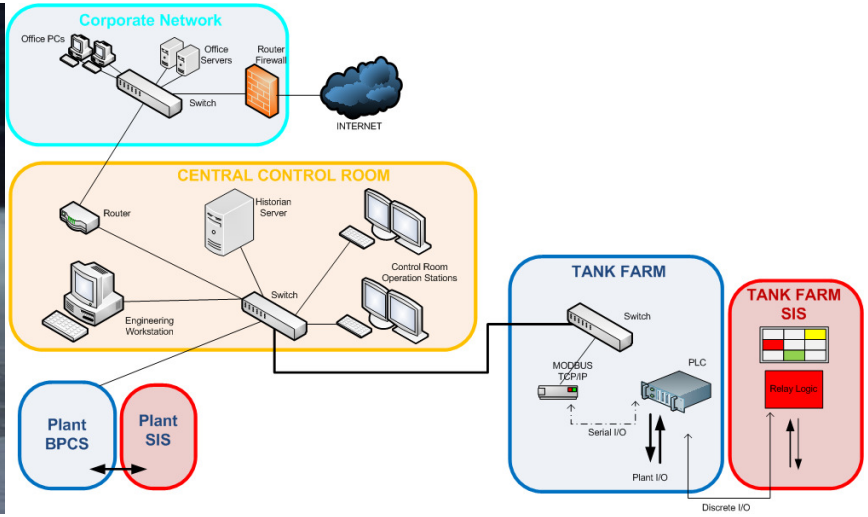
COMAH

The Competent Authority

Cyber Security MAH Example



Nic Butcher MIChemE CEng

HM Specialist EC&I Inspector

Health & Safety Executive

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Introduction

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On 28 Feb 2020, a calm but cold and foggy evening, at approximately 11PM, a jetty tank at HackedChemCo overfilled and released significant quantities of flammable material.

The cloud drifted across the local estuary and towards a residential area where people later reported an unusual smell.

The cloud ignited shortly after causing a massive explosion.

Two people on a boat in the estuary were killed as well as a third person found on the footpath next to the site, along with their dog.

There was substantial blast damage to the residential area and some injuries.

