Value-based case study #7

Combining technologies opens up whole new business opportunities at Royal Dirkzwager

Management introduction

Royal Dirkzwager, now more than 130 years old, serves the Port of Rotterdam. It provides maritime information services to all those associated with shipping (owners, charterers, agents, harbor masters, etc.), particularly about when ships will arrive, where they will berth and when they will leave, plus information about these ships (cargo types, tonnage, positions, ETAs and ETDs, etc.). Rotterdam is the largest port in Europe, with a location open not only to the North Sea and the Channel/Atlantic but also inland, via the River Maas, to the Rhine basin in Germany and beyond. Being able to schedule and thereby control shipping movements is critical: otherwise vessels have to anchor and wait for a berth — which costs everyone in time as well as money.

Paul Wieland is the Manager of the Maritime and Logistics ICT Department in Royal Dirkzwager. He joined some 2 years ago (before he had worked for 17 years in ICT in the aviation industry). As he describes in this case study, Royal Dirkzwager is taking advantage of 3 key technologies – AIS, an enterprise service bus (ESB) and event processing. In so doing Royal Dirkzwager is aiming dramatically to improve the efficiency of the Port of Rotterdam while simultaneously extending Royal Dirkzwager's information reach from being local (focused on Rotterdam) to becoming global.

Indeed, what Mr. Wieland describes is nothing less than establishing Royal Dirkzwager as a new type of information utility. Albeit founded on its long established Rotterdam-based business, it is now adding new capabilities and opportunities because it selected technologies to enable this.

The business issues

Until 10 years ago Royal Dirkzwager was locally oriented, around what was needed for the operation the Port of Rotterdam. The processes we used were immensely manual and time consuming, with little automation or interconnection. They involved large numbers of telexes, telephone calls and even voice radio traffic between agents, ships, the Port and our selves. Although shipping movements were far fewer in number than today, the people involvement dimension was enormous.

Since then we have seen two major technological changes. We started to interconnect our systems with other companies (like the shipping companies, for example) so that data can flow system to system without manual intervention. In addition, the mandatory introduction of the Automatic Identification System (AIS) for ships now produces position data for each ship every few seconds

Initially AIS, and its use of the Global Positioning System or GPS, was based on transponders on each ship using VHF (with a limited range) to communicate data. This made sense when the original purpose of AIS was for safety — collision avoidance: ships broadcast their positional data (including speed and course) which other ships within VHF range received and, using this AIS data, the ships could compute courses so that collisions did not occur.

This data was, however, also useful for ports like Rotterdam: if they could receive the same positional information within VHF range (usually up to about 50Kms) and on what courses, with speeds, the ships were proceeding they could anticipate arrivals earlier and more accurately than before. Estimated times of arrival could now automatically be calculated at a greater distance from Rotterdam, without the immense manual effort that had been necessary before.

Royal Dirkzwager went further. It realized that this positional information would be even more useful if the data could be acquired still further away from Rotterdam. It proceeded to add receiver stations around the coasts of Western Europe (for example at the entrance to the Channel) so that these receiver stations would notify Royal Dirkzwager's systems as a soon as a ship entered European waters. In effect we, via these stations, could now assemble a 'picture' of all ships in European waters within VHF range of one of our receiver stations, including where they were, at what speed were they going, on what course, etc.

Add to this that each AIS transponder is associated with details of 'its' host ship (tonnage, vessel type – container, tanker, bulk cargo, liner, cruise ship, etc – plus other relevant data like the presence of dangerous cargos) and Royal Dirkzwager could generate as complete a view of shipping around Europe as was practical given the VHF range limitations.

Satellites add the global dimension

This worked well and was integrated into the Royal Dirkzwager systems, which in turn could now supply improved information to agents, owners, harbor masters and other customers. But it was still restricted to European waters within VHF range.

Yet our customers, who buy our information, wanted more. They wanted to extend their planning horizons.

Though 'coastal AIS' was a great improvement over what had been available previously on the primarily manual basis, customers wanted to 'see' further out. If they possessed this information they could improve utilization and thereby profitability (if a berth is going to be occupied, it often makes more sense to reduce a ship's speed so that she arrives when the berth is available rather than to steam normally and then have to anchor). The pressure was on us to extend what we had been doing.

