



# Core-Edge Working Group

Core-Edge Working Group Session

MIT CFP Conference

January 25, 2005

# Agenda For Today

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- Refinement of taxonomy concepts
- Introduction to our methodology for dynamic modeling
- Application of methodology to cases
- Lessons learned
- Next steps

Note: The focus will be on the use case part!

Refine taxonomy concepts

# Goal of the Taxonomy

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Provide an analytical tool for

- identifying control points within a certain service offering
- enumerating control point constellations within our methodology
- evaluating possible impact of triggers on control point constellations

Hence: the taxonomy serves a support role within our methodology (later!)

# What Happened Since Last September?

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- Some clarifications re the *functionality* dimension
- Where are *Core* & *Edge* in the taxonomy?
- *Coreness*: the path to our methodology

# Clarifications in Functionality Dimension

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- Captures the service value chain
  - introduced sequence of *service transactions*
  - defined *provider & consumer* roles in the value chain
- Refined *application* with respect to sequence of service transactions
- Introduced notion of *service object* as opposed to *product*

# Core & Edge in the Taxonomy

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From Andy's straw man definitions:

- **Core:** A function implemented in the infrastructure, either by dint of technology, regulation, social, or business practice.
- Seems well aligned with our common perception of “core”

BUT: There is no *core & edge* in our taxonomy! WHY NOT?

- As topological constructs, *core & edge* lose meaning when it comes to evaluating value creation
  - In other words, value creation depends less on whether or not a service is provided in the *core* or at the *edge*
- Therefore, our taxonomy classifies services in terms of core and edge *characteristics* (as originally perceived) rather than their *location* in the core or at the edge

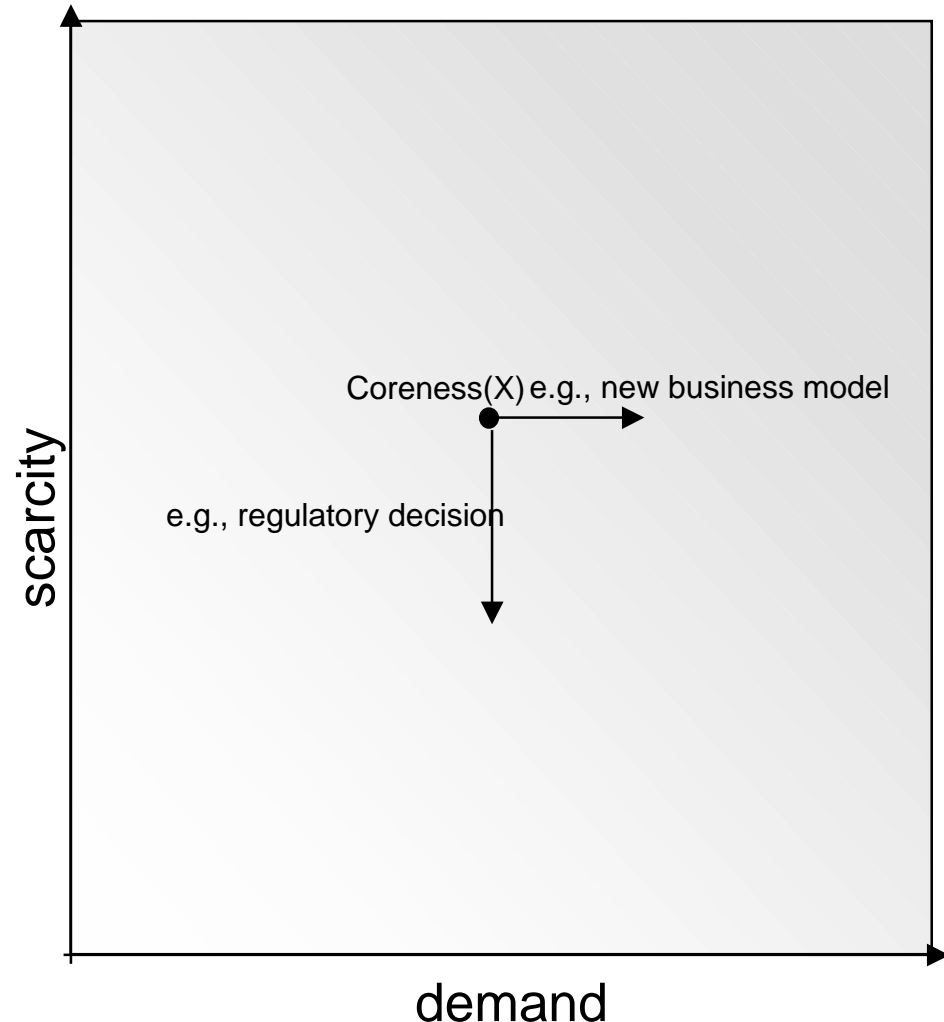
# **Coreness: The Way to Our Methodology**

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- Discussion sparked from the idea that traditional core services were a function of *scarcity & demand*
- The ability to replace a particular service transaction within a value chain with an alternative offering was deemed critical
- Scarcity seemed to imply ownership of critical control points!



# The Function of Coreness for a Given Service X



- *Coreness* of a service is defined as a function of *scarcity* and *demand*
- Scarcity is related to the degree of interchangeability of service transactions within the sequence of transactions necessary to fulfill a given service
- Demand is related to the relevance of the service within the communication value chain, i.e., its value
- Scarcity and demand can be created through
  - Underlying technology
  - Business models
  - Regulatory constraints
- Dynamics in the scarcity-demand plane seem to fit value chain dynamic

# Coreness: Continued

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- Alternative definition (from Andy's definitions)  
In a higher level description of a service, the use-weighted average of whether the service is provided by a "core-based architecture" or an "edge-based architecture". This can be a function of time.
  - Example:  
One year ago, Skype did not change the "coreness" of telephony, but when it became widespread, it did.
- Encountered Problems:
  - How to capture dynamics of coreness?
  - How to compare different functions of coreness?
  - How to determine "use-weighted averages" in alternative definition?

