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Cisco Mobile Exchange **“How to Enable Mobile Data Services”**

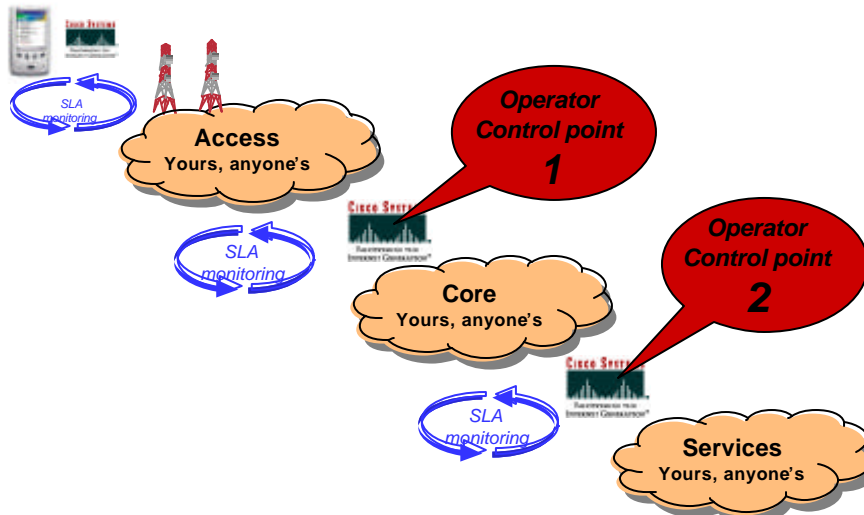
Gaétan Feige
gfeige@cisco.com

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Cisco Mobile Exchange

Solution Set : Giving control back to the operator

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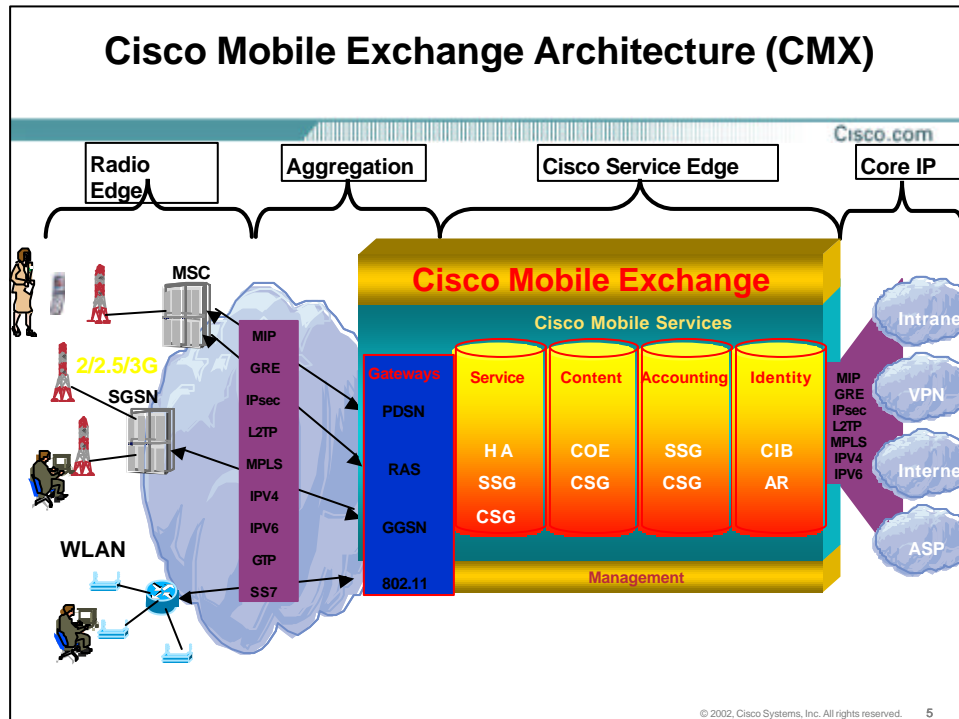
Market Drivers

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CMX (*Cisco Mobile Exchange*) is an architecture which:

- Enables Mobile Internet Edge customized data services. Gives the service control back to the operator, not the content provider.
- *Empowers* any access technology. Allows delivery of data services on existing networks (2G/2.5G), future networks (3G) and other access networks like CDMA or WLAN ones.
- Allows an operator to deliver value added Data Services, on the contrary of bit pipe data services.
- Included Postpaid and Prepaid solutions, on time, volume and content.
- Provides a line of scalable *network-bred* products which can be implemented in a pay as you grow model.

