Big Data Use Cases: “The Size of the Data does not define Big Data”

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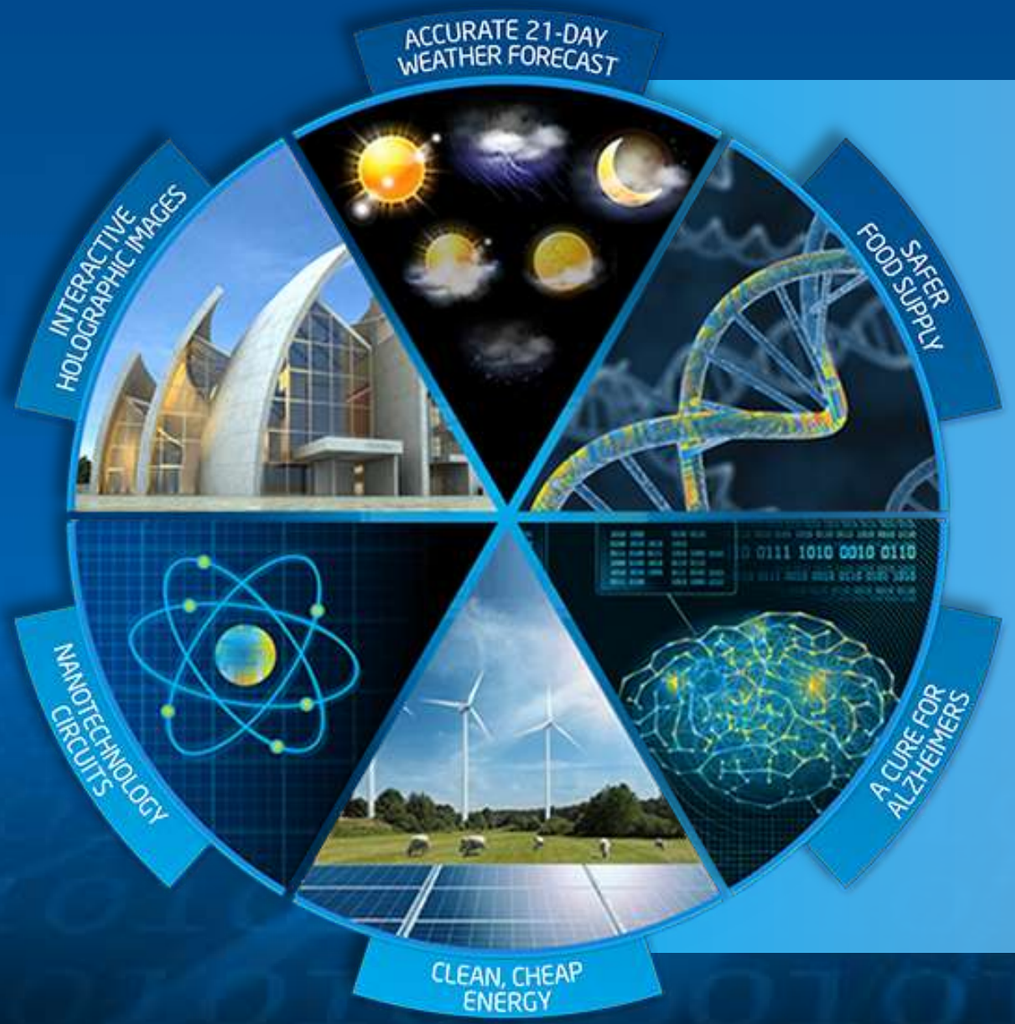
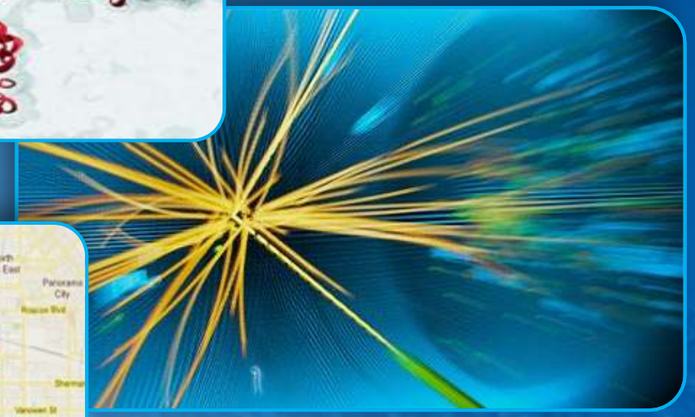
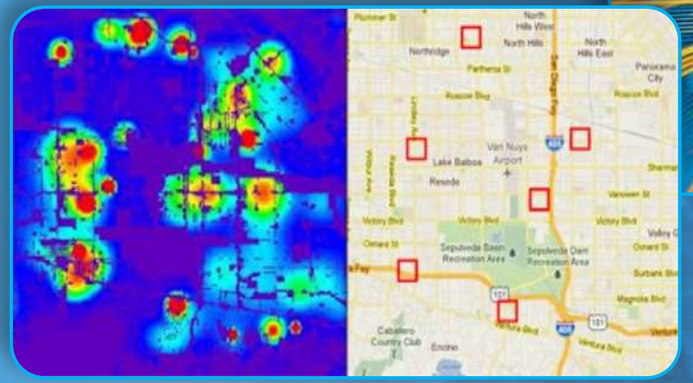
Uncharted Territory on Path to Discovery In Science and Engineering







We Struggle to Define Big Data..

