

Internet of Things and Business Process Management – IoT & BPM

Data from devices will need to be analyzed and actions will need to be taken based on that data. These actions could trigger alerts or invoke corrective processes before routine issues snowball into disasters (examples include flight delays, parts replacements, fire emergencies, etc). These actions will impact critical business processes requiring integration with operational systems, from enterprise resource planning (ERP) and customer relationship management (CRM) to specialist vertical applications.

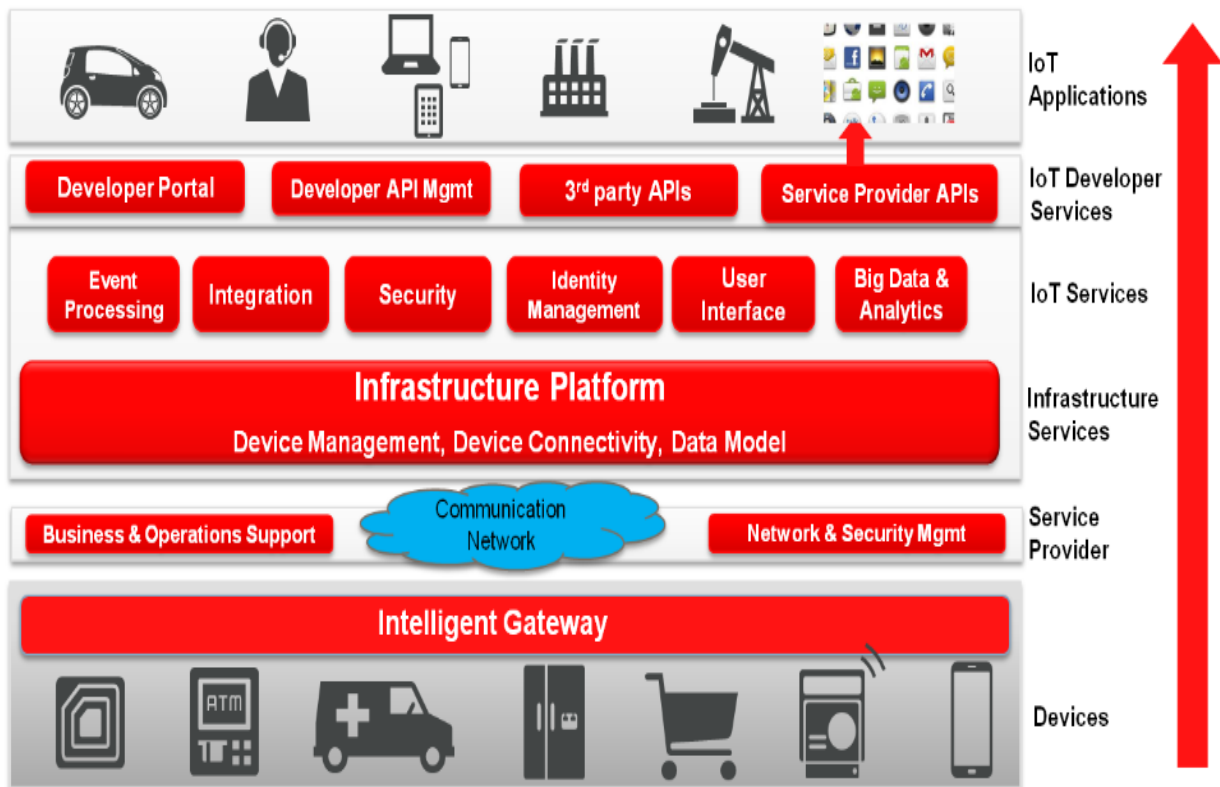


Figure 1. *IoT Architectural Framework*

The IoT services

Layer is completely independent from the underlying devices, communication protocols and connectivity semantics. This layer includes a core set of services to build IoT applications (i.e. composite applications) across a range of industry sectors. The IoT services layer helps the enterprise to:

- Analyze data in real-time (event processing)
- Act on M2M data and events (integration services)
- Provide historical, real-time and predictive analytics (analytics services)
- Visualize operational and analytical data through mobile/desktop (UI services)
- Manage data Security and identity of devices/apps (security and identity management Service)

- The IoT Developer services layer enables developers to build applications using IoT services, development kits, software tools and services. This layer helps expose the platform to a range of applications and use-cases.

