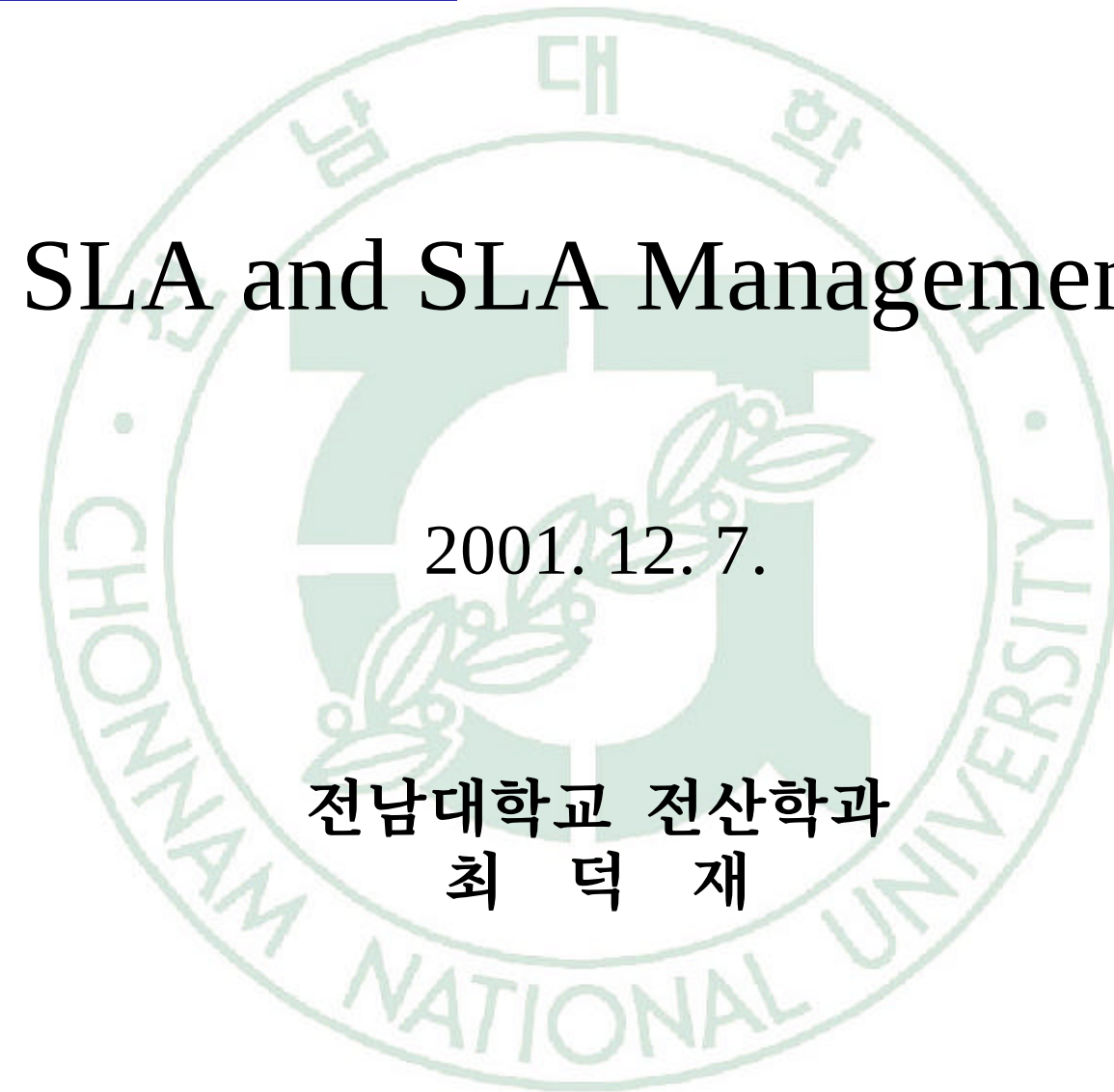


KNOM2001

SLA and SLA Management

2001. 12. 7.

전남대학교 전산학과
최 덕 재





발표순서

✍ SLA 정의

✍ SLA Data Model

✍ IRTF AAA(Authorization Authentication Accounting) Architecture
Research Group

✍ Type of SLA

✍ Application Availability

✍ SLA Management

✍ SLA Parameters Measurement

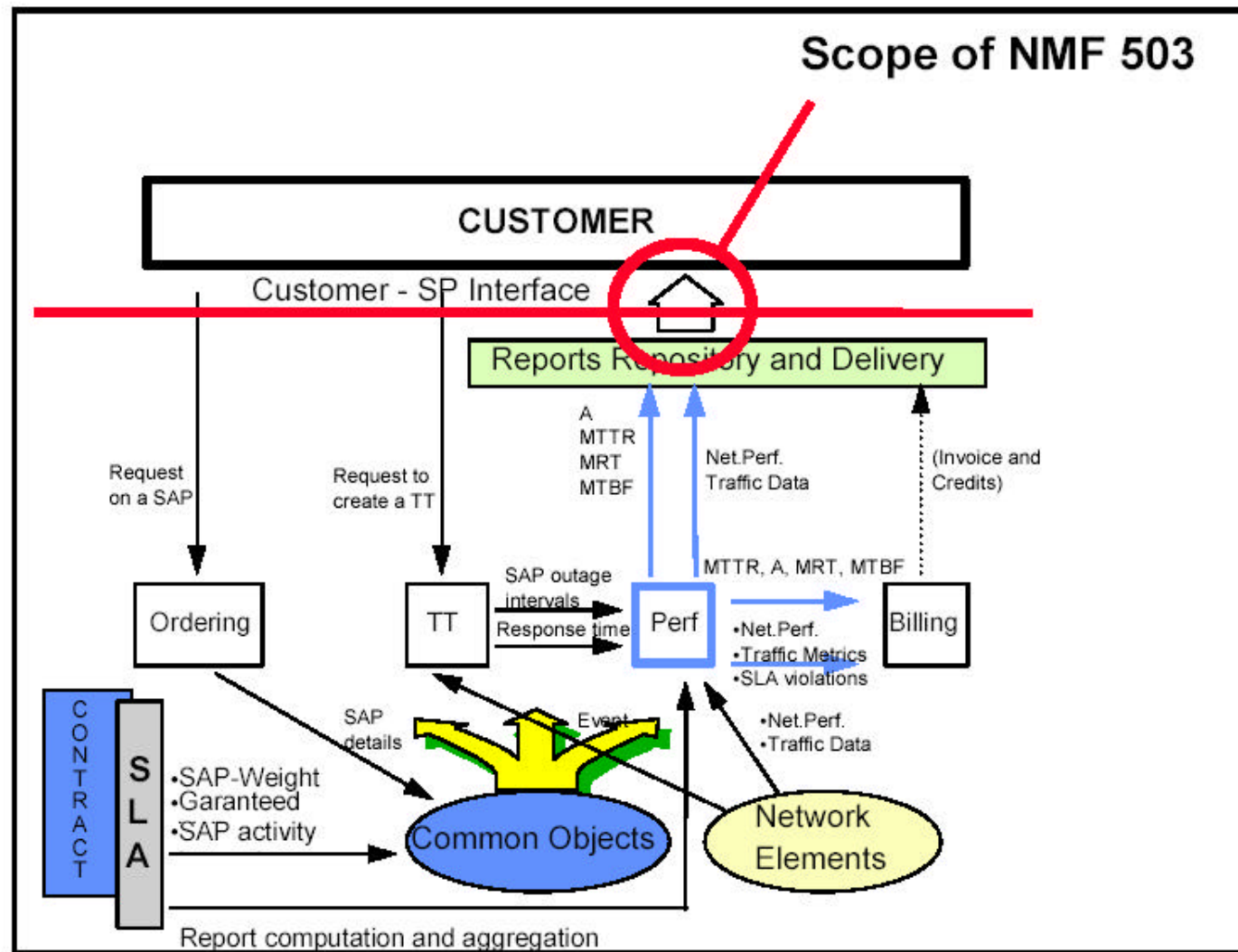


SLA 등장배경

- ✍ 통신시장의 자유경쟁
 - ✍ 개방화와 규제 철폐
 - ✍ 민영화
- ✍ 통신서비스의 분할
- ✍ 서비스의 차별화
 - ✍ 인터페이스 자동화
 - ✍ 사용자 중심의 서비스 관리
 - ✍ NMF Business Process Model

