

# SODA – Data@Edge

(<https://www.meetup.com/OpenDataAutonomy/events/273025932/>)

## Sustainable Data Management at the Edge

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# Recap: Why Edge/Private Cloud Computing ?

## Near Real Time Processing, Autonomous Operations vs Cloud Latency/Availability

- Multiple real-time streams of sensor and embedded based data
- Metrics Aggregation and localized Decision Algorithms, A/B Testing
- Safety and Security
  - Anomaly Detection and Isolation
- Availability
  - Fault Patterns and Redundancy
  - Security Denial of Service issues

## Cost of Computing-In and Connectivity-To the Cloud

- 3-5 Year Cost Analysis:
  - Storage and Archival
  - Connectivity and Data Transit (APIs)
  - Computing (Serverless and Server Based) with ever increasing Data
  - Data extraction and portability costs
- Delicate Balance
  - Skills vs Recurring Non Core Cost
  - How critical is Autonomy ?

## Privacy, Data Retention, Regulations/Compliance

- Data Retention:
  - Locally Managed – push only what is needed in the Cloud
- Privacy
  - Cloud Data Storage Privacy versus local Aggregation and/or Anonymization/Pseudonymisation of PII Data
  - Explicit Opt-In/Out Costs
- Data Sovereignty
  - Geo-location of Data At Rest

# What's Missing on the Edge – SW Platform ?

## Platform for Application Development and Deployment

- Developer:
  - PaaS Environment for application lifecycle management at scale and with security
  - A/B Testing in the Field
  - Plug-n-play Function modules
  - Ease of solution deployment
  - Leverage HCI for simple localized storage and compute intensive ML processing with high availability of data
  - Autoscale on demand

## Seamless Data Pipelines and Transformation

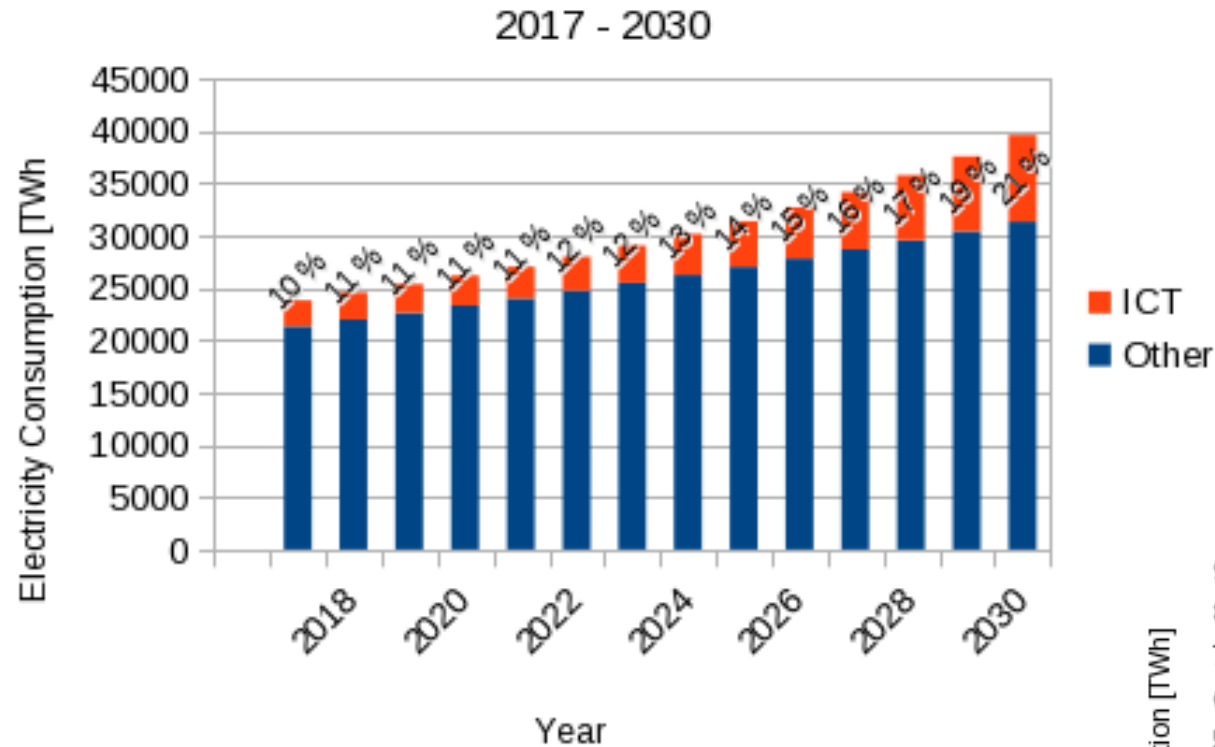
- Data Pipeline
  - Focus should be on data ingestion and transformation logic, and not on pipelines
  - Focus on near realtime data processing and chaining of logic blocks without worrying about interlinking transport
  - Non-standardized sensor models and transport. Provide opportunity for standardization and innovation around custom features