With the arrival of satellite-based AIS, AIS — which uses satellites to pick up the AIS signals and relay the data from wherever in the world — more changes became possible. While Royal Dirkzwager had partnered with other coast based receiver stations around the world to share data, this only worked if ships were within VHF range of a coast-based receiver station. With satellite relay, a ship's movements can be captured anywhere in the world that AIS-receiving satellites cover, even in mid-ocean.

As AIS became global so Royal Dirkzwager was presented with the opportunity to move from its new Western European waters-orientation to being global. In so doing it could become the shipping information source for all those who wish to subscribe.

Let me give you an example. A ship might leave (say) Valparaiso in Chile. Using satellite AIS we would see when she cleared port. She would then (say) head for the Panama Canal. When she arrived in the Gulf of Panama she would likely have to wait her turn before entering the first locks of the Canal; again we would see this and as she progressed through the Canal. When she eventually emerged at the northern (Caribbean) end, we would see that normal steaming speed had resumed. Now we can calculate and then anticipate when she will enter European waters as well as know to what port she is headed.

Furthermore, using the satellite capability, even when on the high seas (in mid-Atlantic, definitely out of VHF range), we can see her position course and speed. Thus both owner and port can constantly update for when she will arrive, make sure a berth will be available and schedule the unloading. Owners can then advise their customers, or trans-shippers (for a barge going up the Rhine or onto a train going elsewhere) when cargos will be ready for collection.

Volumes increase by at least order of magnitude

Going global has its own ramifications. Before satellite AIS, we tracked around 5000 ships at any one moment. By going global this number rises to 50,000+, a ten-fold increase. This increase meant that we had to do some major rethinking and retooling of our systems if we were to be able take advantage of the opportunities presented.

The first stage in addressing this was to contract with LuxSpace. LuxSpace provides us with an AIS data feed from all the ships that are sending out data. We then have to process the vast amount of resulting data in order to make it useful.

To handle this we had previously implemented an Enterprise Services Bus (ESB) as the mechanism to connect our own systems together and also to make the connections with the systems of our customers. Whenever a message is originated on one system for another one (whether it comes from one of our own applications or from a customer), this message enters our ESB (we had implemented the Sonic ESB from Progress Software) and then this is routed to the appropriate destination according to the logic running on the ESB.

The Sonic ESB was already, therefore, a critical element for interconnecting applications, both inside Royal Dirkzwager and also with customers and data suppliers. We had proven its relevance before acceptance by interconnecting our systems with the Port of Rotterdam systems, ensuring that all worked. Subse-

quently it has become an essential component of our ICT infrastructure because it 'switches' data between services and applications (whether internal or external). It also possessed 'always-on' capabilities; we can even introduce maintenance updates and changes without having to take the ESB down (a vital consideration for us).

The introduction of AIS expanded our needs, especially when the global dimension (using the satellite information) arrived. We contracted with LuxSpace to send us a data feed with the global AIS data. But this needed to be processed — the AIS position 'events' have to be analyzed and systems updated. The ESB was not the place for this.

In talking with Progress we learned about its Apama event processing engine. This can handle huge amounts of data per second (as it does in financial centers). By building rules we decided could use Apama to analyze the AIS data stream and use Apama to create alerts twice a day (or more often nearer to destination ports) as to where a ship is located plus we could define boundaries or areas so that when a vessel crossed a boundary (say a line between the Lizard and Ushant for entry into the Western Channel) a specific type of alert would be issued.

In effect we have the LuxSpace data feed coming into the Apama engine. This runs the rules looking for data that satisfies the rules and when rule conditions are satisfied, an alert is passed to the ESB. The ESB then routes that event, with associated data (like position and speed) to all those applications that need this data.

This combination of the event processing engine and the ESB are what gives us both flexibility and automation. To give some measure of what this means we were handling about 500 event-messages/second (which is a tiny proportion of Apama's throughput capability). We expect to go 5000 event-messages/second as we embrace the global dimension.

