

SHEDMASTER USER GUIDE

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Note: Underlined words are contained in the SMUG Glossary file, which should be located in the same folder as this document.

INTRODUCTION

In Trainz, interactive industries undertake processes that consume input commodities to produce output commodities. Without regular [deliveries](#) of inputs and [collections](#) of outputs, inputs will be depleted and/or output storage space will run out, and so the industry process will stop. In order to provide timely commodity service to the industries, a system has been devised to initiate these deliveries and collections automatically under control of a dispatcher rule. This rule is called Shedmaster, **hereafter abbreviated to SM**.

So as not to tie down a locomotive to one specific [task](#), locomotives of a particular performance class can be grouped together. All tasks that can be performed by locomotives of one class can then be allocated to the next available locomotive in that class. Idle locomotives in each class need to be in a predictable location so that SM can easily identify them. This is elaborated below in the sections headed 'Motive Power Depots' and 'Departure Roads'.

For an interactive industry to communicate its commodity needs with SM, the industry asset's script needs to be modified. The modified script routinely checks the levels of its inputs and outputs, and if these fall outside threshold levels, a [service request](#) is sent when a commodity needs to be delivered to or collected from [exchange groups](#), or when wagons require to be [shunted](#) between or within non-exchange [groups](#) and/or industry loading docks.

In order to service these messages the following resources are required:

1. A supply of wagons capable of loading and unloading the commodities
2. A suitable yard or yards where these wagons can be located
3. A supply of locomotives to respond to the service requests
4. A place or places on the map where these locomotives wait for orders from SM
5. A set of driver schedules set up in the Schedule Library rule to carry out the tasks specified in service requests.
6. New driver commands to facilitate the servicing of the industries

SHEDMASTER RULE - PRINCIPLES OF OPERATION

SM will measure the load or capacity of the requesting industry and attempt to provide just enough wagons to fulfill the industry needs.

- SM will measure the length of a consist and attempt to locate a [deposit siding](#) which is long enough to accommodate the consist.
- SM will try to use all the wagons in the [active source siding](#), switching to the next siding in the same group that holds appropriate wagons if necessary. If found, this siding will then be marked as the active source siding. Likewise, SM will try to deposit wagons into the active deposit siding unless there is insufficient space to hold the whole consist. In

that case the next siding with the required space in the same group will be selected and marked as the active siding.

- If there is no suitable siding available for depositing the wagons then the task will not be allocated to a loco until space becomes free.
- And likewise, if there is no source siding with suitably configured wagons then the task will remain in the queue until stock arrives.
- Tasks will not be issued to the leading loco of a Departure Road if more than one command is present in its driver's schedule. A "busy" message is displayed if this happens and the task will remain in the queue. Allocation of this task will be tried again after an interval.

YARDS

Yards are composed of groups of sidings.

A siding that is expected to be accessed from either end is defined by a matching pair of trackmarks, one at each end with the arrows pointing inwards, and differing by only the letter at the end. Sidings that are closed at one end can have a track mark at the open end and a trackside object starting with the keyword name "END" at the closed end.

A yard usually needs a group of adjacent sidings dedicated to each commodity which is an input and/or output for local industries served by SM. A group of sidings is defined by specially named trackmarks that SM recognizes so that wagons can be drawn from an appropriate source siding and returned to a deposit siding. In each group there may be up to 99 sidings dealing with a particular product. The maximum number of groups is 99.

Please refer to EXCHANGE YARD DESIGN in the appendix for details of how to plan and set up groups of sidings.

MOTIVE POWER DEPOTS (MPD)

An MPD is a home base where locomotives gather to be refueled, maintained and await tasks to perform. An MPD can have a number of dedicated tracks or "roads" that serve different purposes. Amongst these are the Departure Roads at which SM can expect to find idle locos to appoint to tasks. Each MPD road can be either double-ended or dead-ended (discussed below).

Locomotives are shared out to service nearby industries that generate tasks by posting *service requests*. A schedule from the Schedule Library and linked to the particular *task* is allocated by SM to the AI Driver of the lead locomotive in a queue at the MPD associated with the task.

Concentration of departure roads at a single MPD location is not a requirement of SM. Departure roads may be spread over the map to be near where their respective *tasks* are to be performed.

Departure Roads

An MPD can have more than one queue supplying locos. Each queue is represented by a length of track known as a departure road that is delimited by a matching pair of trackmarks with the arrows pointing inwards. The names of the defining trackmarks must start with the capital letters **MPD** and end in a letter **A** at one track end and **B** at the other.

Example: MPD1A and MPD1B or MPD XXX A and MPD XXX B where XXX is any text.

Double-ended MPD roads

When there are other locos behind the leading one, they are ordered to move forward to fill the space vacated when the leading loco departs to perform a *task*. Shuffling forward makes room at the rear of the queue for returning locos.

While locos may be dispatched from either end of a double-ended departure road, care needs to be taken that returning locos do not interfere with departing ones. Normal operation entails one end being dedicated to dispatch from the queue and the other end to re-entering the queue. This is of no consequence when only one loco is allocated to the departure road.

The responsibility for returning a loco to an MPD lies with the schedule allocated to the driver of the loco. A loco does not need to be returned to the same MPD or departure road from which it was dispatched. If sharing of locos between departure roads is to occur, care needs to be taken that departure roads are not depleted of locos or overfilled.

Dead-ended MPD roads

Where it is not possible for the returning locos to return to the tail-end of a queue on a departure road, special precautions need to be taken to ensure that a loco at the head of the queue is not trapped by a returning loco arriving before this lead loco has cleared the MPD siding. To this end, a special access token is used to give access permission to returning and departing locos to cross the common track they must share.

A returning loco should be ordered to drive to the "dead" end of the road so as to make room for any other locos that might return. Each subsequent loco will approach the preceding loco and stop short of it. Please refer to the instructions dealing with the driver commands: **Approach Target Mark** and **Token Management 2** for details of how to use these commands.

Locomotive allocation at an MPD

If certain types of loco are to be allocated to particular tasks then best practice is to restrict each departure road to a certain type of loco and ensure that they are returned to the opposite end of their respective roads. For example, one departure road is reserved for low-power locomotives and another for high-power ones. In this way, a task requiring high power can be allocated to the high-power departure road, and so on. How to classify the departure roads depends on the nature of the tasks that the serviced industries generate.

INDUSTRY MESSAGES

An industry might produce or consume only one commodity or it might process several input and output commodities. It may or may not require wagons to be brought from and/or returned to sidings under SM supervision.

Internal Service Requests

Messages sent by an SM-compatible industry to request the transfer of loaded or empty wagons between industry sidings and an associated exchange group are referred to as "internal service requests". Such messages indicate which commodity is involved and the required state of the wagons (loaded or unloaded). Wagons are sourced at an exchange group and later deposited at the same or another exchange group.

