



Voice over Internet Protocol (VoIP)

Core-Edge Working Group Meeting, September 28-29, 2004

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Outline

- Part I – Regulatory Issues
- Part II – The Core-Edge Movement
- Part III – Core-Edge as a Regulatory Lens
- Part IV – Regulatory Outcome and the Core-Edge Challenges and Opportunities

Part I

Regulatory Issues

Positioning this talk

While there is much debate about the following issues...

- Categorization (Title I, II, III, VI)
- Classification (Telecommunications vs. Information Service; Forbearance vs. Ancillary Jurisdiction)
- Jurisdiction (Interstate vs. Intrastate)
- Consumer Protection
- Economic Regulation
- Rural Considerations
- International Trade

... many of these can be discussed more clearly only if we understand how VoIP will address five regulatory issues...

Five Regulatory Issues

- Social
 - 911/E911
 - CALEA
 - Disability Access
 - Universal Service
- Economic
 - Inter-Carrier Compensation (ICC)

911/E911

- **Current Obligations**

1. Identify emergency call and route to appropriate PSAP (Basic 911)
2. Provide call back information (E911)
3. Provide Location (E911)

- **VoIP Challenges**

1. Different Identifier
 - Identifies a person or device, not a line or location
 - May not be a phone number (e.g. chintanv@sip.mit.edu)
2. Devices are Nomadic (more than wireless)
 - Devices move, the Identifier remains the same (customer must change location)
 - Multiple devices, the same Identifier
3. Separation of Access, Transport and Application

- **VoIP Opportunities**

1. More robust 911 with multimedia support
2. Reconcile differences in wireline and wireless

Social Issues Summary

ISSUE	CURRENT OBLIGATIONS	VoIP CHALLENGES
911/E911	<ol style="list-style-type: none"> 1. Identify emergency call and route to appropriate PSAP 2. Provide call back information 3. Provide location 	<ol style="list-style-type: none"> 1. Different Identifier 2. Devices are Nomadic 3. Separation of Access, Transport and Application
CALEA	<ol style="list-style-type: none"> 1. Provide call-identifying information 2. Provide content tracing (lawful intercept) capability 3. Ensure security and privacy 	<ol style="list-style-type: none"> 1. Call-identification Information unknown to the service provider 2. Tension between wiretap, security, privacy and innovation
Disability Access	<ol style="list-style-type: none"> 1. Manufacture accessible telecommunications equipment and CPE 2. Provide relay service (TRS, IP, VRS etc.) 3. Do not install network features, functions or capabilities not compliant with disability access requirement 	<ol style="list-style-type: none"> 1. Standardization of multimode communications 2. Funding multimode communications
Universal Service	<ol style="list-style-type: none"> 1. Contribution to the USF 2. Receive subsidy from the USF 	<ol style="list-style-type: none"> 1. Should VoIP support the USF? 2. Should the USF support VoIP?

