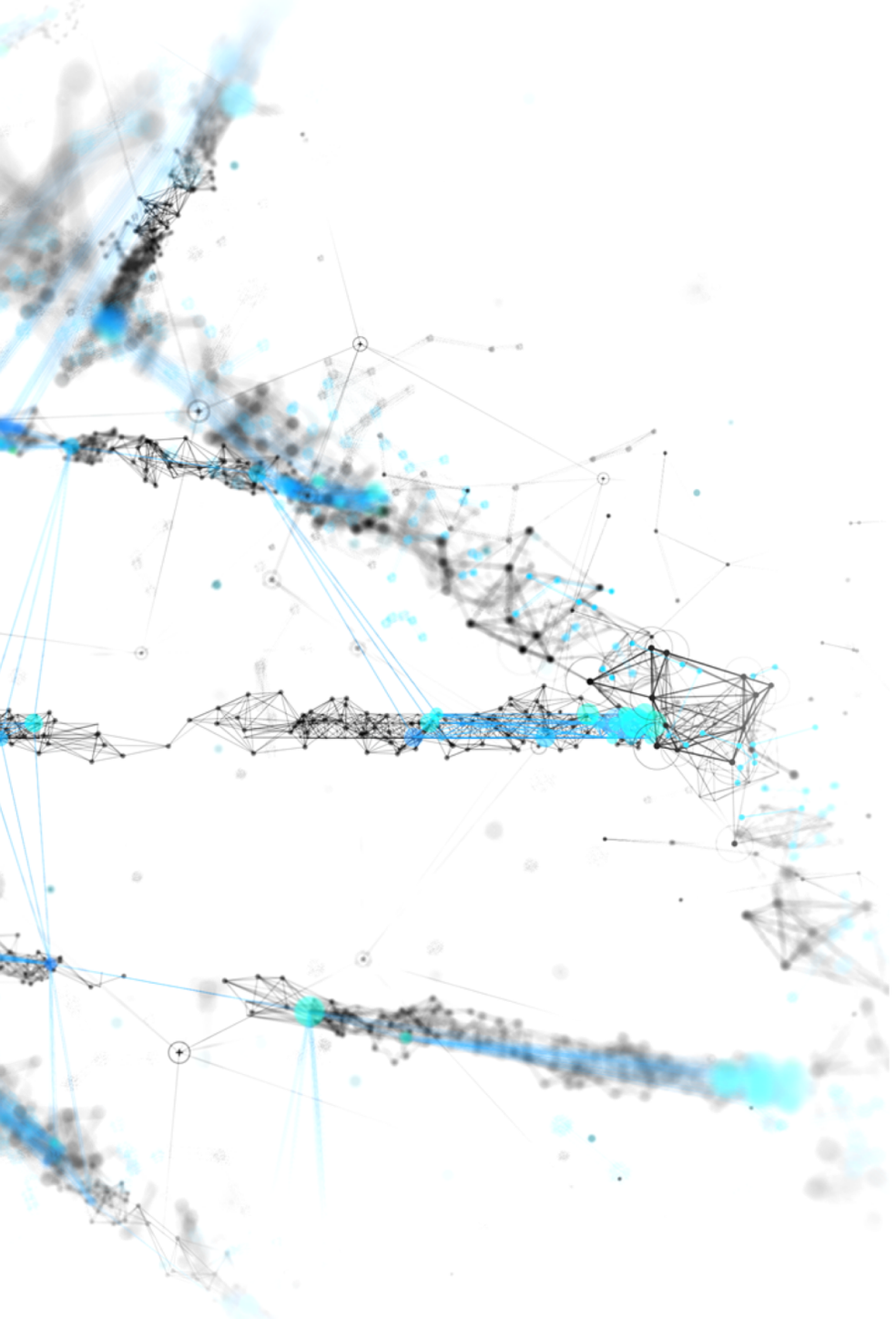


Designing Automated Enforcement for Spectrum Regulation

Automating Enforcement at the Regulatory Authority Level

J. Stephanie Rose

University of Pittsburgh

15:30-16:45

PACIFIC TELECOMMUNICATIONS COUNCIL

PTC'19 | FROM PIPES TO PLATFORMS
20–23 January 2019 | Honolulu, Hawaii

