

Advances in Cyber Risk Modeling
Ratemaking, Product and Modeling (RPM) Seminar & Workshops
Wednesday, March 27, 2019
9:30-10:45am

Pamela Eck
Cyber Security Scientist

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Agenda

- Cyber Insurance Industry
- Probabilistic Cyber Modeling
- What is Silent Cyber?
- Q&A

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Cyber Insurance Industry

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Cyber Attacks and Causes of Loss Continue to Evolve

October 2016

February 2017

May 2017

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Cyber Attacks and Causes of Loss Continue to Evolve

May 2017

September 2017

December 2018

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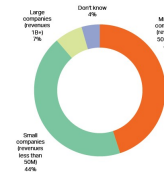
What does and doesn't a cyber policy cover?

<p>Included</p> <ul style="list-style-type: none"> - Security Breach <ul style="list-style-type: none"> • Forensics • Notification • Overtime salaries • Call Center • Post-event monitoring • Other expenses - Extortion Threats - Business Interruption And Extra Expense - Public Relations Expense - Security Breach Liability 	<p>Excluded</p> <ul style="list-style-type: none"> - Acts of war - Acts of nature - Satellite failure or malfunction - Criminal, dishonest, malicious or fraudulent act or any willful violation of any statute or regulation committed by an "insured", acting alone or in collusion with others - Action or proceeding brought by, or on behalf of, any governmental authority or regulatory agency
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Not Just Large Corporations Are Seeking Cyber Coverage

Q The majority of our new-to-market buyers of standalone cyber insurance are (including those switching from endorsements):



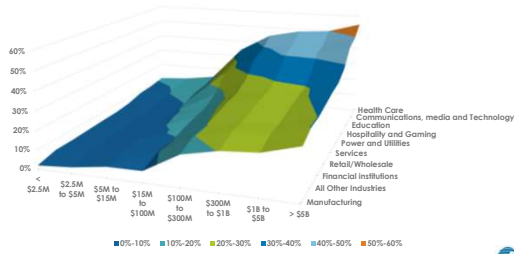
Furthermore, 76% of existing insureds seek higher coverage and limits

Source: Advisen and Partner Re, 2018
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Cyber Insurance Take-up Rates Vary Widely

Cyber insurance take-up rates by industry and turnover



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Cyber Risk Landscape Continues to Evolve

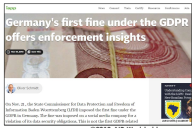
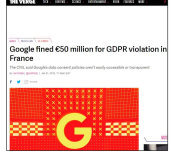
Little or no cyber data → the risk is not well understood

Increased competition in a rapidly growing market

Businesses of all sizes are at risk

GDPR data/privacy regulations

GDPR Fines Are Being Issued



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Probabilistic Cyber Modeling

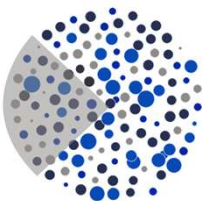
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Robust Risk Management Includes Several Approaches

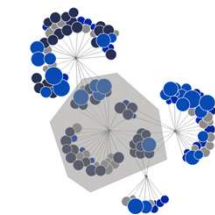
Market Share Approach



Cloud Vendor X has 25% Market Share

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Detailed Accumulation Approach



Cloud Vendor X is used by these specific 33% companies

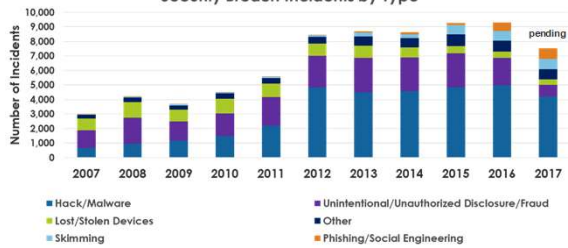
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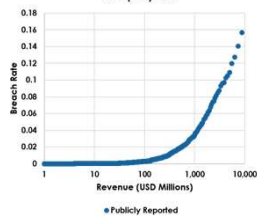
Example 1: Data Compromise

Data on Wide Range of Security Incidents Available Security Breach Incidents by Type

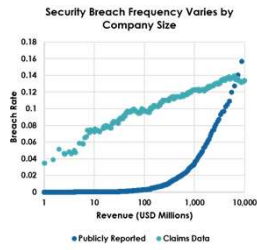


Bias in Reported Data Requires Adjustment Using Claims

Security Breach Frequency Varies by Company Size



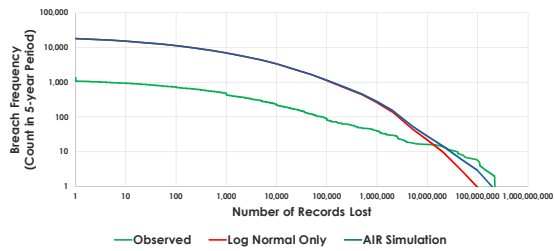
Bias in Reported Data Requires Adjustment Using Claims



