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IT@Intel: Driving Digital Acceleration with Application Portfolio Management

Intel is using APM as the data-driven foundation that fuels transformation and enables a best-in-class IT organization

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Executive Summary

Best-in-class organizations continuously strive to innovate and improve IT assets. This transformation is critical for business organizations to perform operations without disruption. IT transformation also enhances business units' ability to meet objectives through deeper IT asset insights and improved total cost of ownership (TCO), all while running leaner and more efficiently.

Application portfolio management (APM) is an information system that stores and manages a wide range of IT assets throughout their lifecycles. APM provides insights into several measurable data points that enable management to make data-driven conclusions, including:

1. Architecture modernization and simplification

2. Technical debt reduction though IT asset rationalization

3. TCO management while weighing IT asset return on investment (ROI) and business value

4. Recommendations on investments across strategic, innovative, and disruptive technical and business capabilities

5. Improving IT services and agility through insights into IT asset health and associated metrics

6. Providing insights into IT operations outsourcing, consolidation of services, visibility into security and compliance risks, and awareness of strategic value and importance

Intel IT implemented APM several years ago as a basic inventory management tool for applications and platforms. However, we continue to evolve this solution and its surrounding processes not only to meet Intel requirements but to elevate our group to be exemplary among global IT organizations. We offer this paper as both a blueprint and inspiration for others to follow.

Acronyms

APM   application portfolio management
BDAT   business, data, application, technology
EA   enterprise architecture
KPI   key performance indicator
PESTEL   political, economic, social, technological, environmental, legal
ROI   return on investment
SWOT   strength, weakness, opportunity, threat
TCO   total cost of ownership
TIME   tolerate, invest, migrate, eliminate

Glossary

IT Assets An integral piece of software or hardware within an organization's systems and network infrastructure. Tracking IT assets within an IT asset management system can be crucial to the operational or financial success of an enterprise.

Background

For over 15 years, Intel has been using the application portfolio management (APM) solution for comprehensive inventory, analysis, and evaluation of IT assets, and we are continuously evolving this solution. APM provides deep, actionable insights into measurable data points to help stakeholders and management make data-driven strategic decisions that result in transformation and innovation to support business outcomes.

The APM framework encompasses a broad range of IT assets spanning several viewpoints across the entire business, data, application, and technology (BDAT) stack, all of which enable deep analysis. As shown in Table 1, this solution incorporates several systems of reference in addition to being the system of record for data elements across the BDAT domain.

Table 1. BDAT Stack and Elements within the APM

Domain	Elements
Business	• Drivers, vision, mission, goals, strategies, objectives, and key performance indicators (KPIs) • Business capabilities (aka enterprise capability model or catalog) and business processes
Data	• Data objects, ownership, classification, and retention
Application	• Applications, platforms, and APIs
Technology	• Data centers, hosting environments (public, private, hybrid), servers, storage, network components • Technologies with supplier association

Each IT asset (also referred to as an element in this context) has its own lifecycle along with financial, operational, delivery, organizational, and transformational attributes. Most of them are interconnected and mapped using several enterprise architecture (EA) tools. For example:

• An EA documentation and modeling tool
• An IT service management suite
• Security and risk assessment solutions
• Several other solutions, including project and portfolio management, software asset management, discovery tools, entity and relationship modeling, and business process management and mining

Figure 1 captures a high-level view of many of the primary IT assets and their interconnectedness within the APM framework.