External Service Requests

Messages sent by an SM-compatible industry to request the transfer of loaded or empty wagons between an associated exchange group and another exchange group or game portal are referred to as "external service requests". Because the industry is not monitoring the occupancy of exchange sidings, to assess when such a message needs to be sent the industry relies on advice in messages received from AI Drivers that shunt the exchange sidings.

Messages are specified in the config.txt file of the industry and appear in a drop-down list which is displayed by SM when setting up a task. The programmer modifying the industry is responsible for deciding on the wording of the messages.

The format of an industry message is KKK FFF-PPP/XXX/YYYY/ZZZ where :

- KKK is a keyword (e.g. **Deliver** or **Collect**). There may be more than one keyword intermingled with optional words.
- FFF is an optional qualifying word to make the context clearer. There may be more than one optional word intermingled with keywords.
- PPP is the name of the product to be handled. It is separated from the body of the message by a hyphen (-)
- XXX, YYY and ZZZ are additional parameters supplied by the industry if necessary.
- Please refer to the heading "SERVICE REQUESTS" in the [appendix](#) for full details.

SM was initially designed for the situation where a consist is *delivered* to an industry loading bay and left there for an interval determined by the industry, then the consist is either *collected* or it is *shunted* so that more wagons may be loaded/unloaded. This realistic design could not be made to work successfully with Trainz interactive industry scripts which anticipate loading/unloading to be completed in one continuous procedure. While SM supports separate delivery and collection tasks, these will not work well with interactive industries. There is, however, no problem when used to control wagon movements to and from scenery or buildable assets or

sidings that serve interactive industries (where the interaction with industry loading bays does not depend on AI-driven locomotives, e.g. a gravity-fed colliery loader).

One-shot operations

Consequently it was decided to develop SM so that it can also work with standard suitably modified Trainz interactive industries where a continuous moving load or stopped load is employed. In these cases the consist is delivered and then taken to its deposit siding immediately after the loading/unloading: the locomotive remains attached to the train for the whole duration.

This operation is named [One-shot](#) to distinguish it from the earlier design where 2 or more *service requests* were required to complete loading/unloading. Industries such as the built-in coal mine and the power station are examples of industries which perform one-shot operations when modified for SM compatibility.

Another two documents describe the modifications to an industry asset in order to make it compatible with SM. These are "Industry script edits for Shedmaster compatibility" and "Industry config-file edits for Shedmaster compatibility".

MESSAGES FROM TRAIN DRIVERS

During the course of developing SM it became necessary to provide commands whereby a train driver could request SM to either decide between alternative schedules or advise an industry to raise a service request.

Choose between alternative schedules

Trains that offer services to SM-enabled industries may travel over the route initially under schedules that were not allocated by SM. In particular, but not exclusively, this relates to trains entering the route via portals. The driver's initial schedule will carry the train to a decision point. At this point, the schedule issues a message to SM to decide between alternative schedules. The details of train driver messages that choose amongst schedule options are covered in Part 2 of this user guide.

Advise an industry to raise an external service request

As a consequence of the driver having dropped off or picked up a consist at an exchange siding, a siding may be filled or depleted of wagons. Such critical changes in siding occupancy may need to be addressed by the industry. As mentioned above in the Industry Messages > External Service Request section, the train driver may advise an industry to issue an external service request by sending an appropriate message to the industry. Keywords used in such messages are detailed below.

Further information is found in the [appendix](#).

KEYWORDS

Certain words contained in service request messages are designated as having special meaning to SM. These keywords are defined in tags in the extensions container of the config.txt file of SM. In the table below the word **wagons** is not a keyword, but a filler word without which the message would not make sense to a human reader. All the words in bold type are keywords.

Internal service request	Message originates from Industry
Deliver loaded wagons *	Wagons containing product are to be delivered to an industry from its exchange group
Deliver empty wagons *	Empty wagons are to be delivered to an industry from its exchange group
Collect loaded wagons	Wagons containing product are to be removed from an industry to its exchange group
Collect empty wagons	Empty wagons are to be removed from an industry to its exchange group
External service request	Message originates from Train Driver
Request loaded wagons	Advise industry to request loaded wagons for delivery to its exchange group from another exchange group or game portal
Request empty wagons	Advise industry to request empty wagons for delivery to its exchange group from another exchange group or game portal
Dispatch loaded wagons	Advise industry to request removal of wagons containing product from its exchange group to another exchange group or game portal
Dispatch empty wagons	Advise industry to request removal of empty wagons from its exchange group to another exchange group or game portal

* These requests are also used when the operation is a [one-shot](#) (collection immediately follows delivery of the consist).

RESERVATION OF WAGONS AND SIDING SPACE

Because (a) there is a time lag between issuing a service request and the task's execution, and (b) multiple industries are able to access the same sidings for wagons or storage space, it becomes necessary to institute a system to reserve wagons and space that will be required to meet service requests. Rather than holding a register of every wagon in the session, SM maintains both a

count of wagons on each source siding that are currently dedicated to outstanding tasks, and a measure of space to be occupied on each deposit siding by currently-outstanding tasks. This record keeping process was dubbed "earmarking".

Earmarking source sidings

When SM allocates a rake of wagons it increases the number of earmarked wagons on the chosen siding, but does not know when the wagons are removed. The schedule of the train removing the wagons must issue an instruction to SM announcing the removal of wagons so that the records can be adjusted.

At the same time, the loco coupling to the wagons in the designated siding must uncouple any wagons surplus to industry requirements, otherwise wagons will be carried unnecessarily and a mixed consist (loaded and unloaded wagons together) will result.

The driver command to decouple surplus wagons is combined with the one to advise SM of the removal of wagons into one command: **Decouple or Release Marked Wagons**. The name is so chosen because at times there will be no surplus wagons, yet the release of earmarks wagons still needs to take place.

Earmarking deposit sidings

Space on a siding is reserved for the future deposit of a rake of wagons by noting the length of the expected consist and earmarking that amount of space on the chosen deposit siding. When the deposit is made the loco needs to be uncoupled from the rake. By using the special **SMC:Decouple Locomotive** command the records of space are automatically adjusted downwards by the length of the deposited rake.

Force clearing of earmarks

There may be a situation where it is not convenient to use one or the other special driver commands when sourcing or depositing a rake. An additional pair of driver commands is provided to perform the resetting of the earmarks on either the source or deposit sidings: **SMC:Clear Earmarks at siding**. Bear in mind that these instructions completely erase the records of wagons and space earmarked.

SETTING UP SHEDMASTER

Creating a successful session requires good initial planning and lots of experimentation and modification of the arrangements – in other words, trial and error.

