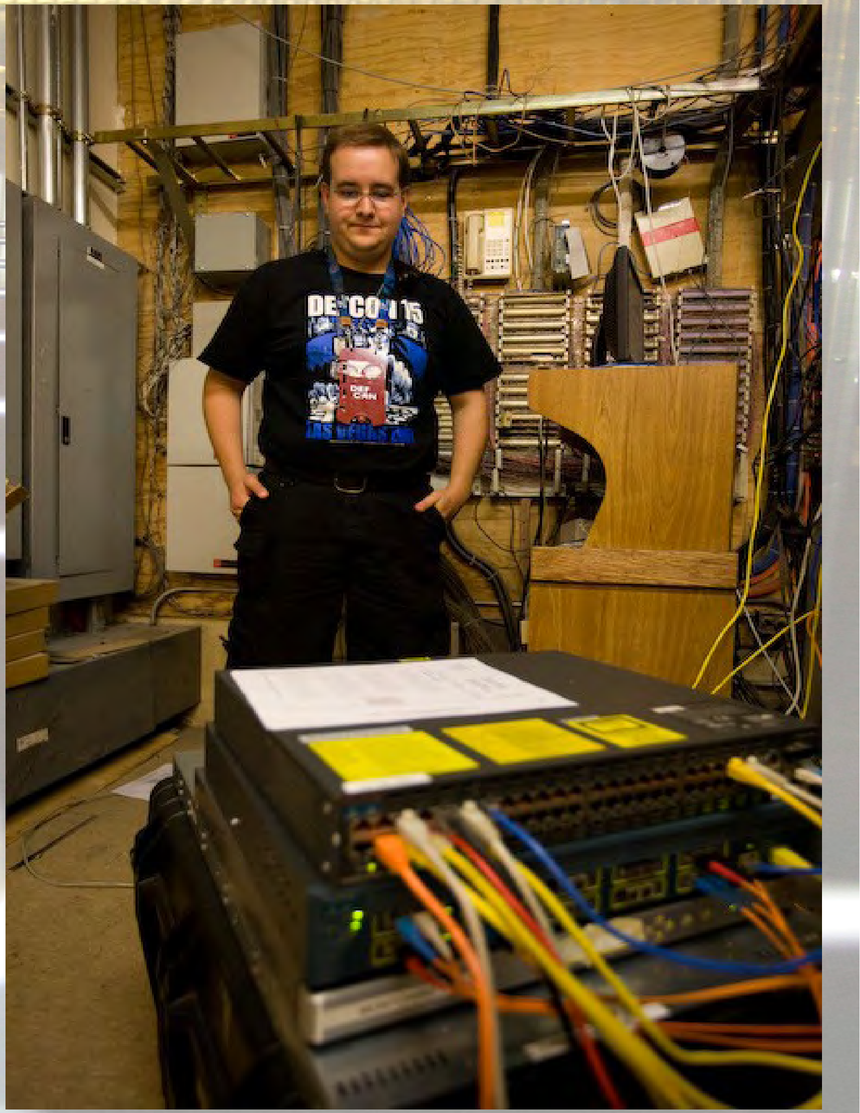
Hacking With GnuRadio

How to have fun with wireless transmissions!

netSPI
RISK COMPLIANCE SECURITY

David M. N. Bryan

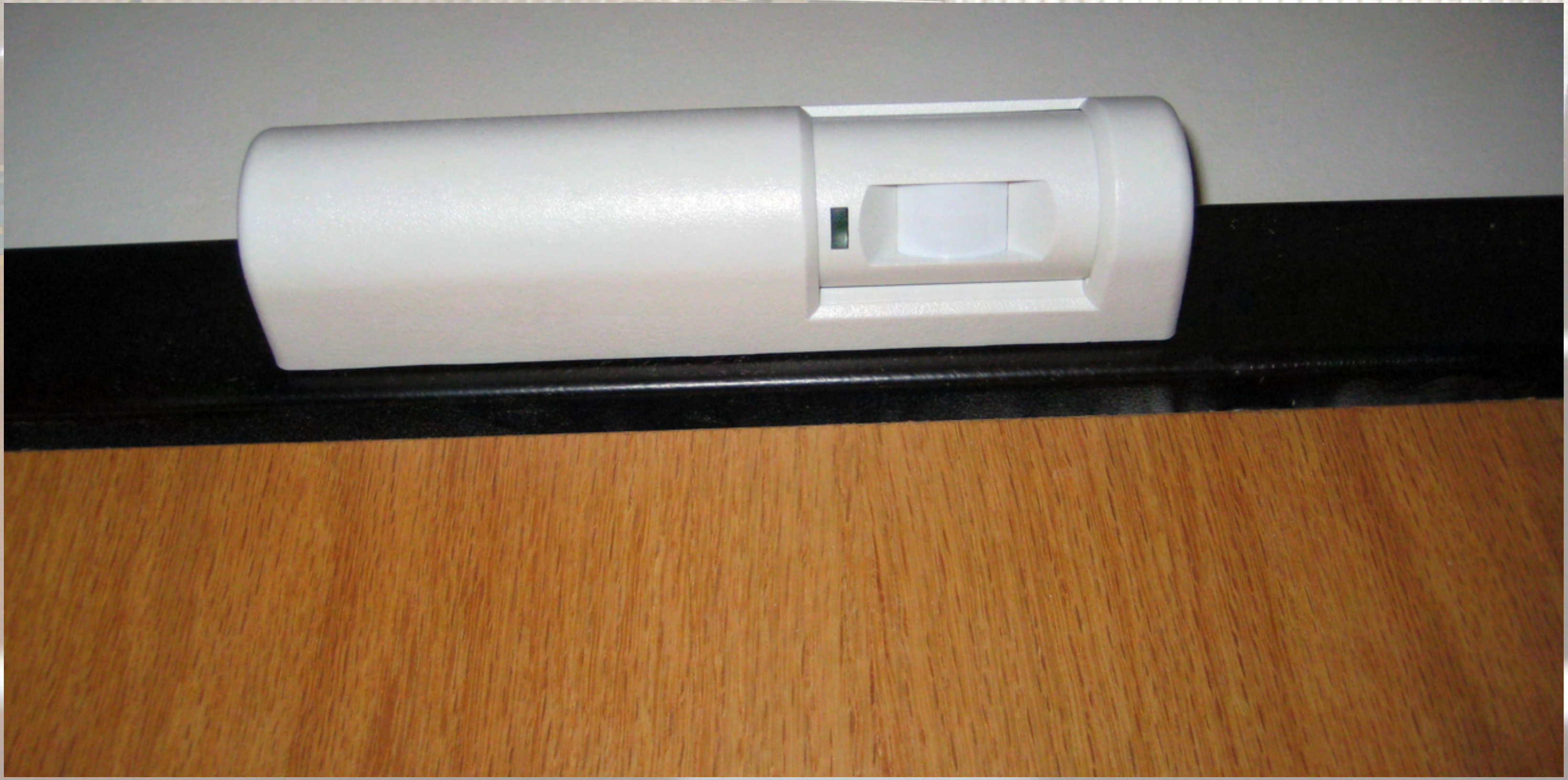
- Info Security Consultant
- CISSP
- HAM
- Hacker
- DEFCON



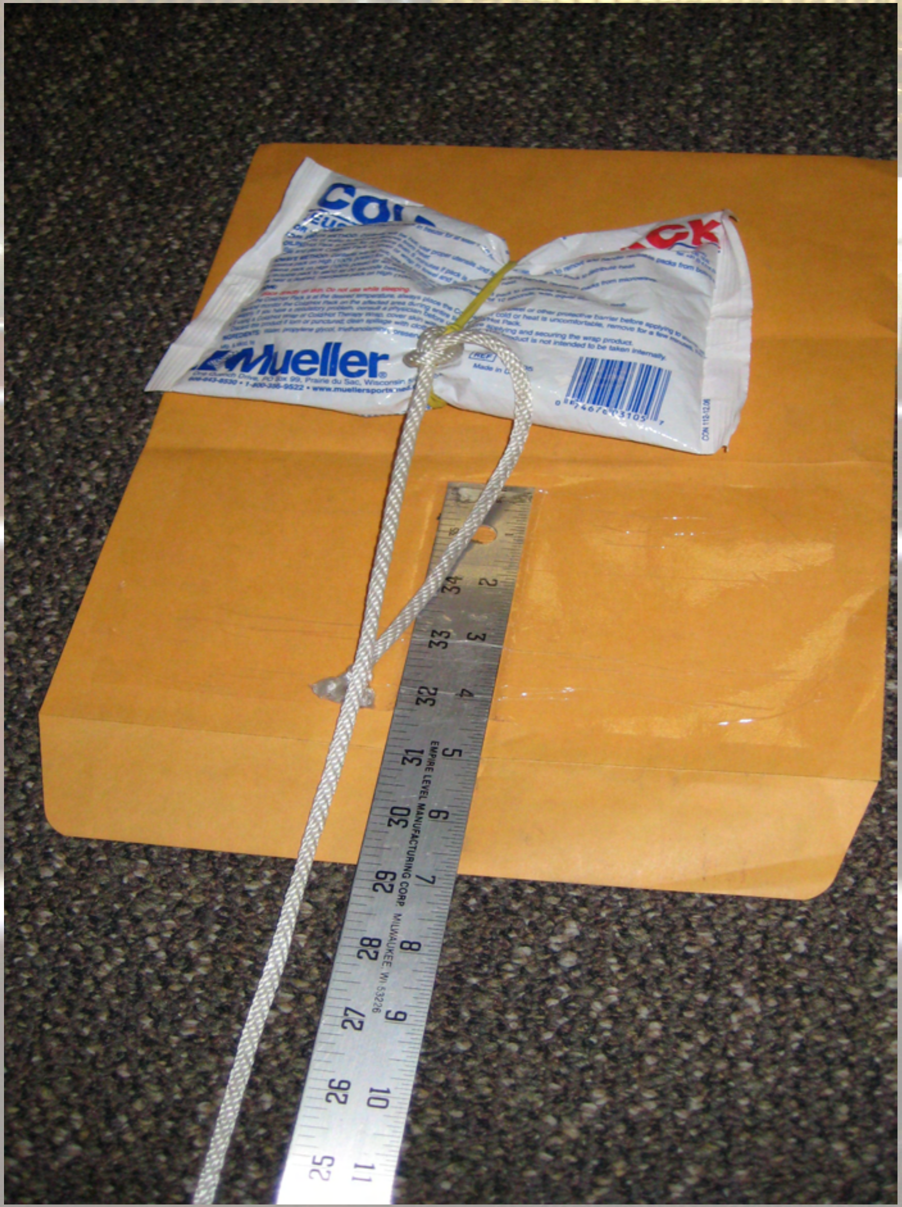
Hacker Spaces!!!

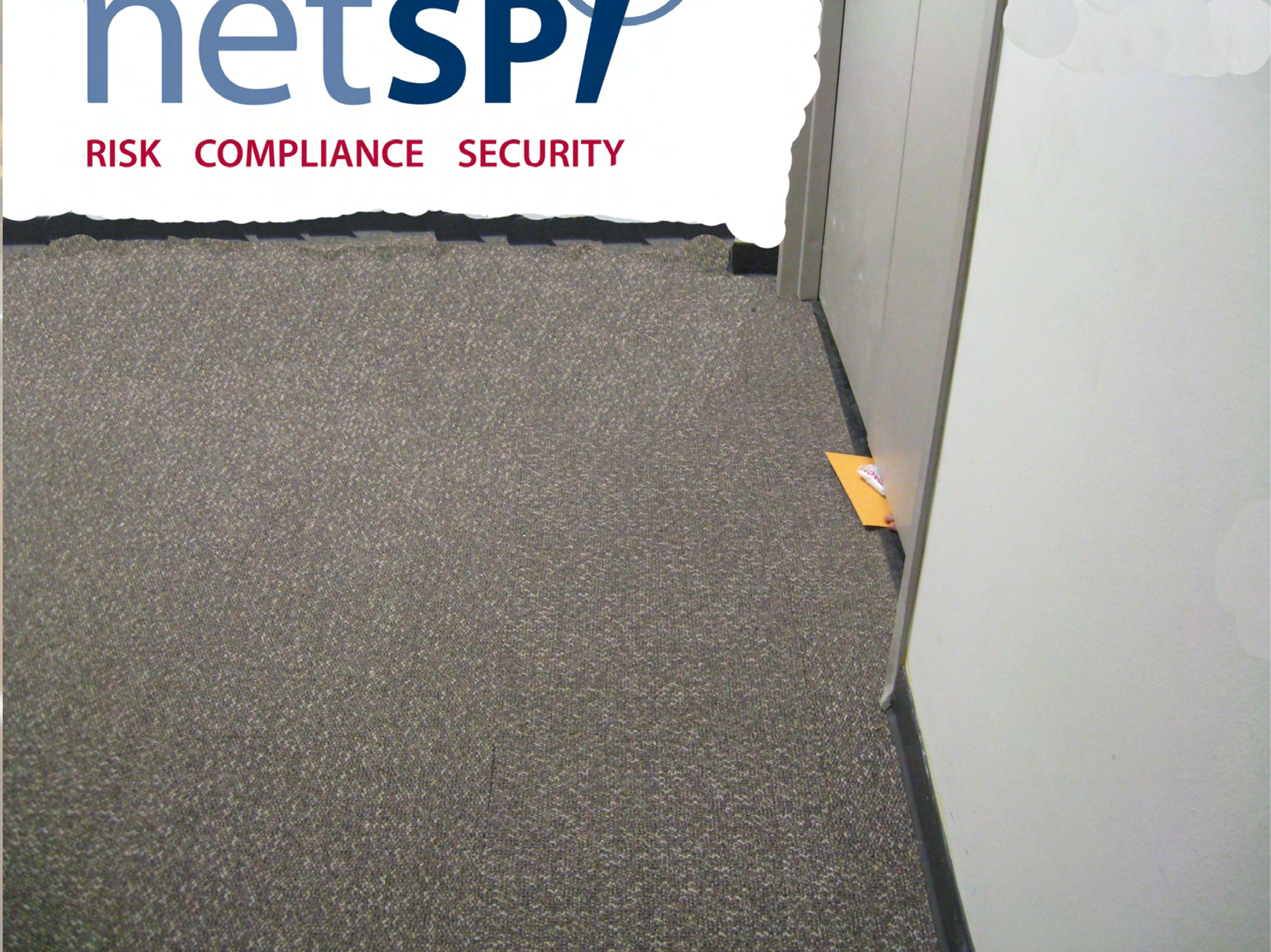
Thanks to CCCKC – Sweet Hacker Space!

What is this?



Is that a hot pack in your pocket?

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netspi

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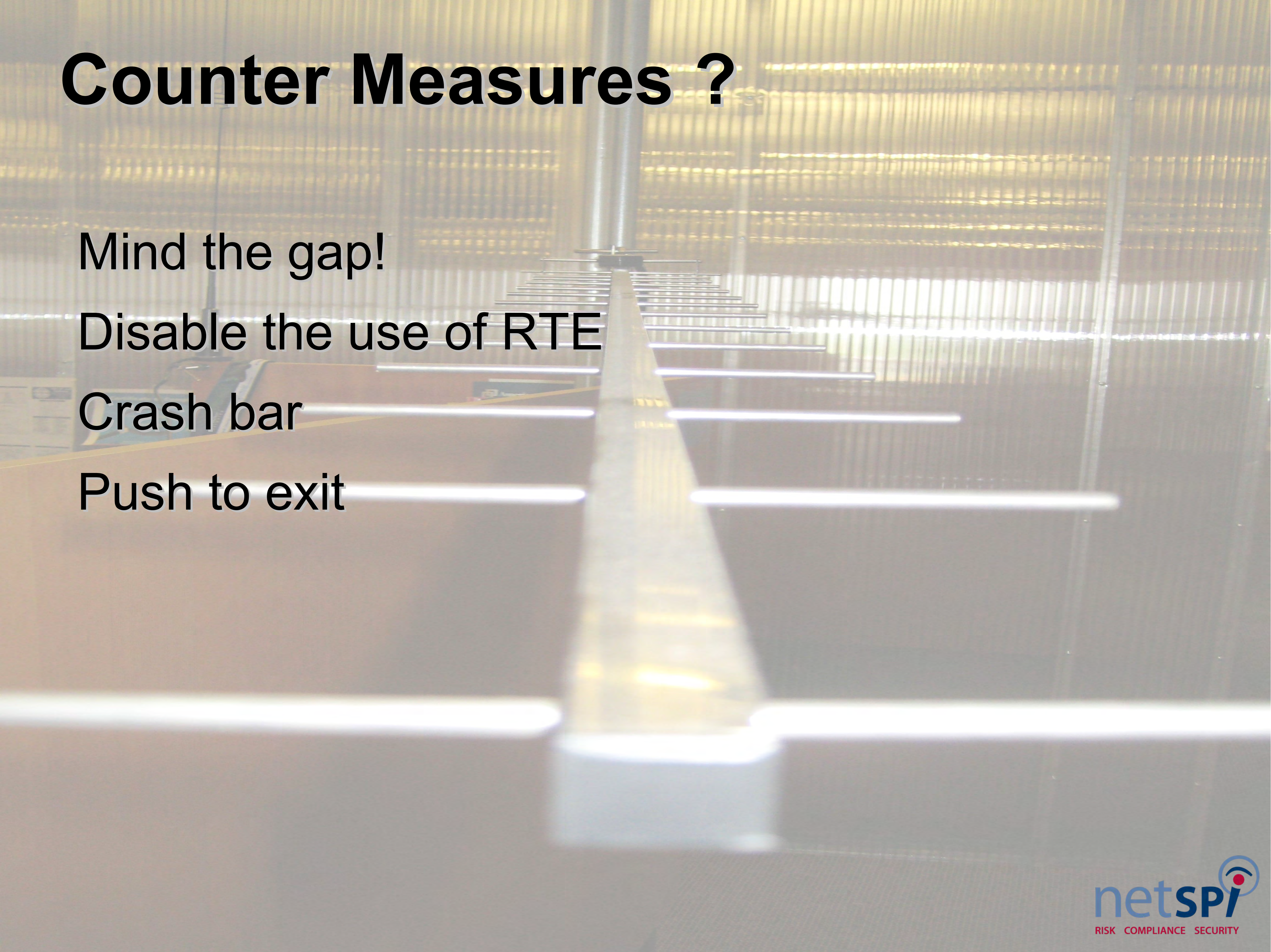
Counter Measures ?



