European Data Relay System (EDRS)
Request for Information (RFI)
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# ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>BC</td>
<td>Business Case</td>
</tr>
<tr>
<td>BER</td>
<td>Bit Error Rate</td>
</tr>
<tr>
<td>BP</td>
<td>Business Plan</td>
</tr>
<tr>
<td>BFLGS</td>
<td>EDRS-C Back-up Feeder Link Ground Station</td>
</tr>
<tr>
<td>BMOO</td>
<td>Back-up Mission Operations Centre</td>
</tr>
<tr>
<td>ColKa</td>
<td>Columbus Ka-Band ISL Terminal</td>
</tr>
<tr>
<td>CRM</td>
<td>Customer Relations Management</td>
</tr>
<tr>
<td>DA</td>
<td>Delegation Agreement</td>
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<tr>
<td>DCSU</td>
<td>Data Consolidation Unit</td>
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<tr>
<td>DGS</td>
<td>Data Ground Stations</td>
</tr>
<tr>
<td>DLR</td>
<td>Deutsche Luft &amp; Raumfahrt Agentur</td>
</tr>
<tr>
<td>DRS</td>
<td>Data Relay Satellite</td>
</tr>
<tr>
<td>DPCC</td>
<td>EDRS-A Payload Control Centre</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EDRS</td>
<td>European Data Relay System</td>
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<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>FAR</td>
<td>Flight Acceptance Review</td>
</tr>
<tr>
<td>FLGS</td>
<td>EDRS-C Feeder Link Ground Station</td>
</tr>
<tr>
<td>Gbps</td>
<td>Gigabit per second</td>
</tr>
<tr>
<td>GEO</td>
<td>Geostationary Earth Orbit</td>
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<tr>
<td>GHz</td>
<td>Gigahertz</td>
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<tr>
<td>GSOC</td>
<td>German Space Operations Centre</td>
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<td>GTO</td>
<td>Geosynchronous Transfer Orbit</td>
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<tr>
<td>HDGGS</td>
<td>Harwell Data Ground Station</td>
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<tr>
<td>IOV</td>
<td>In-Orbit Validation</td>
</tr>
<tr>
<td>ISL</td>
<td>Inter-Satellite Link</td>
</tr>
<tr>
<td>ITT</td>
<td>Invitation to Tender</td>
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<td>IOT</td>
<td>In-Orbit Test</td>
</tr>
<tr>
<td>IOCR</td>
<td>In-Orbit Commissioning Results Review</td>
</tr>
<tr>
<td>ISS</td>
<td>International Space Station</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
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<tr>
<td>Ka-ISL</td>
<td>Ka-Band Inter-Satellite Link</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LCT</td>
<td>Laser Communication Terminal</td>
</tr>
<tr>
<td>LEO</td>
<td>Low Earth Orbit</td>
</tr>
<tr>
<td>MOC</td>
<td>Mission Operations Centre</td>
</tr>
<tr>
<td>OISL</td>
<td>Optical Inter-Satellite Link</td>
</tr>
<tr>
<td>OGS</td>
<td>Optical Ground Station</td>
</tr>
<tr>
<td>OPEX</td>
<td>Operational Expenditure</td>
</tr>
<tr>
<td>P/L</td>
<td>Payload</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private Partnership</td>
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<tr>
<td>RFI</td>
<td>Request for Information</td>
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<tr>
<td>RDGS</td>
<td>Weilheim Data Ground Station</td>
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<tr>
<td>SCC</td>
<td>EDRS-C Satellite Control Center</td>
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<tr>
<td>S-IOCR</td>
<td>Service In-Orbit Commissioning Results Review</td>
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<td>SLA</td>
<td>Service Level Agreement</td>
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<tr>
<td>TBC</td>
<td>To Be Confirmed</td>
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<tr>
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<td>To Be Defined</td>
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<td>-----------</td>
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<tr>
<td>TC</td>
<td>Telecommand</td>
</tr>
<tr>
<td>TDP1</td>
<td>Technology Demonstration Payload Number 1</td>
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<tr>
<td>TM</td>
<td>Telemetry</td>
</tr>
<tr>
<td>TTC</td>
<td>Telemetry, Tracking and Command</td>
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<tr>
<td>UGS</td>
<td>User Ground Station</td>
</tr>
<tr>
<td>USC</td>
<td>User Spacecraft</td>
</tr>
<tr>
<td>UST</td>
<td>User Space Terminal</td>
</tr>
<tr>
<td>UAV</td>
<td>Unmanned Aeronautical Vehicle</td>
</tr>
</tbody>
</table>
2 \hspace{1em} \textbf{REFERENCE DOCUMENTATION}