It is important to highlight that APM is not simply an applications system of record; there is more to an application than its name. Each IT asset in our APM database typically links to over 50 associated attributes that are either entered in the system or sourced from other enterprise solutions. These attributes help with analysis on dependencies and the levels of interconnection between assets and their attributes. The APM framework includes all the attributes associated with each element and connectedness of these elements with each other.
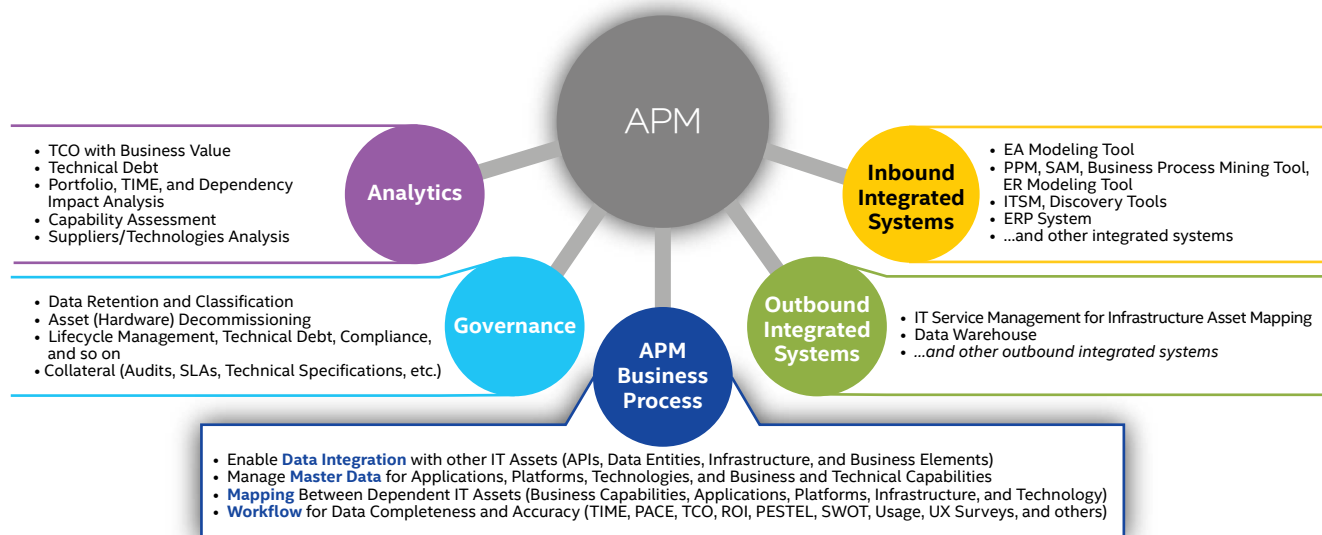

Analytics
• TCO with Business Value
• Technical Debt
• Portfolio, TIME, and Dependency Impact Analysis
• Capability Assessment
• Suppliers/Technologies Analysis

APM

Inbound Integrated Systems
• EA Modeling Tool
• PPM, SAM, Business Process Mining Tool, ER Modeling Tool
• ITSM, Discovery Tools
• ERP System
• …and other integrated systems

Governance
• Data Retention and Classification
• Asset (Hardware) Decommissioning
• Lifecycle Management, Technical Debt, Compliance, and so on
• Collateral (Audits, SLAs, Technical Specifications, etc.)

Outbound Integrated Systems
• IT Service Management for Infrastructure Asset Mapping
• Data Warehouse
• …and other outbound integrated systems

APM Business Process
• Enable **Data Integration** with other IT Assets (APIs, Data Entities, Infrastructure, and Business Elements)
• Manage **Master Data** for Applications, Platforms, Technologies, and Business and Technical Capabilities
• **Mapping** Between Dependent IT Assets (Business Capabilities, Applications, Platforms, Infrastructure, and Technology)
• **Workflow** for Data Completeness and Accuracy (TIME, PACE, TCO, ROI, PESTEL, SWOT, Usage, UX Surveys, and others)

Figure 1. APM is the centerpiece of EA, with analytics (purple), governance (light blue), "what" is being tracked (dark blue), and integrated inbound and outbound data integration systems (yellow/green).

The Rationale for APM

Since APM applies across the entire enterprise, it should theoretically prevent silos. However, in reality, silos may develop unless Intel's business units see the value of APM and support it with thorough, accurate disclosures. We noted in our white paper "Enterprise Architecture: Enabling Digital Transformation at Intel" how broad initiative support has been uneven across Intel business units in years past. This hampered our ability to identify technical debt or ascertain optimal strategic steps moving forward. Intel's efforts towards organizational EA alignment now enable us to implement the true potential of APM.

Addressing Critical Business Questions

APM allows us to address many critical business questions, such as the examples below.

Do we know all the capabilities supporting our mission- and business-critical objectives?