INTRODUCTION

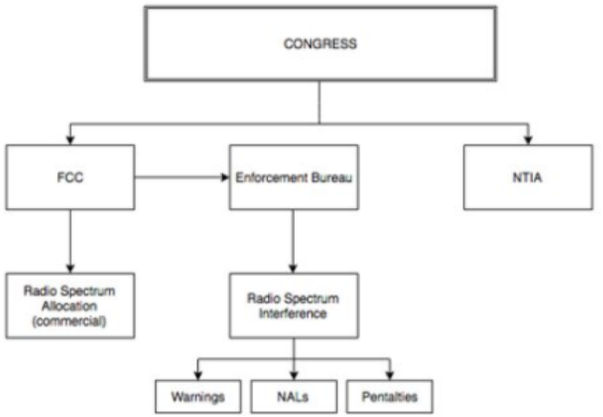
- ❑ Spectrum Scarcity
- ❑ Timing intervention
- ❑ *Ex ante* vs *ex post*
- ❑ Regulation for emerging technologies and intensely shared spectrum environments

In Eventus

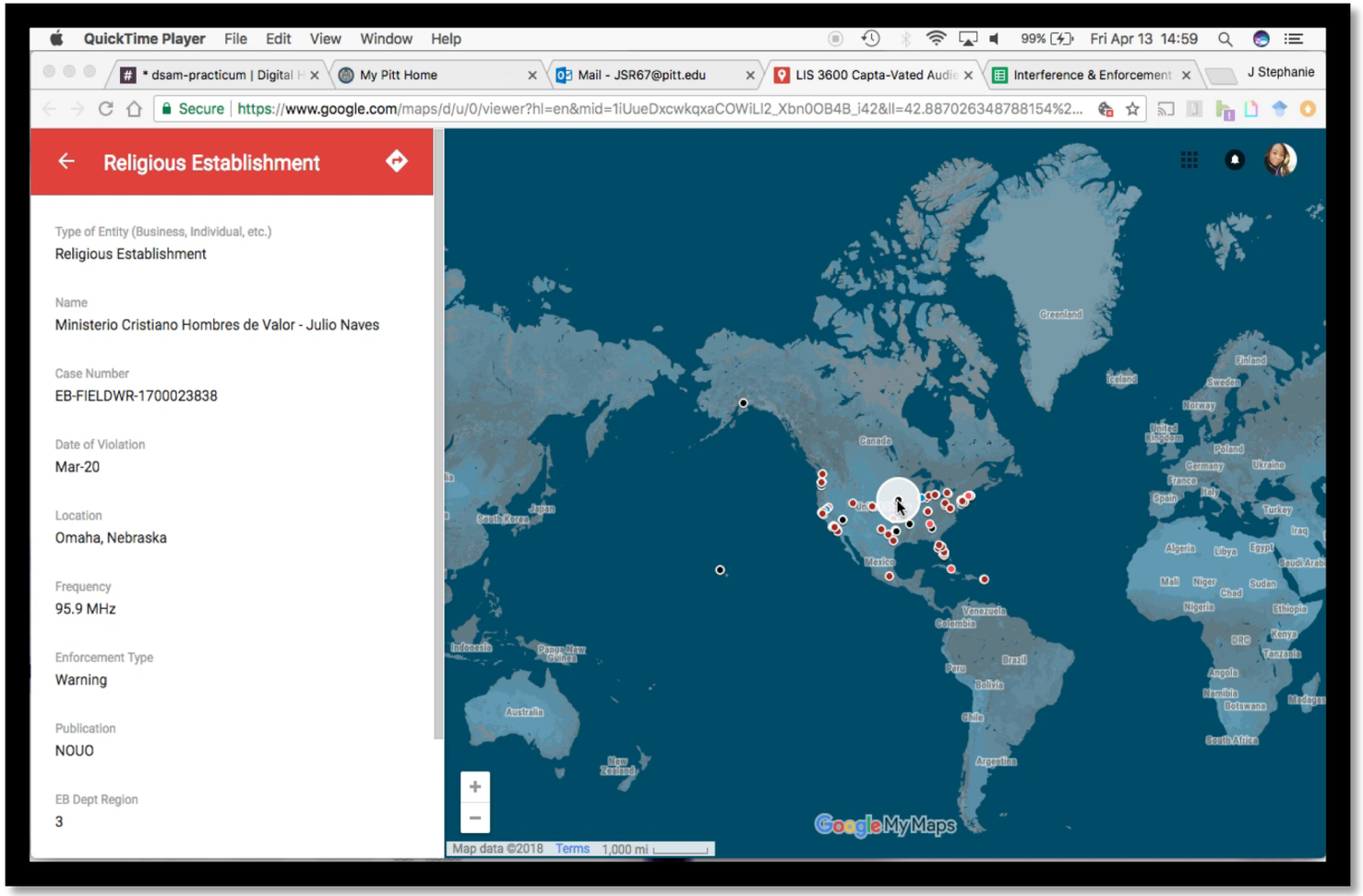
"Not just before and after, but during"

