

CASE STUDY 6

CHEVRON'S INFRASTRUCTURE

EVOLUTION

Chevron Corporation (www.chevron.com) is one of the world's leading energy companies. Chevron's headquarters are in San Ramon, California. The company has more than 62,000 employees and produces more than 700,000 barrels of oil per day. It has 19,500 retail sites in 84 countries. In 2012, Chevron was number three on the Fortune 500 list and had more than \$244 billion in revenue in 2011 [STAT12].

IT infrastructure is very important to Chevron and to better support all facets of its global operations, the company is always focused on improving its infrastructure [GALL12]. Chevron faces new challenges from increased global demand for its traditional hydrocarbon products and the need to develop IT support for new value chains for liquid natural gas (LNG) and the extraction of gas and oil from shale. Huge investments are being made around the world, particularly in Australia and Angola on massive projects of unprecedented scale. Modeling and analytics are more important than ever to help Chevron exploit deep water drilling and hydrocarbon extraction in areas with challenging geographies. For example, advanced seismic imaging tools are used by Chevron to reveal possible oil or natural gas reservoirs beneath the earth's surface. Chevron's proprietary seismic imaging

technology contributed to it achieving a 69% discovery rate in 2011[CHEV12].

Supervisory Control and Data Acquisition (SCADA) Systems

Chevron refineries are continually collecting data from sensors spread throughout the facilities to maintain safe operations and to alert operators to potential safety issues before they ever become safety issues. Data from the sensors is also used to optimize the way the refineries work and to identify opportunities of greater efficiency. IT controls 60,000 valves at Chevron's Pascagoula, Mississippi refinery; the efficiency and safety of its end-to-end operations are dependent on advanced sensors, supervisory control and data acquisition (SCADA) systems, and other digital industrial control systems [GALL12].

SCADA systems are typically centralized systems that monitor and control entire sites and/or complexes of systems that are spread out over large areas such as an entire manufacturing, fabrication, power generation, or refining facility. The key components of SCADA systems include:

- Programmable logic units (PLCs) that and remote terminal units (RTUs) connected to sensors that convert sensor signals to digital data and send it to the supervisory system
- A supervisory computer system that acquires data about the process and sends control commands to the process
- A human-machine interface (HMI) that presents process to the human operators that monitor and control the process.
- Process meters and process analysis instruments
- Communication infrastructure connecting the supervisory system and RTUs and PLCs.

These are illustrated in Figure C6.1.