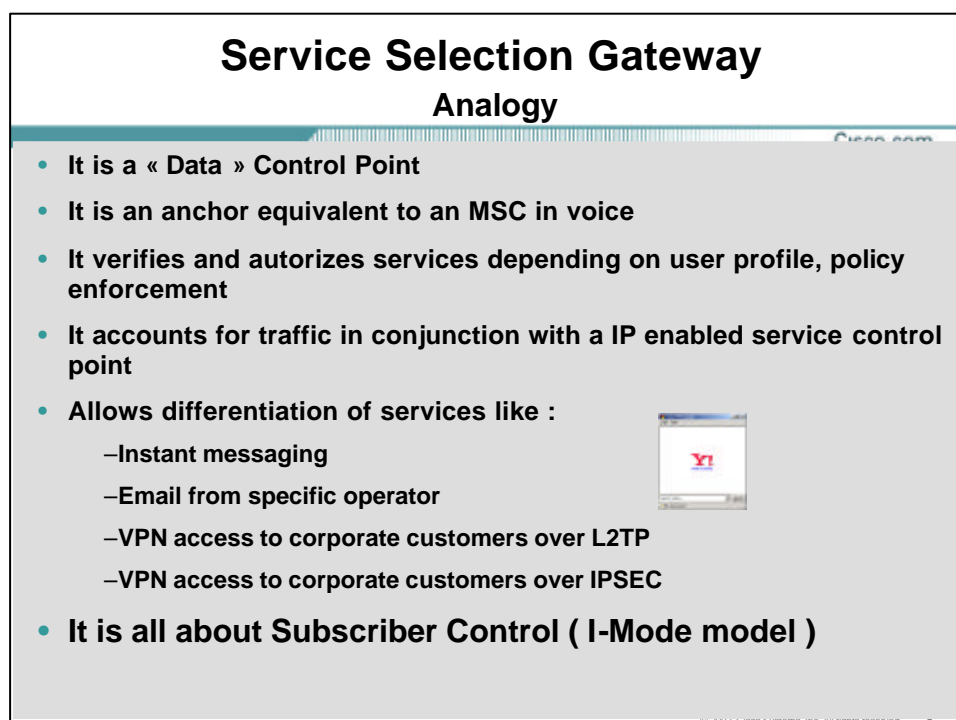
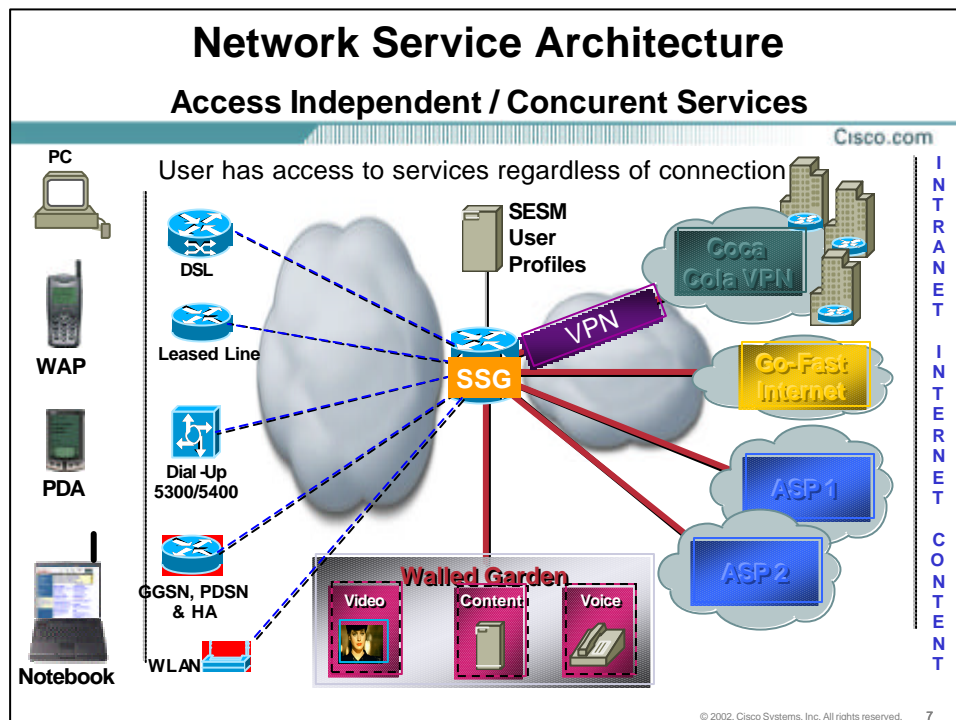
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CMX Part I : Service Selection Gateway Subscriber Edge Services Manager SSG / SESM