Personalizing applications and CruiseSMS

In addition we can 'personalize' the event analysis. For example the owner of a fleet of ships might want to know where each one is and what she is doing on (say) an every six hour basis for the fleet. By writing owner-specific rules we can assemble what a customer wants and, via the ESB, communicate this to that fleet owner. This, in turn, can be used as an input to trigger business processes. We now provide this for the Port of Rotterdam; we track ships destined for Rotterdam.

We have also created a consumer product called CruiseSMS. In the latter case whenever a named cruise ship is approaching (say) Rotterdam, we will generate arrival information that is sent by SMS to those who subscribe. Currently this is aimed at friends or relatives who may want to know when to pick up passengers from a cruise ship or go to the harbor to take photos, etc. But you can imagine how usage could expand around (say) the Caribbean Islands: holiday and tour agents as well as other professionals could subscribe so as to know when they need to be ready for specific cruises. While this is only a modest application at present, we believe it has real potential to generate new revenues for us in the longer term.

There are innumerable other possibilities. Consider ships carrying hazardous cargo. The movements of these are restricted (you may recall that a Chinese ship carrying coal 'took a wrong course' into the restricted area of Australia's Great Barrier Reef). We can define areas and, knowing about hazardous cargos, we can not only alert the authorities that limits may have been breached but even inform the ship's crew that her course is not appropriate and advise them how to remedy their position.

Similarly, safety applications exist. Using Apama we can create a rule that triggers an alert when Apama detects that a ship is 'there' one moment and then stops transmitting for a predetermined period; if this happens we can generate an alert to the search and rescue authorities as well as give a position that might only be minutes (or seconds) old.

I should add that, with the exception of the Port of Rotterdam and CruiseSMS applications, we are only starting to exploit.the capabilities I describe above But our experience so far indicates that all these capabilities are made possible by the combination of technologies embracing satellite AIS, Apama event analysis and alert distribution by an ESB.

Lessons learned and best practices

My first lesson learned — and I would add this is a required and necessary 'best practice — is that it is really important to choose technologies that are close

to the fundamentals of the business you are in or want to be in. Too much separation or difference and you will find yourself 'bending technology to fit your needs'; with software this is almost always possible — but at what cost (in time and money)? With the Sonic ESB first and then Apama's event processing we found technologies that matched our business. In addition, by buying from Progress we obtained a professional software supplier that was able to respond to specific needs and willing to use its experience.

My second best practice reflect this: look for outside support early if you are not certain. Let me give one instance of the value here by talking about what happened to us. We have to run both the AIS event analysis and the ESB 24x7; we cannot afford to have 2 hours downtime for updates during which we cannot detect vessels' positions. This means that we need to be able to install maintenance and application updates when the systems are running. This is not trivial if you do not know how to do it. We found that using Progress' existing knowledge and experience with its other customers made this much simpler for us than having to work it out for ourselves. The result is stability, obtained much faster than if we had tried to do everything ourselves.

Finally, when you introduce new technology, even if it does seem to fit the business need well, start slowly and carefully. As important, do not attempt to build or deploy mission critical elements until you have proved that the technologies do what you expect (and want). Be prepared to deploy simpler or less vital applications to start with, to build internal and external credibility. This is why we introduced CruiseSMS; it was unlikely to create a business problem if it did not work perfectly at the start (though it did). Starting with (say) looking for environmental infringements would have been higher profile; but what would have happened if we missed the first oil spill, or coal ship entering prohibited waters? Once we had established our credibility we could move onto our more vital business activities with confidence.

Management conclusion

Royal Dirkzwager has always been an information gatherer and provider, primarily to those associated with the Port of Rotterdam. The introduction of the three key technologies — ESB, AIS and event processing — is enabling the company to evolve from being a local, Dutch, information provider to becoming a global information provider. This is a major expansion of focus and capability.

The future for Royal Dirkzwager now offers many more possibilities than the past. All that movement data (5000 message events/second) allied to the data about ships and their cargos will enable Royal Dirkzwager to expand its service offerings. No longer need it focus solely on port movements in Rotterdam (although this will remain a core competence) but it can look to consumer revenues (as in CruiseSMS), enforcement (identifying ships contravening regulations), safety (spotting ships possibly in distress by their pattern of movement) and much more. In effect, new technologies have created a whole new raft of opportunities for Royal Dirkzwager.