# Methodology for Dynamic Modeling

# Goal of the Methodology

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Create a framework that

- identifies players in the value chain
- identifies value creation within the value chain
- illustrates transitions from one business model to another (change in value chain)

**Ultimately:** Allow for predicting value chains of tomorrow!

# Methodology – Overview

## OBJECTIVE

1. Enumerate possible control points for a given service
2. Enumerate varying business models
3. Identify triggers causing change of business
4. Capture cause-and-effect of triggers

## METHOD

Apply taxonomy to a given case study



Create control point constellations



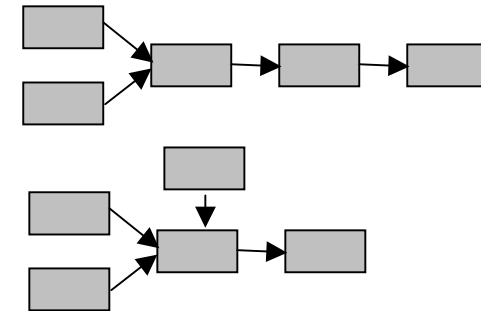
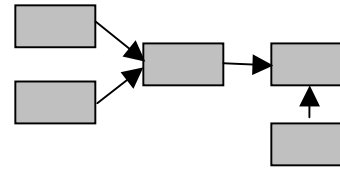
List triggers



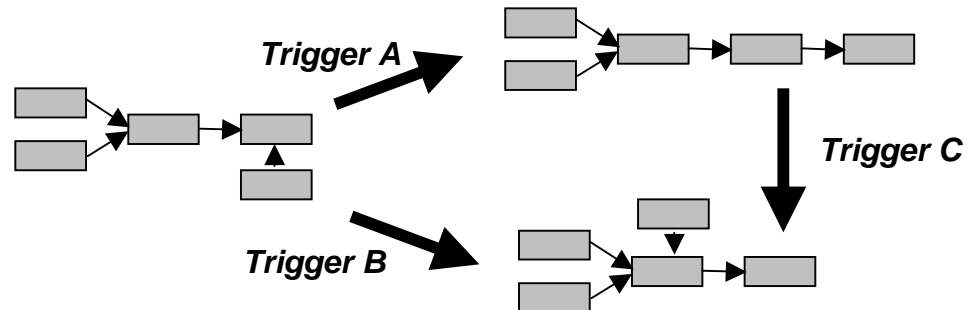
Create transitions of control point constellations

## OUTCOME

	Offering A	Offering B	Offering C
Service transactions	...	...	...
Control points	...	...	...
Delivery infrastructure	...	...	...
Service infrastructure	...	...	...
Management infrastructure	...	...	...
...	...	...	...



Technological	Regulatory	Social	Business
...	...	...	...
...	...	...	...



# Step 1: Enumerate Control Points

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Use taxonomy as a tool

- Decompose different service offerings based on elements in taxonomy
  - Functionality dimension of great importance!
- Identify control points in delivery, service, and management infrastructure
  - A point at which management can be applied by the various players in a value chain
- Consider aspects of centralized vs. distributed

	Offering A	Offering B	Offering C
Service transactions	...	...	...
Control points	...	...	...
Delivery infrastructure	...	...	...
Service infrastructure	...	...	...
Management infrastructure	...	...	...
...	...	...	...

## **Step 2: Enumerate Varying Business Models**

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- Create constellations of control points within each service offering

### **Rationale:**

- Control points influence business model design, i.e.,
  - Business models are built around control point constellations
  - Control points ownership equals access to profit streams
- Control points can be rooted in
  - Regulation
  - Technology
  - Business

# Step 3: Identify Triggers Causing Change

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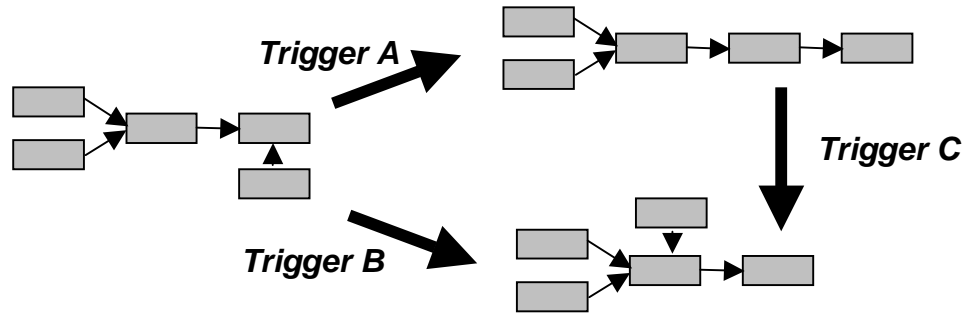
- **Triggers** are defined as anything that can cause a transition from one constellation of control points to another  
→ effectively, it changes the business models
- Triggers can be created through
  - **Regulation:** A certain constellation become “legit” or “illegit”
  - **Technology**
    - **Availability:** Constellations become technically possible
    - **Maturity:** A certain technology is not only available but also mature beyond a critical mass
  - **Social Acceptance:** A constellation becomes socially (non-) acceptable
  - **Business:** Certain business aspects make a constellation viable or obsolete, such as price of offering or industry restructuring
- Innovation enables a constellation to overcome market barriers
  - Might require complementary infrastructures to be developed



# Step 4: Capture Cause and Effect of Trigger

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- Create transitions of control point constellations caused by triggers



- Still to be done:
  - The quest for the right visualization of such transitions
    - Case studies will help here greatly!
  - Prediction of possible business models rather than existing ones