	Traditional View of Data	Big Data
Volume	Gigabytes to Terabytes	Petabytes and beyond But does THIS MATTER?
Velocity	Occasional Batch – Complex Event Processing	Real-Time Data Analytics
Variety	Centralized, Structured i.e. Database	Distributed, Unstructured Multi-format
Value	The Data itself is the end (a lot of HADOOP stuff)	Insight Derived from Data (Find the Cancer Cure)

Not Unlike we Struggle to Define HPC!

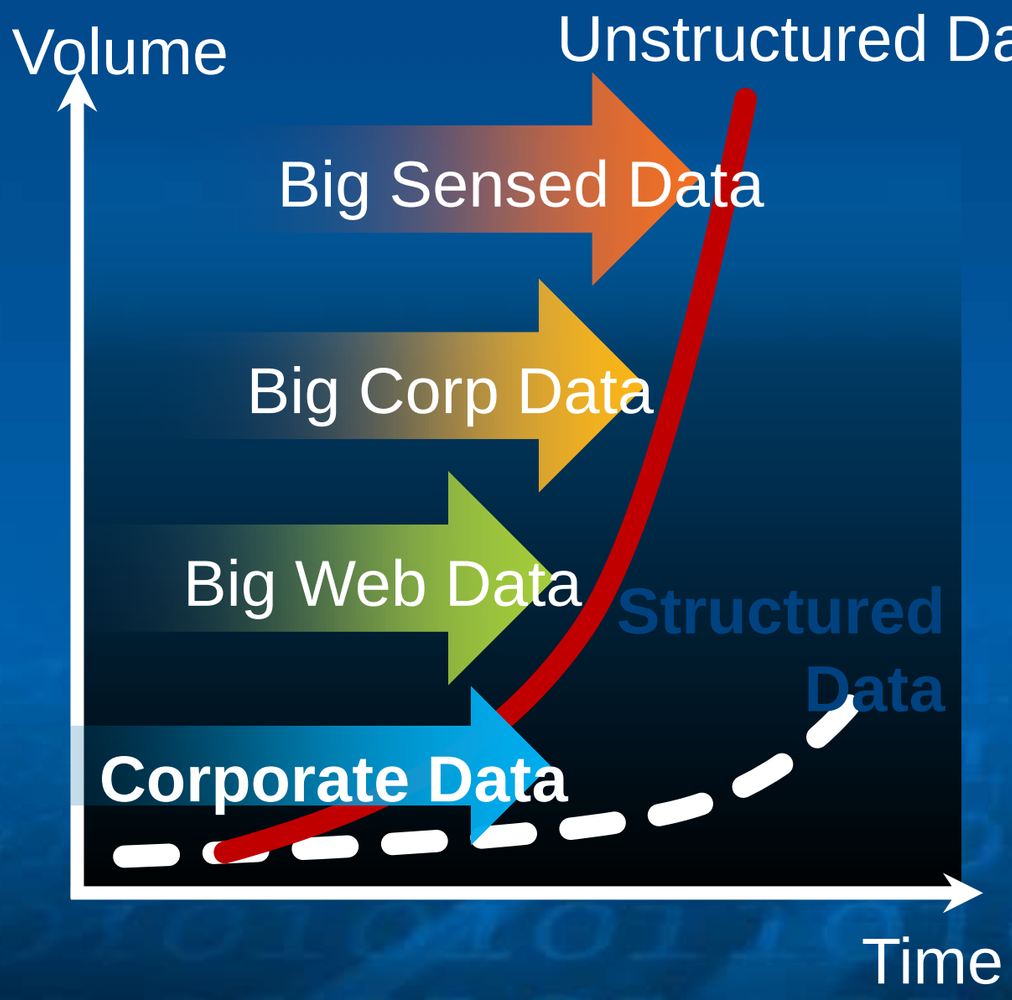
When is a computation requirement “high performance”?

The canonical definitions are problematic…
because they ignore temporal contextuality

HPC is defined by not only the processing…
But the fact that processing is connected together
to work on a single problem seamlessly.

…. Interconnection (fabric) is essential to HPC’s nature.

What will be big tomorrow?



Does Big Data having anything to do with the size or structure of the data?