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Subscriber Edge Services Manager

An Enhanced Layer 3 Service Portal

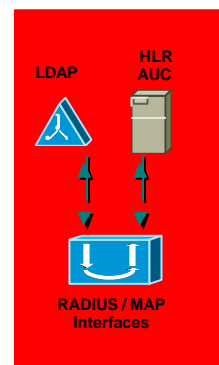
- Advertise available services.
- Offer on-demand services.
- User Autoprovisioning tool, personalized service access portfolio.
- Operator control from tailored customer profiles and user authentication.
- Turn services on/off instantly.
- Access multiple services simultaneously (versus GPRS APN).
- Offer on-demand services.
- Keeps users "on net".
- Offer similar look and feel for any access solution.
- Accounting / Billing. Postpaid and Prepaid on time / volume.



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Service Profiles in HSS

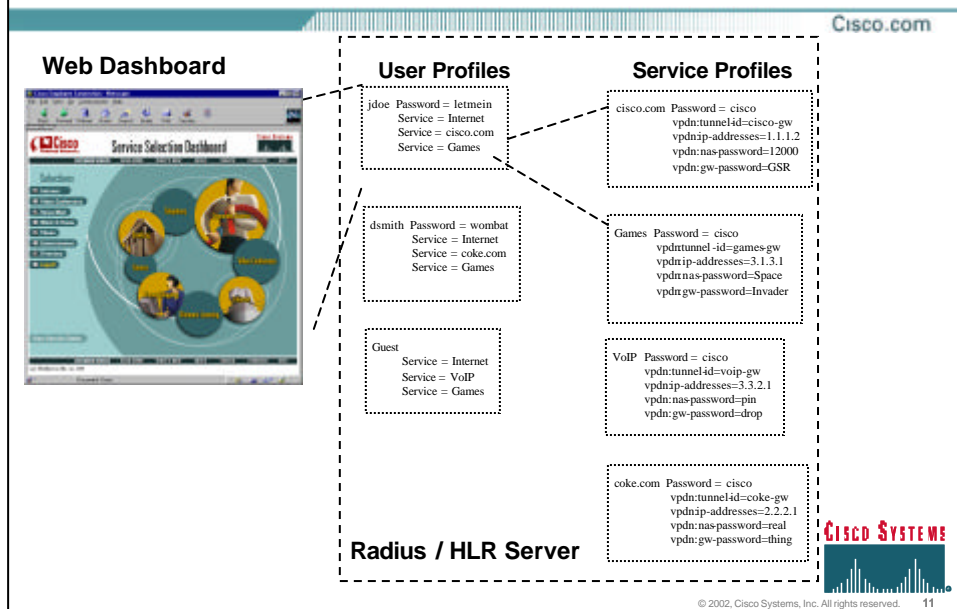
- An HLR has limited evolution capabilities. Performance and standardisation.
- HLR restricts delivery of new data profiles, very limited available fields. Recommendation of working ASAP with new profile registry to complement HLR, a Radius/LDAP mechanism



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SSG/SESM RADIUS Profiles

CMX leverages Radius as for the PDSN / Mobile IP



CMX Part II : Gateway Service Node GGSN/PDSN

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CMX Part III : Content Optimisation Engine COE

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Mobile Content Delivery


Problem Statement (I) : Content Presentation

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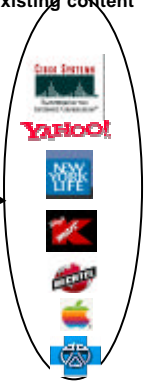
Many types of devices