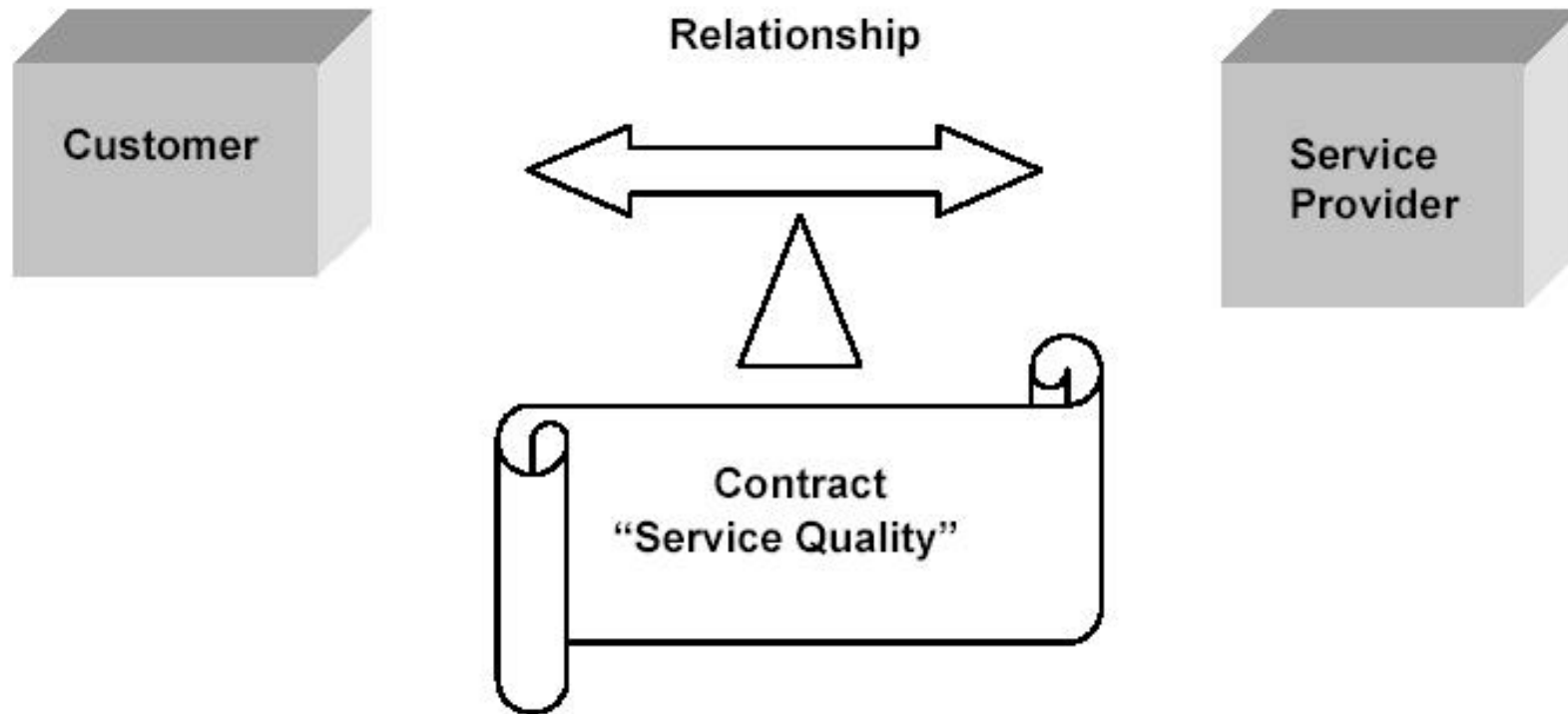


NMF Performance Reporting





SLA 정의





SLA 정의

- ✍ Define the role of SPs and their customers, removing ambiguity from the business relationship and bringing clarity to the marketplace
- ✍ Define the complete set of responsibilities and obligations of a SP and the users of that service
- ✍ Define the services provided, the supported products, the performance levels, measurement and reporting criteria, appropriate quality standards
- ✍ TMF: A set of appropriate procedures and targets formally or informally agreed between NOs/SPs or between NOs/SPs and Customer, in order to achieve and maintain specified QoS in accordance with ITU recommendation



Business Benefits

- ✍ Customers – Cost of service outage
 - ✍ SLA will make user happy
- ✍ SPs – the stronger the SLA, the stronger the SP & Reliability
 - ✍ SLA will results in higher service levels
 - ✍ Penalty clauses in an SLA will guarantee service levels



전통적인 SLA 구조

✍ Network-level SLA

✍ Customer < -- > ISP or Telecom SP

✍ Internet Access, Transparent LAN, VPN 등

✍ Parameters

✍ Network 가용성

✍ 복구시간 등 Fault Management 관련 컴포넌트

✍ 서비스 Provisioning 등 Configuration Management 관련 컴포넌트

✍ 응답시간 등 Performance Management 관련 컴포넌트

✍ billing 등 Account Management 관련 컴포넌트

✍ 계약위반에 따른 보상 관련 컴포넌트 등



SLA 확장

✍ 다양한 SP들의 등장

✍ ASP, HSP, MSP 등

✍ E-Business Outsourcing Value Chain

✍ 부족한 IT 인력 해결

✍ 저가의 고품질 자원이용

✍ 새로운 서비스의 빠른 상품화

✍ 위험부담 감소



SLA 확장

✍ Extended SLA

✍ ASP IC(Industry Consortium)

- ✍ More than 700 members in 30 countries on five continents

✍ 2000-2001년 SLA 설문조사

- Outsourcing Value Chain에 관련한 명확한 책임규명을 제시하고, e-Business를 성공으로 이끄는 최선의 방법

✍ NextSLM

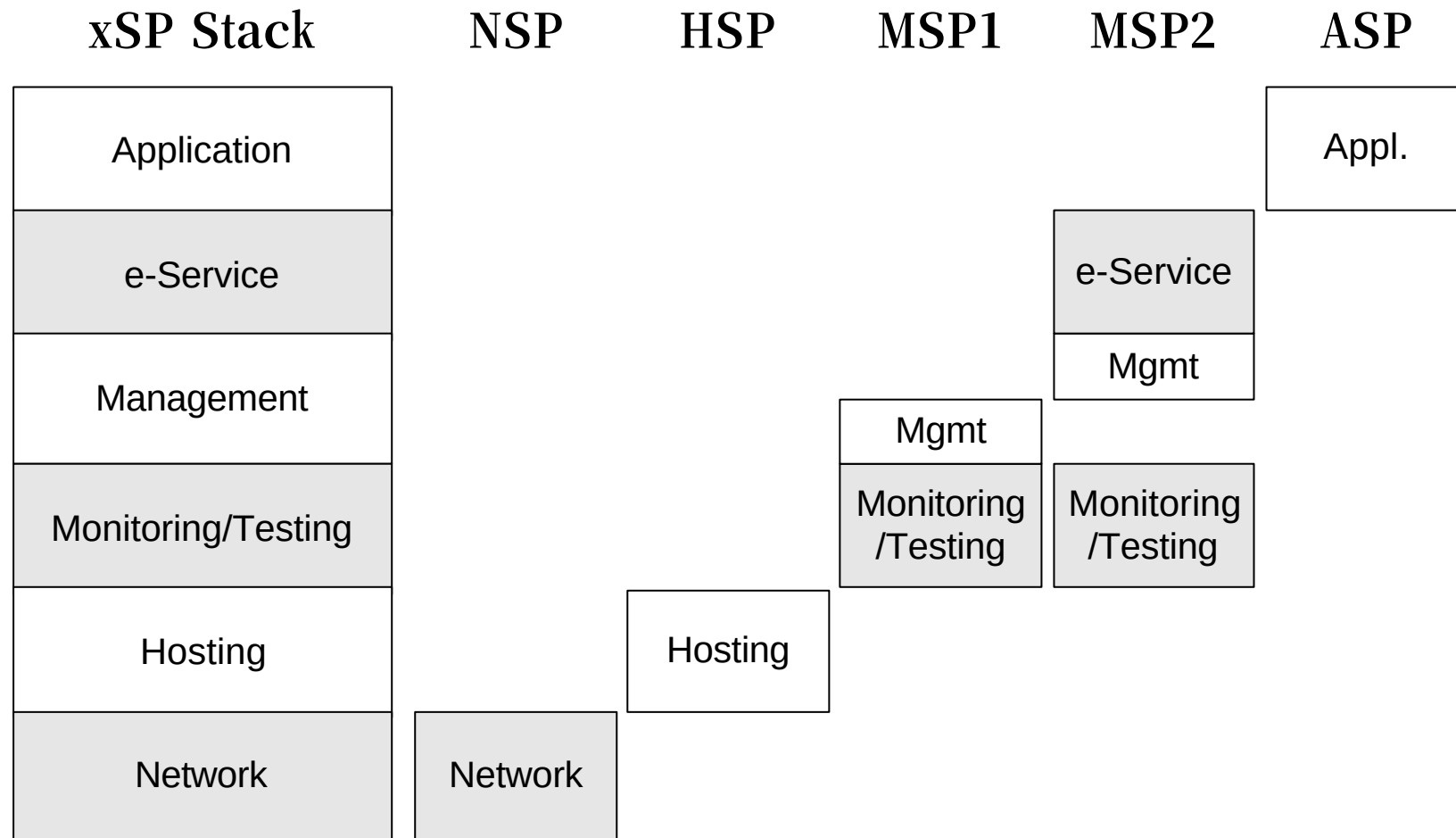
- ✍ A learning community sponsored by BMC Software, Enterprise Management Associates, Sun Microsystems, and PricewaterhouseCoopers.