Mind the gap!

Disable the use of RTE

Crash bar

Push to exit

Hacking With GnuRadio

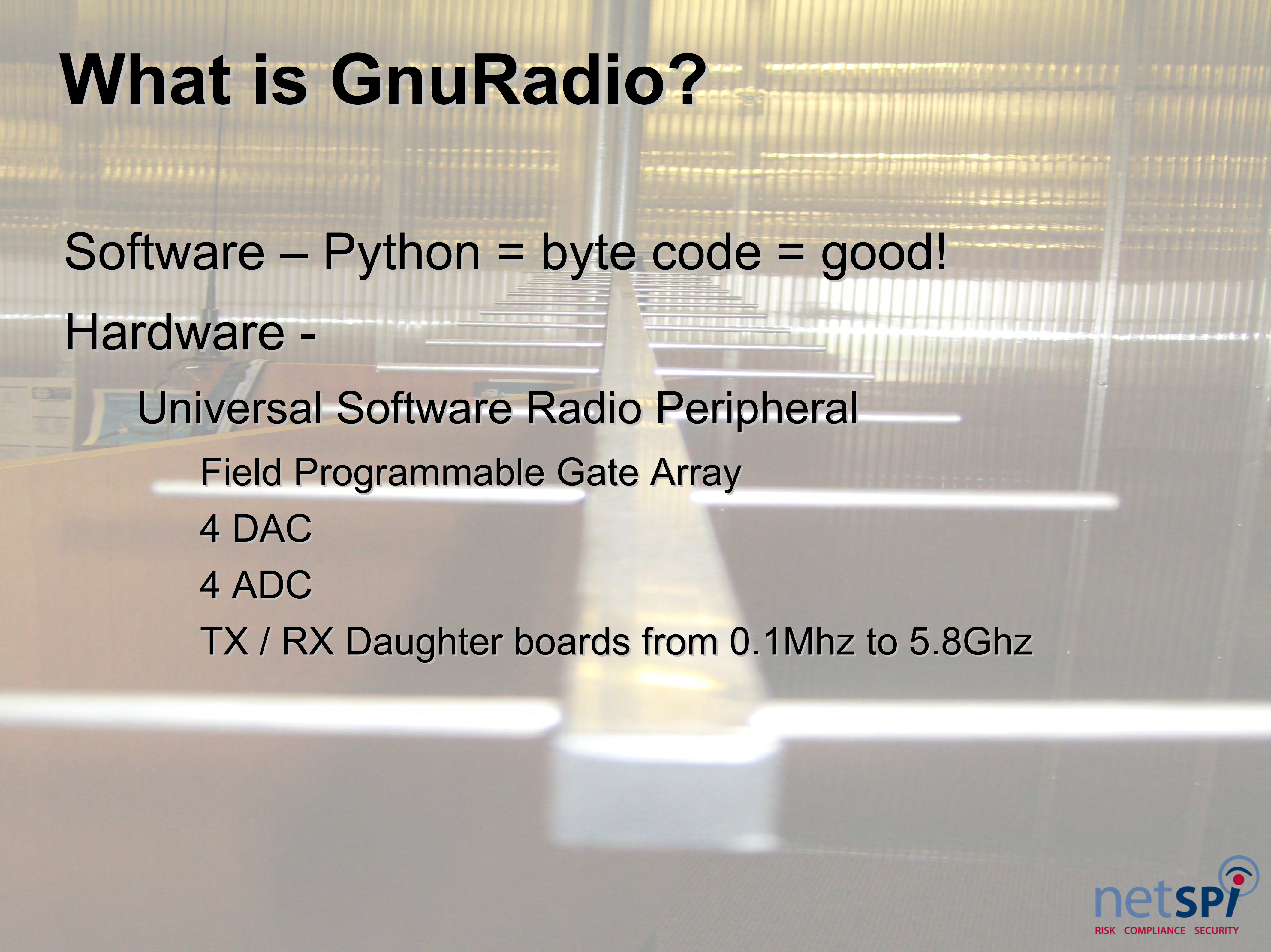
What is GnuRadio?

What you need

Requirements

Costs

What is GnuRadio?

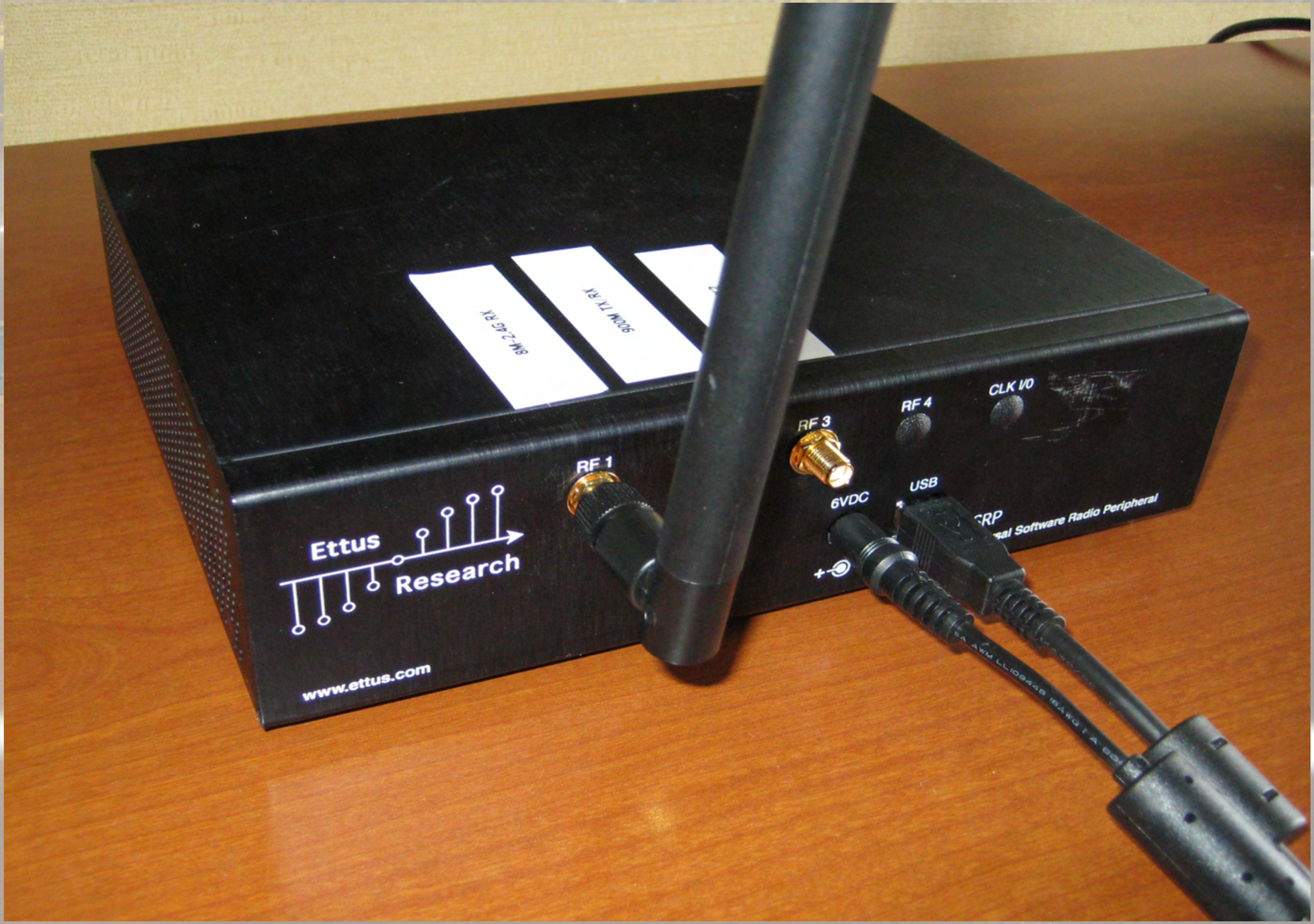


Software – Python = byte code = good!

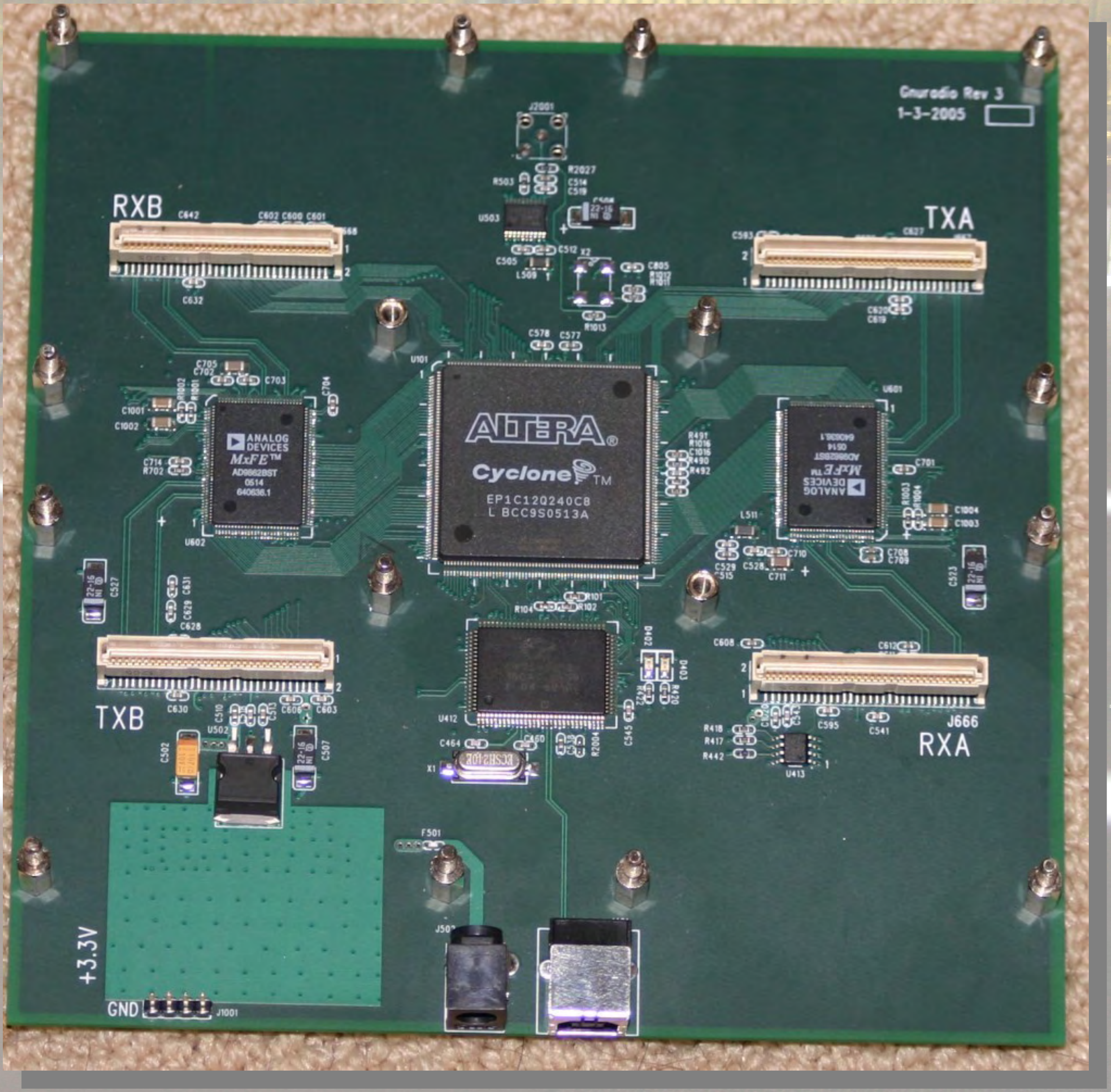
Hardware -

- Universal Software Radio Peripheral
  - Field Programmable Gate Array
  - 4 DAC
  - 4 ADC
  - TX / RX Daughter boards from 0.1Mhz to 5.8Ghz

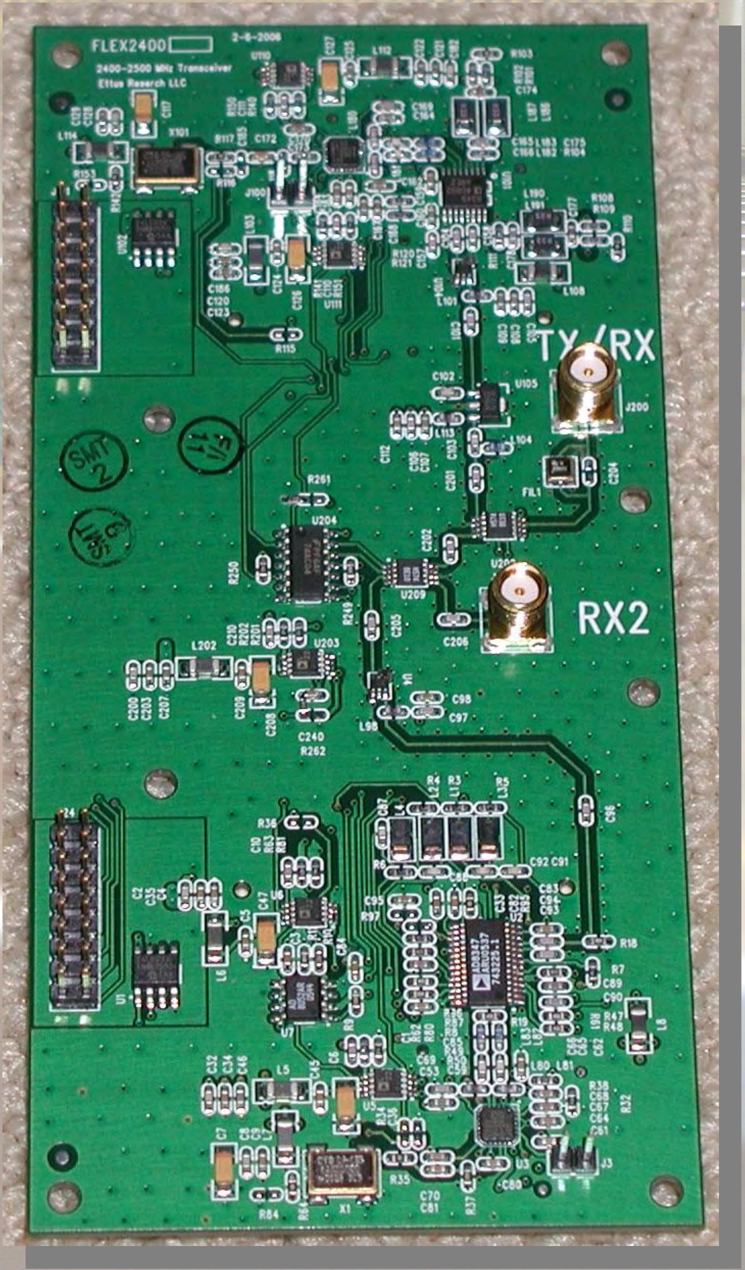
USRP v1.0

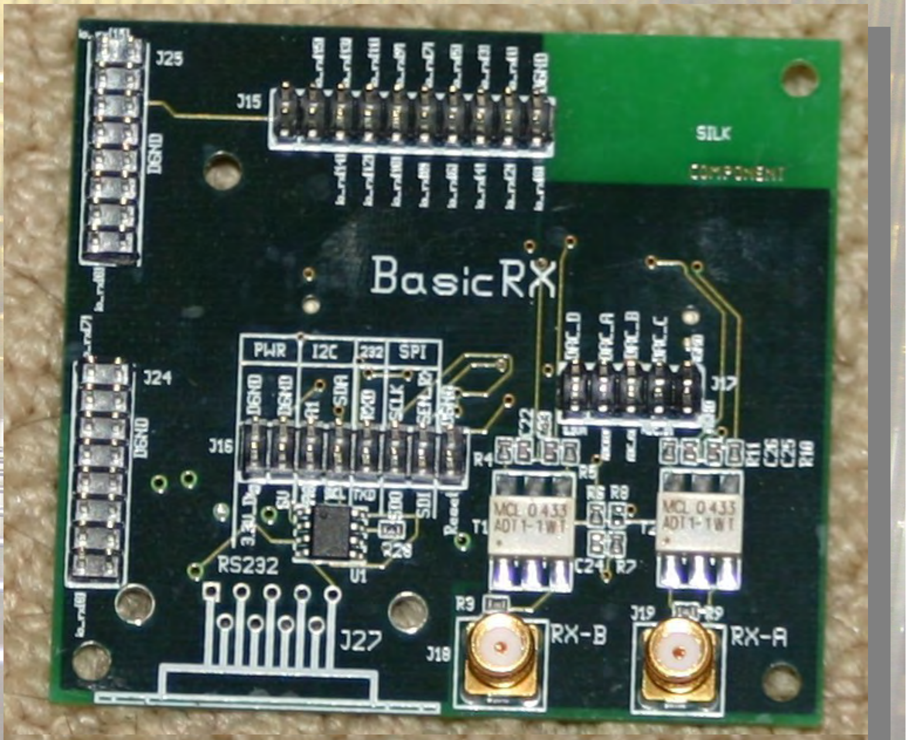

8M 2.4G RX
900M TX RX
RF 1
RF 3
RF 4
CLK I/O
6VDC
USB
+-◎
...RP
...sal Software Radio Peripheral
Ettus
Research
www.ettus.com

