



Two More Certainties In Life & How They Will Impact Financial Services: Growth In Compute Power & Commoditization

Peter Elger, CEO & Co-founder, fourTheorem
Colum Thorne, VP Platform Architecture, RenaissanceRe

Wednesday, 04 May 2022



A Word From Today's Chairwoman

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Managing Director
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Today's Agenda

- 11:00 – 11:05 Chairman's Introduction
- 11:05 – 11:30 Keynote Presentation – Peter Elger & Colum Thorne
- 11:30 – 11:45 Question & Answer



Today's Speakers



Peter Elger
CEO & Co-founder
fourTheorem



Colum Thorne
VP Platform Architecture
RenaissanceRe

Death and Taxes

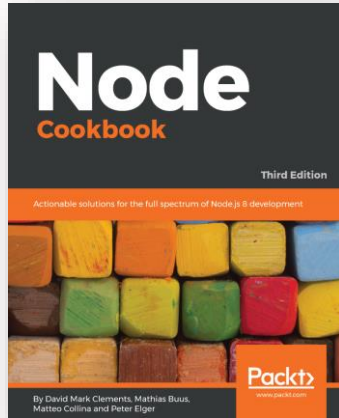
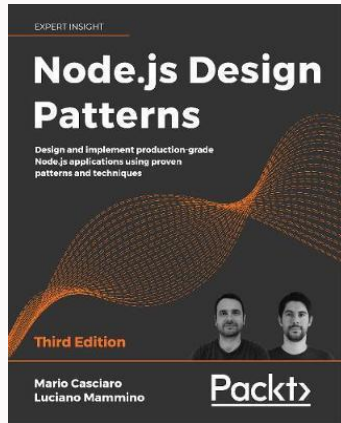
Two More Certainties In Life & How They Will Impact Financial Services:
Growth In Compute Power & Commoditization

Peter Elger - fourTheorem
Colum Thorne - RenaissanceRe

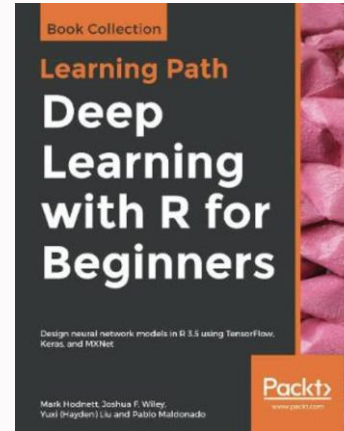


RenaissanceRe

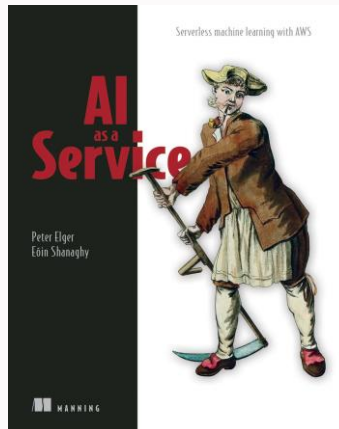
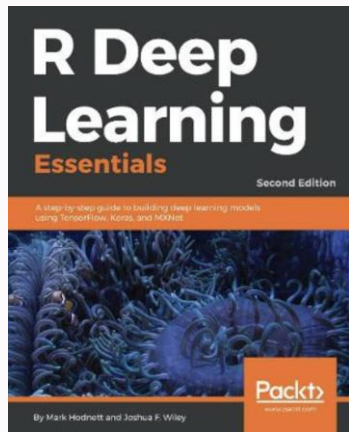
fourTheorem



“I've read basically every Node.js book ever published, and this is my personal favorite (and best) by far!”



Middy Lambda
middleware
framework



“AI as a Service is a fast-paced guide to harnessing the power of cloud-based solutions... A practical approach to real-life AI smartly based on a serverless approach. Enlightening!”



