

REPORT

Emergency Vehicle Priority System Investigation

7 December 2023

PREPARED FOR

**Queensland Department of
Transport and Main Roads**

PREPARED BY

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1.0 Introduction

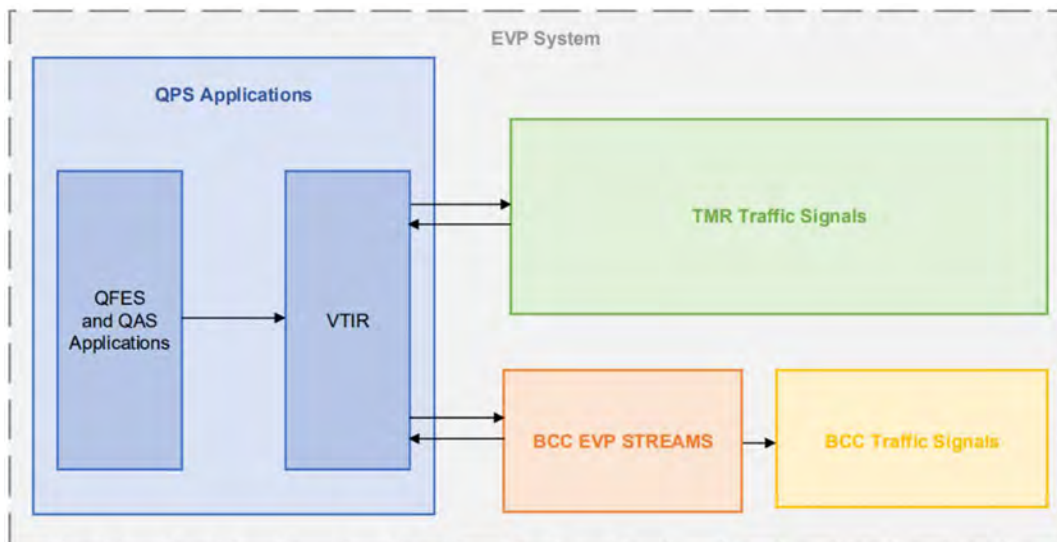
On 18 October 2022, part of Queensland’s Emergency Vehicle Priority (EVP) system became inoperable resulting in the EVP service becoming unavailable across Brisbane City Council’s (BCC’s) 310 EVP-enabled traffic signals until March 2023.

TMR’s contracted supplier Transmax found that the issue was due to an unrelated system upgrade. TMR engaged Transport Management Consulting to investigate the maintenance controls, processes and responsibilities for the EVP service, identify the root cause of the issue and make recommendations to prevent similar incidents in the future.

This report provides the results of the investigation, including an overview of the EVP service and incident details, findings and recommendations. The incident event timeline is provided in the Appendix.

2.0 EVP Overview and Incident Details

- The EVP service provides priority green signals to Queensland Ambulance Service and Queensland Fire and Emergency Services responding to incidents to reduce response times.
- EVP is enabled across 310 of 1035 BCC-controlled traffic signals and 2580 of 2683 TMR-controlled traffic signals across Queensland.
- The EVP service is managed by TMR and its partners Queensland Police Service (QPS) and BCC, and is delivered by a system that comprises a number of QPS, TMR and BCC applications and infrastructure, as shown in the figure below.



- Emergency service vehicles send a route request to QPS’s Vehicle Tracking and Intervention Request (VTIR) application. VTIR then determines the appropriate route and green light schedule and sends these green signal requests to TMR traffic signals (for TMR-controlled signals) or the BCC EVP STREAMS component (for BCC-controlled signals). The respective TMR and BCC traffic signals then display a green signal according to the requested time schedule that matches the emergency vehicle’s estimated travel path.
- On 18 October 2022, during an unrelated TMR hardware maintenance upgrade, the BCC EVP STREAMS component (shown in the figure above) became inoperable and the EVP service did not operate for BCC-controlled signals (i.e. no priority green signals were granted for BCC traffic signals). This situation went undetected until 1 March 2023 and was rectified on 8 March 2023. During this period, TMR-controlled signals were unaffected and the EVP service continued to operate for TMR traffic signals.

3.0 Review Findings

The incident, its root cause and other contributing factors are outlined below.

3.1 Incident cause

The 18 October 2022 incident was caused by an incorrect Internet Protocol (IP) address being assigned to a network switch, which was replaced as part of an unrelated TMR hardware upgrade. The IP address provided to the new network switch belonged to the BCC EVP STREAMS server. This IP address error made BCC EVP STREAMS inoperable, and no green signals could be requested for the EVP-enabled BCC traffic signals.

3.2 Root cause

The EVP service has been operating across 310 BCC traffic signals since 2017; however, all EVP system components were not properly transitioned from the pilot project state into production by TMR and its project partners (QPS and BCC). Instead, each partner was focused on operating their own system components and no partner was formally responsible for monitoring or maintaining the BCC EVP STREAMS component.

This situation was caused by a lack of defined EVP service owner to take responsibility for overall service monitoring and management. This resulted in a lack of formal supplier agreements for the monitoring and maintenance of each system component. As such, the integrity of the EVP service could not be assured during any system change affecting its operation (as was apparent in the 18 October 2022 incident).

There are a number of other factors that contributed to the 18 October 2022 incident, including:

- Insufficient change controls (including testing and deployment requirements) by suppliers and their subcontractors. A more rigorous set of controls could have identified the system's issue at the time the switch was changed.
- Inappropriate EVP system component and data flow monitoring (including for BCC EVP STREAMS) to identify a lack of successful green light requests and responses.
- The EVP service using BCC signals has a higher level of complexity as it needs to communicate with SCATS to control these signals.