[RD1] EDRS – The Sentinel Requirements – Data Relay Services; GM-RS-ESA-SY-27; Issue 1.0; 9.3.2010


[RD3] EDRS Service Management Requirements; GMES-GSOP-EOPG-RD-11-0029; Issue 1.0; 8.7.2011

The Reference documentation may be made available on request if required during the dialogue phase.
3 BACKGROUND AND INTRODUCTION

The European Data Relay System (EDRS) Programme has the objective to provide ESA with the necessary data relay services via satellite, to foster the development of the satellite data relay services market, to support the standardization and adoption of Optical and Ka-Band Data Relay technology and to achieve a cost effective Programme through a Public Private Partnership with an operator/service provider.

The long term plan and objective of the Programme is to consolidate the design and the PPP model of service provision to allow the provision of data relay services with new user communities and to develop new service capabilities globally.

The above Programme objectives and plans remain unchanged and equally apply to the present EDRS RFI.

EDRS is in its system implementation phase, approaching in-orbit deployment. Subsequently, it will enter its exploitation phase and start the provision of data relay services. The first EDRS satellite, EDRS-A is scheduled for launch by mid 2015 together with the planned start of services to the Sentinel satellites of the EC/ESA Copernicus Programme. The second EDRS satellite, EDRS-C is scheduled for launch by 2016.

Options for the completion of the EDRS System infrastructure implementation phase and arrangements for the subsequent exploitation phase including services to Copernicus have been presented by ESA to the relevant ESA Programme Board. The Programme Board requested ESA

- to pursue the EDRS Programme in its current set-up until a decision milestone by end December 2014,
- while in parallel preparing an alternative approach in dialogue with potentially interested parties and the preparation of an Invitation to Tender. Such ITT may be issued for the selection of a new public-private partnership arrangement via a competitive process.

The present RFI supports the ITT preparation, including a dialogue phase with interested parties. The RFI responses may be used in support to the ITT preparation. This preparatory process shall be concluded by early December 2014.

If requested by the ESA Programme Board, the Invitation to Tender is planned to be issued by January 2015 to the parties identified during the RFI phase. The ITT would require the new EDRS partnership to take effect with the start of EDRS-A services to Sentinel-1A planned for mid 2015.

ESA has no obligation to issue such ITT nor to place a contract.
4 SCOPE

This document presents the ESA EDRS RFI including:
- Description of the Opportunity
- RFI Conditions and Principles
- RFI Process and Evaluation Criteria
- RFI Guidelines

Four annexes provide the Bidders information regarding:
- Appendix A: Template for Notice of intent
- Appendix B: EDRS Technical description
- Appendix C: EDRS Operation description
- Appendix D: EDRS Copernicus SLA Key Characteristics
- Appendix E: EDRS ISS/Columbus SLA Key Characteristics
5 DESCRIPTION OF THE OPPORTUNITY

5.1 Main principles of the opportunity

This RFI prepares an opportunity for one or several Satellite Operators and Service Providers residing in an ESA Member State or Associate Member State to obtain

- Full ownership of the EDRS system as well as
- the rights and obligations associated to its exploitation, in particular for Services to the EC/ESA Copernicus Programme, ISS/Columbus and related service revenues.

In return the Operator(s)/ Service Provider(s) shall

- provide private co-funding for completion of the EDRS System infrastructure implementation phase, including full funding of the launch of EDRS-C,
- ensure availability of the EDRS System for operations over its lifetime, and
- as an option, demonstrate his capability to develop the service with future users, and its perspective /plans for the evolution of the system and services, ensuring EDRS sustainability

The transfer of ownership shall proceed in two stages:

- For EDRS-A after successful EDRS-A Service Commissioning with Copernicus Sentinel-1A (S-IOCR)
- For EDRS-C after successful EDRS-C Flight Acceptance Review (FAR), while the EDRS-C infrastructure implementation phase is open to participation by the operator/ service provider.

If considered beneficial by the operator/ service provider, ESA may support EDRS throughout implementation and exploitation phase

- in attracting new institutional users,
- in support to international cooperation with other space agencies,
- and in support to international standardization.

5.2 EDRS mission description

The EDRS mission and operations description is provided in Annex B and C.
6 CONDITIONS AND PRINCIPLES OF THE ESA EDRS RFI

The response to the RFI shall comply with the following principles and conditions:

6.1 Expected benefit for ESA

1. A new partnership arrangement shall provide for the completion of the EDRS system infrastructure implementation and prepare for a sustainable exploitation of EDRS, including the required adequate share of funding and risks between the partners.