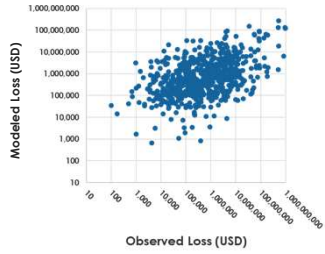
Numerous Drivers of Risk to Consider



Data Compromise Severity Is Driven by Number of Records Lost

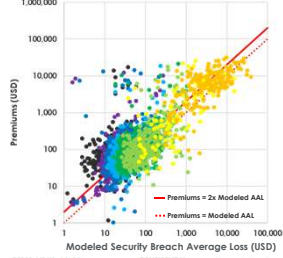


Sufficient Data Available to Validate Model Output

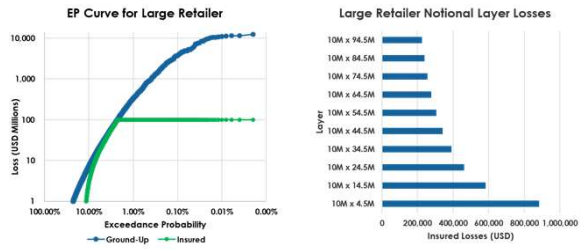


Cyber Risk Policies Have Been Mispriiced

Comparison of Insurance Pricing vs Model Estimates



Most Data Compromise Results in Total Insured Loss



Example 2: Probabilistic Business Interruption

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Cloud Computing Trends by the Numbers



36%
Compound
annual growth
rate of public
cloud service
industry
Source: Wikibon



12%
Increase of IaaS
as the primary
work environment
Source: McKinsey & Company



70%
Market share of
top 15 cloud
service providers
Source: AIR

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Cloud Providers Can Fail for a Variety of Reasons



Environmental



Accidental



Adversarial



Structural

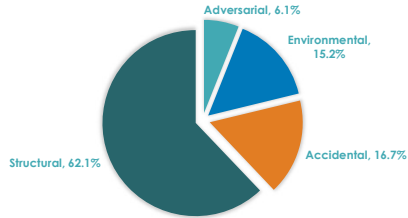
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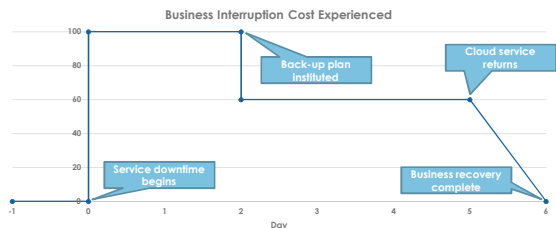
Cloud Providers Can Fail for a Variety of Reasons



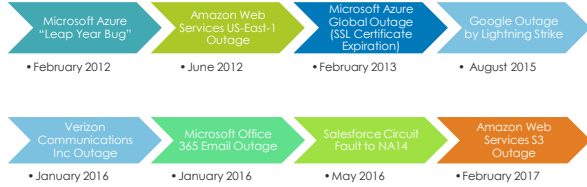
Factors Driving Severity of Cloud Downtime

- Cloud service provider recovery time
- Business dependency on cloud
- Company back-up plans
- Company ramp up time

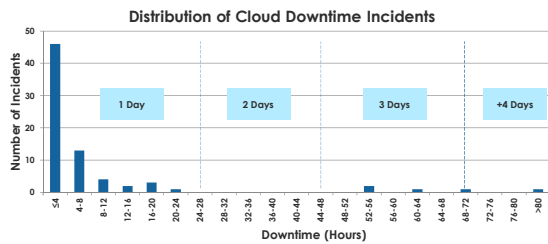
Losses Change Throughout Downtime Event



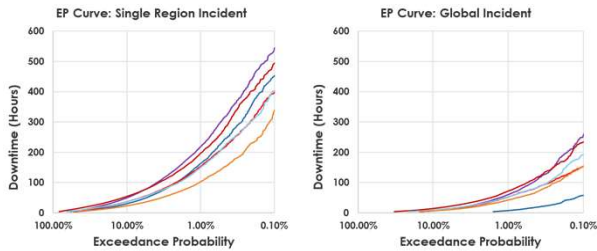
Historical Cloud Downtime Events



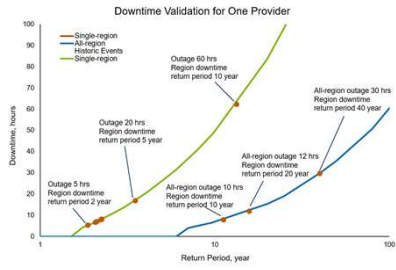
Data on Cloud Downtime Incidents Available



Not All Cloud Providers Are Equally at Risk



Downtime Validation for One Cloud Provider



(Re)Insurers and Brokers Leverage Cyber Risk Solutions Across a Number of Use Cases



What is Silent Cyber?