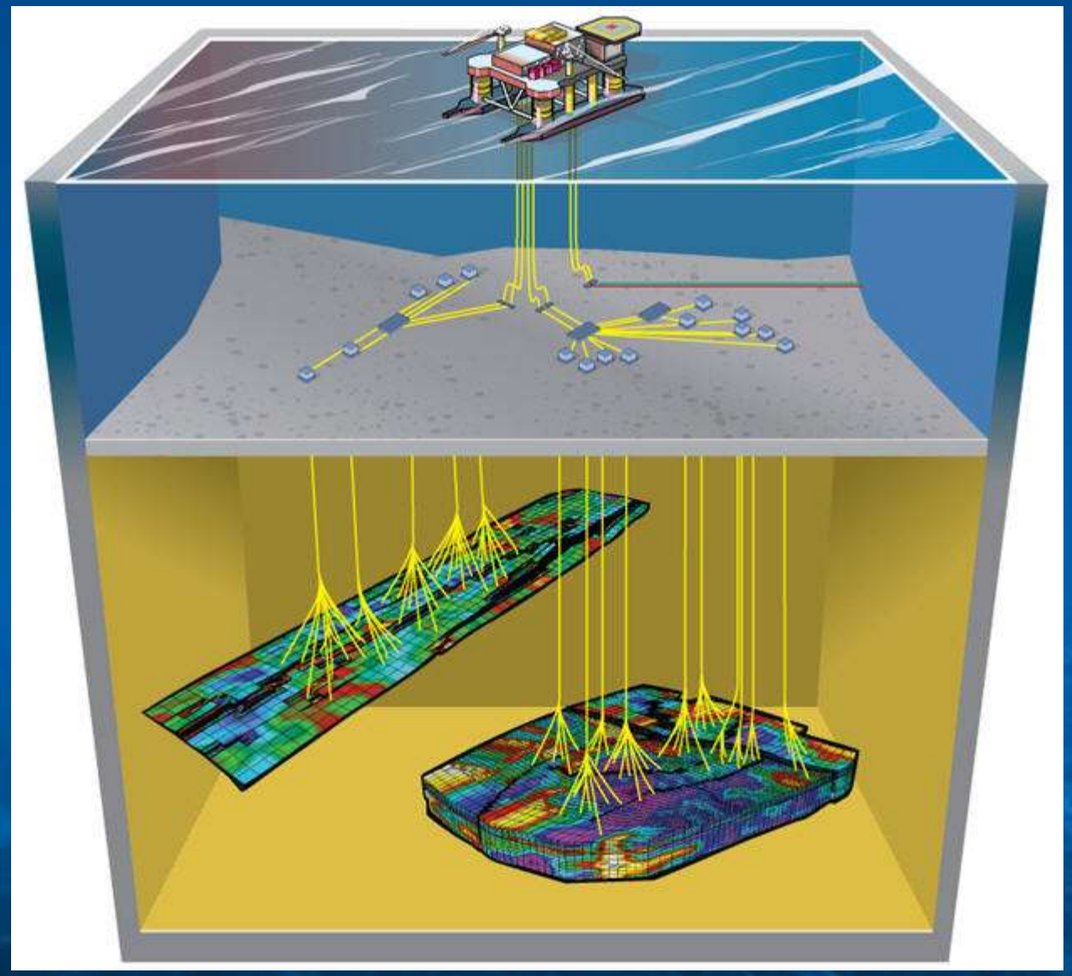
We struggle because we try to define The opportunity from an irrelevant attribute of the storage architecture!

More important than HOW BIG..

Is the impact HOW BIG has to WHERE the data is.. And how we reach it. (interconnect is essential to nature)

John's Definition of Big Data

"Big Data" is a class of insight opportunities where the data brought to the problem is multisourced, distributed or of such a scale that significant processing capability is required to derive insight from it.



(An Oil field is defined by how you reach the oil)

HPC is Essential to Big Data

Four “Use Case Classes”:

Data Aggregation:

Find a specific group of records that comply with a set of requirements.

Filesystem Application

Data Analytics:

Computation of common characteristics or key regression characteristics in data aggregated for the analysis.

HPC + Filesystem

Data Visualization:

Construct a Visual representation of a computationally-derived model of data aggregated for analysis.

HPC + Filesystem + Visual Analytics

Interactive Visualization and Simulation

Command adaptive analysis through manipulation and simulation of aggregated data. Insight from Human Derived Optimization Points.

HPC + Filesystem + Visual Analytics + Interactive Design

Big Data – A Foundation For Delivering Big Value

Intel Leverages the Power of Big Data

Chip Design Validation:

Cut Product Time to Market by 25%

Faster analysis process for validating results

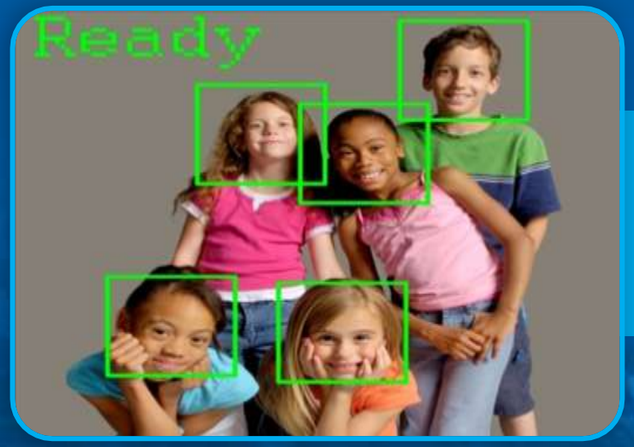
Streamlined debug process through analysis of large volumes of historical test data