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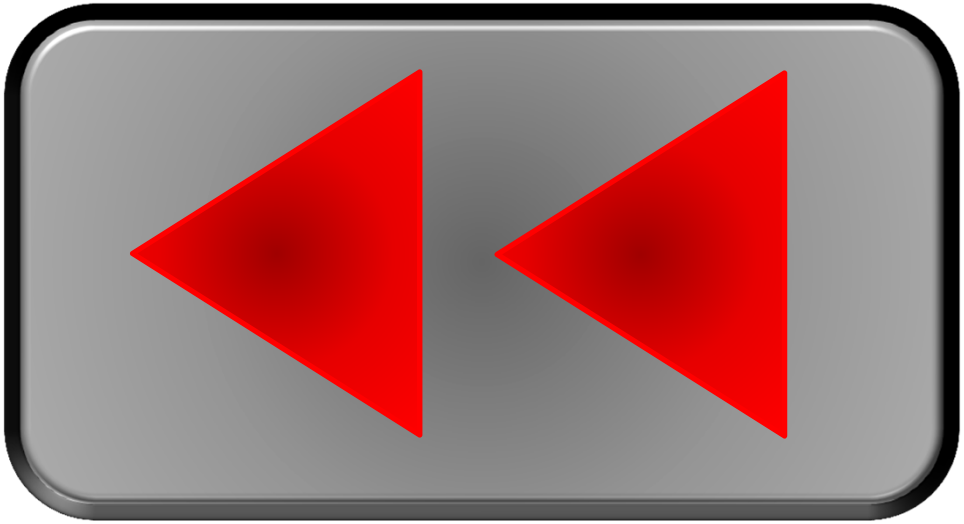
