Thank You for Choosing Ross

You've made a great choice. We expect you will be very happy with your purchase of Ross Technology.

Our mission is to:

1. Provide a Superior Customer Experience
   - offer the best product quality and support
2. Make Cool Practical Technology
   - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at solutions@rossvideo.com.

David Ross
CEO, Ross Video
dross@rossvideo.com

Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

1. We will always act in our customers’ best interest.
2. We will do our best to understand our customers’ requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it’s our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. If there’s no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)
End User Software License Agreement

This End User Software License Agreement is a legal agreement between you (the “Licensee”) and Ross Video Limited (“Ross Video”) specifying the terms and conditions of your installation and use of the Software and all Documentation (as those terms are defined herein).

IMPORTANT:
BY DOWNLOADING, Accessing, Installing OR USING THE SOFTWARE AND/OR DOCUMENTATION LICENSEE AGREES TO THE TERMS OF THIS AGREEMENT AND THE LICENSE GRANTED HEREUNDER SHALL BE EFFECTIVE AS OF AND FROM SUCH DATE. IF YOU DO NOT WISH TO ACCEPT THE TERMS AND CONDITIONS OF THIS AGREEMENT, DO NOT DOWNLOAD, ACCESS, INSTALL, REFER TO OR OTHERWISE USE THE SOFTWARE AND/OR DOCUMENTATION.

1. INTERPRETATION.

In this Agreement, (a) words signifying the singular number include the plural and vice versa, and words signifying gender include all genders; (b) every use of the words “herein”, “hereof”, “hereto” “hereunder” and similar words shall be construed to refer to this Agreement in its entirety and not to any particular provision hereof; (c) reference to any agreement or other document herein will be construed as referring to such agreement or other document as from time to time amended, modified or supplemented (subject to any restrictions on such amendment, modification or supplement set forth therein); (d) every use of the words “including” or “includes” is to be construed as meaning “including, without limitation” or “includes, without limitation”, respectively; and (e) references to an Article or a Section are to be construed as references to an Article or Section of or to this Agreement unless otherwise specified.

2. DEFINITIONS.

In this Agreement, in addition to the terms defined elsewhere in this Agreement, the following terms have the meanings set out below:

“Affiliate” means, with respect to any Person, any other Person who directly or indirectly controls, is controlled by, or is under direct or indirect common control with, such Person. A Person shall be deemed to control a Person if such Person possesses, directly or indirectly, the power to direct or cause the direction of the management and policies of such Person, whether through the ownership of voting securities, by contract or otherwise; and the term “controlled” and “controlling” shall have a similar meaning.

“Agreement” means this End User Software License Agreement including the recitals hereto, as the same may be amended from time to time in accordance with the provisions hereof.

“Backup System” means the secondary piece of Designated Equipment upon which the Software is installed and mirrored for the sole purpose of replacing a Primary System in the event such Primary System is not available or functioning properly for any reason.

“Change of Control” means (a) the direct or indirect sale, transfer or exchange by the shareholders of a Party of more than fifty percent (50%) of the voting securities of such Party, (b) a merger or amalgamation or reorganization or other transaction to which a Party is party after which the shareholders of such Party immediately prior to such transaction hold less than fifty percent (50%) of the voting securities of the surviving entity, (c) the sale, exchange, or transfer of all or substantially all of the assets of a Party.

“Confidential Information” means all data and information relating to the business and management of either Party, including the Software, trade secrets and other technology to which access is obtained or granted hereunder by the other Party, and any materials provided by Ross Video to Licensee; provided, however, that Confidential Information shall not include any data or information which:

(i) is or becomes publicly available through no fault of the other Party;
(ii) is already in the rightful possession of the other Party prior to its receipt from the other Party;
(iii) is already known to the receiving Party at the time of its disclosure to the receiving Party by the disclosing Party and is not the subject of an obligation of confidence of any kind;
(iv) is independently developed by the other Party;
(v) is rightfully obtained by the other Party from a third party; or
(vi) is disclosed with the written consent of the Party whose information it is.

“Designated Equipment” shall mean (a) the hardware products sold by Ross Video to Licensee on which the Software is installed and licensed for use, as the same may be replaced from time to time by Ross Video; or (b) in the case of Software sold on a stand-alone basis, the equipment of Licensee on which the Software is to be installed and meets the minimum specifications set out in the Documentation.
“Documentation” shall mean manuals, instruction guides, user documentation and other related materials of any kind pertaining to the Software (whether in electronic, hard-copy or other media format) that are furnished to Licensee by or on behalf of Ross Video in relation to the Software.

“Governmental Authority” means (a) and federal, provincial, state, local, municipal, regional, territorial, aboriginal, or other government, governmental or public department, branch, ministry, or court, domestic or foreign, including any district, agency, commission, board, arbitration panel or authority and any subdivision of any of them exercising or entitled to exercise any administrative, executive, judicial, ministerial, prerogative, legislative, regulatory, or taxing authority or power of any nature; and (b) any quasi-governmental or private body exercising any regulatory, expropriation or taxing authority under or for the account of any of them, and any subdivision of any of them.

“Improvements” means all inventions, works, discoveries, improvements and innovations of or in connection with the Software, including error corrections, bug fixes, patches and other updates in Object Code form to the extent made available to Licensee in accordance with Ross Video’s release schedule.

“License Fee” means the fee(s) payable in respect of the Software in accordance with the relevant invoice(s) or other purchase documents delivered in connection with this Agreement.

“License Period” means the period of time that Licensee will have the rights granted under this Agreement, as may be specified in a Quote.

“Maintenance Fee” means the yearly maintenance fee(s) payable by Licensee to Ross Video, as determined by Ross Video, for the support, maintenance and update of the Software after the expiry of the Maintenance Period as set forth in this Agreement.

“Maintenance Period” means, in connection with the Software, the maintenance period of one (1) year from the date of shipment unless otherwise specified in the table below:

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Software Maintenance Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchers</td>
<td>For the life of the Designated Equipment</td>
</tr>
<tr>
<td>Routers (excluding Ultrix)</td>
<td>For the life of the Designated Equipment</td>
</tr>
<tr>
<td>Master Control System Software (DashBoard)</td>
<td>For the life of the Designated Equipment</td>
</tr>
<tr>
<td>Gear</td>
<td>For the life of the Designated Equipment</td>
</tr>
<tr>
<td>Nielsen Encoders</td>
<td>For the life of the Designated Equipment</td>
</tr>
<tr>
<td>Sports Analysis</td>
<td>For the License Period</td>
</tr>
</tbody>
</table>

“Modifications” means any enhancements, changes, corrections, translations, adaptations, revisions, developments, upgrades or updates thereto; and “Modify” shall mean the creation of any of the foregoing.

“Object Code” means the machine readable executable form of a computer software program.

“Parties” means both Ross Video and Licensee and “Party” means either one of them as the context requires.

“Person” will be broadly interpreted and includes (a) a natural person, whether acting in his or her own capacity, or in his or her capacity as executor, administrator, estate trustee, trustee or personal or legal representative; (b) a corporation or a company of any kind, a partnership of any kind, a sole proprietorship, a trust, a joint venture, as association, an unincorporated association, an unincorporated syndicate, an unincorporated organization or any other association, organization or entity of any kind; and (c) a Governmental Authority.

“Primary System” means the Designated Equipment upon which the Software is installed and executed to deliver its intended functionality.

“Quote” means the document provided by Ross Video to Licensee detailing the Ross Video products contemplated for purchase, the corresponding fees and any License Period that may apply to the Software.

“Software” shall mean the version of the Object Code sold and delivered to Licensee by Ross Video concurrently with delivery of this Agreement and any subsequent error corrections, updates, Modifications or Improvements provided to Licensee by Ross Video pursuant to this Agreement, but specifically excluding any features or plug-ins that may be purchased by you directly from third parties as upgrades or enhancements to the Software.
“Source Code” means the human readable form of a computer software program, all tools and documentation necessary for a reasonably computer programmer to understand, maintain and modify the Software.

“Third Party Software” means those portions of the Software, if any, which are owned or controlled by third parties and licensed to Ross Video pursuant to certain license agreements or arrangements with such third parties, including the NewTek NDI™ software (http://NDI.NewTek.com/)

“Use” means to execute, run, display, store, copy, make, use, sell, merge, network, modify, translate, host, outsource, or integrate with Licensee’s products or other third party software;

3. LICENSE.

Subject to the terms and conditions of this Agreement, upon payment of the applicable License Fee by Licensee, Ross Video hereby grants to Licensee a non-transferable and nonexclusive right to Use the Software and Documentation solely for the internal use of Licensee (the "License"), during the License Period. In the event that a License Period is not identified on the Quote, such License Period shall be deemed to be perpetual, subject to Section 7 D of this Agreement. The Software shall only be used in connection with or installed on the Designated Equipment and, where applicable, shall only be used on the Primary System, provided such Primary System is operating properly. If the Primary System is not operating properly for any reason, the Software may be used on the designated Backup System for that Primary System until such time that the Primary System begins operating properly. The Software and Documentation are provided to Licensee for the exclusive use by Licensee’s organization for its ordinary business purposes and shall not be used by any third party for any purposes. Licensee may make copies of the Software as required for internal backup and archival purposes. To the extent permitted hereunder, Licensee may distribute copies of the Software and/or Documentation to members of its organization, provided (a) this Agreement is included with each copy, (b) any member of its organization who uses the Software and/or Documentation accepts and agrees to be bound by the terms of this Agreement and by any other license agreements or other agreement incorporated by reference into this Agreement, and (c) Licensee has paid any applicable additional License Fees in respect of copying and redistributing of the Software. To the extent Licensee is permitted to make copies of the Software under this Agreement, Licensee agrees to reproduce and include on any copy made or portion merged into another work, all Ross Video proprietary notices, including any notices with respect to copyrights, trademarks and this License. With the exception of copying the Software for backup or archival purposes, Licensee agrees to keep a record of the number and location of all such copies and will make such record available at Ross Video’s request. The Software may include mechanisms to limit or inhibit copying.

4. LICENSE RESTRICTIONS.

Except as otherwise provided in section 2 above, Licensee shall not: (1) copy any Software or Documentation, or part thereof, which is provided to Licensee by Ross Video pursuant to this Agreement, in Object Code form, Source Code form or other human or machine readable form, including written or printed documents, without the prior written consent of Ross Video; (2) in any way market, distribute, export, translate, transmit, merge, modify, transfer, adapt, loan, rent, lease, assign, share, sub-license, sell, make available for download on any website or make available to another Person, the Software and/or Documentation, in whole or in part, provided that Licensee shall not be prohibited from renting or leasing the Software if Ross Video has consented, in writing, to Licensee engaging in such activities in respect of the Software; (3) reverse engineer, decompile or disassemble the Software or electronically transfer it into another computer language; or (4) otherwise use the Software or Documentation in a manner that is inconsistent with the License granted hereunder or that will result in a breach of this Agreement. Licensee agrees to take all reasonable precautions to prevent third parties from using the Software and/or Documentation in any way that would constitute a breach of this Agreement, including such precautions Licensee would ordinarily take to protect its own proprietary software, hardware or information.

5. DELIVERY.

Ross Video shall deliver to Licensee one (1) master copy of the Software in compiled binary (executable) form suitable for reproduction in electronic files only and Ross Video shall deliver to Licensee a minimum of one copy of the Documentation.

6. IMPROVEMENTS.

Licensee may from time to time request Ross Video to incorporate certain Improvements into the Software. Ross Video may, in its sole discretion, undertake to incorporate and provide such Improvements to Licensee with or without payment of a fee to be negotiated at the time of such request. All Improvements, whether recommended and developed by Ross Video or Licensee, shall be considered the sole property of Ross Video and shall be used by Licensee pursuant to the terms of the License granted under this Agreement.
7. LIMITED REPRESENTATIONS AND WARRANTIES.

(A) Software Warranties

Ross Video represents and warrants that

(i) During the Maintenance Period the Software is warranted to be free from material defects under normal use;

(ii) Ross Video has the authority to enter into this Agreement, is the owner or licensee of the Software and Documentation and has the right to grant all of the license rights herein;

(iii) Except as expressly stated herein, no disabling mechanism or protection feature designed to prevent the Software’s Use, including any computer virus, worm, lock, drop dead device, Trojan-horse routine, trap door, time bomb or any other codes or instructions that may be used to access, Modify, delete, damage or disable the Software or any other hardware or computer system, will be used or activated by Ross Video in respect of Software that is delivered to Licensee under a valid License; and

(iv) The Software, if properly installed and used with Designated Equipment, will perform substantially as described in Ross Video’s then current Documentation for such Software for the Maintenance Period.

(B) Warranty Exclusions and Inclusions

Notwithstanding the above, all of Ross Video’s obligations with respect to the warranties set out in 7(A) above shall be contingent on Licensee’s use of the Software in accordance with the terms and conditions of this Agreement and Ross Video’s instructions as provided in the Documentation. Ross Video shall have no warranty obligations where any Software failure occurs as a result of misuse, neglect, accident, abuse, misapplication, improper installation, unauthorized modification, extreme power surge or extreme electromagnetic field or other Act of God. Ross Video shall pass through to Licensee the benefit of all warranties from third party manufacturers and suppliers.

(C) Remedy

If the Software becomes defective, and a valid claim is received by Ross Video during the Maintenance Period, Ross Video will, at its sole option and sole discretion, either (1) repair the defective Software at no charge, or (2) exchange the defective Software for a comparable product at no charge. The remedies set forth in this Section shall be the exclusive remedies available to Licensee in connection with a breach of the limited warranties set out above.

(D) Maintenance Charges

Technical support for the Software by telephone and email contact with Ross Video is provided by Ross Video to Licensee at no extra charge for the life of the product. During the Maintenance Period, Ross Video shall supply downloadable Software Modifications upon request of Licensee, when available, at no extra charge to Licensee. Notwithstanding the foregoing, Ross Video shall be under no legal obligation to create or release Software Modifications at any time or in accordance with a fixed schedule. Upon expiry of the Maintenance Period, where applicable, Licensee may purchase Software maintenance, including downloadable Software upgrades in one (1) year increments at the then applicable extended Maintenance Fee rates offered by Ross Video, in which case the warranties granted by this Agreement shall survive and remain in full force and effect during each such one (1) year term.

8. OWNERSHIP.

The Parties acknowledge and agree that, as between the Parties, Ross Video shall be the owner of all intellectual property rights in the Software, Documentation and all related Modifications and Improvements, written materials, logos, trademarks, trade names, copyright, patents, trade secret and moral rights, registered or unregistered. No proprietary interest or title in or to the intellectual property in the Software, Documentation or any Improvements or Modifications is transferred to Licensee by this Agreement. Ross Video reserves all rights not expressly licensed to Licensee under section 3.

9. THIRD PARTY SOFTWARE.

Licensee acknowledges that the Third Party Software is not owned by Ross Video. Notwithstanding any other provision of this Agreement, Ross Video, to the extent permitted by applicable law, offers no warranties (whether express, implied, statutory or by course of communication or dealing with Licensee, or otherwise) with respect to the Third Party Software. Ross Video may pass through to Licensee, if and to the extent permitted by applicable law, any warranties expressly provided by such third parties to Ross Video for such Third Party Software.
10. INTELLECTUAL PROPERTY INDEMNITY.

Ross Video agrees to defend, indemnify and hold harmless Licensee from final damages awarded by a court of
compentent jurisdiction (hereinafter referred to as the “Losses”), which Licensee, or any of its officers or
directors, may incur, suffer or become liable for as a result of, or in connection with, any third party claim
asserted against Licensee to the extent such claim is based on a contention that the Software, Documentation
or any portion thereof, infringes any valid, registered, enforceable patents, copyrights, trade secrets, trademarks
or other intellectual property rights of any third party, provided that (a) the allegedly infringing Software or
Documentation has been used within the scope of and in accordance with the terms of this Agreement, and (b) Licensee
notifies Ross Video in writing of such claim within ten (10) days of a responsible officer of Licensee
becoming aware of such claim. If the Software, Documentation or any portion thereof is held to constitute an
infringement of a third party’s intellectual property rights, and use thereof is enjoined, Ross Video shall, at its
election and expense, either (i) procure the right to use the infringing element of the Software or Documentation;
or (ii) replace or modify the element of the Software or Documentation so that the infringing portion is no longer
infringing and still performs the same function without any material loss of functionality. Ross Video shall make
every reasonable effort to correct the situation with minimal effect upon the operations of Licensee.

Notwithstanding the above, Ross Video reserves the right to terminate this Agreement and the License granted
hereunder on immediate notice to Licensee, and without liability to Licensee, in the event that the Software or
Documentation constitutes or may, in Ross Video’s determination, constitute, an infringement of the rights of a
third party that Ross Video, in its sole discretion, does not consider to be affordably remediable.

Either party may terminate this Agreement immediately should any Software become, or in either party's opinion
be likely to become, the subject of a claim of infringement of any intellectual property right and, in such event,
there shall be no claim by either Licensee or Ross Video against the other arising out of such termination,
provided that the foregoing shall not apply to a claim for infringement by Ross Video against Licensee in the
event that Licensee is alleged to have infringed Ross Video's intellectual property rights, in which case Licensee
shall remain liable for all outstanding License Fees and other amounts owing to Ross Video.

Notwithstanding the foregoing, Ross Video shall have no liability for any claim of infringement based on use of
other than a current, unaltered release of the Software and/or Documentation available from Ross Video if such
infringement would have been avoided by the use of a current, unaltered release of the Software and/or
Documentation provided that such current, unaltered release performs substantially in conformance with the
specifications set out in the Documentation and was provided, at no additional cost by Ross Video, to those
subscribing for maintenance services for the Software or Documentation.

11. CONFIDENTIALITY.

Each Party shall maintain in confidence all Confidential Information of the other Party, shall use such
Confidential Information only for the purpose of exercising its rights and fulfilling its obligations under this
Agreement, and shall not disclose any Confidential Information of the disclosing Party to any third party except
as expressly permitted hereunder or make any unauthorized use thereof. Each Party shall disclose the
Confidential Information only to those of its employees, consultants, advisors, and/or subcontractors who have a
need to know the Confidential Information. Each Party shall, prior to disclosing the Confidential Information to
such employees, consultants, advisors and/or subcontractors, obtain their agreement to receive and use the
Confidential Information on a confidential basis on the same terms and conditions contained in this Agreement.
The receiving Party shall treat the Confidential Information of the disclosing Party with the same degree of care
against disclosure and/or unauthorized use as it affords to its own information of a similar nature, or a
reasonable degree of care, whichever is greater. The receiving Party further agrees not to remove or destroy
any proprietary or confidential legends or markings placed upon any documents or other materials of the
disclosing Party. The obligations of confidence set forth in this Agreement shall extend to any Affiliates that have
received Confidential Information of the disclosing Party and shall also cover Confidential Information disclosed
by any Affiliate. The receiving Party shall be responsible for any actions or omissions of its Affiliates as if such
actions or omissions were its own.

Either party may disclose certain Confidential Information if it is expressly required to do so pursuant to legal,
judicial, or administrative proceedings, or otherwise required by law, provided that (i) such Party provides the
other Party with reasonable written notice prior to such disclosure; (ii) such Party seeks confidential treatment
for such Confidential Information; (iii) the extent of such disclosure is only to the extent expressly required by law
or under the applicable court order; and (iv) such Party complies with any applicable protective or equivalent
order.
Each of Ross Video and Licensee (the “Indemnifying Party”, as applicable) agree to indemnify the other (the “Indemnified Party”, as applicable) for all Losses incurred by the Indemnified Party as a result of a failure of the Indemnifying Party to comply with its obligations under this Section 11 provided that the Indemnified Party has given prompt notice of any such claim and, to the extent that a claim may lie against a third party for the unauthorized disclosure of such Confidential Information, the right to control and direct the investigation, preparation, action and settlement of each such claim and, further, provided that the Indemnified Party reasonably co-operates with the Indemnifying Party in connection with the foregoing and provides the Indemnifying Party with all information in the Indemnified Party’s possession related to such claim and such further assistance as reasonably requested by the Indemnifying Party.

The Parties acknowledge and agree that any breach of the confidentiality provisions of this Agreement by one Party may cause significant and irreparable injury to the other Party that is not compensable monetarily, as well as damages that may be difficult to ascertain, and agrees that, in addition to such other remedies that may be available at law or in equity, the other Party shall be entitled to seek injunctive relief (including temporary restraining orders, interim injunctions and permanent injunctions) in a court of competent jurisdiction in the event of the breach or threatened breach by such party of any of the confidentiality provisions of this Agreement. The relief contemplated in this Section shall be available to each Party without the necessity of having to prove actual damages and without the necessity of having to post any bond or other security. Each Party further agrees to notify the other Party in the event that it learns of or has reason to believe that any Person has breached the confidentiality provisions of this Agreement.

12. LIMITATION OF LIABILITY.

The limitation of liability provisions of this Agreement reflect an informed voluntary allocation of the risks (known and unknown) that may exist in connection with the licensing of the Software or Documentation hereunder by Ross Video, and that voluntary risk allocation represents a material part of the Agreement reached between Ross Video and Licensee. Should Ross Video be in breach of any obligation, Licensee agrees that Licensee’s remedies will be limited to those set forth in this Agreement. No action, regardless of form, arising out of this Agreement may be brought by Licensee more than twelve (12) months after the facts giving rise to the cause of action have occurred, regardless of whether those facts by that time are known to, or reasonably ought to have been discovered by, Licensee.

(A) EXCEPT AS EXPRESSLY PROVIDED IN THIS AGREEMENT, THE SOFTWARE AND DOCUMENTATION ARE PROVIDED “AS IS” AND ROSS VIDEO (I) MAKES NO OTHER REPRESENTATIONS, AND PROVIDES NO WARRANTIES OR CONDITIONS OF ANY KIND, EXPRESS OR IMPLIED, STATUTORY, BY USAGE OF TRADE CUSTOM OF DEALING, OR OTHERWISE, AND (II) SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF UNINTERRUPTED OR ERROR FREE OPERATION, MERCHANTABILITY, QUALITY OR FITNESS FOR A PARTICULAR PURPOSE. ROSS VIDEO DOES NOT REPRESENT OR WARRANT THAT THE SOFTWARE WILL MEET ANY OR ALL OF LICENSEE’S PARTICULAR REQUIREMENTS, THAT THE USE AND OPERATION OF THE SOFTWARE WILL OPERATE ERROR-FREE OR UNINTERRUPTED, THAT ALL PROGRAMMING ERRORS IN THE SOFTWARE CAN BE FOUND IN ORDER TO BE CORRECTED, OR THAT THE SOFTWARE WILL BE COMPATIBLE WITH OTHER PROGRAMS, SYSTEMS, AND HARDWARE.

