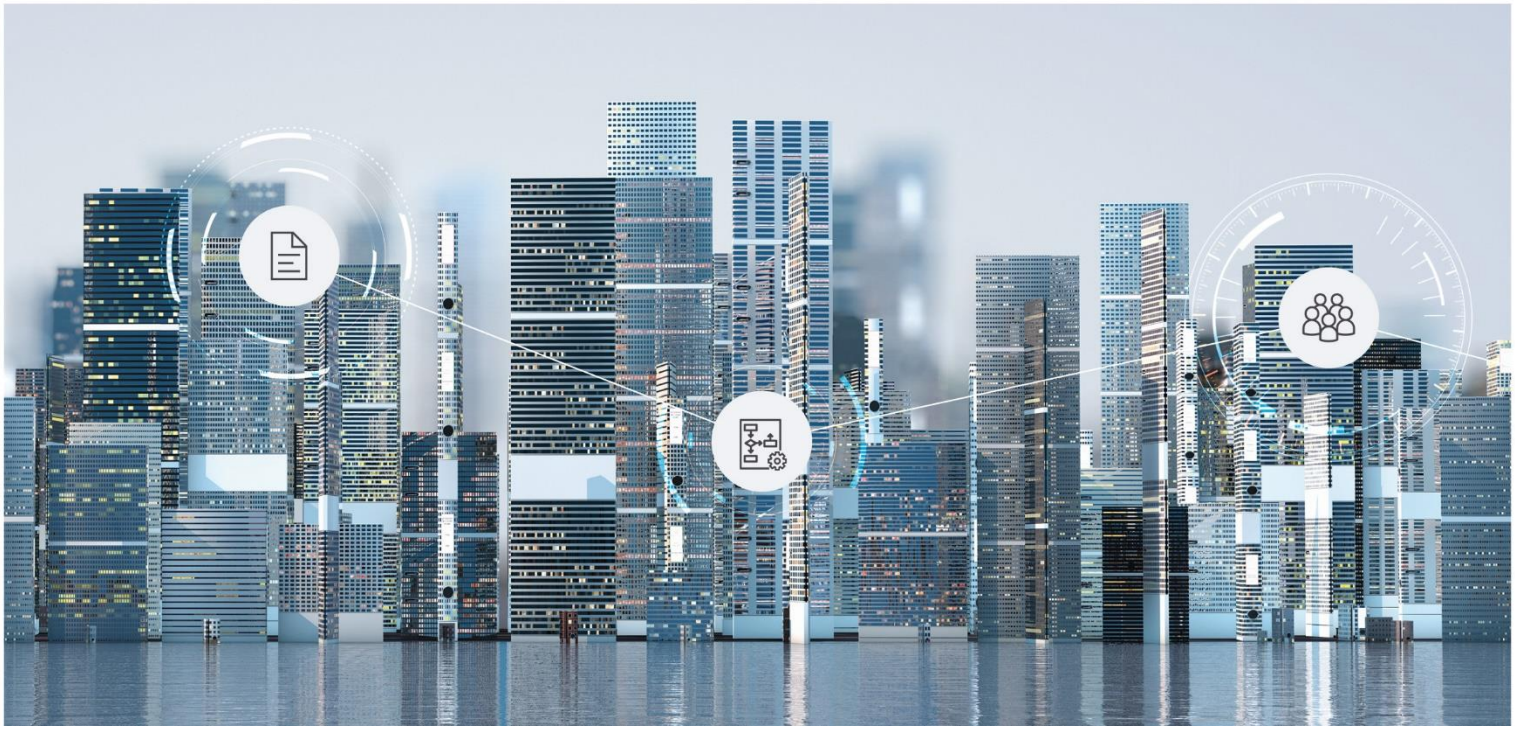
Fabasoft



White Paper

Fabasoft Folio Kernel Optimization

Fabasoft Folio 2020 Update Rollup 3

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1 Introduction

The “cache and UDP multicast protocol” optimizes the Fabasoft Folio Kernel cache behavior. The aim of the protocol is to reduce the necessary RPCs (remote procedure calls) between server and client, if the object is already placed in the client cache. To achieve this, each Fabasoft Folio COO Service sends UDP multicast packages to inform the client about potential object modifications.

The “cache and UDP multicast protocol” can be enabled or disabled in the *Current Domain* (default: enabled).

2 Software Requirements

System environment: All information contained in this document implicitly assumes a Microsoft Windows environment or Linux environment.

Supported platforms: For detailed information on supported operating systems and software see the software product information on the Fabasoft distribution media.

3 Functionality in Detail

3.1 General

If an object gets locked (e.g. because of editing) it is refreshed by the `FORCE` option. By means of this option in each case an RPC (remote procedure call) to the Fabasoft Folio COO Service is performed to ensure that the object is up to date. If necessary, the update is ensured by another RPC.

If an object that is already placed in the Fabasoft Folio Kernel cache is accessed without the `FORCE` option (e.g. reading access), no RPC to the Fabasoft Folio COO Services is necessary in case that no modification notice is received from the Fabasoft Folio COO Service. This RPC reduction improves the performance.