# Application of Methodology to Cases



# Location Based Services

Gabriel Weinberg

CFP, MIT

# Step 1: Control Points




- Examine existing mobile navigators by enumerating across static taxonomy, e.g:
  - Garmin Street Pilot  
Off-the-shelf packaged product
  - Pharos Pocket GPS Navigator  
Peripheral w/ software for use with PDAs
  - Avis Assist  
Subscription add-on w/rent-a-cars



# Control Points Continued

- Observed control points:
  - Software Creation
  - Device Manufacture
  - Device Distribution
  - Location Collection
  - Map Creation
  - Map Distribution
  - Software Update Distribution
- Other (yet exerted) control points could be...
  - Software & Hardware Support
  - Third-party Trust Management

# Step 2: Business Models

Service Offering / Control Point			
Software Creation	Centralized Service Provider	Centralized Service Provider	Centralized Operator
Device Manufacture	Centralized Service Provider	Both Service Provider	Centralized Operator
Device Distribution	Distributed User	Distributed User	Centralized Service Provider
Location Collection	Centralized Operator	Centralized Operator	Centralized Operator
Map Creation	Centralized Service Provider	Centralized Service Provider	Centralized Operator
Map Distribution	Distributed User	Distributed User	Centralized Operator
Software Updates	Centralized Service Provider	Centralized Service Provider	n/a
<i>Business Model</i>	<i>Single-Purpose Ready-Made Product</i>	<i>Multi-Purpose Third-Party Enabling Download</i>	<i>Multi-Purpose Ready-Made Subscription</i>

# Business Models Continued

- Other “probable” models:
  - Multi-Purpose Ready-Made Product
  - Single-Purpose Ready-Made Subscription
  - Multi-Purpose Third-Party Subscription
  - Multi-Purpose Third-Party Download
  - Multi-Purpose Third-Party Enabling Subscription
- Less “probable” models could be imagined by further varying centrality & ownership, e.g.:
  - Distributed Location Collection
  - Distributed Software Creation
  - Distributed Map Creation

# Step 3: Triggers

- Regulation
  - Changes to GPS and WAAS.
  - E-911
- Technology
  - Increased precision of mobile phone location collection methods.
  - Deployment of wireless networks.
  - Deployment of RFID w/ embedded location.
- Others?



# Triggers Continued

- Social Acceptance
  - Acceptance of converged devices.
  - Acceptance of micro-payment mechanisms.
- Business
  - Opening of device APIs.
  - Complementary LBS services.
  - Aggregation of locations.
  - Community services.
- Others?

# Step 4: Scenarios

- Scenario 1: People come to have LBS-enabled mobile phones as their primary carry-around devices.
  - Single-purpose products, e.g. Garmin Street Pilot fall by the way-side.
  - Mapping becomes a subscription add-on to mobile phone service.
  - Operators capture most of the profits.

# Scenarios Continued

- Scenario 2: wireless networks become widely available and people come to have LBS-enabled PDAs with open APIs as their primary carry-around devices.
  - Single-purpose products, e.g. Garmin Street Pilot fall by the way-side.
  - Mapping becomes a subscription third-party application available over wireless.
  - Increase in community services and complementary services to get customers.
  - ISVs capture most of the profits.

# Scenarios Continued

- Scenario 3: wireless networks become widely available as well as open APIs, and open source maps and software develop.
  - Mapping becomes a competition between subscription third-party applications available over wireless and installed open-source apps packaged for a one-time fee (download).
  - Increase in complementary services, e.g. location aggregation to get subscriptions.
  - ISVs capture most, but less, profits.

# Lessons Learned

- Who captures most of the profits in the future mobile mapping market depends on what becomes peoples' primary device.
- Rise of subscription services to capture recurring revenue by including complementary services and aggregation.
- The current major business model, i.e. the stand-alone consumer device, seems to have a limited life-span.



# Voice over Internet Protocol

Chintan Vaishnav

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# Step 1: Control Points

Examine existing VoIP incarnations by enumerating across static taxonomy

<b>VoIP in the backbone</b>	<b>VoIP at the edge, with PSTN interaction</b>		<b>VoIP at the edge, no PSTN interaction</b>
<b>A</b>	<b>B1</b>	<b>B2</b>	<b>C</b>
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)

Note: Enterprise VoIP studied separately.

# Control Points (Contd.)

VoIP in the backbone (AT&T)	Facility based VoIP (Comcast)	VoIP over BB (Vonage)	P2P VoIP (Skype, FWD)
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	Local Loop	Cable Modem	Phone Adapter	BB/PSTN Network
Access	Natl. Backbone	CMTS	BB Network	
	Intl. Backbone	BB Network		

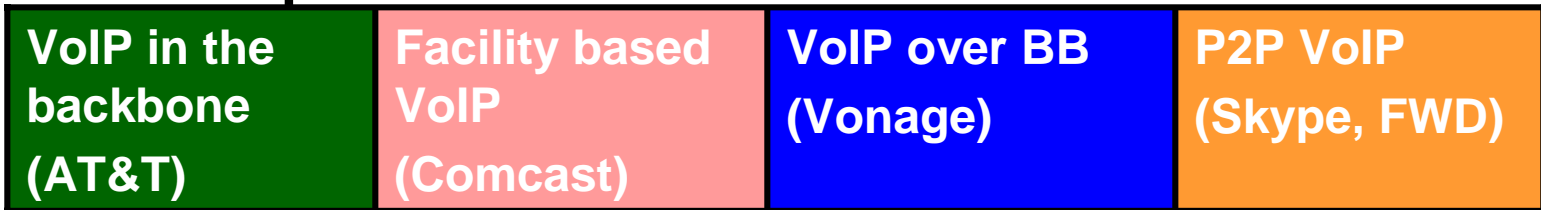
<b>Bit Transport</b>	Circuit Switching <i>(QoS, Reliability)</i>	Packet Switching <i>(Convergence)</i>	Packet Switching <i>(Independence from transport)</i>	Packet Switching <i>(P2P)</i>
				Coding <i>(Quality)</i>

