



Global insights

Location intelligence – knowing the ‘who, what, when and where’ – is finding its way into a widening range of business applications. *Malcolm Brown* takes a look at its rapid uptake by BP in support of the company’s continuing drive toward smarter and safer operations

When the Gulf of Mexico’s hurricane season starts in June, BP should be well placed to cope with whatever nature throws at it. A new hurricane management system, developed after hurricanes Katrina and Rita in 2005, combines weather information and a wide range of data on assets and personnel to give crisis managers a very powerful aid to decision-making. The incident commander at BP’s Houston-based crisis centre can see in real time on his computer screen the present and predicted trajectories of a hurricane in relation to BP’s offshore platforms, overlaid on a map of the Gulf and constantly updated as live feeds come in from the weather forecasters.

And at the click of a mouse on the map, the commander, or anyone else involved, can also call up location-specific information on platforms and people and assess the potential impact of the hurricane on them.

Consolidating information from many disparate databases and embedding it in the new management system gives the crisis team an up-to-the-minute snapshot of what is happening. It enables them to make very rapid decisions about such things as offshore installation evacuations, or alerts to humanitarian aid teams about personnel whose homes are in the path of the storm.

It is all a far cry from the days when crisis management teams worked with wall maps, pushpins and pieces of string that showed how far away each facility was from the eye of the hurricane. Even when that process was to some extent automated using mapping software it could take hours to manually pull all the necessary information from many different

databases. Now it is on tap, available instantly.

BP’s hurricane management system is just one example of ‘location intelligence’, something that the chief technology office (CTO) within BP’s digital communications and technology operation has designated a ‘game changer’ – a technology-driven idea that has the potential to transform BP’s operations across the board.

Location intelligence is not a single software system or technology but a family of technologies and software applications whose common feature is that they do something clever with location data. Most computer

applications or technologies are driven by algorithms that draw on databases which, when interrogated by the computer, can answer the questions ‘who, what and when’ and sometimes even ‘how’. Location intelligence adds

‘where’ to the mix. It complements the other data with information about geographic location, or location in three-dimensional (3D) space. And it displays all this information in easy-to-understand screen visualisations.

Location intelligence is particularly relevant to BP because the company’s operations are global and very physical.

‘Almost everything we do has a location element to it,’ says Ceri Carlill, one of CTO’s technology directors, ‘whether it’s drilling for oil, running a pipeline, or keeping track of employees in an operating process plant.’

The CTO became interested in location intelligence as a potential game changer when it saw the convergence of three things.

The first was the proliferation in the consumer market of very high powered low or zero cost geospatial tools, such as the proprietary Google Earth and Microsoft Virtual Earth tools. The second element was the rapid growth in sources of location data – this includes everything from global positioning systems that tell the user exactly where they are, to radio frequency identification (RFID) tags which allow someone in a control room to locate and track very precisely, in three dimensions, anyone or anything moving in a facility (*Frontiers*, April 2006). The third influence was the ubiquity of real-time data availability. With wireless, cellular and other forms of communication, including satellites, data can be transmitted to and from almost anywhere on the planet instantly.

Making the mash

Because off-the-shelf location intelligence packages aren’t available, BP is using its own in-house expertise in conjunction with that of technology and software suppliers to create leading edge applications. The company is particularly interested in three categories of location intelligence applications, namely: ‘*mashups*’; ‘*real-time location*’, which uses a variety of different technologies for live tracking of people or assets; and finally ‘*mobility*’, which provides users with access to web-based applications at the point of need on a hand-held mobile device.

The term ‘mashup’ originally referred to the practice in pop music of producing a new song by mixing two or more existing pieces. In computing it describes web applications that blend data from many existing sources to create new capabilities and provide new insights.

BP’s hurricane management system is classed as a mashup. Two other very innovative mashups have been developed by the BP team renewing sections of the Prudhoe Bay oil

Location intelligence is a ‘game changer’ that could transform BP operations



BP's hurricane management system is classed as a 'mashup' in the world of location intelligence. Real-time information from many different databases gives an up-to-the-minute snapshot of where a hurricane is heading and what lies in its path

➤ transit pipelines (OTLs) in Alaska. The Alaska pipeline Compliance Access Portal (CAP) will enable government regulators to go to a map of Alaska, zoom in on BP's new pipelines and call up detailed information about different sections of the line, such as original drawings, inspection reports and so on.

'The CAP stitches together all the required regulatory documentation in a digital environment,' says Steve Gerlek, leading the OTL renewal project. 'It has an intuitive map interface so that you can just point and click on the segment of pipeline that you are interested in and get all the associated regulatory data. Rather than going to the site and being shown several filing cabinets full of hard copy files to search through, it's all there for you.'

Gerlek's team also oversees the Alaska pipeline hazard monitoring system, a project

which provides those working on pipelines with what is – quite literally – a new way of looking at them. The team becomes part of a virtual world, but, crucially, one that mirrors the real world with absolute fidelity. The project came about, says Gerlek, after a pipeline construction contractor pulled down a high voltage power line, an accident that led the OTL team to look for ways to improve safety.

The resulting system is a 3D visualisation of the pipeline and its surrounding environment built up from very precise terrain information and data from BP's own data banks about power lines, pipelines, rights-of-way, construction equipment and other relevant information. Viewers, including contractors' teams, can 'fly' through this mirror world.