The role of middleware is to provide the infrastructure and IoT services which in turn help drive innovation, enable new revenue streams, and improve operational efficiencies.

Benefits of IoT and BPM Integration

Embedding intelligence by way of real-time data gathering from gateways and devices and consuming them through business processes helps businesses achieve not just cost savings and efficiency but helps them generate more revenue patterns. Businesses need to overcome several business and service challenges to be able to realize smooth orchestration and manageability of disparate systems.

Use Case - Outage Initiation over IoT

When we talk about 'Internet of things', we are talking about – *Sense à Acquire à Communicate à Event Processing à Integrate à Visualize and Analyze*

Let's walk through this with a sample use case of outage management.

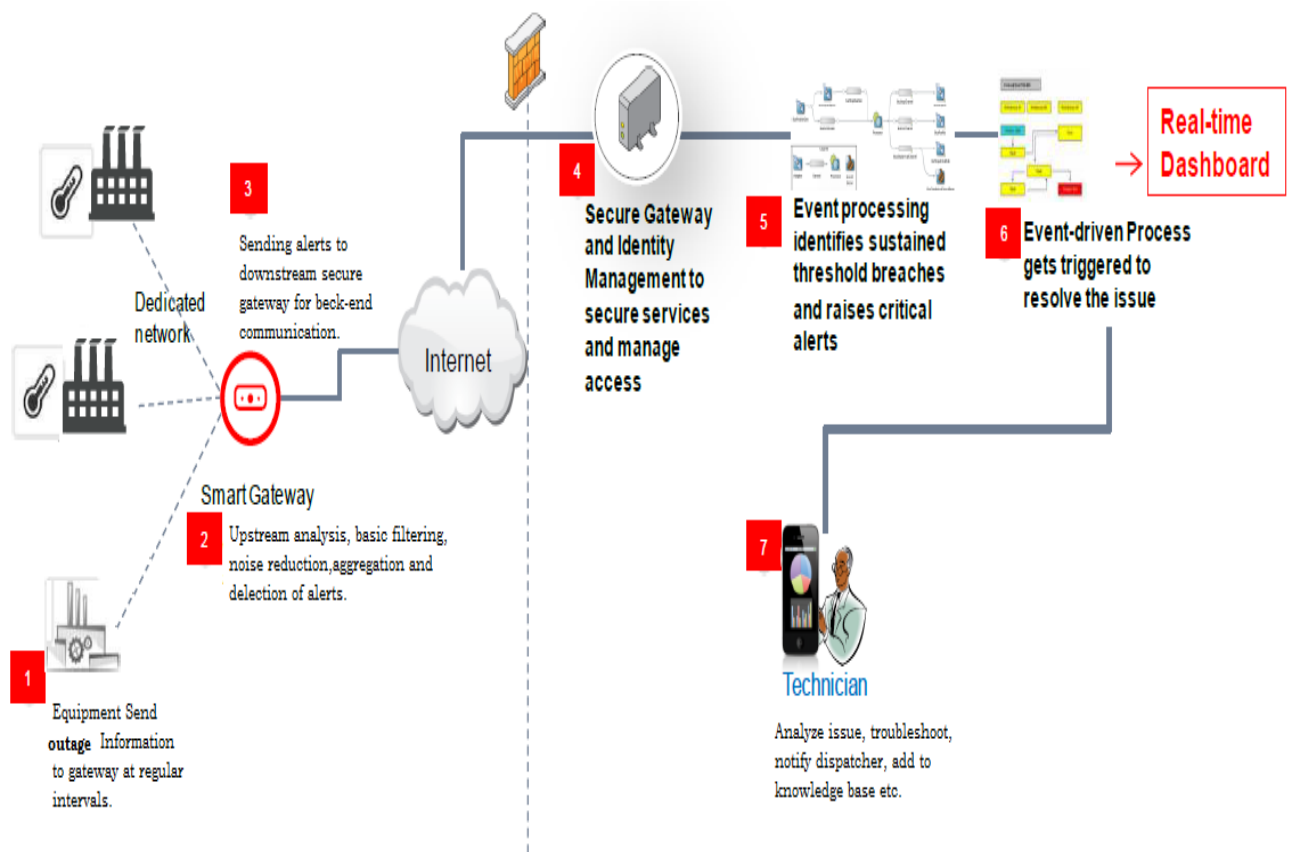


Figure 2. Sample use case

Use Case explained

We are here talking about outage caused due to brownout (drop in voltage in the supply), faults at power stations, fault in supply devices etc. If power outage not resolved within limits, can lead to, customer compensation, penalties and loss of revenue. In this use case, we will talk about 2 things – first is how IoT can lead to the initiation of a BPM process which is going to handle the outage incident. Second is the BPM process itself, where we will Model the process using Process Cloud Service and leave it for implementation by developers.

1. Equipment sends
Status information at a regular rate to the smart gateway. **[Sense]**
2. Smart gateways

Have Oracle event processing for java embedded, which is a small foot print of Oracle event processing which is deployment on the gateways. It performs various upstream operations to perform basic filtering and aggregation, local decisions eliminate noise/false positive, optimize bandwidth, etc. Oracle Event Processing for Java Embedded has the ability to handle millions of events per second with microseconds of processing latencies. Oracle Event Processing for Java Embedded installed in the gateway appliance, helps filter and analyze real time usage, and detect fault and problem event patterns across thousands of distributed data centers, enabling dynamic diagnostic and automatic correction interception. **[Acquire]**

3. Events of significance are sent from the gateway to the backend systems for a more detailed analysis. **[Communicate]**