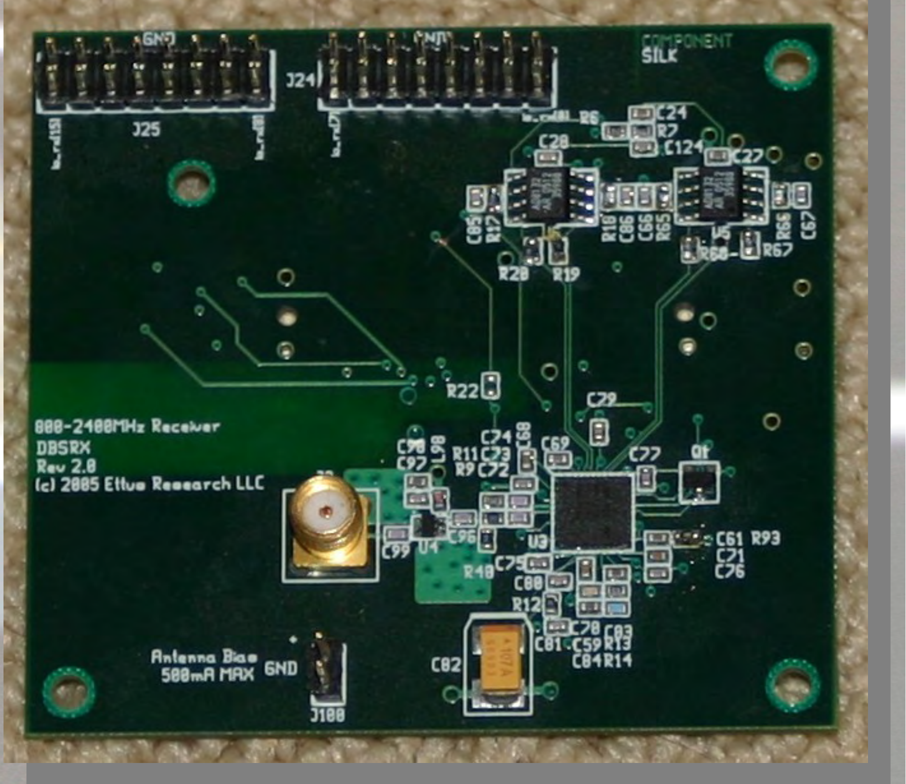
USRP Board

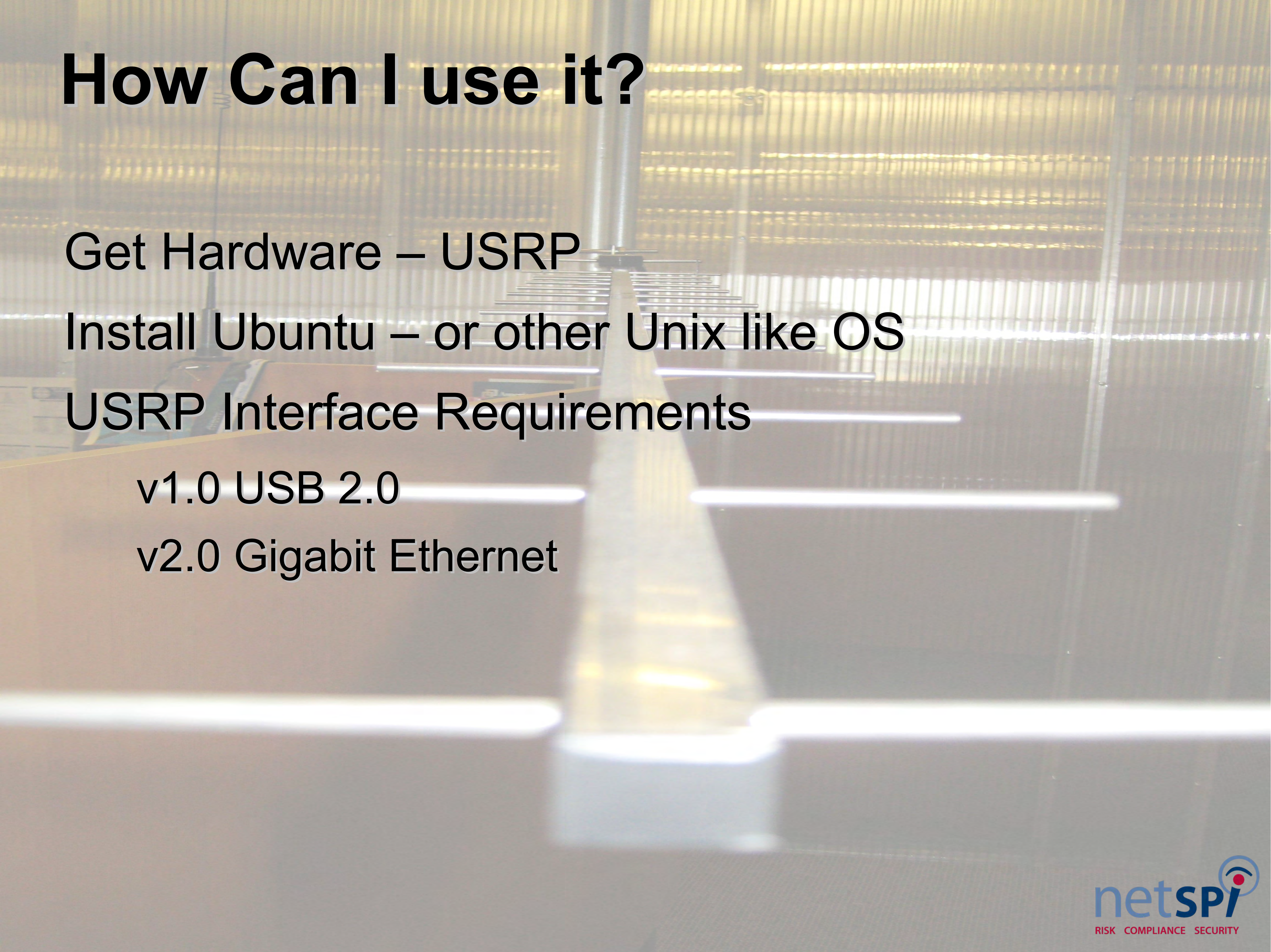

Gnuradio Rev 3
1-3-2005
RXB
TXA
ALTERA
Cyclone
EP1C12Q240C8
L BCC9S0513A
ANALOG DEVICES
MxFE
AD9862BST
TXB
RXA
+3.3V
GND

Daughter Boards





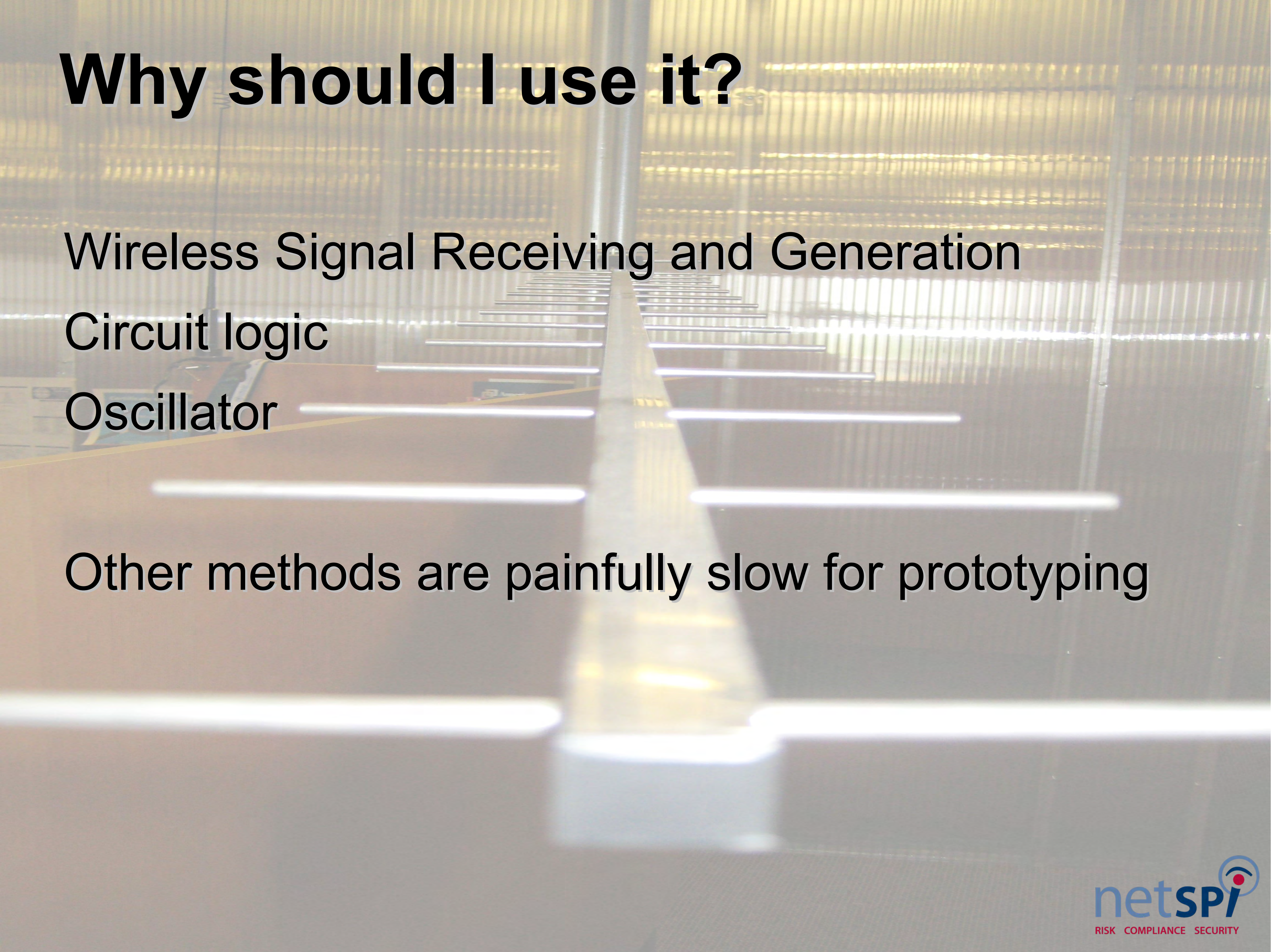




How Can I use it?

- Get Hardware – USRP
- Install Ubuntu – or other Unix like OS
- USRP Interface Requirements
  - v1.0 USB 2.0
  - v2.0 Gigabit Ethernet

Why should I use it?



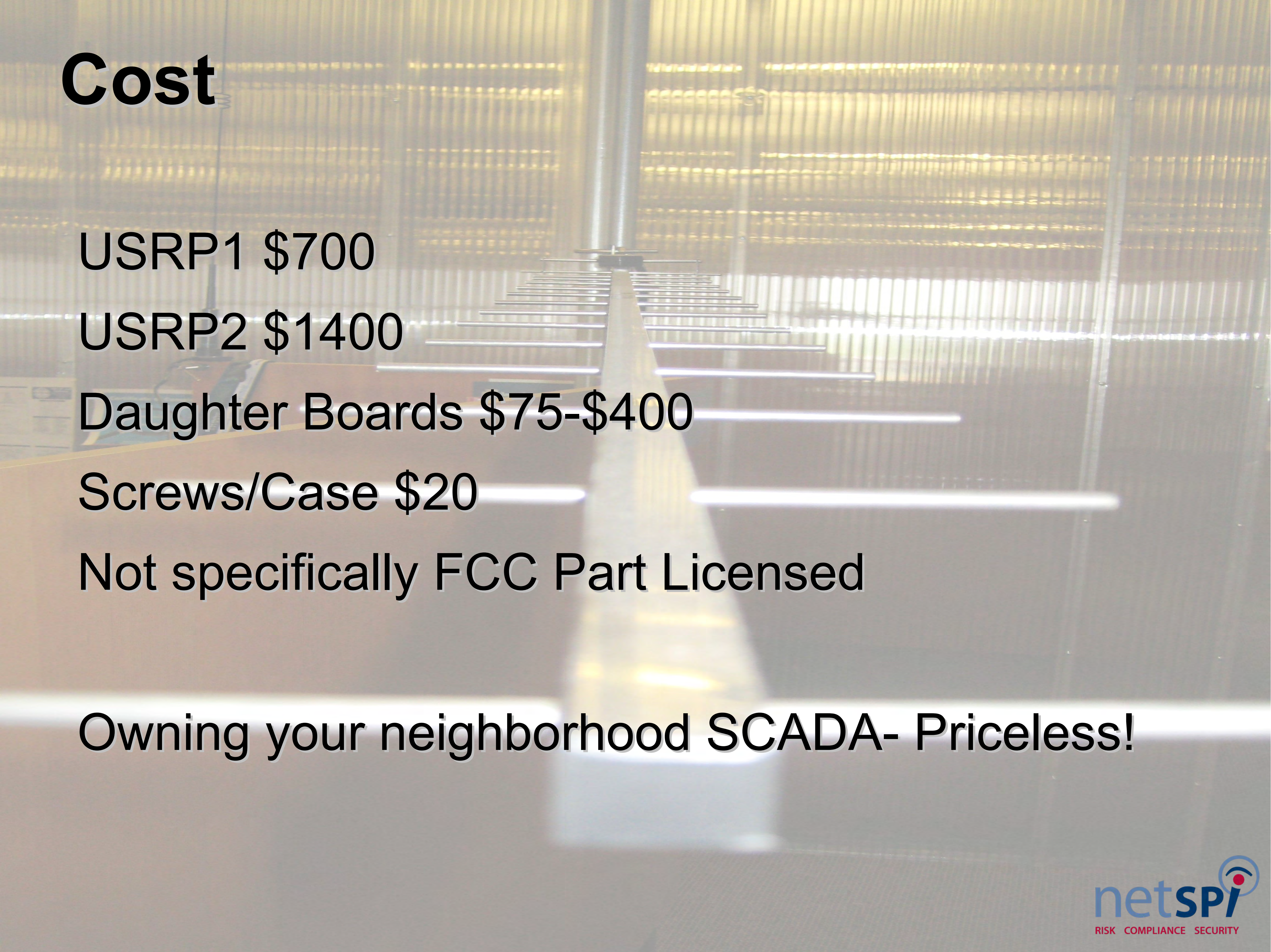
Wireless Signal Receiving and Generation