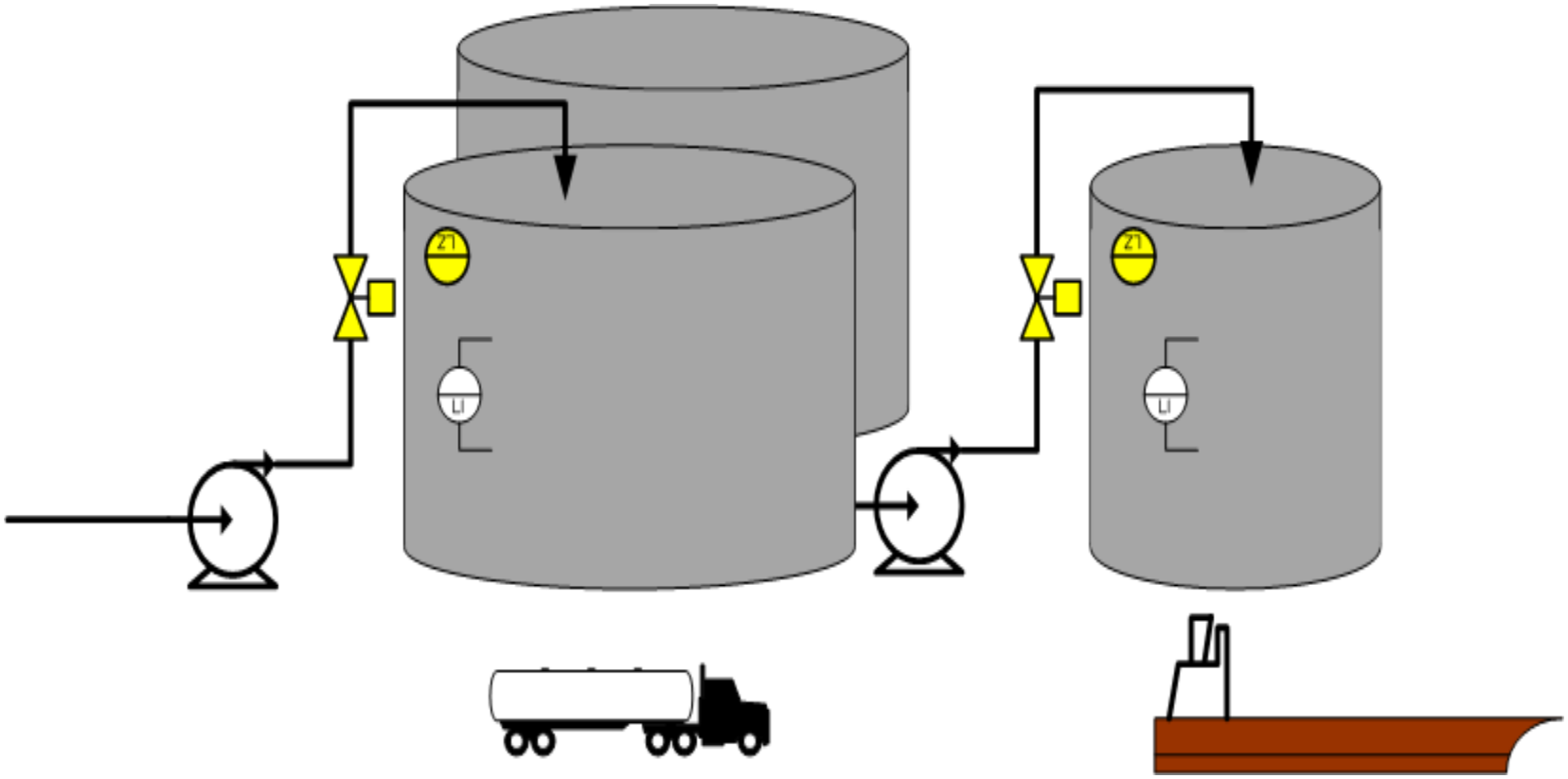
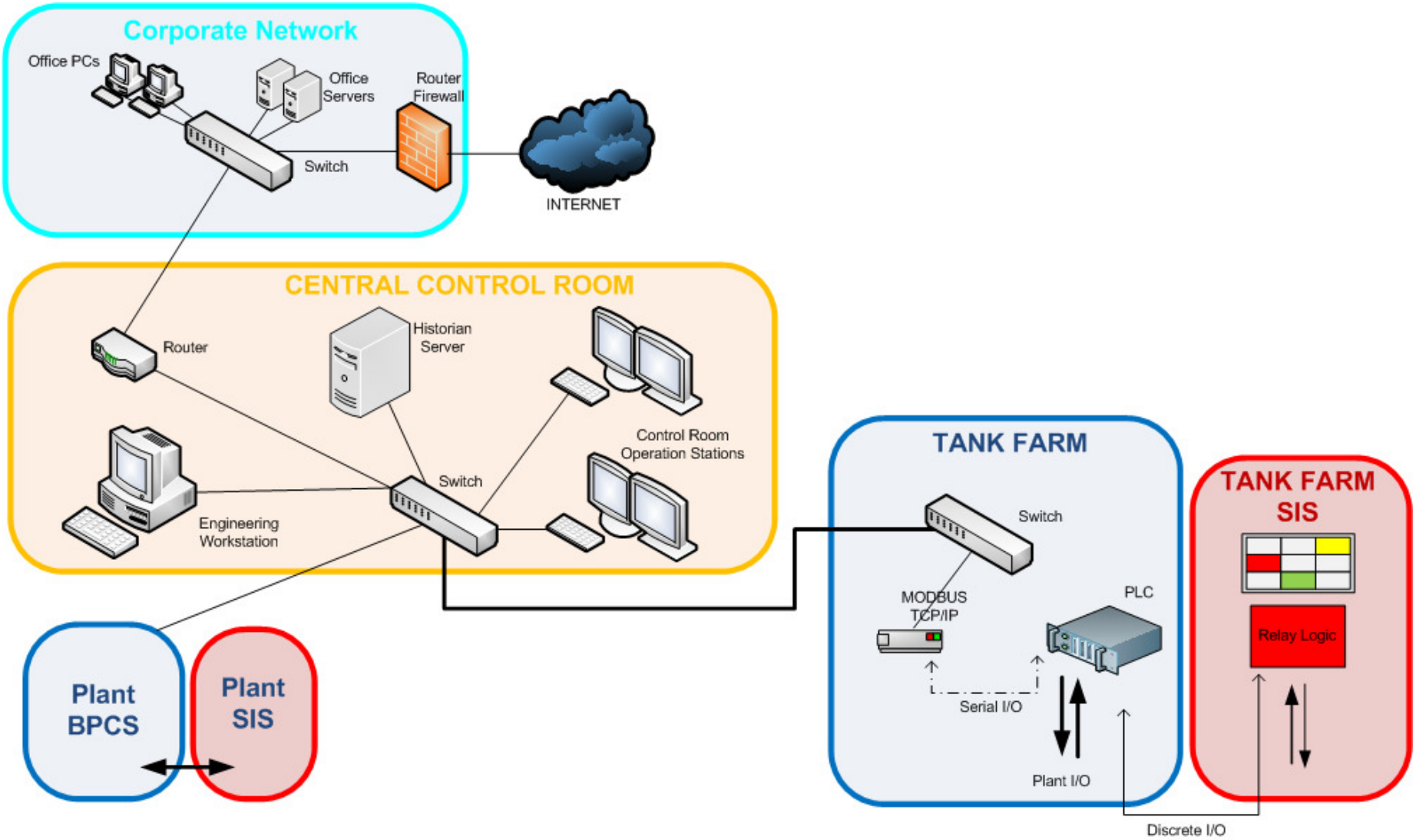
What happened?



