Management of the World Wide Web

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How often do you see one of these messages?

```
This server does not have a DNS entry.
Host contacted. Waiting for reply...
Transfer interrupted.
100 % 87 kB transferred.
Document not found.
The server may not be accepting connections or may be busy.
Try connecting again later.
...
```

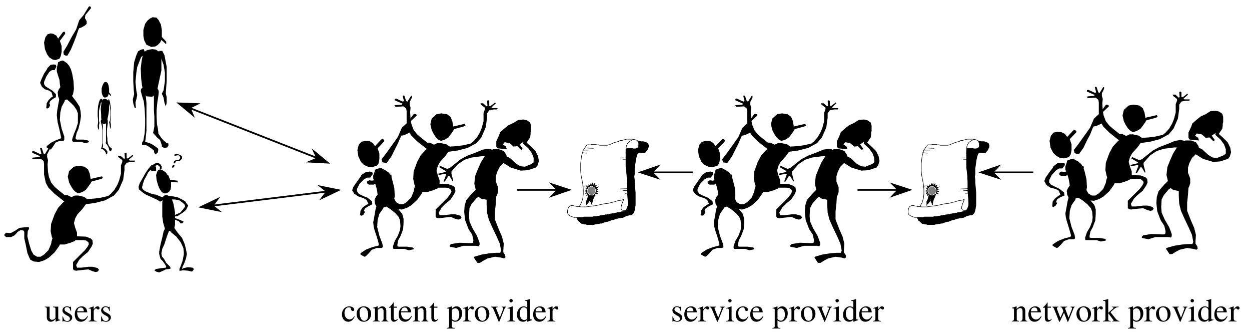
How often do you not get a free line when picking up the phone?

$\Longrightarrow$ Increasing the availability of Web services is a major challenge for the next years if the Web is expected to play a role similar to todays telephone systems.

Analysis of Management Information Requirements:

- Identify groups of users that are interested in management information.
- Identify the management information needs for each group.
- Identify available management information sources.
- Analyze how well the information sources fit the needs.

Groups, Relationships and Roles



Management Information Requirements

- Content Provider:

CP1	Document access statistics for selected documents (page views).
CP2	Document access pattern for selected documents (path statistics).
CP3	Browser capabilities (browser types, browser capabilities).
CP4	Service availability and downtime distribution.
CP5	Average service response times and error rates.

- Network Provider:

NP1	Availability of the network and the network elements.
NP2	Connectivity to other IP network provider.
NP3	Traffic flows and traffic characteristics.
NP4	Network utilization and protocol specific error rates.
NP5	Subnetwork and network element specific status information.

Management Information Requirements

- Service Provider:

SP1	CPU usage for capacity planning and fault detection.
SP2	Disk space usage for capacity planning and fault detection.
SP3	Network usage for capacity planning and fault detection.
SP4	Availability of the overall server system(s).
SP5	Availability of the processes that make up the server(s).
SP6	Number of transactions handled by the server(s).
SP7	Number of successful and failed transactions.
SP8	Authentication and access control monitoring.
SP9	Error notification and error logging.
SP10	Overall availability of the local IP network (percentage).
SP11	Connectivity to selected IP network provider.
SP12	Network usage and network utilization.
SP13	Response times to selected IP network provider.

Sources of Management Information

- ICMP

  Simple and most reliable way to test the reachability of Internet hosts.

- MIB-2

  Some network traffic related counters, information about TCP connections.

- RMON

  MAC layer network traffic statistics on a (local) network segment.

- RMON2

  Application layer network traffic statistics on a (local) network segment.

- HR-MIB

  Information about typical host components (storage devices, running processes).

- NSM-MIB

  Information about applications that provide network services (mail, dns).

Sources of Management Information

- SYSAPPL-MIB

  Information about files that make up an application and the currently running or recently finished applications and application elements (processes).

- APPL-MIB

  Resource usage information for application elements (number of open files and network connections, transaction and response time statistics).

- WWW-MIB

  Statistics concerning the protocol underlying a WWW service, short-term statistics about actions invoked on documents.

- Log-File Analyzer

  Programs to create various statistics out of log-files created by WWW server software. Often in combination with a CGI Interface.