**Mobile Wireless Network
Any Network**

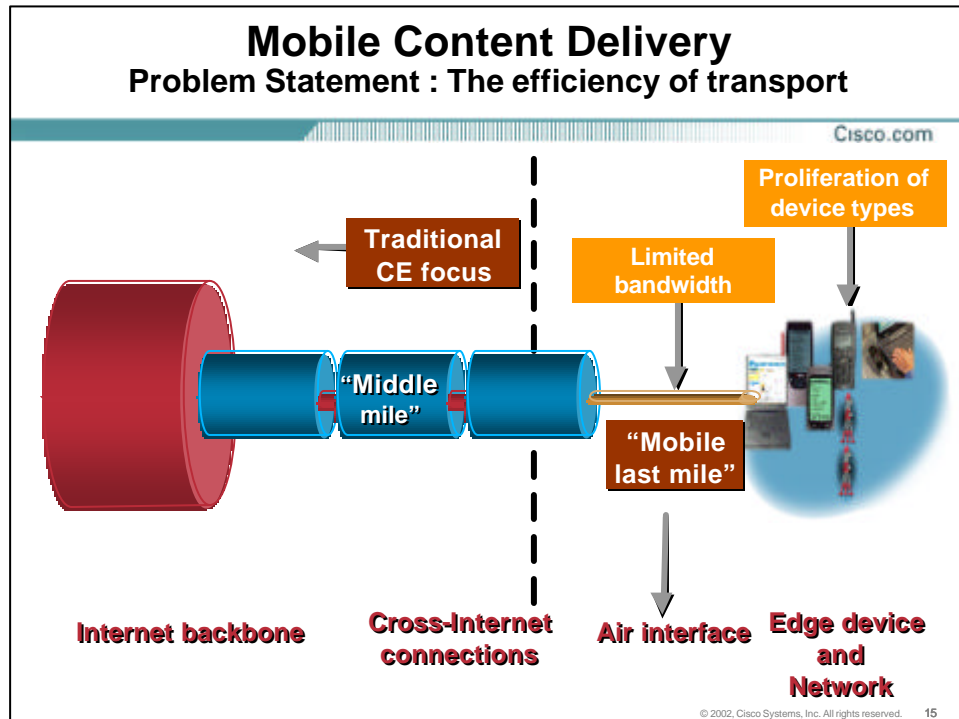


Existing Content



Deliver existing PC- centric content and applications seamlessly to wireless devices.

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Transport problem: you need to modify network

Processes on the go!

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TCP was designed for a wire-based infrastructure and the protocol makes numerous assumptions that are typical of such environments. **TCP assumes:**

- Packet loss is the result of network congestion
- Bandwidth is constant
- Round-trip times (RTT) have some level of stability
- Session duration justifies the initial TCP handshake overhead.

Wireless environments challenge these assumptions ...so how do we modify Transport Layer behavior on the go?

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Example maximum BW as a function of RTT and Jitter

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RTT, ms	Jitter, ms	Max BW, bit/s	RTT, ms	Jitter, ms	Max BW, bit/s
100	50	163.1k	500	200	35.3k
100	100	163.1k	500	500	34.3k
200	50	85.9k	1000	50	17.9k
200	100	85.9k	1000	100	17.9k
200	200	85.9k	1000	200	17.8k
500	50	35.5k	1000	500	17.5k
500	100	35.5k	1000	1000	17.2k

MTU = 1500 bytes, packet loss = 0.5%, clock = 100ms

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TCP Optimisation

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IETF RFC's:

<http://search.ietf.org/internet-drafts/draft-ietf-pilc-2.5g3g-02.txt> (TCP over 2.5G and 3G Wireless Networks)

<http://search.ietf.org/internet-drafts/draft-ietf-pilc-link-design-06.txt> includes an empirical model of TCP behaviour

<http://www.ietf.org/rfc/rfc2988.txt?number=2988> includes specification of RTO calculations




WAP Forum:

<http://www1.wapforum.org/tech/documents/WAP-225-TCP-20010331-p.pdf> (Wireless Application Protocol Wireless Profiled TCP Specification)

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Critical performance parameters

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- **Packet Loss**  Will be impacted by radio performance, e.g., including user environment
- **Round trip time**  Should not be impacted by user environment
- **Round trip time variation**  Should not be impacted by user environment