## Cost Optimization, Unified Management and Control Plane at Scale with Security

- Unified Management/Control Plane:
  - Common Platform for Hybrid Cloud
  - Manage what remains on the Edge and in the Cloud
  - Open pipeline integration into 3<sup>rd</sup>. Party IoT Aggregation Solutions
- Cost
  - Optimize what is on-premise versus on the Cloud
  - Opportunity for form factor reduction and partnerships between SW and HW platform vendors

# The Elephant In The Room - ICT Energy Consumption

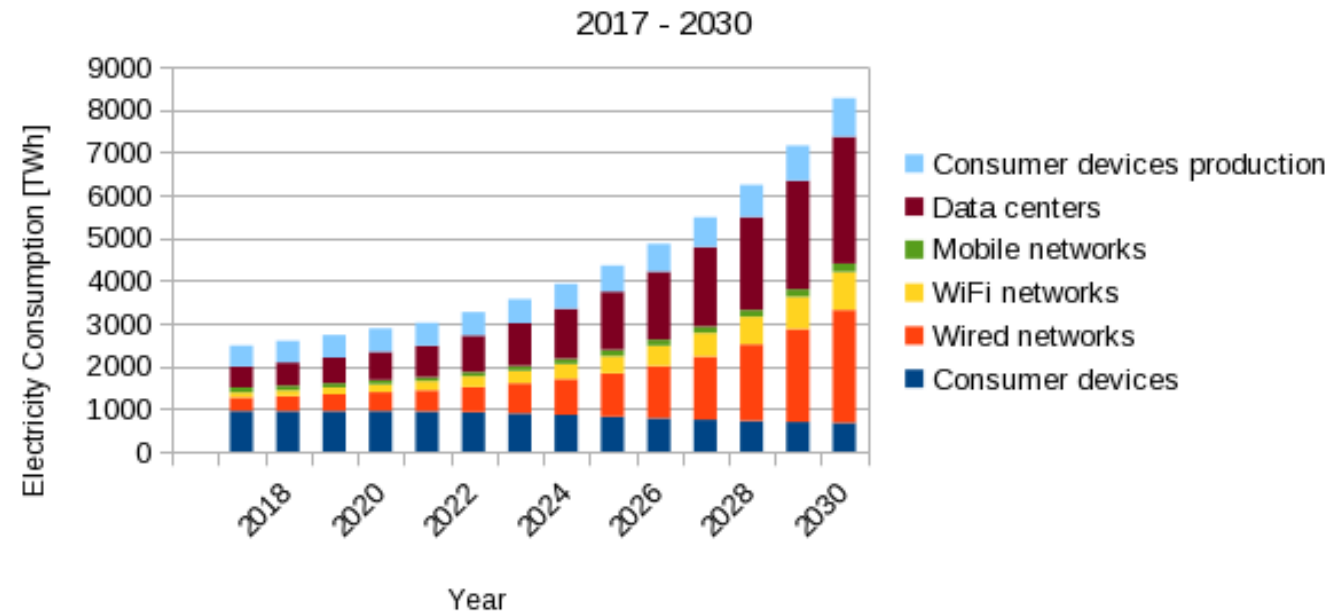
Global electricity consumption



**Our Insatiable appetite for Data, for personal consumption (video, voice, images), data analytics/ML**

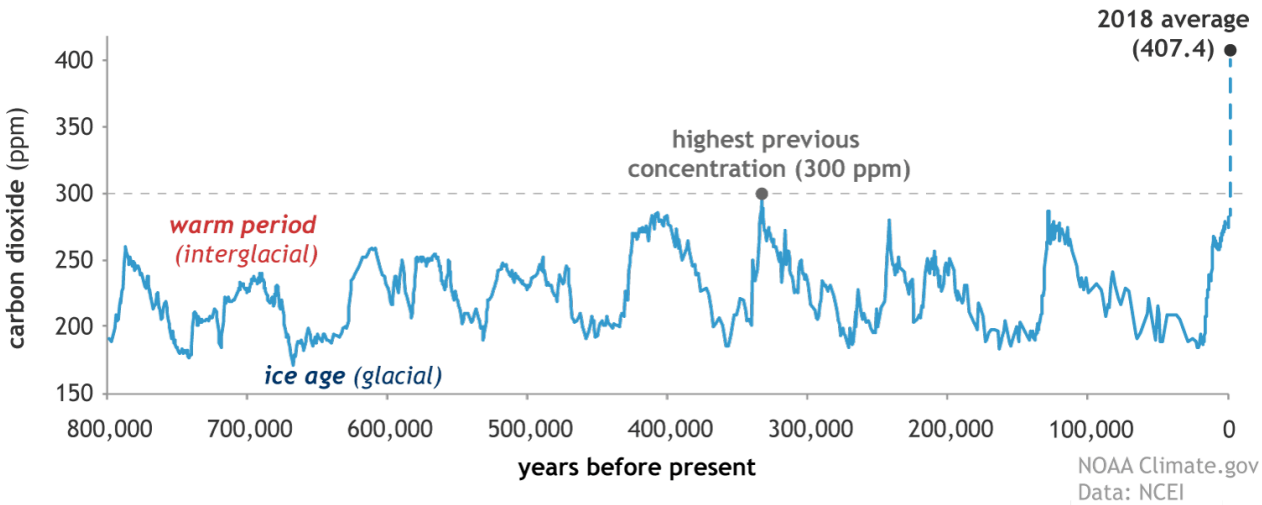
**Unfortunately equipment vendors have no control over vast amounts of wasteful content being transmitted, processed and stored**

Global ICT electricity consumption



# Climate Change → Energy Imbalance → Growing Share of ICT

CO<sub>2</sub> during ice ages and warm periods for the past 800,000 years



**Personal Quote: Climate Change (C2) is a Globally Pervasive, Borderless Phenomenon, owing to Man-Made Energy Imbalance, resulting the Unnatural Extinction of Species in the Natural World, along with Unnatural “Landscaping” of the Geographical Environment**

**Webinar on Sustainable Development, Green Energy and Education:**

<https://www.youtube.com/watch?v=0lptxs1dmrk&t=496>