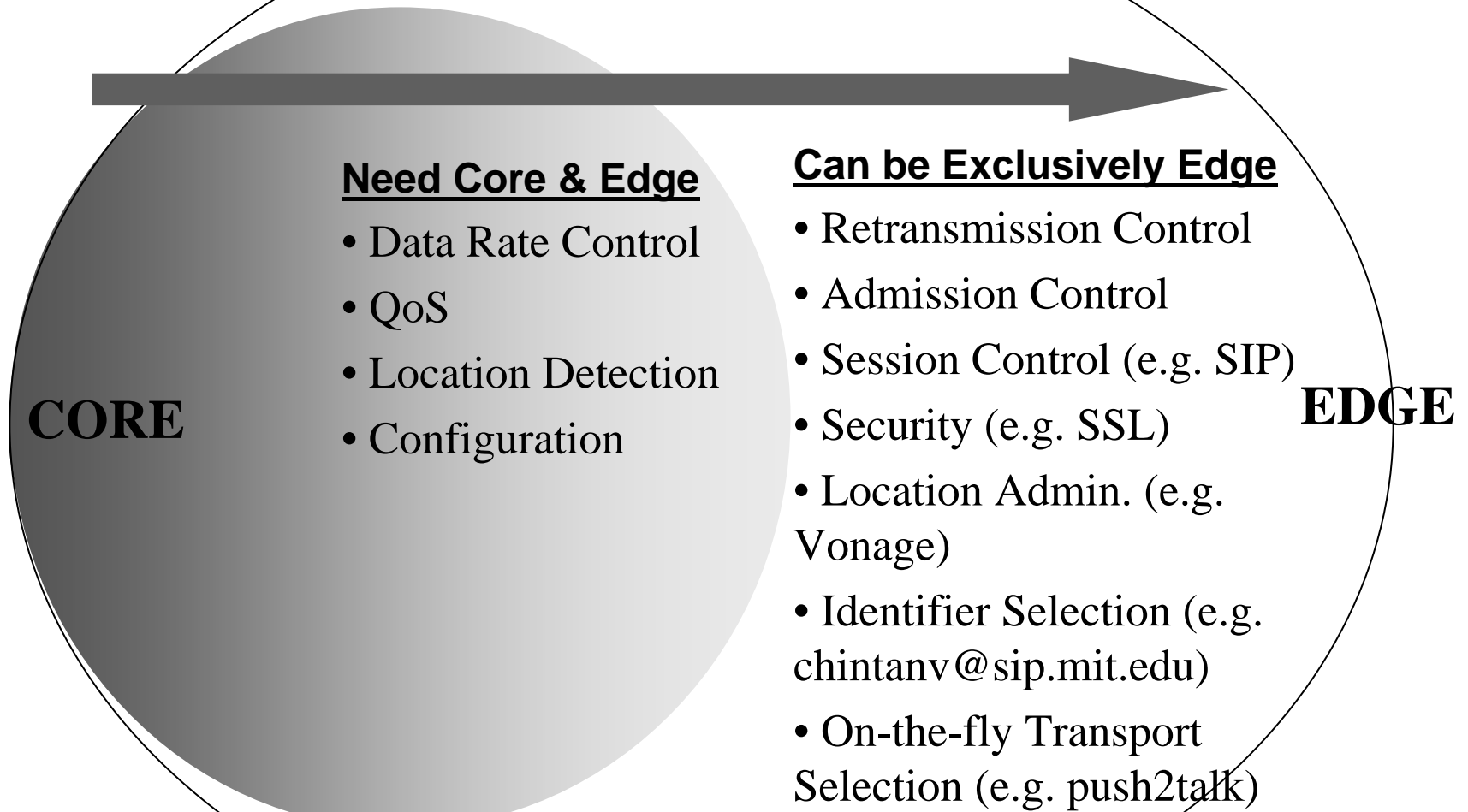
Economic Issue Summary

ISSUE	CURRENT OBLIGATIONS	VoIP CHALLENGES
Inter-Carrier Compensation	<ol style="list-style-type: none">1. Access Charges2. Reciprocal Compensation3. Voluntary Negotiations	<ol style="list-style-type: none">1. IP agnostic to physical media exacerbates the existing arbitrage opportunities2. Signaling and bearer (content) separation

Part II

The Core-Edge Movement

Core-Edge Movement



Migrating Functionality + Fragmented Ownership = Distributed Control

Policy Question – Can the societal goals be achieved through distributed regulatory responsibility?