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Value Proposition

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- Optimize use of expensive spectrum and limited bandwidth.
 - Maximize infrastructure value with up to 8 times increase in performance on existing networks.
 - Drive advanced data service usage as soon as possible -- no waiting for 3G and XML enabled WEB sites
 - Increase value-added services to retain and attract power users
- 
- Improve subscriber experience
 - Support multiple device and environment types from existing applications
 - Enable seamless access to existing enterprise applications.
 - Allow develop advanced portal and enterprise applications with external interfaces and workflow tools.
 - **Make it as seamless as possible for developers to smoothly migrate for HTML to full XML based solutions**

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Meeting Challenges

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- **Problem:** Inefficient transmission link (air interface) which results in up to 70% overhead addition due to bit error rate (BER), latency, and fading
- **Solution:** TCP optimization
- **Problem:** Bandwidth on wireless networks is typically less than in wired ones, making HTML or rich-content download time lengthy if not impossible
- **Solution:** Image and text compression
- **Problem:** Using one source of content to support multiple devices
- **Solution:** Transcoding of markup languages
HTML, SGML, XHTML, CHTML, WML, AnyML
- **Problem:** Caching interface for scalability— reduce CPU load in the backend plus saving WAN bandwidth
- **Solution:** Store multiple instances of the same content after first request
Increase scalability and reduce latency
- **Problem:** Ability to build portals/ e-business solutions that interface with external data sources for AAA, personalization, workflow, push messaging and database synchronisation
- **Solution:** Application Developers

Focus on:
1. Standards
2. Clientless

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CMX Part IV : Scalability of Mobile Internet Edge

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Aspects of Redundancy

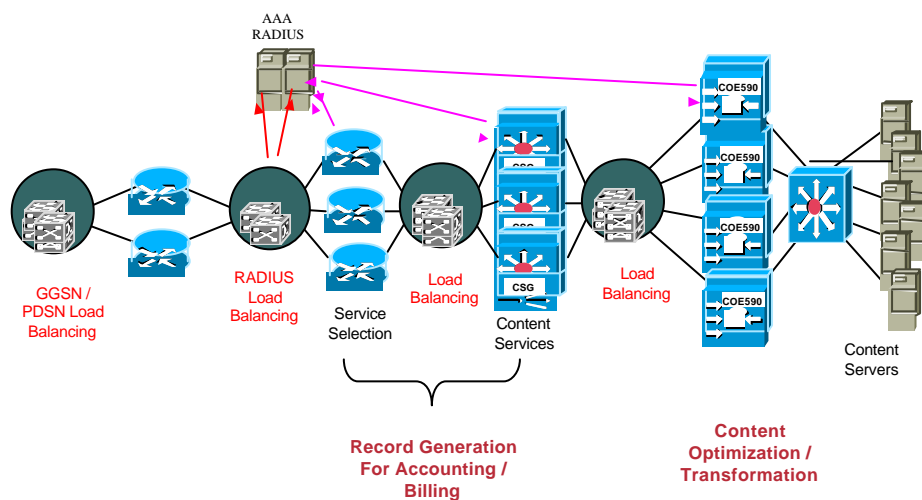
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- Failure of a single component within a site
- Load distribution within a site
- Failure of an entire site
- Overloading of a site

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Cisco Mobile Exchange : The scalability challenge Typical Overall Logical Architecture

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Content Switching Module

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Highest available content switching performance!



- VPN, Firewall and Server load balancing
- Layer 4-7 Feature Set with full IOS integration
- 4-Gbps line-rate Network Address Translation (NAT)
- Failure of a single component within a site
- Load distribution within a site
- Failure of an entire site
- Overloading of a site
- Enhances the datacenter architecture providing a clean, supportable solution.

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CMX Part V : Content Services Gateway CSG