If so, what is the health status of these capabilities, and what are our investment plans to continue making these capabilities modern and best-of-breed? Answering these questions will help management look deeper into capability maturity levels; user feedback; industry benchmarks and trends; and exposure to any potential risks including aging technologies and insights into PESTEL and SWOT analyses. Eventually, these data points will help management make data-driven investment decisions to improve these business-critical capabilities. This exercise will help business organizations with agility and improve their time to market for delivering products and services. Simultaneously, IT will act like a partner by providing core foundational framework and data that enables such analysis.

Do we know the TCO and ROI of the applications and/or platforms?

Answering this helps us to determine current spending relative to ROI and if action is necessary to reduce complexity and total costs. APM lets us see expense vectors with trends such as risk, support, and user experience and uses them for total cost calculations.

Do we know supplier and technology footprints by value stream, service, or capability?

Enterprises can be overdependent on suppliers and/or their products and services. Perhaps they may be dependent upon technologies that could expose license or security risks. Or organizations may be missing opportunities by under-utilizing their products and services while overpaying them against use. Similarly, organizations may have inadvisable exposure to non-strategic suppliers.[1]

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[1] Non-strategic suppliers are suppliers/vendors with competitive advantage, financial or PESTEL risks, shrinking or negative growth, stagnant or declining product evolution, and current and anticipated future costs are greater than returns.

Are we able to gauge impacts over time?

Tracking the changes to IT assets, their attributes, and properties is important to determine the overall maturity and lifecycle performance of an asset. APM enables us to accurately track these changes and the rate of change, or responsiveness. We gain additional insights by linking the APM system with other systems, such as our EA Tool, API Hub, and several other Business of IT operational tools.

Do we know the end-to-end, current business value of applications?

APM offers integrated TIME modeling (see the Application Rationalization section), pace layering, and cost-value metrics (as illustrated below). These tools help us make informed to support our major strategies, including mobile, cloud, SaaS, open source, and COTS versus in-house solutions.

Investment Heatmap Example
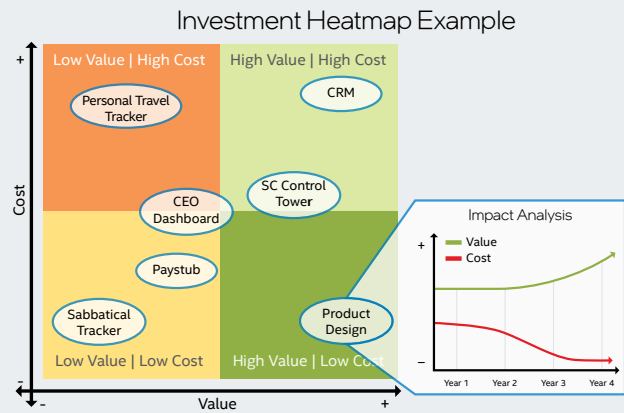
To derive investment recommendations or priorities, applications are shown on a "heat map." This creates insights into each application's cost-value impact over time to help create future plans.

Driving Transformation With APM

Best-in-class IT provides complete visibility into operational, delivery, financial, organizational, and transformational metrics. That visibility enables us to obtain answers to pressing questions around operational services availability. Is it at or near the top of the range for similar organizations? Alternatively, how competitively does an organization deliver solutions, and is that delivery done at a relatively profitable cost? In the financial domain, what is actual spend versus budget? For transformational investigation, is Intel reaping the benefits of its investments or other strategic initiatives into cloud platforms? Are artificial intelligence investments yielding tangible improvements in agility? Our goal is to use our APM framework to find answers to such questions that can then be presented to management.

APM can elevate and accelerate the four stages of IT organizational evolution: Foundation, Transform, Innovate, and Best In Class. When we started our company-wide pursuit of best-in-class IT, we primarily focused on hardening and maturing our foundational capabilities—defining what we do and making sure we were doing it. Once those essentials were met, transformation could begin. Without having the foundation covered, transformation may prove extremely difficult or impossible. Once the enterprise is making peak use of available tools and strategies, it can then innovate and develop new approaches to achieving top-level goals. This might mean developing a new production technology or crafting an in-house application with novel functionality unavailable from the open market. Finally, when these stages are functioning in an interconnected way across the organization, and the efforts made at each stage yield consistently excellent results, true best-in-class IT can be achieved.

