GHOST – Gateway Host Nodes

*A paradigm shift in integration technology - by Ghost Labs AB*

Integration has become more difficult to handle. It has also become a capability that drives huge costs. When enterprises extend business globally, adds new applications and more computing paradigms, e.g. B2B growth, cloud adaptation (SaaS), social, mobile, and IoT/IIoT, just to name a few. The old integration standards are not fit for purpose anymore.

Old Integration Standards

Addressing the increasing integration challenges above, the present and centralized integration standards such as Enterprise service buses (ESBs) and Message brokers have limitations.

This resides partly on the integration logic for solving an integration problem that is highly distributed in its nature, by a centralized approach, which is even further accelerated when enterprises try to transform into digital business. Integrating big data or any things from human, machine and applications is emerging as the greatest challenge that enterprises face today.

Hence, a traditional centralized integration approach fails to deliver on implementation speed, cost, operations and control due to its complexity.
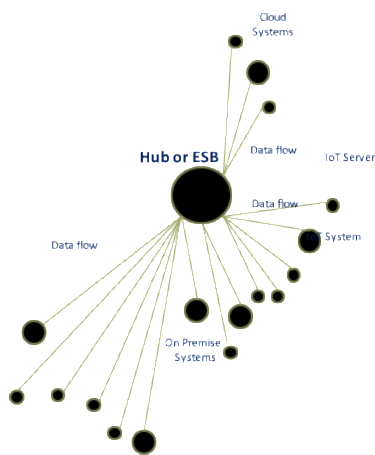
Example of old integration standard

New Integration Standards

A distributed architecture is a prerequisite to support innovation and an explorative rapid development style. This architecture also ensures low cost when scaling and supports reliable end-to-end operational monitoring, control and governance capabilities.
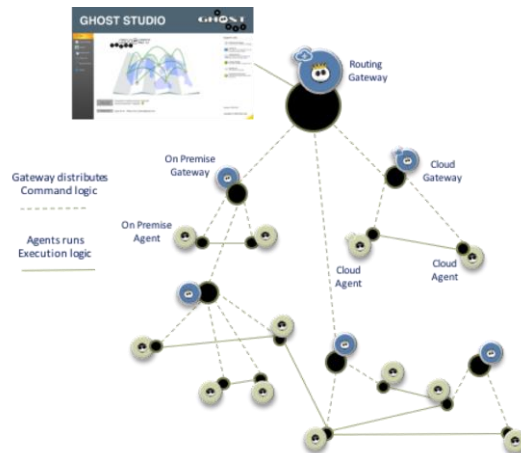
Example of the integration paradigm shift

The GHOST integration platform is fully distributed and also has proven capabilities as the key component in high frequency data collection and aggregation. It also ensures that logic can be pushed back out to an operating node (e.g. edge computing). This is typical for IoT/IIoT integration scenarios. It is also equally important for traditional integration patterns and scenarios.

The GHOST platform origins from traditional integration scenarios between applications within an organization, including its partners and cloud services, resulting in higher uptime and better quality of the integration infrastructure, while reducing operational cost and implementation effort substantially.

Why was GHOST invented?

The Applied Research Think-Tank Duqtor [1], in collaboration with the Department of Data and Systems Science at Stockholm University, and the Royal Institute of Technology, identified that current integration methods have challenges in current and future integration scenarios meeting the demands of Digitalization and various IoT/IIoT scenarios.

Based on this, a distributed integration platform has been designed, realized, and proven to significantly reduce costs, lead time and complexity while simplifying scalability, improving reliability and robustness [2].

The close cooperation with research institutions has ensured GHOST is built based on the latest research available. In late 2014 the GHOST integration platform made it to the final and top 10 out of 163 competitors in an EU wide contest for innovators in the category IoT [3].

GHOST can be used as the framework to create integrations and setup of nodes collecting data in a distributed landscape (also including partner and cloud environments). These nodes are key in the setup which is managed from a central configuration, development and control tool (the GHOST Studio).