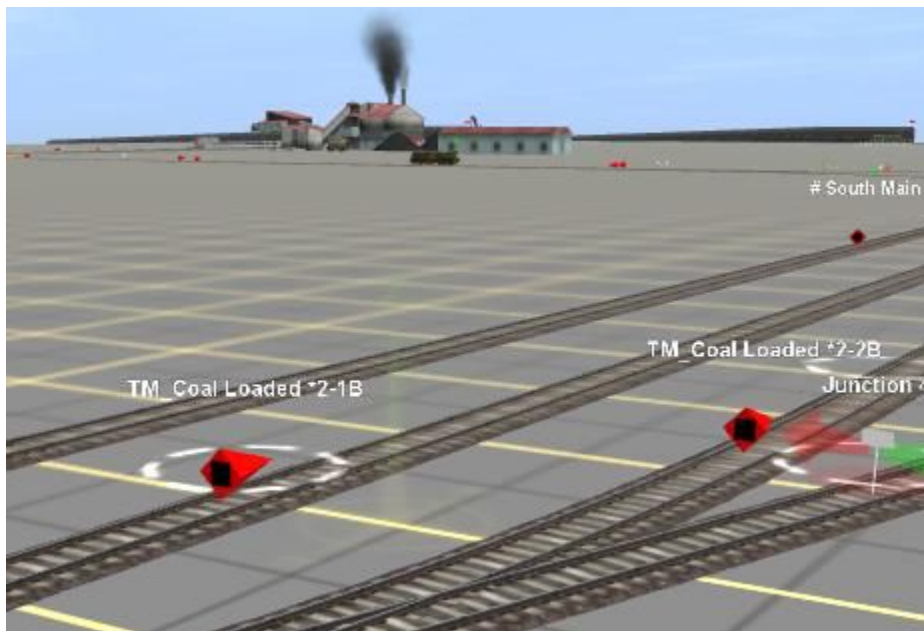
Some SM compatible industries need to be added to the map and some appropriate siding groups defined. Most SM-compatible industries will be SM **disabled** by default. For each instance of an SM-compatible industry that you wish to interact with SM within a session, the Properties window must be opened in Surveyor, and the SM-enabling Boolean variable toggled to 'true'.

Before starting to configure SM it is advisable to add the Schedule Library rule to the session

and create some schedule entries. The names and details of the schedules can be adjusted later. Lets define two siding groups, 1 and 2, to house empty and loaded coal wagons.



Group 1



Group 2

Add Shedmaster rule to the session and edit it.



Figure 1 shows the properties window of Shedmaster:



Figure1

Begin by clicking Add Task. A drop-down list of message sources is presented.

Select the name of an industry that will send a message to SM.



Figure 2



Each row represents one [task](#) which needs to be carried out when the specified industry or train driver sends the Service Request message specified above in the **Message From** column. The underlined words are links that produce menus of choices when clicked.

Clicking on a link in the **Service Request** column produces a list of possible messages that could be sent by the industry selected in the **Message From** column or by a driver if "driver message" is selected.

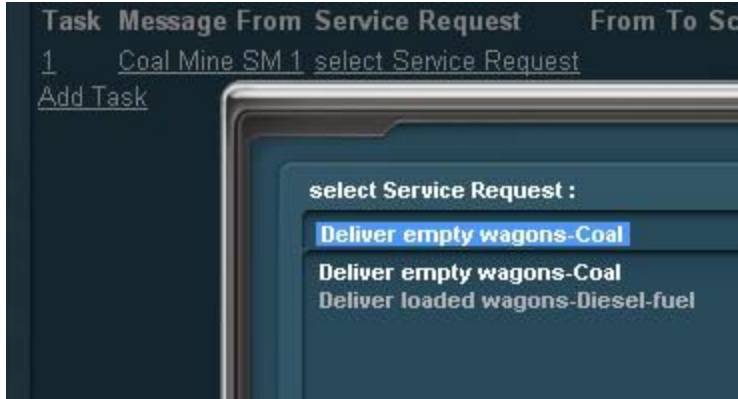


Figure 4

An industry/driver message is scanned for the presence of the word "loaded" which is set up in config.txt of SM. If the word is found then SM treats the operation as one where goods are delivered to the industry in loaded wagons from an [exchange group](#). If not found, SM assumes that the task facilitates removal of goods from the industry (by delivering empty wagons and/or collecting loaded wagons) or, in the case of a shunt, provides no wagons at all from an exchange group.

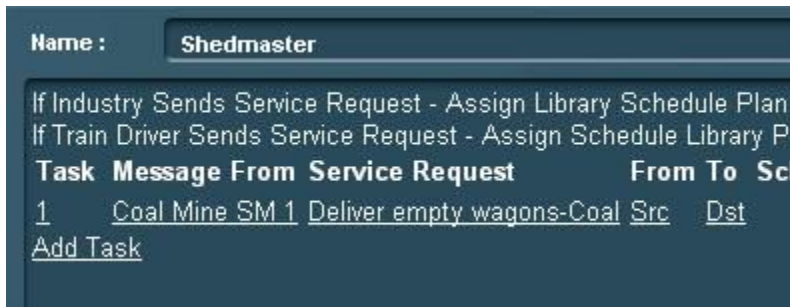


Figure 5

The siding [group](#) number where wagons are to be *sourced* is typed into the **From** column



and the group number where the wagons will be *deposited* is typed into the **To** column.

A letter "A" or "B" must be added to the group number to indicate from which end the siding will be entered. Remember to include only the group number and the end letter.



Figure 7:

Delivery or collection or both?

A [delivery](#) is defined when only the **From** column of a task has a group number. A [collection](#) is defined when only the **To** column is filled in. If *both* columns contain a group number then the operation is a [One-shot](#) as shown in figure 7, and if neither, the operation is a [Shunt](#).

Clicking on the "select schedule" link lists all the library SM schedules available for that particular industry and the user chooses the one appropriate to the task at hand.

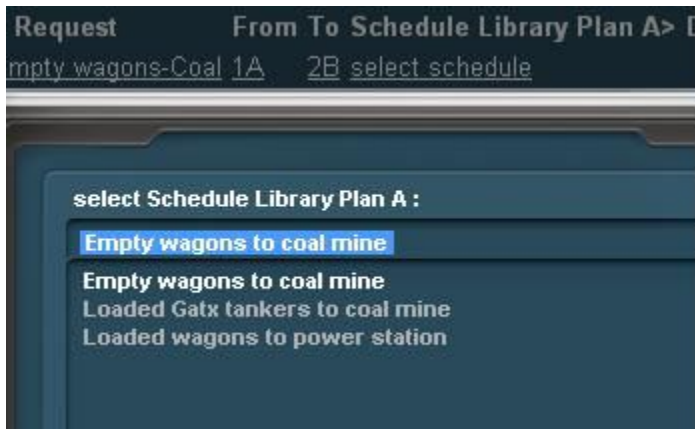


Figure 8



In the **Departure Road** column the user must specify which MPD trackmark to use when dispatching a loco.