APM can and should act as a foundation for all these stages as it constantly provides visibility into the maturity levels of each capability. As Figure 2 indicates, APM elevates each step. With an APM system fully stacked with all possible data, we have much faster, more thorough insights into where foundational pursuits may be wasteful or misfiring. Transformation can execute more quickly because IT knowledge is aligned across business units, which minimizes poor communication and project thrash, and all parties can see the impact of transformation on business metrics in less time. With so much visibility into IT assets and tuning their financial underpinnings, there will be more resources available for innovation and further ongoing improvement through APM-driven feedback loops.
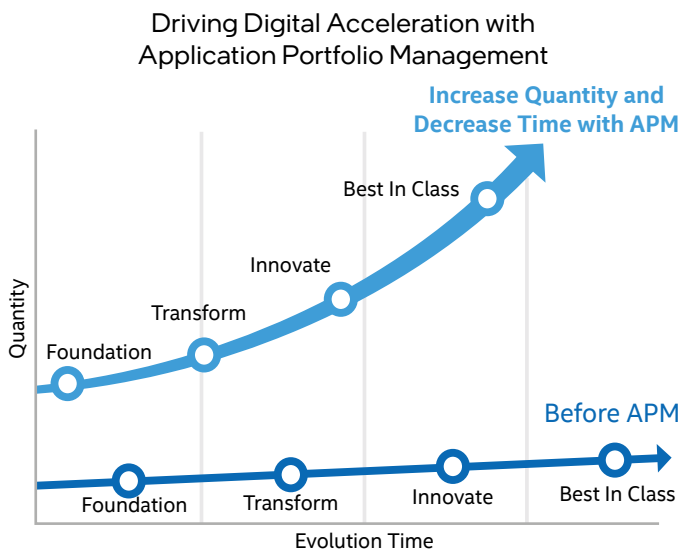
The Relationship Between APM and EA

When an attribute is linked to an IT asset, it automatically maps to other dependent IT assets. For example, if the lifecycle of a technology asset is shorter than the lifecycle of an application, the APM framework will raise alerts to upgrade the technology before it is unsupported by the supplier. Figure 3 offers a high-level view of the network that exists between EA elements. For example, these connections make it possible to have business goals tie directly to technology suppliers.
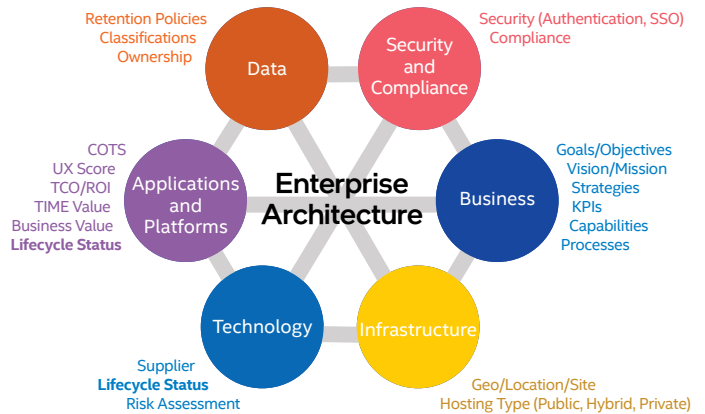

Figure 3. The interconnected EA framework highlights how APM dependencies can flow between IT asset attributes.

In the previously mentioned Intel EA white paper, we discussed how a federated EA operating model could help Intel solve organizational challenges related to people, processes, and tools. Stated differently, EA helps in our pursuit to be a best-in-class enterprise, and APM serves as one foundational framework or capability to accomplish this.

Within EA, we have created two major deliverable areas: core activities and deliverables and IT asset management analytics (Figure 4). Exploring these areas more closely will make it easier to understand how APM correlates with other EA activities. The five categories in IT asset management and analytics section interconnect and occasionally overlap.

Driving Digital Acceleration with Application Portfolio Management

Figure 2. APM has the potential to elevate the drive toward best-in-class IT while potentially accelerating the steps already under way.

Figure 4. APM plays a critical role within Intel's broader EA efforts, but it is still only one of several essential and interwoven domains.