VoIP Scenarios

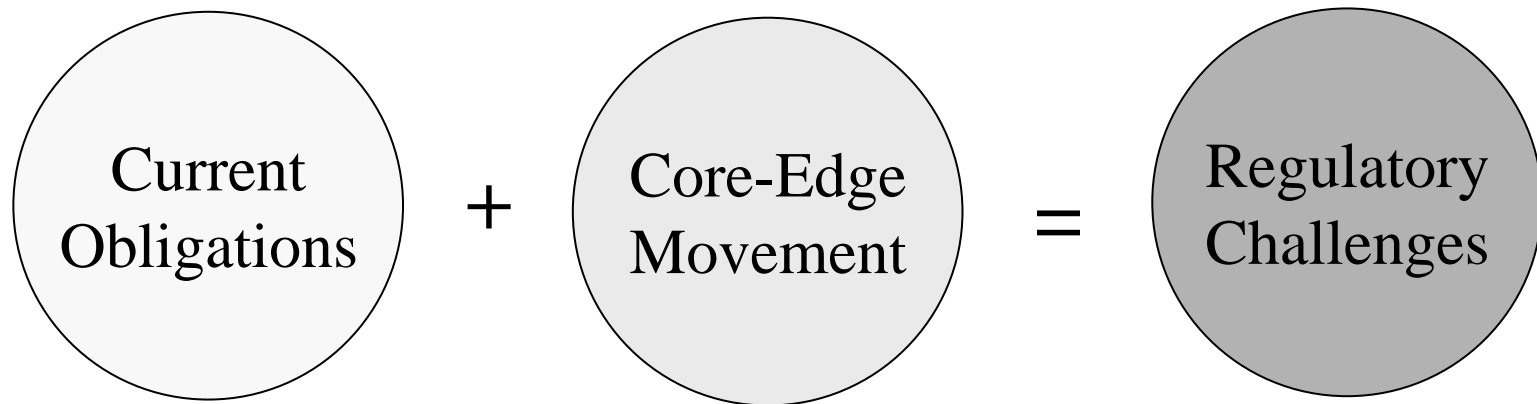
VoIP in the backbone	VoIP at the edge, with PSTN interaction		VoIP at the edge, no PSTN interaction
A	B1	B2	C
IXC – Domestic and International Long Distance (e.g. AT&T)	Facilities based IP Telephony (e.g. VoCable, VoDSL, VoIP over Wireless)	VoIP over Broadband (e.g. Vonage)	P2P (e.g. FWD, Skype, Yahoo!, IM)

Q. Are there other scenarios?

Part III

Core-Edge as a Regulatory Lens

Impact of Core-Edge Movement on Regulations



On the communications value chain...

1. Who currently has/fulfills the obligation?
2. Who in the VoIP world could have the capability to fulfill the obligation?
3. Which component(s) of Core-Edge explain the discrepancy between 1 and 2?

911/E911 Example

Who Currently has/fulfills the Obligation?

Communications Value Chain

EQUIPMENT MANU- FACTUROR	FACILITIES PROVIDER	SERVICE PROVIDER	FEATURE	CPE	CUSTOMER
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Current Obligation

Identify emergency call and route to appropriate PSAP	Yes	Yes	Yes			
Provide call back information	Yes	Yes	Yes			
Provide location	Yes	Yes	Yes	Yes	Yes	

911/E911 Example

Who in the VoIP world could have the capability to fulfill the obligation?

Communications Value Chain

EQUIPMENT MANUFACTURER	FACILITIES PROVIDER	SERVICE PROVIDER	FEATURE	CPE	CUSTOMER
------------------------	---------------------	------------------	---------	-----	----------

Obligation

Identify emergency call and route to appropriate PSAP						
Provide call back information						
Provide location						

A
VoIP in the backbone
(e.g. AT&T)

B1
Facility based
IP Telephony
(e.g. VoCable)

B2
VoIP over Broadband
(e.g. Vonage)

C
VoIP at the edge,
no PSTN interaction

911/E911 Example

Which component(s) of Core-Edge explain the discrepancy?

Communications Value Chain

EQUIPMENT MANUFACTURER	FACILITIES PROVIDER	SERVICE PROVIDER	FEATURE	CPE	CUSTOMER
------------------------	---------------------	------------------	---------	-----	----------

Obligation

Identify emergency call and route to appropriate PSAP	Obligation	Yes	Yes	Yes			
	Capability	A,B1	A,B1	A,B1,B2	C		
	Core-Edge	Session Control, Identifier Selection					

Provide call back information	Obligation	Yes	Yes	Yes			
	Capability	A,B1,B2	A,B1	A,B1,B2	B2,C	B2,C	
	Core-Edge	Session Control, Location Detection, Identifier Selection					

Provide location	Obligation	Yes	Yes	Yes	Yes	Yes	
	Capability	A,B1	A,B1	A,B1, B2	A,B1, B2,C	A,B1,B2,C	B2,C
	Core-Edge	Session Control, Location Detection, Location Administration					

A- VoIP in the backbone

B1 – Facilities based IP Telephony

B2 – VoIP over Broadband

C – VoIP at the edge, no PSTN interaction

CALEA Example

Which component(s) of Core-Edge explain the discrepancy?

