mint command (MINT version)

Successfully pass the free certification exam at IW Academy and become an Infinet Certified Engineer.

To the certification exam

- Description
- Parameters
  - Frequency roaming
  - Local Nodes Database
  - Remote Command Management
  - Routing in the network with the "hub-and-spoke" topology
  - Marker access mode (polling)
  - Over-the-air update
  - Setting of "join" connections type
  - Current Connections Information
- Examples
- Upgrading current RMA network to MINT

Description

CAUTION

This description of "*mint*" command is not applicable to WANFleX software RMA version. Before upgrading from RMA to MINT read the documentation carefully and test in the lab.

This document describes the "*mint*" command in version of the WANFleX software without the TDMA technology support.

The MINT (Mesh Interconnection Networking Technology) architecture gives a functionality to present a radio interface of a unit (as well as a network connected to it) as a traditional Ethernet in a bus topology. Therefore a unit can have several Ethernet interfaces and several pseudo-interfaces (tun, ppp, null etc). Any of Ethernet interfaces can be united in bridging groups which consist of two or more interfaces to increase link capacity. Moreover, routing mode can also be used.

Syntax:

```
mint IFNAME -type {master | slave}
mint IFNAME -mode {mobile | nomadic | fixed}
mint IFNAME -nodeid NUMBERID
mint IFNAME -name NAME
mint IFNAME -netid NUMBER
mint IFNAME -key SECRETKEY
mint IFNAME -authmode {public | static | remote}
mint IFNAME -[no]scrambling
mint IFNAME -[no]authrelay -[no]snmprelay -[no]syslog
mint IFNAME -[no]replicate [$ACL]
mint IFNAME -[no]swborder
mint IFNAME -tpcmin {dBm|default} -tpcmax {dBm|default} -tpcadj {+/-dBm|default}
mint IFNAME -ratefall 0..8 [0]
mint IFNAME -[no]idfs
mint IFNAME -[no]autobitrate [+/-DB] | -fixedbitrate
mint IFNAME -minbitrate N
mint IFNAME -extracost N -fixedcost N -joincost N -meshextracost N
mint IFNAME -maxlinks N
mint IFNAME -mulcast [0..5]
mint IFNAME -loamp N -hiamp N
mint IFNAME -maxamp N [-lockdown T]
mint IFNAME -hierr N (default 15)
mint IFNAME -[no]log [detail]
mint IFNAME [-]failover {MAC|auto}

mint IFNAME -roaming {leader | enable [multiBS] [global] | disable}
mint IFNAME profile N|all [-freq X[,Y,N-M,...] | auto] [-sid X[,Y,..]]
            [-band NN] [-bitr NN|max] [-miso | -mimo [greenfield | legacy]]
            [-type {master|mesh|slave}] [-key XXX] [-nodeid N]
            [{-minbitr XXX [-autobitr [+/-dB]] | -fixedbitr}]
            [enable | disable | delete]

mint IFNAME addnode [-defgw X.X.X.X] [-defmask X.X.X.X]
mint IFNAME addnode -mac X:X:X:X:X:X [-key STR] [-note STR] [-maxrate N | -maxmcs N]
            [-lip X.X.X.X] [-tip X.X.X.X] [-mask X.X.X.X]
            [-lgw X.X.X.X] [-tgw {X.X.X.X | none}]
            [-lcost N] [-tcost N] [{-setpri | -addpri} NN | -1]
            [-mimo | -miso]
            [-disable | -enable | -delete]
mint IFNAME delnode -mac X:X:X:X:X:X

mint IFNAME rcmd {-n[t] ADDR | -l[t] | -all | -swg N [-t]} [-self[2]] [-key KEY [-q]
             [-mask 1,2..16] {"Command" | -file URL}
mint rcmdserver -guestKey STRING -fullKey STRING [-mask 1,2..16]

mint IFNAME -odr hub
mint IFNAME -odr spoke [[-]connected [$ACL]] [[-]kernel [$ACL]]
mint IFNAME -odr disable | show


mint join IFNAME1 IFNAME2 ...
mint disjoin

mint IFNAME poll {start [[-]qos ][[-]log] | stop | stat [clear]}
mint IFNAME monitor [-s] [-i SEC] [MAC [MAC ...]]
mint IFNAME -airupdate  {disable | {[active|passive]|force}}
                        [-f ftp://user:pass@host/path/file]

mint [IFNAME] map [routes | full | swg] [detail] [-a] [-m]
mint [IFNAME] snap[shot] [N] [list | save ["Comment"] | diff [cost|hops|name]]
                             [fix MAC [MAC ...] | del]
mint -[no]colormap
mint IFNAME ping [-n MAC] ... [-s LEN] [-swg N] [-p PRIO] [-i]
mint [IFNAME] info MAC
mint [IFNAME] -cluster N NAME

mint IFNAME start | stop | restart | clear
```