Circuit logic

Oscillator

Other methods are painfully slow for prototyping

Cost



USRP1 $700

USRP2 $1400

Daughter Boards $75-$400

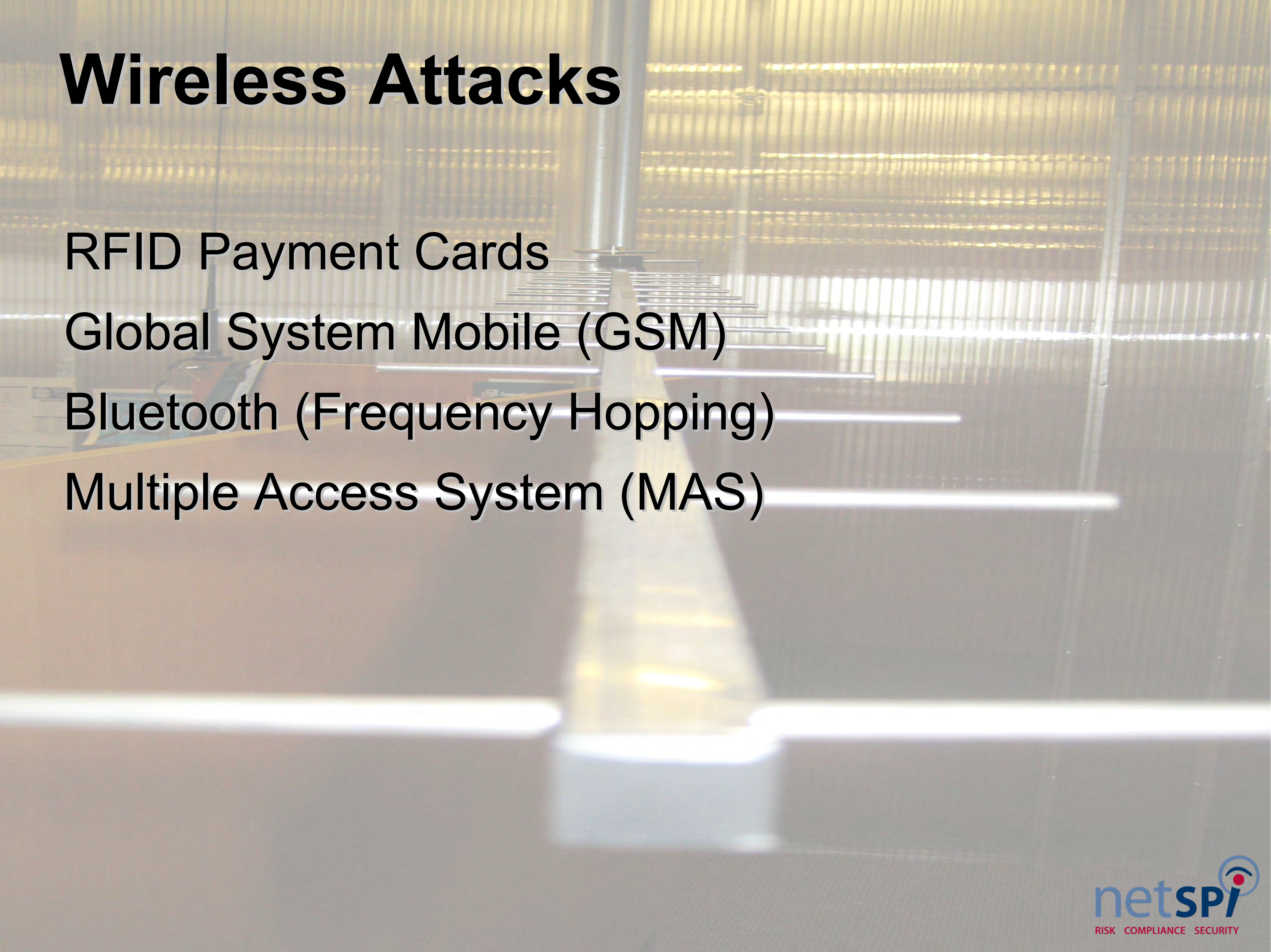
Screws/Case $20

Not specifically FCC Part Licensed

Owning your neighborhood SCADA- Priceless!

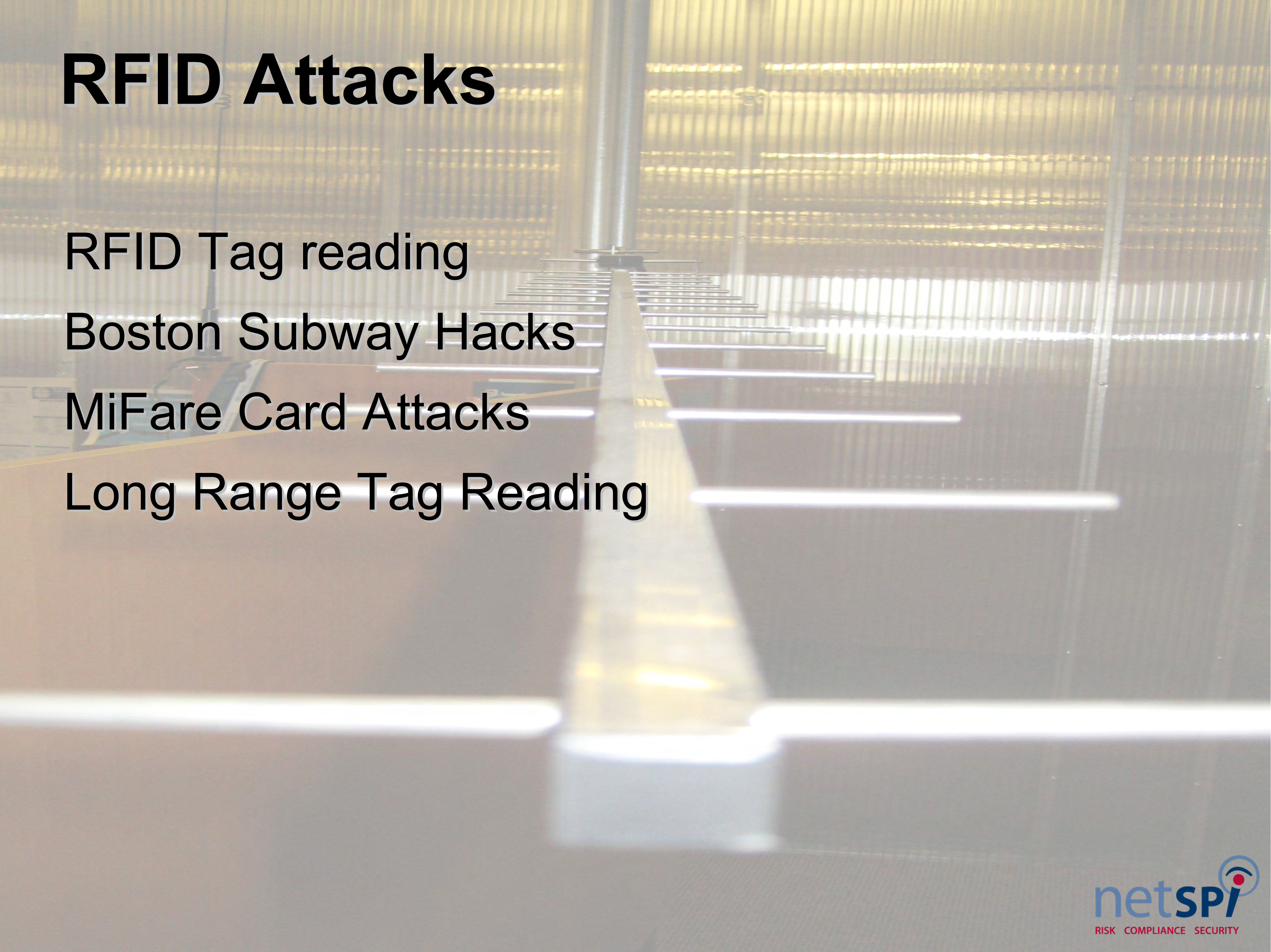
So what can we do with it?

Wireless Attacks



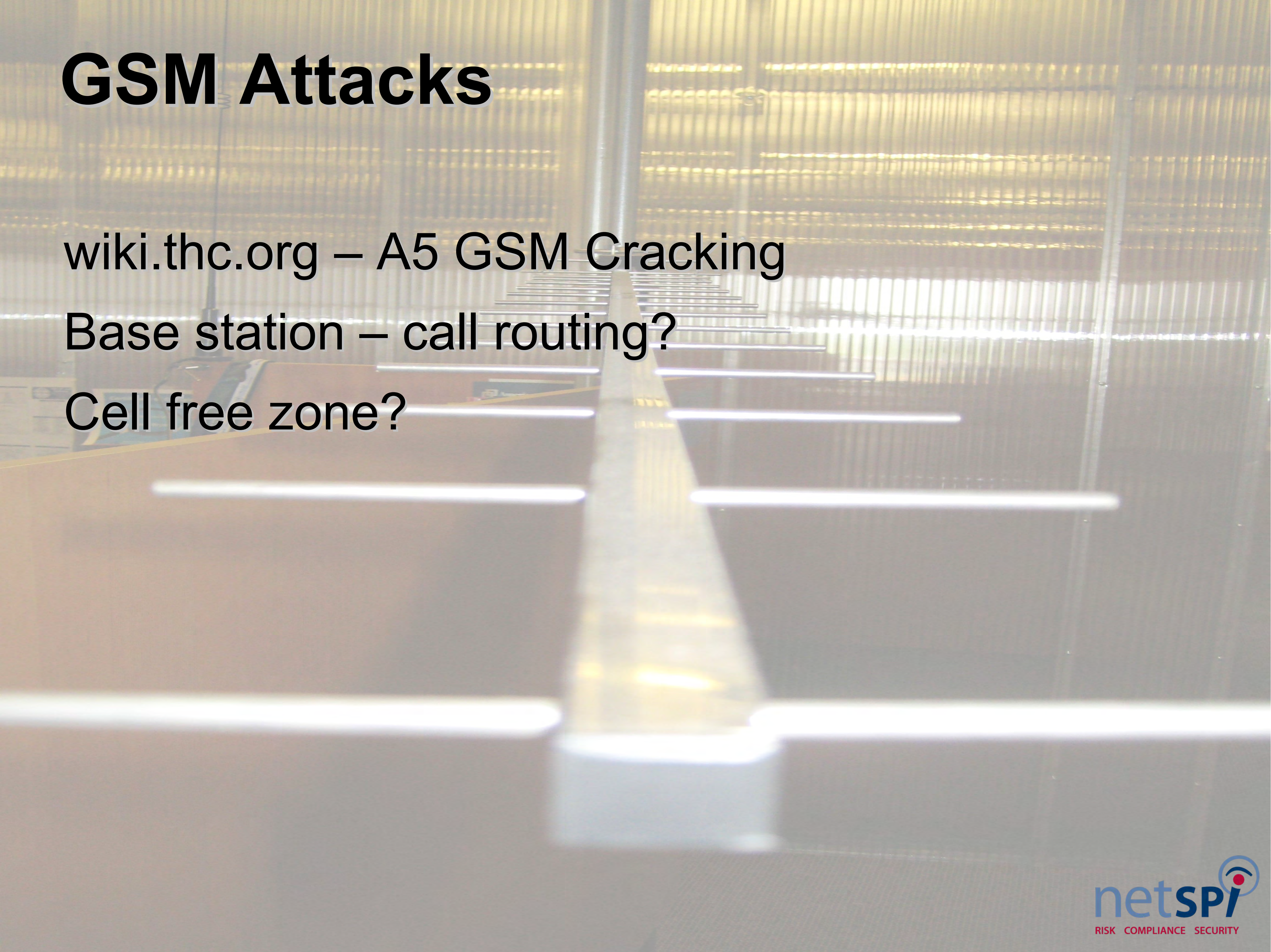
- RFID Payment Cards
- Global System Mobile (GSM)
- Bluetooth (Frequency Hopping)
- Multiple Access System (MAS)

RFID Attacks



- RFID Tag reading
- Boston Subway Hacks
- MiFare Card Attacks
- Long Range Tag Reading