6.2 EDRS co-funding

1. Co-funding of the EDRS System infrastructure implementation phase is required by the operator/service provider. For the purposes of this RFI a private co-funding in the order of 85MEURO plus the cost of the EDRS-C launch services shall be assumed, when considering the full EDRS System (EDRS-A, EDRS-C, related Ground Segment).
2. In case of a future contract, this co-funding shall be secured and committed at contract signature.
3. Following a successful EDRS-A Service in-orbit commissioning (S-IOCR) with Sentinel-1A the private funds related to the completion of the EDRS System infrastructure shall be made available over the period from mid 2015 to end 2016, with the exception of funds related to the EDRS-C launch services. The latter shall be made available as required for the timely completion of these activities.

6.3 EDRS Service Provision

1. The operator/service provider shall commit to and provide EDRS services to Copernicus as per the SLA key features as defined in Annex D.
2. The operator/service provider shall benefit from the revenues associated with the Copernicus SLA. For the purposes of this RFI these revenues shall be assumed to be
   a. 12MEURO/year, paid on a quarterly basis from mid 2015 up to December 2020,
   b. with an option for extension into a second phase of service under similar conditions and up to 2028.
   c. With the possibility of further extensions in line with the Copernicus/Sentinel mission lifetime.
3. The operator/service provider shall commit to and provide EDRS services to ISS/Columbus as per the SLA key features anticipated in Annex E. For the purposes of this RFI the operator/service provider shall assume related revenues of
   a. revenues of TBD MEURO/year depending on the service capacity and conditions of service, paid on a quarterly basis from 2017 up to end 2020,
   b. with an option for extension into a second phase of service under similar conditions, in line with possible operations lifetime extension of ISS/Columbus.
4. The operator/service provider shall ensure the availability of EDRS System for operations/services to any future ESA or ESA partner mission requiring EDRS services, at least at the price and quality of service conditions provided to Copernicus and ISS/Columbus. This availability shall be within the limits of the EDRS overall system capacity and under consideration of requirements of any future 3rd party user. Conditions (e.g. fee and usage rights) for making available to ESA and ESA partners an
additional capacity of 100,000 minutes/year shall be identified.

5. The operator/service provider shall ensure the operation of the Hylas-3 P/L on board EDRS-C under direct contract from Avanti.

6. The operator/service provider shall identify how additional service revenues (e.g. additional capacity provided to Copernicus, ISS/Columbus or revenues from additional ESA/ESA partners capacity requests) may impact the level of available co-funding specified in chapter 6.2

6.4 EDRS Evolution

As an Option of the RFI response, the operator/service provider may outline its intentions and plans for the evolution of the EDRS, under consideration of the following elements:

1. The operator/service provider may identify any outline plans regarding the development of services with future users,

2. The operator/service provider may identify its outline plans regarding the evolution of the system towards global coverage and new capabilities, including potential launch dates and orbital location of considered future system extensions.

3. The operator/service provider may propose variations of the EDRS-C deployment/start of service schedule as part of the EDRS overall evolution, provided that the proposed variations are technically and economically better or equal to the nominal deployment/start of service of EDRS-C by March 2017 latest, and provided that agreements are proposed in the light of the condition defined under 6.3.5.

6.5 EDRS operation

1. Upon transfer of ownership of the EDRS System, the operations are under the responsibility of the selected Operator/Service Provider. The Operator/Service Provider shall as baseline perform EDRS operations using the facilities and operations arrangements as currently implemented as part of the EDRS Programme.

2. The EDRS operations are currently implemented to be operated using

   • The Mission Operations Centre (MOC), which could be located at the operators/service providers premises
   • The Back-up MOC, located at Redu/Belgium
   • The EDRS-A Payload Control Centre (DPCC), located at DLR/Oberpfaffenhofen, Germany
   • The EDRS-A hosting Satellite Operations Centre at EUTELSAT, France
   • The EDRS-A Data Ground Stations, at Weilheim, Germany and at Harwell, UK
   • The EDRS-C Satellite Control Centre (SCC), located at DLR/Oberpfaffenhofen
   • The EDRS-C Ground Station, located at DLR/Oberpfaffenhofen
   • The EDRS-C Back-up Ground Station, located at Redu/Belgium

3. The total fixed cost of operations related to 6.5 above may be assessed during the dialogue phase of this RFI, including potential ways of further optimization of the baseline and the related costs.
4. The operator/service provider may propose variations of operations arrangements as currently implemented under 6.5.2, e.g. by upgrading of facilities/migration of operations to own premises.

   a. Any cost related to such amendments/migration shall be covered by the operator/service provider.
   b. The anticipated expected level of operations cost may be identified as input to a possible cost optimization during dialogue phase.
   c. The proposal for a variation shall not discharge the operator/service provider to propose EDRS operations as currently designed and set-up for EDRS as per 6.5.2 above.

