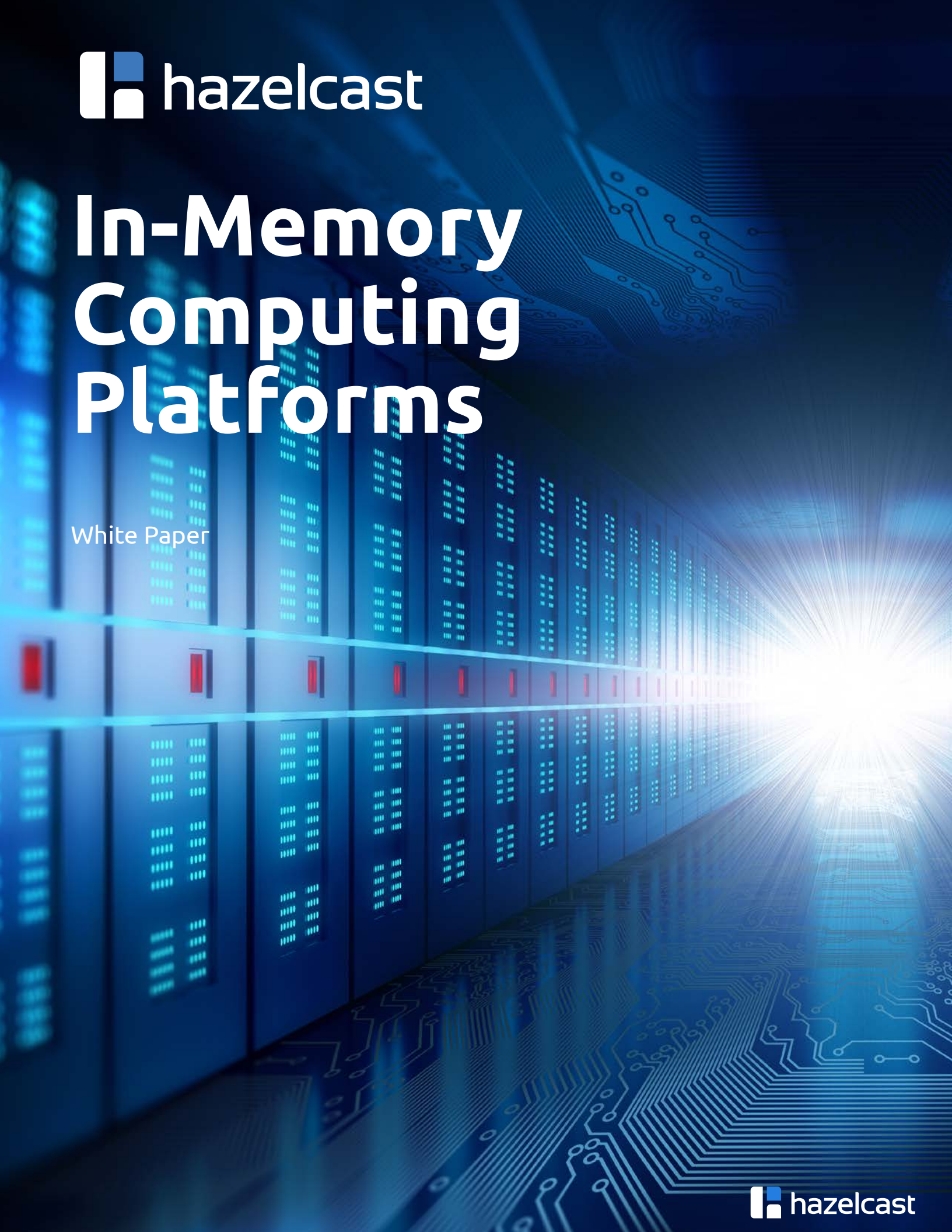
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In-Memory Computing Platforms
White Paper
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In-Memory Computing Platforms
– Real-time processing for the new business reality