HPC Insights from Big Data

Better Medical Therapies

Fastest Route Through Traffic

Urban Planning and Simulation



Improved Security (Scary guys)

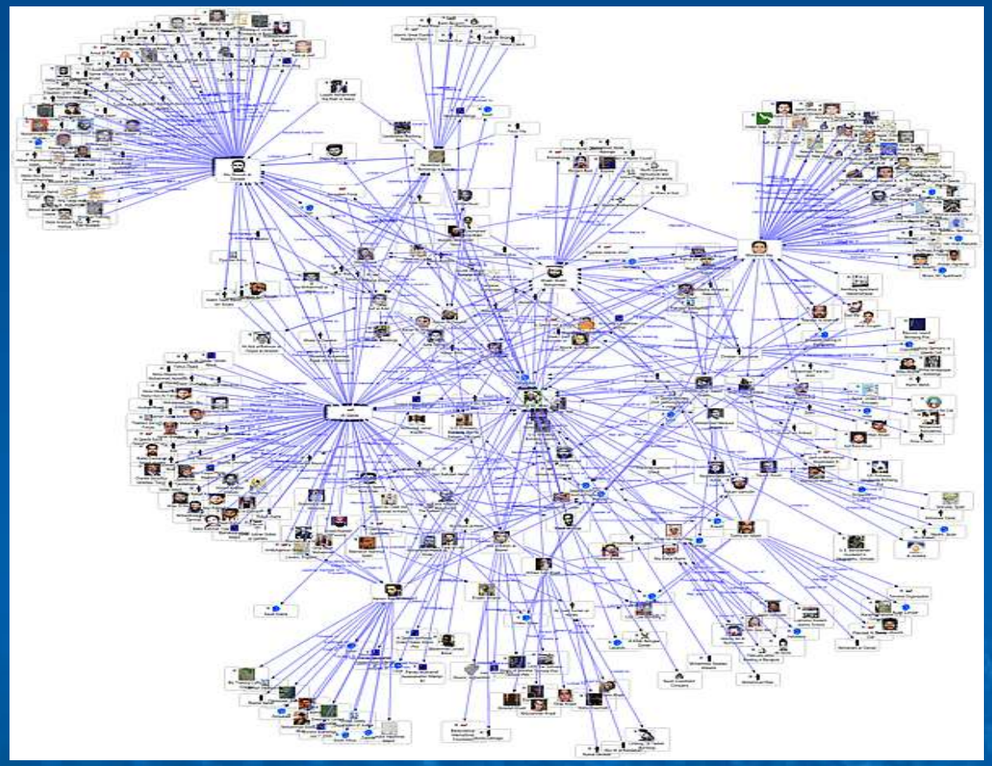
intel

Graph Data

Analytic problems with Data with a graph structure:

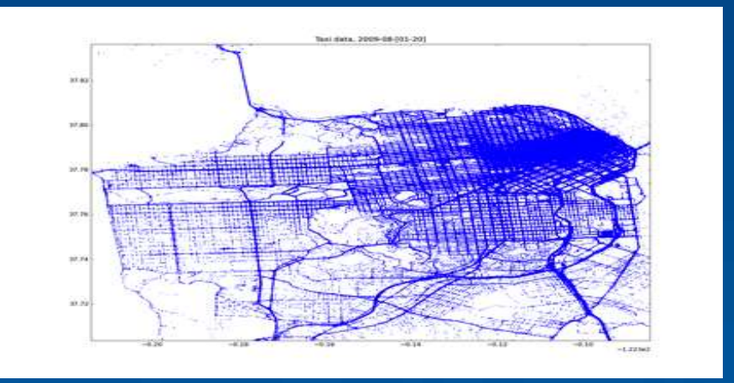
- Match Genomes of tumors
- Find the bomber in the haystack?

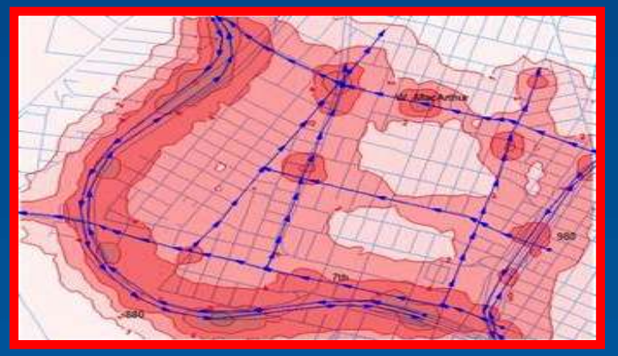
Some of these graphs are..
HUGE.



Data for the compute is ~never where you want it from a computation efficiency point of view.
Rarely here, rarely low latency to access.

What can you do with the data?





Crowdsourcing + physical modeling + sensing + data assimilation
to produce:

From Alex Bayen, UCB

Intel's view of the world - Enabling Discovery through Big Data

Example: Life Sciences Applications

Many (most) applications are single threaded, single address space ..