GSM Attacks

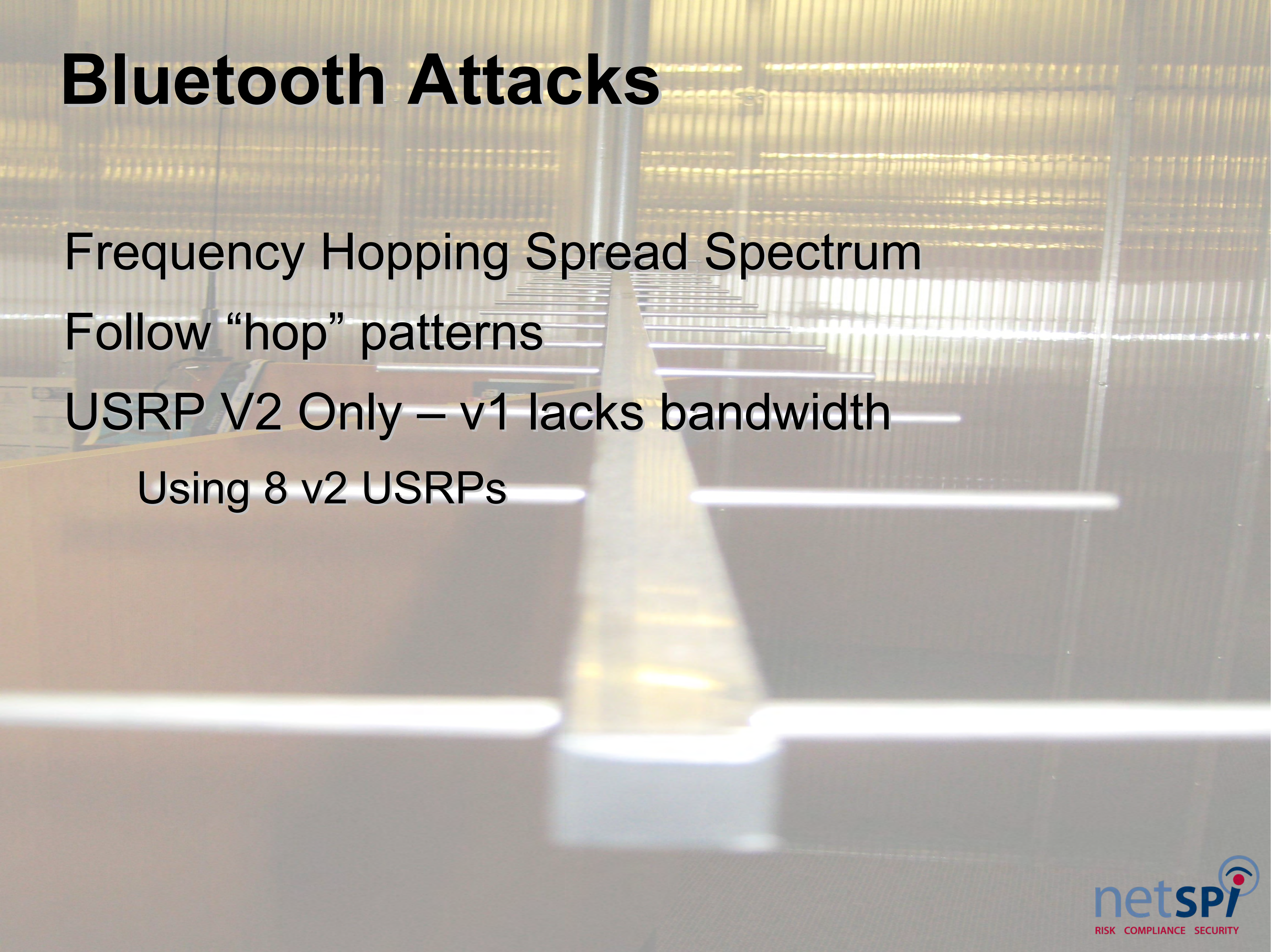


wiki.thc.org – A5 GSM Cracking

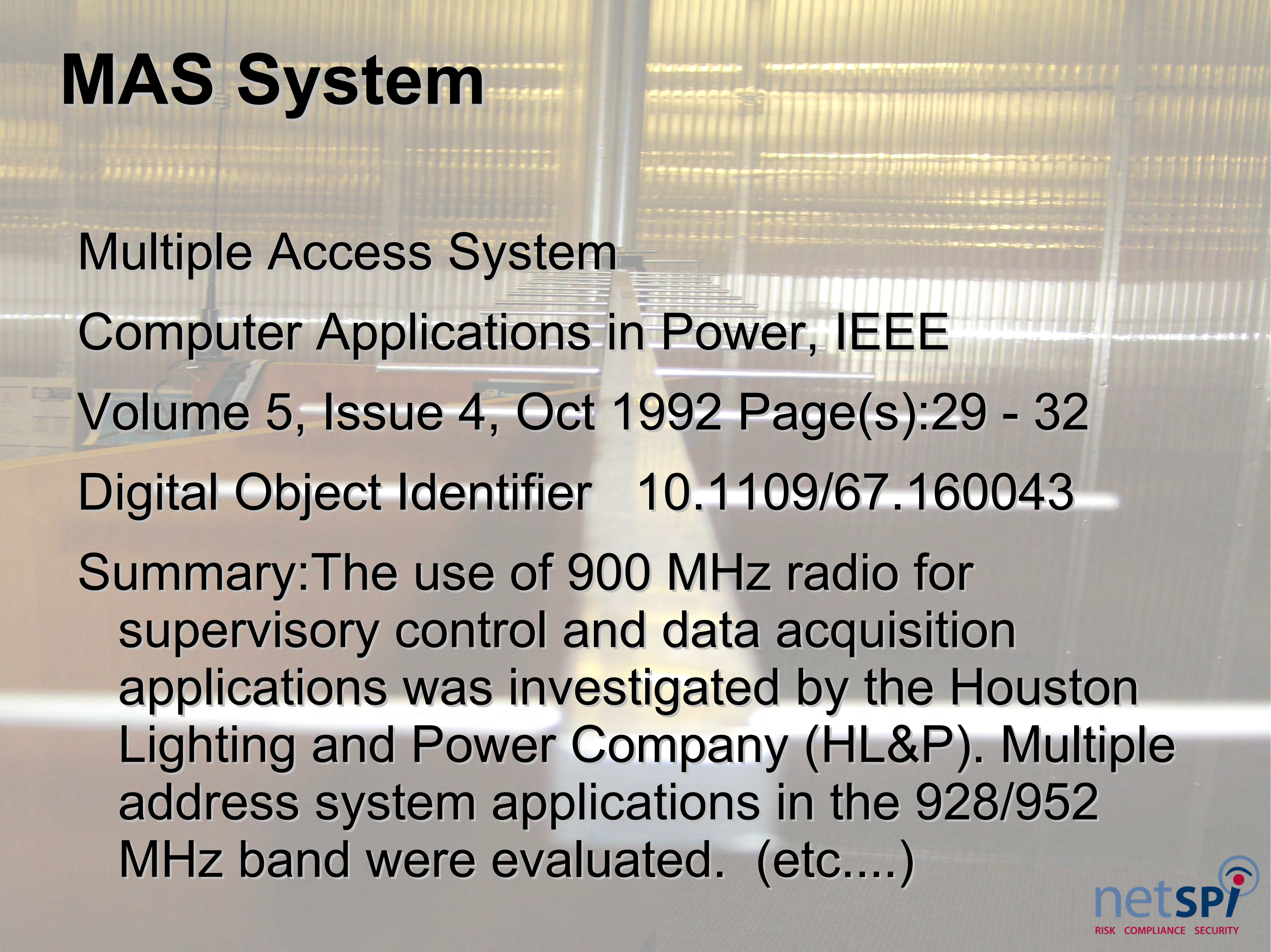
Base station – call routing?

Cell free zone?

Bluetooth Attacks



- Frequency Hopping Spread Spectrum
- Follow “hop” patterns
- USRP V2 Only – v1 lacks bandwidth
  - Using 8 v2 USRPs



MAS System

Multiple Access System

Computer Applications in Power, IEEE

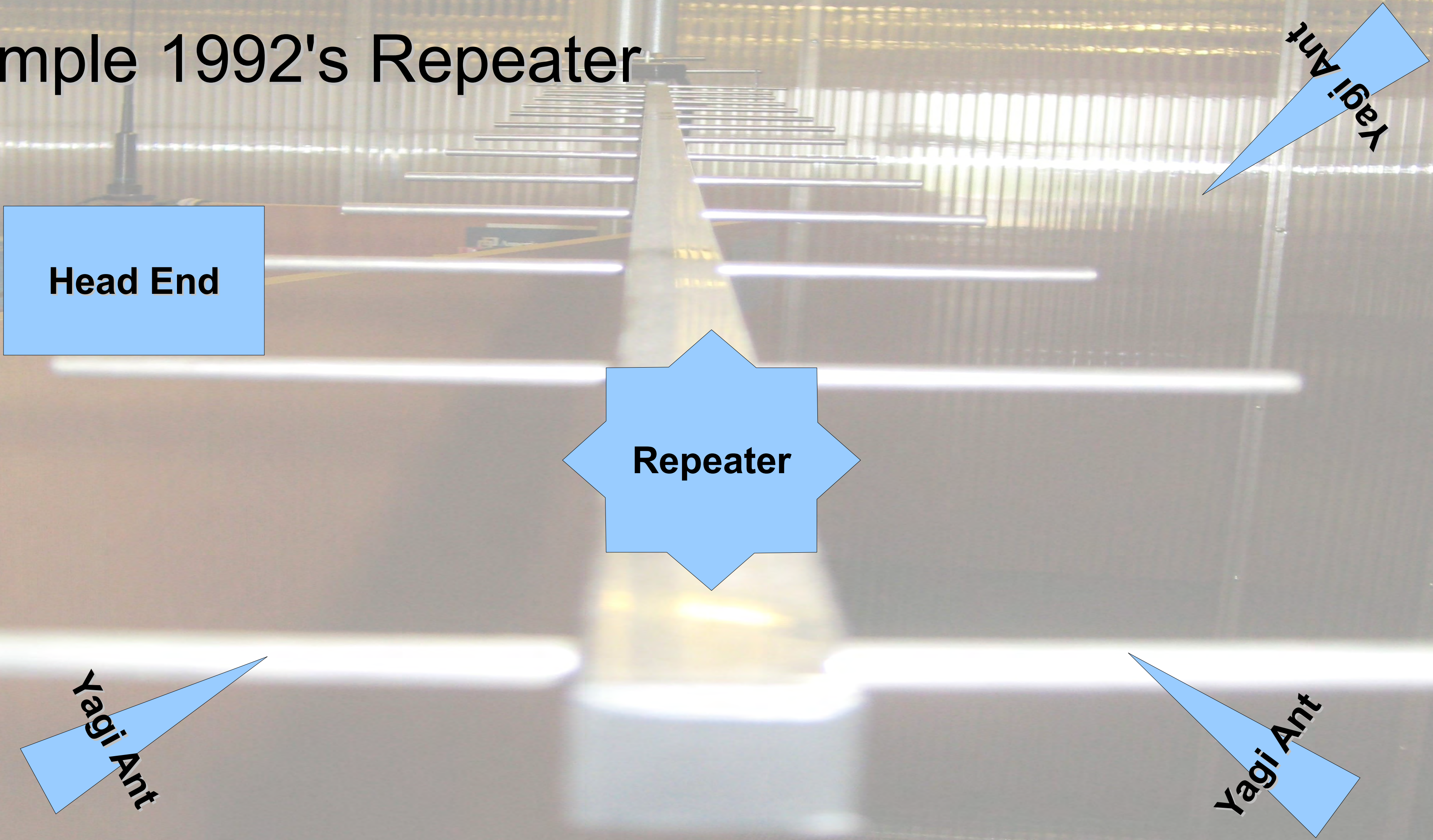
Volume 5, Issue 4, Oct 1992 Page(s):29 - 32

Digital Object Identifier 10.1109/67.160043

Summary:The use of 900 MHz radio for supervisory control and data acquisition applications was investigated by the Houston Lighting and Power Company (HL&P). Multiple address system applications in the 928/952 MHz band were evaluated. (etc....)