6.6 EDRS-C launch, in-orbit commissioning and de-orbiting

1. The EDRS-C satellite shall be launched, commissioned in orbit and at the end of its lifetime be de-orbited under the responsibility of the operator/service provider. The operator/service provider shall select the launcher from the list of EDRS-C compliant, i.e. Falcon 9, Ariane V, and Proton having demonstrated their reliability.

6.7 ESA Support

1. The operator/service provider shall identify any support from ESA as described under chapter 5.1 which may be beneficial for EDRS.
6.8 Contractual Principles

This section highlights the main legal and contractual principles applicable to the RFI and a possible future ITT and contract, should such ITT and contract be implemented. They relate to:

- the completion of the EDRS System infrastructure implementation,
- the intended transfer of ownership of the EDRS System,
- the EDRS exploitation phase and Service provision
- the EDRS evolution (RFI Option)

which would form part of several contracts which may be concluded between ESA and the selected Operator/Service Provider.

- A first contract shall be required covering:
  o the completion of the EDRS System infrastructure implementation and related co-funding,
  o EDRS-C launch,
  o transfer of ownership and
  o availability of the EDRS System for operations over the mission lifetime.
- A second contract shall be required for the specific services to be provided under the EDRS/Copernicus SLA, to be signed at the same time as the first contract.
- A third contract shall apply for the specific services to be provided under the EDRS SLA with ISS/Columbus to be signed at the same time as the first contract.

The Operator/Service Provider shall make available the co-funding as defined under 6.2

1. ESA shall be responsible for the completion of the EDRS System implementation, for EDRS-A at EDRS-A Service-IOCR with Sentinel-1A, for EDRS-C up to EDRS-C FAR

2. The operator/service provider shall become the full owner of the EDRS System as described in Annex B.

3. Property and risk of the EDRS-A System and Services shall pass to the Operator/Service Provider upon hand-over at successful EDRS-A Service-IOCR with Sentinel-1A (On-Orbit delivery/Handover). At the same time, possession of the EDRS-A System shall be deemed to have passed to the Operator/Service Provider.

4. Property and risk of the EDRS-C System and Services shall pass to the selected Operator/Service Provider upon hand-over at successful EDRS-C FAR (On-Ground delivery/Handover). At the same time, possession of the EDRS-C System shall be deemed to have passed to the selected Operator/Service Provider.

5. The operator/service provider shall ensure EDRS-C launch and commissioning and the availability of the EDRS system and services for operations over the lifetime of the system and provide EDRS services as required by the SLAs in force over the lifetime of the system.

6. The operator/service provider shall procure the EDRS-C launch services and ensure its launch in time for start of satellite operations latest by March 2017. The operator/service provider may provide variations for phasing EDRS-C deployment and start of service in line with the development of the data relay market and within
the conditions defined in chapter 6.4.3.

7. The selected Operator/ Service Provider shall be responsible for the safe de-orbiting of the EDRS-C satellite in coordination with Avanti.

8. The Agency transfers the EDRS System in the condition as accepted at EDRS-A Service-IOCR and EDRS-C FAR. The operator/ service provider is invited as co-chair of these reviews.

9. The Agency novates all sub-contracts in place for EDRS operations unless the operator/ service provider proposes and can ensure alternative contracts which are at least technically and economically equivalent and the resulting variation of the operational set-up is agreed with ESA.

10. The Agency intends to transfer the property of selected operations facilities of the EDRS ground segment as defined in Appendix B or to put such equipment at the disposal of the selected operator in any other way.
7 RFI PROCEDURE AND EVALUATION CRITERIA

7.1 RFI related procedure

The RFI related procedure will follow the steps further described below.

Step 1: Notice of Intent
Step 2: Dialogue phase
Step 3: RFI submission
Step 4: ITT Preparation

In case of a subsequent ITT, final selection and contract signature will follow.

7.1.1 Step 1: Notice of Intent

Following the issuing of this RFI, interested parties are requested to submit a Notice of Intent indicating their firm intention to submit a response to the RFI and providing a first set of information as defined in the template provided in Appendix A and Table 2.

There will be no pre-selection done among the interested parties on the basis of content of the Notice of Intent.