From this central tool, the connection logic is then automatically pushed out in the distributed landscape as close as possible to the actual data sources. This allows point-to-point data flows that ensure the shortest and most efficient data transfer between data sources and applications. In addition to transport capabilities, the nodes can include adapters and processors that could be configured to hold algorithms for managing mapping, translation, aggregation and any business rule and logic that is desirable to place close to the data source before or after a data transfer. This minimizes incidents since the data is only translated once and is flowing point-to-point with the relevant data only.
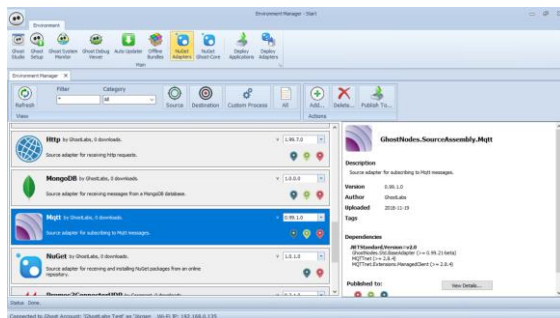
Ghost Studio with examples of GHOST Adapters

The adapters and processors ensure that data and information are processed and distributed to the right recipient in a network similar to the principles used in the Internet protocol.

Adapters distributed close to data sources can hold business rules and can also easily be configured through an open API. This allows for GHOST to be a key component in IoT/IIoT scenarios and Service Enablement Platforms, in addition to handle classical integration scenario setups, complementing or replacing integration solutions based on centralized architectures.

GHOST is designed to fit small-, mid-size and large companies. The pricing model is based on the actual use, i.e. no traditional license fees.

Distributed vs Central Integration Architecture

Integration is an exchange of information between different actors with an interpreter who translates from one format to another. In centralized approaches, typically seen in an Enterprise Service Bus (ESB) setup, the ESB become a single point of failure for all data transfers in addition to be the one point all data need to enter and be routed out of.

Just to ensure the ESB operates reliable and according to security and performance levels and up time requirements, the cost alone for the hardware to reliably operate the ESB become complex and very expensive. Compared to GHOST the total cost of ownership of these centralized solutions is remarkable (see figures under TCO below).

With a distributed solution, the data transfer can follow the shortest route and leverage existing hardware that the data sources already are running on. It also significantly increases traceability compared to a traditional centralized approach, as it allows for true end-to-end visibility within the control span of the data transfer, all visible in the GHOST monitoring dashboard.

With the end-points virtually at the very data sources, the distributed architecture offers reliable and secure data transfer in all situations, as all nodes also can be equipped with queuing capabilities and receipt mechanisms for processed data from the other end-point(s).

Central Governance

Even if GHOST can integrate point-to-point, the central management and control tool ensures a single point of management and monitoring. This is initially why hub-spoke approaches became so popular when introduced, some 15 years ago, as it allowed for better central governance and control of the integration landscape.

Hence, GHOST offers both the superior and low-cost point-to-point integration, combined with central control and configuration abilities. All in an intuitive tool with a user interface that simplifies configuration and support. Use of the GHOST approach has showed that design and configuration is more than 50% faster than in traditional approaches.
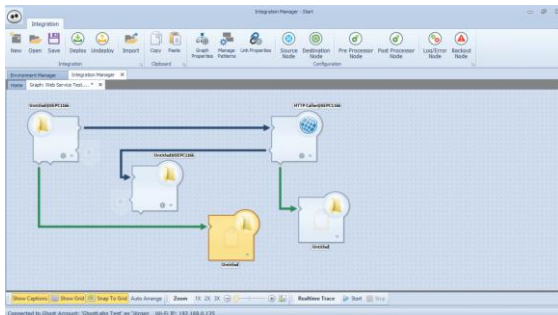

Ghost Studio with an example of how to design an integration

The system landscape set up with GHOST consists of gateways and agents. The gateways are parents to agents or other gateways, and make up the backbone of the governance and control infrastructure. The agents are process controllers, nursing and monitoring the integrations that are created in the GHOST Studio and deployed through the gateways.