(B) IN NO EVENT SHALL ROSS VIDEO, ITS AFFILIATES AND LICENSORS, AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES AND AGENTS, BE LIABLE FOR ANY CLAIM FOR INDIRECT, CONSEQUENTIAL, SPECIAL, INCIDENTAL, PUNITIVE, EXEMPLARY, AGGRAVATED DAMAGES; LOST PROFITS, OR LOST REVENUE ARISING FROM OR IN CONNECTION WITH THIS AGREEMENT, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, OR IN TORT, EVEN IF THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

(C) IN ANY EVENT THE AGGREGATE LIABILITY OF ROSS VIDEO, ITS AFFILIATES AND LICENSORS, AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES AND AGENTS, FOR ANY CLAIM FOR DIRECT DAMAGES WITH RESPECT TO THE SUBJECT MATTER OF THIS AGREEMENT SHALL NOT EXCEED THE AMOUNT OF THE PURCHASE PRICE PAID TO ROSS VIDEO UNDER THIS AGREEMENT.

13. TERM AND TERMINATION.

(1) Unless terminated earlier in accordance with the terms of this Agreement, the term of this Agreement shall commence upon Licensee’s first download, access, installation, or other use of the Software or Documentation and continues until, in the case of Software sold with Designated Equipment provided by Ross Video, the earliest of (a) the end of the License Period, or (b) if the Designated Equipment is assigned or transferred in accordance with this Agreement, the date on which the Designated Equipment is no longer owned by Licensee;
(2) Either Party shall have the right to terminate this Agreement on notice to the other Party if:

(a) the other Party fails to pay any fees or other amounts when due hereunder or under any other agreement between the Parties (or any Affiliates of the Parties, as applicable) in connection with the Software and/or Designated Equipment and such breach is not cured within thirty (30) days after written notice of such failure to pay is given to the defaulting Party by the non-defaulting Party;

(b) the other Party shall file a voluntary petition in bankruptcy or insolvency or shall petition for reorganization under any bankruptcy law, consent to an involuntary petition in bankruptcy, or if a receiving order is given against it under the Bankruptcy and Insolvency Act (Canada) or the comparable law of any other jurisdiction (and such is not dismissed within ten (10) days);

(c) there shall be entered an order, judgment or decree by a court of competent jurisdiction, upon the application of a creditor, approving a petition seeking reorganization or appointing a receiver, trustee or liquidator of all or a substantial part of the other Party’s assets and such order, judgment or decree continues in effect for a period of thirty (30) consecutive days; or

(d) the other Party shall fail to perform any of the other material obligations set forth in this Agreement and such default, in the case of a default which is remediable, continues for a period of thirty (30) days after written notice of such failure has been given by the nondefaulting Party or, in the case of a non-remediable default, immediately upon notice.

(3) Notwithstanding any to the contrary contained in this Agreement:

(a) Ross Video may forthwith terminate this Agreement if Licensee is in breach of any of sections 3, 4 or 11 of this Agreement. For greater certainty, In such instances Ross Video shall provide written notice of such termination as soon as practicable but written notice shall not be a necessary prerequisite to such termination; and

(b) in the event of a Change of Control of Licensee, Ross Video shall have the rights to terminate this Agreement and the License granted hereunder upon thirty (30) days’ prior written notice to Licensee. For greater certainty, Ross Video’s right to terminate in the event of a Change of Control of Licensee shall continue for a period of six (6) months from the date Licensee delivers notice of such Change of Control to Ross Video.

(c) Ross Video may terminate the License immediately on the date on which it provides notice to Licensee, if its agreements for Third Party Software are terminated.

(4) Upon the termination or expiry of this Agreement:

(a) Licensee shall immediately cease and desist all use of the Software and Documentation;

(b) Licensee shall immediately deliver to Ross Video any of Ross Video’s Confidential Information provided hereunder (including the Software and Documentation) then in its possession or control, if any, and shall deliver a certificate of an officer of Licensee certifying the completeness of same;

(c) Licensee shall refrain from further use of such Confidential Information; and

(d) Licensee shall forthwith pay all amounts owing to Ross Video or any of its Affiliates hereunder.

14. SURVIVAL.

The provisions of sections 1, 2, 4, 6, 8, 9, 11, 12, 13, 14, 17 and 19 herein shall survive the expiry or termination of this Agreement.

15. FORCE MAJEURE.

Dates and times by which Ross Video is required to render performance under this Agreement shall be automatically postponed to the extent and for the period that Ross Video is prevented from meeting them by reason of events of force majeure or any cause beyond its reasonable control provided Ross Video notifies Licensee of the commencement and nature of such cause and uses its reasonable efforts to render performance in a timely manner.

16. ASSIGNMENT.

Ross Video may assign this Agreement, or any of its rights or obligations hereunder, in whole or in part, upon notice to Licensee. Licensee shall not assign this Agreement, or any of its rights or obligations hereunder, in whole or in part, without the prior written consent of Ross Video, which consent may not be unreasonably withheld. This Agreement enures to the benefit of and is binding upon each of the Parties and their respective successors and permitted assigns.
17. GOVERNING LAW.
This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and federal laws of Canada applicable therein and shall be treated, in all respects, as an Ontario contract. Each Party irrevocably and unconditionally submits and attorns to the exclusive jurisdiction of the courts of the Province of Ontario to determine all issues, whether at law or in equity, arising from this Agreement.

18. LANGUAGE.
The Parties have expressly required that this Agreement and all documents relating thereto be drawn-up in English. Les parties ont expressément exigé que cette convention ainsi que tous les documents qui s’y rattachent soient rédigés en anglais.

19. GOVERNMENT CONTRACTS.
If the Software and/or Documentation to be furnished to Licensee hereunder are to be used in the performance of a government contract or subcontract, the Software and/or Documentation shall be provided on a "restricted rights" basis only and Licensee shall place a legend, in addition to applicable copyright notices, in the form provided under the applicable governmental regulations. For greater certainty, Ross Video shall not be subject to any flowdown provisions required by any customers of Licensee that are a Governmental Authority unless Ross Video expressly agrees to be bound by such flowdown provisions in writing.

20. EXPORT AND IMPORT LAWS.
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This Agreement, and any other documents referred to herein, constitutes the entire agreement between the Parties relating to the subject matter of this Agreement and supersedes all prior written or oral agreements, representations and other communications between the Parties.
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Ross Video Limited (Ross) warrants its Voyager systems to be free from defects under normal use and service for the following time periods from the date of shipment:

• **Voyager Server** — 12 months

• **Voyager Software Upgrades** — 12 months free of charge

• **System and Media hard drives** — 60 months

If an item becomes defective within the warranty period Ross will repair or replace the defective item, as determined solely by Ross.

Warranty repairs will be conducted at Ross, with all shipping FOB Ross dock. If repairs are conducted at the customer site, reasonable out-of-pocket charges will apply. At the discretion of Ross, and on a temporary loan basis, plug-in circuit boards or other replacement parts may be supplied free of charge while defective items undergo repair. Return packing, shipping, and special handling costs are the responsibility of the customer.

This warranty is void if products are subjected to misuse, neglect, accident, improper installation or application, or unauthorized modification.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profit). Implied warranties, including that of merchantability and fitness for a particular purpose, are expressly limited to the duration of this warranty.

This warranty is TRANSFERABLE to subsequent owners, subject to Ross’ notification of change of ownership.

Extended Warranty

For customers that require a longer warranty period, Ross offers an extended warranty plan to extend the standard warranty period by one year increments. For more information about an extended warranty for your Voyager system, contact your regional sales manager.
Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.
<table>
<thead>
<tr>
<th>Company Address</th>
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<tbody>
<tr>
<td><strong>Ross Video Limited</strong></td>
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**Alternately, you can contact:**  
**Technical Support:** (+1) 613 • 652 • 4886  
**After Hours Emergency:** (+1) 613 • 349 • 0006

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Introduction

Voyager is Ross Video's latest graphics platform, powered by Epic Games' Unreal Engine 4. Voyager leverages the world's most powerful and realistic renderer, enabling its use for Augmented Reality (AR) and Virtual Studio (VS) and helping the user to create stunning, complex virtual environments designed for use in broadcast television.

Voyager uses the Lucid Studio (formerly UX) control platform as an operator-friendly front end, so operators are not required to have in-depth knowledge of the Unreal 4 engine to use the system. Voyager supports customization, flexibility, and scalability in terms of number of cameras and graphics engines through the integration of Lucid Studio and Lucid Track applications.

About This Guide

If, at any time, you have a question pertaining to the operation of the Voyager system, please contact Ross Video at the numbers listed in the section Contacting Technical Support. Our technical staff are always available for consultation, training, or service.
Documentation Conventions

Special text formats are used in this guide to identify parts of the user interface, text that a user must type, or a sequence of menus and submenus that must be followed to reach a particular command.

**Bold text**

Bold text is used to identify a user interface element such as a dialog box, menu item, or button.

For example:

In the **IBP SD 4:2:0 Compression Options** dialog box, select the **ZigZag Scan** option, and click **OK**.

**Courier text**

Courier text is used to identify text that a user must type.

For example:

At the prompt, type `c:\windows\system32`.

**Italic text**

Italic text is used to identify the titles of referenced guides, manuals, or documents.

For example:

For more information, refer to the section "**Creating and Configuring a Media Profile**" on page 3-2 in the **Voyager Setup Guide**.

> Menu arrows are used in procedures to identify a sequence of menu items that you must follow.

For example, if a step reads "**Server > Save As**," you would click the **Server** menu and then click **Save As**.
Getting Help

Voyager documentation is provided on the product USB key.

Contacting Technical Support

At Ross Video, we take pride in the quality of our products, but if problems occur, help is as close as the nearest telephone.

Our 24-hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support is provided directly by Ross Video personnel. During business hours (Eastern Time), technical support personnel are available by telephone. After hours and on weekends, a direct emergency technical support phone line is available. If the technical support person who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. This team of highly trained staff is available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

- **Technical Support:**
  - (+1) 613-652-4886
  - 1-844-652-0645 (North America)
  - +800 1005 0100 (International)

- **After Hours Emergency:** (+1) 613-349-0006

- **E-mail:** techsupport@rossvideo.com

- **Website:** http://www.rossvideo.com
**Installation Notes**

Voyager is compatible with Windows 10, build 1809 and forward. It’s best not to install Voyager and the Unreal Engine on the same computer, as you will have to re-install Voyager to launch projects properly. If you do want both on the same computer, install the Unreal Engine first and then Voyager. It’s also recommended not to run both applications at the same time, to avoid compatibility issues.

**NDI Plugin**

The NDI plugin included in Voyager 4.27 requires that Newtek NDI 5 be installed.

**nVidia Power Management Settings**

If your Voyager engine contains the nVidia Quadro Sync II card, you will need to adjust the nVidia power management settings.

To adjust nVidia power management settings:

1. In the **nVidia Control Panel**, select **Manage 3D Settings**.

2. In the **Global Settings** tab, in the **Settings** section, scroll down to **Power management mode** and from the drop-down, select **Prefer maximum performance**.

3. Click **Apply** and close the control panel.

**Multi-engine Systems**

When working in a multi-engine configuration, some rules need to be followed:

- Each engine runs its own exact copy of the projects. Those projects needs to be copied in the exact same local path on every engine. Example: `D:\Voyager_Projects`

- The Voyager software itself also needs to be installed in the same exact local path on every engine. By default, Voyager software is installed to `C:\Program Files\Voyager`. 
Getting Started

When creating a Voyager project, you’ll need to consider whether your project will use internal or external compositing and whether it will be a Virtual Set (VS) or Augmented Reality (AR) project. The difference in settings between VS and AR will be explained within the instructions for internal and external compositing.

The instructions in this guide reference a system that has a Matrox video card. If your Voyager system uses an AJA video card, anywhere in the instructions where it says to select “Ross Matrox...”, select the AJA version of that component instead.

You can choose one of the following methods to set up your project:

• Creating a Project from a Template
• Making an Existing Project Compatible with Voyager

When you are working in Voyager and haven’t yet saved your work, an asterisk appears beside the title of the window in which you are working. When you save your work, the asterisk disappears.

![Figure 2.1 Before and After Saving](image)

Logging in to Voyager

If you haven’t already done so, log onto your Voyager system.

To log onto the Voyager system:

1. Press the Power button on the front of the Voyager system.
2. Click the Voyager user account icon on the desktop.
3. Log onto the system using the following credentials:
   - **Username** - Voyager
   - **Password** - beyondinfinity
4. Launch Voyager from the Start menu.
Creating a Project from a Template

Voyager provides several templates to make setting up your project simpler. This is the recommended method for creating projects. You can still import files from an existing project, if you have one prepared that you want to use.

For instructions on using each template, see the following sections:

- **Augmented Reality (AR) Template** - Augmented Reality Set projects
- **Virtual Set (VS) Template** - Virtual Set projects
- **Augmented Reality + Virtual Set Template with Set Extension** - Augmented Reality or Virtual Set projects that support set extension
- **Virtual LED Template** - nDisplay Virtual LED projects
- **Virtual LED + Set Extension Template** - nDisplay Virtual LED projects that support set extension
Augmented Reality (AR) Template

Voyager provides several templates to make setting up your project simpler. This section describes how to create a project from the AR template, with which you can create an augmented reality set.

The following topics are covered in this section:

- Setting up an Augmented Reality Project
- Selecting or Creating a Media Profile
- Updating Voyager Project Settings
Setting up an Augmented Reality Project

The first step is to create an empty project from the template. Then you can migrate files from an existing project to the template and add the migrated level(s) to the new project.

To create an empty project:

1. Launch Voyager from the desktop icon.
2. In the **New Project Categories** section, select the **Film, Television and Live Events** option and click **Next**.

![Figure 3.1 Select Film, Television and Live Events](image)

3. In the **Select Template** window, select the AR template and click **Next**.

![Figure 3.2 Select AR Template](image)

4. In the **Project Settings** window, from the **Raytracing** drop-down, select whether or not to use real-time raytracing in your project.
   
   If you don’t know which option to choose, select **Raytracing Disabled**. You can change this setting later in the project settings. Raytracing can be very GPU-intensive, so only use it if necessary.

5. Click **Browse** beside the **Folder** field to navigate to a folder in which to save your new project (eg. D:\Voyager_Projects) and click **Select Folder**.

6. In the **Name** field, enter a name for your project.
   
   Your project name cannot have any spaces in it. Use underscores rather than spaces.
7. Then click **Create Project**.
   Your new project opens, with the default folders in the **Content Browser** and the Voyager components listed in the **World Outliner** panel.

8. Click the **Save Current** icon and minimize your empty project to the task bar.

**Migrating Files into a Project**

Next you'll need to migrate the levels you want to use from an existing project into the template.

**To migrate files into a project:**

1. Launch the source project containing the level(s) you want to use, by double-clicking the `.uproject` file.
2. In the **Select Unreal Engine Version** dialog, select the latest version of UE4 and click **OK**.
3. In the **Multiple Instances Running** dialog, click **Yes**.
   Wait a few minutes for the project to launch and the shaders to compile.
4. If you don’t see the project levels in the **Content Browser**, click the **Filters** drop-down and from the **Filters** list, select **Level**.
5. Double-click the level you want to use to load it in the viewport, if it is not already displayed.
6. In the **Content Browser**, right-click the level and select **Asset Actions > Migrate**.
   You can migrate more than one level at a time, by using **Ctrl + Click** or **Shift + Click** to select multiple levels.
   You can only migrate to the same version of UE4 or forwards. You cannot migrate backwards from a newer version.

![Figure 3.3 Migrate Level](image)

7. In the **Save Content** screen, click **Save Selected**.
8. In the **Asset Report** screen, click **OK**.
9. In the **Choose a destination Content folder** screen, navigate to the **Content** folder of your new project and click **Select Folder**.
   The level files are copied to the new project and you’ll see a "Content migration completed successfully!" message in the bottom-right corner of the project.
10. Close the source project and restore your new project.
    You’ll see that in addition to the default folders, the **Content Browser** now displays the migrated folder(s).
Adding the Migrated Level(s) to the Project

Now you’ll add the migrated levels to your new project.

To add migrated levels to the project:

1. In the new project, click **Window > Levels** to open the **Levels** panel if it is not already present.

2. Resize the **Levels** panel, if necessary and dock it on the right side of the screen, above the **World Outliner** panel (it may resize and dock automatically).

3. In the **Content Browser**, click **Filters > Level** to display the levels in your project.
   
   You will see the default Voyager level (**Build_"Template Type"**) and the migrated level(s).

4. Drag the migrated project level into the **Levels** panel, where it will be nested under the **Persistent Level**.
   
   Notice that in the **Levels** panel, the migrated level name is blue and there is a dot beside it. This indicates that a blueprint is required to launch the level.

5. If you only have one level in your project, right-click the level in the **Levels** panel and select **Change Streaming Method > Always Loaded** instead of creating a blueprint.

   The level will be selected and played when the project is launched. Notice that the level name is no longer blue and there is no dot beside it.

   If you have more than one level in your project, see **Creating a Blueprint to Launch Multiple Levels**.

6. Click **Save Current** to save your project.
Selecting or Creating a Media Profile

Next you'll need to select or create a media profile. At its most basic level, a media profile is comprised of a composite input and an output.

Your media profile can also include a number of live source inputs (perhaps for displaying video on a surface in your project). This section describes how to configure a composite input. For configuring a live source input, see Creating Live Sources.

Instructions are provided for configuring an output for internal compositing or for external compositing. Select the one that corresponds to your compositing mode.

Selecting a Media Profile

If you have previously created a media profile on your engine, it will be saved in Engine Content and is available for use with any project.

To select an existing media profile:

- Click the arrow beside the Media Profile icon, and select the media profile that matches your requirements.

Creating a Media Profile

If you do not have a media profile on your engine, you'll need to create one.

First you'll create an empty media profile (like a container) for the input(s) and output in your project.

Then you'll configure your input(s) and output.

Finally, you'll configure the Genlock settings.

Accessing the Media Profiles Folder

When creating a media profile, you'll need to access a folder in the Engine Content. It is best not to have the core engine files visible all the time, as inadvertently changing something in these files could interfere with your Voyager installation. Make them visible only while it is necessary, then hide them again.

To view engine content:

1. In the bottom-right corner of the Content space, click View Options and select the Show Engine Content checkbox.

2. Proceed with the instructions for creating a media profile.

3. When you have finished creating your media profile, go back to View Options and deselect the Show Engine Content checkbox.
To create a media profile:

1. In the main toolbar, click the arrow beside the Media Profile icon.
2. From the drop-down menu, select New Empty Media Profile.
3. In the Pick Media Profile Class dialog, select the MediaProfile item and click Select.

![Figure 3.6 Pick Media Profile Class](image)

4. In the Save Asset As window, in Content Browser > Engine Content, navigate to and select the MediaProfiles folder.
   - If MediaProfiles does not exist, right-click Engine Content and select New Folder to create a folder named MediaProfiles.

![Figure 3.7 Save Asset As Window](image)

5. In the Name field at the bottom of the Save Asset As window, enter a name for the media profile you will create and click Save.
   
   As an example, an AR media profile for a Matrox card could be named Matrox_1080p_5994_AR.
   
   Typically, the name provides the graphics card (Matrox or AJA), resolution (1080/), format (progressive or interlaced), the frame rate, and an indication of the type of project (in this case, an AR project). You can also add an indicator of the type of compositing that will be used. The new empty media profile is saved in the MediaProfile folder and the Details tab opens.

   Continue with configuring the inputs and output.
To configure a composite input:

1. Expand the Inputs > Media Sources section, then click the ProxyMediaSource_Composite1 drop-down and select Ross Matrox Media Source.

![Figure 3.8 Media Source Input](image)

2. Expand the ProxyMediaSource_Composite1 input and then expand RossMatrox to access Configuration.

3. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.
   
   • **Input Type**: Fill
   
   • **Device**: DSXLE4/8/100F
   
   • **Source**: Single Link 1
   
   • **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

![Figure 3.9 Input Configuration - Composite Input](image)

4. Expand Video and configure the settings as follows:
   
   • Select the Capture Video checkbox.
   
   • From the Color Format drop-down, select the color format that works best for your project.
     
     10bit YUV 422 is recommended when using HDR and Wide Color Gamut.
     
     With multiple inputs, there may be a performance cost when using 10bit YUV 422. In this case, try using 8bit YUV 422.
     
     10bit YUV 422 is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.
     
   • From the Max Num Video Frame Buffer drop-down, select 8 if you are using a Progressive format or if you are using an Interlaced format, select 16.
• From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Figure 3.10 Video Configuration - Composite Input](image1)

5. Expand **Colorspace** and configure the settings as follows:
   • From the **Colorimetry** drop-down, select one of the following options:
     › **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     OR
     › **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)
   • From the **Transfer Function** drop-down, select one of the following options:
     › **SDR (Rec. 1886)** — Standard Dynamic Range
     › **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     › **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Figure 3.11 Colorspace Settings](image2)

6. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.

Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.
   • If you selected an 8bit color format in the **Video** settings, these are the only **Colorspace** settings available. Continue with the output configuration.
   • If you selected a 10bit color format in the **Video** settings, the **HDR** settings will also be available. Continue with Step 7 to edit **HDR** settings.

7. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

8. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.

9. From the **LUT Output Transfer Function** dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

10. Then click **Save**.
To configure an output for internal compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

![Figure 3.12 Media Profile Details Tab](image)

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Source, Resolution and Frame Rate options will differ depending on your hardware configuration.
   - **Output Type**: Fill
   - **Device**: DSXLE4/8/100F
   - **Destination**: Single Link 2
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.
   - **Reference**: External

![Figure 3.13 Output Configuration](image)

5. Expand Output, click the arrow in the Pixel Format field and select the format that works best for your project. **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.

   With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.

   Leave the remaining settings as they are.
6. Expand Audio and configure the settings as follows:
   - Select the Capture Audio checkbox to capture audio from the media port.
   - In the Buffered Audio Frames field, enter the maximum number of frames of audio data to be stored in memory at any given time.
     The default value is 4. If you notice jumps or hitches in the input video, you can try raising this value.

7. Then click Save.

To configure an output for external compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.
   - Output Type: Fill and Key
   - Device: DSXLE4/8/100F
   - Destination: Single Link 2
   - Resolution/Standard/Frame Rate: The video format that corresponds to your workflow.
   - Key Destination: The appropriate key destination will be automatically selected, based on your selection of Destination, if using a Matrox card. If using an AJA card, select the appropriate key destination manually.
   - Reference: External
5. Expand **Output**, click the arrow in the **Pixel Format** field and select the format that works best for your project. **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.

With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try one of the 8bit formats.

Leave the remaining settings as they are.

6. Expand **Audio** and configure the settings as follows:
   - Select the **Capture Audio** checkbox to capture audio from the media port.
   - In the **Buffered Audio Frames** field, enter the maximum number of frames of audio data to be stored in memory at any given time.
     
     The default value is 4. If you notice jumps or hitches in the input video, you can try raising this value.

7. Then click **Save**.

**To configure the Genlock Reference:**

1. In the **Genlock** section, select the **Override Project Settings** checkbox.

2. Click the **Custom Time Step** arrow and from the drop-down select **Ross Matrox SDI Input**.

3. Expand **Custom Time Step** and then expand **Genlock** and select the **Use Reference In** checkbox.

4. Click **Save** and close the **Media Profile** window.

5. Then continue with **Updating Voyager Project Settings**.

**Updating Voyager Project Settings**

Once you've set up your project, it's time to update the Voyager project settings and play your project

**To update the project settings:**

1. Click the arrow beside the **Voyager** icon and select **Update Project Settings**.

2. In the **Voyager Project Defaults** dialog, click **Yes** to proceed.
Virtual Set (VS) Template

Voyager provides several templates to make setting up your project simpler. This section describes how to create a project from the VS template, with which you can create a virtual set.