SLIC Serverless
starter kit



SLIC Watch
serverless
observability
plugin

This Talk:



- Two forces have shaped the tech industry:
 - The exponential growth in compute power (Moore's law)
 - Commoditization
- We are now moving to the world of 'true utility' computing.
- **Apart from a few special cases, all enterprise computing will ultimately become cloud native (AKA Serverless)**
- How can this benefit you? A real world example

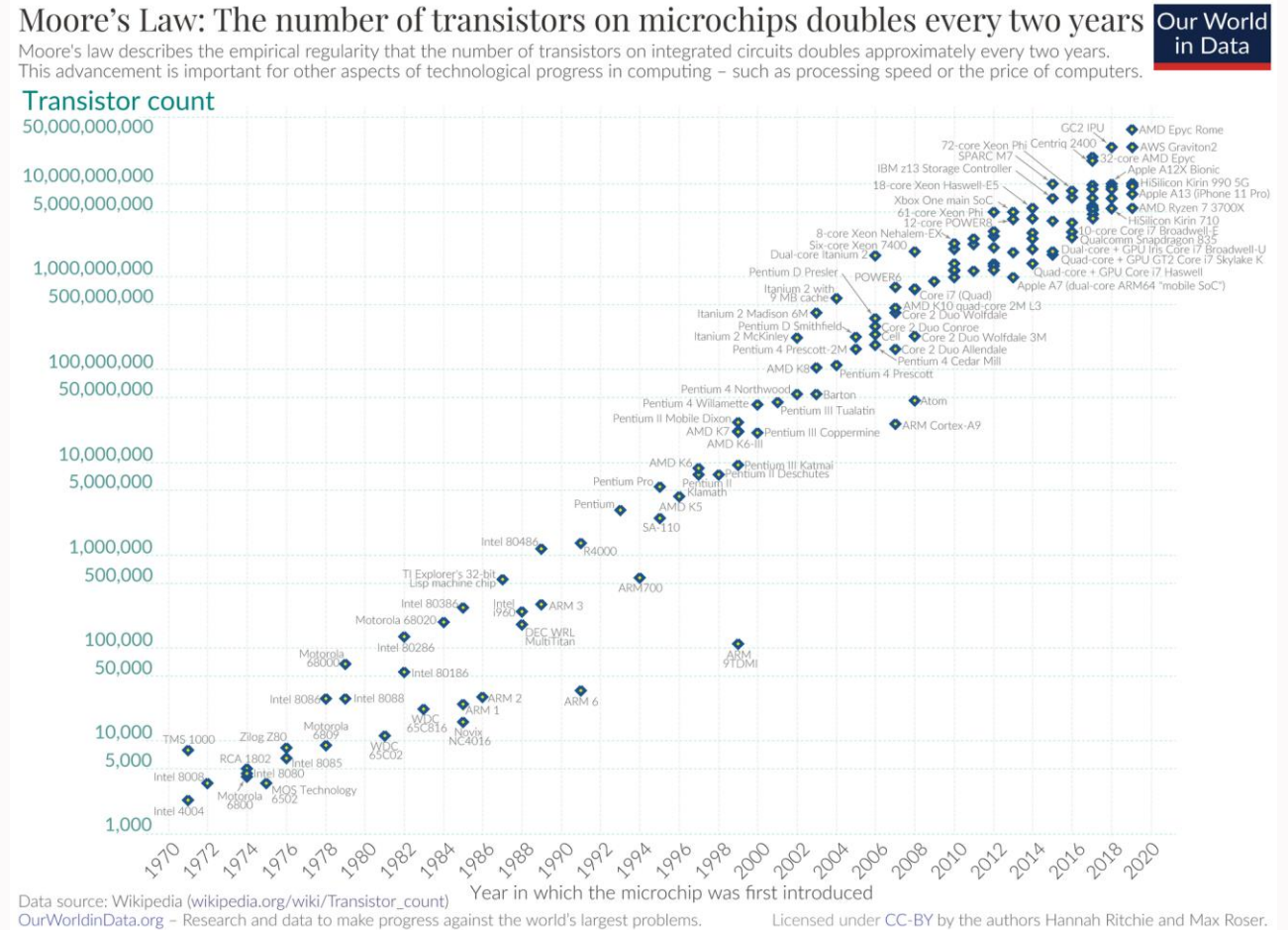
Beware the Exponent



- Square 20 - 1,000,000 grains
- Square 40 - 1,000,000,000
- Square 64 - 18,000,000,000,000,000,000 (210 Bn Tonnes)