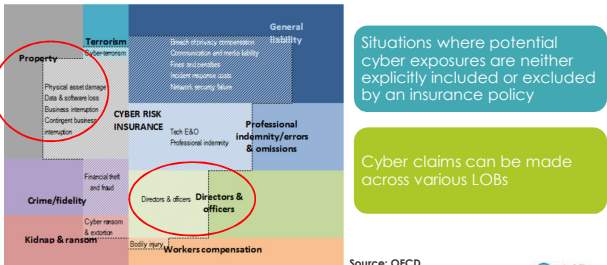
A Year Ago, There Were 3 Categories of Cyber Risk



Today, Some Would Argue There Are 4!



What Is Silent Cyber?



NotPetya: Silent Cyber vs. Affirmative Cyber

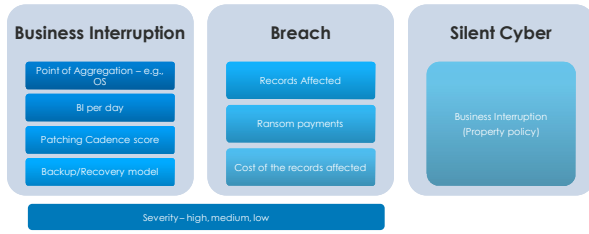
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... your important files are encrypted.
you can't fix that. Your files are no longer accessible, because
to have access to them, you need a key. Perhaps you can buy a key to recover
your files, but don't waste your time. Nobody can recover your files without
a guarantee that you can recover all your files safely and easily. All
you have to do is follow the instructions!
Send $388 worth of Bitcoin to following address:
1Nz7Y3HmuaKtK2117mG5d4d4R80X
Send your Bitcoin wallet ID and personal installation key to e-mail:
w0w@n1131250@protonmail.com Your personal installation key:
0102030405060708091011121314151617181920212223242526272829303132333435363738394041424344454647484950515253545556575859606162636465666768697071727374757677787980818283848586878889909192939495969798991001011021031041051061071081091101111121131141151161171181191201211221231241251261271281291301311321331341351361371381391401411421431441451461471481491501511521531541551561571581591601611621631641651661671681691701711721731741751761771781791801811821831841851861871881891901911921931941951961971981992002012022032042052062072082092102112122132142152162172182192202212222232242252262272282292302312322332342352362372382392402412422432442452462472482492502512522532542552562572582592602612622632642652662672682692702712722732742752762772782792802812822832842852862872882892902912922932942952962972982993003013023033043053063073083093103113123133143153163173183193203213223233243253263273283293303313323333343353363373383393403413423433443453463473483493503513523533543553563573583593603613623633643653663673683693703713723733743753763773783793803813823833843853863873883893903913923933943953963973983994004014024034044054064074084094104114124134144154164174184194204214224234244254264274284294304314324334344354364374384394404414424434444454464474484494504514524534544554564574584594604614624634644654664674684694704714724734744754764774784794804814824834844854864874884894904914924934944954964974984995005015025035045055065075085095105115125135145155165175185195205215225235245255265275285295305315325335345355365375385395405415425435445455465475485495505515525535545555565575585595605615625635645655665675685695705715725735745755765775785795805815825835845855865875885895905915925935945955965975985996006016026036046056066076086096106116126136146156166176186196206216226236246256266276286296306316326336346356366376386396406416426436446456466476486496506516526536546556566576586596606616626636646656666676686696706716726736746756766776786796806816826836846856866876886896906916926936946956966976986997007017027037047057067077087097107117127137147157167177187197207217227237247257267277287297307317327337347357367377387397407417427437447457467477487497507517527537547557567577587597607617627637647657667677687697707717727737747757767777787797807817827837847857867877887897907917927937947957967977987998008018028038048058068078088098108118128138148158168178188198208218228238248258268278288298308318328338348358368378388398408418428438448458468478488498508518528538548558568578588598608618628638648658668678688698708718728738748758768778788798808818828838848858868878888898908918928938948958968978988999009019029039049059069079089099109119129139149159169179189199209219229239249259269279289299309319329339349359369379389399409419429439449459469479489499509519529539549559569579589599609619629639649659669679689699709719729739749759769779789799809819829839849859869879889899909919929939949959969979989991000
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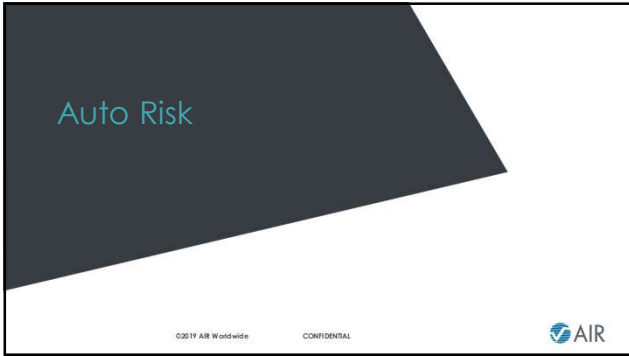