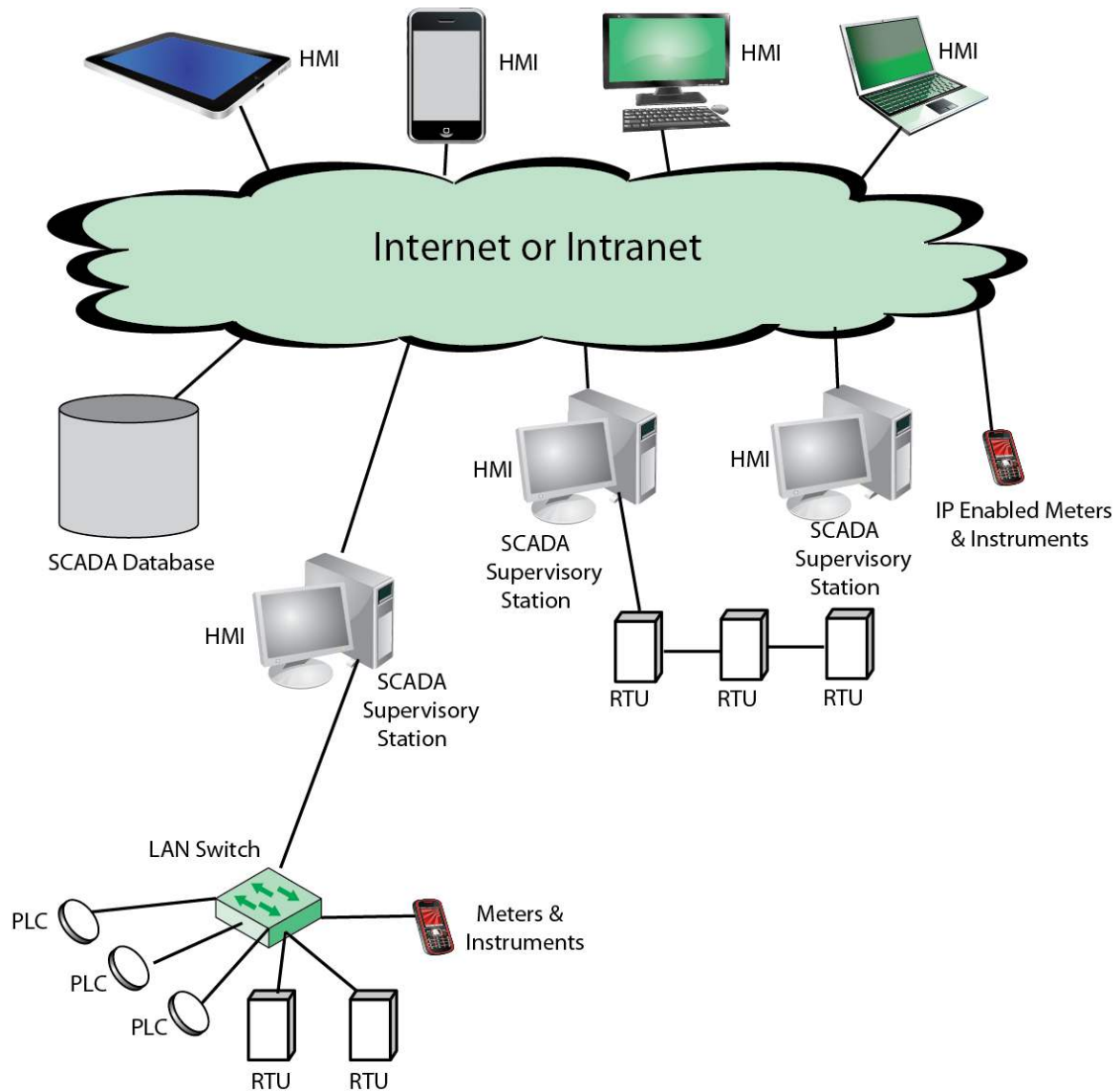


Figure C6.1 SCADA Example

Data acquisition occurs at the PLC or RTU level. This includes meter readings and equipment status reports that are sent to the supervisory system. The collected data is compiled and formatted by the HMI to enable the operator to make determine whether adjustments to normal PLC or RTU settings are needed. Current data may also be compared to historical data in a SCADA database to assess trends or perform analytical auditing.

In addition to Chevron refineries, SCADA are extremely important in national infrastructures such as water supplies, pipelines, and electric grids. Because attacks or damage to SCADA systems can affect large numbers of people, ensuring adequate security is important.

Business Infrastructure Transformation

Because of the complexity of its operational processes and the IT that is needed to support them, Chevron has traditionally been more infrastructure than business focused. SCADA systems and digital industrial control systems are critical IT infrastructure at Chevron's refineries and will always play an important role in monitoring and managing facility-based processes. These also are among the first IT systems needed to support Chevron's new value chains for LNG and shale oil extraction. However, like any large corporation, Chevron relies on a wide variety of business applications to run its businesses.

As it is for most global businesses, SAP ERP is a key transaction processing system at Chevron. Chevron has been using SAP for more than two decades and it has played an important role in the development of SAP's vertical solutions for the hydrocarbon industry. There are more than 50 instances of SAP used by Chevron [SCRI11]. Most of these run on Oracle databases. Some other key enterprise applications at Chevron include Ariba Buyer, EMC Documentum, Informatica, MicroStrategy, multiple Oracle applications [SCRI11].

Going forward, IT executives at Chevron would like to flip the company's traditional IT priorities so that the majority of the IT staff's time and attention is focused on improving business capabilities [GALL12]. To do this, Chevron's IT leaders have increasingly turned their attention to Web services, software as a service (SaaS), and cloud computing to help it run its business. Chevron considers mobility to be a game changer in how it

delivers information and provides solutions and it is convinced that it can do both without sacrificing security or reliability.

IT infrastructure at Chevron pervades every facet of its operations. However, Chevron's executives have not lost sight of the fact that IT is not the company's core competency. By moving business solutions to the cloud, Chevron executives hope to help the company maintain its focus on its core competencies.