Growth in Compute Power (Moore's Law)

- The number of transistors in an integrated circuit doubles roughly every two years.
- Over 50 years improvement factor of approximately 2Bn



- Source: By Max Roser, Hannah Ritchie - <https://ourworldindata.org/uploads/2020/11/Transistor-Count-over-time.png>, CC BY 4.0, <https://commons.wikimedia.org/w/index.php?curid=98219918>

Rumors of its death

- *The original prediction was to look at 10 years, which I thought was a stretch [...] The fact that something similar is going on for 50 years is truly amazing. [...] But someday it has to stop. No exponential like this goes on forever. - G.Moore*
- Today's best super computers (Fugaku) execute at $\sim 10^{17}$ flops has ~ 4 PB memory, uses 28 Mega Watts, occupies 396 racks
- The human brain, it is estimated, can execute at $\sim 10^{15}$ flops, has ~ 100 TB of working memory, uses only 20 Watts of power (a banana a day) and weighs ~ 3.5 pounds
- In its original form Moore's law has stalled - because physics! However, we will continue to see growth in compute power:
 - GPU, NPU, TPU growth
 - System on chip (e.g. Apple M1), Multi-core architectures
 - Optical & Quantum computing

Source - <https://en.wikipedia.org/wiki/TOP500>

Certainty 1

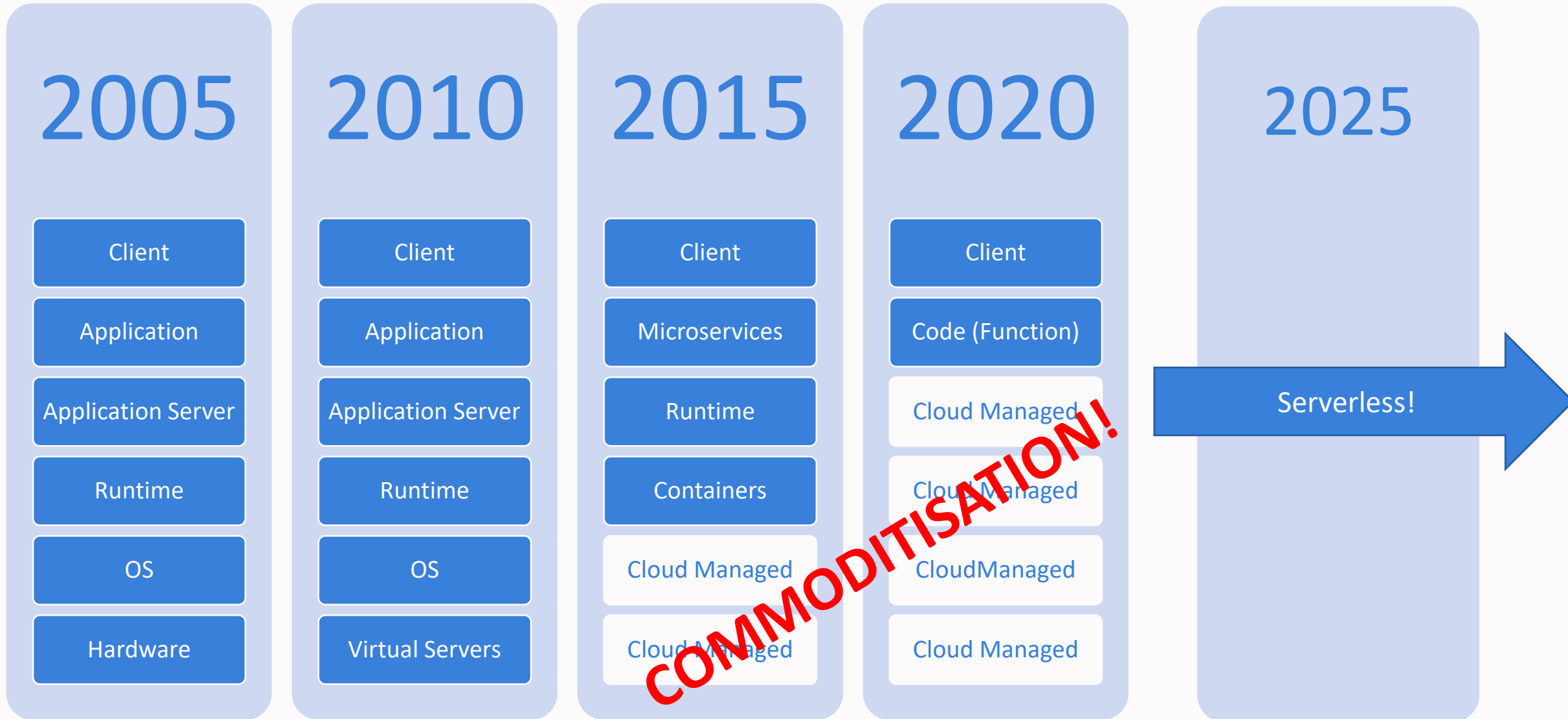
- The ability to process information at greater speed and lower cost is just too valuable to our species. Barring an extinction event, growth in compute power, networks and storage will continue.