Architecture Definition

Table 2 displays a list of document/blueprints created using our EA tool as applied to our BDAT stack. In the document/ blueprint column the elements (IT assets) are sourced from APM and other IT business tools. To create these architecture blueprints, APM data is central in defining the interconnects and relationships among these elements.

Table 2. Example of Blueprints Created using our EA Tool

Domain	Document/Blueprint
Business	Business outcome statement, business reference architecture, process flow diagrams, organizational decomposition, business use case diagrams, and transition evolution roadmap (of business capability)
Data	Information flow diagrams, data models, and enterprise data catalog
Application	Application reference and solution architecture
Technology	Infrastructure architecture and application deployment model

Strategies and Roadmaps

To be successful, it is critical for an IT organization to understand business strategies, visions, missions, goals, objectives, and key performance indicators (KPIs). APM, along with the EA tool, helps management understand impacts if and when there are any strategic shifts for the corporation or any major transformational or M&A activity is underway. Roadmaps highlight dependencies and underlying impacted IT assets, whether new or existing.

Governance

Figure 5 shows how governance overlays the various EA domains. APM plays a core role in enabling EA governance automation across the BDAT stack.
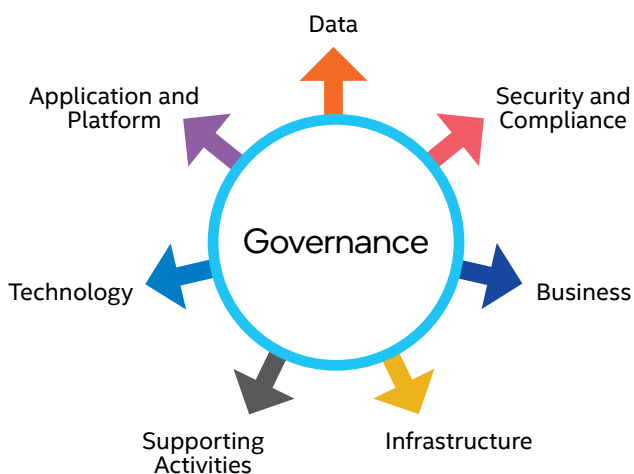

Figure 5. Governance plays a key role in all EA domains.

BDAT Governance Examples

Within the business domain

APM contains a comprehensive list of business capabilities highlighting end-to-end interdependencies on applications, platforms, data objects, and infrastructure components. This information helps business stakeholders analyze, monitor, and govern the solution delivery via IT and business roadmap alignment. Since APM contains collateral including service level agreements (SLAs), product requirements documents, technical design documents, KPIs, and audits, it provides insights into business justification and other reasons for creating and supporting the solution.

Within the data domain

APM provides insights into security, risk, and compliance assessment, including data classification, data APIs, and data platforms integrated with an IT asset.

Within the applications and platforms domain

APM provides the lifecycle status and dependencies for infrastructure components that eventually help with decommissioning assigned hardware assets when an application is eliminated. Factors such as financial data, usage metrics, user experience score, incidences, and business value allow a service owner to govern the trends surrounding such data points and make necessary adjustments to the solution's TIME model.

Within the infrastructure domain

Through integration with IT service management, Intel IT's APM details an environment's scalability and security as well as how that environment adheres to our disaster and recovery requirements.

Within the supporting activities domain

APM also plays a range of roles, from comparing the costs and values of pilot programs to assessing and vetting vendor offerings.

Application Rationalization (Technical Debt Reduction)

Another zone of IT/business unit governance partnership includes managing technical debt. We might think of technical debt as being conceptually linked to "minimum viable product." There are short-term gains to rushing a project out the door. There are also long-term gains (lower support costs, higher adoption rates, and so on) by creating a more finished, higher-quality project. The gap between these two is technical debt. Over time, accumulating technical debt can lead to diminishing productivity, reduced quality, and perpetual revision cycles.

Identifying technical debt can be difficult and nuanced, but Intel IT has created a scale to measure it. Following are the key factors we use to measure technical debt:

- **Redundant/duplicate solutions enabling similar business process or functions.** This could be applications, platforms, data containers or hubs, or APIs.

- **Solutions with risk.** This includes exposure to security threats, compliance, copyrights, and licenses as well as solutions running on unsupported vendor products and/or out-of-compliance capabilities.