The following topics are covered in this section:

- Setting up a Virtual Set Project
- Selecting or Creating a Media Profile
- Updating Voyager Project Settings
Setting up a Virtual Set Project

The first step is to create an empty project from the template. Then you can migrate files from an existing project to the template and add the migrated level(s) to the new project.

To create an empty project:

1. Launch Voyager from the desktop icon.
2. In the New Project Categories section, select the Film, Television and Live Events option and click Next.
3. In the Select Template window, select the VS template and click Next.
4. In the Project Settings window, from the Raytracing drop-down, select whether or not to use real-time raytracing in your project.
   
   If you don’t know which option to choose, select Raytracing Disabled. You can change this setting later in the project settings. Raytracing can be very GPU-intensive, so only use it if necessary.
5. Click Browse beside the Folder field to navigate to a folder in which to save your new project (eg. D:\Voyager_Projects) and click Select Folder.
6. In the **Name** field, enter a name for your project.
   Your project name cannot have any spaces in it. Use underscores rather than spaces.

7. Then click **Create Project**.
   Your new project opens, with the default folders in the **Content Browser** and the Voyager components listed in the **World Outliner** panel.

8. Click the **Save Current** icon and minimize your empty project to the task bar.

**Migrating Files into a Project**

Next you’ll need to migrate the levels you want to use from an existing project into the template.

**To migrate files into a project:**

1. Launch the source project containing the level(s) you want to use, by double-clicking the `.uproject` file.
2. In the **Select Unreal Engine Version** dialog, select the latest version of UE4 and click **OK**.
3. In the **Multiple Instances Running** dialog, click **Yes**.
   Wait a few minutes for the project to launch and the shaders to compile.
4. If you don’t see the project levels in the **Content Browser**, click the **Filters** drop-down and from the **Filters** list, select **Level**.
5. Double-click the level you want to use to load it in the viewport, if it is not already displayed.
6. In the **Content Browser**, right-click the level and select **Asset Actions > Migrate**.
   You can migrate more than one level at a time, by using **Ctrl + Click** or **Shift + Click** to select multiple levels.
   ![Migrate Level](image)

   You can only migrate to the same version of UE4 or forwards. You cannot migrate backwards from a newer version.

7. In the **Save Content** screen, click **Save Selected**.
8. In the **Asset Report** screen, click **OK**.
9. In the **Choose a destination Content folder** screen, navigate to the **Content** folder of your new project and click **Select Folder**.
   The level files are copied to the new project and you’ll see a “**Content migration completed successfully!**” message in the bottom-right corner of the project.
10. Close the source project and restore your new project.
    You’ll see that in addition to the default folders, the **Content Browser** now displays the migrated folder(s).
Adding the Migrated Level(s) to the Project

Now you’ll add the migrated level to your new project.

To add migrated levels to the project:

1. In the new project, click **Window > Levels** to open the **Levels** panel.

2. Resize the **Levels** panel, if necessary and dock it on the right side of the screen, above the **World Outliner** panel (it may resize and dock automatically).

3. In the **Content Browser**, click **Filters > Level** to display the levels in your project.
   
   You will see the default Voyager level (Build_"Template Type") and the migrated level(s).

4. Drag the migrated project level into the **Levels** panel, where it will be nested under the **Persistent Level**.
   
   Notice that in the **Levels** panel, the migrated level name is blue and there is a dot beside it. This indicates that a blueprint is required to launch the level.

5. If you only have one level in your project, right-click the level in the **Levels** panel and select **Change Streaming Method > Always Loaded** instead of creating a blueprint.
   
   The level will be selected and played when the project is launched. Notice that the level name is no longer blue and there is no dot beside it.
   
   If you have more than one level in your project, see Creating a Blueprint to Launch Multiple Levels.

6. Click **Save Current** to save your project.
Selecting or Creating a Media Profile

Next you’ll need to select or create a media profile. At its most basic level, a media profile is comprised of a composite input and an output.

Your media profile can also include a number of live source inputs (perhaps for displaying video on a surface in your project). This section describes how to configure a composite input. For configuring a live source input, see Creating Live Sources.

Instructions are provided for configuring an output for internal compositing or for external compositing. Select the one that corresponds to your compositing mode.

Selecting a Media Profile

If you have previously created a media profile on your engine, it will be saved in Engine Content and is available for use with any project.

To select an existing media profile:

- Click the arrow beside the Media Profile icon, and select the media profile that matches your requirements.

Creating a Media Profile

If you do not have a media profile on your engine, you’ll need to create one.

First you’ll create an empty media profile (like a container) for the input(s) and output in your project.

Then you’ll configure your input(s) and output.

Finally, you’ll configure the Genlock settings.

Accessing the Media Profiles Folder

When creating a media profile, you’ll need to access a folder in the Engine Content. It is best not to have the core engine files visible all the time, as inadvertently changing something in these files could interfere with your Voyager installation. Make them visible only while it is necessary, then hide them again.

To view engine content:

1. In the bottom-right corner of the Content space, click View Options and select the Show Engine Content checkbox.
2. Proceed with the instructions for creating a media profile.
3. When you have finished creating your media profile, go back to View Options and deselect the Show Engine Content checkbox.

   If you want to reuse the media profile you create here in another project, you’ll need to again go to View Options, select the Show Engine Content checkbox and in the Content Browser navigate to the profile in the MediaProfile folder.
To create a media profile:

1. In the main toolbar, click the arrow beside the Media Profile icon.
2. From the drop-down menu, select New Empty Media Profile.
3. In the Pick Media Profile Class dialog, select the MediaProfile item and click Select.

![Image of Pick Media Profile Class dialog]

4. In the Save Asset As window, in Content Browser > Engine Content, navigate to and select the MediaProfiles folder.
   - If MediaProfiles does not exist, right-click Engine Content and select New Folder to create a folder named MediaProfiles.

![Image of Save Asset As window]

5. In the Name field at the bottom of the Save Asset As window, enter a name for the media profile you will create and click Save.
   
   As an example, an AR media profile could be named Matrox_1080p_5994_AR.

   Typically, the name provides the graphics card (Matrox or AJA), resolution (1080i), format (progressive or interlaced), the frame rate, and an indication of the type of project (in this case, an AR project). You can also add an indicator of the type of compositing that will be used. The new empty media profile is saved in the MediaProfile folder and the Details tab opens.

   Continue with configuring the inputs and output.
To configure a composite input:

1. Expand the **Inputs > Media Sources** section, then click the **ProxyMediaSource_Composite1** drop-down and select **Ross Matrox Media Source**.

![Image of Media Source Input](image1)

**Figure 3.8 Media Source Input**

2. Expand the **ProxyMediaSource_Composite1** input and then expand **RossMatrox** to access **Configuration**.

3. Click the **Configuration** drop-down and in the configuration panel that opens, select the options described below and click **Apply**.

   The **Resolution** and **Frame Rate** options will differ depending on your hardware configuration.

   - **Input Type**: Fill
   - **Device**: DSXLE4/8/100F
   - **Source**: Single Link 1
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

![Image of Input Configuration - Composite Input](image2)

**Figure 3.9 Input Configuration - Composite Input**

4. Expand **Video** and configure the settings as follows:

   - Select the **Capture Video** checkbox.
   - From the **Color Format** drop-down, select the color format that works best for your project.
     - **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
     - With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
     - **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
     - From the **Max Num Video Frame Buffer** drop-down, select 8 if you are using a **Progressive** format or if you are using an **Interlaced** format, select 16.
• From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Video Configuration - Composite Input](image)

**Figure 3.10 Video Configuration - Composite Input**

5. Expand **Colorspace** and configure the settings as follows:
   • From the **Colorimetry** drop-down, select one of the following options:
     - **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     - **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)
   • From the **Transfer Function** drop-down, select one of the following options:
     - **SDR (Rec. 1886)** — Standard Dynamic Range
     - **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     - **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Colorspace Settings](image)

**Figure 3.11 Colorspace Settings**

6. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.

   Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.
   • If you selected an 8bit color format in the **Video** settings, these are the only **Colorspace** settings available. Continue with the output configuration.
   • If you selected a 10bit color format in the **Video** settings, the **HDR** settings will also be available. Continue with Step 7 to edit **HDR** settings.

7. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

8. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.

9. From the **LUT Output Transfer Function** dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

10. Then click **Save**.
To configure an output for internal compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

![Figure 3.12 Media Profile Details Tab](image)

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

The Source, Resolution and Frame Rate options will differ depending on your hardware configuration.

- **Output Type:** Fill
- **Device:** DSXLE4/8/100F
- **Destination:** Single Link 2
- **Resolution/Standard/Frame Rate:** The video format that corresponds to your workflow.
- **Reference:** External

![Figure 3.13 Output Configuration](image)

5. Expand Output, click the arrow in the Pixel Format field and select the format that works best for your project.

10bit YUV 422 is recommended when using HDR and Wide Color Gamut.

With multiple inputs, there may be a performance cost when using 10bit YUV 422. In this case, try using 8bit YUV 422.

10bit YUV 422 is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.

Leave the remaining settings as they are.
6. Expand **Audio** and configure the settings as follows:
   - Select the **Capture Audio** checkbox to capture audio from the media port.
   - In the **Buffered Audio Frames** field, enter the maximum number of frames of audio data to be stored in memory at any given time. The default value is 4. If you notice jumps or hitches in the input video, you can try raising this value.

7. Then click **Save**.

**To configure an output for external compositing:**

1. In the **Outputs** section, expand **Media Outputs**.
2. Then click the **ProxyMediaOutput1** drop-down and select **Ross Matrox Media Output**.
3. Expand **ProxyMediaOutput1** and then expand **RossMatrox** to access **Configuration**.
4. Click the **Configuration** drop-down and in the configuration panel that opens, select the options described below and click **Apply**.
   - **Resolution** and **Frame Rate** options will differ depending on your hardware configuration.
     - **Output Type**: Fill and Key
     - **Device**: DSXLE4/8/100F
     - **Destination**: Single Link 2
     - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.
     - **Key Destination**: The appropriate key destination will be automatically selected, based on your selection of **Destination**, if using a Matrox card. If using an AJA card, select the appropriate key destination manually.
     - **Reference**: External

   ![Output Configuration - External Compositing](image_url)

5. Then click **Save** and continue with configuring the **Genlock Reference**.
To configure the Genlock Reference:

1. In the Genlock section, select the Override Project Settings checkbox.

   ![Genlock Configuration](image)

2. Click the Custom Time Step arrow and from the drop-down select Ross Matrox SDI Input.
3. Expand Custom Time Step and then expand Genlock and select the Use Media Output Settings checkbox.
4. Click Save, close the Media Profile window and continue with Updating Voyager Project Settings.

Updating Voyager Project Settings

Once you’ve set up your project, it’s time to update the Voyager project settings and play your project.

To update the project settings:

1. Click the arrow beside the Voyager icon and select Update Project Settings.
2. In the Voyager Project Defaults dialog, click Yes to proceed.
Augmented Reality + Virtual Set Template with Set Extension

Voyager provides several templates to make setting up your project simpler. This section describes how to create a project from the AR + VS template, with which you can create a combined augmented reality and virtual set project with set extension.

The following topics are covered in this section:

- Setting up an AR + VS Set Extension Project
- Selecting or Creating a Media Profile
- Using the VoyagerARDespill Mask
- Updating Voyager Project Settings
Setting up an AR + VS Set Extension Project

The first step is to create an empty project from the template. Then you can migrate files from an existing project to the template and add the migrated level(s) to the new project.

To create an empty project:

1. Launch Voyager from the desktop icon.
2. In the New Project Categories section, select the Film, Television and Live Events option and click Next.

![Figure 3.1 Select Film, Television and Live Events]

3. In the Select Template window, select the AR + VS template and click Next.

![Figure 3.2 Select AR + VS Template]

4. In the Project Settings window, from the Raytracing drop-down, select whether or not to use real-time raytracing in your project.
   
   If you don’t know which option to choose, select Raytracing Disabled. You can change this setting later in the project settings. Raytracing can be very GPU-intensive, so only use it if necessary.

5. Click Browse beside the Folder field to navigate to a folder in which to save your new project (eg. D:\Voyager_Projects) and click Select Folder.

6. In the Name field, enter a name for your project.
   
   Your project name cannot have any spaces in it. Use underscores rather than spaces.

7. Then click Create Project.
Your new project opens, with the default folders in the **Content Browser** and the Voyager components listed in the **World Outliner** panel.

8. Click the **Save Current** icon and minimize your empty project to the task bar.

**Migrating Files into a Project**

Next you’ll need to migrate the levels you want to use from an existing project into the template.

To migrate files into a project:

1. Launch the source project containing the level(s) you want to use, by double-clicking the `.uproject` file.
2. In the **Select Unreal Engine Version** dialog, select the latest version of UE4 and click **OK**.
3. In the **Multiple Instances Running** dialog, click **Yes**.
   Wait a few minutes for the project to launch and the shaders to compile.
4. If you don’t see the project levels in the **Content Browser**, click the **Filters** drop-down and from the **Filters** list, select **Level**.
5. Double-click the level you want to use to load it in the viewport, if it is not already displayed.
6. In the **Content Browser**, right-click the level and select **Asset Actions > Migrate**.

   You can migrate more than one level at a time, by using **Ctrl + Click** or **Shift + Click** to select multiple levels.

   ✩ You can only migrate to the same version of UE4 or forwards. You cannot migrate backwards from a newer version.

   ![Figure 3.3 Migrate Level](image)

7. In the **Save Content** screen, click **Save Selected**.
8. In the **Asset Report** screen, click **OK**.
9. In the **Choose a destination Content folder** screen, navigate to the **Content** folder of your new project and click **Select Folder**.
   The level files are copied to the new project and you’ll see a “**Content migration completed successfully!**” message in the bottom-right corner of the project.
10. Close the source project and restore your new project.

   You’ll see that in addition to the default folders, the **Content Browser** now displays the migrated folder(s).
Selecting or Creating a Media Profile

Next you’ll need to select or create a media profile. At its most basic level, a media profile is comprised of a composite input and an output.

Your media profile can also include a number of live source inputs (perhaps for displaying video on a surface in your project). This section describes how to configure a composite input. For configuring a live source input, see Creating Live Sources.

Instructions are provided for configuring an output for internal compositing or for external compositing. Select the one that corresponds to your compositing mode.

Selecting a Media Profile

If you have previously created a media profile on your engine, it will be saved in Engine Content and is available for use with any project.

To select an existing media profile:

- Click the arrow beside the Media Profile icon, and select the media profile that matches your requirements.

Creating a Media Profile

If you do not have a media profile on your engine, you’ll need to create one.

First you’ll create an empty media profile (like a container) for the input(s) and output in your project.

Then you’ll configure your input(s) and output.

Finally, you’ll configure the Genlock settings.

Accessing the Media Profiles Folder

When creating a media profile, you’ll need to access a folder in the Engine Content. It is best not to have the core engine files visible all the time, as inadvertently changing something in these files could interfere with your Voyager installation. Make them visible only while it is necessary, then hide them again.

To view engine content:

1. In the bottom-right corner of the Content space, click View Options and select the Show Engine Content checkbox.
2. Proceed with the instructions for creating a media profile.
3. When you have finished creating your media profile, go back to View Options and deselect the Show Engine Content checkbox.
   
   If you want to reuse the media profile you create here in another project, you’ll need to again go to View Options, select the Show Engine Content checkbox and in the Content Browser navigate to the profile in the MediaProfile folder.
To create a media profile:

1. In the main toolbar, click the arrow beside the Media Profile icon.
2. From the drop-down menu, select New Empty Media Profile.
3. In the Pick Media Profile Class dialog, select the MediaProfile item and click Select.

![Figure 3.4 Pick Media Profile Class](image)

4. In the Save Asset As window, in Content Browser > Engine Content, navigate to and select the MediaProfiles folder.
   - If MediaProfiles does not exist, right-click Engine Content and select New Folder to create a folder named MediaProfiles.

![Figure 3.5 Save Asset As Window](image)

5. In the Name field at the bottom of the Save Asset As window, enter a name for the media profile you will create and click Save.

   As an example, an AR media profile for a Matrox card could be named Matrox_1080p_5994_AR, while a VS media profile for a Matrox card could be named Matrox_1080p_5994_VS.

   Typically, the name provides the graphics card (Matrox or AJA), resolution (1080/), format (progressive or interlaced), the frame rate, and an indication of the type of project (in this case, an AR project). You can also add an indicator of the type of compositing that will be used. The new empty media profile is saved in the MediaProfile folder and the Details tab opens.

Continue with configuring the inputs and output.
To configure the ProxyMediaSource_CompositeBackground input:

1. Double-click the Media Profile icon in the main toolbar to open the media profile you created, if it is not already open.
2. Expand the Inputs > Media Sources section, then click the ProxyMediaSource_Composite1 drop-down and select Ross Matrox Media Source.

3. Expand the ProxyMediaSource_CompositeBackground input and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

The Resolution and Frame Rate options will differ depending on your hardware configuration.

- **Input Type**: Fill
- **Device**: DSXLE4/8/100F
- **Source**: Single Link 1
- **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

*Figure 3.6 Media Source Inputs*

*Figure 3.7 Input Configuration - ProxyMediaSource_CompositeBackground Input*
5. Expand **Video** and configure the settings as follows:
   - Select the **Capture Video** checkbox.
   - From the **Color Format** drop-down, select the color format that works best for your project.
   - Select the **Capture Video** checkbox.
   - From the **Color Format** drop-down, select the color format that works best for your project.
   - **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
   - With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
   - **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
   - From the **Max Num Video Frame Buffer** drop-down, select 8 if you are using a **Progressive** format or if you are using an **Interlaced** format, select 16.
   - From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Figure 3.8 Video Configuration - Composite Input](image)

6. Expand **Colorspace** and configure the settings as follows:
   - From the **Colorimetry** drop-down, select one of the following options:
     - **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     - **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)
   - From the **Transfer Function** drop-down, select one of the following options:
     - **SDR (Rec. 1886)** — Standard Dynamic Range
     - **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     - **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Figure 3.9 Colorspace Settings](image)

7. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.
   - Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.
8. Then click **Save**.
To configure the ProxyMediaSource_Composite1 input:

1. Expand the **Inputs > Media Sources** section, then click the **ProxyMediaSource_Composite1** drop-down and select **Ross Matrox Media Source**.

   ![Figure 3.10 Media Source Input](image)

2. Expand the **ProxyMediaSource_Composite1** input and then expand **RossMatrox** to access **Configuration**.

3. Click the **Configuration** drop-down and in the configuration panel that opens, select the options described below and click **Apply**.

   The **Resolution** and **Frame Rate** options will differ depending on your hardware configuration.
   - **Input Type**: Fill
   - **Device**: DSXLE4/8/100F
   - **Source**: Single Link 2
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

   ![Figure 3.11 Input Configuration - ProxyMediaSource_Composite1 Input](image)

4. Expand **Video** and configure the settings as follows:
   - Select the **Capture Video** checkbox.
   - From the **Color Format** drop-down, select the color format that works best for your project.
     - **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
     - With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
     - **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use **RGBA**.
   - From the **Max Num Video Frame Buffer** drop-down, select **8** if you are using a **Progressive** format or if you are using an **Interlaced** format, select **16**.
• From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Figure 3.12 Video Configuration - Composite Input](image)

5. Expand **Colorspace** and configure the settings as follows:
   - From the **Colorimetry** drop-down, select one of the following options:
     - **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     - **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)
   - From the **Transfer Function** drop-down, select one of the following options:
     - **SDR (Rec. 1886)** — Standard Dynamic Range
     - **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     - **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Figure 3.13 Colorspace Settings](image)

6. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.

Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.

- If you selected an 8bit color format in the **Video** settings, these are the only **Colorspace** settings available. Continue with the output configuration.
- If you selected a 10bit color format in the **Video** settings, the **HDR** settings will also be available. Continue with Step 7 to edit **HDR** settings.

7. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

8. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.

9. From the **LUT Output Transfer Function** dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

10. Then click **Save**.
To configure an output for internal compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Source, Resolution and Frame Rate options will differ depending on your hardware configuration.
   - Output Type: Fill
   - Device: DSXLE4/8/100F
   - Destination: Single Link 5
   - Resolution/Standard/Frame Rate: The video format that corresponds to your workflow.
   - Reference: External

5. Expand Output, click the arrow in the Pixel Format field and select the format that works best for your project.
   - 10bit YUV 422 is recommended when using HDR and Wide Color Gamut.
   - With multiple inputs, there may be a performance cost when using 10bit YUV 422. In this case, try using 8bit YUV 422.
   - 10bit YUV 422 is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.

   Leave the remaining settings as they are.
6. Then click Save and continue with configuring the Genlock Reference.
To configure an output for external compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.
3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.

   • Output Type: Fill and Key
   • Device: DSXLE4/8/100F
   • Destination: Single Link 2
   • Resolution/Standard/Frame Rate: The video format that corresponds to your workflow.
   • Key Destination: The appropriate key destination will be automatically selected, based on your selection of Destination, if using a Matrox card. If using an AJA card, select the appropriate key destination manually.
   • Reference: External

   ![Figure 3.16 Output Configuration - External Compositing](image)

5. Then click Save and continue with configuring the Genlock Reference.

To configure the Genlock Reference:

1. In the Genlock section, select the Override Project Settings checkbox.
2. Click the Custom Time Step arrow and from the drop-down select Ross Matrox SDI Input.
3. Click the Genlock arrow and make sure the Use Media Output Settings checkbox is selected.

   ![Figure 3.17 Genlock Configuration](image)
4. Click **Save** and close the **Media Profile** window.

**To select the startup media profile:**

1. Once you have a media profile selected or created, click **Edit > Project Settings > Plugins > Media Profile**.
2. In the **Media Profile** plugin, from the **Startup Media Profile** dropdown, select the media profile you selected or created for your project.

![Figure 3.18 Select Startup Media Profile](image)

3. Then close the **Project Settings** editor.

**Using the VoyagerARDespill Mask**

If you are seeing some reflection from the green screen in parts of the physical set, you can use the **VoyagerARDespill Mask** actor to grey out the green.

By default, the **VoyagerARDespillMask** actor is a plane, but it is a 3D object that can be replaced by a static mesh, if that would be more suitable for masking a particular area.

The **VoyagerARDespillMask** is used in conjunction with the **despill_matte** actor. The **despill_matte** actor determines how the despill will be applied, either to an area in the AR background outside of the **VoyagerARDespillMask** object (**Garbage Matte**) or only to the area defined by the **VoyagerARDespillMask** object (**Holdout**).

You can also feather the edges of the mask in order to provide a more seamless blending of the masked area and the unmasked area.

**To use the VoyagerARDespillMask:**

1. Determine to which part of the set you want to apply the mask.
2. In the **World Outliner**, select the **despill_matte** actor.
3. In the **Details** tab, scroll down to **Composure > Input > Matte Type** and select the appropriate option:
   - **Garbage Matte** - to remove any green reflection from the camera feed on the AR background outside of the region defined by the **VoyagerARDespill Mask**. This is the default setting.
   - **Holdout** - to remove any green reflection in the region defined by the **VoyagerARDespill Mask**.
4. Then, in the **World Outliner**, select the **VoyagerARDespillMask** actor.
5. In the Output window, move the VoyagerARDespillMask from its default location so that the green reflection is removed.

