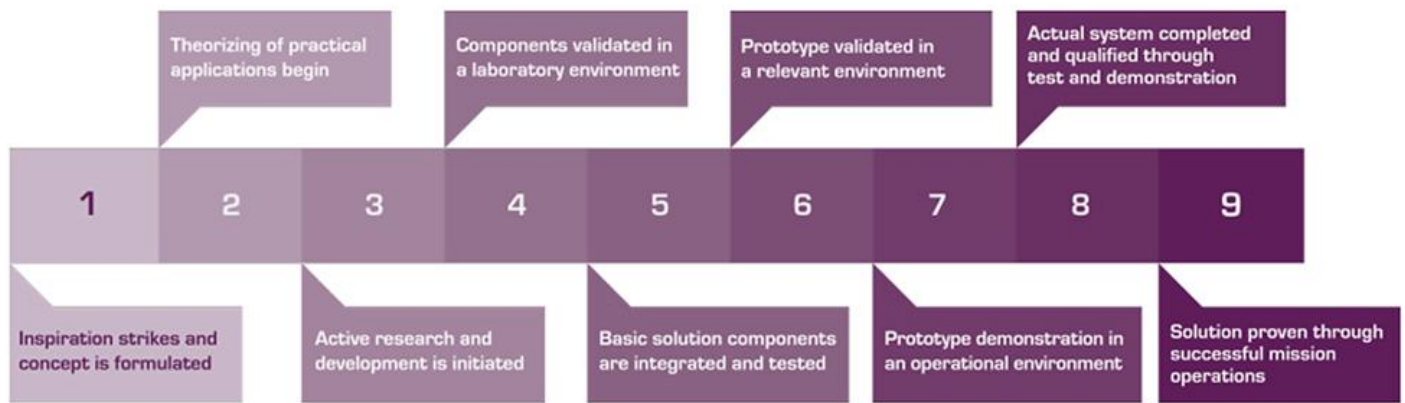


SOLUTION READINESS LEVEL (SRL)



<https://www.canada.ca/en/department-national-defence/programs/defence-ideas/solution-readiness-level.html>

Most of our Products catalogue is at **level 1** that will lead us to Level 2 intention for lab work, experiment and development of validated components. So we seek funds for Levels 2 onwards.

These applies to BOTH Services and Products. We have identified about 100 services and 90 products that have great potential and are complementary to each other. From here onwards, we will work on Level 2 EXIT that enables us to work in a min-lab at Home and a full lab at a research unit or in a University lab setup. We can start developing high level components, frameworks, architectures that enable quicker lab level assessments, identify tasks and generate required reports that show the features benefits that will be derived from this product or service.

Technology Readiness Assessments (TRAs) are important procedures for organizations managing resource allocation for technology development programs. A metric commonly employed in TRAs for approximating the degree of maturity of a technology is the Technology Readiness Level (TRL) scale first developed by the National Aeronautics and Space Administration (NASA). This scale has been implemented and modified since the early 1990's in government programs. Ultimately, this work resulted in a calculator, the Air Force Research Laboratory (AFRL) TRL Calculator, that helps a user assess the TRL, Programmatic Readiness Level (PRL), and Manufacturing Readiness Level (MRL) of a given technology or system. This calculator is oriented in its terminology and structure to the Department of Defense (DoD) research, development, and acquisition process.

TRLs are relevant to both simple and complex technological systems, as well as to their component subsystems. They are applicable to software and/or hardware or to systems encompassing both software and hardware elements. TRLs can also be used as exit criteria for program life cycle phases. In terms of program management, knowing a program's TRL can prescribe an action plan of activities that still need to be accomplished in order to facilitate transition for a particular technology to an operational end user

Numerous types of readiness levels: Integration Readiness Levels (IRLs), System Readiness Levels (SRLs), Manufacturing Readiness Levels (MRLs), Programmatic Readiness Levels (PRLs).

The methodology for the TRL assessment used in the calculator was refined by May 2004, to include questions relating to TRLs, MRLs, and PRLs (TRL Calculator (ver 2.2)). The —user has the option of assessing the —overall TRL based on three combinations of questions:

1) only TRL questions, 2) TRL questions and PRL or MRL questions, or 3) all three categories of questions together. In general, the levels can be grouped into three higher-level activities:

1. RLs 1-3: Research and Development (R&D): these activities most likely occur in a basic laboratory setting, prior to identification of a sponsoring organization.

2. **RLs 4-6: Technology Demonstration:** these activities occur as a result of funding provided by a sponsoring organization, such as DHS S&T.

3. **RLs 7-9: Production and Deployment:** these activities occur once the technology has been transferred from the sponsoring organization to the customer or end user.

Table 1. Appropriate and inappropriate uses of the TRL Scale.

Appropriate Uses	Inappropriate Uses
Identify technical gaps to be filled to advance the technology.	Evaluate investment required to advance the technology.
	Estimate the technical impact of the technology.
Perform a rough portfolio analysis in terms of technology maturity.	Analyze the market for the technology.
	Use as a single indicator for whether projects should continue.
Serve as a “shorthand” when discussing the project status, internally and externally.	Use to evaluate projects designed to facilitate implementation of an existing technology.
	Use to evaluate projects that include multiple subprojects with different user communities or underlying technologies.