Commoditization



...A tale of two toasters

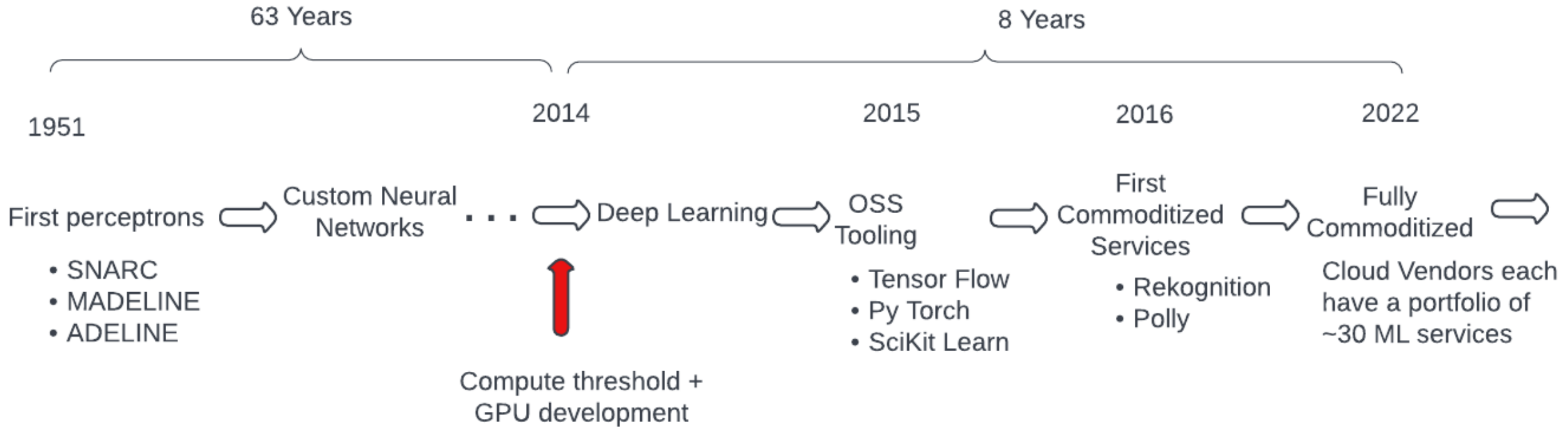
Commoditization of Compute Services



Cloud Services Count - 2019/2020 (Out of Date!)