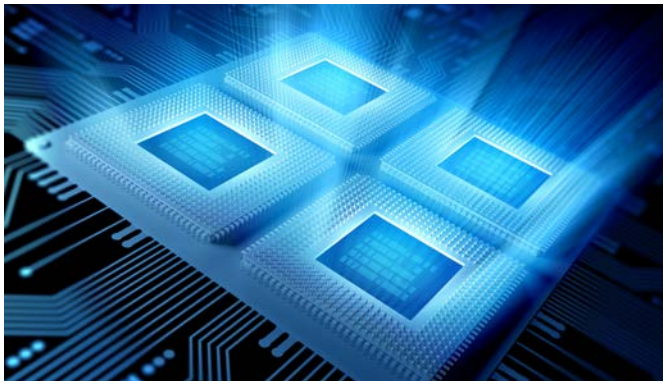
Businesses that achieve high levels of profitability and sustainable competitive advantage during the next decade will be intensely focused on the need for immediacy in interactions with their ecosystem, whether it's customers, IT systems, data streams, IoT devices or any of a myriad of data-driven entities. They will leverage all data at their disposal in real-time, seek business insights, harvest actionable opportunities and be perpetually vigilant about malicious or competitive threats. The IT systems these companies use will need to support vastly more significant volumes of streaming data and quickly process them into meaningful business metrics upon which they can be acted *during the moment*.

Companies will need IT solutions optimized for real-time decisions while leveraging historical data. In an environment that is continuously changing, historical trends may potentially be indicative of future performance. Since aggregate behaviors and patterns don't change quickly, any company's archive of historical data can be an important input to predictive modeling and analytics. It is the decisions companies make each day, however, that matter. **Business requires IT solutions that are optimized to support decision-making during the moment** – essentially an **in-memory computing platform (IMCP)** delivering the core enablement.

An IMCP is predicated on the integration of in-memory technologies, such as an in-memory data grid and in-memory stream processing, which together are complementary to systems of record, aka a database. A system of record provides persistence of data, (which is what it was designed to do), but is poorly suited for today's high-volume data-streaming environment and the need for immediacy. **It's not an either/or situation; the two types of systems are complementary and companies will need both.** Supporting rapid change and real-time decision-making requires a system that is:

1. **Quick to deploy** – Delivering rapid time to value
2. **High performance** – Providing extremely low latency processing that is fast, scalable and stable
3. **Adaptable** – Evolving as business needs change, driven by elasticity or cloud requirements

Almost all modern business is progressing through a period of digital transformation, integrating new technologies into business processes to achieve a new level of operational productivity. Enablers, such as in-memory computing, cloud services, mobile apps, 5G networks and machine learning, are all expanding the scope of what is possible with IT systems, by giving management more options from which to choose in support of a company's needs. These enabling technologies provide a set of high-performance options, but there is a weak link in IT systems that is limiting the real-time performance that companies require.



The current speed of data processing is preventing companies from realizing the potential these technologies promise – which is why an IMCP could be an excellent choice. Companies need a data-processing solution that increases the speed of business agility, not one that is complicated by too many technology requirements. This requires a system that delivers continuous/real-time data-processing capabilities for the new business reality, driven by:

Innovation: As companies pursue their digital transformation strategies, the need for a new, hyper-fast processing layer in the enterprise technology stack has emerged. **Previously unthinkable applications are possible through a massive leap forward in performance and scale of data processing,** including apps that leverage both data at rest and streaming data.

Data-Enabled Business: Businesses increasingly must engage data from the moment at which it enters the organization to the time its historical value can be maximized. An IMCP can analyze data streams (e.g., stock prices, e-Commerce behaviors, sensor and telemetry feeds, etc.) to organize data and create actions on the fly, as well as perform processing on historical collections of data (e.g., time-based, operational data stores and data lakes).

Perishable Insights and Actions: During this new era of time-sensitive applications, **latency has become the new downtime**. Actual value is hidden in milliseconds and microseconds.

Elimination of "Processing Islands": Organizations implementing specific in-memory systems find their architectures to be comprised of different "processing islands" for either data at rest (data grids and databases) or streaming data (ETL and event processing). These different system types and skill sets create costly and painful resource inefficiencies. **An integrated solution based on common technology for both types of processing for maximum resource leverage is critical to drive performance to the next level.**

Run Anywhere: The requirement for an ultra-small footprint would enable the broadest range of possible implementations, from tiny edge devices or embedding in applications, to powering Kubernetes microservices and scaling to massive clusters.

Cloud-Neutral: **An IMCP would adapt to the specifics of a business' informational framework,** including on-premises, cloud, multi-cloud or hybrid WAN-distributed solutions. Leveraging this versatility provides architectural freedom, data and application portability, and prevention of lock-in by cloud providers.

