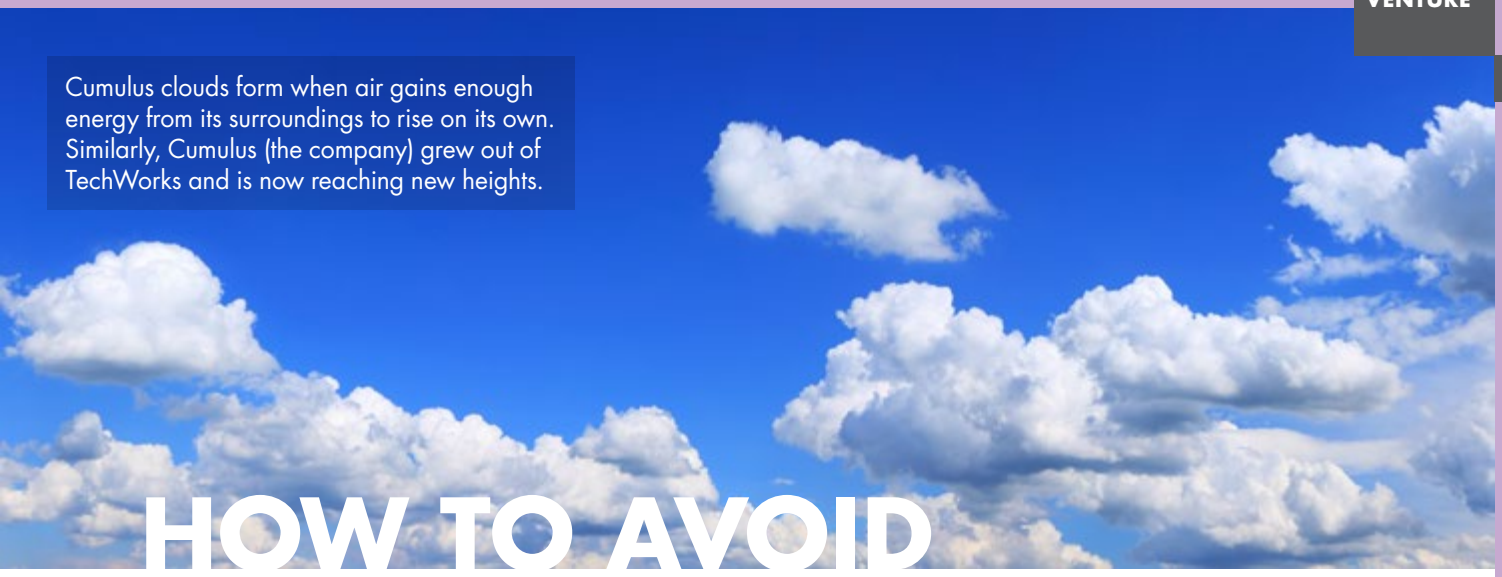

Cumulus clouds form when air gains enough energy from its surroundings to rise on its own. Similarly, Cumulus (the company) grew out of TechWorks and is now reaching new heights.

HOW TO AVOID ALL TORQUE AND NO ACTION

A few years ago, Shell TechWorks invented an integrated management system that uses connected digital torque wrenches to make up flanged pipe connections reliably. The invention had such great potential for use in applications outside oil and gas projects that it deserved an entrepreneurial environment for its commercialisation – one with a higher tolerance for risk-taking than is traditionally found at Shell. So, Shell TechWorks and Shell Ventures settled on an unconventional approach: a spin-out company financed by venture capitalists. That decision, in and of itself, helped to reduce the overall risk to the company: Cumulus Digital Systems, Inc.

Matt Kleiman, formerly of TechWorks and now chief executive officer of Cumulus, and Brian Panoff, senior venture principal, Shell Ventures, talked to *TechXplorer* about the dual role that Shell Ventures played – first as an adviser and then as an investor – in bringing the Smart Torque System (STS) to market. Carl Stjernfeldt, senior venture principal at the time for Shell Ventures, was also instrumental in the project.

Can you outline how the STS came into being and how you became involved?

Matt: The story starts in 2010 when I was working at Draper Laboratory, a research and development spin-out of MIT that works on control and guidance systems for aircraft and spacecraft. It was right after the Deepwater Horizon tragedy, when Shell and other oil and gas companies were looking to the aircraft industry for help in improving safety-critical systems. A Draper colleague and I ended up working with Shell for two years on applying proven systems-engineering approaches to blowout prevention and things like that.

Shell must have liked what we were doing, because, by 2012, it had decided to take much of what we were doing in-house. The idea was to hire people like ourselves, who had the right mix of expertise and entrepreneurship, to work directly with Shell's businesses to help solve difficult problems. The outcome was that Shell hired my colleague and me to establish TechWorks as a unit of the Shell Projects & Technology (P&T) organisation.