Service Type	AWS	Google	Azure
Compute	14	12	19
Data and Storage	20	12	28
Network	12	10	15
Developer	12	16	10
AI and Machine Learning	19	19	39
Other (e.g. IoT)	98	94	135
Totals	175 (current total: ~250)	163	246

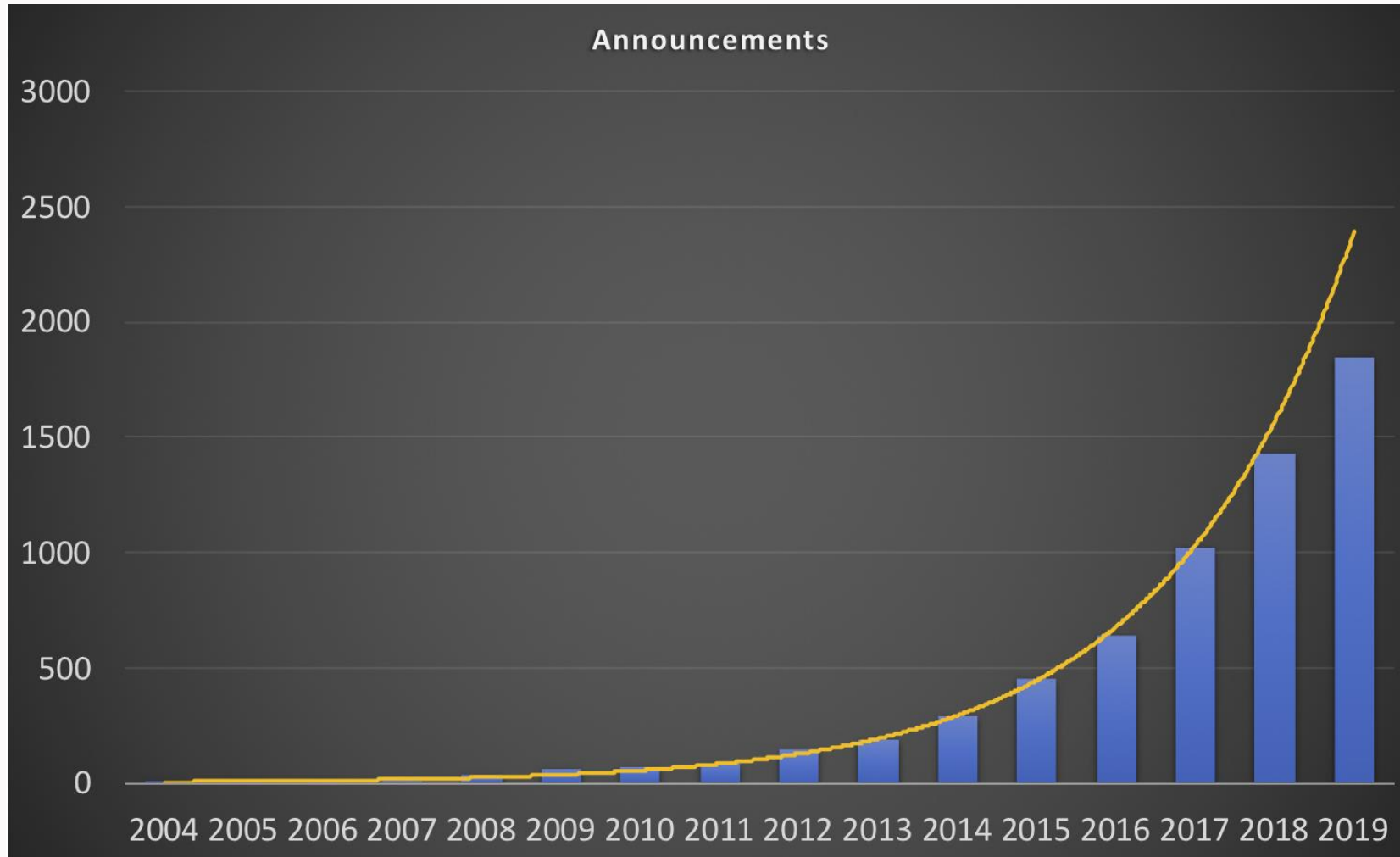
Commoditization of AI/ML



Commodity AI/ML Services

Service Type	AWS	Google	Azure
Image + Video	Rekognition	Vision, Video Intelligence	Face Detect, Video Indexer
Recommendations	Personalize	Recommendations AI	Personalizer
Voice	Lex, Polly, Transcribe	Cloud Speech to text, text to speech	speech to text, text to speech, speech translation, speaker recognition
Chatbot	Lex	Dialogflow	QnA Maker, Azure bot service
Prediction	Forecast, FraudDetector	Cloud inference API	Azure ML
Language	Comprehend, Textract, Transcribe	Cloud Natural Language, Cloud Translation	Form recognizer, translator, reader, text analytics
Training/Custom	SageMaker, Inferentia, Elastic Inference	AI Hub, Cloud AI, Auto ML	Azure ML service
Search	Kendra	Cloud search services	Cognitive search
Developer	CodeGuru, SageMaker Studio	TensorFlow, CoLab	ML Studio

Growth Trend AWS



Source: <https://www.cloudpegboard.com/servicecounts.html>

Certainty 2

- The continued growth in available compute power will inevitably drive continued and indeed accelerated growth in commodity cloud services.