Process Overview



ICS Overview



1 Compromise the supply chain

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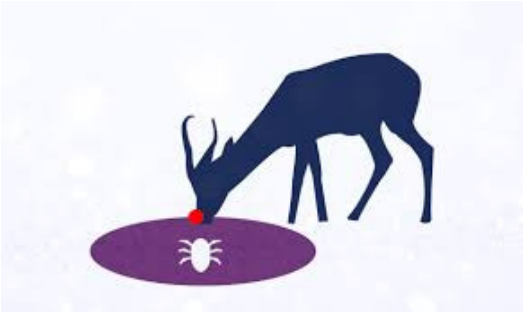
The attacker uses a “watering hole” attack to compromise a SME supplier to the COMAH operator.



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2 Send an email from the supply chain containing malware

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The attacker crafts a "spear-phishing" email which is sent from the supplier's systems. The email contains malware which gives the attacker command and control of the COMAH operator's enterprise desktop.

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3 Establish persistent access to the enterprise network

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The attacker spreads laterally across the COMAH operator's corporate network, securing persistent access.

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4 Exfiltrate network design documents, ICS docs, P&ID, maintenance schedules, passwords for key systems.

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The attacker accumulates the technical information they need in order to attack the system.

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5 Move laterally to the ICS

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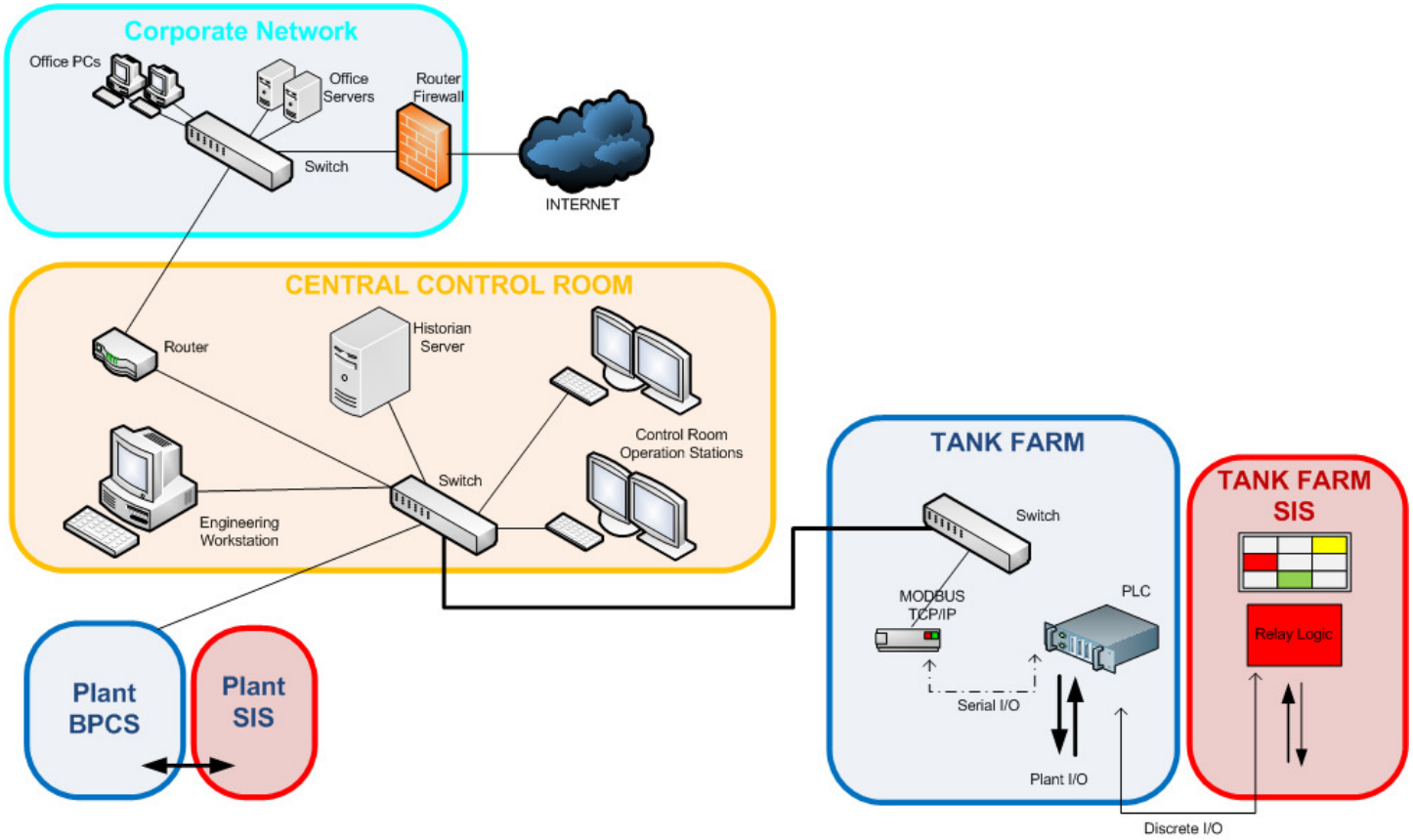
The attacker obtains the credentials and has the knowledge of the network to penetrate deeper into the control system.