Release 1 in deployment

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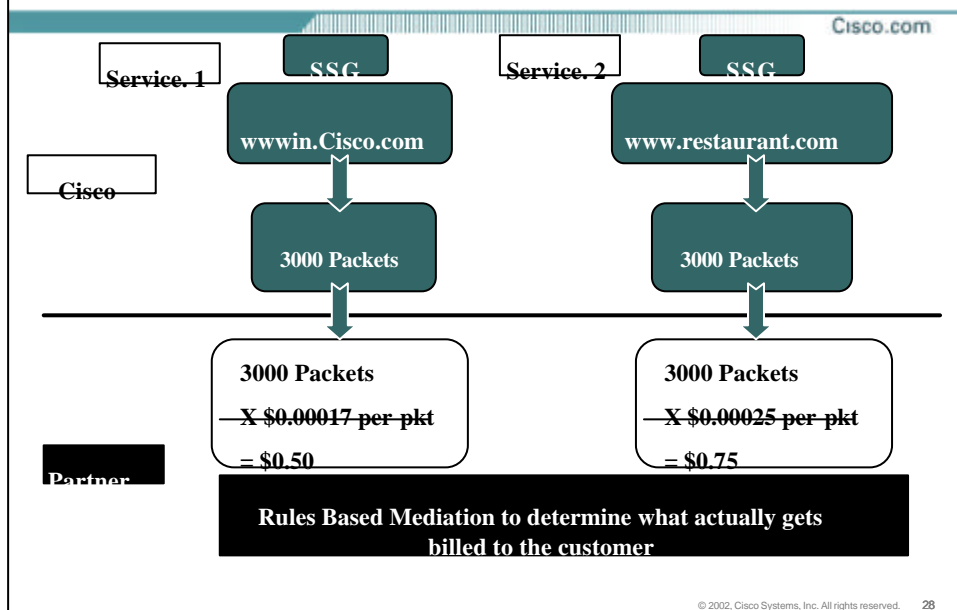
Comparing Billing Mechanisms

	Pros	Cons
Flat fee	<ul style="list-style-type: none"> • Easy to understand • Little impact on system performance • Generates predictable revenues • Low investment 	<ul style="list-style-type: none"> • Rule: 80 percent of resources used by 20 percent of customers • Heavy users subsidized by regular users • Cannot profit from power users • Growth in customers expected to outpace growth in network capacity
Usage-based	<ul style="list-style-type: none"> • Intermediate step to content billing • Can charge premium per packet/byte rate for predetermined set of content sources • Users pay only for what they use (time / volume) • Allows for rating of differentiated services • Leads to higher margins 	<ul style="list-style-type: none"> • Customers do not understand charging for bytes or packets • Bytes or packets do not reflect value of service
Content-based	<ul style="list-style-type: none"> • Places true value on each service in everyday terms • Can charge premium rates for selected content • Allows for rating of differentiated services and for combination rating • Leads to higher margins 	<ul style="list-style-type: none"> • Different paradigm for user to comprehend • May be viewed as complex compared to flat fee • Adds more detail to billing system

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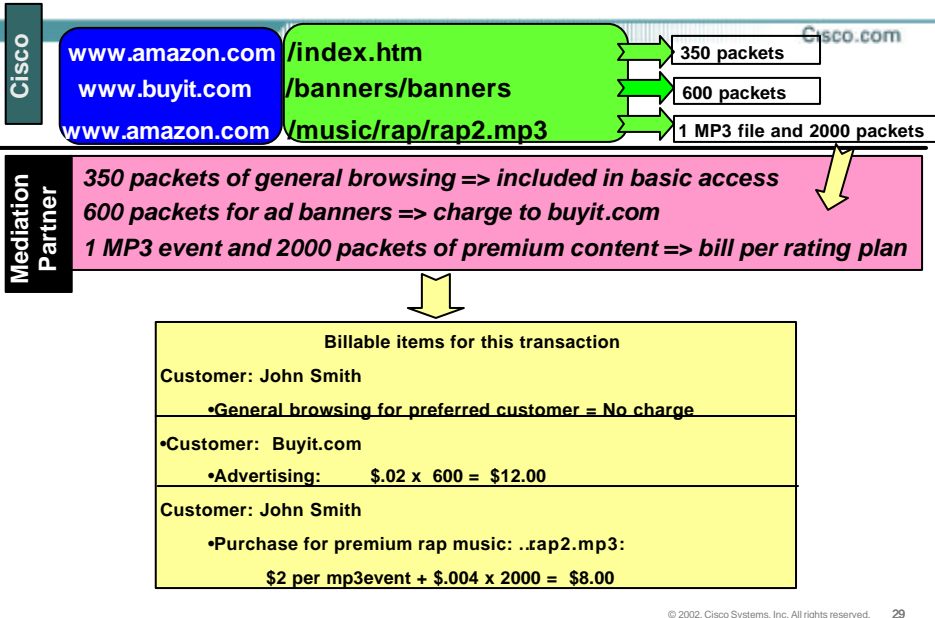
SSG Differential Billing



