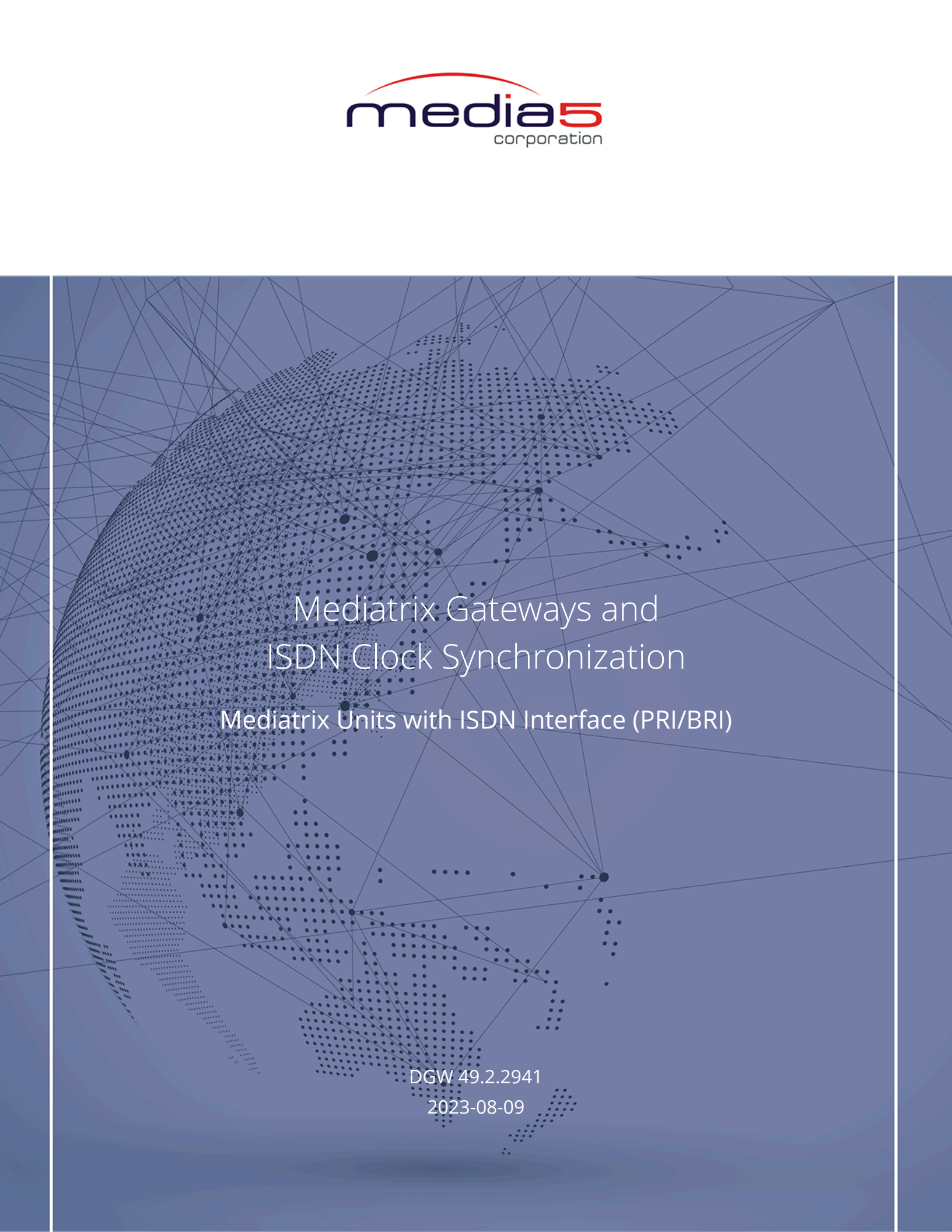


The background of the slide is a dark blue gradient with a complex, abstract pattern of white lines and dots. The pattern resembles a network or a stylized globe, with lines connecting various points across the surface.