BACKGROUND

- Enforcement measures do not encompass an *in eventus* approach
- Minimal to no regulatory authority optimal enforcement framework
- Proposed automated enforcement measures do not encompass a component for regulatory authority oversight



BACKGROUND CONT'D



RESEARCH QUESTIONS

RQ1:

How prevalent are interference issues within commercial spectrum management?

RQ2:

How does the FCC adjudicate spectrum interference violations?

RQ3:

Is there a more innovative way to regulate radio spectrum?

METHODS

Using a multi-method approach

❑ Document Analysis

- 650 Federal Communications Commission Enforcement Bureau actions of various types of enforcement

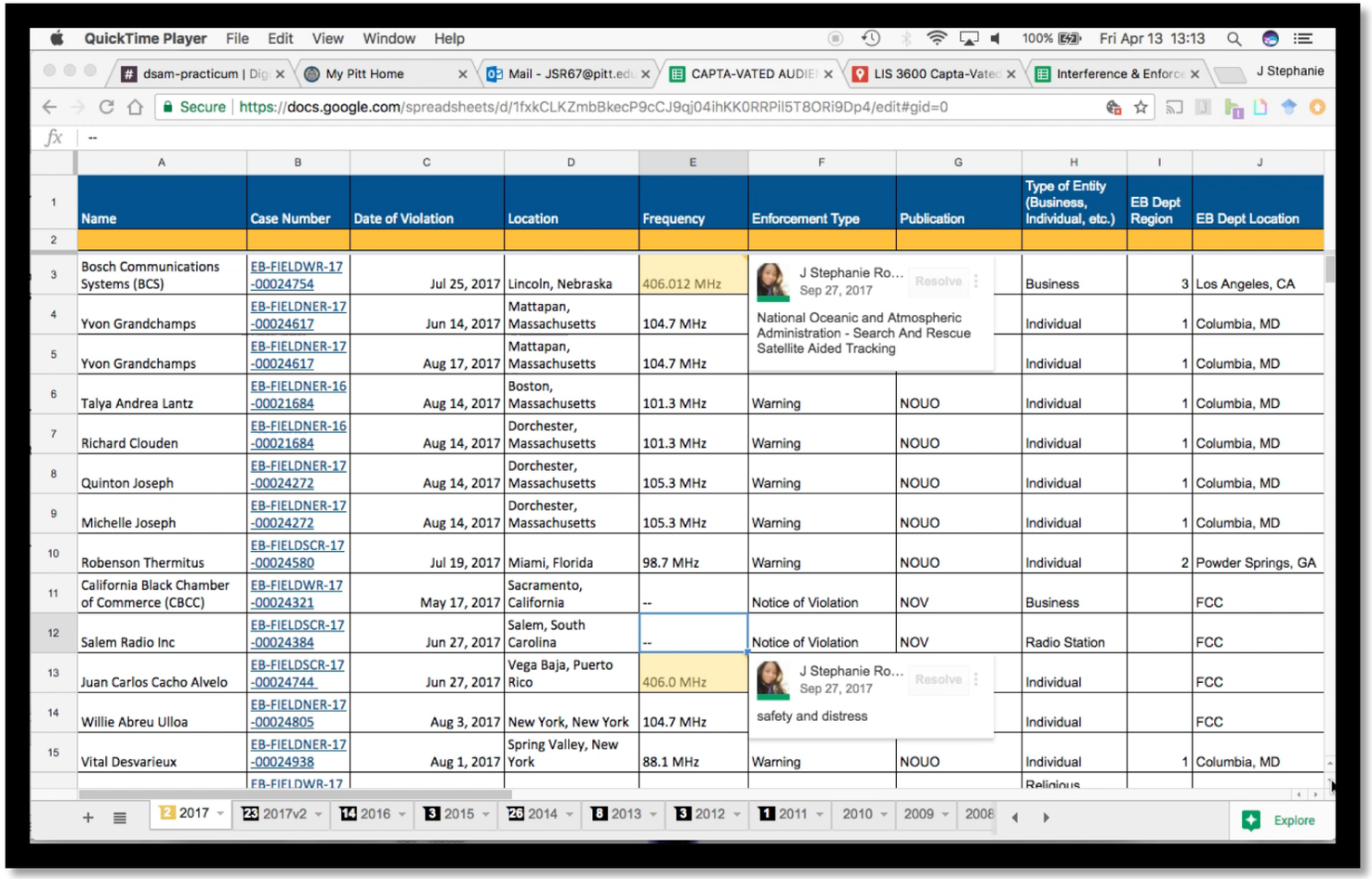
❑ Case Studies

- Existing automated enforcement frameworks

❑ System Requirements

- Reminiscent of an Agile methods

DOCUMENT ANALYSIS



	Name	Case Number	Date of Violation	Location	Frequency	Enforcement Type	Publication	Type of Entity (Business, Individual, etc.)	EB Dept Region	EB Dept Location
3	Bosch Communications Systems (BCS)	EB-FIELDWR-17-00024754	Jul 25, 2017	Lincoln, Nebraska	406.012 MHz			Business	3	Los Angeles, CA
4	Yvon Grandchamps	EB-FIELDNER-17-00024617	Jun 14, 2017	Mattapan, Massachusetts	104.7 MHz			Individual	1	Columbia, MD
5	Yvon Grandchamps	EB-FIELDNER-17-00024617	Aug 17, 2017	Mattapan, Massachusetts	104.7 MHz			Individual	1	Columbia, MD
6	Talya Andrea Lantz	EB-FIELDNER-16-00021684	Aug 14, 2017	Boston, Massachusetts	101.3 MHz	Warning	NOUO	Individual	1	Columbia, MD
7	Richard Clouden	EB-FIELDNER-16-00021684	Aug 14, 2017	Dorchester, Massachusetts	101.3 MHz	Warning	NOUO	Individual	1	Columbia, MD