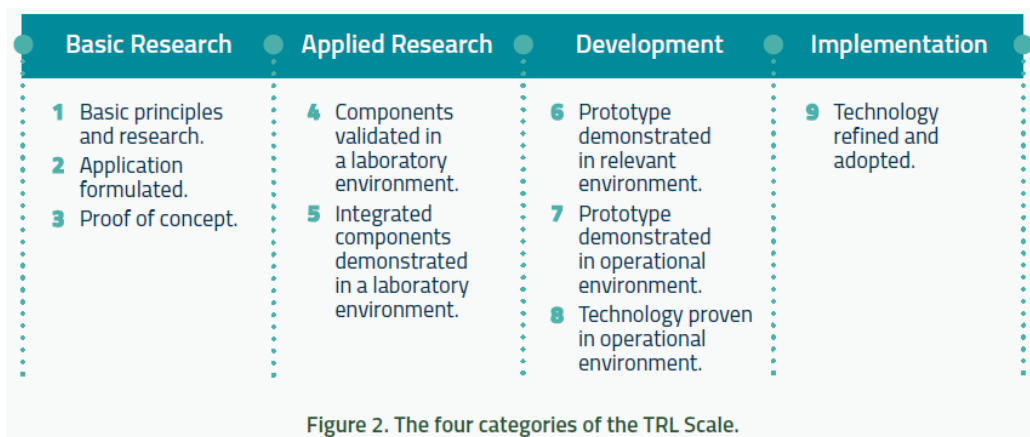


Figure 2. The four categories of the TRL Scale.

Table 2. Descriptions and requirements of TRLs 1, 2, and 3.

TRL	Description	Requirements
1	Basic principles and research	<ul style="list-style-type: none"> Do basic scientific principles support the concept? Has the technology development methodology or approach been developed?
2	Application formulated	<ul style="list-style-type: none"> Are potential system applications identified? Are system components and the user interface at least partly described? Do preliminary analyses or experiments confirm that the application might meet the user need?
3	Proof of concept	<ul style="list-style-type: none"> Are system performance metrics established? Is system feasibility fully established? Do experiments or modeling and simulation validate performance predictions of system capability? Does the technology address a need or introduce an innovation in the field of transportation?

Table 3. Descriptions and requirements of TRLs 4 and 5.

TRL	Description	Requirements
4	Components validated in laboratory environment	<ul style="list-style-type: none"> Are end-user requirements documented? Does a plausible draft integration plan exist, and is component compatibility demonstrated? Were individual components successfully tested in a laboratory environment (a fully controlled test environment where a limited number of critical functions are tested)?
5	Integrated components demonstrated in a laboratory environment	<ul style="list-style-type: none"> Are external and internal system interfaces documented? Are target and minimum operational requirements developed? Is component integration demonstrated in a laboratory environment (i.e., fully controlled setting)?

Table 4. Descriptions and requirements of TRLs 6, 7, and 8.

TRL	Description	Requirements
6	Prototype demonstrated in relevant environment	<ul style="list-style-type: none"> Is the operational environment (i.e., user community, physical environment, and input data characteristics, as appropriate) fully known? Was the prototype tested in a realistic and relevant environment outside the laboratory? Does the prototype satisfy all operational requirements when confronted with realistic problems?
7	Prototype demonstrated in operational environment	<ul style="list-style-type: none"> Are available components representative of production components? Is the fully integrated prototype demonstrated in an operational environment (i.e., real-world conditions, including the user community)? Are all interfaces tested individually under stressed and anomalous conditions?
8	Technology proven in operational environment	<ul style="list-style-type: none"> Are all system components form-, fit-, and function-compatible with each other and with the operational environment? Is the technology proven in an operational environment (i.e., meets target performance measures)? Was a rigorous test and evaluation process completed successfully? Does the technology meet its stated purpose and functionality as designed?

Table 5. Description and requirements of TRL 9.

TRL	Description	Requirements
9	Technology refined and adopted	<ul style="list-style-type: none"> Is the technology deployed in its intended operational environment? Is information about the technology disseminated to the user community? Is the technology adopted by the user community?

Review: Panel organizers provide the panel with—or offer them access to—technical deliverables for a project, in addition to the framing documents. Deliverables may include research project proposal; technical reports produced by the research team; and any interim and final reports, presentations, or published papers. If possible, the project PI should complete a “self-assessment” of the project using the TRL Scale and share it with the panel in advance of the TRL Assessment

NOTE: For further details of the forms, Q&A list, Investigation, assessment reports please refer to Appendix of TRL Assessment guide- IMP.pdf

SELF-ASSESSMENT: *We, at Bhadale IT (startup) are in range Level RL 1-3, precisely to say at Level 1. We are doing internal research and literature review and have identified several key technology areas and related product+ services concept. We are working towards the details of the Prototype that will be mini tested inside our own home lab setup. Later on once we are ready with the first viable solution; we plan to demo that to our investors, R&D units for grants that enable moving to TRL Level 2 and further progressing to RLs 4-6 into a full lab environment that lead to making a decision for full blown production of few of our products that are mostly likely to meet market needs*

ISO standard for TRL

<https://www.iso.org/standard/56064.html>

ISO 16290:2013 defines Technology Readiness Levels (TRLs). It is applicable primarily to space system hardware, although the definitions could be used in a wider domain in many cases.

Projects

<https://www.asc-csa.gc.ca/eng/funding-programs/funding-opportunities/ao/2018-stdp-ao-5-4.asp>