Parameters

Parameter	Description
IFNAME	The network interface to which commands are referred.
-type {mesh | master | slave}	Sets the node type. Three node types are available: "*master*", "*mesh*" or "*slave*". • MASTER – can establish connections with all other types of nodes. It is able to form a network of any topology with other masters or with nodes of mesh type. On master node a marker access (polling) can be enabled. Only one master in a network segment can have this option enabled by means of which forming a star-topology segment (point-to-multipoint). With this, all other nodes break their connections with their respective neighbors (with exception of connections formed by join). This type of nodes is usually used for static networks with no or small number of nomadic or mobile clients. • SLAVE – can only connect to a node with master type. When connection is lost, the device attempts to restore the connection to the master node or to establish connection with different master. Slave node can work with master node using marker access in a classical point-to-multipoint topology.
-mode {mobile | nomadic | fixed}	Sets a mode of the node. A mode is defined by the application of the node for the network • "*fixed*" – the network node has a fixed allocation and always is switched on. It is a core network node. In this mode a node recalculates the MINT connection cost every 3 seconds. • "*nomadic*" – node may change its physical allocation but it transmits data when the node is not moving (or moving very slowly). The recalculation of the MINT connection cost is proceeded every 1,5 second. • "*mobile*" – the node moves often, proceeds the data transmitting while moving. The recalculation time of the MINT connection cost is 1 second.
-nodeid NUMBERID	Sets a node identifier. By default, it is set equal to the device's serial number. The number may be specified in the "XXX.YYY" format reflecting a part of the IP address (both "XXX" and "YYY" numbers can range from 1 to 255). This optional parameter simplifies the identification of the node. ⚠ **NOTE** The "XXX.YYY" format is displayed only if the device's own identifier is also specified in this format. Thus, if you set an identification number in the "XXX.YYY" format at the base station, then the neighbors identifiers will also be shown in this format (no matter how they are defined on the neighboring devices).
-name NAME	Sets a name for the node. This node name will be displayed in the "*mint map*" set of commands. A node name should not exceed 16 characters. Spaces in the node name are accepted if placed in quotes.
-netid NUMBER	Sets a network system identifier (up to 8-digit HEX figure). It must be the same at both ends of the link.
-key SECRETKEY	Sets a secret key for the current node. The key can be up to 64 characters long and should not contain spaces (or should be placed in quotes). Authentication modes are described by parameters below.
-authmode {public | static | remote}	Sets the type of nodes authentication.There are three types of nodes authentication available. • "*public*" – all nodes have the same key (password) for access. It is the simplest case of authentication. It can be used for small workgroups, point-to-point connections, mass public access networks and for MINT architecture testing purposes. Any two nodes of the network can establish a connection (when other settings are suitable) if their keys are equal. In the public mode, when found a potential neighbor a node check for its information in the local database (defined by "*mint IFNAME addnode*" command). If requested information is found, a key from a local database will be used. Otherwise, it is assumed that neighbor's key corresponds with node's own key ("mint IFNAME –key" parameter). • "*static*" – every node has a full list of nodes (including their parameters and access keys) with which a connection can be established. This mode is suitable for an autonomous area of service with no need of centralized management and monitoring. Obviously, nodes that are included in each others access lists (local databases) should have a physical ability to connect to each other in order to establish a connection. In static mode each node must have a list of all permitted neighbors in a local database formed by a set of "*mint IFNAME addnode*" commands. If no information on the neighbor is found in the database the connection is being rejected. • "*remote*" – centralized authentication mode with remote server. In this mode any node can request the information from a remote authentication server. This means that the node must have an access to this server (e.g. using IP).

-[no]authrelay	By this parameter a node having a local database of its neighbors or having an access to a remote authentication server can be configured as an authentication relay. The information about authentication relay will be automatically distributed throughout the MINT network. Nodes which use remote mode of authentication but both do not have access to the "*remote*" server and do not have the information in their local database will use authentication relay in order to obtain the keys of potential neighbors.
-[no]snmprelay	A node becomes an SNMP relay. The information about SNMP relay will be automatically distributed throughout the MINT network.
-[no]syslog	A node become a syslog server. All devices in MINT network will send notification about incidents in own system log to local device. Those incidents will be displayed in syslog of local node. The device keep the syslog server functions until a reboot, after which the command must be re-entered. The information about syslog server will be automatically distributed throughout the MINT network.
-[no]scrambling	Enables/disables the data scrambling to improve the connection stability. By default is enable.
-[no]replicate [$ACL]	Allows to make "isolation" of wireless subscriber stations from direct exchange of information with each other in switching mode. If this option is enabled on the base station then the traffic entering into a wireless network from wired segment of a subscriber station and coming to the base station from this subscriber station won't be transmitted back to the wireless segment by the base station. It may return to the wireless segment only through an external wired switchboard connected to the base station. By default an exchange is enabled. In addition $ACL list of "*num*" type may be specified (acl add $ ISOLATE num N1 N2 ...) with a list of switching group's numbers for which you should enable or disable the listed feature (for all by default). **NOTE** This feature applies only to traffic entering a wireless network from the wired segment of a subscriber station. Inside a wireless network nodes are all accessible to each other at all times.
-[no]swborder	Enables/disables the "Switch border" regime. In this mode a node becomes "border" between MINT domains, it stops the exchange of information about switching groups and whole data exchange between these domains, but all capabilities of MINT protocol can still be used (obtaining information about the whole MINT network, remote command implementation and so on).
-tpcmin {dBm|default} -tpcmax {dBm|default} -tpcadj {+/-dBm|default}	Allow to manage ATPC (Automatic Transmit Power Control) function behavior. ATPC function is enabled/disabled by the "*rfconfig <interface> pwrctl*" command. • "*tpcmin dBm*" – sets the minimal transmit power level in dB which ATPC function is allowed to set on the radio interface. • "*tpcmax dBm*" – sets the maximal transmit power level in dB which ATPC function is allowed to set on the radio interface. • "*tpcadj +/-dBm*" – influences the optimal power level to be set on the radio interface by the ATPC function. The ATPC can be forced to set higher (tpcadj + <number in dBm>) or lower (tpcadj - <number in dBm>) power levels compared to the values it estimates itself.
-hierr N	Sets the percentage of retries after which the system will change the modulation to the lower value. By default is 15.
-[no]autobitrate [+/-DB] | -fixedbitrate	• "*-[no]autobitrate*" – enables/disables an automatic bitrate management mode. In autobitrate mode every device controls the connection parameters independently (amplitude of the received signal, number of ARQs on transmitting, errors, SNR on the opposite side etc) and chooses such transmitting speed which provides necessary conditions for a reliable work with minimum number of ARQs and losses. Speed values can be different for each direction but it will be optimal. When no autobitrate is used transmitting speed will be set according to the setting of "*bitr*" parameter of "*rfconfig*" command. When autobitrate is used, transmitting speed will be automatically adjusted according to current link conditions. The ranges of speed will be in between the setting of "*bitr*" parameter (maximal speed) and "*minbitrate*" parameter (see below). If no "*minbitrate*" is specified the minimal RF interface speed will be taken as a lowest possible transmitting speed. The "*+/-DB*" argument influences the autobitrate function sensitivity. Autobitrate can be forced to set a higher bitrate (*mint IFNAME –autobitrate - <number in dB>*) even if the signal level is lower than expected on the specified number of dB. Or not to set a higher bitrate (*mint IFNAME –autobitrate + <number in dB>*) till the signal level won't become higher than expected on the specified number of dB. • "*fixedbitrate*" – disables "*autobitrate*" mode. In the fixedbitrate mode the actual bitrate is set with the "*bitr*" parameter of the "*rfconfig*" command.