<b>Call Signaling</b>	PSTN Signaling <i>(enabling features)</i>	Cable Signaling <i>(managing converged bandwidth)</i>	SIP Signaling Servers <i>(enabling mobility, virtual phone numbers)</i>	Proprietary Signaling <i>(PC2PC QoS)</i>
		PSTN Gateway	SIP Gateway	

<b>Application/ Feature</b>	PSTN Feature Set	PSTN-like Feature Set	Billing (Flat rate)	Converged Features
	Regulatory Compliance	Bundled Service (TV, Internet, Telephony)	PC Application	PC Application Free Service Name Space



# Step 2: Business Models



<b>Access</b>	<b>Local Loop</b>			
	Centralized	Centralized	Centralized	Centralized
	Operator (LEC) <b>Backbone</b> Centralized Service Provider (AT&T)	Operator (Comcast)	Operator (e.g. Comcast)	Operator (e.g. Comcast etc.)
<b>Bit Transport</b>	Centralized Service Provider (AT&T)	Centralized Service Provider (Comcast)	Distributed Operator (e.g. Comcast etc.)	Distributed Operator (e.g. Comcast etc.)
<b>Call Signaling</b>	Centralized Service Provider (AT&T)	Centralized Service Provider (Comcast)	Centralized Service Provider (Vonage)	Distributed Service Provider (Skype)
<b>Application/Feature</b>	Centralized Service Provider (AT&T)	Centralized Service Provider (Comcast)	Centralized Service Provider (Vonage)	Distributed Service Provider (Skype)
<b>Business Model</b>	Vertically Integrated MOU Rate High Reliability Ph2Ph Voice Service	Vertically Integrated Bundled/Flat Rate Medium Reliability Ph2Ph Voice Service	Vertically Disintegrated Flat Rate Medium Reliability Ph2Ph / PC2Ph Voice Service	Vertically Disintegration Free Low Reliability PC2PC Voice Application

# Business Model (Contd.)

- Control Points Constellations
  - Threats and Opportunities defined by the control points a business model owns
- Control Point related decisions shape the nature of business opportunity
  - Access
    - WiFi, WiMax, BlueTooth => decentralization of the local loop
  - Signaling
    - SIP signaling enables presence and other voice, text, video convergence opportunities => service differentiation, stickiness
    - Proprietary signaling (skype) => control of name space, access to customers behind NAT boxes and firewalls
  - Application/Features
    - Converged application based business models (e.g. ConnectMevoice – Internet Voice Mail)
    - Regulatory compliance related business models (e.g. Intrado - VoIP 911)

# Step 3: Triggers

- Regulation
  - Social Regulation
    - 911, CALEA, Disability Access, Universal Service
  - Economic Regulation
    - Inter-Carrier Compensation
  - Scope of Regulation
- Technology and Standards Setting
  - New Converged Applications
  - QoS
  - Numbering
  - Power Failure
  - Access Technologies -- WiFi, WiMax, BlueTooth
  - Security

# Triggers (Contd.)

- Social Acceptance
  - Hype (migration to VoIP)
  - Risk Aversion (big brands)
  - Bandwagon Effect (nascent VoIP application/services)
- Business
  - BB saturation
  - WiFi, WiMax, BlueTooth saturation
  - Voice becomes a commodity
- Others
  - Heightened concern for national security
  - Institutional Lock-in (Universal Service)
  - ?

# Step 4: Scenarios

- Scenario 1-2: Broadband Saturation; QoS Maturation
  - Broadband Voice Communications become the prominent mode of (non-Mobile) Voice Communication
  - Facilities-based VoIP – due to their ownership of Access related control points, which lets them control voice quality and bundle voice – becomes more prominent than Voice over BB or P2P Voice
  - Voice Communications become commoditized
- Lesson 1:
  - Despite highly layered architecture of technology, we may end up with highly integrated voice service controlled by the facilities provider, owing to the capital intensive nature of access
  - Unbundling of access may be a natural choice, but then who would invest in the infrastructure?

# Scenarios (Contd.)

- Scenario 3-4: WiFi, WiMax, BlueTooth  
Maturation/Saturation; Rise of Highly Attractive  
Converged Applications
  - Appliances (Cell Phones, PDAs etc.) use WiFi etc. for economic arbitrage to use the cheapest access available
  - Vertically disintegrated models – such as VoIP over BB and P2P VoIP – become prominent
  - Broadband facilities providers rush to own/deploy WiFi etc.
- Lesson 2:
  - If 3<sup>rd</sup> party (e.g. Municipal WiMax) owns the WiFi etc., providers of VoIP as a converged application will begin to capture profit
  - If the Broadband facilities providers own majority of WiFi etc., we will end up with Scenario 1

# Scenarios (Contd.)

- Scenario 5: Light-touch Social and Economic Regulations
  - Regulation will require coordination between the Operator and the Service Provider in vertically disintegrated models (e.g. Comcast and Vonage)
  - Cost of meeting the regulatory requirements will be lower for the Facilities-based VoIP providers
  - Risk averse consumers will favor voice service with regulatory compliance
- Lesson 3
  - Timing of regulation is critical. Light touch regulation, if imposed sooner, will provide a lead to facilities-based solutions. If regulation is delayed, VoIP over BB and P2P may be better prepared