8	Quinton Joseph	EB-FIELDNER-17-00024272	Aug 14, 2017	Dorchester, Massachusetts	105.3 MHz	Warning	NOUO	Individual	1	Columbia, MD
9	Michelle Joseph	EB-FIELDNER-17-00024272	Aug 14, 2017	Dorchester, Massachusetts	105.3 MHz	Warning	NOUO	Individual	1	Columbia, MD
10	Robenson Thermitus	EB-FIELDSCR-17-00024580	Jul 19, 2017	Miami, Florida	98.7 MHz	Warning	NOUO	Individual	2	Powder Springs, GA
11	California Black Chamber of Commerce (CBCC)	EB-FIELDWR-17-00024321	May 17, 2017	Sacramento, California	--	Notice of Violation	NOV	Business		FCC
12	Salem Radio Inc	EB-FIELDSCR-17-00024384	Jun 27, 2017	Salem, South Carolina	--	Notice of Violation	NOV	Radio Station		FCC
13	Juan Carlos Cacho Alvelo	EB-FIELDSCR-17-00024744	Jun 27, 2017	Vega Baja, Puerto Rico	406.0 MHz			Individual		FCC
14	Willie Abreu Ulloa	EB-FIELDNER-17-00024805	Aug 3, 2017	New York, New York	104.7 MHz			Individual		FCC
15	Vital Desvarieux	EB-FIELDNER-17-00024938	Aug 1, 2017	Spring Valley, New York	88.1 MHz	Warning	NOUO	Individual	1	Columbia, MD

CASE STUDIES –ENFORCEMENT & AUTOMATION

❑ Automated Traffic Enforcement of Road Violations

- "Automated traffic applications typically encompass the detection and segmentation of moving vehicles as a crucial process" (Marikhu et al 2013).

❑ Automated Enforcement of Copyright

- Automated copyright enforcement is initiated by the owner of the copyrighted material and/or intellectual good. "Today's major digital communities include: P2P file sharing systems, chat applications and social networking sites" (Hughes et al 2008).

