



This table of bus security solutions has been developed in the SAFE BUS project as guide for bus managers and drivers. It aims to provide a comprehensive overview of measures and solutions that could enhance safety and security in public bus networks.

Assessment and planning	
<p><b>Vulnerability assessment</b> Risk and vulnerability assessments help bus operators identify potential weaknesses and prioritise investment in upgrading their facilities. These assessments should be regularly repeated to reflect structural changes or construction activities, as well to be aligned with the emergence of new threats and development of modus operandi. It is important not to limit risk and vulnerability assessment to critical assets, but also to consider public spaces needed for the operation of bus services.</p>	<ul style="list-style-type: none"> <li>• <b>COUNTERACT risk and vulnerability assessment</b> The COUNTERACT project, coordinated by UITP, has elaborated a methodology for risk and vulnerability assessment specifically tailored to the public transport sector. This methodology has been continuously updated to the evolving threat situation and is recommended by UITP for use by public transport operators</li> </ul>
<p><b>Security plan</b> All relevant business assets need a security plan, this includes restricted facilities, such as control rooms or depots, as well as publicly accessible locations. Special security plans need to be prepared for specific events, when passenger numbers and flow are expected to differ from the daily routine</p>	<ul style="list-style-type: none"> <li>• <b>Threat monitor</b> The UITP Threat monitor is a survey among Security and other interested members to follow the evolution of security threads. It regularly collects emerging challenges and modus operandi that operators notice from their daily operation.</li> </ul>
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<p><b>Security plan</b> All relevant business assets need a security plan, this includes restricted facilities, such as control rooms or depots, as well as publicly accessible locations. Special security plans need to be prepared for specific events, when passenger numbers and flow are expected to differ from the daily routine</p>	<ul style="list-style-type: none"> <li>• <b>Event security plan</b> detail the management of special situations, when passenger numbers and flows are expected to differ from the daily routine. Such plan requires a close collaboration with the authorities and the relevant business community as such events are normally organised and planned by 3rd parties, with the bus operator in a facilitating role</li> </ul>
<p><b>Security organisation</b> Depending on the size of the organisation and the complexity of the bus operation, the security organisation</p>	<ul style="list-style-type: none"> <li>• <b>Corporate security organisation</b> should oversee strategic aspects, have a coordinating role in preparedness and crisis management, and liaise with relevant external partners. Its responsibility includes the installation of a crisis management organisation</li> </ul>

<p>needs to comprise several levels, looking at strategic and operational aspects. Dedicated persons need to be assigned the responsibility of coordinating and implementing security measures as defined in the security plan</p>	<ul style="list-style-type: none"> <li>• <b>Operational security organisation</b></li> </ul> <p>is responsible for security in company assets or in operational processes. Major stations and facilities such as depots should have a dedicated person responsible. Depending on the complexity of bus lines, persons in charge operational security should be responsible for the entire networks, selected lines, or business areas</p>
<p><b>Crisis management plan</b> Given the complexity of transport systems and the flexibility of bus operations, crisis management comprises the handling of a crisis itself, but also managing the impact of a crisis at one location on the rest of the operation. Having to deal with a crisis does not mean an automatic shut-down of the entire operation as too many people depend on the availability Crisis management plans need to address handling the actual crisis, adapting and re-routing services where possible and informing passengers about available services</p>	<ul style="list-style-type: none"> <li>• <b>Crisis cell</b></li> </ul> <p>should be formally established. It should involve all departments of the organisation and be able to be activated with minimum delay to take charge of crisis management</p>
	<ul style="list-style-type: none"> <li>• <b>Crisis management plan</b></li> </ul> <p>clarifies the roles and responsibilities of all departments within crisis management and operational management in degraded modes, involving re-routed bus lines and truncated services</p>
	<ul style="list-style-type: none"> <li>• <b>Crisis communication plan</b></li> </ul> <p>needs to be prepared, which helps to deal with the media attention following any incident.</p>