# Digital Music Services

Natalie Klym

CFP, MIT



# Step 1: Enumerate Control Points

*Delivery to PCs*

*Delivery to Cell Phones*

	<b>KaZaA</b>	<b>(Old) Napster</b>	<b>Altnet</b>	<b>Wippit</b>	<b>iTunes</b>	<b>Sony StreamMan</b>	<b>T-Mobile</b>	<b>IcyPole</b>
Transport architecture	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Centralized OPERATOR</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Input (supply)	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Storage (supply)	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Search	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
DRM	<b>n/a</b>	<b>n/a</b>	<b>Both SERVICE PROVIDER &amp; USER</b>	<b>Both SERVICE PROVIDER &amp; USER</b>	<b>Both SERVICE PROVIDER &amp; USER</b>	<b>Centralized</b>	<b>Centralized OPERATOR</b>	<b>n/a</b>
E-commerce	<b>n/a</b>	<b>n/a</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized</b>	<b>Centralized OPERATOR</b>	<b>n/a</b>

# Step 1: Enumerate Control Points

*Delivery to PCs*

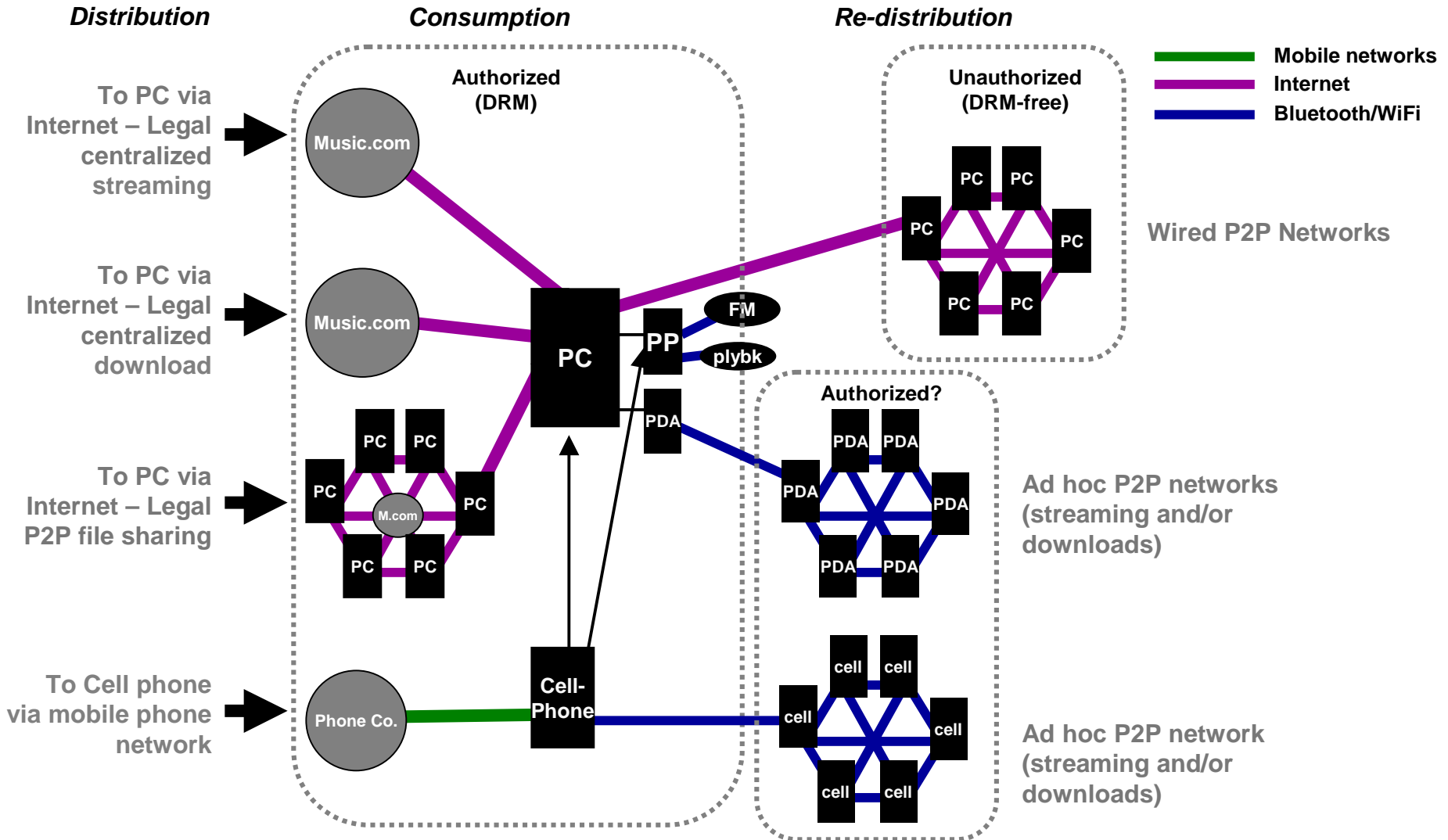
*Delivery to Cell Phones*

	KaZaA	(Old) Napster	Altnet	Wippit	iTunes	Sony StreamMan	T-Mobile	IcyPole
Transport architecture	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	<b>Distributed OPERATOR</b>	ISP	Telia Sonnera	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Input (supply)	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	Apple	<b>Centralized</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Storage (supply)	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Distributed USERS</b>	<b>Distributed USERS</b>		<b>Centralized</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
Search	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Distributed USERS</b>	<b>Centralized SERVICE PROVIDER</b>		<b>Centralized SERVICE PROVIDER</b>	<b>Centralized OPERATOR</b>	<b>Distributed USERS</b>
DRM	n/a	n/a	Both MS	Both MS		<b>Centralized</b>	<b>Centralized OPERATOR</b>	n/a
E-commerce	n/a	n/a	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized SERVICE PROVIDER</b>	<b>Centralized</b>	<b>Centralized OPERATOR</b>	n/a