Reconfiguration, e.g. data collection frequency and processing of data at the very source, is also easily managed from the GHOST Studio.

State of the art Architecture

The distributed and network-based architecture is *state of the art* in which the distributed solution will continue to function even if parts of the network or the system malfunctions. The solution can run entirely in the cloud, within the company's or partner networks, or as a hybrid (a combination of cloud and on premise).
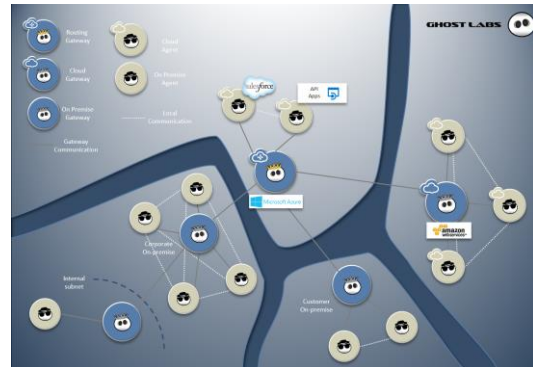
State-of-the-art integration architecture by GHOST

The logic of GHOST

An unlimited number of endpoints can be set up in GHOST. Also, a large number of endpoint adapters and processors are already available "out of the box" in GHOST.

GHOST monitors each steps of the integration chain with alarms when there is a deviance from the predetermined thresholds. This means that the failure of the integration chain can quickly be found, notifying the right people with the right skills for the job, or secure e.g. an automatic shutdown of a machine in real time.

TCO and Implementation Speed

Using the GHOST platform, TCO (Total Cost of Ownership) can be reduced by 70%. More than 50% better efficiency can easily be gained in the design, configuration and deployment of integrations.

GHOST is designed to run on existing hardware with a small footprint of the agents. The inbuilt reliable and secure data transfer notably reduces TCO compared to a more complex centralized solution.

GHOST Integration Platform Summary, January 2018

Reference Case Example

Benefits in a large industrial manufacturing company replacing a centralized integration platform with a distributed integration setup shows [4]:

- Overall operations & maintenance costs reduced > 70%
- Integration cost in new projects reduced >50% (from 35 to 15%)
- New/changed Integration implementation time reduced >30% due to less complexity and more configuration & reuse (less coding)
- Reliability/Quality: No of faults reduced >70% (#exceptions/100000 messages) due to improved monitoring plus identification & handling of exceptions
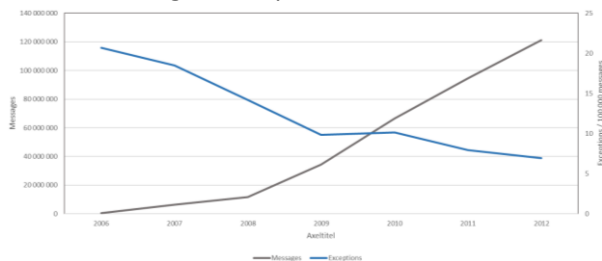
Reliability/Quality: 7 years evolution of transaction volume and message exceptions in a large industrial company

Who implements GHOST?

GHOST can easily be managed by companies and organizations themselves, or supported by GHOST implementation partners.

Start your GHOST experience here:
https://ghostnodes.com/gettingstarted/

Identified benefits by Solution & Integration Architects:

- Improved documentation (automatic)
- Innovation and future proof
- Control, speed, and less administration

"What GHOST has compared to all others, is a well structured framework that is currently not available on the market:
- *Fast to roll out*
- *Adaptable*
- *Self-updating, which is very good*
- *A lot of existing standard adapters available."*

Quote by a Solution Architect at a Large Telco Enterprise

References

[1] http://www.duqtor.com

[2] Research report: P2PIE: A new enterprise application integration solution. http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A868513&dswid=4681

[3] EIT ICT labs Idea Challenge 2014. EIT ICT Labs is a pan-European education and research-based innovation organisation.

[4]https://www.youtube.com/watch?v=dd08JCH3orM&feature=youtu.be

GHOST Integration Platform Summary, January 2018