Figure 10

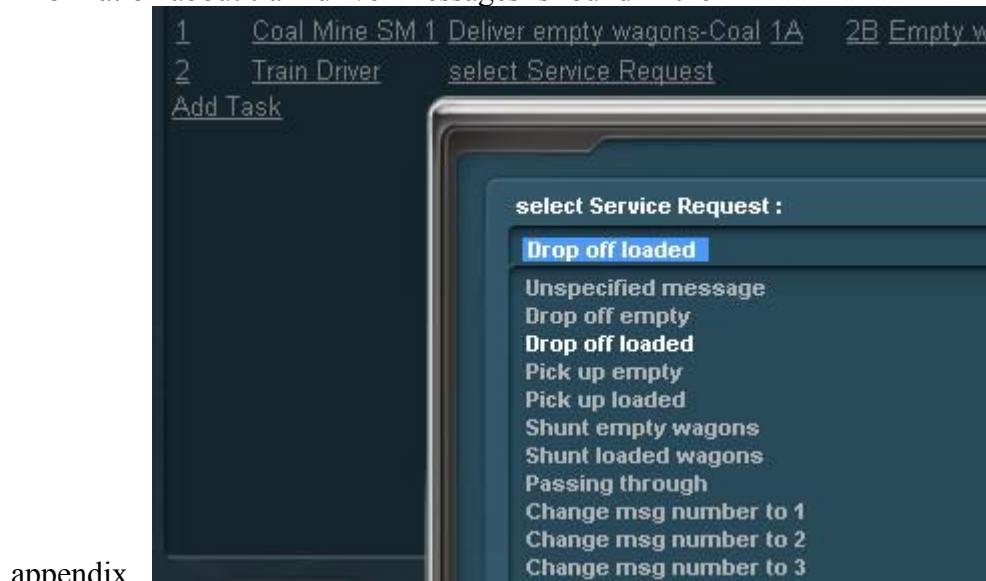
Figure 11 shows the completed task. This is a one-shot – the consist is sourced, loaded and deposited all in one operation. Clicking on the text in the **Message From** column refreshes the links in the *From* and *To* columns if they are lost.

Task	Message From	Service Request	From	To	Schedule	Library	Plan A>	Departure Road
1	Coal Mine SM 1	Deliver empty wagons-Coal	1A	2B	Empty wagons to coal mine			MPD1A

Add Task

Figure 11

If the message source is a train driver then a preset menu of messages is presented. More information about train driver messages is found in the

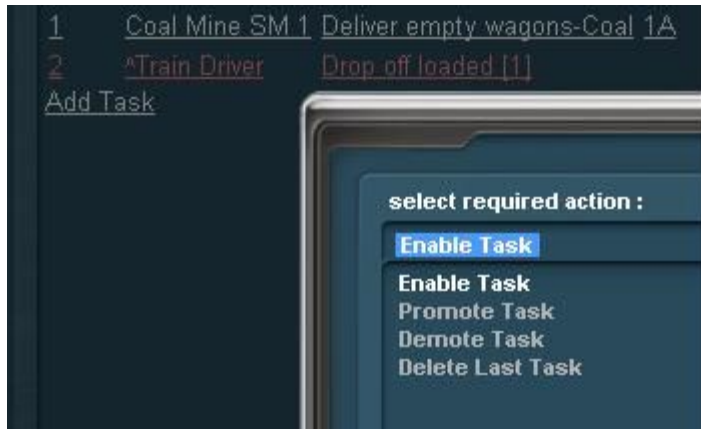


appendix.

As tasks are added to the SM configuration, task numbers increment down the first column. Each **Task** number is a **clickable link** that presents a menu of options for re-ordering the tasks .

Item 1 is to **disable** a task. The task row colour changes to pink. The menu changes to Enable Task on clicking the disabled task number again. Tasks can be promoted or demoted, changing their position in the window.

Only the last task can be deleted. This happens when the window is saved and reopened.



REQUIRED DRIVER COMMANDS AND RULES

Certain driver commands are needed to instruct the train driver where to go and what to do.

- Shedmaster Command
- Approach Target Mark
- Token Management 2
- Driver Communication
- Special Instructions

The following rules are also used:

- Schedule Library
- Shedmaster rule
- Copy Commands From
- Message Console rule (optional)

SHEDMASTER COMMAND (SMC)

This is a special driver command which provides numerous menu options.

The menu is divided into three sections:

1. Options concerning source sidings

Navigate to siding	Drive the train to the end (A or B) of the active source siding of the exchange group specified in the <i>From</i> column of the SM properties window.
Couple at siding	Couple to the first vehicle found at the <i>active source</i> siding of the <i>exchange group</i> specified in the <i>From</i> column of the SM properties window.
Set Path from TM to loco	Sets up the junction levers so that the train can autodrives to the source trackmark. The loco must be behind the trackmark (A or B) of the selected siding group.
Set path from opposite TM to loco	Sets up the junction levers so that the loco can drive through the <i>source</i> siding to the opposite-end siding, coupling to any vehicle encountered. The path search is conducted from the opposite siding trackmark, through the siding to the loco.
Autodrive to siding	Autodrives to the trackmark identified by SM as the target in the <i>From</i> column of the SM properties window.
Navigate to opposite marker	Drive the train to the terminating marker at the other end of this <i>source</i> siding.
Decouple or Release Marked Wagons	Decouples vehicles surplus to industry requirements. Removes the earmarked wagons from the reserved list for the allocated siding.
Clear earmarks at siding	Removes the earmarked wagons from the reserved list for the allocated siding.
Register siding trackmark	Records the identity of the entry-end trackmark on the <i>active source siding</i> of an <i>exchange group</i> . This allows other commands to access the trackmark which would otherwise be unknown. An example is when the length of the rake on an <i>active</i> siding needs to be measured.

2. Options concerning deposit sidings.

Navigate to siding	Drive the train to the end (A or B) of the <i>active deposit</i> siding of the <i>exchange group</i> specified in the <i>To</i> column of the SM properties window.
Couple at siding	Couple to the first vehicle found at the <i>active deposit</i> siding of the <i>exchange group</i> specified in the <i>To</i> column of the SM properties window.
Set Path from TM to loco	Sets up the junction levers so that the train can autodrives to the <i>active source</i> siding's entry trackmark. The loco must be behind the trackmark (A or B) of the selected siding group.
Set path from opposite TM to loco	Sets up the junction levers so that the loco can drive through the <i>deposit</i> siding to the opposite-end, coupling to any vehicle encountered. The path search is conducted from the opposite siding trackmark, through the siding to the loco.
Autodrive to siding	Autodrives to the trackmark identified by SM as the target in the <i>To</i> column of the SM properties window.
Navigate to opposite marker	Drive the train to the terminating marker at the other end of this <i>deposit</i> siding.
Decouple at siding	Decouples the wagons remaining within the siding markers. Used when the deposited consist is too long to fit into the given siding.
Clear Earmarks at siding	Removes the earmarked space from the reserved list for the allocated siding.
Register siding trackmark	Records the identity of the entry-end trackmark on the <i>active deposit</i> siding of an <i>exchange group</i> . This allows other commands to access the trackmark which would otherwise be unknown. An example is when the length of the rake on an <i>active deposit</i> siding needs to be measured.
Mark siding inactive	Resets the active siding so that other trains may use it.

