

Auto Disable of Paging During MME Manager CPU Congestion

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	MME
Applicable Platform(s)	• ASR 5000 • ASR 5500 • VPC-DI • VPC-SI
Feature Default	Enabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	• *Command Line Interface Reference* • *MME Administration Guide* • *Statistics and Counters Reference*

Revision History

Revision Details	Release
First introduced.	21.5.13

Feature Description

The Auto Disabling of eNodeB Paging feature optimizes the volume of Paging events in congestion scenarios by disabling the non-critical paging triggers/events and allowing critical paging events at the same time.

The existing Paging features are enhanced to control the paging events and messages during MME Manager CPU congestion to provide better serviceability and resiliency.

MME supports the paging implementations/algorithms — Default Non-Heuristics Paging, Default Heuristics Paging, and Heuristics Paging. Heuristics Paging and Intelligent Paging procedures are used to reduce the volume of Paging messages.

MME supports the following functionalities:

- CPU congestion parameters for MME Managers — Threshold and Tolerance levels
- Periodic poll for CPU usage MME Managers
- Mark critical and non-critical stages under paging profile
- Disable paging for critical and non-critical stages, even if MME Managers are busy
- Disable paging of unregistered IMSIs for busy MME Managers if it is from SGS interface

For more information on the Heuristics Paging and Intelligent Paging, see the *Heuristic and Intelligent Paging* feature chapter in the *MME Administration Guide*.

Configuring MME Paging

This section provides information on the CLI commands to configure the Paging Congestion feature.

Configuring Congestion Control

Use the following configuration to enable or disable CPU Usage based congestion control for MME Manager(s), and configure congestion parameters (CPU Threshold and Tolerance values).

```
configure
  mme-manager
    congestion-control cpu-utilization [ threshold threshold_value tolerance
 tolerance_value ]
     no congestion-control [ cpu-utilization ]
     end
```



Important MME Manager is marked busy if CPU utilization is above threshold value and it will be marked not-busy once CPU utilization comes back to threshold - tolerance value.

NOTES:

- **mme-manager**: Configures MME Manager(s).

  Entering the **mme-manager** command results in the following prompt and changes to the MME Manager Configuration mode:

  ```
  [context_name]host_name(mme-manager)#
  ```

- **congestion-control**: Enables or disables congestion control.
- **cpu-utilization**: Specifies the average CPU utilization in %.
- **threshold** *threshold_value*: Specifies the thresholds for various resources. *threshold_value* must be an inetger from 1 to 100.

  Default: 90%

- **tolerance** *tolerance_value*: Specifies the tolerance limit. *tolerance_value* must be an inetger from 1 to 100.

  Default: 10

- **no**: Disables congestion control.
- This feature is enabled by default.

Verifying the Configuration

Use the following command to view the Congestion Configuration, Congestion State, and History per MME Manager instance.

```
show session subsystem facility mmemgr all
```

Configuring Critical Paging Events

Use the following configuration to enable paging criticality and continue the paging procedure even when the MME manager is busy.

```
configure
  lte-policy
    paging-profile paging_profile_name
      [ no ] critical paging_stage
      end
```

NOTES:

- **paging-profile** *paging_profile_name*: Specifies the name of the paging profile being created or accessed. If the profile name does not refer to an existing profile, a new profile is created. *paging_profile_name* must be an alphanumeric string of 1 to 64 characters.

- **critical** *paging_stage*: Enables the paging criticality for the specified paging stages. The paging procedure continues even when the MMEMgr is busy. *paging_stage* specifies the paging stage precedence as an integer from 1 to 5 where 1 is the highest and 5 is the lowest.

  A maximum number of 5 entries are accepted.

- **no**: Disables the paging criticality that is configured for all paging stages and applies the default configuration. Stage-1 is considered as critical by default.
- Default: Stage-1 is considered as critical if the operator does not configure paging criticality for any paging stages.

Verifying the Configuration

Use the following commands to verify the stage wise paging criticality configured per paging-profile:

show lte-policy paging-profile name profile-name

Monitoring and Troubleshooting

This section provides information regarding show commands and bulk statistics available to monitor and troubleshoot the Paging Congestion feature.