❑ Vessel Monitoring System

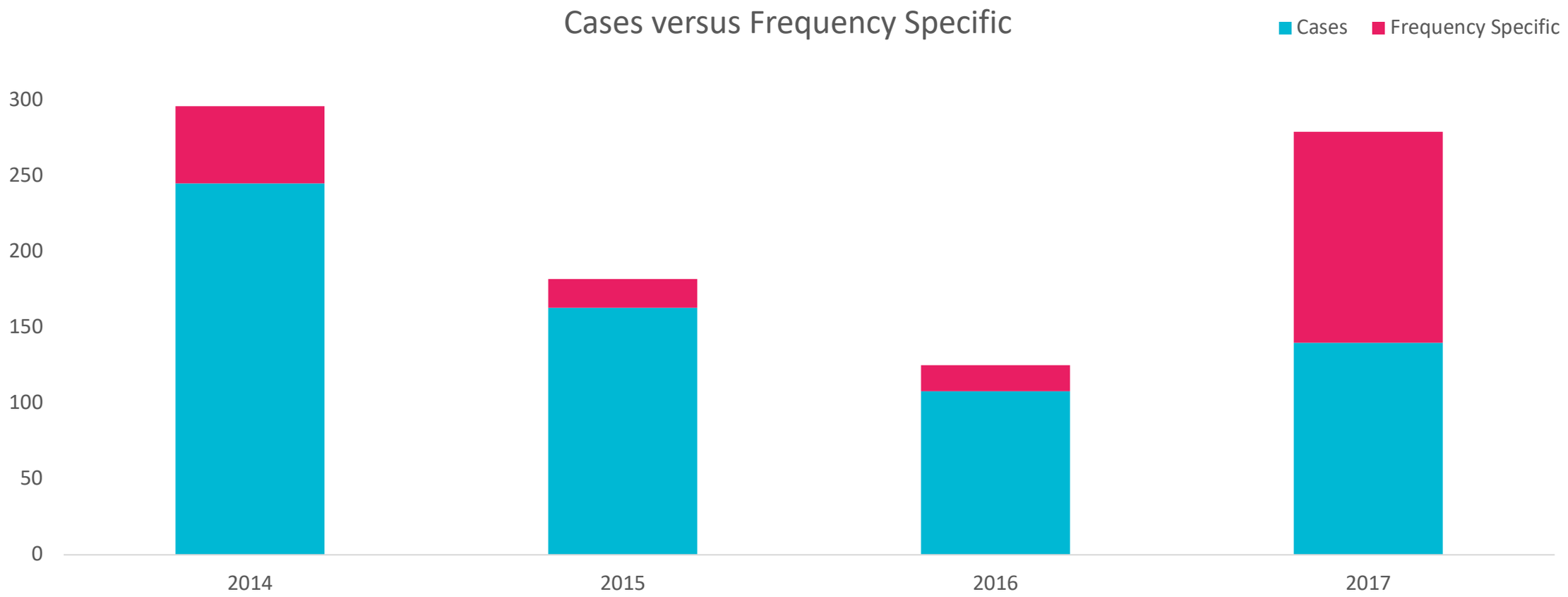
- This system focuses on fisheries as well as nautical search and recovery missions. In order to accomplish this, VMS utilizes "satellite communications and GPS technology, this system provides near-real time two-way communication between fishing vessels and enforcement monitoring centers monitoring fishing vessel activity throughout the United States EEZ, Pacific Ocean and Atlantic Ocean" (NMFS 2005)

Although automated enforcement schemes between traffic, copyright, and vessels are decidedly different, they are all similar in detecting and reporting enforceable actions. Evermore, users (possible violators) are aware that there is an enforcement mechanism in place that is essentially "always watching".

SYSTEMS REQUIREMENTS

- ❑ Consistent Enforcement Framework
- ❑ Optimal *in eventus* enforcement
- ❑ Prioritizing what actions need to be automated

SYSTEMS REQUIREMENTS CONT'D



CONCEPTUAL FRAMEWORK

Conditions/Actions	Rules							
	Individual				Business			
Licensed	X	X			X	X		
Unlicensed			X	X			X	X
Intentional (E.g. unlicensed radio, exceeded power limits, jammer/blocker, etc.)	X		X		X		X	
Unintentional (e.g. hardware failure)		X		X		X		X

- In terms of initial implementation, prioritization of enforcement should more than likely be given to interference and violations that could cause actual harm.