-minbitrate N	Sets minimal transmitting speed for "*autobitrate*" mode.
-ratefall 0..8 [0]	Allows to influence autobitrate mechanism in the following way: it sets upper bitrate index threshold below which errors and retries checks are not performed, just energetic ability to upper bitrate is taken into consideration. Bitrate indexes are from 1 to 8 and correspond with bitrates available on the device's radio interface (to see bitrate list use the "*rf rfX cap*" command). "0" ratefall's value cancels the command.
-[no]idfs	Enables/disables the Instant DFS function.
[-meshextracost N] [-extracost N] [-fixedcost N] [-joincost N]	• "*extracost N*" – sets an extra cost for all connections on this interface. The value of the parameter is added to the cost automatically calculated by MINT protocol. Value of this parameter can only be positive. Zero value disables the parameter. • "*meshextracost N*" – sets an extra cost for all connections of master node with its mesh nodes. By default is 500. • "*fixedcost N*" – all costs for all units connections will be set as the value specified in this parameter (exclude join). Zero value disables the parameter. • "*joincost*" – sets a cost for all "*join*" connections on this interface (by default is 1). Zero value disables the parameter.
-maxlinks N	Sets the maximum allowed number of simultaneously connected CPEs (radio connections). When this value is reached, other attempts to connect to the base station will be rejected.
-mulcast [0..5]	Makes the transformation of multicast traffic to unicast. If two or more clients are subscribed to the same multicast stream, a copy of the original stream will be sent to each of them in unicast mode. This parameter limits the number of subscribers for which this transformation can be performed. If the limit is not specified, the transformation is always performed. A "0" value disables the transformation to unicast. **NOTE** Transformation into unicast requires copy of data by the memory, it increases the CPU load of the device. Furthermore, for each of the new unicast streams a certain percentage of attempts may be required that increases traffic even more. • "*[0..5]*" – the number of subscribers. Zero value disables the parameter. If value is not specified the transformation is always executed. By default is 3.
[-]failover MAC|auto	Allows to backup the main communication channel, which can be organized on third party manufacturers equipment. Communication is established between Master and Slave devices via the radio and at the same time using the pseudo-radio interface, through the main communication channel. The Master device with enabled "*failover*" function checks the availability of the MAC address of the remote device through the primary channel. If the address is available, an operation of the backup channel (radio) is blocked. If the address of the Slave device disappears in the primary channel, the backup channel is unlocked and traffic starts to flow over it, until the MAC address of the remote node is available through the primary channel again. If the primary channel is created by InfiNet devices, same as backup, then not only the presence / absence of an alternative link with the monitored node will be taked into account but also the cost of this connection. In this case, the device that provides the lowest cost of communication (best quality) through the radio will become the main one, the second device will turn off its transmitter and go into standby mode. More information about settings of this function is in the paragraph "Examples".
[-loamp N] [-hiamp N]	• "*loamp*" – sets the minimal signal level for the neighbor. Signal level is measured in dB above the noise threshold for the current bitrate. If the level gets lower than specified value the connection with a neighbor will be lost. Default value is 2. • "*hiamp*" – sets the minimal SNR for a new neighbor. Signal level is measured in dB above the noise threshold for the current bitrate. If neighbor's signal level is equal or higher than a specified value the node will consider this neighbor to be a candidate. Default value is 6.
-maxamp N [-lockdown T]	Limits the maximum "N" signal level, preventing devices connection. If the SNR level of an already connected neighbor is exceeded, the connection will be terminated. • "*[-lockdown T]*" – blocks attempts to connect from a device whose signal level has exceeded the limit for a specified time.