- Serverless will become the de-facto standard for (nearly) all enterprise computing over the near-term

An Example - Cloud Native HPC Financial Modelling

- Isn't serverless just for APIs and web apps?
 - Answer: No
- Can you really do compute at scale with serverless?
 - Answer: Yes
- For example, Renaissance Re:

RenaissanceRe

Operation	Value Creation	Business	Capital	Investments
29 years Track record <i>(1993 to 2022)</i>	\$7.5B Market capitalization	\$7.8B Gross premiums written <i>(2021)</i>	~\$18B Total managed capital (equity, preferred, debt + 3 rd party)	\$21.3B Managed investment portfolio
649 Employees <i>(February 2, 2022)</i>	\$6.2B Share buybacks + dividends <i>(Inception – Dec. 31, 2021)</i>	~50:50 Property vs. Casualty & Specialty mix <i>(2021)</i>	~\$10B Managed 3rd party capital (excluding RenaissanceRe ownership)	1.2% Weighted average yield to maturity
11 Global offices (with RenaissanceRe Risk Sciences)	+12.3% Growth in book value plus accumulated dividends <i>(2006 - 2021)</i>	70% Combined ratio <i>(Inception - 2021)</i>	\$6.6B Shareholder's Equity	3.0 years Average portfolio duration
A+ A.M. Best / S&P Ratings	+12.7% Return on average common equity <i>(2006 - 2021)</i>	78% Of our premium is from clients who buy multiple lines <i>(January 1, 2022)</i>	6 Distinct 3 rd party capital platforms	AA \$-weighted average credit quality