Show Commands and Outputs

This section provides information regarding show commands and their outputs for the Paging Congestion feature.

show mme-service statistics paging-profile profile-name <paging_profile_name>

The output of this command includes the following fields:

Paging Profile Level Statistics:

- Profile name — Displays the name of the configured paging profile.
- Stage-1 / Stage-2 / Stage-3 / Stage-4 / Stage-5:
  - Attempted — Displays the number of times when the session manager sends paging request to at least 1 MME manager for the stage.
  - Skipped — Displays the number of times when the session manager skips sending paging request to at least 1 busy MME manager for the stage.
  - Success — Displays the number of times when the paging procedure has completed successfully while the corresponding paging stage is awaiting UE response.
  - Failure — Displays the number of times when the paging procedure moves to next paging stage and/or paging procedure completes with failure.

show mme-service statistics

The output of this command includes the following fields:

- Paging Initiation for CS Unknown UE:
  - Attempted — Displays the number of times when the session manager sends paging request to at least 1 MME manager.
  - Skipped — Displays the number of times when the session manager skips sending paging request to at least 1 busy MME manager.

show session subsystem facility mmemgr all

The output of this command includes the following fields:

Congestion-Configuration:

- CPU Congestion — Indicates whether CPU congestion control is enabled or disabled - Enabled/Disabled.
- Thresholds:
  - CPU Utilization — Displays the configured CPU utilization value.
  - CPU Tolerance — Displays the configured CPU tolerance value.
  - Congestion-State — Indicates the congestion state - Busy/Not Busy.
- Congestion History:
  - Timestamp — Displays the timestamp.
  - CPU usage — Displays the CPU usage.



Important Congestion history will capture the MME manager CPU-utilization transitions based on the configured values.

Bulk Statistics

The following Paging related bulk statistics are available in the MME Paging Profile schema. This schema is new in this release.

Bulk Statistics	Description
mme-paging-profile-name	The name of the paging profile.
mme-paging-profile-stage1-attempted	The total number of stage1 paging attempted by this MME for this paging profile.
mme-paging-profile-stage1-success	The total number of stage1 paging success for this paging profile.
mme-paging-profile-stage1-failure	The total number of stage1 paging failure for this paging profile.
mme-paging-profile-stage1-skipped	The total number of stage1 paging skipped due to MMEMGR busy state for this paging profile.

Bulk Statistics	Description
mme-paging-profile-stage2-attempted	The total number of stage2 paging attempted by this MME for this paging profile.
mme-paging-profile-stage2-success	The total number of stage2 paging success for this paging profile.
mme-paging-profile-stage2-failure	The total number of stage2 paging failure for this paging profile.
mme-paging-profile-stage2-skipped	The total number of stage2 paging skipped due to MMEMGR busy state for this paging profile.
mme-paging-profile-stage3-attempted	The total number of stage3 paging attempted by this MME for this paging profile.
mme-paging-profile-stage3-success	The total number of stage3 paging success for this paging profile.
mme-paging-profile-stage3-failure	The total number of stage3 paging failure for this paging profile.
mme-paging-profile-stage3-skipped	The total number of stage3 paging skipped due to MMEMGR busy state for this paging profile.
mme-paging-profile-stage4-attempted	The total number of stage4 paging attempted by this MME for this paging profile.
mme-paging-profile-stage4-success	The total number of stage4 paging success for this paging profile.
mme-paging-profile-stage4-failure	The total number of stage4 paging failure for this paging profile.
mme-paging-profile-stage4-skipped	The total number of stage4 paging skipped due to MMEMGR busy state for this paging profile.
mme-paging-profile-stage5-attempted	The total number of stage5 paging attempted by this MME for this paging profile.
mme-paging-profile-stage5-success	The total number of stage5 paging success for this paging profile.
mme-paging-profile-stage5-failure	The total number of stage5 paging failure for this paging profile.
mme-paging-profile-stage5-skipped	The total number of stage5 paging skipped due to MMEMGR busy state for this paging profile.