........?
- ..... how and what does this?
4. Required basic measurements

- Network management platforms
  - Most network administrators utilise such tools
  - Centrally managed geographic area of network
  - Already used as central point for ....
    - Alert and configuration management
    - Software distribution
    - Trouble ticketing
  - Can also be used as an integral component of network capacity planning data collection
4. Required basic measurements

- **Network management platforms**
  - Management Information bases (MIBs)
    - Object orientated agents (residing on routers, bridges, etc)
    - Event and/or alert driven
  - Data transported by management protocols
    - Simple Network Management Protocol (SNMP)
    - Common Management Information Protocol (CMIP)
  - MIBs provide a wealth of data.
  - But be careful .... they are not always useful for capacity planning activities!
4. Required basic measurements

MIB alert data presented on management station

MIB data centrally stored
Interval and event (alert) based

TCP backbone

Typical Network Management platform environment
4. Required basic measurements

- Other required data measurements
  - Operating system sources
    - General system health
  - Network sources (hardware probes)
  - Application based sources
    - Application layer measurements
    - Possibly the ‘key’ to end-to-end response
    - Measurements
Methodology (revisited)

- 6 stage approach
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  6. Reporting and action
5. Implementation

- ‘Test-bed’ implementation - (Pilot)
- Start ‘small’ and keep it simple
  - Attack a resolvable problem
  - A problem that is ‘measurable’ but has high corporate profile
  - e.g - WAN activity across connecting devices
- Test new or evaluating products at this stage (for data collection and reporting)
5. Implementation

- Implement data collection policies
  - MIBs, operating system & NOS logging
- Manage data centrally
  - Collection interval - daily, weekly ........
  - Consider bandwidth and storage utilisation
- Define reporting baseline
- Evaluate ‘test-bed’ implementation
Methodology (revisited)

• 6 stage approach
  1. Overall objectives
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  4. Basic measurements required
  5. Implementation processes
  6. Reporting and action
6. Reporting and action

- Define reporting baseline
  - Ensure reporting product provides all required functionality
  - Dependant on ‘main objectives’
  - Who should receive reports?
  - Reporting interval
  - Reporting requirements:
    - Technical - adhoc, in-depth based analysis
    - Managerial - regular reports, executive summaries
  - Reporting media?
6. Reporting and action

- Acting upon reporting and analysis
  - Performance prediction
  - Forecasting
  - Accounting

What is happening today?

Correct reporting!

Balance cost vs service

Predict and hit the centre!
Conclusions

• Corporate network capacity planning ....
  • Divorced from ‘day-to-day’ administrative duties
  • Consistent service delivery
  • Balanced computing environments
  • Potential Profit making organisation
  • ‘Retain and gain’ of customer base
  • Reduced threat of out-sourcing

‘Capacity Planning of the network is a required function’
Conclusions

• Capacity Planning Methodology summarised
  • Networking environments are complex
  • A formal approach is needed to succeed
  • 6 step approach
    • Establish overall objectives
    • Identify main components of network
    • Identify current and potential problems
    • Basic measurements required
    • Implementation processes
    • Reporting and action
Corporate goals rely upon excellent corporate communications.

Successful management of the network infra-structure is therefore vital for corporate growth.
Questions
Thank you for your attention

The SAS® System for successful decision making