monitor [-s] [-i SEC] [MAC [MAC ...]]	If a MAC address is not specified then all neighbors and candidates of this node will be monitored. The "*nodeid*" and name of node are permitted to use instead of MAC addresses. • "*-s*" – disables the line output mode (output on one screen). • "*-i SEC*" – sets the interval for information updating.
start | stop | restart | clear	Starts/stops/restarts/clears the MINT configuration for the specified interface.
-[no]log [detail]	Allows to control logging settings for MINT protocol. Three different modes are available: • "*-nolog*" – logging is disabled. • "*-log*" – limited logging. The messages about connected/disconnected neighbors will be put to the system log. • "*-log detail*" – detailed logging. Along with the messages from limited logging mode, messages about changed costs of the routes and changed bitrates (in autobitrate) mode will be put to the system log.
Frequency roaming	
-roaming {leader | enable [multiBS] [global] | disable}	For a flexible management of frequency resource, higher noise immunity and throughput optimization InfiNet Wireless equipment supports frequency roaming capability based on MINT protocol. Roaming is turned off by default – that means that the unit works using fixed radio interface configuration. • "*leader*" – define required radio frequency parameters of the wireless network. "*Roaming leader*" also works with a fixed radio interface parameters, however its radio parameters configuration is transmitted over the network in special packets so every node of the network knows whether it is connected to the "*roaming leader*" or to the network that has a roaming leader. If the network has several "*roaming leaders*", their parameters should be identical. "*Roaming leader*" also supports DFS and Radar Detection features (if a special license is installed for selected countries). • "*enable*" – other network nodes can use roaming in order to search for the "*roaming leader*" or the network having a "*roaming leader*" (roaming enable). The search is implemented by switching between different sets of radio parameters that are defined in profiles. Each profile contains a fixed set of radio interface parameters which are set on each iteration of the search. Heuristic search algorithm can quickly evaluate general air media parameters and chooses the profile which defines the most suitable network. If the connected BS is down, the slave retries to connect to it once and in case of failure, it looks for a new BS to connect. • "*multiBS*" – enables the slave node to constantly check the link quality and try to find another BS if the quality become worse. If the parameter is disabled then slave the will keep the connection with a current base station until the signal is completely lost. • "*global"* – if enable, device should search and connect only to a network which has one or more global roaming leaders. It helps to prevent the creation of locally closed segments that are separated from the main network. Any MINT device (including InfiMUX) that has direct access from the control center or has access to the Internet can be assigned as a leader.
profile N|all [-freq X[,Y,N-M,...] | auto] [-sid X[,Y,..]] [-band NN] [-bitr NN|max] [-miso | -mimo [greenfield | legacy]] [-type {master|mesh|slave}] [-key XXX] [-nodeid N] [{-minbitr XXX [-autobitr [+/-dB]] | -fixedbitr}] [enable | disable | delete]	Managing roaming profiles. • "*N|all*" – profile ID, any non-zero positive number/ all profiles. • "*freq X[,Y,N-M,...] | auto*" – radio interface center frequency or list of frequencies. "*Auto*" – all frequencies that the unit supports will be used. • "*sid X[,Y,..]*" – SID of the radio interface. • "*bitr NN|max*" – bitrate of the radio interface. Acts as a top limit for the bitrate if "*autobitrate*" mechanism is turned on. • "*band NN*" – defines the channel width for the profile. If profiles use different channel widths, "*auto*" mode for frequency cannot be used. • "*type {master|mesh|slave}*" – node type. • "*key XXX*" – secret key. • "*nodeid N*" – node ID. • "*fixedbitr*" – sets fixed bitrate for the node. • "*minbitr XXX*" – minimum bitrate for operation in "*autobitrate*" mode. • "*autobitr [+/-dB]*" – operation mode with automatic bitrate control. "*[+/-dB]*" – allows to manage bitrate control sensitivity. • "*enable | disable | delete*" – enables, disables or deletes the profile. • "*-miso |-mimo*" – sets a signal coding method: MIMO or MISO. • "*greenfield*" – enables/disables the "*Greenfield*" mode. Greenfield mode is an operational mode which can be enabled on 802.11n-based devices which reduces transmitted frame size by removing legacy (pre-802.11n) field from a frame header. By enabling Greenfield mode on an InfiNet unit, you can achieve up to 15% increase in performance. Also, this mode allows to avoid processing and decoding others "noise" preambles resulting in the better signal quality of a link. • "*legacy*" – disables the "*Greenfield*" mode.