- ✍ Templates for building SLA

- ✍ Guidelines for the process of negotiating a SLA



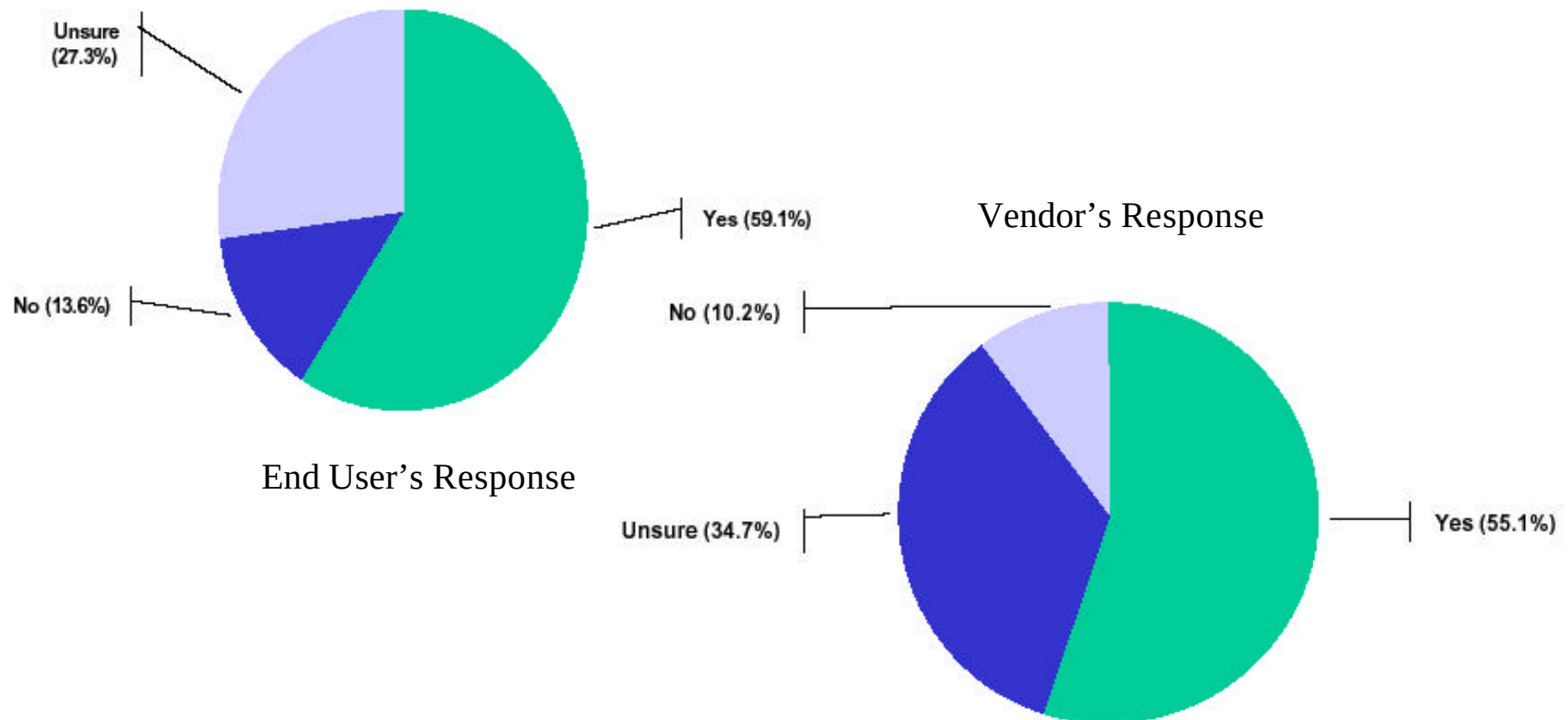
E-Business Outsourcing Value Chain





ASP IC – WhitePaper

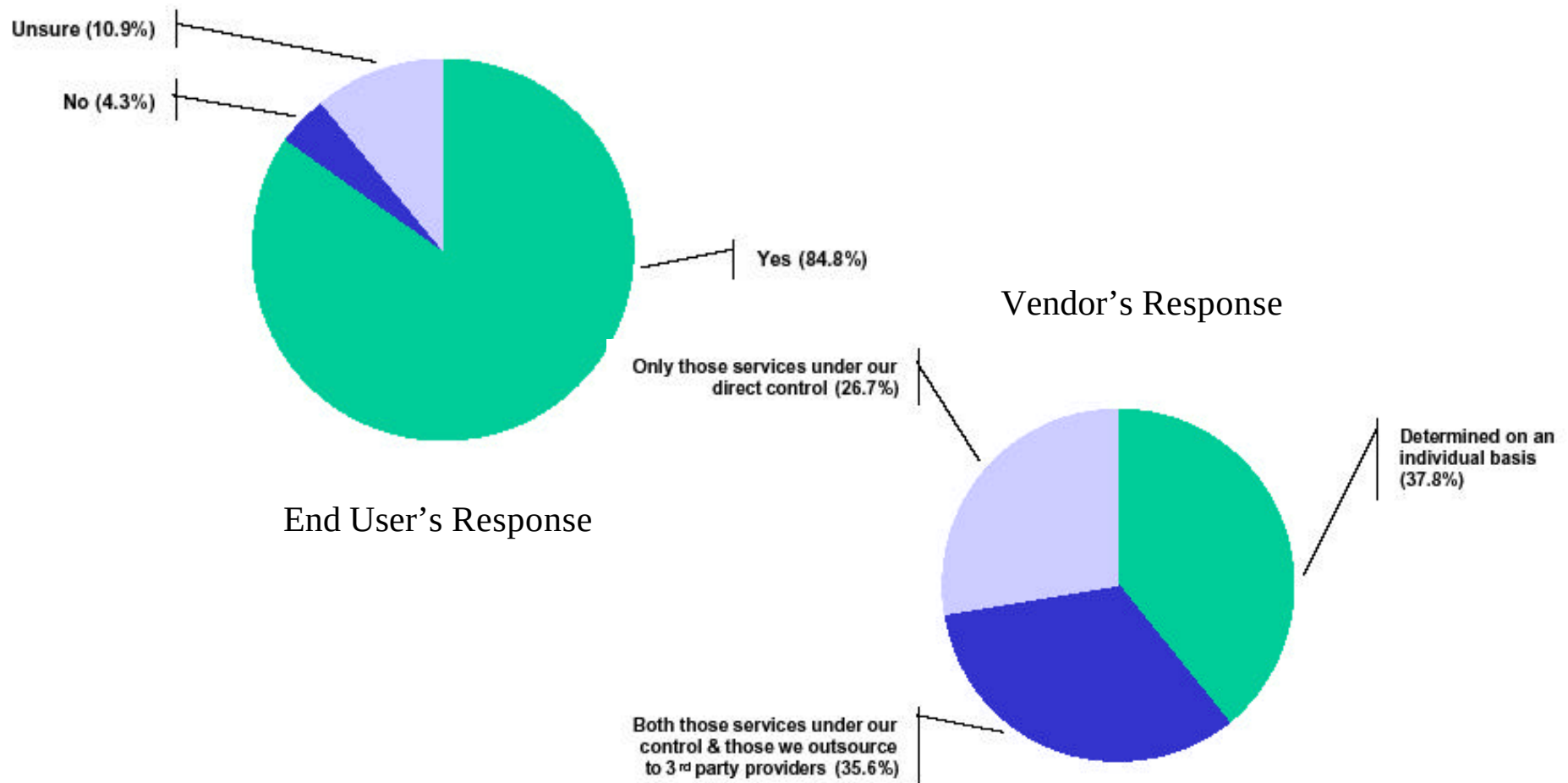
✍ Are SLAs the best way to ensure that outsourced applications/networks/systems work to the satisfaction of all involved parties?