'Just as aircraft pilots use flight simulators to get used to a new airport,' says Gerlek, 'our crews can use this to understand better their safety envelopes before they even step on the ground.'

In March 2008, the project's success was rewarded with a European Green IT Award.

Real-time movers

The second major category of location intelligence, real-time location, lets BP keep a constant eye on its vehicles on the move. In one of the first such projects BP plans to equip all of its North American road tankers with a system that enables truck location to be monitored in real time to maximise fleet efficiency. The system combines global positioning system technology with wireless communications and will, in the future, interface with on-vehicle computers to work seamlessly within the supply chain.

Another real-time location project, targeted at enhancing safety, is in operation at BP's new preservation and maintenance facility at Houma, Louisiana, an 11,600-square-metre covered workspace situated on six hectares of land. The facility preserves and maintains over 30,000 pieces of offshore equipment and materials needed for BP's Gulf of Mexico deepwater operations, requiring numerous

The Alaska pipeline hazard monitoring system provides 3D visualisation of a pipeline construction corridor and the surrounding environment





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Location intelligence in action:

1. BP plans to equip its road tankers with a location monitoring system to improve fleet efficiency
2. Unmanned aerial vehicles such as this one may be able to conduct frequent pipeline surveys in the near future. Shown is the six-metre-wingspan Sierra aircraft being developed by NASA's Ames Research Centre
3. Personnel and vehicles at BP's facility in Houma, Louisiana, have RFID tags to show their location and enhance safety

heavy mobile vehicles such as fork-lift trucks and cranes. All of these vehicles, and anyone who might be in their vicinity, are equipped with RFID tags that constantly send location signals back to a control centre.

'A computer watches the movement of everything,' says Carlill. 'The system applies a number of safety rules to those movements, and flags up unsafe or potentially unsafe situations. You can think of it as a fork-lift truck having a sort of virtual bubble around it and people having virtual bubbles around them, indicating a safe separation distance. If the bubbles intersect because the person is too close to the fork-lift truck an alarm will sound.'

A more futuristic real-time location project is the idea of using unmanned aerial vehicles (UAVs) to patrol the many thousands of kilometres of pipelines operated by BP in North America.

At present the pipelines are over-flown by manned aircraft. A qualified pilot looks for evidence of oil spills or anything that might threaten the integrity of the pipeline. The pilots radio in their location and details of what they have seen to a central control office.

Federal law requires pipelines to be patrolled every two weeks. BP has already increased that to once a week and ideally would like to do it three or four times a week, but using manned aircraft at this frequency would be financially prohibitive. UAVs would be much cheaper to run and would be used to supplement, rather than replace, the manned aircraft.

'BP has initiated a collaborative effort to apply leading edge technology to increase the safety and security of North America's critical pipeline infrastructure,' says Jim Lamanna, business unit leader for BP's North America Pipelines. 'Because a joint approach is key to success, we have brought together others in the pipeline industry along with US government agencies including the Department of Transportation's Pipeline and Hazardous Materials Safety Administration, the Transportation Safety Administration, the Transportation Security Administration, the Federal Aviation

Administration (FAA), and the National Aeronautics and Space Administration.'

The crucial question that the project is exploring is whether small on-board surveillance devices could make the observations that pilots normally make. Could a UAV use 'machine vision' to spot incidents or other threats? If so, it could automatically transmit detailed alerts back to headquarters, along with the precise location of the problem.

'The human brain takes what the eye sees and performs a lot of processing of the information,' says Gary Shane, project manager for the UAV initiative. 'The challenge is how to replicate what the human is doing. I think that perhaps in three to five years' time we will have a fully integrated workable system, flyable on a UAV with approvals from the FAA.'

On the job

The third category of location intelligence is about collecting, analysing and sharing location and related information between office and field-based job roles. The first such 'mobile



Hand-held terminals will give BP workers two-way connection with the company's Integrated Safe System of Work

location intelligence' project is planned to go live late in 2008 and will be an enhancement of BP's Integrated Safe System of Work (ISSOW) computer application. ISSOW supports a company-wide standard designed to ensure the safe execution of work conducted in the field – primarily on production platforms, refineries and other process plants – through appropriate risk assessments, isolation certificates and 'permits to work'.

At present, the status and location of maintenance and engineering activities are displayed graphically on screens in a facility's control room – workers on the plant rely on paper printouts of key information, such as permits. Location intelligence technologies will extend the system's usefulness and value. Ken Douglas, another of the CTO's technology directors, explains.

'We aim to make all of the information visible, immediate and actionable for field workers at their actual point of work,' he says. 'To achieve this we will equip them with portable hand-held terminals allowing two-way connection with ISSOW in real time. The graphical displays in the control room will be updated directly from the field.'

'Extensive field trials of the first version of this "mobile ISSOW" solution are under way at several BP sites and the early feedback is very encouraging. Looking further ahead we will be able to use information about a worker's location to automatically reinforce additional safe working rules – for example, flagging a potential issue if a single person carries out work that needs at least two people to be present.'

Where will location intelligence go from here? For the moment most of the developments are taking place in the USA, but that will change, concludes Carlill.

'It is likely that within five years location technology will be woven into the fabric of BP's operations throughout the world, bringing significant benefits, reinforcing safety, and leading to radical improvements in efficiency throughout the value chain.' ■

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