# Step 2: Enumerate Varying Business models – Control Point Constellations

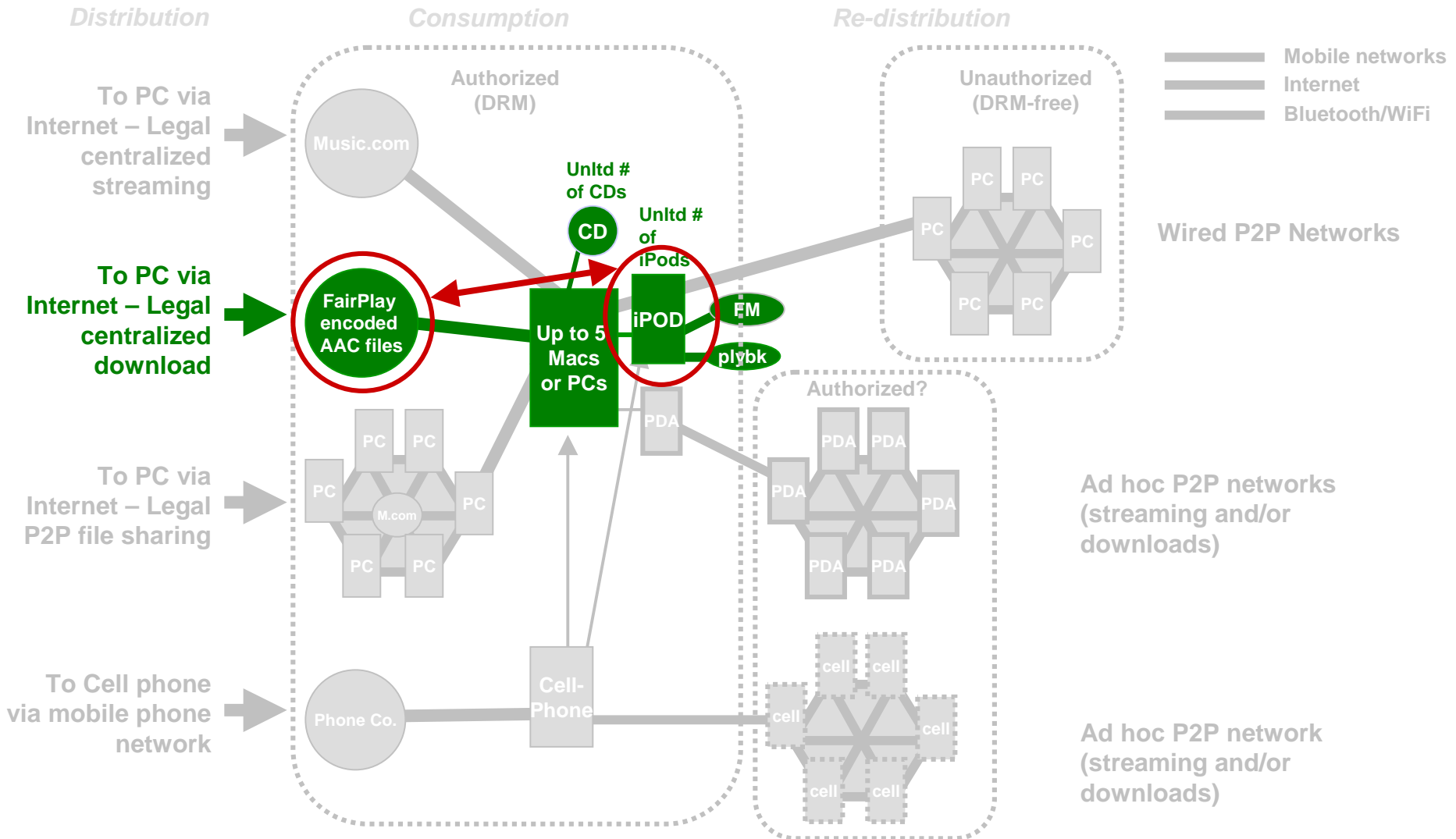
Control points define the parameters of the user experience

- delivery channels (network + devices)
- consumption infrastructure (for ripping, burning, sharing, playback)
- authorized vs unauthorized use



# Step 2: Enumerate Varying Business models – Control Point Constellations

e.g., iTunes Music Store • DRM ties iTMS to iPod for portable music experience



## Step 3: Triggers

### Technology

- P2P networks continue to circumvent authority
- DRM for P2P accepted by major labels
- DRM becomes standardized/interoperable
- Device convergence

### Social

- Hackers crack/circumvent all DRM
- Users response to legal action against P2P networks
- Users response to availability of legal downloads
- Major labels acceptance of P2P distribution
- Artists acceptance of P2P distribution and alternative compensation/CR
- New production/creation processes