Ingestion: Data originates from a diverse set of sources, across a broad range of formats. Modern IT environments include data that is created internally (through sources, such as sales, customer support, manufacturing systems, etc.), sourced from 3rd parties (data subscriptions), aggregated from SaaS solutions, and streamed from an increasing set of IoT and mobile devices. Informed decision-making requires leveraging all available data. **An IMCP must have the capability to ingest and process large amounts of data at almost real-time speed, so it can be consumed across the entire business.**

Analysis: Companies can analyze both real-time and contextualized data with information from historical sources in a system of record. The power of data is all about synergy – combining data from different sources to give leaders a complete and accurate perspective on company operations and the business environment. **An IMCP is responsible for gathering all data in a highly efficient way and organizing it for consumption by IT and reporting systems as well as end-users.**

Continuous Intelligence: Digital transformation strategies are built with the goal of providing decision-makers with real-time actionable insights. An IMCP integrates with existing BI tools to provide operations staff, management and company leaders with curated data that enables them to make real-time operational improvements.

Value: Both at the point of use and across all downstream functions, value must be achieved. **An IMCP is all about converting the data companies already have and the new data being created every second into tangible, quantifiable and sustainable business value.** Increased revenue, improved profitability, stronger customer relationships and competitive differentiation in the marketplace are the measures of success.

It's all about speed and scalability

Latency is downtime for modern business processes. Once a company digitally transforms its business processes, the performance of the technology directly impacts the performance of business operations. It's not just having all of the pieces of the puzzle connected with the right set of functionalities; **companies need data to flow from various sources, through layers of processing and analytics into the hands of the people and systems that need to consume it immediately**.

Latency and data-processing delays can impact customer interactions, the effectiveness of security and risk management controls, the quality of business decisions and many other facets of a company. **Anything less than immediate/real-time performance might as well be a complete system outage – the business is impaired.**

An IMCP helps companies achieve the real-time data processing they need. In-memory computing technologies provide ultra-fast processing of data at scale, from the moment it enters the system and is captured via real-time streaming until operations staff and decision makers consume it, enabling companies to solve some of their most pressing technology and business challenges.

Anything less than immediate/real-time performance might as well be a complete system outage – the business is impaired.

The next generation of emerging technology depends on real-time data that an In-Memory Computing Platform can enable

Big data is real, and is becoming bigger every day. Unfortunately, **traditional database solutions apply a hefty performance penalty and are not a suitable solution for time-sensitive applications and workloads that many new technologies require**. The next generation of emerging solutions depends on real-time data that an IMCP can enable.

Artificial intelligence

AI applications are becoming more mainstream for early-adopter businesses as technology and business leaders are beginning to fully appreciate the many ways that it can impact business processes. Built on a machine-learning platform, **AI systems are experts at answering questions which are often too nuanced or complex for humans**.
Familiar examples of AI systems are found in digital assistants, such as Siri and Cortana, that are found on most smartphones. Companies are using AI for applications, such as customer support, loss prevention, identifying equipment failure and tracking the spread of disease around the globe. **What makes AI systems so powerful is their speed** – the capability to process vast amounts of data entering a system at high speed, and the capability to respond immediately and without processing delays. **An IMCP provides AI systems with real-time streaming data that can be used to make responses more intelligent and user interactions seem more natural.**

Modern user experiences

In digitally transformed businesses (and in many consumer scenarios), technology is integral to daily activities. Users expect web pages, mobile apps, chatbots, digital assistants and interactive customer service systems to provide complete, correct, meaningful and fast interactions that are aware of who the user is, what he or she is trying to do and the context (location, process, etc.) where the interaction is occurring. Enabling new user experiences requires interfaces to have access to integrated streaming and historical context data about the user and the specifics of the associated event. **An IMCP provides the capabilities for aggregating, processing and curating a wide variety of real-time data on which today's user experiences depend.**

IoT and embedded sensors built into digital business processes

IoT devices and embedded sensors are enabling remote monitoring and control of physical equipment involved in digital business processes. Small-footprint components can be distributed throughout a company's global operations, facilities and operations process, streaming data back to centralized teams or analytic systems. With the cost of IoT devices decreasing rapidly and the variety of options in the marketplace expanding, **it won't be uncommon for companies to have thousands or potentially millions of sources streaming continuous data during the next few years**. An IMCP is designed to help companies manage large-scale streaming data in almost real-time and process it into actionable insights to support digital business processes.