Mediatrix Gateways and ISDN Clock Synchronization

Mediatrix Units with ISDN Interface (PRI/BRI)

DGW 49.2.2941
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ISDN Clock Mode

ISDN is a synchronous network, meaning that all endpoints on the network need to synchronize on the same clock signal. Typically, one endpoint acts as the clock MASTER, generating the clock signal, and the other endpoints act as clock SLAVE, synchronizing on the clock signal received from the MASTER.

By default, a NT type endpoint acts as clock MASTER, and a TE type endpoint acts as clock SLAVE. This default behaviour can be changed by using the web interface of the Mediatrix units. The clock mode of the ISDN endpoints can be set to either clock MASTER or clock SLAVE.

The following is a description of the endpoints behaviour with regards to clock signal synchronization:

- In transmission, all endpoints, regardless of their type, send a clock signal along with the data they send.
- In reception, all endpoints, regardless of endpoint type, use the clock they receive from the other end to synchronize the received data.
- In transmission, a clock SLAVE adjusts the clock it sends, based on the clock received from the other end in reception.
- In transmission, a clock MASTER sends an absolute clock signal that does not depend on the clock received from the other end.

Setting the Clock Mode

Steps

- 1) Go to **ISDN/Basic Rate Interface**.
- 2) In the **Select Endpoint** dropdown menu, select the endpoint you want to configure.
- 3) In the **Interface Configuration** table, set the **Clock Mode**.

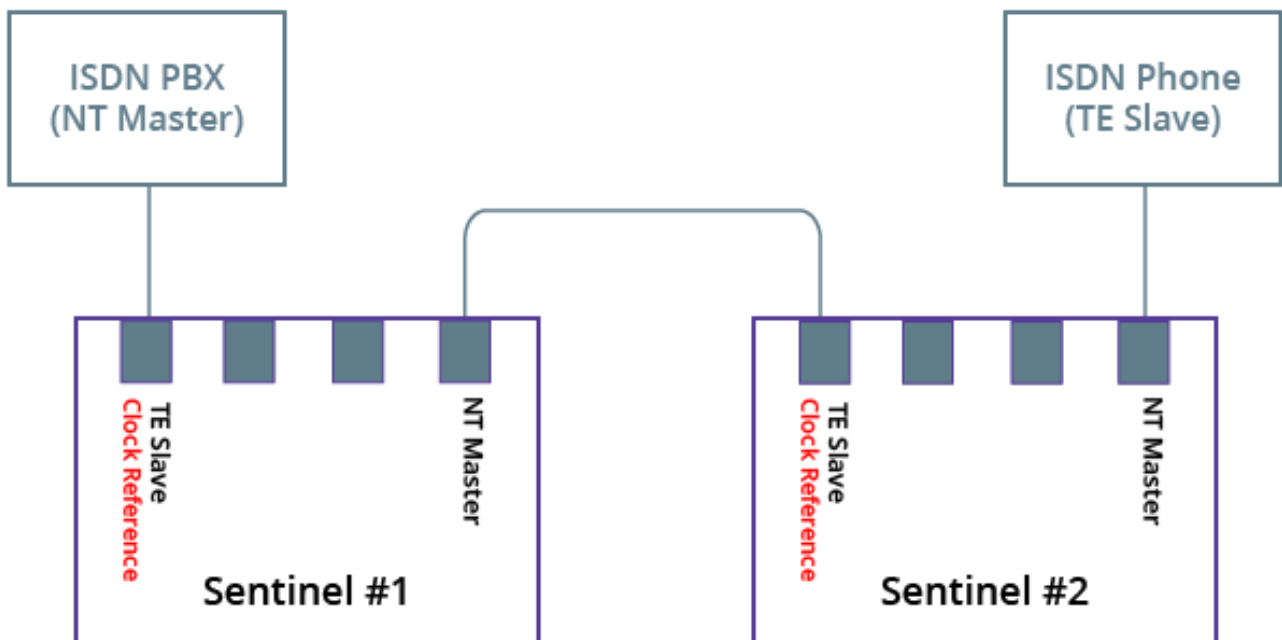
Result

Interface Configuration	
Endpoint Type:	TE ▼
Clock Mode:	Auto ▼
Monitor Link State:	Auto Master Slave
Connection Type:	int ▼

ISDN Clock Reference

On Mediatrix units with multiple ISDN endpoints, it is possible to select which endpoint should be used as the clock reference. When an endpoint is designated as clock reference, the other endpoints on the Mediatrix unit use this endpoint's clock as a synchronization source for generating their own clock.