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Content-Based Billing



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Benefits of the Cisco CSG

- **Advanced content measurement**
Content deciphered based on actual object requested for HTTP. Records Domain name, directories, filenames, extensions, variables.
UDP or other TCP sessions identified on protocol type
- **Enhanced user-awareness capability**
Identifies users to enable billing by user, by transaction
Mapping of user and IP address with AAA reconciliation, performs NAT/PAT afterwards
- **Opens up Internet Billing**
- **Creates Captive Portal**
HTTP insertion capability
Push advertisement
- **Open interface with multiple billing and mediation agents using standard GTP' . (Openet / Portal / Mind CTI)**
- **Scalable architecture built in Cisco 6500 and CSM blade**



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Outstanding Price/Performance Value

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- 300,000 users per card
- 4 GB per second data rate
- Small footprint- Fits into slot in new or existing Cisco Catalyst 6500 or 7600 platform
- Up to 11 Cisco CSGs per chassis, slots permitting
- Utilizes same native Cisco IOS Software interface as Cisco Catalyst switches

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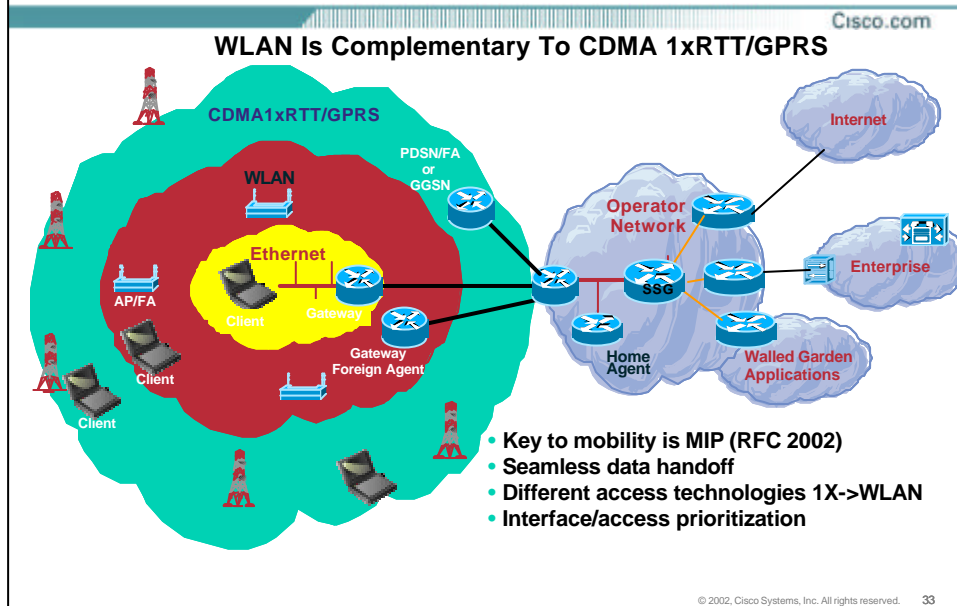
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CMX Part VI : Seamless Mobility

In testing phase with EMEA operators

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Mobile Architecture Seamless Mobility Solution