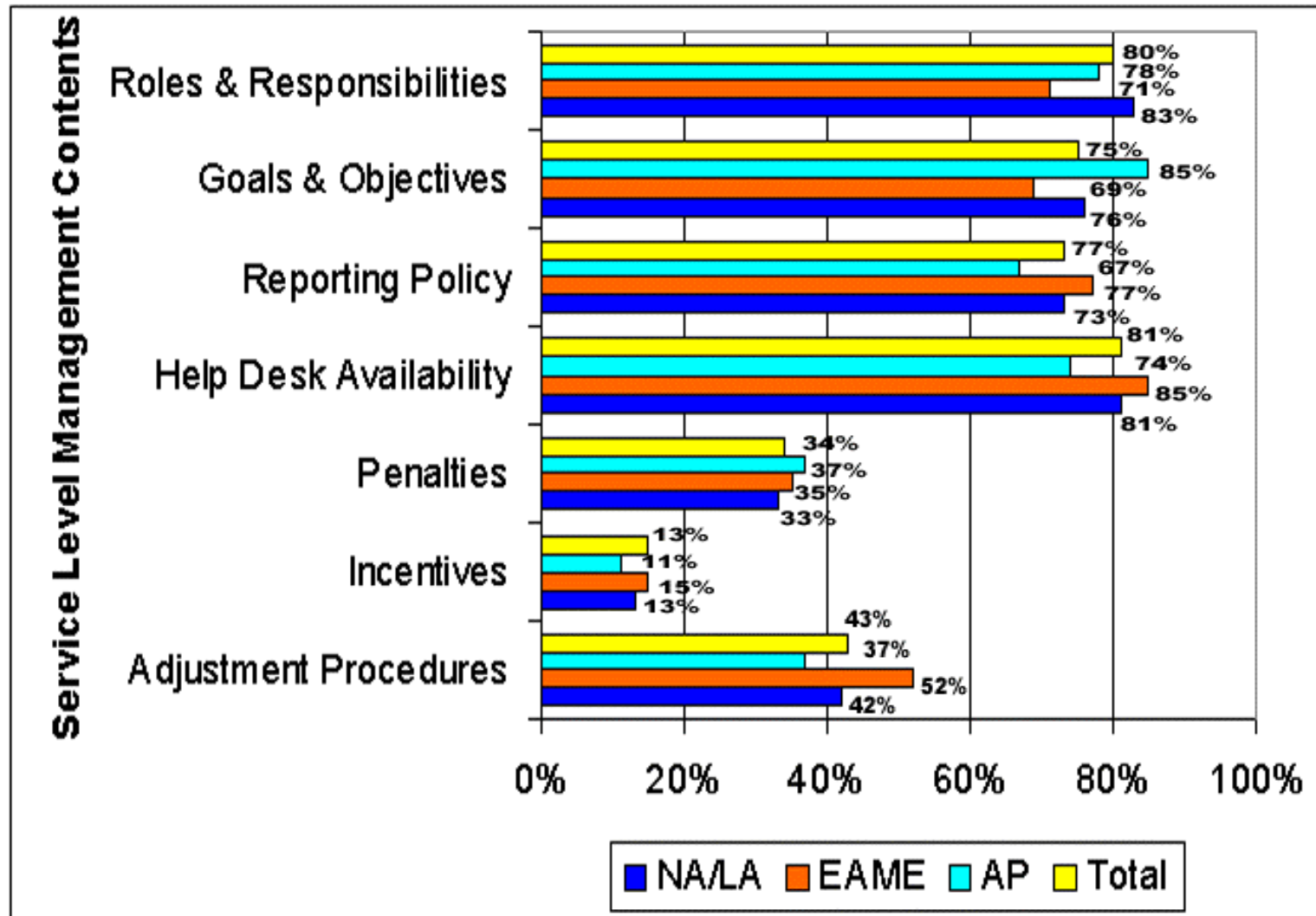
ASP IC – WhitePaper

✍ Do you expect an ASP to manage all their SPs to meet SLA?



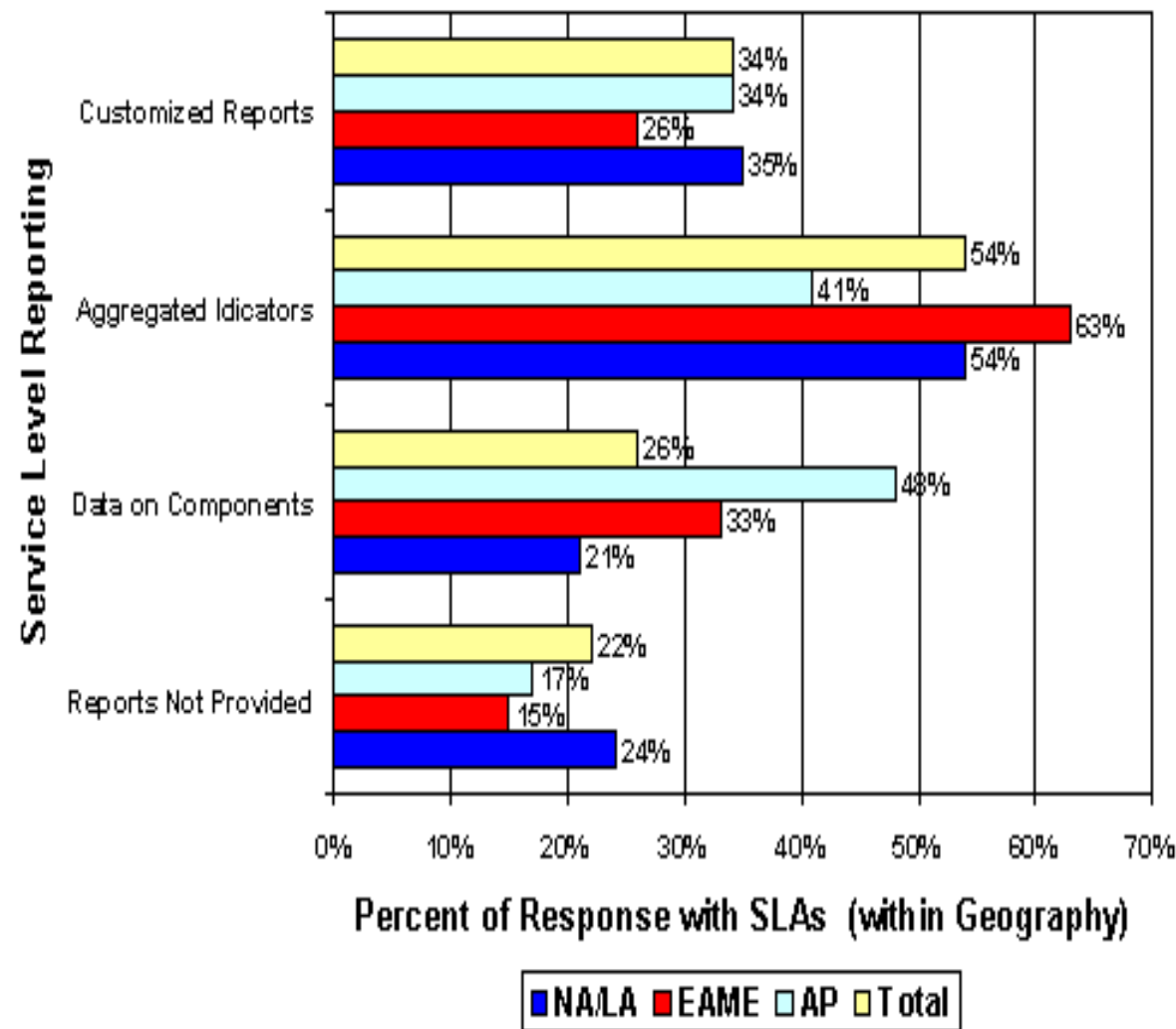


NextSLM – Global Survey 2001





NextSLM – Global Survey 2001





SLA Data Model

✍ General clauses

- ✍ Goal of the agreement
- ✍ Parties involved
- ✍ Duration and validity of the agreement
- ✍ Responsibilities of the parties involved
- ✍ Guarantees, warranties
- ✍ Dispute handling
 - ✍ Dispute Avoidance & Resolution
- ✍ Maintenance of the agreement
- ✍ Cost involved