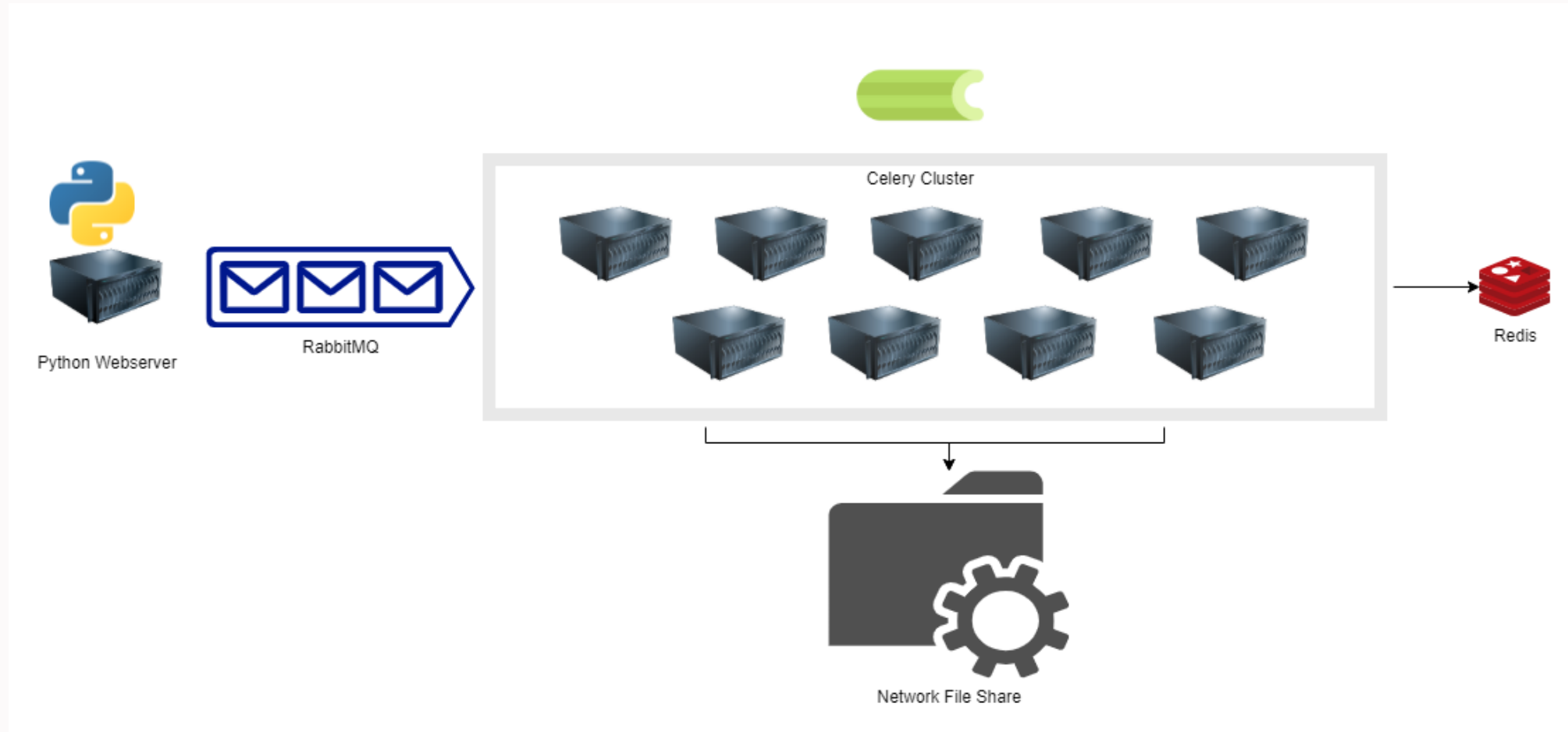
Understanding Our Risk Portfolio

- Risk Rollup
 - Uses financial modeling to understand our portfolio of risk
 - Run internal custom-built risk model on all reinsurance deals
 - HPC (High-Performance Computing) workload
 - ~45TB data processed, ~600GB produced for analytics
 - 2/3 rollups per day

Understanding Our Risk Portfolio

- Deal Analytics
 - Near real-time deal pricing using the same risk model
 - Lower data volumes
 - High frequency of execution – up to 1000 per day

On Premise System (Pre Cloud)