Local Nodes Database	
addnode [-defgw X.X.X.X] [-defmask X.X.X.X]	Allows to create a local devices database with which this node can establish connections. • "*defgw*" – sets default gateway IP address. • "*defmask*" – sets default mask.
addnode -mac X:X:X:X:X:X [-key STRING] [-note STRING] [-maxrate N| -maxmcs N] [-lip X.X.X.X] [-tip X.X.X.X] [-mask X.X.X.X] [-lgw X.X.X.X] [-tgw {X.X.X.X | none}] [-lcost N] [-tcost N] [{-setpri | -addpri} NN | -1] [-mimo | -miso] [-disable | -enable | -delete]	• "*mac*" – node MAC address with which connection can be established. • "*key*"– unique device key. Key word or phrase up to 64 characters long. If contains spaces should be put into quotes. Used in authentication procedures. The same key should be specified in the connecting device settings. • "*lip*" – local IP address. This address will be assigned to this device when the connection with a remote is established. • "*tip*" and "*mask*" – target IP address and mask. This address will be assigned to the remote side when a connection is established. The mask is applied to both Local IP address and Target IP address. If mask is not specified these addresses will not be used. • "*lgw*" – local gateway IP address. Will be assigned to the local node once connection is established. • "*tgw*" – target gateway IP address. Will be assigned to the remote node once connection is established. • "*none*" – prohibits the transfer of the information about the default gateway to the remote node (see "*defgw*" parameter). • "*lcost*" – local cost of the connection to this neighbor from current node. If not specified, MINT will automatically calculate the cost. • "*tcost*" – target cost of the connection from this neighbor to the current node. If not specified, MINT will automatically calculate the cost. If "*lcost*" and "*tcost*" parameters are set on a pair of neighbors, "*lcost*" will have a higher priority. • "*enable/disable/delete*" – enables, disables or deletes a record in a local database. • "*maxrate*" – target node maximum bitrate in kilobit per second. • "*maxmcs*" – allows to specify the maximum modulation. • *"[-mimo | -miso]"* – sets the transmission mode. • "*setpri | addpri*" – this options allows setting/increasing the priority of packets passing through to the specified node. The "*setpri*" parameter is used to change a priority to the value specified in the command. When using "*-1*" value a package priority is dropped to the lowest priority. The "*addpri*" is used to change a priority only in case it is higher than the previous one. So you can only increase priority using "*addpri*" parameter. • "*note*" – word note (description) for the specified node.
delnode -mac X:X:X:X:X:X	• "*mac*" – deletes a device record with a corresponding MAC address from the local database.
Remote Command Management	
rcmd {-n[t] ADDR | -all | -l[t] -swg N [-t]} [-self[2]] [-key KEY] [-t] [-q] [-mask 1,2..16] {"Command" | -file URL}	Remote command management allows one MINT node to perform commands on one other or all MINT nodes in the network. • "*-n ADDR|all*" – destination node MAC address or all MINT nodes. • "*l*" – performs commands only on the nodes that is connected to the given device directly. • "*-swg N"* – sets a switch group in the MINT network, which nodes will receive the command. • "*self[2]*" – executes commands sent on the device itself, but only if the command has been executed by all remote nodes. "2" – the command will be executed by the device even if one of the remote nodes has not confirmed the command execution. • "*key KEY*" – access key to the nodes with enabled remote control commands. • "*[t]*" – activates the information display on the screen, not in the system log. The parameter works only if the request is sent to a certain number of devices, so the number of responses that must be received are known in advance. • "*q*" – disables writing replies from the remote devices to the system log. • "*Command" | -file URL*" – command to be performed on the remote unit or root to a command file by ftp. **ВНИМАНИЕ** The maximum "Command" lenght is 60000 characters, but via SSH/Telnet only 512 is available. If your command lenght is longer please use "Command line" mode in the device's web-interface. • "*-mask 1,2..16*" – allows to assign up to 16 arbitrary classification attributes. For example, MUX-1, BS-2, CPE-3, PTP-4, PTMP-5, MIMO-6, Master-7, Slave-8, etc. These attributes are used when the command executing "*mint rcmd*" to restrict the action of the command only those devices that have the specified attribute (mint rf rcmd-all-mask 3.8 " sys version”).

-rcmdserver [-guestKey STRING] [-fullKey STRING] [-mask 1,2..16]	Disables/enables remote control management mode (enabled by default). • "*-guestKey STRING"* - guest key. Guest key allows to perform read only commands on the node. • "*-fullKey STRING"* - full key. Full key grants full access to the node (all commands can be performed). • "*[-mask 1,2..16]*" – allows to assign up to 16 arbitrary classification attributes. For example, MUX-1, BS-2, CPE-3, PTP-4, PTMP-5, MIMO-6, Master-7, Slave-8, etc.

Routing in the network with the "hub-and-spoke" topology

On-Demand Routing (ODR) protocol – is an add-ons over the MINT protocol that allows routing in networks with the "hub" topology without the use of any special routing protocol.

The main ODR using advantage is the available network bandwidth increasement by eliminating the service traffic of a separate routing protocol whilst still maintaining dynamic routing functionality. The ODR protocol propagates IP prefixes on the Layer 2 using MINT protocol.

ODR is applicable only for the networks with the "hub-and-spoke" topology, when all nodes (spokes) are connected only to a hub node. A "hub-and-spoke" network example is a simple "Point-to-Multipoint" topology where each subscriber terminal has the only wireless connection to the base station.

-odr hub	Sets the device as a hub.
-odr spoke [[-]connected [$ACL]] [[-]kernel [$ACL]]	Sets the device as a spoke. Allows to specify a list of IP addresses/networks using the Access Control List. • "*connected*" – allows announcing IP addresses/networks set on the spoke's own interfaces. • "*kernel*" – allows announcing static routes (set with the "*route add*" command).
-odr disable | show	• "*show*" – shows the ODR protocol current state and established connection. • "*disable*" – disables the ODR protocol.

Marker access mode (polling)

Polling mode is a method of accessing common radio channel under master station control, which consists in centralized distribution of transmission authorization markers by a master station to slaves. This mode greatly improves operational stability and throughput of master stations under conditions of heavy load and signal level misbalance between different slave units. It is particularly useful when slaves units are at long range from a base station and not in the direct visibility of each other, so that they cannot avoid mutual collisions in the radio channel by listening each other's transmission. The polling regime makes it possible to establish reliable communication between subscribers when the ordinary CSMA/CA wireless access method does not work at all.

