



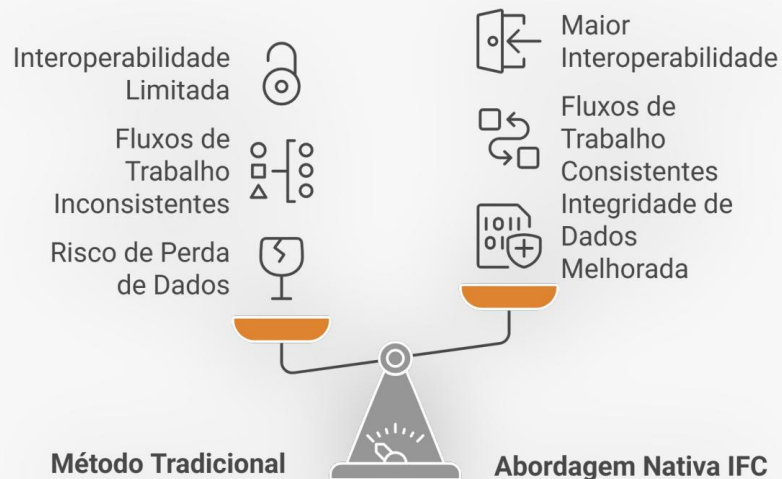
Native IFC in FreeCAD

A New Approach to BIM Modeling

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Free Software - FreeCAD

Introduction

FreeCAD is an open-source 3D CAD modeling platform that has been gaining prominence in the context of building information modeling (BIM). Traditionally, the use of the IFC (Industry Foundation Classes) format in BIM software occurs through the import and export of files, which can generate data loss and inconsistencies throughout the workflow. **With the introduction of the Native IFC concept in FreeCAD, this approach evolves into a model where IFC becomes the main working format, ensuring greater fidelity and interoperability in project development.**



Comparando Métodos Tradicional e Nativo IFC no FreeCAD

What is IFC?