3. General options

Couple to vehicle ahead	Couples to whatever vehicle is ahead of the loco. Does not refer to any SM trackmark info, so this command can be used externally if desired.
Decouple locomotive	Decouples the locomotive or tender if present. Removes the earmarked space from reserved list.
Couple at leading end of consist	Used when shunting to couple to the vehicle that was closest to the <i>active source</i> siding's entry trackmark at the time of sourcing the consist. Can only be used if a delivery of wagons was made to the industry. The name of the leading vehicle is stored by SM at delivery time for later use during coupling.
Couple at trailing end of consist	Used when shunting to couple at the other end of the consist. Can only be used if a delivery of wagons was made to the industry. The name of the leading vehicle is stored by SM at delivery time for later use during coupling.
Toggle diagnostic message flag	Advance the Shedmaster diagnostic messages flag to provide more detailed information for diagnosing problems in sessions. Four levels – 0 to 3.

DRIVER COMMUNICATION driver command

A driver command allowing a train driver to send messages either directly to SM or via an industry. Find more information in the [appendix](#).

TOKEN MANAGEMENT 2 (TM2) driver command

A method for preventing a train from trying to occupy tracks that are needed by another train. A token is awarded to the requesting train if it is not owned by another driver. Any other trains requesting the token are forced to wait until the token owner releases his token. Please read details entered under the "description" tag of the asset's config file.

MESSAGE CONSOLE RULE (FIXED)

This rule <kuid:160293:10001> is on the download station and creates a window for displaying special messages which are sent by SM . The messages are not vital but provide a record of which tasks are being executed and, when diagnostics is turned on, information that assists in identifying the cause of problems.

APPROACH TARGET MARK (ATM) driver command

This command was written to overcome the difficulties encountered when trying to bunch locomotives together on MPD departure roads.

Some locos tend to stop more slowly than others so three "approach distances" were set up to accommodate different loco characteristics.

The first three options of the command try to move the loco slowly towards the target trackmark while watching out for intervening locos standing between it and the target. If the loco executing the ATM command gets too close to an intervening loco, it stops and waits for the latter to move away. A terminating trackmark must be specified to limit the movement of the loco. In the context of SM, the terminating trackmark is the one at the head of the loco's departure road. These command options respect speed limits and wait at closed junctions but ignore signals and direction markers.

Other options have been added to the command. The second three options allow the command to terminate after a short delay. This is useful when depositing a rake at a siding where no coupling must be performed.

Several couple-to options are also available. These can be used for navigating to trackmarks and coupling to the vehicle ahead. When no wagons are situated in the path of the loco the **Couple** options perform as **Drive To** options.

Any trackside item with a name starting with the letters "END" serves as an end marker which can be used to terminate a siding or act as a target for the option "Couple or drive to end marker". This option also treats triggers as end markers if the name begins with "Trigger".

The **Drive via trackmark** option is able to respect signals and speed limits. It can be used to drive at high speed along tracks where the path has been preset. The speed is controlled depending on the distance to the next signal or track obstruction. Speeding is sometimes observed.

SPECIAL INSTRUCTIONS (SI) driver command

A specialized command that gathers a few often-used commands into one and provides some unique new options. It is required to provide certain information needed by SM. Below are those options used when working with Shedmaster.

Option	What it does
Get Last Wagon ID	The identity of the last vehicle on the train is stored in a session variable.
Decouple Loco and tender	The locomotive is decoupled from the train. If the loco has a tender then the uncouple point is at the tender.
Couple to Last Wagon	After navigating the loco to a point near the rear of the train this command causes the loco to locate and couple to the last wagon identified by the 'Get Last Wagon ID' command. Useful when 'Runaround Train' will not work.
Register Product	Allows the user to nominate a particular commodity carried on the train or to be collected at a siding as the product on which Shedmaster will focus its attention.
Measure Train at Trackmark	Performs various measurements and stores the results in session variables. These values are then accessible by other driver commands to make decisions about train movements.
Measure Train at Registered Trackmark	Measure the consist located on a siding specified by Shedmaster. Refer to SMC: Register Siding Trackmark.
Apply Brakes	Applies the handbrake on the vehicles of this train.
Toggle ATM diagnostics	Enables or disables diagnostic messages that are useful in tracing faults when using the "Approach Target Mark" driver command.
Reverse Train Direction	Changes the train direction.
Reset Train Direction	Sets the direction of the loco to "Forward".
Reverse Loco	Not prototypical, but turns the loco around so that the driver is at the front of the train. (steam locos excluded)
Stop Train, wait	Waits for the train to stop before commencing a timed delay.

SETTING UP THE SCHEDULE LIBRARY

The schedule library rule is built-in to TS2010 and higher versions. It stores sequences of driver orders so that they can be inserted into the schedule of the train driver either by using the **copy commands from** driver command or automatically under control of SM.

Certain special driver orders are needed to inform the AI Driver which siding of a group has been selected by SM to comply with the [service request](#). These are all available in the **Shedmaster Command** driver command described above.

It is important to follow certain practices when setting up the schedule:

- When a loco delivers a consist to a siding it must be able to stop in time to ensure that the consist falls within the limiting trackmarks. SM will search into the siding between these trackmarks to locate wagons suitably stocked to meet the industry requirements.
- Wagons being deposited at a siding should be propelled, rather than pulled. This is to prevent the loco from being trapped if there are some wagons already on the siding.

A typical delivery library schedule

Delivery involves locating suitably configured wagons at a [source](#) siding group and conveying them to the requesting industry for loading or unloading.

SM measures the amount of product available or required by the industry and "[earmarks](#)" sufficient wagons on the active siding to meet the industry needs. If insufficient wagons are available on the [active](#) siding then other sidings in the group are considered. If no sidings meet requirements then the task is queued until more wagons arrive.

The schedule library should be structured as below:

- The driver must be instructed to navigate his loco near to the start of the siding group where vehicles will be found. (This may not be necessary if the couple command below can be executed directly)
- On arrival, he must be issued a command from the menu options in SMC to couple to the nearest vehicle standing in the active source siding identified by the *From* column of the SM properties window. (SMC: Couple at Src Siding)
- Once coupled, the surplus wagons must be decoupled. (SMC: Decouple or release marked wagons)

There are two reasons why this must be done:

1. To ensure that only the required wagons are conveyed to the industry. Taking more wagons than are required will result in mixed-status wagons (some loaded and others not) occurring on the [deposit](#) sidings.
2. The wagons requested are allocated to the train by a process named 'earmarking'. This

prevents SM booking the same wagons to several different tasks. When the loco decouples the surplus vehicles it also wipes out the earmark so that SM, when assessing the next service request, can consider as available all the unreserved wagons remaining in the siding.

- The loco driver is then instructed to navigate to the industry that requested service and either load or unload the product.
- The driver can now decouple the loco and return to its MPD (SMC: Decouple loco)

A typical collection library schedule

Collection involves locating and earmarking a vacant space on a deposit siding and then collecting empty or loaded wagons at an industry and conveying them to the selected siding. If there is insufficient space on the active deposit siding then SM tries other sidings in the group until a suitable one is found. If there is no space available then the task is queued until such time that space is freed.