6. With the VoyagerARDespillMask still selected, in the Details tab, in the Materials section, double-click the ARComposureFeather_Inst material to open the editor.

7. In the editor, in the Details tab, in the Feather section, select an edge of the mask and adjust the value to blur the edge.

8. Adjust each edge as necessary to soften any hard lines.

9. Then click Save and close the material editor.

Updating Voyager Project Settings

Once you've set up your project, it's time to update the Voyager project settings and play your project.

To update the project settings:

1. Click the arrow beside the Voyager icon and select Update Project Settings.

2. In the Voyager Project Defaults dialog, click Yes to proceed.
Virtual LED Template

Voyager provides several templates to make setting up your project simpler. This section describes how to create a project from the Virtual LED template, with which you can render content on multiple displays simultaneously. This type of project typically requires several Voyager engines. One engine is identified as the “master node” and additional engines are identified as “cluster nodes”.

A Virtual LED setup outputs directly to the video wall from an HDMI or DisplayPort connection.

The following tools will help you make the most of your Virtual LED project:

- The nDisplay plugin inside Voyager communicates and synchronizes information amongst all the Voyager engines that make up the cluster, to make sure all engines render correctly at the same time (enabled by default).
- The Voyager Switchboard Launcher application (located on the master node only) is used to automatically launch and quit your Voyager project on all the engines in your setup.
- The Voyager Switchboard Listener application (running on the master node and each cluster node) listens for incoming requests from Voyager Switchboard Launcher, and processes those requests on the local engine.
- In the Voyager level blueprint, you can set up camera switching amongst multiple cameras from a number of input sources. See Adding Camera-Switching to the Level Blueprint for more information.

![Figure 3.1 Voyager Virtual LED Rendering Content on Three Screens Simultaneously](image)

This section covers the following topics:

- Setting up a Virtual LED Project
- Configuring Your Screen Setup
- Using Voyager Switchboard Launcher
- Using Voyager Switchboard Listener
- Switching Cameras in a Multi-Camera Display
Setting up a Virtual LED Project

The first step is to create an empty project from a template. Then you can migrate files from an existing project to the template and add the migrated level(s) to the new project.

To create an empty project:

1. Launch Voyager from the desktop icon.
2. In the **New Project Categories** section, select the **Film, Television and Live Events** option and click **Next**.

![Figure 3.2 Select Film, Television and Live Events](image)

3. In the **Select Template** window, select the VLED template and click **Next**.

![Figure 3.3 Select VLED Template](image)

4. In the **Project Settings** window, from the **Raytracing** drop-down, select whether or not to use real-time raytracing in your project.

   If you don’t know which option to choose, select **Raytracing Disabled**. You can change this setting later in the project settings. Raytracing can be very GPU-intensive, so only use it if necessary.

5. Click **Browse** beside the **Folder** field to navigate to a folder in which to save your new project (eg. D:\Voyager_Projects) and click **Select Folder**.

6. In the **Name** field, enter a name for your project.

   Your project name cannot have any spaces in it. Use underscores rather than spaces.
7. Then click **Create Project**.
   Your new project opens, with the default folders in the **Content Browser** and the Voyager components listed in the **World Outliner** panel.

8. Click the **Save Current** icon and minimize your empty project to the task bar.

### Migrating Files into Your Empty Project

Next you’ll need to migrate the levels you want to use from an existing project into the empty template.

**To migrate files from an existing project into an empty project:**

1. Launch the source project containing the level(s) you want to use, by double-clicking the `.uproject` file.
2. If the **Select Unreal Engine Version** dialog appears, select the latest version of UE4 and click **OK**.
3. In the **Multiple Instances Running** dialog, click **Yes**.
   Wait a few minutes for the project to launch and the shaders to compile.
4. In the **Content Browser**, click the **Filters** drop-down and from the **Filters** list, select **Level**.
   The levels are displayed in the **Content Browser**.
5. Double-click the level you want to use to load it in the viewport, if it is not already displayed.
6. Then right-click the level and select **Asset Actions > Migrate**.
   You can migrate more than one level at a time, by using **Ctrl + Click** or **Shift + Click** to select multiple levels.
   
   ✴ You can only migrate to the same version of UE4 or forwards. You cannot migrate backwards from a newer version.

![Figure 3.4 Migrate Level](image)

7. In the **Asset Report** screen, click **OK**.
8. In the **Choose a destination Content folder** screen, navigate to the **Content** folder of your empty project and click **Select Folder**.
   The level files are copied to the empty project and you’ll see a message saying “**Content migration completed successfully!**” in the bottom-right corner of the project.
9. Close the source project and restore your new project.
   The migrated folder(s) is saved in the **Content Browser**.
Adding the Migrated Level(s) to the Project

Now you’ll add the migrated level to your new project.

To add migrated levels to the project:

1. In the new project, click Window > Levels to open the Levels panel if it is not already present.

2. Resize the Levels panel, if necessary and dock it on the right side of the screen, above the World Outliner panel (it may resize and dock automatically).

3. In the Content Browser, click Filters > Level to display the levels in your project.
   You will see the default Voyager level (Build_"Template Type") and the migrated level(s).

4. Drag the migrated project level into the Levels panel, where it will be nested under the Persistent Level.
   Notice that in the Levels panel, the migrated level name is blue and there is a dot beside it. This indicates that a blueprint is required to launch the level.

5. If you only have one level in your project, right-click the level in the Levels panel and select Change Streaming Method > Always Loaded instead of creating a blueprint.
   The level will be selected and played when the project is launched. Notice that the level name is no longer blue and there is no dot beside it.
   If you have more than one level in your project, see Creating a Blueprint to Launch Multiple Levels.

6. Click Save Current to save your project.
Configuring Your Screen Setup

In your new project, you’ll need to match the screens in the project to your physical screen layout. You define most aspects of the nDisplay system in the nDisplay Config Editor. Here you will define the engines that make up your network, the size and location of the screens and the viewports to render on each engine.

The VLED template provides configuration blueprints for a number of example screen layouts, but the default configuration is the NDC_VirtualLEDStage. This configuration can be altered to match your physical layout.

The NDC_VirtualLED_Stage blueprint is configured for two engines. Depending on your screen setup and content, you may need more engines. In this case, you’ll have to add engines to the template and assign viewports to each engine.

To set up the template screens:

1. In the World Outliner, right-click the NDC_VirtualLEDStage actor and select Edit NDC_VirtualLEDStage.
   Alternatively, from the Content Browser > Content > ExampleConfigs, you can double-click the NDC_VirtualLEDStage configuration to open the editor.

   ![nDisplay Configuration Blueprint](image)

   **Figure 3.7** nDisplay Configuration Blueprint

   In the Editor, you’ll see the example configuration components in the upper-left section (called STEP 1).

2. Define the screen parameters and add engines or screens as described in Screen Setup.
Screen Setup

This section describes the steps for defining the screen parameters, adding new engines and screens to the project and deleting screens.

To define the screen parameters:

1. In the nDisplay 3D Configuration Editor, in the Preview window or in the Components panel (STEP 1), select a screen and then move and rotate (if necessary) the screen to position it approximately where it is located in the physical screen setup.
2. In the Details panel, in the Transform section, set the Y and Z Scale values for each screen to match the size of the corresponding physical screen in your studio.
3. Measure from the zero point (0,0) of your studio to the bottom-left corner of each upright screen and to the front-left corner of each floor screen (if applicable) and enter these values into the appropriate Location fields.
4. When you have finished configuring your screens, in the main tool bar click Save.
5. Then click Export to save your new configuration file in your project, either by replacing the default NDC_XRStage.ndisplay file or entering a new file name and clicking Open.

The default location for the configuration file is in the Content folder of your project.
6. Then click the arrow beside the Export icon and select Export on Save.

Thereafter, any changes to the configuration file will be automatically exported when they’re saved.

To add new engines:

1. In the Cluster tab (STEP 2), click Add New > Add New Cluster Node.
2. In the Add New Cluster Node editor, give the third engine a name (eg. Node_2) and deselect the Add Viewport to New Cluster Node option.
3. In the Configuration section of the editor, enter the IP Address of the third engine.
4. Then click Add.

5. To assign one or more of the viewports from the second engine to the third engine, click and drag the viewport from Host_0 - node_virtual_led to Host 3 - node_2.
6. Repeat the above steps to add additional engines, giving each one a unique name.

To add new screens to the blueprint:

1. In the Components panel (STEP 1), right-click any of the default screens and click Duplicate to make a copy.
2. With the new screen selected, in the Details tab on the right, rename it to correspond with one of the screens in your physical layout.
3. Move the new screen to its approximate location in the blueprint.
4. In the Details tab, in the Transform section, define the size and location of the screen as you did in the previous section for the default screens.
5. In the main tool bar click Save.

To delete screens:

1. In the Components panel (STEP 1), right-click any of the default screens and click Delete to remove it.
2. In the main tool bar click Save.
Using Voyager Switchboard Launcher

Voyager Switchboard Launcher is used to automatically launch and quit your Voyager project on all the engines in your setup simultaneously. The Voyager Switchboard Launcher is located on the master node. You will need to launch the Voyager Switchboard Listener manually on each cluster node.

To launch Voyager Switchboard Launcher:

1. Click on the Voyager Switchboard Launcher desktop icon. Alternatively, in the menu bar, double-click on the Switchboard icon.

![Launch Switchboard](image)

Figure 3.11 Launch Switchboard

When you launch Switchboard for the first time, it will set up a new Python virtual environment.

![Python Virtual Environment Setup](image)

Figure 3.12 Python Virtual Environment Setup

Then the Add new Switchboard Configuration dialog opens.

![Add New Switchboard Configuration](image)

Figure 3.13 Add New Switchboard Configuration

The Config Path (the name of the configuration file), the uProject path and the Engine Dir field are automatically populated with the details of the currently open project.

2. Click OK to accept the automatically populated settings or edit the settings as described in the next section.
To edit the Voyager Switchboard Configuration file:

1. In the **Config Path** field, enter a new name for the Voyager Switchboard configuration file or click the **Browse** button and navigate to the folder containing the configuration file you want to use.

2. Beside the **uProject** field, click the **Browse** button and navigate to the project you want to control with Switchboard.

3. Beside the **Engine Dir** field, click the **Browse** button and navigate to the location of the Voyager engine on your computer.

4. Click the **Detect** button to return to the default configuration for the project that is currently open.

5. When you have finished editing the Switchboard configuration file, click **OK**. The **Voyager Switchboard** editor opens.

![Voyager Switchboard Editor](image)

*Figure 3.14  Voyager Switchboard Editor*
To configure Voyager Switchboard Launcher:

1. In the **Voyager Switchboard** editor, click **Add Device** and from the dropdown menu, select **nDisplay**.
2. In the **Add nDisplay Device** dialog, click **Browse** and navigate to the **Content** folder of your Voyager project.

![Add nDisplay Device](image1)

*Figure 3.15 Add nDisplay Config File*

3. Select the **NDC_XRStage.ndisplay** config file and click **Open**.
4. Then, in the **Add nDisplay Device** dialog, click **OK**.

Now you’ll see the virtual LED node displayed in the **Switchboard** editor along with any Voyager Switchboard Listeners that are part of your system. Each engine in your system needs to have an instance of the Voyager Switchboard Listener installed.

![Voyager Switchboard with nDisplay Device Added](image2)

*Figure 3.16 Voyager Switchboard with nDisplay Device Added*

5. Click on the **Connection** icon beside each component that you want to connect or click the top-level icon to connect all the components.

To start a project from Voyager Switchboard Launcher:

- In the list of **nDisplay Devices**, click the top level arrow to start all connected devices.

![Voyager Switchboard Launcher - Start Connected Device](image3)

*Figure 3.17 Voyager Switchboard Launcher - Start Connected Device*
To stop a project from Switchboard:

1. Press the Windows key on your keyboard to access the task bar.
2. Click the Voyager Switchboard Launcher icon to open the launcher.
3. In the list of nDisplay Devices, click the X to stop the connected device.

![Figure 3.18 Voyager Switchboard Launcher - Stop Connected Device](image)

Using Voyager Switchboard Listener

While only the master node requires an instance of Voyager Switchboard Launcher to be running, each cluster node in your multi-display network will need to be running an instance of the Voyager Switchboard Listener in order to receive messages from the Launcher.

When Voyager is installed, a Voyager Switchboard Listener icon is automatically added to the desktop.

To launch the Voyager Switchboard Listener application:

1. Double-click the Voyager Switchboard Listener icon on the desktop.
   
   If you get a Windows Security Alert message, click Allow Access to continue.
   
   Voyager Switchboard Listener opens.

![Figure 3.19 Voyager Switchboard Listener - Started](image)

2. Minimize the Voyager Switchboard Listener.
Switching Cameras in a Multi-Camera Display

You can switch between multiple cameras in a Virtual LED setup to show the same scene from a different perspective. This requires defining a number of virtual cameras to be associated with the physical cameras in your set and adding nodes to the level blueprint that will set the active tracker actor.

Follow the steps below to set up camera switching:

1. Enabling the Adrienne GPIO Plugin
2. Adding a Voyager Operator to your Project (if you don’t already have one)
3. Adding Voyager Trackers
4. Adding Voyager Tracker Actors
5. Adding Camera-Switching to the Level Blueprint

Adding a Voyager Operator to your Project

If you have used the Virtual LED template to create your project, you will need to add a Voyager Operator to your project in order to do camera-switching. If you already have a Voyager Operator in your project you can skip these instructions and continue with Adding Voyager Trackers.

To add a Voyager Operator to your project:

1. In the main toolbar, from the Voyager drop-down, select New Voyager Operator.
2. In the Save Asset As window, navigate to the Voyager folder and add a new folder named Operator.
3. Then save the new Voyager Operator in the Operator folder, with a name like VoyagerOperator.

The VoyagerOperator editor opens and the VoyagerOperator_InnerAssets folder is automatically created.

4. In the VoyagerOperator editor, in the Voyager section, from the Compositing Mode drop-down, select nDisplay.
5. From the Tonemapping drop-down, select either the Native or Hybrid option.
   - **Native** - The Unreal Engine native tonemapping and post-processing will be applied to everything in the level, including the incoming camera feed. This setting is not recommended in internal compositing as the look of the camera feed will be affected.
   - **Hybrid** - A broadcast tonemapping (designed to preserve the look of the incoming camera feed) will be applied only to the incoming camera feed. Native tonemapping and post-processing will only affect the graphics and not the incoming camera feed used for the tracked composite plane.
6. Click **Save** and close the editor.
7. In the **Content Browser**, open the **Voyager > Operator** folder and then click and drag the **VoyagerOperator** into the level.

   The location of the **VoyagerOperator** actor in the scene is not important. It can be placed anywhere.

**Adding Voyager Trackers**

Typically, your project will have at least one VoyagerTracker. For multi-camera switching, you'll need to add an additional Voyager Tracker for each physical camera in your set to which you want to be able to switch.

**To add Voyager Trackers:**

1. In the **Content Browser**, in the **Tracker** folder, right-click in the empty space and select **Media > Voyager Tracker**.
2. Rename the Voyager Tracker to identify the physical camera it represents (Cam1, Cam2, etc.).
3. Double-click the new Voyager Tracker to open the editor.
4. In the **UDP Port** field, enter a different port number from any other tracker in the scene.
   
   By default, the **UDP Port** is **8456**, so you can enter **8457** for the second tracker, **8458** for the third tracker, etc.
5. Click **Save** and close the editor.
6. Drag the new Voyager Tracker into the scene.
7. Repeat the above steps for each camera view you want to display.

**Adding Voyager Tracker Actors**

Once you’ve added the required number of Voyager Trackers to your project, you’ll need to add them to the Voyager Operator.

**To add Voyager Tracker Actors:**

1. In the **World Outliner** tab, select **VoyagerOperator**.
2. In the **Details** tab, in the **Tracking** section, click the **+** icon to add a **Tracker Actor Array element** for each tracker you added to the scene.
3. From the drop-down for the first new element (**Tracker Actor “0”**), select your first VoyagerTracker (eg Cam1).

![Figure 3.21 Add Tracker Actors](image)

4. From the dropdown for the second new element (**Tracker Actor “1”**), select your second VoyagerTracker (eg Cam2).
5. Repeat for each additional tracker.
Adding Camera-Switching to the Level Blueprint

Now you'll need to add some nodes to the level blueprint to switch cameras. The trigger to switch cameras can come from a number of inputs, such as a switcher node, a **Lucid Exec** node, or a **RossTalk** node, depending on your workflow.

**To open the level blueprint:**

- Click the arrow beside the **Blueprints** icon and select **Open Level Blueprint**.

![Figure 3.22 Open Level Blueprint](image)

**To create the first camera switch graph:**

1. In the **Event Graph** tab, right-click in an empty section of the graph and in the **Search** field, start typing the first part of the input node name and then select the node from the list:
   - Type **Adrienne** to add an **Adrienne GPI Input Event** node.
   - Type **RossTalk** to add a **RossTalk GPI Event** node.
   - Type **Lucid** to add a **Lucid Exec** node.

2. Click the **On GPI** pin (or **Exec 1** on a Lucid input node) and drag out a connection to place a new node.

3. In the **Executable Actions** list, start typing **Set Active Tracker Index** and add a **Set Active Tracker Index** to the input node.

4. Click on the **Output** pin of the **Set Active Tracker Index** node and in the **Search** field, start typing **Adrienne Output Pin** and add an **Adrienne Output Pin** node to the **Set Active Tracker Index** node.

5. In the **Input** node, set the applicable parameters as described below:
   - Set the **Pin Condition/Condition** to **Match Number Only**.
   - In a **Lucid Exec** node, in the **Var Name** field, enter a name (eg Camera_Switch_1).
   - Set the **Pin** field to the **Index** number of the tracker actor to which it refers ("0" for Cam1, “1” for Cam2, etc.) as defined in the Voyager Operator.
   - Set the **Time Condition** to **After Delay in frames**.

6. In the **Set Active Tracker Index** node:
   - Set the **Target** to self.
   - Set the **An Index** field to the **Index** number of the tracker actor to which it refers ("0" for Cam1, “1” for Cam2, etc.) as defined in the Voyager Operator.
   - Click and drag off the output pin to the input pin of the connected **Adrienne Output Pin** node.
7. In the Adrienne Output Pin node:
   • Set the Pin field to the Index number of the connected Set Active Tracker Index node.
   • Select the State checkbox.
   • Set the Time Condition to After Delay in frames.
   • Set the Delay Amount to the number of frames to wait from the time the switch is executed to the time the GPO is sent.

To add additional camera switches:

1. Left-click and drag around the three nodes created above to select them and then right-click and select Duplicate to create another set of identical nodes.

2. Change the GPI Number/An Index number/Pin number in the new nodes to correspond to the Index number of the second tracker actor defined in the Voyager Operator.

3. In a second Lucid Exec node, change the Var Name (eg Camera_Switch_2) to correspond to the Index number of the second tracker actor defined in the Voyager Operator, which would be called in a Renderer Logic function in Lucid Studio (Method 1).

   Alternatively, you can have one Lucid Exec node that switches up to 5 cameras and connect the Exec 2 pin to the second camera, the Exec 3 pin to the third camera, etc. (Method 2).

   If you need more than 5 camera switches, you’ll need to use Method 1.

4. Repeat steps 1 and 2 for any additional physical cameras to which you want to be able to switch.

5. Connect the Output pin of the first Input node to the Input pin of the second Input node and connect the Output pin of the second Input node to the Input pin of the third Input node, as is necessary for the number of Input nodes.

A blueprint for two cameras with a switcher trigger would look like the blueprint below:

![Figure 3.23 Camera Switching via Adrienne GPI](image)

*Figure 3.23 Camera Switching via Adrienne GPI*
A blueprint for two cameras with a RossTalk trigger would look like the blueprint below:

Figure 3.24 Camera Switching via RossTalk GPI

A blueprint for two cameras with a Lucid trigger could look like either of the blueprints below:

Figure 3.25 Camera Switching via Lucid Exec (Method 1)

Figure 3.26 Camera Switching via Lucid Exec (Method 2)

6. Click Save and close the level blueprint.
Virtual LED + Set Extension Template

Voyager provides several templates to make setting up your project simpler. This section describes how to create a project from the Virtual LED + Set Extension template, with which you can render content on multiple displays simultaneously and enhance your virtual set with set extension. This type of project typically requires several Voyager engines. One engine is identified as the “master node” and handles the AR or VS set extension. The additional engines are identified as “cluster nodes” and feed the LED screens.

There are three components in a Virtual LED + Set Extension setup, as follows:

- The nDisplay plugin inside Voyager communicates and synchronizes information amongst all the Voyager engines that make up the cluster, to make sure all engines render correctly at the same time (enabled by default).
- The Voyager Switchboard Launcher application (located on the master node only) is used to automatically launch and quit your Voyager project on all the engines in your setup.
- The Voyager Switchboard Listener application (running on the master node and each cluster node) listens for incoming requests from Voyager Switchboard Launcher, and processes those requests on the local engine.

This section covers the following topics:

- Setting up a Virtual LED with Set Extension Project
- Selecting or Creating a Media Profile
- Configuring Your Screen Setup
- Using Voyager Switchboard Launcher
- Using Voyager Switchboard Listener
Setting up a Virtual LED with Set Extension Project

The first step is to create an empty project from a template. Then you can migrate files from an existing project to the template and add the migrated level(s) to the new project.

To create an empty project:

1. Launch Voyager from the desktop icon.
2. In the New Project Catagories section, select the Film, Television and Live Events option and click Next.

   ![Select Film, Television and Live Events](image)

   *Figure 3.2 Select Film, Television and Live Events*

3. In the Select Template window, select the VLED+Ext template and click Next.

   ![Select VLED+Ext Template](image)

   *Figure 3.3 Select VLED+Ext Template*

4. In the Project Settings window, from the Raytracing drop-down, select whether or not to use real-time raytracing in your project.

   If you don’t know which option to choose, select Raytracing Disabled. You can change this setting later in the project settings. Raytracing can be very GPU-intensive, so only use it if necessary.

5. Click Browse beside the Folder field to navigate to a folder in which to save your new project (eg. D:\Voyager_Projects) and click Select Folder.
6. In the **Name** field, enter a name for your project. Your project name cannot have any spaces in it. Use underscores rather than spaces.

7. Then click **Create Project**. Your new project opens, with the default folders in the **Content Browser** and the Voyager components listed in the **World Outliner** panel.

8. Click the **Save Current** icon and minimize your empty project to the task bar.

**Migrating Files into a Project**

Next you’ll need to migrate the levels you want to use from an existing project into the template.