The completed Notice of Intent shall be submitted by e-mail to the address indicated in the cover letter.

7.1.2 Step 2: Dialogue phase

Additional information regarding the EDRS System and Services will only be provided to the parties which have confirmed their interest (by means of the Notice of Intent defined in Step 1) at the latest by the deadline defined in section 7.2. and subject to the signature of a mutually agreed NDA.

It is recognised that some interactions with the Interested Parties may be required during the dialogue phase. ESA therefore may offer support in providing further clarifications, once the NDA is agreed, aimed at better shaping the response to the RFI.

Questions shall be addressed via e-mail to the address stated in the cover letter. Questions will be collected during this period and may be answered on an individual basis as soon as possible. Dialogue sessions may be organised individually with each Interested Party during this phase on request. However, the results of such dialogue sessions shall never be interpreted as changing the terms and conditions of the present RFI.

At the end of the dialogue phase, the Interested Parties shall provide an update of the Summary description provided in the Notice of Intent, reflecting the main results of the dialogue phase and main elements relevant to the RFI response optimization and finalization. This update shall provide the information as defined under 8.2.2, Table, fourth column and shall be in the range of about 10 pages.
7.1.3  **Step 3: RFI response submission**

By the defined deadline (see calendar in section 7.2) a full response to the RFI will need to be submitted, with the content defined in section 8 and Table 2).

7.1.4  **Step 4: ITT Preparation**

An evaluation of the RFI responses will be done in support to any ITT preparations and may also be used for a possible down selection. The criteria as defined in section 7.3 will be used in that process.

7.1.5  **Subsequent Steps**

If requested by its EDRS Participating States, ESA will proceed with the issuing of an ITT, based on the ITT preparations defined in the above and limited to the operators/service providers which provided a Notice of Intend as requested and limited to those operators/service providers as might have been down-selected in the RFI process.

7.2  **RFI process schedule**

The schedule associated to the RFI is defined in the following table:

<table>
<thead>
<tr>
<th>Step</th>
<th>Event</th>
<th>Date/duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Notice of Intent incl. initial summary description</td>
<td>3rd November 2014 12h00 (CET)</td>
</tr>
<tr>
<td>2</td>
<td>Dialogue and update of summary description</td>
<td>Up to 17th November 2014</td>
</tr>
<tr>
<td>3</td>
<td>RFI response</td>
<td>28th November 2014</td>
</tr>
</tbody>
</table>

Table 1: RFI process schedule

7.3  **Evaluation criteria**

Through this RFI the Agency is looking to obtaining maximum benefits for the Agency and the European space telecom industry. For any RFI down-selection, the following evaluation criteria will be used:

1. Consortium experience in Satellite Operation and Service provision as well as Service and System development
2. Proposed Organisation, management of risks, approach to operations and service provision and considered level of co-funding of implementation
3. Commitment to the EDRS Copernicus SLA obligations and EDRS ISS/Columbus SLA obligations and to the availability of the EDRS System for operations over its lifetime
4. Agreement with the contractual principles introduced with the RFI. Note that any proposed variation of the EDRS overall operations arrangement and any option for EDRS Evolution considered beneficial may subsequently be considered in the ITT preparations.
8 RFI GUIDELINES

8.1 General tender conditions

The RFI response and all correspondence relating to it shall be in English.

Any document submitted in reply to the RFI shall become the property of the Agency. The Agency will treat commercially sensitive or proprietary information confidentially and solely for the purpose of the assessment of the response and any pre-selection.

Expenses incurred in the preparation and dispatch of the RFI response will not be reimbursed. This includes any expenses connected with potential dialogue phase.

The RFI does not bind the Agency in any way to issue an ITT or to place a contract. The Agency reserves the right to issue amendments to the RFI.

Prior to submitting the reply to the RFI, the operator/service provider is requested to complete and send a Notice of Intent form no later than the date indicated in section 7.2. The template for this document is provided in Appendix A.

8.2 RFI Response Content

The RFI response shall include at least the following content (any additional relevant information deemed necessary by the operator/service provider may be included in its response).