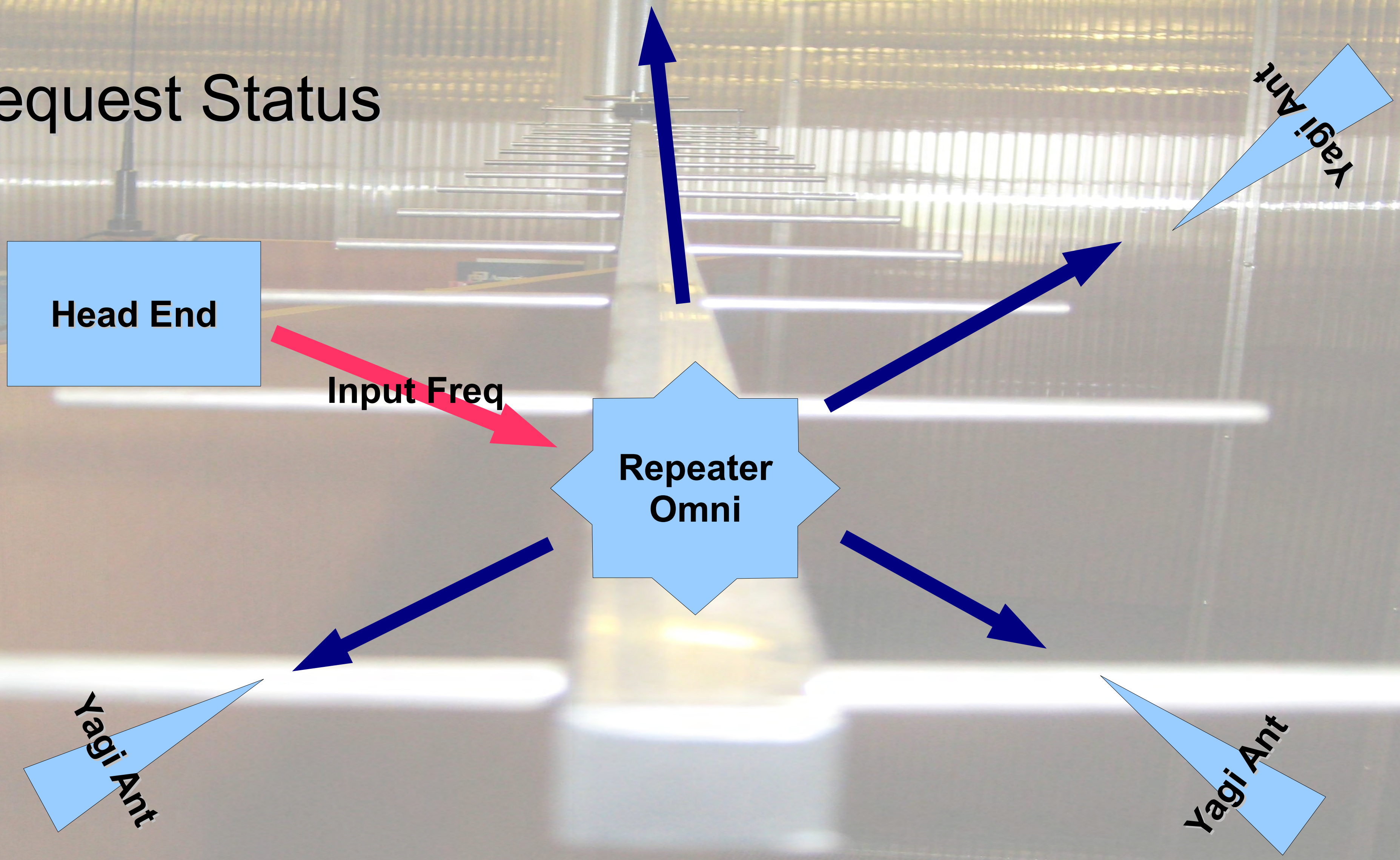
MAS System Attacks

Simple 1992's Repeater



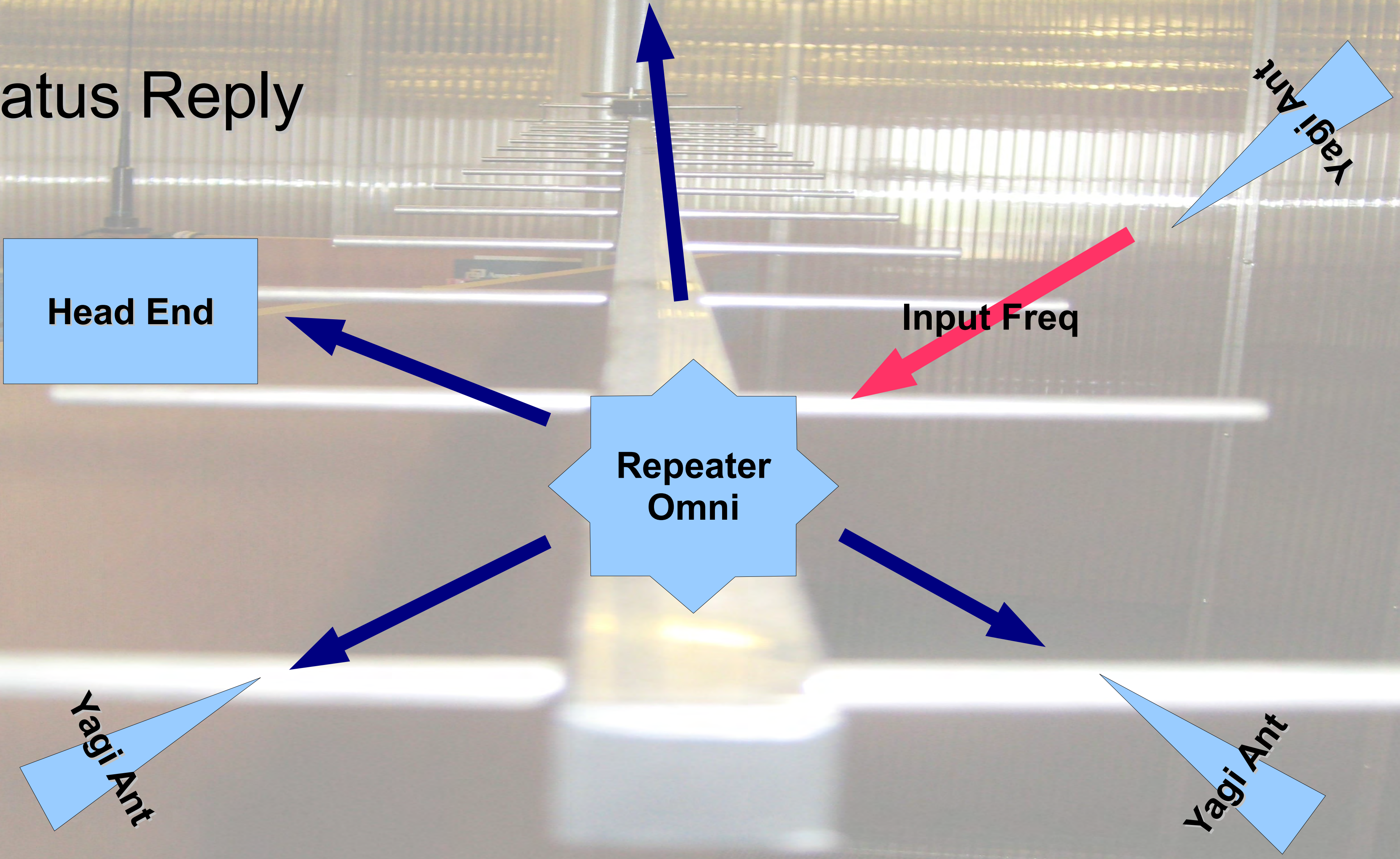
MAS System Attacks

Request Status



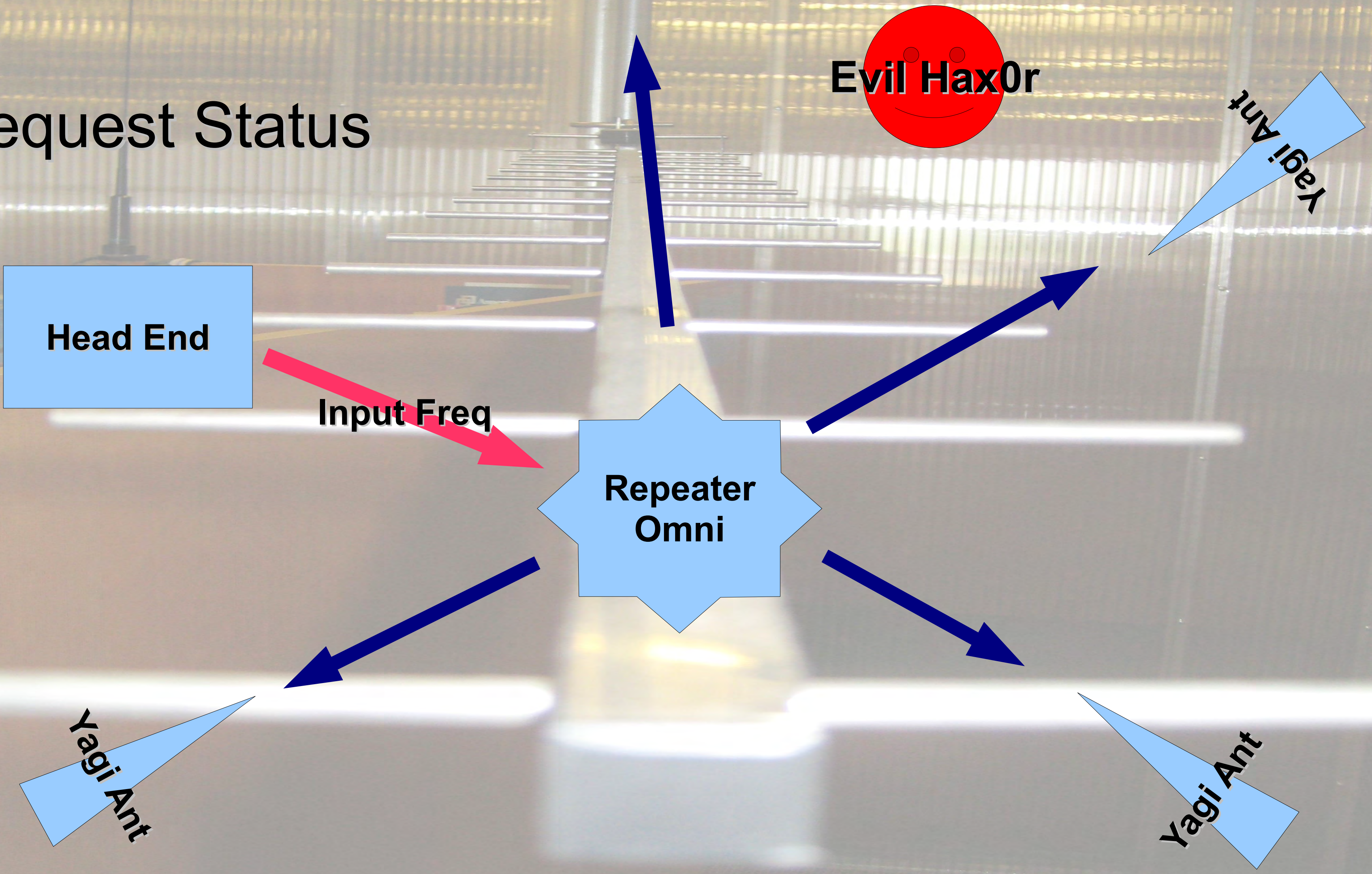
MAS System Attacks

Status Reply



MAS System Attacks

Request Status



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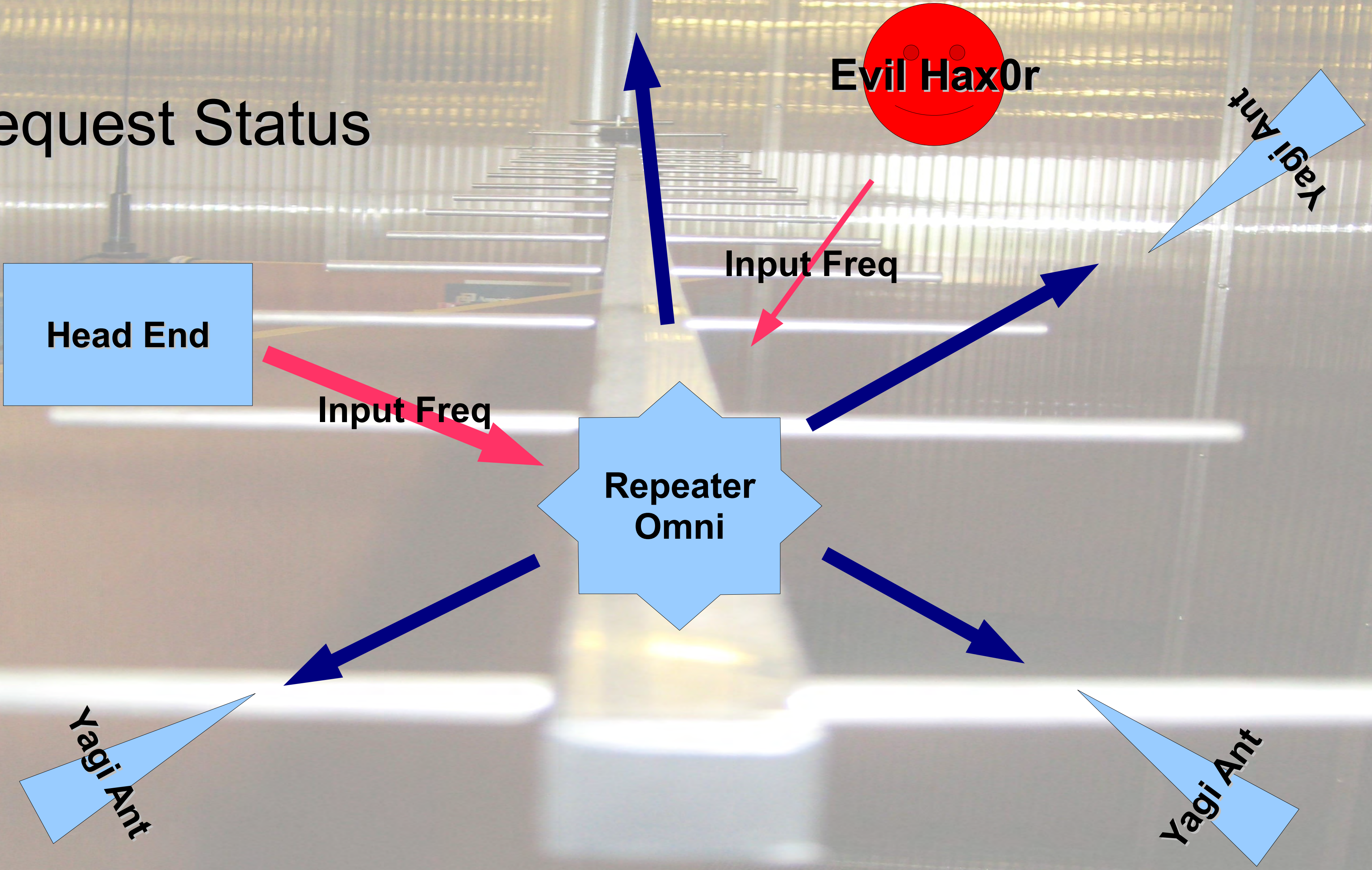
MAS System Attacks