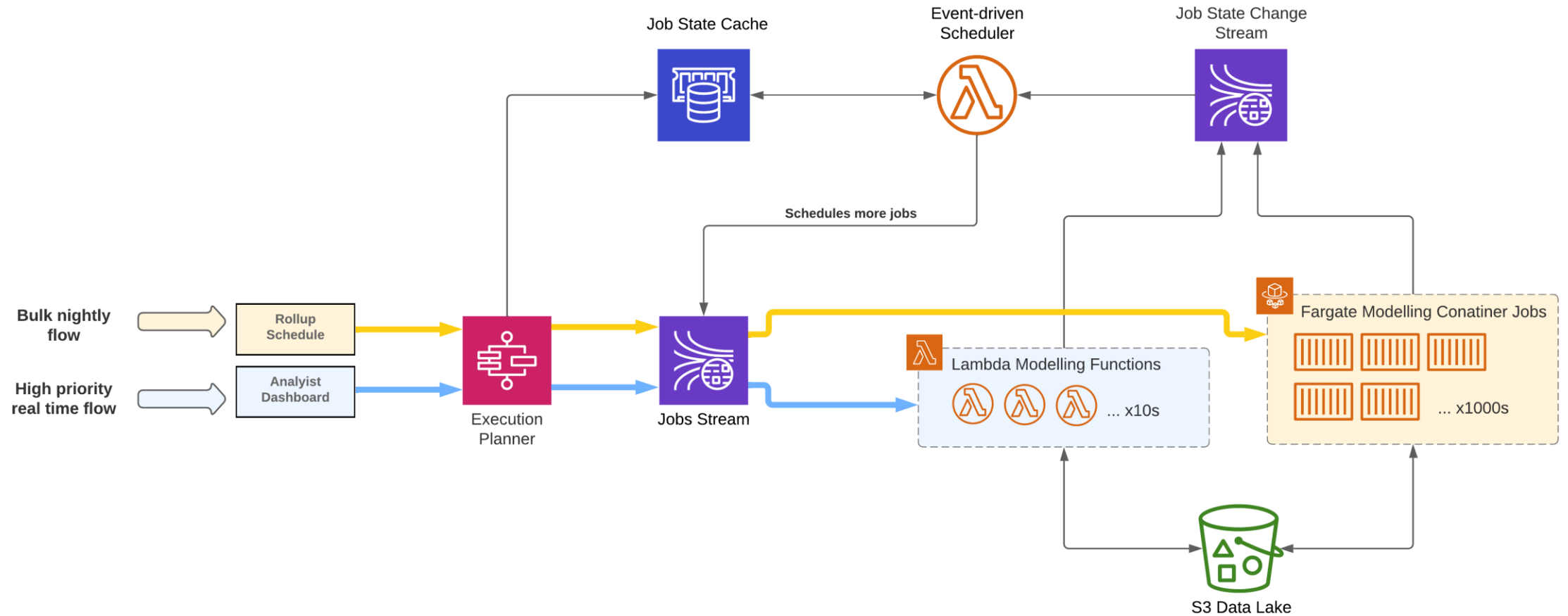
Challenges

- Scale!
- Long execution times, constraining business agility
- Competing workloads
- Limits our ability to support portfolio growth
- Can't deliver new features

Thinking big!

- Imagine a solution that would ...
 - Offer a dramatic increase in performance
 - Provide consistent run times
 - Support more executions more often
 - Support future portfolio growth and new capabilities – 15x data volumes

System Architecture



Challenges

- New components
 - Fargate Scaler
 - S3 Object Cache
- Data Storage
 - S3 Partitioning
 - Kinesis Sharding

Outcomes

- Business
 - Delivering Rollup in ~ 1 hour
 - Removed constrains on number of runs
 - Faster and more consistent deal analytics
 - Business spending more time on revenue generating activities
 - Well positioned to support portfolio growth and to deliver on capabilities producing larger data volumes

Outcomes

- Technology
 - Brought serverless to HPC financial modeling
 - Reduced our codebase by ~70%
 - Lowered total cost of ownership
 - Increased dev team agility
 - Reduced our carbon footprint

RenRe is now ASAP
As Serverless As Possible!

Wrap Up

- Certainty 1 - we will continue to see a growth in compute power, whilst the original Moore's law will end, other innovations will continue to drive this growth
- Certainty 2 - Commoditization is an unstoppable force, we will continue to see accelerated commoditization of software technology to cloud
- Systems of the future will increasingly be created through the consumption of commodity cloud native services, AKA Serverless.
- Ultimately all enterprise compute will become cloud native.
- The future is NOW be As Serverless As Possible (ASAP)

Thank You - Questions?

peter.elger@fourtheorem.com

www.linkedin.com/in/peterelger



Comments, Questions & Answers





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Thank You For Listening

Forthcoming Events

- Thu, 05 May (15:00-15:45) Can A Standard For Good Governance Make A Difference? The Case For ISO 37000
- Tue, 10 May (15:00-15:45) To Trust Or Not To Trust? This Is The Question When Buying Or Selling Cryptocurrencies
- Wed, 11 May (18:00-21:00) FS Club Spring Garden Party
- Fri, 13 May (08:30-14:30) Employee Share Schemes And Trustees Conference 2022

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<https://app.pzaz.tv/app/pzaz/store/zyentv>