- **Underutilized technical or business capabilities.** These will be characterized by total costs outstripping ROI, either currently or in the future. Imagine investing in a unified messaging solution that employees only use for phone calling.

- **Lack of reusability.** Abstraction layers (or wrappers) to consolidate several APIs can help increase re-usability.

- **Solutions with below-average user experience, performance, usability, or accessibility.** APM data will help spotlight these factors.

- **Unscalable and/or unyielding solution architecture.** This will limit ability, either technically or financially, to scale up or out.

- **Solutions delivered by nonstrategic suppliers:**
  – Supplier/vendors with competitive advantage
  – Financial or PESTEL risks
  – Shrinking or negative growth
  – Stagnant/declining product evolution
  – Current and anticipated future cost of TCO is greater than returns

Some may approach application rationalization and/or TIME recommendations with reasoning based on associations with similar applications or even hunches. But APM metrics and analyses will provide objective data to support (or reject) a position and greatly simplify the process of creating tools to substantiate recommendations, such as the grid shown in Figure 6. For more information on Intel's use of the TIME model, see our white paper on technical debt.
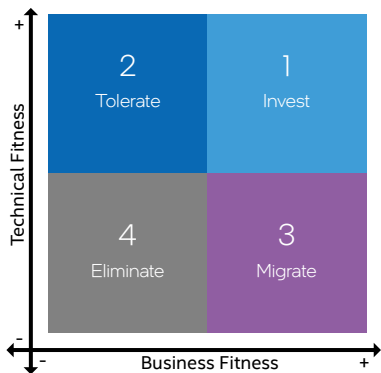

Figure 6. TIME model decisions may be visualized and summarized on a quadrant grid according to technical and business fitness levels.

EA Metrics

EA metrics help organizations take necessary actions towards excellence through best-in-class solutions and processes. APM plays an important role in providing EA metrics that cover financial, operational, project, talent, user satisfaction, and strategic facts. These metrics are generated on periodic basis. Trends are stored in the system for comparisons and contrasts, which then assist with taking strategic actions.

Business and Technical Capability Assessment and Framework

Just as the capability maturity of an athlete is judged by scores and competitive performance, so too are business and technical capabilities. APM provides a framework to generate and store data points on technical and business capability maturity levels. There are several internal and external influencers that play key roles in assessing and calculating maturity levels, and APM periodically tracks these maturity levels to help make TIME recommendations to management.

We use CMMI from ISACA to appraise, assess, and define maturity levels. Our intent is to refresh this data on a yearly basis. Visit cmmiinstitute.com for more information.

APM and Transformation

Organizational transformation is an ongoing journey, not a destination. At Intel IT, we recognize that people, processes, and tools play equal and critical roles in enabling successful transformation. In fact, they work in a successive fashion: Transformation cannot happen without people; people's actions will be random and ineffective without processes to follow, and those processes require wielded tools to cause a change.

Transformation is a process because nothing is permanent. All changes have a lifecycle that begins with ideas that eventually peak in maturity. APM acts as a monitor and guide along this transformation continuum.

Although this paper is primarily focused on APM and not on how transformation and innovation are done, it is important to note that several steps, as shown in Figure 7, are involved in capability transformation as well as how and where APM helps.
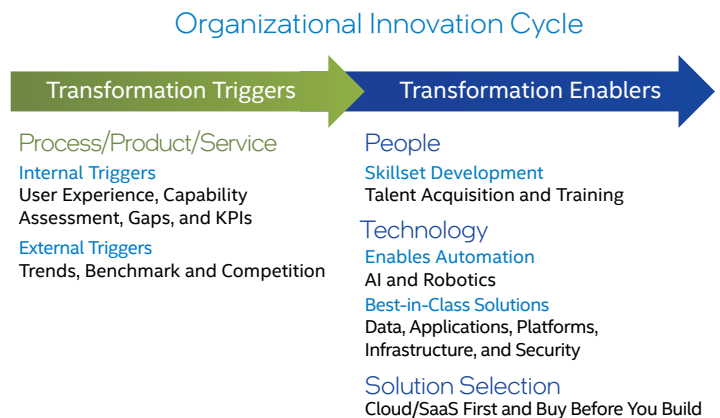

Figure 7. APM plays a core role in guiding the organizational transformation and innovation process, particularly in the Transformation Triggers and the Technology domain.