The STS started life at TechWorks in 2015 as part of the "Future Construction" project, which aimed to find opportunities for efficiency and productivity improvements in P&T's bread and butter activity: the construction of oil and gas facilities.

Can you briefly describe what makes the STS a commercial proposition?

Matt: The system uses digital technologies not only to record the torque applied during making up of bolts but also to manage those records. It enables faster and more reliable assembly and quality control of flanged pipe connections.

When you consider that there are tens of thousands – even hundreds of thousands – of safety-critical bolted connections in a new refinery, each with, on average, eight bolts that must be tightened to the right torque and in the right order to prevent leaks during testing, then the potential for the STS to deliver the original objectives is clear. But what really made it stand out from the 20 or so other TechWorks projects at the time was its value beyond plant construction.

The system's wider potential was first recognised when it was presented as one of several TechWorks technologies during a workshop ▸▸▸

held in April 2016 at the Shell Jurong Island plant in Singapore. The facility's engineering manager immediately recognised how the STS could be used to improve facility turnarounds, which involve opening, inspecting and reclosing large numbers of flanged connections. He wanted to know how quickly he could get the system!

At this point, the Downstream business started driving the project, even though P&T continued to support it. But the Upstream and Integrated Gas businesses also started to take an interest, and it was soon clear that the STS could be really useful across all of Shell. This was unusual for Shell, where things tend to be siloed by business. Serendipitously, we had discovered a technology with diverse potential applications in almost every business in Shell and, by implication, across the energy industry.

How was the STS originally put into service and how did Shell Ventures get involved?

Matt: TechWorks secured more resources for the STS as the project started to take on a high profile in the spring of 2016, which enabled a field trial of a very early prototype. This was completed in August 2016, the month that the provisional patent application was first filed.

The first large-scale pilot of a more mature prototype was during a facility turnaround at Jurong Island in March 2017. As the trials progressed, we gave a lot of thought as to how the STS could be delivered. We felt that significant opportunities existed for offering it more widely and there was robust discussion about whether to keep it within Shell or whether it made more sense to offer it to others. It was at this point that we involved Shell Ventures in an advisory capacity to

There might be a million bolts in a new refinery, but the STS can ensure that each is tightened to the required torque.

help us decide how best to commercialise the technology. By May, a Shell Ventures' permission to commence investigation had been approved.

Brian: Sometimes, it is appropriate to keep a new Shell technology internal, for example, a new seismic method that gives us a real competitive advantage. This was not the case with the STS. It was not difficult to see that the system had wide-ranging applications in other energy companies and potential in vertical markets such as aerospace, transportation infrastructure, safety-critical industrial construction and maintenance. But Shell TechWorks does not have a mandate to provide services to external parties and, more broadly, Shell is not set up to support a growing merchant software business; it is just not what we do. Consequently, we looked at ways of delivering the STS that involved third parties.

What ways did you consider for commercialising the STS via third parties?
Brian: Shell is open to licensing some proprietary technologies – typically those that benefit safety, as the STS does. In this case, though, we felt that a licensing approach would constrain the markets in which the technology could be offered. It is one thing to offer, say, a new wireline logging technology under licence to an oilfield services company that provides global coverage in its specialist area, but it was quite another thing to find a company with sufficient reach to promote the STS across many industries and sectors. In addition, we questioned whether the existing industry contractors would have enough incentive to adopt the technology, as it is somewhat disruptive to the existing supply chain and ways of working.

In the end, the decision was to spin out a new company from TechWorks to offer the technology on a stand-alone commercial basis. By doing this, we expected to harness entrepreneurial energy to improve how our industry and others work in terms of safety and productivity.

Matt: Spinning out a new, third-party business offered a way for Shell to have access to its technology while maximising the return on its investment. However, the approach was not without risk for the new company, Cumulus. Shell Ventures' experience with start-ups was extremely valuable in questioning whether a new company, with all the associated risks, was really the best route to commercialising the technology.

Can you describe the key points that were considered when agreeing terms for spinning out Cumulus?
Brian: Among venture capitalists, we have a simple rule of thumb, which is that more than half of all start-ups fail for one reason or another. Although we had every faith in Matt and the team at Cumulus, and we wanted to do whatever we could to increase the odds of success, the most important thing for Shell was that it retained access to the technology if the spin-out did not flourish.

That said, we also aimed to give Cumulus the freedom it needed to succeed. We knew, for example, that spin-outs from Shell and other companies have failed because they were not sufficiently distant from the parent company. We tried to avoid imposing conditions that did not make commercial sense for any stakeholder or that artificially restricted the company's ability to pursue its own interests, for example, by retaining the right of first refusal on new technology developments. Cumulus had to be able to capture the potential gains for investors and employees alike if it and Shell were to tap the energy that drives start-ups.