- Navigate the loco to the area near where the target wagons stand.
- Instruct the driver to couple to the leading or trailing end of the consist at the industry loading bay, whichever is more convenient (SMC)
- The driver must now navigate to the deposit area such that the loco is the furthest vehicle from the deposit siding trackmark, preparatory to reversing into the siding.
- He should then set the path to the deposit group if necessary (SMC: Set path to Dst trackmark)
- And couple to the first vehicle found at the active deposit group siding. (SMC: Couple at Dst Trackmark) Note: If there is no vehicle at the deposit siding then this command is ignored and the next one is executed.
- To ensure that all the wagons are driven past the leading trackmark the driver must drive the train to the opposite end of the deposit siding (SMC: Navigate to opposite Dst TM)
- The loco should be decoupled using the SMC "Decouple Loco" command. This also cancels the earmarked space on the siding.
- The loco then returns to its MPD.

A typical shunt library schedule

Wagons involved in a service request are sometimes already at the industry or located on track that is not part of a siding group under SM supervision. The handling of such wagons has been named a *shunt*.

- Navigate the loco to the area near where the target wagons stand.
- Couple at leading end of consist or at trailing end of consist, whichever is convenient for the shunting loco (SMC)
- Perform the shunt of the consist.
- Decouple the loco and return to MPD (SMC: Decouple loco may be used here because the deposit siding is undefined, and no earmarking is involved).

A One-shot library schedule

Here the industry does not need to shunt the consist and the deposit operation follows immediately after loading or unloading. It is a combination of delivery and collection.

Follow the principles set out for collection and delivery above.

- Navigate to source group and couple at active siding (SMC)
- Decouple surplus vehicles (important step, do not omit) (SMC:Decouple or Release Marked Wagons)
- Navigate to the industry and load/unload the wagons.
- Navigate to deposit group and couple at deposit trackmark. Note that this command is ignored if there is no wagon on the deposit siding. (SMC)
- Navigate to opposite siding marker (SMC)
- Decouple loco and return to MPD (SMC). Decoupling includes clearing the earmarked space.

APPENDIX

Exchange yard design

Yards, Groups, Sidings and Functions

Sidings are collected into *groups*. Each siding in a group can be either inactive or currently performing 1 of 4 *functions*:

1. A source of empty wagons for industry output
2. A source of loaded wagons (inputs) to an industry
3. A deposit site for empty wagons that have been unloaded at an industry
4. A deposit site for loaded wagons that have collected industry output

Groups with four or more sidings can perform all of the above functions on one commodity. Excess sidings, where more than 4 exist in a group, are spare and available for allocation to a function for which the current active siding has become exhausted. Groups with less than 4 sidings would typically be *dedicated* to one function, or two functions on one commodity, such as functions 1 and 3 or 2 and 4.

There may be more than one group dedicated to handling the same commodity. Usually these similar groups would be separated geographically, whereas groups with different functions for the same commodity, and/or for different commodities could well congregate in a yard. An *exchange yard* is a collection of *groups* where wagons are exchanged between carriers. A common type of exchange yard conducts an exchange between a private carrier serving an industry directly and a common carrier that brings industry inputs from, and takes industry outputs to, locations remote from the industry.

Every group has a set of four pointers numbered (P1 – P4) that indicate which siding has been allocated the function represented by each *pointer*.

Assigning initial functions to a siding

The session planner can allocate one function to each siding in a group, to a maximum of four functions. This is accomplished by prefixing the special identifier character with a function number. Refer to [Track mark naming conventions](#) below for details.

This initial allocation is not fixed; the function can change under normal operations.

If a siding is not allocated an initial function then SM allocates an appropriate function as needed. This decision is made for each siding when an industry service request (SR) causes a *scan*. Depending on the result of the scan, the scanned siding is allocated one of the four possible functions or remains inactive.

An active source siding becomes inactive when all the wagons have been removed. An active deposit siding becomes inactive when there is no remaining space. SM allocates another siding if possible. Once the inactive siding has been refreshed (full sidings emptied or empty ones replenished) it is available to be activated when SM needs to do this.

'Dedicated' groups

If the tasks involved in servicing an industry draw their wagons from one group and deposit them in another group then the two groups are said to be *dedicated*.

This implies that, for all tasks in which the group is used: (a) the group would only be identified in either the To or From column of the SM configuration window for each task, not both; and (b) the loading of the wagons involved was the same - all empty or all loaded (not some tasks requiring empty wagons and others loaded wagons).

Dimensioning groups

Consider an industry producing one commodity. It sources wagons from group X and deposits the output in group Y. At least two sidings are recommended per group but three or more will improve the flow as sidings are filled or emptied. In order to maintain the flow, deposited wagons need to be removed and the sourced wagons need replenishing. Having spare sidings in a group makes it easier to replenish low stocks of wagons or remove surplus ones. The more sidings, the less chance of congestion.

Where two complementary industries (one produces a commodity and the other consumes it) are located near one another, and therefore can share the same *exchange yard*, it is possible to cover both industries' operations using *dedicated* groups of two or more sidings.

- The producing industry draws empty wagons from group X and the loaded output is deposited in group Y.
- The consuming industry draws loaded wagons from group Y and deposits the empties back in group X.

Provided that the production and consumption of the complementary industries is balanced the

quantities of wagons on the sidings will remain stable.

A one-siding dedicated group

A group with only one siding can only be assigned one function, such as being the source of loaded wagons. Once the stock on the siding is depleted the siding becomes inactive. The siding is replenished by a common carrier train which drops off wagons at inactive sidings. Once replenished the siding can revert to being a source loaded siding.

'Common' groups

If an industry producing one commodity sources wagons from group X and deposits the output back in group X then group X is a common group. A common group contains mixed wagons but not mixed within a siding.

The advantage of a common group is that as the wagons ebb and flow the boundary between loaded and unloaded wagons is not fixed and a surplus of one or other type can be accommodated in the spare sidings.

In terms of the configuration of SM, *a common group is indicated by the From and To columns containing the same group number*. Such an arrangement requires at minimum one siding but this is obviously very restrictive.

Tolerance when scanning a siding

Occasionally an industry will fail to load or unload some wagons. If a *scan* for loaded wagons encounters up to three empty wagons anywhere in a consist that is supposed to contain loaded wagons, the erroneous vehicles are accepted and not included in the *calculations*. Finding more than three empty wagons will cause the SR to reject the siding and try the next. The same applies to loaded wagons encountered on a siding that is supposed to contain empty wagons.

Track mark naming conventions for groups and their sidings

When SM builds an internal picture of a siding group it discards all track marks that do not contain the special siding identifier character in the name.

A track mark is considered part of a group if it contains an asterisk (*).

Following the asterisk is a group number and a siding number within a group, separated by a hyphen.

Preceding the asterisk is an optional digit to assign an initial function to the siding.