In the following example, the clock signal generated by the ISDN PBX is received on the Mediatrix C740 #1's TE Slave endpoint and taken as a reference for this unit. Therefore the clock signal generated by this unit's NT Master endpoint is synchronized on this signal. The Mediatrix C740 #2's TE Slave endpoint receives this signal and uses it as a reference for this unit, meaning that the clock signal generated by this unit's NT Master endpoint towards the ISDN phone is synchronized on this signal, therefore on the PBX's signal.



Selecting the Source of the Clock Reference

Steps

- 1) Go to **System/Hardware**.
- 2) From the **Clock Reference Configuration** table, select from the **Suggestion** list, several clock reference sources.
- 3) Click **Apply**.

Result

The selected **Clock Reference** sources for each available telephony card, according to the unit type, are displayed in the **Value** field of the **Clock Reference Configuration** table. The first selected

source will be used as a the clock reference. The following one will be used as the fallback source, in the listed order, if the first one becomes unavailable. Only one source is used at a time for the **Clock Reference**.

Clock Reference Configuration			
	Value	Suggestion	
Clock Reference Source:	Telephony interface	--- Suggestion --- ▼	

Current Clock Reference

The Mediatrix unit selects the interface that is effectively used as clock reference in the following way:

- Only a clock SLAVE interface can be used as clock reference.
- If there is a configured preferred clock reference interface, this interface becomes the clock reference as soon as it is UP (and running in SLAVE mode).
- If the preferred clock reference interface is DOWN or if there is no configured preferred clock reference interface, the first clock SLAVE interface to become UP becomes the clock reference.
- If no clock SLAVE interface is UP, there is no clock reference and the unit uses its own internally-generated clock signal.

Mediatrix Unit Clock Synchronization

An ISDN network will be reliable when all endpoint clocks are synchronized correctly. When endpoints are not synchronized, they each run on their own internally-generated clock signals (free-running). The following are acceptable clock signal deviations from the reference specified clock frequency in ppm (parts-per-million).

Recommendation	Interface	Acceptable deviation
ITU-T I.430	Basic Rate (BRI)	100 ppm
ITU-T I.431	Primary Rate (PRI)	50 ppm

Mediatrix units are tested and certified against these specifications, and are guaranteed to follow the specified clock signal accuracy.

When endpoints are not synchronized, the clock signals are obviously not running at the exact same frequency, because of normal hardware deviations. The clock signals therefore gradually drift away from each other and a periodical frame slip happens

With respect to the specified accepted deviations, the worst case frame slip rates are calculated as follows:

Interface	Acceptable deviation	Worst case difference between endpoints	Frame slip rate
Basic Rate (BRI)	100 ppm for each endpoint on a link	200 ppm	2E-4 (one slip every 5000 frames)
Primary Rate (PRI)	50 ppm for each endpoint on a link	100 ppm	1E-4 (one slip every 10000 frames)