Awareness and training	
<p><b>Public awareness campaigns</b> Given the complexity of bus systems, largely public access and the high number of passengers frequenting vehicles and infrastructure, passenger can play an important role in protecting bus operations. Situational awareness can help an early detection of threats and knowing how to react in the case of an attack can aid the crisis management. Being alert for suspicious situations and being familiar with existing emergency and support tools can help preventing the escalation of any potential danger. It is important to find the right balance in public awareness campaigns, encouraging support, but not scaring</p>	<ul style="list-style-type: none"> <li>• <b>Hotlines and specific reporting numbers</b></li> </ul> <p>can facilitate reporting any suspicion and avoid overloading emergency channels. They should be clearly visible in stops, stations, and on board of vehicles</p>
	<ul style="list-style-type: none"> <li>• <b>Reporting apps and text message options</b></li> </ul> <p>offer a more discreet contact and may courage passengers use them without being exposed to a potential offender. Built-in reporting templates can help to guide passengers through the process and ensure that all relevant details are communicated</p>
	<ul style="list-style-type: none"> <li>• <b>Posters and stickers</b></li> </ul> <p>In station or on board of busses help remind passengers to be vigilant, the correct behaviour and available emergency and help contacts</p>
	<ul style="list-style-type: none"> <li>• <b>Educational campaigns</b></li> </ul> <p>can help generate a general security awareness in society, promote correct behaviour and encourage people to report any suspicion</p>
<p><b>Security awareness and culture</b></p>	<ul style="list-style-type: none"> <li>• <b>Awareness programmes</b></li> </ul> <p>help remind staff of general rules, recognise suspicious situations and the procedures that must be followed</p>

<p>It is key to acknowledge that security is not only the task of security managers and staff, but that every employee in every position has a role to play</p>	<ul style="list-style-type: none"> <li>• <b>Targeted campaigns</b></li> </ul> <p>can contribute to maintaining general security awareness as well as refreshing the familiarity of rules and procedures</p>
<p><b>Insider threat awareness</b> Like every organisation, also bus operators may be threatened by an insider. This could be countered by a careful selection of staff to be employed, by defining clear procedures for work and instilling the discipline to follow those procedures and encouraging staff to be vigilant for suspicious behaviour</p>	<ul style="list-style-type: none"> <li>• <b>Handouts and handbooks</b></li> </ul> <p>distributed to staff or <b>posters</b> visible at the workplace can be important references to keep important contacts or procedures ready at hand</p>
<p><b>Security training</b> Security in bus operation is the responsibility of all staff members. Training programmes need to clarify the role and responsibility of staff at every position and provide employees with the expertise need for their job. Their focus of their training would also include preventing sabotage, theft, or vandalism. An additional focus for control room staff is the handling of emergency calls or incoming threats and potential activation of security protocols</p>	<ul style="list-style-type: none"> <li>• <b>Criticality analysis of staff positions</b></li> </ul> <p>helps determine necessary access rights and develop a clearer framework for background checks</p>
	<ul style="list-style-type: none"> <li>• <b>Background checks and vetting</b></li> </ul> <p>as part of the recruitment process is the first step to prevent people with malicious intent to join the company. Clear criteria for applicants, background checks and potentially vetting help screening at the moment of employment, but it has to be noted that such screening only represents a snapshot of the past</p>
	<ul style="list-style-type: none"> <li>• <b>Insider threat awareness training</b></li> </ul> <p>can help familiarising personnel with potential damage that can could be created by malicious intent, non-compliance or using personal vulnerabilities</p>
	<ul style="list-style-type: none"> <li>• <b>Awareness campaigns</b></li> </ul> <p>can help to remind staff of the potential damage to passengers, staff and business that could be caused by insiders</p>
	<ul style="list-style-type: none"> <li>• <b>Credential management</b></li> </ul> <p>including an exit procedure helps managing keys, passwords, access codes, etc. ensuring the cancellation of access to asset, systems, and information</p>
	<ul style="list-style-type: none"> <li>• <b>Initial operational security training</b></li> </ul> <p>courses should provide the general skills and knowledge expected in every position. Drivers and operational staff need to be vigilant and able to take correct action in potentially dangerous situations they might encounter during their daily work</p>
	<ul style="list-style-type: none"> <li>• <b>Recurrent operational security training</b></li> </ul> <p>programmes can be used to refresh specific know-how. The responsibility of operational and field staff typically includes to be vigilant for and report suspicious situations, to handle conflicts and de-escalate, to respond to an incident when necessary. Employees in locations with restricted access, such as control rooms or depots, need to be aware of the access policy of the site they work in and potential consequences of intruders</p>

	<ul style="list-style-type: none"> <li>• <b>Security management training</b></li> </ul> <p>should focus on more strategic aspects, such as risk and vulnerability assessment, security plans and procedures as well as crisis management. Regular refresher courses should be conducted to keep up with evolving threats and the emergence of new safeguards</p>
<p><b>Security exercises</b></p> <p>Regular security exercises help monitor the level of preparedness within an organisation and understand shortcomings and vulnerabilities</p>	<ul style="list-style-type: none"> <li>• <b>Internal table-top exercises</b></li> </ul> <p>can be used to simulate the response to specific incidents and practice the activation of the crisis management organisation</p>
	<ul style="list-style-type: none"> <li>• <b>Table-top exercises with external partners</b></li> </ul> <p>can help to align plans, procedures, and responsibility</p>
	<ul style="list-style-type: none"> <li>• <b>Live exercises</b></li> </ul> <p>should also involve all relevant external partners. They are also crucial to ensure that first responders are familiar with infrastructure layout, rolling stock and safety regulations of bus operation</p>