When diagnostic level 3 is selected (**SMC:MessagesToggle diagnostic message flag**) the names of sidings found within the group being searched are displayed in the message window (at the bottom of the screen, only once per session). The amount of sidings that were assigned initial functions is also displayed. This aids in diagnosing wrongly named siding trackmarks.

The general form of an SM trackmark is: XXXX_PRODUCT F*GG-SSL where

- XXXX is a text identifier of any length, such as "TM_ "
- PRODUCT is the name of the commodity served e.g. Coal. This optional term documents the usage of the siding.
- F is a digit (1-4) designating the initial *function* of a siding that will be active at the session start. See note # below.
- * is a siding identifier character as defined in config.txt of SM
- GG is the group number (1-99)
- - is a mandatory separator character as defined in config.txt of SM
- SS is the siding number (1-99).
- L is a letter designating one end of the siding (A or B)

A Space between the product and the function digit is recommended.

Group and siding numbers can be one or two digits as needed.

Note #: *Dedicated* groups should have one or, in the case of complementary industries, two sidings designated with the appropriate function. Complementary industries are defined in para 2 under heading DIMENSIONING GROUPS above.

In *common* groups, four sidings should be chosen and each assigned a unique function. See section above titled " Yards, Groups and Sidings and Pointers" for a legend to function digits.

Example 1: **TM_Coal *3-1A**.

Example 2: **TM_Diesel Fuel 4*16-2A**

If a siding is intended to be accessible from either end (a 'through' siding), the track marks at the other end of the sidings in the above examples must be named

TM_Coal *3-1B and **TM_Diesel Fuel 4* 16-2B**

If a siding is accessed from one end only, a siding-end marker (kuid:368725:90010) may be optionally placed at the other end instead of an ending trackmark and given the name:

END AAA where 'AAA' is an optional alphanumeric string.

Siding numbers (SS) must start at 1 with no gaps allowed. The sidings do not need to lie in sequence on the map, as long as they are all present.

Group numbers (GG) do not need to be sequential, i.e. gaps in the sequence are permitted. The array of variables storing groups assumes a starting group of 1 and unused numbers will have a placeholder in the array.

At session start SM displays the number of the highest group used in the session (not the highest group defined in the map).

Wherever possible the naming of siding trackmarks is checked and warnings posted if errors are detected. Unfortunately, some mistakes cannot be identified and will only become apparent when a train does not behave as expected. Use of the diagnostic messages can help to locate errors.

The separator character is defined in SM config.txt string-table under tag "siding_separator" and is set to "-" hyphen. Changing this setting will render sessions incompatible with standard maps.

The separator character may not be @ * # % & underscore, space , alpha characters or digits 0-9.

The XXXX and PRODUCT portion of siding track marks is of no interest to SM. Each siding could use a different wording as long as both the A and B end have the same base name. Using a meaningful name makes it easier for the session planner to pick out groups and track marks.

SERVICE REQUESTS

The basic service request (SR) is specified in the following format.

- a. For *deliveries* and *one-shot* operations use the *keywords* **Deliver loaded** to indicate that the industry is expecting the product to be supplied in loaded wagons (input), and **Deliver empty** when product is to be removed from the industry. SM will *source* the wagons from a siding performing the appropriate function (empty or loaded).
- b. For *collections* use the keywords **Collect loaded** or **Collect empty**. SM needs to know if the wagons will be loaded or empty so that the appropriate deposit siding can be located.
- c. *Shunts* are operations where neither source nor deposit sidings are specified therefore no specific keyword is needed in the text. Use words that indicate what is required.

The format is:

Delivery	Deliver loaded wagons–PRODUCT Deliver empty wagons–PRODUCT
Collection	Collect empty wagons–PRODUCT Collect loaded wagons–PRODUCT
Shunt	Shunt–PRODUCT

The filler word ‘wagons’ is optional. The hyphen (–) is a mandatory separator.

‘PRODUCT’ is the asset username of the commodity to be transported.

Where an AI Driver, in performing a task, must be directed to one siding in a group at an industry, a Shedmaster Driver Command (SMC) could not normally be used because SM does not control industry groups. To enable the use of an SMC command, the industry script must provide additional information at the time of raising the SR that activated the task. In particular, the SR must specify the *start* and/or *end* sidings for wagons moved in accord with the task.

To specify the sidings associated with an SR, a suffix is introduced to the SR format. The suffix contains the names of the track marks placed at the entry points to target industry sidings. One or two ‘slash’ separator characters (‘/’) are placed after the product descriptor.

- The track-mark name that points to the *start* siding from which wagons are to be moved in accord with the task, follows the first slash. If no *end* siding name is present, then there is no second slash.
- The track-mark name that points to the *end* siding to which wagons will be moved in accord with the task, follows a second slash. If no *start* siding name is present, then the 2 slashes must be separated by a space character.

The extended format is:

Collection	Collect empty wagons–PRODUCT/<start TM NAME> Collect loaded wagons–PRODUCT/<start TM NAME>
Delivery	Deliver loaded wagons–PRODUCT/<space>/<end TM NAME> Deliver empty wagons–PRODUCT/<space>/<end TM NAME>
Shunt*	Shunt-PRODUCT/<start TM NAME>/<end TM NAME>

The filler word ‘wagons’ is optional

'-' (hyphen) is a mandatory separator

'/' is a mandatory separator

<space> is mandatory whitespace

'<TM NAME>' is the in-game name given to the track mark.

* It is not mandatory for the industry to supply either the start or end names if the loco driver’s schedule assigns a fixed location for start or end instead.

Where industry sidings specified in SR suffixes have track marks at the entry-end only, then the remote end of the siding must be marked by a trackside object such as a buffer stop. Where no existing trackside object is available, siding-end marker (KUID:368725:90010) may be used. This marker provides a known terminator that is required by SM to conduct searches of the siding, otherwise the search may continue indefinitely and the script will falter. The name given to such markers must conform to:

END AAA where 'AAA' is an optional alphanumeric string.

Extended-format Example: A gravity-fed coal loader

Task	Example SRs ('WC' is Wollstanton Colliery ID)
1	Take empties from a source siding in an Exchange Group dedicated to empty coal-carrying wagons to the 'Empties' Colliery Group
Delivery (empty)	Deliver empty wagons–coal/ /TM_WC_Empty_LRLR Deliver empty wagons–coal/ /TM_WC_Empty_RLRL
2	Take loaded wagons from a 'Full' Colliery Group to a deposit siding in an Exchange Group dedicated to 'coal of small grade' or 'coal'
Collection	Collect loaded wagons–coal of small grade/TM_WC_Full_Small_RRL Collect loaded wagons–coal/TM_WC_Full_Best_RL

Managing siding resources using driver messages

With the addition of the guards van to arriving trains, a complication arose in connection with the earmarking and release thereof.