SLA Data Model

✍ Services and service levels

- ✍ Service description

- ✍ Entities involved

- ✍ Service levels

 - ✍ SLA Parameters

 - Technology-specific, Service-specific, Technology/Service-independent

✍ Specific clauses

- ✍ Financial handling

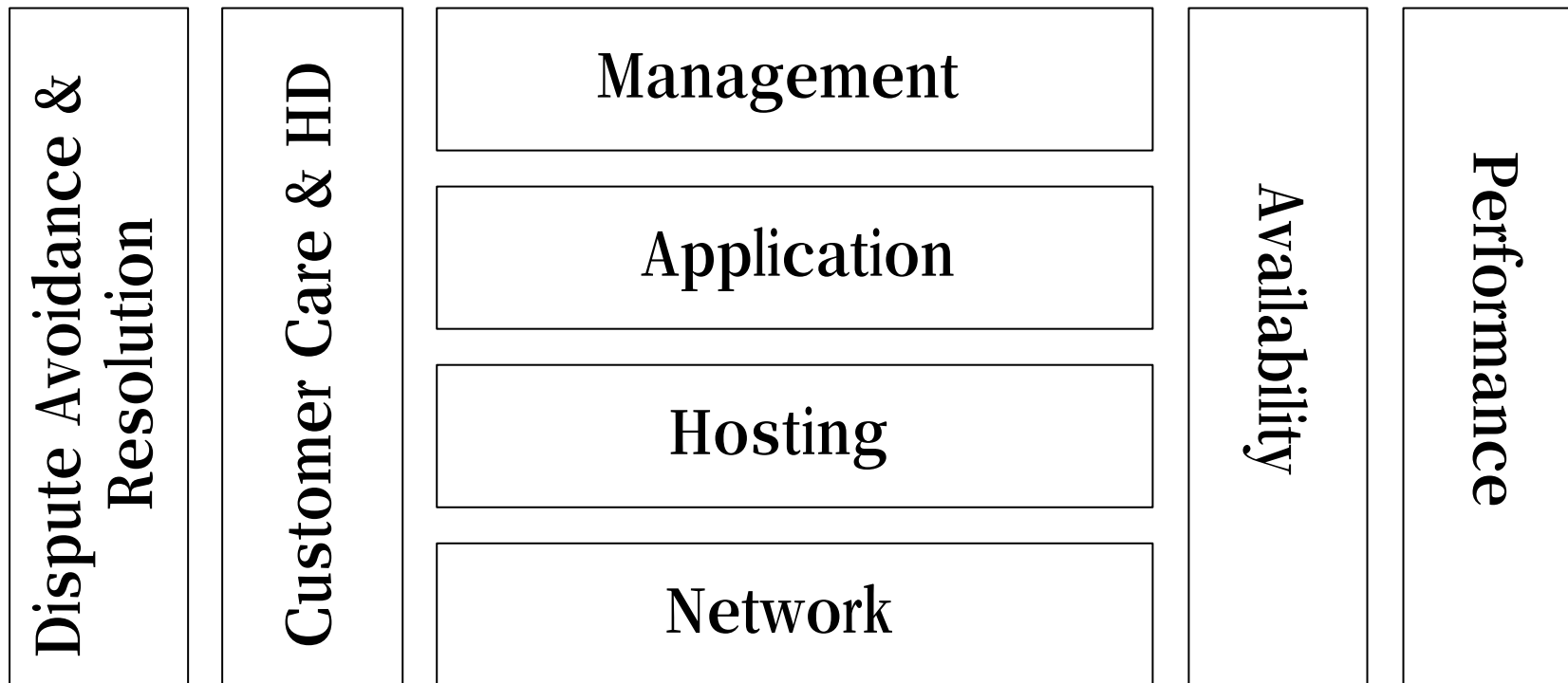
- ✍ Reporting

- ✍ Point of contacts

- ✍ Activities

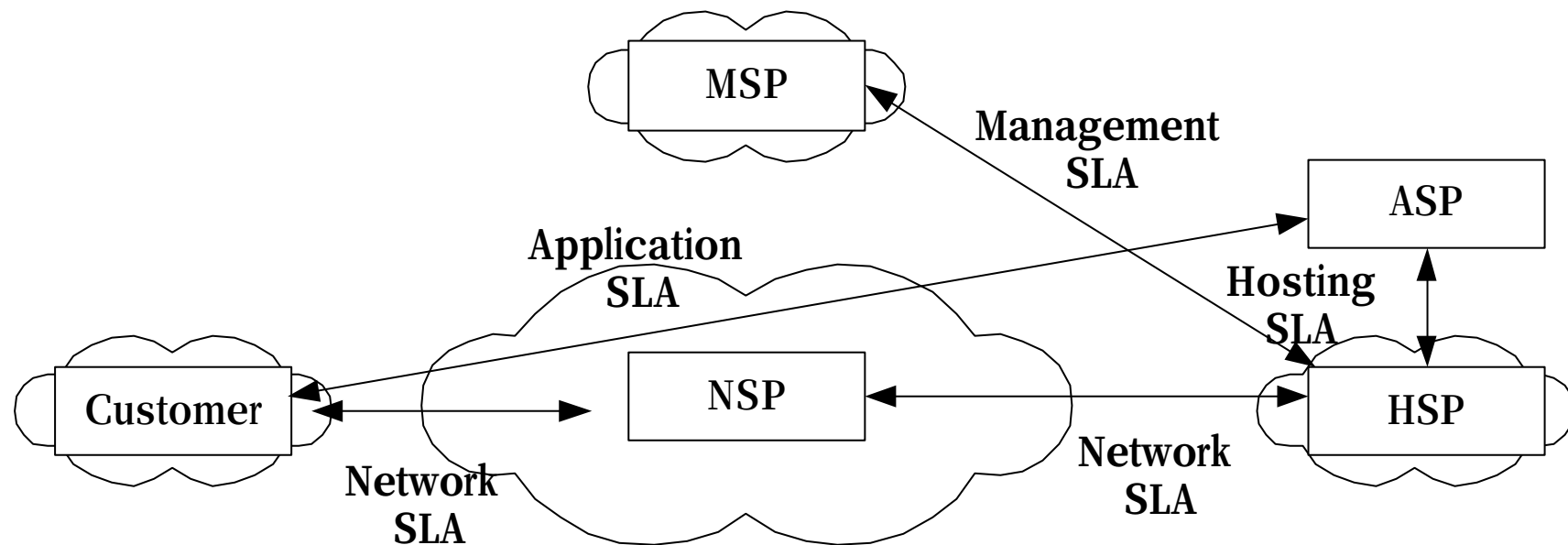


Type of SLA





SLA 구조 in Value Chain





Network-level SLA

✍ Network Characteristics Components

✍ 망을 구성하는 물리적 요소, 망 디자인 등의 infrastructure 특성을 기술하기 위한 component

✍ Network Availability, Network Throughput

✍ Network Equipment and Architecture

- Redundancy

- » How is network redundancy provided?

- Network Growth

- » When will the network equipment be obsolete?

- » How is it being upgraded and replaced?

- » What are the NSP expansion plan?

- Peering

- » What is the network's reach?

- » What if I want to extend my service to a new customer site or a new branch office location?

- » What happens if I want to work with a site located outside the NSP footprint?

- » What peering relationships does the NSP have with other NSPs to deal with this?



Network-level SLA

✍ Security Components

✍ 데이터의 안전한 전송을 위하여 암호화 기술 등의 보안 메커니즘을 기술하기 위한 component

✍ Authentication, Privacy, Encryption, Key Management

✍ Security Performance

- Impact on throughput when encryption is enabled
- Impact on implementing network security on QoS



Network-level SLA

✍ Network Connection Component

✍ Network Service Customer가 사용하는 Network Connection에 대한 특성을 기술하기 위한 component

✍ Bandwidth, Data Loss

✍ Latency(or Delay)

- Real-time, interactive application like voice: $\leq 100\text{ms}$
- Web-surfing: $\leq 250\text{ms}$

✍ Service and Support component

✍ 망의 신뢰성을 높이기 위해 제공되는 기능을 기술하기 위한 component

✍ Response times for problem resolution, reaction time, restoration time

✍ Network outage planning



Hosting-level SLA

✍ System Hosting View

✍ Server Availability Component

✍ 서버의 다운을 초래하는 하드웨어 failure, 파워 failure 등의 문제를 정의하여 일정기간동안 측정된 서버의 Uptime percentage

✍ Backup Services and Media Rotation Component

✍ 데이터의 백업, 파일의 복구 등의 계획된 스케줄에 의하여 처리되는 percentage

✍ Server Management Component

✍ Capacity관리, 소프트웨어 유지보수, 계정관리, 보안서비스 등에 대한 규정

✍ Web/Application Hosting View

---> Application-level SLA



Application-level SLA

✍ Per-site Application Availability Component

- ✍ Site Availability and Application Availability

✍ Application Performance Component

- ✍ Application Latency, Throughput

✍ Application Security Component

✍ Application Management Component

- ✍ Mean Time-to-Service Provisioning and Restoration

- ✍ Software Management/Version Control



Dispute Avoidance & Resolution

✍ The source of the largest number of disputes is likely to be the gap between the actual performance by an ASP and the performance expected by the end user/customer based on the terms of the underlying SLA

✍ Dispute Avoidance

✍ Well-negotiated and Well-draft SLA

✍ Dispute Resolution Mechanism

✍ Negotiation

✍ Mediation

✍ Arbitration



Customer Care/Help Desk

✍ Refer to a point of contact for customers who seek point-solution assistance

✍ Availability

✍ Average Speed of Answer, Average Hold Time, Abandonment Rate, Speed of Email Acknowledgement

✍ Responsiveness: a state of reacting quickly and appropriately to end user or NOC requests

✍ Contact Method(telephone, email, web), Priority of the Problem, Source of the Problem

✍ Customer Satisfaction

✍ Customer Satisfaction Rating



Management-level SLA(?)

☞ Customer Network/System/Service에 대한 접근



Application Availability

✍ Definition

✍ General Availability

✍ Simply the probability that the system will be available when demanded, and it depends on both the reliability and reparability of the system

– Time Running / Time Measured

✍ NMF701 Service Availability

✍ A measure of the fraction of time during a defined period when the service provided is deemed to be better than a defined QoS threshold

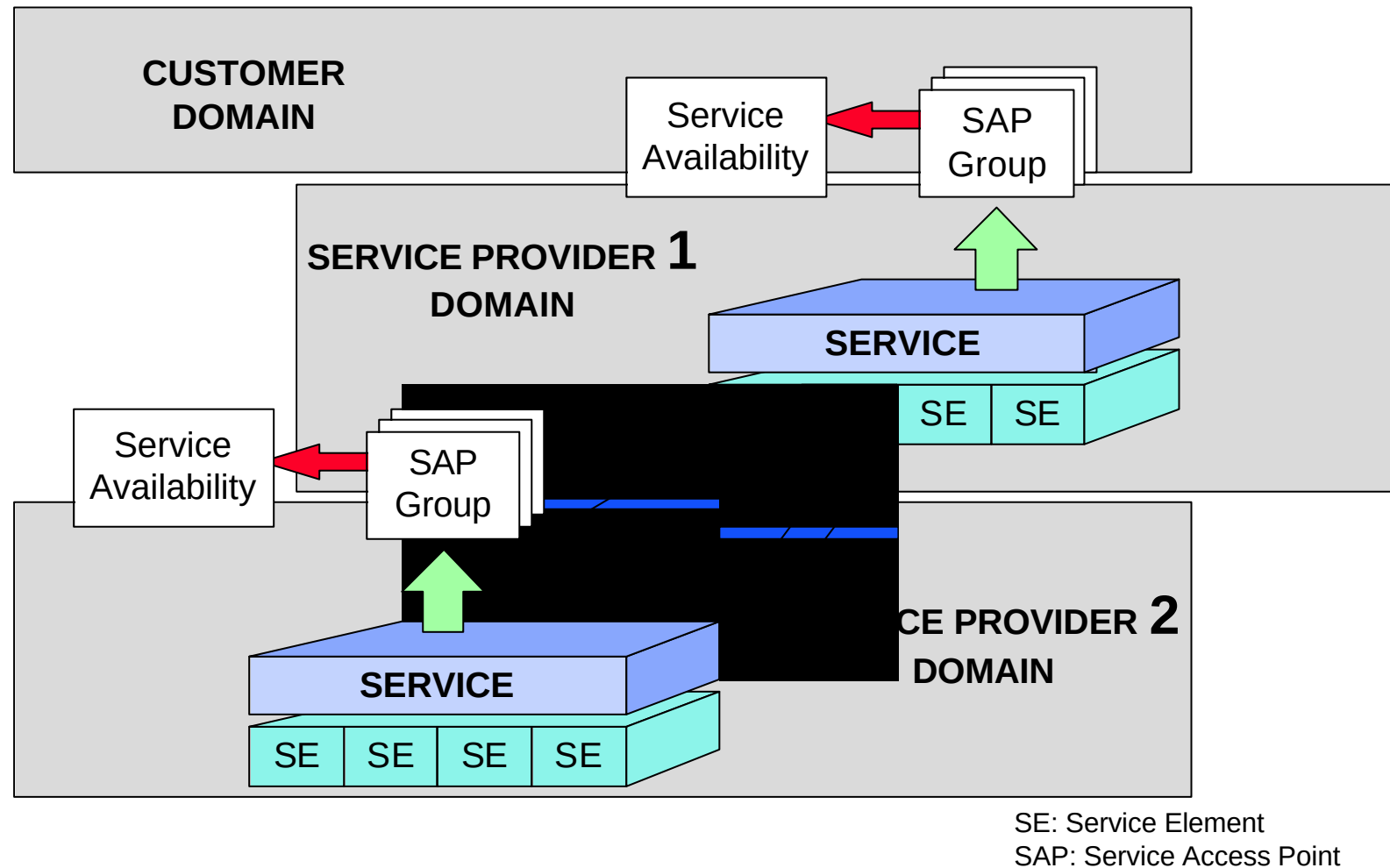
✍ David M. Fishman, Sun Microsystems

✍ Continuous application access with predictable performance

– User's QoE(Quality of Experience) become the most useful place to measure application availability.