Communications Value Chain

EQUIPMENT MANUFACTURER	FACILITIES PROVIDER	SERVICE PROVIDER	FEATURE	CPE	CUSTOMER
------------------------	---------------------	------------------	---------	-----	----------

Obligation

Provide call-identifying information	Obligation	Yes	Yes	Yes	Yes		
	Capability	A,B1	A,B1	A,B1,B2	A,B1, B2,C	B1, B2	B2,C
	Core-Edge	Session Control, Security, Identifier Selection					

Provide content tracing (lawful intercept) capability	Obligation	Yes	Yes	Yes	Yes		
	Capability	A,B1,B2	A,B1	A,B1,B2*	A, B2*,C**	B2*,C**	B2+,C+
	Core-Edge	Session Control, Security, Location Detection					

Ensure security and privacy	Obligation	Yes	Yes	Yes	Yes		
	Capability	A,B1	A,B1	A,B1,B2*	A,B1, B2*,C**	B1,B2*,C**	B2+,C+
	Core-Edge	Session Control, Security, Location Detection, Location Administration					

* = must collaborate with the BB provider

** - Technical Feasibility Concerns

+,+ = Security/Privacy

A- VoIP in the backbone

B1 – Facilities based IP Telephony

B2 – VoIP over Broadband

C – VoIP at the edge, no PSTN interaction

This kind of analysis helps us think about...

1. Is meeting the obligation technically feasible at a reasonable cost?
2. Which entity or entities should logically have the obligation?
3. Do we have the legal bases for imposing the obligation?

As an entity in the VoIP value chain, if you had to meet the social regulatory obligations (e.g. 911/E911, CALEA, Disability Access, Universal Service)...