## Step 3: Triggers (con't)

### Business

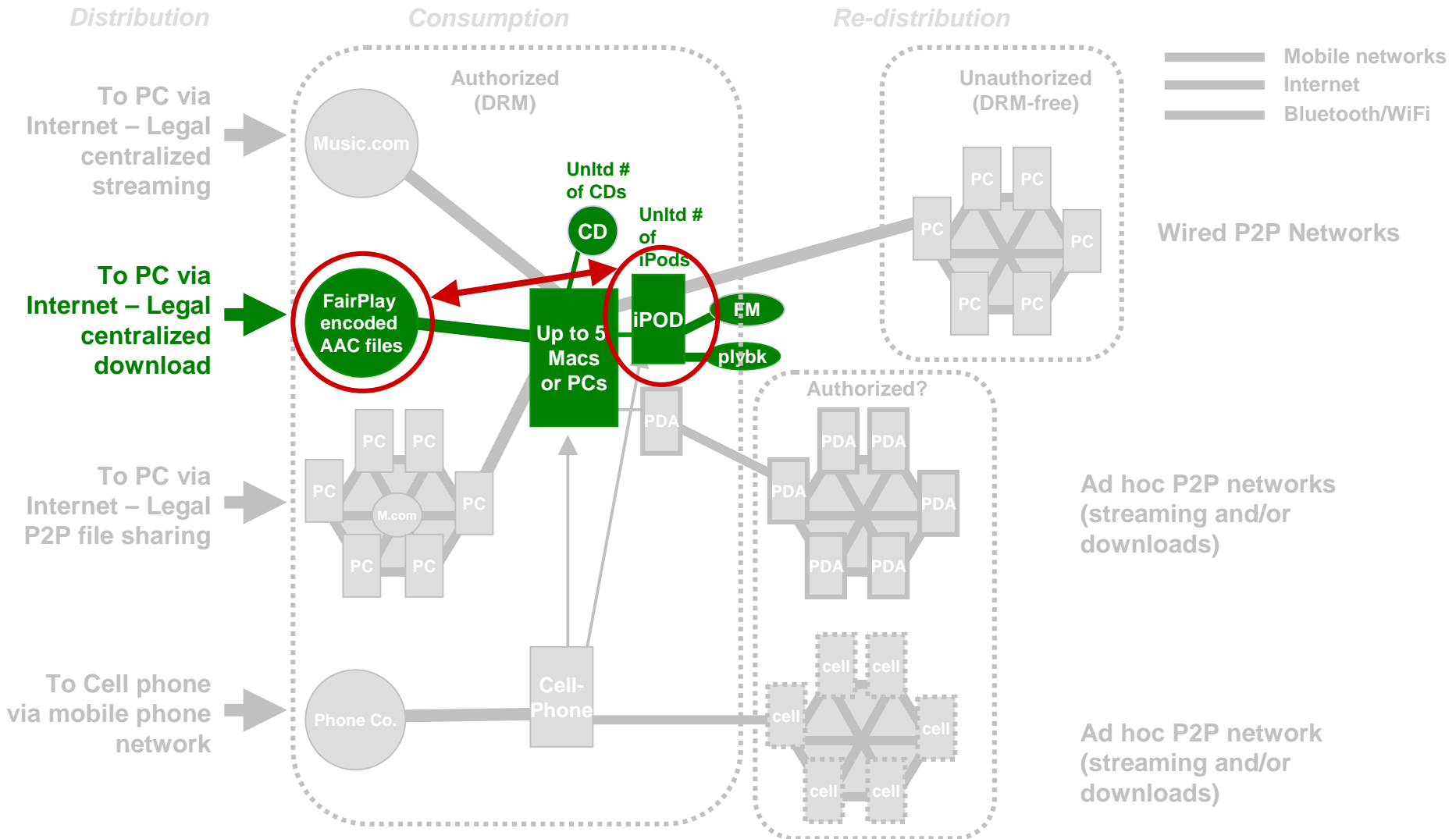
- Pricing models
  - free P2P drives down price of downloads
  - subscription vs buying tracks
  - music becomes free
- Ring tones
  - Promotes sale of music
  - Music promotes the sale of ring tones
- Role of record labels
- Convergence of radio & retail
- Musical product changes

### Regulation

- Copyright law
- Legality of P2P networks
- Economic (anti-trust law)

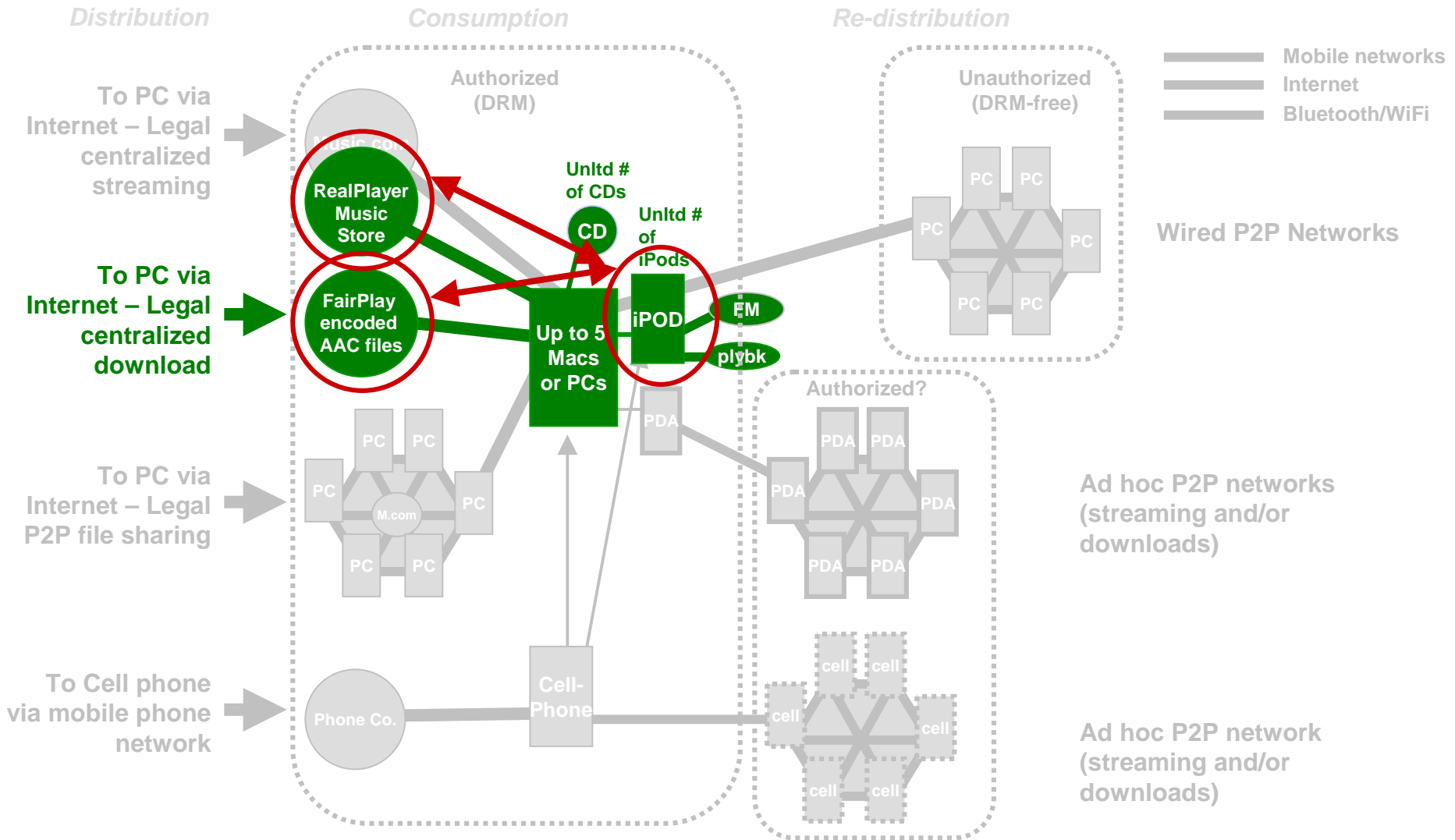
# Step 4: Scenarios – impact of triggers