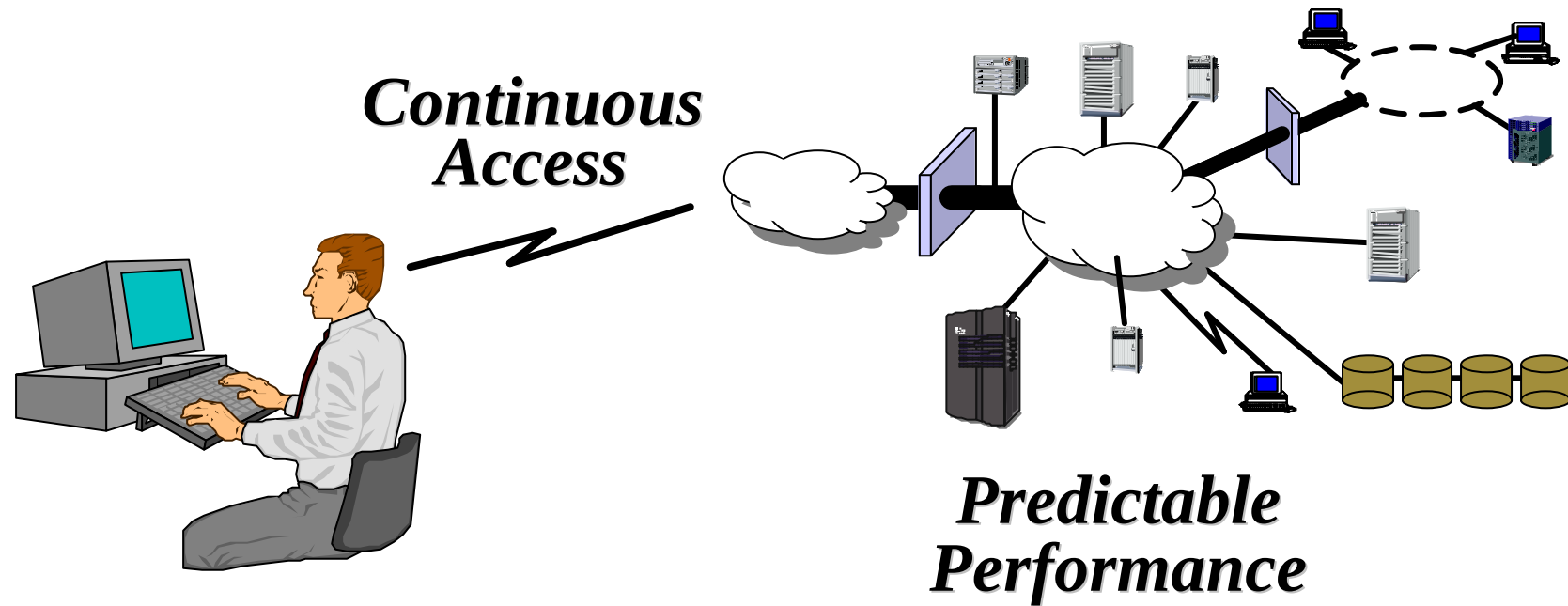


Application Availability





Application Availability





Application Availability

$$\text{A(Availability)\%} = 100\% - \text{UA(UnAvailability)\%}$$

$$\text{UA\%} = \frac{\text{? Outage Interval}}{\text{Activity Time}} \times 100 \%$$

$$\text{UA\%} = \frac{\text{? (Outage Interval X SDF)}}{\text{Activity Time}} \times 100 \%$$



Application Availability

✍ SDF(Service Degradation Factor)

- ✍ Determine whether an event affecting the service at the SAP is causing a complete service outage(service fully unavailable) or a partial service outage(service degraded available)

Service Degraded Factor Agreed Value	Event Type
1	Service Fully Unavailable
0.8	Outage Type A
0.6	Outage Type B
0.5	Outage Type C
...	...
0	Service Considered Available



Application Availability

✎ For each SAP

$$UA\% = \frac{\sum_{\text{for each SAP}} \left[\text{SAP Weight} \times \left(\text{SAP Outage Interval} \times \text{SDF} \right) \right]}{\sum \left(\text{SAP Weight} \times \text{SAP Activity Time} \right)} \times 100 \%$$



Application Availability

AVAILABILITY MEASURE	DOWNTIME PER YEAR	DOWNTIME PER WEEK
98%	7.3 days	202.15 minutes
99%	87.6 hours	101.08 minutes
99.5%	43.8 hours	50.54 minutes
99.8%	1,052 minutes	20.22 minutes
99.9%	526 minutes	10.11 minutes
99.95%	4.38 hours	5.05 minutes
99.99%	53 minutes	1.01 minutes
99.999%	5 minutes	6.00 seconds



Application Availability

✍ Availability IQ

- ✍ Do you know the true cost of your unplanned downtime?
- ✍ Have you calculated the cost of your planned downtime?
- ✍ Is it difficult to trace the causes of your outages?
- ✍ Are you struggling to hit critical availability targets?
- ✍ Do you have a strategic availability plan in place?
- ✍ Can you develop solid data to justify availability investments?



Application Availability

✍ Cost of Downtime

- ✍ One hour of downtime cost a telecom company nearly US\$500,000
- ✍ A utility company lost 25,000 staff hours from 0.1% system downtime
- ✍ Just 4 hours of cargo operation downtime cost an airline US\$2 million

(Source: Trend Consulting)



Application Availability

✍ Availability Components

✍ System-Level

✍ Software, OS, Hardware

✍ Network-Level

✍ Client, Internet, Server Network

✍ Application-Level

✍ Application Client

✍ Web Server, DBMS

✍ Application Server

✍ Management-Level

✍ IT Management Software

*Availability is only as strong as the weakest
Component*

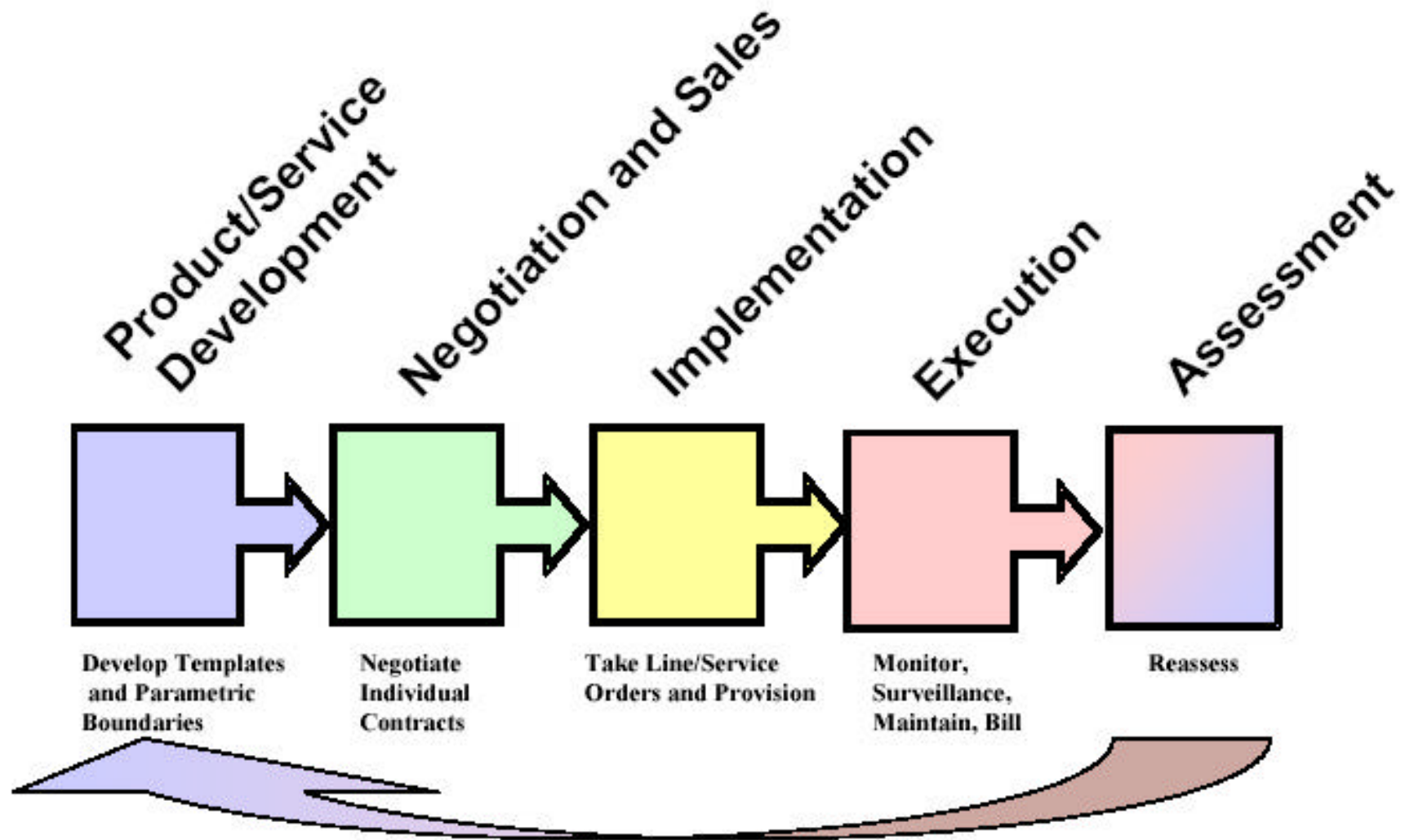


SLA Management

- ✍ SLA Life Cycle
- ✍ SLA Management Processes
- ✍ SLA Management Functions in TOM