1. Signed Cover Letter including:
   - A summary of the RFI response;
   - The name, telephone / fax number and e-mail address of the operator/service provider's contact person to whom all communications relating to its RFI response should be addressed;
   - The contact details of the persons responsible for technical and contractual matters;
   - The name and function of the legal representative;
   - The name of the author(s) of the RFI

2. Detailed Description of RFI Response which may follow the outline as per Table 2 below (as per right-most column):

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
<th>Notice of Intent Initial Summary Description (about 3-5 pages)</th>
<th>Updated Initial Summary Description (about 10 pages)</th>
<th>RFI Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experience in Satellite Operations &amp; Service Provision (General)</td>
<td>Short summary</td>
<td>Update of summary, incl. demonstration of the capability to ensure</td>
<td>Detailed description of relevant experience</td>
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<td>2.</td>
<td>Organisation, Proposed approach to EDRS operations &amp; service provision (as per 6.3; 6.5; 6.6; 6.7) NB: The RFI response may propose arrangement between more than one operator/ service provider, e.g. share or rights and obligations with respect to EDRS-A and EDRS-C or share of rights and obligations with respect to geographical criteria or user markets.</td>
<td>- Short summary of considered approach - Identification of anticipated main operator(s)/service provider(s) - Identification of any further potential partners/ key contractors (satellite operations; ground operations; service provision) - Other information as considered relevant, e.g. EDRS-C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Share of risks and co-funding (as per 6.1; 6.2)</td>
<td>General statement first level of detail; considered revenues and co-funding level Details of anticipated sharing of risks and co-funding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>SLA Commitment to Copernicus; ISS/Columbus; System availability to operations over lifetime (as per 6.3 &amp; Annex D&amp;E)</td>
<td>General statement any relevant updates, e.g. on specific SLA aspects Detailed description, incl. detailed compliance statement to Annex D&amp;E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Agreement to contractual principles (as per 6.8)</td>
<td>Agreement to the RFI principles of ownership and co-funding and firm intention to prepare a RFI response any updates in anticipation of details of RFI response and its optimization Details in particular on responsibilities; transfer &amp; ownership; property and risks; EDRS-C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Variants (if considered) (as per 6.4.3; 6.5.4)</td>
<td>Identification of any considered variants Description of any variants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Options (if considered) (as per 6.4)</td>
<td>Identification of any considered options Description of any options</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: RFI (and Notice of Intent) Content
APPENDIX A  NOTICE OF INTENT FORM

SUMMARY PAGE

Name of the Bidder company:

Contract manager name:  Technical manager name:

Mailing address:  Mailing address:
Tel.:  Tel.:
Fax:  Fax:
E-mail:  E-mail:

- Statement of firm intention to submit a RFI response signed by an authorised representative of the bidder.
- Outline/Summary Description as per 8.2.2, Table 2, third column.

Note: this document should be approximately 3-5 pages long. (The update of the Summary Description shall be about 10 pages long, see 8.2.2, Table 2, fourth column)
APPENDIX B  EDRS TECHNICAL DESCRIPTION

The EDRS-A system consists of
- A hosted P/L on-board the EUELSAT EB9B satellite, to be located at 9 degrees east, to be launched in mid 2015 and with an operational lifetime of 15 years
  - The P/L provides for
    - An optical ISL @ 1800Mbps via LCT
    - An optical forward tasking @ 1kbps
    - A Ka-ISL at 400 MHz bandwidth (around 300 MMbps)
    - A Ka forward tasking at 2 MHz bandwidth (1 Mbps)
    - A Ka-feeder downlink @ 1800 Mbps
  - The Ground Segment for EDRS-A operations

The EDRS-C system consists of
- A dedicated satellite and P/L, located at 31 degrees east, to be launched in 2016 with an operational lifetime of 15 years and with a launcher compatibility with Falcon 9, Ariane V and Proton
  - The P/L provides for
    - An optical ISL @ 1800Mbps via LCT
    - An optical forward tasking @ 4kbps
    - A Ka-feeder downlink @ 1800 Mbps
  - 3rd party hosted P/Ls
    - Hylas-3 Payload (by Avanti)
    - Radiation Monitor (NGRM) (by RUAG)
  - The Ground Segment for EDRS-C operations

The Ground Segment consists of
- The Mission Operations Centre (MOC), which could be located at the operators/ service providers premises
- The Back-up MOC, located at Redu/Belgium
- The EDRS-A Payload Control Centre (DPCC), located at DLR/Oberpfaffenhofen, Germany
- The EDRS-A hosting Satellite Operations Centre at EUTELSAT, France
- The EDRS-A Data Ground Stations, at Weilheim, Germany and at Harwell, UK
- The EDRS-C Satellite Control Centre (SCC), located at DLR/Oberpfaffenhofen
- The EDRS-C Ground Station, located at DLR/Oberpfaffenhofen
- The EDRS-C Back-up Ground Station, located at Redu/Belgium

Ground Station antenna diameter typically is 6.8m..
APPENDIX C  EDRS OPERATIONS DESCRIPTION

Operations

The central part is the Mission Operation Center (MOC, location Ottobrunn, Germany and Back-up MOC, Redu, Belgium) which is processing the service requests by the users. The planning details may vary from user to user, but will contain information on the orbital position of the counter terminal/user satellite at the time of service requested, the planned duration of the link and the handling of the data on-ground. Such information, together with the planning constraints of the EDRS and the user satellite are defining the overall service schedule. Based on the information described above, the MOC will task the corresponding ground segment elements – either the one related to EDRS-A or the one related to EDRS-C.