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6 Attack ICS

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The attacker intercepts and modifies MODBUS over TCP/IP communications between the tank farm PLC and DCS. The SIS is overridden, and material covertly pumped to overfill the jetty tank.

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The actual story

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This is what really happened…

The company was actually called SecureChemCo.

And they'd followed good practice with respect to cyber security

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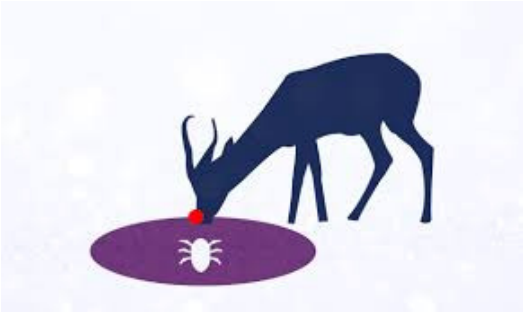

A4 - Supply Chain Security: The operator has minimised the risk to information stored by the supplier by putting in place robust processes for handling information.

A4 - Supply Chain Security: The operator stipulates Cyber Essentials as a minimum requirement, which decreases the likelihood that the attack will be successful.

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2 Send an email from the supply chain containing malware

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The attacker crafts a “spear-phishing” email which is sent from the supplier’s systems. The email contains malware which gives the attacker command and control of the COMAH operator’s enterprise desktop.

B6 – Staff awareness and training: The operator has provide general awareness training which reduces the likelihood that the malware is activated

A4 Supply chain: The operator has recognised the corporate network as an internal third party and stipulates Cyber Essentials as a minimum requirement, which decreases the likelihood that the attack will be successful.

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The attacker spreads laterally across the COMAH operator's corporate network, securing persistent access.

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4 Exfiltrate network design documents, ICS docs, P&ID, maintenance schedules, passwords for key systems.

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The attacker accumulates the technical information they need in order to attack the system.

B3 – Data Security: Key documents are encrypted at rest and when sent between systems.

C1 : Security Monitoring : Access to key design documentation is logged and any anomalous activity investigated.

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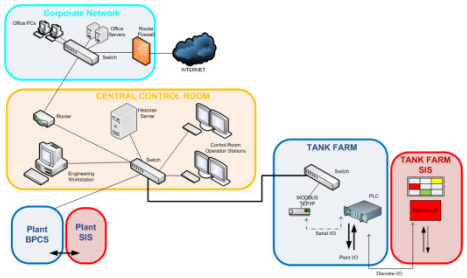

B4 – System Security: Well-maintained IT/ICS perimeter systems prevent the attacker from gaining access by exploiting vulnerabilities.

B4 – System Security: System architecture, patch management (patches are deployed at the top levels of the ICS) and devices are hardened to minimise vulnerabilities.

B2 - Identity and Access Control: Appropriate technical controls prevents credentials from the enterprise being reused for ICS making it harder for the attacker to move laterally.

C1 : Security Monitoring : Analysts review system logs and discover evidence of the attacker's actions in the network.

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The attacker intercepts and modifies MODBUS over TCP/IP communications between the tank farm PLC and DCS. The SIS is overridden, and material covertly pumped to overfill the jetty tank.

B5 – Resilient networks and systems: The operator had recognised the Modbus TCP/IP as vulnerable and physically segregated from other networks

B5 – Resilient networks and systems: The operator had further segregated the SIS by requiring a hardwired enable for any overrides

D1 & D2 – Response & Recovery Planning/Lessons Learned: Impact from the incident is minimised as an effective response plan is put in place.