Physical protection	
<p><b>Design</b></p> <p>Resilient assets are a corner stone for the protection bus systems. Standards and guidelines for layout and material have evolved a lot during recent years and are followed for new structures or the upgrading of existing facilities and equipment. In general, however, public transport systems are not new and involve legacy infrastructure directly embedded into the public space</p>	<ul style="list-style-type: none"> <li>• <b>Clear lines of sight</b></li> </ul> <p>in any passenger related facility help monitoring the area, avoid creating areas of concealment and facilitate a speedy evacuation if needed. Furniture, vending machines and information screens and boards should be made of vandalism-proof material and not be positioned to not block any view</p>
	<ul style="list-style-type: none"> <li>• <b>Facility layout with functional separation</b></li> </ul> <p>should separate left luggage and other storage facilities from concourses, platforms, and passenger flow routes to minimise the impact of a potential explosion</p>
	<ul style="list-style-type: none"> <li>• <b>Adequate lighting</b></li> </ul> <p>is needed for good orientation and overview for passengers. It also supports surveillance and the monitoring of bus stations by CCTV cameras</p>
	<ul style="list-style-type: none"> <li>• <b>Locks and seals</b></li> </ul> <p>can prevent access to cup boards, equipment boxes or access to technical installations, which could potentially be used as places of concealment. Where locks cannot be installed, tamper evident seals should be fitted</p>
	<ul style="list-style-type: none"> <li>• <b>Clear plastic sacks</b></li> </ul> <p>suspended from metal hoop sack holders allow for maximum transparency are considered best practice. If possible, litter bin should be placed into areas covered by CCTV to monitor them. Litter bins should be regularly emptied to make best use of the sacks' transparency</p>
	<ul style="list-style-type: none"> <li>• <b>Physical barriers</b></li> </ul>

	<p>Waiting areas and bus stops should be protected against vehicle borne attacks without jeopardising an obstacle free access for passengers. Protection could be achieved by physical barriers, such as bollards or planters as well as elevated curbs</p>
	<ul style="list-style-type: none"> <li>• <b>Glazing protection</b></li> </ul> <p>Transparent structures, such as bus shelters, should have <b>glazing protection</b> to avoid flying or falling glass in case of an explosion. Laminated glass or anti-shatter film to retrofit existing structures can also help to prevent vandalism and graffiti</p>
	<ul style="list-style-type: none"> <li>• <b>Driver cabins</b></li> </ul> <p>Cabins separating the driver from passengers are continuously under discussion. While protecting the driver and preventing unauthorised access, they impact the driver's ability to assist passengers</p>
<p><b>Barriers and access control</b> Access control to restricted facilities and equipment aims to ensure that only authorised personnel and material can enter a site. All doors between public and restricted areas should be locked or controlled</p>	<ul style="list-style-type: none"> <li>• <b>Access gates</b></li> </ul> <p>Restricted assets, such as depots should be equipped with <b>access gates</b>, only allowing authorised persons in</p>
	<ul style="list-style-type: none"> <li>• <b>Check-in procedures</b></li> </ul> <p>should that non-authorised staff and visitors are checked and registered. If private cars can be parked on the ground, they should be inspected including the luggage and be subject to a parking permit system</p>
	<ul style="list-style-type: none"> <li>• <b>Badges and permit policy</b></li> </ul> <p>issued, should be visibly displayed to identify any person or car as accredited. Clear sign in/out procedures facilitate an evacuation if needed</p>
	<ul style="list-style-type: none"> <li>• <b>Bus hand-over procedure</b></li> </ul> <p>Access to busses and bus keys can be controlled by a <b>hand-over procedure</b>, handing out the keys to planned and assigned drivers only</p>
	<ul style="list-style-type: none"> <li>• <b>Smart bus ignition locks</b></li> </ul> <p>can provide a further layer of protection with individual keys to ensure that only the planned and assigned driver can access and start the bus</p>
	<ul style="list-style-type: none"> <li>• <b>Passenger- baggage reconciliation</b></li> </ul> <p>can ensure that only the use of passengers with a valid ticket can use staffed luggage storage facilities</p>
	<ul style="list-style-type: none"> <li>• <b>x-ray screening</b></li> </ul> <p>Any item to be stored should be subject to screening by <b>x-ray equipment</b></p>
	<ul style="list-style-type: none"> <li>• <b>front-door boarding</b></li> </ul> <p>Some form of access control can be carried by guiding passenger streams. Many operators had implemented the principle of <b>front-door-boarding-only</b> for busses; obliging passengers to pass the driver and buy or display a ticket. During the recent pandemic, however, this measure was revoked in many places for health and safety reasons</p>
	<ul style="list-style-type: none"> <li>• <b>boarding procedure coaches</b></li> </ul>