The EDRS-A related Ground Segment consists of the Devolved Payload Control Center (DPCC), which is preparing the commands for the EDRS payload hosted on Eutelsat’s EB9B satellite. The command files are send to Eutelsat’s Satellite Control Center and finally uplinked to the satellite. The user data are downloaded to the data receiving Ground Stations (RDGS, Weilheim, Germany and HDGS, Harwell, United Kingdom).

The EDRS-C related Ground Segment consists of two ground stations which serve as spacecraft control and data receiving station at the same time (FLGS, Weilheim, Germany and BFLGS, Redu, Belgium).

In addition to the EDRS data receiving stations, the user has the option to receive the data at his own ground stations to ensure direct access to the required data at the desired location.

Services

EDRS will provide 4 different services, 2 based on the Optical ISL and 2 based on the microwave Ka-ISL. They are listed in table 1.

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Data Flow</th>
<th>Data Rate</th>
<th>Service available on GEO-Node</th>
</tr>
</thead>
</table>

- The data relay RETURN service provides data gathered by the LEO satellite, via Inter-Satellite Links to the geostationary node and from there via Ka-Band Feeder link down to ground.

- The FORWARD service will be mainly used to task and command the LEO satellite in near real time if the LEO has no direct line-of-sight with its own ground segment. The optical forward service is routed via TM/TC channels from the ground to either EDRS-A or EDRS-C and from there to the LEO user satellite.
<table>
<thead>
<tr>
<th>Service Type</th>
<th>Direction</th>
<th>Data Rate (bit/s)</th>
<th>Service Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical ISL return service</td>
<td>LEO→GEO→Ground</td>
<td>600 Mbit/s or 1.8 Gbit/s</td>
<td>EDRS-A, EDRS-C</td>
</tr>
<tr>
<td>Optical ISL forward service</td>
<td>Ground→GEO→LEO</td>
<td>500 bit/s</td>
<td>EDRS-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 kbit/s</td>
<td>EDRS-C</td>
</tr>
<tr>
<td>Ka-ISL return service</td>
<td>LEO→GEO→Ground</td>
<td>300 Mbit/s</td>
<td>EDRS-A</td>
</tr>
<tr>
<td>Ka-ISL forward service</td>
<td>Ground→GEO→LEO</td>
<td>1 Mbit/s</td>
<td>EDRS-A</td>
</tr>
</tbody>
</table>

The EDRS initial anchor customer, Sentinel, makes use of the optical ISL return service at a data rate of 600 Mbit/s for the first 4 satellites, Sentinel 1A, 2A, 1B and 2B. The follow-on Sentinel satellites (C/D models) may consider to use higher data rates. The service details are defined in the Service Level Agreement (SLA), which also specifies the Key Performance Indicators to measure the quality of the service provided. The SLA also specifies the link duration between the Sentinel satellites and the EDRS with up to 20min per Sentinel orbit (approx. 100min). The first satellite, Sentinel 1A, was successfully launched on April 3rd 2014.

The Ka-ISL forward and return service is planned to be used by the ISS-Columbus module as the initial customers. This service is planned to be used for the download of scientific data gathered on-board Columbus and for real time connections to ground, e.g. for remote experiments.
APPENDIX D  EDRS Copernicus SLA Key Characteristics

The EDRS/ Copernicus Service Level Agreement as currently under finalization stipulates:

1. that the operator undertakes to provide ESA, on behalf of the EC with data relay services
   a. in response to the EDRS - Sentinel Requirements for Data Relay Services as defined in [RD1] and
   b. within the Sentinels/EDRS Operations Constraints and Concept as defined in [RD2] and
   c. in line with the EDRS Service Management Requirements as defined in [RD3].