CONCEPTUAL FRAMEWORK CONT'D

Conditions/Actions	Rules							
	Individual				Business			
Licensed	X	X			X	X		
Unlicensed			X	X			X	X
Intentional (e.g. unlicensed radio, exceeded power limits, jammer/blocker, etc.)	X		X		X		X	
Unintentional (e.g. hardware failure)		X		X		X		X

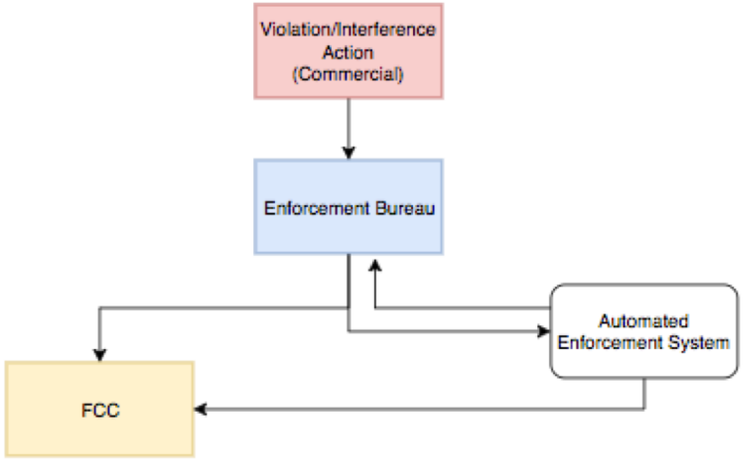
Conditions/Actions	Rules							
	Individual				Business			
Licensed	X	X			X	X		
Unlicensed			X	X			X	X
Intentional (e.g. unlicensed radio, exceeded power limits, jammer/blocker, etc.)	X		X		X		X	
Unintentional (e.g. hardware failure)		X		X		X		X

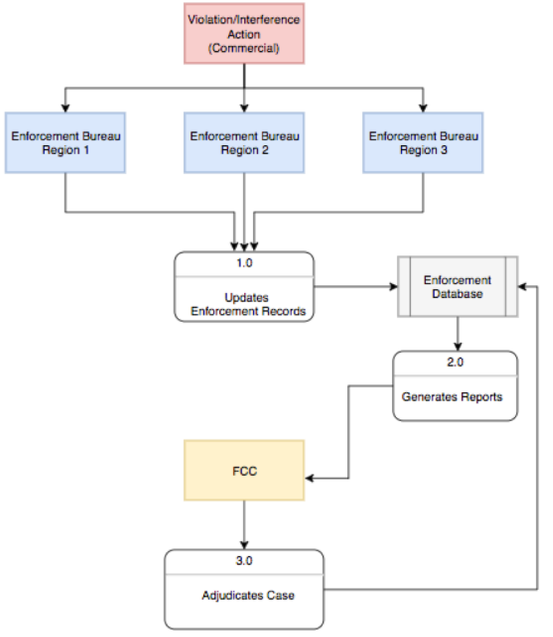
Conditions/Actions	Rules							
	Individual				Business			
Licensed	X	X			X	X		
Unlicensed			X	X			X	X
Intentional (e.g. unlicensed radio, exceeded power limits, jammer/blocker, etc.)	X		X		X		X	
Unintentional (e.g. hardware failure)		X		X		X		X

Conditions/Actions	Rules							
	Individual				Business			
Licensed	X	X			X	X		
Unlicensed			X	X			X	X
Intentional (e.g. unlicensed radio, exceeded power limits, jammer/blocker, etc.)	X		X		X		X	
Unintentional (e.g. hardware failure)		X		X		X		X

CONCEPTUAL FRAMEWORK

The figures take the current enforcement process – which was described at the beginning of this paper – and make those actions compatible for system adaptation.





DISCUSSION

As technologies and services continue to emerge, it is imperative to

- ❑ Include optimal enforcement schemes
- ❑ Incorporate *in eventus* measures for automated enforcement
- ❑ Have an automated enforcement system at the regulatory authority level

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QUESTIONS?