Matt: I agree with Brian. One of the main conditions we set for spinning out Cumulus from Shell was that it had to be an arm's-length transaction, one in which the benefits to both parties were very clear. It was essential that it could operate independently and sell STS technologies to third parties unhampered. The only difference between Shell and other Cumulus customers was that Shell would receive a royalty from third-party users in recognition of its investment. ▸▸▸

Shell Ventures

We also considered aspects of the deal other than the purely commercial terms, for example, our ability to attract and retain talent. At Cumulus, we needed to be free to incentivise individuals sufficiently to leave safe positions, including with Shell, and to secure their full commitment to the new venture. In doing so, we took care not to set any expectations that the team could return to Shell should Cumulus fail to thrive. In other words, we needed Cumulus to be a true entrepreneurial start-up without Shell as a safety net.

Step by step, how did the spin-out proceed?

Brian: Shell Ventures initially acted as the conscience of the outside venture capital world. It helped to set out what the new company should look like at a high level. This framed the argument for spinning out for those in Shell who did not have a personal interest and were simply wondering whether it was viable or the right thing to do.

Matt: We believed that the new company had to be attractive to outside investors, ones that would evaluate it just like any other potential investment. Shell Ventures agreed on this key point, which drove a lot of the decision making. It helped to prevent any wishful thinking on our part as to the likelihood of commercial success. The acid test for the terms we agreed on was whether the new company would attract external investors. This was important and became a requirement very early on.

Brian: Once the decision to spin out a fully independent company had been made, Cumulus was incorporated. It was granted a sole licence to deploy the technology and basic terms were agreed. At this point, Shell Ventures shifted from being an adviser to becoming an investor. And, as the first investment round got going, the decisions made during the run-up to the offering were

Pipefitters working on a flange on a Shell floating production, storage and offloading facility in the Gulf of Mexico.

Left to right: Matt Kleiman and Brian Panoff.

validated. Two other interested investors came forward: Brick & Mortar Ventures, a San-Francisco-based, early-stage venture-capital firm that focuses on emerging technologies with applications in the construction industry, and Castor Ventures, which enables MIT alumni to invest together in ventures connected to their peers.

Of the three investors, it was decided that Brick & Mortar Ventures would lead the first investment round as a matter of good hygiene and to make sure we were not seeing unrealistic potential through being too close. It ensured the fundamentals such as the incentive and capital structures and the licensing terms were set up in the right way and that the spin-out was a truly independent company, as capable of serving any of the other oil majors as it was Shell.

Has investing effort and equity in Cumulus paid off for both parties? How is the company doing and what are its and Shell Ventures' plans?
Brian: Unlike the other two investors, Shell Ventures had a nurturing role in helping Cumulus to lift off; in this respect, we are very pleased with what has been achieved so far.

At present, Shell is the largest of the eight Cumulus customers and remains, through Shell Ventures, an investor, so it is still exposed to risk on two fronts. What has changed now is that Cumulus has successfully secured third-party investment and a first patent (US 10,589,406) was confirmed on 17 March to issue in the USA, so Cumulus can safely say that it owns IP rights in the technology. This puts the company in a good position to seek additional funding to grow its business by, for example, developing the STS and other Internet of Things services that take it into new markets, and to create further value for its investors.

Along with a representative from Brick & Mortar Ventures, I take an active role as a director on Cumulus' board; my Shell Ventures colleague Alexander Urban attends board meetings as an observer and Shell's shareholder representative. Ultimately, Cumulus' success rests on the shoulders of Matt and the team, but Shell will continue to help it on its way by providing input as a valued and important customer and Shell Ventures will provide help on the board until it exits as an investor.

Matt: I am very proud of what we did to create TechWorks and Cumulus, which has come out of it. Both were inherently entrepreneurial achievements; that is what attracted me in the first place.

We have seven Shell operating facilities actively using the STS. Now, with other customers that include major and national oil companies and engineering, procurement and construction contractors in North America, the Middle East, the Far East and South Africa, we want to expand our oil and gas sector customer base further and to add other connected-tool applications. We think that, eventually, all safety-critical manual work in the industry could be managed using our system.

Longer term, we know that the challenges that led to the development of the STS are common to many other industries, including power generation, transmission, railroads, aerospace and even amusement parks. So, at the right time, we are going to expand into some of these industries while still looking at efficiency and safety.

One final question. Why is the company named after a type of convective cloud?
Matt: It was nothing to do with ascending to great heights! It is a reference to the way we use cloud storage to keep the data accessible and a play on the word "cumulative". In contrast to the very siloed way construction and maintenance is handled currently, all the data we generate are brought together in one place. ■