Predictive Analytics built on big-data

AI and machine learning are both contributing to the rapid growth in the market for predictive analytics capable of processing real-time streaming and historical data into information that can be used to anticipate events. Potential applications include sales forecasting, real-time customer engagement, supply-chain optimization, preventative maintenance on equipment (and potentially humans) and IT capacity/cost optimization. **IMCPs can enable companies to harvest data from predictive analytics faster, so they can be transformed into preventative actions that neutralize negative business impacts.**

Real-time risk detection

The environments in which companies operate are highly dynamic, with threats coming from seemingly every angle. Credit card fraud, information security threats, negative social media feedback and changes with competitors all put a company at risk. Streaming data is one of the best sources that companies have to know what is happening in their environment and where action is required to mitigate risk. **An IMCP can enable companies to monitor a wide range of data sources, applying complex risk-management algorithms without slowing transactional processing and user experiences.**

How In-Memory Computing Platforms will transform businesses

Business transformation is a continual process of evolution. **Real-time data and how it can make companies more efficient, competitive and profitable is driving the next wave.** As the volume and speed of data increases, companies will need the capabilities to process data faster and at massive scale to achieve sustainable profitability and competitive advantage.

Companies that have experienced digital transformations will transition into a period of fine-tuning their business processes to reduce latency, accelerate decision-making and optimize the use of assets and resources across the enterprise. **IMCPs will be the engine that facilitates digitally-enabled processes to leverage streaming data to enable machine learning and predictive analytic applications**.

The 5G mobile network will deliver vast increases in the speed and capacity of how data is transported. **IMCPs can help companies take advantage of these new capabilities to process data in the field,** using edge computing to stream high-volume, complex data back to corporate decision-makers for real-time action. This will enable companies to extend their global reach, using streaming data from around the globe to reach new customers, monitor distributed operations and manage remote facilities.

IoT devices, embedded sensors and mobile apps are just a few of the technologies that are creating new streaming data sources that companies can use to gain a better understanding about their enterprise, competitors, customers and the markets in which they operate. This process is already highly mature in some markets, and emerging in others, but even in developed markets, the presence of remote sensors has barely scratched the surface. **IMCPs will integrate streaming data in real-time,** giving company leaders the big-picture visibility to operations that can be the difference between thriving in a highly competitive environment or becoming another cautionary tale.

Technology has evolved to the point that companies can finally transform big data into real business value. For many years, companies have been collecting data and storing it in massive data warehouses, unsure about when or how they would be able to mine it. IMCPs provide the in-memory computing capabilities with a scalable architecture that can separate large-scale big-data collections into manageable pieces for mining and refinement into actionable insights.

About Hazelcast In-Memory Computing Platform

The **Hazelcast In-Memory Computing Platform** delivers the industry's fastest in-memory data grid (**Hazelcast IMDG**), tightly integrated with the industry's fastest stream-processing engine (**Hazelcast Jet**). This system delivers four key components that are critical to success in today's demanding, always-on information ecosystem:

Hazelcast delivers the ability to process millions of transactions per second. For example, ordering a highly configurable product that must integrate data from multiple, disparate systems, and do it quickly enough that the consumer doesn't notice.

Delivered in a variety of distributed configurations, the Hazelcast In-Memory Computing Platform enables effortless scaling up, regardless of workloads, and then scaling down when the resources are no longer required.

Nobody wants an unstable system. Moving at high speeds, scaling up and down easily, and without the slightest wobble in the system should be table stakes for all IT vendors. Hazelcast routinely delivers this to the most demanding companies in the world.

While speed, scalability and stability are critical in today's world, security is always the first order of business. Years of hard work gaining a customer's trust can vanish during an instant if your system is compromised. Our integrated security suite is used by the industry's leading enterprises and they rely on us for mission-critical applications.

The world in which businesses and consumers operate is almost unrecognizable from just a few years ago, and this trend will not only continue, but also accelerate. **In-memory solutions from Hazelcast are the optimal solution to today's 24/7 high-speed streaming digital ecosystem.** For further detail at both the business and technical levels, please visit the resource section of our Website, accessible here.

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