4. Oracle Event Processing Server edition performs complex downstream operations combining and correlating multiple streams of data putting it in a larger context (Customer information from CRM, etc.) Oracle Event Processing delivers on real-time analysis of high-velocity data. It is a complete solution for building IoT applications to filter, correlate and process events in real time so that downstream applications are driven by true, real-time intelligence. Oracle Event Processing filters out noise (such as data ticks without any change in values) and helps identify critical conditions before this data is actually relayed to the back-end. Oracle Event Processing can trigger a business event to perform integration with the BPM process. **[Event processing]**
5. Processes Essentially “listen” for event patterns & issues as they arise. Powered with this insight, systems can trigger alerts or invoke corrective processes immediately before routine issues snowball into disasters. **[Integrate]**
 - Using BPEL and BPMN industry standards, users can model process that capture optimal paths, alternative paths, exception flows, process conversations, and handling of business events.
 - Processes can be invoked directly on receipt of events from devices or after the events have been pre-processed by event processing engines such as Oracle Event Processing
 - Oracle BPM thus provides the ability to integrate processes that involve devices, applications and human intervention.

6. Processes can be integrated with business intelligence infrastructure to further optimize core processes and operations. SOA processes can invoke Oracle Business Intelligence to gather contextual information. In IoT use-cases, this is essential when sensor data or events lack enough context to determine how the data should be processed. Combining real-time sensor information with historical and prescriptive analytics can make the processes intelligent and responses much more human-centric. SOA and BPM processes acting on sensor-related data and events are tightly integrated with Oracle Business Activity Monitoring, which provides dashboards that allow administrators to make decisions based on real-time streaming information coming either directly from sensing devices/gateways or events arriving from Oracle Event Processing engine. **[Visualize and Analyze]**

Supplement Course

http://web.stanford.edu/class/archive/ee/ee392b/ee392b.1176/lecture/may23/Oracle_IOT.pdf