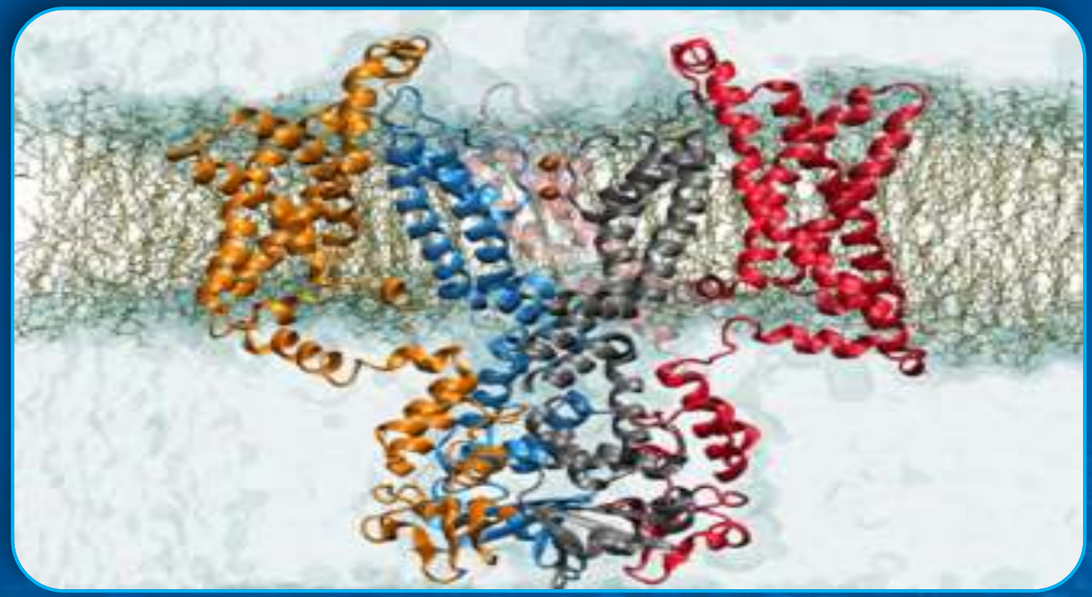
Intel is working with app/code developer, upstream code changes

Some algorithms have quadratic scaling with the size of the problem, so are the needs for larger working data sets resulting in compute capacity constraints

Technology innovations in compute, storage, and data fluidity

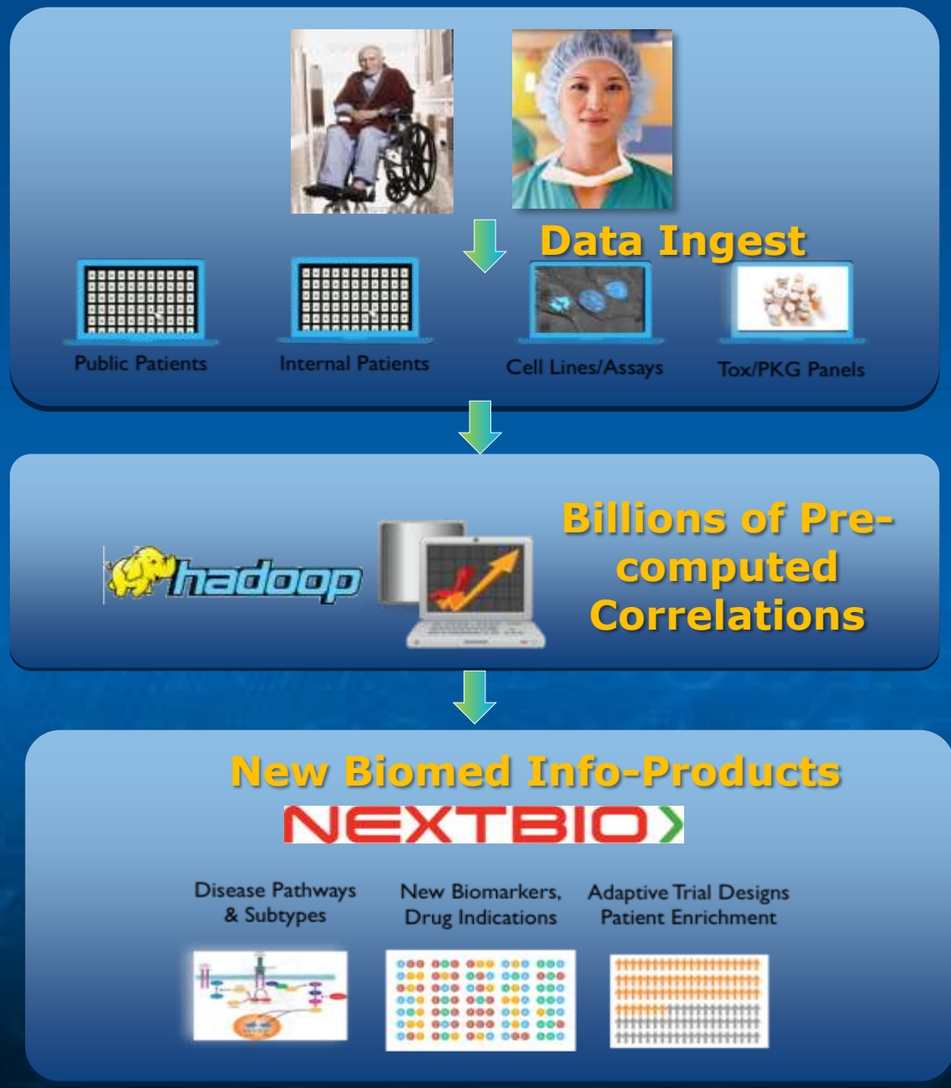
Databases are distributed, data is siloed and will likely stay that way