Despite a slight decrease in the maximum transmission speed, the polling mode substantially increases the total throughput of a base station and provides for its fair distribution between client units. The polling algorithm is so designed as to minimize the protocol overhead while maintaining high efficiency and reliability.

The marker access disadvantages in the radio environment are a relatively large initial delay and variation in response time on short packets, which affects critical services, such as online games and telemetry. In addition, two base station sectors with marker access, which are situated closely and operate at the same frequencies, almost completely suppress each other's.

poll {start [[-]qos] [[-]log] | stop | stat [clear]}	• "*start*" – starts polling mode. • "*qos*" – starts "*qos*" mode (prioritization) on the uplink. • "*log*" – enable logging mode. • "*stop*" – stops polling mode. • "*stat*" – displays the statistic for this mode. • "*clear*" – clears the statistic. Restrictions on the enabling of this mode depend on types of devices in the MINT architecture.

Over-the-air update

The "air update" system allows to facilitate the task of the firmware mass upgrade in the MINT network, which includes a large number of similar devices. It is enough to update the firmware manually (or via the task scheduler) only on one device (of each type), the other devices will be updated automatically.

-airupdate {disable | {[active|passive]|force}} [-f ftp://user:pass@host/path/file]	Each device can be configured to use either active or passive update mode. Active devices periodically (every half an hour) announce to the MINT network information about the firmware they have, its version and the time of continuous (without reboots) work with this version. All MINT network devices (both active and passive) accept and store information from active devices, selecting the sources that offer the most recent version and work with it for the longest time. After a period of information accumulation, the devices send their requests for a new version to the most appropriate source. Active devices collect requests, group them and send a new version simultaneously to all subscribers using a special protocol of MINT-MTP multicast distribution. • "*force*" – used for emergency firmware updates. This command is direct action, it is not saved in the configuration, but serves as a signal for all devices to immediately send their requests for updates regardless of the operation mode and without waiting for the end of the information accumulation period. • "*-f*" – specifies the path to the ftp server from where the device will download updates. If the firmware is sent to a group of subscribers and the transmission fails, or the connection between the source and the subscriber is lost, the subscriber will stop receiving the update and will repeat the request when receiving the next announcements until the update is successfully completed.
Setting of "*join*" connections type	
join IFNAME1 IFNAME2 ...	The capability to join two or more interfaces of one device in one "*mesh*" network is an important function of MINT architecture. There is no differences in the settings of these interfaces and protocols which can limit association. This way radio and pseudo radio interfaces can be associated. By reasonably combining join bridges and pseudo-radio interfaces, can be ensured a sufficient number of reliable alternative paths on the network and optimal traffic distribution which allows to eliminate bottlenecks. ⚠ **NOTE** If several interfaces are combined by the "*join*" function, only one of them (any) need to be included in the switching group.
disjoin	Disjoins interfaces and make them independent.
Current Connections Information	
info MAC	Displays information about the "MAC" node status and the traffic route to this node.
ping [-n MAC] ... [-s LEN] [-swg N] [-p PRIO] [-i]	Sends test packets from the network interface. The the command result is reflected in the system log. If the network node MAC address is not specified, the test packet will be sent to all network nodes in "*reliable multicast*" mode. It should be noted that in contrast to the well-known network utility "*ping*", the command "*mint ping*" receives only delivery confirmation, not return packets from the tested network nodes. The main goal of the command is to check the reachability of all (or some) network nodes and get an idea of the quality of the selected delivery routes. • "*-n MAC*" – specifies the network node MAC address to which test packets should be sent, multiple addresses can be specified. • "*-s LEN*" – test packet size in bytes. • "*-swg N*" – sends the test packet from the interface to the switching group "*N*". • "*-p PRIO*" – sets the packet priority from 0 to 16. • "*-i*" – displays additional information.
map [routes | full | swg] [detail] [-a] [-m]	The parameter is used to get information about the current links of this node. Without arguments, displays information about the MINT network neighbor nodes. • "*routes*" – displays information about the MINT network routes. • "*swg*" – used in the case when switching groups are used. Displays information about the current connections of this node in the context of the switching groups created in the network. It shows in which groups the nodes are neighbors. • "*full*" – the previous two arguments combined output. • "*detail*" – for each individual connection to the neighbor node, displays information about the distance to the node, the download of the up and down links, the connection cost, the main neighbor node IP address. • "*-m*" – displays input / output signal levels relative to the minimum rate. By default, it is displayed relative to the current rate. • "*-a*" – displays only the active (connected) neighbors, without candidates, applicants and static links.

snap[shot] [N] [list | save ["Comment"] | diff [cost|hops|name]] [fix MAC [MAC ...] | del]	Allows to save data about MINT network neighbor nodes to the device memory that allows to compare it state in future.
	• "*N*" – save number in the range from 1 to 8.
	• "*list*" – displays the list of the previously save records, maximum 8.
	• "*save ["Comment"]"* – saves data about current device links, "*Comment*" – text comment.
	• "*diff [cost|hops|name]*" – displays the differences between the current state of the neighbor nodes and the state saved under the number "*N*". Displays information about added and missing devices by default. Following details can be displayed:
	  ◦ "*cost*" – changes in routes costs;
	  ◦ "*hops*" – changes in hops number of the shortest route;
	  ◦ "*name*" – changes in devices names.
	• "*del*" – deletes the save with the specified number.
	• "*fix MAC*" – allows to add or remove the device with the specified MAC address from the saved data under the number "*N*".