**To migrate files into a project:**

1. Launch the source project containing the level(s) you want to use, by double-clicking the `.uproject` file.
2. In the **Select Unreal Engine Version** dialog, select the latest version of UE4 and click **OK**.
3. In the **Multiple Instances Running** dialog, click **Yes**. Wait a few minutes for the project to launch and the shaders to compile.
4. If you don’t see the project levels in the **Content Browser**, click the filters drop-down and from the Filters list, select **Level**.
5. Double-click the level you want to use to load it in the viewport, if it is not already displayed.
6. In the **Content Browser**, right-click the level and select **Asset Actions > Migrate**. You can migrate more than one level at a time, by using **Ctrl + Click** or **Shift + Click** to select multiple levels.
   - You can only migrate to the same version of UE4 or forwards. You cannot migrate backwards from a newer version.

   ![Figure 3.4 Migrate Level](image)

7. In the **Save Content** screen, click **Save Selected**.

8. In the **Asset Report** screen, click **OK**.

9. In the **Choose a destination Content folder** screen, navigate to the **Content** folder of your new project and click **Select Folder**. The level files are copied to the new project and you’ll see a “**Content migration completed successfully!**” message in the bottom-right corner of the project.

10. Close the source project and restore your new project. You’ll see that in addition to the default folders, the **Content Browser** now displays the migrated folder(s).
Adding the Migrated Level(s) to the Project

Now you’ll add the migrated level to your new project.

To add migrated levels to the project:

1. In the new project, click **Window > Levels** to open the **Levels** panel if it is not already present.

   ![Figure 3.5 Add Levels Panel](image)

2. Resize the **Levels** panel, if necessary and dock it on the right side of the screen, above the **World Outliner** panel (it may resize and dock automatically).

3. In the **Content Browser**, click **Filters > Level** to display the levels in your project.

   You will see the default Voyager level (Build_"Template Type") and the migrated level(s).

4. Drag the migrated project level into the **Levels** panel, where it will be nested under the **Persistent Level**.

   Notice that in the **Levels** panel, the migrated level name is blue and there is a dot beside it. This indicates that a blueprint is required to launch the level.

5. If you only have one level in your project, right-click the level in the **Levels** panel and select **Change Streaming Method > Always Loaded** instead of creating a blueprint.

   The level will be selected and played when the project is launched. Notice that the level name is no longer blue and there is no dot beside it.

   If you have more than one level in your project, see **Creating a Blueprint to Launch Multiple Levels**.

6. Click **Save Current** to save your project.
Selecting or Creating a Media Profile

Next you’ll need to select or create a media profile. At its most basic level, a media profile is comprised of a composite input and an output.

Your media profile can also include a number of live source inputs (perhaps for displaying video on a surface in your project). This section describes how to configure a composite input. For configuring a live source input, see Creating Live Sources.

Instructions are provided for configuring an output for internal compositing or for external compositing. Select the one that corresponds to your compositing mode.

Selecting a Media Profile

If you have previously created a media profile on your engine, it will be saved in Engine Content and is available for use with any project.

To select an existing media profile:

- Click the arrow beside the Media Profile icon, and select the media profile that matches your requirements.

Creating a Media Profile

If you do not have a media profile on your engine, you’ll need to create one.

First you’ll create an empty media profile (like a container) for the input(s) and output in your project.

Then you’ll configure your input(s) and output.

Finally, you’ll configure the Genlock settings.

Accessing the Media Profiles Folder

When creating a media profile, you’ll need to access a folder in the Engine Content. It is best not to have the core engine files visible all the time, as inadvertently changing something in these files could interfere with your Voyager installation. Make them visible only while it is necessary, then hide them again.

To view engine content:

1. In the bottom-right corner of the Content space, click View Options and select the Show Engine Content checkbox.

2. Proceed with the instructions for creating a media profile.

3. When you have finished creating your media profile, go back to View Options and deselect the Show Engine Content checkbox.

If you want to reuse the media profile you create here in another project, you’ll need to again go to View Options, select the Show Engine Content checkbox and in the Content Browser navigate to the profile in the MediaProfile folder.
To configure a composite input:

1. Double-click the Media Profile icon in the main toolbar to open the media profile you created, if it is not already open.

2. Expand the Inputs > Media Sources section, then click the ProxyMediaSource_Composite1 drop-down and select Ross Matrox Media Source.

3. Expand the ProxyMediaSource_Composite1 input and then expand RossMatrox to access Configuration.

4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.
   - **Input Type**: Fill
   - **Device**: DSXLE4/8/100F
   - **Source**: Single Link 1
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

5. Expand Video and configure the settings as follows:
   - Select the Capture Video checkbox.
   - From the Color Format drop-down, select the color format that works best for your project.
   - Select the Capture Video checkbox.
• From the **Color Format** drop-down, select the color format that works best for your project.

**10bit YUV 422** is recommended when using HDR and Wide Color Gamut.

With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.

**10bit YUV 422** is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.

• From the **Max Num Video Frame Buffer** drop-down, select 8 if you are using a Progressive format or if you are using an Interlaced format, select 16.

• From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Figure 3.9 Video Configuration - Composite Input](image)

6. Expand **Colorspace** and configure the settings as follows:

• From the **Colorimetry** drop-down, select one of the following options:
  > **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
  OR
  > **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)

• From the **Transfer Function** drop-down, select one of the following options:
  > **SDR (Rec. 1886)** — Standard Dynamic Range
  > **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
  > **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Figure 3.10 Colorspace Settings](image)

7. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.

Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.

• If you selected an 8bit color format in the **Video** settings, these are the only **Colorspace** settings available. Continue with the output configuration.

• If you selected a 10bit color format in the **Video** settings, the **HDR** settings will also be available. Continue with Step 8 to edit **HDR** settings.

8. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

9. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.
10. From the LUT Output Transfer Function dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

11. Then click Save.

To configure a composite output:

1. In the Outputs section, expand Media Outputs.

2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.

4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Source, Resolution and Frame Rate options will differ depending on your hardware configuration.

   • Output Type: Fill
   • Device: DSXLE4/8/100F
   • Destination: Single Link 2
   • Resolution/Standard/Frame Rate: The video format that corresponds to your workflow.
   • Reference: External

5. Continue with configuring the Genlock Reference.
To configure the Genlock Reference:

1. In the **Genlock** section, select the **Override Project Settings** checkbox.

   ![Figure 3.13 Genlock Configuration](image)

2. Click the **Custom Time Step** arrow and from the dropdown select **Ross Matrox SDI Input**.
3. Click the **Genlock** arrow and make sure the **Use Media Output Settings** checkbox is selected.
4. Click **Save** and close the **Media Profile** window.

To select the startup media profile:

1. Once you have a media profile selected or created, click **Edit > Project Settings > Plugins > Media Profile**.
2. In the **Media Profile** plugin, from the **Startup Media Profile** dropdown, select the media profile you selected or created for your project.

   ![Figure 3.14 Select Startup Media Profile](image)

3. Then close the **Project Settings** editor.
Configuring Your Screen Setup

In your new project, you’ll need to match the screens in the project to your physical screen layout. You define most aspects of the nDisplay system in the nDisplay Config Editor. Here you will define the engines that make up your network, the size and location of the screens and the viewports to render on each engine.

The VLED+Ext template provides configuration blueprints for a number of example screen layouts, but the default configuration is the NDC_VirtualLEDStage. This configuration can be altered to match your physical layout.

If you modify the NDC_VirtualLEDStage screen setup, you’ll have to also modify the BP_VoyagerGreenScreen actor so that it matches the screen setup in size and position.

For more information about configuring a green screen, see Using the Voyager Green Screen Model.

The NDC_VirtualLED_Stage blueprint is configured for two engines. Depending on your screen setup and content, you may need more engines. In this case, you’ll have to add engines to the template and assign viewports to each engine.

To add engines:

1. In the World Outliner, right-click the NDC_VirtualLEDStage actor and select Edit NDC_VirtualLEDStage. The Configuration Editor opens.

![Figure 3.15 nDisplay Configuration Editor](image)

In the Editor, you’ll see the example configuration components in the upper-left section (called STEP 1).

2. Define the screen parameters and add engines or screens as described in Screen Setup.
Screen Setup

This section describes the steps for defining the screen parameters, adding new engines and screens to the project and deleting screens.

To define the screen parameters:

1. In the nDisplay 3D Configuration Editor, in the Preview window or in the Components panel (STEP 1), select a screen and then move and rotate (if necessary) the screen to position it approximately where it is located in the physical screen setup.
2. In the Details panel, in the Transform section, set the Y and Z Scale values for each screen to match the size of the corresponding physical screen in your studio.
3. Measure from the zero point (0,0) of your studio to the bottom-left corner of each upright screen and to the front-left corner of each floor screen (if applicable) and enter these values into the appropriate Location fields.
4. When you have finished configuring your screens, in the main toolbar click Save.
5. Then click Export to save your new configuration file in your project, either by replacing the default NDC_XRStage.ndisplay file or entering a new file name and clicking Open.
   The default location for the configuration file is in the Content folder of your project.
6. Then click the arrow beside the Export icon and select Export on Save.

Thereafter, any changes to the configuration file will be automatically exported when they’re saved.

To add new engines:

1. In the Cluster tab (STEP 2), click Add New > Add New Cluster Node.
2. In the Add New Cluster Node editor, give the third engine a name (eg. Node_2) and deselect the Add Viewport to New Cluster Node option.
3. In the Configuration section of the editor, enter the IP Address of the third engine.
4. Then click Add.

To assign one or more of the viewports from the second engine to the third engine, click and drag the viewport from Host_0 - node_virtual_led to Host 3 - node_2.
To define the screen parameters:

1. In the nDisplay 3D Configuration Editor, in the Preview window, select a screen and then move and rotate (if necessary) the screen to position it approximately where it is located in the physical screen setup.
2. In the Details panel, in the Transform section, set the Y and Z Scale values for each screen to match the size of the corresponding physical screen in your studio.
3. Measure from the zero point (0,0) of your studio to the bottom-left corner of each upright screen and to the front-left corner of each floor screen (if applicable) and enter these values into the appropriate Location fields.
4. In the main toolbar click Save.

To add new screens to the blueprint:

1. In the Components panel (STEP 1), right-click any of the default screens and click Duplicate to make a copy.
2. With the new screen selected, in the Details tab on the right, rename it to correspond with one of the screens in your physical layout.
3. Move the new screen to its approximate location in the blueprint.
4. In the Details tab, in the Transform section, define the size and location of the screen as you did in the previous section for the default screens.
5. In the main toolbar click Save.

To delete screens:

1. In the Components panel (STEP 1), right-click any of the default screens and click Delete to remove it.
2. In the main toolbar click Save.

To export the configuration file:

1. When you have finished configuring your screens, in the main toolbar of the nDisplay Configuration Editor, click Export to save your new configuration file (.ndisplay) in the Content folder of the project. The file will replace the existing .ndisplay file and set the export path.
2. Then click the arrow beside the Export icon and select Export on Save.

Figure 3.18 Export on Save

Thereafter, any time a change is saved, it will automatically update the asset and the nDisplay config file.
Using Voyager Switchboard Launcher

Voyager Switchboard Launcher is used to automatically launch and quit your Voyager project on all the engines in your setup simultaneously. The Voyager Switchboard Launcher is located on the master node. You will need to launch the Voyager Switchboard Listener manually on each cluster node.

To launch Voyager Switchboard Launcher:

1. Click on the Voyager Switchboard Launcher desktop icon.
   Alternatively, in the menu bar, double-click on the Switchboard icon.

   ![Launch Switchboard](image)
   *Figure 3.19 Launch Switchboard*

   When you launch Switchboard for the first time, it will set up a new Python virtual environment.

   ![Python Virtual Environment Setup](image)
   *Figure 3.20 Python Virtual Environment Setup*

   Then the Add new Switchboard Configuration dialog opens.

   ![Add New Switchboard Configuration](image)
   *Figure 3.21 Add New Switchboard Configuration*

   The Config Path (the name of the configuration file), the uProject path and the Engine Dir field are automatically populated with the details of the currently open project.

2. Click OK to accept the automatically populated settings or edit the settings as described in the next section.
To edit the Voyager Switchboard Configuration file:

1. In the **Config Path** field, enter a new name for the Voyager Switchboard configuration file or click the **Browse** button and navigate to the folder containing the configuration file you want to use.
2. Beside the **uProject** field, click the **Browse** button and navigate to the project you want to control with Switchboard.
3. Beside the **Engine Dir** field, click the **Browse** button and navigate to the location of the Voyager engine on your computer.
4. Click the **Detect** button to return to the default configuration for the project that is currently open.
5. When you have finished editing the Switchboard configuration file, click **OK**.

The **Voyager Switchboard** editor opens.

**Figure 3.22** Voyager Switchboard Editor

To configure Voyager Switchboard Launcher:

1. In the **Voyager Switchboard** editor, click **Add Device** and from the dropdown menu, select **nDisplay**.
2. In the **Add nDisplay Device** dialog, click **Browse** and navigate to the **Content** folder of your Voyager project.

**Figure 3.23** Add nDisplay Config File

3. Select the **NDC_VirtualLEDStage.ndisplay** config file and click **Open**.
4. Then, in the **Add nDisplay Device** dialog, click **OK**.
5. Now click **Settings > Settings** to open the **Settings** editor and select the **Master Device Used As Set Extension** checkbox and close the editor.

![Voyager Switchboard Settings Editor](image)

**Figure 3.24 Voyager Switchboard Settings Editor**

Now you’ll see the set extension node (automatically selected as the master node) and virtual LED node displayed in the **Switchboard** editor along with any Voyager Switchboard Listeners that are part of your system. Each engine in your system needs to have an instance of the Voyager Switchboard Listener installed.

![Voyager Switchboard with nDisplay Device Added](image)

**Figure 3.25 Voyager Switchboard with nDisplay Device Added**

6. Click on the **Connection** icon beside each component that you want to connect or click the top-level icon to connect all the components.
To start a project from Voyager Switchboard Launcher:

- In the list of nDisplay Devices, click the top level arrow to start all connected devices.

![Figure 3.26 Voyager Switchboard Launcher - Start All Connected Devices]

To stop a project from Switchboard:

1. Press the Windows key on your keyboard to access the task bar.
2. Click the Voyager Switchboard Launcher icon to open the launcher.
3. In the list of nDisplay Devices, click the top level X to stop all connected devices.

![Figure 3.27 Voyager Switchboard Launcher - Stop All Connected Devices]

Using Voyager Switchboard Listener

While only the master node requires an instance of Voyager Switchboard Launcher to be running, each cluster node in your multi-display network will need to be running an instance of the Voyager Switchboard Listener in order to receive messages from the Launcher.

When Voyager is installed, a Voyager Switchboard Listener icon is automatically added to the desktop.

To launch the Voyager Switchboard Listener application:

1. Double-click the Voyager Switchboard Listener icon on the desktop.
   - If you get a Windows Security Alert message, click Allow Access to continue.
   - Voyager Switchboard Listener opens.

![Figure 3.28 Voyager Switchboard Listener - Started]

2. Minimize the Voyager Switchboard Listener.
Making an Existing Project Compatible with Voyager

With this method, you’ll open an existing non-Voyager project and add the necessary Voyager components. The steps for this method are:

- Setting up an Existing Project
- Selecting or Creating a Media Profile
- Creating and Configuring the Voyager Operator
- Creating and Configuring the Voyager Tracker
- Setting Up Compatibility With Voyager
- Updating Voyager Project Settings
- Organizing Voyager Assets
Setting up an Existing Project

Any UE4 project can be made to work with Voyager.

To open an existing project:

1. Navigate to the folder containing the UE4 project you want to use in Voyager and double-click the project file (.uproject).
2. In the Select Unreal Engine Version dialog, select version 4.27 and click OK.
3. In the Content Browser, if the levels aren’t already displayed, click the Filters drop-down and from the Filters list, select Level.
4. If there is more than one level, double-click the level you want to use in your project to open it in the viewport.

To set up a Voyager folder structure for your project:

1. In the Content Browser, click the Show or hide the sources panel icon (if necessary), to display the Content tree.
2. Then select the Content folder and click the Add New button and from the context menu, select New Folder. Alternatively, you can right-click the Content folder and from the context menu, select New Folder.
3. Name the folder “Voyager”.
4. With the Voyager folder selected, add the following subfolders as shown in the image below:
   - LiveSources
   - Operator
   - Proxies
   - Tracker

![Content Folder Tree](image)

Selecting or Creating a Media Profile

- If you already have a media profile on your engine that suits the needs of your project, click the arrow beside the Media Profile icon in the main toolbar and select that media profile.
- OR
  - If you don’t have a suitable media profile set up, see Creating a New Empty Media Profile.
  - You will not need a media profile for a Virtual LED project.
Creating a New Empty Media Profile

First you’ll need to create an empty media profile (like a container) for the input(s) and output in your project. When creating a media profile, you’ll need to access a folder in the Engine Content. See To view engine content:

It is best not to have the core engine files visible all the time, as inadvertently changing something in these files could interfere with your Voyager installation. Make them visible only while it is necessary.

To view engine content:

1. In the bottom-right corner of the Content space, click View Options and select the Show Engine Content checkbox.
2. Proceed with the instructions for creating a media profile.
3. When you have finished creating your media profile, go back to View Options and deselect the Show Engine Content checkbox.

If you want to reuse the media profile you create here in another project, you’ll need to again go to View Options, select the Show Engine Content checkbox and in the Content Browser navigate to the profile in the MediaProfile folder.

To create a new empty media profile:

1. In the main toolbar, click the arrow beside the Media Profile icon.
2. From the drop-down menu, select New Empty Media Profile.
3. In the Pick Media Profile Class dialog, select the MediaProfile item and click Select.
4. In the Save Asset As window, in Content Browser > Engine Content, navigate to and select the MediaProfiles folder.
   - If MediaProfiles does not exist, right-click Engine Content and select New Folder to create a folder named MediaProfiles.

5. In the Name field at the bottom of the Save Asset As window, enter a name for the media profile you will create and click Save.

As an example, the media profile could be named Matrox1080p5994VS_Internal (for internal compositing) or Matrox1080p5994VS_EXTERNAL (for external compositing).
Typically, the name provides the graphics card (Matrox or AJA), resolution (1080), format (progressive or interlaced), the frame rate, and an indication that it is for either a virtual set (VS) or augmented reality (AR) project. You can also add an indicator of the type of compositing that will be used. The new empty media profile is saved in the MediaProfile folder and the Details tab opens.

6. Click Save.

The new empty media profile is saved in the MediaProfile folder and the Media Profile editor opens.

![Media Profile Editor](image)

**Figure 4.3 Media Profile Editor**

7. Close the Media Profile editor and continue with Creating and Configuring Media Proxies.
Creating and Configuring Media Proxies

You’ll need to configure media proxies to provide a connection between your media profile and the places in your project where the input and output are actually used or generated.

Voyager templates include the media proxies.

To configure a media proxy for a composite input:

1. Click Edit > Project Settings, scroll down to Plugins and select Media Profile.
   The Plugins - Media Profile pane opens.

2. Click the arrow in the middle of the plugin to expand it to see the Media Source Proxy parameters.

3. Expand Media Source Proxy > Array elements to add a proxy input that will correspond to the input you will create later.

Figure 4.4 Media Profile Plugin

Figure 4.5 Add Media Input Proxy
4. Click the arrow in the input drop-down and select **Create New Asset > Proxy Media Source.**

![Figure 4.6 Add Proxy Media Source](image)

5. In the Save Asset As window, navigate to the Voyager > Proxies folder and give the asset a name that will correspond to the composite input (eg. **ProxyMediaSource_Composite1**) you will create later.

6. Click **Save.**

To configure a media proxy for an output:

1. In the Plugins - Media Profile pane, in the Media Output Proxy section, click the + icon to add an output proxy that will correspond to the output you will create later.

![Figure 4.7 Add Media Output Proxy](image)

2. Click the arrow in the drop-down and select **Create New Asset > Proxy Media Output.**

3. In the Save Asset As window, navigate to the Voyager > Proxies folder and give the asset a name to match the output you will create later (eg. **ProxyMediaOutput1**).

4. Click **Save** and close the Project Settings editor.
Configuring Inputs and Outputs

Now you'll configure your input(s) and output. The instructions in this section describe how to configure a composite input. If you also want to create one or more live source inputs (perhaps for displaying video on a surface in your project) see Creating Live Sources.

Instructions are provided for configuring an output for internal compositing or for external compositing. Select the one that corresponds to your compositing mode.

Select your hardware version for the appropriate instructions.

- Voyager SDI and 12G
- Voyager IP
Voyager SDI and 12G

The configuration instructions in this section are for the Voyager SDI and 12G versions.

To configure a composite input:

1. Double-click the Media Profile icon in the main toolbar to open the media profile you created, if it is not already open.

2. Expand the Inputs > Media Sources section, then click the ProxyMediaSource_Composite1 drop-down and select Ross Matrox Media Source.

3. Expand the ProxyMediaSource_Composite1 input and then expand RossMatrox to access Configuration.

4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.

   - **Input Type**: Fill and Key (for a VS) or Fill (for AR)
   - **Device**: DSXLE4/8/100F
   - **Source**: Single Link 1
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.
   - **Key Source**: The appropriate key source will be automatically selected, based on your selection of Source, if using a Matrox card. If using an AJA card, select the appropriate key source manually.
   - **Keying Mode**: Select Shaped (premultiplied) or Unshaped (straight alpha).
5. Expand **Audio** and configure the settings as follows:
   - Select the **Capture Audio** checkbox.
   - From the **Audio Channel** dropdown, select the channel you want to use, either **Channel 6** or **Channel 8**.
   - In the **Max Num Audio Frame Buffer** field, enter the number of frames to buffer.
     Default is 8.

6. Expand **Video** and configure the settings as follows:
   - Select the **Capture Video** checkbox.
   - From the **Color Format** drop-down, select the color format that works best for your project.
     10bit YUV 422 is recommended when using HDR and Wide Color Gamut.
     With multiple inputs, there may be a performance cost when using 10bit YUV 422. In this case, try using 8bit YUV 422.
     10bit YUV 422 is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
   - From the **Max Num Video Frame Buffer** drop-down, select 8 if you are using a **Progressive** format or if you are using an **Interlaced** format, select 16.
   - From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

7. Expand **Colorspace** and configure the settings as follows:
   - From the **Colorimetry** drop-down, select one of the following options:
     - Rec. 709 (HD SDR) for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     - OR
     - Rec. 2020 (WCG) for Wide Color Gamut (increased selection of color values)

8. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.
Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.

- If you selected an 8bit color format in the Video settings, these are the only Colorspace settings available. Continue with the output configuration.

- If you selected a 10bit color format in the Video settings, the HDR settings will also be available. Continue with Step 9 to edit HDR settings.

9. From the Conversion LUT dropdown, browse to and select the Look Up Table you want to apply to your color grading.

10. From the LUT Output Colorimetry dropdown, select either Rec. 709 (HD SDR) or Rec. 2020 (WCG).

11. From the LUT Output Transfer Function dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

12. Then click Save.

To configure an output for internal compositing:

1. In the Outputs section, expand Media Outputs.

2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.

3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.

4. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

The Source, Resolution and Frame Rate options will differ depending on your hardware configuration.

- Output Type: Fill
- Device: DSXLE4/8/100F
- Destination: Single Link 2
- Resolution/Standard/Frame Rate: The video format that corresponds to your workflow.
- Reference: External
5. Expand **Output**, click the arrow in the **Pixel Format** field and select the format that works best for your project. **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
   With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
   **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
   Leave the remaining settings as they are.