If an object is modified by means of a transaction, the appropriate Fabasoft Folio COO Service sends a modification notice via UDP multicast. Each Fabasoft Folio Kernel receives this modification notice and marks the object in its Fabasoft Folio Kernel cache as modified. As a consequence, the object needs to be updated by Fabasoft Folio COO Service at the next access.

The modification notice only indicates that the object has been modified but the update of the object is not performed until the next access.

Note: The Fabasoft Folio Kernel optimization works only if the UDP packets sent by the server can be received by the client. Ensure an appropriate network configuration. On Linux systems, the following command can be executed to add the appropriate route:

```
route add -net 224.0.0.0 netmask 240.0.0.0 dev <device>
```

3.2 Heartbeat and Sequence Numbers

Because there is no guarantee that UDP packages reach their recipient, it may happen, that the Fabasoft Folio Kernel spuriously treats an object to be up to date.

To avoid this, each Fabasoft Folio COO Service sends a so-called heartbeat periodically (every 5 seconds) where each message contains a sequence number.

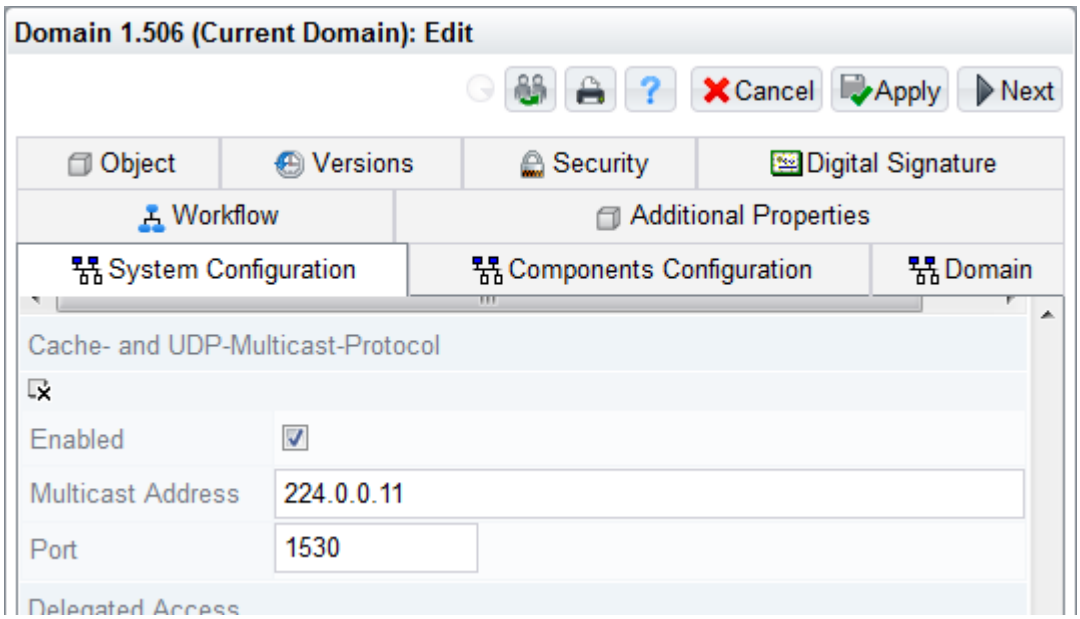
An object in Fabasoft Folio Kernel cache is only up to date, if the following conditions are fulfilled:

- Since the last update all notices have been received in the cache (ensured by sequence numbers),
- no received notice contains a modification of this object and
- the last received notice is not older than the specified heartbeat plus a tolerance value (about 7 seconds) for the duration of reception.

4 Configuration

In the Fabasoft Folio Domain, it can be configured, whether the "cache and UDP multicast protocol" should be used or not. In addition the multicast address and the multicast port can be configured.

These settings can be made in the current domain object.



Performing a Fabasoft Folio update or a reinstallation, the "cache and UDP multicast protocol" is activated by default and the multicast address and the appropriate port are initialized with default values. These default values are dependent on the installed Fabasoft Folio Domain. The assigned multicast address stays between 224.0.0.10 and 224.0.0.250.

Note: The address range between 224.0.0.0 and 224.0.0.255 is assigned to low level protocols. Datagrams that are sent to addresses within this range are not routed by a multicast capable router.

These settings can be modified subsequently. Wait a short moment after a modification to ensure that the modifications are distributed to all Fabasoft Folio COO Services (synchronization threads run in periodical intervals).

After a restart of Fabasoft Folio COO Services the new settings are active. Starting the Fabasoft Folio COO Services the used settings are written to the event log (see chapter 5.1 "Event Log").

Note: If the "cache and UDP multicast protocol" does not work (error message in the event log), it is possible that another Fabasoft Folio Domain with the same license (same domain ID) exists in the network. In this case change the automatically calculated default values to prevent that several domains use the same multicast address and the same port.

Note: If you are using Linux and no default gateway is set, you have to set a route entry for the Multicast address-range.

5 "Cache and UDP Multicast Protocol" Monitoring

5.1 Event Log

At the startup of the Fabasoft Folio COO Service an event log entry is generated, which shows the status of the multicast server.