2. The main characteristics and Key Performance Indicators of the above provisions are
   a. Service to 4 Sentinel satellites (Sentinel-1A/B and Sentinel-2A/B for extension to Sentinel-1C/D and 2C/D)
   b. Optical ISL at 600 Mbps
   c. About 10 minutes/Sentinel orbit average effective communications time
      i. Note: considering all 4 Sentinel satellites, this corresponds to about 200,000 minutes/ year or 20-25% of the total EDRS capacity of EDRS-A and EDRS-C
      ii. Note: this corresponds to about 50% of Sentinel mission data
   d. Option for additional communications time
   e. Major KPIs:
      i. End-to-end service availability: 98% (97% minimum)
      ii. Max. duration of single outage: 12hours
      iii. Max. duration planed interruptions: 2hours
      iv. Availability Sentinel-Ground data relay link: 96.6%
      v. Frame Error Rate Sentinel-to-Ground data relay: 10E-7
      vi. LCT acquisition time Sentinel-EDRS: 55 seconds, 2 minutes worst case
      vii. Data relay contacts schedule changes: nominally within 2 weeks; within 24 hours in case of special requests; within 6 hours in case of ground segment contingency
      viii. Helpdesk availability: 99.9% during 9:00-17:00, 7 days a week
      ix. Contingency on-call support: within 3 hours 24/7 in 99% of calls

3. A start of service with EDRS-A/ Sentinel-1A service in-orbit commissioning
4. End of first period of service on 31.12.2020
5. Option for a second period of service starting 1.1.2021 until 31.12.2028
6. Possibility to prolong the duration after 31.12.2028
7. For the purposes of this RFI, the service fee/year shall be assumed at 12MEURO, starting mid 2015 for the first period of service as defined above and for optional extension for the second period
8. The following launch dates and end of commissioning dates shall be assumed:
   a. Sentinel-1A: launched (April 2014), commissioned (September 2014) and in operation
   b. Sentinel-2A: Launch May 2015, commissioned August 2015
   c. Sentinel-1B: Launch February 2016, commissioned May 2016
9. The commissioning of EDRS-A and -C with Sentiel-1B, -2A, and -2B will be covered
as part of the EDRS Copernicus SLA at a total cost of not more than 6MEURO. Note: The commissioning of EDRS-A with Sentinel-1A will be covered as part of the EDRS implementation contract.

10. The Data relay services shall be provided including in-orbit redundancy. This redundancy shall be available at the latest 3 year after start of service.
APPENDIX E  EDRS ISS/Columbus SLA Key Characteristics

The EDRS ISS/Columbus SLA is currently under finalization including service parameters still to be consolidated. For the purposes of this RFI the following key characteristics shall be assumed:

- Ka-ISL service at 50Mbps based on the use of EDRS-A
- Service duration mid 2017 to end 2020 with option for extension within the limits of ISS/Columbus lifetime
- Quality of Service requirements as per EDRS Copernicus SLA (e.g. Service availability 98%; outage duration)
- Service fee per effective minute of communication shall be equal to the fee applied to Copernicus SLA.
  o Note. the “effective communication” is to be understood as minutes of communication time between COLKA Terminal and the Data Rely service after link is established.

Furthermore, the following characteristics shall be assumed:

1. The COLKa Data Service shall provide
   a. a capacity of minimum of 3500 minutes, up to a maximum of 9000 minutes of effective communication time average per quarter year.
   b. additional capacity per minute, beyond the maximum per quarter year.
   c. additional 20000 Minutes per quarter against an optimized fee structure.

2. The scheduling of Columbus<--> GEO service availability windows and communications periods for every orbit and orbit repeat cycle shall be predefined incrementally, starting from 6 months till one day in advance and in line with the Columbus data downlink/uplink schedule provided by ESA. Changes to the scheduling of the planned COLKa Service communications periods shall be possible within 3 days for normal cases and within 1 hour in cases of special requests.

3. The COLKa Data Service shall have perform the measurements and reporting of its Key Performance Indicators.

4. The end-to-end BER shall be less than 10-11 for the Return link and 10-9 for the Forward link, from output of the Ka-ISL Terminal to output of Ground Station, and from input of Ground Station to the input of the Ka-ISL Terminal.

5. The COLKa Data Service shall provide an end-to-end communication between Ka-ISL terminal on Columbus and the Columbus Ground Station Output with a maximum one way latency of 400 ms +/- 10%

6. The COLKa Data Service shall identify the minimum and maximum expected coverage. As minimum, the COLKa Data Service shall be capable to provide Ka-band communications line of sight (LoS) visibility between the Columbus Terminal and the
GEO (EDRS-A) for an average of 30 minutes per ISS orbit, with an average effective communication link duration of 5 minutes every orbit scalable to double/triple/quadruple this capability.

The COLKa Data Service shall include one Ground Station for transmit/receive located in UK, preferably at Harwell.