4.0 Recommendations

The following actions are recommended for TMR and its partners (BCC and QPS) to minimise the risk of similar incidents affecting EVP service operation in the future:

- Establish an agreed and formalised EVP service owner and EVP service customer, along with agreed organisational roles and responsibilities for monitoring and maintaining each EVP system component.
- Once EVP service ownership and management responsibilities are established, develop appropriate service management practices to assure the EVP service, including:
 - an overall EVP service transition management process to ensure service changes are documented, tested, released and appropriately deployed into the live environment
 - a change management policy to define components under change control and to manage them effectively; and implement change management processes to receive, decide, and manage change requests
 - service level monitoring and management of all EVP components and data flows (including status, data content and quality)

- service performance monitoring and reporting, measurement, analysis and evaluation
- an incident management process for integrated and holistic incident detection and response
- EVP service and system documentation to provide common understanding across all stakeholder organisations; this includes an operations and support manual for TMR-supplied components
- customer relationship management between the service owner and its customers to ensure the EVP service requirements are defined and continually supported
- agreements for maintenance and operation of all system components (including for BCC EVP STREAMS); this includes resources and funding for suppliers to ensure ongoing availability.

5.0 Actions Already Taken by TMR and Partners

Since March 2023, TMR, QPS, BCC and Transmax (as a key TMR contracted supplier) have undertaken a number of actions to improve the EVP service. These includes:

- TMR contracted Transmax to monitor the BCC EVP STREAMS server performance.
- TMR is negotiating with Transmax to include BCC EVP STREAMS server maintenance activities as part of their software assurance contract.
- Brisbane Metropolitan Transport Management Centre operators are now monitoring EVP green light requests to BCC-controlled traffic signals.
- QPS are now monitoring the status of EVP green light request responses from STREAMS EVP servers across all of Queensland (i.e. TMR and BCC controlled signals).
- Transmax have improved their subcontractor change management processes following an internal review of the 18 October 2022 incident.
- TMR are holding monthly performance review meetings with key stakeholders (QPS, BCC and Transmax) to discuss EVP service performance.

6.0 Conclusion

The investigation recommends that TMR and its EVP service partners QPS and BCC continue with the actions already underway and work collaboratively to address the identified recommendations. This will ensure the EVP service is effective and sustainable and continues to benefit Queensland.

Appendix - Incident Event Timeline

The key event timeline of the 18 October 2022 incident is shown below.

Date	Event
17 October 2022	The BCC EVP STREAMS server operating system is identified as a Risk in the September 2022 TMR Monthly Managed Services report (issued 17 October 2022; Item 10, Risk no. K05 – STREAMS BCC running Windows Server 2008 R2).
18 October 2022	<ul style="list-style-type: none"> Transmax replaces a switch on the TMR communications network as part of TMR's Southeast Queensland hardware refresh project. The change involved an incorrect Internet Protocol (IP) address being assigned to the replaced switch by Transmax's subcontractor. The incorrectly used IP address belongs to a sub-component of BCC EVP STREAMS, which means that the IP address was duplicated, leaving BCC EVP STREAMS unable to communicate; this results in the EVP service not working for BCC EVP-enabled traffic signals.
18 October 2022 – 1 March 2023	<ul style="list-style-type: none"> The EVP service did not operate for BCC traffic signals during this period. TMR, QPS and BCC system monitoring did not detect that it was receiving messages from the replaced TMR switch rather than the BCC EVP STREAMS component. TMR-controlled traffic signals are unaffected by this issue and continue to provide the EVP service.
1 March 2023	Transmax identify that the BCC EVP STREAMS component is unresponsive while performing another activity, indicating that the EVP service is not working on BCC traffic signals.
1–6 March 2023	Transmax develop a solution to fix the issue.
6 March 2023	<ul style="list-style-type: none"> Transmax raise an incident relating to the BCC EVP STREAMS component's issue and provide a Customer Advisory notification to TMR about the outage. Transmax advise that a system change will be carried out on 7 March 2023 to restore the EVP service for BCC traffic signals. TMR advise QPS of the service outage.
7 March 2023	BCC contact TMR to alert that the EVP service is not functioning on BCC traffic signals.
7–8 March 2023	Transmax correct the IP address error and the EVP service is restored on BCC traffic signals.
21 March 2023	TMR receive a Post Incident Review from Transmax.
January–September 2023	<p>TMR and Transmax work towards an upgrade of the Windows operating system and version of STREAMS as follows:</p> <ul style="list-style-type: none"> January 2023 – TMR and Transmax initial discussions take place on how to address the BCC EVP STREAMS server operating system being end-of-life. March 2023 – Transmax provides an initial technical assessment and upgrade recommendations to TMR. Late July 2023 – TMR requests Transmax for a quote and timeframe to upgrade the BCC EVP STREAMS server.
8 August 2023	Transmax expedites the server upgrade due to security vulnerability. It is noted that Transmax does not have a contract in place with either TMR or BCC for this upgrade.
12 September 2023	The BCC EVP STREAMS server operating system is upgraded to the current Windows operating system and version of STREAMS software.
September 2023	The BCC EVP STREAMS server is being maintained and managed in line with the TMR/Transmax Standing Offer Agreement STREAMS ITS Platform Support Contract.