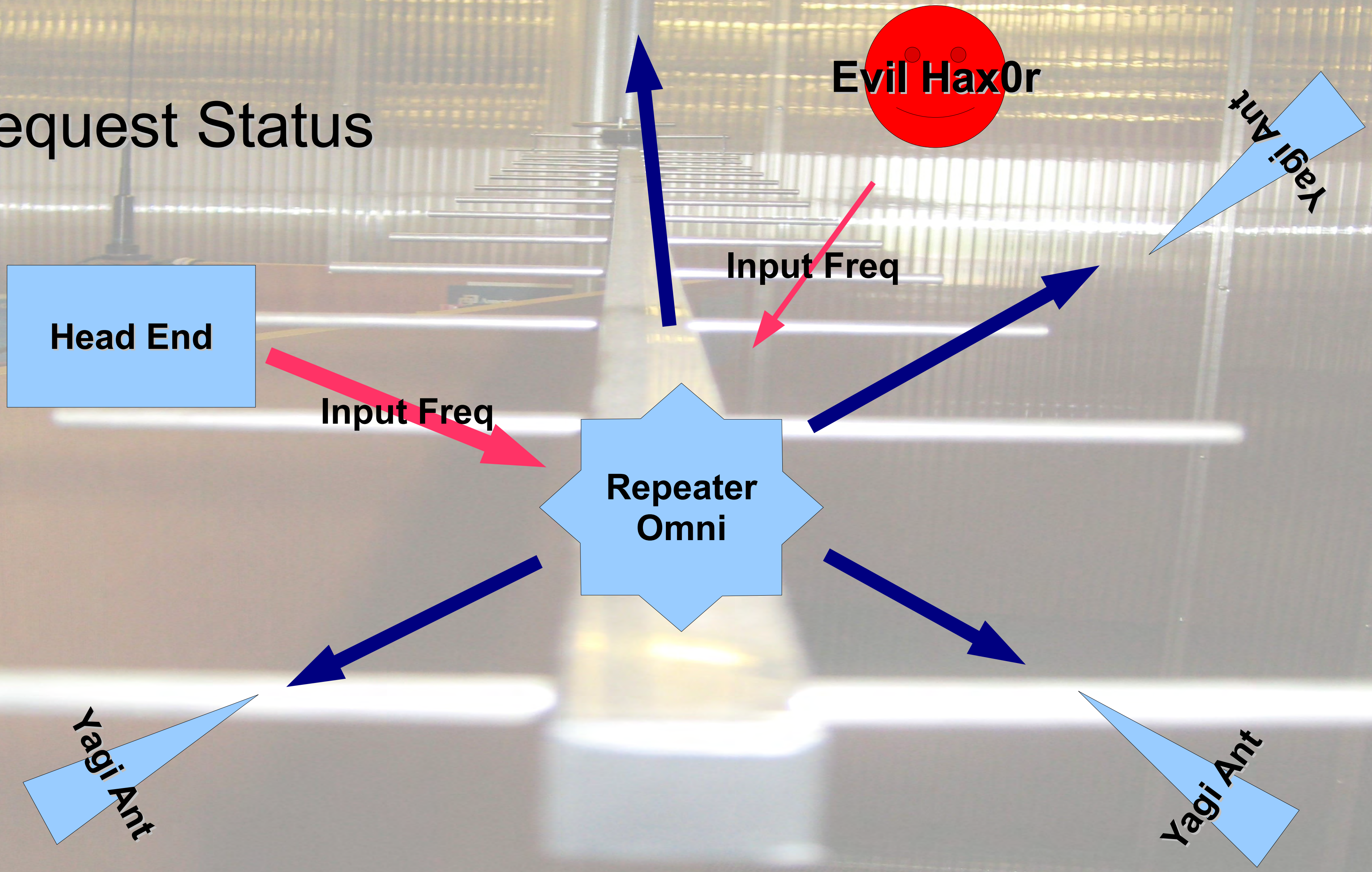
Request Status



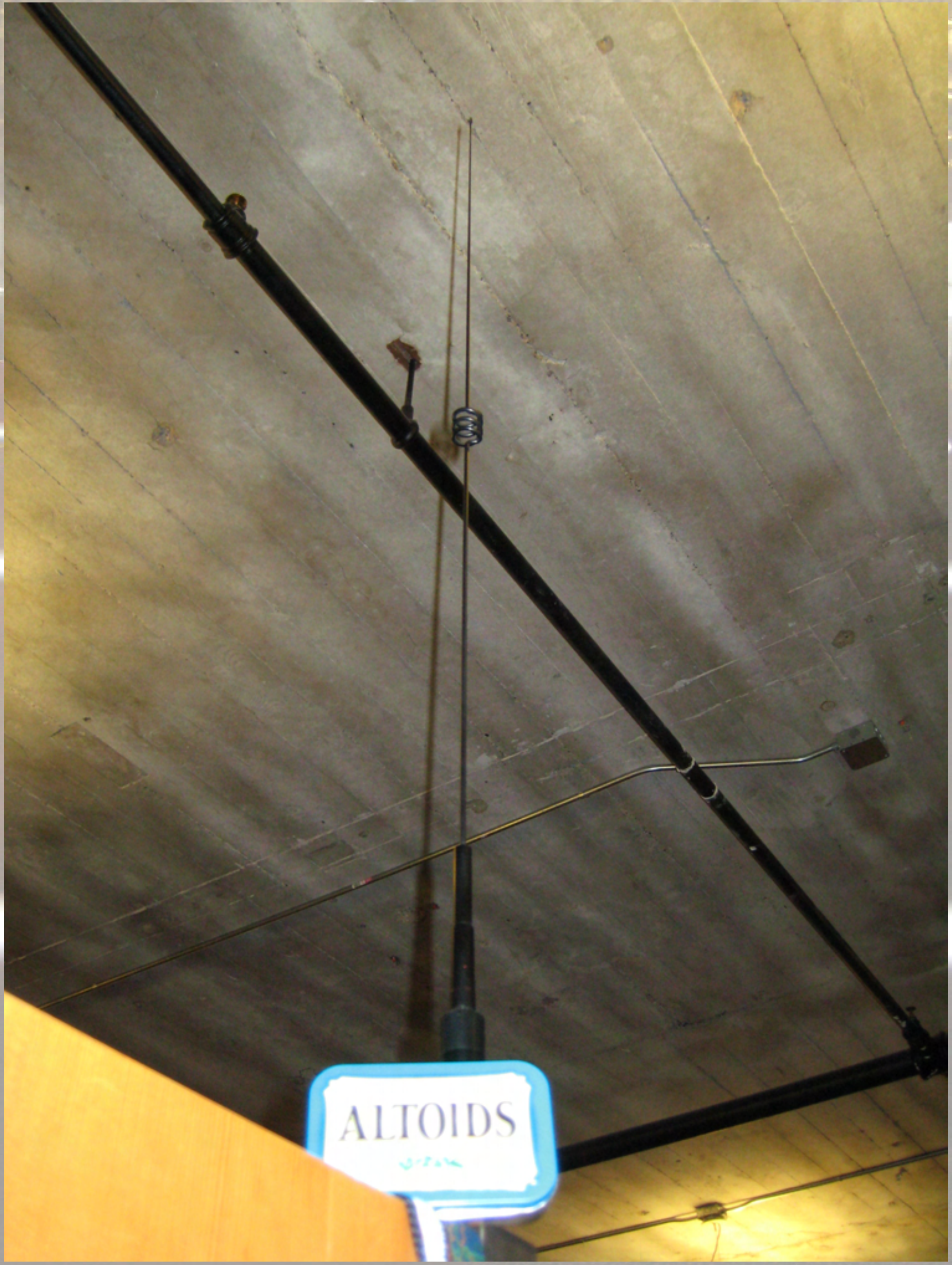
USRP - First Attempt

MAS System Attacks

Request Status

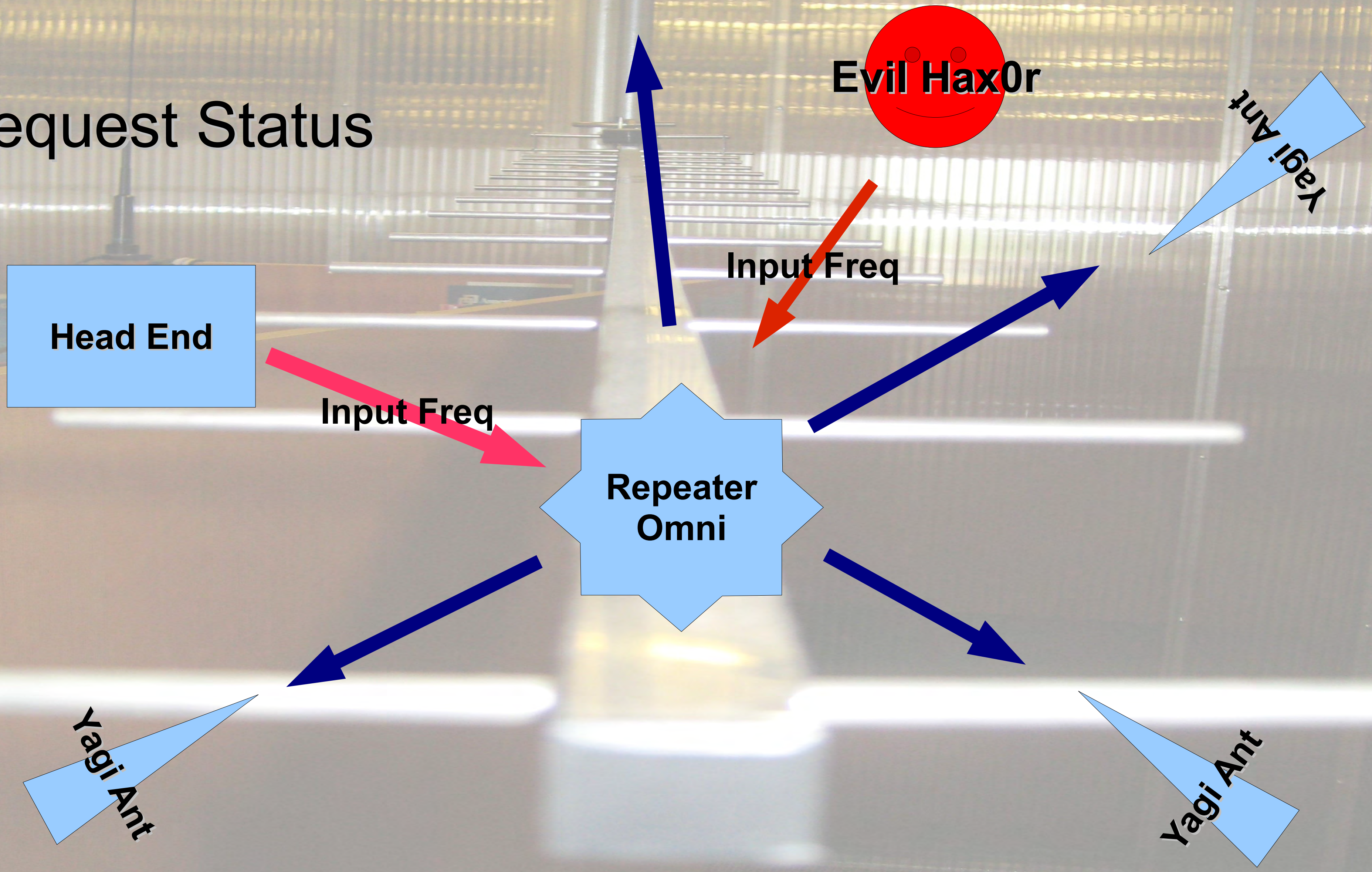


USRP - Second Attempt

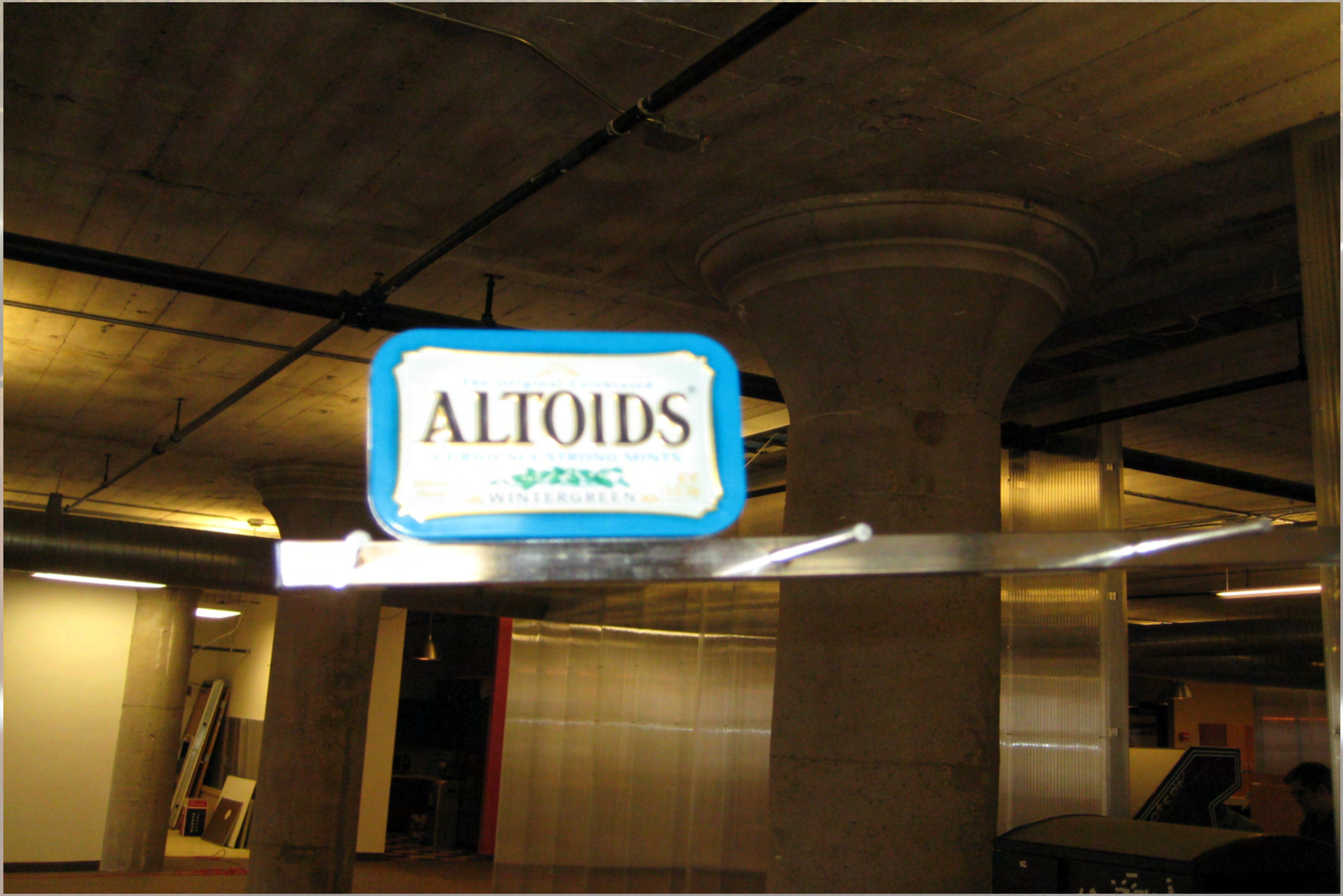


MAS System Attacks

Request Status



USRP - Third Attempt



USRP - Third Attempt

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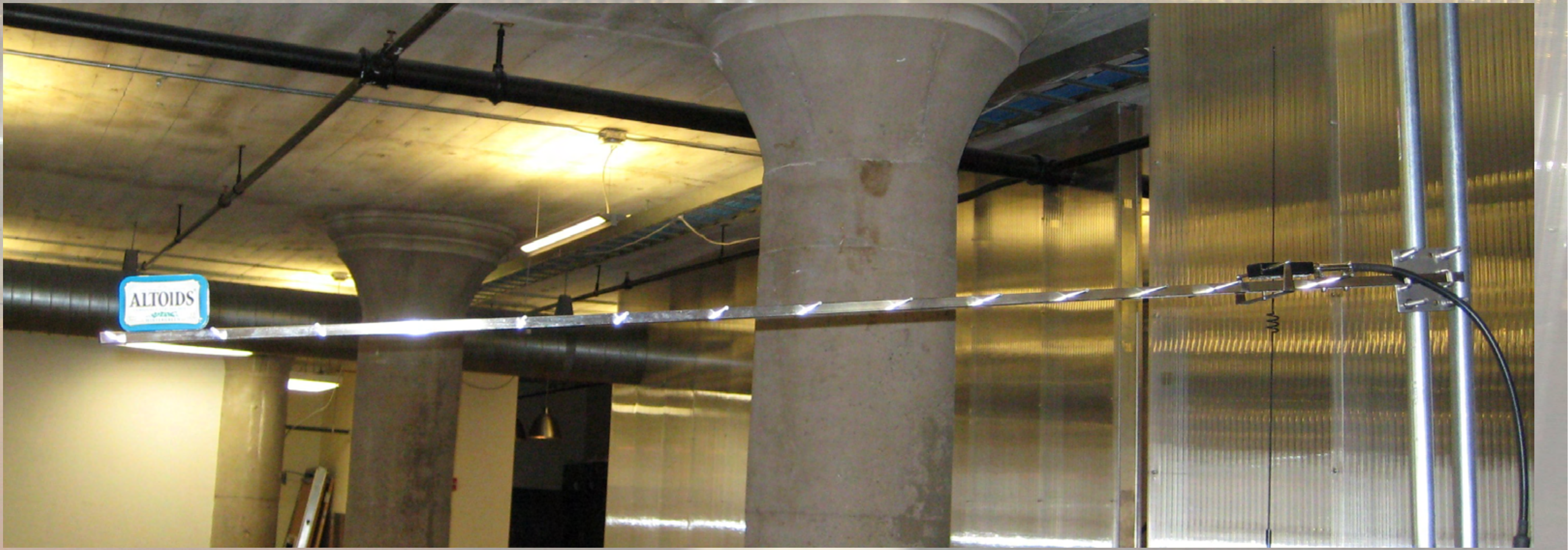
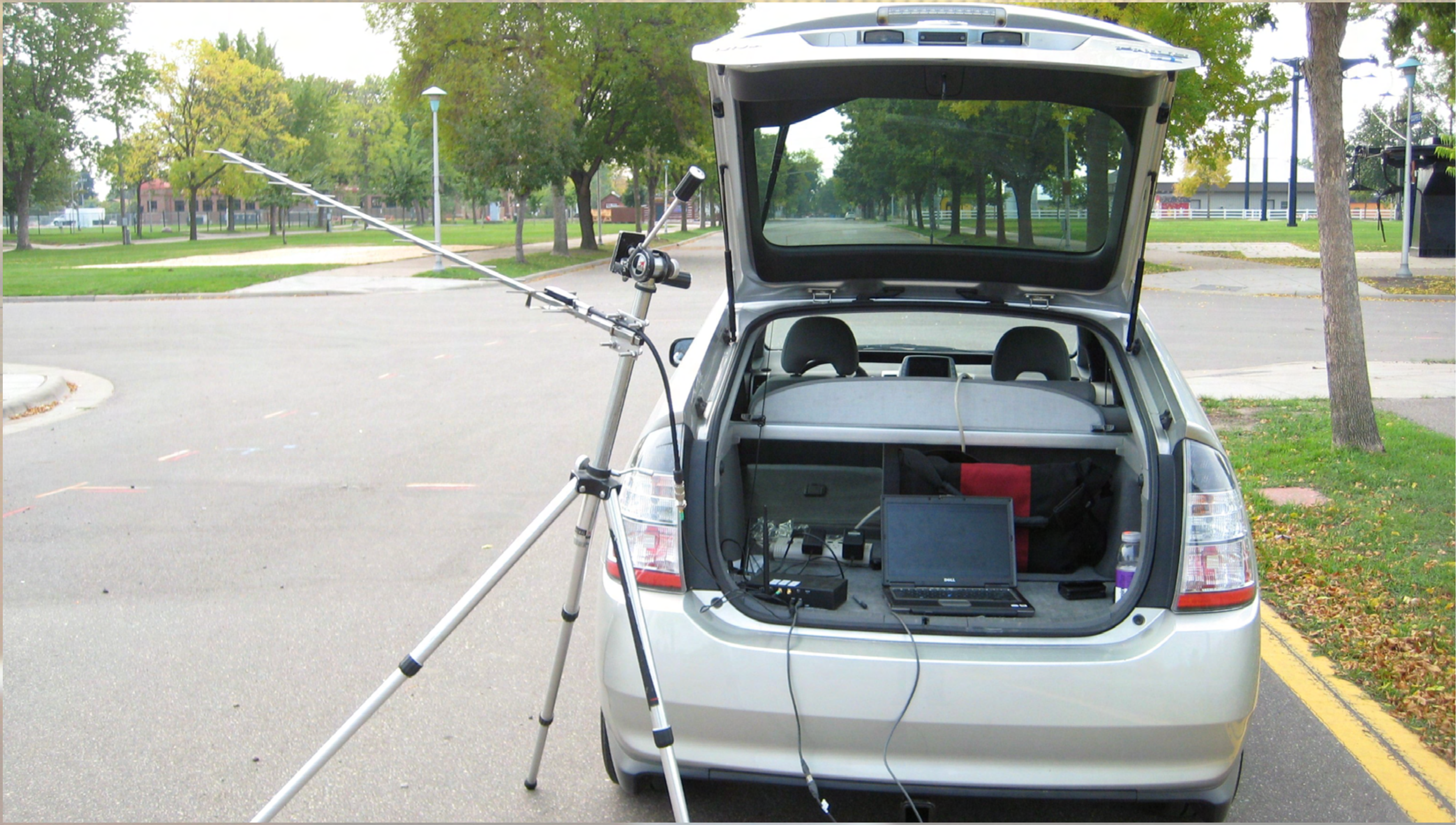
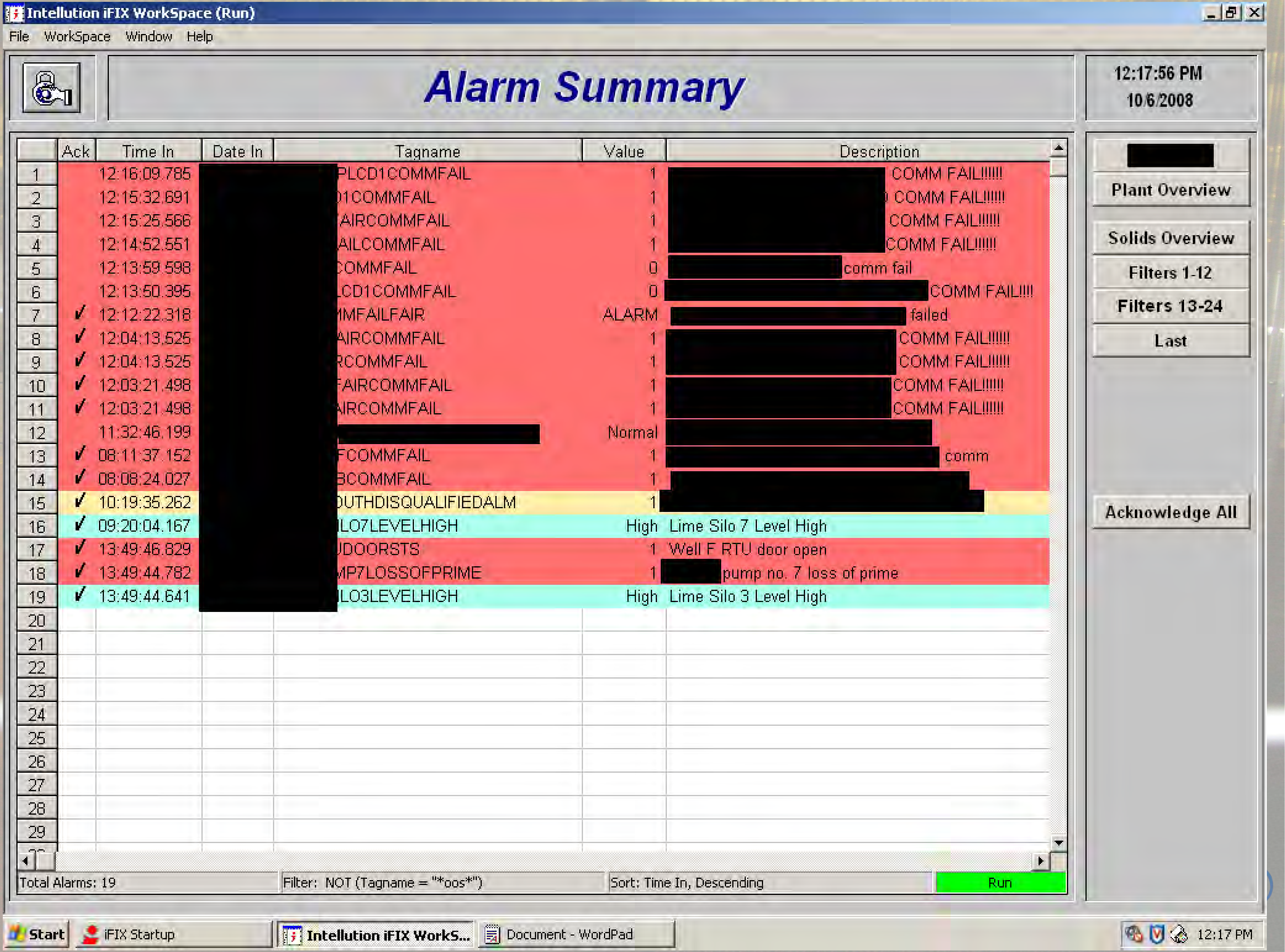