6. Then click **Save**.

To configure an output for external compositing:

1. In the **Outputs** section, expand **Media Outputs**.
2. Then click the **ProxyMediaOutput1** drop-down and select **Ross Matrox Media Output**.
3. Expand **ProxyMediaOutput1** and then expand **RossMatrox** to access **Configuration**.
4. Click the **Configuration** drop-down and in the configuration panel that opens, select the options described below and click **Apply**.
   The **Resolution** and **Frame Rate** options will differ depending on your hardware configuration.
   - **Output Type**: Fill and Key
   - **Device**: DSXLE4/8/100F
   - **Destination**: Single Link 2
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.
   - **Key Destination**: The appropriate key destination will be automatically selected, based on your selection of **Destination**, if using a Matrox card. If using an AJA card, select the appropriate key destination manually.
   - **Reference**: External

   ![Figure 4.14 Output Configuration - External Compositing](image)

   - Expand **Output**, click the arrow in the **Pixel Format** field and select the format that works best for your project.
   - **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
   With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
   **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
   Leave the remaining settings as they are.

5. Then click **Save**.
Voyager IP

The configuration instructions in this section are for the Voyager IP version.

To configure a composite input:

1. Double-click the Media Profile icon in the main toolbar to open the media profile you created.
2. Expand the Inputs > Media Sources section, then click the ProxyMediaSource_Composite1 drop-down and select Ross Matrox Media Source.

![Figure 4.15 Media Source Input](image)

3. Expand the ProxyMediaSource_Composite1 input and then expand RossMatrox to access Configuration.
4. From the Timecode Format drop-down, select VITC.
5. Click the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

   The Resolution and Frame Rate options will differ depending on your hardware configuration.
   - **Input Type**: Fill and Key (for a VS) or Fill (for AR)
   - **Device**: Matrox
   - **Source**: IP Flow 1
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

![Figure 4.16 Input Configuration - Composite Input (IP)](image)

6. Expand the IP section and then expand Primary and configure the settings as follows:
   - Select the Enabled checkbox.
   - Enter the IP address of the remote machine.
   - Enter the Port number on which the machines will be communicating.
7. Expand Secondary and from the IGMP Join drop-down, select IGMP v2.
8. Expand Video and configure the settings as follows:
   • Click the Capture Video checkbox.
   • From the Color Format dropdown, select the color format that works best for your project.
     **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.

     With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.

     **10bit YUV 422** is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.

   • From the Max Num Video Frame Buffer dropdown, select 8 if you are using a Progressive format or 16 if you are using an Interlaced format.

   • From the Input Frame Delay dropdown, select the frame delay that works best for your project.

   ![Figure 4.17 Video Configuration - Composite Input]

9. Expand Colorspace and configure the settings as follows:
   • From the Colorimetry dropdown, select one of the following options:
     › **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     **OR**
     › **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)

   • From the Transfer Function dropdown, select one of the following options:
     › **SDR (Rec. 1886)** — Standard Dynamic Range
     › **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     › **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

   ![Figure 4.18 Colorspace Settings]

10. Select the Linear Alpha checkbox if the incoming alpha is already linear; the Transfer Function will not be applied.

    Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.

    • If you selected an 8bit color format in the Video settings, these are the only Colorspace settings available. Continue with the output configuration.

    • If you selected a 10bit color format in the Video settings, the HDR settings will also be available. Continue with Step 11 to edit HDR settings.
11. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

12. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.

13. From the **LUT Output Transfer Function** dropdown, select either SDR (Rec. 1886), HLG (Rec. 2100) or HDR10 (PQ 1000 nits).

14. Then click **Save**.

To configure an output for internal compositing:

1. In the **Outputs** section, expand **Media Outputs**.

2. Then click the **ProxyMediaOutput1** drop-down and select **Ross Matrox Media Output**.

![Figure 4.19 Media Profile Details Tab](image)

3. Expand **ProxyMediaOutput1** and then expand **RossMatrox** to access **Configuration**.

4. Click the **Configuration** drop-down and in the configuration panel that opens, select the options described below and click **Apply**.

   The **Source**, **Resolution** and **Frame Rate** options will differ depending on your hardware configuration.
   - **Output Type**: Fill
   - **Device**: Matrox
   - **Destination**: IP Flow 1
   - **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.
   - **Reference**: PTP
   - **Sync Source**: Best Match

![Figure 4.20 Output Configuration - Internal Compositing (IP)](image)

5. Expand **Output**, click the arrow in the **Pixel Format** field and select the format that works best for your project.
   - **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.
   - With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.
   - **10bit YUV 422** is not supported in a **Fill and Key** configuration with an AJA card. In this case you could use RGBA.
Leave the remaining settings as they are.

6. Then click Save.

To configure an output for external compositing:

1. In the Outputs section, expand Media Outputs.
2. Then click the ProxyMediaOutput1 drop-down and select Ross Matrox Media Output.
3. Expand ProxyMediaOutput1 and then expand RossMatrox to access Configuration.
4. Click the Configuration drop-down and in the configuraton panel that opens, select the options described below and click Apply.

The Resolution and Frame Rate options will differ depending on your hardware configuration.

- **Output Type:** Fill and Key
- **Device:** Matrox
- **Destination:** IP Flow 1
- **Resolution/Standard/Frame Rate:** The video format that corresponds to your workflow.
- **Key Destination:** The appropriate key destination will be automatically selected, based on your selection of Destination.
- **Reference:** PTP
- **Sync:** Best Match

![Figure 4.21 Output Configuration - External Compositing (IP)](image)

- Expand Output, click the arrow in the Pixel Format field and select the format that works best for your project.
  
  **10bit YUV 422** is recommended when using HDR and Wide Color Gamut.

  With multiple inputs, there may be a performance cost when using **10bit YUV 422**. In this case, try using **8bit YUV 422**.

  **10bit YUV 422** is not supported in a Fill and Key configuration with an AJA card. In this case you could use RGBA.

  Leave the remaining settings as they are.

5. Then click Save.
Configuring the Genlock Reference

The **Genlock Reference** is configured the same way for all hardware versions of Voyager.

**To configure the Genlock Reference:**

1. In the **Genlock** section, select the **Override Project Settings** checkbox.

![Figure 4.22 Genlock Configuration](image)

2. Click the **Custom Time Step** arrow and from the drop-down select **Ross Matrox SDI Input**.
3. Expand **Custom Time Step** and then expand **Genlock** and select the **Use Media Output Settings** checkbox.
4. Click **Save** and close the **Media Profile** window.
Creating and Configuring the Voyager Operator

To create and configure the Voyager Operator:

1. In the main toolbar, from the Voyager drop-down, select New Voyager Operator.

2. In the Save Asset As window, navigate to the Voyager > Operator folder and enter a name for the operator (eg. VoyagerOperator) and click Save.

The VoyagerOperator editor opens and the VoyagerOperator_InnerAssets folder is automatically created.

3. In the VoyagerOperator editor, in the Voyager section, from the Compositing Mode drop-down, select the appropriate option.

   The options are:
   - Internal
   - External
   - Portal
   - nDisplay

4. From the Tonemapping drop-down, select the Tonemapper you want to use.

   The options are:
   - Native - The Unreal Engine native tonemapping and post-processing will be applied to everything in the level, including the incoming camera feed. This setting is not recommended in internal compositing as the look of the camera feed will be affected.
   - Broadcast - A broadcast tonemapping (designed to preserve the look of the incoming camera feed) will be applied to everything in the level. Post-processing will affect everything in the level, including the incoming camera feed.
   - Hybrid - A broadcast tonemapping (designed to preserve the look of the incoming camera feed) will be applied only to the incoming camera feed. Native tonemapping and post-processing will only affect the graphics, not the incoming camera feed used for the tracked composite plane.

5. In the Outputs section, click the + icon to add one Array element.
6. Click the **Output** drop-down and scroll down to select the proxy output (**ProxyMediaOutput**) you created earlier.

![Figure 4.24 Select Proxy Media Output](image)

7. If you selected **External** in Step 3, in the **External Compositing** section, from the drop-down select whether you are using a **Virtual Set** or **Augmented Reality**. Then click **Save** and close the **VoyagerOperator** editor.

   OR

   If you selected **Internal** in Step 3, in the **Internal Compositing** section, click the **Compositing Planes +** icon to add an **Array element** and continue with Step 8.

8. From the element drop-down, select **Create New Asset > Voyager Composite Media Bundle**.

9. In the **Save Asset As** window, navigate to the **Voyager > Live Sources** folder and enter a name for the media bundle (e.g. **VoyagerComposite1**).

   The **VoyagerComposite1_InnerAssets** folder is automatically created.

10. Click **Save** and close the **VoyagerOperator** editor.
Creating and Configuring the Voyager Tracker

To create the Voyager Tracker:

1. In the Content Browser, navigate to the Voyager > Tracker folder.
2. Right-click in the empty space and select Media and then Voyager Tracker at the very bottom of the menu and give it a name (e.g., VoyagerTracker).

The VoyagerTracker_InnerAssets folder is automatically created.
To configure the Voyager Tracker:

1. In the Content pane, double-click VoyagerTracker to open the VoyagerTracker Details tab.

![VoyagerTracker - Details](image)

**Figure 4.26** VoyagerTracker - Details

In the Details tab, the UDP Port is by default, the same as the default port in Lucid Track. If you need to change the port in either Voyager or Lucid Track, it needs to be changed in both.

2. The Queue Size setting needs to be larger than the Target Buffer Depth to allow more tracking packets to be held in the queue and released when appropriate.

3. The Target Buffer Depth setting is used to create a delay in the application of the tracking data, to align with the incoming video feed. Increasing the value increases the delay of the tracking data.

4. In the Scene Units field, leave the units at the default setting of cm.

5. In the Tracker Units field, ensure that the units selected match the units set in Lucid Track.

6. The default Sensor Size values should work for most broadcast situations.

7. In the Lens Distortion Method field, select Lucid Track if you are using a lens distortion type from the list in Lucid Track or None if you are not using lens distortion. Use the Spherical option if you are using a lens with spherical distortion curves.

8. Leave the Lens Distortion Overscan setting at 0.15. Increasing this value may cause performance issues.

9. In the Log Anomalies section, enter or use the arrows to select a value for each option. A value of “0” indicates that it is disabled.

   **Variation Threshold Position** — log variations in position between two tracking packets if beyond this threshold.

   **Variation Threshold Rotation** — log variations in rotation between two tracking packets if beyond this threshold.

   **Variation Threshold FOV** — log variations in FOV between two tracking packets if beyond this threshold.

10. Click Save and close the VoyagerTracker Details window.

Continue with Setting Up Compatibility With Voyager.
Setting Up Compatibility With Voyager

To make your project compatible with Voyager, you'll need to add a **Voyager Camera Actor** to the level. Then you will add the assets you created in the previous sections and configure them to connect with each other.

The assets you add depends on whether you’re doing internal compositing or external compositing. You will need to add a **Voyager Camera Actor** for either method.

- **Internal Compositing:** *VoyagerOperator*, *VoyagerTracker* and *VoyagerComposite*
- **External Compositing:** *VoyagerOperator* and *VoyagerTracker*

If you have more than one level in your project you need to add these assets to each level.

To add a Voyager Camera Actor to the scene:

1. If you haven’t already opened the project level, open the **Maps** folder and click on the level now to open it.
2. In the **Place Actors** tab, select **Voyager** and drag the **Voyager Camera Actor** into the level. By default the **Voyager Camera Actor** will be named **VoyagerCameraActor1**.

3. **For External Compositing - AR only:**
   - In the **World Outliner**, delete any actors that aren’t necessary (eg. Atmospheric Fog, Floor, Player Start, Sky Sphere, SkyLight, SphereReflectionCapture).
4. In the **World Outliner**, with **VoyagerCameraActor1** selected, in the **Details** tab at the right of the screen, in the **Transform** section, make sure that the **Location Z** position value is set to **0.0** (or at the same level as the virtual floor if it is not at **0.0**).
5. Maneuver the **Voyager Camera Actor** in the scene using the X and Y arrows (one at a time) to the position needed for the view you want to show.

   The **Location** and **Rotation** values in the **Transform** section will adjust accordingly.

6. Press **Play** to verify the final location of the camera in the virtual world.

7. If you’re not seeing what you expect to see, your camera actor may be turned the wrong way. Try changing the **Z Rotation** value (eg. to **180.0**, if it is currently **0.0**).

**To add assets:**

- In the **Content Browser**:
  - Open the **Voyager > Operator** folder and then click and drag **VoyagerOperator** into the level.
    
    The location of the **VoyagerOperator** actor in the scene is not important. It can be placed anywhere.
  
  - Open the **Tracker** folder and then click and drag **VoyagerTracker** into the level.
    
    The location of the **VoyagerTracker** actor in the scene is not important. It can be placed anywhere.
  
  - Open the **LiveSources** folder and then click and drag **VoyagerComposite1** into the level (for Internal Compositing only, this asset is not required for External Compositing).
  
  - Scroll down to the **Voyager Content > Blueprints** folder and then click and drag the **FreeRoamingCamera** into the level (optional).

**To configure VoyagerOperator:**

1. In the **World Outliner** tab, select **VoyagerOperator**.

2. In the **Details** tab, in the **Tracking** tab, click the + icon to add one **Tracker Actor Array element** and from the drop-down for the new element, select **VoyagerTracker**.

![Figure 4.29 Configure VoyagerOperator](image)
To configure VoyagerTracker:

1. In the World Outliner tab, select VoyagerTracker.
2. In the Details tab, in the Tracking tab, from the Camera Actor drop-down, select VoyagerCameraActor1.
3. Select the Track In Editor checkbox to enable camera tracking.

• If you are using External Compositing, your project setup is now complete.
• If you are using Internal Compositing, continue with the next section, To configure the Voyager Composite actor.

Figure 4.30 Configure VoyagerTracker
To configure Voyager Composite 1:

1. In the World Outliner tab, select VoyagerComposite1.
2. In the Media Bundle section, from the Media Bundle drop-down, select the VoyagerComposite1 media bundle.
3. Make sure the front side of the VoyagerComposite1 actor is facing you.
   If you don’t see a white face on the VoyagerComposite1 actor:
   a) In the Details tab on the right, in the Plane Visualization tab, select the Visualize Plane checkbox.
   b) In the Transformation section, use the Y Rotation value to rotate the VoyagerComposite1 actor until you see the white face. For example, if the Y Rotation value is 0, change it to 180.
   c) Deselect the Visualize Plane checkbox.
4. In the Media Bundle section, click the Request Play Media button.

![Figure 4.31 Configure VoyagerComposite1](image)

5. In the Tracking section, from the Tracker Actor drop-down, select VoyagerTracker.
   Your project setup is now complete.
Updating Voyager Project Settings

Once you’ve set up your project, it’s time to update the Voyager project settings and play your project.

To update your Voyager project settings:

1. In the main toolbar, from the Voyager drop-down, select Update Project Settings. The Voyager Project Defaults confirmation dialog opens.

![Update Project Settings Confirmation](image)

2. Click Yes.

   If this is the first time you are updating project settings, you’ll be prompted to restart Voyager.

3. In the bottom-right corner click Restart Now.

4. In the Save Content pop-up, select all the files and click Save Selected.

   Restarting will take some time, while the program compiles the shaders.
Organizing Voyager Assets

It’s helpful from an organizational standpoint to create a Voyager folder in the World Outliner to contain the Voyager assets.

To create a Voyager folder in the World Outliner:

1. In the World Outliner, select one of the Voyager assets you created.
2. Click the + symbol to the right of the Search field.
   A new folder is created and the selected asset is placed inside the folder.
3. Name the new folder Voyager.
4. Right-click on each Voyager asset and at the bottom of the context menu, select Move To.
   Press Shift and click to select multiple assets and move them all at once.
5. From the folder list, select the Voyager folder you just created.
   • If you have a long list of folders, start typing "Voyager" in the Search field to find the Voyager folder quickly.

![World Outliner](Figure.png)  

*Figure 4.33 Placing Voyager Actors in the Voyager Folder*
Launching and Playing a Voyager Project

Now that you’ve created your Voyager project, you can launch and play it to ensure it’s behaving as you expect.

Launching a Voyager Project

You can launch a Voyager project in several ways, as follows:
- Locally, using Lucid Studio Renderer Service
- Remotely, using Lucid Studio
- From the desktop icon
- Directly from a Voyager project file
- From Voyager Switchboard (Virtual LED projects), see Using Voyager Switchboard Launcher

To launch your Voyager project locally:

1. Launch **Lucid Renderer Service** if it is not already running.

   ![Lucid Renderer Service Settings](image)
   **Figure 5.1 Lucid Renderer Service Settings**

2. In **Settings**, from the **Renderer** drop-down, select **Voyager**.

3. Click the **Browse** button beside the **Unreal Engine Path** field and navigate to the location of your Unreal Engine executable file (**UE4Editor.exe**), select the file and click **Open**.
   Typically, this file is located in `C:\Program Files\Voyager\Engine\Binaries\Win64`.

4. To launch Voyager in the editor window before going on air, in the **Extra Command Line Parameters** field, enter `-piewin`.
   OR
   Leave the **Extra Command Line Parameters** field blank if you want to launch Voyager on air.

5. In the **Voyager Projects Paths** window, select the path to your Voyager projects.

6. Click **View All** to display the list of projects in that location.

7. Select the project (**name.uproject** file) you want to open and click **Run**.

8. Then click **Close**.
To launch your Voyager project remotely:

1. Configure **Lucid Renderer Service** as described in Steps 1 to 5 in To launch your Voyager project locally:

2. In **Lucid Studio**, in the **Server** panel, click on the **Renderer Service** tab.

3. Click the + sign in the bottom-right corner of the **Renderer Services** pane to add the **Lucid Service** that resides on your Voyager engine to the list, if it is not already there.

4. In the **Name** field, enter a unique name for the **Lucid Renderer Service**, for example, **Voyager Render Service**.

5. In the **IP** field, enter the **IP** address of the Voyager machine on which the **Renderer Service** is running.

6. In the **Port** field, enter the **TCP Port** number found in the **Settings** window of the **Renderer Service** on the Voyager engine.
   
   The default port is 8911.

7. Then click **OK**.

8. From the **Renderer Services** list, double-click the **Renderer Service** instance you just created for Voyager, to load a list of available projects on that engine.

9. From the **Available Projects** list, double-click the project you want to open.
To launch your Voyager project from the desktop icon:

1. Click on the Voyager icon on your desktop.
2. Select the project you want to launch from Recent Projects and click Open Project.
   If the project you want isn’t displayed, click the More button.

To launch your project directly from a project file:

1. Navigate to the location on your PC where your project file is located.
2. Double-click the project file (name.uproject).
   If this is the first time you are launching this project, the Select Unreal Engine Version dialog opens.
3. From the drop-down, select the latest build from the drop-down and click OK.
   Subsequently, your project will launch immediately upon double-clicking the project file.

**Playing a Voyager Project**

With your project launched, you can now play the project in the editor and check your results.

For Virtual LED projects with multiple screens, you can play your project from the Voyager Switchboard Launcher. See Using Voyager Switchboard Launcher.

To play your project:

1. Launch your Voyager project.
2. In the main toolbar of Voyager, click the Play button arrow, and from the context menu, select Advanced Settings.

![Figure 5.4 Advanced Settings](image)

The Editor Preferences window opens with Level Editor - Play displayed.
3. In the **Game Viewport Settings** section, check that the **New Window Size** is set to **1920 x 1080** and close the **Editor Preferences** window.

![Figure 5.5 New Window Size Setting](image)

4. Now, click the arrow beside the **Play** button and select **New Editor Window (PIE)**.

![Figure 5.6 Project Playout](image)

The white text you see is informational and is not visible on air.

The following information is provided if selected:

- **Enable Output**: Puts the signal out for broadcast (selected by default).
- **Performance**: Indicates the level of performance.
- **Reference**: Indicates whether the reference signal is locked or unlocked.
• **Debug View**: Provides a selection of different views for information or troubleshooting. 

  *None* is selected by default.

  * Do not select other views while on air, as this could interfere with the output.

• **Show Delay Info**: Shows the breakdown of frame delays for tracking, composite input and set extension (if applicable). The set extension delay can be changed in this screen, if necessary.

• **Show Composite Source Info**: Shows information about the incoming VoyagerComposite video feed (the talent feed inside the set).

• **Show Tracker Info**: Displays camera tracking data and incoming camera position data. Red X’s indicate a problem.
Chroma Keying

Once you’ve created a project from a template or made an existing project compatible with Voyager, you may need to make some adjustments in the chroma keying.

There are a couple of ways to do this.

- Composure Chroma Keying
- Color Difference Chroma Keying

You might find it helpful to first open the Voyager Editor Preview Output window. This allows you to see how the set and talent will look in Play mode without actually playing it.
Composure Chroma Keying

This method uses the **VS Composure Input** mode and **Multi Pass Chroma Keying**. You will also need to create a composure shot and add a media plate, as described below.

**To select the chroma keying mode:**

1. In the **World Outliner**, select **VoyagerComposite1**.
2. In the **Details** panel, scroll down to the **Media Bundle** section and double-click the **VoyagerComposite1 Media Bundle** icon to open the **Details** editor.
3. In the **Details** tab, in the **Media Bundle** section, from the **Mode** drop-down, select **VS Composure Input**.

![Figure 6.1 VS Composure Input](image)

4. Click **Save** and close the editor.
To create a composure shot:

1. Click **Window > Composure Compositing** and dock the panel that opens to the right of the **Content Browser**.

![Figure 6.2 Composure Compositing](image)

2. In the **Composure Compositing** panel, right-click and select **Create New Comp**.

![Figure 6.3 Create New Comp Shot](image)

3. In the **Pick an Comp Class** dialog, select **Empty Comp Shot**.

4. In the **Composure Compositing** panel, name the comp shot (eg. ColorDifferenceKeyer).
To add a media plate element:

1. In the **Composure Compositing** panel, right-click on the new comp shot and select **Add Layer Element**.

![Add Layer Element](image)

**Figure 6.4 Add Layer Element**

2. In the **Pick an Element Type** dialog, select **Media Plate**.
   
   The **Media Plate** element is nested inside the **ColorDifferenceKeyer** comp shot and by default is named **media_plate1**.

3. In the **World Outliner**, move the **media_plate1** element into the **Voyager** folder to be able to find it easily.

4. In the **World Outliner**, select **VoyagerComposite1**.

5. In the **Details** panel, in the **Composure** section, from the **Composure Input Pass** drop-down, select **media_plate1**.

6. In the **World Outliner**, select **media_plate1** and in the **Details** panel, scroll down to the **Input** section.
   
   You’ll see that the appropriate selections have been made by default, as shown in the image below:

![media_plate1 Details](image)

**Figure 6.5 media_plate1 Details**

7. Continue with **Multi Pass Chroma Keyer**.
Multi Pass Chroma Keyer

The settings and parameters for Multi Pass chroma keying are found in the media_plate1 actor. You will need to select the Multi Pass chroma keyer, then select two colors to be keyed out and make some adjustments in the material parameters to get a sharp keyed image.