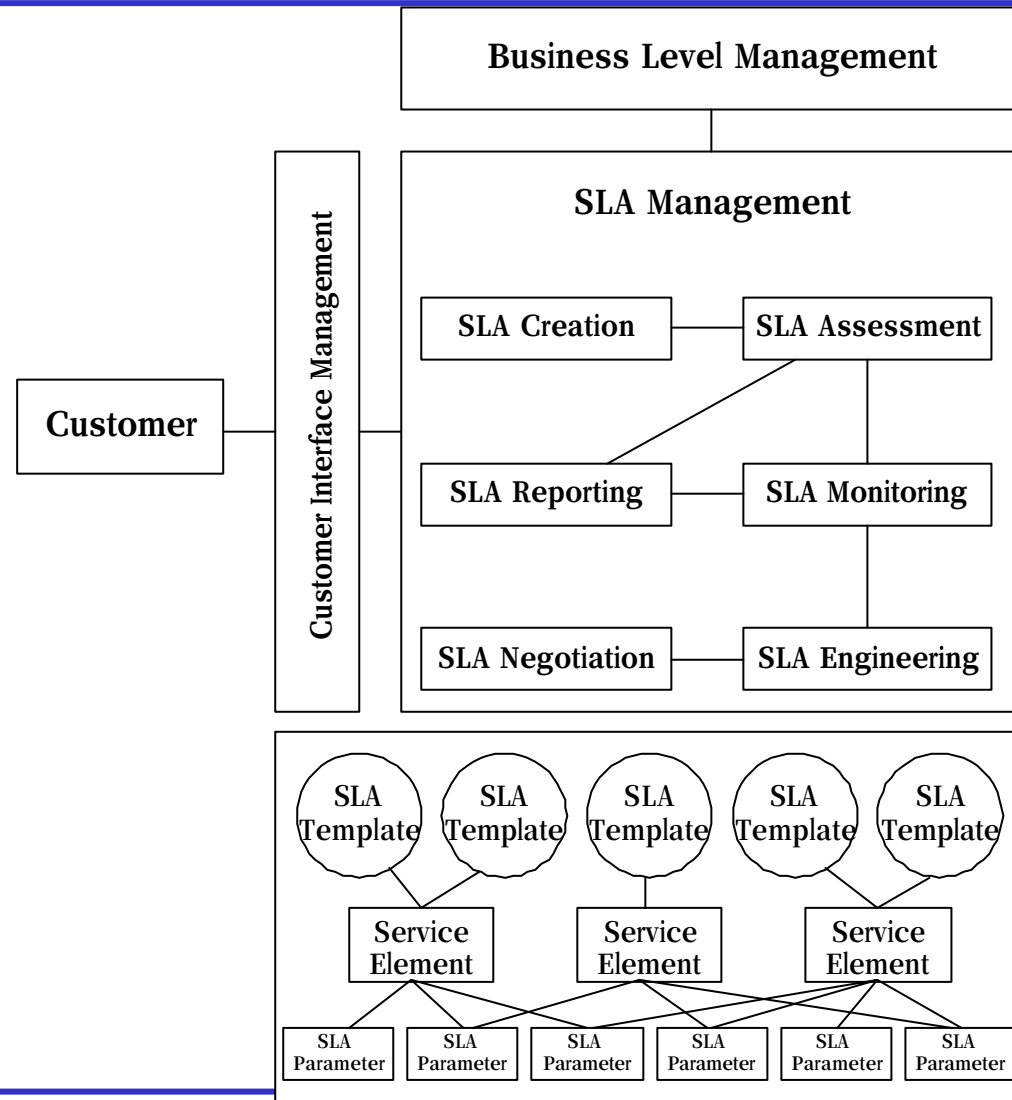


SLA Life Cycle





SLA Management Processes





SLA Management Processes

✍ SLA Creation

- ✍ 고객의 요구나 서비스 제공조건의 개선, 현재 SLA 문제 개선 등으로 새로운 SLA Template를 생성

✍ SLA Negotiation

- ✍ Cost를 포함한 다양한 SLA Parameter를 선택하고 적절한 값을 결정하기 위한 SLA 계약 체결

✍ SLA Engineering

- ✍ SLA 계약준수를 위한 망이나 서비스의 구성

✍ SLA Monitoring

- ✍ SLA Parameter 감시

✍ SLA Reporting

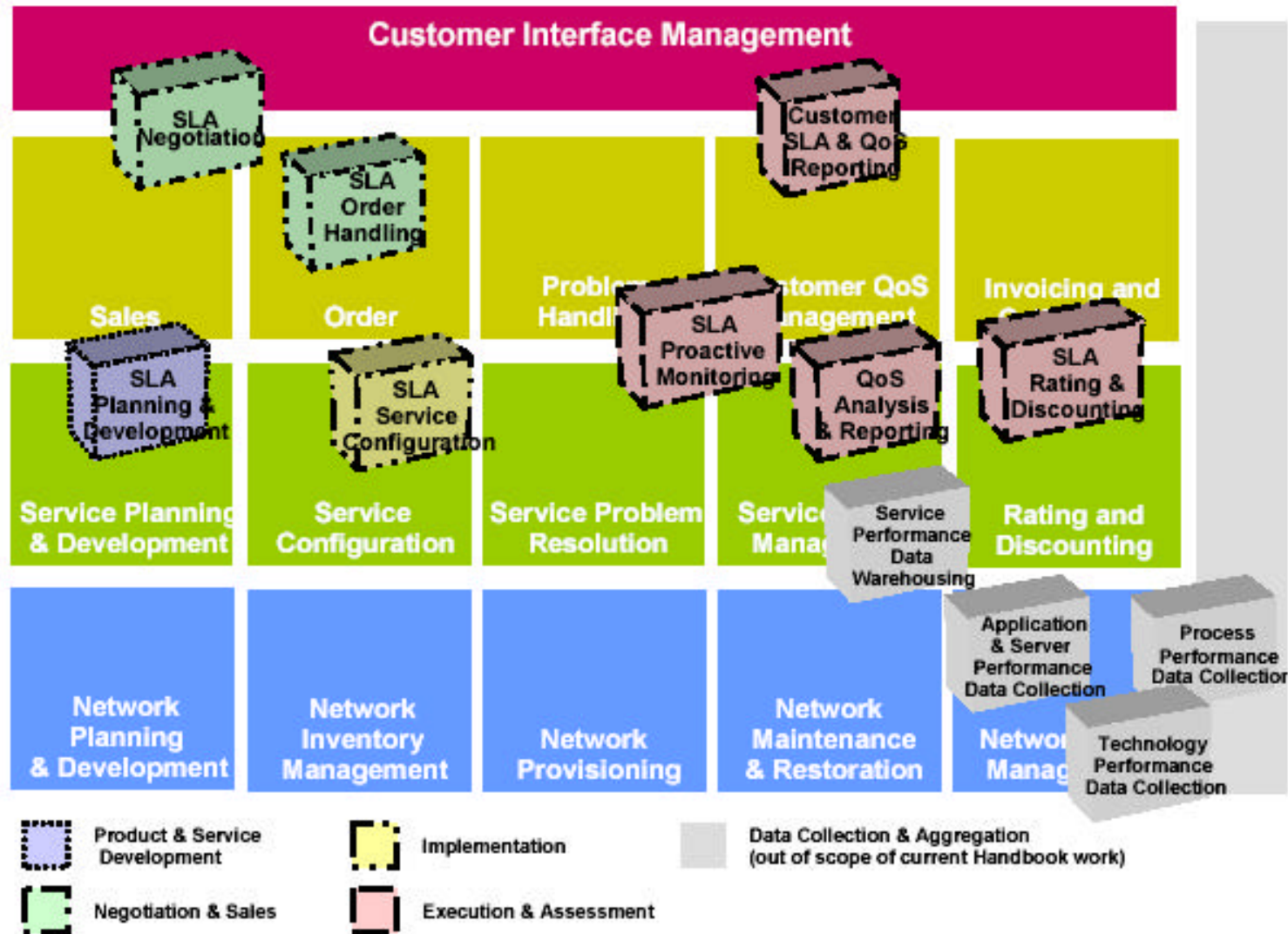
- ✍ SLA 계약준수에 대한 결과 보고

✍ SLA Assessment

- ✍ 고객관점과 서비스제공자관점에서 SLA 평가



SLA Management Functions in TOM



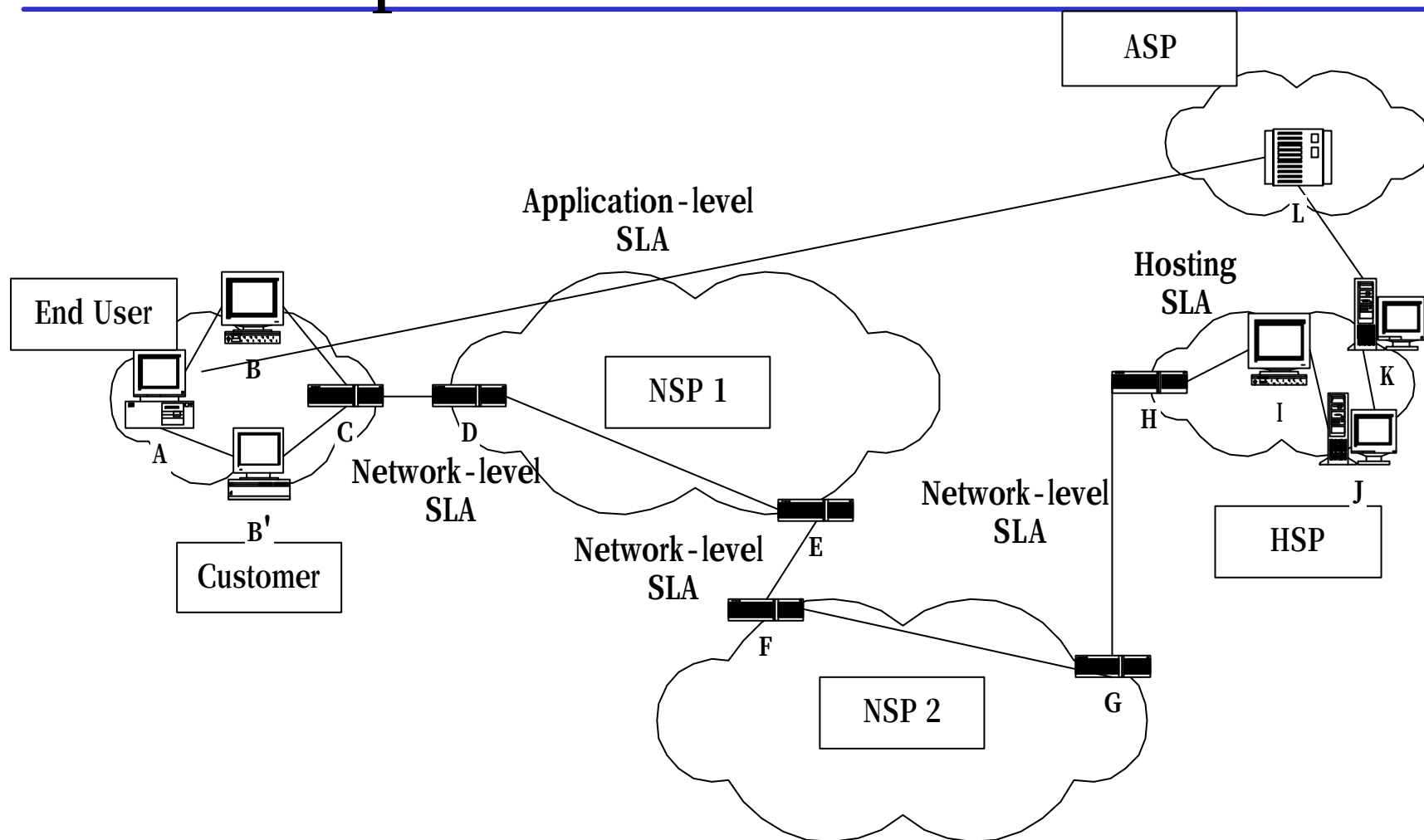


SLA Parameters Measurement

- ✍ Web-based Application Components
- ✍ SLA Parameters for Web-based Application
- ✍ SLA Parameters Measurement



Web-based Application Components





SLA Parameters for Web-based Application

✍ Application-level SLA

- ✍ Application/Site Availability, Client/Cache/DNS Availability
- ✍ Application/Site Latency, Client/DNS Latency

✍ Hosting-level SLA

- ✍ Site/Server Availability
- ✍ Site/Server Latency

✍ Network-level SLA