Tools like hadoop, lustre, graphlab, in-memory etc.



Big Data needs Balanced Infrastructure

Genomics for Translational Medicine using Intel® Distribution for Apache Hadoop - NextBio



- **Challenge:** Derive new value added patient discovery services while bringing down genome processing costs
- **Solution:** Dynamically partition & scale correlation of patient data to all public data using Hadoop and Hbase
- **Benefits: Contributes to 800x reduction in cost to process 4 Million genome variants**

HPC Compute Technology and Big Data

- HPC transforms Big Data From Batch orientation to Mission critical and real time orientation
- Data moves from target of static search to constructed in a pipeline of intelligent agents
- This requires shift form simple storage architecture to Greater Intelligence in the Storage System
- Cluster computation for rapid/accurate real time answers to real time data
- Fabric Performance becomes Essential to Insight delivery

INSIGHT

Big Data Architecture Framework changing over next 2 years

Data Access
User Authentication

Data Aggregation

Data Analytics

Modeling and Simulation

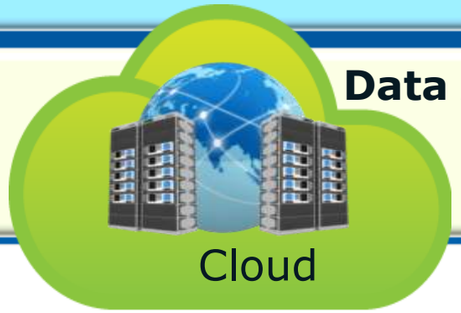
Visualization

Data as a Services

Distributed
Event, Message

Virtual
Real-Time, Cached, Federated

Persistence
EDW, Marts



Data Aggregation, Ingestion, Integration and Processing Services

Distributed High Performance Data Processing
Hadoop* MapReduce

Integration Tools

Data Location, Access, Storage and Distribution

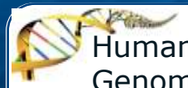
NAS - SAS and Distributed Storage

10GBe Fast Fabric

Databases DBMS / NoSQL

MPP Databases
DW Appliances

Data Sources


Human Genome & Drug Discovery

Diagnostic Images

Surveillance and Medical Device Streaming Data

Log Files

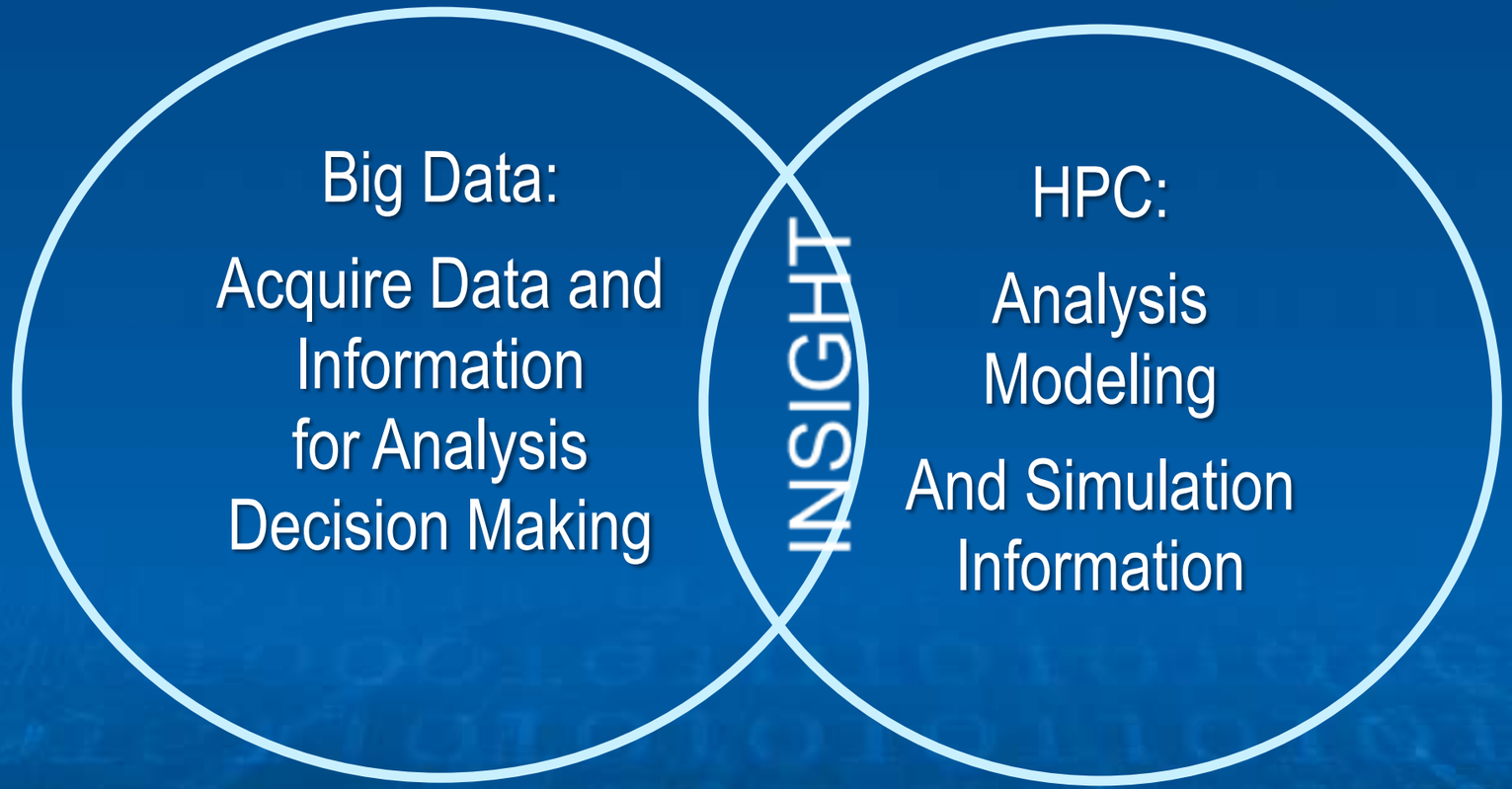
Social Media

Medical Records

GIS

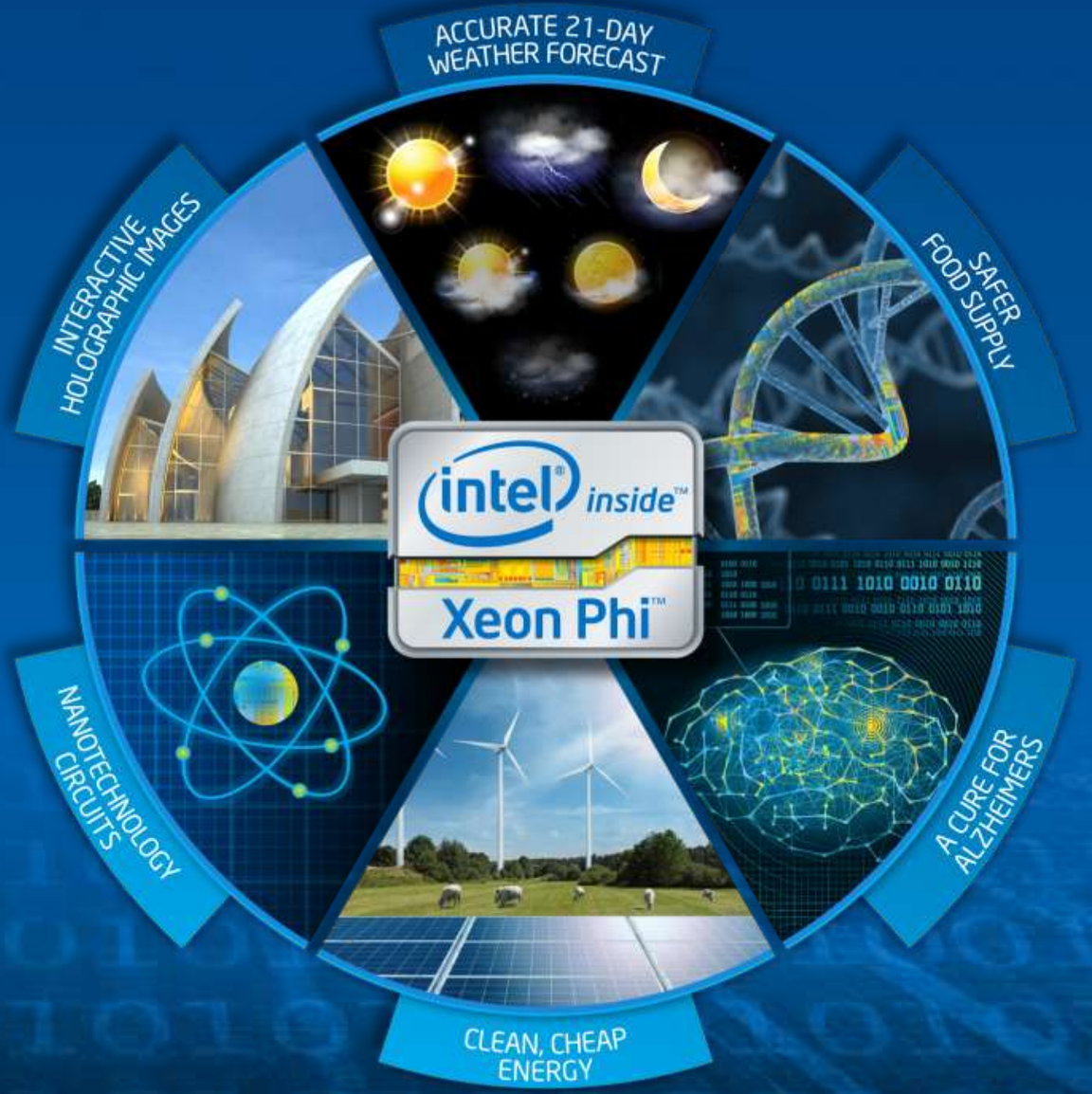
IS360.. Internally generated data.