Lets take the case of a train of empty coal hoppers arriving from a portal. As well as reserving the space on the siding it is also necessary to increase the earmark count by the number of wagons in the consist (excluding the guards van). This is so that when the loco uncouples to collect the van, SM is prevented from immediately grabbing the wagons. The sequence is thus:

- Train spawned at portal
- Register product command is issued e.g. coal. This causes a search for wagons that have a coal queue, starting at the last wagon. See Note 2 below.
- If the specified queue is found the wagon count is incremented and the search continues. The length of the wagon is also accumulated.
- If the wagon does not contain the required queue the search is terminated and the count is returned. Exception: If the wagon is the last one on the train it is ignored and the search continues.
- A session variable is set up containing information derived from above steps.
- Driver Communication command issued. Currently there are 20 DC commands in the drop-down list. Each command can be an unspecified message or have sub-goals called Service Types.
 1. Drop off Empty Wagons
 2. Drop off Loaded Wagons
 3. Pick up Empty Wagons
 4. Pick up Loaded Wagons
 5. Shunt Empty Wagons
 6. Shunt Loaded Wagons
 7. Passing Through. (No wagons involved.)
 8. Unspecified Message This is for trains not intending to deposit or source wagons.

Each of the above commands carries the message number in brackets.

The number in brackets is appended to the message so that a driver can use the same service type at different siding groups.

- An optional Navigation command is issued.

At this stage SM scans the sidings of the specified source or deposit sidings and takes action:

- If the requested product or space is found at the specified siding a *new schedule* (Plan A) is appended to the train's running schedule.
- If the request is rejected then *Plan B* is appended to the train's running schedule.

Exception: If the task line in SM contains no *Plan B* then the train's *default schedule* is left intact.

SM earmarks the required space on the siding and also earmarks the number of vehicles expected.

The train now arrives at the deposit siding neck. Assuming that it is able to drive forward into the siding, this is a typical command sequence:

1. **Set Path to Dst siding trackmark.** Note: The Dst trackmark must be the one nearest to the loco because the path search extends backwards from the trackmark. If the loco is on the A side of the siding then it must set the path to the A trackmark.
2. **Autodrive to opposite Dst trackmark.** This is possible if there are no junctions after the Dst trackmark.
3. **Special Instruction: Stop train, wait x seconds.** Combines Stop train with a choice of wait time.
4. **Special Instruction: Get ID of last vehicle.** A session variable stores vehicle name.
5. **SMC: Decouple loco (and tender).** The earmarked space is released by this command, so it is important to use this command and not another uncouple one. The wagon count earmark is still in effect. Note: Using run-around is not advisable since there is no position where the above command can be fitted in.
6. **Navigate to** the other end of the consist, requesting tokens where necessary.
7. **Special Instruction: Couple to last vehicle.** Retrieves the vehicle name from the s-var.
8. **SMC: Release Marked Vehicles.** Because the command knows that it was issued by a driver message dropping off wagons, it uncouples from vehicle #1, separating the van from the rest of the consist. In addition the earmarked wagon count is cleared, and the session variable is destroyed.

Note: If the loco has a tender the above vehicle number needs to be modified. This coding has not yet been done. See note 1 below.

9. **Navigate to** neck of van storage yard, requesting tokens as necessary.
10. **Couple at trackmark.** Various commands could be suitable for this part of the session.
11. (Optional) **Drive to opposite trackmark.** To make sure the van clears the leading trackmark.
12. **SI: Decouple Loco (and tender).** (An alternative decouple command)

13. **Navigate to** suitable location and await further orders.

The case of a train picking up loaded wagons has yet to be tested and debugged.

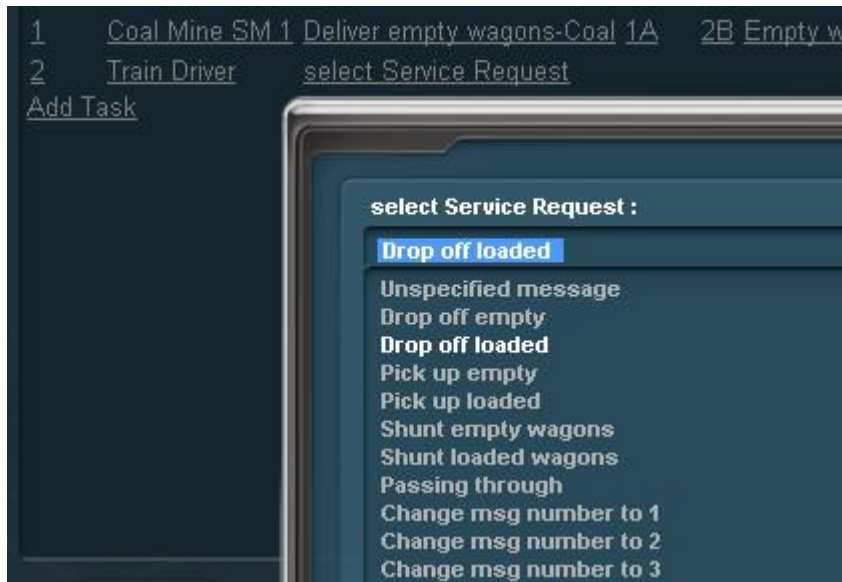
Note 1: Also important is to consider what happens if the arriving train does not have a guard van:

Step 5 above is still effective but would need to be preceded by step 8 to release the earmarked wagons. A slight problem arises because step 8 uncouples vehicle #1. Steps 4, 6, 7, 9,10, 11 and 12 would be omitted. It might be possible to detect the presence of a van by examining it's queues or by comparing the number of earmarked vehicles with the consist length. If it can be established that there is no van the command in step 5 could modify its behaviour, solving the problem.

It may also be possible to do this when the driver message is issued, provided that a mono-product load is on board.

Note 2: One reason for searching from the rear is to provide for the possibility of multi-product trains arriving. The first product registered is sought and if it fails, plan B could then drive the train to a siding and uncouple the wagons containing the unwanted product before trying again.

How Driver Messages appear in Shedmaster properties screen.



- Click on **Add Task** to present a list of message sources, select **Train Driver**.
- Click the check mark to accept the selection. A select service request link appears.
- Click the link to view a list of driver messages.
- Select the desired option and click the check mark to accept the selection.

Notice that the appropriate To or From column will be enabled.

Also, the selected message has a number in brackets: e.g. Drop off empty[1].

This number does not relate to the number of wagons being handled.

To change the number in brackets, click the link in the **Message** column and from the drop-down list select Message N where N is the number you want. E.g. Selecting Message 5 will change the message to Drop off empty[5].

Selecting **Unspecified Message** will change the text to Message[1] and selecting one of the other options will change the text accordingly.

The choice of library schedule names is up to the user but it can make things easier if the schedule names have numbered extensions. Task 5 invokes the 4th instance of the message Pick up loaded and is matched to the schedule Pick up loaded Coal via South Main[4]. The use of different extension numbers makes it easier to plan tasks that are similar but use different library schedule plans.

Alternative Schedule (Plan B) naming requirement

All Plan B library schedules must be named starting with an "at" symbol (@). All other library schedule names are excluded from the Plan B list.