e.g., iTunes Music Store



# Step 4: Scenarios – impact of triggers

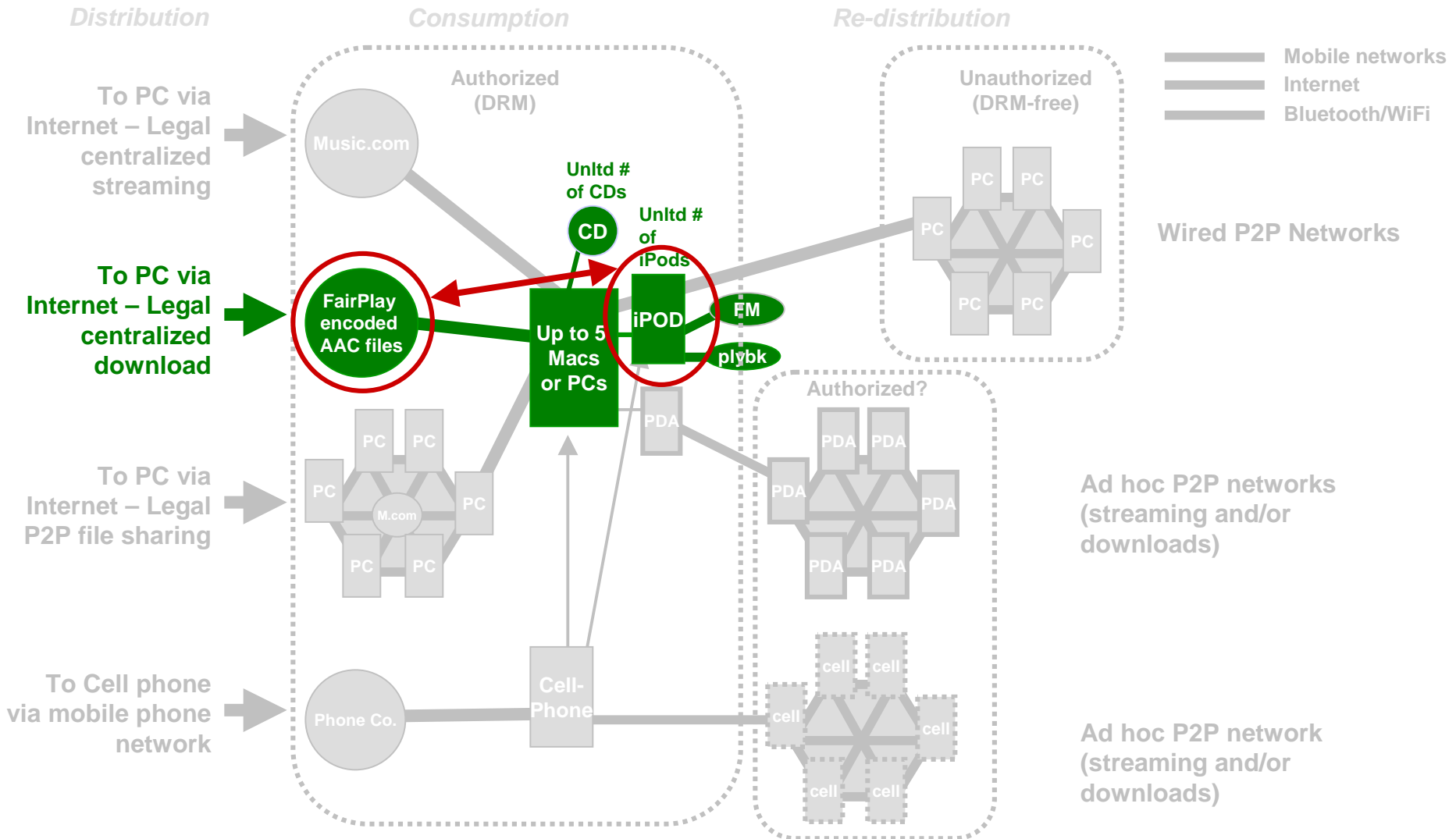
e.g., iTunes Music Store • Harmony (RealNetworks) sabotages FairPlay DRM, enables iPod users to play music from RealPlayer music store





# Step 4: Scenarios – impact of triggers

e.g., iTunes Music Store • Apple disables Harmony in the next version of the iPod



# Lessons Learned

# Generally

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- Value creation is no longer bound to concepts like *core & edge*
  - Hence, core & edge seem to have less meaning in studying value creation!
- Technology matures
  - Value can be created almost anywhere!
  - Rapidly accelerates clock speed of industry
- Value creation with “traditional” core approaches still possible
- Anything else?

# Next Steps

# Open For Discussion

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- Further apply methodology to case studies
  - SIP & RFID to be revived
- Do we need other case studies?
- Visualization of control point constellations and transitions of these
- Deeper study possible triggers
- Enter the prediction phase
  - Evaluate possible new business models in selected areas
  - Suggestions?