In this case the "cache and UDP multicast protocol" is enabled, the used multicast address is 224.0.0.11 and the multicast port is 1190.

```
Fabasoft Components Server 7.0.4.37
Domain 1.1190 (FSCDomain) Service 1 (COOST1) Thread 4796.3168

RMP: Multicast server startup
Address 224.0.0.11
Port 1190
Heartbeat 5000 msecs
```

If the "cache and UDP multicast protocol" is disabled, an entry in the event log is created too when starting the Fabasoft Folio COO Service.

```
Fabasoft Components Server 7.0.4.37
Domain 1.1190 (FSCDomain) Service 1 (COOST1) Thread 4592.5368

RMP: Multicast based cache invalidation is disabled

Operating System: Windows NT 5.2 Service Pack 1 on x86(15/4/3)
Service Account: NT AUTHORITY\SYSTEM
```

Also the client (Fabasoft Folio Kernel) writes an entry in the event log after a successful start.

```
FSCRMP: Multicast client startup
Address 224.0.0.11
Port 1190
Heartbeat 5000 msecs
```

UDP package losses (modification notices and heartbeats) are written as warning t the event log.

Note: A package loss does not lead to a data loss or inconsistency. It is simply impossible to perform optimized cache behavior.

```
FSCRMP: Server lost: unexpected message sequence number 757177
Server: 286586004570114
Sequence: 757176
```

or

```
FSCRMP: Server lost: heartbeat missing
Timeout: 9313 msecs
Server: 286586004570116
Sequence: 757176
```

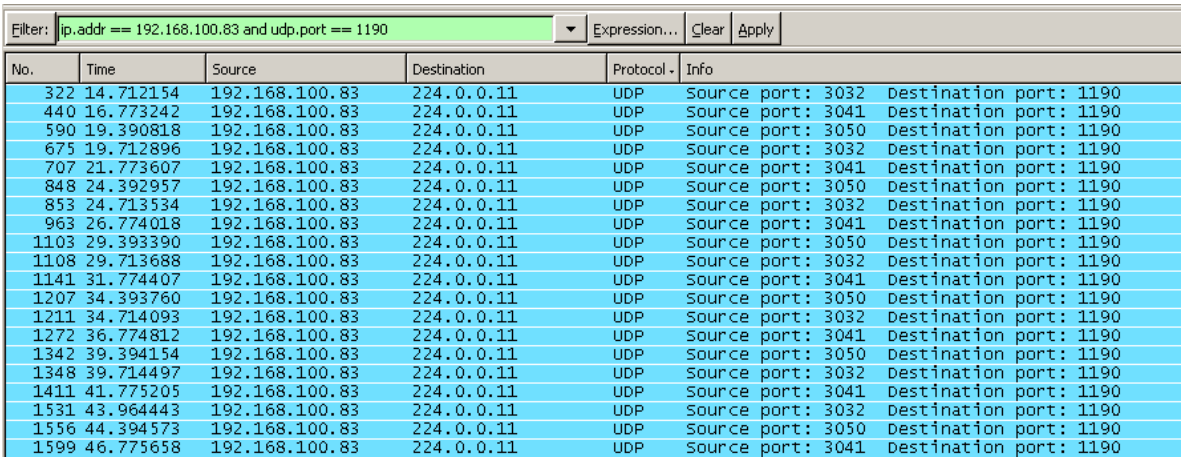
5.2 Network Load Monitoring

For analyzing the network traffic, a tool like "Wireshark" (http://www.wireshark.org) can be used.

With an appropriate filter, all UDP packages of a certain address (e.g. IP address of the server) can be filtered in a certain area.

Example: `ip.addr == 192.168.100.83 and udp.port == 1190`

This filter restricts to UDP packages with the sender IP address 192.168.100.83 and the destination port 1190.



No.	Time	Source	Destination	Protocol	Info
322	14.712154	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
440	16.773242	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
590	19.390818	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
675	19.712896	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
707	21.773607	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
848	24.392957	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
853	24.713534	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
963	26.774018	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
1103	29.393390	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
1108	29.713688	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
1141	31.774407	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
1207	34.393760	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
1211	34.714093	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
1272	36.774812	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
1342	39.394154	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
1348	39.714497	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
1411	41.775205	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190
1531	43.964443	192.168.100.83	224.0.0.11	UDP	Source port: 3032 Destination port: 1190
1556	44.394573	192.168.100.83	224.0.0.11	UDP	Source port: 3050 Destination port: 1190
1599	46.775658	192.168.100.83	224.0.0.11	UDP	Source port: 3041 Destination port: 1190

6 Further Information

Topic	Link
UDP (RFC 768)	http://tools.ietf.org/html/rfc768
Host Extensions for IP Multicasting (RFC 1112)	http://tools.ietf.org/html/rfc1112
Transmission of IPv6 Packets over Ethernet Networks (RFC 2464)	http://tools.ietf.org/html/rfc2464
Internet Protocol Version 6 (IPv6) Addressing Architecture (RFC 3513)	http://tools.ietf.org/html/rfc3513
Wireshark	http://www.wireshark.org