USRP - Third Attempt



USRP - Third Attempt



Alarm Summary

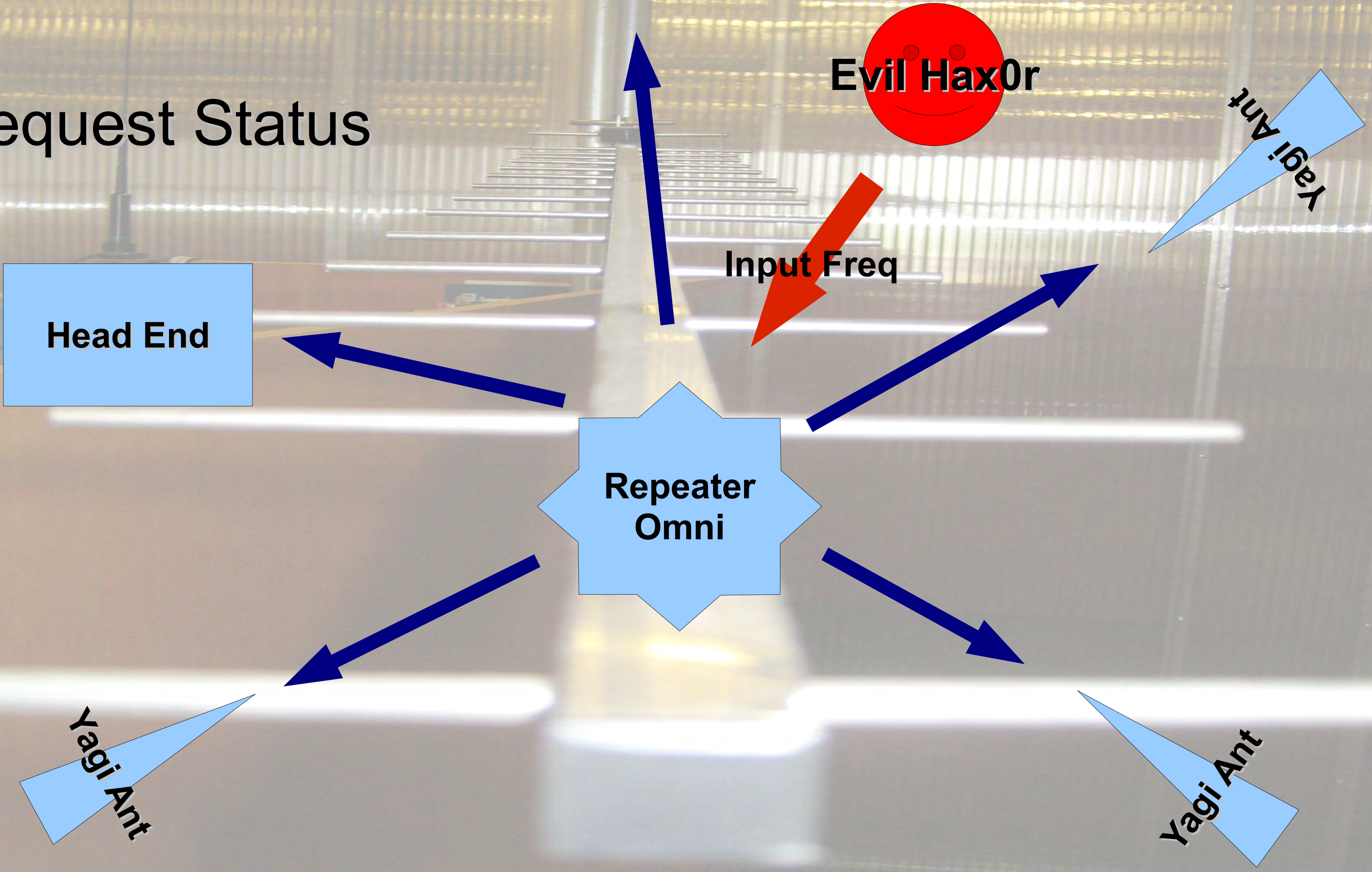
12:17:56 PM
10/6/2008

	Ack	Time In	Date In	Tagname	Value	Description
1		12:16:09.785	[redacted]	[redacted]PLCD1COMMFAIL	1	[redacted] COMM FAIL!!!!!
2		12:15:32.691	[redacted]	[redacted]01COMMFAIL	1	[redacted] COMM FAIL!!!!!
3		12:15:25.566	[redacted]	[redacted]AIRCOMMFAIL	1	[redacted] COMM FAIL!!!!!
4		12:14:52.551	[redacted]	[redacted]AILCOMMFAIL	1	[redacted] COMM FAIL!!!!!
5		12:13:59.598	[redacted]	[redacted]COMMFAIL	0	[redacted] comm fail
6		12:13:50.395	[redacted]	[redacted]LCD1COMMFAIL	0	[redacted] COMM FAIL!!!!
7	✓	12:12:22.318	[redacted]	[redacted]MMFAILFAIR	ALARM	[redacted] failed
8	✓	12:04:13.525	[redacted]	[redacted]AIRCOMMFAIL	1	[redacted] COMM FAIL!!!!!
9	✓	12:04:13.525	[redacted]	[redacted]RCOMMFAIL	1	[redacted] COMM FAIL!!!!!
10	✓	12:03:21.498	[redacted]	[redacted]AIRCOMMFAIL	1	[redacted] COMM FAIL!!!!!
11	✓	12:03:21.498	[redacted]	[redacted]AIRCOMMFAIL	1	[redacted] COMM FAIL!!!!!
12		11:32:46.199	[redacted]	[redacted]	Normal	[redacted]
13	✓	08:11:37.152	[redacted]	[redacted]FCOMMFAIL	1	[redacted] comm
14	✓	08:08:24.027	[redacted]	[redacted]BCOMMFAIL	1	[redacted]
15	✓	10:19:35.262	[redacted]	[redacted]OUTHDISQUALIFIEDALM	1	[redacted]
16	✓	09:20:04.167	[redacted]	[redacted]ILO7LEVELHIGH	High	Lime Silo 7 Level High
17	✓	13:49:46.829	[redacted]	[redacted]UDOORSTS	1	Well F RTU door open
18	✓	13:49:44.782	[redacted]	[redacted]MP7LOSSOFPRIME	1	[redacted] pump no. 7 loss of prime
19	✓	13:49:44.641	[redacted]	[redacted]ILO3LEVELHIGH	High	Lime Silo 3 Level High
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						

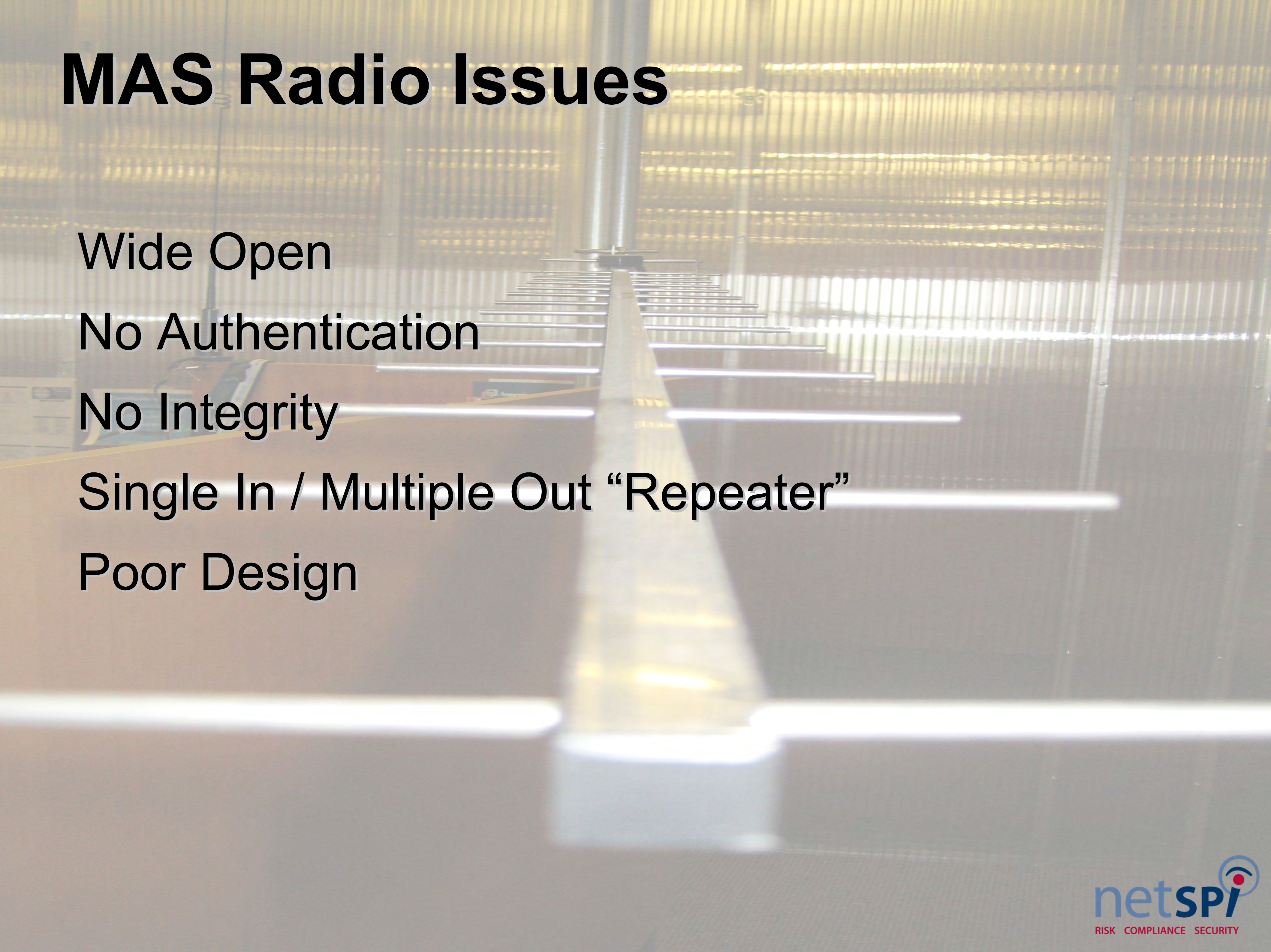
Total Alarms: 19 | Filter: NOT (Tagname = "*oos*") | Sort: Time In, Descending | Run

MAS System Attacks

Request Status



MAS Radio Issues



Wide Open

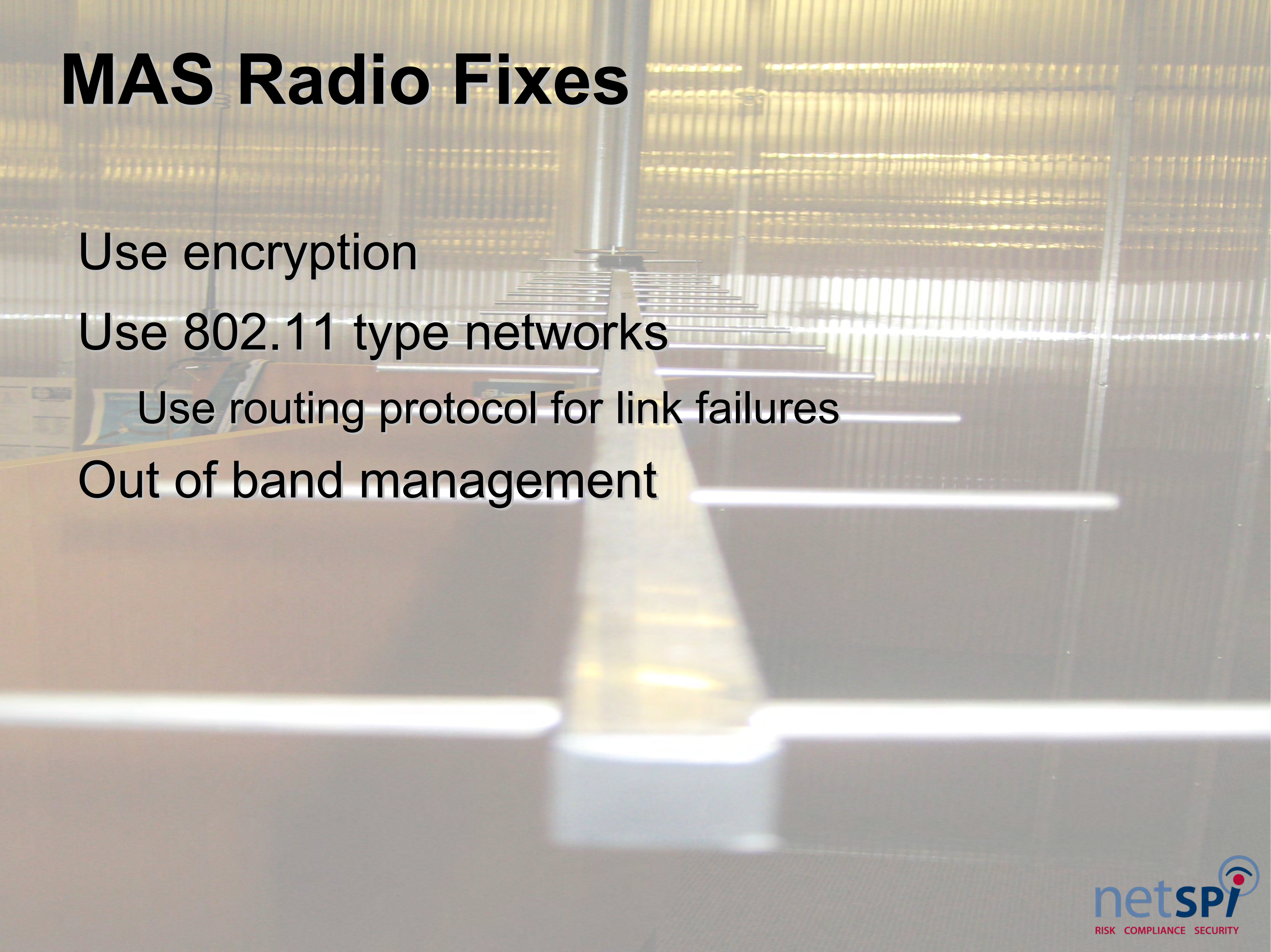
No Authentication

No Integrity

Single In / Multiple Out “Repeater”

Poor Design

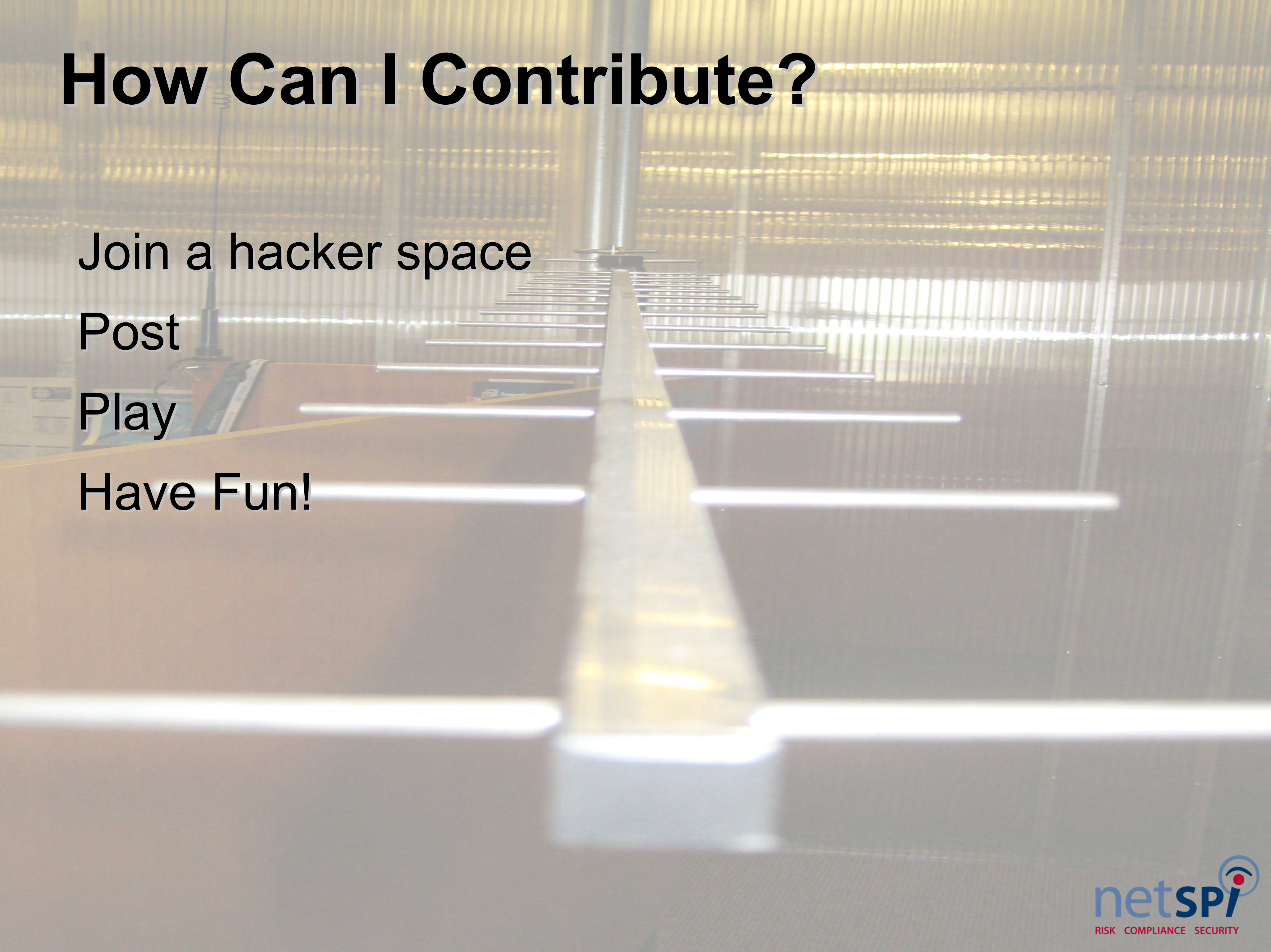
MAS Radio Fixes



- Use encryption
- Use 802.11 type networks
  - Use routing protocol for link failures
- Out of band management

Demo ?

How Can I Contribute?



- Join a hacker space
- Post
- Play
- Have Fun!

Thank you!

My wife, Heather

netSPI

RISK COMPLIANCE SECURITY

References

- www.gnuradio.org
- http://www.ettus.com/
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- http://www.blackhat.com/presentations/bh-europe-08/Steve-DHulton/Whitepaper/bh-eu-08-steve-dhulton-WP.pdf
- http://dc4420.org/files/dominicgs/bluesniff_slides.pdf
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