You may find it helpful to zoom your camera in on the talent while adjusting the Chroma Keyer parameters. This will make it easier to see the changes.

To select the Multi Pass Chroma Keyer:

1. In the World Outliner, select media_plate1, if it is not already selected.
2. In the Details panel, in the Transform/Compositing Passes section, expand Transform Passes and make sure that Multi Pass Chroma Keyer is selected in the Chroma Keying drop-down.

To select colors to be keyed out:

1. In the Content Browser, open the Voyager > LiveSources > VoyagerComposite_InnerAssets folder and double-click the T_VoyagerComposite_BC media texture to open its editor.
2. Resize the editor, so that you can see the editor and the World Outliner and Details panels.
3. With media_plate1 selected in the World Outliner, expand Chroma Keying and from the Material drop-down, select M_SinglePassDiffColorKeyer.
4. Click the + icon beside Key Colors to add an Array element.
5. Click the checkered bar to open the Color Picker and click on the eye-dropper.
6. Use the eye-dropper to select the main color in the background of the T_VoyagerComposite_BC media texture.

![Figure 6.6 Select Main Key Color (Multi Pass)](image)

7. Click the + icon beside Key Colors to add a second Array element.
8. Click the second checkered bar to open the Color Picker and click on the eye-dropper.
9. Use the eye-dropper to select the second most prominent color in the background of the T_VoyagerComposite_BC media texture.
10. Close the T_VoyagerComposite_BC media texture.
To select the Despill color:

1. Scroll down to Despill and expand that section.
2. Click the + icon beside Key Colors to add an Array element.
3. Copy and paste the main color from the Chroma Keying Key Colors into the checkered bar in the Despill Key Colors.
   This helps to remove any reflection spilling onto the talent from the background.

To adjust the material parameters:

1. Zoom in on the talent to be able to see details like the hair better.
2. Still in the media_plate1 Details panel, in the Chroma Keying section, expand the Material Parameters section.

   ![Figure 6.7 Material Parameters - Composure Chroma Keying](image)

3. Adjust the Material Parameters as necessary to achieve a good image.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Threshold</td>
<td>Removes most of the core green signal while keeping detail (ie hair).</td>
</tr>
<tr>
<td>Alpha Offset</td>
<td>Adding a positive value brings back the core fill if the talent or object starts to become transparent. Turning on SHOW ALPHA in the Debug tab will help you make better adjustments.</td>
</tr>
<tr>
<td>Red Weight</td>
<td>Helps add or remove red tint from the green spill.</td>
</tr>
<tr>
<td>Blue Weight</td>
<td>Helps add or remove blue tint from the green spill.</td>
</tr>
<tr>
<td>Clip Black</td>
<td>Adds or removes blacks from the signal.</td>
</tr>
<tr>
<td>Clip White</td>
<td>Adds or removes whites from the signal.</td>
</tr>
</tbody>
</table>
Make the minimum amount of adjustment possible to get a good image.

4. If further adjustment is necessary, increase or decrease the other parameter values one at a time and check the result to see if the image is improved.

You can return to the default values at any time by clicking the yellow reset arrow that appears beside the parameter field when it’s changed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| Despill   | - Despill Hue
  Desaturates or saturates the signal to neutralize the hue.
  - Despill Amount
  Replaces the despill with a color range depending on the value input. |
### Color Difference Chroma Keying

This method uses the **VS Internal Chroma Keyer** mode and **Single Pass Chroma Keying**.

**To select the chroma keying mode:**

1. Navigate to the **Voyager > LiveSources** folder and double-click the **VoyagerComposite1 Media Bundle** to open the **Details** tab.
2. In the **Details** tab, in the **Media Bundle** section, from the **Mode** drop-down, select **VS Internal Chroma Keyer**.

![Figure 6.8 VS Internal Chroma Keyer](image)

3. Click **Save** and close the editor.
4. Continue with **Single Pass Chroma Keying**.

### Single Pass Chroma Keying

The settings and parameters for **Single Pass** chroma keying are found in the **VoyagerComposite1 Media Bundle**. You'll need to select the color to be keyed out and make some adjustments in the material parameters to get a sharp keyed image.

You may find it helpful to zoom your camera in on the talent while adjusting the Chroma Keyer parameters. This will make it easier to see the changes.

**To select the color to be keyed out:**

1. In the **Content Browser**, open the **Voyager > LiveSources > VoyagerComposite_InnerAssets** folder and double-click the **T_VoyagerComposite_BC** media texture to open its editor.
2. In the **World Outliner**, select the **VoyagerComposite1** actor.
3. In the **Details** tab, scroll down and expand the **Chroma Keyer** section.
4. Click the **Key Color** bar to open the **Color Picker** and click on the eye-dropper.
5. Use the eye-dropper to select the main color in the background of the T_VoyagerComposite_BC media texture.

![Figure 6.9 Select Key Color (Single Pass)](image)

6. Close the T_VoyagerComposite_BC media texture.

**To adjust the material parameters:**

1. Zoom in on the talent to be able to see details like the hair better.
2. Still in the media_plate1 Details panel, in the Chroma Keying section, expand the Material Parameters section.

![Figure 6.10 Material Parameters - Color Difference Chroma Keying](image)

3.  

4. Adjust the **Key Color** parameters as necessary to achieve a good image.

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</tr>
</tbody>
</table>
5. Begin by adjusting the **Alpha Threshold** and **Alpha Offset** parameters slightly to remove any transparent areas and sharpen the image. Make the minimum amount of adjustment possible to get a good image.

6. If further adjustment is necessary, increase or decrease the other parameter values one at a time and check the result to see if the image is improved. You can return to the default values at any time by clicking the yellow reset arrow that appears beside the parameter field when it’s changed.

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</tbody>
</table>
| Despill     | **Despill Hue**
Desaturates or saturates the signal to neutralize the hue.
**Despill Amount**
Replaces the despill with a color range depending on the value input. |
Creating Live Sources

This section describes the procedure for creating a live video source that can be displayed on a surface in the scene. The procedure is the same whether you’re using Internal or External Compositing.

The steps for this process are:

- Configuring a Proxy Media Source for a Live Input
- Configuring a Live Input
- Creating a Media Bundle
- Creating a Live Source Material
Configuring a Proxy Media Source for a Live Input

To be able to add one or more live inputs to your project, you'll first need to add an equal number of media source proxies.

To add a proxy media source for a live input:

1. In the main menu, click Edit > Project Settings and scroll down to the Plugins section.
2. Select Media Profile.
3. Expand the Media Source Proxy section, and click the + icon to add an Array element.
   You may need to click the arrow at the bottom of the Media Profile section to see the Advanced options where the Media Source Proxy section is located.

4. From the new element drop-down, select Create New Asset > Proxy Media Source.
5. In the Save Asset As window, navigate to the Voyager > Proxies folder and in the Name field, enter a name for the proxy (eg. ProxyMediaSource_Live1).
6. Click Save and close the Project Settings window.
Configuring a Live Input

You can have several live inputs displayed on various surfaces in the project scene.

To configure a live input:

1. In the main toolbar, double-click the Media Profile icon to open the details window.
2. In the Media Sources section, from the ProxyMediaSource_Live1 input drop-down, select Ross Matrox Media Source.
3. Expand the ProxyMediaSource_Live1 input and then expand RossMatrox to access Configuration.
4. Click the arrow in the Configuration drop-down and in the configuration panel that opens, select the options described below and click Apply.

The Resolution and Frame Rate options will differ depending on your hardware configuration.

- **Input Type**: Fill (for displaying a video source on a surface in the scene)
- **Device**: DSXLE4/8/100F
- **Source**: Single Link 3 (first live source), Single Link 7 (second live source)
- **Resolution/Standard/Frame Rate**: The video format that corresponds to your workflow.

![Figure 7.2 Input Configuration - Live Source](image)

5. Expand Video and configure the settings as follows:

- Click the Capture Video checkbox.
- From the Color Format drop-down, select the format that works best for your project.
  - Use **10bit YUV 422** if you have a 10bit signal.
  - Use **8bit YUV 422** if you have an 8bit signal.
  - Use **RGBA** only if you need alpha/transparency.
- From the Max Num Video Frame Buffer drop-down, select 8 if you are using a Progressive format or if you are using an Interlaced format, select 1 or 16.
- From the **Input Frame Delay** drop-down, select the frame delay that works best for your project.

![Input Frame Delay](image)

**Figure 7.3 Video Configuration - Live Source**

6. Expand **Colorspace** and configure the settings as follows:
   - From the **Colorimetry** drop-down, select one of the following options:
     - **Rec. 709 (HD SDR)** for High Dynamic Range (increased levels in the range between bright and dark) and Standard Dynamic Range
     - **Rec. 2020 (WCG)** for Wide Color Gamut (increased selection of color values)
   - From the **Transfer Function** drop-down, select one of the following options:
     - **SDR (Rec. 1886)** — Standard Dynamic Range
     - **HLG (Rec. 2100)** — increases the dynamic range of the video and is compatible with both SDR and HDR displays
     - **HDR10 (PQ 1000 nits)** — more than twice as bright as SDR, with a corresponding increase in contrast and a color palette of one billion shades.

![Colorspace](image)

**Figure 7.4 Colorspace Settings - Live Source**

7. Select the **Linear Alpha** checkbox if the incoming alpha is already linear; the **Transfer Function** will not be applied.

   Refer to the documentation for your chroma keyer or key source to determine whether or not the alpha is linear.
   - If you selected an 8bit color format in the **Video** settings, these are the only **Colorspace** settings available. Continue with the output configuration.
   - If you selected a 10bit color format in the **Video** settings, the **HDR** settings will also be available. Continue with Step 8 to edit **HDR** settings.

8. From the **Conversion LUT** dropdown, browse to and select the **Look Up Table** you want to apply to your color grading.

9. From the **LUT Output Colorimetry** dropdown, select either **Rec. 709 (HD SDR)** or **Rec. 2020 (WCG)**.

10. From the **LUT Output Transfer Function** dropdown, select either **SDR (Rec. 1886)**, **HLG (Rec. 2100)** or **HDR10 (PQ 1000 nits)**.

11. Then click **Save**.
Creating a Media Bundle

You need to create a media bundle asset to play the video that you want to see on a surface in your scene. This will allow the asset to be controlled by Lucid Studio.

To create a media bundle:

1. Navigate to the Voyager > LiveSources folder.
2. Right-click in an empty section of the Content pane and select Media > Media Bundle. Do not select the VoyagerCompositeMediaBundle in this step.
3. In the Content pane, rename the Media Bundle asset to LiveInput_1. The LiveInput_1_InnerAssets folder is created automatically.
4. Double-click the LiveInput_1 media bundle to open the Details tab.
5. In the Details tab, from the Media Source drop-down, select Proxy Media Source.

![Figure 7.5 Create Media Bundle](image1)

![Figure 7.6 Select Proxy Media Source](image2)
6. Expand **Media Source** and **Media Proxy** and from the drop-down, select **ProxyMediaSource_Live1**.

![Image of Media Source and Media Proxy settings]

*Figure 7.7 Select ProxyMediaSource_Live1*

7. Click **Save** and close the **Details** tab.
Creating a Live Source Material

This procedure creates a material for the media bundle you created previously, using a texture present in the Inner Assets folder. It then hides the media bundle from the camera view.

To create a live source material:

1. Drag the LiveInput_1 media bundle into the level and position this actor so that it is out of sight of the camera (beneath the floor or elsewhere in the scene).
2. Double-click the LiveInput_1_Inner Assets folder to open it.

3. Then right-click on the T_LiveInput_1_BC media texture and from the context menu, select Create Material.

4. In the content pane, name the material LiveInput_1.
5. Double-click the LiveInput_1 material and in the Details tab, in the Material section, set the Shading Model to Unlit.

![Figure 7.10 LiveSource1_SDI Material Details](image)

6. In the blueprint, drag the RGB pin of the Texture Sample node to the Emissive Color pin of the LiveInput_1 node.

7. Click Save and close the editor.
Creating a Blueprint to Launch Multiple Levels

If your project contains more than one level, you’ll need to create a blueprint that will launch the level you want. Multi-level projects present some challenges, beyond just launching the desired level. See the Unreal Engine 4 documentation for more information.

The following procedures describe a simple blueprint that can be used to launch any of three levels. For the sake of these instructions, the levels are named Studio_A, Studio_B, and Studio_C.

- To create a new blueprint:
- To create a variable to launch levels:
- To load a specific level:
- To unload a level:
- To connect the nodes:

To create a new blueprint:

1. In the main toolbar, click the arrow beside the Blueprints icon.
2. Select New Empty Blueprint Class.
3. From the Pick Parent Class list, select any class.
4. In the Create Blank Blueprint Class, in the Name field, enter a name for your new blueprint and click OK. By default, the blueprint is saved in the Blueprints folder.

To create a variable to launch levels:

1. In the blueprint editor, select the Event Graph tab.
2. Right-click in the graph and in the Search field, type Lucid.
3. Select the Lucid Exec node.
4. In the Lucid Exec node, in the Var Name field, enter a name for the variable (eg. Load_Levels).
To load a specific level:

1. Right-click in the graph and in the Search field, type **Load Stream**.

![Image of Search Results for Load](image)

Figure 8.2 Search Results for Load

2. Select **Load Stream Level (by Name)**.
3. In the **Level Name** field, enter the name of the first level you want to load.

To unload a level:

1. Right-click in the graph and in the Search field, type **Unload Stream**.

![Image of Search Results for Unload](image)

Figure 8.3 Search Results for Unload

2. Select **Unload Stream Level (by Name)**.
3. In the **Level Name** field, enter the name of the level that should not be launched.
4. Repeat Steps 2 and 3 to create additional **Unload Stream Level** nodes for the other levels in your project.

To connect the nodes:

1. Connect the **Output** pin of the **Event Begin Play** node to the **Input** pin of the **Lucid Exec** node.
2. Connect **Output** pin **Exec 1** of the **Lucid Exec** node to the **Input** pin of the first **Unload Stream Level** node (eg Studio_B).
3. Connect the **Output** pin of the **Unload Stream Level** node to the **Input** pin of the second **Unload Stream Level** node (eg Studio_C).
4. Connect the **Output** pin of the second **Unload Stream Level** node to the **Input** pin of the **Load Stream Level** node (e.g., Studio_A).

![Figure 8.4 Blueprint to Launch Studio_A](image)

5. Create additional **Unload Stream Level** and **Load Stream Level** nodes to launch Studio_B and Studio_C.

6. Connect the **Output** and **Input** pins in the same way as previously, starting with **Output** pin **Exec 2** in the **Lucid Node** and changing the names so that the **Load Stream Level** node will launch a different level.

<table>
<thead>
<tr>
<th>Unload Stream Level</th>
<th>Load Stream Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio_B, Studio_C</td>
<td>Studio_A</td>
</tr>
<tr>
<td>Studio_A, Studio_C</td>
<td>Studio_B</td>
</tr>
<tr>
<td>Studio_A, Studio_B</td>
<td>Studio_C</td>
</tr>
</tbody>
</table>

The blueprint for launching all three levels would look like this:

![Figure 8.5 Blueprint to Launch Multiple Levels](image)

7. Click **Save** and close the blueprint editor.
Using Remote Assets

In the Voyager level blueprint, you can add nodes to apply remote assets (images or videos) to an actor or object in your scene or to multiple actors or objects. You only need to identify the URL of the remote location of the asset and specify to which actor(s)/object(s) you want to apply the asset.

The asset can then be applied using a key press, Lucid Exec, RossTalk GPI or other input node.

To be able to use remote assets, you first need to configure a few general settings.

To configure remote asset settings:

1. From the main menu, select **Window > Voyager > General Settings**.

![Figure 9.1 Configure General Settings]

2. In the **General Settings** tab, click the **Remote Asset Storage Location Browse** button and navigate to the folder to which you want to download your remote assets.

3. In the **Remote Asset Cache Expiration Interval** field, set the amount of time in minutes for which the locally cached assets will be used.

   After the interval, the next time the asset is requested, the system will check the remote source for updates to the asset and download any that have changed. If the remote asset can't be found or there haven't been any changes, the cached asset will be used.

![Figure 9.2 General Settings - Remote Assets]
4. Click **Apply changes and save settings**.
5. Close the **General Settings** tab.

**To apply a remote asset to an actor or object:**

1. In the main toolbar, click **Blueprints > Open Level Blueprint**.
2. Right-click in an empty part of the **Event** graph and start typing **Apply Remote Asset to Actor**.
3. Select the **Apply Remote Asset to Actor** node.
4. From the **World Outliner**, drag the actor or object to which you want to apply the asset into the blueprint and connect the **Output** pin on the node that is created to the **Actor** pin on the **Apply Remote Asset to Actor** node.
5. Then drag the **Input** pin of the **Apply Remote Asset to Actor** node out and start typing **Input 1** to place an input event node.

Alternatively, you can add a **Lucid Exec** node or a **RossTalk GPI** node or other input node.

![Figure 9.3 Apply a Remote Asset to Actor](image)

6. From the **Keyboard Events** list, select 1.
7. In the **Apply Remote Asset to Actor** node, in the **URL** field, enter the full URL of the asset you want to apply.
8. Select the **Unlit** checkbox if you don’t want lighting applied to the asset or leave it unchecked if you do want lighting applied.
9. Click **Save** and close the blueprint.
To apply a remote asset to multiple actors or objects:

1. In the main toolbar, click **Blueprints > Open Level Blueprint**.
2. Right-click in an empty part of the **Event** graph and start typing **Apply Remote Asset to Actors**.
3. Select the **Apply Remote Asset to Actors** node.
4. From the **World Outliner**, drag the actors or objects to which you want to apply the asset into the blueprint and connect the **Output** pin on one of the asset/actor nodes that are created to the **Actors** pin on the **Apply Remote Asset to Actors** node.

   A **Make Array** node is automatically created to handle multiple actors/objects.

5. In the **Make Array** node, click the **Add pin** icon to add another **Input** pin for the second actor/object.
6. Continue adding pins to accommodate as many actors/objects as you want to apply the asset to and connect the **Output** pin of each actor/object node to an **Input** pin on the **Make Array** node.
7. Then drag the **Input** pin of the **Apply Remote Asset to Actor** node out and start typing **Input 1** to place an input event node.

   Alternatively, you can add a **Lucid Exec** node or a **RossTalk GPI** node or other input node.

8. In the **Apply Remote Asset to Actors** node, in the **URL** field, enter the full URL of the asset you want to apply.
9. Select the **Unlit** checkbox if you don’t want lighting applied to the asset or leave it unchecked if you do want lighting applied.
10. Click **Save** and close the blueprint.

![Figure 9.4 Apply Remote Asset to Multiple Actors](image-url)
Creating a Portal Effect

Voyager uses tracked off-axis projection to create a portal effect that gives the impression that you are looking through a window into another space.

The portal effect can also be used to extend the set to give it depth without using a green screen.

Follow the steps outlined in this guide for creating a project from a template or making an existing project compatible with Voyager. Then follow the instructions below to add a portal effect.

To set up a portal effect:

1. In the Place Actors tab, in the Search field, enter "BP" to find the BP_VoyagerPortalWindow.

2. Drag the BP_VoyagerPortalWindow into the level.

3. In the Content browser, navigate to the VoyagerOperator actor and double-click on it to open the Details tab.

4. Change the Compositing Mode to Portal, click Save and close the editor.

Figure 10.1 Search BP_VoyagerPortalWindow

Figure 10.2 Select Portal Mode
5. In the World Outliner, select the VoyagerOperator and in the Portal section of the Details tab, select the BP_VoyagerPortalWindow actor.

![Figure 10.3 Select BP_VoyagerPortalWindow](image)

6. In the World Outliner, select the VoyagerCameraActor1 and in the Transform section of the Details tab, set the Location to 0, 0, 0.

7. Take the following measurements from the 0, 0, 0 reference point of the room:
   a. Horizontally to the center of the screen.
   b. Vertically from the floor to the center of the screen.
   c. Forwards to the front face of the screen.
   d. The width of the screen.
8. In the **World Outliner**, select the **BP_VoyagerPortalWindow** and in the **Transform** section of the **Details** tab:
   - Enter the measurements for **a**, **b**, and **c** into the appropriate **Location** fields.
   - Click the lock to the right of the **Scale** field to lock the axis.
   - Enter the measurement for **d** into the appropriate **Scale** field.
   
   The height of the screen will automatically be calculated to maintain a 16/9 ratio and be entered into the appropriate field.

9. Enter a value of **1** into the third **Scale** field.

**To position the portal window:**

1. In the viewport, select both the **VoyagerCameraActor1** and the **BP_VoyagerPortalWindow** actor.
2. Move both actors together to the position that gives you the desired view.
3. Press **Play** to check the viewpoint.

**Tip:**

In the **VoyagerTracker**, set the **Target Buffer Depth** setting to the lowest value that works for your project.
Using the Voyager Green Screen Model

When your project uses internal compositing, you have the option to add a virtual green screen to define the area on which a video or static image will be displayed.

If you have created your project from a template, the BP_VoyagerGreenScreen model is included. If you have not used a template, you'll have to add the model as described below.

You can also use a custom green screen model that you've created in another program. In this case, you'll have to ensure that the mapping of the UV coordinates in the model applies to the static mesh as a whole, rather than to individual sections. This will ensure that any feathering is applied correctly.

In the two examples of the green screen model shown below, the UV coordinates are correctly mapped on the model on the left, but incorrectly mapped on the model on the right. Incorrect mapping results in the feathering being applied to each section of the model instead of to the model as a whole.

![Figure 11.1 UV Mapping Example](image)

To further refine the green screen area, you can add garbage mattes to the scene to hide parts of the physical set that you don't want to see in the output.

You might find it helpful to first open the Voyager Editor Preview Output window. This allows you to see how the set will look in Play mode without actually playing it.

To open the Voyager Editor Preview Output window:

1. In the World Outliner, select the VoyagerOperator.
2. In the Details panel, expand the Editor Preview Output section and select the Enable Editor Output Capture.
   Alternatively, you can click Start Capture.
3. To keep the Preview window on top, select the Keep Preview Window on Top checkbox.

To add the Voyager Green Screen model:

1. In the Place Actors tab, click on the Voyager group.
2. Drag the Voyager Green Screen Model into your project scene.
   By default, the model is given the name BP_VoyagerGreenScreen.
3. In the World Outliner, move the BP_VoyagerGreenScreen actor into the Voyager folder, to be able to find it quickly.
4. In the World Outliner, select VoyagerComposite1.
5. In the Details tab, scroll down to the Internal Compositing section and select the Use Physical Set Model checkbox.
To configure the Voyager Green Screen:

1. In the World Outliner, select the BP_VoyagerGreenScreen actor.
2. Using the Move tool, position the BP_VoyagerGreenScreen approximately where you want it in the scene.
3. In the Details tab, in the Transform section, adjust the Rotation of the BP_VoyagerGreenScreen actor, if necessary.

Alternatively, you can use the Rotate tool in the Viewport to adjust the rotation.

4. In the Dimension section, increase or decrease the values of each parameter to make the size of the BP_VoyagerGreenScreen actor roughly the same size as the physical green screen.