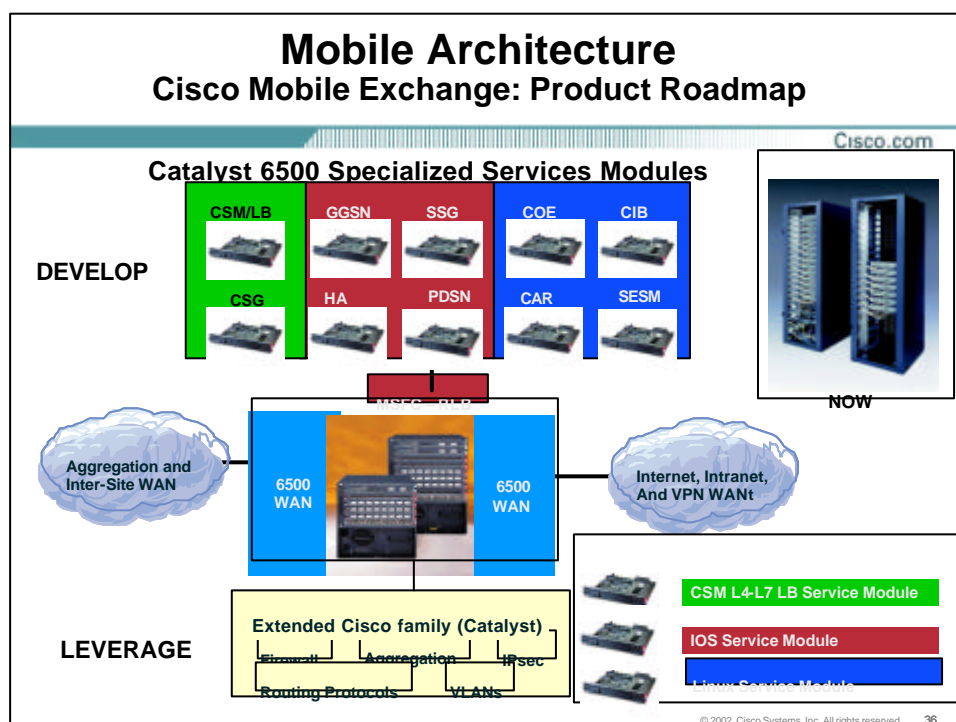
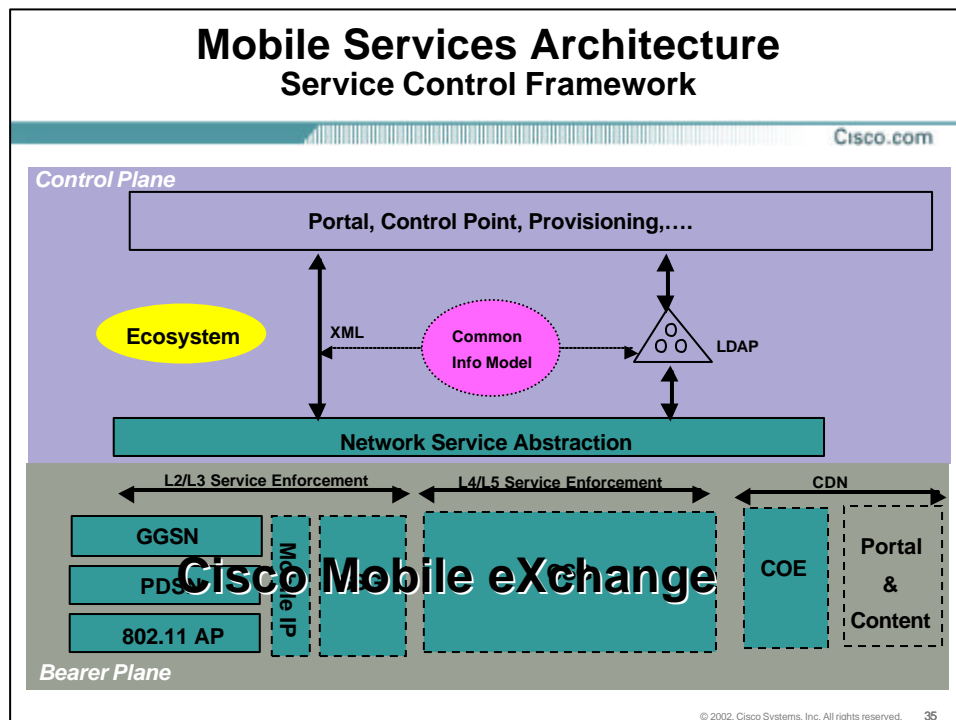


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Conclusion

Cisco Mobile Exchange Value

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Competitive / Differentiation

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CMX is the most advanced Data Service delivery platform :

- It is the first « Data » Control Point, equivalent to an MSC in voice.
- It verifies and authorizes services depending on user profile, it performs policy enforcement.
- It accounts for traffic in conjunction with a IP enabled service control point. Has built in prepaid and postpaid mechanisms for time, volume and content transactions.
- Allows differentiation of services like *Instant messaging, Email from specific operator, VPN access to corporate customers over L2TP, VPN access to corporate customers over IPSEC*, and gives the control back to the operator allowing a service approach.
- Is available today and unlike competition (Nortel Shasta, Unisphere, Watercove, Tahoe) addresses all data network service delivery aspects :
 - Access
 - Profiles & Services
 - Content optimisation

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Major Values

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- **A GPRS / CDMA Data differentiator for Services**
- **A billing integration with major vendors on both prepaid and postpaid**
- **Multi Access Service aggregation, provides seamless data delivery across access types and evolution path**

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