Computation of Insight from Big Data



Parallelism is Your
Path to the Future

Intel is ..more than ever.. Your Roadmap



Model courtesy of Martin Lubich
www.loramel.net

HPC's Value for Big Data

"HPC is key for extracting value from Big Data...HPC will move Big Data from the target of static searches to a pipeline of intelligent agents."

John Hengeveld, Intel
(Intel Developer Forum, September 2012)

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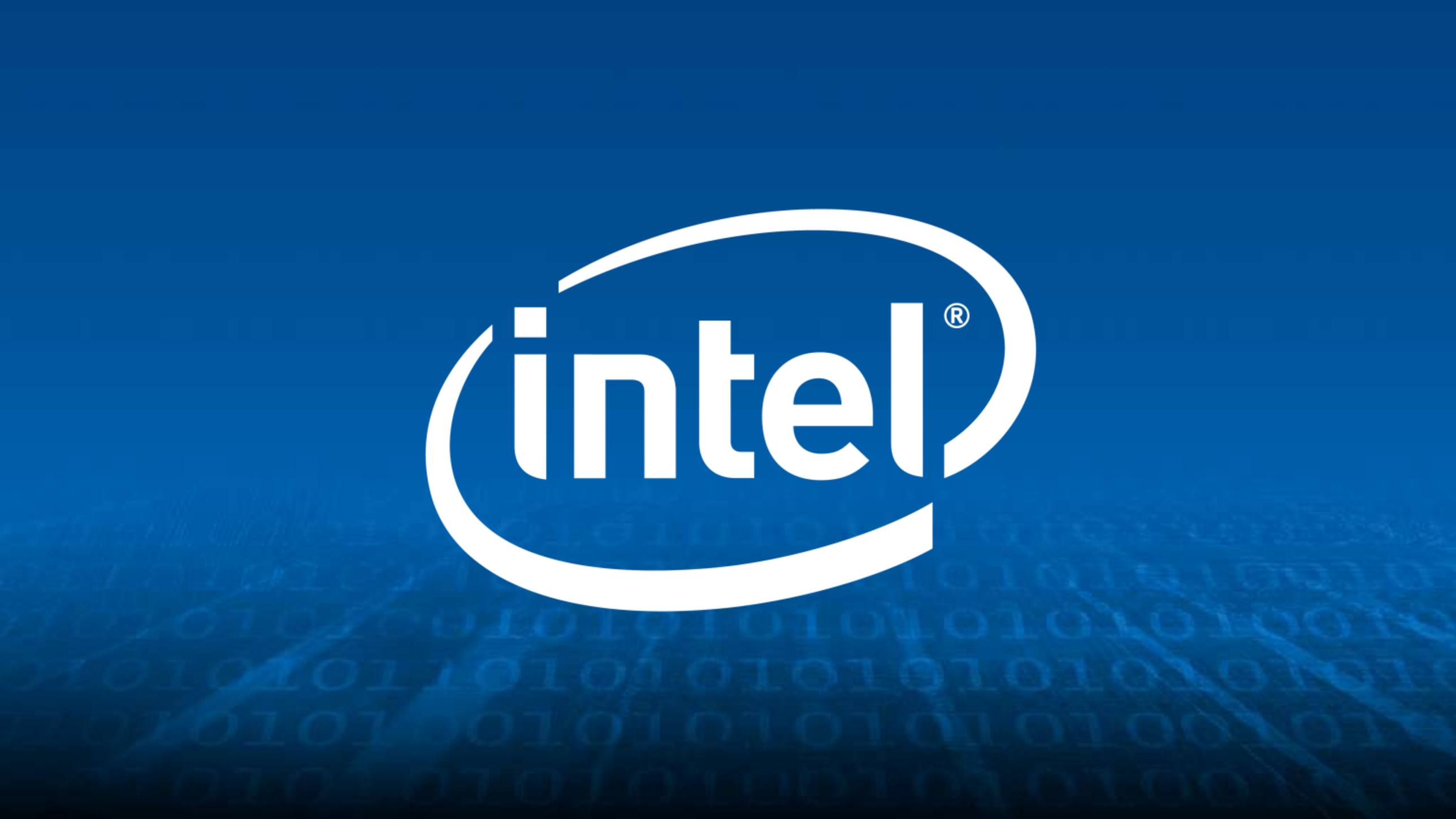
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