5. In the Feather section, increase or decrease the values of each parameter to adjust the blending of each edge of the green screen model.
   - The Left feathering is applied from u=0, going towards 1.
   - The Right feathering is applied from u=1, going towards 0.
   - The Top feathering is applied from v = 0, going towards 1.
   - The Bottom feathering is applied from v =1, going towards 0.

To use a custom shape for the Voyager Green Screen model:

1. From the Place Actors tab, select and drag a Voyager Green Screen Static Mesh actor into the project scene.
2. In the World Outliner, select the Voyager Green Screen Static Mesh actor.
3. In the Details tab, scroll down to the Static Mesh section and from the dropdown, select your custom green screen model.
4. Then delete the BP_VoyagerGreenScreen actor (if using a template).

To add a Voyager Compositing Garbage Matte:

1. In the Place Actors tab, click on the Voyager group.
2. Drag the Voyager Compositing Garbage Matte into your project scene.

By default, the matte is given the name BP_VoyagerCompositingGarbageMatte and is red.
To configure a Voyager garbage matte:

1. In the World Outliner, select the **BP_VoyagerCompositingGarbageMatte**.
   If you don’t see a red rectangle when the garbage matte is selected, try changing the **Z Rotation** value.

2. With the **BP_VoyagerCompositingGarbageMatte** selected, use the **Move** tool to place the actor on top of the part of the set you want hidden.
   Wherever the garbage matte intersects with the **VoyagerComposite1** plane, you won’t see that part of the plane.

3. Use the **Scale** tool to adjust the size of the garbage matte, so that it just covers the area to be hidden.

4. In the World Outliner, move the **BP_VoyagerCompositingGarbageMatte** actor into the **Voyager** folder, to be able to find it quickly.
Voyager Plugins

Voyager contains a number of plugins to make the connections between Voyager and other video production components, including other Voyager plugins. Some are enabled by default, while others need to be enabled.

**Enabled by Default:**
- AJA Media Player for Voyager - Implements input and output using AJA Capture cards.
- Lucid Plugin - Allows Lucid Studio to operate Voyager remotely. See Configuring the Lucid Studio Plugin.
- Matrox Media Player for Voyager - Implements input and output using Matrox DSX cards.
- Ross Voyager Core Plugin - Provides the shared functionality and common dependencies for other Voyager plugins.
- Ross Voyager Media I/O Framework - Core interfaces and utilities for the Media I/O plugins inside Voyager.
- Ross Voyager Plugin - Handles AR and VS solutions, as well as Virtual LED set extensions.
- Ross Voyager Tracker Plugin - Handles camera tracking.

**Disabled by Default**
- Ross Voyager API Plugin - Enables Voyager’s RESTful API server for third-party integration. See Enabling and Using the Voyager Web API.
- Ross DataLinq™ Plugin - The client for the XPression DataLinq server. See Configuring the DataLinq Plugin.
- Ross Adrienne GPIO Plugin - Communicates with a switcher. See Enabling the Adrienne GPIO Plugin.
- Ross Tally TSL UMD Plugin - Receives and sends Tally TSL UMD (under monitor display) messages.
- Ross Voyager PIERO Plugin - Communicates with the PIERO sports graphics analysis tool.
Accessing the Voyager Plugins

The process is the same to access any of the Ross Virtual Solutions plugins.

To access the Voyager plugins:

1. From the Edit menu, select Plugins.
   Alternatively, click Settings > Plugins from the main toolbar.

2. In the Search field, begin entering “Voyager”.

The list will move to the Voyager plugins.

3. Select the plugin you want to enable or edit.
Configuring the Lucid Studio Plugin

The Lucid Studio Plugin is the interface between Lucid Studio and Voyager. When running Lucid Studio with the Voyager renderer, you need to set up communication between Lucid Studio and Voyager.

Once communication is established, you’ll also be able to use the Lucid Studio logic function to query Voyager and have Voyager return the values that can be set from the Renderer Logic function block in Lucid Studio.

To configure the Lucid Plugin Settings:

1. In Voyager, in the main toolbar, click the the Lucid icon.
   Alternatively, you can click Window > Lucid > Lucid Plugin Settings.
   The Lucid plugin opens.

2. In the Create Server section, from the IP drop-down, select the IP address that will be used by the Lucid Plugin to listen to Lucid commands.
   You can also select the option Any IP (0.0.0.0) which will allow communication from any address.
3. In the Port field, enter the port on which the Lucid Studio plugin will listen for Lucid Studio commands.
   This is the same port as is defined when adding a renderer in Lucid Studio > Server Panel > Server > Add New Element, in the Operate Port field.
   Default Port is 8458.
4. Select the Use MipMaps checkbox, to generate mipmaps for image sequences.
   Using mipmaps increases rendering speed and reduces stress on the CPU.
   Default is unchecked.

Figure 12.3 Lucid Plugin Settings
5. Select the **Force power of two textures** checkbox to convert textures that are not sized to “power of two” dimensions to “power of two” dimensions, so mipmaps can be used.

   This setting is only applicable if **Use MipMaps** is enabled.

6. Select the **Garbage Mattes** checkbox to create garbage mattes in the renderer.

   Garbage mattes are only enabled by this setting. They need to be configured in **Lucid Studio > Track Operate Panel > Garbage Mattes**, to take effect.

   Default is unchecked.

7. In the **Log** section, make the following optional selections:
   - Select the **On screen** checkbox if you want to show the Lucid Studio log on the **Unreal Editor** screen.
   - Select **Send to Lucid** if you want to send a log to Lucid Studio.

   And/OR
   - Select **To File** to save the log in a file.
     The log will be saved in the project **Saved > Logs** folder.
   - From the **Verbosity** drop-down, select the amount of detail you want to get in the log.
   - Select the **Notify media (re)load** checkbox to notify Lucid Studio when all media have been loaded after reloadding sources and every loaded source is logged.

8. In the **Lucid Studio Materials Properties** section, make the following optional selections:
   - In the **Unlit Emission Factor** field, enter a value or use the arrows to increase or decrease the amount of emission for unlit Lucid Studio materials.
   - Select the **Render After DOF** checkbox to enable **Render After DOF** on Lucid Studio materials.
     This requires a restart.
   - Select the **Cast Dynamic Shadows as Masked** checkbox to have Lucid Studio materials cast dynamic shadows as masked.
   - Select the **Automatically stop unused movies** checkbox to stop and reset to the beginning, any movie that is not being used in any actor.
   - Select the **Automatically play movies from start when assigned** checkbox to play movies from the beginning when assigned in Lucid Studio (unless they are already visible in another object).
   - Select the **Loop movie based on file name suffix** checkbox to override Lucid's “Loop” command, setting it to true of a movie file ends with "_LOOP" or false if a movie file ends with "_NOLOOP".
   - In the **Movies cache (seconds)** field, use the arrows to set a time (in seconds) for which movies should be played in the background, on load. This improves the first run in certain (usually high resolution) movies, but it takes longer for the project to fully load.

9. In the **Miscellaneous Properties** section, make the following optional selections:
   - Select the **Position Quadrant Animation Override** checkbox to allow an active animation to be overriden in Lucid Studio with an event that controls the same item.
   - Select the **Copy Track camera parameters to Trackless**, if you want any virtual camera in the set to have the same camera properties as the broadcast camera.

   OR
   - Clear the checkbox if you want to ensure that the virtual camera(s) you set up in the editor retain their own properties.

10. From the **Units** drop-down, select the unit of length to be used by the Lucid Plugin and close the **Lucid** plugin.
Enabling and Using the Voyager Web API

The Voyager Web API is a beta feature that allows an authorized user to remotely ping running Voyager engines to retrieve detailed information on the processes without needing to log into each engine. The machine from which you are accessing the Web API must be on the same network or VPN as the Voyager engines.

The Web API can be found at a URL defined by the IP address of the Voyager engine (eg. http://xx.xx.xxx.xx:8087/status/report).

The type of information retrieved is shown below:

```
{
  "success": true,
  "message": "The status of the server",
  "data": {
    "currenttime": 1643664071,
    "engine": {
      "voyager": true,
      "version": "4.37.2.418",
      "playing": false,
      "mode": "editor",
      "edisplay": "name"
    },
    "plugin": [
      {
        "name": "Voyager-API",
        "versionName": "4.2.7.0.18",
        "versionNumber": 418
      },
      {
        "name": "RossTalk",
        "versionName": "0.37",
        "versionNumber": 37
      },
      {
        "name": "UXUnreal_Plugin",
        "versionName": "0.2.2215",
        "versionNumber": 2
      }
    ],
    "world": {
      "Editor"
    },
    "monitor": {
      "time": 1173.89,
      "delta": 0.0100000,
      "fps": 59.0461,
      "voyager": {
        "performance": 22.4583,
        "gonlock": {
          "configured": true,
          "locked": true,
          "mode": "external"
        },
        "tracker": {
          "configured": true,
          "sync": false,
          "packetrate": 0
        }
      }
    }
  }
}
```

*Figure 12.4  Voyager Web API Data*

To enable the Voyager API Plugin:

1. From the **Edit** menu, select **Plugins**.
2. In the **Search** field, start typing **Voyager** and scroll down to the Ross Voyager API Plugin.
3. Select the **Enabled** checkbox.
4. In the **Confirmation** dialog, click **Yes** to enable the plugin.
5. Click **Restart Now** and click **Save Selected** to continue.

Voyager will be restarted with the plugin enabled.
To configure the Voyager Web API:

1. Select Window > Voyager > Web API Settings.
2. In the Web API editor the Web API Key is automatically entered when the API plugin is enabled. This can be changed manually if necessary.

![Web API Settings](image.png)

**Figure 12.5 Web API Settings**

3. Then enter the Port number on which the API will communicate with the Voyager engines. The default Port number is **8087**, but if this port is being used by something else in your network, you can change it to a free port.

4. Make sure that the Port is enabled in the firewall. See Appendix A: Enabling a Port Number in the Firewall for instructions.

5. Then click **Apply Changes and Restart VoyagerAPI**.
Enabling the Adrienne GPIO Plugin

Voyager contains blueprint nodes that read and write the GPI state to the Adrienne card. Selecting a virtual camera relays a message to a switcher (such as Ross Carbonite) which triggers the physical camera switch.

You will need to update the Adrienne Driver 1.0.1.1 to version 5/29/12 and then enable the Adrienne Plugin.

To enable the Adrienne GPIO Plugin:

1. From the Edit menu, select Plugins.
2. In the Search field, start typing Adrienne.

3. In the Adrienne GPIO Plugin, select the Enabled checkbox.
4. In the Confirmation dialog, click Yes to enable the plugin.
5. Click Restart Now and click Save Selected to continue.

Voyager will be restarted with the plugin enabled.
Configuring the DataLinq Plugin

The DataLinq plugin is disabled by default and allows you to connect to a DataLinq server and make DataLinq data available to Voyager.

To configure the DataLinq plugin:

1. In the **Main** menu, click **Window > Voyager > DataLinq Settings**.

   ![Voyager - DataLinq Settings](image1)

   *Figure 12.7  Voyager - DataLinq Settings*

   The **DataLinq Settings** tab opens.

   ![DataLinq Client Settings](image2)

   *Figure 12.8  DataLinq Client Settings*

2. Select the **AutoUpdate** checkbox to allow automatic update of the plugin.

3. In the **DataLinq Server IP** field, enter the IP address to be used by the plugin to connect to the DataLinq server.
4. In the **DataLinq Server Port** field, enter the port to be used by the plugin to connect to the DataLinq server. The default port is **8888**.

5. Click **Apply changes and restart DataLinq Client**.

6. Close the **DataLinq Settings tab**.
Configuring the RossTalk Plugin

The RossTalk Plugin is enabled by default and can be configured in the Voyager UI. It is not necessary to restart Voyager when making changes to the plugin.

To configure the RossTalk plugin:

1. Select Window > Voyager > RossTalk Settings.

   ![Figure 12.9 Voyager - RossTalk Settings]

   The RossTalk Settings tab opens.

   ![Figure 12.10 RossTalk Settings]

2. From the Listening IP/Network dropdown, select the local IP address to be used by the plugin to listen to RossTalk commands.
3. In the **Listening Port** field, enter the number of the TCP port to be used by the plugin to listen to RossTalk commands.
   The default port is **7799**.
4. Click **Apply changes and restart RossTalk Server**.
5. Close the **RossTalk Settings** tab.
Voyager and Lucid Studio

What is Lucid Studio?

Lucid Studio is a studio operator control software developed by Ross Video. Studio operators should never need to go into the Unreal Editor to adjust elements in the virtual set. Instead, Lucid Studio communicates with an Unreal Engine plugin that parses all the objects in the scene, and interfaces the objects to its user interface.

The Lucid Studio Plugin is the interface between Lucid Studio and Voyager. When running Lucid Studio with the Voyager renderer, you need to set up communication between Lucid Studio and Voyager. See Configuring the Lucid Studio Plugin for configuration instructions.

What is interfaced?

Currently Lucid Studio interfaces the following actors:

- Static Mesh Actors
- Lights
  - Point Lights
  - Spot Lights
  - Directional Lights
- Skeletal Mesh Actors
- Cameras
  - Camera Actors
  - Cinema Camera Actors
- Sequences and Matinees
- Floating Text

![Figure 13.1 Lucid Studio Interface](image)
What can be controlled through Lucid Studio?

These are the basic properties that can be controlled through Lucid Studio:

- Position
- Scale
- Rotation
- Visibility
- Foreground/Background (in external compositing only)
- Material
  - Lucid Studio can add video/textures from the UI to any static mesh object.
  - Lucid Studio can also change materials to other materials found in the scene.
- Light color and intensity

Can Lucid Studio interface blueprints?

Lucid Studio can select and interact with (move, rotate, scale, show/hide, etc.) blueprint actors through its Position panel, but not with the blueprint coding. If a mesh is a component of a blueprint, Lucid Studio will not interface it. However, if you make the mesh a child of a Static Mesh Actor, Lucid Studio will be able to control it.

Lucid Studio can also interface with blueprints through the Logic panel. This requires that you select a Lucid Studio node in the blueprint and make it part of the Exec flow. In Lucid Studio, you will use the Renderer Logic function block to access the Voyager blueprint.

Naming convention

When you create an Actor blueprint in Voyager that you want to control with Lucid Studio, you need to preface the name of the blueprint with "BP_", eg BP_Lucid StudioActor. This will ensure that Lucid Studio will see the blueprint. Once you place the actor in the scene, you can change the name in the Details tab, if you like. Lucid Studio will continue to see it as long as the source blueprint uses the correct naming convention.

For further information on using a Voyager blueprint with Lucid Studio, see the Lucid Studio User Guide > Lucid Studio > Logic > Renderer.
BP_FreeRoaming_Camera

This actor is used to switch from the tracked Voyager Camera to another camera that will not use tracking data. This allows you to use Lucid Studio to trigger a trackless move like fly away from the talent in front of the green screen.

To switch from a tracked camera to a trackless camera:

1. In the Content Browser, go to the Voyager Content folder, open the Blueprints folder and double-click the BP_FreeRoaming_Cam actor twice to open the blueprint.

   ![Figure 13.2 BP_FreeRoaming_Cam](image)

2. In the Event Graph, right-click in the blueprint and in the Search field, type “Trackless”.
3. From the results, select the Set Trackless Camera node.
4. In the Set Trackless Camera node:
   • Connect the Target pin to the Operator node.
   • Connect the Trackless Camera pin to the Free Roaming Voyager Camera.
   • In the Blend Time field, enter a value to set the transition time from the tracked camera to the untracked camera.
   • From the Blend Func drop-down, select the easing/smoothing method for the transition.
   • Use the Blend Exp field to enter a value to modify the Blend Function.

   For more information about the Blend Time and Blend Func settings, see the Unreal Engine 4 documentation.

   • Select the Lock Outgoing checkbox to ensure that the transition goes to the targeted Trackless camera without resetting.

   **OR**

   • Leave the Lock Outgoing checkbox unchecked to have the focus returned to the tracked camera before switching to the targeted Trackless camera.
Asset Metadata

You can assign metadata to any actor in your Voyager project, identifying the actor as either a Moveable Object or a Target Object.

Once set, you can use this metadata to filter assets in Lucid Studio.

To assign metadata to an actor:

1. In the World Outliner, select the actor to which you want to assign metadata.
2. In the Details tab, scroll down to and expand the Asset User Data section.

3. Click the + icon to add an Array element.
4. From the Array element dropdown, select Voyager Metadata.
5. Expand the Array element and then expand Voyager Metadata.
6. Select either the Movable Object or Target Object checkbox.

Movable objects can then be found in Lucid Studio in the Position panel, when adding items to a set.
Target objects can be found in Lucid Studio in the **Router** panel, when adding targets.

*Figure 13.5 Filter Results for Target Objects in Lucid Router Panel*
Adding a Free-Roaming Camera (Optional)

You can also add another Voyager camera (called the BP_FreeRoaming_Cam) that will not use tracking data. This allows you to switch between cameras, to get different viewpoints while you’re working on your project. This is not something you can use while you’re on air.

To add a Free Roaming Camera (optional):

1. In the Content browser, click on the View button and select the Show Engine Content and Show Plugin Content checkboxes, if they are not already selected.

2. Then in the Content tree, go to Voyager Content > Blueprints and drag the BP_FreeRoaming_Cam actor into the level.
Virtual Set Considerations

- Many visual issues only show up when looking through a tracked camera.
  There are ways to simulate a tracked camera through Lucid Studio, but mostly issues of flickering occur when the tracked camera is slightly defocused. This can be tested by running the level with camera tracking from Lucid Track applied.

- MipMaps are important.
  When using big textures for detailed background, use mipmaps. Backgrounds in virtual sets are typically a bit out of focus. If mipmaps are not used, details start to flicker.
  An example of textures that should be mipmapped are the images on the screens in the background:

![Using MipMaps](image)

- Avoid thin lines.
  When the camera is slightly out of focus, thin lines can start to flicker because the temporal AA will blur the pixels completely with neighboring colors. Ensure that lines are not too thin from the expected camera positions.

- Avoid high emissive values.
  High emissive values cause flickering when zoomed out.
  The best way to test for flickering is to run the level in the studio. Alternatively, you can test it by running it through Lucid Studio.
  When running with a tracked camera, we will run a defocus filter as a post-process effect. In practice, cameras will send data slightly defocused. This defocus may cause flickering on screen if there are thin lines or high emissive values. If you cannot run it through a real TV studio test, run it through Lucid Studio.

- Screens must be separate meshes from the TV. Screens should also be children of the TV.
  This is because Lucid Studio can only apply textures and materials on whole meshes.

- Screen UVs must match the mesh so that an arbitrary video in 16:9 format can be shown without being zoomed in or cut.
  When creating screen meshes make sure that the UVs do not crop out arbitrary textures. Do not create screen objects so that they only work with a single texture or video.

- Screens prefer emissive values and should probably be nonlit.
  Video on lit screens can be pretty performance intensive, and if the screen is already emissive, it does not need lights on it.
• In external composite virtual sets, do not set a translucent material on a foreground object, as this will allow the background to be seen through the object.

• Lucid Studio can change textures on materials and retain their properties, provided the material is built with special parameters.

When Lucid Studio sets a texture or video to a mesh, it typically applies a basic surface material with base color, nothing more, so you need to ensure that the existing material properties are retained.

**To retain existing material properties:**

1. In the **Content Browser > Materials**, double-click the material whose properties you want to retain, to open the **Material Editor**.
   
   You’ll see the blueprint with all of the material parameters in the **Material Editor**.

2. In the **Material Editor**, add two **TextureSampleParameter2D** textures with the following names:
   - UX_Texture_A
   - UX_Texture_B

3. In the **Parameter Defaults** tab, make sure both parameters are set to the default texture.

4. Add a **ScalarParameter** with the name:
   - UX_Interpolation_A

5. Add a **LinearInterpolate** (Lerp) node so that Lucid Studio can transition smoothly between two textures over time.

   It will look like this:

   ![Figure 15.2 Setting up Lucid Studio Materials](image)

   **Figure 15.2 Setting up Lucid Studio Materials**
• In external compositing, you can configure an object or objects in your scene to always appear in the foreground or always appear in the background. If you have objects configured to always appear in the foreground, you need to also configure the background objects.

To enable an object to appear in the foreground:

1. In the **World Outliner**, select the object you want to appear in the foreground.
2. In the **Search Details** field, type "custom" to get to the **Rendering** tab.

![Custom Depth Settings - External Compositing](image)

3. In the **Rendering** tab, select the **Render Custom Depth** checkbox.
4. In the **CustomDepth Stencil Value** field, enter 2.
5. Then select the object(s) you want to remain in the background.
6. This time, in the **CustomDepth Stencil Value** field, for each object, enter 1.
7. Save your project.

🌟 A custom depth value of 1 will automatically be applied to all objects without a custom depth value set, when you click **Update Project Settings**.
Augmented Reality Set Considerations

This section provides some design recommendations to consider when creating an augmented reality set as they apply to either internal or external compositing.

Internal Compositing

- You can use the VoyagerComposite_ShadowCatcher to display the reflections of virtual objects in the scene (for example, if they are sitting on a shiny surface), by setting the Specular Intensity to a value greater than 0 up to a maximum of 1. However, if you are also using the VoyagerComposite_Plate actor to reflect a part of the live background feed, you need to position the Reflection actor so that it is not reflecting on the ShadowCatcher.

Otherwise, both the reflections of the virtual objects and the reflection of the live background feed could be displayed on the real world floor.

You can adjust the Ambient Lighting Intensity to make the ShadowCatcher shadow better match the other shadows in the scene. A value of 0 disregards all the ambient lighting when generating shadows, while anything above 0 factors in ambient lighting, with 1 using all the ambient lighting.

* For more information on Ambient Lighting and Ambient Occlusion, see the Unreal Engine 4 documentation.

![Figure 16.1 VoyagerComposite_ShadowCatcher](image)

- In internal compositing, when you add a new object to the scene, you need to configure the CustomDepth Stencil Value to differentiate the new object from the rest of the scene.
To configure the CustomDepth Stencil Value:

1. In the World Outliner, select the new object you’ve added.
2. In the Search Details field, type "custom" to get to the Rendering tab.

![Custom Depth Settings - Internal Compositing](image)

3. In the Rendering tab, select the Render Custom Depth checkbox.
4. In the CustomDepth Stencil Value field, enter 1.
5. Save your project.

🌟 A custom depth value of 1 will automatically be applied to all objects without a custom depth value set, when you click Update Project Settings.
Appendix A: Enabling a Port Number in the Firewall

When using Voyager, you need to make sure that any port you are using to listen to connections has been enabled in the Windows Defender Firewall.

To enable a port number:

1. In the Control Panel, select Windows Defender Firewall.
2. Select Advanced settings > Inbound Rules.
3. In the Actions pane, select New Rule.
4. In the Rule Type window, select Port and click Next.
5. In the Protocol and Ports window, select TCP.
6. Then select Specific local ports, enter the port number you will be using and click Next.
7. In the Action window, select Allow the connection and click Next again.
8. In the Name window, enter a name for the new rule (eg. Voyager Web API, Lucid Studio, RossTalk, etc.) and click Finish.
9. Close all the windows.
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