	<p>for coach services can help ensure that only passengers with a valid and personalised ticket can enter a coach</p>
<p><b>Technology</b> Technology tools can substantially help improving the protection of bus systems, with closed circuit television (CCTV) being the most used and important one in public transport</p>	<ul style="list-style-type: none"> <li>• <b>Passenger- baggage reconciliation coaches</b></li> </ul> <p>should take place before loading any item into the luggage compartment of coaches</p>
	<ul style="list-style-type: none"> <li>• <b>CCTV with video and audio recording</b></li> </ul> <p>Cameras cover sensitive points inside the bus, including the driver position and the rear doors. They also give a general overview of the bus interior. Recording in on-board devices and stored for a legally binding period, before being overwritten. The length of this period varies across the countries in Europe. Recorded CCTV images can only be used as evidence, if needed the video images can be downloaded and saved. This can either be a manual procedure or be done remotely with secure connections at depots</p>
	<ul style="list-style-type: none"> <li>• <b>CCTV with real time monitoring</b></li> </ul> <p>allows using CCTV for alarm verification and incident management. Often, this is a challenge due to incoherent bandwidth of communication networks across cities or in rural areas</p>
	<ul style="list-style-type: none"> <li>• <b>Video analytics</b></li> </ul> <p>in CCTV cameras can help identifying suspicious situations. It has already proven to be a very useful solution in bus depots for intrusion monitoring. Combined with night-vision cameras it can help protecting fenced and unfenced facilities. Video analytics is also installed and operated or tested in public areas, such as stations and terminals. Most common algorithms tested include detecting abandoned items, aggressive behaviour, or unusual passenger movements</p>
	<ul style="list-style-type: none"> <li>• <b>Body cameras</b></li> </ul> <p>can be used to protect staff. They act as deterrence against aggressions, their live images help control room staff to understand situations and recordings provide evidence in the investigation of incidents</p>
	<ul style="list-style-type: none"> <li>• <b>Microwave imaging curtains</b></li> </ul> <p>curtains aim to detect firearms without the need for check points and no impact on passenger flows</p>
	<ul style="list-style-type: none"> <li>• <b>Spectroscopy technology</b></li> </ul> <p>aims to detect traces of explosives and their precursors on persons and items without the need for check points</p>
	<ul style="list-style-type: none"> <li>• <b>SOS intercoms</b></li> </ul> <p>installed at major stations and interchanges enable passengers and staff to call for help. Often, these intercoms are equipped with cameras to prevent misuse</p>
	<ul style="list-style-type: none"> <li>• <b>Driver alarm buttons</b></li> </ul>

	<p>enabling them to directly connect with the control room or dispatcher. Often these alarms are silent and allow the control room or dispatcher to listen into the situation to improve situational awareness</p>
	<ul style="list-style-type: none"> <li>• <b>AVM systems</b></li> </ul> <p>increasingly common practice to manage and coordinate bus fleets. The continuous awareness of bus positions can help detecting deviations and suspicious movements</p>
	<ul style="list-style-type: none"> <li>• <b>Geofencing</b></li> </ul> <p>can be used to monitor the position and movement of busses. It could be used to prevent the unauthorised removal of busses from unfenced depots or parking spots and alert in case of deviation of busses from their assigned route and service pattern</p>

Cooperation	
1.	<p><b>Clear points of contact and regular exchange</b></p> <p>between bus operators, first responders and security authorities are key for the protection of bus systems. Major incidents require the collaboration of many stakeholders, and it is crucial that plans, procedures, and equipment are aligned, that all partners have a clear situational picture and understand each other's role</p>
2.	<p><b>Common situational awareness</b></p> <p>is crucial for efficient incident management and helps in general to shorten intervention times. This could be supported by providing a police workplace in the OCC of the bus operator or the installation of a direct connection between the control room of the operator and the police</p>
3.	<p><b>Dedicated intervention support</b></p> <p>can support bus operators in potentially dangerous areas and situations, where skills and the intervention capacity of bus operator staff may not be sufficient</p>
4.	<p><b>Joint prevention initiatives</b></p> <p>with authorities help to communicate that security in public transport is a societal concern</p>
5.	<p><b>Mutual training support</b></p> <p>can help all stakeholders benefit from each other experience and know-how. The police can benefit from insight into infrastructure layout, operational rules, and safety regulations. Bus operators can benefit from security know-how and threat intelligence</p>
6.	<p><b>Intelligence and information sharing</b></p> <p>about incidents or modus operandi trends can help public transport operators keep their risk and vulnerability assessment as well as security plans up to date</p>