-[no]colormap	Displays information about the current connections of this node in the same way as the "*map*" parameter, applying to the neighbors the color indication depending on the signal level between the current device and the neighbor node, as well as the number of retries and transmission errors.
-cluster N NAME	Allows to combine devices that are in close proximity to each other to the single cluster for easy display on the map. • "*N*" – cluster sequence number. • "*NAME*" – cluster name.

Examples

Display information about the wireless links state using the "*mint rf5.0 map detail*" command:

```
mint rf5.0 map detail

================================================================================
Interface rf5.0
Node  00043523FA96  "Slave", Id 60758, Nid 0, (Slave)
Freq 5550, Band 40, Sid 10101010, autoBitrate 300000 (min 30000), Noise -88

 ------- --------------------------- ------------ -----  ------- ----- -------
   Id         Name                        Node      SNR   Bitrate Retry Options
 ----------------------------------- ------------ rx/tx   rx/tx  rx/tx -------
   13659 LINAR                       00043514C93B 46/45  300/300  0/0  /M/F
         load 5/2, pps 3/0, cost 51
          pwr 10/10, thr 23/23 dist 2,
          H08v1.90.46, up 18:20, IP=192.168.103.82
 ------- --------------------------- ------------ -----  ------- ----- -------
 1 active neighbors
 Total load: 5/2 (rx/tx), 7 (sum) Kbps
 Total nodes in area: 2
```

Indicators in the "Options" column can have the following values:

- "*S*" - device is in the Slave mode;
- "*M*" - device is in the Master mode;
- "*L*" - the device throughput is limited by license;
- "*P*" - the polling mode is enabled on the device;
- "*F*" - the software version is older than on the local device.

A "?" mark in front of the remote device name indicates that there is no password set on this device.

Pay attention to the "*" symbol, which can mean the following:

- At the "*pwr*" column - hardware device failure.

Title

Nodes A and B use the same key and can connect to each other in "*public*" mode.

Node A:

```
mint rf5.0 –key SECRETKEY
mint rf5.0 –authmode public
```

Node B:

```
mint rf5.0 –key SECRETKEY
mint rf5.0 –authmode public
```

Nodes A and B use different access keys, but can connect to each other in "*public*" mode using local databases.

Node A:

```
mint rf5.0 –key SECRETKEY
mint rf5.0 –authmode public
mint rf5.0 addnode -mac B:B:B:B:B:B -key KEY2
```

Node B:

```
mint rf5.0 –key KEY2
mint rf5.0 –authmode public
mint rf5.0 addnode -mac A:A:A:A:A:A -key SECRETKEY
```

In this case, each node can additionally establish links with other nodes operating in the "*public*" mode, if their keys match the node's own key.

Node A uses a local database and acts as an authentication gateway. Node B does not have its own database and uses authentication gateway services in "*remote*"

Node A:

```
mint rf5.0 –key KEY1
mint rf5.0 –authmode static
mint rf5.0 –authrelay
mint rf5.0 addnode -mac B:B:B:B:B:B -key KEY2
mint rf5.0 addnode -mac ::::: -key KEY3
```

Node B:

```
mint rf5.0 –key KEY2
mint rf5.0 –authmode remote
```

Node B will receive neighbor information through the authentication gateway (node A).

In order to simplify the base station sector configuration in the static description of the subscribers, the command "*mint addnode*" will add with two parameters "*-X.X.X*" and "*-defmask X.X.X.X*".

```
mint rf5.0 addnode –mac 000028BAF234 –lip 1.1.1.1 –tip 1.1.1.2 –mask 255.255.255.252 –lcost 120
```

If the description of the particular subscriber does not specify the exact gateway address or network mask, the default values set in these parameters will be used. each subscriber it is enough to specify only dynamically assigned IP address and access key.

```
mint rf5.0 addnode -mac 000435567322 -tip 10.1.1.1 -key SecretKey1
```

If no access key is specified, it is assumed that it matches the base station key. If no IP address is specified, no action is taken on the addresses.

CAUTION

Information about the default gateway (which is defined by the "*addnode-tgw / addnode –defgw*" commands) is not passed to the host unless it has spec an address and a network mask.

The command removes the network node with the MAC address "*00:00:28:BA:F2:34*" from the local database.

```
mint rf5.0 delnode –mac 000028BAF234
```

The command sends remote commands to all devices on the MINT network: display device configuration (in the first case), upload command file from ftp (in the se case).

```
mint rf5.0 rcmd -n all -cmd "co sh"
mint rf5.0 rcmd -n all -file ftp_name:ftp_pswd@192.168.100.21/1.txt
```

Enable polling.

```
mint rf5.0 poll start
```

Display polling statistic by using "*stat*" parameter.

```
mint rf5.0 poll stat
MI=9, MP=60, MT=120, started
md=143234, ma=123212, mt=36
pd=312762, pa=22343, pt=11
```

В выводе отображаются значения следующих параметров:

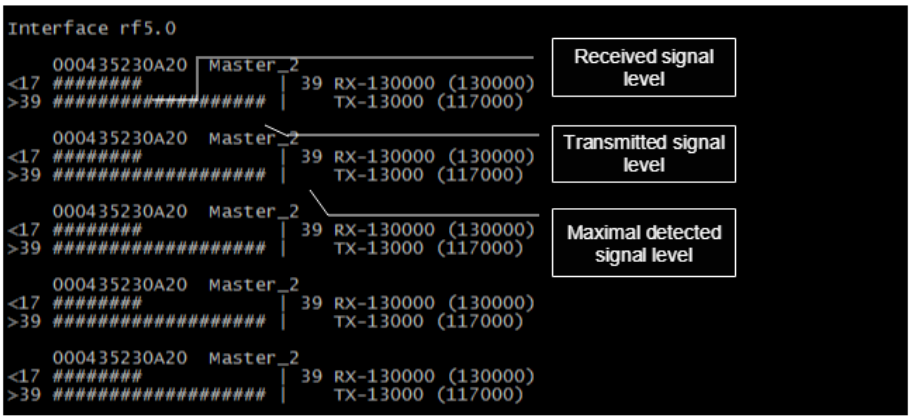
- "*md*" - the number of markers in response to which the data packet was received.
- "*ma*" - the number of markers in response to which the answer "no data" was received.
- "*mt*" - the number of markers in response to which no data was received (time-out).
- "*pd*" - the number of packets in response to which the data packet was received.
- "*pa*" - the number of packets in response to which the answer "no data" was received.
- "*pt*" -the number of packets in response to which no data was received (time-out).

Title

The command displays data for monitoring signal levels.

```
mint rf5.0 monitor
```

The input/output signal levels are displayed relative to the minimum rate for receiving/transmitting.



The operator decides to replace the firmware on the network with a new, obviously proven one.

```
mint rf5.0 –airupdate force
```

This device does not participate in the automatic update system, does not generate and does not listen to announcements.

```
mint rf5.0 –airupdate disable
```

The operator specifies the path to the ftp server from where the device will download updates.

```
mint rf5.0 -f ftp://user:pass@host/path/file
```

Let's make a link reservation. To do this, create a pseudo-radio interface on each device via Ethernet (or vlan). In this case, both devices will communicate with eac via "*prf*" interfaces using the main link.

```
ifconfig prf0 up
prf 0 parent eth0
mint prf0 start
```

On both devices join the "*rf5.0*" and "*prf0*" interfaces with the "*join*" parameter.

```
mint join rf5.0 prf0
```

Both devices must have at least one switching group between ETH and RF interfaces, which will provide L2 traffic transmission for the time of the main link absenc

```
switch group 1 add eth0 rf5.0
switch group 1 start
switch start
```

CAUTION

In case the InfiNet Wireless devices are used for the redundant link, it is recommended to use own switching group on each link.

In case it is necessary to use one switching group, "*rf5.0*" and "*prf0*" interfaces can not be joined with the "*join*" parameter. Also, it is necessary to explicit specify the MAC address of the remote device, since the "*auto*" option will not work.

The "*failover*" function is enabled on the Master radio interface.

```
mint rf5.0 -failover auto
```

As soon as the Master detects that the monitored MAC address is accessible via the "*prf0*" interface, it will immediately turn off its radio transmitter and put the ra interface into the DOWN state, simultaneously stopping the traffic switching. Having lost synchronization on the radio with the Master, Slave will stop transmitting into a standby mode.

If the connection to the MAC address being monitored is lost, for example, if the main link fails, the Master will turn on its transmitter and put the radio interface i UP state. The Slave detects the presence of a signal from the Master and go into a mode of communication. The client traffic will start to be transmitted over the ra again.

Upgrading current RMA network to MINT

CAUTION

It is recommended to study MINT technology features and test your basic configuration skills on the test devices before complying this instruction.

It is also recommended to consider principles of new network building in advance: will it be Mesh or "Point-to-Multipoint" network, how and what routing will be used, will it be a switched network.

Perform the following actions on each client device:

- Note down or remember MAC address of radio interface which is used to connect to base station. You can view it using command:

```
ifc rf5.0
```

- Save current configuration (it is supposed that client device is connected to base station in the moment) using command:

```
config save
```

- Upload MINT firmware using command:

```
fl get user:password@server/file
```

- Perform restart of all the client devices (one after another) using command:

```
 restart y
```

- Upload MINT firmware on the base station and restart base station.

After the restart all devices will start with MINT firmware. Upon discovering the old configuration (RMA) new MINT firmware will start neighbor search protocol on all radio interfaces of the device with default parameters (master, autobitrate, hiamp=4). Radio interface parameters will be delivered from the old configuration (at the time of its last saving). This is enougth for device to connect to MINT Network. The devices will lose IP address assigned by RMA.

- Ensure all devices have connected to base station using "*mint map*" command.
- Assign appropriate IP address on base station radio interface.

```
ifc rf5.0 10.0.0.254/24 up
```

- By using "*mint rcmd*", assign IP addresses on radio interfaces of all client devices addressing them using MAC address (colon in MAC addresses are not necessary).

```
mint rf5.0 rcmd -node 17:9a:c2:f4:34 -cmd "ifc rf5.0 10.0.0.1/24 up; co save;"
mint rf5.0 rcmd -node 17:9a:c3:ad:46 -cmd "ifc rf5.0 10.0.0.2/24 up; co save;"
mint rf5.0 rcmd -node 179ab1f391     -cmd "ifc rf5.0 10.0.0.3/24 up; co save;"
```

After that all client devices will be accessible from base station by IP (if it wasn't rejected by configuration options).

- Using telnet perform the rest necessary configuration on each device for smooth network functioning (routing and so on).

If IP access is not obtained, it is always possible to verify or correct configuration of client devices using "*mint rcmd*" command.

```
mint rf5.0 rcmd -node 0023113231 -cmd "co show" -reply
```

With "*–reply*" parameter the command result will be displayed in a local system log (sys log show).