The IFC (Industry Foundation Classes) format is an open and internationally recognized standard for the digital representation of civil construction components. Created to enable interoperability between different BIM platforms, **the IFC uses a structure based on the STEP format** and is human-readable, which allows it to be directly manipulated as a database. Its adoption allows projects to be shared and edited by different teams without the need for frequent conversions between different proprietary formats.

```
FILE_NAME('/dev/null','2025-03-13T00:23:45-03:00',(),(),'IfcOpenShell 0.0  
FILE_SCHEMA(('IFC4'));  
ENDSEC;  
DATA;  
#1=IFCPROJECT('2ig7mGX4z0XRJqf98yoM1$',$,,$,$,$,$,$,($13,$17),#23);  
#2=IFCPERSON('Hseldon','PedroHenrique','Hari',$,,$,$,$,$);  
#3=IFCORGANIZATION('APTR','HRCampacta',$,,$,$);  
#4=IFCPERSONANDORGANIZATION(#2,#3,$);  
#5=IFCACTORROLE(.USERDEFINED.,'CONTRIBUTOR',$);  
#6=IFCTELECOMADDRESS(.USERDEFINED.,$, 'WEBPAGE',$,,$,$,$,'https://ifcopensh
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Problems with Conventional Use of IFC

Currently, IFC is widely used as an exchange format, being used mainly for exporting BIM models.

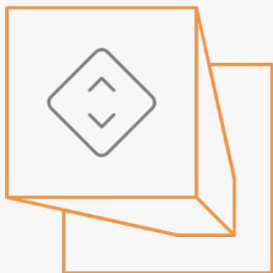
This process, however, presents several limitations, such as the loss of information during conversion, difficulties in tracking editions and problems in collaboration between different professionals. As a result, many companies end up resorting to proprietary solutions that restrict interoperability and increase project development costs.



Evaluating IFC Limitations vs. Development Cost

IFC Ideal

IFC Ideal equilibra interoperabilidade com baixos custos de desenvolvimento.



IFC com Alta Perda de Dados

IFC com Alta Perda de Dados aumenta custos devido à perda de informações.



IFC com Baixa Colaboração

IFC com Baixa Colaboração resulta em baixos custos, mas limita interoperabilidade.



Soluções Proprietárias

Soluções Proprietárias oferecem alta interoperabilidade, mas elevam custos.



The Concept of Native IFC

Given these limitations, the concept of Native IFC emerged, which proposes the use of IFC as the working format itself, eliminating the need for conversions. In this model, FreeCAD is able to open, create and modify IFC files directly, recording all changes in a clear and traceable manner. This approach transforms the way BIM projects are developed, promoting a more efficient and collaborative workflow.



Advantages of Native IFC in FreeCAD

The adoption of Native IFC in FreeCAD brings several advantages to construction professionals, engineers and architects.

First, it eliminates the need for constant exports, ensuring that project information remains intact throughout the process. Furthermore, using Native IFC facilitates collaboration between different teams, allowing multiple users to simultaneously edit the same file and integrate their changes in a structured manner. Another significant benefit is the possibility of using version control systems, such as Git, to track the history of changes to the project and manage contributions from different professionals.

Collaborative Workflow

With the implementation of Native IFC, the collaborative workflow is improved, allowing different professionals to work simultaneously on the same file without compromising the integrity of the project. The use of versioning tools, such as Git, allows each change to be recorded transparently, enabling the tracking of modifications and the reversal of any errors. This approach transforms the way BIM projects are managed, reducing conflicts between versions and ensuring greater control over the development of the model.

Compatible Tools and Applications

FreeCAD is one of the main software programs that adopts the Native IFC concept, offering support for the direct manipulation of IFC files. In addition, other tools and libraries have developed solutions to enhance this approach, allowing the integration of Native IFC with different BIM platforms. The evolution of this ecosystem is essential to consolidate the use of IFC as a working standard in the construction industry.



Case Study: Collaborative Design in FreeCAD

To illustrate the practical application of Native IFC, we can consider a collaborative project developed in FreeCAD. In this scenario, several professionals work simultaneously on the modeling of the building, using IFC files as the main base. Each contribution is recorded and integrated in a structured way, allowing the model to evolve without loss of information. The use of version control systems ensures that all modifications are documented and that any errors can be corrected quickly.

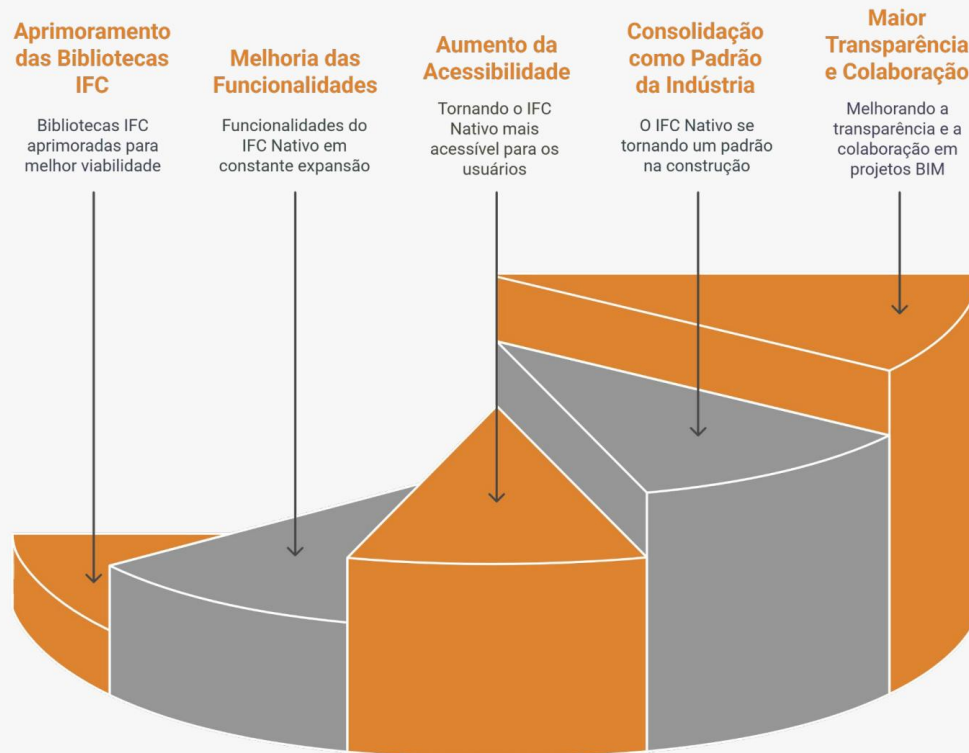
Challenges and Solutions

Although the Native IFC concept has numerous advantages, its implementation still faces challenges. One of the main obstacles is the adaptation of professionals to this new approach, since most are accustomed to the traditional IFC import and export model. In addition, compatibility with proprietary software can be a limiting factor, requiring the development of solutions to improve interoperability. However, initiatives such as FreeCAD and the improvement of IFC libraries are making this transition increasingly viable.

Future Perspectives

The future of Native IFC in FreeCAD is promising, with constant improvements being implemented to expand its functionality and make it even more accessible. The expectation is that this approach will become a standard in the construction industry, promoting greater transparency, collaboration and efficiency in BIM project management. As the tools evolve and knowledge about Native IFC spreads, the trend is for this methodology to become a viable and widely adopted alternative in the sector.

Native IFC Ladder



Comparison: Native IFC vs. Traditional Workflows

When comparing Native IFC with traditional workflows, a number of significant benefits can be observed. While the conventional approach requires constant file conversions, resulting in loss of information and difficulties in collaboration, Native IFC maintains data integrity and allows for a more efficient workflow. In addition, the use of versioning systems allows for more precise control of changes made to the project, ensuring greater reliability in the development of the BIM model.

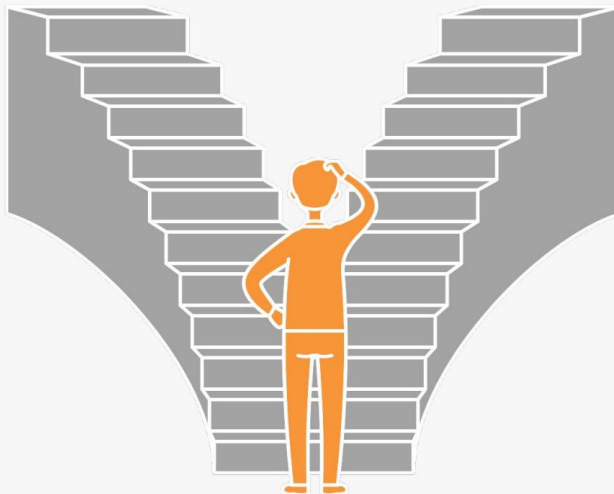
Path to follow

IFC Nativo

Mantém a integridade dos dados e melhora a eficiência do fluxo de trabalho.

Fluxos de Trabalho Tradicionais

Envolve conversões de arquivos que podem resultar em perda de dados.



Conclusion

The Native IFC concept represents a significant evolution in the way BIM projects are developed, providing greater interoperability, efficiency and collaboration. The implementation of this approach in FreeCAD demonstrates its potential to transform the construction industry, making processes more agile and transparent. The adoption of Native IFC not only eliminates the limitations of traditional methods, but also opens up new possibilities for BIM modeling and project management, consolidating itself as a promising path for the future of the industry.