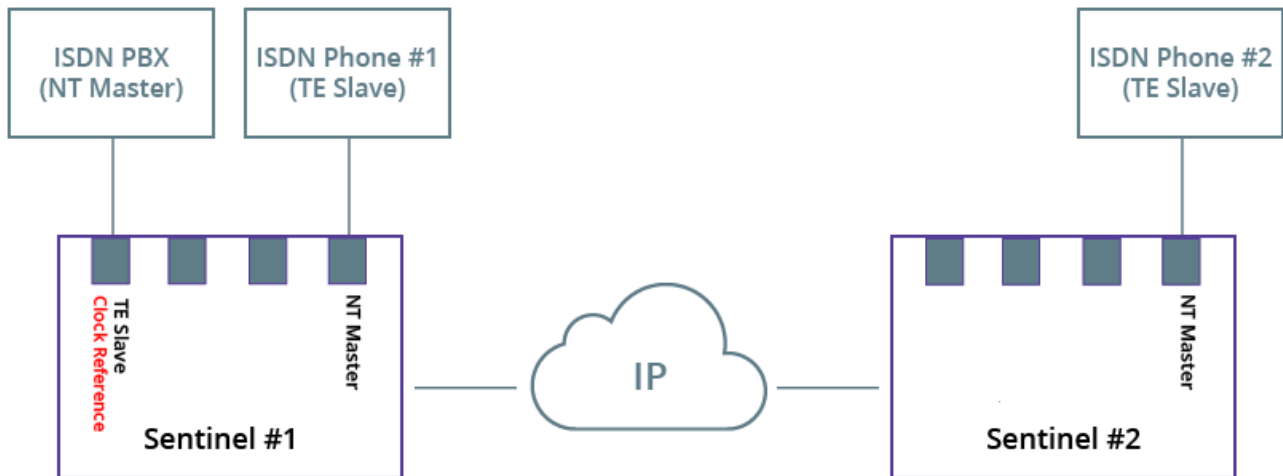
Direct ISDN Connection Between Endpoints

It is important to configure each endpoint appropriately so the clock signal is synchronized correctly with the rest of the network. The following table shows the different endpoint clock mode combinations and the associated behaviour.

Endpoint 1 \ Endpoint 2	Master	Slave
Master	- Endpoints are not synchronized. - Connection experiences frame slips and potentially loses data.	Endpoints are synchronized.
Slave	Endpoints are synchronised.	Connection MAY be established but is unreliable due to synchronization loop.

IP Connection Between ISDN Networks

When using Mediatrix units to connect different ISDN networks through IP, each ISDN network runs on its own clock because there is no way to share the clock signal between the networks. Therefore, VoIP calls between different ISDN networks always experience periodical frame slips, which result in periodical packet losses, or measured bit error rates.



Online Help

If you are not familiar with the meaning of the fields and buttons, click **Show Help**, located at the upper right corner of the Web page. When activated, the fields and buttons that offer online help will change to green and if you hover over them, the description will be displayed.

DGW Documentation

Mediatrix devices are supplied with an exhaustive set of documentation.

Mediatrix user documentation is available on the [Media5 Documentation Portal](#).

Several types of documents were created to clearly present the information you are looking for. Our documentation includes:

- **Release notes:** Generated at each GA release, this document includes the known and solved issues of the software. It also outlines the changes and the new features the release includes.
- **Configuration notes:** These documents are created to facilitate the configuration of a specific use case. They address a configuration aspect we consider that most users will need to perform. However, in some cases, a configuration note is created after receiving a question from a customer. They provide standard step-by-step procedures detailing the values of the parameters to use. They provide a means of validation and present some conceptual information. The configuration notes are specifically created to guide the user through an aspect of the configuration.
- **Technical bulletins:** These documents are created to facilitate the configuration of a specific technical action, such as performing a firmware upgrade.
- **Hardware installation guide:** They provide the detailed procedure on how to safely and adequately install the unit. It provides information on card installation, cable connections, and how to access for the first time the Management interface.
- **User guide:** The user guide explains how to customise to your needs the configuration of the unit. Although this document is task oriented, it provides conceptual information to help the user understand the purpose and impact of each task. The User Guide will provide information such as where and how TR-069 can be configured in the Management Interface, how to set firewalls, or how to use the CLI to configure parameters that are not available in the Management Interface.
- **Reference guide:** This exhaustive document has been created for advanced users. It includes a description of all the parameters used by all the services of the Mediatrix units. You will find, for example, scripts to configure a specific parameter, notification messages sent by a service, or an action description used to create Rulesets. This document includes reference information such as a dictionary, and it does not include any step-by-step procedures.

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