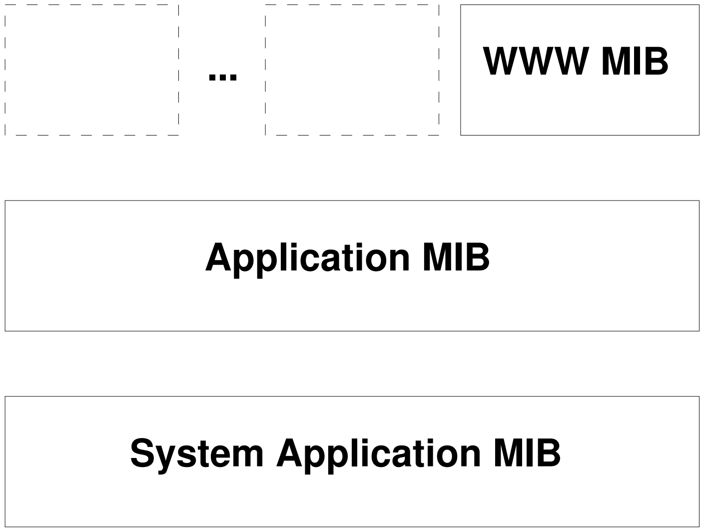
- Server Management Modules

  Special software modules in a WWW server to calculate some statistics about server performance etc. Output usually as a document served by the server.

WWW-MIB History:

September	1995	Interested people formed the HTTP-MIB mailing list
April	1996	BOF (35. IETF, Los Angeles)
June	1996	Pushing hard to make it an IETF effort (36. IETF, Montreal)
November	1996	Applicability of standard MIBs document (RFC 2039)
		Join with the Application Management WG
December	1996	First Internet Draft (used RMON2 time filter)
December	1997	Meeting of the WG (37. IETF, San Jose)
February	1997	Second Internet Draft
March	1997	Third Internet Draft (change of format)
April	1997	Meeting of the WG (38. IETF, Memphis)
June	1997	Fourth Internet Draft (simplified document statistics)
July	1997	Fifth Internet Draft
August	1997	Final meeting of the WG (39. IETF, Munich)
September	1997	Latest Internet Draft (draft-ietf-applmib-wwwmib-05.txt)

Application Management Framework



service oriented
requires application instrumentation

process/service oriented
requires application instrumentation

process oriented
requires no application instrumentation

The (final ?) WWW Services MIB

- Service Information Group
- Protocol Statistics Group
- Document Statistics Group

Abstract Document Transfer Protocol

- The abstract DTP uses request/response interactions.
- Every request has a request type field (OCTET STRING).
- Every response has a response type field (INTEGER).
- A single request can result in multiple responses. The "primary" response for a request must be identifiable.
- Mappings defined for HTTP and FTP. Additional mappings can be defined in the future.

Document Statistics

- Tradeoff between memory usage, server overhead, network bandwidth.
- Solution: Statistics are collected over configurable time intervals (buckets).
- Focus on statistics for short-term operational purposes and not for long-term (accounting) purposes.
- Avoid document management via SNMP - other protocols are much better for this purpose.

Evaluation

- Content Provider:

	CP1	CP2	CP3	CP4	CP5
SYSAPPL-MIB				X	
WWW-MIB	(X)				
ANALOG	(X)	(X)	X		(X)
APACHE					(X)

- Network Provider:

	NP1	NP2	NP3	NP4	NP5
ICMP	X	X			
MIB-2	X			X	X
RMON-MIB			X	X	X

Evaluation

- Service Provider:

	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	SP-8	SP-9	SP-10	SP-11	SP-12	SP-13
ICMP										X	X		X
MIB-2			X							X		X	
RMON-MIB			X									X	
HR-MIB	X	X		X	X								
NSM-MIB						X							
SYSAPPL-MIB				X	X								
APPL-MIB				X	X	X							
WWW-MIB						X	X		X				
ANALOG			(X)			X	X		(X)				
APACHE					(X)	X							

Summary

- IETF MIBs provide quite a bit of management information to detect operational problems.
- None of existing specifications deals with authentication and access control monitoring.
- Support for the content provider is relatively small.
- Log-file analyzer are very attractive for content provider (cheap, easy to use, complex queries).
- Built-in management modules are very interesting for configuration management, but have limited use for monitoring the health or performance of WWW servers.
- Different approaches will and should coexist to address the needs of the different user groups.