**IBERDROLA**

**SOCIAL AND ECONOMIC IMPACT OF CLIMATE CHANGE**

- The cost of adapting coastal areas to rising sea levels
- Relocation of whole towns
- Shrinking productivity of harvests
- Prices of basic foodstuffs and consumer goods will rise
- Extreme meteorological phenomena will cause widespread poverty
- Diseases will spread due to higher temperatures
- Fresh water will be in short supply in some areas
- Loss of the capacity to work due to heat
- More wars to gain access to limited resources

# What's The Future Holy Grail for Data@Edge

## Energy Efficiency

- Engineering & Product Management:
  - Use case driven data collection as opposed to grounds up design approach
  - An emphasis on type, depth and frequency of content being captured
  - Programming language constructs used
  - Platform services used. This includes storage and transport protocols, off-cycle consumption,

## Performance

- Engineering & Product Management:
  - How do we ensure Energy Efficiency and Performance are not orthogonal ?
  - There is an intersection on programming language and platform services
  - HCI inherently offers certain advantages owing to collapsed architecture

## Environmental Impact Assessment

- Engineering & Product Management:
  - EIA in terms of energy consumed per unit of storage i.e. KWH/Byte for a given compute, network and storage architecture
  - EIA in terms of how much renewable energy can be feasibly used to power Edge devices

THANK YOU !