Present and Future Results

Intel IT has made tremendous strides in bringing our APM framework into action, yet there's still lot to do, and we intend to expand its utility over time. Nevertheless, we have made many achievements, and intend to make more by implementing APM into our ongoing EA process. These accomplishments include:

- **Reduction of technical debt** through architecture simplification and innovation

- **Closer alignment of business strategy and goals,** which yields greater agility in addressing business demands

- **Ongoing maintenance and improvement** of Intel's various regulation compliance requirements

- **Efficiency improvement** through the ability to perform instant impact analysis

- **Greater balance and distribution of dependencies** across our suppliers and technologies

- **Greater visibility into business capabilities** via PESTEL and SWOT analyses

- A **well-integrated and interconnected system** across all IT assets, including business, data, applications, platforms, infrastructure, and technology components

- **Keeping applications and platforms current** while reducing technical debt through consolidating and standardizing existing processes and solutions

- **Consolidating supplier/technology spends** and contractual obligations while mitigating security risks and exposure for Intel's software assets

Next Steps

As described in the introduction, Intel IT has extended the core APM functionality of cataloging and quantifying applications and their attributes by embedding additional features around managing various elements, such as strategies, objectives, trends, business and technical capability assessments, and SWOT/PESTEL analytics. Over time, these data points will progressively be mapped to other IT assets. The integration of these tools will provide us with a comprehensive view of our portfolio landscape.

To ensure the APM system's data quality and completeness, we have implemented role-based approvals to complete the registration and lifecycle management of our IT assets, including several other key data points that feed decision-making activities. Our APM system manages these roles and responsibilities within our enterprise workflow engine. Table 4 highlights these positions and their associated tasks.

Table 4. New Intel APM Governance Roles

Role	Responsibility
Application or Product Owner	Responsible for the end-to-end lifecycle of the application (IT asset)
Solution Architect	Certify and/or attest data entered by product owner. Examples include: TIME, pace layering, hosting information, data classification, tier support, technology mapping, and platform mapping
Business Architect	Ensure data mapping to business processes, capabilities, strategies, goals, objectives, trends, and KPIs
Data Architect	Ensure IT asset mapping to data objects for information flow/architecture

Ideally, all Intel® technologies would qualify for investment, but reality dictates that some solutions become obsolete. We will try to integrate the lifecycle management of these technologies with industry-led technology roadmaps and lifecycle solutions. This integration will help us with visibility into end-of-life and end-of-support for several technologies. Combined with our APM framework, this integration will also provide insights into security vulnerabilities that could be identified by external or internal sources.

We intend to use APM as an essential tool to give business leaders control. This will help them make strategic decisions based upon business and technical capability maturity levels along with various data facts related to costs, business value, strategic importance, and criticality. Intel has an extensive portfolio of assets owned and managed by the business units. Intel has also prioritized the need to drive efficiencies and reduce costs by consolidating ownership and driving an accurate inventory of all software, hardware, and network assets while reducing non-IT asset-managed cyber risk.

Ultimately, our end goal with APM is to provide a one-stop shop for the metrics and data our organization needs to make fast, effective, transformative strategic decisions while making these data and metrics available for integration with other business or IT tools.

Conclusion

APM is a foundational framework for transformation, driven by end-to-end cataloging of IT assets that are supported with a wealth of attributes. These attributes are the backbone of analytics that allow IT to quantify criteria such as asset performance, business value, and risk. Operating without APM poses a significant liability to executive decision making.

To successfully navigate transformation, APM helps us focus on business outcomes while managing technical debt. Furthermore, APM helps us to reduce architecture complexity, lower costs, and invest in strategic long-term solutions.

We have learned that optimizing data completeness and quality is extremely important to make the right decisions and win the trust of stakeholders. Therefore, data must be managed by subject matter experts who are well versed with APM and related IT assets. Through APM and EA governance, we are enabling these experts to take periodic, event-based actions to maintain data quality.

Strategically, APM enables the framework that accelerates transformation and allows us to become and remain best in class.

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