Q. What will be your technical challenges?

Q. Will you have collaborate with anyone to meet the obligation?

Q. What would be the cost?

Q. Will you have a competitive advantage due to meeting an obligations?

Q. Is there a market based solution to these regulatory issues?

Q. What happens to the cots functions with the functions moving to the edge?

Work in Progress

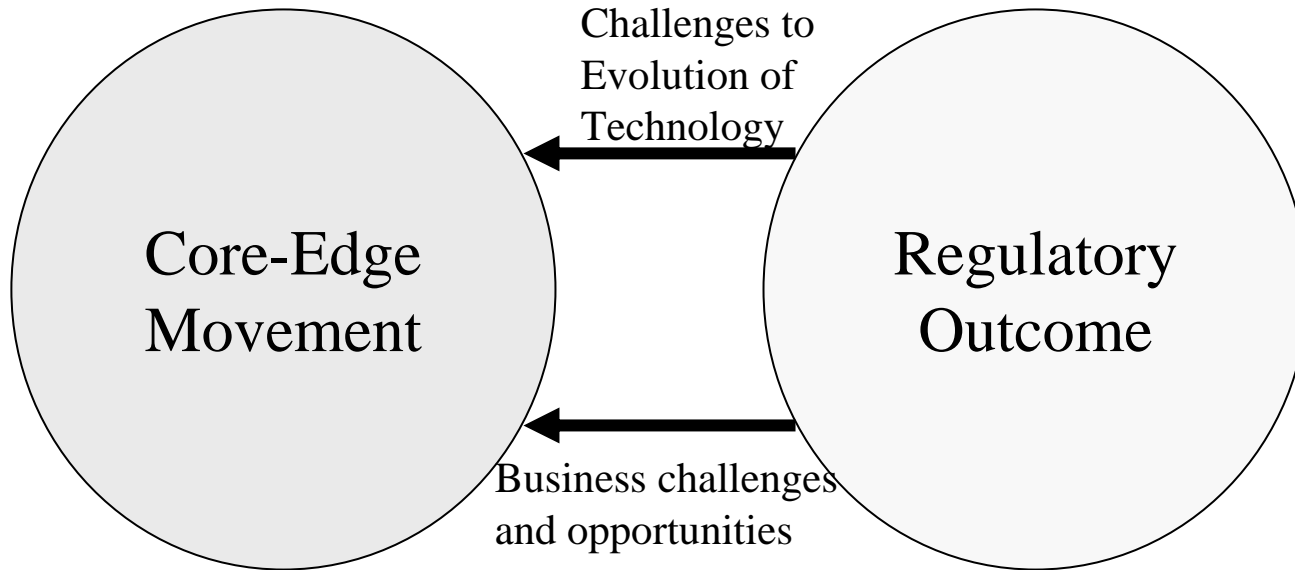
Part IV

Regulatory Outcome

And

The Core-Edge Challenges and Opportunities

Impact of Regulations on Core-Edge Movement



Challenges to Evolution of Technology

Control over which functions is necessary to meet the regulatory goal? Can this be achieved without...

1. Challenging the design principles
2. Curtailing innovation

<u><i>Example</i></u>	Challenges the Design Principles	Curtails Innovation
Movement to the Core	<ul style="list-style-type: none">• Retransmission Control	<ul style="list-style-type: none">• Session Control• Location Administration

Q. Can you think of sub optimal design decisions that might result due to regulatory obligation?

Q. What kinds of regulatory outcome will lead to less innovation?

Business Challenges to Opportunities at the Core-Edge

What challenges and opportunities a regulatory outcome presents at the core vs. edge?

e.g. AT&T (VoIP in the backbone), Pulver.Com FWD Rulings (VoIP at the edge, no PSTN interaction)

Q. What kinds of threats and opportunities do you see at the core vs. the edge?
Q. Can you think of business decisions made due to regulatory uncertainty, and not due to market or technology reasons?

EXTRA

CALEA

- **Current Obligations**

1. Provide call-identifying information
2. Provide content tracing (lawful intercept) capability
3. Ensure security and privacy

- **VoIP Challenges**

1. Call-identification Information unknown to the service provider
2. Tension between wiretap, security, privacy and innovation

Disability Access

- **Current Obligations**

1. Manufacture accessible telecommunications equipment and CPE
2. Provide relay service (TRS, IP, VRS etc.)
3. Do not install network features, functions or capabilities not compliant with disability access requirement

- **VoIP Challenges**

1. Standardization of multimode communications
2. Funding multimode communications

- **VoIP Opportunities**

1. Multimode means more people served
2. Functional Equivalency through video

Universal Service

- **Current Obligations/Benefits**
 1. Contribution to the USF
 2. Receive subsidy from the USF
- **VoIP Challenges**
 1. Should VoIP support the USF?
 2. Should the USF support VoIP?

Inter-Carrier Compensation (ICC)

- **Current Schemes**
 1. Access Charges
 2. Reciprocal Compensation
 3. Voluntary Negotiations
- **Questions for VoIP**
 1. Should there be ICC?
 2. Should the rate be uniform across the providers?
 3. What should the rate be?
- **VoIP Challenges**
 1. IP agnostic to physical media – exacerbates the already existing arbitrage opportunities
 2. Signaling and bearer (content) separation

Numbering

- What directly affects Numbering?
 - Choose a number in any area code
 - Keep your number when moving
- VoIP Challenges
 - Policy
 - Assignment, Relief, Exhaust, Utilization and Forecasting
 - Usage Assumptions about ownership, association with geographic area and the rate center
 - Technical
 - Number Portability – Service Provider, Location and Service
 - Portability between PSTN and VoIP

Rulings

- AT&T's Phone-to-Phone IP Telephony Service (FCC 04-97)
 - Petition:
 - AT&T's Phone-to-Phone IP Telephony Services are exempt from access charges
 - Decision:
 - AT&T's specific service is a Telecommunications Service
 - Access Charges apply to AT&T's specific service

Rulings

- Pulver.com's Free World Dialup (FWD)
 - Petition:
 - Pulver.com's FWD is neither Telecommunications nor a Telecommunications Service
 - Decision:
 - Pulver.com's FWD is neither Telecommunications nor a telecommunications service
 - Furthermore, FWD is an unregulated Information Service subject to the Commission's jurisdiction