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Points to make

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- Based upon an example provided by the NCSC describing how ICS could be attacked.
- This sort of architecture is quite common – i.e. reusing network infrastructure to bring PLC control interface to a central control room.
- Path of least resistance – the attacker didn't have break into more complex control system communications or compromise an operator station – targeted Modbus because very well documented and tools exist to analyse and spoof.
- The various parts of the attack are mostly going on at the moment and would not require a very high level of sophistication.

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Better ICS Architecture

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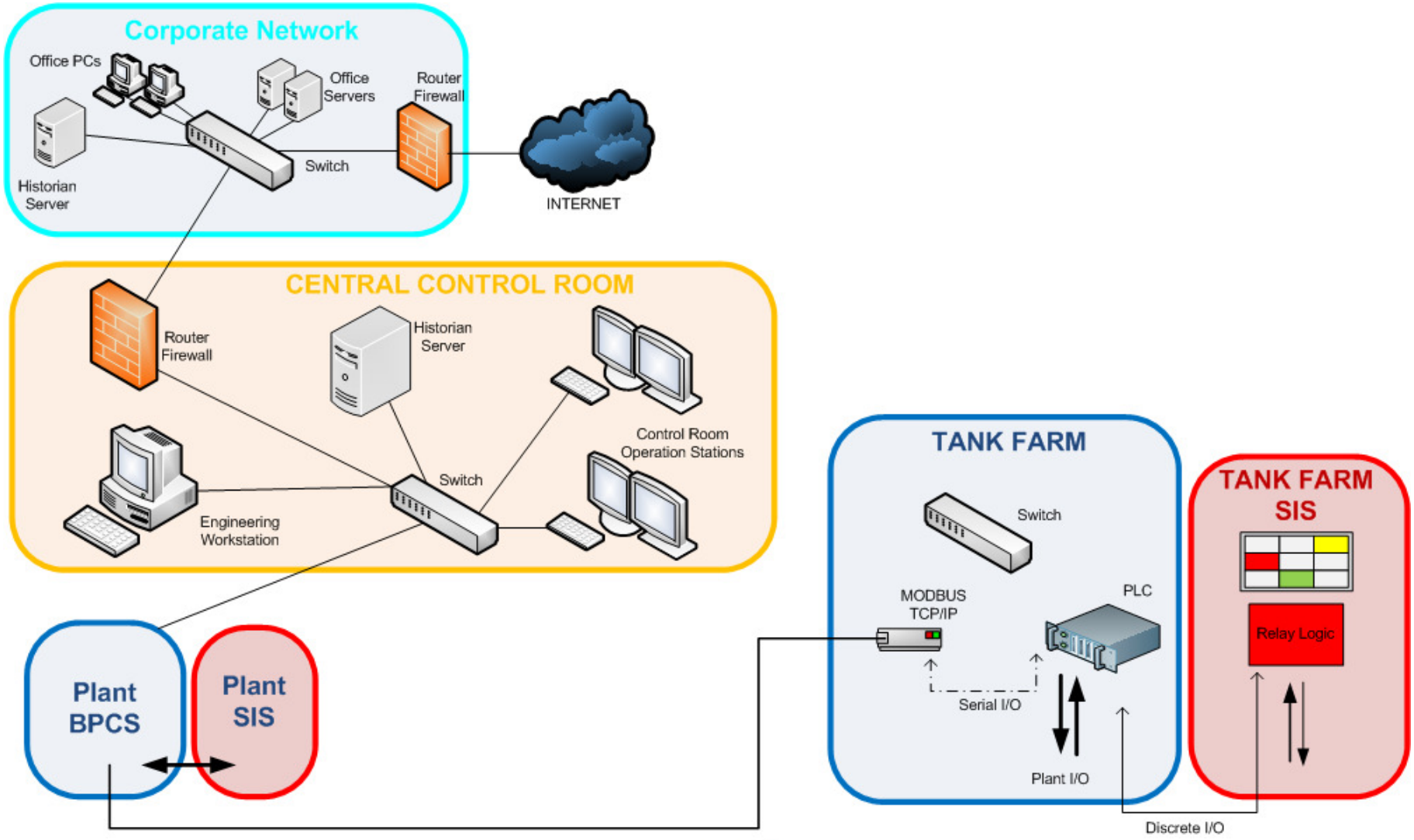

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