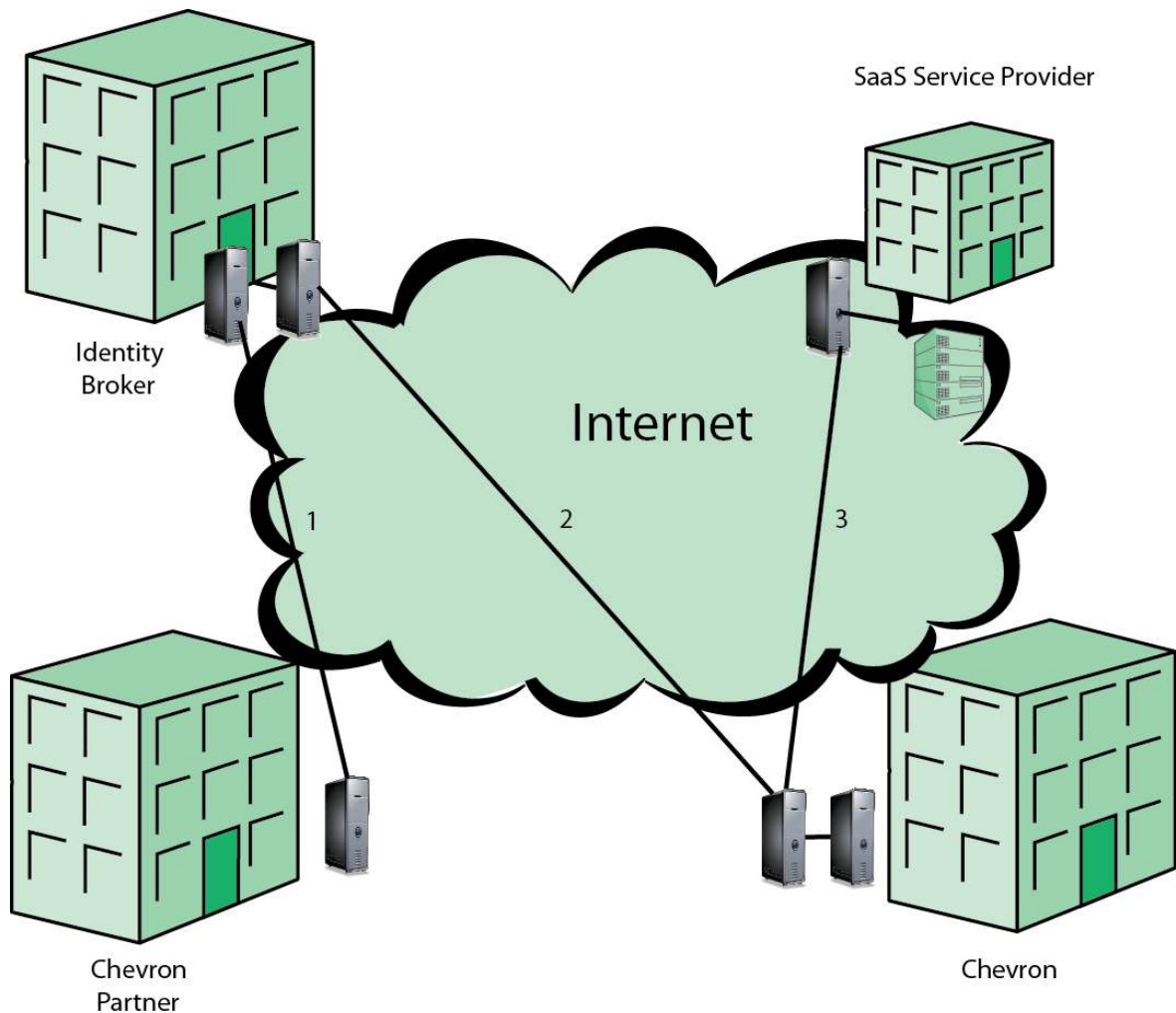


Figure C6.2 Chevron Ecosystem SSO

Chevron has used business-oriented Web services for several years. Ariba Buyer, Salesforce.com, and Ketera's price negotiation system are just a few of the SaaS solutions that Chevron has woven into its IT architecture.

Chevron is interested in developing an integrated information network that includes all of its major supply chain partners, both upstream and downstream. Identity management has emerged as a priority at Chevron to ensure secure data transfer among its business partners. A generic example of an identity management system is illustrated in Figure C6.2. When users at Chevron partners need to access Chevron's intranet and/or SaaS data or solutions, they are first cleared by an identity broker. The identity broker authenticates the user and transparently provides a single sign on (SSO) token that enables the partner to access Chevron's intranet (2) or the company's SaaS solution providers (3).

Chevron hopes to better align its operations with those of its business partners via its migration of business applications to the cloud. It hopes that the business infrastructure transformation that is currently underway will also lead to better IT and business alignment. As a global company, the cloud may be an ideal platform for running the business.

In the years ahead, Chevron's IT leaders expect mobility, analytics and visualization, and social media to become critical aspects of its business infrastructure. At the facilities level, advanced sensors and deeper embedding of RTUs and PLCs within operations are foreseen [GALL12]. Technical appreciation of convergence network infrastructure will continue to be important, but business literacy/savvy will be most important to the long-term success of Chevron's IT leaders.

Discussion Points

- 1.** Do some Internet research on Chevron's use of seismic imaging technology. Briefly explain how it works and how it has helped Chevron discover new oil and gas reservoirs.

2. Do some Internet research on security vulnerabilities associated with SCADA and digital industrial control systems. Summarize the major security concerns associated with these systems and steps that can be taken to enhance their security.
3. Discuss the pros and cons of moving enterprise-wide applications that have traditionally been supported on premises to the cloud.
4. Do some Internet research on identify management and single sign on systems. Briefly explain how these work and why they are important in business intranets and extranets.
5. Why is it increasing most important for a CIO or IT executive who oversees geographically distributed enterprise networks to be business literate?

Sources

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[SCRI11] Scribd.com. "Chevron Corporation CRUSH Report." August 17, 2011. Retrieved online at <http://www.scribd.com/doc/62481977/Chevron-CRUSH-Report-09A1>.

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