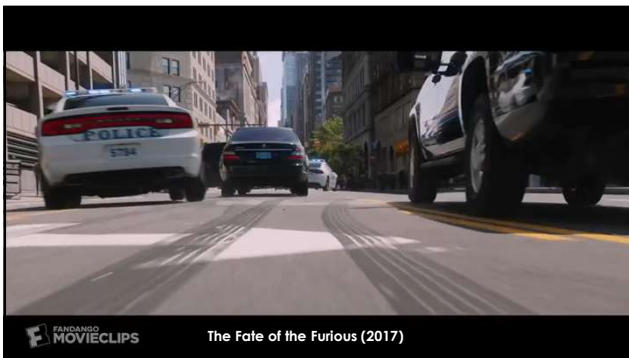
- USD 3.3B in claims with 90% attributed to silent cyber
- USD 1.75B silent cyber losses from Merck & Co. alone
- Are bits of data an asset?
- A debate of semantics?

Ransomware

Aggregation Events (Ransomware + Silent)



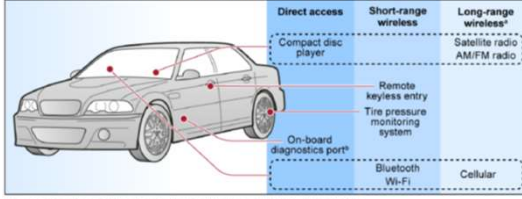






Attack Surface Categories

Key Vehicle Interfaces That Could Be Exploited in a Vehicle Cyberattack



Source: GAO analysis of stakeholder interviews and Checkoway et al. 2011. | GAO-16-350
 *In this context, long-range refers to access at distances over 1 kilometer.
 *This port is mandated in vehicles by statute for emission-testing purposes and to facilitate diagnostic assessments of vehicles, such as by repair shops. 42 U.S.C. § 7521(a)(6).



Scenario Types



Vehicle Theft



Physical Damage



Data Theft



Non-Operability (Bricking & Ransomware)

Oil and Gas Industry

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Oil and Gas Overview

Upstream	Midstream	Downstream
Exploration	Transportation	Manufacturing
Field Development	Processing	Refining
Production Operations	Storage & Distribution	

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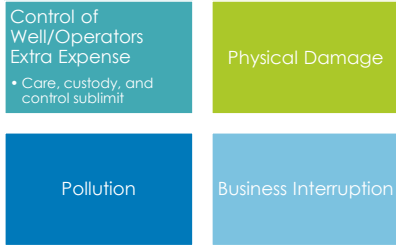
Generic Industrial Control System

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    graph TD
      A[Input Devices] --> B[Control System]
      B --> C[Output Devices]
      C --> A
  
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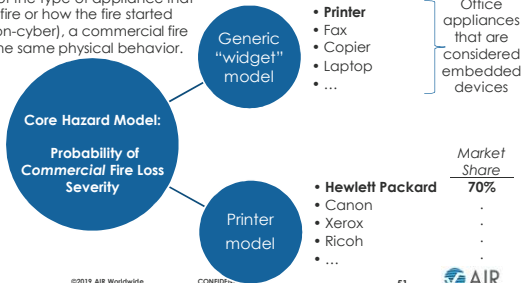
Offshore Energy Insurance Policies



Commercial Property

Overview: Office Buildings

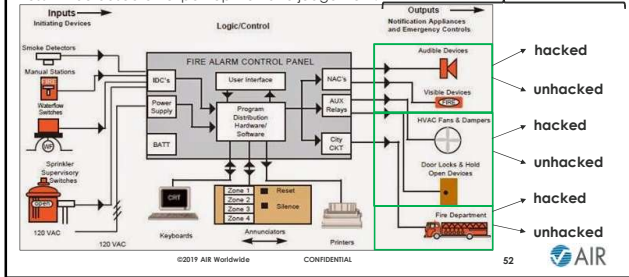
Regardless of the type of appliance that catches on fire or how the fire started (cyber or non-cyber), a commercial fire will exhibit the same physical behavior.






Details: Simulate Extreme Tail Events

To what degree each "switch" impacts the severity of loss will be based on expert opinion and judgement.

Outputs provide three types of "switches" that can be turned on or off, resulting in eight different possible outcomes



Cyber Risk Modeling Enables Business Growth

-  Optimize your underwriting strategy
-  Diversify portfolio with more confidence
-  Keep up with evolving risk landscape

Q&A