- ✍ Network Availability
- ✍ Network Latency



SLA Parameters for Web-based Application

✍ Parameter 포함관계

✍ Availability

✍ Application/Site Availability(ASP)

- Client Availability, DNS Availability, Cache Availability(Customer)
- Server Availability, Site Availability(HSP)

✍ Site Availability(HSP)

- Network Availability(NSP)

✍ Response Time

✍ Application/Site Latency(ASP)

- Client Latency, DNS Latency, Cache Latency(Customer)
- Site Latency(HSP)

✍ Site Latency(HSP)

- Network Latency(NSP)

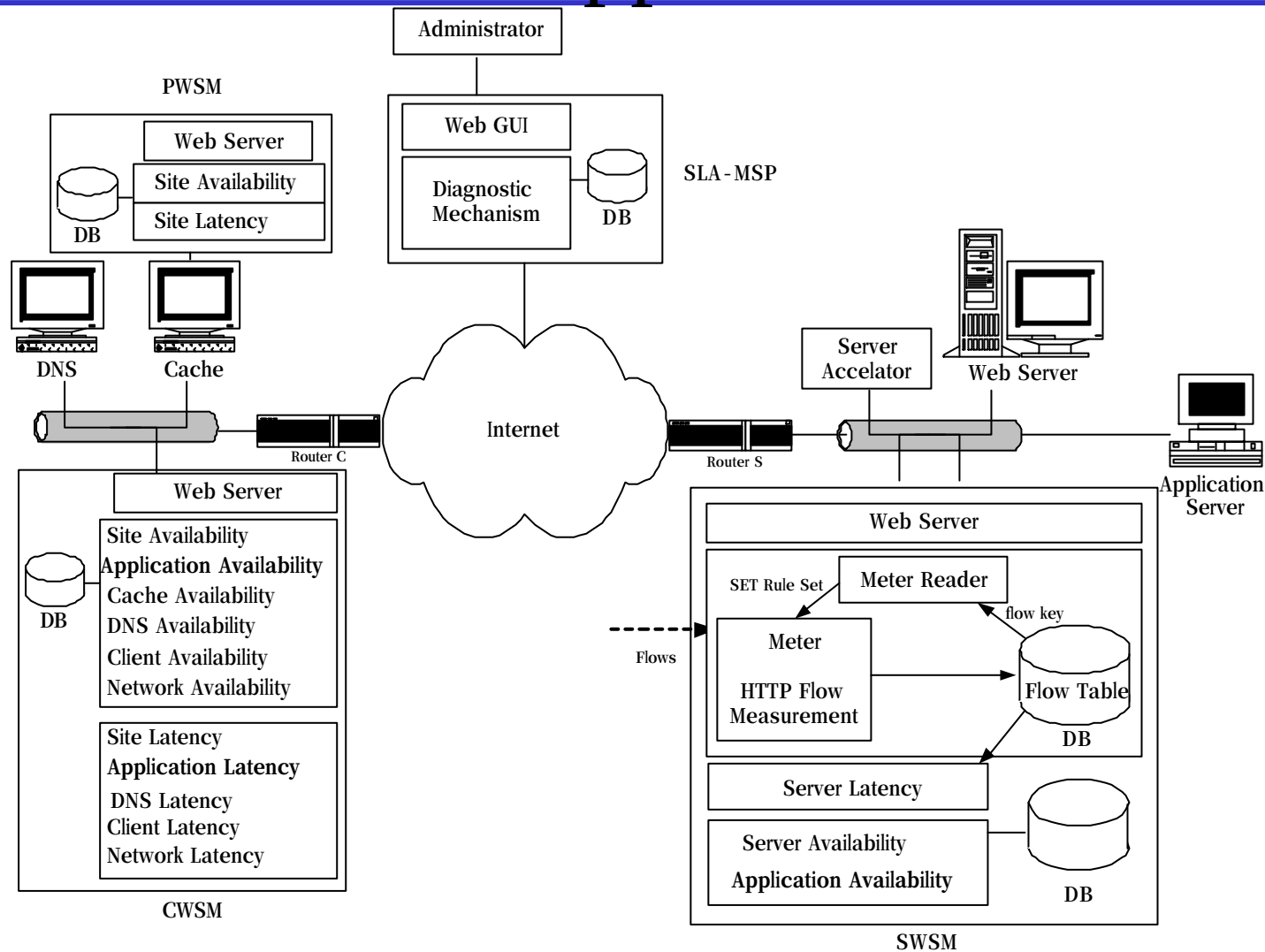


SLA Parameters Measurement

- ✍ Assure that the measured performance statistics reflect the actual impact of performance deficiencies of the application
- ✍ Passive approach
- ✍ Active approach



SLA Parameters Measurement for Web-based Application





Reference

- ✍ NMF701: Performance Reporting Definitions Document
- ✍ TMF, SLA Management Handbook, June 2001
- ✍ ASPIC, White Paper on SLA, 2000
- ✍ NextSLM, <http://www.nextslm.org>



Question

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